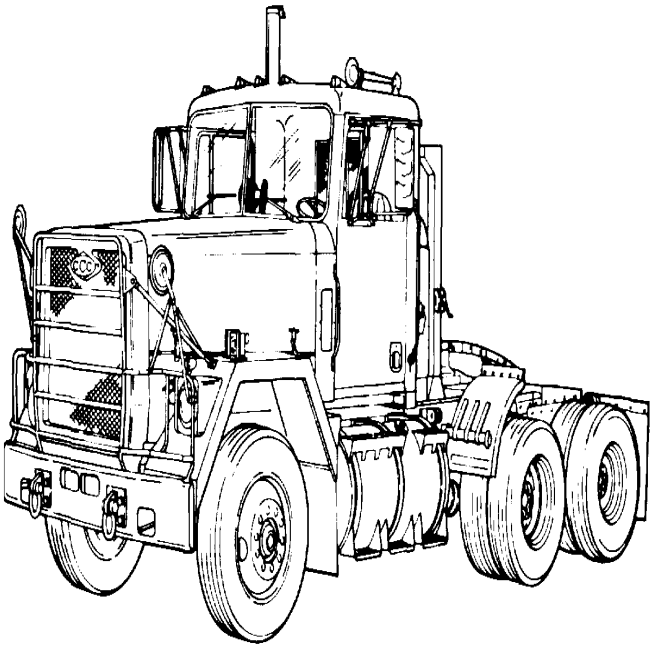
TECHNICAL MANUAL

ORGANIZATIONAL MAINTENANCE

TRUCK TRACTOR, LINE HAUL, 50,000 GVWR, 6 x 4, M915A1

(NSN 2320-01-125-2640)



DECEMBER 1983

HEADQUARTERS, DEPARTMENT OF THE ARMY

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No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D.C , *20* April 1993

TECHNICAL MANUAL
ORGANIZATIONAL MAINTENANCE
TRUCK TRACTOR, LINE HAUL,
50,000 GVWR, 6X4, M915A1
'(NSN 2320-01-125-2640)

TM 9-2320-283-20-1, 8 December 1983, is changed as follows:

1. Remove old pages and insert new pages as indicated below.
2. The Preventive Maintenance Checks and Services have been completely replaced; no change bars or pointing hands will appear on pages 2-3 through 2-28.12.

Remove Pages	*Insert Pages*
2-3 thru 2-28	2-3 thru 2-28.12

3. File this change sheet in the front of the publication for information purposes.

By Order of the Secretary of the Army:

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4047

Distribution:
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WARNING

CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU

Carbon monoxide is without color or smell, but it can kill you. Breathing air with carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, a sleepy feeling, and coma. Brain damage or death can result from heavy exposure. Carbon monoxide occurs in the exhaust fumes of fuel burning heaters and internal combustion engines. Carbon monoxide can become dangerously concentrated under conditions of no air movement. Precautions must be followed to insure crew safety when the personnel heater, main engine, or auxiliary engine of any vehicle is operated for any purpose.

1. DO NOT operate personnel heater or engine of vehicle in a closed place, unless the place has a lot of moving air.
2. DO NOT idle engine for long periods without ventilator blower operating.
3. DO NOT drive any vehicle with inspection plates, cover plates, or engine compartment doors removed, unless necessary for maintenance purposes.
4. BE ALERT at all times during vehicle operation for exhaust odors and exposure symptoms. If either is present, IMMEDIATELY VENTILATE personnel compartments. If symptoms persist, remove affected crew to fresh air; keep warm; DO NOT PERMIT PHYSICAL EXERCISE; if necessary, give artificial respiration.

   FOR ARTIFICIAL RESPIRATION, REFER TO FM2111.

5. BE AWARE: the field protective mask for chemical biological radiological (CBR) protection will not protect you from carbon monoxide poisoning.

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS GOOD VENTILATION.

WARNING

Whenever hood is raised, insert the S-shaped safety hook through the two matching holes in the prop channels to prevent the hood from falling accidentally.

WARNING

Let radiator cool before removing cap. Remove radiator cap in two steps. First, place a thick cloth over the cap and slowly rotate cap counterclockwise to its first stop; pause, and let pressure escape from cooling system. Then rotate cap further counterclockwise until you can remove it. Failure to follow this procedure can result in serious burns.

WARNING

Do not smoke, have open flames, or make sparks around the batteries, especially if the caps are off. Battery gases can explode and cause injury.

WARNING

Particles blown by compressed air are hazardous. Always direct air stream away from the user and other persons in the area. User must wear a safety eyeshield when using compressed air in cleaning.

WARNING

Improper cleaning methods and use of unauthorized cleaning solvents could injure personnel and damage equipment. See TM 9-247 for proper cleaning methods and authorized solvents.

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personnel protective equipment (goggles/shield, gloves, etc.).

WARNING

Ether is highly explosive. Dispose of ether cylinders properly. Be alert for the strong odor of spilled ether. Guard against flame or sparks in work area when servicing ether cylinder.

WARNING

During normal operation, the exhaust pipes and muffler can become very hot. Be careful not to touch these components with your bare hands. Do not allow your body to come in contact with the hot pipes or muffler. Exhaust system components may be hot enough to cause serious burns.

WARNING

Cooling system components become hot during operation. To avoid personal injury, do not service cooling system components until cooling system has cooled down.

WARNING

Always remove negative battery ground cables first and install them last to avoid sparks that can cause an explosion. Failure to follow this precaution may result in serious injury to you and other personnel.

WARNING

Transmission oil is hot. Use care when draining transmission oil to prevent personal injury.

WARNING

Never work on air system components without first draining air pressure. Failure to follow this precaution can result in serious injury.

TECHNICAL MANUAL
TM 9-2320-283-20-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 8 December 1983

ORGANIZATIONAL MAINTENANCE MANUAL

TRUCK TRACTOR, LINE HAUL, 50,000 GVWR, 6 X 4, M915A1

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 20282 located in the back of this manual directly to Commander, U.S. Army Tank Automotive Command, ATTN:DRSTAMB, Warren, MI 48090. A reply will be furnished to you.

VOLUME 1 OF 3

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Page

VOLUME 2 OF 3

Page

Section VI ELECTRICAL SYSTEM (Continued)

Page

Page

Section XI BRAKE SYSTEM (Continued).

VOLUME 3 OF 3 Page

Page

HOW TO USE THIS MANUAL

As a maintenance technician, you are responsible for maintaining the equipment covered in this manual. The best way to do this is with the aid of your maintenance manual. Below is a sample problem.

PROBLEM: Vehicle operator reports that the engine cranks but fails to start.

1. Turn to the cover of your manual.

   On the righthand side you will find a listing for "TROUBLESHOOTING." Along with the listing is a page number and a black marker. Follow either the page number reference or the black marker to the first page in the troubleshooting section.

2. What is the quickest way to find the solution to the problem?

   Turn to paragraph 2-10.

   This is the "TROUBLESHOOTING SYMPTOM INDEX." Follow the numerical listing "ENGINE" until you see item 2, "Engine cranks but fails to start." Now go to the page listed directly to the right of the malfunction.

3. What caused the problem?

   Turn to paragraph 2-11.

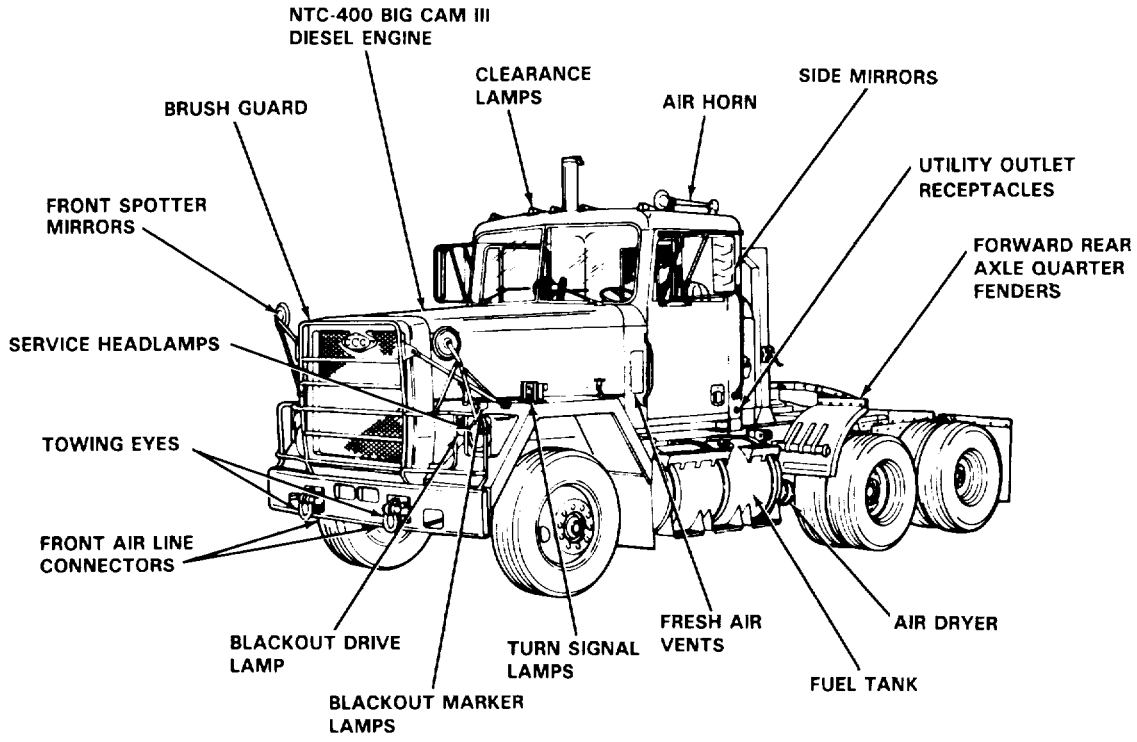
   These are the "TROUBLESHOOTING PROCEDURES." Locate the symptom "Engine cranks but fails to start." Here you will find the most likely causes of the problem. After following each step in the order listed and finding the problem, let's say, "The fuel solenoid valve is defective," go to the referenced paragraph.

4. How do you fix the problem?

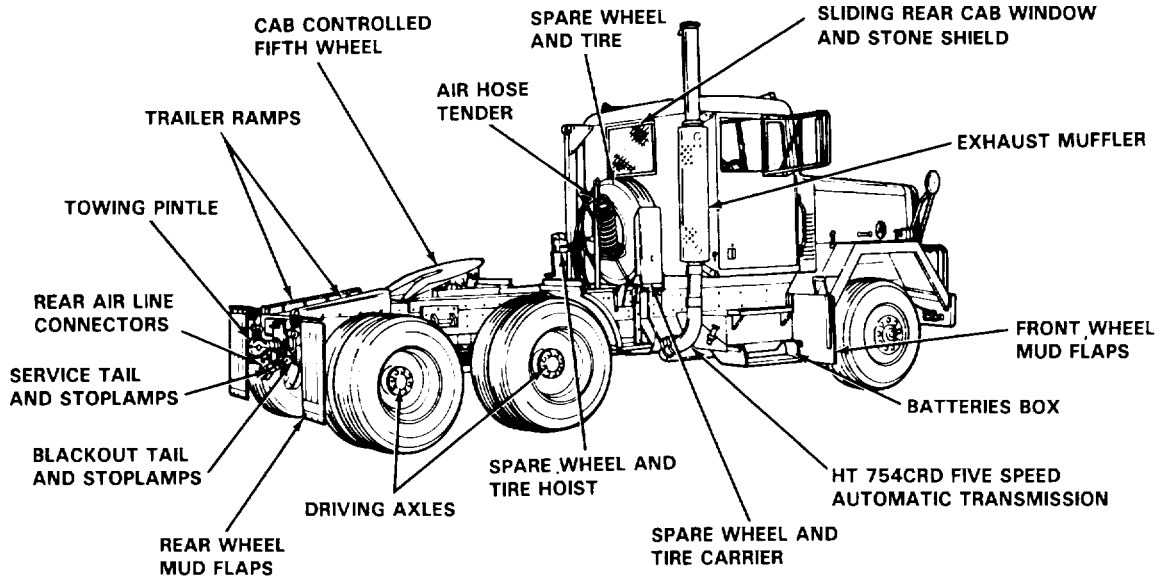
   Turn to paragraph 3-33.
   This is the maintenance procedure for the fuel solenoid valve. It is arranged step-by-step so everything you need to know to maintain the fuel solenoid valve is covered. Now you are ready to correct the problem.

Your maintenance manual is easy to use. You eliminate mistakes and are always made aware of the warnings and cautions you need to know for personnel and equipment safety.

The M915A1 Truck Tractor and equipment are non-metric and do not require any metric tools. Therefore, metric units are not supplied in this manual. Furthermore, for the sake of clarity, tactical instructions will also remain non-metric.



M915A1 - LEFT FRONT 3/4 VIEW.



M915A1- RIGHT REAR 3/4 VIEW.

CHAPTER 1

1-1. SECTION I. OVERVIEW

This chapter provides the following information:

a. Forms and record data required for maintenance.

b. Physical descriptions and data of major components

c. Functional explanations of components maintained at the organizational level.

1-2. SCOPE

Type of Manual: Organizational maintenance.

Model Number and Equipment Name: M915A1, Truck Tractor, Line Haul, 50,000 GVWR, 6 x 4.

Purpose of Equipment: Used with the M-872 Trailer for on-road, line hauling of loads up to a gross vehicle weight rating of 50,000 lbs (30,000 lbs on fifth wheel).

1-3. MAINTENANCE FORMS, RECORDS, AND REPORTS.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System.

1-4. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Requirements and procedures for destruction of Army materiel to prevent enemy use are given in TM 750-244-6.

1-5. PREPARATION FOR STORAGE OR SHIPMENT.

Storage information is given in TM 740-90-1, Administrative Storage.

SECTION II. GENERAL INFORMATION.

1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your M915A1 Truck Tractor needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF368 (Quality Deficiency Report). Mail it to us at: Commander, U.S. Army Tank Automotive Command, ATTN: DRSTAM, Warren, Michigan 48090. We'll send you a reply.

1-7. WARRANTY INFORMATION.

Warranty information can be found in TB9-2300-295-15/20 (M915A1 Warranty Bulletin).

1-8. SECTION II. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

The characteristics and capabilities of the M915A1 Truck Tractor are given in paragraphs 19 and 110. Two of the more important features that allow for ease of maintenance are:

a. Commercial-type replacement parts for entire vehicle available through national network of dealers and vendors.

b. Commercial operating components that require no special maintenance procedures and a minimum of special tools:

(1) Six-cylinder, in-line, four-stroke, four-cycle, turbocharged diesel engine.

(2) Five speed automatic transmission.

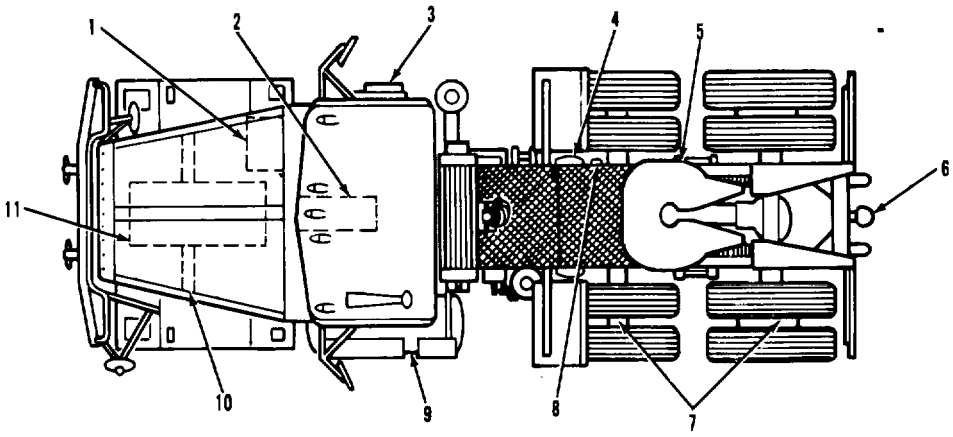
(3) Rear tandem axles.

EQUIPMENT DESCRIPTION AND DATA.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

a. Exterior Components.

The illustration below identifies the major exterior components located on the M915A1 vehicle. For more information. see the Operator's Manual. TM 9-2320-283-10.



1. AIR CLEANER. Heavy duty, tri-phase, dry type with automatic dust unloader.
2. TRANSMISSION. Automatic with five forward speeds and one reverse speed.
3. BATTERIES. Four, heavy duty, 12-volt, maintenance free, connected in series-parallel.
4. AIR BRAKE CHAMBER. Standard diaphragm, S-cam type.
5. FIFTH WHEEL. Slide mounted with air operated release.
6. TOWING PINTLE. Swivel type with a 49,000 lb maximum gross trailer weight capacity.
7. REAR TANDEM AXLES. Single reduction type.
8. REAR AXLE DIFFERENTIAL LOCKOUT. Air operated.
9. FUEL TANK. Aluminum with shallow dished heads and half baffle construction.
10. FRONT AXLE. Non-driving, steering type with I-beam construction.
11. ENGINE. In-line, six-cylinder, four stroke, four cycle, turbocharged diesel.

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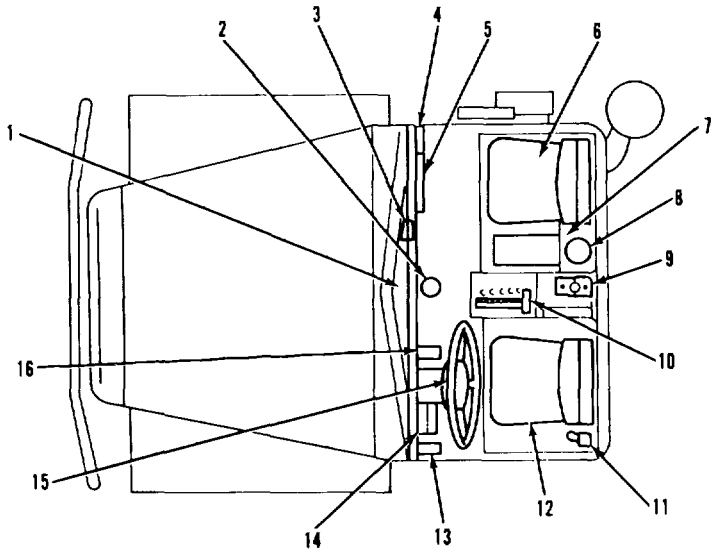
EQUIPMENT DESCRIPTION AND DATA.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (Continued).

b. Interior Components.

The illustration below identifies the major interior components located on the M915A1 vehicle. For more information, see the Operator's Manual, TM 9-2320-283-10.



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EQUIPMENT DESCRIPTION AND DATA.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (Continued).

b. Interior Components (Continued).

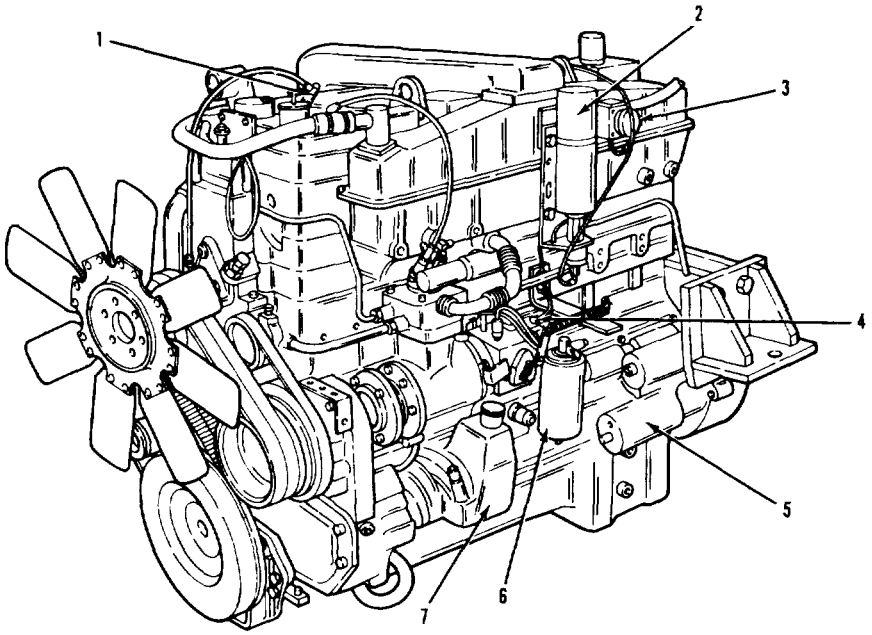
1. INSTRUMENT PANEL. Hinged type; used to house instrument gages and lamps.
2. WINDSHIELD WASHER RESERVOIR. Air pressure type.
3. DIFFERENTIAL LOCKOUT CONTROL. Three-way, two-position toggle valve.
4. VENTILATOR. Two-way hingeless type.
5. HEATER. Hot water type with two blower wheels.
6. COMPANION SEAT. Fully adjustable, shock mounted, bracket style.
7. TOOL BOX. Located under companion seat with two hinged doors for easy access.
8. FIRE EXTINGUISHER. Located behind tool box. Hand portable, stored pressure type.
9. FIFTH WHEEL RELEASE CONTROL. Three-way, two-position toggle valve.
10. TRANSMISSION SHIFTER CONTROL. Mounted to cab floor with cable type control.
11. AIR HORN VALVE. Mounted on cab roof above driver's door with chain type control.
12. DRIVER'S SEAT. Fully adjustable, suspension type.
13. ENGINE RETARDER FOOT PEDAL. Mounted on cab floor with electric switch control.
14. BRAKE PEDAL AND VALVE. Mounted on cab floor with dual type air control.
15. STEERING WHEEL. Fixed position, molded plastic type with steel reinforced sleeve.
16. ACCELERATOR PEDAL. Mounted on floor with linkage type control.

EQUIPMENT DESCRIPTION AND DATA.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (Continued).

c. Engine Components.

The Cummins NTC400 Engine is used on all M915A1 vehicles. It is an inline, six cylinder, four stroke, four cycle, turbocharged diesel engine. The engine is a common production diesel truck engine, without special operating or maintenance requirements. This subparagraph provides you with illustrations that identify engine components serviced at the organizational level.



1. FAN CLUTCH AIR VALVE. Mechanically actuated, air control type.
2. ETHER QUICK START KIT. Electrically actuated with replaceable 18-oz ether container.
3. STE/ICE CONNECTOR. Standard circular type with bayonet coupling.
4. FUEL SOLENOID SHUTOFF VALVE. Electrically actuated, coil type.
5. STARTER MOTOR AND SOLENOID. 24-volt, heavy duty, water resistant type with an electric shift engagement, over-running clutch drive.
6. FUEL FILTER/WATER SEPARATOR. Spin-on type element with water draincock.
7. POWER STEERING PUMP AND RESERVOIR. Heavy duty, roll vane type with built in flow control and relief valve.

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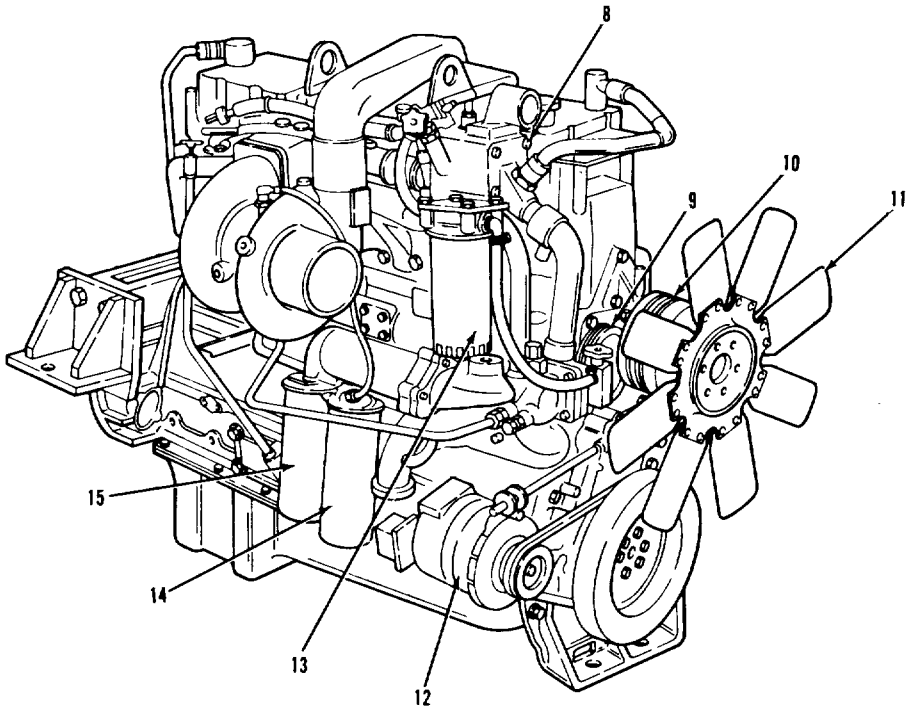
EQUIPMENT DESCRIPTION AND DATA.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (Continued).

c. Engine Components (Continued).



8. THERMOSTAT. Located in cast housing. 180 degree blocking type.

9. WATER PUMP. Belt driven, eccentric type.

10. FAN CLUTCH. Pneumatically operated, thermostatically controlled.

11. FAN. 8-blade, clockwise rotating type.

12. ALTERNATOR. 14-volt, self load limiting type with a fully adjustable, built in, solid state voltage regulator.

13. WATER FILTER. Spin-on type element with chemical protection and positive filteration.

14. OIL FILTER. Full-flow, spin-on type element.

15. OIL FILTER. By-pass, spin-on type element.

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EQUIPMENT DESCRIPTION AND DATA.

1-10. EQUIPMENT DATA.

The following table contains equipment data for components and subassemblies that have maintenance authorized at the organizational level. For additional equipment data concerning the M915A1, refer to TM 9-2320-283-10.

OVERALL CHARACTERISTICS

National Stock Number	2320-01-125-2640
Gross Vehicle 'Weight Rating	50,000 lbs
Curb Weight (empty)	19,720 lbs
Gross Vehicle Weight (28,400 lbs 5th wheel load)	48,120 lbs
Gross Axle Weight Rating:	
Front Axle	13,000
Rear Tandem Axles	40,000 lbs
Axle Loads (empty):	
Front Axle	9,730 lbs
Rear Tandem Axles	9,100 lbs
Axle Loads (28,400 lbs 5th wheel load):	
Front Axle	11,580 lbs
Rear Tandem Axles	36,540 lbs
Gross Combination Weight Rating	105,000 lbs
Towed Load (M872 Trailer-28,400 lbs on king pin)	54,000 lbs
Gross Combination Weight	103,230 lbs

DIMENSIONAL DATA

Overall Length (Chassis)	262.00 in.
Overall Width:	
Including Mirrors	124.00 in.
Mirrors Folded	96.00 in.
Overall Height:	
To Top of Exhaust Stack	142.00 in.
To Top of Air Horn	115.50 in.
Cab to Rear Tandem Axle Centerline	86.00 in.
Bumper to Back of Cab	119.00 in.
Bumper to Front Axle	38.00 in.
Rear Tandem Axle Centerline to End of Frame	53.50 in.
Wheel Base	167.00 in.
Tandem Axle Spacing	52.00 in.
Fifth Wheel Centerline to Rear Tandem Axle Centerline	O to 8 in.

EQUIPMENT DESCRIPTION AND DATA.

1-10. EQUIPMENT DATA (Continued).

DIMENSIONAL DATA (Continued)

Tread Width:	
Front	78.40 in.
Rear	72.00 in.
Dual Tire Spacing	13.25 in.
Overall Length with M872 Trailer	55.00 ft
Angle of Approach	38*
Minimum Turning Diameter (curb to curb)	53.50 ft
Minimum Ground Clearance (under rear walking beam; empty)	10.40 in.
Fording Depth (maximum; hardbottom)	20 in.

PERFORMANCE

Maximum Speed Forward (at 2,100 rpm-5th gear)	58 mph
Speed on 3.9% Grade	25 mph
Maximum Grade	19.9
Maximum Drawbar Pull (at 0.7 coefficient)	20,541 lbs
Maximum Side Slope (with adequate tractive surface)	10%

Make	Cummins
Model	NTC-400 Big Cam III
Type	4-Stroke, In-line Diesel
Displacement	855 CID
Compression Ratio	14.0:1
Maximum Horsepower (at 2,100 rpm)	400
Maximum Torque (at 1,300 rpm)	1,250 lb-ft
Lube Capacity	44 qts
Governed Speed	2,100 rpm
Retarder (integral with engine):	
Make	Jacobs
Model	30E Series

EQUIPMENT DESCRIPTION AND DATA.

1-10. EQUIPMENT DATA (Continued).

ELECTRICAL SYSTEM

Type ..... 12-volt Basic/24-volt Starting
Batteries:
- Make Delco Remy
- Model 1200 Series
- TypeMaintenance Free
- Quantity and Potential ..... Four, 12-volt

Starting Motor:
- Make Leece-Neville
- Model 7406 MA Series
- Type24-volt

Alternator:
- Make Leece-Neville
- Model 2500 JB/TR Series
- Model 2500 JB/TR Series
- Type ..... 12-volt With Integral Voltage Regulator and Transformer-Rectifier for 24-volt dc; 85/15-amp

TRANSMISSION

Make ..... Detroit Diesel Allison
Model ..... HT 754 CRD
Type ..... 5-speed, Fully Automatic
Torque Converter ..... TC 498, Lockup type
Shifter ..... Remote Control Cable
Oil Capacity ..... 8 gal.

FRONT AXLE

Make ..... Eaton
Model ..... EFA 13F3
Type ..... Reverse Elliot/Forged I-Beam
Rated Capacity ..... 13,000 lbs
Maximum Steering Angle 40*

EQUIPMENT DESCRIPTION AND DATA.

1-10 EQUIPMENT DATA (Continued).

REAR TANDEM AXLE

Make	Eaton
Model (forward/rear	DS 401P
Ratio	4.33:1
Rated Capacity (Tandem)	40,000 lbs
Forward Rear:	
Type Controlled	Traction Biasing
Oil Capacity	40 pts
Rear Rear:	
Type	Differential
Oil Capacity	36 pts
Lubrication	Pressure
Interaxle Differential Lockup	Air Controlled

BRAKES

Service:	
Make	Eaton
Model (front/rear)	541/541 L.W.
Type	Air Drum "S" Cam
Diameter x Width (front/rear)	15-1/2 x 5 in./16-1/2 x 7 in.
Parking:	
Make	Anchorlock
Model	3030
Type	Spring Brake Actuator
Location	Forward-Rear Tandem Axle

WHEELS

Make	Firestone
Model	27404
Size	22.50 x 8.25 in.
Number of Studs/Bolt Circle	10/11.25 in.
Stud Size (diameter)	1.125 in.
Rated Capacity	7,000.00 lbs

EQUIPMENT DESCRIPTION AND DATA.

1-10. EQUIPMENT DATA (Continued).

TIRES

Make	Goodyear
Type	Radial Ply/On Road
Size	11.00 x 22.50 in.
Load	Range/Ply Rating G/14
Rated Capacity (single/dual)	6040 lbs/5300 lbs
Air Pressure (maximum cold):	
Front	105 psi
Rear	95 psi

STEERING

Gear:	
Make	Ross
Model	HFB-64
Type	Integral Gear
Ratio	20.4:1
Wheel:	
Make	Sheller Globe
Diameter	20 in.
Pump:	
Make	Eaton
Model	B165R
Type	Positive Displacement Roll Vane; Gear Driven
Flow Rates	3.25 GPM at 600 RPM and 1200 psi; 4.3-5.0 GPM at 3000 RPM and 50 psi

SUSPENSION

Front:	
Type	Asymmetrical Leaf; Pin and Shackle
Rate	1,861 lbs/in.
Static Deflection	2.73 in.

EQUIPMENT DESCRIPTION AND DATA.

1-10. EQUIPMENT DATA (Continued).

SUSPENSION (Continued)

Rear:
- Make ..... Hendrickson
- Model RTE380
- Type ..... Walking Beam;
- Rated Capacity ..... 40,000 lbs
- Static Deflection ..... 97 in.

FIFTH WHEEL

- Make ..... Holland
- Model FW2536
- Type ..... Sliding; Cab Controlled Air Lock
- Rated Capacity:
  - Drawbar Pull ..... 150,000 lbs
  - Vertical Load ..... 40,000 lbs
- King Pin Size ..... 2.0 in.
- Pitch (fore/aft) 150/10
- Travel ..... 12 in.

PINTLE
- Make ..... Holland
- Model No 760
- Rated Capacity ..... 25 ton

SECTION III. PRINCIPLES OF OPERATIONS

these components relate to each other. The explanations are divided into the following paragraphs:

1-11. ENGINE
- a Engine Oil System Components and Piping
- b Engine Oil Monitoring System
- c Engine Retarder Brake Controls
- b Rear Tandem Axle

1-12. FUEL SYSTEM
- a Fuel Delivery
- b Accelerator Pedal and Linkage.
- c Air Intake
- d Ether Quick-Start System.

1-13. EXHAUST SYSTEM

1-14. COOLING SYSTEM
- a Cooling System Components and Piping
- b Coolant Temperature Monitoring System

1-15. ELECTRICAL SYSTEM
- a Starting System
- b Batteries and Power Generating System.
- c Service Lighting System
- d Blackout Lighting System.
- e Relays, Circuit Breakers, and Diode
- f Electric Horn.
- g Wiring

1-16. TRANSMISSION

1-17. FRONT AXLE AND SUSPENSION

1-18. REAR TANDEM AXLES
- a Rear Tandem Axle Components.
  Differential Lockout.

1-19. COMPRESSED AIR SYSTEM

1-20. BRAKE SYSTEM
- a Air Brake System Arrangement.
- b Brake System Components.
- c Brake System Switches and Lamps.

1-21. AUXILIARY AIR-POWERED SYSTEMS
- a Windshield Wipers and Washers.
- b Air Horn.
- c Fan Clutch Controls.

1-22. STEERING SYSTEM

1-23. CAB HEATING AND VENTILATING SYSTEM

1-24. WINTERIZATION KIT

PRINCIPLES OF OPERATION.

1-11. ENGINE.

a. Engine Oil System Components and Piping.

BREATHER TUBE. Allows fumes from hot oil to escape.

OIL FILLER. Located in front rocker arm cover. Used for replenishing oil supply.

OIL PUMP. Circulates oil through engine to provide cooling and lubrication.

OIL COOLER. Coolant circulates through internal tubes of cooler and carries away heat from engine oil.

PRIMARY OIL FILTER. Throwaway filter removes dirt and foreign particles from oil.

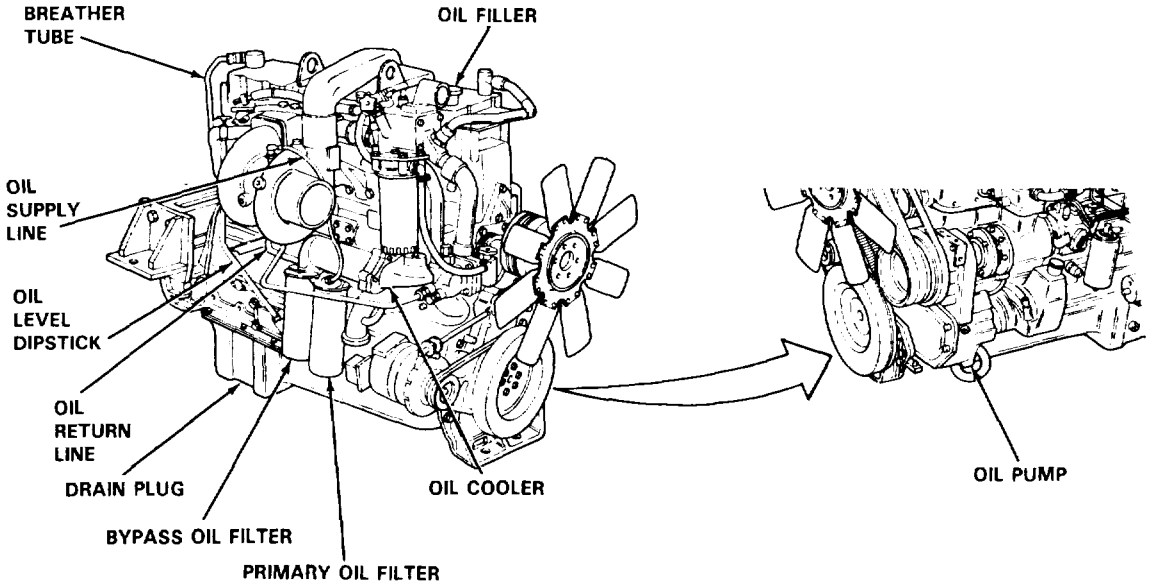
BYPASS OIL FILTER. Throwaway filter provides filtration when primary filter is clogged or damaged.

DRAIN PLUG. Located in bottom of engine oil pan. Used to drain oil from engine.

OIL RETURN LINE. Carries return oil from turbocharger to engine block.

OIL LEVEL DIPSTICK. Engine oil level indicator.

OIL SUPPLY LINE. Carries oil under pressure to cool and lubricate turbocharger



TA 236755

PRINCIPLES OF OPERATION.

1-11. ENGINE (Continued).

b. Engine Oil Monitoring System.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

IGNITION SWITCH. Supplies 24-volt power to relay (RY-9), which in turn provides 12-volt power to electrical system, including oil pressure gage and warning lamp circuits.

RELAY (RY-9). Energized by 24-volt power from ignition switch. When energized, RY-9 supplies 12-volt power to circuit breaker (CB-2).

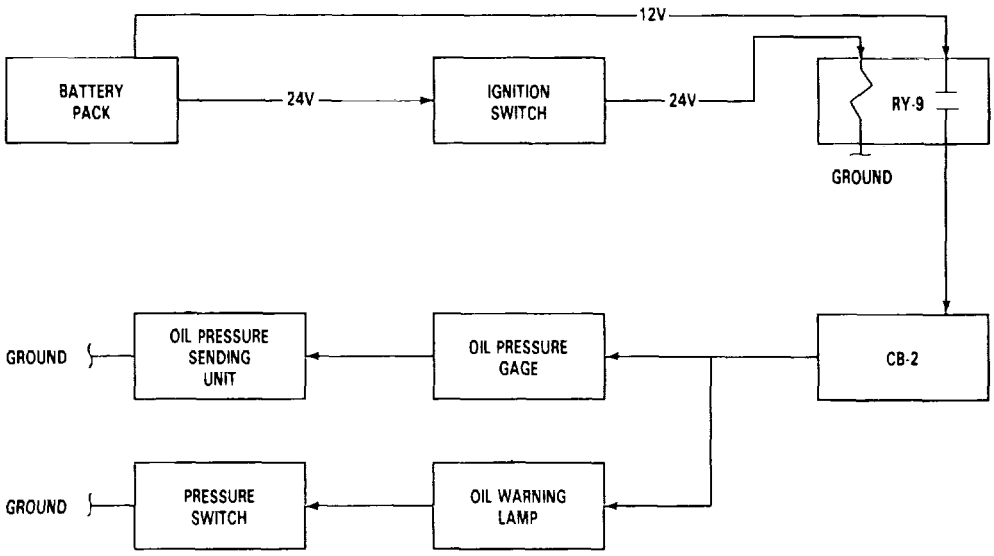
CIRCUIT BREAKER (CB-2). Protects electrical components of oil system by opening circuit when load exceeds 20 amperes. May be manually reset by pressing CB-2 button in.

OIL PRESSURE GAGE. Activated by electrical signal from oil pressure sending unit. Indicates engine oil pressure.

OIL PRESSURE SENDING UNIT. Provides electrical signal to oil pressure gage to indicate engine oil pressure.

OIL WARNING LAMP. Indicator lamp is activated by 12-volt power from pressure switch when engine oil pressure drops below 5 psi.

PRESSURE SWITCH. Closes to supply 12-volt power to oil warning lamp when oil pressure drops below 5 psi



TA 236756

PRINCIPLES OF OPERATION.

1-11. ENGINE (Continued).

c. Engine Retarder Brake Controls.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

IGNITION SWITCH. Supplies 24-volt power to relay (RY-9), which in turn provides 12-volt power to electrical system, including engine retarder brake circuit.

RELAY (RY-9). Energized by 24-volt power from ignition switch. When energized, RY-9 supplies 12-volt power to circuit breaker (CB-2).

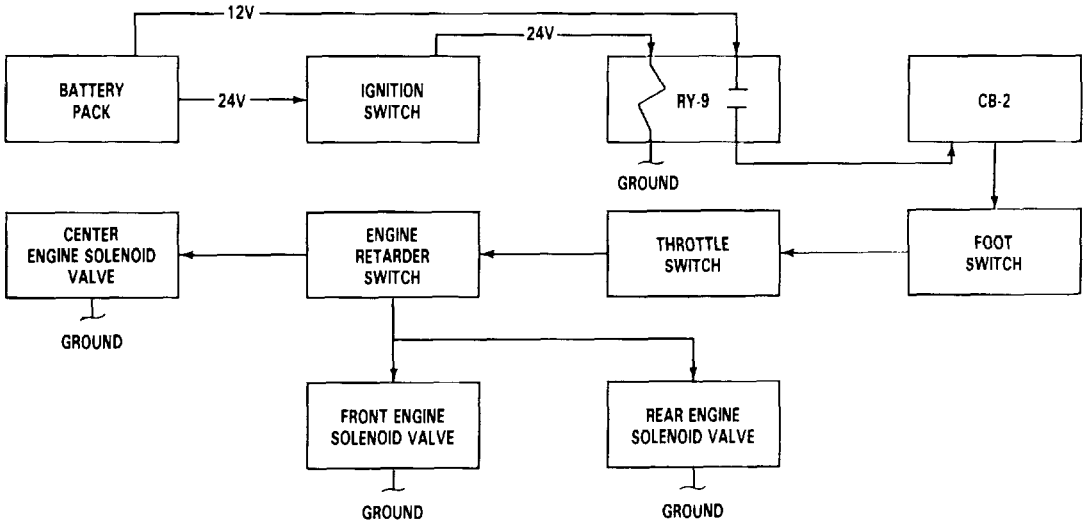
CIRCUIT BREAKER (CB-2). Protects electrical components of engine retarder brake circuit by opening when load exceeds 20 amperes. May be manually reset by pressing CB-2 button in.

FOOT SWITCH. Allows driver to activate engine brake circuit with left foot. When depressed, switch supplies 12-volt power through CB-2, throttle switch, and engine retarder switch, to energize selected solenoid valve(s).

THROTTLE SWITCH. Switch is open when accelerator pedal is pressed down to prevent activation of engine retarder brake. Activating arm on fuel pump lever closes switch when accelerator is disengaged.

ENGINE RETARDER SWITCH. Three-position switch allows driver to select engine braking for two cylinders (LOW), four cylinders (MED), or six cylinders (HIGH). Depressing pedal actuated foot switch completes 12-volt power circuit to energize one, two, or three solenoids.

SOLENOID VALVES. Operate engine braking mechanism when activated.



TA 2366757

PRINCIPLES OF OPERATION.

