Operation and Installation

Mobile Generator Sets

Models:

10CCOZ61

ISO 9001
KOHLER GENERATORS
INTERNATIONALLY REGISTERED
U.S.A. Plant ISO Registered

KOHLER®
POWER SYSTEMS

TP-5647 4/93a

Table of Contents

SUBJECT	PAGE
Safety Precautions	i
Section 1. Specifications	1-1
Introduction	1-1
General Specifications	1-1
Engine	1-2
Generator	1-3
Service Views	1-5
Section 2. Operation	2-1
Prestart Checklist	2-1
Exercising the Generator	2-1
Manual Controller Operation	2-2
Starting Procedure	2-4
Stopping Procedure	2-4
Coolant System Filling	2-5
Fault Shutdowns	2-6
Low Oil Pressure Shutdown Switch	2-6
High Water Temp. Shutdown Switch	2-6
Low Coolant Level Shutdown Switch	2-7
Low Fuel Level Shutdown Switch	2-7
Section 3. Scheduled Maintenance	3-1
General	3-1
Lubrication System	3-3
Oil Selection	3-3
Oil Check	3-3
Oil Change	3-4
Oil Filter	3-5
Fuel System	3-6
Specification	3-6
Fuel Filter	3-6
Fuel Filter (Supplied Loose)	3-7
Bleeding the Fuel System	3-7
Air Cleaner Service	3-8
Governor	3-8
Cooling System	3-9
Drive Belt	3-11
Belt Tension	3-11
Battery Charging	3-11
Battery	3-12
Cleaning	3-13
Checking Electrolyte Level	3-13
Checking Specific Gravity	3-14
Wattage Requirements	3-15
Generator Service	3-16
General	3-16
Storage Procedure	3-16
Section 4. Troubleshooting	4-1
Engine	4-1
Electrical System	4-5
Generator	4-6
Section 5. Wiring Diagrams	5-1
Section 6. Installation	6-1
Introduction	6-1
General Information	6-1
Features	6-1
Generator Selection and Wattage Requirements	6-2
Installation Factors	6-2
Electrical Load	6-3
Appliance Loads	6-3
Kilowatt Derating	6-3
Compartment Size	6-3
Air Requirements	6-5
Fuel System	6-8
Fuel Lines and Filters	6-9
Exhaust System	6-10
Electrical Systems	6-11
Battery and Connections	6-11
Section 7. Installation Drawings	7-1
Section 8. Service Ordering Instructions	8-1
Service Manual Procurement	8-1
Routine Service Parts	8-1
Section 9. Operating Hour Service Log	9-1

Glossary of Abbreviations

Abbreviations are used throughout this manual. Normally in the text they will appear in complete form with the abbreviation following in parentheses the first time they are used. After that they will appear in the abbreviated form. The commonly used abbreviations are shown below.

ABDC	after bottom dead center
AC	alternating current
AISI	American Iron and Steel Institute
AHWT	anticipatory high water temp.
ALOP	anticipatory low oil pressure
AM	amplitude modulation
amp.	ampere
amps.	amperes
ANSI	American National Standard Institute
API	American Petroleum Institute
approx.	approximate, approximately
A/R	as required, as requested
A/S	as supplied, as stated, as suggested
ASA	American Standards Association (former name of ANSI)
ASME	American Society of Mechanical Engineers
assy.	assembly
ASTM	American Society for Testing Materials
ATDC	after top dead center
aux.	auxiliary
A/V	audio-visual
AWG	American Wire Gauge
AWM	appliance wiring material
BBDC	before bottom dead center
BDC	before dead center
bhp	brake horsepower
bmep	brake mean effective power
B.&S.	Brown & Sharpe Wire Gauge
BTDC	before top dead center
Btu	British thermal unit
℃	Celsius degree
cc	cubic centimeter
CCA	cold cranking Amps.
CEC	Canadian Electrical Code
cfh	cubic feet per hour
cfm	cubic feet per minute
CID	cubic inch displacement
cm	centimeter, centimeters
cmm	cubic meters per minute
co.	company
cont'd.	continued
CPVC	chloropoly vinyl chloride
CRT	cathode ray tube
C.S.A.	Canadian Standards Association
CT	current transformer
cu. in.	cubic inch, cubic inches
cyl.	cylinder
dBA	decibels
DC	direct current
DCR	direct current resistance
deg.	degree
dept.	department
dia.	diameter
DIN	Deutsches Institut fur Normung e. V. (also Deutsche Industrie Normenausschuss)
e.g.	example given
EIA	Electronic Industries Association
EMI	electromagnetic interference
EPA	Environmental Protection Agency
etc.	etcetera, (and so forth)
ext.	external
℉	Fahrenheit degree
fl. oz.	fluid ounce, fluid ounces
FM	frequency modulation
ft.	foot, feet
ft. lbs.	foot pound, foot pounds
fs	full scale
ga.	gauge (meters, wire size)
gal., gals.	gallon, gallons
gal./hr.	gallons per hour
gph	gallons per hour
gpm	gallons per minute
gr.	grade
grd.	ground
HCHT	high cylinder head temperature
HET	high exhaust temperature
Hg	mercury (element)
H_2O	water
hp	horsepower
hr, hrs	hour
HWT	high water temperature
Hz	hertz (cycles per second)
ID	inside diameter
IEEE	Institute of Electrical and Electronics Engineers
in.	inch(es)
inc.	incorporated
in. lbs.	inch pounds
int.	internal
int.-ext.	internal-external

ISO	International Standards Organization
J	joule, joules
JIS	Japanese Industry Standard
kg	kilogram, kilograms
kg/cm^2	kilograms per square centimeter
kgm	kilogram meter(s)
km	kilometer, kilometers
kPa	kiloPascal, kiloPascals
kph	kilometers per hour
kV	kilovolt
kVA	kilovolt amperes
kW	kilowatt, kilowatts
kWH	kilowatt hour
L	liter, liters
L x W x H	length x width x height
LED, LEDs	light emitting diode
lb., lbs.	pound, pounds
L/hr.	liter per hour, liters per hour
L/min.	liter(s) per minutes,
LOP	low oil pressure
LP	liquefied petroleum
LWT	low water temperature
m	meter, meters
m^3	cubic meter, cubic meters
max.	maximum
MCM	one thousand circular mils.
MHz	megahertz
mi.	mile, miles
mil	one one-thousandth of an inch
min.	minimum
mJ	milli joule, milli joules
MJ	mega joule, mega joules
mm	millimeter, millimeters
m^3/min	cubic meters per minute
MPa	megaPascal
MPG	miles per gallon
mph	miles per hour
MS	military standard
mW	milliwatt, milliwatts
MW	megawatt, megawatts
N/A	not available
NBS	National Bureau of Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
meggar	megohmmeter
misc.	miscellaneous
NFPA	National Fire Protection Association
Nm	Newton meter, Newton meters
no., nos.	number, numbers
NPT	National Standard taper pipe thread per general use
N/R	not required
OC	overcrank
OD	outside diameter
OEM	original equipment manufacturer
OS	overspeed, oversize
OSHA	Occupational Safety and Health Act
OV	overvoltage
oz.	ounce, ounces
PF	power factor
PMG	permanent magnet generator
pot.	potentiometer
ppm	parts per million
psi	pounds per square inch
pt., pts.	pint, pints
PVC	polyvinyl chloride
qt., qts.	quart, quarts
qty.	quantity
ref.	reference
RFI	radio frequency interference
r.h.m.	round head machine (screw)
rms	root mean square
rpm	revolutions per minute
RV	recreational vehicle
SAE	Society of Automotive Engineers
SCR	silicon controlled rectifier
sec.	second, seconds
spec, specs	specification
sq.	square
sq. cm	square centimeters
sq. in.	square inch, square inches
tach	tachometer
TDC	top dead center
tech. pub.	technical publications
temp.	temperature
TIF	telephone influence factor
TP, TPs	technical publications
turbo	turbocharger
UHF	ultra high frequency
UNC	Unified coarse thread (was NC)
UNF	Unified fine thread (was NF)
UL	Underwriter ъ Laboratories, Inc.
US	undersize
V	volt, volts
VAC	volts alternating current
VDC	volts direct current
VHF	very high frequency
W	watt, watts

Safety Precautions and Instructions

A Generator Set, like any other electro-mechanical device can pose potential dangers to life and limb if improperly maintained or imprudently operated. The best way to prevent accidents is to be aware of the potential dangers and to always use good common sense. In the interest of safety, some general precautions relating to operating of a Generator Set follow. Keep these in mind. This manual contains several types of safety precautions which are explained below.

DANGER

Danger is used to indicate the presence of a hazard which *will* cause *severe* personal injury, death, or substantial property damage if the warning is ignored.

WARNING

Warning is used to indicate the presence of a hazard which *can* cause *severe* personal injury, death, or substantial property damage if the warning is ignored.

CAUTION

Caution is used to indicate the presence of a hazard which *will* or *can* cause *minor* personal injury or property damage if the warning is ignored.

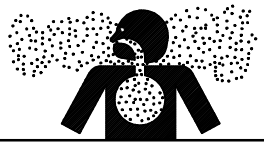
NOTE

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

Safety decals are affixed to the generator set in prominent places to advise the operator or service technician of potentially hazardous situations. The decals are reproduced here to improve operator recognition and thereby increase decal effectiveness. For a further explanation of decal information, reference the accompanying safety precautions. Before operating or servicing the generator set, be sure you understand the message of these decals. Replace decals if missing or damaged.

EXHAUST SYSTEM

⚠ WARNING



Carbon monoxide.
Can cause severe nausea, fainting, or death.

The exhaust system must be leakproof and routinely inspected.

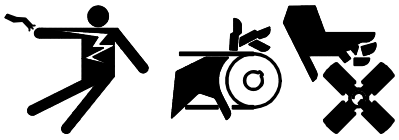
Carbon monoxide can cause severe nausea, fainting, or death. Install exhaust system tail pipe so discharged exhaust gases will not be drawn into vehicle interior through windows, doors, air conditioners, etc. Do not use flexible tail piping since this type could crack and allow lethal exhaust fumes to enter the vehicle.

Carbon monoxide can cause severe nausea, fainting, or death. Never operate the generator set inside a building unless the exhaust gas is piped safely outside. Never operate in any area where exhaust gas could accumulate and seep back inside an occupied building or vehicle. Be careful when parking your vehicle to avoid obstructing the exhaust outlet. The exhaust gases must discharge freely, otherwise carbon monoxide may deflect into the vehicle. Avoid breathing exhaust fumes when working on or near the generator set. Carbon monoxide is particularly dangerous because it is an odorless, colorless, tasteless, nonirritating gas which can cause death if inhaled for even a short period of time.

Carbon monoxide can cause severe nausea, fainting, or death. Diesel fumes can rapidly destroy copper tubing in diesel exhaust systems. Do not use copper tubing in diesel exhaust systems. Exhaust sulphur will cause rapid deterioration and this could result in exhaust leakage.

ACCIDENTAL STARTING

⚠ WARNING



Accidental starting.
Can cause severe injury or death.
Disconnect battery cables before working on generator set (negative lead first and reconnect it last).

Accidental starting can cause severe injury or death. Disconnect battery cables (remove negative lead first and reconnect it last) to disable generator set before working on any equipment connected to generator. The generator set can be started by remote start/stop switch unless this precaution is followed.

MOVING PARTS

⚠ WARNING

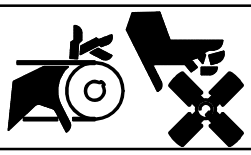
Hazardous voltage.

Moving rotor.

Can cause severe injury or death.

Do not operate generator set without all guards and electrical enclosures in place.

⚠ WARNING



Rotating parts.
Can cause severe injury or death.

Do not operate generator set without all guards, screens, or covers in place.

Exposed moving parts can cause severe injury or death. Keep hands, feet, hair, clothing, and test leads away from belts and pulleys when unit is running. Replace guards, covers, and screens before operating generator set.

Flying projectiles can cause severe injury or death. Retorque all crankshaft and rotor hardware after servicing. When making adjustments or servicing generator set, do not loosen crankshaft hardware or rotor thru-bolt. If rotating crankshaft manually, direction should be clockwise only. Turning crankshaft bolt or rotor thru-bolt counterclockwise can loosen hardware and result in serious personal injury from hardware or pulley flying off engine while unit is running.

ENGINE BACKFIRE/FLASH FIRE

⚠ WARNING

Fire.
Can cause severe injury or death.

Do not smoke or permit flame or spark to occur near fuel or fuel system.

A sudden backfire can cause severe injury or death. Do not operate with air cleaner removed.

HAZARDOUS VOLTAGE/ ELECTRICAL SHOCK

⚠ WARNING

Hazardous voltage.

Moving rotor.

Can cause severe injury or death.

Do not operate generator set without all guards and electrical enclosures in place.

⚠ WARNING

Hazardous voltage.
Backfeed to utility system can cause severe injury, death, or property damage.
Do not connect to any building electrical system without connecting through an approved device and after building main switch is open.

Hazardous voltage can cause severe injury or death. The heat sink of the voltage regulator contains high voltage. Do not touch voltage regulator heat sink when testing or electrical shock will occur. *(PowerBoost, PowerBoost III, and PowerBoost V Voltage Regulator Models only.*)

Hazardous voltage can cause severe injury or death. Perform electrical service only as prescribed in equipment manual. Be sure that generator is properly grounded. Never touch electrical leads or appliances with wet hands, when standing in water, or on wet ground as the chance of electrocution is especially prevalent under such conditions. Wiring should be inspected at the interval recommended in the service schedule–replace leads that are frayed or in poor condition. The function of a generator set is to produce electricity and wherever electricity is present, there is the hazard of electrocution.

Hazardous "backfeed" voltage can cause severe injury or death. The generator must not be used to "backfeed" by connecting it to building/campground electrical circuits. Install a transfer switch in vehicle generator installations to prevent connection of vehicle and other sources of power. Electrical backfeed into a utility electrical system can cause serious injury or death to utility personnel working on transmission lines.

Hazardous voltage can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage**.** Do not contact electrical connections with tools or jewelry while adjustments are made. Remove wristwatch, rings, and jewelry that can cause short circuits.

FUEL SYSTEM

⚠ WARNING

Explosive fuel vapors.
Can cause severe injury or death.

Use extreme care when handling, storing, and using fuels.

Explosive fuel vapors can cause severe injury or death. All fuels are highly explosive in a vapor state. Use extreme care when handling, storing, and using fuels. Store fuel in a well-ventilated area away from spark producing equipment and out of the reach of children. Never add fuel to the tank while the engine is running since spilled fuel may ignite on contact with hot parts or from ignition spark. Do not smoke or permit flame or spark to occur near potential sources of spilled fuel or fuel vapors. Keep fuel lines and connections tight and in good condition–don't replace flexible fuel lines with rigid lines. Flexible sections are used to avoid breakage due to vibration. Should any fuel leakage, fuel accumulation, or electrical sparks be noted, DO NOT OPERATE GENERATOR SET. Have systems repaired before resuming generator operation.

Explosive fuel vapors can cause severe injury or death. Spilled fuel can cause an explosion. Use a container to catch fuel when draining fuel system. Wipe up all spilled fuel after draining system.

HAZARDOUS NOISE

⚠ CAUTION

Hazardous noise.
Can cause loss of hearing.
Never operate generator without a muffler or with faulty exhaust system.

BATTERY

⚠ WARNING

Sulfuric acid in batteries.
Can cause severe injury or death.

Use protective goggles and clothes. Can cause permanent damage to eyes, burn skin, and eat holes in clothing.

Sulfuric acid in batteries can cause severe injury or death. Sulfuric acid in battery can cause permanent damage to eyes, burn skin, and eat holes in clothing. Always wear splash-proof safety goggles when working around the battery. If battery electrolyte is splashed in the eyes or on skin, immediately flush the affected area for 15 minutes with large quantities of clean water. In the case of eye contact, seek immediate medical aid. Never add acid to a battery once the battery has been placed in service. Doing so may result in hazardous spattering of electrolyte.

Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flame or spark to occur near a battery at any time, particularly when it is being charged. Avoid contacting terminals with tools, etc. to prevent burns and to prevent sparks that could cause an explosion. Remove wristwatch, rings, and any other jewelry before handling battery. Never connect negative (-) battery cable to positive (+) connection terminal of starter solenoid. Do not test battery condition by shorting terminals together or sparks could ignite battery gases or fuel vapors. Any compartment containing batteries must be well ventilated to prevent accumulation of explosive gases. To avoid sparks, do not disturb battery charger connections while battery is being charged and always turn charger off before disconnecting battery connections. When disconnecting battery, remove negative lead first and reconnect it last.

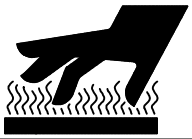
HOT PARTS

⚠ WARNING

Hot coolant and steam.
Can cause severe injury or death.

Before removing pressure cap stop generator, allow to cool and loosen pressure cap to relieve pressure.

⚠ WARNING



Hot engine and exhaust system.
Can cause severe injury or death.

Do not work on generator set until unit is allowed to cool.

Fire can cause severe injury or death. Hot exhaust system can ignite adjacent combustible materials. Do not locate electrical wiring, fuel lines, or combustible material above the exhaust muffler. Be careful when parking your vehicle to prevent grass fires started by exhaust system and hot exhaust gases.

Fire can cause severe injury or death. Hot generator can ignite debris in compartment. Keep the compartment and generator set clean and free of debris and combustible materials to minimize chances of fire. Do not block fuel/oil drain opening in generator mounting tray. If sub-flooring is used, cut a corresponding hole in the sub-flooring for drain opening.

Hot parts can cause severe injury or death. Do not touch hot engine parts. An engine gets hot while running and exhaust system components get extremely hot.

Hot coolant can cause severe injury or death. Allow engine to cool and release pressure from cooling system before opening pressure cap. To release pressure, cover the pressure cap with a thick cloth then turn it slowly counterclockwise to the first stop. After pressure has been completely released and the engine has cooled, remove cap. If generator set is equipped with a coolant recovery tank, check coolant level at tank.

NOTES

NOTE

This generator set does not comply with United States Coast Guard (U.S.C.G.) requirements and must not be used for marine applications. Use only generator sets specified for marine use in marine installations. U.S.C.G. Regulation 33CFR183 requires a generator set to be "ignition protected" when used in a gasoline-fueled environment.

NOTE

Do not "tee" into fuel injected fuel systems. Use a two dip tube arrangement for fuel supply. Consult an Authorized Kohler Service Dealer for further fuel system installation information.

NOTE

Wipe up all spilled diesel fuel after bleeding system. Wash hands after any contact with fuel oil.

NOTE

ENGINE DAMAGE! Failure to bleed air from cooling system may cause overheating and subsequent damage to engine.

NOTE

Special attention should be given when checking for proper coolant level. After the coolant has been drained, it normally requires some time before complete refill of the engine water jacket takes place.

