# TM9-2320-211-20-2-2
# T.O.36A12-1C-422-1-2

TECHNICAL MANUAL

VOLUME 2 OF 3

PART 2 OF 2

## TROUBLESHOOTING

ORGANIZATIONAL LEVEL

## 5-TON, 6X6, M39 SERIES TRUCKS

## (MULTIFUEL)

## TRUCK, CHASSIS: M40A2C, M61A2, M63A2; TRUCK, CARGO: M54A2, M54A2C, M55A2; TRUCK, DUMP: M51A2; TRUCK, TRACTOR: M52A2; TRUCK, WRECKER, MEDIUM: M543A2

**NOTE:**

THE STYLE OF THIS TM IS EXPERIMENTAL. IT IS BEING TRIED BY THE ARMY ONLY ON A LIMITED BASIS

DEPARTMENTS OF THE ARMY AND THE AIR FORCE

DECEMBER 1980

## WARNING

### EXHAUST GASES CAN BE DEADLY

Exposure to exhaust gases produces symptoms of headache, dizziness, loss of muscular cent rol, apparent drew siness, 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 combusion 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.

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 level in gear.

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

If your vehicle class number is greater than the bridge class number, your vehicle is too heavy for the bridge; DO NOT CROSS.

WARNING - Cont

Dry cleaning solvent is flammable. Do not use near an open flame. Keep a fire extinguisher nearby when solvent is used. Use only in well-ventilated places. Failure to do this may result in injury to personnel and damage to equipment.

Eye shields must be worn when using compressed air. Eye injury can occur if eye shields are not worn.

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.

TECHNICAL MANUAL
NO. 9-2320 -211-20-2-2
TECHNICAL ORDER
NO. 36A12-1C-422-1-2

DEPARTMENTS OF THE ARMY
AND
THE AIR FORCE
WASHINGTON. DC. *10 December 1980*

TECHNICAL MANUAL

VOLUME 2 OF 3

PART 2 OF 2

# TROUBLESHOOTING

ORGANIZATIONAL LEVEL

# 5-TON, 6X6, M39 SERIES TRUCKS (MULTIFUEL)

| Model | | NSN without Winch | NSN with Winch |
|---|---|---|---|
| Chassis | M40A2C | 2320-00-969-4114 | |
| | M61A2 | 2320-00-055-9264 | 2320-00-965-0321 |
| | M63A2 | 2320-00-226-6251 | 2320-00-285-3757 |
| Truck, Cargo | M54A2 | 2320-00-055-9266 | 2320-00-055-9265 |
| | M54A2C | 2320-00-926-0874 | 2320-00-926-0874 |
| | M55A2 | 2320-00-073-8476 | 2320-00-055-9259 |
| Truck, Dump | M51A2 | 2320-00-055-9262 | 2320-00-055-9263 |
| Truck, Tractor | M52A2 | 2320-00-055-9260 | 2320-00-055-9261 |
| Truck, Wrecker, Medium | M543A2 | | 2320-00-055-9258 |

*This manual together with TM 9-2320-211.20-1, 10 December 1980; TM 9-2320-211-20-2-1, 10 December 1980; TM 9-2320-211-20-3-1, 10 December 1980 and TM 9-2320-211-20-3-2, 10 December 1980 supersedes so much of TM 9-2320-211-20, 1 June 1973 as pertains to multifuel vehicles including all changes.

**REPORTING OF 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 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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# CHAPTER 27

# ELECTRICAL SYSTEM TROUBLESHOOTING SUMMARY

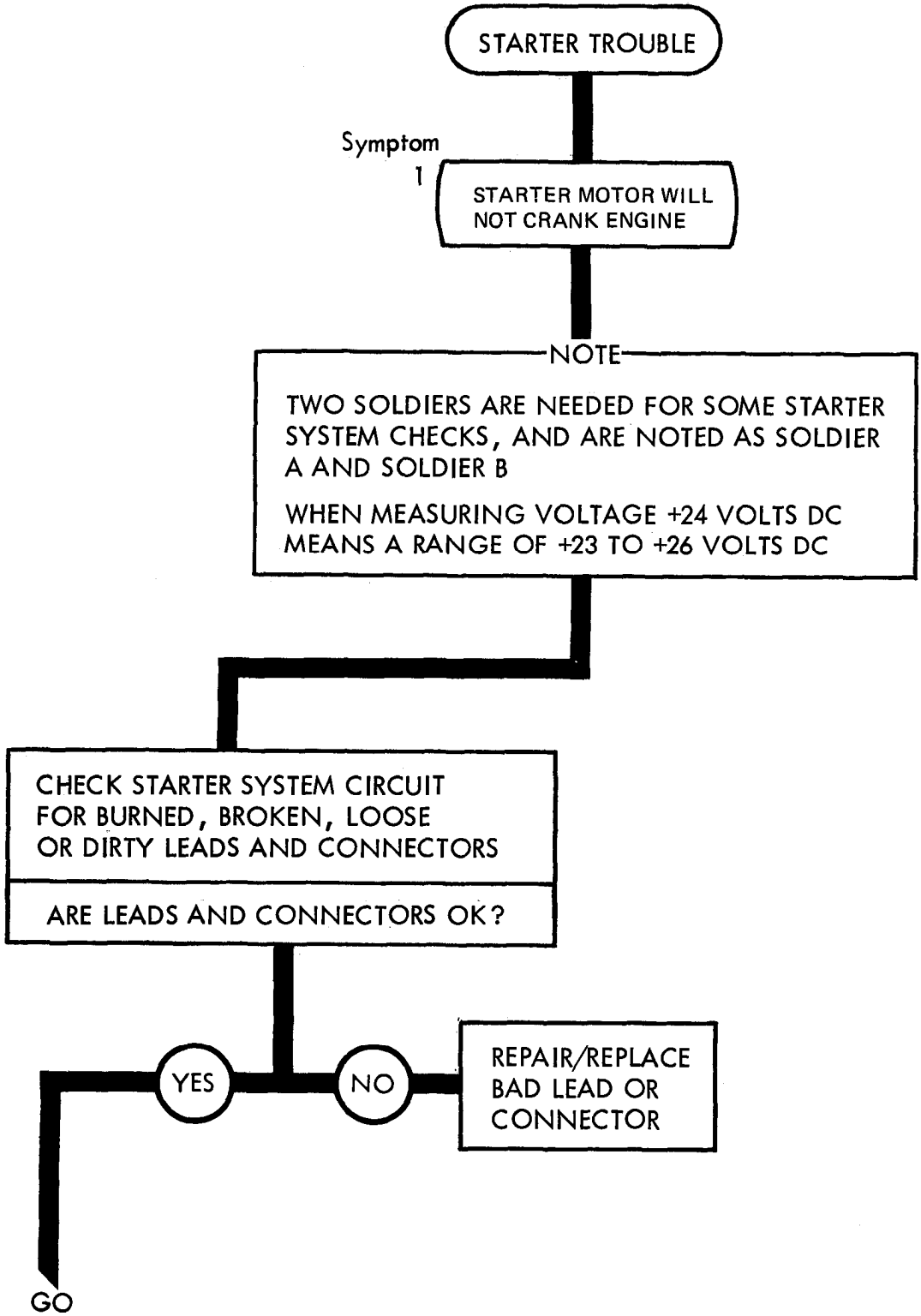
27-1. GENERAL . This chapter gives a summary of troubleshooting procedures given in chapter 26, for the Electrical System.

27-2. PROCEDURES. The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures. Chapter 7 outlines a sample troubleshooting procedure. The summary procedures are based on the "what-to-do" portions of the detailed procedures and do not include the "How-to-do-it" instructions. Warnings, cautions, and notes are given where needed.

NOTE

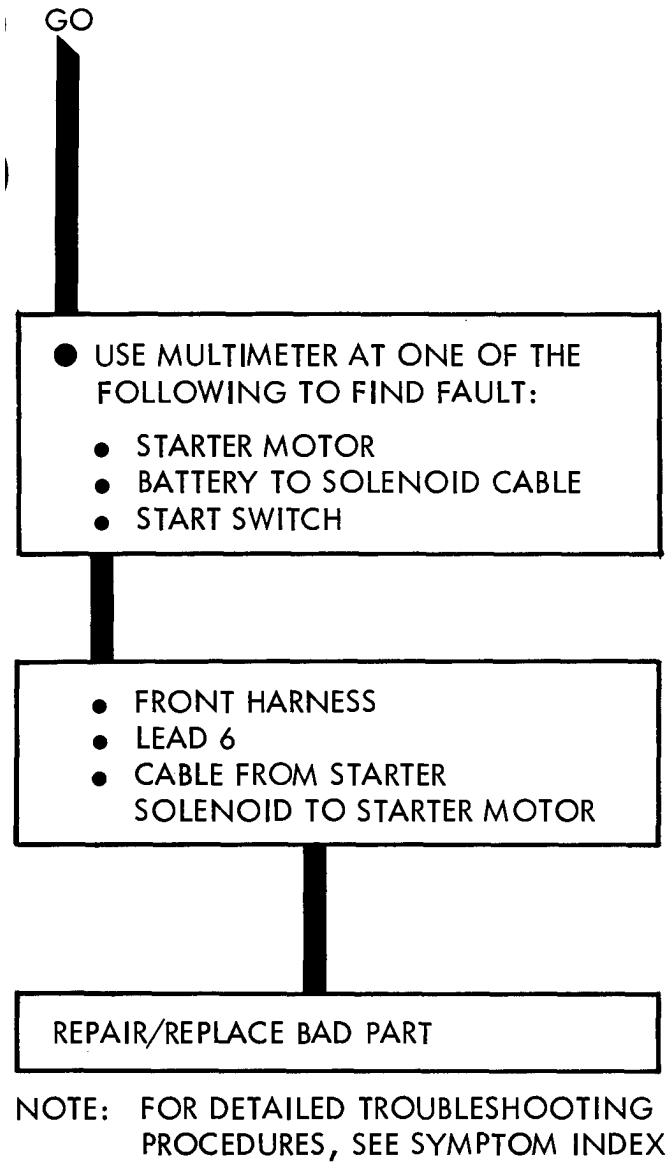
All references to TM 9-2320-211-10 apply to the 10 Series only.

## ELECTRICAL SYSTEM - STARTER SYSTEM TROUBLESHOOTING SUMMARY




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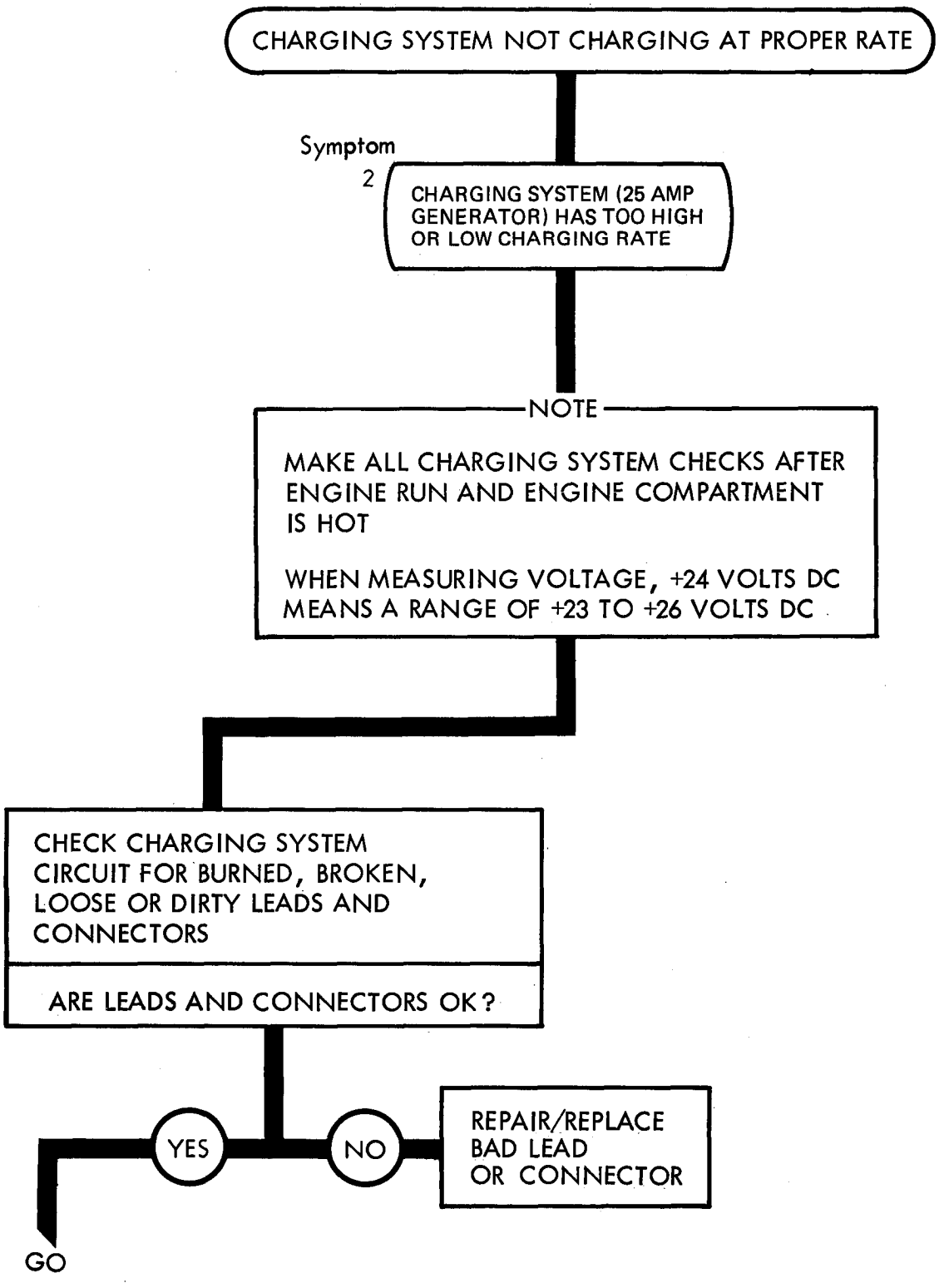



NOTE: FOR DETAILED TROUBLESHOOTING PROCEDURES, SEE SYMPTOM INDEX

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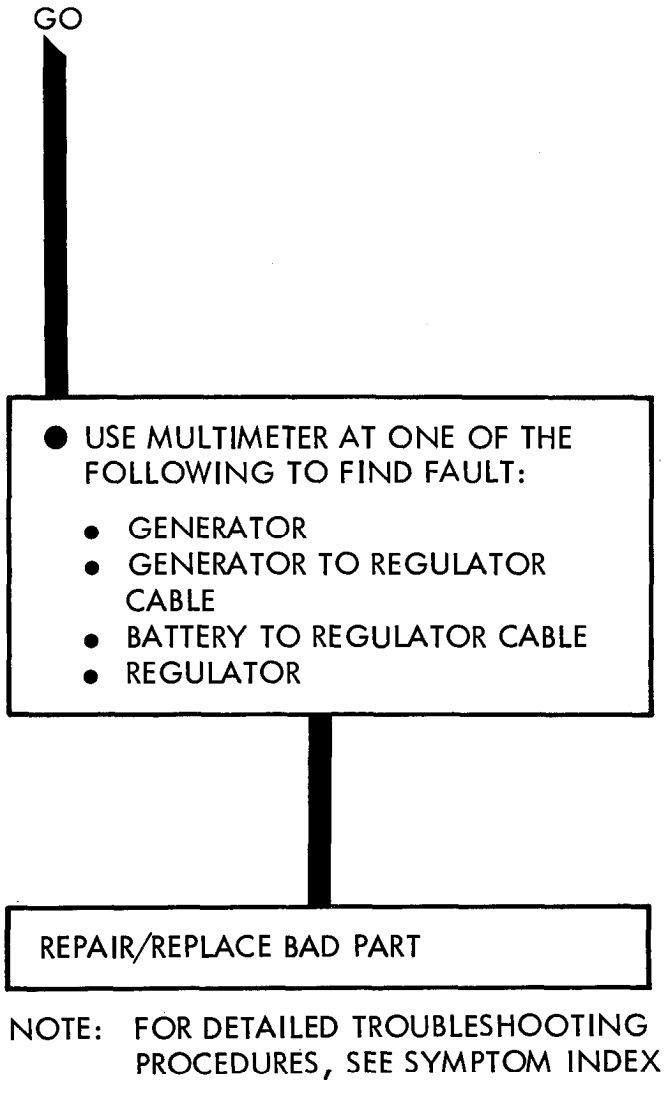
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## ELECTRICAL SYSTEM - CHARGING SYSTEM TROUBLESHOOTING SUMMARY




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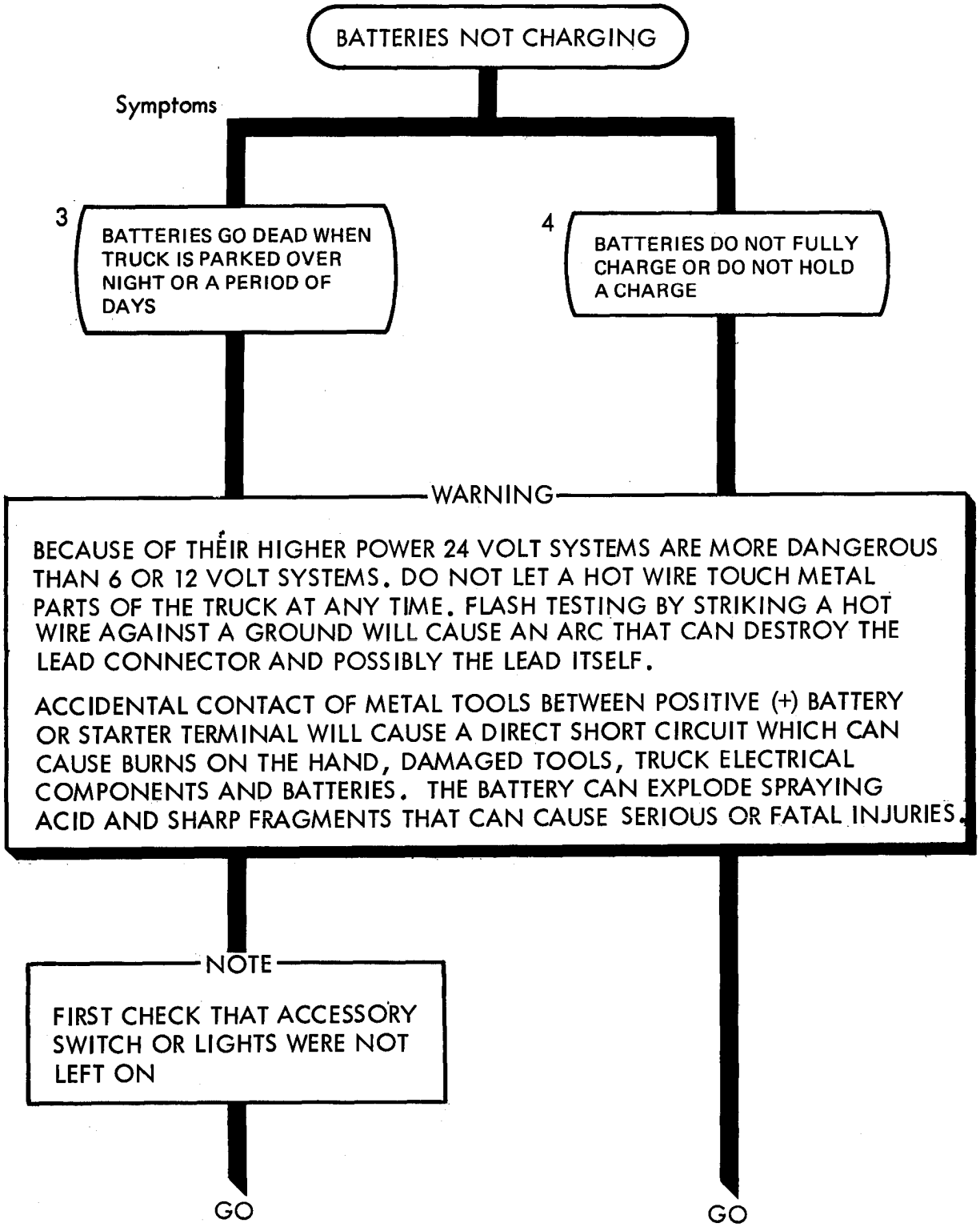
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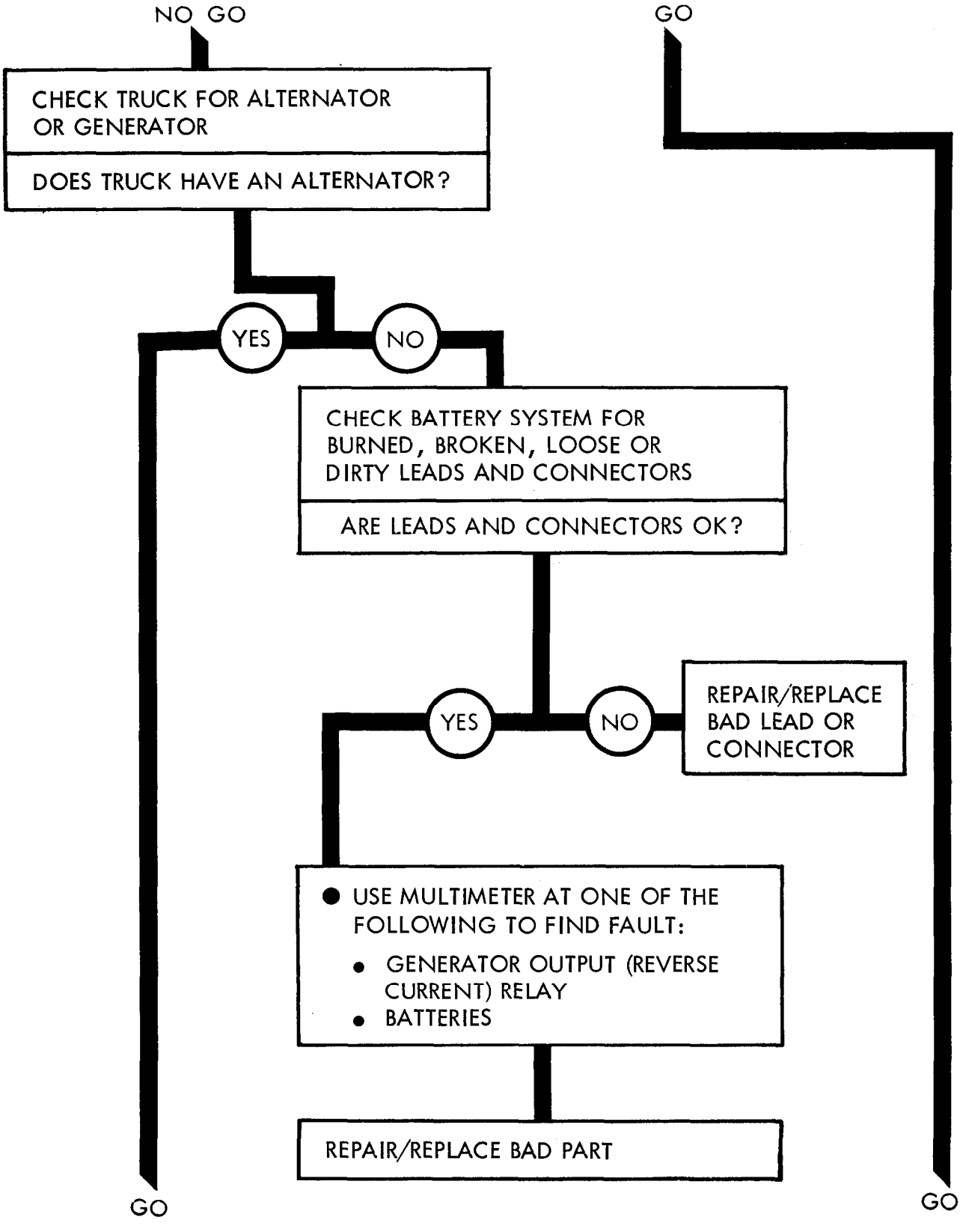
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## ELECTRICAL SYSTEM - BATTERY SYSTEM TROUBLESHOOTING SUMMARY




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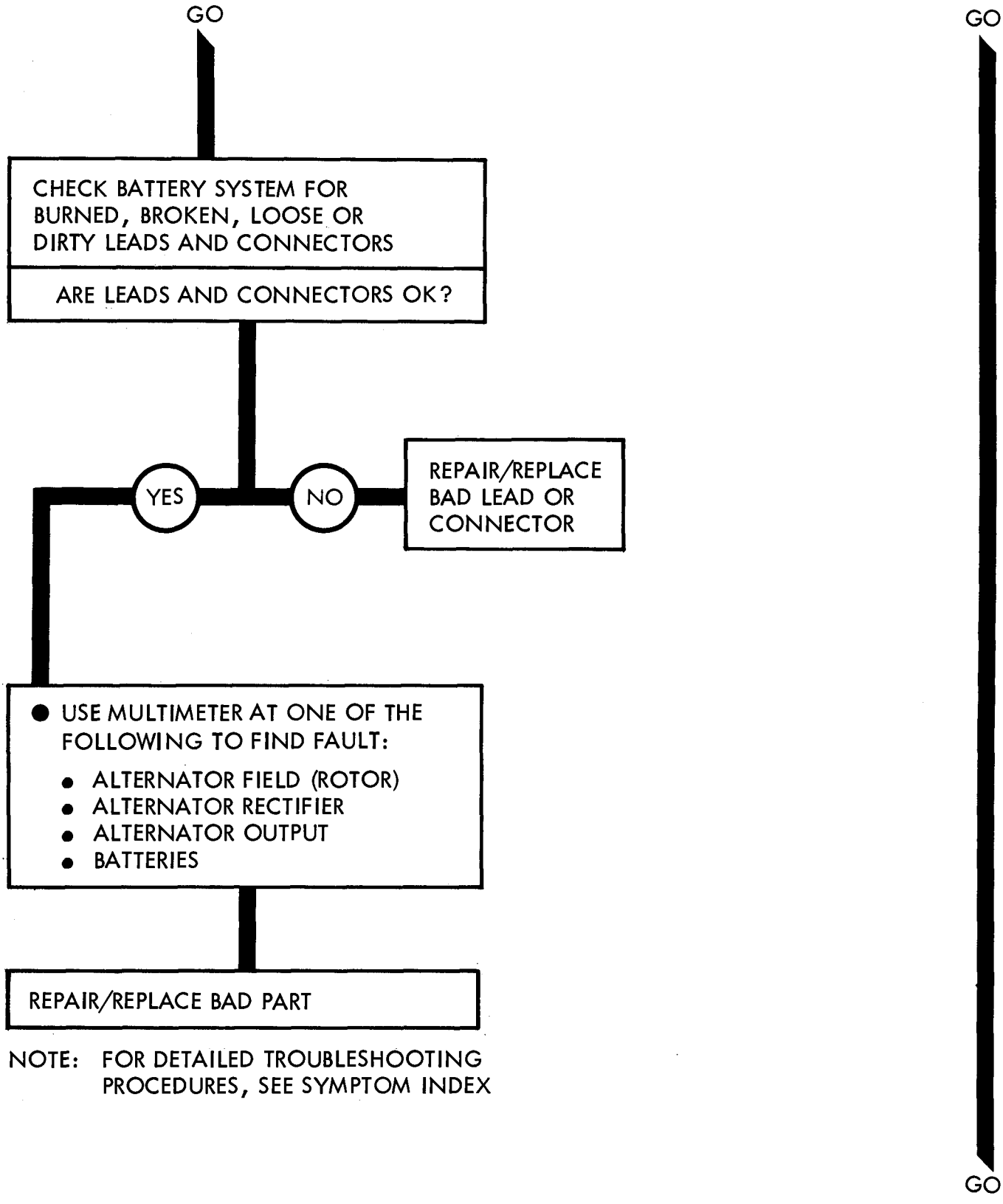
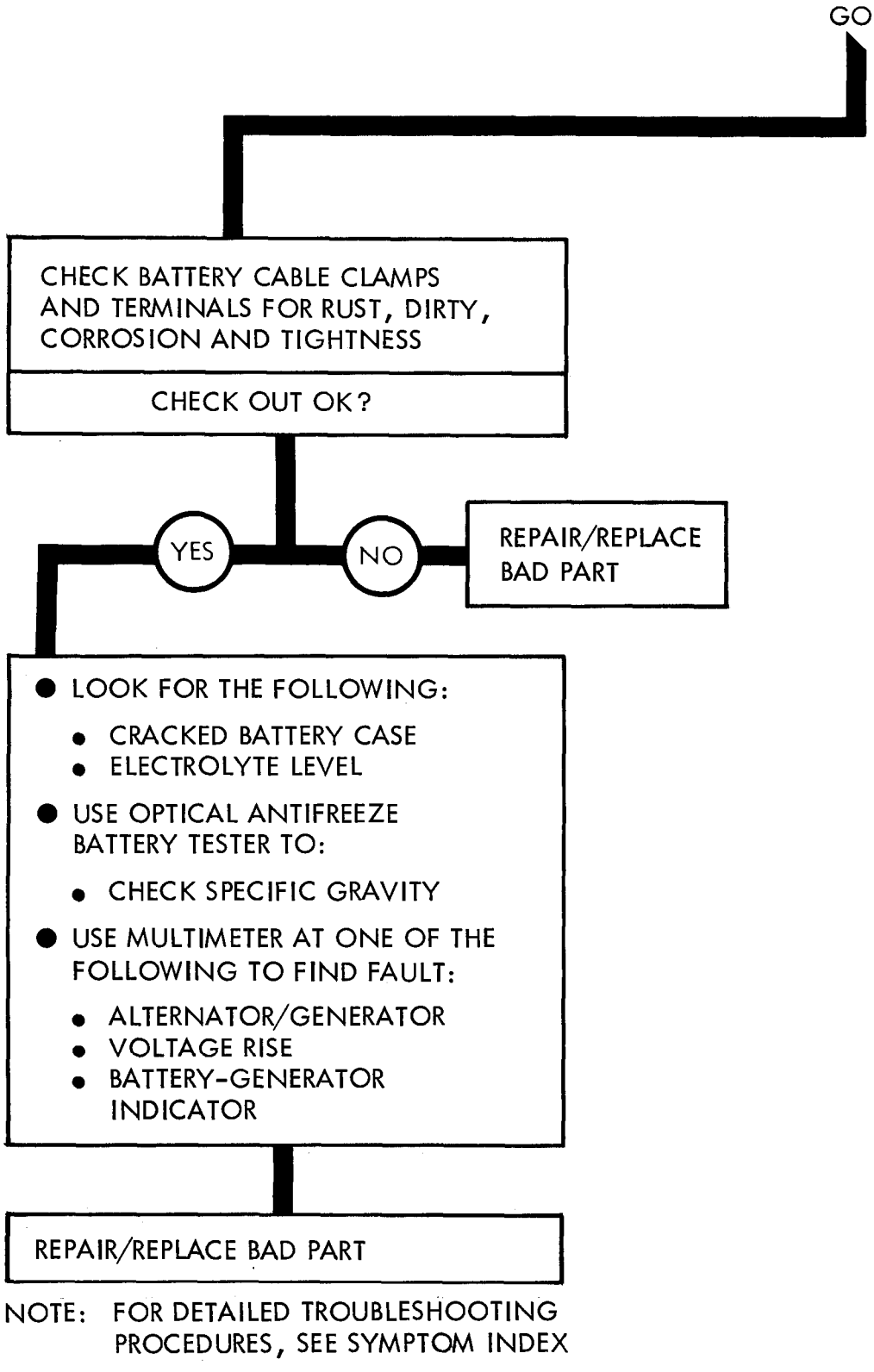



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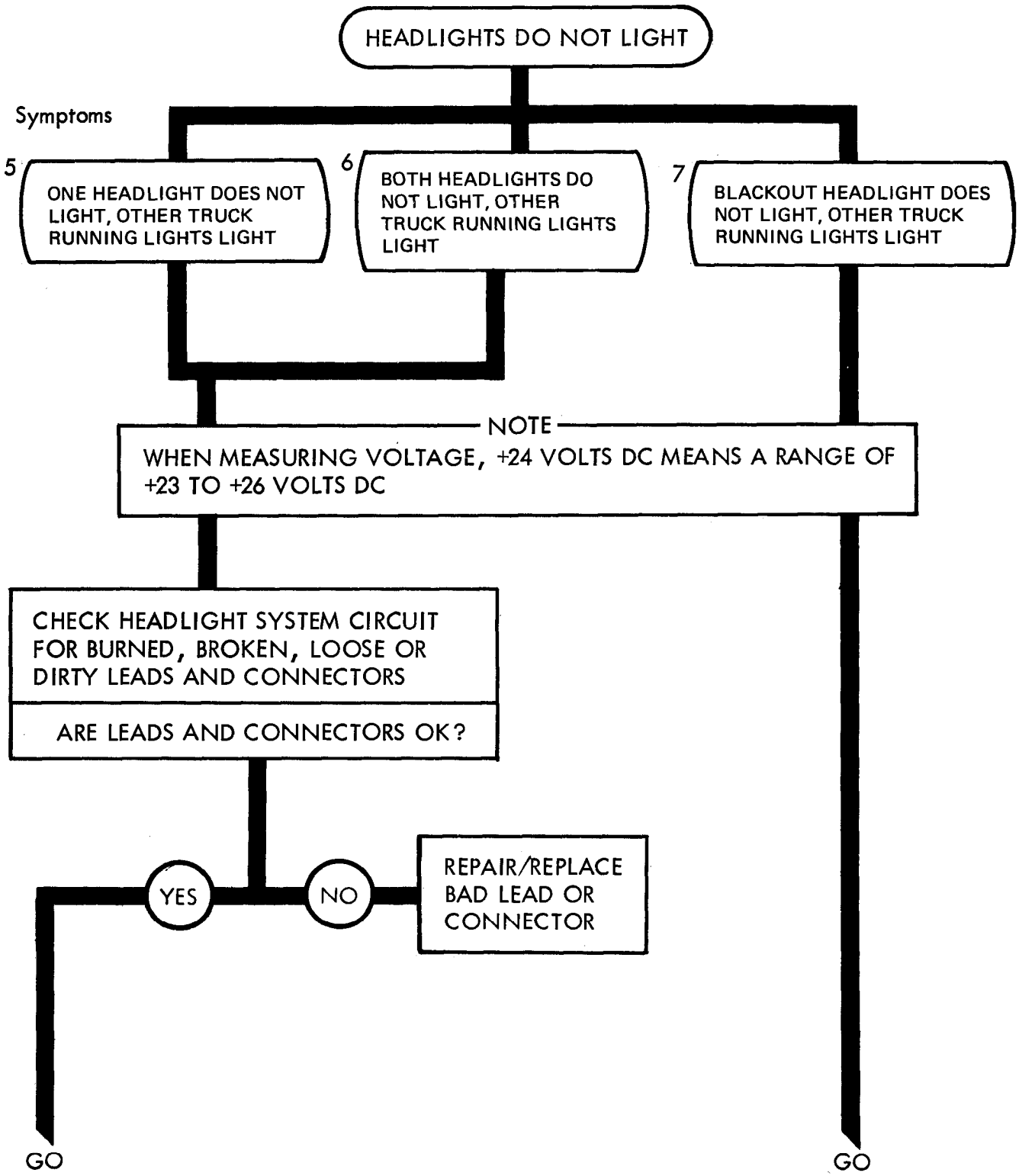



NOTE: FOR DETAILED TROUBLESHOOTING PROCEDURES, SEE SYMPTOM INDEX

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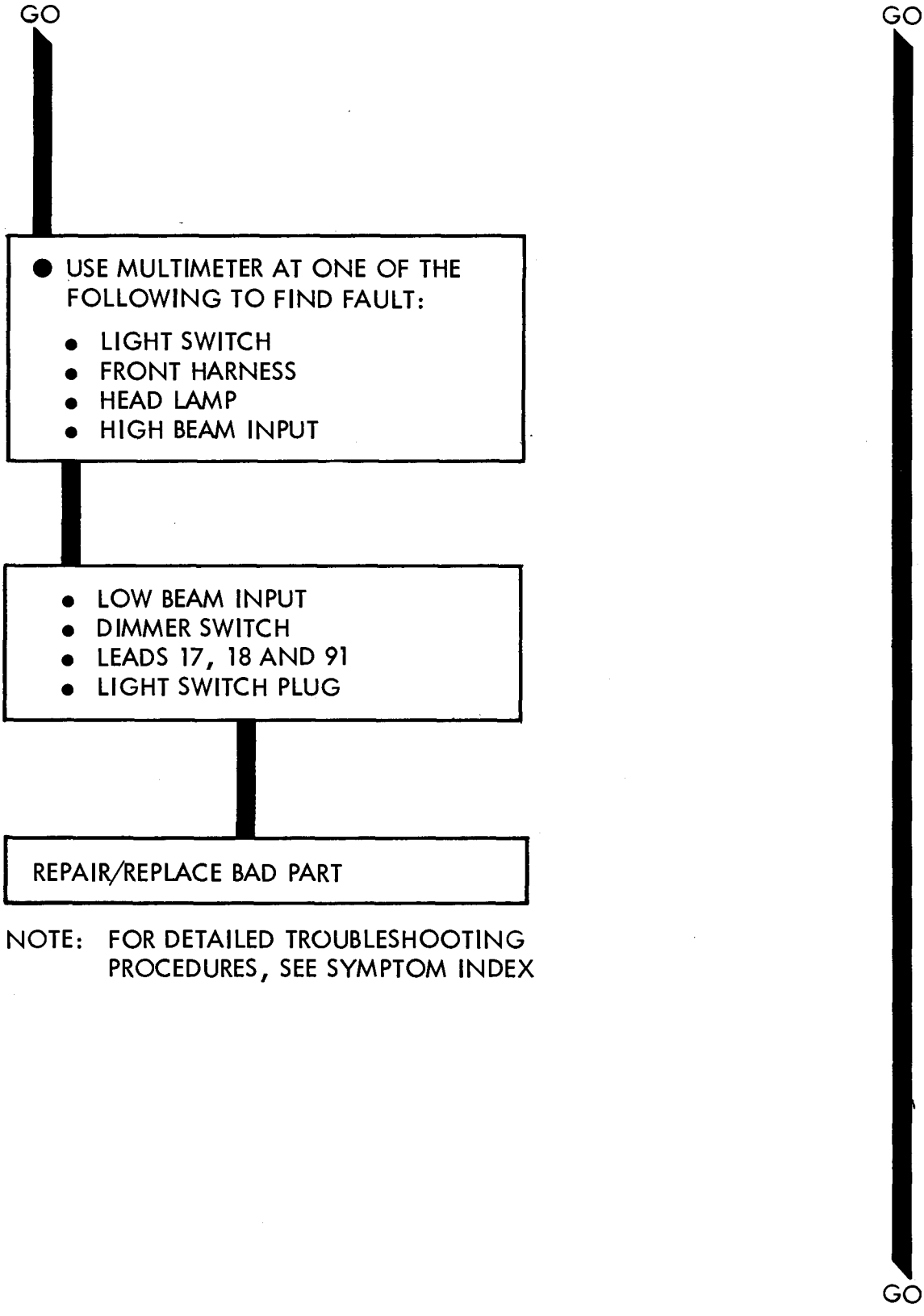
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## ELECTRICAL SYSTEM - LIGHTING SYSTEM TROUBLESHOOTING SUMMARY



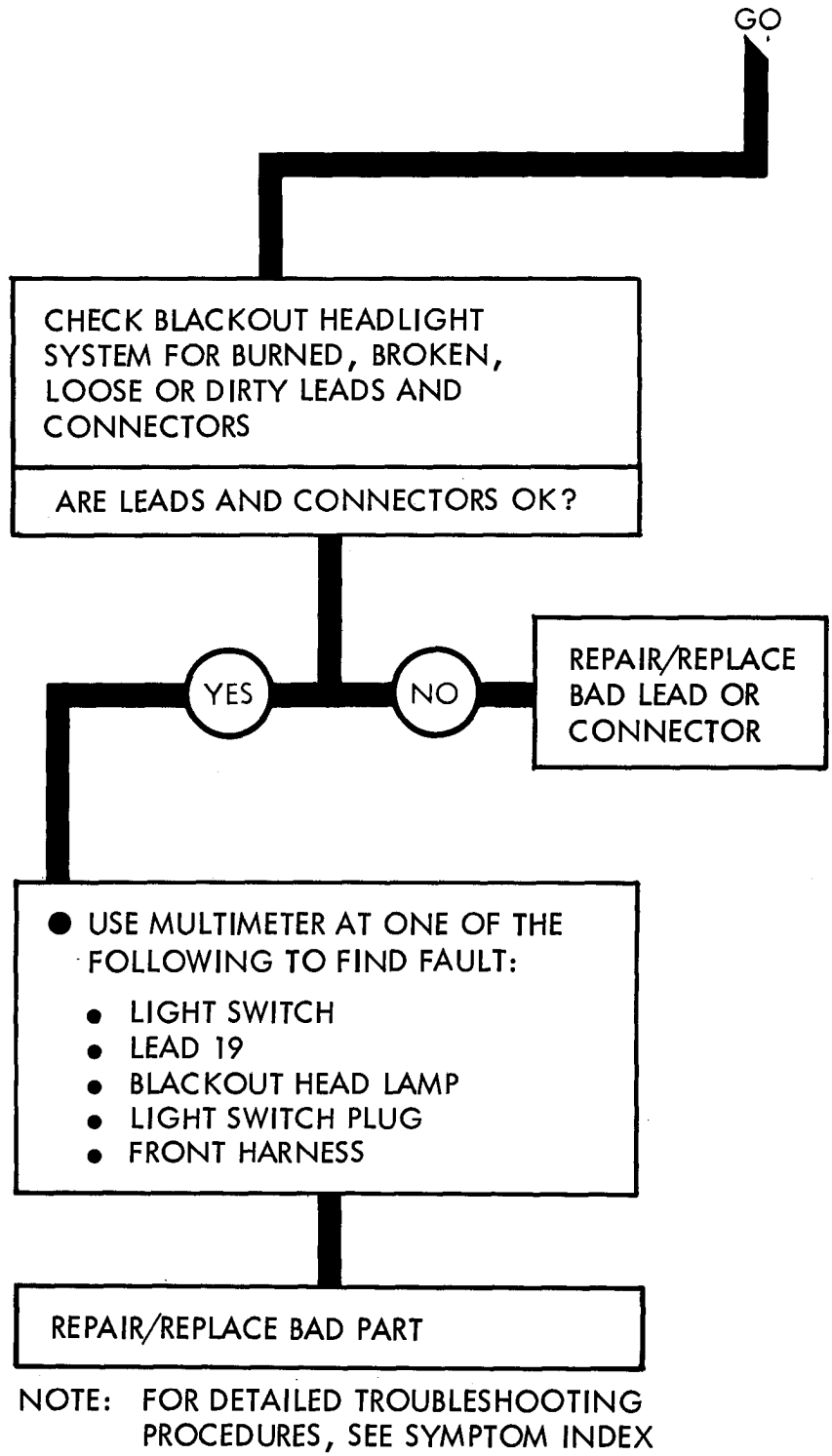

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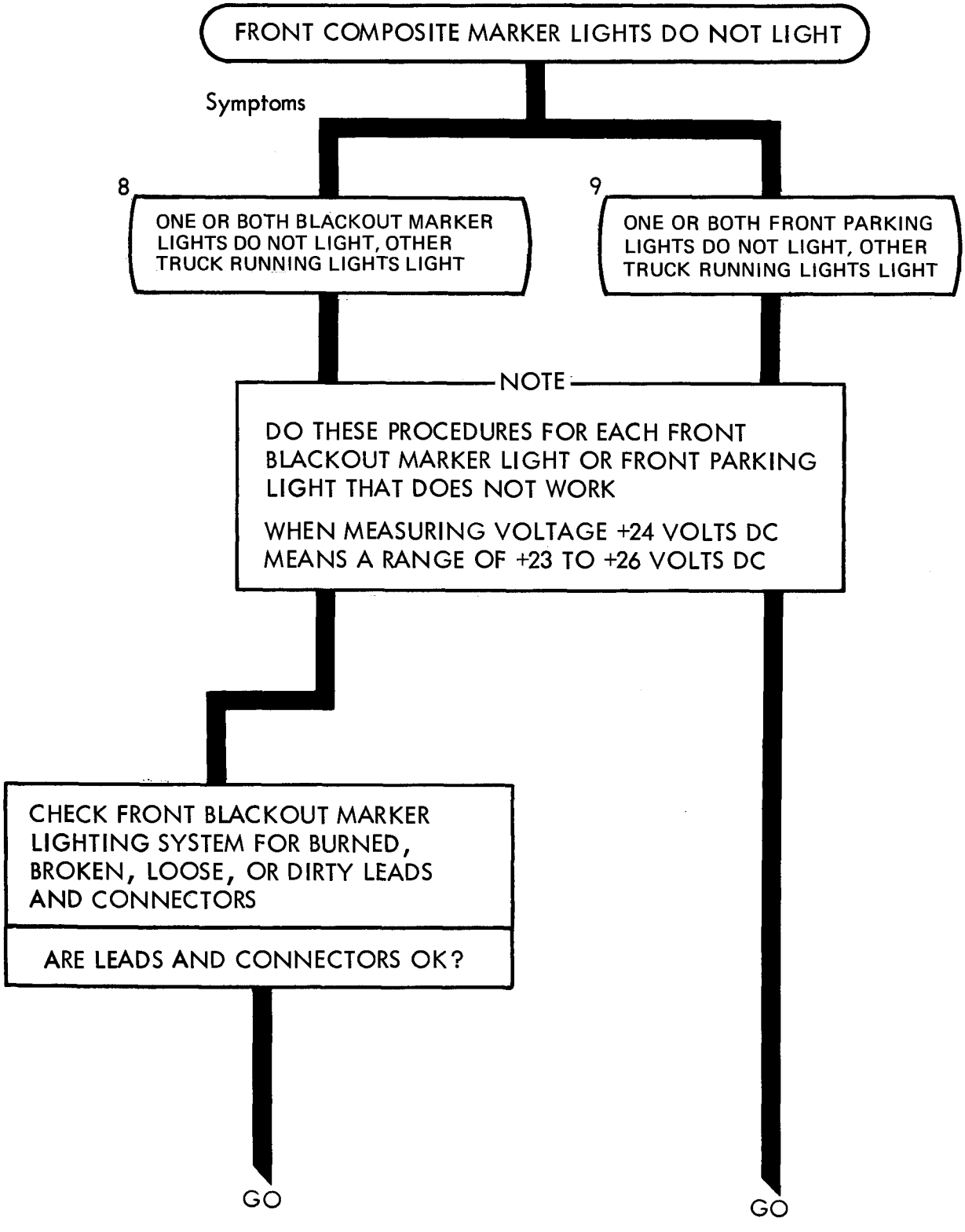
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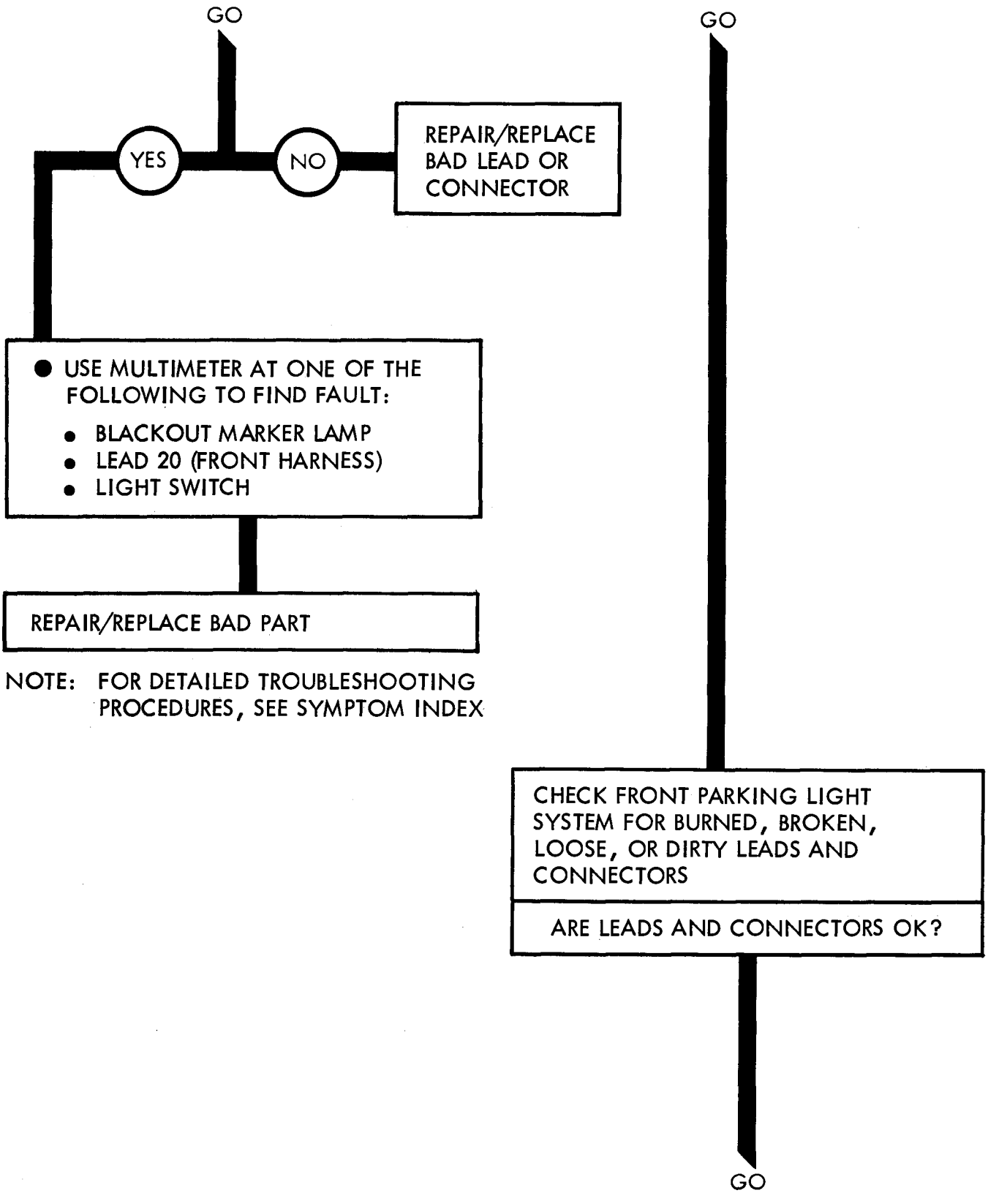
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## ELECTRICAL SYSTEM - LIGHTING SYSTEM TROUBLESHOOTING SUMMARY



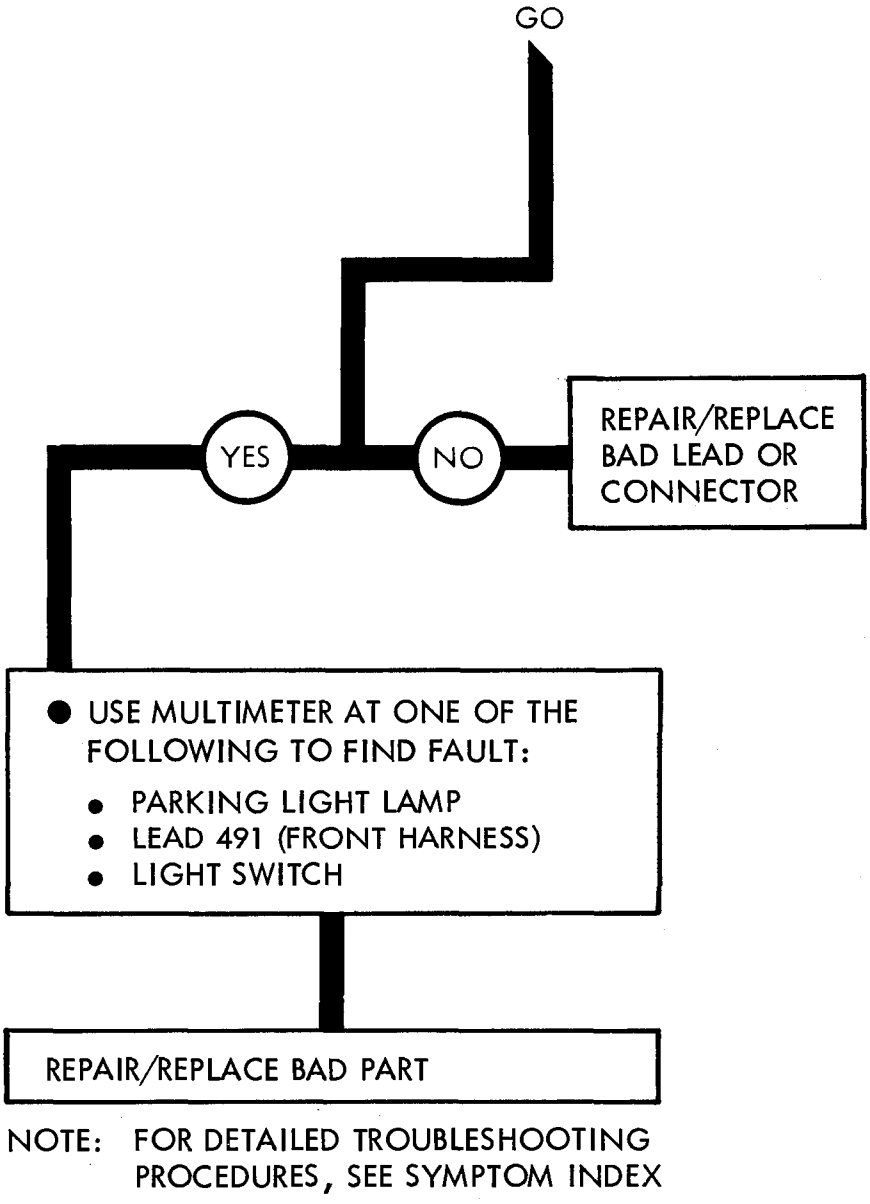

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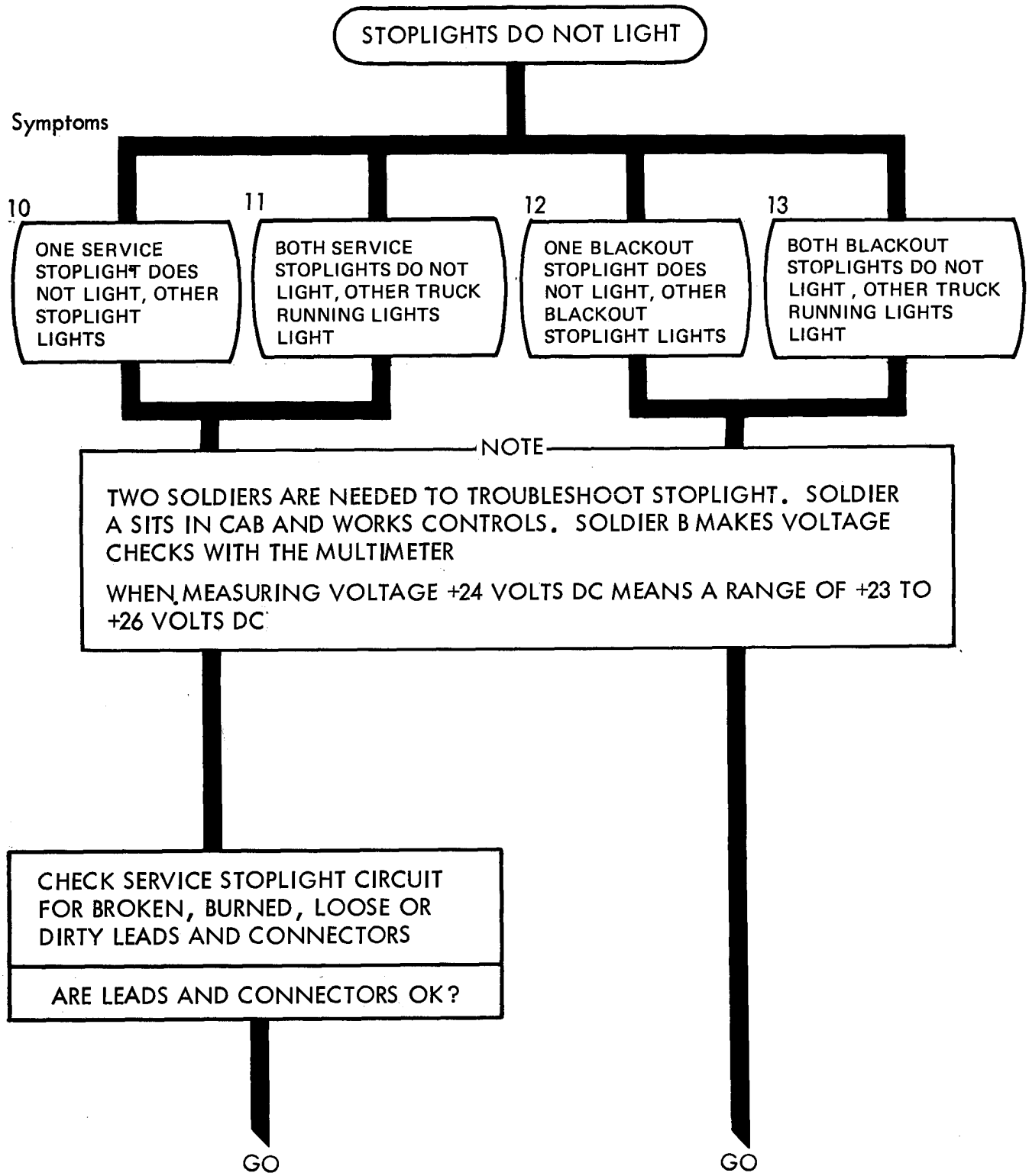
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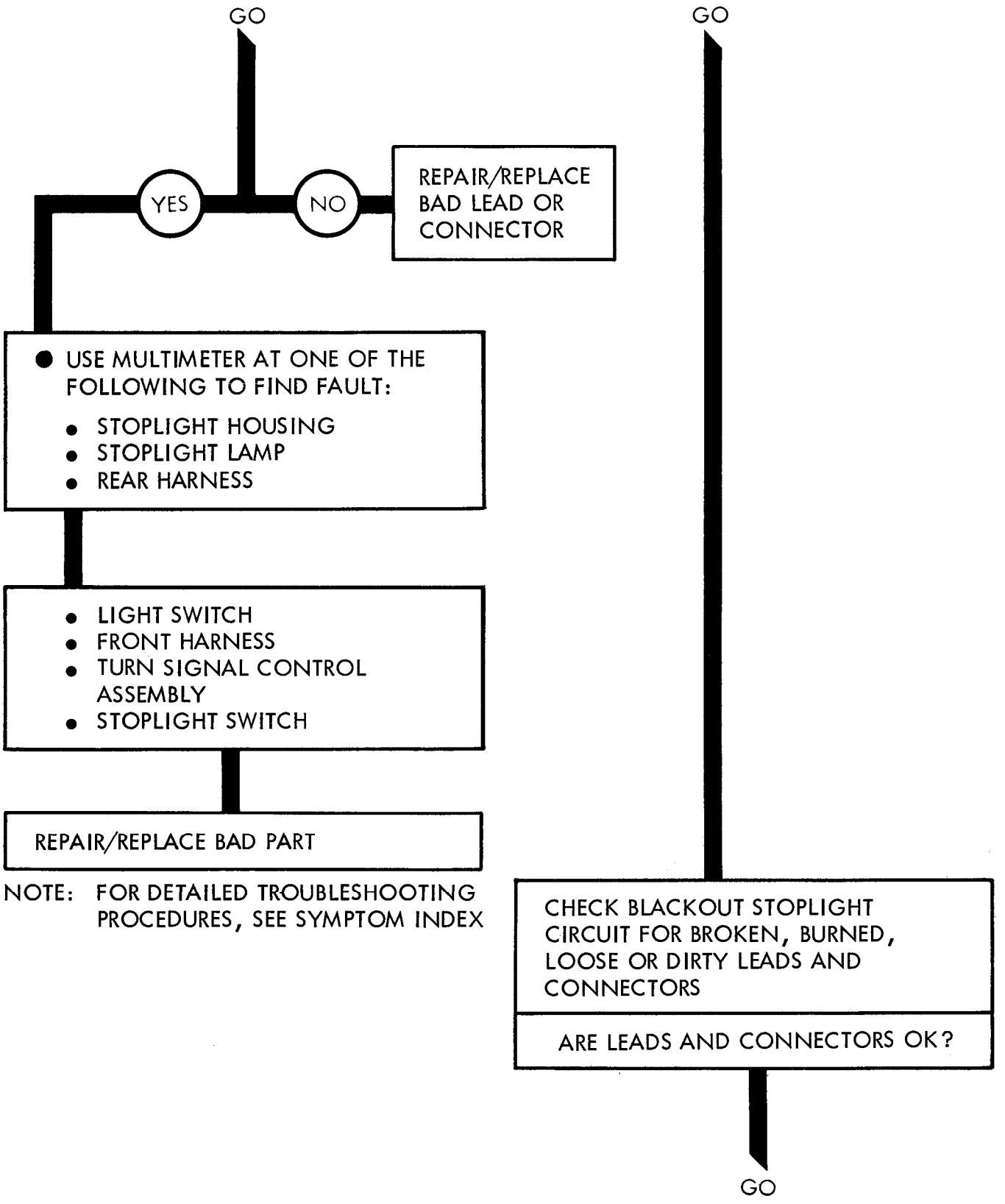
Figure 27-4 (Sheet 6 of 19)

## ELECTRICAL SYSTEM - LIGHTING SYSTEM TROUBLESHOOTING SUMMARY



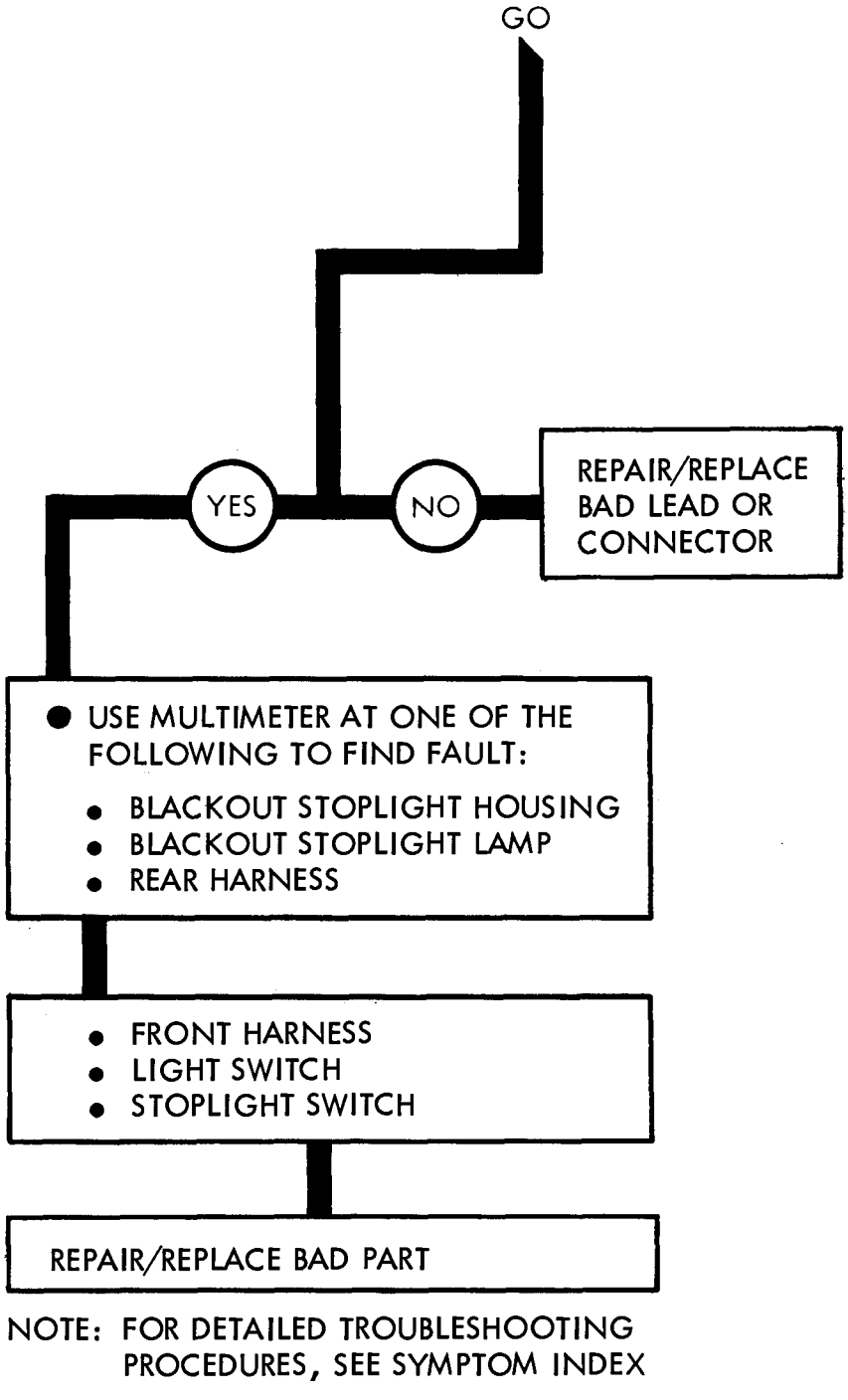

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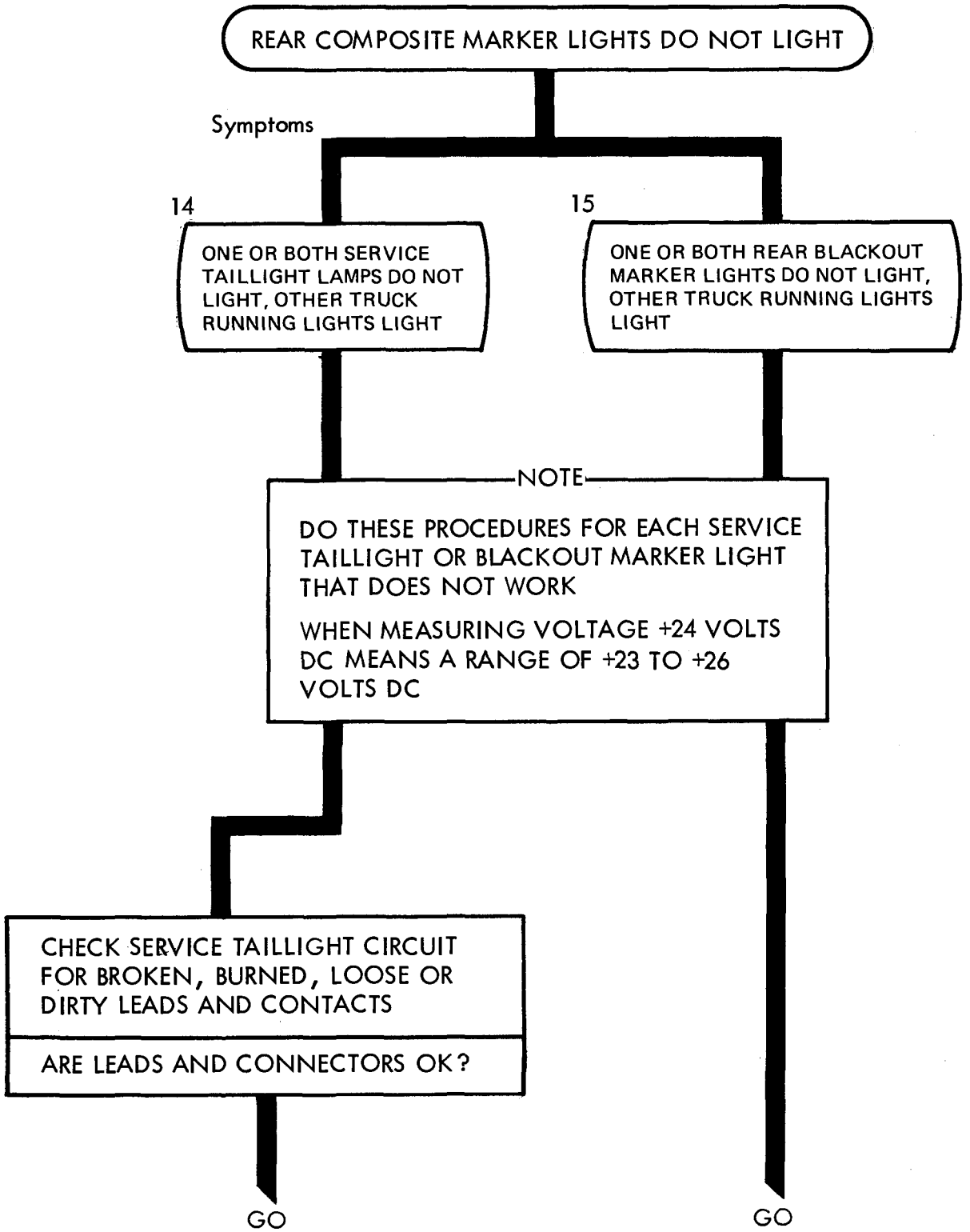
Figure 27-4 (Sheet 8 of 19)




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**ELECTRICAL SYSTEM - LIGHTING SYSTEM TROUBLESHOOTING SUMMARY**




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Figure 27-4 (Sheet 10 of 19)

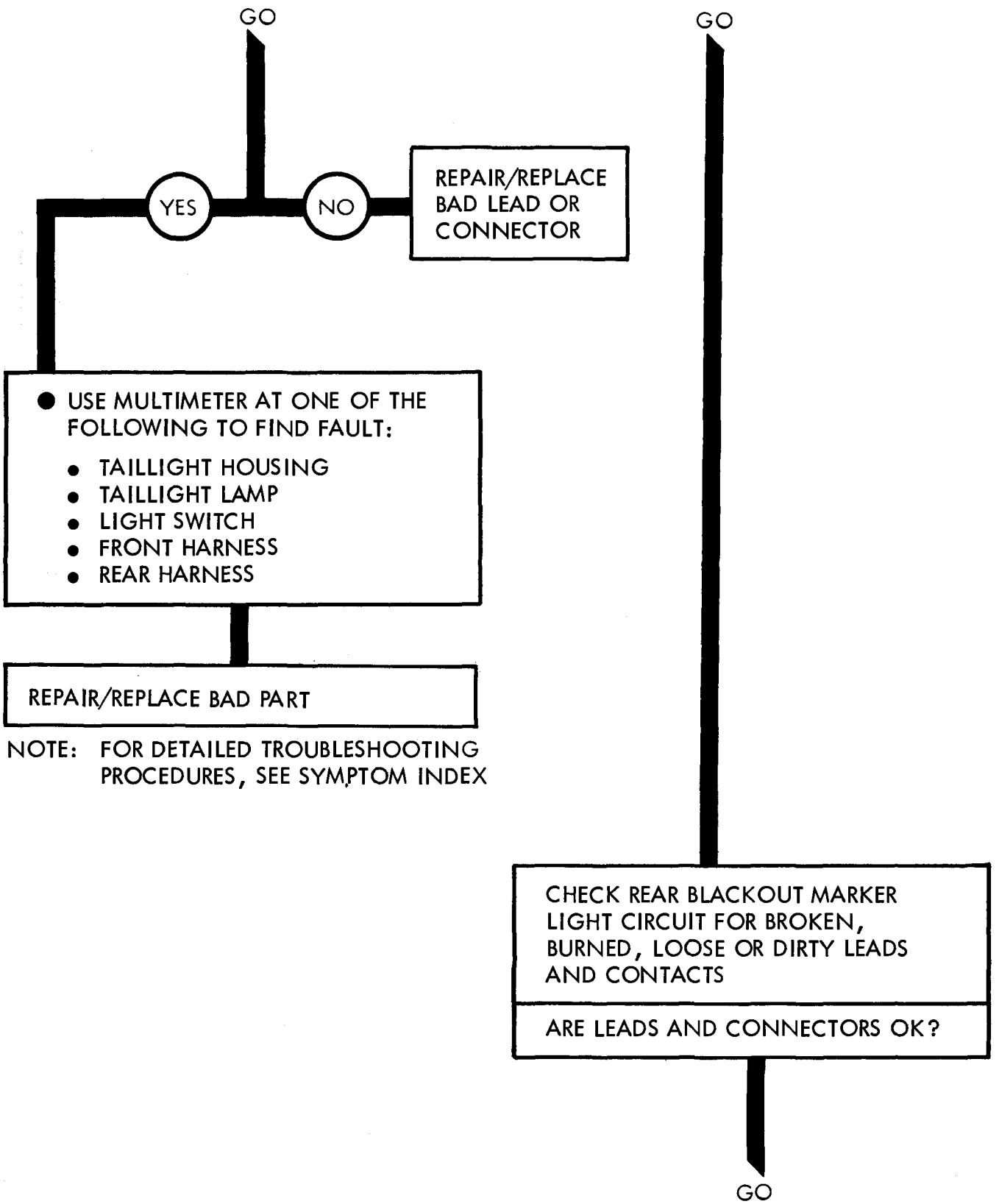
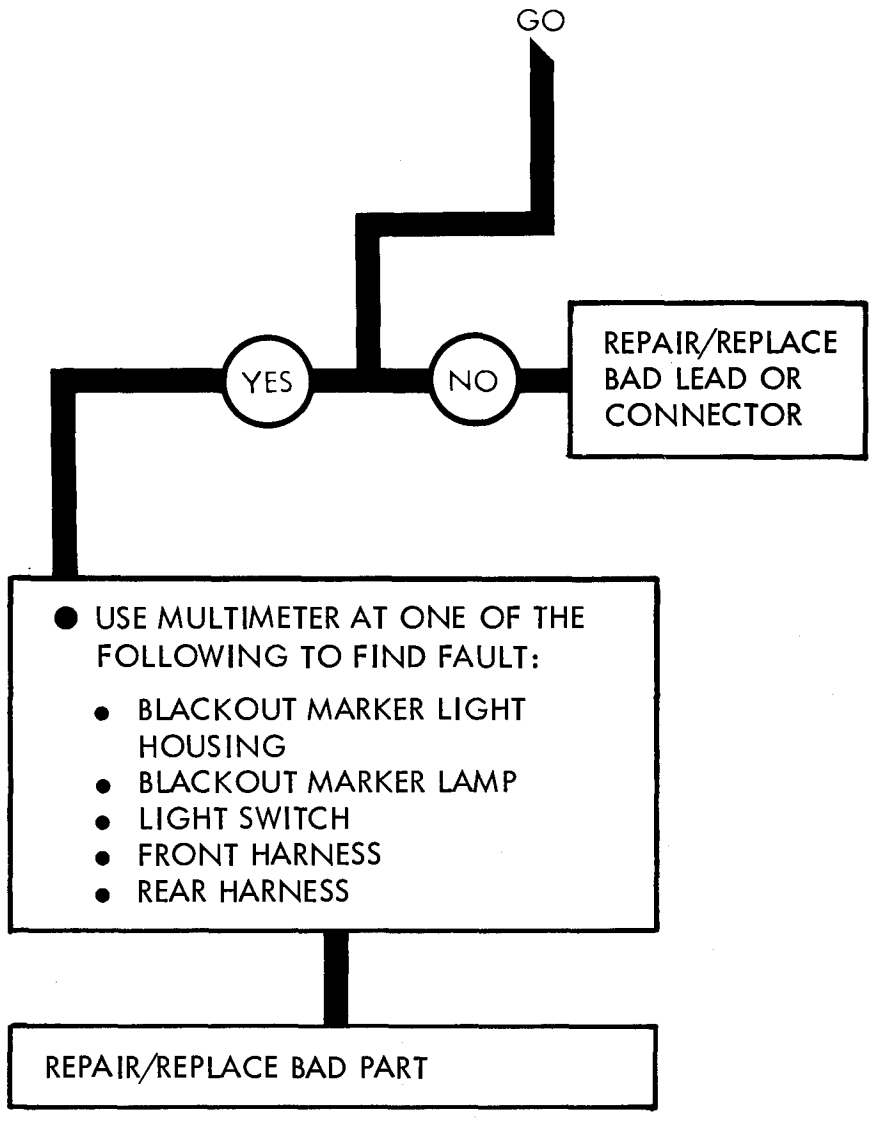
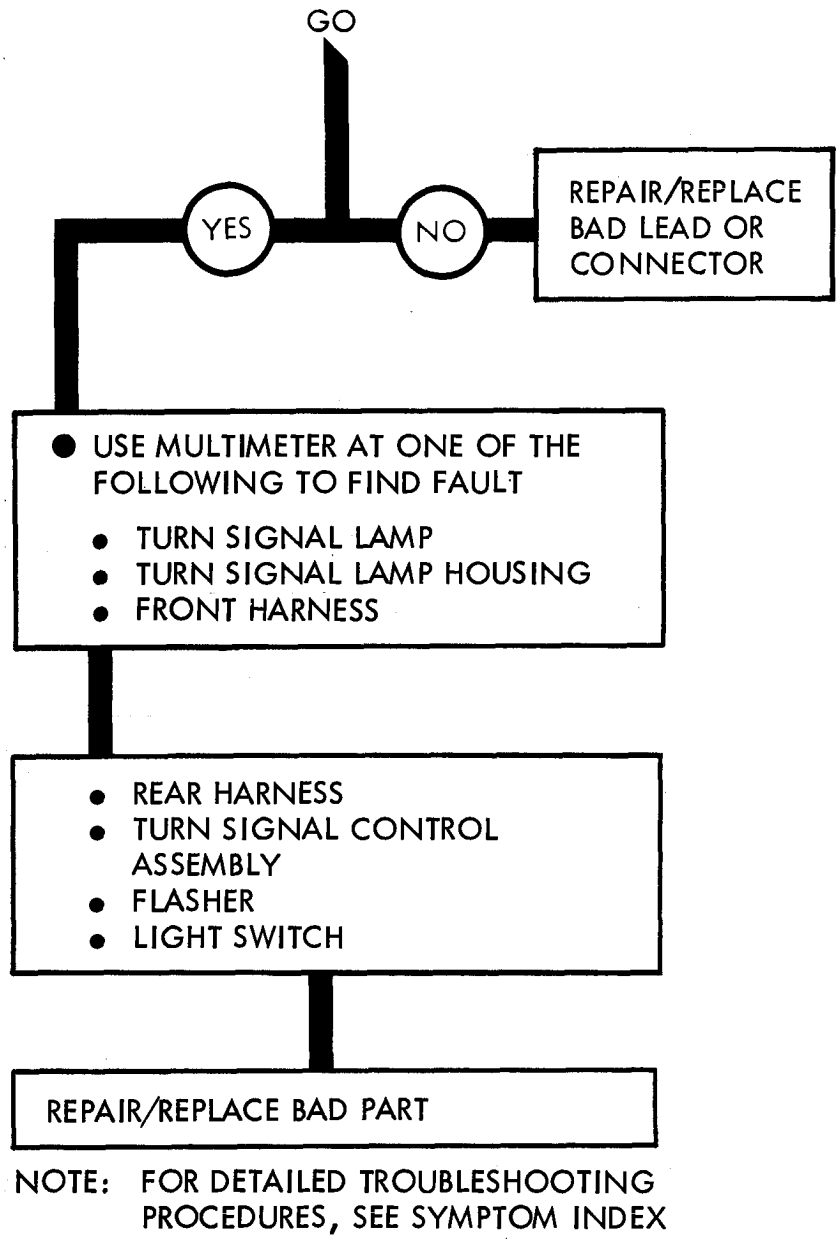



Figure 27-4 (Sheet 11 of 19)



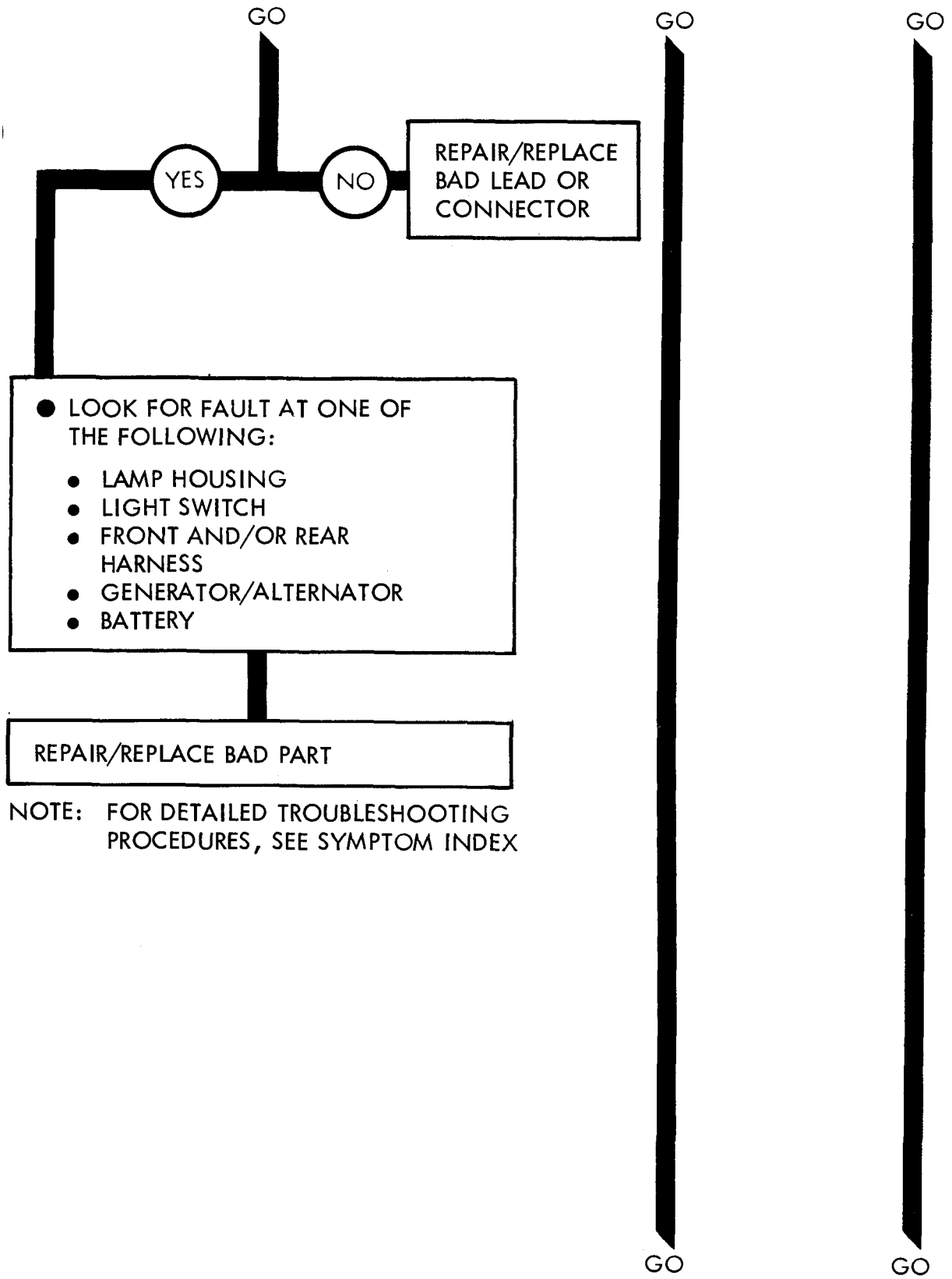

TA 116038

Figure 27-4 (Sheet 12 of 19)



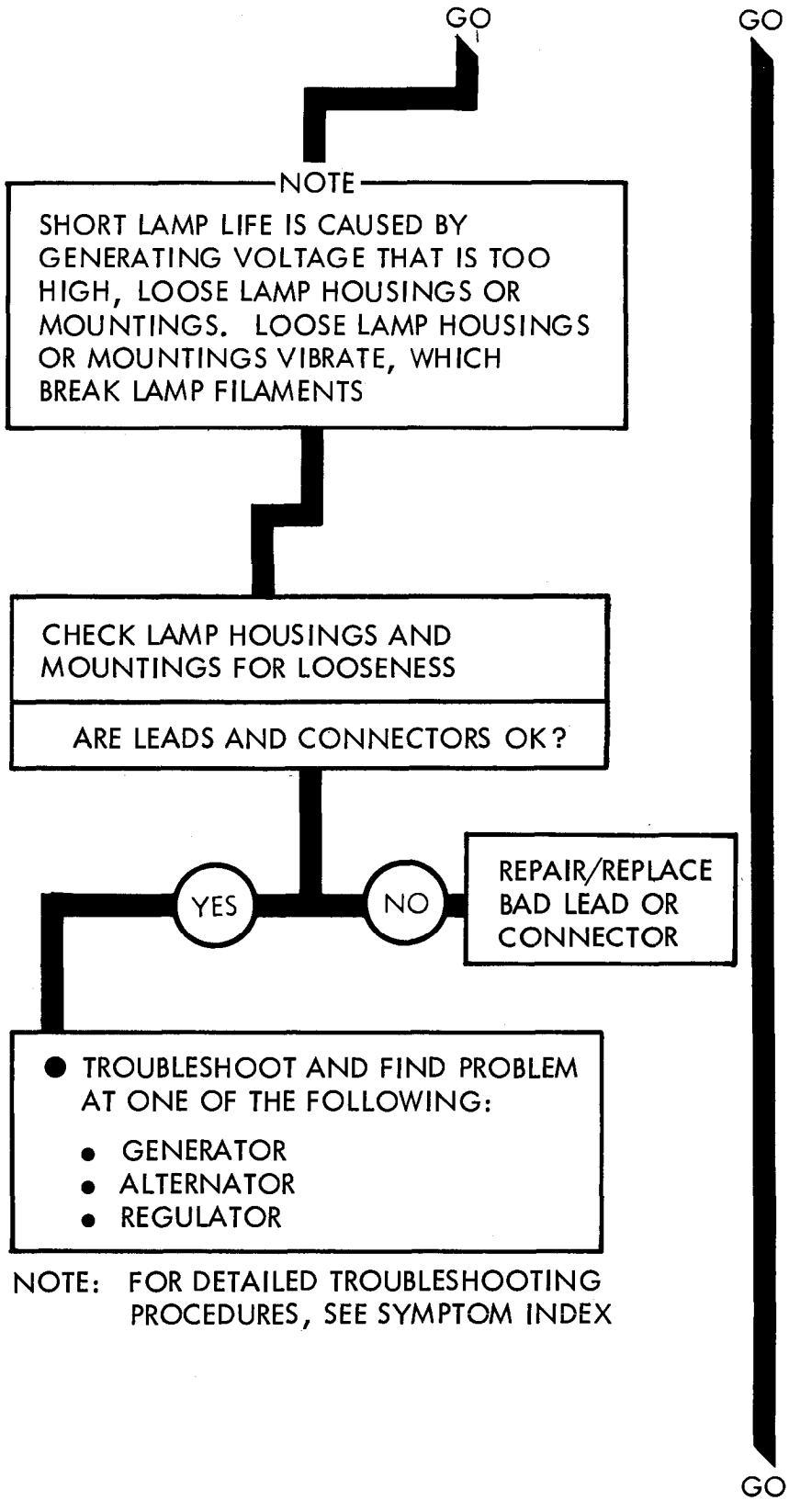

TA 116047,

Figure 27-5 (Sheet 2 of 4)



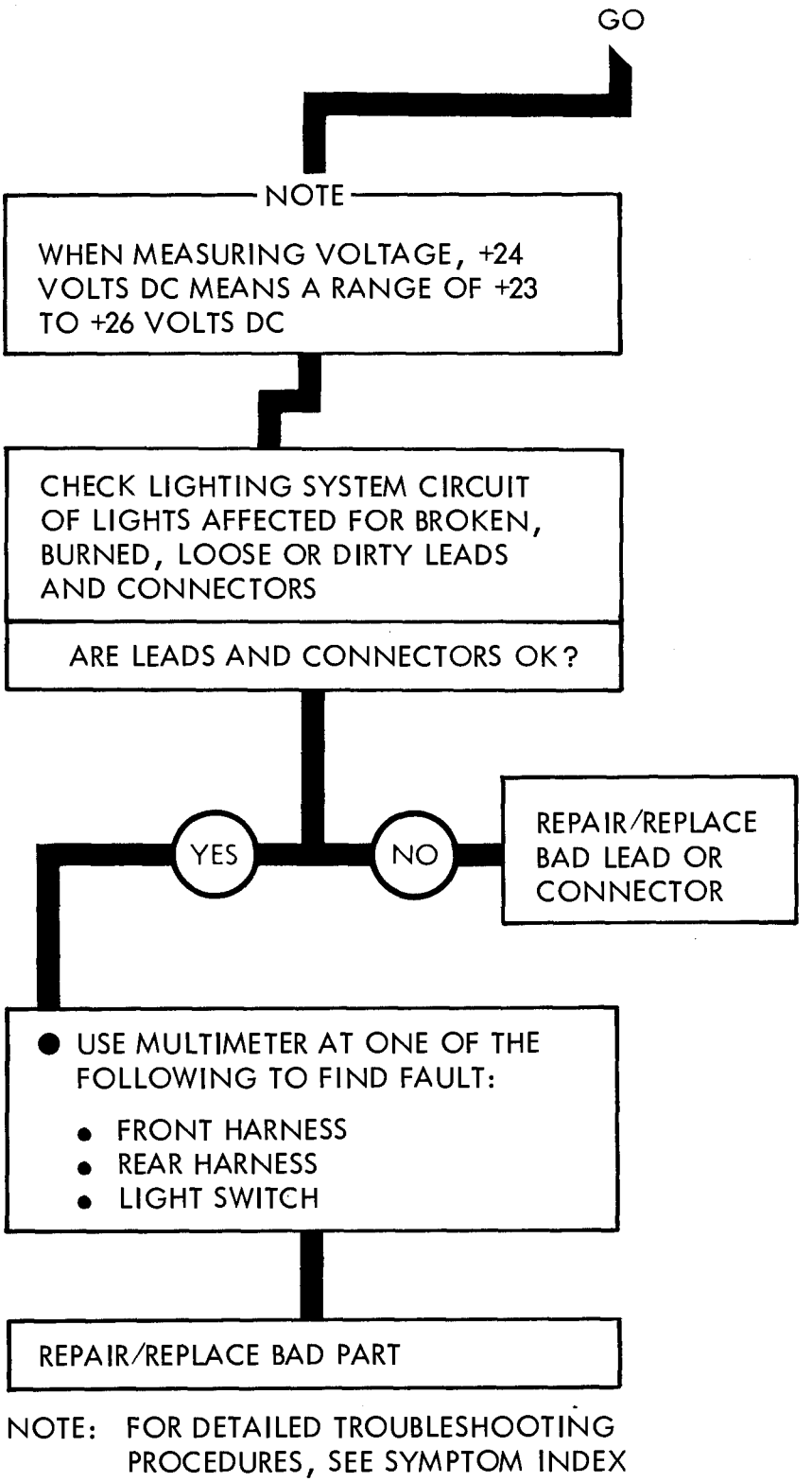

TA 116040

Figure 27-4 (Sheet 14 of 19)




TA 116041

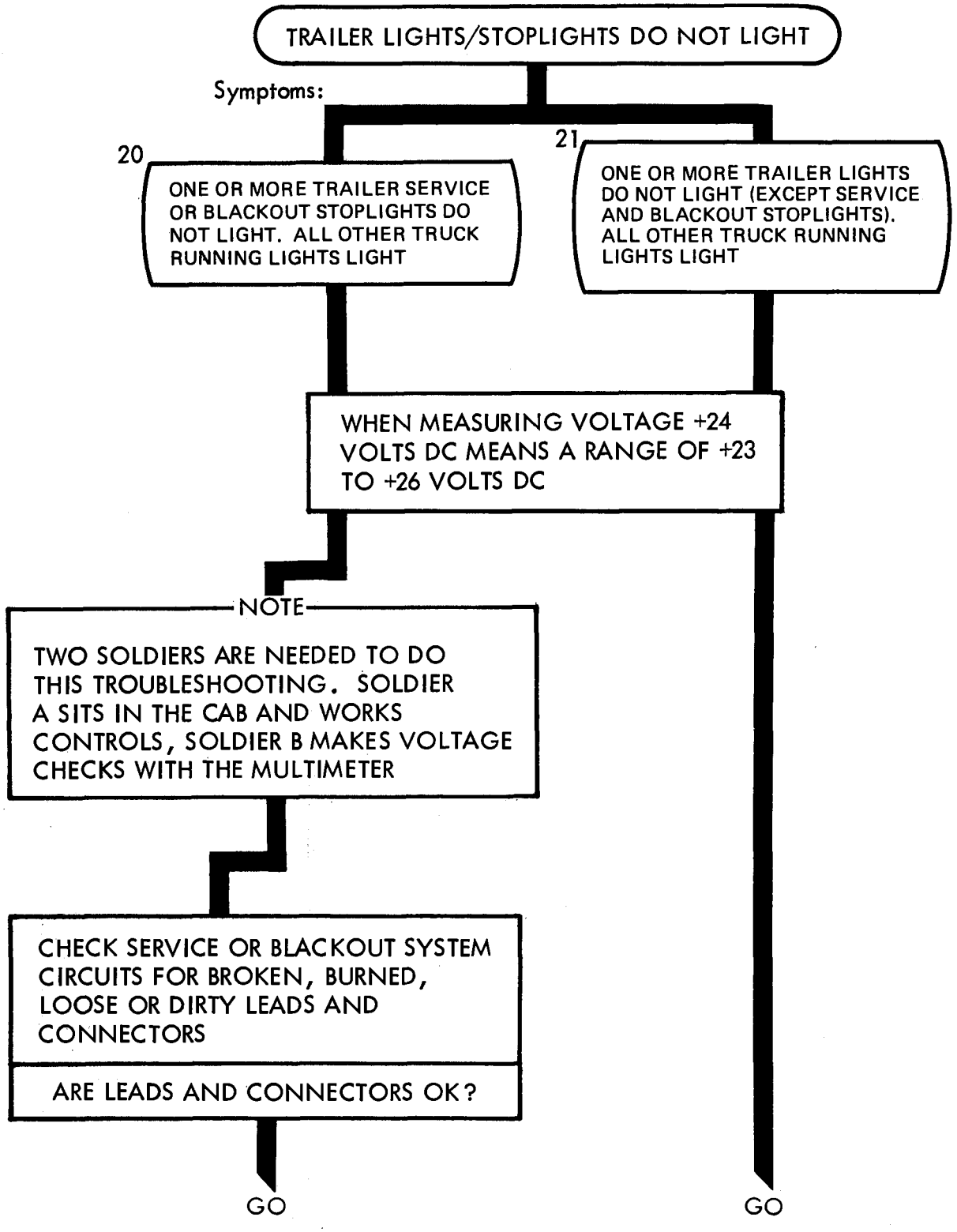
Figure 27-4 (Sheet 15 of 19)




TA 116042

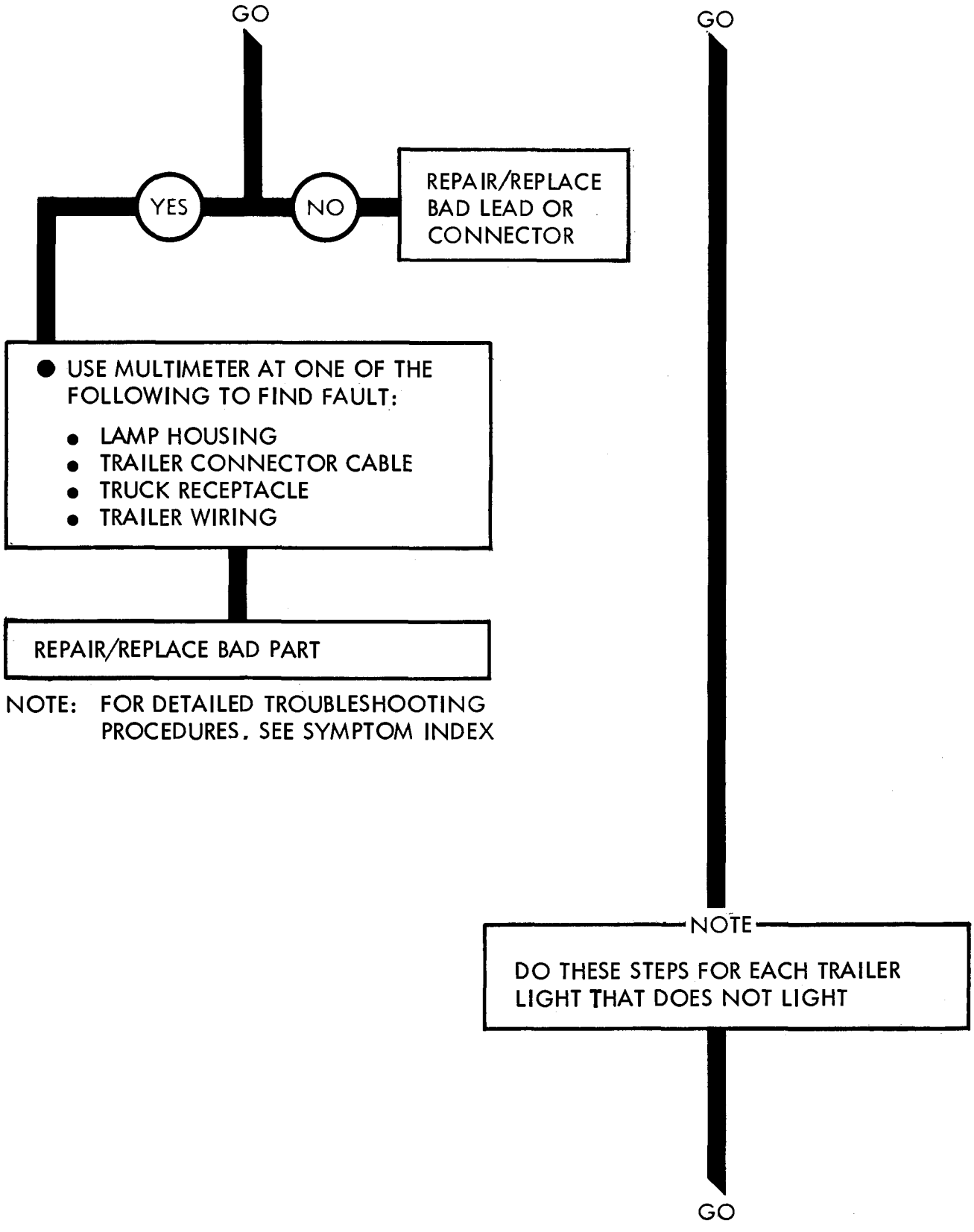
Figure 27-4 (Sheet 16 of 19)

## ELECTRICAL SYSTEM - LIGHTING SYSTEM TROUBLESHOOTING SUMMARY



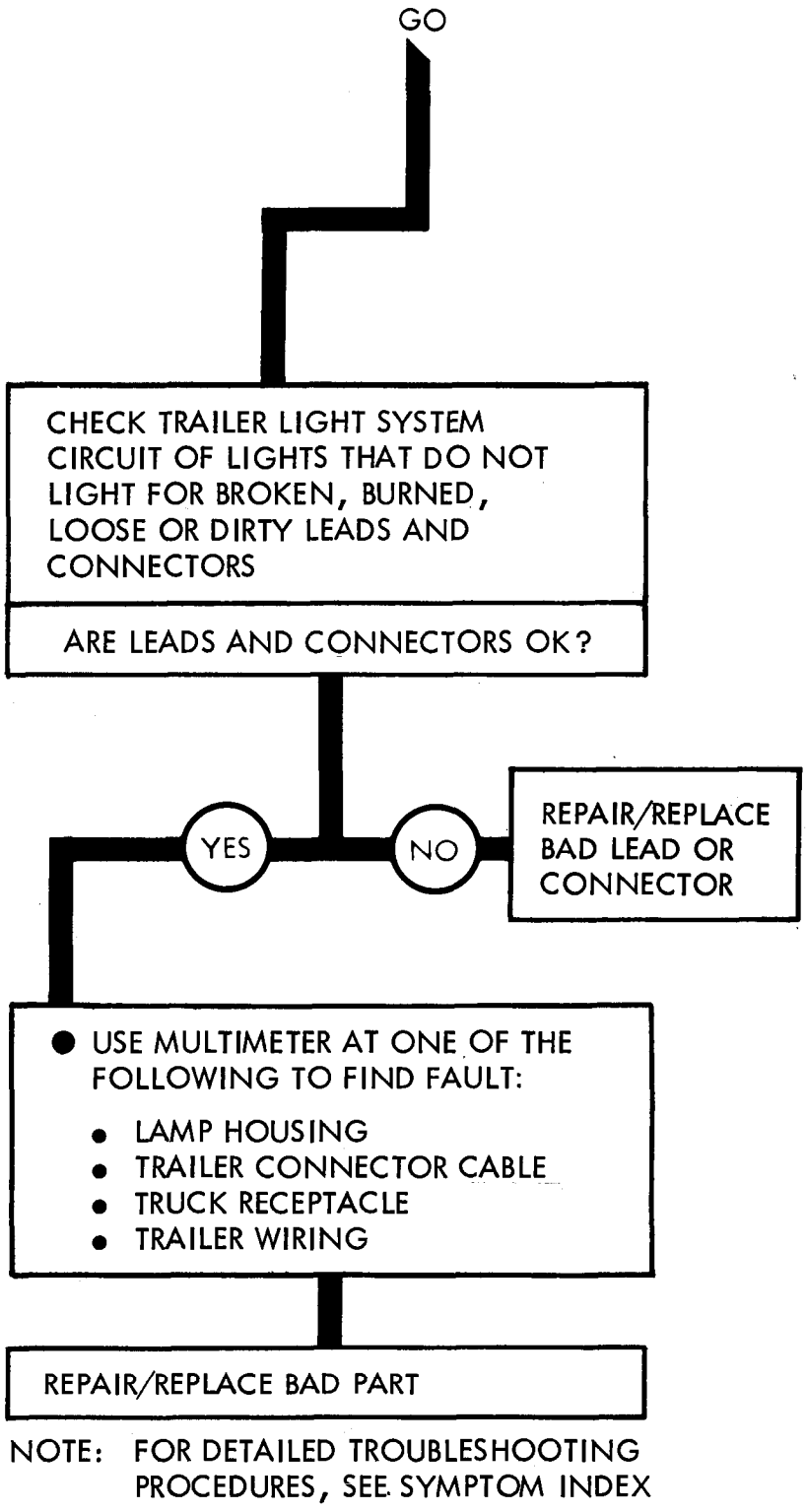

TA 116043

Figure 27-4 (Sheet 17 of 19)




TA 116044

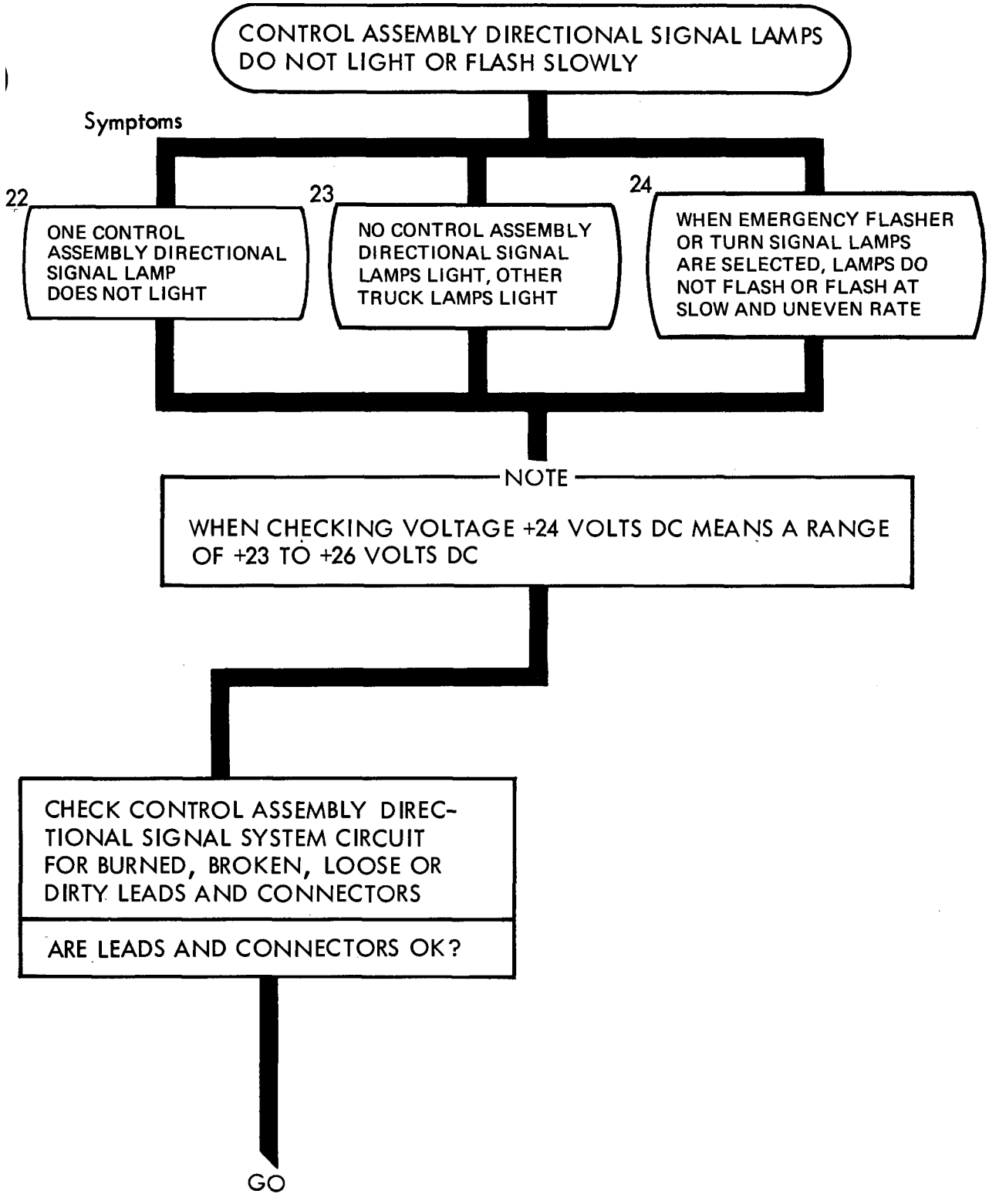
Figure 27-4 (Sheet 18 of 19)




TA 116045

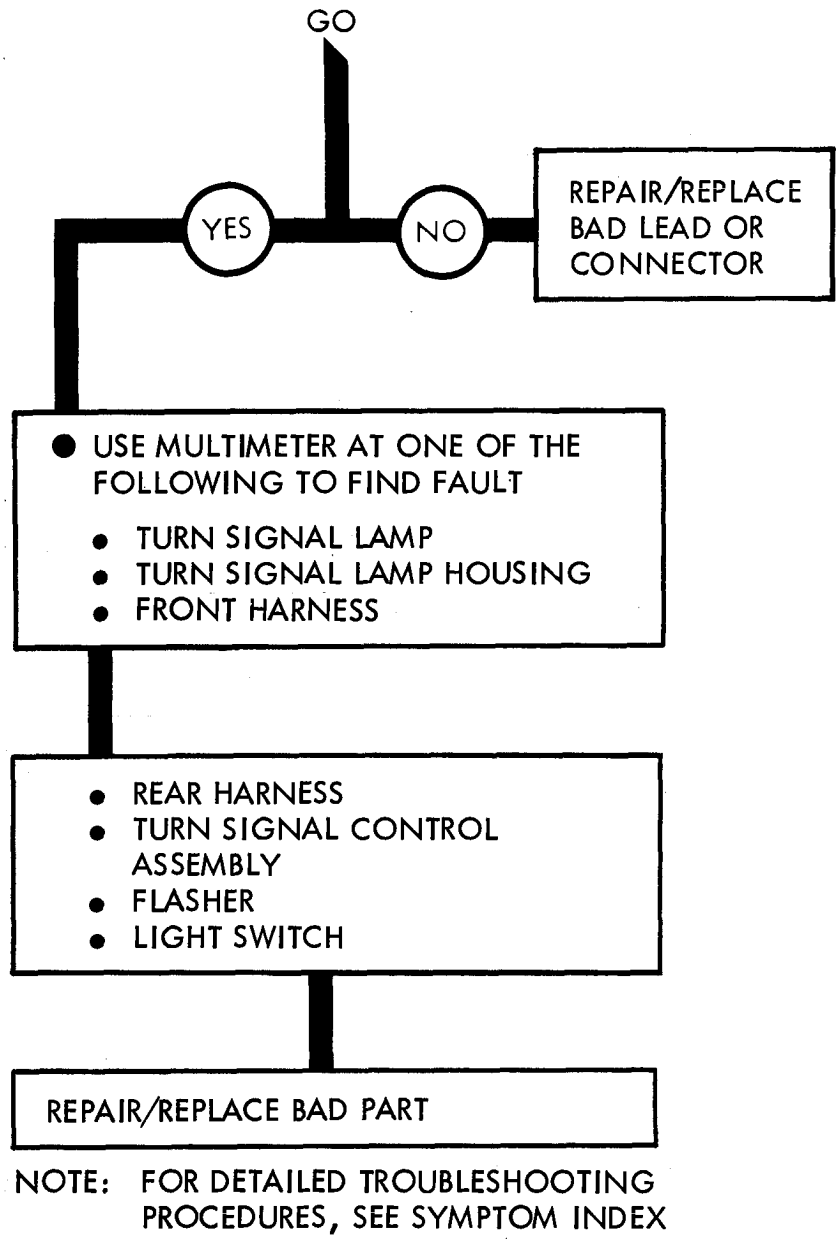
Figure 27-4 (Sheet 19 of 19)

## ELECTRICAL SYSTEM - DIRECTIONAL SYSTEM TROUBLESHOOTING SUMMARY




TA 116046

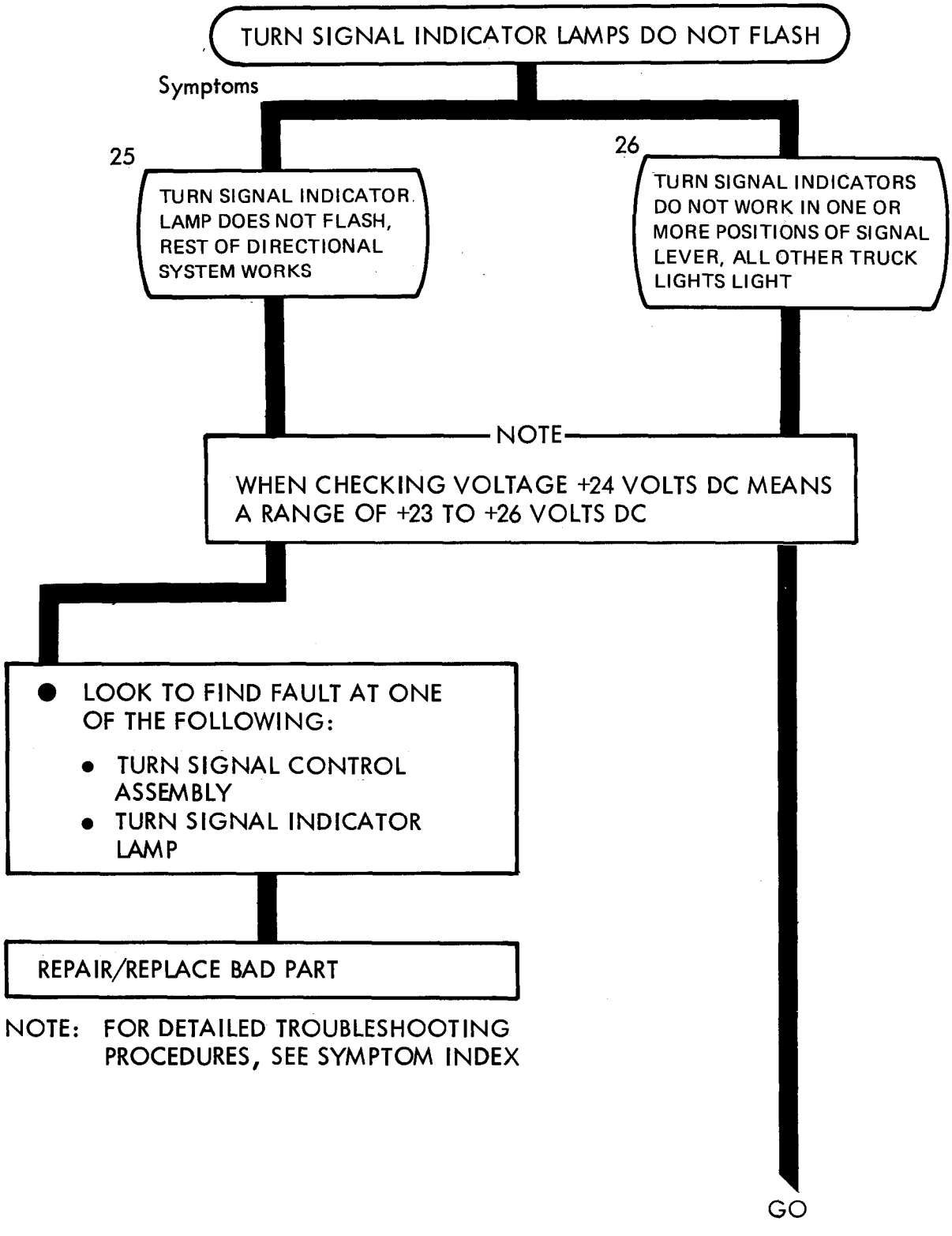
Figure 27-5 (Sheet 1 of 4)




TA 116047,

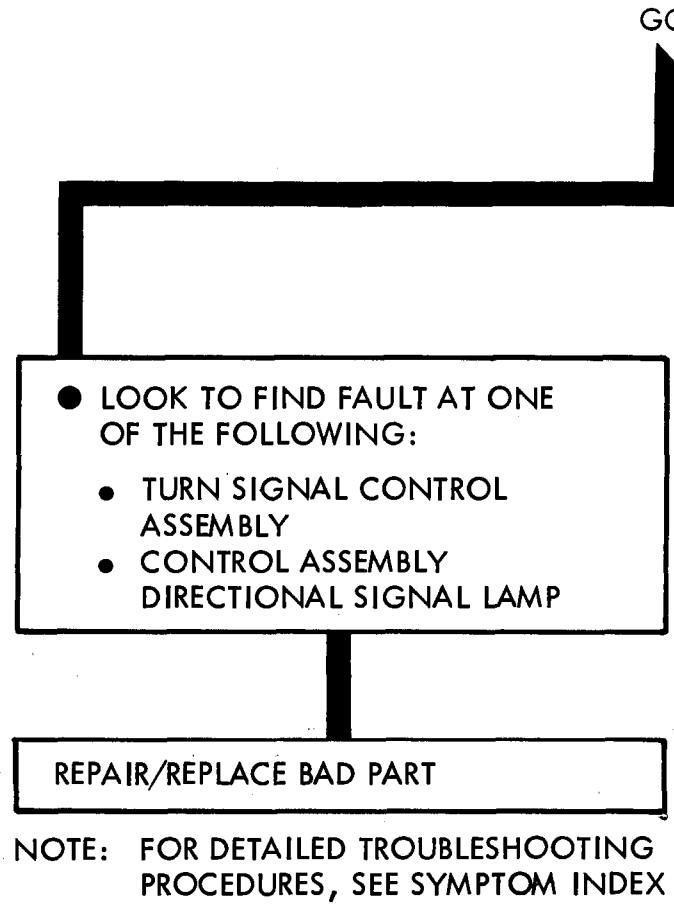
Figure 27-5 (Sheet 2 of 4)

## ELECTRICAL SYSTEM - INDICATOR SYSTEM TROUBLESHOOTING SUMMARY




TA 116048

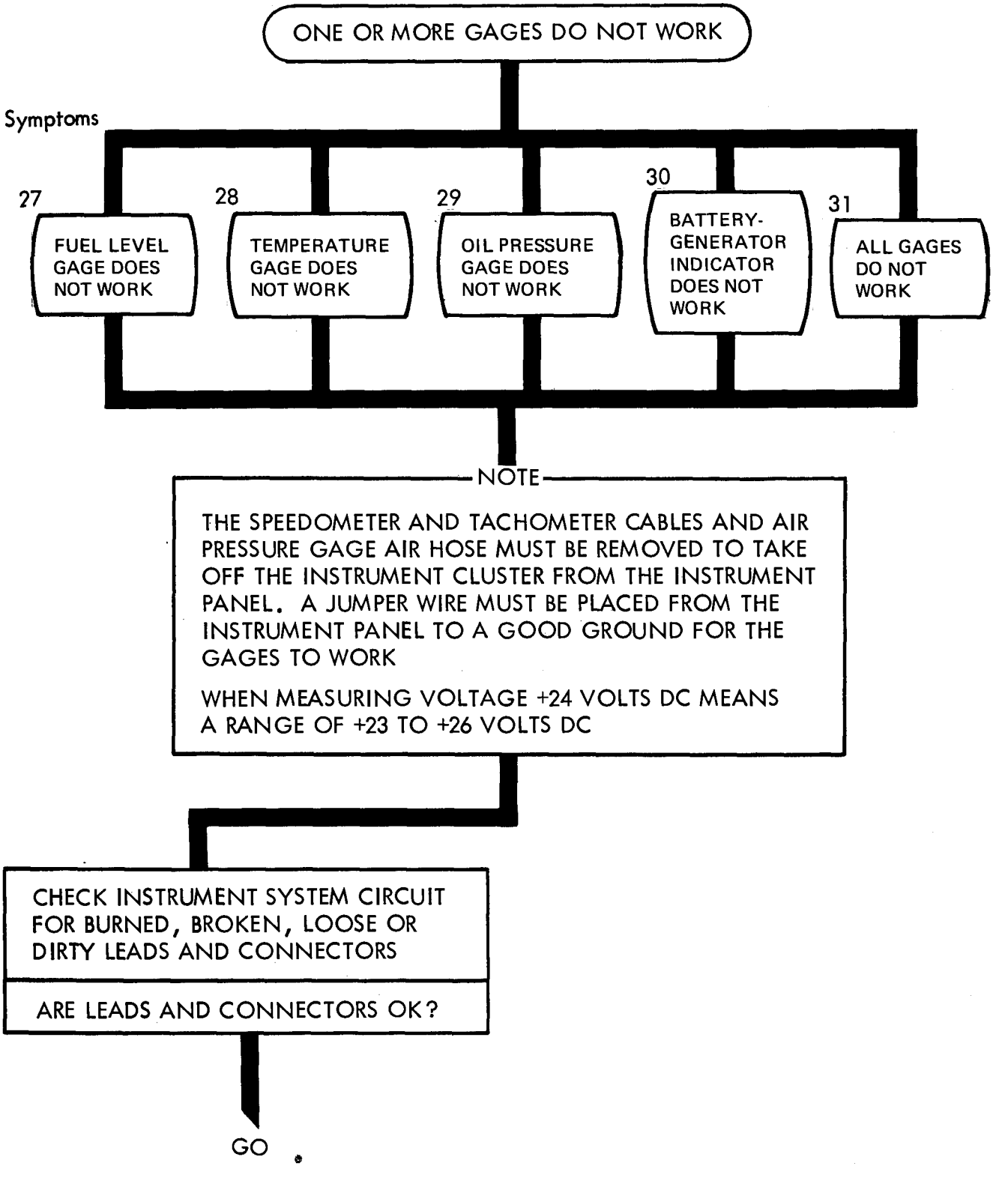
Figure 27-5 (Sheet 3 of 4)




TA 116049

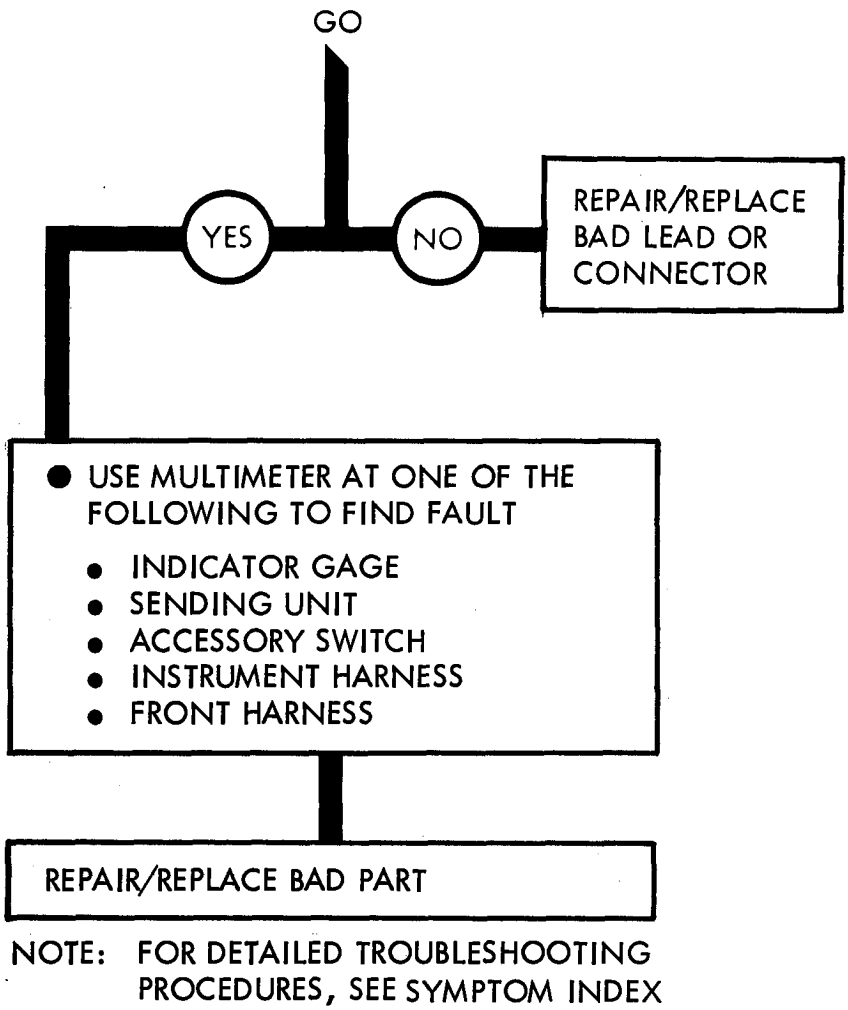
Figure 27-5 (Sheet 4 of 4)

## ELECTRICAL SYSTEM - INDICATOR SYSTEM TROUBLESHOOTING SUMMARY




TA 116050

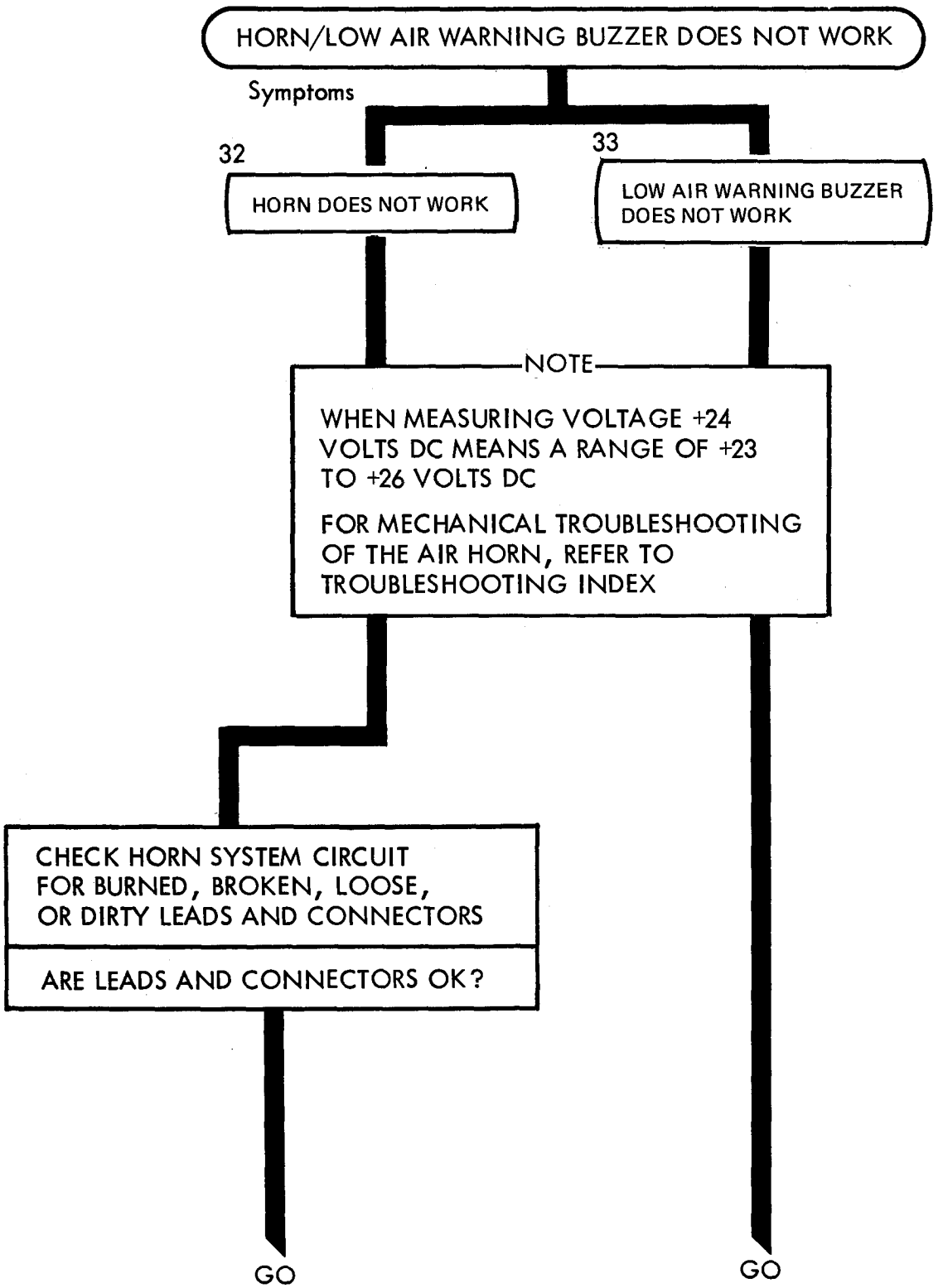
Figure 27-6 (Sheet 1 of 2)




TA 116051

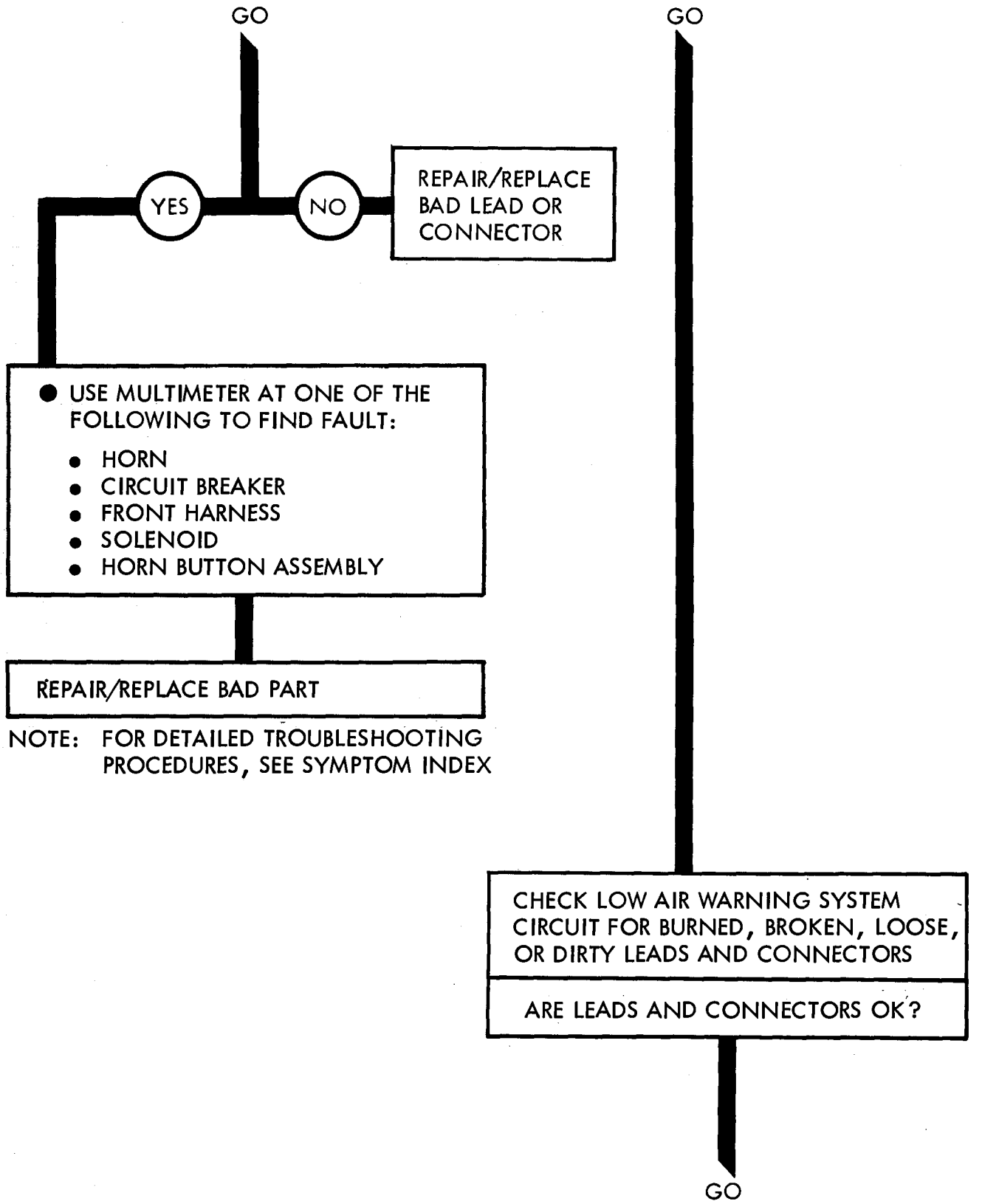
Figure 27-6 (Sheet 2 of 2)

## ELECTRICAL SYSTEM - WARNING SYSTEM TROUBLESHOOTING SUMMARY



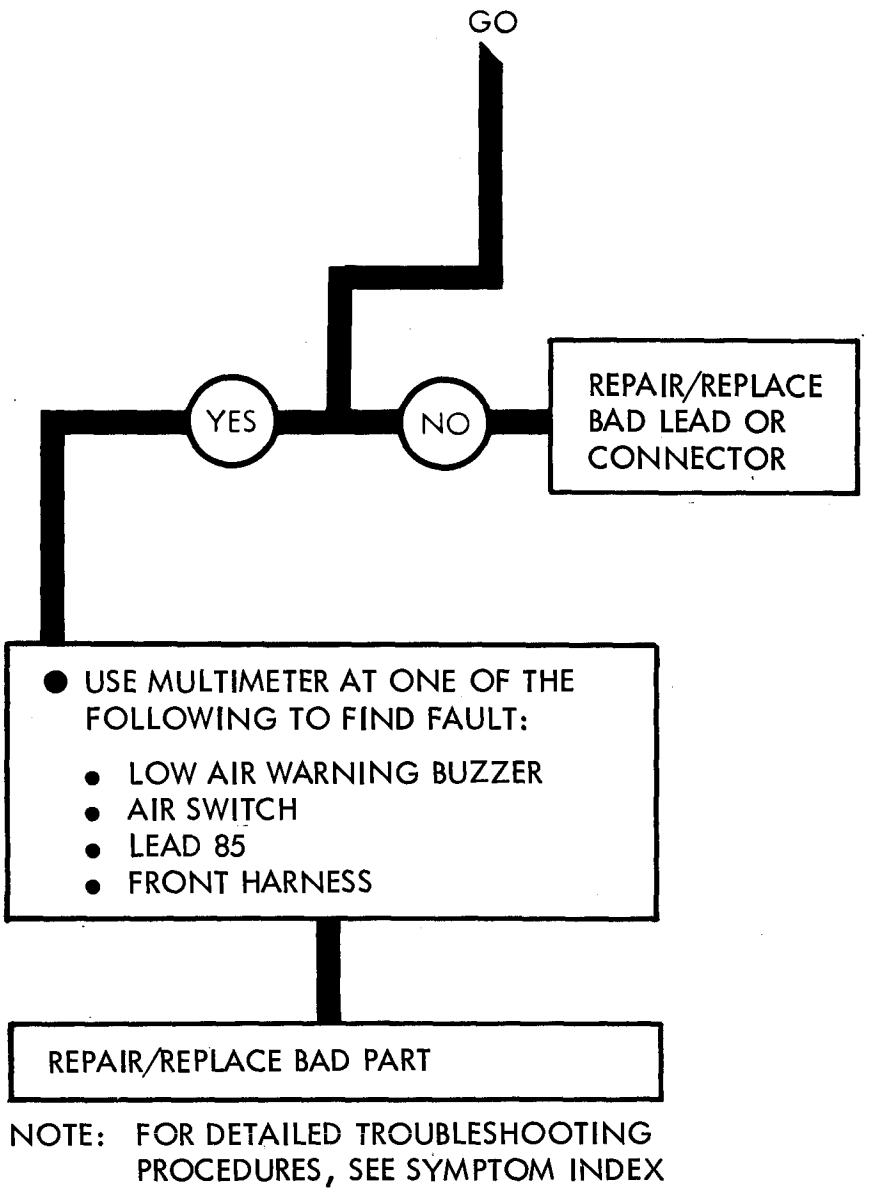

TA 116052

Figure 27-7 (Sheet 1 of 3)




TA 116053

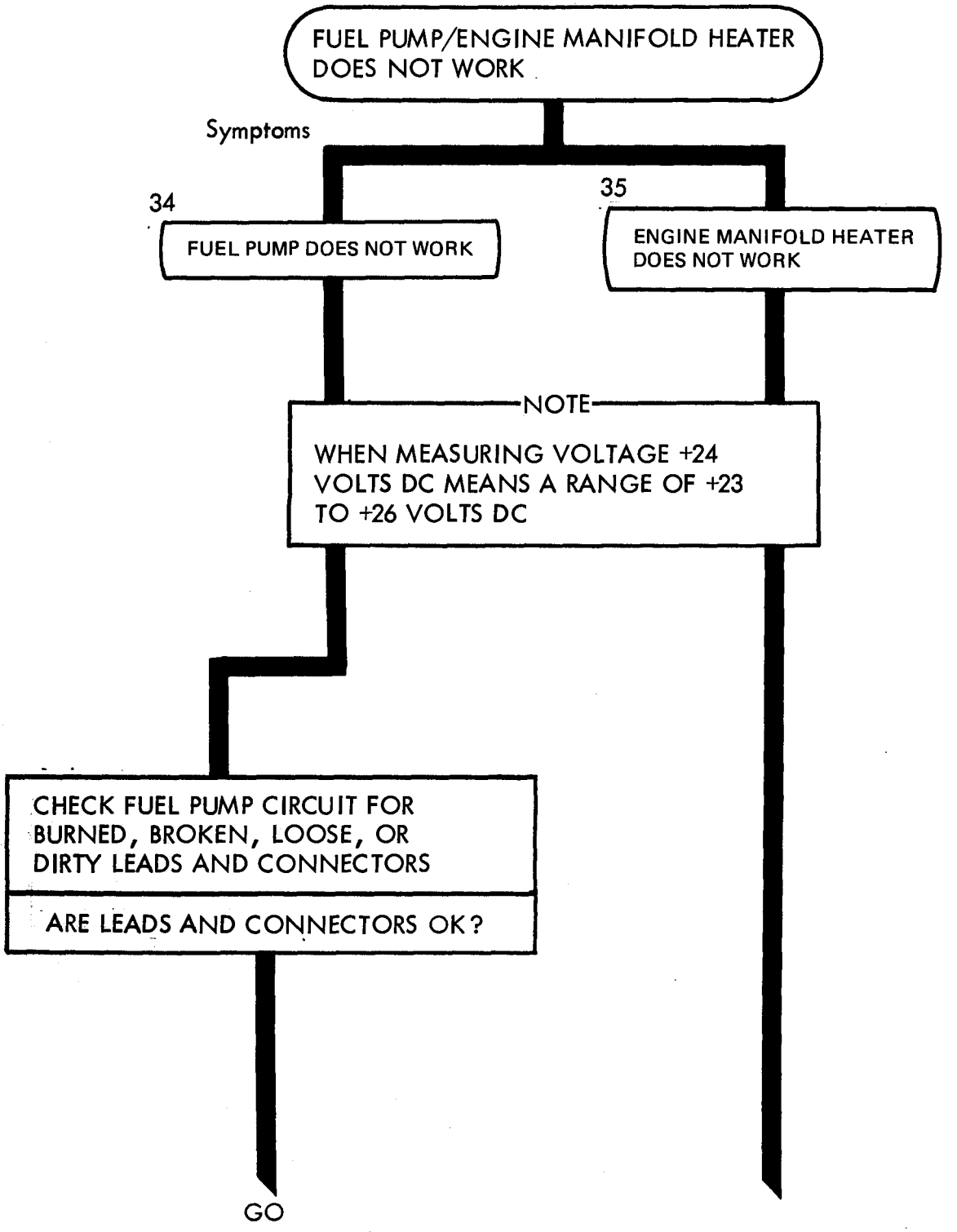
Figure 27-7 (Sheet 2 of 3)




TA 116054

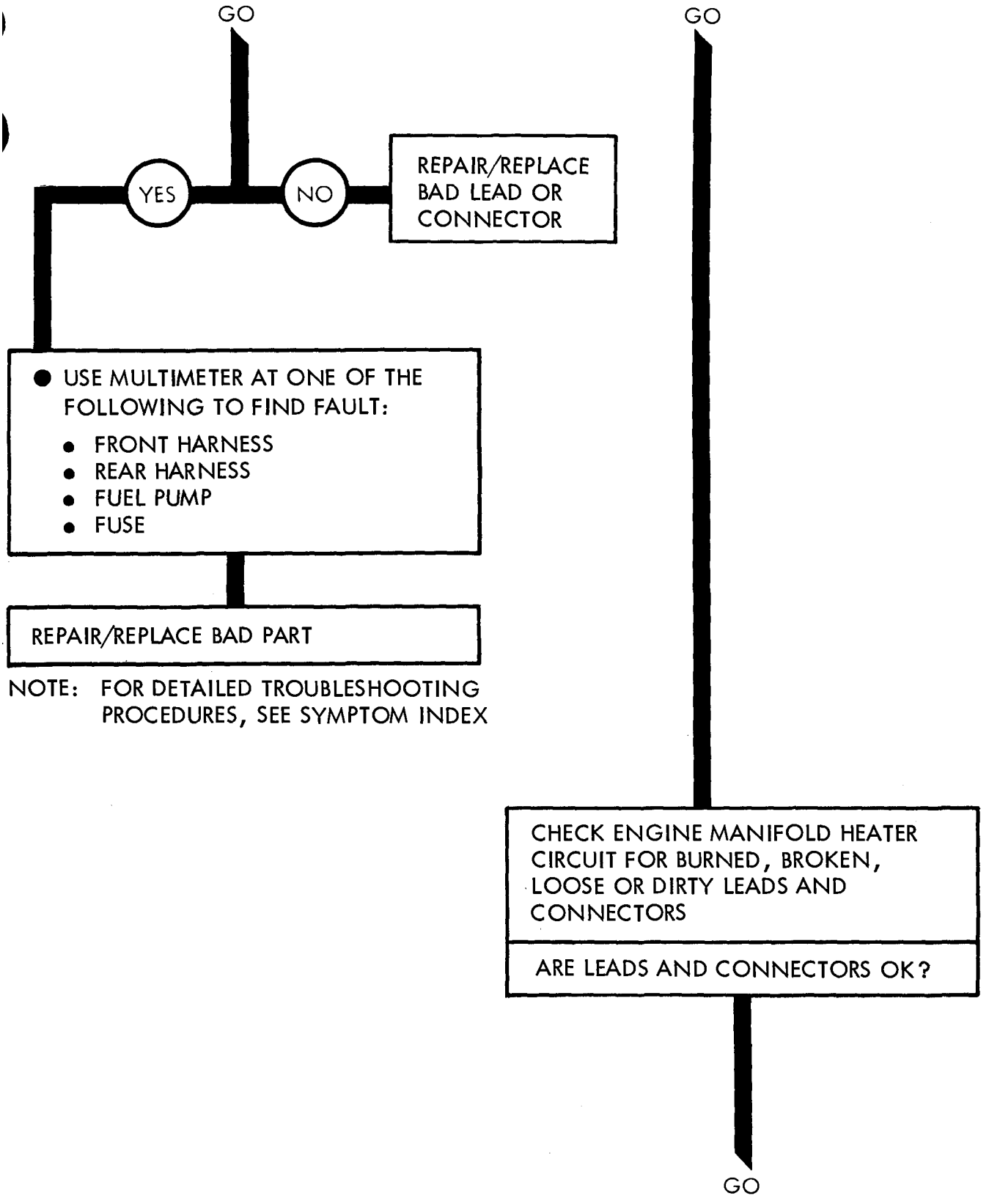
Figure 27-7 (Sheet 3 of 3)

**ELECTRICAL SYSTEM - FUEL PUMP/ENGINE MANIFOLD HEATER TROUBLESHOOTING SUMMARY**



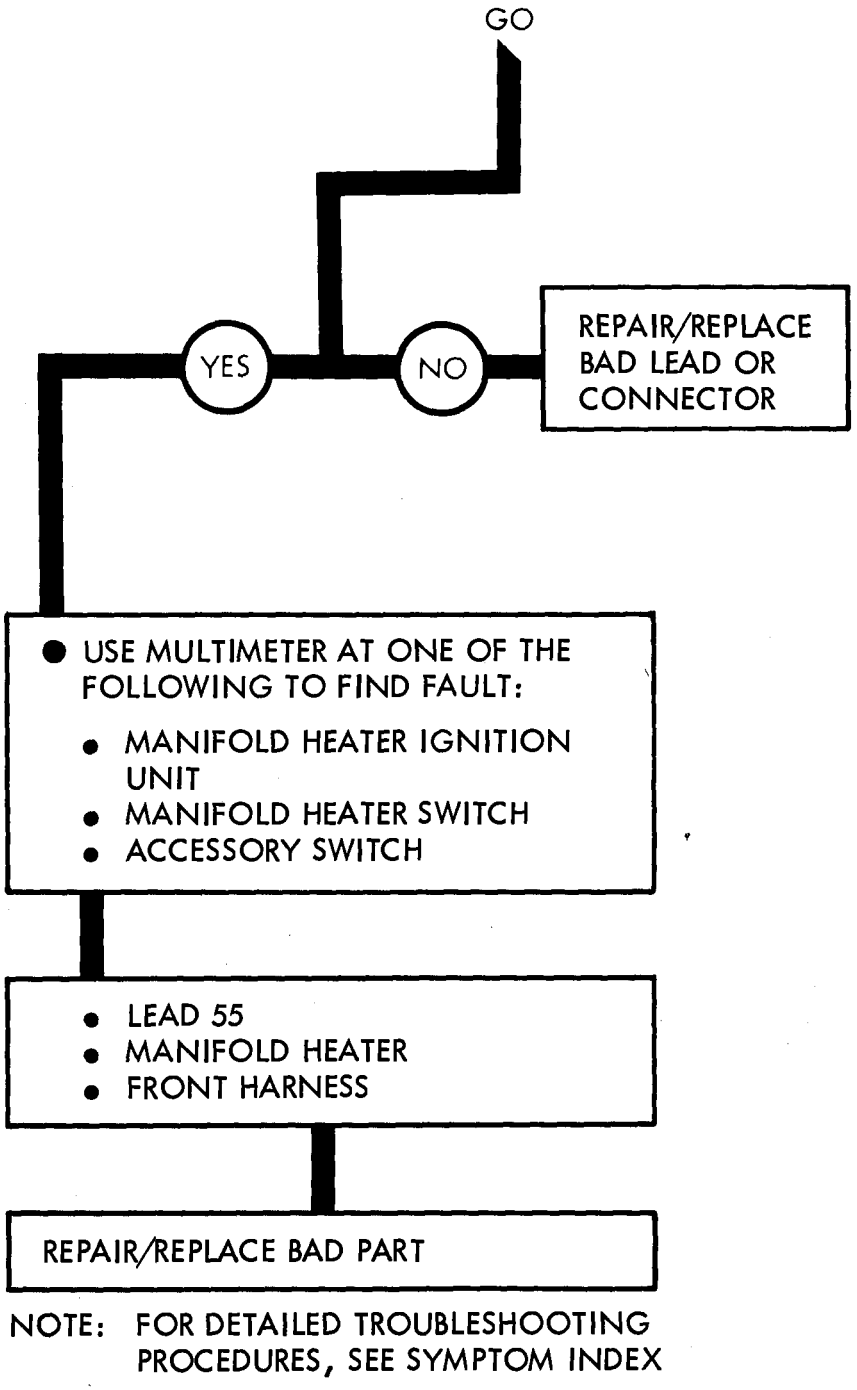

TA 116055

Figure 27-8 (Sheet 1 of 3)




TA 116056

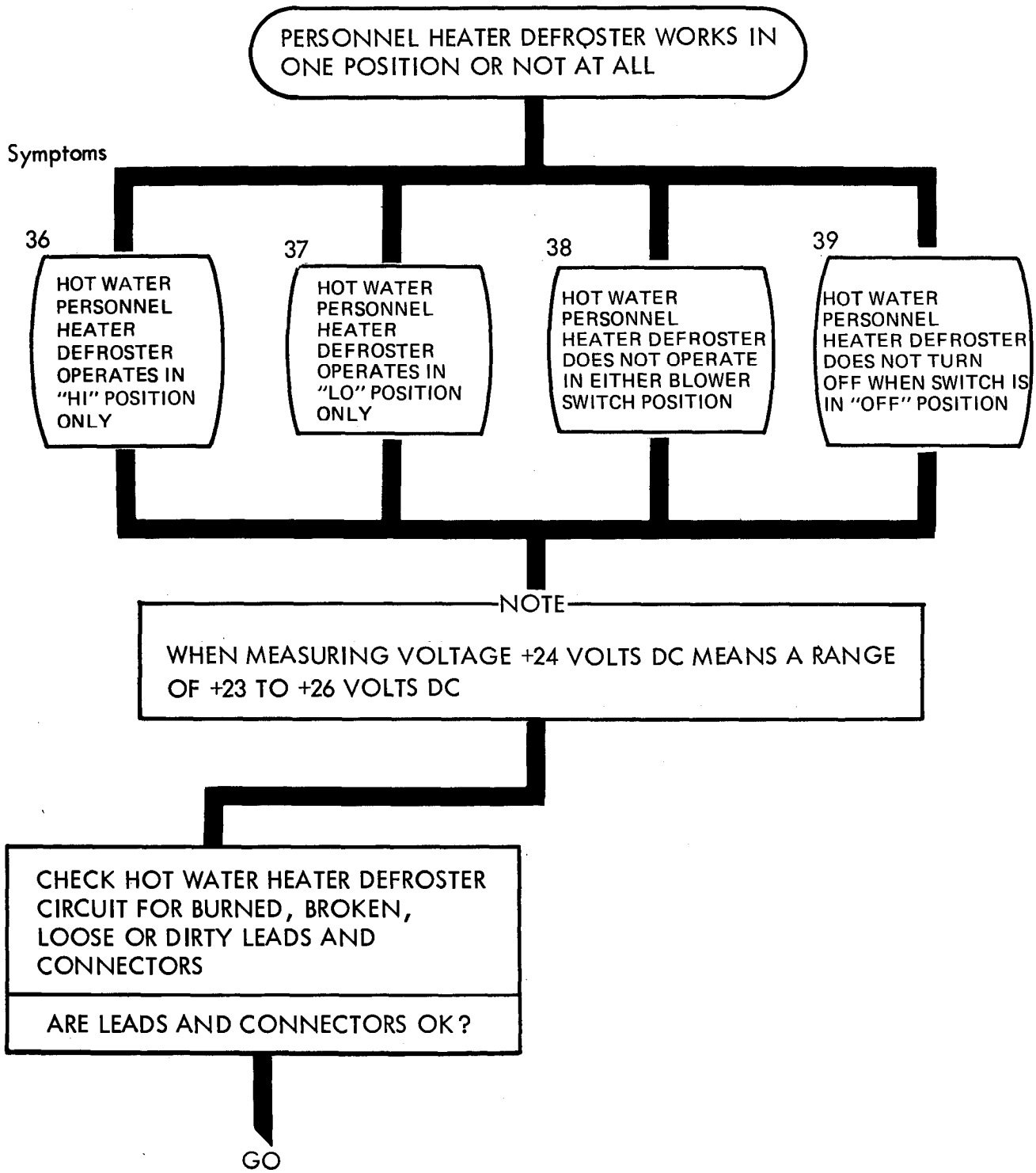
Figure 27-8 (Sheet 2 of 3)




TA 116057

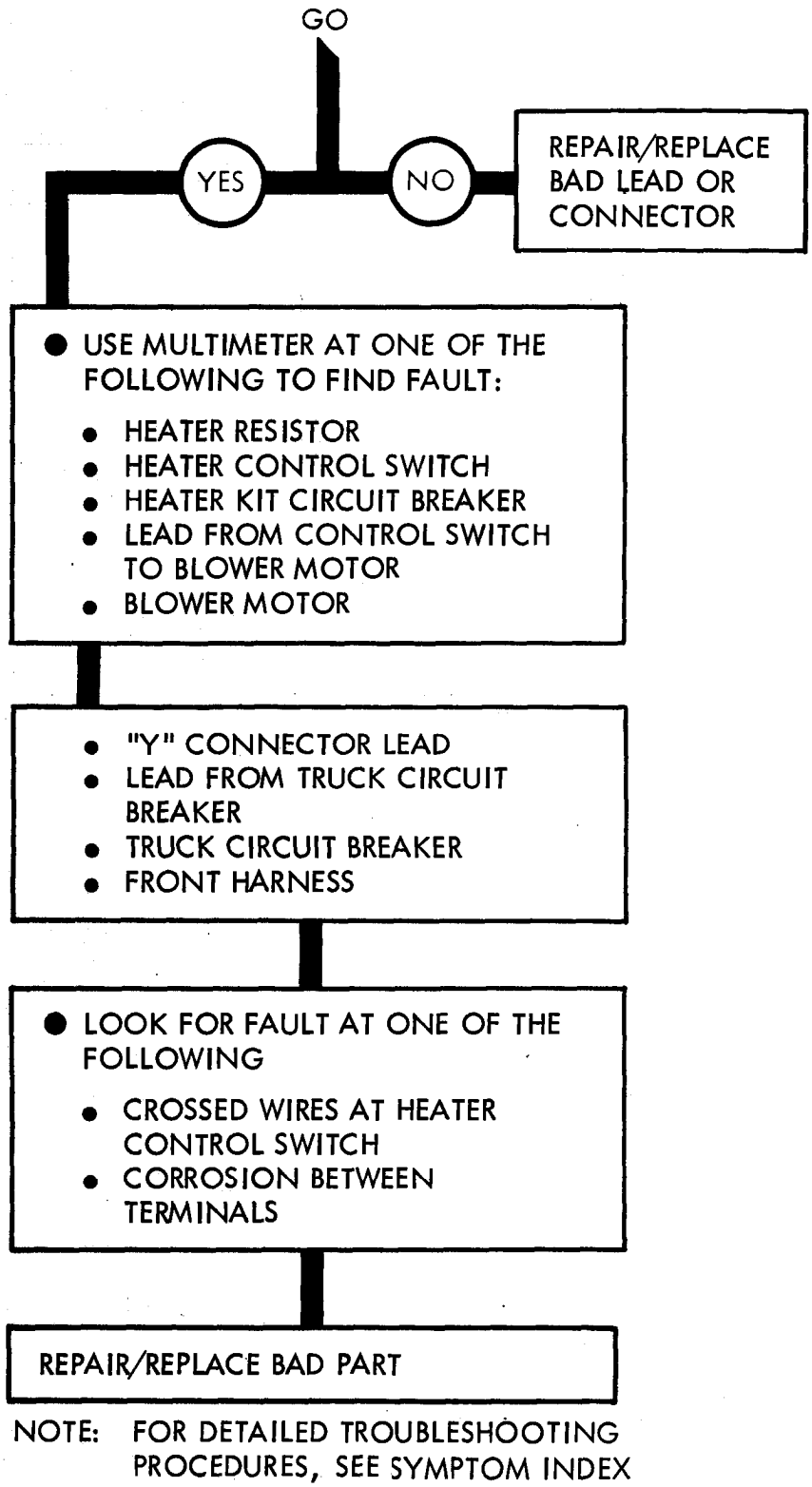
Figure 27-8 (Sheet 3 of 3)

**ELECTRICAL SYSTEM - HOT WATER PERSONNEL HEATER DEFROSTER TROUBLESHOOTING SUMMARY**




TA 116058

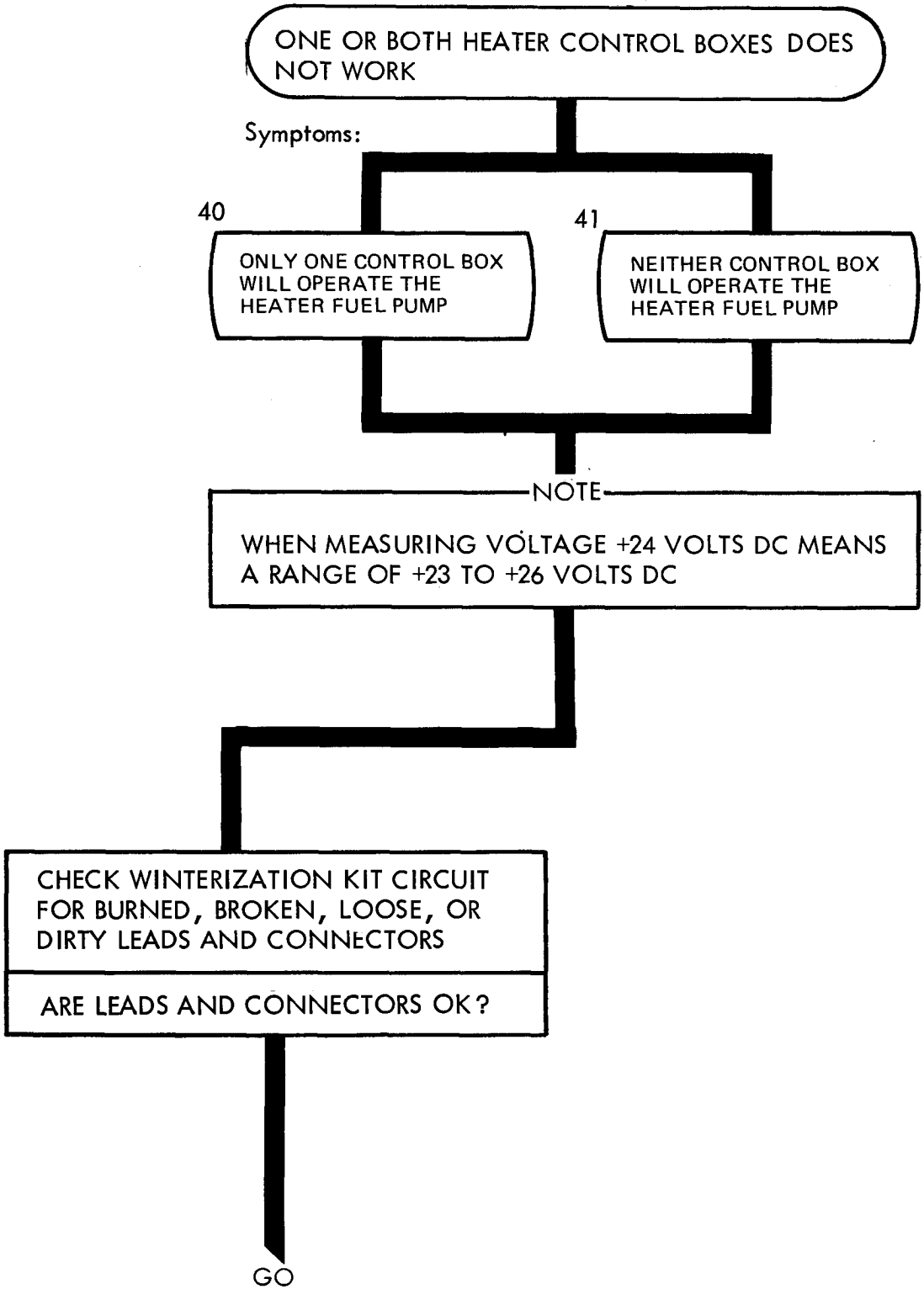
Figure 27-9 (Sheet 1 of 2)




TA 116059

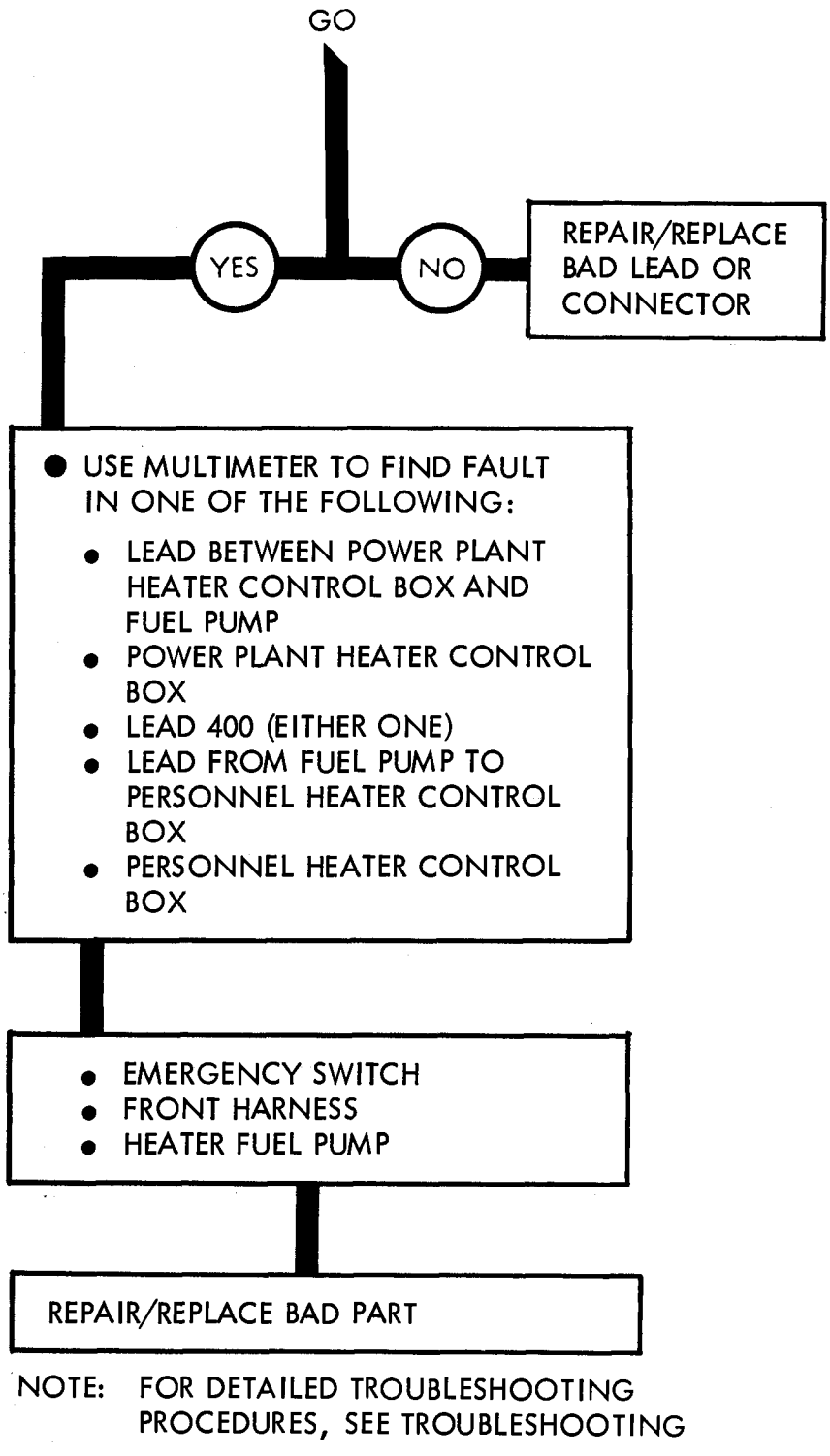
Figure 27-9 (Sheet 2 of 2)

## ELECTRICAL SYSTEM - WINTERIZATION KIT TROUBLESHOOTING SUMMARY




TA 116060

Figure 27-10 (Sheet 1 of 2)




NOTE: FOR DETAILED TROUBLESHOOTING PROCEDURES, SEE TROUBLESHOOTING

TA 116061

Figure 27-10 (Sheet 2 of 2)

# CHAPTER 28

# ELECTRICAL SYSTEM SUPPORT DIAGRAMS

28-1. GENERAL. This chapter gives the diagrams you need when doing trouble-shooting procedures in chapter 26. Table 3-1 is a complete listing of all support diagrams used in this manual.

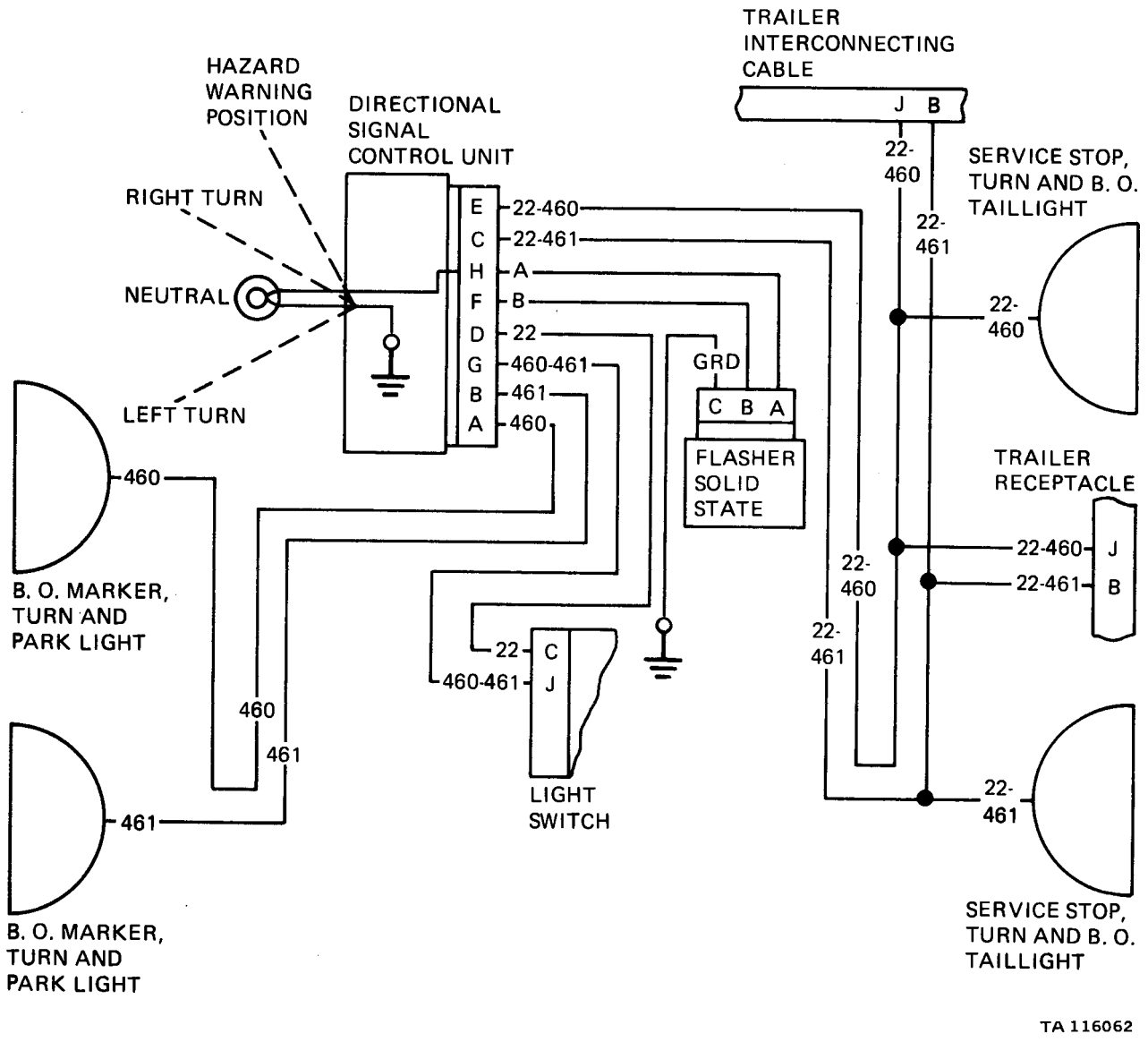



Figure 28-1. Wiring Diagram for Directional Signal Circuit

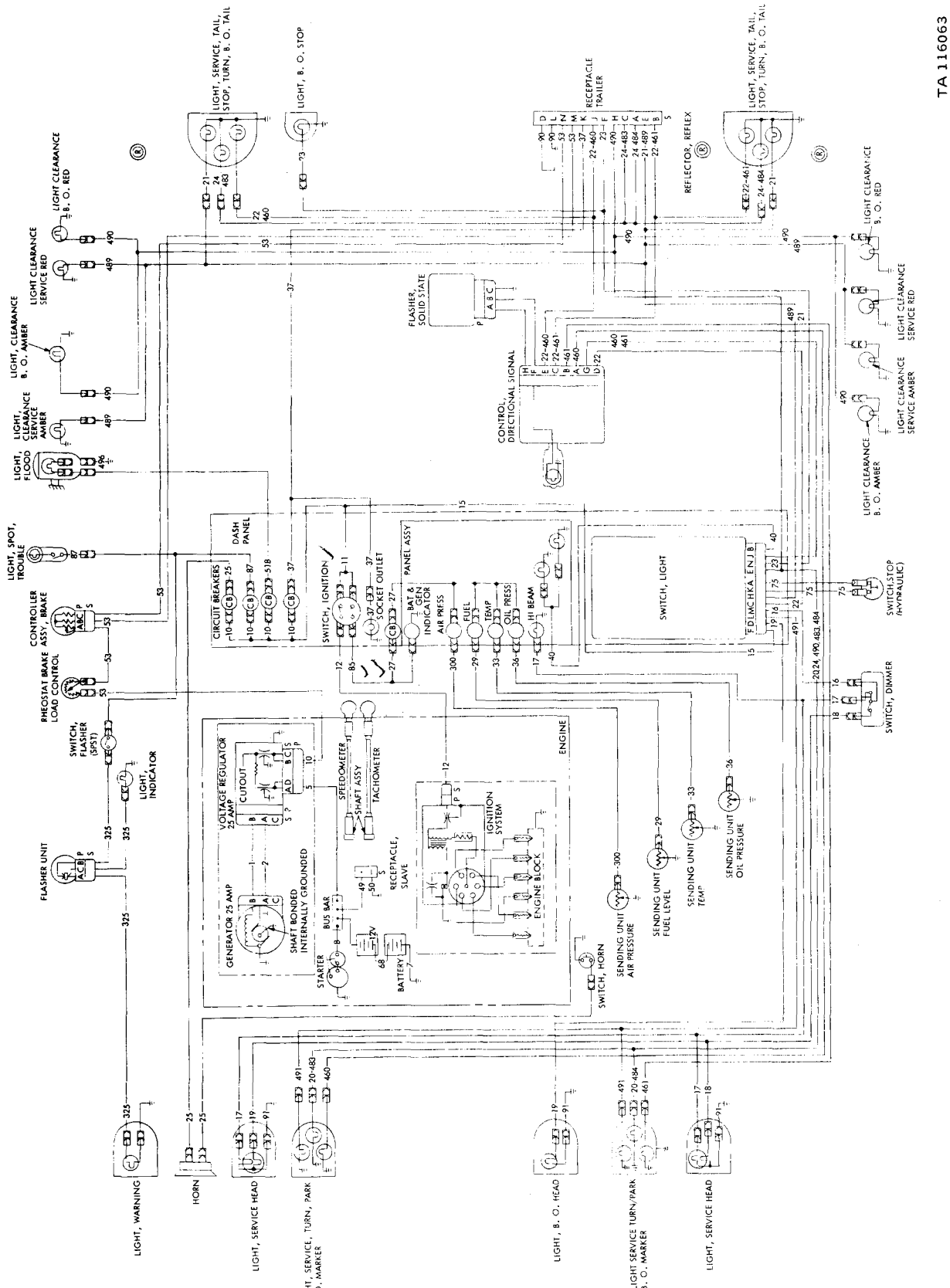



Figure 28-2. Truck Wiring Diagram

# CHAPTER 29

# ELECTRICAL SYSTEM TEST PROCEDURES

29-1. GENERAL . This chapter gives test procedures for the multimeter troubleshooting.

29-2. TEST SET-UP. Instructions for setup of test equipment and parts to be tested are given before the test procedures. Illustrations are used, when needed, to show you how to hook up the test equipment to the part to be tested.

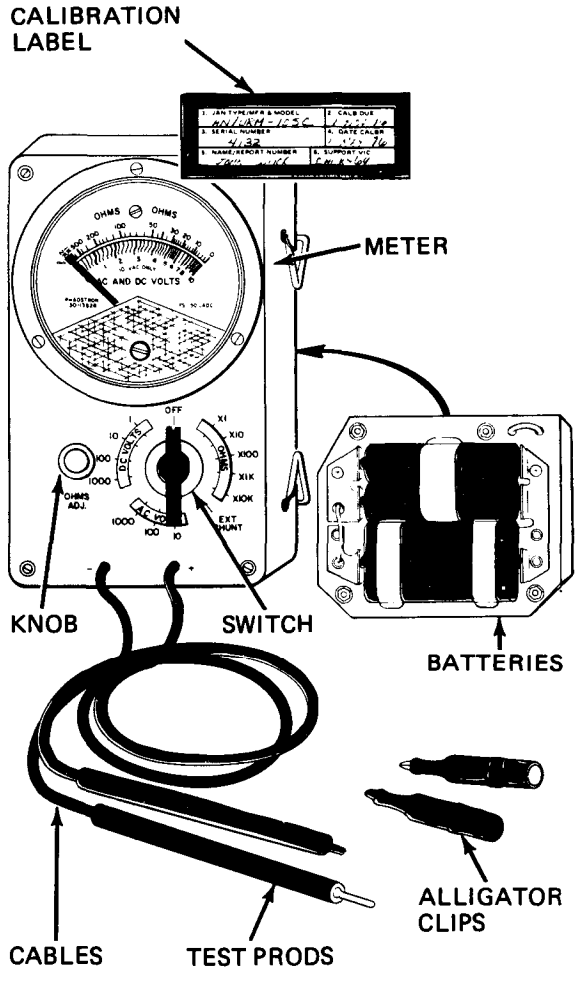
29-3. TEST PROCEDURE . Detailed step-by- step instructions, in flow chart form are given for each test. The procedure calls out the type of test and the conditions of the truck system for each part of testing. The step-by- step test will lead you to the bad component or to a fault symptom within a related system. Reference is made to the fault symptom index, chapter 28 if the test shows a fault in another system.

MULTIMETER AN/URM-105C TEST PROCEDURES

## GENERAL INSTRUCTIONS

- Check That Multimeter is Ready for Use
  - Calibration label - Check to be sure multimeter has been calibrated in the last 12 months
  - Meter - Glass and pointer not broken. Pointer should be resting over zero mark at left side of scales
  - Batteries - Not corroded or leaking Put in right.

- Cables - No cuts, sharp kinks or bad fraying
- Test prods - Tight on cable, tip free of paint or anything that might be an insulator
- Switch and knob - Work freely without binding or scraping
- Alligator clips - Free of paint or anything that might be an insulator




TA 119922

Figure 29-1

Test

1 DC VOLTAGE TEST - To measure battery voltage, charging system output, and voltage drops at various test points

1

- Set up selector switch

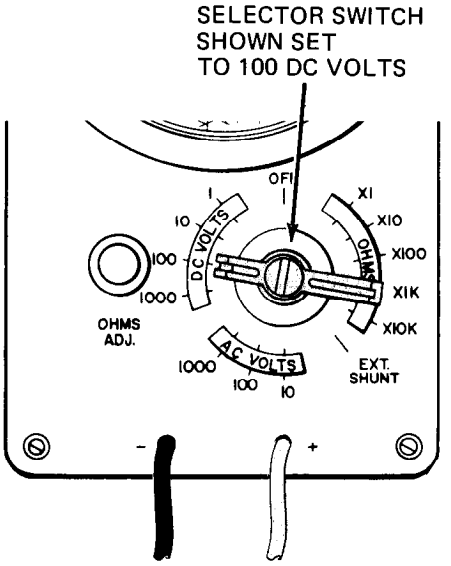
  Note: The highest truck DC voltage that is measured is about 28 volts. Therefore, the selector switch is never set to 1000 DC VOLTS

- See table to find out setting of selector switch. Table shows switch setting when normal value of measured voltage is known or unknown

| IF NORMAL VALUE OF VOLTAGE BEING MEASURED IS THIS: | SET SELECTOR SWITCH TO: |
|---|---|
| 0 TO 0.8 VOLTS | 1 DC VOLTS |
| 0.8 TO 8 VOLTS | 10 DC VOLTS |
| 8 TO 80 VOLTS | 100 DC VOLTS |
| UNKNOWN | 100 DC VOLTS |

- Set selector switch to setting you picked

  Note: The OHMS ADJ knob is not used for DC voltage tests




NOTE

When you need to turn on power before measuring DC voltage, the fault isolation procedures gives the turn-on instructions

GO

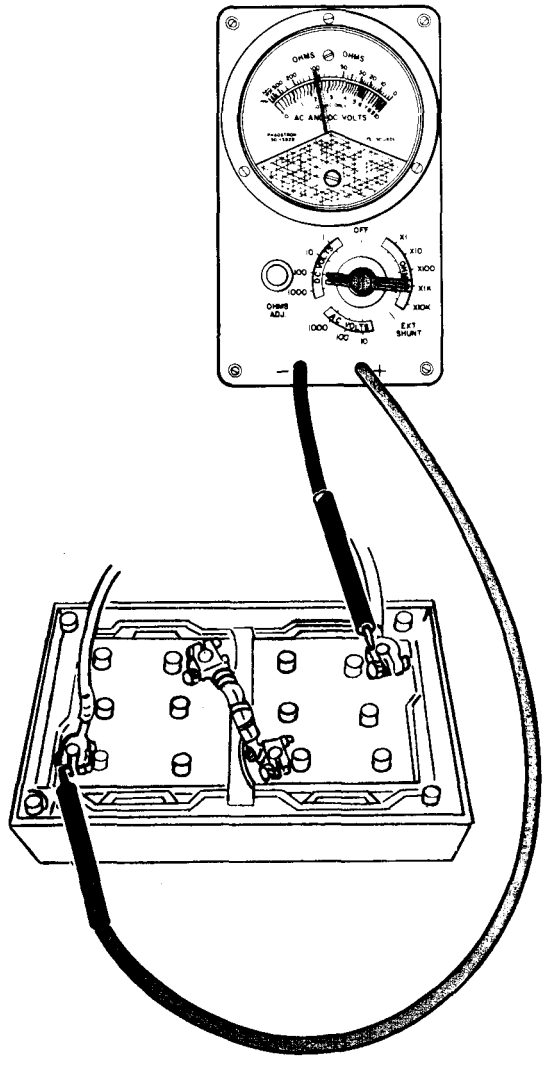
TA 119923

Figure 29-2 (Sheet 1 of 5)

GO

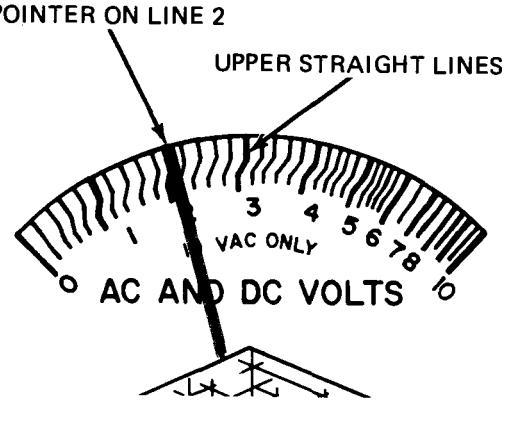
2

- Put multimeter leads across (in parallel with) circuit being measured
  - Put test prod of black lead (-) on negative terminal of circuit being measured
  - Put test prod of red lead (+) on positive terminal of circuit being measured



3

- If pointer falls exactly on a numbered line read multimeter as follows:
  - Read upper straight lines of AC AND DC VOLTS scale. See which straight line pointer is on




GO

TA 119924

Figure 29-2 (Sheet 2 of 5)

GO

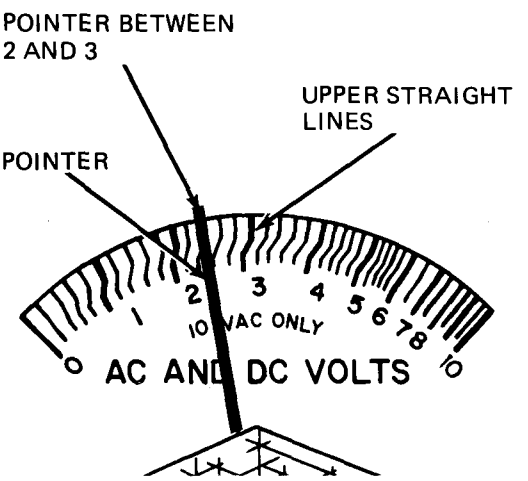
| SELECTOR SWITCH SETTING | INSTRUCTION |
|---|---|
| 1 DC VOLTS | DIVIDE BY 10 |
| 10 DC VOLTS | USE AS IS |
| 100 DC VOLTS | MULTIPLY BY 10 |

- Get multimeter reading as follows:

| Step A | Step B | Step C | Step D |
|---|---|---|---|
| Read selector switch setting | From table, pick instruction that is listed next to selector switch setting | See what numbered line pointer is on | Do the instruction you picked in step B to the number in step C |
| Example: 100 DC VOLTS | Multiply by 10 | 2 | 10 x 2 = 20 volts DC |

4

- If pointer is between numbered lines read multimeter as follows:
  a. Look at upper straight lines of AC AND DC VOLTS scale. See which two numbered lines the pointer is between. Take smaller number 2



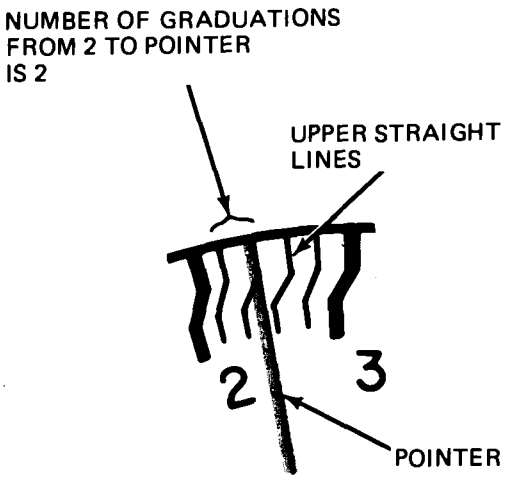

GO

TA 119925

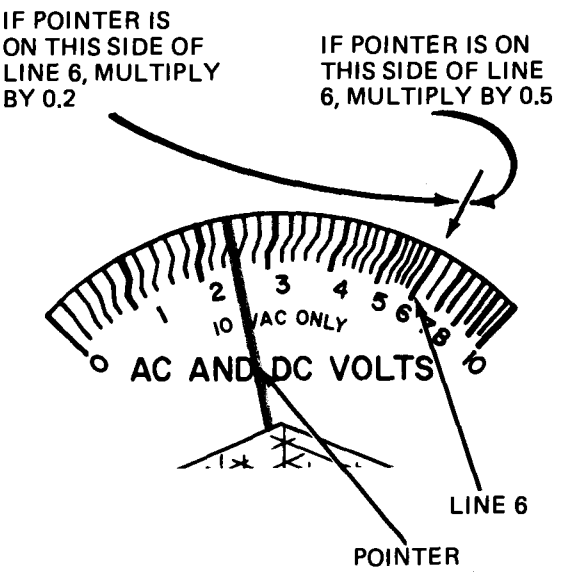
Figure 29-2 (Sheet 3 of 5)

GO

b. Count number of graduations from smaller number to pointer: 2




c. Multiply number from step b by either 0.2 or 0.5 as shown in picture: 2X 0.2 = 0.4




d. Add number from step a to number from step c: 2 + 0.4 = 2.4

GO

TA 119926

Figure 29-2 (Sheet 4 of 5)

GO

| SELECTOR SWITCH | INSTRUCTION |
|---|---|
| 1 DC VOLTS | DIVIDED BY 10 |
| 10 DC VOLTS | USE AS IS |
| 100 DC VOLTS | MULTIPLY BY 10 |

e. Get multimeter reading as follows:

| | Step A | Step B | Step C | Step D |
|---|---|---|---|---|
| | Read selector switch setting. | From table, pick instruction that is listed next to selector switch setting. | See what step 4d number is. | Do the instruction you picked in step B to the number in step C. |
| Example: | 100 DC VOLTS | Multiply by 10 | 2.4 | 10 x 2.4=24 volts DC |

5

- Make circuit normal again:
  - Take both test prods off measured circuit.

Figure 29-2 (Sheet 5 of 5)

2

AC VOLTAGE TEST - To measure van input and operating voltages.

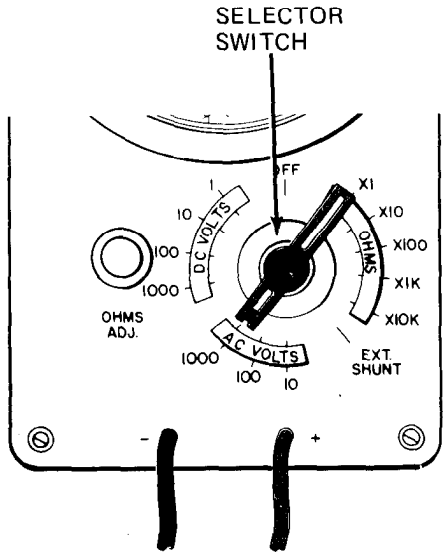
1

- Set up multimeter:

Note: The truck AC voltages measured are 208 and 120 volts. Therefore, only the 1000 AC VOLTS selector switch position is used.

- Set selector switch to 1000AC VOLTS.

Note: The OHMS ADJ knob is not used for AC voltage tests.




TA 119927

GO

Figure 29-3 (Sheet 1 of 5)

GO

**NOTE**

When you need to turn on power before measuring AC voltage, the fault isolation procedure gives the turn-on instructions.

2

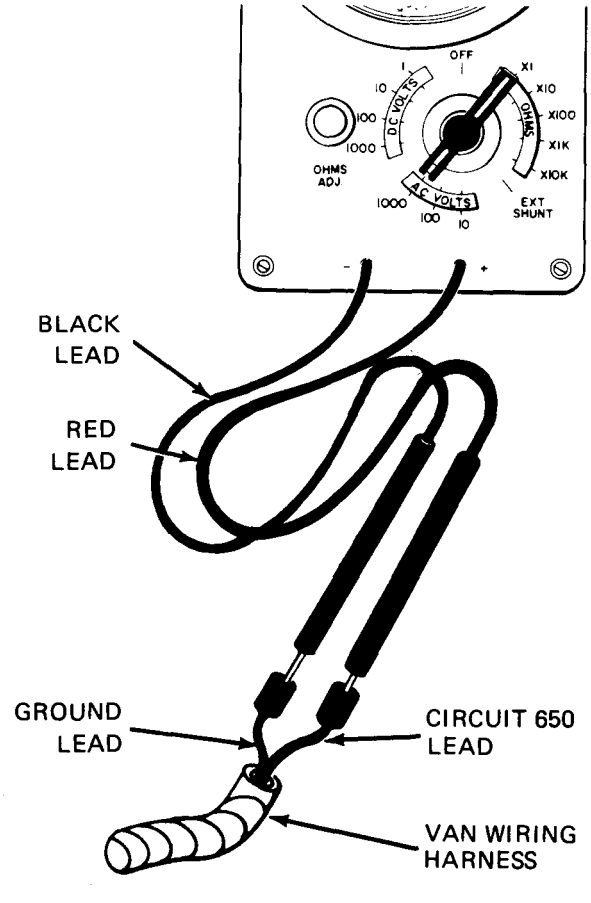
- Put multimeter leads across (in parallel with) circuit being measured:

  Note: In AC voltage measurement you can hook up the test lead connections to the circuit either way. You will still get correct multimeter readings and no damage will be done to the multimeter. But, when one side of the circuit is electrical ground, it is a good idea to put the black lead on electrical ground

- Put test prod of black lead on ground side or one side of circuit being measured. Put test prod of red lead on other side of circuit being measured.

GO

NOTE: MULTIMETER SHOWN MEASURING 120 VOLTS AC VAN CEILING LIGHT VOLTAGE



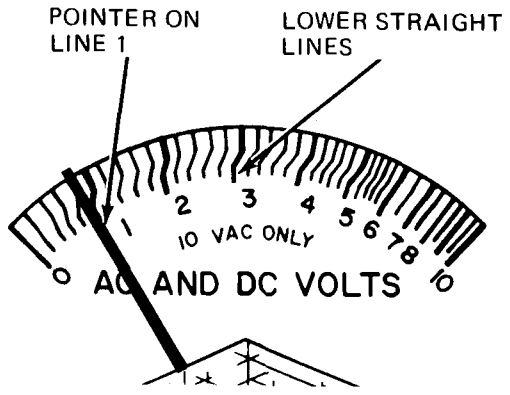

TA 119928

Figure 29-3 (Sheet 2 of 5)

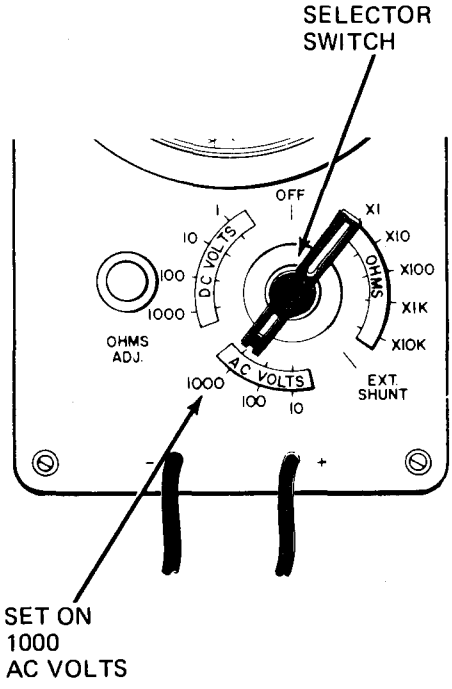
GO

3

- If pointer falls exactly on a numbered line read multimeter as follows:
  - Read lower straight lines of AC AND DC VOLTS scale. See which straight line pointer is on: 1




- For 1000 AC VOLTS setting, multiply pointer line number by 100 to get multimeter reading: 1 X 100 = 100 volts AC.




GO

TA 119929

Figure 29-3 (Sheet 3 of 5)

GO

4

- If pointer is between numbered lines read multimeter as follows:
  a. Look at lower straight lines of AC AND DC VOLTS SCALE. See which two numbered lines the pointer is between. Take smaller number: 1

b. Count number of graduations from smaller number to pointer: 1

c. Multiply number from step b by either 0.2 or 0.5 as shown in figure: 1 X 0.2 = 0.2

d. Add number from step a to number from step c: 1 + 0.2 = 1.2

GO

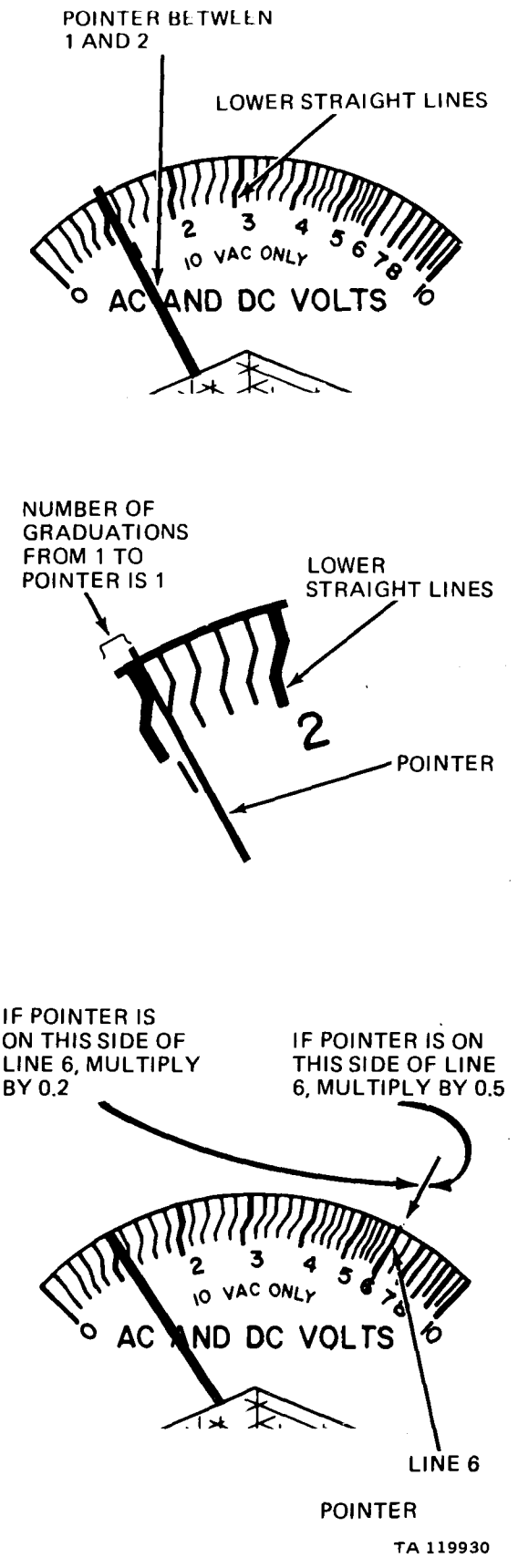



Figure 29-3 (Sheet 4 of 5)

GO

e. For 1000 AC VOLTS setting, multiply step d number by 100 to get multimeter reading: 1.2 X 100 = 120 volts AC.

5

- Make circuit normal again.
  - Take both test prods off measured circuit.

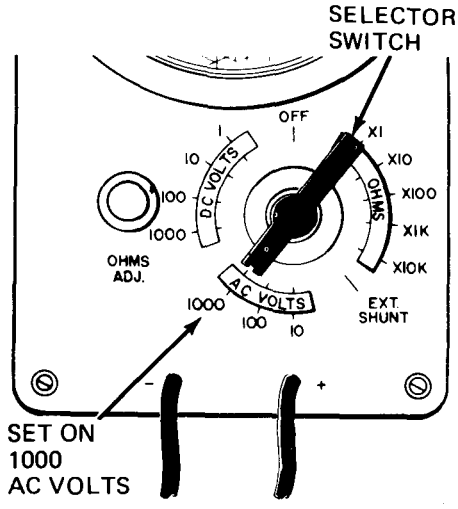



Figure 29-3 (Sheet 5 of 5)

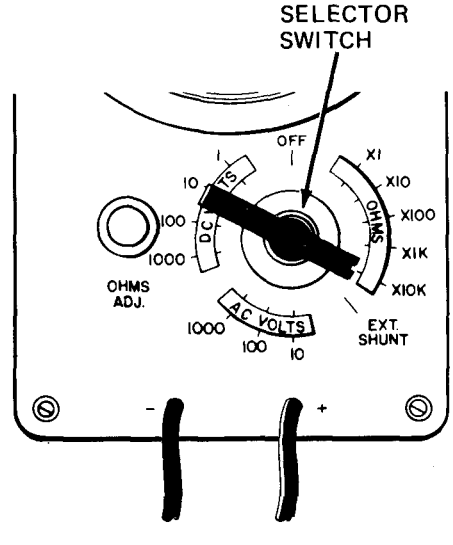
3

RESISTANCE TEST - To measure resistance of temperature sending unit and blower motor resistor.

1

- Set up multimeter:
  - Set selector switch to OHMS X10K.

GO




TA 119931

Figure 29-4 (Sheet 1 of 10)

GO

NOTE

Detailed steps for making the truck parts ready for resistance test are in the fault isolation procedures. The steps given here are typical.

2

● Make Tested Part Ready for Resistance Test:

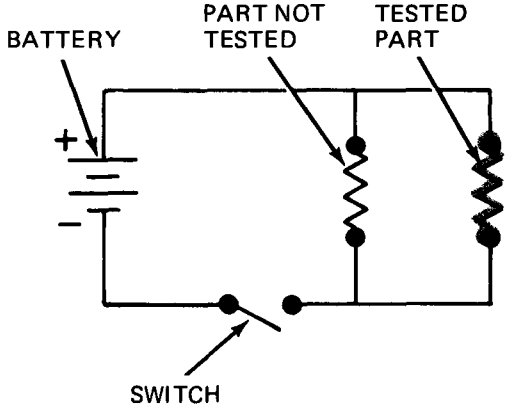
CAUTION

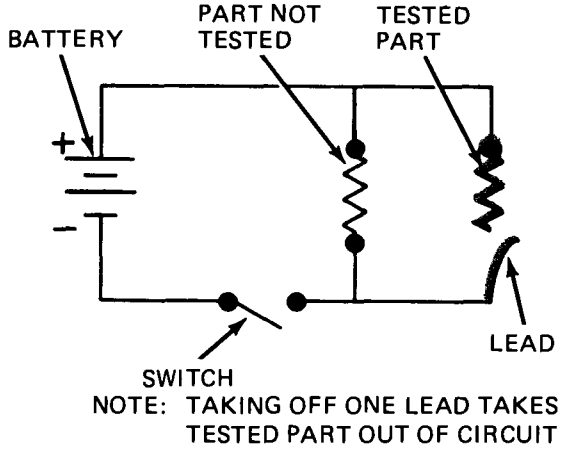
If power totested part is not turned off, multimeter will be damaged.

● Turn off power to tested part.

● Take off one lead from tested part.

GO




TA 119932

Figure 29-4 (Sheet 2 of 10)

GO

3

- Zero the multimeter
  - Take off multimeter leads from tested part
  - Touch multimeter test probes together

- While touching multimeter test probes together look at OHMS scale. Pointer should be at 0 (zero). If it is not, turn OHMS ADJ knob to move pointer to 0

GO

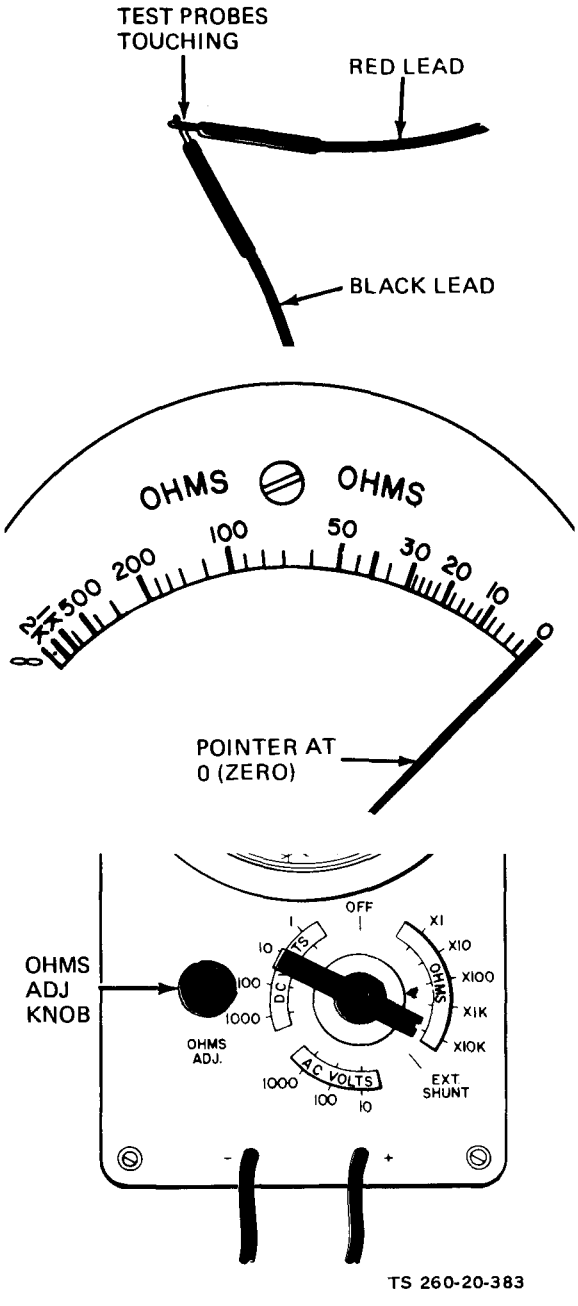



Figure 29-4 (Sheet 3 of 10)

TA 119933

GO

4

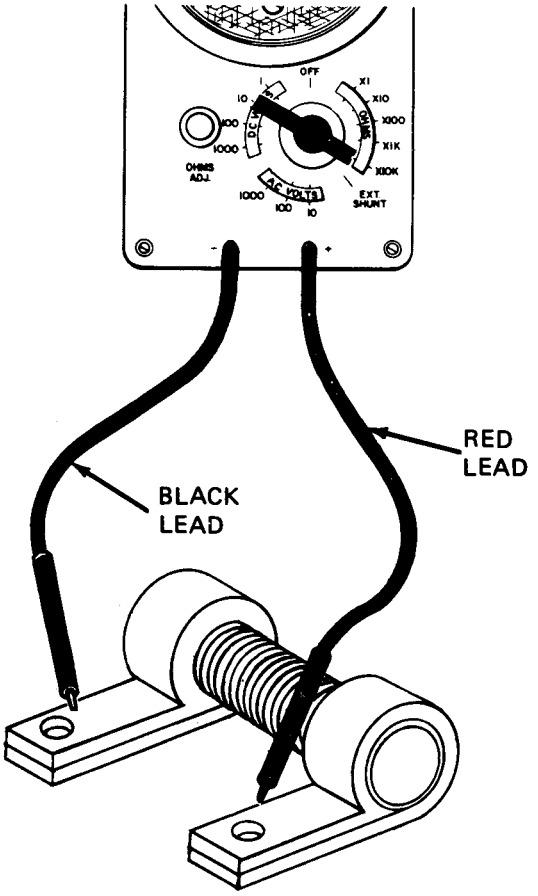
- Put multimeter leads across tested part
  - Put one test prod on one terminal of tested part
  - Put other test prod on other terminal of test part

**NOTE**

Zero the multimeter each time you turn the selector switch knob to another position (See step 3 )

GO

NOTE: MULTIMETER SHOWN MEASURING RESISTANCE OF A COLD START RESISTOR.




RESISTOR UNDER TEST

TA 119934

Figure 29-4 (Sheet 4 of 10)

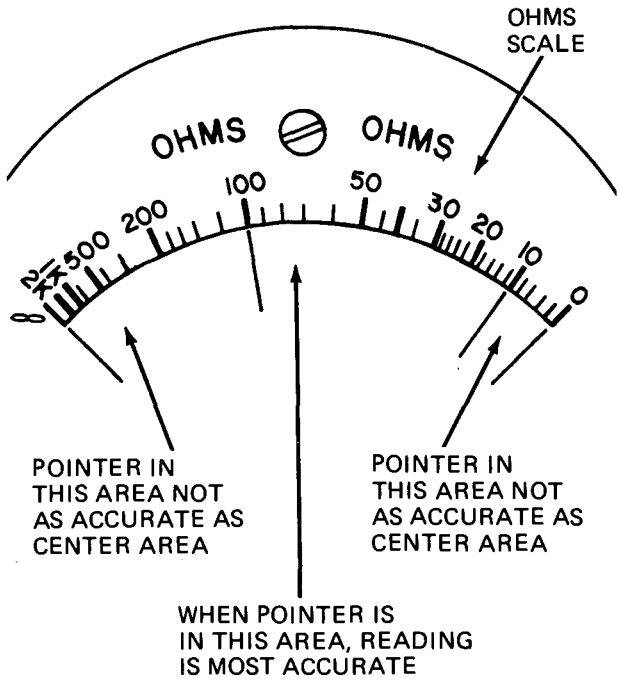
GO

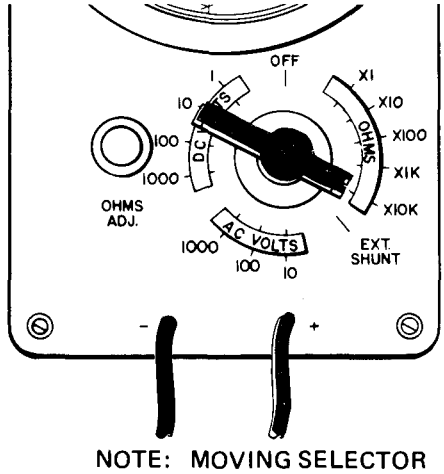
5

- Get the most accurate multimeter reading as follows

  Note: The closer the multimeter pointer is to the center of the OHMS scale, the more accurate the reading

- Note position of pointer on OHMS scale. Turn selector switch knob to left while looking at pointer. Try to find selector switch knob position that gives most centered pointer position




NOTE: MOVING SELECTOR SWITCH KNOB TO LEFT MOVES POINTER TO LEFT

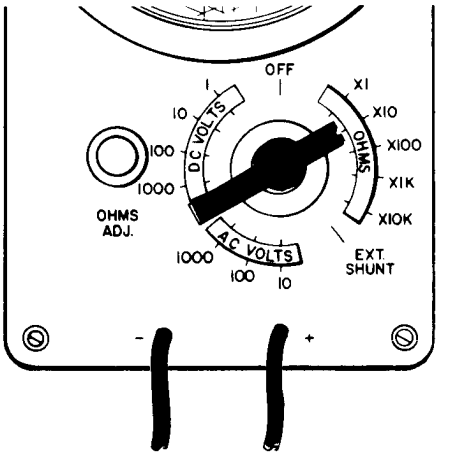
GO

TA 119935

Figure 29-4 (Sheet 5 of 10)

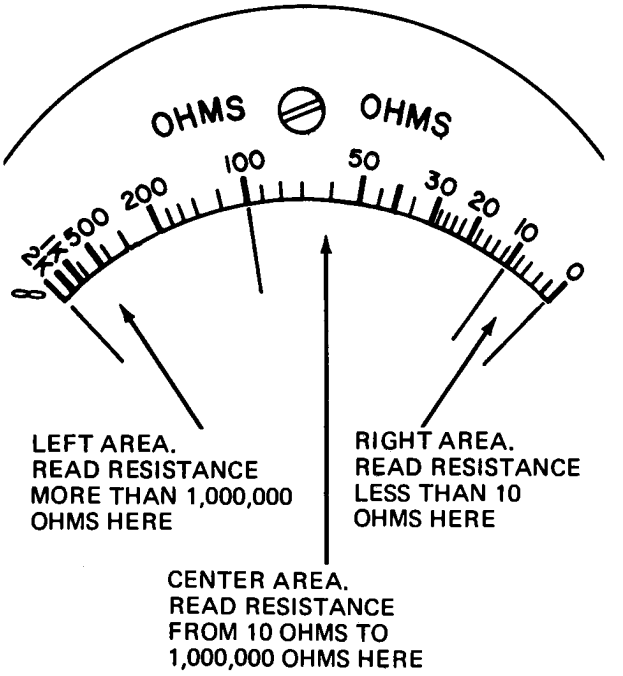
GO

- You may overshoot most centered pointer position. If you do, turn selector switch knob to right to put pointer in most centered position




NOTE: MOVING SELECTOR SWITCH KNOB TO RIGHT MOVES POINTER TO RIGHT

- Pointer will stay in right area if resistance is less than 10 ohms. Pointer will stay in left area if resistance is more than 1,000,000 ohms
- Leave selector switch in position that puts pointer in most centered position




GO

TA 119936

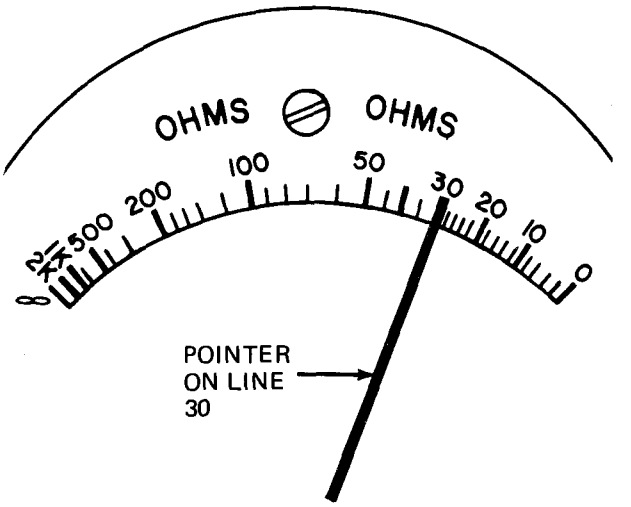
Figure 29-4 (Sheet 6 of 10)

GO

6

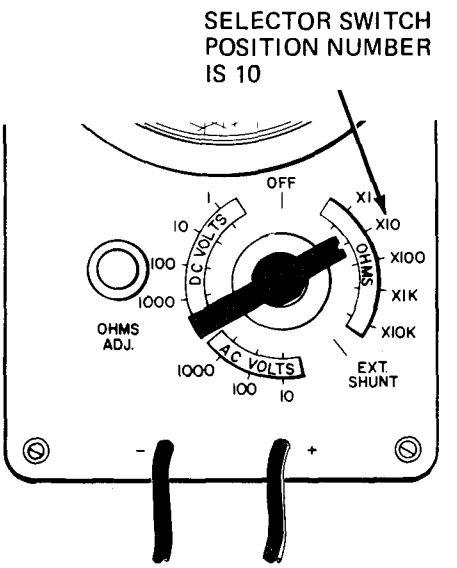
- If pointer falls exactly on a numbered line read multimeter as follows

  a. Look at OHMS scale and see which numbered line pointer is on: 30




b. See what selector switch position number is: 10

c. Multiply number from step a by number from step b to get multimeter reading:
30 X 10 = 300 ohms




GO

TA 119937

Figure 29-4 (Sheet 7 of 10)

GO

7

- If Pointer is Between Numbered Lines Read Multimeter as Follows:

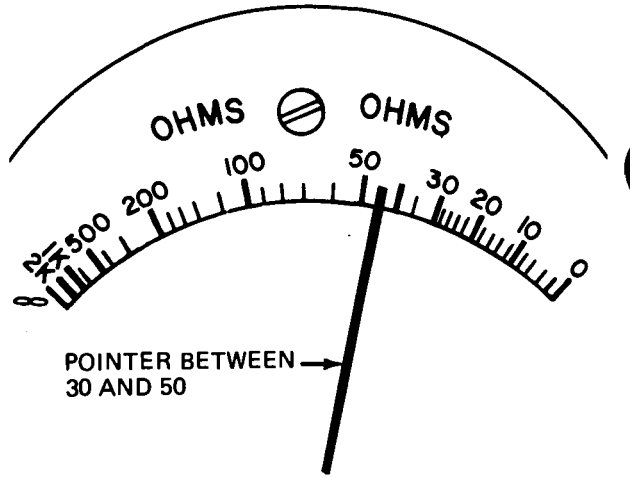
  a. Look at OHMS scale and see which two numbers the pointer is between. Subtract smaller number from larger number to get span: 50 - 30 = 20

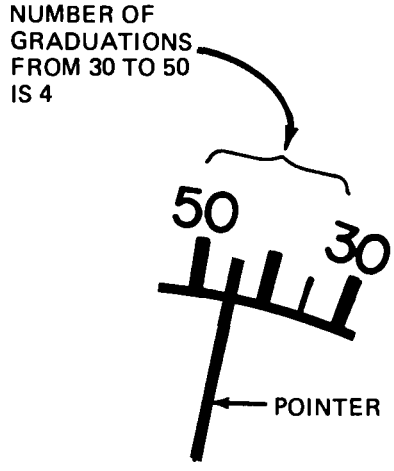
b. Count number of graduations from smaller number to larger number: 4

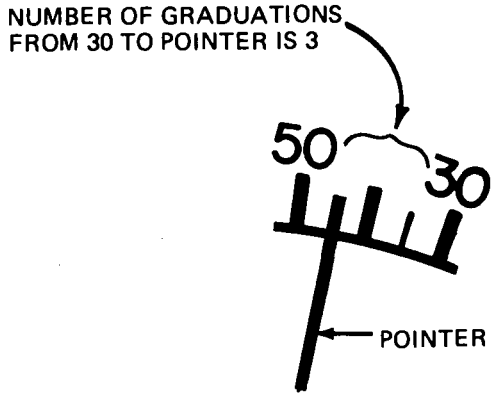
c. Divide span (step a) by number of graduations (step b) to get value of each graduation: 20 ÷ 4 = 5

d. Count number of graduations from smaller number to pointer: 3

GO




TA 119938

Figure 29-4 (Sheet 8 of 10)

GO

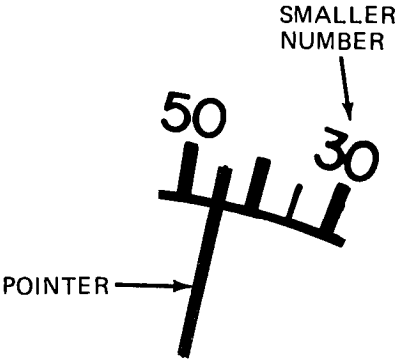
8

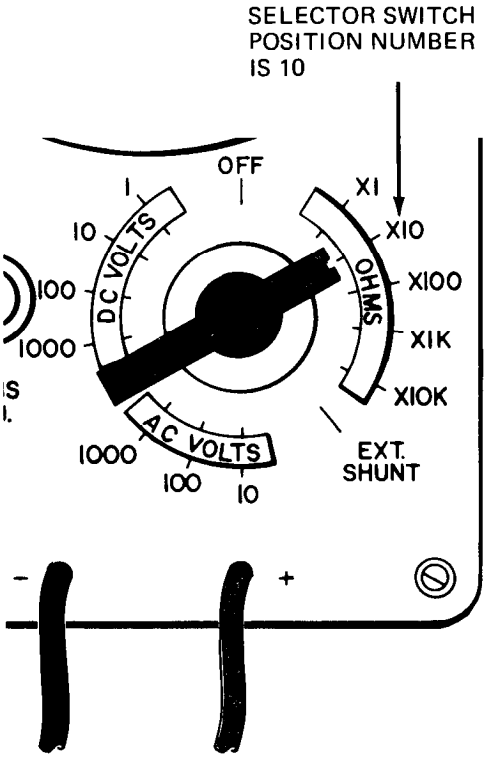
a. Multiply number from step 7d by value from step 7c to get total value of graduations: 3 X 5 = 15

b. Add total value of graduations (step a) to smaller number to get scale reading: 15 + 30 = 45

c. Multiply scale reading (step b) by selector switch position number to get multimeter reading: 45 X 10 = 450 ohms

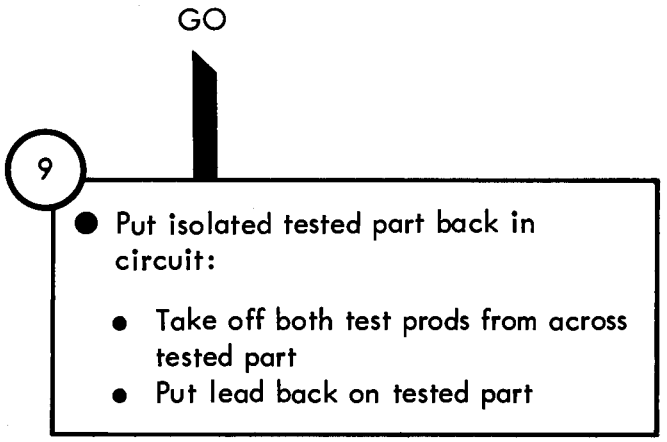
GO




TA 119939

Figure 29-4 (Sheet 9 of 10)



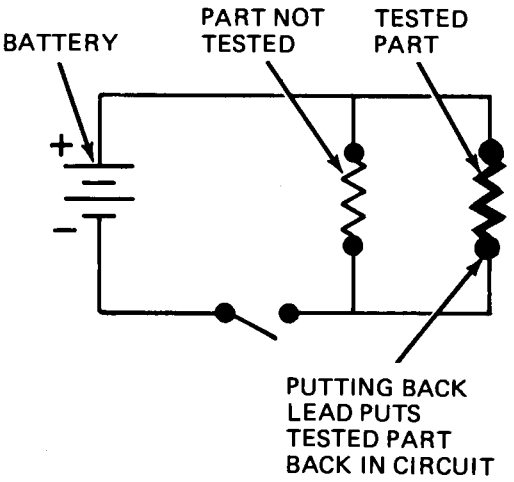
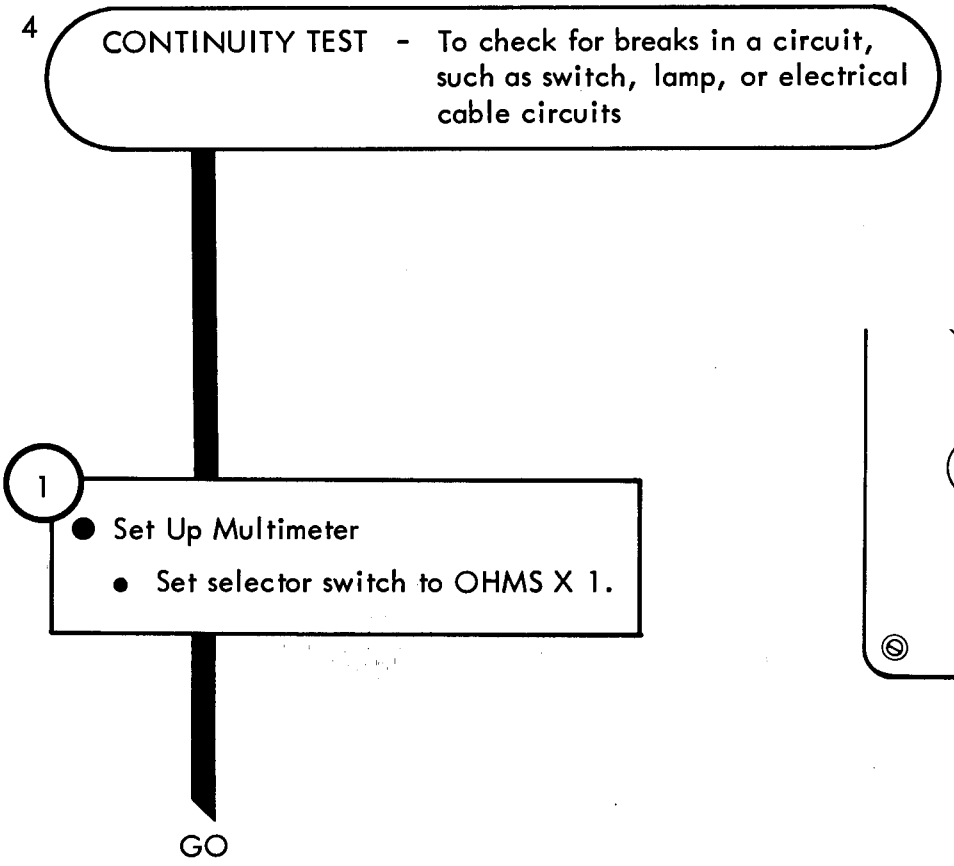
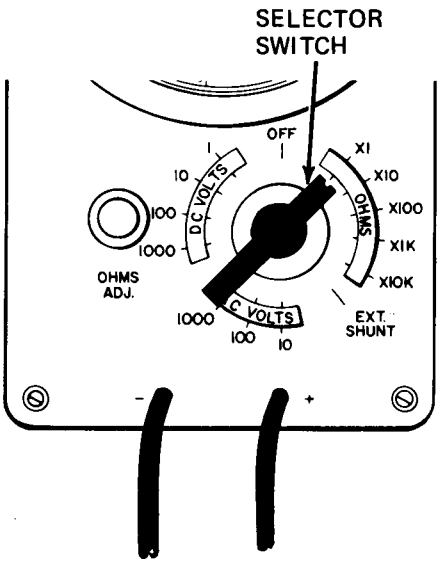




Figure 29-4 (Sheet 10 of 10)




TA 119940

Figure 29-5 (Sheet 1 of 4)

GO

NOTE

Detailed steps for making the truck circuits ready for continuity tests are in the fault isolation procedures. The steps given here are typical

2

- Make tested circuit ready for continuity test

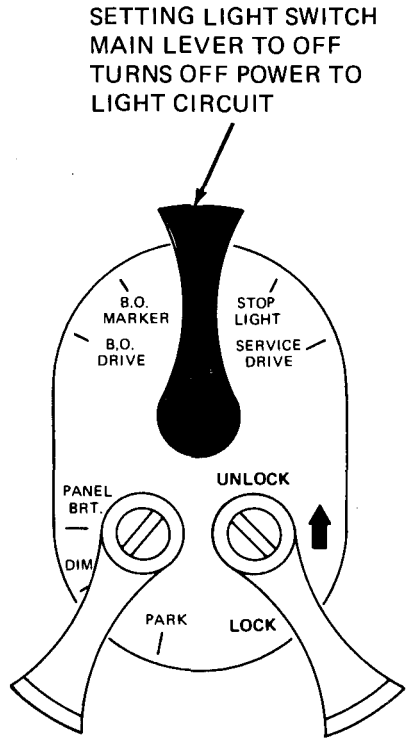
CAUTION

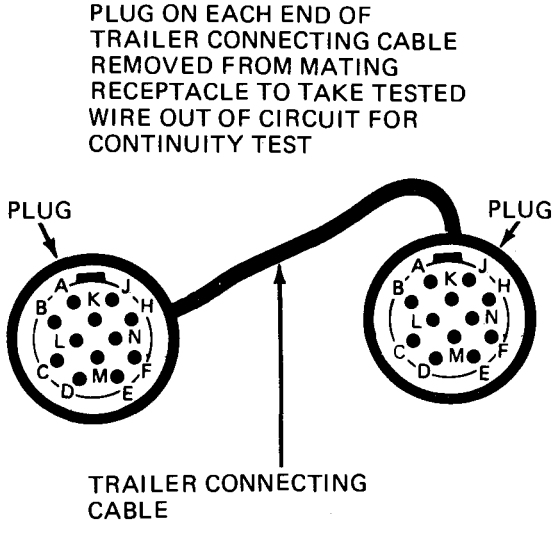
If power to tested part is not turned off, multimeter will be damaged

- Turn off power to tested circuit

- Take tested wire out of circuit

GO




TA 119941

Figure 29-5 (Sheet 2 of 4)

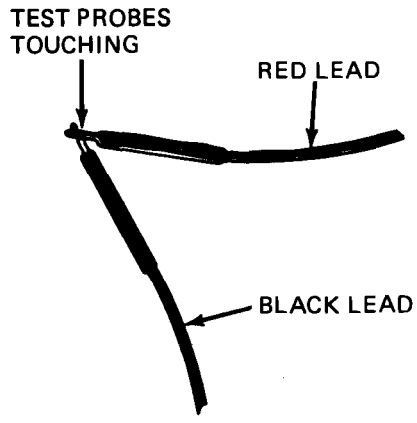
GO

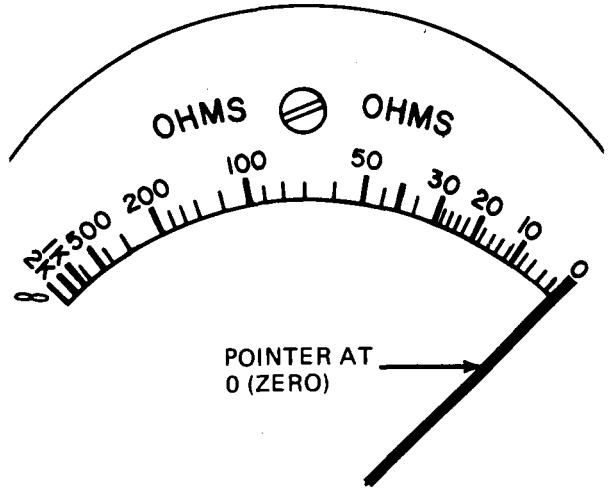
3

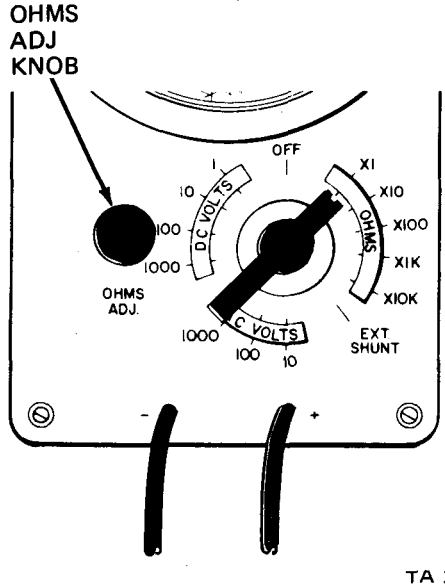
- Zero The Multimeter:
  - Touch multimeter test probes together.

