



Operation and Maintenance Manual

C32 Marine Engine

S/N SDN00001-UP



Operation and Maintenance Manual C32 Marine Engine

Media Number -SEBU8773-02

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Foreword

SMCS - 1000

Literature Information

This manual contains safety, operation instructions, lubrication and maintenance information. This manual should be stored in or near the engine area in a literature holder or literature storage area. Read, study and keep it with the literature and engine information.

English is the primary language for all Caterpillar publications. The English used facilitates translation and consistency in electronic media delivery.

Some photographs or illustrations in this manual show details or attachments that may be different from your engine. Guards and covers may have been removed for illustrative purposes. Continuing improvement and advancement of product design may have caused changes to your engine which are not included in this manual. Whenever a question arises regarding your engine, or this manual, please consult with your Caterpillar dealer for the latest available information.

Safety

This safety section lists basic safety precautions. In addition, this section identifies hazardous, warning situations. Read and understand the basic precautions listed in the safety section before operating or performing lubrication, maintenance and repair on this product.

Operation

Operating techniques outlined in this manual are basic. They assist with developing the skills and techniques required to operate the engine more efficiently and economically. Skill and techniques develop as the operator gains knowledge of the engine and its capabilities.

The operation section is a reference for operators. Photographs and illustrations guide the operator through procedures of inspecting, starting, operating and stopping the engine. This section also includes a discussion of electronic diagnostic information.

Maintenance

The maintenance section is a guide to engine care. The illustrated, step-by-step instructions are grouped by fuel consumption, service hours and/or calendar time maintenance intervals. Items in the maintenance schedule are referenced to detailed instructions that follow.

Use fuel consumption or service hours to determine intervals. Calendar intervals shown (daily, annually, etc.) may be used instead of service meter intervals if they provide more convenient schedules and approximate the indicated service meter reading.

Recommended service should be performed at the appropriate intervals as indicated in the Maintenance Interval Schedule. The actual operating environment of the engine also governs the Maintenance Interval Schedule. Therefore, under extremely severe, dusty, wet or freezing cold operating conditions, more frequent lubrication and maintenance than is specified in the Maintenance Interval Schedule may be necessary.

The maintenance schedule items are organized for a preventive maintenance management program. If the preventive maintenance program is followed, a periodic tune-up is not required. The implementation of a preventive maintenance management program should minimize operating costs through cost avoidances resulting from reductions in unscheduled downtime and failures.

Maintenance Intervals

Perform maintenance on items at multiples of the original requirement. Each level and/or individual items in each level should be shifted ahead or back depending upon your specific maintenance practices, operation and application. We recommend that the maintenance schedules be reproduced and displayed near the engine as a convenient reminder. We also recommend that a maintenance record be maintained as part of the engine's permanent record.

See the section in the Operation and Maintenance Manual, "Maintenance Records" for information regarding documents that are generally accepted as proof of maintenance or repair. Your authorized Caterpillar dealer can assist you in adjusting your maintenance schedule to meet the needs of your operating environment.

Overhaul

Major engine overhaul details are not covered in the Operation and Maintenance Manual except for the interval and the maintenance items in that interval. Major repairs are best left to trained personnel or an authorized Caterpillar dealer. Your Caterpillar dealer offers a variety of options regarding overhaul programs. If you experience a major engine failure, there are also numerous after failure overhaul options available from your Caterpillar dealer. Consult with your dealer for information regarding these options.

California Proposition 65 Warning

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

Battery posts, terminals and related accessories contain lead and lead compounds. **Wash hands after handling.**



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Burn Prevention

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Do not touch any part of an operating engine. Allow the engine to cool before any maintenance is performed on the engine. Relieve all pressure in the appropriate system before any lines, fittings or related items are disconnected.

Coolant

When the engine is at operating temperature, the engine coolant is hot. The coolant is also under pressure. The radiator and all lines to the heaters or to the engine contain hot coolant. Any contact with hot coolant or with steam can cause severe burns. Allow cooling system components to cool before the cooling system is drained.

