

TM 55-1945-205-24-3-2

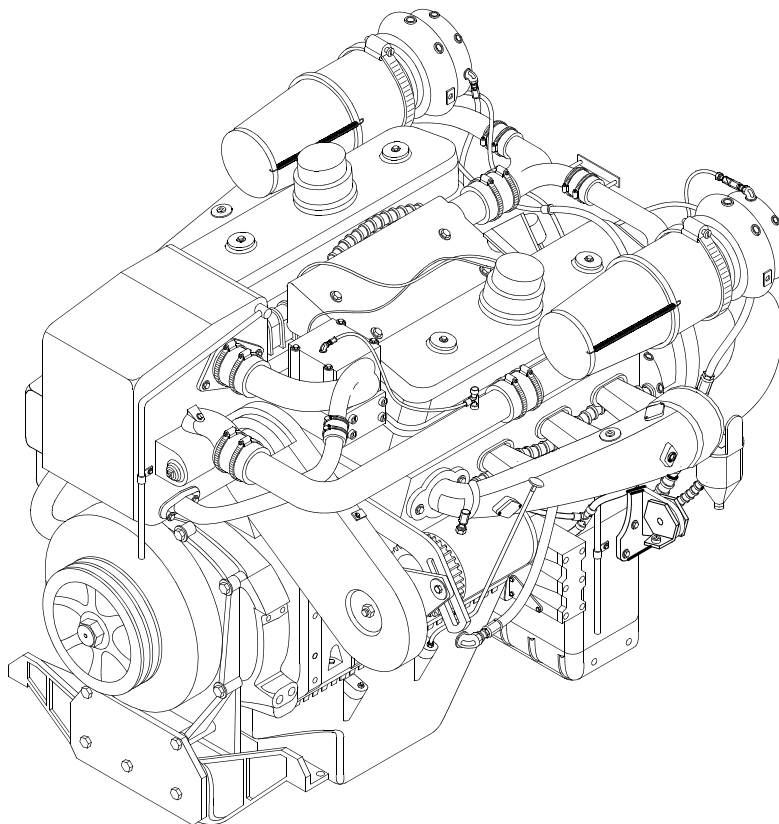
TECHNICAL MANUAL

UNIT, DIRECT SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL
FOR

MODULAR CAUSEWAY SYSTEM (MCS)
WARPING TUG (WT) ENGINE

8V92TA

NSN 2815-01-505-2025



This manual supersedes TM 55-1945-205-24-2 dated 29 August 1997, including all changes.

DISTRIBUTION STATEMENT A - Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY

30 AUGUST 2003

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 30 AUGUST 2003

TECHNICAL MANUAL

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MANUAL
FOR**

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REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028 (Recommended Changes to Equipment Technical Publications), through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is <http://aeprs.ria.army.mil>. If you need a password, scroll down and click on "ACCESS REQUEST FORM". The DA Form 2028 is located in the ONLINE FORMS PROCESSING section of the AEPS. Fill out the form and click on SUBMIT. Using this form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or email your letter or DA Form 2028 direct to: AMSTA-LC-CI / TECH PUBS, TACOM-RI, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The email address is TACOM-TECH-PUBS@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

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HOW TO USE THIS MANUAL

This manual contains certain features to improve the convenience of using this manual and increase the user's efficiency. These features include:

a. Accessing Information

Information is accessed by referring to the Table of Contents, located in the front of this manual, or by looking in the Alphabetical Index, located in the back of this manual.

b. Illustrations

Various methods are used to locate and repair components. Locator illustrations in Controls and Indicator tables, PMCS tables, exploded views and cut-away diagrams make the information in the manual easier to understand and follow.

c. Using This Manual

When using this manual, read and understand the entire maintenance action before performing the task. Also, read and understand all warnings, cautions and notes as well as general safety precautions that apply to the task to be performed. The warning summary will inform personnel of hazards associated with the equipment to be worked on. However, the summary is not all inclusive and personnel should be aware at all times of hazardous conditions that may arise.