Section 1. Specifications

Introduction

Your equipment includes a dependable Kohler alternating-current mobile generator set. Service requirements of the generator set are minimal but it is important that the required services be performed at the prescribed intervals. Please take a few moments to read through this manual then carefully follow all service recommendations to keep your set in top condition. In the space provided, record the MODEL, SPECIFICATION, SERIAL and ENGINE SPEC. numbers as found on the nameplate attached to the radiator bracket of the generator (see "Section 8 Service Ordering Instructions"). This information will enable your Kohler Generator Service Dealer/Distributor to supply the correct part or data for your particular version. Keep this manual in your vehicle for future reference. The illustrations in this manual are representative of most units. Your generator set may differ slightly from that shown.

General Specifications 10CCOZ-Mobile

Dimensions (Inline Radiator Model)
- L x W x H in. (mm) . . . . . 44.16 x 21.03 x 26.62 (1122 x 534 x 676)

Weight lbs. (kg) 605 (274)

Air Requirements
- Combustion CFM (M^3/min) 36 (1.02)
- Cooling CFM (M^3/min) 1300 (36.8)

Fuel Inlet Size in. (mm) 5/16 (8)

Fuel Return Size in. (mm) 3/16 (4.8)

Fuel Consumption:

Load	**25%**	**50%**	**75%**	**100%**
gph (Lph)	0.46 (1.7)	0.60 (2.3)	0.80 (3.0)	1.07 (4.0)

DERATION: All units are rated 1.0 power factor. The kilowatts of the generator set will decrease 3.5% for each 1,000 feet (305 meters) above 500 feet (152 meters) above sea level and 1% for each 10°F (5.5°C) above 85°F (30°C).

Engine

Some general engine specifications are listed below. Refer to the appropriate service section and the engine service manual for specific service details.

	10CCOZ
Manufacturer	Kubota
Model	V1305BG-2
Type	Water-cooled, 4-cycle diesel engine
Number Cylinders	4, in-line cylinders
Firing Order	1-3-4-2
Compression Ratio	22:1
Displacement cu. in. (cm^3)	81.46 (1335)
Rated Horsepower 60 Hz	18.6
RPM 60 Hz	1800
Bore in. (mm)	2.99 (75.95)
Stroke in. (mm)	2.90 (73.99)
Combustion System	Indirect Injection
Valve Clearance (cold) in. (mm)	0.0057-0.0072 (0.145-0.185)
Cylinder Block Material	Cast Iron
Cylinder Head Tightening Torque ft. lbs (Nm)	47-51 (64-69)
Cylinder Head Material	Cast Iron
Connecting Rod	Forged Carbon Steel
Piston Rings	2 Compression/1 Oil
Bearings	Replaceable Sleeve
Lubrication System	Pressure
Oil Capacity (with filter) qts. (L)	6.3 (6.0)
Oil Type (API)	MIL-L-2104C, or API classification of CC, CD, or CE
Oil Pressure psi (kPa)	36-64 (248-441)
Fuel Recommendation	Diesel Fuel No. 2-D (ASTM D975)
Fuel Injection Pump	Bosch MD
Battery Voltage	12
Battery Recommendation (min.)	450 CCA for use in ambient temperatures above 32°F (0°C)
	625 CCA for use in ambient temperatures below 32°F (0°C)
Starter Motor	Gear Reduction Type
Cooling System	Liquid
Cooling System Capacity qts. (L)	5.1 (4.8)
Cold Weather Starting Aids	Glow Plugs
Air Intake Restriction Limit:	
(Installation)	8 inches (200 mm) of water
(After Use)	25 inches (635 mm) of water
Back Pressure Limit (maximum)	28 inches (700 mm) of water

Generator

	10CCOZ
Rated kW	10
Frequency Hz	60
Rated Voltage	120/240 volt, 3 wire, single phase
Rated Amps. (120/240 volt)	41.7
Stator Resistance (ohms)** Leads:	
1-2, 3-4, 33-44	1.6
55-33	0.1
B1-B2	0.1
Rotor Resistance (ohms)	3.9
Exciter Field Resistance (ohms)	4.8
Exciter Armature Resistance L-L (ohms)	1.2
Excitation Method	Rotating Exciter
Overbolt Torque ft. lbs. (Nm)	30 (40.68)
Voltage Regulator Type	PowerBoostä V
Insulation (Rotor and Stator)	Class 155, Epoxy Varnish, Vacuum Impregnated
Winding Material	Copper
Bearing, Number and Type	1, Replaceable Ball
Circuit Protection:	
Controller (Input)	10 Amp. Fuse
Fuel Solenoid	10 Amp. Fuse
PowerBoost V Sensing Leads	(2) 1.5 Amp. Fuse

** Most ohmmeters will not give accurate readings when measuring less than 1 ohm. The stator can be considered good if a low resistance reading (continuity) is obtained and there is no evidence of shorted windings (discoloration). Do not confuse a low resistance reading with a reading indicating a shorted winding.

Service View Components

1. Controller
2. Voltage Regulator
3. High Water Temperature Shutdown Switch
4. Fuel Return Connection Point
5. Intake Manifold
6. Injectors
7. Injector Pump
8. Oil Fill
9. Pressure Cap/Initial Coolant Fill
10. Lifting Eye
11. Generator Nameplate
12. Oil Fill
13. Low Coolant Level Shutdown Switch
14. Governor
15. Inline Radiator
16. Coolant Drain
17. Oil Filter
18. Oil Drain
19. Fuel Filter
20. Equipment Ground Location
21. Fuel Pump
22. Fuel Inlet Connection Point
23. Glow Plug Relay
24. Oil Level Check
25. Fuel Solenoid
26. Low Oil Pressure Shutdown Switch and Sender
27. Battery Charging Alternator
28. Water Temperature Sender
29. Exhaust Outlet
30. Lifting Eye
31. Starter
32. Belt Guard

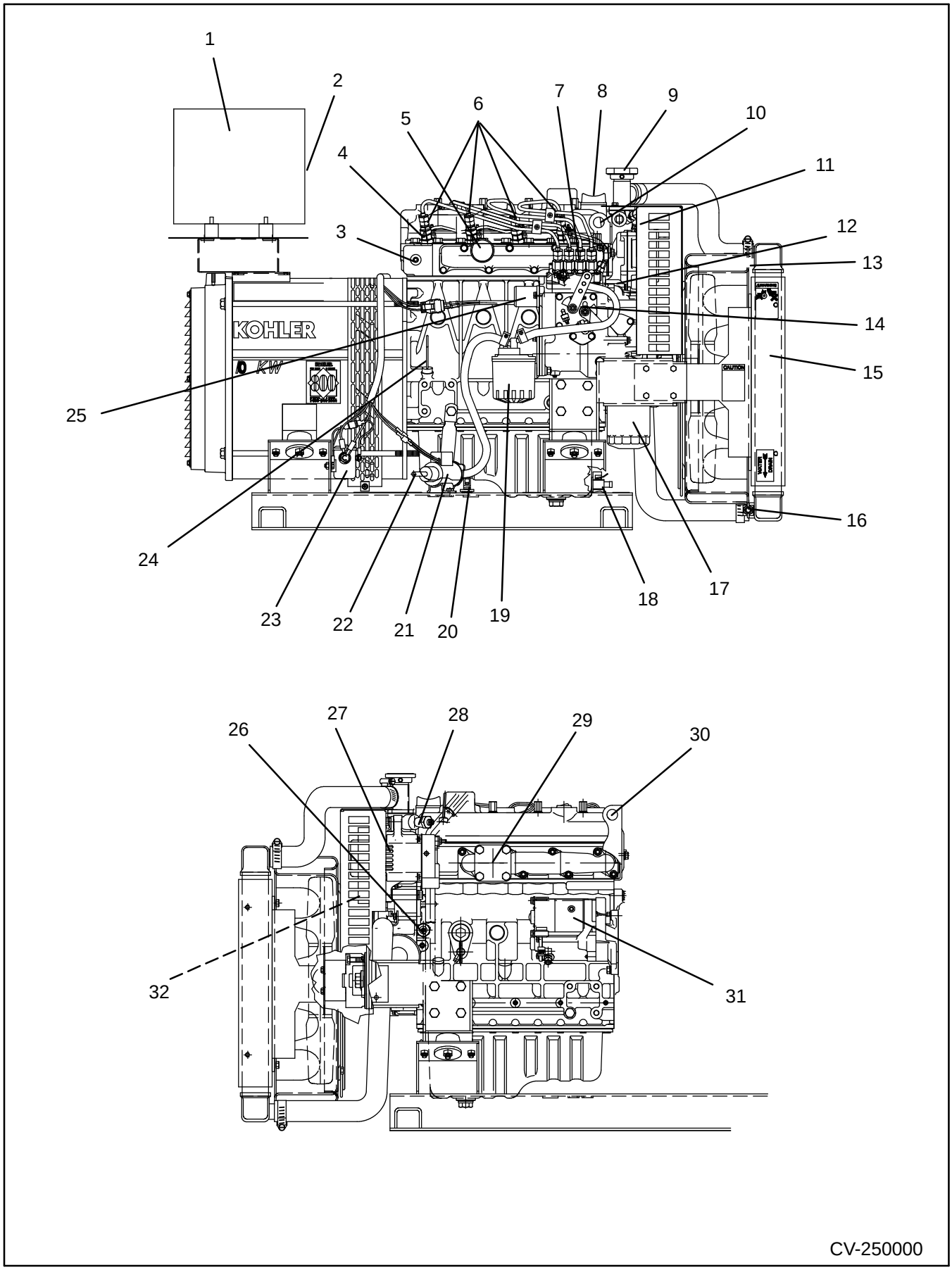


Figure 1-1. Service View - Typical (10CCOZ).

Section 2. Operation

To insure continued satisfactory operation, the following items should be checked before each startup.

Prestart Checklist

OIL LEVEL: Should be at or near Full mark (not over).

AIR INLETS: Must be clear and unobstructed.

COMPARTMENT: Interior must be clean. Check the condition of fuel system, exhaust piping, hoses, and muffler. If fuel leaks, fumes, exhaust gases, or electrical sparks are noted, contact a qualified service technician before operating generator set.

AIR CLEANER: Must be clean and properly installed to prevent unfiltered air from entering the engine.

ELECTRICAL: All connections (including battery) must be tight.

FUEL LEVELS: Make sure the fuel tank(s) are full and the fuel system primed for operation.

COOLING: If the cooling system is equipped with a coolant recovery tank, check coolant level (and refill coolant as necessary) at tank. Maintain level according to markings on the tank. Coolant level should be just below the filler neck [approx. 3/4 to 1 1/2 in. (19.38 mm)] when the engine is cold.

BATTERY: Check connections and level of battery electrolyte.

DRIVE BELTS: Check radiator fan, water pump, and the battery charging belt to make sure it is properly tensioned and in good condition.

OPERATING AREA: Make sure there are no obstructions that could block the flow of cooling air. Make sure the area is clean. Rags, tools, or debris must not be left on or near the generator set.

EXHAUST SYSTEM: Exhaust outlet must be clear; silencer and piping must be tight and in good condition. Exhaust gas must be vented safely outside.

Exercising the Generator

Run the generator set once a week for one hour (under load). The operator should be in attendance during this period. Be sure to make all "Prestart Checks" before starting the exercise procedure. Start the generator set according to the procedure given for the generator controller.

Manual Controller Operation

The Manual Controller is designed for prime power applications and is used on the 10CCOZ-Mobile diesel generator. For identification of Manual Controller components and an explanation of their function, refer to Figure 2-1 and the following descriptions.

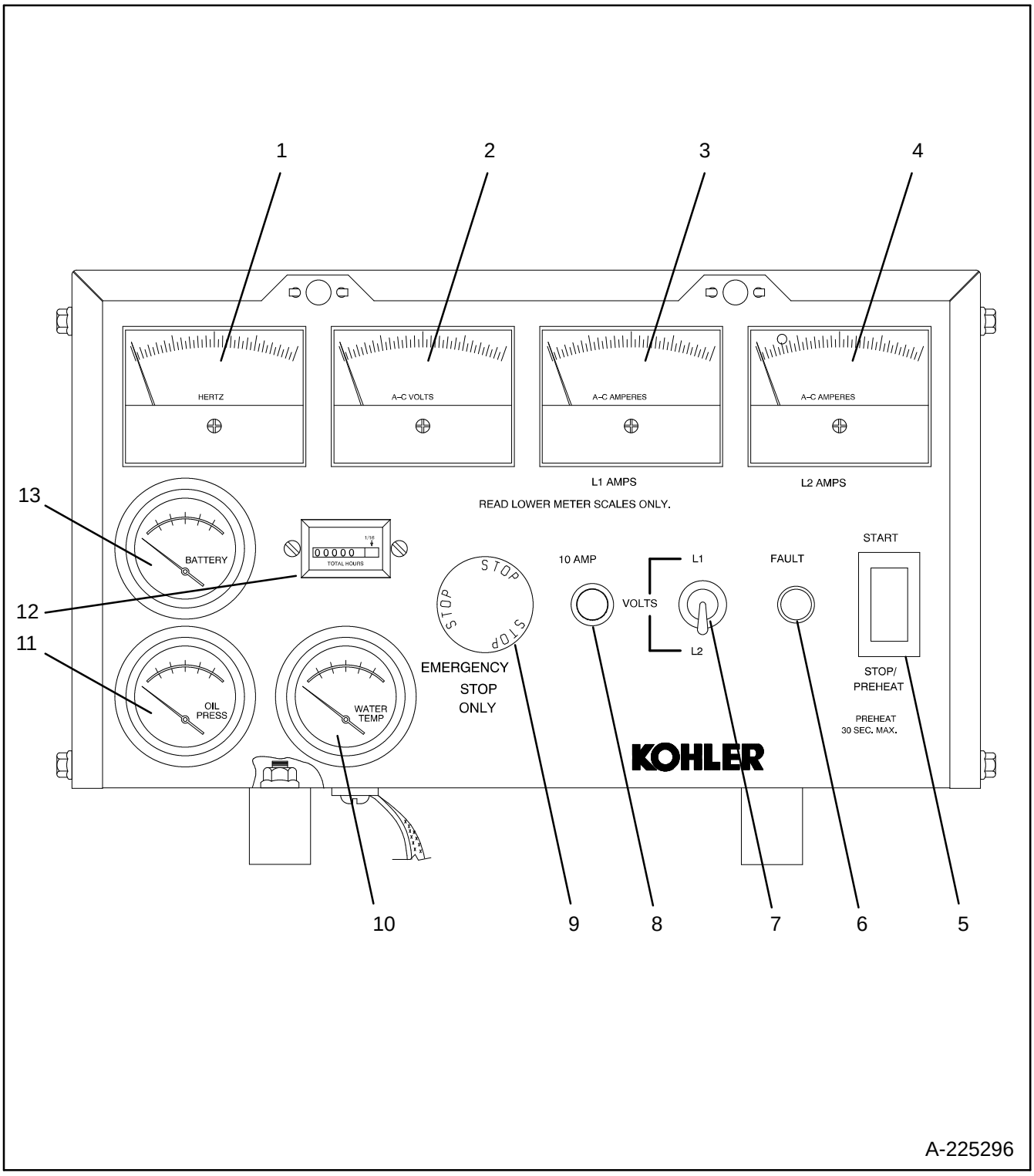


Figure 2-1. Controller

Features

1. **Frequency Meter** measures frequency (Hz) of generator output voltage.

2. **AC Voltmeter** measures voltage across output leads indicated by the voltage toggle switch.

3. **AC Ammeter (L1 Amps)** measures amperage from output lead L1.

4. **AC Ammeter (L2 Amps)** measures amperage from output lead L2.

5. **Start-Stop/Preheat Switch** is used to start, stop, and preheat the generator set. The start-stop/preheat switch serves a dual function of generator operation and generator preheat. When pressed to the "preheat" position, the preheat switch aids in cold-weather starting. Refer to "Start/Stop" and "Preheating" procedures following.

6. **Fault Lamp** lights during engine shutdown if the engine has shut down due to high engine temperature, low oil pressure, low water level, low fuel level, or overspeed faults. See "Fault Shutdowns" following for additional shutdown information. (Fault lamp will not stay lit after unit shuts down. Fault lamp will only light as fault occurs. Fault lamp will also light for an emergency stop.)

7. **Voltage Toggle Switch** selects the Line 1 (L1) or Line 2 (L2) output voltages to be measured.

8. **10 Amp. Fuse** protects the controller circuitry from short circuits and overloads.

9. **Emergency Stop Switch** instantly shuts down the generator set in emergency situations. Reset the switch after the shutdown by rotating the switch clockwise. *THE EMERGENCY STOP SWITCH IS INTENDED FOR EMERGENCY SHUTDOWNS ONLY.* Use the generator stop switch to stop the set under normal circumstances.

10. **Water Temperature** indicates engine coolant temperature.

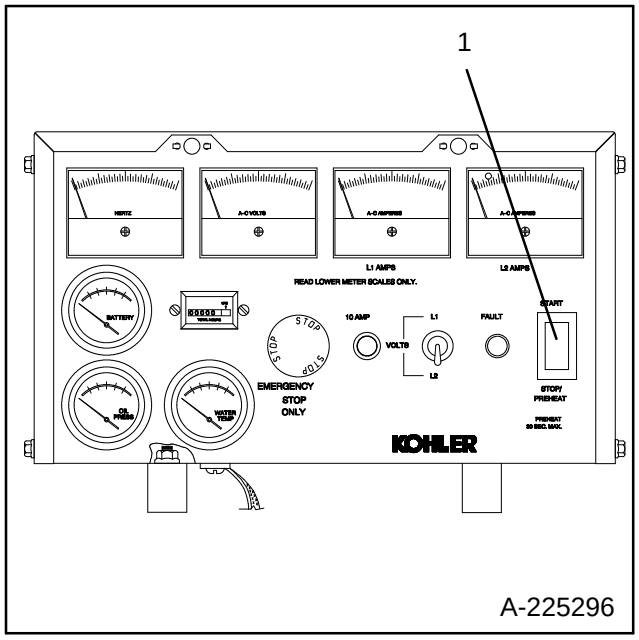
11. **Oil Pressure** indicates engine oil pressure.

12. **Hourmeter** records generator set total operating hours for reference in scheduling maintenance.

13. **DC Voltmeter** indicates voltage of battery(ies).

Starting Procedure

The generator is equipped with a preheat feature. Place controller start switch in STOP/PREHEAT position for the amount of time shown in Figure 2-3 before attempting to start the generator set. This provides energizing of the glow plugs. Do not energize preheat feature for more than 20 seconds or damage may occur. See Figure 2-2. Move the START-STOP switch into the START position and hold in this position until the engine is running, then release. Do not crank engine continuously for more than 10 seconds at a time. A 60-second cooldown period must be allowed between cranking attempts if the engine does not start. If the unit fails to start after three attempts contact an Authorized Service Dealer/Distributor for repair. Failure to follow these guidelines may result in damage to the starter motor.



