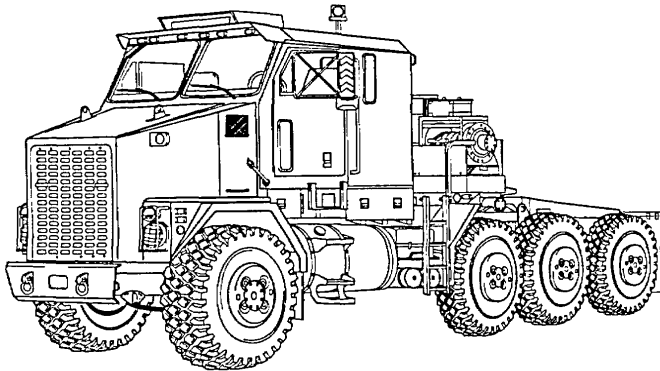


VOLUME NO. 2
GENERAL SUPPORT

TECHNICAL MANUAL
DIRECT SUPPORT AND
GENERAL SUPPORT MAINTENANCE



TRUCK, TRACTOR, M1070, 8 X 8,
HEAVY EQUIPMENT TRANSPORTER (HET)

NSN 2320-01-318-9902

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HEADQUARTERS, DEPARTMENT OF THE ARMY

MARCH 1994

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

**TRUCK, TRACTOR, M1070, 8 X 8,
HEAVY EQUIPMENT TRANSPORTER (HET)
(NSN 2320-01-318-9902)**

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Tank-Automotive and Armaments Command, ATTN: AMSTA-IM-OPIT, Warren, MI 48397-5000. A reply will be furnished to you.

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**CHAPTER 19
ENGINE MAINTENANCE**

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Section I. INTRODUCTION

19-1. INTRODUCTION

This chapter contains maintenance instructions for removal, installation, and repair of the engine at the General Support maintenance level. Some subassemblies and parts must be removed before the engine and components can be accessed. They are referenced to other paragraphs of this manual or TM 9-2320-360-20.

Section II. SERVICE UPON RECEIPT

19-2. GENERAL MAINTENANCE INSTRUCTIONS

- a. Follow these maintenance instructions when removing and installing engine:
 - (1) When unpacking items, remove packing material (for example: barrier paper, tape, plastic bags, and protective caps).
 - (2) Cap or tape over engine inlets and exhaust ducts to prevent foreign objects from getting inside the engine. Keep dust, dirt, and other objects out of internal parts of the engine.

CAUTION

Do not use tape to close off fuel or oil openings. Adhesive surface of tape will mix with fuel or oil and will get in the engine lines.

- (3) Cap or tape over open tubes, hoses, fittings, and engine openings as soon as parts are taken off.
- (4) Use suitable container to catch oil and coolant when removing hoses, fittings, and plugs.
- (5) Handle and store removed engine components carefully.
- (6) Inspect parts as removed for breaks, dents, cracks, surface defects, or other obvious damage. Turn in bad parts. Set aside good parts for later use.

19-2. GENERAL MAINTENANCE INSTRUCTIONS (CONT)

- (7) When possible, replace gaskets, packings, and seals removed during repair work. Replace lockwire, lockwashers, and cotter pins at time of reassembly.
 - (8) Replace broken, worn, or burned electrical wiring.
 - (9) Replace broken, frayed, crimped, or soft flexible hoses. Replace stripped or damaged fittings. Replace entire connected flexible hoses if fittings are damaged.
 - (10) Tag and mark shims, connectors, wires, valves, fittings, and mating ends of lines before disconnecting or removing. Identify similar parts to ensure correct assembly.
 - (11) Use hoists, jacks, and other aids when lifting engine.
- b.** Follow these inspection instructions when removing and installing engine:
- (1) Inspect mounting surfaces and surfaces in contact with gaskets, seals, or machined surfaces. Look for burrs or scratches which might damage parts or seals upon installation. Remove any defects found.
 - (2) Remove drain plugs from engine system components and inspect sediment sticking to plug. Grit or fine metal particles may indicate actual or potential component failure. A few fine particles are normal. This inspection will help to show defective parts before internal inspection of the components.
 - (3) Inspect hose surfaces for broken or frayed fabric. Check for breaks caused by sharp kinks or contact with other parts of the vehicle. Inspect fitting threads for damage. Replace any defective parts. After assembly and during initial vehicle operation period, check for leaks. Inspect wiring harnesses for chafed or burned insulation. Inspect terminal connectors for loose connections and broken parts. Visually inspect castings and weldments for cracks.

