

TM 9-2320-242-10-3
T.O. 36A12-1A-2051-3

TECHNICAL MANUAL

TROUBLESHOOTING

OPERATOR LEVEL

TRUCK, CARGO:

1-1/4-TON, 6x6, M561 (NSN 2320-00-873-5407)

TRUCK, AMBULANCE:

1-1/4-TON, 6x6, M792 (NSN 2310-00-832-9907)

(DIESEL)

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
SEPTEMBER 1980

WARNING

EXHAUST GASES CAN BE DEADLY

Exposure to exhaust gases produces symptoms of headache, dizziness, loss of muscular control, apparent drowsiness, and coma. Permanent brain damage or death can result from severe exposure.

Carbon monoxide occurs in the exhaust fumes of fuel burning heaters and internal combustion engines, and becomes dangerously concentrated under conditions of inadequate ventilation. The following precautions must be observed to insure the safety of personnel whenever fuel burning heater(s) or engine of any vehicle is operated for maintenance purposes or tactical use.

Do not operate heater or engine of vehicle in an enclosed area unless it is adequately ventilated.

Do not idle engine for long periods without maintaining adequate ventilation in personnel compartments.

Do not drive any vehicle with inspection plates or cover plates removed unless necessary for maintenance purposes.

Be alert at all times during vehicle operation for exhaust odors and exposure symptoms. If either are present, immediately ventilate personnel compartments. If symptoms persist, remove affected personnel from vehicle and treat as follows: expose to fresh air; keep warm; do not permit physical exercise; if necessary, administer artificial respiration.

If exposed, seek prompt medical attention for possible delayed onset of acute lung congestion. Administer oxygen if available.

The best defense against exhaust gas poisoning is adequate ventilation.

WARNING

Serious or fatal injury to personnel may result
if the following instructions are not complied with.

Use extreme care when removing radiator cap, especially when temperature gage shows above 180°F.

Always wear leather gloves when handling winch cable. Never allow cable to slip through hands. Do not operate winch with less than four turns of cable on drum.

Do not drive truck until the low air pressure warning buzzer is silent and the air pressure gage shows at least 65 PSI. This is the minimum pressure required for safe braking action.

Do not use hand throttle to drive the vehicle.

Do not park truck with front transmission gearshift lever in gear.

If your vehicle class number is greater than the bridge class number, do not cross.

WARNING

Do not place arms, legs, or objects between tractor and carrier. Any object hanging over this bulkhead may be crushed when truck articulates (turns at the joint).

Before backing up truck, make sure the rear and sides of the truck are clear of personnel and obstructions.

Deep fording may become a swimming operation due to increased water depth. Before fording, make sure that drain plugs are in place and bilge pump is working. Make sure all personnel have on life jackets.

Use extreme care while working in the area of the batteries. Grounding of the positive terminal to the truck frame can cause severe personnel injury and damage to equipment.

When used to carry flammables, explosives, or other hazardous material, equip truck with a fire extinguisher.

TECHNICAL MANUAL
NO. 9-2320-242-10-3
TECHNICAL ORDER
NO. 36A12-1A-2051-3

DEPARTMENTS OF THE ARMY
AND
THE AIR FORCE
Washington, DC, 30 September 1980

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Current as of 1 February, 1980

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedure, please let us know. Mail your letter DA Form 2028 (Recommended Changes to Publication and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Tank Automotive Materiel Readiness Command, ATTN: DRSTA-MB, Warren, Michigan 48090. A reply will be furnished to you.

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*This manual, together with TM 9-2320-242-10-1, 30 September 1980; -10-2, 30 September 1980 and -10-4, 30 September 1980 supersedes TM 9-2320-242-10, 4 March 1977.

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CHAPTER 1

GENERAL INFORMATION

1-1. SCOPE. This volume tells you how to do troubleshooting at the operator's level of maintenance. The amount of troubleshooting you can do is based on what the Maintenance Allocation Chart says you can fix. Because of this, the only trouble symptoms you will find here are those that could be caused by faulty things you can fix.

1-2. ORGANIZATION. When you do PMCS, or when you drive the truck and find that something is wrong, write down what is wrong. Then check the fault symptom index to see if the trouble (fault symptom) you noted is in the index. If it is, you can do troubleshooting to find the fault and fix it. If the symptom is not in the index, tell organizational maintenance.

1-3. TROUBLESHOOTING APPROACH. In order to find out what is causing the problem in the truck, you must use a good approach. A good approach just means a way of doing troubleshooting so you can find the problem and not get confused or lost. The following chapter describes how you can use the materials in this volume to troubleshoot with a good approach.

CHAPTER 2

TROUBLESHOOTING APPROACH

2-1. GENERAL APPROACH. This chapter gives you instructions on how to use the troubleshooting material to help you find and fix the trouble. In every system of the truck there can be faults or problems which will cause certain symptoms. Symptoms can be such things as unusual noise, vibration, or even complete failure of a system. This volume gives information for each system on which you can do troubleshooting to find faults and fix them. Before you troubleshoot a system, you should look at the troubleshooting indexes which will lead you to the information you need to help make your troubleshooting faster and easier. If you follow the instructions the right way, you will find those troubles you can fix. But, if you fix something and the trouble is still there, it means there is more than one trouble. If this happens, start all over again to find the other trouble.

2-2. TROUBLESHOOTING INDEX. The troubleshooting index, and instructions on how to use it are in chapter 3. Go to this index first because it tells you where to find troubleshooting roadmaps, fault symptom indexes, summary troubleshooting charts and support diagrams for each system.

2-3. TROUBLESHOOTING ROADMAPS. Troubleshooting roadmaps for each system are in chapter 5. If the system is made up of subsystems, these subsystems are also on the roadmap. Under the subsystem is a list of things which are the most likely causes of a fault symptom in that subsystem. If you have enough skill, you can troubleshoot these things on the truck without using the detailed troubleshooting procedures. So if you know enough about the truck to work on your own, use the roadmap for the system with the problem before you check the fault symptom index.

2-4. FAULT SYMPTOM INDEX. Fault symptom indexes and instructions on how to use them are in chapter 6. For each system of the truck, there is an index which gives you a list of the fault symptoms for that system. The index also tells you where to find the detailed troubleshooting procedures and what resources (tools/people) you need to do each procedure.

2-5. SAMPLE TROUBLESHOOTING PROCEDURE. A sample troubleshooting procedure is in chapter 7. This sample procedure will help you see the way detailed troubleshooting procedures are to be used.

CHAPTER 3

TROUBLESHOOTING INDEX

3-1. GENERAL. This chapter has a troubleshooting index which covers every system of the truck on which you can do troubleshooting. The index tells you where to find all the other information you need to do your troubleshooting procedures.

3-2. INDEX. The troubleshooting index (fig. 3-1) is divided into five columns that list systems, troubleshooting roadmaps, fault symptoms, summary troubleshooting procedures, and system support diagrams. The following breakdown tells you what is in each column.

a. System Column. This column gives a list of systems on the truck for which troubleshooting can be done at the operator's maintenance level.

b. Troubleshooting Roadmaps Column. This column tells you where to find the troubleshooting roadmap for each listed system. These roadmaps are given in chapter 5.

c. Fault Symptom Index Column. This column tells you where to find the troubleshooting fault symptom index for each listed system. Fault symptom indexes are given in chapter 6.

d. Summary Troubleshooting Procedures Column. Summary troubleshooting procedures are not needed at this level of maintenance because they would be the same as the detailed troubleshooting procedures, so this column is not used. The detailed troubleshooting procedures found for using the fault symptom indexes will get you to the cause of the trouble quickly.

e. System Support Diagrams Column. The detailed troubleshooting procedures in this volume will give you all the information you need to find the bad part or problem with the truck. So, because support diagrams are not needed, this column is not used.

[illegible]

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Figure 3-1. Troubleshooting Index

CHAPTER 4

TEST EQUIPMENT PROCEDURES INDEX

There is no test equipment needed at the operator maintenance level to do troubleshooting, so, no test equipment procedures index is given.

CHAPTER 5

TROUBLESHOOTING ROADMAPS

5-1. GENERAL. This chapter gives troubleshooting roadmaps for every system of the truck for which you have detailed troubleshooting procedures. Figures 5-1 through 5-15 cover all the roadmaps for the detailed procedures.

5-2. ROADMAPS. Each roadmap gives a list of things which are most likely to cause a fault symptom in a system or subsystem. At least one of the items listed will be found to be bad when you do the detailed troubleshooting procedures for that system.