1. - Preheat Switch

Figure 2-2. Preheat Switch Location.

Ambient Temperature	Preheating Time
Above 23°F (–5°C)	Approx. 5 Seconds
Below 23°F (–5°C)	Approx. 10 Seconds
Limit of Continuous Use	20 Seconds

Figure 2-3. Preheating Time.

NOTE

If the engine starts and then stops, allow the engine to come to a complete stop before making a restart attempt. If the flywheel ring gear is still rotating when the starter pinion gear is engaged, the pinion gear will clash which may damage the ring gear teeth.

Stopping Procedure

Whenever possible, allow a brief cooling period by running the set at low or no load for a few minutes just prior to shutdown. To stop, push the switch into the STOP/PREHEAT position. If the generator set shuts down automatically, identify and correct the problem before attempting to restart.

NOTE

Do not place Start-Stop/Preheat Switch in Stop/Preheat position for more than 20 seconds or damage may occur to the preheat feature.

Coolant System Filling

The low-profile coolant system of the 10CCOZ-Mobile generator set provides a compact design but requires that a coolant recovery system be utilized to ensure that the system remains full of coolant. It is also required that the unit be filled using special precautions to ensure that it does, in fact, get filled with fluid before the unit is placed into service. The unit includes a Low Coolant Level (LCL) switch, which provides protection against operation with low coolant.

Due to the configuration of the system and its extremely low profile, it is necessary to fill the system with coolant *VERY SLOWLY* to allow air to escape fully from the radiator and the engine block. Once the coolant system seems to be full, some air may still remain trapped in the system. Often, when the unit is started and run for approximately 10 to 15 minutes after filling, a shutdown will be experienced or the unit may continue to run but will not start at the next attempt. If either of these conditions occur, the shutdown may be due to low coolant level in the radiator. As a remedy for this, add one to two cups of coolant to the radiator. Be sure to connect the coolant recovery tank to the system, as it is an integral and required part of the cooling system. Once the unit has been refilled after the initial fill, the coolant recovery system will replace the last small amounts of air, which remain trapped in the cooling system, with coolant.

Often, when troubleshooting the unit, the low coolant level and the low fuel level are overlooked as possible causes for a shutdown. Any time a unit shuts down, and no other cause can be found, check for a low fuel or low coolant level condition. Remove the radiator pressure cap from the engine very slowly, releasing hot coolant into the coolant recovery tank if the unit is hot.

At scheduled maintenance intervals, the coolant should be checked cold at the coolant recovery tank, as well as, at the pressure cap prior to starting the unit for its maintenance. Add coolant at the pressure cap if it is not completely full. Add coolant to the recovery tank to bring the level up to the appropriate mark.

NOTE

Do not use ether or any other starting fluid to assist in starting the unit under cold conditions. This is an indirect fuel-injected engine and severe engine damage is likely.

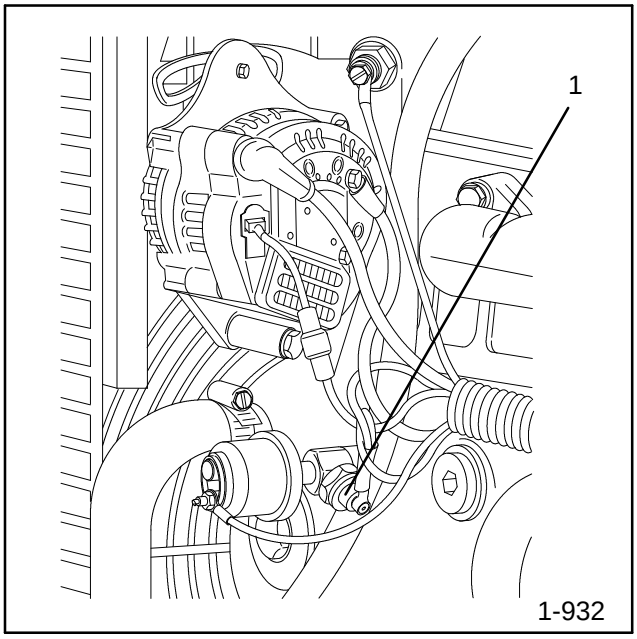
Fault Shutdowns

Low Oil Pressure Shutdown Switch

The low oil pressure (LOP) shutdown feature protects the engine against internal damage if the oil pressure drops below 7 psi (48.3 kPa) due to an oil pump fault or other engine malfunction. The LOP shutdown does not protect the set from damage due to operating with the oil level below the safe range– IT IS NOT A LOW OIL *LEVEL* SHUTDOWN. The only protection against running out of oil is to check the oil level regularly and add oil as needed. Location of the LOP shutdown switch is shown in Figure 2-4.

NOTE

This is not a low oil *level* shutdown. Proper oil level must be maintained for low oil pressure shutdown switch to function

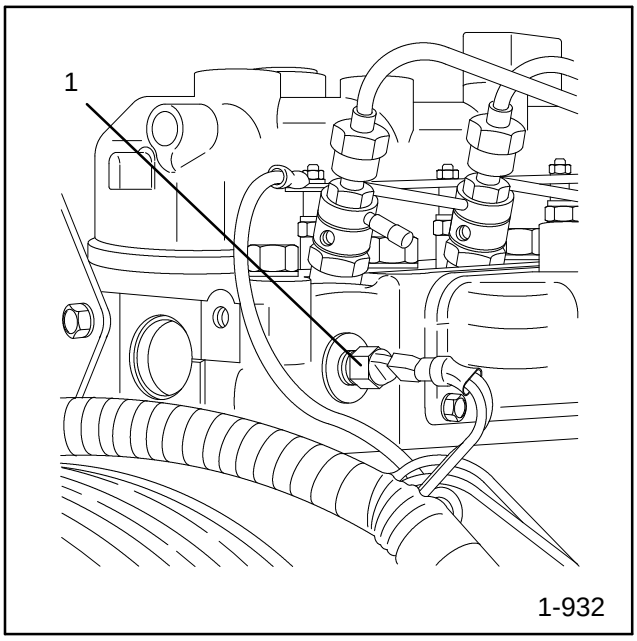


1. - Low Oil Pressure Switch

Figure 2-4. Low Oil Pressure Shutdown Switch.

High Water Temperature Shutdown Switch

The generator set is also equipped with a high water temperature (HWT) shutdown switch. See Figure 2-5. The unit will automatically shut down when the engine coolant temperature exceeds 230°F (110°C). Cause of the shutdown must be corrected before the generator can be restarted.

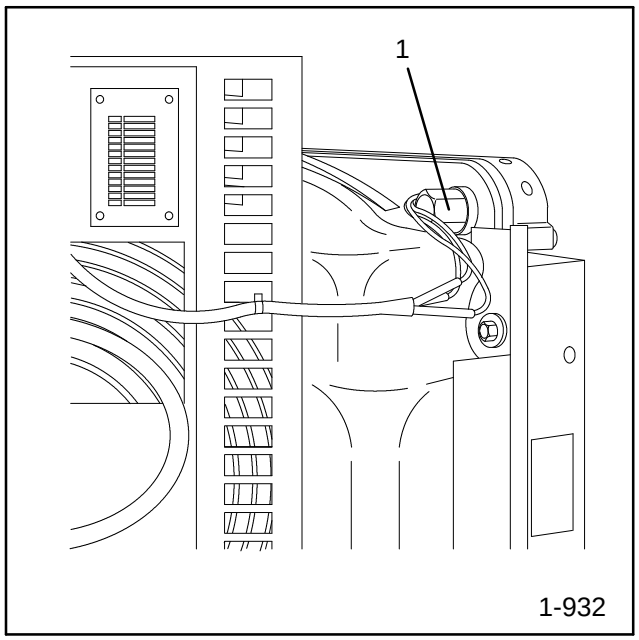


1. - High Water Temperature Switch

Figure 2-5. High Water Temperature Shutdown Switch.

Low Coolant Level Shutdown Switch

If the engine coolant falls below the "safe" range in the radiator, the generator will automatically shutdown. The generator set will not run until coolant is added to reach the specified level. The Low Coolant Level (LCL) shutdown switch will not function during the first five seconds after startup. Location of the LCL shutdown switch is shown in Figure 2-6.



1. - Low Coolant Level Switch

Figure 2-6. Low Coolant Level Shutdown Switch.

Low Fuel Level Shutdown Switch

Provisions have been made in the wiring harness for wiring a Low Fuel Level (LFL) switch to the generator. A LFL switch will shut the unit down in the event that the fuel nears empty. Running a diesel engine out of fuel completely results in a dry fuel injection system which must be completely bled in order to restart the engine after refilling the fuel tank. The LFL switch prevents the fuel system from being run dry, thus allowing immediate restarting, once the fuel tank has been refilled.

Section 3. Scheduled Maintenance

General

Schedule routine maintenance using the "Maintenance Schedule" following and the hourmeter located on the generator controller. If the generator will be subject to extreme operating conditions, service the unit more frequently. Instructions to perform most of the scheduled services are provided in the following pages. Items in the maintenance schedule marked with an asterisk (*) should be performed more often if the generator set is operated in dirty, dusty conditions. Items identified with asterisks (**) should only be performed by an Authorized Kohler Service Dealer/Distributor. Usually, tools and instruments required for these additional steps are not available to the generator set owner. For this reason, the set should be returned periodically to an authorized Service Dealer/Distributor for complete servicing and tune-up. The benefits of such service will be improved performance and continuous satisfactory operation during a long trouble free service life.

NOTE

The items listed in the maintenance schedule must be performed at the designated intervals for the life of the generator. For example, an item to be serviced "Every 100 Hours or 3 Months" must also be serviced after 200 Hours or 6 Months, 300 Hours or 9 Months, etc. The generator will eventually accumulate enough hours to warrant a complete overhaul. The exact time at which extensive service will be necessary cannot be predicted. However, rough operation, lack of power, and excessive oil use indicate serious generator set problems. As part of a preventive maintenance program, service the engine (clean cylinder head, inspect valves, check compression, etc.) and generator (replace bearing, inspect wiring, remove debris, etc.) at the earliest indication that a serious problem exists.

Perform Service at Intervals Indicated (X)	Before Each Startup	Every 50 Hours or 1 Month	Every 100 Hours or 3 Months	Every 400 Hours or 6 Months	Every 500 Hours or Yearly
FUEL SYSTEM					
Check the fuel level	X				
Fill fuel tank	X				
Check fuel pipes and clamps		X			
Remove sediment from fuel tank				X	
Replace the fuel filter element				X	
Check governor operation and adjust as necessary**					X
Check the nozzle injection pressure**					X (1000 Hrs)
Check and/or replace fuel filter (supplied loose)			X		
LUBRICATION SYSTEM					
Check the oil level in crankcase	X				
Replace the oil in crankcase*		X (Break-in Period)	X		
Replace the lube oil filter element*		X (Break-in Period)	X		
COOLING SYSTEM					
Check coolant level	X				
Check water pipes and clamps			X		
Adjust the tension of water pump V-belt		X (Break-in Period)	X		
Change coolant					X
Clean radiator fins, inspect hoses			X		
AIR CLEANER					
Replace the air cleaner element*,***				X (300 Hrs)	
Clean the breather pipe*, ***			X		
ELECTRICAL SYSTEM					
Verify proper operation of gauges (if equipped)	X				
Check the electrolyte level in the battery	X				
Check the electrical connections		X			
Check the battery specific gravity			X		
Adjust battery charging alternator V-belt			X		
CYLINDER HEAD					
Check for leakage of water and oil	X	X			
Retighten all major nuts and bolts		X (Break-in Period)			X
Check mounting bolts and vibro mounts for tightness				X	
Adjust intake/exhaust valve clearance**					X (800 Hrs)
GENERATOR					
Blow dust out of generator*					X

* Service more frequently if operated in dusty areas.
** Should be performed by an authorized Kohler Service Dealer/Distributor.
*** If this schedule conflicts with the manufacturer's instructions, follow the manufacturer's recommendation.

Lubrication System

Your engine has a positive pressure lubrication system and low oil pressure shutdown.

Oil Selection

The selection of engine oil is very important to a diesel engine. If an unsuitable oil is used or an oil change is neglected, it may result in damage and a shorter engine life. Oil must meet the American Petroleum Institute (API) classification of CC, CD or CE. Avoid mixing different brands of oils and lubricants; oils of different manufacturers may be incompatible and deteriorate when mixed. Recommended SAE viscosity designation for given temperature ranges in which the generator set will be operated are listed in Figure 3-1.

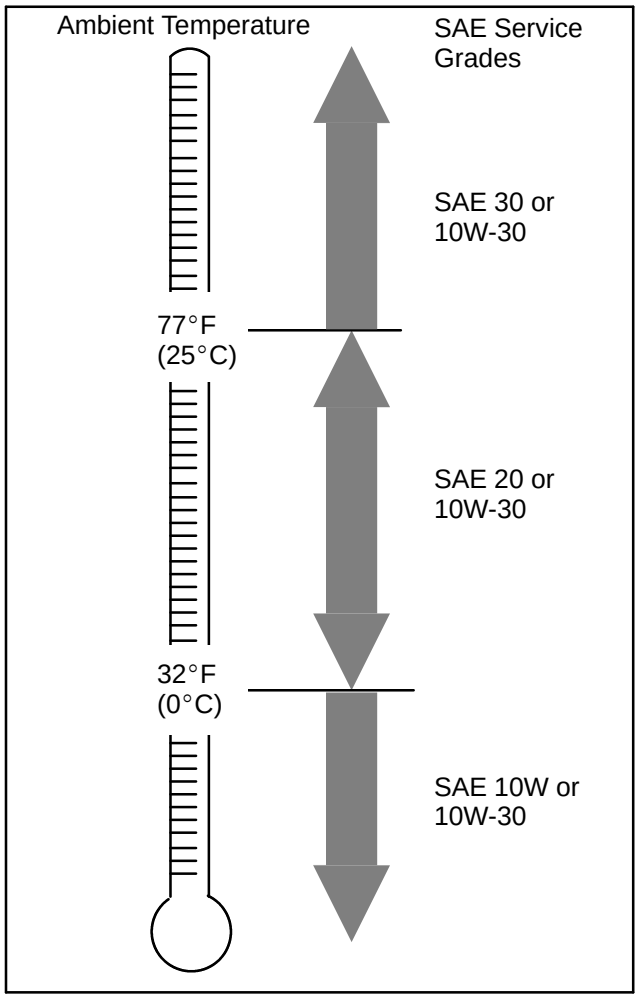


Figure 3-1. Engine Oil Selection.

NOTE

Failure to observe these standards may cause inadequate oil pressure and cold-starting difficulties.

Oil Check

Check crankcase oil level daily or before each start to insure that the level is in the "safe range." To check oil level, remove oil dipstick and wipe dipstick clean (see Figure 3-2). Reposition dipstick in crankcase and push it all the way down into the tube. Remove dipstick and check the level. Oil level should read between MIN and MAX marks on dipstick. Do not operate set if oil level exceeds the MAX mark or registers below the MIN mark on dipstick.

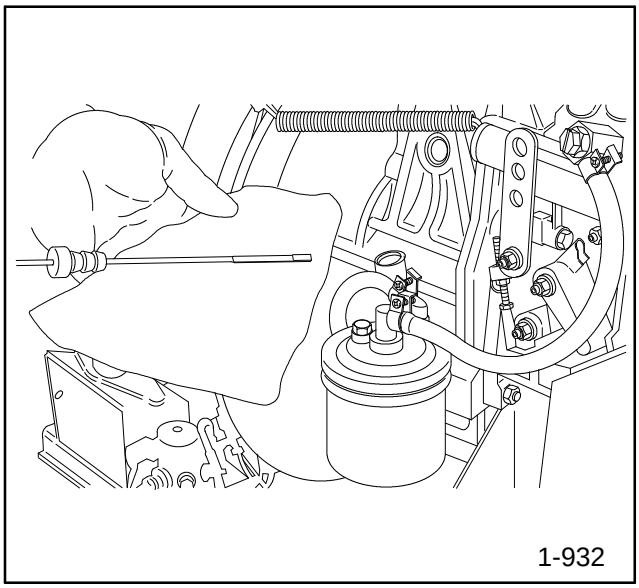


Figure 3-2. Oil Level Check.

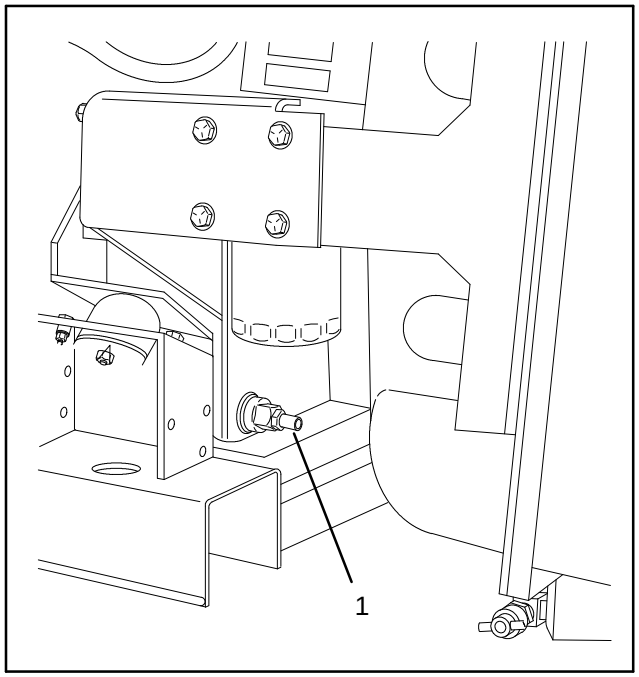
NOTE

Do not check oil level when the set is in operation. The Engine must be stopped and on a level surface when checking oil. Most accurate oil reading is obtained by shutting down the generator and waiting several minutes before checking oil.

Oil Change

On a new engine, change the oil after the first 50 hours of operation and thereafter at 100-hour intervals or 3 months, whichever occurs first. Change oil more frequently under dirty, dusty conditions. Change oil while the engine is still warm.

1. Place a container below the oil drain and open the oil drain valve. See Figure 3-3. Allow sufficient time for the old oil to drain completely. Close the oil drain valve. Dispose of used engine oil in an environmentally safe manner. Take used oil to a suitable collection facility in your area. *DO NOT POUR USED OIL ON THE GROUND, DOWN SEWERS, OR INTO STREAMS OR OTHER BODIES OF WATER.*



1. - Oil Drain

Figure 3-3. Oil Drain Location

2. Remove either oil fill cap. One is located on the rocker arm cover and one is located near the fuel injector pump. See Figure 3-5.