- While touching multimeter test probes together look at OHMS scale. Pointer should be at 0 (zero). If it is not, turn OHMS ADJ knob to move pointer to 0.

GO




TA 119942

Figure 29-5 (Sheet 3 of 4)

GO

4

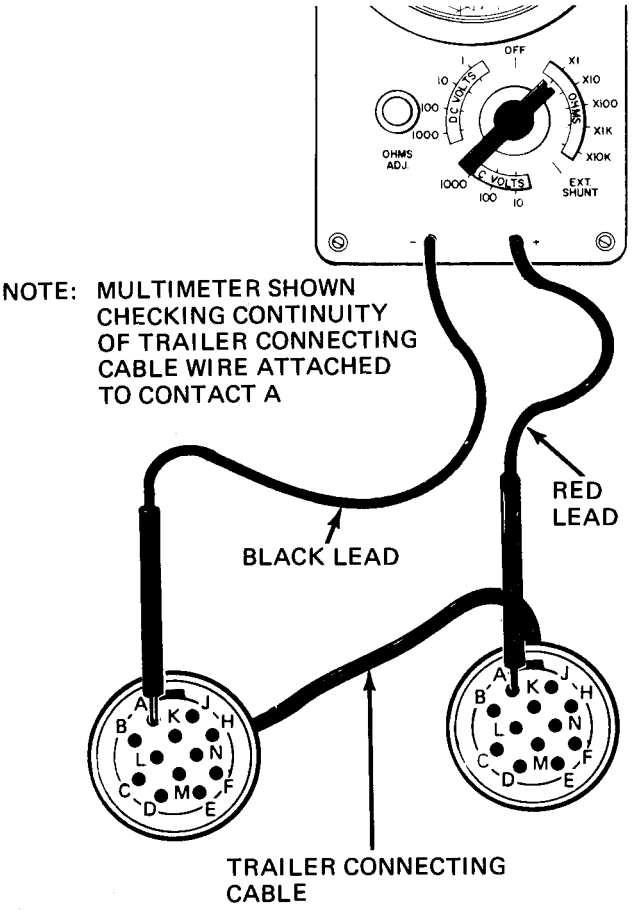
- Put multimeter leads across tested circuit
  - Put test prod of black lead (-) on one contact of tested circuit
  - Put test prod of red lead (+) on other contact of tested circuit

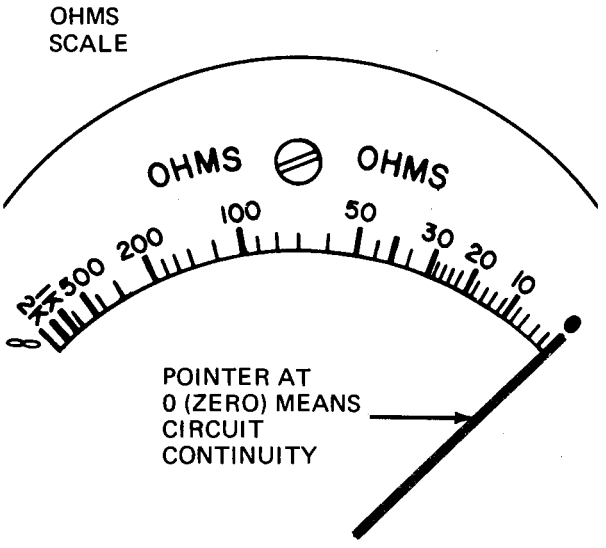
5

- Read multimeter
  - Look at multimeter OHMS scale. For continuity, pointer should be all the way to far right over 0 (zero)
  - If pointer stays all the way to left, tested circuit is open. If pointer jumps or flickers, tested circuit has a loose connection

6

- Put tested circuit back in operation
  - Take off both test prods from tested circuit
  - Put back any plugs or other parts previously removed to take tested wire out of circuit




TA 119943

Figure 29-5 (Sheet 4 of 4)

Test

5 SHORT TEST - To check for shorts in electrical cables.

NOTE

A short (or short circuit) happens when two circuits that should not be connected have metal-to-metal contact with each other. A short also happens when a circuit that should not touch electrical ground has metal-to-metal contact with ground.

1

- Set Up Multimeter:
  - Set selector switch to OHMS X 10K.

NOTE

Detailed steps for making the truck circuits ready for short test are in the fault isolation procedures. The steps given here are typical.

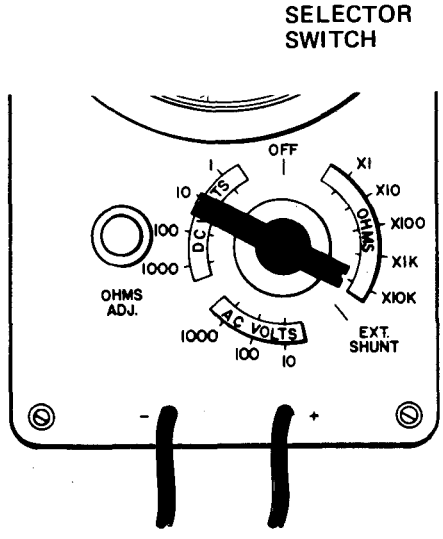
2

- Make Tested Circuits Ready for Short Test:

CAUTION

If power to tested part is not turned off, multimeter will be damaged

GO




TA 119944

Figure 29-6 ( Sheet 1 of 5)

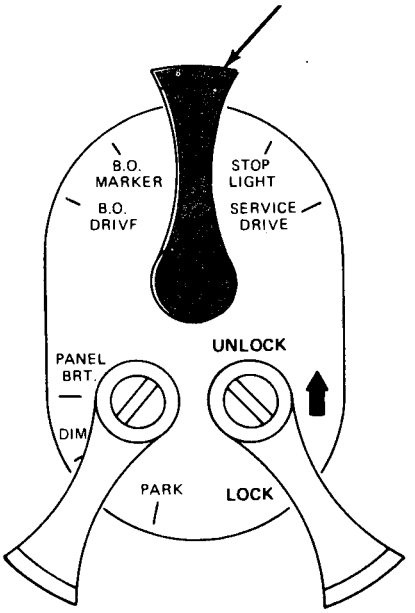
GO

- Turn off power to tested circuit.

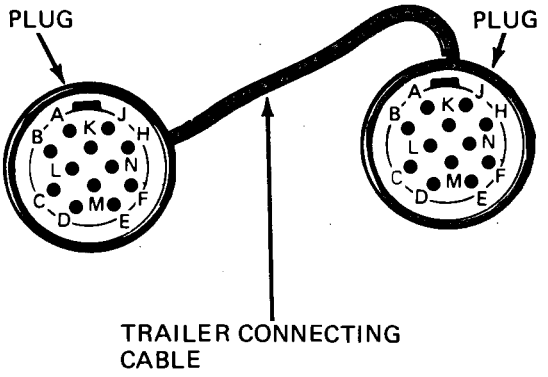
- Take tested wire out of circuit

GO

SETTING LIGHT SWITCH MAIN LEVER TO OFF TURNS OFF POWER TO LIGHT CIRCUITS.




PLUG ON EACH END OF TRAILER CONNECTING CABLE REMOVED FROM MATING RECEPTACLE TO TAKE TESTED WIRE OUT OF CIRCUIT FOR SHORT TEST




TA 119945

Figure 29-6 (Sheet 2 of 5)

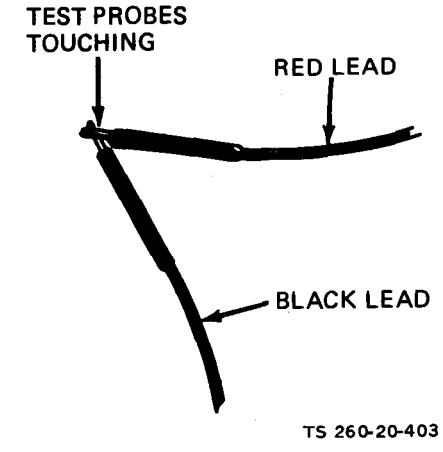
GO

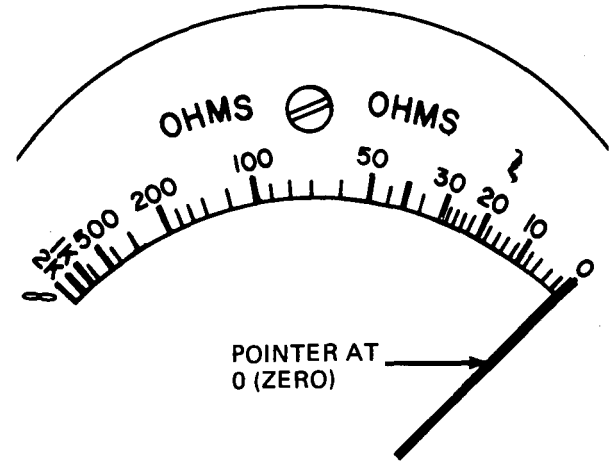
3

- Zero the Multimeter:
  - Touch multimeter test probes together

- While touching multimeter test probes together look at OHMS scale. Pointer should be at 0 (zero). If it is not, turn OHMS ADJ knob to move pointer to 0

GO



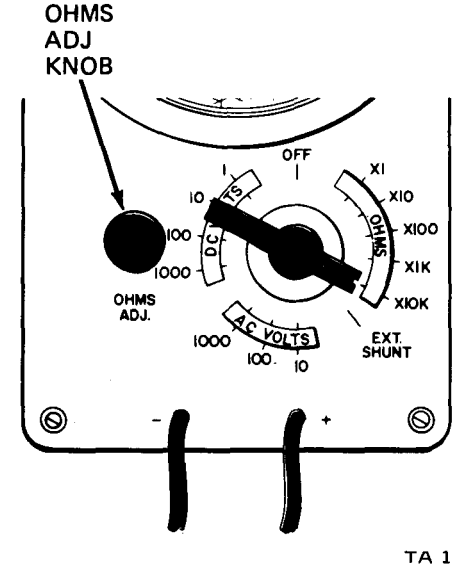
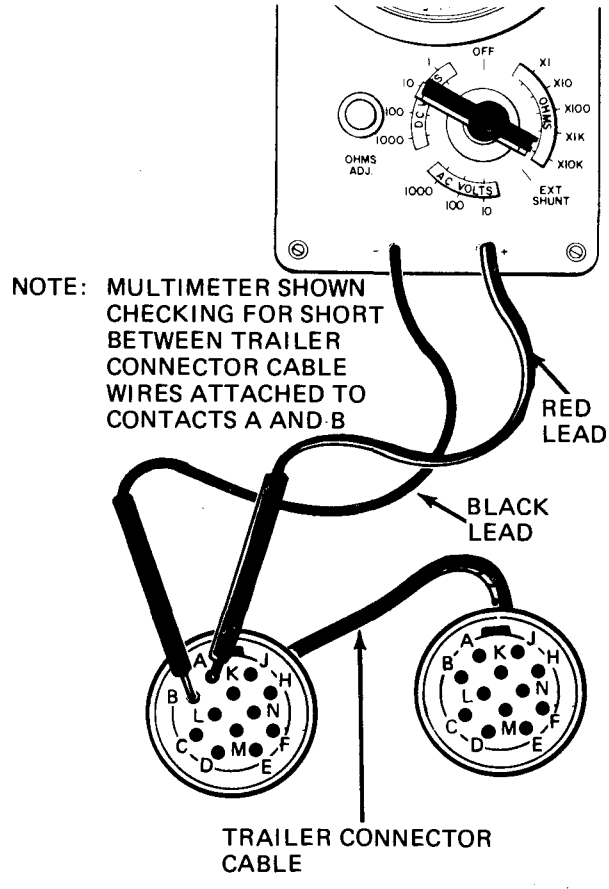




Figure 29-6 (Sheet 3 of 5)

GO

4

- Put multimeter leads across tested circuits
  - To test for short between two wires, put test probes on contacts of both wires




GO

TA 119947

Figure 29-6 ( Sheet 4 of 5)

GO

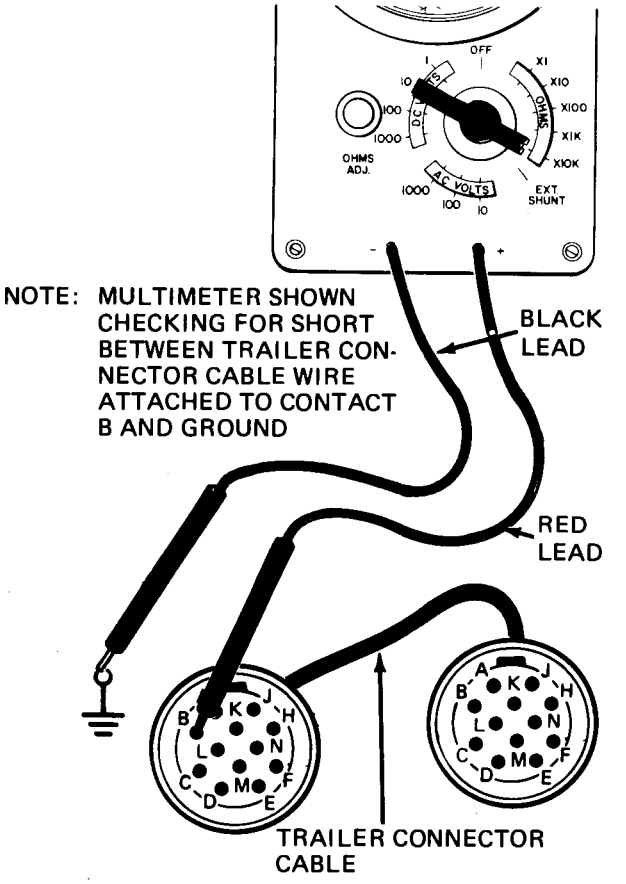
- To test for short between a wire and ground, put test probes on wire contact and ground

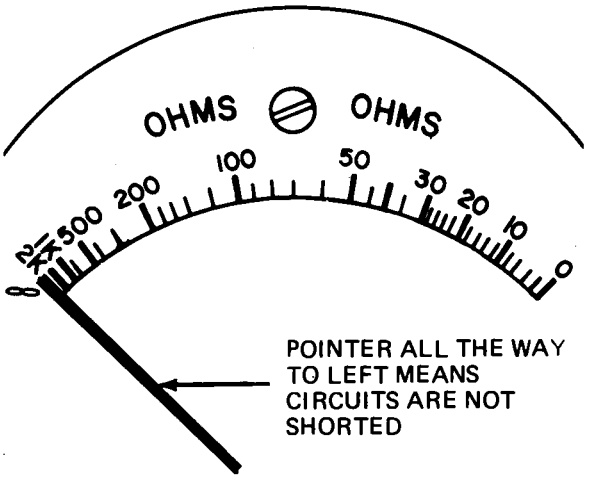
5

- Read multimeter
  - Look at multimeter OHMS scale. If pointer stays all the way to far left without moving, circuits are not shorted
  - If pointer moves all the way to far right over 0 (zero), circuits are shorted. If pointer jumps or flickers, circuits are sometimes shorted

6

- Put tested circuit back in operation
  - Take off test prods from contacts and ground
  - Put back any plugs or other parts previously removed to take tested wire out of circuit




TA 119948

Figure 29-6 (Sheet 5 of 5)

1

DC VOLTAGE TEST - To measure battery voltage, charging system output, and voltage drops at various test points

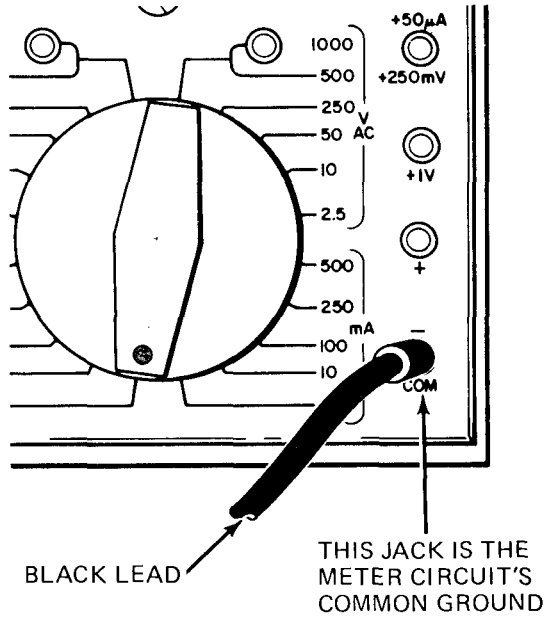
1

- Set up multimeter test leads
  - Put jack plug of black (-) test lead into COM - jack

  Note: The highest truck DC voltage that is measured is about 28 volts. Therefore, the multimeter red (+) lead is never put into the 1000 VDC jack

  - See table to find out which jack to put red (+) lead into. Table shows which jack to use when normal value of measured voltage is known or unknown

GO




| IF NORMAL VALUE OF VOLTAGE BEING MEASURED IS THIS: | PUT RED LEAD INTO THIS JACK ON RIGHT SIDE OF MULTIMETER: |
|---|---|
| 0 TO 230 MILLIVOLTS | +50 μA +250mV |
| 230 MILLIVOLTS TO 0.8 VOLTS | +1V |
| 0.8 TO 2 VOLTS | + |
| 2 TO 8 VOLTS | + |
| 8 TO 40 VOLTS | + |
| UNKNOWN | + |

TA 119950

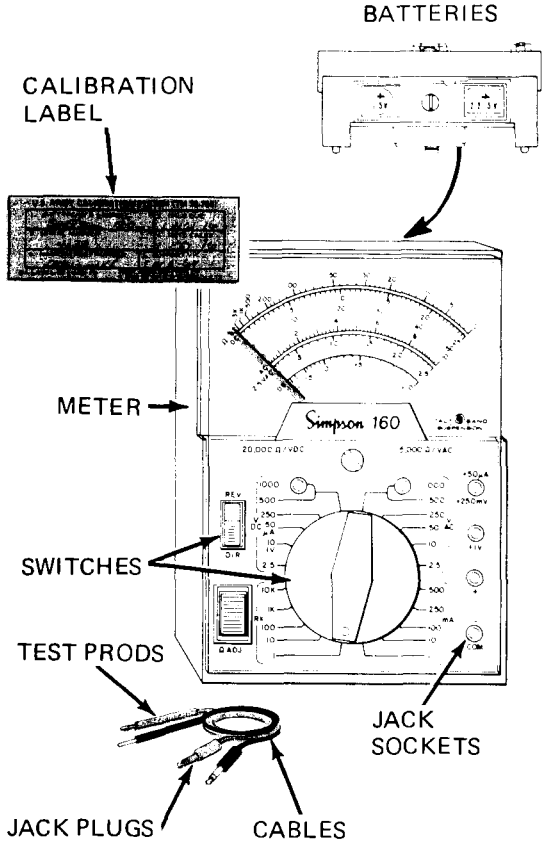
Figure 29-7

# MULTIMETER SIMPSON 160 TEST PROCEDURES

## GENERAL INSTRUCTIONS

- Check that multimeter is ready for use
  - Calibration label - Check to be sure multimeter has been calibrated in the last 12 months
  - Meter - Glass and pointer not broken. Pointer should be resting over zero mark at left side of scales
  - Jack sockets - Open and dirt free
  - Batteries - Not corroded or leaking Put in right

- Cables - No cuts, sharp kinks or bad fraying
- Jack plugs - Tight on cable, prods clean
- Test prods - Tight on cable, tip free of paint or anything that might be an insulator
- Switches - Work freely without binding or scraping

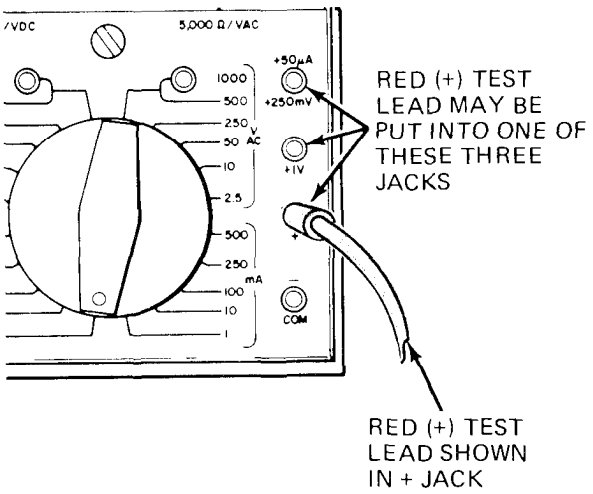



TA 119949

Figure 29-8 (sheet 1 of 13)

GO

- Put jack plug of red (+) test lead into jack receptacle you picked on right side of multimeter

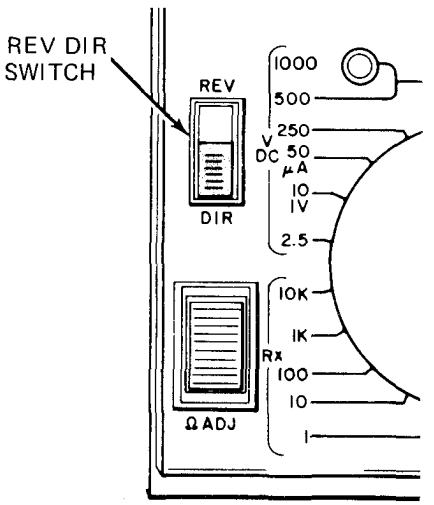



2

- Set up multimeter switches

  Note: The Ω ADJ knob is not used for DC voltage tests

  - Set REV DIR switch to DIR




- See table to find out setting of function/range switch. Table shows switch setting when normal value of measured voltage is known or unknown

| IF NORMAL VALUE OF VOLTAGE BEING MEASURED IN THIS: | SET FUNCTION/RANGE SWITCH TO: |
|---|---|
| 0 TO 230 MILLIVOLTS | 50 μA |
| 230 MILLIVOLTS TO 0.8 VOLTS | 10 1V |
| 0.8 TO 2 VOLTS | 2.5 |
| 2 TO 8 VOLTS | 10 1V |
| 8 TO 40 VOLTS | 50 μA |
| UNKNOWN | 50 μA |

GO

TA 119951

Figure 29-8 (Sheet 2 of 13)

GO

- Set function/range switch to setting you picked

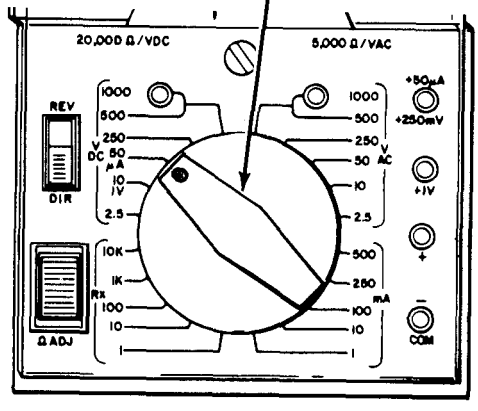
**NOTE**

When you need to turn on power before measuring DC voltage, the fault isolation procedure gives the turn-on instructions

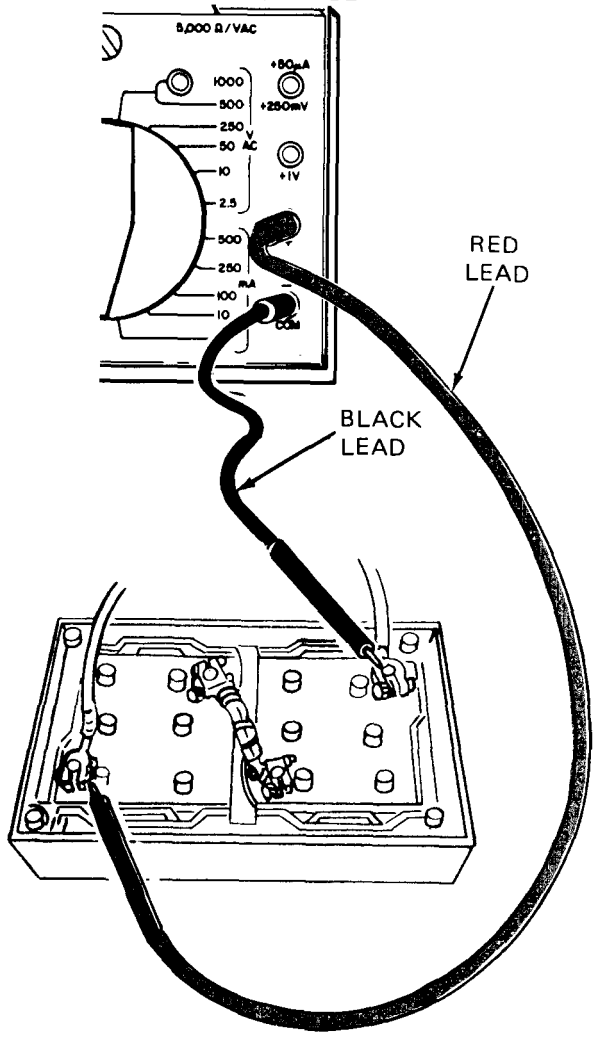
3

- Put multimeter leads across (in parallel with) circuit being measured
  - Put test prod of black lead (-) on negative terminal of circuit being measured
  - Put test prod of red lead (+) on positive terminal of circuit being measured

GO




NOTE: MULTIMETER SHOWN MEASURING +24 VOLTS DC BATTERY VOLTAGE



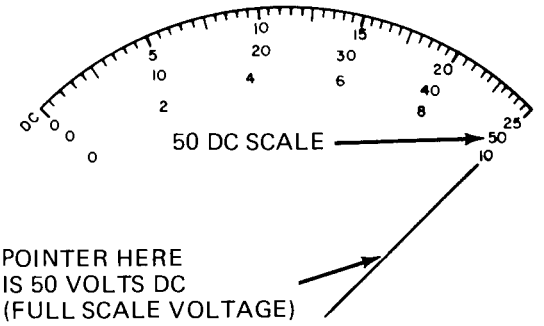

TA 119952

Figure 29-8 (Sheet 3 of 13)

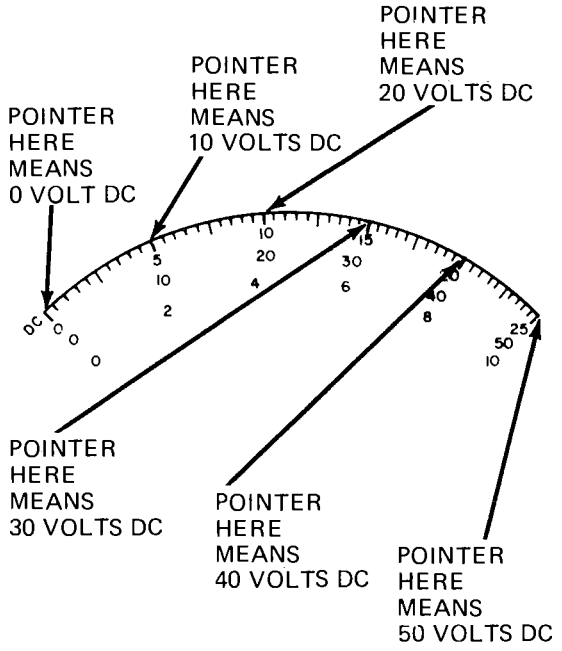
GO

4

- If normal value of voltage being measured is 8 to 40 volts or unknown, read multimeter as follows
  - Use 50 DC scale. Full scale voltage is 50 volts DC




- Read each numbered line as shown



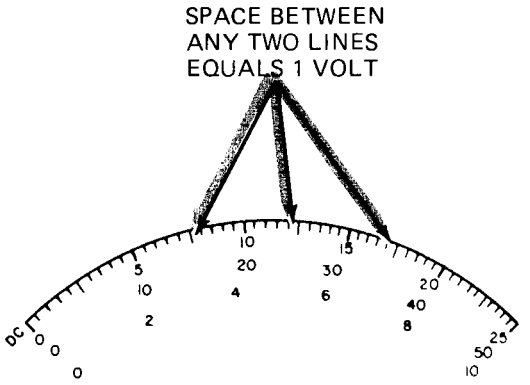

GO

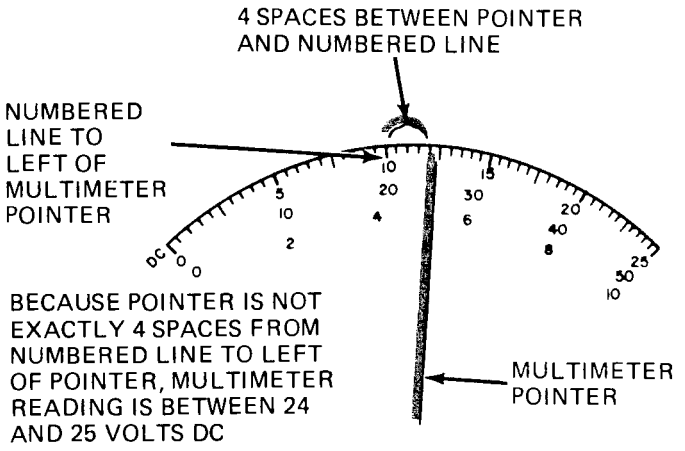
TA 119953

Figure 29-8 (Sheet 4 of 13)

GO

- Each space between lines equals 1 volt




- Get multimeter reading as follows:

| | Step A | Step B | Step C |
|---|---|---|---|
| | Read first numbered line to left of pointer | Count number of spaces between pointer and numbered line to left of pointer | Add numbers from steps A and B |
| Example: | 20 | 4 | 20 + 4 = 24 volts DC |

GO

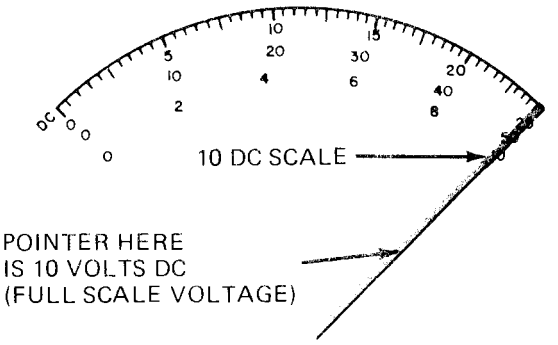
TA 119954

Figure 29-8 (Sheet 5 of 13)

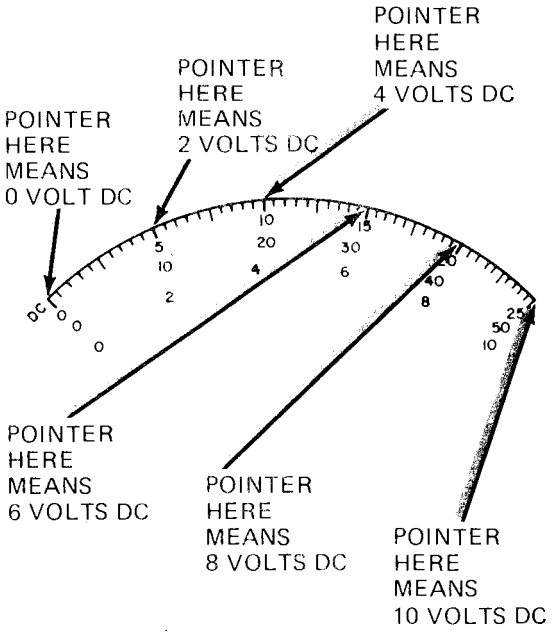
GO

5

- If normal value of voltage being measured is 2 to 8 volts, read multimeter as follows
  - Use 10 DC scale. Full scale voltage is 10 volts DC




- Read each numbered line as shown



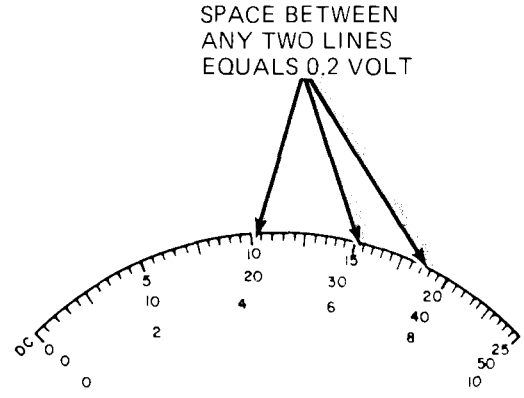

GO

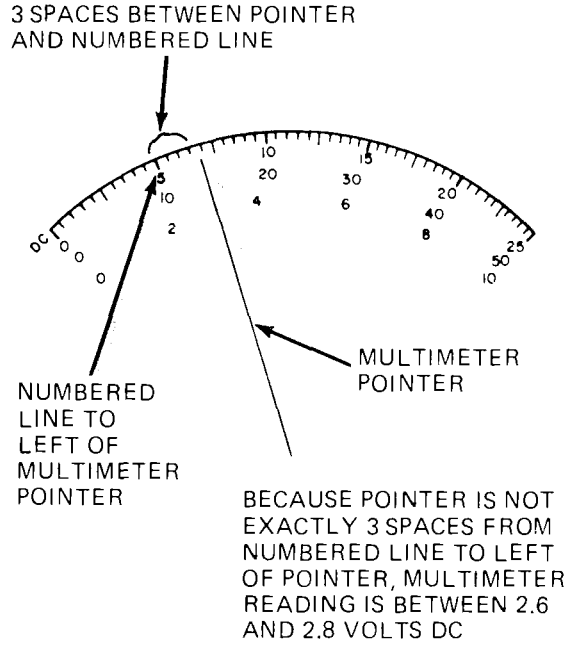
TA 119955

Figure 29-8 (Sheet 6 of 13)

GO

- Each space between lines equals 0.2 volt




- Get multimeter reading as follows:

| Step A | Step B | Step C | Step D |
|---|---|---|---|
| Read first numbered line to left of pointer | Count number of spaces between pointer and first numbered line to left of pointer | Multiply number from step B by 0.2 | Add numbers from steps A and C |
| Example: 2 | 3 | 3 x 0.2 = 0.6 | 2 + 0.6 = 2.6 volts DC |

GO

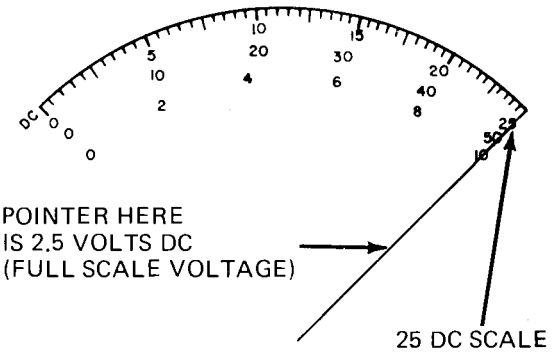
TA 119956

Figure 29-8 ( Sheet 7 of 13)

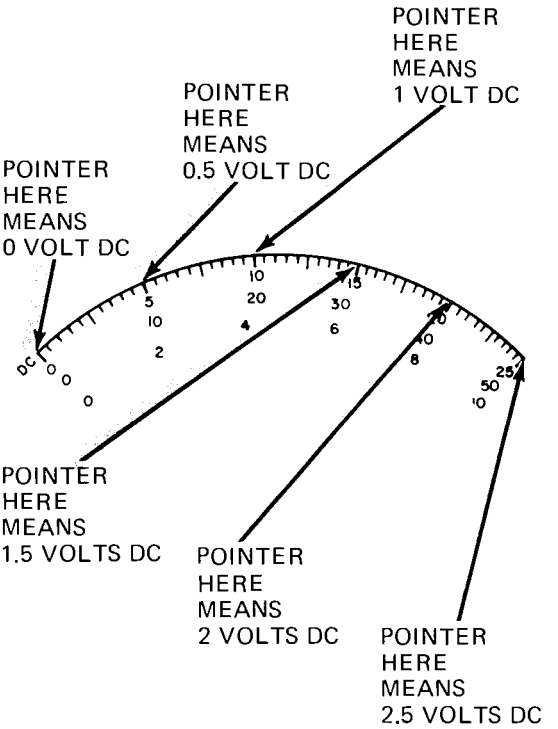
GO

6

- If normal value of voltage being measured is 0.8 to 2 volts, read multimeter as follows:
  - Use 25 DC scale. Full scale voltage is 2.5 volts DC.




- Read each numbered line as shown



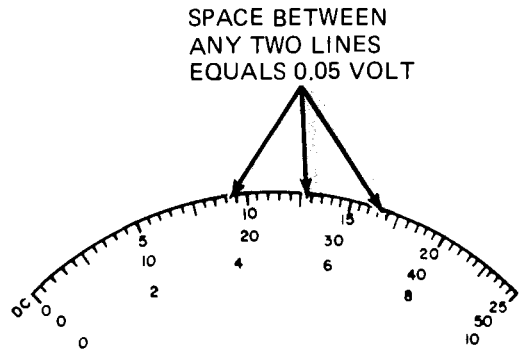

GO

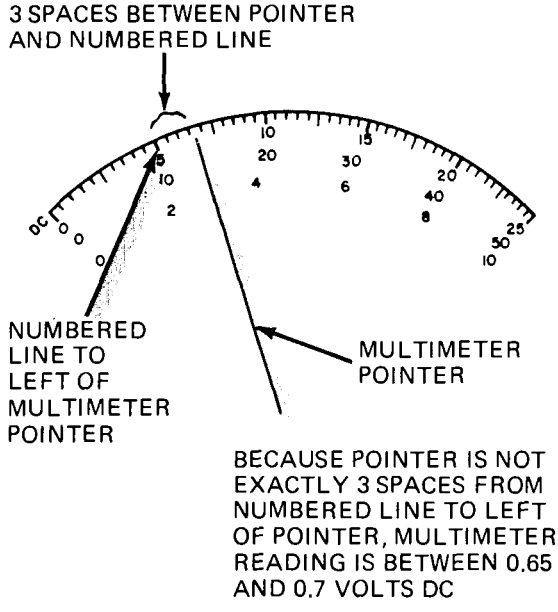
TA 119957

Figure 29-8 (Sheet 8 of 13)

GO

- Each space between lines equals 0.05 volt




- Get multimeter reading as follows:

| Step A | Step B | Step C | Step D |
|---|---|---|---|
| Read first numbered line to left of pointer. Divide number by 10 | Count number of spaces between pointer and first numbered line to left of pointer | Multiply number from step B by 0.05 | Add numbers from steps A and C |
| Example: 0.5 | 3 | 3 x 0.05 = 0.15 | 0.5 + 0.15 = 0.65 volt DC |

GO

TA 119958

Figure 29-8 (Sheet 9 of 13)

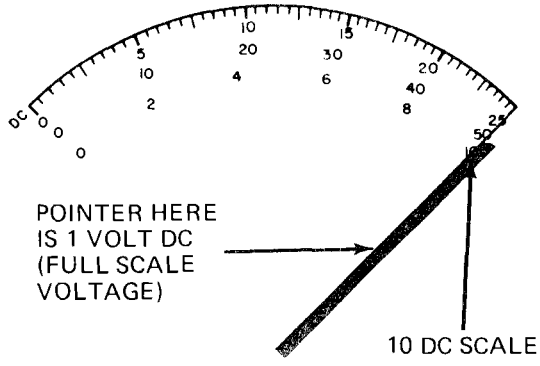
GO

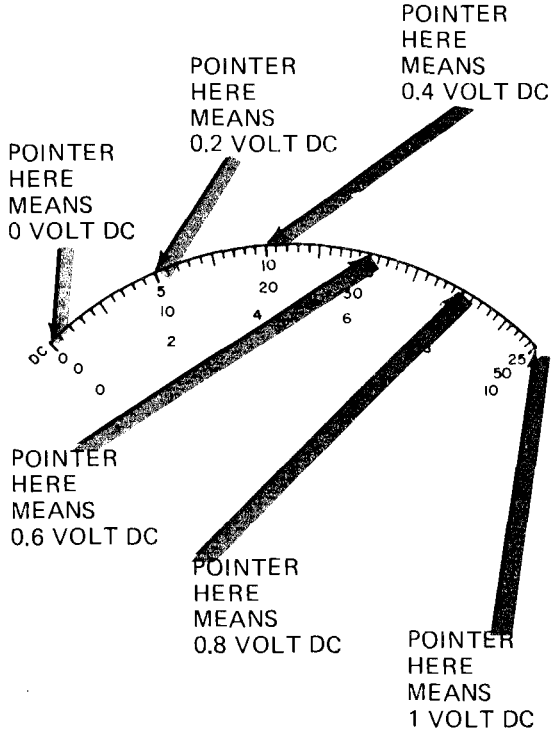
7

- If normal value of voltage being measured is 230 millivolts to 0.8 volts read multimeter as follows:
  - Use 10 DC scale. Full scale voltage is 1 volt DC

- Read each numbered line as shown

GO



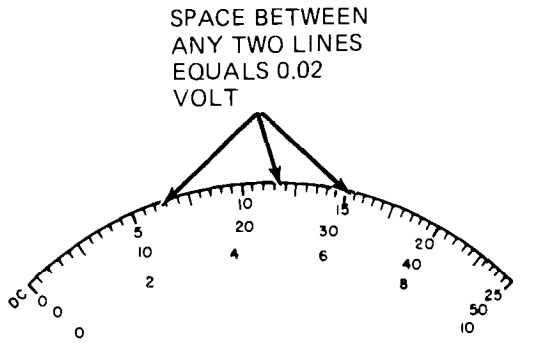



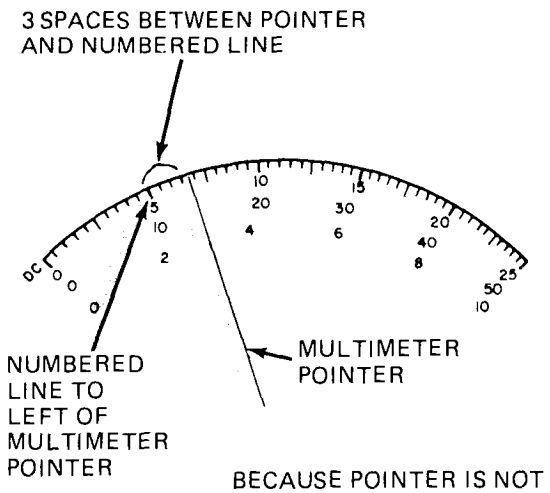

TA 119959

Figure 29-8 (Sheet 10 of 13)

GO

- Each space between lines equals 0.02 volt




- Get multimeter reading as follows:

| Step A | Step B | Step C | Step D |
|---|---|---|---|
| Read first numbered line to left of pointer. Divide number by 10 | Count number of spaces between pointer and first numbered line to left of pointer | Multiply number from step B by 0.02 | Add numbers from steps A and C |
| Example: 0.2 | 3 | 3 x 0.02 = 0.06 | 0.2 + 0.06 = 0.26 volt DC |

GO

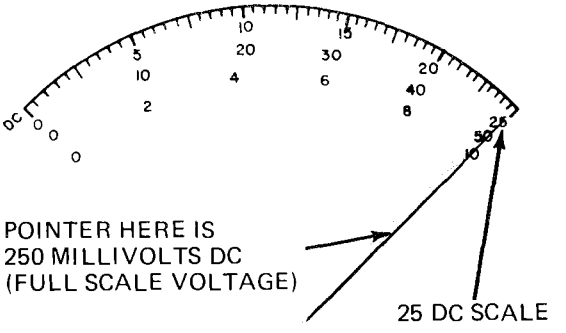
TA 119960

Figure 29-8 (Sheet 11 of 13)

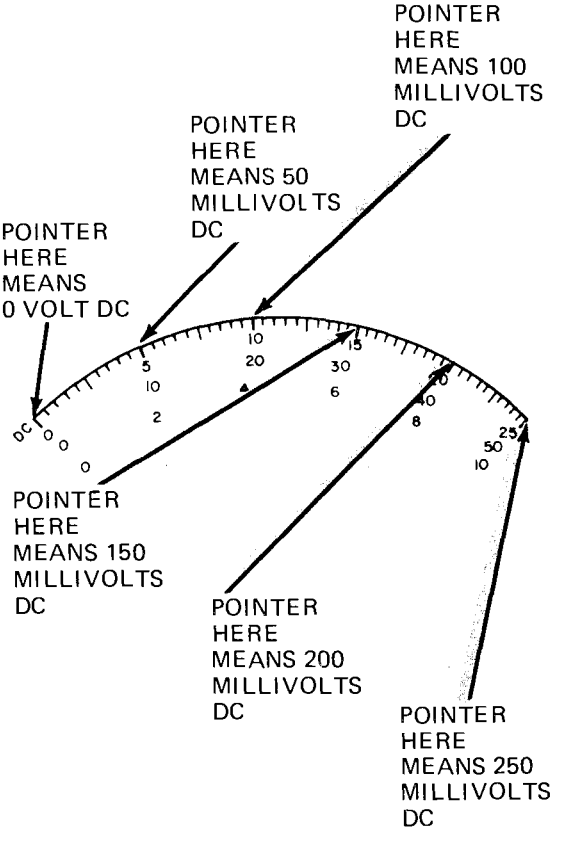
GO

8

- If normal value of voltage being measured is 0 to 230 millivolts read multimeter as follows:
  - Use 25 DC scale. Full scale voltage is 250 millivolts DC




- Read each numbered line as shown



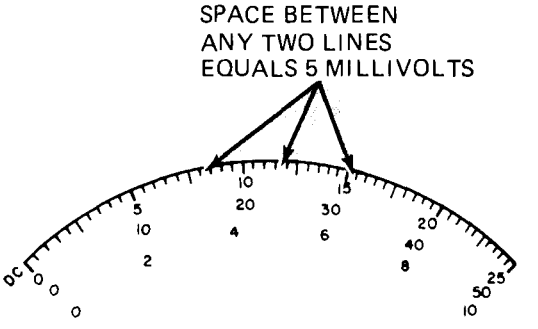

GO

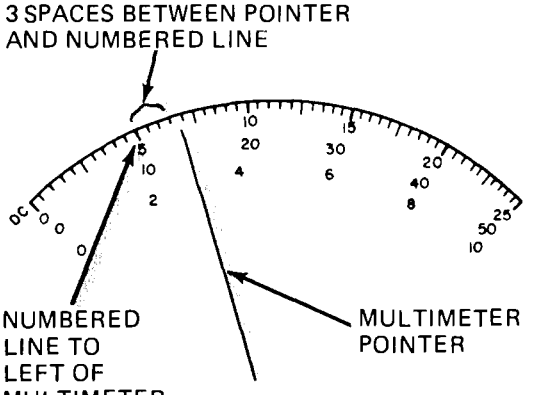
TA 119961

Figure 29-8 (Sheet 12 of 13)

GO

- Each space between lines equals 5 millivolts




BECAUSE POINTER IS NOT EXACTLY 3 SPACES FROM NUMBERED LINE TO LEFT OF POINTER, MULTIMETER READING IS BETWEEN 65 AND 70 MILLIVOLTS DC

- Get multimeter reading as follows:

| | Step A | Step B | Step C | Step D |
|---|---|---|---|---|
| | Read first numbered line to left of pointer | Count number of spaces between pointer and first numbered line to left of pointer | Multiply number from step B by 5 | Add numbers from steps A and C |
| Example: | 50 | 3 | 3 x 5 = 15 | 50 + 15 = 65 millivolts DC |

9

- Make circuit normal again.
  - Take both test prods off measured circuit.

TA 119962

Figure 29-8 (Sheet 13 of 13)

2 AC VOLTAGE TEST - To measure van input and operating voltages

1

- Set Up Multimeter As Follows:

  Note: The truck AC voltages measured are 208 and 120 volts. Therefore, only the 250 VAC function/range switch position is used

  - Set function/range switch to 250 VAC
  - Set REV DIR switch to DIR

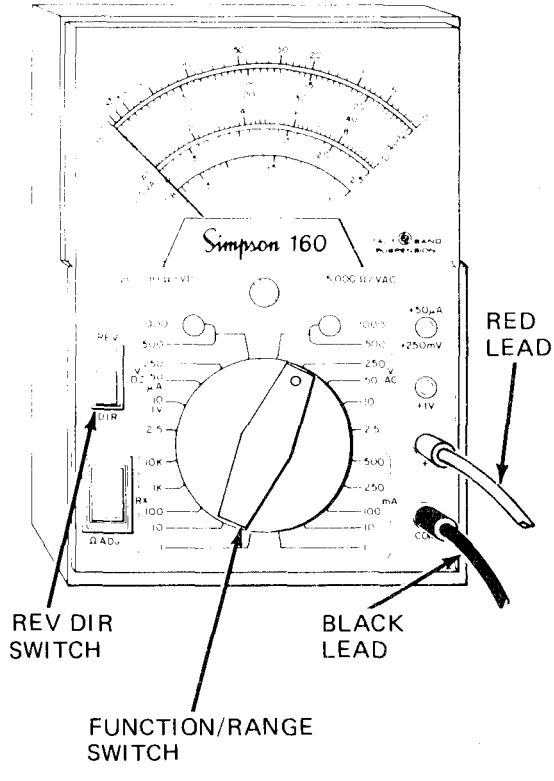
    Note: The Ω ADJ knob is not used for DC voltage tests

  - Put jack plug of black test lead into COM - jack receptacle
  - Put jack plug of red test lead into + jack receptacle

NOTE

When you need to turn on power before measuring AC voltage, the fault isolation procedure gives the turn-on instructions

GO




TA 119963

Figure 29-9 (Sheet 1 of 4)

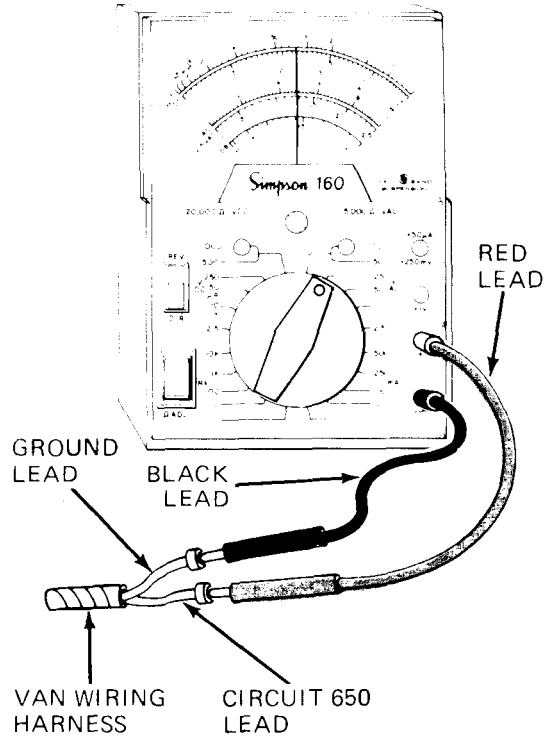
GO

2

- Put multimeter lead across (in parallel with) circuit being measured

  Note: In AC voltage measurement you can hook up the test lead connections to the circuit either way. You will still get correct multimeter readings and no damage will be done to the multimeter. But, when one side of the circuit is electrical ground, it is a good idea to put the black lead on electrical ground.

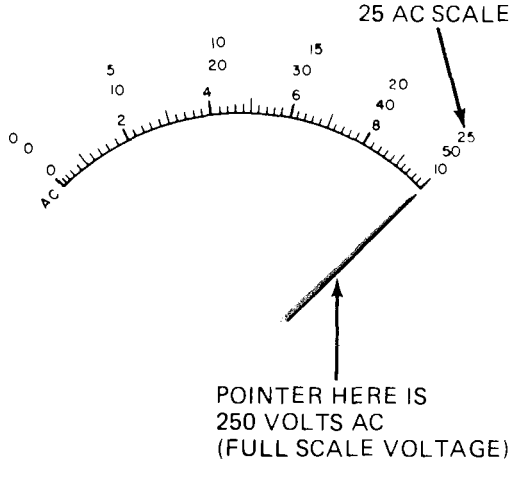
  - Put test prod of black lead on ground side or one side of the circuit being tested. Put test prod of red lead on other side of circuit being measured




NOTE: MULTIMETER SHOWN MEASURING 120 VOLTS AC VAN CEILING LIGHT VOLTAGE.

3

- Read multimeter
  - Use 25 AC scale. Full scale voltage is 250 volts AC




GO

TA 119964

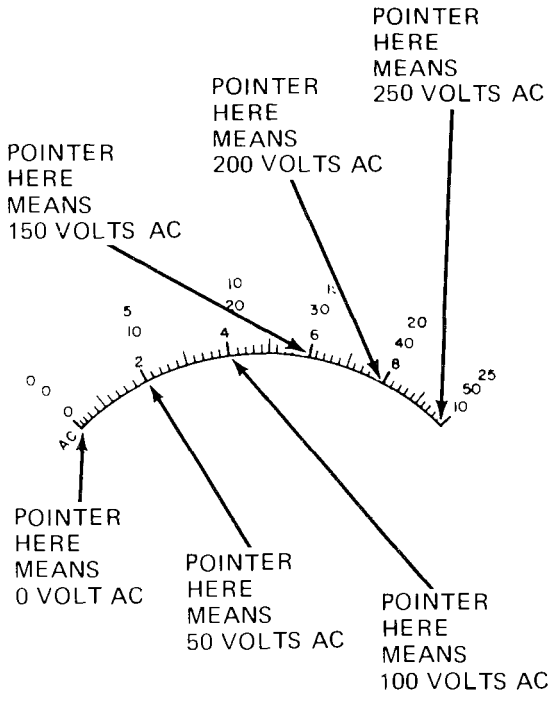
Figure 29-9 (Sheet 2 of 4)

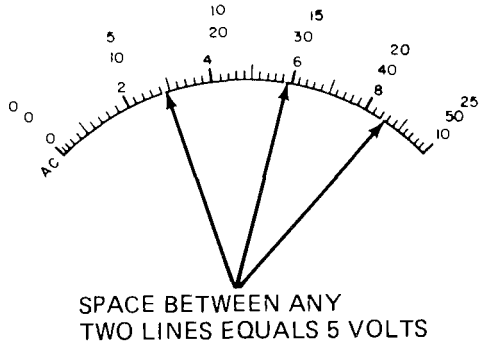
GO

- Read each numbered line as shown

- Each space between lines equals 5 volts

GO

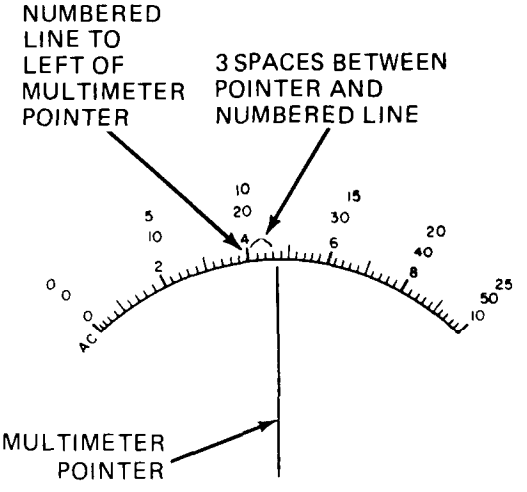



TA 119965

Figure 29-9 (Sheet 3 of 4)

GO




- Get multimeter reading as follows:

| Step A | Step B | Step C | Step D |
|---|---|---|---|
| Read first numbered line to left of pointer. Multiply number by 10. | Count number of spaces between pointer and first numbered line to left of pointer. | Multiply number from step B by 5. | Add numbers from steps A and C. |
| Example: 100 | 3 | 3 x 5 = 15 | 100 + 15 = 115 volts AC |

4

- Make circuit normal again
  - Take both test prods off measured circuit

TA 119966

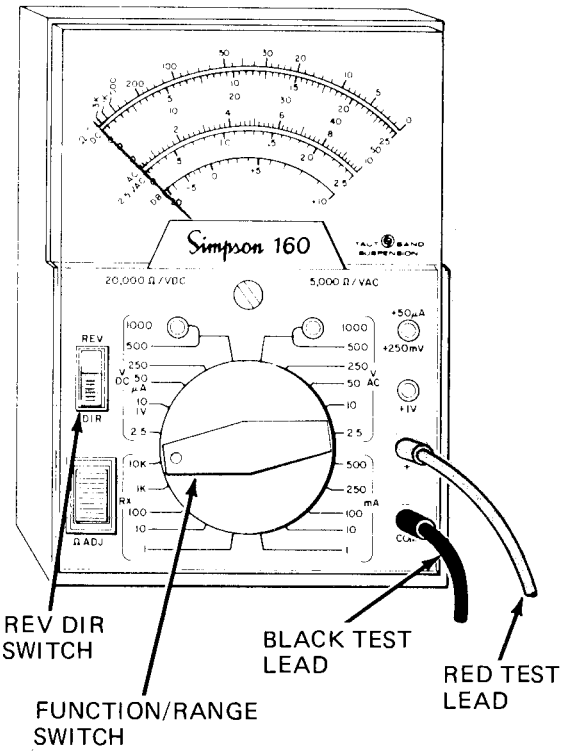
Figure 29-9 (Sheet 4 of 4)

3 Test

RESISTANCE TEST - To measure resistance of temperature sending unit, and blower motor resistor

1

- Set up multimeter
  - Set REV DIR switch to REV
  - Set function/range switch to 10K
  - Put jack plug of black test lead into COM - jack
  - Put jack plug of red test lead into + jack




NOTE

Detailed steps for making the truck parts ready for resistance test are in the fault isolation procedures. The steps given here are typical

2

- Make tested part ready for resistance test

GO

TA 119967

Figure 29-10 (Sheet 1 of 10)

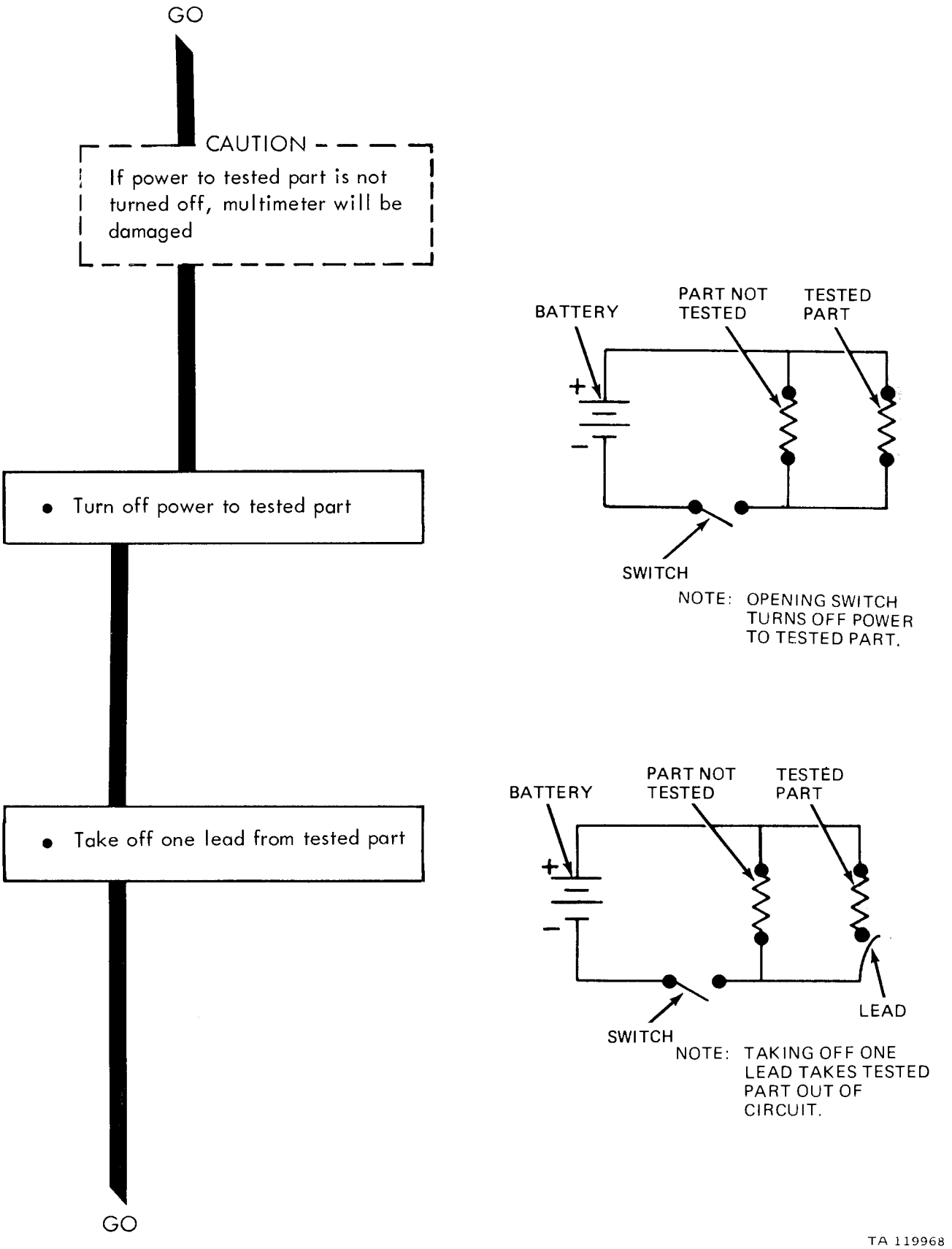
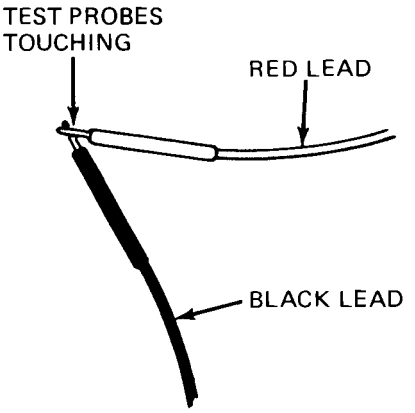


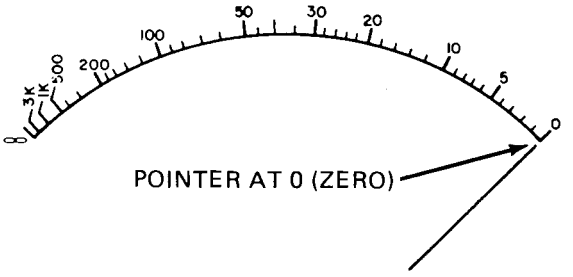

Figure 29-10 (Sheet 2 of 10)

GO

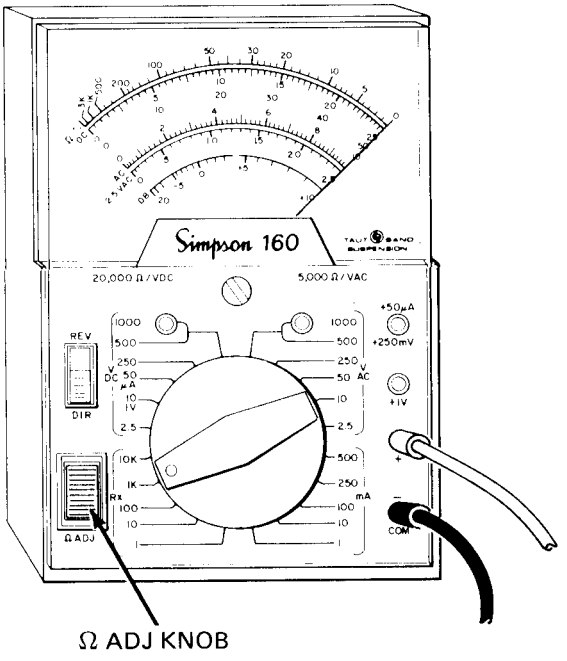
3

- Zero the multimeter
  - Touch multimeter test probes together




- While touching multimeter test probes together look at ohms scale. Pointer should be at 0 (zero). If it is not, turn Ω ADJ knob to move pointer to 0




GO

TA 119969

Figure 29-10 (Sheet 3 of 10)

GO

4

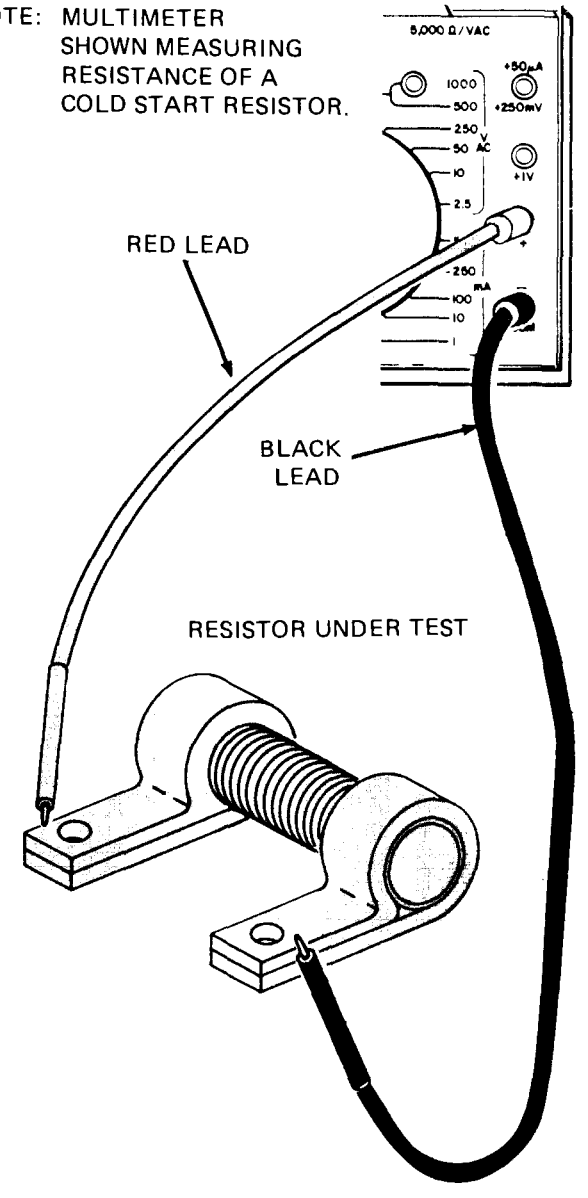
- Put multimeter leads across tested part
  - Put one test prod on one terminal of tested part
  - Put other test prod on other terminal of tested part

**NOTE**

Zero the multimeter each time you turn the function/range switch knob to another position. (See step 3)

GO

NOTE: MULTIMETER SHOWN MEASURING RESISTANCE OF A COLD START RESISTOR.




TA 119970

Figure 29-10 (Sheet 4 of 10)

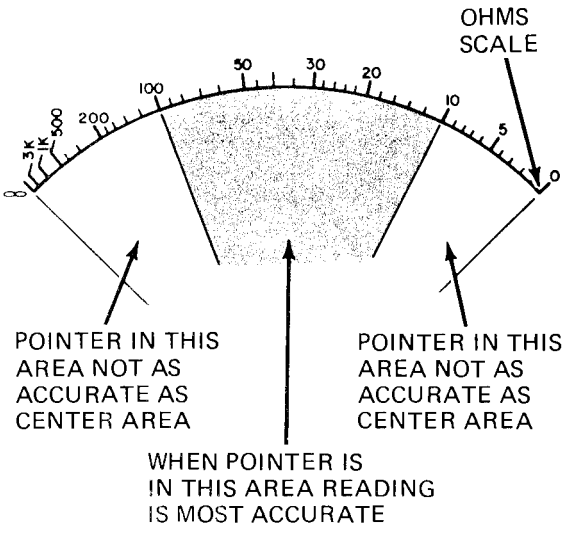
GO

5

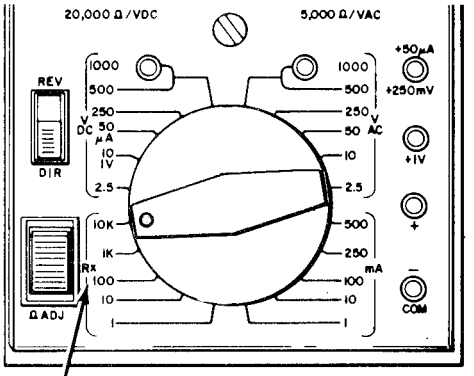
- Get the most accurate multimeter reading as follows:

  Note: The closer the multimeter pointer is to the center of the ohms scale, the more accurate the reading

  - Note position of pointer on ohms scale. Turn function/range knob to left while looking at pointer. Try to find function/range switch knob position that gives most centered pointer position




TS 260-20-325




ONLY THESE SWITCH POSITIONS USED FOR RESISTANCE MEASUREMENTS

NOTE: MOVING FUNCTION/ RANGE SWITCH KNOB TO LEFT MOVES POINTER TO LEFT

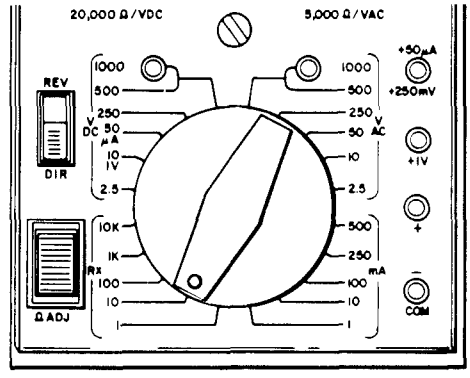
TA 119971

GO

Figure 29-10 (Sheet 5 of 10)

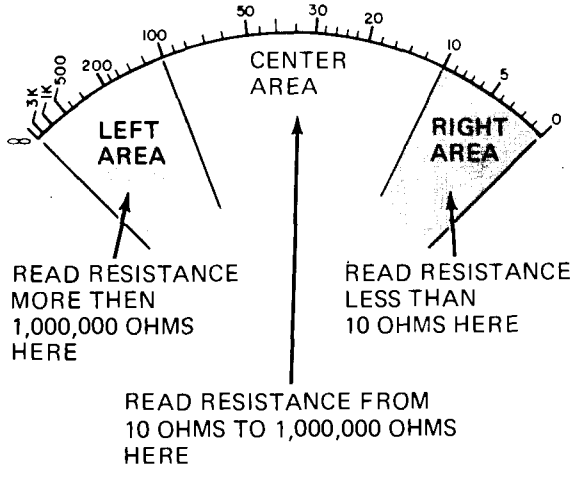
GO

- You may overshoot most centered pointer position. If you do, turn function/range switch knob to right to put pointer in most centered position




NOTE: MOVING FUNCTION/ RANGE SWITCH KNOB TO RIGHT MOVES POINTER TO RIGHT

- Pointer will stay in right area if resistance is less than 10 ohms. Pointer will stay in left area if resistance is more than 1,000,000 ohms
- Leave function/range switch in position that puts pointer in most centered position




GO

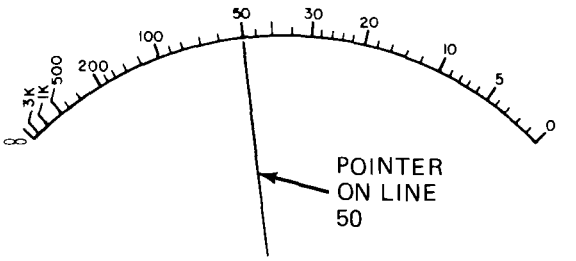
TA 119972

Figure 29-10 (Sheet 6 of 10)

GO

6

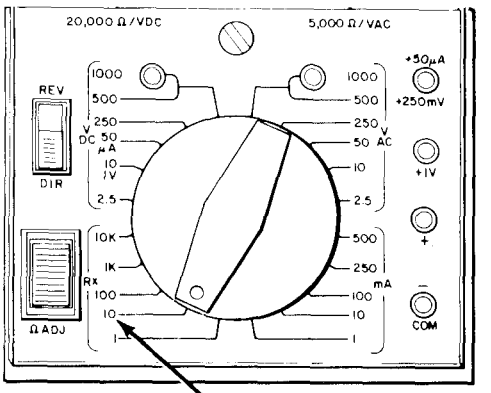
- If pointer falls exactly on a numbered line read multimeter as follows:
  a. Look at ohms scale and see which numbered line pointer is on: 50




TS 260-20-332

b. See what function/range switch position number is: 10

c. Multiply number from step a by number from step b to get multimeter reading: 50 X 10 = 500 ohms




GO

TA 119973

Figure 29-10 (Sheet 7 of 10)

GO

7

- If pointer is between numbered lines read multimeter as follows:

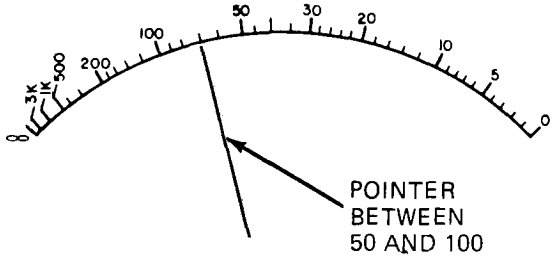
  a. Look at ohms scale and see which two numbers the pointer is between. Subtract smaller number from larger number to get span: 100 - 50 = 50

b. Count number of graduations from smaller number to larger number: 5

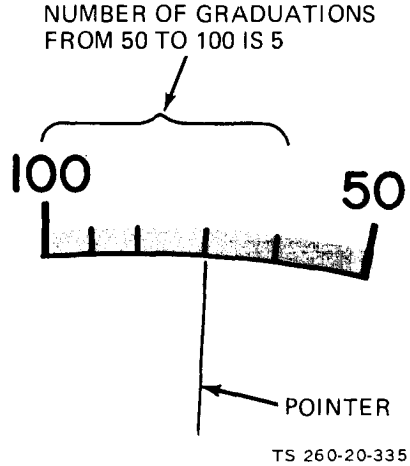
c. Divide span (step a) by number of graduations (step b) to get value of each graduation: 50 ÷ 5 = 10

d. Count number of graduations from smaller number to pointer: 2

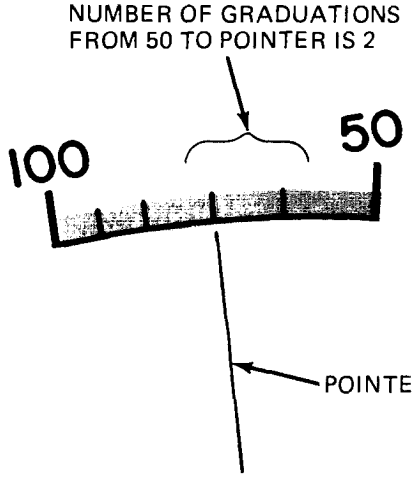
GO




TS 260-20-334




TS 260-20-335




TA 119974

Figure 29-10 (Sheet 8 of 10)

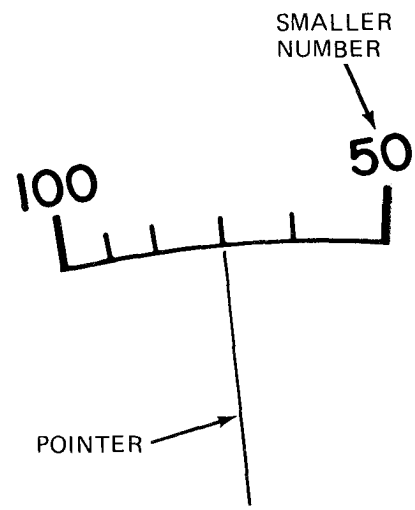
GO

e. Multiply number from step 7d by value from step 7c to get total value of graduations:

2 x 10 = 20

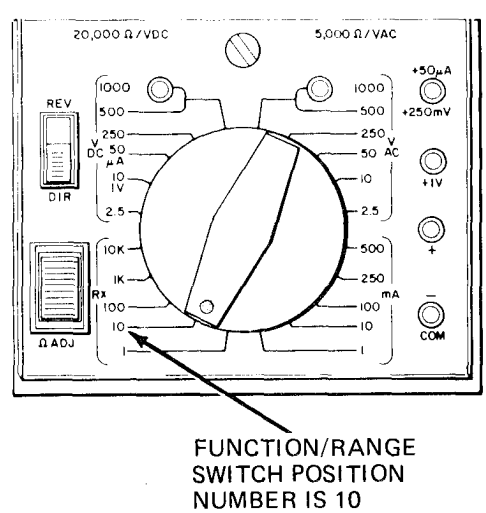
f. Add total value of graduations (step e) to smaller number to get scale reading:

20 + 50 = 70




g. Multiply scale reading (step f) by function/range switch position number to get multimeter reading:

70 x 10 = 700 ohms




GO

TA 119975

Figure 29-10 (Sheet 9 of 10)

GO

8

- Put tested part back in circuit
  - Take off both test prods from across tested part
  - Put lead back on tested part

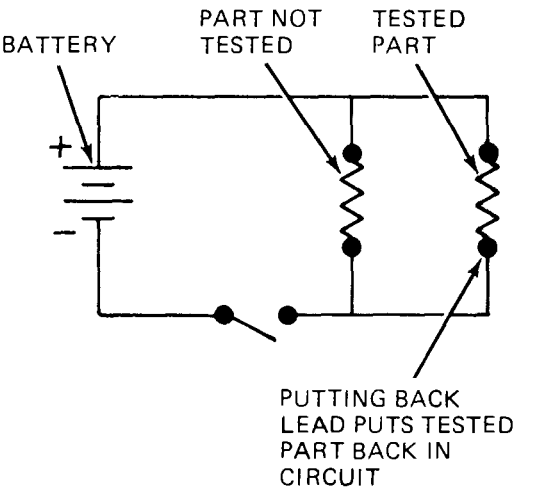



Figure 29-10 (Sheet 10 of 10)

4

CONTINUITY TEST - To check for breaks in a circuit, such as switch, lamp, or electrical cable circuits

1

- Set up multimeter
  - Set REV DIR switch to DIR
  - Set function/range switch to RX1
  - Put jack plug of black (-) test lead into COM - jack
  - Put jack plug of red (+) test lead into + jack

GO

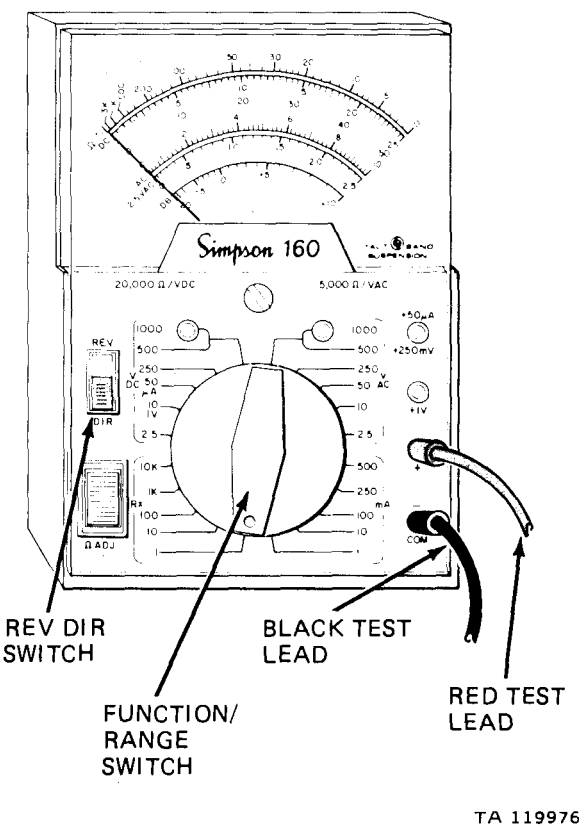



Figure 29-11 (Sheet 1 of 6)

GO

NOTE

Detailed steps for making the truck circuits ready for continuity tests are in the fault isolation procedures. The steps given here are typical

2

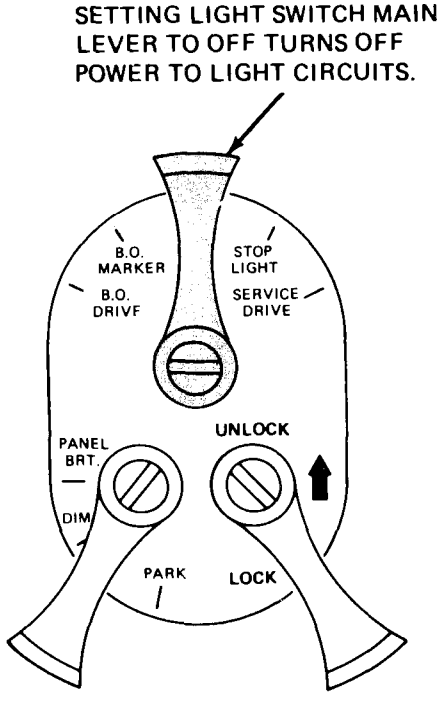
- Make tested circuit ready for continuity test

CAUTION

If power to tested circuit is not turned off, multimeter will be damaged

- Turn off power to tested circuit

GO

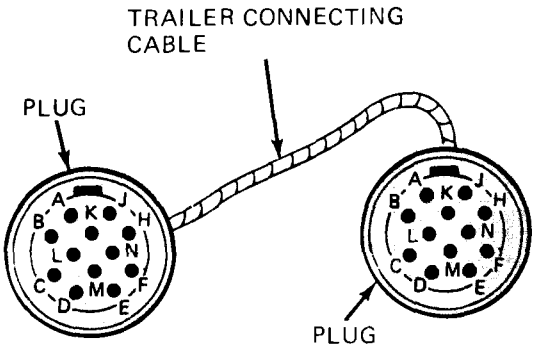



TA 119977

Figure 29-11 (Sheet 2 of 6)

GO

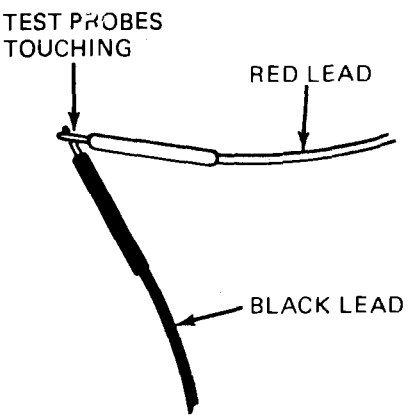
- Take plug on each end of trailer connecting cable off mating receptacle




TAKING CABLE PLUGS OFF MATING RECEPTACLES LETS YOU TEST CONTINUITY OF CABLE WIRES

3

- Zero the multimeter
  - Touch multimeter test probes together



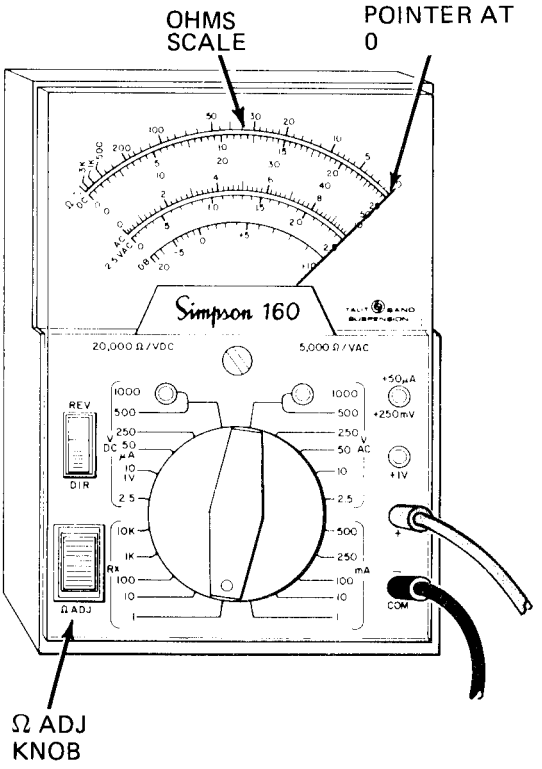

GO

TA 119978

Figure 29-11 (Sheet 3 of 6)

GO

- While touching multimeter test probes together look at ohms scale. Pointer should be at 0 (zero). It it is not, turn Ω ADJ knob to move pointer to 0




GO

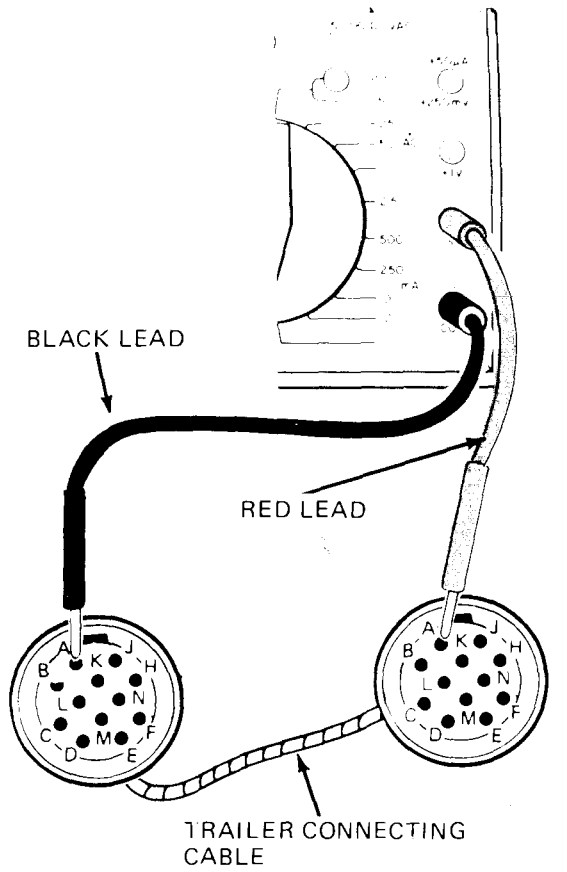
TA 119979

Figure 29-11 (Sheet 4 of 6)

GO

4

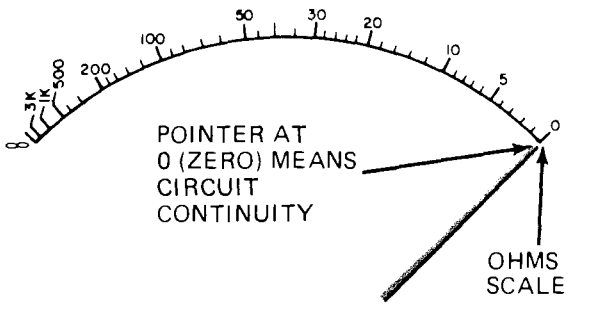
- Put multimeter leads across tested circuit
  - Put test prod of black lead (-) on one contact of tested circuit
  - Put test prod of red lead (+) on other contact of tested circuit




NOTE: MULTIMETER SHOWN CHECKING CONTINUITY OF TRAILER CONNECTING CABLE WIRE ATTACHED TO CONTACT A.

5

- Read multimeter
  - Look at multimeter ohms scale. For continuity, pointer should be all the way to far right over 0 (zero)
  - If pointer stays all the way to left, tested circuit is open. If pointer jumps or flickers, tested circuit has a loose connection




GO

TA 119980

Figure 29-11 (Sheet 5 of 6)

GO

6

- Put tested circuit back in operation
  - Take off both test prods from contacts of tested circuit
  - Put back any plugs or other parts previously removed to test continuity

Figure 29-11 (Sheet 6 of 6)

5 SHORT TEST - To check for shorts in electrical cables

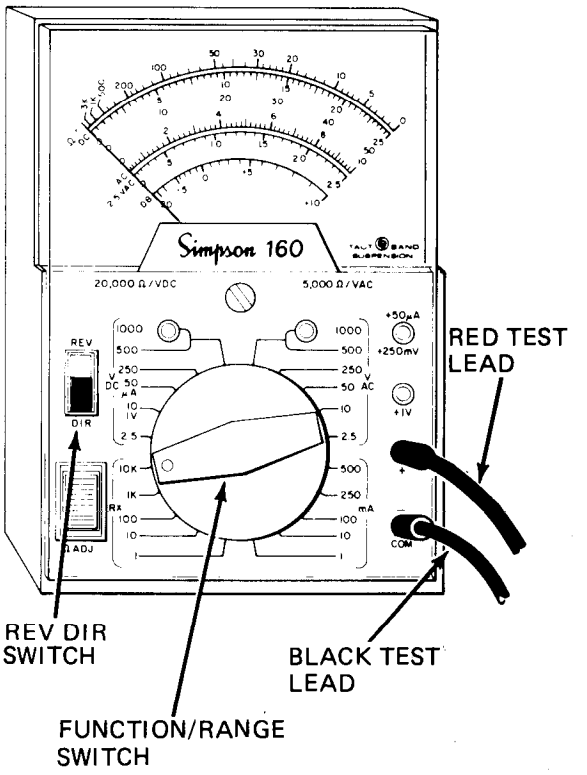
NOTE

A short (or short circuit) happens when two circuits that should not be connected have metal-to-metal contact with each other. A short also happens when a circuit that should not touch electrical ground has metal-to-metal contact with ground

1

- Set up multimeter
  - Set REV DIR switch to DIR
  - Set function/range switch to RX10K
  - Put jack plug of black (-) test lead into COM - jack
  - Put jack plug of red (+) test lead into + jack

GO




TA 119981

Figure 29-12 (Sheet 1 of 7)

GO

NOTE

Detailed steps for making the truck circuits ready for short test are in the fault isolation procedures. The steps given here are typical

2

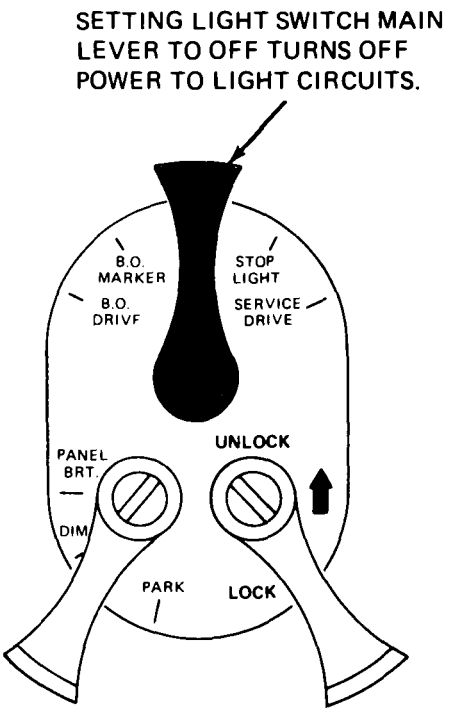
- Make tested circuit ready for short test

CAUTION

If power to tested circuit is not turned off, multimeter will be damaged.

- Turn off power to tested circuit

GO



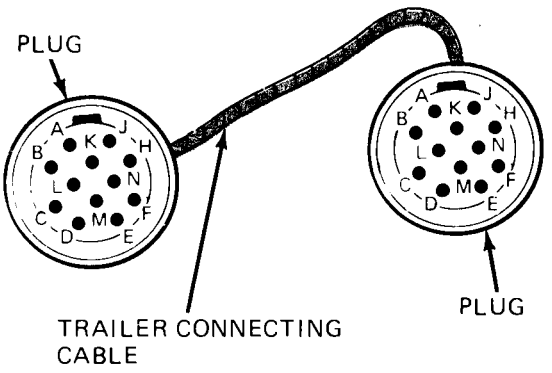

TA 119982

Figure 29-12 (Sheet 2 of 7)

GO

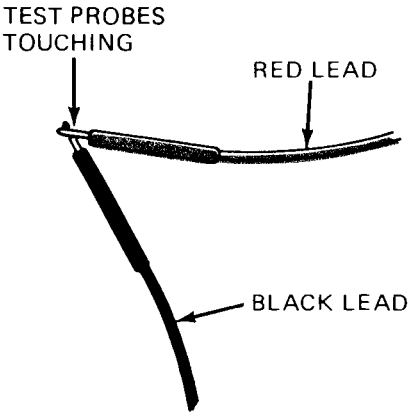
- Take plug on each end of trailer connecting cable off mating receptacle

TAKING CABLE PLUGS OFF MATING RECEPTACLES LETS YOU TEST CABLE WIRES FOR SHORTS




3

- Zero the multimeter
  - Touch multimeter test probes together



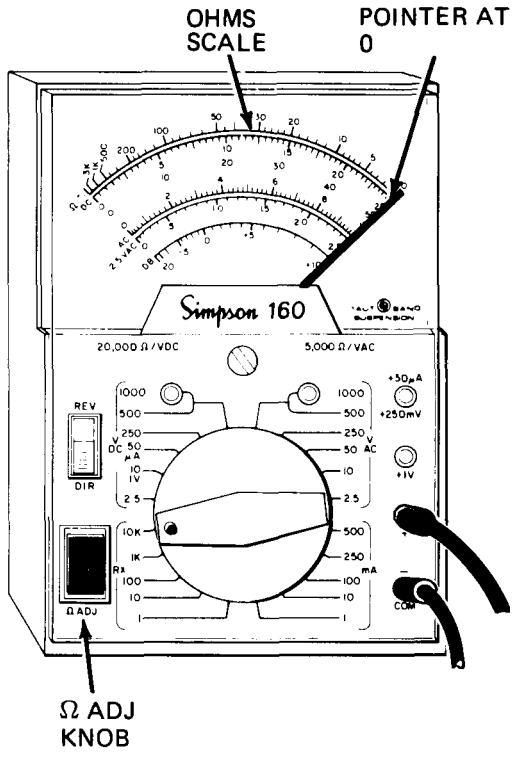

GO

TA 119983

Figure 29-12 (Sheet 3 of 7)

GO

- While touching multimeter test probes together look at ohms scale. Pointer should be at 0 (zero). If it is not, turn Ω ADJ knob to move pointer to 0




GO

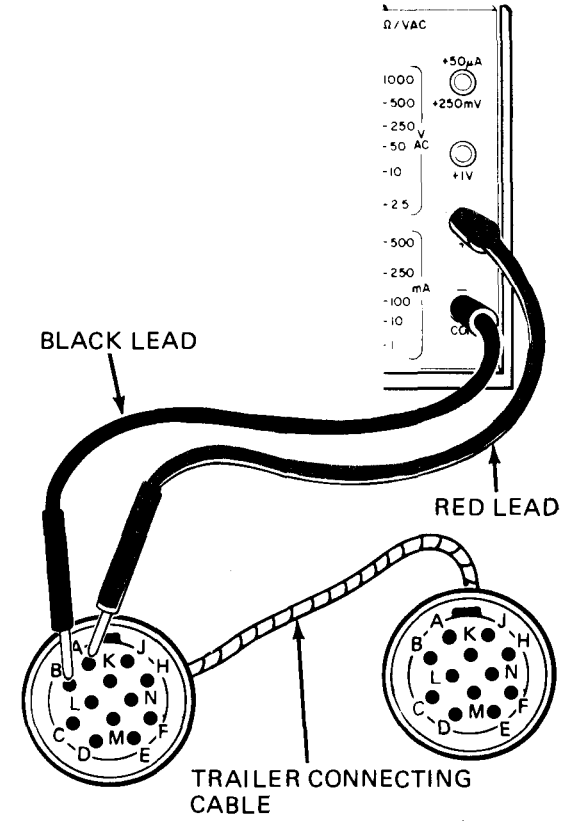
TA 119984

Figure 29-12 (Sheet 4 of 7)

GO

4

- Put multimeter leads across tested circuits
  - To test for short between two circuits, put test probes on contacts of both circuits




NOTE: MULTIMETER SHOWN CHECKING FOR SHORT BETWEEN TRAILER CONNECTOR CABLE WIRES ATTACHED TO CONTACTS A AND B.

GO

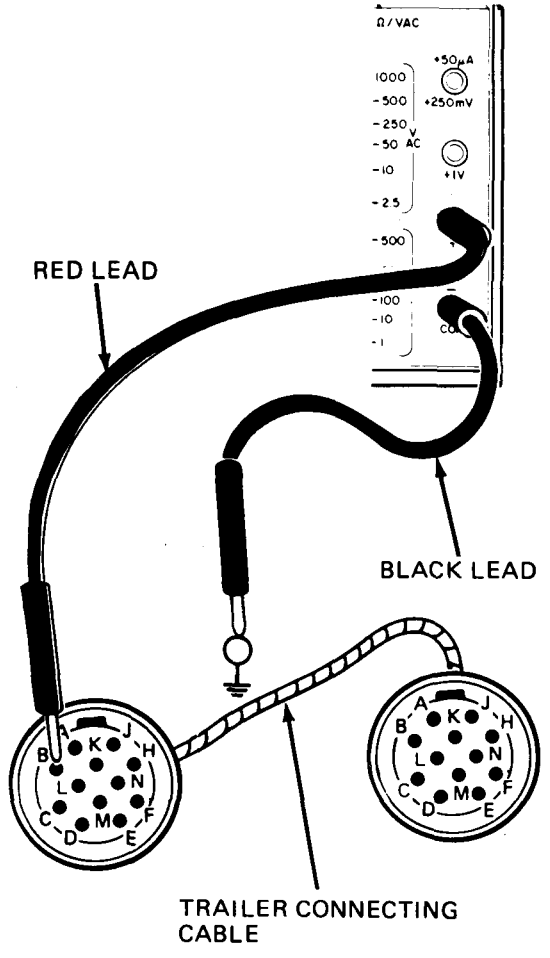
TA 119985

Figure 29-12 (Sheet 5 of 7)

GO

- To test for short between a circuit and ground, put one test probe on circuit contact and other test probe on ground

GO




NOTE: MULTIMETER SHOWN CHECKING FOR SHORT BETWEEN TRAILER CONNECTOR CABLE WIRE ATTACHED TO CONTACT B AND GROUND.

TA 119986

Figure 29-12 (Sheet 6 of 7)

1 DC VOLTAGE TEST - To measure battery voltage, charging system output, and voltage drops at various test points

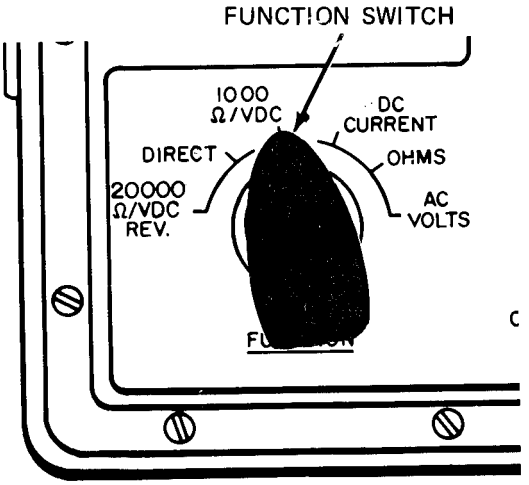
1

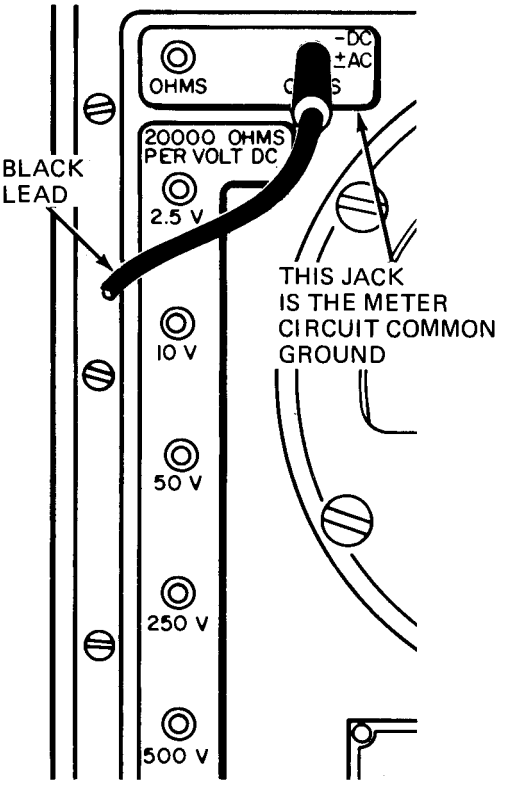
- Set up multimeter FUNCTION switch and black test lead:

  Note: The range switch and OHMS ZERO ADJ knob are not used for DC voltage tests

  - Set FUNCTION switch to 1000 Ω / VDC
  - Put jack plug of black (-) test lead into -DC ± AC OHMS jack

GO




TA 119989

Figure 29-14 (Sheet 1 of 9)

GO

2

- Set up red test lead:

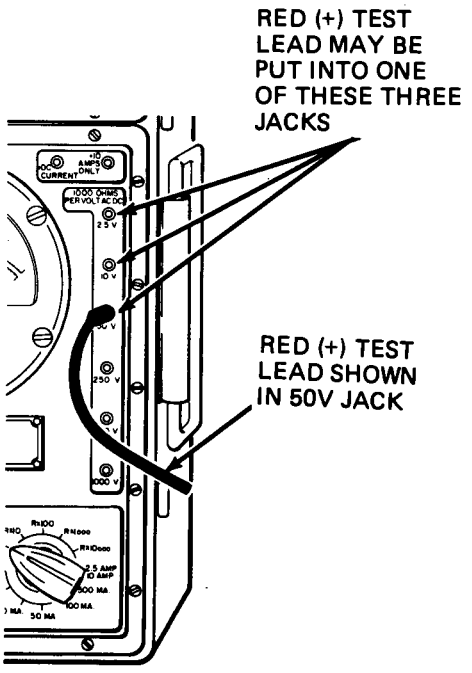
  Note: The highest truck DC voltage that is measured is about 28 volts. Therefore, the multimeter red (+) lead is never put into the 250V, 500V, and 1000V jacks

- See table to find out which jack to put red (+) lead into. Table shows which jack to use when normal value of measured voltage is known or unknown

THE JACK USED IS ALWAYS MARKED HIGHER THAN THE VOLTAGE YOU WANT TO MEASURE

| IF NORMAL VALUE OF VOLTAGE BEING MEASURED IS THIS: | PUT RED LEAD INTO THIS JACK ON RIGHT SIDE OF MULTIMETER: |
|---|---|
| 0 TO 2 VOLTS | 2.5V |
| 2 TO 8 VOLTS | 10V |
| 8 TO 40 VOLTS | 50V |
| UNKNOWN | 50V |

- Put jack plug of red (+) test lead into jack you picked on right side of multimeter. The jacks are in the 1000 OHMS PER VOLT AC DC column of multimeter




NOTE

When you need to turn on power before measuring DC voltage, the fault isolation procedure gives the turn-on instructions

GO

TA 119990

Figure 29-14 (Sheet 2 of 9)

GO

3

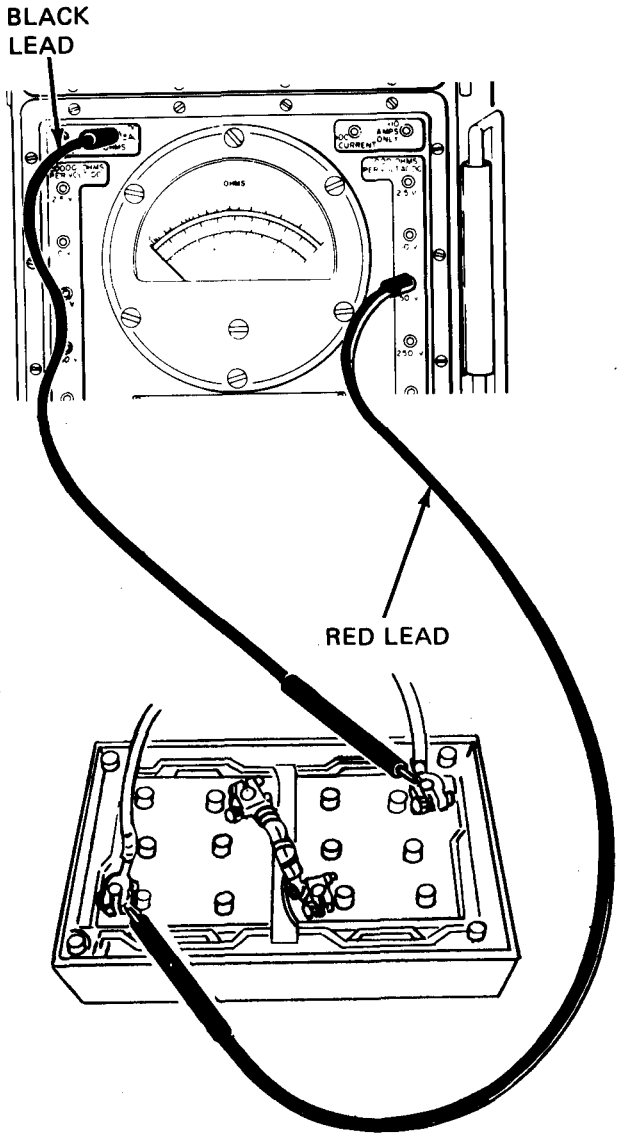
- Put multimeter leads across (in parallel with) circuit being measured:
  - Put test prod of black lead (-) on negative terminal of circuit being measured
  - Put test prod of red lead (+) on positive terminal of circuit being measured

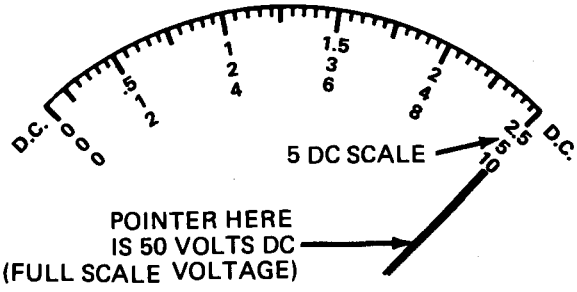
4

- If multimeter red test lead is on 50V jack, read multimeter as follows:
  - Use 5DC scale. Full scale voltage is 50 volts DC

GO

NOTE: MULTIMETER SHOWN MEASURING +24 VOLTS DC BATTERY VOLTAGE.




TA 119991

Figure 29-14 (Sheet 3 of 9)

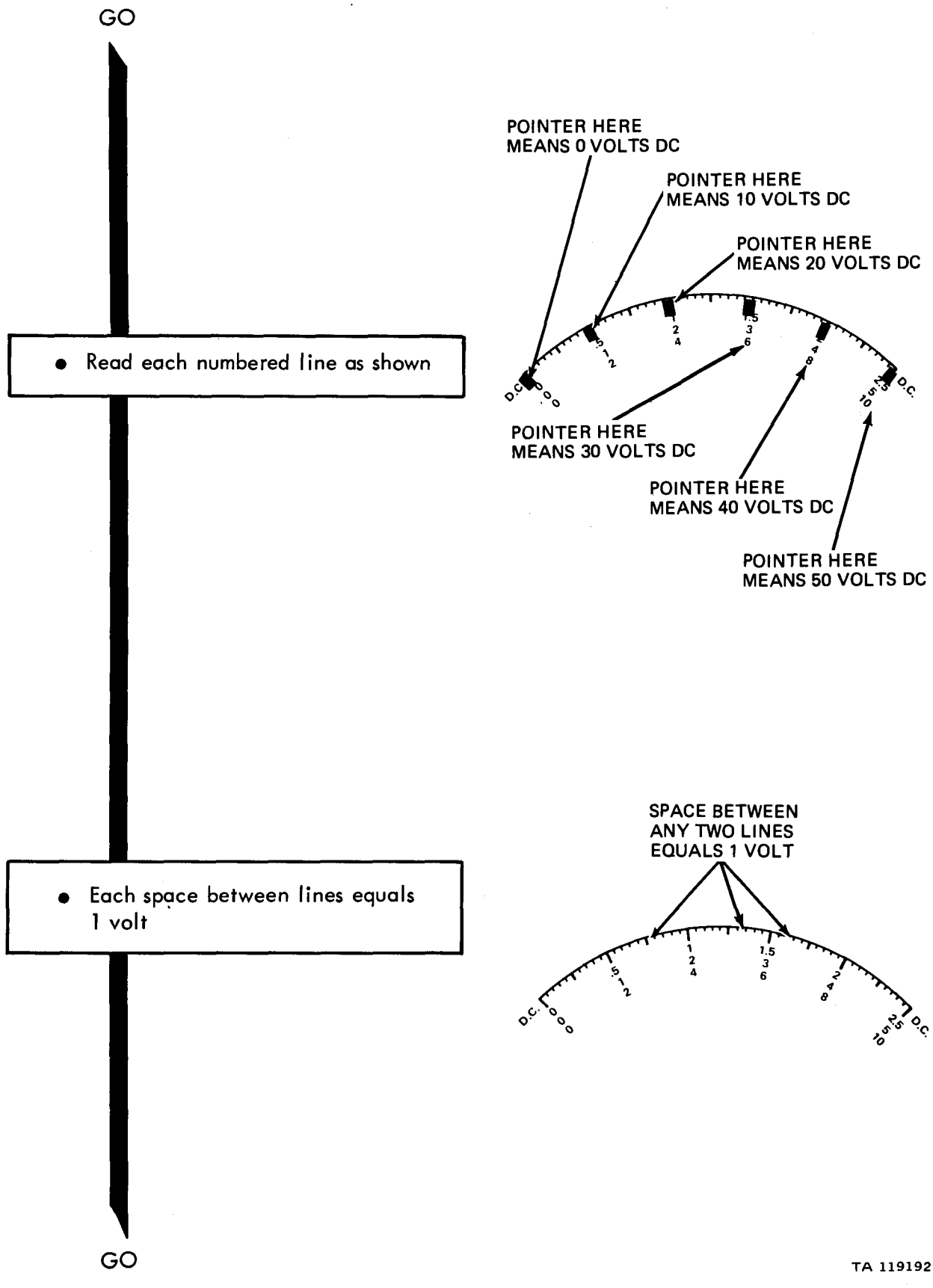
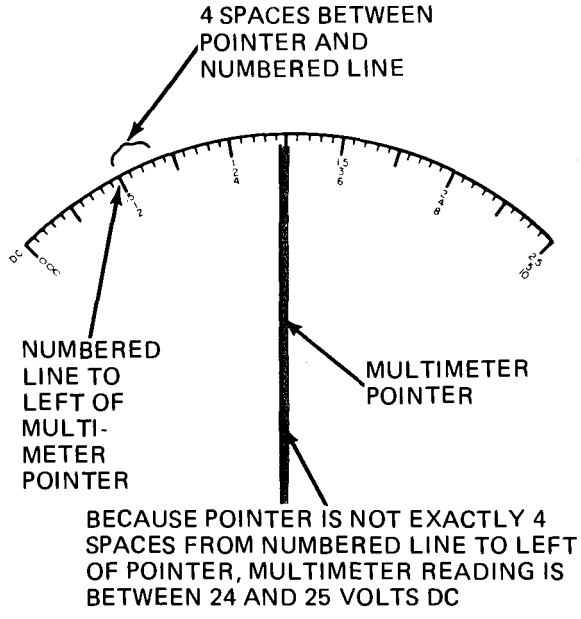



Figure 29-14 (Sheet 4 of 9)

GO



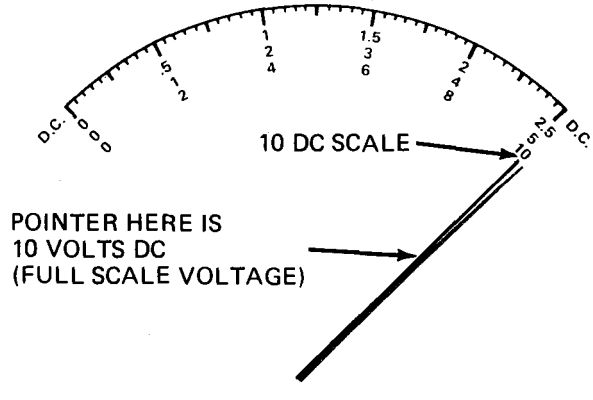

- Get multimeter reading as follows:

| Step A | Step B | Step C |
|---|---|---|
| Read first numbered line to left of pointer. Multiply number by 10. | Count number of spaces between pointer and first numbered line to left of pointer. | Add the numbers from steps A and B. |

Example: 2 x 10 = 20 + 4 = 24 volts DC

5

- If multimeter red test lead is in 10V jack, read multimeter as follows:
  - Use 10 DC scale. Full scale voltage is 10 volts DC




GO

TA 119993

Figure 29-14 (Sheet 5 of 9)

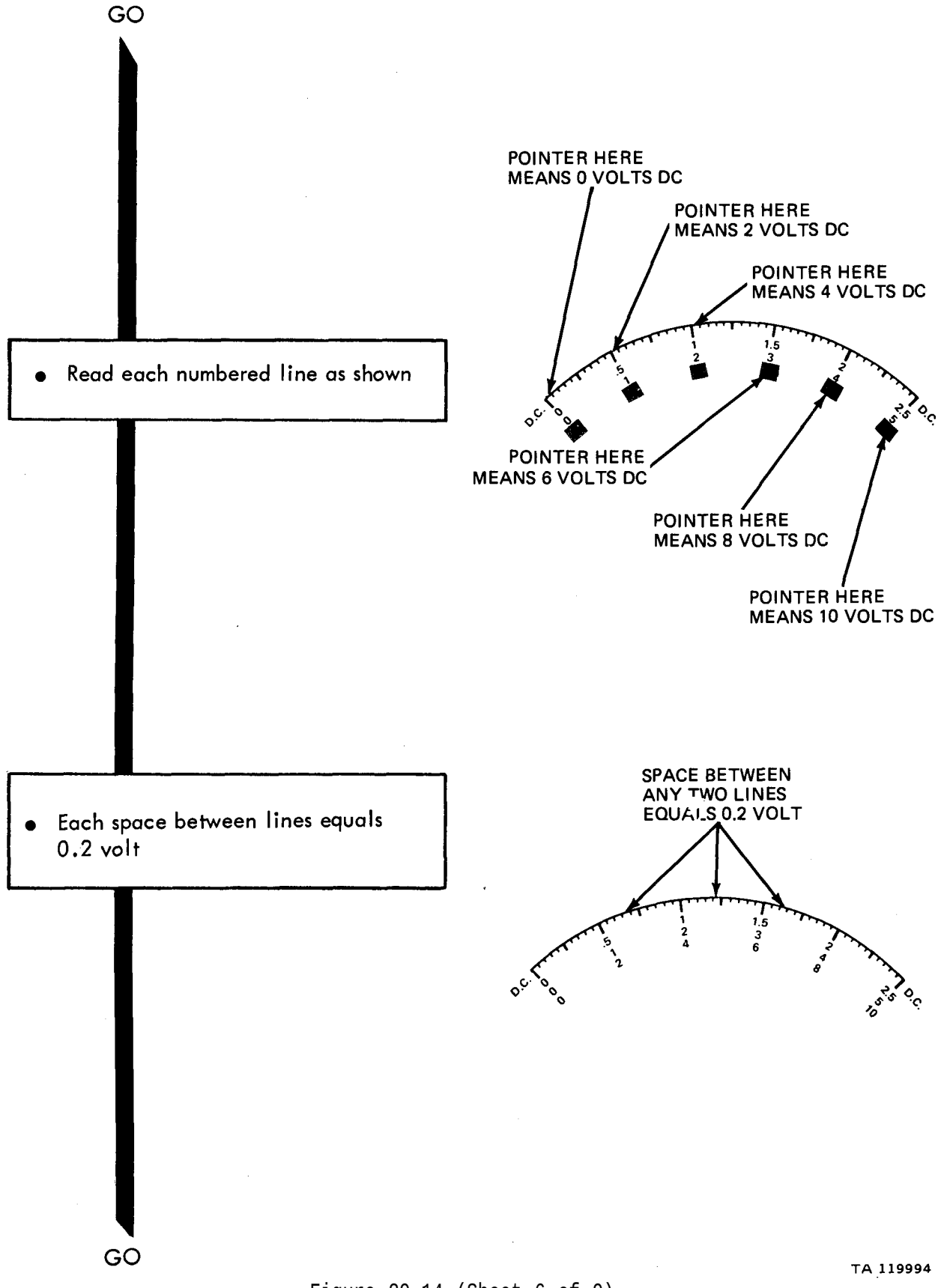
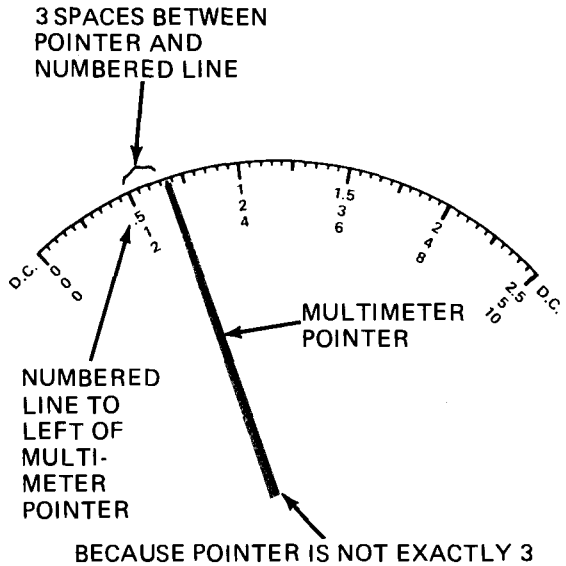



Figure 29-14 (Sheet 6 of 9)

GO

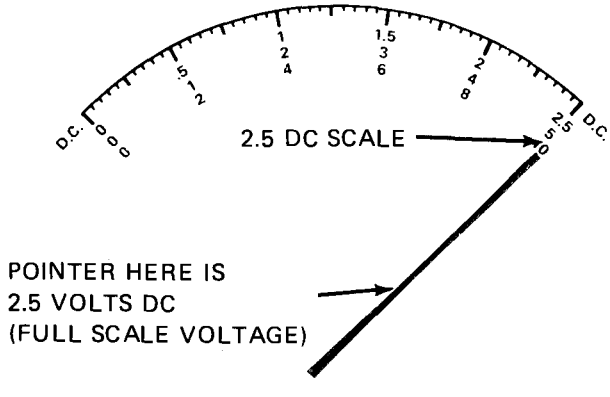



- Get multimeter reading as follows:

| Step A | Step B | Step C |
|---|---|---|
| Read first numbered line to left of pointer. | Count number of spaces between pointer and first numbered line to left of pointer. Multiply number of spaces by 0.2 | Add the numbers from steps A and B. |
| Example 2 + | 0.2 x 3 = 0.6 | = 2.6volts DC |

6

- If multimeter red test lead is in 2.5V jack, read multimeter as follows:
  - Use 2.5 DC scale. Full scale voltage is 2.5 volts DC




GO

TA 119995

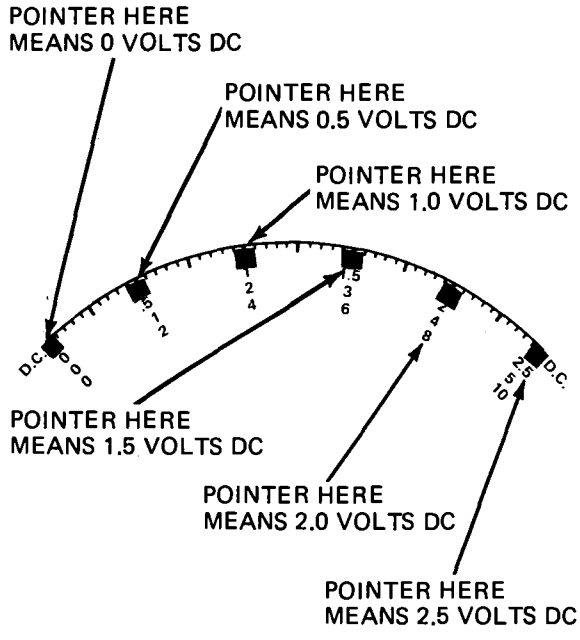
Figure 29-14 (Sheet 7 of 9)

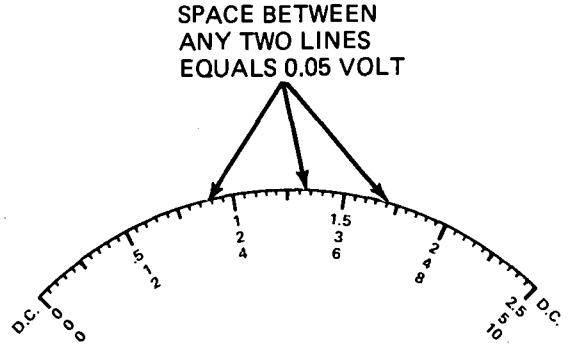
GO

- Read each numbered line as shown

- Each space between lines equals 0.05 volt

GO

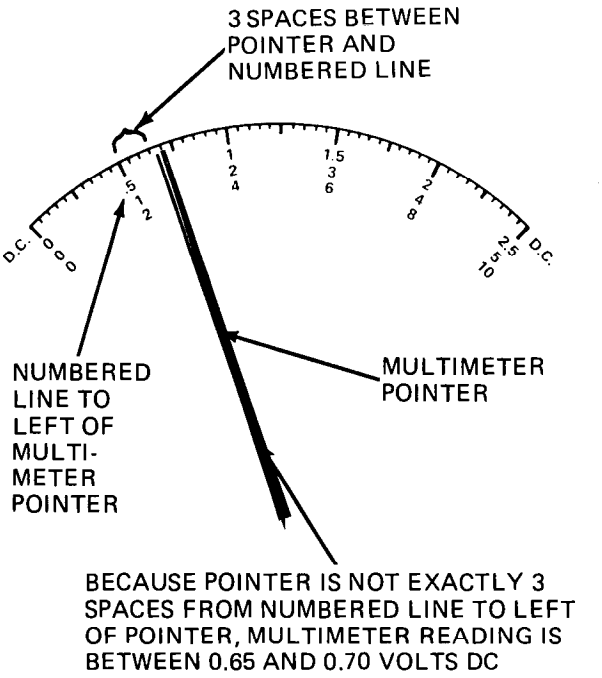



TA 119996

Figure 29-14 (Sheet 8 of 9)

GO




- Get multimeter reading as follows:

| Step A | Step B | Step C |
|---|---|---|
| Read first numbered line to left of pointer. | Count number of spaces between pointer and first numbered line to left of pointer. Multiply number of spaces by 0.05. | Add the numbers from steps A and B. |

Example: 0.5 + 0.05 x 3 = 0.15 = 0.65 volts DC

7

- Make circuit normal again:
  - Take both test prods off measured circuit

TA 119997

Figure 29-14 (Sheet 9 of 9)

2

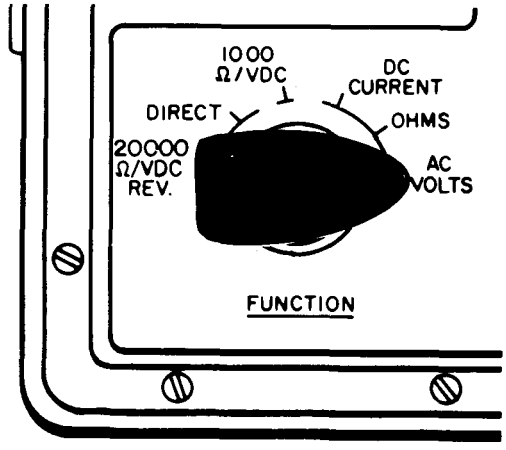
AC VOLTAGE TEST - To measure van input and operating voltages

1

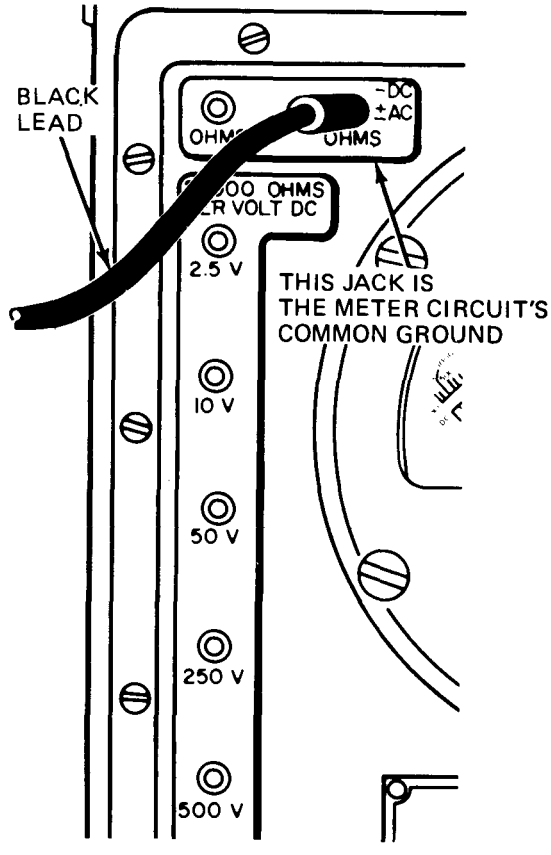
- Set up multimeter as follows

  Note: The range switch and OHMS ZERO ADJ knob are not used for AC voltage tests

- Set FUNCTION switch to AC VOLTS




- Put jack plug of black test lead into -DC ±AC OHMS jack




GO

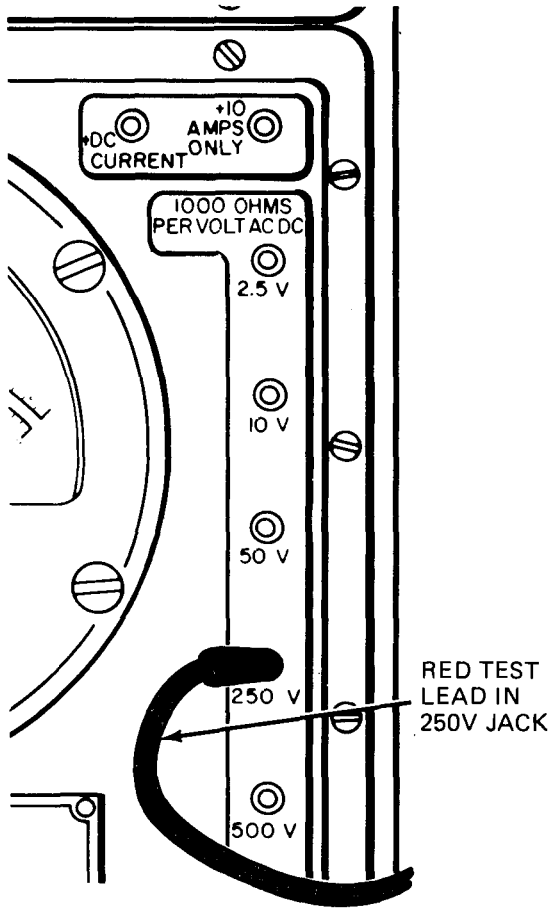
TA 119998

Figure 29-15 (Sheet 1 of 5)

GO

- Put jack plug of red test lead into 250 V jack on right side of multimeter. The jack is in the 1000 OHMS PER VOLT AC DC column

  Note: The truck AC voltages measured are 208 and 120 volts. Therefore, the multimeter red lead is never put into the 2.5 V, 10 V, 50 V, 500 V, and 1000 V jacks




NOTE

When you need to turn on power before measuring AC voltage, the fault isolation procedure gives the turn-on instructions

GO

TA 119999

Figure 29-15 (Sheet 2 of 5)

GO

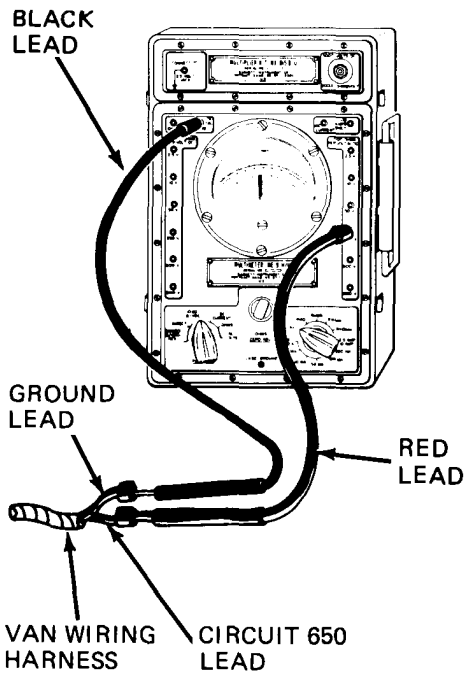
2

- Put multimeter leads across (in parallel with) circuit being measured

  Note: In AC voltage measurement you can hook up the test lead connections to the circuit either way. You will still get correct multimeter readings and no damage will be done to the multimeter. But, when one side of the circuit is electrical ground, it is a good idea to put the black lead on electrical ground

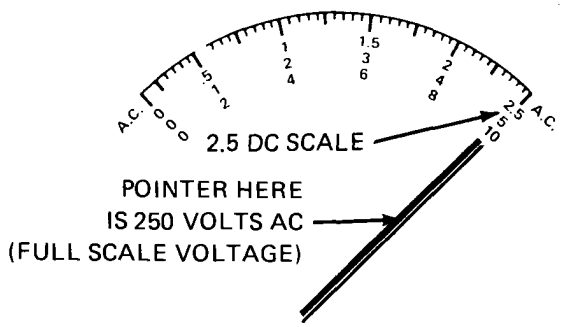
- Put test prod of black lead on ground side or one side of circuit being measured. Put test prod of red lead on other side of circuit being measured

NOTE: MULTIMETER SHOWN MEASURING 120 VOLTS AC VAN CEILING LIGHT VOLTAGE.




3

- Read multimeter
  - Use 2.5 AC scale. Full scale voltage is 250 volts AC




GO

TA 120000

Figure 29-15 (Sheet 3 of 5)

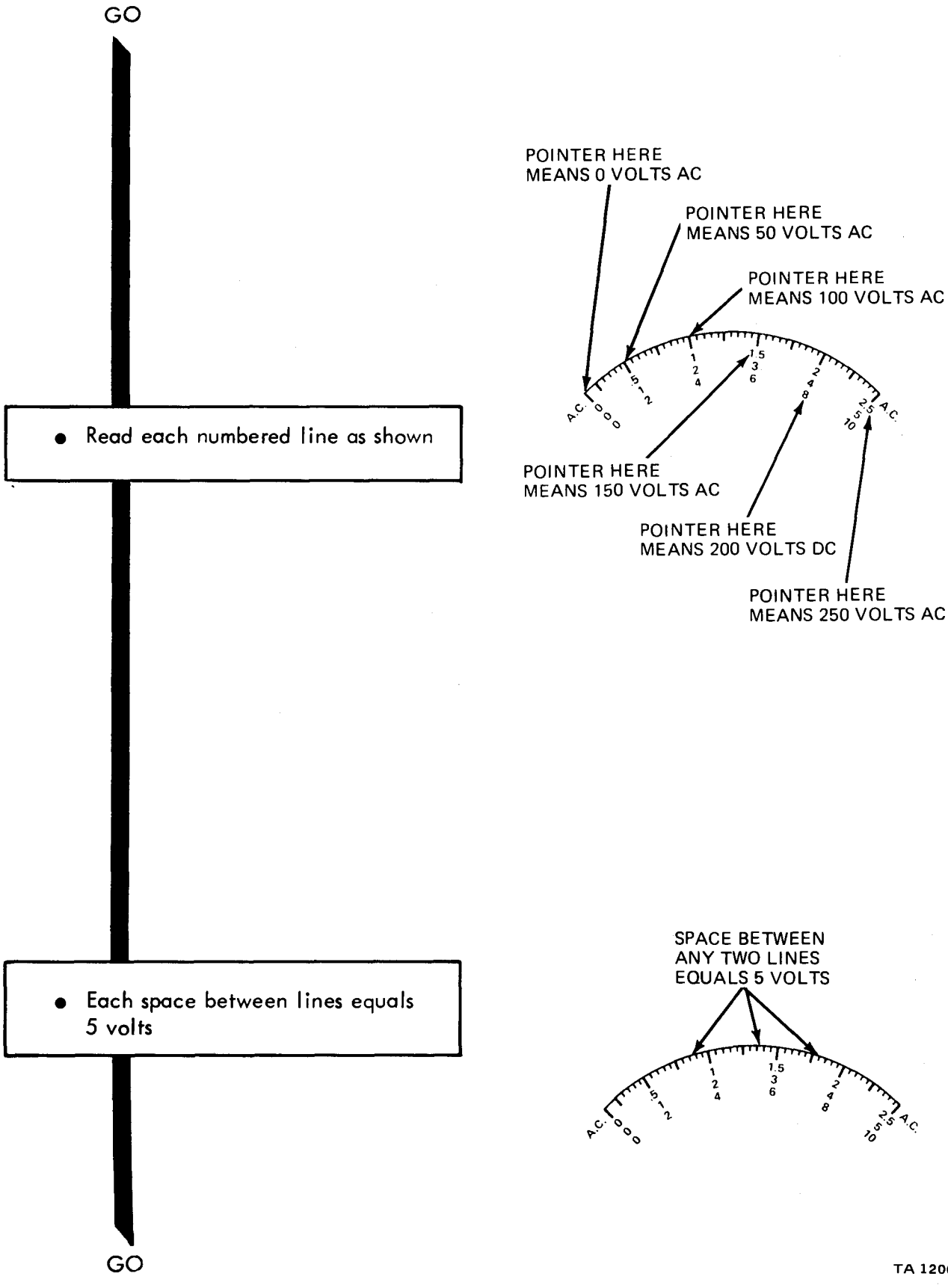
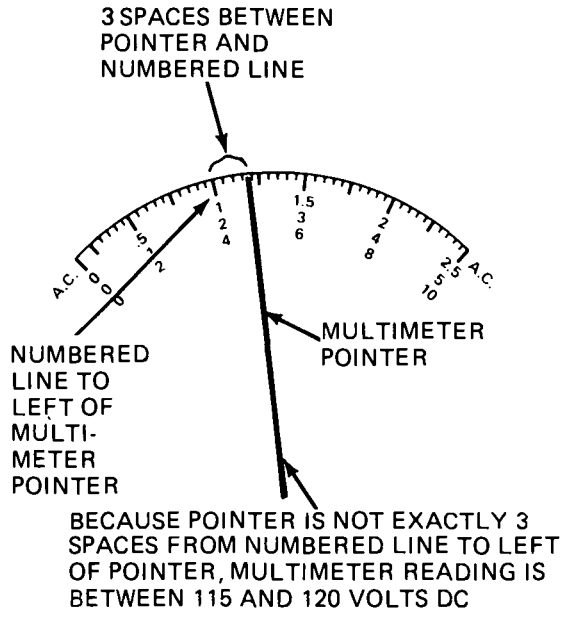



Figure 29-15 (Sheet 4 of 5)

GO




- Get multimeter reading as follows:

| Step A | Step B | Step C |
|---|---|---|
| Read first numbered line to left of pointer. Multiply number by 100. | Count number of spaces between pointer and first numbered line to left of pointer. Multiply number of spaces by 5 | Add the numbers from steps A and B. |

Example: 1 x 100 = 100 + 5 x 3 = 15 = 115 volts AC

4

- Make circuit normal again
  - Take both test prods off measured circuit

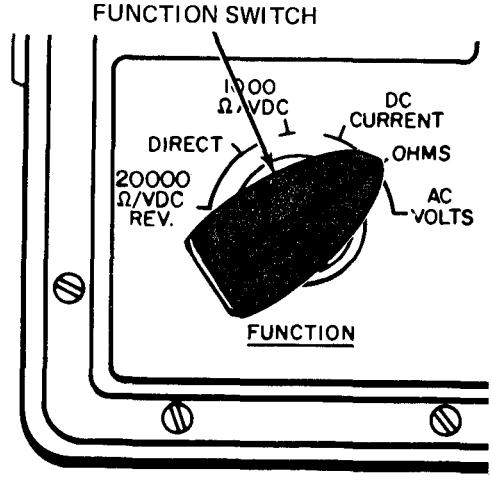
TA 120002

Figure 29-15 (Sheet 5 of 5)

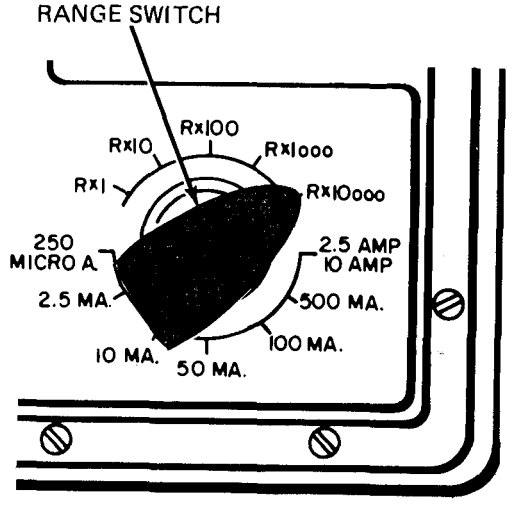
3 RESISTANCE TEST - To measure resistance of temperature sending unit, and blower motor resistor

1

- Set up multimeter:
  - Set FUNCTION switch to OHMS




- Set range switch to RX10000




GO

TA 120003

Figure 29-16 (Sheet 1 of 10)

GO

- Put jack plug of black (-) test lead into -DC ±AC OHMS jack
- Put jack plug of red (+) test lead into OHMS jack

NOTE

Detailed steps for making the truck parts ready for resistance test are in the fault isolation procedures. The steps given here are typical

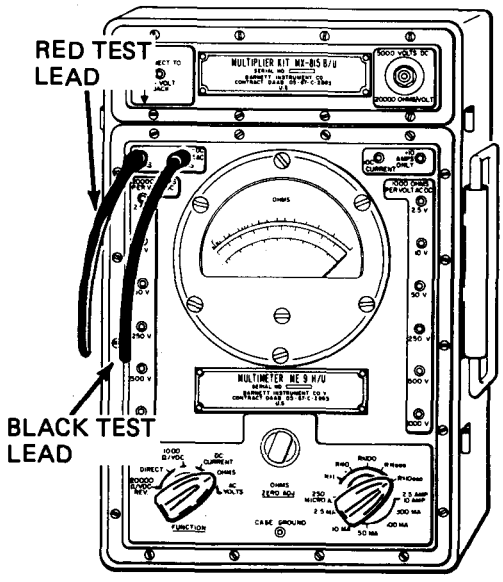
2

- Make tested part ready for resistance test:

CAUTION

If power to tested part is not turned off, multimeter will be damaged

GO




TA 120004

Figure 29-16 (Sheet 2 of 10)

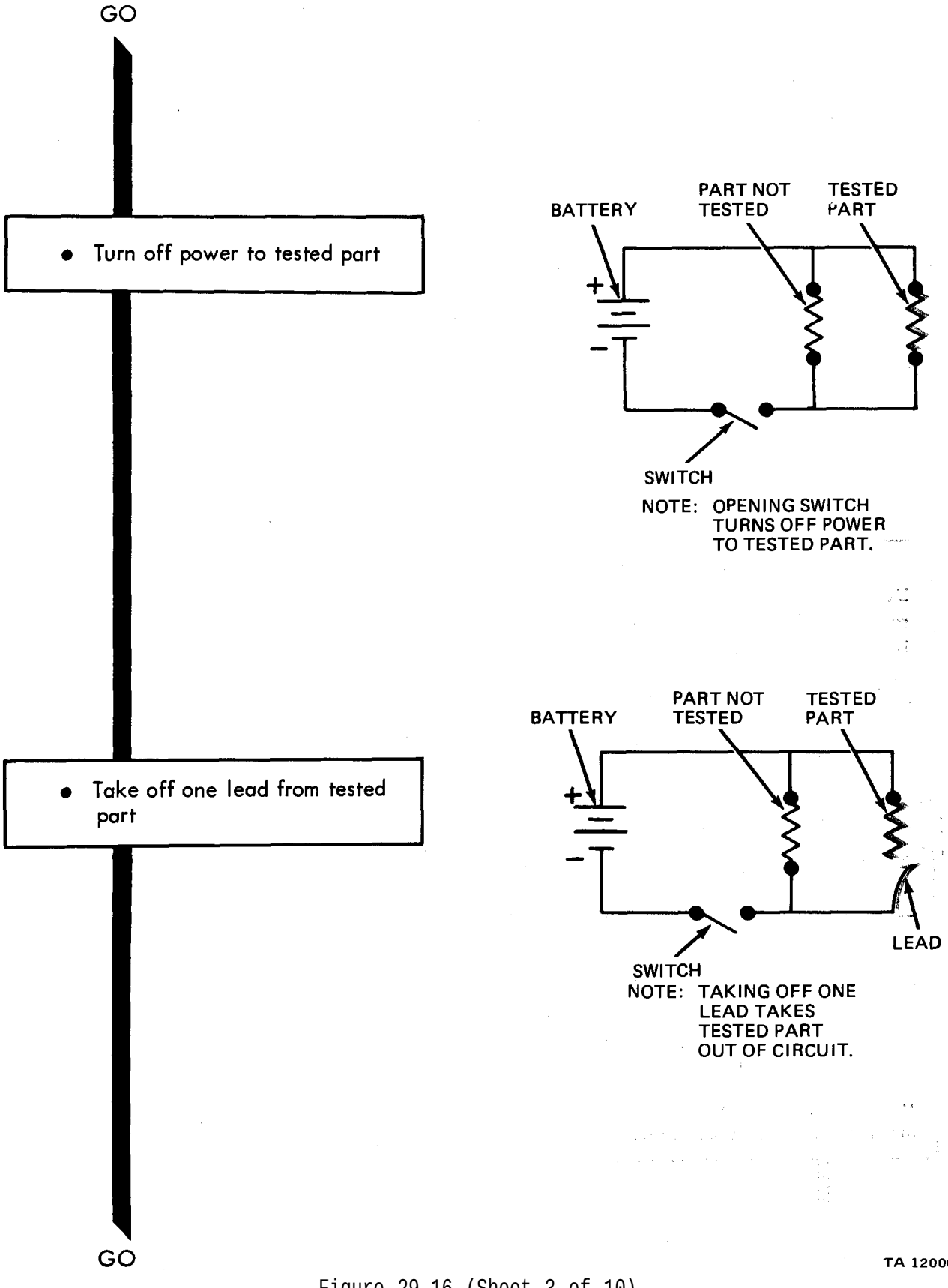



Figure 29-16 (Sheet 3 of 10)

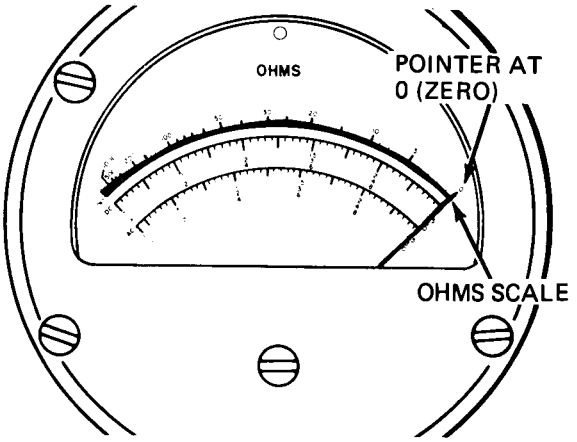
GO

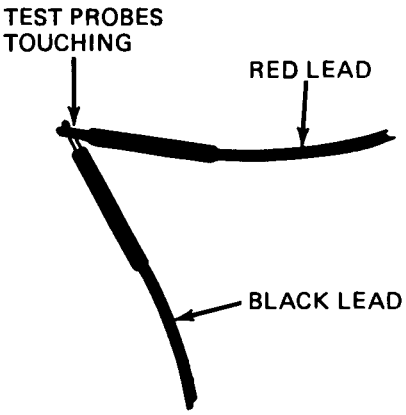
3

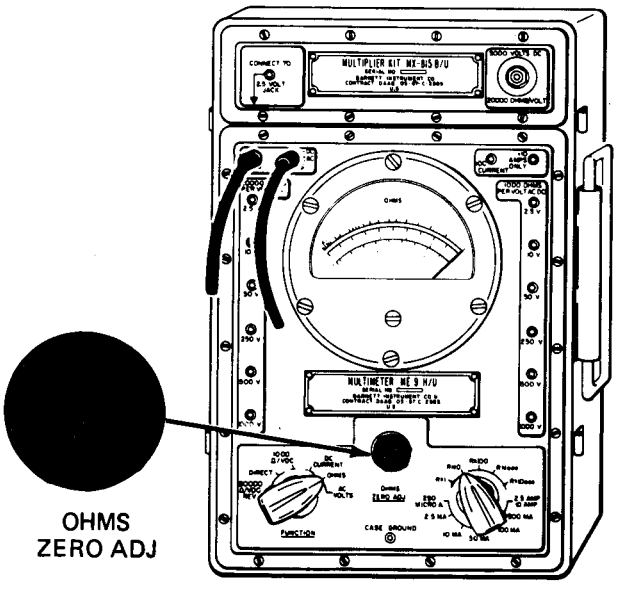
- Zero the multimeter:
  - Touch multimeter test probes together

- While touching multimeter test probes together look at OHMS scale. Pointer should be at 0 (zero). If it is not, turn OHMS ZERO ADJ knob to move pointer to 0

GO




TA 120006

Figure 29-16 (Sheet 4 of 10)

GO

4

- Put multimeter leads across tested part:
  - Put one test prod on one terminal of tested part
  - Put other test prod on other terminal of tested part

**NOTE**

Zero the multimeter each time you turn the range switch knob to another position. (See step 3 )

5

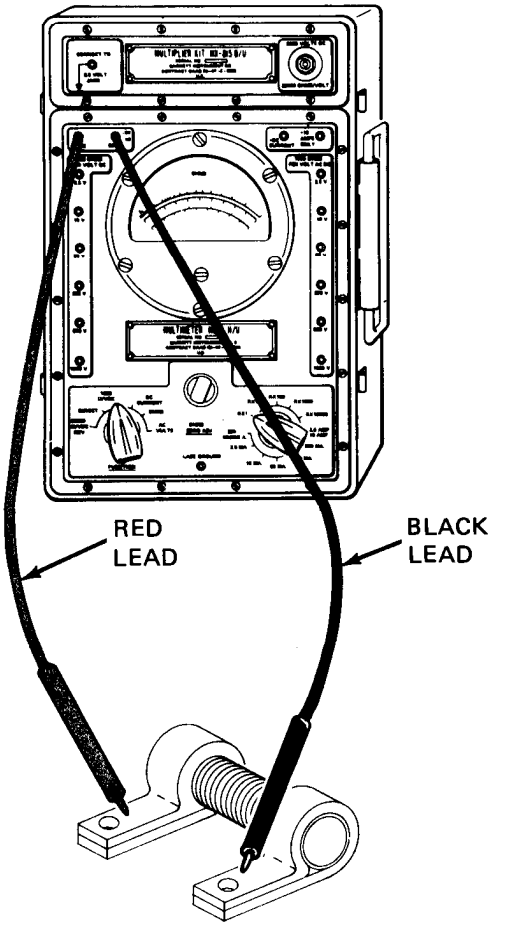
- Get the most accurate multimeter reading as follows:

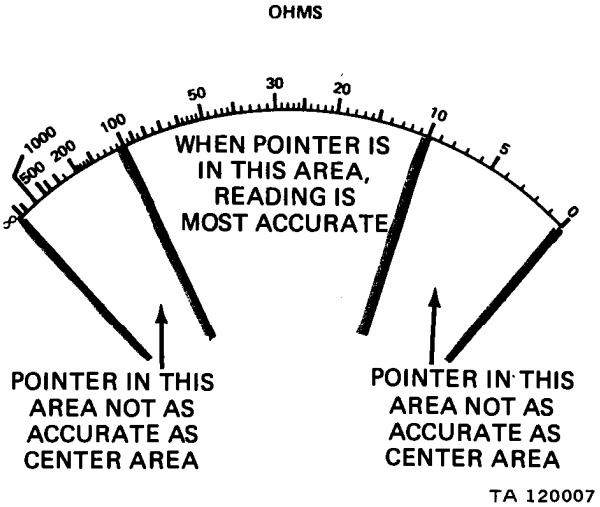
  Note: The closer the multimeter pointer is to the center of the OHMS scale, the more accurate the reading

  - Note position of pointer on OHMS scale. Turn range switch knob to left while looking at pointer. Try to find range switch knob position that gives most centered pointer position

GO

NOTE: MULTIMETER SHOWN MEASURING RESISTANCE OF A COLD START RESISTOR



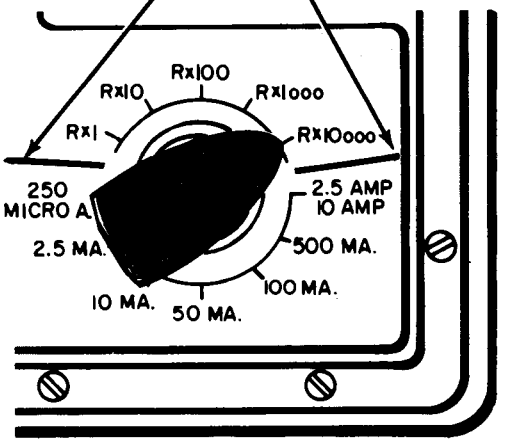




TA 120007

Figure 29-16 (Sheet 5 of 10)

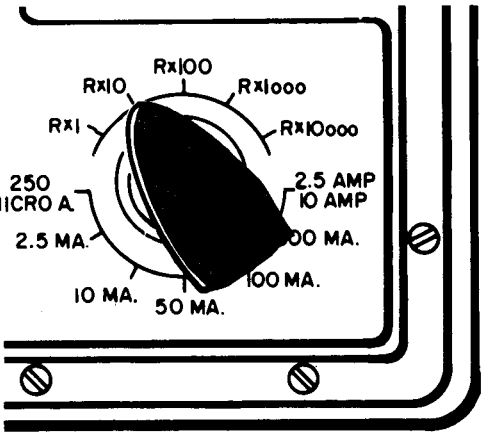
GO

ONLY THESE RANGE SWITCH POSITIONS USED FOR RESISTANCE MEASUREMENTS




NOTE: MOVING RANGE SWITCH KNOB TO LEFT MOVES POINTER TO LEFT.

- You may overshoot most centered pointer position. If you do, turn range switch knob to right to put pointer in most centered position




NOTE: MOVING RANGE SWITCH KNOB TO RIGHT MOVES POINTER TO RIGHT.

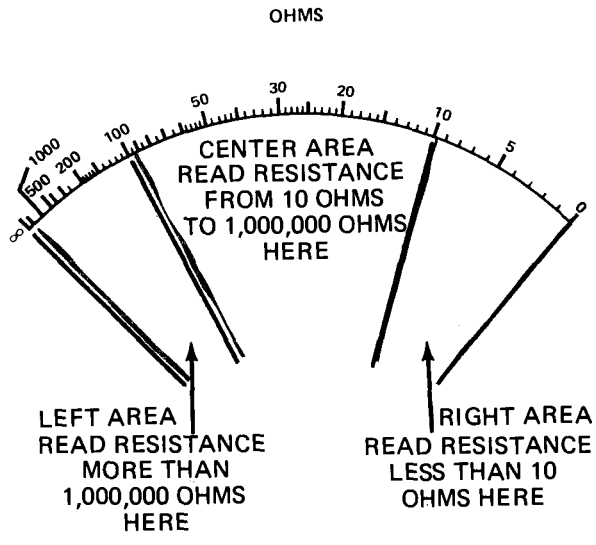
GO

TA 120008

Figure 29-16 (Sheet 6 of 10)

GO

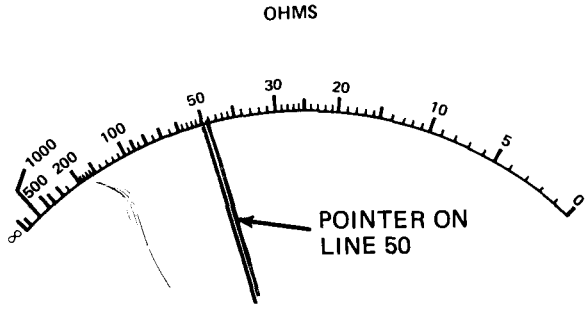
- Pointer will stay in right area if resistance is less than 10 ohms. Pointer will stay in left area if resistance is more than 1,000,000 ohms
- Leave range switch in position that puts pointer in most centered position




6

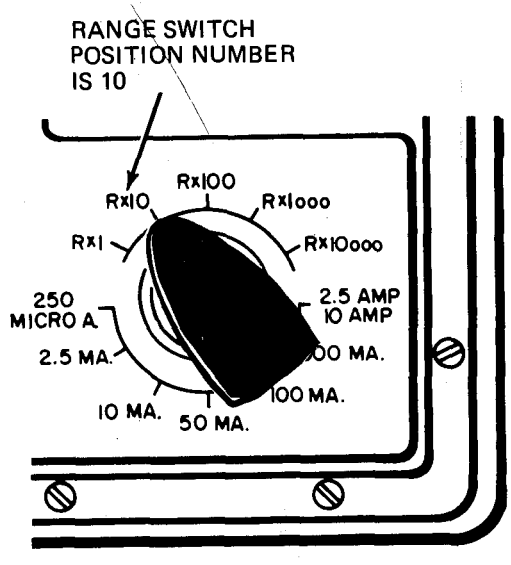
- If pointer falls exactly on a numbered line read multimeter as follows:

  a. Look at OHMS scale and see which numbered line pointer is on: 50




b. See what range switch position number is: 10

c. Multiply number from step a by number from step b to get multimeter reading:
50 X 10 = 500 Ohms




GO

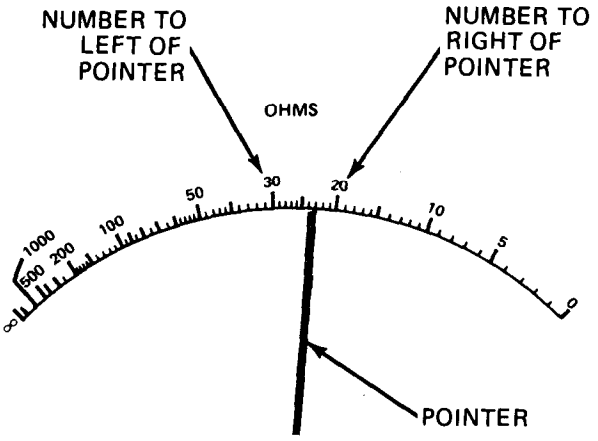
TA 120009

Figure 29-16 (Sheet 7 of 10)

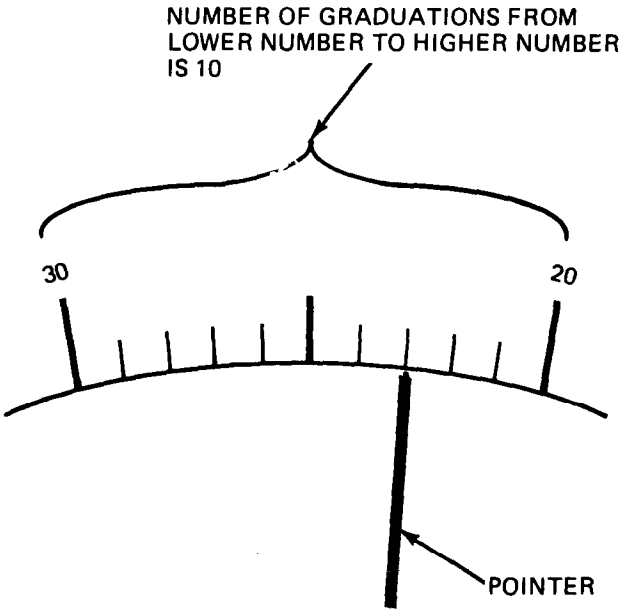
GO

7

- If pointer falls between numbered lines read multimeter as follows:
  a. Look at OHMS scale and note the numbers to left and right of pointer: 30 and 20
  b. Subtract lower number from higher number: 30 - 20 = 10




c. Count number of graduations from lower number to higher number. (If pointer is to left of number 50, count only the longer graduations.): 10




GO

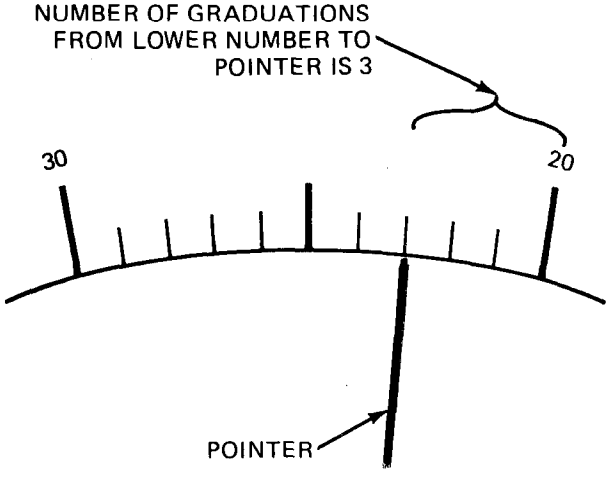
TA 120010

Figure 29-16 (Sheet 8 of 10)

GO

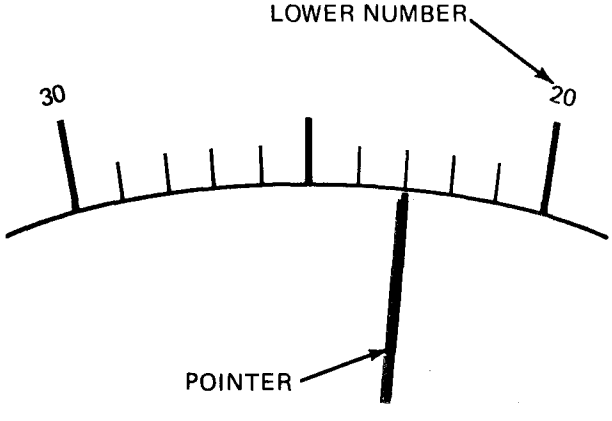
d. Divide number from step b by number of graduations counted from step c: 10 ÷ 10 = 1

e. Count number of graduations from lower number to pointer. (If pointer is to left of number 50, count only the longer graduations): 3




f. Multiply number of graduations counted in step e by answer from step d: 3 X 1 = 3

g. Add answer from step f to lower number to get scale reading: 3 + 20 = 23



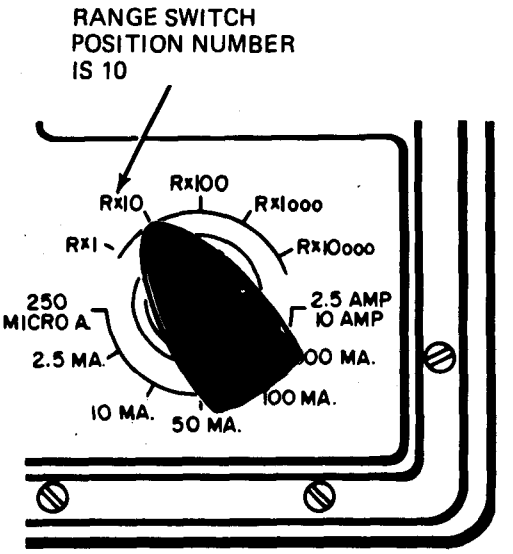

GO

TA 120011

Figure 29-16 (Sheet 9 of 10)

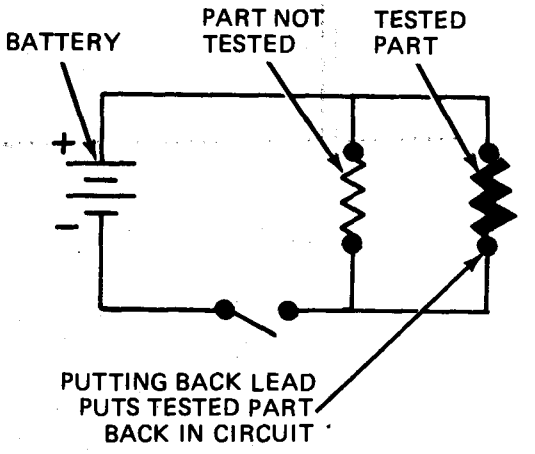
GO

h. Multiply scale reading (step g) by range switch position number to get multimeter reading:
23 x 10 = 230 ohms




8

- Put tested part back in circuit:
  - Take off both test prods from across tested part
  - Put lead back on tested part




TA 120012

Figure 29-16 (Sheet 10 of 10)

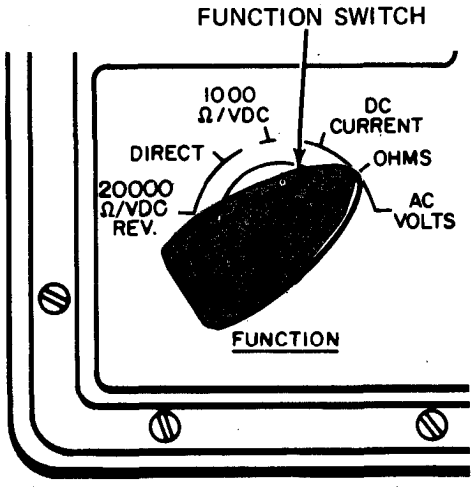
3 CONTINUITY TEST - To check for breaks in a circuit, such as switch, lamp or electrical cable circuits

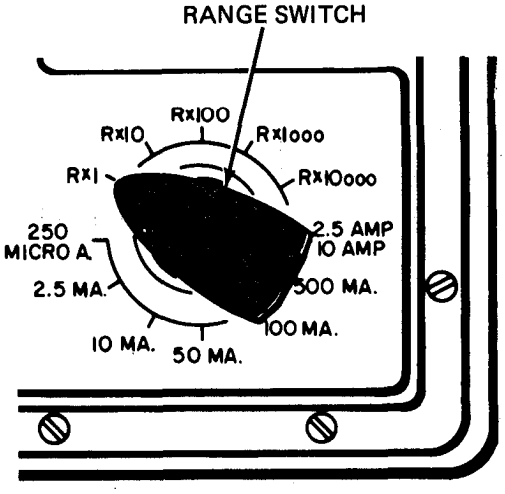
1

- Set up multimeter:
  - Set FUNCTION switch to OHMS

- Set range switch to RX1

GO




TA 120013

Figure 29-17 (Sheet 1 of 6)

GO

- Put jack plug of black (-) test lead into -DC ±AC OHMS jack
- Put jack plug of red (+) test lead into OHMS jack

NOTE

Detailed steps for making the truck circuits ready for continuity tests are in the fault isolation procedures. The steps given here are typical

2

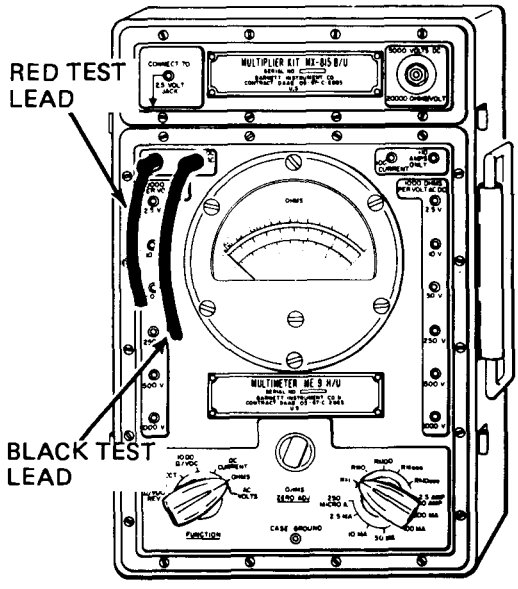
- Make tested circuit ready for continuity test:

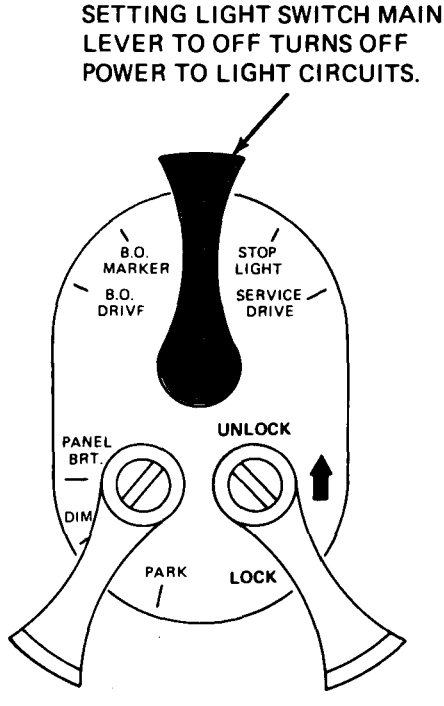
CAUTION

If power to tested circuit is not turned off, multimeter will be damaged

- Turn off power to tested circuit

GO



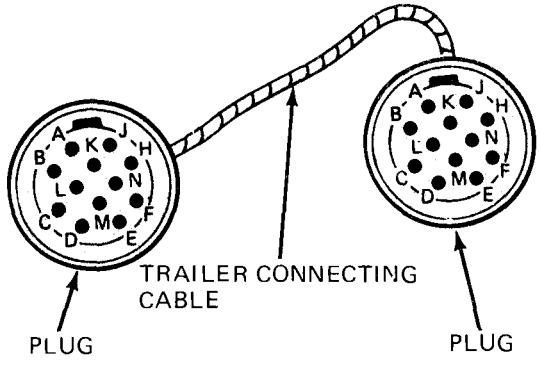

TA 120014

Figure 29-17 (Sheet 2 of 6)

GO

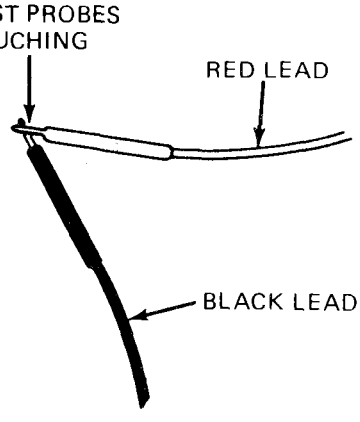
- Take plug on each end of trailer connecting cable off mating receptacle

TAKING CABLE PLUGS OFF MATING RECEPTACLES LETS YOU TEST CONTINUITY OF CABLE WIRES




3

- Zero the multimeter:
  - Touch multimeter test probes together

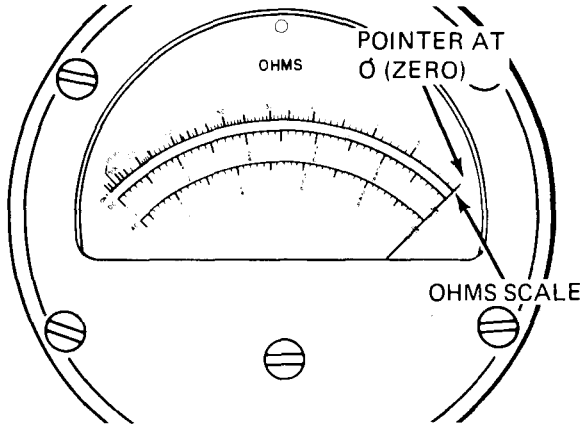



GO

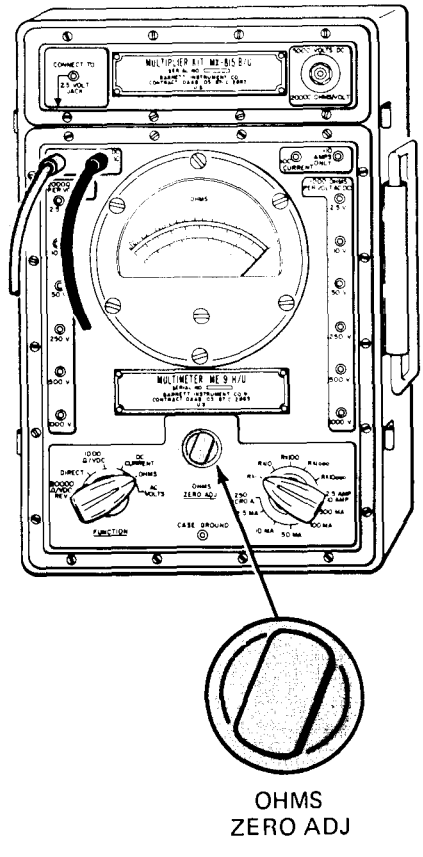
TA 120015

Figure 29-17 (Sheet 3 of 6)

GO




- While touching multimeter test probes together look at OHMS scale. Pointer should be at 0 (zero). If it is not, turn OHMS ZERO ADJ knob to move pointer to 0




GO

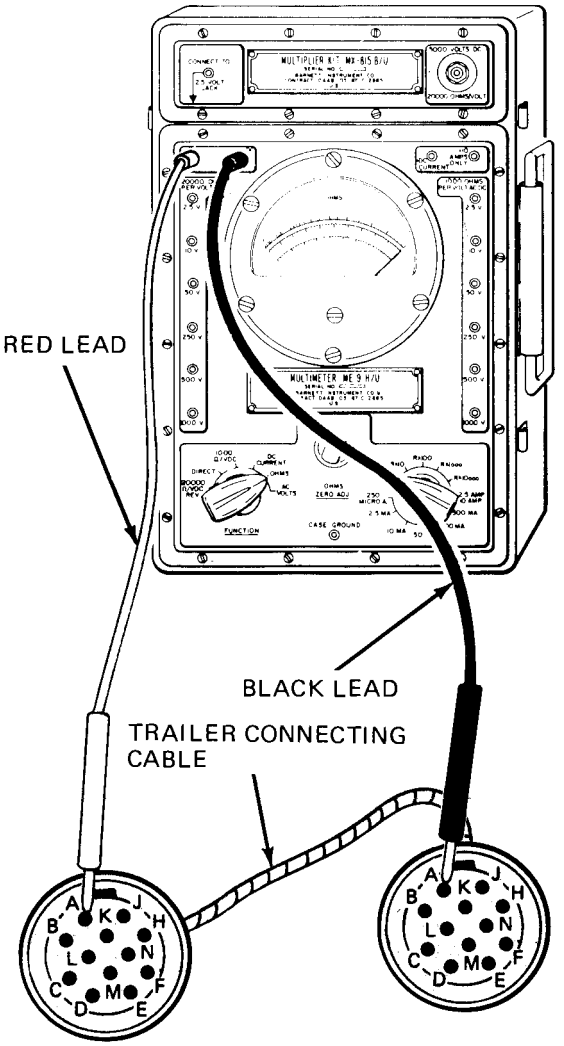
TA 120016

Figure 29-17 (Sheet 4 of 6)

GO

4

- Put multimeter leads across tested circuit:
  - Put test prod of black lead (-) on one contact of tested circuit
  - Put test prod of red lead (+) on other contact of tested circuit




NOTE: MULTIMETER SHOWN CHECKING CONTINUITY OF TRAILER CONNECTING CABLE WIRE ATTACHED TO CONTACT A.

GO

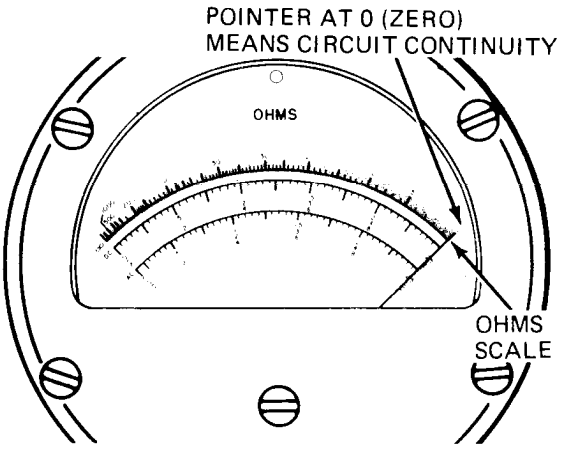
TA 120017

Figure 29-17 (Sheet 5 of 6)

GO

5

- Read multimeter:
  - Look at multimeter OHMS scale For continuity, pointer should be all the way to far right over 0 (zero)
  - If pointer stays all the way to left, tested circuit is open. If pointer jumps or flickers, tested circuit has a loose connection




6

- Put tested circuit back in operation:
  - Take off both test prods from contacts of tested circuit
  - Put back any plugs or other parts previously removed to test continuity

Figure 29-17 (Sheet 6 of 6)

4 SHORT TEST - To check for shorts in electrical cables

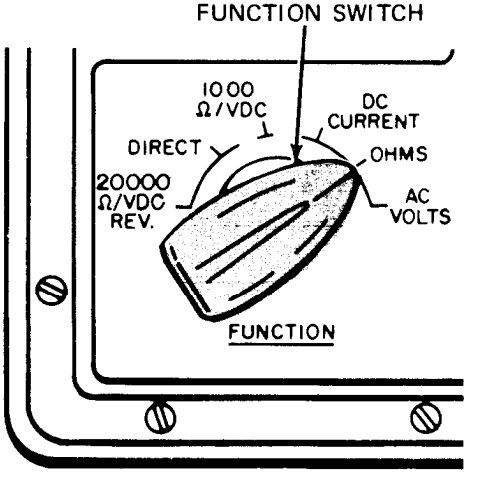
NOTE

A short (or short circuit) happens when two circuits that should not be connected have metal-to-metal contact with each other. A short also happens when a circuit that should not touch electrical ground has metal-to-metal contact with ground

1

- Set up multimeter:
  - Set FUNCTION switch to OHMS

GO

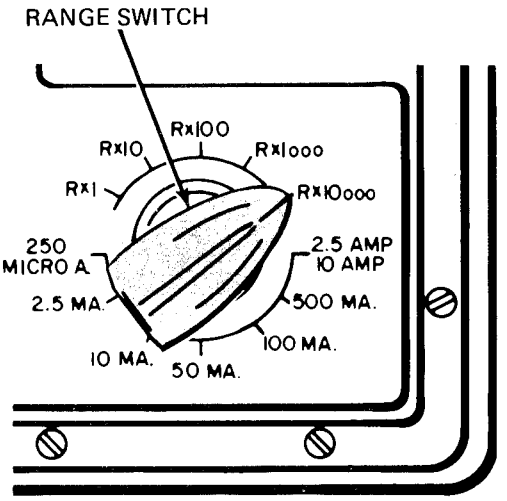



TA 120018

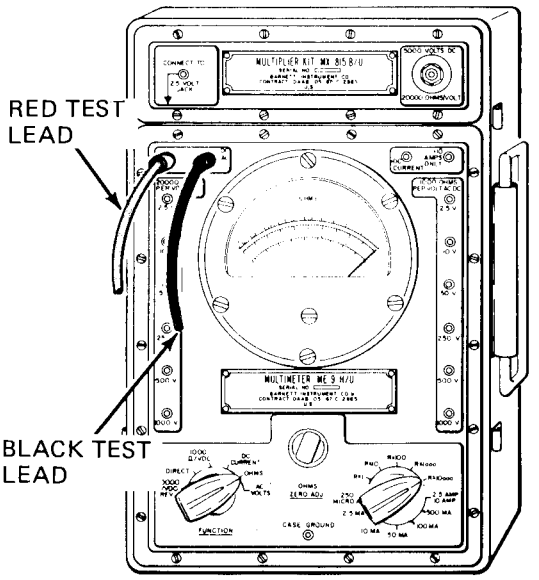
Figure 29-18 (Sheet 1 of 8)

GO

- Set range switch to RX10000




- Put jack plug of black (-) test lead into -DC ±AC OHMS jack
- Put jack plug of red (+) test lead into OHMS jack




GO

TA 120019

Figure 29-18 (Sheet 2 of 8)

GO

NOTE

Detailed steps for making the truck circuits ready for short test are in the fault isolation procedures. The steps given here are typical

2

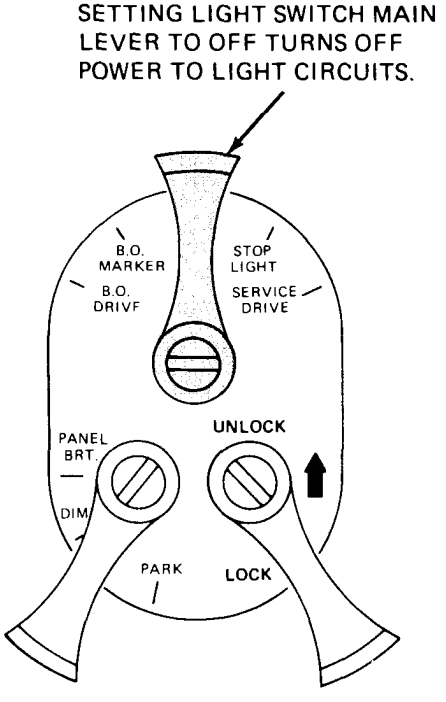
- Make tested circuits ready for short test:

CAUTION

If power to tested circuits is not turned off, multimeter will be damaged.

- Turn off power to tested circuit

GO



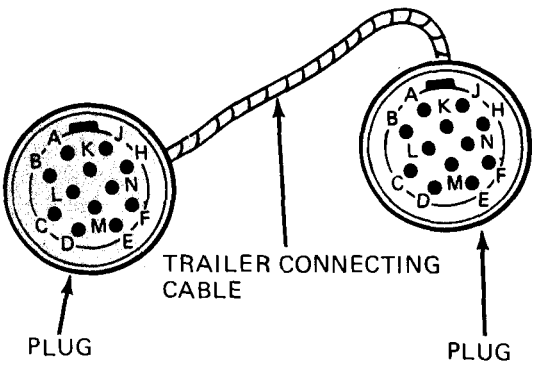

TA 120020

Figure 29-18 (Sheet 3 of 8)

GO

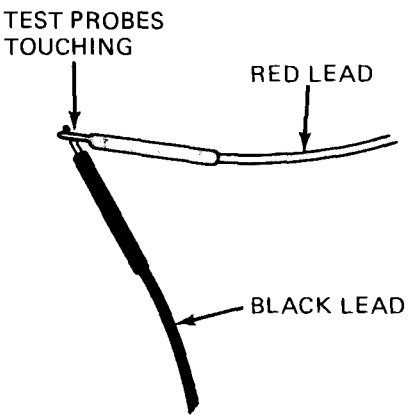
- Take plug on each end of trailer connecting cable off mating receptacle

TAKING CABLE PLUGS OFF MATING RECEPTACLES LETS YOU TEST CABLE WIRES FOR SHORTS




3

- Zero the multimeter:
  - Touch multimeter test probes together

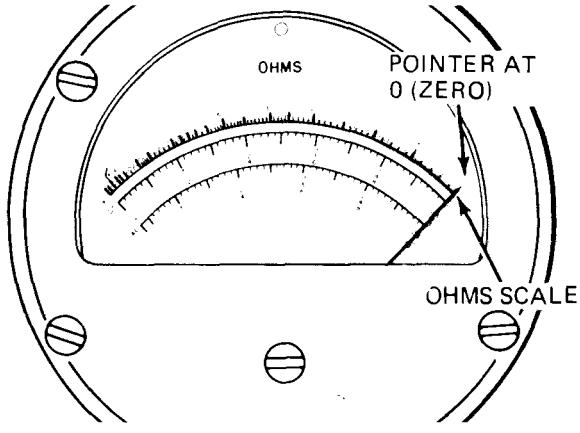



GO

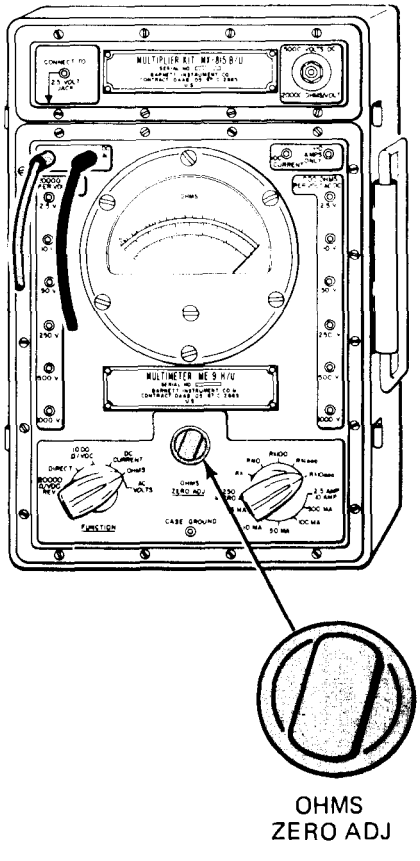
TA 120021

Figure 29-18 (Sheet 4 of 8)

GO




- While touching multimeter test probes together look at OHMS scale. Pointer should be at 0 (zero). If it is not, turn OHMS ZERO ADJ knob to move pointer to 0




GO

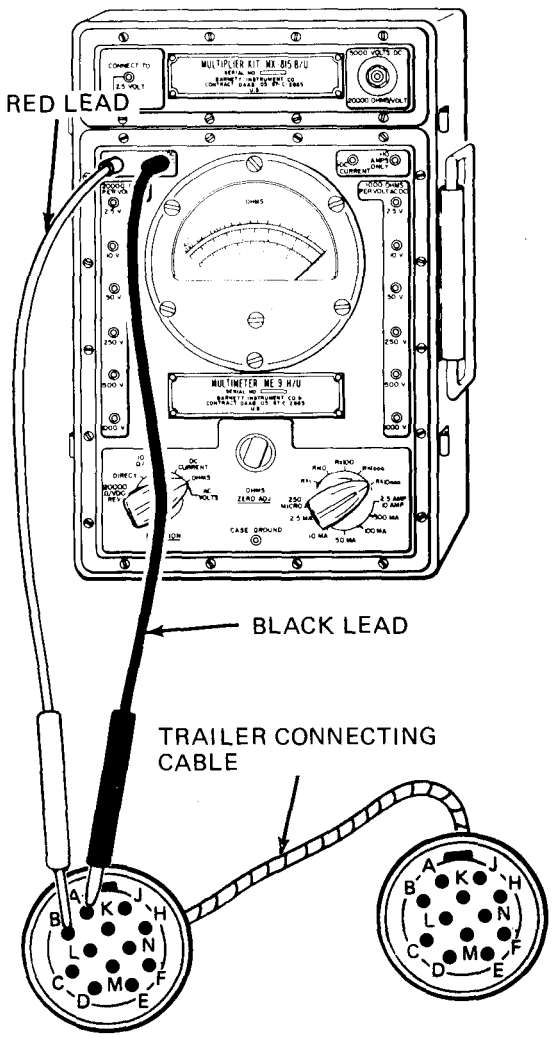
TA 120022

Figure 29-18 (Sheet 5 of 8)

GO

4

- Put multimeter leads across tested circuits:
  - To test for short between two circuits, put test probes on contacts of both circuits




NOTE: MULTIMETER SHOWN CHECKING FOR SHORT BETWEEN TRAILER CONNECTOR CABLE WIRES ATTACHED TO CONTACTS A AND B

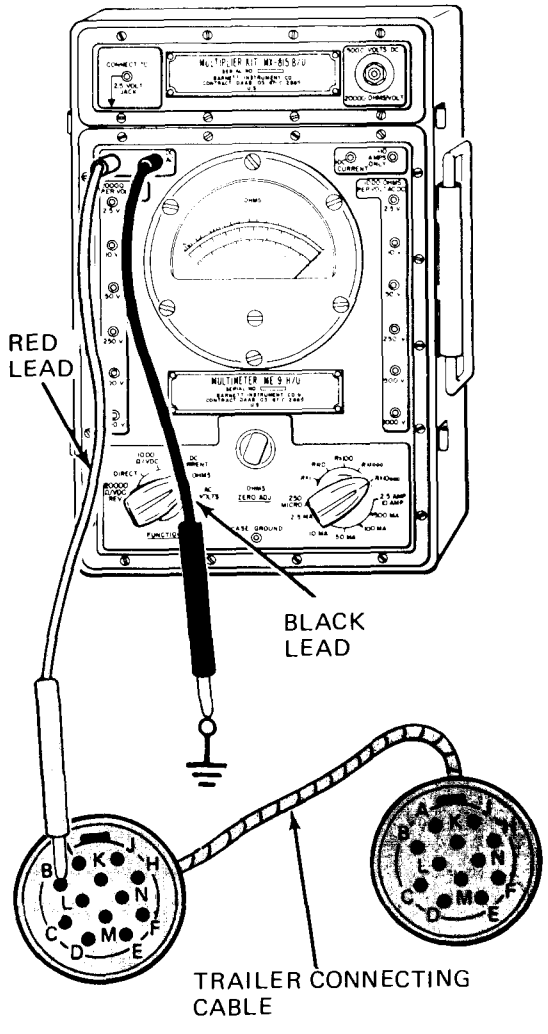
GO

TA 120023

Figure 29-18 (Sheet 6 of 8)

GO

- To test for short between a circuit and ground, put one test probe on circuit contact and other test probe on ground




NOTE: MULTIMETER SHOWN CHECKING FOR SHORT BETWEEN TRAILER CONNECTOR CABLE WIRE ATTACHED TO CONTACT B AND GROUND.

GO

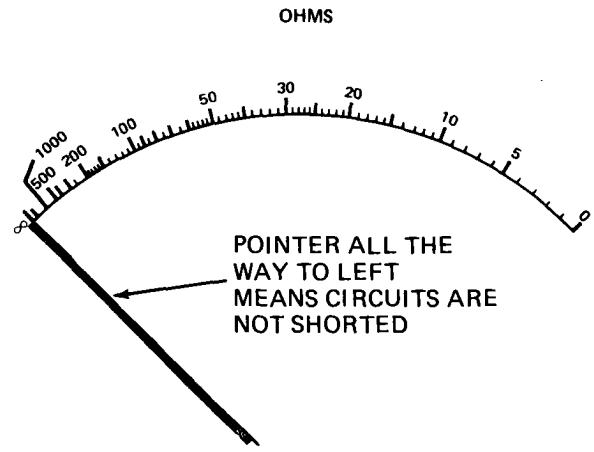
TA 120024

Figure 29-18 (Sheet 7 of 8)

GO

5

- Read multimeter:
  - Look at multimeter OHMS scale. If pointer stays all the way to far left without moving, circuits are not shorted
  - If pointer moves all the way to far right over 0 (zero), circuits are shorted. If pointer jumps or flickers, circuits are sometimes shorted




6

- Put tested circuit back in operation
  - Take off both test prods from contacts of tested circuit and from ground
  - Put back any plugs or other parts previously removed to test for shorts

TA 120025

Figure 29-18 (Sheet 8 of 8)

# CHAPTER 30

# ELECTRICAL SYSTEM OPERATING AND PRELIMINARY PROCEDURES

30-1. EQUIPMENT ITEMS COVERED. This chapter gives equipment operating and preliminary procedures for the system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

30-2. EQUIPMENT ITEMS NOT COVERED. All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

## GENERAL INFORMATION

**NOTE**

When making light switch main lever selections from OFF to any ON position except B. O. MARKER, unlock switch must be lifted to UNLOCK position

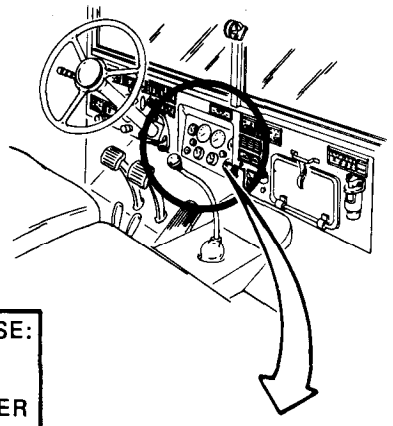
The condition of the batteries should always be checked before troubleshooting any system in the truck

The truck has two 12 volt DC batteries connected in series, to furnish 24 volts DC to the electrical system which uses a negative (-) ground and positive (+) power feed to the electrical components

To test the condition of batteries, set BATTERY SWITCH to ON. (Do not start engine)

The battery indicator should be in position as shown in view A

Start engine and run at 1200 RPM. See view B



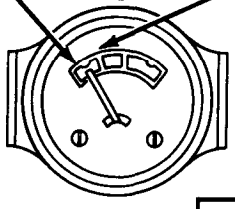
VIEW B

BATTERY IN USE:

CHARGING OR UNDER STARTER LOAD.

READINGS HERE INDICATE THAT BATTERY IS NEARLY WORN OUT.

ENGINE RUNNING AT NORMAL SPEED FOR SEVERAL MINUTES, AND POINTER RESTS HERE, MEANS BATTERY IS NOT CHARGING. CHECK VOLTAGE REGULATOR. IF OK, CHECK GENERATOR.

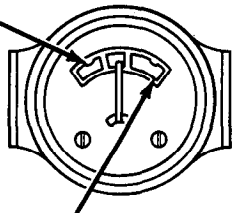


ENGINE RUNNING AT MAXIMUM CHARGING SPEED LONG EOUGH TO CHARGE BATTERY, WITH ALL ELECTRICAL UNITS TURNED ON, POINTER SHOULD STAY IN GREEN SECTION. IF NOT, VOLTAGE REGULATOR IS SET TOO LOW, OR BATTERY IS WORN OUT.

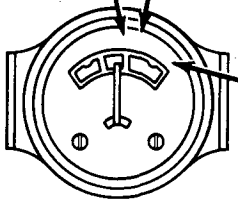
BATTERY AT REST:

READINGS HERE INDICATE A DEAD BATTERY. COULD BE UNDERCHARGING OR A SHORT IN ELECTRICAL SYSTEM. IF NEEDLE REMAINS HERE, BATTERY IS WORN OUT OR DEFECTIVE.

VIEW A



WITH ALL ELECTRICAL UNITS OFF, RUN ENGINE TO MAXIMUM CHARGING RATE. IF VOLTAGE REGULATOR IS PROPERLY SET, POINTER WILL FALL IN TOP HALF OF GREEN SECTION.



OVERCHARGE SECTION MALADJUSTED OR DEFECTIVE VOLTAGE REGULATOR.

READINGS HERE SHOW BATTERY WAS RECENTLY CHARGED AT HIGH RATE (OVERCHARGED)

TA 116091

Figure 30-1

# CHAPTER 31

# ELECTRICAL SYSTEM CHECKOUT PROCEDURES

31-1. GENERAL. This chapter gives procedures for checking out the system after troubleshooting and repair have been done. Procedures are set up in flow chart form showing the checkout steps in order and referring to the fault symptom index when the system does not check out.

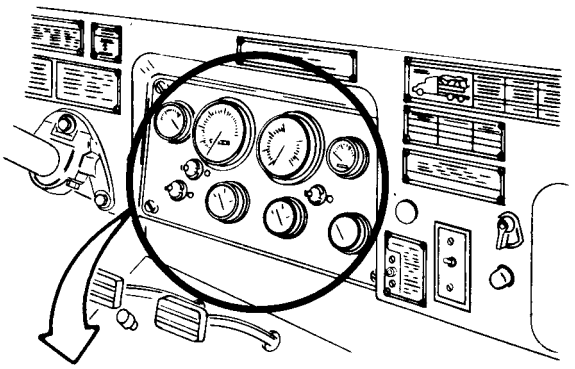
1 CHECKOUT INDICATOR GAGE SUBSYSTEM

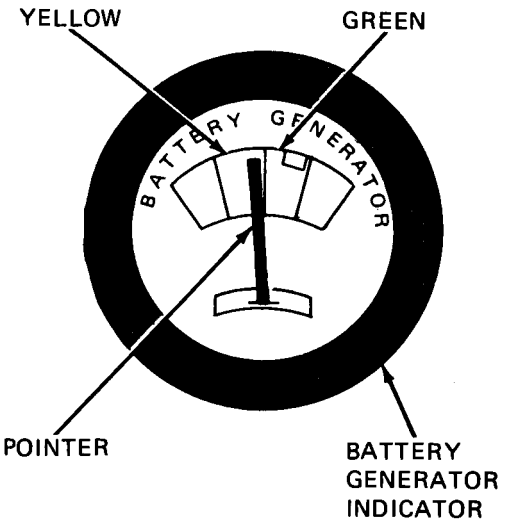
1
- Park truck
  - Refer to TM 9-2320-211-10

2
- Check that battery-generator works
  - Set ACCESSORY switch to ON
  - Look at battery-generator indicator. Pointer should be at mid yellow and low green

OK?

GO






TA 116092

Figure 31-1 (Sheet 1 of 6)

GO

YES

NO

3

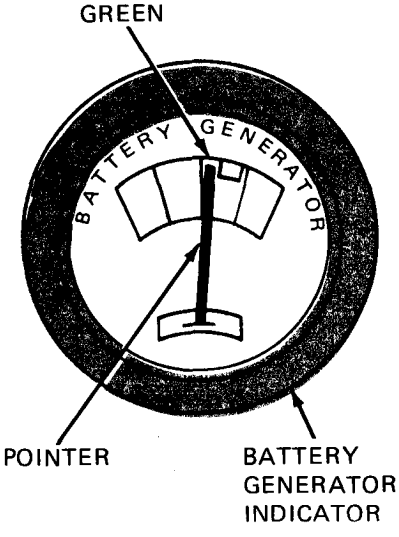
- Troubleshoot indicator gage subsystem
  - Set ACCESSORY switch to OFF
  - Troubleshoot indicator gage subsystem. Refer to fault symptom index

4

- Check that battery-generator indicator shows voltage output
  - Start engine. Refer to TM 9-2320-211-10
  - Look at battery-generator indicator. Pointer should be in green area

OK?

GO




TA 116093

Figure 31-1 (Sheet 2 of 6)

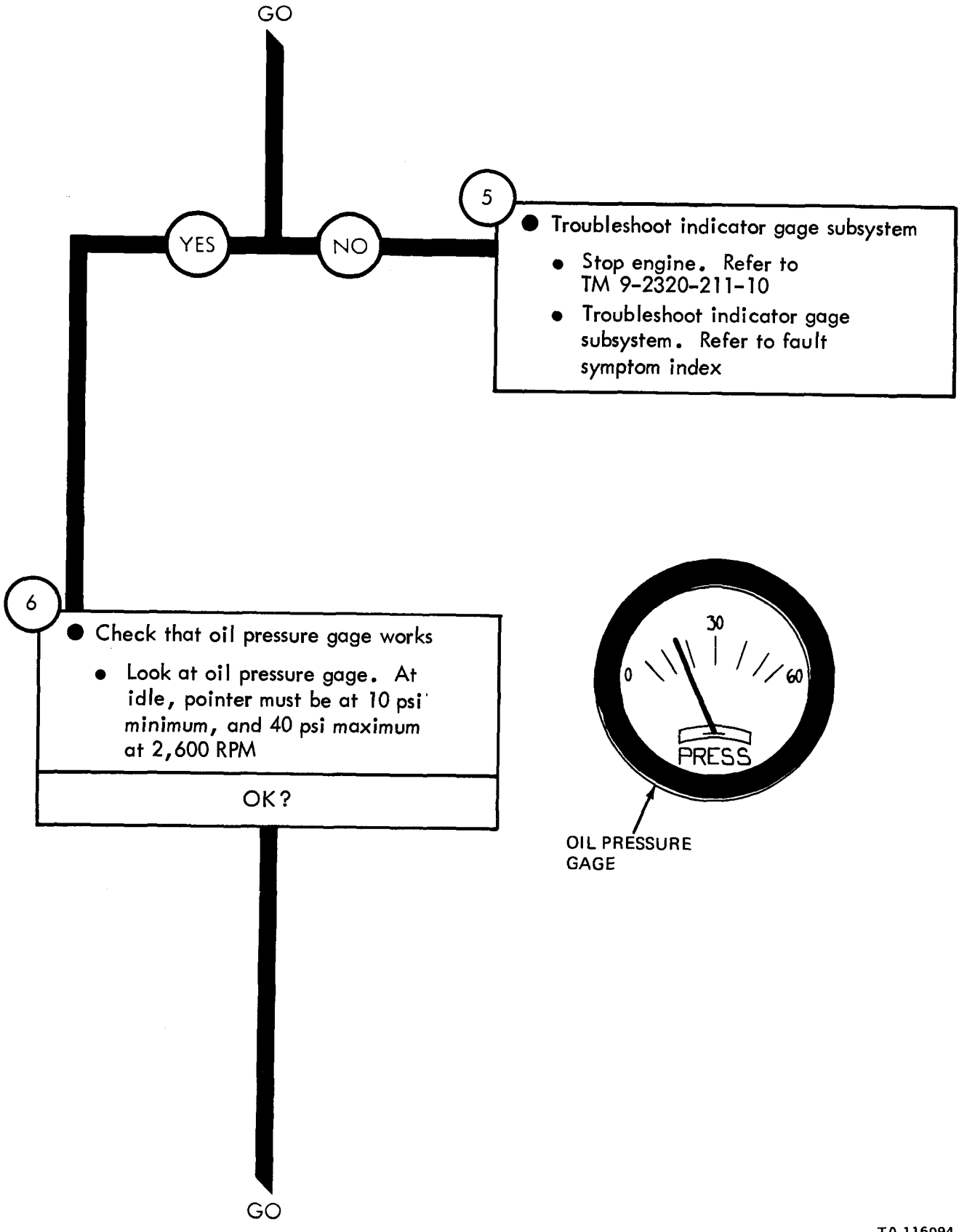



Figure 31-1 (Sheet 3 of 6)

GO

YES

NO

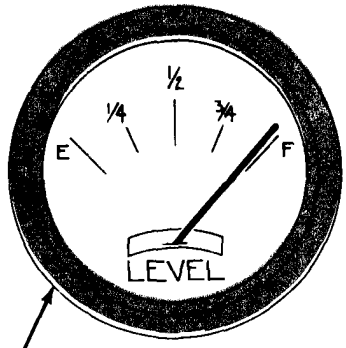
7

- Troubleshoot oil pressure gage
  - Shut off engine. Refer to TM 9-2320-211-10
  - Troubleshoot oil pressure gage. Refer to fault symptom index

8

- With fuel tank full check that fuel level indicator gage works
  - Look at fuel level indicator gage. Pointer should be on F

OK?




FUEL LEVEL INDICATOR GAGE

GO

TA 116095

Figure 31-1 (Sheet 4 of 6)

GO

YES

NO

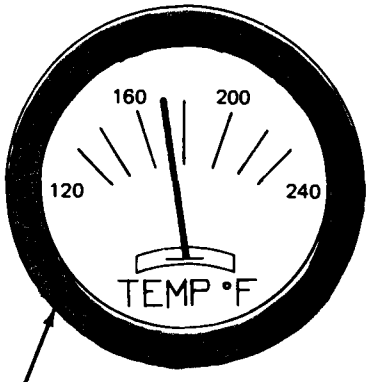
9

- Troubleshoot fuel level gage subsystem
  - Stop engine. Refer to TM 9-2320-211-10
  - Troubleshoot fuel level indicator gage subsystem. Refer to fault symptom index

10

- Check that temperature gage works
  - When truck has been run at least 10 minutes, look at temperature gage. Pointer should be between 160° and 180°F

OK?