Section III. MAINTENANCE PROCEDURES

19-3. ENGINE TO ENGINE STAND INSTALLATION/REMOVAL

This task covers:

- a. Installation
- b. Removal

c. Follow-On Maintenance

INITIAL SETUP**Equipment Conditions**

Sending units and attachments removed (TM 9-2320-360-20).

Starter removed (TM 9-2320-360-20).

150 amp circuit breakers removed (TM 9-2320-360-20).

24-volt (front) alternator/bracket removed (TM 9-2320-360-20).

Exhaust manifolds removed (para 3-23).

Air box drains removed (para 3-9).

Air box covers removed (para 3-8).

Tools and Special Tools

Tool Kit, Genl Mech (Item 202, Appendix E)

Plate, Adapter (Item 7, Appendix E)

Tools and Special Tools (Cont)

Sling Assemblies (2) (Item 160, Appendix E)

Stand, Engine (Item 181, Appendix E)

Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)

Materials/Parts

Compound, Sealing, Pipe Thread (Item 28, Appendix B)

Tags, Identification (Item 56, Appendix B)

Ties, Cable, Plastic (Item 60, Appendix B)

Lockwasher (Item 120, Appendix F)

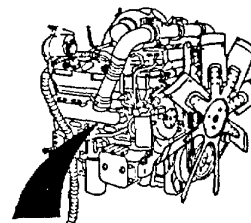
Screws (13) (Item 275, Appendix F)

Personnel Required

Two

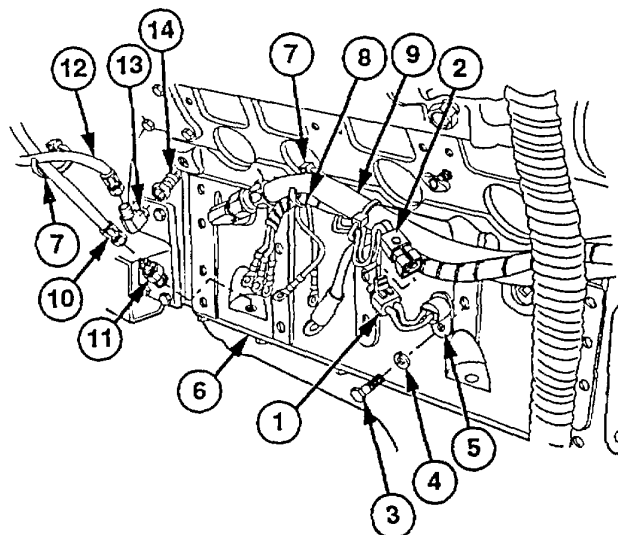
a. Installation

- (1) Remove electrical connector (1) from electrical connector (2).
- (2) Remove screw (3), lockwasher (4), and ether start temperature sensor (5) from engine assembly (6). Discard lockwasher.

**NOTE**

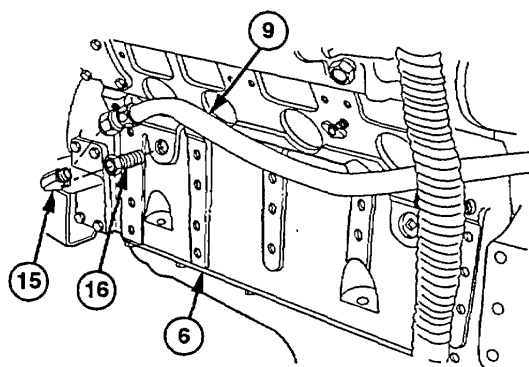
Location of plastic cable ties should be marked before removal.

- (3) Remove plastic cable tie (7) from engine wire harness (8) and hose no. 2630 (9).
- (4) Remove hose no. 2761 (10) from adapter (11).
- (5) Remove adapter (11) from engine assembly (6).
- (6) Remove plastic cable tie (7) from hose no. 27 (10) and hose no. 2682 (12).
- (7) Remove hose no. 2682 (12) from elbow (13).
- (8) Remove elbow (13) from adapter (14).
- (9) Remove adapter (14) from engine assembly (6).