1-12. FUEL SYSTEM.

a. Fuel Delivery.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

IGNITION SWITCH. Supplies 24-volt power to relay (RY-9), which in turn provides 12-volt power to electrical system, including fuel system circuit.

SOLENOID SHUTOFF VALVE. Normally closed, shutting off fuel supply to engine. Open when ignition switch is ON.

RELAY (RY-9). Energized by 24-volt power from ignition switch. When energized, RY-9 supplies 12-volt power to circuit breaker (CB-2).

CIRCUIT BREAKER (CB-2). Protects electrical components of fuel system by opening circuit when load exceeds 20 amperes. May be manually reset by pressing CB-2 button.

FUEL GAGE. Actuated by electrical signal from fuel sending unit which shows level of fuel in tank.

FUEL LEVEL SENDING UNIT. Provides electrical signal to fuel gage for indicating fuel quantity in tank.

FUEL TANK. 118 gallon capacity (100 gallon draw).

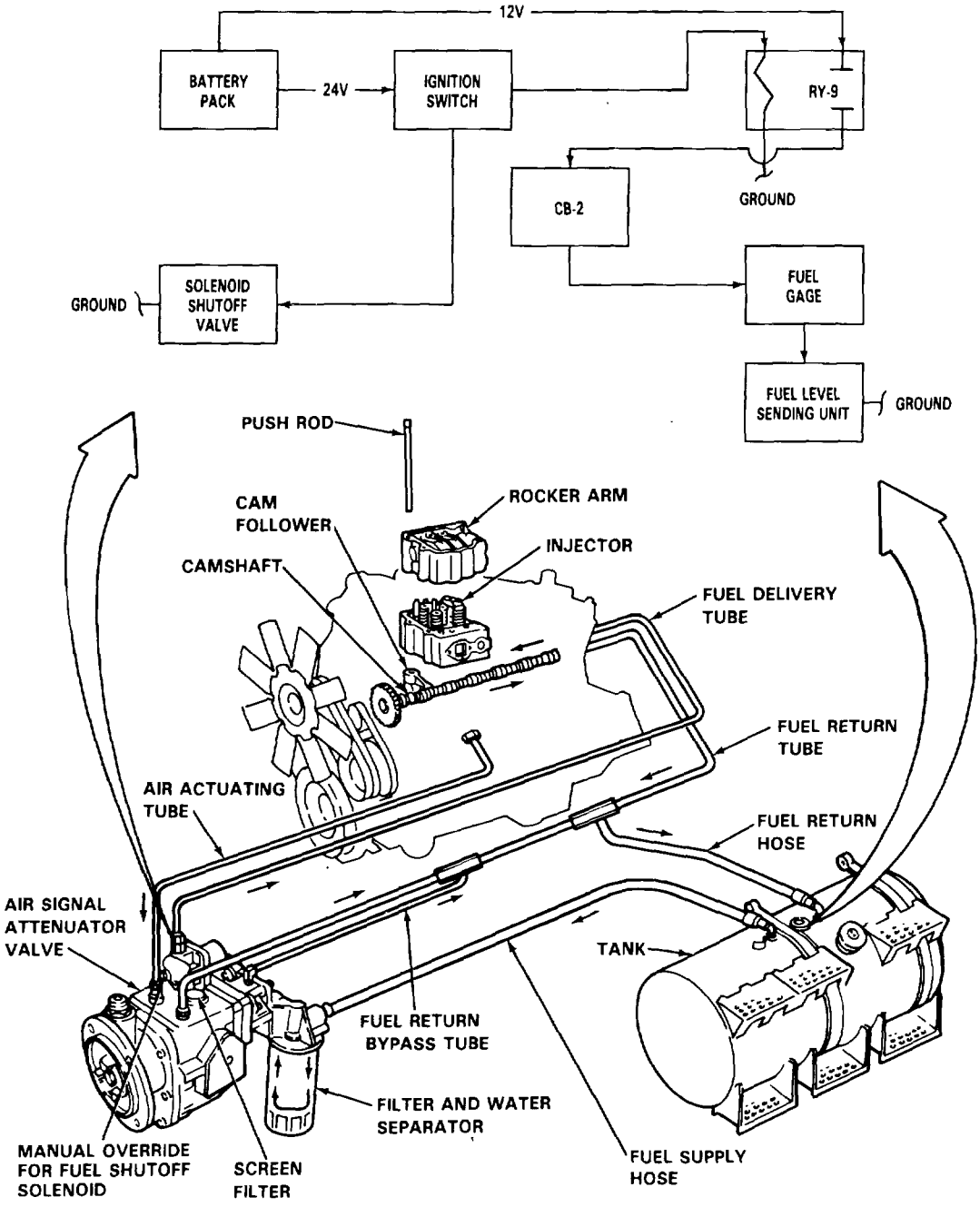
FILTER AND WATER SEPARATOR. Throwaway filter removes impurities and water from fuel. Petcock at bottom allows operator to drain off water filtered from fuel.

FUEL PUMP. Gear driven by air compressor. Built-in governor meters fuel through screen filter, solenoid shutoff valve, and into injectors. Excess fuel from pump is returned to tank. A tachometer drive is located on the fuel pump housing.

PRINCIPLES OF OPERATION.

1-12. FUEL SYSTEM (Continued).

a. Fuel Delivery (Continued).



TA 236758

PRINCIPLES OF OPERATION.

1-12. FUEL SYSTEM (Continued).

a. Fuel Delivery (Continued).

AIR ACTUATING TUBE. Carries pressurized air from intake manifold to air signal attenuator valve.

AIR SIGNAL ATTENUATOR VALVE. Modifies fuel flow helping to eliminate noise and exhaust smoke. Operated by pressurized air from manifold.

SCREEN FILTER. Located in fuel pump. Provides additional filtration for fuel prior to entering engine.

MANUAL OVERRIDE FOR FUEL SHUTOFF SOLENOID. Normally closed, can be screwed open to allow operation of engine when solenoid is not working.

CAM FOLLOWER. Mechanical lever transmits cam lobe movement from camshaft to push rod.

CAMSHAFT. Determines valve and injector timing.

FUEL RETURN BYPASS TUBE. Carries excess fuel from fuel pump to fuel tank.

FUEL SUPPLY HOSE. Carries fuel from fuel tank to fuel pump.

ROCKER ARM. Transmits directional movement from push rod to injector.

PUSH ROD. Transmits motion from cam follower to rocker arm.

INJECTOR. Cam timed to meter and inject proper amount of fuel into each

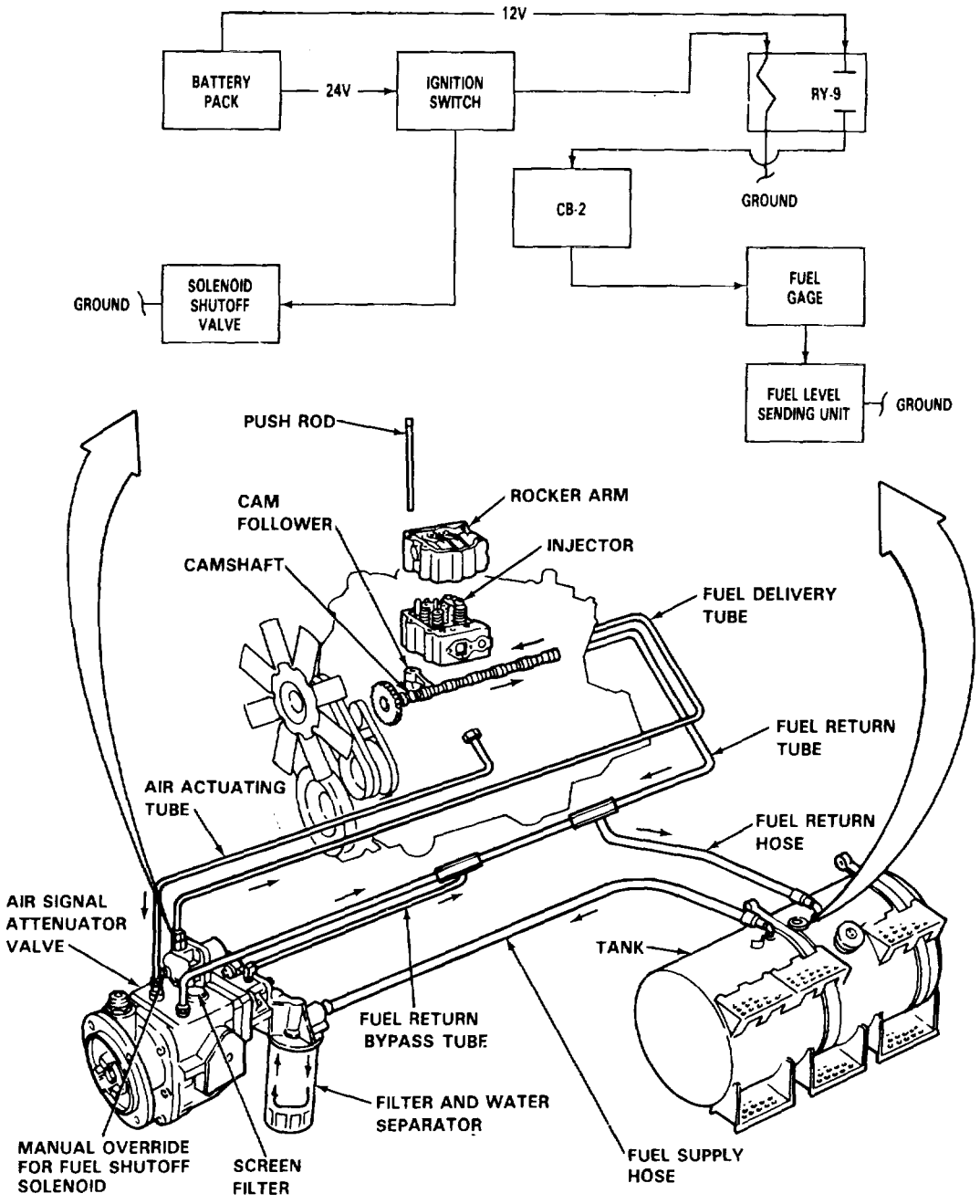
FUEL DELIVERY TUBE. Carries fuel under pressure from fuel pump to fuel injectors.

FUEL RETURN TUBE. Carries excess fuel from injectors back to tank.

PRINCIPLES OF OPERATION.

1-12. FUEL SYSTEM (Continued).

a. Fuel Delivery (Continued).



TA 236759

PRINCIPLES OF OPERATION.

1-12. FUEL SYSTEM (Continued).

b. Accelerator Pedal and Linkage.

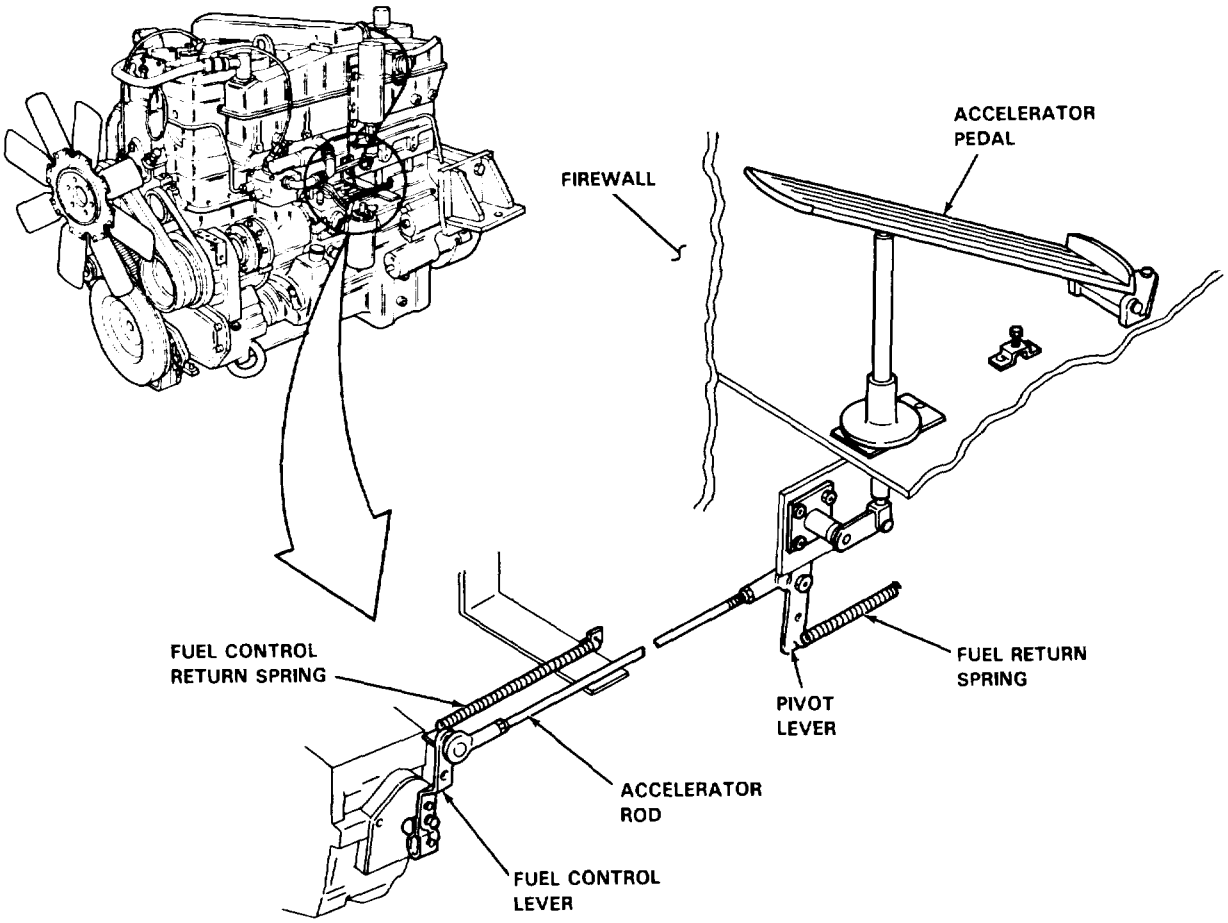
ACCELERATOR PEDAL. Connected by mechanical linkage to pivot lever under cab.

PIVOT LEVER. Mechanical linkage that connects accelerator pedal to accelerator rod.

ACCELERATOR ROD. Connects accelerator pedal to fuel control lever on fuel pump.

FUEL CONTROL LEVER. Controls flow of fuel through fuel pump, thus setting engine speed.

FUEL CONTROL RETURN SPRING. Returns fuel control lever to normal position when accelerator pedal is not engaged.



TA 236760

PRINCIPLES OF OPERATION.

1-12. FUEL SYSTEM (Continued).

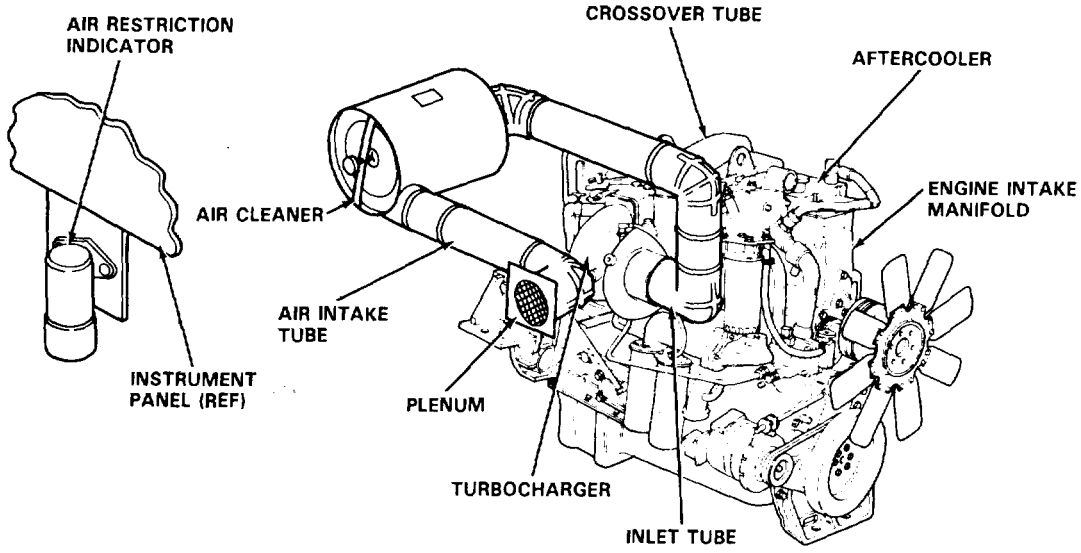
c. Air Intake.

AIR RESTRICTION INDICATOR. Mounted on instrument panel. Signal changes from green to red in indicator housing when air cleaner needs servicing. A tube connects indicator to air cleaner outlet. When air flow through cleaner is restricted, the red signal becomes visible. Factory set to signal at a specific filter restriction. Resetting is accomplished by pushing a button on top of the indicator.

CROSSOVER TUBE. Directs compressed air from turbocharger, through after cooler, to intake manifold.

AFTERCOOLER. Cools air entering intake manifold from turbocharger. Water flow from engine cooling system absorbs heat. (See illustration of cooling system in paragraph 1-14a).

ENGINE INTAKE MANIFOLD. Directs compressed air charge to each cylinder after it has been cooled by aftercooler.



TA 236761

PRINCIPLES OF OPERATION.

1-12. FUEL SYSTEM (Continued).

c. Air Intake (Continued).

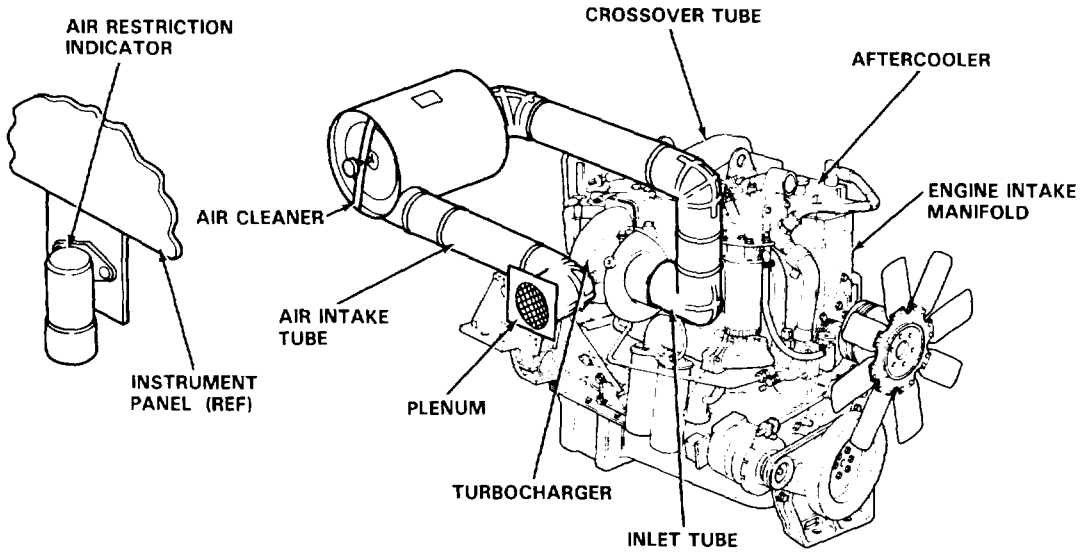
INLET TUBE. Directs air from air cleaner to turbocharger.

TURBOCHARGER. Driven by exhaust gases. Compresses air into intake manifold to increase engine power.

PLENUM. Directs outside air into air intake tube.

AIR INTAKE TUBE. Draws outside air through grille mounted plenum and into air cleaner.

AIR CLEANER. Mounted on fire wall. Removes impurities from air entering turbocharger. Has replaceable, dry, two-stage element.



TA 236762

PRINCIPLES OF OPERATION.

1-12. FUEL SYSTEM (Continued).

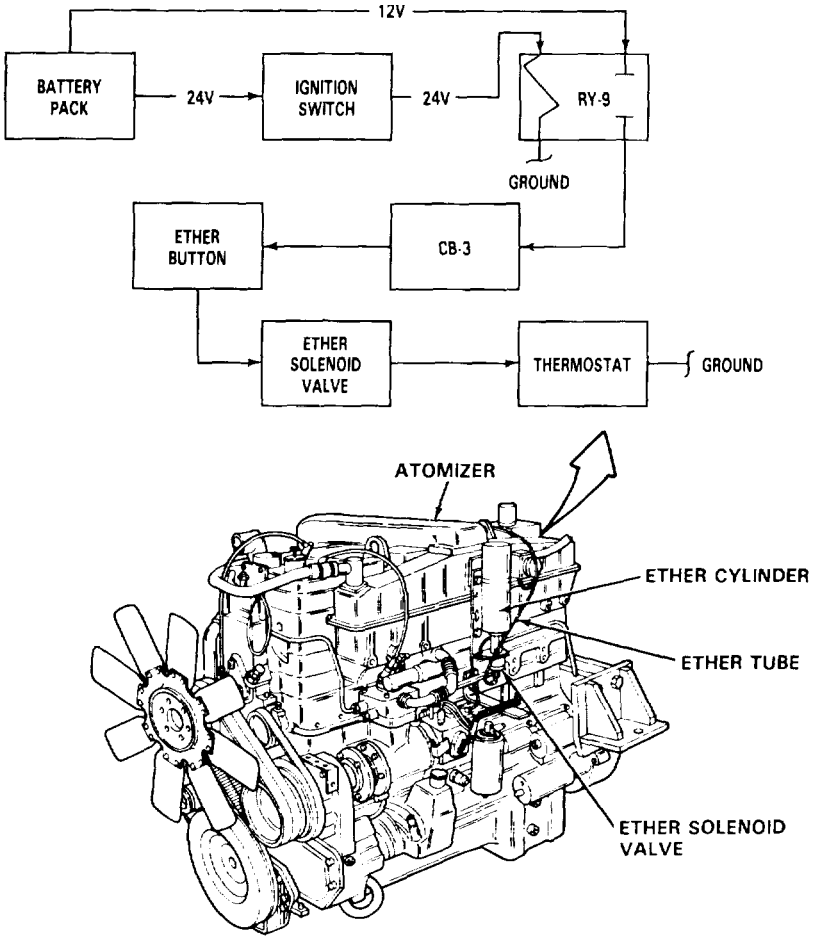
d. Ether Quick-Start System.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

IGNITION SWITCH. Supplies 24-volt power to relay (RY-9), which in turn provides 12-volt power to electrical system, including ether quick-start system circuit.

RELAY (RY-9). Energized by 24-volt power from ignition switch. When energized, RY-9 supplies 12-volt power to circuit breaker (CB-3).

CIRCUIT BREAKER (CB-3). Protects electrical components and wiring of quick-start system by opening circuit when load exceeds 20 amperes. May be manually reset by pressing CB-3 button in.



TA 236763

PRINCIPLES OF OPERATION.

1-12. FUEL SYSTEM (Continued).

d. Ether Quick-Start System (Continued).

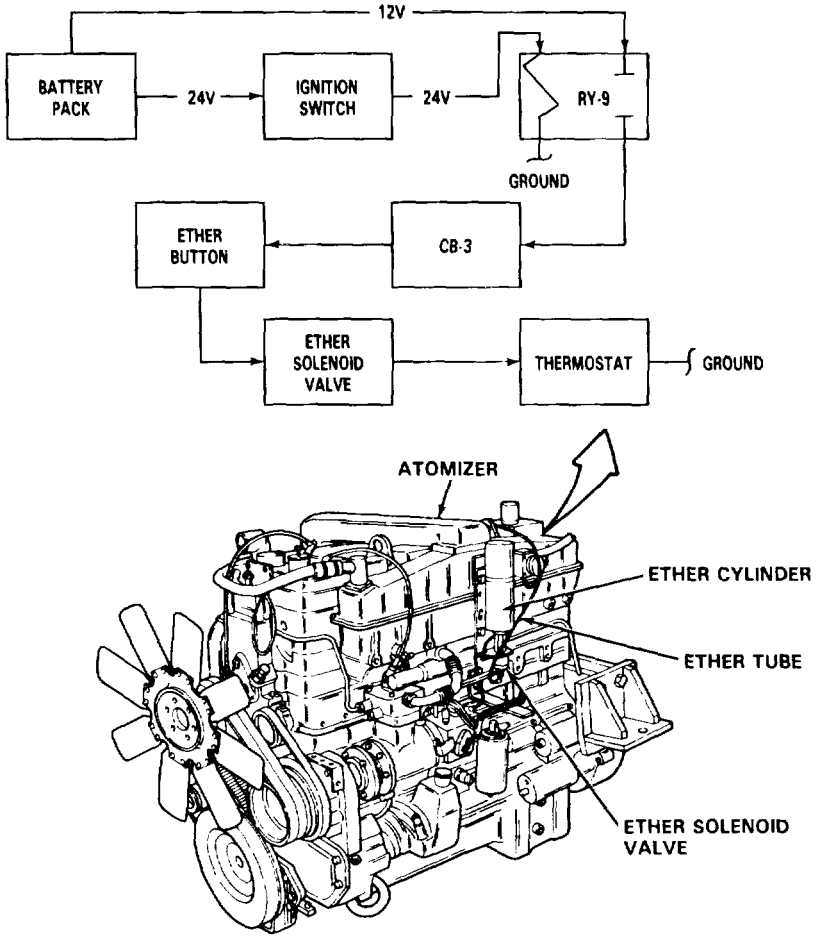
ETHER SOLENOID VALVE. Controls release of ether from cylinder. When solenoid is energized, ether flows to atomizer.

THERMOSTAT. Opens when coolant temperature is above 50°F to prevent ether solenoid valve from activating.

ETHER CYLINDER. Replaceable 18-oz ether container.

ETHER TUBE. Carries ether from solenoid valve to atomizer.

ATOMIZER. Sprays fine ether mist into engine air intake manifold.



TA 23674

PRINCIPLES OF OPERATION.

1-13. EXHAUST SYSTEM.

EXHAUST STACK CAP. Prevents entry of rain and dirt into exhaust pipes when engine is not in use.

EXHAUST MANIFOLD. Bolted to exhaust ports on cylinder heads. Collects exhaust from ports and directs it to turbocharger.

TURBOCHARGER. See illustration and description in paragraph 1-12c.

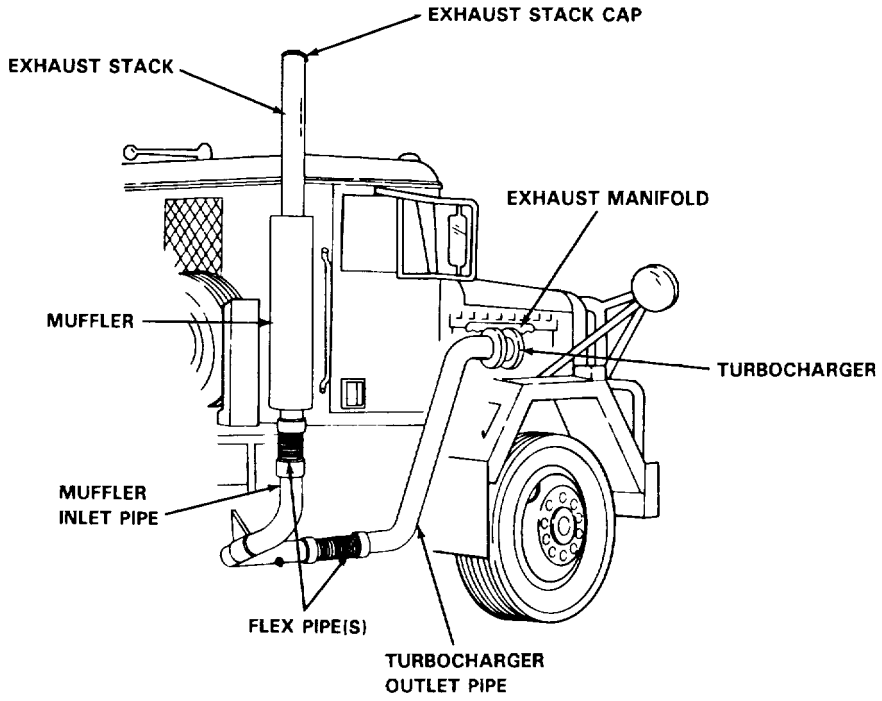
TURBOCHARGER OUTLET PIPE. Carries hot exhaust away from turbocharger.

FLEX PIPE(S). Connects turbocharger outlet pipe, muffler inlet pipe, and muffler. Pipes are flexible to allow for vibrations and expansion in system.

MUFFLER INLET PIPE. Carries exhaust from turbocharger outlet pipe to muffler.

MUFFLER. Directs exhaust through baffles to deaden noise.

EXHAUST STACK. Directs exhaust from muffler.



TA 236765

PRINCIPLES OF OPERATION.

1-14. COOLING SYSTEM.

a. Cooling System Components and Piping.

RADIATOR CAP. Closes off filler opening and keeps system under pressure up to a maximum of 10 psi.

RADIATOR. Coolant is circulated through a series of fins and baffles so that outside air flow can dissipate heat.

WATER FILTER. Removes dirt and foreign particles from coolant.

WATER SHUT-OFF VALVE(S). Can be closed to allow replacement of water filter without having to drain cooling system.

OIL COOLER. Engine oil circulates through internal tubes of cooler, and coolant carries away heat.

THERMOSTAT. Shuts off coolant flow to radiator until temperature reaches 180°F. Coolant is then directed through radiator inlet hose to the radiator.

FAN CLUTCH ACTUATOR. When coolant temperature rises above 190°F, actuator directs compressed air into fan clutch, causing fan to engage.

WATER MANIFOLD. Collects coolant from cylinder head and directs it to thermostat housing.

FAN. Draws air through radiator to control coolant temperature.

FAN CLUTCH. Air pressure from actuator engages fan when coolant temperature rises above 190°F.

AFTERCOOLER. Coolant flowing through core cools hot air entering intake manifold port from turbocharger.

WATER CROSSOVER TUBE. Carries coolant under pressure from block to after- cooler.

COMPRESSOR COOLING WATER TUBE "A." Carries coolant from water pump to air compressor.

COMPRESSOR COOLING WATER TUBE "B." Carries coolant from air compressor to thermostat housing.

ACCESSORY DRIVE. Powers the fan and water pump.

THERMOSTAT DEAERATION (AIR REMOVAL) LINE. Escape route for air trapped in radiator or theromstat housing.

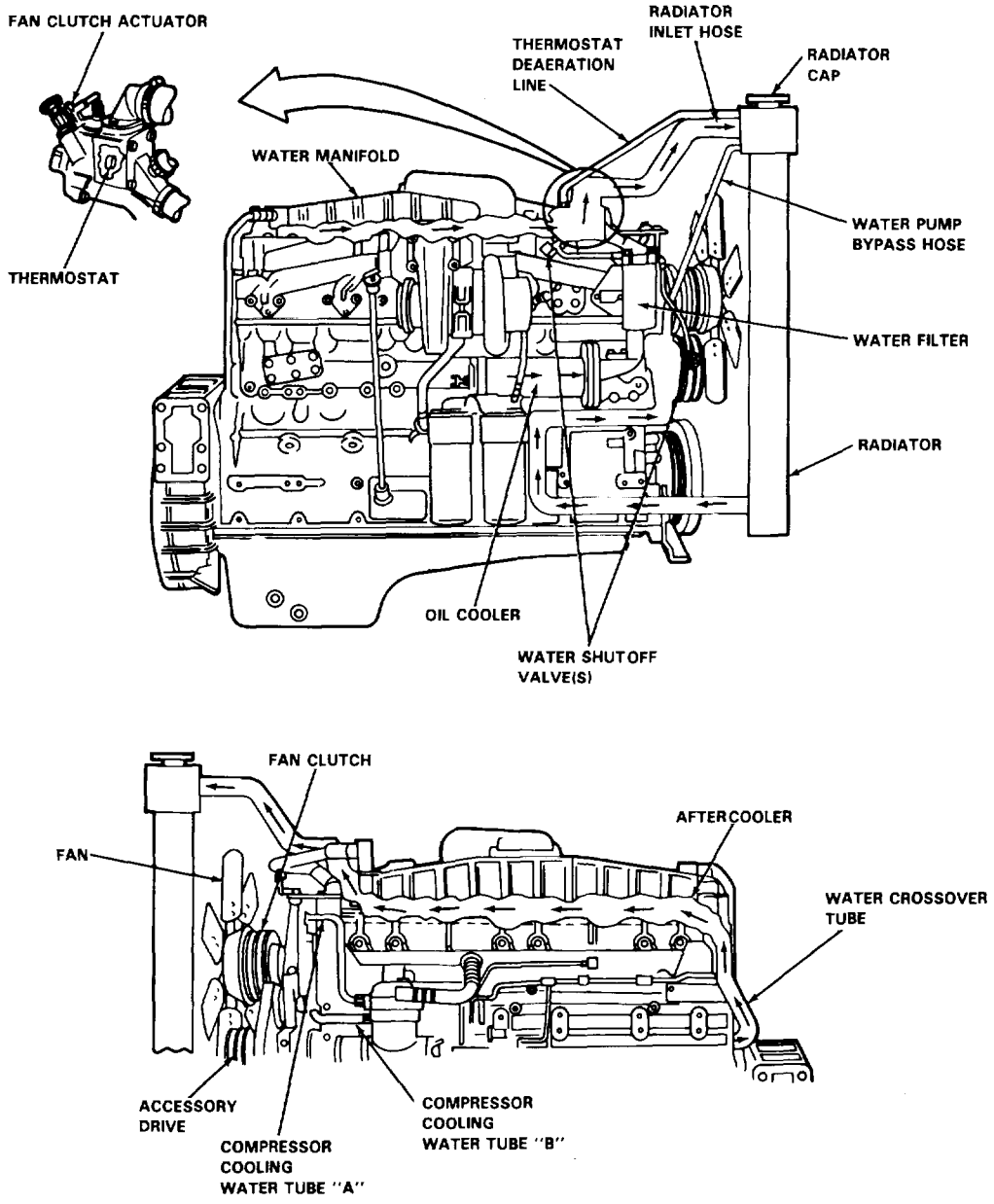
PRINCIPLES OF OPERATION.

1-14. COOLING SYSTEM (Continued).

a. Cooling System Components and Piping (Continued).

RADIATOR INLET HOSE. Channels hot coolant into radiator when thermostat is open.

WATER PUMP BYPASS HOSE. Allows air bubbles from coolant to escape from water



TA 236766

PRINCIPLES OF OPERATION.

1-14. COOLING SYSTEM (Continued).

b. Coolant Temperature Monitoring System.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

IGNITION SWITCH. Supplies 24-volts to relay (RY-9), which in turn provides 12-volt power to electrical system, including coolant temperature monitoring system.

RELAY (RY-9). Energized by 24-volts from ignition switch. When energized, RY-9 supplies 12-volt power to circuit breaker (CB-2).

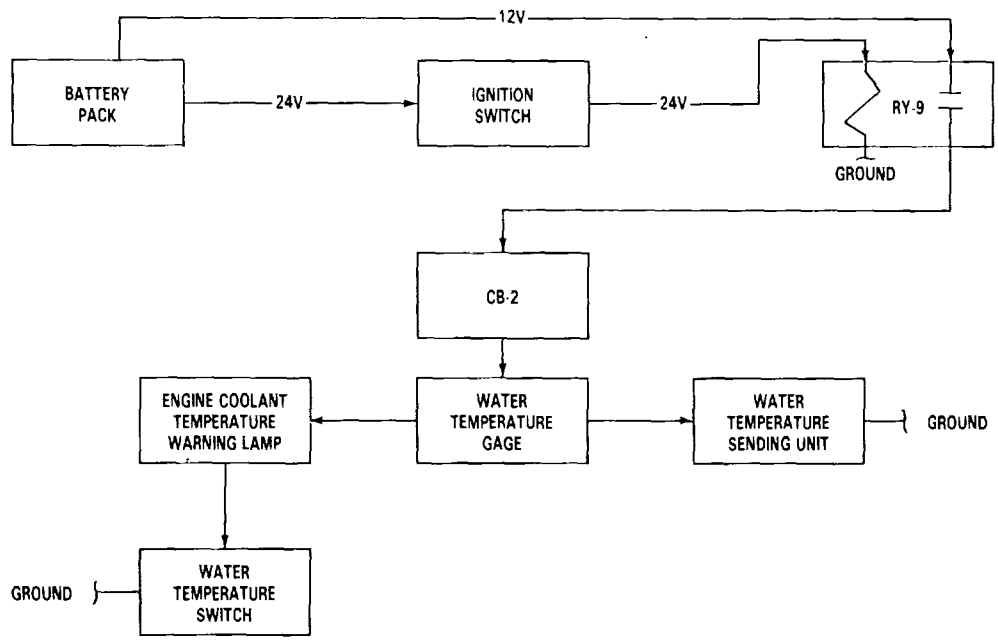
CIRCUIT BREAKER (CB-2). Protects electrical components and wiring of coolant system by opening circuit when load exceeds 20 amperes. May be manually reset by pressing CB-2 button in.

WATER TEMPERATURE GAGE. Shows coolant temperature when actuated by electrical signal from water temperature sending unit.

WATER TEMPERATURE SWITCH. Normally open switch is closed to activate indicator lamp when coolant temperature exceeds 2250F.

ENGINE COOLANT TEMPERATURE WARNING LAMP. Activated by 12-volt power from water temperature switch when engine temperature exceeds 225°F.

WATER TEMPERATURE SENDING UNIT. Provides electrical signal to temperature gage.



TA 236767

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM.

a. Starting System.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

STARTER MOTOR. When energized, motor engages with ring gear on flex plate (flywheel) to start engine.

STARTER MOTOR SOLENOID. 24-volt power is applied to starter solenoid when starter relay is energized. Solenoid closes and supplies 24-volt power, which energizes starter motor.

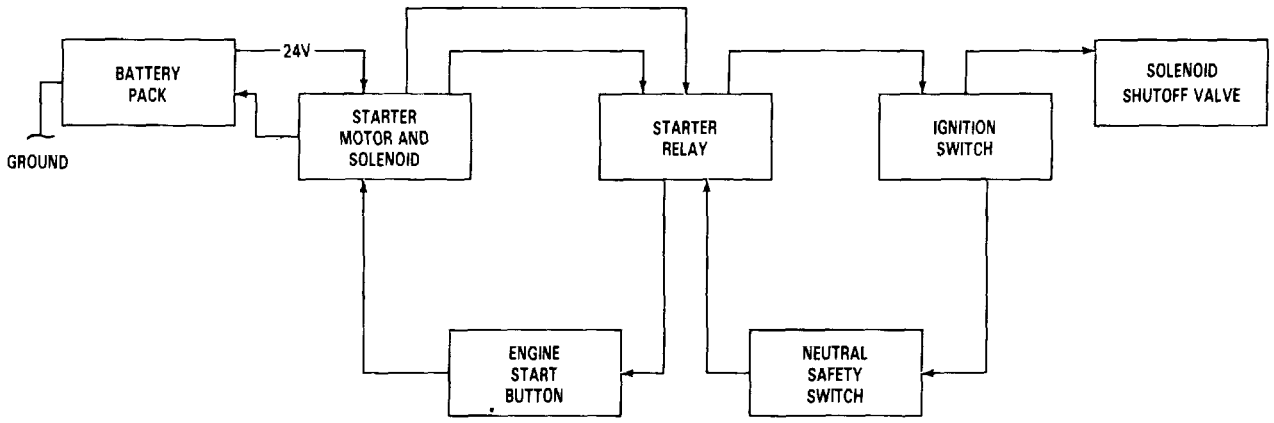
STARTER RELAY. With ignition switch in ON position, transmission shift control lever in neutral, and ENGINE START button depressed, relay energizes and closes starter solenoid circuit.

IGNITION SWITCH. Supplies 24-volt power to relay (RY-9), which in turn provides 12-volt power to electrical system, including engine starting system circuit.

SOLENOID SHUTOFF VALVE. Normally closed. When the ignition switch is turned to ON position, valve opens allowing fuel to pass to injectors. (Refer to paragraph 1-12 for description of fuel system).

NEUTRAL SAFETY SWITCH. Normally open. Prevents starting circuit from being activated when transmission shift control lever is in any position other than neutral.

ENGINE START BUTTON. Activates starting circuit by energizing the starter relay.



TA 236768

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

b. Batteries and Power Generating System.

The batteries and power generating system provide 12-volt and 24-volt power to the electrical system.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

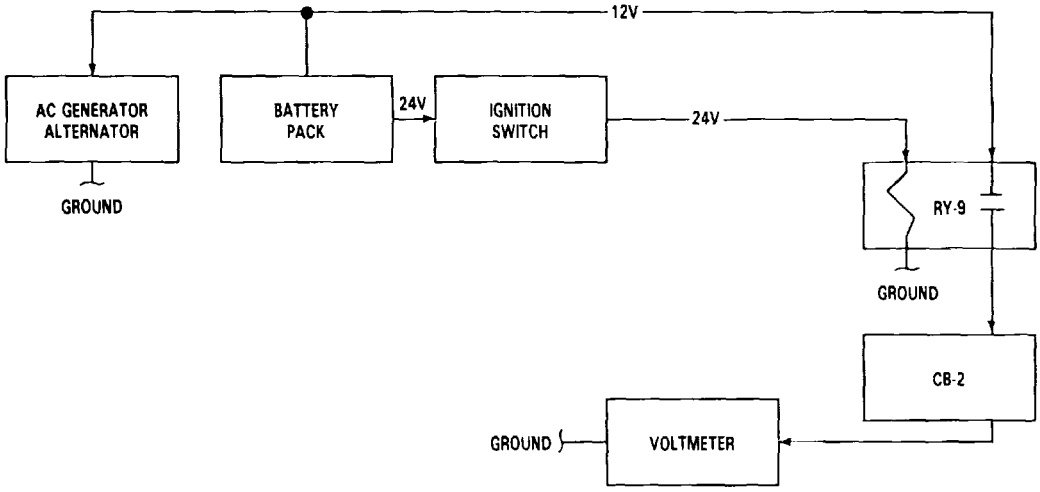
AC GENERATOR (ALTERNATOR). Generates voltage for recharging battery pack. Has external 24-volt transformer-rectifier.

IGNITION SWITCH. Supplies 24-volt power to relay (RY-9), which in turn provides 12-volt power to electrical system, including batteries and power generating system circuits.

RELAY (RY-9). Energized by 24-volt power from ignition switch. When energized, RY-9 supplies 12-volt power to circuit breaker (CB-2).

CIRCUIT BREAKER (CB-2). Protects electrical components of voltmeter circuit by opening when load exceeds 20 amperes. May be manually reset by pressing CB-2 button in.

VOLTMETER. 10-16 gage indicates voltage provided by battery pack and alternator.



TA 236769

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

c. Service Lighting System.

The service lighting system provides illumination required while operating the vehicle. This system consists of the following subsystems:

(1) Headlamps and Taillamps.
(2) Marker and Clearance Lamps.
(3) Turn Signals and Hazard Warning Lamps.
(4) Backup Lamps.
(5) Instruments, Gages, Dome Lamp, and Map Lamps.
(6) Stoplamps. (Refer to Brake System Switches and Lamps, para 1-20c).