Check the coolant level after the engine has stopped and the engine has been allowed to cool. Ensure that the filler cap is cool before removing the filler cap. The filler cap must be cool enough to touch with a bare hand. Remove the filler cap slowly in order to relieve pressure.

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

Oils

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

If the application has a makeup tank, remove the cap for the makeup tank after the engine has stopped. The filler cap must be cool to the touch.

Batteries

The liquid in a battery is an electrolyte. Electrolyte is an acid that can cause personal injury. Do not allow electrolyte to contact the skin or the eyes.

Do not smoke while checking the battery electrolyte levels. Batteries give off flammable fumes which can explode.

Always wear protective glasses when you work with batteries. Wash hands after touching batteries. The use of gloves is recommended.



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Electrical System

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Never disconnect any charging unit circuit or battery circuit cable from the battery when the charging unit is operating. A spark may cause the combustible gasses that are produced by some batteries to ignite.

Connect the negative jump-start cable last from the external power source to the negative terminal of the starting motor. This connection sequence helps to prevent sparks from igniting any combustible gasses which batteries may produce. If the starting motor is not equipped with a negative terminal, connect the jump-start cable to the engine block.

Check the electrical wires daily for wires that are loose or frayed. Tighten all loose electrical wires before the engine is operated. Repair all frayed electrical wires before the engine is started. See this Operation and Maintenance Manual, "Engine Starting" for specific starting instructions.

Grounding Practices

Properly ground the electrical system for the vessel and the engine. Proper grounding is necessary for optimum engine performance and reliability. Improper grounding will result in uncontrolled or unreliable electrical circuit paths.

Uncontrolled or unreliable electrical circuit paths may result in damage to main bearings, crankshaft bearing journal surfaces, and aluminum components. Uncontrolled electrical circuit paths may also cause electrical noise. Electrical noise may degrade the performance of the vessel and of the radio.

Connect the starting motor directly to the negative battery terminal. Connect the alternator to the negative battery or negative terminal for the starting motor. The alternator and the starting motor must meet marine isolation requirements.

Note: All electrical connections must meet or exceed the American Boat and Yacht Council Standard E-11.

Use a bus bar with a direct path to the negative battery terminal for low current components that require a negative battery connection. Connect the bus bar directly to the negative battery terminal.

Note: All return paths to the negative battery must be able to carry any likely fault currents.

The use of a bus bar ensures that the electronic control module (ECM) and the components connected to the ECM have a common reference point.

Refer to Special Instruction, REHS1187, "Marine Engine Electronic Installation Guide" for additional information on grounding procedures.