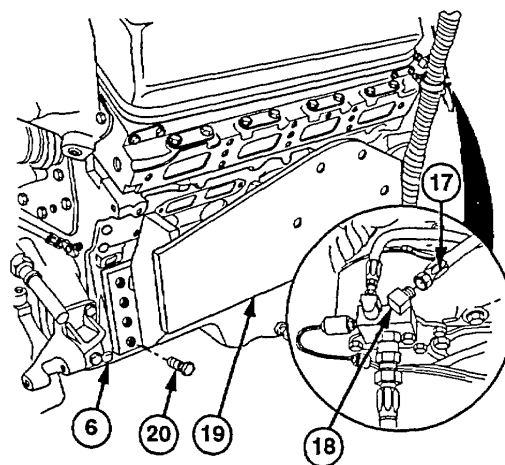


19-3. ENGINE TO ENGINE STAND INSTALLATION/REMOVAL (CONT)

- (10) Remove hose no. 2630 (9) from elbow (15).
- (11) Remove elbow (15) from adapter (16).
- (12) Remove adapter (16) from engine assembly (6).



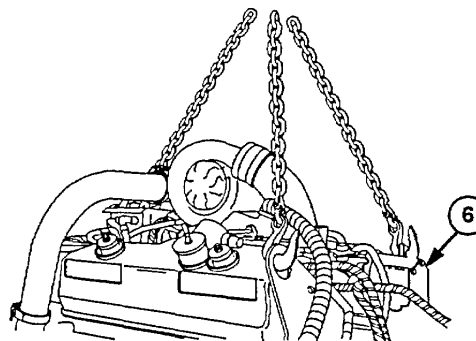
- (13) Remove fuel line (17) from elbow (18).
- (14) Install adapter plate (19) on engine assembly (6) with 13 screws (20) with aid of assistant.



WARNING

Engine assembly weighs 2605 lb (1182 kg). Stay clear of engine assembly when it is supported by lifting device. If engine falls, serious injury or death may result.

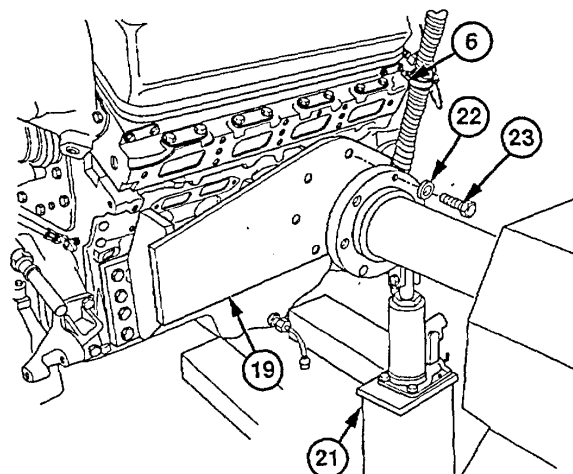
- (15) Install suitable lifting device on engine assembly (6).



WARNING

Stand clear of engine when supported by lifting device. Engine may fall and cause serious injury to personnel.

- (16) Mount engine assembly (6) and adapter plate (19) on engine stand (21) with six washers (22) and screws (23). Torque to 147 lb-ft (200 N m).
- (17) Remove lifting device from engine assembly (6).



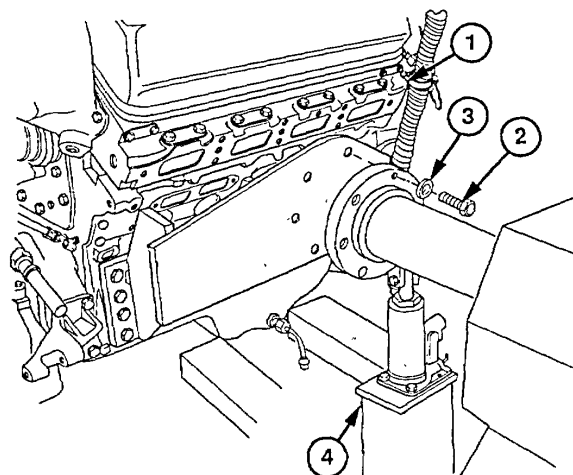
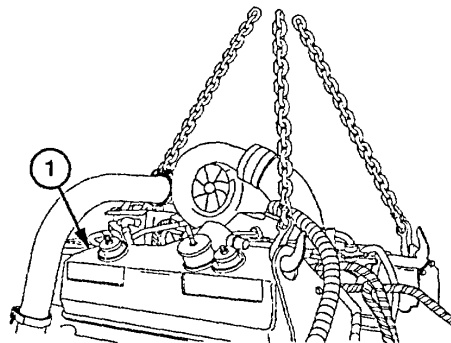
b. Removal