3. If the engine oil filter is to be replaced, see "Oil Filter" following.

4. Fill crankcase with proper amount and type of oil, see Figure 3-4 and "Oil Selection."

5. Replace oil fill cap. Start the generator set and check for oil leaks.

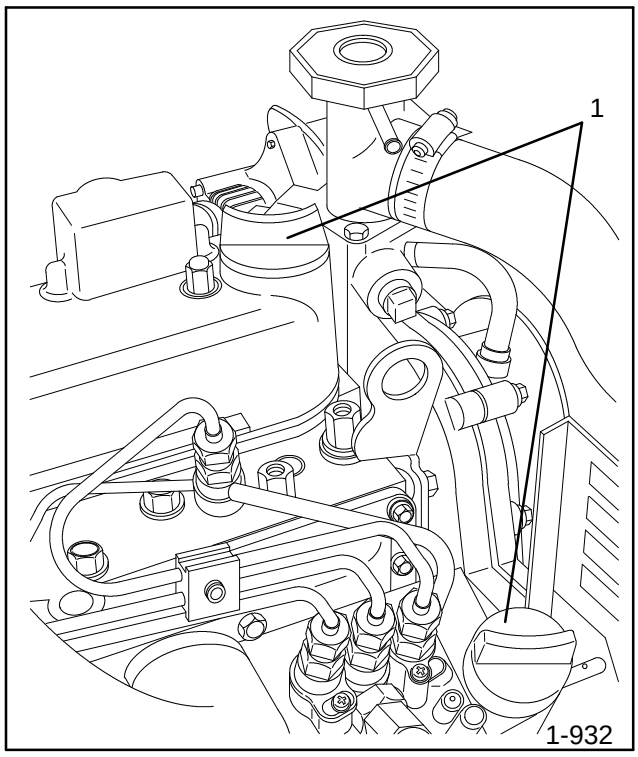
6. Stop the generator set. Remove the dipstick and wipe clean, reinsert as far as possible, and remove to check oil level. Add oil, as necessary, to bring level up to MAX mark.

OIL CAPACITY (with Filter) qts. (L)	
10CCOZ	6.3 (6.0)

Figure 3-4. Oil Capacity.

NOTE

Too high an oil level causes high oil consumption and carbonizing of the engine. Low oil level will cause engine damage.

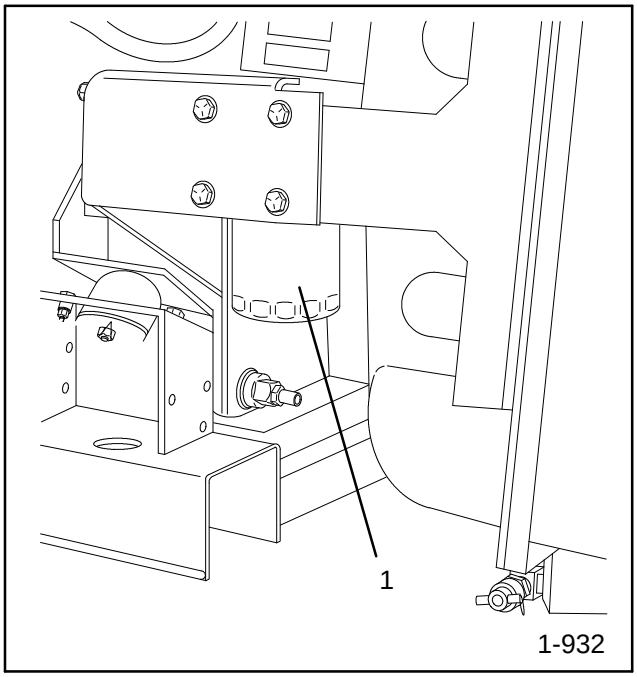


1. - Oil Fill

Figure 3-5. Oil Fill Locations.

Oil Filter

Replace the oil filter for the first time after 50 hours or 1 month of operations and then every 100 hours or 3 months. Change more frequently if operating in dirty, dusty conditions. See Figure 3-6 and refer to the following procedure.



1. - Oil Filter

Figure 3-6. Oil Filter Location.

1. With oil system drained, loosen oil filter by turning with a filter wrench in a counterclockwise direction. Use rags to clean up spilled oil. Remove and discard.
2. Clean contact surface on oil filter adapter.
3. Lightly lubricate the gasket surface of the new oil filter with the fresh engine oil. Thread oil filter to adapter until gasket makes contact, hand-tighten an additional one-half turn.
4. Replace engine oil. See "Oil Change" section for proper oil capacity.
5. Start the generator set and check for oil leaks.
6. Stop the generator set. Remove dipstick and wipe clean, reinsert as far as possible, and remove to check oil level. Add oil as necessary to bring level up to MAX level.

Fuel System

Specification

Use a clean, good quality No. 2-D (DIN 51 601) diesel fuel oil. The fuel must meet the requirements of the American Society of Testing and Materials (ASTM) diesel fuel classification D975 (Federal Specification W-F-800a). Cleanliness of the fuel is especially important on diesel engines which have easily clogged, precision fuel injectors and pumps. See chart below.

United States	ASTM/D975	No. 2-D Diesel
United Kingdom	BS2869	Class A1

Other Considerations:
Sulfur Content . . . . . Less than 0.5%
Sediment/Water Content . . . . . Not to exceed 0.05%
Cetane Number . . . . . 45 minimum
Flash point . . . . . At least 125°F (52°C)

NOTE

Never store diesel fuel in galvanized containers; diesel fuel and the galvanized coating react chemically to produce flaking which quickly clogs filters or causes failure of the fuel pump or injectors. Do not run the generator set out of fuel; air will be drawn into the fuel lines and the entire system will have to be bled before the unit can be restarted.

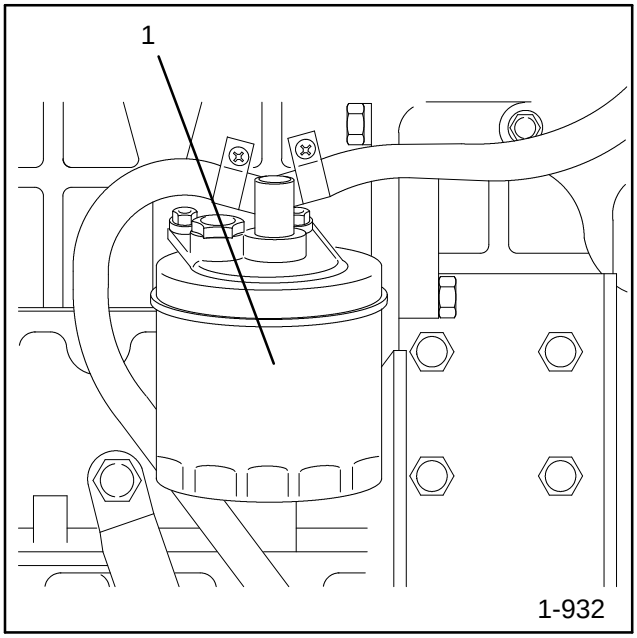
NOTE

Avoid storing fuel over long periods of time. Take special precautions to keep all dirt, water, and other contaminants out of the fuel. Storage tanks containing diesel fuel contaminated with water may cause the growth of "microbes." The presence of microbes will form a slime which will clog fuel filters and lines.

Fuel Filter

The fuel filter serves to remove water and dirt contained in the fuel. The engine-mounted fuel filter element is paper and no attempt should be made to clean it. Its useful life will be determined largely by the quality and condition of the fuel used. Under normal conditions, the fuel filter element should be replaced every 400 hours or six months. See Figure 3-7 for location and use the following procedure to service the fuel filter.

1. Loosen the fuel filter by turning in a counterclockwise direction. Use rags to clean up spilled fuel oil. Remove and discard.
2. Clean contact surface on the fuel filter adapter.
3. Lightly lubricate the gasket surface of the new fuel filter with fresh fuel oil. Thread the fuel filter to the adapter until the gasket makes contact, hand-tighten an additional one-half turn.
4. See "Bleeding" section following.



1. - Fuel Filter

Figure 3-7. Fuel Filter Location.

Fuel Filter (Supplied Loose)

The fuel filter, supplied loose with the unit, serves as a preliminary source to remove dirt and metal particles from the fuel system before they reach the electric fuel pump. If the fuel filter is clogged with debris, the generator may be difficult to start or may run rough. The service life of the fuel filter is solely dependent on the quality of the diesel fuel used and the amount of debris entering the fuel system when refueling. As part of a regular maintenance program, the fuel filter should be checked and/or replaced every 3 months or 100 hours of operation. The fuel filter cannot be cleaned and should be replaced if fuel starvation or poor engine performance is evident.

⚠ WARNING

Explosive fuel vapors.
Can cause severe injury or death.

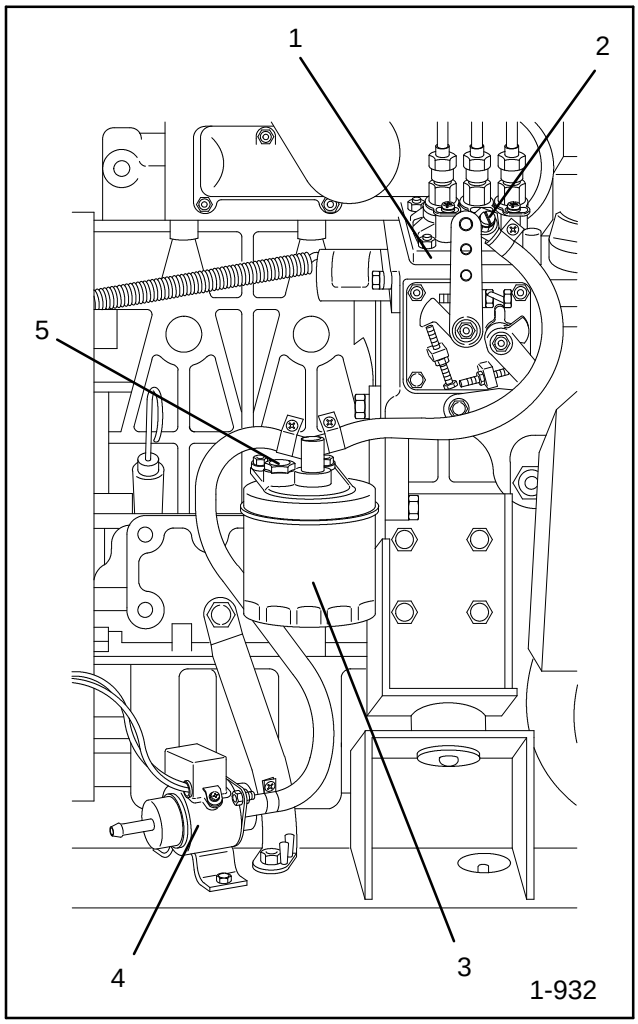
Use extreme care when handling, storing, and using fuels.

Explosive fuel vapors can cause severe injury or death. Spilled fuel can cause an explosion. Use a container to catch fuel when draining fuel system. Wipe up all spilled fuel after draining system.

Bleeding the Fuel System

If the generator set engine runs out of fuel, air leaks develop in the suction side of the fuel system, or the fuel filter is replaced, it will be necessary to bleed the entire system to prevent starting failures and/or erratic operation. See Figure 3-8 and refer to the following procedure.

1. Disconnect lead 71A from the starter motor to disable cranking during the bleeding procedure.
2. Fill the fuel tank.
3. Loosen the small vent screw on the fuel filter a few turns.
4. Using start switch on the controller, operate the fuel pump until fuel, free from air bubbles, flows from this point. Tighten vent screw.
5. Loosen the line connection (bleed point) at fuel injection pump inlet.
6. Using start switch on the controller, operate the fuel pump until fuel, free from air bubbles, flows from this point. Tighten line connection.
7. Reconnect lead 71A to the starter motor.



1. - Fuel Injection Pump
2. - Line Connection (Bleed Point)
3. - Fuel Filter
4. - Electric Fuel Pump
5. - Vent Screw

Figure 3-8. Bleeding the Fuel System.

Air Cleaner Service

The air cleaner for this unit is not provided by Kohler Co., but has been specified by the trailer manufacturer. The element should be replaced at 400-hour or 6-month intervals (if this schedule conflicts with the manufacturer's instructions, follow the manufacturer's recommendation); change more frequently if operating under extremely dirty, dusty conditions. Operating the generator set with a dirty air cleaner element may cause engine damage and also increase fuel consumption.

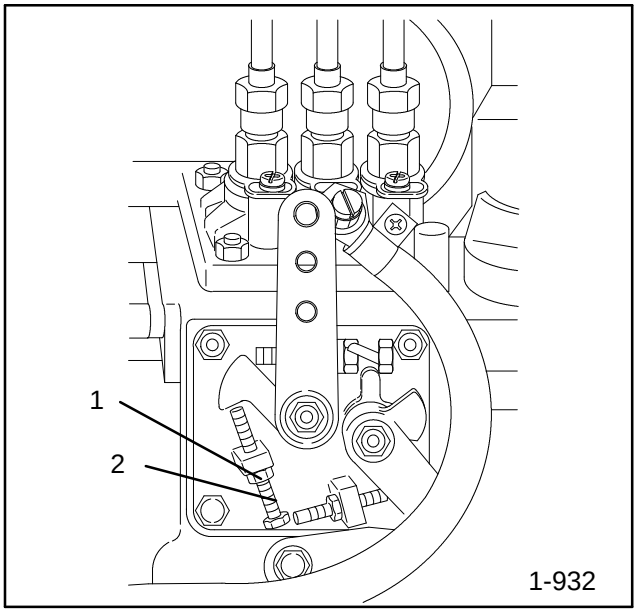
NOTE

Do not attempt to clean dry-type element in any liquid or with compressed air as this will damage paper filter material.

Governor

The centrifugal, mechanical-type governor serves to keep the engine speed constant by automatically adjusting the amount of fuel supplied to the engine according to changes in the load. No regular service is required on the unit. The governor is adjusted during run-in at the factory, and further adjustment should not be needed unless greatly varying load conditions are encountered or if poor governor control develops after extended usage.

This set is designed to operate at 60-63 Hz, 1800 rpm under full load and 1890 rpm under no load. To check speed, use a hand-held tachometer or a frequency meter. See Figure 3-9. Loosen locking nut on the speed-adjusting screw. Turn the screw in clockwise direction to increase speed (frequency) or in counterclockwise direction to decrease speed. Tighten the locknut to secure screw at new setting.



1. - Locking Nut
2. - Speed Adjusting Screw

Figure 3-9. Governor.

Cooling System

⚠ WARNING

Hot coolant and steam.
Can cause severe injury or death.

Before removing pressure cap stop generator, allow to cool and loosen pressure cap to relieve pressure.

Hot coolant can cause severe injury or death. Allow engine to cool and release pressure from cooling system before opening pressure cap. To release pressure, cover the pressure cap with a thick cloth then turn it slowly counterclockwise to the first stop. After pressure has been completely released and the engine has cooled, remove cap. If generator set is equipped with a coolant recovery tank, check coolant level at tank.

To prevent the inconvenience of having the generator set shut down or become damaged due to overheating, keep the cooling air inlets to the system clean and unobstructed at all times. Inspect the exterior of the radiator for obstructions; remove all dirt and foreign material with a soft brush or cloth (to avoid damaging radiator fins). Check all hoses and connections for leaks and replace any hoses that are cracked, frayed, or feel spongy. When coolant level checks are made, check condition of the radiator cap rubber seal; replace if cracked or deteriorating. Remove dirt and other debris from the radiator cap and filler neck.

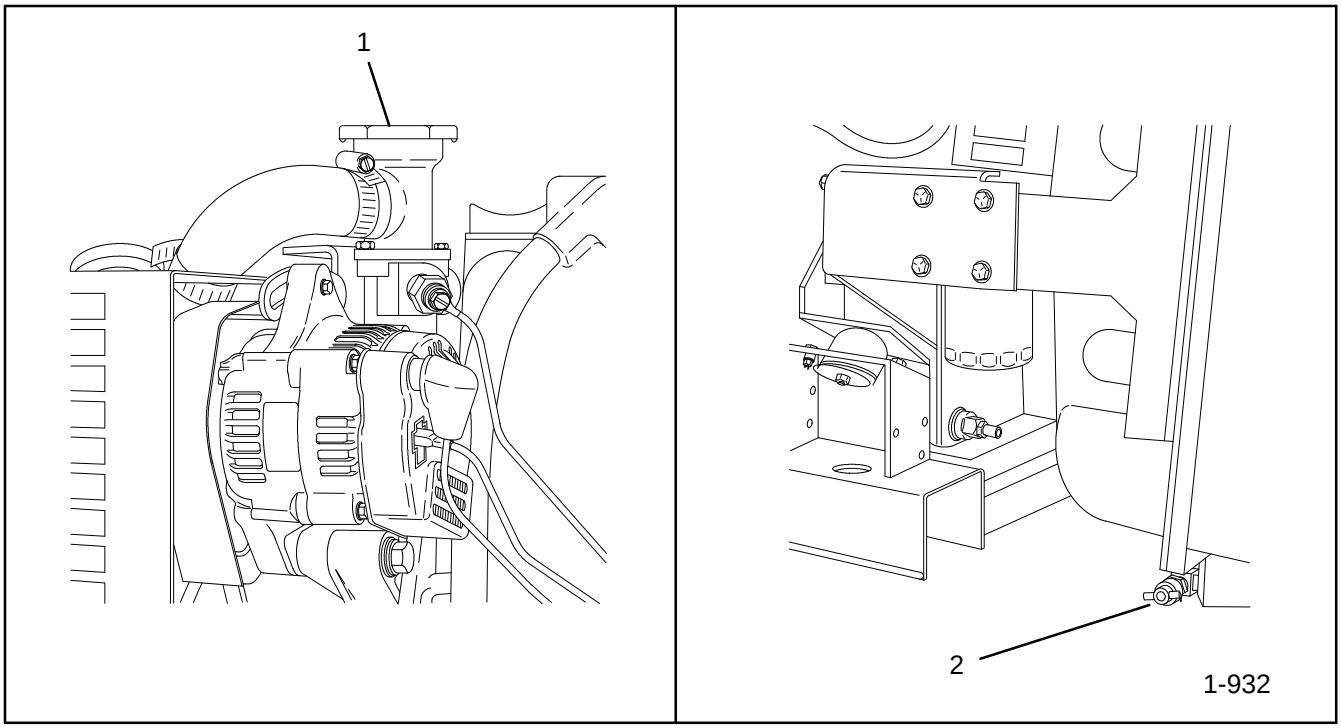
Coolant capacity for the 10CCOZ-Mobile inline radiator model is 5.1 qts. (4.8 L). Drain petcocks are provided on the bottom tank of the radiator and another in the engine block to drain the system. When draining the coolant, remove the radiator cap and open the block drain located near the flywheel housing and the radiator drain; this will allow the entire system to drain and prevent air pockets from forming and restricting coolant passage in the block. To refill the cooling system, close the drain petcock and fill the radiator to the proper level with the recommended coolant mixture. See Figure 3-10 for coolant fill location. Replace the radiator cap and operate the engine until the thermostat opens and the radiator upper hose becomes hot. Stop the engine and allow to cool. Add coolant to the radiator to just below the overflow tube on the filler neck. Replace the radiator cap.