Individual circuit descriptions (except for stoplamps) can be found in this subparagraph. A complete electrical schematic diagram and wiring harness diagrams can be found in Appendix D (TM 9-2320-283-20-3).

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

c. Service Lighting System (Continued).

(1) Headlamps and Taillamps.

When headlamp switch is in ON position and blackout toggle switch is in NORMAL position, battery power is supplied to illuminate headlamps, tail- lamps, and trailer taillamps. The trailer taillamps are powered through cab and chassis connectors.

HIGH BEAM LAMP. When power is supplied to each high beam filament in the headlamps, the high beam indicator is illuminated by the same circuit.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

CIRCUIT BREAKER (CB-9). Protects 24-volt blackout stop, marker, and tail lamp circuits for trailers used with the M915A1.

HEADLAMP SWITCH. Has one OFF position and two ON positions. In either ON position, 12-volt battery power illuminates taillamps. Only when pulled fully ON will headlamps illuminate.

DIMMER SWITCH. Two-position, floor-mounted switch. Switch is always closed in one of two positions to energize either low beam or high beam headlamp filament.

BLACKOUT TOGGLE SWITCH. Two-position safety switch for NORMAL and BLACKOUT modes of operation. To select mode, switch is pulled out and placed to either position. Set to NORMAL position, 12-volt power from headlamp switch passes through blackout toggle switch contacts to energize tail- lamps, headlamps (through dimmer switch), and coil of relay. Set to

BLACKOUT position 12-volt power is removed from regular service lamps and electrical horn while 12-volt power from headlamp switch is supplied through blackout toggle switch to blackout taillamp, marker lamps, and headlamps.

HEADLAMPS. 12-volt, dual filament, sealed beams.

TAILLAMPS. Each assembly contains two bulbs: a double-element bulb is used for taillamp, turn signal lamp, and stoplamp; and a separate bulb is used for the backup lamp. The taillamp circuit is energized through the blackout toggle switch when headlamp switch is in either ON position.

RELAY (RY-6). When normally open contacts are closed, relay provides 24-volt power to trailer taillamps.

PRINCIPLES OF OPERATION.

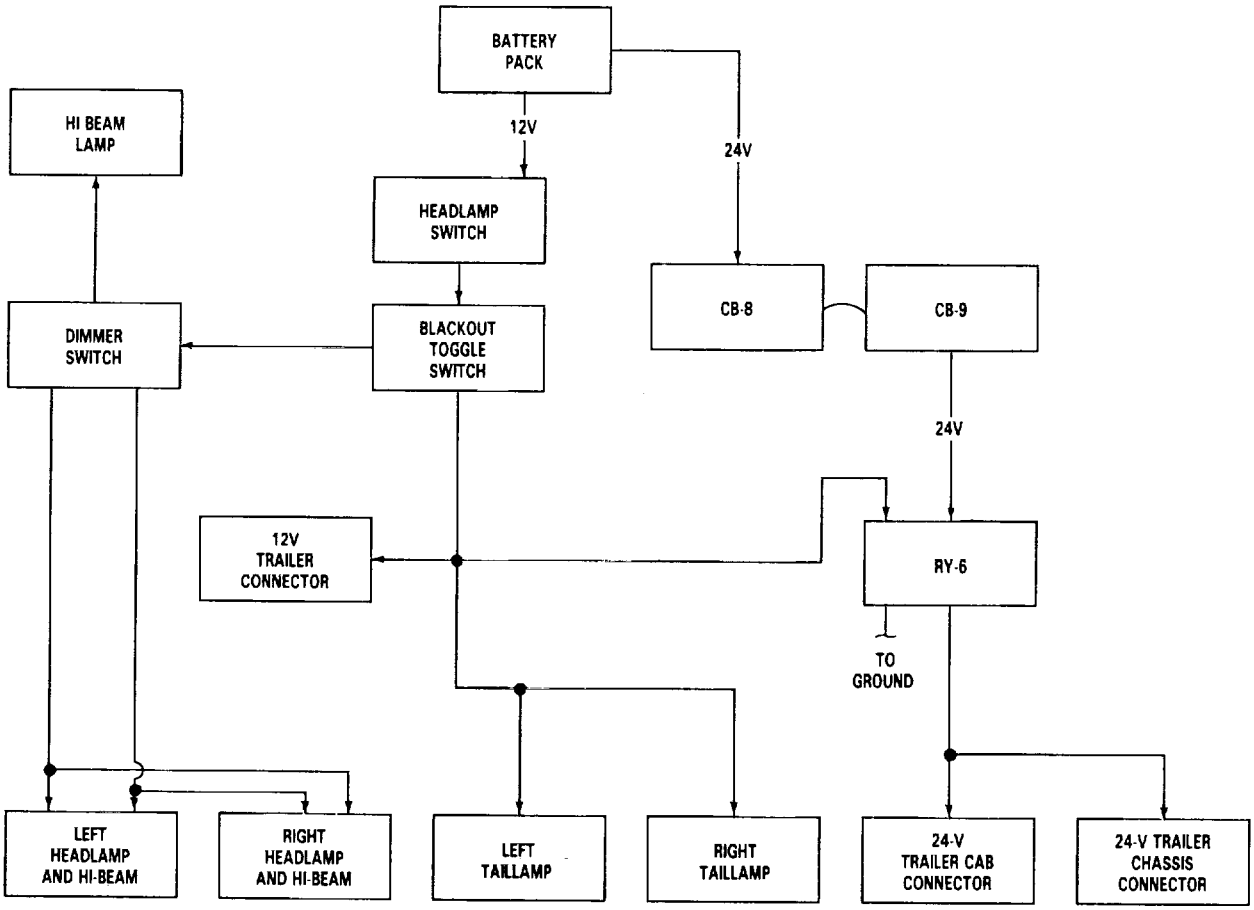
1-15. ELECTRICAL SYSTEM (Continued).

c. Service Lighting System (Continued).

(1) Headlamps and Taillamps (Continued).

24-VOLT TRAILER CONNECTORS. Cab and chassis mounted 12-pin connectors. Provide 24-volt output to trailers with 24-volt electrical system.

12-VOLT TRAILER CONNECTOR. Cab mounted 7-pin connector. Provides 12-volt output to trailers with 12-volt electrical system.



TA 236770

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

c. Service Lighting System (Continued).

(2) Marker and Clearance Lamps.

When headlamp switch is in either ON position and blackout toggle switch is in NORMAL position, 12-volt power is supplied to illuminate clearance lamps, front marker lamps, and trailer marker lamps. Trailer marker lamps receive power through connectors mounted on cab and chassis.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

CIRCUIT BREAKER (CB-7). Protects 12-volt marker and clearance lamp switch circuit. May be manually reset by pushing button in.

HEADLAMP SWITCH. Has one OFF position and two ON positions. Supplies 12-volt power in either ON position, to clearance lamps, marker lamps, and 12-volt tractor connector when blackout toggle switch is in NORMAL position.

BLACKOUT TOGGLE SWITCH. With toggle switch is set to NORMAL position and headlamp switch is set to ON position, 12-volt power is supplied to marker lamps, clearance lamps, and 12-volt tractor connector.

12-VOLT TRAILER CONNECTOR. Seven-pin connector, containing 12-volt circuit for trailer clearance and marker lamps.

CLEARANCE LAMP SWITCH. Provides capability of flashing clearance lamps on cab and 12-volts supplied to the tractor connector, when switch is depressed and released. 12-volt power is supplied to switch when headlamp switch is in ON position and blackout toggle switch is in NORMAL position.

CLEARANCE LAMPS. Each unit has a replaceable single-element bulb that illuminates when headlamp switch is in either ON position and blackout toggle is in NORMAL position. The clearance lamps will flash when clearance lamp switch is depressed and released.

MARKER LAMP ASSEMBLY. Each assembly has two bulbs that illuminate whenever headlamp switch is in ON position and blackout toggle switch is in NORMAL position. One bulb is used as a marker lamp, and the other is for turn signals.

RELAY (RY-6). Normally open contacts are closed by 12-volt power when blackout toggle switch is in NORMAL position and headlamp switch is in ON position. When contacts of relay close, 24 volts from circuit breaker CB-9 is supplied to tractor chassis connector.

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

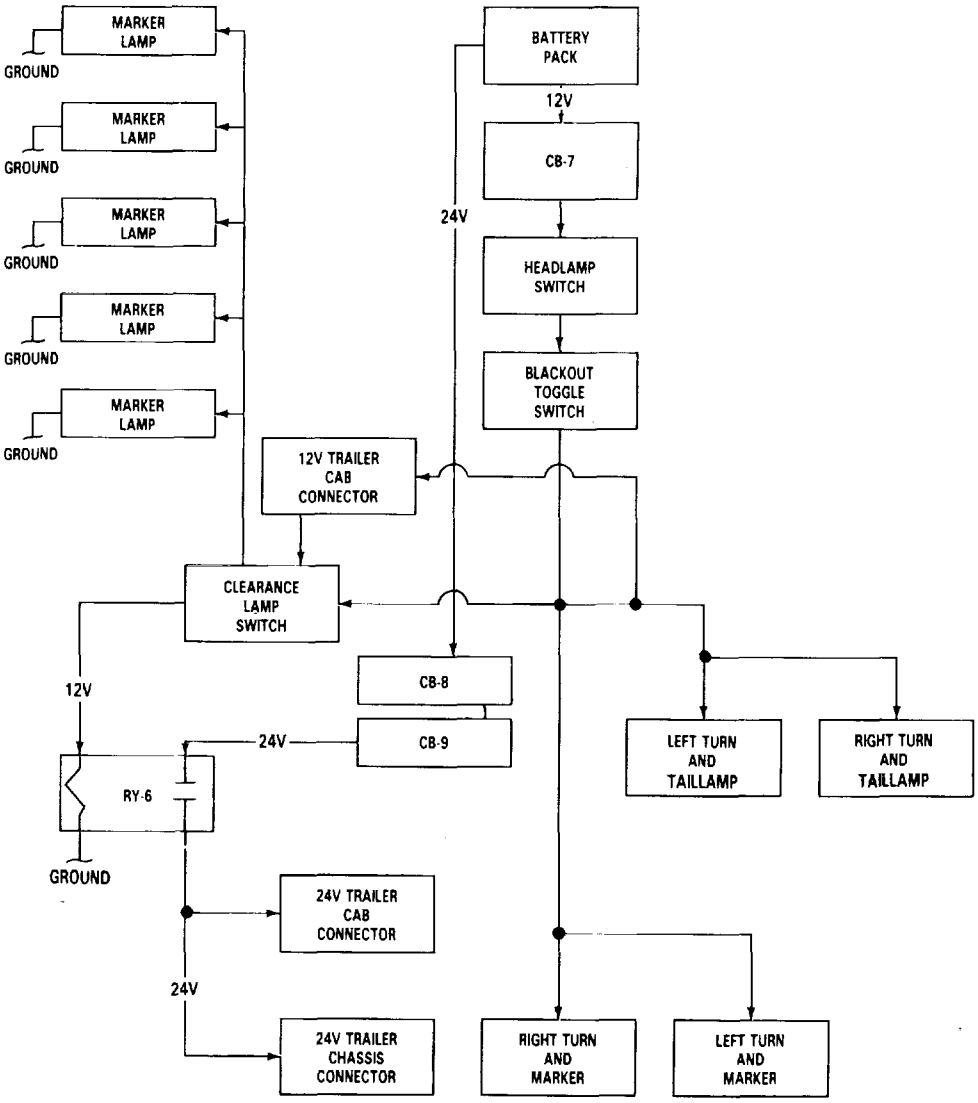
c. Service Lighting System (Continued).

(2) Marker and Clearance Lamps (Continued).

CIRCUIT BREAKER (CB-9). Protects electrical components for 24-volt tractor receptacle circuits by opening when load exceeds 20 amperes. May be manually reset by pressing CB-9 button in.

24-VOLT TRAILER CONNECTOR. Chassis mounted 12-pin connector, containing 24-volt power for 24-volt trailer marker lamp circuits.

24-VOLT TRAILER CONNECTOR. Cab mounted 12-pin connector provides 24-volt power for towed vehicles marker lamp circuits.



TA 236771

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

c. Service Lighting System (Continued).

(3) Turn Signal and Hazard Warning Lamps.

When the blackout toggle switch is in NORMAL position, battery power is applied to the turn signal switch to illuminate right or left front turn signals and rear turn signals as well as trailer turn signals through tractor-mounted connector. Also, the turn signal switch contains a hazard warning switch that allows the operator to flash all lamps in the turn signal system simultaneously.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

CIRCUIT BREAKER (CB-5). Protects electrical components of flasher, turn signal switch, and hazard warning switch circuits by opening when load exceeds 20 amperes. May be manually reset by pressing CB-5 button in. CIRCUIT BREAKER (CB-8). Protects electrical components of 24-volt relay and circuits by opening when load exceeds 20 amperes. May be manually reset by pressing CB-8 button in.

BLACKOUT TOGGLE SWITCH. Two-position switch for normal and blackout modes of operation. When set to NORMAL position, 12-volt power from circuit breaker (CB-5) passes through switch contacts to turn signal switch, flasher unit, and hazard warning switch.

FLASHER UNIT. Receives 12-volt power from blackout toggle switch in NORMAL position and supplies this power alternately on and off to turn signal control or hazard warning switch when either one is engaged.

TURN SIGNAL SWITCH. When engaged, it receives 12-volt power from flasher unit. (The flasher unit receives 12-volt power through blackout toggle switch and circuit breaker CB-5). Power is then supplied to:

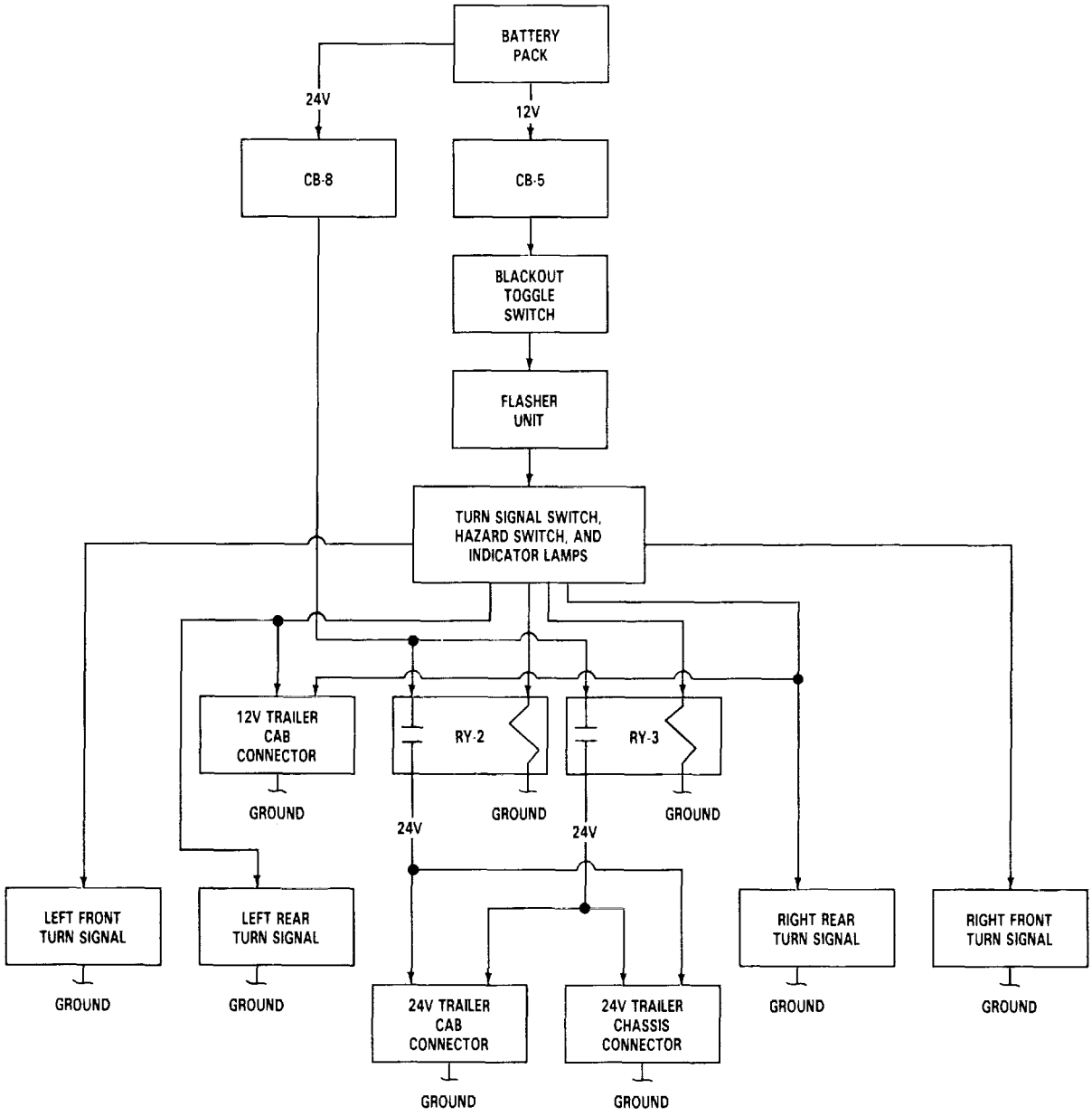
(a) Front left or right turn signals.
(b) Rear left or right turn signals.
(c) 12-volt trailer connector.
(d) Relays RY-2 and RY-3 (to supply power to both tractor mounted 24-volt connectors for trailer turn signals).

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

c. Service Lighting System (Continued).

(3) Turn Signal and Hazard Warning Lamps (Continued).



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PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

c. Service Lighting System (Continued).

(3) Turn Signal and Hazard Warning Lamps (Continued).

INDICATOR LAMPS. Three bulbs to indicate left turn (green), right turn (green), or hazard (red).Bulbs are energized, by selection, with 12-volt power from flasher unit.

HAZARD WARNING SWITCH. When engaged, it receives 12-volt power from blackout toggle switch through flasher and energizes all lights in the turn signal circuits at the same time.

RELAY (RY-2). Normally open contacts are closed by 12-volt power from left turn signal switch or hazard warning switch. When relay is energized, 24-volt power is supplied to tractor mounted connector for trailer left turn signals.

RELAY (RY-3).Normally open contacts are closed by 12-volt power from right turn signal switch or hazard warning switch. When relay is energized, 24-volt power is supplied to tractor mounted connector for trailer right turn signals.

12-VOLT TRAILER CONNECTOR. Cab mounted seven-pin connector provides 12-volt power to the trailer turn signal lamps.

24-VOLT TRAILER CONNECTOR. Chassis mounted 12-pin connector provides 24-volt power to the trailer turn signal lamps.

24-VOLT TRAILER CONNECTOR. Cab mounted 12-pin connector provides 24-volt power to vehicles.

REAR TAILLAMPS. Each assembly contains two bulbs; the taillamp turn signal and stoplamp circuits use the same bulb. When either the turn signal switch or hazard warning switch are on, the turn signal and stoplamp filaments flash. When the turn signal control is activated, only the bulb on the side selected flashes. If the brakes are engaged at the same time that the hazard warning switch is on, both bulbs flash. When the brakes are engaged and the turn signal control is activated, one bulb will flash and the other bulbs will remain on constantly.

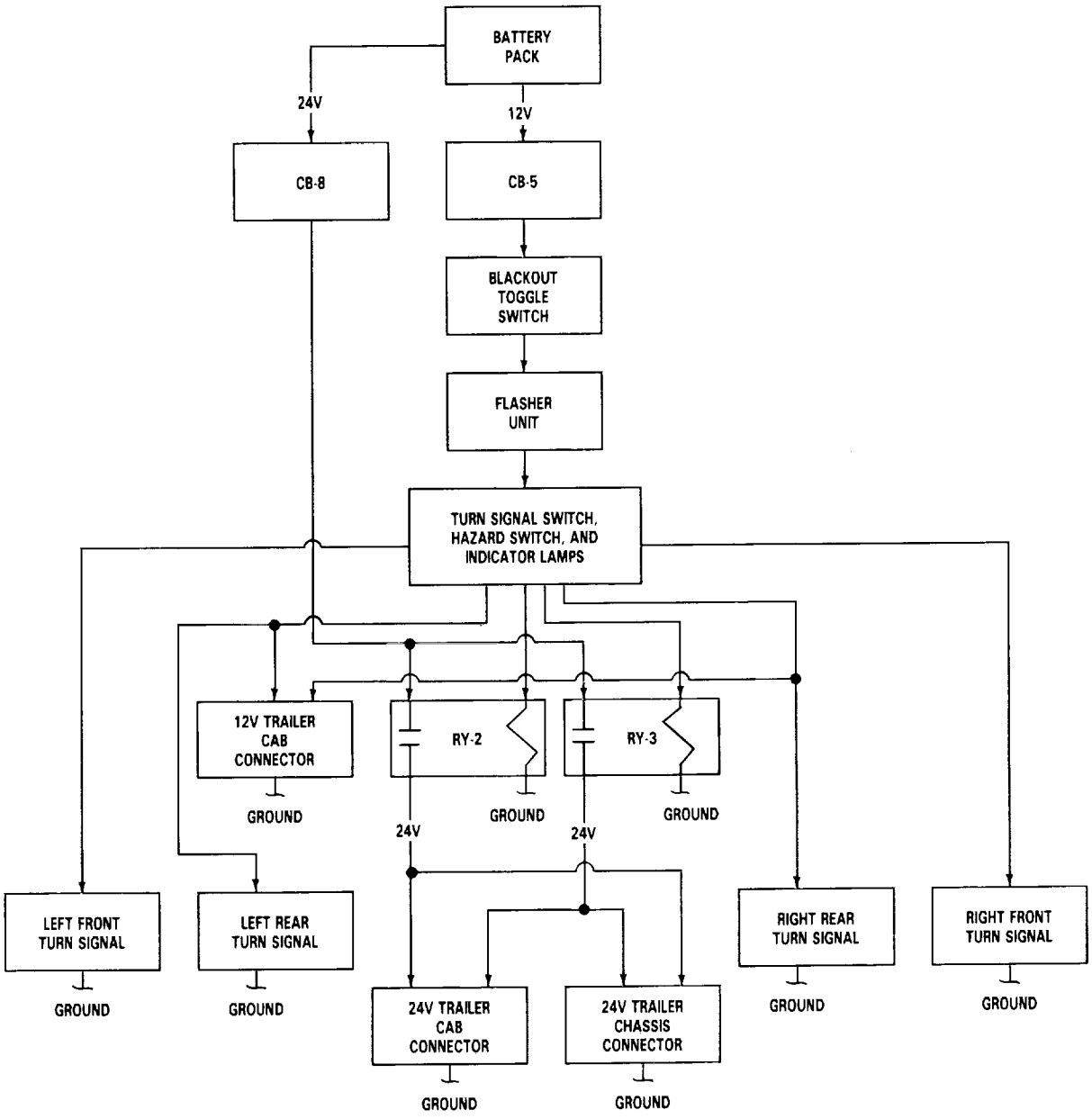
MARKER AND TURN SIGNAL LAMP ASSEMBLY. Each assembly has a replaceable single filament bulb that flashes when turn signal switch or hazard warning signal is on.

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

c. Service Lighting System (Continued).

(3) Turn Signal and Hazard Warning Lamps (Continued).



TA 236773

1-15. ELECTRICAL SYSTEM (Continued).

c. Service Lighting System (Continued).

(4) Backup Lamps.

When the operator places the transmission shift lever in REVERSE position (R), the reverse switch closes. When blackout toggle switch is in NORMAL position and ignition switch is in ON position, the circuit is energized to illuminate backup bulb in each taillamp assembly.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

IGNITION SWITCH. Supplies 24-volt to relay (RY-9), which in turn provides 12-volt power to electrical system, including backup lamp circuit.

RELAY (RY-9). Energized by 24-volts from ignition switch. When energized, RY-9 supplies 12-volt power to circuit breaker (CB-3).

CIRCUIT BREAKER (CB-3). Protects electrical components of backup switch circuit by opening when load exceeds 20 amperes. May be manually reset by pressing CB-3 button in.

REVERSE SWITCH. Normally open contacts. When closed, it receives 12-volt battery power through circuit breaker CB-3 and supplies power through normally closed contacts of relay RY-7 to energize backup lamps in taillamp assemblies.

RELAY (RY-7). Normally closed contacts are opened by 12-volt power when blackout toggle switch is placed to BLACKOUT position. This prevents the backup lamps from coming on whenever the blackout toggle switch is in BLACKOUT mode.

TAILLAMP (BACKUP LAMP). Each assembly contains two bulbs: a taillamp, turn signal, and stoplamp bulb that contains two filaments; and a backup bulb that contains one filament. When the backup switch closes, the backup lamp illuminates.

CIRCUIT BREAKER (CB-5). Protects electrical components of relay RY-7 circuits by opening when load exceeds 20 amperes. May be manually reset by pressing CB-5 button in.

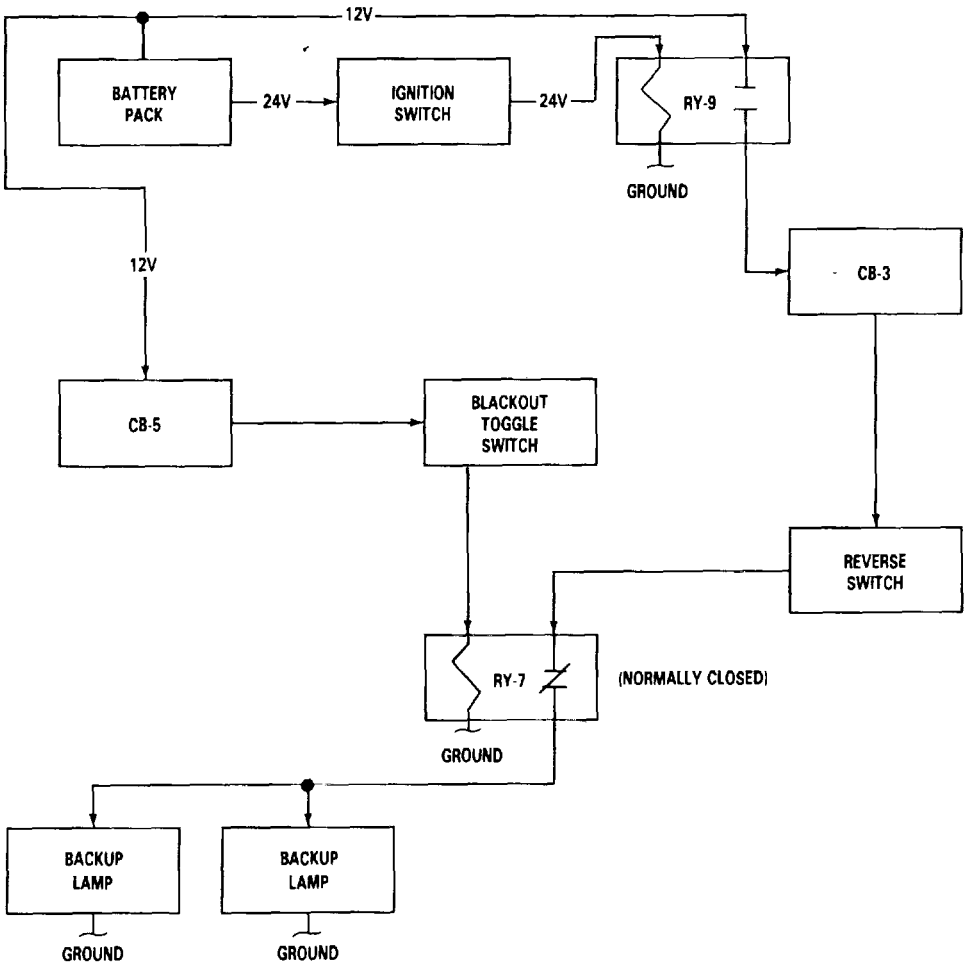
PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

c. Service Lighting System (Continued).

(4) Backup Lamps.

BLACKOUT TOGGLE SWITCH. Two-position switch for NORMAL and BLACKOUT modes of operation. In this circuit, the switch is used to prevent operation of the backup lamp. In BLACKOUT position, 12-volt power from circuit breaker CB-5 passes through toggle switch and energizes coil of relay RY-7, thus



TA 236774

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

c. Service Lighting System (Continued).

(5) Instruments, Gages, Dome Lamp, and Map Lamps.

Instrument gages operate when ignition switch is in ON position. Instrument lamps illuminate when headlamp switch is pulled to ON position. Dome lamp and map lamps illuminate whenever dome or map lamp switches are on and blackout toggle switch is in NORMAL position.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

IGNITION SWITCH. Supplies 24-volt power to relay (RY-9), which in turn provides 12-volt power to electrical system, including instrument gage, dome lamp, and map lamp circuits.

RELAY (RY-9). Energized by 24-volt power from ignition switch. When energized, RY-9 supplies 12-volt power to circuit breaker (CB-2).

CIRCUIT BREAKER (CB-2). Protects electrical components of instrument gage circuit by opening when load exceeds 20 amperes. May be manually reset by pressing CB-2 button in.

WATER TEMPERATURE GAGE. Changes in water temperature cause sending unit to increase and decrease resistence in circuit. As resistence changes, voltage at gage is changed, operating gage.

FUEL LEVEL GAGE. Changes in fuel level cause sending unit to increase and decrease resistence in circuit, as resistence changes, voltage at gage is changed, operating gage.

VOLTMETER. In series with 12-volt system. Shows voltage in system when ignition switch is in either ACCESSORY or IGNITION (ON) position.

TRANSMISSION OIL TEMPERATURE GAGE. Changes in transmission temperature cause sending unit to increase and decrease resistence in circuit. As resistence changes, voltage at gage is changed, operating gage.

ENGINE OIL PRESSURE GAGE. Changes in engine oil pressure cause sending unit to increase and decrease resistence in circuit as resistence changes, voltage at gage is changed, operating gage.

CIRCUIT BREAKER (CB-5). Protects 12-volt electric horn and turn signal flasher circuits.

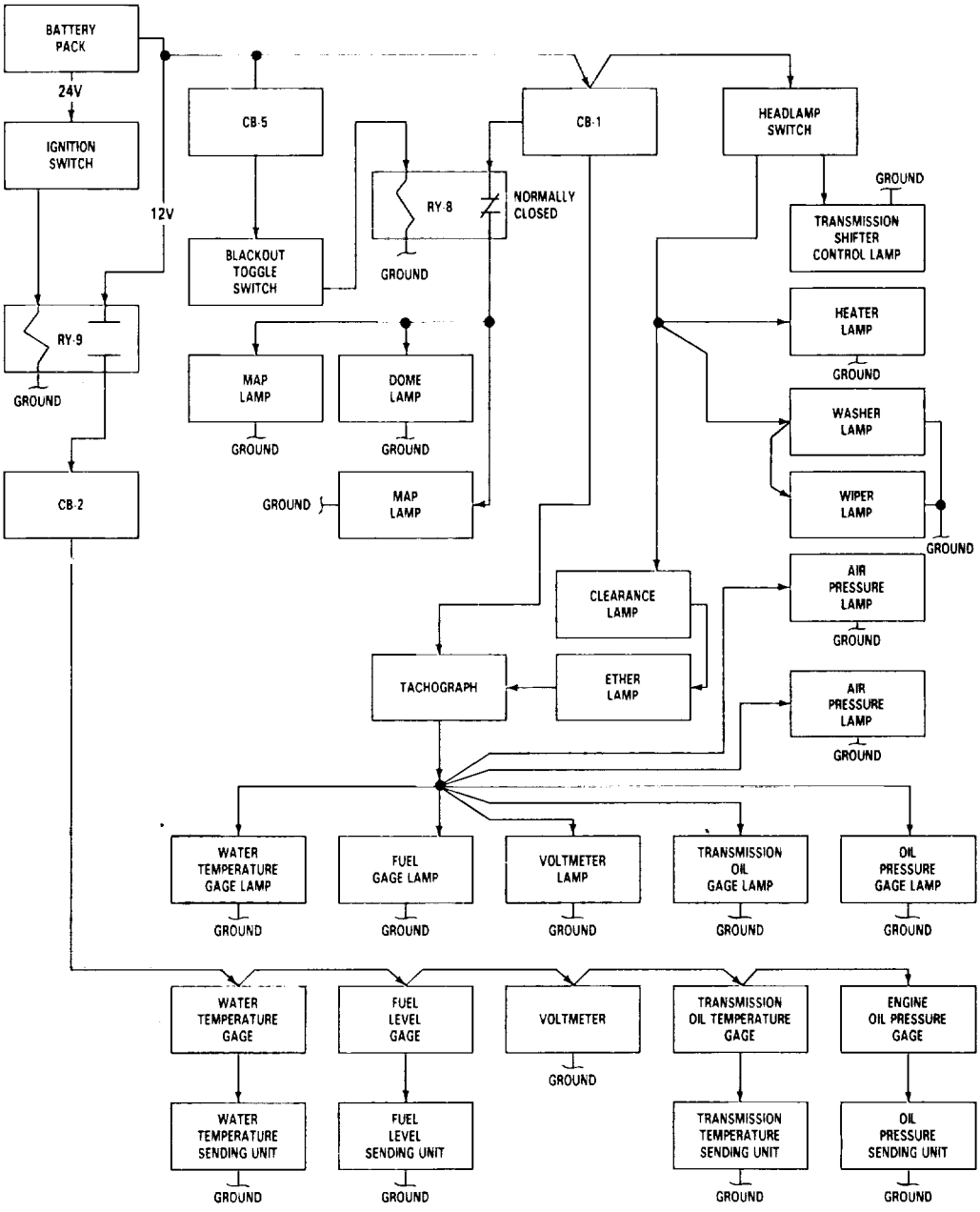
PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

c. Service Lighting System (Continued).

(5) Instruments, Gages, Dome Lamp, and Map Lamps.

CIRCUIT BREAKER (CB-1). Protects electrical components of dome and map lamps circuit by opening when load exceeds 20 amperes. May be manually reset by pressing CB-1 button in.



PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

c. Service Lighting System (Continued).

(5) Instruments, Gages, Dome Lamp, and Map Lamps.

RELAY (RY-8). Normally closed contacts are opened by 12-volt power when blackout toggle switch is placed in BLACKOUT position. This prevents the dome and map lamps from coming on whenever the blackout toggle switch is in the BLACKOUT mode.

BLACKOUT TOGGLE SWITCH. Two-position switch for NORMAL and BLACKOUT modes of operation. In this circuit, the switch is used to prevent operation of the dome and map lamps. In BLACKOUT position, 12-volt power from circuit breaker CB-1 passes through the switch and energizes coil of relay RY-8, thus preventing dome and map lamps from possibly coming on.

DOME LAMP AND MAP LAMPS SWITCH ASSEMBLY. When the dome lamp or map lamps switch is in ON position and the blackout toggle switch is in NORMAL position, the lamp is energized by 12-volt power through relay (RY-8) and circuit breaker (CB-1).

HEADLAMP SWITCH. Has one OFF position and two ON positions. In either ON position, 12-volt power passes through the switch to energize the following lamps in this circuit:

(a) Instrument lamps on left-hand instrument cluster.
(b) Clearance, ether switch, and tachograph illumination lamps on center cluster.
(c) Switch and functional indicators on right-hand instrument cluster.
(d) Illumination lamps on heater panel.
(e) Illumination lamps on shifter control tower.

The headlamp switch has a variable rheostat that allows the operator to adjust the brightness of all lamps in this circuit by turning the switch knob.

TACHOGRAPH. Receives 12-volt power from headlamp switch for illumination.

WINDSHIELD WIPER AND WASHER LAMPS. Receives 12-volt power from headlamp switch for illumination.

HEATER PANEL LAMPS. When headlamp switch is in either ON position, lamps are energized by 12-volt power and illuminate heater control panel.

TRANSMISSION SHIFTER CONTROL LAMP. When headlamp switch is in either ON position, lamp is energized by 12-volt battery power and illuminates transmission shifter control.

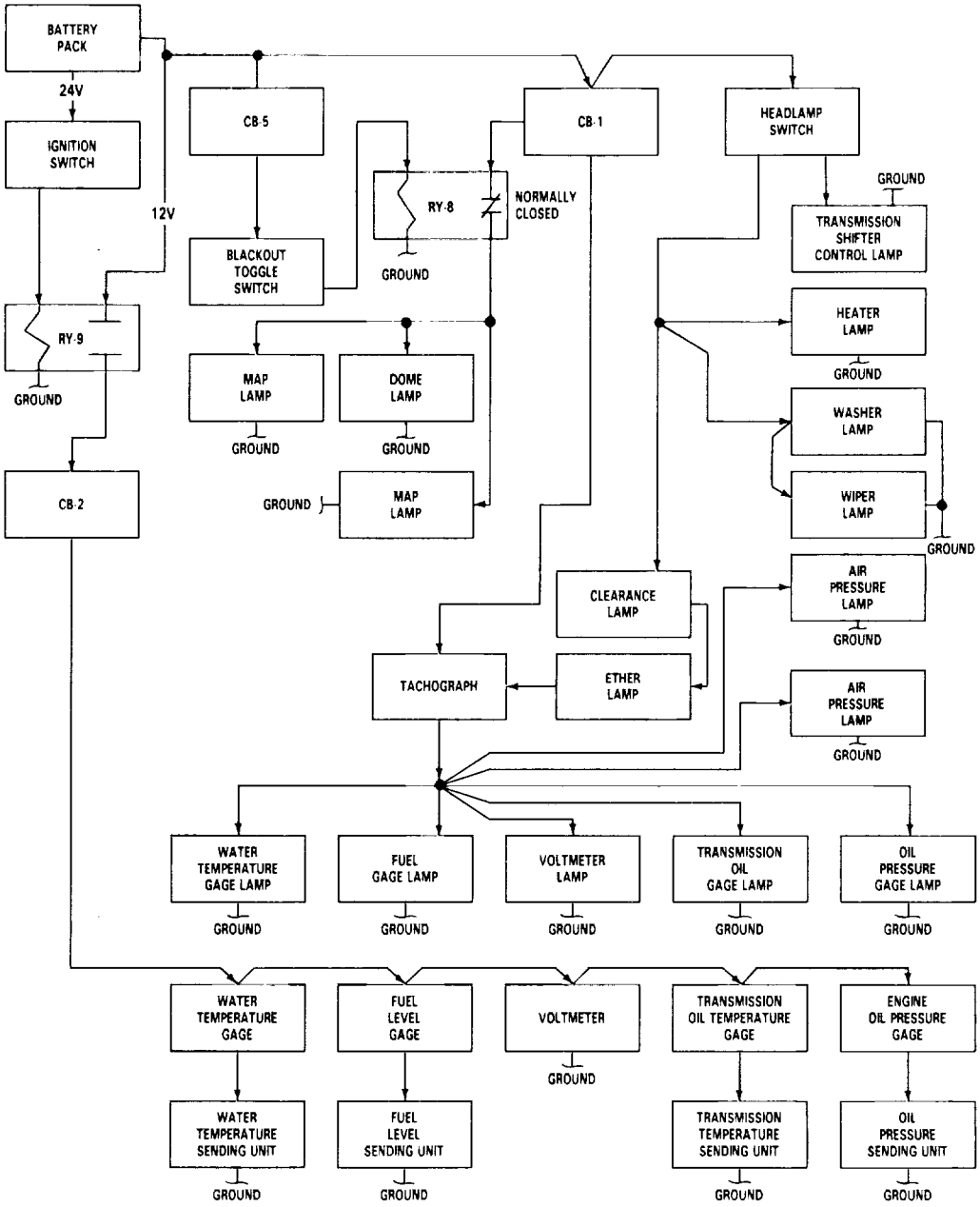
PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

c. Service Lighting System (Continued).

(5) Instruments, Gages, Dome Lamp, and Map Lamps.

GAGE LAMPS. Receive 12-volt power when headlamp switch is on. Illuminates



TA 236776

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

d. Blackout Lighting System.

The blackout lighting system prevents operation of the horn and all service lighting, except instrument lamps. The system provides the following intensity lighting for operation:

(1) One blackout drive headlamp.
(2) Two front blackout marker lamps.
(3) Two taillamps and stoplamps.
(4) Trailer taillamps, stoplamps, and marker lamps at cab and chassis mounted 12-pin trailer connector.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

IGNITION SWITCH. Supplies 24-volt power to relay (RY-9), which in turn provides 12-volt power to electrical system, including blackout lighting system.

BLACKOUT TOGGLE SWITCH. Two-position switch for NORMAL and BLACKOUT modes of operation. With this switch in BLACKOUT position, 12-volt battery power is available from headlamp switch to energize: blackout headlamp, blackout marker lamps, taillamps, and relays RY-4 and RY-5.

BLACKOUT HEADLAMP. Consists of a single, replaceable sealed beam unit. With headlamp switch in ON position, the blackout headlamp is energized by 12-volt battery power.

BLACKOUT MARKER LAMPS. Each consists of a replaceable bulb that is energized by 12-volt battery power when the headlamp switch is in either ON position.

RELAY (RY-4). Normally open contacts are closed by 12-volt power when blackout toggle switch is in BLACKOUT position. When relay is energized, 24-volt power is supplied from circuit breaker CB-9 through 24-volt trailer connector.