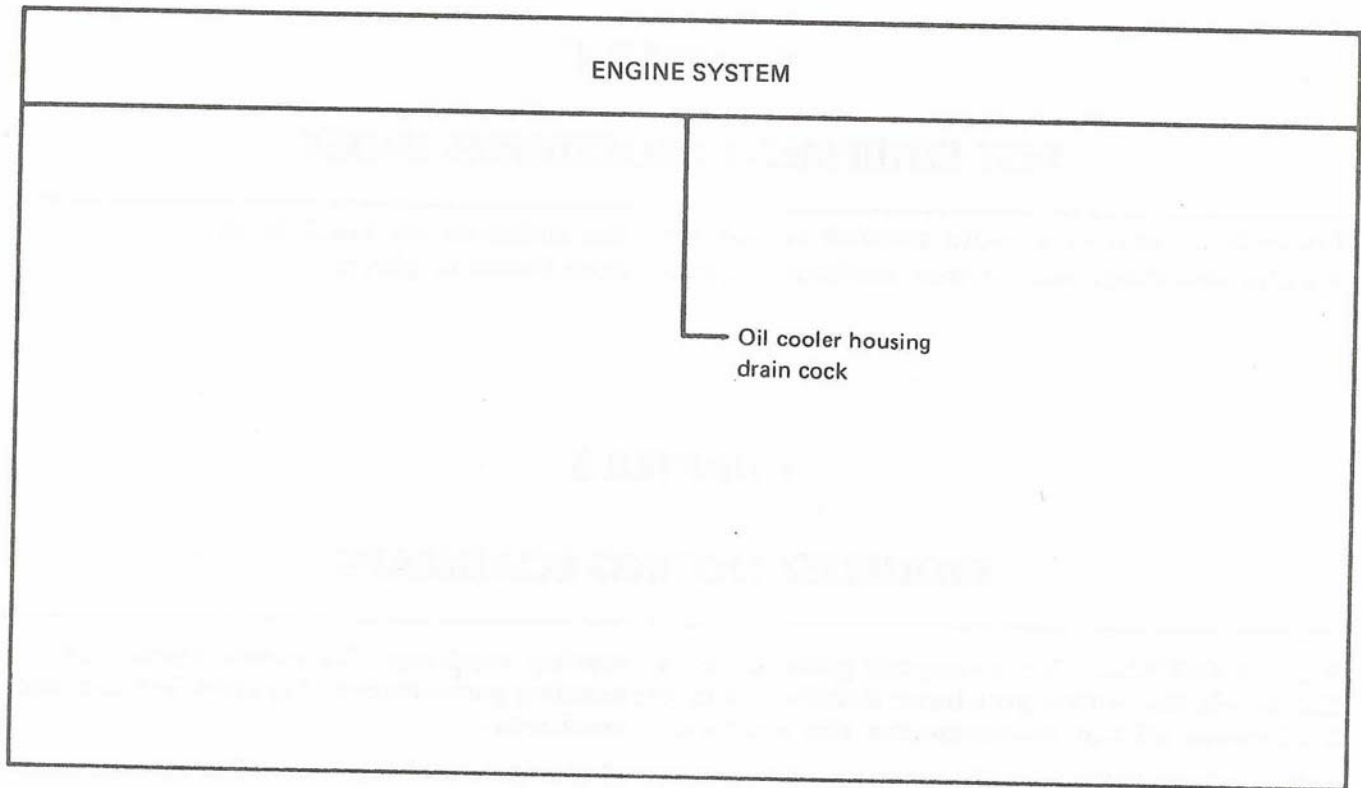


Figure 5-1. Troubleshooting Roadmap, Engine System

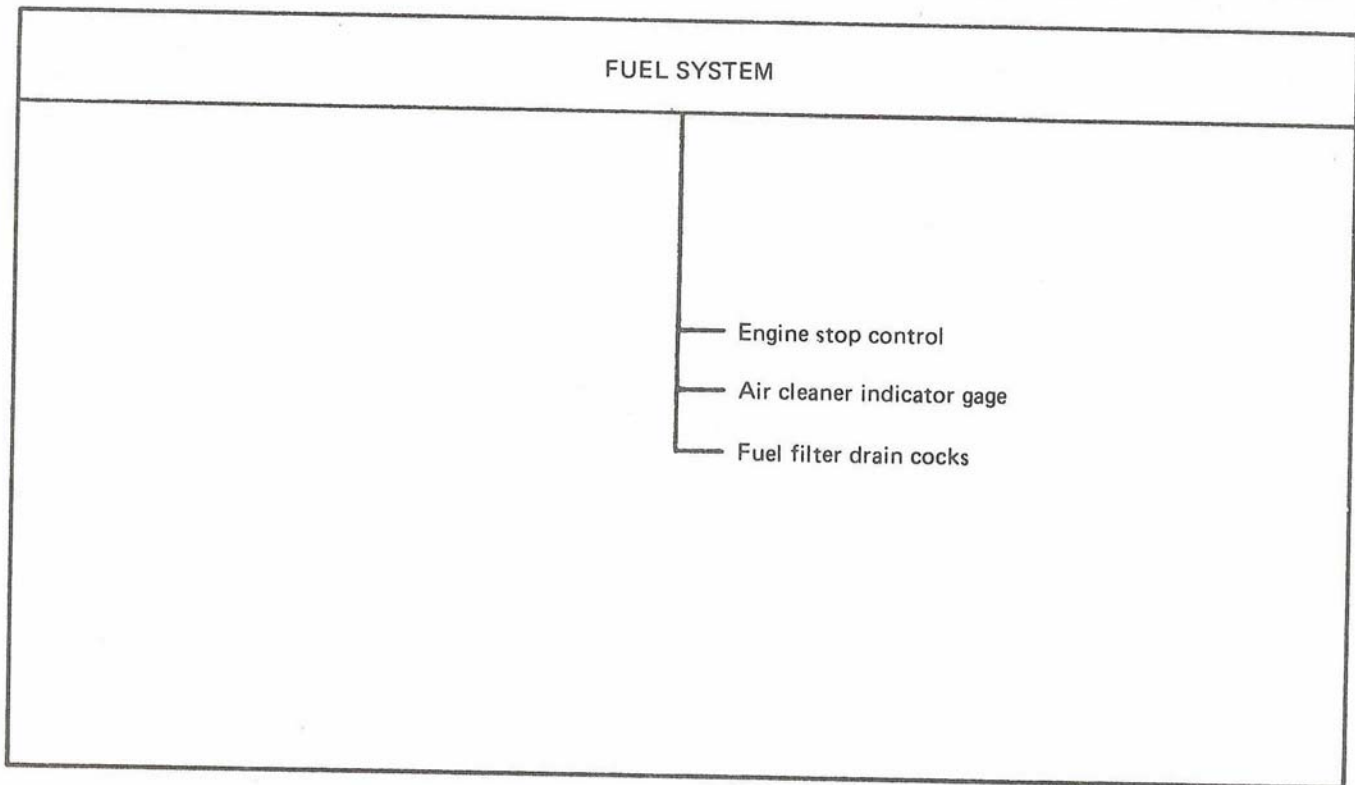


Figure 5-2. Troubleshooting Roadmap, Fuel System

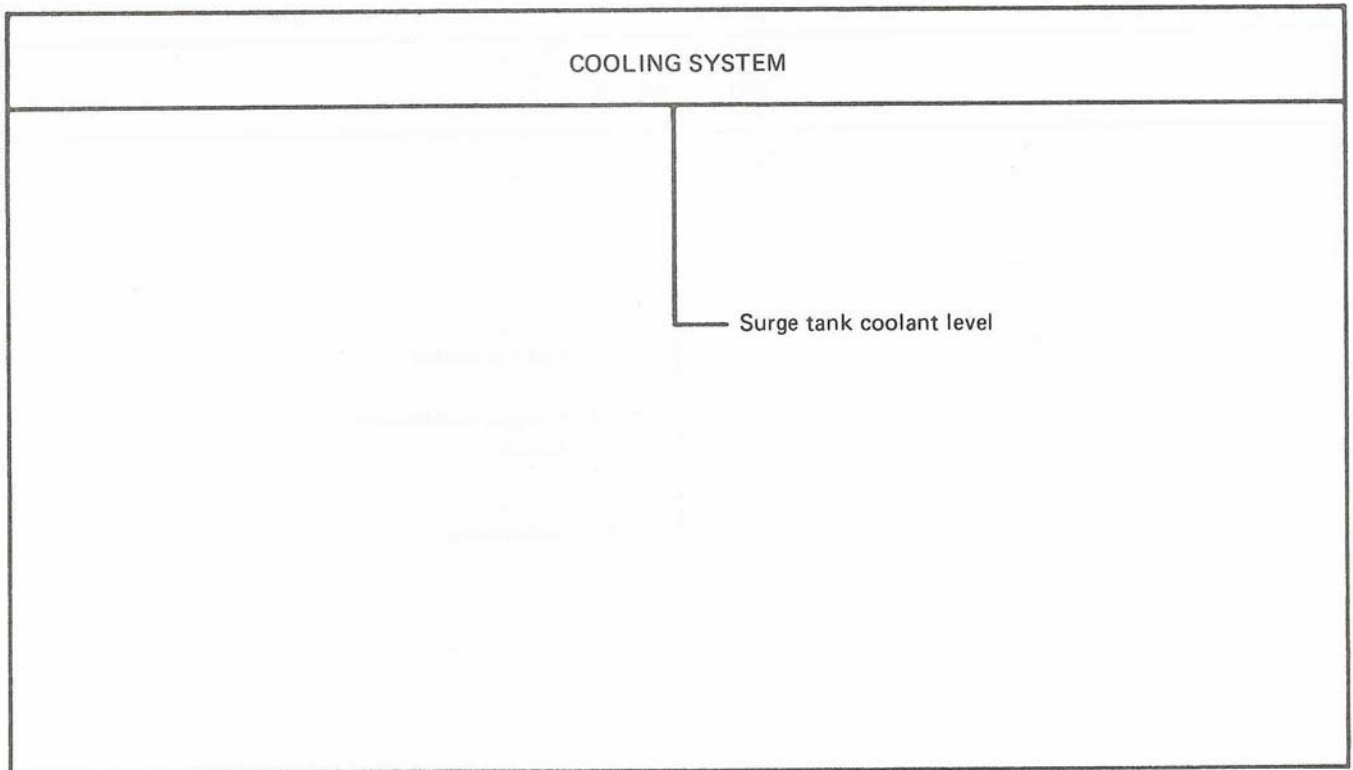


Figure 5-3. Troubleshooting Roadmap, Cooling System

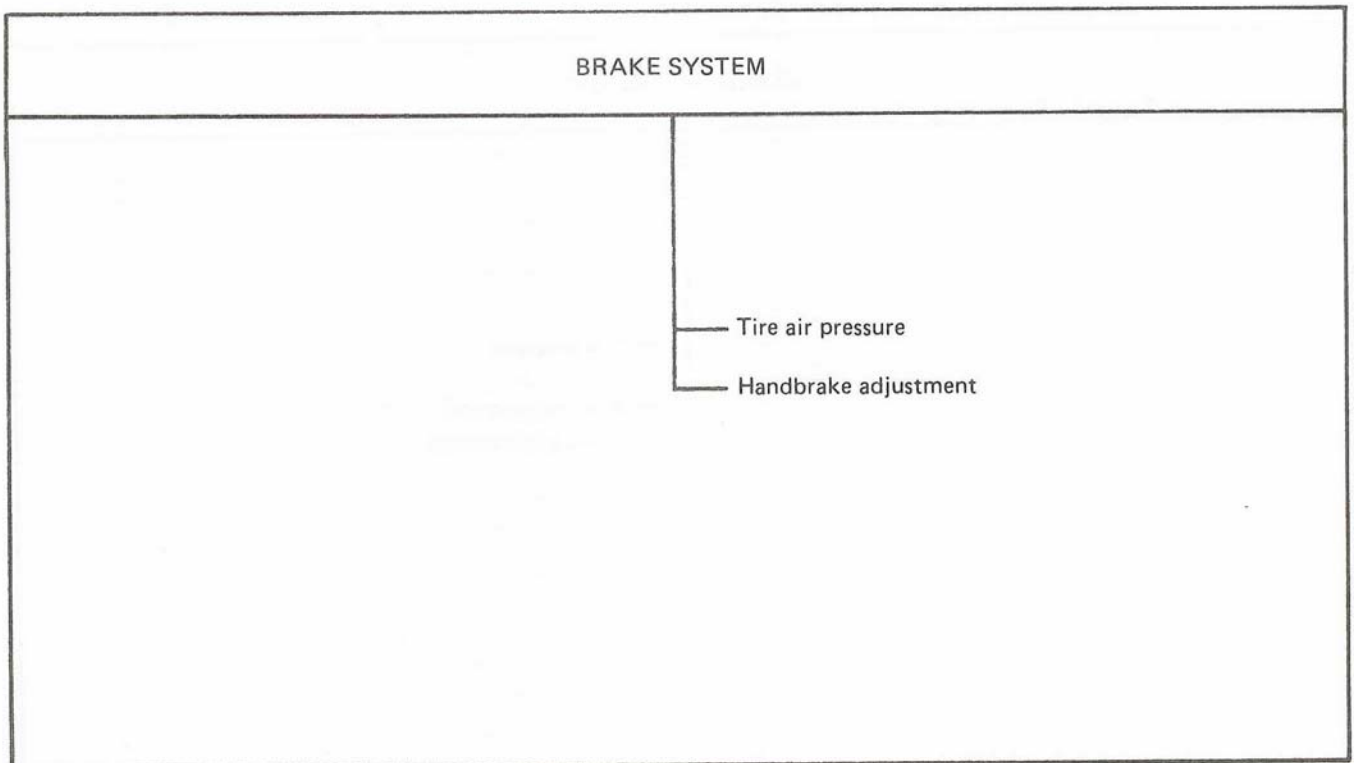


Figure 5-4. Troubleshooting Roadmap, Brake System

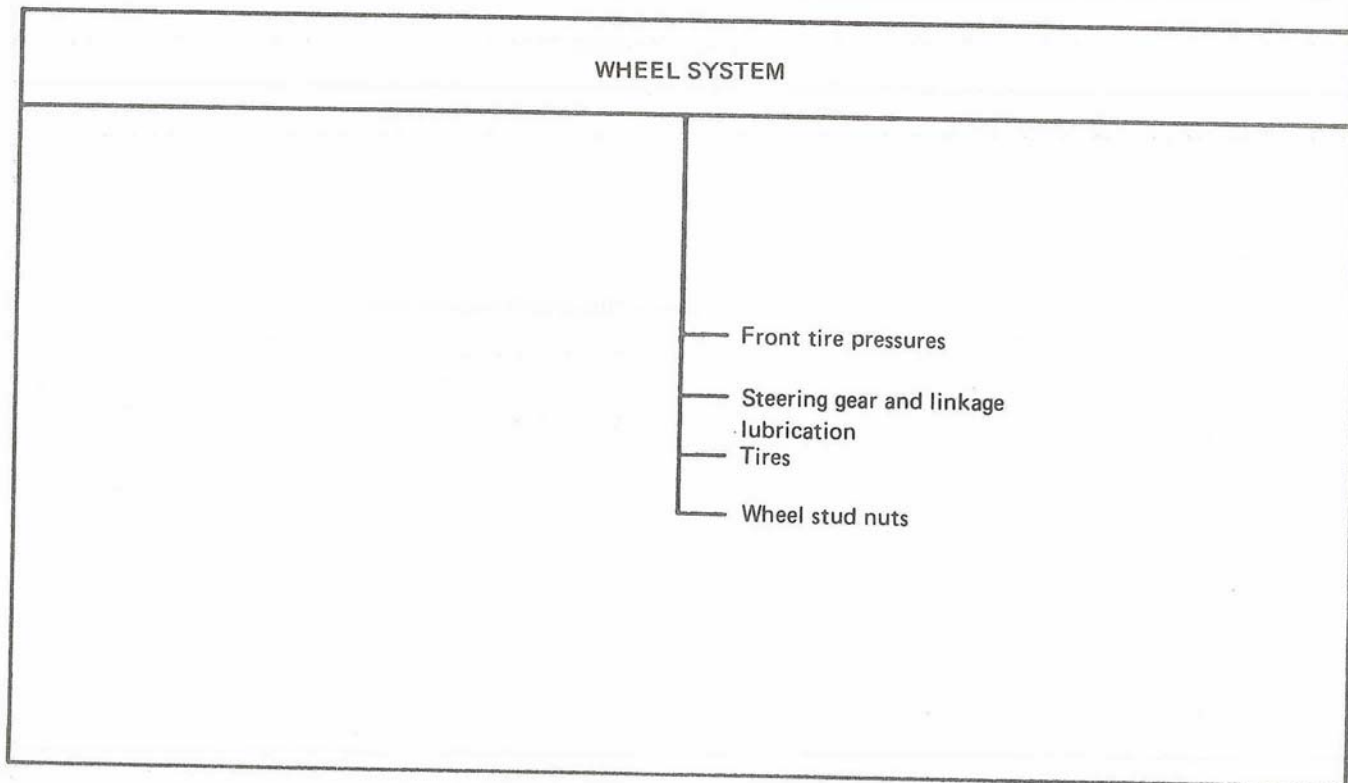


Figure 5-5. Troubleshooting Roadmap, Wheel System

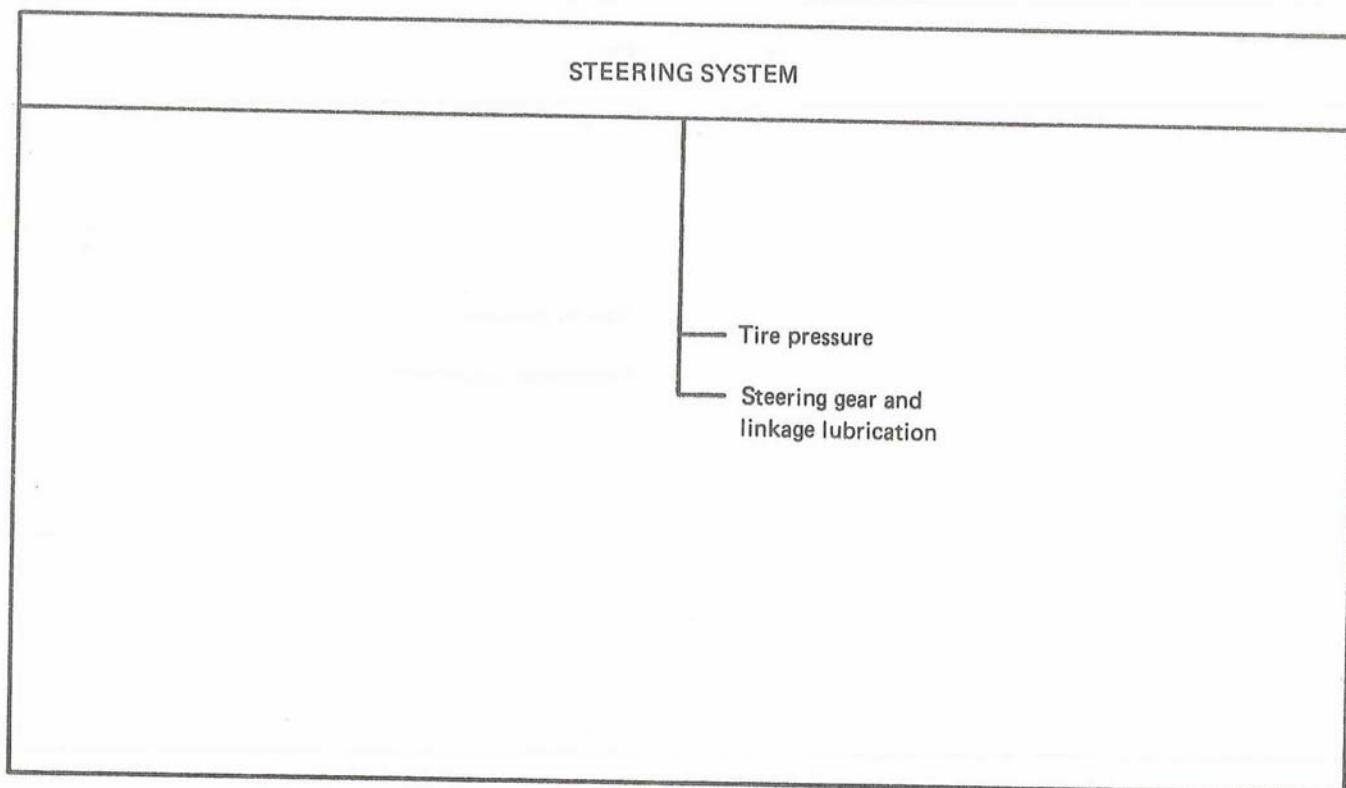


Figure 5-6. Troubleshooting Roadmap, Steering System

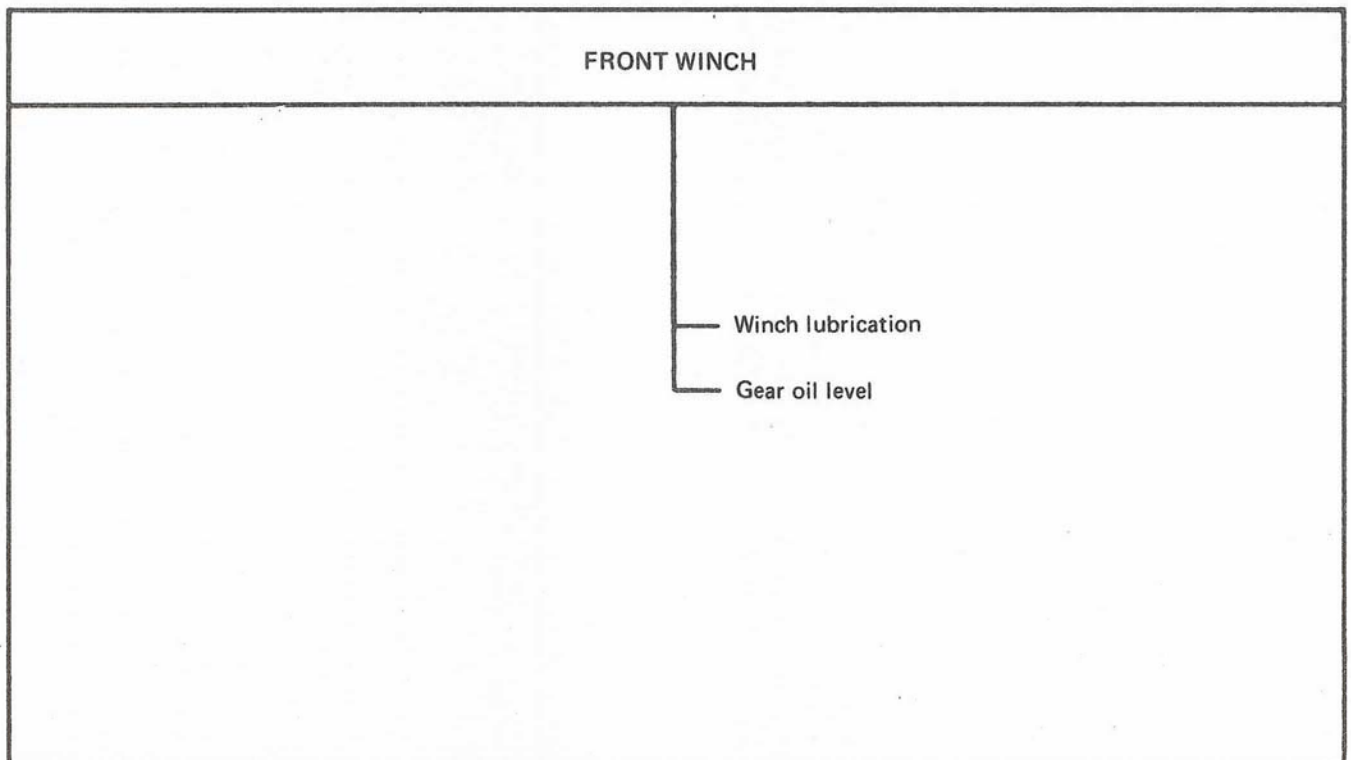


Figure 5-7. Troubleshooting Roadmap, Front Winch

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CHAPTER 6

FAULT SYMPTOM INDEXES

6-1. **GENERAL.** This chapter gives troubleshooting fault symptom indexes for every system of the truck for which you have detailed troubleshooting procedures. These indexes are in table form (tables 6-1 through 6-15) which gives you a quick way to check what material you have to use to do your troubleshooting.

6-2. **INDEXES.** Each index is divided into columns which give you information you need to help you do troubleshooting procedures. The following breakdown tells you what is in each column.

- a. Subsystem Column. If the main system is divided into subsystems, the subsystems will be listed in this column.
- b. Symptom Column. This column lists the symptoms, or problems for which detailed troubleshooting procedures are given.
- c. Summary Column. No summary troubleshooting procedures are needed at the operator's level of troubleshooting, so, the summary column is not used.
- d. Detailed Column. This column tells you where to find the detailed troubleshooting procedure for each symptom.
- e. Persons Column. This column tells you how many people are needed to do the troubleshooting procedure.
- f. Special Tools Column. Any tools needed to do the troubleshooting procedure which are not included in your common tool kit are listed in this column.
- g. Standard Tools Column. A dot in this column means that tools found in your common tool kit are needed to do the troubleshooting procedure.
- h. Materials Column. This column tells you what materials are needed to do the troubleshooting procedure. These materials and how they will be issued will be decided by your maintenance officer.
- i. Time Column. This column tells you how much time you will need to do the detailed troubleshooting procedure. The time will be decided by your maintenance officer.

FAULT SYMPTOM INDEX

TABLE 6-1. ENGINE SYSTEM								
SUBSYSTEM	SYMPTOM	TS PROCEDURE		RESOURCES REQ'D				
		SUMMARY	DETAILED	PERSONS	TEST EQUIPMENT		MATERIALS	TIME
					SPECIAL TOOLS	STANDARD TOOLS		
—	1. Engine uses more oil than normal	—	Figure 8-1	1	—			

TABLE 6-2. FUEL SYSTEM								
SUBSYSTEM	SYMPTOM	TS PROCEDURE		RESOURCES REQ'D				
		SUMMARY	DETAILED	PERSONS	TEST EQUIPMENT		MATERIALS	TIME
					SPECIAL TOOLS	STANDARD TOOLS		
—	1. Engine is hard starting or cranks and does not start	—	Figure 9-1	1	—			
—	2. Engine runs rough and lacks power, or poor fuel mileage	—	Figure 9-2	1	—			

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FAULT SYMPTOM INDEX

TABLE 6-3. COOLING SYSTEM								
SUBSYSTEM	SYMPTOM	TS PROCEDURE		RESOURCES REQ'D				
		SUMMARY	DETAILED	PERSONS	TEST EQUIPMENT		MATERIALS	TIME
					SPECIAL TOOLS	STANDARD TOOLS		
—	1. Engine temperature gage reads above 200°F while running	—	Figure 10-1	1	—			

TABLE 6-4. BRAKE SYSTEM								
SUBSYSTEM	SYMPTOM	TS PROCEDURE		RESOURCES REQ'D				
		SUMMARY	DETAILED	PERSONS	TEST EQUIPMENT		MATERIALS	TIME
					SPECIAL TOOLS	STANDARD TOOLS		
—	1. Truck pulls to one side when brakes are put on	—	Figure 11-1	1	—			
—	2. Handbrake does not hold parked truck or drags after lever has been put down	—	Figure 11-2	1	—			