Prior to starting the procedures in this manual, the initial setup requirements are located directly above each procedure. The information is given to ensure all materials, expendables, tools and any other equipment necessary are readily available for use. The initial setup will be accomplished prior to starting the actual steps of each maintenance procedure.

Locating Major Components

Obtain the manual for the system to be worked on. Open to the Table of Contents located in the front of this manual. Find Chapter 1, *Description and Theory of Operation*. Under the chapter title you will find the work package titled *Location and Description of Major Components*. Turn to the work package indicated. This work package will give a brief description of the major components, and show an illustration of what the component looks like and its location.

The Alphabetical Index, located in the back of this manual, contains an alphabetical list of all sections of this manual. *Location and Description of Major Components* is found in section L. The work package is found on the right side of the title where the *Location and Description of Major Components* is located. Turn to the work package indicated to find the description and location of each component.

Troubleshooting Procedures

The Table of Contents or Alphabetical Index may be used to locate sections within this manual. To locate a particular troubleshooting procedure, open the manual to the Table of Contents located in the front of this manual. Find Chapter 2, *Troubleshooting Procedures*. Under this section, find a work package titled *Troubleshooting Index*. Turn to the work package indicated, which lists all of the troubleshooting procedures. Look down the list until you find the appropriate work package for the problem you are trying to solve. To the right side of the procedure will be a work package number. Turn to the work package indicated and follow the steps to complete the troubleshooting procedure. The procedures list the malfunction, symptom and the corrective action. The corrective action will indicate which maintenance procedure to go to for the repair of the symptom or what level of maintenance is capable of repair of the problem. Follow the procedures indicated to complete the task. At the top of the task you will have a section called INITIAL SETUP. There are five basic headings listed under INITIAL SETUP.

Test Equipment: Lists all test equipment (standard or special) required to troubleshoot, test and inspect the equipment covered in this manual. The test equipment is identified with an item number and work package number from the *Tool Identification List* located in Chapter 4, *Supporting Information*.

Tools: Lists all tools (standard or special) required to perform the task. Tools are identified with an item number and work package number from the *Tool Identification List* located in Chapter 4, *Supporting Information*.

Personnel Required: Lists all personnel necessary to perform the task.

Equipment Condition: Notes the conditions that must exist before starting the task. The equipment condition will also include any prerequisite maintenance tasks to be performed with reference to the work package number or to the TM number.

References: Includes any other manuals necessary to complete the task. When there are no references listed, all steps necessary to complete the task are contained within this manual. A listing of reference materials is contained in the work package *References* in Chapter 4, *Supporting Information*.

Maintenance Instructions

To locate a maintenance procedure, open the manual to the Table of Contents located in the front of this manual. Find Chapter 3, *Maintenance Instructions*. Look down the list and find the maintenance procedure to be accomplished. On the right side of the maintenance procedure will be a work package number. Turn to the work package indicated. Before beginning the maintenance task, look through the procedure to familiarize yourself with the entire maintenance procedure. At the top of the task you will have a section called INITIAL SETUP. There are five basic headings listed under INITIAL SETUP.

Tools: Lists all tools (standard or special) required to perform the task. Tools are identified with an item number and work package number from the *Tool Identification List* located in Chapter 4, *Supporting Information*.

Materials/Parts: Lists all parts or materials necessary to perform the task. Expendable and durables are identified with an item number from the applicable work package located in Chapter 4, *Supporting Information*.

Personnel Required: Lists all personnel necessary to perform the task.

References: Includes any other manuals necessary to complete the task. When there are no references listed, all steps necessary to complete the task are contained within this manual. A listing of reference materials is contained in the work package *References* in Chapter 4, *Supporting Information*.

Equipment Condition: Notes the conditions that must exist before starting the task. The equipment condition will also include any prerequisite maintenance tasks to be performed with reference to the work package number or to the TM number.

Test Equipment: Lists all test equipment (standard or special) required to troubleshoot, test and inspect the equipment covered in this manual. The test equipment is identified with an item number and work package number from the *Tool Identification List* located in Chapter 4, *Supporting Information*.