Negative Battery Connection for Multiple Engines

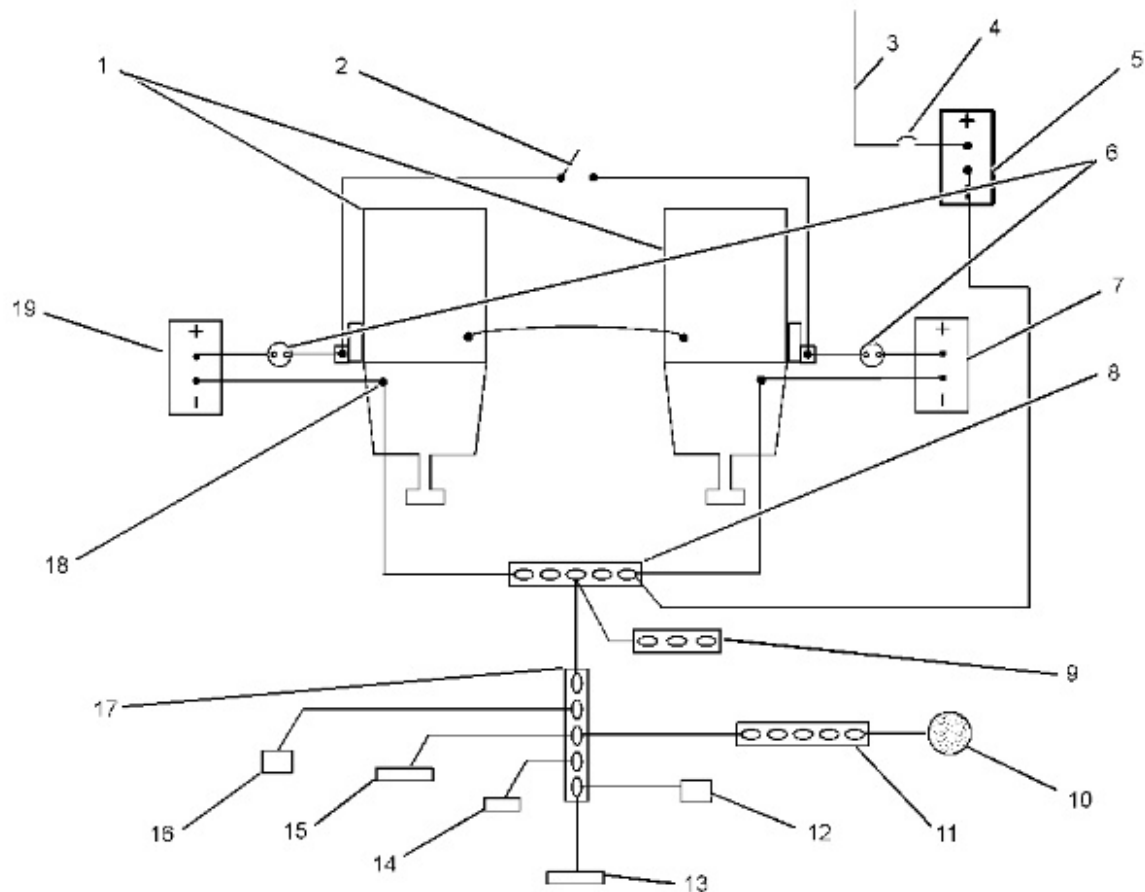


Illustration 1

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- (1) Engines
- (2) Parallel switch
- (3) Customer miscellaneous vessel loads
- (4) Overcurrent protection
- (5) Battery
- (6) Battery disconnect switches
- (7) Battery
- (8) Direct current (DC) main negative bus bar
- (9) Alternating current (AC) grounding bus bar
- (10) Strainer

- (11) Cathodic protection bus bar
- (12) Lightning protection ground point
- (13) Immersed ground plate
- (14) Zinc bar
- (15) Electronics ground plate
- (16) Chain plates
- (17) Grounding bus bar
- (18) Engine negative terminal
- (19) Battery

Install the battery disconnect switches as close as possible to the battery positive (+) but outside of the battery enclosure.

Note: If multiple bus bars are used to connect components to the negative battery, a common reference should be provided. All bus bars must be wired together for proper engine synchronization for multiple engine operations.



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Fuel System - Prime

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Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire. To help prevent possible injury, turn the start switch off when changing fuel filters or water separator elements. Clean up fuel spills immediately.

The fuel system should be primed after a unit injector is changed or when the fuel system is totally dry.

Note: The fuel system does not typically need to be primed when the primary fuel filters or secondary fuel filters are changed or when an Electronic Control Module (ECM) is replaced. When the engine is started under these circumstances, the engine may momentarily run rough until the air is purged from the system.

NOTICE

Do not allow dirt to enter the fuel system. Thoroughly clean the area around a fuel system component that will be disconnected. Fit a suitable cover over any disconnected fuel system components.