A coolant solution of 50% ethylene glycol and 50% clean, softened water is required to inhibit corrosion, prevent freezing to −34°F (−37°C), and to improve cooling. The antifreeze should contain a rust inhibitor and be changed every two years. Do not use alcohol or methanol antifreeze or mix them with the coolant. Do not add coolant to an engine that has overheated until the engine has cooled. Adding coolant to an extremely hot engine can cause a cracked block or cylinder head.

Check coolant level frequently and add antifreeze solution as needed to maintain level just below the overflow tube and at the min. level in the overflow tank when cold (max. when hot).

NOTE

Special attention should be given when checking for proper coolant level. After a radiator has been drained, it normally requires some time before complete refill of all air cavities take place.



1. - Initial Coolant Fill (after initial fill, use coolant recovery tank to maintain coolant level)
2. - Coolant Drain in Radiator

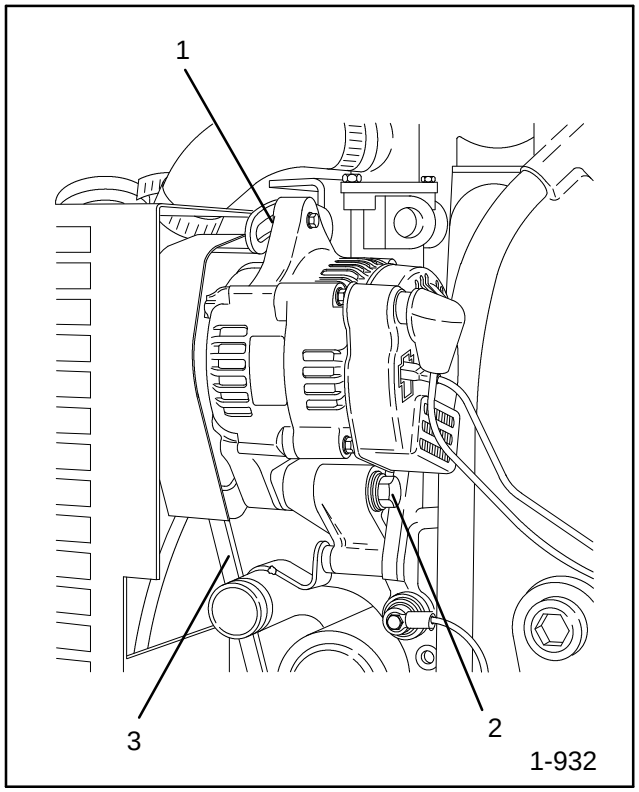
Figure 3-10. Coolant Fill/Drain Locations.

Drive Belt

The alternator, fan, and water pump are belt driven. The drive belt must be properly adjusted at all times since a loose drive belt causes the belt to overheat and also results in improper operation of belt-driven components. Overtightening the belt may cause excessive wear on the alternator and water pump bearings, as well as premature belt wear. See Belt Tension following.

Belt Tension

The belt tension should be adjusted so that it can be depressed about 0.28 to 0.35 in (7 to 9 mm) with about 22 lbs. (10 kg) of force, see Figure 3-11.



1. - Adjusting Screw
2. - Pivot Screw
3. - Fan Belt

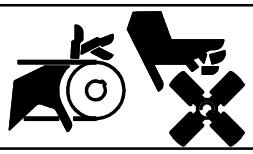
Figure 3-11. Belt Tension.

1. Loosen pivot and adjusting screws.
2. While prying alternator outward, tighten adjusting screw.
3. Tighten pivot screw.
4. Recheck and adjust as necessary.

NOTE

Also, check fan belt for cracks or tears and replace if necessary

⚠ WARNING



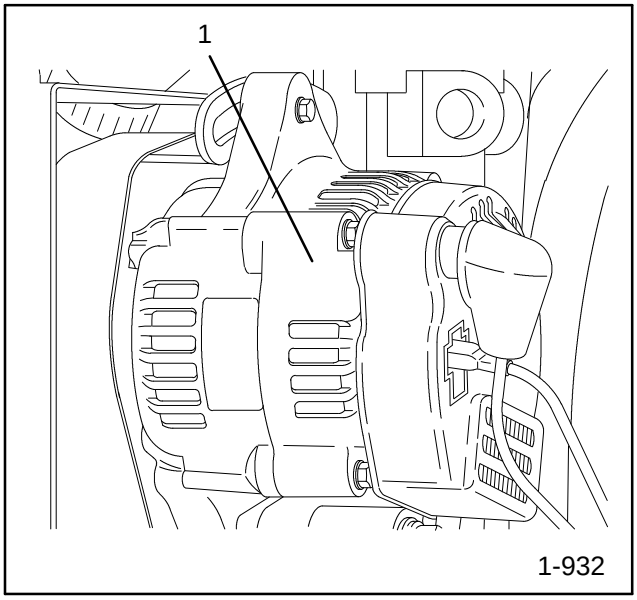
Rotating parts.
Can cause severe injury or death.

Do not operate generator set without all guards, screens, or covers in place.

Exposed moving parts can cause severe injury or death. Keep hands, feet, hair, and clothing away from belts and pulleys when unit is running. Replace guards, covers, and screens before operating generator set.

Battery Charging

Your generator is equipped with a 20-amp. belt-driven battery charging alternator. See Figure 3-12. It is attached to the engine block by a bracket and serves to keep the battery constantly charged. Be sure to observe battery polarity when connecting the battery to the generator set. The alternator requires no maintenance other than maintaining belt tension. To adjust the alternator belt tension, see "Belt Tension."



1. - Battery Charging Alternator

Figure 3-12. Battery Charging Alternator.

Battery

The recommended starting battery is one 12-volt with a minimum CCA (cold cranking amps.) of:

450 CCA for use in temps. above 32°F (0°C) or

625 CCA for use in temps. below 32°F (0°C).

When using a maintenance-free battery it is not necessary to check the specific gravity or electrolyte level. Otherwise, these procedures should be done at the intervals specified in the Maintenance Schedule. A negative ground system is used. Battery connections are shown on the wiring diagrams. Make sure that the battery is properly connected and the terminals are tight.

NOTE

The generator set will not start if the battery connections are made in reverse.

⚠ WARNING

Sulfuric acid in batteries.
Can cause severe injury or death.

Use protective goggles and clothes. Can cause permanent damage to eyes, burn skin, and eat holes in clothing.

Sulfuric acid in batteries can cause severe injury or death. Sulfuric acid in battery can cause permanent damage to eyes, burn skin, and eat holes in clothing. Always wear splash-proof safety goggles when working around the battery. If battery electrolyte is splashed in the eyes or on skin, immediately flush the affected area for 15 minutes with large quantities of clean water. In the case of eye contact, seek immediate medical aid. Never add acid to a battery once the battery has been placed in service. Doing so may result in hazardous spattering of electrolyte.

Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flame or spark to occur near a battery at any time, particularly when it is being charged. Avoid contacting terminals with tools, etc. to prevent burns and to prevent sparks that could cause an explosion. Remove wristwatch, rings, and any other jewelry before handling battery. Never connect negative (-) battery cable to positive (+) connection terminal of starter solenoid. Do not test battery condition by shorting terminals together or sparks could ignite battery gases or fuel vapors. Any compartment containing batteries must be well ventilated to prevent accumulation of explosive gases. To avoid sparks, do not disturb battery charger connections while battery is being charged and always turn charger off before disconnecting battery connections. When disconnecting battery, remove negative lead first and reconnect it last.

Cleaning

Keep battery clean by wiping it with a damp cloth. Keep all electrical connections dry and tight. If corrosion is present, disconnect cables from battery and remove corrosion with a wire brush. Clean battery and cables with a solution of baking soda and water. Be careful that cleaning solution does not enter battery cells. When cleaning is complete, flush battery and cables with clean water and wipe with a dry cloth. After the battery cables are reconnected, coat terminals with petroleum jelly or other non-conductive grease.

Checking Electrolyte Level

Check the level of electrolyte before each startup. Remove filler caps and check to see that electrolyte level is up to bottoms of filler holes. See Figure 3-13. Refill as necessary with distilled water or clean tap water. DO NOT add fresh electrolyte! Be sure filler caps are tight.

NOTE

When using a maintenance-free battery it is not necessary to check the specific gravity or electrolyte level.

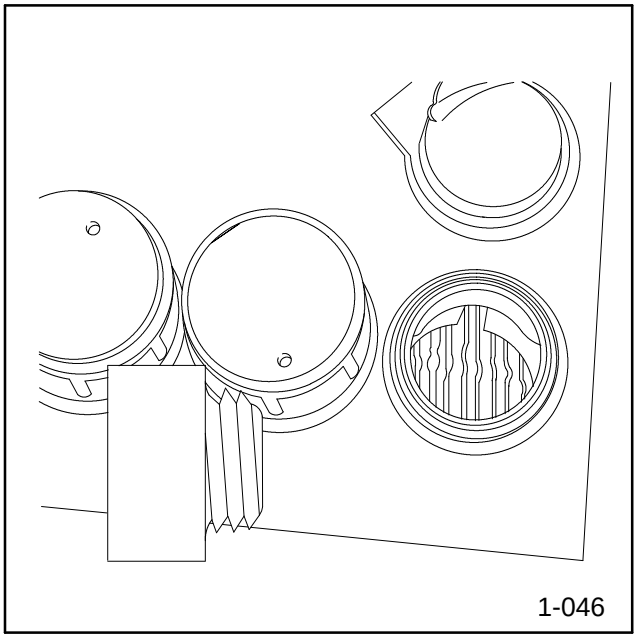


Figure 3-13. Battery Electrolyte Level.

Checking Specific Gravity

Use a battery hydrometer to check the specific gravity of the electrolyte in each battery cell. While holding the hydrometer vertical, read the number on the glass bulb at the top of the electrolyte level. If the hydrometer used does not have a correction table, use the one in Figure 3-14. Determine specific gravity and electrolyte temperature of battery cells. Locate temperature in Figure 3-14 and adjust specific gravity by amount shown. The battery is fully charged if the specific gravity is 1.260 at an electrolyte temperature of 80°F (26.7°C). The difference between specific gravities of each cell should not exceed ±0.01. The battery should be charged if the specific gravity is below 1.215 at an electrolyte temperature of 80°F (26.7°C).

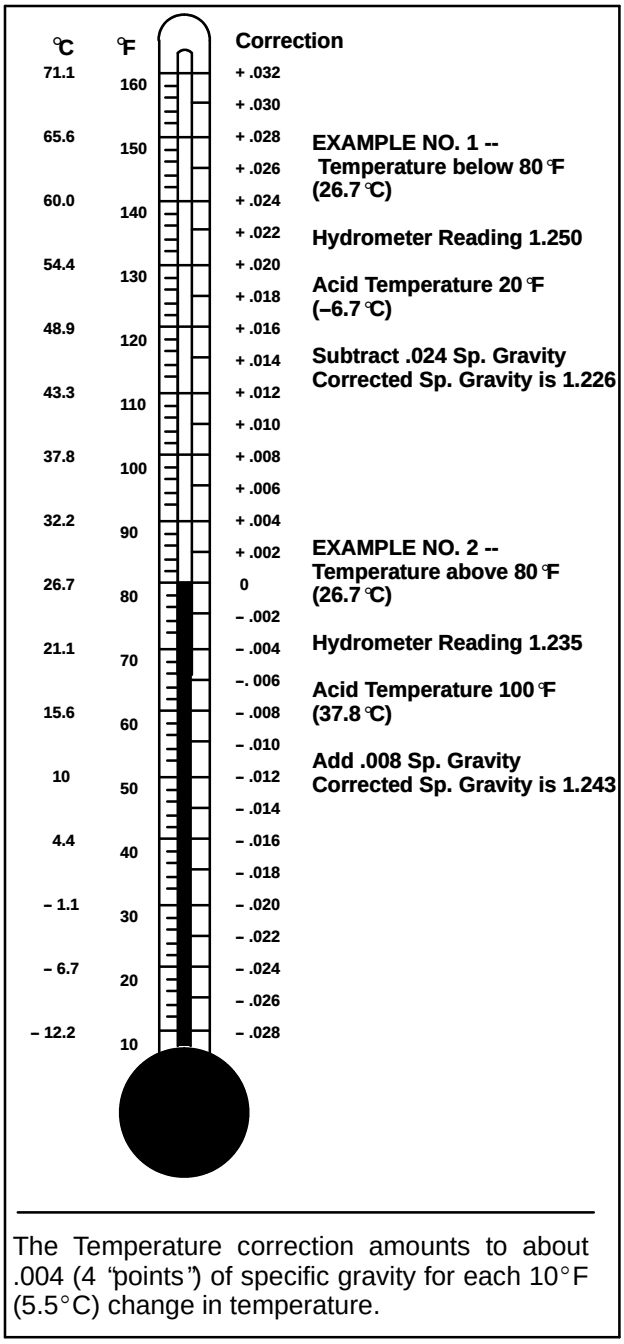


Figure 3-14. Specific Gravity Temperature Correction.

Wattage Requirements

If the rated capacity of your generator is exceeded, the circuit breaker(s) located in the controller will trip to protect the generator against damage. This could be caused by a short in the AC circuit in your vehicle or simply by having too many tools in use at the same time resulting in an overload condition. If the circuit breaker(s) trip, the set may continue running but there will be no AC output to the protected circuit. Before resetting the circuit breaker(s), turn off some of the tools to bring the load down within the rated limits of the set. If this is done and the circuit breaker(s) trips again after being reset, a short circuit is indicated. In this event, turn off the set and have a qualified electrician locate and correct the cause of the short circuit.

The average wattage requirements of some common construction tools are listed in Figure 3-15. Use these figures to calculate the total load on your set to avoid the inconvenience of having the circuit breaker trip due to overload. Check the nameplate rating on motors and tools for exact wattage requirements.

NOTE

Motor driven equipment generally takes 2 to 3 times the listed running amperage or wattage to start the motor. Always check the tool or motor nameplate to be sure.

Construction Tools	Motor Starting Watts	Running Watts
Air Compressor (Small)	1500	725
Air Compressor 3/4 hp	4000+	2000
Drill, 1/4 in.	500	250
Drill, 3/8 in.	600	350
Drill, 1/2 in.	800	600
Grinder 1/2 hp	1500	1200
Hammer, Demolition	2000	1800
Hammer, HD Rotary	1500	1200
Paint Sprayer (Airless)	400	240
Polisher, Orbit	500	360
Power Paint Roller	120	90
Power Plane	600	450
Router	900	700
Saw, Circular 6 1/2 in.	2200	1000
Saw, Circular 7 1/4 in.	2500	1200
Saw, Table 10 in.	4000	1500
Saw, Sabre (Worm Drive)	2500	1200
Sander, Belt	1500	600
Sander, Finishing	900	360
Screwdriver, Power	1000	530
Shear, 12 gauge	1800	720
Soldering Gun	–	250
Vacuum Cleaner, Wet/Dry	1500	1260
Wrench, Impact 1/2 in.	2000	840

Figure 3-15. Appliance Average Wattage Ratings.

Generator Service

General

Under normal conditions, generator service will not be required on a regular basis. If operating under extremely dusty and dirty conditions, use dry compressed air to blow dust out of the generator at frequent intervals. Do this with the generator set operating and direct the stream of air in through the cooling slots at the end of the generator.

Storage Procedure

If your generator set is to be out of service for a considerable length of time (2 months or more), the following steps should be taken to preserve the set before placing it in storage.

1. Drain the oil (while hot) from the crankcase then refill with regular grade oil. See Section 3, "Oil Selection" in this manual.

2. Drain the fuel from the fuel tank to prevent accumulated moisture from mixing with the fuel.

3. Check the engine coolant protection. See Section 3, "Cooling System" for additional information.

4. Disconnect battery (negative lead first) and place in storage.

5. Seal all openings in the engine with non-absorbent adhesive tape. Mask off all areas to be used for electrical contact.

6. Clean exterior surface of the generator. Spread a light film of oil over unpainted metallic surfaces which could rust or corrode.

Section 4. Troubleshooting

When troubles occur, don t overlook simple causes. A starting problem could be caused, for example, by improper fuel or an empty fuel tank. Make sure all electrical connections are secure. Remember the battery negative must have a good ground. The following charts list some common problems. If procedures in this manual do not correct the problem, take the generator set to a Service Dealer/Distributor. Tell the Service Dealer/Distributor personnel exactly what happened when the problem occurred and any adjustments made to the set.