Repair Parts and Special Tools List

Refer to TM 55-1945-205-24P-3 when requisitioning parts, special tools and equipment.

Identify the mandatory repair parts required to perform this task listed at the top of the work package in the INITIAL SET-UP. Using the part number provided, refer to the part number index work package in TM 55-1945-205-24P-3. Look up the part number in the part number column and identify the figure and item number where the part is located. Turn to the figure and locate the item number listed. Verify that the item is correct.

**UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE
WARPING TUG
ENGINE
GENERAL INFORMATION**

SCOPE

This manual contains descriptions and maintenance instructions for the Warping Tug (WT) engine.

Type of Manual: Unit, Direct Support and General Support Maintenance Manual.

Purpose of Equipment: The WT engine is a Detroit Diesel 8V92TA and is the source of power for propulsion and maneuverability of the WT. The WT engine is the first component of the WT drive train which consists of a marine gear, transfer case and pump-jet, which is connected by driveshafts.

MAINTENANCE FORMS, RECORDS AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, Functional Users Manual for The Army Maintenance Management System (TAMMS) and AR 700-138, Army Logistics Readiness and Sustainability.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If any component in your system needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368, Product Quality Deficiency Report. Mail it to the address specified in DA PAM 738-750, or as specified by the contracting activity. We will send you a reply.

CORROSION PREVENTION AND CONTROL (CPC)

CPC of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling or breaking of the materials may be a corrosion problem. If a corrosion problem is identified, it can be reported using SF 368, Product Quality Deficiency Report. Use of key words, such as "corrosion", "rust", "deterioration" or "cracking", will ensure that the information is identified as a CPC problem. The form should be submitted to the address specified in DA PAM 738-750, Functional Users Manual for The Army Maintenance Management System (TAMMS).

OZONE DEPLETING SUBSTANCES (ODS)

The continued use of ODS has been prohibited by Executive Order 12856 of 3 August 1993.

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

The procedures for destruction of Army materiel to prevent enemy use are contained in TM 750-244-6.

CHAPTER 1

DESCRIPTION AND THEORY OF OPERATION

FOR

MODULAR CAUSEWAY SYSTEM (MCS)