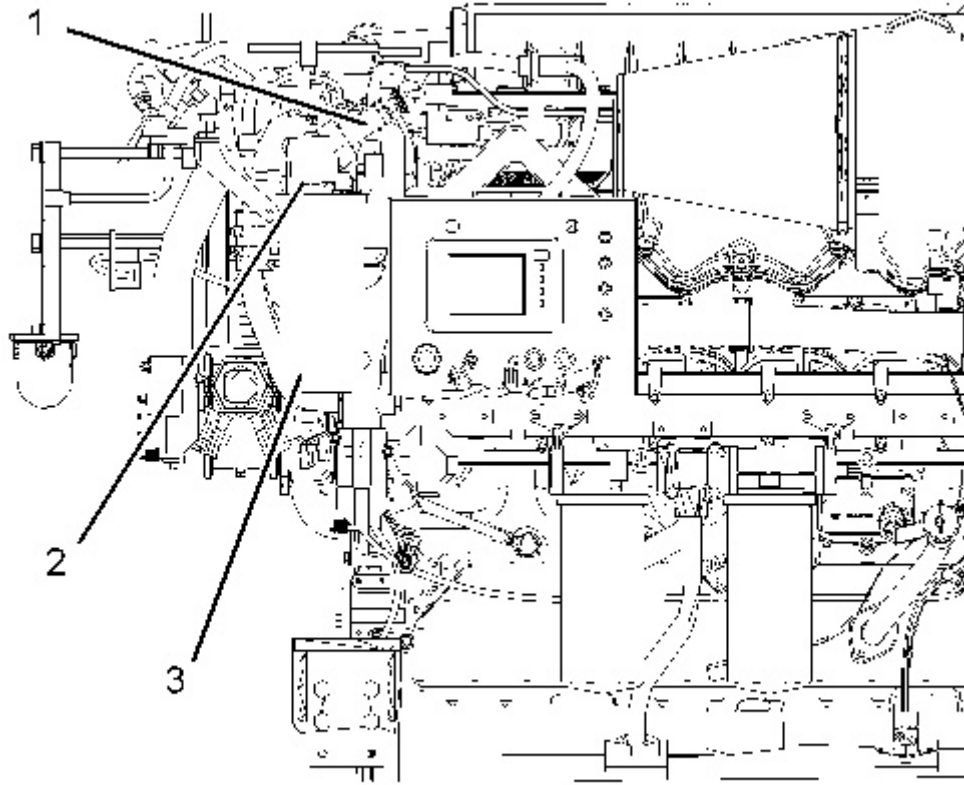


Illustration 1

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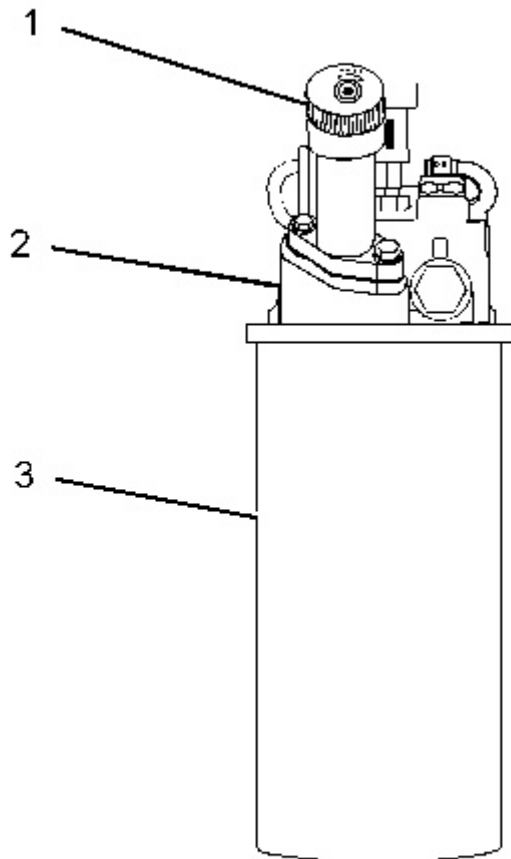


Illustration 2

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- (1) Fuel priming pump
- (2) Fuel filter base
- (3) Secondary fuel filter

Follow the procedure below in order to prime the engine with fuel.

1. Turn the priming pump plunger (4) counterclockwise in order to unlock the plunger. Manually pump the plunger in order to fill the fuel lines and the fuel filters with fuel.
2. As the air is purged from the fuel system, fuel pressure will increase. This will create resistance in the plunger. Continue to pump the plunger until a strong resistance is felt. The number of strokes will vary with the amount of air in the fuel lines.
3. After resistance is felt in the plunger, push in the plunger. Lock the plunger by turning the plunger clockwise.

4. Start the engine at low idle.
5. If the engine runs rough, continue to run the engine at low idle until the engine runs smoothly.