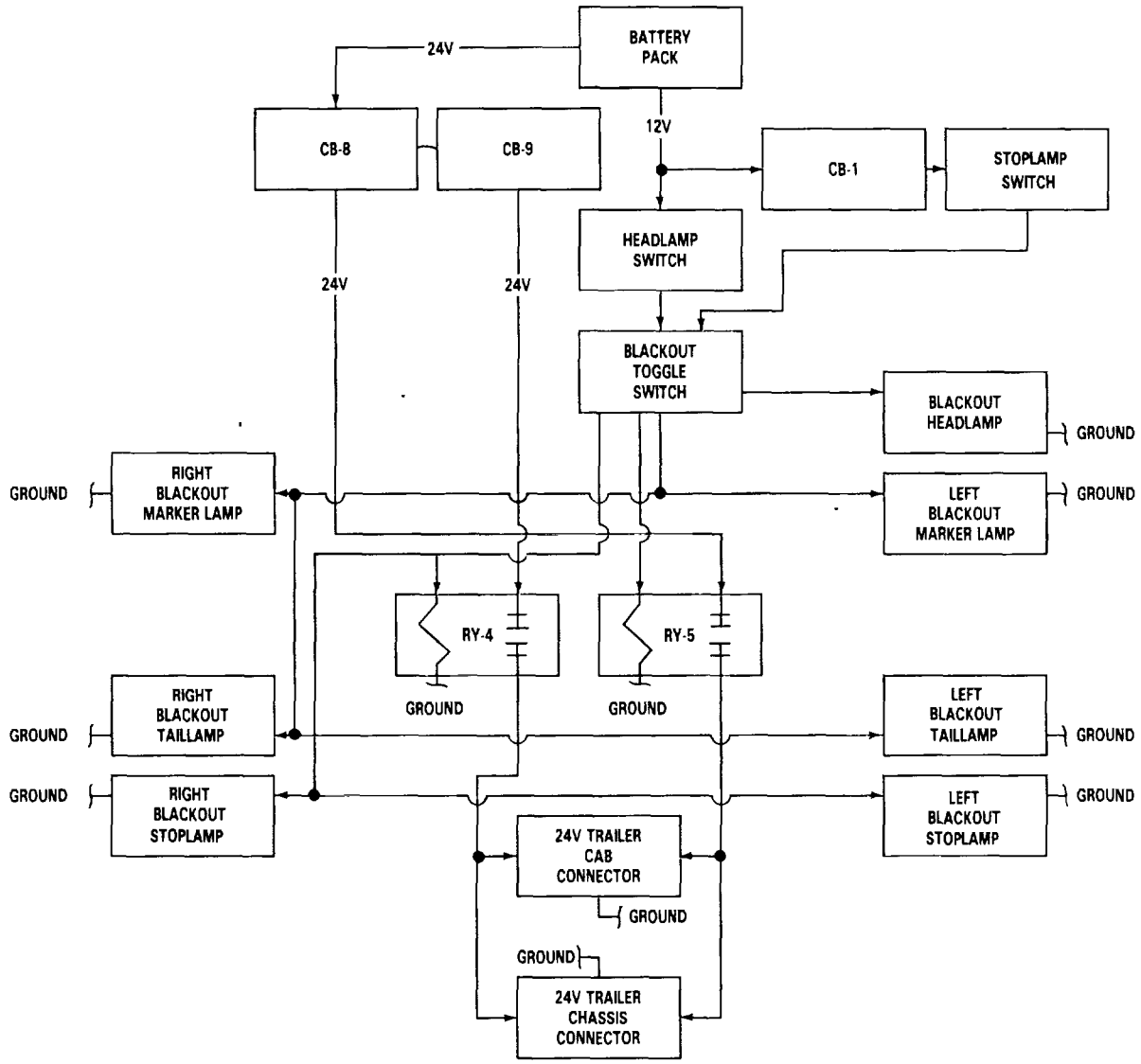
RELAY (RY-5). Normally open contacts are closed by 12-volt power when blackout toggle switch is in BLACKOUT position. When relay is energized, 24-volt power is supplied from circuit breaker CB-8 through 24-volt trailer connector for blackout taillamps.

CIRCUIT BREAKER (CB-1). Protects electrical components of stop switch circuit by opening when load exceeds 20 amperes. May be manually reset by pressing CB-1 button in.

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

d. Blackout Lighting System (Continued).



TA 236777

1-15. ELECTRICAL SYSTEM (Continued).

d. Blackout Lighting System (Continued).

CIRCUIT BREAKER (CB-8). Protects electrical components of 24-volt blackout taillamp relay circuit by opening when load exceeds 20 amperes. May be manually reset by pressing CB-8 button in.

HEADLAMP SWITCH. Has one OFF position and two ON positions. Supplies 12-volt power to the blackout toggle switch.

CIRCUIT BREAKER (CB-9). Protects electrical components of 24-volt blackout stoplamp relay circuit by opening when load exceeds 20 amperes. May be manually reset by pressing CB-9 button in.

24-VOLT TRAILER CONNECTOR. Cab mounted 12-pin connector to provide 24-volt power to trailers for blackout taillamps and stoplamps.

REAR BLACKOUT LAMPS. Contains bulbs for blackout taillamps and stoplamps. Black out taillamp is energized when the blackout toggle switch is in BLACKOUT position and the headlamp switch is in either ON position. Stoplamps are energized when the stoplamp switch is actuated.

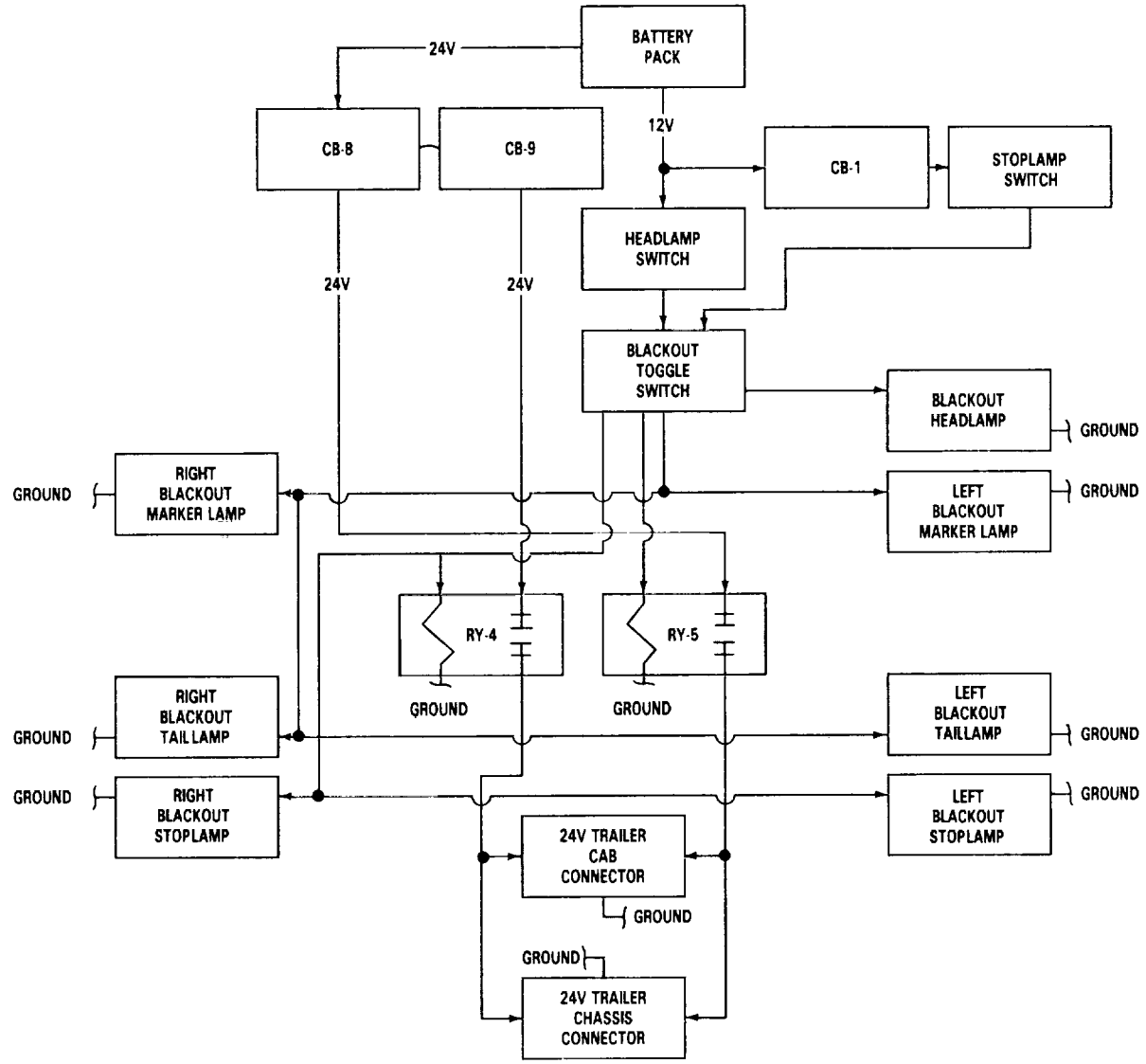
24-VOLT TRAILER CONNECTOR. Chassis mounted 12-pin connector to provide 24-volt power to trailer blackout taillamps and stoplamps.

STOP LAMP SWITCH. Part of the brake system. Shown and described in paragraph 1-20b. In this circuit, the switch receives 12-volt power from circuit breaker CB-1. When the brakes are engaged, switch closes and supplies 12-volt power through the blackout toggle switch to energize relay RY-4. With this relay closed, 24-volt power is supplied through circuit breaker CB-9 to the 24-volt tractor mounted trailer connector.

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

d. Blackout Lighting System (Continued).



TA 236778

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

e. Relays, Circuit Breakers, and Diode.

RELAY (RY-1). When normally open contacts are closed, relay provides 12-volt power to electric horn.

RELAY (RY-2). When normally open contacts are closed, relay provides 24-volt power to trailer left turn signal lamp.

RELAY (RY-3). When normally open contacts are closed, relay provides 24-volt power to trailer right turn signal lamp.

RELAY (RY-4). When normally open contacts are closed, relay provides 24-volt power to trailer blackout stoplamp.

RELAY (RY-5). When normally open contacts are closed, relay provides 24-volt power to trailer blackout taillamps.

RELAY (RY-6). When normally open contacts are closed, relay provides 24-volt power to trailer marker and taillamps.

RELAY (RY-7). When normally closed contacts are opened, relay disconnects 12-volt power from tractor backup lamps.

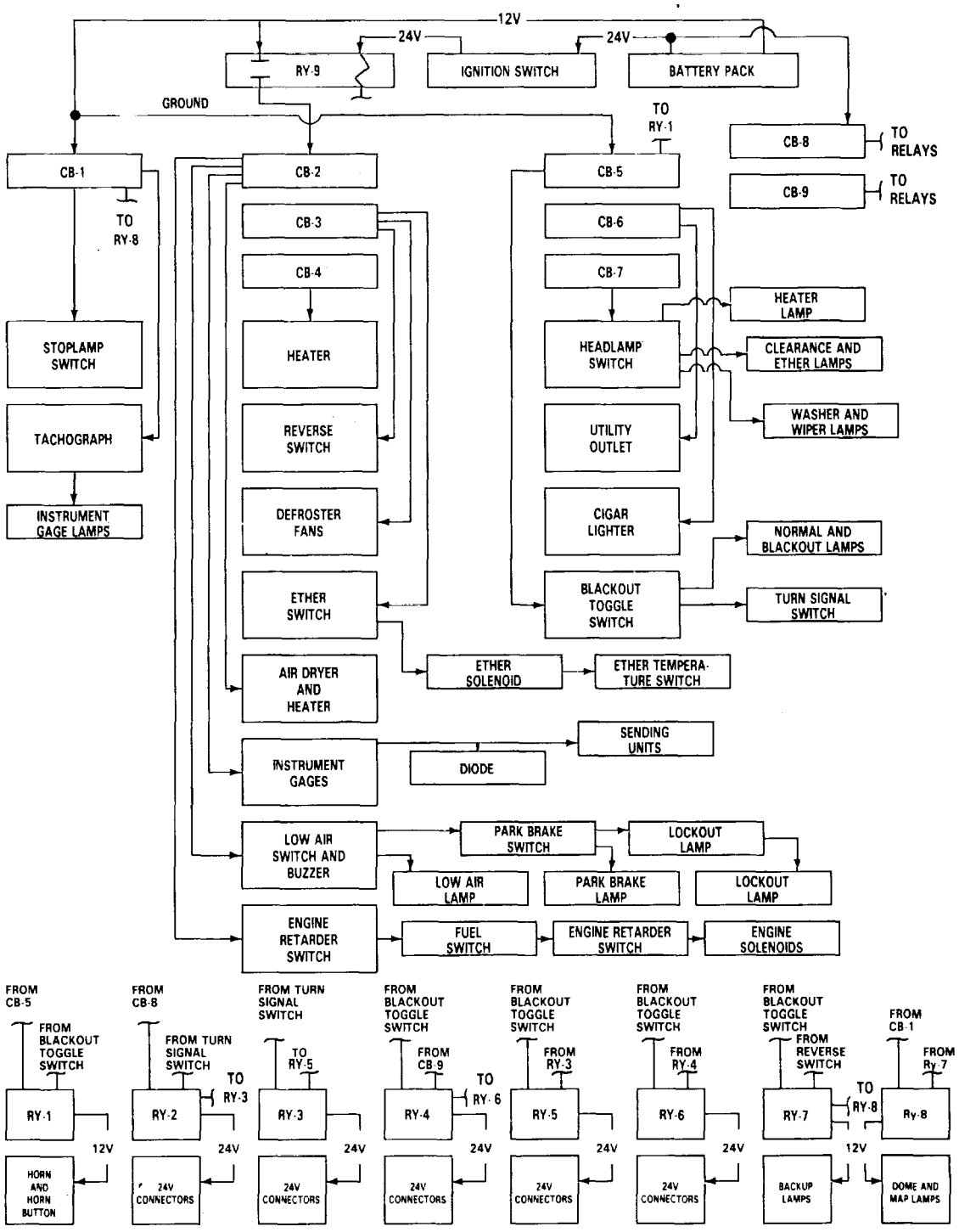
RELAY (RY-8). When normally closed contacts are opened, relay disconnects 12-volt power from dome lamp and map lamps.

RELAY (RY-9). When normally open contacts are closed, relay provides 12-volt power to heater motor, backup lamp, defroster fans, ether quick-start kit, engine brake retarder, air dryer, low air switch, park brake switch, differential lockout switch, instrument gages, and indicator lamps.

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

e. Relays, Circuit Breakers, and Diode.



TA 236779

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

e. Relays, Circuit Breakers, and Diode.

ENGINE TEMPERATURE DIODE. Provides a circuit to illuminate engine temperature indicator when engine is cranking. Prevents engagement of starter by feedback voltage when water temperature switch closes.

CIRCUIT BREAKER (CB-9). Protects 24-volt blackout stoplamp, marker, and taillamp circuits for trailers used with the M915A1.

CIRCUIT BREAKER (CB-8). Protects 24-volt left and right turn signals and blackout taillamp circuits for trailers used with the M915A1.

CIRCUIT BREAKER (CB-7). Protects 12-volt headlamp and operational lamp switch circuit.

CIRCUIT BREAKER (CB-6). Protects 12-volt cigar lighter circuit and 12-volt utility outlets.

CIRCUIT BREAKER (CB-5). Protects 12-volt electric horn and turn signal flasher circuits.

CIRCUIT BREAKER (CB-4). Protects 12-volt heater fan motor circuit.

CIRCUIT BREAKER (CB-3). Protects 12-volt backup lamps, ether start, and defroster fan circuits.

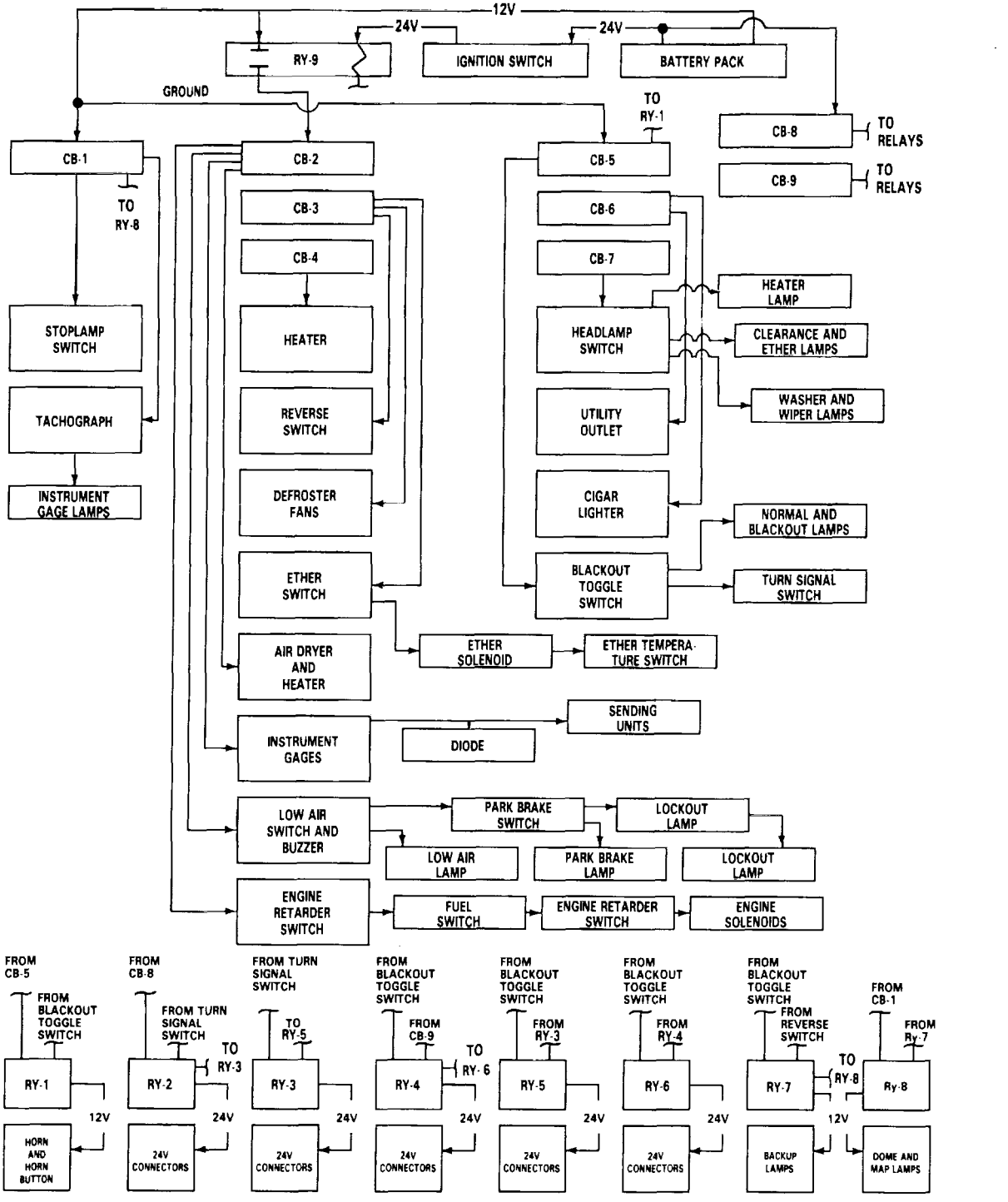
CIRCUIT BREAKER (CB-2). Protects 12-volt engine retarder brake, moisture ejection valve heater, air dryer heater, instrument gages, low air, park brake, and differential lockout circuits.

CIRCUIT BREAKER (CB-1). Protects 12-volt stoplamp, blackout toggle switch, turn signal, dome lamp, map lamps, and instrument lighting circuits.

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

e. Relays, Circuit Breakers, and Diode.



TA 236780

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

f. Electric Horn.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

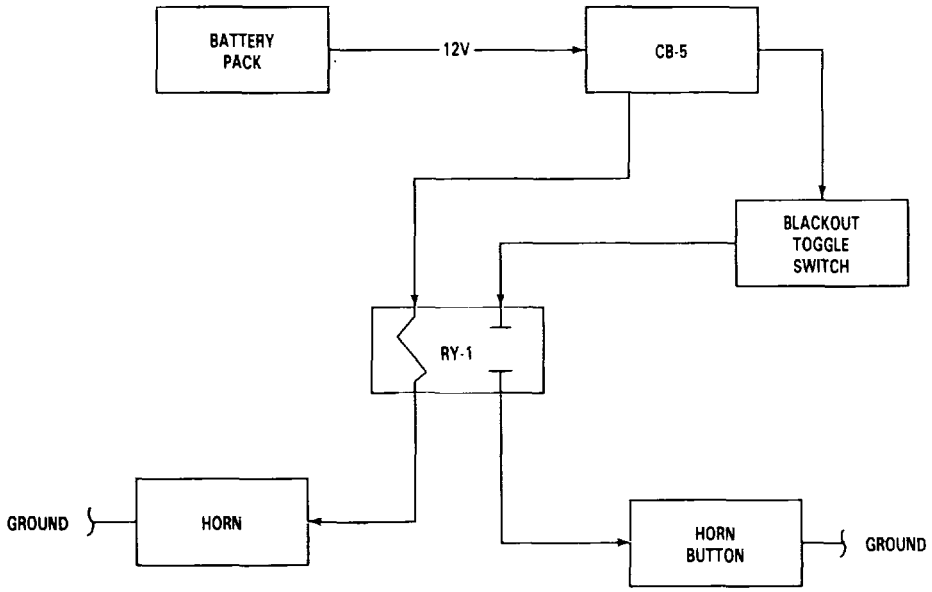
CIRCUIT BREAKER (CB-5). Protects electrical components of horn circuit by opening when load exceeds 20 amperes. May be manually reset by pressing CB-5 button in.

BLACKOUT TOGGLE SWITCH. Two-position switch for NORMAL and BLACKOUT modes of operation. With switch set to NORMAL and horn button depressed, 12-volt power from circuit breaker passes through switch contacts to relay.

HORN BUTTON. Pushing this button activates horn circuit and energizes horn.

RELAY (RY-1). Normally open contacts are closed by 12-volt power from blackout toggle switch when horn button is depressed. With relay deenergized, 12 volts are supplied from a second lead from circuit breaker, through contacts of relay to horn.

ELECTRIC HORN. The horn is energized by 12-volt power when horn button is



TA 236781

PRINCIPLES OF OPERATION.

1-15. ELECTRICAL SYSTEM (Continued).

g. Wiring.

The electrical wiring on the M915A1 vehicle is contained in braided or loomed harness assemblies. The wires are permanently hot-stamped with individual circuit numbers. The circuit numbers appear two inches from each termination end. Refer to Appendix D (TM 9-2320-283-20-3) for wiring harness drawings and wiring diagram for circuit numbers and terminations.

PRINCIPLES OF OPERATION.

1-16. TRANSMISSION.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

IGNITION SWITCH. Supplies 24-volt power to relay (RY-9), which in turn provides 12-volt power to electrical system, including transmission.

RELAY (RY-9). Energized by 24-volt power from ignition switch. When energized, RY-9 supplies 12-volt power to circuit breaker (CB-2).

CIRCUIT BREAKER (CB-2). Protects electrical components of transmission oil temperature circuit when load exceeds 20 amperes. May be manually reset by pressing CB-2 button in.

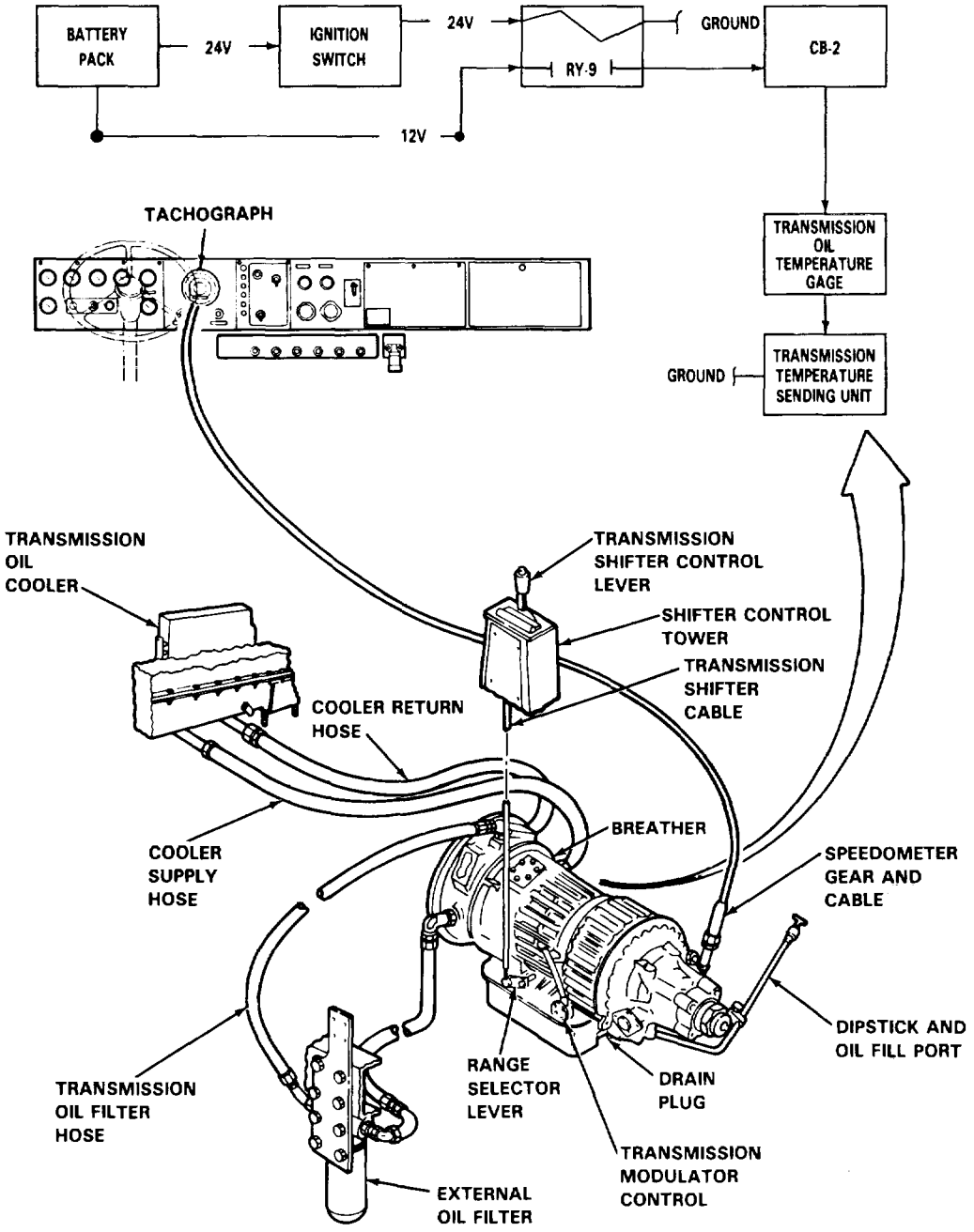
TRANSMISSION OIL TEMPERATURE GAGE. Signal from sending unit actuates pointer gage, showing transmission oil temperature.

TACHOGRAPH. Receives signals from speedometer and tachometer cables and shows MPH, RPM, and miles driven. Also, records this data on 7-day disk pack. (Refer to para 3-309 for more information on tachograph disk pack).

TRANSMISSION OIL TEMPERATURE SENDING UNIT. Provides electrical signal to temperature gage for indicating transmission oil temperature.

PRINCIPLES OF OPERATION.

1-16. TRANSMISSION (Continued).



TA 236782

PRINCIPLES OF OPERATION.

1-16. TRANSMISSION (Continued).

SPEEDOMETER GEAR AND CABLE. Provides engine speed input to tachograph.

DIPSTICK AND OIL FILL PORT. Used to inspect and replenish oil supply.

TRANSMISSION MODULATOR CONTROL. Receives mechanical signal from throttle lever and fuel pump. This signal determines transmission gear range setting.

DRAIN PLUG. Provides access for draining oil. Has magnetic base to attract foreign particles in oil, an early warning of unusual wear of internal parts.

TRANSMISSION SHIFT CONTROL LEVER. Receives mechanical signal from shifter cable and internally sets transmission gear range.

TRANSMISSION TO OIL FILTER HOSE(S). Carry oil between transmission and external oil filter.

EXTERNAL OIL FILTER. Spin-on type element used to remove dirt and foreign particles from transmission oil.

COOLER SUPPLY HOSE. Carries hot oil from transmission to cooler.

COOLER RETURN HOSE. Carries cooled oil from cooler back to transmission.

TRANSMISSION OIL COOLER. Receives hot oil from the transmission through the supply hose, circulates the oil through air cooled fins, and sends cooled oil back to transmission through return hose.

TRANSMISSION SHIFTER CONTROL LEVER. Allows operator to select desired transmission gear range. (Refer to TM 9-2320-283-10).

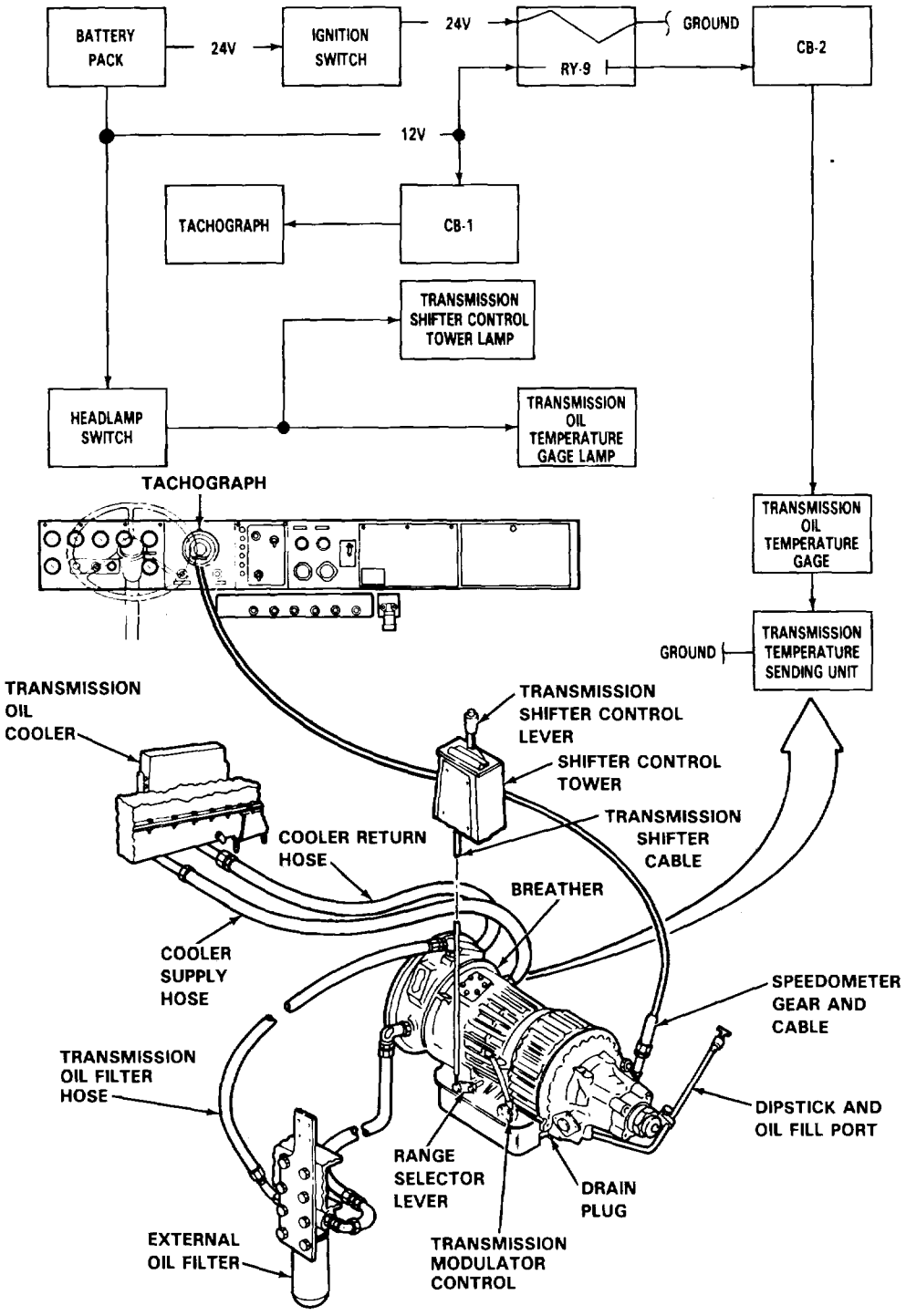
TRANSMISSION SHIFTER CONTROL TOWER. Floor mounted. Used to house transmission range shifter control.

TRANSMISSION SHIFTER CABLE. Mechanically transmits signal from transmission shifter control tower to transmission range selector lever.

BREATHER. Prevents air pressure build-up in case.

PRINCIPLES OF OPERATION.

1-16. TRANSMISSION (Continued).



TA 236783

PRINCIPLES OF OPERATION.

1-17. FRONT AXLE AND SUSPENSION.

LEAF SPRINGS. Absorb and minimize amount of road shock transmitted to vehicle frame.

SHACKLE. Swinging support that permits leaf spring to vary in length as it is deflected.

BRAKE AIR CHAMBER. Pressure is supplied to chambers from air system to mechanically actuate brake mechanism. (Refer to brake system, para 1-20c).

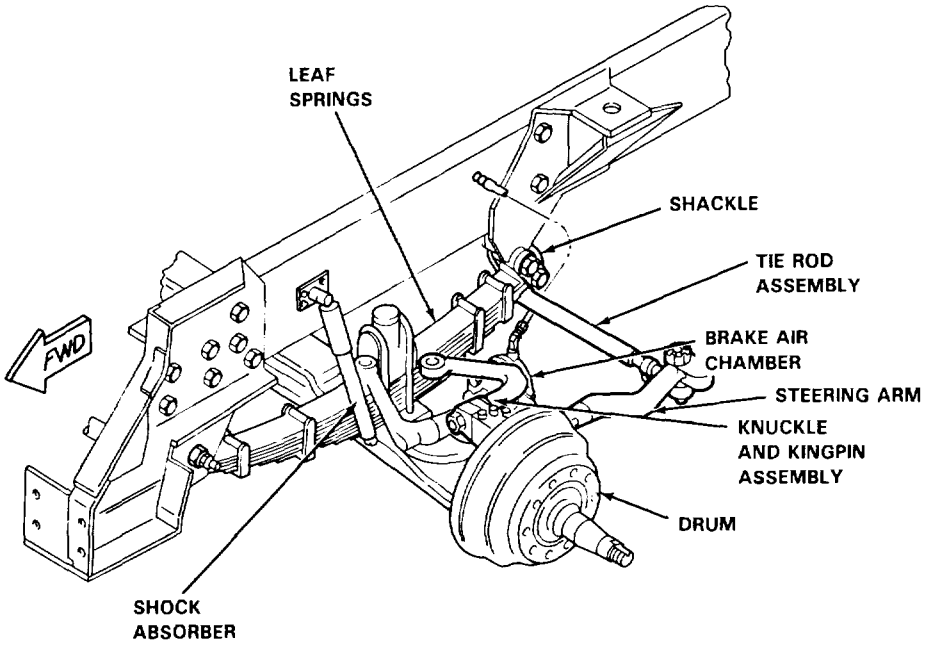
KNUCKLE AND KINGPIN ASSEMBLY. Moveable joint between the wheel and axle I-beam.

DRUM. Houses wheel brakes. Serves as mount for front wheels.

STEERING ARM. Connects to power steering drag link. (Refer to para 1-22).

TIE ROD ASSEMBLY. Connects left and right knuckles for synchronized movement of both wheels.

SHOCK ABSORBERS. Supplement spring and stabilize spring fluctuations caused



TA 236784

PRINCIPLES OF OPERATION.

1-18. REAR TANDEM AXLES.

a. Rear Tandem Axle Components.

HUB AND DRUM ASSEMBLY. Serves as mount for rear wheels. Houses brake shoe assemblies which can be mechanically forced against it to slow or stop vehicle.

FILLER PLUG. Used to inspect oil level and replenish oil supply.

AXLE SHAFT. Located inside axle housing. Transmits power from differential gear assembly to hub assembly.

INTERAXLE PROPELLER SHAFT. Transmits power to rear-rear axle.

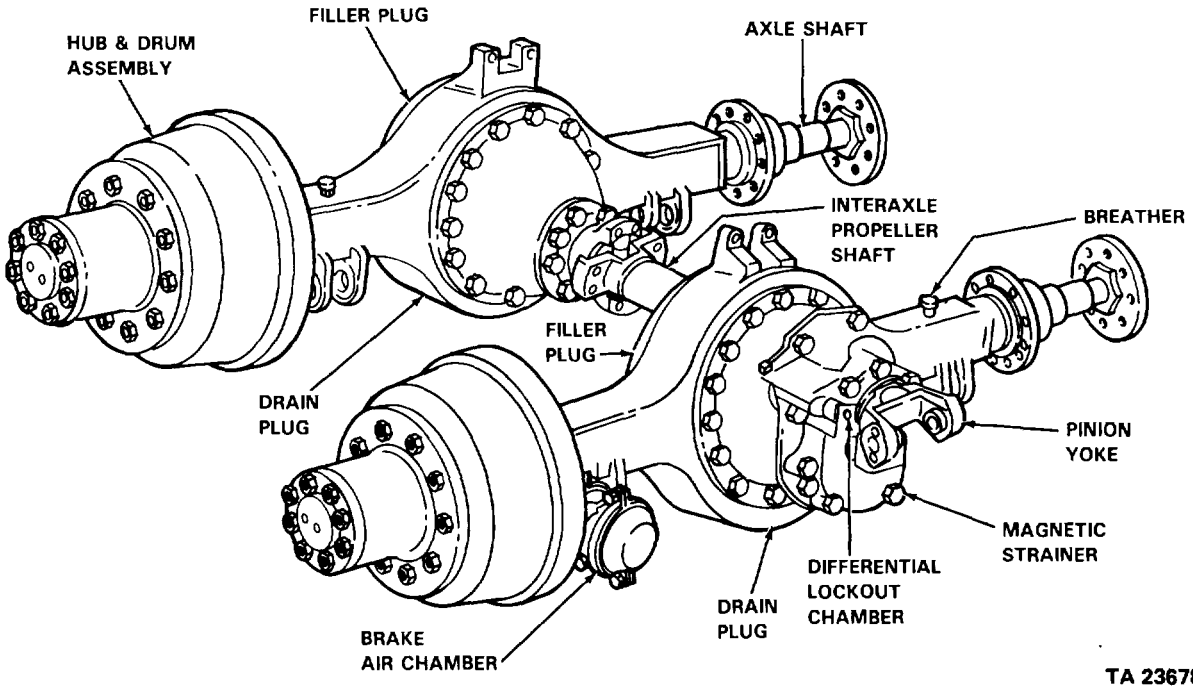
BREATHER. Allows fumes from hot oil to escape.

PINION YOKE. Connects to propeller shaft from transmission.

MAGNETIC STRAINER. Keeps lubrication system clean. Magnet traps small particles and screen blocks out large particles of foreign material.

DIFFERENTIAL LOCKOUT CHAMBER Air actuated by lockout switch located in cab interior. (Refer to para 1-18b for description).

DRAIN PLUG. Allows draining oil at service intervals.



PRINCIPLES OF OPERATION.

1-18. REAR TANDEM AXLES (Continued).

b. Rear Tandem Axle Differential Lockout.

Activating the differential lockout control locks the interaxle differential, thereby connecting the transmission and both front and rear tandem axles solidly together.

The forward-rear tandem axle is equipped with a NO-SPINE differential which automatically locks, eliminating differential action independent of manual control. At least three wheels on the rear tandem must turn when the interaxle differential lock is engaged.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

IGNITION SWITCH. Supplies 24-volt power to relay (RY-9), which in turn provides 12-volt power to electrical system, including differential lockout indicator circuit.

RELAY (RY-9). Energized by 24-volt power from ignition switch. When energized, RY-9 supplies 12-volt power to circuit breaker (CB-2).

LOCKOUT INDICATOR. Illuminates when lockout switch is closed.

CIRCUIT BREAKER (CB-2). Protects electrical components of differential lockout circuit by opening when load exceeds 20 amperes. May be manually reset by pressing CB-2 button in.

AIR MANIFOLD. Routes air from reservoir to control valve.

LOCKOUT CHAMBER. When air pressure is applied, chamber mechanically locks rear axle differential in place so that drive is applied to both rear axles. Without air pressure, differential applies drive to axle that offers least resistence.

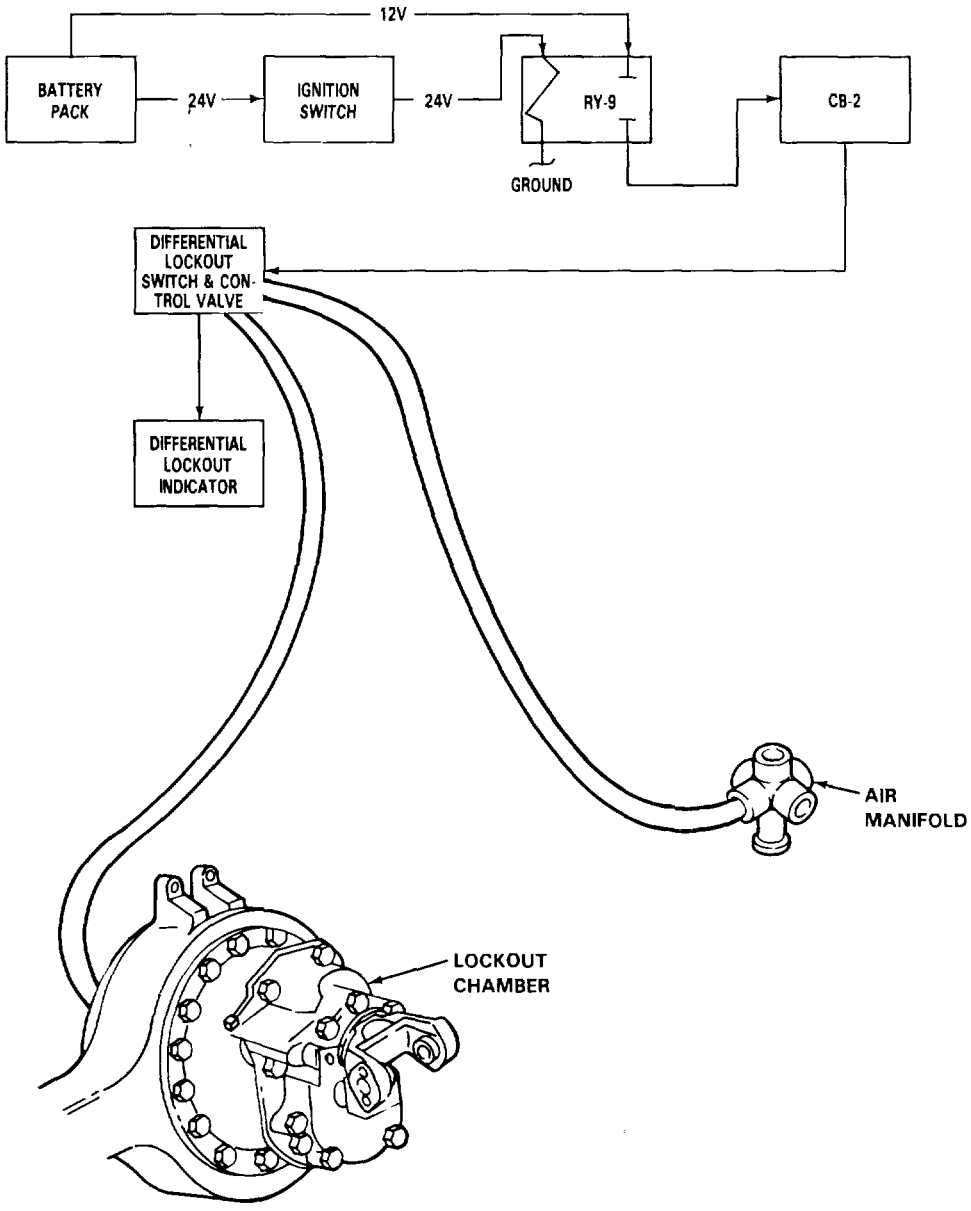
CONTROL VALVE. When engaged, air pressure is applied to lockout rear differential action.

LOCKOUT SWITCH. Normally open. Closed by 60 psi air pressure to activate lockout indicator circuit.

PRINCIPLES OF OPERATION.

1-18. REAR TANDEM AXLES (Continued).

b. Rear Tandem Axle Differential Lockout.