Engine

Problem	Possible Cause	Corrective Action
Engine hard to start or will not start	Weak or dead battery	Recharge or replace
	Battery connections made in reverse	Correct
	Faulty ground	Clean and retighten
	Fuse blown	Replace
	Out of fuel	Replenish
	Improper type of fuel	Use proper type of fuel; consult fuel supplier
	Fault shutdown	Check low oil pressure and high water temperature shutdown switches
	Clogged fuel filter	Replace filter element
	Air cleaner clogged	Clean or replace element
	Clogged exhaust system	Remove obstruction
	Defective fuel feed pump	Replace fuel feed pump
	Air in fuel system	Bleed air from fuel system
	Improper type of crankcase lube oil	Use proper lube oil
	Water, dirt in fuel system	Drain, flush fuel system, and replace fuel
	Dirty or faulty injectors	See Authorized Service Dealer/Distributor
	Improper compression	See Authorized Service Dealer/Distributor
	Injection pump malfunctioning	See Authorized Service Dealer/Distributor
	Improper valve clearance	See Authorized Service Dealer/Distributor

Engine (Continued)

Problem	Possible Cause	Corrective Action
Engine knocks	Faulty injector	See Authorized Service Dealer/Distributor
	Improper type of fuel	Use proper type of fuel; consult fuel supplier
	Incorrect fuel injection timing	See Authorized Service Dealer/Distributor
	Improper cylinder top clearance	See Authorized Service Dealer/Distributor
	Defective piston or piston ring	See Authorized Service Dealer/Distributor
	Defective crankshaft bearing or piston pin bearing	See Authorized Service Dealer/Distributor
	Improper valve clearance	See Authorized Service Dealer/Distributor
	Air in injectors	Bleed air in fuel system
Engine runs irregularly or stalls frequently	Vent in fuel tank cap obstructed	Clean cap in solvent, blow dry
	Clogged fuel filter	Replace fuel filter element
	Water, dirt, or air in fuel system	Drain, flush, fill, and bleed air in fuel system
	Dirty or faulty injectors	See Authorized Service Dealer/Distributor
	Faulty governor linkage	See Authorized Service Dealer/Distributor
	Defective fuel feed pump	Replace fuel feed pump
	Improper valve clearance	See Authorized Service Dealer/Distributor
	Improper compression	See Authorized Service Dealer/Distributor
Stops Suddenly	Out of fuel	Replenish fuel supply
	Air intake restriction	Service air cleaner
	Fuse blown in controller	Replace fuse. If fuse "blows" again, See Authorized Service Dealer/Distributor
	High engine temperature (HET) shutdown*	Check engine coolant level, loose fan belt, radiator obstructions, etc.
	Low oil pressure (LOP) shutdown*	Check engine lube oil level
	Overspeed shutdown*	See Authorized Service Dealer/Distributor
	Low coolant level (LCL) shutdown*	Add coolant
	Defective fuel pump	See Authorized Service Dealer/Distributor
	Clogged fuel filter	Replace filter

*See Section 2. Fault Shutdowns

Engine (Continued)

Problem	Possible Cause	Corrective Action
Lack of engine power	Engine overloaded	Reduce load
	Air intake restriction	Service air cleaner
	Clogged fuel filter	Replace filter element
	Clogged exhaust system	Remove obstruction
	Improper type of fuel	Use proper fuel
	Improper valve clearance	See Authorized Service Dealer/Distributor
	Dirty or faulty injectors	See Authorized Service Dealer/Distributor
	Incorrect fuel injection timing	See Authorized Service Dealer/Distributor
	Improper engine compression	See Authorized Service Dealer/Distributor
	Vent in fuel tank cover obstructed	Clean cap in solvent; blow dry
	Overfueling (rich)	See Authorized Service Dealer/Distributor
Engine overheats	Engine overloaded	Reduce load
	Defective cooling system	Check water pump
	Loose or defective water pump V-belt	Adjust belt tension or replace belt
	Cooling system needs flushing	Flush cooling system
	Defective thermostat	Replace thermostat
	Defective high water temperature switch	Replace switch
	Cooling water leaks from water passages	Check water passages
	Radiator clogged with dirt or oil	Clean with water soluble grease remover and flush cooling system
	Radiator cap defective	Replace
	Cylinder head gasket defective	See Authorized Service Dealer/Distributor

Engine (Continued)

Problem	Possible Cause	Corrective Action
Engine emits black or gray exhaust smoke	Fuel filter clogged	Clean or change
	Overload	Lessen the load
	Improper type of fuel	Use proper fuel
	Clogged or dirty air cleaner	Service air cleaner element
	Defective injection pump	See Authorized Service Dealer/Distributor
	Faulty injectors	See Authorized Service Dealer/Distributor
	Incorrect fuel injection timing	See Authorized Service Dealer/Distributor
	Improper valve clearance	See Authorized Service Dealer/Distributor
	Lube oil level too high	Drain out surplus
	Improper lube oil	Use proper viscosity oil
Engine emits white or blue exhaust smoke	Excessive engine oil	Reduce to specified level
	Piston ring and liner worn	See Authorized Service Dealer/Distributor
	Incorrect injection timing	See Authorized Service Dealer/Distributor
	Improper compression	See Authorized Service Dealer/Distributor
Low lube oil pressure	Low lube oil level	Add lube oil
	Improper lube oil viscosity	Drain, fill with proper viscosity oil
	Defective lube oil pump	See Authorized Service Dealer/Distributor
	Defective oil pressure switch	Replace switch
	Worn engine components	Rebuild– Consult Engine Service Manual
High lube oil consumption	Too light viscosity oil	Use oil of proper viscosity
	Oil leaks	Check for leaks in lines, around gaskets, and drain plug
	Improper type of oil	Use oil of proper viscosity
	Clogged breather system	Clean breather system
	Defective piston ring, piston cylinder liner, valve guide, or valve seat	See Authorized Service Dealer/Distributor
High fuel consumption	Improper type of fuel	Use proper fuel
	Clogged or dirty air cleaner element	Service air cleaner element
	Engine overloaded	Reduce load
	Improper valve clearance	See Authorized Service Dealer/Distributor

Engine (Continued)

Problem	Possible Cause	Corrective Action
High fuel consumption (continued)	Incorrect fuel injection timing	Check injection timing
	Low engine temperature	Check thermostat
	Improper compression	See Authorized Service Dealer/Distributor
	Fuel leakage	Check for leaks at fuel tank, lines, and engine fuel system

Electrical System

Problem	Possible Cause	Corrective Action
Battery will not charge	Loose or corroded connections	Clean and tighten connection
	Sulfated or worn-out battery	Check electrolyte level and specific gravity (batteries with filler caps only)
	Defective alternator	Replace alternator
	Loose or defective alternator belt	Adjust belt tension or replace belt
Starter does not work properly	Loose or corroded connections	Clean and tighten connection
	Low battery output	Check electrolyte level and specific gravity (batteries with filler caps only)
	Defective starter solenoid	Replace starter solenoid
	Defective starter switch	Replace starter switch
	Defective wiring	Check wiring
Starter cranks slowly	Low battery output	Check electrolyte level and specific gravity (batteries with filler caps only)
	Too heavy viscosity lube oil	Use proper viscosity oil
	Loose or corroded wiring	Clean and tighten loose connections
	High starter current draw	Rebuild or replace starter
	Loose or defective alternator belt	Adjust belt tension or replace belt

Generator

Problem	Possible Cause	Corrective Action
No AC output	AC Circuit breaker(s) in OFF Position	Reset to ON position
	No DC power to controller	Check battery connections
	Fuse blown	Replace fuse
	AC Circuit breaker tripping due to overload on generator set	Reduce load (see "Wattage Requirements")
	Short circuit in output circuit causing breaker to trip	Reset circuit breaker. If it trips repeatedly, stop set and contact Authorized Service Dealer/Distributor
	General malfunction such as faulty component or other internal fault	Contact Generator Service Dealer/ Distributor for repairs
Low output or excessive drop in voltage	Engine speed too low	Contact Authorized Service Dealer/ Distributor for repairs
	Generator overloaded	Reduce load

Section 5. Wiring Diagrams

Four-Lead Reconnectable (Single-Phase) Generator Sets Where Generator Output Can Be Reconnected For 120/240 volt, 60 Hz; or 110/220 volt, 50 Hz

To illustrate the proper reconnection of 4-lead generator sets, the following information is provided. In all cases, the National Electrical Code (NEC) should be followed.

NOTE: When a generator set is reconnected to a voltage different than nameplate voltage, notice should be placed on the unit indicating this change. A decal (part no. 246242) is available for this purpose from an Authorized Kohler Dealer/Distributor.

120/240-volt (or 110/220-volt) Configurations– Figure 5-1 (View A)

Circuit breaker MUST be a circuit breaker manufacturer two-pole circuit breaker. Two single-pole circuit breakers do not conform to NEC requirements when supplying a 240-Volt (or 220-Volt) load. This is true even if they are mechanically attached together. Leads L1 and L2 are different phases and must never be connected together.

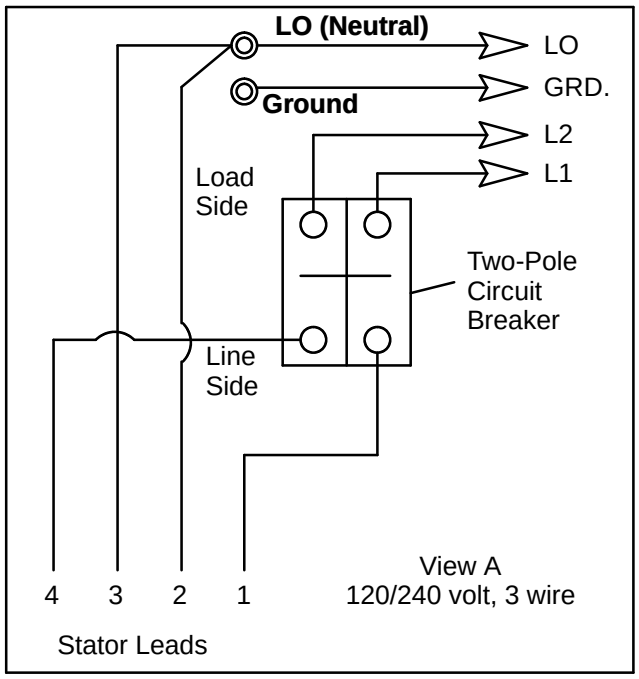
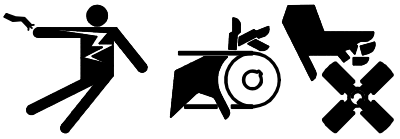


Figure 5-1. 120/240-volt (or 110/220-volt) Configuration

	60 Hz	50 Hz
L0-L1	120 volt	110 volt
L0-L2	120 volt	110 volt
L1-L2	240 volt	220 volt

⚠ WARNING



Accidental starting.
Can cause severe injury or death.
Disconnect battery cables before working on generator set (negative lead first and reconnect it last).

Accidental starting can cause severe injury or death. Disconnect battery cables (remove negative lead first and reconnect it last) to disable generator set before working on any equipment connected to generator. The generator set can be started by remote start/stop switch unless this precaution is followed.

NOTE

Keep load lead circuit away from the generator, specifically fuel and exhaust system components.

NOTE

All field supplied wiring must be capable of withstanding temperatures of 167°F (75°C).

NOTE

A triple-pole, double-throw transfer switch, rated for the calculated load, must be used to transfer the load from one source to the other. A ground-fault circuit interrupter should be installed in the wiring system to protect all branch circuits.

NOTE

The AC load circuit of the generator set must be protected by a circuit breaker(s) against overload or short circuit.

⚠ WARNING

Hazardous voltage.

Moving rotor.

Can cause severe injury or death.

Do not operate generator set without all guards and electrical enclosures in place.

Hazardous voltage can cause severe injury or death. Perform electrical service only as prescribed in equipment manual. Be sure that generator is properly grounded. Never touch electrical leads or appliances with wet hands, when standing in water, or on wet ground as the chance of electrocution is especially prevalent under such conditions. Wiring should be inspected at the interval recommended in the service schedule–replace leads that are frayed or in poor condition. The function of a generator set is to produce electricity and wherever electricity is present, there is the hazard of electrocution.

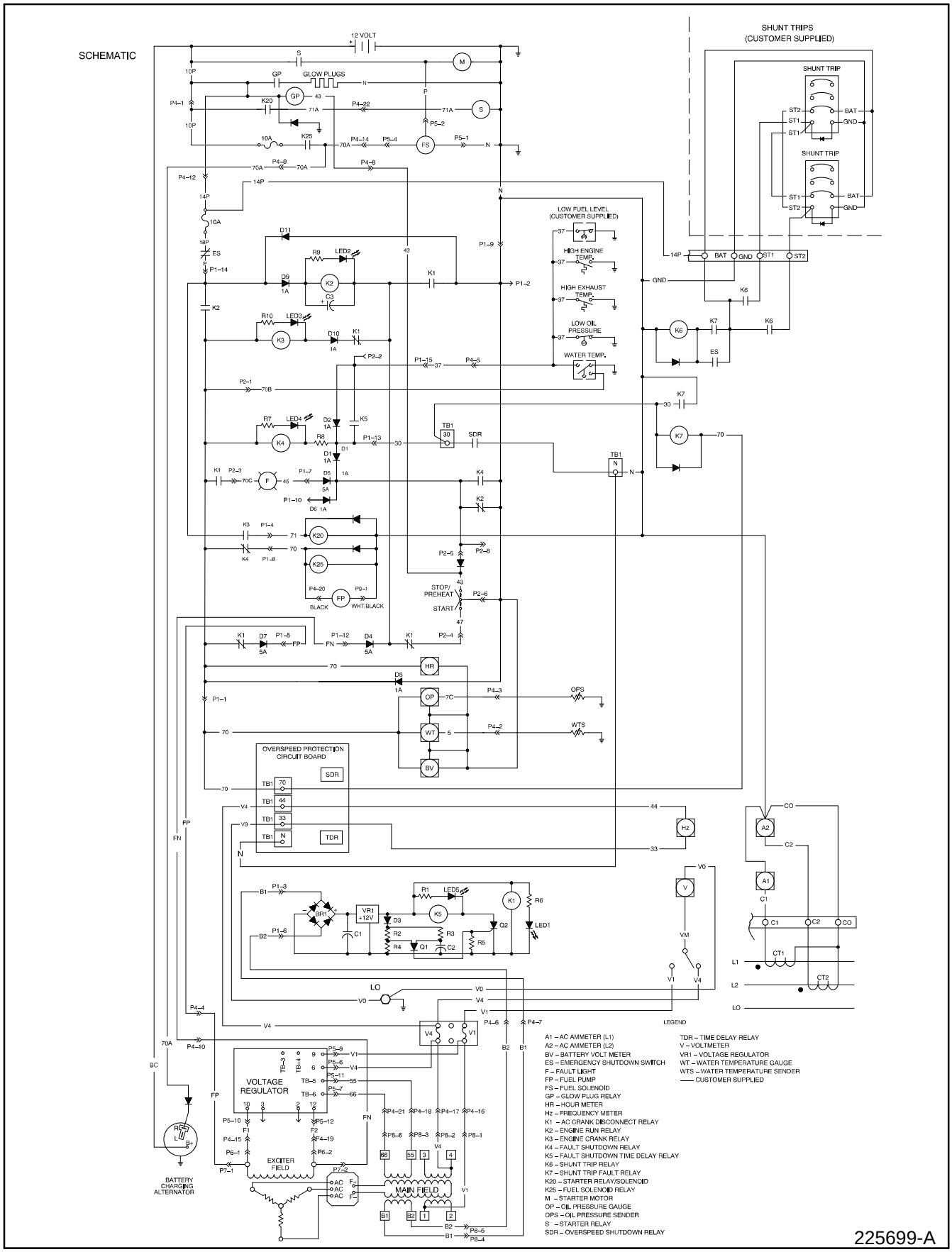


Figure 5-2. Wiring Diagram (Schematic) for 10CCOZ Single Phase.

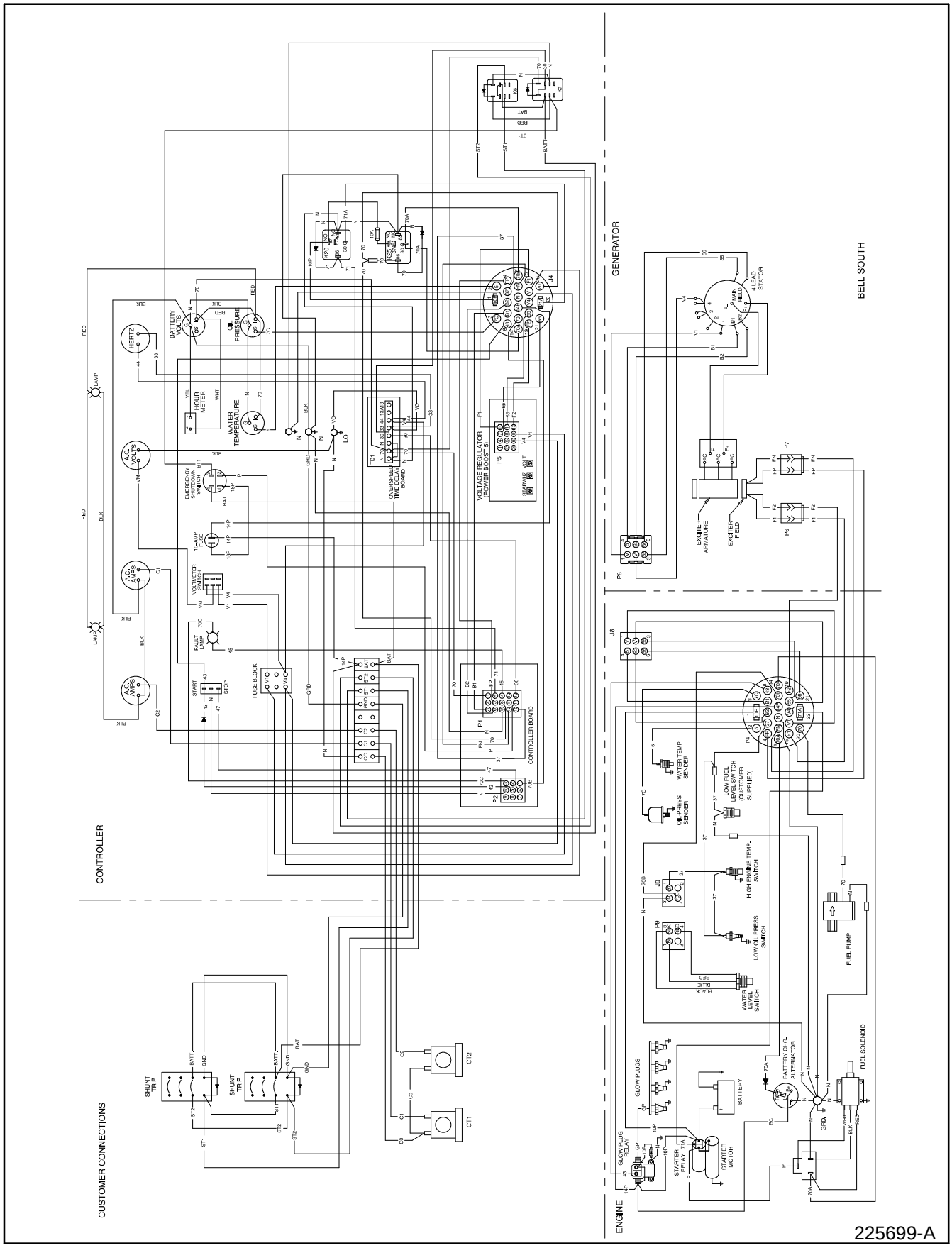


Figure 5-3. Wiring Diagram (Point-to-Point) for 10CCOZ Single Phase.

Section 6. Installation

Introduction

Use this section as a guide when installing a generator set in the vehicle, then refer to the operation section for specific service instructions. When installing a Mobile generator set, the installation must comply with the Kohler detailed installation instructions. Any additional requirements can also be found in the following two sources: (1) ANSI A 119.2/NFPA 501 C and (2) article 551 of ANSI/NFPA 70, National Electrical Code. Generator set installation must also comply with state and local requirements if applicable.

NOTE

These generator sets do not comply with United States Coast Guard (U.S.C.G.) requirements and must not be used for marine applications. Use only generator sets specified for marine use in marine installations. U.S.C.G. Regulation 33CFR183 requires a generator set to be "ignition protected" when used in a gasoline-fueled environment.

General Information

This installation section covers the Kohler Generator Set Models listed in the chart on the next page. To determine which model is involved, check the model number found on the nameplate of the generator being installed. Follow all instructions to insure proper installation.

FEATURES

This generator set features Kubota V1305BG-2 diesel engine, rotating-field, brushless, alternating-current generator and relay controller. The generator is directly connected to the engine for permanent alignment. Each controller includes a Start-Stop/Preheat switch for test operating the set at the controller. After the set is installed, all that is usually required to make it operational is the following:

- Attach exhaust system.
- Add proper amount of radiator coolant. Mount the coolant recovery tank.
- Add oil to crankcase until dipstick reads full.
- Connect fuel lines (inlet and return), load leads, and battery terminals.