WARPING TUG (WT) ENGINE

UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE
WARPING TUG
ENGINE
DESCRIPTION AND DATA

EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES

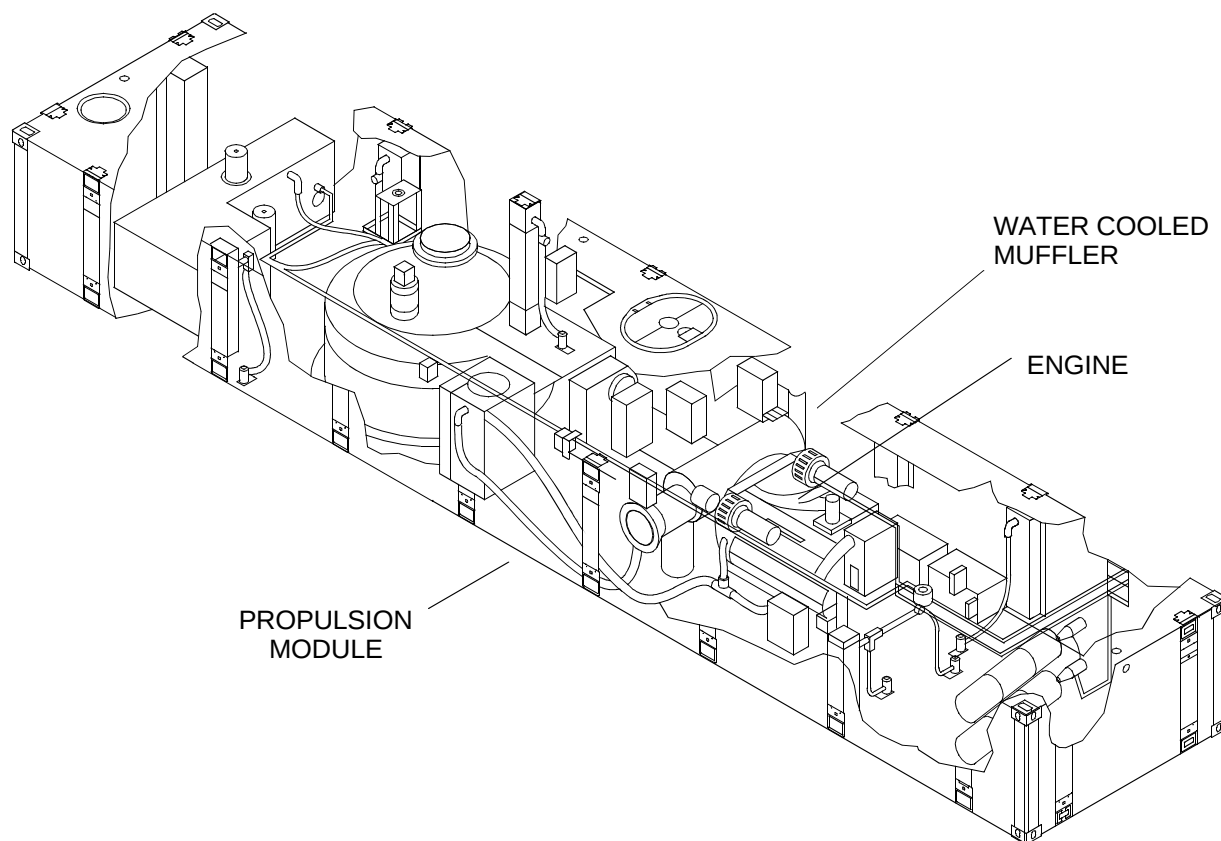
DIESEL ENGINE

The diesel engine is an eight cylinder, water-cooled, turbocharged, aftercooled, two cycle marine engine delivering 600 hp at 2100 RPM. The engine provides power to the drive train which consists of an engine, marine gear, transfer case and pump-jet connected by driveshafts. Operator control of the engine is accomplished from the operators cab, with the exception of below deck emergency stop push buttons and emergency stop actuation control of the fire suppression system.

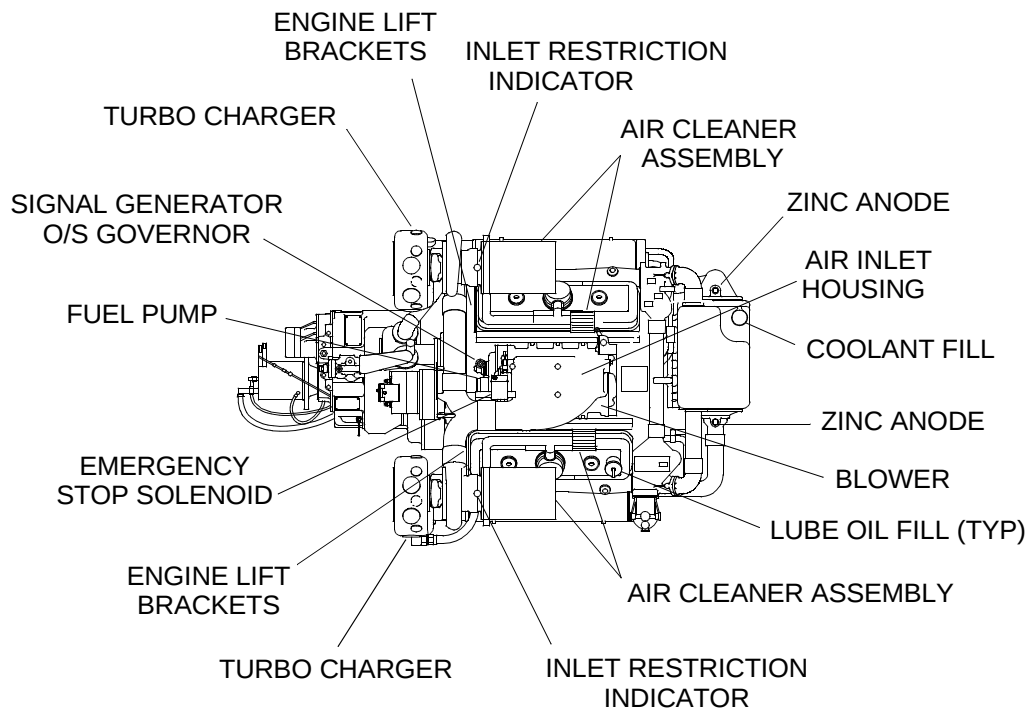
UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE
WARPING TUG
ENGINE
DESCRIPTION AND DATA