TA 236786

PRINCIPLES OF OPERATION.

1-19. COMPRESSED AIR SYSTEM.

This paragraph provides information on components of the compressed air system. For information on the brake system, refer to paragraph 1-20.For information on the auxiliary air-powered systems, refer to paragraph 1-21. For a complete air system diagram, refer to Appendix D (TM 9-2320-283-20-3).

ACCESSORY DRIVE. Driven by camshaft gear. Provides power to operate air compressor.

AIR COMPRESSOR. Draws air from air aftercooler, compresses it, and directs it to the air dryer.

AIR COMPRESSOR GOVERNOR. Opens unloading valve to prevent further air compression when air pressure reaches 125 psi. Closes unloading valve to begin air compression when air pressure falls below 100 psi.

CHECK VALVE(S). One way valve(s) prevent air from flowing out of primary or secondary reservoirs back to supply reservoir.

PRIMARY RESERVOIR. Receives compressed air from supply reservoir and stores it for use in brake system. (Refer to para 1-20).

DRAINCOCK(S). Used to drain compressed air and moisture from primary, secondary, and supply reservoirs.

QUICK DISCONNECT COUPLER. Used in conjunction with tire inflation air hose and chuck.

AUTOMATIC DRAIN VALVE. Automatically ejects moisture and contaminants from supply tank. Each time brake is applied, a pressure drop occurs in the supply tank, causing drain valve to open momentarily.

AIR DRYER. Collects and removes moisture and contaminants before air reaches supply reservoir. Provides "dry air" for air brake system.

SUPPLY RESERVOIR. Receives compressed air from air dryer and supplies it to primary and secondary reservoirs.

SAFETY VALVE. Vents air when pressure in supply tank rises above 150 psi.

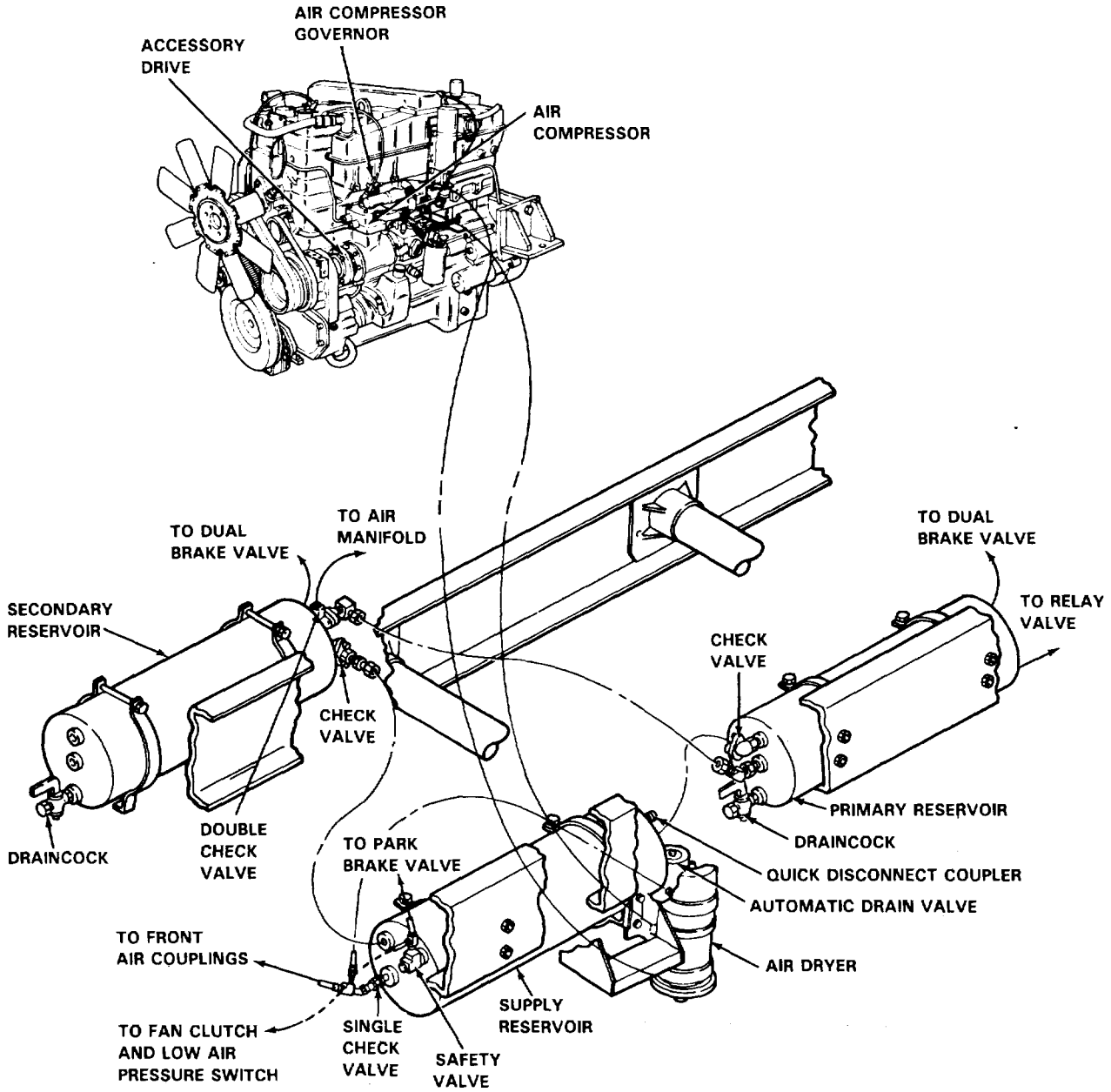
SINGLE CHECK VALVE. One-way check valve prevents air from flowing out of supply reservior back to air compressor.

DOUBLE CHECK VALVE. One-way check valve prevents air from flowing out of primary reservoir or air manifold back to secondary reservoir.

SECONDARY RESERVOIR. Receives compressed air from supply reservoir and supplies it to auxiliary air-powered systems and brake system.

PRINCIPLES OF OPERATION.

1-19. COMPRESSED AIR SYSTEM (Continued).



TA 236787

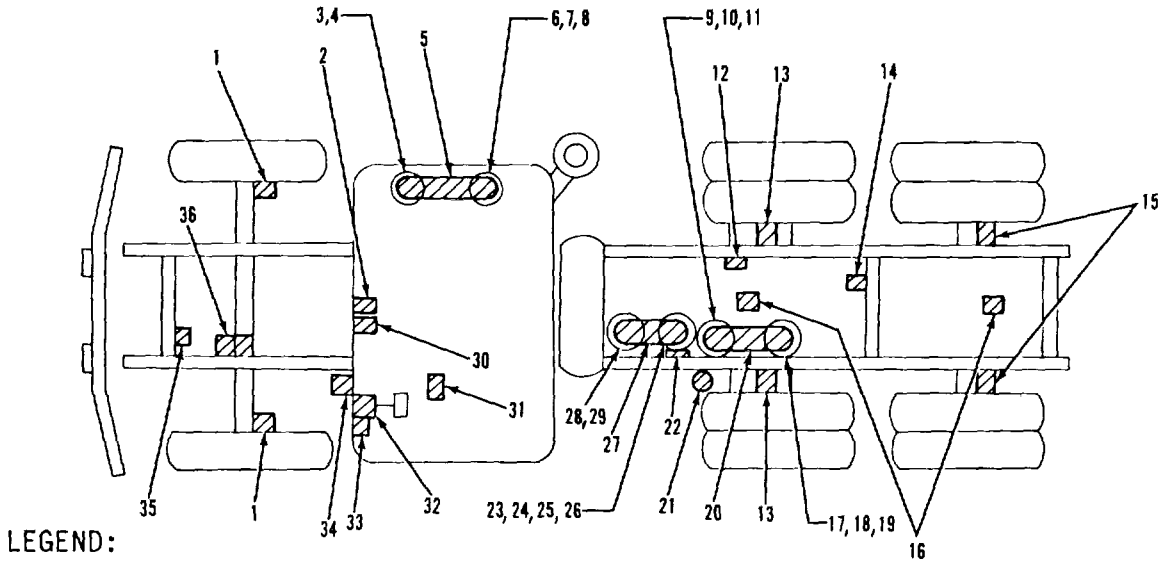
PRINCIPLES OF OPERATION.

1-20. BRAKE SYSTEM.

a. Air Brake System Arrangement.

NOTE

The components shown below are described in paragraphs 1-19 and 1-20.



1. FRONT AXLE BRAKE CHAMBER (2) (para 1-20b)
2. PARKING BRAKE VALVE (para 1-20b)
3. DRAINCOCK (para 1-19)
4. PLUG (2)
5. SECONDARY RESERVOIR (para 1-19)
6. DOUBLE CHECK VALVE (para 1-19)
7. 90° CHECK VALVE (para 1-19)
8. 90° ELBOW
9. DRAINCOCK (para 1-19)
10. 45° ELBOW
11. 45° CHECK VALVE (para 1-19)
12. DOUBLE CHECK AND QUICK RELEASE VALVE (para 1-20b)
13. FORWARD-REAR AXLE BRAKE CHAMBER (2) (para 1-20b)
14. RELAY VALVE (para 1-20b)
15. REAR-REAR AXLE AIR BRAKE CHAMBER (2) (para 1-20b)
16. QUICK RELEASE VALVE (2) (para 1-20b)
17. ADAPTER
18. 90° ELBOW
19. PLUG
20. PRIMARY RESERVOIR (para 1-19)
21. AIR DRYER (para 1-19)
22. TRACTOR PROTECTION VALVE (para 1-20b)
23. AUTOMATIC DRAIN VALVE (para 1-19)
24. 90° ELBOW
25. QUICK RELEASE COUPLER (para 1-19)
26. SAFETY VALVE (para 1-19)
27. SUPPLY RESERVOIR (para 1-19)
28. 90° ELBOW (2)
29. CHECK VALVE (para 1-19)
30. TRAILER SUPPLY VALVE (para 1-19)
31. TRAILER HAND CONTROL BRAKE VALVE (pare 1-20b)
32. BRAKE TREADLE VALVE (para 1-20b)
33. DOUBLE CHECK VALVE (para 1-20b)
34. DOUBLE CHECK AND STOPLAMP VALVE (para 1-20b)
35. FRONT AXLE RATIO VALVE (para 1-20b)
36. AIR COMPRESSOR/GOVERNOR (para 1-19)

TA 236788

PRINCIPLES OF OPERATION.

1-20. BRAKE SYSTEM (Continued).

b. Brake System Components.

This subparagraph describes and illustrates the following components:

(1) S-Type Cam Brake

(2) Slack Adjuster

(3) Front Axle Air Brake Chamber

(4) Forward-Rear Axle Brake Chamber

(5) Rear-Rear Axle Brake Chamber

(6) Brake Treadle Valve

(7) Parking Brake Valve

(8) Trailer Hand Control Brake Valve

(9) Trailer Supply Valve

(10) Front Axle Ratio Valve

(11) Double Check and Stoplamp Valve

(12) Double Check Valve

(13) Tractor Protection Valve

(14) Double Check and Quick Release Valve

(15) Quick Release Valve

(16) Relay Valve

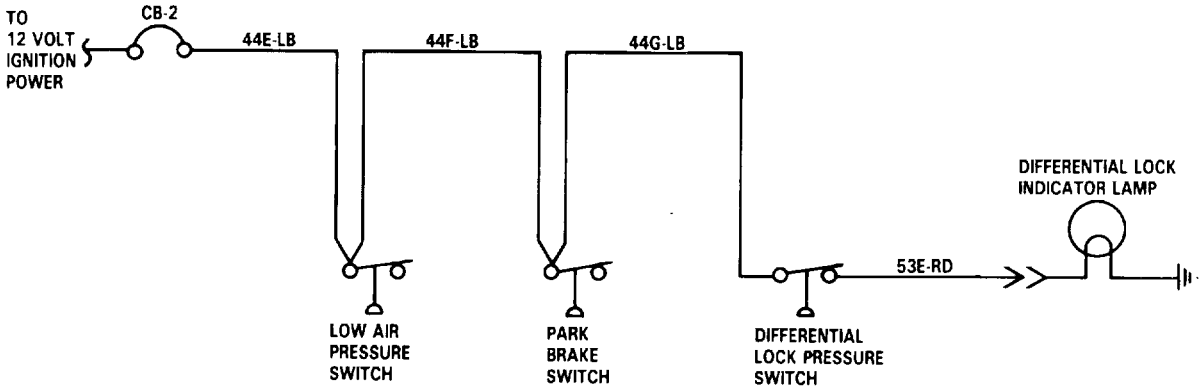
PRINCIPLES OF OPERATION.

1-20. BRAKE SYSTEM (Continued).

b. Brake System Components (Continued).

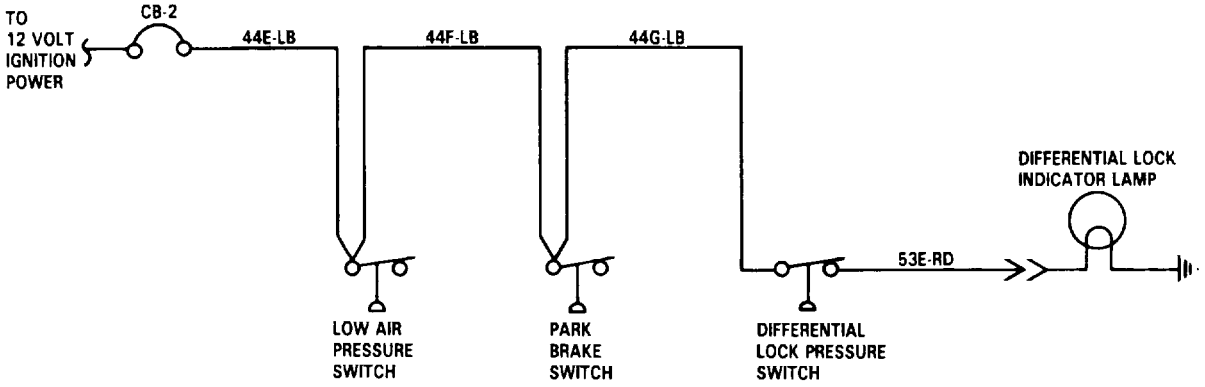
(1) S-Type Cam Brakes.

Used on all axles. Brake shoes are forced against brake drum when cam is rotated by slack adjuster arm.



(2) Slack Adjuster.

Converts linear force of brake chamber push rod into a torque which turns brake camshaft and applies brakes.



TA 236789

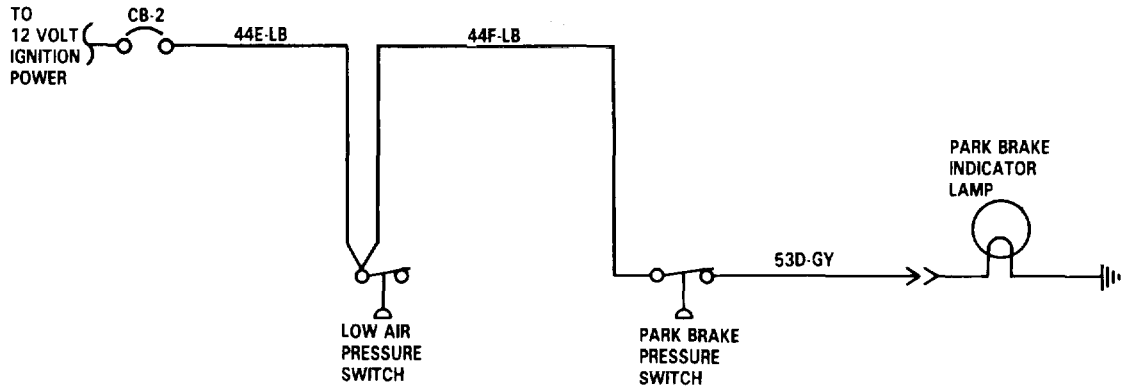
PRINCIPLES OF OPERATION.

1-20. BRAKE SYSTEM (Continued).

b. Brake System Components (Continued).

(3) Front-Axle Air Brake Chamber.

Receives compressed air from ratio valve to mechanically rotate slack adjuster.



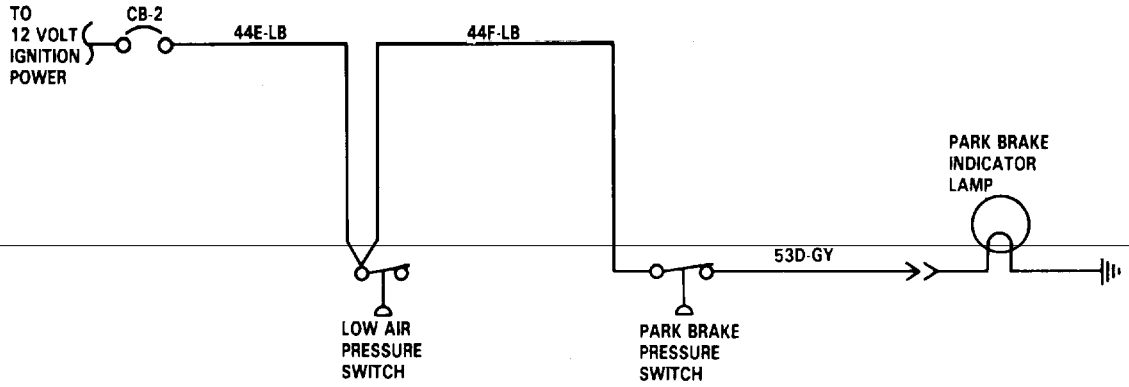
(4) Forward-Rear Axle Brake Chamber.

Receives compressed air from double check and quick release valve to mechanically rotate slack adjuster. Spring loaded chamber rotates slack adjuster (and applies brakes) when air pressure drops due to one of the following:

(a) Compressed air system failure.

(b) Application of park brakes.

(c) Air system draining.



TA 236790

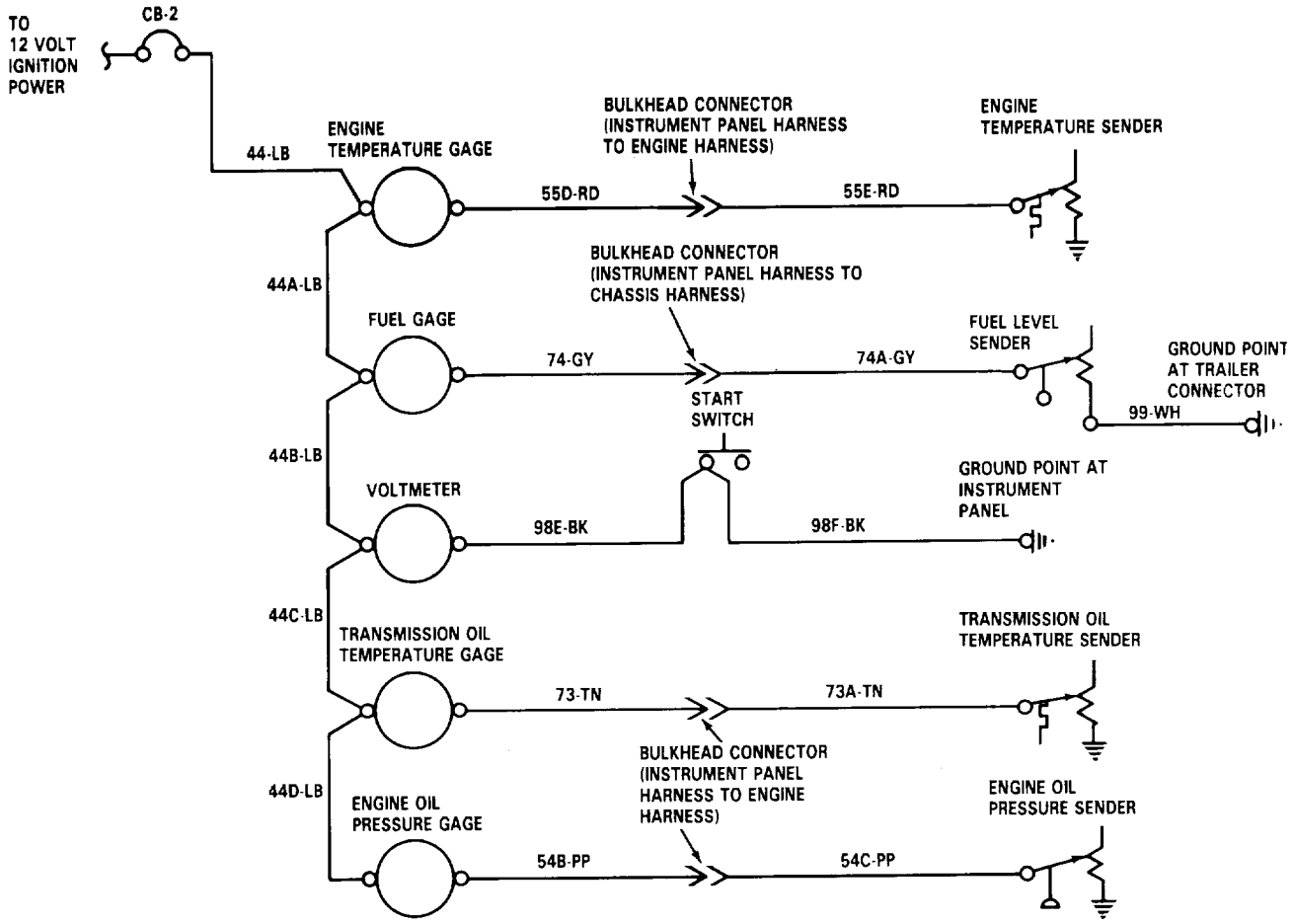
PRINCIPLES OF OPERATION.

1-20. BRAKE SYSTEM (Continued).

b. Brake System Components (Continued).

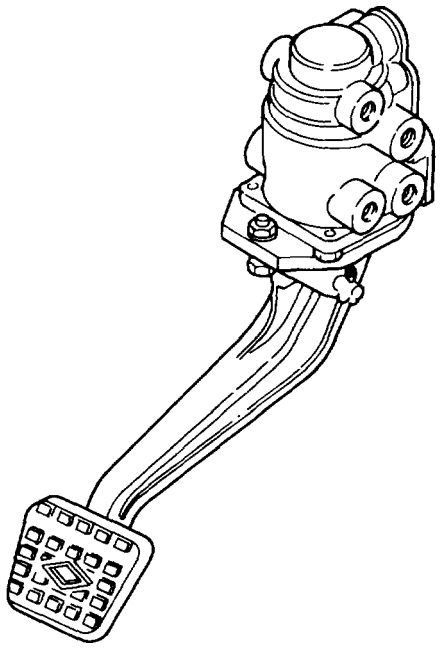
(5) Rear-Rear Axle Brake Chamber.

Receives compressed air from quick release valve to mechanically rotate slack adjuster.



(6) Brake Treadle Valve.

Supplies air to front and rear service brakes at the same time when brake pedal is pushed



TA 236791

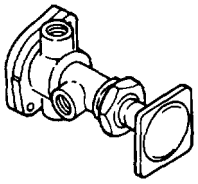
PRINCIPLES OF OPERATION.

1-20. BRAKE SYSTEM (Continued).

b. Brake System Components (Continued).

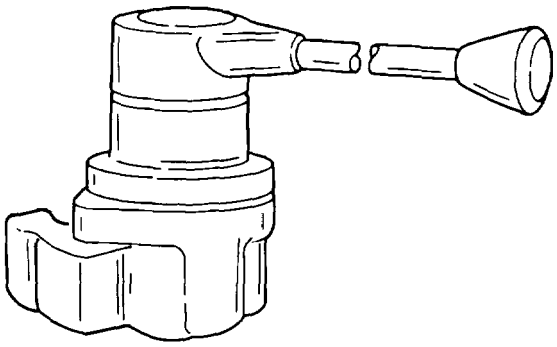
(7) Parking Brake Valve.

Normally supplies air pressure holding spring brakes in compressed position. When knob is pulled out, air pressure is exhausted, allowing spring brakes to apply.



(8) Trailer Hand Control Brake Valve.

Applies trailer brakes only. Opens connections between air supply reservoir and trailer service brake lines as handle is turned clockwise.



TA 236792

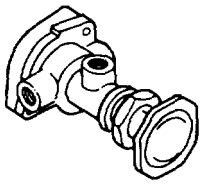
PRINCIPLES OF OPERATION.

1-20. BRAKE SYSTEM (Continued).

b. Brake System Components (Continued).

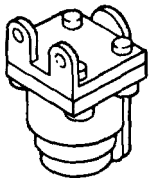
(9) Trailer Supply Valve.

In applied position, supplies air pressure to trailer service and emergency air lines.



(10) Front Axle Ratio Valve.

Directs air pressure from a single incoming line to brakes on both ends of the front axle. Limits brake application pressure to actuators during normal service braking.



TA 236793

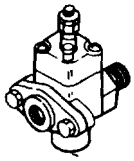
PRINCIPLES OF OPERATION.

1-20. BRAKE SYSTEM (Continued).

b. Brake System Components (Continued).

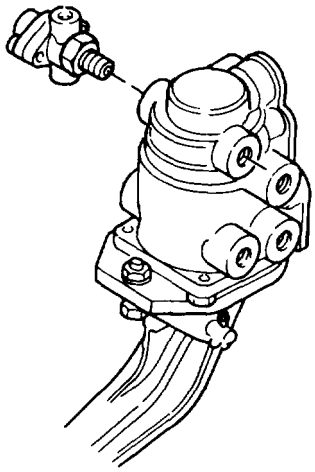
(11) Double Check and Stoplamp Valve.

Directs air flow from two ports of brake treadle valve into a single outlet line leading to the tractor protection valve. Does not allow air pressure to flow back into brake treadle valve. Stoplamps are switched on when this valve is actuated.



(12) Double Check Valve.

Directs air flow from brake treadle valve and front gladhands into tractor protection valve. Does not allow air pressure to flow back into brake treadle valve or front gladhands.



TA 236794

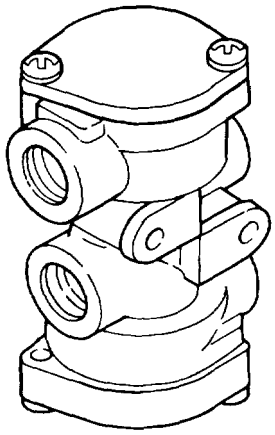
PRINCIPLES OF OPERATION.

1-20. BRAKE SYSTEM (Continued).

b. Brake System Components (Continued).

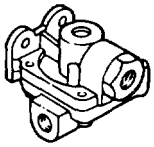
(13) Tractor Protection Valve.

Directs air pressure from brake treadle valve or trailer supply valve to rear gladhands and couplings



(14) Double Check and Quick Release Valve.

Primarily functions as an exhaust valve for the spring chamber of the forward-rear axle brake valve. Also prevents service and emergency brake application from occurring at the same time.



TA 236795

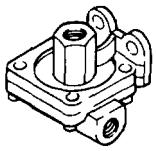
PRINCIPLES OF OPERATION.

1-20. BRAKE SYSTEM (Continued).

b. Brake System Components (Continued).

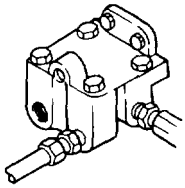
(15) Quick Release Valve.

Speeds up exhaust of air from rear-axle brake chambers when operator releases brakes.



(16) Relay Valve.

Applies rear brakes faster and more firmly than if they were actuated directly by air pressure in control lines from cab brake valves.



TA 236796

1-20. BRAKE SYSTEM (Continued).

c. Brake System Switches and Lamps.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

IGNITION SWITCH. Supplies 24-volt to relay (RY-9), which in turn provides 12-volt power to electrical system, including brake system switch and indicator circuits.

RELAY (RY-9). Energized by 24-volt power from ignition switch. When energized, RY-9 supplies 12-volt power to circuit breaker (CB-2).

CIRCUIT BREAKER (CB-1). Protects electrical components of stoplamp circuit by opening when load exceeds 20 amperes. May be manually reset by pressing CB-1 button in.

CIRCUIT BREAKER (CB-2). Protects electrical components of stoplamp circuit by opening when load exceeds 20 amperes. May be manually reset by pressing CB-2 button in.

CIRCUIT BREAKER (CB-8). Protects electrical components of 24-volt trailer brake system relay circuit by opening when load exceeds 20 amperes. May be manually reset by pressing CB-8 button in.

CIRCUIT BREAKER (CB-9). Protects electrical components of 24-volt trailer brake system relay circuit by opening when load exceeds 20 amperes. May be manually reset by pressing CB-9 button in.

PARK BRAKE LAMP. Illuminates when park brakes are applied. Receives 12-volt power through circuit breaker CB-2 when parking brake switch is closed.

PARK BRAKE SWITCH. Normally open, air actuated switch, located on parking brake. Closes to energize park brake lamp when parking brakes are actuated.

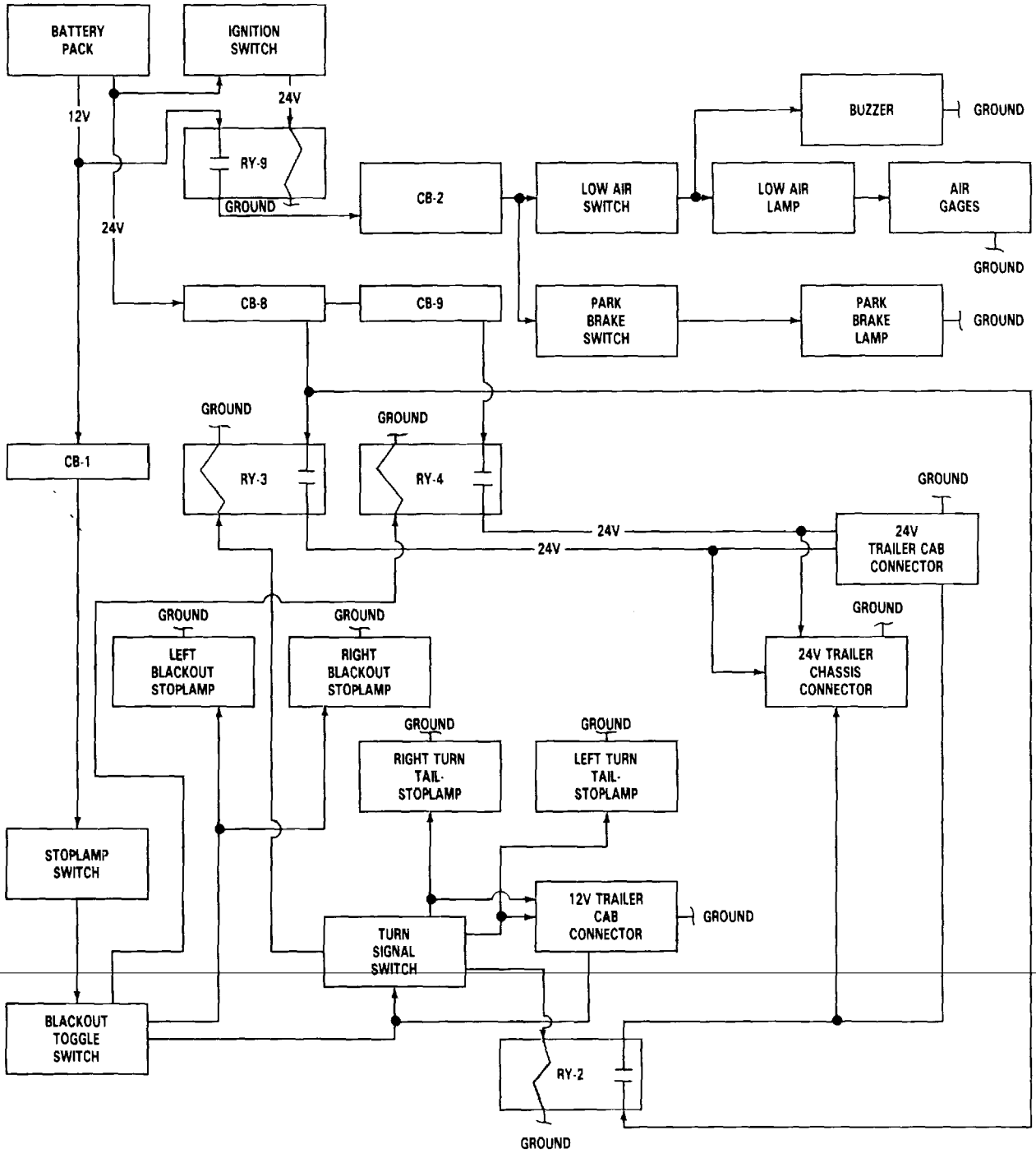
STOPLAMP SWITCH. Normally open air actuated switch. Closes when brakes are actuated. Receives 12-volt power from circuit breaker CB-1 and supplies this power to blackout toggle switch.

BLACKOUT TOGGLE SWITCH. Two-position switch for NORMAL and BLACKOUT modes of operation. 12-volt power is received from closed stoplamp switch and circuit breaker CB-1. With switch set to NORMAL position, 12-volt power is supplied through turn signal switch to tractor taillamps-stoplamps. Also, 12-volt power is supplied to 12-volt trailer connector. With switch set to BLACKOUT position, 12-volt power is supplied to blackout stoplamps.

PRINCIPLES OF OPERATION.

1-20. BRAKE SYSTEM (Continued).

c. Brake System Switches and Lamps (Continued).



TA 236797

PRINCIPLES OF OPERATION.

1-20. BRAKE SYSTEM (Continued).

c. Brake System Switches and Lamps (Continued).

TAILLAMPS-STOPLAMPS. Each assembly contains two bulbs: a single-filament bulb for the backup lamp; and a two-filament bulb for the taillamp, turn signal lamp, and stoplamp. Receive 12-volt power through circuit breaker CB-1, closed stoplamp switch, closed contacts of blackout toggle switch, and turn signal switch.

12-VOLT TRAILER CONNECTOR. When stoplamp switch is closed and blackout toggle switch is in NORMAL position, 12-volt power is supplied to tractor mounted connector for trailer stoplamps.

REAR AIR PRESSURE GAGE. Direct pressure gage indicates air pressure in rear service reservoir.

LOW AIR PRESSURE WARNING
INDICATOR (12-volt). Circuit normally held open by air pressure. Closes to activate control panel indicator when pressure drops below 70 psi.

FRONT AIR PRESSURE GAGE. Direct pressure gage. Indicates air pressure in front service reservoir.

24-VOLT TRAILER CONNECTOR. Cab mounted 12-pin connector to provide 24-volt power to trailers.

24-VOLT TRAILER CONNECTOR. Chassis mounted 12-pin connector to provide 24-volt power to trailer stoplamps.

RELAY (RY-2). When normally open contacts are closed, relay provides 24-volt power to trailer left turn signal lamp.

RELAY (RY-3). When normally open contacts are closed, relay provides 24-volt power to trailer right turn signal lamp.

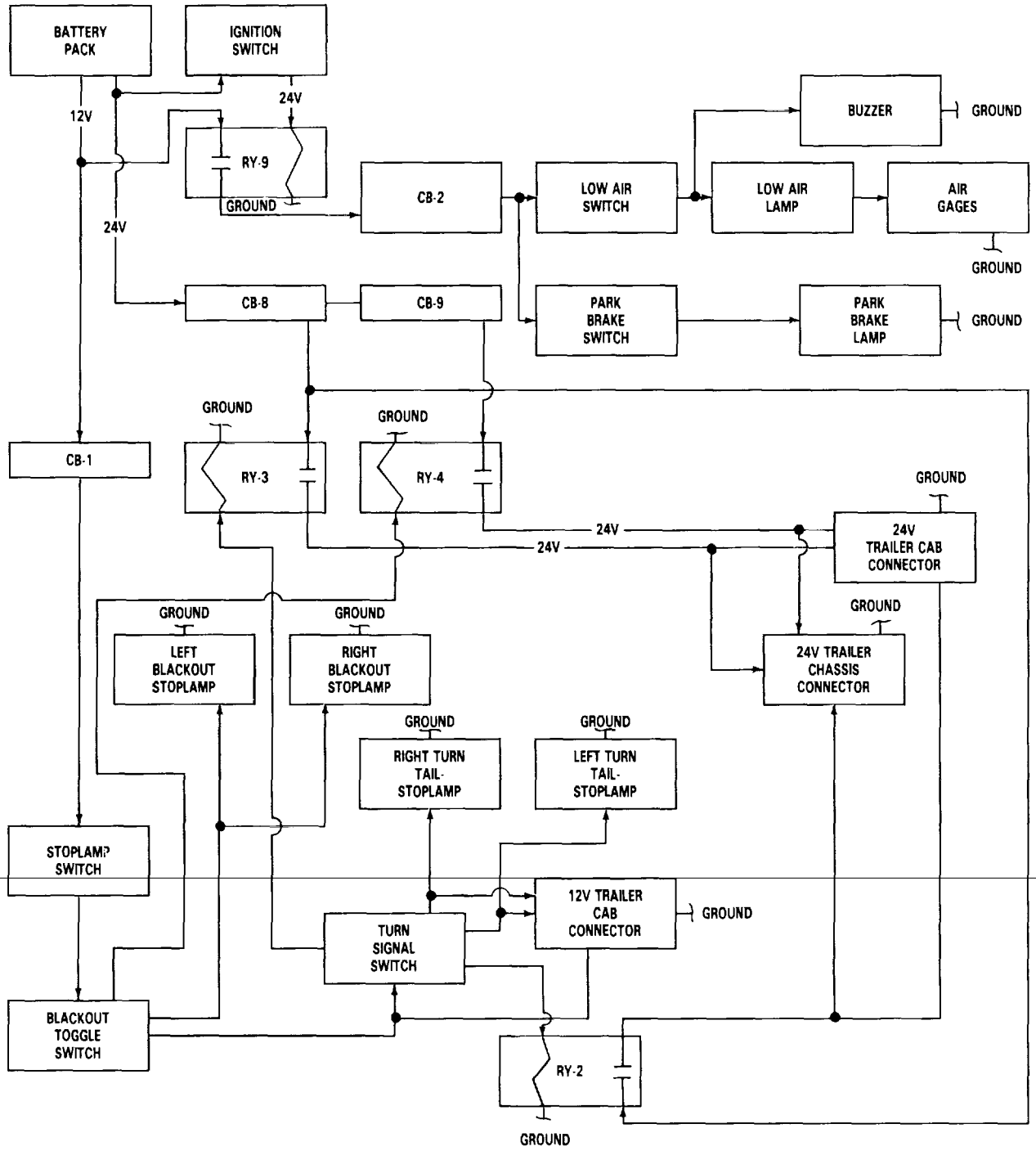
RELAY (RY-4). When normally open contacts are closed, relay provides 24-volt power to trailer blackout stoplamp.

TURN SIGNAL CONTROL. Receives 12-volt power from blackout toggle switch and distributes 12-volt power to right and left taillamps-stoplamps, 12-volt trailer connector, and relay (RY-3).

PRINCIPLES OF OPERATION.

1-20. BRAKE SYSTEM (Continued).

c. Brake System Switches and Lamps (Continued).



TA 236798

PRINCIPLES OF OPERATION.

1-21. AUXILIARY AIR-POWERED SYSTEMS.

a. Windshield Wipers and Washers.

WIPER CONTROL VALVE. In OFF position, valve directs air from supply line to park line. When pulled out, it diverts air to wiper line. By turning clockwise (LOW) or counterclockwise (HIGH), desired speed is selected. To park wipers, turn valve to center position and push in.

WASHER CONTROL VALVE. When button is pushed, air flows from manifold to reservoir.

WIPER SUPPLY LINE. Carries air for wiper system from manifold to control knob.

WASHER AIR SUPPLY LINE. Carries air from manifold to control button.

COMPRESSED AIR SUPPLY MANIFOLD. Supplies compressed air to washer and wiper through supply lines.

WIPER ARM. Connects wiper blade to linkage. Moved by motor.

WIPER BLADE. Actuated by wiper arm to clear windshield of water.

RESERVOIR FILLER CAP. Filter underneath cap prevents dirt from entering system. Cap closes firmly to maintain pressure in system.

WASHER FLUID RESERVOIR. Holds supply of washer fluid.

RESERVOIR AIR LINE. Carries pressurized air from button to reservoir when pressure forces fluid into washer hose.

PARK AIR LINE. When knob is pushed into PARK position, air flows through park line to motor, causing wiper blades to move down to REST position.

WIPER AIR LINE. When knob is in WIPE position, air flows through wiper line to motor, starting wiper blades in motion.

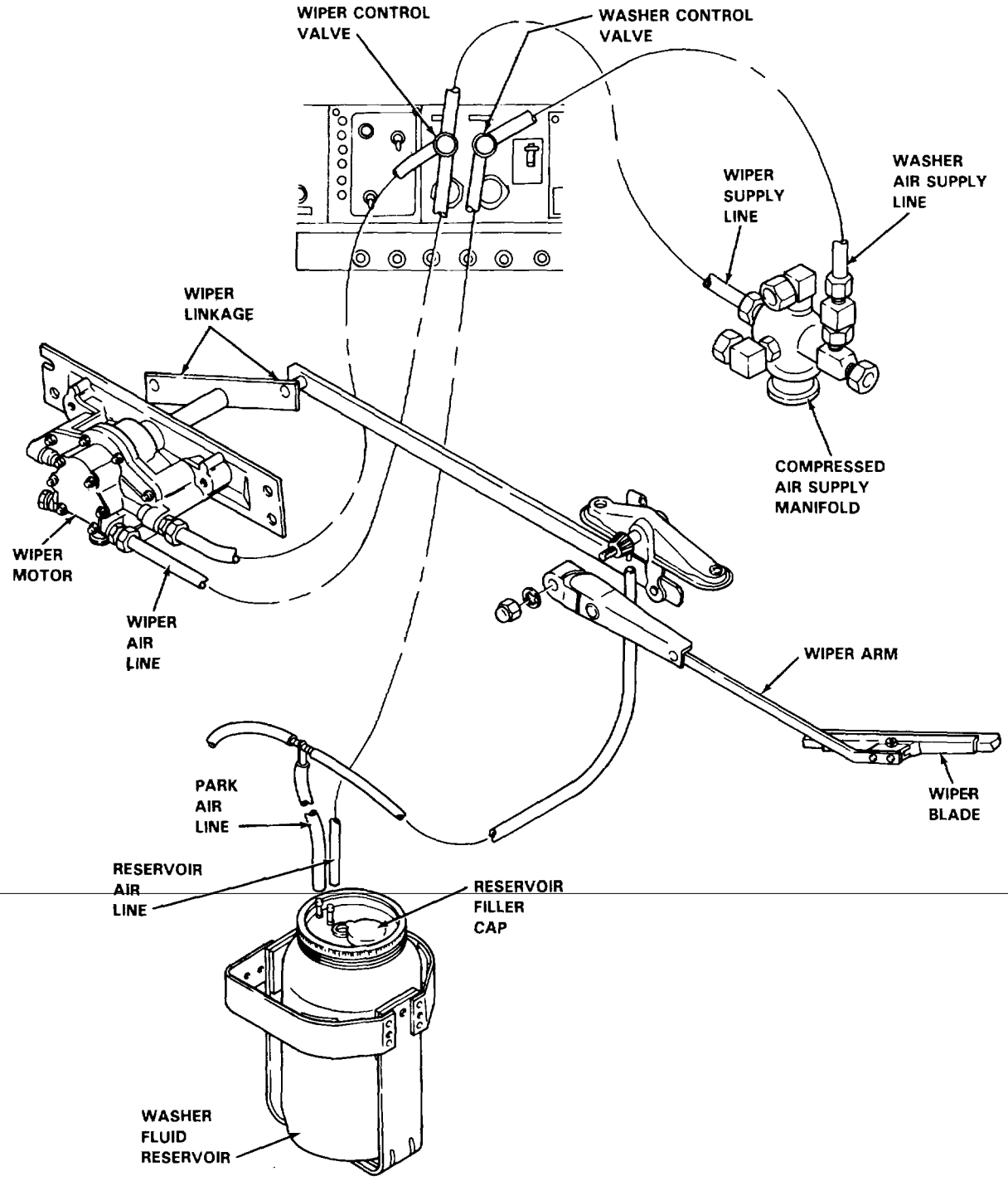
WIPER MOTOR. Air-powered motor turns wipers back and forth when air comes from wiper line, or moves them down windshield to PARK position when air comes through park line.

