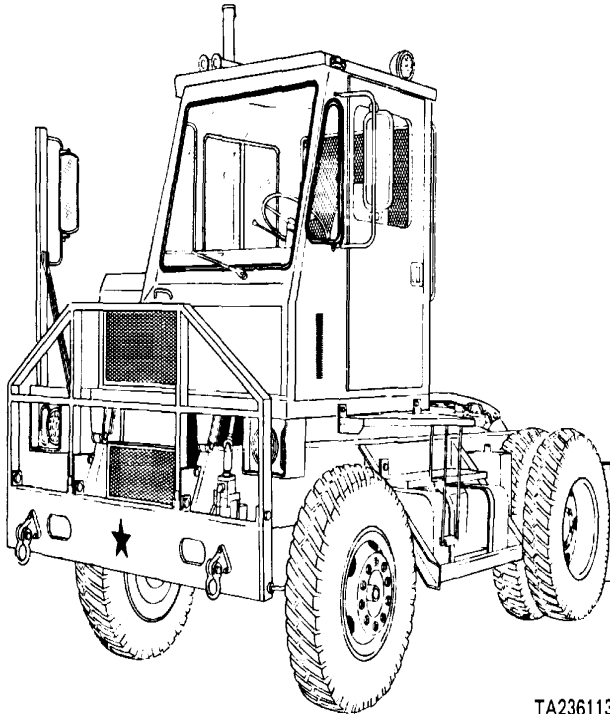


TECHNICAL MANUAL

ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL



TA236113

TRUCK TRACTOR, YARD TYPE,
43,500 LB GVW, DED, 4x2,
ARMY MODEL M878A1
(OTTAWA MODEL 50)
(NSN 2320-01-121-2102)

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REPORTING OF ERRORS

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 back of this manual direct to: Commander, US Army Tank-Automotive Command, ATTN: DRSTA-MT, Warren, MI 48397-5000 . A reply will be furnished to you.

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CHAPTER 3 DIRECT SUPPORT MAINTENANCE PROCEDURES

CHAPTER OVERVIEW

This chapter has some important information that you need to know about the direct support maintenance requirements of the vehicle. This information includes but isn't limited to:

- Maintenance of the various systems and subsystems which the vehicle comprises. These systems and subsystems are listed in the chapter index below.
- Troubleshooting of the various systems and subsystems.
- Refer to TM 9-2815-205-34 for troubleshooting and maintenance of the engine.

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Section I. ENGINE AND COOLING SYSTEMS MAINTENANCE

This section contains the information you need to maintain the:

- Engine
- Cooling System

It gives you instructions on how to troubleshoot problems and repair or replace the components that are within the scope of direct support maintenance.

	Para
Troubleshooting Symptom Index	3-1
Engine Troubleshooting	3-2
Cooling System Troubleshooting	3-3
Engine Maintenance.....	3-4
Cooling System Maintenance.....	3-5
Radiator	3-5a
Fan Shroud.....	3-5b
Fan Drive Assembly	3-5c

NOTE

Refer to TM 9-2815-205-34 for inspection, maintenance, repair, and adjustment of the engine cylinder block, valves and tappets, rocker arm, oil cooler, oil pan, oil inlet tube, and regulator and relief valve.

NOTE

Refer to TM 9-2815-205-34 for test, maintenance, and repair of the fuel injector assemblies and rack, fuel pump assembly, fuel lines, blower assembly, turbo-charger, and governor.

3-1. TROUBLESHOOTING SYMPTOM INDEX

	Para/Malfunction	Page
ENGINE		
Engine lacks power	3-2/1	3-3
COOLING SYSTEM		
Engine overheats or does not reach operating temperature	3-3/1	3-3 j
Cooling system not pressurized	3-3/2	3-4

3-2. ENGINE TROUBLESHOOTING

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. ENGINE LACKS POWER

Perform stall test (para 3-17a(3)).

- a. If maximum engine speed is excessive, troubleshoot transmission (para 3-14).
- b. If maximum engine speed is low, refer to TM 9-2815-205-34 for troubleshooting of the engine and its components.

3-3. COOLING SYSTEM TROUBLESHOOTING

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. ENGINE OVERHEATS OR DOES NOT REACH OPERATING TEMPERATURE

- Step 1. Shut down engine.
Relieve all air pressure in air system (para 2-41h(1)).
Try to rotate fan by hand.
 - a. If fan cannot be rotated by hand, repair fan clutch assembly (para 3-5c).
 - b. If fan can be rotated by hand, proceed to step 2 below.
- Step 2. Disconnect tubing from fitting at top of fan clutch assembly (para 2-15e).
Apply 90 to 120 psi air pressure to fitting.
Check if fan can be rotated by hand with air pressure applied to fitting.
 - a. If fan can be rotated by hand, repair fan clutch assembly (para 3-5c).
 - b. If fan cannot be rotated by hand, proceed to step 3 below.
- Step 3. Check radiator and hoses for leakage or damage.
 - a. If radiator is leaking or damaged, replace (para 3-5a).
 - b. If hoses are leaking or damaged, replace (para 2-15c).
 - c. If leakage and damage are not observed, refer to TM 9-2815-205-34 for troubleshooting of the engine cooling system.