FAULT SYMPTOM INDEX

TABLE 6-5. WHEEL SYSTEM

SUBSYSTEM	SYMPTOM	TS PROCEDURE		RESOURCES REQ'D				
		SUMMARY	DETAILED	PERSONS	TEST EQUIPMENT		MATERIALS	TIME
					SPECIAL TOOLS	STANDARD TOOLS		
— — —	1. Hard steering 2. Shimmy 3. Truck pulls to one side when brakes are put on	— — —	Figure 12-1 Figure 12-2 Figure 12-3	1	— — —			
				1				
				1				

TABLE 6-6. STEERING SYSTEM

SUBSYSTEM	SYMPTOM	TS PROCEDURE		RESOURCES REQ'D				
		SUMMARY	DETAILED	PERSONS	TEST EQUIPMENT		MATERIALS	TIME
					SPECIAL TOOLS	STANDARD TOOLS		
—	1. Hard steering	—	Figure 13-1	1	—			

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FAULT SYMPTOM INDEX

TABLE 6-7. FRONT WINCH								
SUBSYSTEM	SYMPTOM	TS PROCEDURE		RESOURCES REQ'D				
		SUMMARY	DETAILED	PERSONS	TEST EQUIPMENT		MATERIALS	TIME
					SPECIAL TOOLS	STANDARD TOOLS		
—	1. Winch makes noise	—	Figure 14-1	1	—			

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CHAPTER 7

SAMPLE TROUBLESHOOTING PROCEDURE

7-1. GENERAL. This chapter gives a sample troubleshooting procedure. The purpose of the sample procedure is to help you see how the detailed troubleshooting procedures are used to find faults in a system.

7-2. SAMPLE PROCEDURE. The sample procedure given is the fuel system troubleshooting procedure for the symptom, ENGINE IS HARD STARTING, OR CRANKS AND DOES NOT START. This symptom is one you will have when you try to start your truck and certain parts on the truck are not working correctly. In each numbered box, instructions are given which tell you what to do, and how to do it. A large dot is placed next to the "what to do" instructions, and small dots next to the "how to do it" instructions.

a. Box number ① gives general instructions on getting the truck ready before you start to troubleshoot.

b. Box number ② gives a fault isolation test instruction. In this case, you are told to see if the engine stop (ENG STOP) control handle is pushed in. After you do this simple test, you read the question at the bottom of box number ②. If the ENG STOP control handle is pulled out, the answer to the question is NO, so you go to the next box.

c. Box number ③ gives you a corrective action. In this case, the fault is the ENG STOP control handle being pulled out. The corrective action is what you do to fix the fault, which is simply to push the handle back in. If the engine still doesn't start after you do this, it could mean that there are other faults in the fuel system besides the ENG STOP control handle. When this happens, go back to the beginning of the procedure and do each step again until you find the other faults.

d. Sometimes the corrective actions given for a fault will tell you what to do to fix the fault, but will not give you detailed instructions on how to fix it. Instead, you will be told to refer to another volume in this manual for these instructions. Box number ⑤ is an example of this. If the answer to the questions that all the fault isolation test instruction boxes ask is YES, it means that the symptom cannot be corrected at the operator level of maintenance. When this happens you are given the instruction "Tell Organizational Maintenance."

Symptom

1 ENGINE IS HARD STARTING, OR CRANKS AND DOES NOT START

WARNING

Diesel fuel is very flammable. Care must be used when choosing a place to work on fuel system. Keep truck about 50 feet away from an area where open flame, sparks, or smoking may cause a fire. Keep a fire extinguisher close by

1

- Make truck ready for work on fuel system
 - Find a well ventilated area
 - Park truck. Refer to Vol 1, chapter 4, para 4-6e

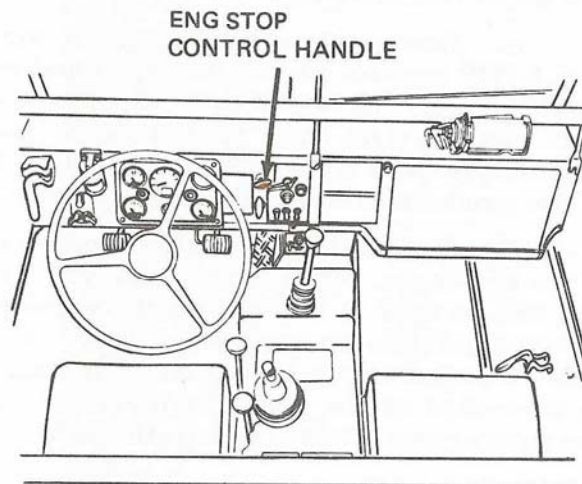
GENERAL INSTRUCTIONS

FAULT ISOLATION TEST INSTRUCTION

2

- Check engine stop control
 - See if ENG STOP control handle has been pushed in

Is ENG STOP control handle OK?