- (1) Install lifting device on engine assembly (1)

WARNING

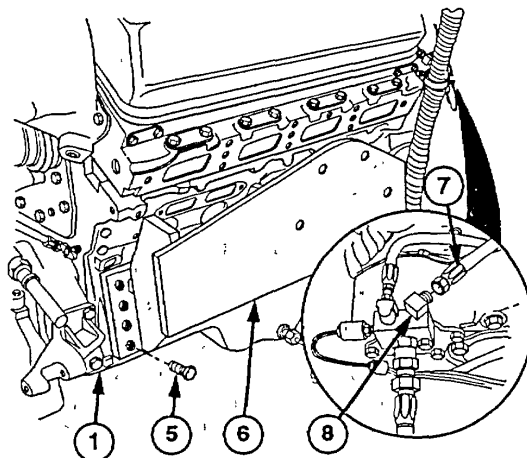
Stand clear of engine when supported by lifting device. Engine may fall and cause serious injury to personnel.

- (2) Support engine assembly (1) with lifting device.
- (3) Remove six screws (2), washers (3), and engine assembly (1) from engine stand (4).
- (4) Place engine assembly (1) on suitable supports.
- (5) Remove lifting device from engine assembly (1).



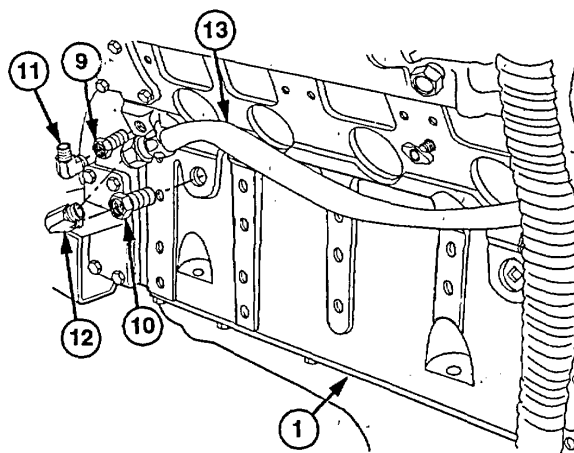
19-3. ENGINE TO ENGINE STAND INSTALLATION/REMOVAL (CONT)

- (6) Remove 13 screws (5) and adapter plate (6) from engine assembly (1).
- (7) Install fuel line (7) on elbow (8).

**WARNING**

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

- (8) Coat threads of two adapters (9 and 10) and elbows (11 and 12) with pipe thread sealing compound.
- (9) Install adapter (10) on engine assembly (1).
- (10) Install elbow (12) on adapter (10).
- (11) Install hose no. 2630 (13) on elbow (12).
- (12) Install adapter (9) on engine assembly (1).
- (13) Install elbow (11) on adapter (9).



- (14) Install hose no. 2682 (14) on elbow (11).

NOTE

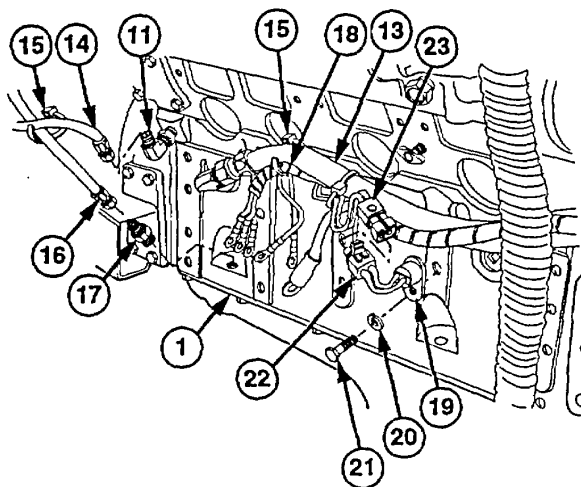
Plastic cable ties should be positioned in locations marked during removal.

- (15) Install plastic cable tie (15) on hose no. 2682 (14) and hose no. 2761 (16).