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

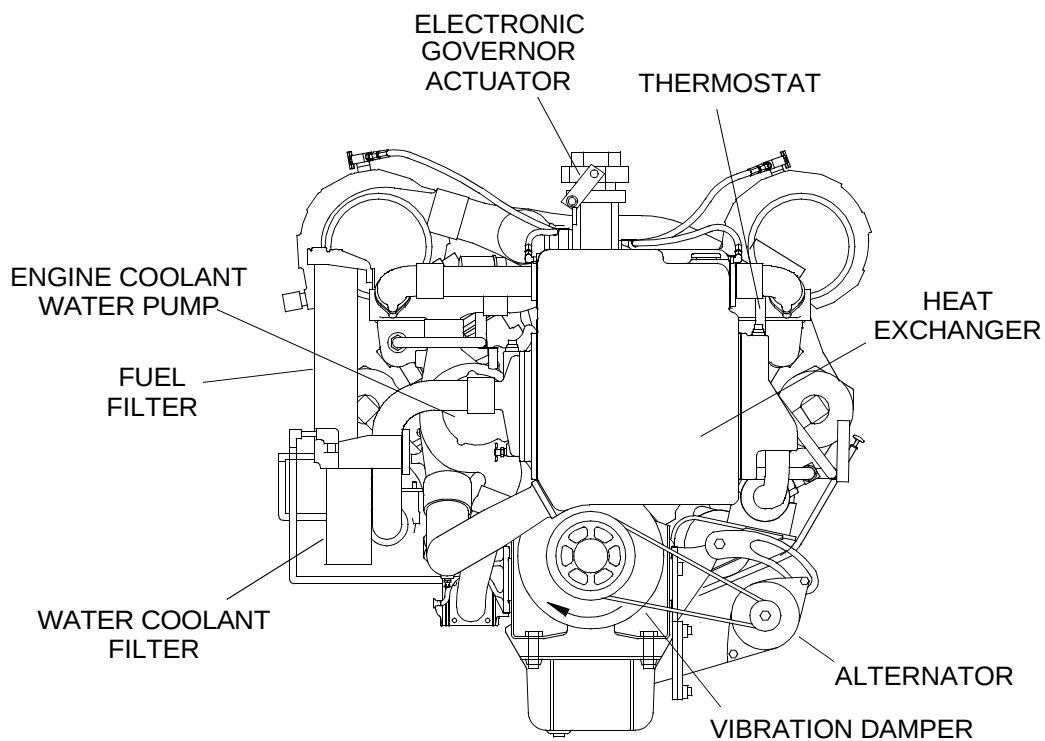
The diesel engine is an eight cylinder, water-cooled, turbo charged, after cooled, two cycle marine engine delivering 600 hp at 2100 RPM. The engine is located in the machinery compartment of the WT propulsion module. The engine contains the cooling system, fuel system, electrical system, governing system, air system and exhaust components which includes a water cooled muffler just aft of the engine.