CORRECTIVE ACTION

3

- Reset engine stop control
 - Push in and turn ENG STOP control handle until it stops

YES

NO

GO

Figure 7-1 (Sheet 1 of 3)

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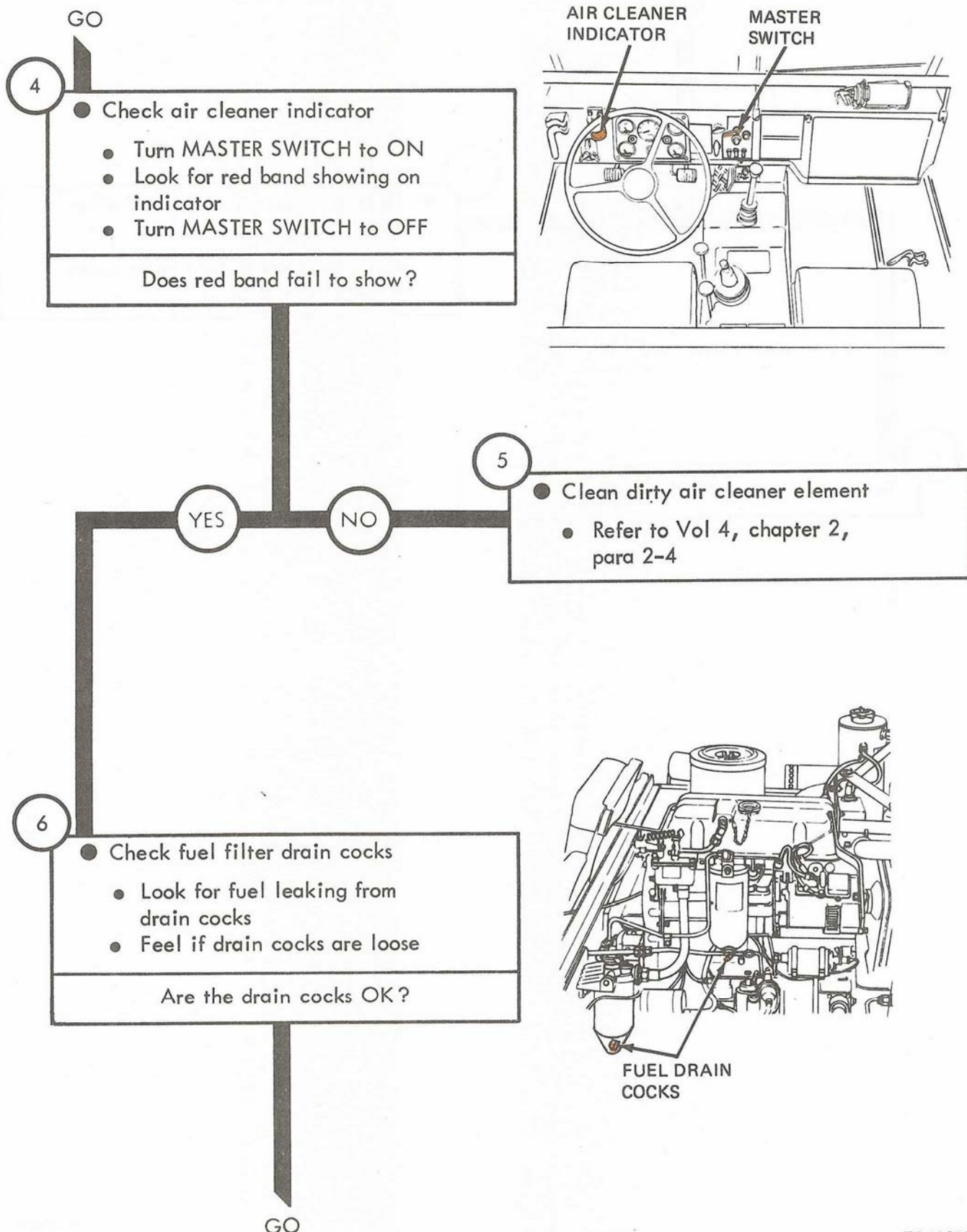


Figure 7-1 (Sheet 2 of 3)

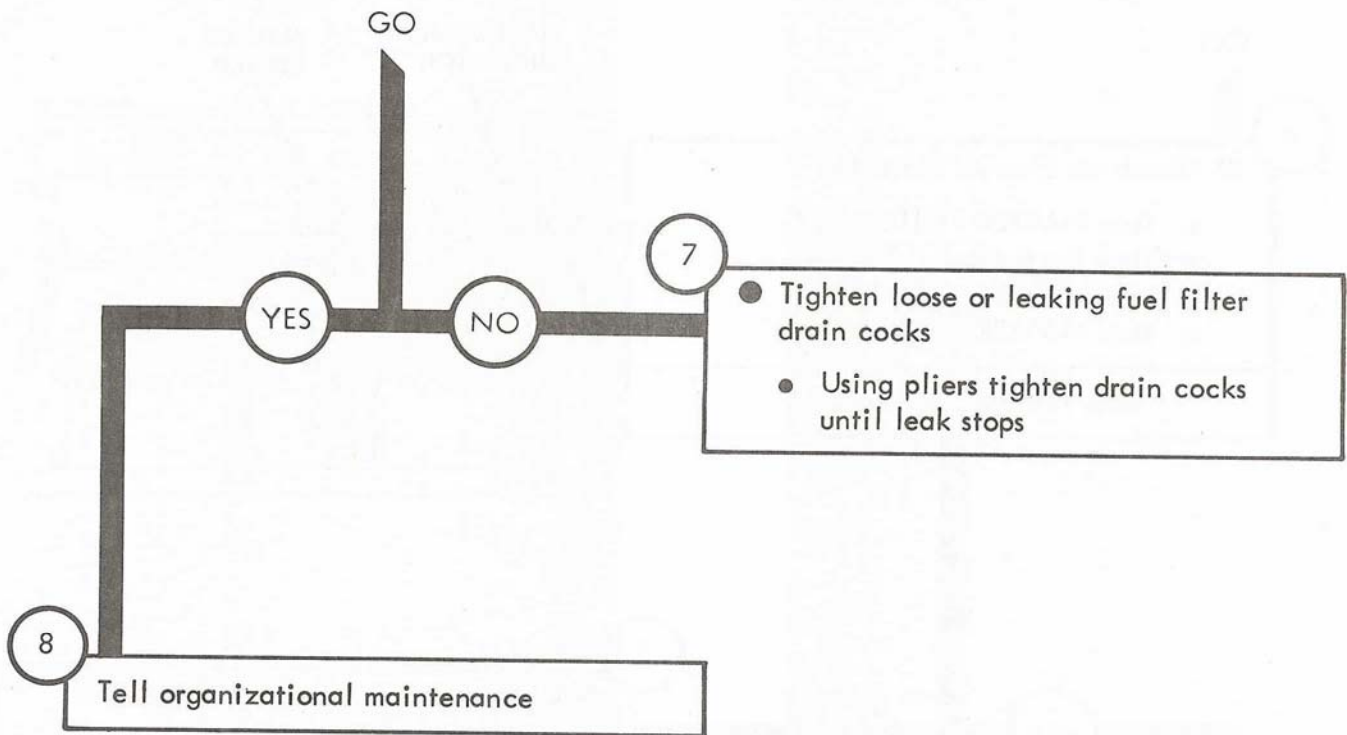


Figure 7-1 (Sheet 3 of 3)

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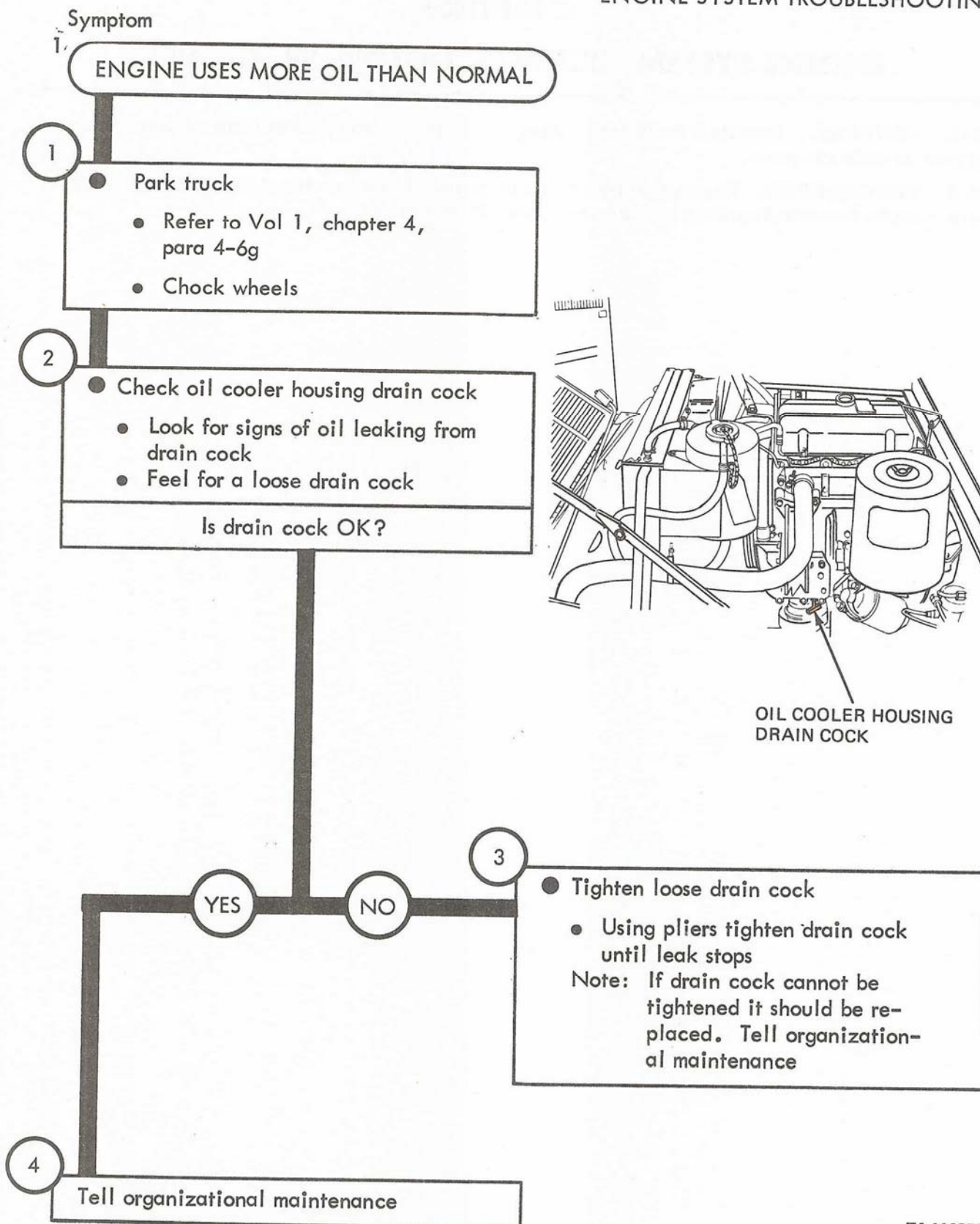
CHAPTER 8

ENGINE SYSTEM TROUBLESHOOTING PROCEDURES

8-1. GENERAL. Detailed troubleshooting procedures for the engine system are given in this chapter.

8-2. PROCEDURES. These troubleshooting procedures are used the same way as the sample troubleshooting procedure given in chapter 7.

ENGINE SYSTEM TROUBLESHOOTING



TA 113576

CHAPTER 9

FUEL SYSTEM TROUBLESHOOTING PROCEDURES

9-1. GENERAL. Detailed troubleshooting procedures for the fuel system are given in this chapter.

9-2. PROCEDURES. These troubleshooting procedures are used the same way as the sample troubleshooting procedure given in chapter 7.

FUEL SYSTEM TROUBLESHOOTING

Symptom

1

ENGINE IS HARD STARTING, OR CRANKS AND DOES NOT START

WARNING

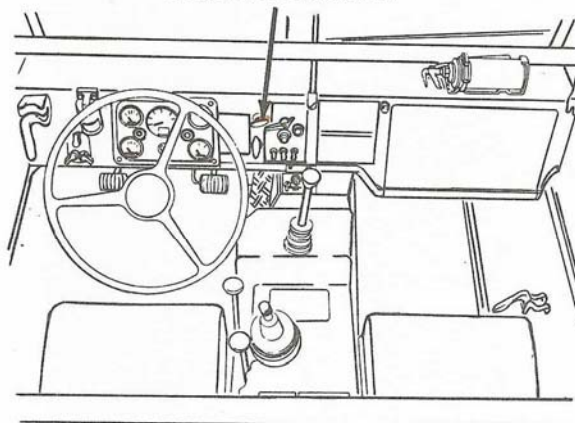
Diesel fuel is very flammable. Care must be used when choosing a place to work on fuel system. Keep truck about 50 feet away from an area where open flame, sparks, or smoking may cause a fire. Keep a fire extinguisher close by

1

- Check engine stop control
 - See if ENG STOP control handle has been pushed in

Is engine stop control OK?