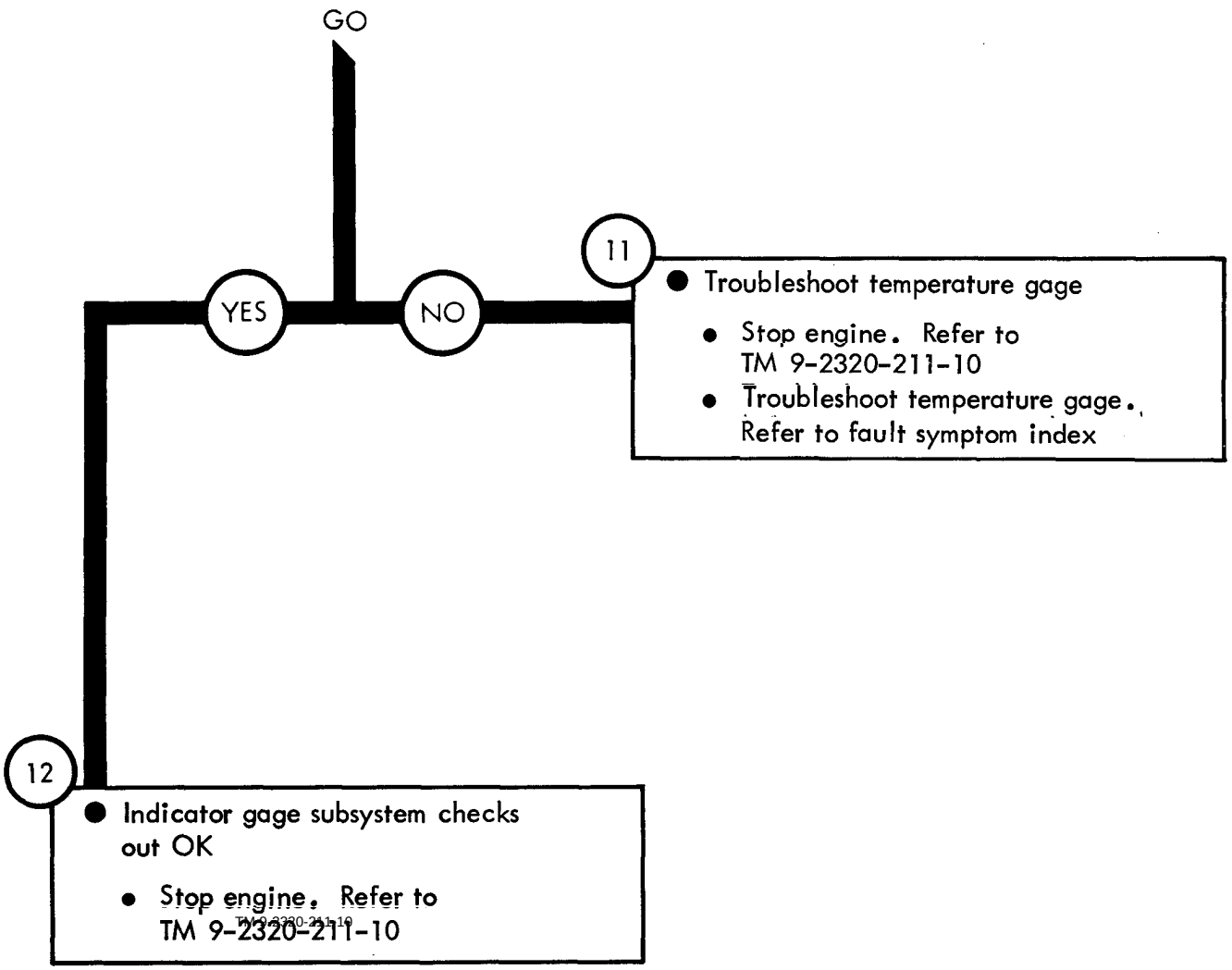



TEMPERATURE GAGE

GO

TA 116096

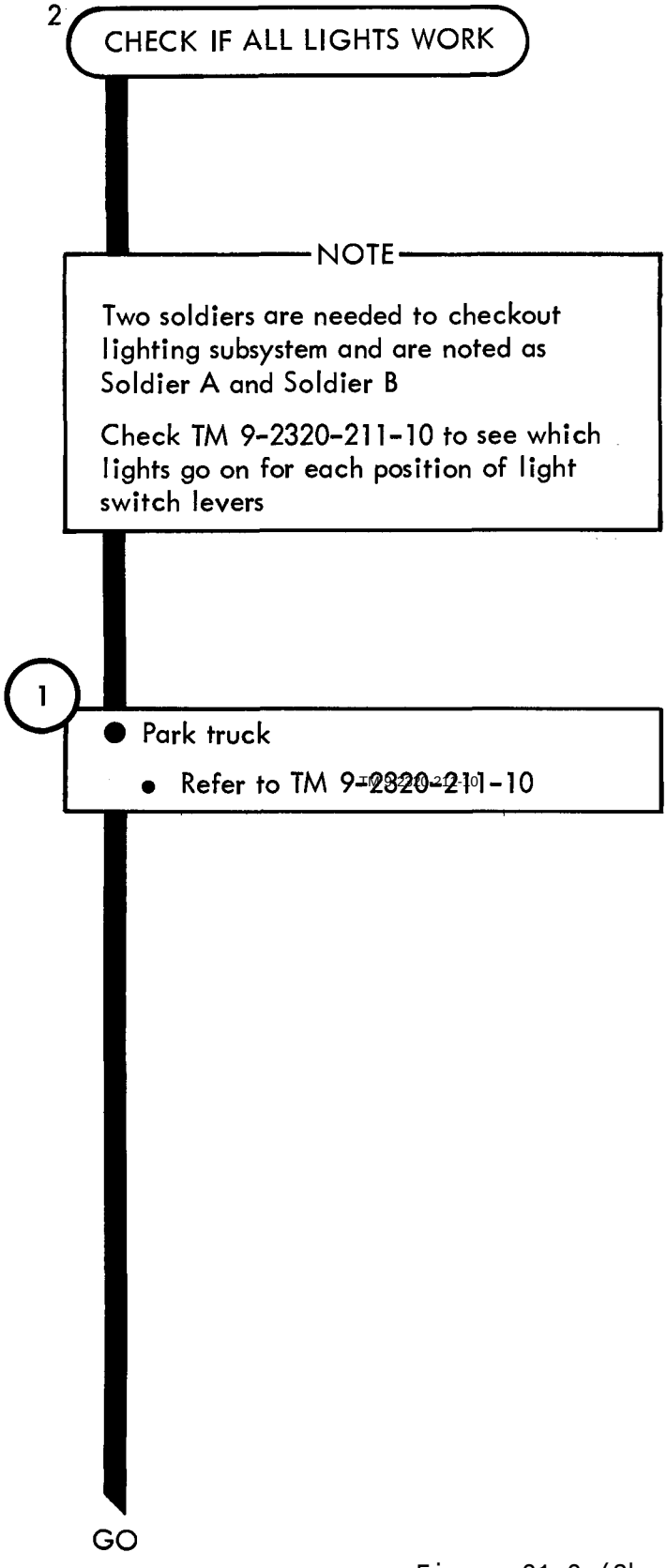
Figure 31-1 (Sheet 5 of 6)




TA 116097

Figure 31-1 (Sheet 6 of 6)

CHECKOUT LIGHTING SUBSYSTEM




TA 116098

Figure 31-2 (Sheet lof 2)

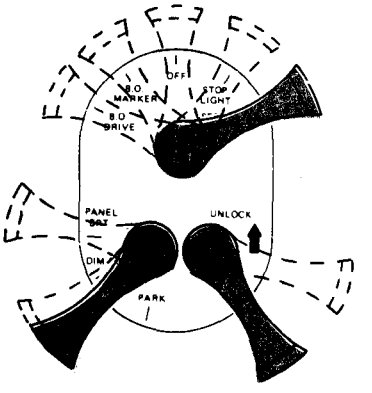
GO

2

- Check if all lights work

SOLDIER A
- Move light switch levers to lights being tested
- Tell Soldier B which lights are being tested

SOLDIER B
- Look at each light being tested
- Write down if light works or not




Do all lights work?

YES

NO

3

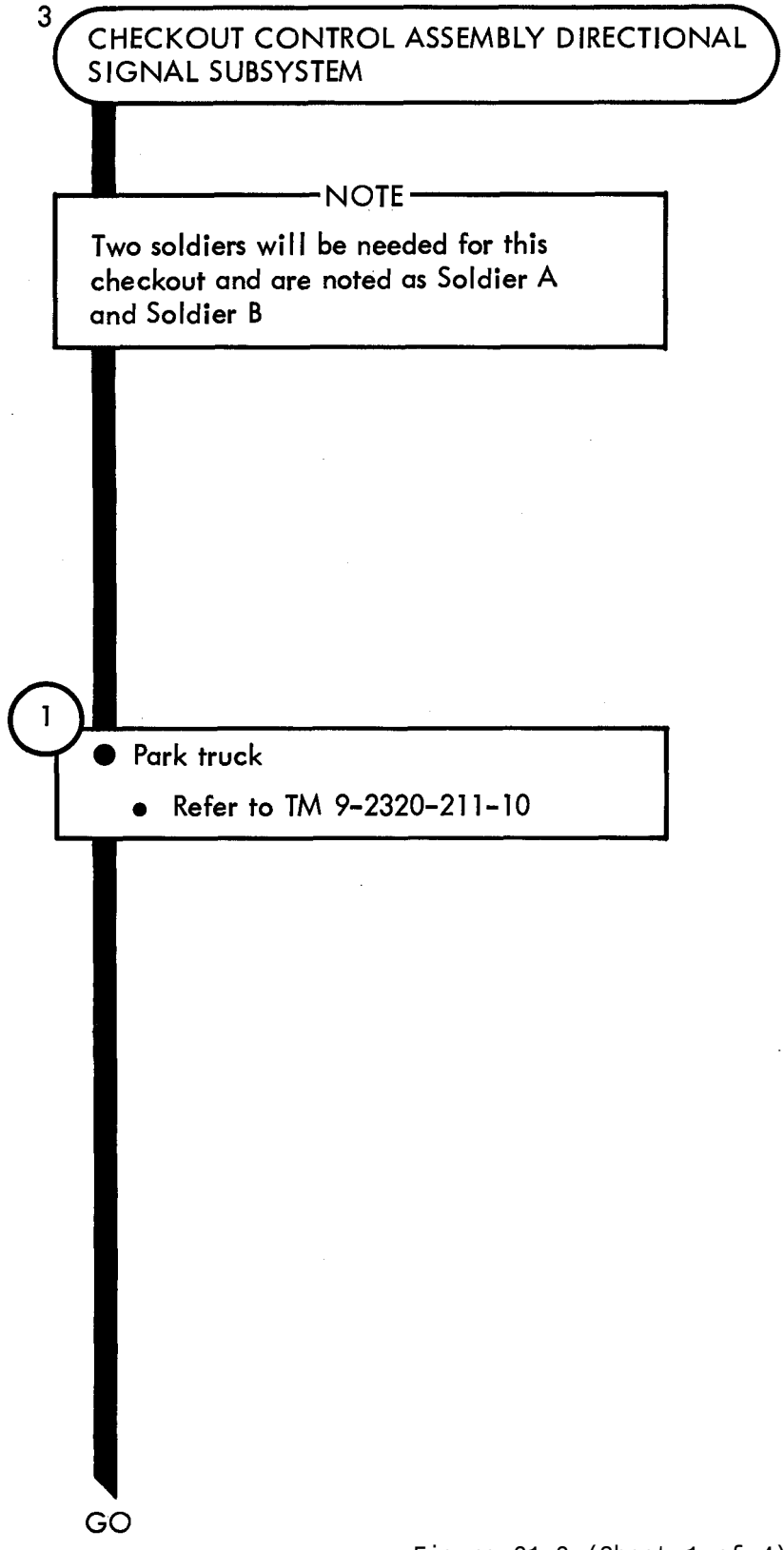
- Refer to electrical troubleshooting index
  - Set light switch levers to OFF
  - Refer to fault symptom index

4

- Checkout of lighting subsystem completed
  - Set light switch levers to OFF

TA 116099

Figure 31-2 (Sheet 2 of 2)




TA 116100

Figure 31-3 (Sheet 1 of 4)

GO

2

- Check that hazard warning lights work

SOLDIER A
- Set IGNITION switch to ON
- Set light switch main lever to SERVICE DRIVE
- Set turn signal control arm to hazard warning position
- Check that turn signal control lamp flashes 1 to 2 times per second

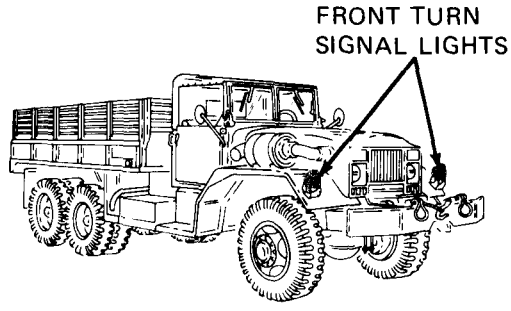
SOLDIER B
- Check that two front signal lamps and two rear signal lamps flash together at 1 to 2 times per second

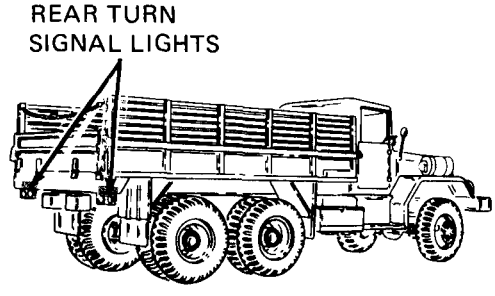
SOLDIER A
- Step on brake pedal and hold it down
- Check that turn signal control arm lamp flashes 1 to 2 times per second

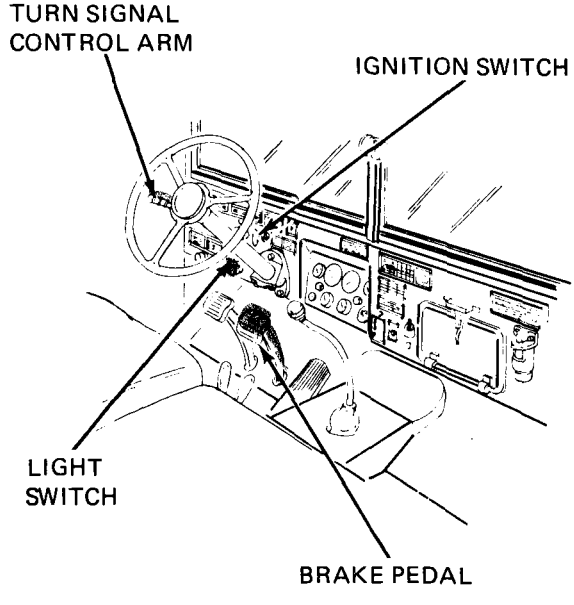
SOLDIER B
- While Soldier A holds down brake pedal check that rear turn signal lamps flash 1 to 2 times per second

Do hazard warning lamps check out OK?

GO




TA 116101

Figure 31-3 (Sheet 2 of 4)

GO

YES

NO

3

- Troubleshoot control assembly directional subsystem
  - Set turn signal control arm to neutral position
  - Set light switch main lever to OFF
  - Set IGNITION switch to OFF
  - Troubleshoot control assembly directional subsystem. Refer to fault symptom index

4

- Check that turn signal control lamps light

SOLDIER A • Set turn signal control arm to left turn

SOLDIER B • Check that front and rear left turn signals work

SOLDIER A • Step on brake pedal and hold it down

SOLDIER B • Check that left turn signal flashes with brake on

SOLDIER A • Keep brake pedal held down and set turn signal control arm to right turn

SOLDIER B • Check that right rear turn signal works with brake on

SOLDIER A • Release brake pedal

SOLDIER B • Check that right rear and front turn signal lights work

Do all turn signal lights work OK?

GO

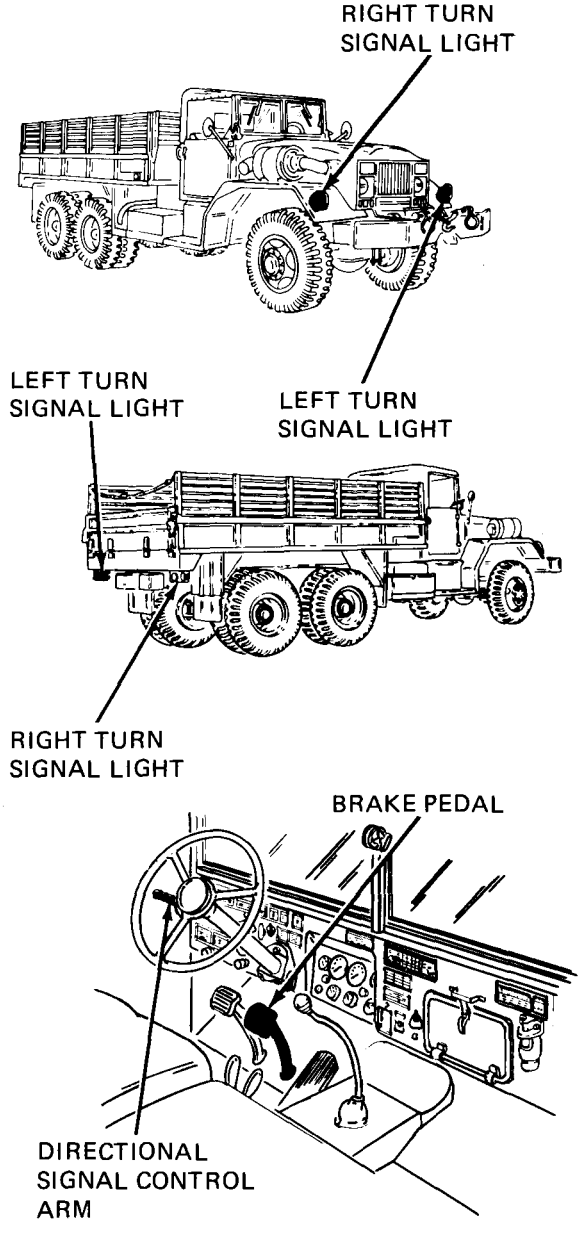
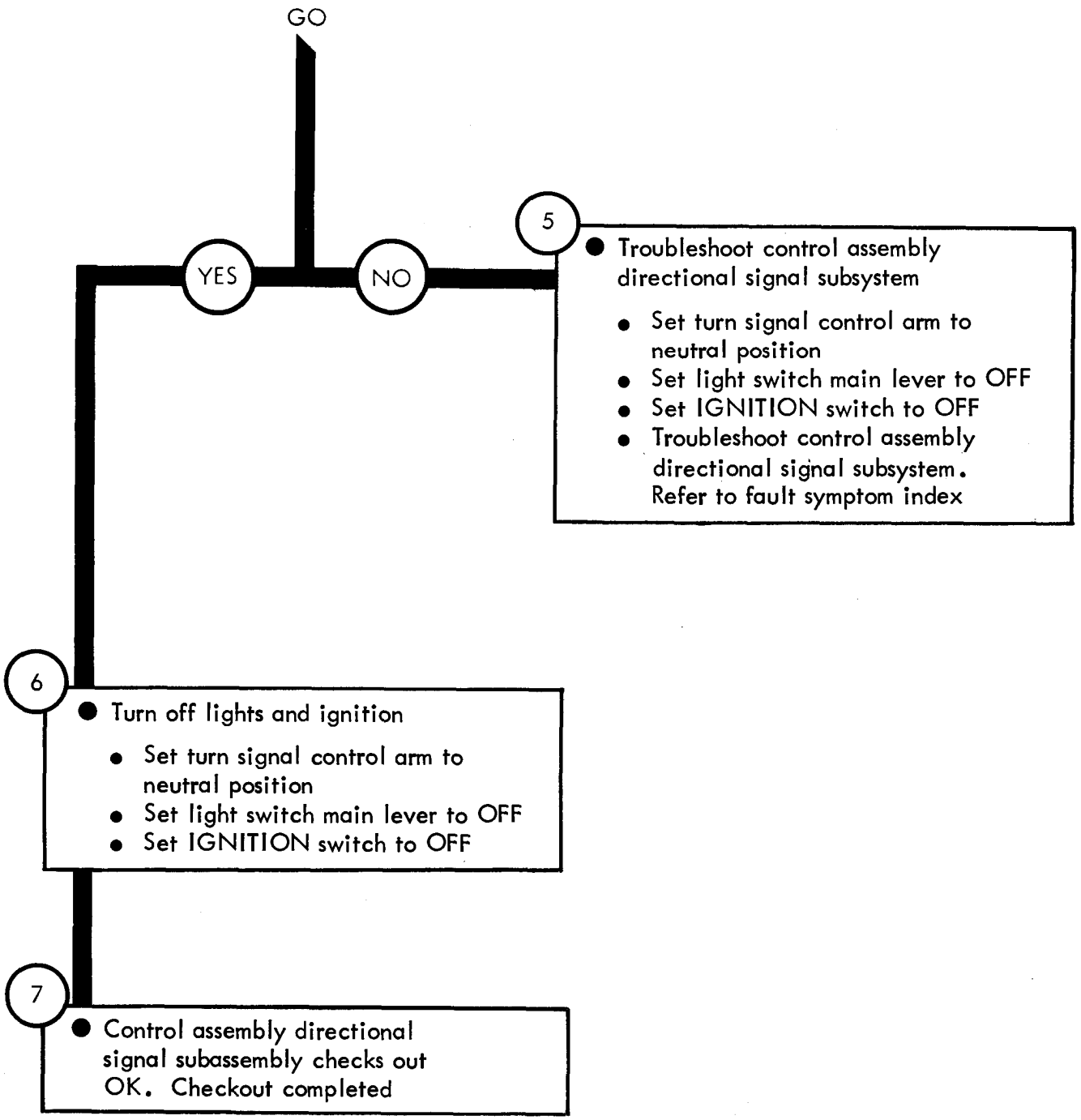



Figure 31-3 (Sheet 3 of 4)




TA 116103

Figure 31-3 (Sheet 4 of 4)

# CHAPTER 32

# TRANSMISSION SYSTEM TROUBLESHOOTING

32-1. EQUIPMENT ITEMS COVERED. This chapter gives equipment troubleshooting procedures for the transmission system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

32-2. EQUIPMENT ITEMS NOT COVERED. All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

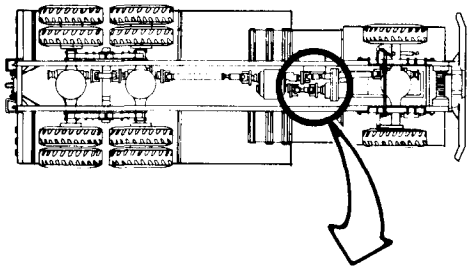
TRANSMISSION SYSTEM TROUBLESHOOTING

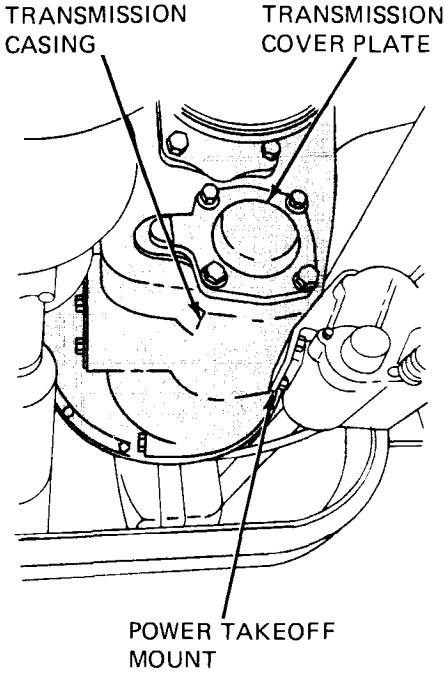
Symptom

1 TRANSMISSION LEAKS OIL

1

- Park truck
  - Refer to TM 9-2320-211-10






2

- Check transmission casing
  - Crawl under truck
  - Look for a cracked or broken casing

Is transmission casing OK?

YES

NO

3

- Replace cracked or broken transmission casing
  - Tell direct support maintenance

GO

TA 116104

Figure 32-1 (Sheet 1 of 3)

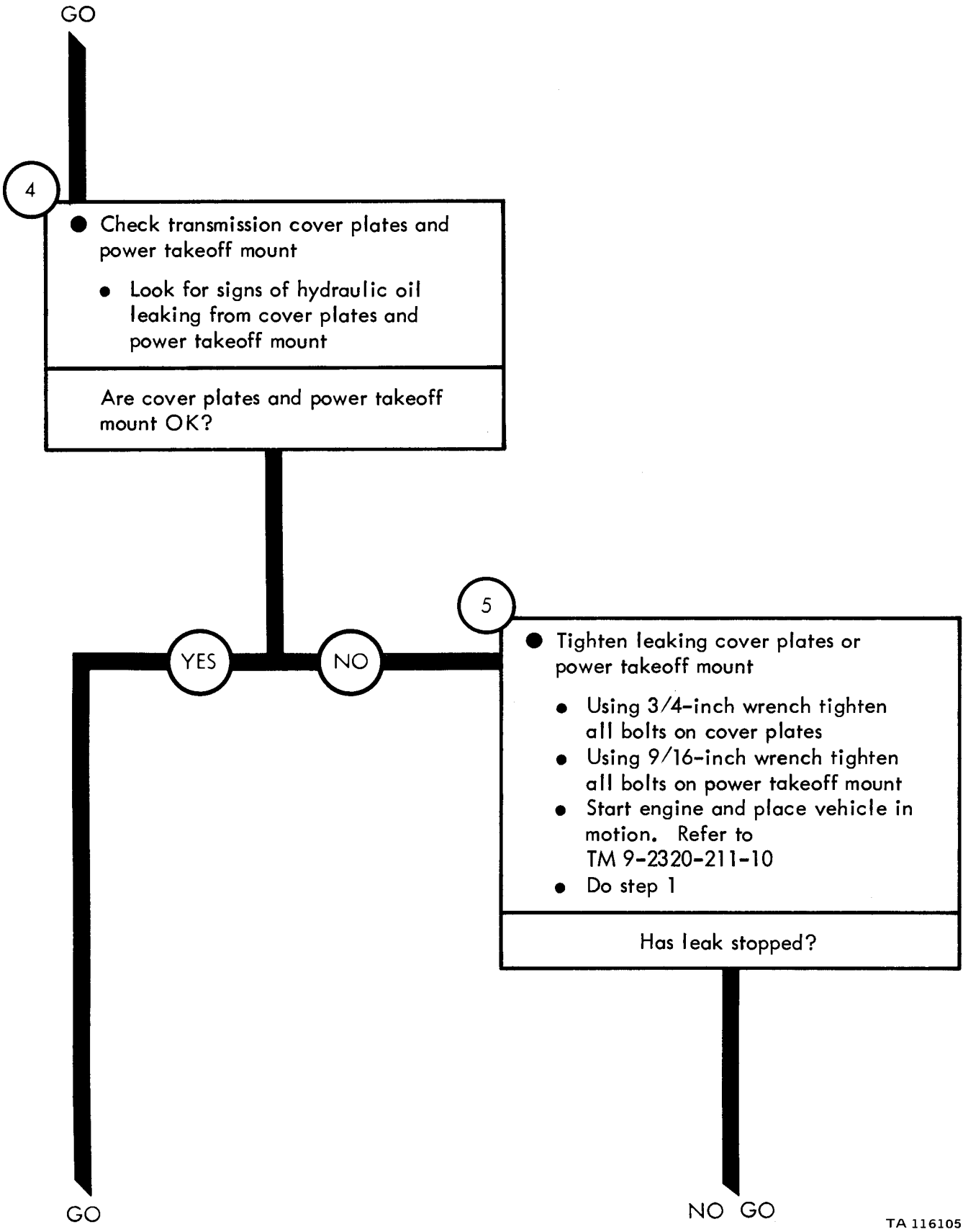
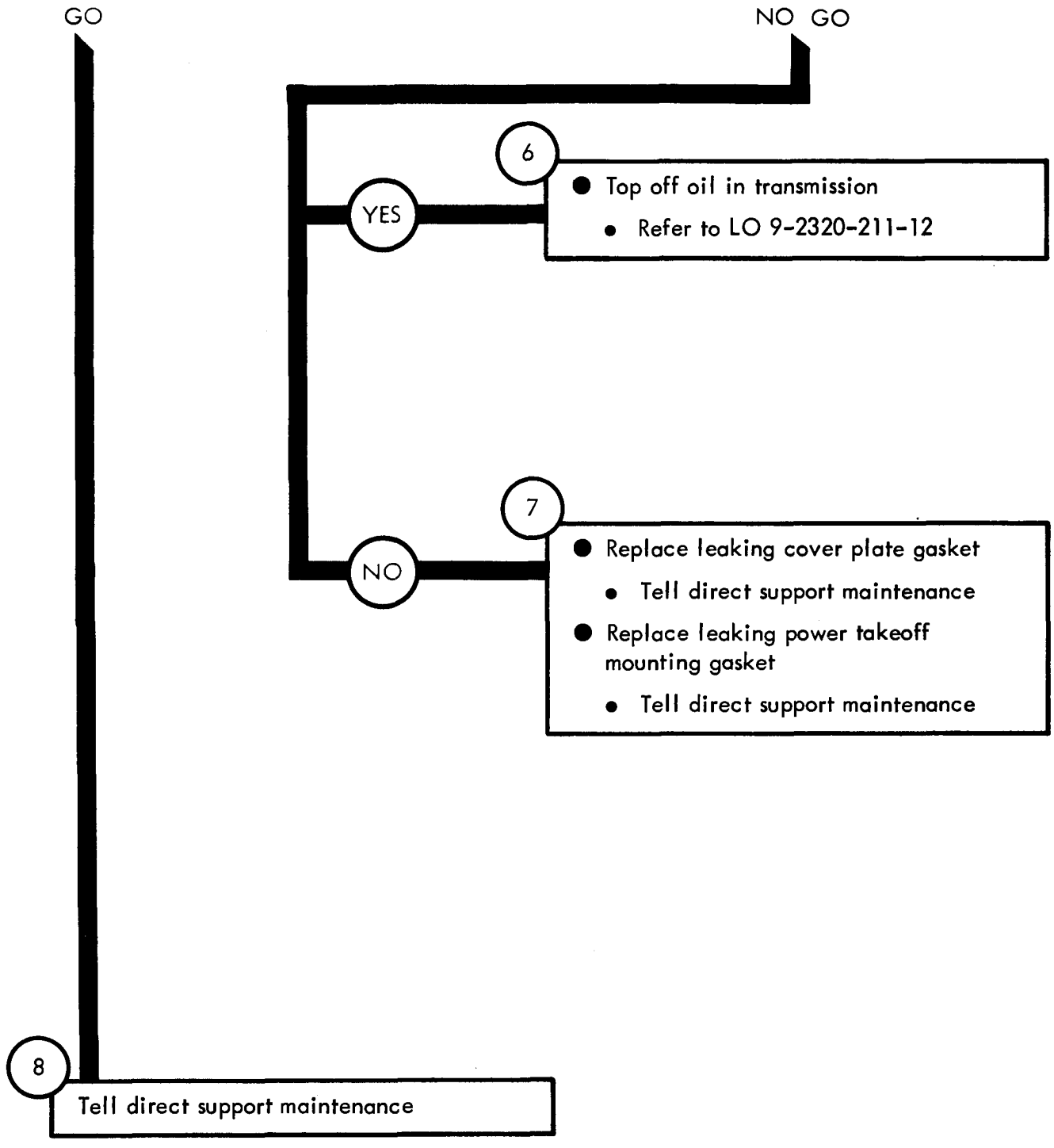



Figure 32-1 (Sheet 2 of 3)




TA 116106

Figure 32-1 (Sheet 3 of 3)

Symptom 2

TRANSMISSION GEARS GRIND WHEN SHIFTING

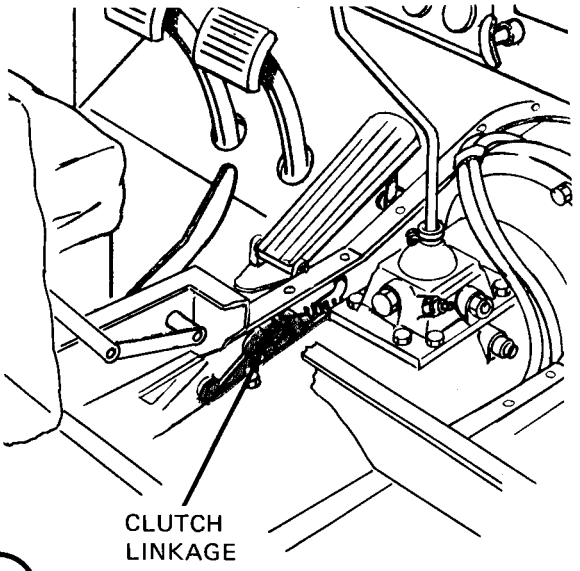
1. ● Park truck
   - Refer to procedures given in TM 9-2320-211-10

NOTE

Clutch system is not part of transmission system. However parts in clutch system can cause the transmission gears to grind when shifting

2. ● Check clutch linkage
   - Look for bent or broken linkage

Is clutch linkage OK?




NO → 3. ● Replace bent or broken linkage
- Refer to Vol 3, chapter 3, para 3-4

NO → 4. ● Replace transmission
- Tell direct support maintenance

TA 116107

Figure 32-2

# CHAPTER 33

# TRANSFER SYSTEM TROUBLESHOOTING

33-1. EQUIPMENT ITEMS COVERED . This chapter gives equipment troubleshooting procedures for the transfer system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

33-2. EQUIPMENT ITEMS NOT COVERED . All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

Symptom

1 TRANSFER LEAKS OIL

1

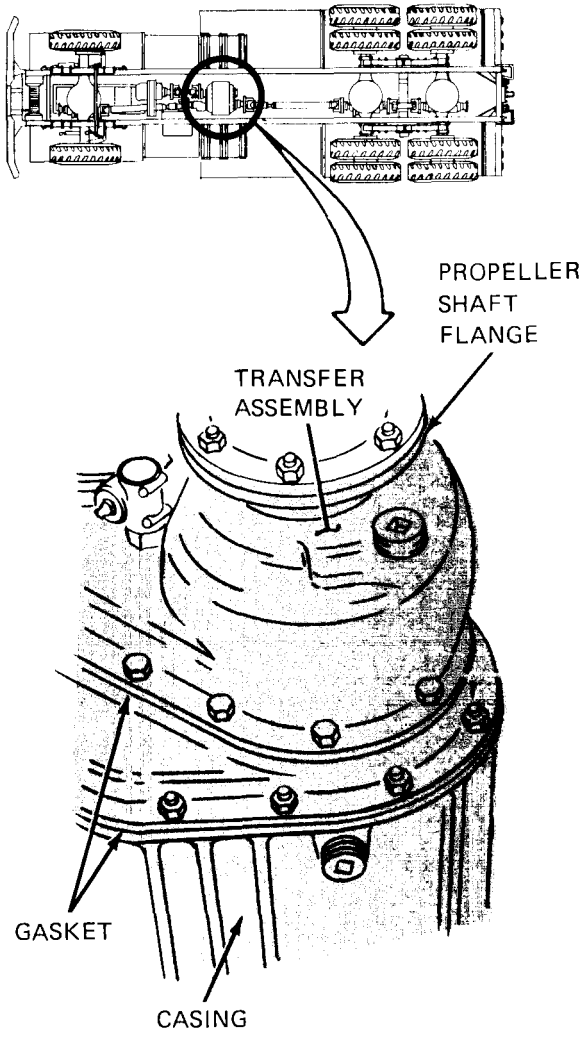
- Make truck ready for work on transfer
  - Park truck. Refer to TM 9-2320-211-10
  - Chock wheels
  - Crawl under truck

2

- Check transfer gaskets and seals
  - Look for signs of gear oil leaking from gaskets
  - Look at propeller shaft flanges to see if gear oil is leaking from seals

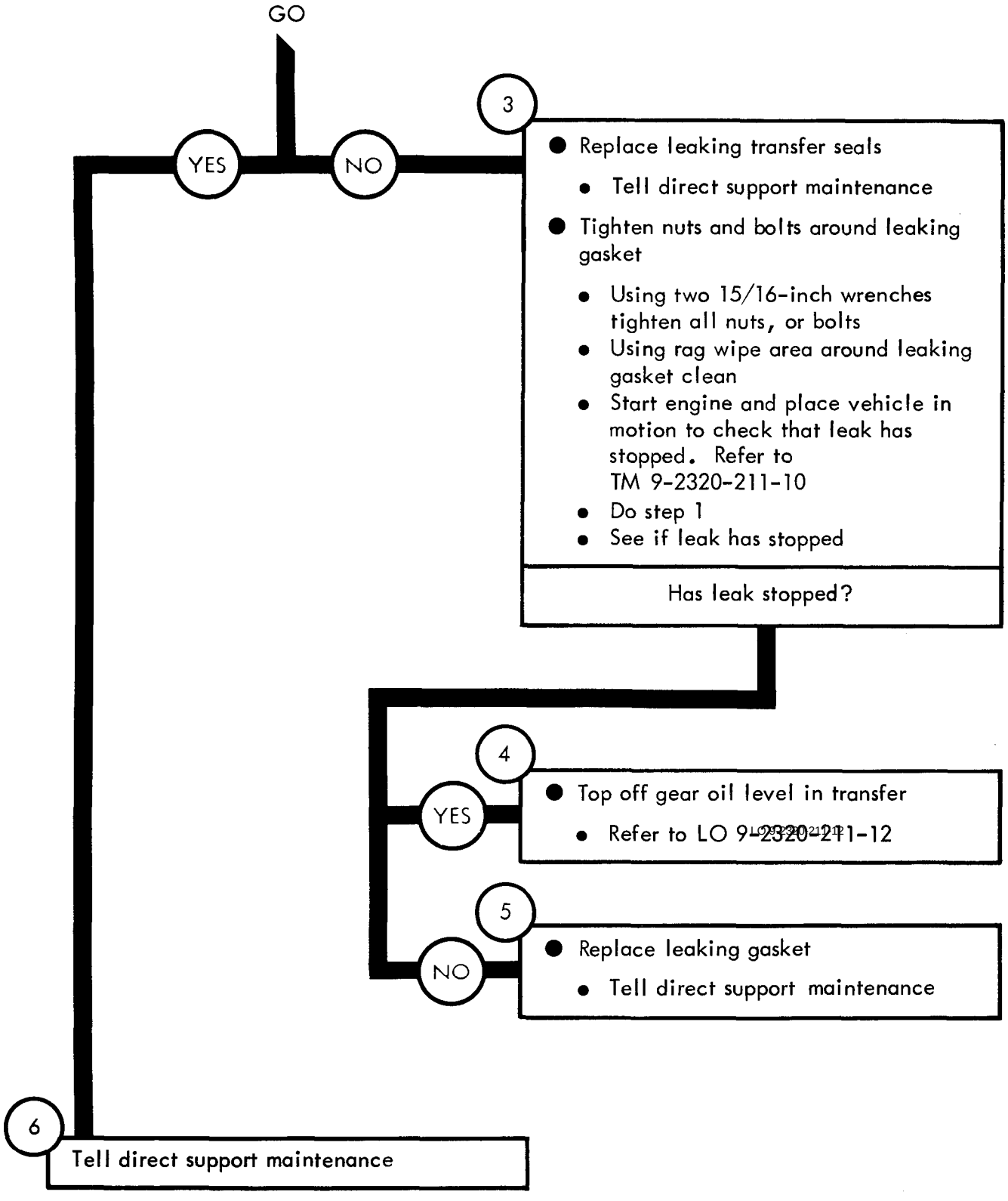
Are gaskets and seals OK?

GO




TA 116108

Figure 33-1 (Sheet 1 of 2)




TA 116109

Figure 33-1 (Sheet 2 of 2)

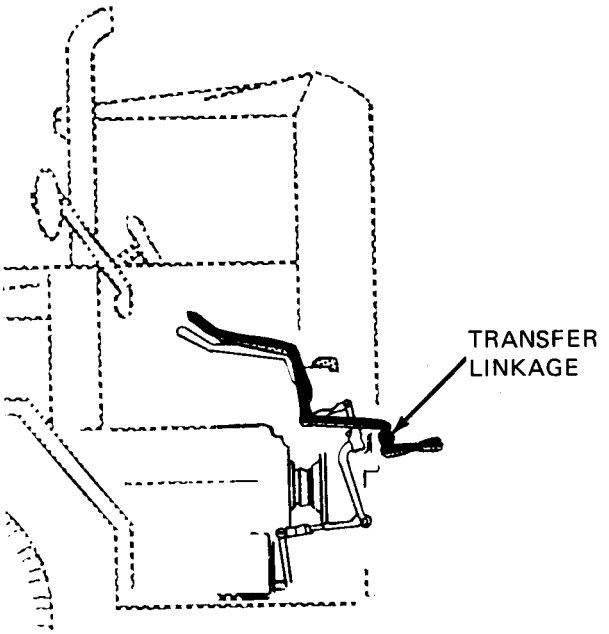
Symptom

2 TRANSFER IS HARD TO SHIFT, OR POPS OUT OF GEAR

1
- Make truck ready for work on transfer
  - Park truck. Refer to TM 9-2320-211-10

2
- Check for bent transfer linkage
  - Crawl under truck
  - Look closely for signs of bent linkage

Is linkage OK?




YES

NO

3
- Replace bent transfer linkage
  - Tell direct support maintenance

GO

TA 116110

Figure 33-2 (Sheet 1 of 2)

GO

**NOTE**

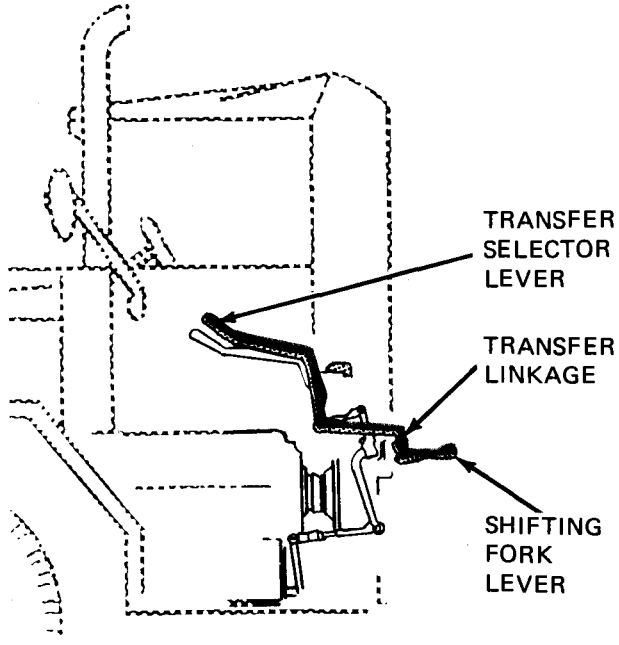
This procedure will need the use of two soldiers. The lead soldier will be called SOLDIER A, and the helper will be called SOLDIER B

4

- Check transfer shift linkage

SOLDIER B
- Go to driver's seat and wait for instructions from SOLDIER A

SOLDIER A
- Crawl under truck
- Tell SOLDIER B to shift transfer lever
- Look for signs of the linkage binding at linkage ends
- See if shifting fork lever moves all the way in and out




Is linkage OK?

YES

NO

5

- Lubricate binding linkages
  - Refer to LO 9-2320-211-12
- Adjust transfer linkage
  - Tell direct support maintenance

6

Tell direct support maintenance

TA 116111

Figure 33-2 (Sheet 2 of 2)

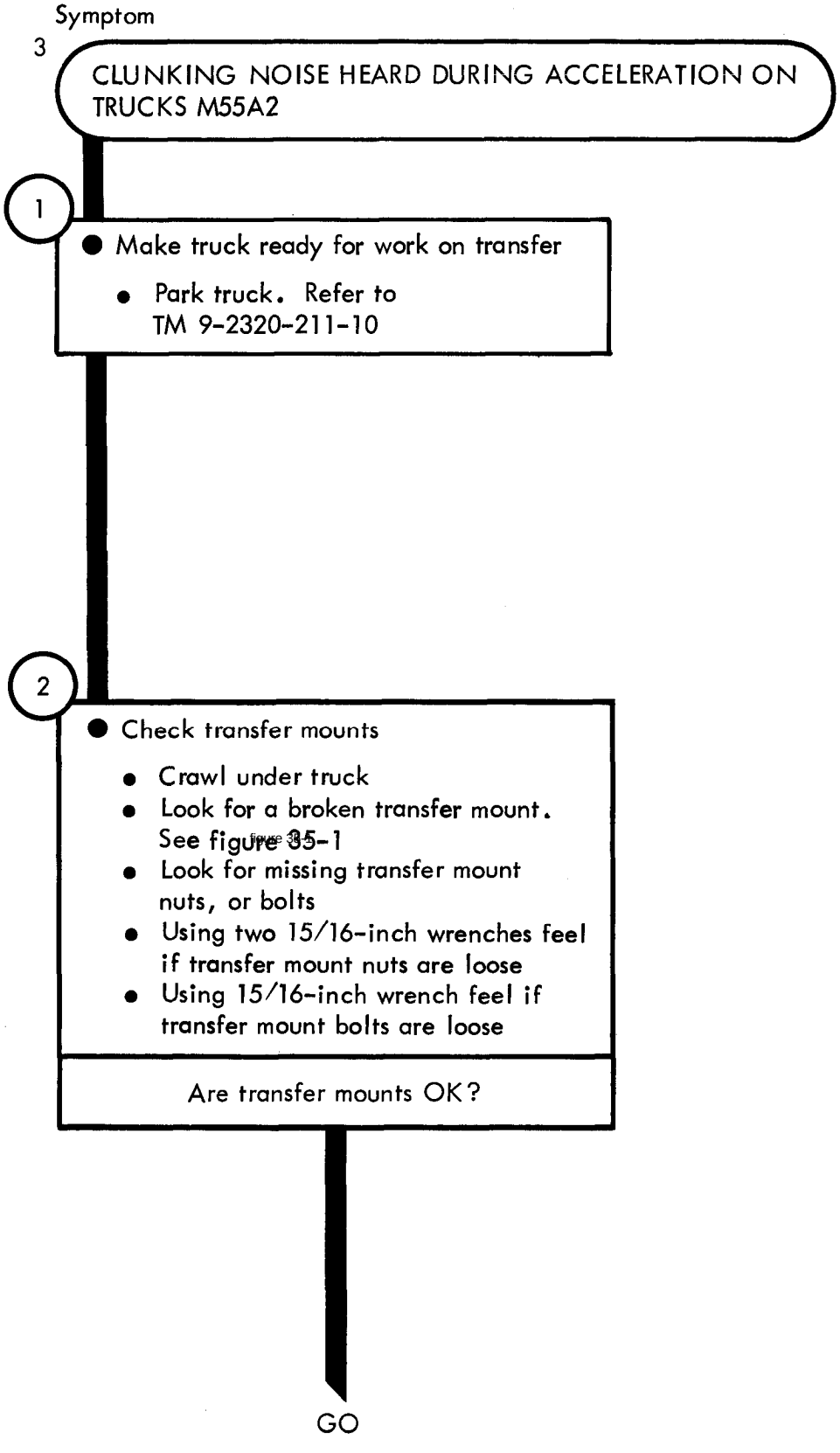



Figure 33-3 (Sheet 1 of 4)

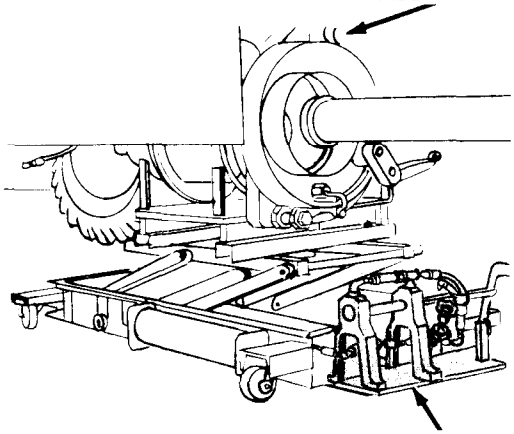
GO

YES

NO

3

- Replace broken transfer mount
  - Tell direct support maintenance
- Put back missing transfer mount nuts and bolts
  - Put a hydraulic jack under transfer and raise jack until weight is removed from transfer mount
  - Put correct bolt, or nut, into transfer mount and tighten using wrench
  - Using two 15/16-inch wrenches tighten all nuts and bolts
- Tighten loose transfer mount nuts and bolts
  - Using two 15/16-inch wrenches tighten nuts and bolts




NOTE

Rear engine mounts are not part of the transfer system. However the rear engine mounts should be checked as a cause of the clunking noise

GO

TA 116113

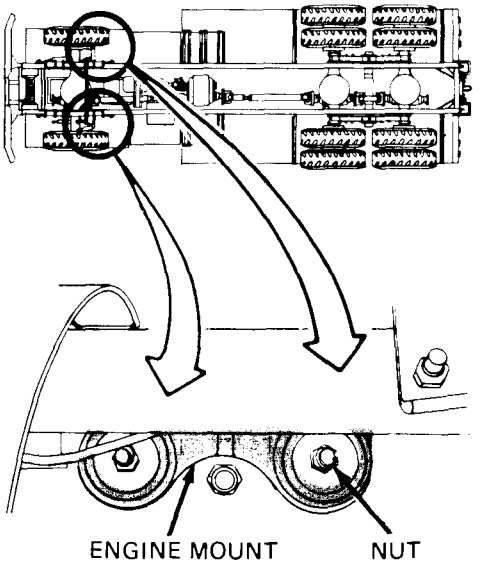
Figure 33-3 (Sheet 2 of 4)

GO

4

- Check rear engine mounts
  - Look for a broken engine mount
  - Look for missing engine mount nut
  - Using 3/4-inch wrench feel for loose nut

Are engine mounts OK?




YES

NO

5

- Replace broken engine mount
  - Tell direct support maintenance
- Put back missing engine mount nut
  - Put a hydraulic jack under transmission bell housing and raise jack until weight is removed from engine mount
  - Put correct nut onto engine mount and screw on until hand tight
  - Using 3/4-inch wrench tighten nut
- Tighten loose engine mount nut
  - Using 3/4-inch wrench tighten nut

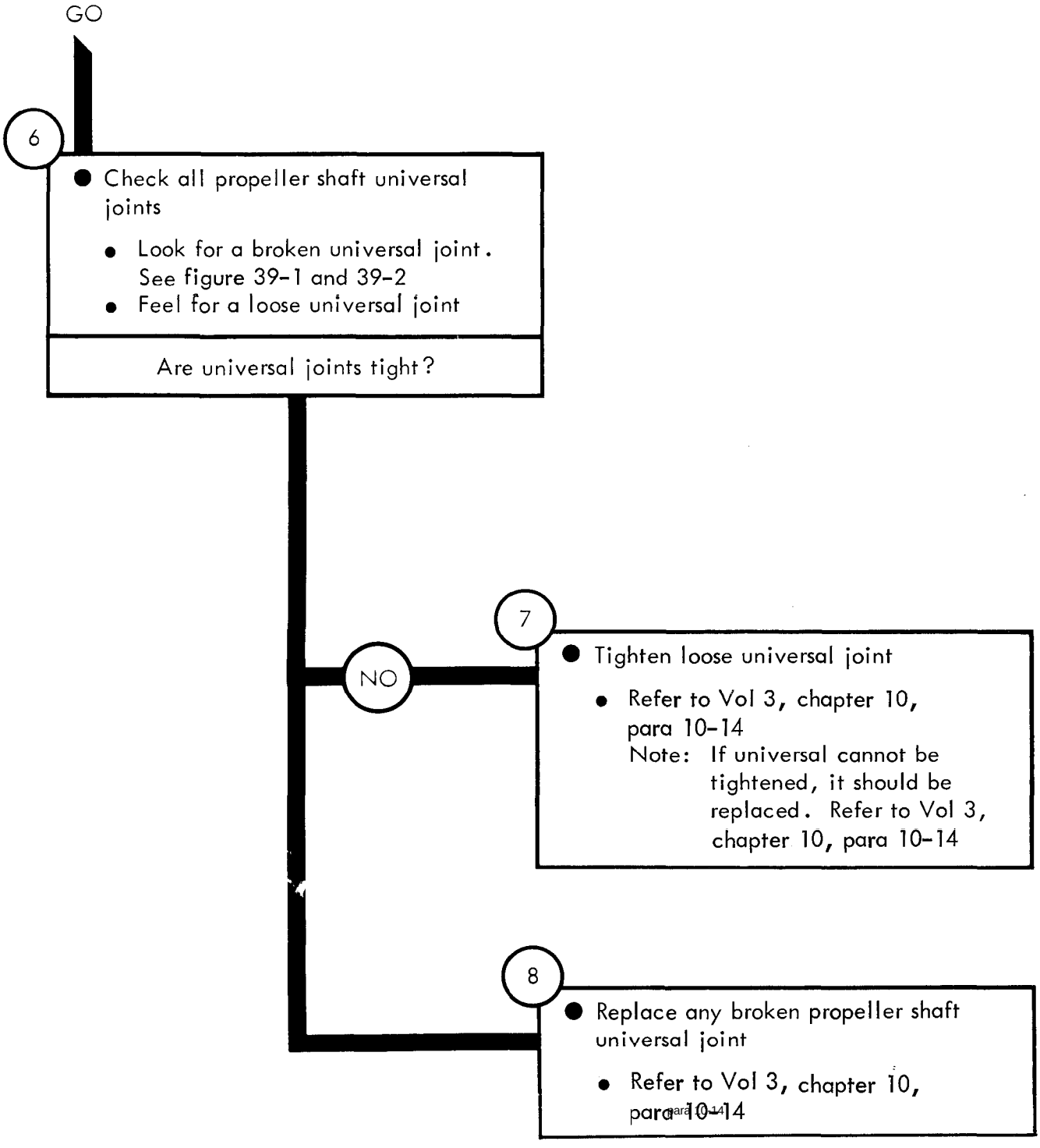
NOTE

Propeller shaft universal joints are not part of the transfer system. However the universal joints should be checked as a cause of the clunking noise

GO

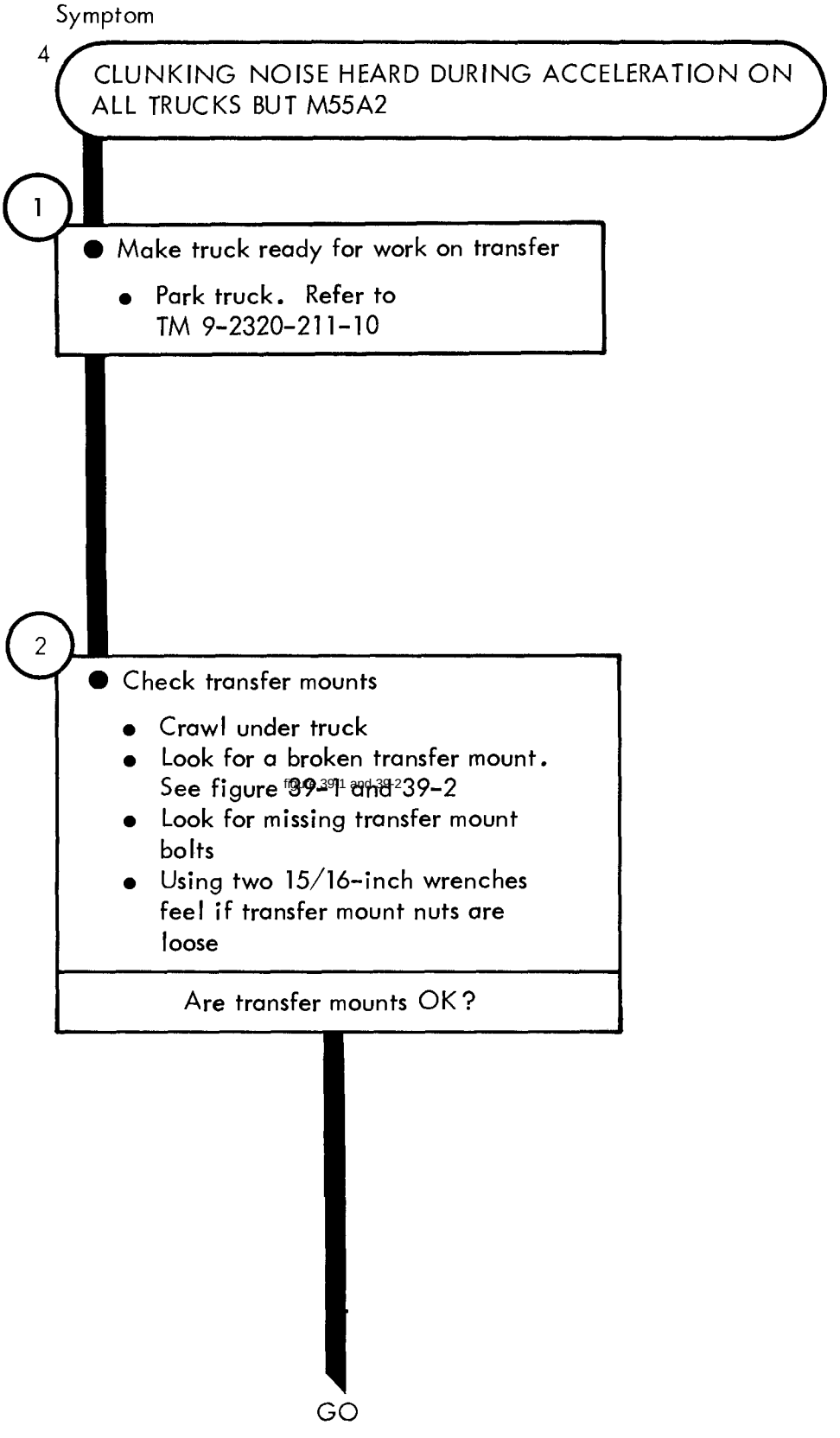
TA 116114

Figure 33-3 (Sheet 3 of 4)




TA 116115

Figure 33-3 (Sheet 4 of 4)




TA 116116

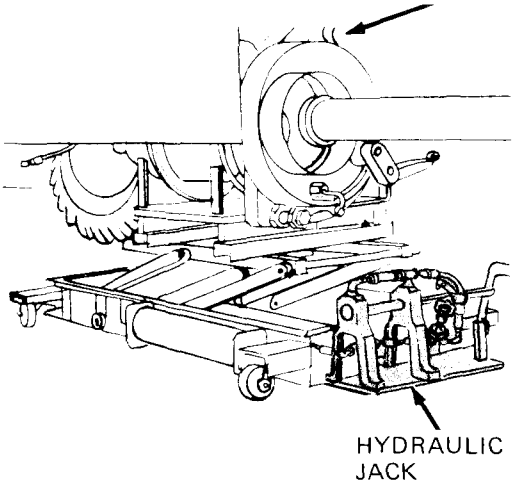
Figure 33-4 (Sheet 1 of 5)

GO

YES

NO

3




- Replace broken transfer mount
  - Tell direct support maintenance
- Put back missing transfer mount nuts and bolts
  - Put a hydraulic jack under transfer and raise jack until weight is removed from transfer mount
  - Put correct bolt, or nut, into transfer mount and tighten using wrench
  - Using two 15/16-inch wrenches tighten all nuts and bolts
- Tighten loose transfer mount nuts and bolts
  - Using two 15/16-inch wrenches tighten nuts and bolts

**NOTE**

Rear engine mounts are not part of the transfer system. However, the rear engine mounts should be checked as a cause of the clunking noise

GO

TA 116117

Figure 33-4 (Sheet 2 of 5)

GO

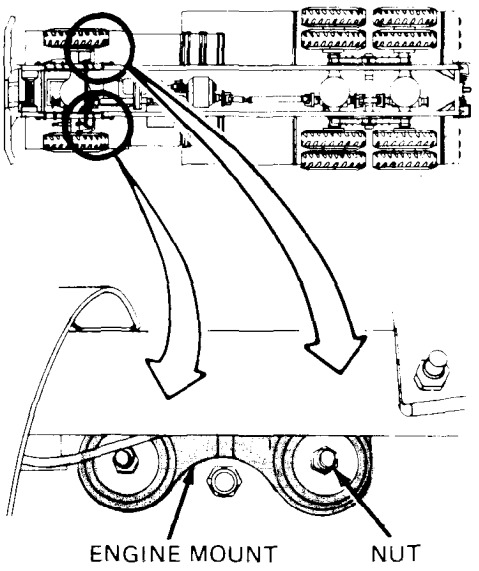
4

- Check rear engine mounts
  - Look for a broken engine mount
  - Look for missing engine mount nut
  - Using 3/4-inch wrench feel for loose nut

Are engine mounts OK?

YES

NO




5

- Replace broken engine mount
  - Tell direct support maintenance
- Put back missing engine mount nut
  - Put a hydraulic jack under transmission bell housing and raise jack until weight is removed from engine mount
  - Put correct nut onto engine mount and screw on until hand tight
  - Using 3/4-inch wrench tighten nut
- Tighten loose engine mount nut
  - Using 3/4-inch wrench tighten nut

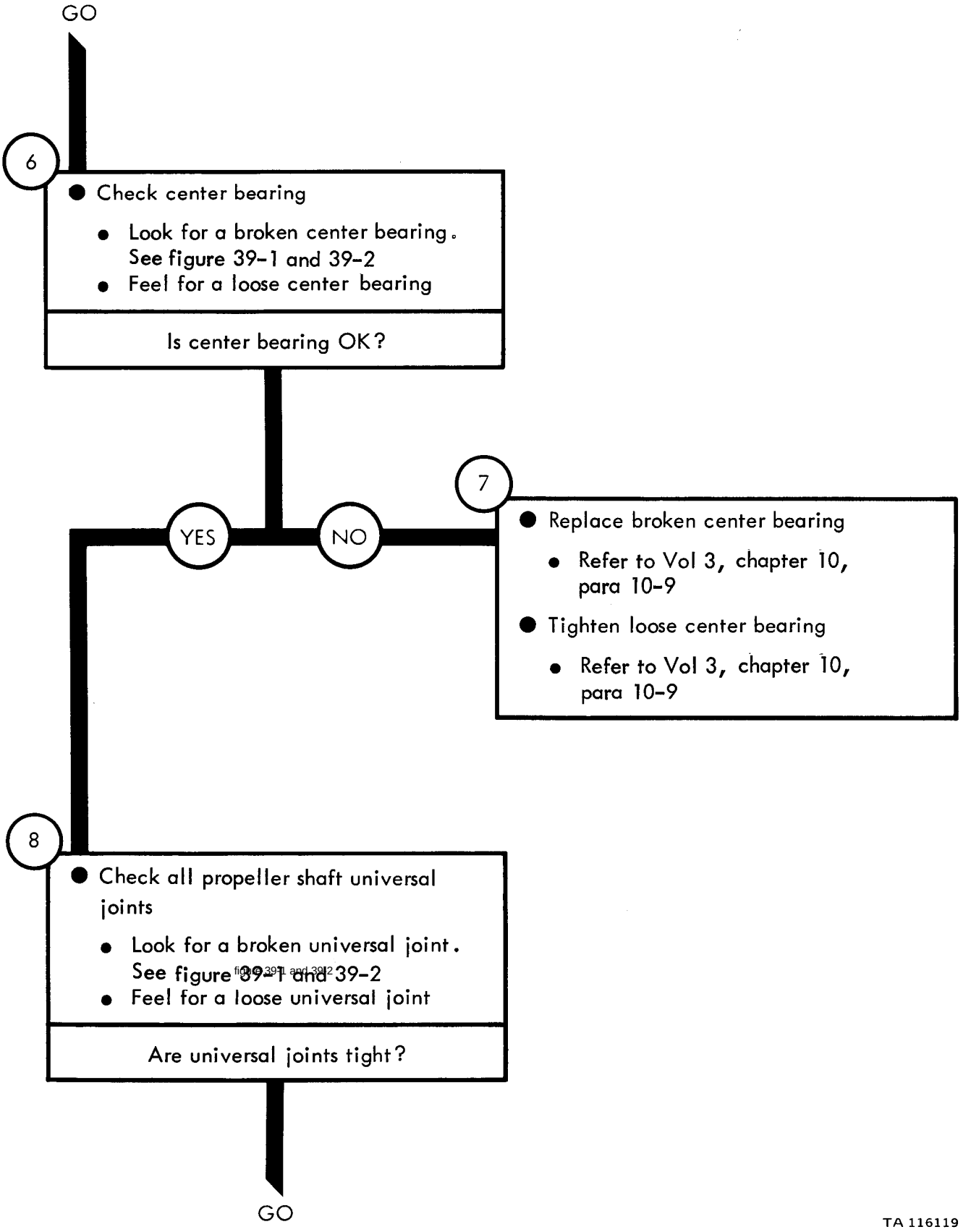
NOTE

Propeller shaft universal joints and center bearing are not part of the transfer system. However the universal joints should be checked as a cause of the clunking noise

GO

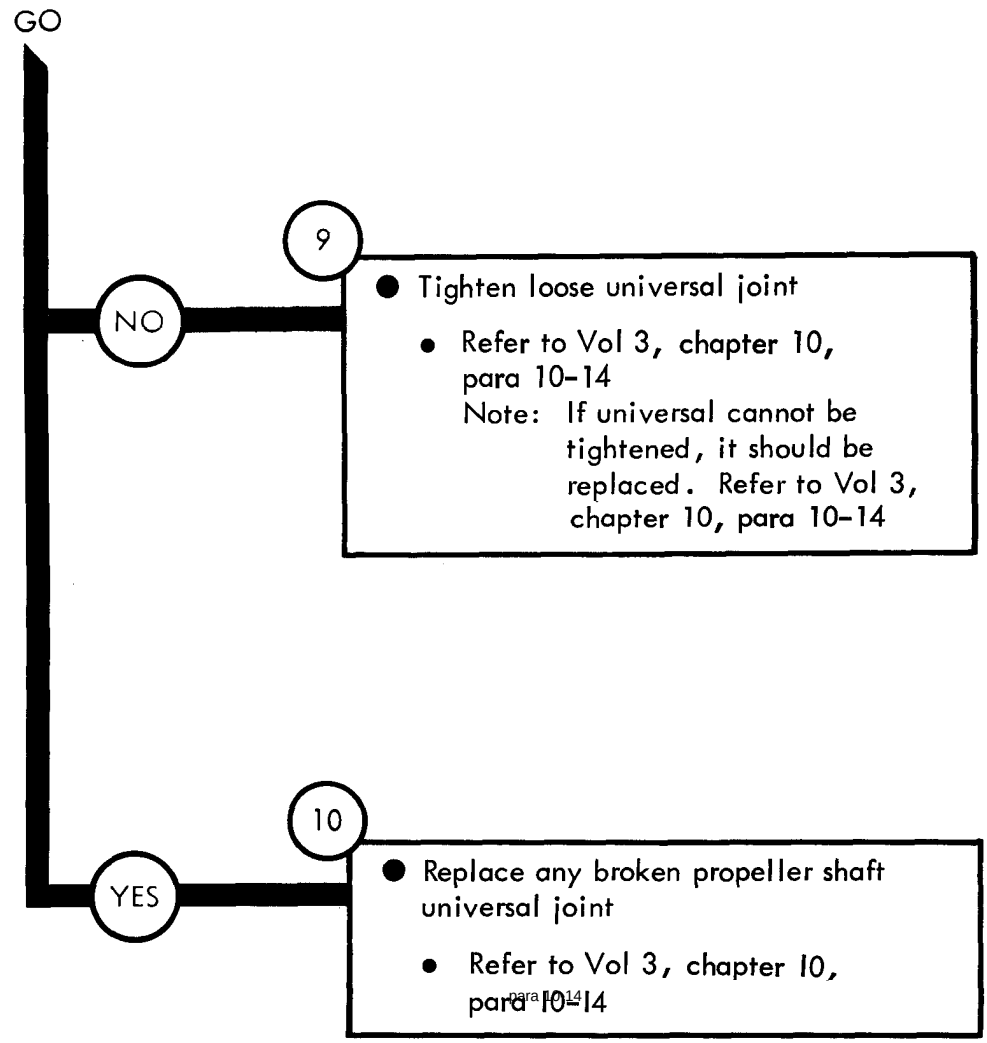
TA 116118

Figure 33-4 (Sheet 3 of 5)




TA 116119

Figure 33-4 (Sheet 4 of 5)




TA 116120

Figure 33-4 (Sheet 5 of 5)

# CHAPTER 34

# TRANSFER SYSTEM TROUBLESHOOTING SUMMARY

34-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 33, for the Transfer System.

34-2. PROCEDURES . The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures in Part 1. Chapter 7 outlines a sample trouble-shooting procedure. The summary procedures are based on the “what-to-do” portions of the detailed procedures and do not include the “How-to-do-it” instructions. Warnings, cautions, and notes are given where needed.

TRANSFER SYSTEM TROUBLESHOOTING SUMMARY

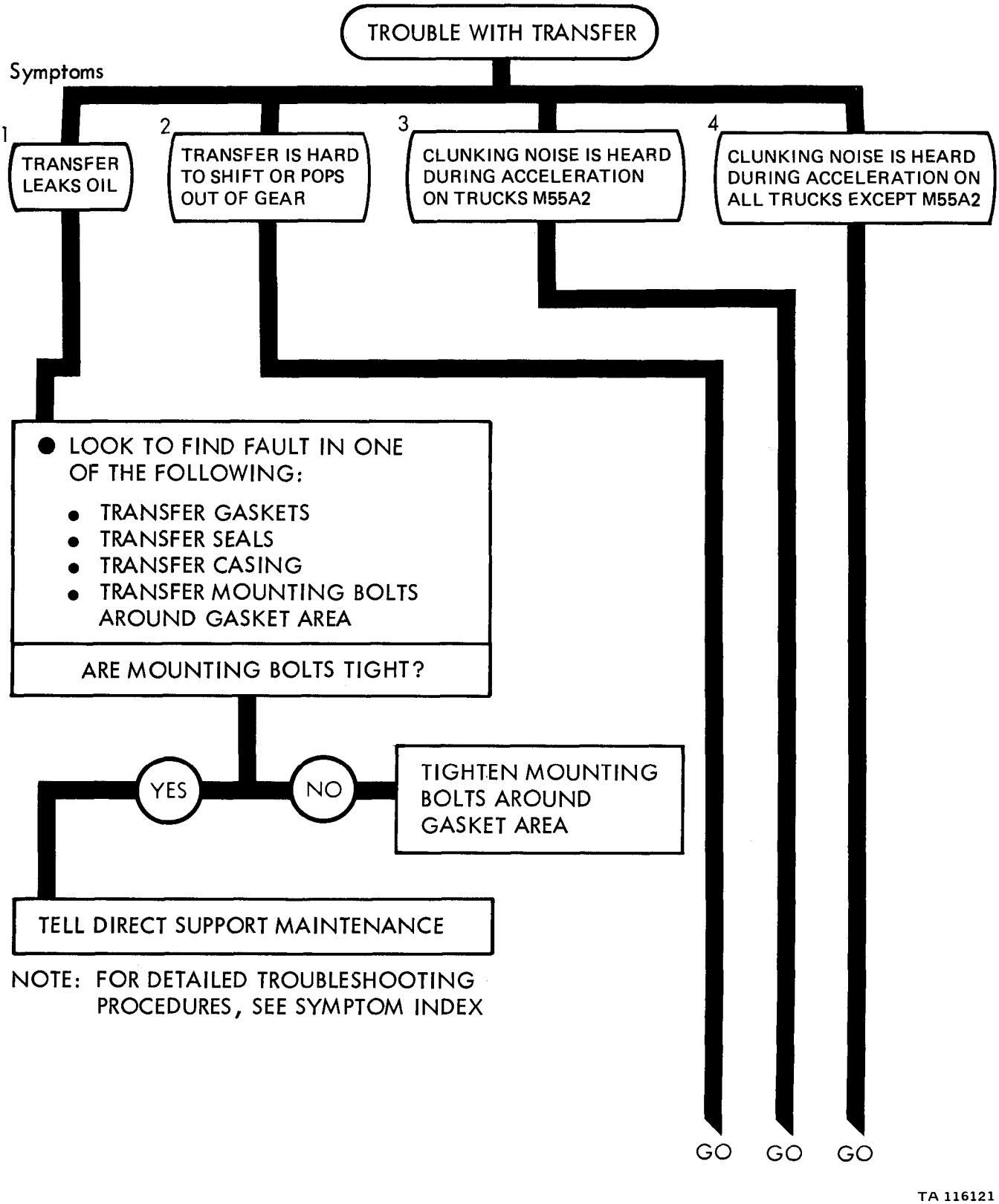
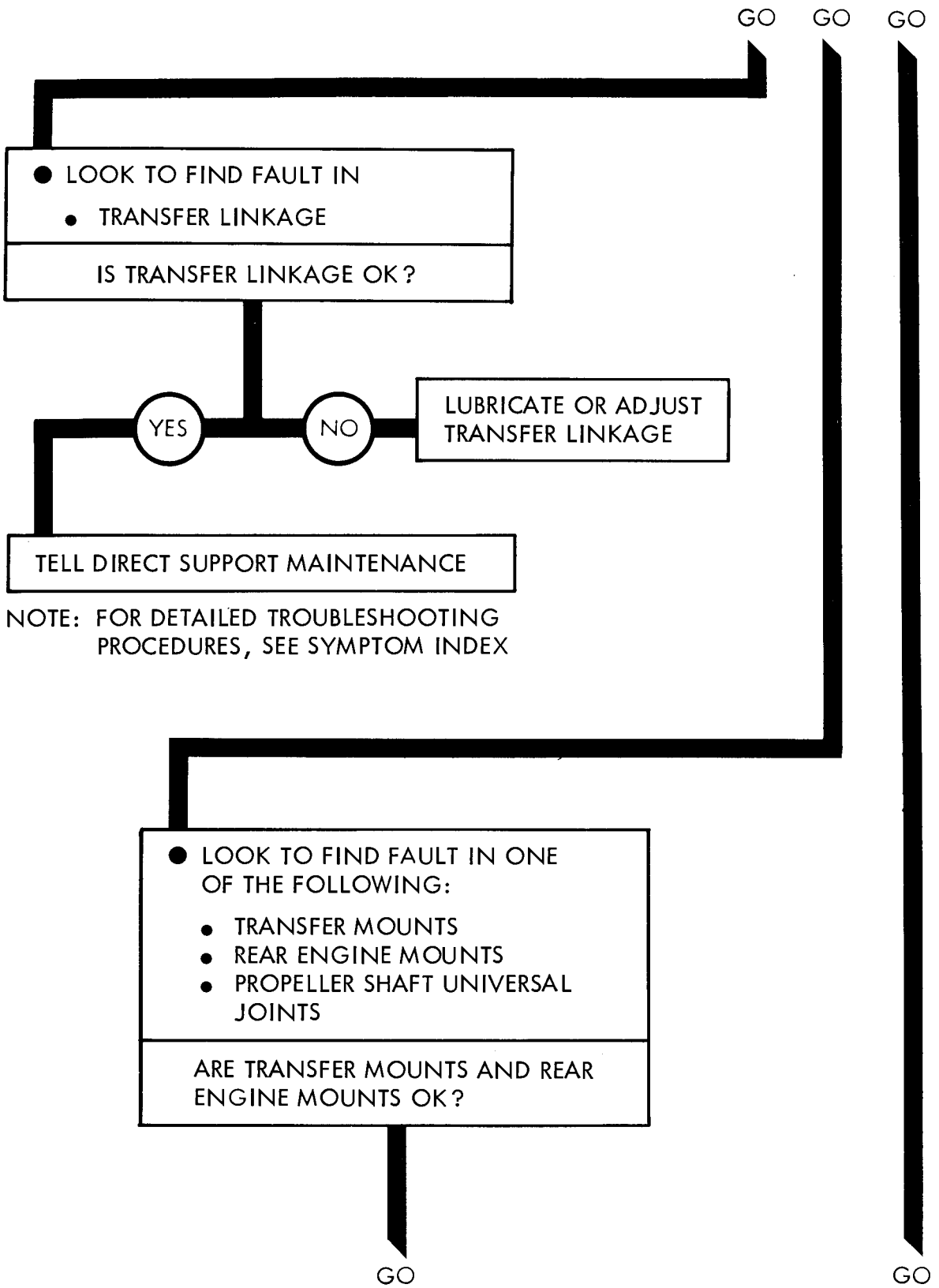
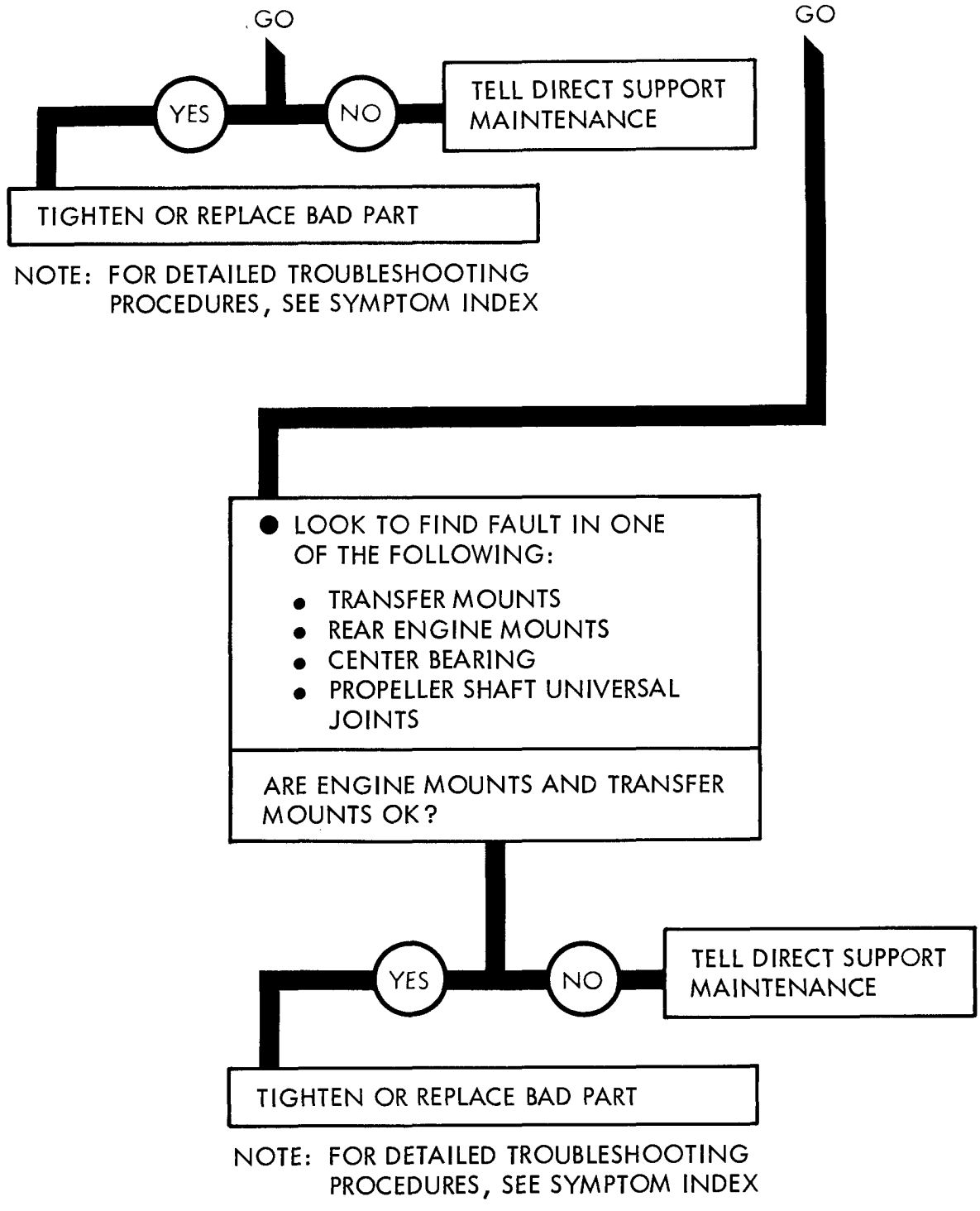



Figure 34-1 (Sheet 1 of 3)




TA 116122

Figure 34-1 (Sheet 2 of 3)




TA 116123

Figure 34-1 (Sheet 3 of 3)

# CHAPTER 35

# TRANSFER SYSTEM SUPPORT DIAGRAMS

35-1. GENERAL. This chapter gives the diagrams you need when doing troubleshooting procedures in chapter 33. Table 3-1 is a complete listing of all support diagrams used in this manual.

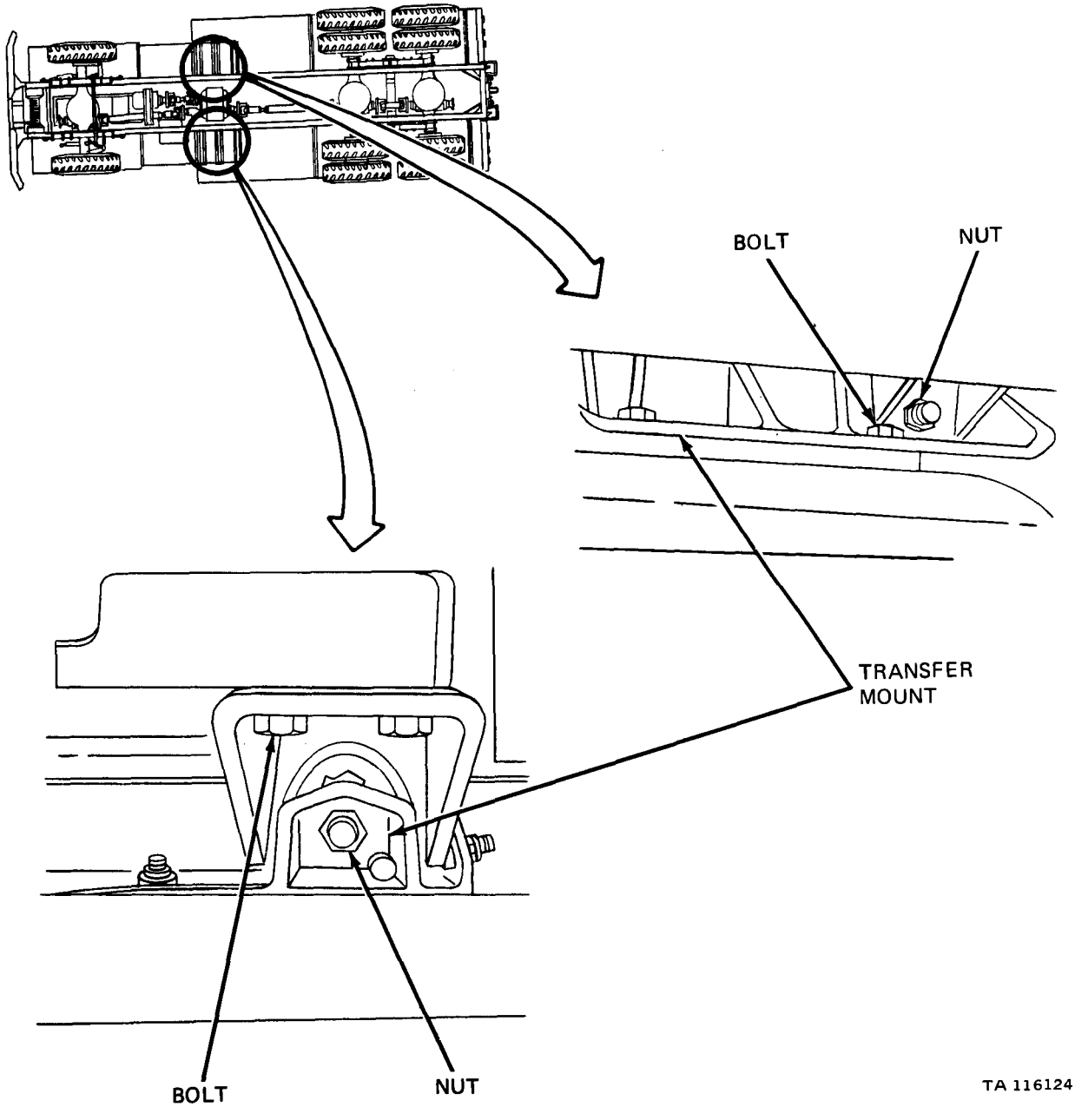



Figure 35-1

# CHAPTER 36

# TRANSFER SYSTEM CHECKOUT PROCEDURES

36-1. GENERAL. This chapter gives procedures for checking out the system after troubleshooting and repair have been done. Procedures are set up in flow chart form showing the checkout steps in order and referring to the fault symptom index when the system does not check out.

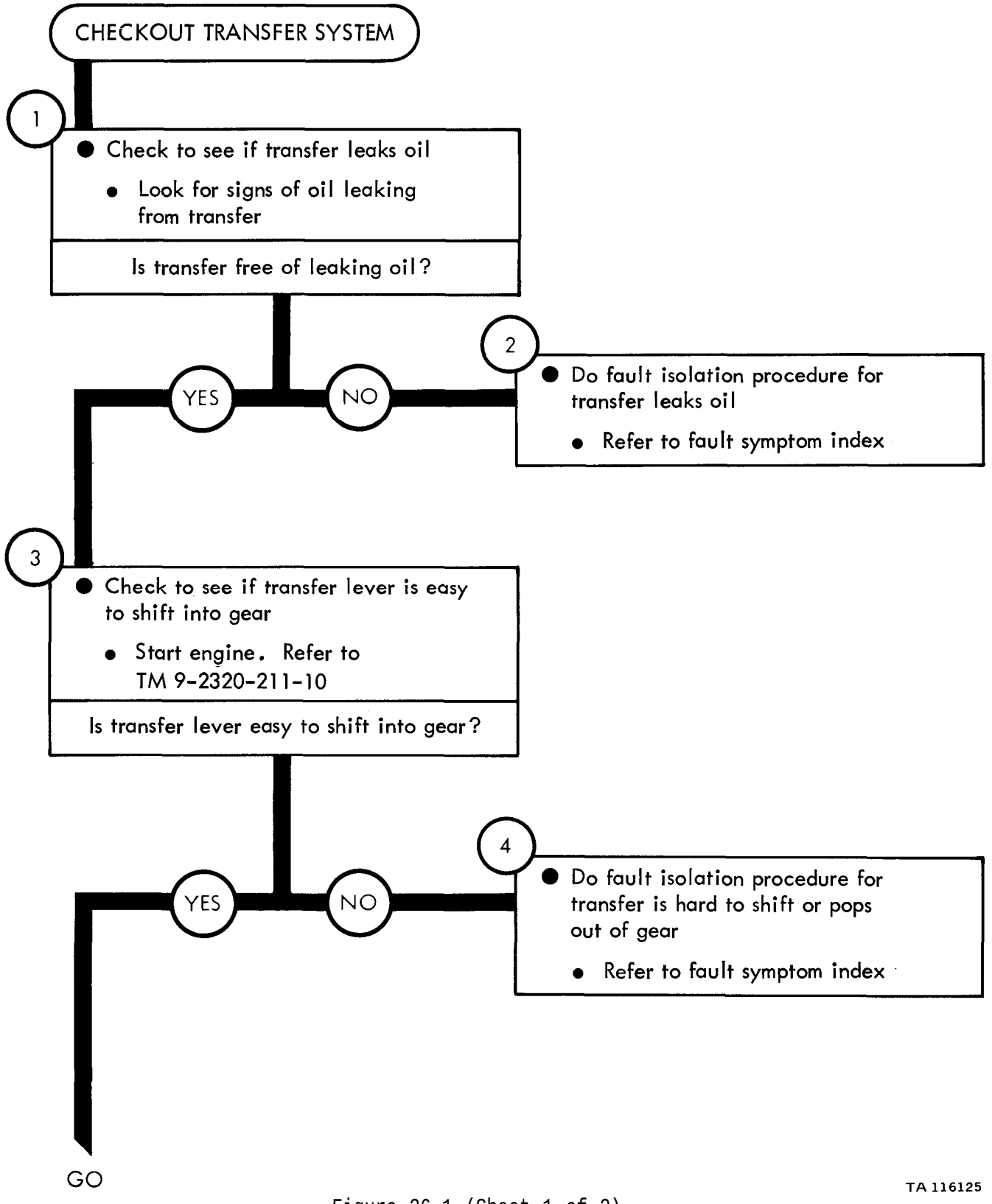
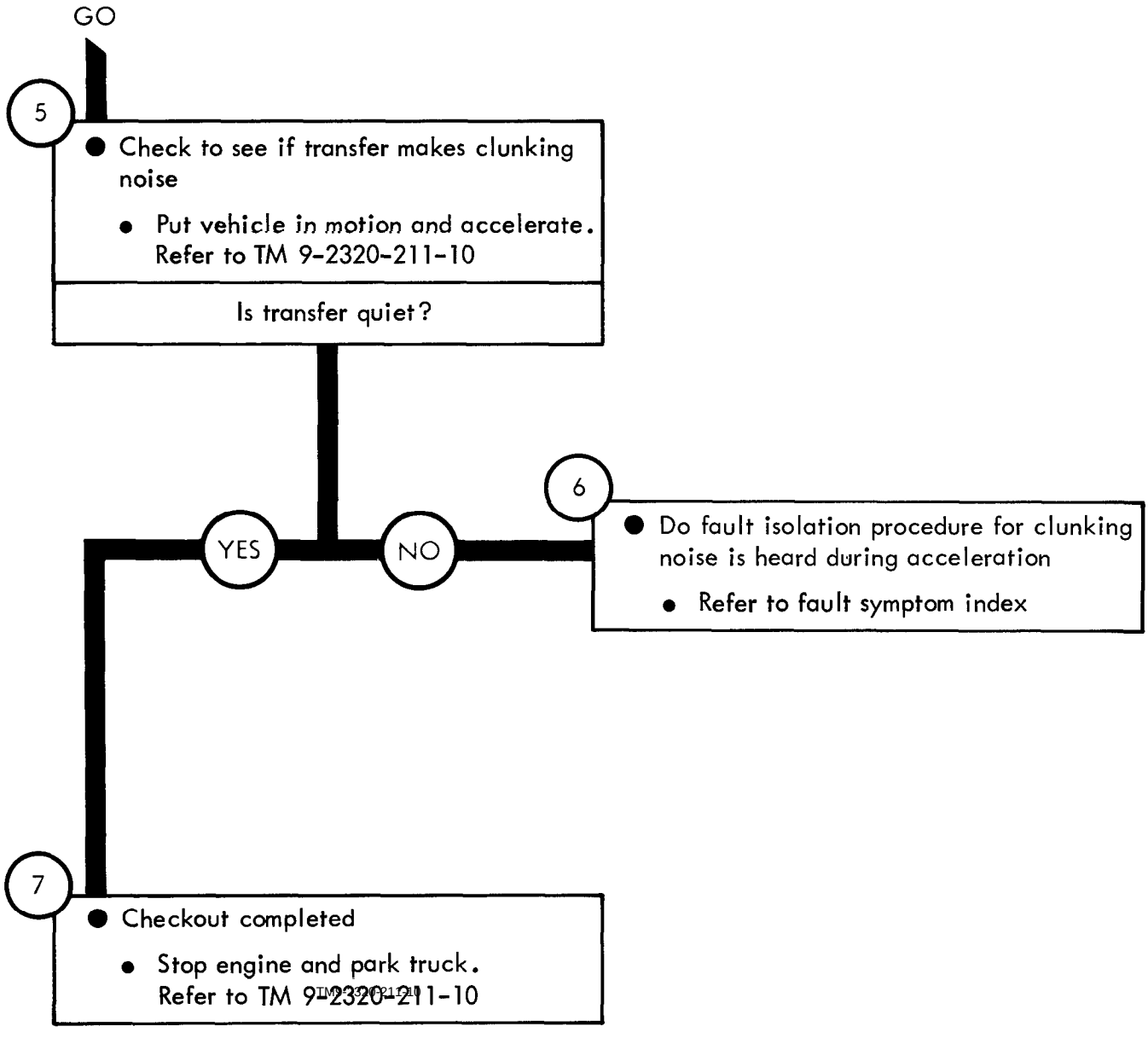



Figure 36-1 (Sheet 1 of 2)




TA 116126

Figure 36-1 (Sheet 2 of 2)

# CHAPTER 37

# PROPELLER SHAFT SYSTEM TROUBLESHOOTING

37-1. EQUIPMENT ITEMS COVERED. This chapter gives equipment troubleshooting procedures for the propeller shaft system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

37-2. EQUIPMENT ITEMS NOT COVERED. All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

PROPELLER SHAFT SYSTEM TROUBLESHOOTING

Symptom

1 CLUNKING NOISE HEARD DURING ACCELERATION ON TRUCK M55A2

1

- Make truck ready for work on propeller shafts
  - Park truck. Refer to TM 9-2320-211-10

NOTE

Transfer mounts are not part of the propeller shaft system. However the transfer mounts should be checked as a cause of the clunking noise

2

- Check transfer mounts
  - Crawl under truck
  - Look for a broken transfer mount. See figure 35-1
  - Look for missing transfer mount nuts, or bolts
  - Using two 15/16-inch wrenches feel if transfer mount nuts are loose
  - Using 15/16-inch wrench feel if transfer mount bolts are loose

Are transfer mounts OK?

GO

TA 116127

Figure 37-1 (Sheet 1 of 5)

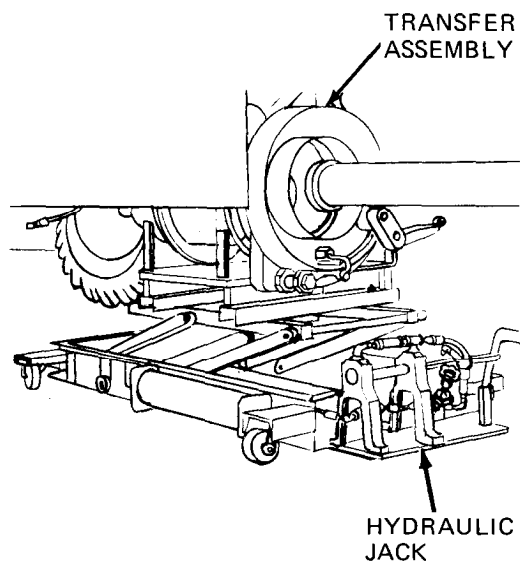
GO

YES

NO

3

- Replace broken transfer mount
  - Tell direct support maintenance
- Put back missing transfer mount nuts and bolts
  - Put a hydraulic jack under transfer and raise jack until weight is removed from transfer mount
  - Put correct bolt, or nut, into transfer mount and tighten using wrench
  - Using 15/16-inch wrench tighten all bolts
  - Using two 15/16-inch wrenches tighten all nuts and bolts
- Tighten loose transfer mount nuts
  - Using two 15/16-inch wrenches tighten nuts and bolts
- Tighten loose transfer mount bolts
  - Using 15/16-inch wrench tighten bolts




**NOTE**

Rear engine mounts are not part of the propeller shaft system. However the rear engine mounts should be checked as a cause of the clunking noise

GO

TA 116128

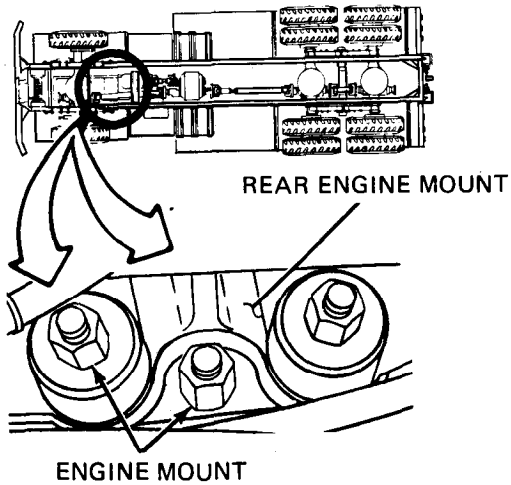
Figure 37-1 (Sheet 2 of 5)

GO

4

- Check rear engine mounts
  - Look for a broken engine mount
  - Look for missing engine mount nut
  - Using 15/16-inch wrench feel for loose nut

Are engine mounts OK?




YES

NO

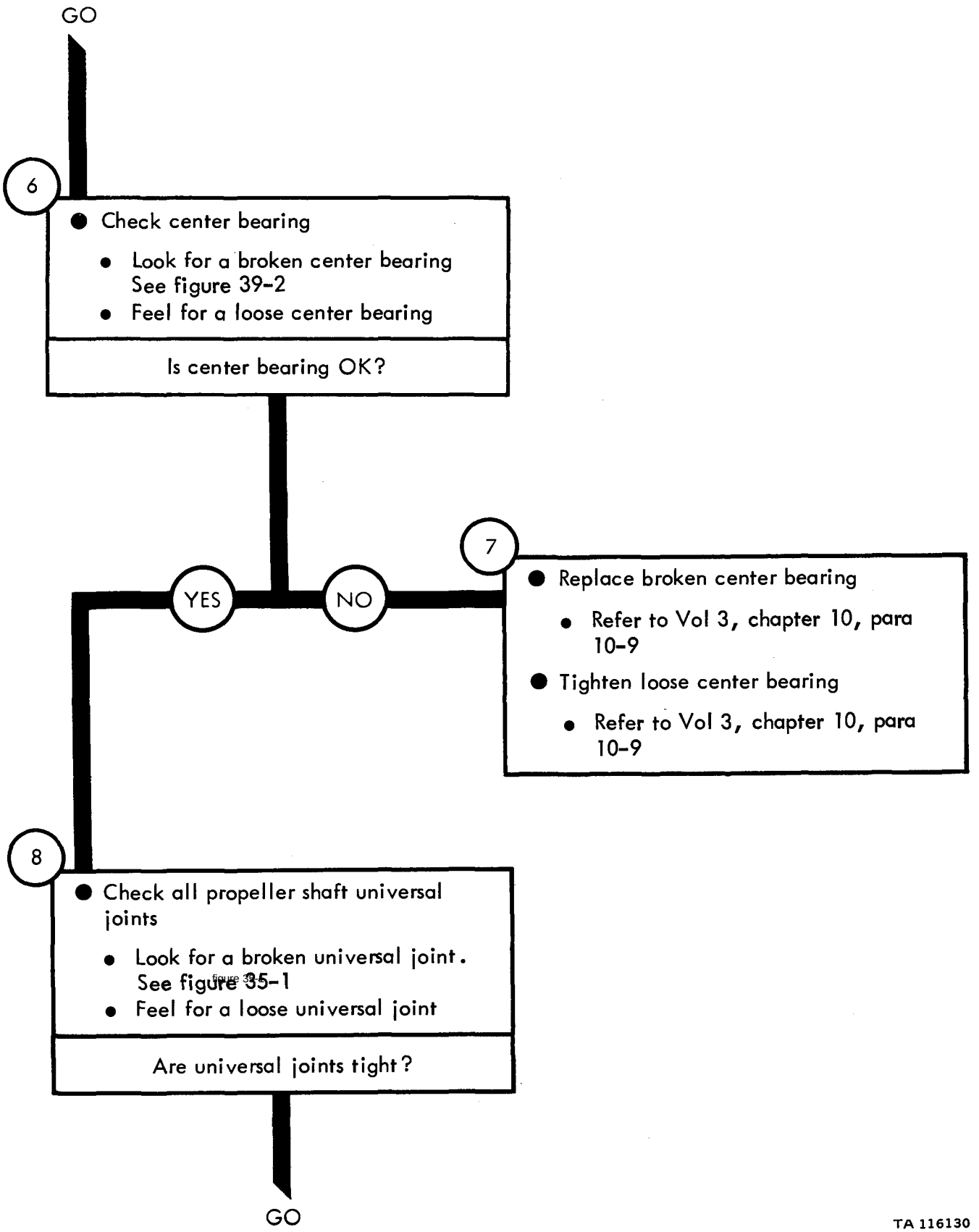
5

- Replace broken engine mount
  - Tell direct support maintenance
- Put back missing engine mount nut
  - Put a hydraulic jack under transmission bell housing and raise jack until weight is removed from engine mount
  - Put correct nut onto engine mount and screw on until hand tight
  - Using 15/16-inch wrench tighten nut
- Tighten loose engine mount nut
  - Using 15/16-inch wrench tighten nut

GO

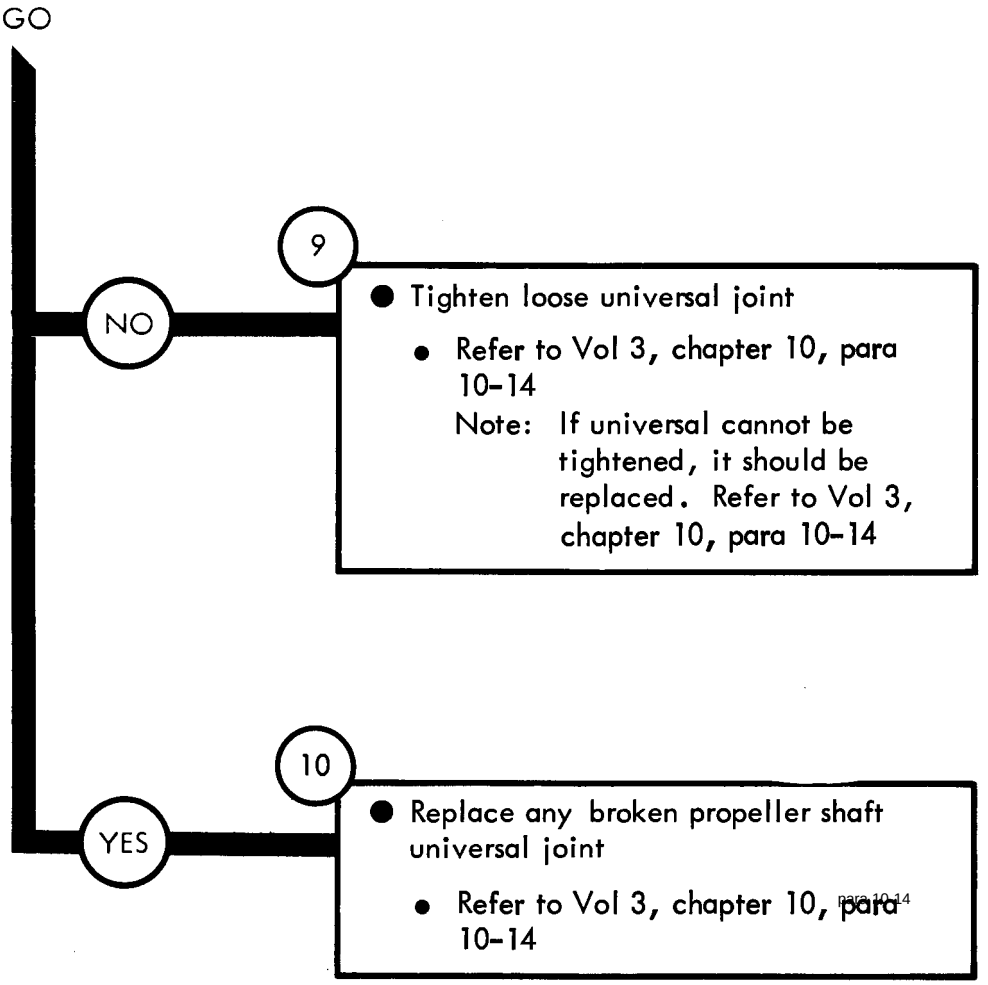
TA 116129

Figure 37-1 (Sheet 3 of 5)




TA 116130

Figure 37-1 (Sheet 4 of 5)




TA 116131

Figure 37-1 (Sheet 5 of 5)

Symptom 2

CLUNKING NOISE HEARD DURING ACCELERATION ON ALL TRUCKS EXCEPT M55A2

1

- Make truck ready for work on propeller shafts
  - Park truck. Refer to TM 9-2320-211-10

NOTE

Transfer mounts are not part of the propeller shaft system. However, the transfer mounts should be checked as a cause of the clunking noise

2

- Check transfer mounts
  - Crawl under truck
  - Look for a broken transfer mount. See figure 35-1
  - Look for missing transfer mount bolts
  - Using two 15/16-inch wrenches feel if transfer mount nuts are loose
  - Using 15/16-inch wrench feel if transfer mount bolts are loose

Are transfer mounts OK?

GO

TA 116132

Figure 37-2 (Sheet 1 of 4)

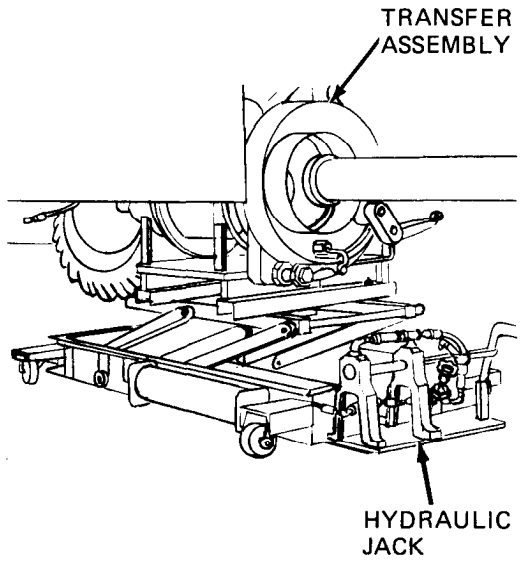
GO

YES

NO

3

- Replace broken transfer mount
  - Tell direct support maintenance
- Put back missing transfer mount nuts and bolts
  - Put a hydraulic jack under transfer and raise jack until weight is removed from transfer mount
  - Put correct bolt, or nut, into transfer mount and tighten using wrench
  - Using two 15/16-inch wrenches tighten all nuts and bolts
- Tighten loose transfer mount nuts
  - Using two 15/16-inch wrenches tighten nuts and bolts
- Tighten loose transfer mount bolts
  - Using 15/16-inch wrench tighten bolts




**NOTE**

Rear engine mounts are not part of the propeller shaft system. However the rear engine mounts should be checked as a cause of the clunking noise

GO

TA 116133

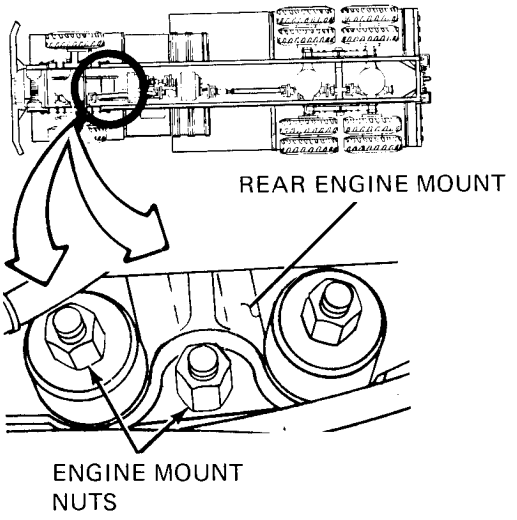
Figure 37-2 (Sheet 2 of 4)

GO

4

- Check rear engine mounts
  - Look for a broken engine mount
  - Look for missing engine mount nut
  - Using two 3/4-inch wrenches feel for loose nut

Are engine mounts OK?




YES

NO

5

- Replace broken engine mount
  - Tell direct support maintenance
- Put back missing engine mount nut
  - Put a hydraulic jack under transmission bell housing and raise jack until weight is removed from engine mount
  - Put correct nut onto engine mount and screw on until hand tight
  - Using two 3/4-inch wrenches tighten nut
- Tighten loose engine mount nut
  - Using two 3/4-inch wrenches tighten nut

GO

TA 116134

Figure 37-2 (Sheet 3 of 4)

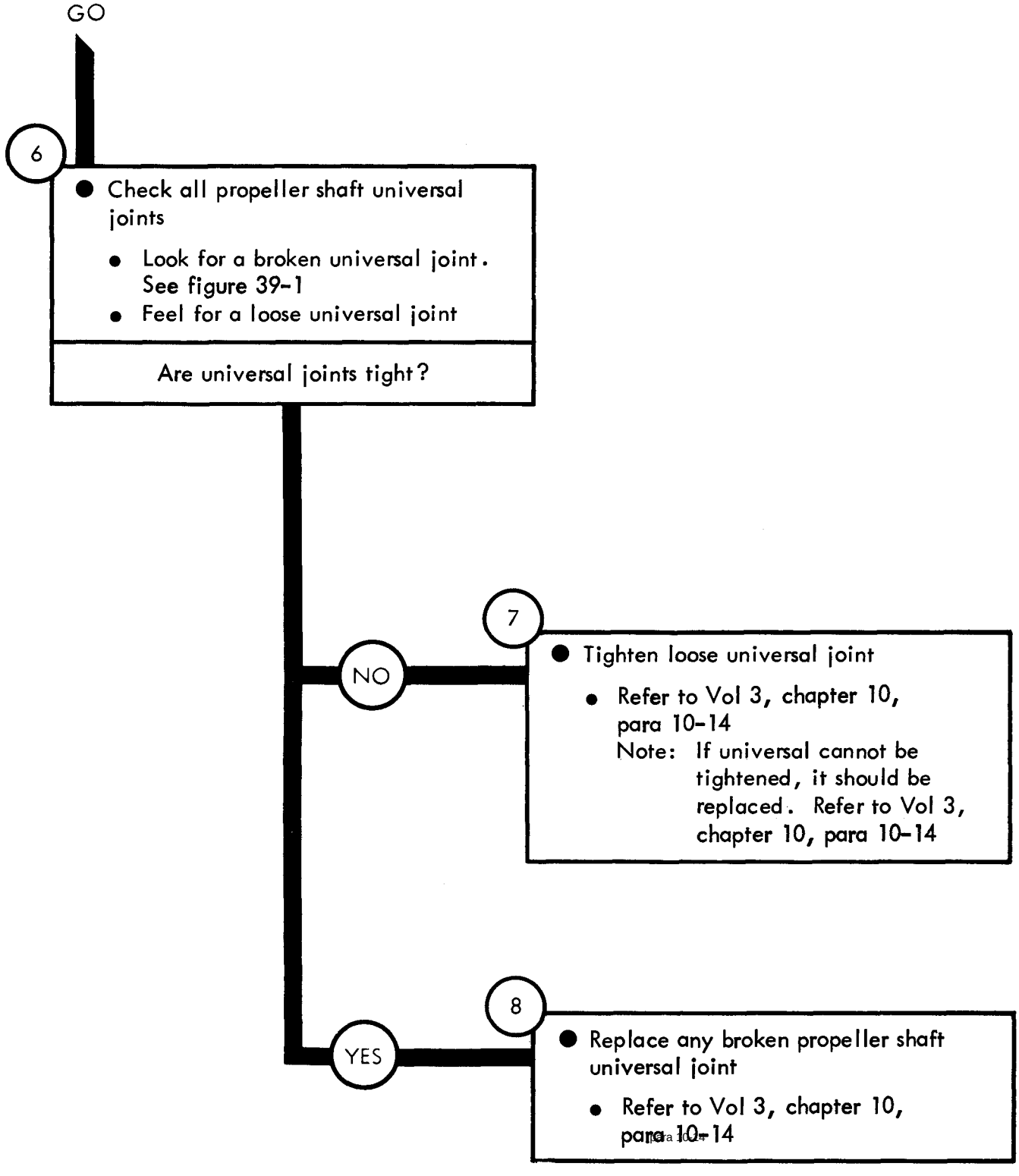



Figure 37-2 (Sheet 4 of 4)

# CHAPTER 38

# PROPELLER SHAFT SYSTEM TROUBLESHOOTING SUMMARY

38-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 37, for the Propeller Shaft System.

38-2. PROCEDURES. The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures in Part 1. Chapter 7 outlines a sample trouble-shooting procedure. The summary procedures are based on the "what-to-do" portions of the detailed procedures and do not include the "How-to-do-it" instructions. Warnings, cautions, and notes are given where needed.

PROPELLER SHAFT SYSTEM TROUBLESHOOTING SUMMARY

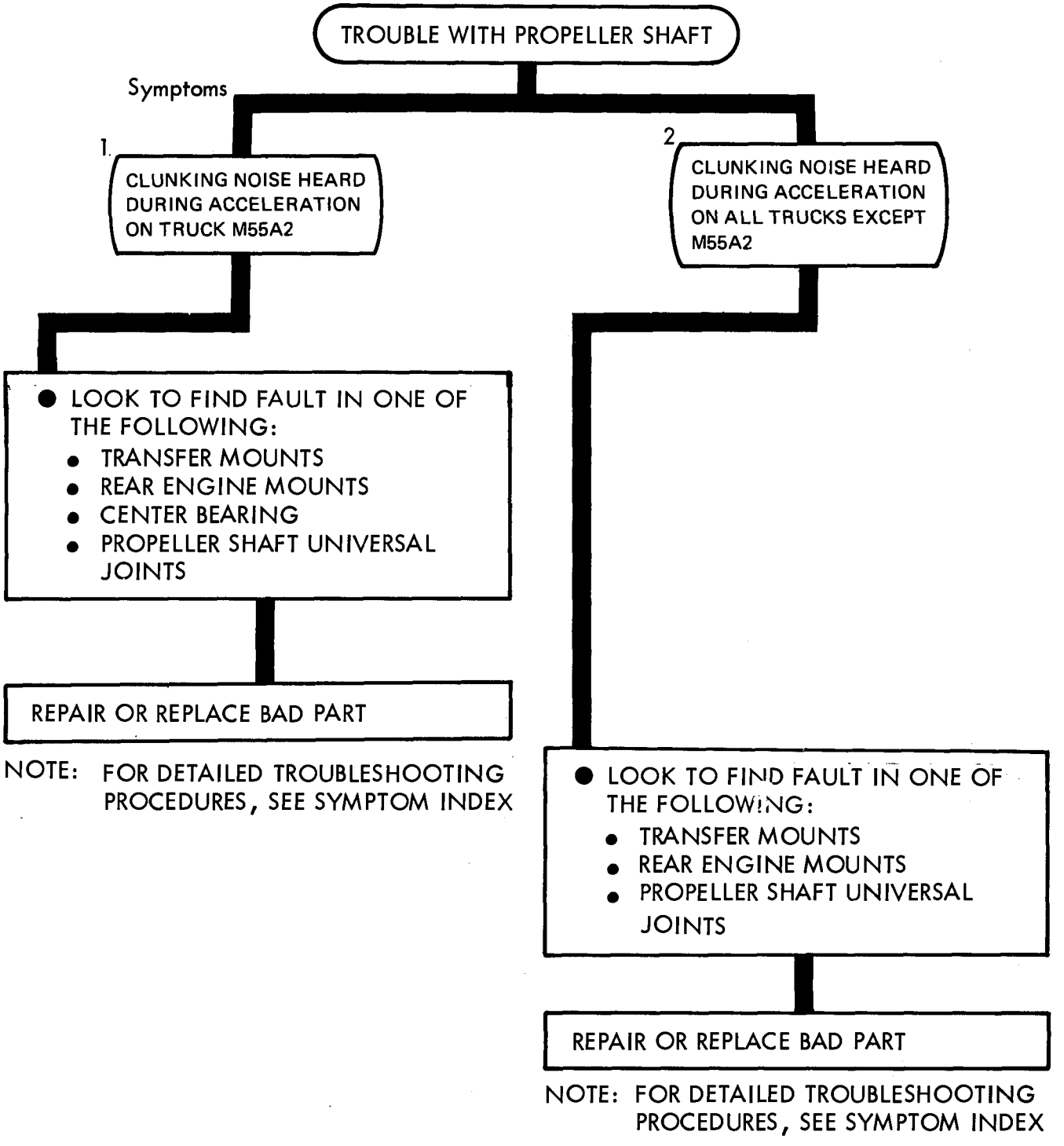



Figure 38-1

# CHAPTER 39

# PROPELLER SHAFT SYSTEM SUPPORT DIAGRAMS

39-1. GENERAL. This chapter gives the diagrams you need when doing trouble-shooting procedures in chapter 37. Table 3-1 is a complete listing of all support diagrams used in this manual.

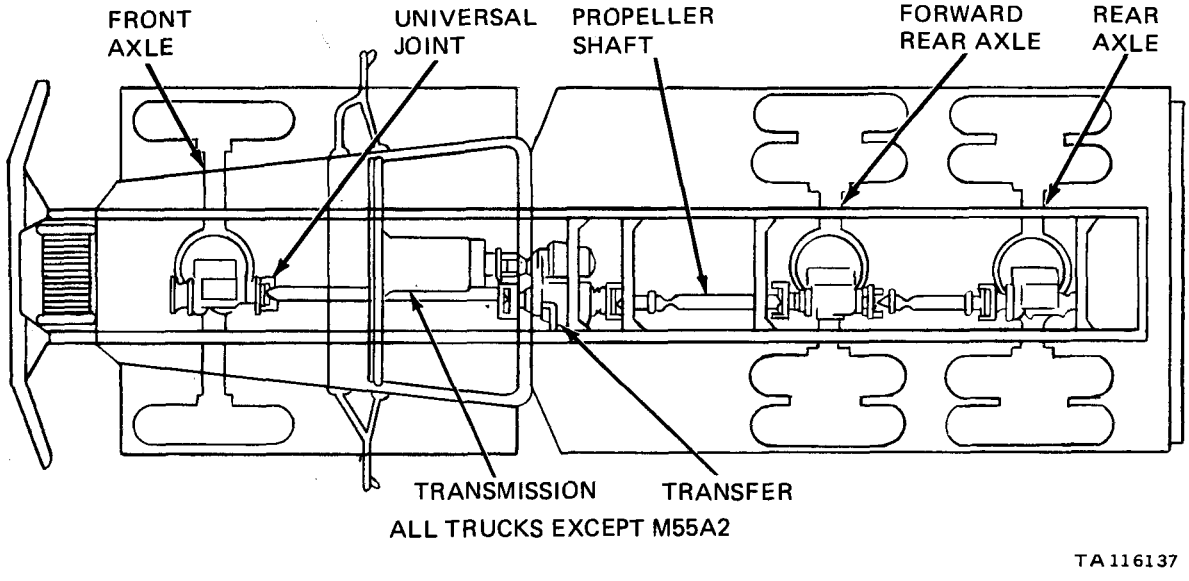



Figure 39-1. Propeller Shaft Arrangement (All Trucks Except M55A2)

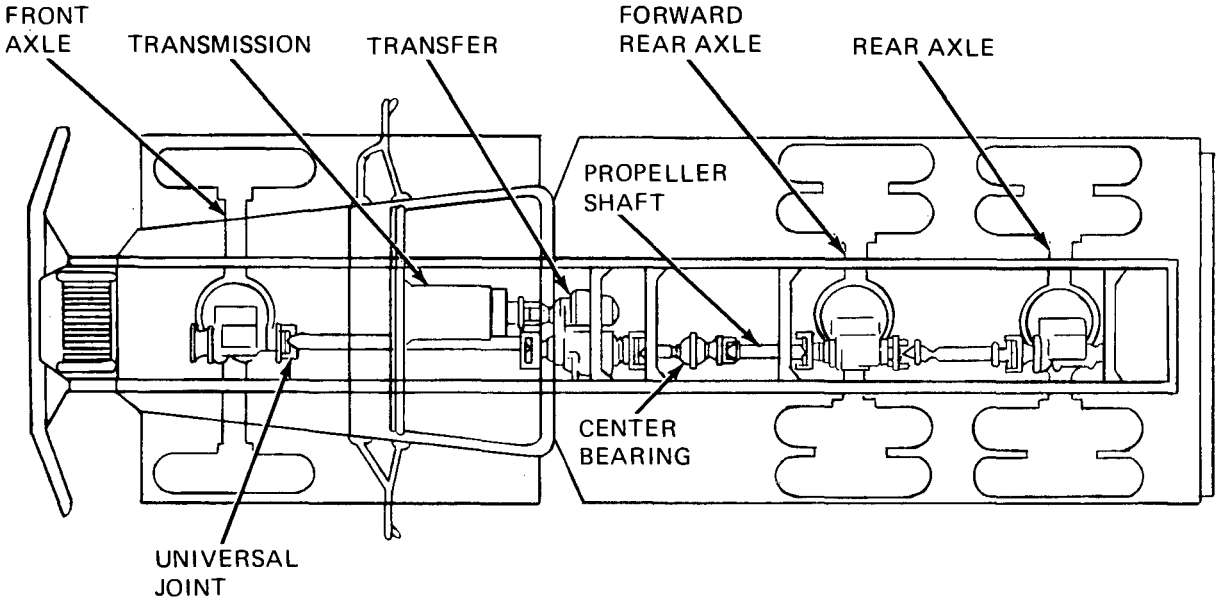



Figure 39-2. Propeller Shaft Arrangement (Truck M55A2)

# CHAPTER 40

# FRONT AXLE SYSTEM TROUBLESHOOTING

40-1. EQUIPMENT ITEMS COVERED. This chapter gives equipment troubleshooting procedures for the front axle system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

40-2. EQUIPMENT ITEMS NOT COVERED. All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

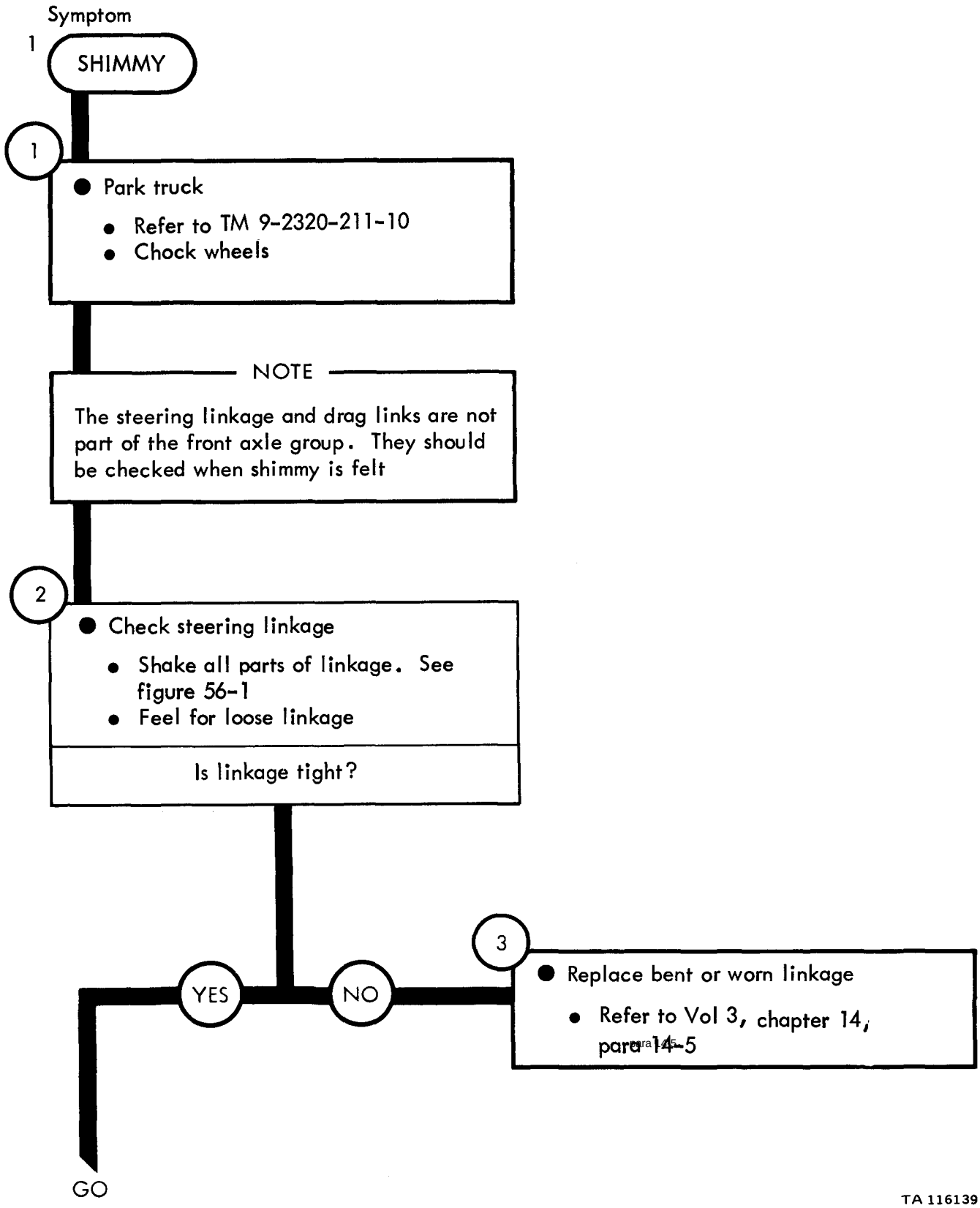



Figure 40-1 (Sheet 1 of 3)

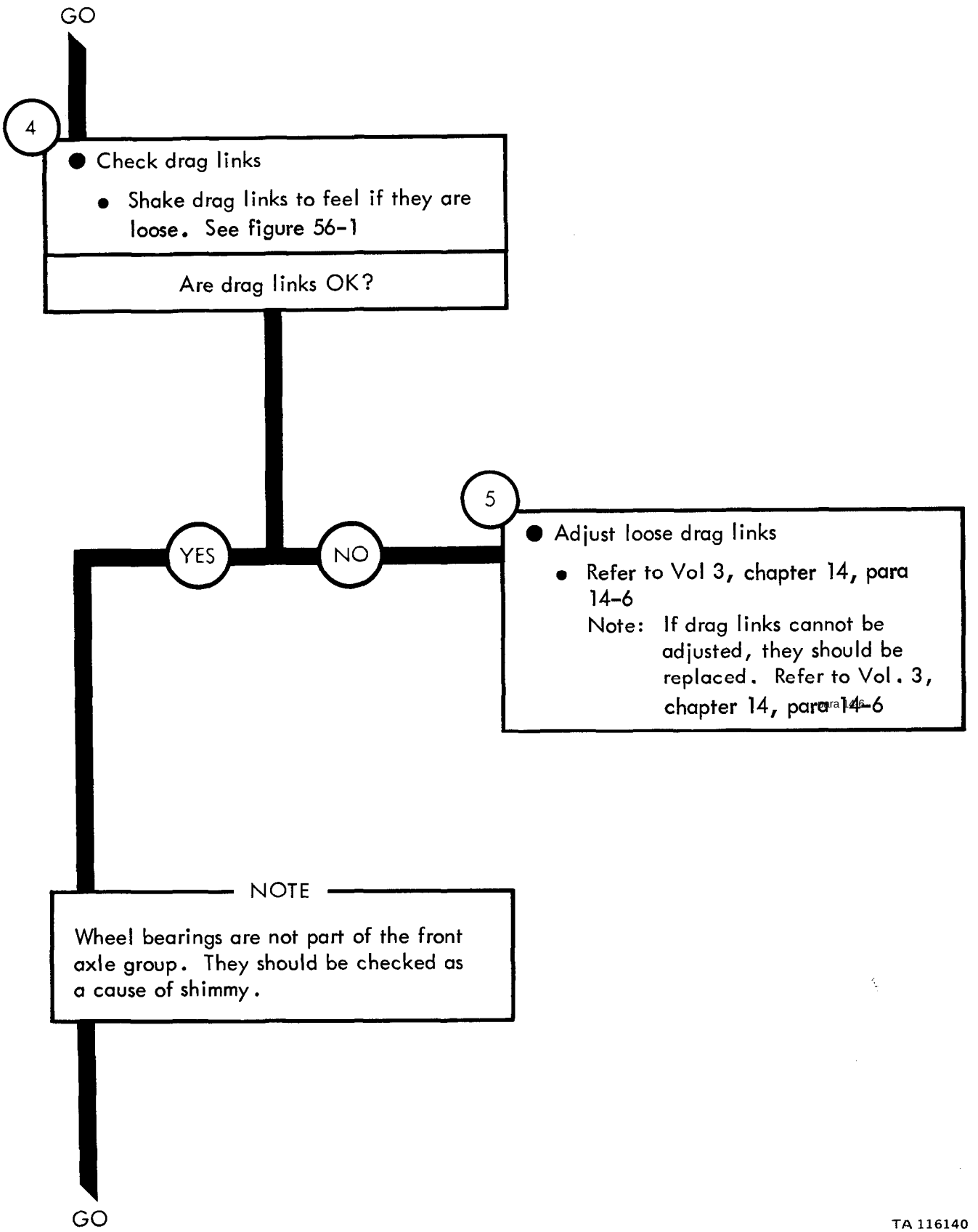



Figure 40-1 (Sheet 2 of 3)

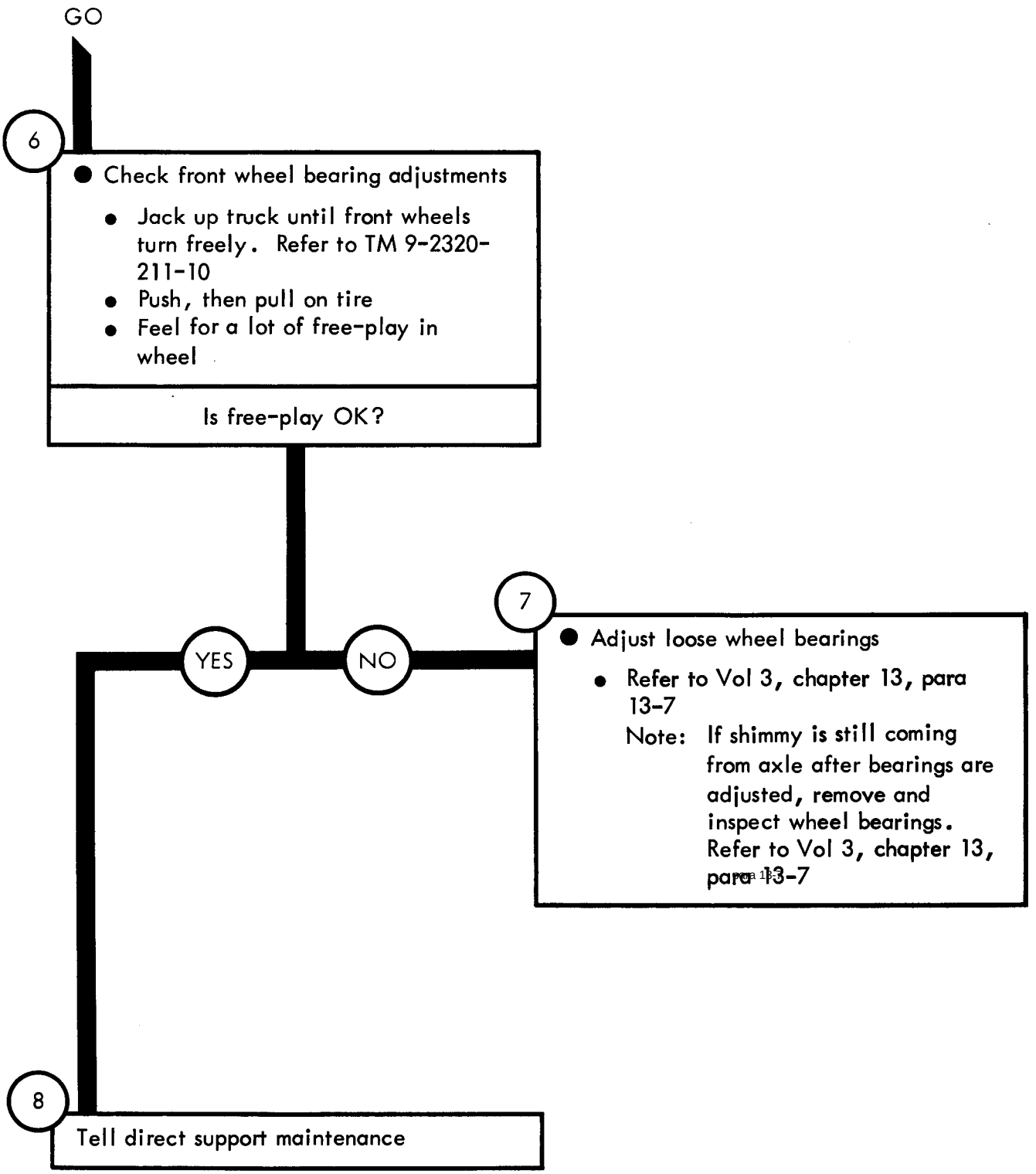
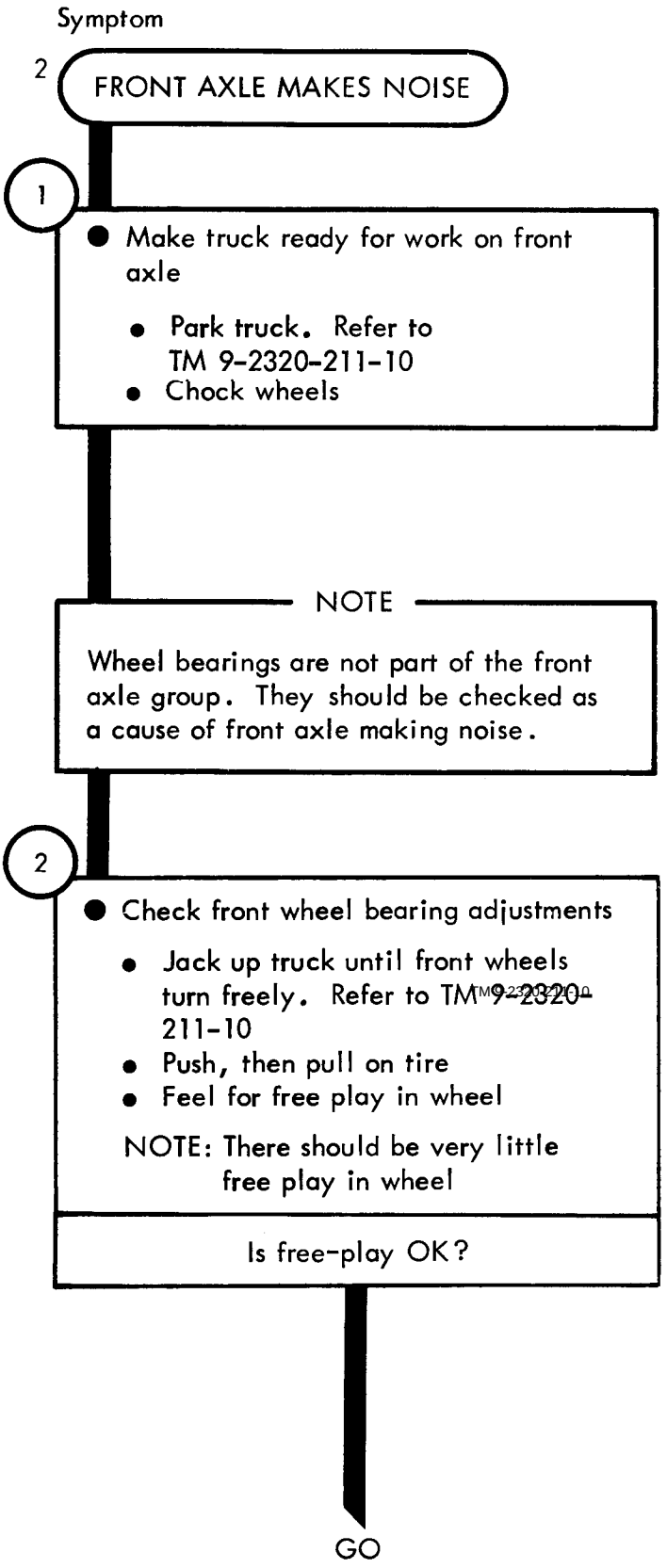



Figure 40-1 (Sheet 3 of 3)




TA 116142

Figure 40-2 (Sheet 1 of 3)

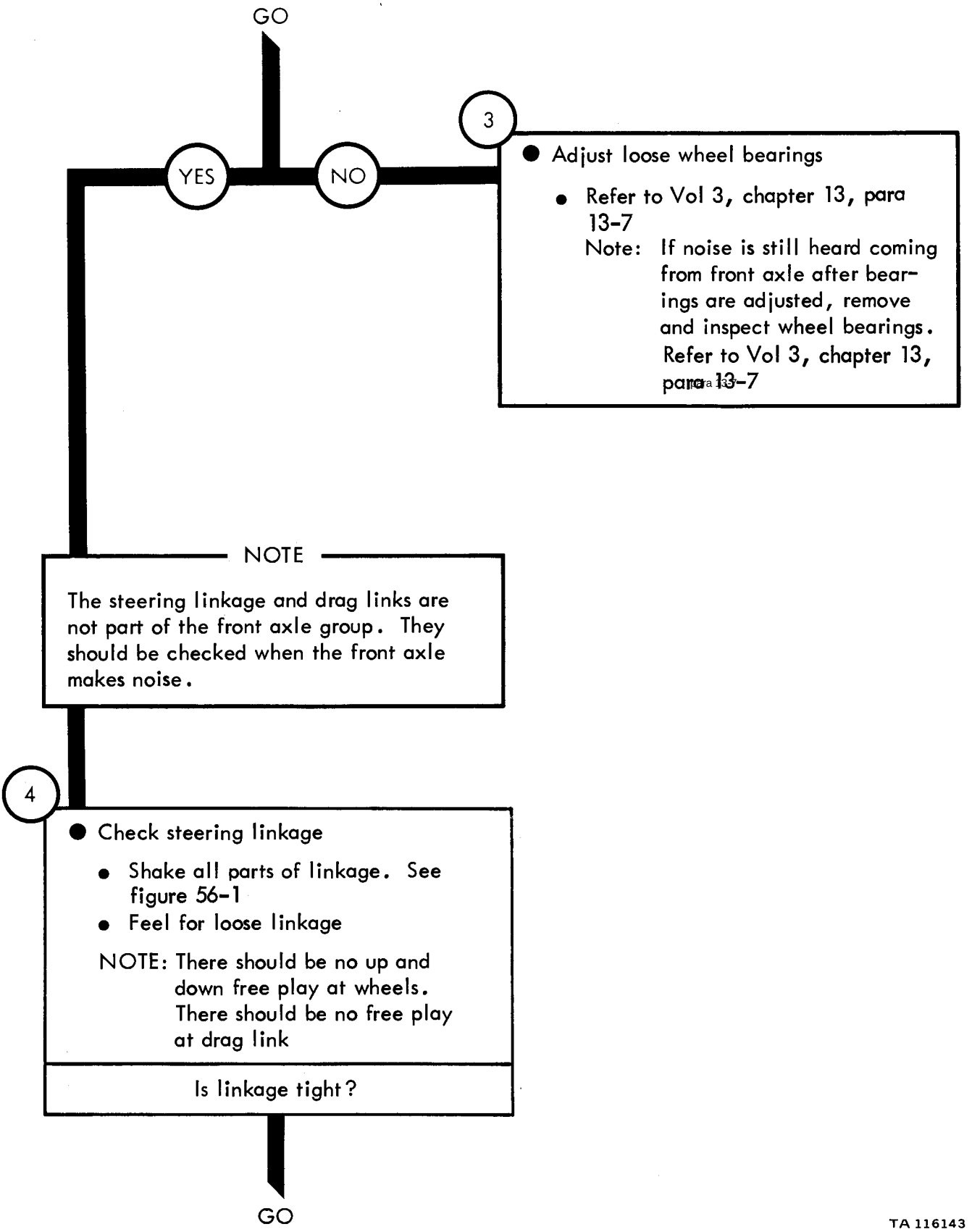
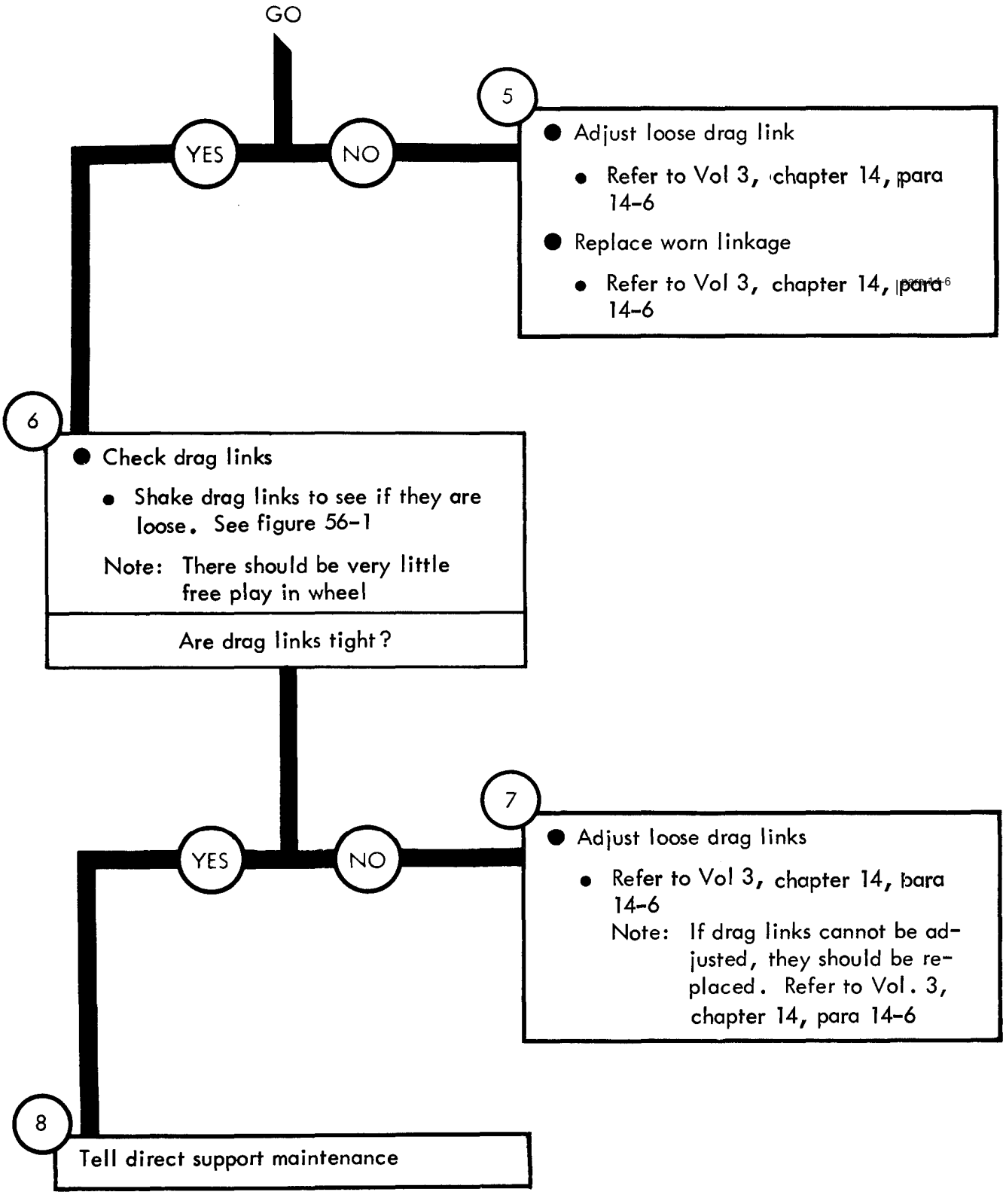
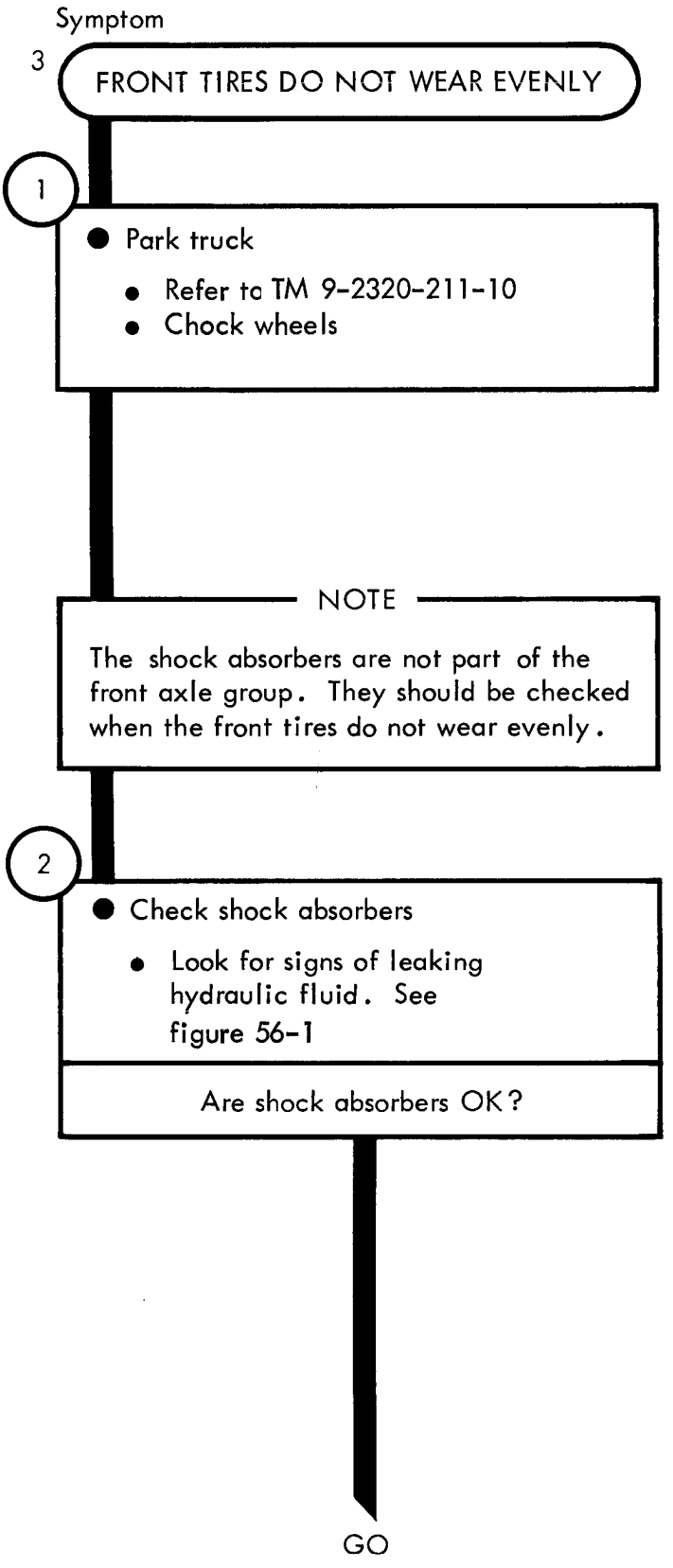



Figure 40-2 (Sheet 2 of 3)




TA 116144

Figure 40-2 (Sheet 3 of 3)




TA 116145

Figure 40-3 (Sheet 1 of 4)

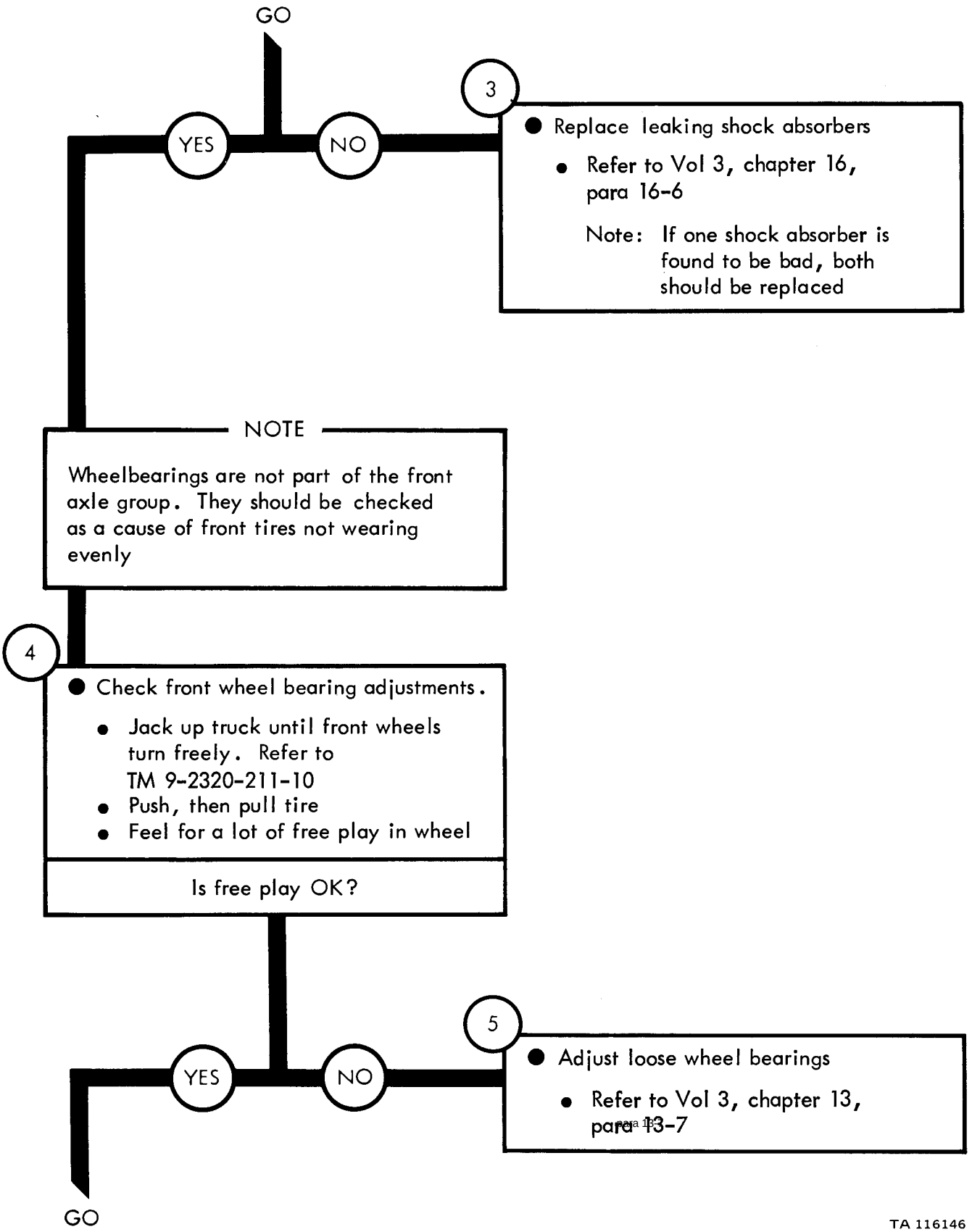



Figure 40-3 (Sheet 2 of 4)

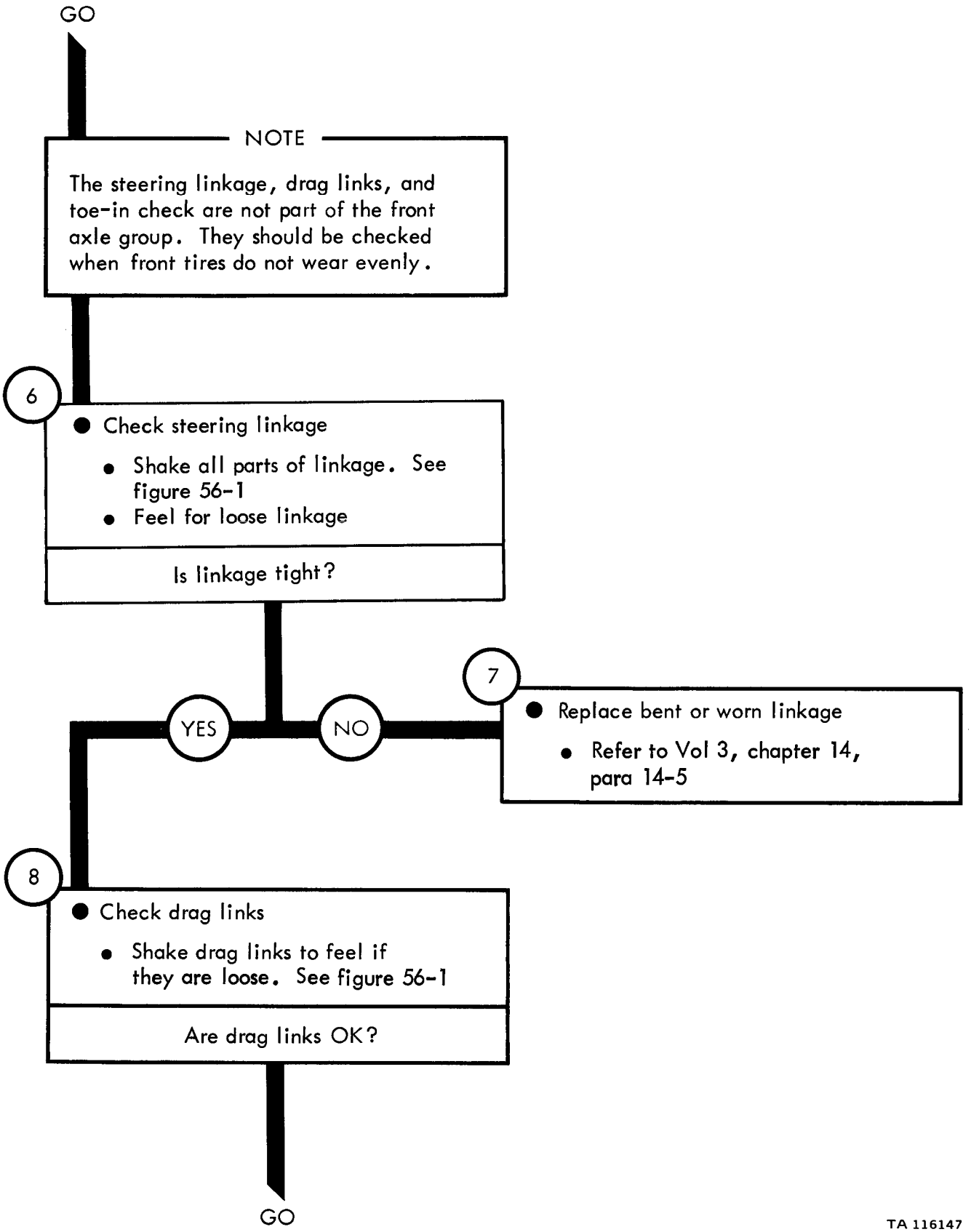
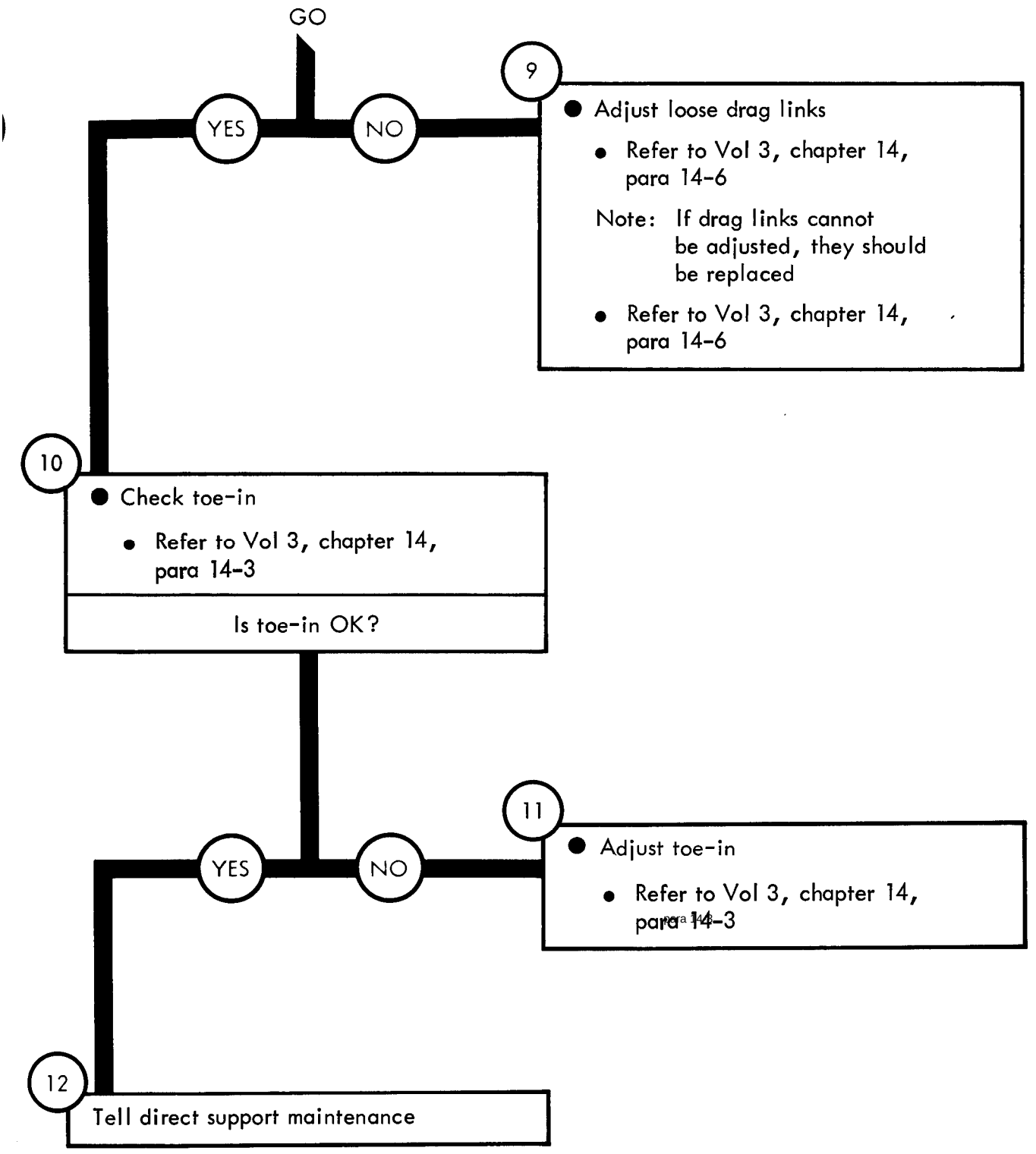



Figure 40-3 (Sheet 3 of 4)




TA 116148

Figure 40-3 (Sheet 4 of 4)

FRONT AXLE SYSTEM TROUBLESHOOTING

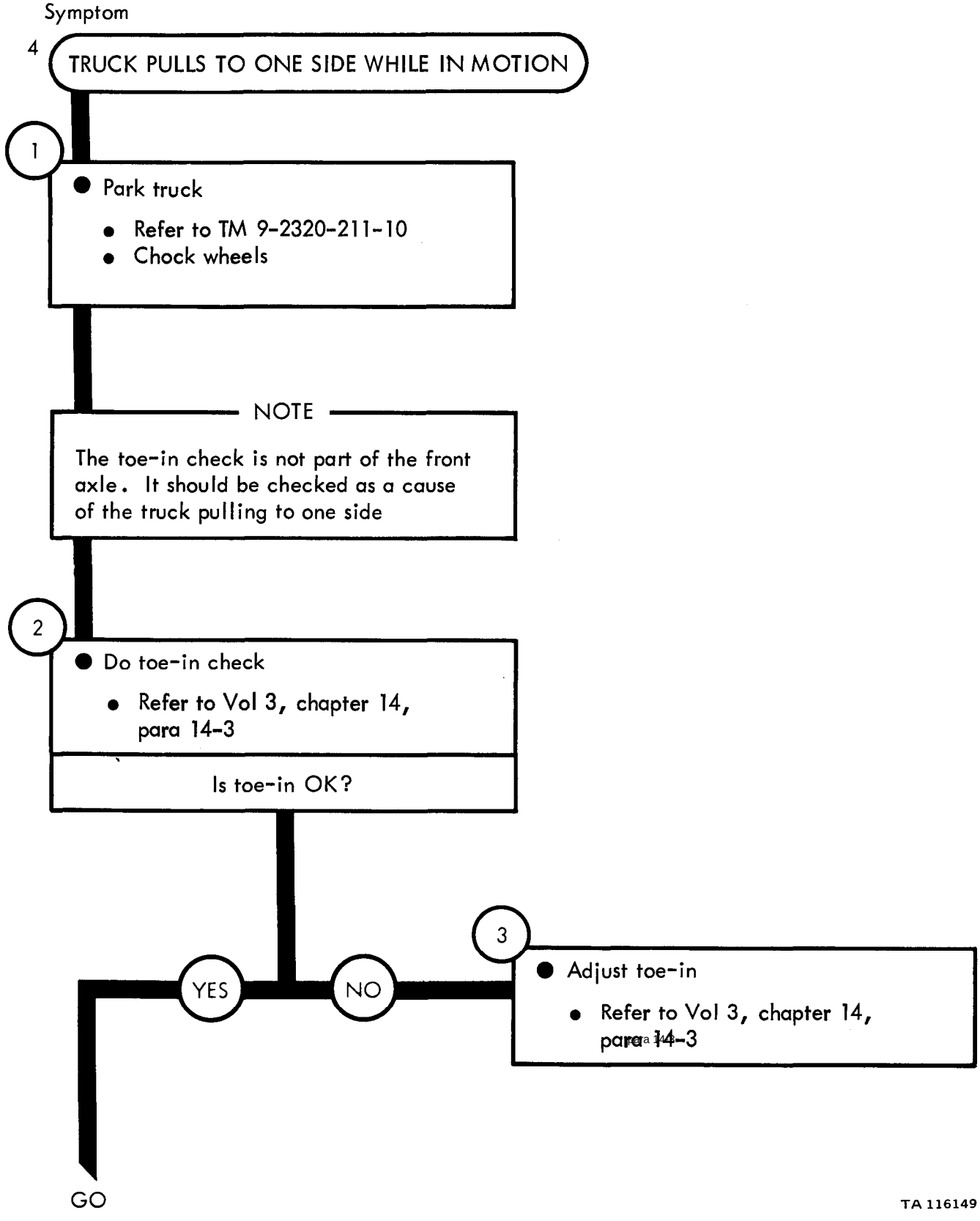
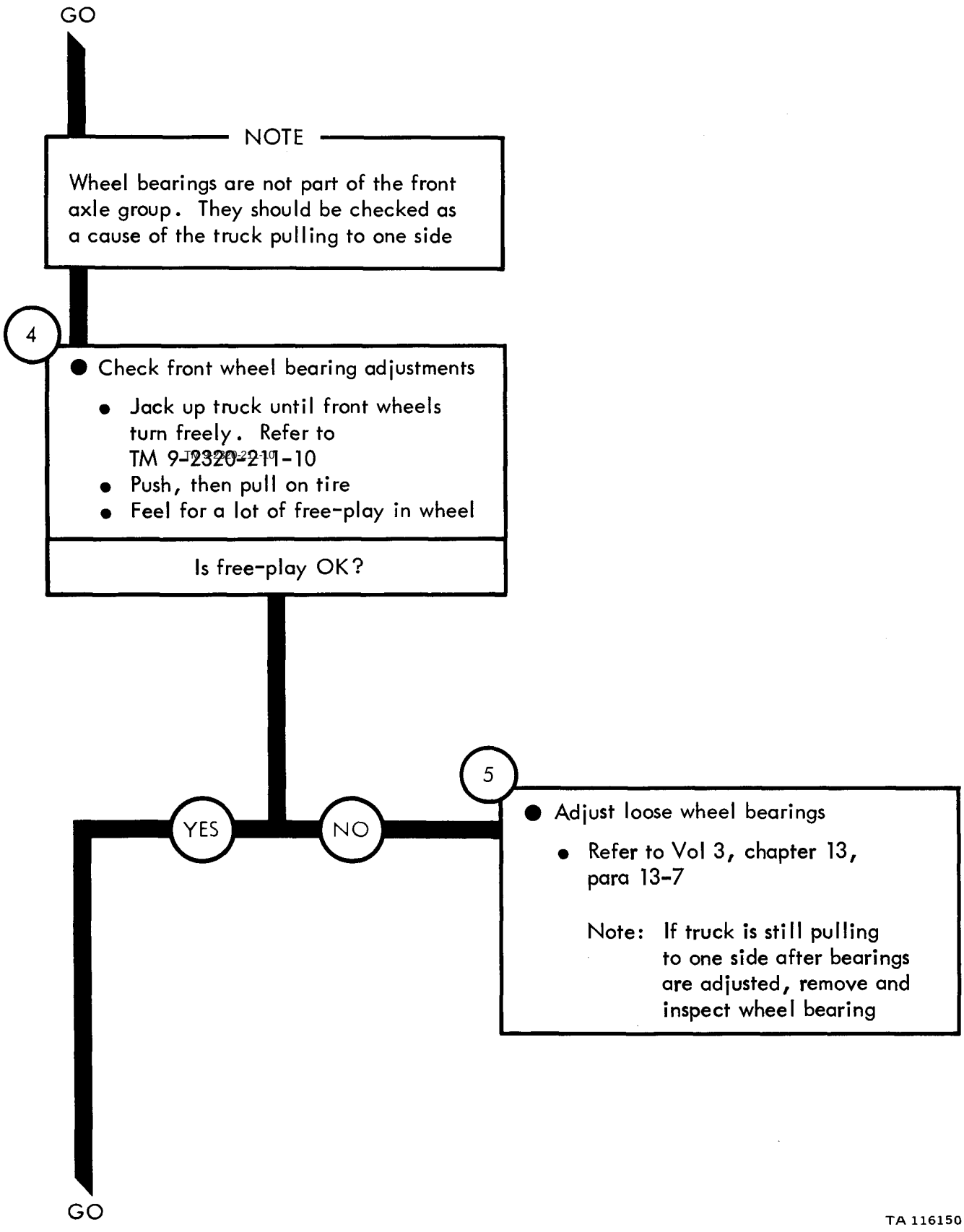



Figure 40-4 (Sheet 1 of 3)




TA 116150

Figure 40-4 (Sheet 2 of 3)

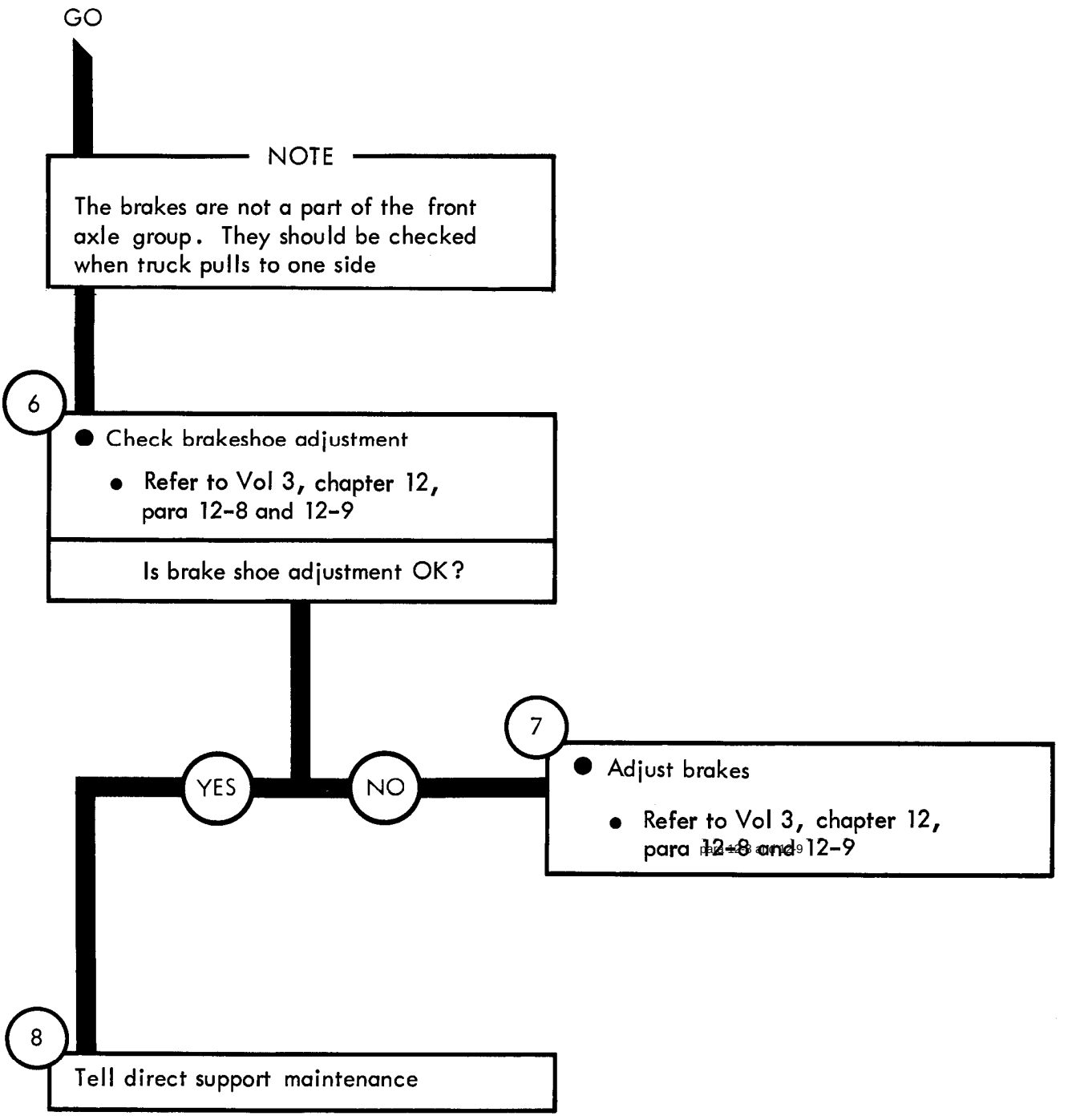



Figure 40-4 (Sheet 3 of 3)

# CHAPTER 41

# FRONT AXLE SYSTEM TROUBLESHOOTING SUMMARY

41-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 40, for the Front Axle System.

41-2. PROCEDURES. The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures in Part 1. Chapter 7 outlines a sample trouble-shooting procedure. The summary procedures are based on the "what-to-do" portions of the detailed procedures and do not include the "How-to-do-it" instructions. Warnings, cautions, and notes are given where needed.

FRONT AXLE SYSTEM TROUBLESHOOTING SUMMARY

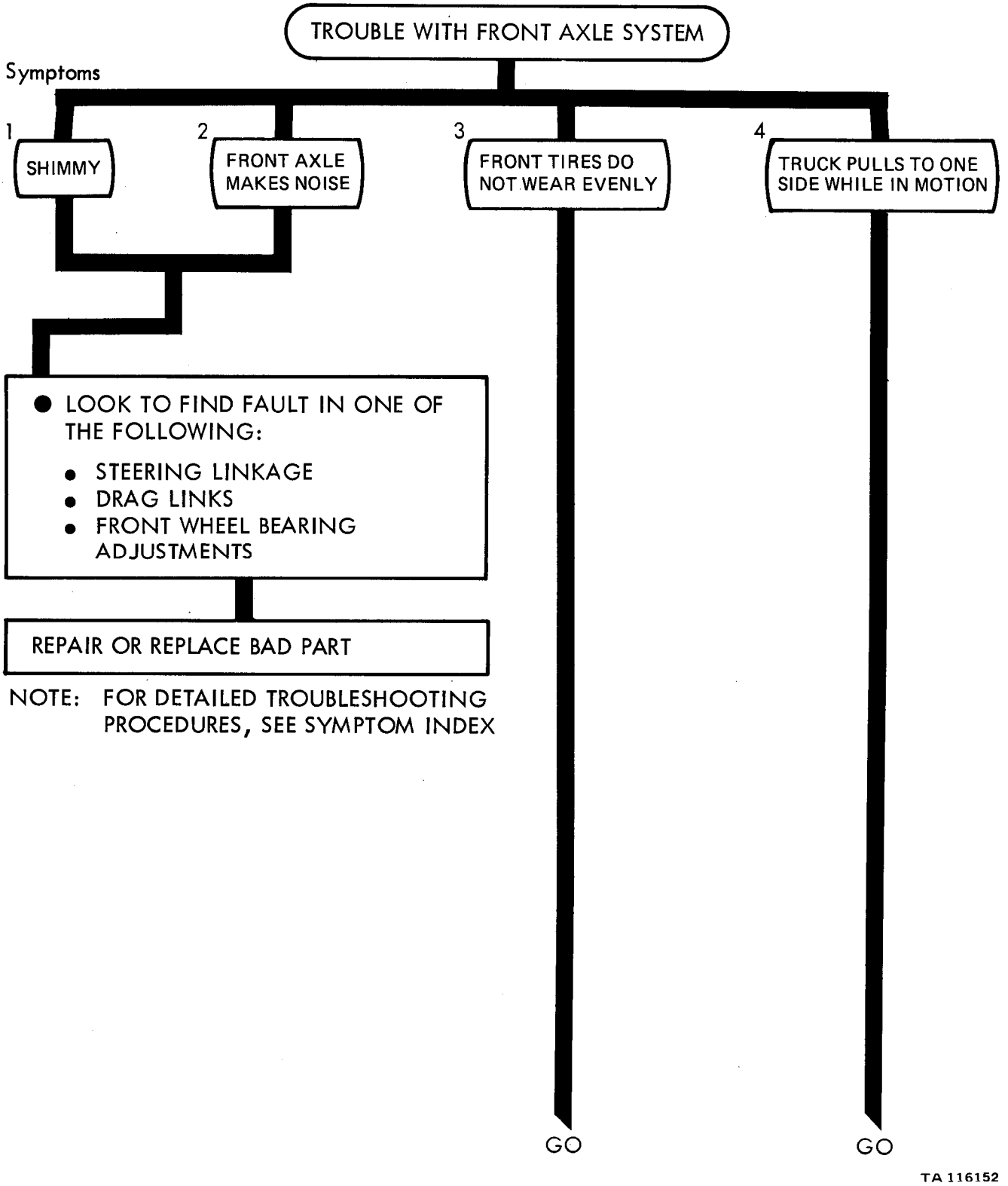



Figure 41-1 (Sheet 1 of 2)

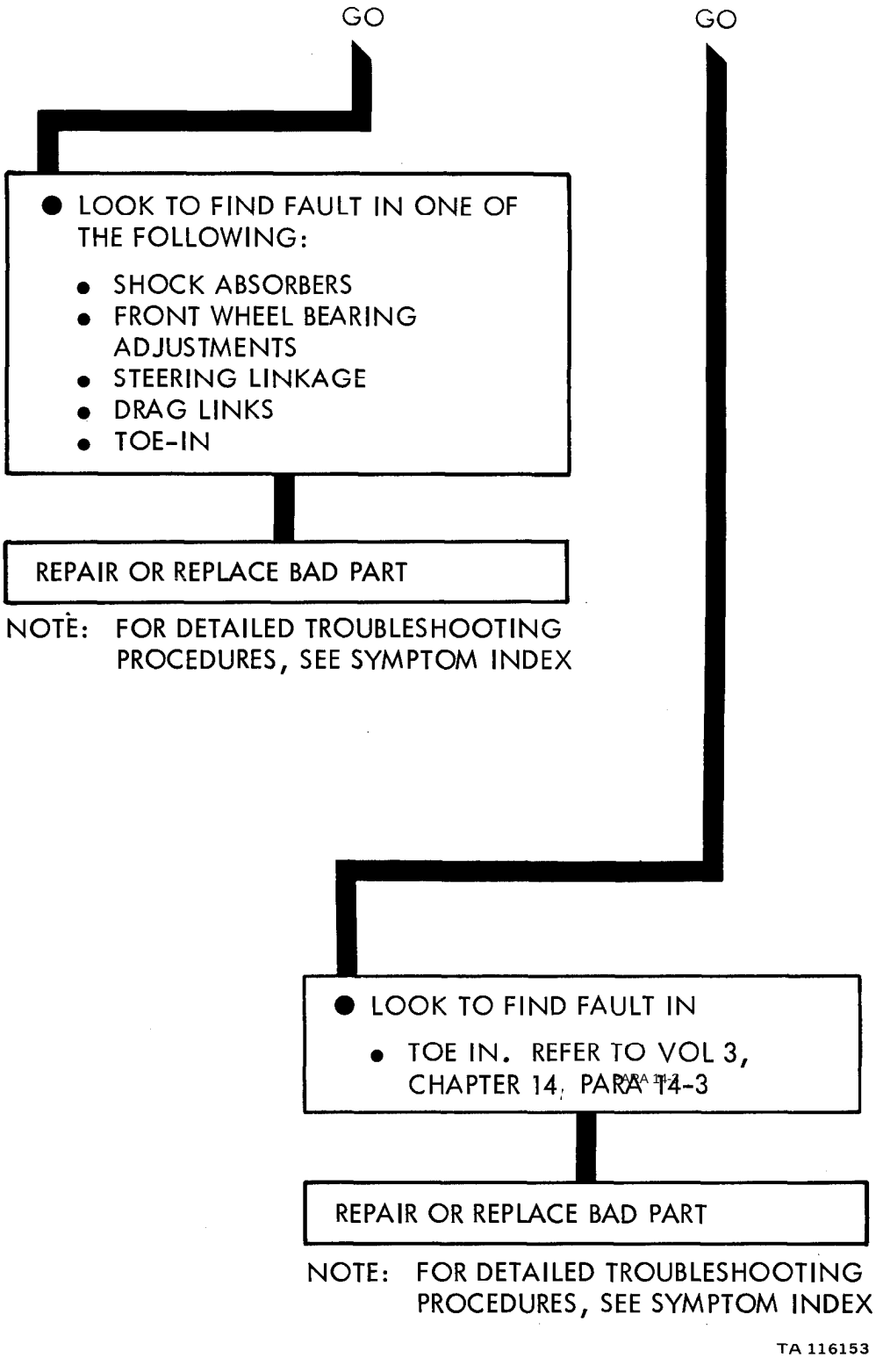



Figure 41-1 (Sheet 2 of 2)

# CHAPTER 42

# FRONT AXLE SYSTEM CHECKOUT PROCEDURES

42-1. GENERAL. This chapter gives procedures for checking out the system after troubleshooting and repair have been done. Procedures are set up in flow chart form showing the checkout steps in order and referring to the fault symptom index when the system does not check out.

FRONT AXLE SYSTEM CHECKOUT

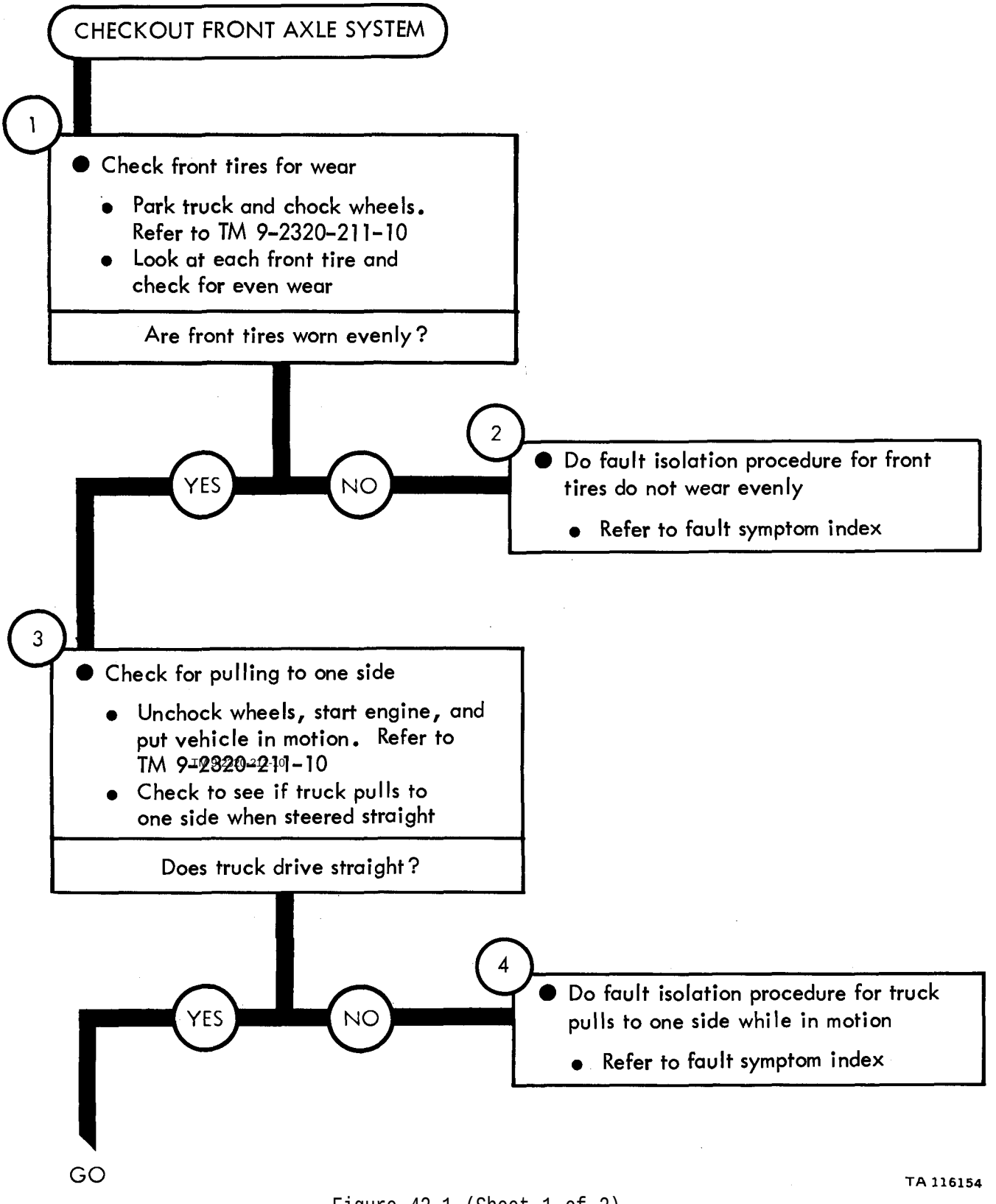



Figure 42-1 (Sheet 1 of 2)

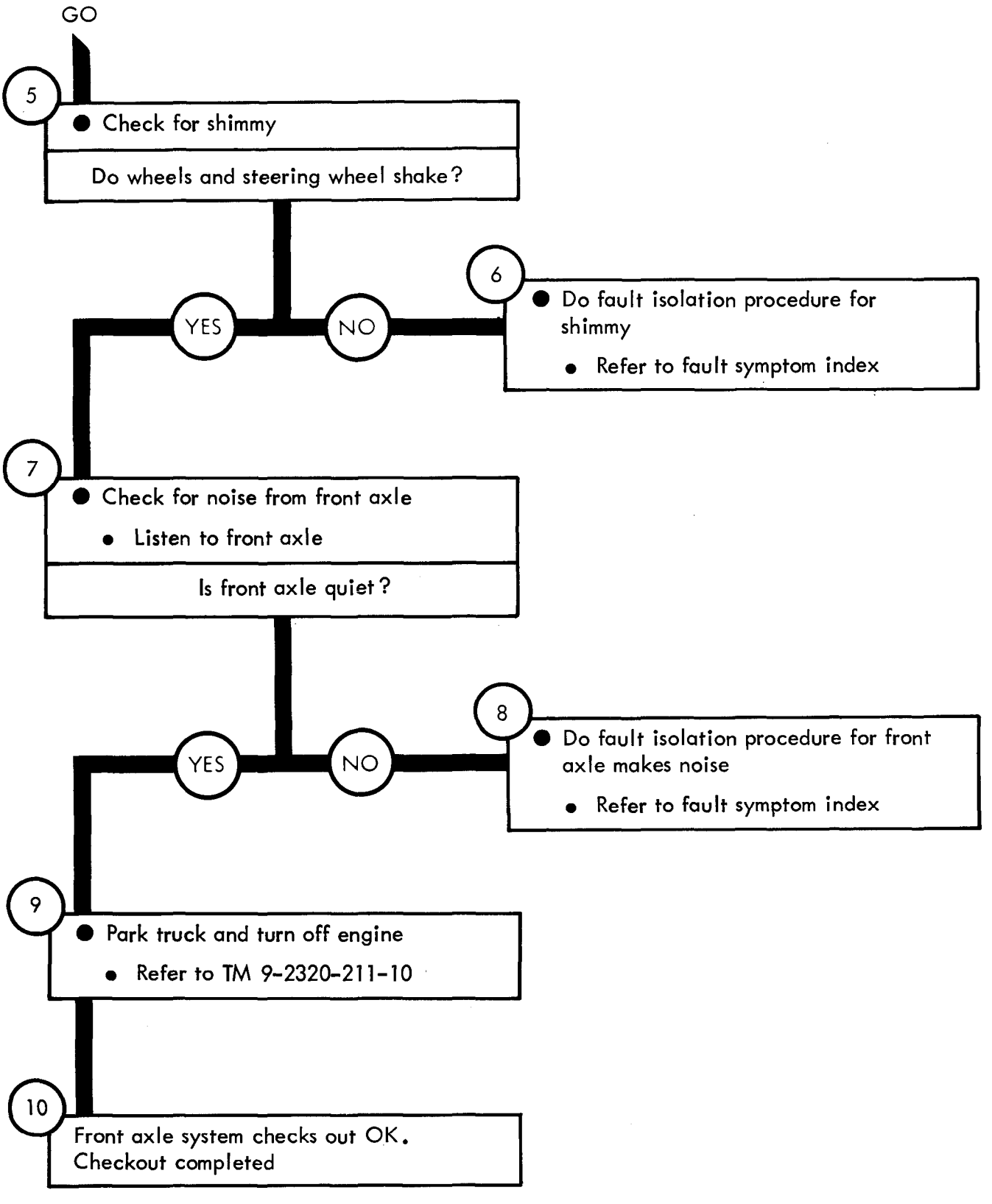



Figure 42-1 (Sheet 2 of 2)

# CHAPTER 43

# REAR AXLE SYSTEM TROUBLESHOOTING

43-1. EQUIPMENT ITEMS COVERED. This chapter gives equipment troubleshooting procedures for the rear axle system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

43-2. EQUIPMENT ITEMS NOT COVERED. All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

Symptom 1

REAR AXLE MAKES NOISE

1

- Park truck
  - Refer to TM 9-2320-211-10

NOTE

Torque rods and spring seats are not part of the rear axle group. However, they should be checked as a cause of the rear axle making noise

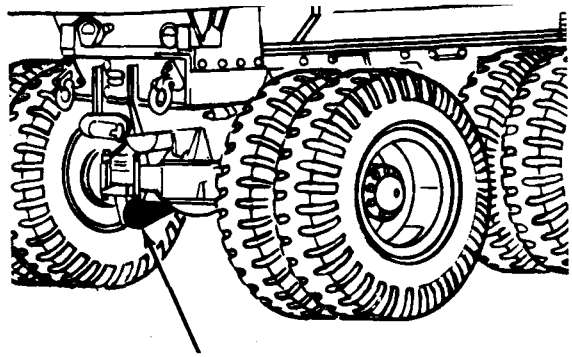
2

- Check torque rods
  - Shake torque rods
  - Look for free play at torque rod ends

NOTE: There should be no freeplay at torque rod ends

Are torque rods OK?

GO




TA 116156

Figure 43-1 (Sheet 1 of 4)

GO

YES

NO

3

- Replace worn torque rods
  - Tell direct support maintenance

NOTE

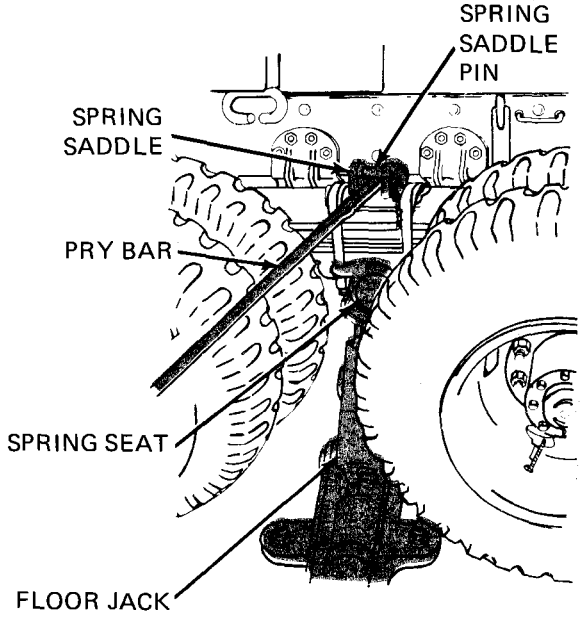
Spring seat is not part of the front axle group. However, the spring seat should be checked as a cause of the rear axle making noise

4

- Check spring seat bearing free play
  - Put floor jack under spring seat
  - Raise truck until wheels come off ground
  - Put pry bar between spring saddle pin and spring saddle
  - Push bar up and down and look for free play in spring seat bearing

Note: There should be no free play in spring seat bearing

Is spring seat bearing free play OK?




GO

TA 116157

Figure 43-1 (Sheet 2 of 4)

GO

YES

NO

5

- Adjust spring seat bearing
  - Refer to Vol 3, chapter 16, para 16-5

Note: If noise is still heard after bearing has been adjusted. Replace spring seat bearing. Refer to Vol 3, chapter 16, para 16-5

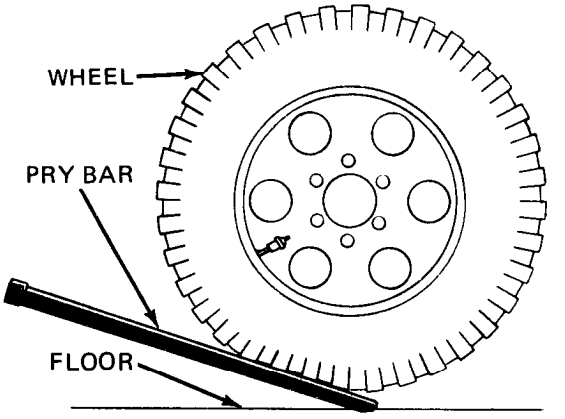
6

- Check rear wheel bearing adjustment
  - Slide a pry bar under rear wheels

Note: Bar is used as a lever to push up on the tire using the floor for support

  - Push up on tire and feel for a lot of free play in wheel

Is wheel bearing adjustment OK?




TS 211-20-114

YES

NO

7

- Adjust loose rear wheel bearings
  - Refer to Vol 3, chapter 13, para 13-11

8

- Jack up and support truck
  - Lower floor jack
  - Refer to Vol 3, chapter 10, para 10-3

GO

TA 116158

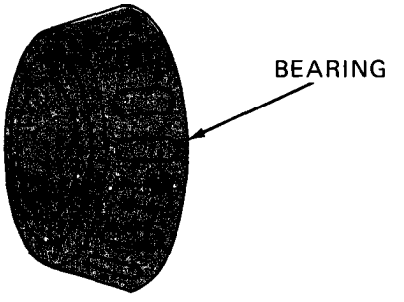
Figure 43-1 (Sheet 3 of 4)

GO

9

- Check rear wheel bearing on wheel that is noisy
  - Remove outer and inner rear wheel bearings. Refer to Vol 3, chapter 13, para 13-11
  - Look at wheel bearings for signs of scorching, melting or metal discoloring

Note: If wheel bearings are found to be OK, put them back. Refer to Vol 3, chapter 13, para 13-11 Then do step 8, for the wheel next to it




TS 211-20-118

Is wheel bearing OK?

YES

NO

10

- Replace bad wheel bearings
  - Refer to Vol 3, chapter 13, para 13-11

11

- Jack down truck
  - Refer to Vol 3, chapter 10, para 10-3

12

Tell direct support maintenance

TA 116159

Figure 43-1 (Sheet 4 of 4)

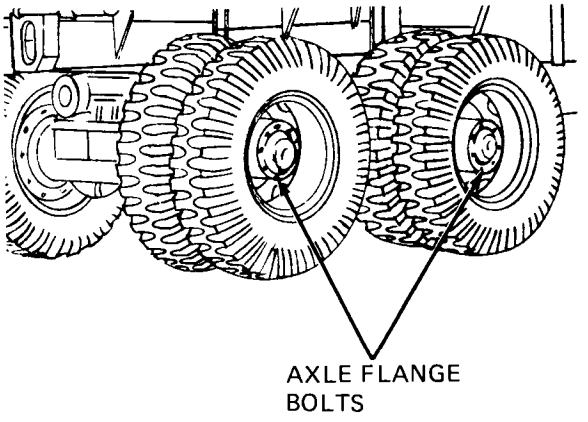
Symptom

2 TOO MUCH BACKLASH WHEN DRIVING

1
- Park truck
  - Refer to TM 9-2320-211-10

2
- Check rear axle flange bolts
  - Using 15- pound-feet torque wrench and 3/4-inch socket make sure each bolt is tightened to 70 to 80 pound feet

Are flange bolts tight?




YES

NO

3
- Tighten loose rear axle flange bolts
  - Using 15- pound-feet torque wrench and 3/4-inch socket tighten bolts to 70 to 80 pound-feet

4 Tell direct support maintenance

TA 116160

Figure 43-2

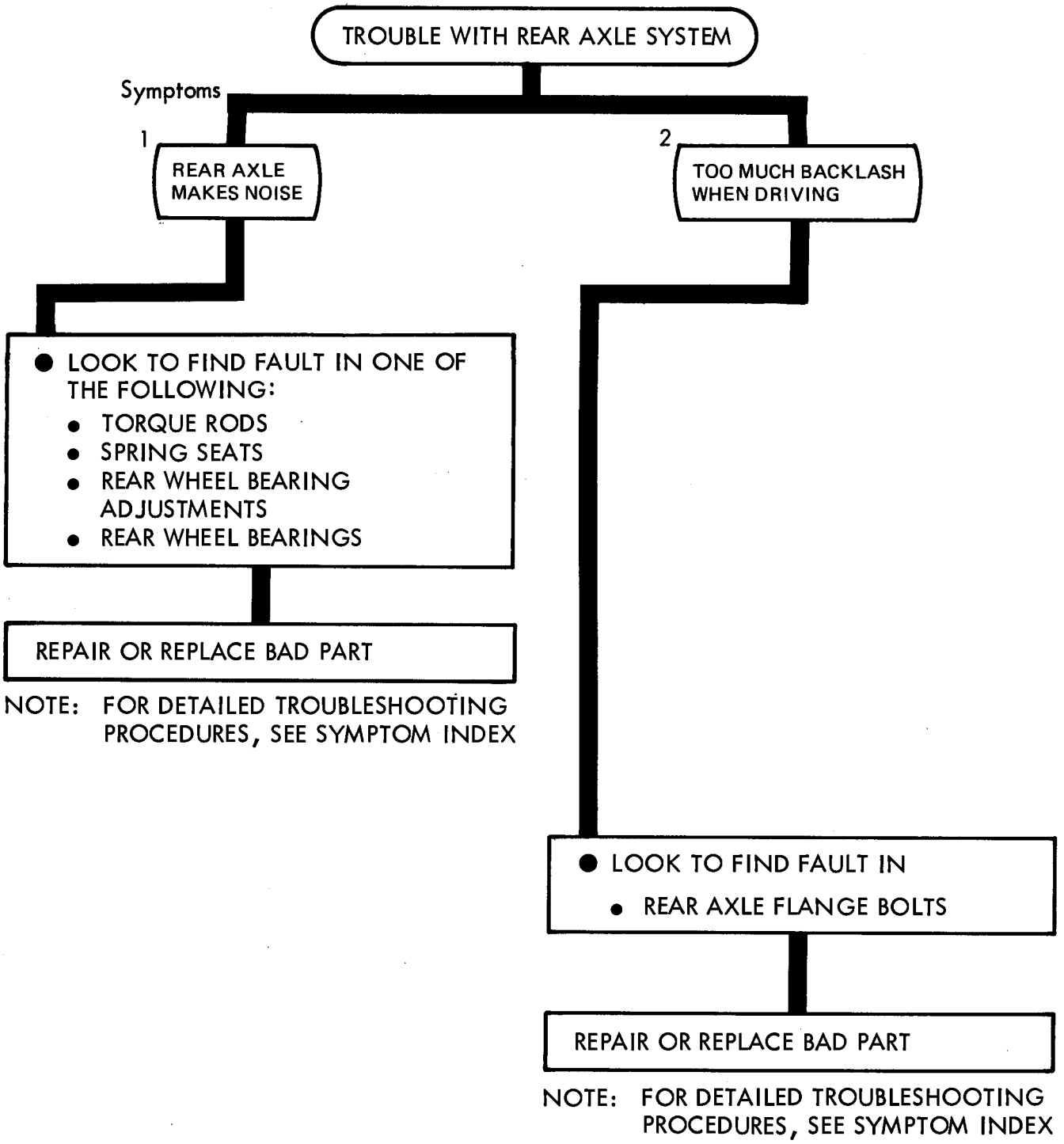
# CHAPTER 44

# REAR AXLE SYSTEM TROUBLESHOOTING SUMMARY

44-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 43, for the Rear Axle System.

44-2. PROCEDURES. The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures in Part 1. Chapter 7 outlines a sample trouble-shooting procedure. The summary procedures are based on the "what-to-do" portions of the detailed procedures and do not include the "How-to-do-it" instructions. Warnings, cautions, and notes are given where needed.

REAR AXLE SYSTEM TROUBLESHOOTING SUMMARY




TA 116161

Figure 44-1

# CHAPTER 45

# REAR AXLE SYSTEM CHECKOUT PROCEDURES

45-1. GENERAL. This chapter gives procedures for checking out the system after troubleshooting and repair have been done. Procedures are set up in flow chart form showing the checkout steps in order and referring to the fault symptom index when the system does not checkout.

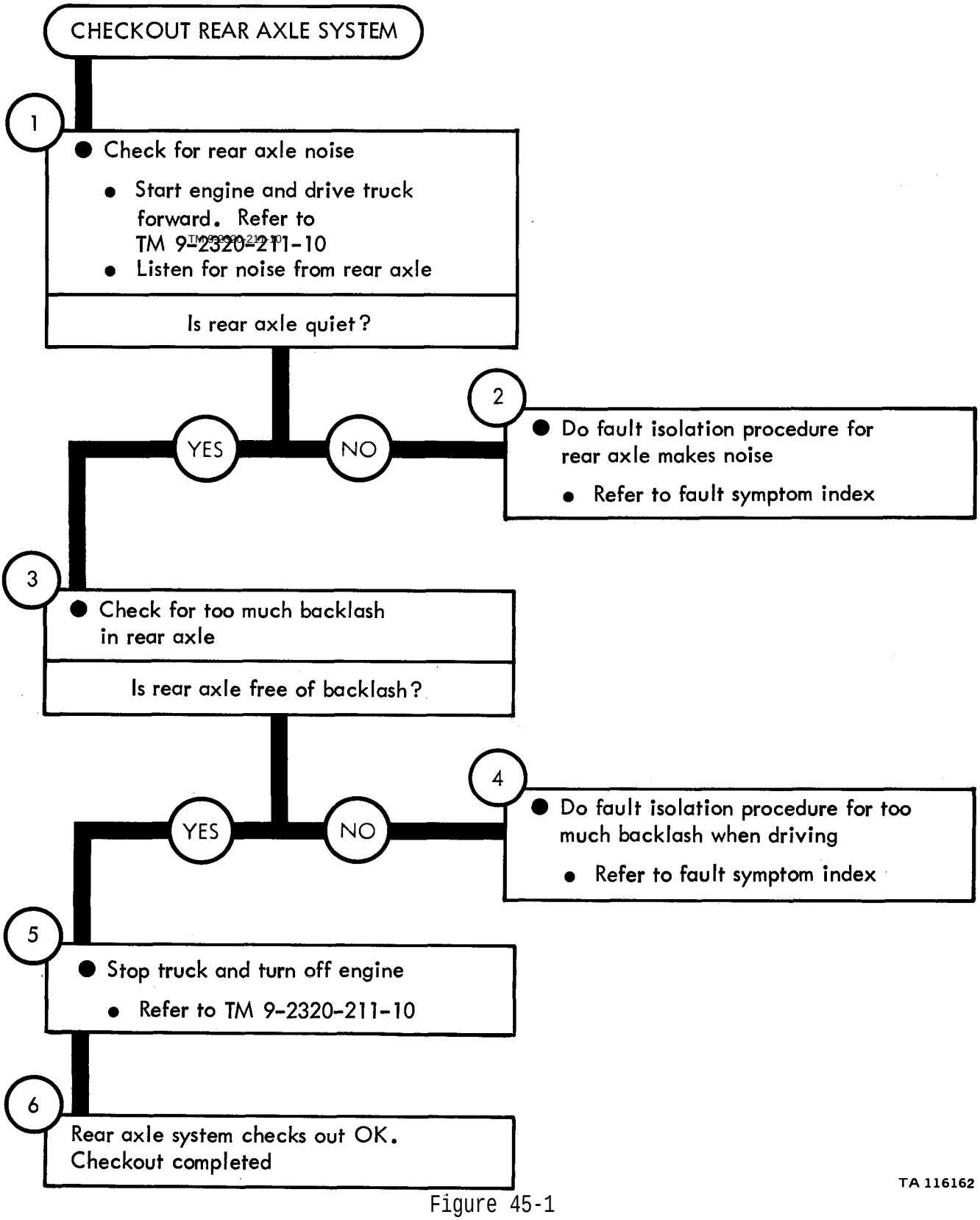

CHECKOUT REAR AXLE SYSTEM
1
● Check for rear axle noise
• Start engine and drive truck forward. Refer to TM 9-2320-211-10
• Listen for noise from rear axle
Is rear axle quiet?
YES
NO
2
● Do fault isolation procedure for rear axle makes noise
• Refer to fault symptom index
3
● Check for too much backlash in rear axle
Is rear axle free of backlash?
YES
NO
4
● Do fault isolation procedure for too much backlash when driving
• Refer to fault symptom index
5
● Stop truck and turn off engine
• Refer to TM 9-2320-211-10
6
Rear axle system checks out OK. Checkout completed
TA 116162

Figure 45-1

# CHAPTER 46

# BRAKE SYSTEM TROUBLESHOOTING

46-1. EQUIPMENT ITEMS COVERED . This chapter gives equipment troubleshooting procedures for the brake system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

46-2. EQUIPMENT ITEMS NOT COVERED . All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

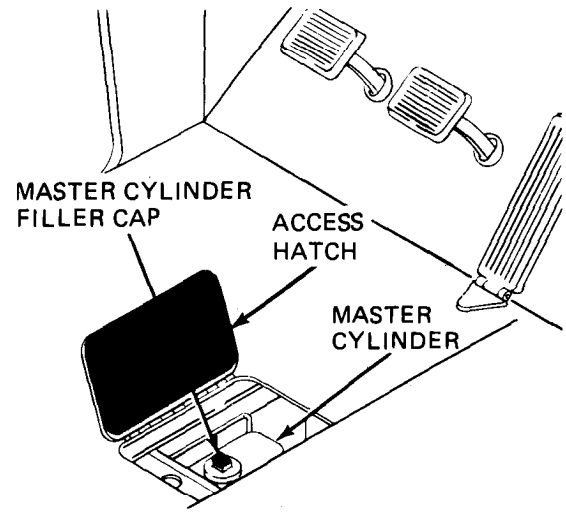
Symptom

1 BRAKE PEDAL PRESSURE IS SPONGY

1
- Park truck
  - Refer to TM 9-2320-211-10

2
- Check hydraulic brake fluid in master cylinder
  - Use 7/16-inch wrench
  - Open master cylinder access hatch
  - Using 13/16-inch wrench, unscrew and take out master cylinder filler cap
  - Using a flashlight, shine light into master cylinder reservoir to see if fluid level is low

Is the hydraulic brake fluid level OK?




TS 211-20-21

YES → GO

NO → 3

3
- Test master cylinder
  - Refer to test equipment procedures test index for master cylinder leakage test. Refer to Vol 3, chapter 12, para 12-11

Is master cylinder OK?

NO GO

TA 116163

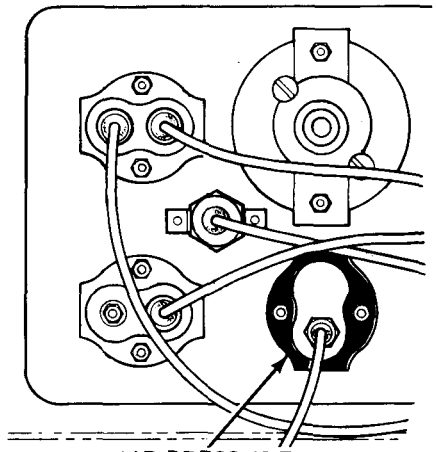
Figure 46-1 (Sheet 1 of 8)

GO

4

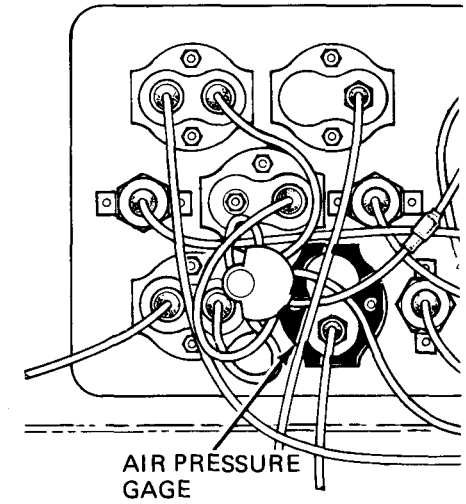
- Check compressed air line to air pressure gage
  - Using soapy water, coat the fitting and look for air bubbles

Is the air line fitting tight?



AIR PRESSURE GAGE

ON ALL TRUCKS EXCEPT SOME LATE MODEL M52A2 TRUCKS



AIR PRESSURE GAGE

ON SOME LATE MODEL M52A2 TRUCKS

YES

NO

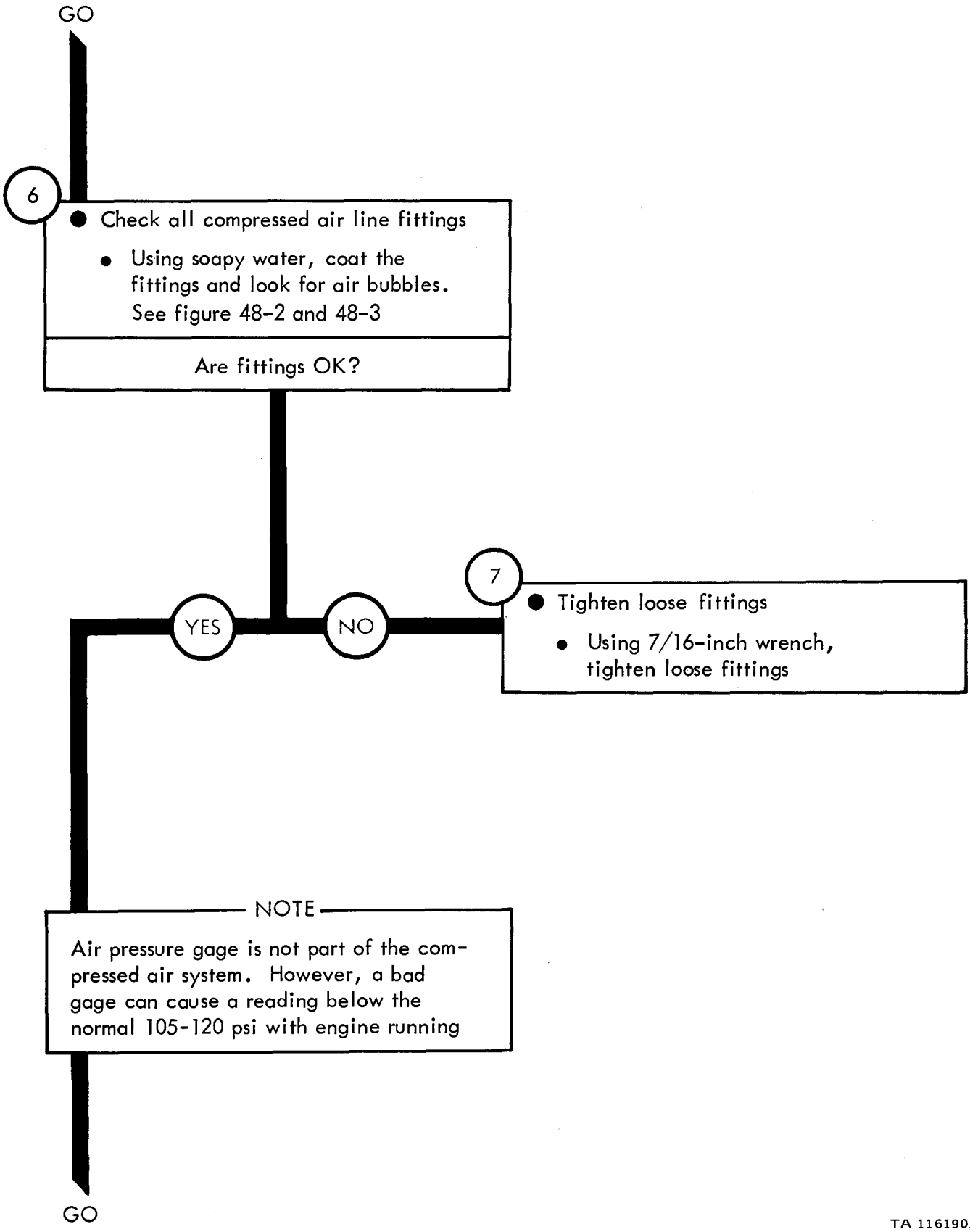
5

- Tighten loose compressed air line fitting until leak stops
  - Using 5/8-inch wrench, tighten fitting until leak stops

GO

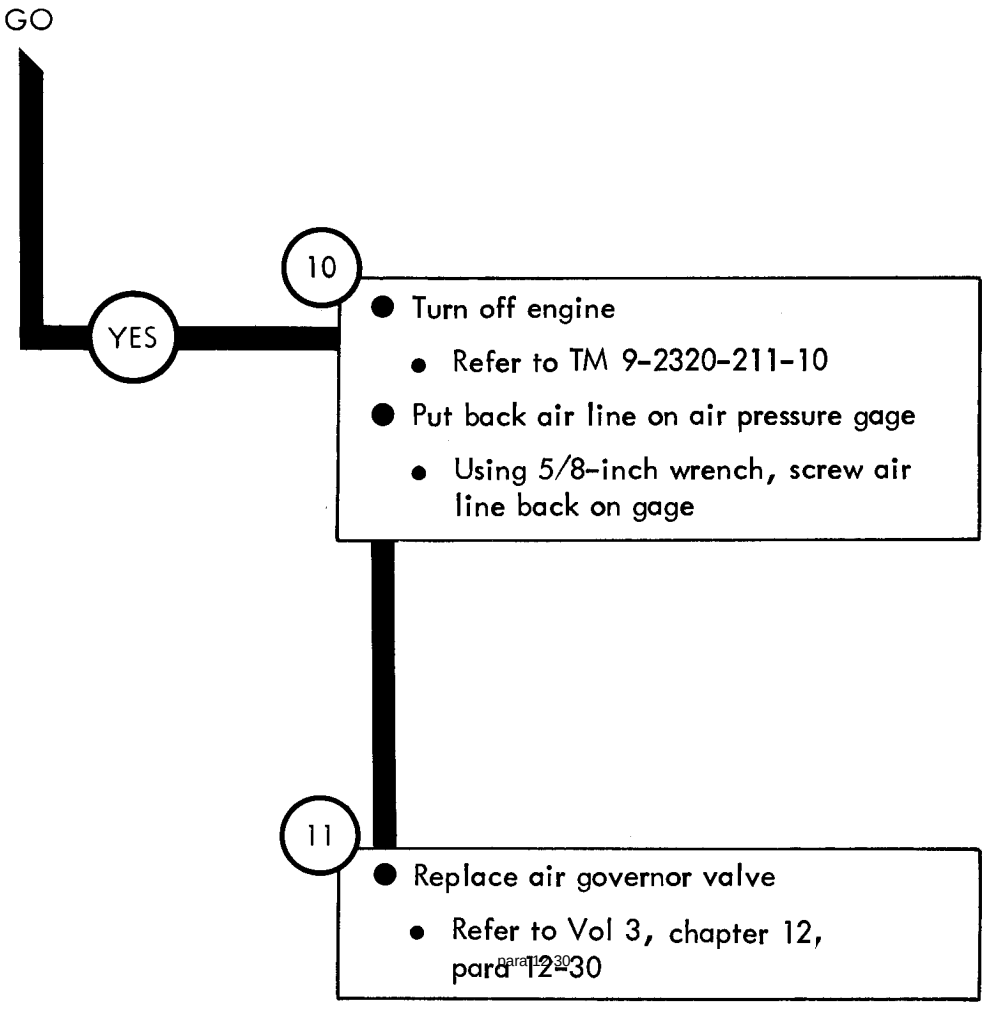
TA 116189

Figure 46-7 (Sheet 2 of 5)




TA 116190

Figure 46-7 (Sheet 3 of 5)




TA 116192

Figure 46-7 (Sheet 5 of 5)

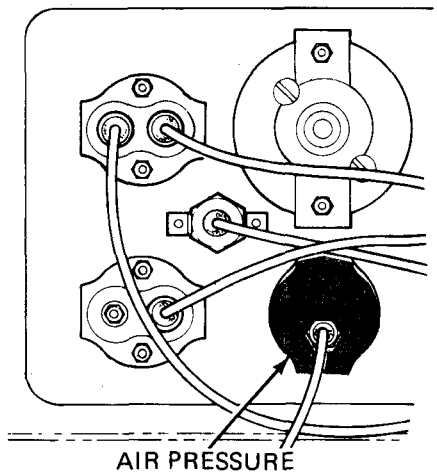
Symptom

8 READING ON AIR PRESSURE GAGE IS ABOVE NORMAL

1
- Park truck and turn off engine
  - Refer to TM 9-2320-211-10

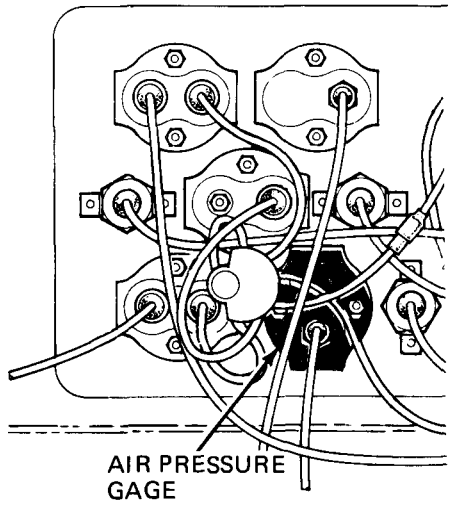
2
- Check air pressure gage
  - Open air reservoir drain valve
  - Using 5/8 inch wrench unscrew and take off air line from gage
  - Put air line on gage that is known to be good and tighten line using 5/8 inch wrench

GO



AIR PRESSURE GAGE

ON ALL TRUCKS EXCEPT SOME LATE MODEL M52A2 TRUCKS



AIR PRESSURE GAGE

ON SOME LATE MODEL M52A2 TRUCKS

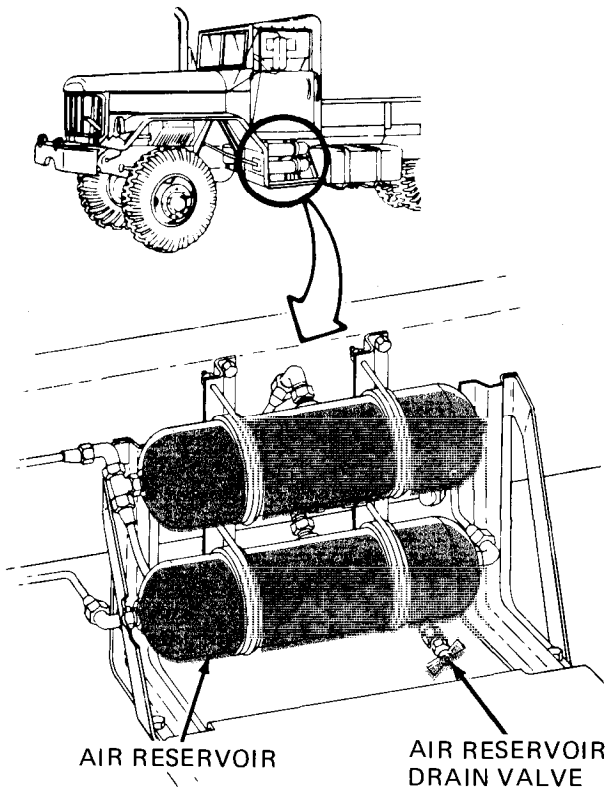
TA 116193

Figure 46-8 (Sheet 1 of 3)

GO

- Close air reservoir drain valve
- Start engine. Refer to TM 9-2320-211-10
- Look at pressure reading on gage

Does gage read over 105 to 120 psi?