WARNING

Pipe thread sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If pipe thread sealing compound gets on skin or clothing, wash immediately with soap and water.

- (16) Coat threads of adapter (17) with pipe thread sealing compound.
- (17) Install adapter (17) on engine assembly (1).
- (18) Install hose no. 2761 (16) on adapter (17).
- (19) Install plastic cable tie (15) on hose no. 2630 (13) and engine wire harness (18).
- (20) Install ether start temperature sensor (19) on engine assembly (1) with new lockwasher (20) and screw (21).
- (21) Install electrical connector (22) on electrical connector (23).



c. Follow-On Maintenance

- (1) Install air box covers (para 3-8).
- (2) Install air box drains (para 3-9).
- (3) Install exhaust manifolds (para 3-23).
- (4) Install 24-volt (front) alternator/bracket (TM 9-2320-360-20).
- (5) Install 150 amp circuit breakers (TM 9-2320-360-20).
- (6) Install starter (TM 9-2320-360-20).
- (7) Install sending units and attachments (TM 9-2320-360-20).

19-4. ENGINE BLOCK REPAIR

This task covers:

- | | |
|---|--|
| <ul style="list-style-type: none"> a. Disassembly b. Cleaning/Inspection c. Assembly | <ul style="list-style-type: none"> d. Testing e. Follow-On Maintenance |
|---|--|
-

INITIAL SETUP
Equipment Conditions

Sending units and attachments removed (TM 9-2320-360-20).
 Starter removed (TM 9-2320-360-20).
 150 amp circuit breakers removed (TM 9-2320-360-20).
 24-volt (front) alternator/bracket removed (TM 9-2320-360-20).
 Exhaust manifolds removed (para 3-23).
 Air box drains removed (para 3-9).
 Air box covers removed (para 3-8).
 Engine mounted on engine stand (para 19-3).
 Fan removed (TM 9-2320-360-20).
 Fan belts removed (TM 9-2320-360-20).
 Fan clutch removed (TM 9-2320-360-20).
 Electronic control module (ECM) removed (TM 9-2320-360-20).
 Thermostats removed (TM 9-2320-360-20).
 DDEC oil pressure sensor removed (TM 9-2320-360-20).
 DDEC oil temperature sensor removed (TM 9-2320-360-20).
 Rocker covers removed (TM 9-2320-360-20).
 Fuel injector wire harnesses removed (para 4-3).
 12-volt (rear) alternator/bracket removed (TM 9-2320-360-20).
 Oil cooler and housing removed (para 3-19).
 Left thermostat housing removed (para 5-3).
 Right thermostat housing removed (para 5-4).
 Secondary fuel filter housing removed (para 4-13).
 Water pump removed (para 5-5).
 Vibration damper and front cover removed (para 3-15).
 Water pump drive gear removed (para 3-24).
 Crankshaft pulley removed (para 3-12).
 Crankshaft vibration damper removed (para 3-14).
 Turbocharger removed (para 4-11).
 Air inlet adapter removed (para 4-5).
 Fuel supply pump removed (para 4-4).
 Blower accessory drive hub removed (para 4-9).
 Tachometer drive gear removed (para 3-25).

Equipment Conditions (Cont)

Blower removed (para 4-6).
 Aftercooler removed (para 5-7).
 Engine brake retarder wire harnesses removed (para 6-16).
 Engine brake retarders removed (para 3-26).
 Rocker arms removed (para 3-18).
 Injectors removed (para 4-2).
 SRS/TRS sensor removed (para 3-7);
 Cylinder heads removed (para 3-10).
 Oil pan removed (para 3-20).
 Oil pressure regulator valve removed (para 3-22).
 Oil pressure relief valve removed (para 3-21).
 Crankshaft cover, front oil seal, and oil pump removed (para 19-14).
 Engine block breather tube removed (para 3-6).
 Flexplate assembly removed (para 3-1 7J).
 Flywheel housing removed (para 19-9).
 Blower drive support removed (para 4-8).
 Camshafts and end bearings removed (para 19-12).
 Idler gear removed (para 19-13).
 Rear end plate removed (para 19-6).
 Front end plate removed (para 19-5).
 Pistons, connecting rods, and liners removed (para 19-10).
 Main bearings and crankshaft removed (para 19-8).