ENG STOP
CONTROL HANDLE



2

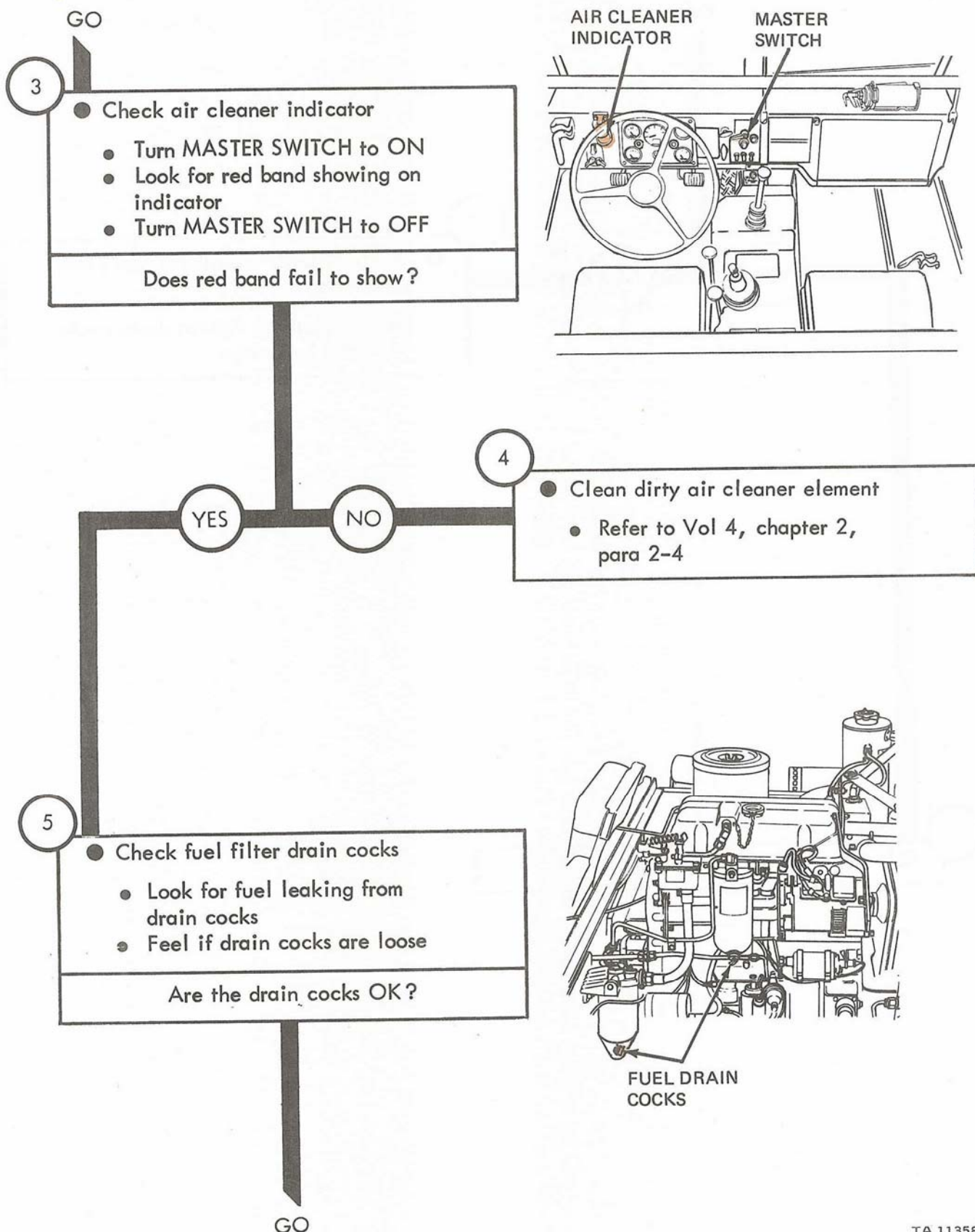
- Reset engine stop control
 - Push in and turn ENG STOP control handle until it stops

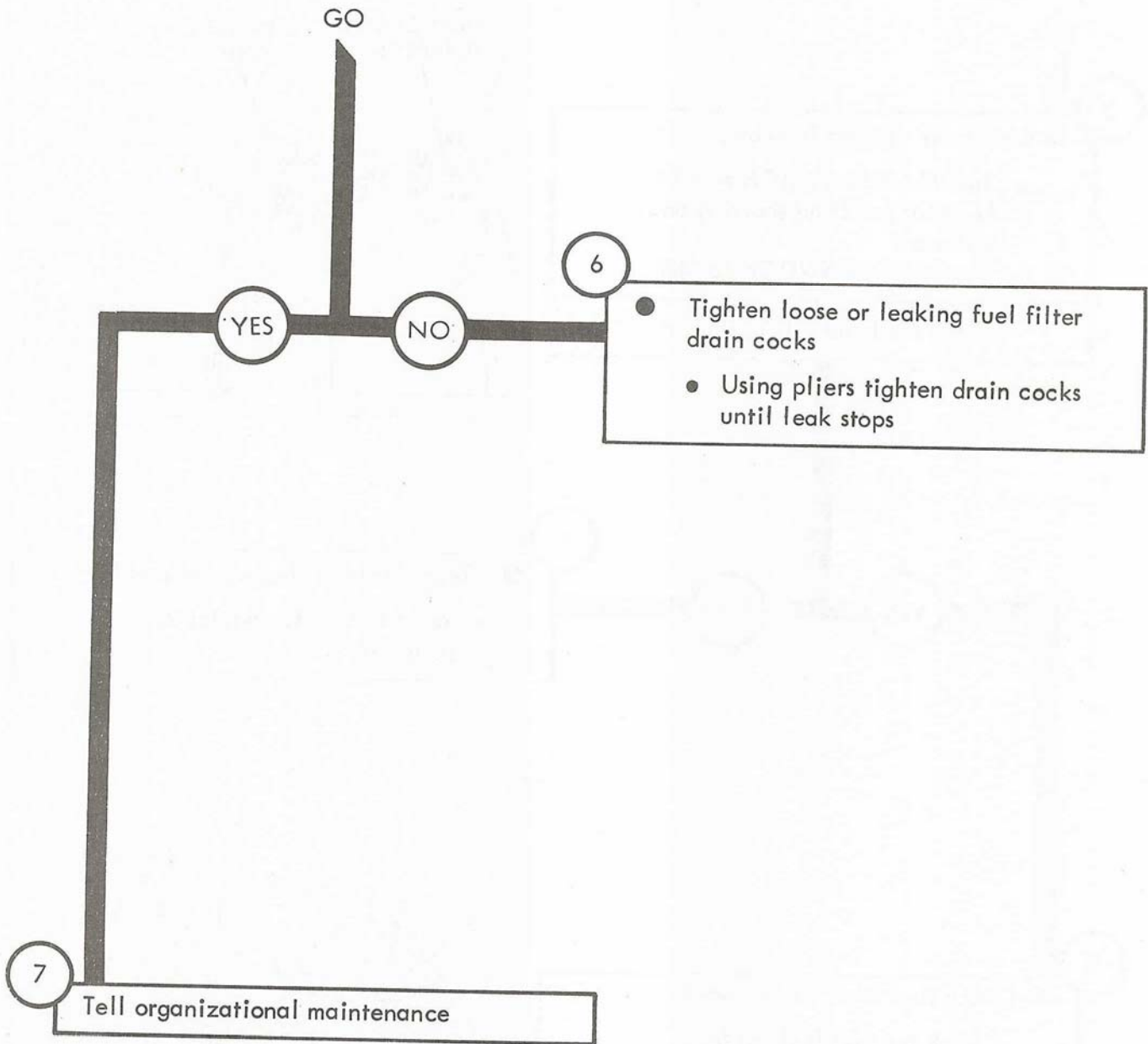
YES

NO

GO

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Symptom

2

ENGINE RUNS ROUGH AND LACKS POWER, OR POOR FUEL MILEAGE

WARNING

Diesel fuel is very flammable. Care must be used when choosing a place to work on fuel system. Keep truck about 50 feet away from an area where open flame, sparks, or smoking may cause a fire. Keep a fire extinguisher close by

1

- Make truck ready for work on fuel system
 - Find a well ventilated area
 - Park truck. Refer to Vol 1, chapter 4, para 4-6g

2

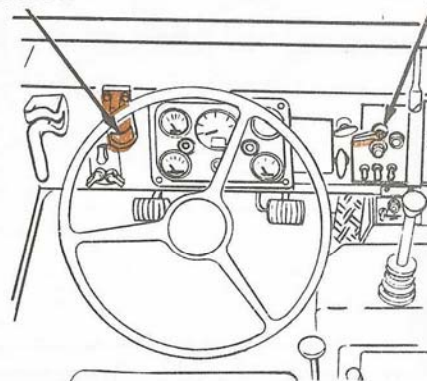
- Check air cleaner indicator
 - Turn MASTER SWITCH to ON
 - Look for red band showing on indicator
 - Turn MASTER SWITCH to OFF

Does red band fail to show?

GO

AIR CLEANER
INDICATOR

MASTER
SWITCH



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CHAPTER 10

COOLING SYSTEM TROUBLESHOOTING PROCEDURES

10-1. GENERAL. Detailed troubleshooting procedures for the cooling system are given in this chapter.

10-2. PROCEDURES. These troubleshooting procedures are used the same way as the sample troubleshooting procedure given in chapter 7.

COOLING SYSTEM TROUBLESHOOTING

Symptom

1

ENGINE TEMPERATURE GAGE READS ABOVE 200°F
WHILE RUNNING

1

- Make truck ready for work on cooling system
 - Park truck. Refer to Vol 1, chapter 4, para 4-6g
 - Chock wheels

WARNING

Engine cooling system runs under pressure and at a temperature of 160°F to 200°F. If filler cap is taken off before pressure is set free scalding coolant will blow out. Due to high temperatures of coolant, bad burns can occur if contact is made with skin

GO

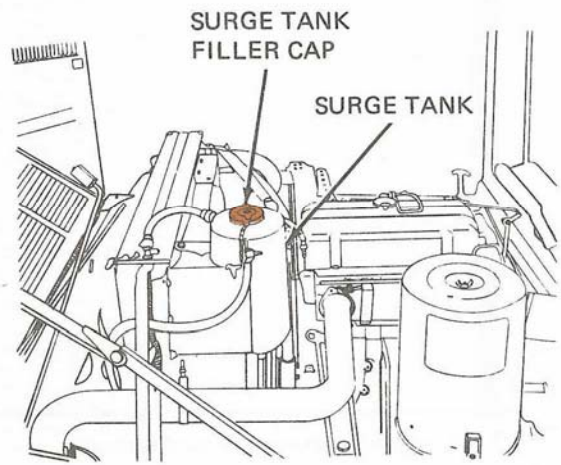
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GO

2

- Check surge tank coolant level
 - Using rag, grab surge tank filler cap and turn to the left until it reaches stop
 - Wait about 30 seconds, or until all pressure has been set free
 - Using rag, push down on cap and turn to left. Take off cap
 - Look inside surge tank and see if coolant level is within two inches from top

Is surge tank coolant level OK?



YES

NO

CAUTION

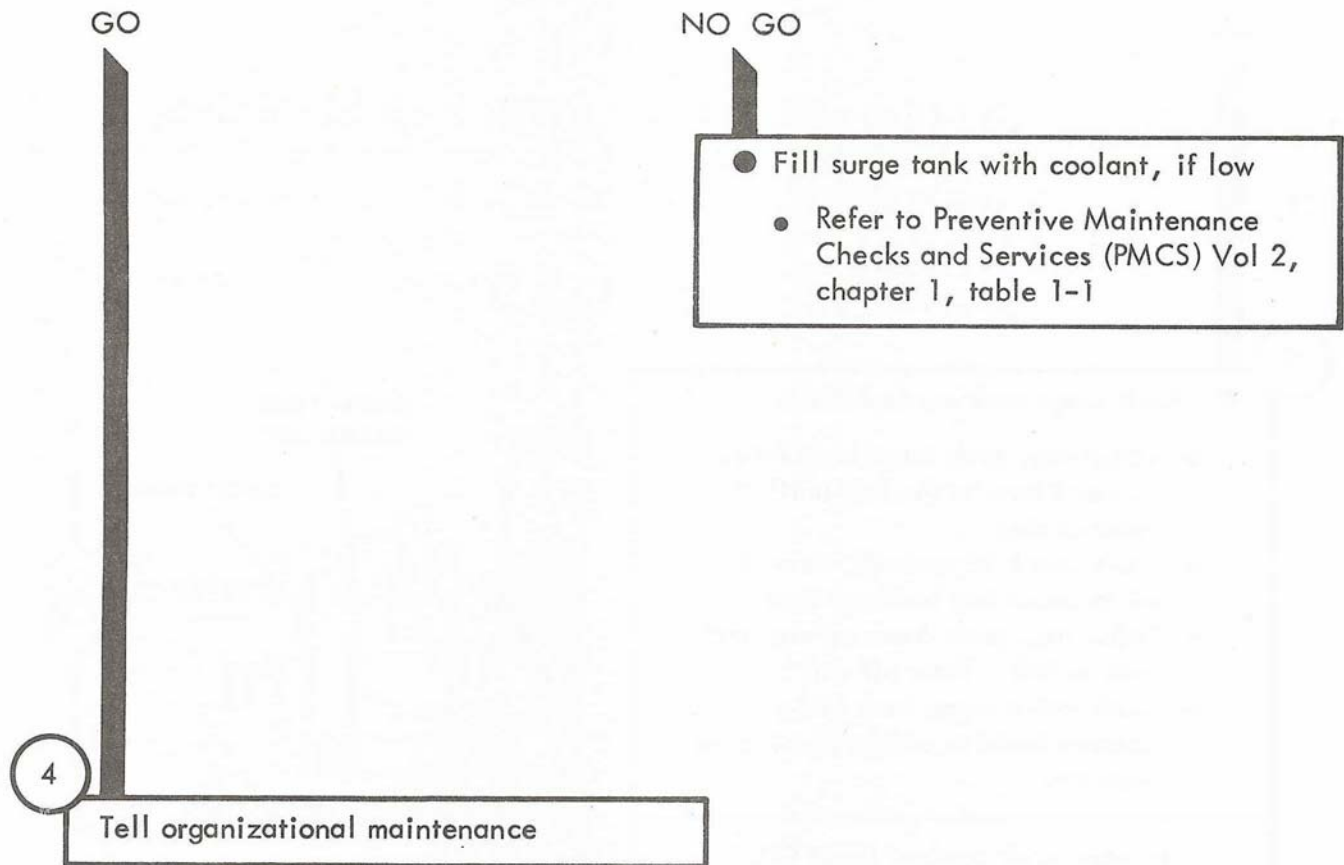
Do not pour cold coolant into the cooling system while engine is still hot. Doing this will cause the thermostat to close. This will prevent the engine water jackets and passages from filling all the way

GO

NO GO

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Figure 10-1 (Sheet 2 of 3)