WIPER LINKAGE. Linkage from motor actuates two wiper arms.

PRINCIPLES OF OPERATION.

1-21. AUXILIARY AIR-POWERED SYSTEMS.

a. Windshield Wipers and Washers Continued



TA 236799

PRINCIPLES OF OPERATION.

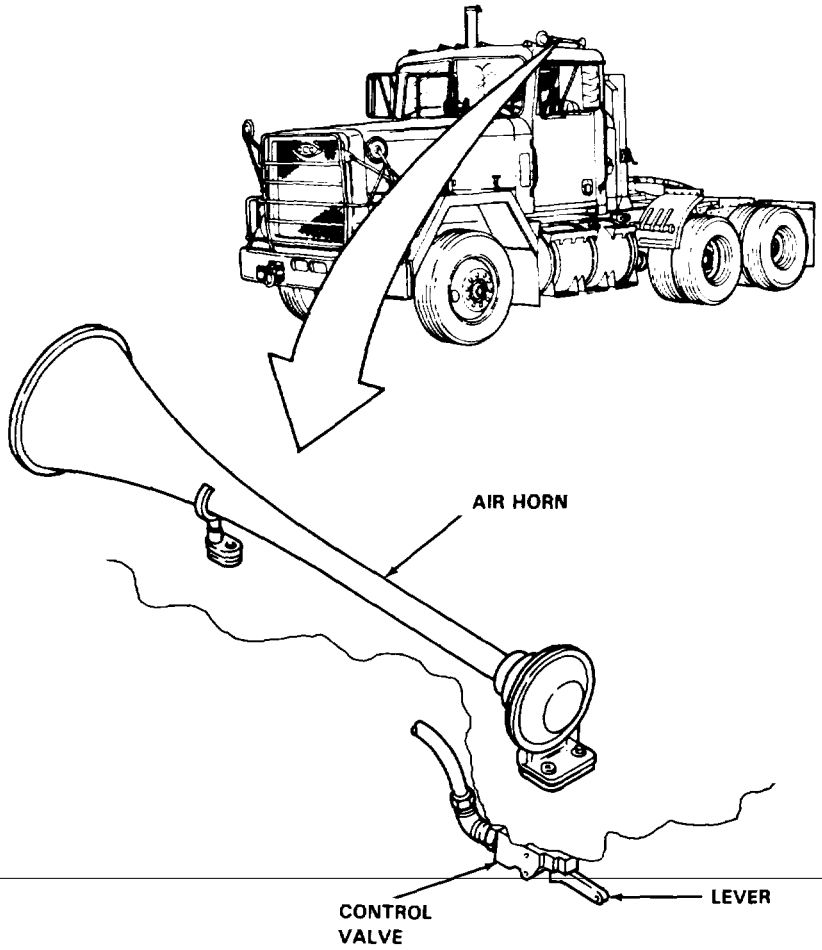
1-21. AUXILIARY AIR-POWERED SYSTEMS.

b. Air Horn

AIR HORN. Air-powered signaling device.

LEVER. Actuates control valve when pulling chain in cab downward.

CONTROL VALVE. Allows compressed air to flow to horn when lever is pulled downward.



TA 236800

PRINCIPLES OF OPERATION.

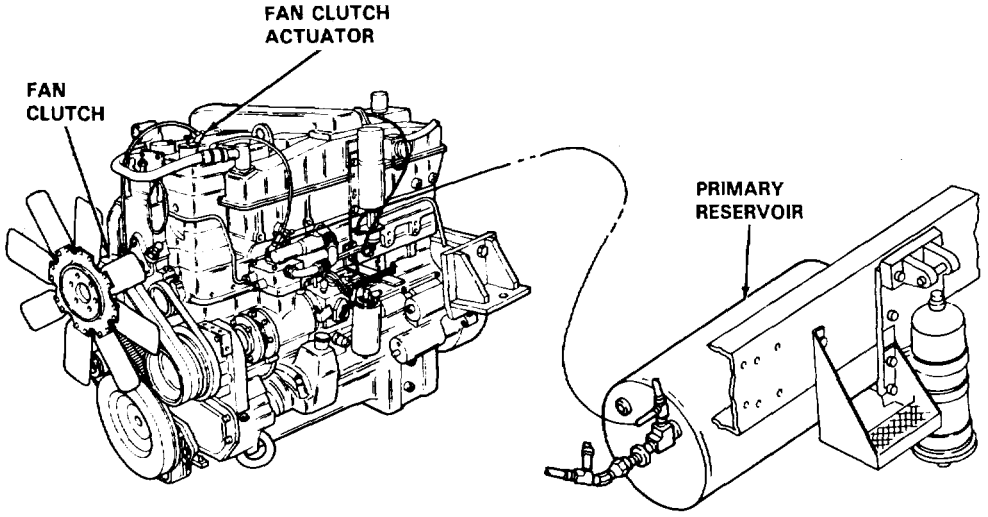
1-21. AUXILIARY AIR-POWERED SYSTEMS.

c. Fan Clutch Controls

FAN CLUTCH. When actuator opens, compressed air from primary reservoir engages clutch to actuate fan.

FAN CLUTCH ACTUATOR. Opens air connection between primary reservoir and fan clutch when coolant temperature rises above 190°F.

PRIMARY RESERVOIR. Supplies air pressure to engage clutch and rotate fan when actuator opens air connection.



TA 236801

PRINCIPLES OF OPERATION.

1-22. STEERING SYSTEM.

POWER STEERING COOLER. Cools power steering fluid by means of a finned unit on vehicle grille, exposed to outside air. After the fluid is cooled, it is returned to the power steering system.

STEERING COOLER RETURN LINE. Carries hydraulic fluid from power steering cooler back to reservoir.

STEERING GEAR SUPPLY LINE. Carries hydraulic fluid under pressure from pump to steering gear.

HYDRAULIC PUMP AND RESERVOIR. Pump supplies hydraulic pressure to power steering system. Reservoir provides a supply of oil to assure complete filling of hydraulic system.

STEERING WHEEL. Provides rotational torque to steering shaft, actuating steering system.

STEERING COLUMNS. Transmit torque from steering wheel to steering gear.

UNIVERSAL JOINTS. Change angle of torque from steering wheel and applies it to input shaft of power steering gear.

TIE ROD ASSEMBLY. Connects steering arms so that wheels turn together.

STEERING ARM. Transmits forward and backward movement from drag link to knuckle assembly.

DRAG LINK. Transfers motion of pitman arm to steering arm and tie rod.

PITMAN ARM. Transfers steering torque (boosted by power steering gear) to drag link.

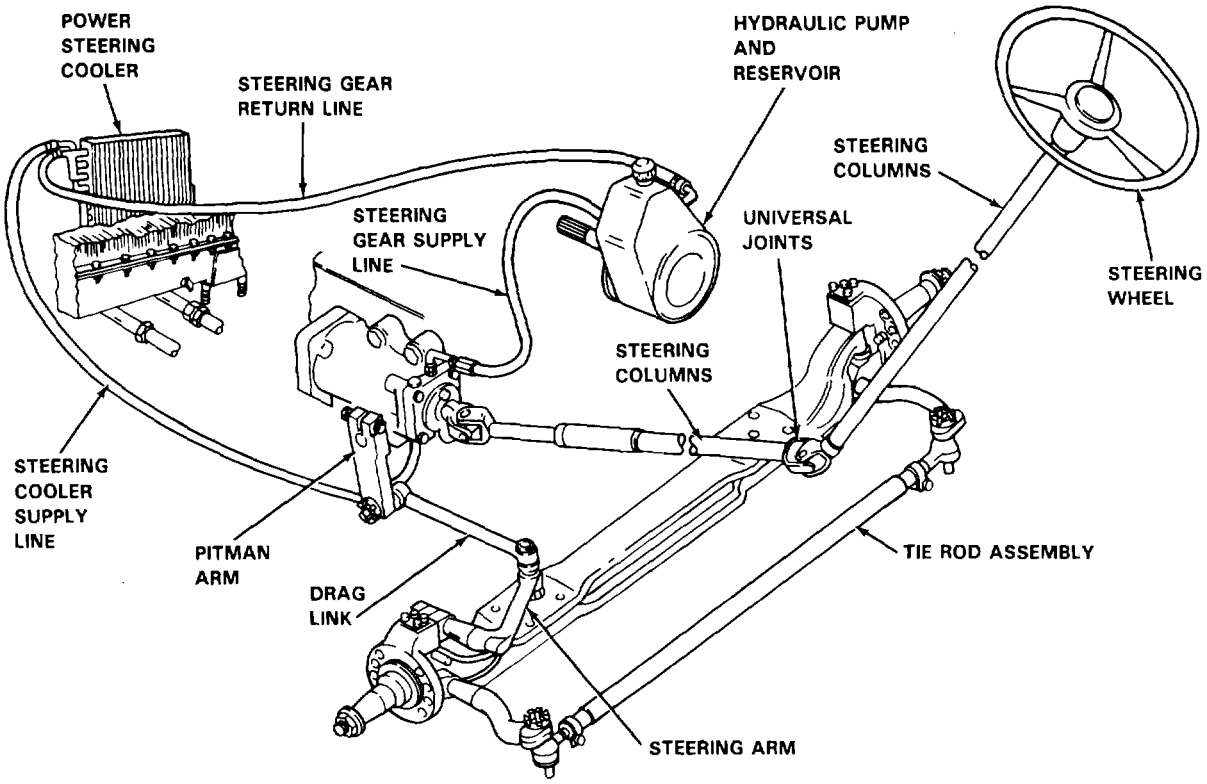
POWER STEERING GEAR. Hydraulically multiplies input torque from steering column and transmits it to pitman arm.

STEERING COOLER SUPPLY LINE. Carries hydraulic fluid from steering gear to power steering cooler.

TA 236802

PRINCIPLES OF OPERATION.

1-22. STEERING SYSTEM.



TA 236802

PRINCIPLES OF OPERATION.

1-23. CAB HEATING AND VENTILATING SYSTEM.

BATTERY PACK. Consists of four, 12-volt, maintenance free batteries. Two batteries are wired in parallel in each set. Each set is connected in series for 24-volt output. Battery pack is used for both 12-volt and 24-volt output.

IGNITION SWITCH. Supplies 24-volt power to relay (RY-9), which in turn provides 12-volt power to electrical system, including cab heating controls.

RELAY (RY-9). Energized by 24-volt power from ignition switch. When energized, RY-9 supplies 12-volt power to circuit breaker (CB-4).

CIRCUIT BREAKER (CB-4). Protects electrical components of heater fan switch by opening when load exceeds 20 amperes. May be manually reset by pressing CB-4 button in.

FAN SWITCH. Four-position switch with three ON positions. Supplies 12-volt power from circuit breaker (CB-4) to motor. Current flow increases as switch is moved from LOW to MEDIUM to HIGH.

HEADLAMP SWITCH. Supplies 12-volt power to heater lamp when switched to ON position.

HEATER LAMP. Illuminates heater fan control.

HEATER CONTROL. Allows driver to heat cab. Connected by cable to water control valve.

DRIVER HEAT CONTROL. Allows driver to open or close heat vent for driver side of cab. Connected by cable to heat control lever.

PASSENGER HEAT CONTROL. Allows passenger to open or close heat vent for passenger side of cab. Connected by cable to vent control lever.

FRESH VENT CONTROL. Allows driver to control fresh air vent on passenger side. Connected by cable to vent control lever.

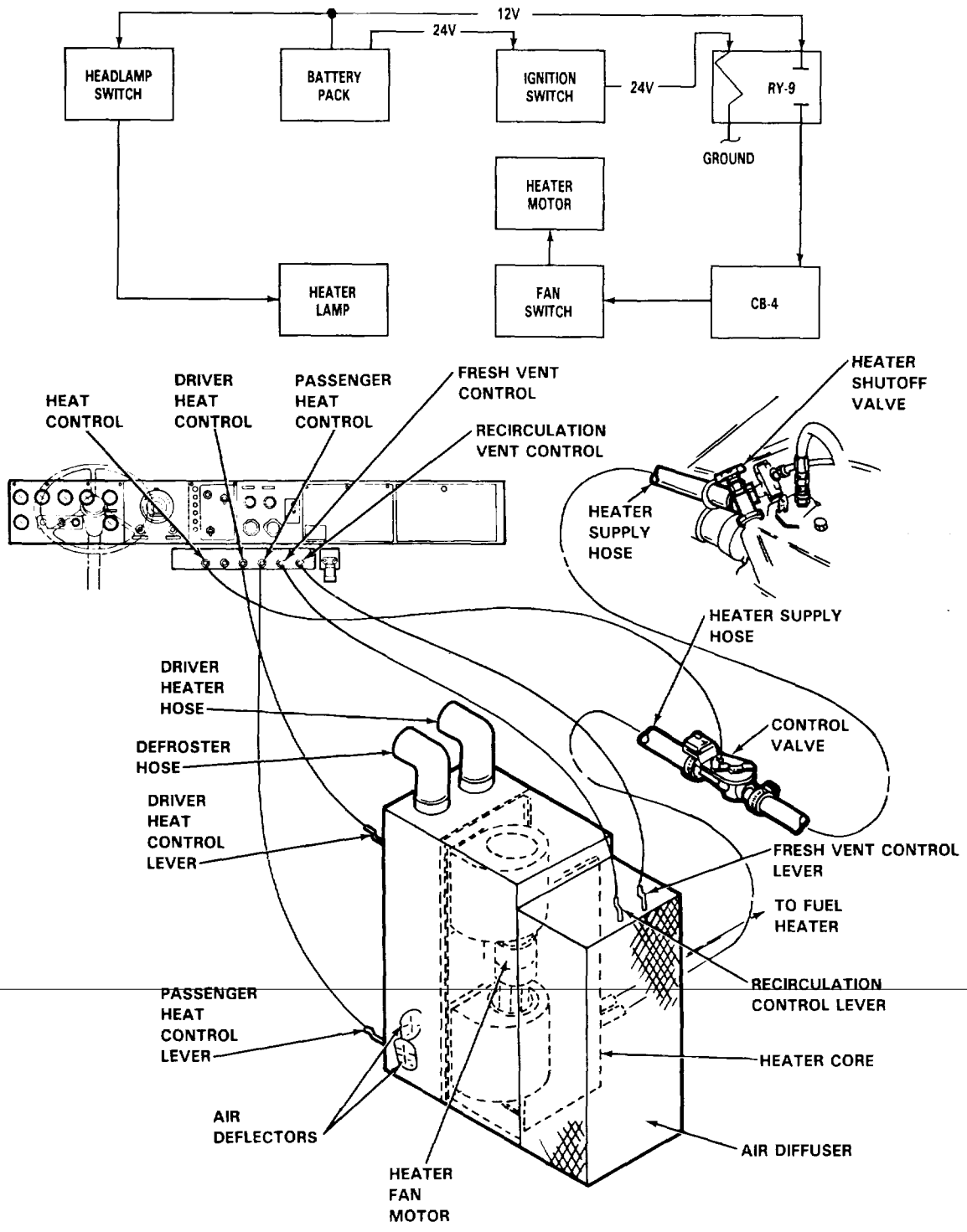
RECIRCULATION VENT CONTROL. Allows driver to recirculate cab air through heater. Connected by cable to recirculation control lever.

HEATER SHUTOFF VALVE. Supplies coolant to control valve. Manual shutoff handle allows complete cutoff of coolant flow to heater.

HEATER SUPPLY HOSE. Carries coolant from front water manifold, through control valve, to heater.

PRINCIPLES OF OPERATION.

1-23. CAB HEATING AND VENTILATING SYSTEM (Continued)



TA 236803

PRINCIPLES OF OPERATION.

1-23. CAB HEATING AND VENTILATING SYSTEM (Continued)

DEFROSTER HOSE. Supplies heat for defrosting front windshield.

DRIVER HEAT HOSE. Supplies heat to driver's side of cab compartment.

RECIRCULATION CONTROL LEVER. Actuates shutter inside heater. Connected by cable to recirculation vent control knob.

FRESH VENT CONTROL LEVER. Actuates shutters at fresh air vent. Connected by cable to fresh vent control knob.

AIR DIFFUSER. Contains baffles that direct flow of air to heater or cab compartment.

HEATER CORE. Circulates hot water through tubing and transfers heat to air coming from air diffuser.

HEATER FAN MOTOR. Drives two fans for distributing heat and air. Actuated by fan switch.

AIR DEFLECTOR(S). Supply heat to lower area of cab compartment.

PASSENGER HEAT CONTROL LEVER. Actuates flap at heat vent for passenger.

Connected by cable to passenger pull knob.

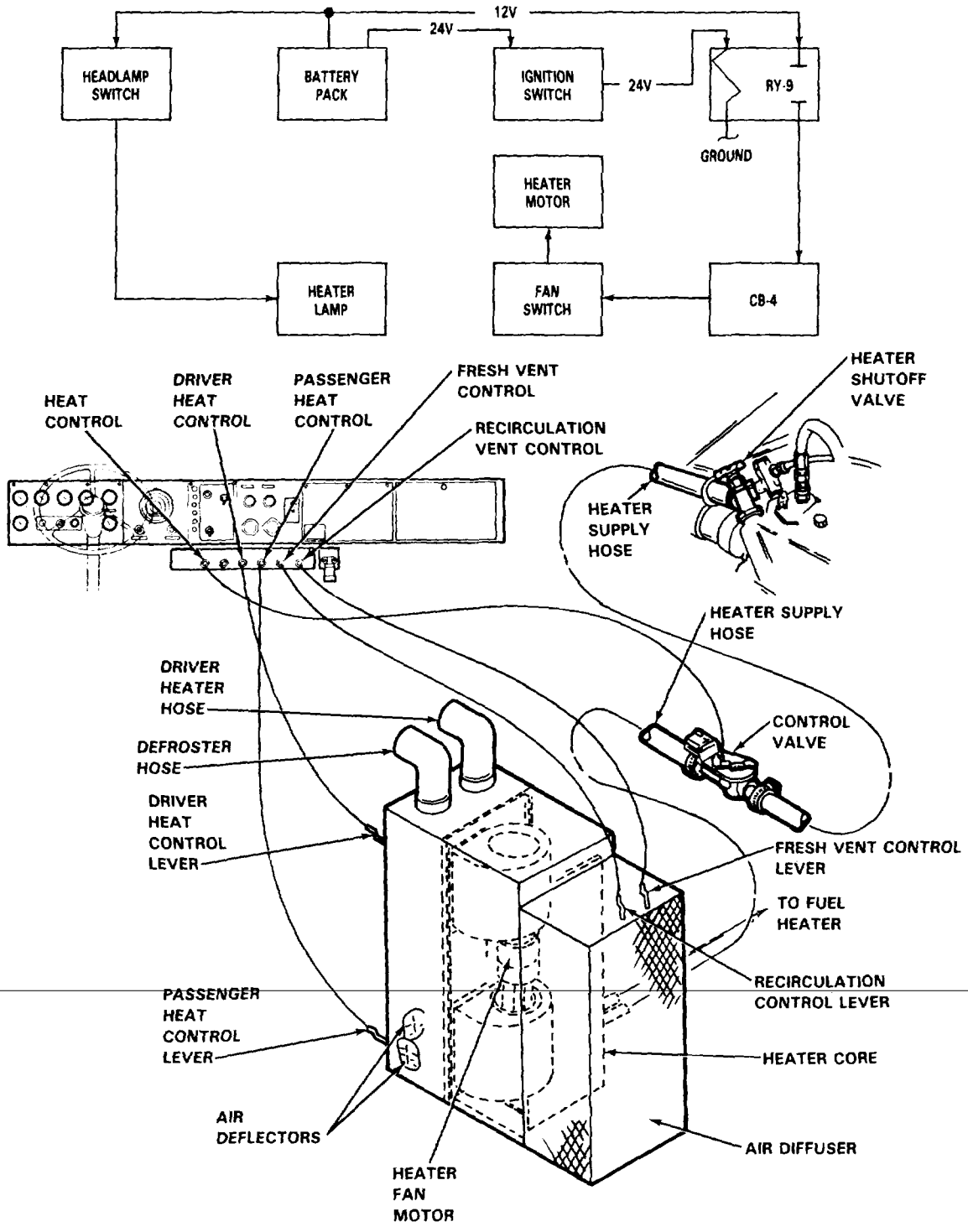
DRIVER HEAT CONTROL LEVER. Actuates flap at heat vent for driver. Connected by cable to driver pull knob.

CONTROL VALVE. Controls heater temperature by regulating flow of hot water to heater core. Cable from heater knob in cab opens valve as knob is pulled.

Valve is spring loaded to close as knob is pushed in. Some water passes through this valve even when it is fully closed.

PRINCIPLES OF OPERATION.

1-23. CAB HEATING AND VENTILATING SYSTEM (Continued)



TA 236804

1-24. WINTERIZATION KIT.

Refer to TB-9-2320-283-14 for winterization kit information.

CHAPTER 2
SERVICE AND TROUBLESHOOTING INSTRUCTIONS

2-1. OVERVIEW.

This chapter provides information on common tools, special tools, and troubleshooting instructions. The information is divided into the following sections:

Section I. Repair Parts; Special Tools; Test, Measurement, and Diagnostic Equipment (TMDE); and Support Equipment.

Section II. Service Upon Receipt.

Section III. Preventive Maintenance Checks and Services (PMCS).

Section IV. Troubleshooting.

Section V. STE/ICE Troubleshooting.

SECTION I. REPAIR PARTS; SPECIAL TOOLS; MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

2-2. COMMON TOOLS AND EQUIPMENT.

Refer to the Modified Table of Organization and Equipment (MTOE) for authorized common tools and equipment applicable to your unit.

2-3. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

Special tools and support equipment are listed and illustrated in TM 92320-283-20P. Information pertaining to types of maintenance, maintenance levels, and work times for M915A1 components, subsystems, and systems are listed in the maintenance allocation chart (MAC). The MAC is located in Appendix B (TM 9-2320-283-20-3).

2-4. REPAIR PARTS.

Repair parts are listed and illustrated in TM 9-2320-283-20P.

SECTION II. SERVICE UPON RECEIPT

2-5. CHECKING UNPACKED EQUIPMENT.

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packaging Improvement Report.

b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of TM 38-750.

2-6. DEPROCESSING UNPACKED EQUIPMENT.

LOCATION/ITEM	ACTION	REMARKS
1. Protective wrappings.	Remove.	
2. All instrument panel switches.	Set to OFF, if necessary.	Refer to TM 9-2320-283-10 for locations.
3. Battery cables.	Connect to batteries.	Refer to paragraph 3-120.
4. Entire vehicle.	a. Inventory basic issue items.	Refer to TM 9-2320-283-10.
	b. Perform operator's preventive maintenance checks and service.	Refer to TM 9-2320-283-10.
	c. Perform organizational preventive maintenance checks and services.	Refer to paragraph 3-8.
	d. Lubricate as needed.	Refer to LO 9-2320-283-12.

SECTION III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-7. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) INTRODUCTION. This section contains Unit PMCS requirements for the M915A1 vehicle. The PMCS tables contain checks and services necessary to ensure the vehicle is ready for operation. Using the PMCS tables, perform maintenance at the specified intervals. Preventive Maintenance Checks and Services in TM 9-2320-283-10 must be completed before doing Unit preventive maintenance.

2-8. MAINTENANCE FORMS AND RECORDS. Every mission begins and ends with paperwork. There is not much of it, but it must be kept up. The filled out forms and records have several uses. They are a record of the services, repairs, and modifications made on the vehicle; they are reports to unit maintenance and to the Commander; and they serve as a checklist to find out what is wrong with the vehicle after its last use, and whether those faults have been fixed. For information needed on forms and records, see DA PAM 738-750.

2-9. GENERAL MAINTENANCE PROCEDURES.

WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from fire and use in well-ventilated area. If adhesive, solvents, or sealing compound get on skin or clothing, wash immediately with soap and water.

a. CLEANLINESS. Dirt, grease, oil and debris only get in the way and may cover up a serious problem. Use dry cleaning solvent on metal surfaces and soapy water on rubber.

b. BOLTS, NUTS, AND SCREWS. Check bolts, nuts, and screws for obvious looseness, missing, bent, or broken condition and tighten or replace as necessary. They cannot all be checked with a tool, of course, but look for chipped paint, bare metal, or rust around bolt heads.

c. WELDS. Look for loose or chipped paint, rust, or gaps where parts are welded together. If a bad weld is found, have it repaired.

d. ELECTRIC WIRES AND CONNECTORS. Look for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors and make sure the wires are in good shape.

e. HYDRAULIC LINES AND FITTINGS. Look for wear, damage, leaks, and make sure clamps and fittings are tight. Wet spots show leaks, of course, but a stain around a fitting or connector may indicate a leak. If a connector or fitting is loose, tighten it. If something is broken or worn out, repair or replace per applicable procedure.

2-10. FLUID LEAKAGE. It is necessary to know how fluid leakage affects the status of fuel, oil, coolant, and the hydraulic systems. The following are definitions of types/classes of leakage necessary to know in order to determine the status of the vehicle.

CAUTION

Equipment operation is allowable with minor leakages (Class I or II). Of course, consideration must be given to the fluid capacity in the item/system being checked/inspected. When in doubt, notify the supervisor. When operating with Class I or II leaks, continue to check fluid levels as required in the PMCS. Class III leaks should be repaired per applicable procedure.

a. Class I. Seepage or fluid as indicated by wetness or discoloration not great enough to form drops.

b. Class II. Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.

c. Class III. Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

2-10. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES.

a. Do the (S) PREVENTIVE MAINTENANCE once every six months and/or every 3,000 miles (4,827 KM) whichever comes first.

b. Do the (A) PREVENTIVE MAINTENANCE once each year and/or every 6,000 miles (9,654 KM) whichever comes first.

c. Do the (B) PREVENTIVE MAINTENANCE once each year and/or every 12,000 miles (19,308 KM) whichever comes first.

d. Always do the PREVENTIVE MAINTENANCE in the same order until it gets to be a habit. Once practiced, it will be easy to spot anything wrong in a hurry.

e. If something does not work, troubleshoot with instructions in Chapter 2.

f. If anything looks wrong and is not fixed, write a DA Form 2404.

g. When doing preventive maintenance, take along the tools and supplies needed to make all the checks. Always take a clean cloth or two.

Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			PRIOR TO ROAD TEST Ensure Operator/Crew has performed -10 PMCS listed in TM 9-2320-283-10. **ROAD TEST** Maintenance personnel will be with vehicle operator to assist in performing -10 PMCS checks and verify pre-service checks. **NOTE** **The following will be performed during the road test. These inspections must be performed before any -20 level PMCS regardless of interval.** For road test, vehicle will be driven at least five miles over different ground to give enough time to detect any malfunctions.	
1	Semi-Annual	Pre-Service Checks	a. Notice if starter engages smoothly and turns the engine at normal cranking speed. b. Listen for unusual engine noise at idle, at operating speeds, and under acceleration. Be alert for excessive vibration and the smell of oil, fuel and exhaust.	a. Starter inoperative or makes excessive grinding sound. b. Engine knocks, rattles or smokes excessively.

Table 2-1. Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
1	Semi-Annual	Pre-Service Checks	c. Check for transmission response to shifting and for smoothness of operation in all speed ranges. Be alert Continued for unusual noises and difficulty in shifting in any speed range.	c. Transmission shifts improperly, does not shift or makes excessive noises.
			d. Check for transfer response to shifting and for smoothness of operation in all gear ranges. Be alert for unusual noises and difficulty in shifting in any gear range.	d. Transfer jumps out of gear or makes excessive noises.
			e. Test for response to accelerator feed. Observe for sticking pedal.	e. Pedal sticking or binding.
			f. With vehicle speed approximately 5 mph (8 kph) turn steering wheel to left, then right, to detect steering backlash, shimmy or if freeplay is more than 1-1/2 inches (38 mm) in either direction. Vehicle should respond instantly. With vehicle moving on straight, level terrain, lightly hold steering wheel to check for pull and wandering.	f. Steering binds, grabs, wanders or freeplay is more than 1-1/2 inch (38 mm) in either direction.
			g. Apply brake pedal with steady force. Vehicle should slow down and stop without pulling to one side or jerking. Release brake pedal. The brakes should release immediately and without difficulty.	g. Brakes chatter, pull to one side or inoperative. Brakes will not release.
			h. Observe vehicle response to road shocks, side sway or continuous bouncing indicates a malfunction.	h. Handling is unstable.

Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
1	Semi-Annual	Pre-Service Checks Continued	AFTER ROAD TEST a. Make sure the vehicle has been cleaned of mud, gravel, etc, from the underbody, outside and crew compartment area. CAUTION Do not hold steering wheel at full left or right position for longer than 10 seconds. Oil overheating and pump damage can result. b. With vehicle stopped, turn steering wheel to extreme left, then to the extreme right to check for hard steering. c. Check engine operation at all speeds. Ensure that engine does not go over engine governed speed - 600-2100 rpm.	b. Hard steering is evident. c. Engine governed speed - no load is below 600 rpm or exceeds 2100 rpm.

Table 2-1.Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
			WARNING **Brake drums can get very hot during vehicle operation. Place hand near drum to check for excessive heat but do not touch.**	
2	Semi-Annual	Brake System	Carefully check and compare each brake drum for overheating which can indicate a dragging brake. Cool brake drums could mean improper adjustment, defective, or inoperative brakes.	Brake drums are overheated or excessively cool.
3	Semi-Annual	Body	Inspect loose rivets, cracks, loose or missing bolts and general damage.	Any body damage that would hinder vehicle operation.
4	Semi-Annual	Vehicle Exterior	Inspect the following for completeness, security and operation: a. Glass b. Hinges c. Panels d. Data, Caution and Warning Plates e. Leaks f. Tow Pintle	 e. Any Class III leak.
5	Semi-Annual	Fuel System	a. Inspect fuel filter/water separator assembly for dents and cracks that could cause leaks. b. Replace filter element every 3, 000 miles (4, 827 km) or semi-annually, whichever occurs first.	a. Any Class III leak. b. Fuel filter clogged.

Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
5	Semi-Annual	Fuel System Continued	**WARNING** Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from fire and use in well-ventilated area. If adhesive, solvents, or sealing compound get on skin or clothing, wash immediately with soap and water. c. Clean screen by soaking in a carbon dissolving agent, followed by flushing in a sonic cleaner unit, or clean the screen in fuel oil and dry with compressed air. Visually inspect screen for holes or embedded metal particles in mesh. d. Purge and clean fuel tank (TB 43-0212), if required. e. Inspect fuel injection pump, nozzle lines, and fittings for leaks and damage. Any nozzle loose or damaged. f. Inspect all fuel lines for loose connections, splits, cracks, and kinks that could leak.	c. Screen is worn or damaged. e. Rubber cap missing or torn on return line. f. Any Class III leak.
6	Semi-Annual	Aftercooler	Check aftercooler for leaks and loose hardware.	Class III leaks or loose hardware.

Table 2-1. Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
7	Semi-Annual	Engine Accessory Drive Belt	Check for missing, broken, cracked and frayed drivebelts, dry rot, excessive fraying and cracks.	Any drivebelt is missing or broken. Belt fiber has more than one crack (1/8 inch in depth or 50% of belt thickness) or has frays more than 2 inches long.
8	Semi-Annual	Water Pump	a. Inspect the pulley for alignment (paragraph 3-63). b. Check the belt for proper tension (1/2 to 3/4 inch, 1.2 to 1.9 cm) deflection when you press down firmly. c. Inspect the water pump for leaks and fan shrouds to see if they are securely mounted.	
9	Semi-Annual	Thermostat Housing and Front, Center, and Rear Water Manifolds	Inspect thermostat housing and water manifold for leaks.	

Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
10	Semi-Annual	Alternator Wiring and Engine Mount	a. Check for loose wiring connections or worn insulation. b. Inspect for cracked or loose engine mounts.	a. Loose connections or worn insulation. b. Cracked or loose engine mounts.
11	Semi-Annual	Radiator and Hoses	a. Check core for leaks, clogging, and bent fins. b. Check hoses for leaks and deterioration from oil and solvents. c. Test coolant (TB 750-651). d. If required, drain radiator and block. Flush and refill cooling system with proper antifreeze/water mixture (paragraph 3-52).	
12	Semi-Annual	Cooling System	**WARNING** If vehicle has been operating, use extreme care to avoid being burned when removing cooling system radiator cap. Use heavy rags or gloves to protect hands. Turn radiator cap only one-half turn counterclockwise and allow pressure to be relieved before fully removing cap. **NOTE** **Coolant level is correct when sight glass is full (TM 9-2320-273-10).**	

Table 2-1. Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
12	Semi-Annual	Cooling System	Use MIL-A-46153 in temperatures above 0°F (180C) and MIL-A-11755 in temperatures below 0°F (-18° Continued C) . a. Check coolant condition. Test coolant to see if draining is necessary (TB 750-651). is required. b. Check all hoses for looseness, splits, wear, and cracks that would cause leaks. c. Inspect hose clamps for wear and serviceability. serviceable. **CAUTION** Apply lubricant sparingly to the fan clutch fitting. Excessive use of lubricant may cause grease to enter in the fan pulley grooves causing slippage of the fan belts. **NOTE** Fan clutch should be lubricated every 6, 000 miles or 6 months, whichever occurs first.	a. Coolant condition/testing shows draining b. Class III leakage evident. Hoses are loose or have splits or cracks. c. Hose clamps are worn or un-
13	Semi-Annual	Fan Clutch	Lubricate fan clutch with GAA.	

Table 2-1.Unit Level Preventive Maintenance Checks and Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
			NOTE **COLD TEMPERATURE OPERATION** For operation of equipment in expected continuous temperatures below 0° F (-18° C), remove lubricants prescribed in the key for temperatures above 0° F (-18° C). Re-lubricate with lubrication specified in the key for temperatures 0° F to -50° F (-18° C to -460 C).	
			NOTE If AOAP laboratory is not available, drain and refill engine crankcase with OE/HDO every 6, 000 miles (9, 654 km) or semi-annually, whichever comes first.	"Do not operate" received from AOAP lab.
14	Semi-Annual	Engine Crankcase	a. Drain and refill crankcase with OE/HDO. b. Replace engine oil filter and bypass oil filter. c. Check all oil lines and hoses for cracks and wear that could cause leaks. d. Check oil filter housing, and oil pan drain plug for looseness. Make sure oil pan bolts are tight.	b. Oil filter has Class III leak. c. Cracks, frays, leaks, and wear are evident. d. Drain plugs and oil pan bolts are loose.

Table 2-1. Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
15	Semi-Annual	Rocker Cover Gaskets	Check rocker cover gasket for oil leaks. If necessary, tighten bolts and/or replace gaskets (paragraph 3-13).	
16	Semi-Annual	Oil Cooler and Lines	Check oil cooler for leaks, loose hardware, and damaged fittings.	
17	Semi-Annual Pump and	Power Steering leaks.	a. Inspect power steering pump for leaks, cracks, and damage. b. Check steering stops for proper adjustment (paragraph 3-217.1). c. Check steering gear poppet valve for proper adjustment (paragraph 3-217.2). d. Change filter when fluid is contaminated.	a. Cracks, damage or Class III b. Steering stops out of adjustment. c. Steering gear poppet valve is out of d. Fluid is contaminated.

Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
18	Semi-Annual	Air Cleaner	a. Check that air cleaner housing and turbocharger inlet and outlet hoses are secure. b. Check filter elements for contamination. Clean or replace as necessary.	 b. Filter is contaminated.
19	Semi-Annual	Cab, Engine, and Front Rear Light Wiring Harness	Check all wiring harnesses for frays, splits, missing insulation or poor connections. Replace as necessary. **WARNING** Do not smoke, have open flames, or make sparks around the batteries, especially if the caps are off. Battery gasses can explode and cause injury. **NOTE** Refer to TM 9-6140-200-14 for more specific details on battery maintenance.	Insulation missing. Frays, splits, poor connections evident.
20	Semi-Annual	Battery Electrical System	a. Inspect battery box for corrosion and debris. b. Clean slave receptacle and coat with corrosion preventive compound. c. Check and record specific gravity of each cell. specific gravity. d. Inspect battery cables for frays, splits, and looseness. or loose.	a. Corrosion that has made holes in metal battery box. b. Terminals corroded. c. If cell is below1.225 d. Cables frayed, split,

Table 2-1. Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
			CAUTION Do not mix radial and bias tires on the same vehicle. Make sure tires are cold when you check pressure.	
21	Semi-Annual	Tires	a. Inspect tires for unusual wear, penetrating objects, and improper matching.	a. Tires improperly match.
			b. Make sure all wheel lugnuts are installed and tightened to correct torque value 450 lb-ft (610 N.m).	b. Any lugnut missing and/or improperly torqued.
22	Semi-Annual	Wheel Alignment	Check toe-in and adjust as necessary. Toe-in should be 1/32 inch plus or minus 1/32 inch for both wheels (paragraph 3-202).	Toe-in cannot be adjusted.
23	Semi-Annual	Steering Gear Mounting Bolts	Check steering gear for loose or missing mounting bolts.	Loose or missing bolts.

Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
			WARNING The exhaust pipe and muffler can become very hot during vehicle operation. Be careful not to touch these parts with bare hands, or allow body to come in contact with pipe or muffler. Exhaust system parts can become hot enough to cause serious burns.	
24	Semi-Annual	Exhaust System	a. Inspect exhaust manifold, exhaust pipes, muffler, and tailpipe for corrosion, carbon deposits which may indicate leaks.	a. Evidence of corrosion or carbon deposits evident.
			b. Inspect for damaged pipes, loose clamps and leaking gaskets or seals.	b. Pipes damaged, clamps loose, gaskets or seals leaking.
			c. Inspect raincap to make sure it operates freely. freely, does not close when engine is off, or missing.	c. Raincap does not operate

Table 2-1. Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
25	Semi-Annual	Drive Line Universal Joint, Slip Yokes	**NOTE** The pressurized grease gun should be held on the fittings until new grease appears. This will assure that all the contaminated grease has been forced out.	
		Splines	a. Lubricate drive line universal joint with GAA and check for looseness or side play.	a. Fitting will not purge old lubricant out of component, loose or side play.
			b. Lubricate slip yokes and spline with GAA and check for looseness or side play.	b. Fitting will not purge old lubricant out of component, loose or side play.

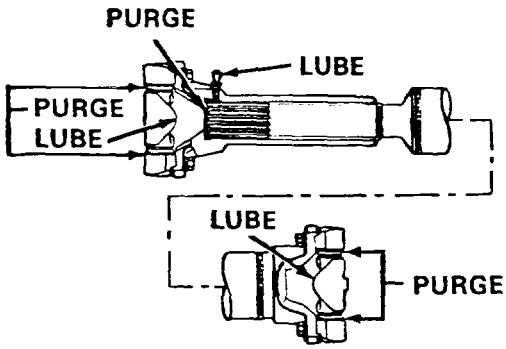


Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
26	Semi-Annual	Universal Joints and Propeller Shafts	Inspect for loose bearings, damaged seals, and damaged lube fittings. Tighten bolts if necessary (paragraph 3-144 and 3-145).	Fitting will not purge old lubricant out of component.
27	Semi-Annual	Front and Rear Slack Adjusters	**NOTE** Pressure gun should be held on fittings until new grease appears. This will assure that all the old contaminated grease has been forced out. Lubricate front and rear slack adjusters with GAA.	Fitting will not purge old lubricant out of component.
28	Semi-Annual	Forward Rear Axle and Rear Axle	**NOTE** **COLD TEMPERATURE OPERATION** For operating of equipment in expected continuous temperatures below 0°F (-18°C), remove lubricants prescribed in the key for temperatures above 0°F (-18° C). Re-lubricate with lubricants specified in the key for temperatures 0° F to -500F (-18°C to -46°C). **NOTE** Pressure gun should be held on fittings until new grease appears. This will assure that all the old contaminated grease has been forced out.	

Table 2-1. Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
28	Semi-Annual	Forward Rear Axle and Rear Axle Continued	a. After the first initial 1, 000 miles of operation, drain the differentials while the assembly is still warm from operation. Inspect the magnetic drain plug for signs of excessive metal particle buildup. b. Clean the magnetic drain plug and magnetic fill plugs and replace when lubricant has stopped draining. **NOTE** Axles must not be flushed with any solvent such as kerosene. c. Check and refill both axle differentials with GO as required. Maintain lube level with bottom of filler hole.	a. Excessive metal particle buildup.
29	Semi-Annual	Rear Axle Spring and Walking Beam	a. Lubricate Axle Spring and Walking Beam with GAA. **NOTE** Adhesives, solvents, and sealming compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from fire and use in well-ventilated area. If adhesive, solvents or sealing compound get on skin or clothing, wash immediately with soap and water.	a. Fitting will not purge old lubricant out and of component.

Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
29	Semi-Annual	Rear Axle Spring and Walking Beam Continued	Axle Housing Vent Plug b. Remove vent plug from axle housing. Wash vent plug in solvent and allow to air dry. cleaned. c. Coat threads with pipe thread sealing compound and install axle housing breather.	b. Axle vent plug missing or cannot be
30	Semi-Annual	Front Axles	**NOTE** **COLD TEMPERATURE OPERATION** For operating of equipment in expected continuous temperatures below 0°F (-18° C), remove lubricants prescribed in the key for temperatures above 0° F (-18° C). Re-lubricate with lubricants specified in the key for temperatures 0° F to -50° F (-18° C to -46° C). **NOTE** Pressure gun should be held on fittings until new grease appears. This will assure that all the old contaminated grease has been forced out.	
		Drag Link	Lubricate drag link with GAA.	Fitting will not purge old lubricant out of component.