3-3. COOLING SYSTEM TROUBLESHOOTING (CONT)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

2. COOLING SYSTEM NOT PRESSURIZED

Pressure test radiator (para 2-15a(2)).

- a. If pressure drops quickly, radiator has serious leakage. Repair or replace radiator (para 3-5a).
- b. If pressure drops slowly, radiator has seepage or slight leakage; repair or replace radiator (para 3-5a).
- c. If pressure holds steady for two or more minutes, radiator is not leaking. Refer to TM 9-2815-205-34 for troubleshooting of the engine cooling system.

3-4. ENGINE MAINTENANCE

This task covers engine-transmission:

- | | |
|-------------|----------------------|
| a. Removal | c. Inspection/Repair |
| b. Cleaning | d. Installation |

INITIAL SETUP:Tools

No. 1 Common Organizational Maintenance
Tool Kit

Torque wrench, 1/2 inch drive,
175 pounds foot capacity
Socket wrench set
Rubber mallet
Rubber mallet Maintenance Manual)
Hoist, 4000 pounds capacity
Three-branch chain sling
Transmission jack, wheeled

Personnel Required

Three Automotive Repairers MOS 63H

References

TM 9-2815-205-34 (6V53T Diesel Engine
Maintenance Manual)

Troubleshooting References

Paragraph

Paragraph

3-2 Engine

3-3 Cooling system

3-14 Transmission

Materials/Parts

Cleaning solvent	Item 1, Appendix C
Clean cloths	Item 2, Appendix C
Automatic trans- mission fluid	Item 8, Appendix C
Hydraulic sealant	Item 20, Appendix C

Equipment Condition

Paragraph

Condition Description

	Tractor parked on level surface, parking brakes applied, and wheels blocked securely.
3-35j	Cab tilted 90 degrees.
2-12b	Engine crankcase drained.
2-12c	Engine-mounted oil filter removed.
2-12d	External engine oil filter lines disconnected.
2-13a	Air cleaner assembly removed; restriction indicator hose disconnected from engine.
2-13b(2)	Fuel lines disconnected from cylinder head, fuel pump, and fuel filters.
2-13c	Fuel filters removed.
2-13d	Quick start removed.
2-13e	Throttle linkage removed from engine.
2-14a	Exhaust pipes removed.
2-14b	Muffler and exhaust stack removed.
2-15a(l)	Radiator drained.
2-15b(2)	Coolant filter assembly, hoses, and fittings removed.
2-15c	Radiator coolant hoses removed and fittings removed from engine.
2-15d	Drive belts, fan, and fan clutch assembly removed.
2-15e	Clutch fan control system removed.
2-24	Belts, alternator assembly, and brackets removed.
2-29	Water level sensor removed.
2-32c	Transmission temperature sender removed.
2-34a	Battery cables disconnected from transmission and starter.
2-35e	Engine-transmission grounding strap removed.
2-41b	Transmission fluid drained.

3-4. ENGINE MAINTENANCE (CONT)**INITIAL SETUP (cont)**Equipment Condition (cont)

Paragraph

Condition Description

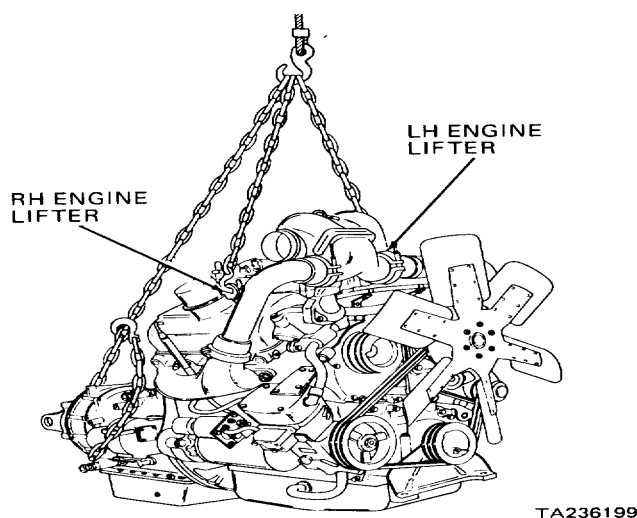
2-41e	External transmission oil filter and transmission cooler hoses and fittings removed.
2-41g(l)	Gear shift control cable and linkage removed from transmission.
2-41h(l)	Tubing disconnected from shift lockout cylinder.
2-41i	Modulator cable assembly removed.
2-41j	Transmission oil sampling valve removed.
2-42	Drive shaft disconnected from transmission yoke.
2-51b	Air compressor governor tubing removed, and supply hose disconnected from air compressor and air reservoir.
2-52b	Air strainer removed.
2-52c	Alcohol evaporator removed.
2-58b	Hoses removed from power steering pump and rear cab guard.
2-65c	Rear platform removed.
2-65d	Rear cab guard removed.
2-73a	Cab heater hoses disconnected from engine.
2-73d	Engine oil heater removed.
2-73e	Coolant heater removed.
2-78b(2)	Hydraulic hose brackets removed from transmission.
2-79b	Hydraulic hose assembly between cab tilt pump and left hand hydraulic latch removed.
2-85	Speedometer cable, adapter, and gear assembly removed from transmission.
2-86	Tachometer sender unit removed.
3-5a	Radiator removed.
3-12d	Wiring harness disconnected and removed from engine.
3-17d	Torque converter capscrews removed.
3-42a	Hydraulic pump removed (lines still connected).
3-42b	Power take-off removed.