CHAPTER 11

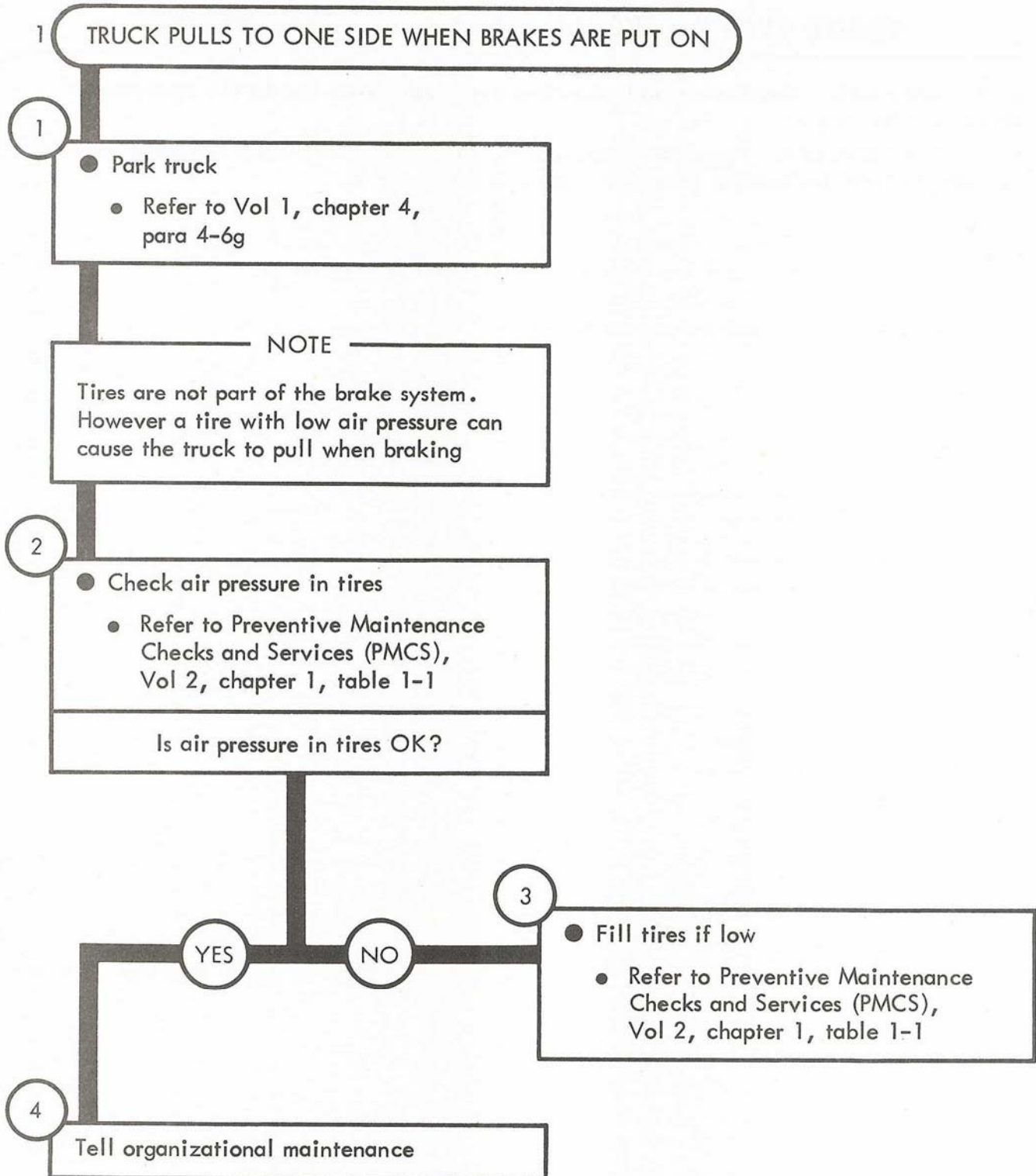
BRAKE SYSTEM TROUBLESHOOTING PROCEDURES

11-1. GENERAL. Detailed troubleshooting procedures for the brake system are given in this chapter.

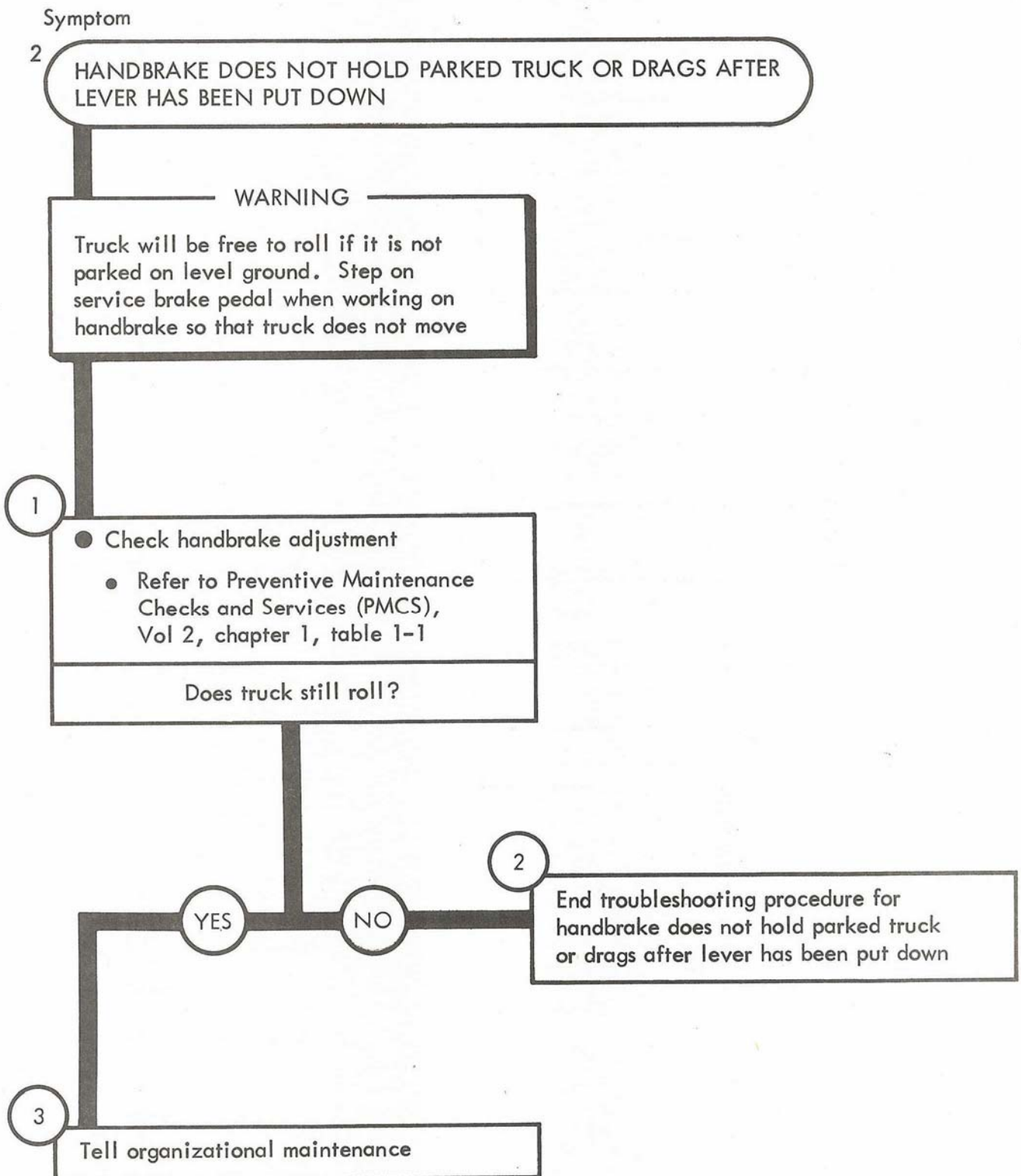
11-2. PROCEDURES. These troubleshooting procedures are used the same way as the sample troubleshooting procedure given in chapter 7.

BRAKE SYSTEM TROUBLESHOOTING

Symptom



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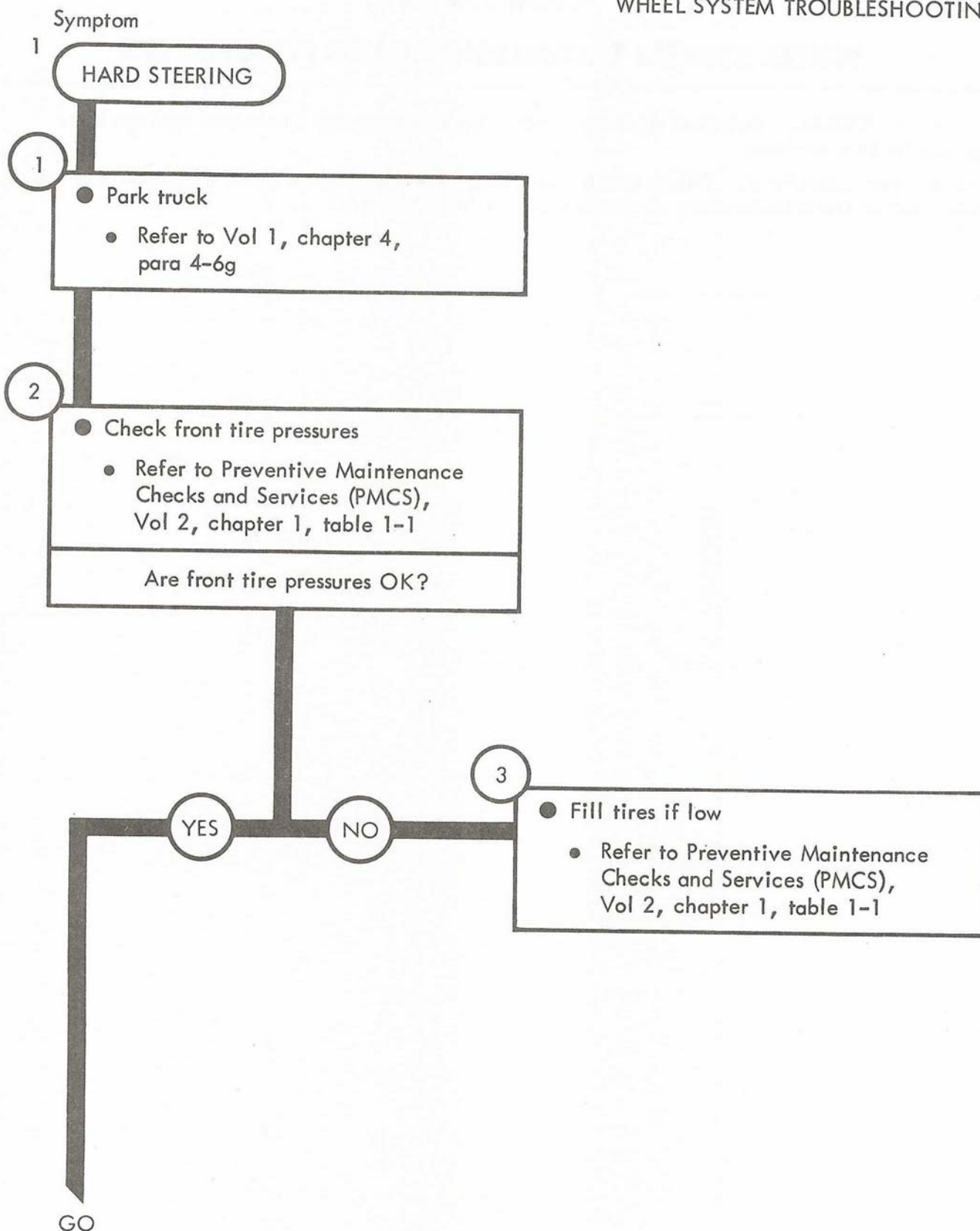
CHAPTER 12

WHEEL SYSTEM TROUBLESHOOTING PROCEDURES

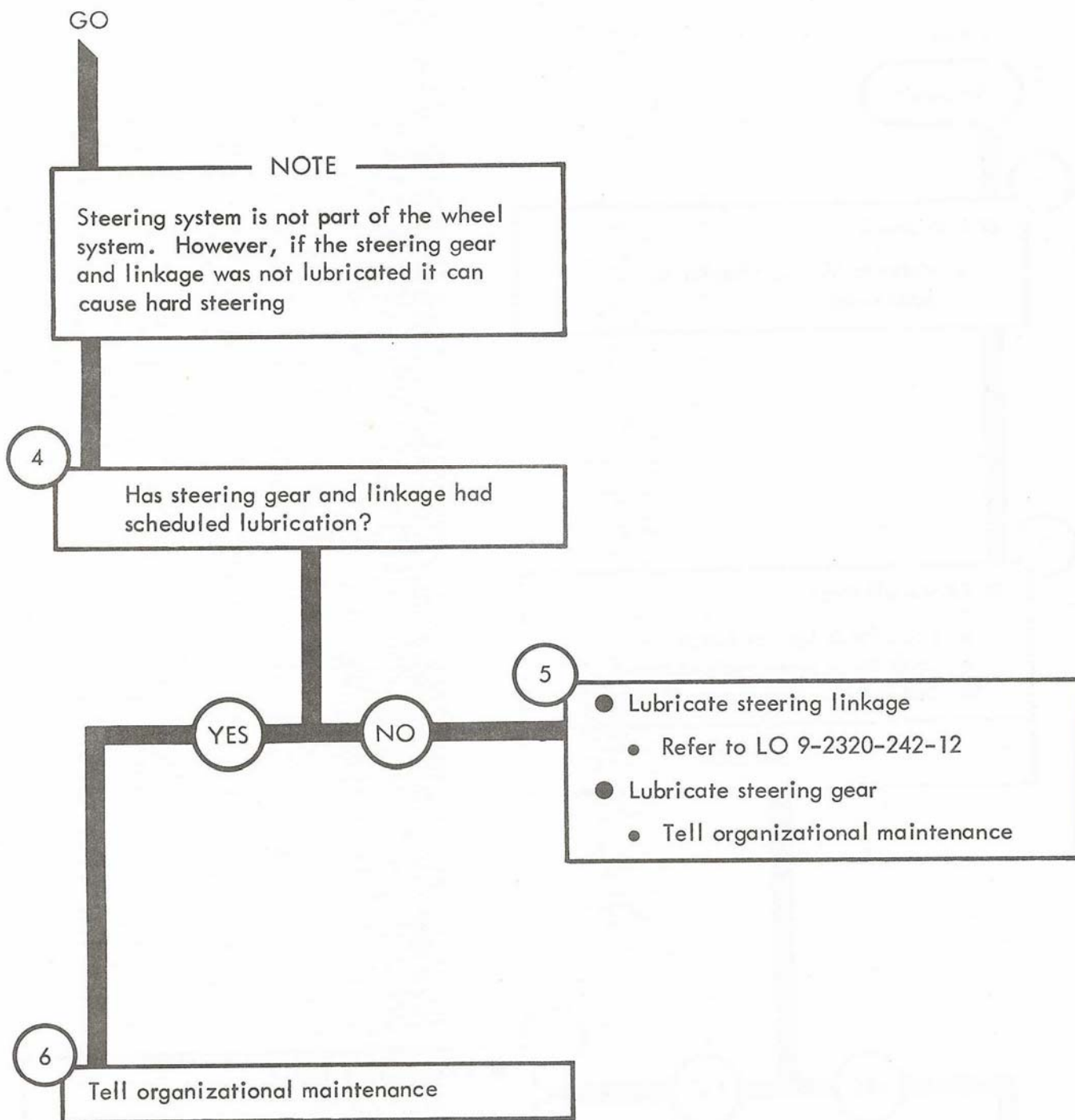
12-1. GENERAL. Detailed troubleshooting procedures for the wheel system are given in this chapter.