YES

NO

3

- Turn off engine
  - Refer to TM 9-2320-211-10
- Replace air pressure gage
  - Refer to Vol 3, chapter 7, para 7-14

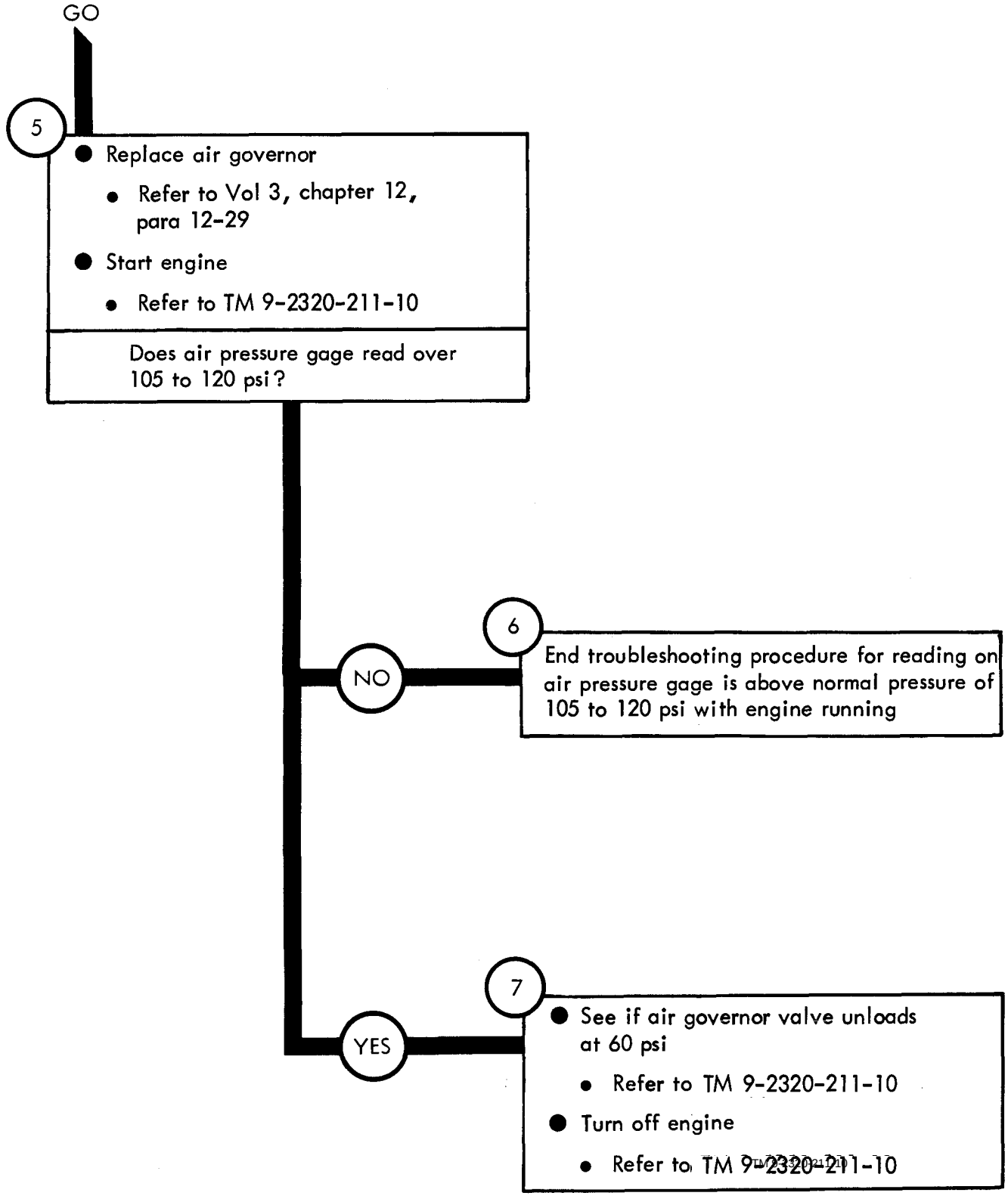
4

- Turn off engine
  - Refer to TM 9-2320-211-10
- Put back air line on air pressure gage in instrument panel
  - Using 5/8 inch wrench screw air line back on gage

GO

TA 116194

Figure 46-8 (Sheet 2 of 3)




TA 116195

Figure 46-8 (Sheet 3 of 3)

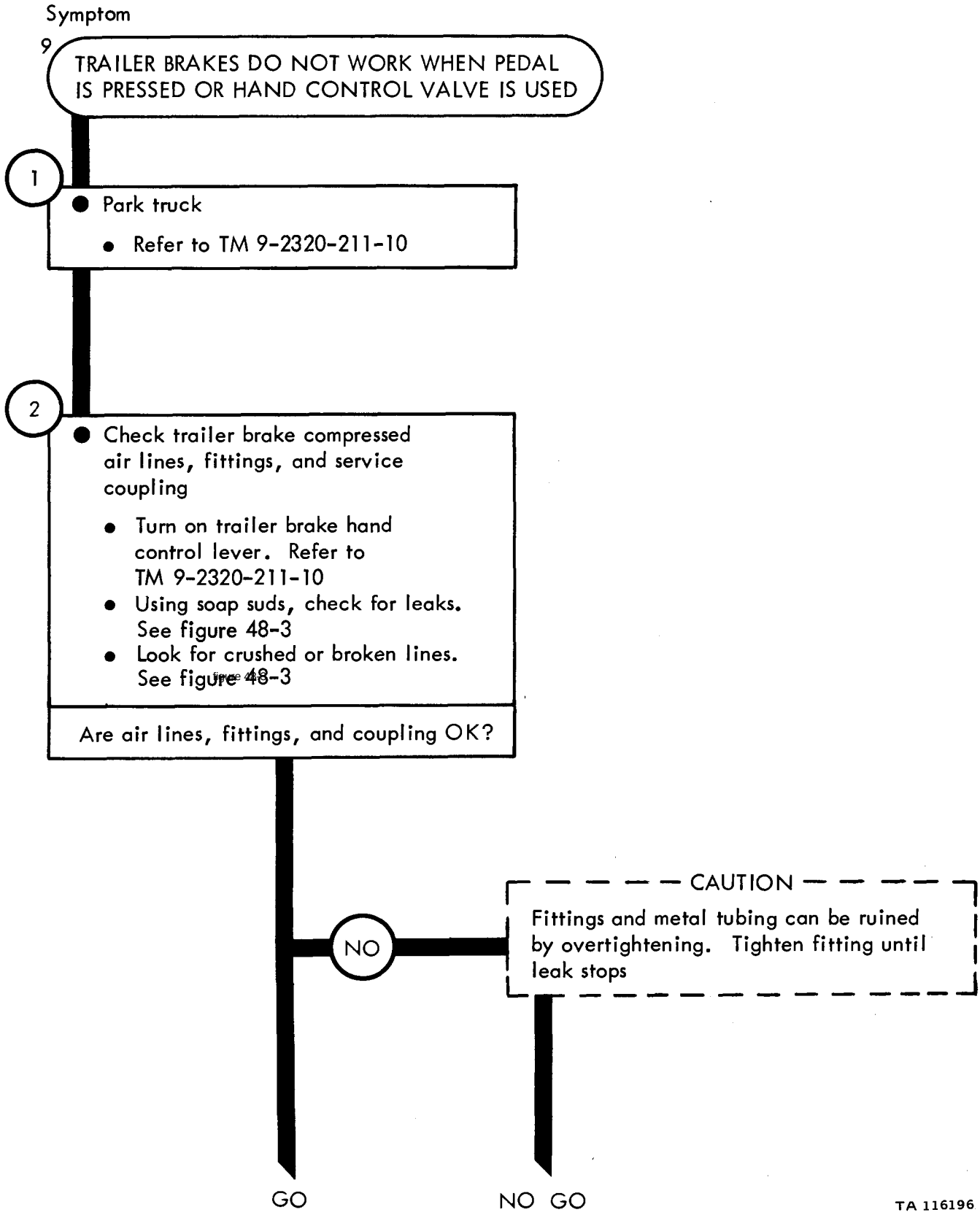
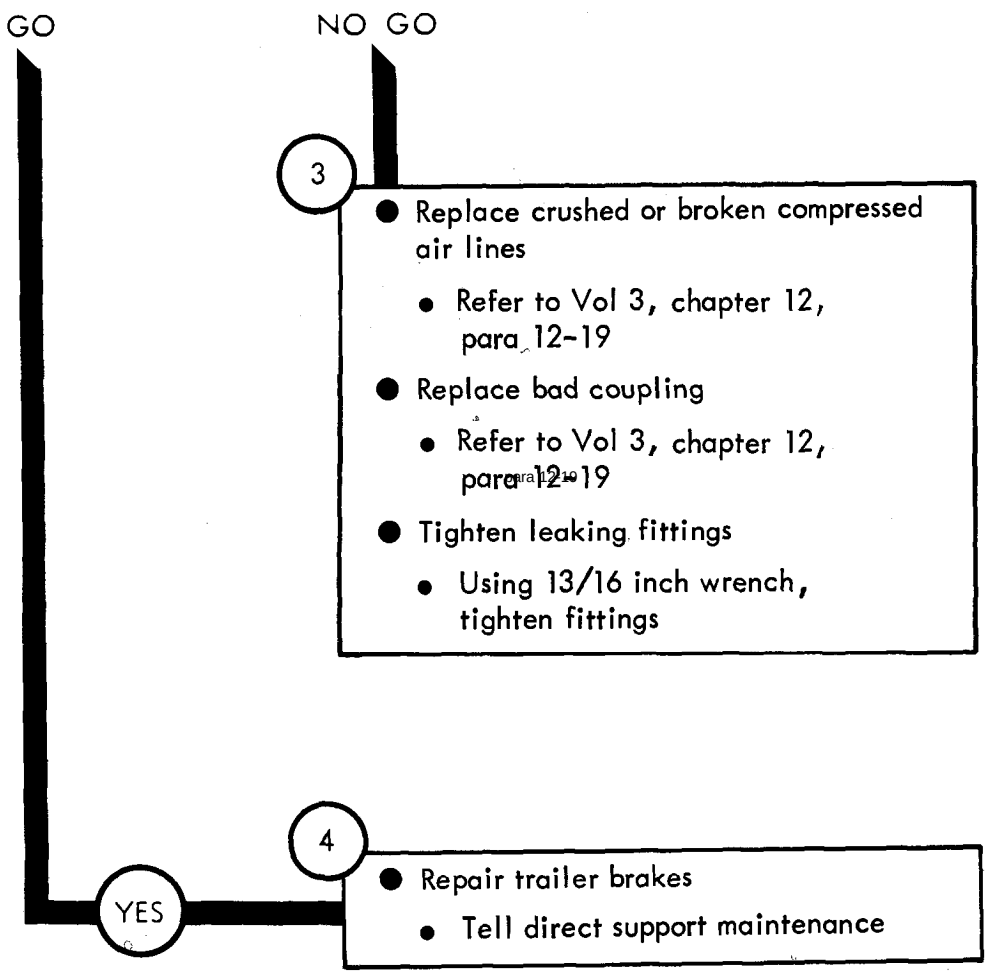



Figure 46-9 (Sheet 1 of 2)




TA 116197

Figure 46-9 (Sheet 2 of 2)

Symptom

11 HANDBRAKE ASSEMBLY DRAGS AFTER HANDBRAKE LEVER IS PUT DOWN

1

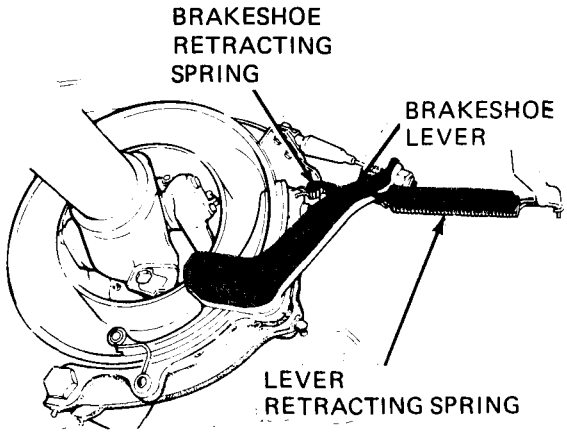
- Make truck ready for work on handbrake
  - Park truck. Refer to TM 9-2320-211-10
  - Chock wheels

2

- Check brakeshoe retracting spring, and lever retracting spring at rear of transfer
  - Crawl under truck
  - Look for retracting springs that have come off mount
  - Look for worn or broken retracting spring

Are retracting springs OK?

GO




TA 116201

Figure 46-11 (Sheet 1 of 3)

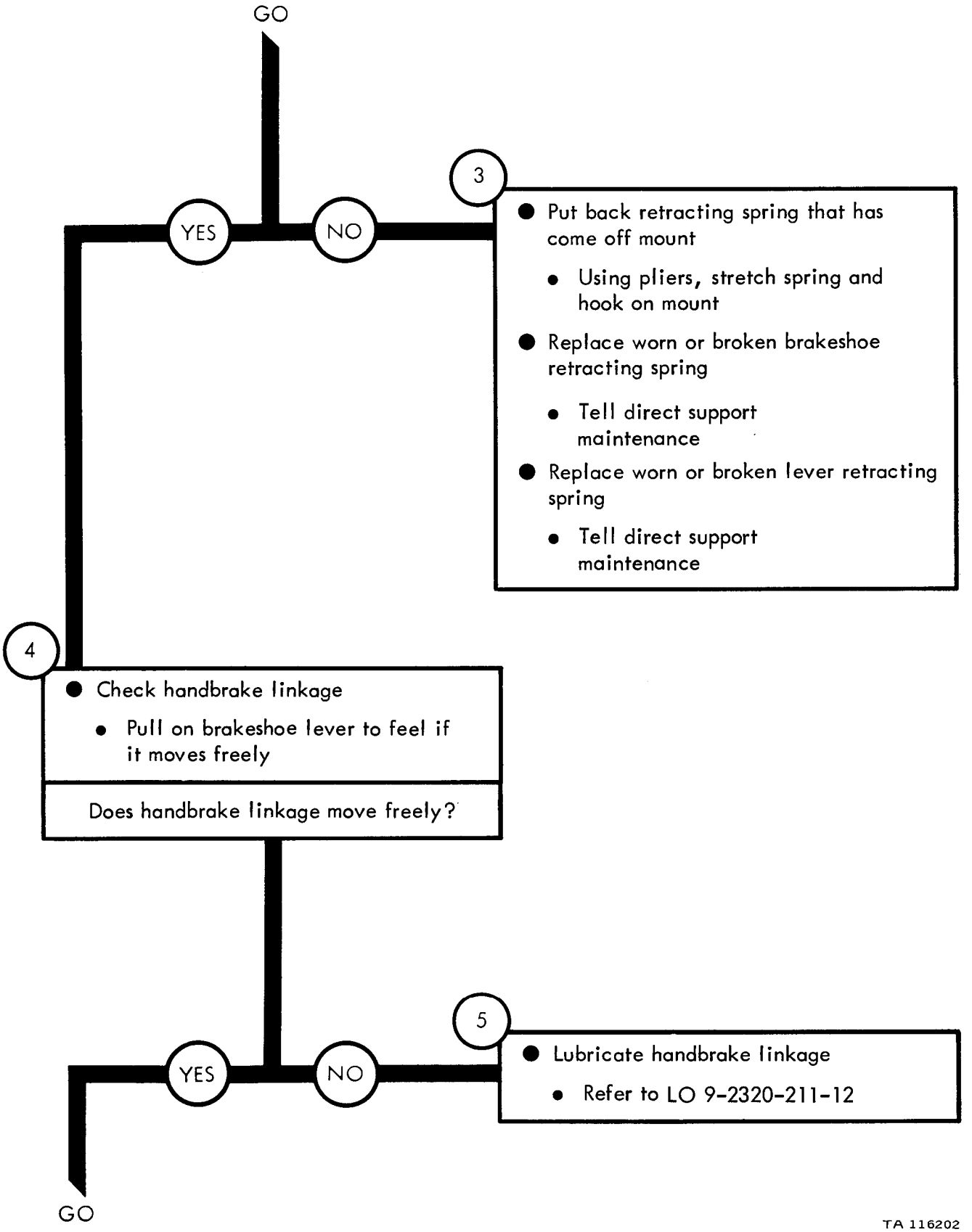


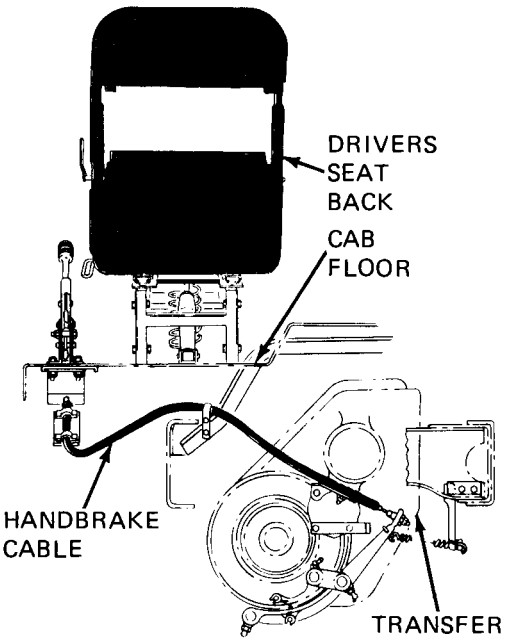

Figure 46-11 (Sheet 2 of 3)

GO

6

- Check handbrake cable
  - Look for a kinked or broken cable

Is handbrake cable OK?




NO

7

- Replace kinked or broken handbrake cable
  - Refer to Vol 3, chapter 12, para 12-4

YES

8

- Adjust handbrake assembly
  - Refer to Vol 3, chapter 12, para 12-6

TA 116203

Figure 46-11 (Sheet 3 of 3)

# CHAPTER 47

# BRAKE SYSTEM TROUBLESHOOTING SUMMARY

47-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 46, for the Brake System.

47-2. PROCEDURES. The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures in Part 1. Chapter 7 outlines a sample troubleshooting procedure. The summary procedures are based on the “what-to-do” portions of the detailed procedures and do not include the “How-to-do-it” instructions. Warnings, cautions, and notes are given where needed.

BRAKE SYSTEM TROUBLESHOOTING SUMMARY

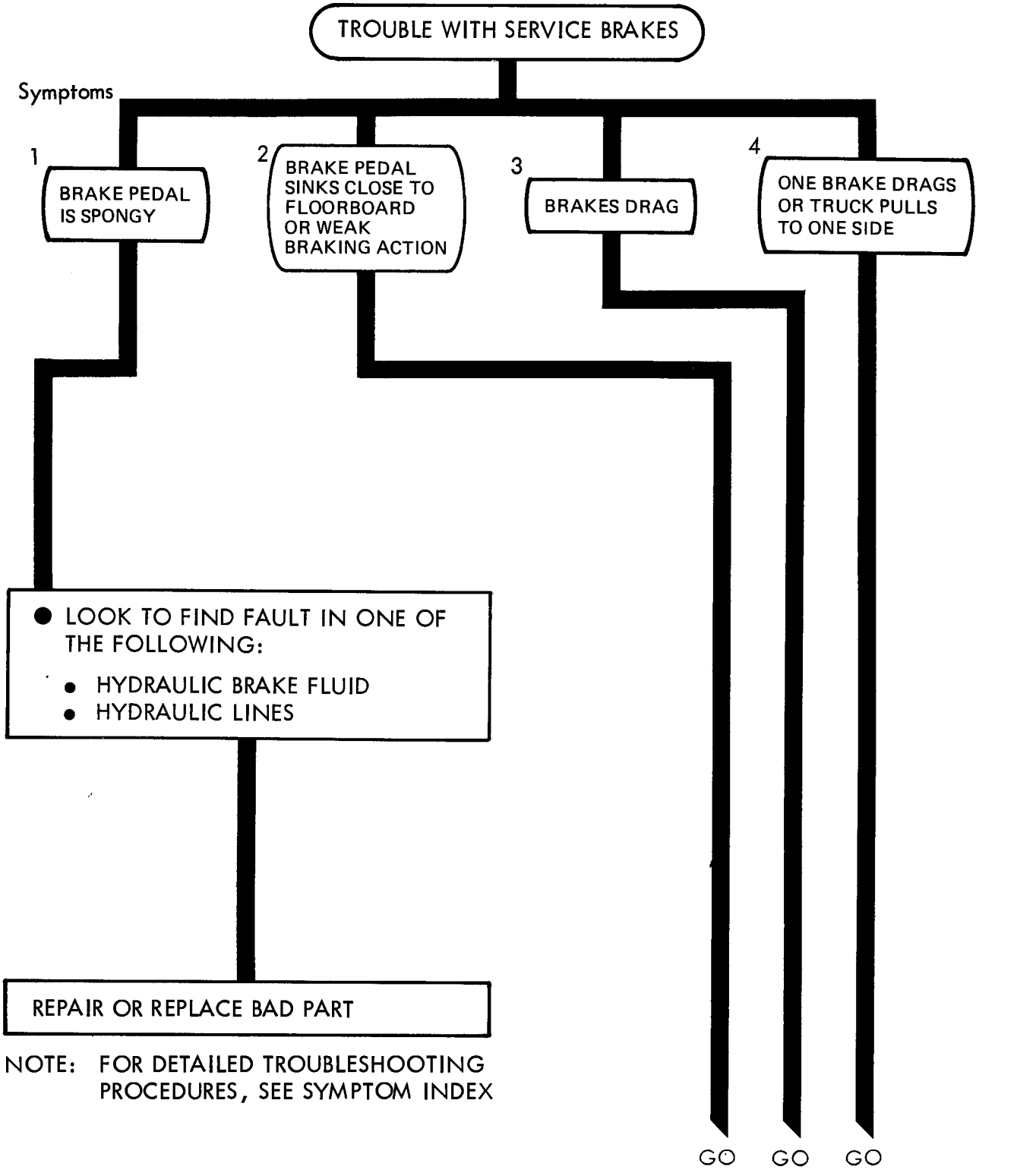
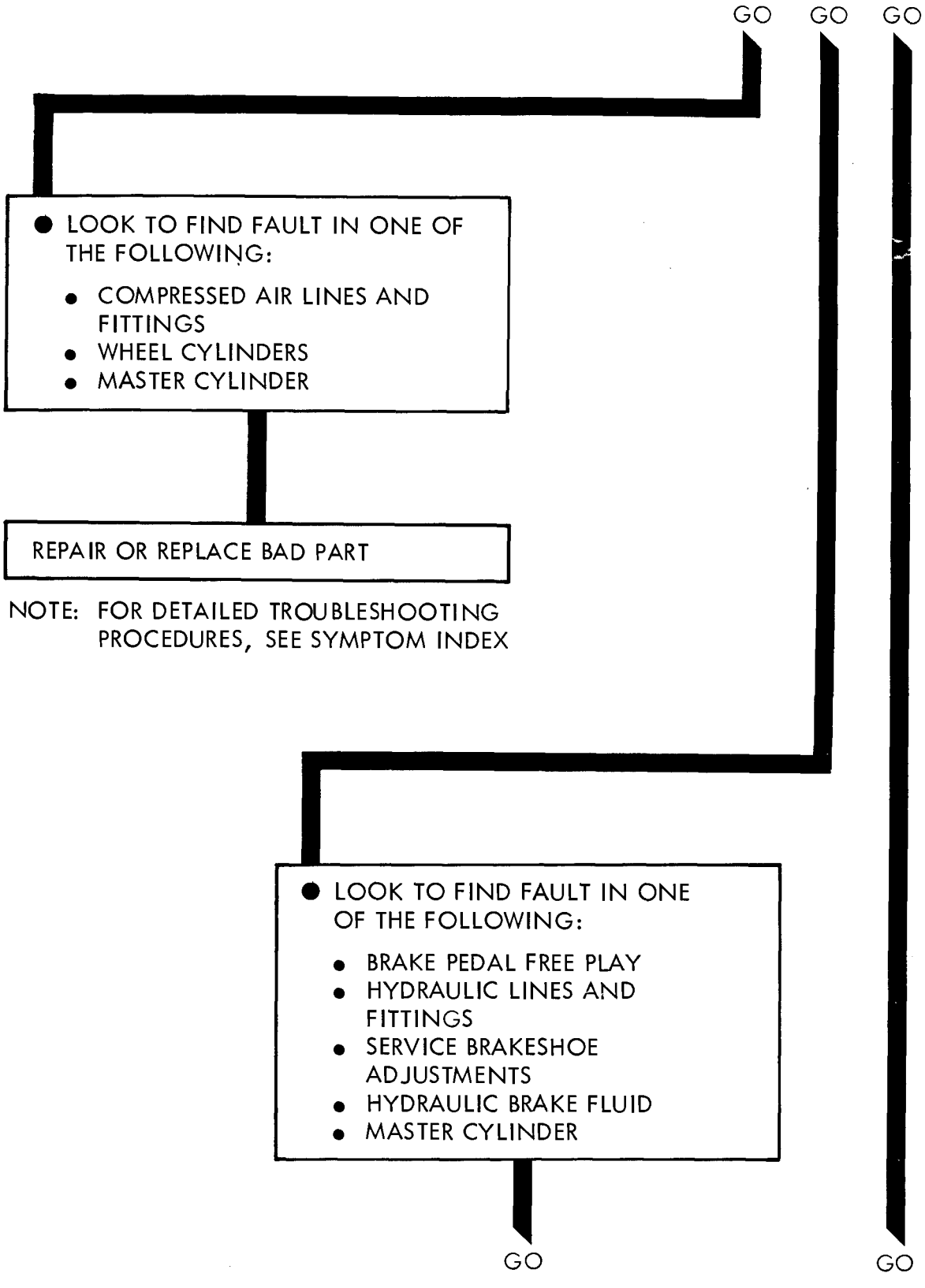
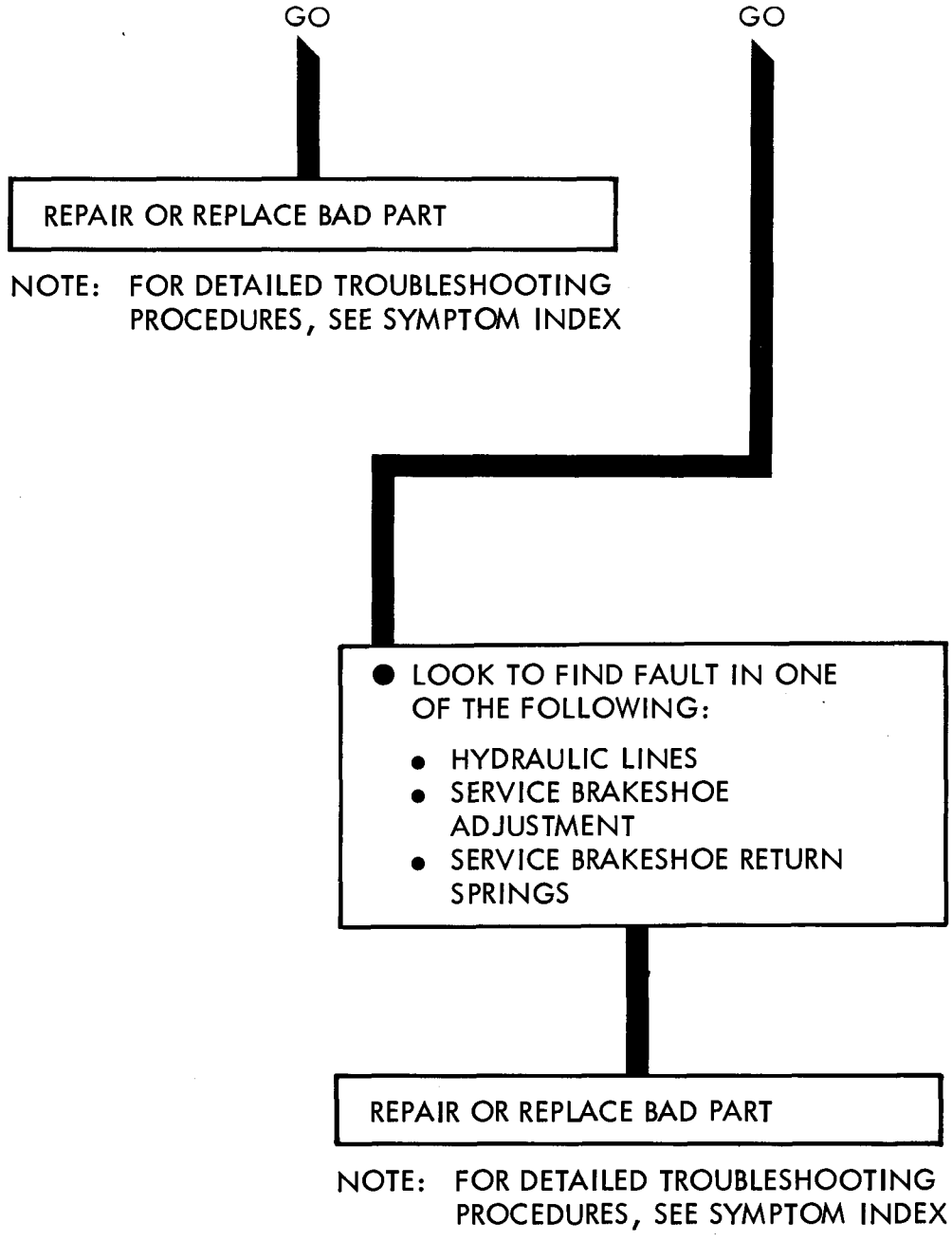



Figure 47-1 (Sheet 1 of 9)



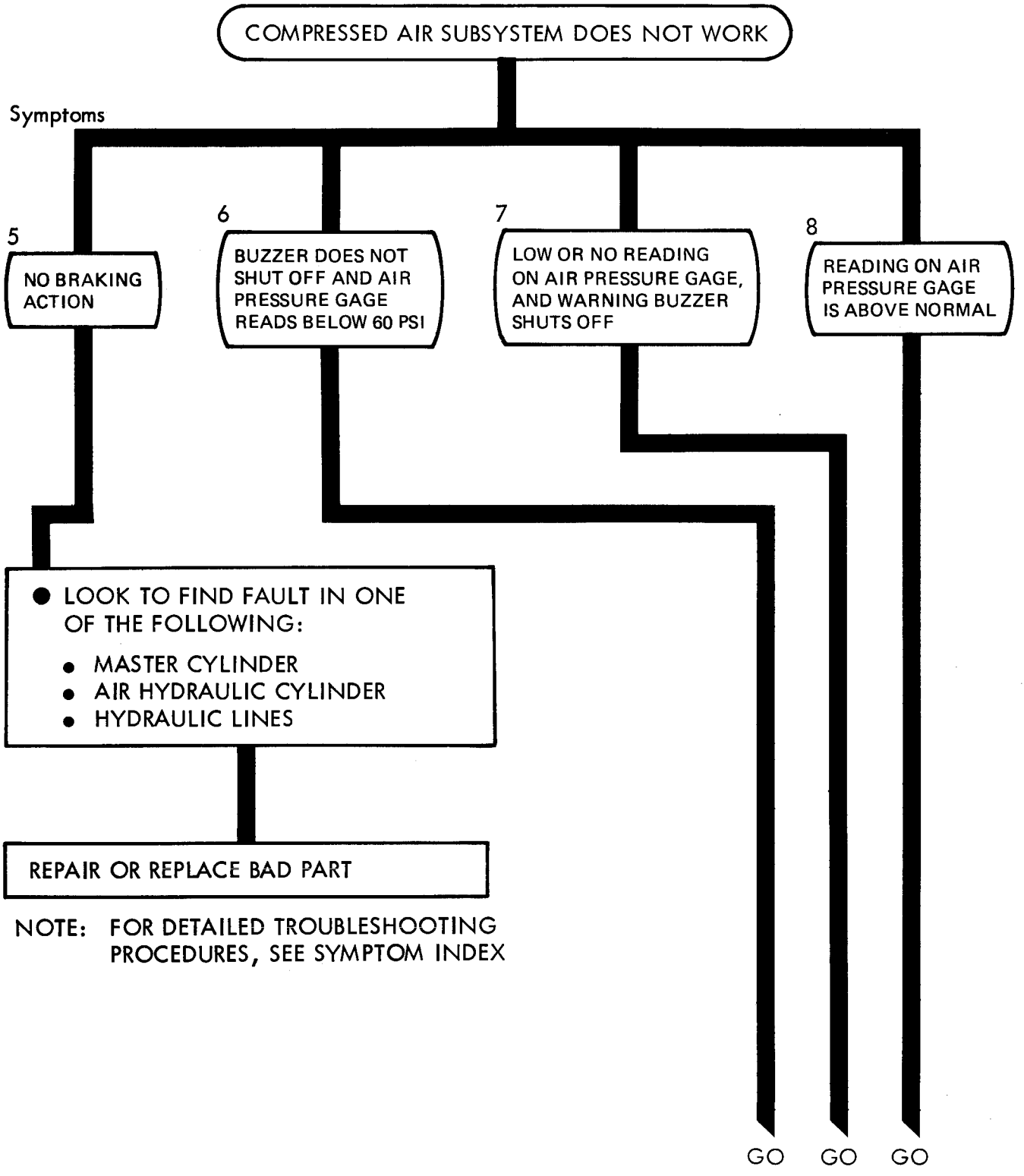

TA 116205

Figure 47-1 (Sheet 2 of 9)



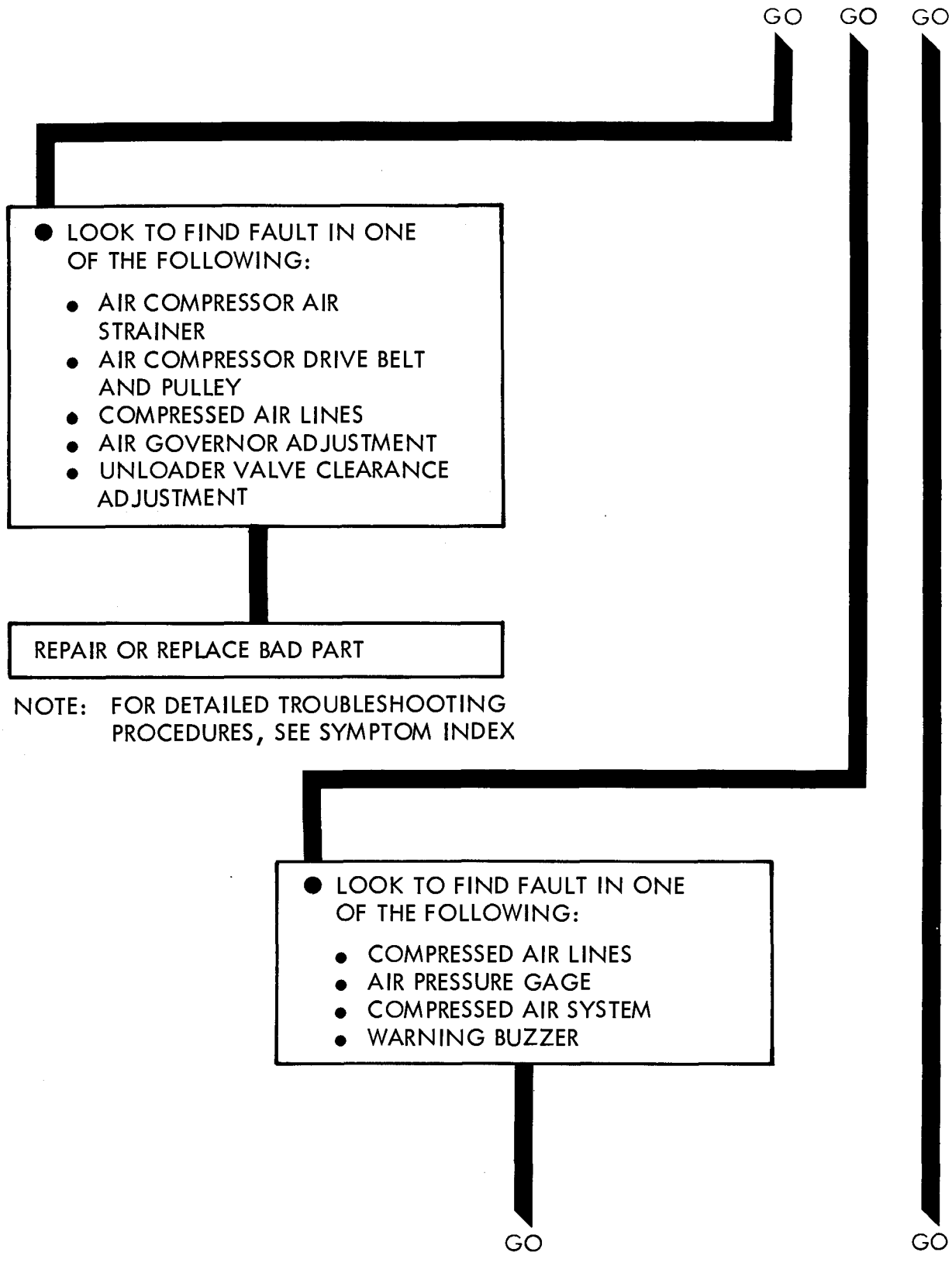

TA 116206

Figure 47-1 (Sheet 3 of 9)



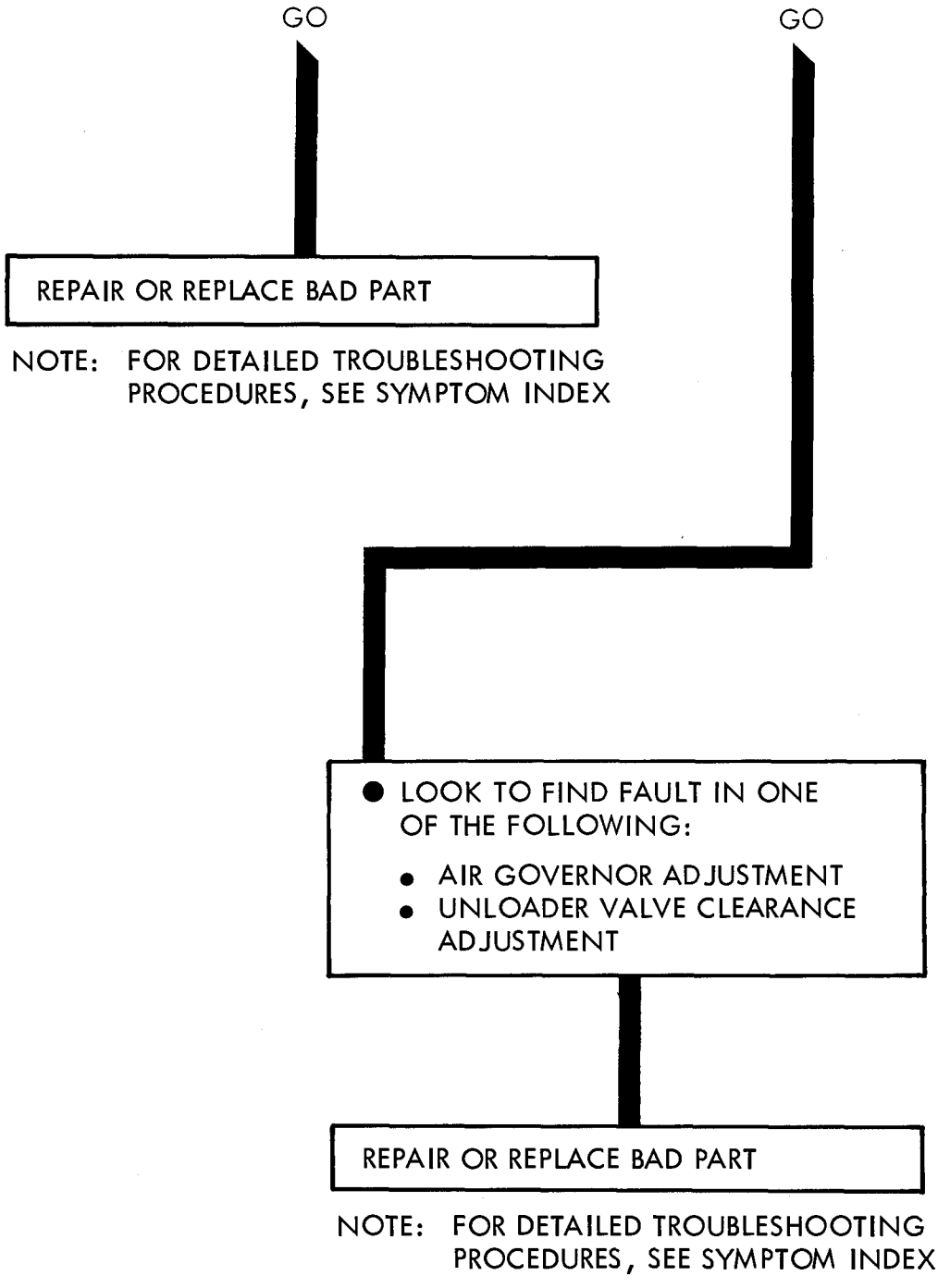

TA 116207

Figure 47-1 (Sheet 4 of 9)



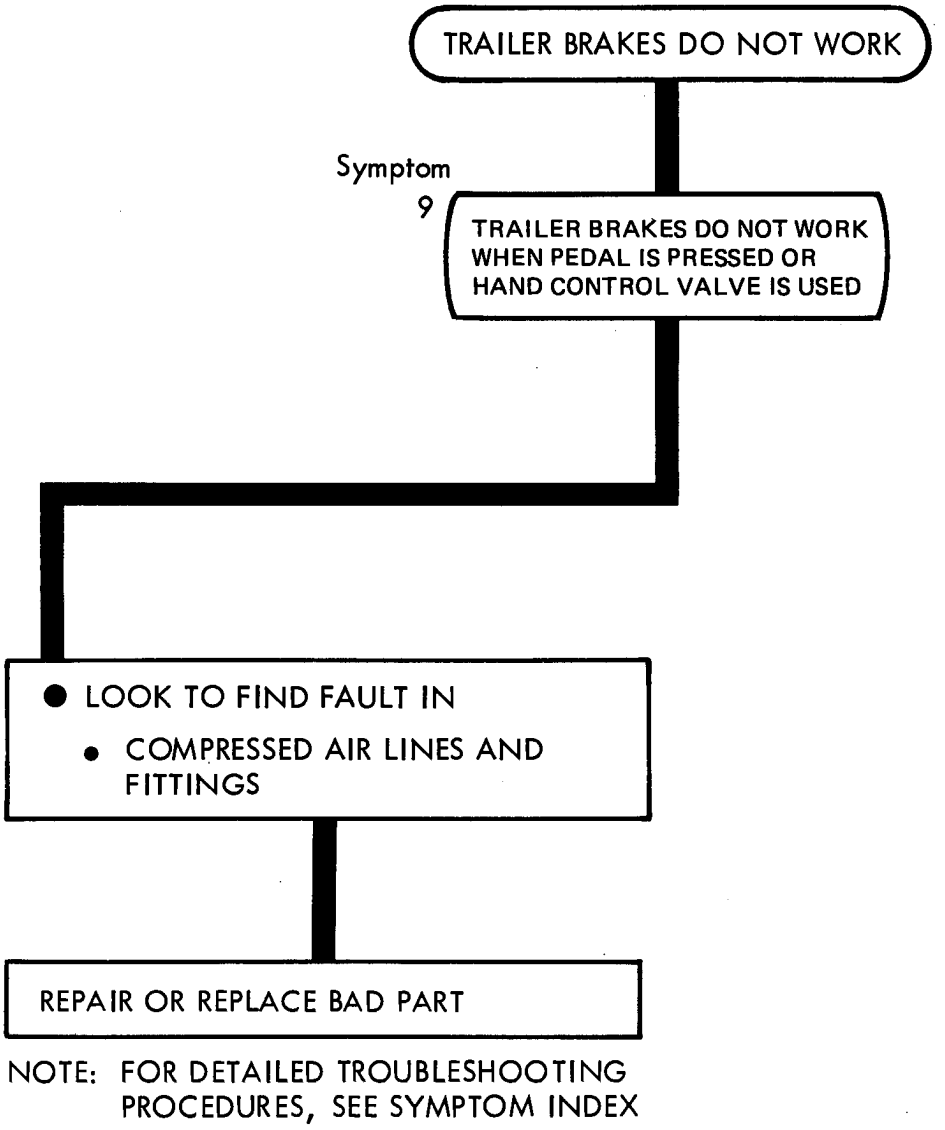

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Figure 47-1 (Sheet 5 of 9)



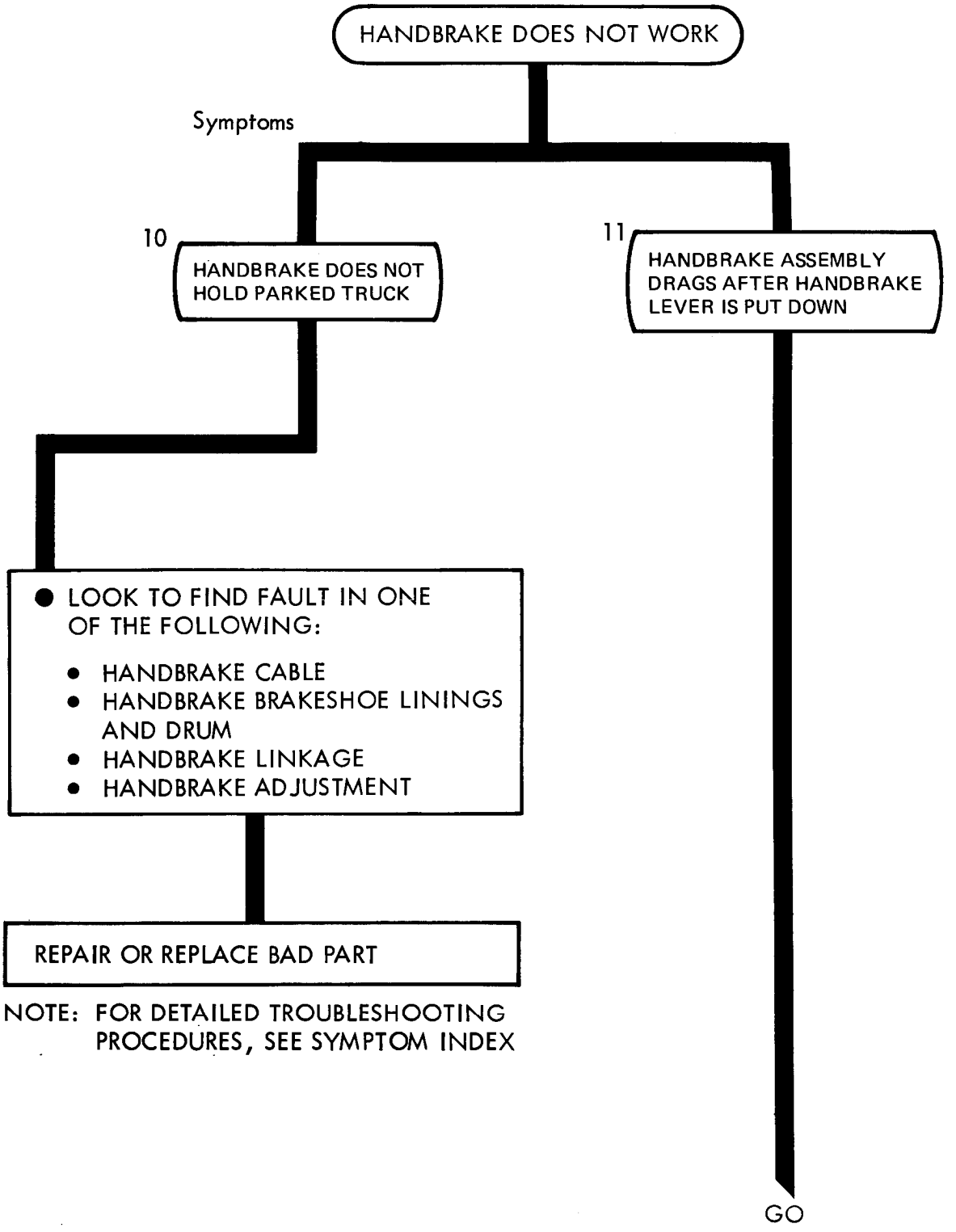

TA 116209

Figure 47-1 (Sheet 6 of 9)



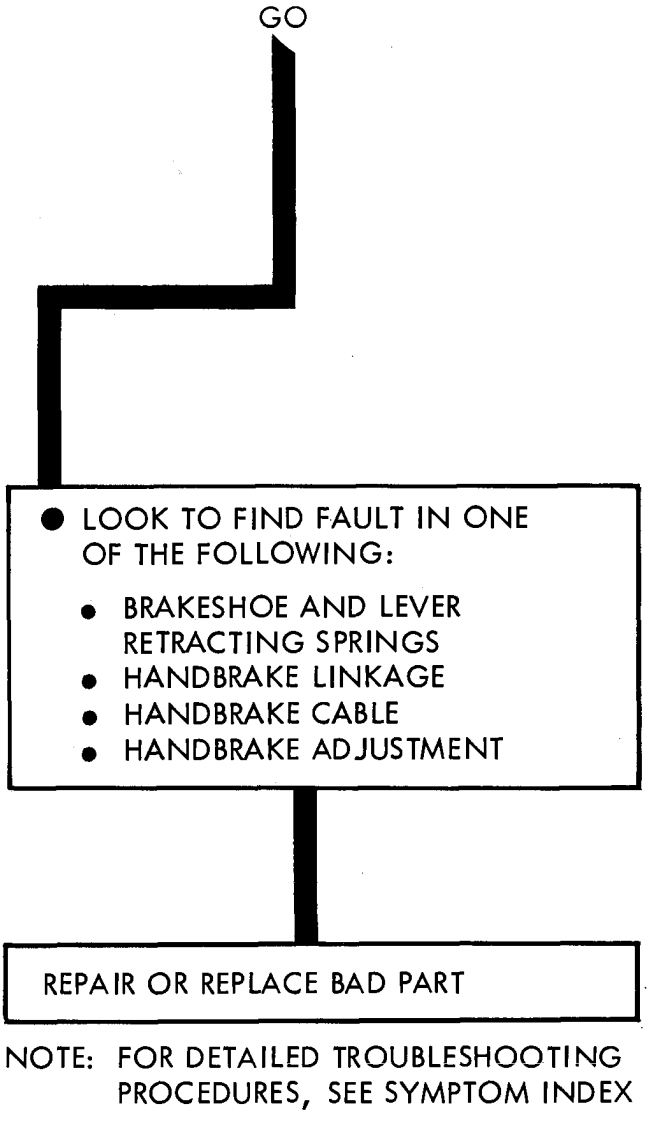

TA 116210

Figure 47-1 (Sheet 7 of 9)




TA 116211

Figure 47-1 (Sheet 8 of 9)




TA 116212

Figure 47-1 (Sheet 9 of 9)

# CHAPTER 48

# BRAKE SYSTEM SUPPORT DIAGRAMS

48-1. GENERAL. This chapter gives the diagrams you need when doing trouble-shooting procedures in chapter 46. Table 3-1 is a complete listing of all support diagrams used in this manual.

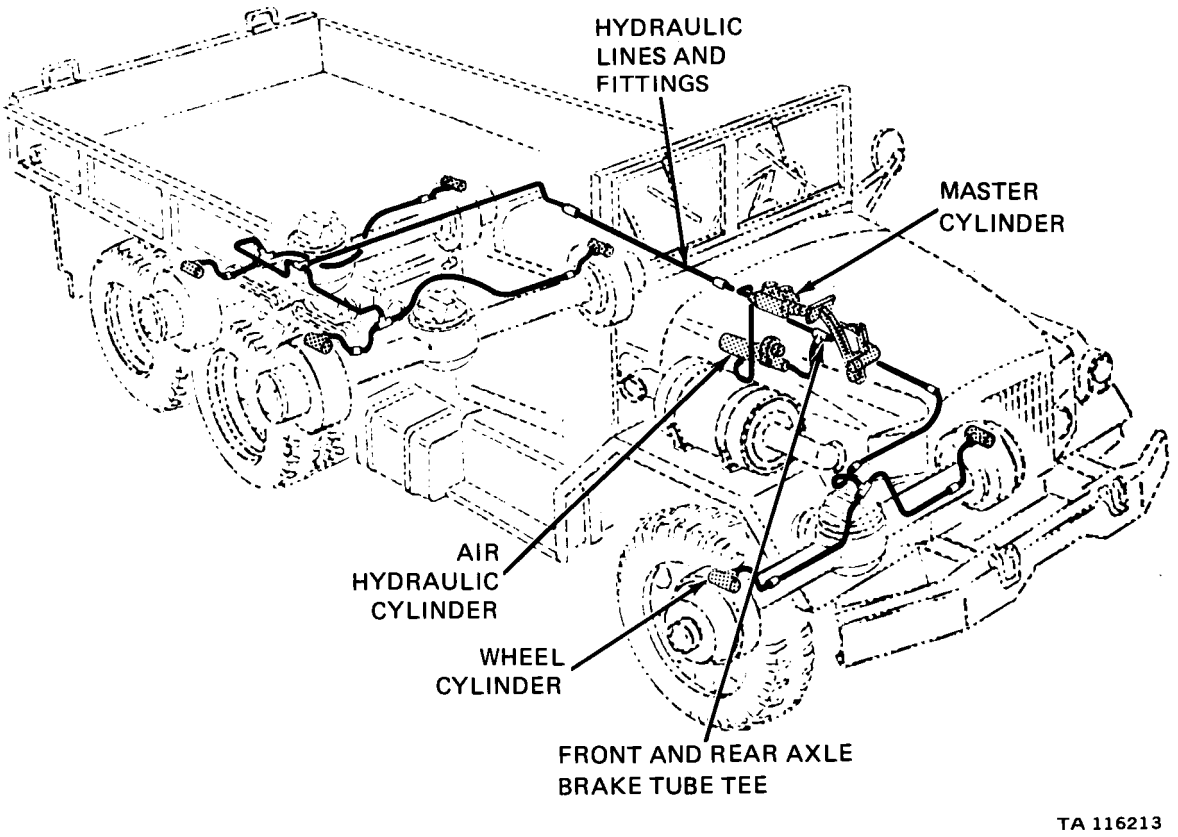



Figure 48-1. Brake Hydraulic Lines

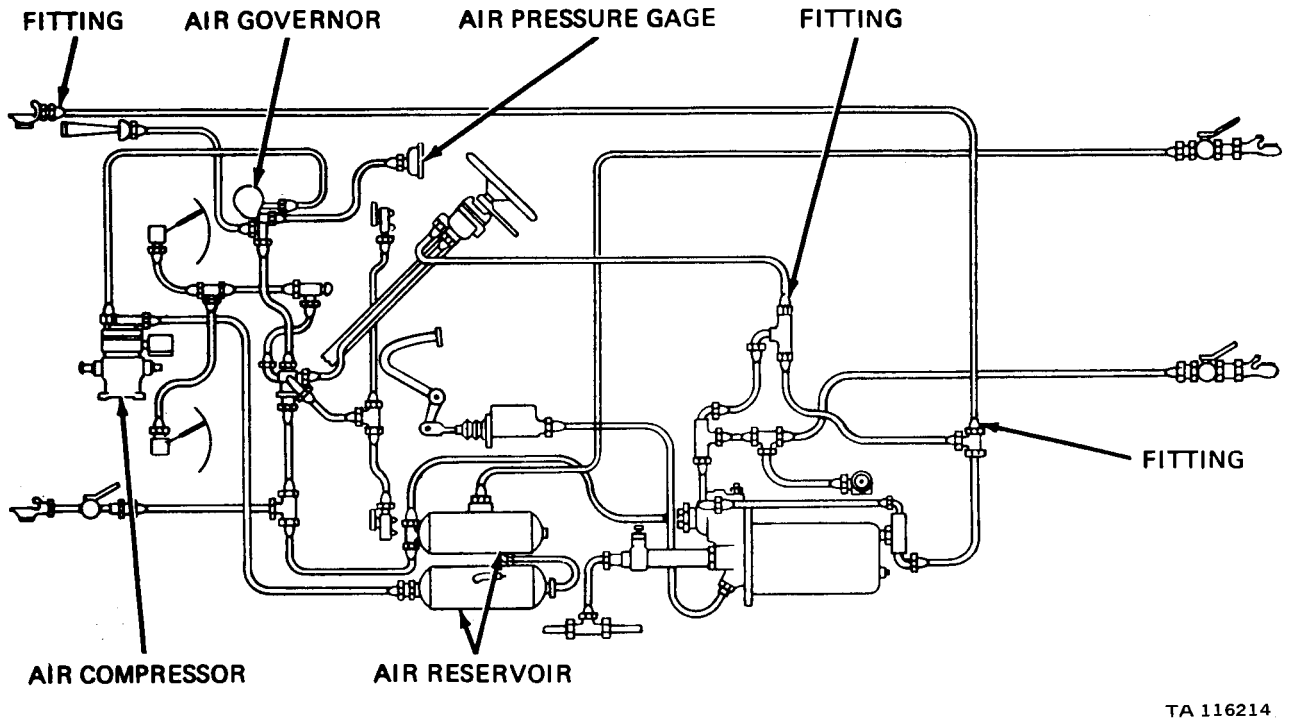



Figure 48-2. Compressed Air System

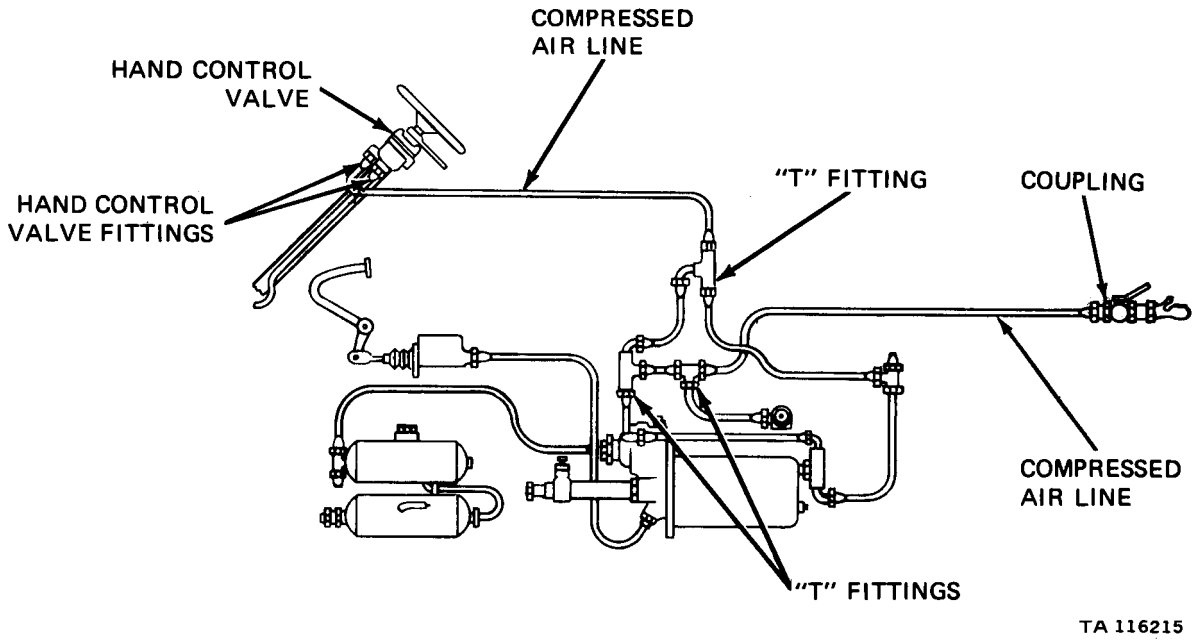



Figure 48-3. Compressor Air System (Trailer Brakes)

# CHAPTER 49

# BRAKE SYSTEM TEST PROCEDURES

49-1. GENERAL. This chapter gives test procedures for the tests given in chapter 46, for the Brake System.

49-2. TEST SET-UP. Instructions for setup of test equipment and parts to be tested are given before the test procedures. Illustrations are used, when needed, to show you how to hook up the test equipment to the part to be tested.

49-3. TEST PROCEDURE. Detailed step-by-step instructions, in flow chart form, are given for each test. The procedure calls out the type of test and the condition of the truck system for each part of testing. The step-by-step test will lead you to the bad component or to a fault symptom within a related system. Reference is made to the fault symptom index, chapter 6, if the test shows a fault in another system.

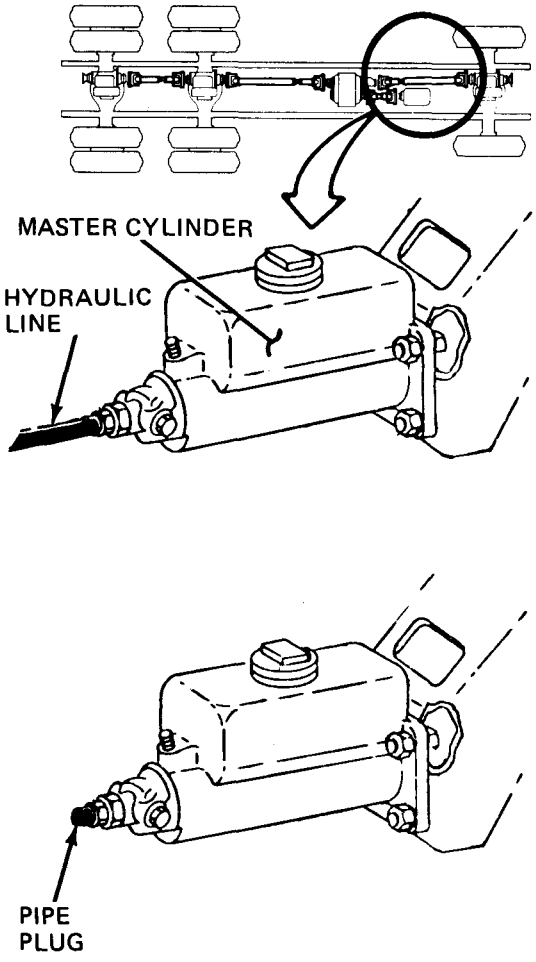
## MASTER CYLINDER LEAKAGE TEST

- Check for leakage in master cylinder

  NOTE: Two soldiers will be needed to do this test. Soldier A will check the master cylinder and soldier B will sit in the cab and work the brake pedal

  SOLDIER A:
  - Using a 1/2-inch wrench, unscrew and take off hydraulic line from master cylinder
  - screw in a 1/2-inch pipe plug and tighten using pipe plug wrench

  SOLDIER B:
  - Press down hard on brake pedal and feel if brake pedal slowly sinks to floorboard. If brake pedal does not sink close to floorboard, master cylinder is good




TA 116216

Figure 49-1

# CHAPTER 50

# BRAKE SYSTEM CHECKOUT PROCEDURES

50-1. GENERAL. This chapter gives procedures for checking out the system after troubleshooting and repair have been done. Procedures are set up in flow chart form showing the checkout steps in order and referring to the fault symptom index when the system does not check out.

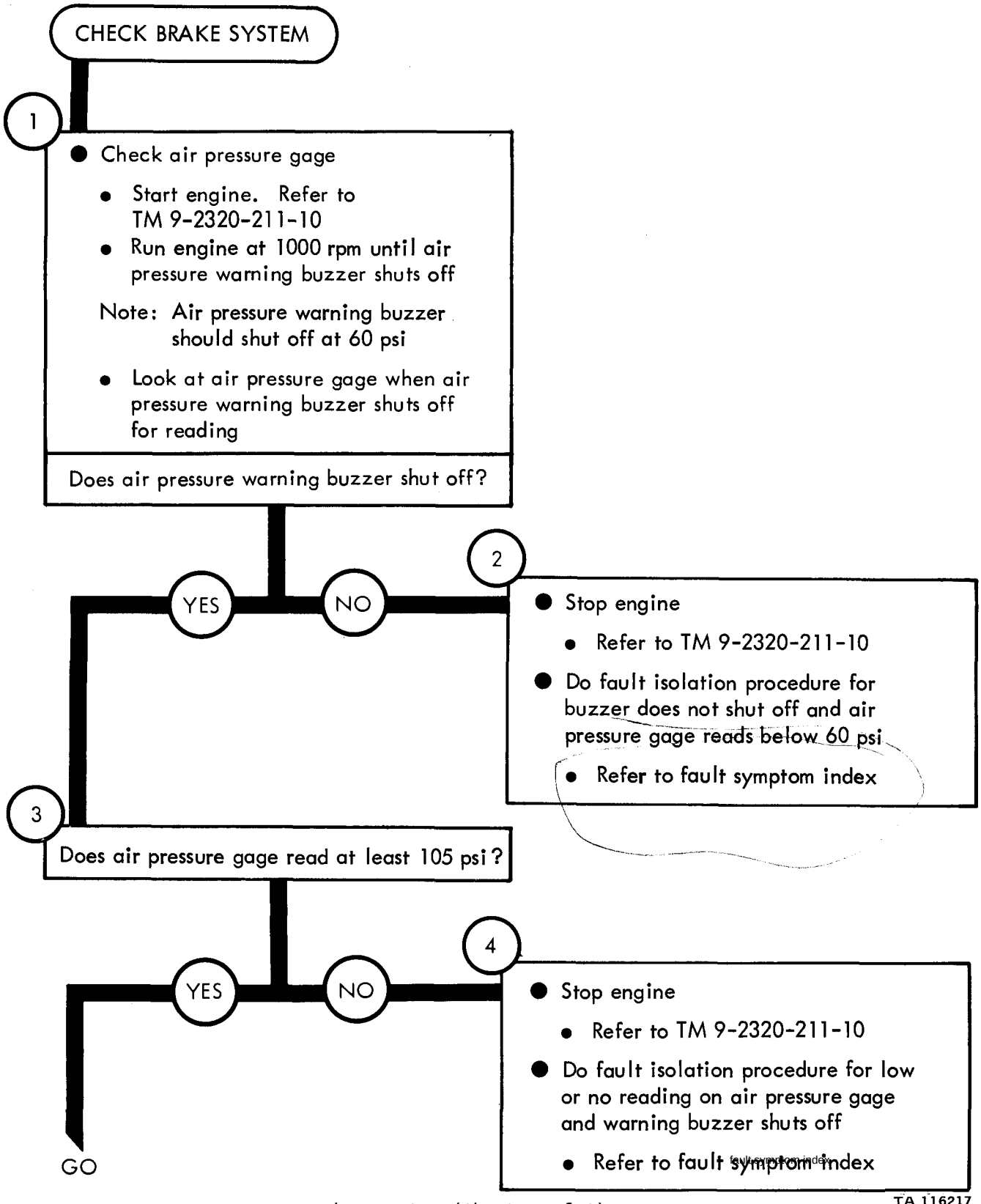
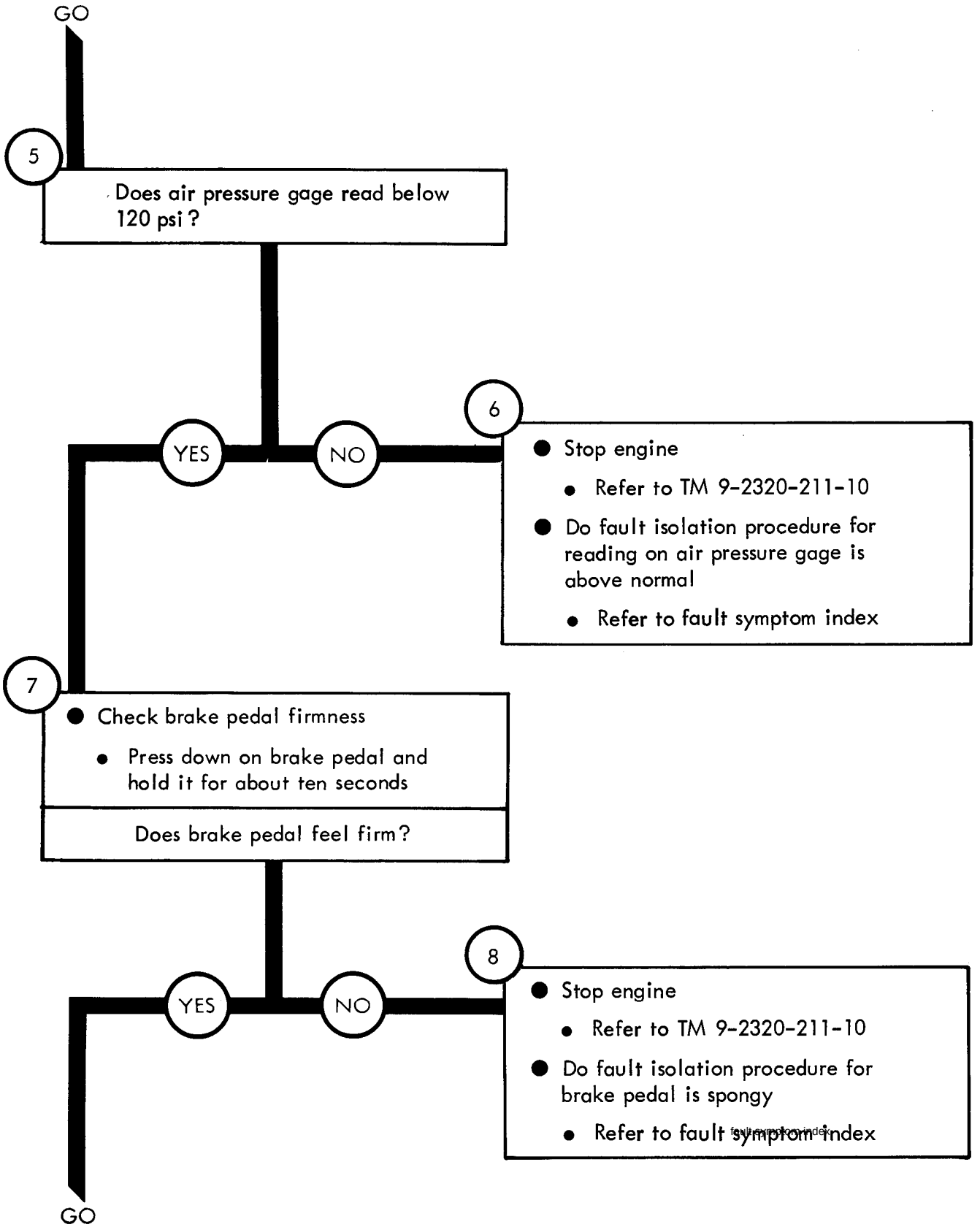



Figure 50-1 (Sheet 1 of 9)




TA 116218

Figure 50-1 (Sheet 2 of 9)

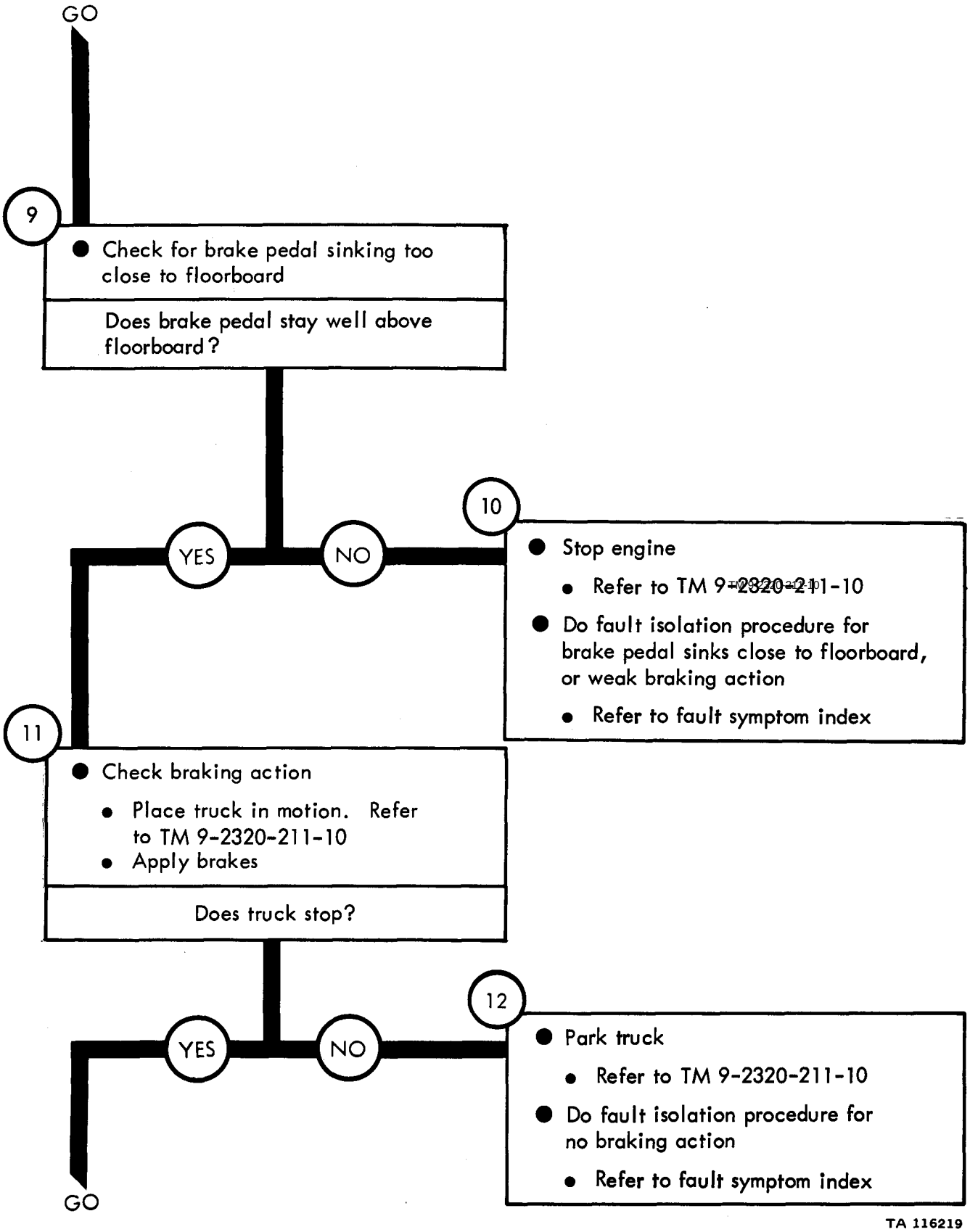
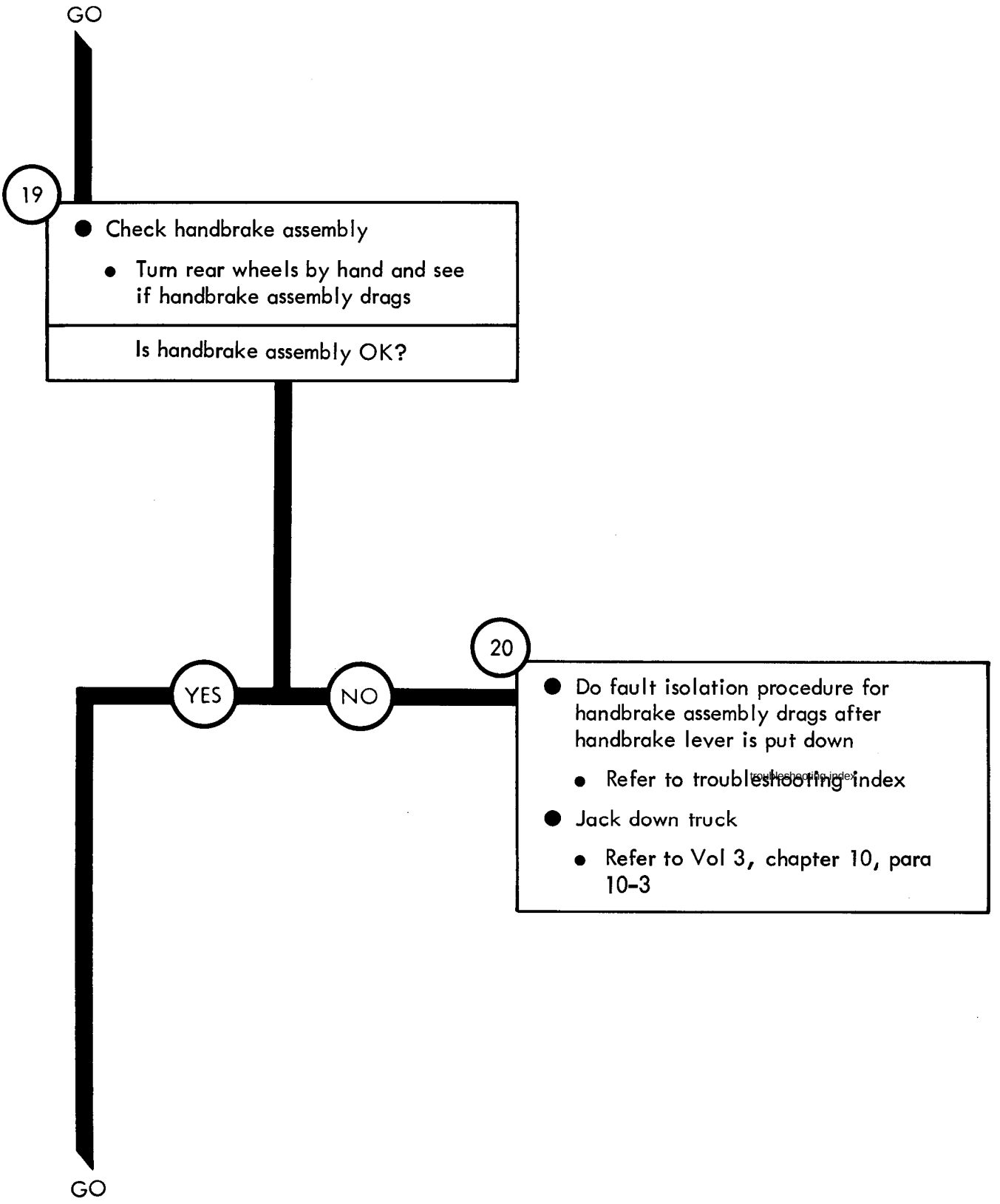
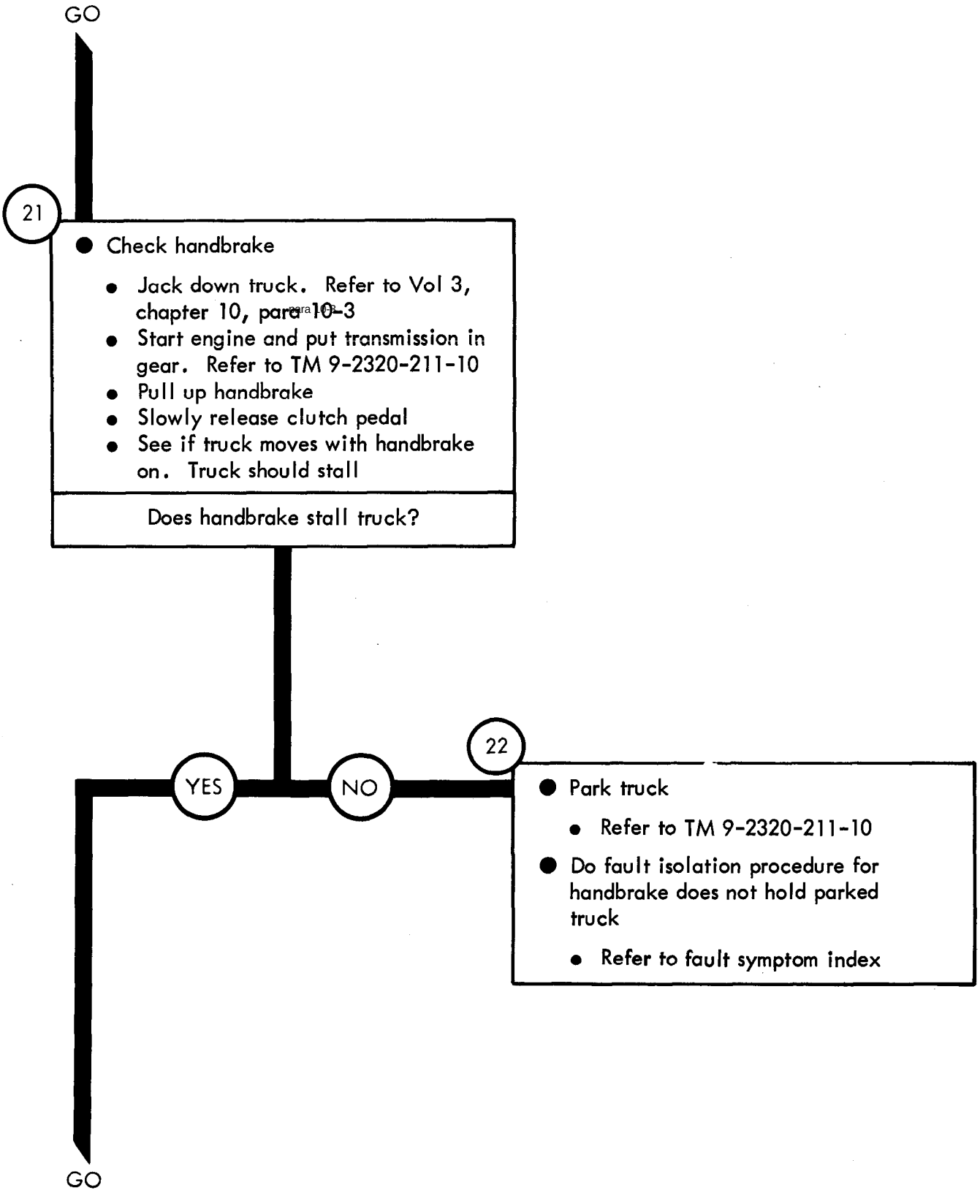



Figure 50-1 (Sheet 3 of 9)



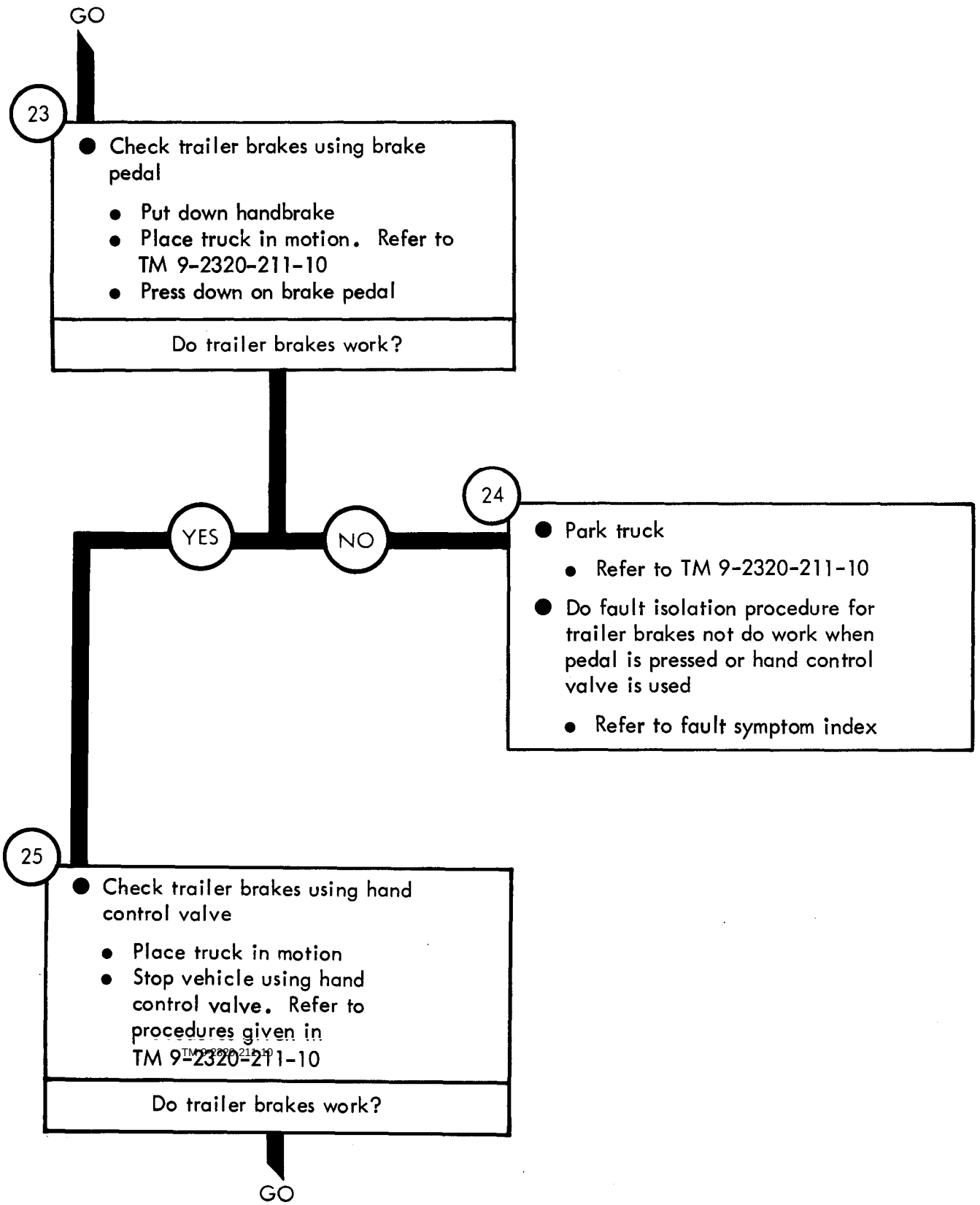

TA 116221

Figure 50-1 (Sheet 6 of 9)



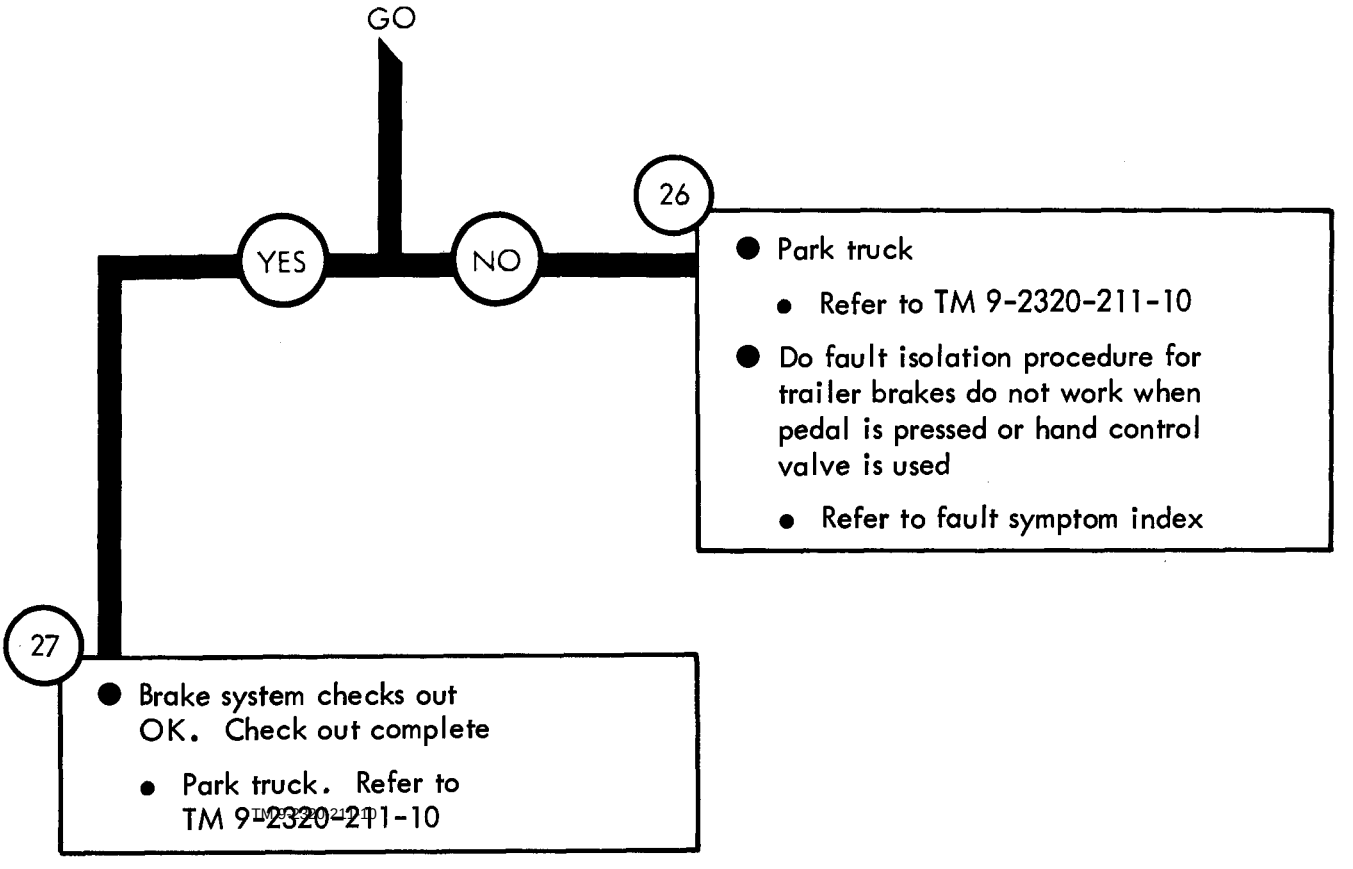

TA 116222

Figure 50-1 (Sheet 7 of 9)




TA 116223

Figure 50-1 (Sheet 8 of 9)




TA 116224

Figure 50-1 (Sheet 9 of 9)

# CHAPTER 51

# WHEEL SYSTEM TROUBLESHOOTING

51-1. EQUIPMENT ITEMS COVERED. This chapter gives equipment troubleshooting procedures for the wheel system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

51-2. EQUIPMENT ITEMS NOT COVERED. All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

WHEEL SYSTEM TROUBLESHOOTING

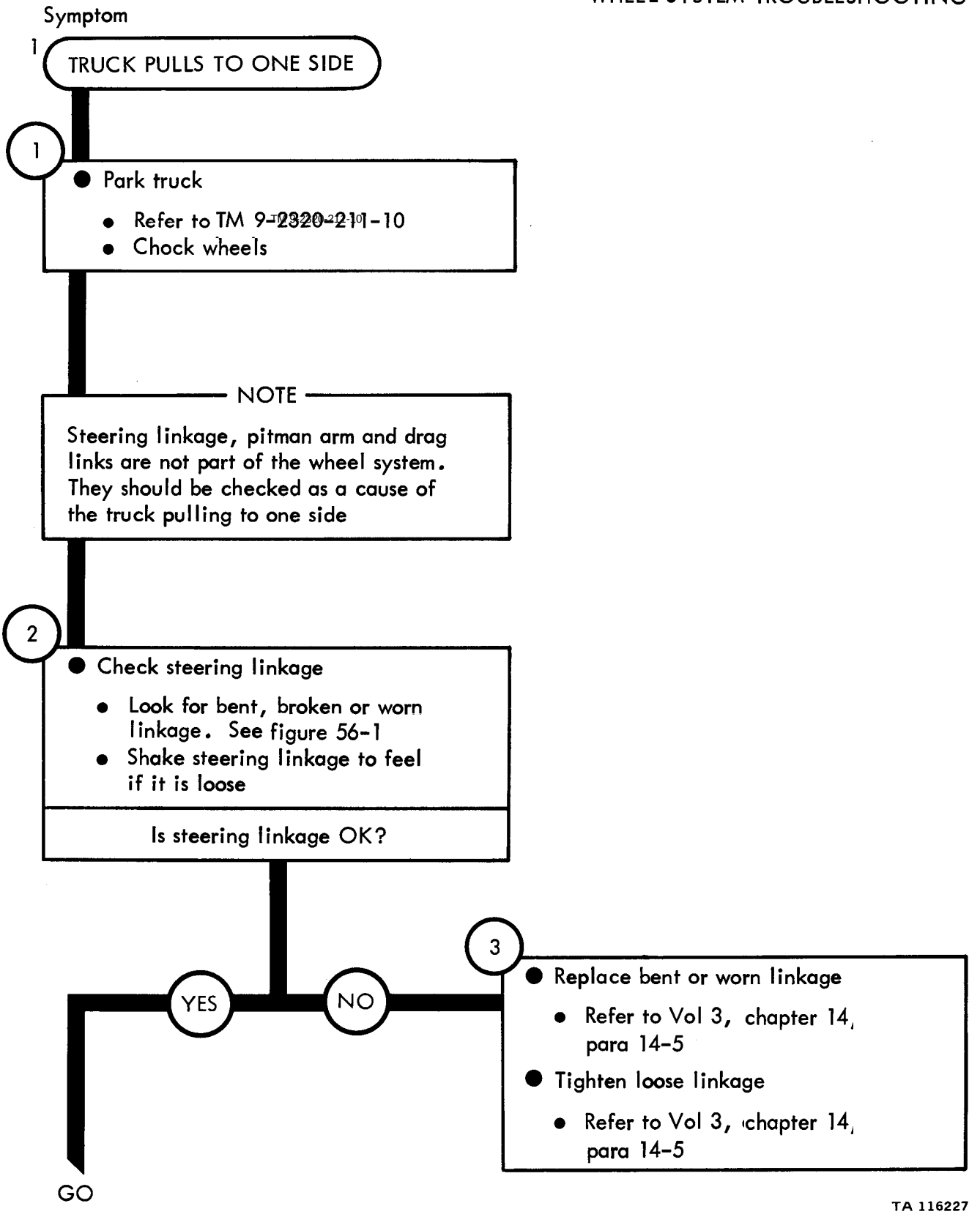
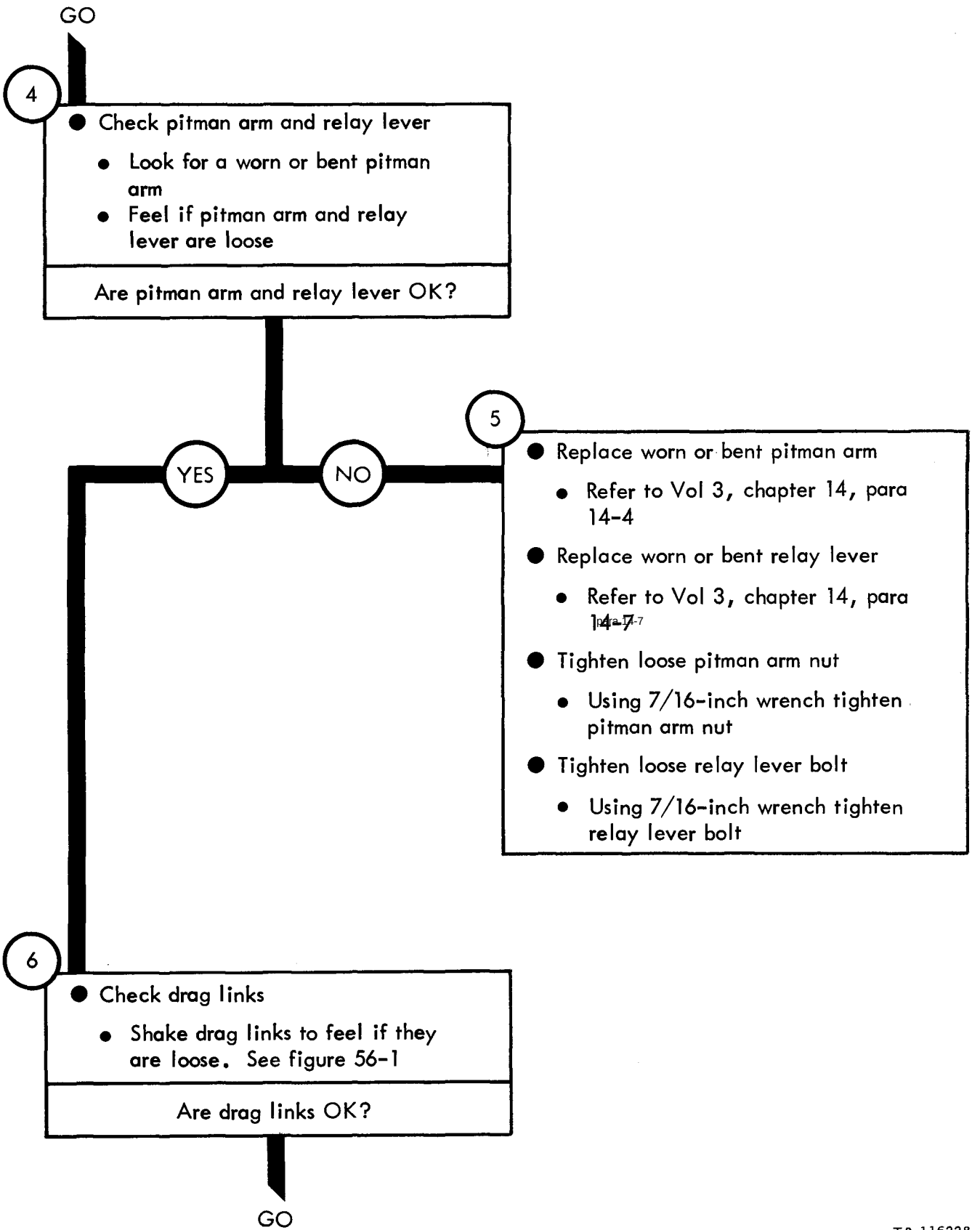



Figure 51-1 (Sheet 1 of 4)




TA 116228

Figure 51-1 (Sheet 2 of 4)

GO

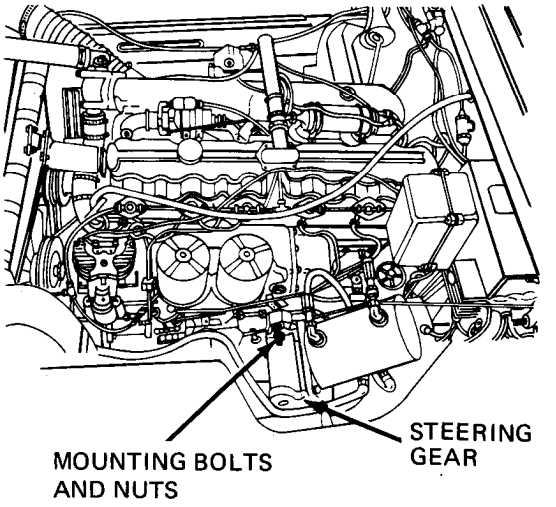
YES

NO

7

- Adjust loose drag links
  - Refer to Vol 3, chapter 14, para 14-6

Note: If drag links cannot be adjusted they should be replaced. Refer to Vol 3, chapter 14, para 14-6




8

- Check steering gear
  - Shake steering gear to feel if it is loose
  - Using 7/16-inch wrench feel for loose mounting nuts and bolts

Is steering gear OK?

YES

NO

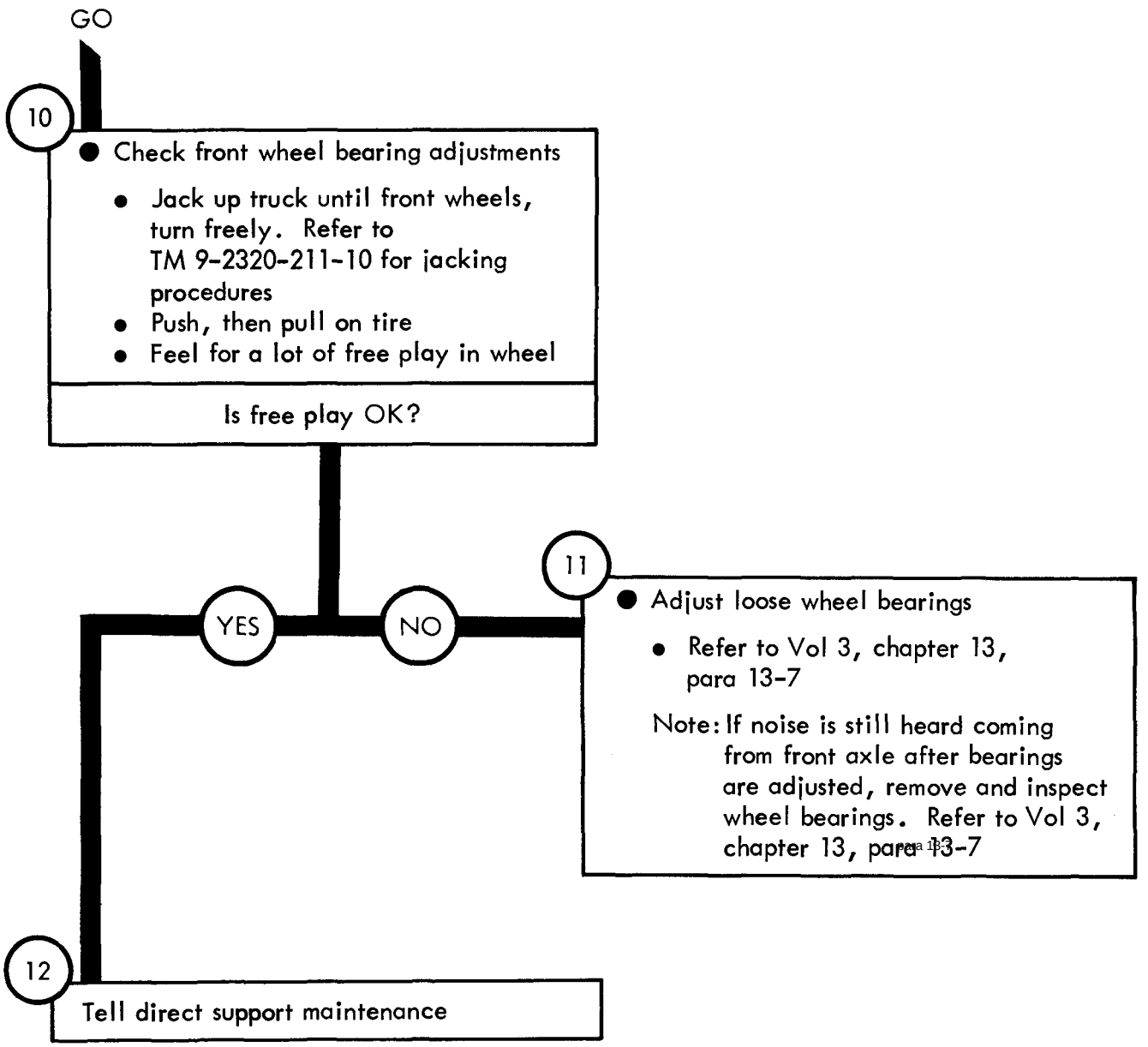
9

- Tighten loose steering mounting bolts and nuts
  - Using a 7/16-inch wrench, hold mounting bolt and tighten mounting nut to 85 pound-feet using a 150 pound-feet torque wrench

GO

TA 116229

Figure 51-1 (Sheet 3 of 4)




TA 116230

Figure 51-1 (Sheet 4 of 4)

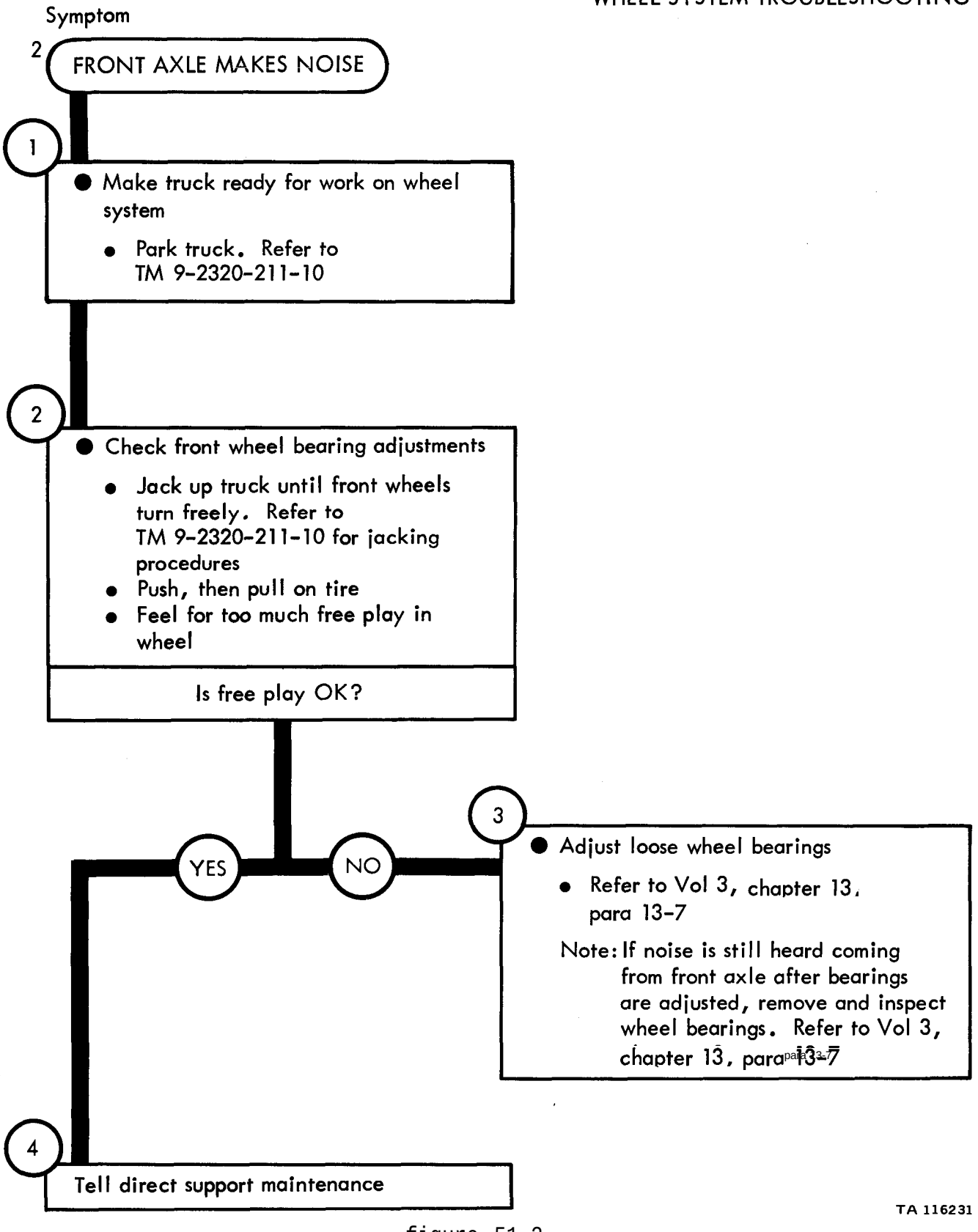

Symptom
2
FRONT AXLE MAKES NOISE
1
● Make truck ready for work on wheel system
• Park truck. Refer to TM 9-2320-211-10
2
● Check front wheel bearing adjustments
• Jack up truck until front wheels turn freely. Refer to TM 9-2320-211-10 for jacking procedures
• Push, then pull on tire
• Feel for too much free play in wheel
Is free play OK?
YES
NO
3
● Adjust loose wheel bearings
• Refer to Vol 3, chapter 13, para 13-7
Note: If noise is still heard coming from front axle after bearings are adjusted, remove and inspect wheel bearings. Refer to Vol 3, chapter 13, para 13-7
4
Tell direct support maintenance
TA 116231

figure 51-2

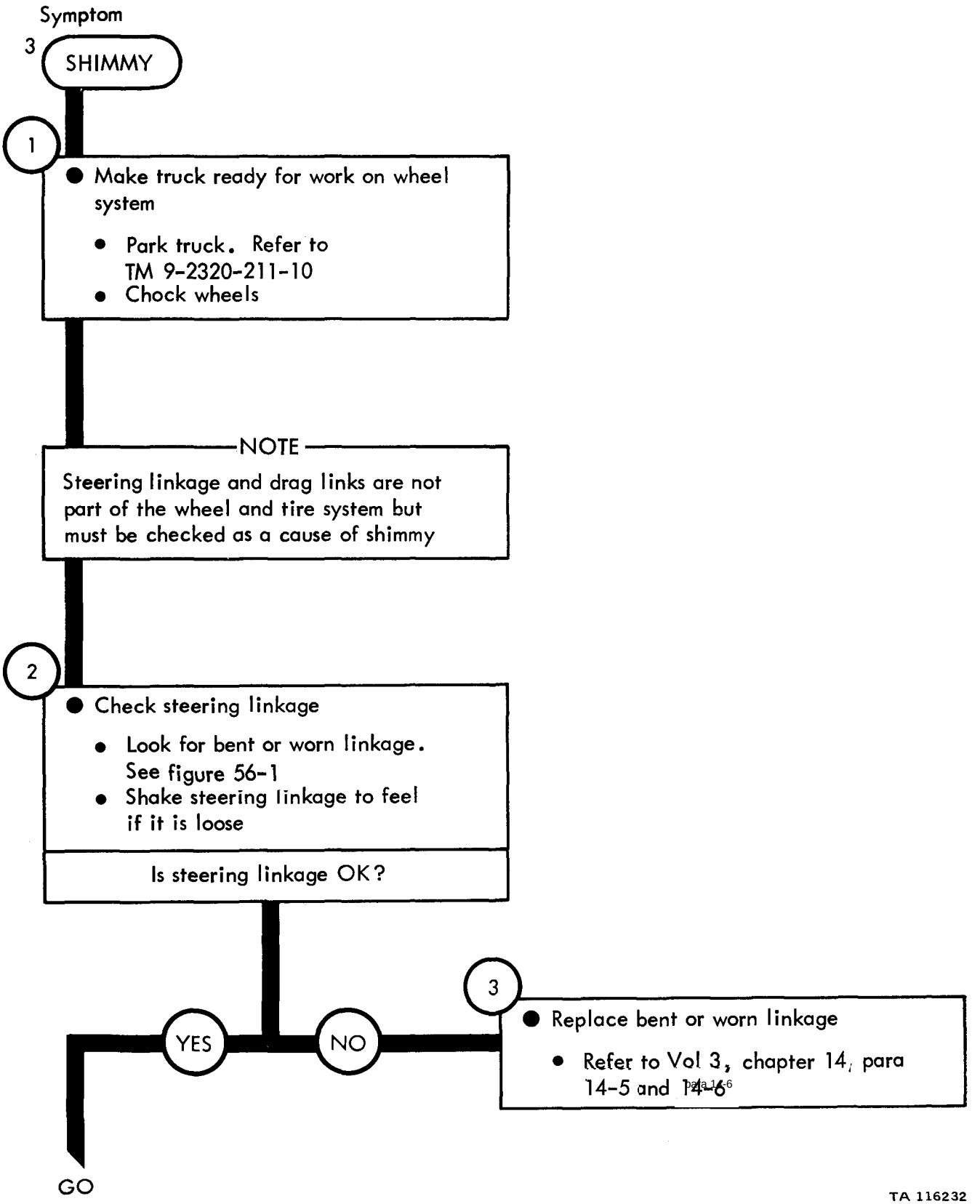



Figure 51-3 (Sheet 1 of 4)

GO

4

- Check drag links
  - Shake drag links to feel if they are loose. See figure 56-1

Are drag links OK?

YES — NO

5

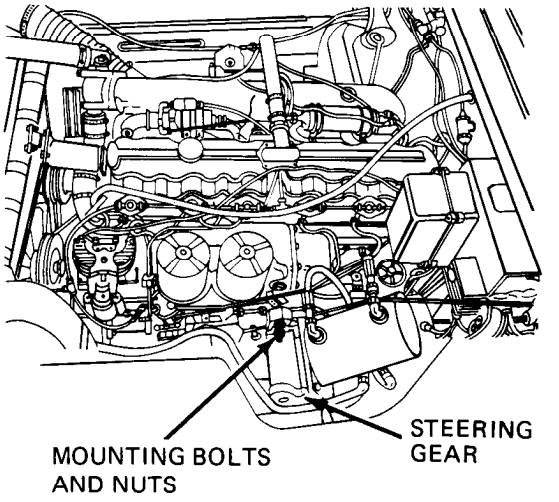
- Adjust loose drag links
  - Refer to Vol 3, chapter 14, para 14-6

Note: If drag links cannot be adjusted they should be replaced. Refer to Vol 3, chapter 14, para 14-6

6

- Check steering gear
  - Shake steering gear to feel if it is loose
  - Using 7/16-inch wrench, feel for loose mounting bolts and nuts

Is steering OK?




YES — NO

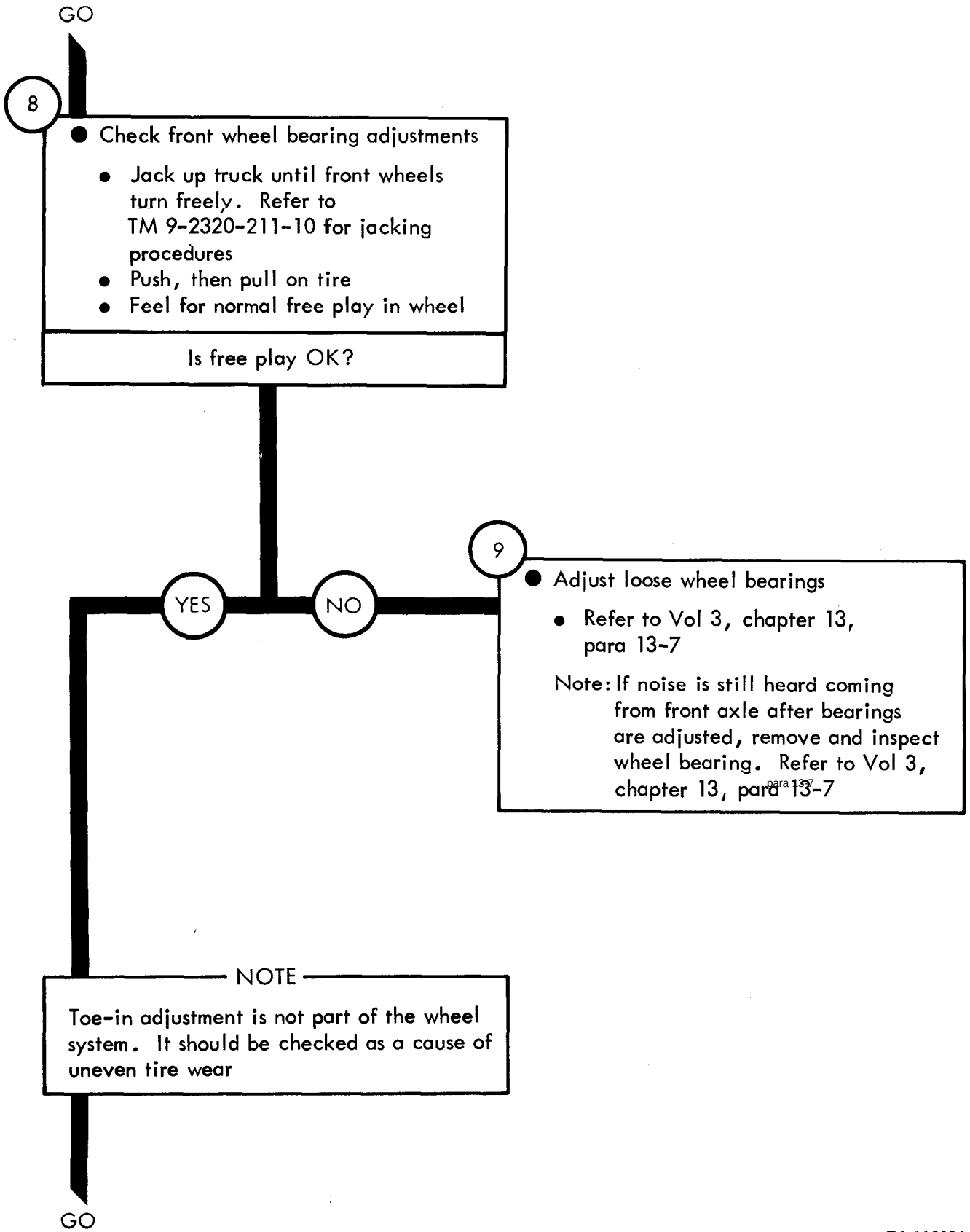
7

- Tighten loose steering gear mounting bolts and nuts
  - Using a 7/16-inch wrench, hold mounting bolt and tighten mounting nut to 85 pound-feet using a 150 pound-feet torque wrench

GO

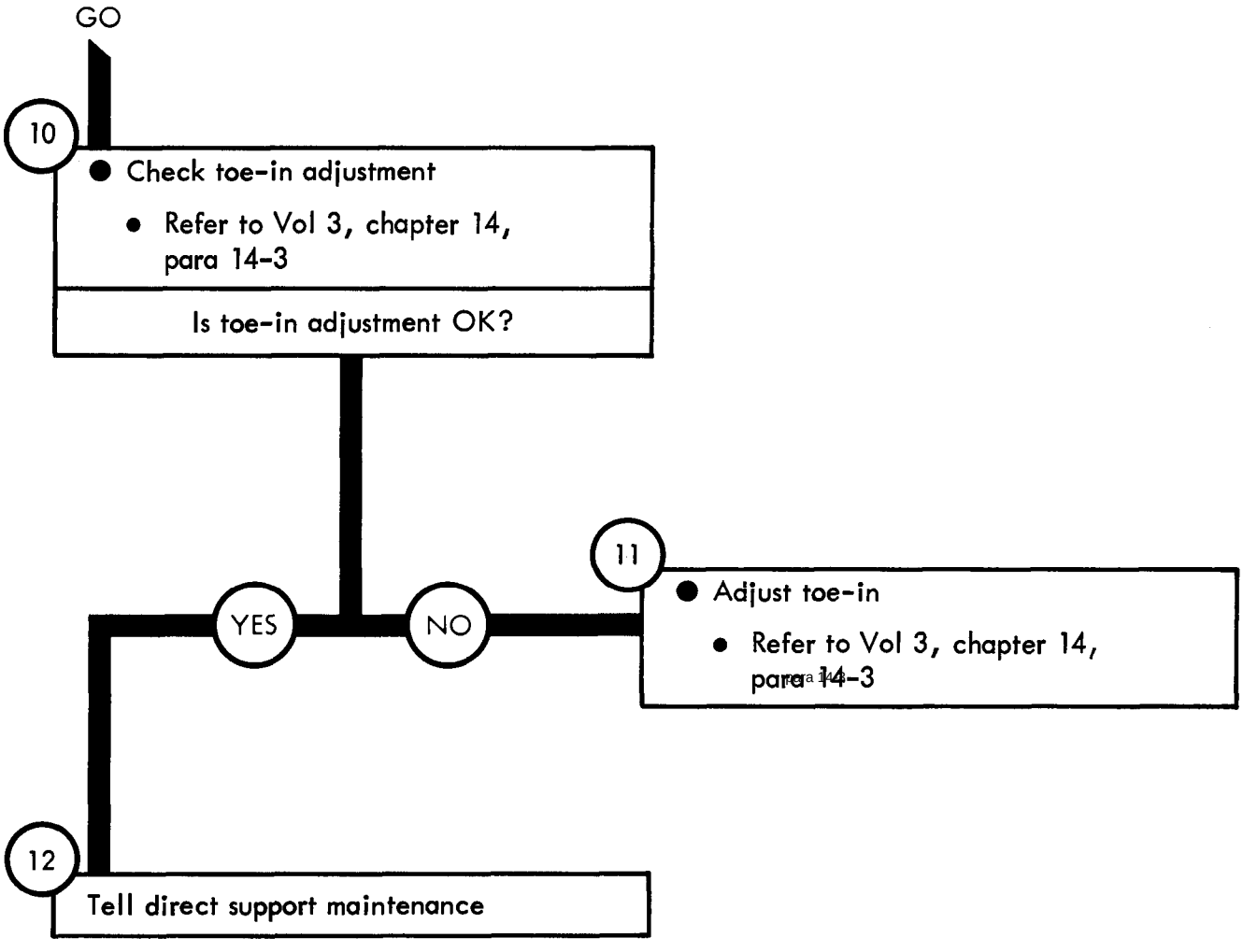
TA 116233

Figure 51-3 (Sheet 2 of 4)




TA 116234

Figure 51-3 (Sheet 3 of 4)




TA 116235

Figure 51-3 (Sheet 4 of 4)

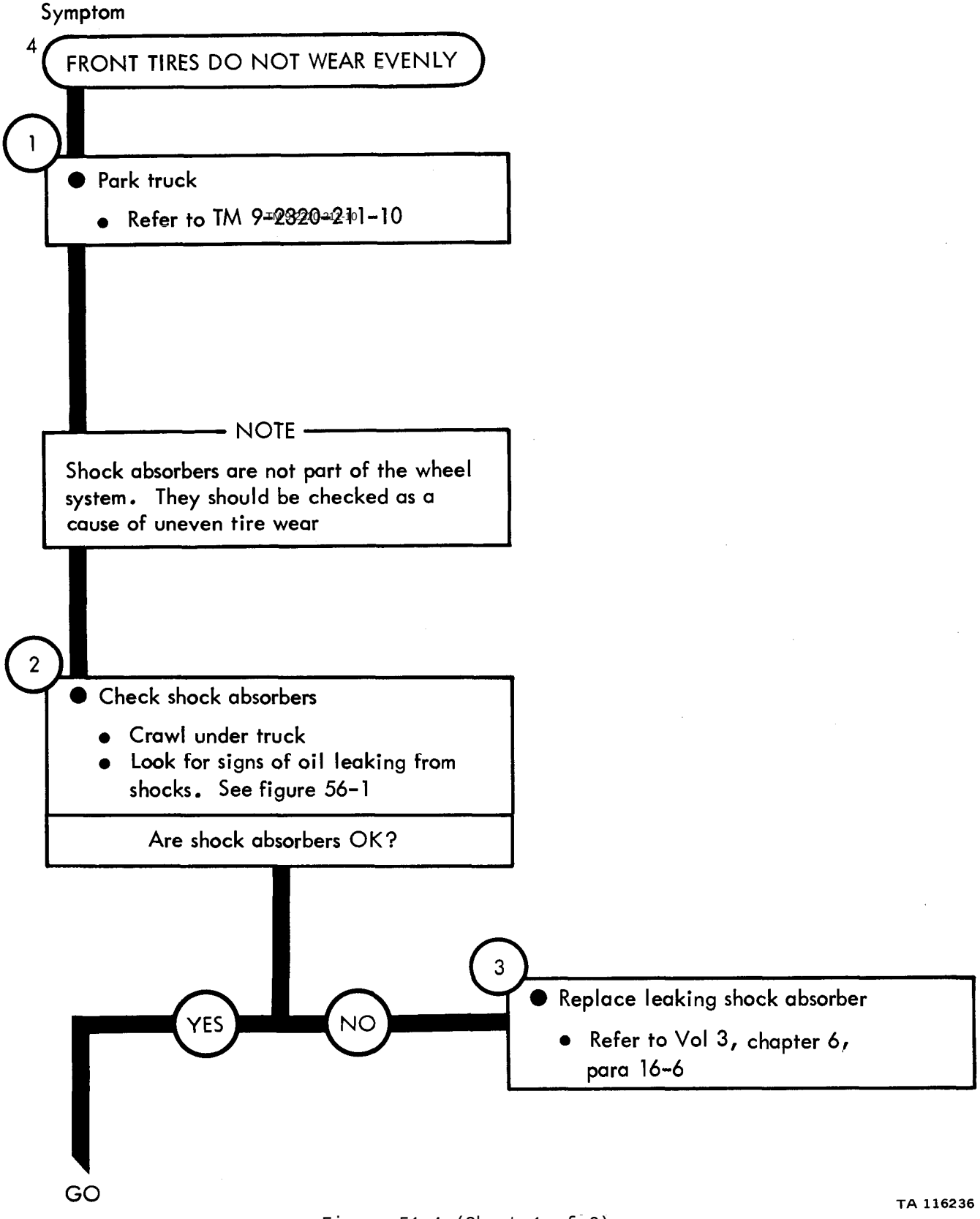
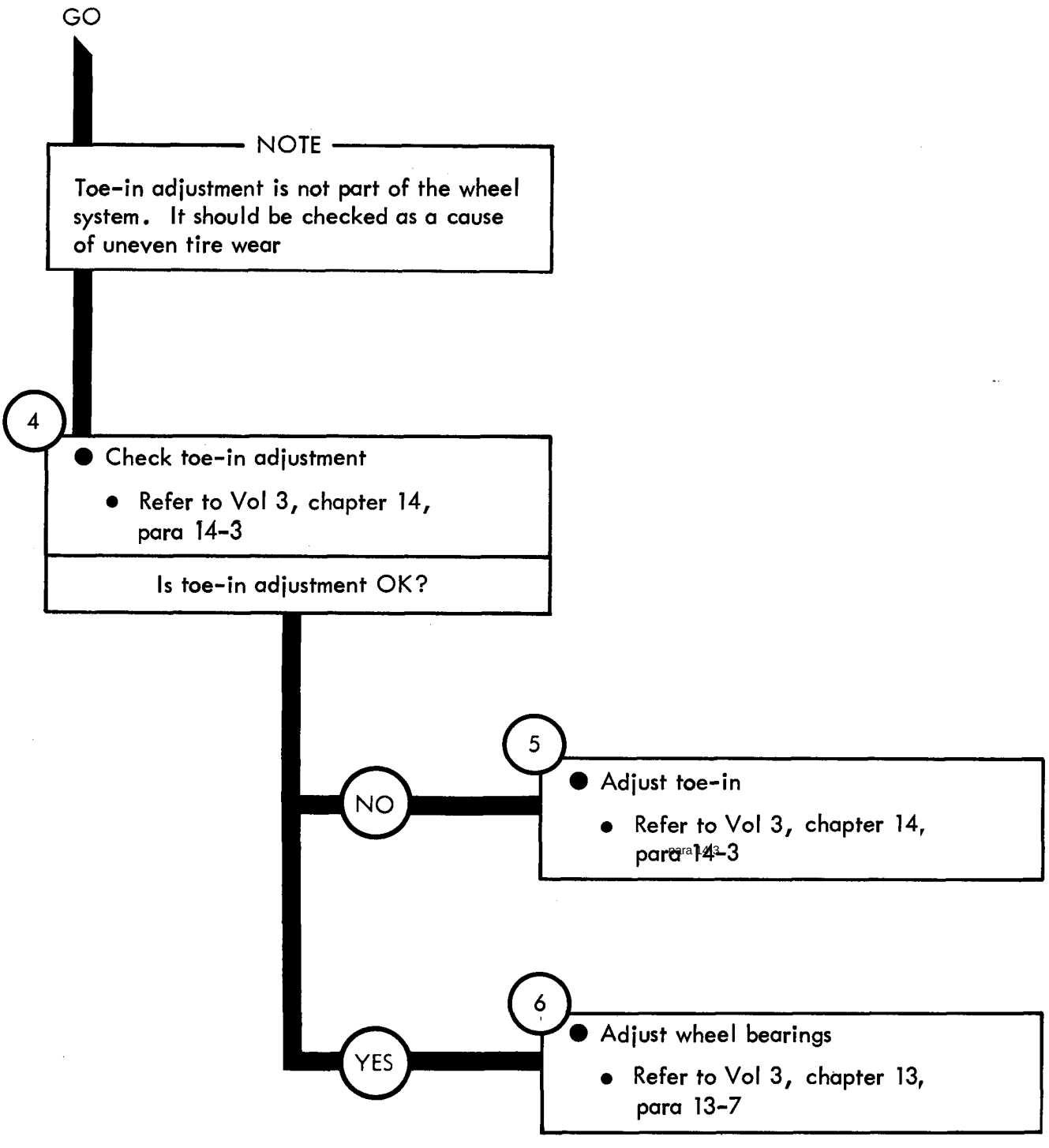



Figure 51-4 (Sheet 1 of 2)




TA 116237

Figure 51-4 (Sheet 2 of 2)

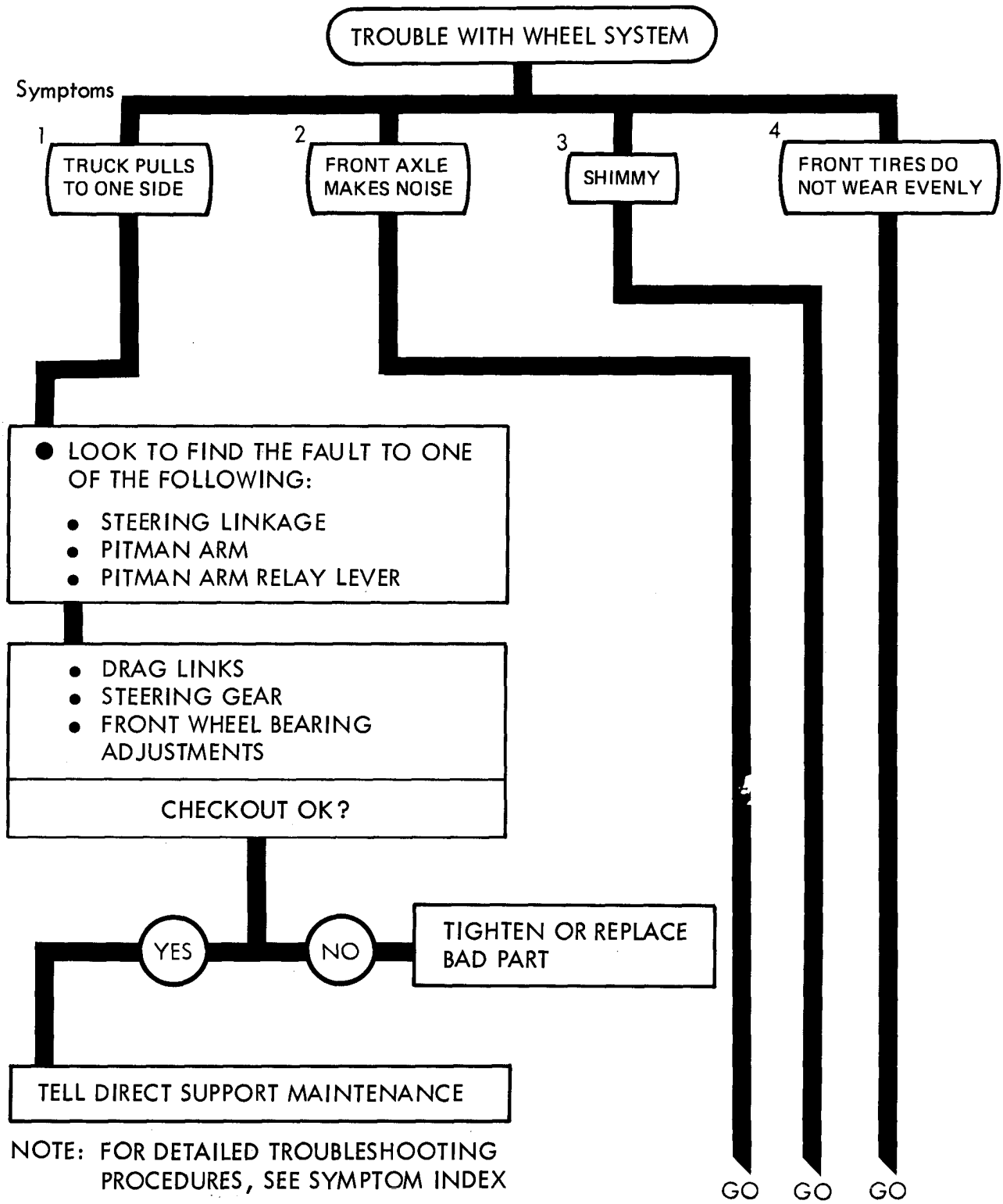
# CHAPTER 52

# WHEEL SYSTEM TROUBLESHOOTING SUMMARY

52-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 51, for the Wheel System.

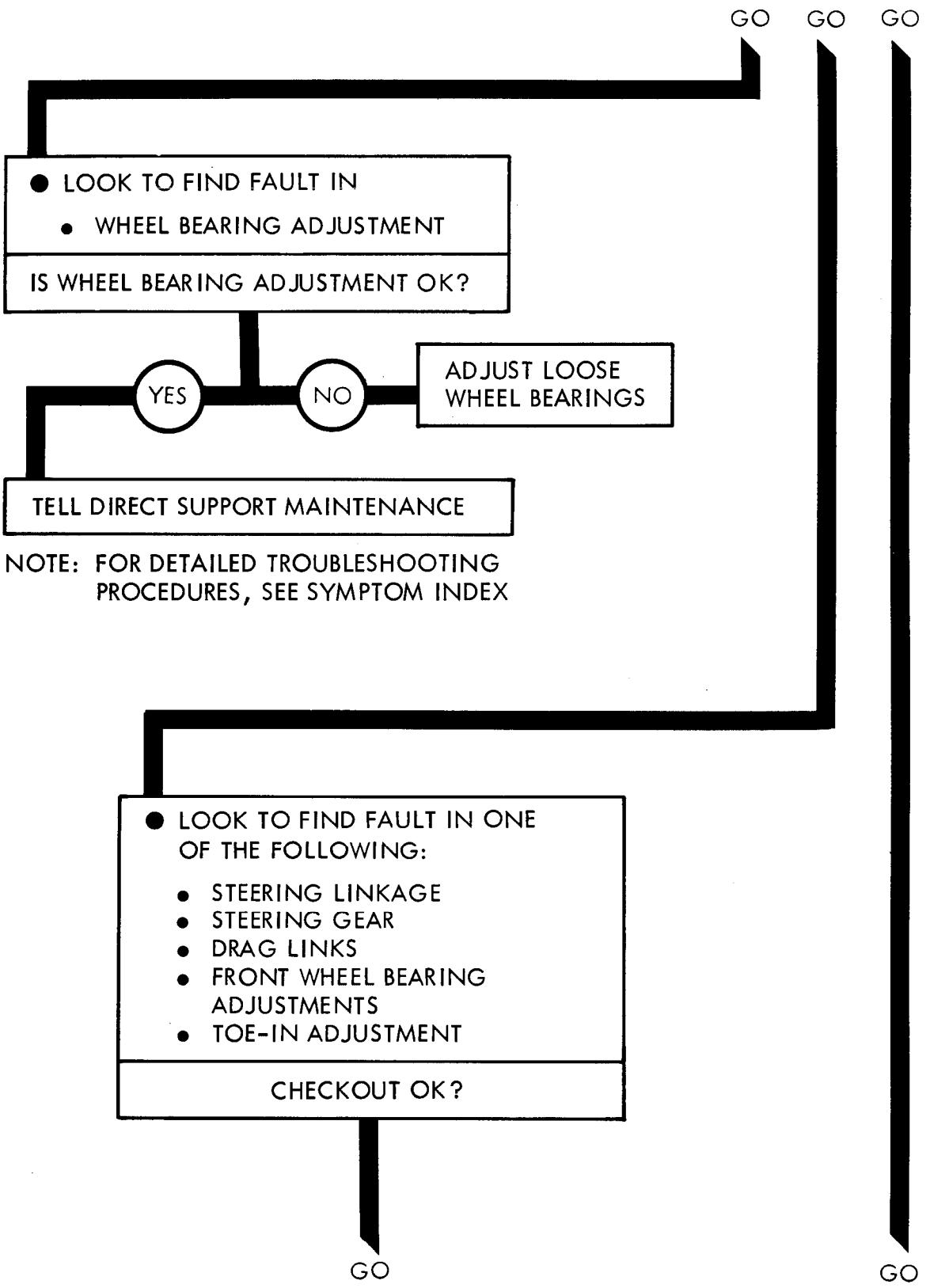
52-2. PROCEDURES. The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures. Chapter 7 outlines a sample troubleshooting procedure. The summary procedures are based on the “what-to-do” portions of the detailed procedures and do not include the “How-to-do-it” instructions. Warnings, cautions, and notes are given where needed.

WHEEL SYSTEM TROUBLESHOOTING SUMMARY



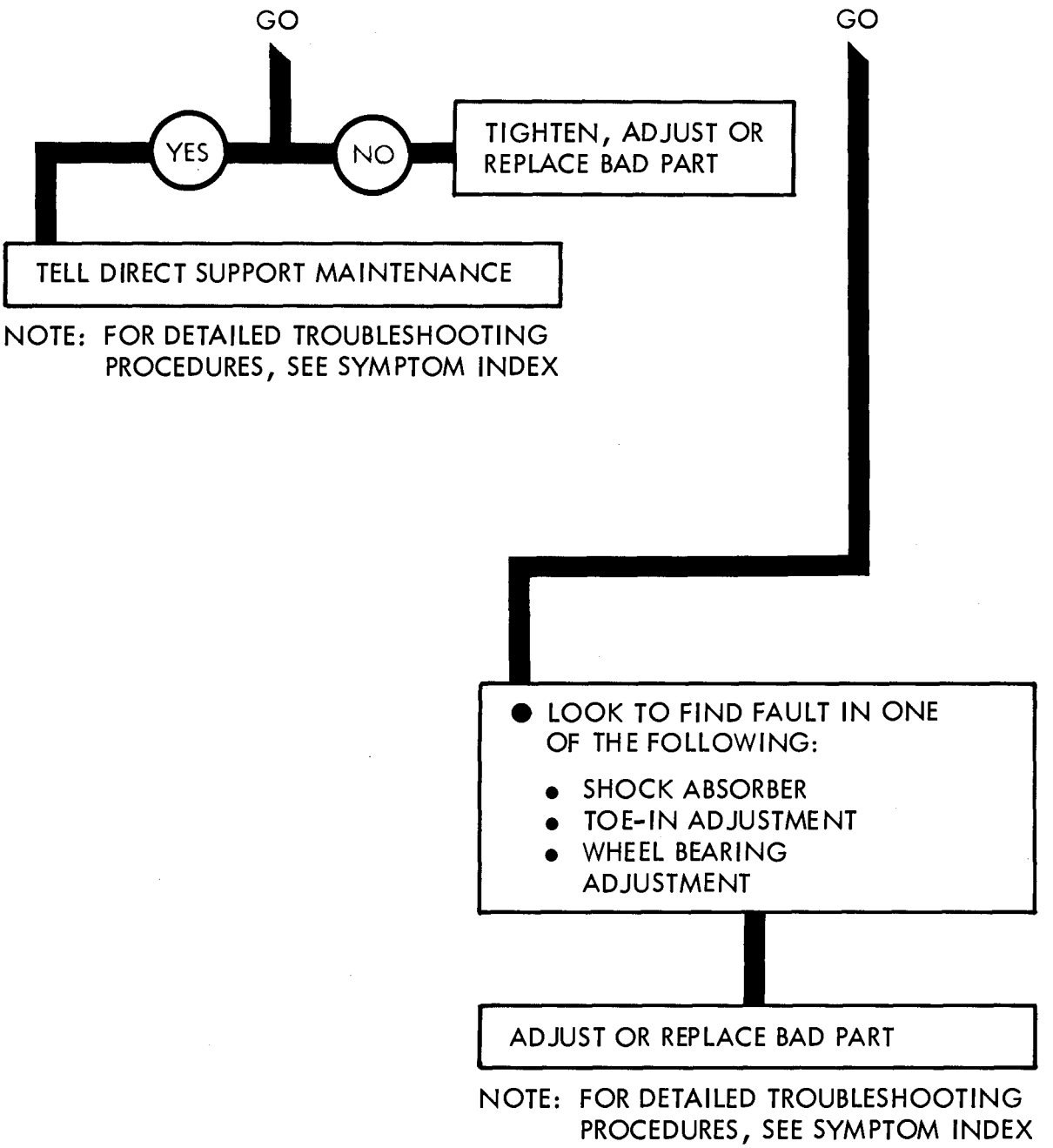

TA 116238

Figure 52-1 (Sheet 1 of 3)




TA 116239

Figure 52-1 (Sheet 2 of 3)



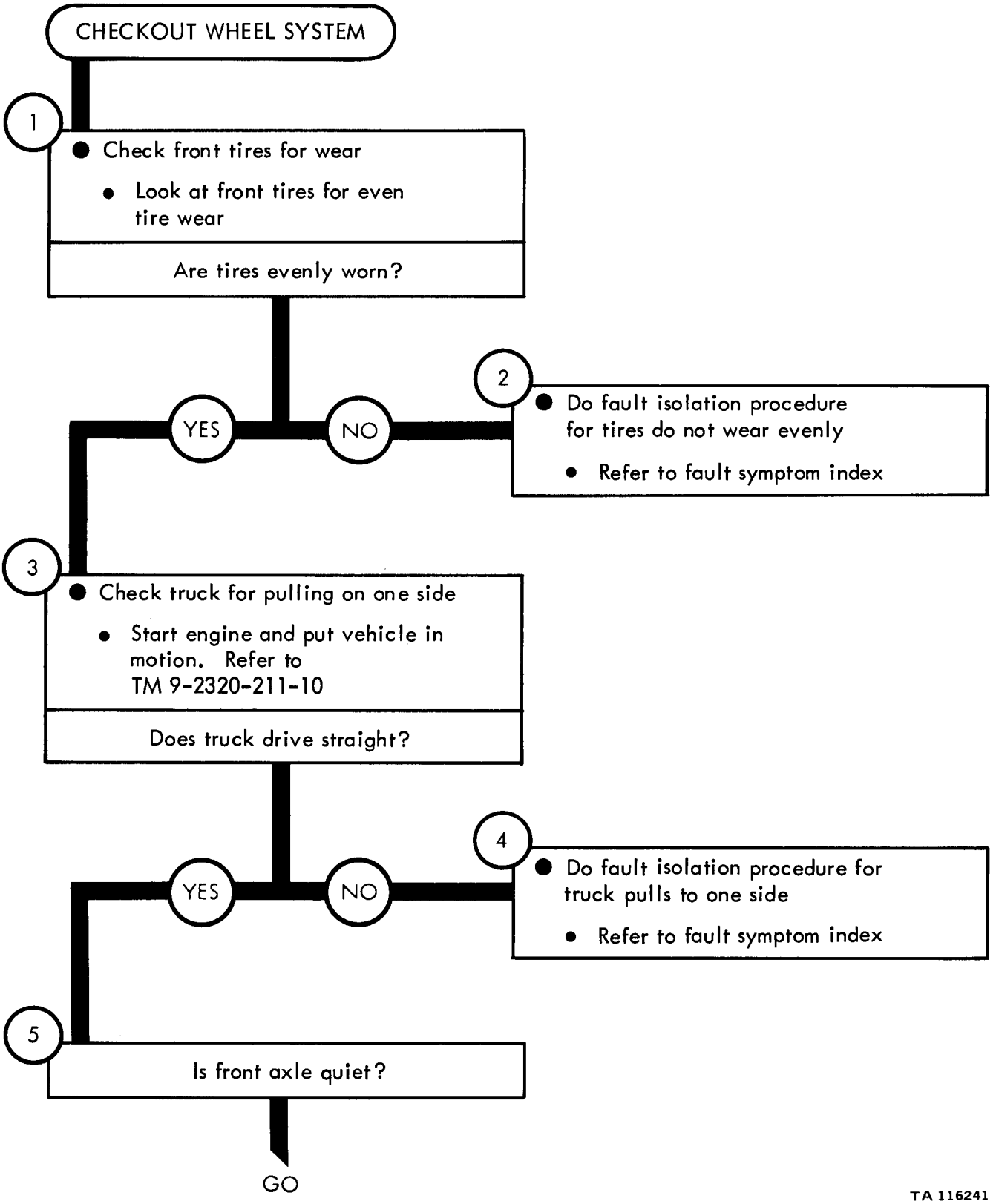

TA 116240

Figure 52-1 (Sheet 3 of 3)

# CHAPTER 53

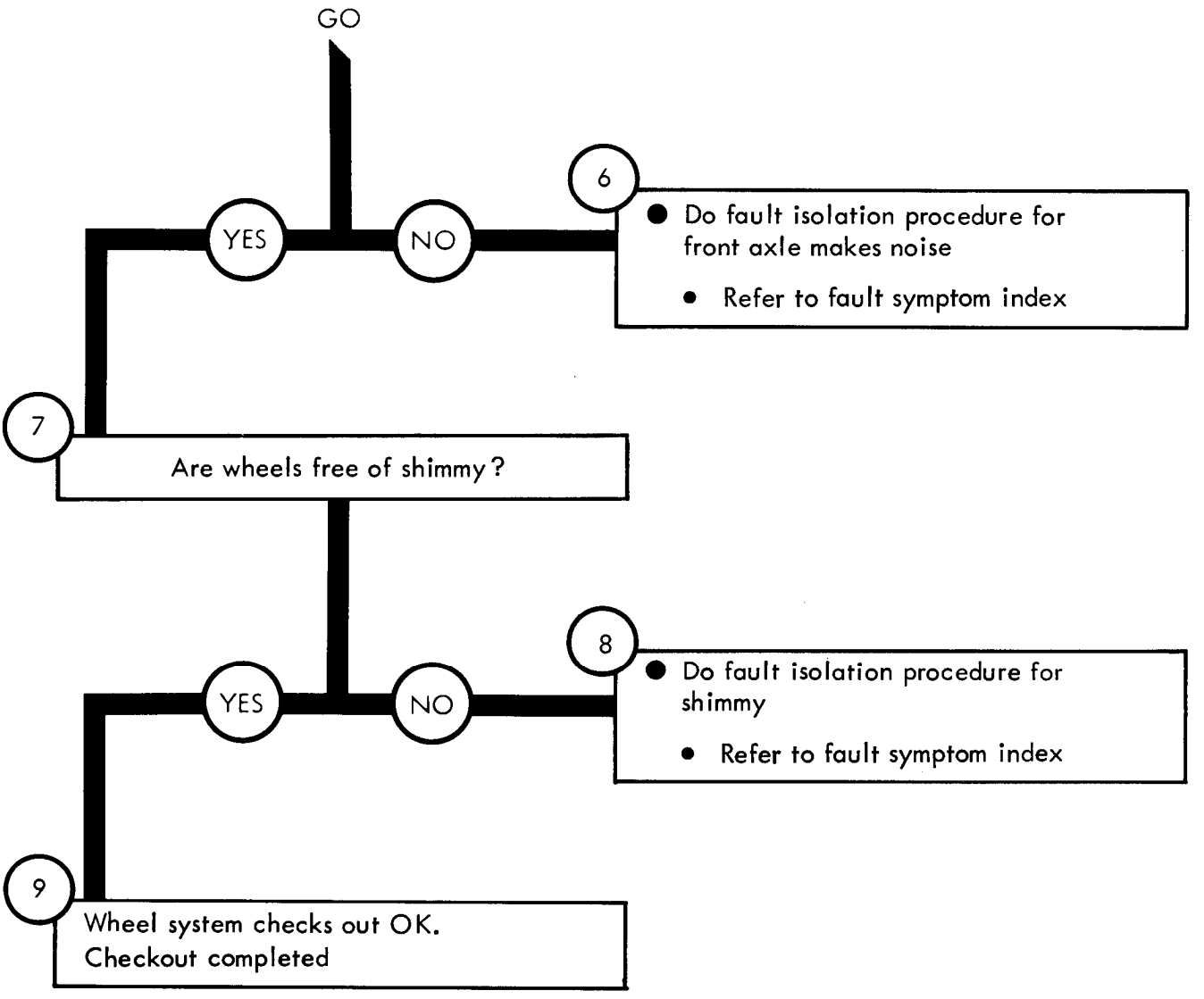
# WHEEL SYSTEM CHECKOUT PROCEDURES

53-1. GENERAL. This chapter gives procedures for checking out the system after troubleshooting and repair have been done. Procedures are set up in flow chart form showing the checkout steps in order and referring to the fault symptom index when the system does not checkout.




TA 116241

Figure 53-1 (Sheet 1 of 2)




TA 116242

Figure 53-2 (Sheet 2 of 2)

# CHAPTER 54

# STEERING SYSTEM TROUBLESHOOTING

54-1. EQUIPMENT ITEMS COVERED. This chapter gives equipment troubleshooting procedures for the steering system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

54-2. EQUIPMENT ITEMS NOT COVERED. All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

STEERING SYSTEM TROUBLESHOOTING

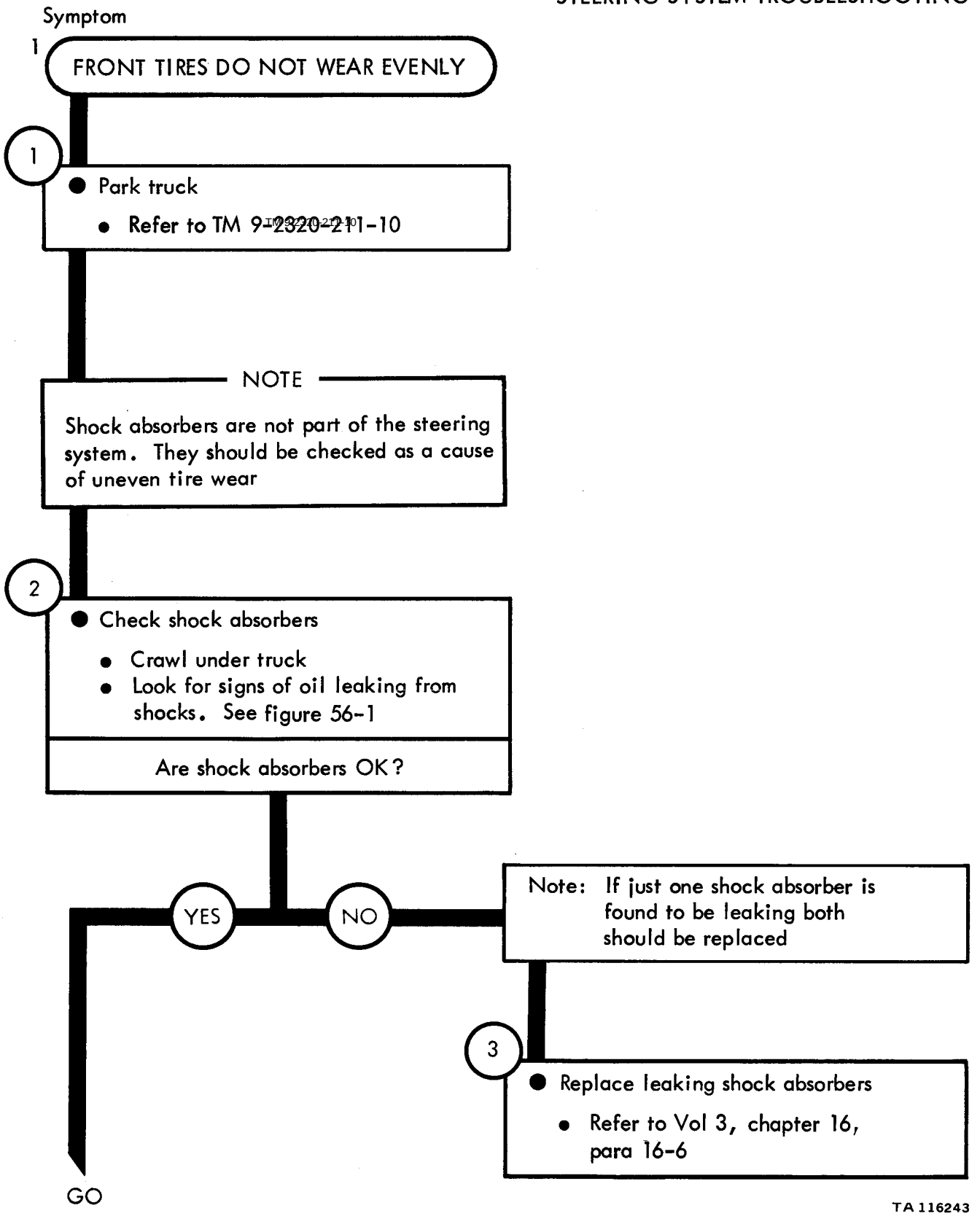
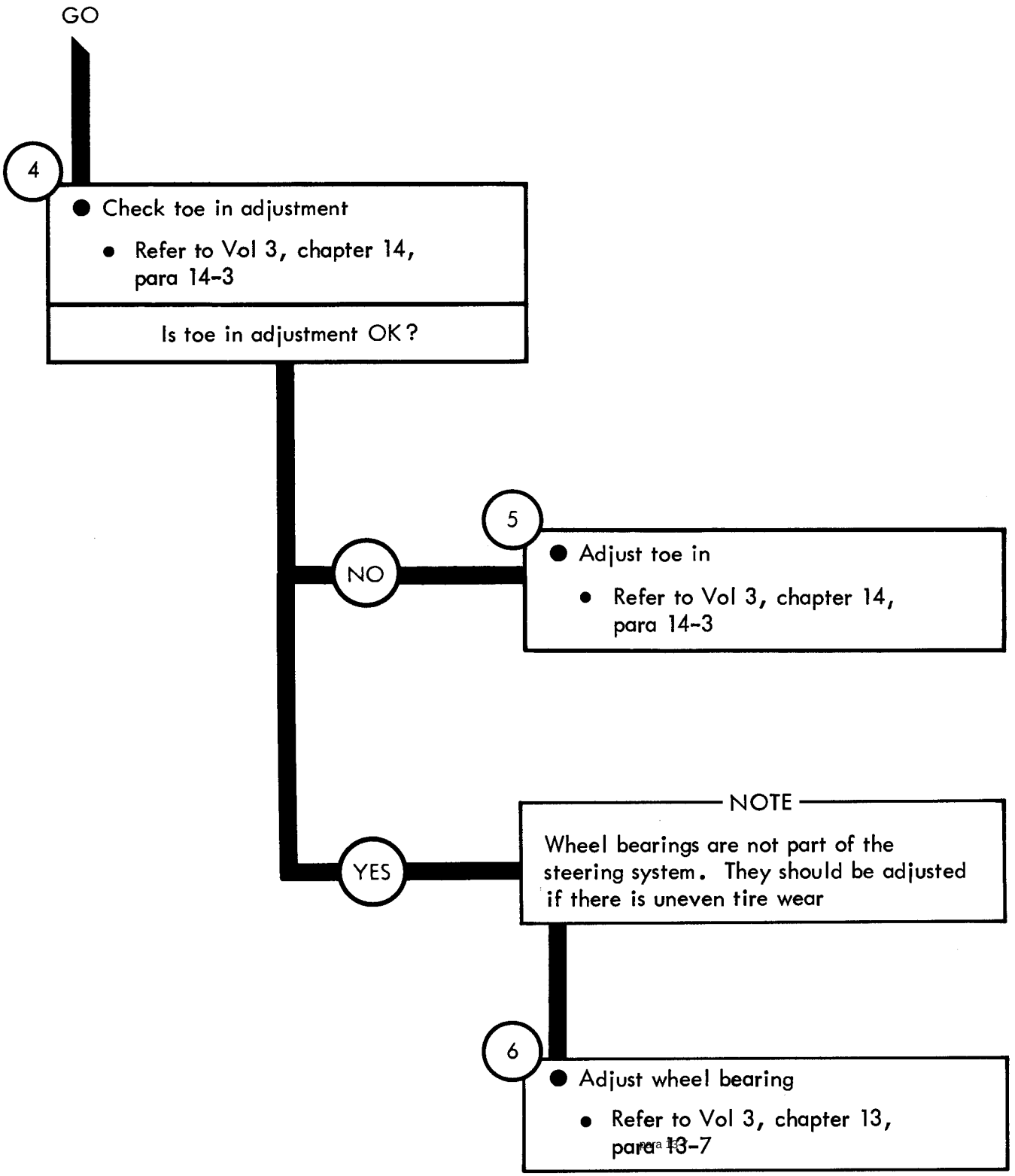



Figure 54-1 (Sheet 1 of 2)




TA 116244

Figure 54-1 (Sheet 2 of 2)

Symptom

2 HARD STEERING

1

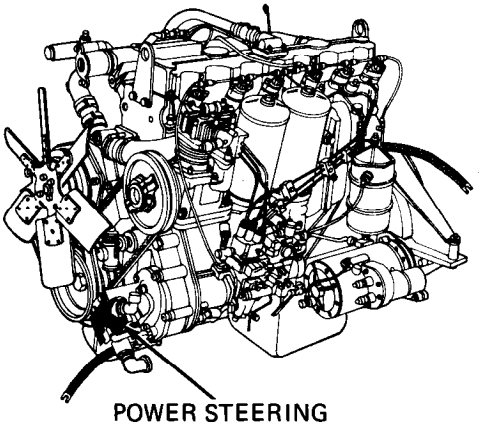
- Park truck
  - Refer to TM 9-2320-211-10

2

- Check power steering pump
  - Look for signs of fluid leaking from pump body

Is power steering pump OK?

GO



POWER STEERING PUMP

TA 116245

Figure 54-2 (Sheet 1 of 4)

GO

YES

NO

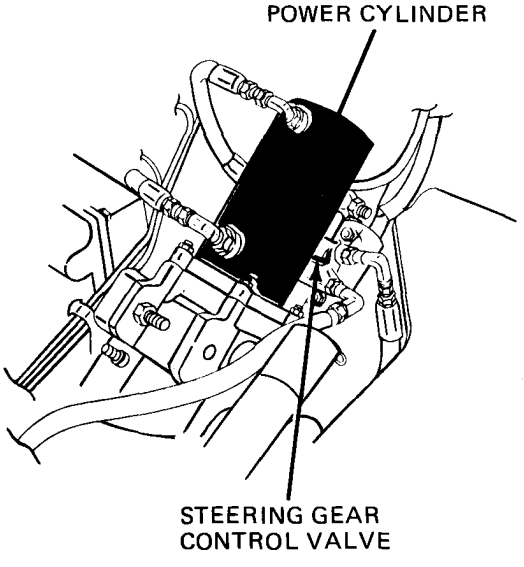
3

- Replace leaking pump
  - Tell direct support maintenance

4

- Check steering gear control valve
  - Look for signs of fluid leading from control valve
- Check power cylinder
  - Look for signs of fluid leaks

Are control valve and power cylinder OK?




YES

NO

5

- Replace leaking control valve
  - Tell direct support maintenance
- Replace leaking power cylinder
  - Tell direct support maintenance

GO

TA 116246

Figure 54-2 (Sheet 2 of 4)

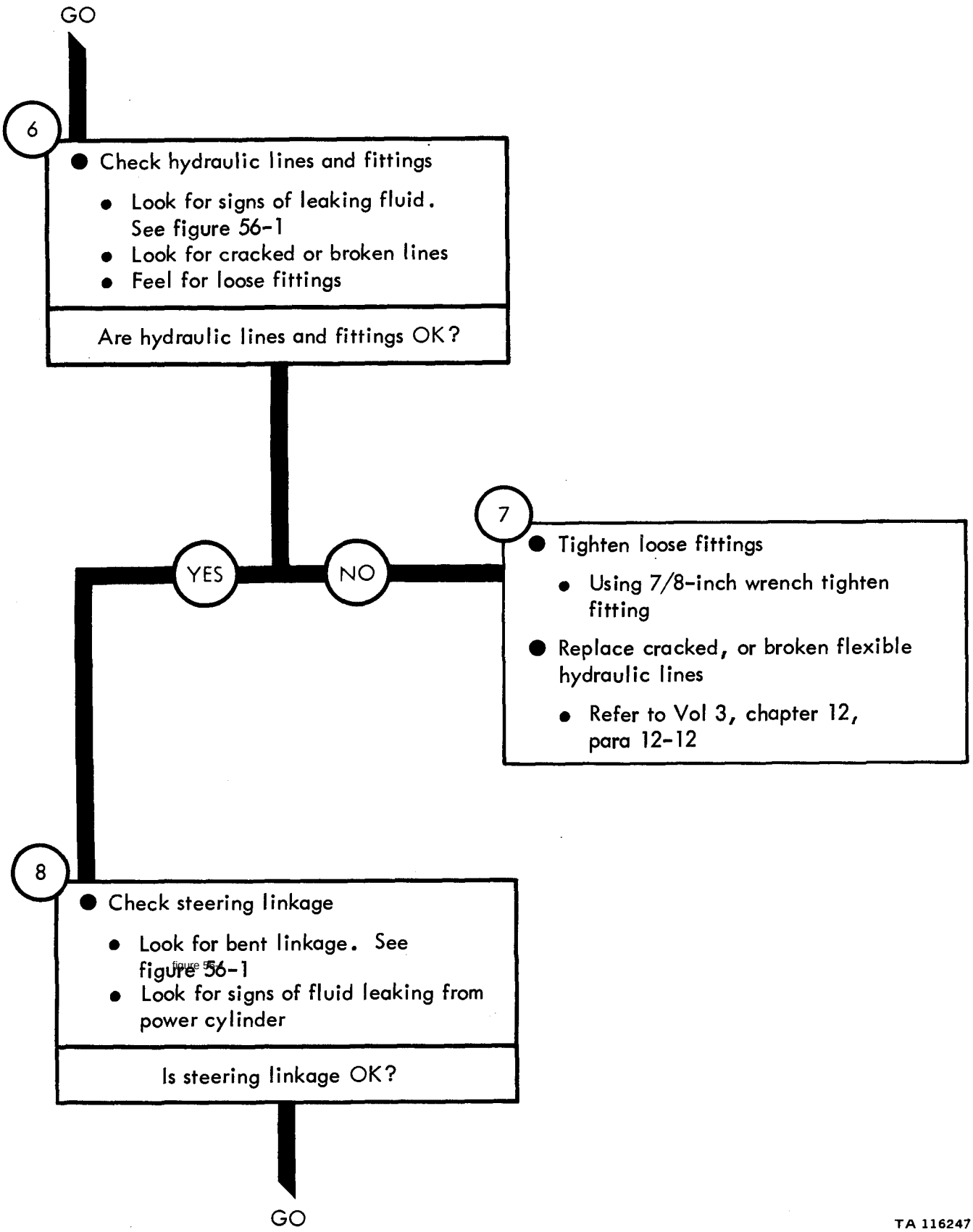
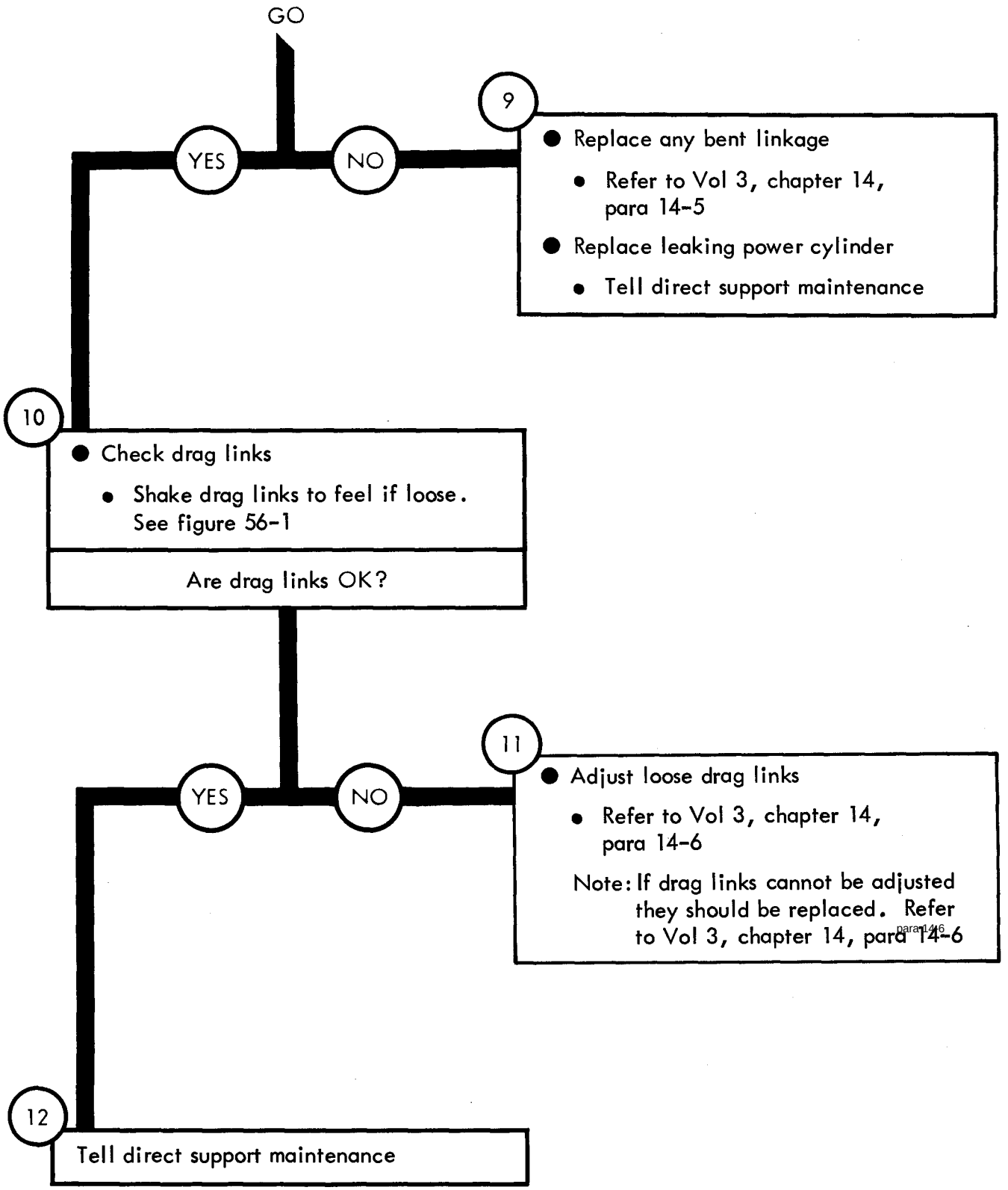



Figure 54-2 (Sheet 3 of 4)




TA 116248

Figure 54-2 (Sheet 4 of 4)

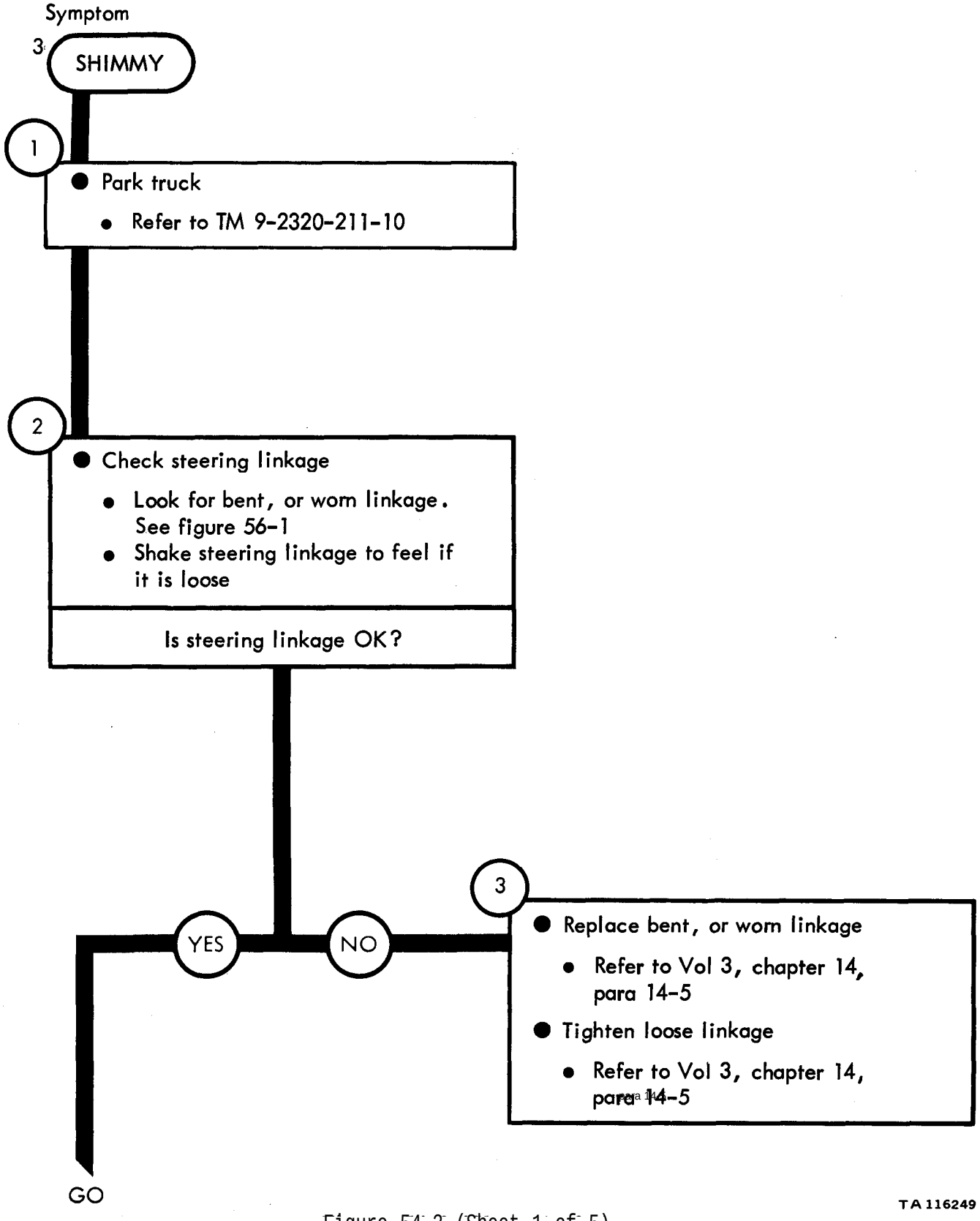
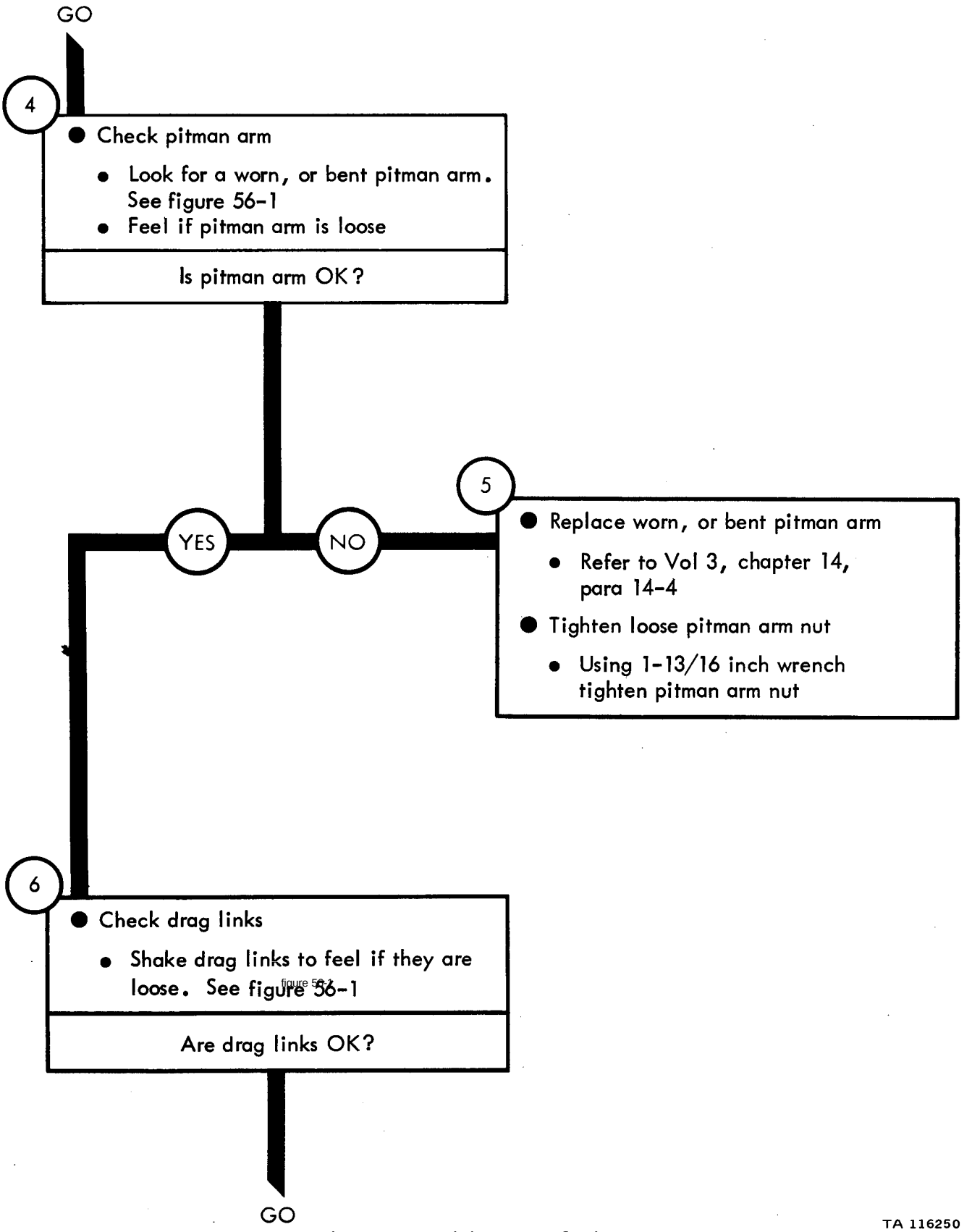



Figure 54-3 (Sheet 1 of 5)




TA 116250

Figure 54-3 (Sheet 2 of 5)

GO

YES

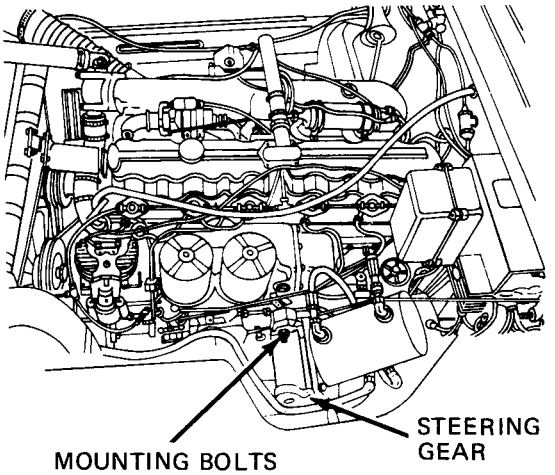
NO

7

● Adjust loose drag link

- Refer to Vol 3, chapter 14, para 14-6

Note: If drag links cannot be adjusted they should be replaced. Refer to Vol 3, chapter 14, para 14-6




8

● Check steering gear

- Feel for loose steering gear

Is steering gear OK?

YES

NO

9

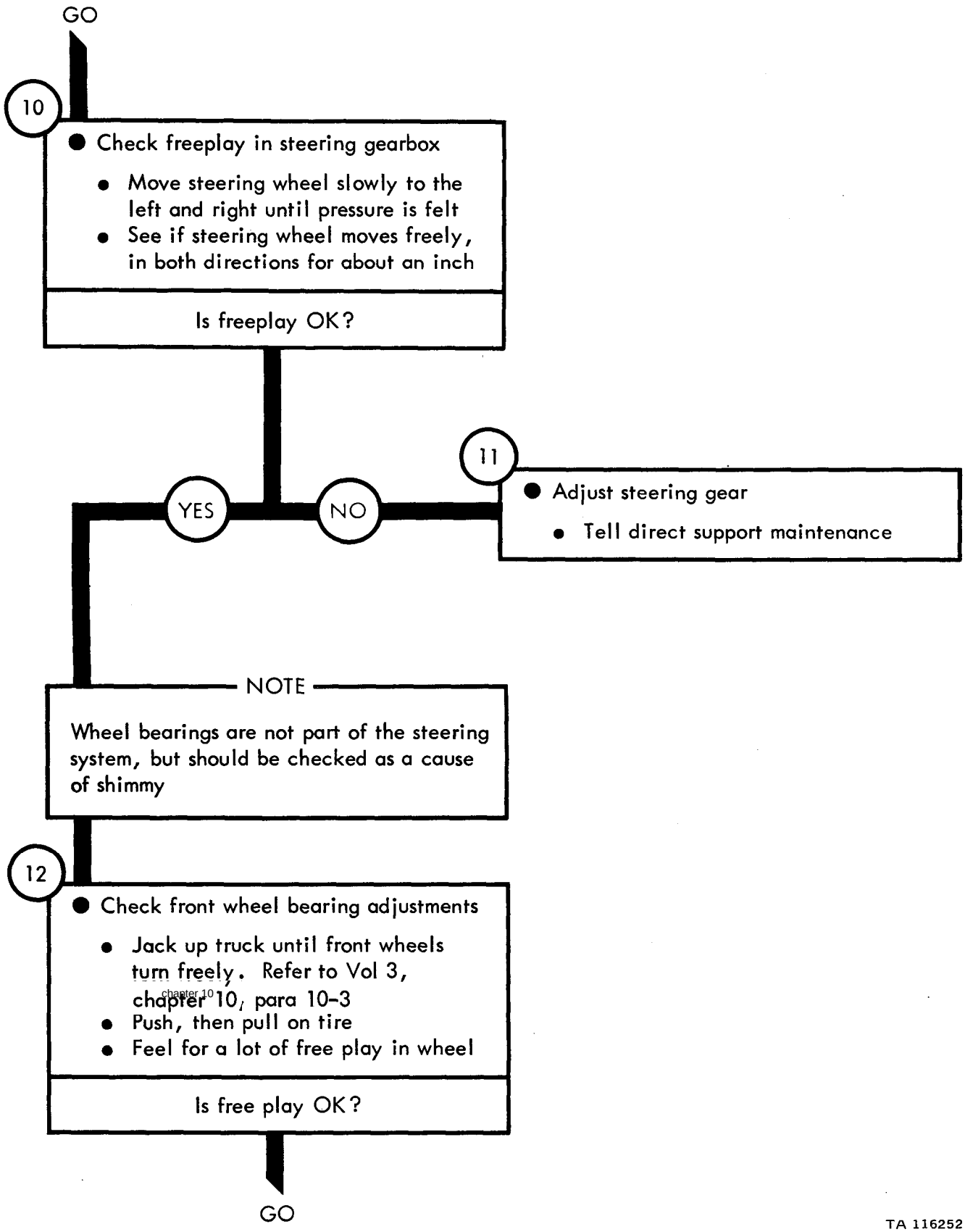
● Tighten loose steering gear mounting bolts

- Using torque wrench tighten steering gear mounting bolts to 75 pound-feet

GO

TA 116251

Figure 54-3 (Sheet 3 of 5)




TA 116252

Figure 54-3 (Sheet 4 of 5)

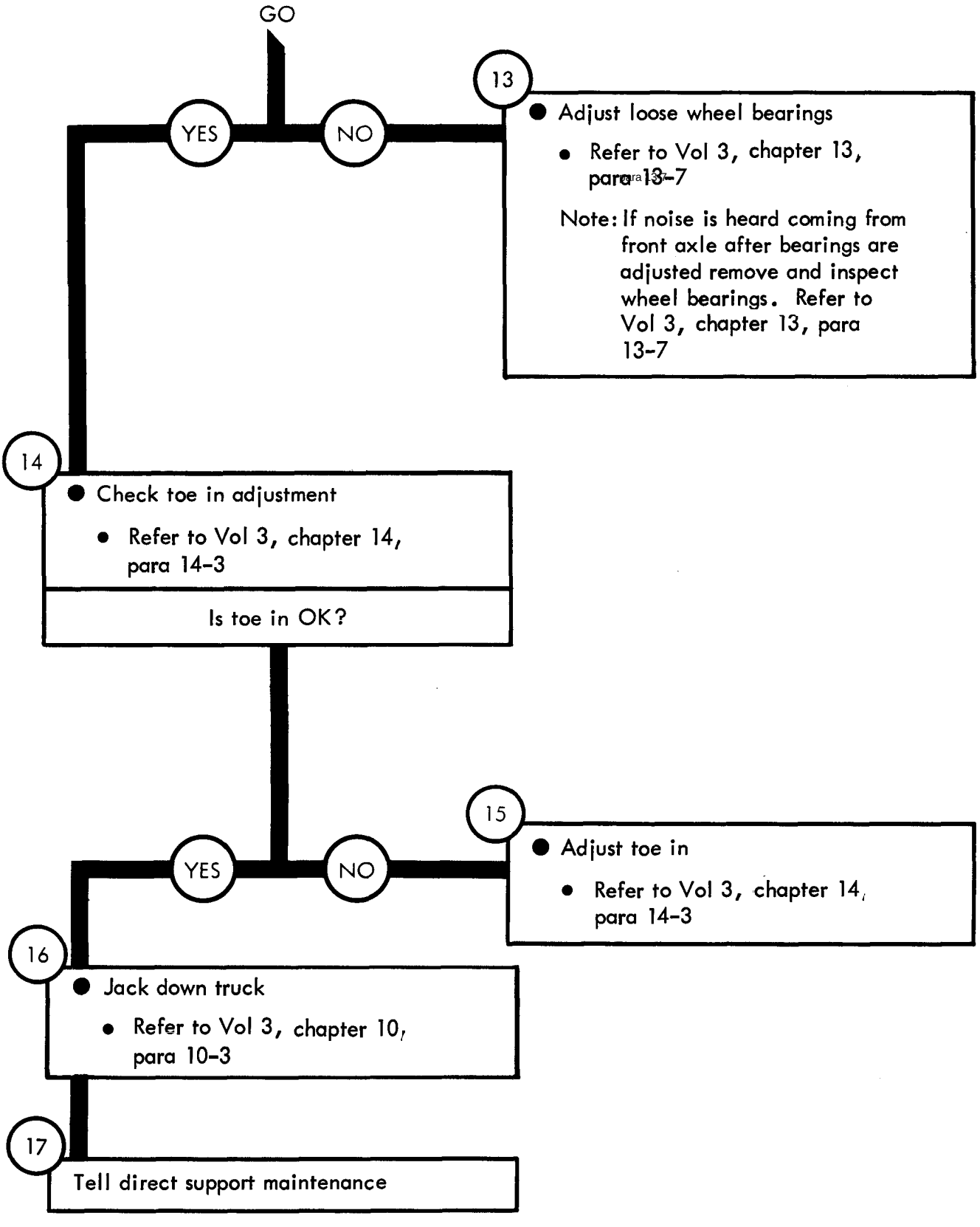



Figure 54-3 (Sheet 5 of 5)

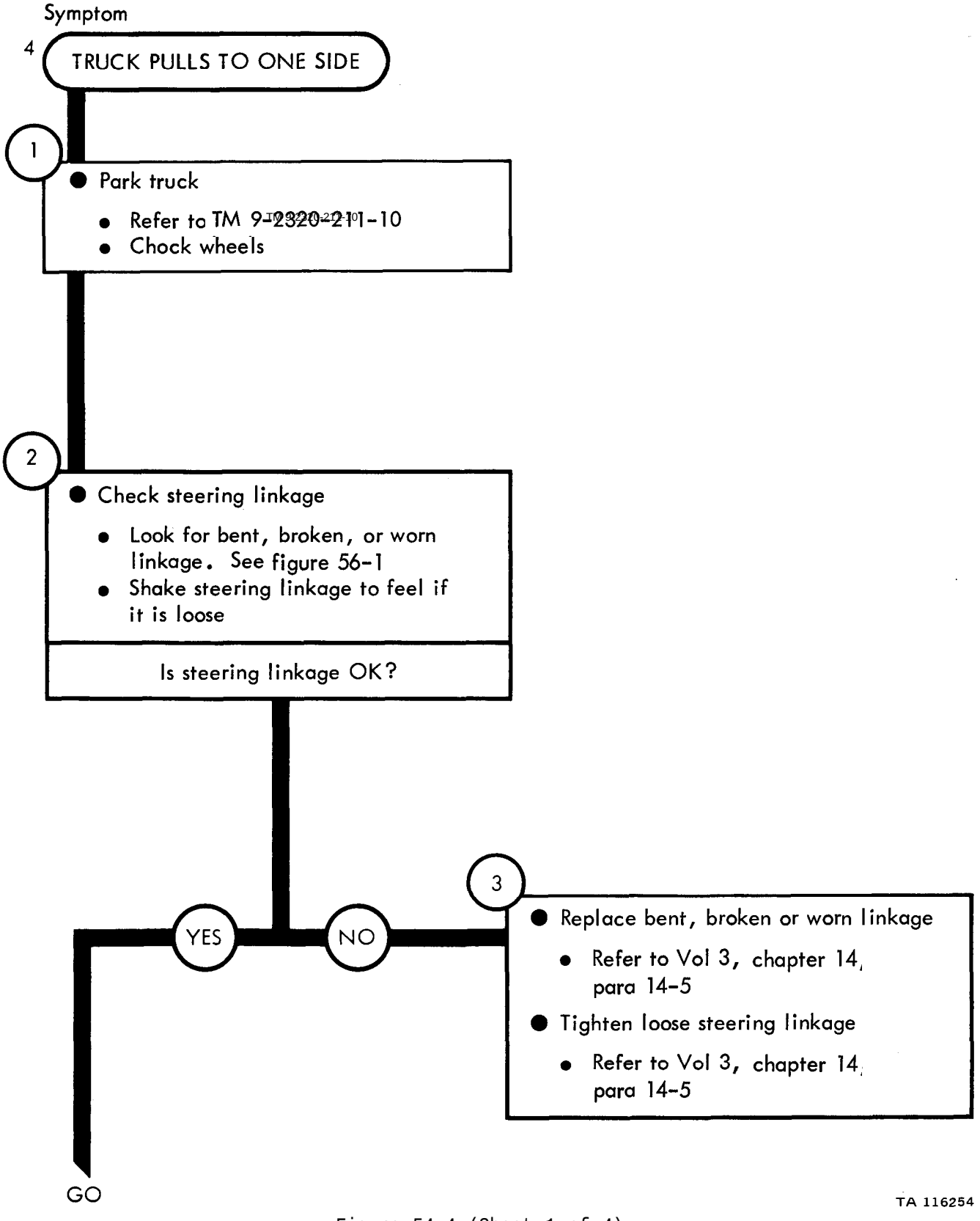



Figure 54-4 (Sheet 1 of 4)

GO

4

- Check pitman arm
  - Look for a worn, or bent pitman arm
  - Feel if pitman arm is loose. See figure 56-1

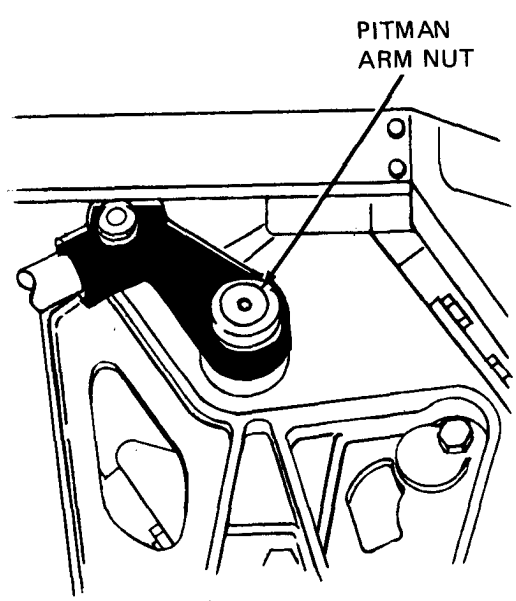
Is pitman arm OK?

YES

NO

5

- Replace worn, or bent pitman arm
  - Refer to Vol 3, chapter 14, para 14-4
- Tighten loose pitman arm
  - Using 1-13/16 inch wrench tighten pitman arm nut




6

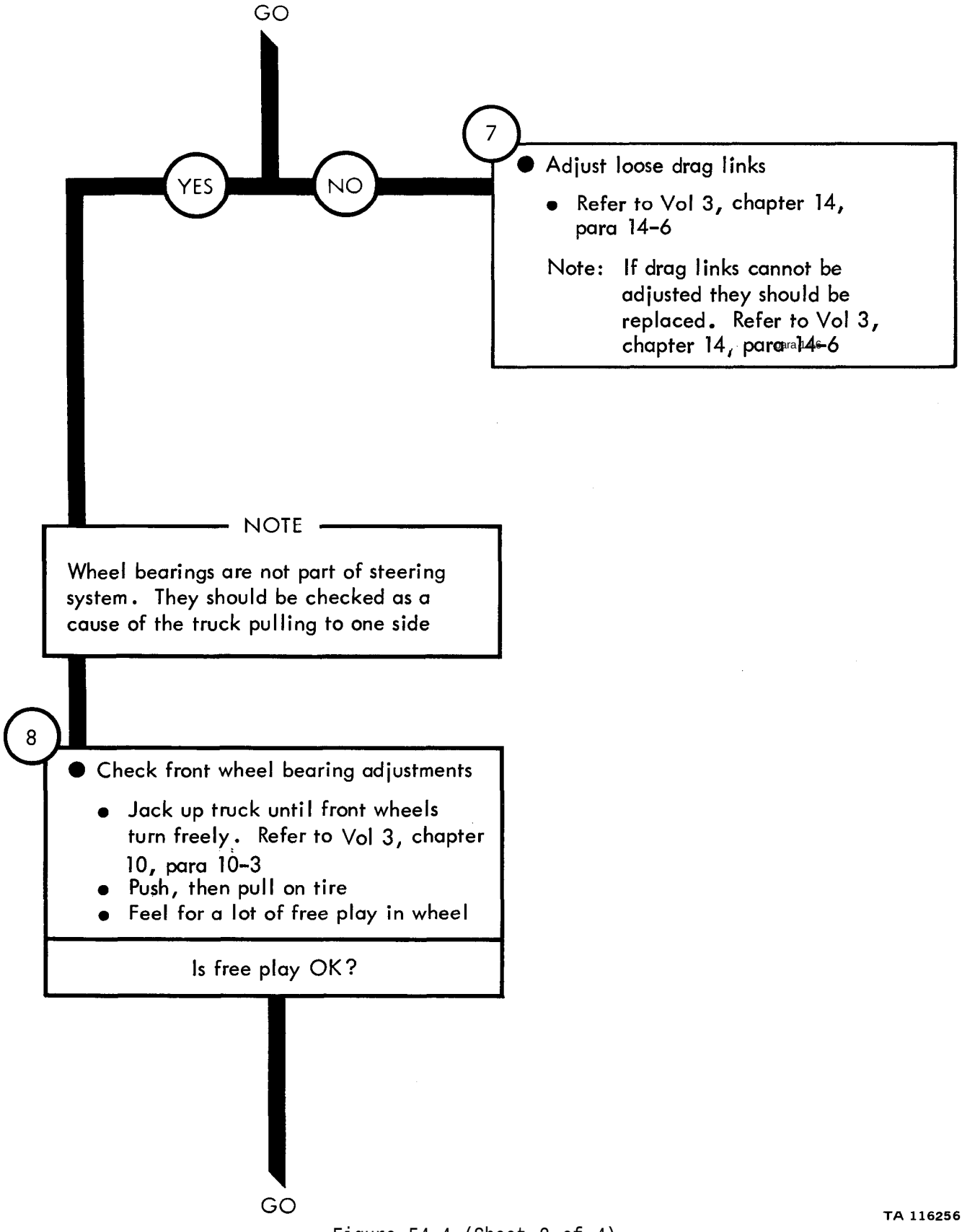
- Check drag links
  - Shake drag links to feel if loose. See figure 56-1

Are drag links OK?

GO

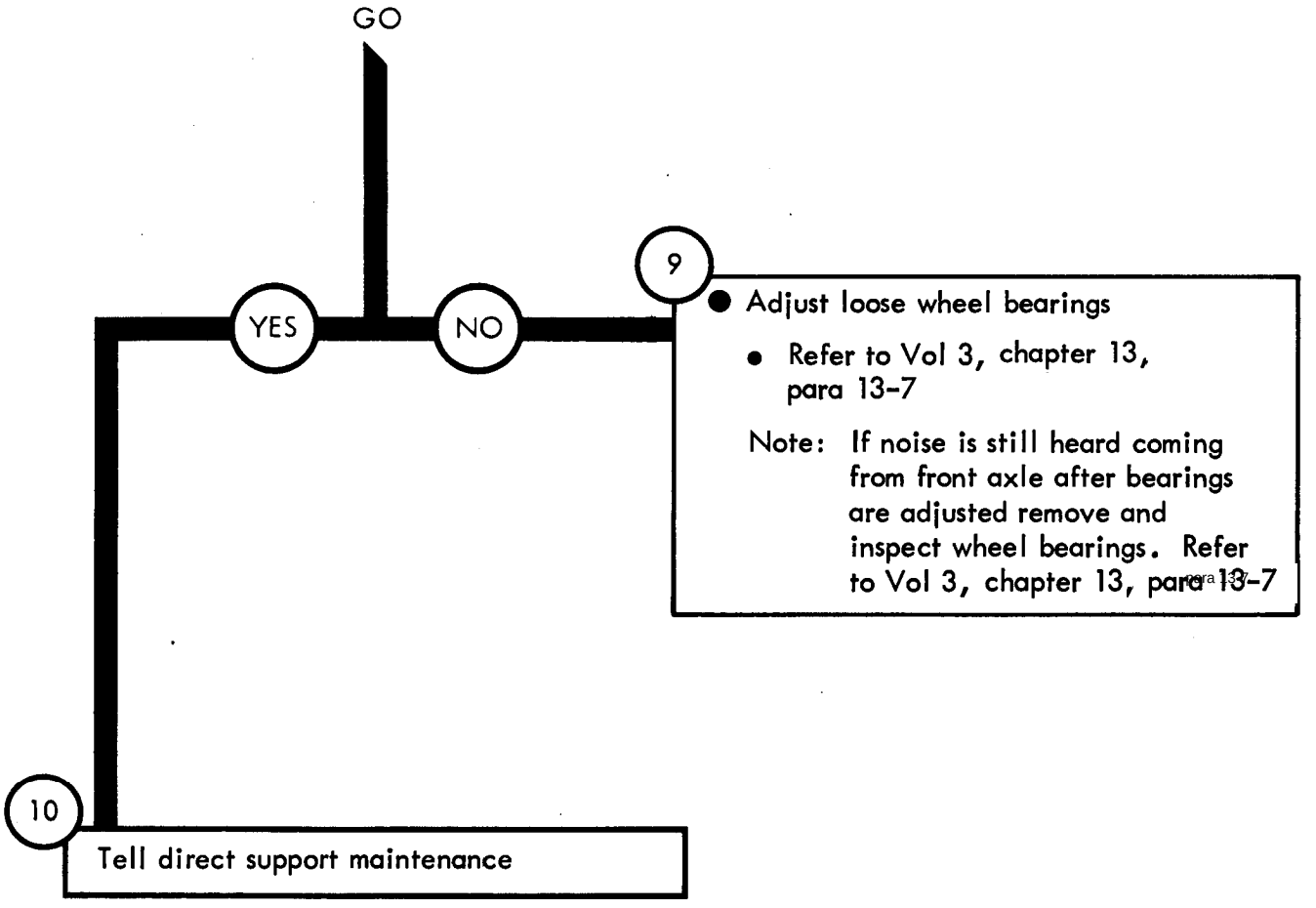
TA 116255

Figure 54-4 (Sheet 2 of 4)




TA 116256

Figure 54-4 (Sheet 3 of 4)




TA 116257

Figure 54-4, (Sheet 4 of 4)

# CHAPTER 55

# STEERING SYSTEM TROUBLESHOOTING SUMMARY

55-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 54, for the Steering System.

55-2. PROCEDURES. The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures. Chapter 7 outlines a sample troubleshooting procedure. The summary procedures are based on the “what-to-do” portions of the detailed procedures and do not include the “How-to-do-it” instructions. Warnings, cautions, and notes are given where needed.

STEERING SYSTEM TROUBLESHOOTING SUMMARY

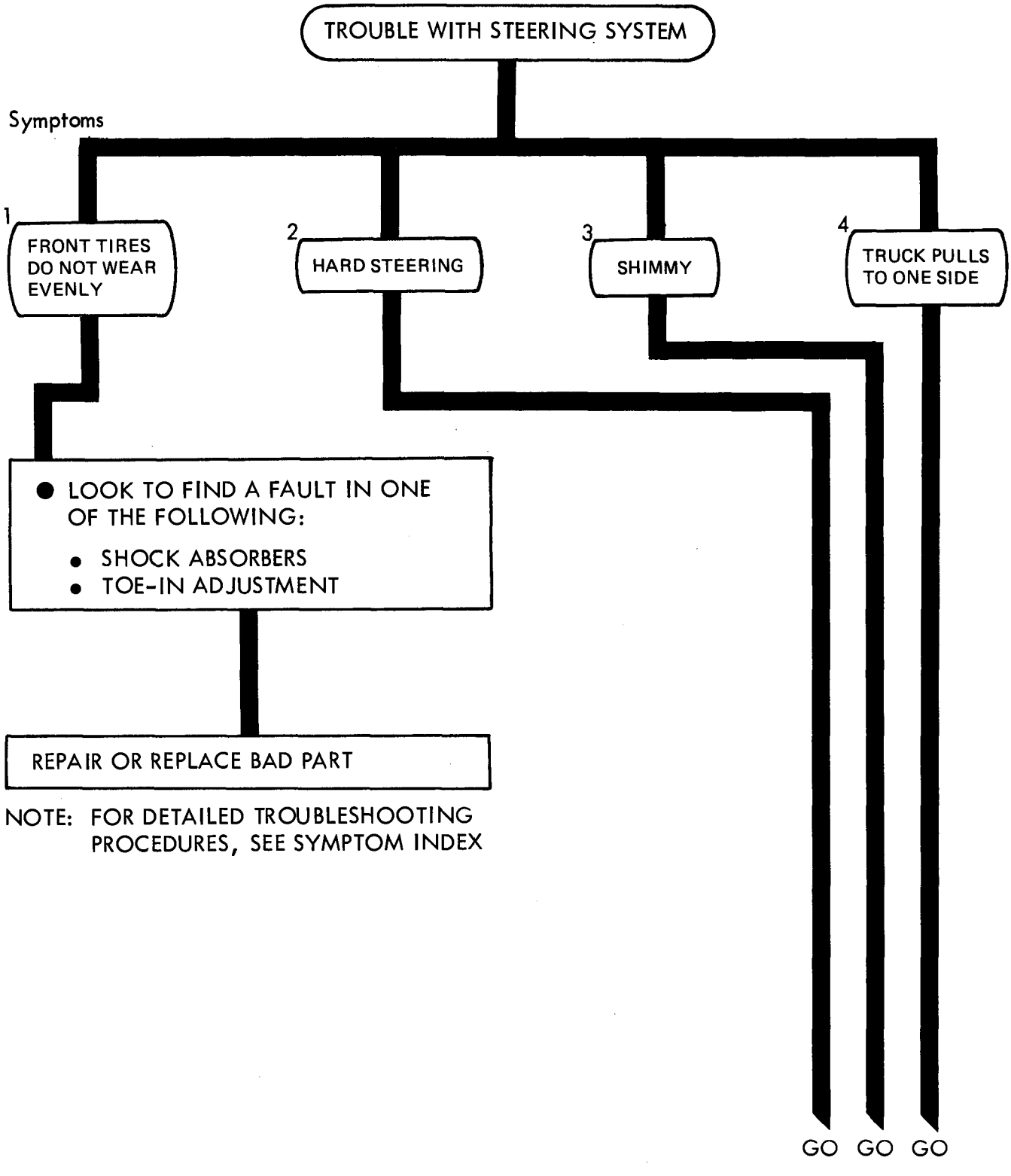



Figure 55-1 (Sheet 1 of 4)

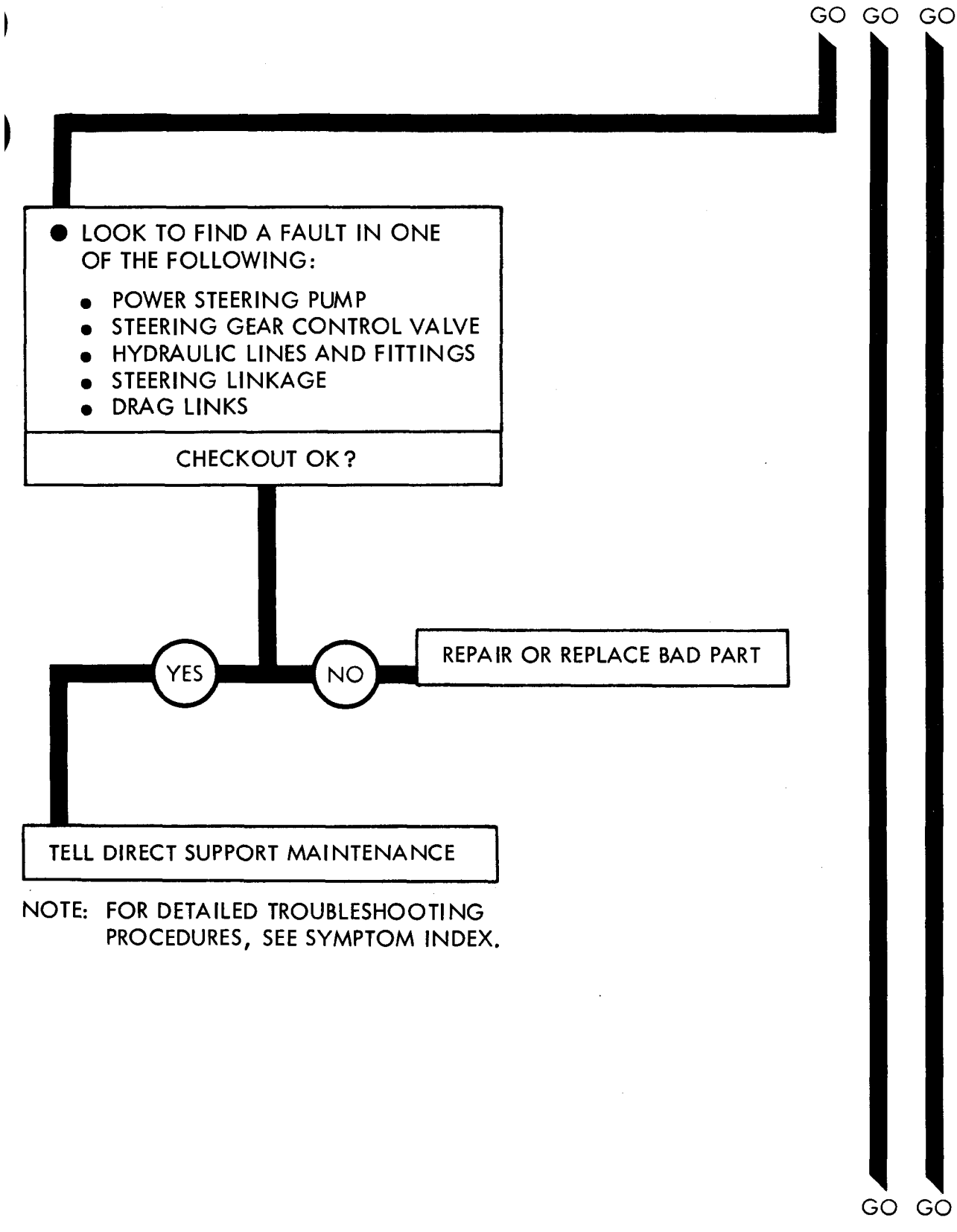



Figure 55-1 (Sheet 2 of 4)

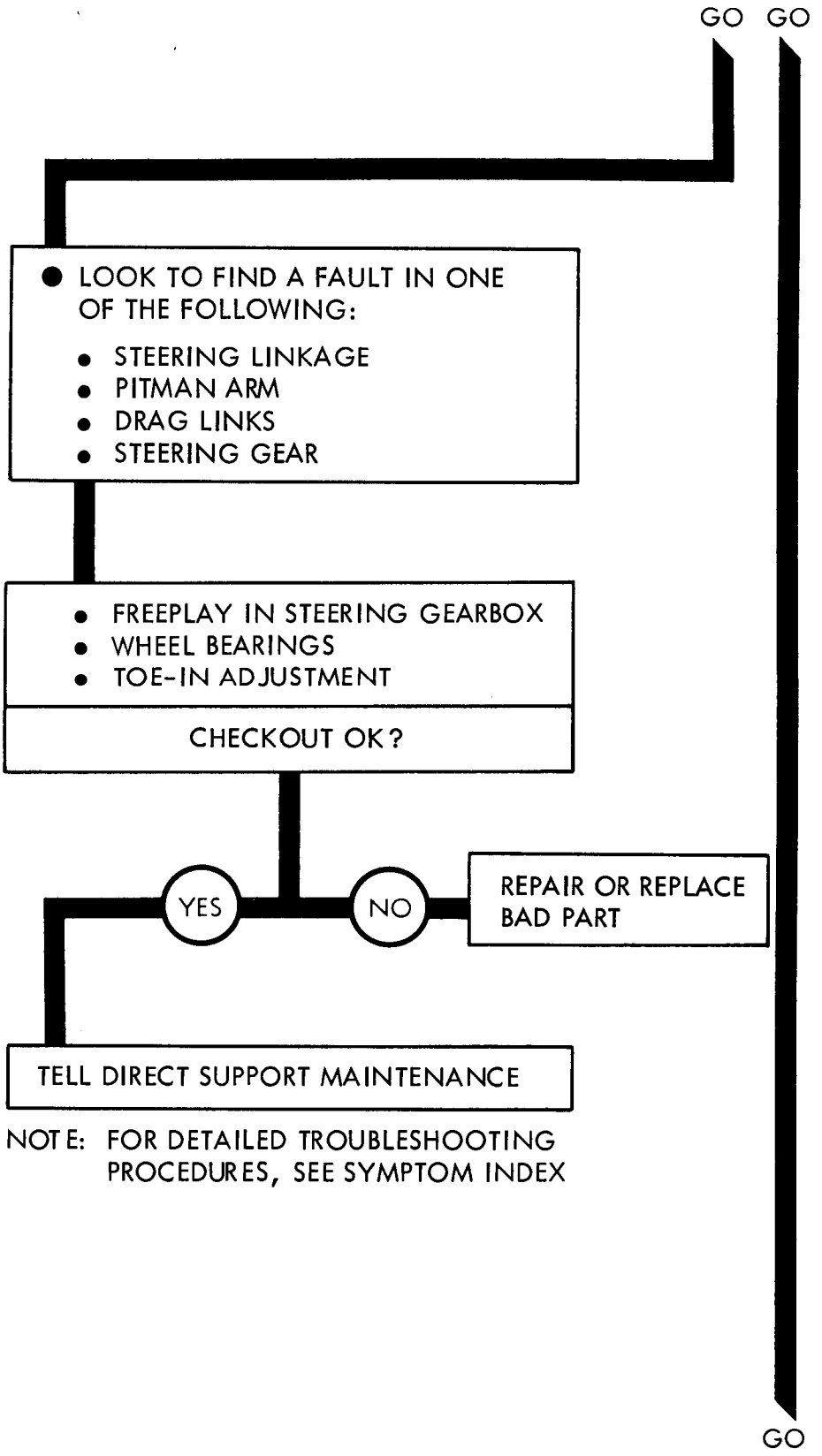
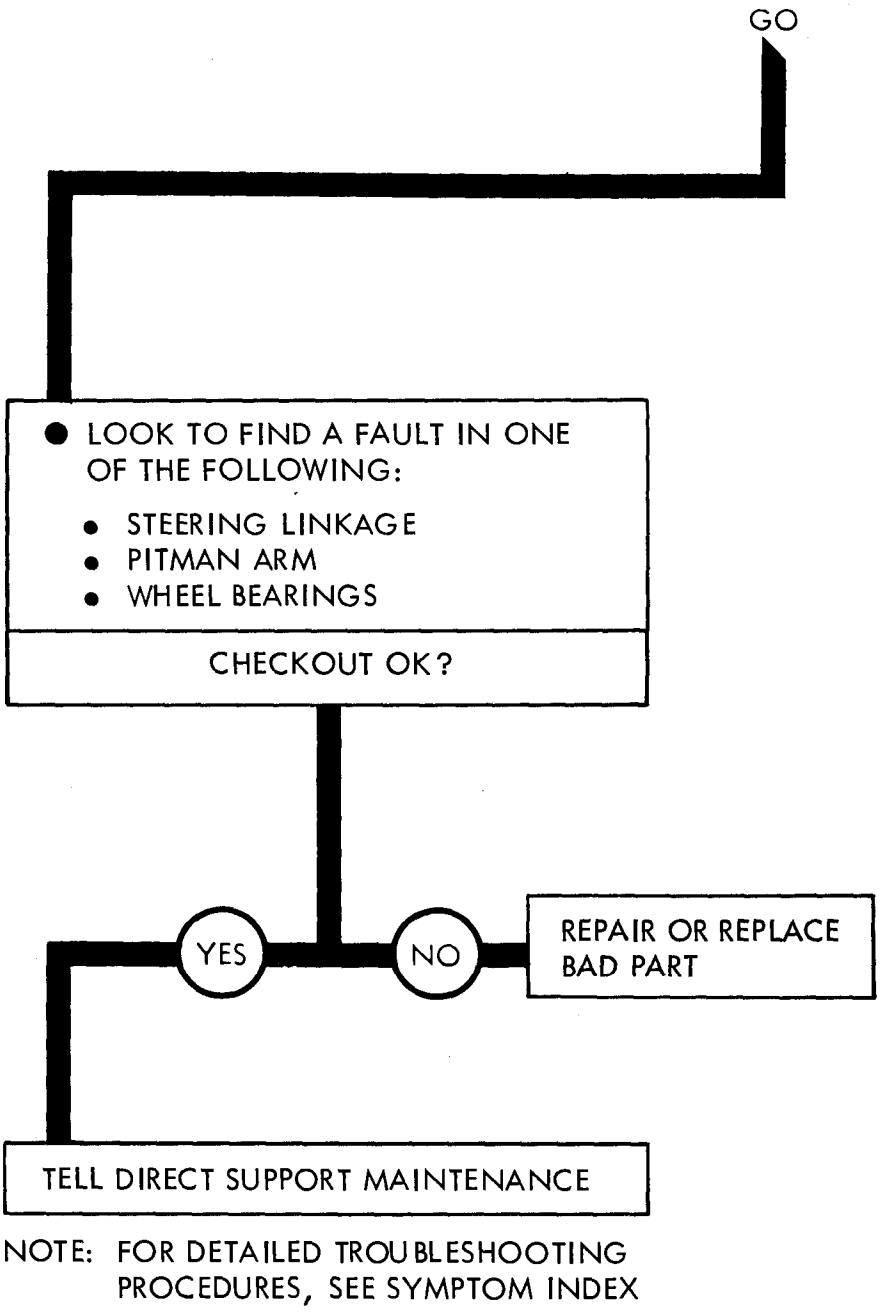



Figure 55-1 (Sheet 3 of 4)




TA 116261

Figure 55-1 (Sheet 4 of 4)

# CHAPTER 56

# STEERING SYSTEM SUPPORT DIAGRAMS

56-1. GENERAL. This chapter gives the diagrams you need when doing troubleshooting procedures in chapter 54. Table 3-1 is a complete listing of all support diagrams used in this manual.