General Safety Instructions**WARNING**

Do not stand under items being handled by hoist or crane. Do not put any body part between moveable and fixed elements of the equipment. If you are injured, seek medical aid immediately.

3-4. ENGINE MAINTENANCE (CONT)

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
1	Engine and transmission	Three-branch chain sling	Attach	Hook one leg to each engine lifter bracket; hook the third leg to a chain around rear of transmission. Take out slack and apply slight upward pressure

**WARNING**

Keep clear of engine-transmission during hoisting and swinging to skid cradle. Never allow hands or body to get under engine-transmission. To do so may result in serious injury or death should the sling, a fastening, or the hoist or crane break and drop the engine-transmission during removal or setting it in the cradle. If you are injured obtain medical aid immediately.

2	Engine, front	Two capscrews	Remove	From front engine mount (nuts and washers were removed during para 2-73e step of initial equipment condition)
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3-4. ENGINE MAINTENANCE (CONT)

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
3	Trans- mission mount	Two locknuts, snubbing washers, and capscrews	Remove	Para 3-17f

CAUTION

Lift engine-transmission slowly, watching for any hoses, lines, electrical wiring, or linkage(s) that may have been overlooked. If necessary, lower the engine transmission and disconnect any such items that may be discovered before continuing with removal.

4	Tractor	a. Engine and transmission	a. Remove b. Position	Lift from tractor On skid
5	Engine and transmis- sion	a. Solenoid and 70A circuit breaker	Remove	Para 2-25a
		b. Starter	Remove	Para 2-25b
		c. Engine oil dipstick and tube	Remove	Para 2-12e
		d. Engine oil sampling valve	Remove	Para 2-12f
		e. Oil pressure sender and sensor	Remove	Para 2-32a
		f. Water tempera- ture sender and alarmstat	Remove	Para 2-32d
		g. Shift lockout cylinder and linkage	Remove	Para 2-41h(2)
		h. Air compressor	Remove	Para 2-52d
		i. Power steering pump	Remove from	Para 3-28f adapter
		j. Transmission mount cross- member	Remove	Para 3-17f
		k. Transmission dipstick	Remove	Para 2-41b
		l. Transmission dipstick tube	Remove	Para 2-41k

3-4. ENGINE MAINTENANCE (CONT)

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
6	Trans- mission, assembly front	a. Transmission	Support	Support transmission with a wheeled transmission jack Para 3-17c(2)
		b. 12 capscrews and lock washers	Remove	
CAUTION				
Install converter retaining strap immediately. Torque converter is now free to move and can fall off.				
7	Engine and transmis- sion	c. Transmission	Remove from engine	Para 3-17c(2)
		Lines, fittings, and component openings created by removal	Seal	Prevents entry of contaminants

CLEANING**WARNING**

Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air and medical attention immediately. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water and seek medical aid immediately.

Compressed air must not exceed 30 psi. Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.

3-4. ENGINE MAINTENANCE (CONT)

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
8	Exterior surfaces	Engine and transmission	Clean	Use cleaning solvent P-D-680 and a stiff brush. Dry with compressed air or clean cloths
INSPECTION/REPAIR				
9	Engine	a. Castings	Inspect	Refer to TM 9-2815-205-34 (6V53 Diesel Engine Maintenance Manual) for repair or replacement of worn, bent, deformed or broken parts
		b. Linkages	Inspect	
		c. Sheet metal	Inspect	
10	Transmission	a. Castings	Inspect	Refer to Chapter 4 for repair or replacement of worn, deformed, or broken parts
		b. Torque converter	Inspect	
INSTALLATION				
11	Transmission,	a. Transmission b. 12 capscrews front and lock washers	Position Install and tighten	On back of engine
12	Engine and transmission	a. Engine oil dipstick and	Install	Para 2-12e
		b. Engine oil sampling valve	tube Install	Para 2-12
		c. Starter	Install	Para 2-25b
		d. Solenoid and 70A circuit breaker	Install	Para 2-25a
		e. Transmission dipstick tube	Install	Para 2-41k
		f. Transmission dipstick	Install	Para 2-41b
		g. Power steering pump	Install Para 3-28f	
		h. Air compressor	Install	Para 2-52d
		i. Transmission mount cross-member	Install	Para 3-17f