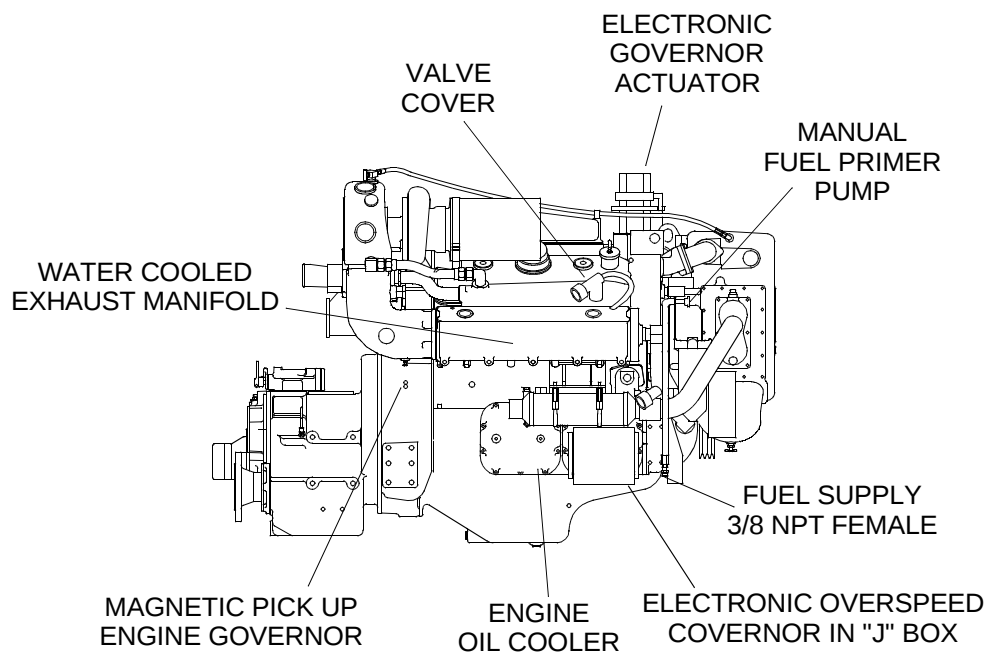
The engine provides power to the drive train, which consists of a marine gear, transfer case and pump-jet connected to each other by driveshafts. Control of the engine is accomplished from the operators cab, with the exception of below deck emergency stop push buttons and emergency stop actuation control of the fire suppression system.