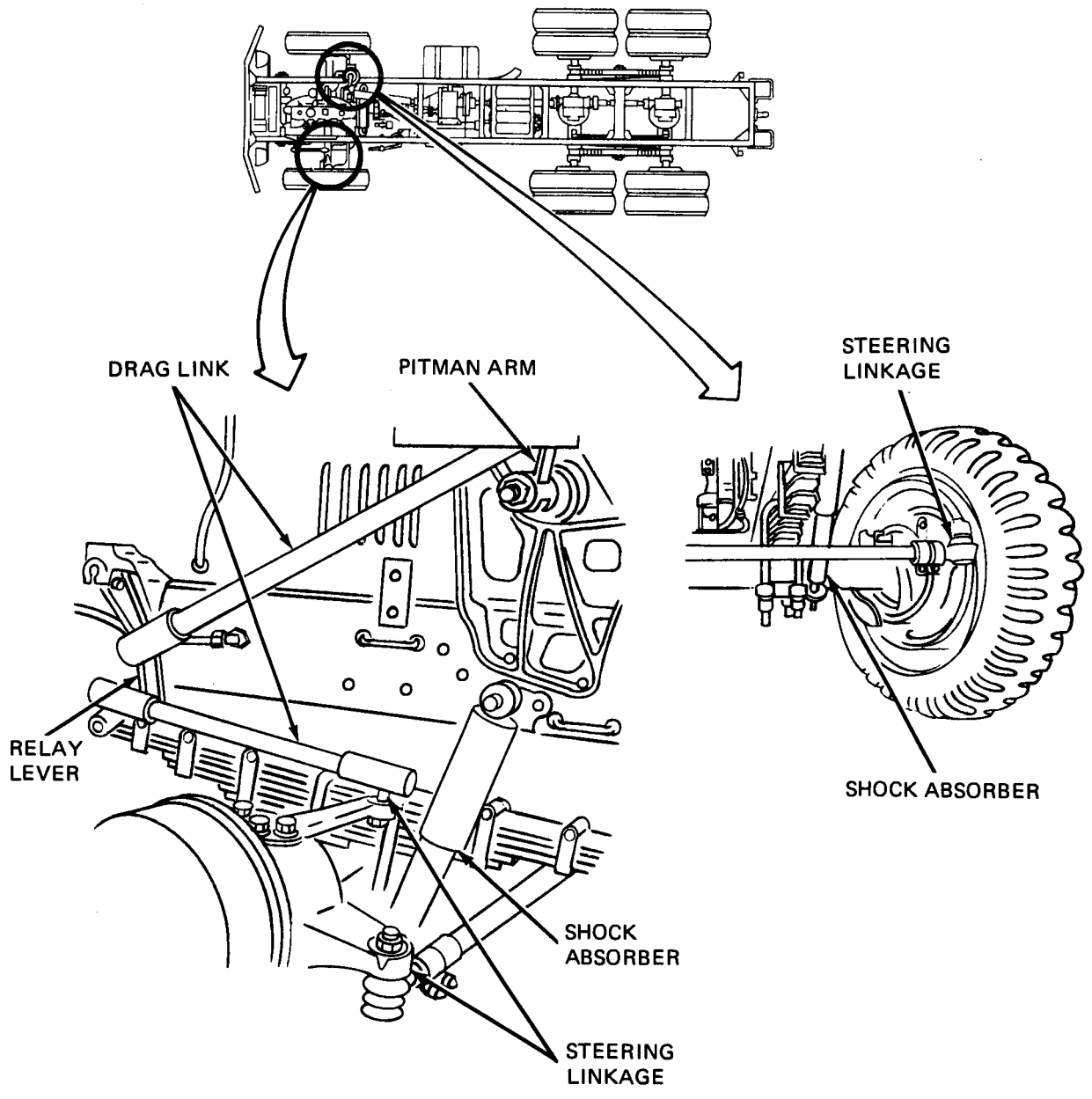



Figure 56-1. Steering Linkage

# CHAPTER 57

# STEERING SYSTEM CHECKOUT PROCEDURES

57-1. GENERAL. This chapter gives procedures for checking out the system after troubleshooting and repair have been done. Procedures are set up in flow chart form showing the checkout steps in order and referring to the fault symptom index when the system does not checkout.

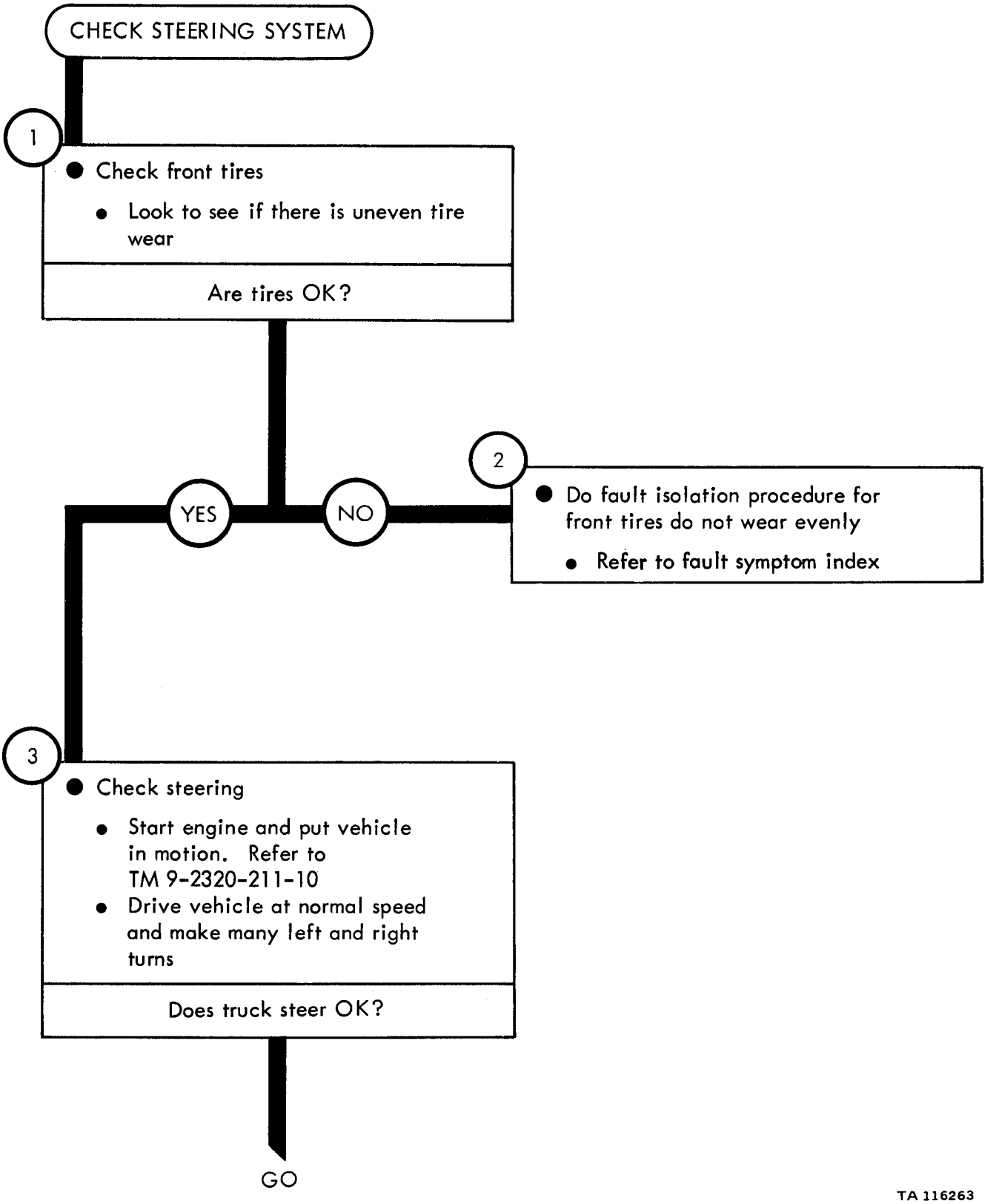
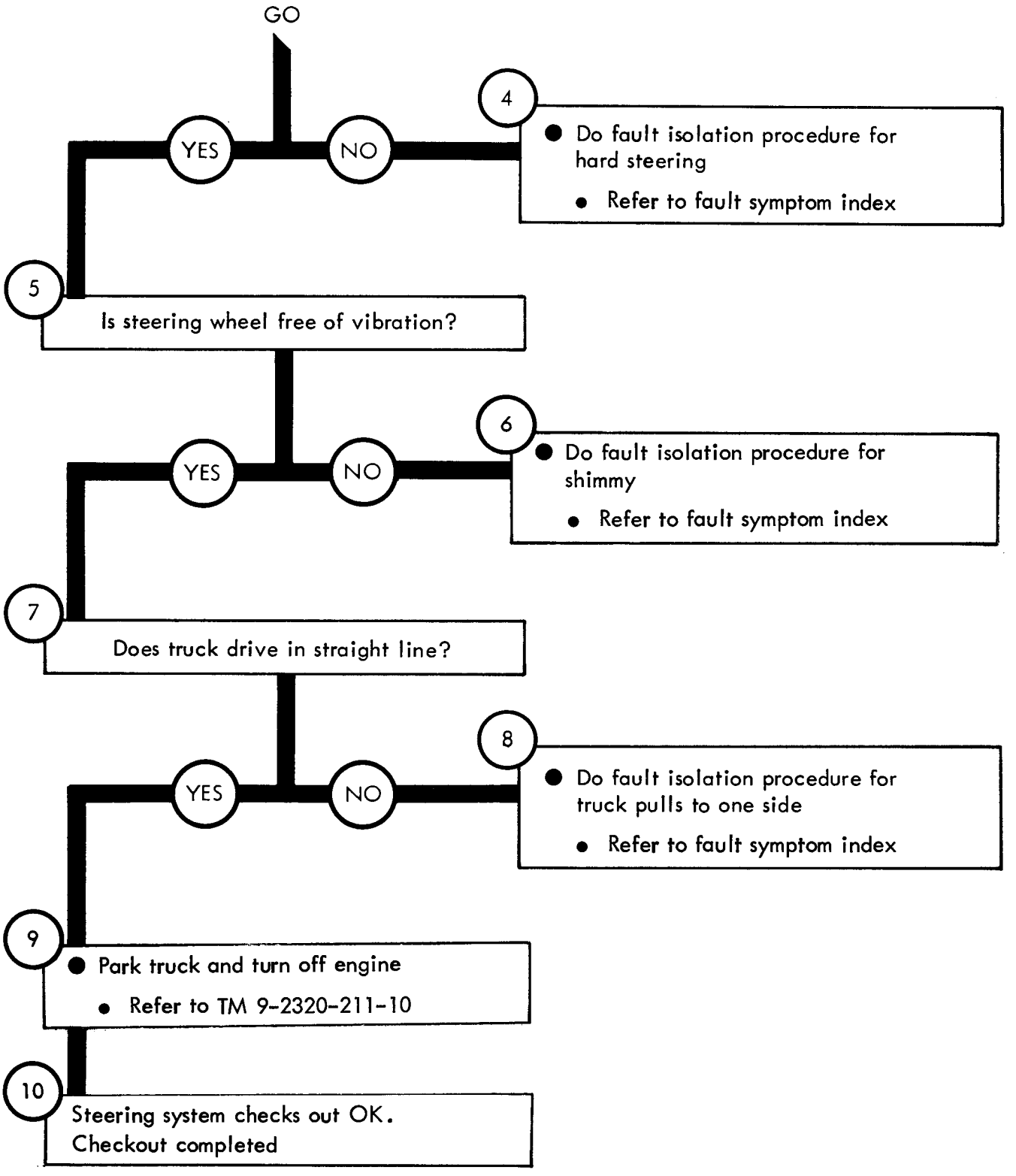



Figure 57-1 (Sheet 1 of 2)




TA 116264

Figure 57-1 (Sheet 2 of 2)

# CHAPTER 58

# SPRING AND SHOCK ABSORBER SYSTEM TROUBLESHOOTING

58-1. EQUIPMENT ITEMS COVERED. This chapter gives equipment troubleshooting procedures for the spring and shock absorber system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

58-2. EQUIPMENT ITEMS NOT COVERED. All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

SPRING AND SHOCK ABSORBER SYSTEM TROUBLESHOOTING

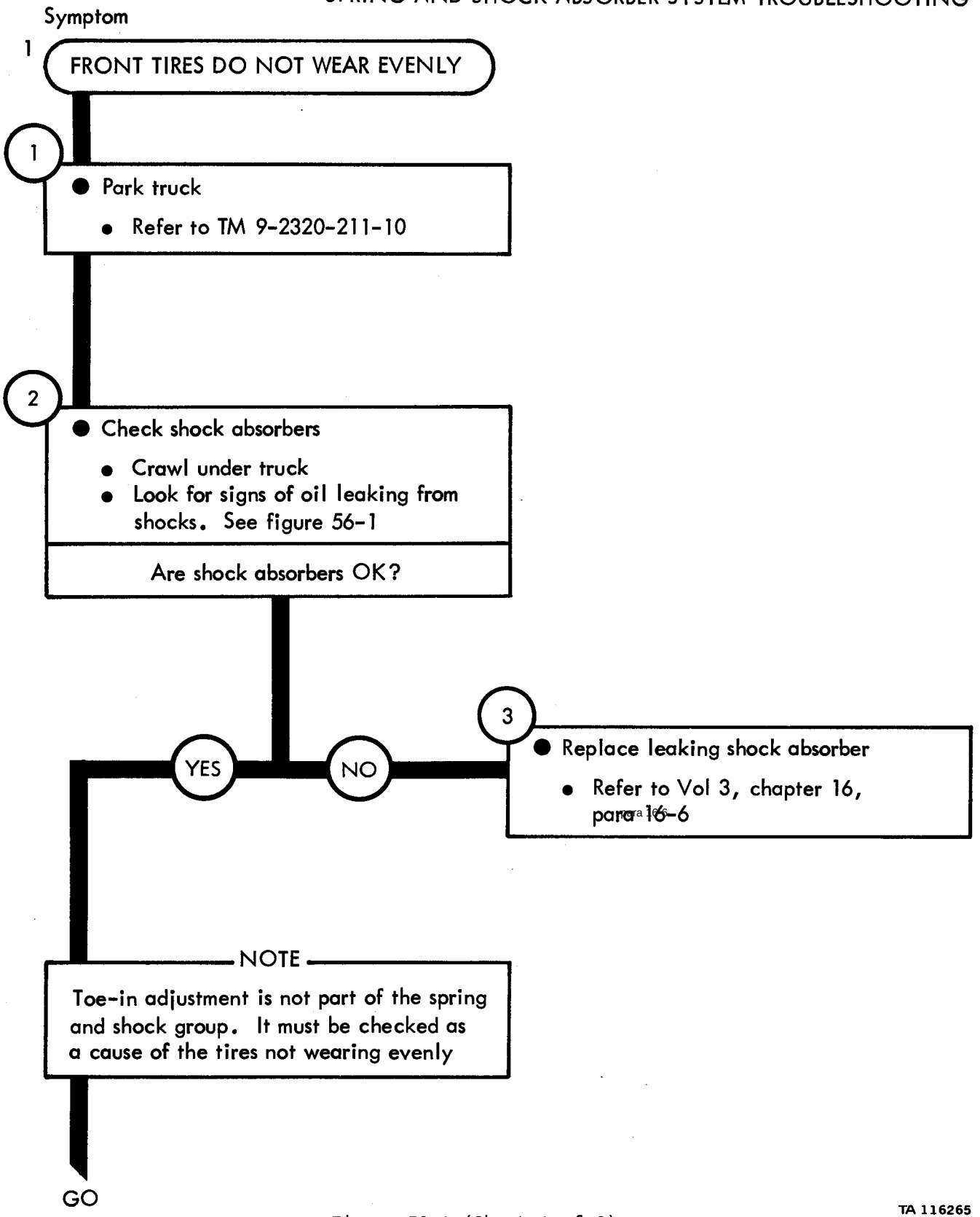
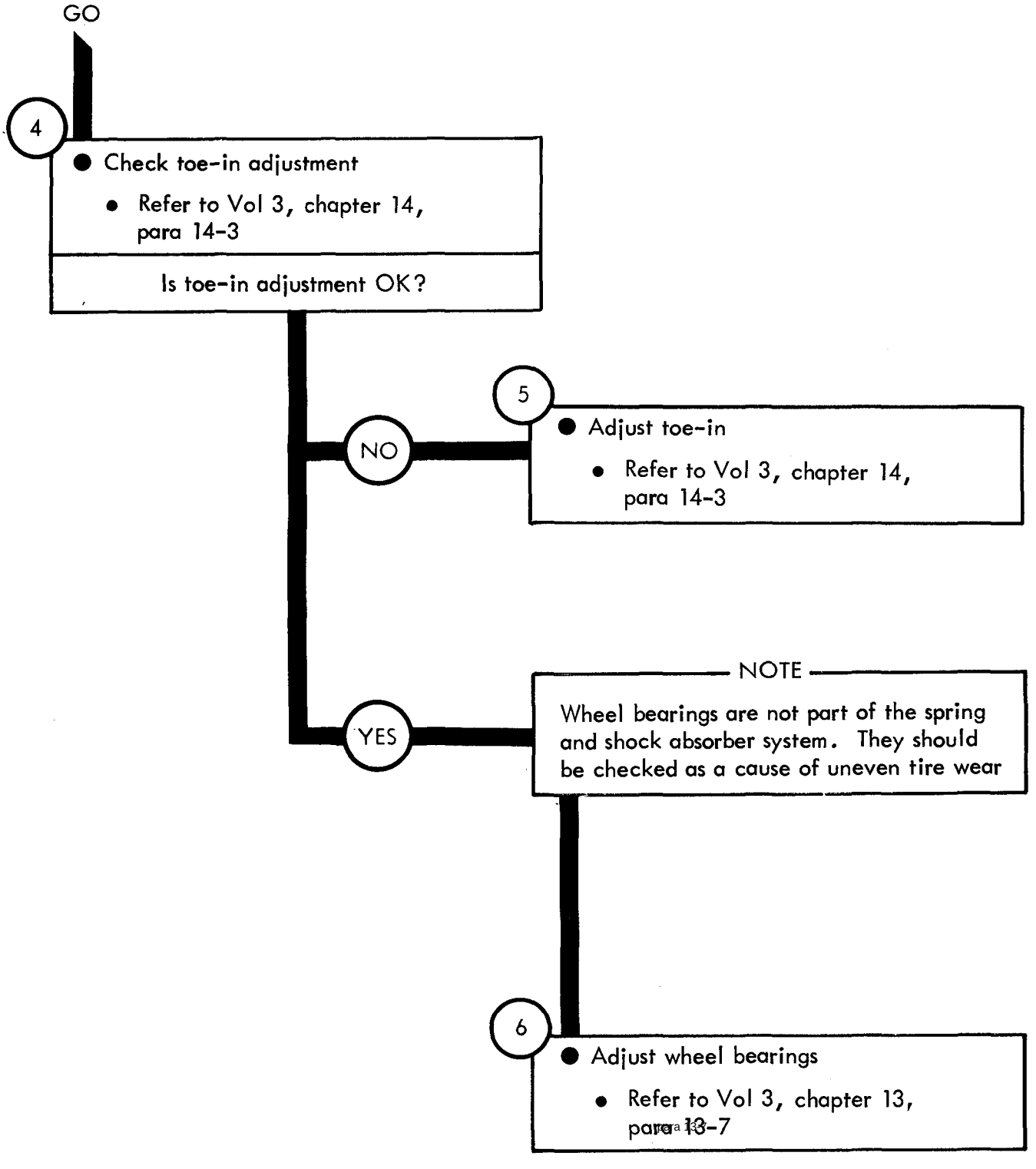



Figure 58-1 (Sheet 1 of 2)



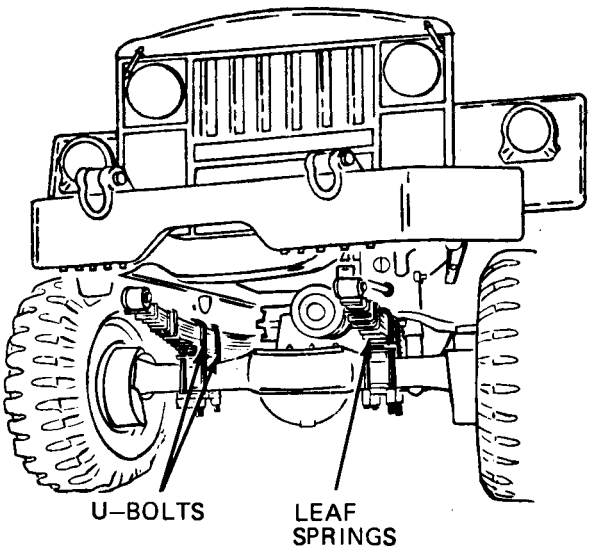

TA 116266

Figure 58-1 (Sheet 2 of 2)

Symptom

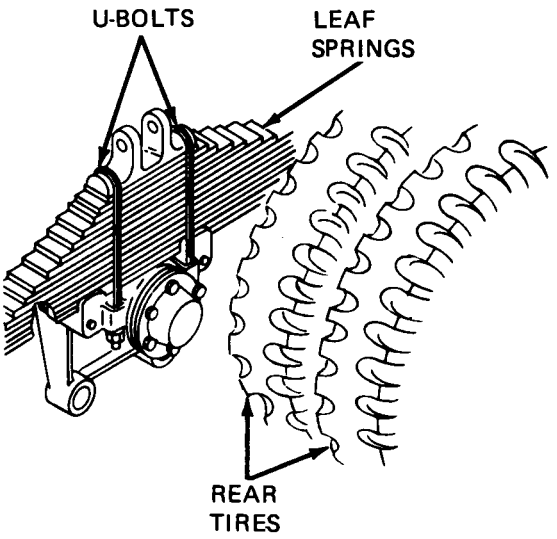
2 TRUCK LEANS TO ONE SIDE

1
- Park truck
  - Refer to TM 9-2320-211-10
  - Chock wheels




2
- Check front and rear leaf springs
  - Look for broken springs

Are springs OK?




YES → GO

NO → 3
- Replace broken leaf springs
  - Refer to Vol 3, chapter 16, para 16-3

TA 116267

Figure 58-2 (Sheet lof 2)

GO

4

- Check front and rear U-bolts
  - Look for broken U-bolts

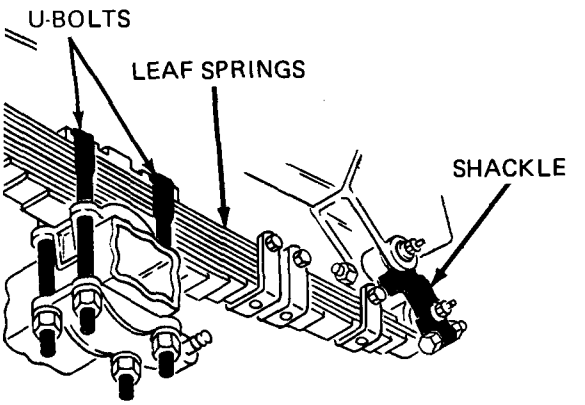
Are U-bolts OK?

YES

NO

5

- Replace broken U-bolts
  - Refer to Vol 3, chapter 16, para 16-3




6

- Check front and rear leaf spring shackles
  - Look for broken shackles

Are shackles OK?

YES

NO

7

- Replace broken shackles
  - Refer to Vol 3, chapter 15, para 15-6

8

Tell direct support maintenance

TA 116268

Figure 58-2 (Sheet 2 of 2)

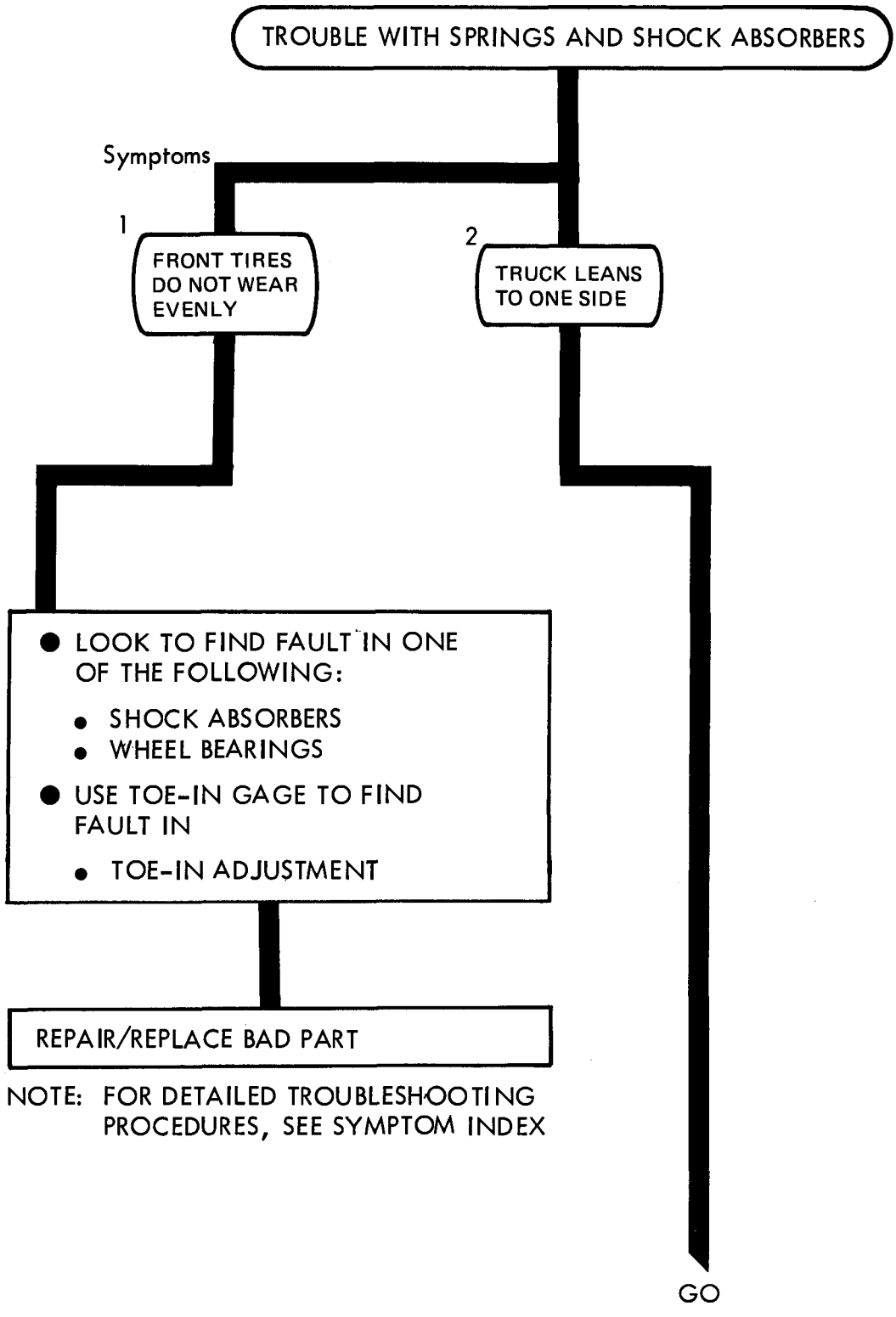
# CHAPTER 59

# SPRING AND SHOCK ABSORBER SYSTEM TROUBLESHOOTING SUMMARY

59-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 58, for the Spring and Shock Absorber System.

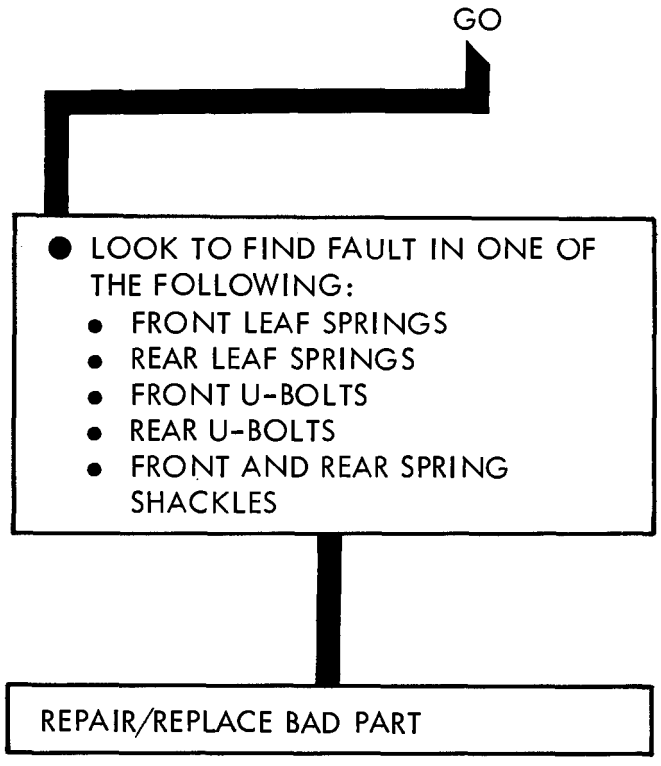
59-2. PROCEDURES. The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures in Part 1. Chapter 7 outlines a sample troubleshooting procedure. The summary procedures are based on the "what-to-do" portions of the detailed procedures and do not include the "How-to-do-it" instructions. Warnings, cautions, and notes are given where needed.

SPRING AND SHOCK ABSORBER SYSTEM TROUBLESHOOTING SUMMARY




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Figure 59-1 (Sheet 1 of 2)




NOTE: FOR DETAILED TROUBLESHOOTING PROCEDURES, SEE SYMPTOM INDEX

TA 116270

Figure 59-1 (Sheet 2 of 2)

# CHAPTER 60

# FRONT WINCH TROUBLESHOOTING

60-1. EQUIPMENT ITEMS COVERED. This chapter gives equipment troubleshooting procedures for the front winch system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

60-2. EQUIPMENT ITEMS NOT COVERED. All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

## FRONT WINCH TROUBLESHOOTING

Symptom

1 WINCH DOES NOT PULL LOAD

1

- Make truck ready for work on front winch
  - Turn off winch. Refer to TM 9-2320-211-10
  - Turn off engine. Refer to TM 9-2320-211-10
  - Chock wheels

2

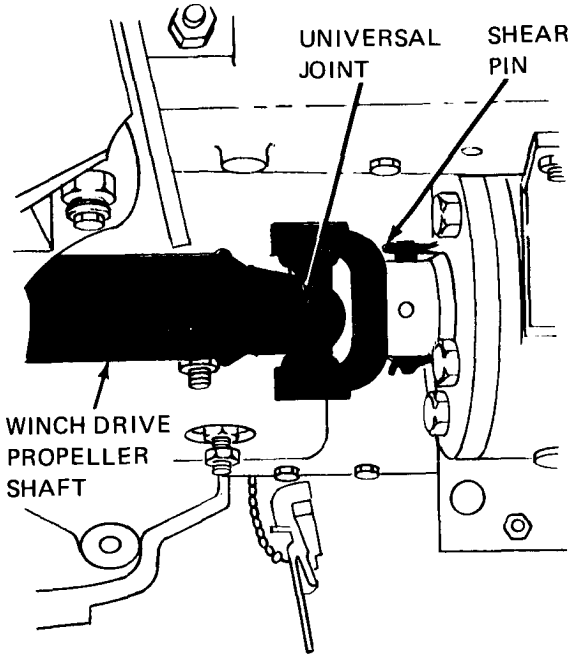
- Check universal joint and shear pin
  - Look for broken universal joint on power takeoff to winch propeller shaft. See figure 39-1 or 39-2
  - Look for a broken shear pin on power divider to rear winch propeller shaft

Are universal joint and shear pin OK?

YES — GO

NO — 3

- Replace broken universal joint on power takeoff to winch propeller shaft
  - Refer to Vol 3, chapter 10, para 10-11
- Replace broken shear pin
  - Refer to Vol 3, chapter 10, para 10-11




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Figure 60-1 (Sheet 1 of 3)

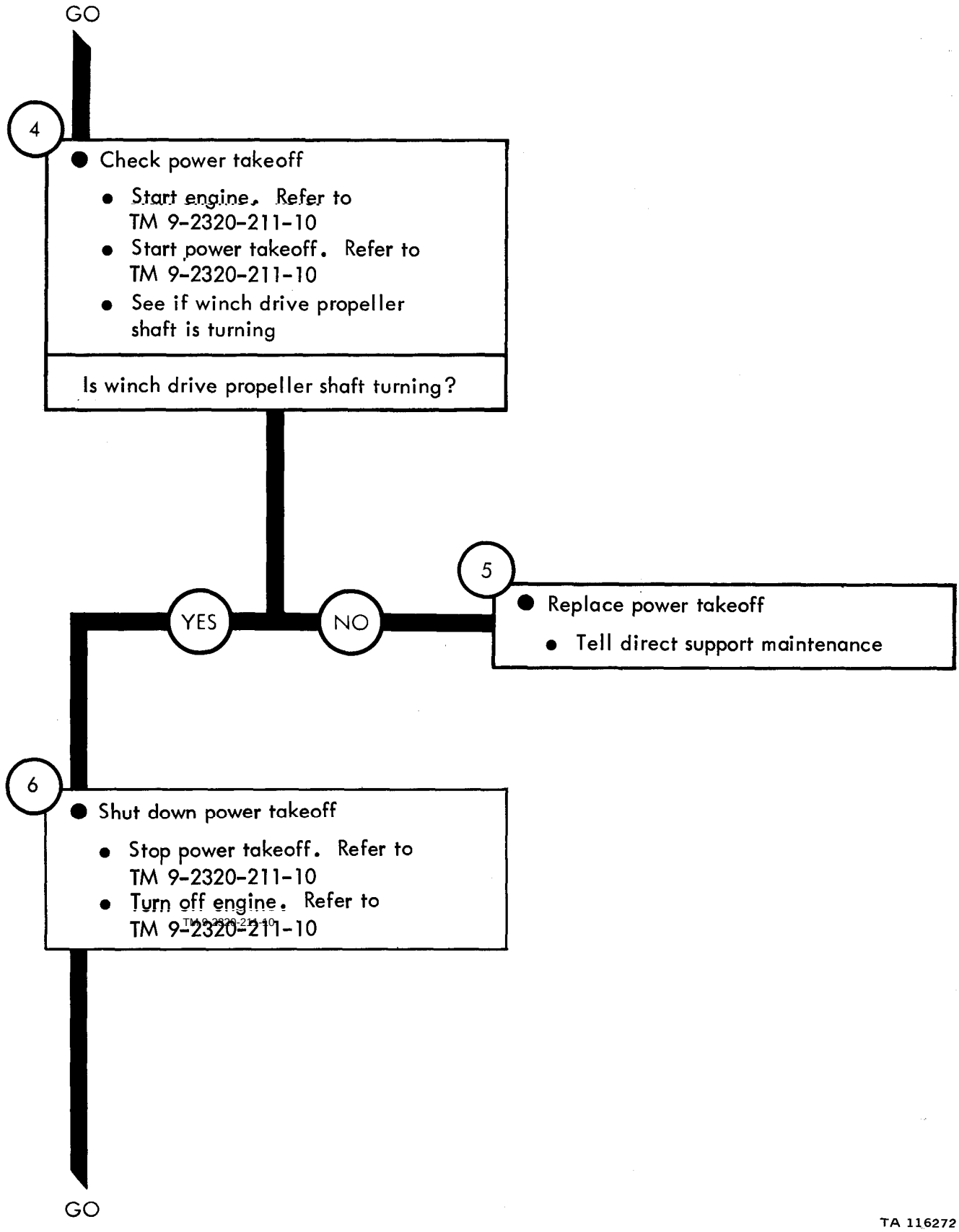



Figure 60-1 (Sheet 2 of 3)

GO

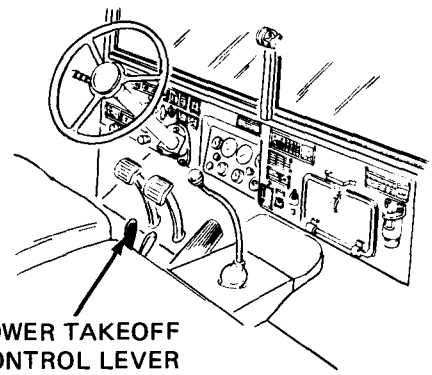
NOTE

The power takeoff control linkage is not part of the front winch. It should be checked when the winch will not pull a load

7

- Check power takeoff control linkage adjustment
  - Engage power takeoff control lever
  - Check that position of shifting arm is all the way
  - Check position of power takeoff control rod front yoke

Is power takeoff control linkage adjustment OK?




YES

NO

8

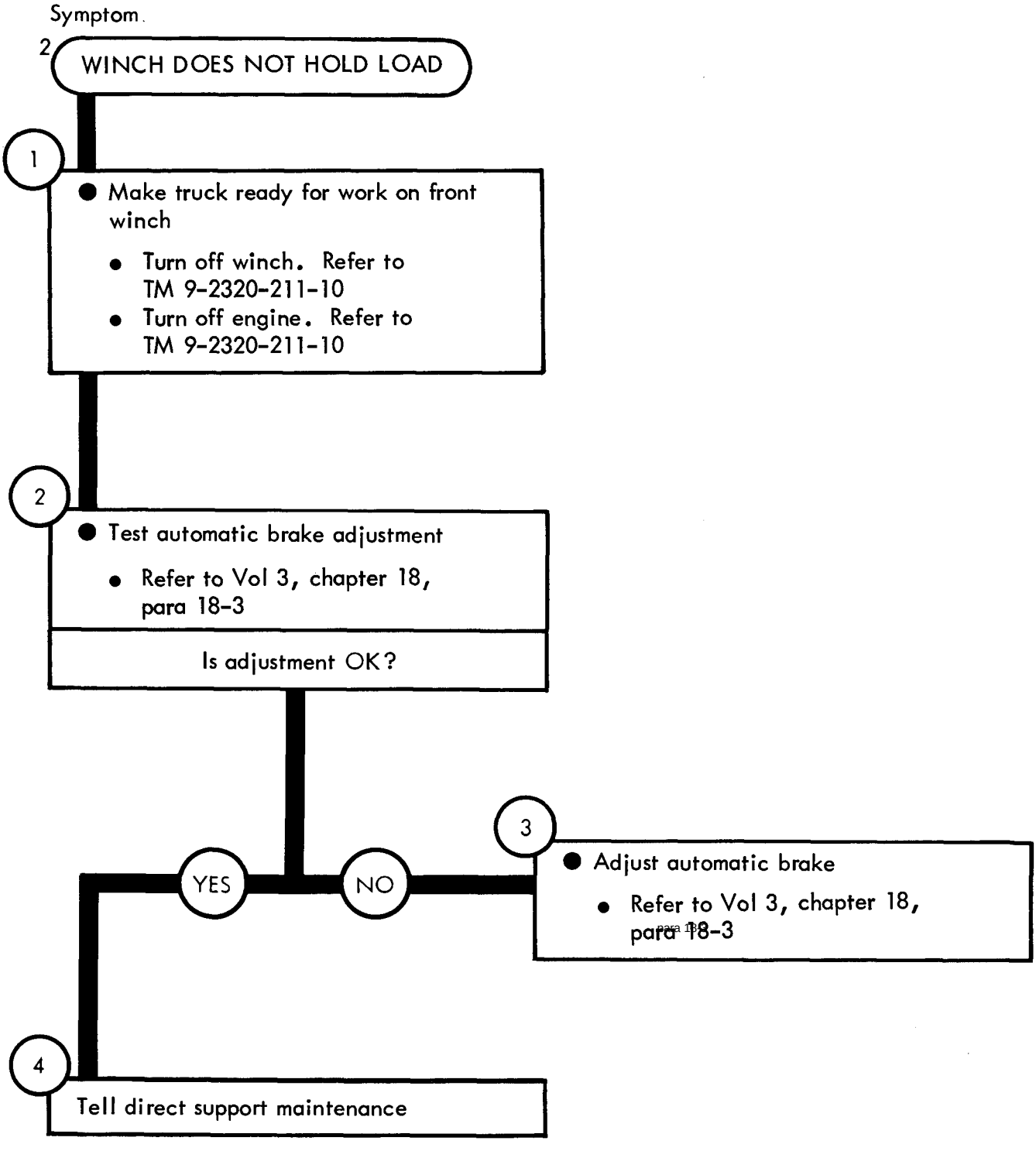
- Adjust power takeoff control linkage
  - Tell direct support maintenance

9

Tell direct support maintenance

TA 116273

Figure 60-1 (Sheet 3 of 3)




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Figure 60-2

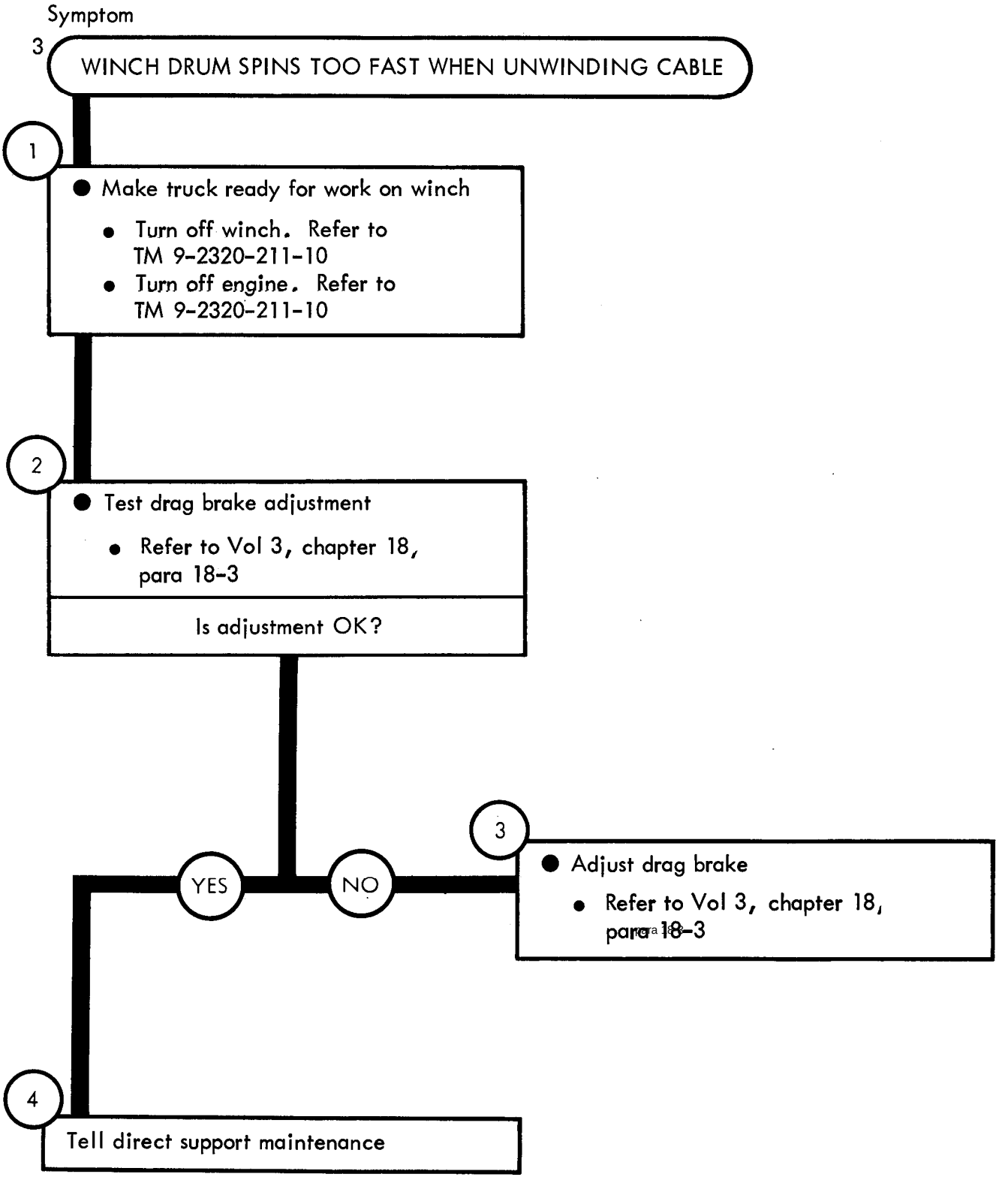

Symptom
3
WINCH DRUM SPINS TOO FAST WHEN UNWINDING CABLE
1
● Make truck ready for work on winch
• Turn off winch. Refer to TM 9-2320-211-10
• Turn off engine. Refer to TM 9-2320-211-10
2
● Test drag brake adjustment
• Refer to Vol 3, chapter 18, para 18-3
Is adjustment OK?
YES
NO
3
● Adjust drag brake
• Refer to Vol 3, chapter 18, para 18-3
4
Tell direct support maintenance
TA 116275

Figure 60-3

# CHAPTER 61

# FRONT WINCH TROUBLESHOOTING SUMMARY

61-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 60, for the Front Winch System.

61-2. PROCEDURES. The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures in Part 1.Chapter 7 outlines a sample troubleshooting procedure. The summary procedures are based on the "what-to-do" portions of the detailed procedures and do not include the "How-to-do-it" instructions. Warnings, cautions, and notes are given where needed.

FRONT WINCH TROUBLESHOOTING SUMMARY

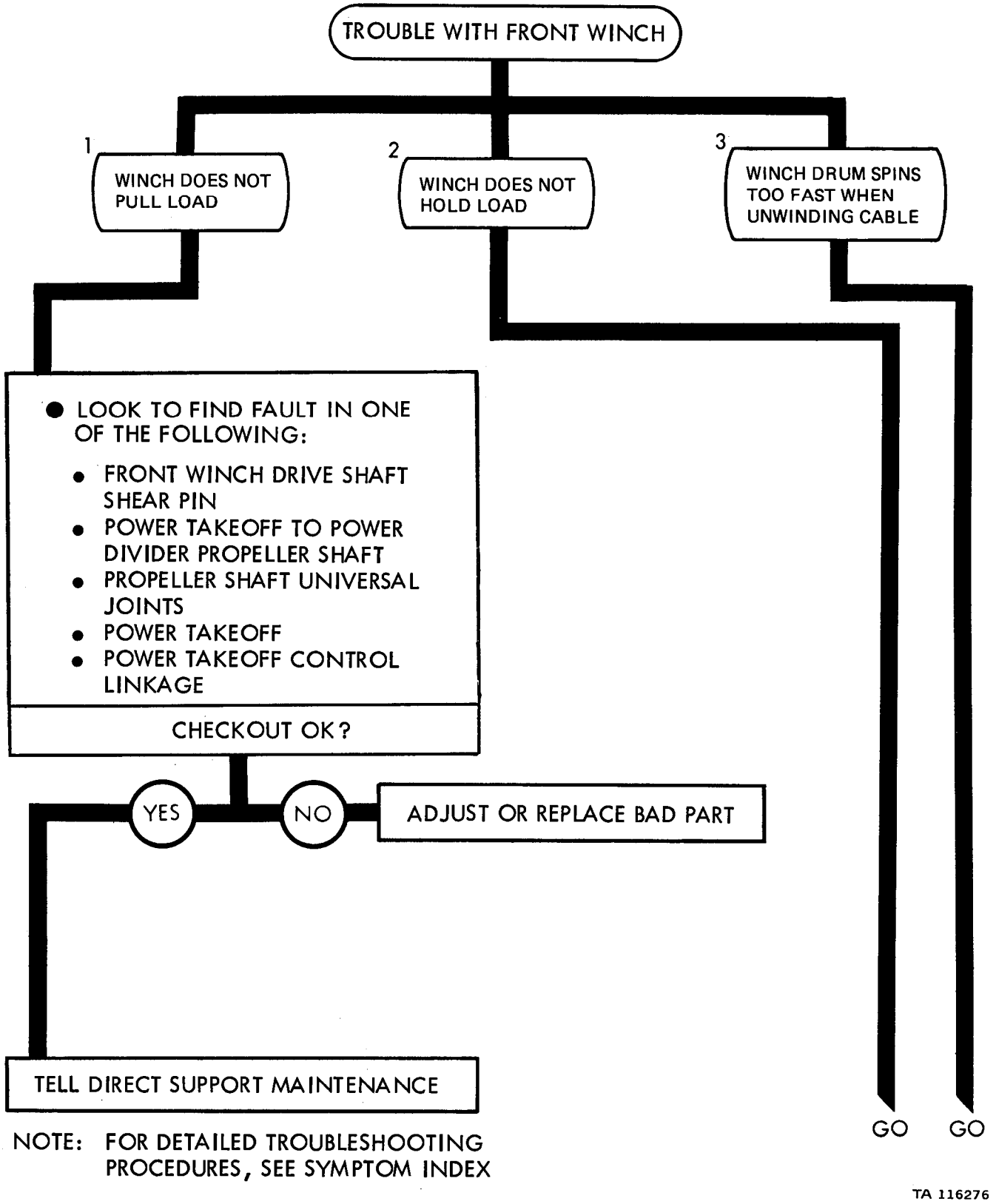
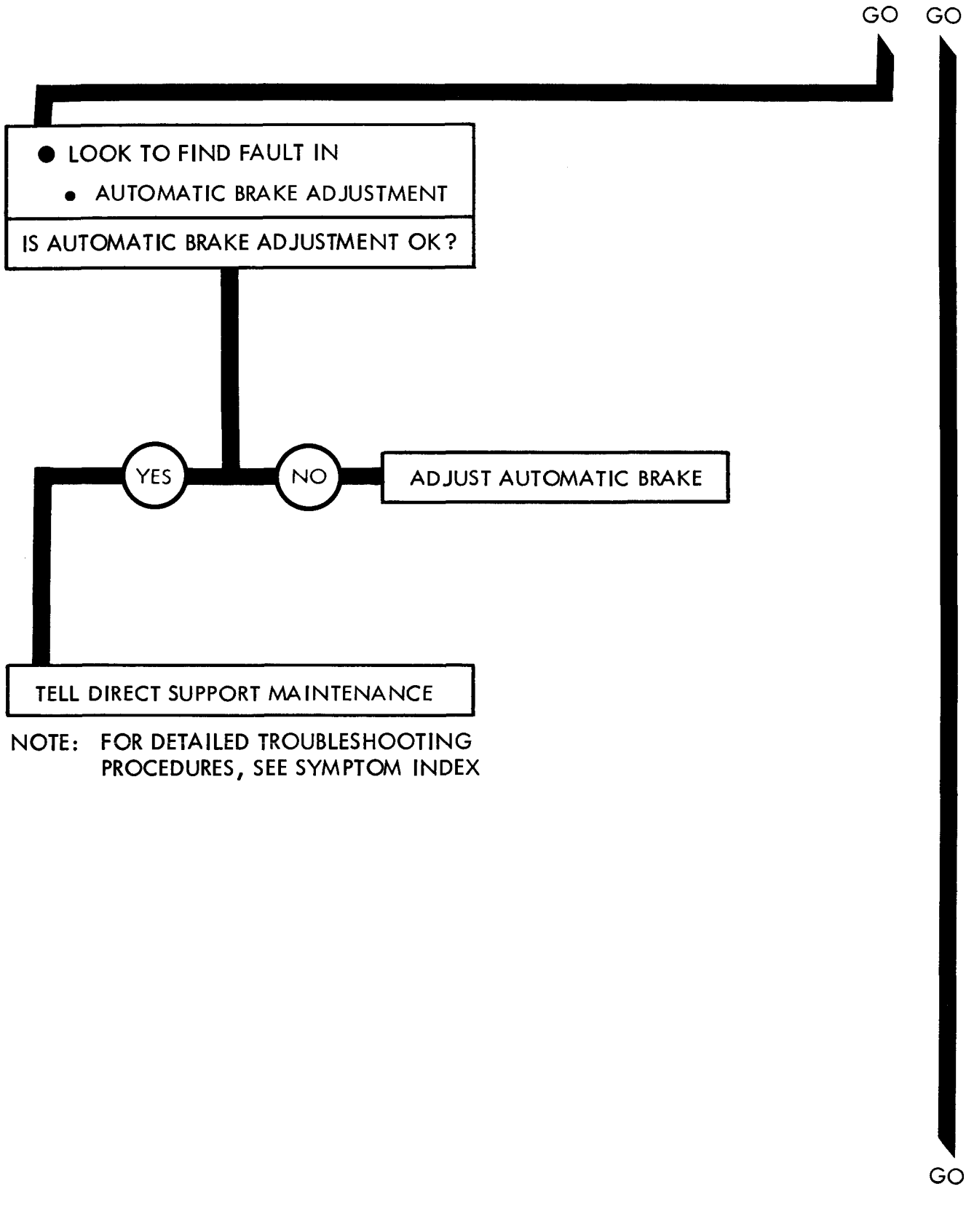
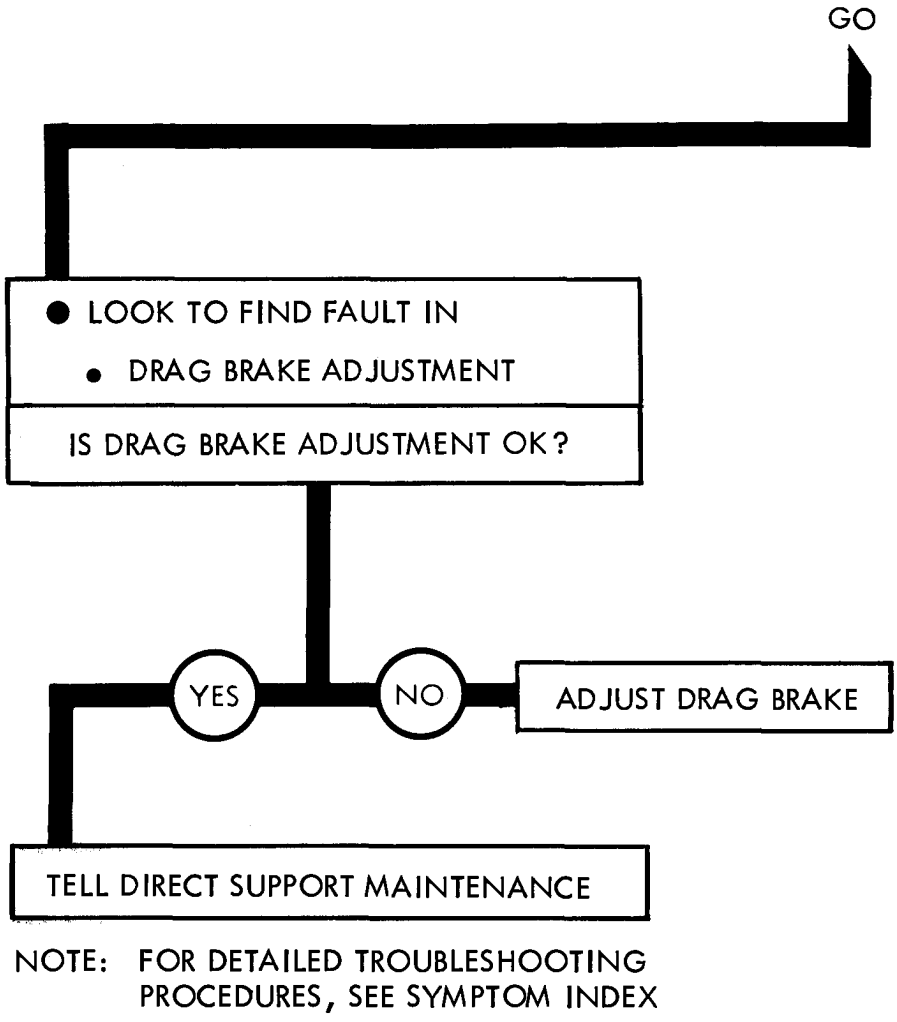



Figure 61-1 (Sheet 1 of 3)




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Figure 61-1 (Sheet 2 of 3)




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Figure 61-1 (Sheet 3 of 3)

# CHAPTER 62

# FRONT WINCH CHECKOUT PROCEDURES

62-1. GENERAL. This chapter gives procedures for checking out the system after troubleshooting and repair have been done. Procedures are set up in flow chart form showing the checkout steps in order and referring to the fault symptom index when the system does not checkout.

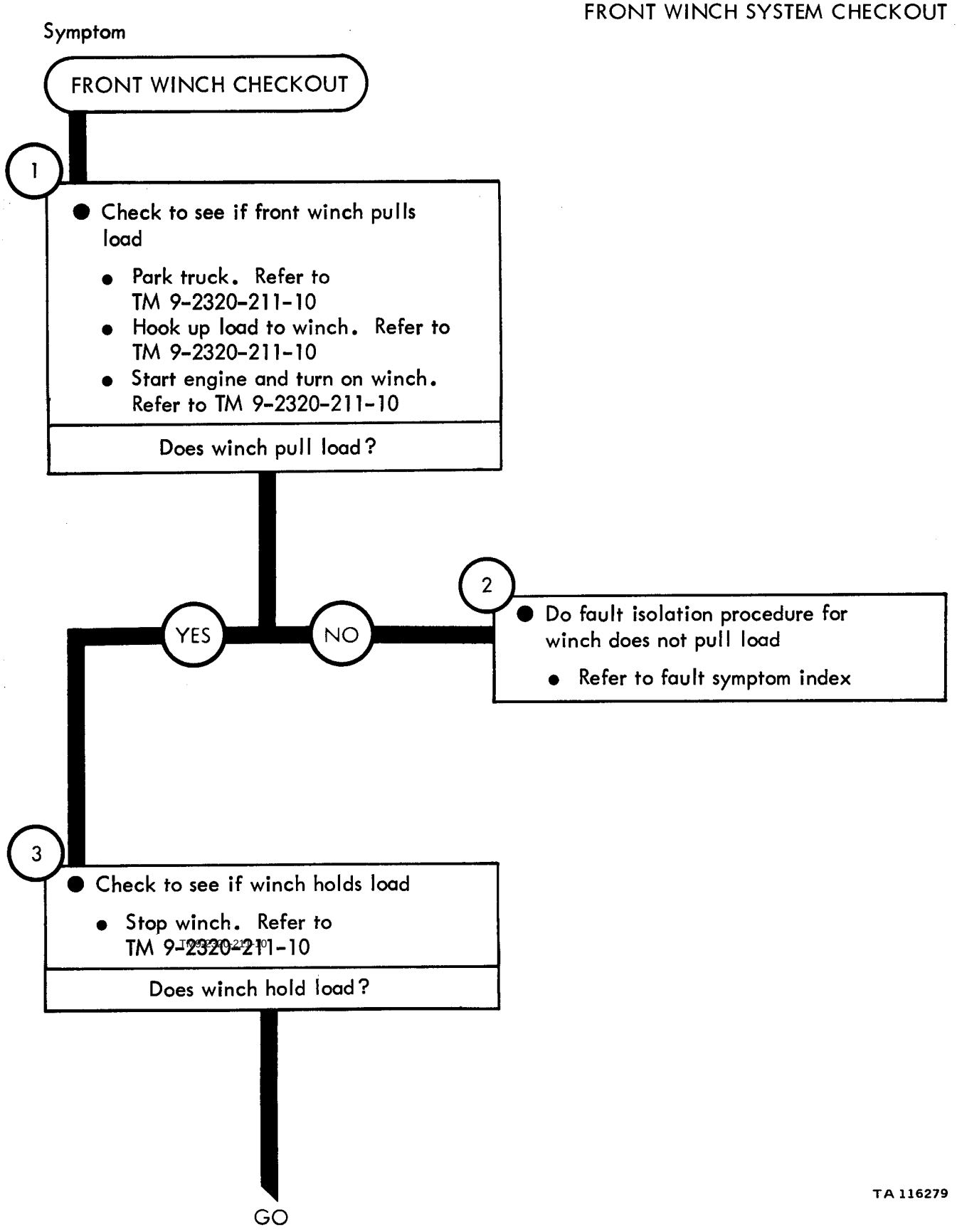
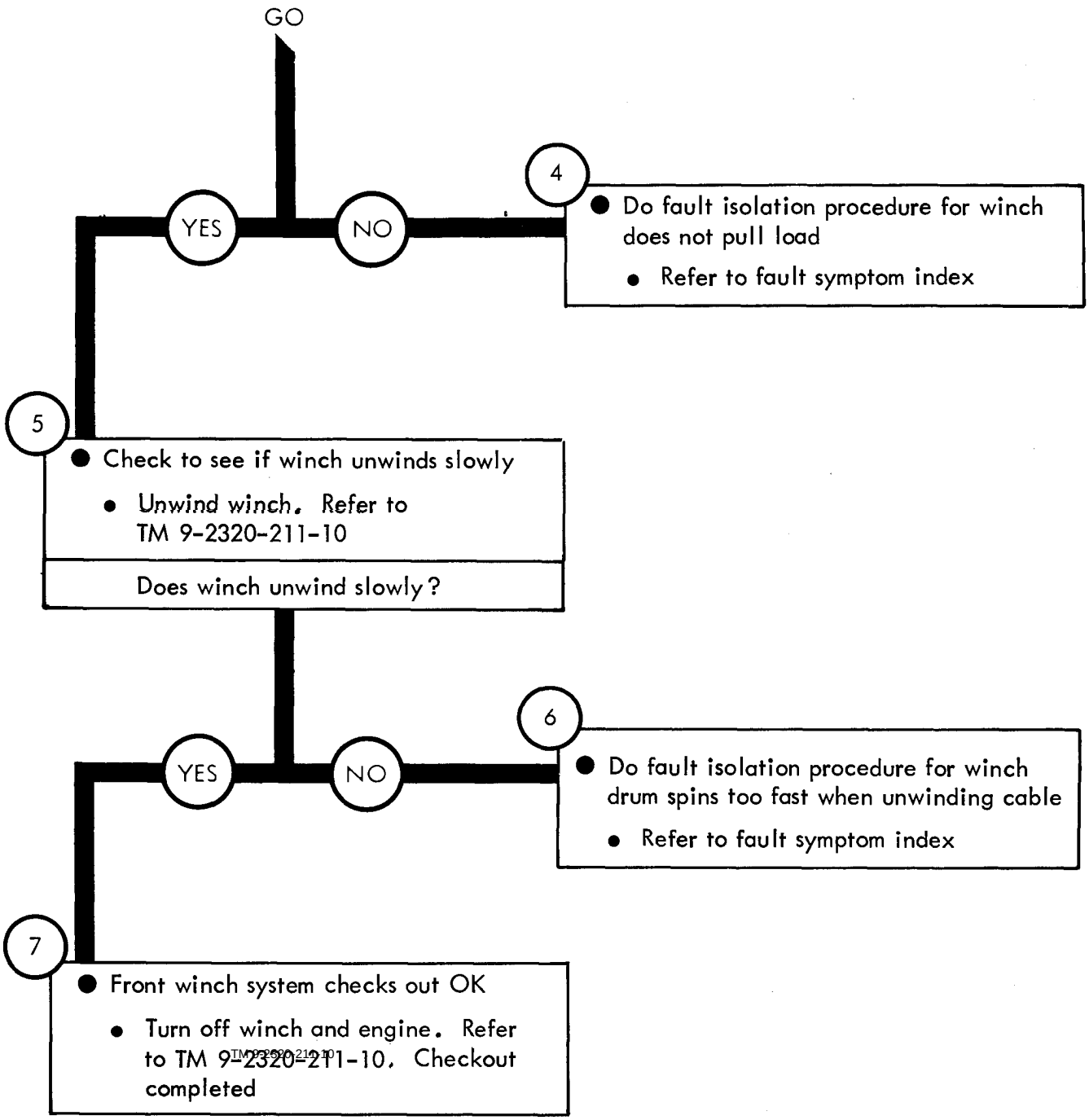



Figure 62-1 (Sheet lof 2)




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Figure 62-1 (Sheet 2 of 2)

# CHAPTER 63

# DUMP BODY AND HOIST SYSTEM TROUBLESHOOTING

63-1. EQUIPMENT ITEMS COVERED. This chapter gives equipment troubleshooting procedures for the dump body and hoist system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

63-2. EQUIPMENT ITEMS NOT COVERED. All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

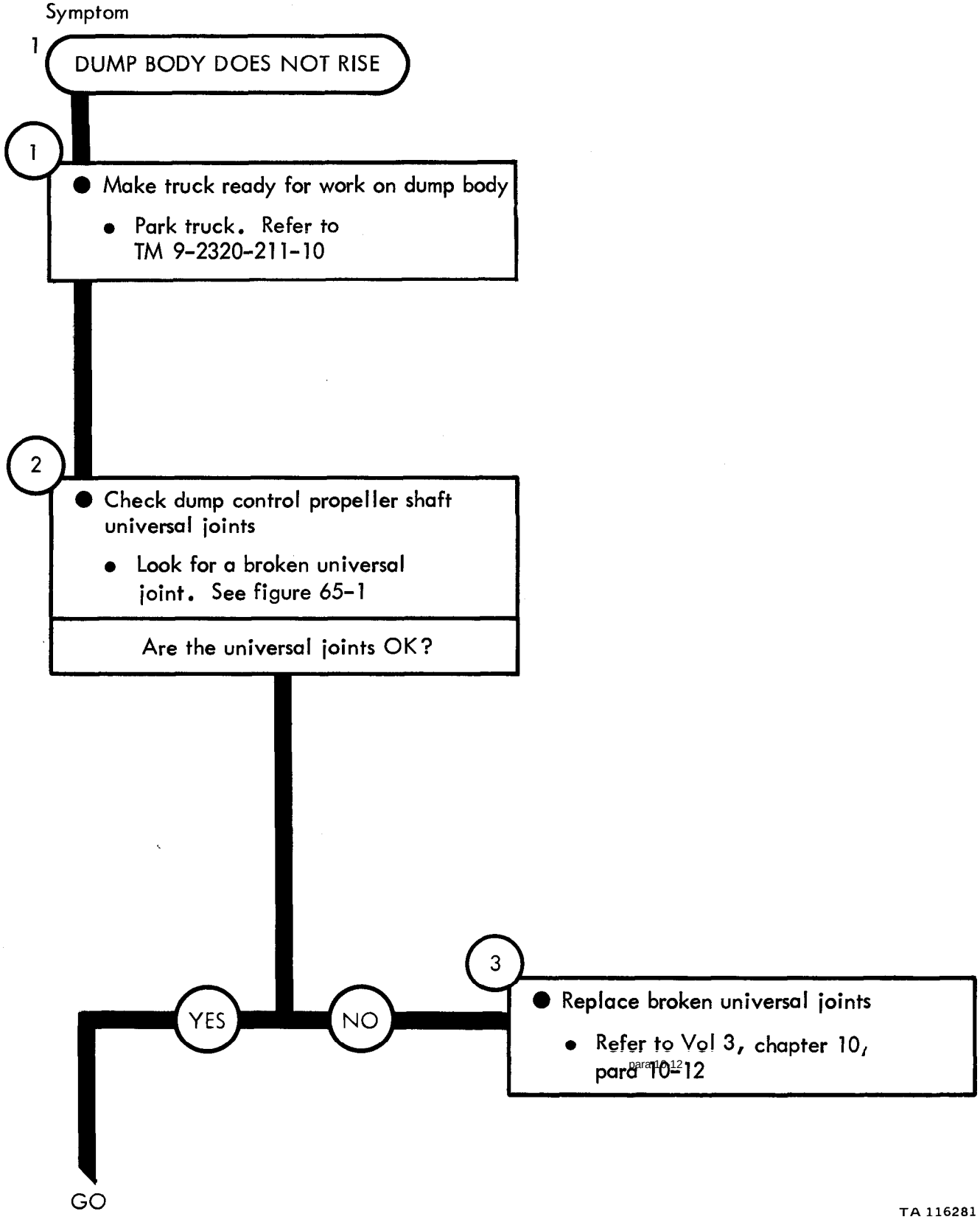
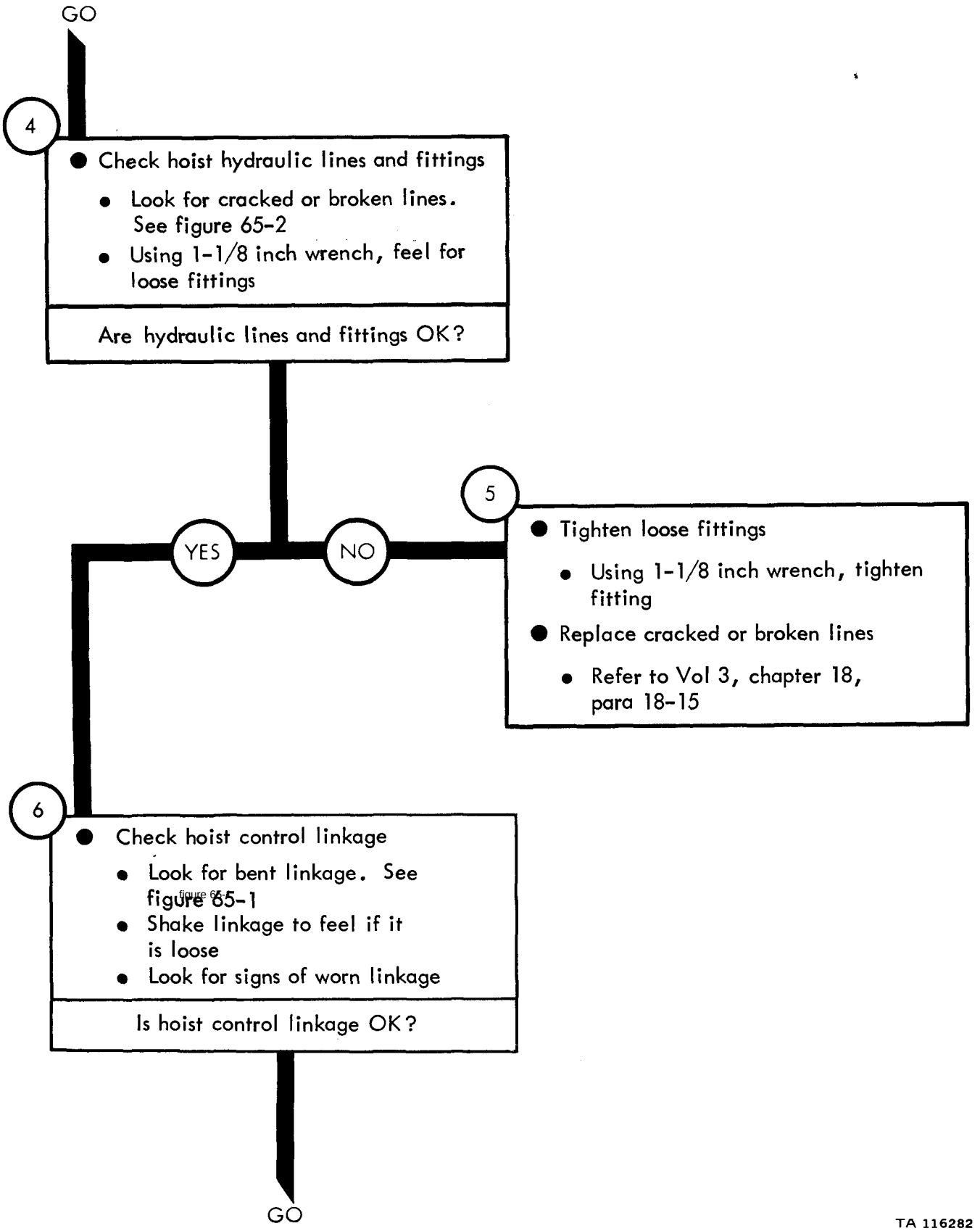



Figure 63-1 (Sheet 1 of 4)




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Figure 63-1 (Sheet 2 of 4)

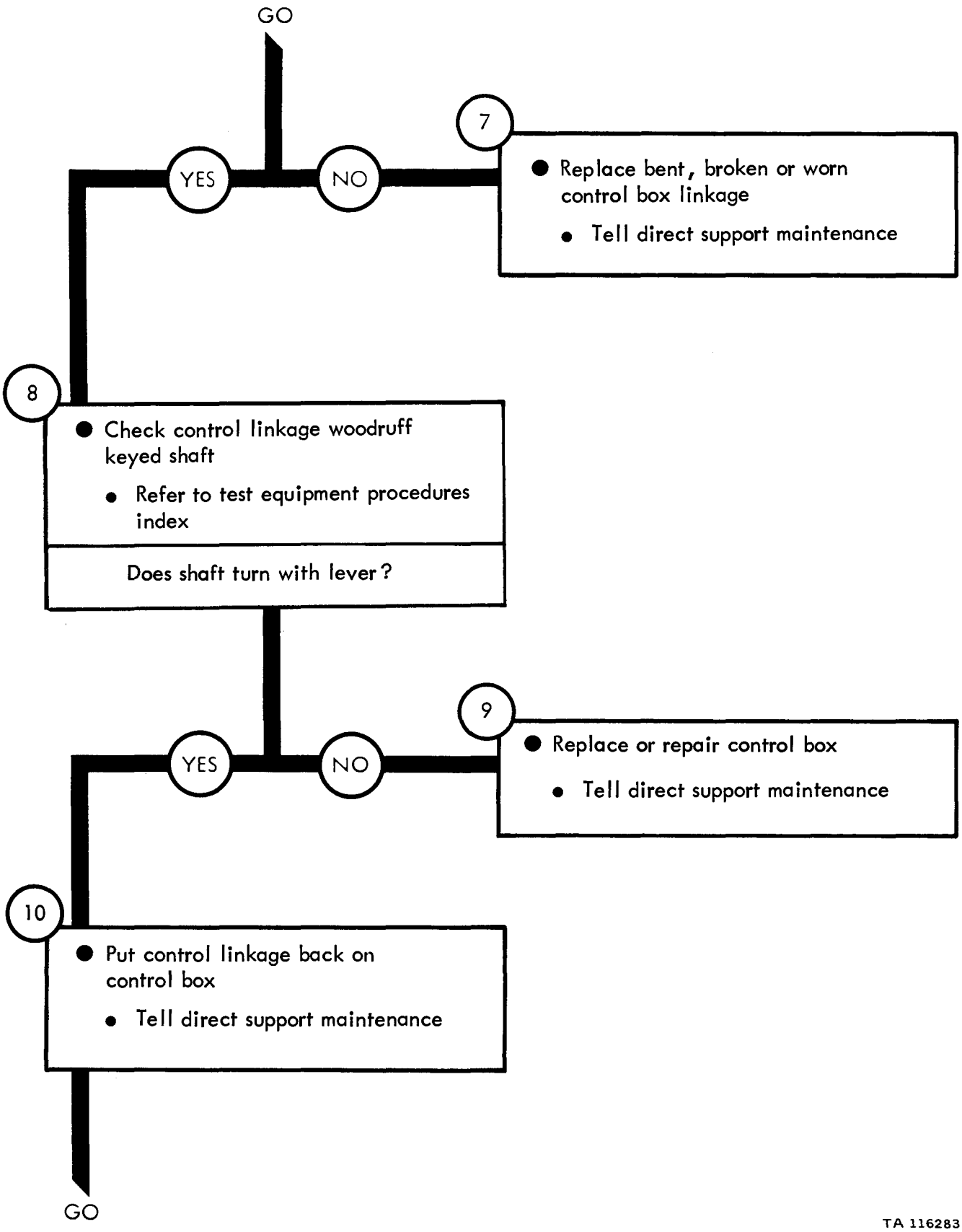
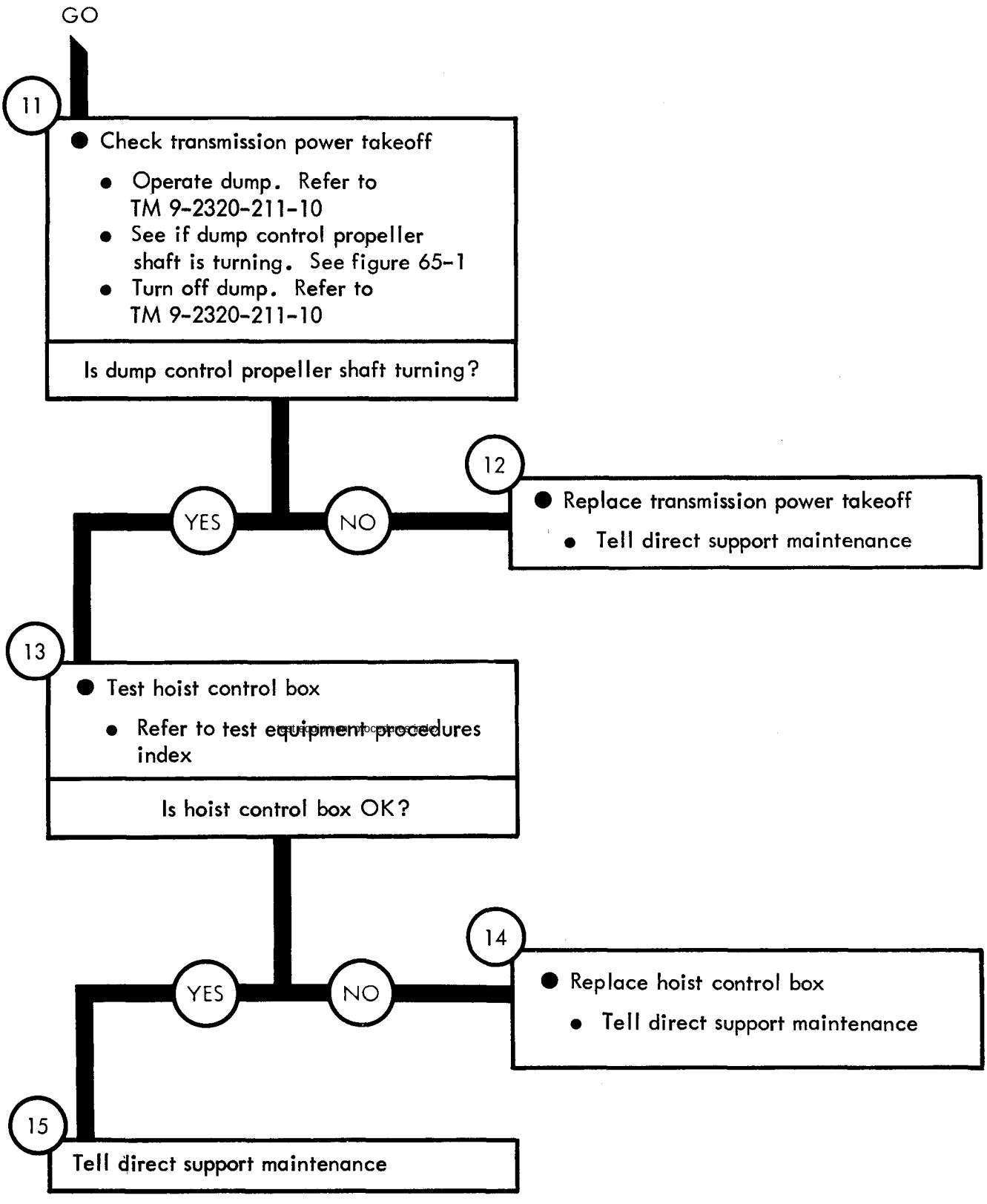



Figure 63-1 (Sheet 3 of 4)




TA 116284

Figure 63-1 (Sheet 4 of 4)

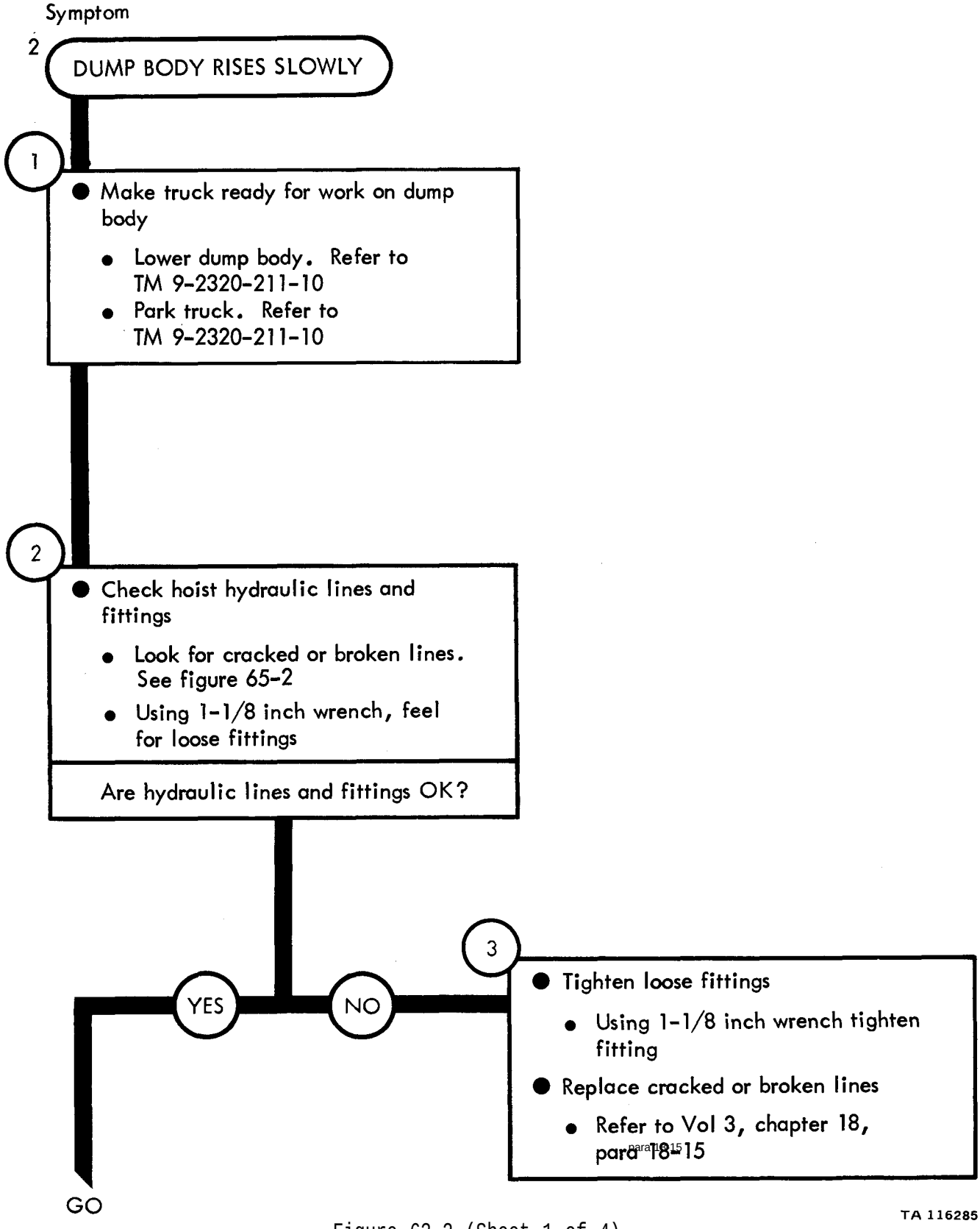
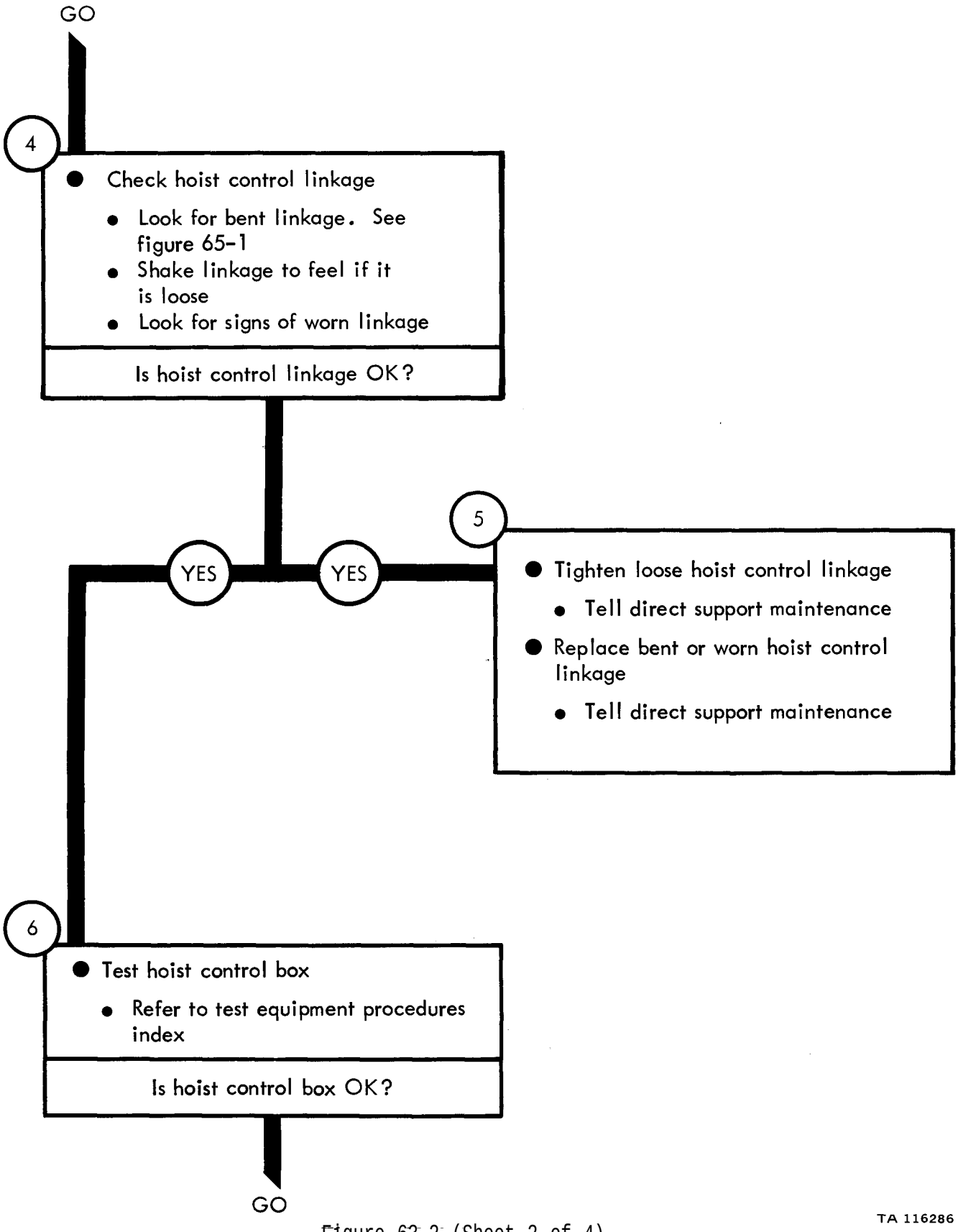



Figure 63-2 (Sheet 1 of 4)




TA 116286

Figure 63-2 (Sheet 2 of 4)

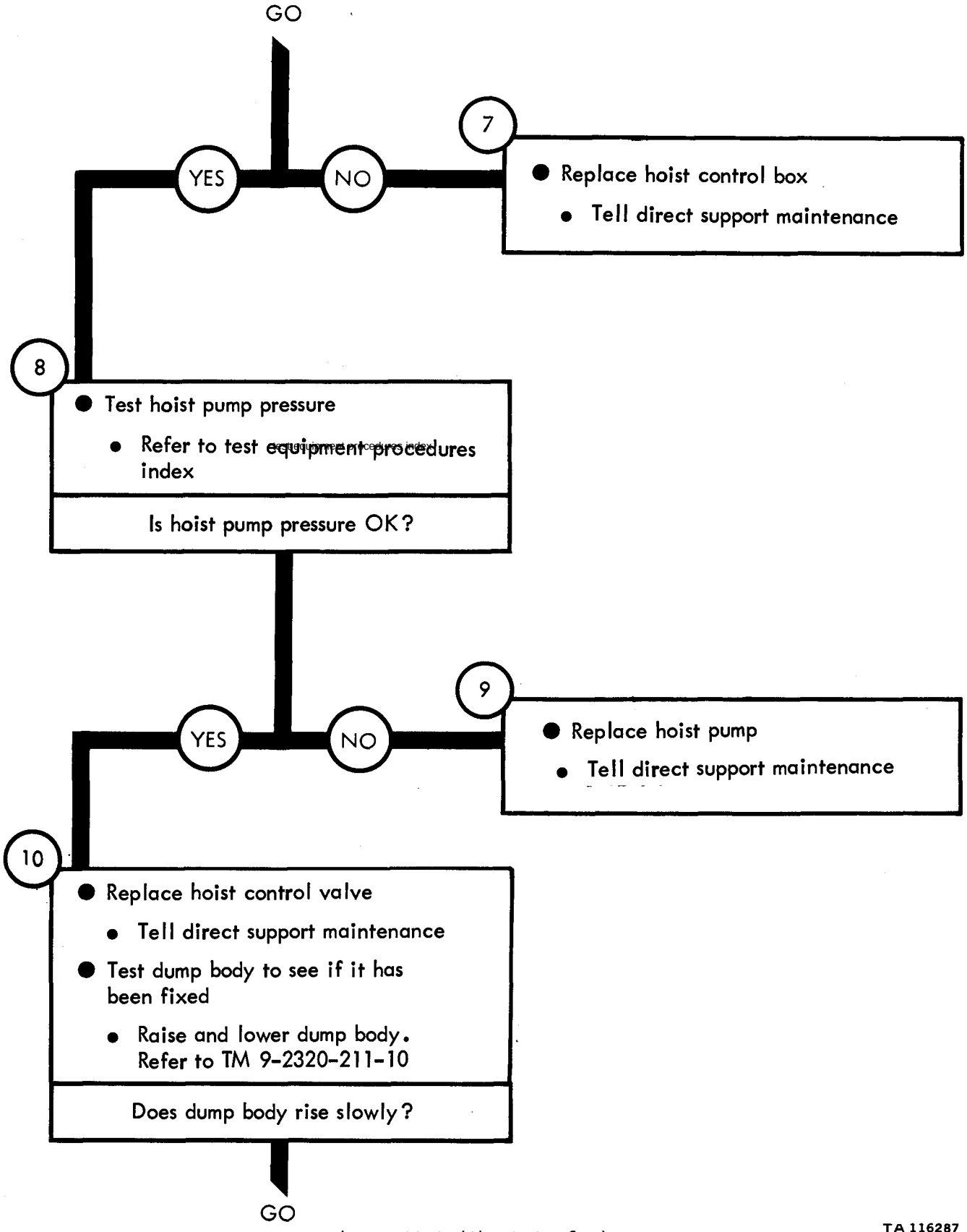
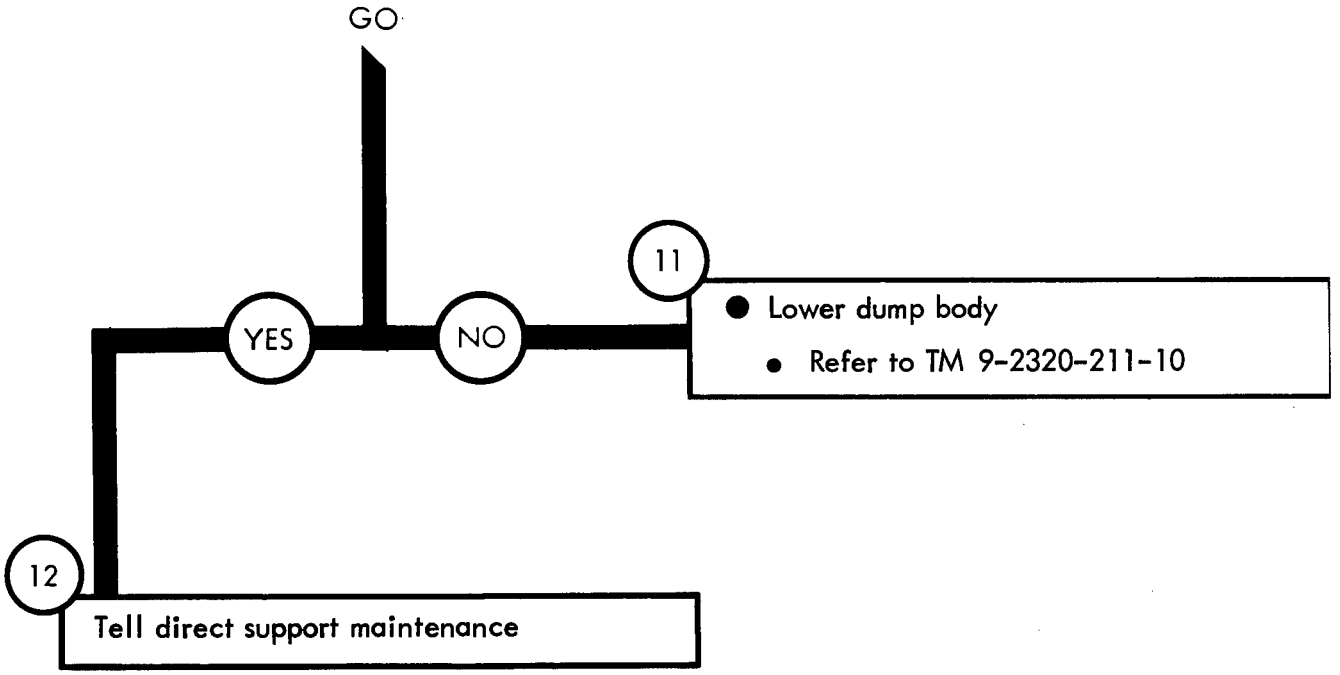



Figure 63-2 (Sheet 3 of 4)




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Figure 63-2 (Sheet 4 of 4)

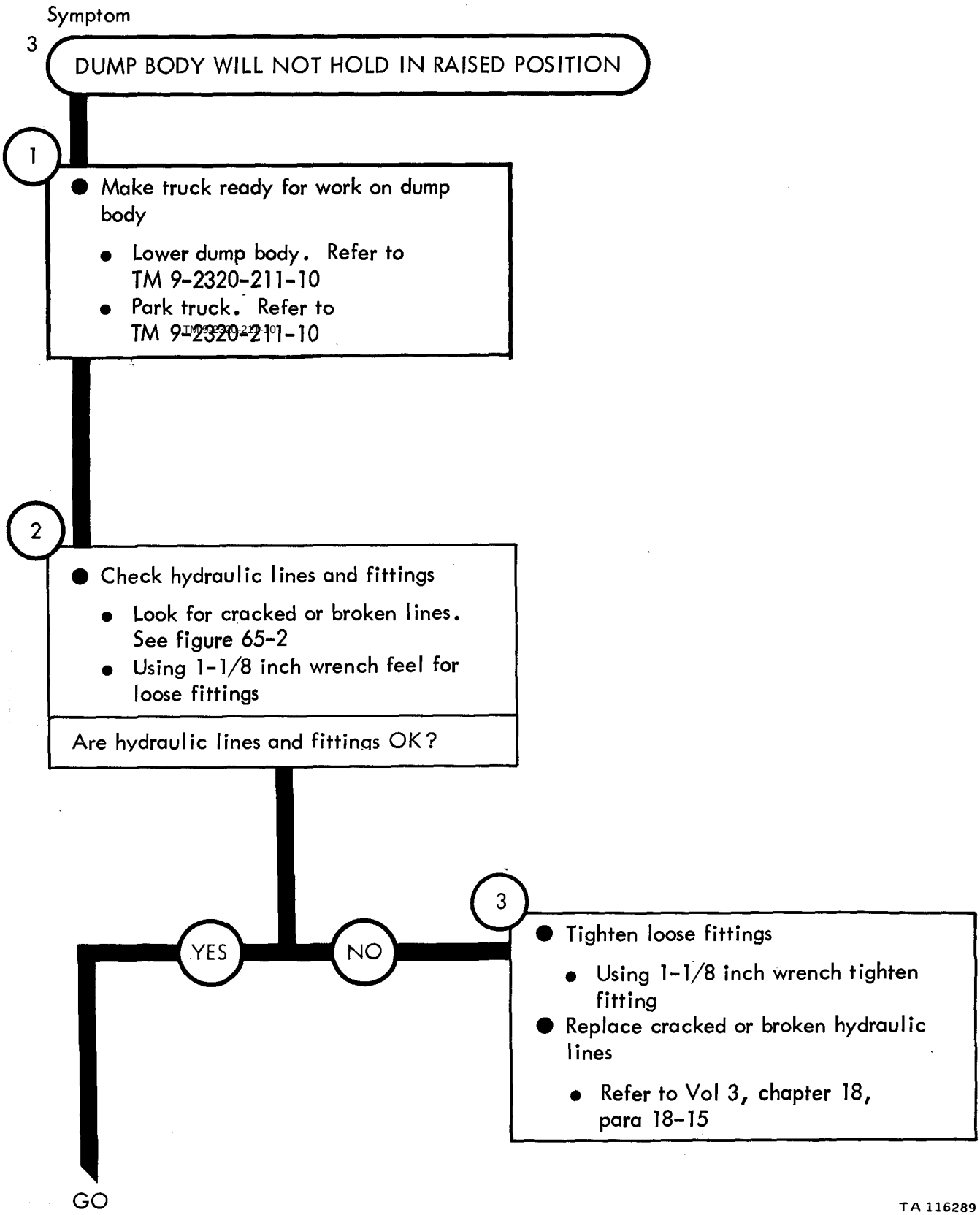
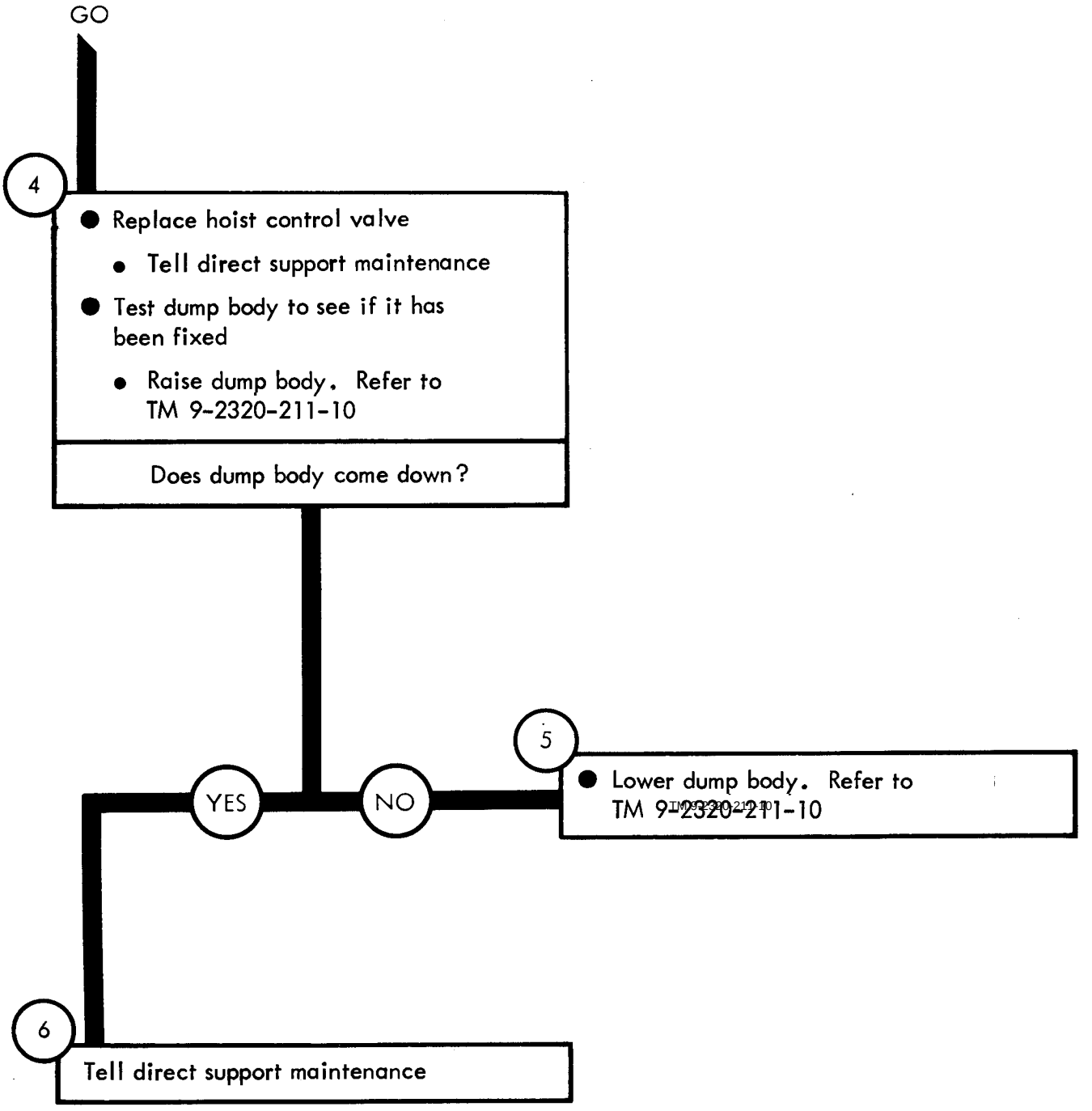



Figure 63-3 (Sheet 1 of 2)




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Figure 63-3 (Sheet 2 of 2)

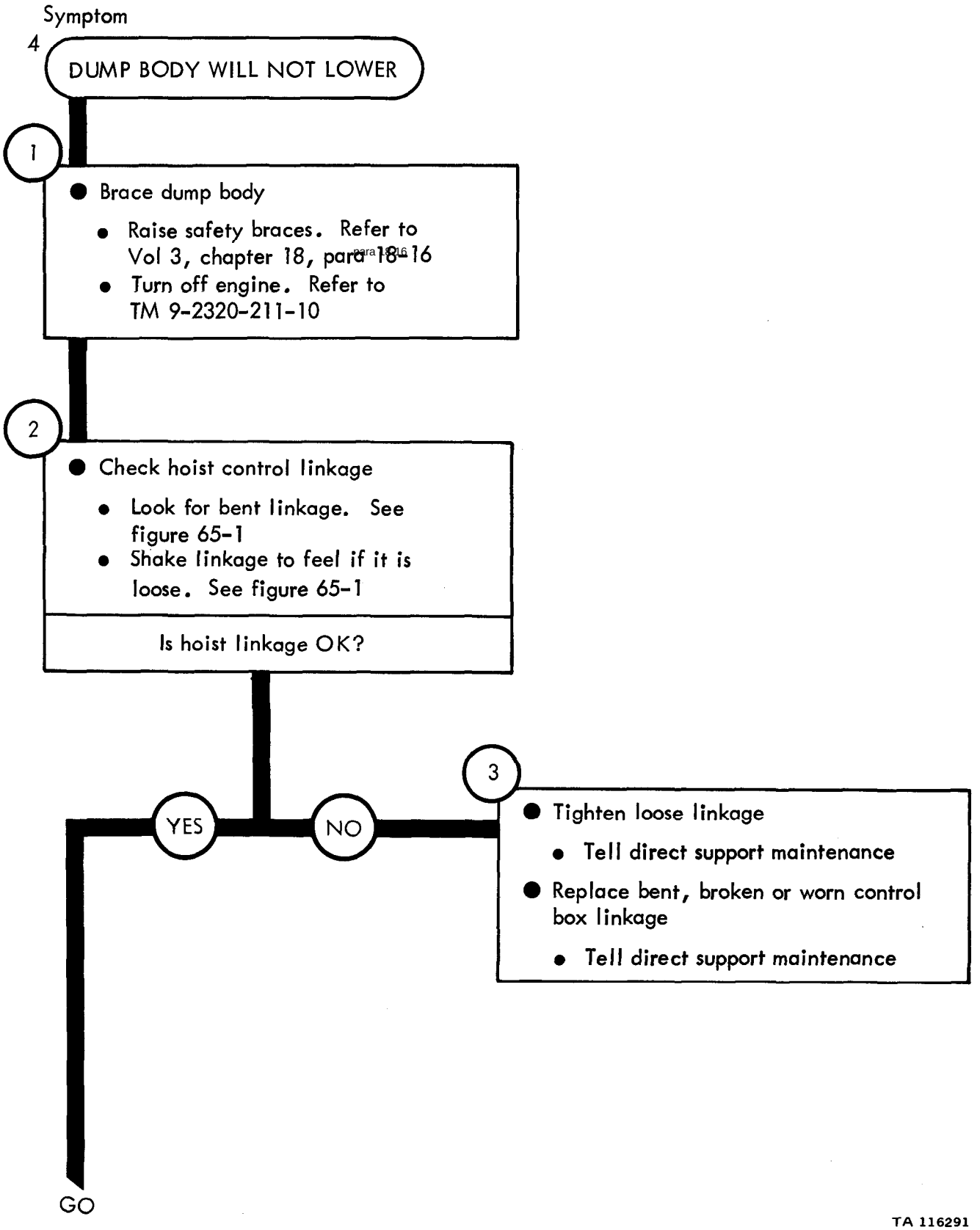
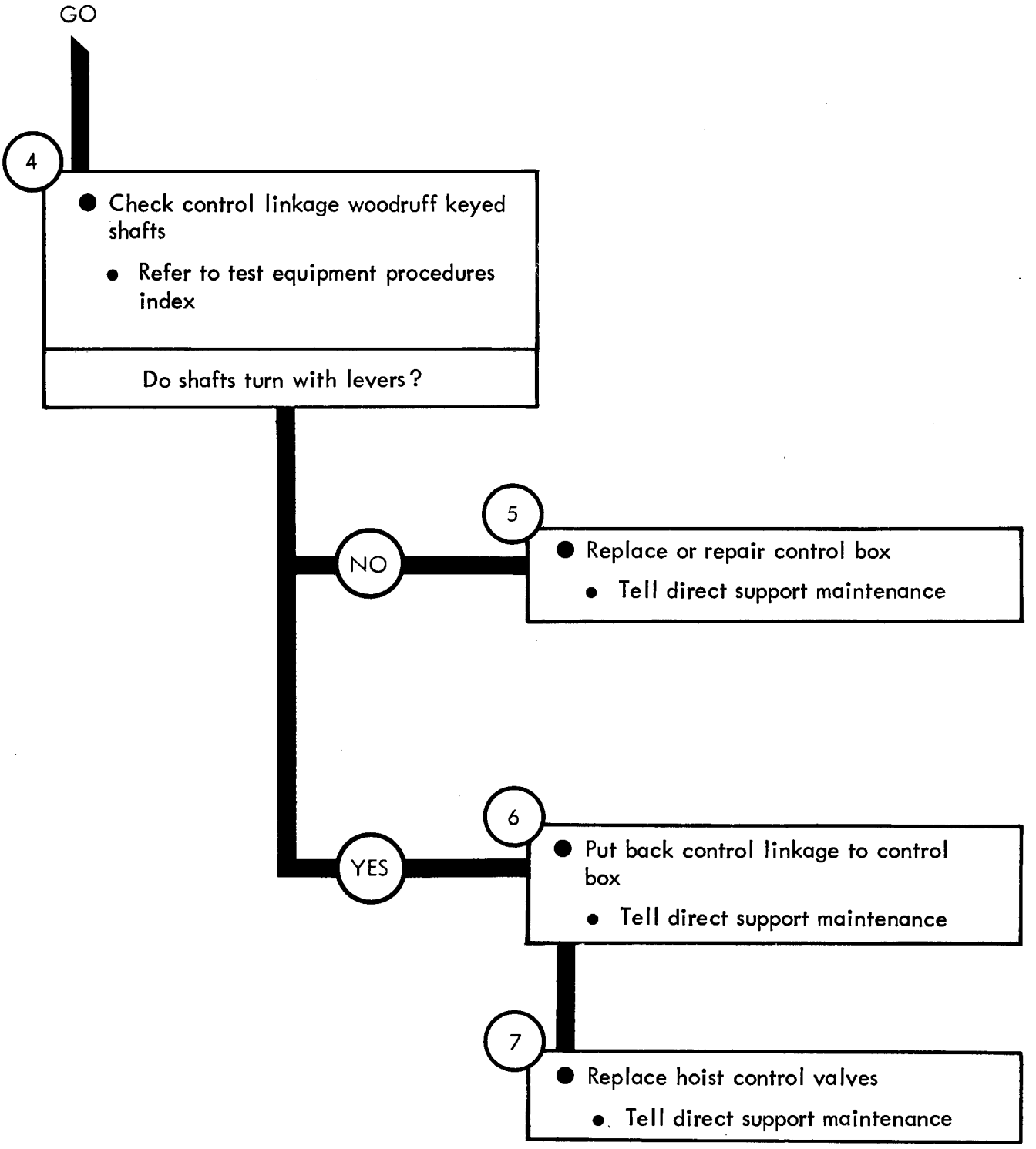



Figure 63-4 (Sheet 1 of 2)




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Figure 63-4 (Sheet 2 of 2)

# CHAPTER 64

# DUMP BODY AND HOIST SYSTEM TROUBLESHOOTING SUMMARY

64-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 63, for the Dump and Hoist System.

64-2. PROCEDURES . The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures in Part 1. Chapter 7 outlines a sample troubleshooting procedure. The summary procedures are based on the “what-to-do” portions of the detailed procedures and do not include the “How-to-do-it” instructions. Warnings, cautions, and notes are given where needed.

DUMP BODY AND HOIST SYSTEM TROUBLESHOOTING SUMMARY

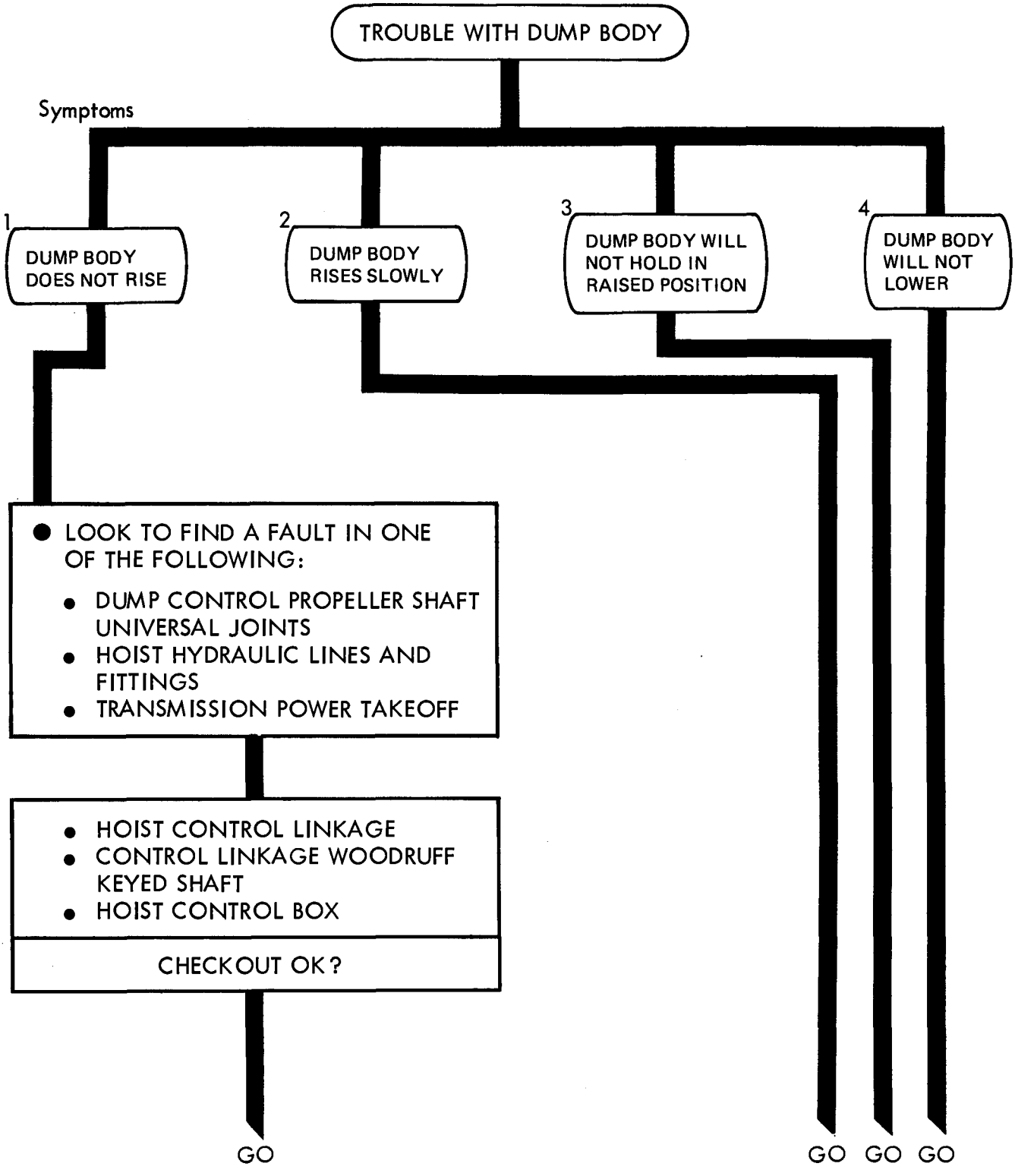
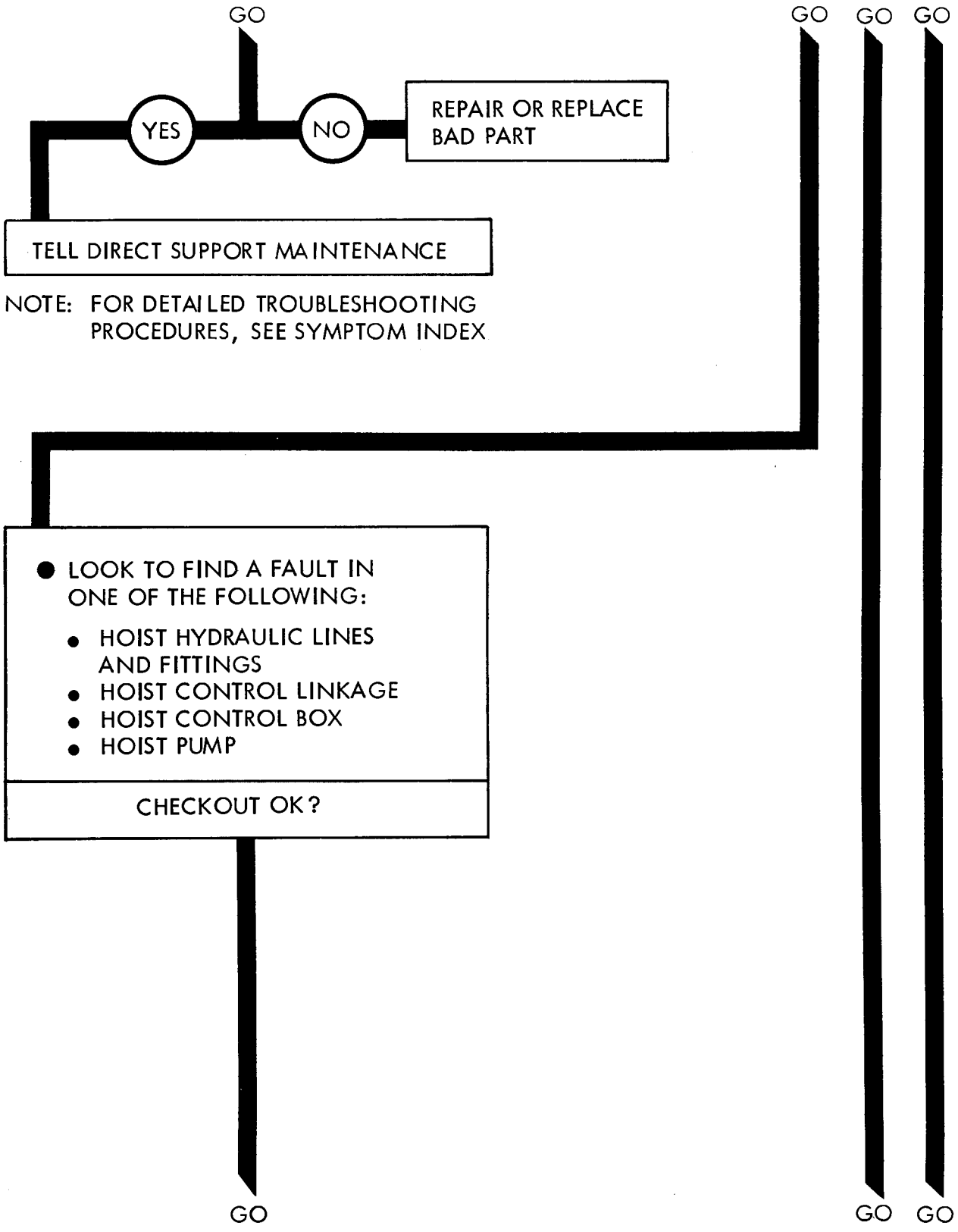



Figure 64-1 (Sheet 1 of 4)




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Figure 64-1 (Sheet 2 of 4)

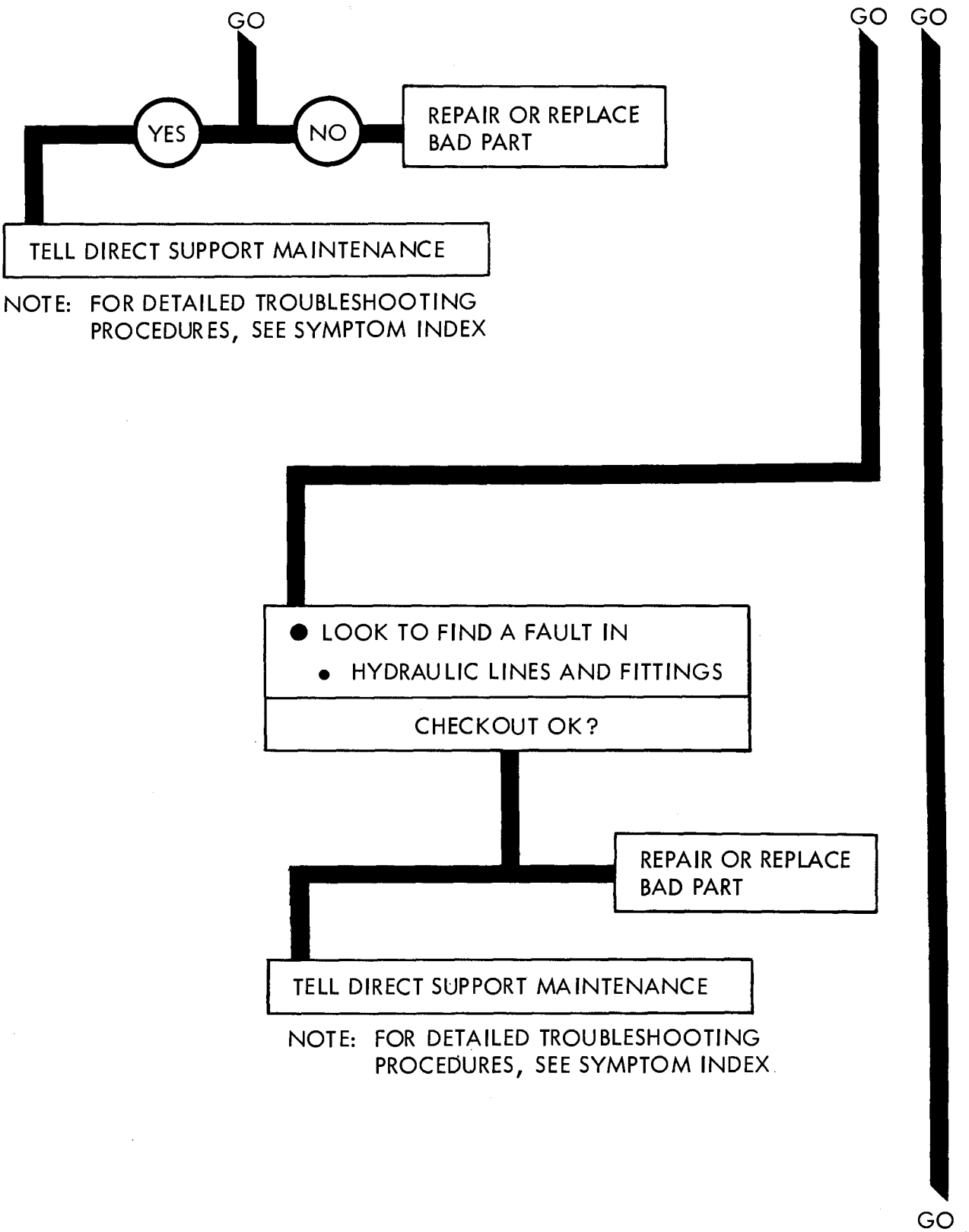
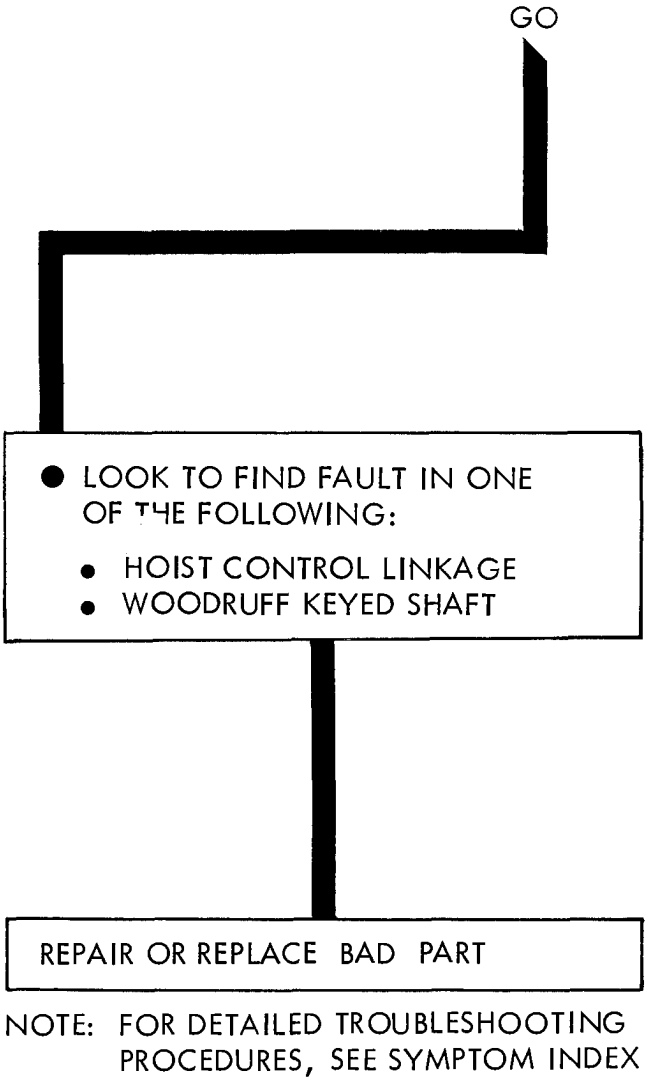



Figure 64-1 (Sheet 3 of 4)




TA 116297

Figure 64-1 (Sheet 4 of 4)

# CHAPTER 65

# DUMP BODY AND HOIST SYSTEM SUPPORT DIAGRAMS

65-1. GENERAL. This chapter gives the diagrams you need when doing trouble-shooting procedures in chapter 63. Table 3-1 is a complete listing of all support diagrams used in this manual.

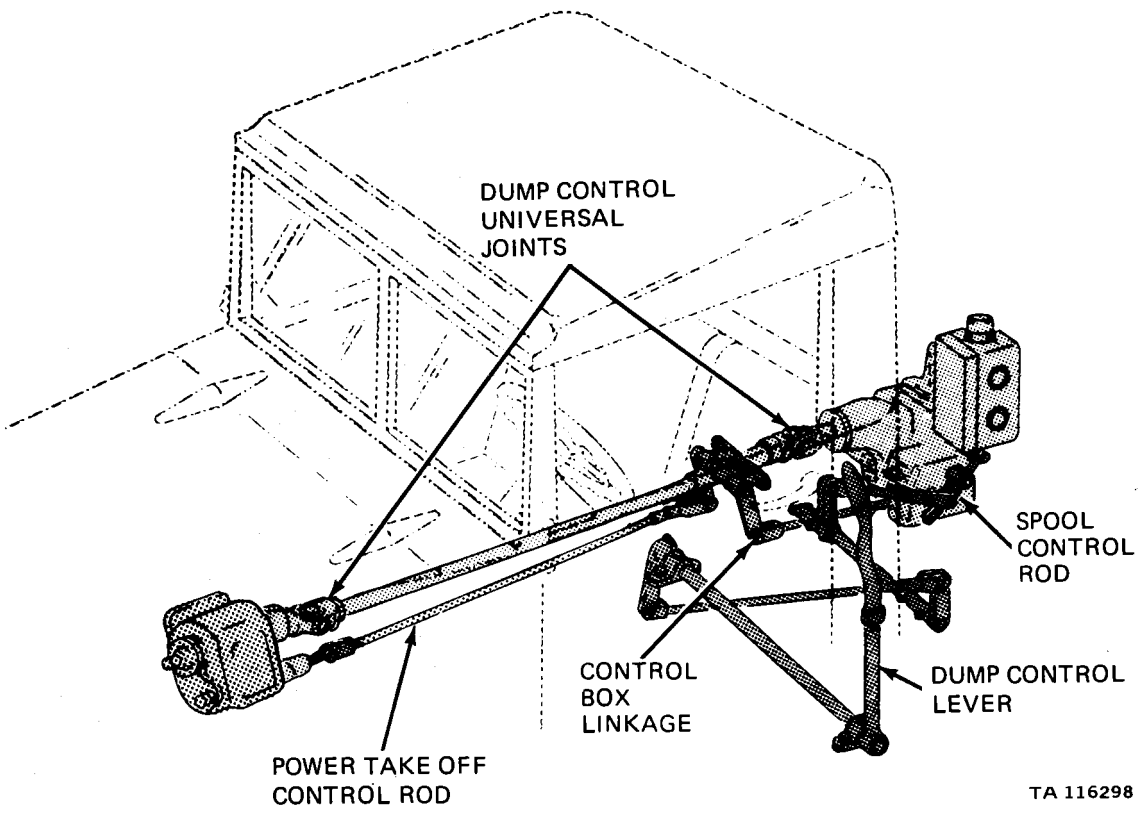



Figure 65-1 Dump Control Linkage

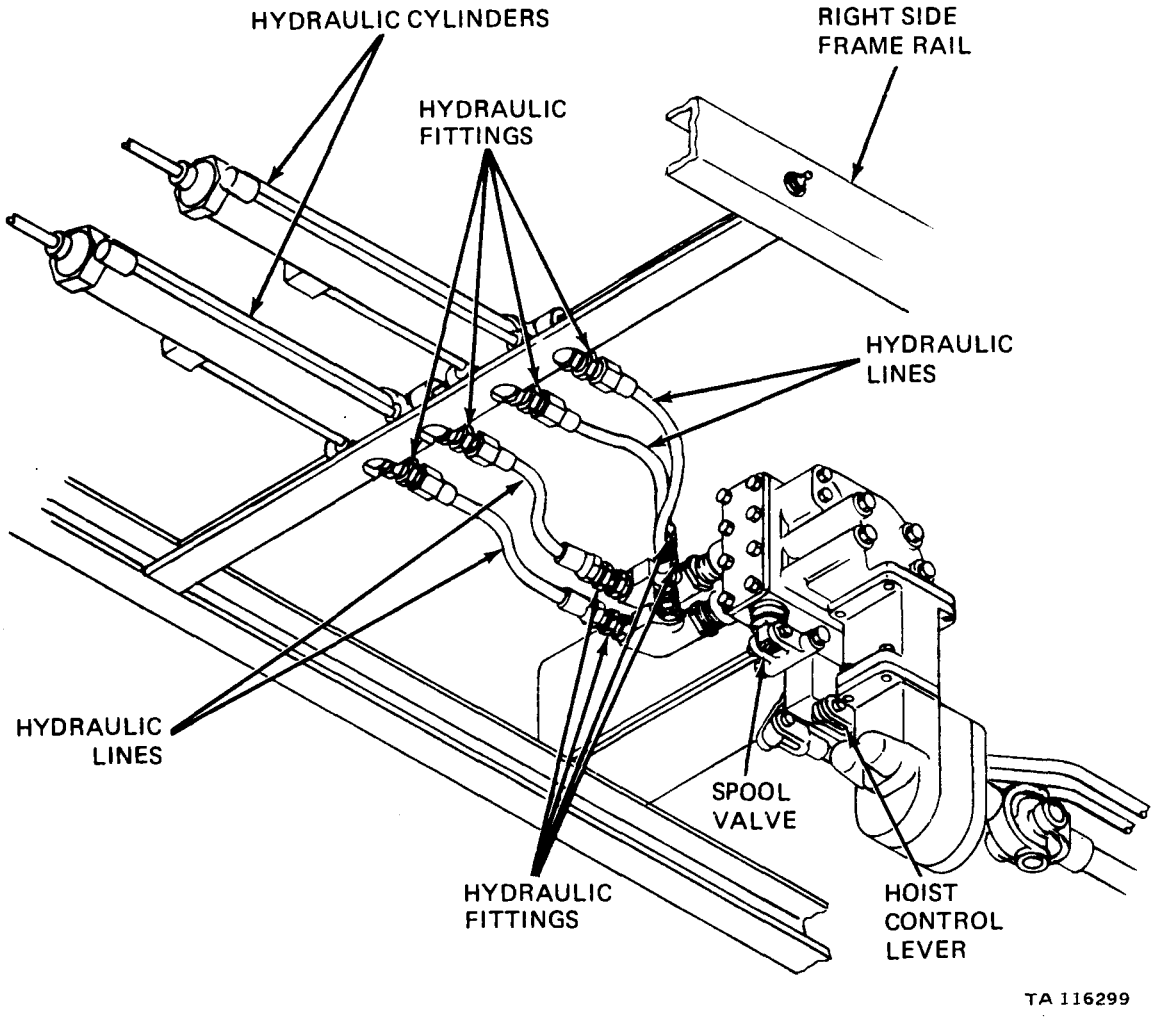



Figure 65-2 Dump Control Hydraulic System

# CHAPTER 66

# DUMP BODY AND HOIST SYSTEM TEST PROCEDURES

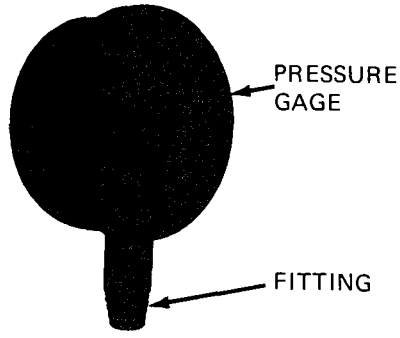
66-1. GENERAL. This chapter gives test procedures for the tests given in chapter 63, for the Dump and Hoist System.

66-2. TEST SET-UP. Instructions for setup of test equipment and parts to be tested are given before the test procedures. Illustrations are used, when needed, to show you how to hook up the test equipment to the part to be tested.

66-3. TEST PROCEDURES. Detailed step-by-step instructions, in flow chart form, are given for each test. The procedure calls out the type of test and the condition of the truck system for each part of testing. The step-by-step test will lead you to the bad component or to a fault symptom within a related system. Reference is made to the fault symptom index, chapter 6, if the test shows a fault in another system.

GENERAL INSTRUCTIONS

- Check pressure gage before using
  - Gage - See that the glass and needle are not broken
  - Fitting - Make sure fitting is on both ends. See if input end is dirt free




1

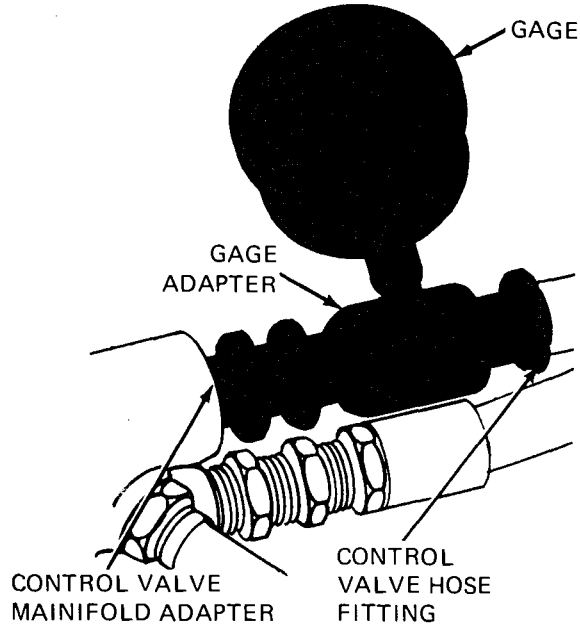
HOIST PUMP PRESSURE TEST

To measure hoist pump pressure at the input side of the hoist cylinders at 1000 rpm. Dump bed empty

1

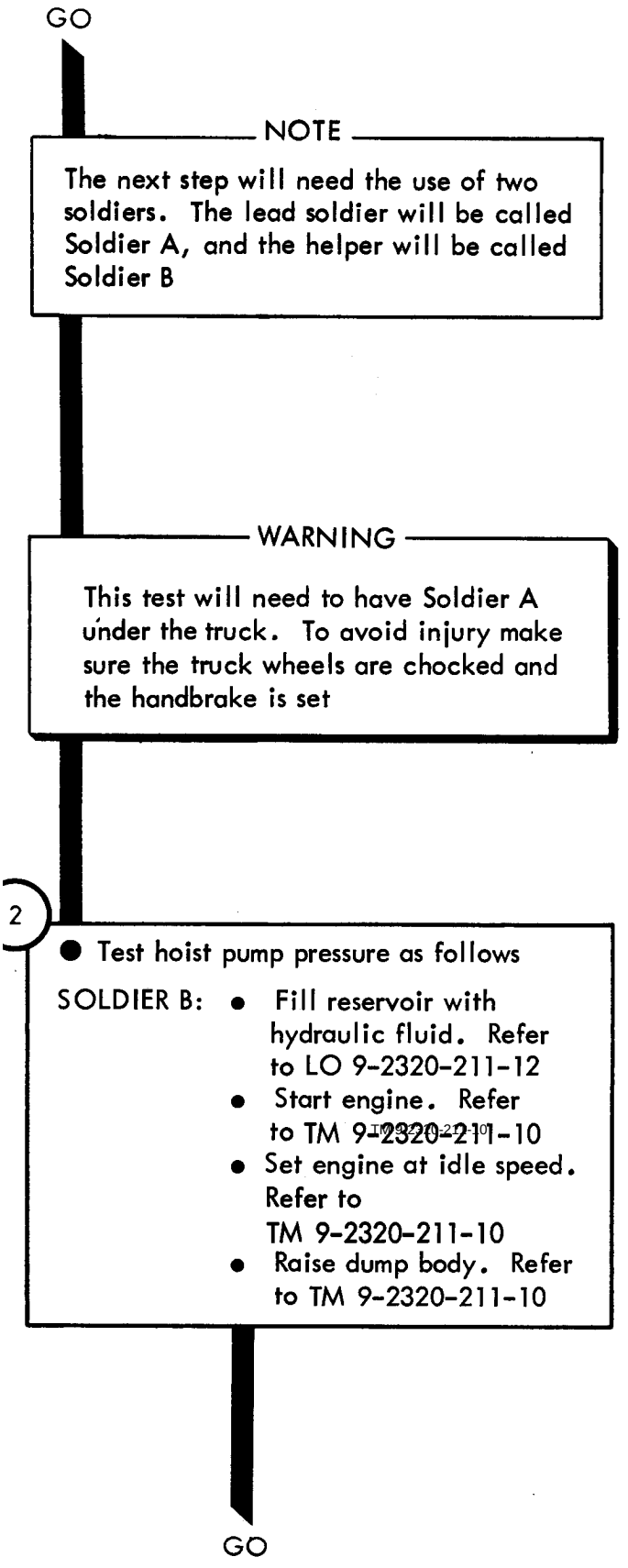
- Set up gage as follows:
  - Using 1-1/4 and 1-3/8 inch wrenches, unscrew bottom control valve hose fitting
  - Put a bucket or can under hose and control valve manifold to catch hydraulic fluid
  - Screw gage adapter into control valve manifold adapter and tighten using 1-1/4 inch wrench
  - Screw control valve hose fitting into gage adapter and tighten using 1-3/8 inch wrench
  - Screw gage input fitting in gage adapter and tighten using 1-1/4 inch wrench

GO



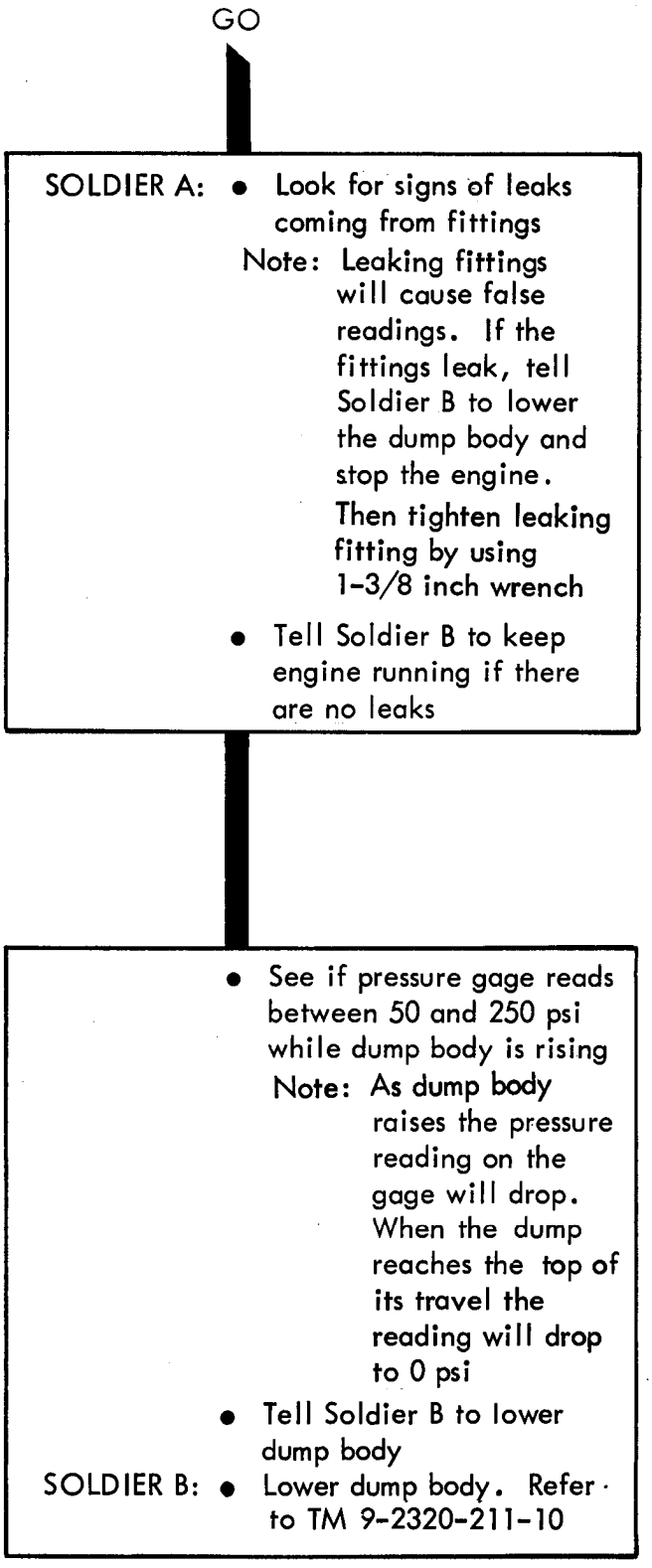

TA 116300

Figure 66-1 (Sheet 1 of 3)




TA 116301

Figure 66-1 (Sheet 2 of 3)




TA 116302

Figure 66-1 (Sheet 3 of 3)

2 HOIST CONTROL BOX TEST

**NOTE**

This test will need the use of two soldiers. The lead soldier will be called Soldier A and the helper will be called Soldier B.

1

- Test hoist control box as follows

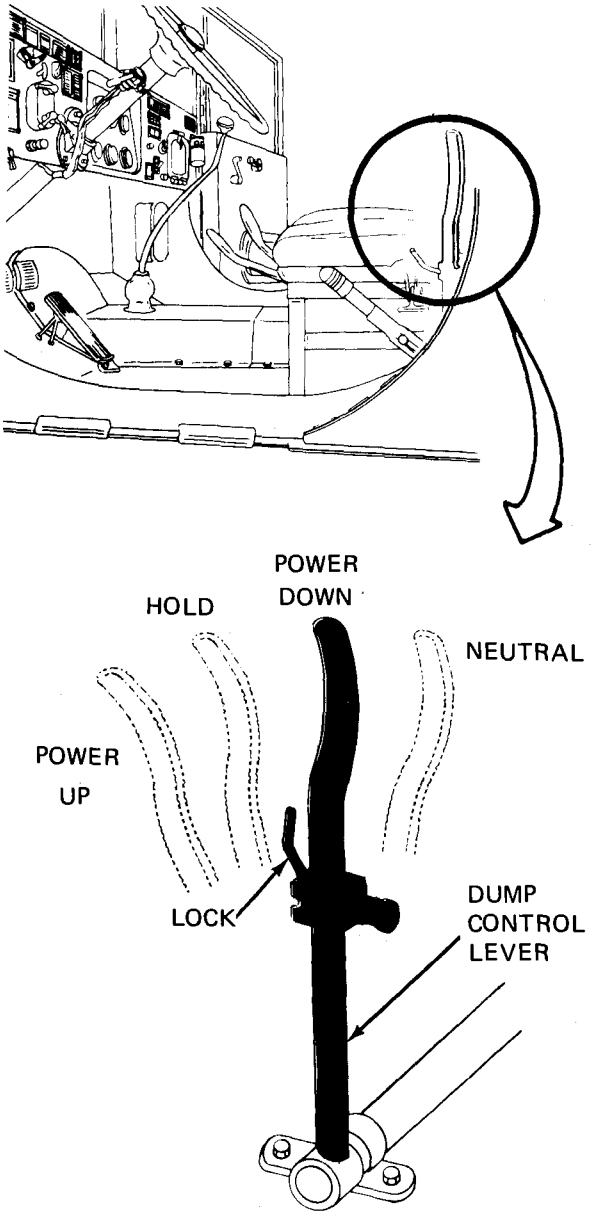
SOLDIER B:
- Sit in driver's seat and wait for instructions from Soldier A

SOLDIER A:
- Crawl under truck
- Tell Soldier B to move dump control lever to POWER DOWN position

SOLDIER B:
- Take off lock and move dump control lever forward to POWER DOWN position

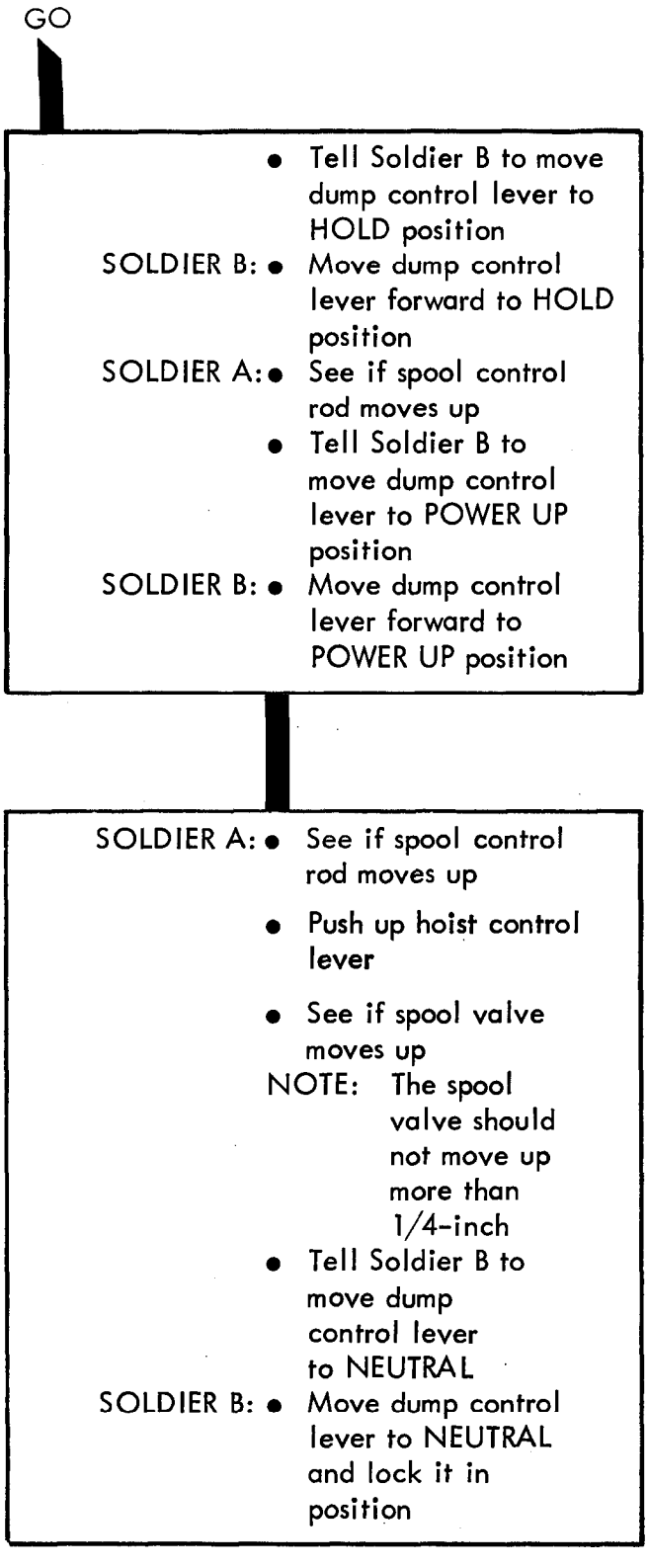
SOLDIER A:
- See if power takeoff rod moves toward front of truck. See figure 65-1

GO




TA 116303

Figure 66-2 (Sheet 1 of 2)



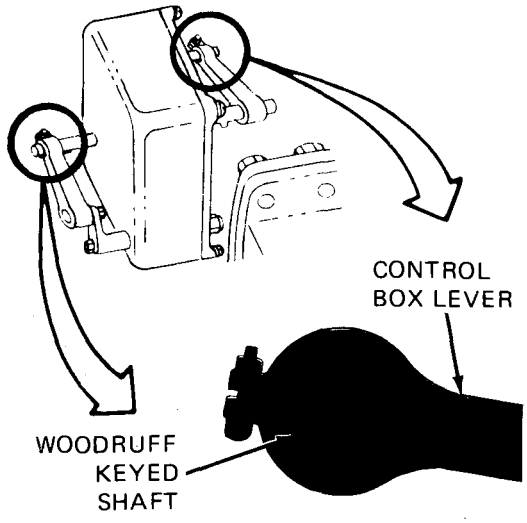

TA 116304

Figure 66-2 (Sheet 2 of 2)

3 CONTROL LINKAGE WOODRUFF KEYED SHAFT CHECK

- Check control linkage woodruff keyed shafts
  - Take off control linkage at control box. Tell direct support maintenance

  Note: Control linkage is attached to a control box lever on the control box. This lever is attached to control box by a woodruffed keyed shaft. This shaft is visable where the control box lever attaches to the shaft
  - Move contol box lever and see if shaft turns with lever




TA 116305

Figure 66-3

# CHAPTER 67

# DUMP BODY AND HOIST SYSTEM CHECKOUT PROCEDURES

67-1. GENERAL. This chapter gives procedures for checking out the system after troubleshooting and repair have been done. Procedures are set up in flow chart form showing the checkout steps in order and referring to the fault symptom index when the system does not checkout.

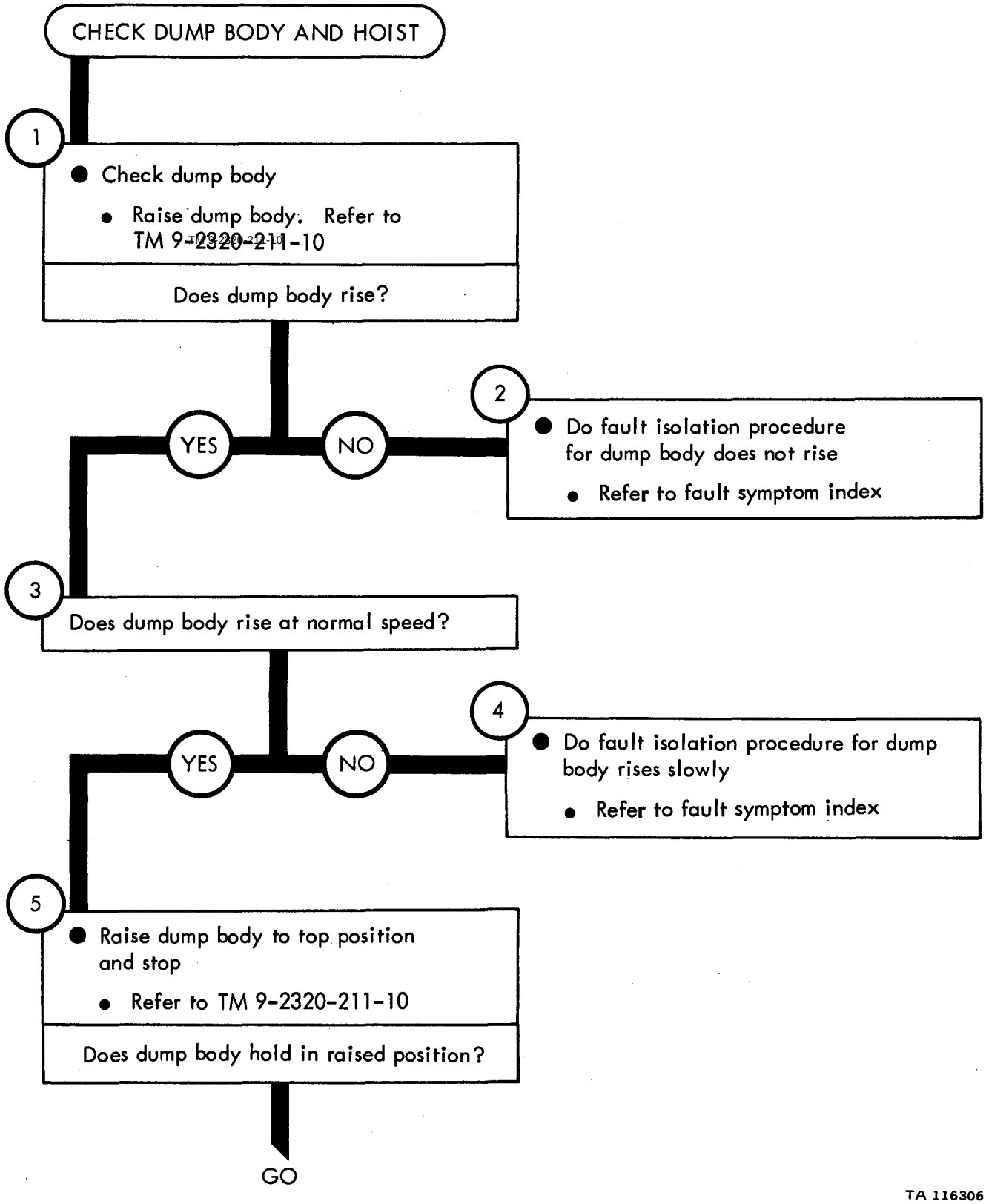
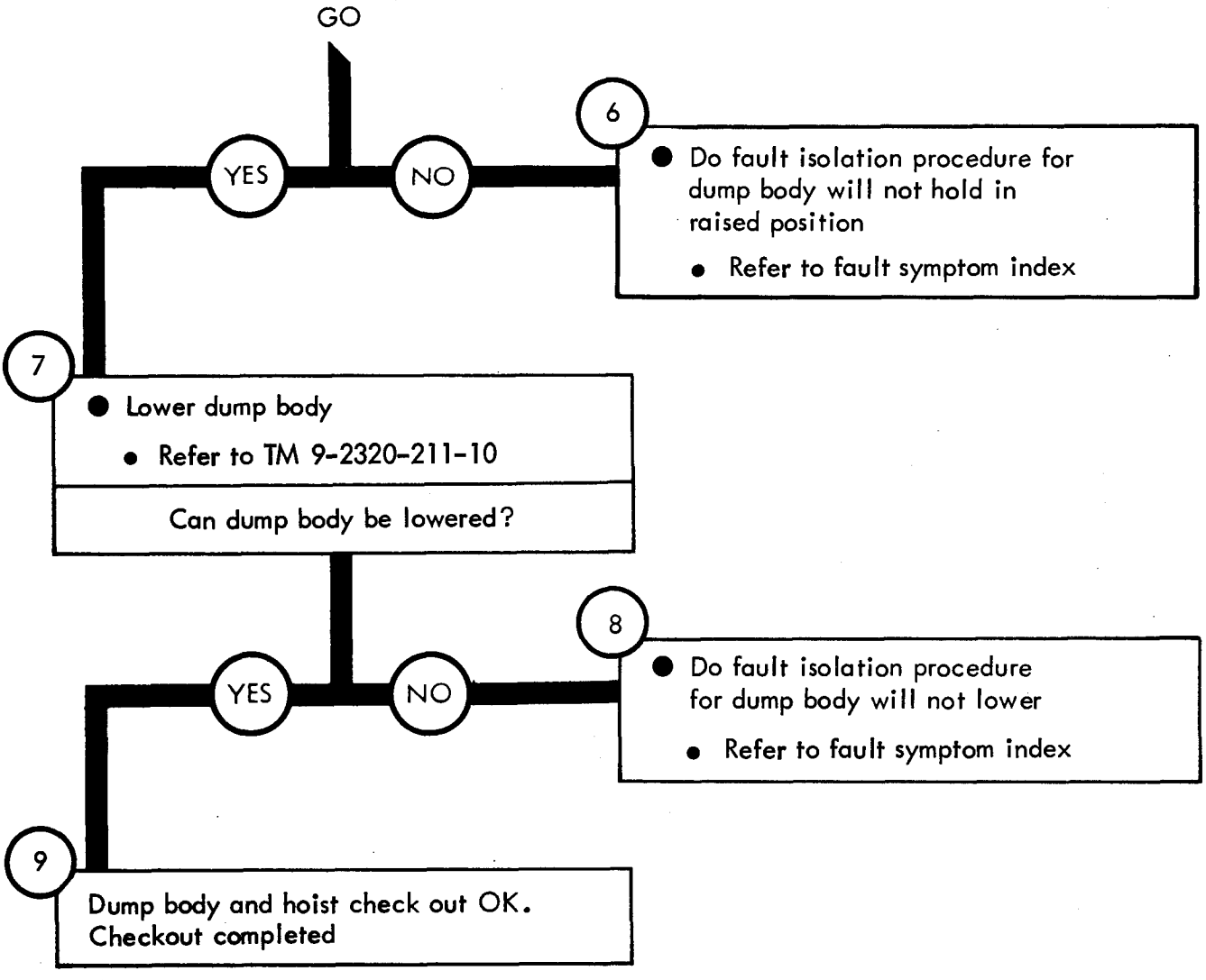



Figure 67-1 (Sheet 1 of 2)




TA 116307

Figure 67-1 (Sheet 2 of 2)

# CHAPTER 68

# REAR WINCH TROUBLESHOOTING

68-1. EQUIPMENT ITEMS COVERED. This chapter gives equipment troubleshooting procedures for the rear winch system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

68-2. EQUIPMENT ITEMS NOT COVERED. All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

REAR WINCH TROUBLESHOOTING

Symptom

1 WINCH DOES NOT PULL LOAD

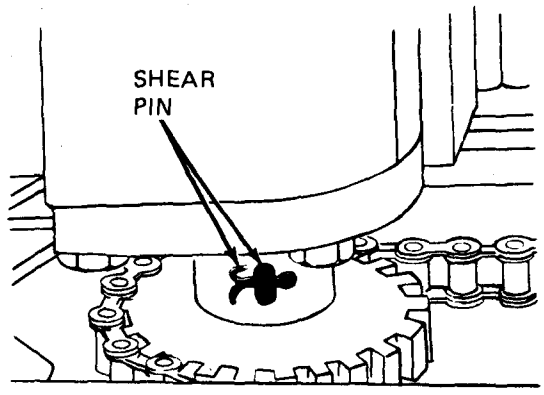
1

- Make truck ready for work on rear winch
  - Stop winch. Refer to TM 9-2320-211-10
  - Stop engine. Refer to TM 9-2320-211-10
  - Unhook cable from load
  - Chock wheels

2

- Check shear pin
  - Look for broken shear pin

Is shear pin OK?




YES

NO

3

- Replace broken shear pin
  - Tell direct support maintenance

GO

TA 116308

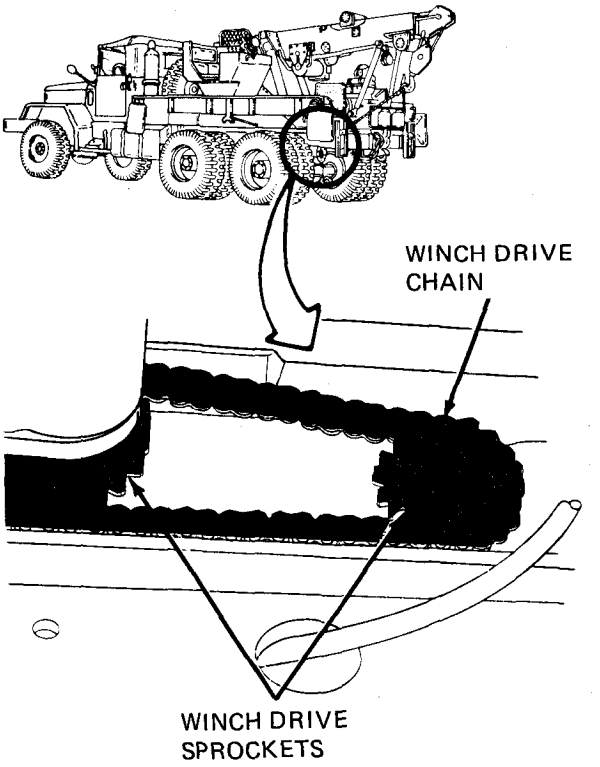
Figure 68-1 (Sheet 1 of 4)

GO

4

- Check winch drive chain and sprockets
  - Look for a broken chain
  - Look for a broken drive sprocket

Are winch drive chain and sprockets OK?




YES

NO

5

- Replace broken drive chain
  - Tell direct support maintenance
- Replace broken winch drive sprockets
  - Tell direct support maintenance

6

- Check winch drive and power divider control linkage
  - Look for bent or broken linkage. See figure 70-2
  - Shake all linkage
  - Feel for loose linkage

Are winch drive and power divider control linkage OK?

GO

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Figure 68-1 (Sheet 2 of 4)

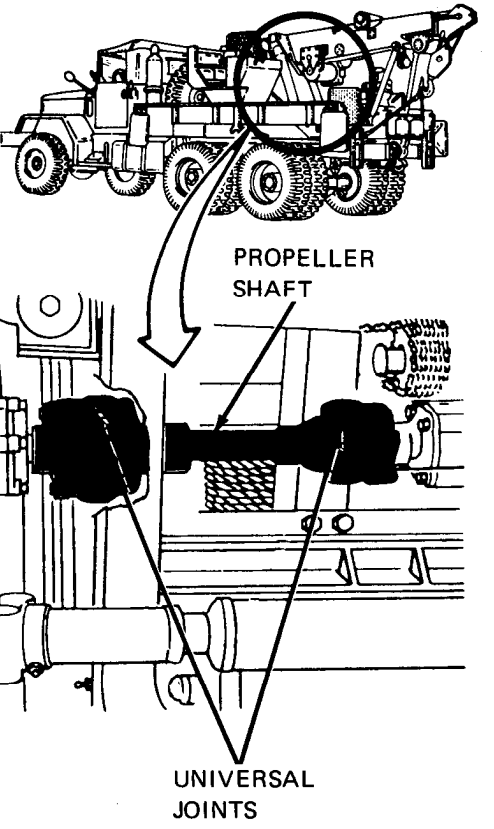
GO

YES

NO

7

- Replace bent or broken linkage
  - Tell direct support maintenance
- Replace worn linkage
  - Tell direct support maintenance




8

- Check winch drive propeller shaft
  - Look for a broken universal joint
  - Look for a broken propeller shaft

Is winch drive propeller shaft OK?

YES

NO

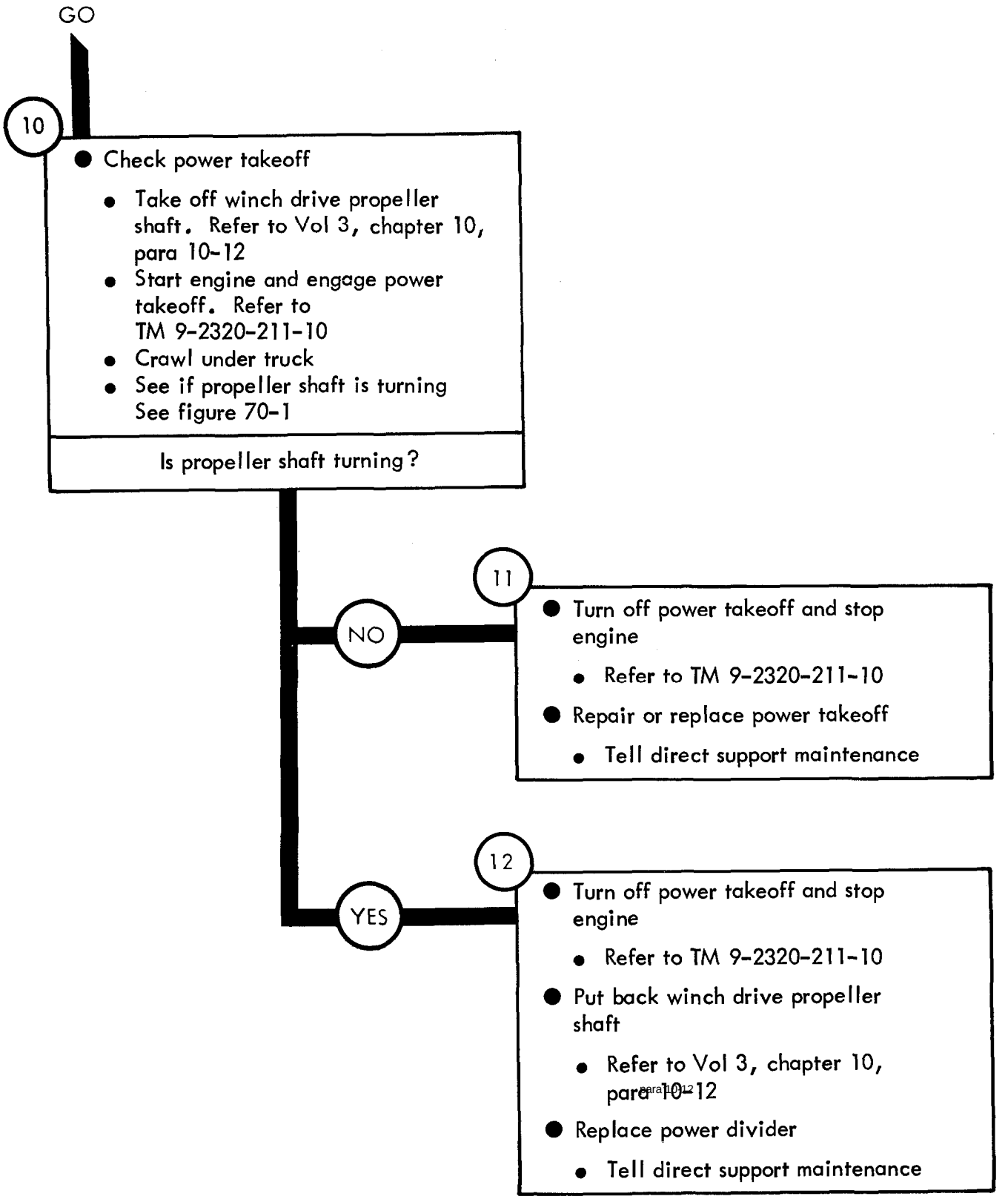
9

- Replace broken universal joint
  - Refer to Vol 3, chapter 10, para 10-12
- Replace broken propeller shaft
  - Refer to Vol 3, chapter 10, para 10-12

GO

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Figure 68-1 (Sheet 3 of 4)




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Figure 68-1 (Sheet 4 of 4)

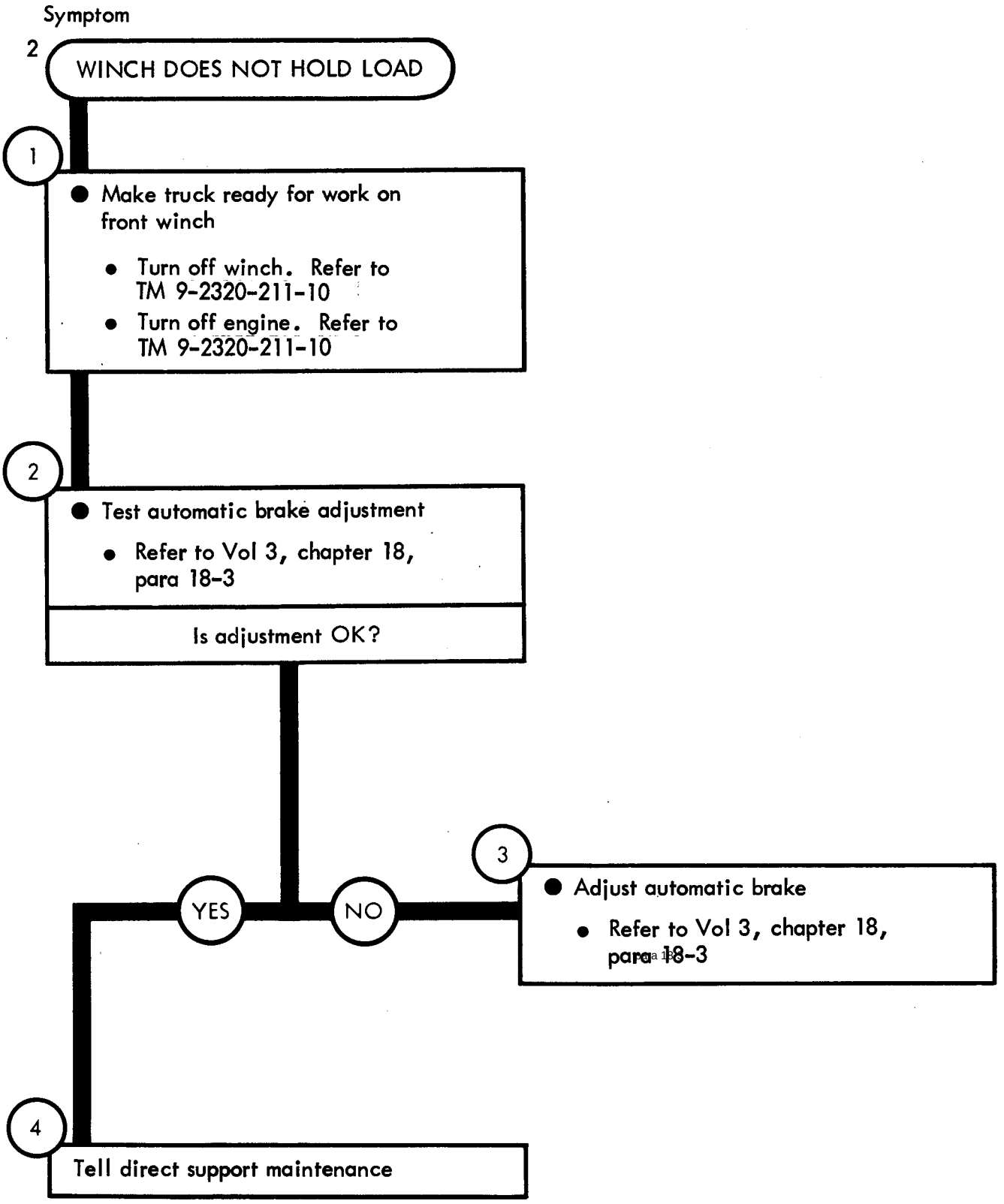

Symptom
2
WINCH DOES NOT HOLD LOAD
1
● Make truck ready for work on front winch
• Turn off winch. Refer to TM 9-2320-211-10
• Turn off engine. Refer to TM 9-2320-211-10
2
● Test automatic brake adjustment
• Refer to Vol 3, chapter 18, para 18-3
Is adjustment OK?
YES
NO
3
● Adjust automatic brake
• Refer to Vol 3, chapter 18, para 18-3
4
Tell direct support maintenance
TA 116312

Figure 68-2

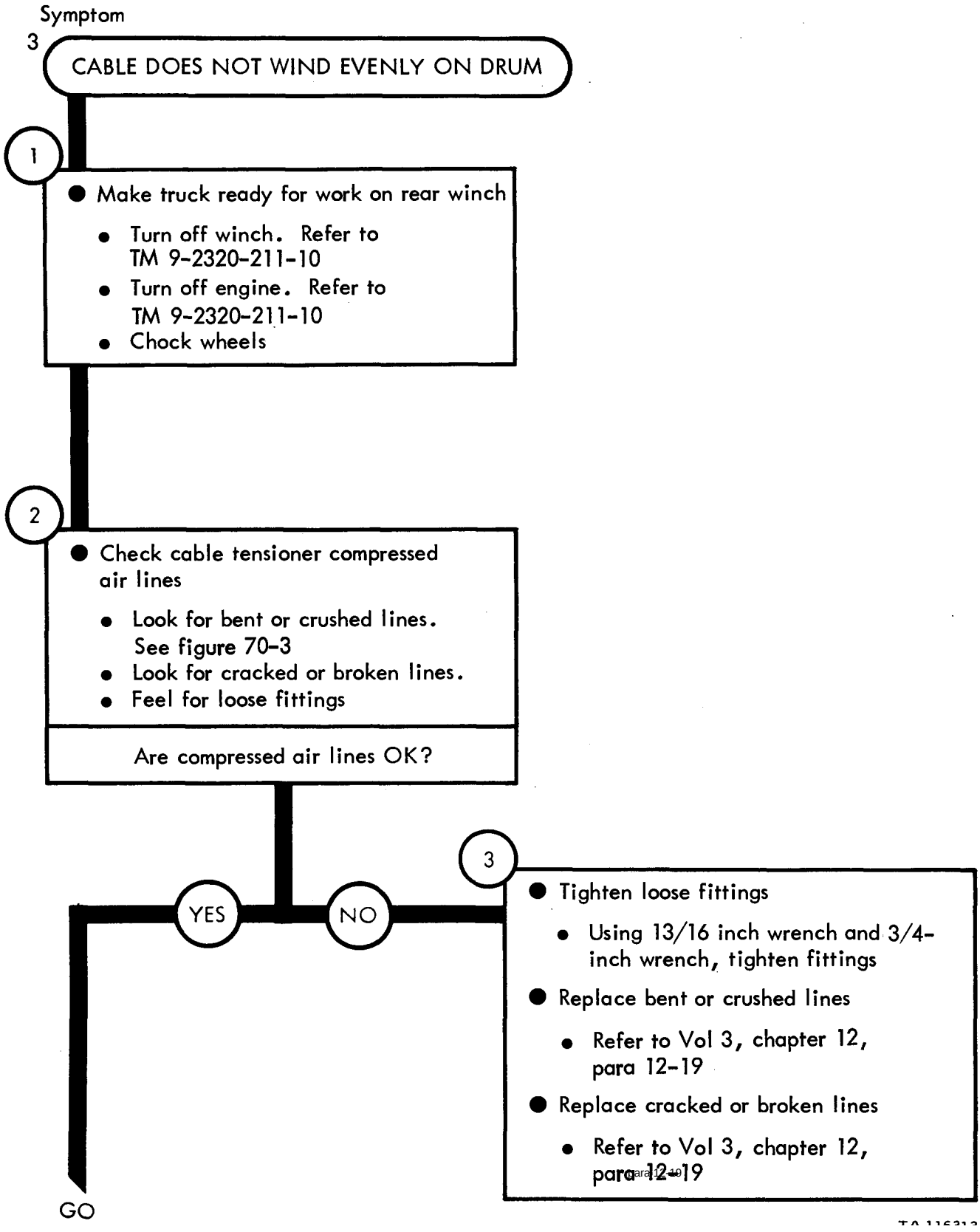


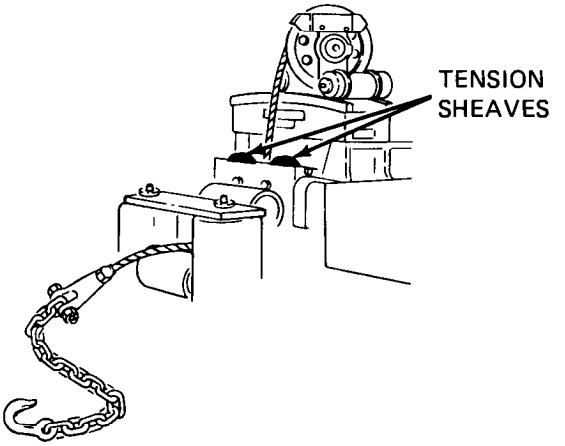

Figure 68-3 (Sheet 1 of 2)

GO

4

- Check cable tensioner air chamber
  - Start engine. Refer to TM 9-2320-211-10
  - Move winch cable tensioner valve lever to "ON."
  - See if tension sheaves move together

Do tension sheaves move?




NO

5

- Replace cable tensioner air chamber
  - Tell direct support maintenance

YES

NOTE

Before going to the next step, turn engine off. Refer to TM 9-2320-211-10

6

chapter 18,
para 18-9

TA 116314

Figure 68-3 (Sheet 2 of 2)

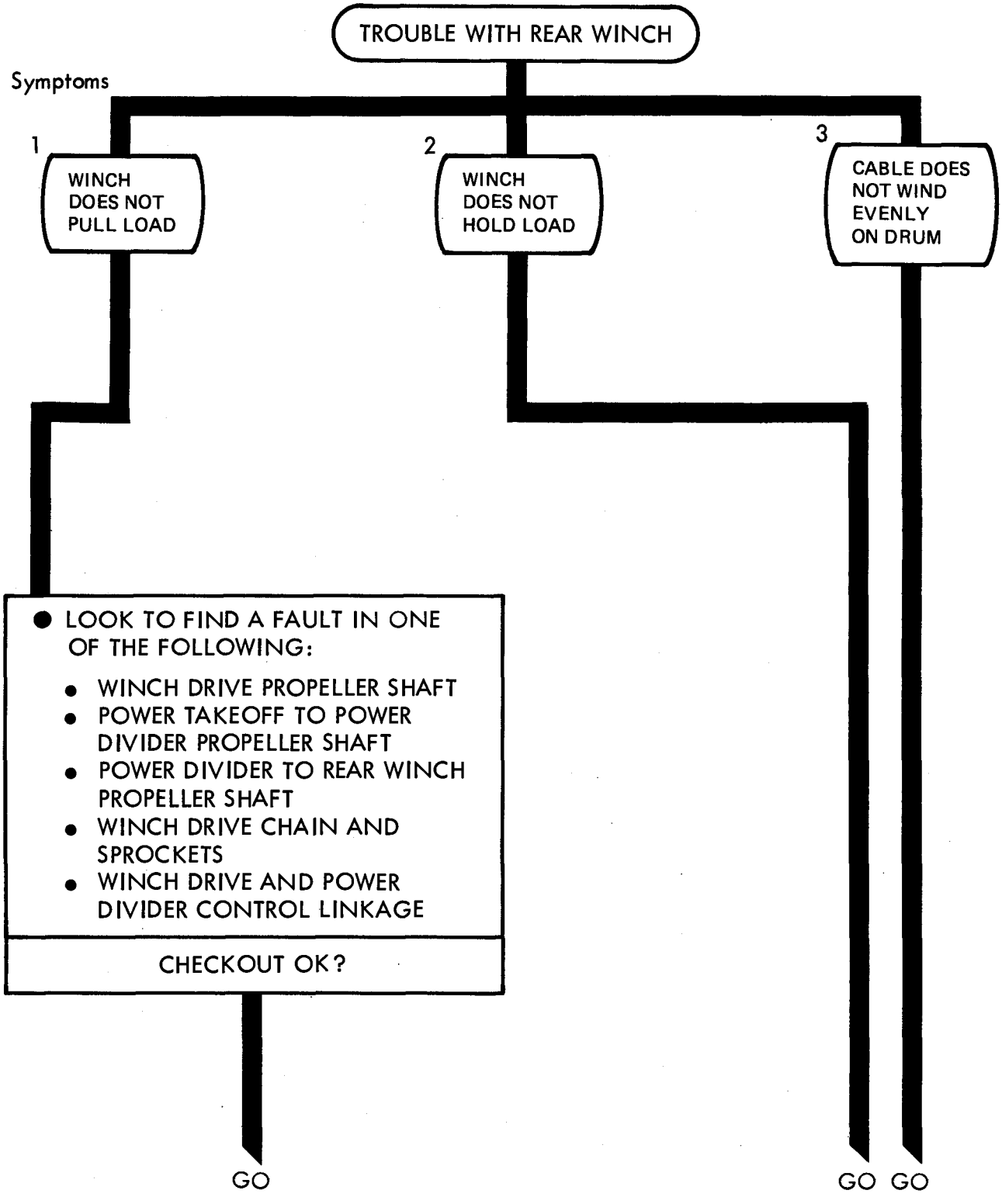
# CHAPTER 69

# REAR WINCH TROUBLESHOOTING SUMMARY

69-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 68, for the Rear Winch System.

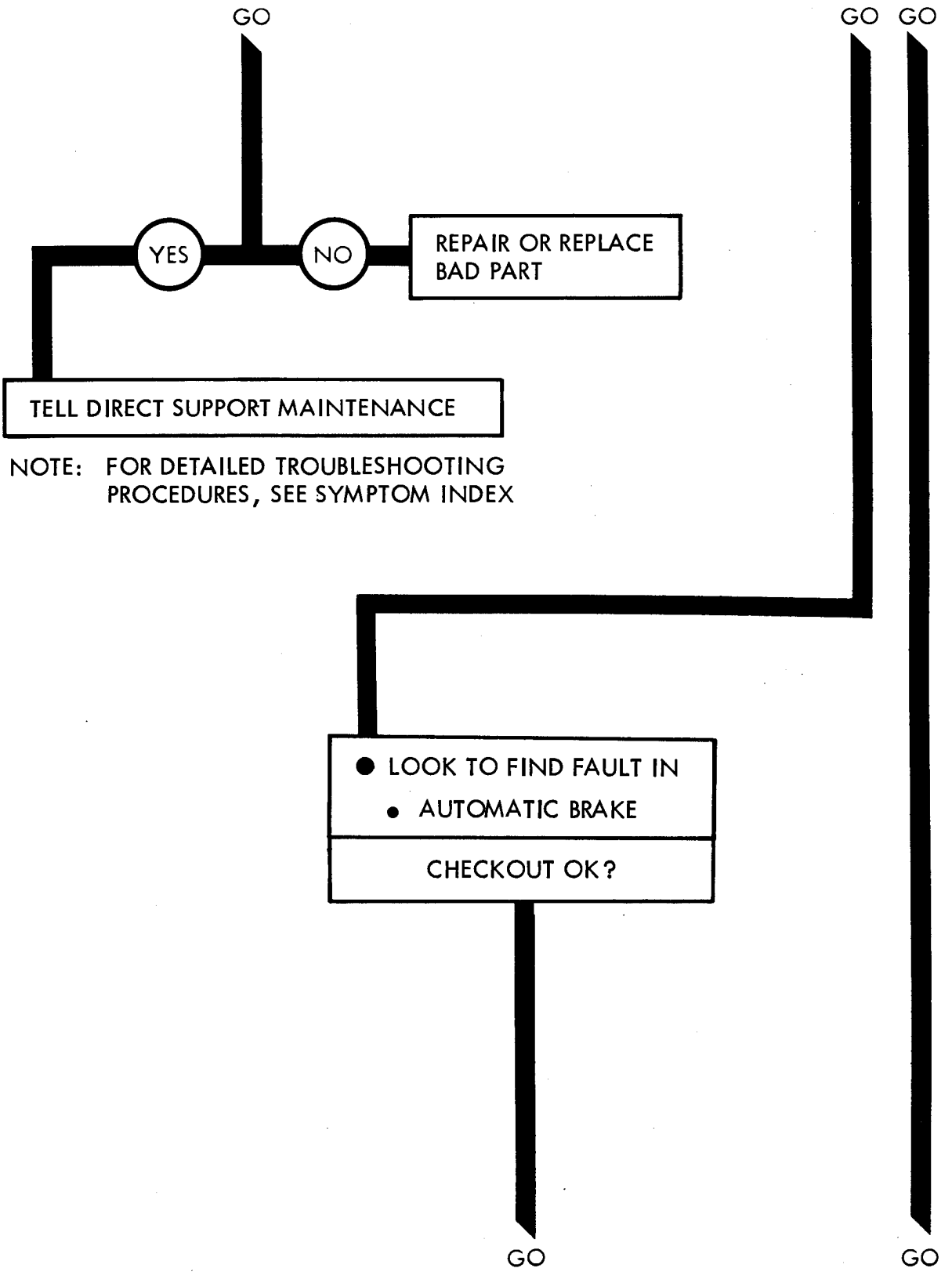
69-2. PROCEDURES. The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures in Part 1. Chapter 7 outlines a sample troubleshooting procedure. The summary procedures are based on the “what-to-do” portions of the detailed procedures and do not include the “How-to-do-it” instructions. Warnings, cautions, and notes are given where needed.

REAR WINCH SYSTEM TROUBLESHOOTING SUMMARY



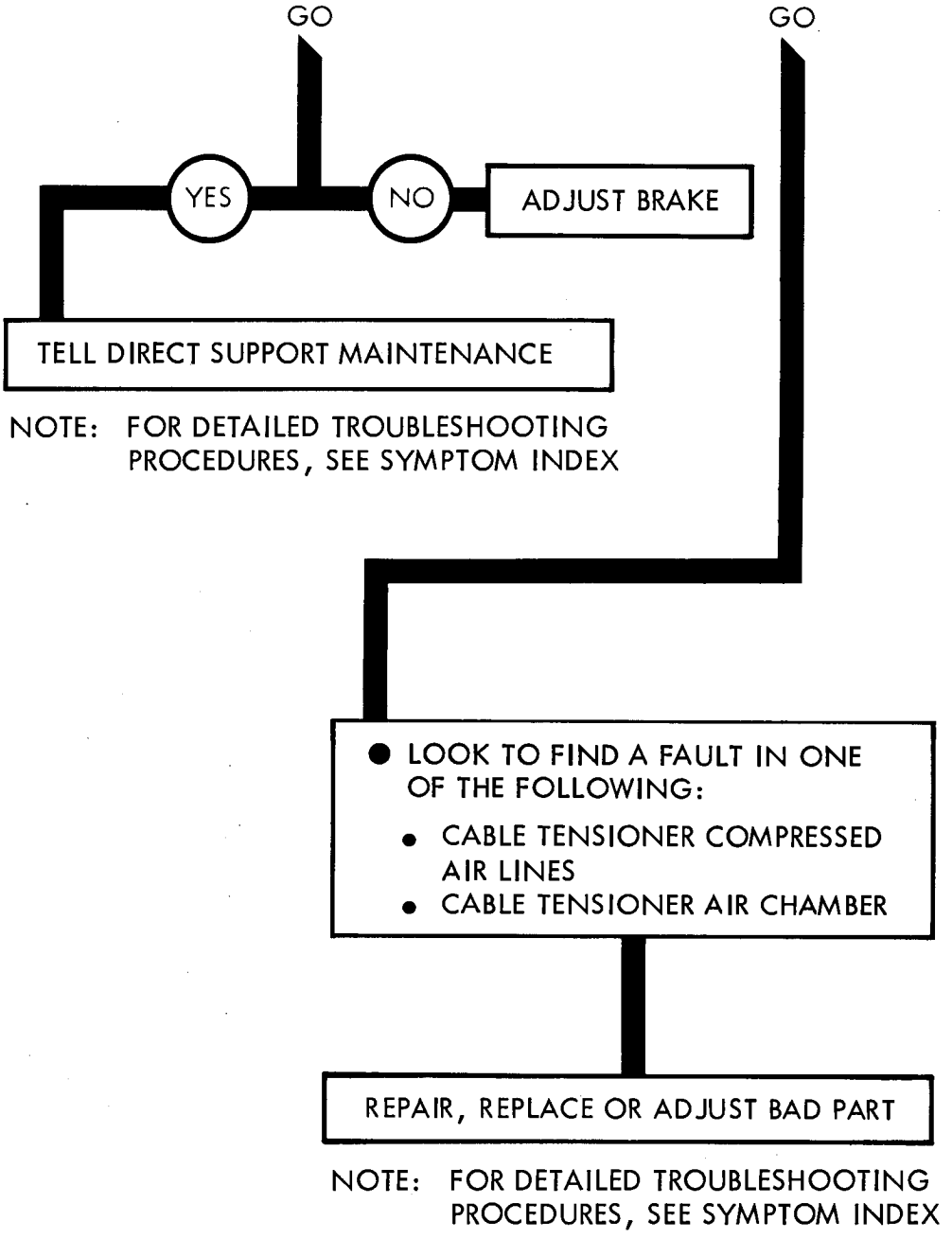

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Figure 69-1 (Sheet 1 of 3)




TA 116316

Figure 69-1 (Sheet 2 of 3)




TA 116317

Figure 69-1 (Sheet 3 of 3)

# CHAPTER 70

# REAR WINCH SUPPORT DIAGRAMS

70-1. GENERAL. This chapter gives the diagrams you need when doing trouble-shooting procedures in chapter 68. Table 3-1 is a complete listing of all support diagrams used in this manual.

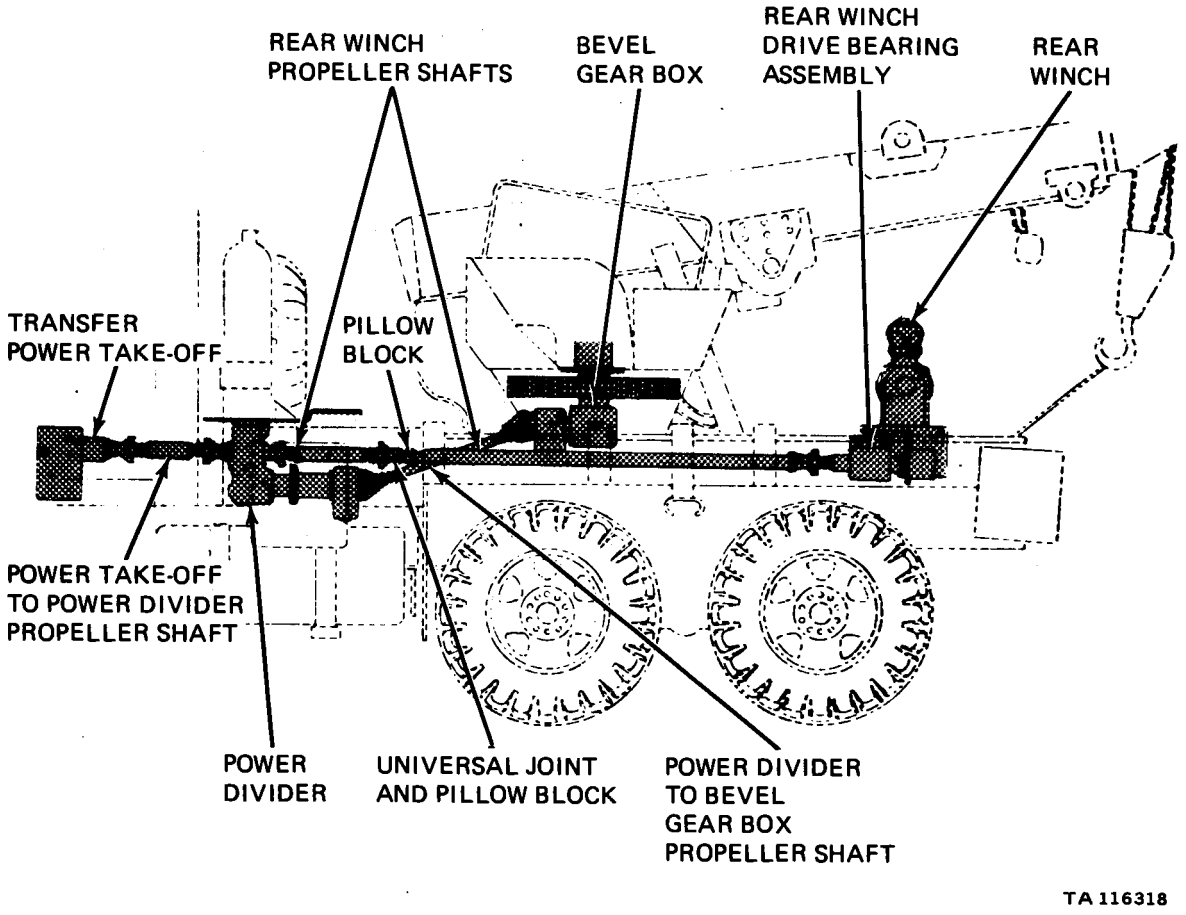



Figure 70-1. Rear winch

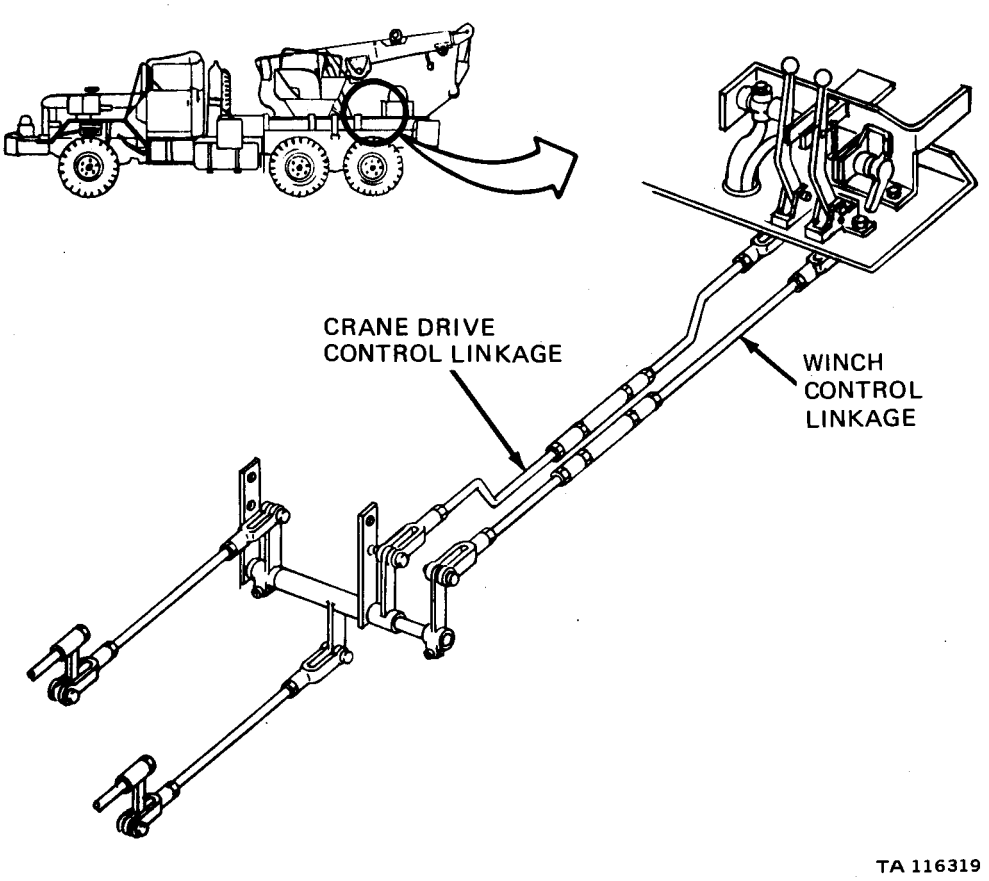



Figure 70-2. Rear Winch Linkage

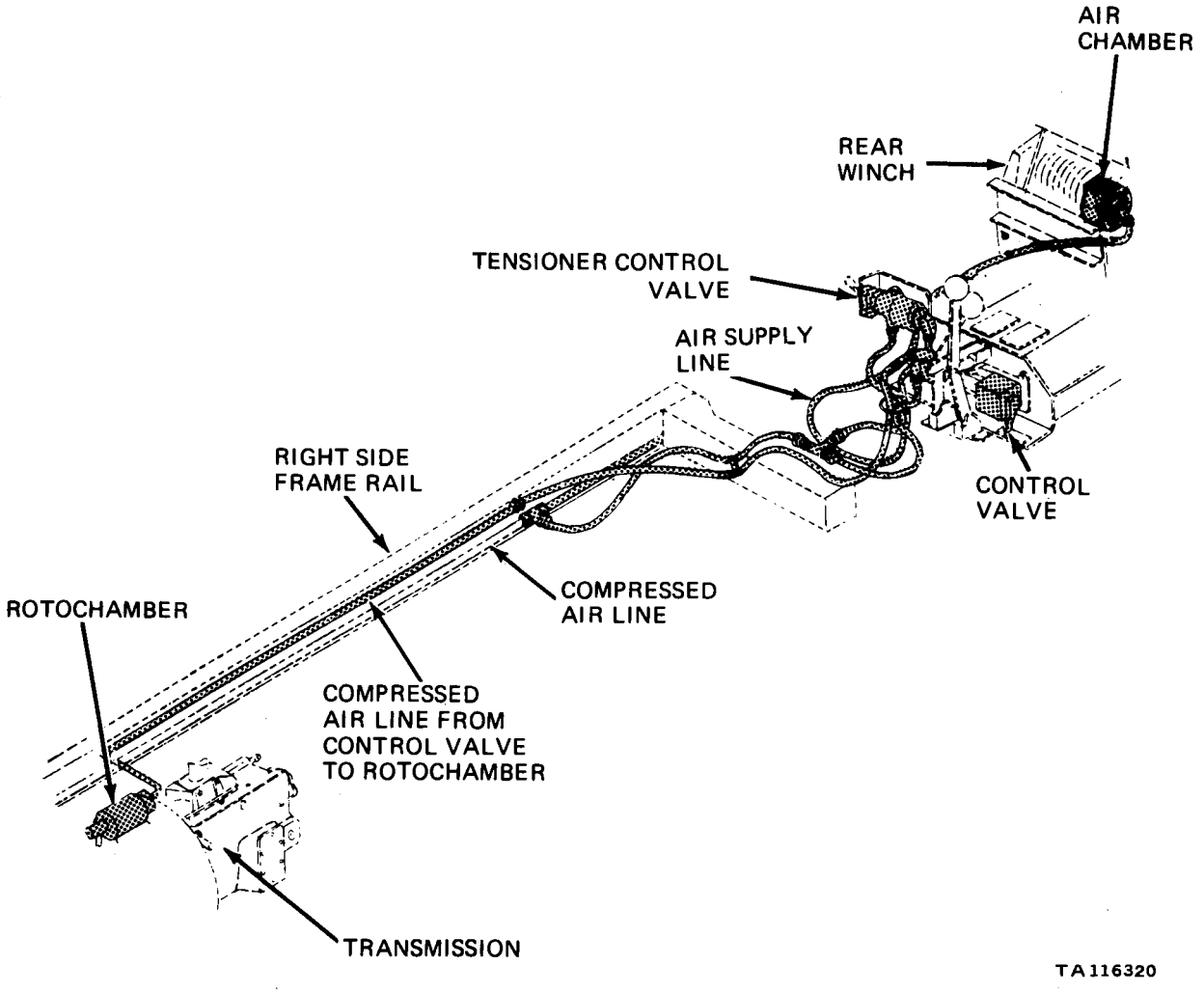



Figure 70-3. Rear Winch Air Lines

# CHAPTER 71

# REAR WINCH CHECKOUT PROCEDURES

71-1. GENERAL. This chapter gives procedures for checking out the system after troubleshooting and repair have been done. Procedures are set up in flow chart form showing the checkout steps in order and referring to the fault symptom index when the system does not checkout.