Tools and Special Tools

Tool Kit, Genl Mech (Item 202, Appendix E)
 Compressor Unit, Air (Item 24, Appendix E)
 Gage, Depth, Micrometer (Item 48, Appendix E)
 Gage, Dial, Cylinder Bore (Item 49, Appendix E)
 Goggles, Industrial (Item 57, Appendix E)
 Remover/installer, Core Plug Plug (Item 133, Appendix E)
 Remover/installer; Water Inlet Adapter, Aftercooler (Item 134, Appendix E)
 Sling Assemblies (2) (Item 160, Appendix E)
 Socket, Pipe Plug (Item 165, Appendix E)
 Testing Kit, Cylinder Block Pressure (Item 192, Appendix E)

19-4. ENGINE BLOCK REPAIR (CONT)**INITIAL SETUP (CONT)****Tools and Special Tools (Cont)**

- Wrench Set, Socket, 3/4 In. Drive (Item 231, Appendix E)
- Wrench, Torque, 0-600 Lb-Ft (Item 233, Appendix E)
- Wrench, Torque, 0-300 Lb-in. (Item 235, Appendix E)
- Wrench, Torque, 0-175 Lb-Ft (Item 236, Appendix E)
- Wrench, Torque, 0-75 Lb-in. (Item 237, Appendix E)

Materials/Parts

- Antifreeze, Permanent (Item 12, Appendix B)
- Compound, International, No. 2 (Item 21, Appendix B)

Materials/Parts (Cont)

- Compound, Sealing and Lubricating (Item 27, Appendix B)
- Compound, Sealing, Pipe Thread (Item 28, Appendix B)
- Oil, Lubricating (Item 45, Appendix B)
- Gaskets (8) (Item 27, Appendix F)
- Gasket (Item 34, Appendix F)
- Gasket (Item 38, Appendix F)
- Gasket (Item 48, Appendix F)
- Lockwashers (2) (Item 127, Appendix F)
- Seal Rings (34) (item 258, Appendix F)
- Seal Rings (16) (Item 271, Appendix F)
- Shims, Head (4) (Item 322, Appendix F)

a. Disassembly**WARNING**

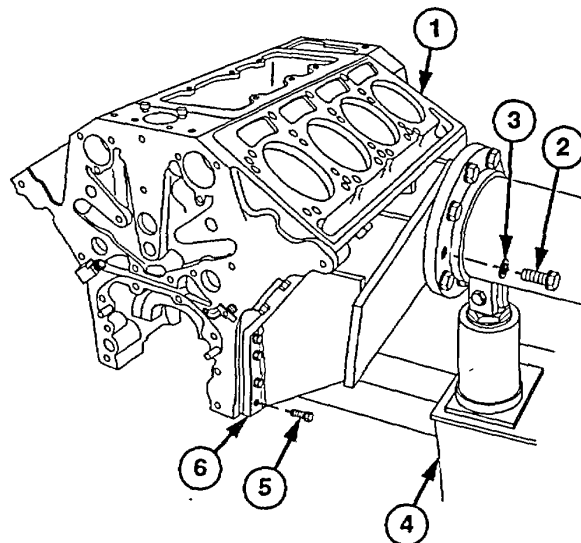
Engine has may sharp edges. Use caution when using hand tools. Failure to comply may result in injury to personnel.

- (1) Install lifting device on engine block (1).

WARNING

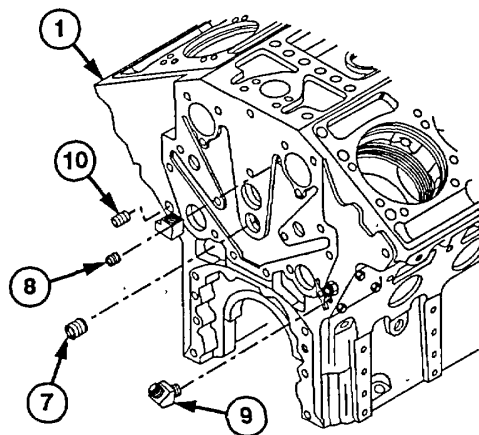
Engine weighs 2605 lb (1182 kg). Stand clear of engine when supported by lifting device. Engine may fall and cause serious injury or death to personnel.

- (2) Support engine block (1) with lifting device.
- (3) Remove six screws (2), washers (3), and engine block (1) from engine stand (4).
- (4) Place engine block (1) on floor.
- (5) Remove lifting device from engine block (1).
- (6) Remove 13 screws (5) and adapter plate (6) from engine block (1).