NOTICE

Do not crank the engine continuously for more than 30 seconds. Allow the starting motor to cool for two minutes before cranking the engine again.



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Maintenance Records

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Caterpillar Inc. recommends the retention of accurate maintenance records. Accurate maintenance records can be used for the following purposes:

- Determine operating costs.
- Establish maintenance schedules for other engines that are operated in the same environment.
- Show compliance with the required maintenance practices and maintenance intervals.

Maintenance records can be used for various other business decisions that are related to engine maintenance.

Maintenance records are a key element of a maintenance program that is managed. Accurate maintenance records can help your Cat dealer to fine-tune the recommended maintenance intervals in order to meet the specific operating situation. This should result in a lower engine operating cost.

Records should be kept for the following items:

Fuel Consumption - A record of fuel consumption is essential in order to determine when the load sensitive components should be inspected or repaired. Fuel consumption also determines overhaul intervals.

Service Hours - A record of service hours is essential to determine when the speed sensitive components should be inspected or repaired.

Documents - These items should be easy to obtain, and these items should be kept in the engine history file. All of the documents should show this information: date, service hours, fuel consumption, unit number and engine serial number. The following types of documents should be kept as proof of maintenance or repair for warranty:

Keep the following types of documents as proof of maintenance for warranty. Also, keep these types of documents as proof of repair for warranty:

- Dealer work orders and itemized bills
 - Owner repair costs
 - Owner receipts
 - Maintenance log
-

Diesel Engines

ABS	Agco-Sisu
Akasaka	Baudouin
BMW	Bukh
Caterpillar	CHN 25/34
Cummins	Daihatsu
Detroit	Deutz
Doosan-Daewoo	Fiat
Ford	GE
Grenaa	Guascor
Hanshin	Hatz
Hino	Honda
Hyundai	Isotta
Isuzu	Iveco
John-Deere	Kelvin
Kioti	Komatsu
Kubota	Liebherr
Lister	Lombardini
MAK	MAN B&W
Mercedes	Mercruiser
Mirrlees BS	Mitsubishi
MTU	MWM
Niigata	Paxman
Perkins	Pielstick
Rolls / Bergen	Ruggerini
Ruston	Scania
Shibaura	Sisu-Valmet
SKL	Smit-Bolnes
Sole	Stork
VM-Motori	Volvo
Volvo Penta	Westerbeke
Wichmann	Yanmar

Machinery

ABG	Airman
Akerman	Ammann
Astra	Atlas Copco
Atlas Weyha.	Atlet
Bell	Bendi
Bigjoe	Bobcat
Bomag	BT
Carelift	Case
Caterpillar	Cesab
Challenger	Champion
Claas	Clark
Combilift	Crown
Daewoo-Doosan	Demag
Deutz-Fahr	Dressta

Machinery

Drott	Dynapack
Extec	Faun
Fendt	Fiat
Fiatallis	Flexicoil
Furukawa	Gehl
Genie	Grove-gmk
Halla	Hamm
Hangcha	Hanix
Hanomag	Hartl
Haulpack	Hiab
Hidromek	Hino truck
Hitachi	Hyster
Hyundai	IHI
Ingersoll-rand	JCB
JLG	John-Deere
Jungheinrich	Kalmar
Kato	Kioti
Kleeman	Kobelco
Komatsu	Kramer
Kubota	Lamborghini
Landini	Liebherr
Linde	Link-belt
Manitou	Massey-Ferg.
Mccormick	MDI-Yutani
Mitsubishi	Moxy
Mustang	Neusson
New-Holland	Nichiyu
Nissan	OK
OM-Pimespo	others-tech
Pel-Job	PH-mining
Poclain	Powerscreen
Same	Samsung
Sandvik	Scania
Schaefer	Schramm
Sennebogen	Shangli
Shibaura	Steiger
Steinbock	Steyr
Still	Sumitomo
Super-pac	Tadano
Takeuchi	TCM
Terex	Toyota
Valpadana	Venieri
Versatile	Vogele
Volvo	Weidemann
Wirtgen	Yale
YAM	Yanmar