REAR WINCH CHECKOUT

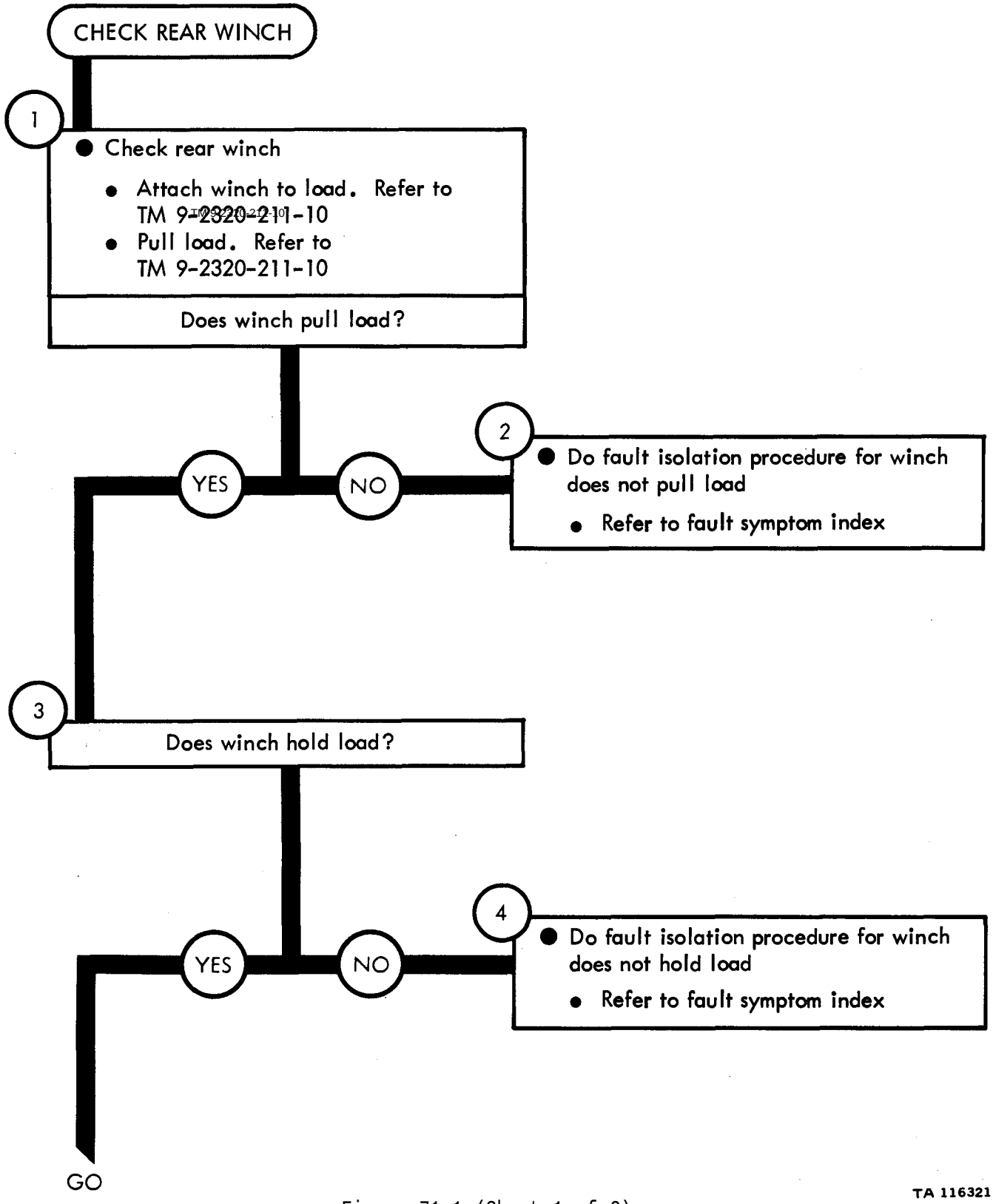
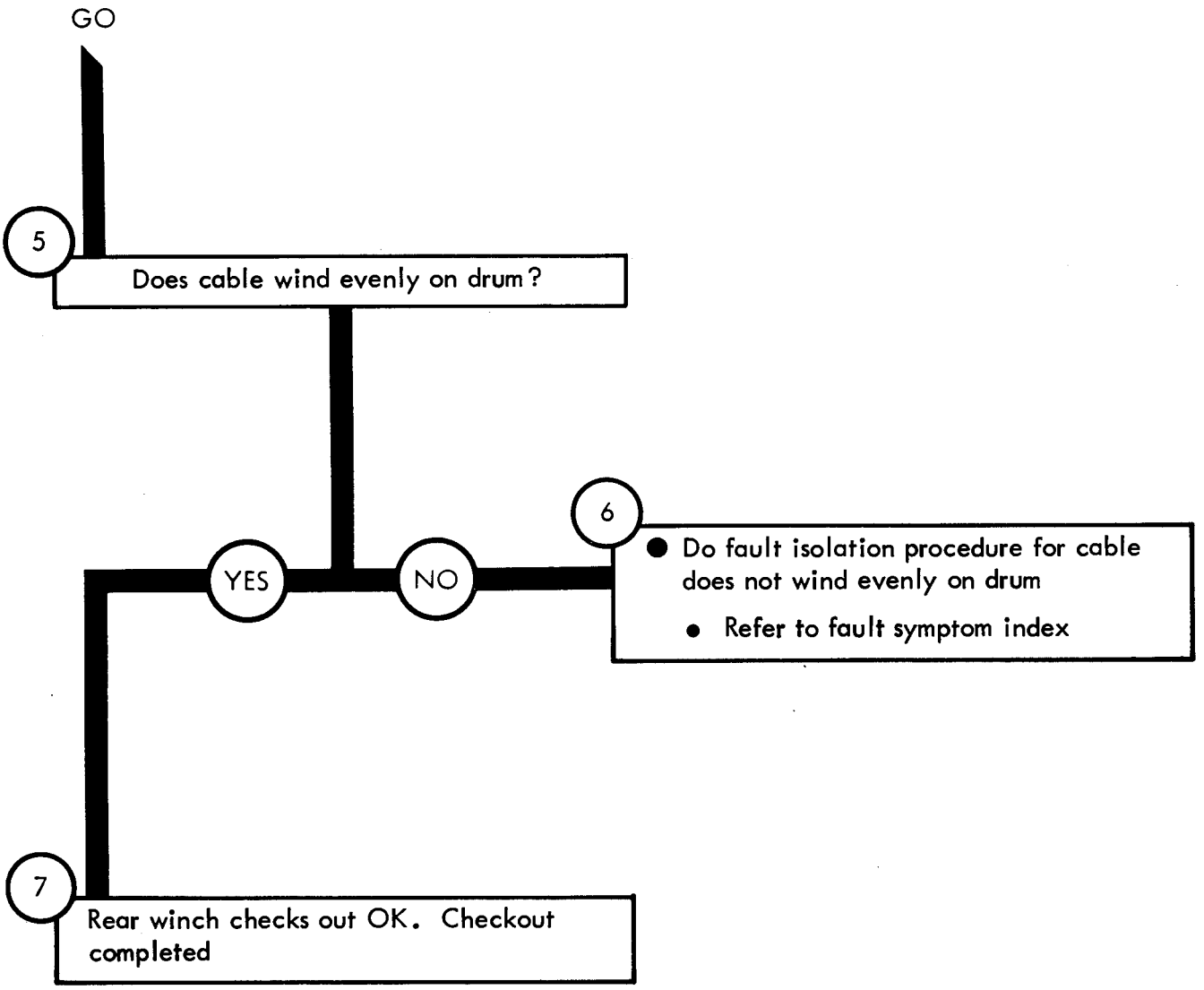



Figure 71-1 (Sheet 1 of 2)




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Figure 71-1 (Sheet 2 of 2)

# CHAPTER 72

# WRECKER SYSTEM TROUBLESHOOTING

72-1. EQUIPMENT ITEMS COVERED. This chapter gives equipment troubleshooting procedures for the wrecker system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

72-2. EQUIPMENT ITEMS NOT COVERED . All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

M543A2 WRECKER TROUBLESHOOTING

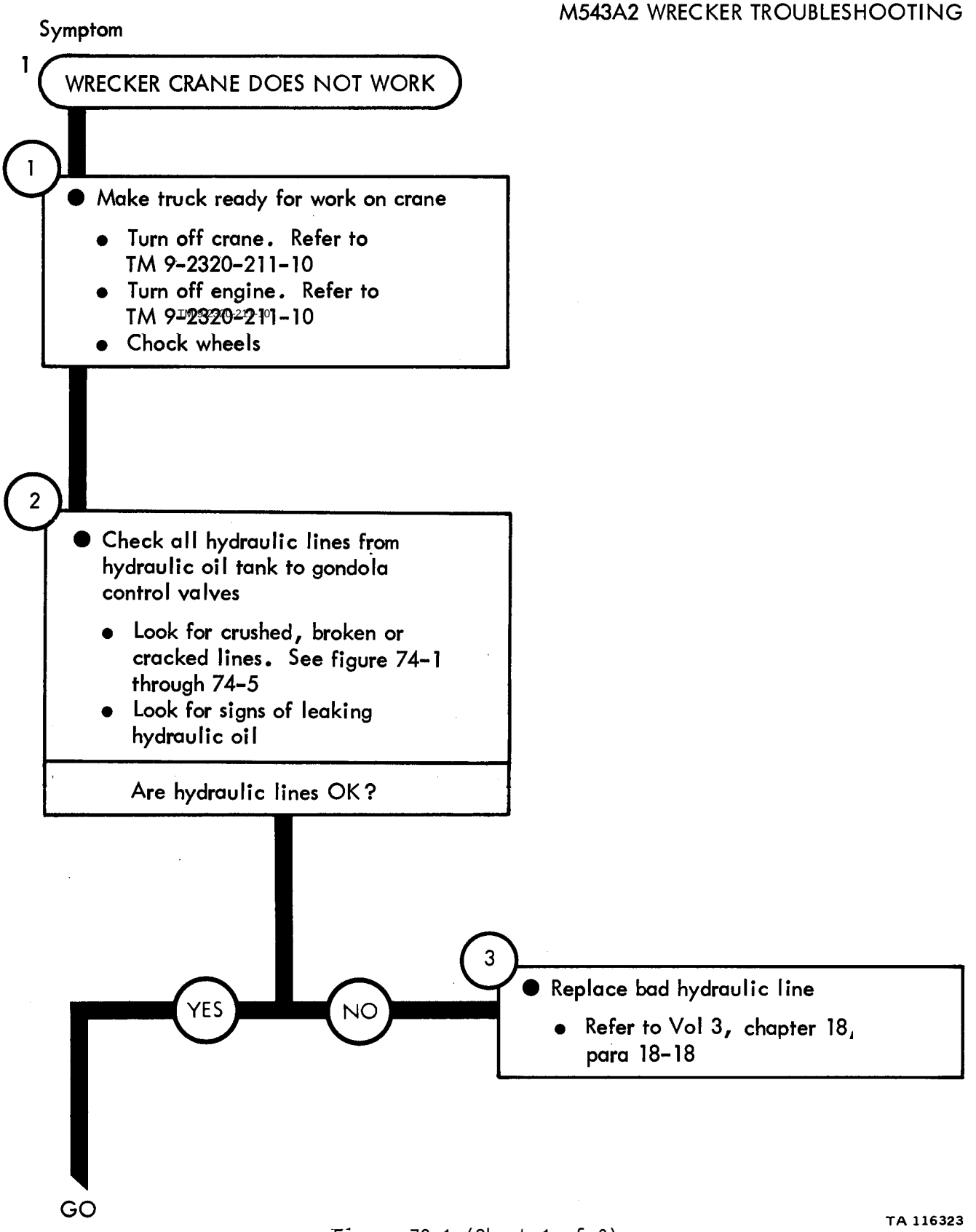



Figure 72-1 (Sheet 1 of 6)

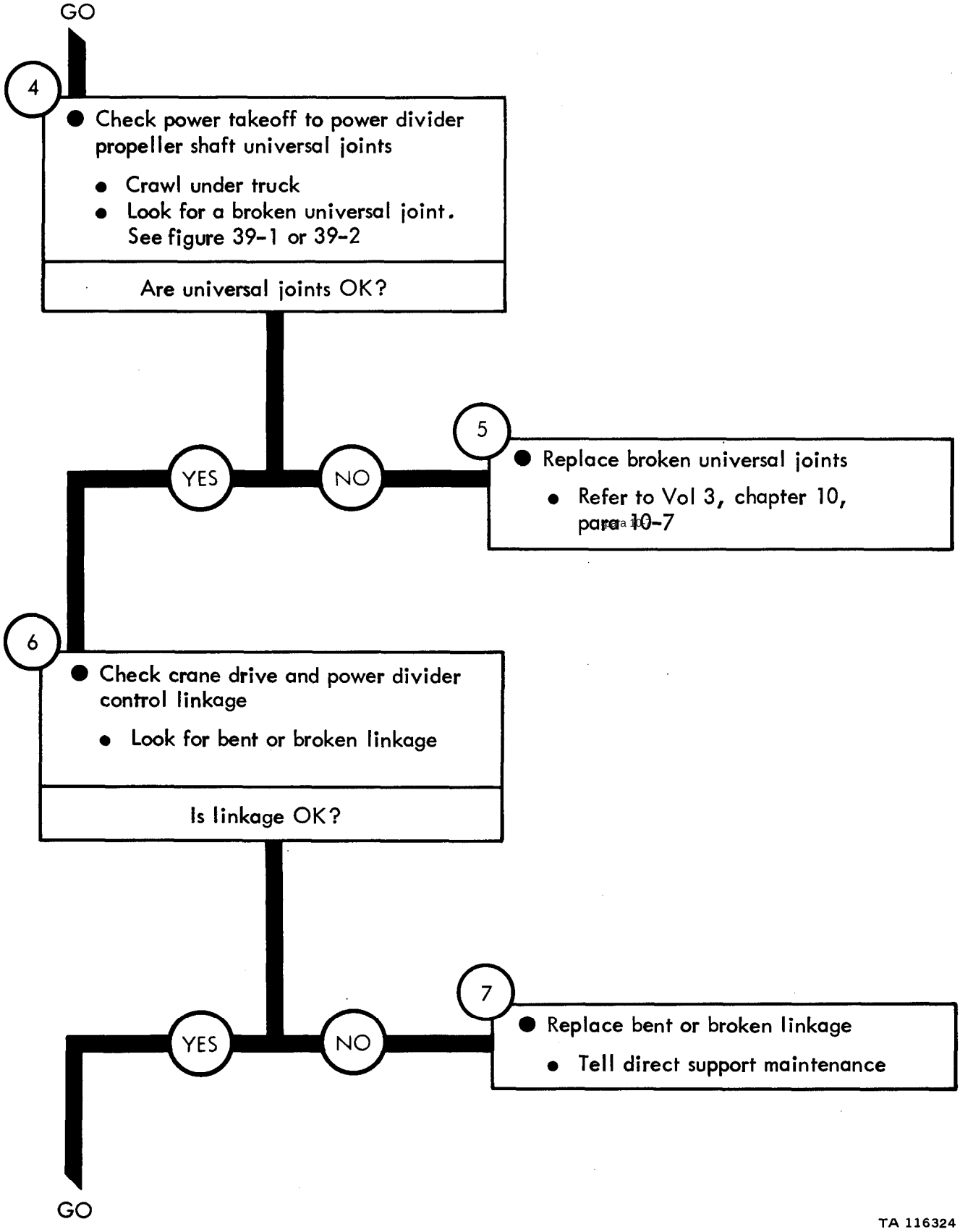



Figure 72-1 (Sheet 2 of 6)

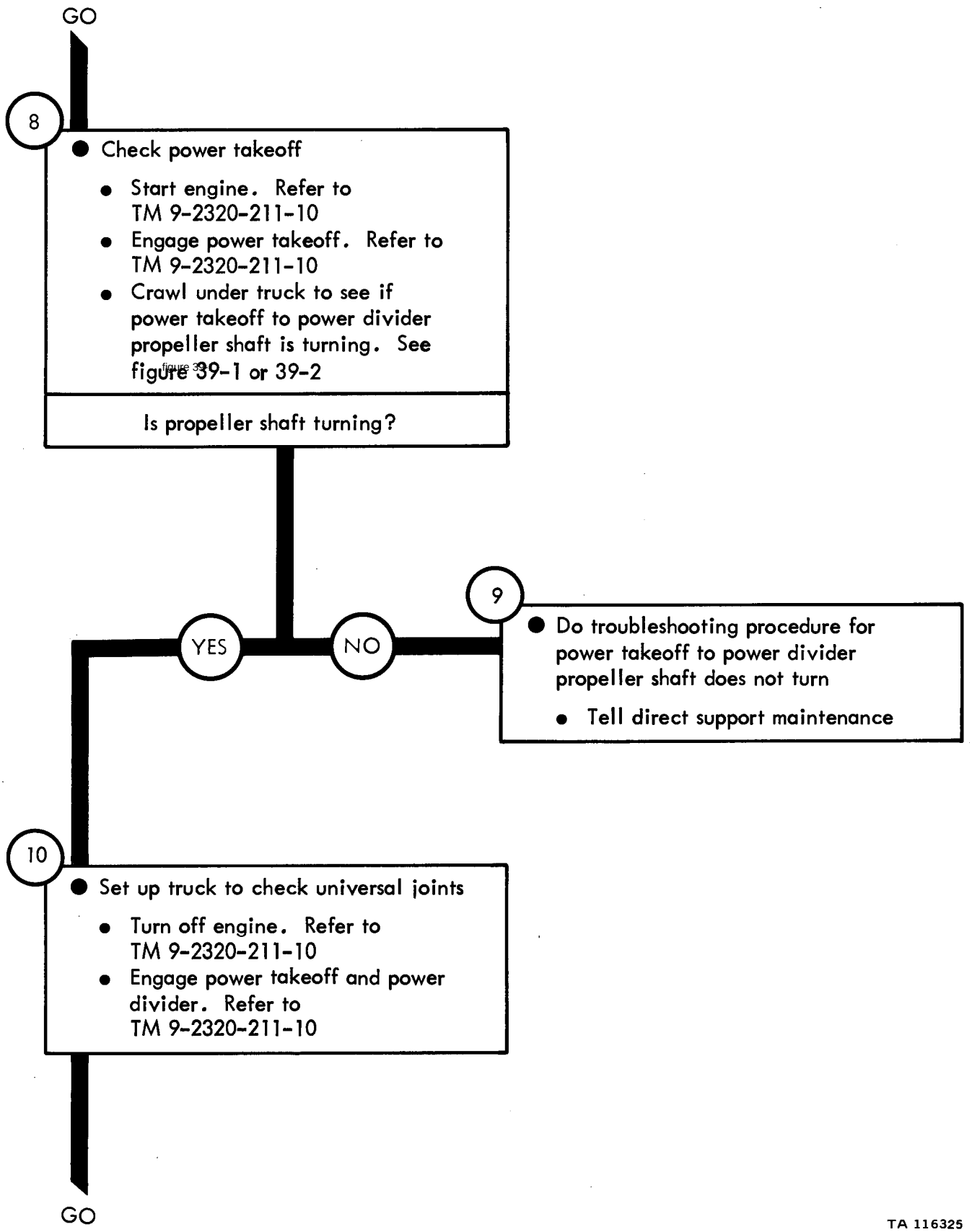



Figure 72-1 (Sheet 3 of 6)

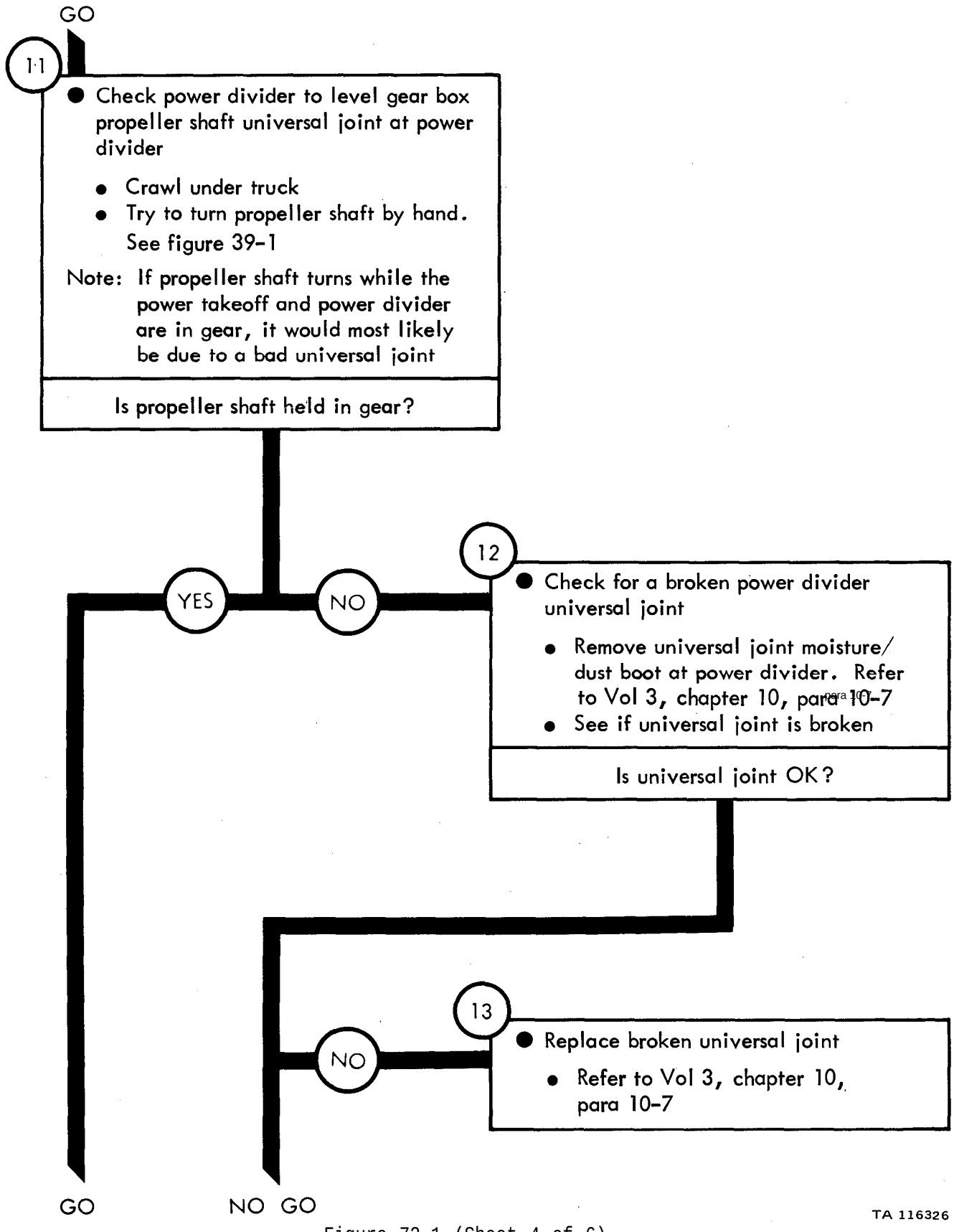



Figure 72-1 (Sheet 4 of 6)

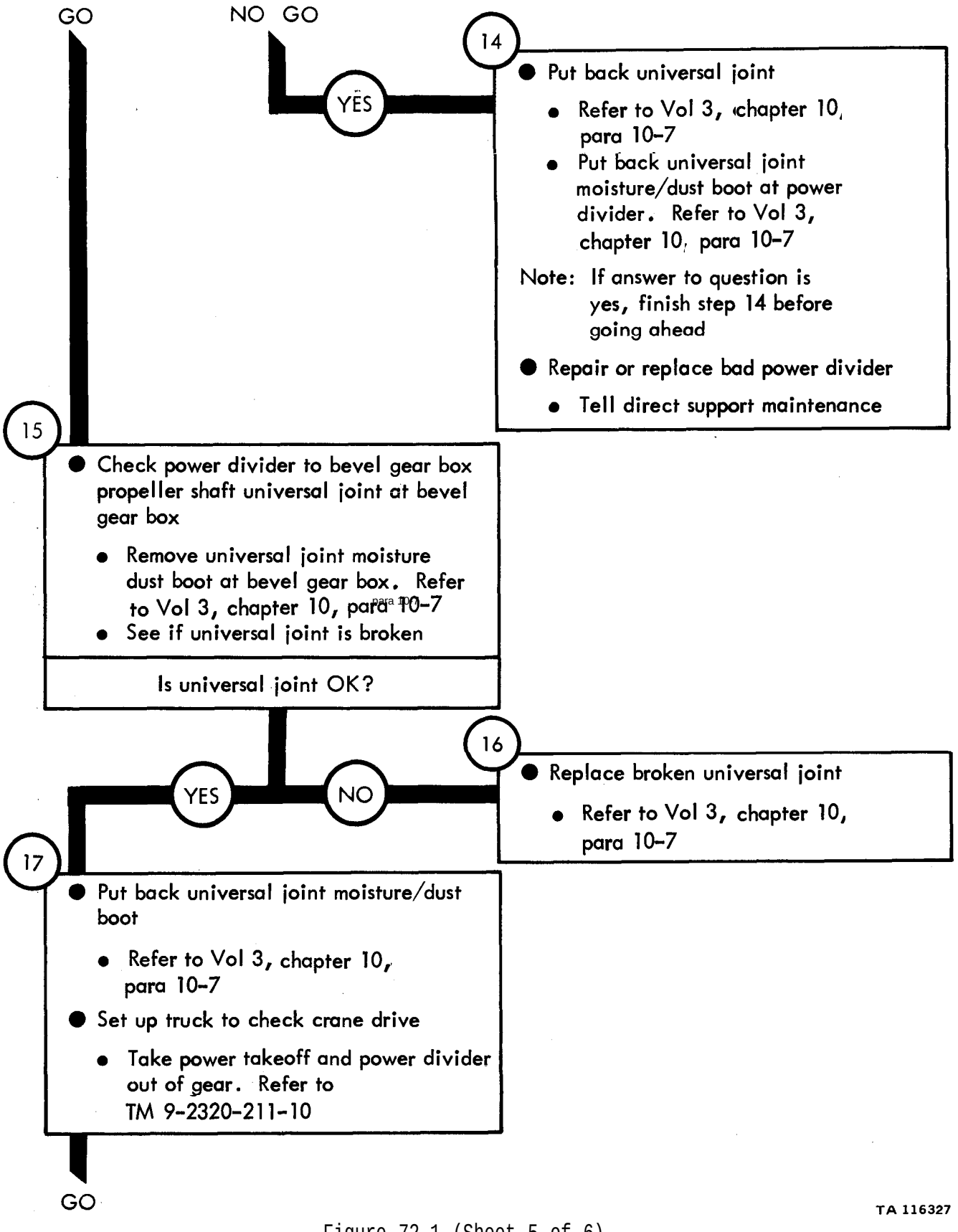
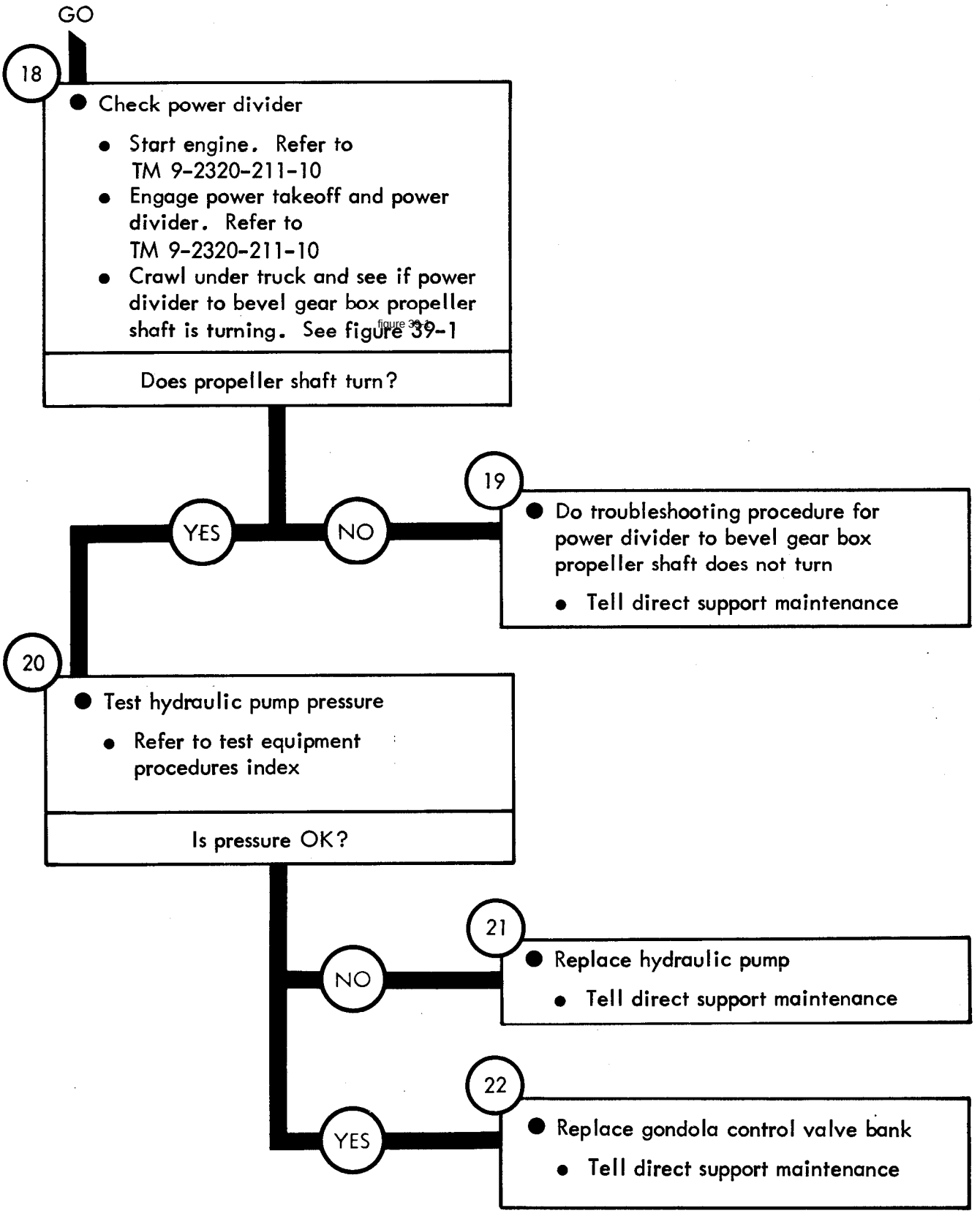



Figure 72-1 (Sheet 5 of 6)




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Figure 72-1 (Sheet 6 of 6)

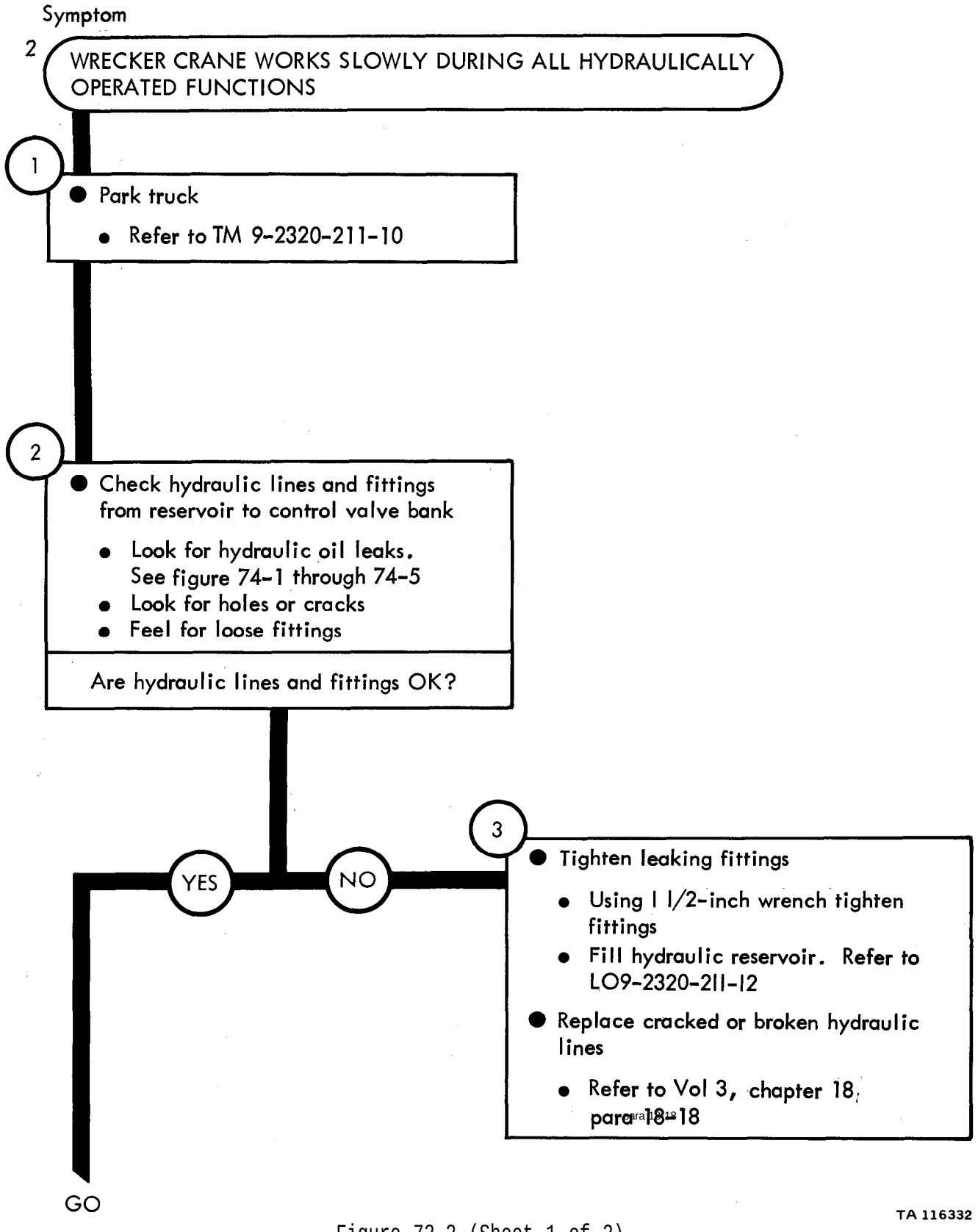
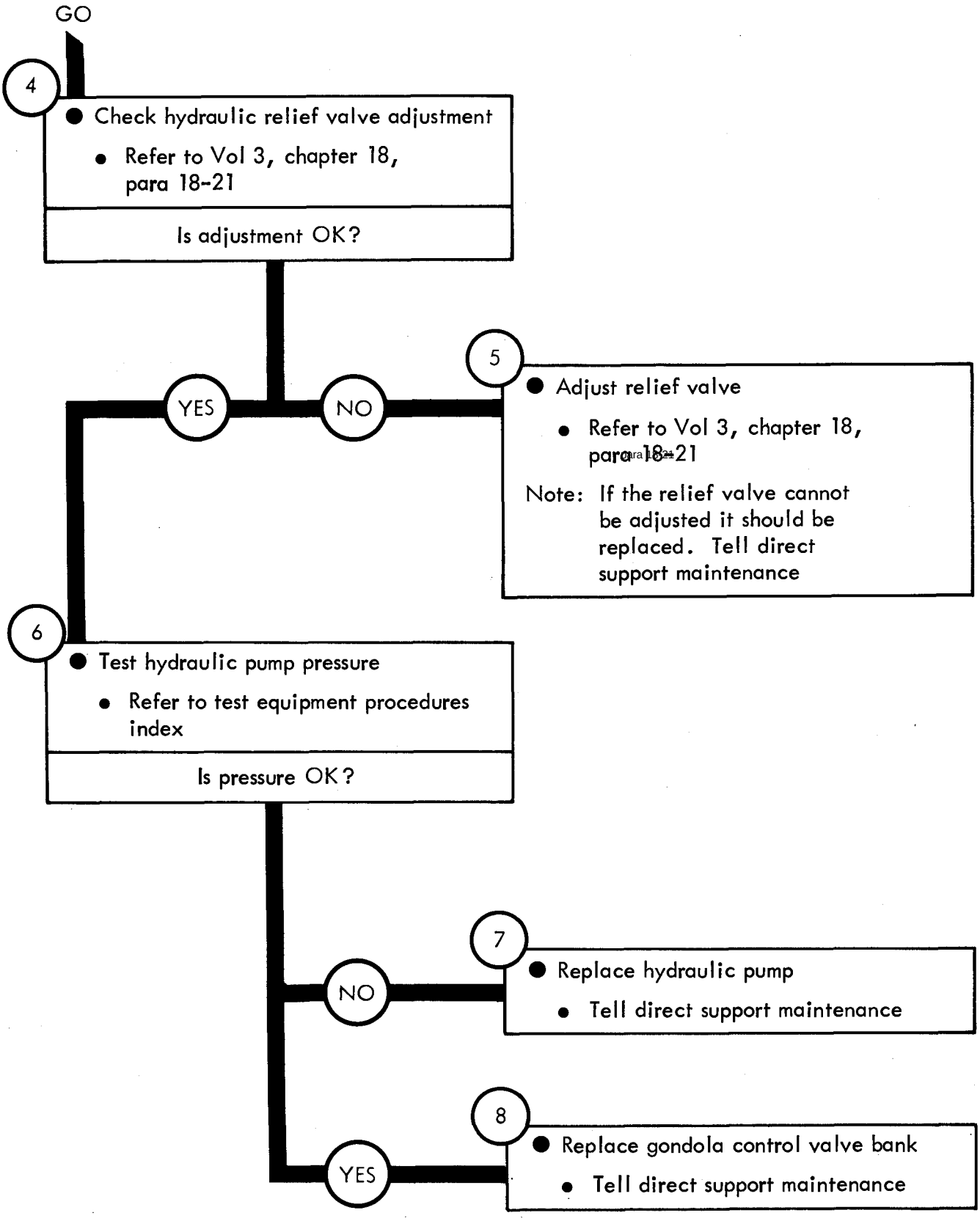



Figure 72-2 (Sheet 1 of 2)




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Figure 72-2 (Sheet 2 of 2)

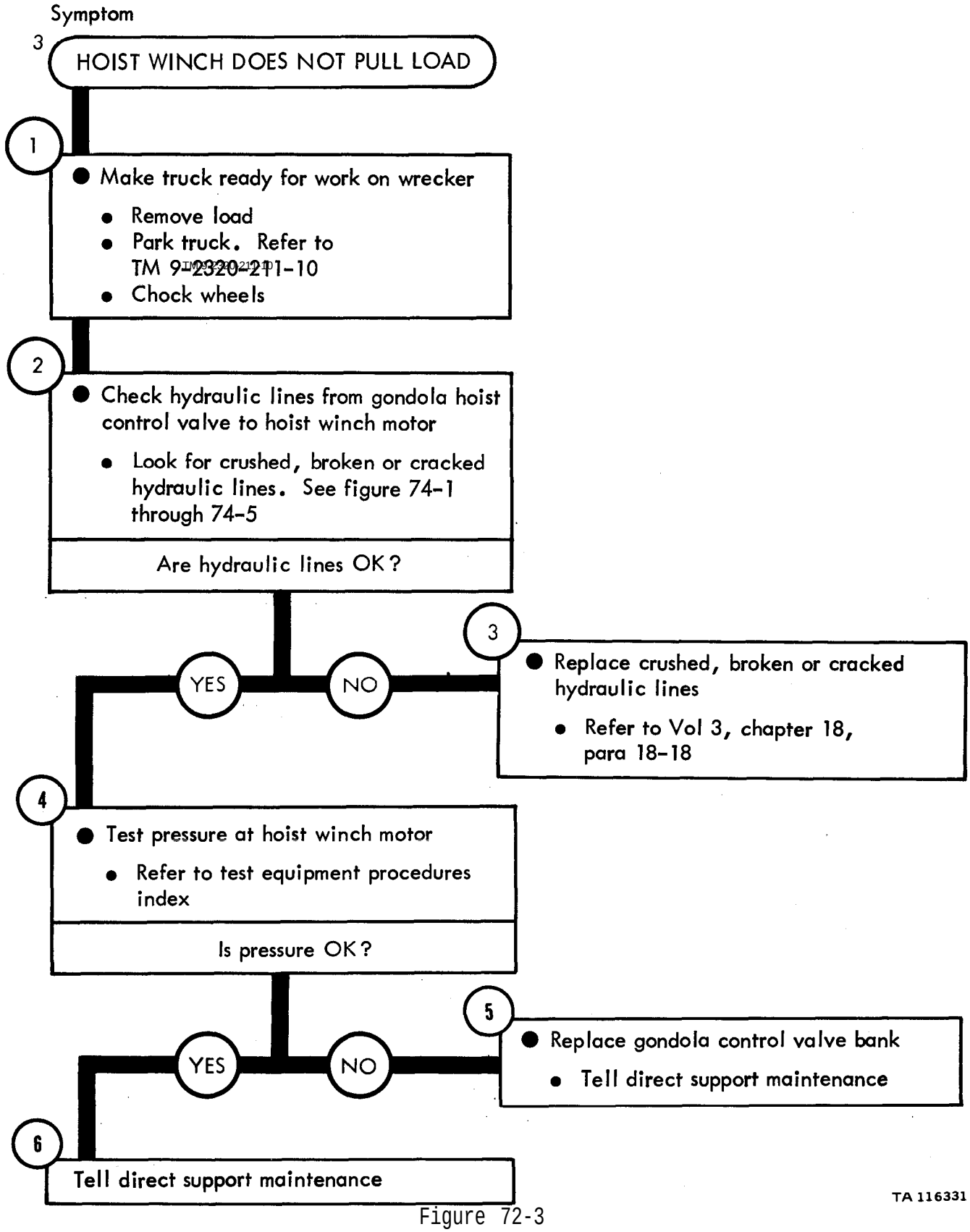
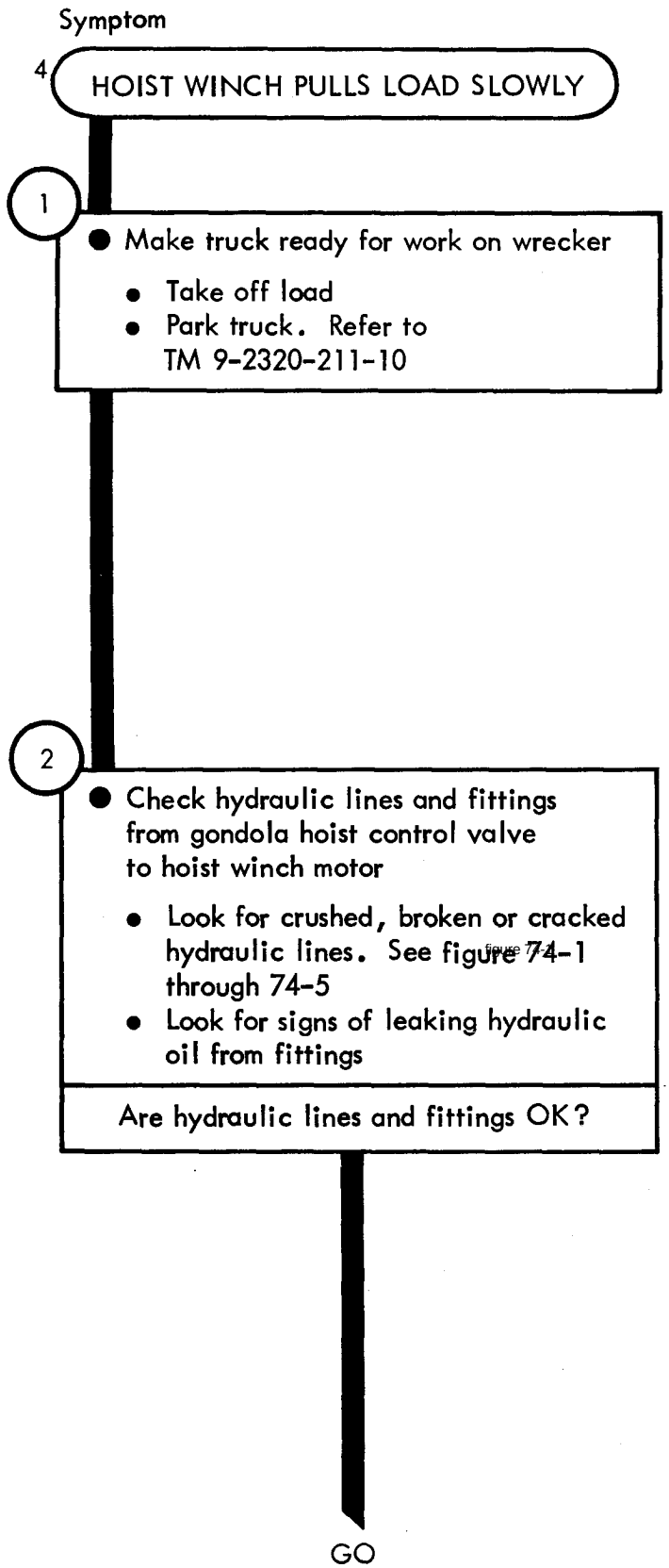
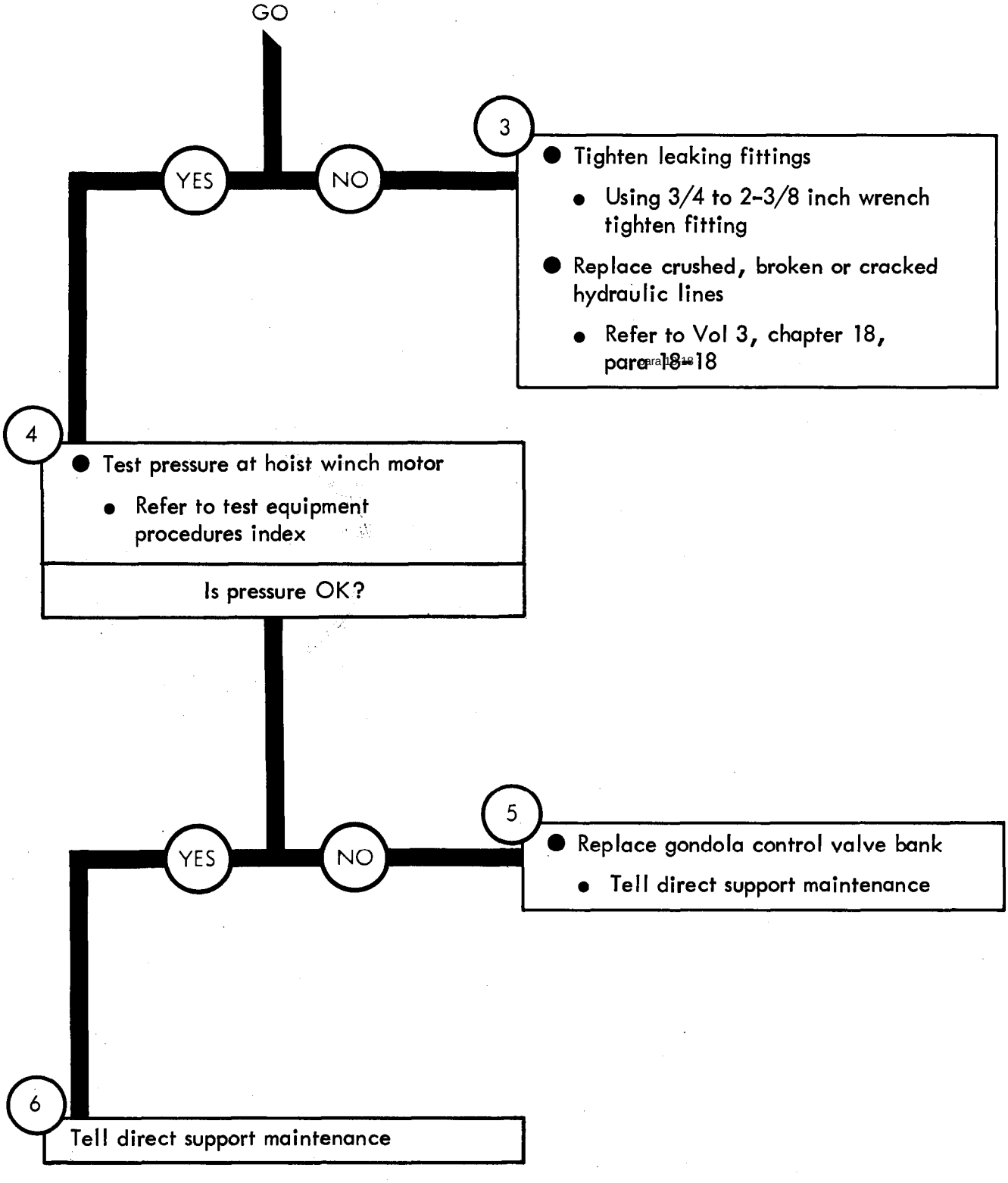

Symptom
3
HOIST WINCH DOES NOT PULL LOAD
1
● Make truck ready for work on wrecker
• Remove load
• Park truck. Refer to TM 9-2320-211-10
• Chock wheels
2
● Check hydraulic lines from gondola hoist control valve to hoist winch motor
• Look for crushed, broken or cracked hydraulic lines. See figure 74-1 through 74-5
Are hydraulic lines OK?
YES
NO
3
● Replace crushed, broken or cracked hydraulic lines
• Refer to Vol 3, chapter 18, para 18-18
4
● Test pressure at hoist winch motor
• Refer to test equipment procedures index
Is pressure OK?
YES
NO
5
● Replace gondola control valve bank
• Tell direct support maintenance
6
Tell direct support maintenance
TA 116331

Figure 72-3




TA 116329

Figure 72-4 (Sheet 1 of 2)




TA 116330

Figure 72-4 (Sheet 2 of 2)

5 HOIST WINCH DOES NOT HOLD LOAD

1
- Make truck ready for work on wrecker
  - Turn off hoist winch. Refer to TM 9-2320-211-10
  - Set handbrake
  - Chock wheels

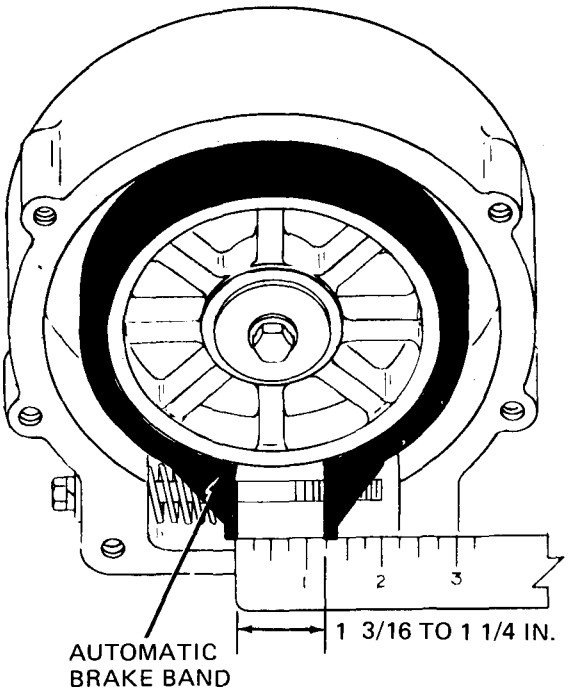
2
- Check automatic brake adjustment
  - Remove winch brake case cover. Refer to Vol 3, chapter 18, para 18-27
  - Using ruler measure automatic brake band to see if spring compression is 1-3/16 to 1-1/4 inch

Is adjustment OK?

YES / NO

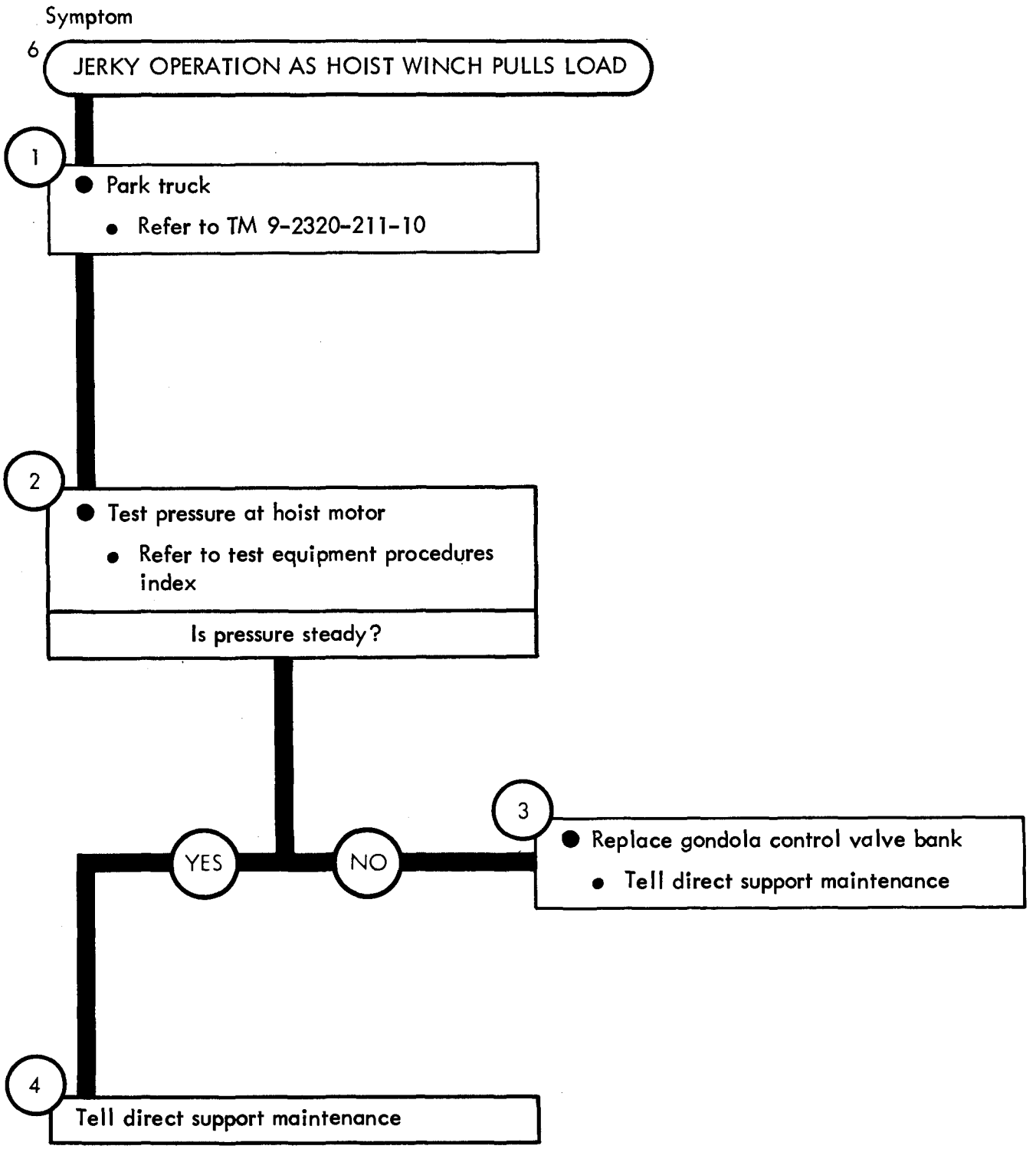
3
- Adjust automatic brake
  - Refer to Vol 3, chapter 18, para 18-3

4
Tell direct support maintenance



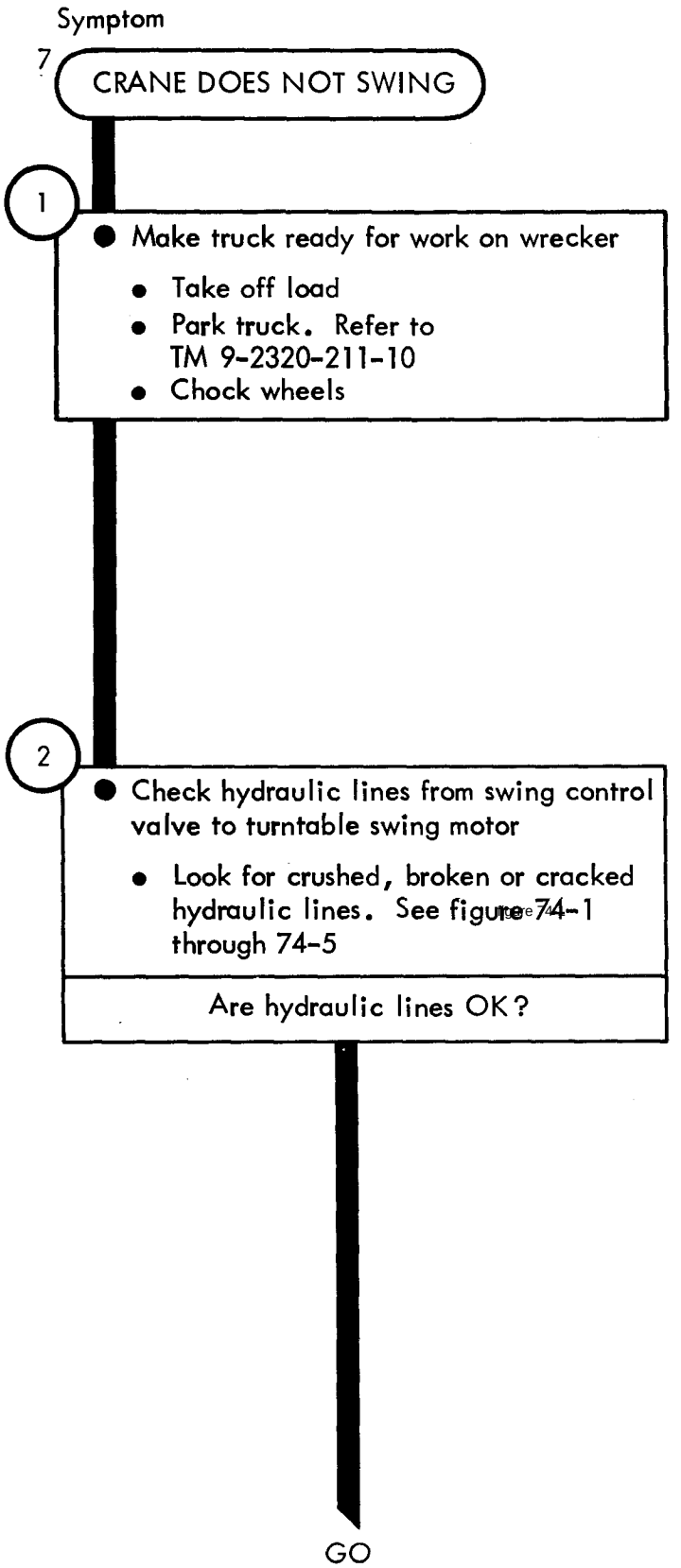

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Figure 72-5



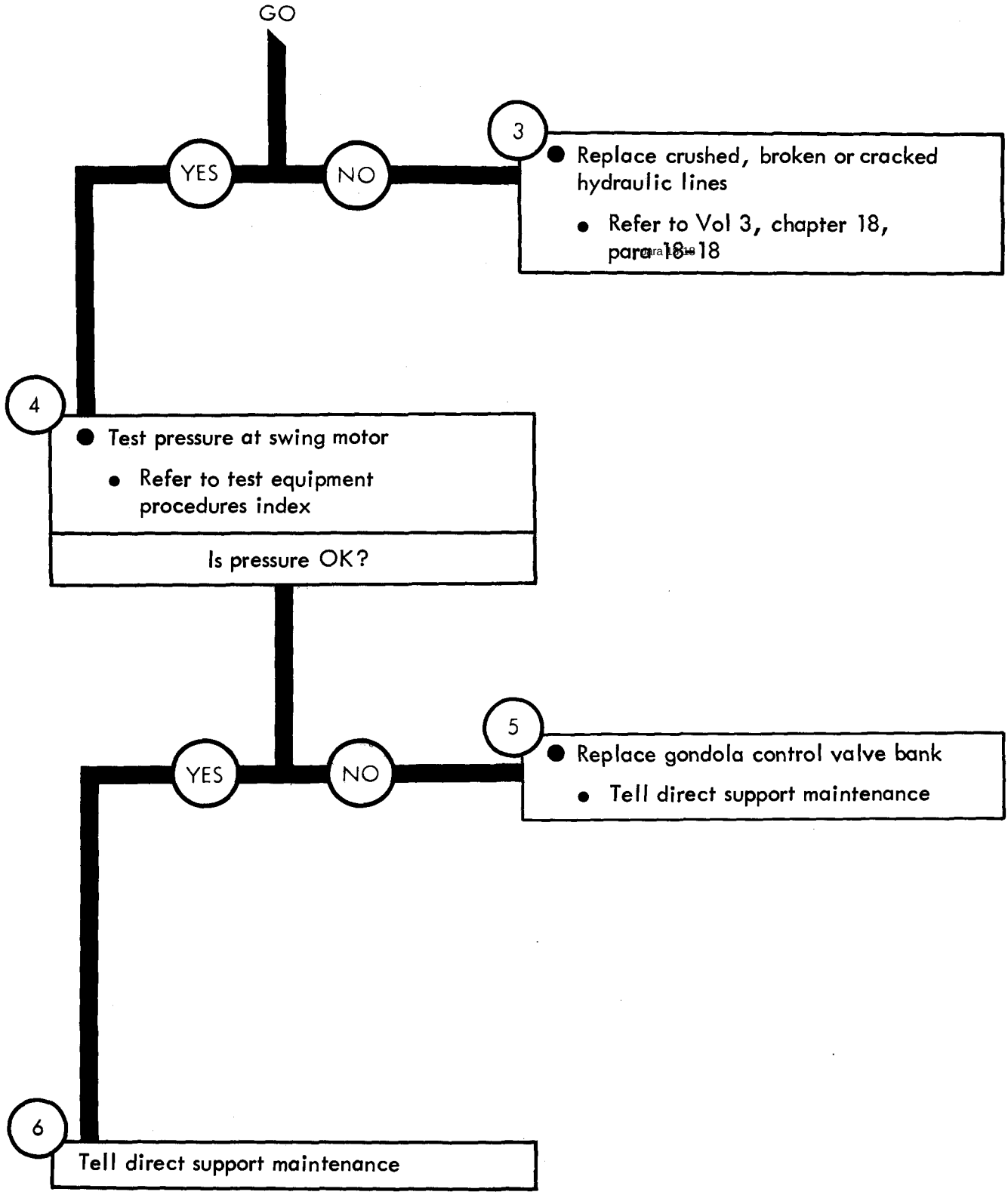

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Figure 72-6



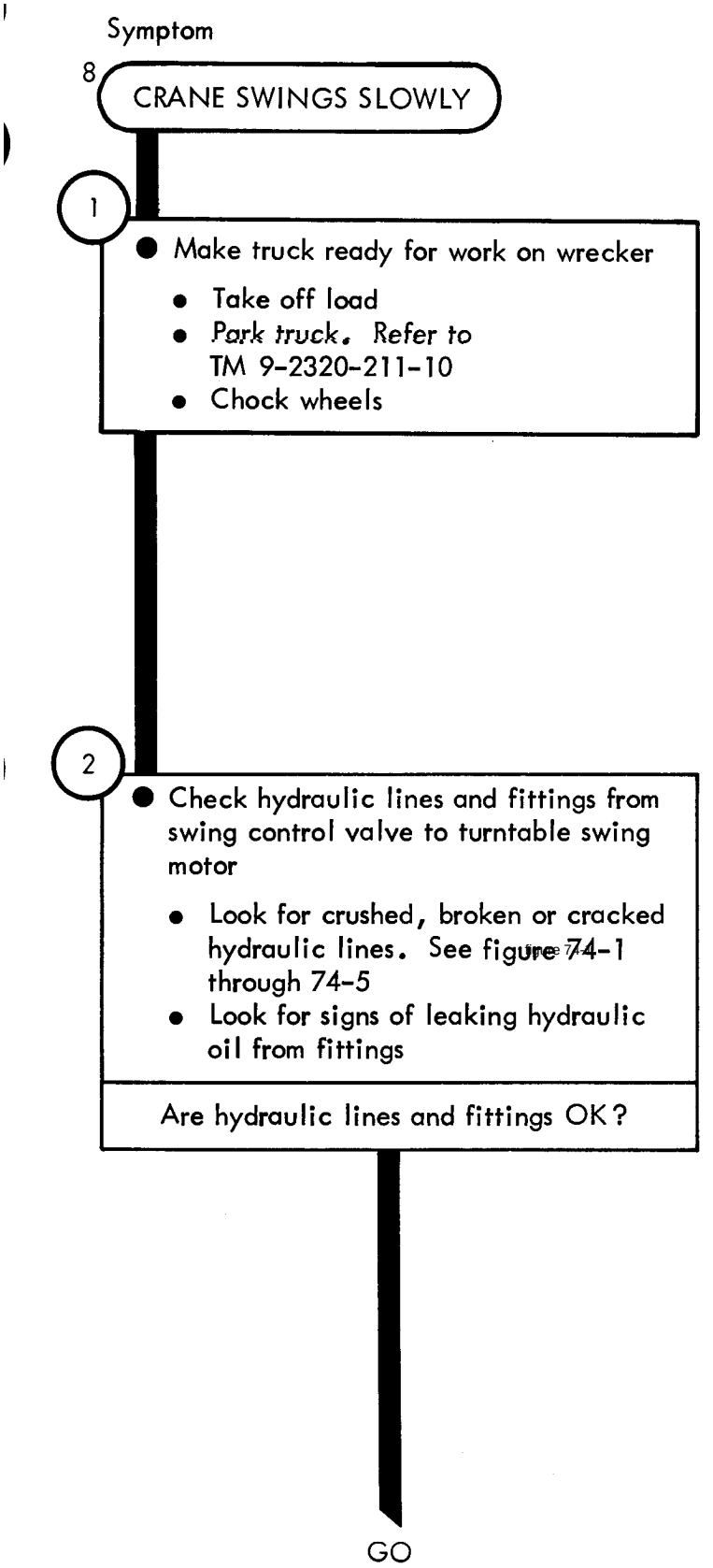

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Figure 72-7 (Sheet 1 of 2)



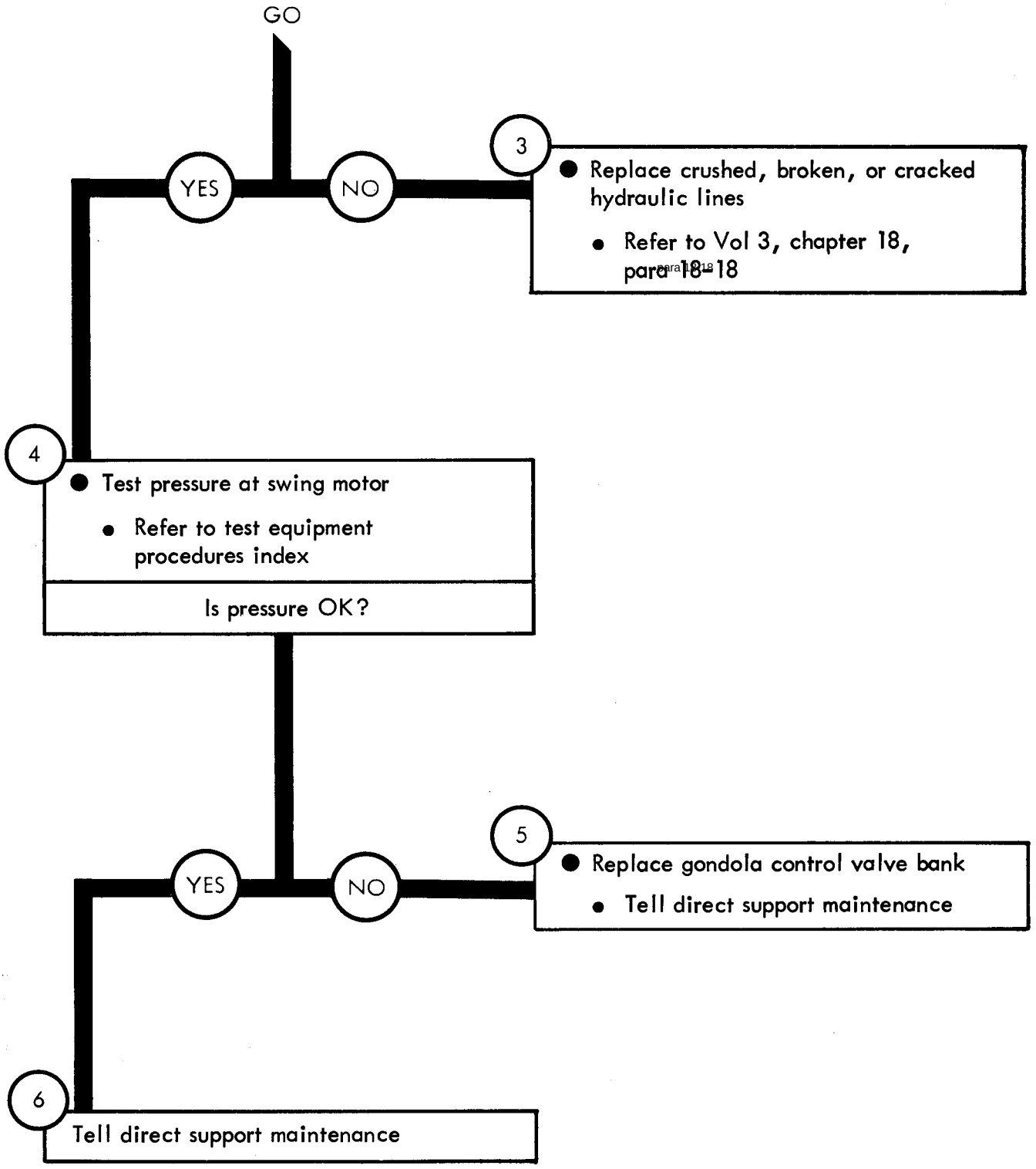

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Figure 72-7 (Sheet 2 of 2)



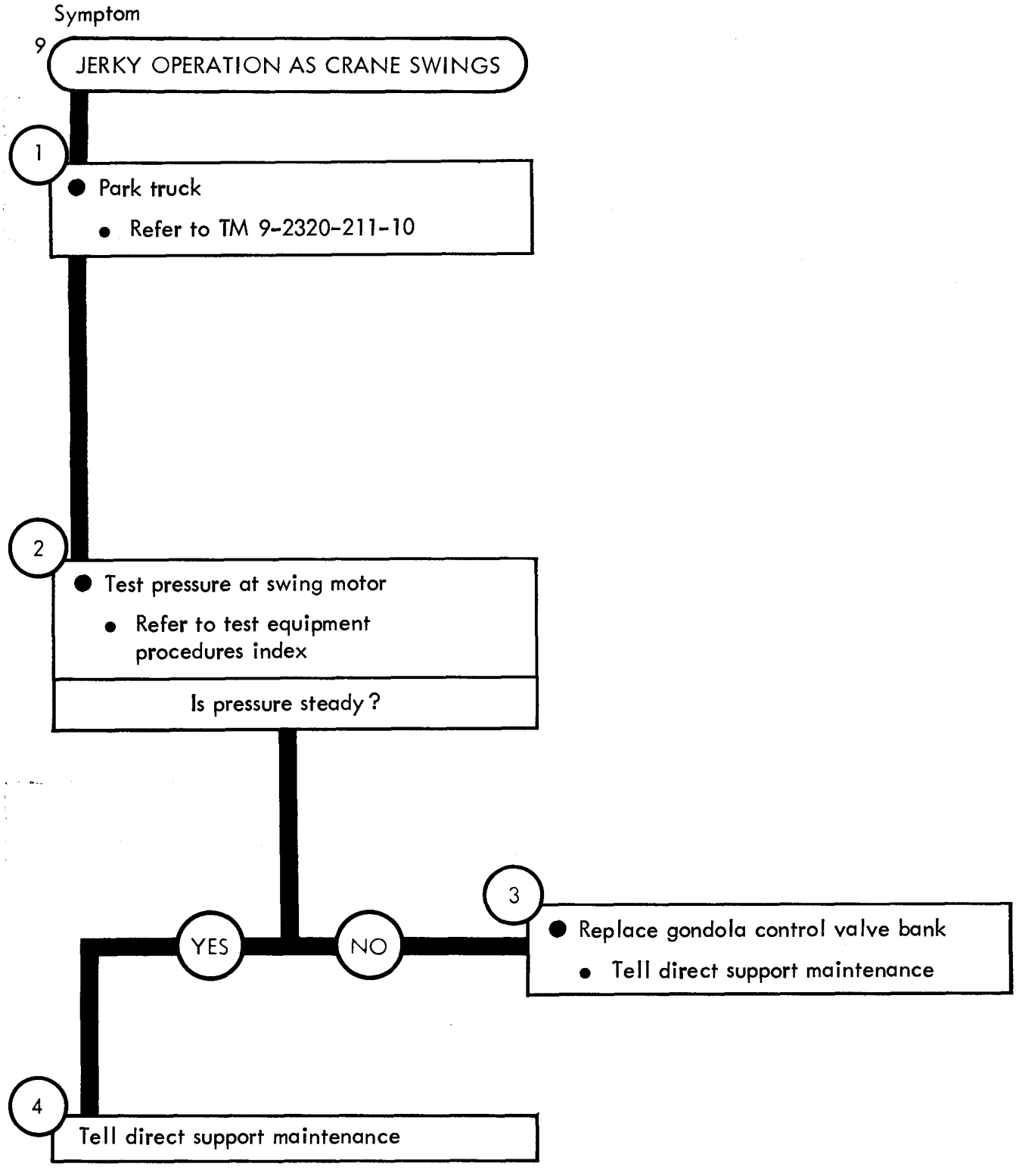

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Figure 72-8 (Sheet 1 of 2)




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Figure 72-8 (Sheet 2 of 2)




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Figure 72-9

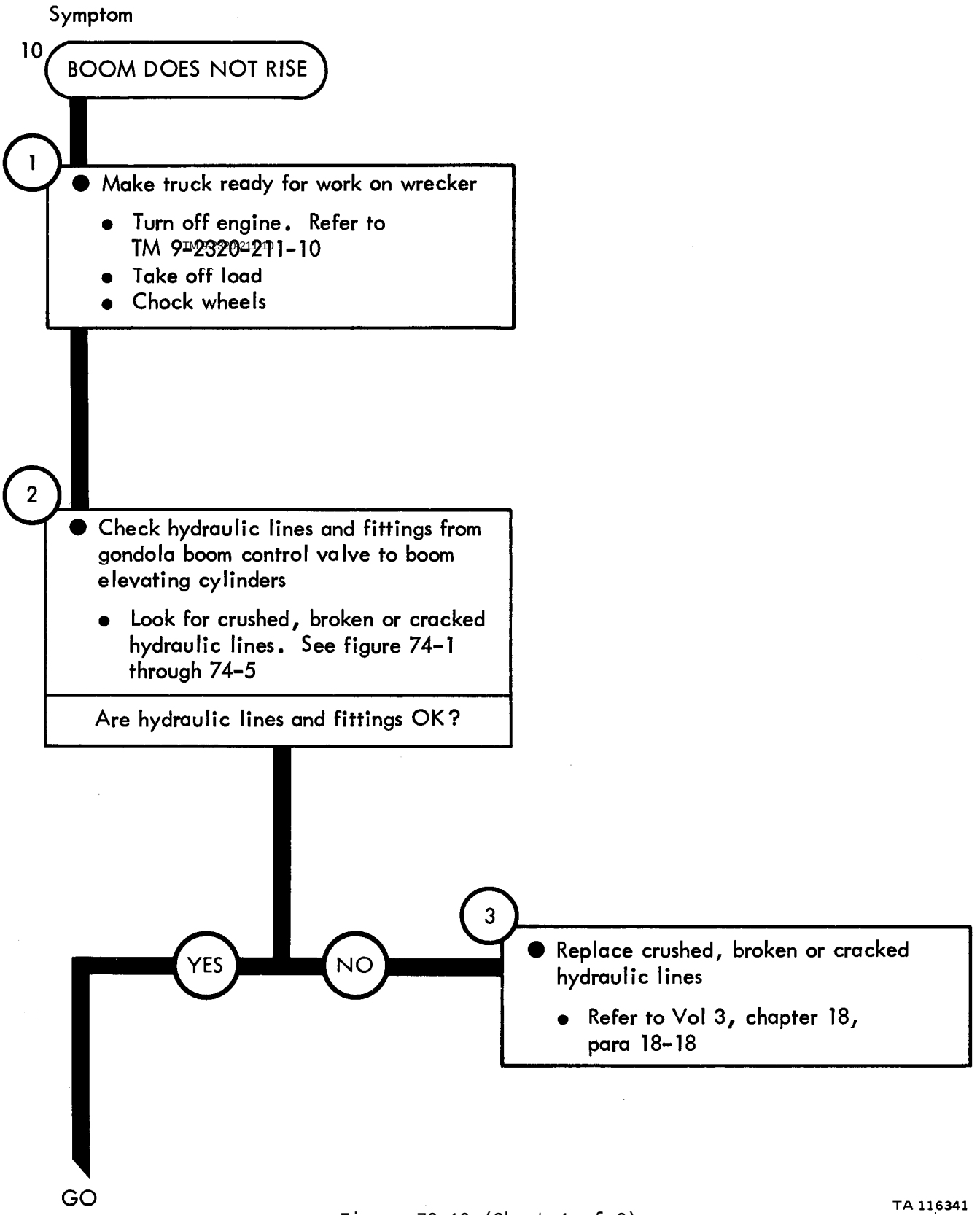



Figure 72-10 (Sheet 1 of 2)

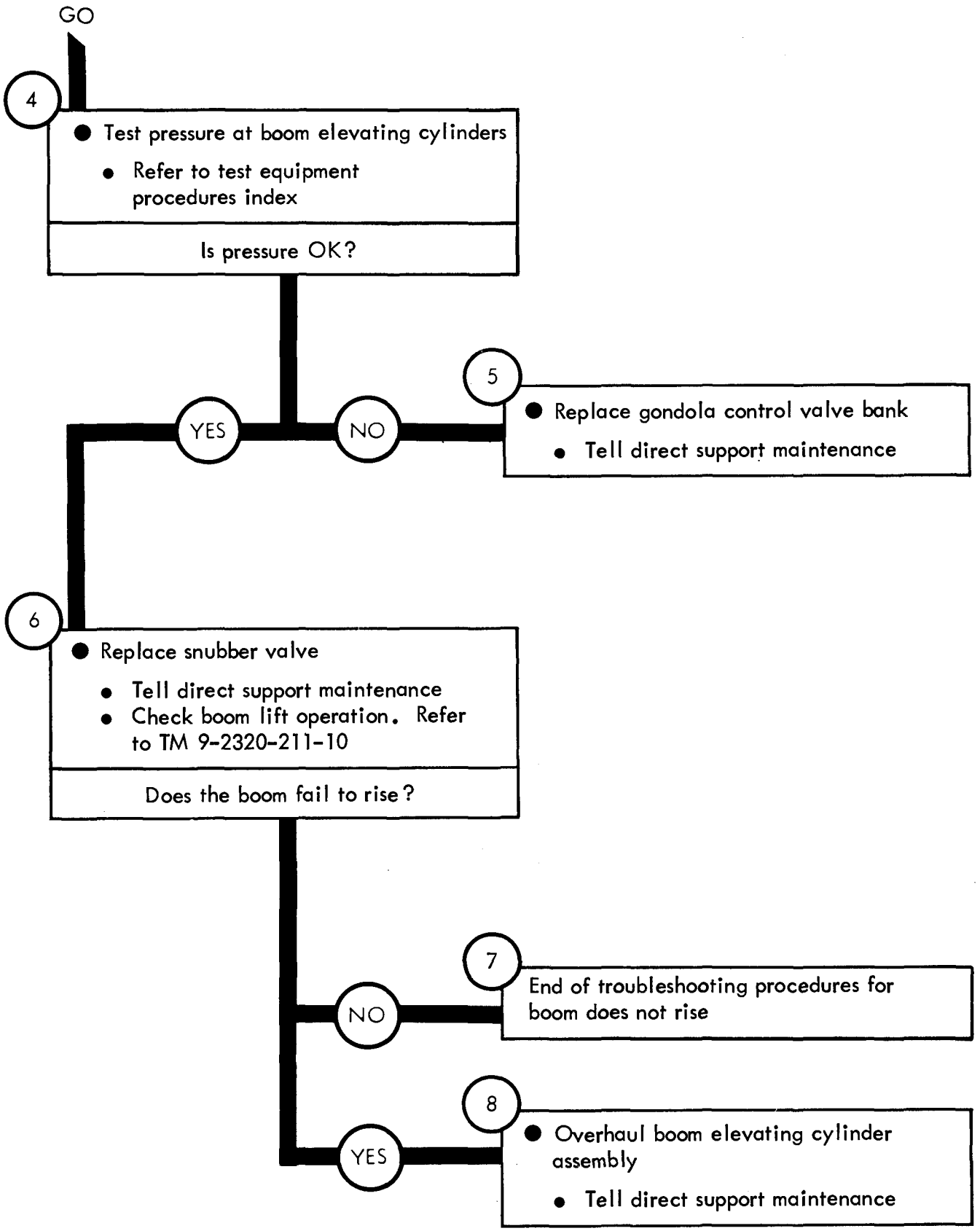
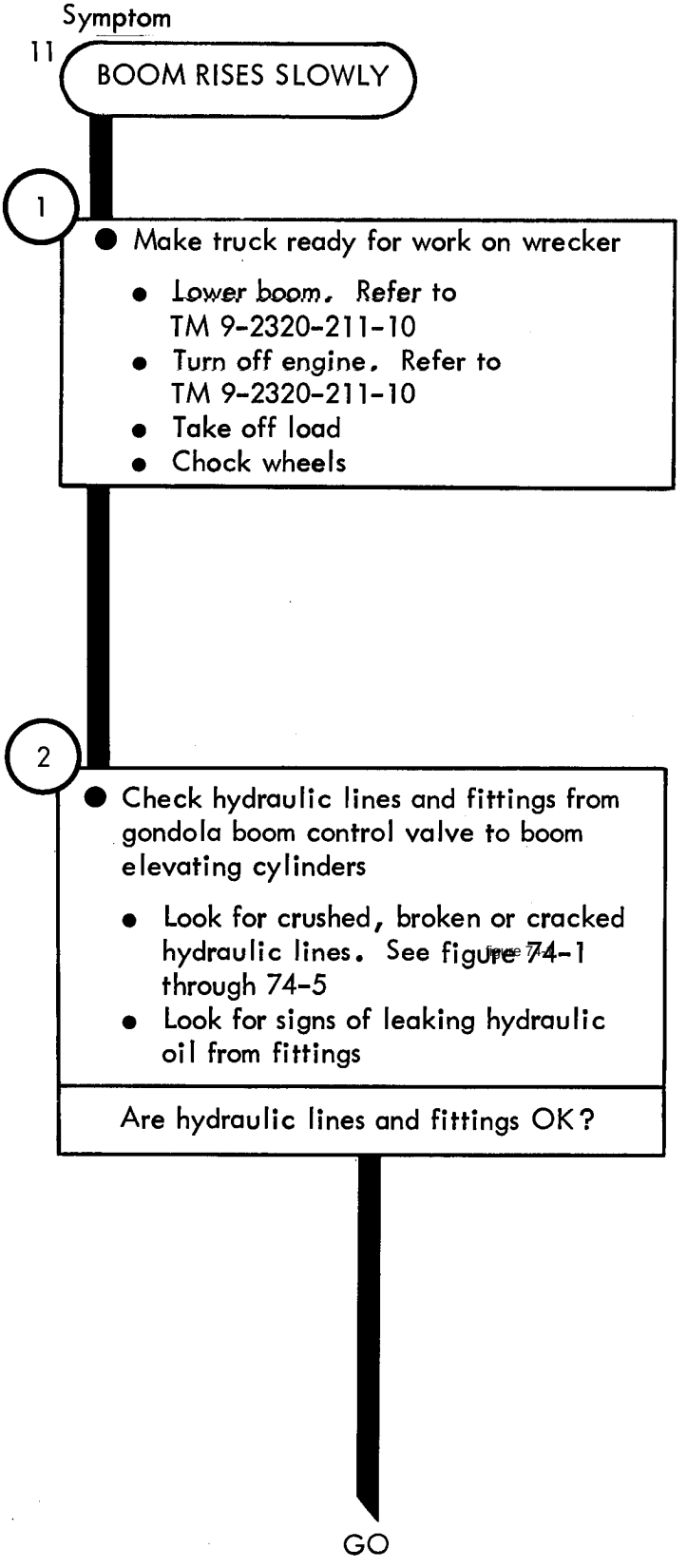



Figure 72-10 (Sheet 2 of 2)




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Figure 72-11 (Sheet 1 of 3)

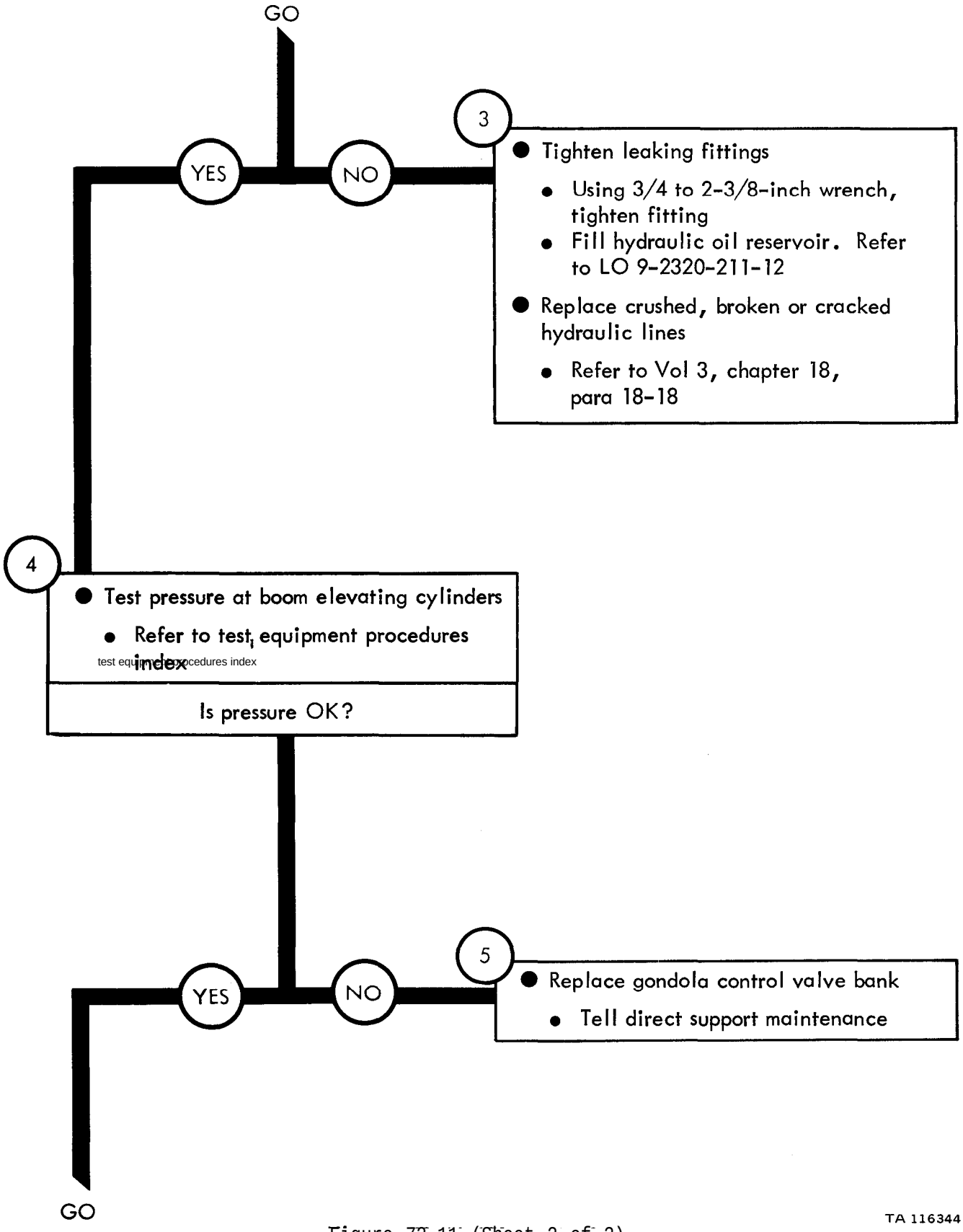



Figure 72-11 (Sheet 2 of 3)

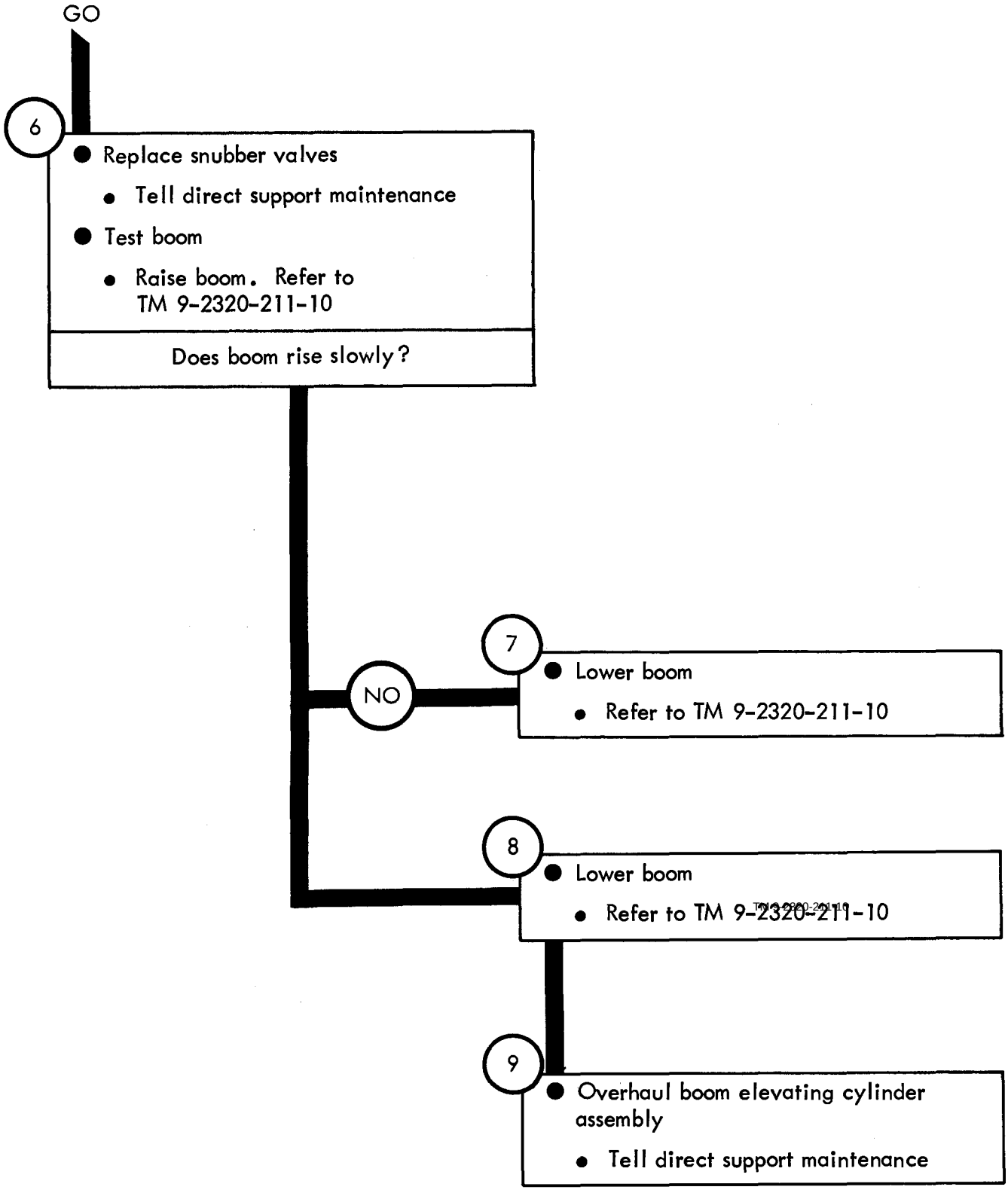



Figure 72-11 (Sheet 3 of 3)

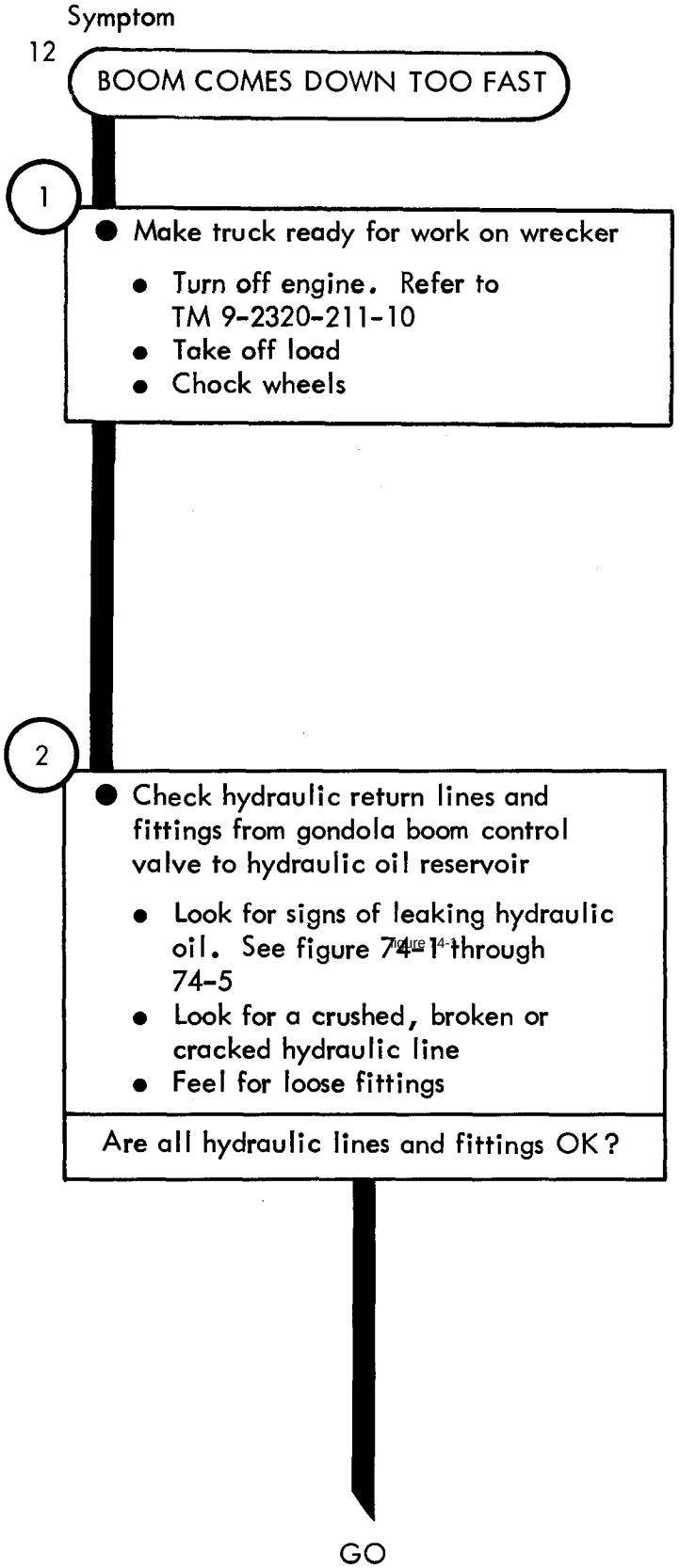
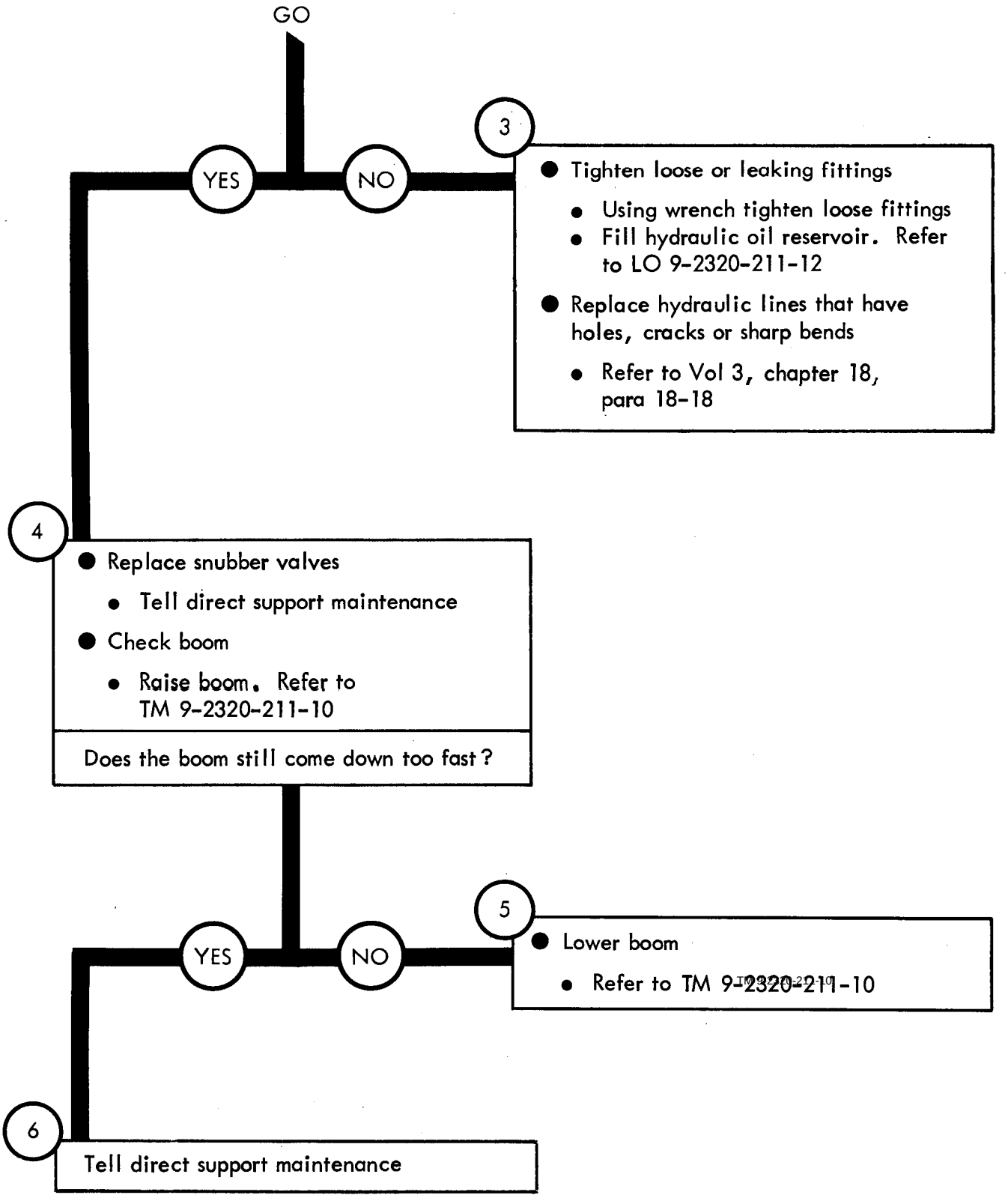



Figure 72-12 (Sheet 1 of 2)

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Figure 72-12 (Sheet 2 of 2)

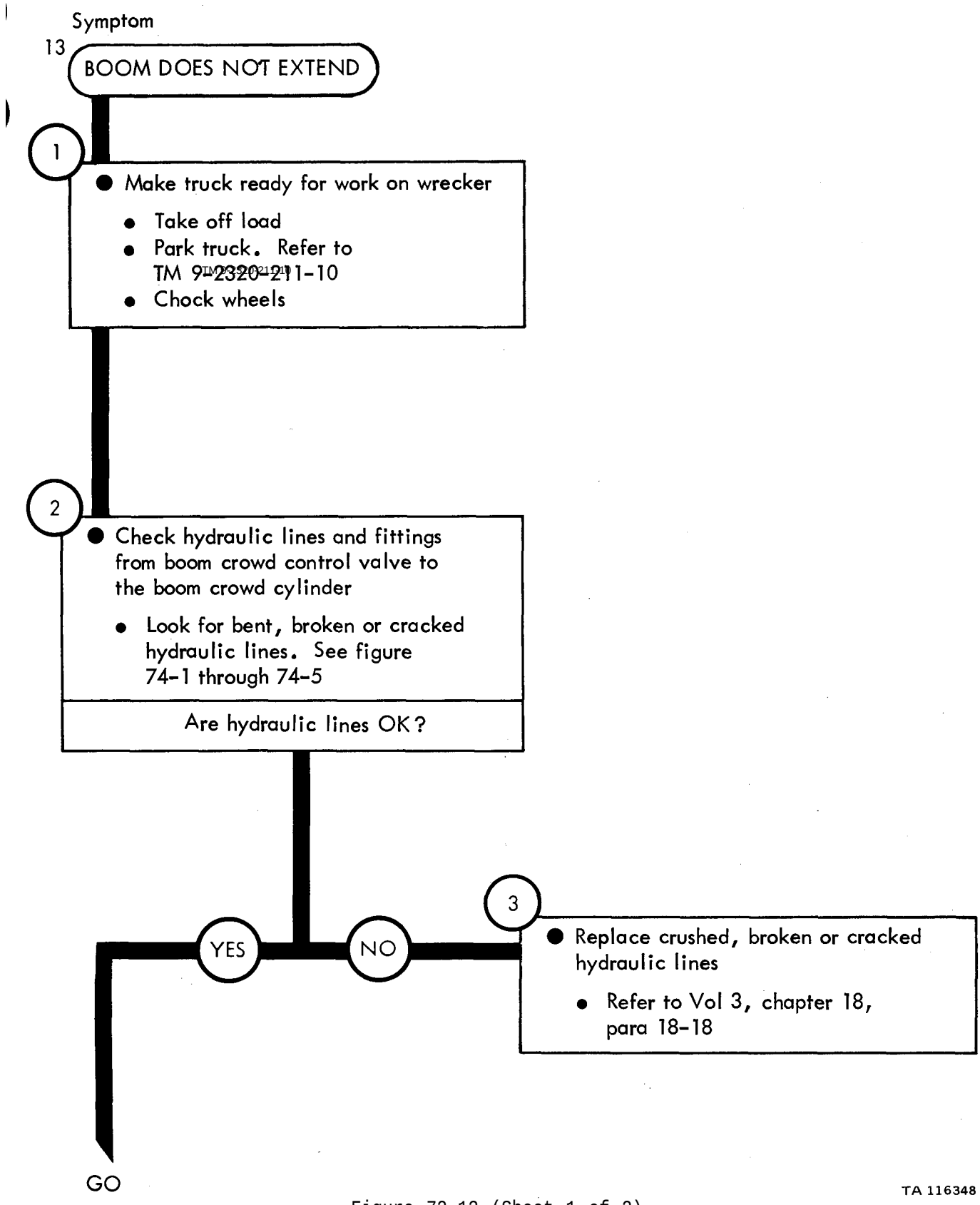



Figure 72-13 (Sheet 1 of 2)

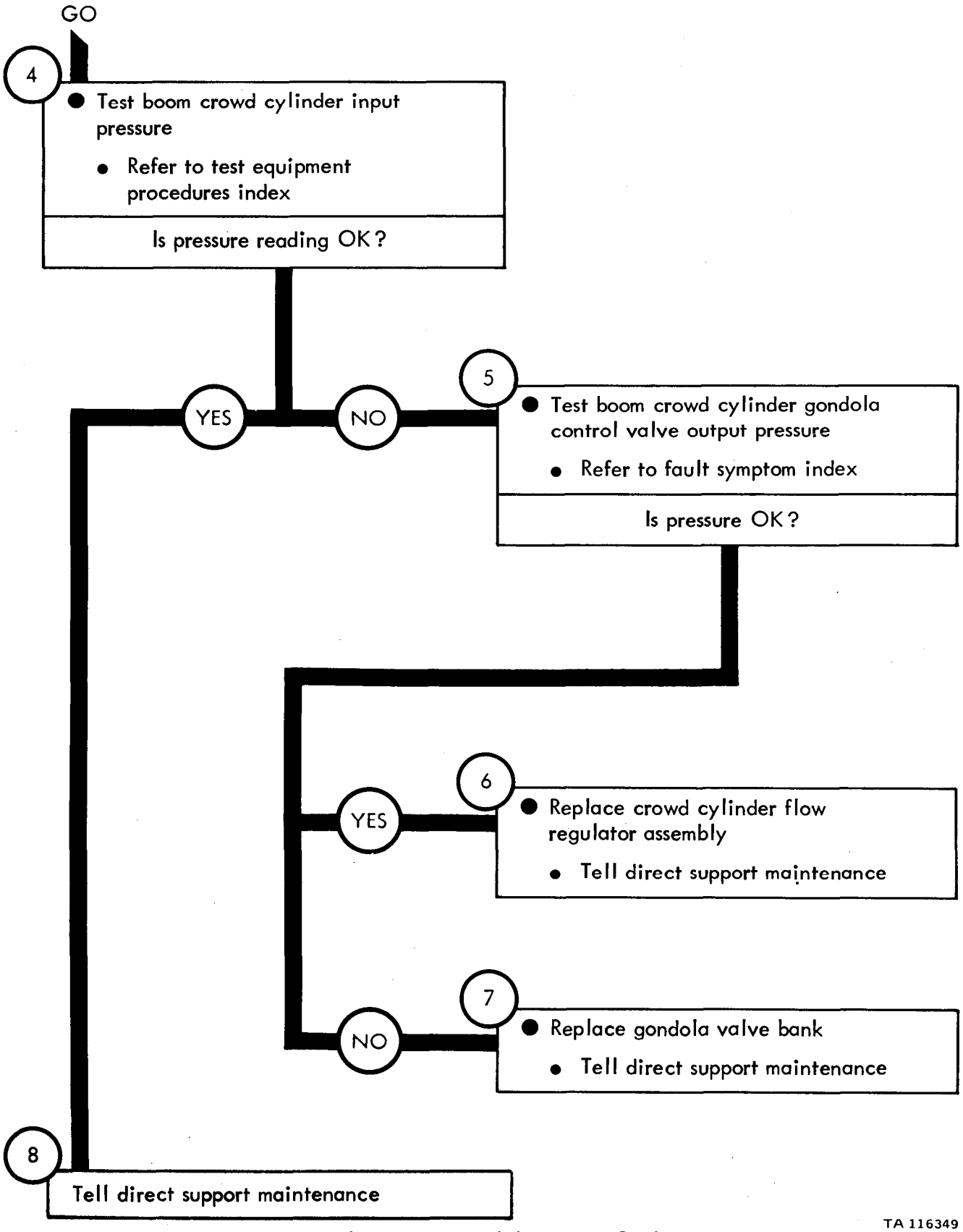
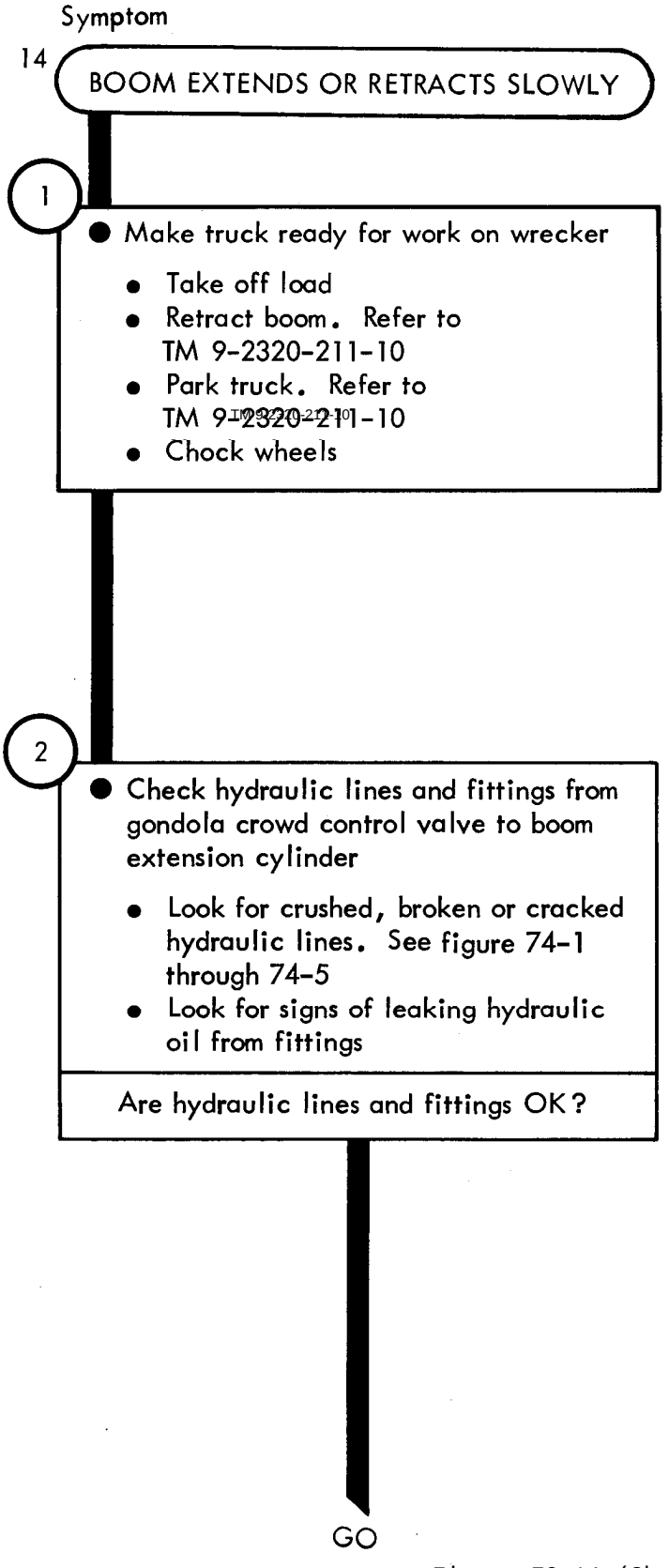



Figure 72-13 (Sheet 2 of 2)




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Figure 72-14 (Sheet 1 of 3)

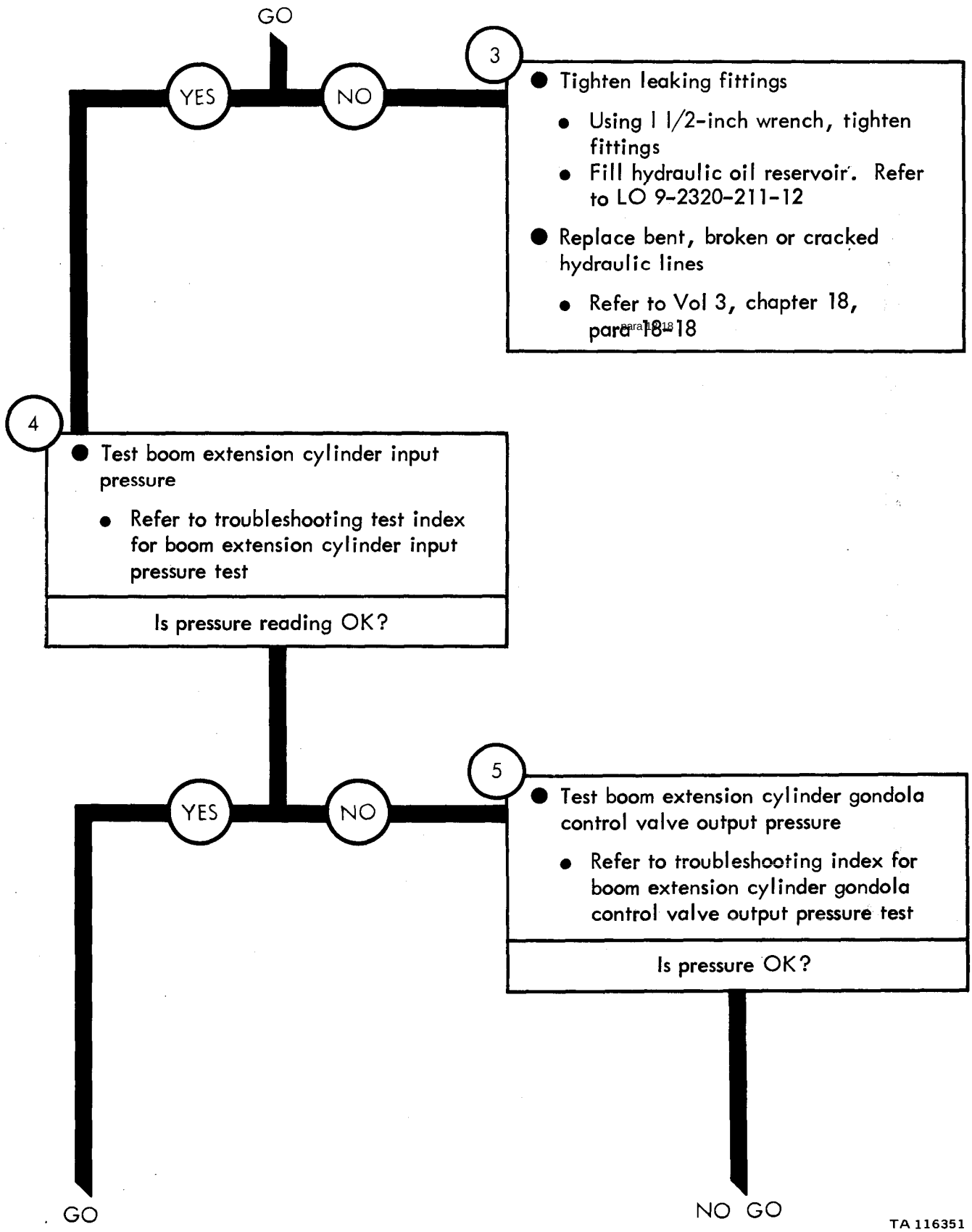
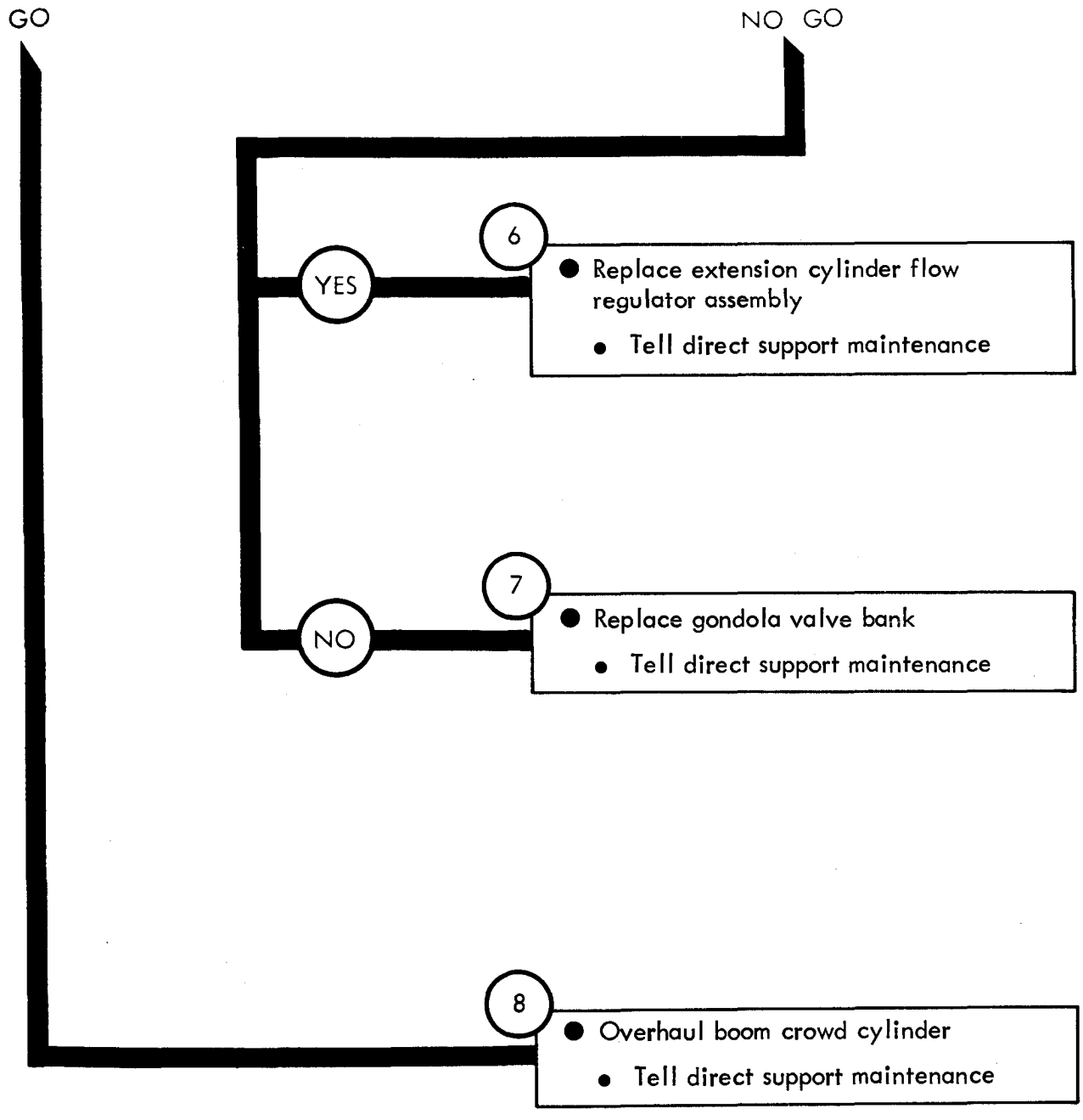
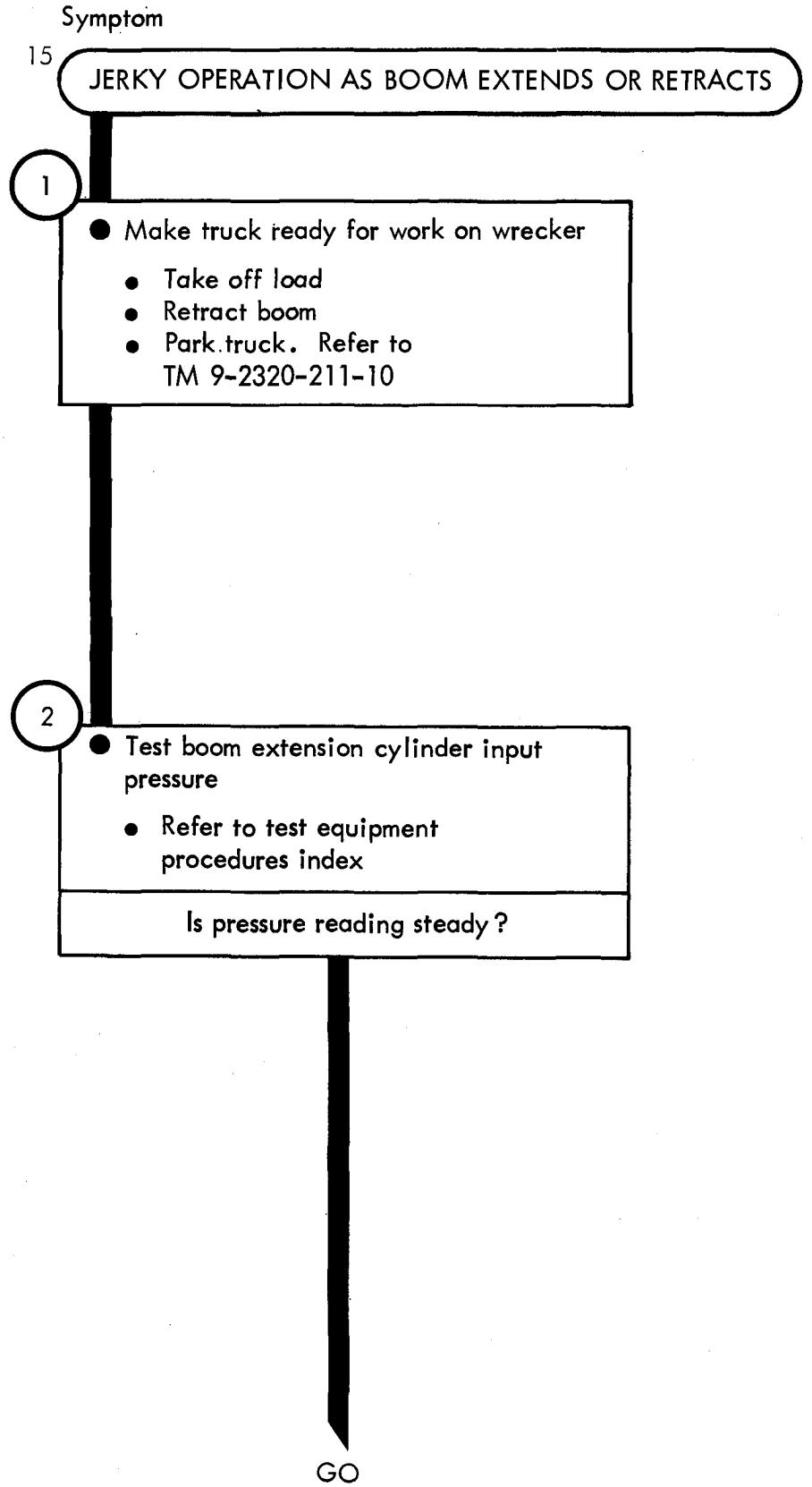



Figure 72-14 (Sheet 2 of 3)



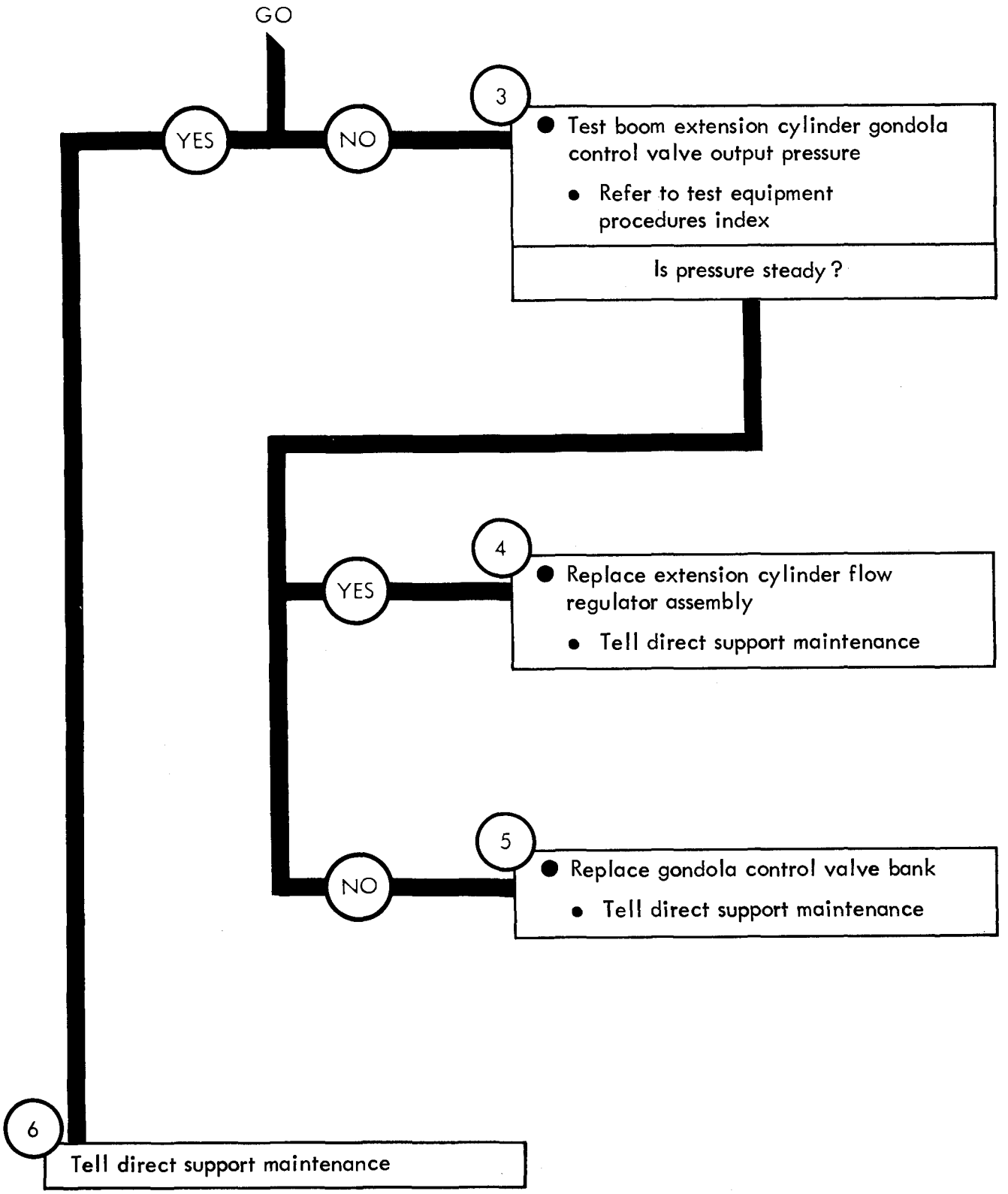

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Figure 72-14 (Sheet 3 of 3)




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Figure 72-15 (Sheet 1 of 2)




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Figure 72-15 (Sheet 2 of 2)

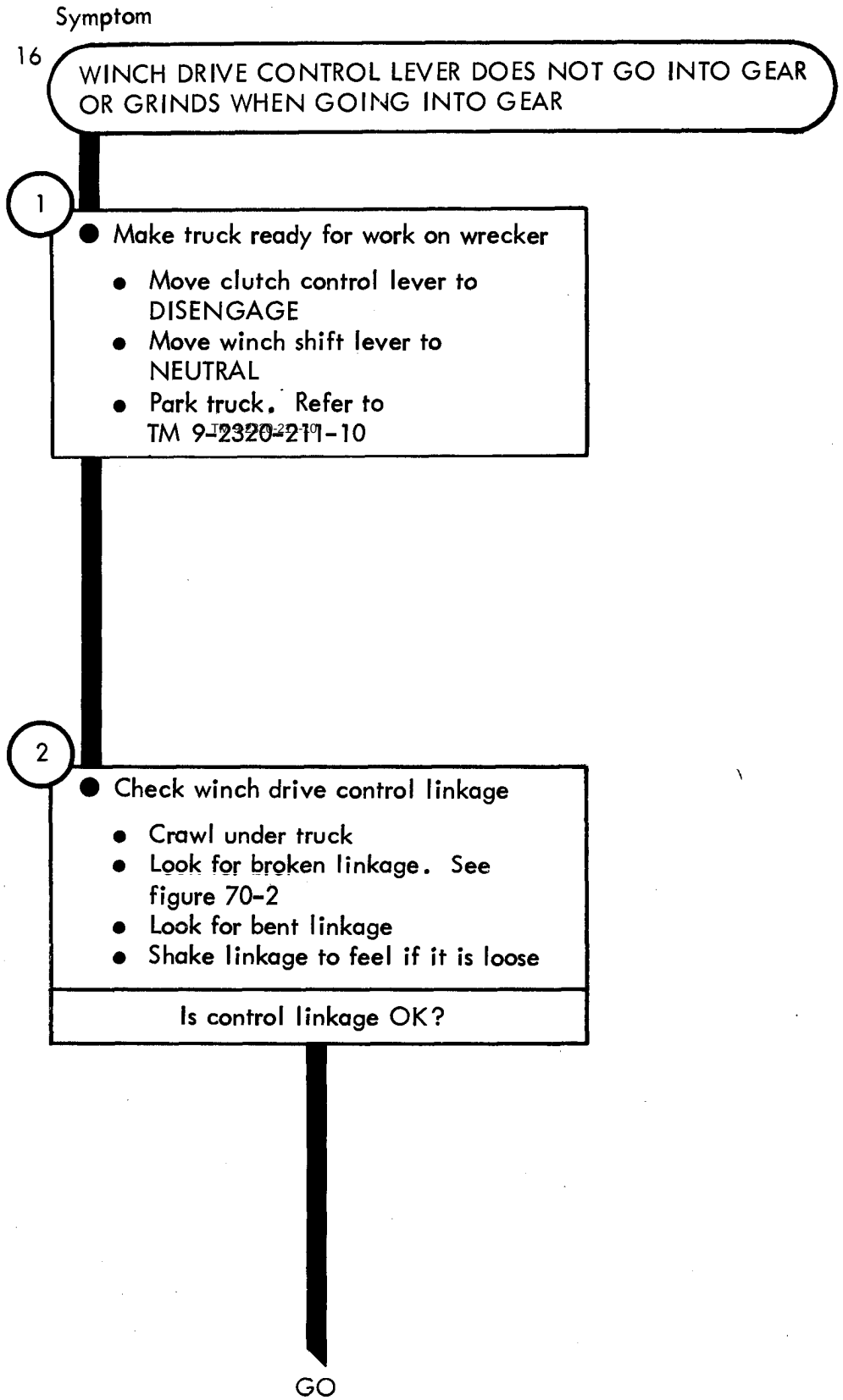
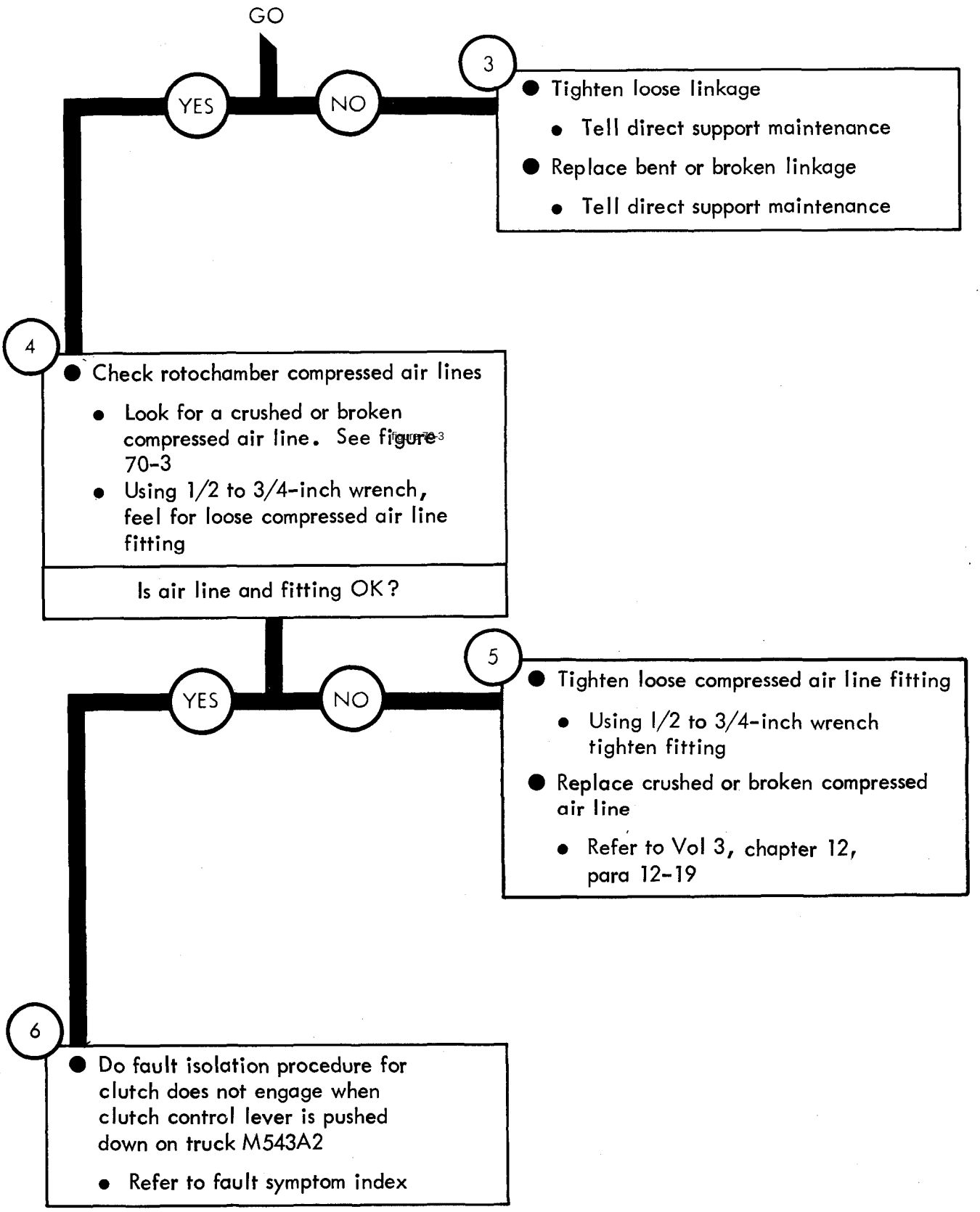
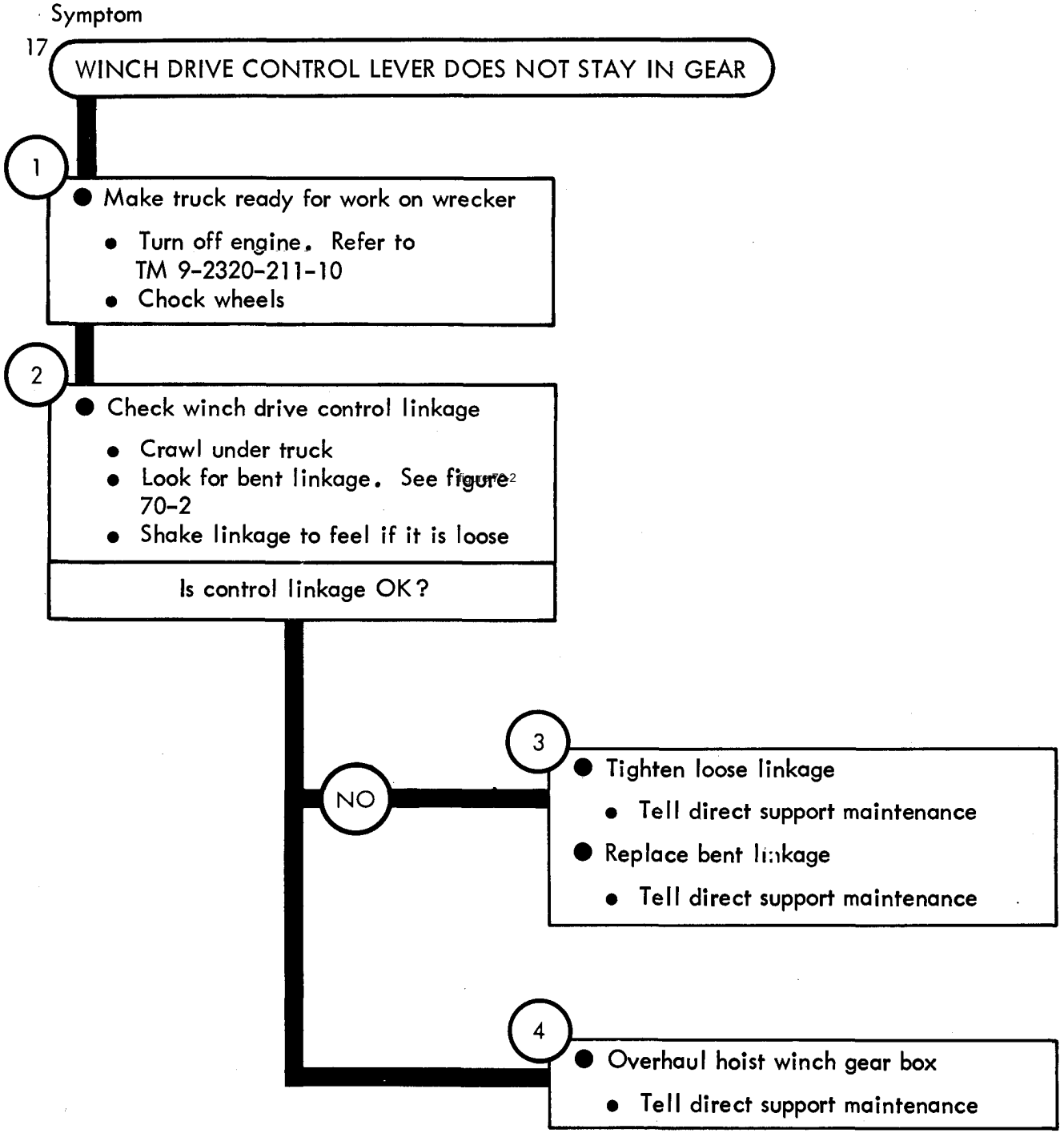



Figure 72-16 (Sheet 1 of 2)



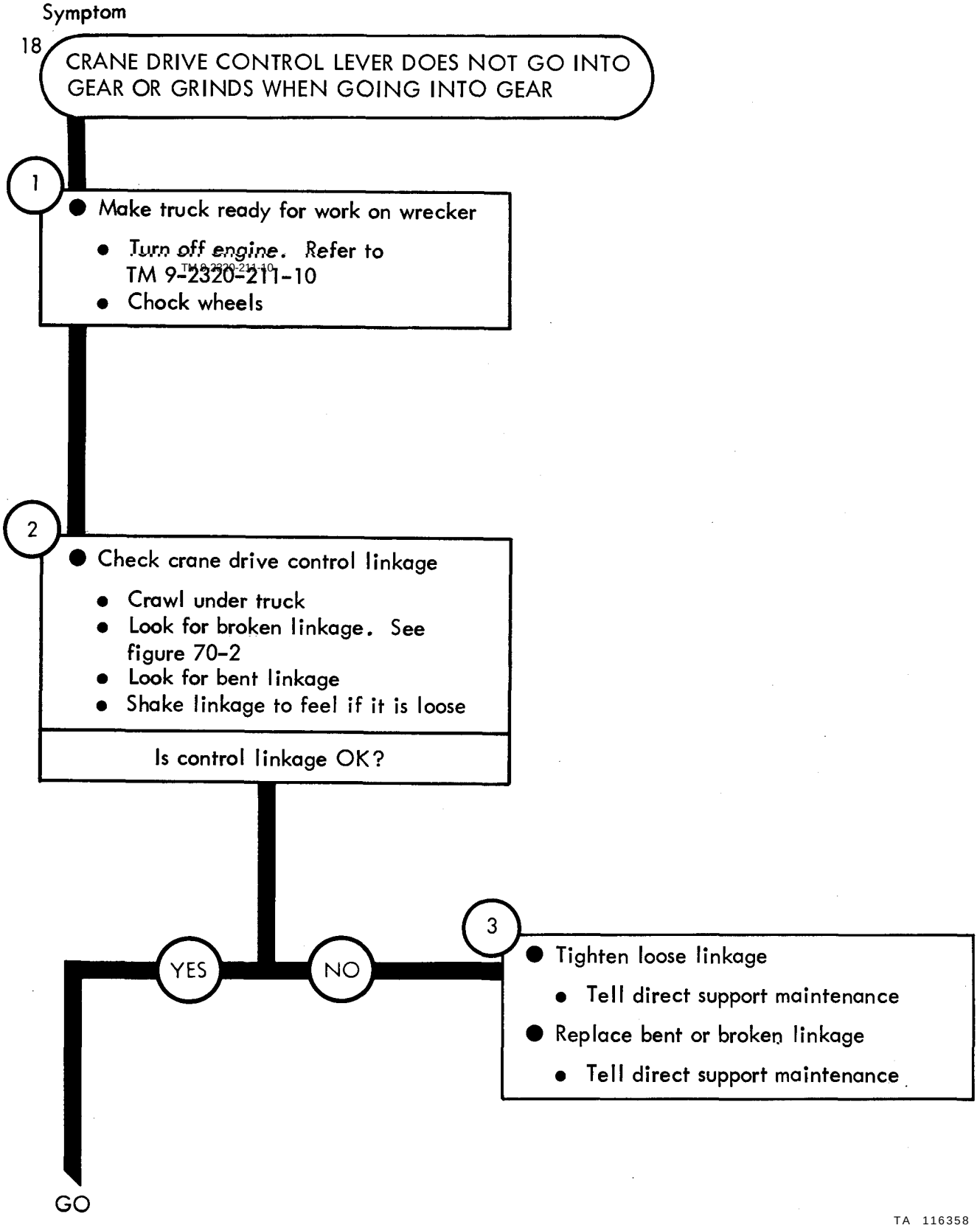

TA 116356

Figure 72-16 (Sheet 2 of 2)



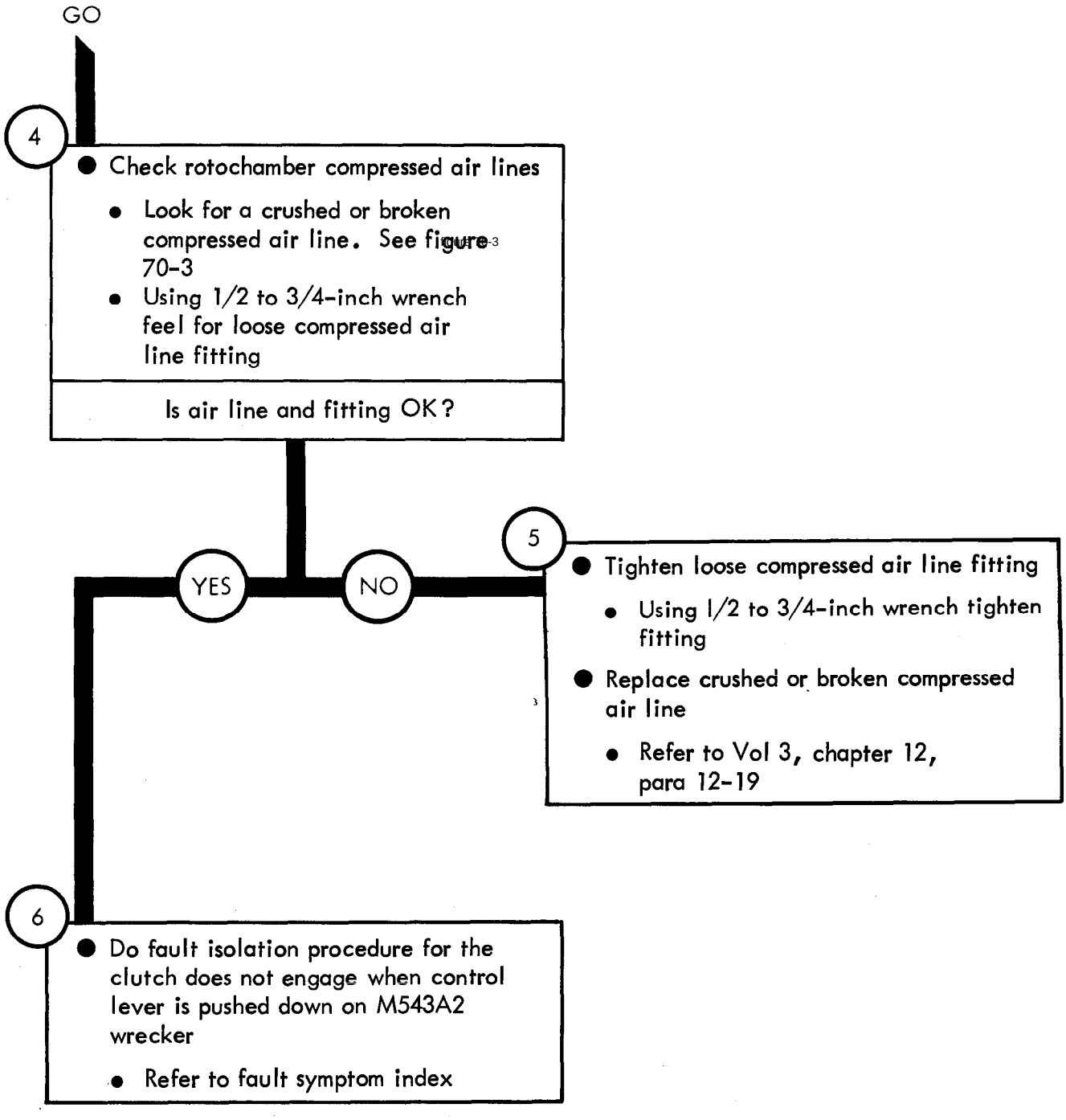

TA 116357

Figure 72-17



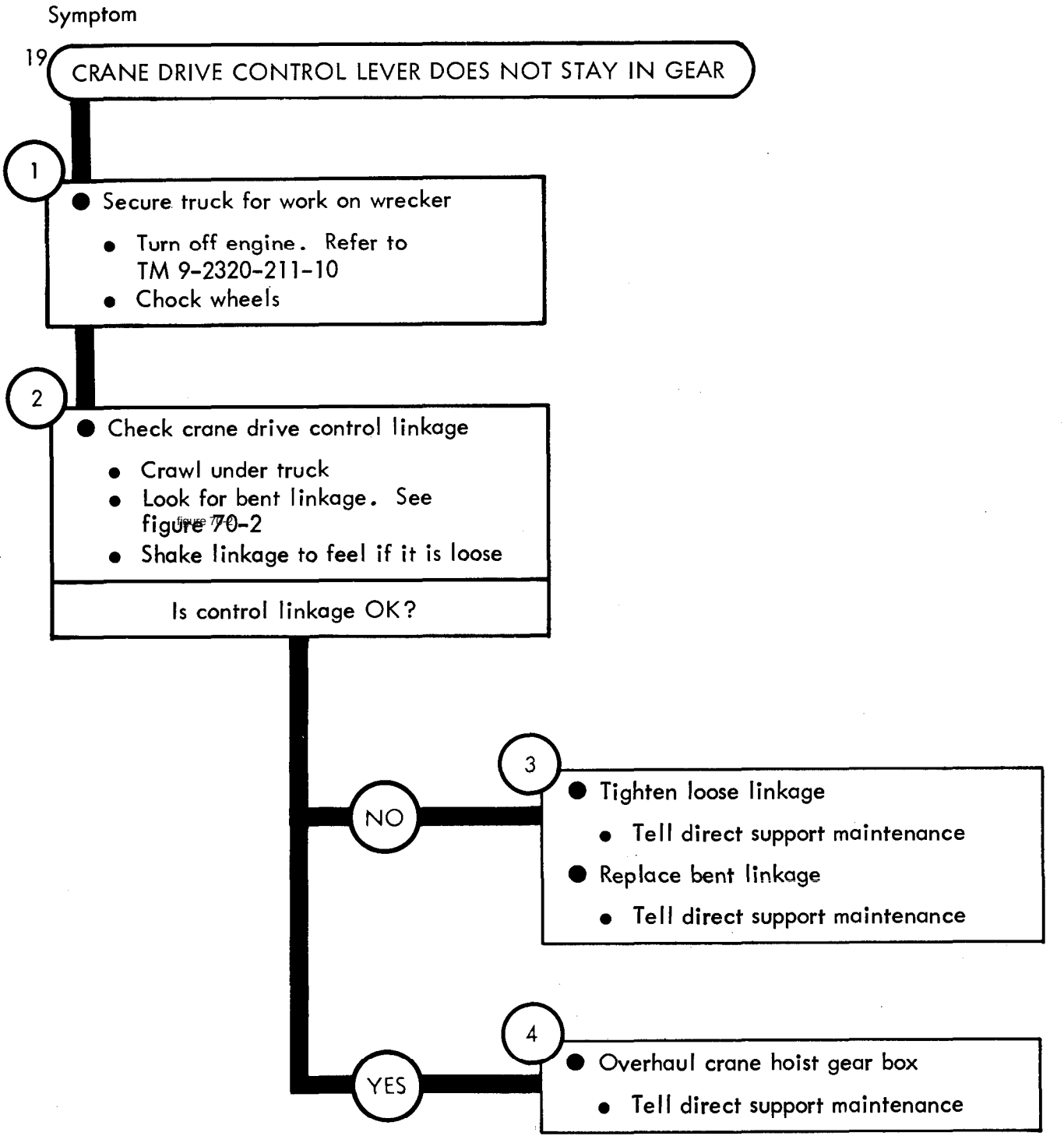

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Figure 72-18 (Sheet 1 of 2)




TA 116359

Figure 72-18 (Sheet 2 of 2)




TA 116360

Figure 72-19

# CHAPTER 73

# WRECKER SYSTEM TROUBLESHOOTING SUMMARY

73-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 72, for the Wrecker System.

73-2. PROCEDURES . The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures in Part 1. Chapter 7 outlines a sample troubleshooting procedure. The summary procedures are based on the “what-to-do” portions of the detailed procedures and do not includes the “How-to-do-it” instructions. Warnings, cautions, and notes are given where needed.

WRECKER SYSTEM TROUBLESHOOTING SUMMARY

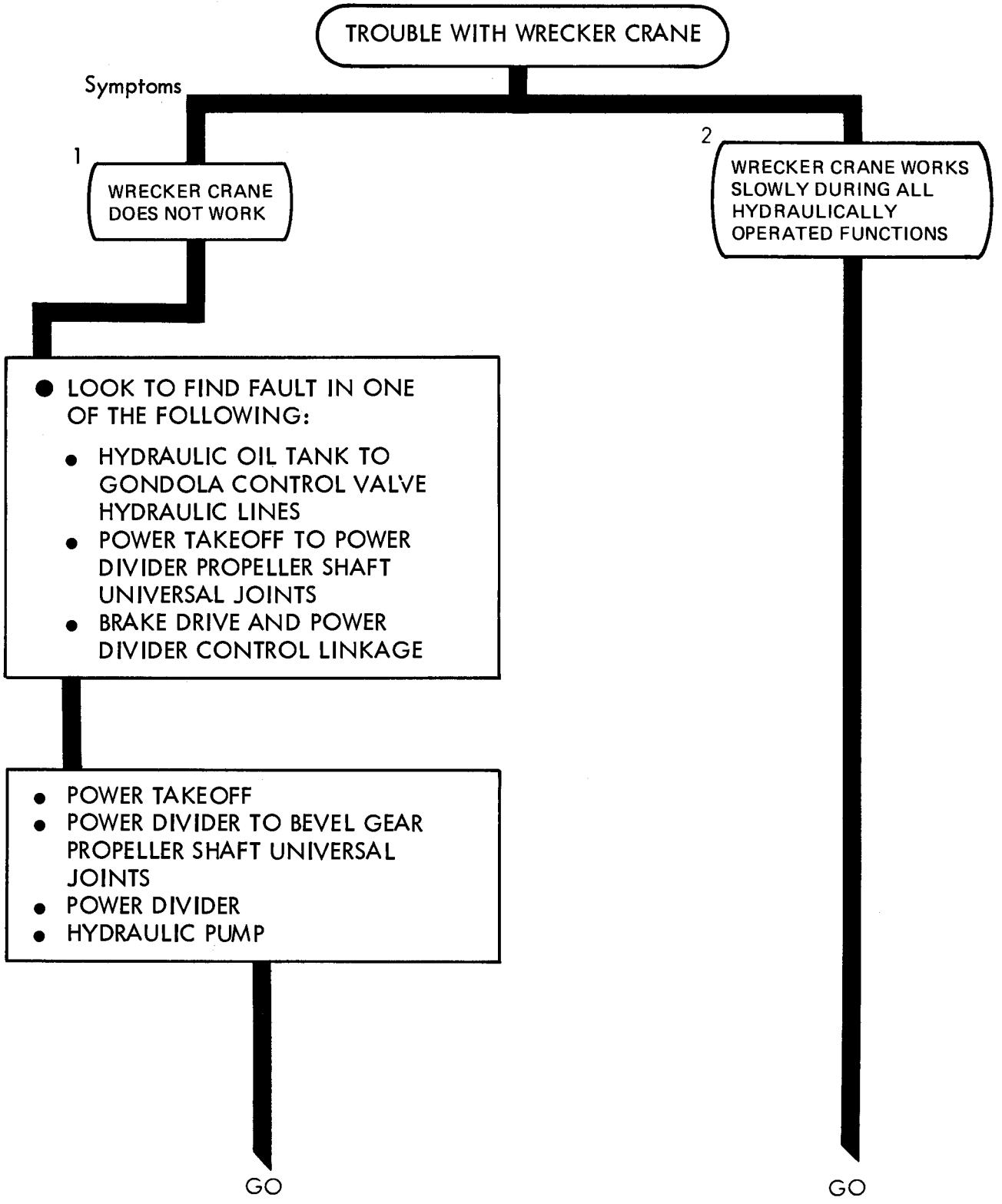
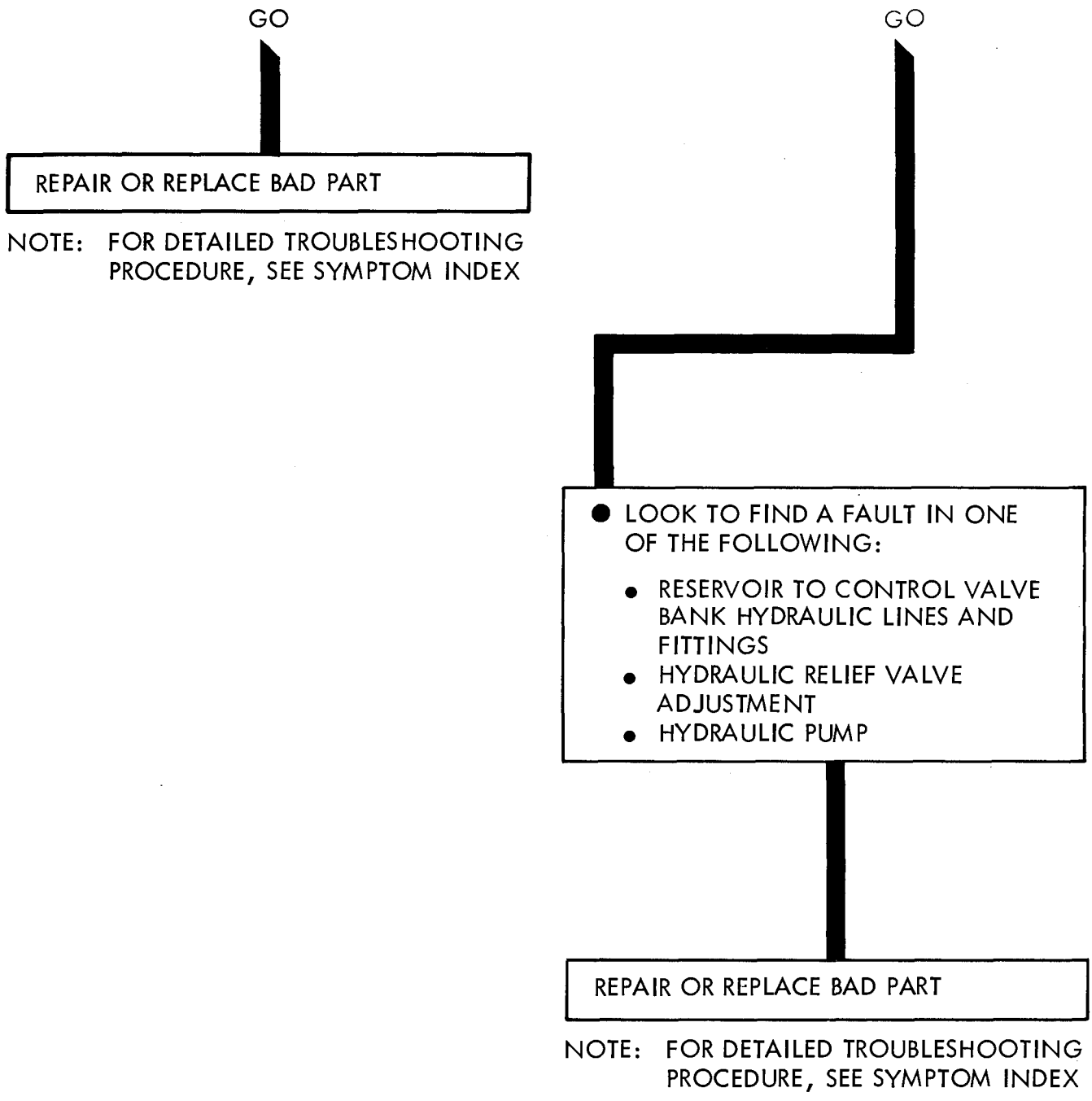



Figure 73-1 (Sheet 1 of 2)




TA 116362

Figure 73-1 (Sheet 2 of 2)

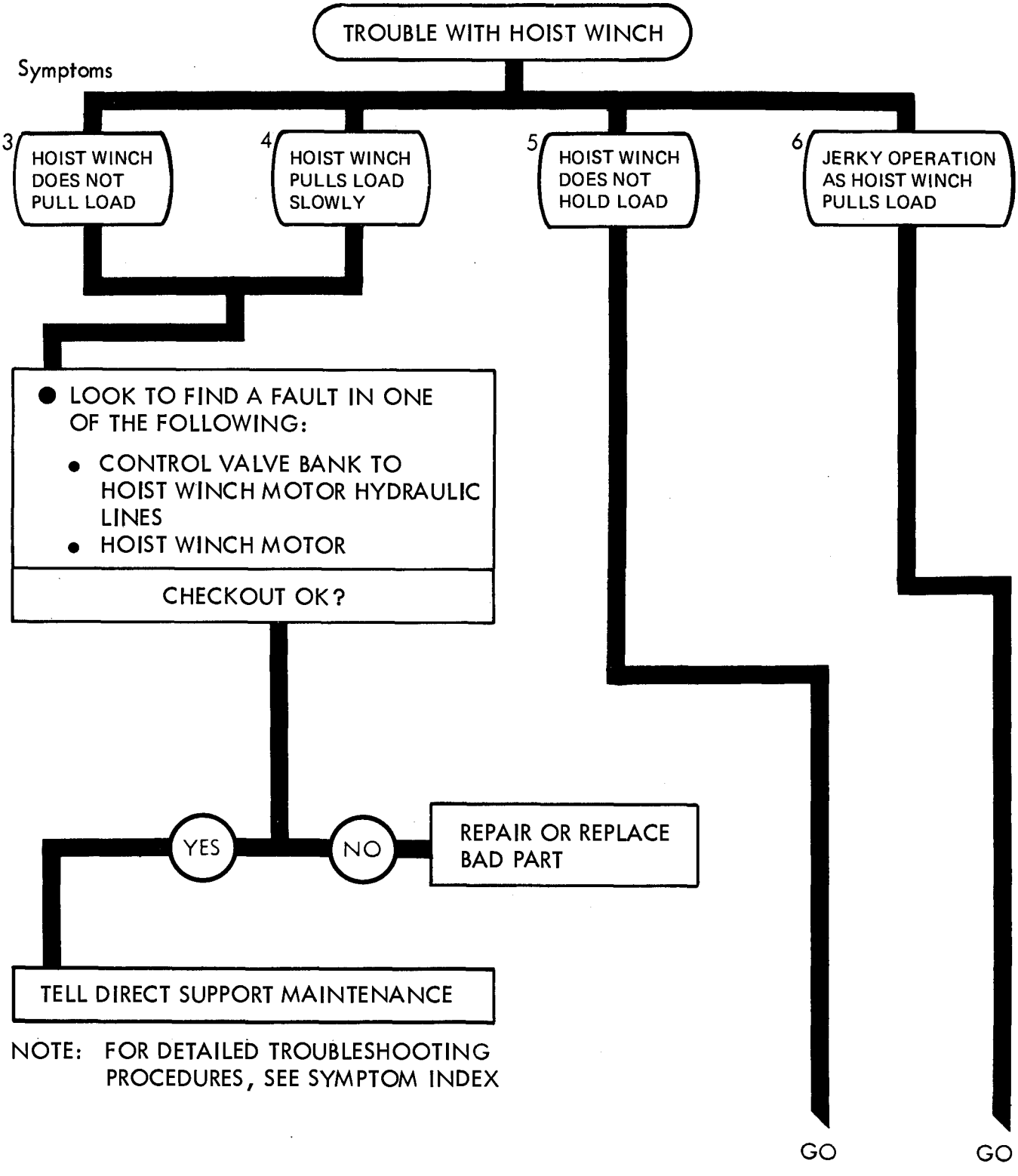
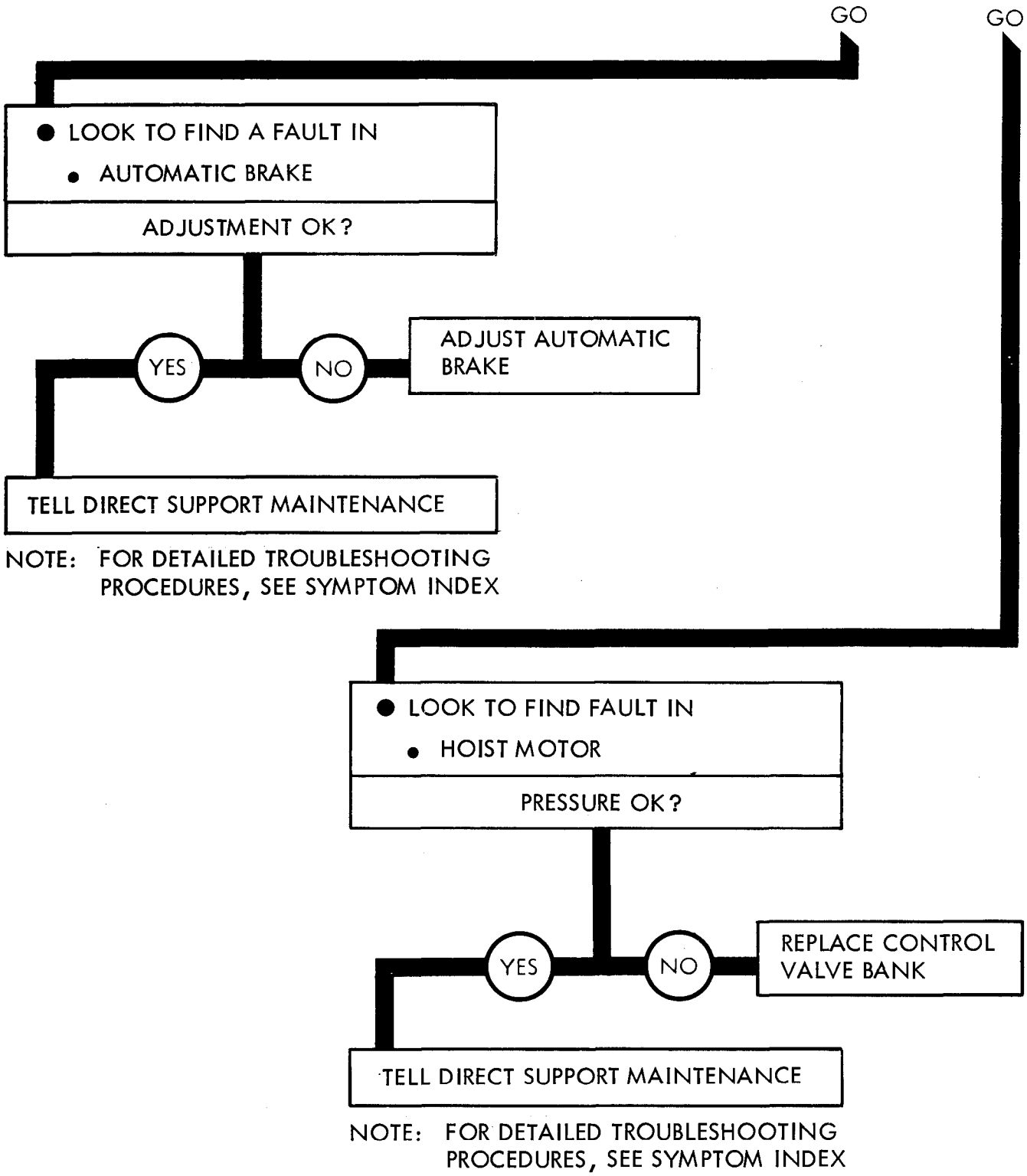



Figure 73-2 (Sheet 1 of 2)




TA 116364

Figure 73-2 (Sheet 2 of 2)

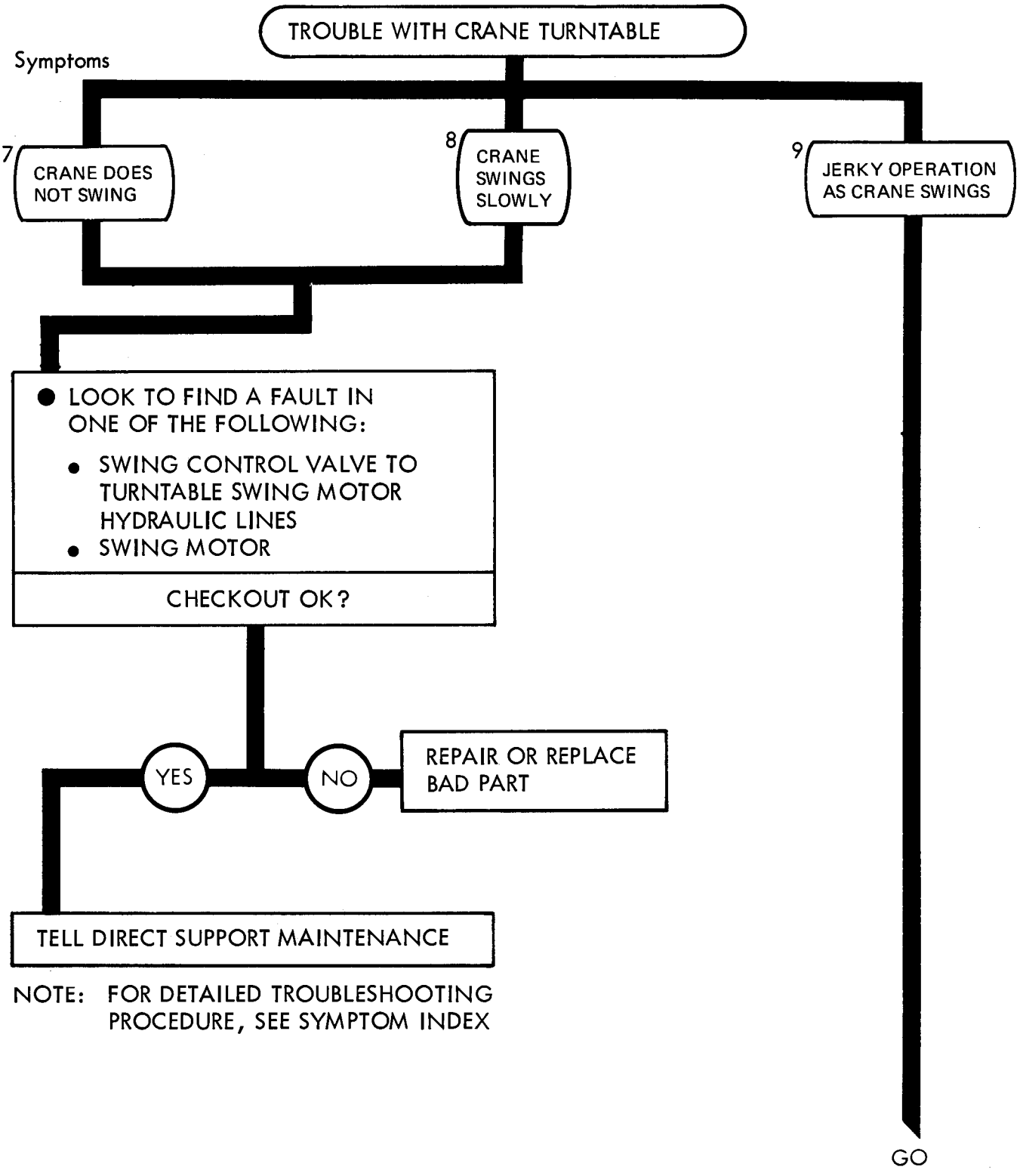
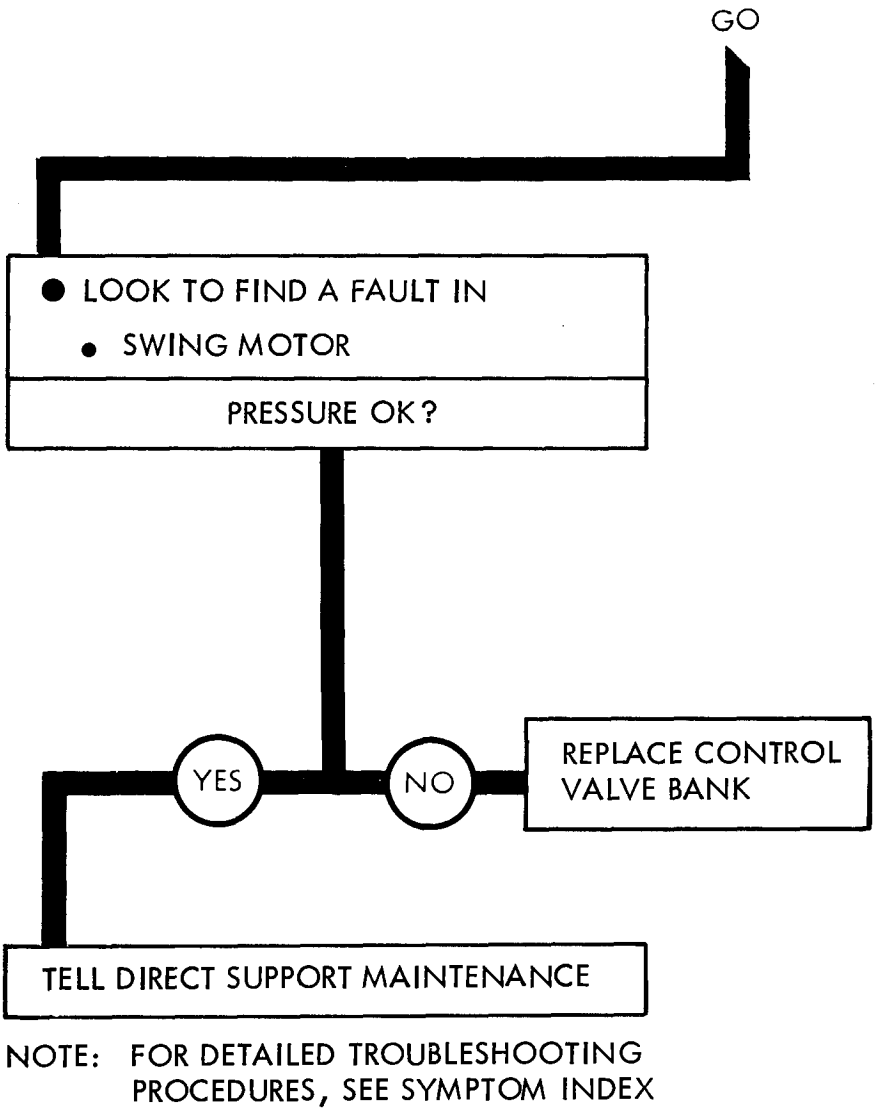



Figure 73-3 (Sheet 1 of 2)




TA 116366

Figure 73-3 (Sheet 2 of 2)

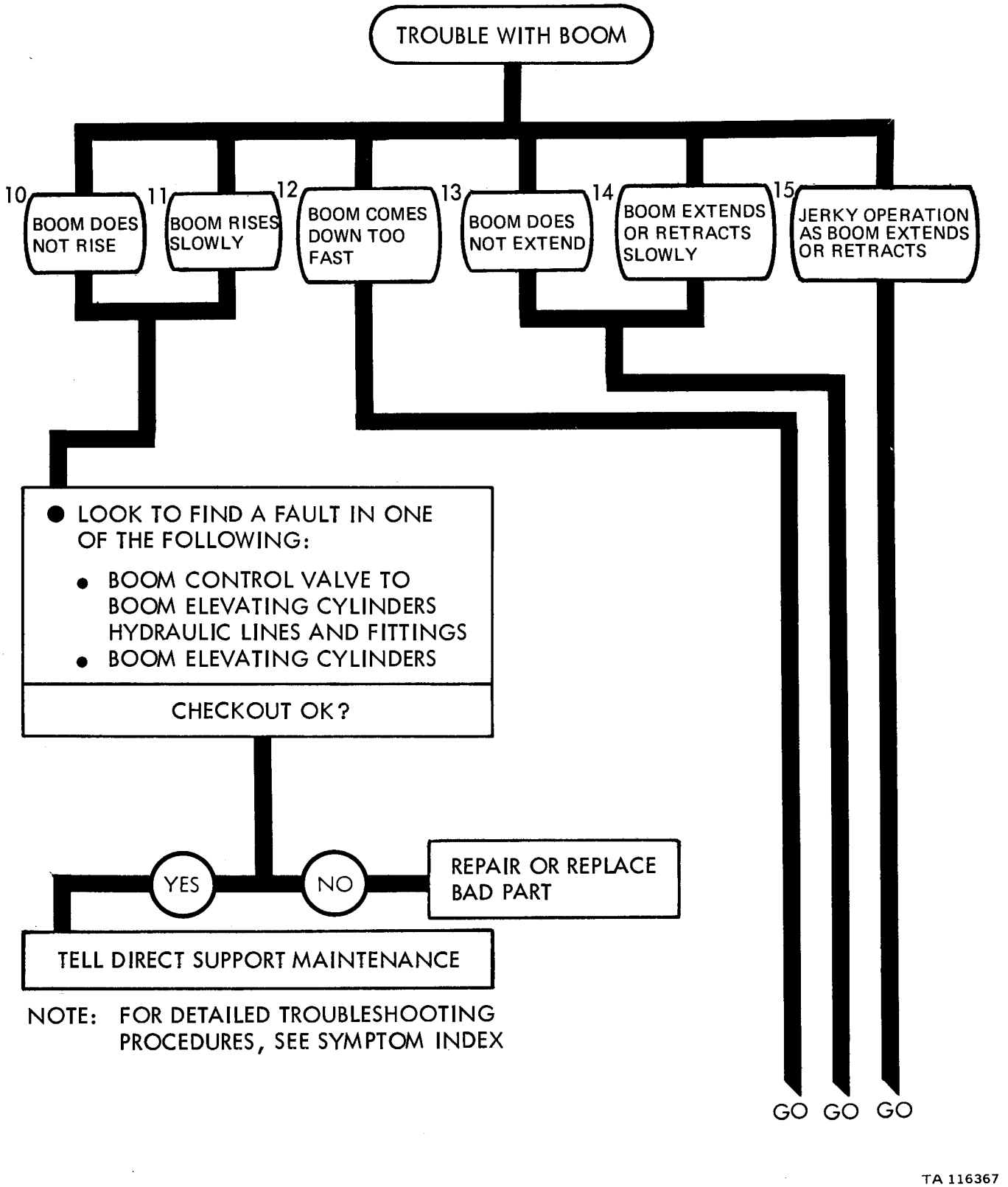
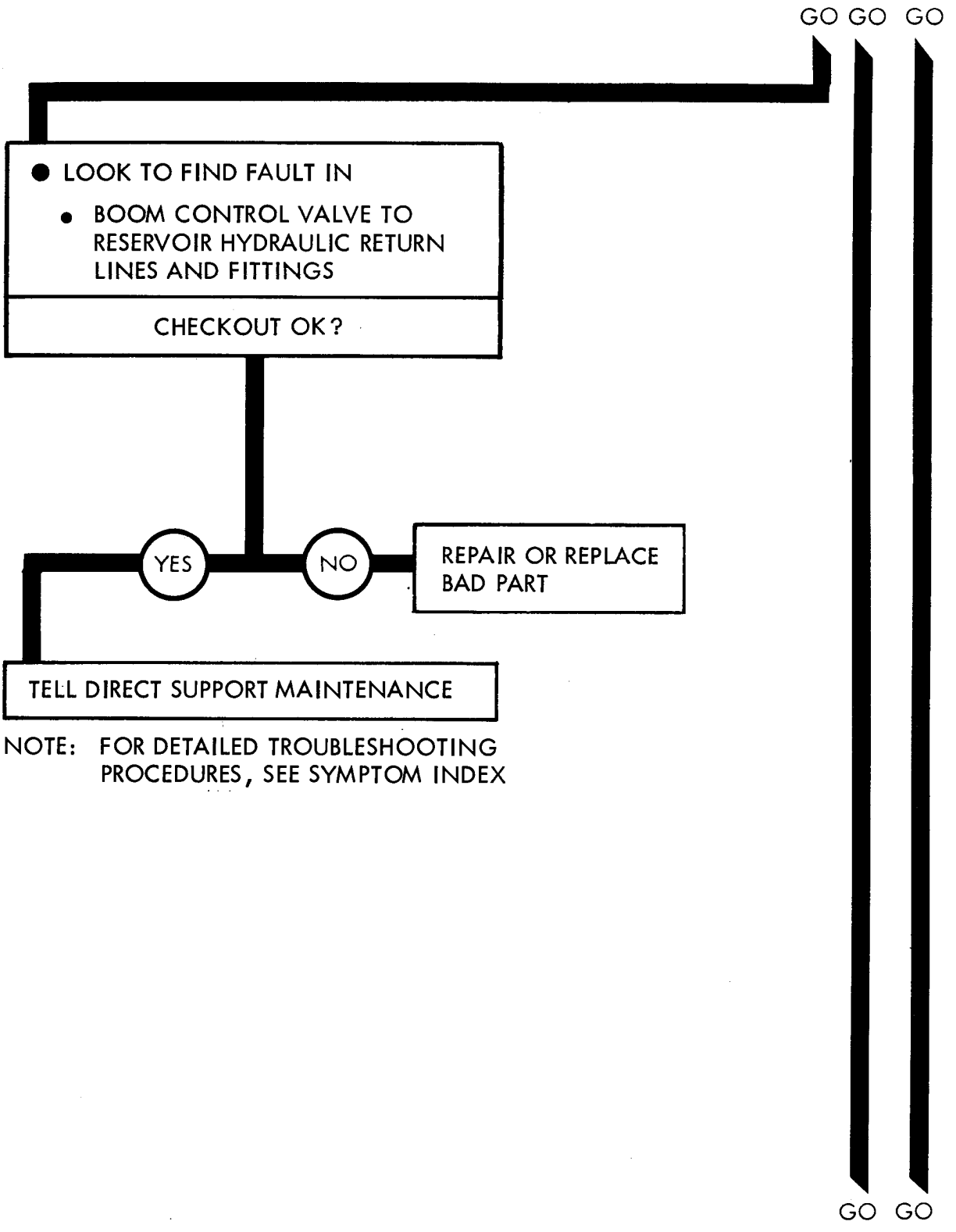



Figure 73-4 (Sheet 1 of 4)




TA 116368

Figure 73-4 (Sheet 2 of 4)

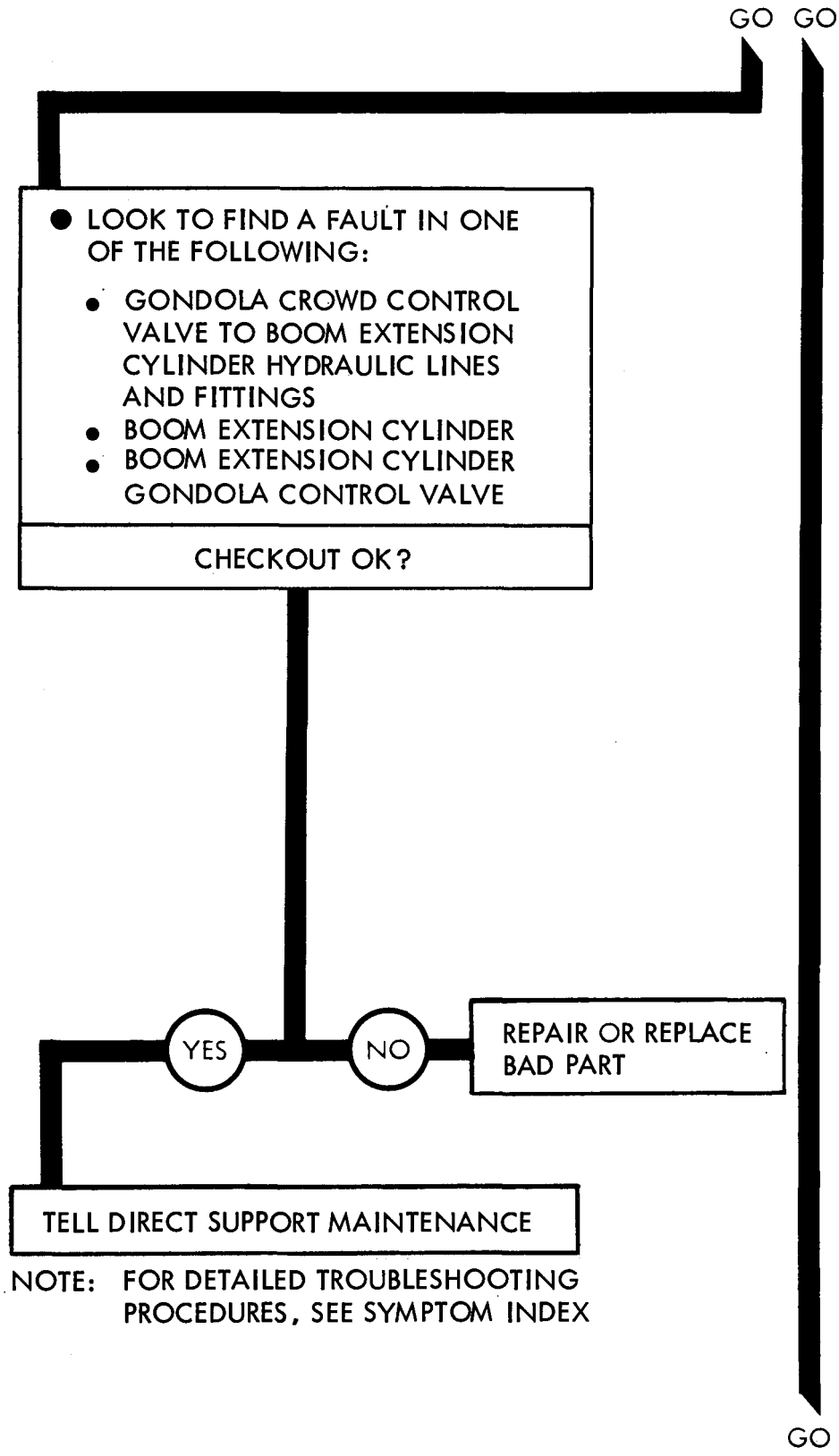
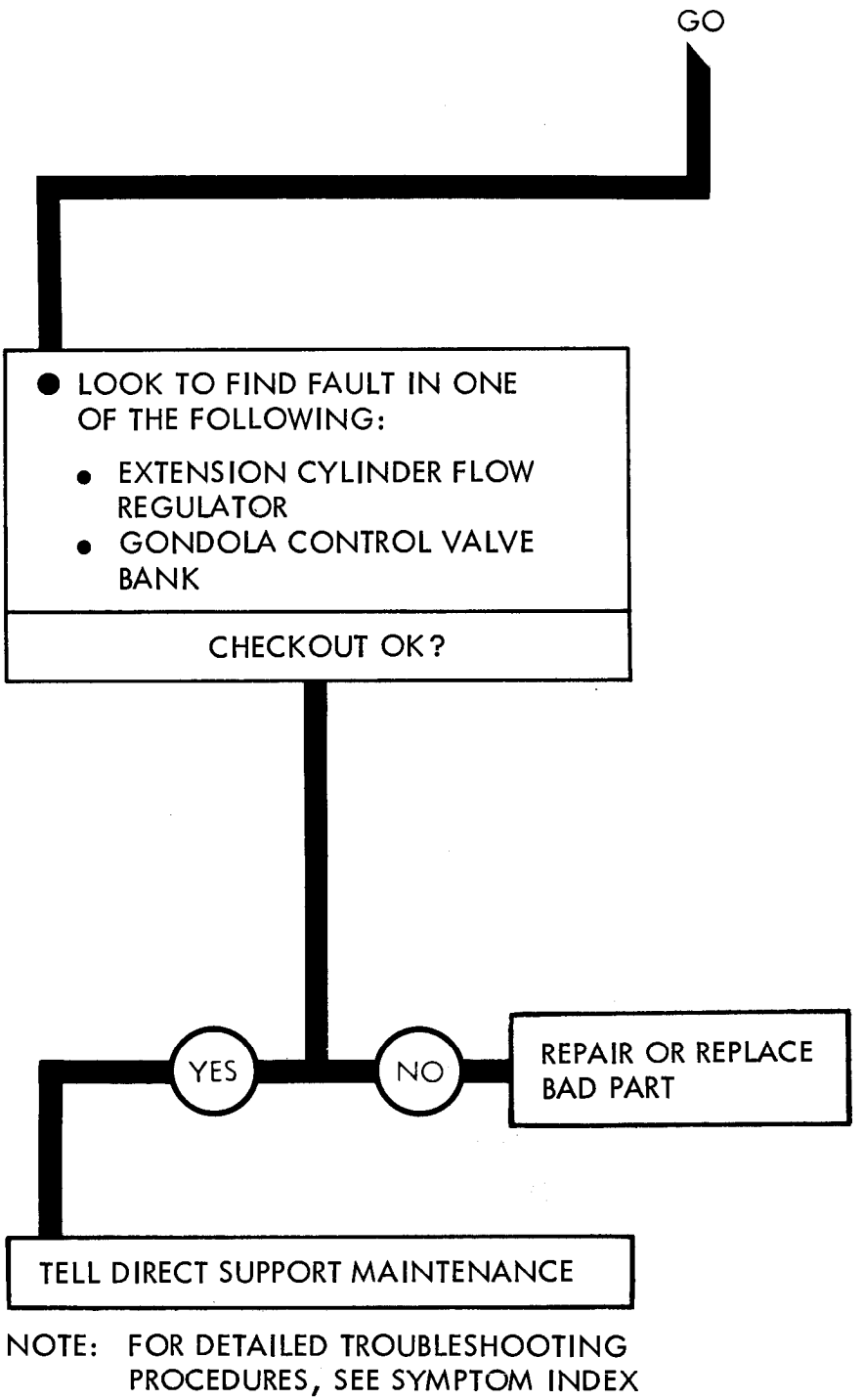
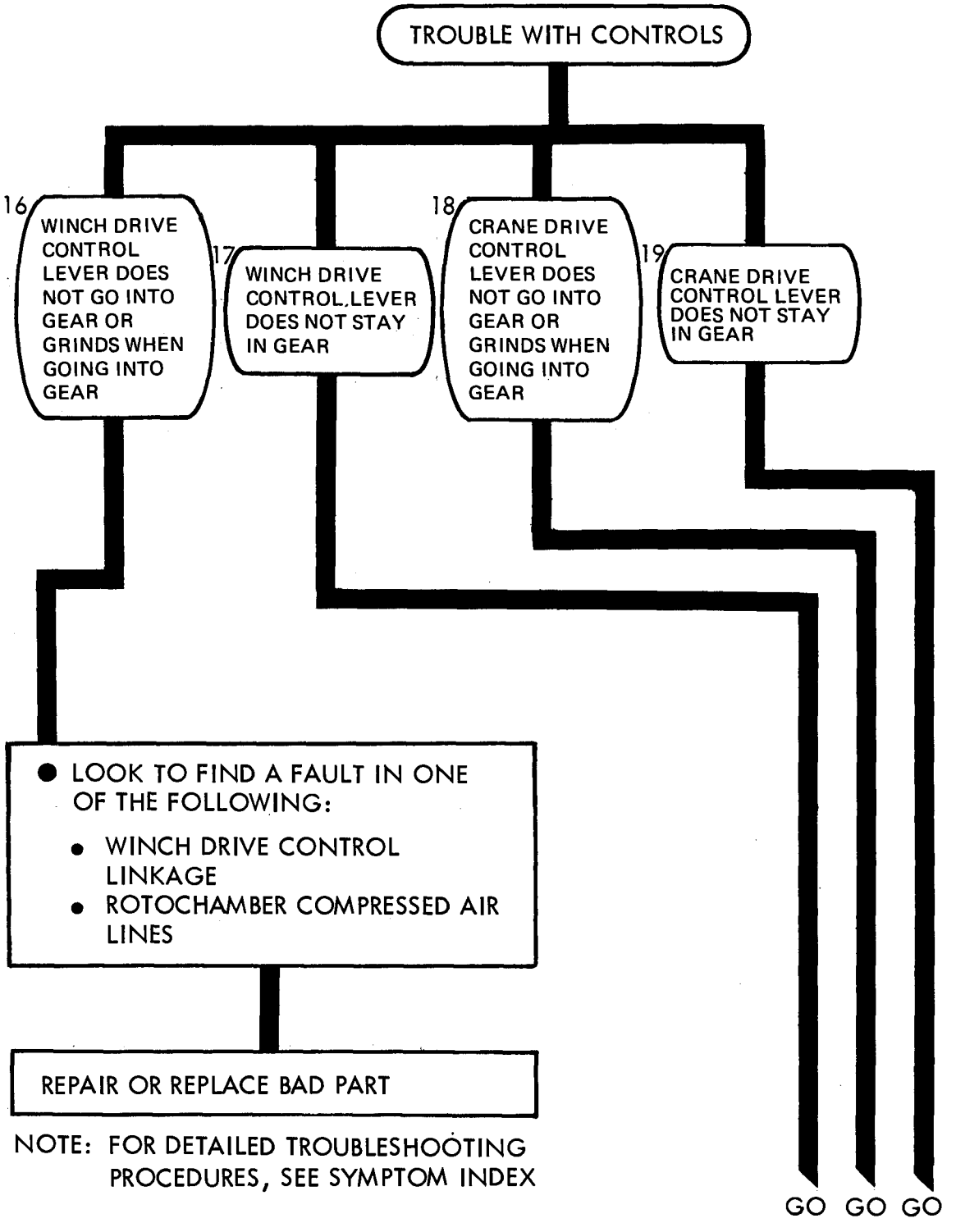



Figure 73-4 (Sheet 3 of 4)



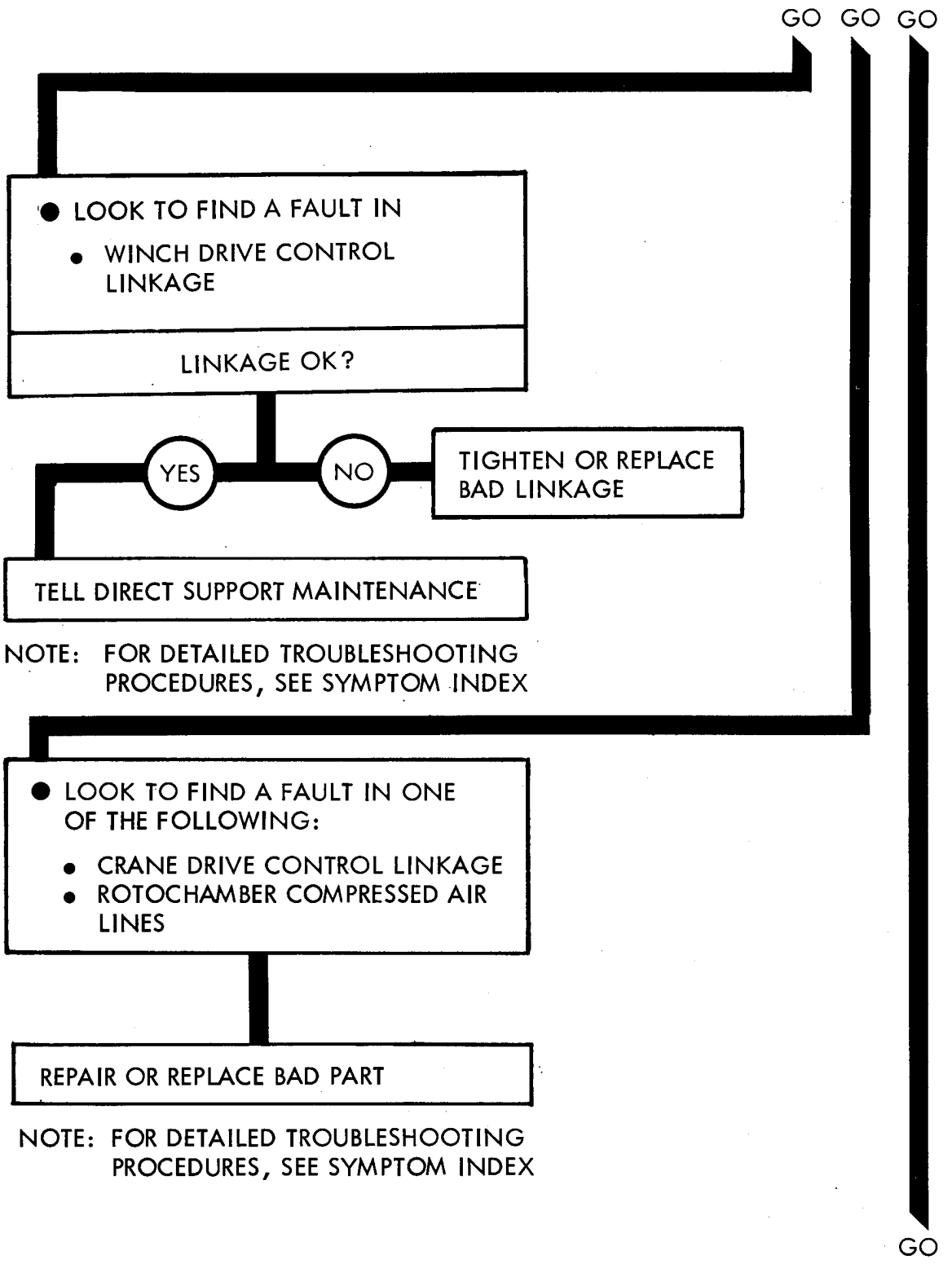

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Figure 73-4 (Sheet 4 of 4)



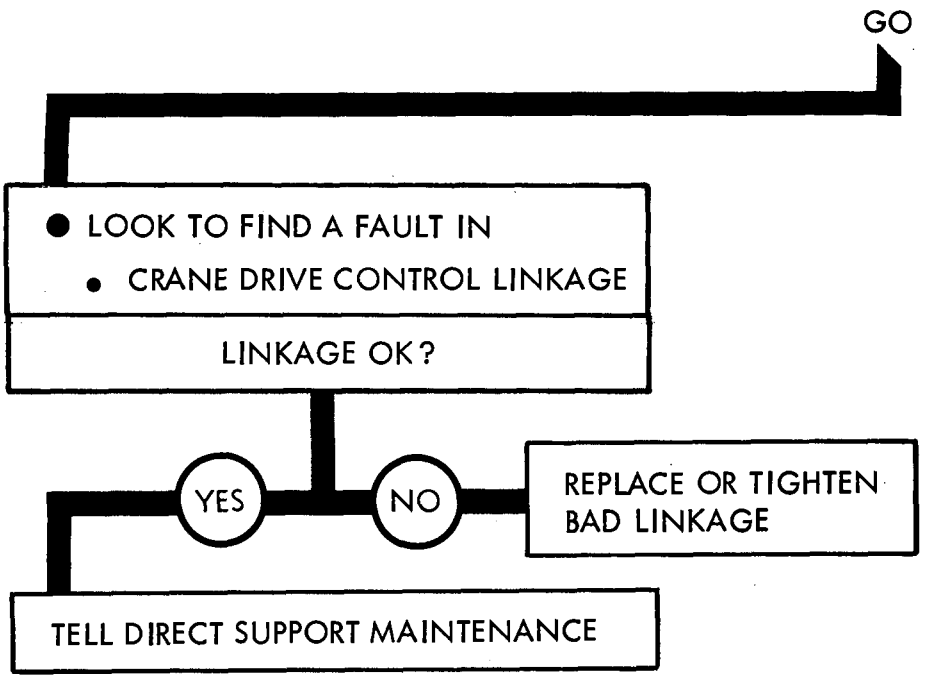

TA 116371

Figure 73-5 (Sheet 1 of 3)




TA 116372

Figure 73-5 (Sheet 2 of 3)




TA 116373

Figure 73-5 (Sheet 3 of 3)

# CHAPTER 74

# WRECKER SYSTEM SUPPORT DIAGRAMS

74-1. GENERAL. This chapter gives the diagrams you need when doing troubleshooting procedures in chapter 72. Table 3-1 is a complete listing of all support diagrams used in this manual.

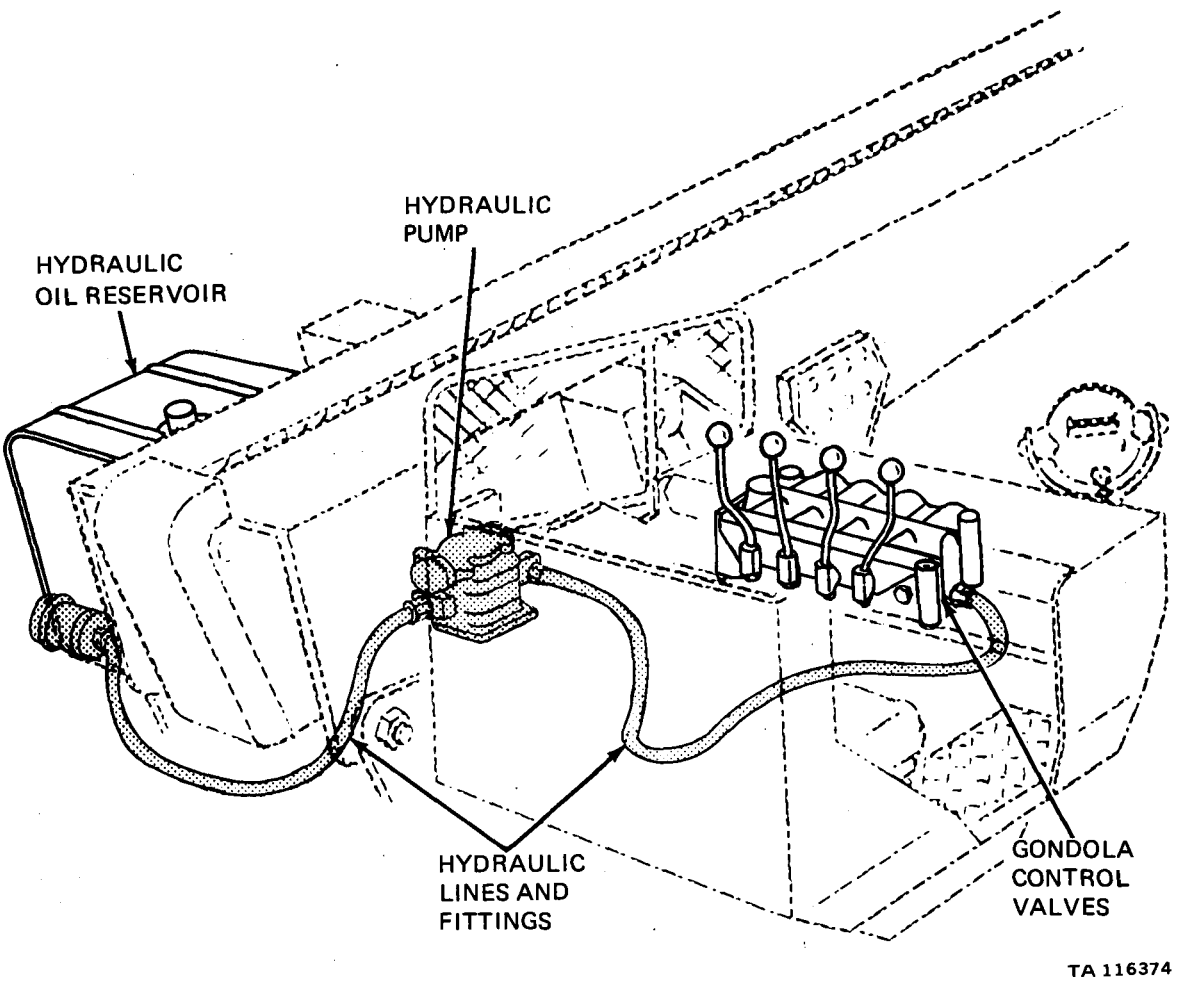



Figure 74-1. Hydraulic Pump System

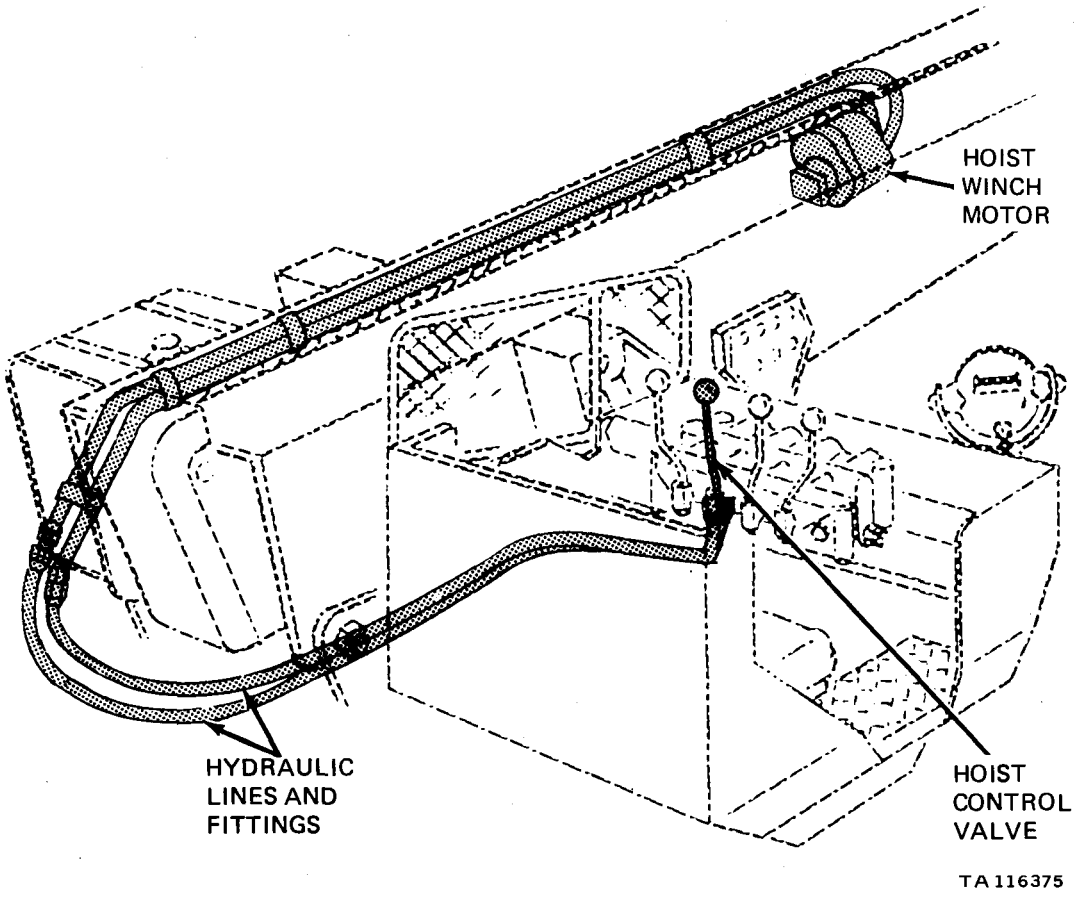



Figure 74-2. Hoist Control Hydraulic System

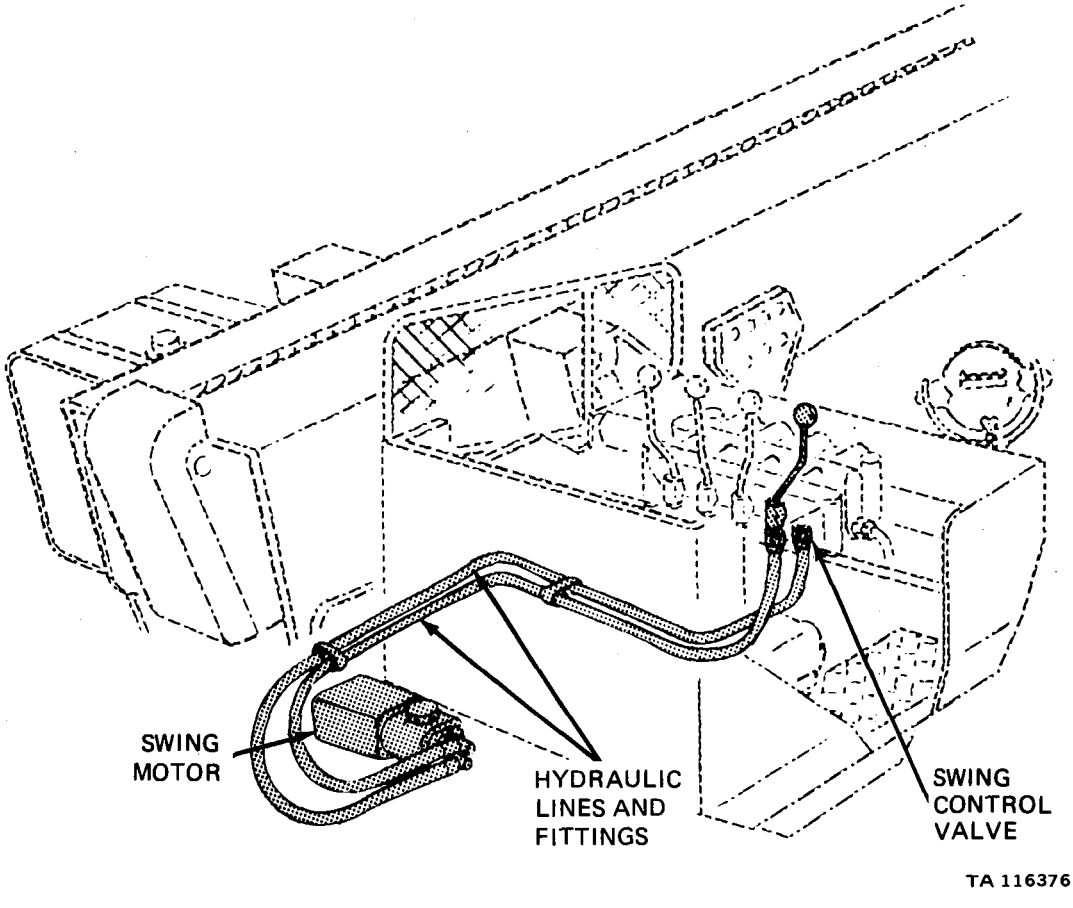



Figure 74-3. Swing Control Hydraulic System

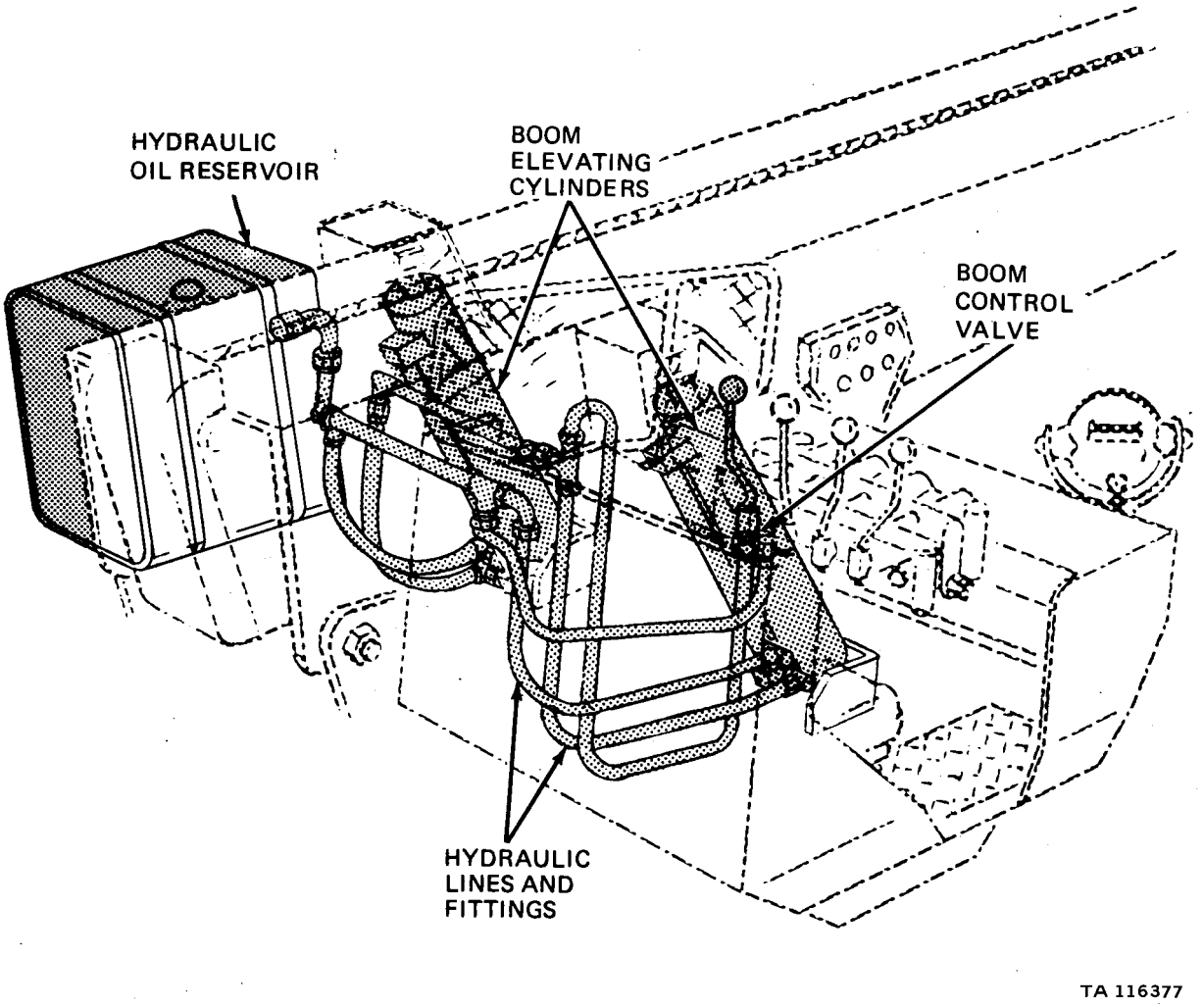



Figure 74-4. Boom Control Hydraulic System

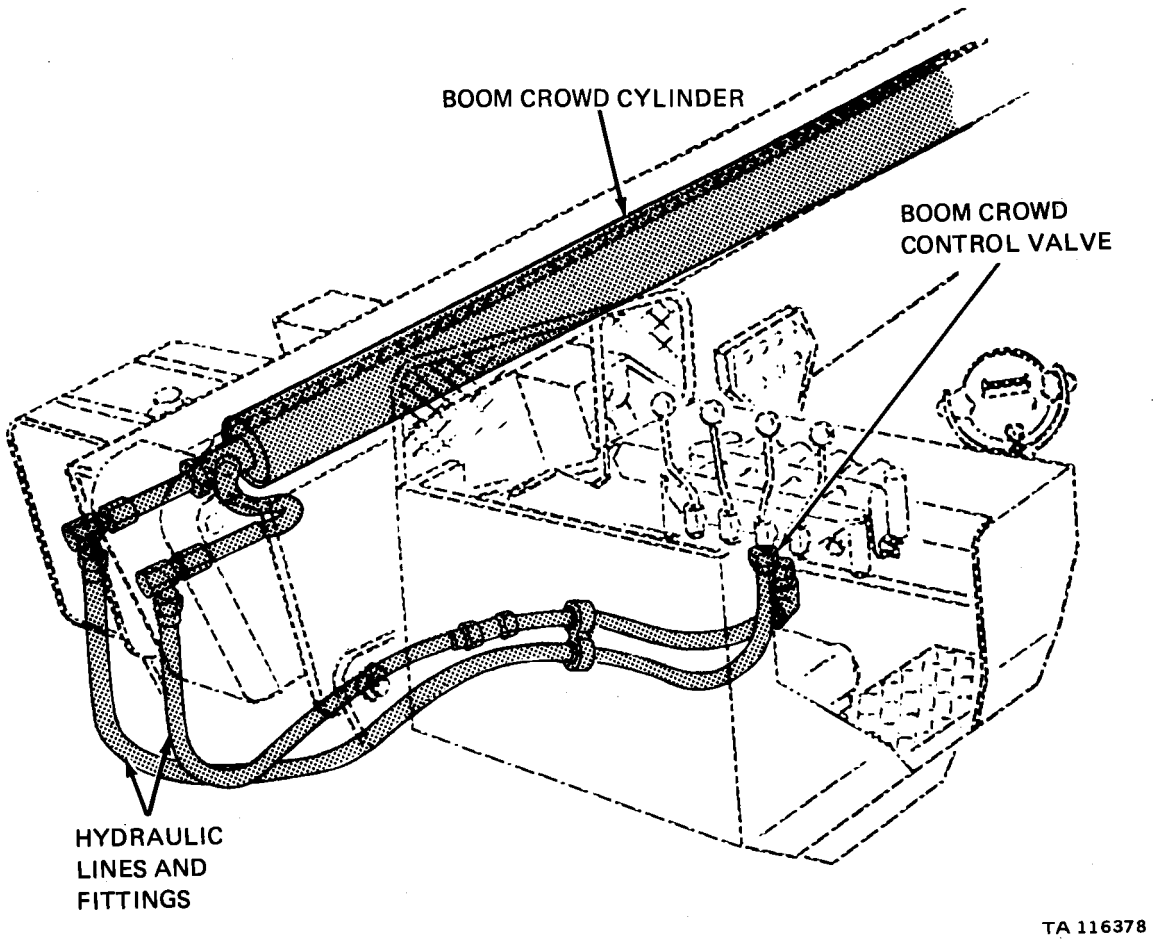



Figure 74-5. Boom Crowd Hydraulic System

# CHAPTER 75

# WRECKER SYSTEM TEST PROCEDURES

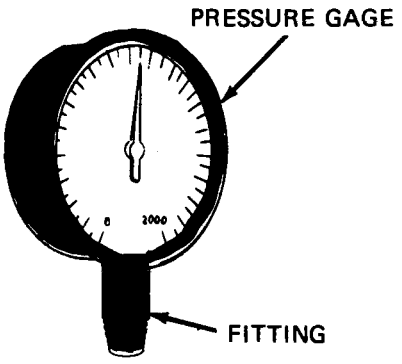
75-1. GENERAL. This chapter gives test procedures for the tests given in chapter 72, for the Wrecker System.

75-2. TEST SET-UP. Instructions for setup of test equipment and parts to be tested are given before the test procedures. Illustrations are used, when needed, to show you how to hook up the test equipment to the part to be tested.

75-3. TEST PROCEDURE. Detailed step-by-step instructions in flow chart form, are given for each test. The procedure calls out the type of test and the condition of the truck system for each part of testing. The step-by-step test will lead you to the bad component or to a fault symptom within a related system. Reference is made to the fault symptom index, chapter 6, if the test shows a fault in another system.