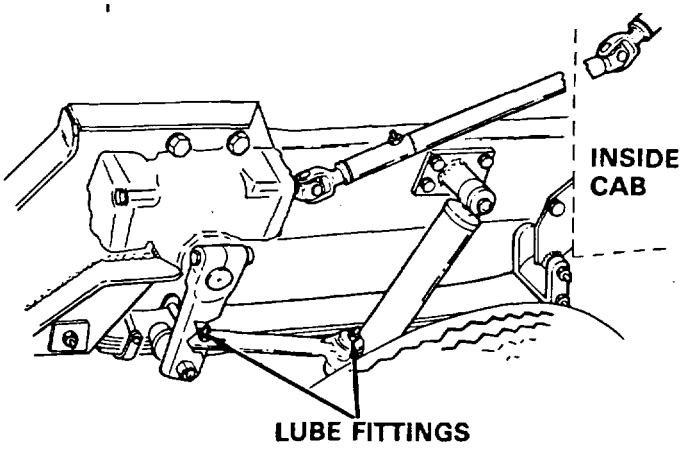


Table 2-1. Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
30	Semi-Annual	Front Axles Continued (Steering Shaft Universals)	Inspect steering shaft for looseness and lubricate with GAA.	Fitting will not purge old lubricant out of component.
31	Semi-Annual	Tie Rod	**NOTE** Pressure gun should be held on fittings until new grease appears. This will assure that all the old contaminated grease has been forced out. Lubricate tie rod ends with GAA.	Fitting will not purge old lubricant out of component, loose or side play.
32	Semi-Annual	Front Wheel Knuckle	**NOTE** Pressure gun should be held on fittings until new grease appears. This will assure that all the old contaminated grease has been forced out.	

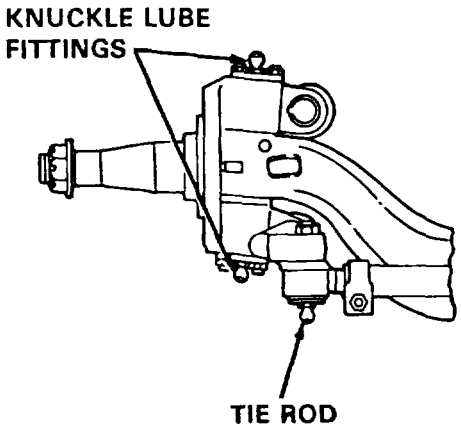


Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

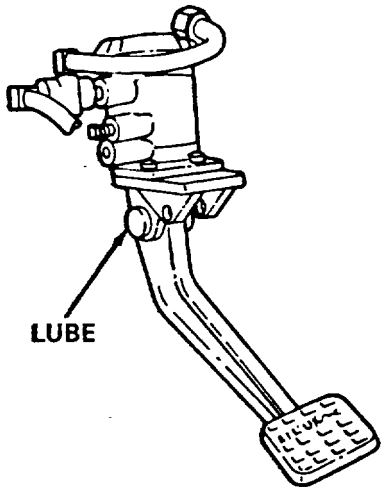
Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
33	Semi-Annual	Hydraulic Steering Lines	Follow routing of all hydraulic steering lines, hoses, and tubes to inspect for loose fitting, rubbing, chaffing, cracks, bends, breaks, and leaks. Tighten if loose and replace hoses that are damaged. **WARNING** Do not start engine or move vehicle when anyone is under vehicle. Severe injury or death could result.	Class III leaks evident.
34	Semi-Annual	Frame and Cross-members	a. Inspect frame side rails for cracks, breaks, bends, wear deterioration and missing and loose fasteners. b. Inspect crossmembers for cracks, breaks, bends, wear deterioration and missing and loose fasteners.	a. Cracks, bends, or breaks in frame. Any loose or missing b. Cracks, bends, or breaks in members. Any loose or missing fasteners.

Table 2-1. Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
35	Semi-Annual	5th Wheel Assem-blies	Check air cylinder, connecting lines, and fittings for leaks and damage.	
36	Semi-Annual	Air Dryer	a. Inspect connecting lines and fittings for leaks and damage. b. Replace air dryer dehydrator cartridge (paragraph 3-200).	
37	Semi-Annual	Air Brake System	a. Inspect air reservoirs air valves, air chambers, connecting lines and fittings for damage or leaks. b. Inspect trailer brake hose and coupling for leaks or damage.	
38	Semi-Annual	Parking Brake	Inspect spring brake control valve, lines and double air brake chambers for leaks and damaged fittings.	Air leaks or damaged fittings.

Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
39	Semi-Annual	Brake Pedal	Lubricate brake pedal with OE/HDO.	Fitting will not purge old lubricant or component.
40	Semi-Annual	Accelerator Pedal and Linkage	Lubricate accelerator pedal and linkage with OE/HDO.	Fitting will not purge old lubricant out of component.
41	Semi-Annual	Air Brake Hoses	a. Check all outer casings of brake hoses for chafing, cracking, crimping or abrading through the first ply of fabric. Replace hose if there is any evidence of leakage or bulges (paragraph 3-163).	



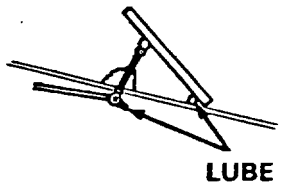


Table 2-1. Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
			FINAL ROAD TEST After all services and inspections have been completed, take vehicle on a short road test to make sure all corrections have been accomplished. Correct any defects or malfunctions that occur during this test. During road test: 1. Listen for any noises. 2. Check steering operation. 3. Check operation of brakes. 4. Check transmission operation; all ranges. 5. Check engine retarder (JACOBS ENGINE BRAKE) operation (TM 9-2320-283-10). 6. Note any loss of power or rough running engine. 7. Check drive line lockup system operation(TM 9-2320-283-10).	

Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

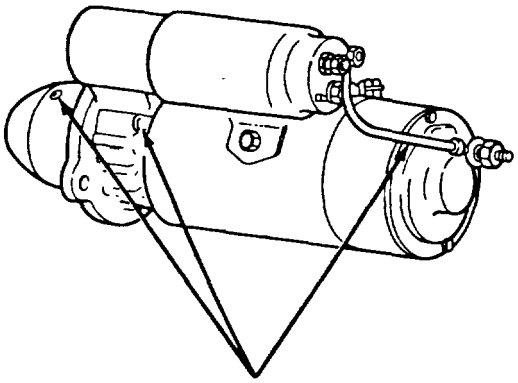
Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
42	Annual	Head-lights	Check headlight adjustment. Adjust headlights (paragraph 3-91.1).	
43	Annual	Starter	a. Remove starter. b. Remove three socket head screws and add three to five drops of OE/HDO to each reservoir.	
			 **SOCKET HEAD SCREWS**	
			WARNING Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from fire and use in well-ventilated area. If adhesive, solvents, or sealing compound get on skin or clothing, wash immediately with soap and water. c. Clean drive and drive spline and apply a thin coat of grease (GAA).	

Table 2-1. Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
44	Annual	Tires	**NOTE** Rotate tires (refer to TM 9-2610-200-14, paragraph 2-9). **WARNING** * Changing tire pressure or wheel alinement, out of the recommended specifications, may adversely affect the vehicle's handling characteristics. Loss of vehicle control may result in serious injury or death and damage to equipment. * Never mix radial tires and bias ply tires on the same axle. If radial tires are used in combination with bias ply tires on a vehicle, the radial tires must be placed on the rear axle only. Failure to do this may cause damage to equipment or injury to personnel. **NOTE** Vehicle must be up on jack stands for the following checks. a. Inspect tires for uneven wear and balance.	a. Tires exhibit excessive or uneven wear or balance.

Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

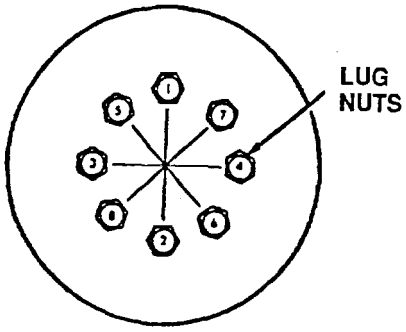
Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
44	Annual	Tires Continued	b. Tighten wheel lug nuts to 90-110 lb-ft (122-149 N-m) in tightening sequence shown. **TIGHTENING SEQUENCE**  **NOTE** If vehicle is new, and has been driven less than 3, 000 miles (4, 800 km), it is not necessary to aline wheels unless abnormal handling is reported. c. Check alinement of front and rear wheels (see TM 9-2320-280-20-1, paragraph(s) 8-7 and 8-8).	b. Any broken studs, loose or missing lug nuts. c. Front or rear wheel are out of alinement.

Table 2-1. Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
45	Annual	Front Wheel Bearings	**NOTE** Do not remove wheels from hubs. Use truck wheel lift to remove wheels and hub as an assembly. **NOTE** See paragraph 3-205 for bearing removal and installation. a. Remove, clean and repack with GAA front wheel bearings. b. Check wheel bearings for looseness, damage or wear (paragraph 3-205). c. Clean hub and brake shoe assemblies with brake cleaning solvent. Replace brake shoes if necessary (paragraph 3-159). **NOTE** If hub has one gouge or grooves, turn hub into Direct Support for resurfacing. d. Check brake drums for obvious grooves and uneven wear.	b. Loose, damaged or worn. d. Deep grooves or uneven wear is evident.
46	Annual	Rear Axles	a. Inspect each input and output shaft seal for damage and leaks. **NOTE** Do not remove wheels from hubs. Use truck wheel lift to remove wheels and hub as an assembly. b. Remove, clean, and check wheel bearings for damage or wear (paragraph 3-205).	a. Class III leaks. b. Loose, damaged or worn.

Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
46	Annual	Rear Axles	c. Clean hub and brake shoe assemblies. Replace brake shoes if necessary (paragraph Continued 3-159). **NOTE** If hub has one gouge or grooves, turn hub into Direct Support for resurfacing. d. Check brake drums for obvious grooves and uneven wear. is evident.	d. Deep grooves or uneven wear
47	Annual	Forward Rear Axle Lube Pump and Magnetic Strainer	**NOTE** The magnetic strainer should be checked and cleaned the first 1, 000 miles of operation. After that, check and clean the magnetic strainer every 24, 000 miles or 12 months, whichever occurs first. **NOTE** Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from fire and use in well-ventilated area. If adhesive, solvents, or sealing compound get on skin or clothing, wash immediately with soap and water. a. Check and clean the magnetic strainer, remove the strainer from the power divider cover and inspect for wear material. b. Wash the magnetic strainer in solvent; blow dry with compressed air to remove oil and metal particles. Reinstall.	

Table 2-1. Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
48	Annual	Springs and Shocks	a. Check spring leaves for cracks and breaks.	a. Cracks or breaks evident.
			b. Check spring clips, saddles, saddle caps, spring hangers for presence, looseness, cracks, and visible damage.	b. Missing, loose, cracks, or visible damage evident.
			c. Check for missing or broken retaining hardware, bolts or parts of suspension system.	c. Any retaining hardware parts, bolts or parts are missing or broken.
			d. Check all shock absorbers. Look for oil leaks and damage.	d. Class III oil leaks or damage is present.
			e. Check rubber bushings for cracks, damage, and looseness.	e. Rubber bushings are cracked, damaged or loose.
			f. Lubricate front axle spring with GAA.	

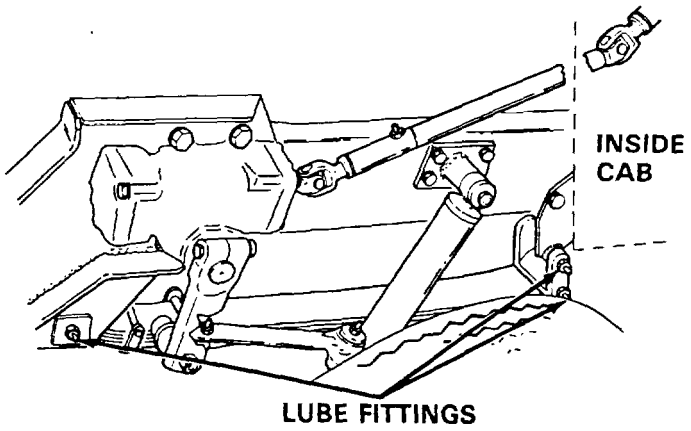


Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
49	Annual	Trans-mission	a. Check transmission for leaks and damage to connecting lines and fittings (paragraph 3-141). b. Change the transmission oil and external transmission oil filter after the initial 3, 000 miles or 3 months, whichever occurs first. Thereafter, the oil and external filter should be changed every 24, 000 miles or 12 months, whichever comes first. **NOTE** The automatic transmission should be at operating tempera-ture when the transmission oil is drained. This will ensure quicker and better drainage. c. Replace the external trans-mission oil filter and fill the transmission through the dip-stick opening with 7.8 gallons. d. Remove and clean the trans-mission breather.	a. Class III leaks or dam-age is pre-sent.

Table 2-1. Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
			FINAL ROAD TEST After all services and inspections have been completed, take vehicle on a short road test to make sure all corrections have been accomplished. Correct any defects or malfunctions that occur during this test. During road test: 1. Listen for any noises. 2. Check steering operation. 3. Check operation of brakes. 4. Check transmission operation; all ranges. 5. Check engine retarder (JACOBS ENGINE BRAKE) operation (TM 9-2320-283-10). 6. Note any loss of power or rough running engine. 7. Check differential lockup system operation(TM 9-2320-283-10).	

Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
50	Bien-nially	Front Wheel Knuckle	**NOTE** Pressure gun should be held on fittings until new grease appears. This will assure that all the old contaminated grease has been forced out. Lubricate wheel knuckle with GAA.	Fittings will not purge old lubricant out of component.
51	Bien-nially	Forward Rear and Rear Axles	**NOTE** Drain and fill the forward-rear axle and rear-rear axle lubrication, including axle hubs, every 24, 000 miles or 24 months, whichever comes first. **CAUTION** Prior to filling the forward-rear axle, remove the filler plug at the top of the differential carrier near the power divider cover and add two pints of gear lube. Reinstall fill plug. Add the remaining 38 pints to the forward-rear axle differential housing.	

Table 2-1. Unit Level Preventive Maintenance Checks And Services M915A1

Item No.	Interval	Item to be Inspected	Procedures:	Not Mission Capable If:
51	Biennially	Forward Rear and Rear Axles Continued	Drain and refill axle differentials with GO.	Differentials have not been drained within specified interval.

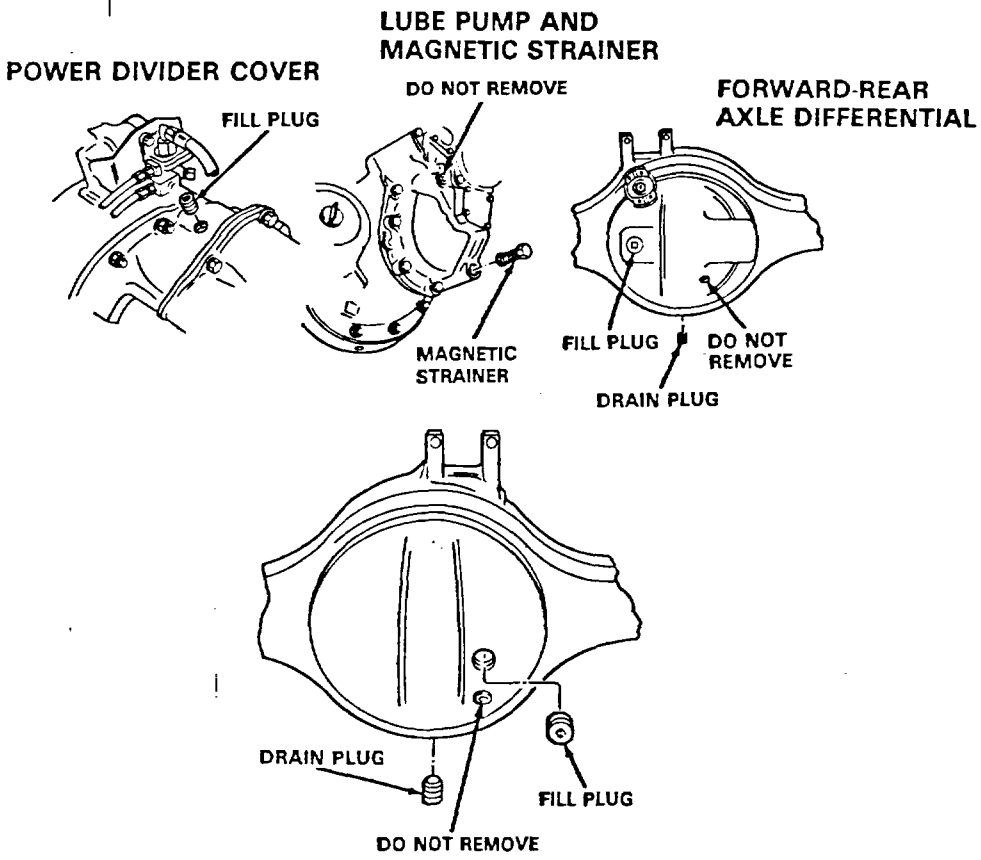


Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

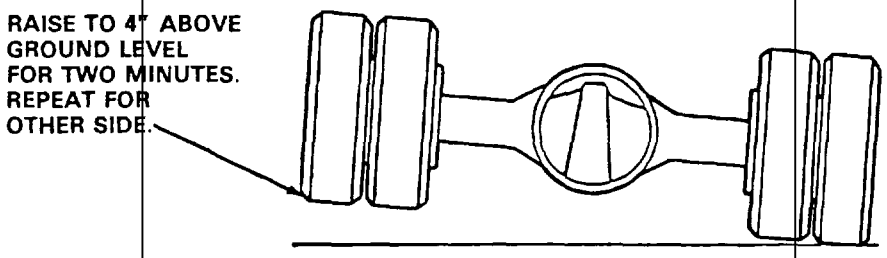
Item No.	Interval	Item To Be Inspected	Procedures	Not Mission Capable If:
52	Biennially	Forward Rear and Rear-Rear Axle Hub Bearings	CAUTION If maintenance or new hub bearings are required in either the forward-rear axle or rear-rear axle, it will be necessary to tilt each side of the rear axles to assure that adequate gear lube is supplied to the individual hub bearings after installation. a. Fill forward-rear axle and rear-rear axle with proper gear lube and replace filler plugs. b. Raise left side of rear axle approximately 4 inches above the ground. Maintain this position for two minutes to allow gear lube to flow into hub bearings at the opposite or right side.  	

Table 2-1. Unit Level Preventive Maintenance Checks and Services M915A1

Item No.	Interval	Item To Be Inspected	Procedures	Not Mission Capable If:
52	Bien-nially	Forward Rear and Rear-Rear Axle Hub Bearings	c. Repeat this procedure for the opposite or right side. d. With vehicle level again, add additional gear lube through the differential cover filler hole. The forward-rear axle and the rear-rear axle should require two pints each.	
53	Bien-nially	Internal Trans-mission Oil Filter	Transmission internal oil filter should be changed every 24,000 miles or 24 months, whichever occurs first.	

M915A1 TRUCK
PMCS PARTS LIST

ITEM NO	PART NUMBER	STOCK NUMBER	NOMENCLATURE	QTY	REMARKS
			SEMI-ANNUAL (6,000 MILES)		
1	299670	2940-01-019-4513	ENG-FF-OIL-FTR	1	
2	3304232	2940-01-145-9455	ENG-BP-OIL-FTR	1	
3	250C127	2940-01-065-8396	INT-AIR-FTR	1	DON'T REUSE
4	286718	2940-01-081-1391	DESSICANT-PACK	1	
			ANNUAL (12,000 MILES)		
1	299670	2940-01-019-4513	ENG-FF-OIL-FTR	1	
2	3304232	2940-01-145-9455	ENG-BP-OIL-FTR	1	
3	250C127	2940-01-065-8396	INT-AIR-FTR	1	DON'T REUSE
4	286718	2940-01-081-1391	DESSICANT-PACK	1	
5	FS1212	2910-01-146-1099	PRI-FUEL-FILT	1	
6	WF2071	4330-00-274-4712	ENG-WTR-FILTER	1	
7	25010643	2520-01-132-4842	TRANS-EXT-FTR	1	
8	250C128	2940-01-066-1237	EXT-AIR-FTR	1	CLEAN 5X ONLY
			BIENNIAL (24,000 MILES)		
1	299670	2940-01-019-4513	ENG-FF-OIL-FTR	1	
2	3304232	2940-01-145-9455	ENG-BP-OIL-FTR	1	
3	250C127	2940-01-065-8396	INT-AIR-FTR	1	DON'T REUSE
4	286718	2940-01-081-1391	DESSICANT-PACK	1	
5	FS1212	2910-01-146-1099	PRI-FUEL-FILT	1	
6	WF2071	4330-00-274-4712	ENG-WTR-FILTER	1	
7	25010643	2520-01-132-4842	TRANS-EXT-FTR	1	
8	250C128	2940-01-066-1237	EXT-AIR-FTR	1	CLEAN 5X ONLY
9	23013625	2520-01-096-1739	TRANS-INT-FTR	1	
10	ERS-27549-PL	2530-01-198-4500	P/S PMP FILTER	1	
11	380-8036	5330-01-177-9673	SEAL, WHL BRNG	2	M915A1 FRONT AX
12	330-3009	5330-01-071-8179	HUB GASKET	2	M915A1 FRONT AX
13	47697	5330-01-117-1014	SEAL, WHL BRNG	4	M915A1 TANDEM

LUBRICATION TABLE

LUBRICANTS (SEE NOTE 24)	REFILL CAPACITY (APR.)	EXPECTED TEMPERATURES		
		Above +32°F	+40°F to -10°F	0°F to 65 °F
OE/HDO - OIL ENGINE	11.5 GAL WITH BOTH FILTERS	OE/HDO 30	OE/HDO 10	OEA
OE/HDO AND OEA (ARCTIC GRADE) TRANSMISSION	22 QUARTS	OE/HDO 10	OE/HDO 10	OEA
GO LUBRICANT, MULTIPURPOSE TRANSFER CASE	5 QUARTS	GO 80/90	GO 80/90	GO 75
GO LUBRICANT, MULTIPURPOSE DIFFERENTIALS	SEE NOTE 7A	GO 85/140	GO 80/90 (40°F LIMIT)	GO 75
GO LUBRICANT, MULTIPURPOSE WINCH DRUM	5 QUARTS	GO 80/90	GO 80/90	GO 75
OE.HDO-OIL AND OEA (ARCTIC GRADE) WINCH RESERVOIR	42 GALLONS OE/HDO 10	OE/HDO 10	OEA	
DEXRON	2 QUARTS			
GAA - GREASE AUTOMOTIVE & ARTILLERY	AS REQUIRED	ALL TEMPERATURES		
CW11-LUBR, CHAIN EXPOSED GEAR AND WIRE ROPE	AS REQUIRED			
		INTERVALS D - DAILY (OPERATOR) S - SEMIANNUALLY (6 MONTHS) A -ANNUALLY 1 -1,000 MILES 2 - 2,000 MILES 10 - 10,000 MILES 24 - 24,000 MILES 50 - 50,000 MILES 100 - 100,000 MILES FOR ARCTIC OPERATION REFER TO FM 9-207		

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2-9. SECTION IV.

a. This section provides procedures to troubleshoot vehicle systems, assemblies, and components for which repairs are authorized at the organizational maintenance level.

b. In many cases, you will be given connector pin designations and harness connections to help make your troubleshooting easier. In Appendix D (TM 9-2320-283-20-3) you will find information that will help you identify connector pins and harness locations that are not yet familiar to you.

c. For your convenience, the appropriate STE/ICE GO and NO-GO chain tests will be referenced next to the corresponding malfunction in the troubleshooting symptom index. The procedures for these tests can be found in section V of this chapter. In the event that STE/ICE equipment is not available (or where it is not applicable), use this section as a troubleshooting substitute.

d. The troubleshooting procedures in this section cannot give all the answers or correct all vehicle malfunctions encountered. However, these procedures are organized as step-by-step studies that direct tests and inspections toward the source of a problem and successful correction.

e. Don't begin troubleshooting with the first malfunction you find. Search for other visible malfunctions. From other malfunctions you may be able to find a common problem area in which to concentrate your efforts.

f. Check all tags, service request forms, and vehicle log book for repair history. This may also help lead you to the source of a problem.

g. Always check the easiest and most obvious things first. For example, check the appropriate circuit breaker and relay for an electrical problem, before troubleshooting the entire circuit. This simple rule saves time and trouble.

h. Before correcting a problem, diagnose the cause of the problem. Do not allow the same failure to occur again.

WARNING

Operation of a deadlined vehicle without preliminary inspection could cause further damage to a disabled component and possible injury to personnel.

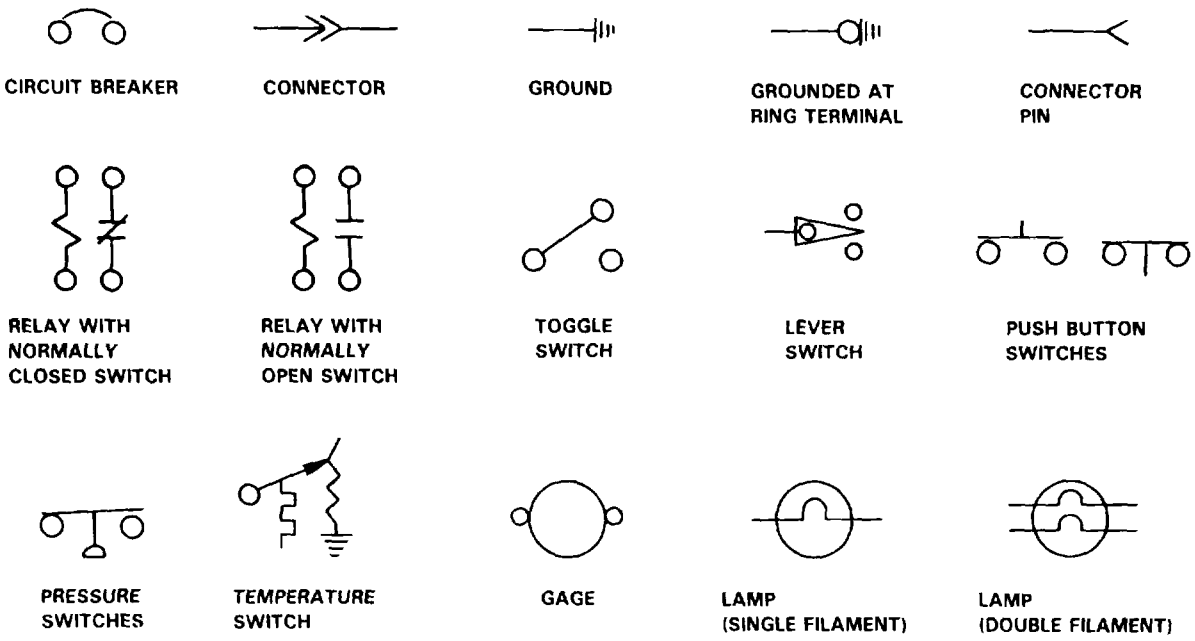
2-9. GENERAL (Continued).

NOTE

• The following list of circuit colors and abbreviations are used in the troubleshooting schematics found in paragraph 2-11.

White	WH	Yellow	YL	Light Blue	LB	Tan	TN
Red	RD	Light Green	LG	Dark Blue	DB	Brown	BR
Pink	PK	Dark Green	DG	Purple	PP	Gray	GY
Orange	OR					Black	BK

• The following symbols shown below are used throughout the troubleshooting procedures. They are listed here as reference only. Additional symbols are used in specific procedures and labeled as required.



i. In the following troubleshooting procedures you will be asked to test for certain voltage measurements. The word nominal will follow a voltage measurement where an exact voltage reading is not important. In these cases a close voltage reading will be considered normal. For example, 10.5 volts dc would be acceptable if measuring for 12-volts dc nominal. However, 10.5 volts dc would not be acceptable if only measuring for 12-volts dc. Remember, a nominal measurement means an approximate measurement.

TROUBLESHOOTING.

2-10. TROUBLESHOOTING SYMPTOM INDEX.

TROUBLESHOOTING.

2-10. TROUBLESHOOTING SYMPTOM INDEX.

TROUBLESHOOTING.

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TROUBLESHOOTING.

2-10. TROUBLESHOOTING SYMPTOM INDEX.

TROUBLESHOOTING.

2-10. TROUBLESHOOTING SYMPTOM INDEX.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE

1. ENGINE FAILS TO CRANK.
   Check electrical system.
   a. Troubleshoot starting system. (Refer to malfunction 20).
   b. Notify direct support maintenance.

2. ENGINE CRANKS BUT FAILS TO START.

   Step 1. Check for leaking or broken fuel lines.
   Tighten connections, or replace fuel lines (para 3-28 or 3-36).
   Step 2. Check fuel specifications for cold weather operation.
   (Refer to TM 9-2320-283-10).
   Replace fuel, if necessary.
   Step 3. Turn ignition switch on and off, while assistant listens for clicking sounds at fuel solenoid valve.
   Replace or repair fuel solenoid valve (para 3-33).
   Step 4. Check for dirt and water in fuel.
   Replace water separator fuel filter, and clean fuel filter screen (para 3-27 and 3-37).
   Step 5. Check exhaust system for damage or blockage.
   a. Replace damaged portion of exhaust system (para 3-45 thru 3-49).
   b. Clear blockage from exhaust system.

TROUBLESHOOTING.

2-10. TROUBLESHOOTING SYMPTOM INDEX.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

2. ENGINE CRANKS BUT FAILS TO START (Continued).

Step 6. Check for air intake restriction.
a. Clean or replace air cleaner filter element (para 3-30).
b. Clean or replace air cleaner tube (para 3-32).

Step 7. Check electrical system.
Troubleshoot starting system. (Refer to malfunction 19).

Step 8. Notify direct support maintenance.

3. ENGINE WILL NOT IDLE.

Step 1. Check for loose or broken fuel supply lines.
Tighten connections, or replace fuel supply lines (para 3-28 or 3-36).

Step 2. Check for dirt and water in fuel.
Replace water separator fuel filter, and clean fuel filter screen (para 3-27 and 3-37).

Step 3. Notify direct support maintenance.

4. ENGINE OVERHEATS (TEMPERATURE EXCEEDS 210°F).

Step 1. Check for loose or broken fan clutch drive belts.
Adjust or replace belts (para 3-67).

Step 2. Check for defective water temperature gage.
Refer to malfunction 31, steps 1 and 8.

TROUBLESHOOTING.

2-10. TROUBLESHOOTING SYMPTOM INDEX.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

4. ENGINE OVERHEATS (TEMPERATURE EXCEEDS 210°F) (Continued).
   - Step 3 Check water temperature sending unit.
     Refer to malfunction 31, step 8.
   - Step 4 With engine running and radiator cap removed, check for proper coolant flow.
     a Replace thermostat (para 3-59).
     b Replace water pump (para 3-64).
   - Step 5 With engine running and radiator cap installed, check for signs of leaks and collapsed radiator hoses.
     a Replace hose, if necessary (para 3-58).
     b Replace radiator, if leaking (para 3-53).
   - Step 6 Check fan clutch operation.
     a Check air valve tubes for cracks. Replace if necessary (para 3-163).
     b Replace air valve (para 3-66).
     c Replace fan clutch (para 3-65).
   - Step 7 Notify direct support maintenance.

5. INTERMITTENT LOSS OF POWER.
   - Step 1 Check for leaking fuel lines.
     Tighten connections, or replace fuel lines (para 3-28 or 3-36).
   - Step 2 Check fuel tank vent plug for blockage.
     Remove and clean fuel tank air vent (para 3-34).

TROUBLESHOOTING.

2-10. TROUBLESHOOTING SYMPTOM INDEX.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

5. INTERMITTENT LOSS OF POWER.

Step 3 Check for dirt and water in fuel.
Replace water separator fuel filter, and clean fuel filter screen (para 3-27 and 3-37).

6. SUDDEN LOSS OF POWER.

Step 1 Check fuel level in tank.
Add fuel, if necessary (Refer to TM 9-2320-283-10).
Step 2 Check fuel tank vent plug for blockage.
Remove and clean fuel tank vent plug (para 3-34).
Step 3 Refer to malfunction 2, steps 1 thru 7.

7. GRADUAL LOSS OF POWER.

Step 1 Check for leaking fuel lines.
Tighten connections, or replace fuel lines (para 3-28 or 3-36).
Step 2 Check for air intake restriction.
Remove blockage from air intake.
Step 3 Check for loose accelerator linkage.
Adjust and replace parts (para 3-41).
Step 4 Check fuel specifications for cold weather operation.
(Refer to TM 9-2320-283-10).
Replace fuel, if necessary.

TROUBLESHOOTING.

2-10. TROUBLESHOOTING SYMPTOM INDEX.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

7 GRADUAL LOSS OF POWER (Continued).

Step 5 Check for dirt and water in fuel.
Replace water separator fuel filter, and clean fuel filter screen (para 3-27 and 3-37).

8 LOW OR NO ENGINE OIL PRESSURE.

Step 1 Check for defective engine oil pressure gage.
Refer to malfunction 31, steps 1 and 12.
Step 2 Check for defective engine oil pressure sending unit.
Refer to malfunction 31, step 12.
Step 3 Notify direct support maintenance.

9 EXCESSIVE EXHAUST SMOKE DURING ACCELERATION.

Step 1 Check for black or gray exhaust smoke.
a Clear blockage from air intake.
b Clean air cleaner element.
c Repair air crossover leaks or replace turbocharger air crossover connection (para 3-31).
d Notify direct support maintenance.
Step 2 Check for blue exhaust smoke If exhaust is blue, check maintenance log for excessive oil usage.
Notify direct support maintenance.

TROUBLESHOOTING.

2-10. TROUBLESHOOTING SYMPTOM INDEX.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

9 EXCESSIVE EXHAUST SMOKE DURING ACCELERATION (Continued).

Step 3 Check for white exhaust smoke (normal in cold weather) If exhaust is white, check radiator coolant for signs of oil.
Notify direct support maintenance.

10 EXCESSIVE EXHAUST SMOKE THROUGHOUT SPEED RANGE.

Step 1 If exhaust smoke is black, check fuel specification for correct fuel type.
Replace fuel, if necessary (Refer to TM 9-2320-283-10).
Step 2 Refer to malfunction 9, steps 1 thru 3.

11 ENGINE STOPS.

Step 1 Check fuel level in tank.
Add fuel, if necessary (Refer to TM 9-2320-283-10).
Step 2 Check fuel tank vent plug for blockage.
Remove and clean fuel tank vent plug (para 3-34).
Step 3 Refer to malfunction 2, steps 1 thru 7.
Step 4 Notify direct support maintenance.

12 HIGH OIL USE.

Step 1 Check for overfilling.
a Check oil level.
b Make sure proper oil level gage (dipstick) is being used by matching it against known correct configuration.

TROUBLESHOOTING.

2-10. TROUBLESHOOTING SYMPTOM INDEX.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

12 HIGH OIL USE (Continued).

Step 2 Check that proper grade oil is used for climate.
Replace oil, if necessary (Refer to LO 9-2320-283-12).
Step 3 Check for loose or broken oil lines.
a Tighten connections, or replace oil lines.
b Notify direct support maintenance.

13 SLOW DECELERATION (ENGINE "FLOATS").

Check for air leaks in fuel pump supply lines.
Tighten connections, or replace fuel lines (para 3-28 or 3-36).

14 HIGH FUEL USE.

Check for leaking and broken fuel lines.
Tighten connections, or replace fuel lines (para 3-28 or 3-36).

15 EXHAUST FUMES IN CAB.

Check for loose or defective manifold, or leaks in turbocharger outlet or muffler inlet pipes.
a Replace pipes as required (para 3-48 and 3-49).
b If manifold or turbocharger is defective, notify direct support maintenance.

TROUBLESHOOTING.

2-10. TROUBLESHOOTING SYMPTOM INDEX.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

COOLING SYSTEM

16 NO CAB HEAT.

Step 1 Check heater and heater air hoses for leaks or blockage.
- a Adjust cables, if necessary (para 3-301).
- b Replace heater air hoses (para 3-296).
- c Replace or repair heater (para 3-298).

Step 2 Check for closed water control valve.
- a Open valve.
- b Bleed heater (para 3-52).

Step 3 With engine running and radiator cap removed, check for proper coolant flow and level.
- a Replace thermostat (para 3-59).
- b Replace water pump (para 3-64).
- c Replace radiator (para 3-53).

Step 4 Check fan clutch operation.
- a Check fan clutch air valve tubes for cracks. Replace, if necessary (para 3-163).
- b Replace fan clutch air valve (para 3-66).
- c Replace fan clutch (para 3-65).

TROUBLESHOOTING.

2-10. TROUBLESHOOTING SYMPTOM INDEX.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ELECTRICAL SYSTEM

17 ETHER SOLENOID FAILS TO OPERATE WHEN ETHER START SWITCH IS PUSHED.

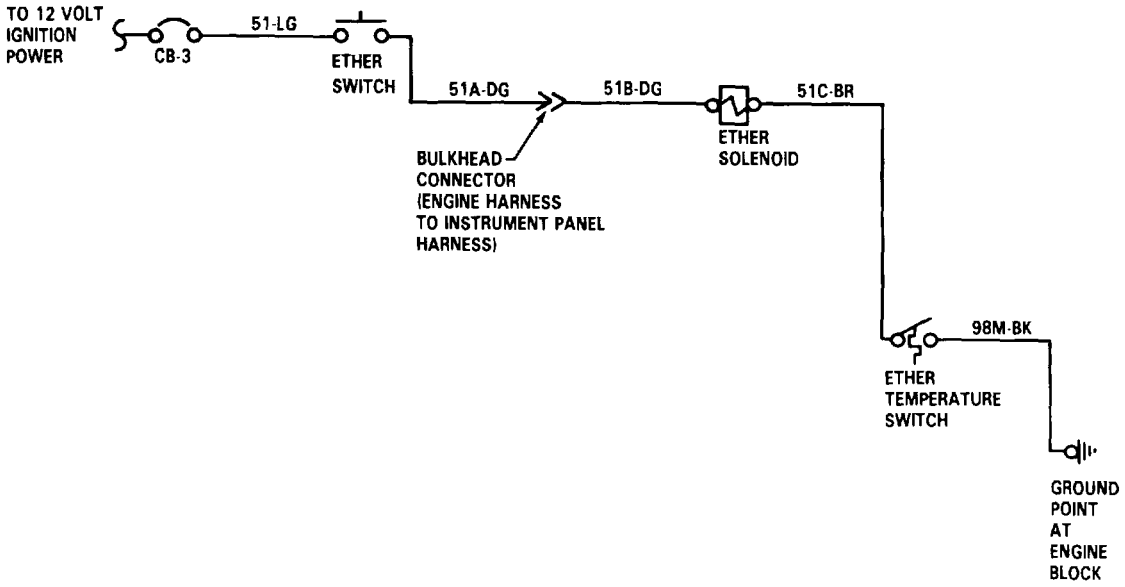
1	Remove circuit breaker bracket far enough to access circuit breaker CB-3 (para 3-114), and go to step 2.			
		NOTE Ignition switch must be in ON position and battery power connected when doing the following checks.		
2	Check for voltage at circuit 51-LG terminal of circuit breaker CB-3	12-volts dc nominal	Install circuit breaker bracket (para 3-114), and go to step 3	Reset circuit breaker CB-3 and/or trouble-shoot CB-3 circuit. (Refer to malfunction 33).
3	Check for voltage at circuit 51-LG terminal of ether start switch	12-volts dc nominal	Go to step 4	Repair circuit 51-LG (para 3-127).
		NOTE Ether start switch must be pushed and held when doing the following checks.		
4	Disconnect circuit 51B-DG from solenoid valve, and go to step 5.			
5	Have assistant operate ether start switch while checking for voltage at circuit 51A-DG terminal of ether start switch.	12-volts dc nominal	Go to step 6	Replace switch (para 3-76). Connect circuit 51B-DG to solenoid.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

17. ETHER SOLENOID FAILS TO OPERATE WHEN ETHER START SWITCH IS PUSHED (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

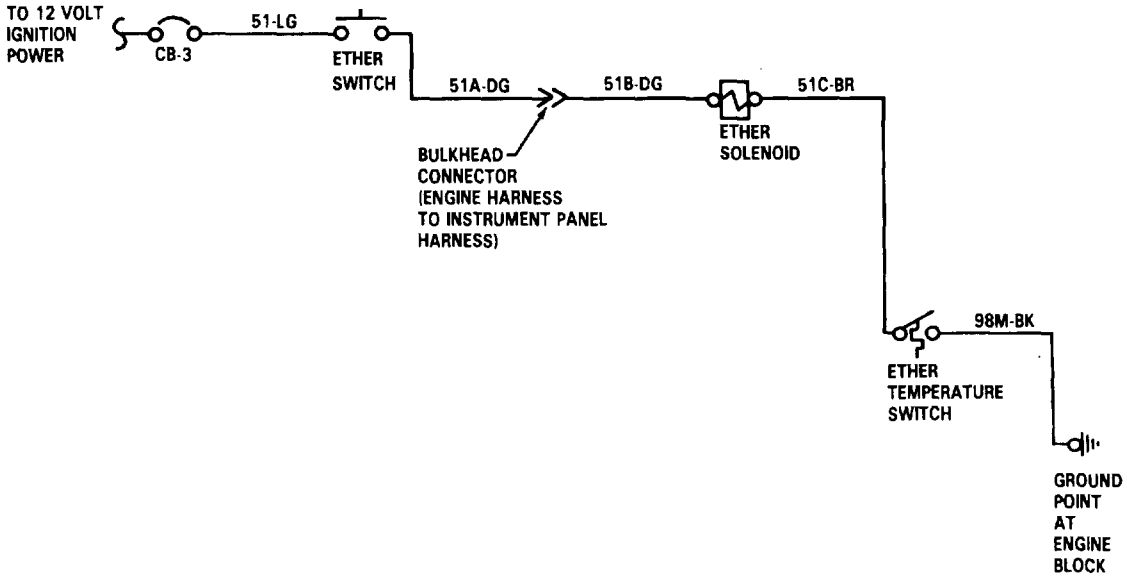
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
17 ETHER SOLENOID FAILS TO OPERATE WHEN ETHER START SWITCH IS PUSHED (Continued).				
6 Disconnect circuit 51A-DG from 51B-DG at connector, and go to step 7.				
7 Check for voltage at circuit 51A-DG (pin 6 of connector)	12-volts dc nominal		Connect circuit 51A-DG to 51B-DG, and go to step 8.	Repair circuit 51A-DG (para 3-127).
8 Have assistant operate ether start switch while checking for voltage at circuit 51B-DG of solenoid valve.	12-volts dc nominal		Go to step 9	Repair circuit 51B-DG (para 3-127).
	NOTE -With positive lead on circuit 51B-DG (or other suitable 12-volt source), check ground with negative lead when doing the following checks. -Engine coolant must be below 70°F.			
9 Check for voltage at circuit 98M-BK of engine block.	12-volts dc nominal		Go to step 10	Tighten and/or clean connection. Connect circuit 51B-DG to solenoid valve.
10 Check for voltage at circuit 98M-BK of thermostat	12-volts dc nominal		Go to step 11	Repair wire 98M-BK (para 3-127). Connect circuit 51B-DG to solenoid valve.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

17. ETHER SOLENOID FAILS TO OPERATE WHEN ETHER START SWITCH IS PUSHED (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

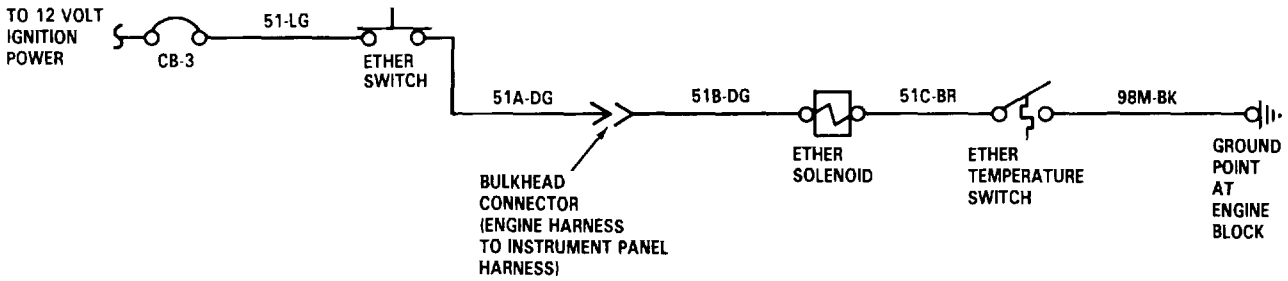
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
17. ETHER SOLENOID FAILS TO OPERATE WHEN ETHER START SWITCH IS PUSHED (Continued).				
11.	Check for voltage at circuit 51C-BR terminal of thermostat.	12-volts dc nominal.	Go to step 12.	Replace thermostat (para 3-39). Connect circuit 51B-DG to solenoid valve.
12.	Check for voltage at circuit 51C-BR terminal of solenoid valve.	12-volts dc nominal.	Go to step 13.	Repair wire 51C-BR (para 3-127). Connect circuit 51B-DG to solenoid valve.
	WARNING Ether burns easily. Avoid open flames to prevent personal injury to you and other personnel.			
13.	Remove ether supply tube from engine (para 3-40), and go to step 14.			
14.	Connect circuit 51B-DG to solenoid valve, and go to step 15.			
15.	Have assistant press and hold ether start switch while watching for shot of ether from atomizer.	Ether sprays from end of supply line.	Ether system OK. Install ether supply tube (para 3-40).	Replace atomizer, clean supply tube, or replace solenoid valve (para 3-40).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

17 ETHER SOLENOID FAILS TO OPERATE WHEN ETHER START SWITCH IS PUSHED (Continued).



18 ALL ELECTRICAL SYSTEMS ARE WEAK.

1	Inspect battery Terminals	a	Loose	Tighten terminals.	Go to step b.
		b	Corroded or dirty	Clean terminals.	Go to step 2.
2	Inspect battery Case	Cracked or broken		Replace battery (para 3-121).	Go to step 3.
3	Inspect cables	Frayed or broken		Replace battery cable(s) (para 3-124).	Go to step 4.