EXTERNAL COMPONENTS

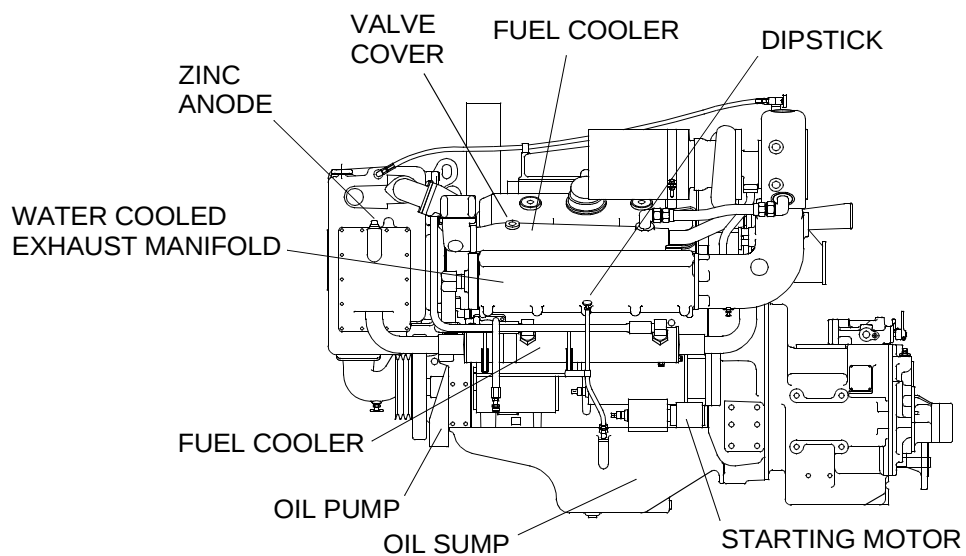
DIESEL ENGINE COMPONENTS, TOP VIEW



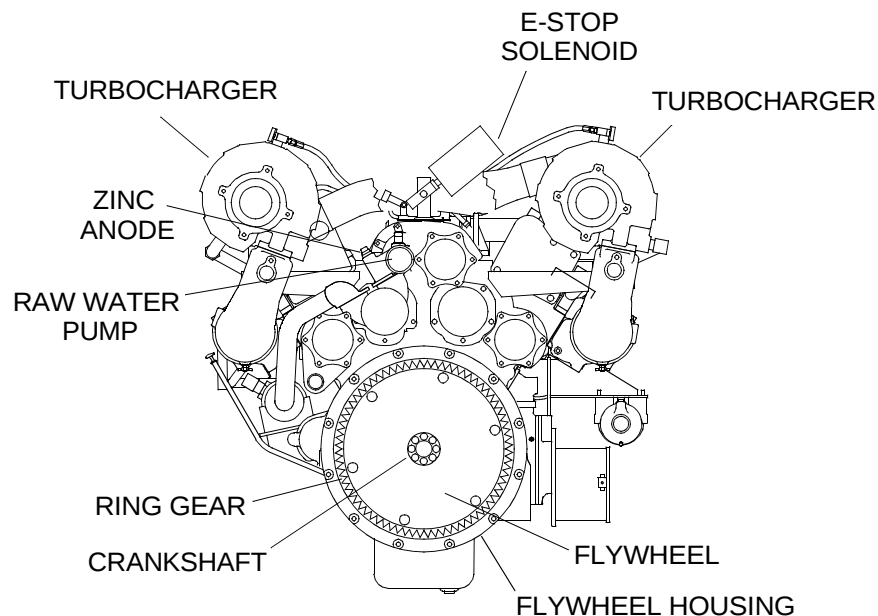
DIESEL ENGINE COMPONENTS, FORWARD VIEW



DIESEL ENGINE COMPONENTS, STARBOARD SIDE VIEW



DIESEL ENGINE COMPONENTS, PORT SIDE VIEW



DIESEL ENGINE COMPONENTS, AFT VIEW

Cooling System

Coolant is circulated through the engine by a centrifugal-type water pump, which is located on the forward end of the engine. Heat is removed from the coolant, which circulates in a closed system, by the heat exchanger also on the forward end of the engine. Control of the engine temperature is accomplished by thermostats located on the forward end of the engine, which regulate the flow of the coolant within the cooling system. The closed cooling system filter is located on the forward starboard corner of the engine, which cleans the coolant of dirt, sediment and oxidation. The coolant level is checked and filled through a cap located on the top of the heat exchanger.

The engine raw water cooling system consists of a sea chest, a butterfly valve and a duplex strainer which are all discussed in TM 55-1945-205-24-3-1. The engine raw water pump is located on the aft end of the engine, which circulates raw water through the entire raw water system. The fuel cooler is located on the port side of the engine. The marine gear oil cooler is located on the starboard side of the engine.

Fuel System

The fuel system is an integrated part of the diesel engine. The fuel is pumped by a gear type fuel pump located on the aft end of the engine blower. The fuel is cleaned by a fuel filter located on the starboard side of the engine. Fuel injectors, located in the cylinder heads, properly meter the fuel to the engine. Fuel manifolds, located in the cylinder head casting, supply an ample amount of fuel for the injectors to draw from. The excess fuel is then pumped through the fuel cooler located on the port side of the engine where it is cooled prior to being sent back to the fuel tank. A manual primer pump is located on forward starboard corner and is used to prime the fuel system after sitting in storage.

Lubrication System

Full pressure lubrication is supplied to all main, connecting rod and camshaft bearings and to other moving parts within the engine. A gear-type pump located on the front end of the engine behind the vibration damper, draws oil from the oil sump located on the bottom of the engine through an intake screen. It is then pumped through the oil filter located remotely on the starboard bulkhead and then to the oil cooler located on the starboard side of the engine. From the oil cooler, the oil flows through passages that connect with the oil galleries in the cylinder block and cylinder heads for distribution to the bearings, rocker arm mechanism and other functional internal parts. The oil level

is checked through a dipstick on the port side of the engine and is filled through oil filler cap on the starboard valve cover. The oil pressure is regulated by an oil pressure regulator located on the bottom side of the engine inside the oil sump. The engine is protected from excessive oil pressure by an oil pressure relief valve also located on the bottom side of the engine in the oil sump.