## GENERAL INSTRUCTIONS

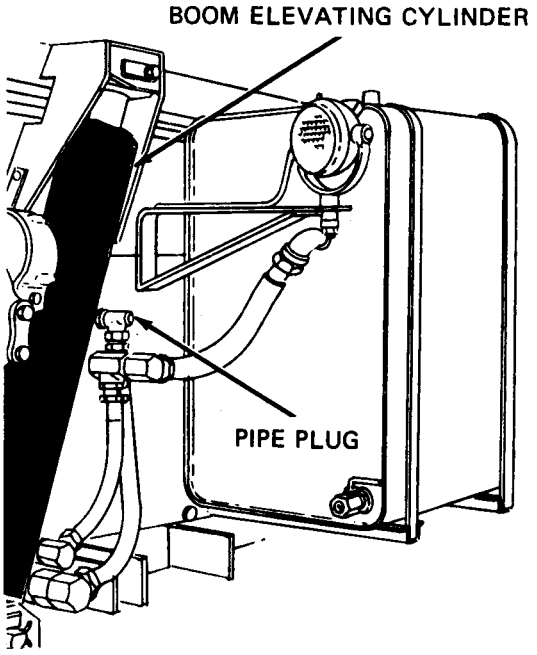
- Check pressure gage before using
  - Gage - see that the glass and needle are not broken
  - Fitting - make sure fitting is tight on gage. See if fitting end is dirt free




1 BOOM ELEVATING CYLINDER PRESSURE TEST -. To measure hydraulic oil pressure from gondola control valves to boom elevating cylinder

1

- Set up gage as follows
  - Using 1/4-inch breaker bar loosen boom elevating cylinder pipe plug pipe plug
  - Hold a can or bucket under boom elevating cylinder pipe plug and take off plug
  - Screw in pressure gage and tighten using 9/16-inch wrench




GO

TA 116379

Figure 75-1 (Sheet 1 of 3)

GO

**NOTE**

The following procedure will need the use of two soldiers. The lead soldier will be called SOLDIER A and the helper will be called SOLDIER B

2

- Test pressure to elevating cylinder as follows

SOLDIER B:
- Start engine and engage wrecker crane drive. Refer to TM 9-2320-211-10
- Go to gondola and wait for instructions from SOLDIER A

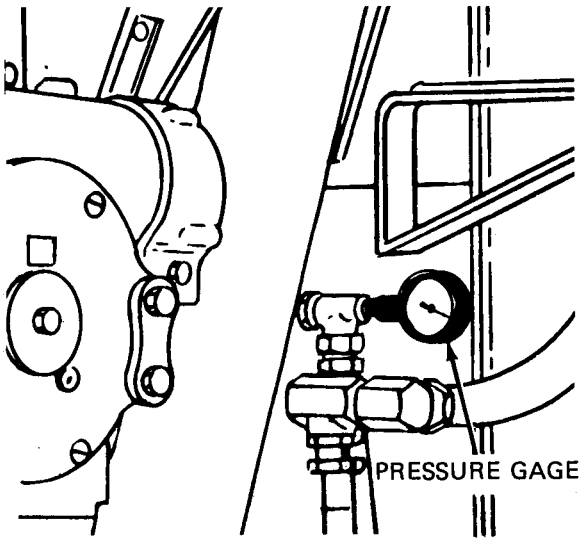
SOLDIER A:
- Look at pressure gage
- Tell SOLDIER B to raise boom

SOLDIER B:
- Raise boom as high as it will go. Refer to TM 9-2320-211-10

SOLDIER A:
- See if pressure is between 400 and 450 psi while boom is rising and between 1175 and 1225 psi at stop
- Tell SOLDIER B to lower boom and shut down wrecker crane operation

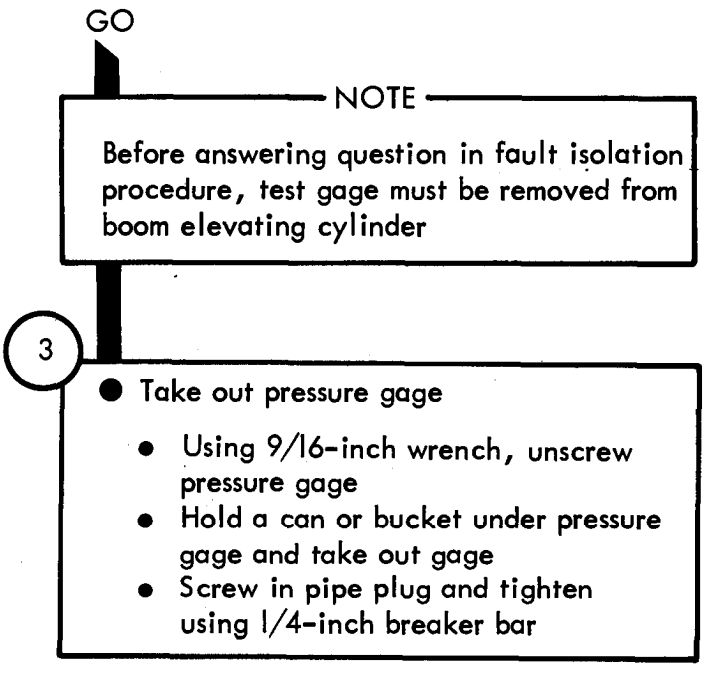
SOLDIER B:
- Shut down wrecker crane operation. Refer to TM 9-2320-211-10

GO




TA 116380

Figure 75-1 (Sheet 2 of 3)

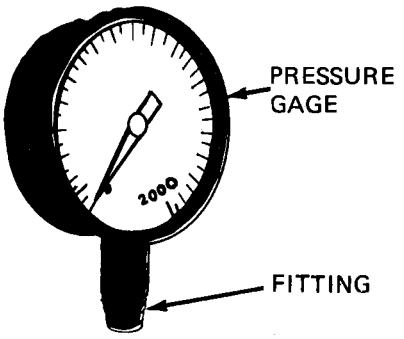



TA 116381

Figure 75-1 (Sheet 3 of 3)

GENERAL INSTRUCTIONS

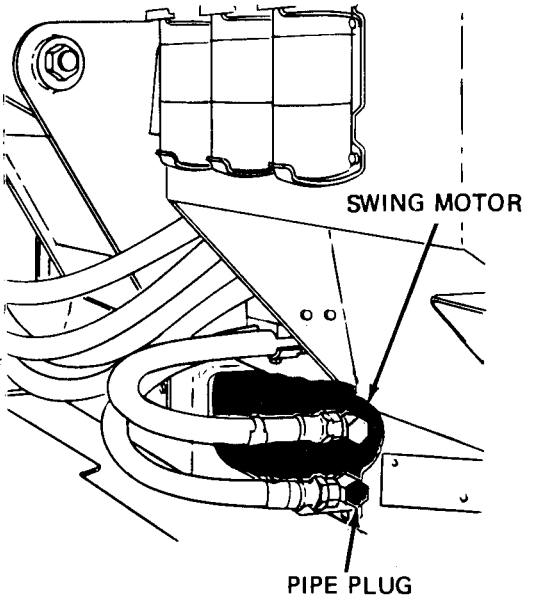
- Check pressure gage before using
  - Gage - make sure that the glass and needle are not broken
  - Fitting - make sure fitting is tight on gage. See if fitting end is dirt free




2 SWING MOTOR PRESSURE TEST - To measure hydraulic oil pressure from gondola control valves to swing motor

1

- Set up gage as follows
  - Using 1/4-inch breaker bar unscrew swing motor pipe plug
  - Hold a can or bucket under swing motor and take off plug
  - Screw in pressure gage and tighten using 9/16-inch wrench




NOTE

The following procedure will need the use of two soldiers. The lead soldier will be called SOLDIER A and the helper will be called SOLDIER B

GO

TA 116382

Figure 75-2 (Sheet 1 of 2)

GO

2

● Test pressure to swing motor as follows

SOLDIER B:
- Start engine and engage wrecker crane drive. Refer to TM 9-2320-211-10
- Go to gondola and wait for instructions from SOLDIER A

SOLDIER A:
- Look at pressure gage
- Tell SOLDIER B to swing crane

SOLDIER B:
- Swing crane until it reaches a stop

SOLDIER A:
- See if pressure gage reads between 700 and 750 psi, while it swings and 1175 and 1225 psi at stop

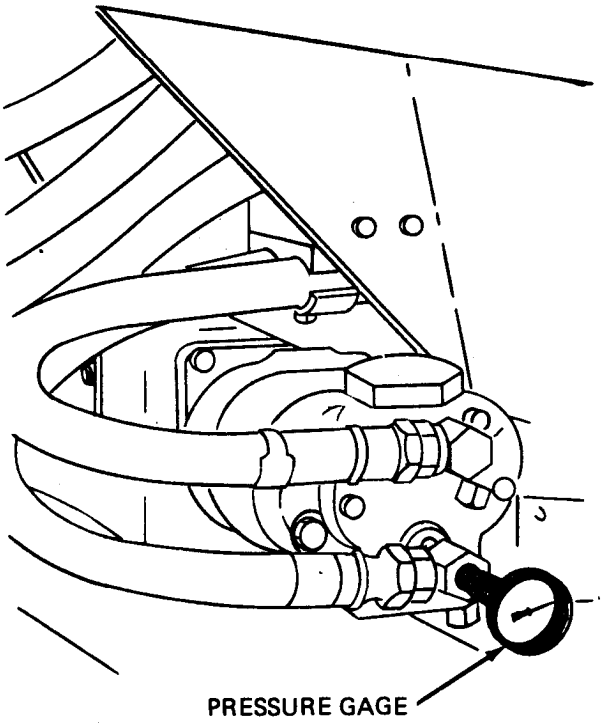
SOLDIER B:
- Shut down from wrecker crane operation. Refer to TM 9-2320-211-10

NOTE

Before answering question in fault isolation procedure, test gage must be removed from swing motor

3

● Take out pressure gage
- Using 9/16-inch wrench, unscrew pressure gage
- Hold a can or bucket under pressure gage and take out gage
- Screw in pipe plug and tighten using 1/4-inch breaker bar

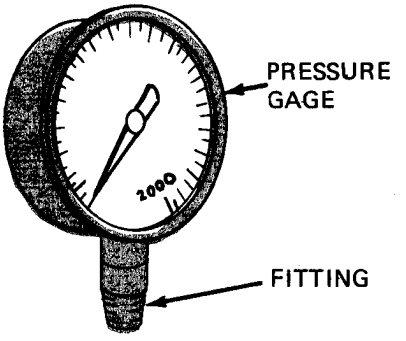



TA 116383

Figure 75-2 (Sheet 2 of 2)

GENERAL INSTRUCTIONS

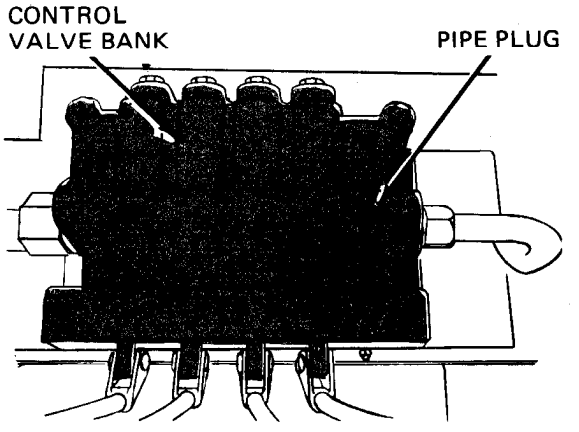
- Check pressure gage before using
  - Gage - make sure that the glass and needle are not broken
  - Fitting - make sure fitting is tight on gage. See if fitting end is dirt free




3 HYDRAULIC PUMP PRESSURE TEST - To measure hydraulic oil pressure from hydraulic pump

1

- Set up gage as follows
  - Remove gondola control valve data plate assembly. Tell direct support maintenance
  - Using 3/16-inch wrench, unscrew and take out pipe plug
  - Screw in pressure gage and tighten using 7/16-inch wrench




GO

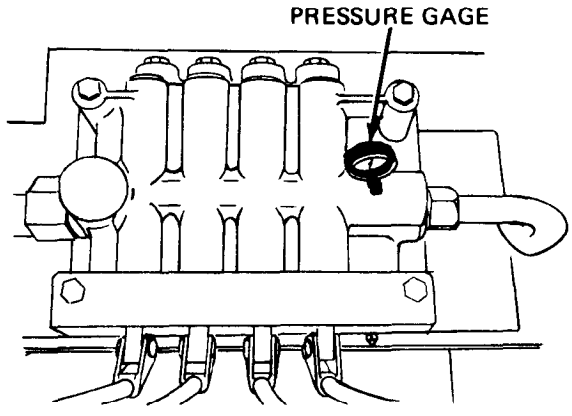
TA 116384

Figure 75-3 (Sheet 1 of 2)

GO

2

- Test pressure at gondola control valve bank
  - Start engine and engage wrecker crane drive. Refer to TM 9-2320-211-10
  - Go to gondola and extend boom until it stops. Refer to TM 9-2320-211-10
  - Look at pressure gage
  - See if pressure is between 1250 and 1350 psi with boom fully extended
  - Shut down from wrecker crane operation. Refer to TM 9-2320-211-10




NOTE

Before answering questions in fault isolation procedure, test gage must be removed from control valve bank

3

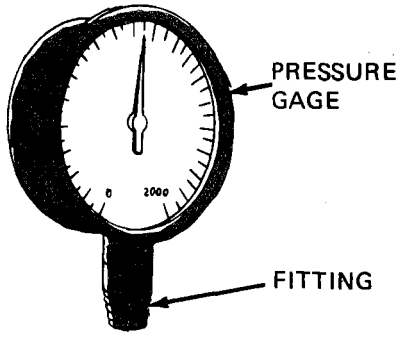
- Take out pressure gage
  - Using 9/16-inch wrench, unscrew and take out pressure gage
  - Screw in pipe plug and tighten using 1/4-inch wrench
- Put back gondola control valve data plate assembly
  - Tell direct support maintenance

TA 116385

Figure 75-3 (Sheet 2 of 2)

GENERAL INSTRUCTIONS

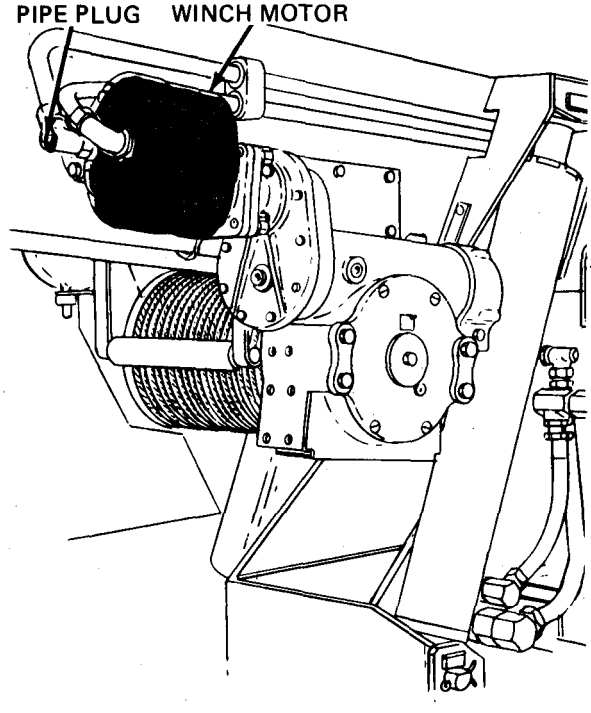
- Check pressure gage before using
  - Gage - see that the glass and needle are not broken
  - Fitting - make sure fitting is tight on gage. See if fitting end is dirt free




4 HOIST MOTOR PRESSURE TEST - To measure hydraulic oil pressure from gondola control valves to hoist motor

1

- Set up gage as follows
  - Using 1/4-inch breaker bar unscrew hoist motor pipe plug
  - Hold a can or bucket under hoist motor pipe plug and take off plug
  - Screw in pressure gage and tighten using 9/16-inch wrench




GO

TA 116386

Figure 75-4 (Sheet 1 of 3)

GO

**NOTE**

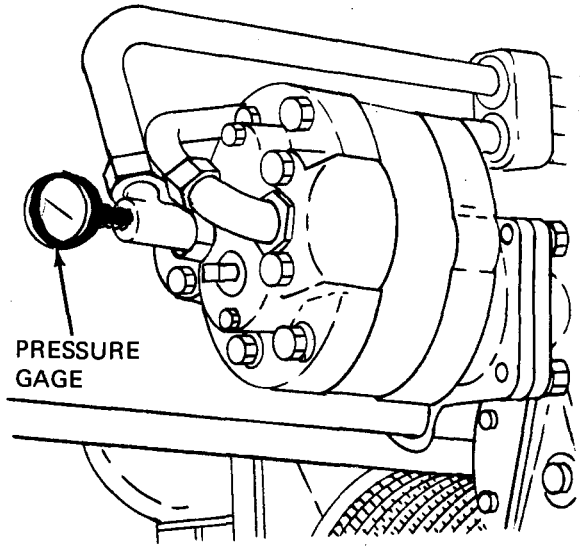
The following procedure will need the use of two soldiers. The lead soldier will be called SOLDIER A and the helper will be called SOLDIER B

2

- Test pressure to hoist motor as follows

SOLDIER B:
- Start engine and engage wrecker crane drive. Refer to TM 9-2320-211-10
- Go to gondola and wait for instructions from SOLDIER A

SOLDIER A:
- Look at pressure gage
- Tell SOLDIER B to raise hoist




SOLDIER B:
- Operate hoist. Refer to TM 9-2320-211-10

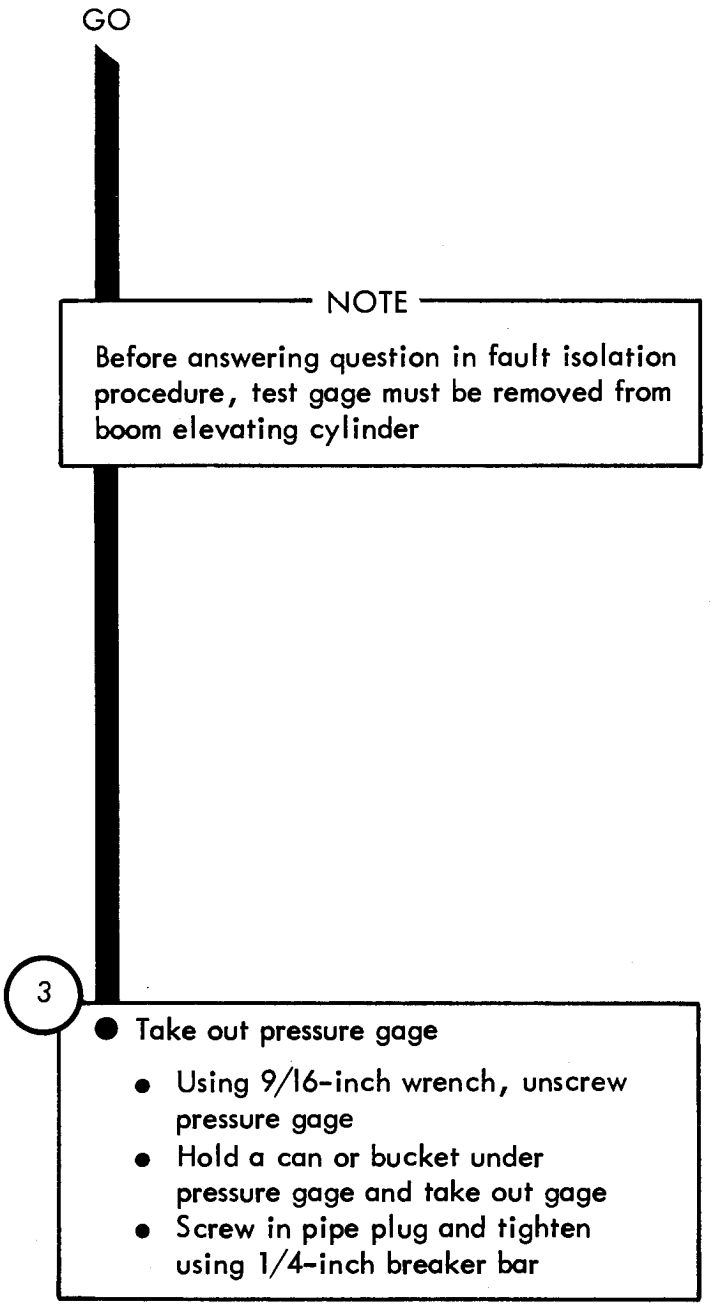
SOLDIER A:
- See if pressure gage reads between 425 and 500 psi while raising hoist
- Tell SOLDIER B to shut down wrecker crane operation

SOLDIER B:
- Shut down wrecker crane operation. Refer to TM 9-2320-211-10

GO

TA 116387

Figure 75-4 (Sheet 2 of 3)

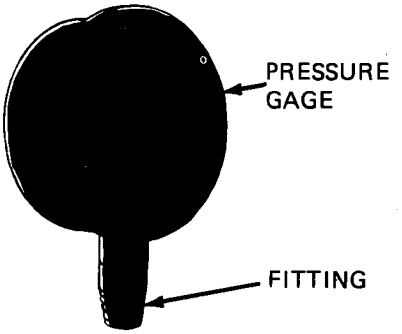



TA 116388

Figure 75-4 (Sheet 3 of 3)

GENERAL INSTRUCTIONS

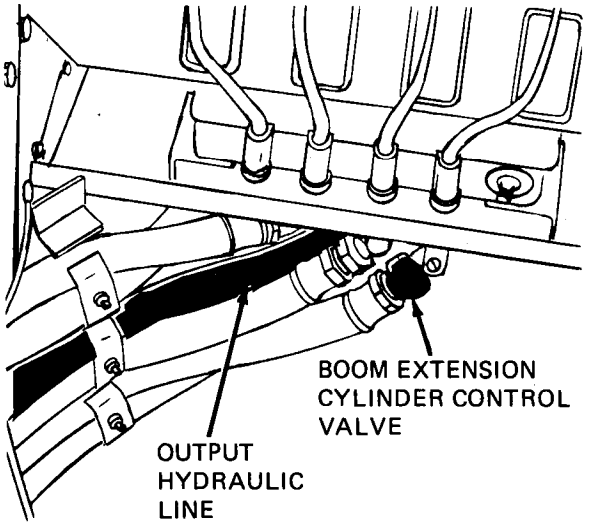
- Check pressure gage before using
  - Gage - make sure that the glass and needle are not broken
  - Fitting - make sure fitting is tight on gage. See if fitting end is dirt free




5 BOOM EXTENSION CYLINDER GONDOLA CONTROL VALVE OUTPUT PRESSURE TEST - To check output pressure at gondola control valve bank

1

- Set up gage as follows
  - Put a bucket, or can under boom extension cylinder control valve
  - Using a 1/2-inch wrench unscrew and take off output hydraulic line at control valve
  - Screw a suitable T-fitting onto control valve and tighten using wrench
  - Put a hydraulic line on T-fitting end and tighten using 1/2-inch wrench
  - Screw in pressure gage to T-fitting and tighten using wrench




GO

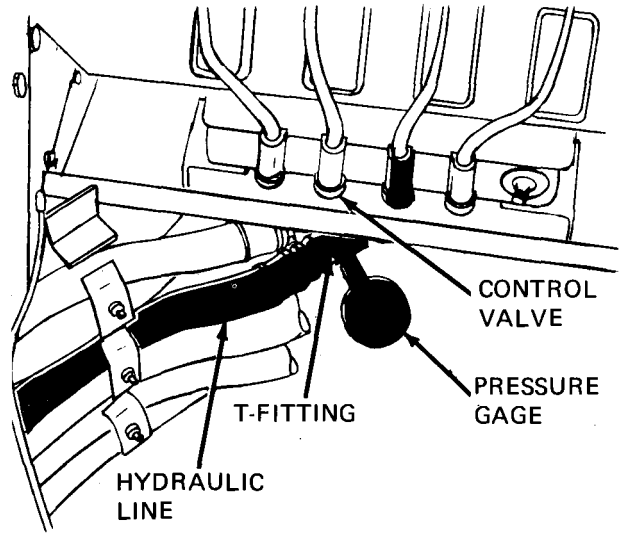
TA 116389

Figure 75-5 (Sheet 1 of 2)

GO

2

- Test output pressure from boom extension cylinder control valve
  - Start engine and engage wrecker crane drive. Refer to TM 9-2320-211-10
  - Go to gondola and extend boom until it stops. Refer to TM 9-2320-211-10
  - Look at pressure gage
  - See if pressure is between 400 to 450 psi as boom is in motion and between 1175 and 1225 psi with boom fully extended
  - Retract boom and shut down wrecker crane operations. Refer to TM 9-2320-211-10




NOTE

Before answering question in fault isolation procedures, test gage must be removed from control valve bank

3

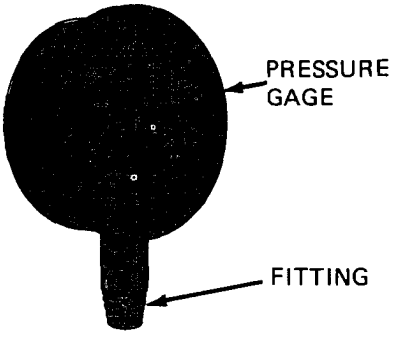
- Take out pressure gage
  - Using wrench unscrew and take out pressure gage
  - Using 1/2-inch wrench unscrew and take off hydraulic line
  - Using wrench unscrew and take out T-fitting
  - Put hydraulic line back on control valve bank fitting and tighten using 1/2-inch wrench

TA 116390

Figure 75-5 (Sheet 2 of 2)

GENERAL INSTRUCTIONS

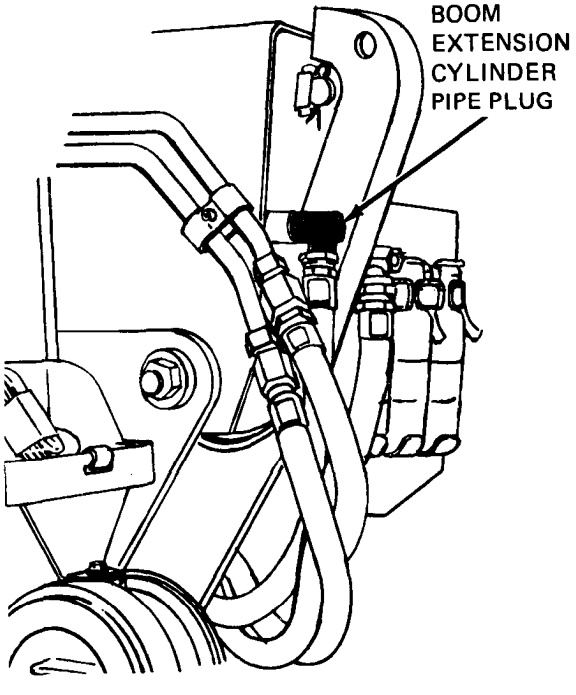
- Check pressure gage before using
  - Gage - make sure that glass and pointer are not broken
  - Fitting - make sure fitting is tight on gage. See if fitting end is dirt free




6 BOOM EXTENSION CYLINDER INPUT PRESSURE TEST - To measure oil pressure from gondola control valves to boom extension cylinder

1

- Set up gage as follows
  - Using 1/4-inch breaker bar unscrew boom extension cylinder pipe plug
  - Hold a can or bucket under extension cylinder and take off plug
  - Screw in pressure gage until tight using 9/16-inch wrench




GO

TA 116391

Figure 75-6 (Sheet 1 of 3)

GO

**NOTE**

The following procedure will need the use of two soldiers. The lead soldier will be called SOLDIER A and the helper will be called SOLDIER B

2

- Test pressure to extension cylinder as follows

SOLDIER B:
- Start engine and engage wrecker crane drive. Refer to TM 9-2320-211-10
- Go to gondola and wait for instructions from SOLDIER A

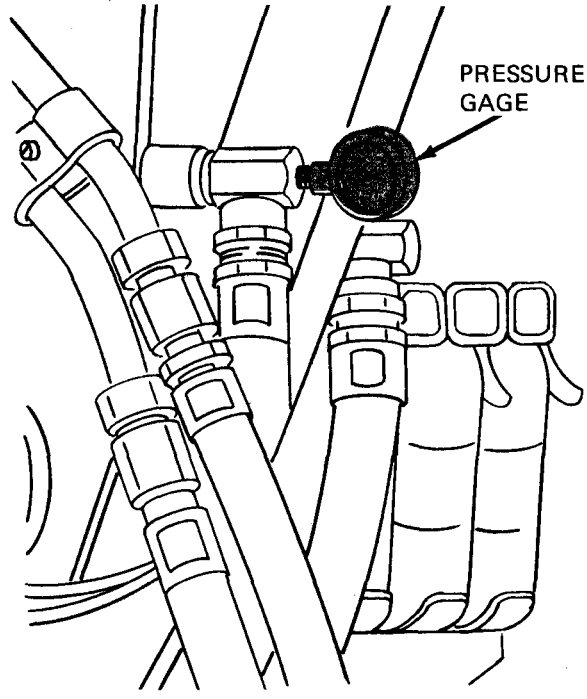
SOLDIER A:
- Look at pressure gage
- Tell SOLDIER B to extend boom

SOLDIER B:
- Extend boom to its limit. Refer to TM 9-2320-211-10

SOLDIER A:
- See if pressure gage reads between 475 and 525 psi while boom extends and between 1175 and 1225 psi fully extended
- Tell SOLDIER B to retract boom and shut down wrecker crane operation

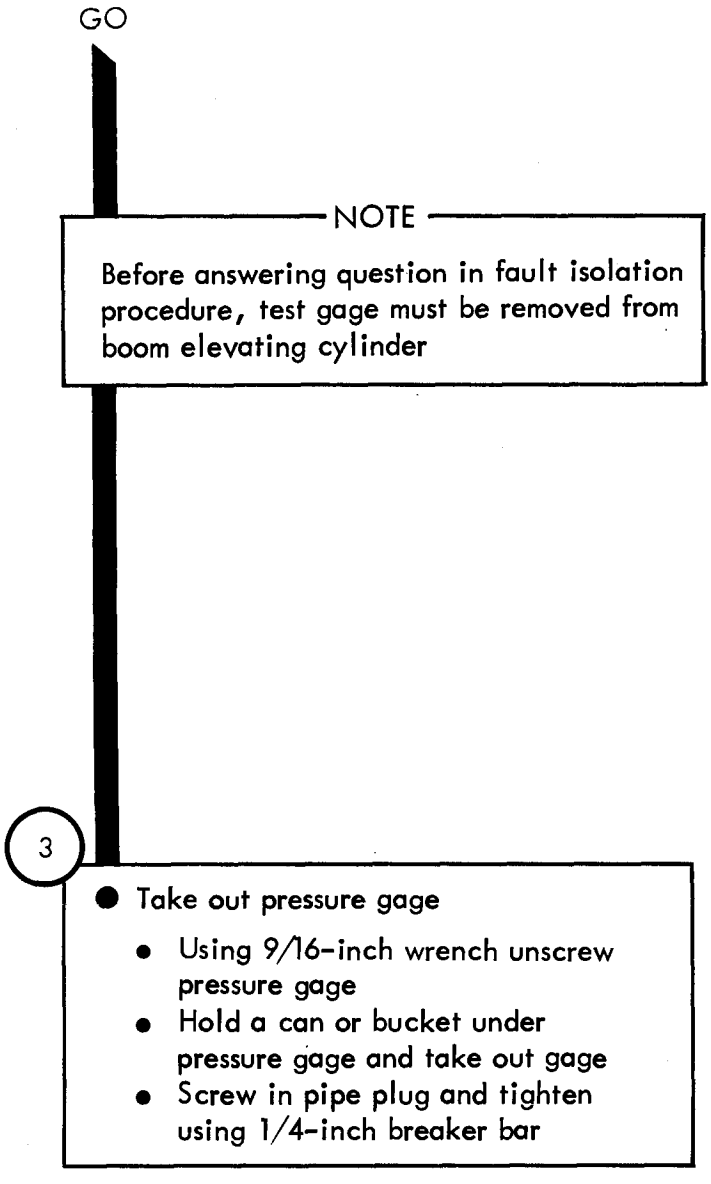
SOLDIER B:
- Retract boom and shut down wrecker crane operation. Refer to TM 9-2320-211-10

GO




TA 116392

Figure 75-6 (Sheet 2 of 3)




TM 116393

Figure 75-6 (Sheet 3 of 3)

# CHAPTER 76

# WRECKER SYSTEM CHECKOUT PROCEDURES

76-1. GENERAL. This chapter gives procedures for checking out the system after troubleshooting and repair have been done. Procedures are set up in flow chart form showing the checkout steps in order and referring to the fault symptom index when the system does not checkout.

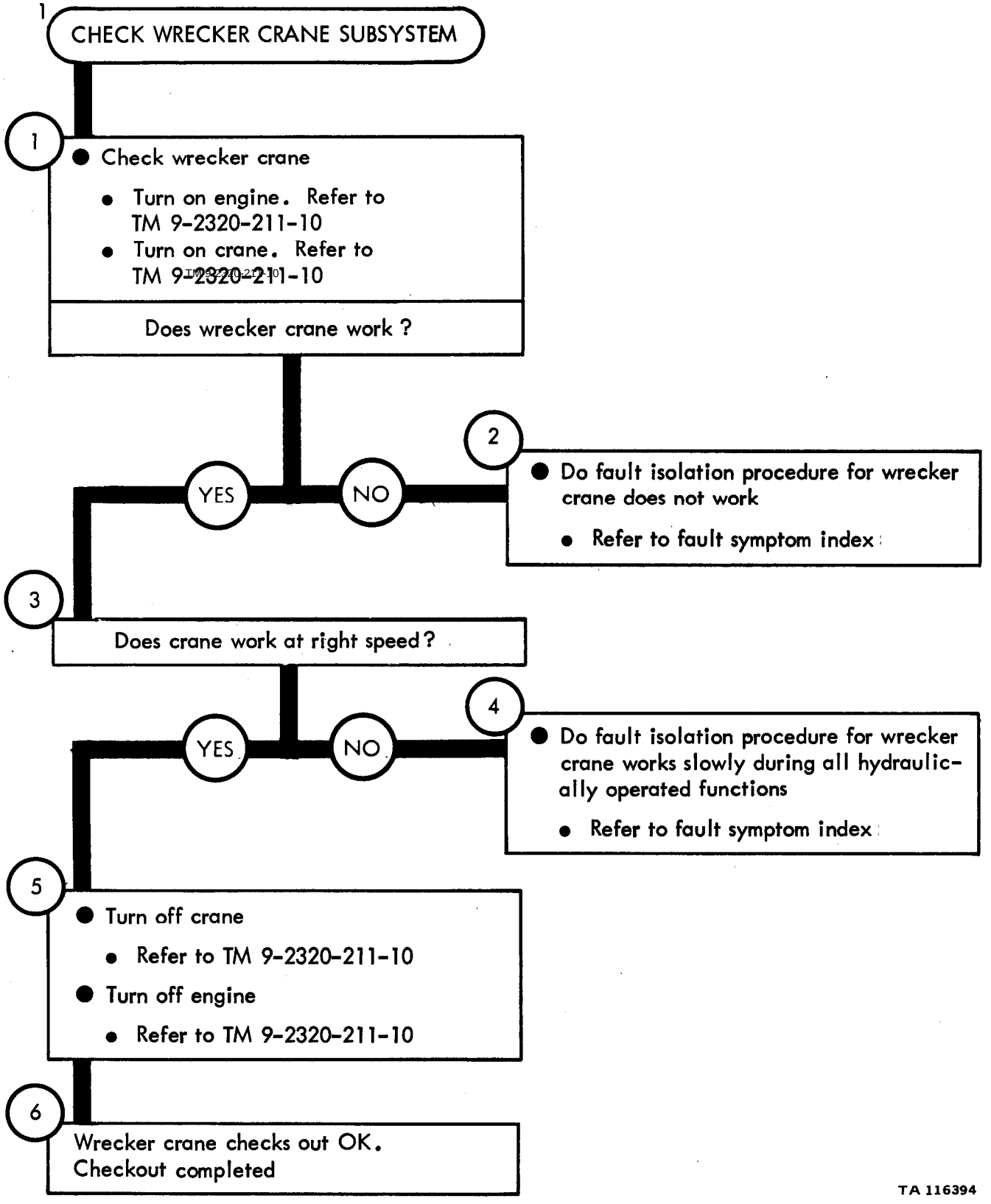

1
CHECK WRECKER CRANE SUBSYSTEM
1
Check wrecker crane
Turn on engine. Refer to TM 9-2320-211-10
Turn on crane. Refer to TM 9-2320-211-10
Does wrecker crane work ?
YES
NO
2
Do fault isolation procedure for wrecker crane does not work
Refer to fault symptom index
3
Does crane work at right speed?
YES
NO
4
Do fault isolation procedure for wrecker crane works slowly during all hydraulically operated functions
Refer to fault symptom index
5
Turn off crane
Refer to TM 9-2320-211-10
Turn off engine
Refer to TM 9-2320-211-10
6
Wrecker crane checks out OK. Checkout completed
TA 116394

Figure 76-1

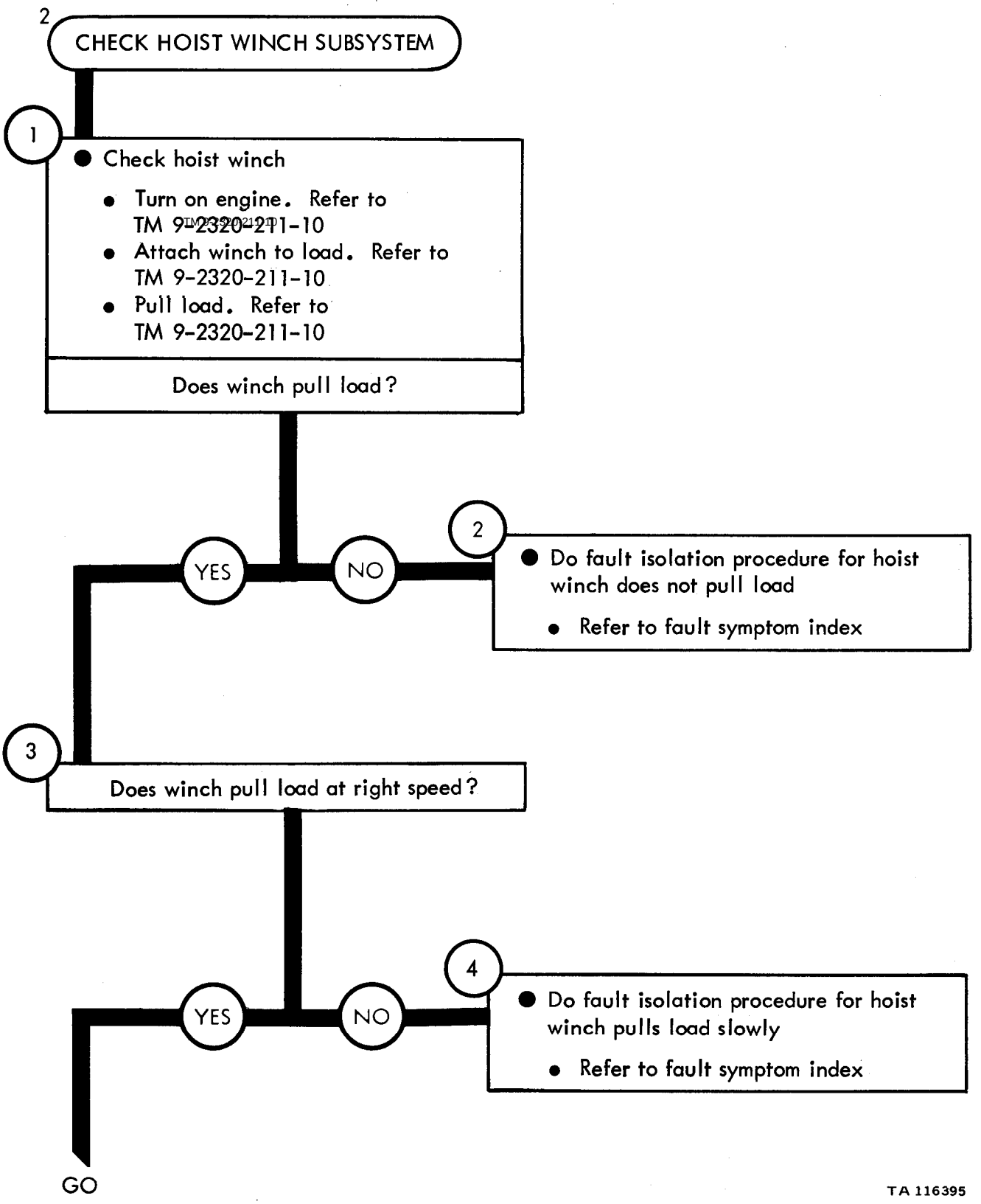



Figure 76-2 (Sheet 1 of 2)

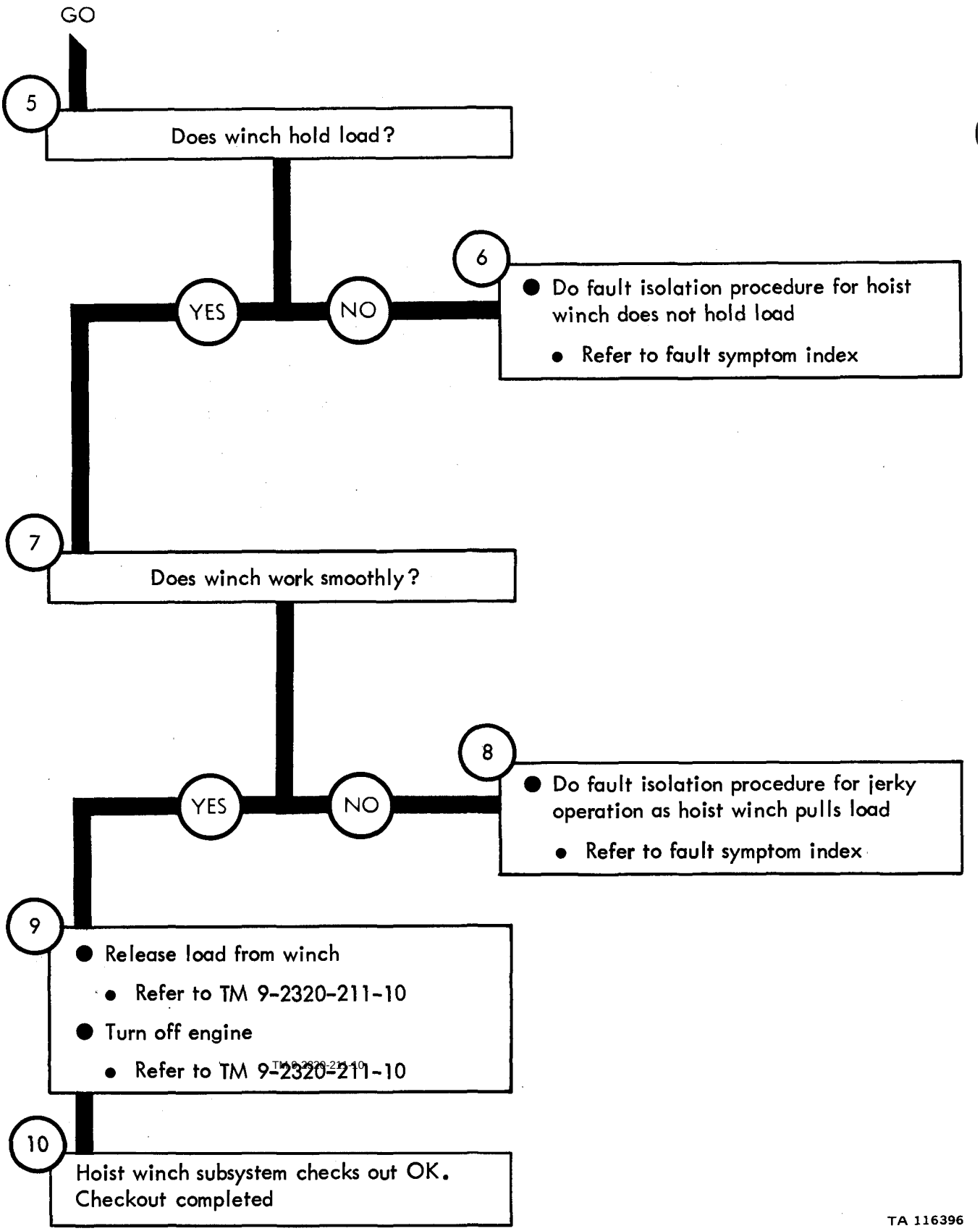



Figure 76-2 (Sheet 2 of 2)

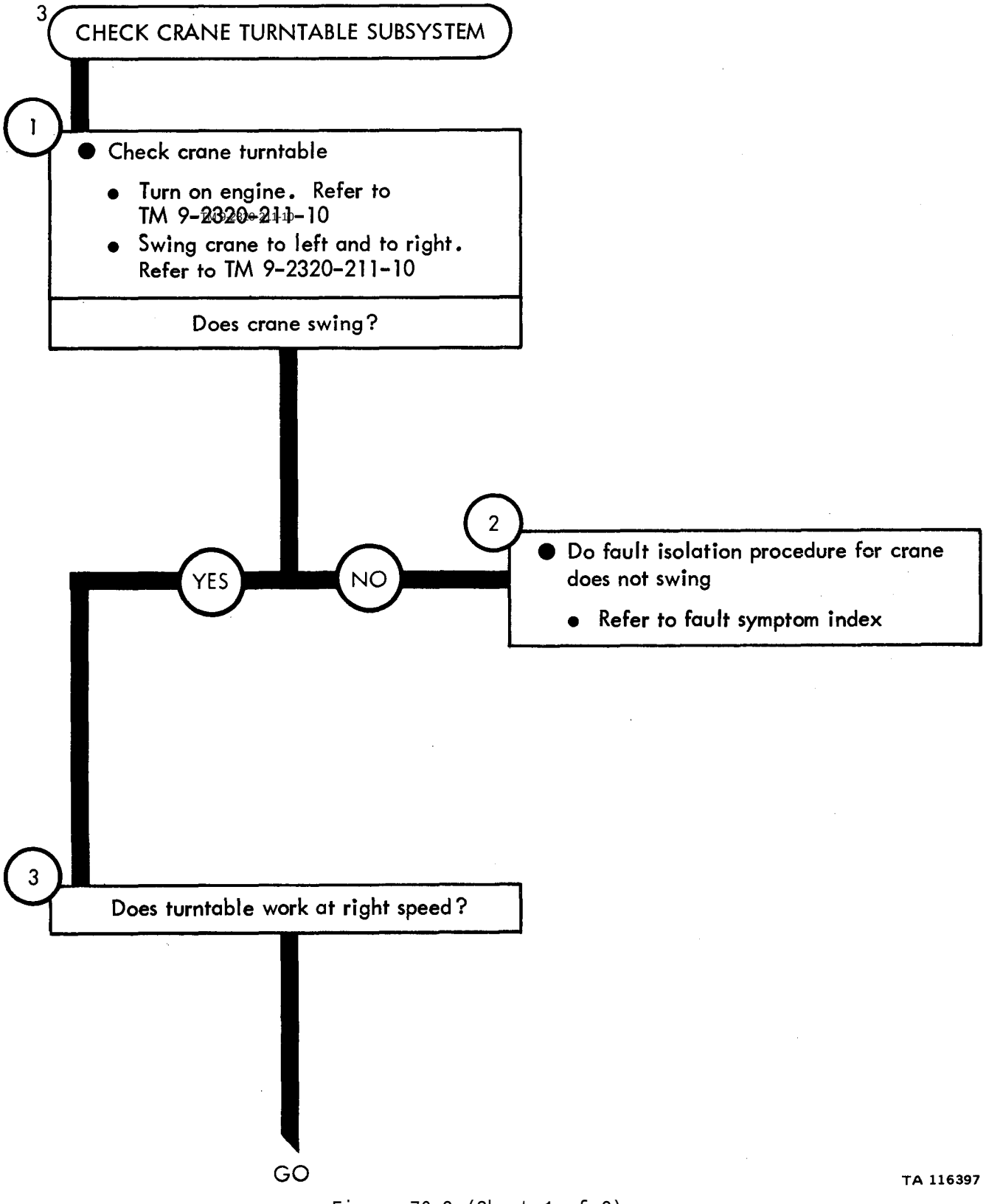
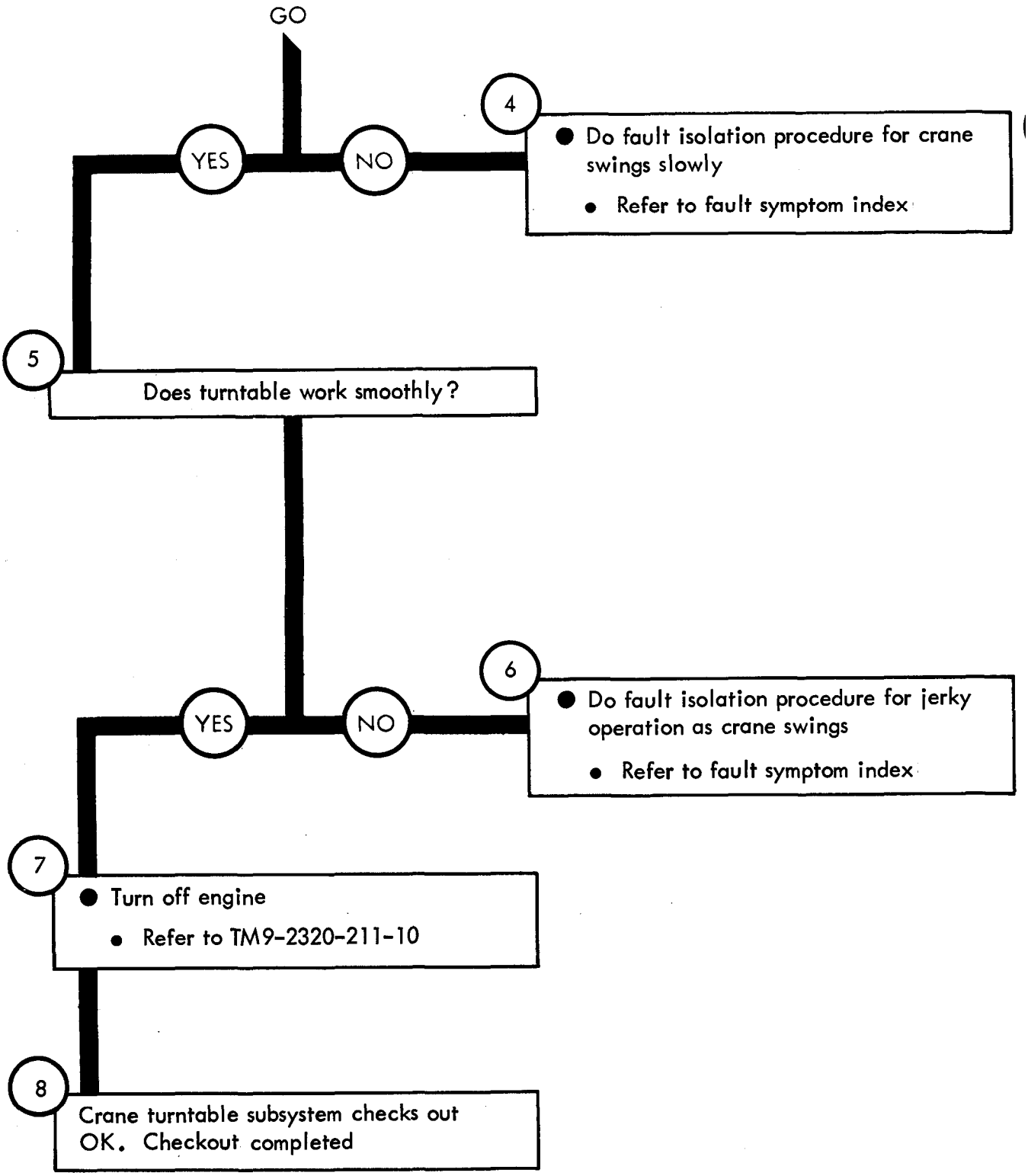



Figure 76-3 (Sheet 1 of 2)




TA 116398

Figure 76-3 (Sheet 2 of 2)

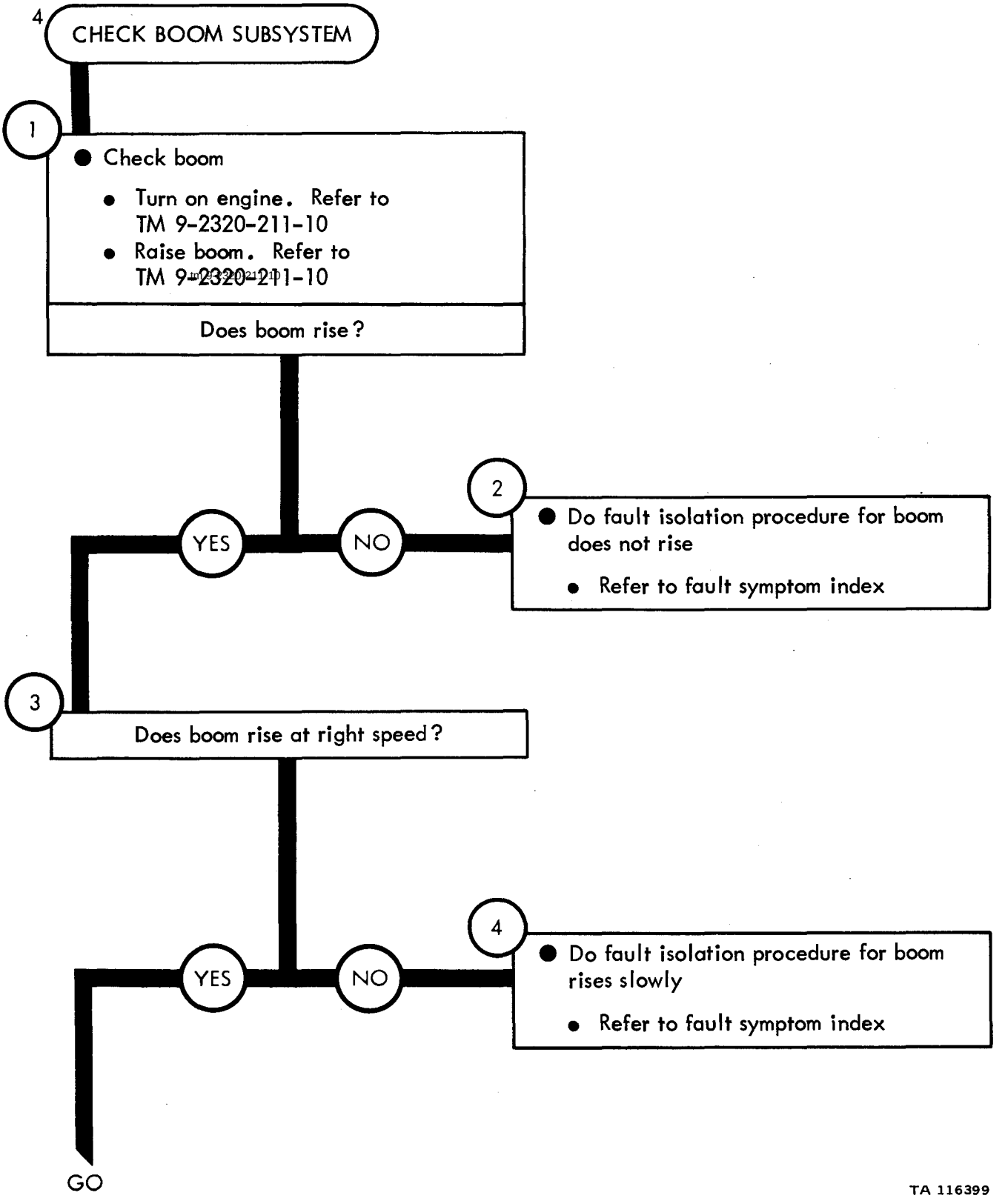



Figure 76-4 (Sheet 1 of 3)

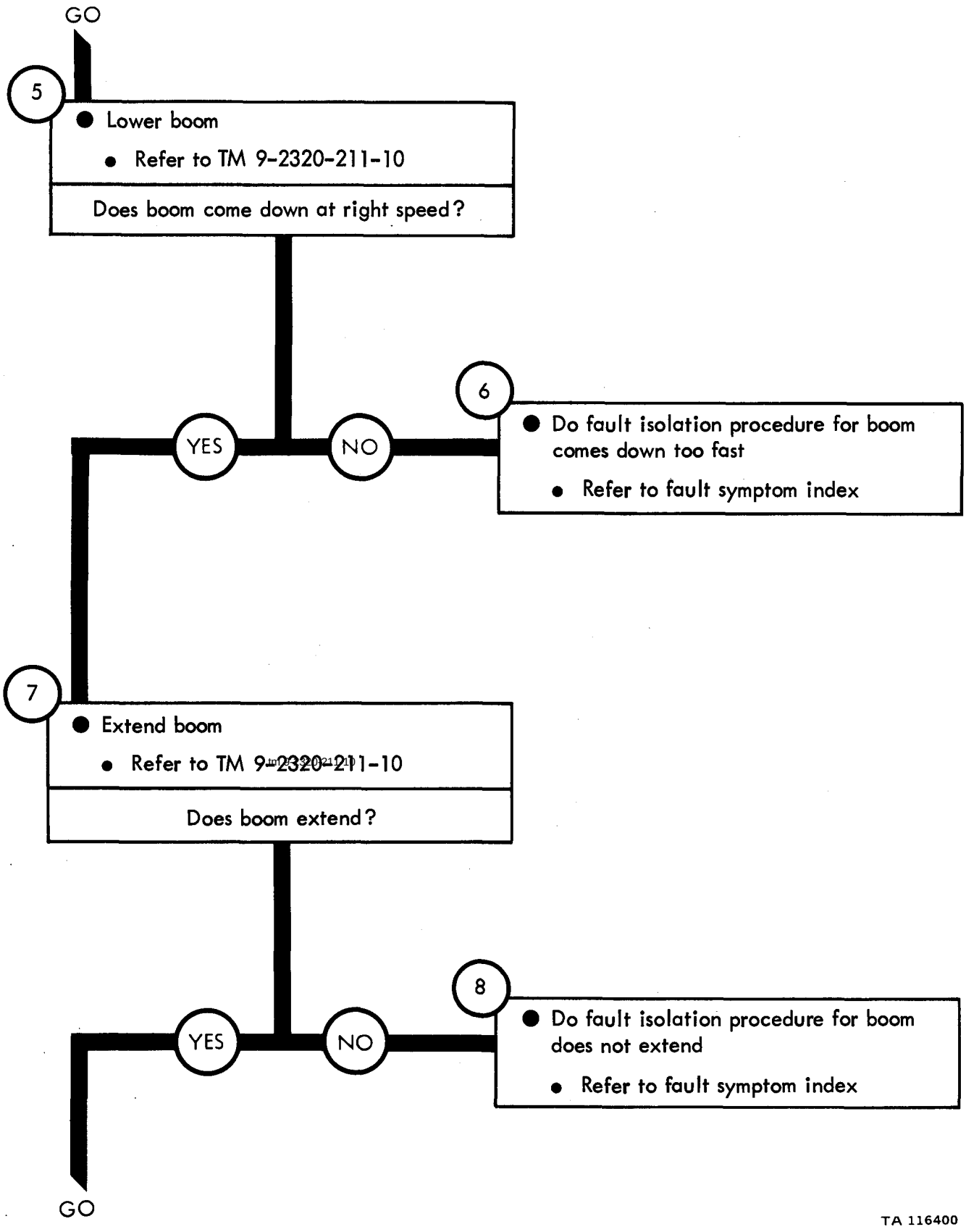



Figure 76-4 (Sheet 2 of 3)

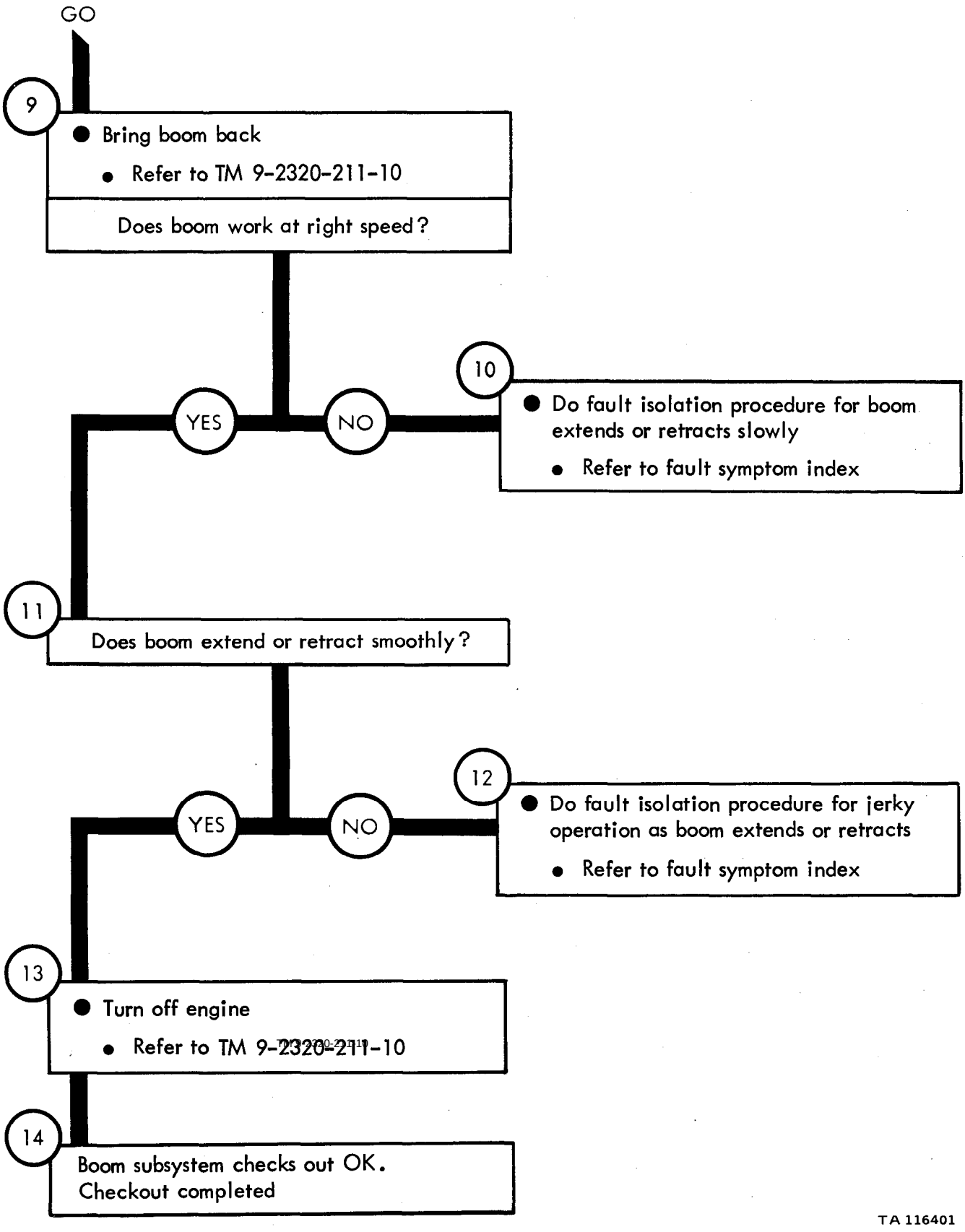



Figure 76-4 (Sheet 3 of 3)

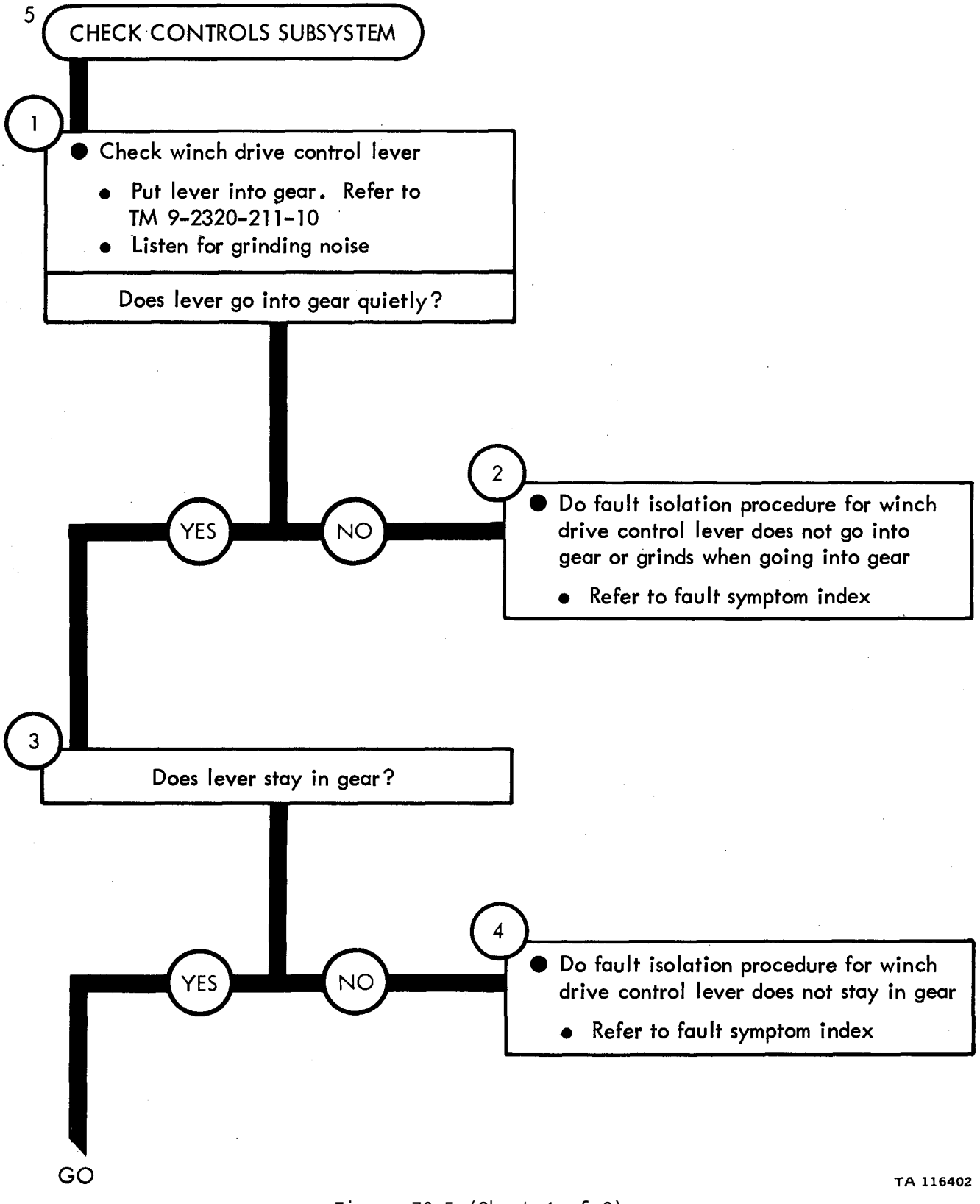



Figure 76-5 (Sheet 1 of 3)

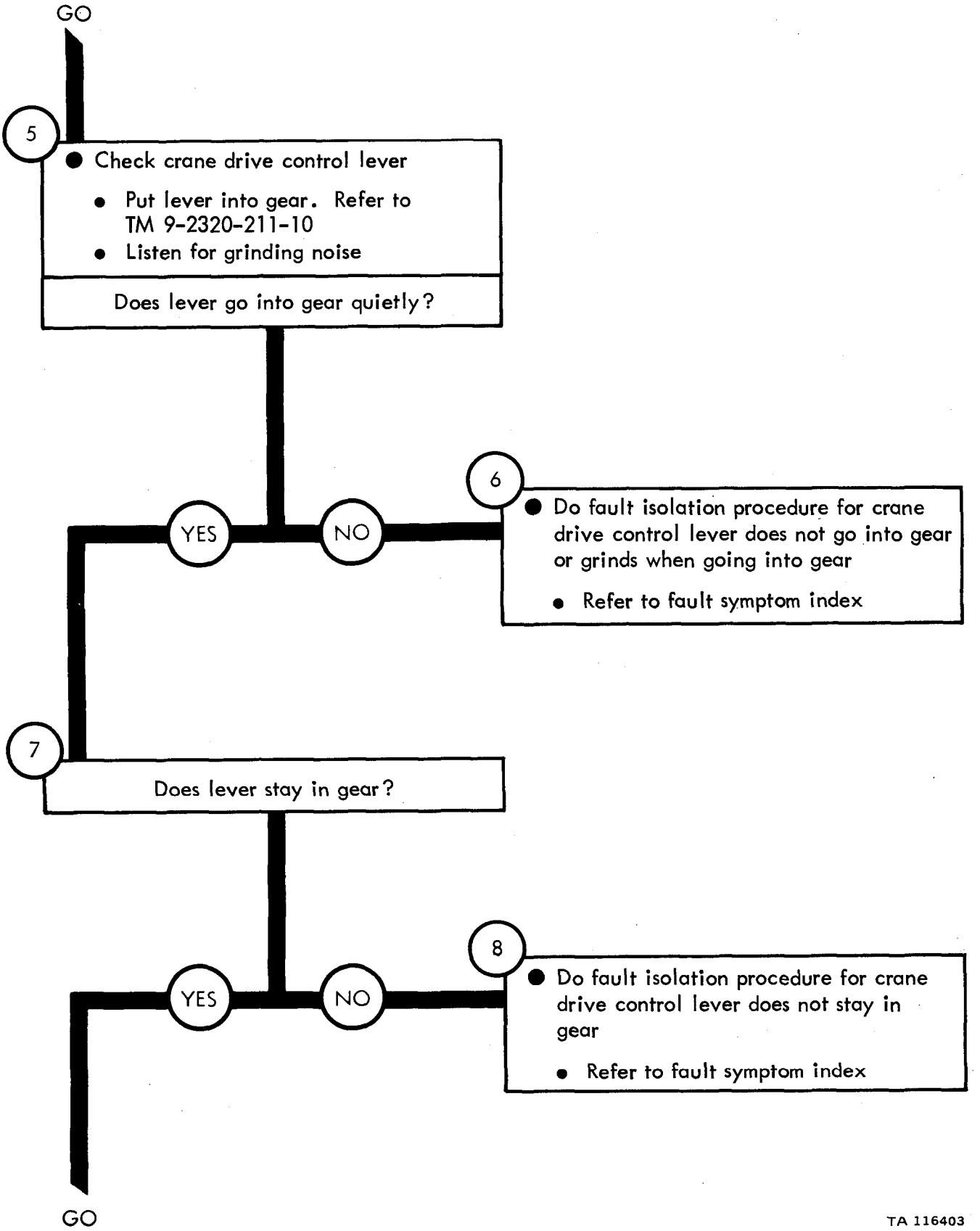
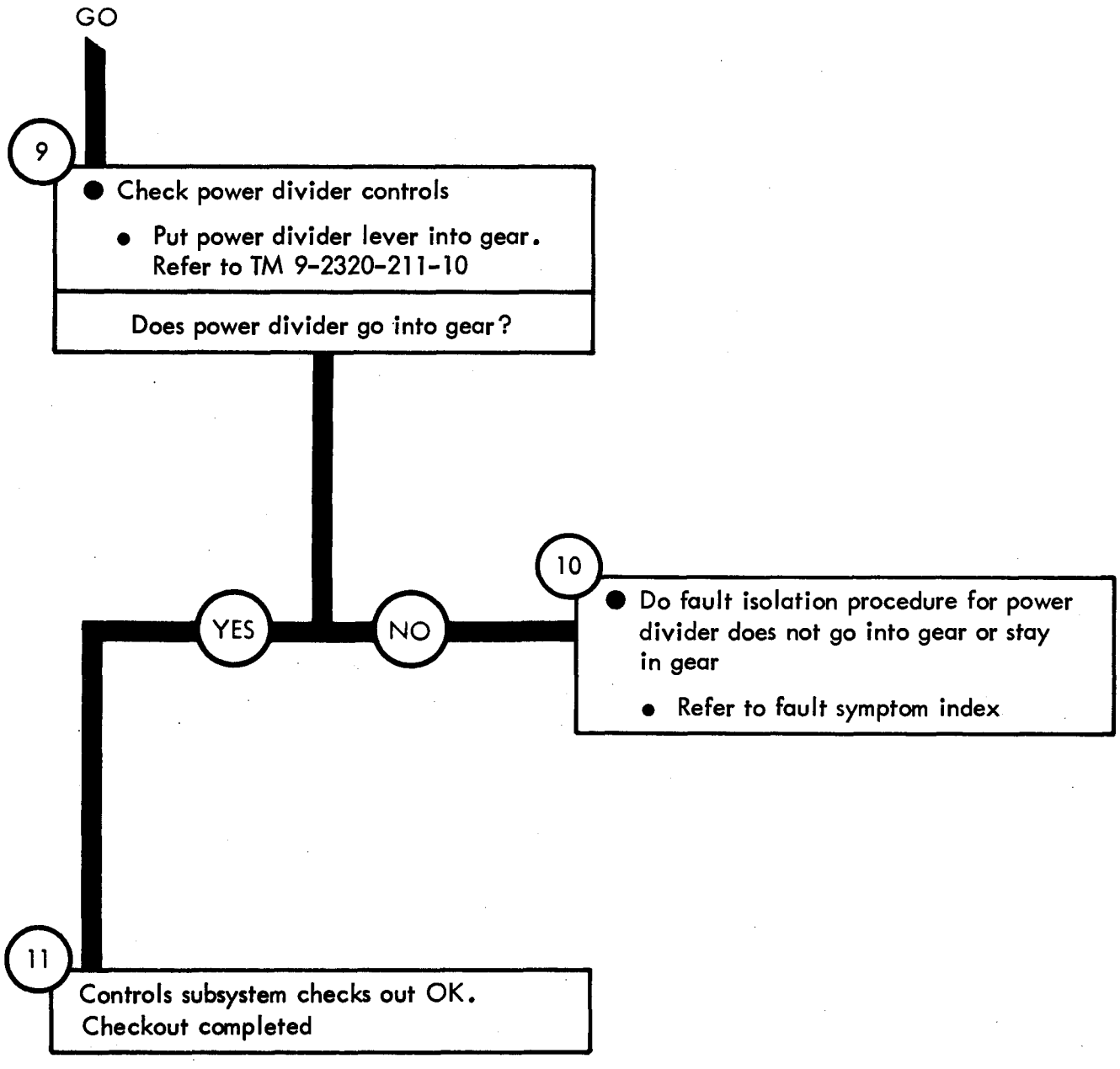



Figure 76-5 (Sheet 2 of 3)




TA 116404

Figure 76-5 (Sheet 3 of 3)

# CHAPTER 77

# ENGINE COOLANT HEATER SYSTEM TROUBLESHOOTING

77-1. EQUIPMENT ITEMS COVERED . This chapter gives equipment troubleshooting procedures for the engine coolant heater system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

77-2. EQUIPMENT ITEMS NOT COVERED. All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

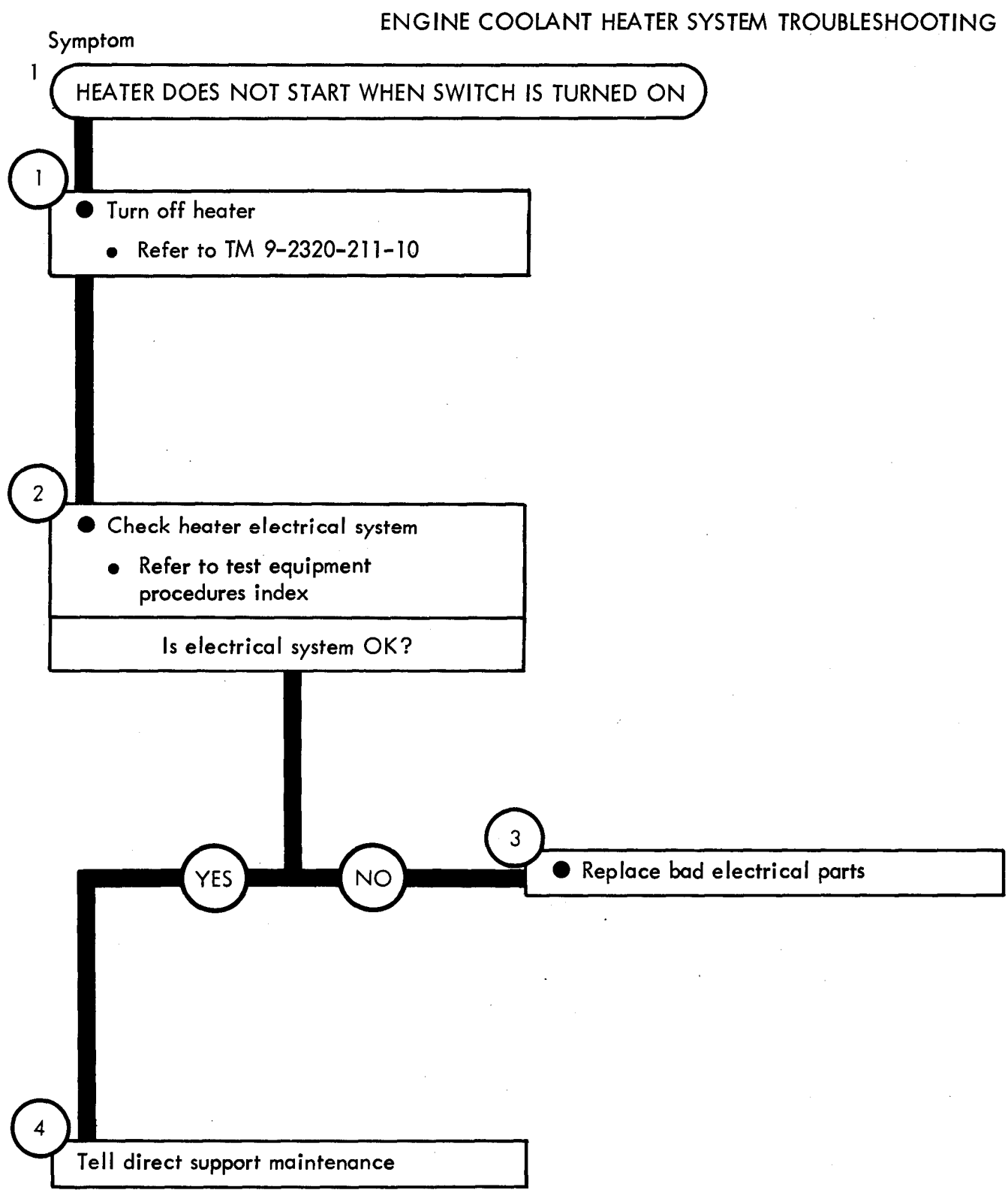

ENGINE COOLANT HEATER SYSTEM TROUBLESHOOTING
Symptom
1
HEATER DOES NOT START WHEN SWITCH IS TURNED ON
1
Turn off heater
Refer to TM 9-2320-211-10
2
Check heater electrical system
Refer to test equipment procedures index
Is electrical system OK?
YES
NO
3
Replace bad electrical parts
4
Tell direct support maintenance
TA 116405

Figure 77-1

Symptom

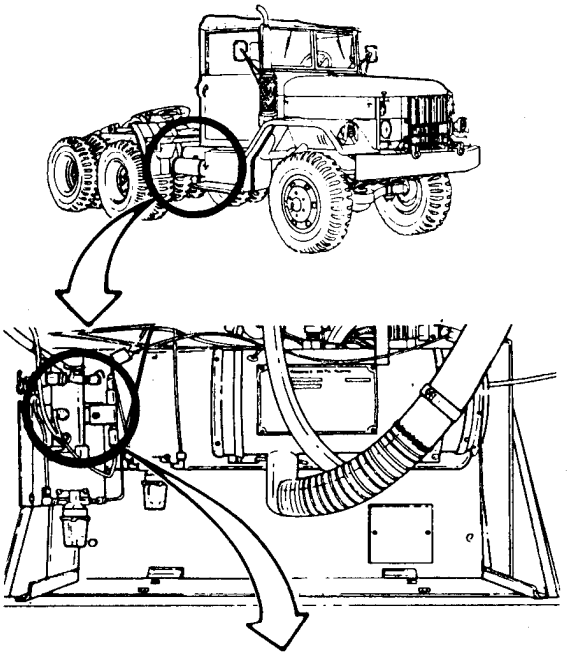
2 HEATER WORKS FOR SEVERAL MINUTES THEN STOPS

1

- Turn off heater
  - Refer to procedures given in TM 9-2320-211-10

WARNING

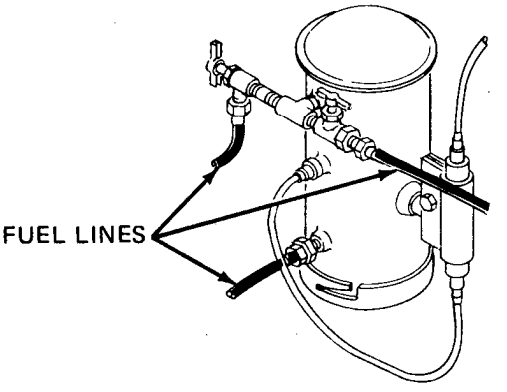
Diesel fuel is very flammable. Care must be used when choosing a place to work on engine coolant heater system. Keep truck about 50 feet away from an area where open flame, sparks, or smoking may cause a fire. Keep a fire extinguisher close by



2

- Check heater fuel lines
  - Look for crushed or kinked fuel lines

Are fuel lines OK?




YES

NO

3

- Replace crushed or bent fuel line
  - Refer to Vol 3, chapter 4, para 4-11

GO

TA 116406

Figure 77-2 (Sheet 1 of 3)

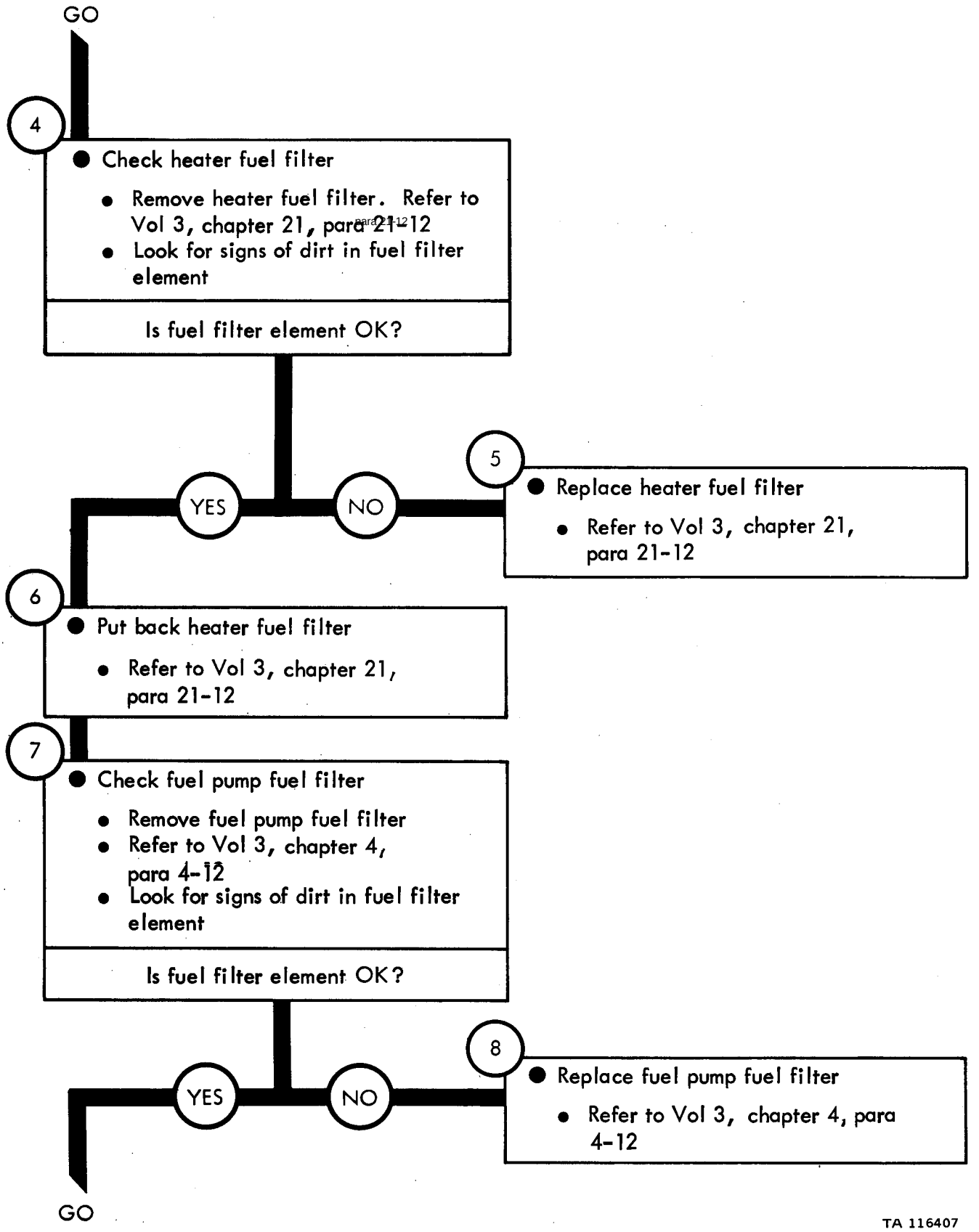
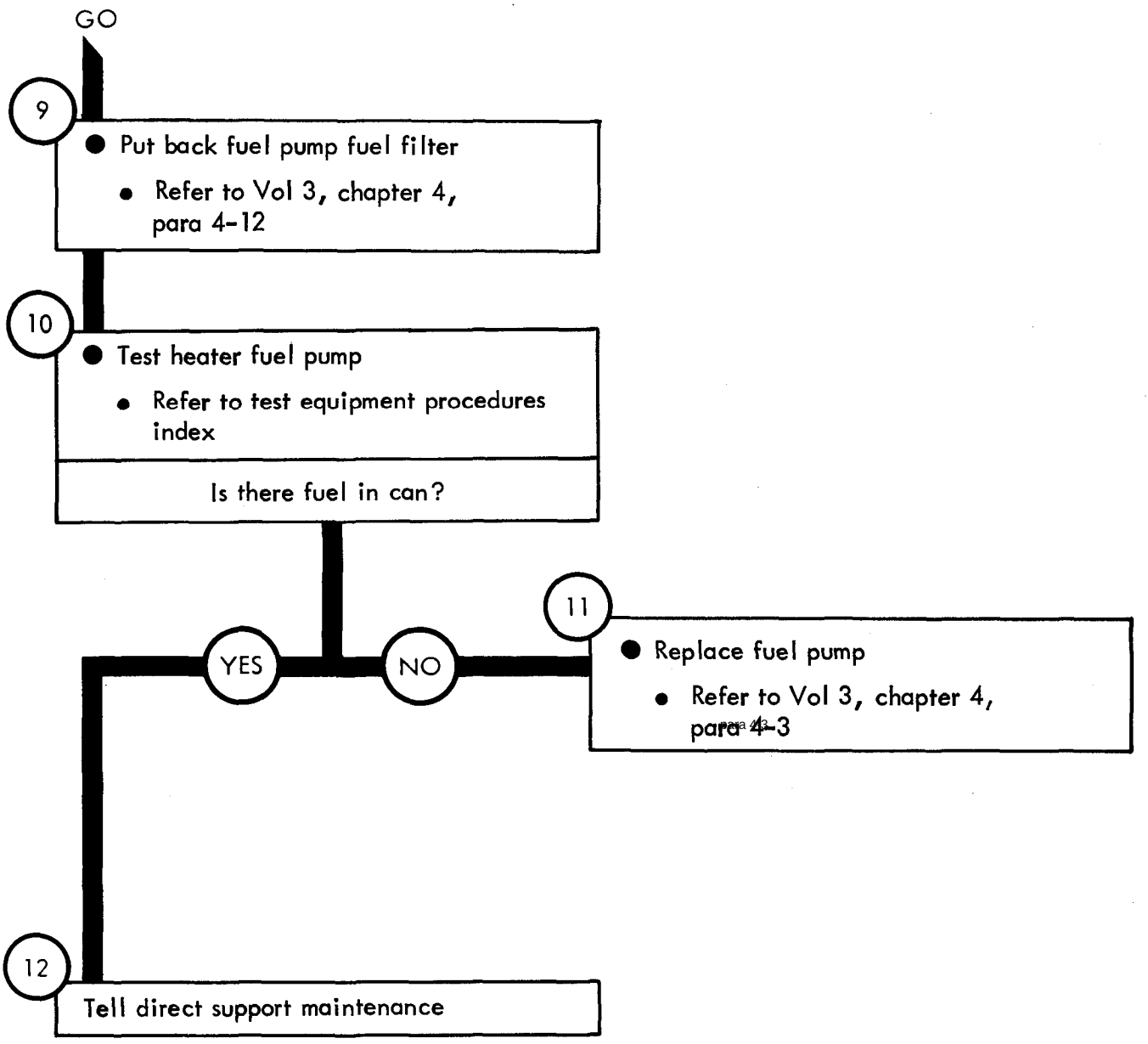



Figure 77-2 (Sheet 2 of 3)




TA 116408

Figure 77-2 (Sheet 3 of 3)

Symptom

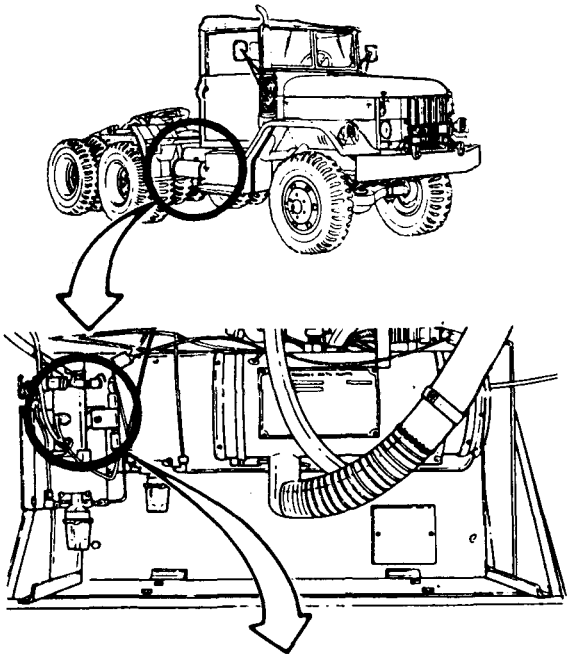
3 HEATER HAS NO OR LOW HEAT OUTPUT

1

- Turn off heater
  - Refer to TM 9-2320-211-10

WARNING

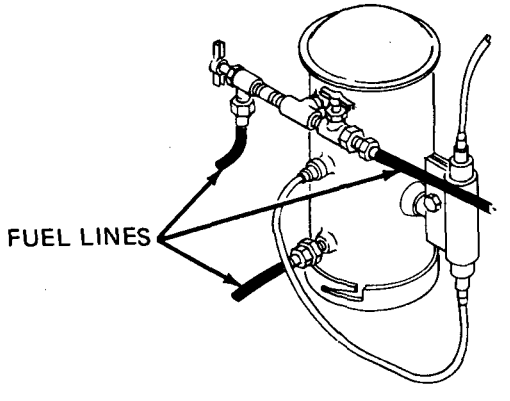
Diesel fuel is very flammable. Care must be used when choosing a place to work on engine coolant heater system. Keep truck about 50 feet away from an area where open flame, sparks, or smoking may cause a fire. Keep a fire extinguisher close by



2

- Check heater fuel line
  - Look for crushed or bent fuel line

Is fuel line OK?




YES

NO

3

- Replace crushed or bent fuel line
  - Refer to Vol 3, chapter 4, para 4-11

GO

TA 116409

Figure 77-3 (Sheet 1 of 3)

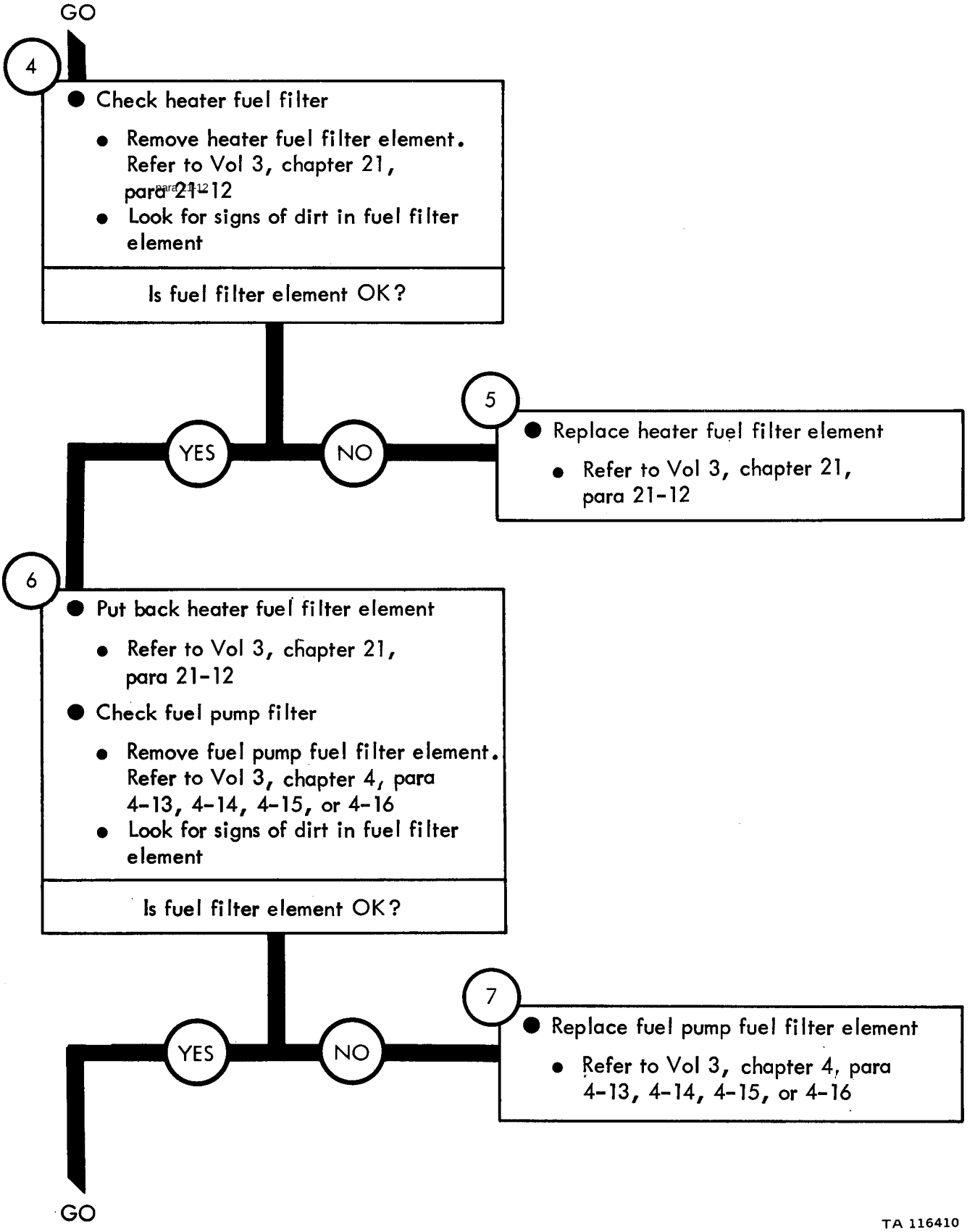



Figure 77-3 (Sheet 2 of 3)

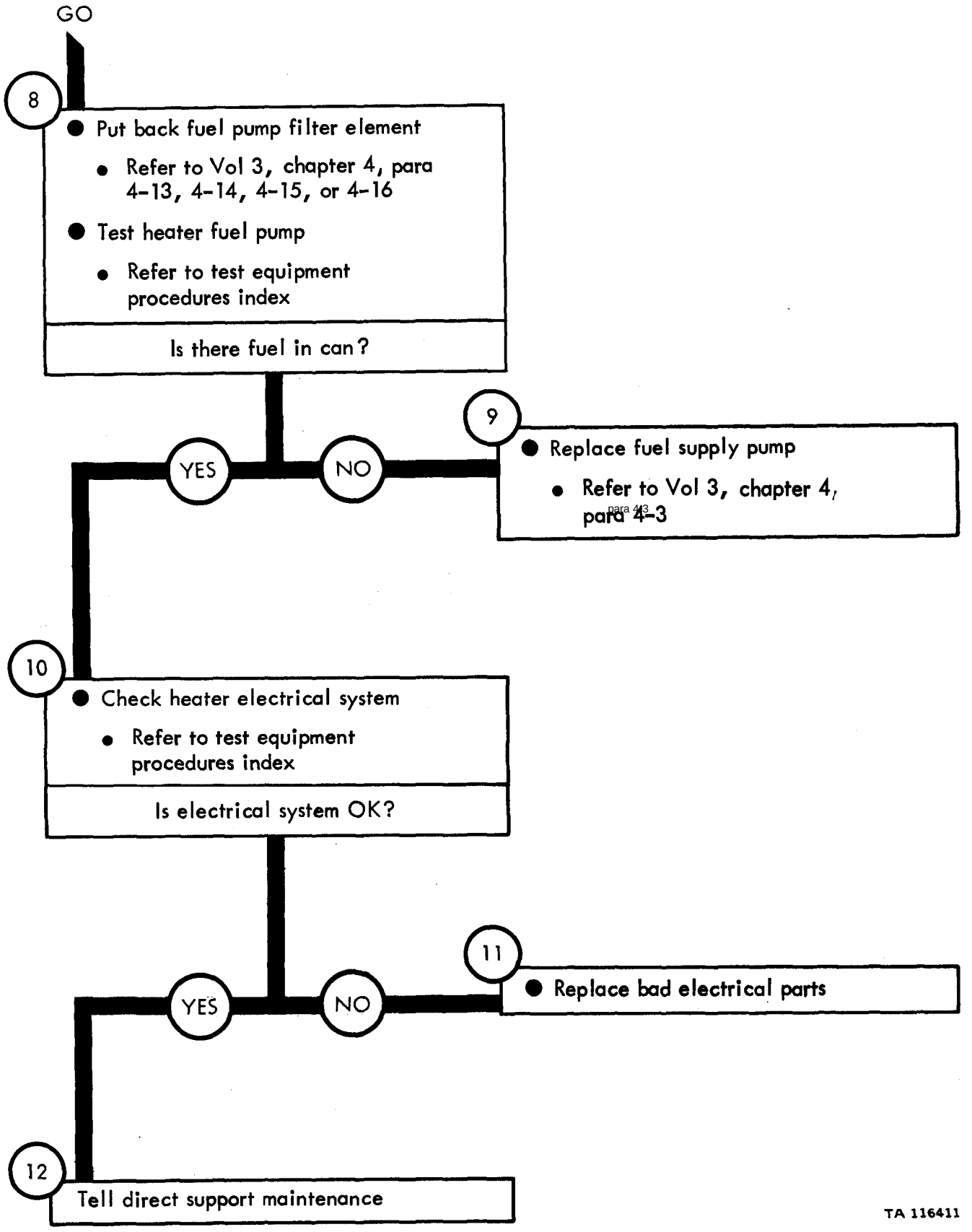



Figure 77-3 (Sheet 3 Of 3)

# CHAPTER 78

# ENGINE COOLANT HEATER SYSTEM TROUBLESHOOTING SUMMARY

78-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 77, for the Engine Coolant Heater System.

78-2. PROCEDURES. The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures in Part 1. Chapter 7 outlines a sample troubleshooting g procedure. The summary procedures are based on the “what-to-do” portions of the detailed procedures and do not include the “How-to-do-it” instructions. Warnings, cautions, and notes are given where needed.

ENGINE COOLANT HEATER SYSTEM TROUBLESHOOTING SUMMARY

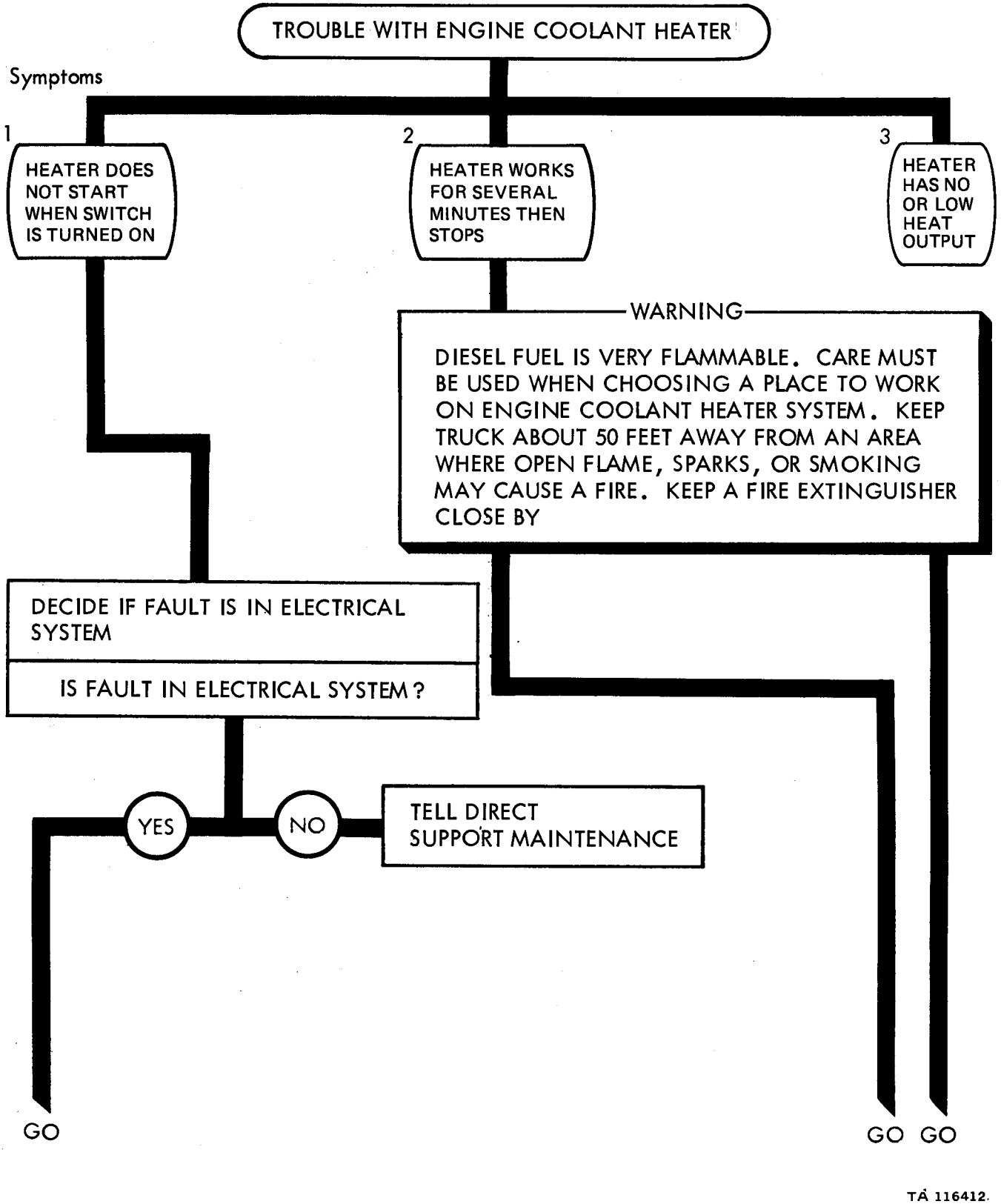



Figure 78-1 (Sheet 1 of 3)

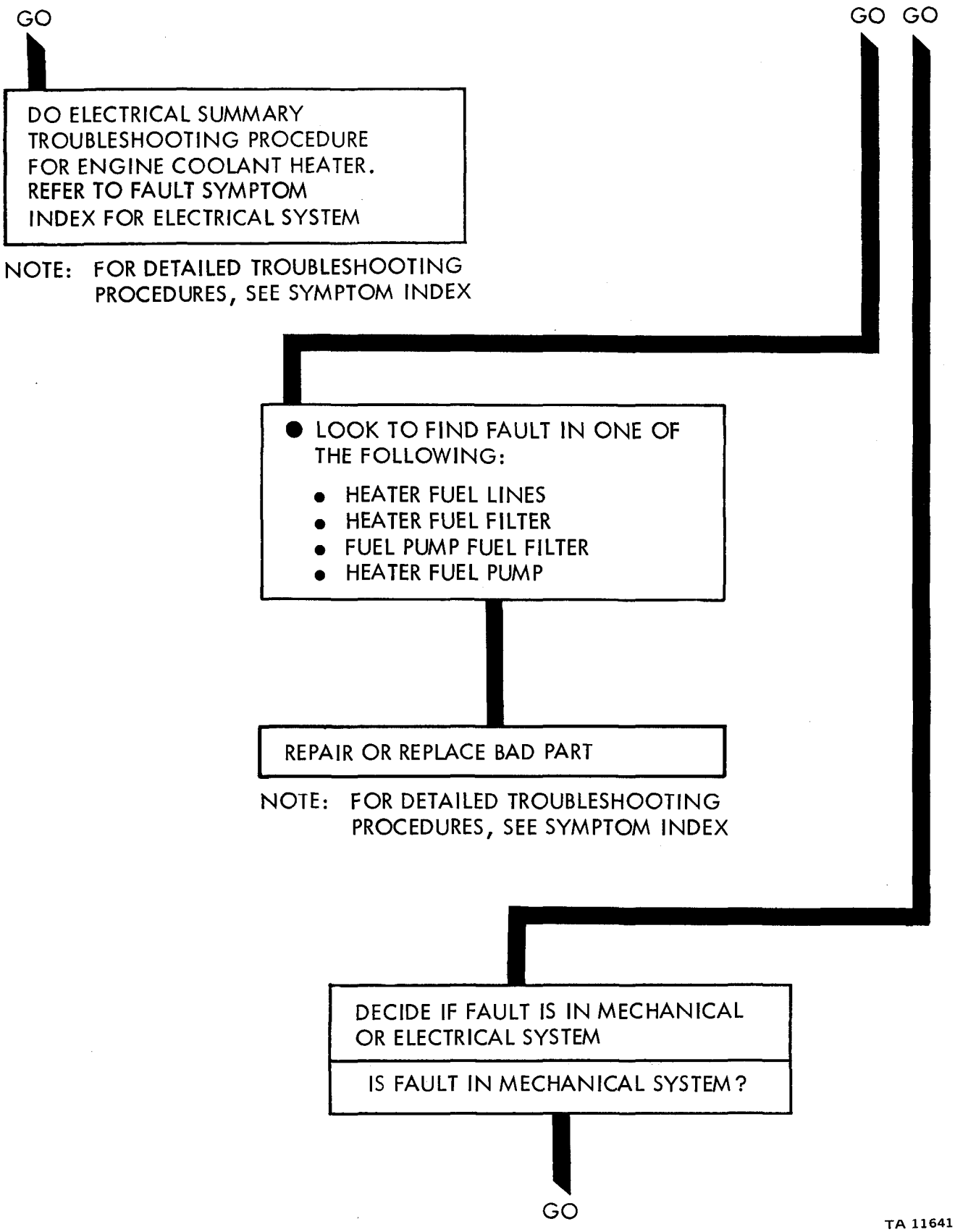
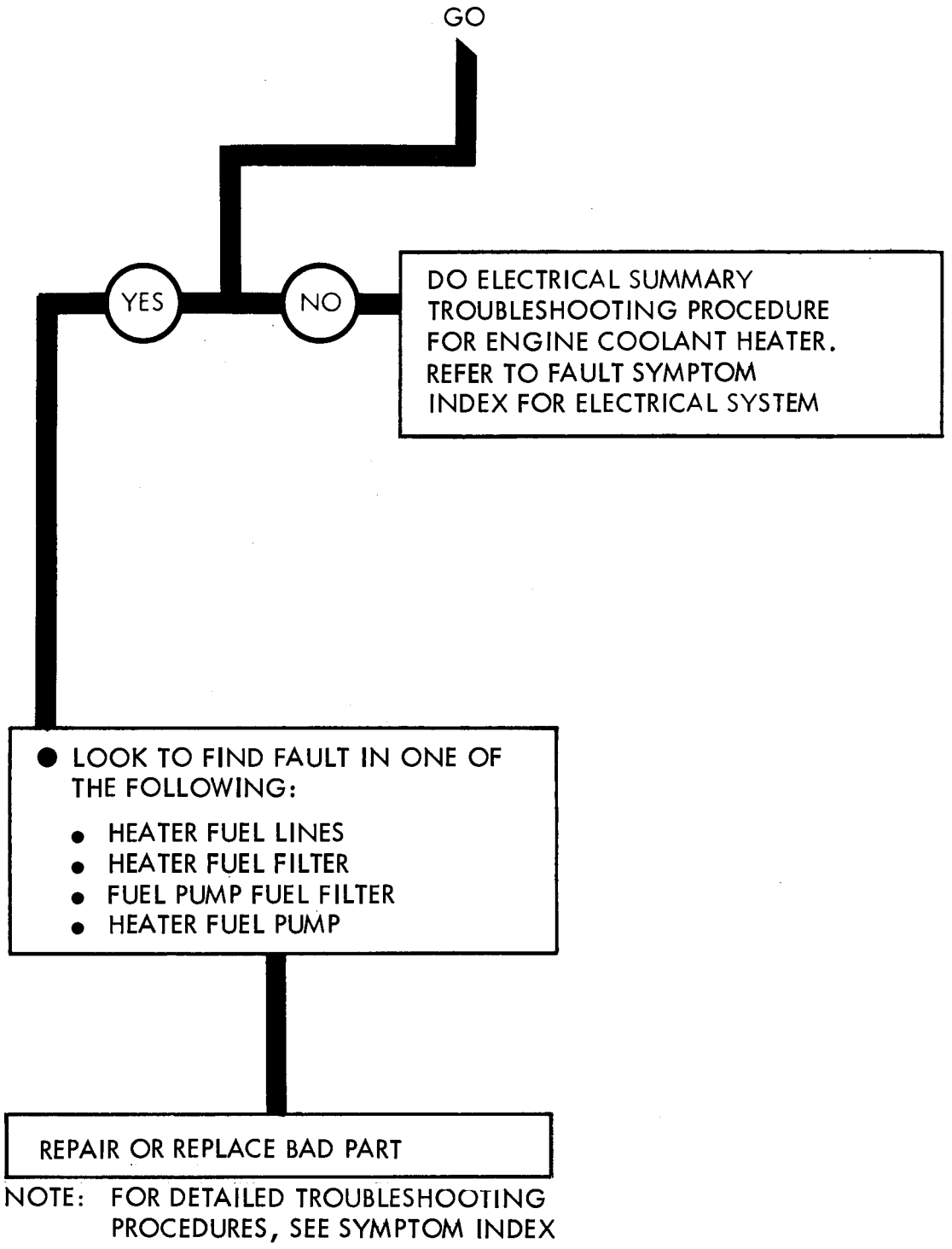



Figure 78-1 (Sheet 2 of 3)




TA 116414

Figure 78-1 (Sheet 3 of 3)

# CHAPTER 79

# ENGINE COOLANT HEATER SYSTEM TEST PROCEDURES

79-1. GENERAL. This chapter gives test procedures for the tests given in chapter 77, for the Engine Coolant Heater System.

79-2. TEST SET-UP. Instructions for setup of test equipment and parts to be tested are given before the test procedures. Illustrations are used, when needed, to show you how to hook up the test equipment to the part to be tested.

79-3. TEST PROCEDURE. Detailed step-by-step instructions, in flow chart form, are given for each test. The procedure calls out the type of test and the condition of the truck system for each part of testing. The step-by-step test will lead you to the bad component or to a fault symptom within a related system. Reference is made to the fault symptom index, chapter 6, if the test shows a fault in another system.

## HEATER FUEL PUMP TEST

**WARNING**

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

**NOTE**

This test will need the use of two soldiers. The lead soldier will be called Soldier A and the helper will be called Soldier B

1

- Check heater fuel pump

SOLDIER A
- Turn off fuel shutoff valve
- Using 7/16-inch wrench unscrew fuel pump output line fitting
- Move output line away from shutoff valve
- Hold a can under fuel shutoff valve
- Turn on fuel shutoff valve

GO

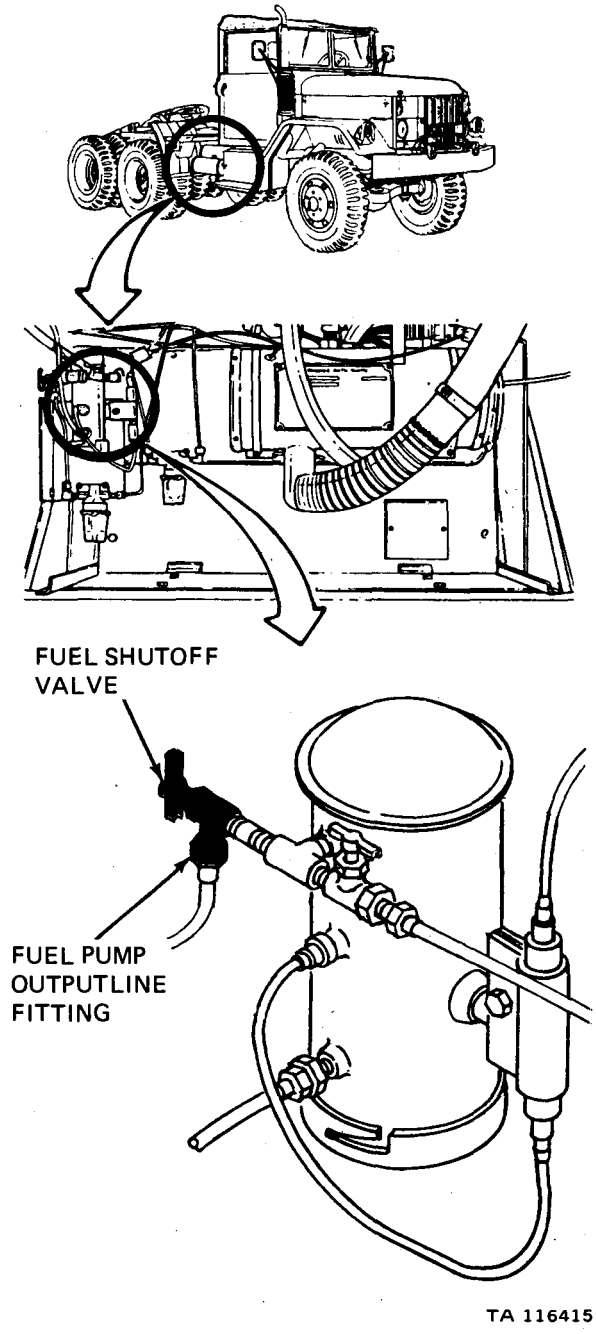
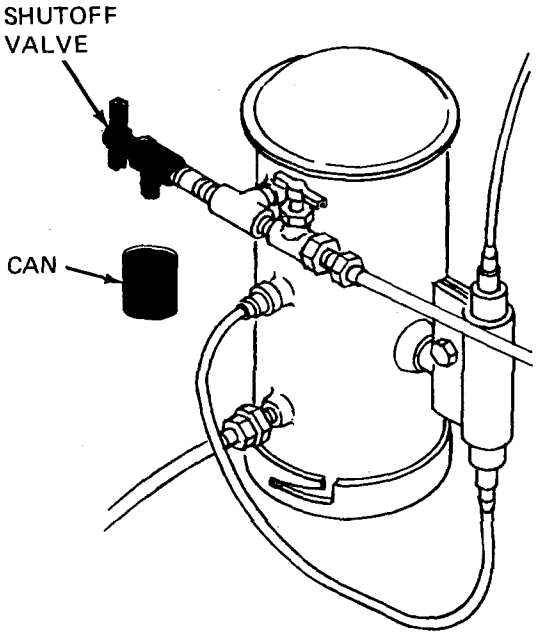



Figure 79-1 (Sheet 1 of 2)

GO

- Tell Soldier B to start heater. Refer to TM 9-2320-211-10. Wait about 30 seconds
- Tell Soldier B to turn off heater. Refer to TM 9-2320-211-10
- See if fuel has entered can




2

- Put back fuel pump output line

SOLDIER A
- Turn off fuel shutoff valve
- Screw in fuel pump output line fitting using 7/16-inch wrench
- Turn on fuel shutoff valve

TA 116416

Figure 79-1 (Sheet 2 of 2)

# CHAPTER 80

# ENGINE COOLANT HEATER SYSTEM CHECKOUT PROCEDURES

80-1. GENERAL. This chapter gives procedures for checking out the system after troubleshooting and repair have been done. Procedures are set up in flow chart form showing the checkout steps in order and referring to the fault symptom index when the system does not checkout.

ENGINE COOLANT HEATER SYSTEM CHECKOUT

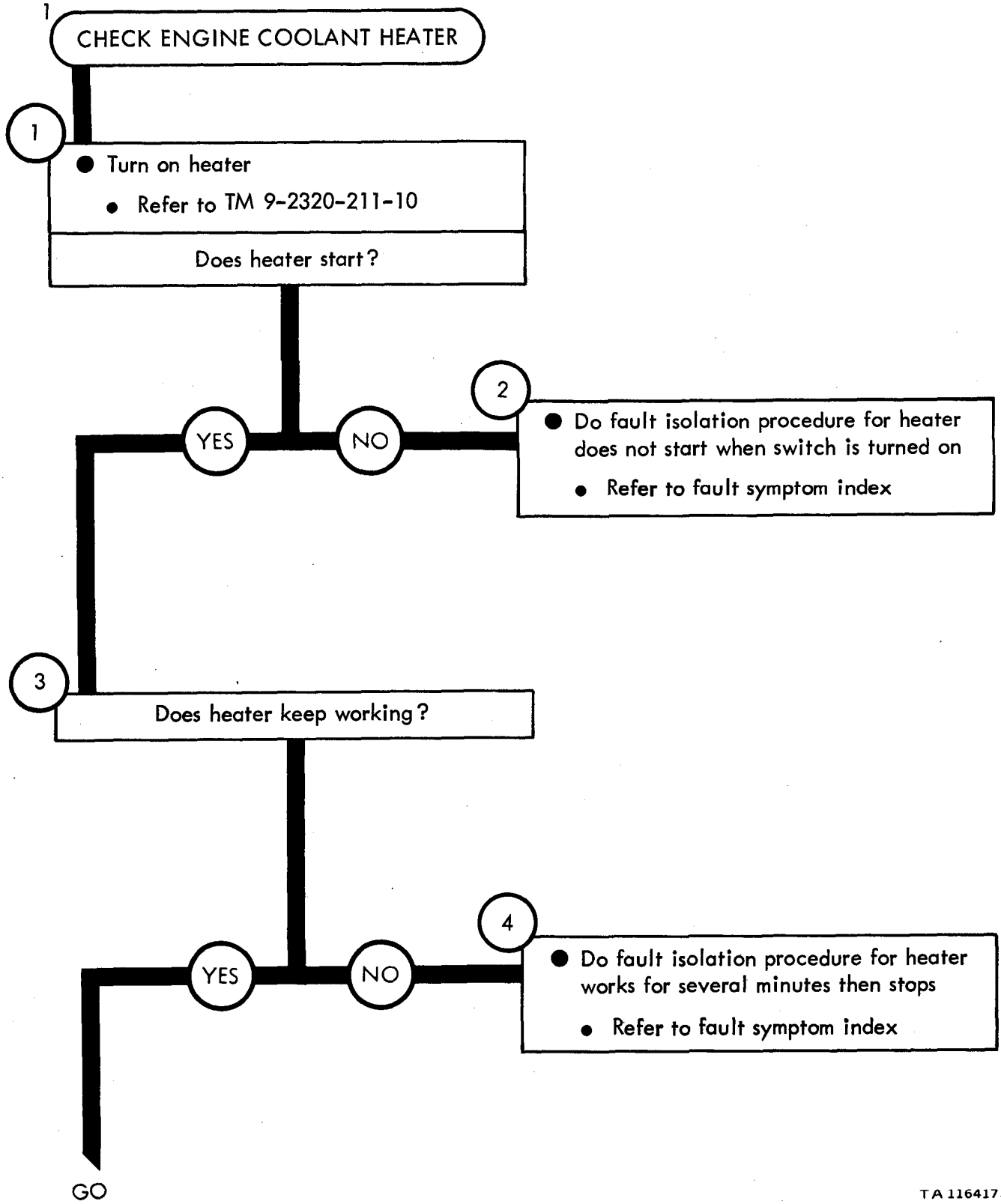
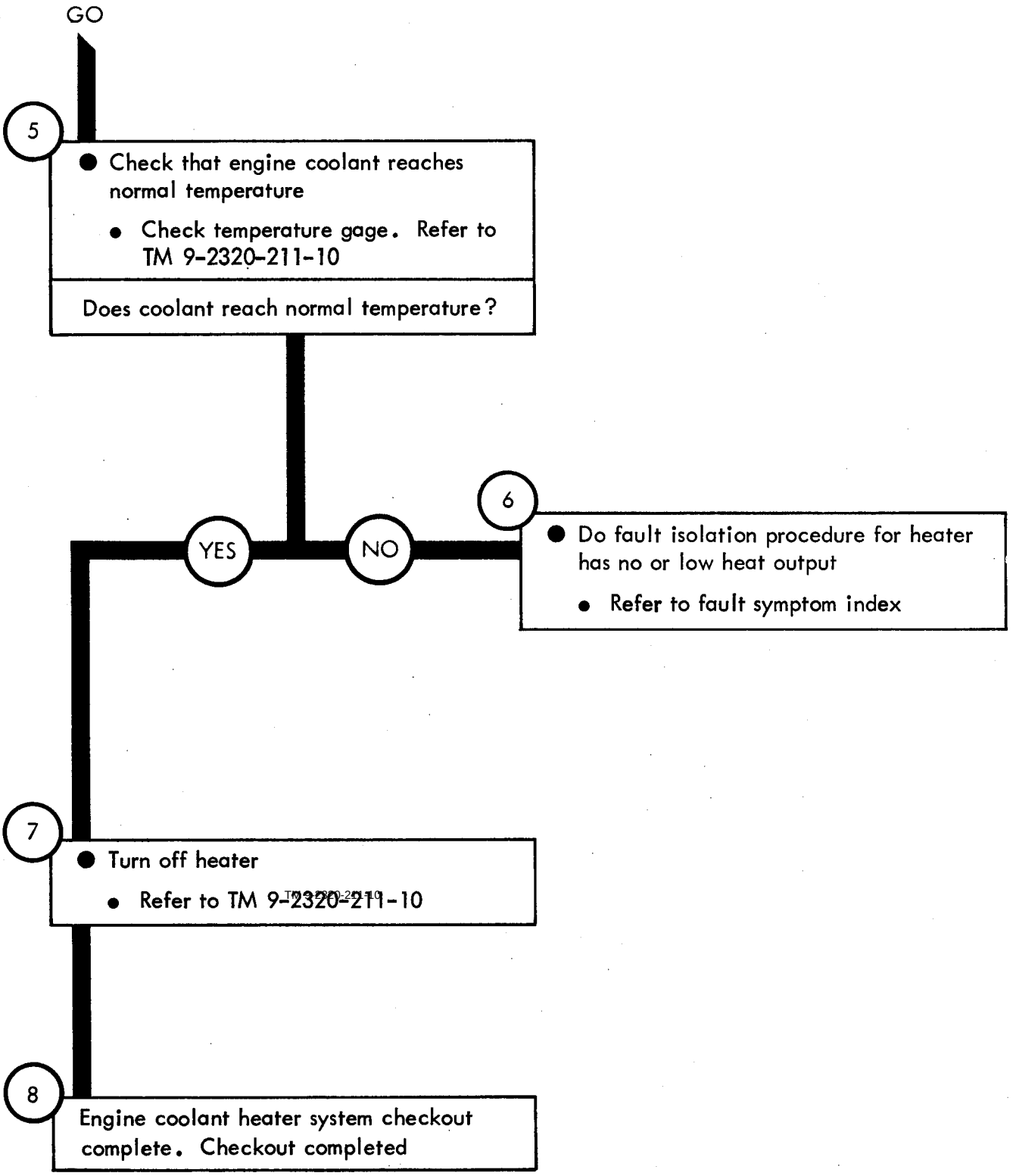



Figure 80-1 (Sheet 1 of 2)




TA 116418

Figure 80-1 (Sheet 2 of 2)

# CHAPTER 81

# FUEL BURNING HEATER SYSTEM TROUBLESHOOTING

81-1. EQUIPMENT ITEMS COVERED. This chapter gives equipment troubleshooting procedures for the fuel burning heater system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

81-2. EQUIPMENT ITEMS NOT COVERED . All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

FUEL BURNING HEATER SYSTEM TROUBLESHOOTING

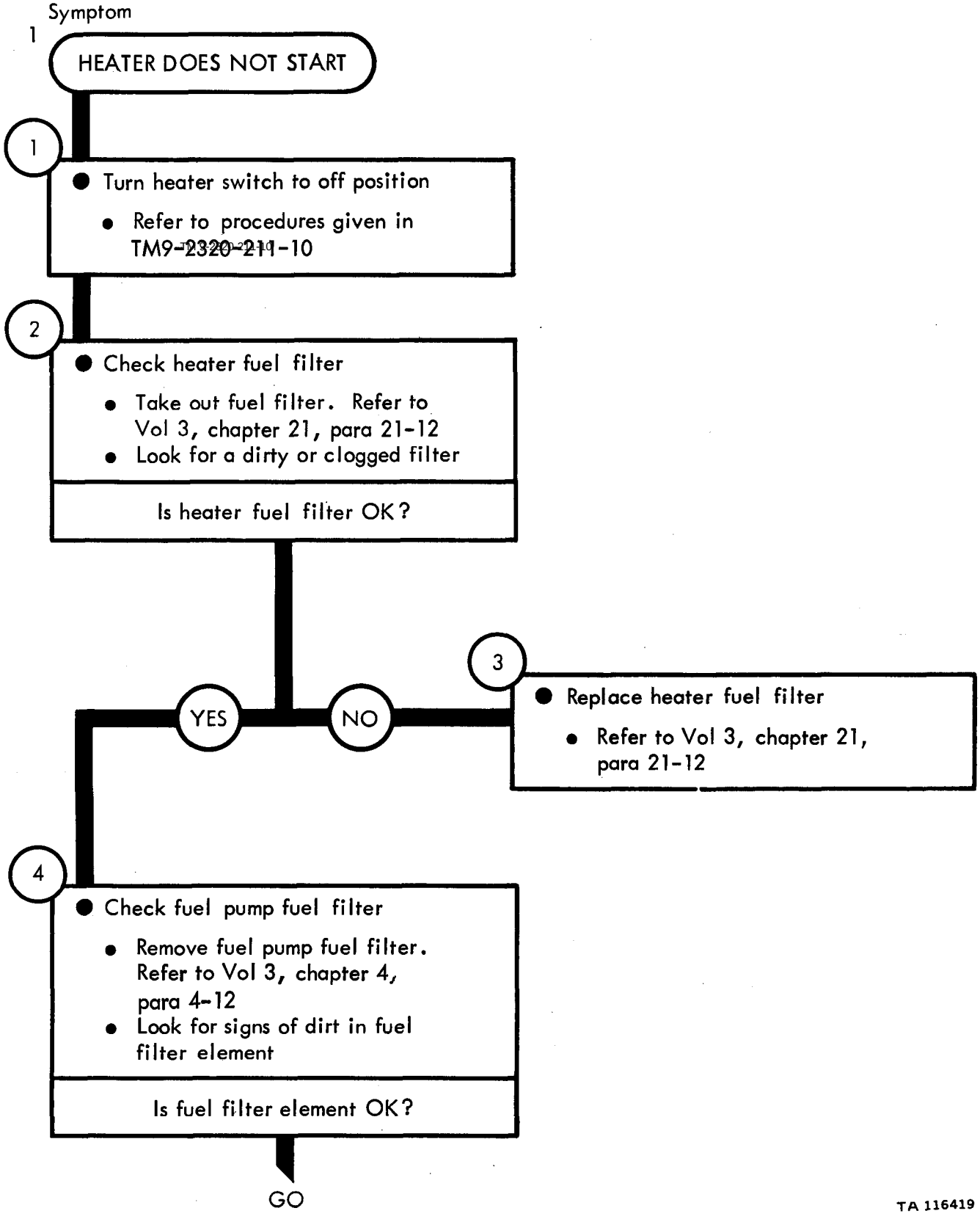
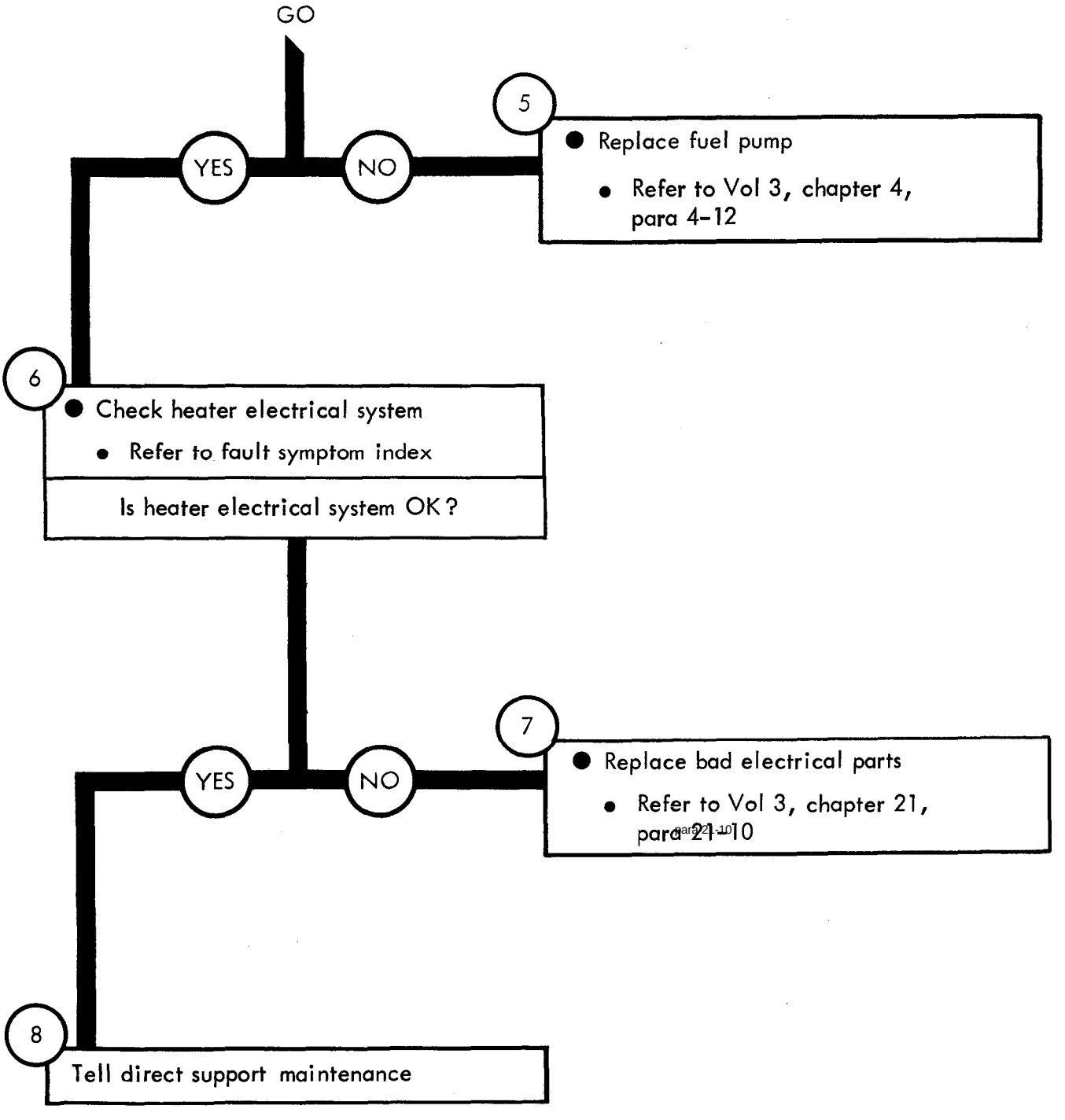



Figure 81-1 (Sheet 1 of 2)




TA 116420

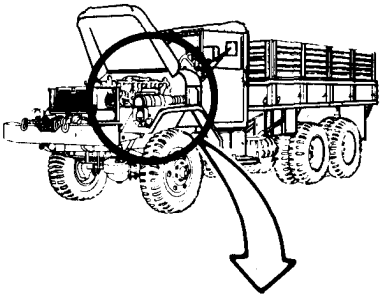
Figure 81-1 (Sheet 2 of 2)

Symptom 2

HEATER AND DEFROSTER DO NOT WORK

1

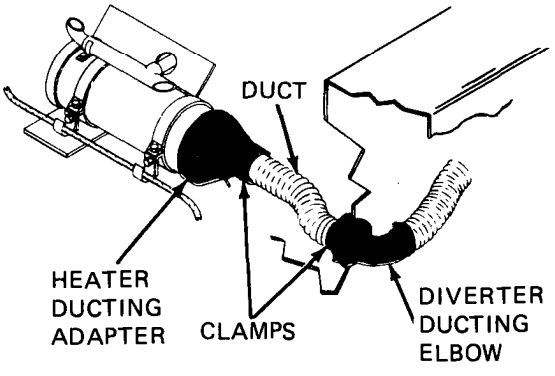
- Park truck
  - Refer to TM 9-2320-211-10



2

- Check heater duct from heater ducting adapter to diverter ducting elbow
  - See if duct has come off heater or diverter ducting elbow

Is heater duct OK?




YES

GO

NO

3

- Put heater duct on heater ducting adapter or diverter ducting elbow
  - Put clamp over duct
  - Slide duct on adapter and elbow
  - Using screwdriver tighten clamp screw

TA 121156

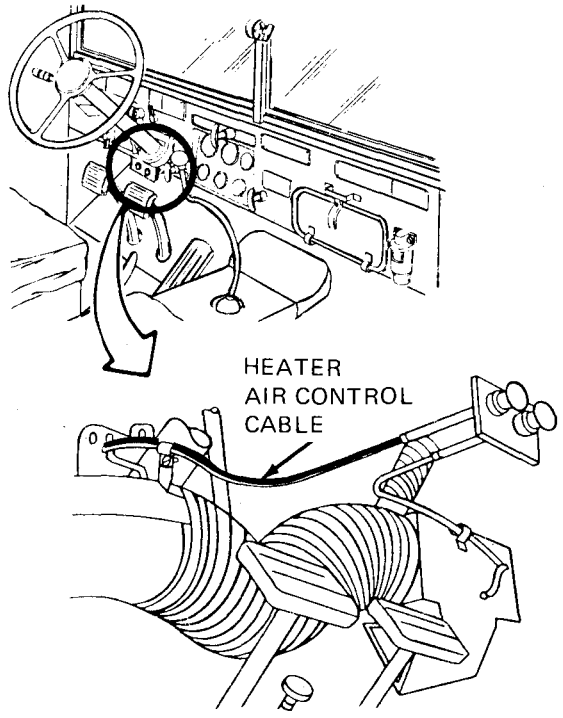
Figure 81-2 (Sheet 1 of 5)

GO

4

- Check heater air control cable
  - Look for broken cable
  - Shake cable to see if it is loose

Is air control cable OK?




YES

NO

5

- Tighten loose cable
  - Refer to Vol 3, chapter 21, para 21-8
- Replace broken cable
  - Refer to Vol 3, chapter 21, para 21-8

GO

TA 11642

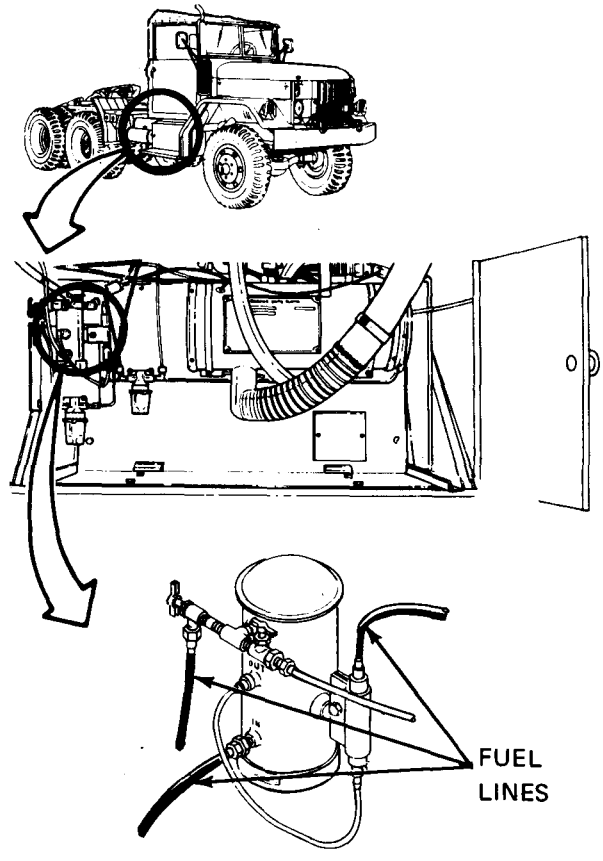
Figure 81-2 (Sheet 2 of 5)

GO

6

- Check heater fuel lines
  - Look for crushed, cracked or broken fuel lines

Are fuel lines OK?




YES

NO

7

- Replace crushed, cracked or broken fuel lines
  - Refer to Vol 3, chapter 4, para 4-11

8

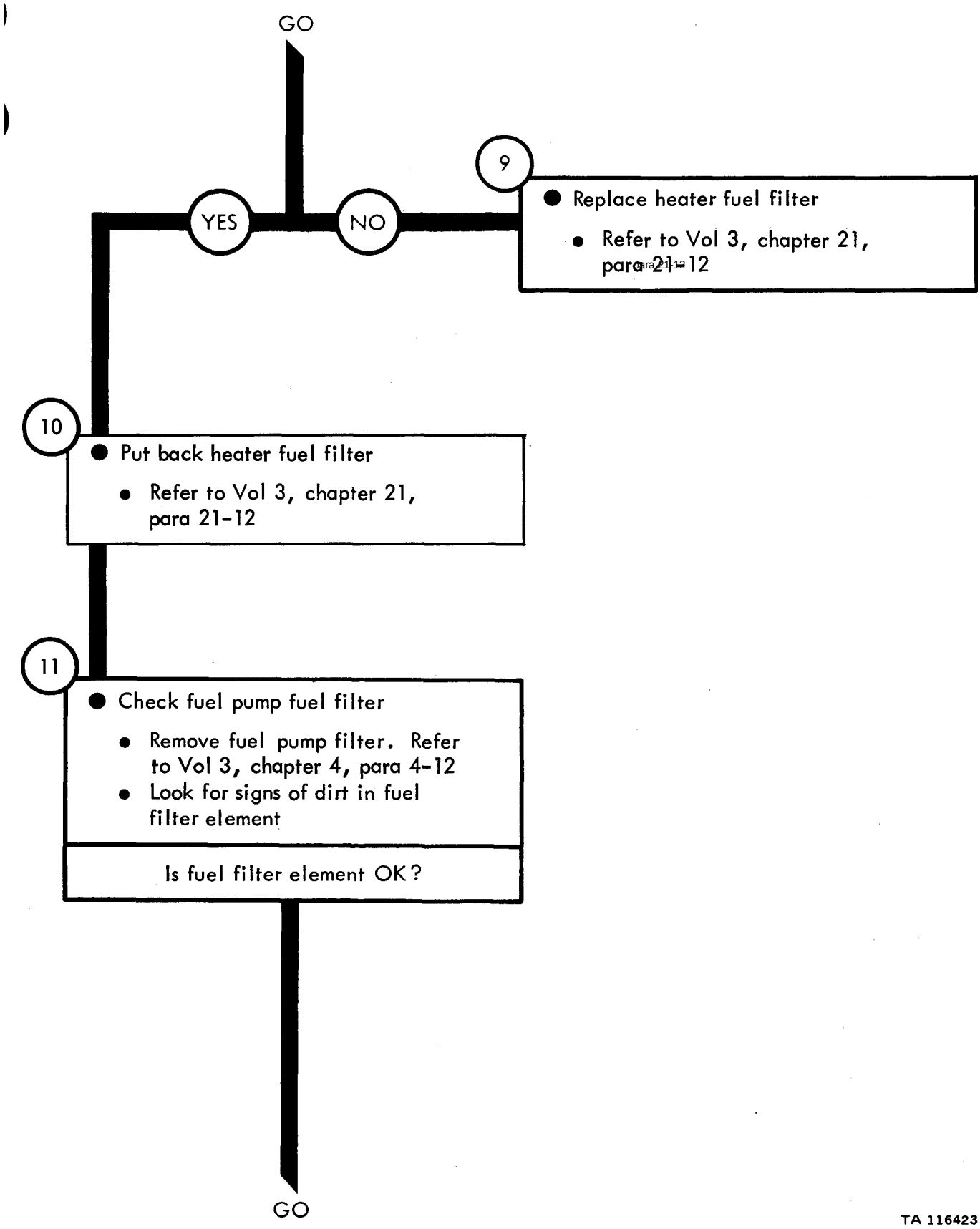
- Check heater fuel filter
  - Take out fuel filter. Refer to Vol 3, chapter 21, para 21-12
  - Look for dirty or clogged filter

Is heater fuel filter OK?

GO

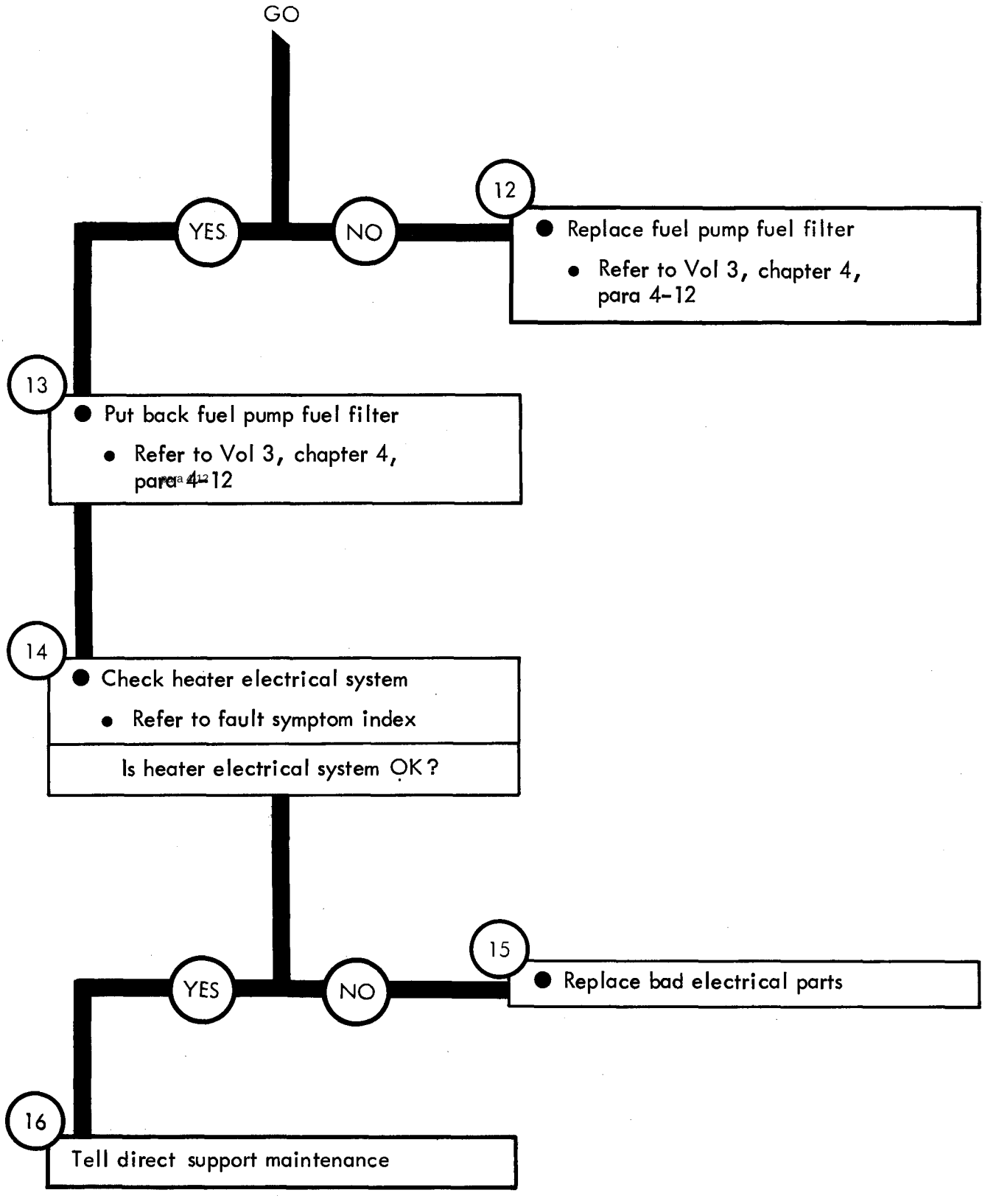
TA 116422

Figure 81-2 (Sheet 3 of 5)




TA 116423

Figure 81-2 (Sheet 4 of 5)




TA 126424

Figure 81-2 (Sheet 5 of 5)

Symptom 3

HEATER DOES NOT WORK

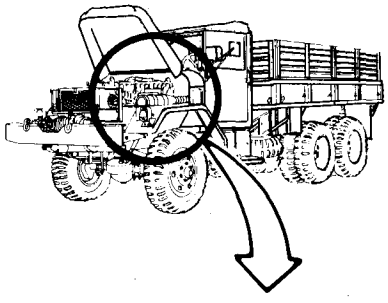
1

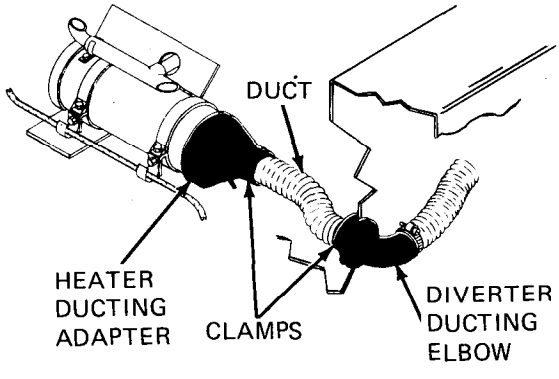
- Park truck
  - Refer to procedures given in TM9-2320-211-10

2

- Check heater duct from heater ducting adapter to diverter ducting elbow
  - See if duct has come off heater ducting adapter or diverter ducting elbow

Is heater duct OK?






YES

NO

3

- Put heater duct back on heater ducting adapter or diverter ducting elbow
  - Put clamp over duct
  - Slide duct on adapter and elbow
  - Using screwdriver tighten clamp screw

GO

TA 116425

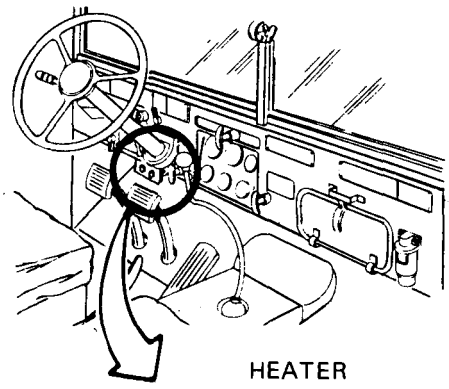
Figure 81-3 (Sheet 1 of 2)

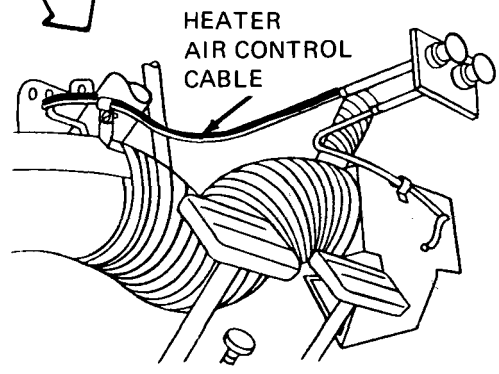
GO

4

- Check heater air control cable
  - Look for broken cable
  - Shake cable to see if it is loose

Is heater air control cable OK?






YES

NO

5

- Replace broken heater air control cable
  - Refer to Vol 3, chapter 21, para 21-8
- Tighten loose heater air control cable
  - Refer to Vol 3, chapter 21, para 21-8

6

Tell direct support maintenance

TA 116426

Figure 81-3 (Sheet 2 of 2)

Symptom

4 DEFROSTER DOES NOT WORK

1

- Park truck
  - Refer to TM 9-2320-211-10

2

- Check defroster control cable
  - Look for broken cable
  - Shake cable to see if it is loose

Is defroster control cable OK?

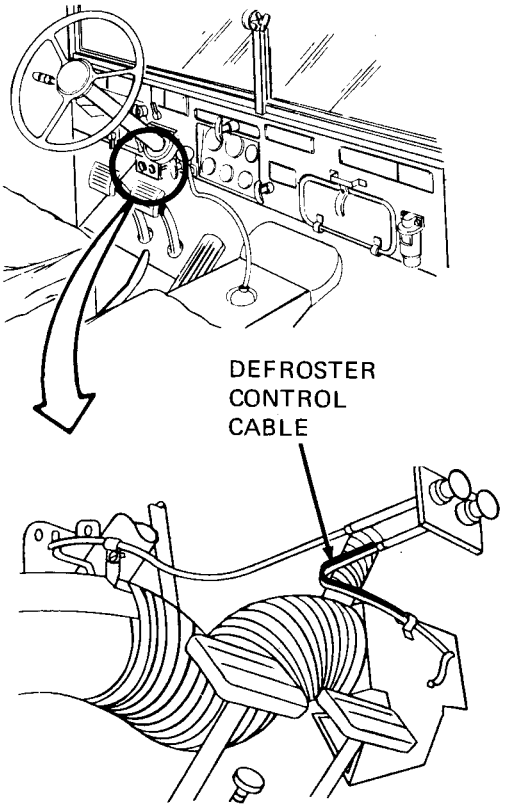
YES

GO

NO

3

- Replace broken defroster control cable
  - Refer to Vol 3, chapter 21, para 21-8
- Tighten loose defroster control cable
  - Refer to Vol 3, chapter 21, para 21-8




TA 116427

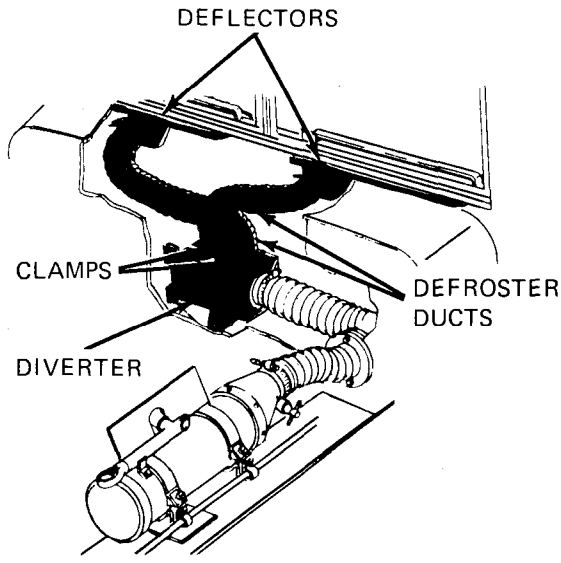
Figure 81-4 (Sheet 1 of 2)

GO

4

- Check defroster ducts
  - See if ducts have come off of diverter or deflector

Are defroster ducts OK?




YES

NO

5

- Put back defroster ducts
  - Put clamp over duct end
  - Slide duct on diverter or deflector
  - Using screwdriver tighten clamp

6

Tell direct support maintenance

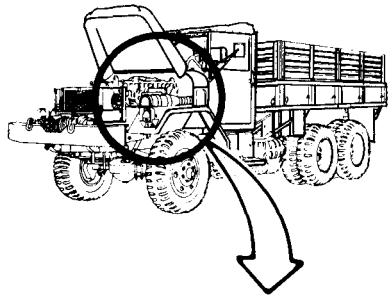
TA 116428

Figure 81-4 (Sheet 2 of 2)

Symptom

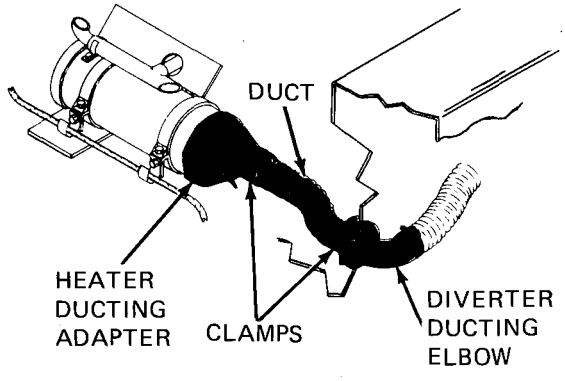
5 HEATER AND DEFROSTER DO NOT GIVE OFF ENOUGH HEAT

1
- Park truck
  - Refer to TM 9-2320-211-10



2
- Check duct from heater ducting adapter to diverter ducting elbow
  - See if duct has come off heater ducting adapter or diverter ducting elbow

Is heater duct OK?




GO

TA 116429

Figure 81-5 (Sheet 1 of 5)

GO

YES

NO

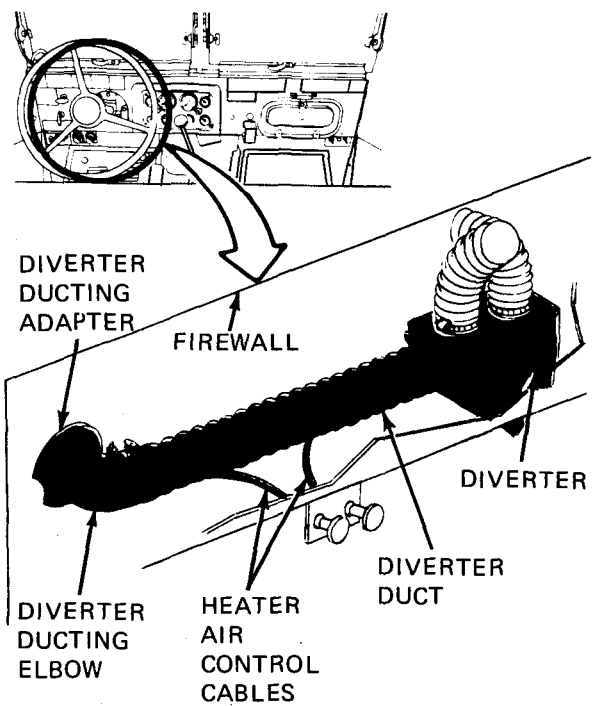
3

- Put heater duct back on heater ducting adapter or diverter ducting elbow
  - Put clamp over duct
  - Slide duct on adapter and elbow
  - Using flat tip screwdriver tighten clamp screw

4

- Check diverter ducting elbow
  - See if ducting elbow has come off firewall
- Check diverter duct
  - See if duct has come off diverter or diverter ducting elbow
- Check heater air control cables
  - Look for broken cable
  - Shake cables to feel if they are loose

Are diverter, ducting adapter, and diverter duct and heater air control cable OK?




GO

TA 116430

Figure 81-5 (Sheet 2 of 5)

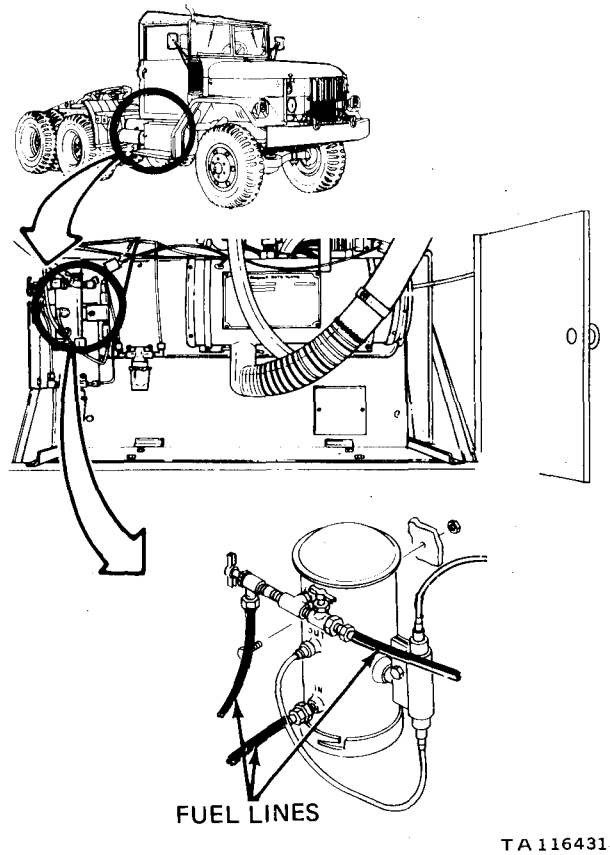
GO

YES

NO

5

- Put back diverter ducting adapter
  - Put screws back in adapter
  - Using screwdriver tighten screws
- Put back diverter duct
  - Put clamp over duct
  - Slide duct on diverter or diverter ducting elbow
  - Using screwdriver tighten clamp screw
- Tighten loose heater air control cable
  - Refer to Vol 3, chapter 21, para 21-8
- Replace broken heater air control cable
  - Refer to Vol 3, chapter 21, para 21-8




6

- Check heater fuel lines
  - Look for crushed, cracked or broken fuel lines

Are fuel lines OK?

GO

Figure 81-5 (Sheet 3 of 5)

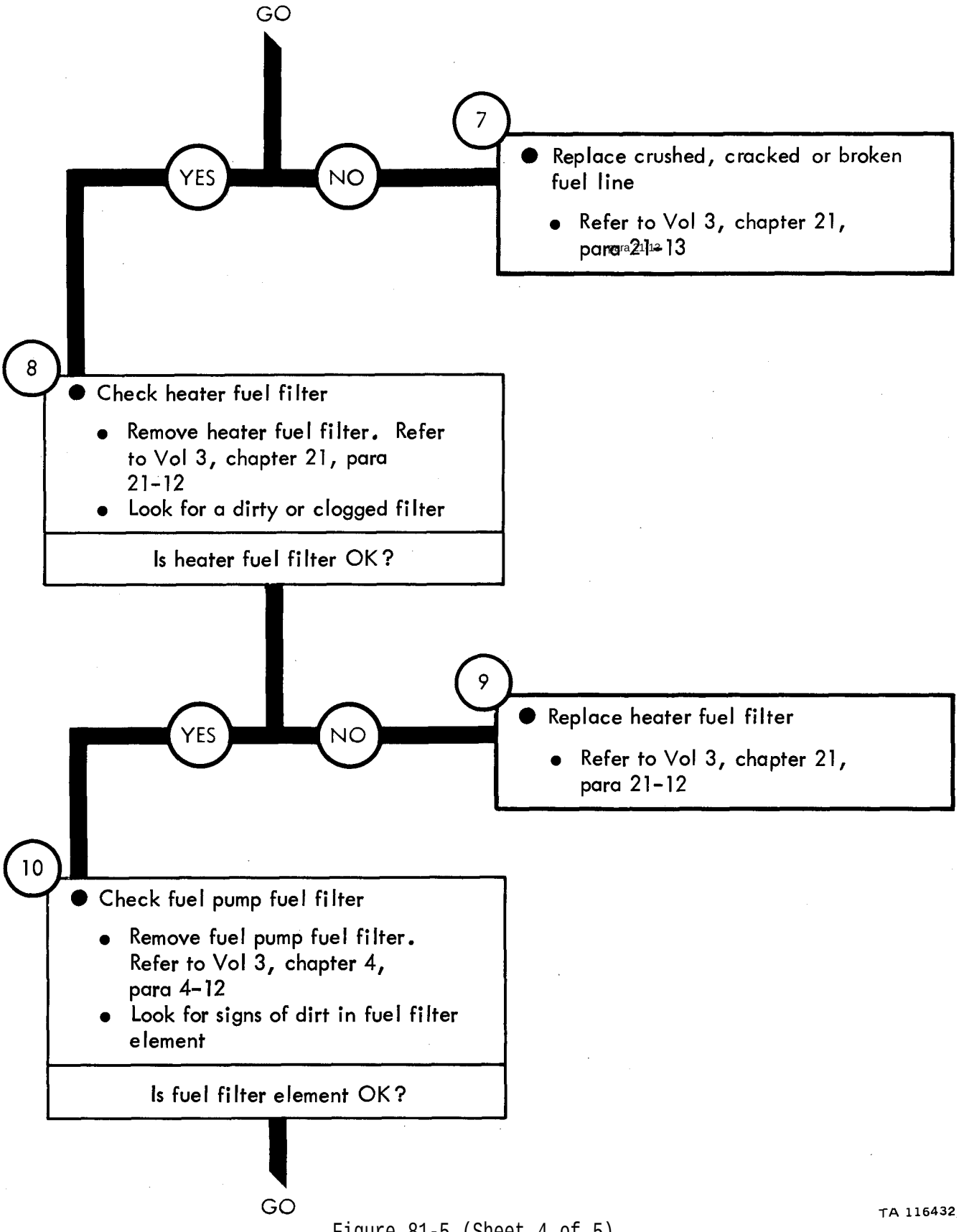
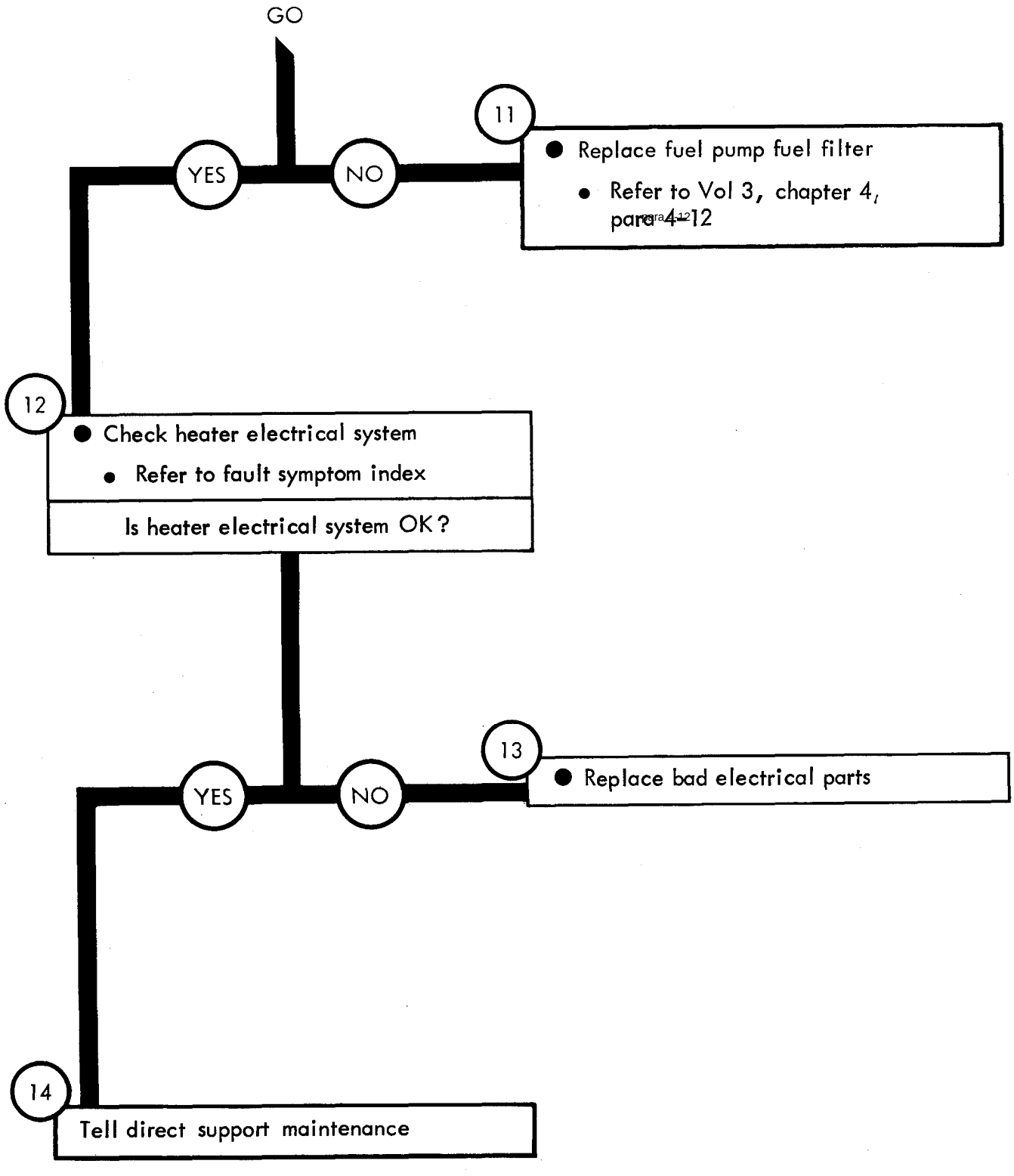



Figure 81-5 (Sheet 4 of 5)




TA 116433

Figure 81-5 (Sheet 5 of 5)

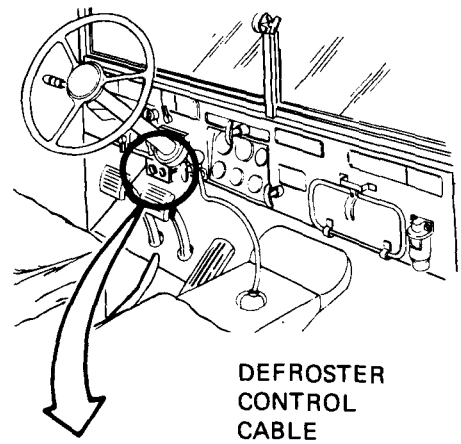
Symptom

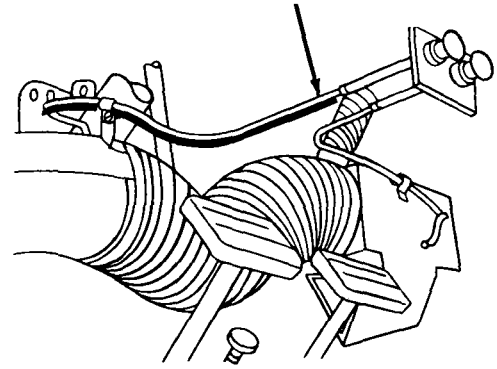
6 DEFROSTER DOES NOT GIVE OFF ENOUGH HEAT

1
- Park truck
  - Refer to TM 9-2320-211-10

2
- Check defroster control cable
  - Look for broken cable
  - Shake cable to see if it is loose

Is defroster control cable OK?






YES

NO

3
- Replace broken defroster control cable
  - Refer to Vol 3, chapter 21, para 21-8
- Tighten loose defroster control cable
  - Refer to Vol 3, chapter 21, para 21-8

GO

TA 116434

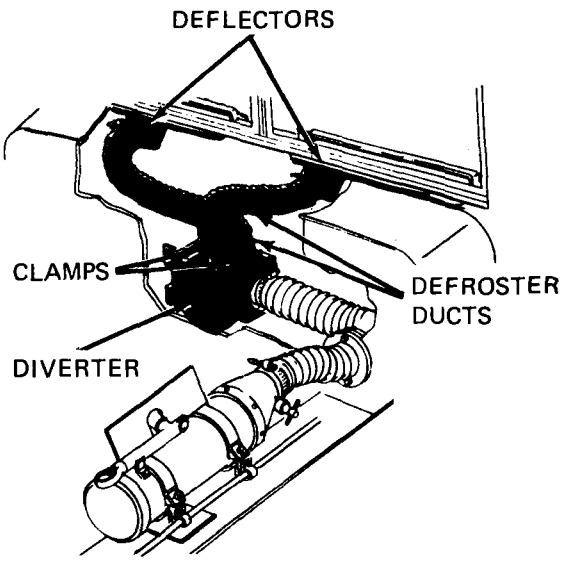
Figure 81-6 (Sheet 1 of 2)

GO

4

- Check defroster ducts
  - See if ducts have come off diverter or deflector

Are defroster ducts OK?




YES

NO

5

- Put back defroster ducts
  - Put clamp over duct end
  - Slide duct on diverter or deflector
  - Using screwdriver tighten clamp

6

Tell direct support maintenance

TA 116435

Figure 81-6 (Sheet 2 of 2)

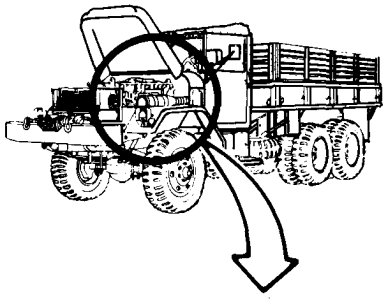
Symptom

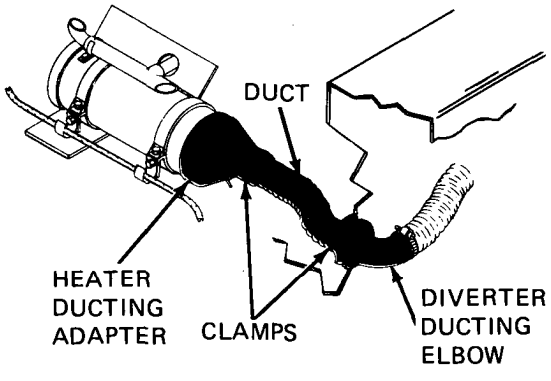
7 HEATER DOES NOT GIVE OFF ENOUGH HEAT

1
- Park truck
  - Refer to procedures given in TM9-2320-211-10

2
- Check heater duct from heater ducting adapter to diverter ducting elbow
  - See if duct has come off heater ducting adapter or diverter ducting elbow

Is heater duct OK?






YES

NO

3
- Put heater duct back on heater ducting adapter or diverter ducting adapters
  - Put clamp over duct
  - Slide duct on adapter and elbow
  - Using screwdriver tighten clamp screw

GO

TA 116436

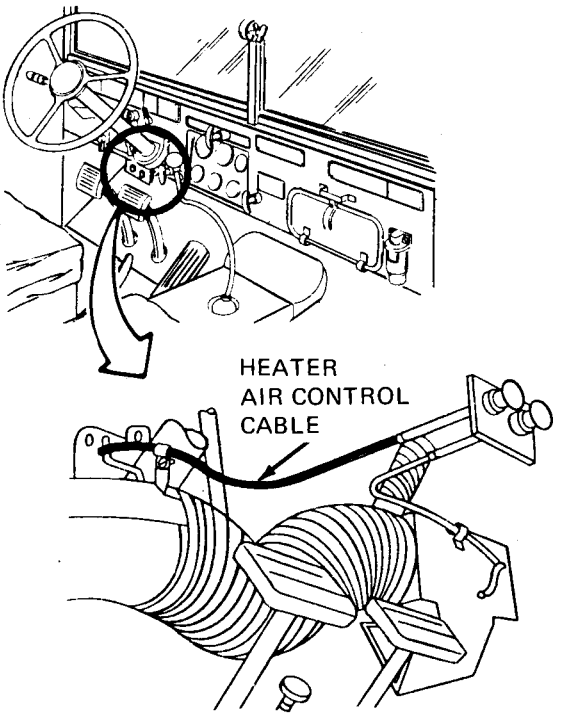
Figure 81-7 (Sheet 1 of 2)

GO

4

- Check heater air control cable
  - Look for broken cable
  - Shake cable to see if it is loose

Is heater air control cable OK?




YES

NO

5

- Replace broken heater air control cable
  - Refer to Vol 3, chapter 21, para 21-8
- Tighten loose heater air control cable
  - Refer to Vol 3, chapter 21, para 21-8

6

Tell direct support maintenance

TA 116437

Figure 81-1 (Sheet 2 of 2)

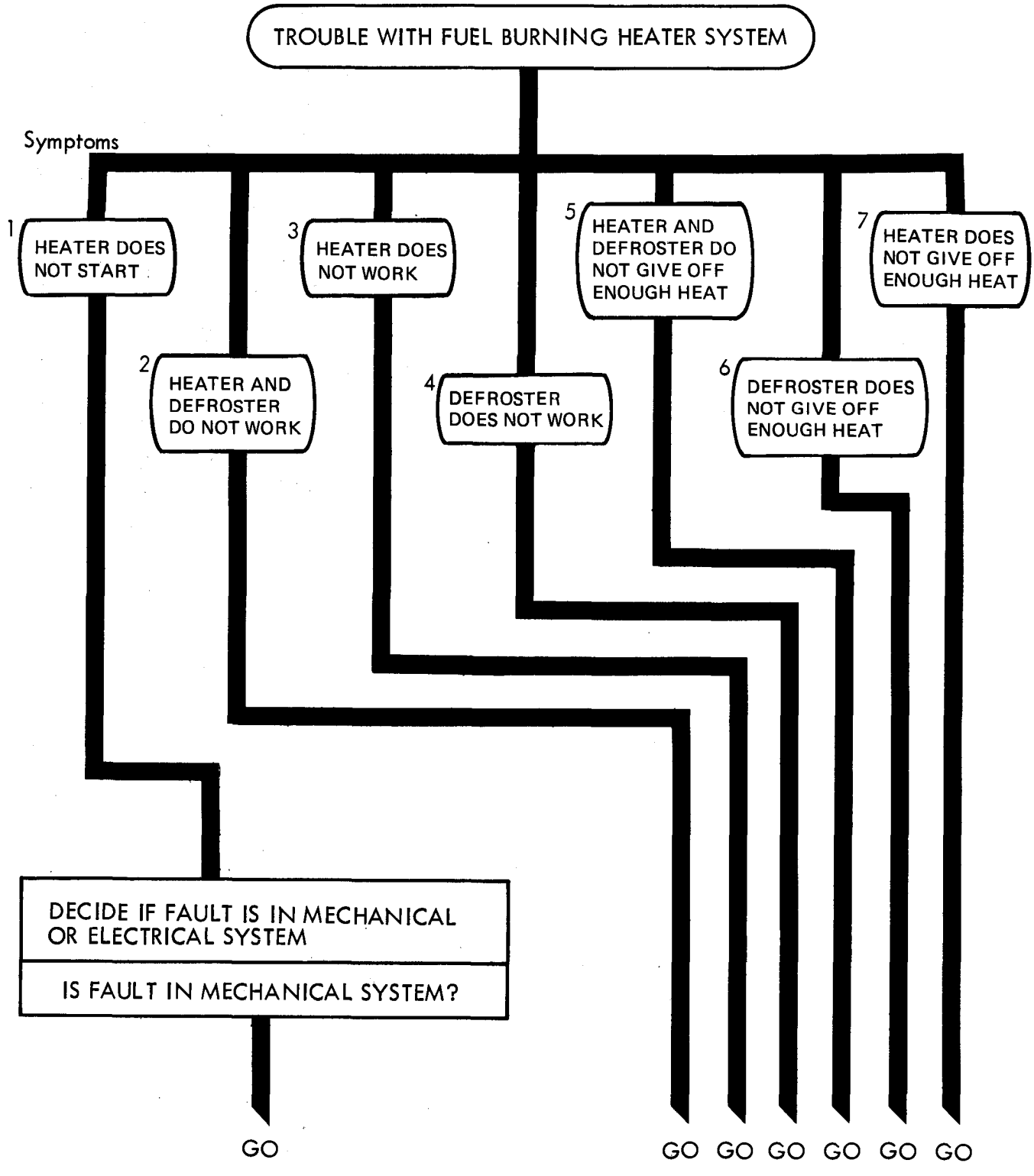
# CHAPTER 82

# FUEL BURNING HEATER SYSTEM TROUBLESHOOTING SUMMARY

82-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 81, for the Fuel Burning Heater System.

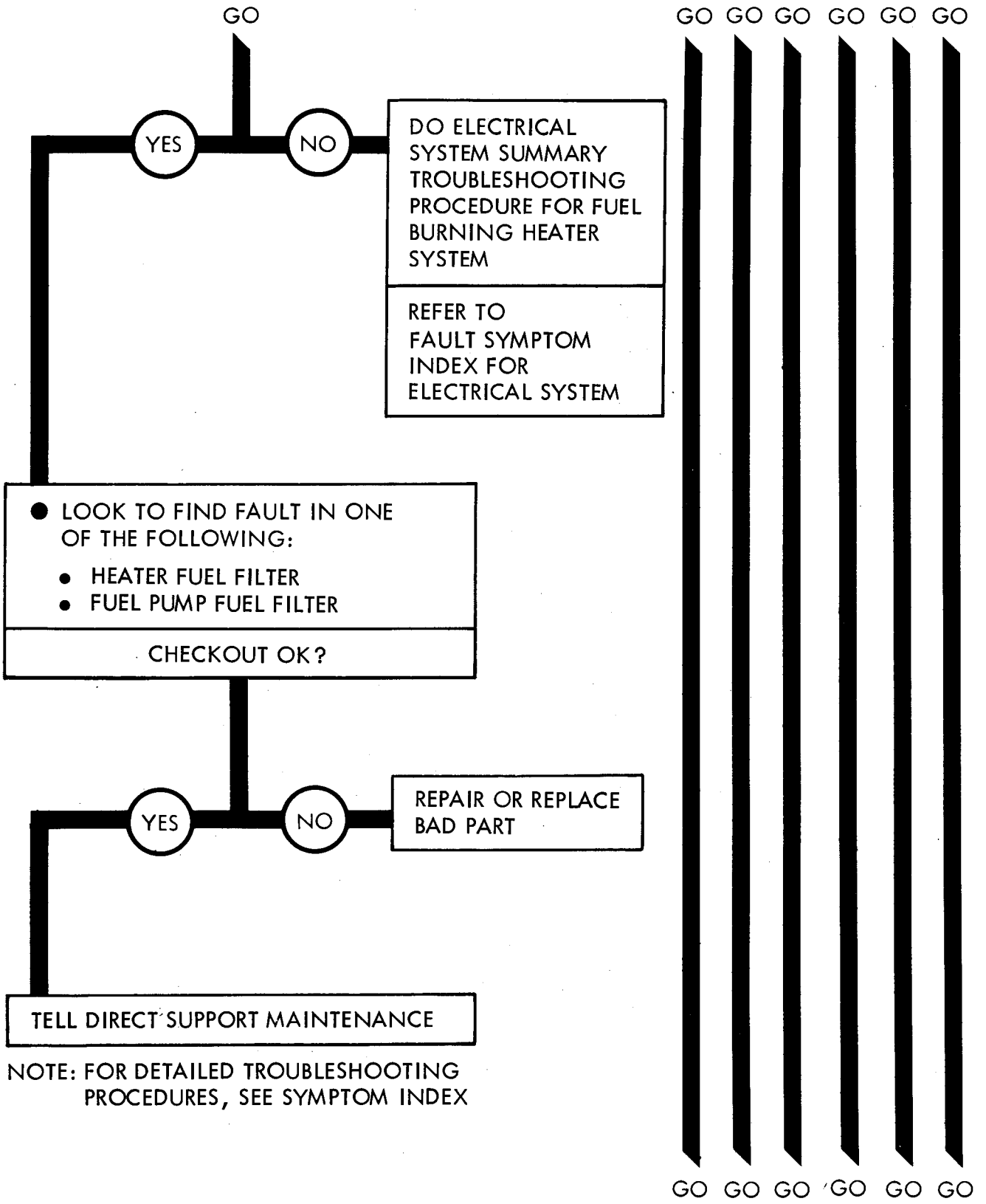
82-2. PROCEDURES. The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures. Chapter 7 outlines a sample trouble-shooting procedure. The summary procedures are based on the “what-to-do” portions of the detailed procedures and do not include the “How-to-do-it” instructions. Warnings, cautions, and notes are given where needed.

## FUEL BURNING HEATER SYSTEM TROUBLESHOOTING SUMMARY



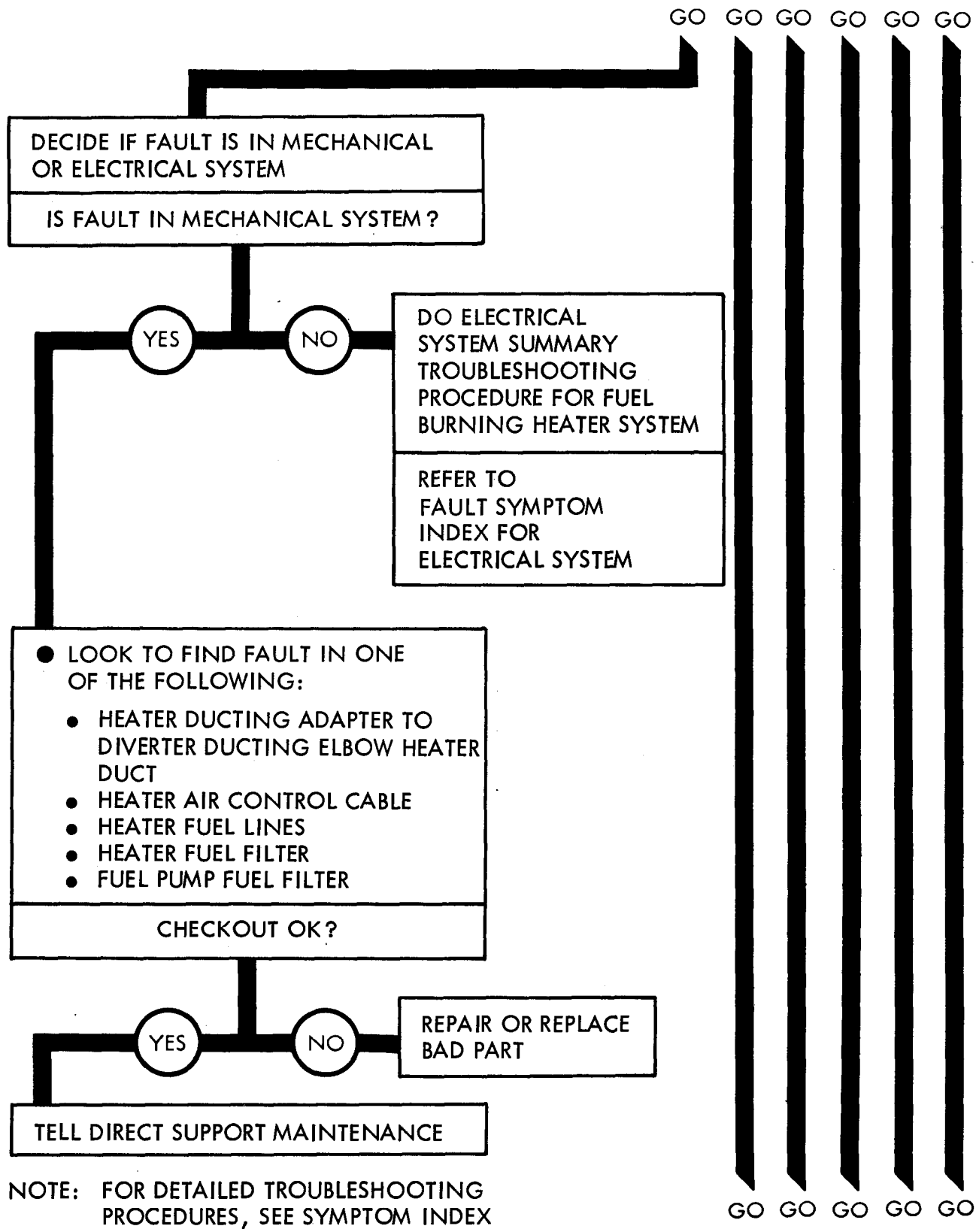

TA 116438

Figure 82-1 (Sheet l of 8)




TA 116439.

Figure 82-1 (Sheet 2 of 8)




TA 116440

Figure 82-1 (Sheet 3 of 8)

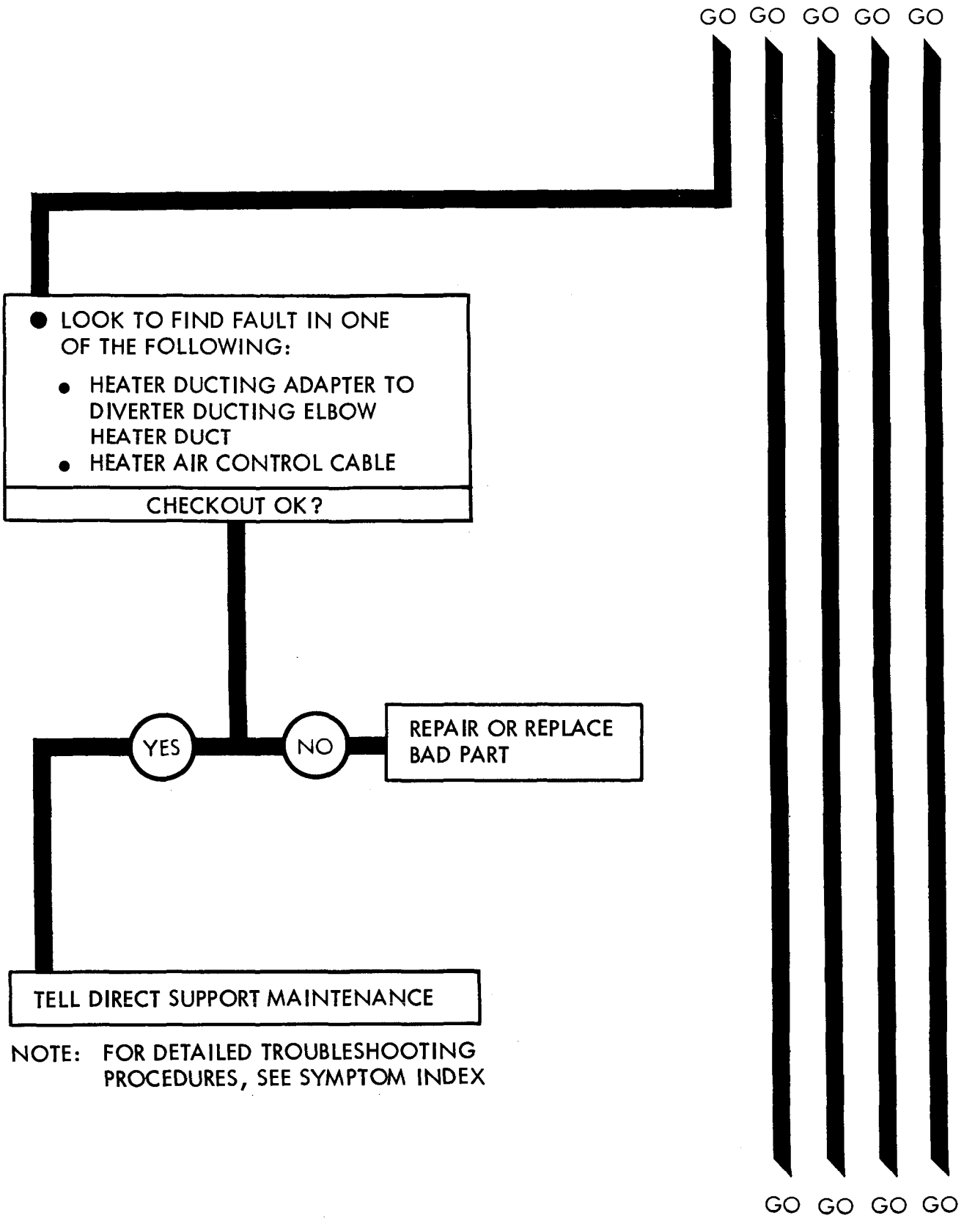



Figure 82-1 (Sheet 4 of 8)

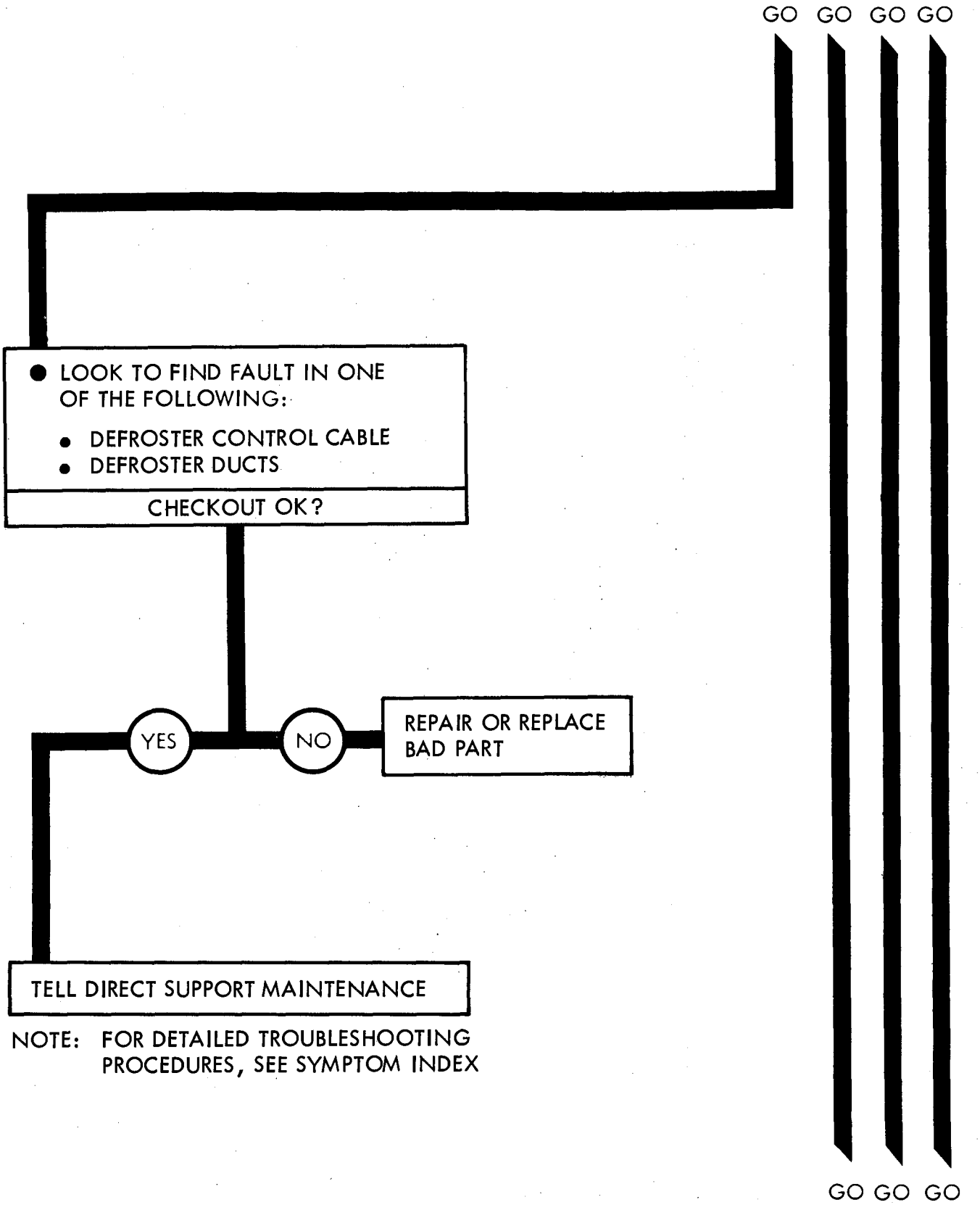
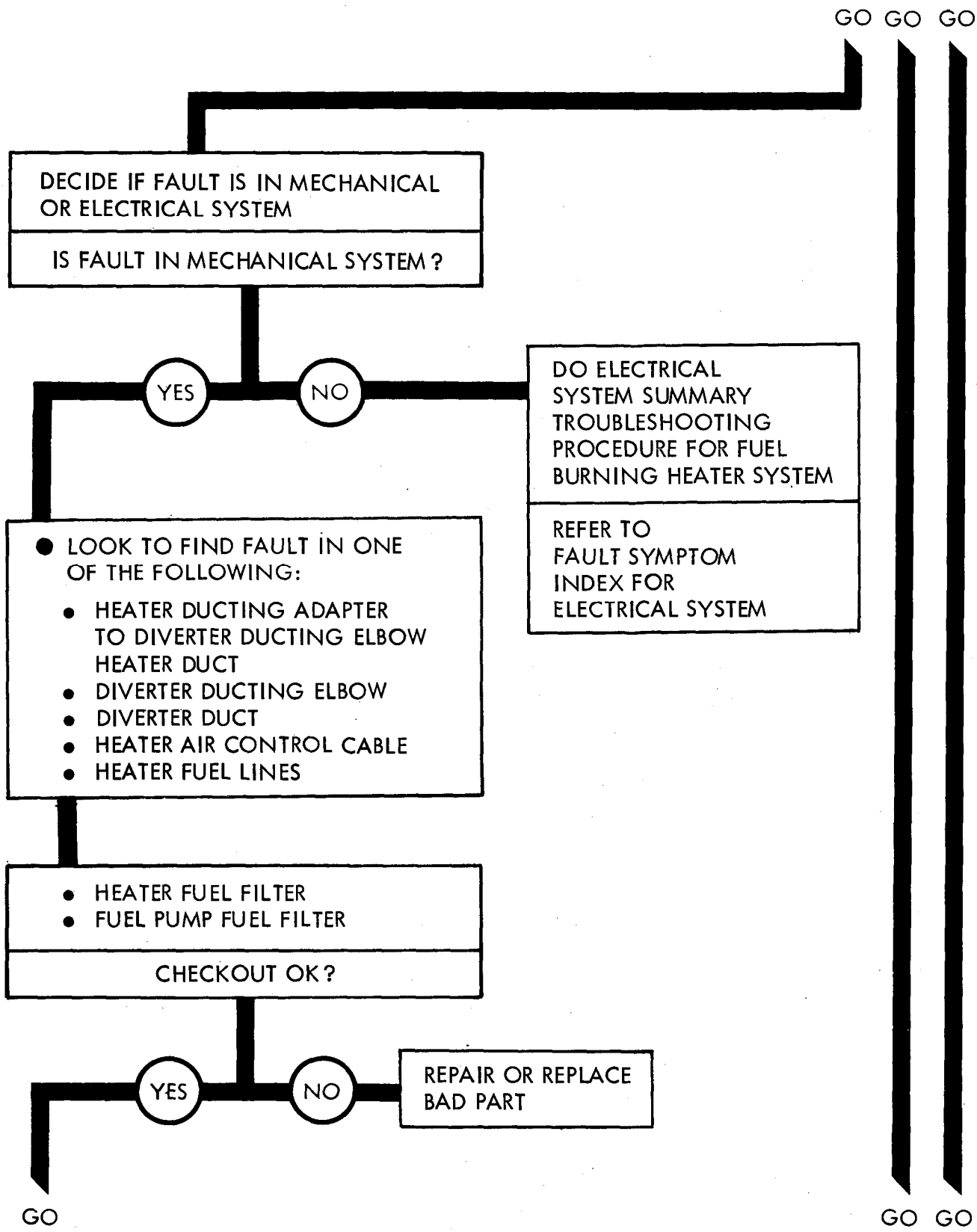
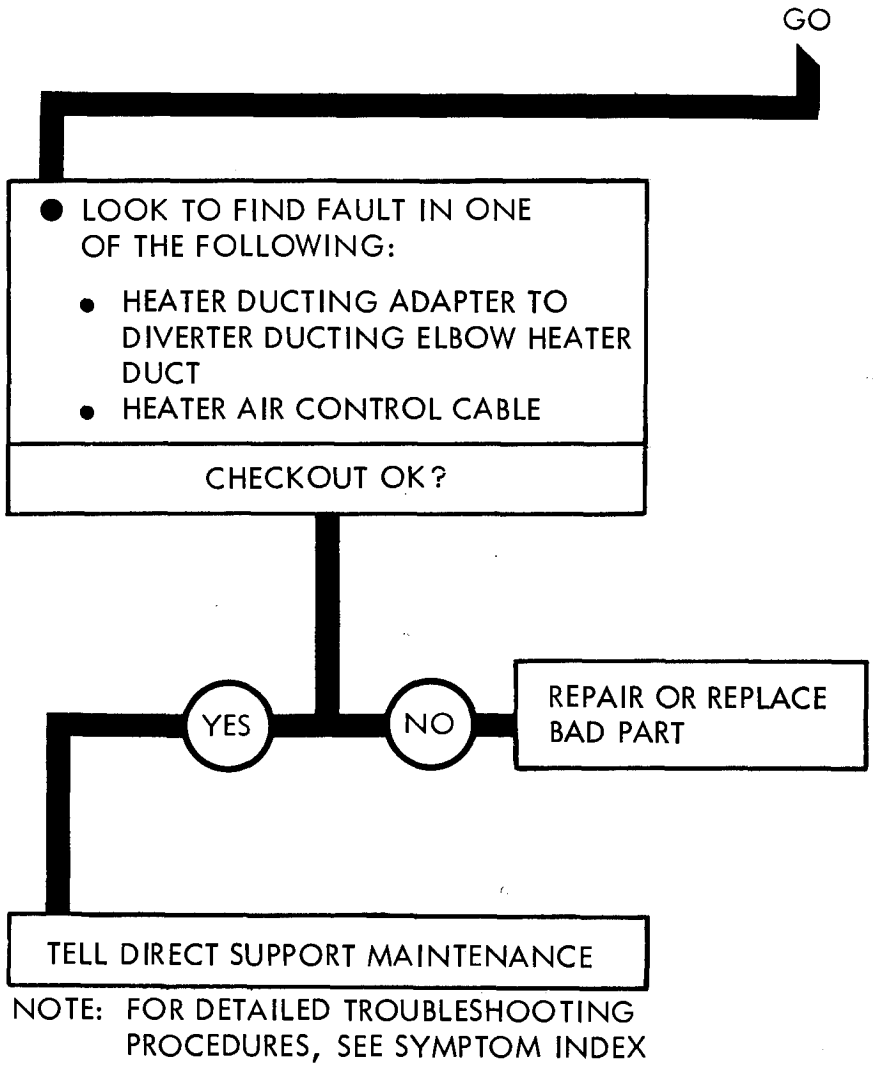



Figure 82-1 (Sheet 5 of 8)




TA 116443

Figure 82-1 (Sheet 6 of 8)




TA 116445

Figure 82-1 (Sheet 8 of 8)

# CHAPTER 83

# FUEL BURNING HEATER SYSTEM CHECKOUT PROCEDURES

83-1. GENERAL. This chapter gives procedures for checking out the system after troubleshooting and repair have been done. Procedures are set up in flow chart form showing the checkout steps in order and referring to the fault symptom index when the system does not checkout.

FUEL BURNING HEATER SYSTEM CHECKOUT

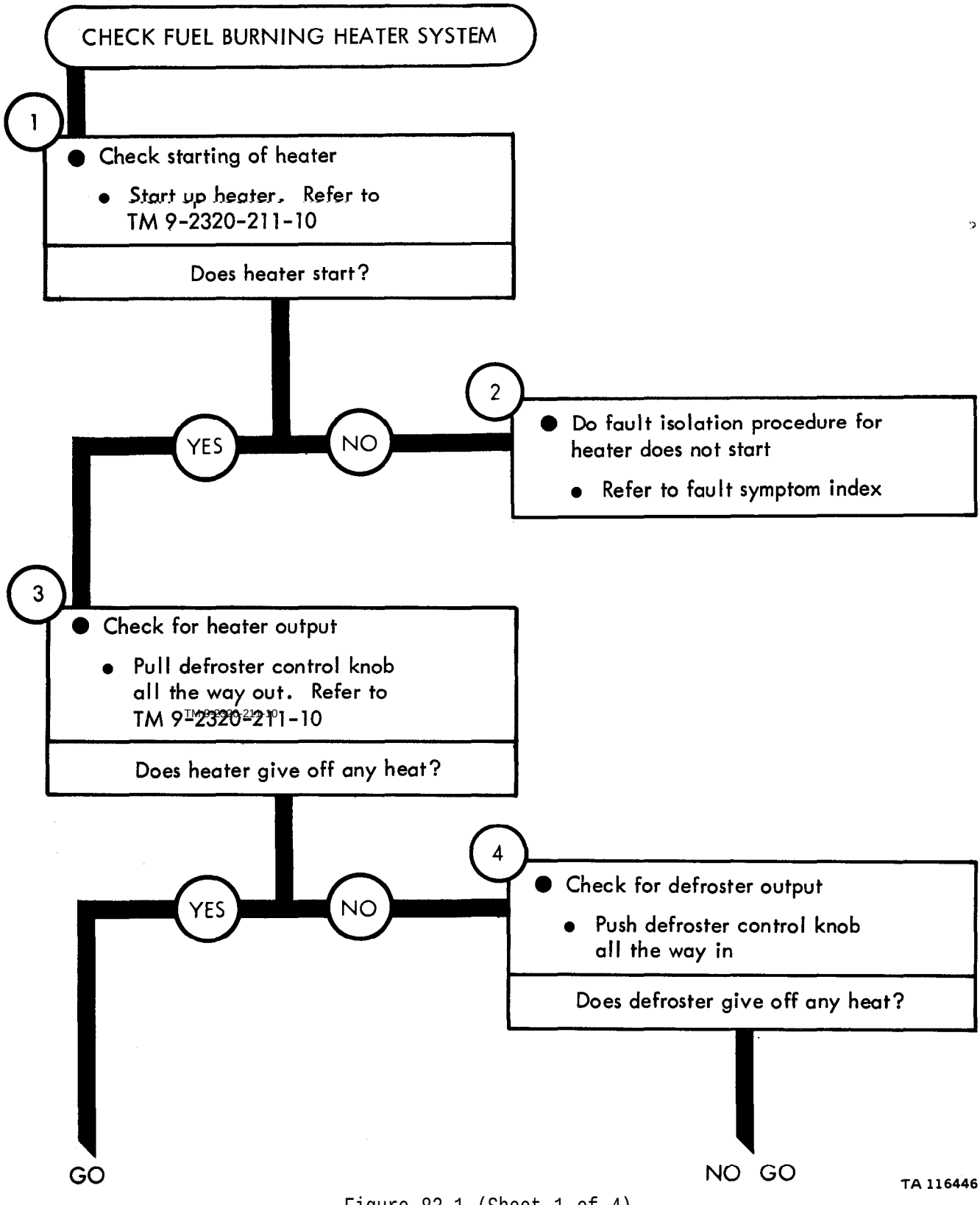
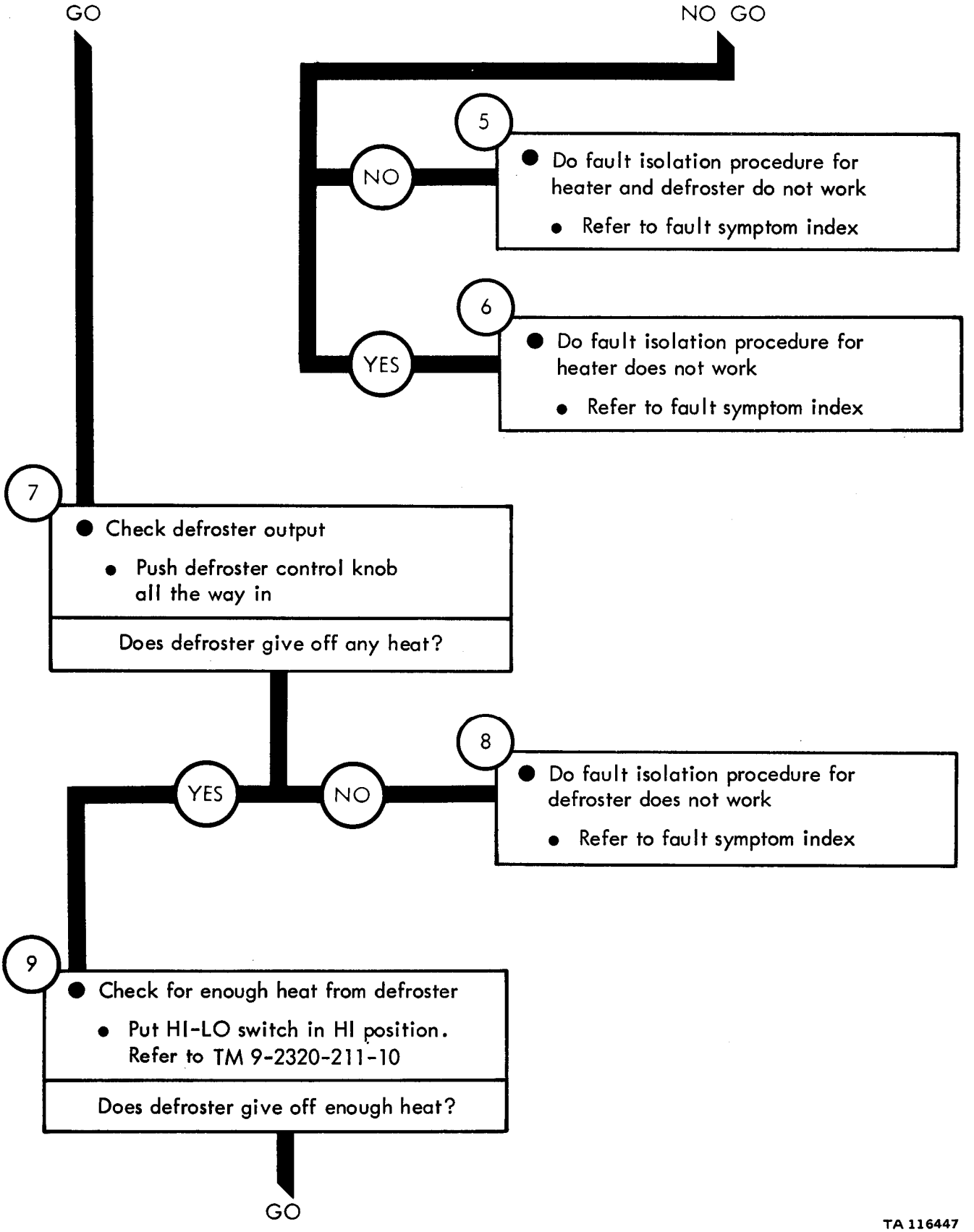



Figure 83-1 (Sheet 1 of 4)




TA 116447

Figure 83-1 (Sheet 2 of 4)

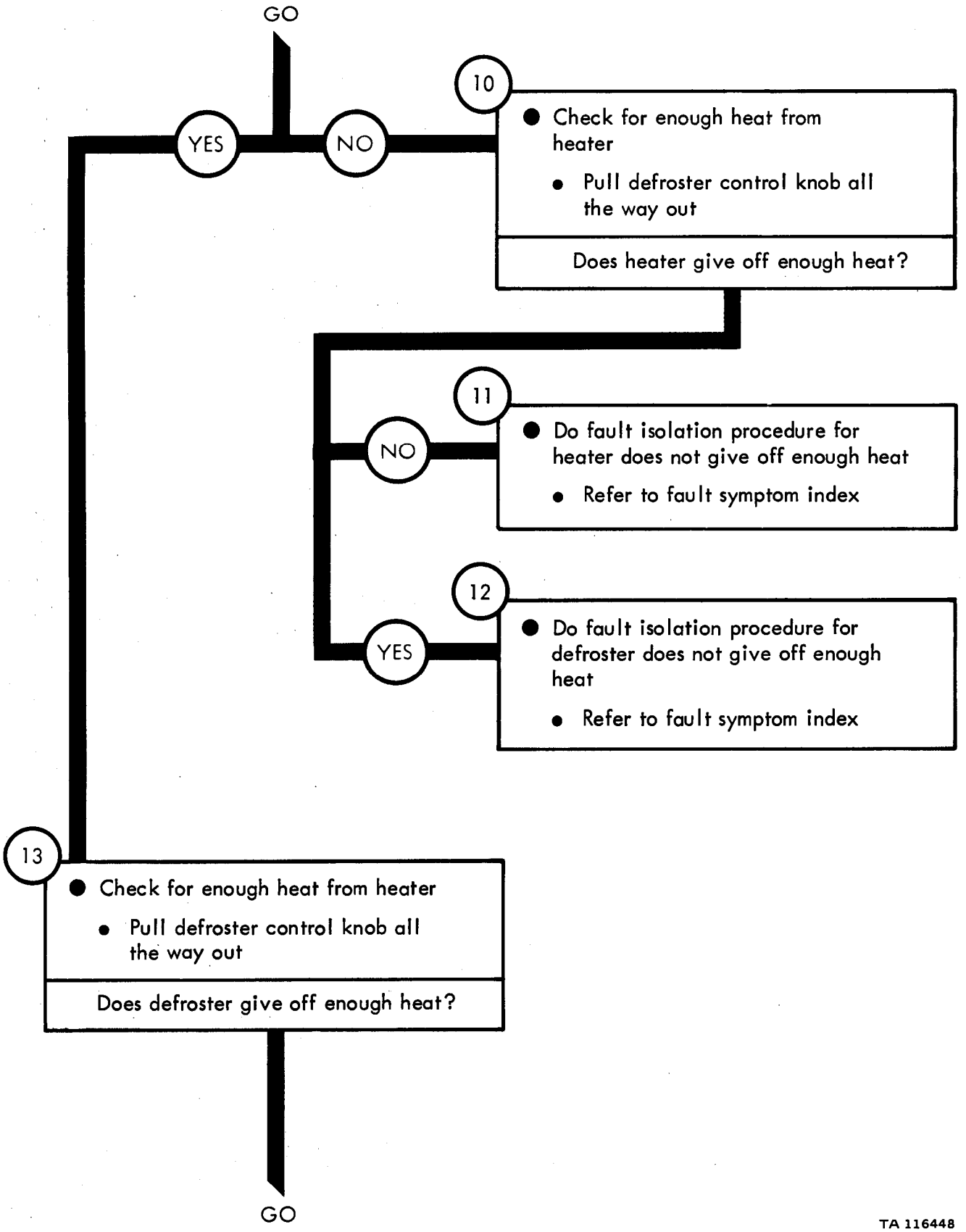
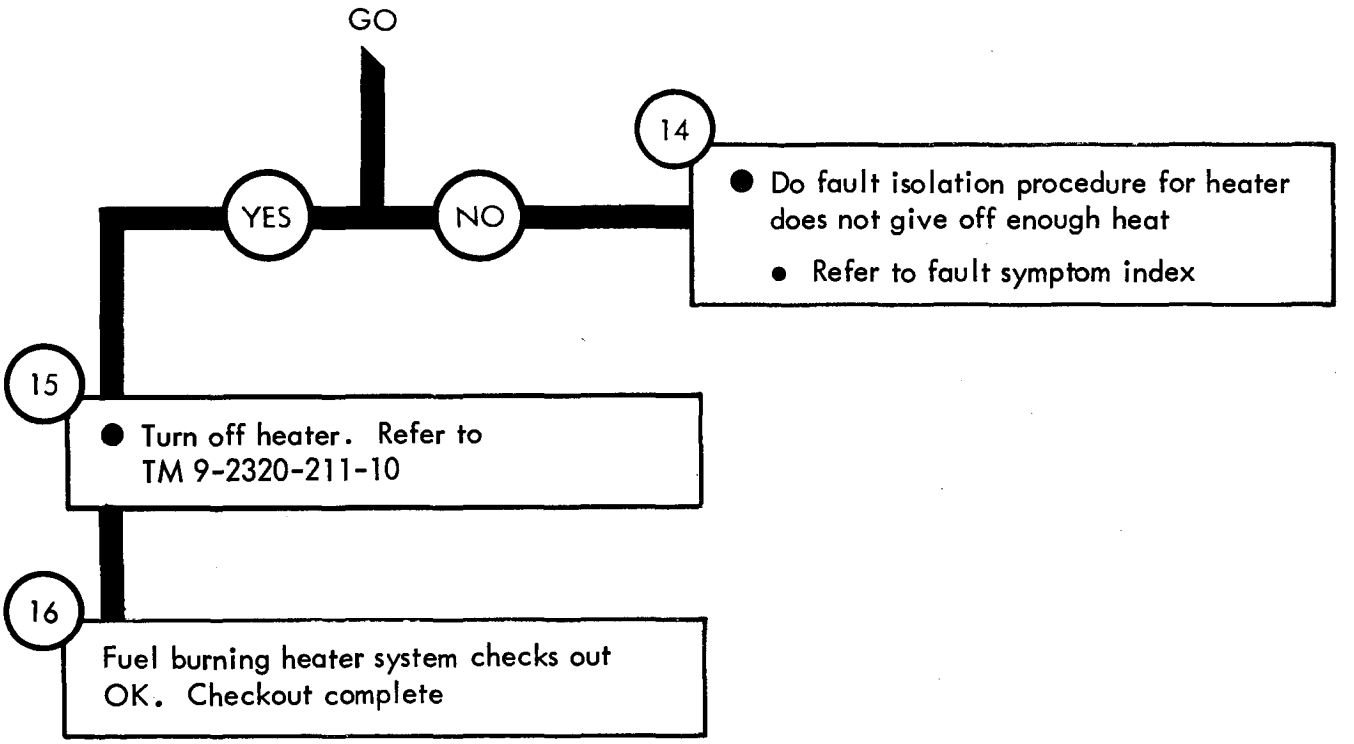



Figure 83-1 (Sheet 3 of 4)




TA 115284

Figure 83-1 (Sheet 4 of 4)

# CHAPTER 84

# HOT WATER HEATER SYSTEM TROUBLESHOOTING

84-1. EQUIPMENT ITEMS COVERED. This chapter gives equipment troubleshooting procedures for the hot water heater system, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

84-2. EQUIPMENT ITEMS NOT COVERED. All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

## HOT WATER HEATER SYSTEM TROUBLESHOOTING

Symptom 1

**COOL OR COLD AIR AT OUTLETS AFTER ENGINE HAS REACHED OPERATING TEMPERATURE**

**1**

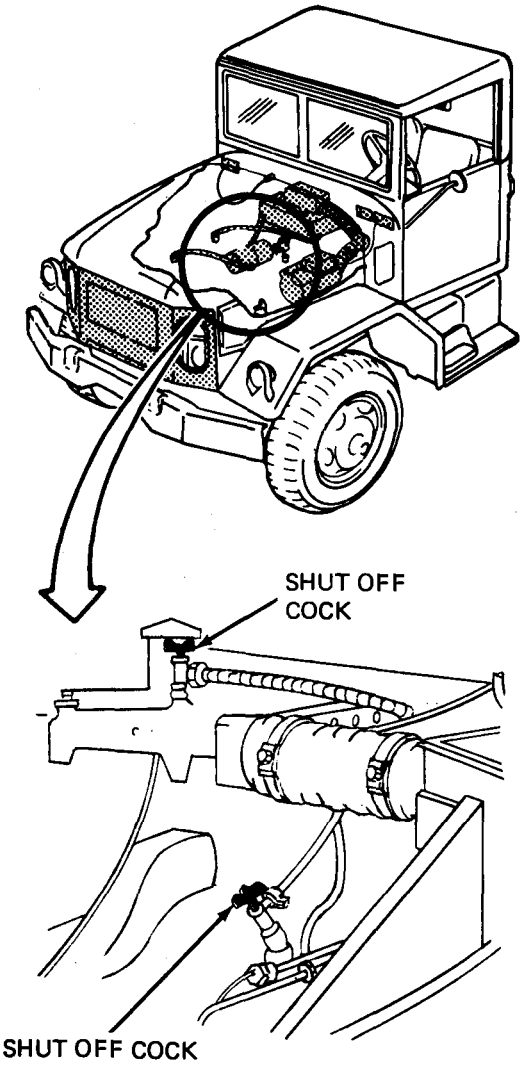
- Park truck
  - Refer to TM 9-2320-211-10

**2**

- Check shut off cocks
  - Open hood. Refer to TM 9-2320-211-10
  - Check if shut off cocks are fully open to the left

Are shut off cocks fully open to left?

GO




TA 116449

Figure 84-1 (Sheet 1 of 2)

GO

YES

NO

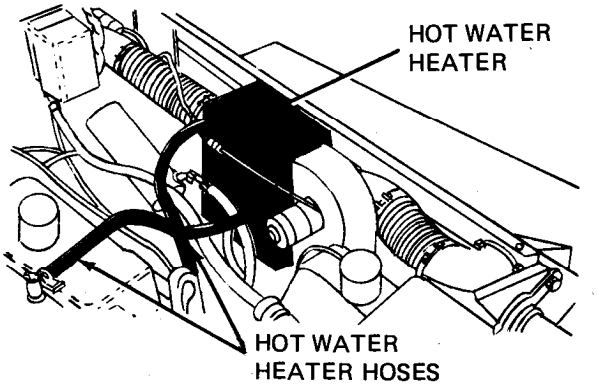
3

- Fully open shut off cocks to left

4

- Check hot water hoses
  - Feel if hot water heater hoses are soft
  - See if hot water heater hoses have collapsed

Are hot water heater hoses OK?




NO

5

- Replace hot water hoses
  - Refer to Vol 3, chapter 21, para 21-11

YES

6

- Replace heater core
  - Tell direct support maintenance

TA 116450

Figure 84-1 (Sheet 2 of 2)

Symptom

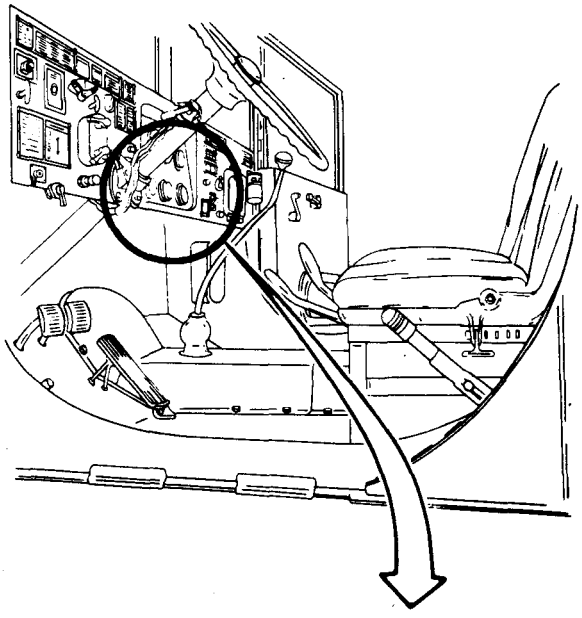
2 NO AIR FLOW AT DEFROSTER

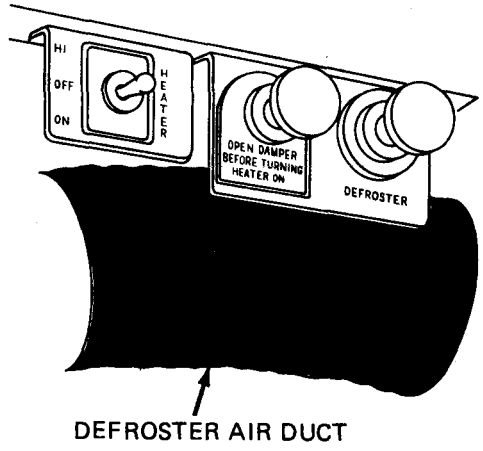
1
- Park truck
  - Refer to TM 9-2320-211-10

2
- Check if defroster air duct is hanging loose at windshield defroster nozzle
  - Under dash panel, look and see if defroster air duct is attached to nozzle

Is defroster air duct attached to nozzle?

GO






DEFROSTER AIR DUCT

TA 116451

Figure 84-2 (Sheet 1 of 2)

GO

YES

NO

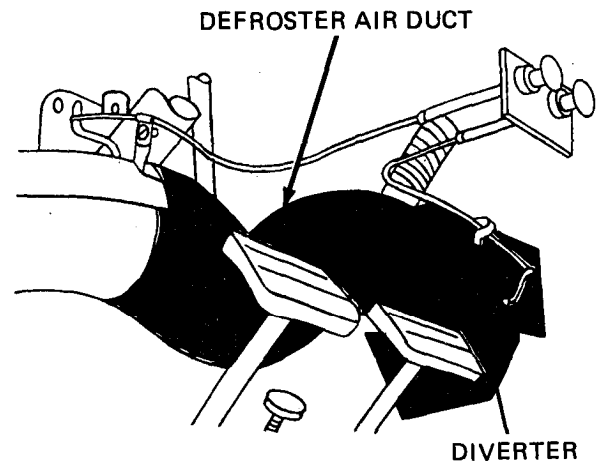
3

- Connect defroster duct to windshield defroster nozzle
  - Tell direct support maintenance

4

- Check if defroster duct is hanging loose at air diverter
  - Under dash panel, look and see if defroster duct is attached to air diverter

Is defroster duct attached to air diverter?




NO

5

- Connect defroster duct to air diverter
  - Tell direct support maintenance

YES

6

- Repair or replace duct
  - Tell direct support maintenance

TA 116452

Figure 84-2 (Sheet 2 of 2)

Symptom

3 NO AIR FLOW AT HEAT OUTLET

1
- Park truck
  - Refer to TM 9-2320-211-10

2
- Check if heater to air diverter duct is hanging loose
  - Look under dash and check if heater to air diverter duct is hanging loose from heater or air diverter

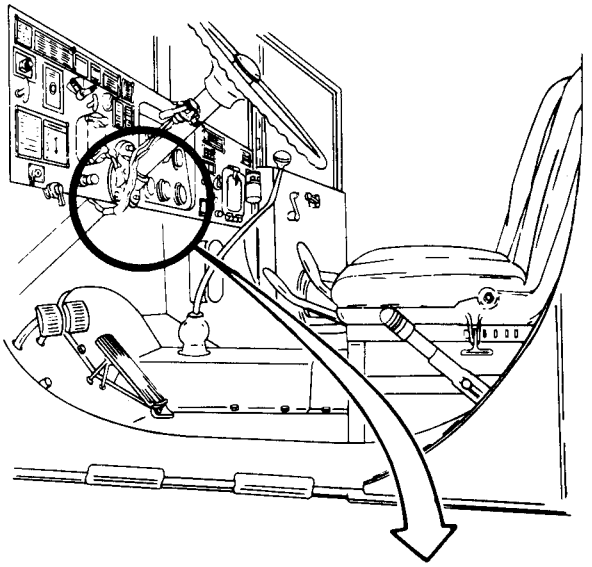
Is heater to air diverter duct attached to heater and air diverter?