SPECIFICATIONS	10CCOZ
Inline Radiator Model:	
Weight lbs (kg)	605 (274)
Length Overall in. (mm)	44.16 (1122)
Width Overall in. (mm)	21.03 (534)
Height Overall in. (mm)	26.62 (676)
Radiator Type	Inline
Fan Type	Blower
Cooling System Capacity	
(with Inline Radiator) qts. (L)	5.1 (5.4)
Total Air Requirements CFM (M^3/min)	1264 (35.8)
Engine Combustion Req.	36 (1.02)
Engine/Generator Cooling Req.	1300 (36.8)
Fuel Inlet Connection in. (mm)	5/16 (8)
Fuel Return Connection in. (mm)	3/16 (4.8)
Battery Voltage	12
Battery Recommendation (min.)	450 CCA (Temperatures above 32°F, 0°C) 625 CCA (Temperatures below 32°F, 0°C)
Battery Cranking Current	65 Amp. Hr.
Battery Ground	Negative
Fuel Recommendation	No. 2-D Diesel Oil (Cetane > 45); ASTM D975
Fuel Consumption Gal./hr. (L/hr.)	
(% Load)	
25%	0.46 (1.7)
50%	0.60 (2.3)
75%	0.80 (3.0)
100%	1.07 (4.0)

Generator Selection and Wattage Requirements

Total wattage requirements (lights, motors, appliances) must be considered in selecting a generator set, or sizing wattage requirements when available space and construction may limit the size of the generator set. Refer to the following when figuring wattage requirements.

Installation Factors

Each generator set is shipped as a unit except for the optional exhaust system and air cleaner components.

When pre-planning the installation, the following factors must be considered.

1. **ELECTRICAL LOAD**: Does the set selected have adequate capacity to handle the load?

2. **COMPARTMENT SIZE**: Will there be sufficient room around the set to maintain minimum clearances?

3. **AIR REQUIREMENTS**: Are the compartment air inlets and outlets sized to allow adequate circulation of air for cooling and combustion?

4. **COMPARTMENT FLOOR**: Is the compartment floor strong enough to support the weight of the generator set?

5. **COOLING SYSTEM**: Is the cooling system large enough to adequately cool the generator set?

6. **FUEL SYSTEM**: Is the system properly designed to prevent fuel starvation of either the main engine or generator set engine?

7. **EXHAUST SYSTEM**: Will the system meet all safety requirements after installation?

8. **ELECTRICAL CONNECTIONS**: Will all systems (battery, load and remote switch) be compatible with vehicle systems?

Each of these installation considerations are covered in detail on the following pages.

Electrical Load

While the electrical load of the vehicle should have been calculated prior to purchase of the generator set, you may want to recheck the load before installing the set to make sure that the capacity is ample to meet demands without possible overloading.

Appliance Loads

Generator sets in mobile vehicles are often used to furnish AC for mechanical tools. Such loads must not, however, be overlooked when figuring total requirements. Reserve capacity should be available for anticipated loads to avoid overloading of the set. The average power requirements of some construction tools are listed in Figure 6-1.

Construction Tools	Motor Starting Watts	Running Watts
Air Compressor (Small)	1500	725
Air Compressor 3/4 hp	4000+	2000
Drill, 1/4 in.	500	250
Drill, 3/8 in.	600	350
Drill, 1/2 in.	800	600
Grinder 1/2 hp	1500	1200
Hammer, Demolition	2000	1800
Hammer, HD Rotary	1500	1200
Paint Sprayer (Airless)	400	240
Polisher, Orbit	500	360
Power Paint Roller	120	90
Power Plane	600	450
Router	900	700
Saw, Circular 6 1/2 in.	2200	1000
Saw, Circular 7 1/4 in.	2500	1200
Saw, Table 10 in.	4000	1500
Saw, Sabre (Worm Drive)	2500	1200
Sander, Belt	1500	600
Sander, Finishing	900	360
Screwdriver, Power	1000	530
Shear, 12 gauge	1800	720
Soldering Gun	–	250
Vacuum Cleaner, Wet/Dry	1500	1260
Wrench, Impact 1/2 in.	2000	840

Figure 6-1. Appliance Ratings (60 Hz)

Kilowatt Derating

All units are rated 1.0 power factor. The kilowatt capability of the generator set will decrease 3.5% per 1000 ft. (305 m) above 500 ft. (152 m) above sea level. Derate 1% for every 10°F (5.5°C) above 85°F (30°C).

Compartment Size

When planning compartment size requirements, allow the minimum clearances for cooling of the generator set as shown in Figure 6-2.

NOTE

Since the sets are flexibly mounted, the minimum clearances will assure that the sides of the compartment and the set will not rub while the set is in operation or while the vehicle is in transit.

Front	1 1/2 in.	(38 mm)
Side	1 1/2 in.	(38 mm)
Top	1 1/2 in.	(38 mm)
Rear	1 1/2 in.	(38 mm)

Figure 6-2. Minimum Clearance Requirements.

NOTE

Minimum clearances listed for cooling air circulation. Additional clearance may be required for routine servicing of the generator set.

The thickness of insulating and sound deadening material used to line the compartment must be taken into consideration when planning clearances. If necessary, enlarge the compartment so minimum clearance requirements are maintained. The generator set must be securely fastened to avoid unwanted movement from vibration and road shock. Skid-mounted units can either be affixed to a tray for tray mounting or attached directly to the vehicle frame by the installer. Avoid road splash and the possibility of igniting combustible material beneath the generator.

When designing the compartment, allow sufficient room for the set to be easily removed when major service is required. Also keep in mind that the compartment must have air intake openings having a free area equal to or greater than that specified under "Air Requirements" following.

Line the compartment with a good sound deadening material. The material selected must be fireproof or highly resistant to fire. An available type of 3-layer foam material does a very efficient job of absorbing sound. This type of material is easily cut to size with scissors and can be quickly installed using special fire retardant adhesive which bonds the material to almost any surface that is clean and dry.

NOTE

Be careful not to place combustible insulation near exposed exhaust system components.

Air Requirements

Each engine is equipped with a high water temperature shutdown switch which will automatically shut down the set, if operating temperatures climb too high. To prevent the generator set from shutdown, make sure the compartment openings are large enough to allow adequate circulation of the cooling air. The minimum **free air** opening into the compartment is shown in Figure 6-3. Remember, louvers, screens, and protective decorative grill work definitely restrict the effective air flow. Even a simple, relatively open mesh screen, as shown in Figure 6-4, will restrict air flow as much as 45%. The intake opening must be increased to compensate for such restrictions.

Air inlet and discharge openings for inline radiator mounted models are shown in Figure 6-5.

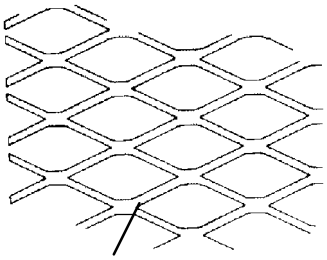
Minimum Air Openings, sq. in. (sq. cm)

Model	Inlet
10CCOZ	325 (2097)

Figure 6-3. Compartment Door Air Opening.

NOTE

Certain applications may require the use of two supplemental cooling fans capable of 265 cfm (7.49 m^3/min) each. These fans should be installed to supply adequate air to the generator compartment. Cooling fans are only required if the compartment is sized to the minimum requirements.



Wide Mesh Screen

Figure 6-4. Inlet Screen.

NOTE

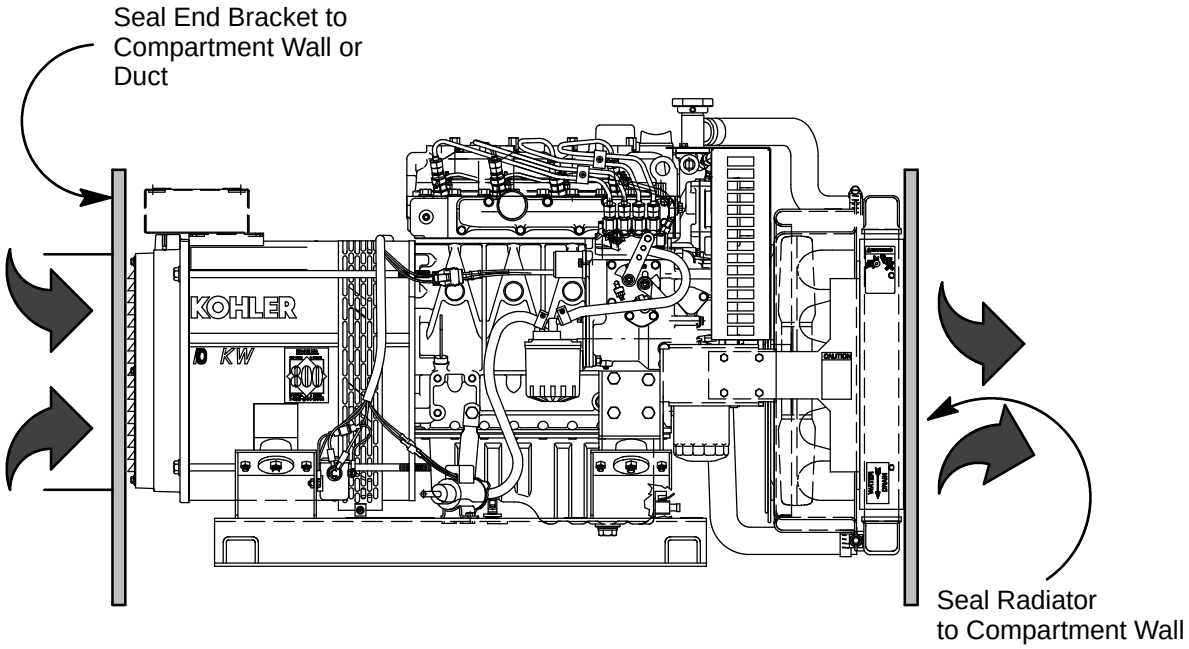
The air inlet perimeters, at the engine radiator and generator end bracket must be sealed against the compartment wall. This is to make sure that only exterior air is drawn into the generator compartment.

NOTE

Air intake restriction limit:

8 inches (200 mm) of water (Installation)
25 inches (635 mm) of water (after use)

Generator Free-Air Opening: 10CCOZ: 140 sq. in. (903 sq. cm)



Radiator Free-Air Opening: 10CCOZ: 306 sq. in. (1974 sq. cm)

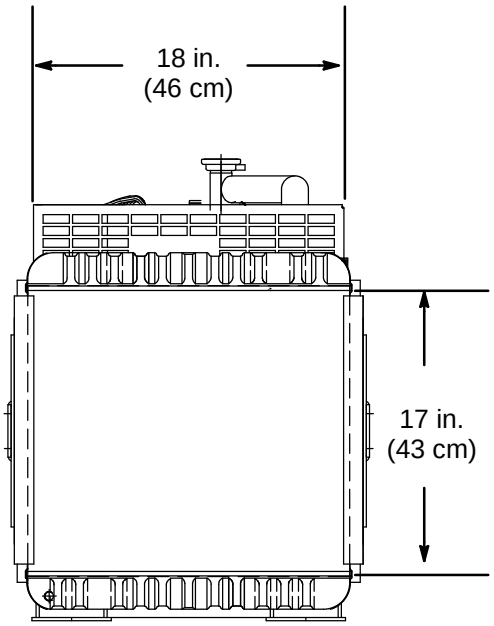
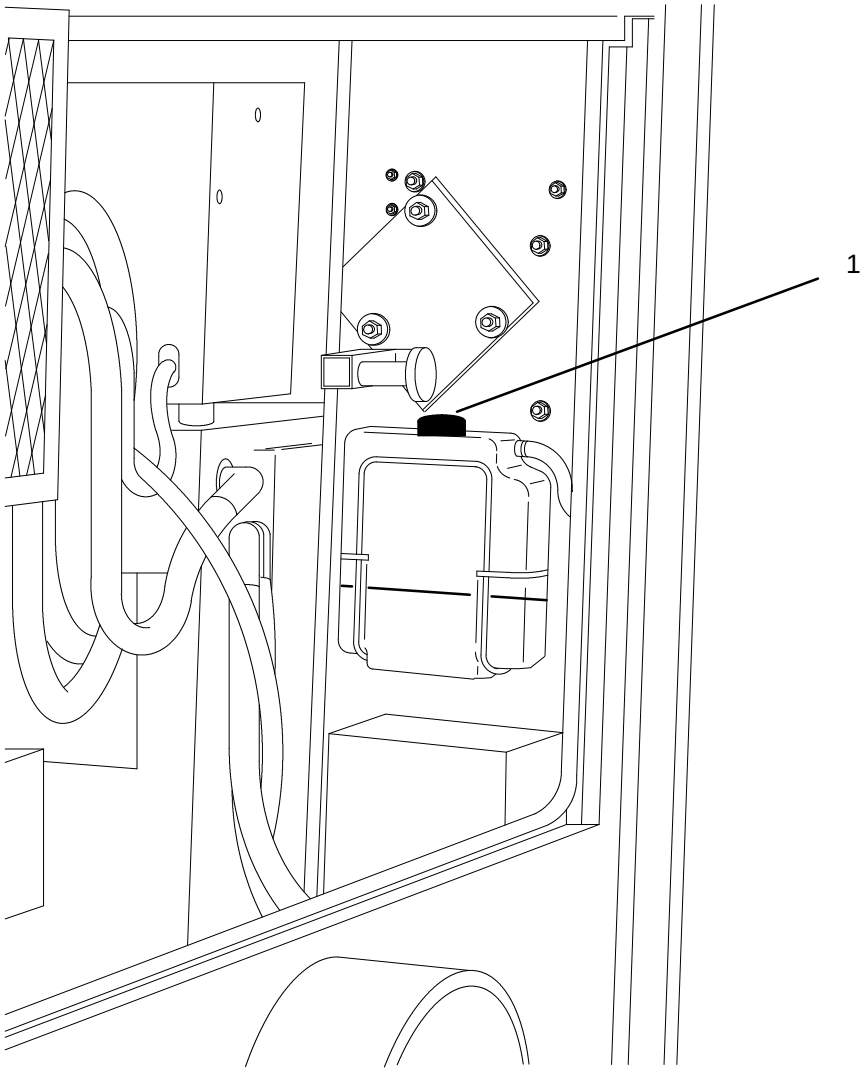


Figure 6-5. Air Flow Requirements– Blower Fan (Inline Radiator).

NOTE

Mount the coolant recovery tank so that its surface level is the same height or 2 in. (5 cm) max. below the level of the pressure cap. See Figure 6-6. If the cooling system fill (coolant recovery tank) is not located as directed, cooling water will not completely fill the engine and result in overheating of the engine.



1. - Coolant Fill

Figure 6-6. Cooling System Fill (Coolant Recovery Tank).

Fuel System

WARNING

Explosive fuel vapors.
Can cause severe injury or death.

Use extreme care when handling, storing, and using fuels.

Explosive fuel vapors can cause severe injury or death. All fuels are highly explosive in a vapor state. Use extreme care when handling, storing, and using fuels. Store fuel in a well-ventilated area away from spark producing equipment and out of the reach of children. Never add fuel to the tank while the engine is running since spilled fuel may ignite on contact with hot parts or from ignition spark. Do not smoke or permit flame or spark to occur near potential sources of spilled fuel or fuel vapors. Keep fuel lines and connections tight and in good condition–don't replace flexible fuel lines with rigid lines. Flexible sections are used to avoid breakage due to vibration. Should any fuel leakage, fuel accumulation, or electrical sparks be noted, DO NOT OPERATE GENERATOR SET. Have systems repaired before resuming generator operation.

Explosive fuel vapors can cause severe injury or death. Spilled fuel can cause an explosion. Use a container to catch fuel when draining fuel system. Wipe up all spilled fuel after draining system.

The diesel fuel system for the generator set must be designed to operate independently from the system for the vehicle engine if both engines are to be operated at the same time. The best way to do this is to have separate fuel tanks; however, this is usually impractical because of space restrictions. In most installations, both engines operate off a common tank with a separate dip tube arrangement as shown in Figure 6-7. This prevents the smaller engine from being starved of fuel by the larger engine. The generator set dip tube is generally shorter than the vehicle dip tube. With this arrangement, fuel may not be available to the generator set when fuel supply is low.

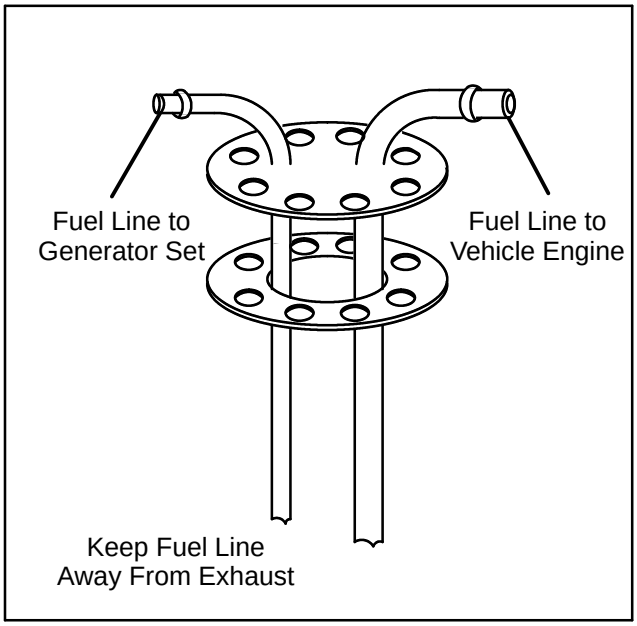


Figure 6-7. Two Dip Tubes in Fuel Tank.

A simple tee fitting is sometimes used to provide fuel for both engines off a common tank; however, this usually prohibits simultaneous operation. There is also the possibility that operation of either engine could completely drain the fuel line of the other engine, thus making starting difficult if not impossible. The tee arrangement should not be used.

NOTE

Do not "tee" into fuel injected fuel systems. Use a two dip tube arrangement for fuel supply. Consult an Authorized Kohler Service Dealer/Distributor for further fuel system installation information.