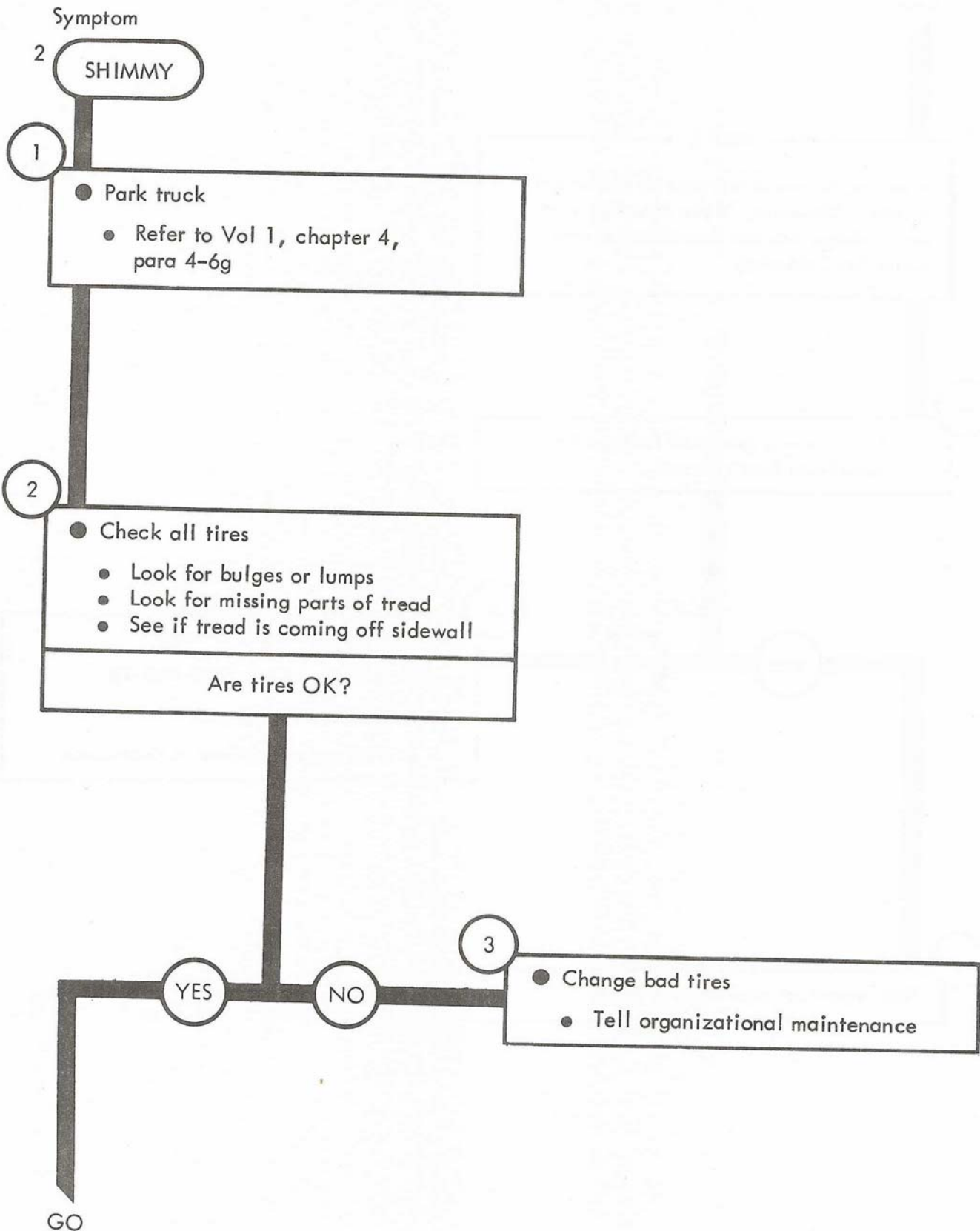
12-2. PROCEDURES. These troubleshooting procedures are used the same way as the sample troubleshooting procedure given in chapter 7.