Electrical System

Engine starting is provided by an electric starting system. The electric starting motor, located on the port side of the engine, is energized by a storage battery. A battery-charging alternator, located port side forward corner of the engine, serves to keep the storage battery charged. The battery charging alternator is driven by a pulley mounted on the vibration damper, which is located on the forward end of the engine on the end of the crankshaft. An emergency stop solenoid, located on the aft end of the air inlet housing, activates a flapper in the air inlet housing when the air supply to the engine needs to be shut down.

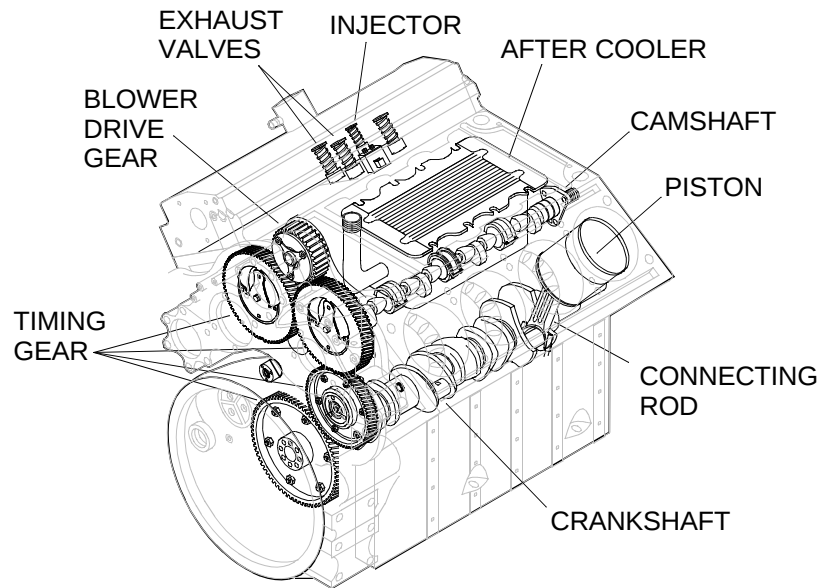
Engine Governing System

Engine speed is controlled by a governor system. The governor system consists of a speed controller located in the engine junction box A4 aft of the engine, a governor actuator located on the top of the engine and a magnetic pick-up located on the aft end of the engine on the flywheel housing.

The engine is protected from over speed by an over speed governor. The over speed governor consists of an electronic speed switch located on the lower starboard side of the engine, a dual function signal generator which is located aft of the blower. The dual function signal generator transmits engine RPM's to both the over speed governor and the tachometer gauge.

Air Induction System

The air induction system begins with two paper type air filters located on top of the of the engine in front of the turbochargers and two air limiters located inboard of each valve cover on top of the engine. Two large volume water cooled turbochargers are located on the aft end both port and starboard sides of the engine. The air inlet housing mounted top center of the engine can shut off all air to the engine, shutting it down in an emergency situation. The engine blower located top center beneath the air intake housing maintains a constant pressure in the air box to maintain an efficient scavenging process. Located directly beneath the blower is an after cooler, which is a small radiator designed to cool and condense the air prior to entering the air box.

INTERNAL ENGINE COMPONENTS**Crankshaft Group**

The crankshaft is located on the lower center line of the engine and is used to convert the linear motion of the pistons to rotational torque which may be used by the rest of the drive train. The cross head pistons are located, four per side, in both the port and starboard banks of the engine block. The pistons connect to the crankshaft with a connecting rod.

Camshaft Group

The port and starboard camshafts are located just outboard of the after cooler, running parallel to the crankshaft, providing synchronous operation of the exhaust valves and the injectors, which are located on both port and starboard cylinder heads. The camshaft is driven by a timed set of gears located on the aft end of the engine which also drives the blower drive gear.