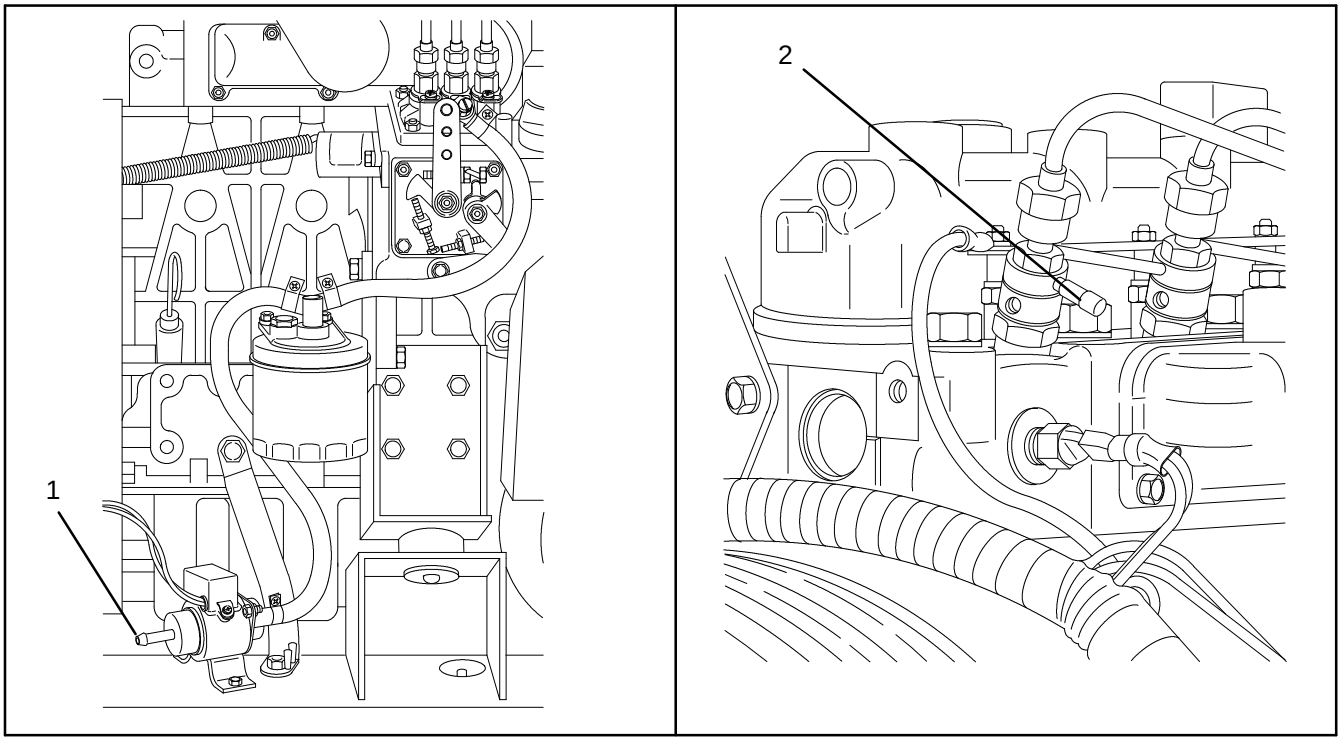
The diesel fuel system for the generator set must be designed to operate without completely emptying the fuel tank. The generator set includes connections and wiring for a low fuel level (LFL) switch which the installer can provide. Use of the LFL switch is recommended to provide shutdown prior to running out of fuel.

The fuel inlet and return lines (from the fuel tank) must include dip tubes extending to near-the-bottom of the fuel tank. These allow pick-up of fuel and prevents air from entering the system during storage or inoperative periods. Air entering the system will cause drainage and hard starting (fuel system bleeding will be required).

Care must be taken when routing the fuel line from the fuel tank to the generator set. Keep fuel lines as short as possible but maintain adequate clearance from exhaust system. Fuel lines must be run along the frame or undercarriage. Locate fuel lines below the generator set compartment with entry point near fuel pump [max. lift of the fuel pump is 1 meter (39 inches)]. The fuel line must be of adequate size to handle the flow of fuel and withstand road shock and year-round climate conditions. If steel tubing is used, it should be 5/16 in. (8 mm) I.D. (minimum) with an 8 in. (230 mm) (minimum) flexible section to allow free movement of the generator set. Return line to the fuel tank is 3/16 in. I.D. (4.82 mm). The fuel return line should be located as far as practical from the fuel pickup. This will allow return fuel to be cooled by the tank fuel before delivery back to the fuel injectors. Incoming fuel is used to cool the injectors and maximum engine efficiency will be achieved by supplying cool fuel to the engine. Fuel tank capacity and the amount of fuel will affect cooling capability.

Fuel Line Sizes:

Fuel Inlet	5/16 in (8 mm)
Fuel Return	3/16 in (4.8 mm)



1. - Fuel Inlet Connection
2. - Fuel Return Connection

Figure 6-8. Fuel Inlet and Return Connection.

Fuel Lines and Filters

If metal lines are used from the fuel tank, a flexible hose section should connect the metal line to the preliminary fuel filter (supplied loose) and flexible hose section to the engine fuel pump (fuel inlet connection). A flexible hose section should connect the metal line from the fuel tank to the engine fuel return connection point. The flexible sections are necessary to allow vibrational motion of the generator set during operation. See Figure 6-8 for fuel inlet- and return-line connections.

NOTE

Diesel-fueled engines require type B1 hose.

Exhaust Systems

Carefully plan the generator exhaust system to insure a safe, quiet installation. Be sure the installation will comply with all state and local requirements and applicable articles of the codes listed at the beginning of this section.

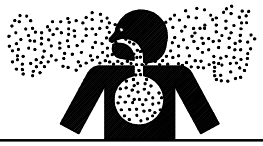
⚠ WARNING

Hot engine and exhaust system.
Can cause severe injury or death.

Do not work on generator set until unit is allowed to cool.

Fire can cause severe injury or death. Hot exhaust system can ignite adjacent combustible materials. Do not locate electrical wiring, fuel lines, or combustible material above the exhaust muffler. Be careful when parking your vehicle to prevent grass fires started by exhaust system and hot exhaust gases.

⚠ WARNING



Carbon monoxide.
Can cause severe nausea, fainting, or death.

The exhaust system must be leakproof and routinely inspected.

Carbon monoxide can cause severe nausea, fainting, or death. Install exhaust system tail pipe so discharged exhaust gases will not be drawn into vehicle interior through windows, doors, air conditioners, etc. Do not use flexible tail piping since this type could crack and allow lethal exhaust fumes to enter the vehicle.

Carbon monoxide can cause severe nausea, fainting, or death. Never operate the generator set inside a building unless the exhaust gas is piped safely outside. Never operate in any area where exhaust gas could accumulate and seep back inside an occupied building or vehicle. Be careful when parking your vehicle to avoid obstructing the exhaust outlet. The exhaust gases must discharge freely, otherwise carbon monoxide may deflect into the vehicle. Avoid breathing exhaust fumes when working on or near the generator set. Carbon monoxide is particularly dangerous because it is an odorless, colorless, tasteless, nonirritating gas which can cause death if inhaled for even a short period of time.

Carbon monoxide can cause severe nausea, fainting, or death. Diesel fumes can rapidly destroy copper tubing in diesel exhaust systems. Do not use copper tubing in diesel exhaust systems. Exhaust sulphur will cause rapid deterioration and this could result in exhaust/water leakage.

Due to the different locations of mufflers and piping to these mufflers, clearance requirements must be followed to protect generator set components and to avoid igniting adjacent combustible materials. A clearance of 1.5 in. (38 mm) is recommended between exhaust system parts and fuel system, electrical system and all combustible components.

The exhaust piping can be routed through the compartment floor or walls, provided minimum clearances are maintained and exhaust piping bends are kept to a minimum. Use a tail pipe with as few gradual bends as possible to reduce back pressure, maximum back pressure allowed is 700 mm water column. The exhaust piping must include an exhaust sleeve or thimble when routed through a combustible wall. Extend tail pipe a minimum of 1 in. (25 mm) past perimeter of vehicle (tail pipe must extend beyond the perimeter of the vehicle body).

Battery, load lead, and control panel connections are needed to complete the installation. Make final connections to the battery only after all other connections have been made as this will prevent unintentional starting. Some specific details on each connection are stated in the following paragraphs. Refer to the wiring diagram for specific details– connections should be made only by qualified electricians. All wiring to the generator set shall be securely supported or harnessed to prevent abrasion. Additional support is required to prevent exposure to the exhaust system and drippage of fuel, oil, or grease– at least 2 ” (51 mm) clearance must be provided between electrical wiring and hot exhaust parts. Also, wiring must not be located directly below or in close proximity to fuel system parts or oil fill tube. Some other points to consider when making AC load connections are covered in the following paragraphs.

NOTE

Wiring connections made at the time of installation should be accessible for inspection and servicing.

Battery and Connections

A separate 12-volt battery is recommended for the generator set. With a separate battery, cables can be kept short which eliminates the problem of excessive voltage drop through long cables. See Figure 6-9 for length and sizes. Refer to Figure 6-10 (View A) for cable connections, note that a grounding strap must be connected between the ground lug on the generator set and frame of the vehicle with this arrangement.

If the starting battery for the vehicle engine must also be used for starting the generator engine, the negative battery terminal must be grounded to the vehicle frame. Heavy gauge (#4) ground strap must connect the ground lug on the generator set to the vehicle frame as illustrated in Figure 6-10.

Distance Between Generator Set And Battery	Cable Size (AWG) At 0°F (–18°C)	Cable Size (AWG) at 32°F (0°C)	Cable Size (AWG) At 75°F (24°C)
40 feet (12.2 m)	00	0	1
30 feet (9.1 m)	0	1	2
25 feet (7.6 m)	1	2	4
20 feet (6.1 m)	2	2	6
15 feet (4.6 m)	2	4	6
10 feet (3.0 m)	4	6	8
5 feet (1.5 m)	6	6	8
2.5 feet (0.8 m)	8	8	8

Figure 6-9. Battery Cable Size.

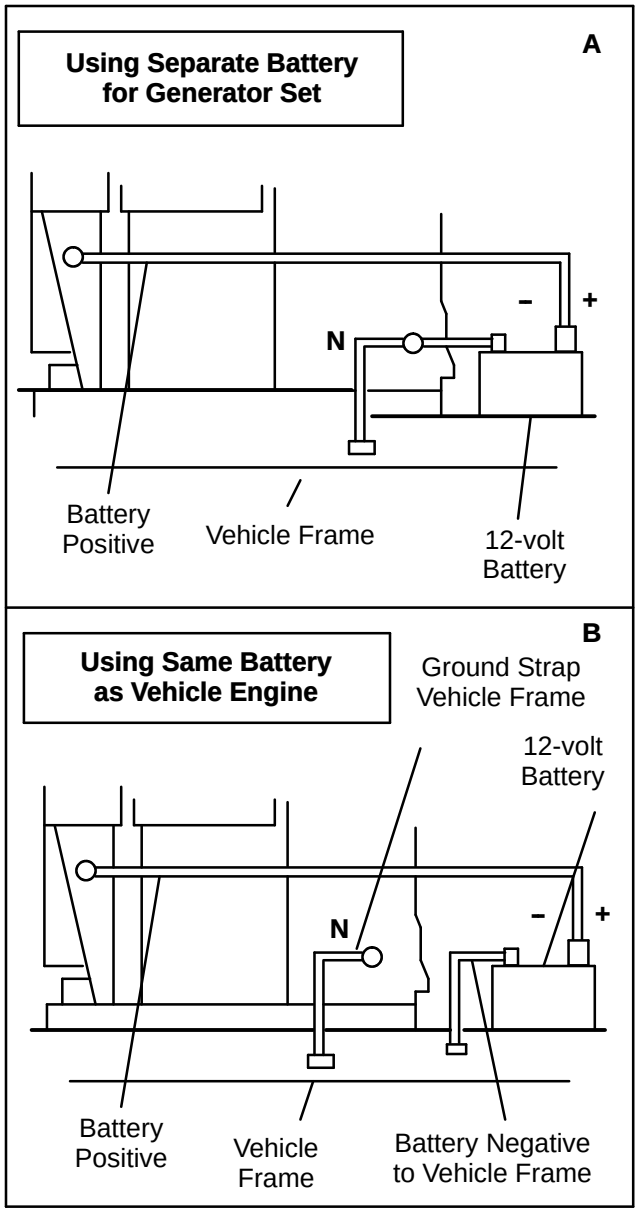


Figure 6-10. Battery Connection Details

⚠ WARNING

Sulfuric acid in batteries.
Can cause severe injury or death.

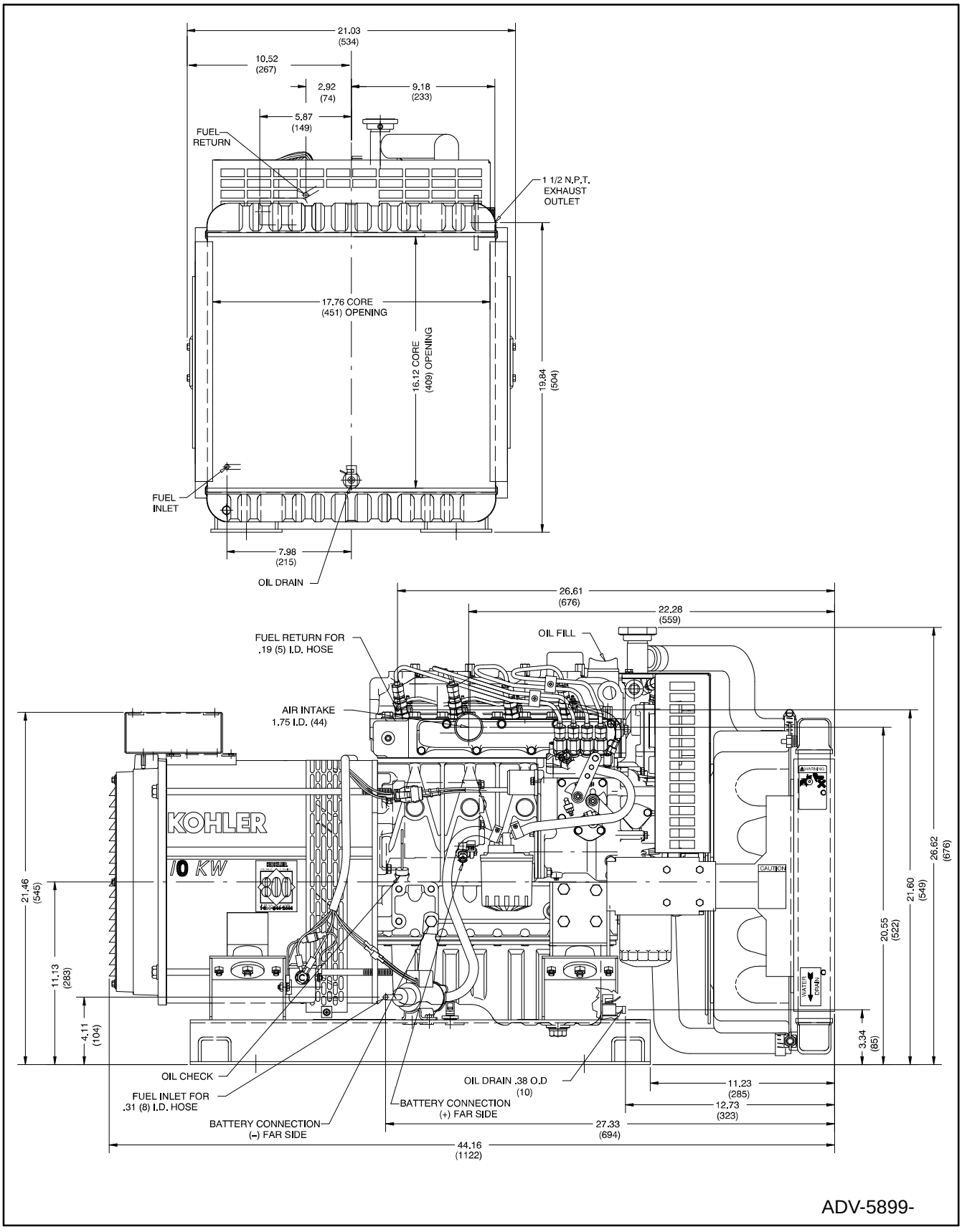
Use protective goggles and clothes. Can cause permanent damage to eyes, burn skin, and eat holes in clothing.

Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flame or spark to occur near a battery at any time, particularly when it is being charged. Avoid contacting terminals with tools, etc. to prevent burns and to prevent sparks that could cause an explosion. Remove wristwatch, rings, and any other jewelry before handling battery. Never connect negative (-) battery cable to positive (+) connection terminal of starter solenoid. Do not test battery condition by shorting terminals together or sparks could ignite battery gases or fuel vapors. Any compartment containing batteries must be well ventilated to prevent accumulation of explosive gases. To avoid sparks, do not disturb battery charger connections while battery is being charged and always turn charger off before disconnecting battery connections. When disconnecting battery, remove negative lead first and reconnect it last.

NOTE

A ground connection is required between the generator and the vehicle frame even if the battery used to start the generator is not the same as the vehicle.

Section 7. Installation Drawings



10CCOZ MOBILE

Section 8. Service Ordering Instructions

In any communications regarding your generator set, please include the MODEL, SPECIFICATION, SERIAL and ENGINE SPEC. numbers as found on the nameplate attached to the belt guard of the generator. Your Authorized Service Dealer/Distributor will need these numbers to provide the correct parts and information for your generator set. Do not attempt to replace major items or any item that calls for special tools or procedures– have this done only by qualified Kohler Generator Specialists. Check the yellow pages of your telephone directory under the heading GENERATORS, ELECTRIC for Kohler Generator Service Dealers/Distributors in your area.

KOHLER CO., Kohler, Wisconsin 53044
Phone 414-565-3381, Telex 26888,
Fax 414-459-1646 (North American Sales)
Fax 414-459-1614 (International)

For Sales & Service in U.S.A. & Canada
Phone 1-800-544-2444

Service Manual Procurement

A service manual or parts catalog for your generator set may be obtained through your local dealer or Kohler Generator Distributor. Record Model, Spec. and Serial numbers (from generator set nameplate) in the spaces below.

Model No. _____

Spec. No. _____

Serial No. _____

Engine Spec. No. _____

Engine Serial No. _____

Routine Service Parts

Your Kohler Generator Dealer/Distributor has a complete listing of parts for your generator set. Contact him for service.

Part Description	Kohler Part No.
Oil filter	322422
Plastic-type fuel filter (Supplied loose)	322056
Metal-type fuel filter element	322536
Alternator V-belt	322456
Low coolant level switch (12v)	273520
Black spray paint	221292

Section 9. Operating Hour Service Log

The following is provided to help you keep an accumulative record of operating hours on your generator set and the dates required services were performed. Enter hours to the nearest quarter hour.

DATE RUN	OPERATING HOURS		SERVICE RECORD	
	HOURS RUN	ACCUMULATIVE	DATE	SERVICE

KOHLER®
POWER SYSTEMS

KOHLER CO. Kohler, Wisconsin 53044
Phone 920-565-3381, Web site www.kohlergenerators.com
Fax 920-459-1646 (U.S.A. Sales), Fax 920-459-1614 (International)
For the nearest sales and service outlet in U.S.A. and Canada
Phone 1-800-544-2444

TP-5647 4/93a