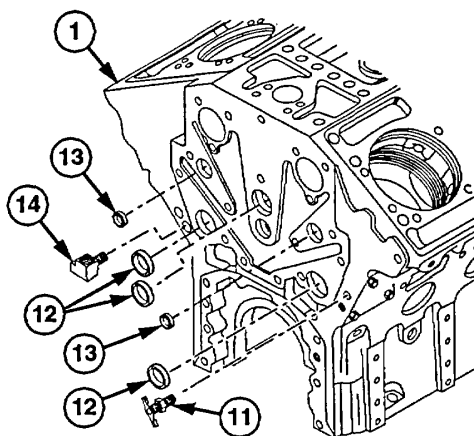
19-4. ENGINE BLOCK REPAIR (CONT)

- (7) Remove oil galley plugs (7 and 8), elbow (9), and plug (10) from front of engine block (1).



- (8) Remove drain cock (11) three plugs (12), and two plugs (13) from front of engine block (1).

- (9) Remove fitting (14) from front of engine block (1).



- (10) Remove oil galley plug (15) from rear of engine block (1).

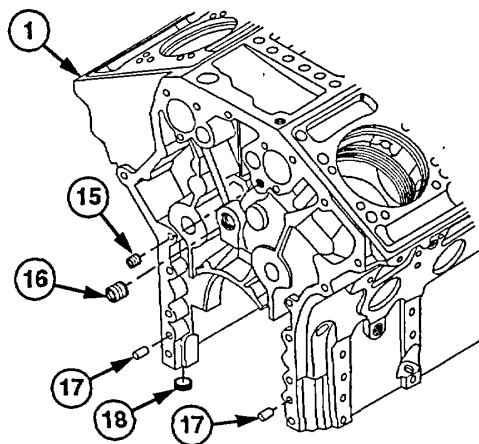
- (11) Remove oil galley plug (16) from rear of engine block (1).

NOTE

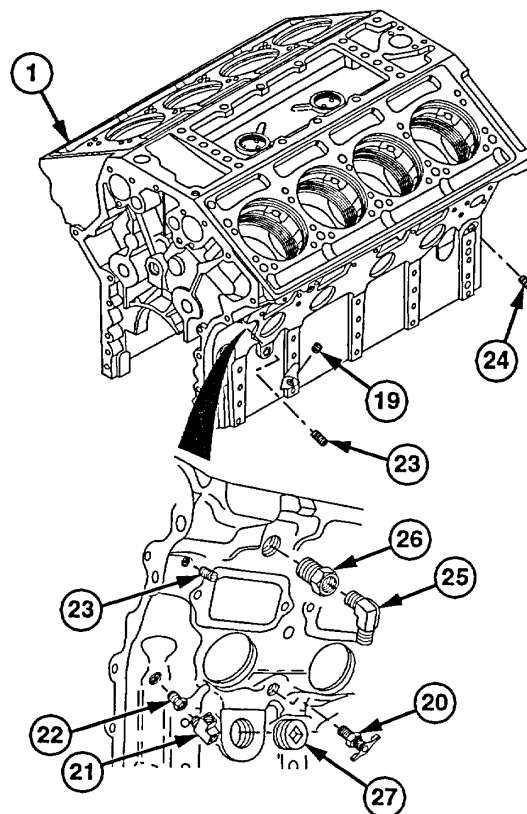
Do step (12) only if dowels are damaged. Do not remove dowels just to dean engine block.

- (12) Remove two dowels (17) from rear of engine block (1).

- (13) Remove two cup plugs (18) from bottom of engine block (1).



- (14) Remove plug (19) from right side of engine block (1).
- (15) Remove drain cock (20) from right side of engine block (1).
- (16) Remove elbow (21) and fitting (22) from right side of engine block (1).
- (17) Remove oil galley plugs (23 and 24) from side of engine block (1).
- (18) Remove elbow (25) and reducer bushing (26) from right side of engine block (1).
- (19) Remove plug (27) from right side of engine block (1).



- (20) Remove two plugs (28) from left side of engine block (1).
- (21) Remove two plugs (29) from left side of engine block (1).
- (22) Remove elbow (30) and reducer bushing (31) from left side of engine block (1).