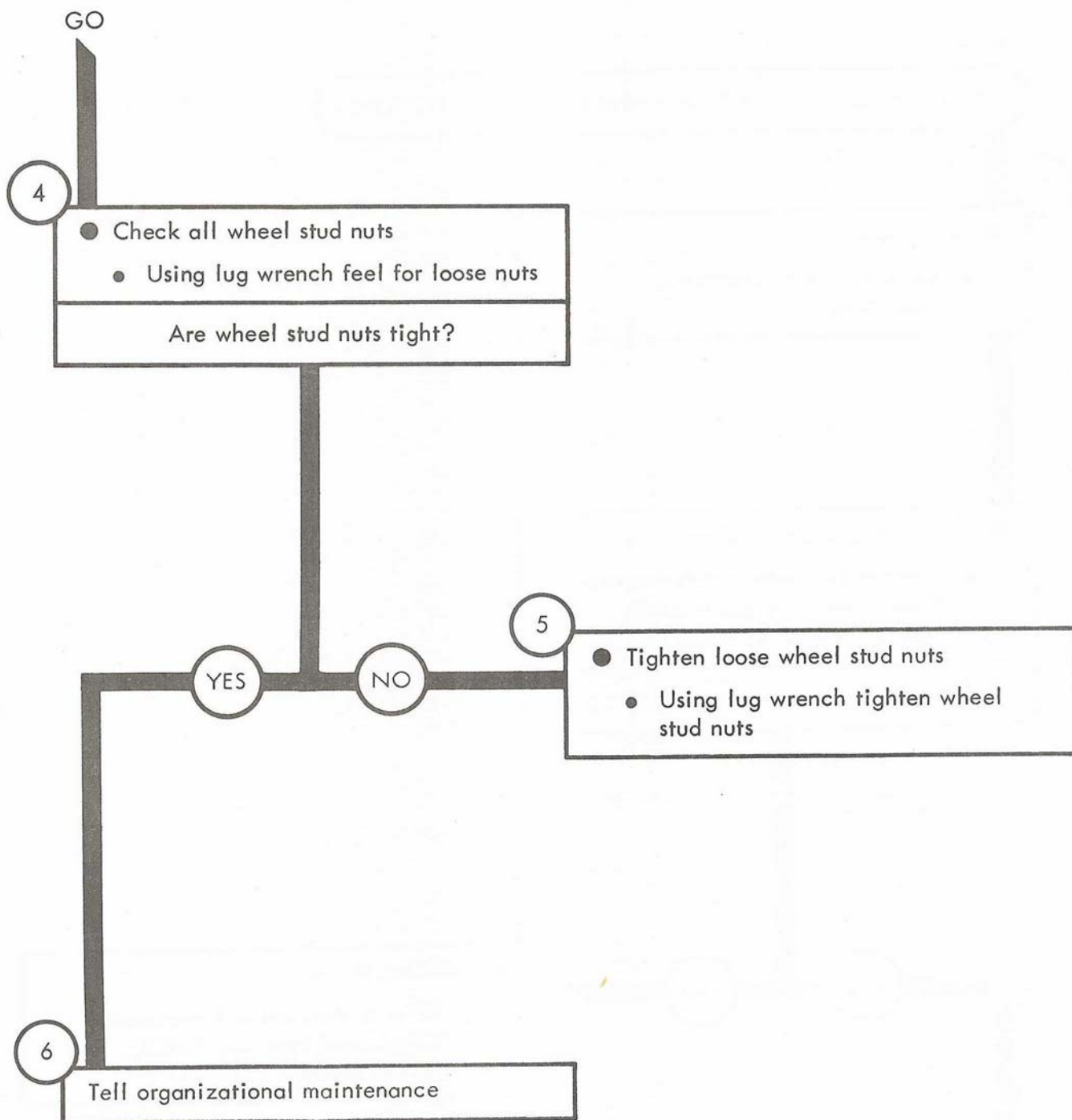
WHEEL SYSTEM TROUBLESHOOTING

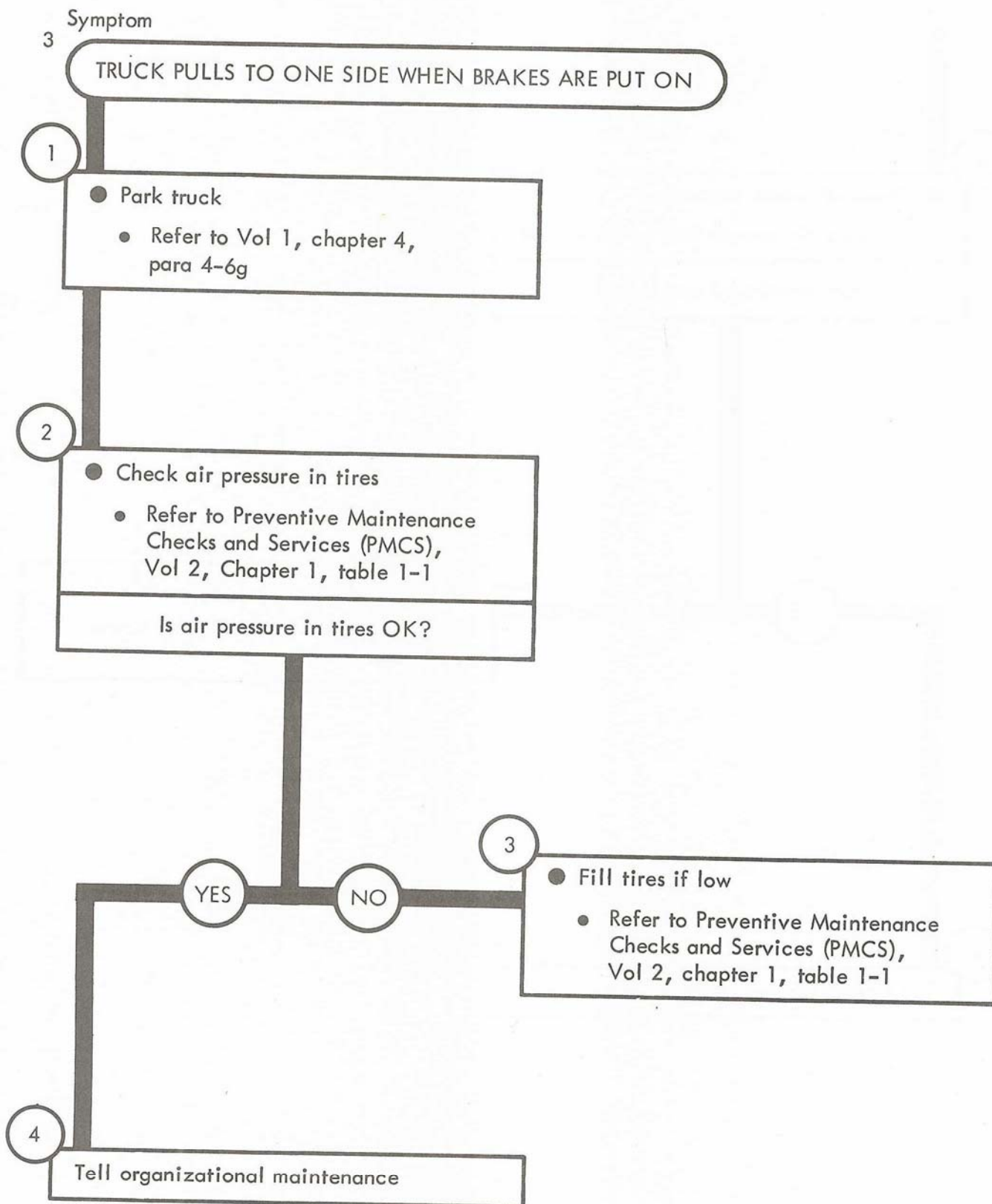


TA 113587









TA 113591

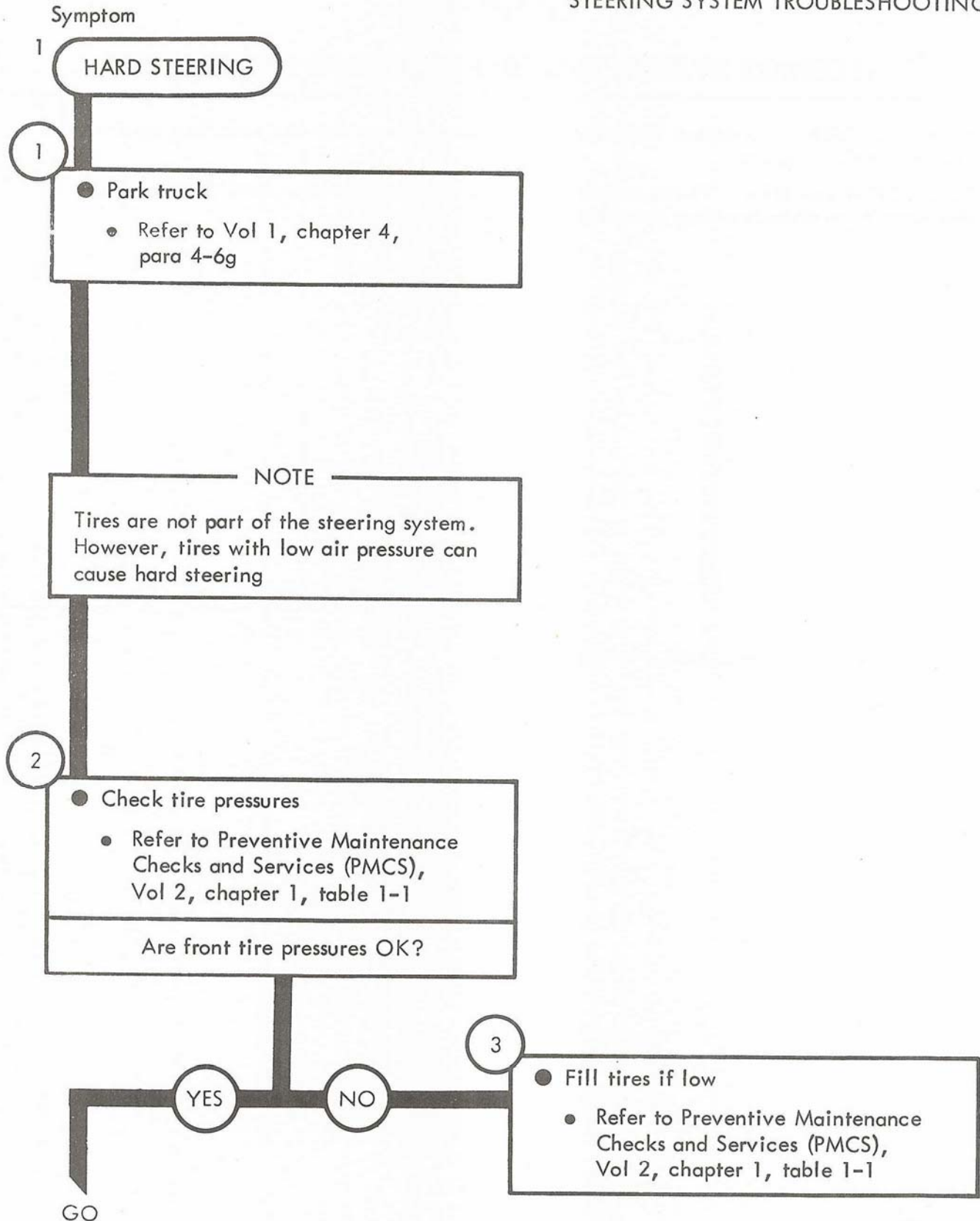
CHAPTER 13

STEERING SYSTEM TROUBLESHOOTING PROCEDURES

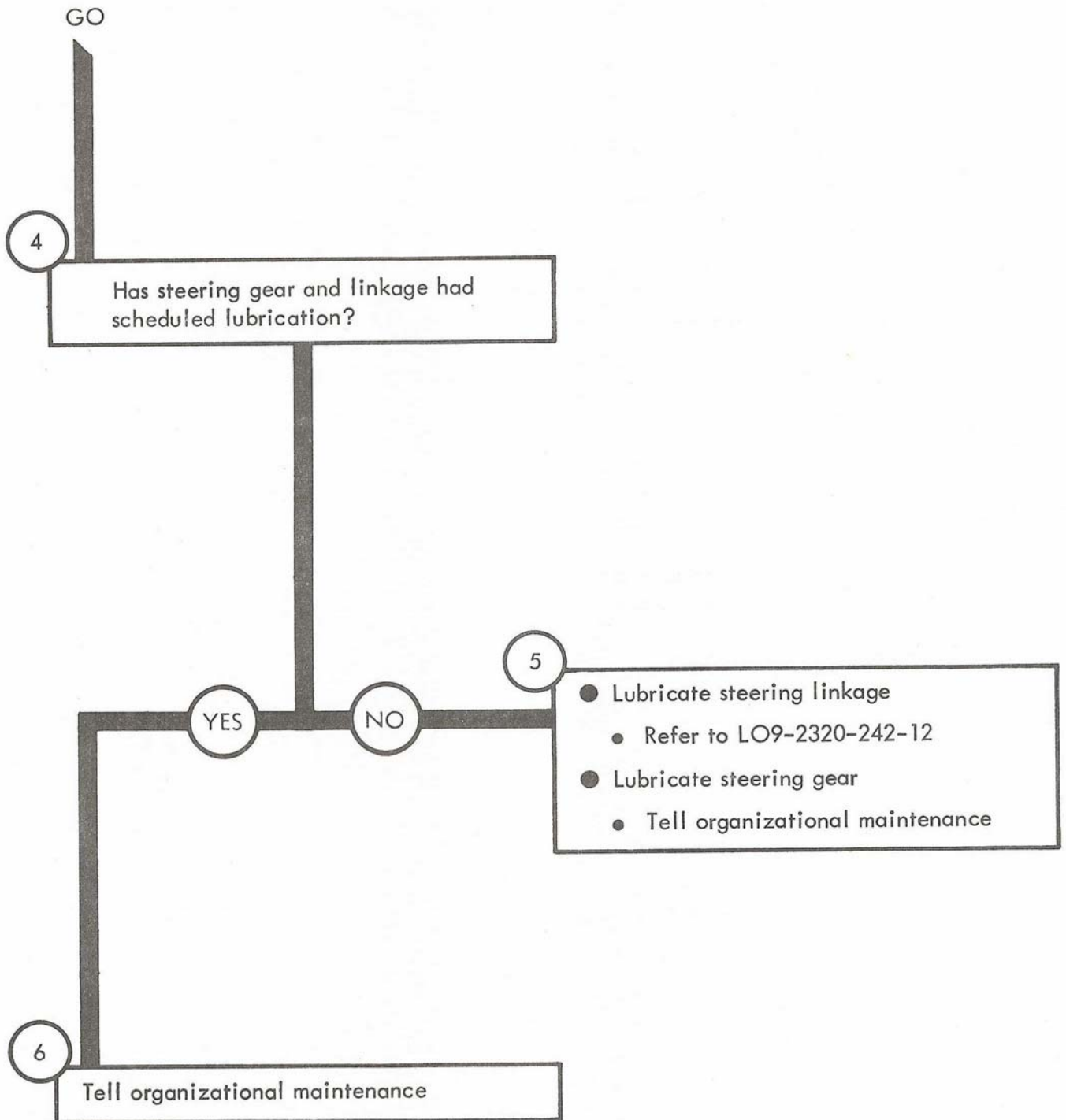
13-1. GENERAL. Detailed troubleshooting procedures for the steering system are given in this chapter.

13-2. PROCEDURES. These troubleshooting procedures are used the same way as the sample troubleshooting procedure given in chapter 7.

STEERING SYSTEM TROUBLESHOOTING



TA 113592



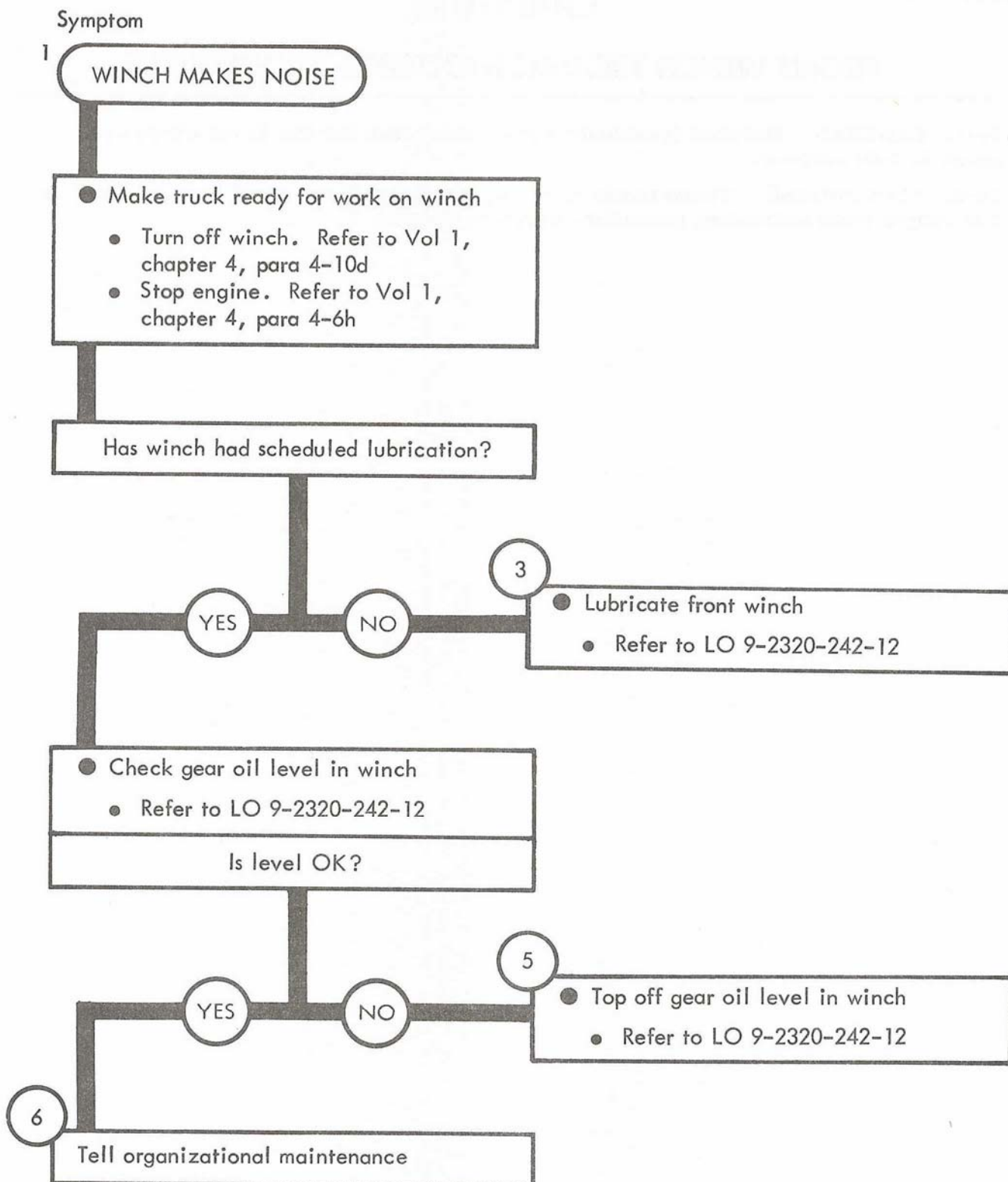
CHAPTER 14

FRONT WINCH TROUBLESHOOTING PROCEDURES

14-1. GENERAL. Detailed troubleshooting procedures for the front winch are given in this chapter.

14-2. PROCEDURES. These troubleshooting procedures are used the same way as the sample troubleshooting procedure given in chapter 7.

FRONT WINCH TROUBLESHOOTING



TA 113594

By Order of the Secretaries of the Army and the Air Force:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

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To be distributed in accordance with DA Form 12-38, Operator Maintenance requirements for Truck, Cargo, 1-1/4 Ton, M561 and Truck Amulance, 1-1/4 Ton, M792.

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DATE SENT
6 October 1980

PUBLICATION NUMBER

TM 9-2320-242-10-3

PUBLICATION DATE

30 Sept 80

PUBLICATION TITLE OPERATOR

TROUBLESHOOTING MANUAL

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO
3-2		3-1	
6-1	6-2		
6-3			6-3

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Item 7 FRONT WINCH
Fault symptom index refers to table 6-6.
Should refer to table 6-7.

Add second sentence to read "The time will be decided by your maintenance officer."

Symptom 1 reads "Engine temperature gage reads above 180°F while running."
Should be "Engine temperature gage reads above 200°F while running."

SAMPLE

PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER

SP4 Jane Idone Autovon 222-2224

SIGN HERE

Jane Idone

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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
 1 Meter = 100 Centimeters = 1,000 Millimeters = 39.37 Inches
 1 Kilo Meter = 1,000 Meters = 0.621 Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1,000 Milligrams = 0.035 Ounces
 1 Kilogram = 1,000 Grams = 2.2 Lb
 1 Metric Ton = 1,000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
 1 Liter = 1,000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches
 1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet
 1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles

CUBIC MEASURE

1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches
 1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

TEMPERATURE

$5/9 (^{\circ}\text{F} - 32) = ^{\circ}\text{C}$
 212° Fahrenheit is equivalent to 100° Celsius
 90° Fahrenheit is equivalent to 32.2° Celsius
 32° Fahrenheit is equivalent to 0° Celsius
 $9/5 (^{\circ}\text{C} + 32) = ^{\circ}\text{F}$

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds Per Square Inch	Kilopascals	6.895
Miles Per Gallon	Kilometers Per Liter	0.425
Miles Per Hour	Kilometers Per Hour	1.609
TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Millimeters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds Per Square Inch	0.145
Kilometers Per Liter	Miles Per Gallon	2.354
Kilometers Per Hour	Miles Per Hour	0.621