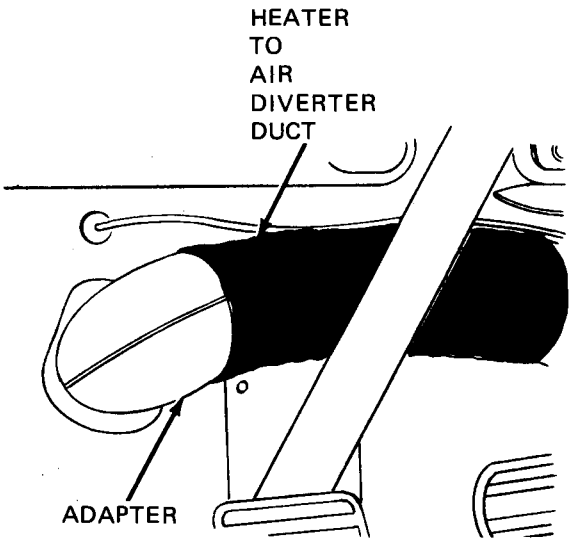
NO

3
- Connect heater to air diverter duct
  - Tell direct support maintenance

YES

4
- Repair or replace duct
  - Tell direct support maintenance






TA 116453

Figure 84-3

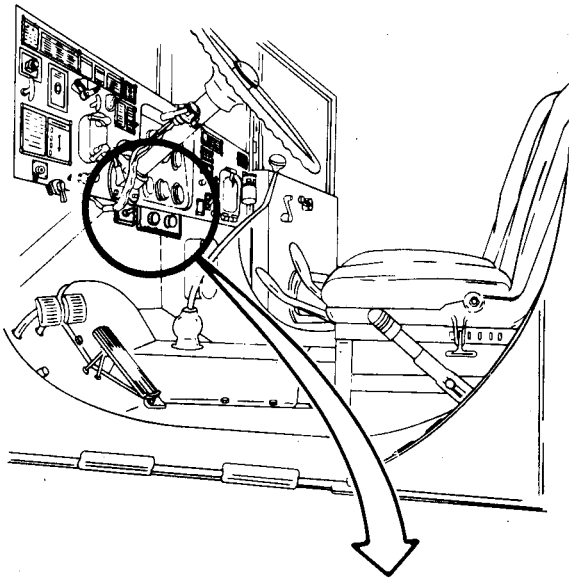
Symptom 4

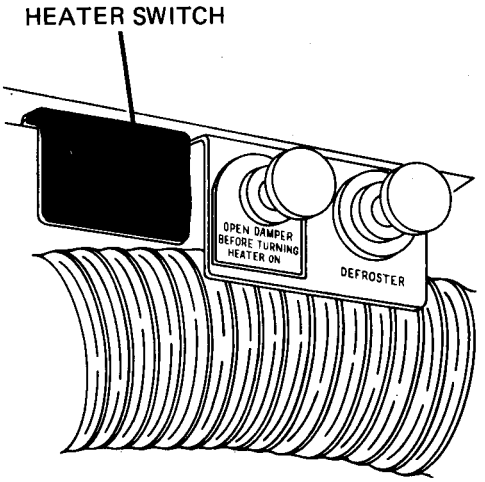
**BLOWER OPERATES IN "LO" ONLY**

1. ● Park truck
   - Refer to TM 9-2320-211-10

2. ● Check if heater switch lead is attached
   - Look under dash panel and see if heater switch lead is attached

Is heater switch lead attached?






NO

3. ● Attach heater switch lead
   - Refer to Vol 3, chapter 21, para 21-6

YES

4. ● Check electrical system
   - Refer to fault system index

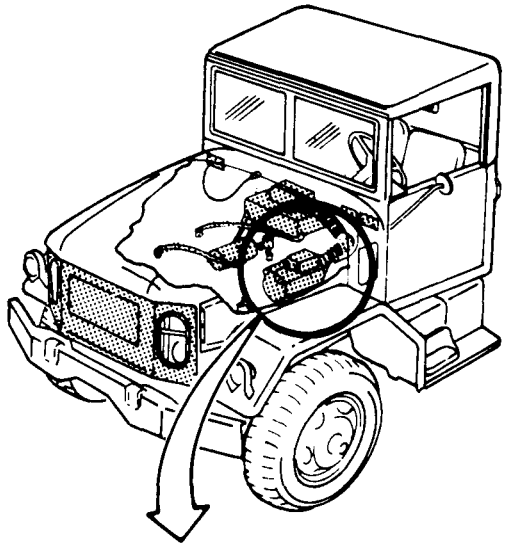
TA 116454

Figure 84-4

Symptom

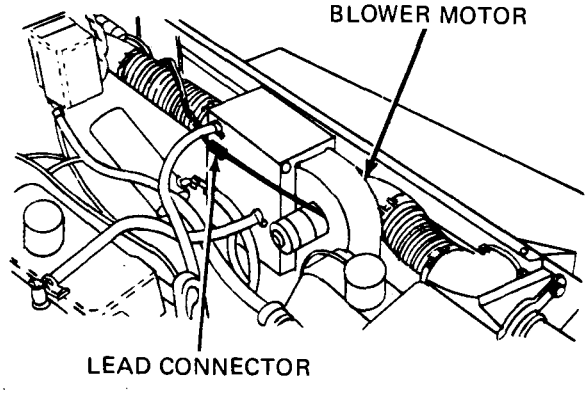
5 BLOWER MOTOR DOES NOT WORK

1
- Park truck
  - Refer to TM 9-2320-211-10



2
- Check lead to blower motor
  - Open hood. Refer to TM 9-2320-211-10
  - Check if lead to blower motor is attached

Is lead to blower motor attached?




YES

NO

3
- Attach lead to blower motor
  - Push lead to blower motor into harness connector

4
- Check electrical system
  - Refer to fault symptom index

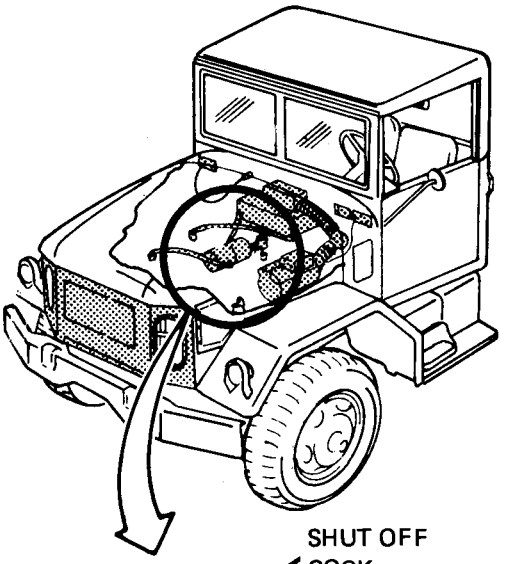
TA 116455

Figure 84-5

Symptom

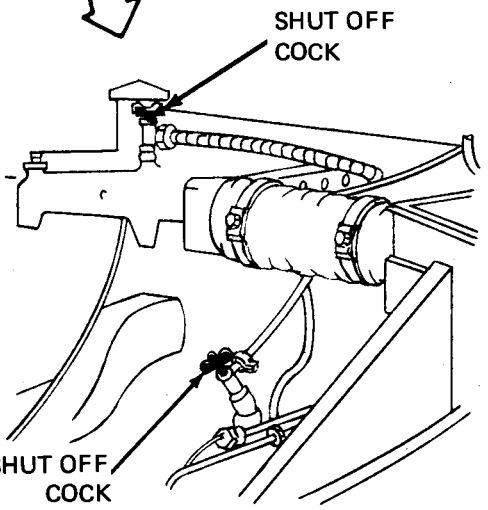
6 HEAT OUTPUT TOO LOW

1
- Park truck
  - Refer to TM 9-2320-211-10



2
- Check shut off cocks
  - Open hood. Refer to TM 9-2320-211-10
  - Check if shut off cocks are fully open to the left

Are shut off cocks fully open to left?




YES

NO

3
- Fully open shut off cocks to left

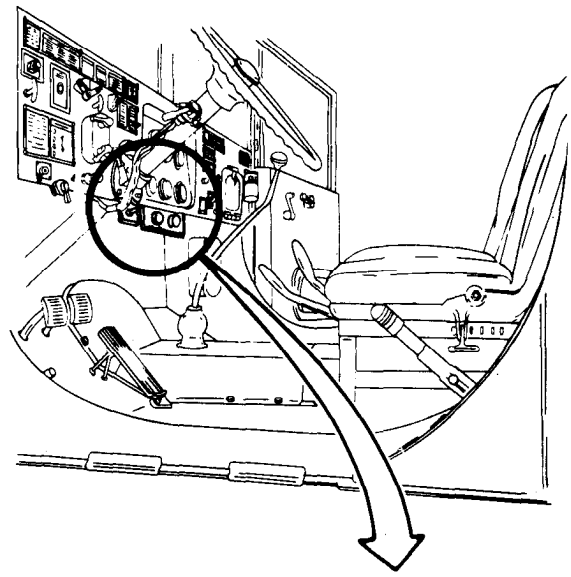
4
- Check electrical system
  - Refer to fault symptom index

TA 116456

Figure 84-6

Symptom 7

**BLOWER MOTOR OPERATES ON "HI" ONLY**



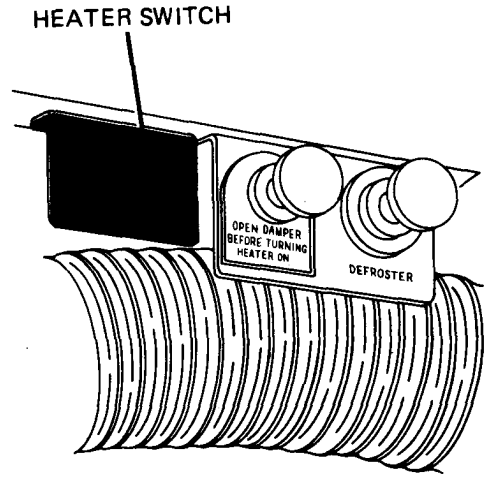
**1**

- Park truck
- Refer to TM 9-2320-211-10

**2**

- Check if heater switch lead is attached
- Look under dash panel and see if heater switch lead is attached

Is heater switch lead attached?




YES / NO

**3**

- Attach heater switch lead
- Refer to Vol 3, chapter 21, para 21-6

**4**

- Check electrical system
- Refer to fault symptom index

TA 116457

Figure 84-7

# CHAPTER 85

# HOT WATER HEATER SYSTEM TROUBLESHOOTING SUMMARY

85-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 84, for the Hot Water Heater System.

85-2. PROCEDURES . The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures in Part 1. Chapter 7 outlines a sample troubleshooting procedure. The summary procedures are based on the “what-to-do” portions of the detailed procedures and do not include the “How-to-do-it” instructions. Warnings, cautions, and notes are given where needed.

HOT WATER HEATER SYSTEM SUMMARY TROUBLESHOOTING

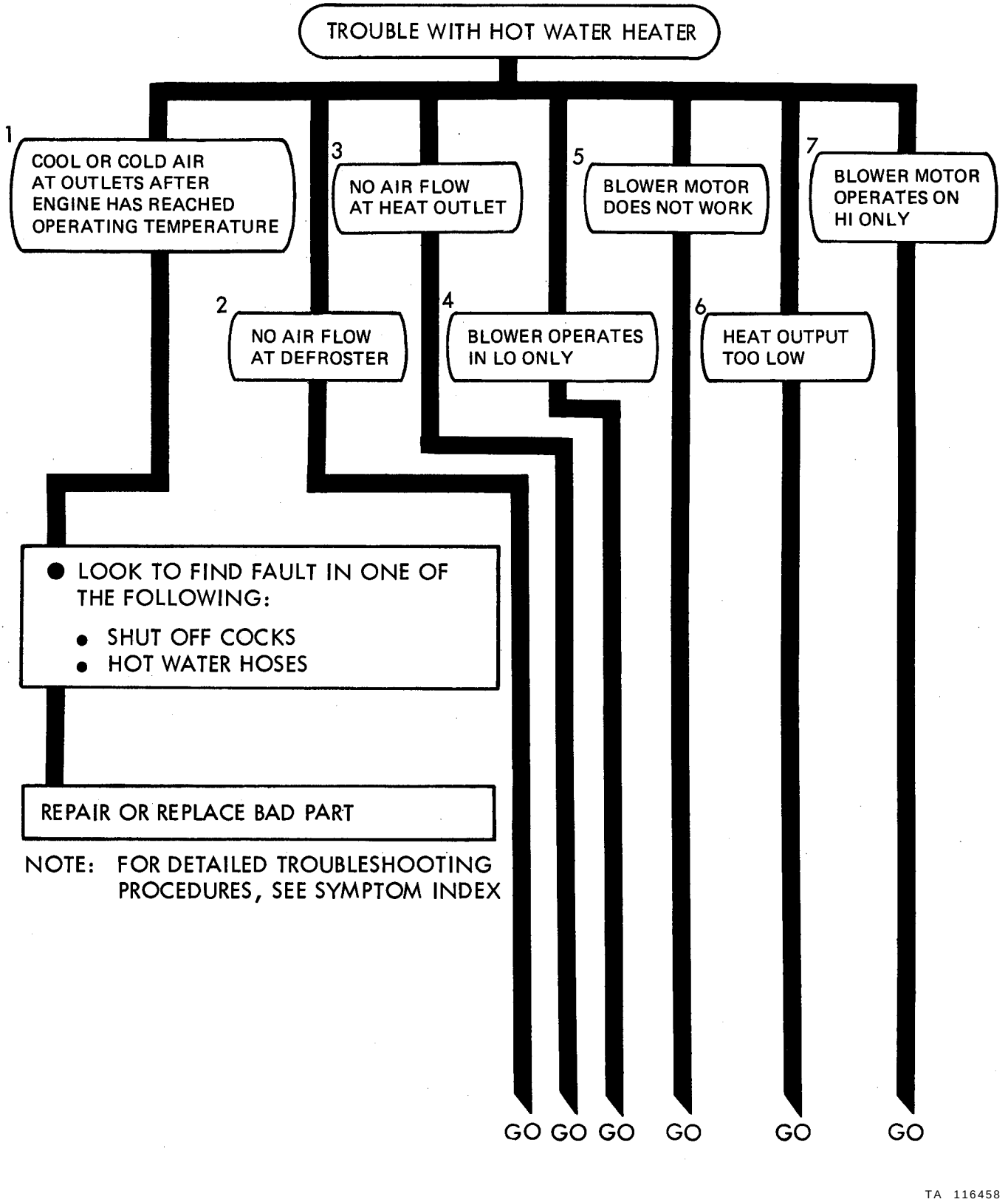
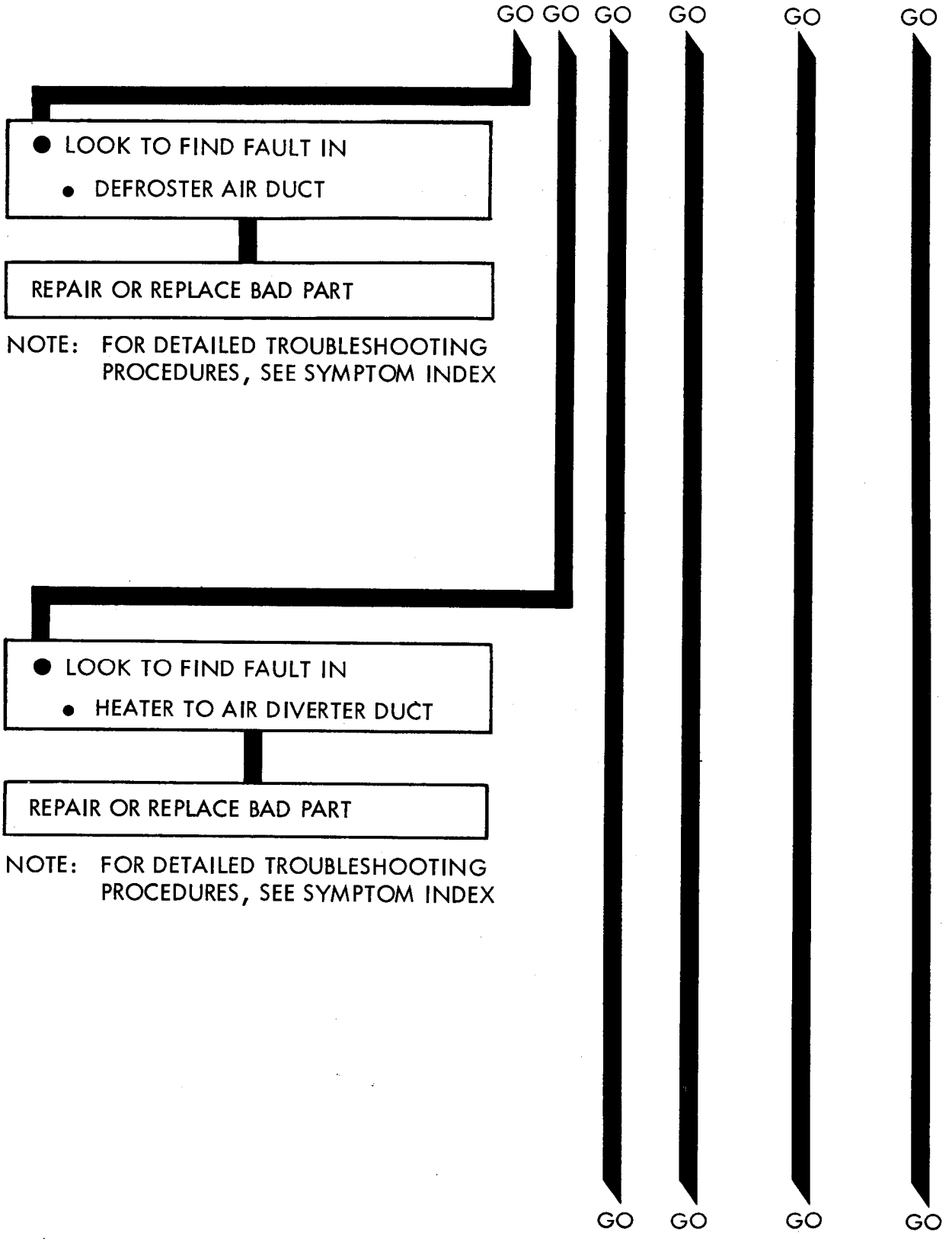
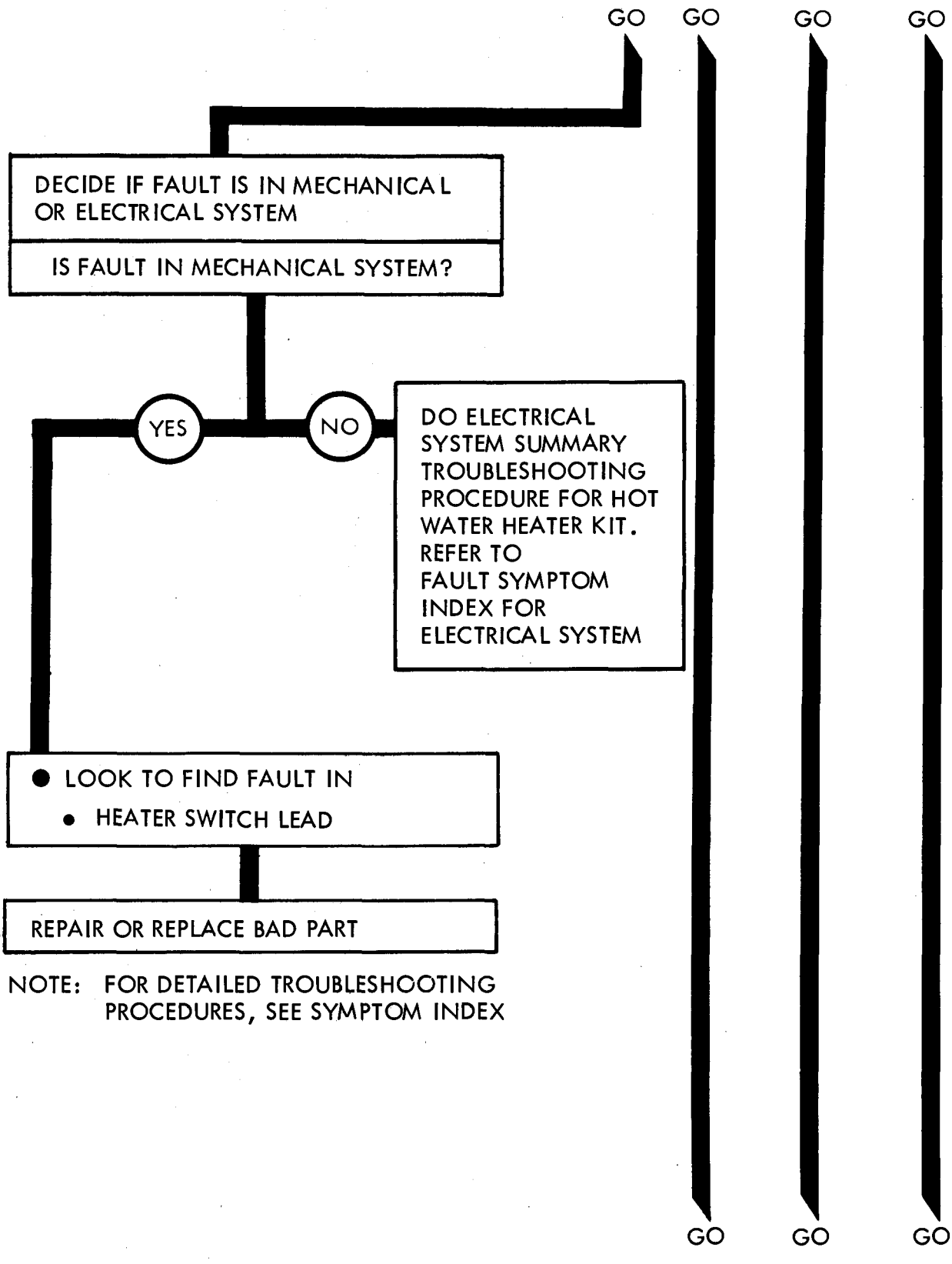



Figure 85-1 (Sheet 1 of 6)



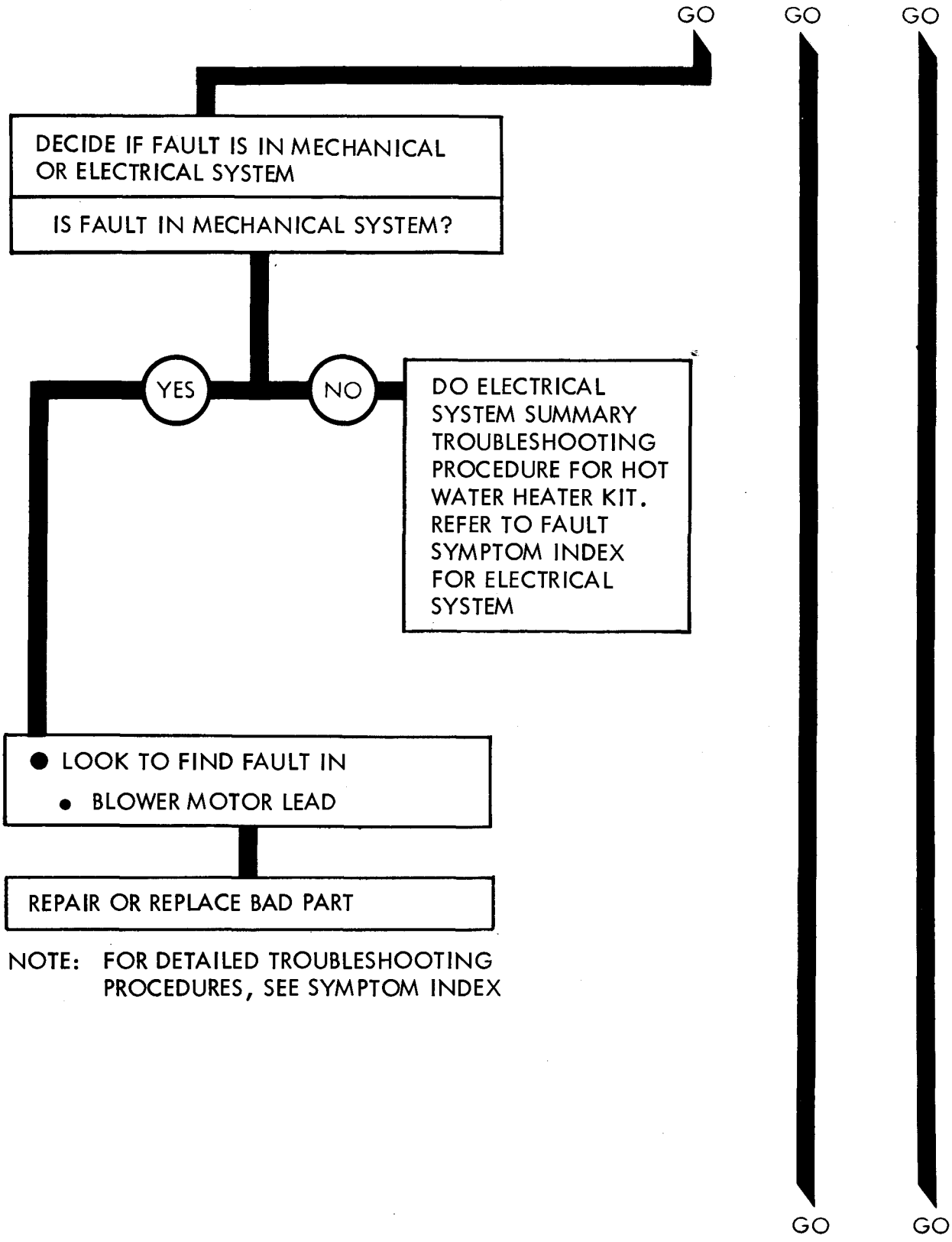

TA 116459

Figure 85-1 (Sheet 2 of 6)



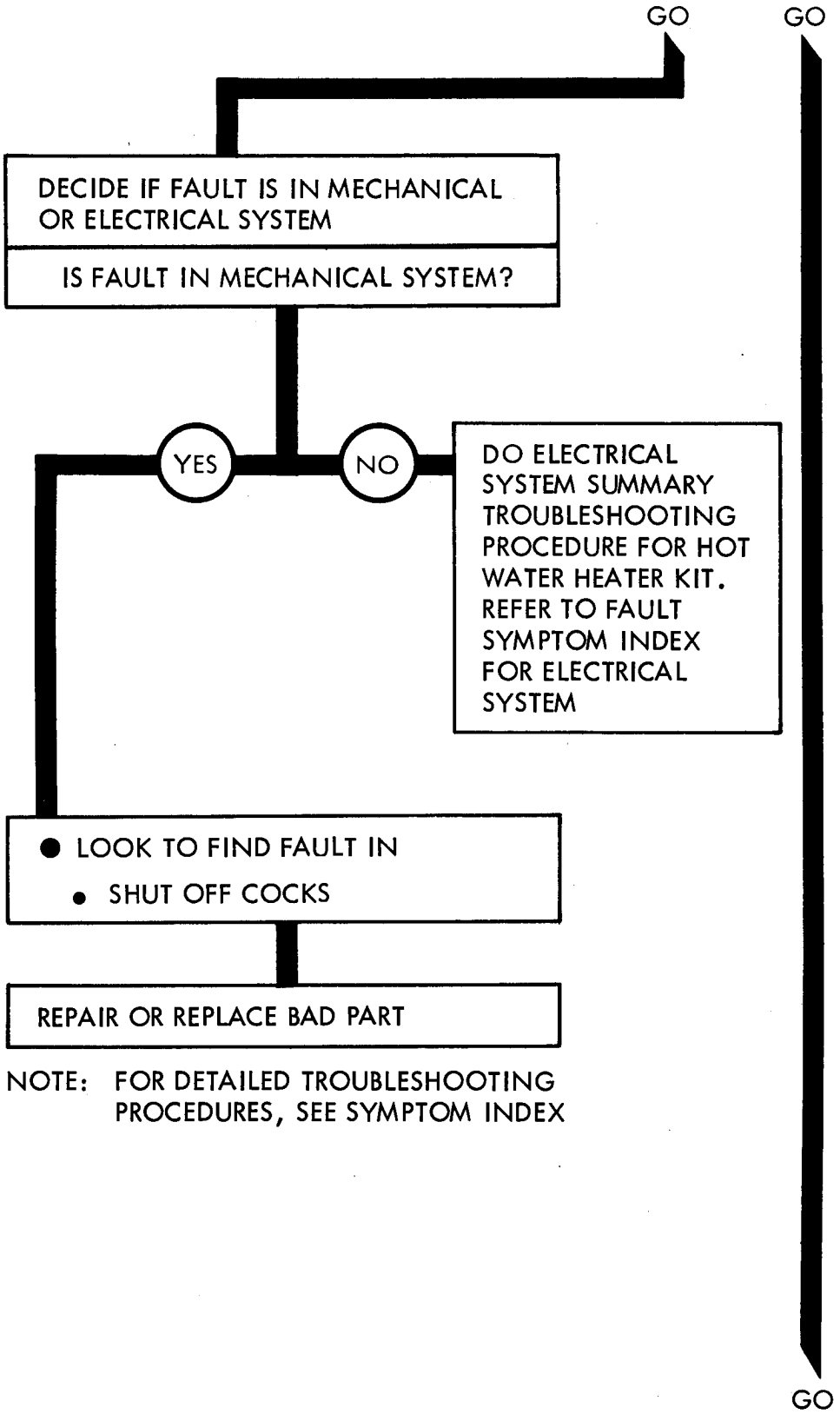

TA 116460

Figure 85-1 (Sheet 3 of 6)



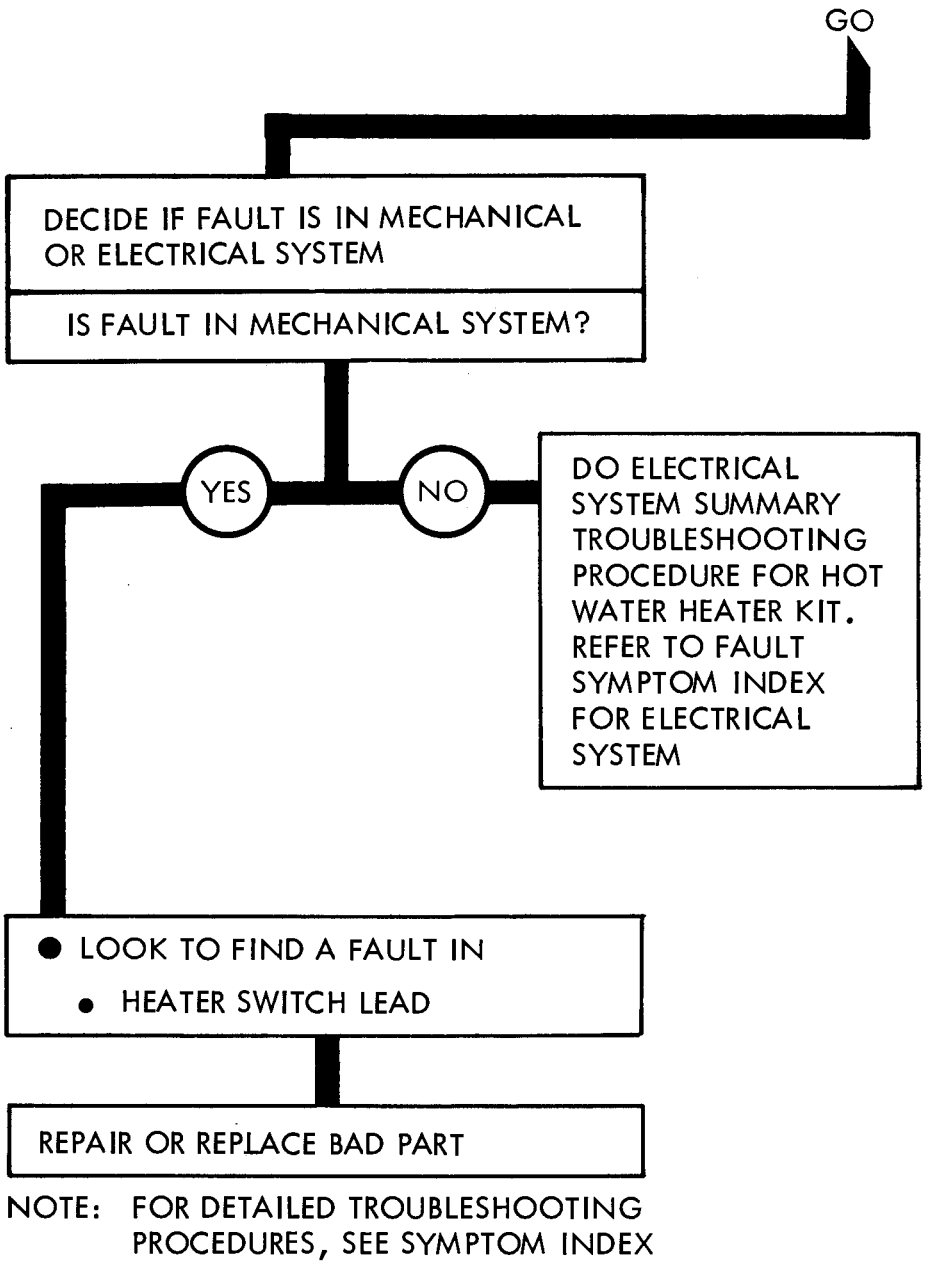

TA 116461

Figure 85-1 (Sheet 4 of 6)




TA 116462

Figure 85-1 (Sheet 5 of 6)




NOTE: FOR DETAILED TROUBLESHOOTING PROCEDURES, SEE SYMPTOM INDEX

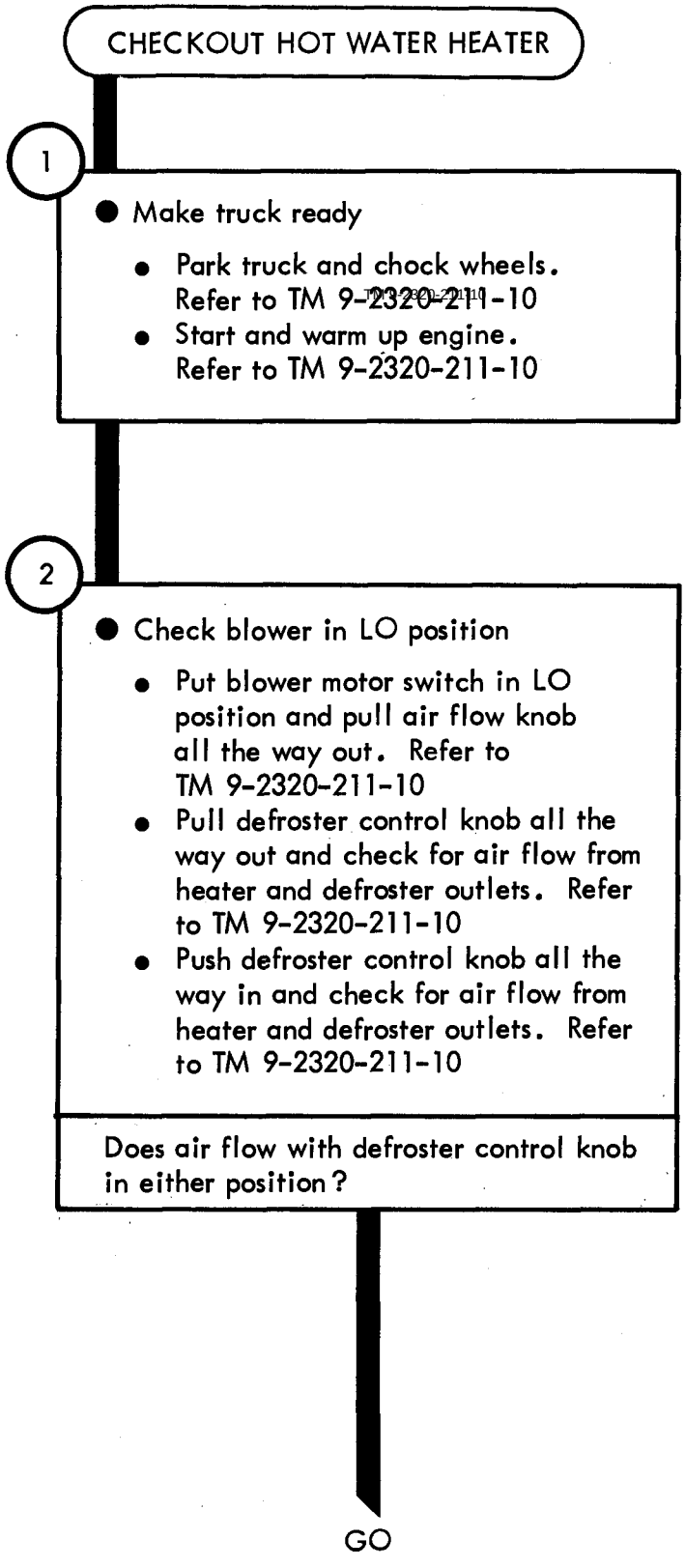
TA 116463

Figure 85-1 (Sheet 6 of 6)

# CHAPTER 86

# HOT WATER HEATER SYSTEM CHECKOUT PROCEDURES

86-1. GENERAL. This chapter gives procedures for checking out the system after troubleshooting and repair have been done. Procedures are set up in flow chart form showing the checkout steps in order and referring to the fault symptom index when the system does not check out.




TA 116464

Figure 86-1 (Sheet 1 of 5)

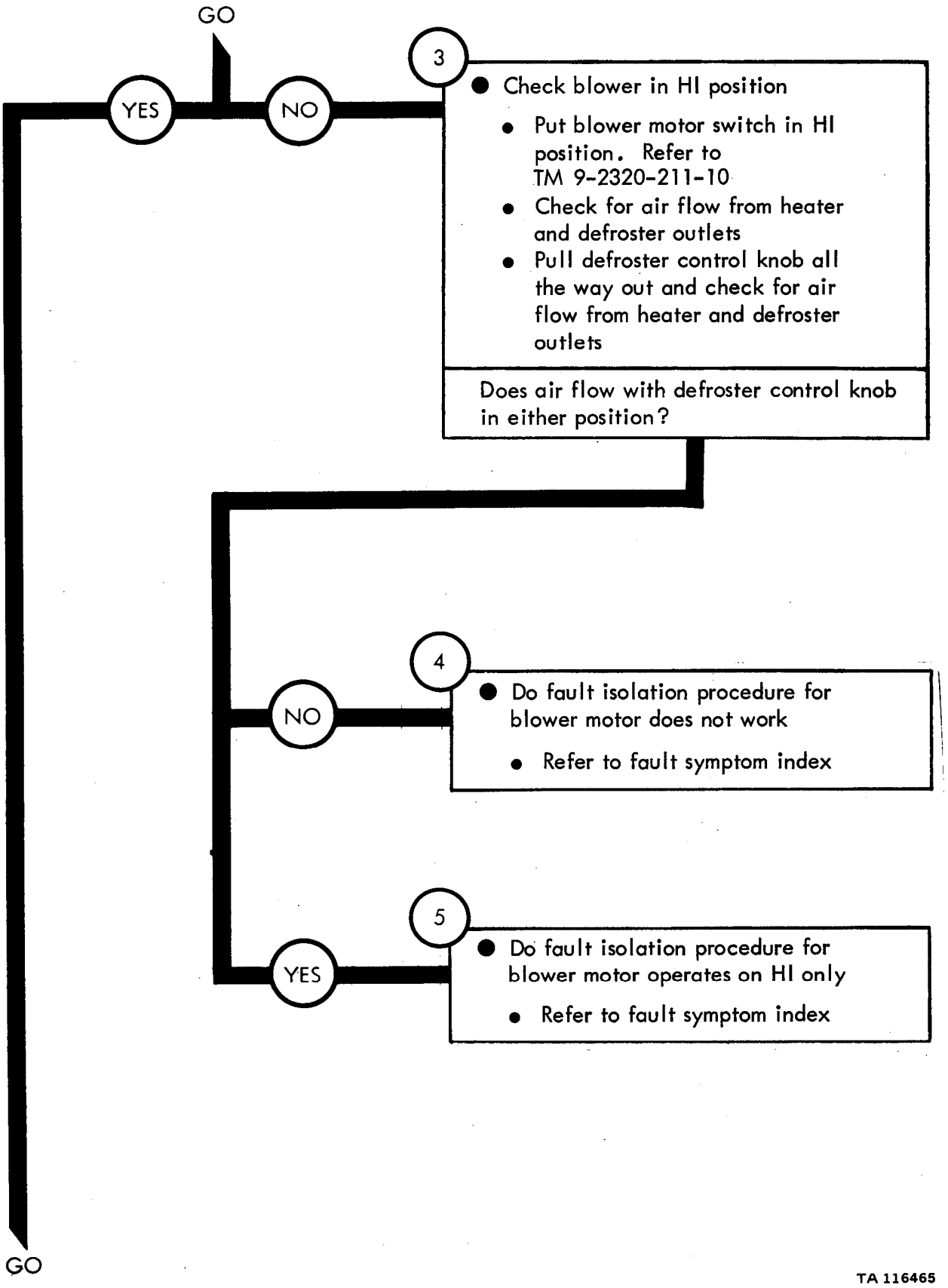



Figure 86-1 (Sheet 2 of 5)

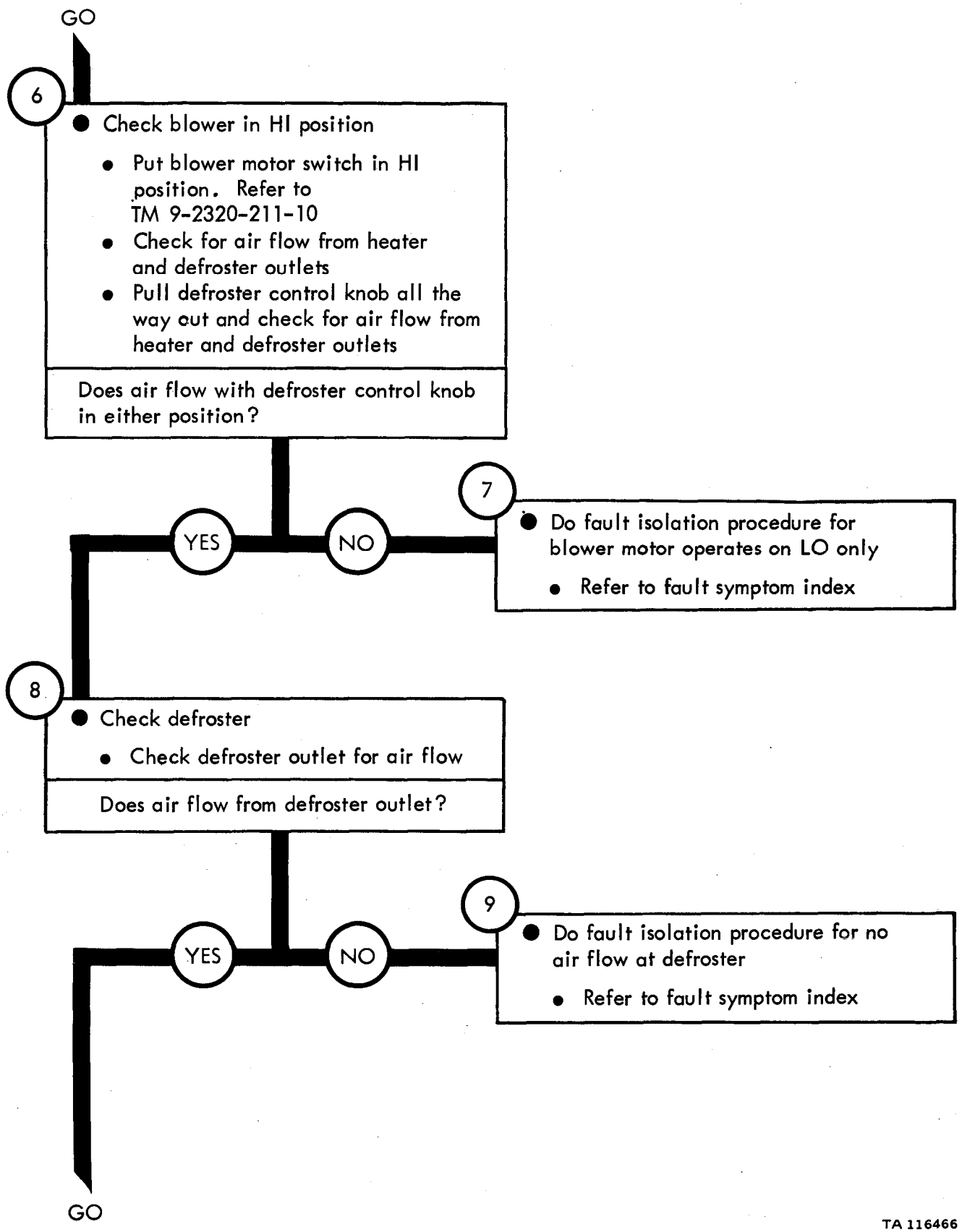



Figure 86-1 (Sheet 3 of 5)

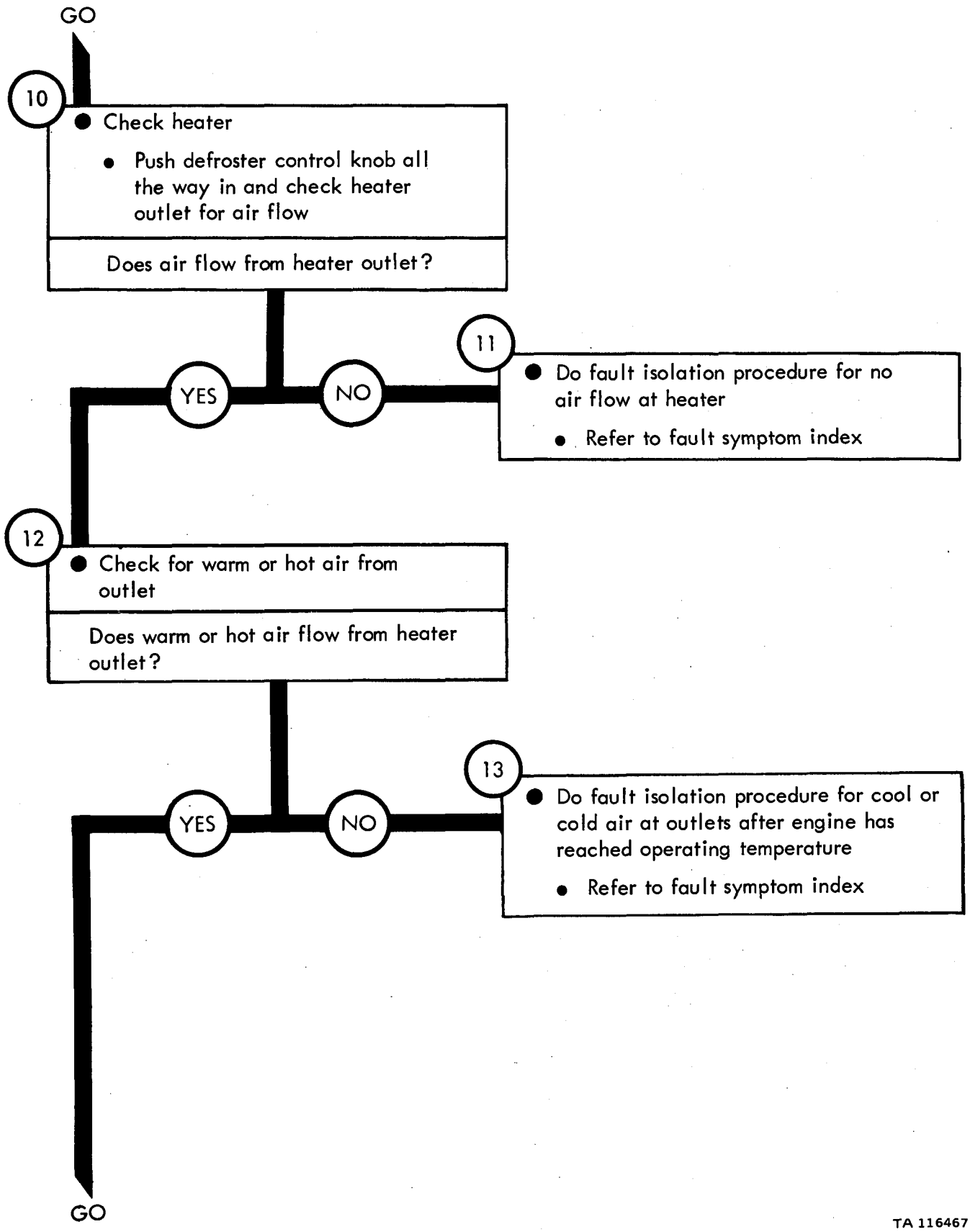
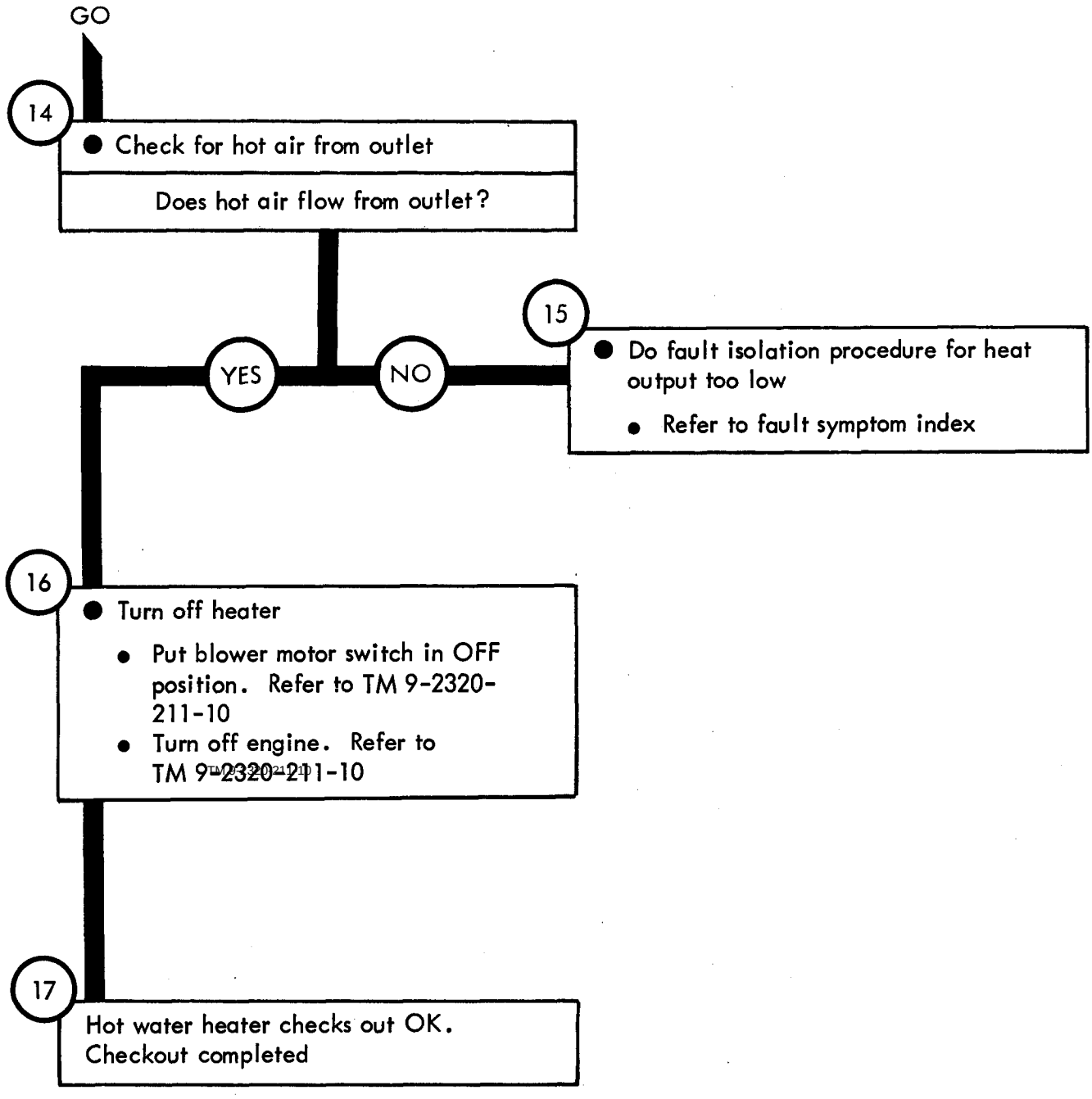



Figure 86-1 (Sheet 4 of 5)




TA 116468

Figure 86-1 (Sheet 5 of 5)

# CHAPTER 87

# NONELECTRICAL GAGES TROUBLESHOOTING

87-1. EQUIPMENT ITEMS COVERED. This chapter gives equipment troubleshooting procedures for nonelectrical gages, for which there are authorized corrective maintenance tasks at the organizational maintenance level.

87-2. EQUIPMENT ITEMS NOT COVERED. All equipment items for which corrective maintenance is authorized at the organizational maintenance level are covered in this chapter.

NONELECTRICAL GAGES TROUBLESHOOTING

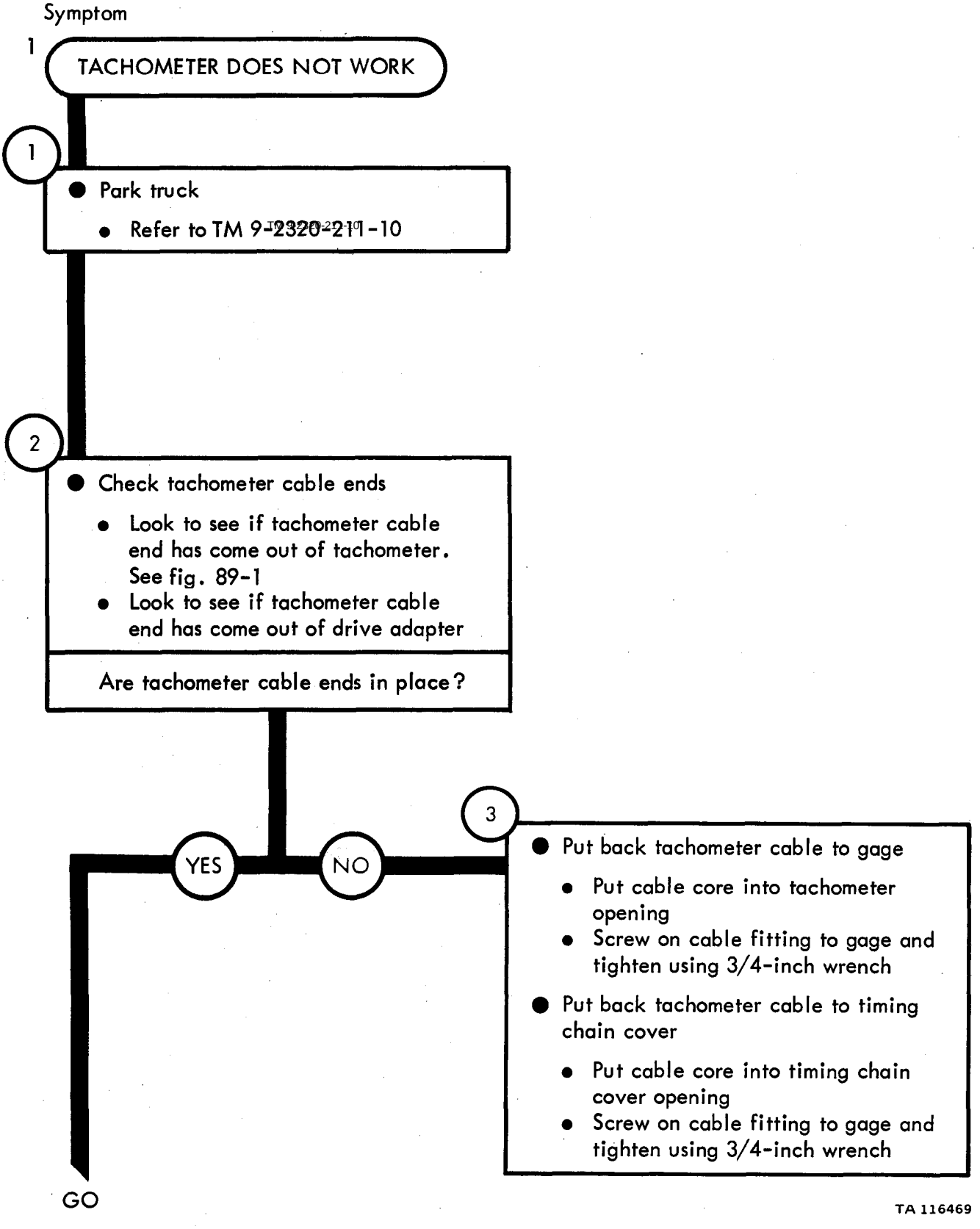



Figure 87-1 (Sheet 1 of 3)

GO

4

- Check tachometer cable
  - Look for bent, crushed or broken cable. See figure 89-1

Is tachometer cable OK?

YES

NO

5

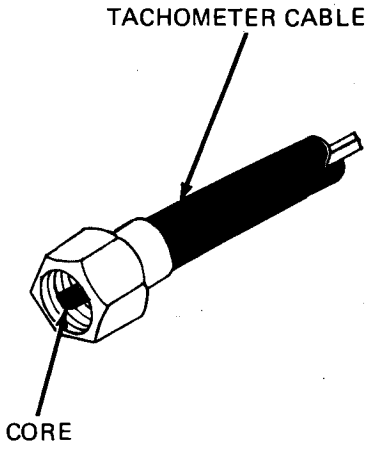
- Replace bent, crushed or broken tachometer cable
  - Refer to Vol 3, chapter 20, para 20-5

6

- Check tachometer cable core
  - Using 3/4-inch wrench unscrew and pull out cable fitting from tachometer. See figure 89-1
  - Let cable hang down so that it is just below instrument cluster
  - Look for a broken cable core
  - Try to turn cable core by hand

Note: If cable core turns this means the core is broken

Is tachometer cable core OK?




GO

TA 116470

Figure 87-1 (Sheet 2 of 3)

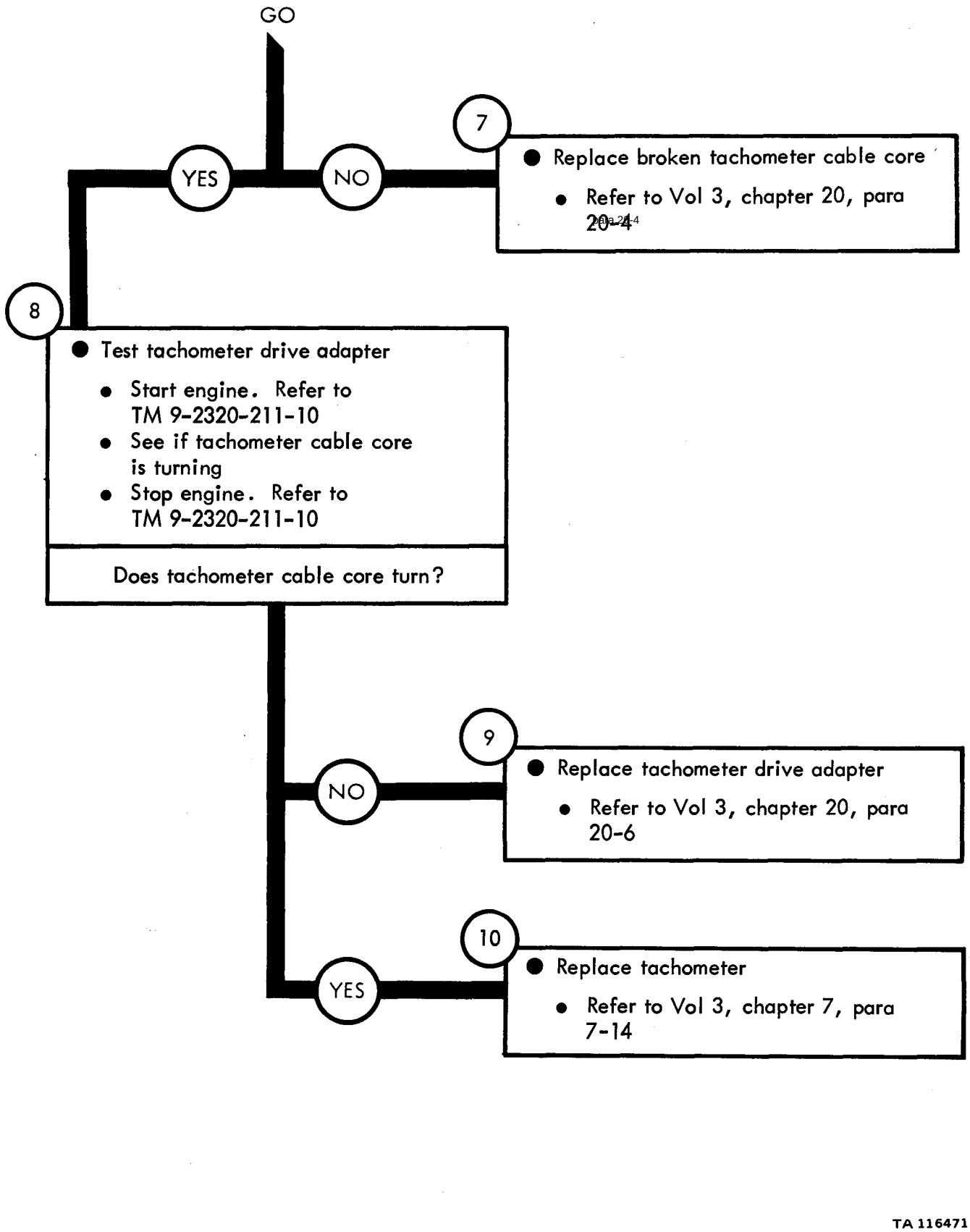
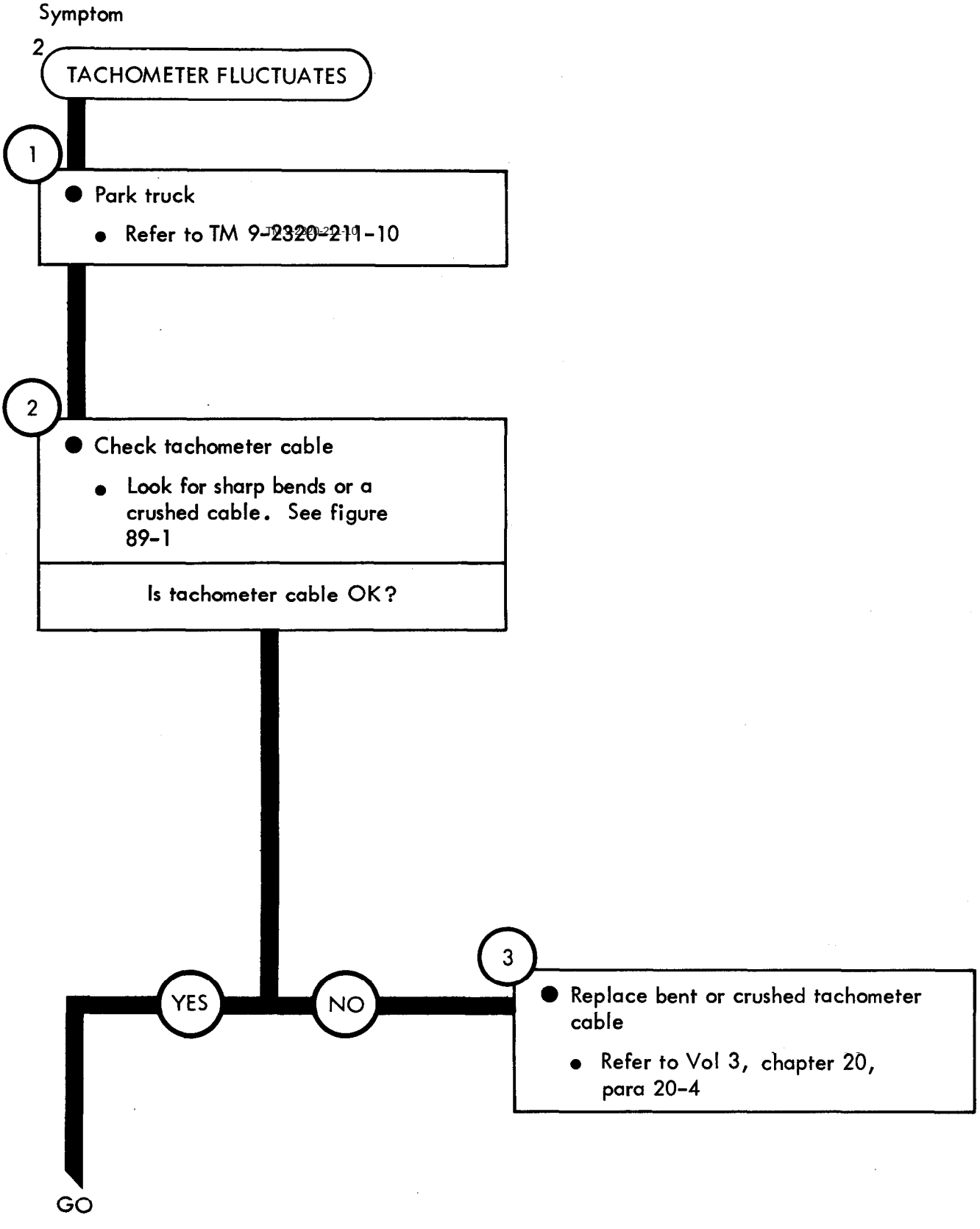



Figure 87-1 (Sheet 3 of 3)




TA 116472

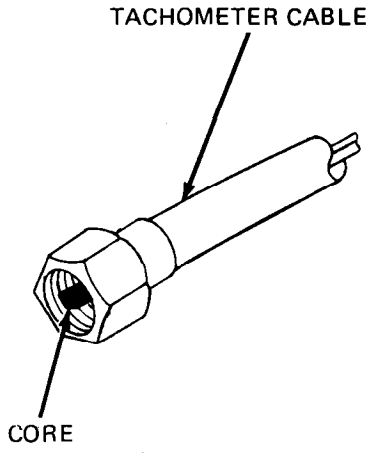
Figure 87-2 (Sheet 1 of 2)

GO

4

- Check tachometer drive adapter
  - Using 3/4-inch wrench, unscrew and pull out cable fitting from tachometer
  - Let cable end hang down so that it is just below the instrument cluster
  - Start engine. Refer to TM 9-2320-211-10
  - Run engine at a steady speed and see if cable core turns at a steady speed
  - Turn off engine. Refer to TM 9-2320-211-10

Does cable turn at a steady speed?




NO

5

- Replace drive adapter
  - Refer to Vol 3, chapter 20, para 20-6

YES

6

- Replace tachometer gage
  - Refer to Vol 3, chapter 7, para 7-14

TA 116473

Figure 87-2 (Sheet 2 of 2)

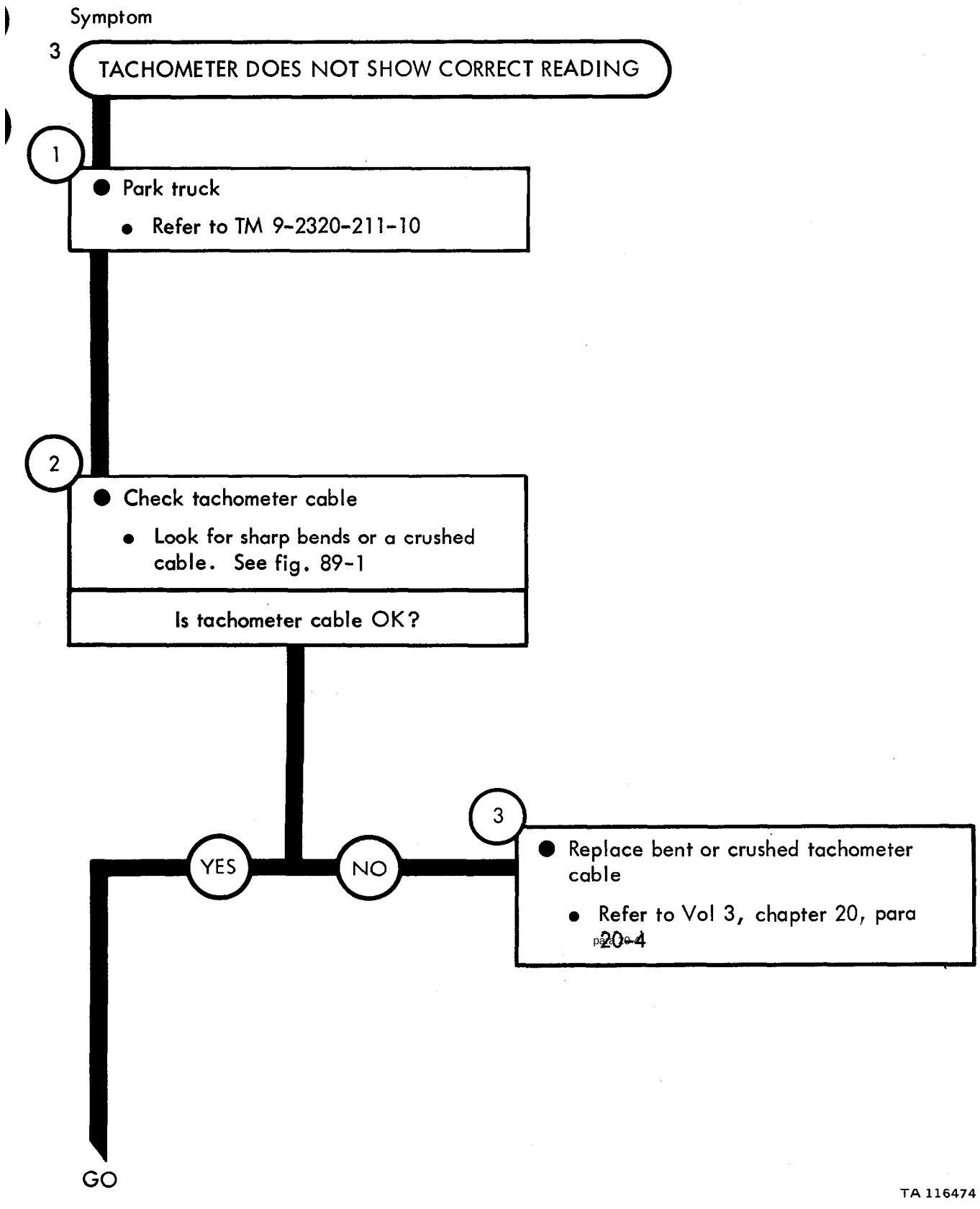
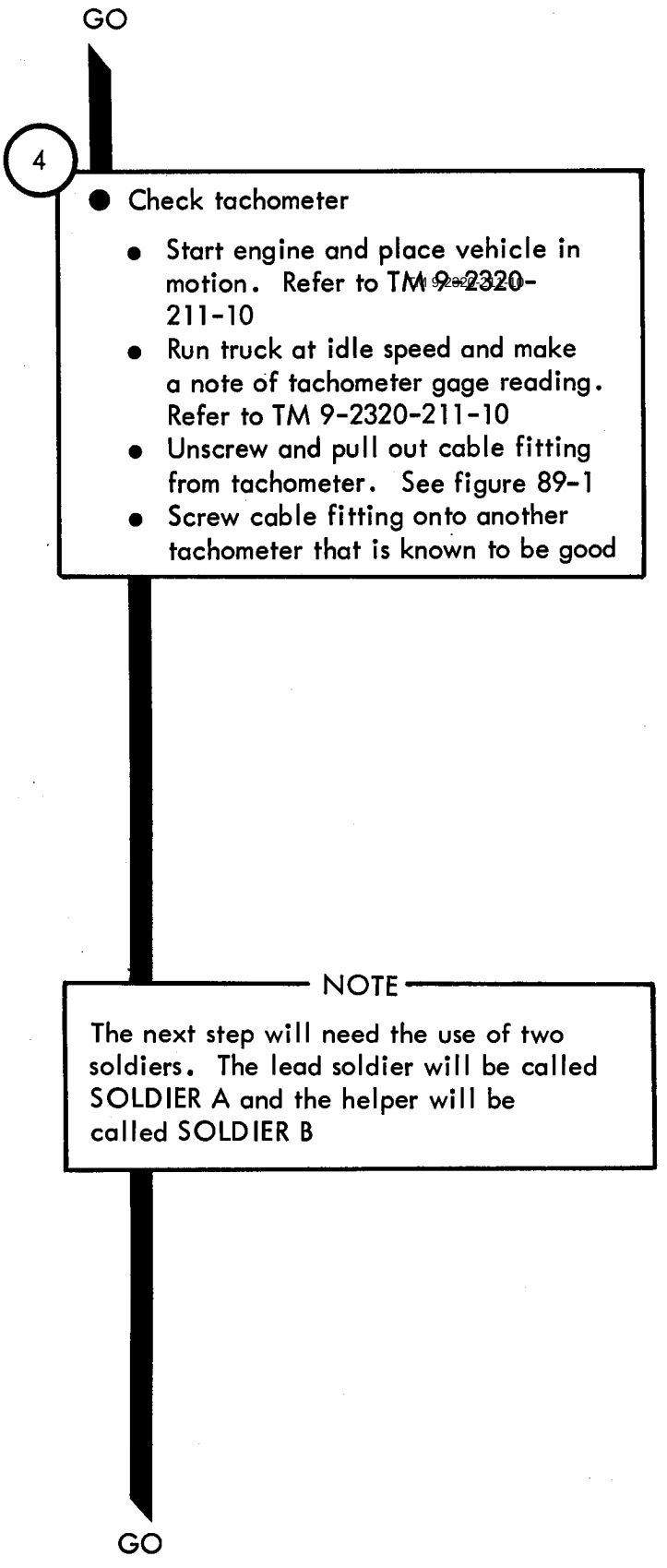



Figure 87-3 (Sheet 1 of 4)




TA 116475

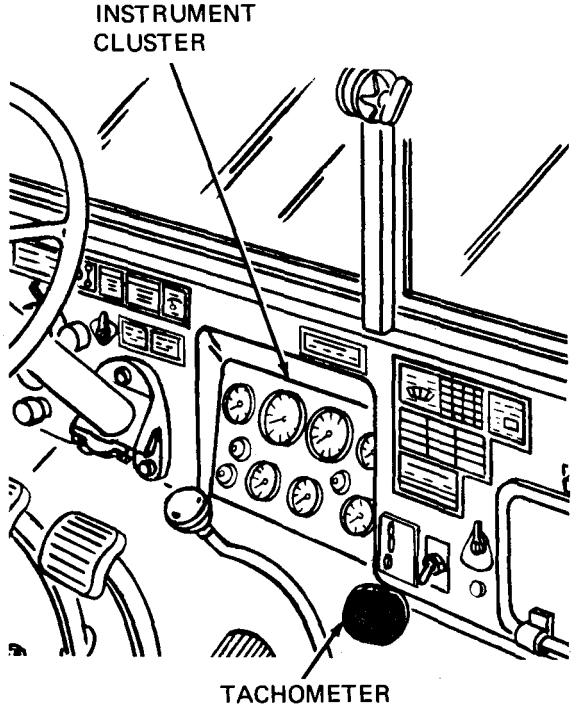
Figure 87-3 (Sheet 2 of 4)

GO

SOLDIER B
- Sit in companion seat and hold tachometer being used for test

SOLDIER A
- Start engine. Refer to TM 9-2320-211-10
- Run truck at idle speed and make note of the reading on the tachometer being used for test. Refer to TM 9-2320-211-10
- Unscrew and pull out cable fitting from tachometer

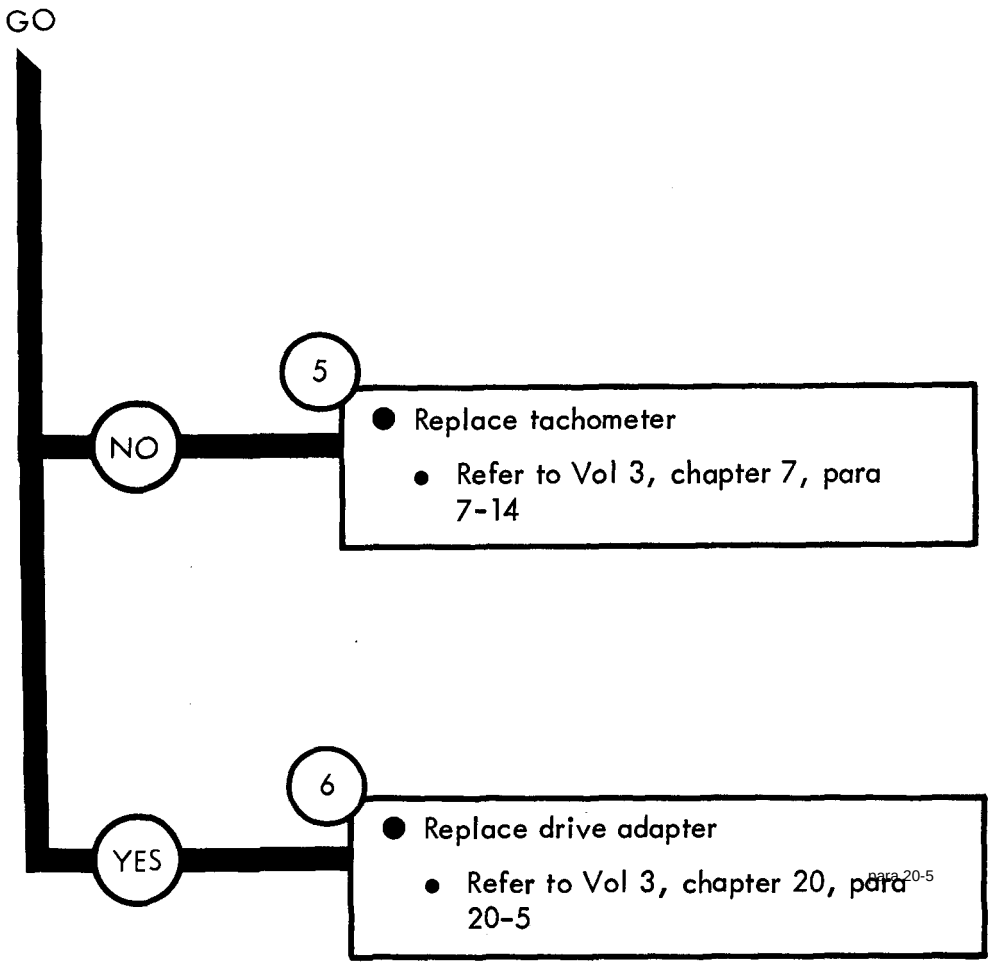
Are both tachometer readings the same?




GO

TA 116476

Figure 87-3 (Sheet 3 of 4)




TA 116477

Figure 87-3 (Sheet 4 of 4)

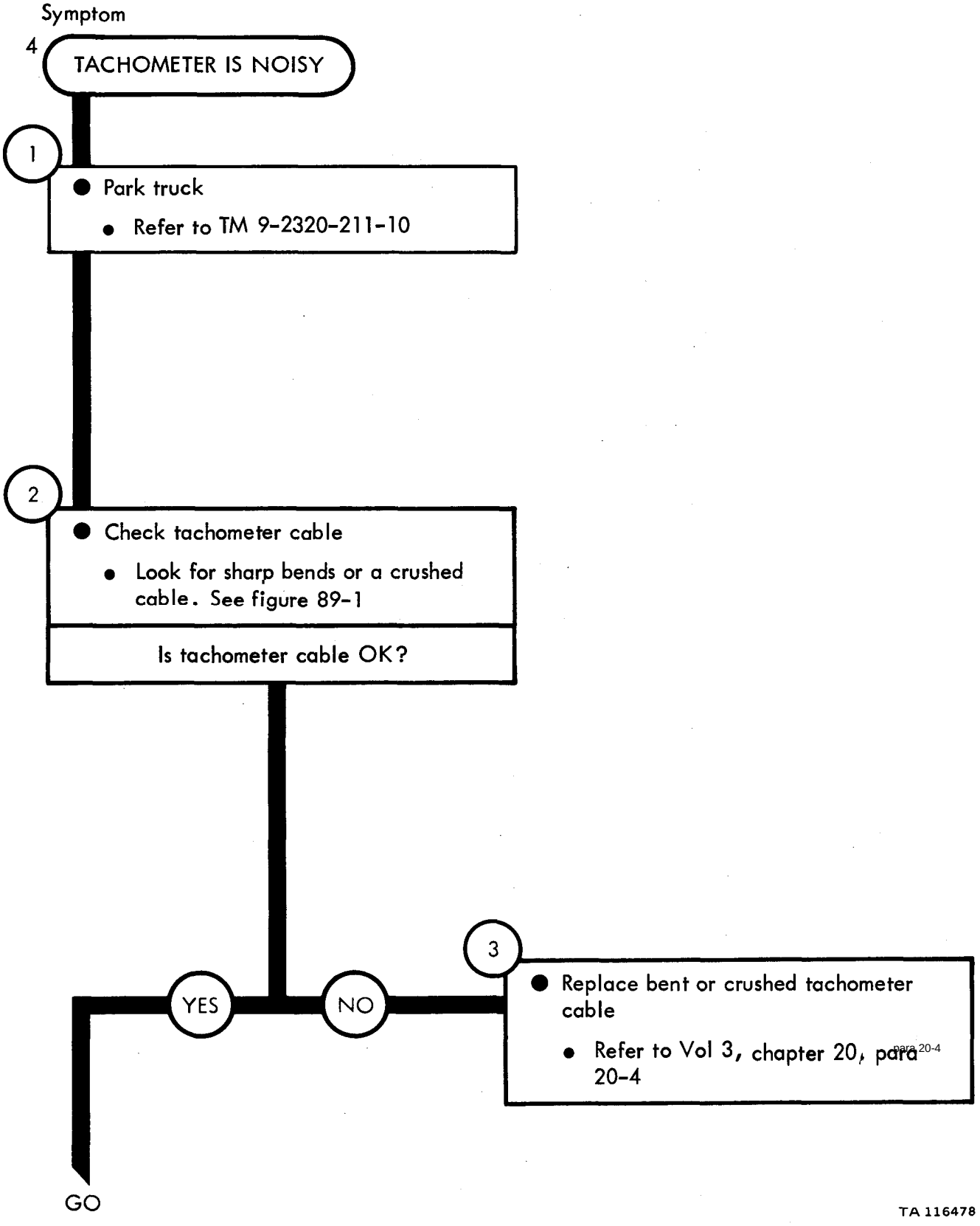


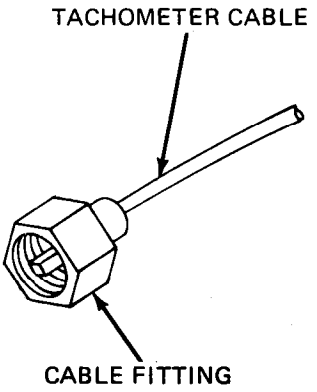

Figure 87-4 (Sheet 1 of 2)

GO

4

- Check tachometer drive adapter
  - Using 3/4-inch wrench, unscrew and pull out cable fitting from tachometer. See fig. 89-1
  - Let cable end hang down so that it is just below the instrument cluster
  - Start engine. Refer to TM 9-2320-211-10
  - Run engine at a steady speed and listen for noise
  - Turn off engine. Refer to TM 9-2320-211-10

Is tachometer noise gone?




NO

5

- Replace drive adapter
  - Refer to Vol 3, chapter 20, para 20-5

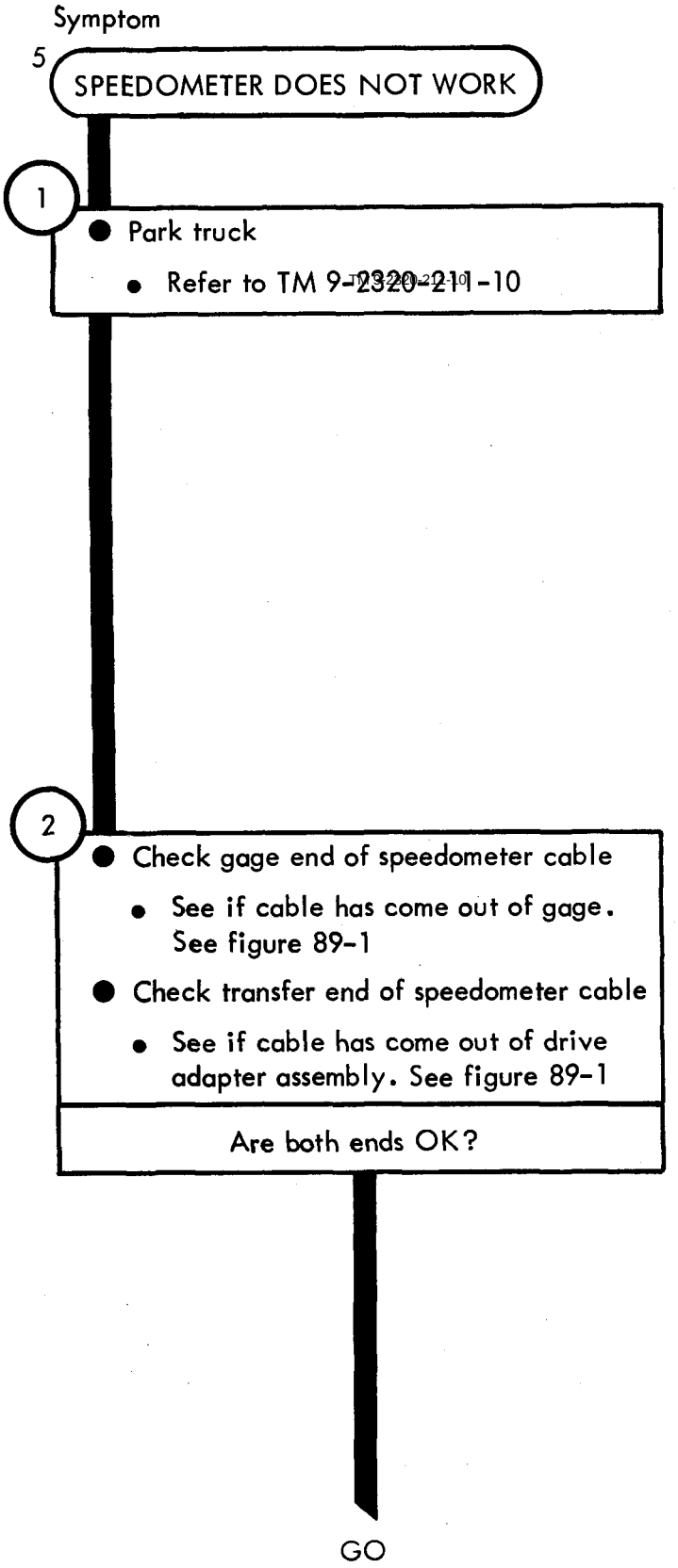
YES

6

- Replace tachometer gage
  - Refer to Vol 3, chapter 7, para 7-14

TA 116479

Figure 87-4 (Sheet 2 of 2)




TA 116480

Figure 87-5 (Sheet 1 of 5)

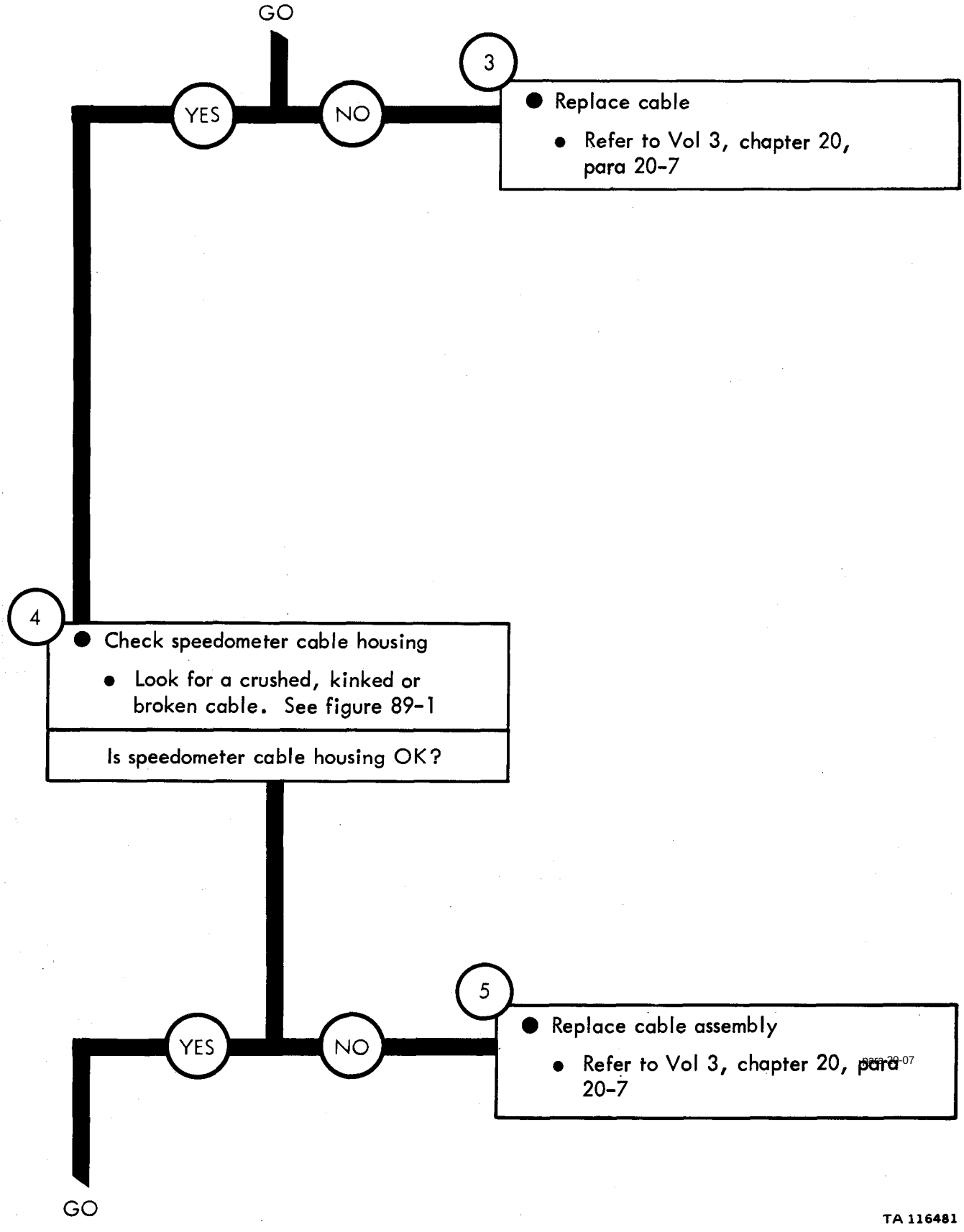


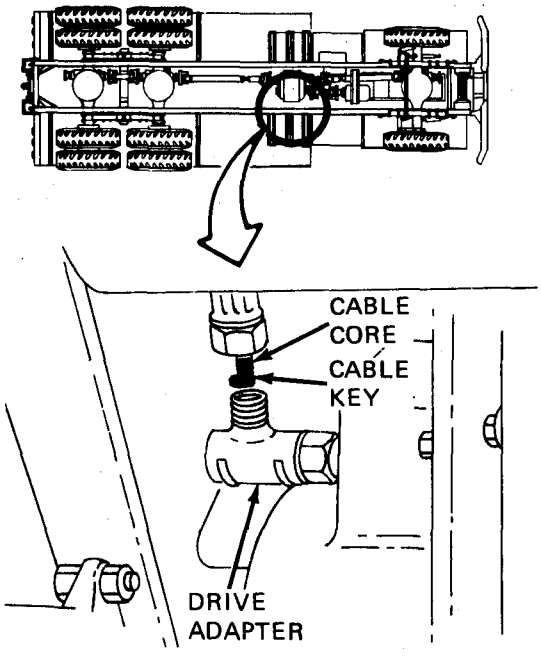

Figure 87-5 (Sheet 2 of 5)

GO

6

- Check cable core and cable key at drive adapter
  - Using 1-inch wrench, unscrew and pull cable out of drive adapter
  - Look for a broken core or key

Are cable core and cable key OK?




YES

NO

7

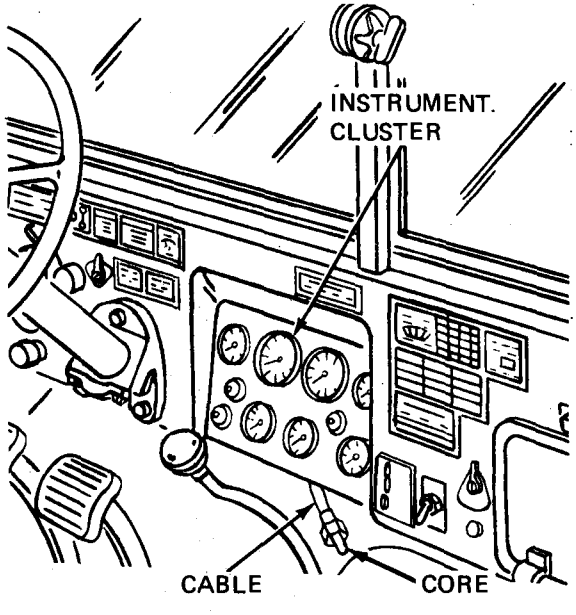
- Replace cable core
  - Refer to Vol 3, chapter 20, para 20-7

8

- Check cable core at speedometer assembly
  - Using 1-inch wrench, unscrew cable fitting and pull out cable fitting from gage
  - Look for a broken core

Is cable core OK?

GO




TA 116482

Figure 87-5 (Sheet 3 of 5)

GO

YES

NO

9

- Replace cable core
  - Refer to Vol 3, chapter 20, para 20-7

NOTE

The next step will need the use of two soldiers. The lead soldier will be called SOLDIER A and the helper will be called SOLDIER B

10

- Check speedometer cable as follows

SOLDIER B: • Crawl under truck

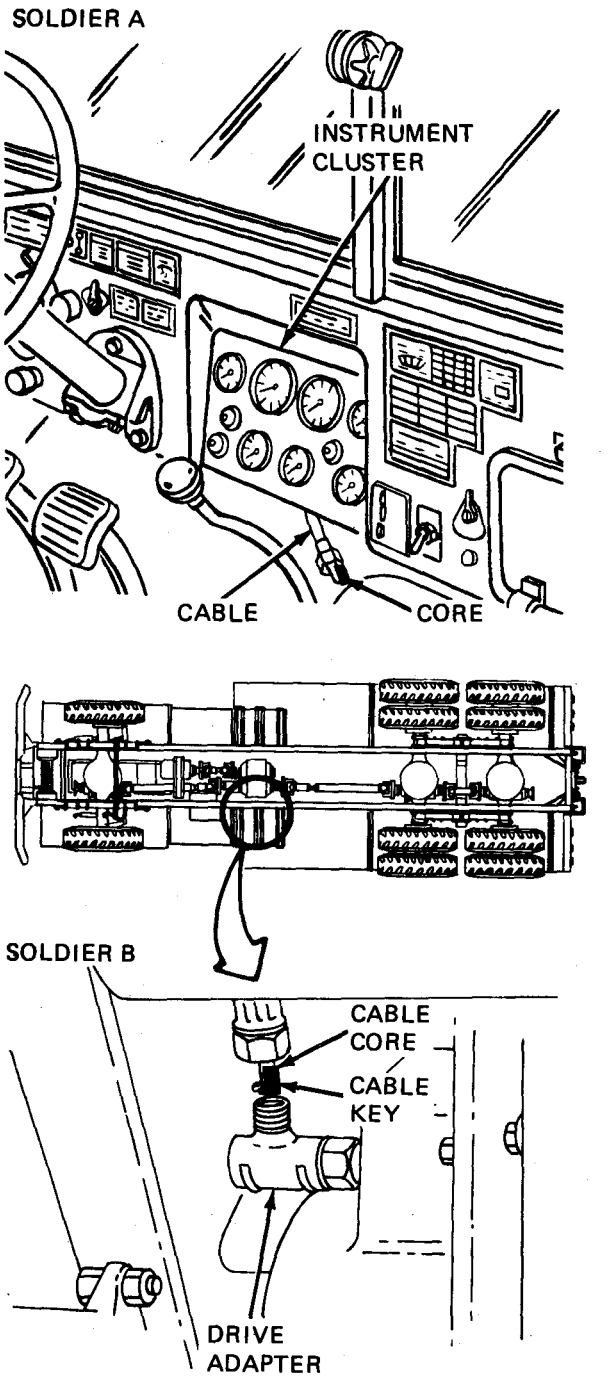
SOLDIER A: • Go to driver's seat
• Tell SOLDIER B to turn speedometer core

SOLDIER B: • Turn speedometer core

SOLDIER A: • See if speedometer cable core turns

Does speedometer core turn?

GO




TA 116483

Figure 87-5 (Sheet 4 of 5)

GO

YES

NO

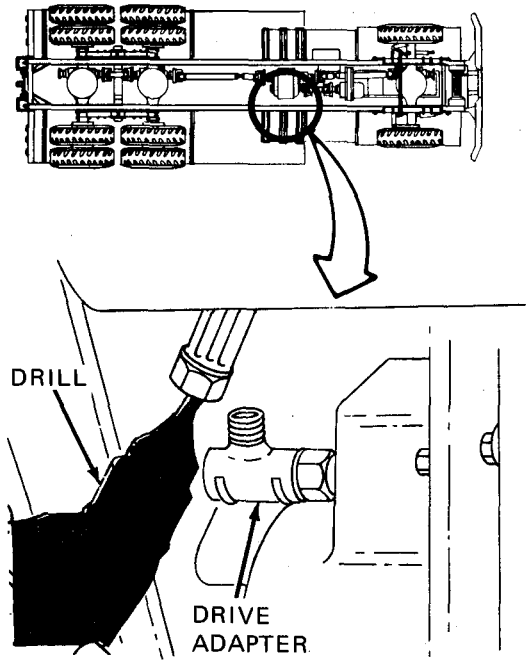
11

- Replace speedometer cable assembly
  - Refer to Vol 3, chapter 20, para 20-7

12

- Set up speedometer test

SOLDIER A:
- Put back core in speedometer gage opening
- Screw on cable fitting and tighten using 9/16-inch wrench
- Put a variable speed drill on drive adapter end of cable core




13

- Test speedometer

SOLDIER B:
- Go to driver's seat and watch speedometer

SOLDIER A:
- Run drill at a slow and steady speed for about 30 seconds

SOLDIER B:
- See if speedometer pointer moves

Does speedometer pointer move?

NO

14

- Replace speedometer gage assembly
  - Refer to Vol 3, chapter 7, para 7-15

YES

15

- Replace speedometer drive adapter
  - Refer to Vol 3, chapter 20, para 20-8

TA 116484

Figure 87-5 (Sheet 5 of 5)

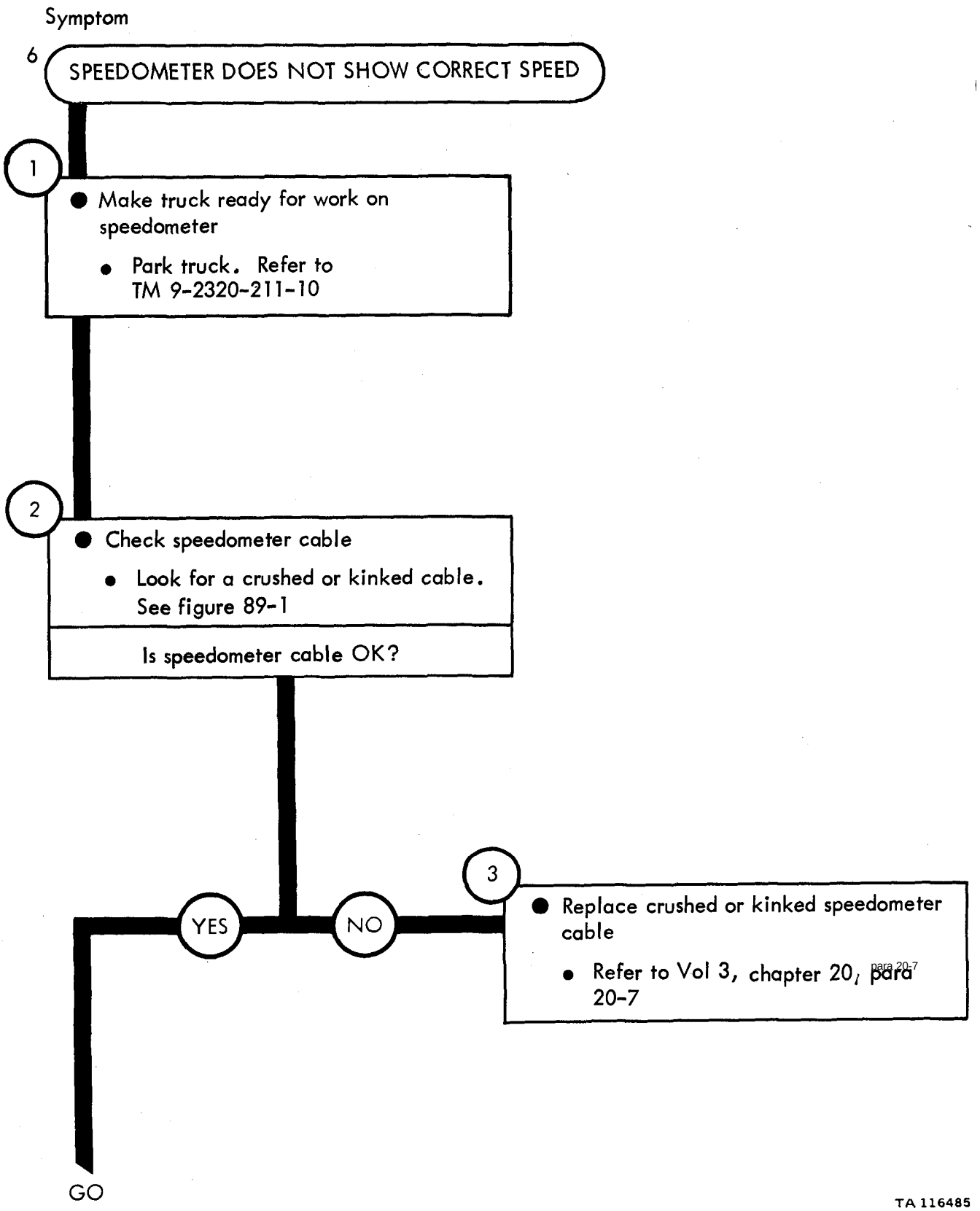
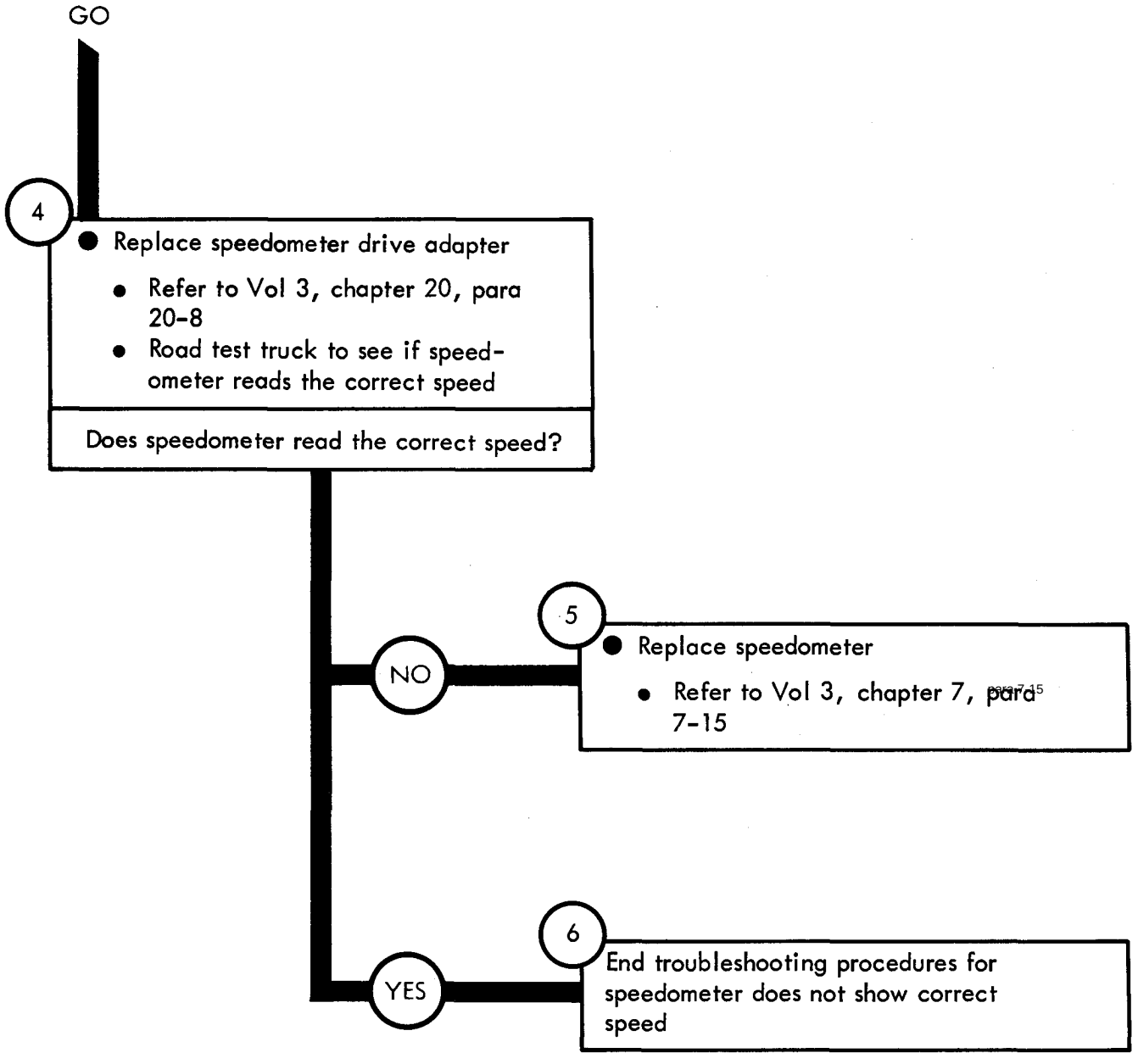



Figure 87-6 (Sheet 1 of 2)




TA 116486

Figure 87-6 (Sheet 2 of 2)

SPEEDOMETER TROUBLESHOOTING

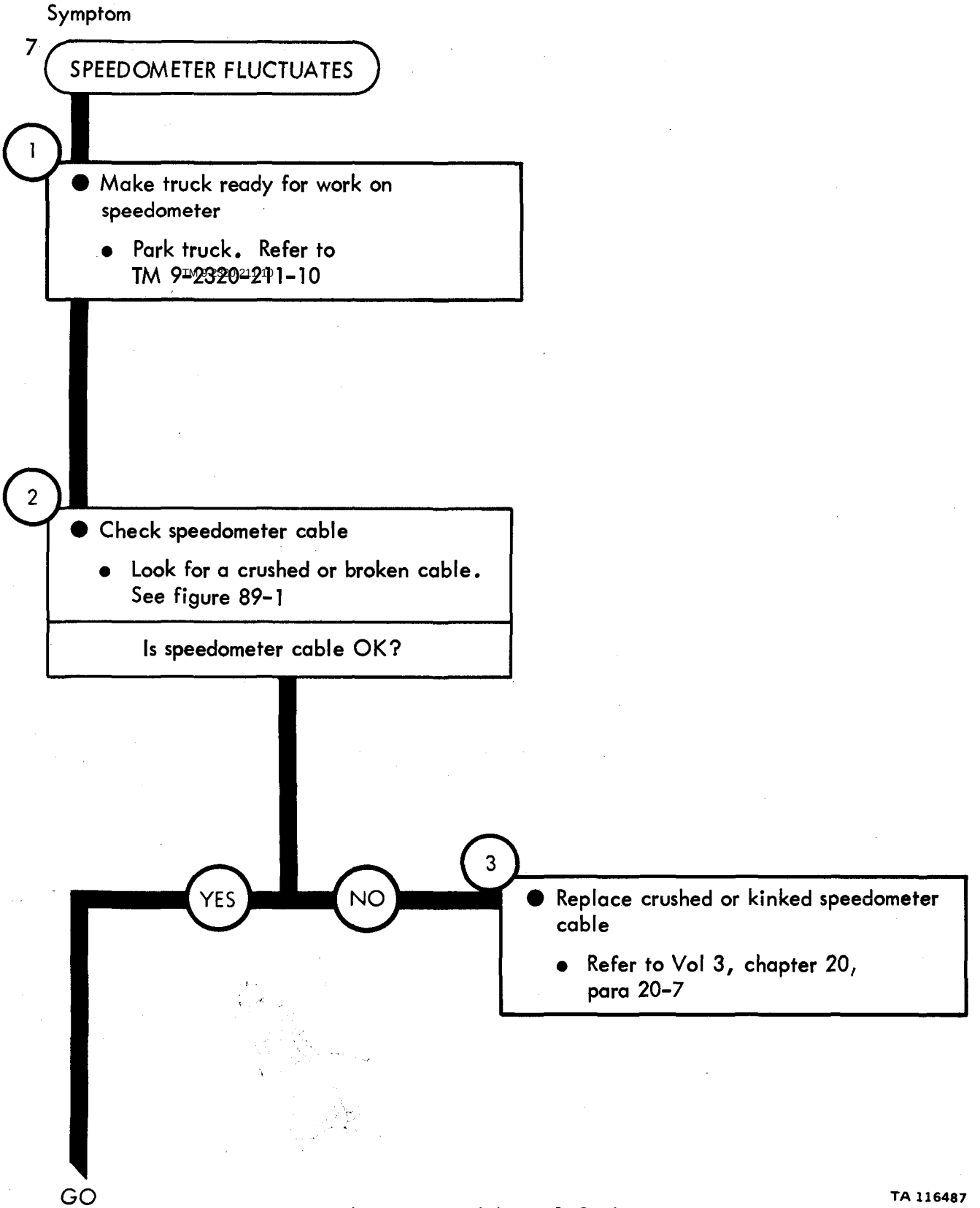
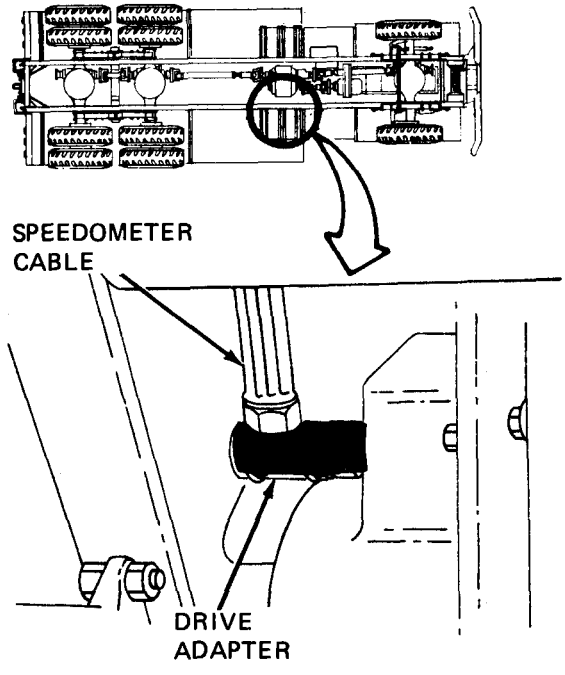



Figure 87-7 (Sheet lof 3)

GO

4

- Set up speedometer test
  - Using 1-inch wrench unscrew and take off speedometer cable from drive adapter assembly
  - Put a variable speed drill on cable core end




NOTE

This next step will need the use of two soldiers. The lead soldier will be called Soldier A and the helper will be called Soldier B

5

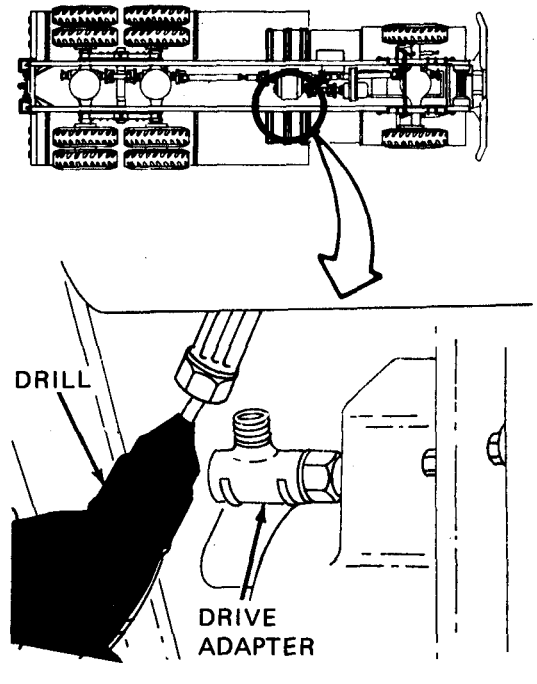
- Test speedometer

SOLDIER B: • Go to driver's seat and watch speedometer

SOLDIER A: • Run drill at a slow and steady speed for about 30 seconds

SOLDIER B: • See if speedometer pointer moves unevenly

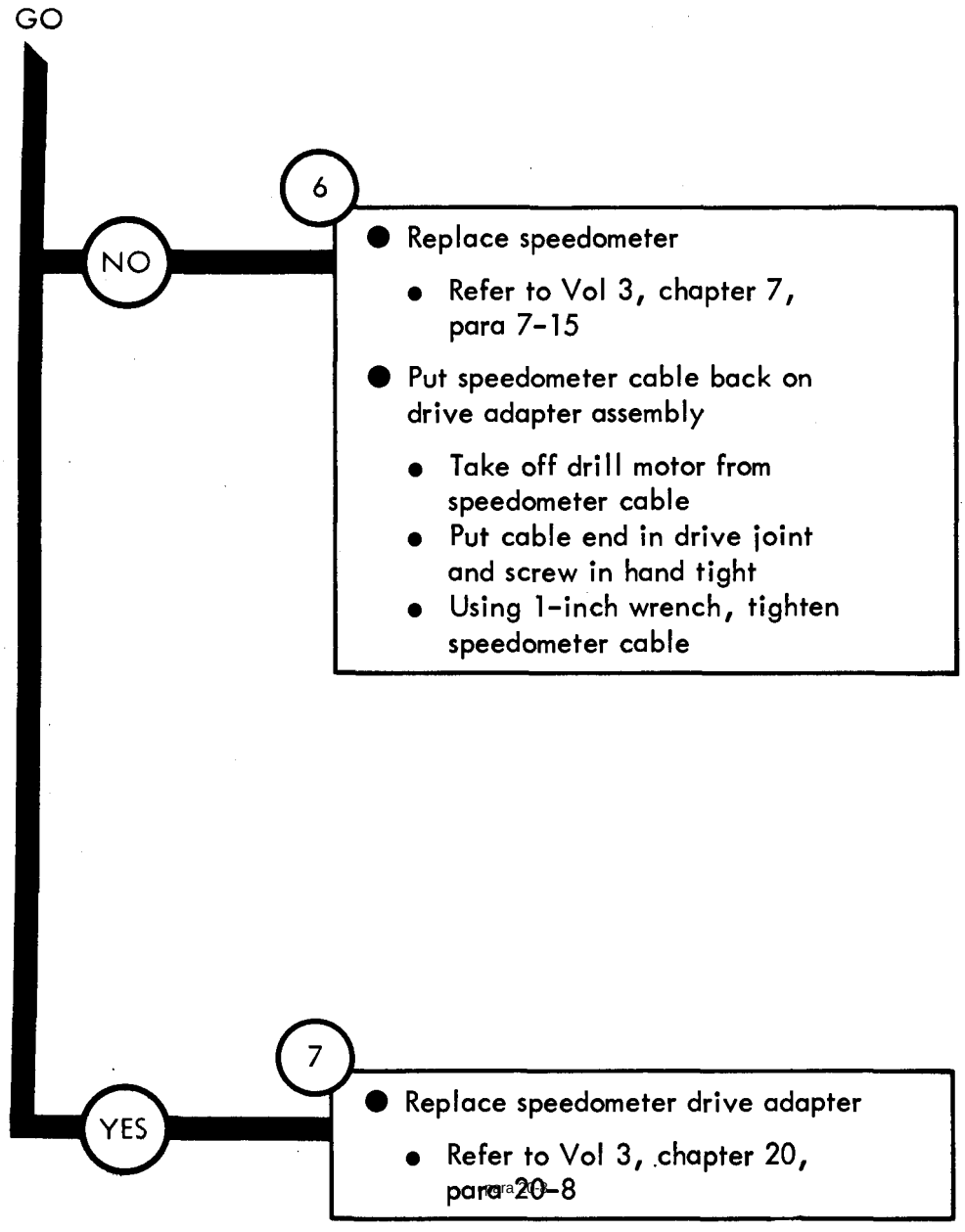
Does speedometer run smoothly?




GO

TA 116488

Figure 87-7 (Sheet 2 of 3)




TA 116489

Figure 87-7 (Sheet 3 of 3)

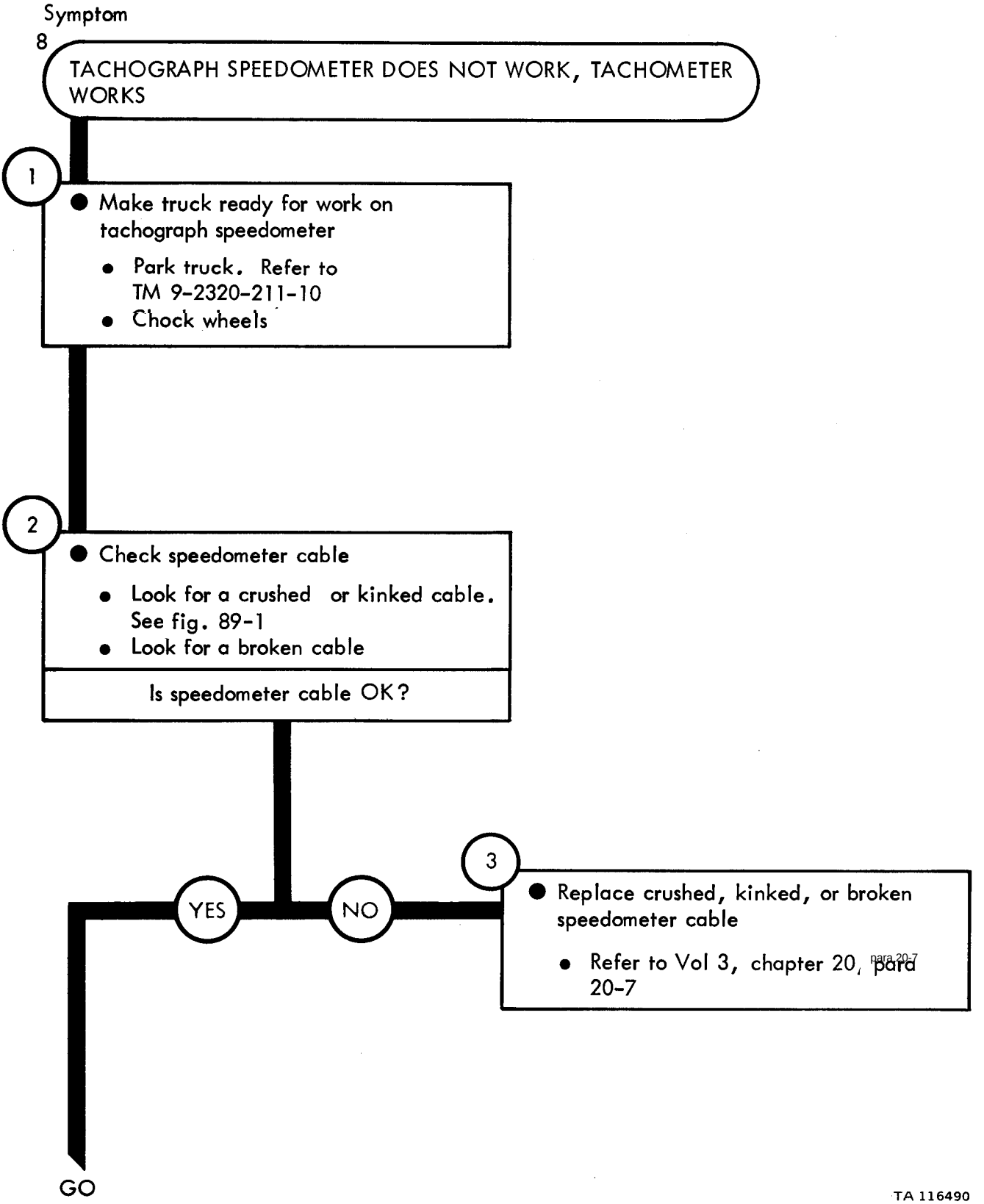
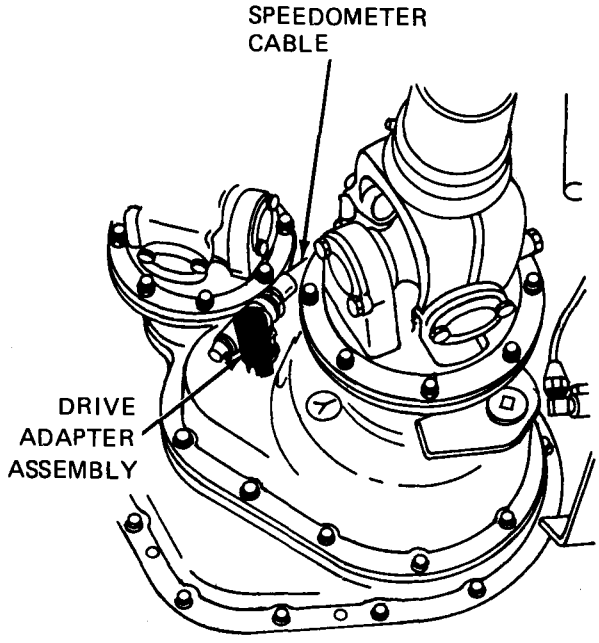



Figure 87-8 (Sheet 1 of 4)

GO

4

- Set up tachograph speedometer test
  - Using 3/4-inch wrench unscrew and take off speedometer cable from drive adapter assembly




NOTE

This next step will need the use of two soldiers. The lead soldier will be called Soldier A, and the helper will be called Soldier B

5

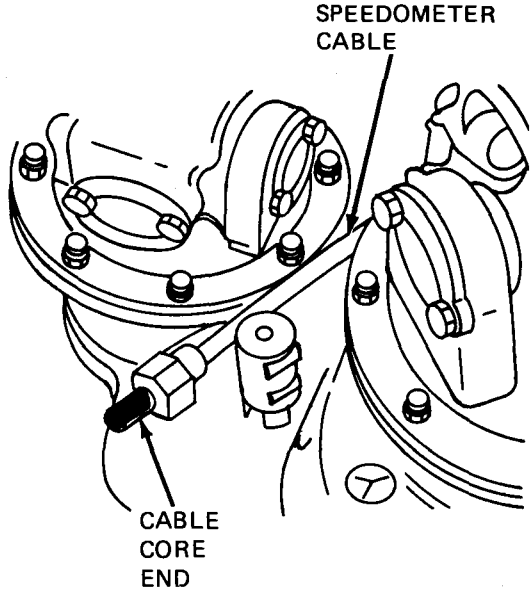
- Test tachograph speedometer

Soldier B: • Go to drivers seat and watch tachograph speedometer

Soldier A: • Turn speedometer cable core to the right as quickly as possible

Soldier B: • See if speedometer pointer moves

Does tachograph speedometer show a reading?




GO

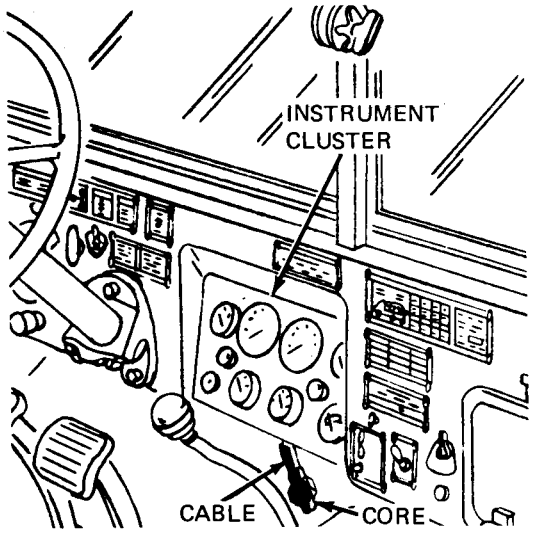
TA 116491

Figure 87-8 (Sheet 2 of 4)

GO

YES

NO




6

- Check for a broken speedometer cable core

Soldier B:
- Using 3/4-inch wrench unscrew and take out speedometer cable from tachograph
- Hold speedometer cable so that core can be seen
- Tell Soldier A, to turn cable core

Soldier A:
- Turn cable core

Soldier B:
- See if speedometer cable core turns

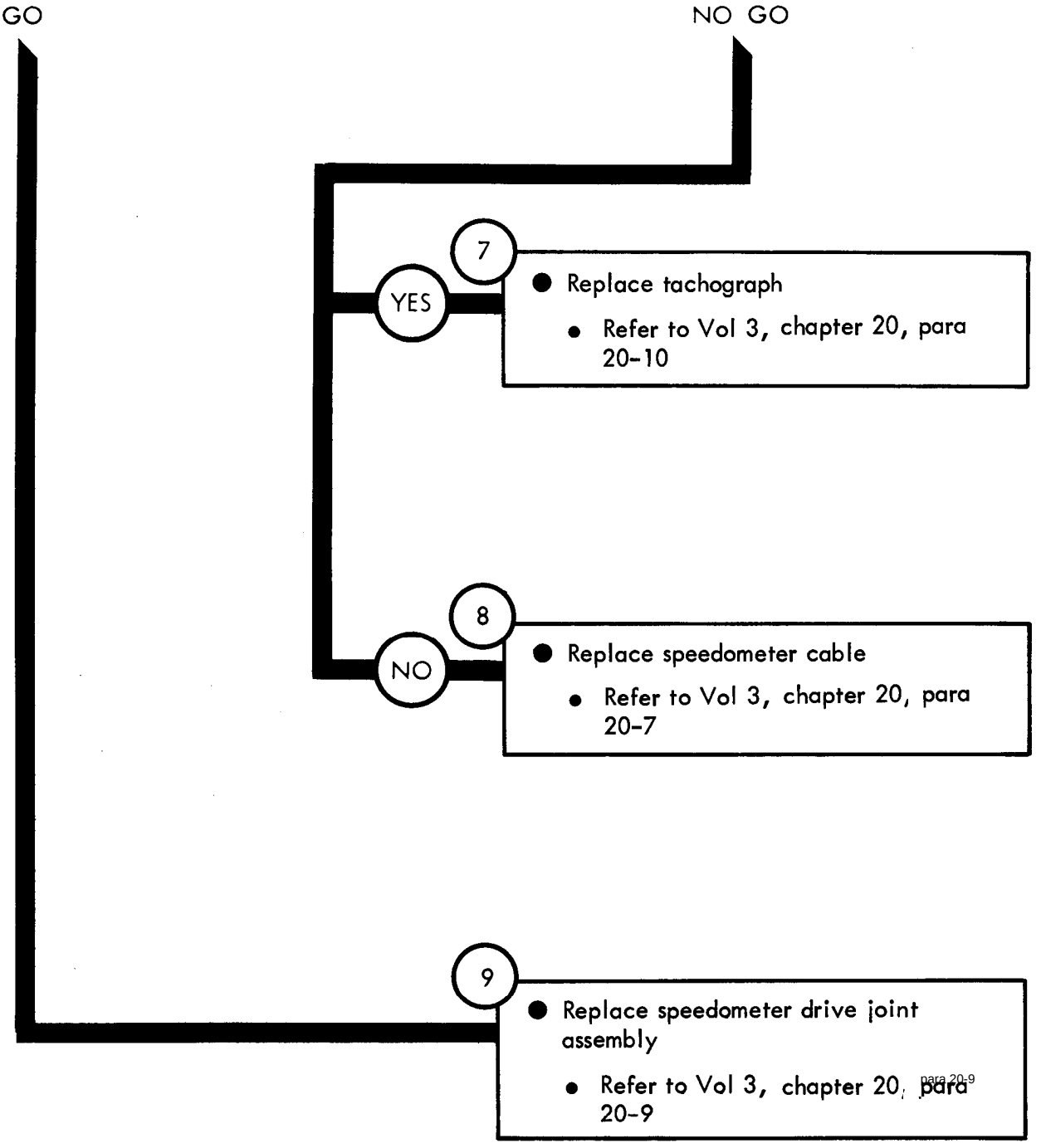
Does speedometer cable core turn?

GO

NO GO

TA 116492

Figure 87-8 (Sheet 3 of 4)




TA 116493

Figure 87-8 (Sheet 4 of 4)

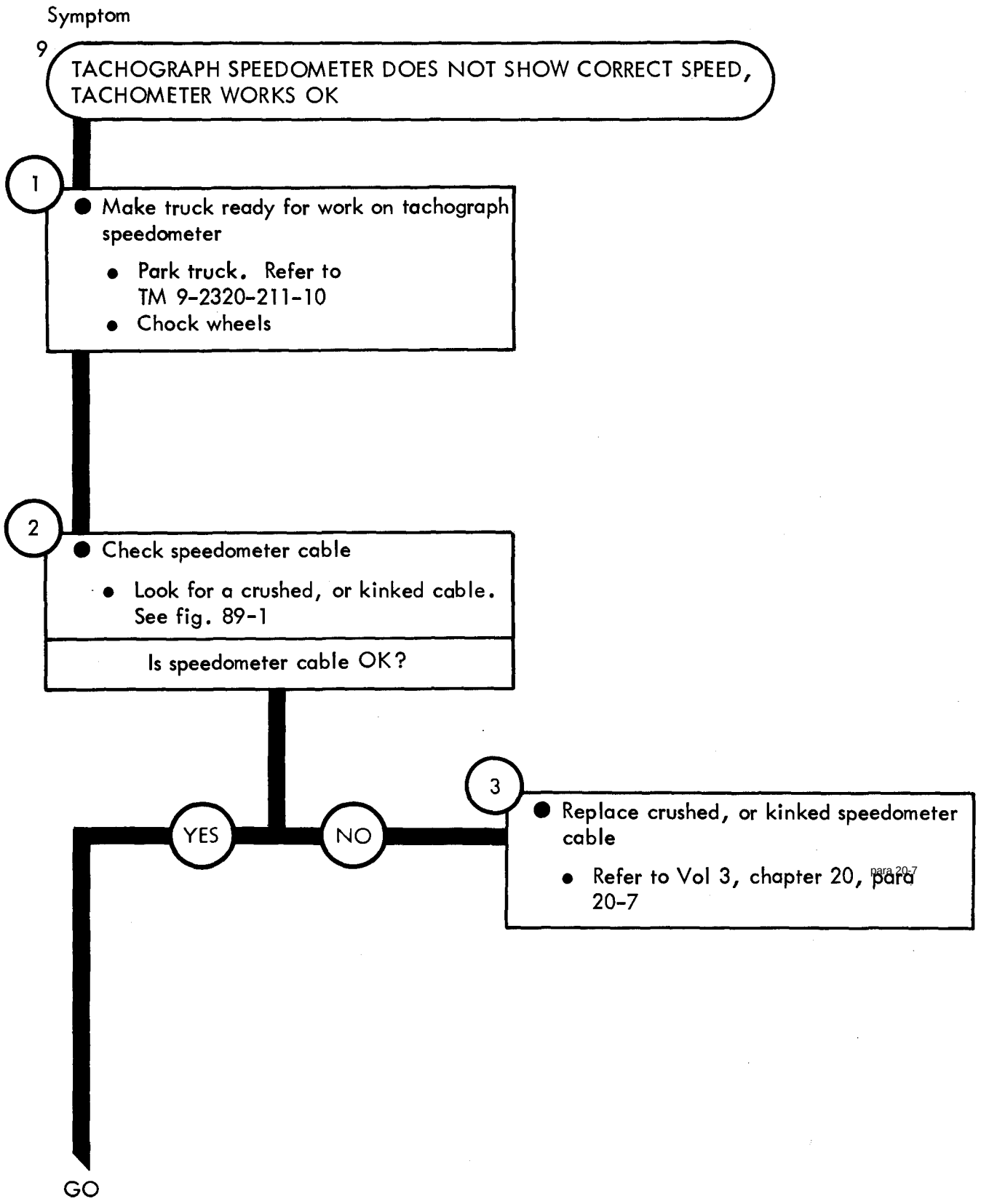
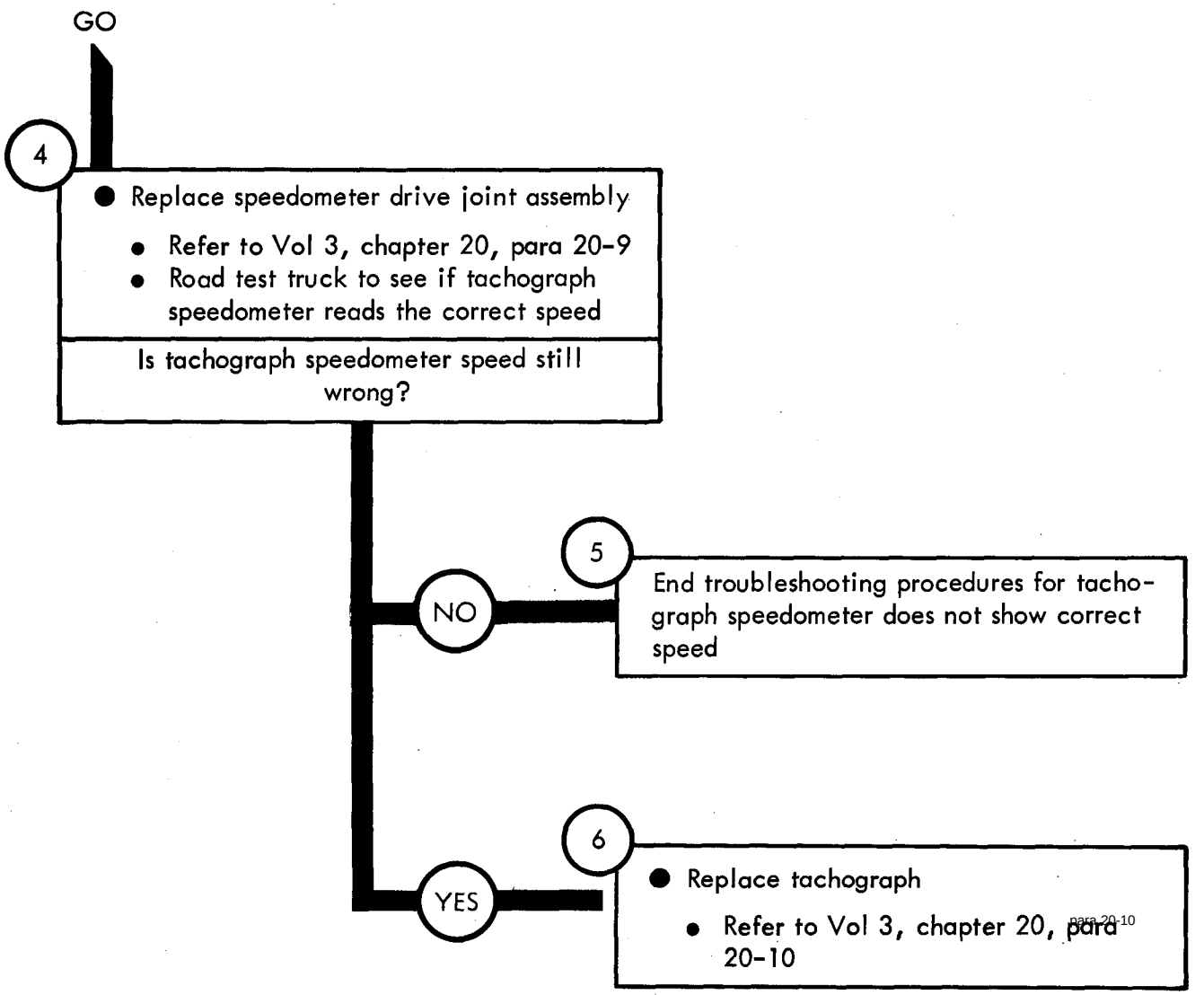



Figure 87-9 (Sheet 1 of 2)




TA 116495

Figure 87-9 (Sheet 2 of 2)

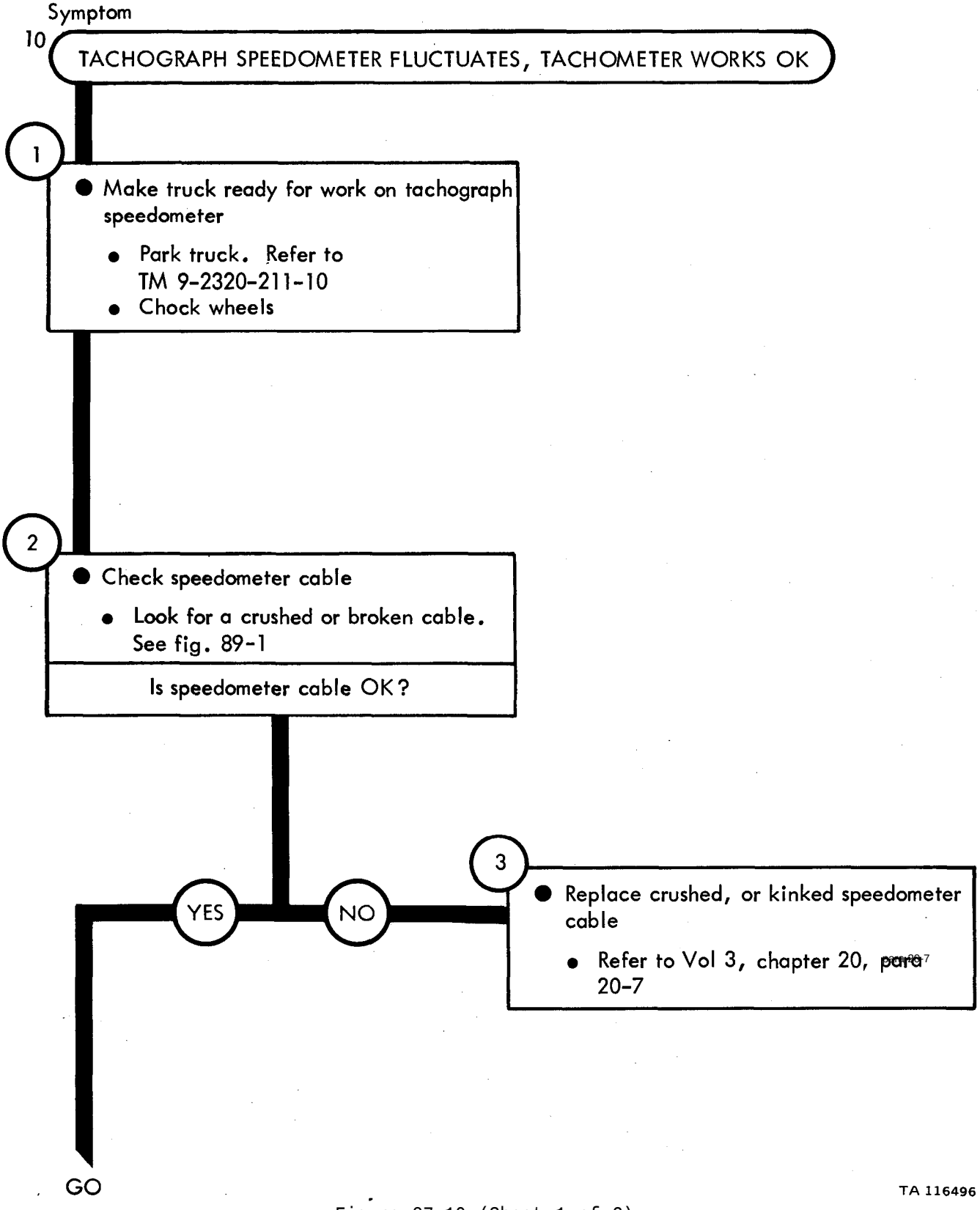
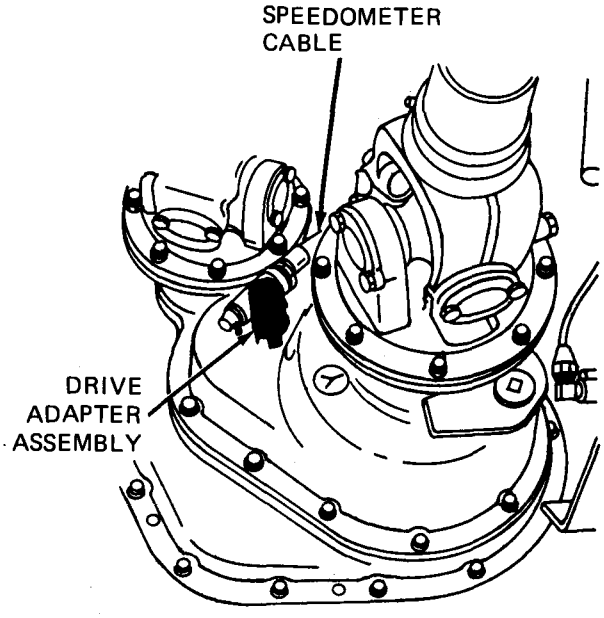



Figure 87-10 (Sheet 1 of 3)

GO

4

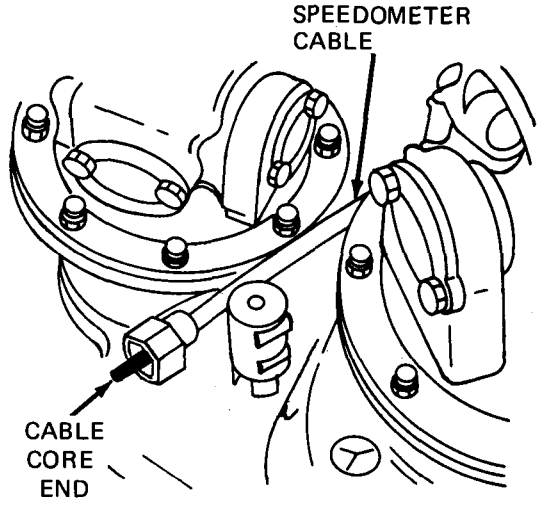
- Set up tachograph speedometer test
  - Using 1-inch wrench unscrew and take off speedometer cable from drive adapter assembly




5

- Test tachograph speedometer
  - Turn cable core end by hand

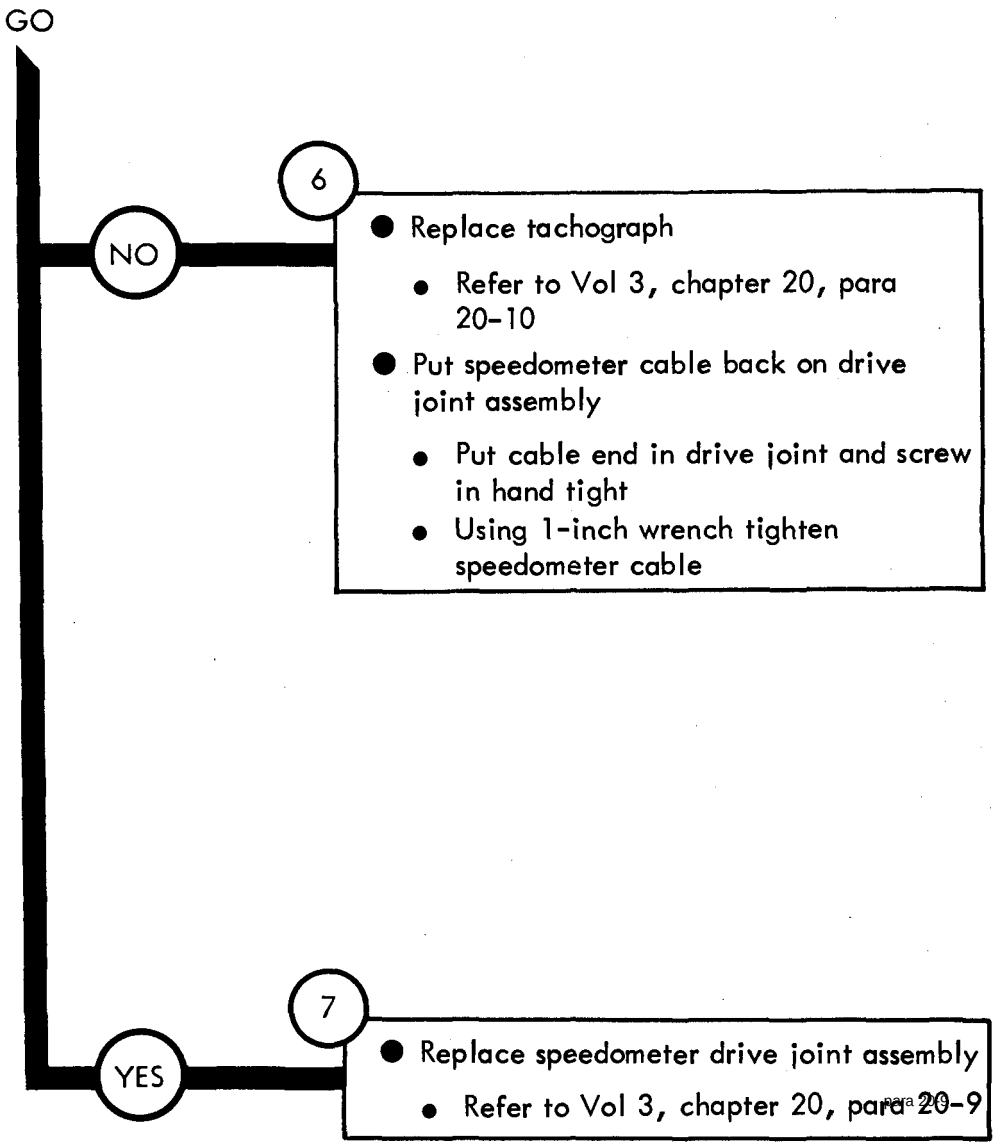
Does cable core end turn smoothly?




GO

TA 116497

Figure 87-10 (Sheet 2 of 3)




TA 116498

Figure 87-10 (Sheet 3 of 3)

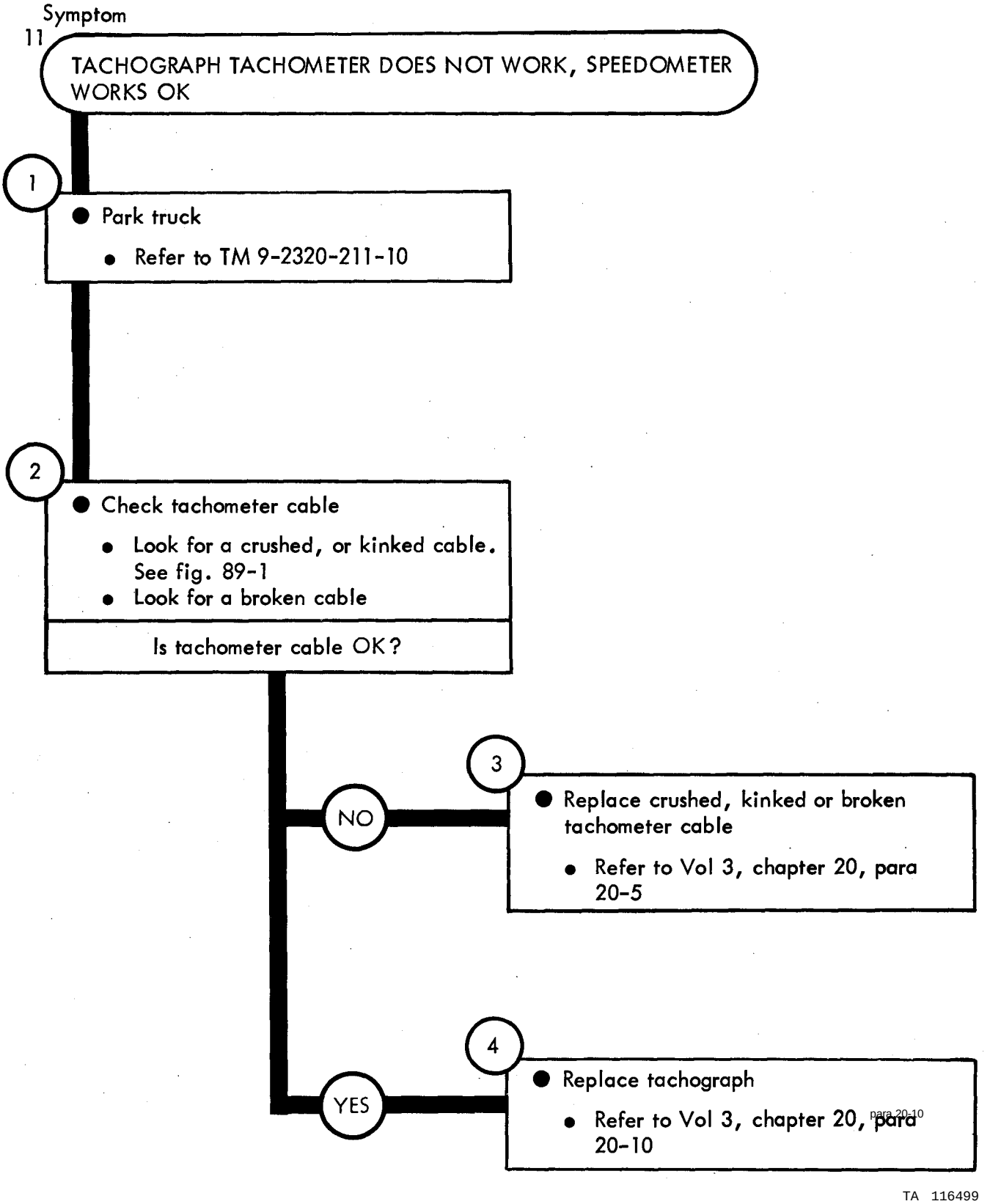
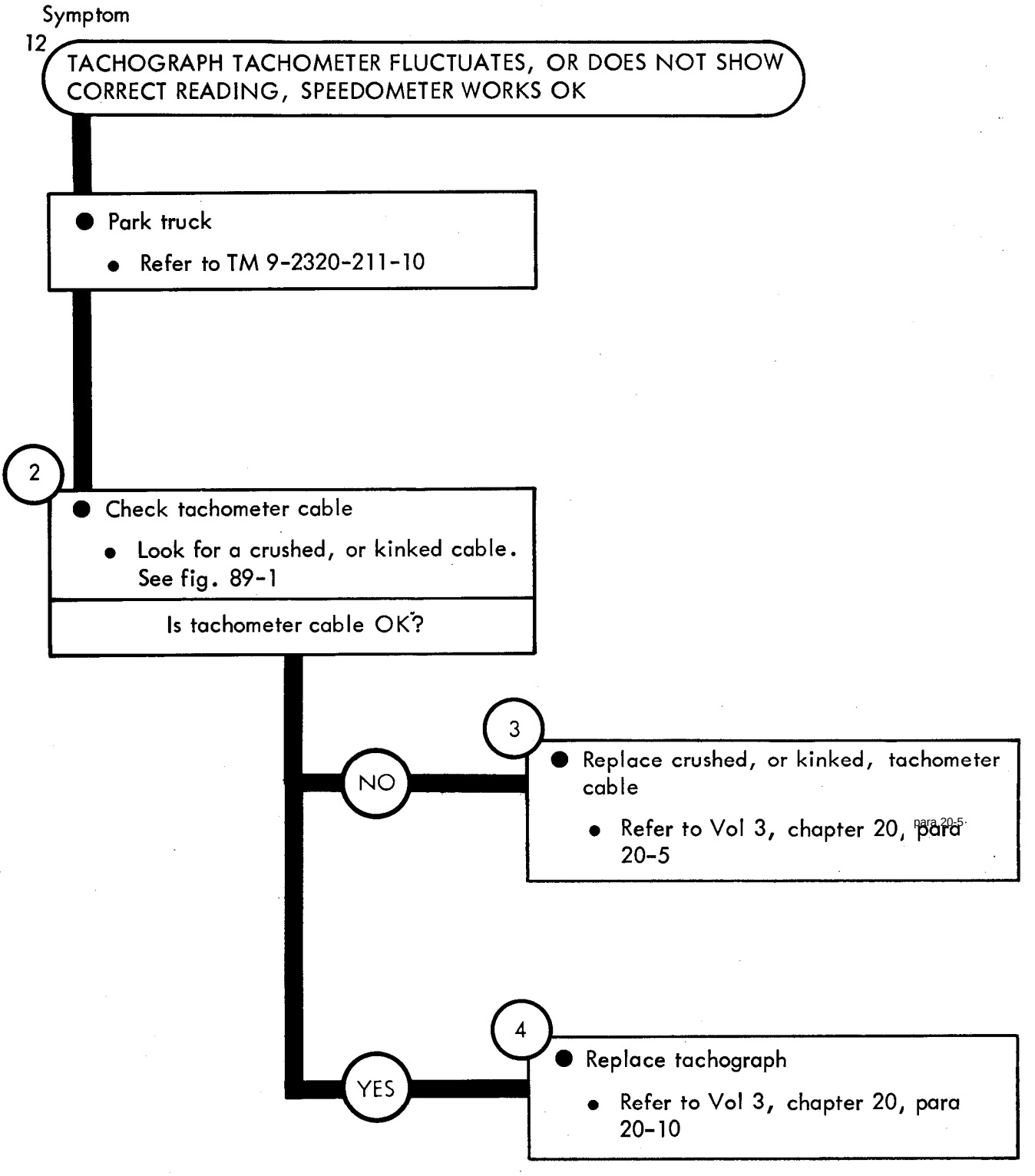



Figure 87-11 (Sheet 1 of 2)




TA 116500

Figure 87-12

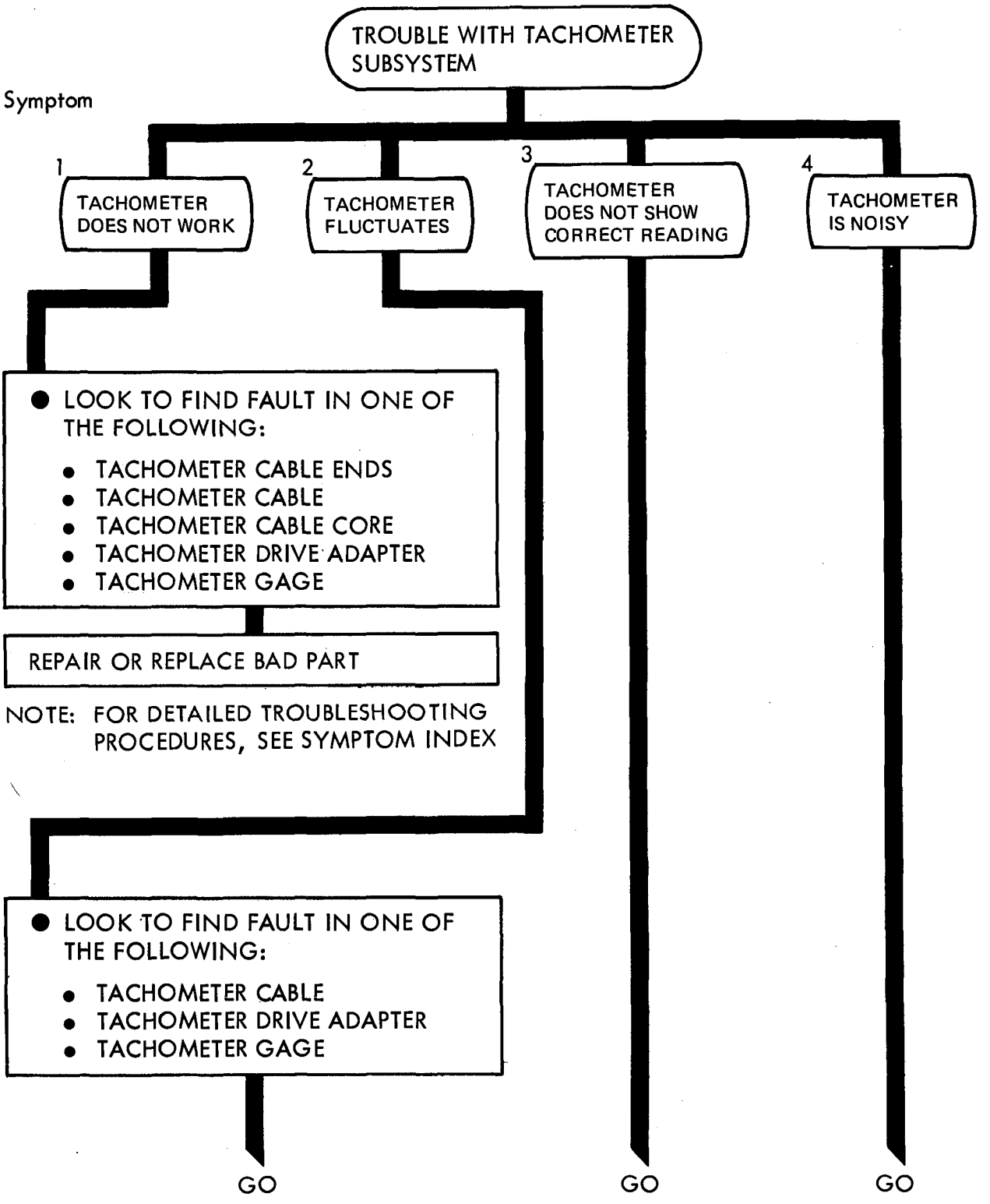
# CHAPTER 88

# NONELECTRICAL GAGES TROUBLESHOOTING SUMMARY

88-1. GENERAL. This chapter gives a summary of troubleshooting procedures given in chapter 87, for the Nonelectrical Gages System.

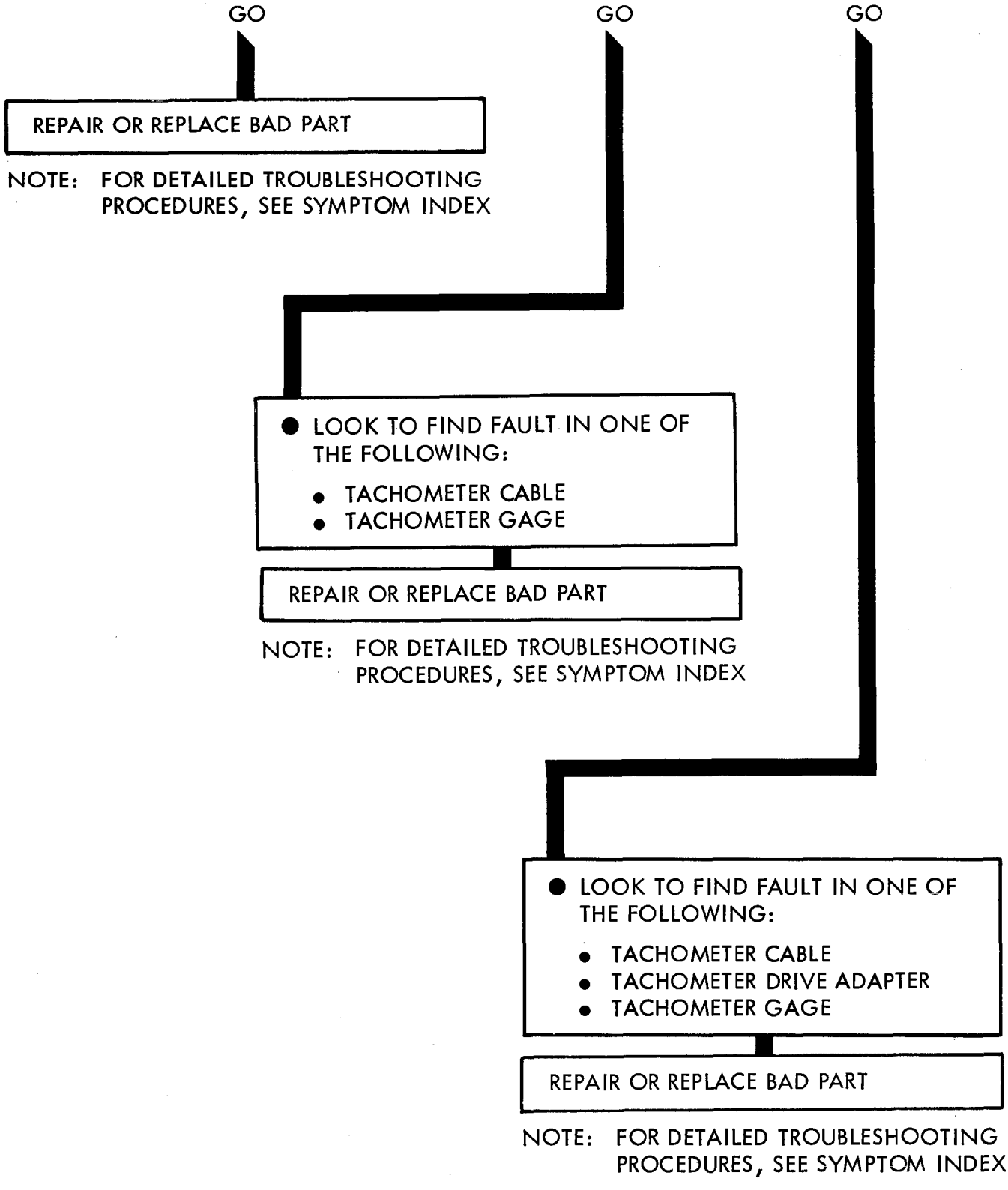
88-2. PROCEDURES. The summary in this chapter covers all fault symptoms found in the detailed troubleshooting procedures in Part 1. Chapter 7 outlines a sample troubleshooting procedure. The summary procedures are based on the "what-to-do" portions of the detailed procedures and do not include the "How-to-do-it" instructions. Warnings, cautions, and notes are given where needed.

NONELECTRICAL GAGES TROUBLESHOOTING SUMMARY



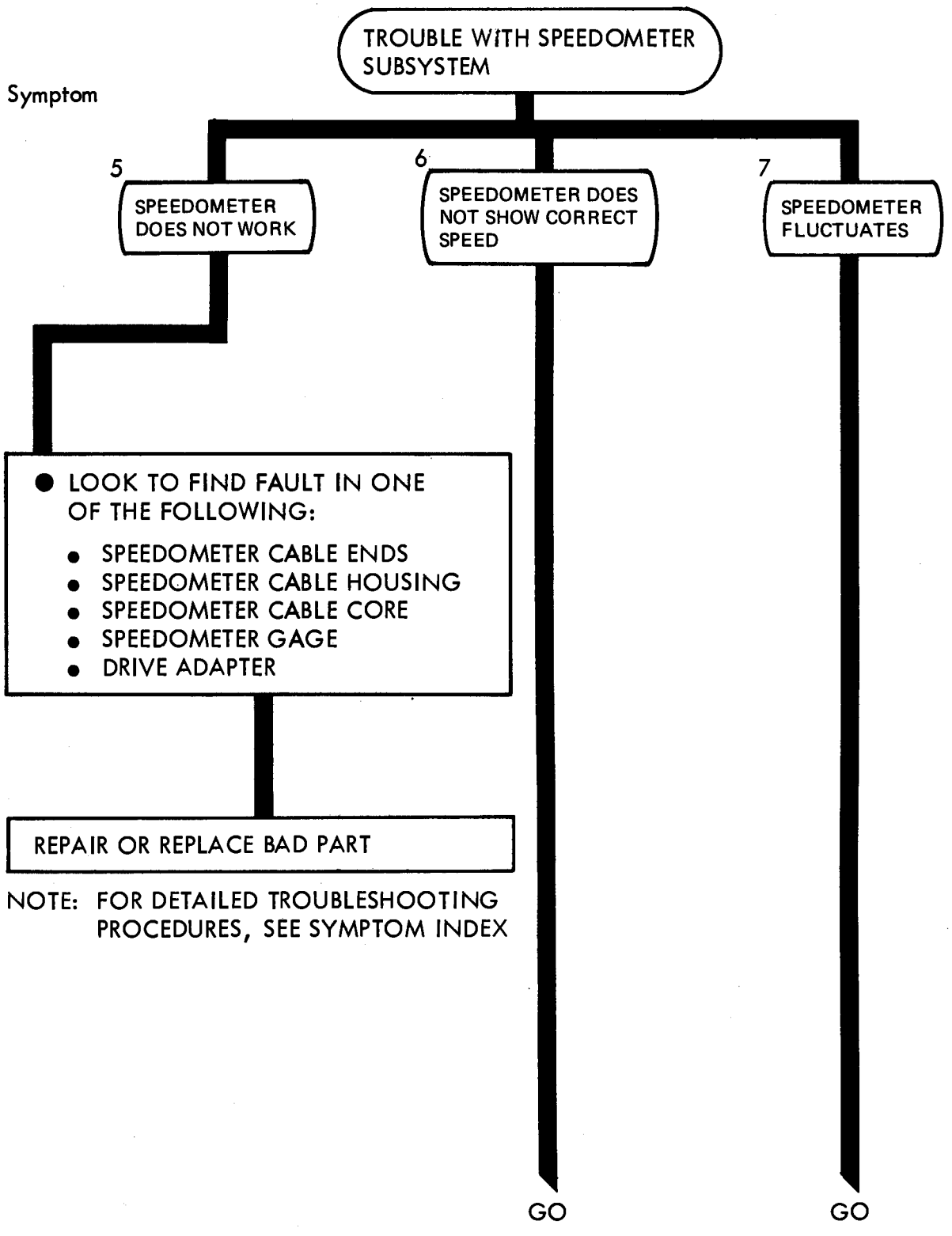

TA 116501

Figure 88-1 (Sheet 1 of 2)



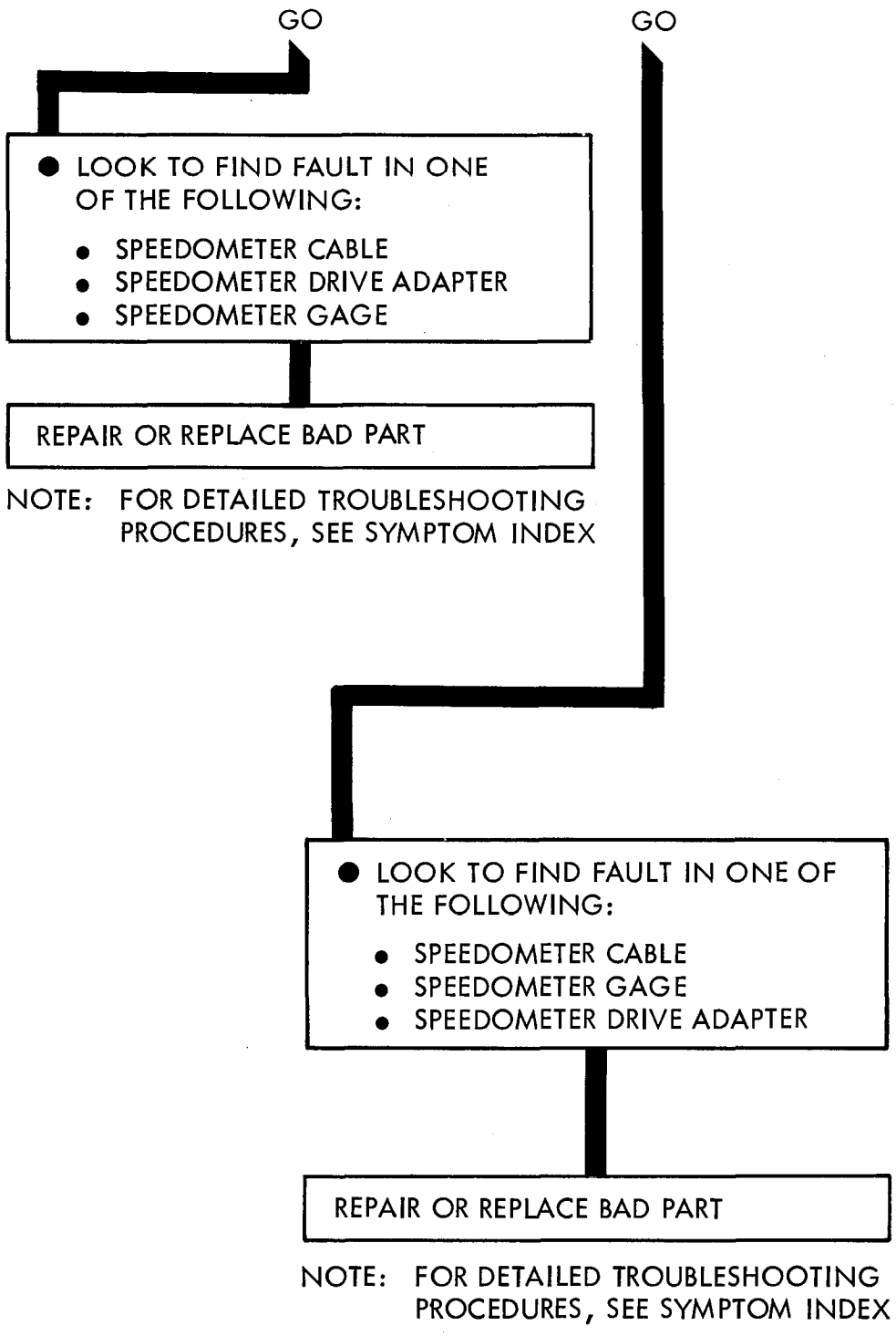

TA 116502

Figure 88-1 (Sheet 2 of 2)



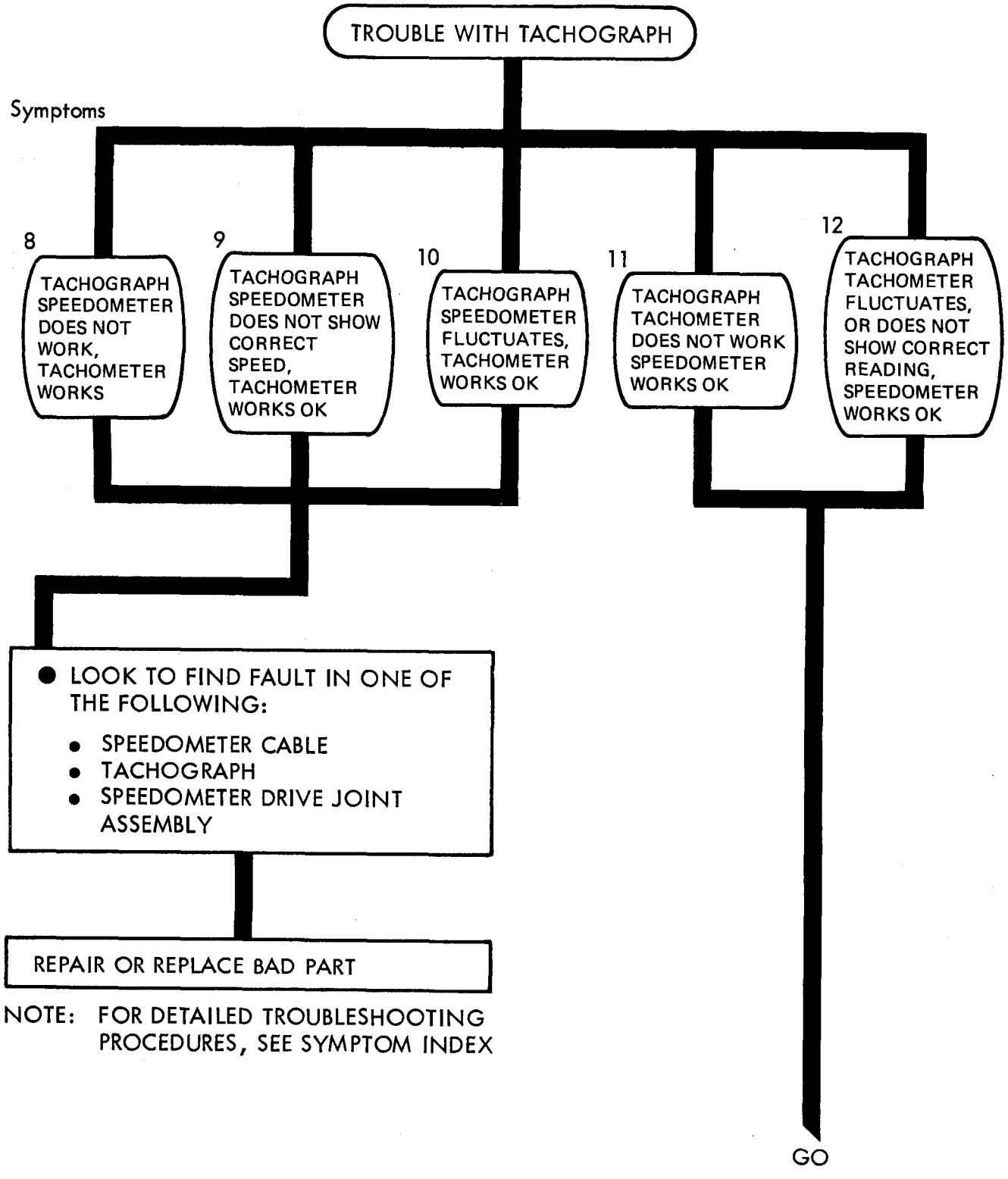

TA 116503

Figure 88-2 (Sheet 1 of 2)



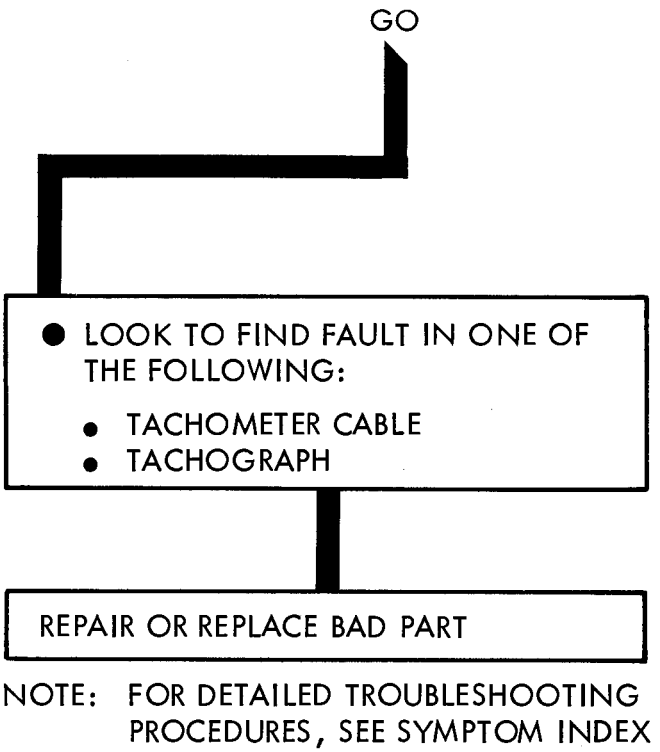

TA 116504

Figure 88-2 (Sheet 2 of 2)




TA 116505

Figure 88-3 (Sheet 1 of 2)




TA 116506

Figure 88-3 (Sheet 2 of 2)

# CHAPTER 89

# NON ELECTRICAL GAGES SUPPORT DIAGRAMS

89-1. GENERAL. This chapter gives the diagrams you need when doing trouble-shooting procedures in chapter 87 (figure 89-1). Table 3-1 is a complete listing of all support diagrams used in this manual.

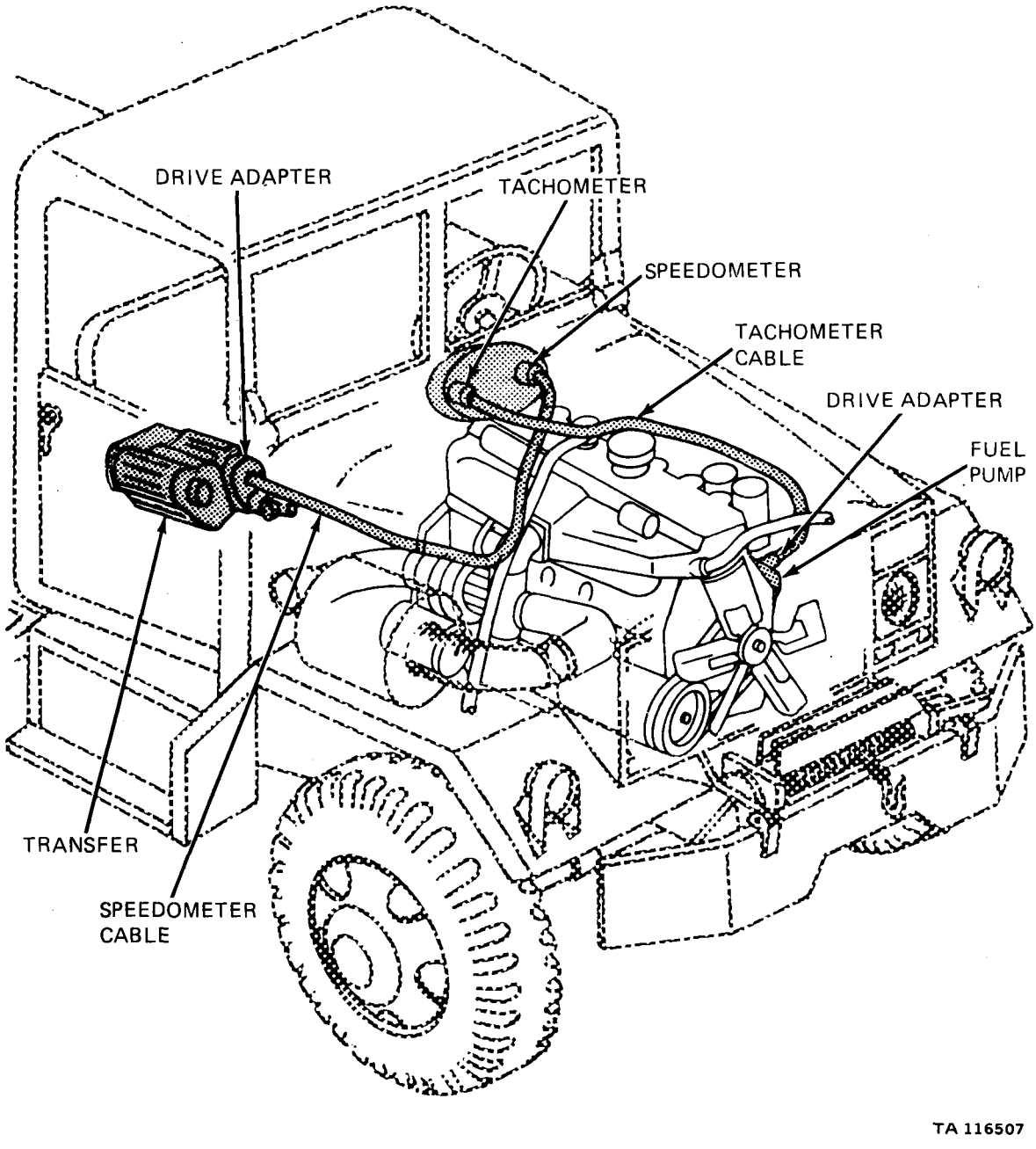



Figure 89-1. Non Electrical Gages Support Diagram

# CHAPTER 90

# NON ELECTRICAL GAGES CHECKOUT PROCEDURES

90-1. GENERAL. This chapter gives procedures for checking out the system after troubleshooting and repair have been done. Procedures are set up in flow chart form showing the checkout steps in order and refering to the fault symptom index when the system does not checkout.

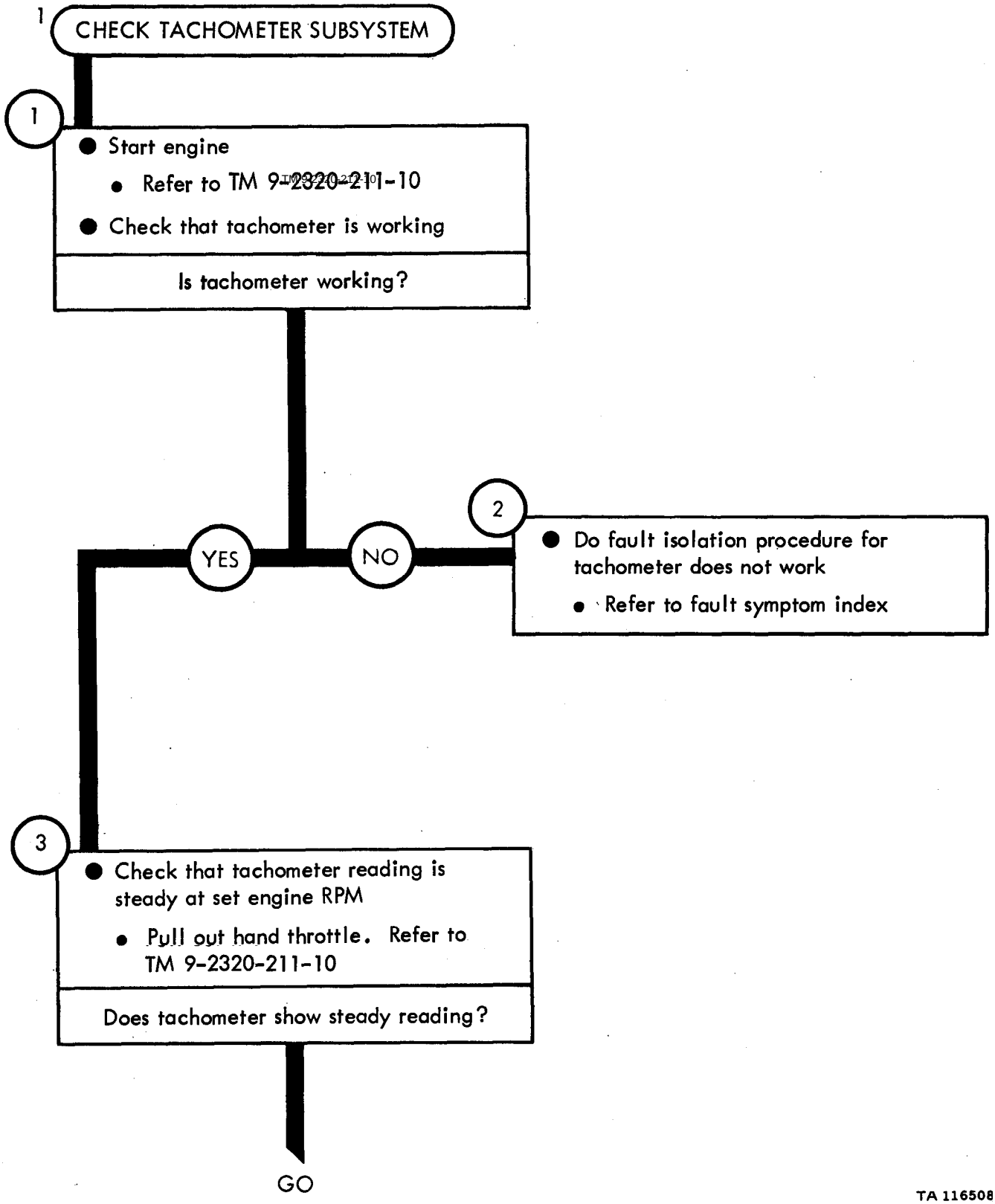



Figure 90-1 (Sheet 1 of 3)

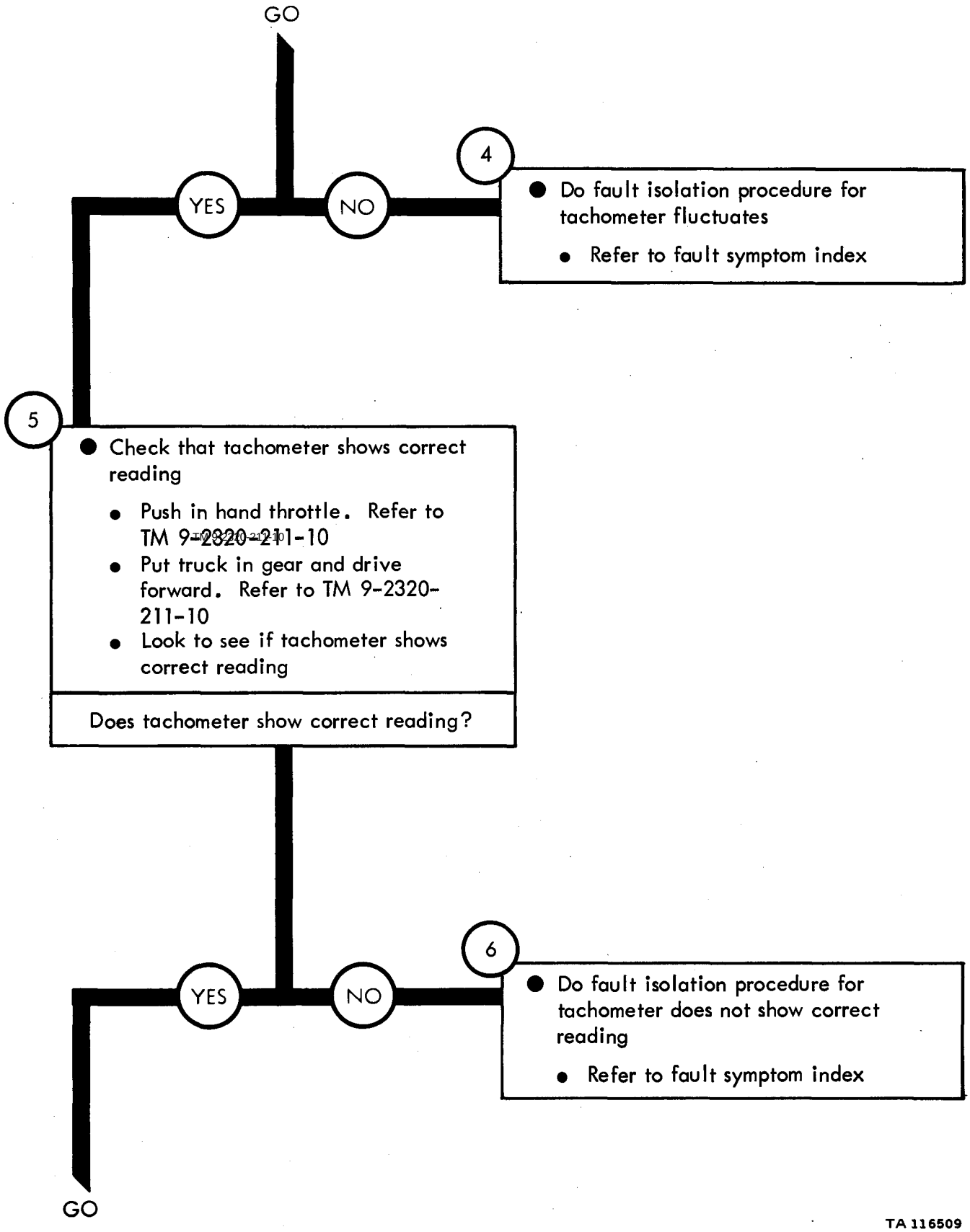
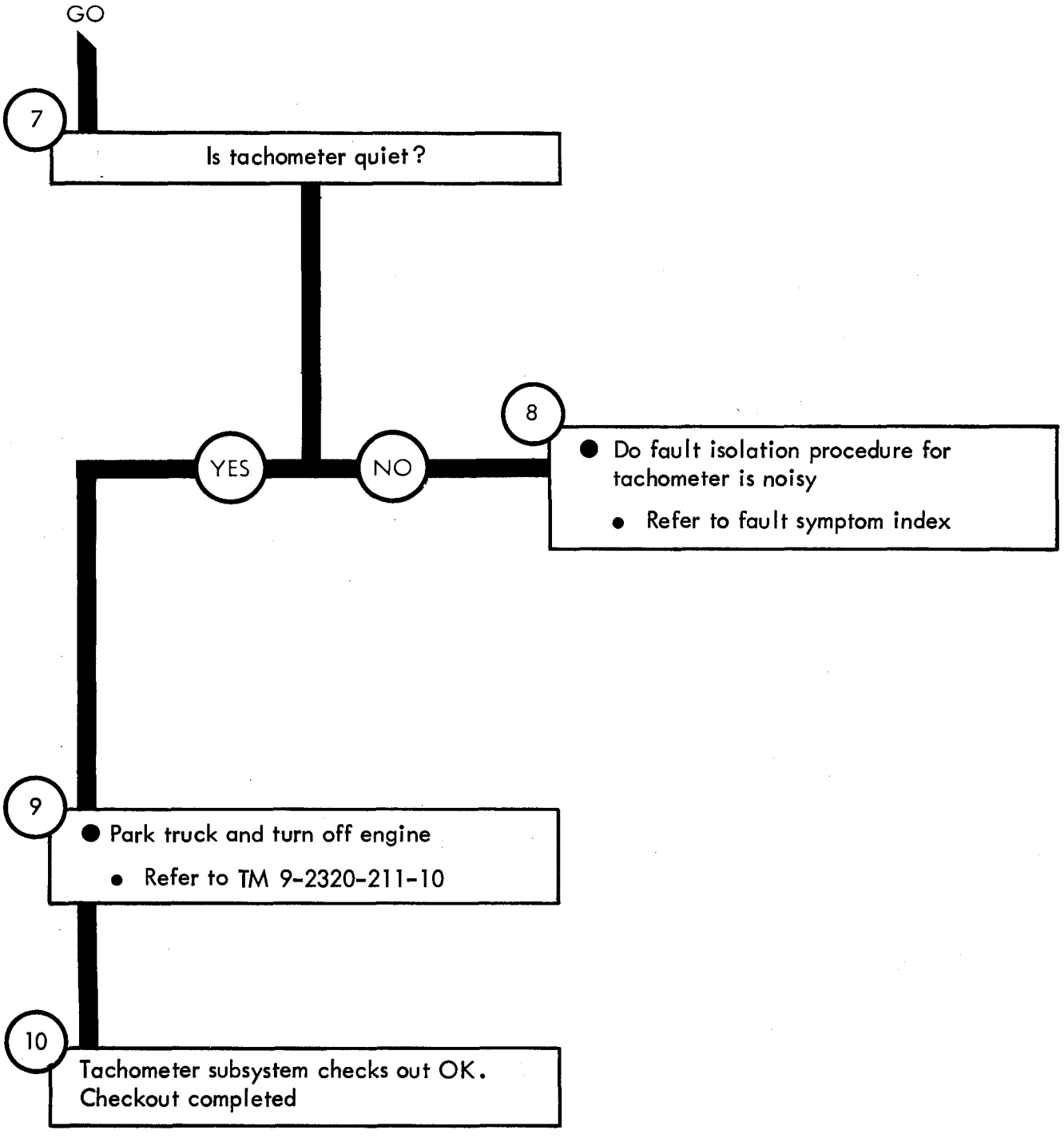



Figure 90-1 (Sheet 2 of 3)




TA 116510

Figure 90-1 (Sheet 3 of 3)

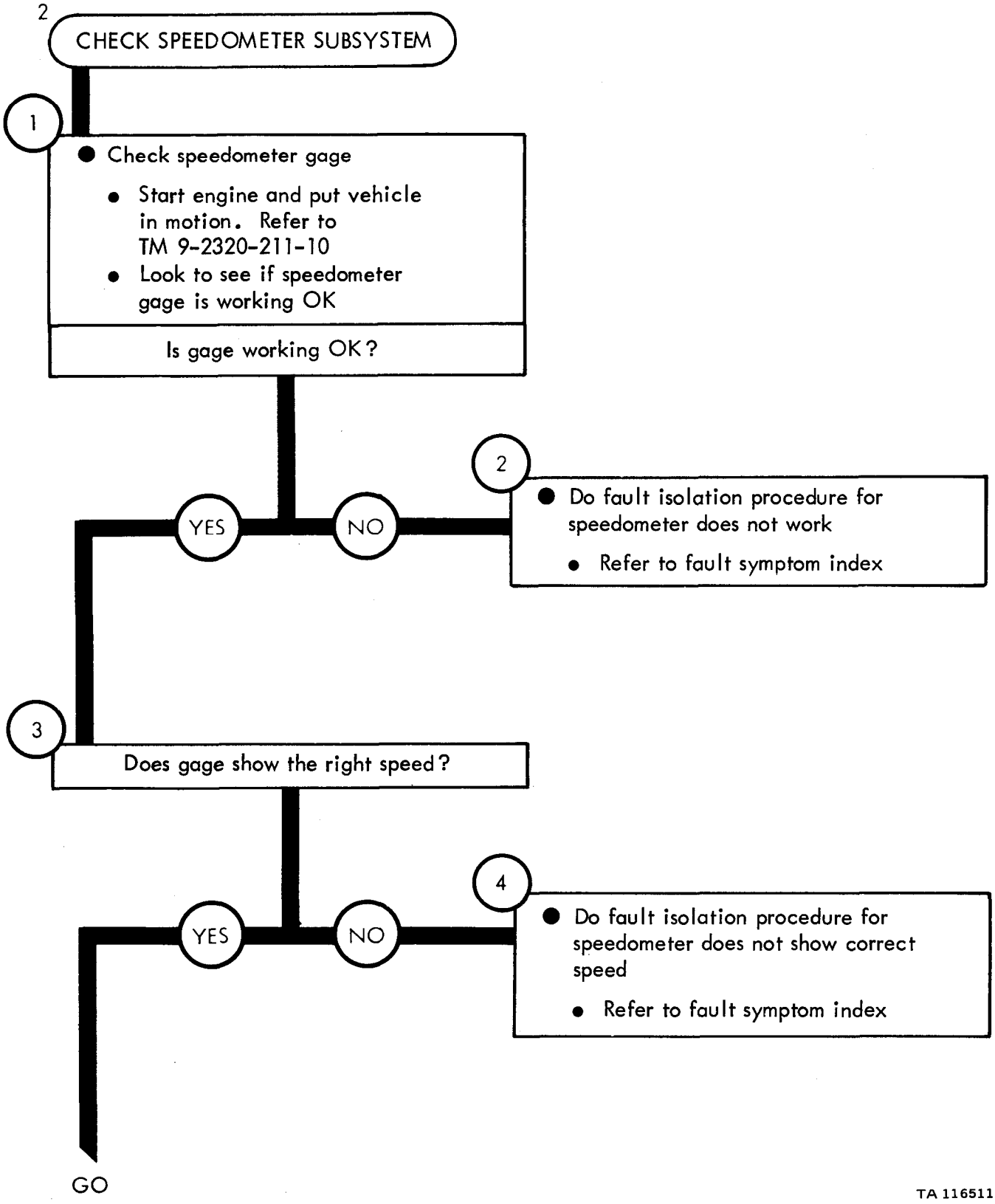
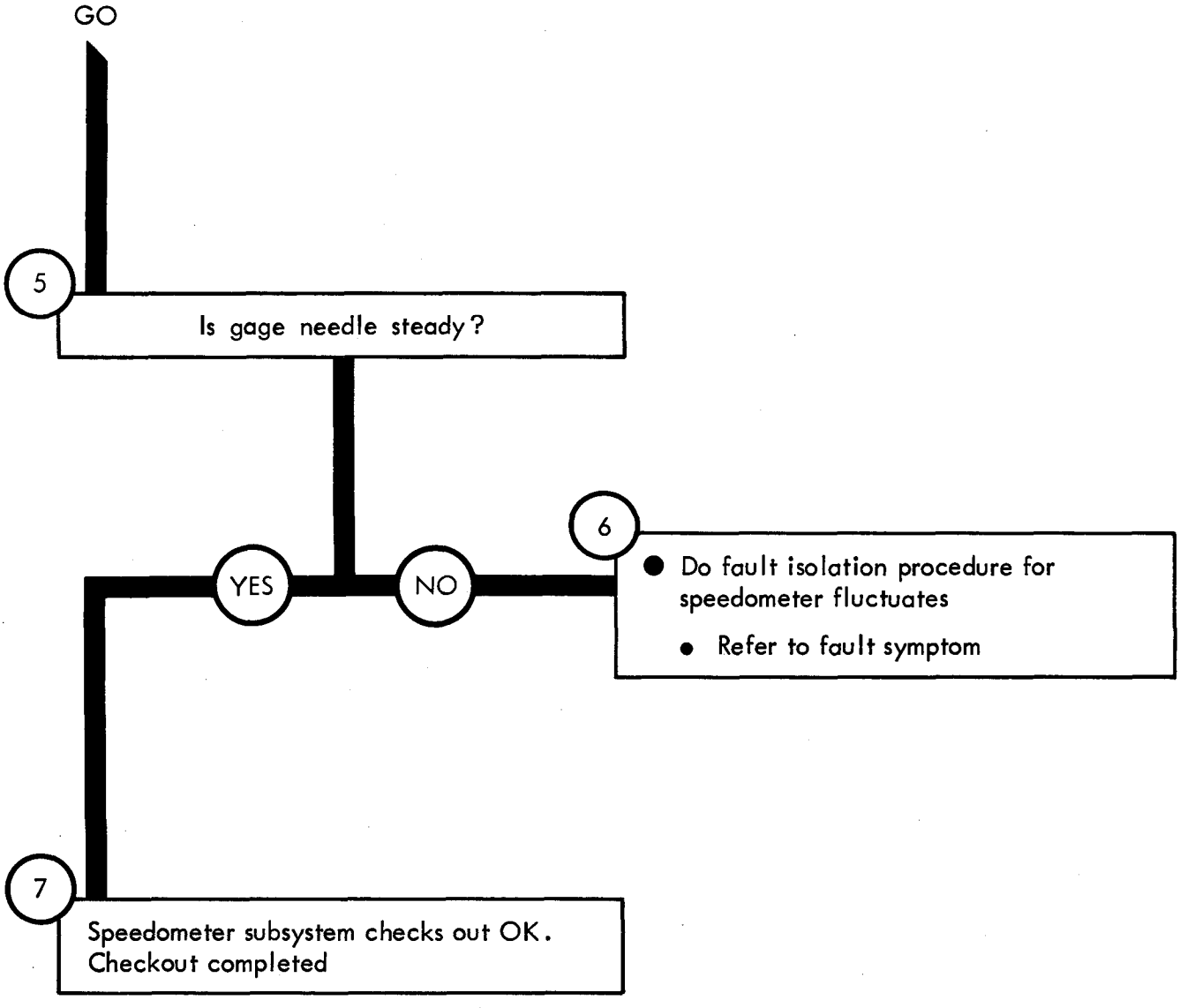



Figure 90-2 (Sheet 1 of 2)




TA 116512

Figure 90-2 (Sheet 2 of 2)

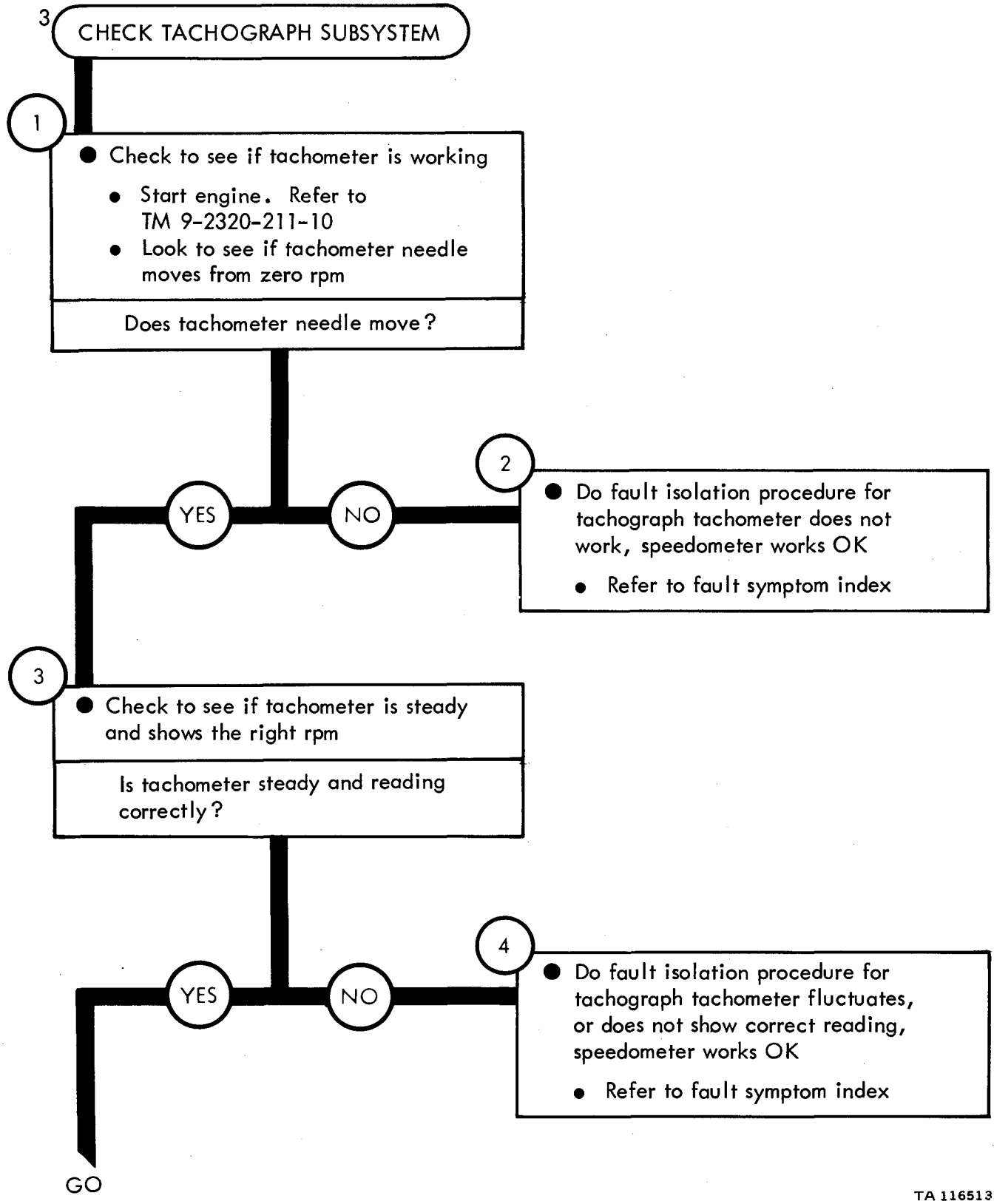



Figure 90-3 (Sheet 1 of 3)

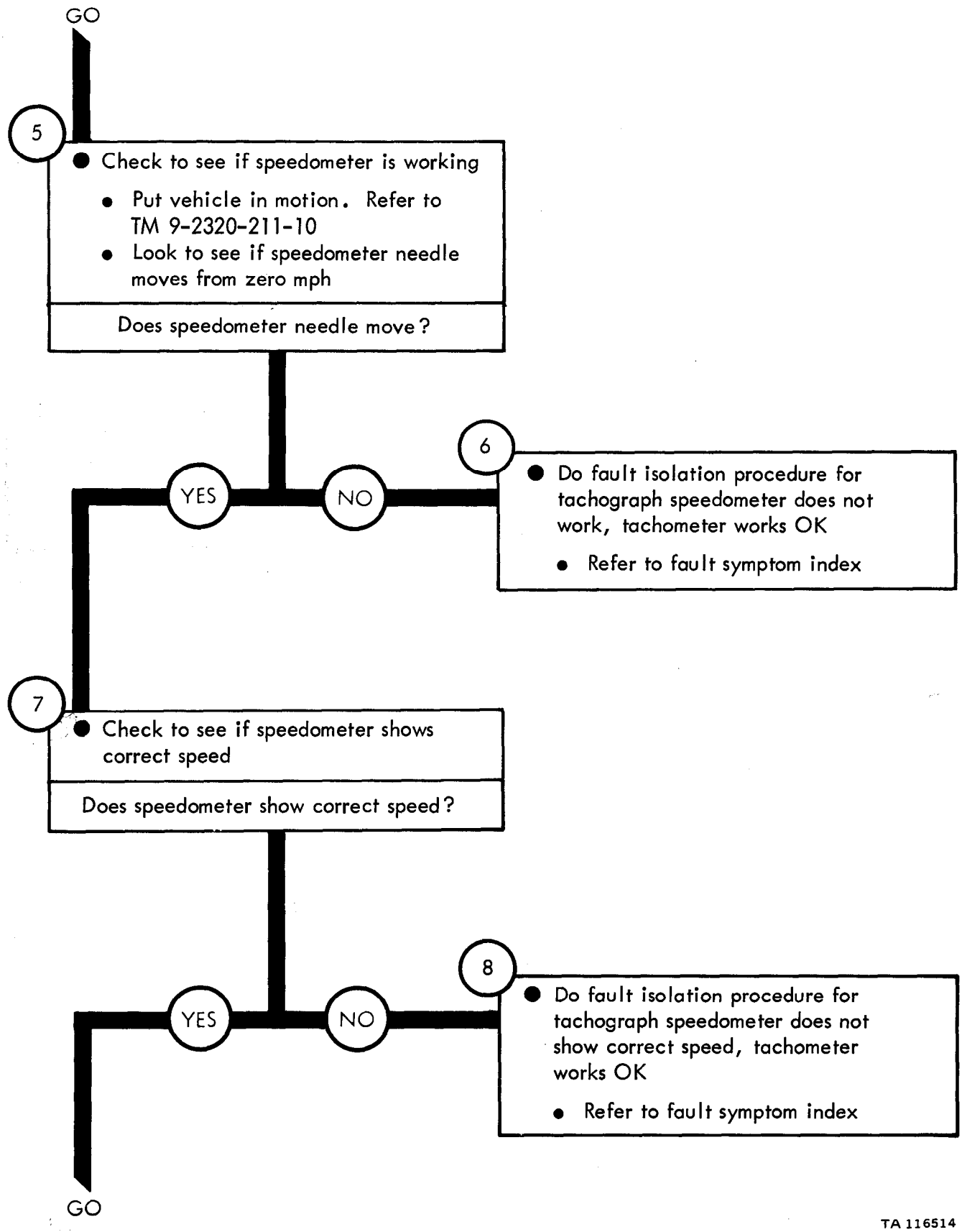
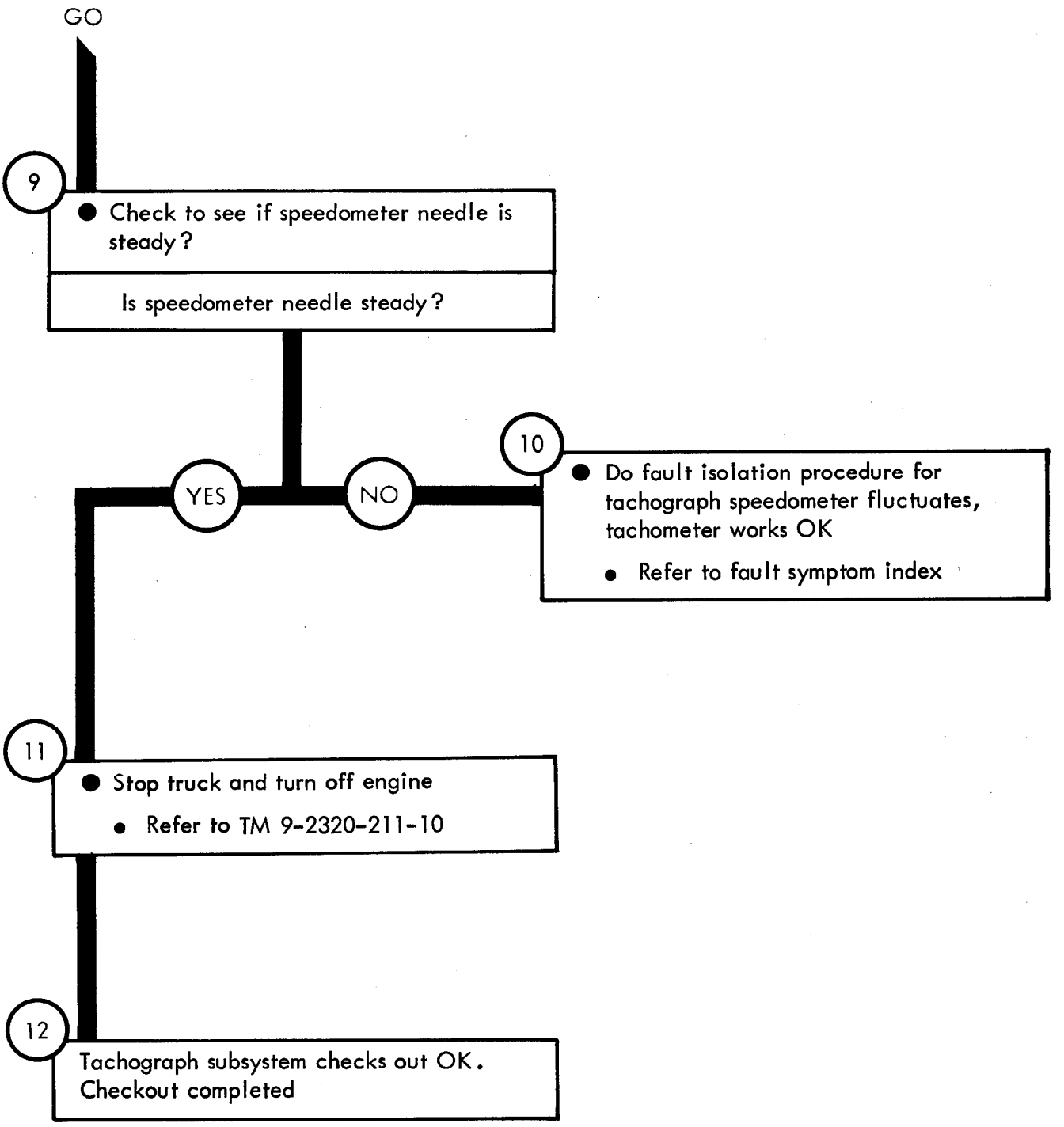



Figure 90-3 (Sheet 2 of 3)




TA 116515

Figure 90-3 (Sheet 3 of 3)

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### LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

### WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 Lb
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

### LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 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 = 1000 Cu Millimeters = 0.06 Cu Inches
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

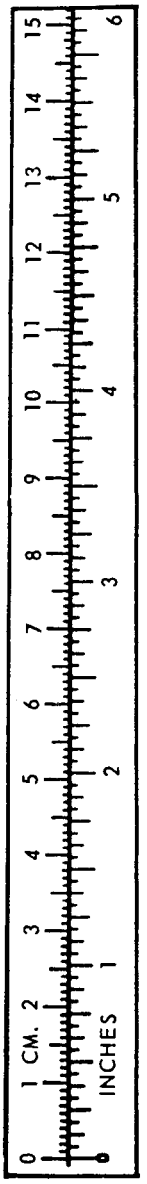
### TEMPERATURE

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

### 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 |
| Milliliters | 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 |




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