NOTE

One defective battery in a series-parallel connection will bring down charge of other batteries.

4	Check battery test indicators	a	Green	Test battery (malf 19, step 2).	Go to step b.
		b	Dark	Charge battery (para 3-119).	Go to step c.
		c	Yellow	Replace battery (para 3-121)	Refer to malfunction 25.

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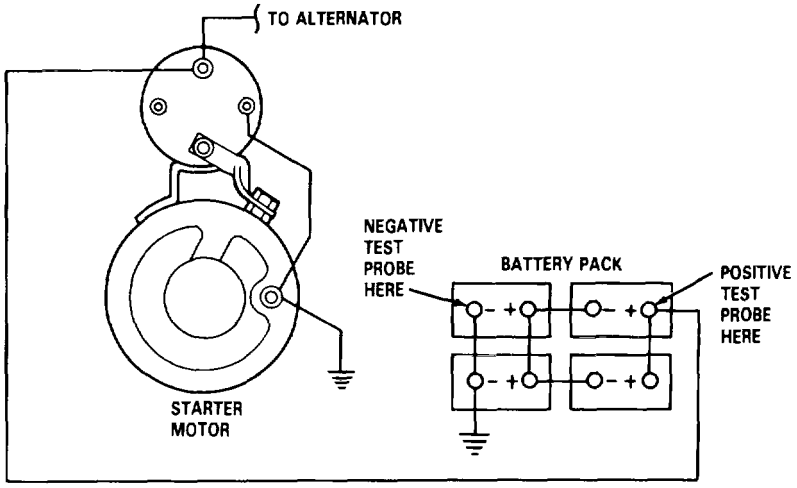
TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION		INDICATION	YES	NO
19 STARTER OPERATES SLOWLY.					
1	Check battery test indicator.	a	Green	Go to step 2.	
		b	Dark	Charge battery (para 3-119).	
		c	Yellow	Replace battery (para 3-121).	
2	Test batteries under load:				
	a Connect a multimeter to positive and negative battery posts.				
	b Have an assistant crank engine for 10 seconds.				
	c Observe meter		18-volts dc nominal	Notify direct support maintenance.	Refer to malfunction 18.



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

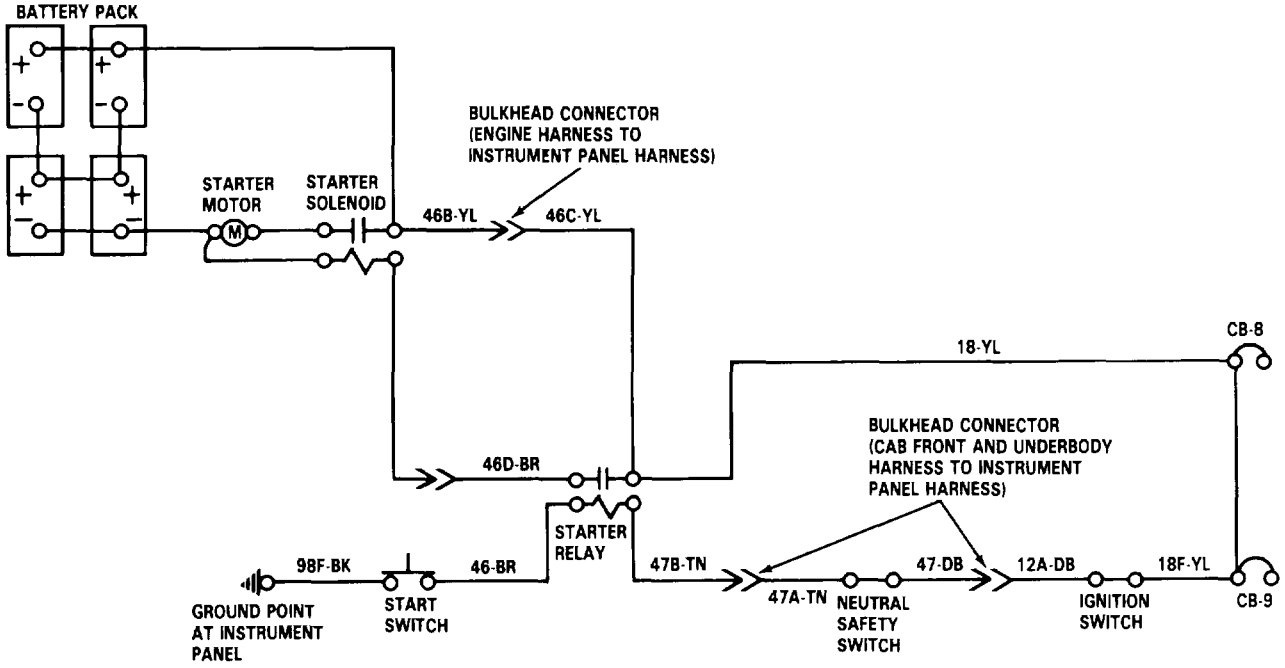
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

20 STARTER FAILS TO OPERATE.

NOTE

Ignition switch must be in ON position and transmission shift control must be in neutral position when doing the following checks.

1	Check for voltage at starter solenoid main battery cable connection.	24-volts dc nominal	Go to step 2	Refer to malfunction 18.
2	Check for voltage at circuit 46C-YL terminal of starter relay.	24-volts dc nominal	Go to step 3	Repair circuit 46B-YL and/or 46C-YL (para 3-127).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

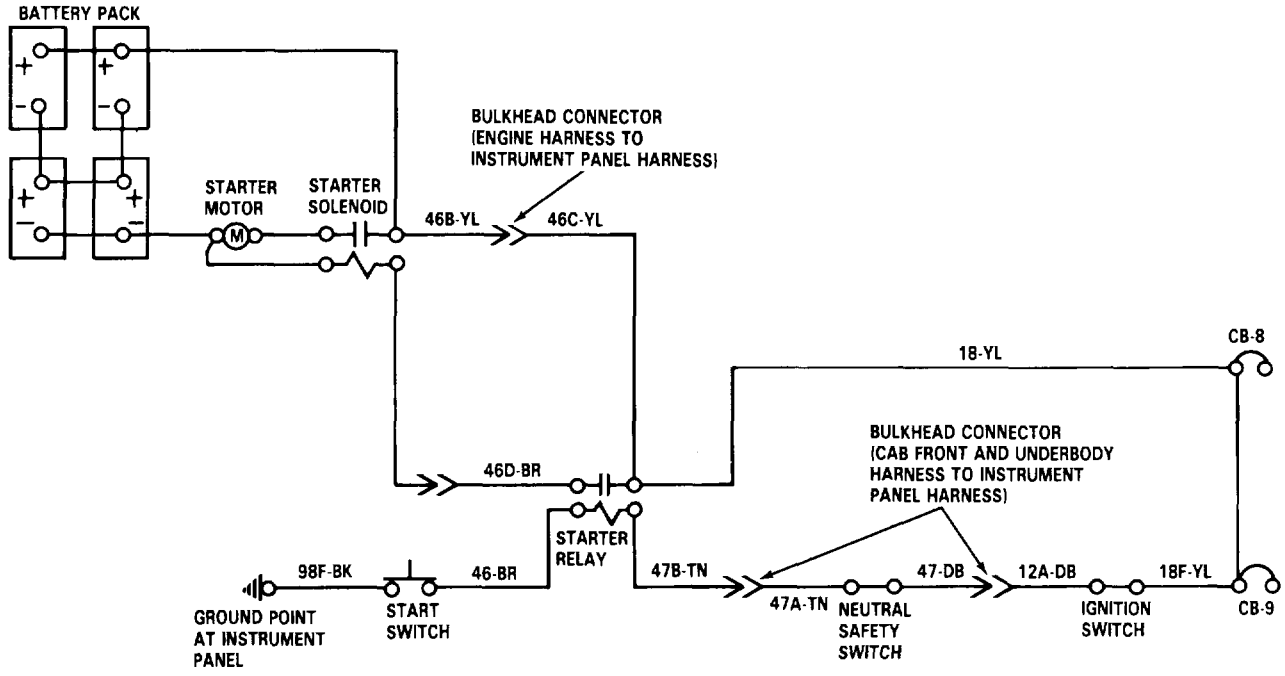
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
20 STARTER FAILS TO OPERATE (Continued).				
3	Remove circuit breaker bracket far enough to access circuit breaker CB-8 (para 3-114), and go to step 4.			
4	Check for voltage at circuit 18-YL terminal of circuit breaker CB-8	24-volts dc nominal	Go to step 5	Repair circuit 18-YL (para 3-127). Install circuit breaker bracket (para 3-114).
5	Check for voltage at circuit 18F-YL terminal of ignition switch	24-volts dc nominal	Install circuit breaker bracket (para 3-114), and go to step 6	Repair circuit 18F-YL and/or clean and tighten connections at circuit breakers CB-8 and CB-9. Install circuit breaker bracket (para 3-114).
6	Check for voltage at circuit 12A-DB terminal of ignition switch.	24-volts dc nominal	Go to step 7	Replace switch (para 3-74).
7	Check for voltage at circuit 47-DB terminal of neutral safety switch	24-volts dc nominal	Go to step 8	Repair circuit 47-DB and/or 12A-DB (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

20. STARTER FAILS TO OPERATE (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

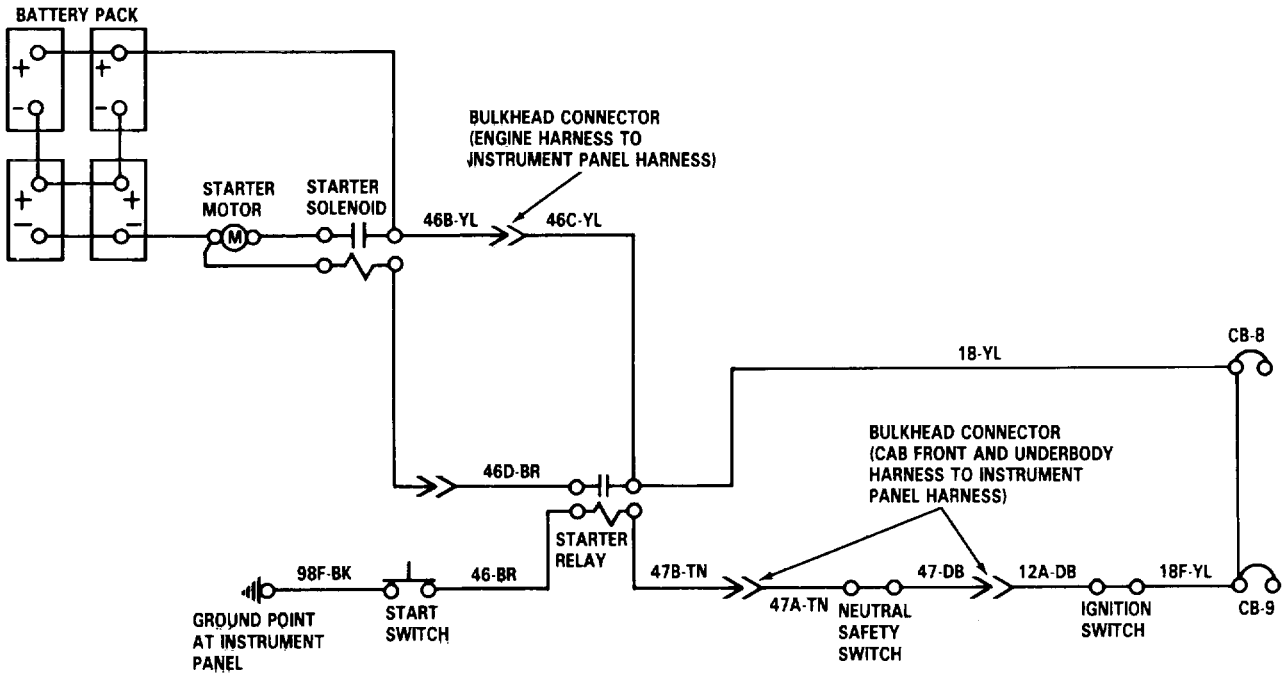
MALFUNCTION		INSTRUCTION	INDICATION	YES	NO
20	STARTER FAILS TO OPERATE (Continued).				
	8	Check for voltage at circuit 47A-TN terminal of neutral safety switch.	24-volts dc nominal	Go to step 9	Replace neutral safety switch (para 3-106).
	9	Check for voltage at circuit 47B-TN terminal of starter relay	24-volts dc nominal	Go to step 10	Repair circuit 47B-TN and/or 47A-TN (para 3-127).
		NOTE With positive lead on circuit 47B-TN, check ground with negative lead when doing the following checks.			
	10	Check for voltage at circuit 98F-BK ground point of instrument panel.	24-volts dc nominal	Go to step 11	Tighten and/or clean connection.
	11	Check for voltage at circuit 98F-BK terminal- of start switch	24-volts dc nominal	Go to step 12	Repair circuit 98F-BK (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

20. STARTER FAILS TO OPERATE (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

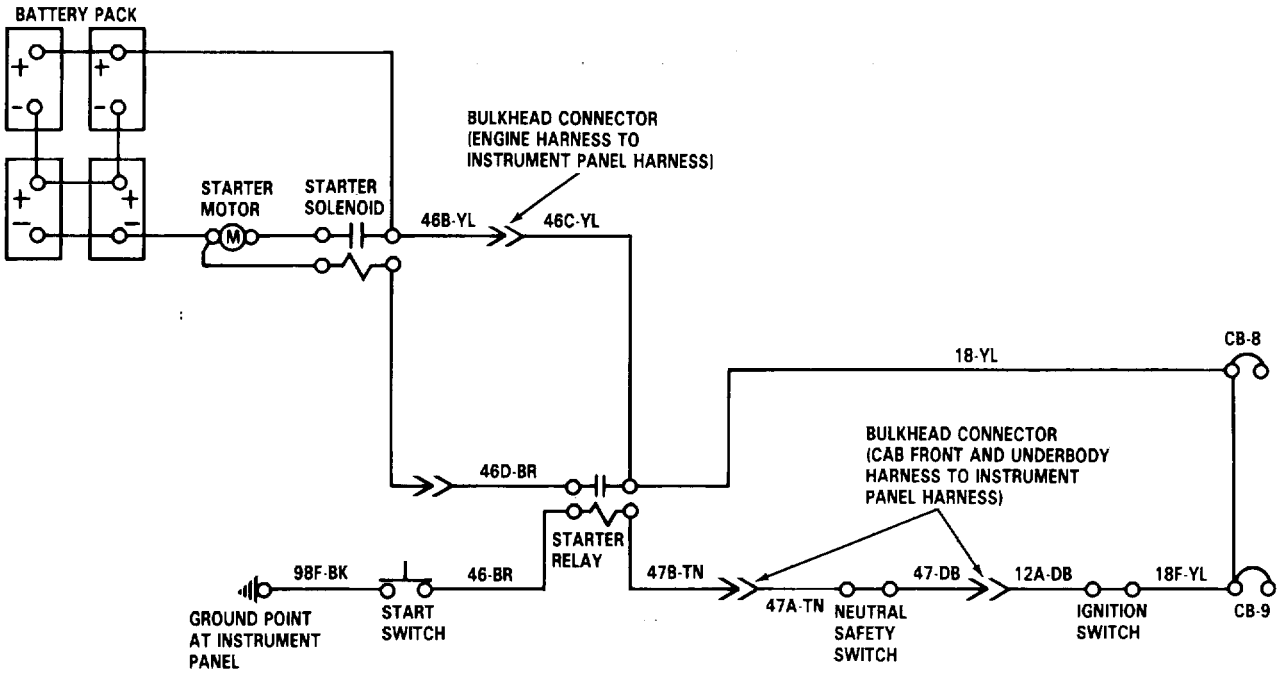
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
20. STARTER FAILS TO OPERATE (Continued).				
	NOTE The start switch must be pushed and held when doing steps 12 thru 18.			
12	Check for voltage at circuit 46-BR terminal of start switch.	24-volts dc nominal	Go to step 13 (para 3-75).	Replace switch
13	Check for voltage at circuit 46-BR terminal of starter relay	24-volts dc nominal 3-127).	Go to step 14 46-BR (para	Repair circuit
14	Release and depress start switch ate (clicking sound).	Starter relay should oper- 3-115).	Go to step 15 relay (para	Replace starter
	NOTE With negative lead on a good chassis or body ground, use positive lead when doing the following checks.			
15	Check for voltage at circuit 46D-BR terminal of starter relay	24-volts dc nominal	Go to step 16	Replace starter relay (para 3-115).
16	Check for voltage at circuit 46E-BR terminal of starter motor solenoid	24-volts dc nominal	Go to step 17	Repair circuits 46E-BR and/or 46D-BR (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

20. STARTER FAILS TO OPERATE (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

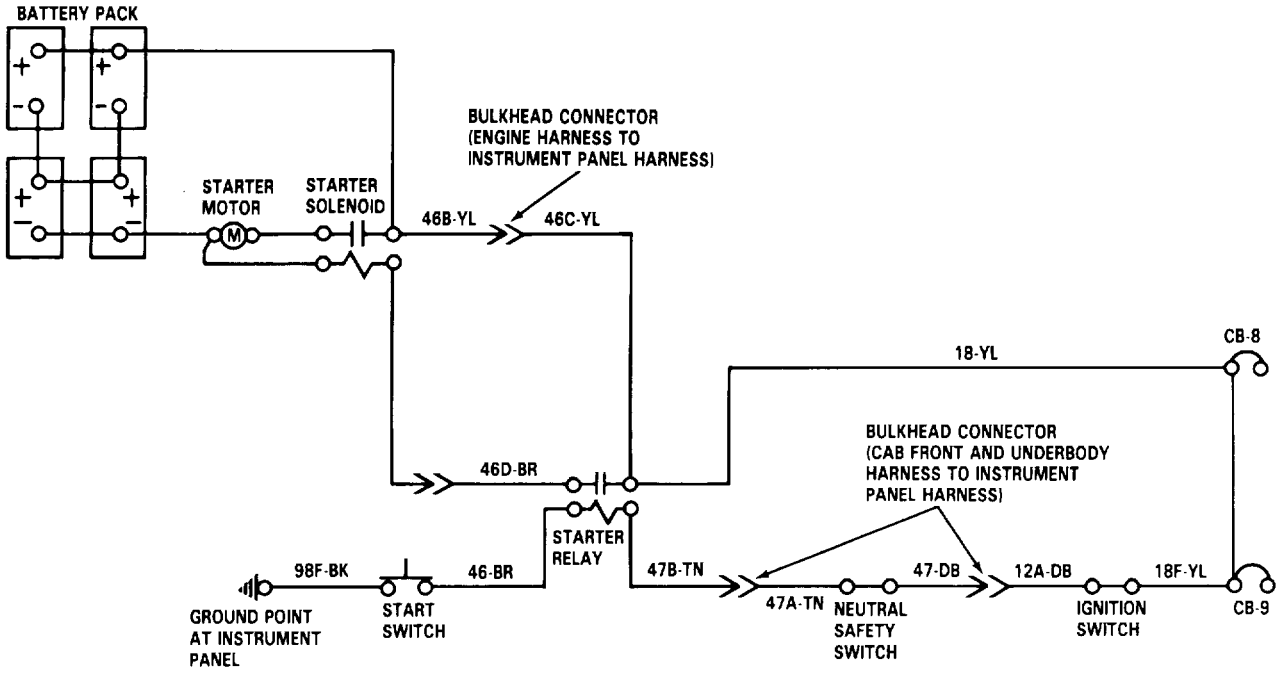
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
20. STARTER FAILS TO OPERATE (Continued).				
	NOTE With positive lead on circuit 46E-BR, check ground with negative leads when doing the following checks.			
17	Check for voltage at starter motor main battery ground connection.	24-volts dc nominal	Go to step 18	Refer to malfunction 18.
18	Check for voltage at starter motor solenoid ground connection	24-volts dc nominal	Go to step 19	Repair, clean, or tighten ground cable noid ground terminal and starter motor ground stud.
19	Release and depress start switch	Starter cranks	Starting system OK	Replace starter motor (para

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

20. STARTER FAILS TO OPERATE (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
21. BATTERIES DO NOT HOLD A CHARGE (ELECTRICAL SYSTEM SHORTED).				
	Check for shorts to ground:			
	a Disconnect battery ground cable at battery (para 3-120).			
	b Set multimeter to 50 volts dc.			
	c Turn all electrical systems off (Refer to TM 9-2320-283-10).			
	d Unplug tachometer clock at back of tachograph (para 3-309).			
	e Connect positive meter lead to removed ground cable and negative meter lead to battery negative terminal.			
	f Observe meter	Any voltage indication	Go to step g	Test batteries. (Refer to malfunction 18, step 4).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
21. BATTERIES DO NOT HOLD A CHARGE (ELECTRICAL SYSTEM SHORTED) (Continued).				
	Check for shorts to ground (continued):			
g	Remove each relay, one at a time, until meter drops to 0 volts	0 voltage indication	Check for defective circuit, and repair (Refer to para 3-127 and Appendix D) If OK, go to step h.	Go to step i.
h	Remove electrical components in faulty circuit, one at a time, until meter drops below 0 volts.	0 voltage indication	Replace defective components.	Go to step k.
i	Remove one wire at a time from circuit breakers CB-1 thru CB-9, until meter drops to 0 volts	0 voltage indication	Check for defective circuit, and repair (Refer to para 3-127 and Appendix D) If OK, go to step j.	Go to step j.
j	Remove electrical components in faulty circuit, one at a time, until meter drops to 0 volts.	0 voltage indication	Replace defective components.	Go to step k.
k	Install tachograph clock connector (para 3-309), and go to step 1.			
l	Remove meter, and connect battery ground cable (para 3-120).			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

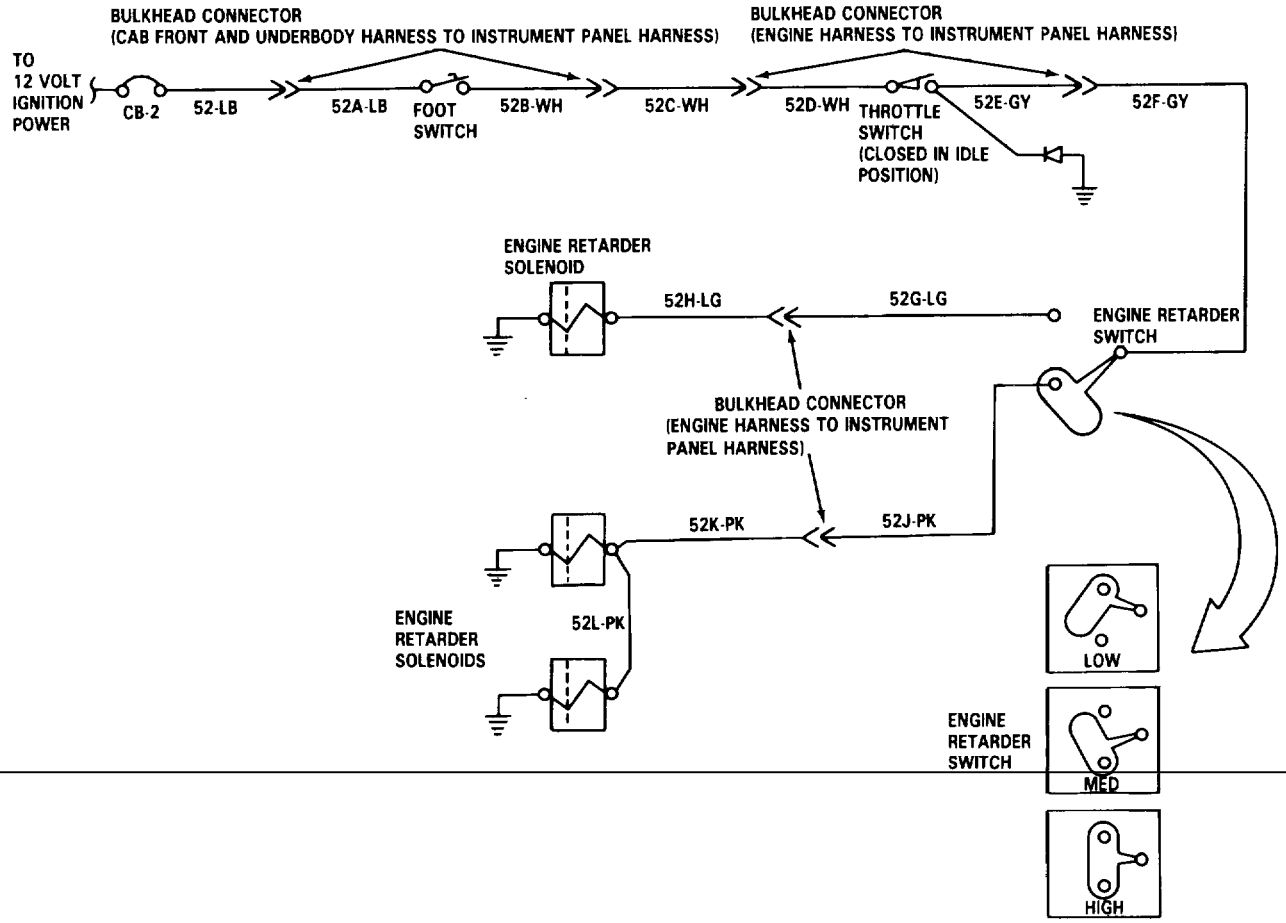
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
22. STARTER MOTOR IS NOISY AND ENGAGEMENT IS ERRATIC.				
	Replace starter motor (para 3-72).			
23. RETARDER NOT WORKING IN ONE OR TWO SELECTOR POSITIONS.				
	NOTE *Ignition switch must be in ON position, engine retarder foot switch must be pressed, and throttle must be in idle position when doing the following checks. *Do steps 1 thru 4 if low range is not working. · Do step 1 and steps 5 thru 7 if medium range is not working. *Do step 8 if high range is not working. · Do step 1 and steps 5 thru 7 if medium and high range are not working.			
1	Check for voltage at circuit 52F-GY terminal of engine retarder switch	12 volts dc nominal	Go to step 2	Reset circuit breaker CB-2 and/or trouble-shoot CB-2 circuit (Refer to malfunction 33).
2	Set engine retarder switch to LOW range. (Refer to TM 9-2320-283-10) Go to step 3.			
3	Check for voltage at circuit 52G-LG terminal of engine retarder switch.	12 volts dc nominal	Go to step 3	Replace switch (para 3-88).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

23. RETARDER NOT WORKING IN ONE OR TWO SELECTOR POSITIONS (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

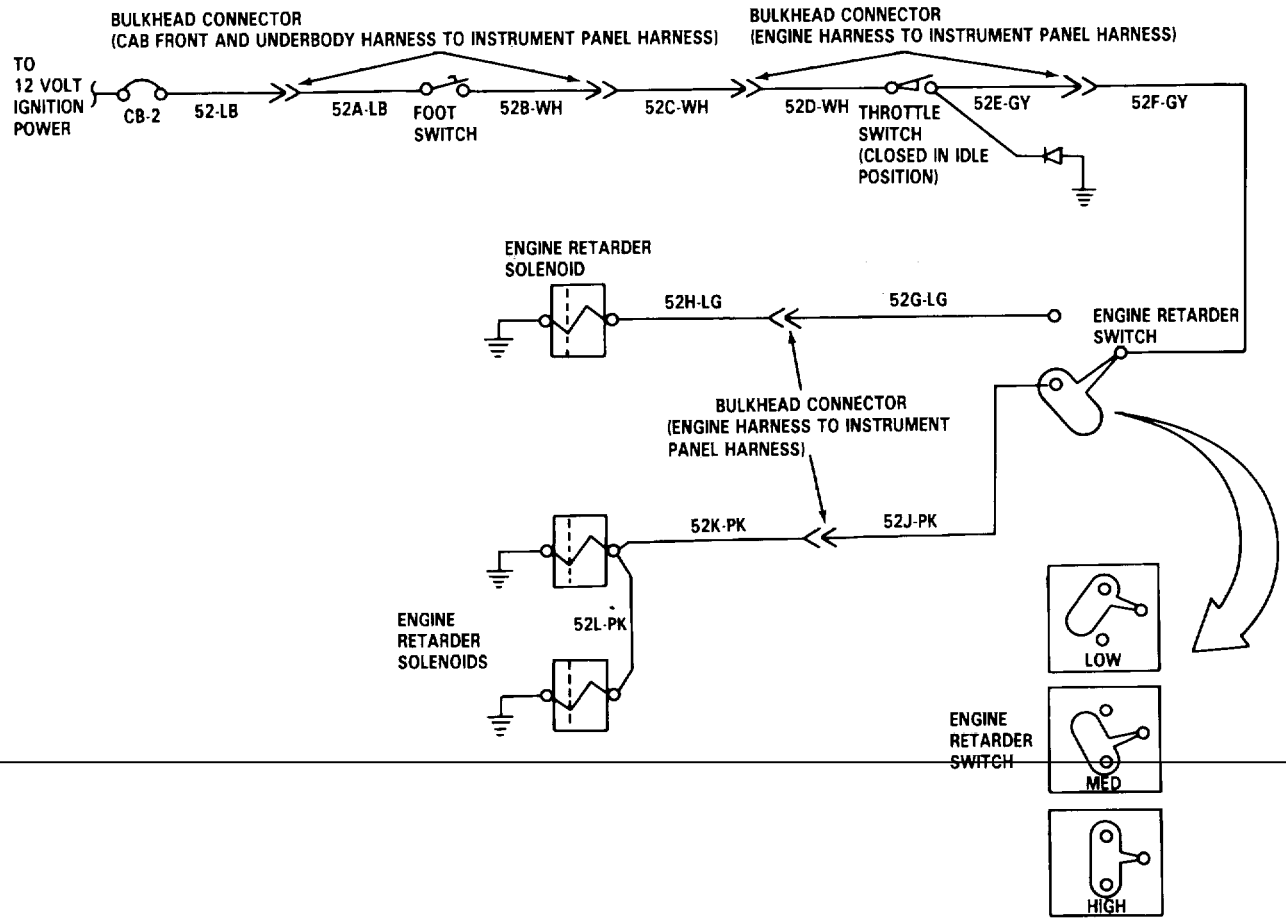
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
23. RETARDER NOT WORKING IN ONE OR TWO SELECTOR POSITIONS (Continued).				
4	Check for voltage at circuit 52H-LG terminal of engine retarder solenoid	12 volts dc nominal	Notify direct support maintenance	Repair circuit 52H-LG and/or 52G-LG (para 3-127).
5	Set engine retarder switch to MED range. (Refer to TM 9-2320-283-10) Go to step 6.			
6	Check for voltage at circuit 52J-PK terminal of engine retarder switch.	12 volts dc nominal	Go to step 8	Replace switch (para 3-88).
7	Check for voltage at circuit 52K-PK terminal of engine retarder solenoid	12 volts dc nominal	Notify direct support maintenance	Repair circuit 52K-PK and/or 52J-PK (para 3-127).
8	Check for voltage at circuit 52K-PK terminal of engine retarder switch.	12 volts dc nominal	Notify direct support maintenance	Repair circuit 52K-PK (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

23. RETARDER NOT WORKING IN ONE OR TWO SELECTOR POSITIONS (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

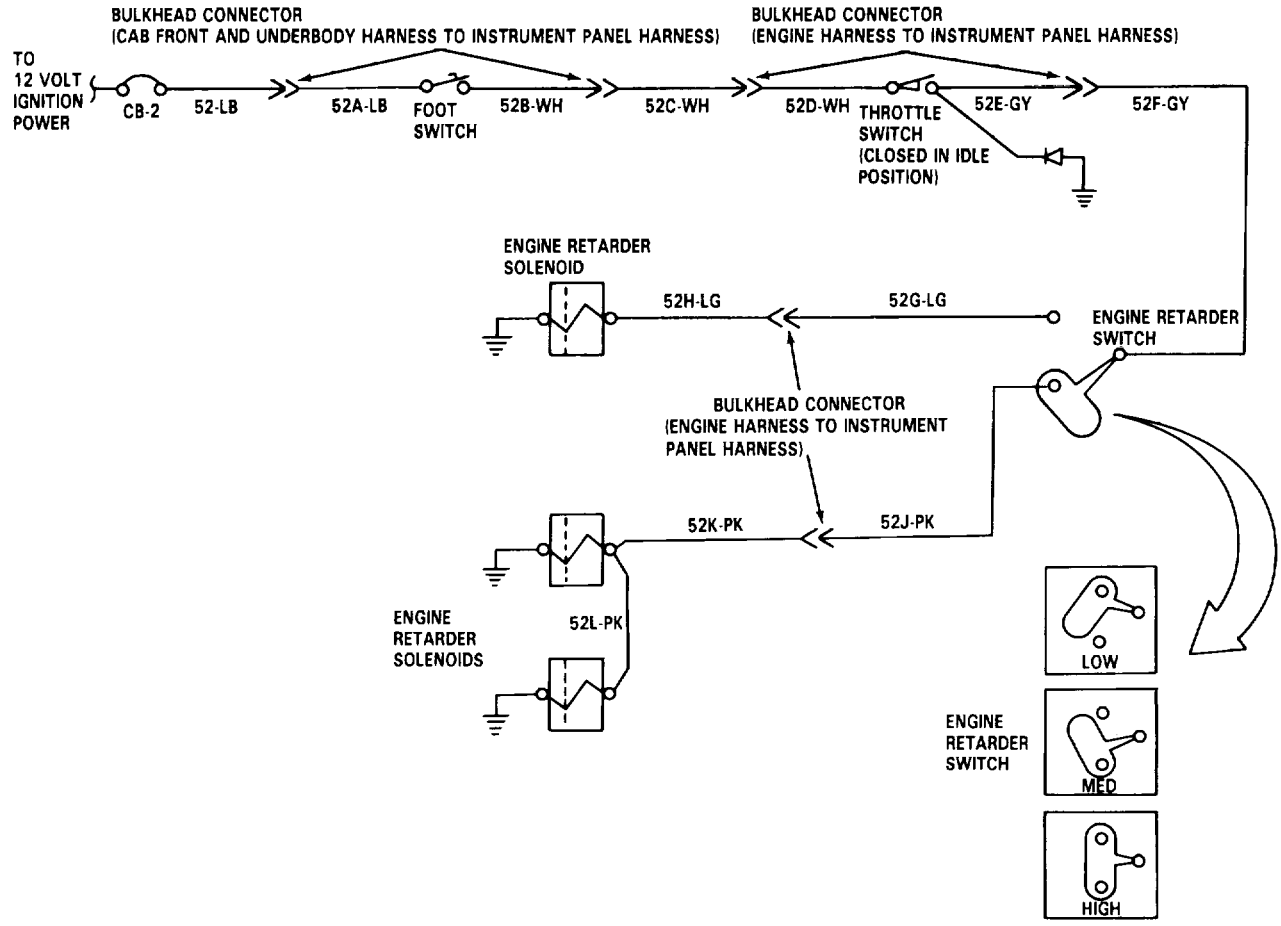
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
24. NO RETARDING ACTION.				
1.	Remove circuit breaker bracket far enough to access circuit breaker CB-2 (para 3-114), and go to step 2.			
	NOTE Ignition switch must be in ON position, battery power connected, and engine retarder foot switch pressed with throttle in idle position when doing the following checks.			
2	Check for voltage at circuit 52-LB terminal of circuit breaker CB-2 to step 3	12 volts dc nominal	Install circuit breaker bracket (para 3-114), and go circuit	Reset circuit breaker CB-2 and/or troubleshoot CB-2 (Refer to malfunction 33).
3	Check for voltage at circuit 52A-LB terminal of foot switch	12 volts dc nominal	Go to step 4	Repair circuit 52A-LB and/or 52-LB (para
4	Check for voltage at circuit 52B-WH terminal of foot switch.	12 volts dc nominal	Go to step 5	Replace foot switch (para 3-89).
5	Disconnect circuit 52B-WH from 52C-WH at connector, and go to step 6.			
6	Check for voltage at circuit 52B-WH (pin M of connector)	12 volts dc nominal	Connect circuits 52B-WH to 52C-WH, and go to step 7.	Repair circuit 52B-WH (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

24. NO RETARDING ACTION (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

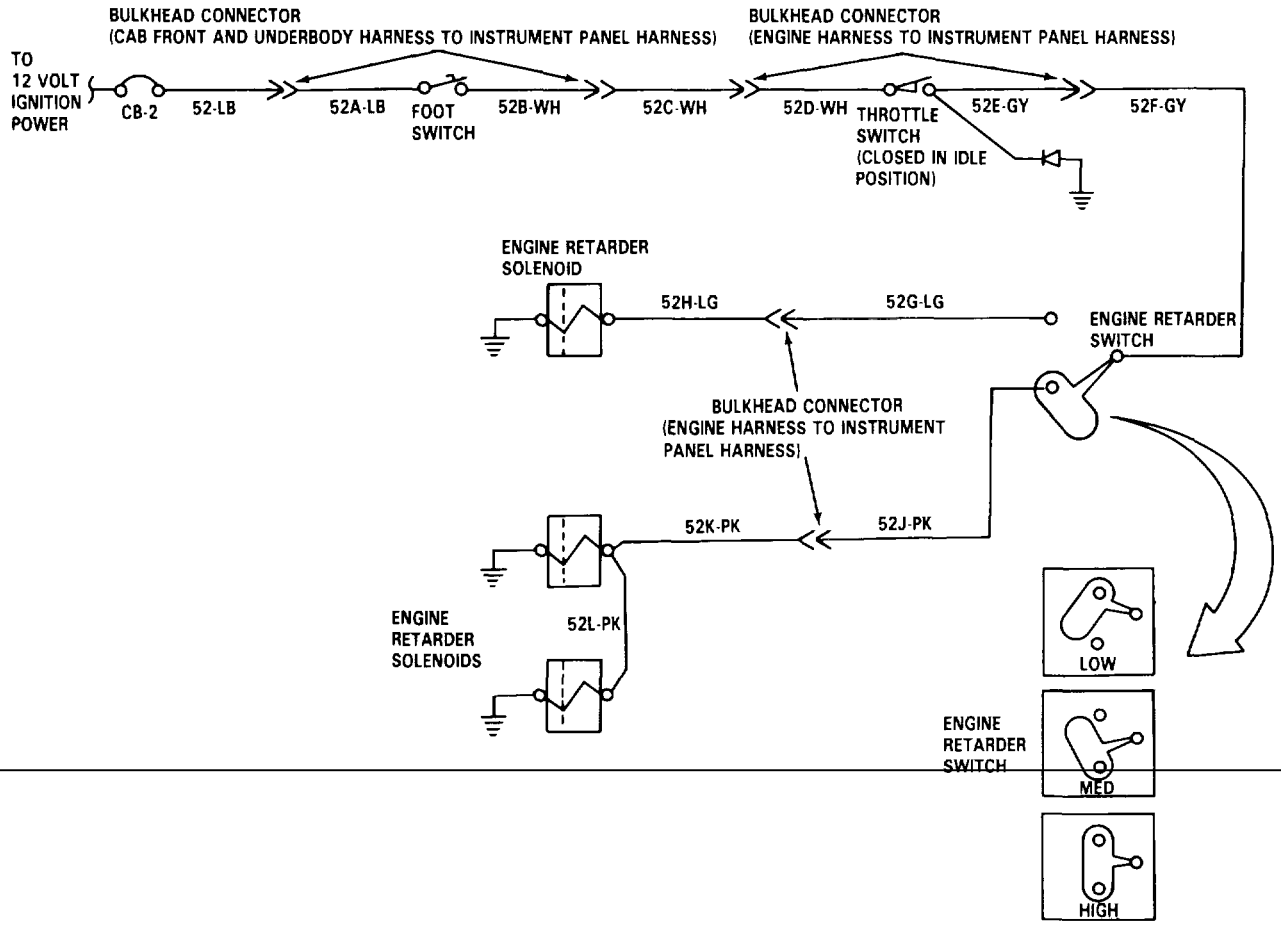
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
24. NO RETARDING ACTION (Continued).				
7	Disconnect circuit 52C-WH from 52D-WH at connector, and go to step 8.			
8	Check for voltage at circuit 52C-WH (pin 13 of connector)	12 volts dc nominal	Connect circuit 52C-WH to 52D-WH, and go to step 9.	Repair circuit 52C-WH (para 3-127).
9	Check for voltage at circuit 52D-WH terminal of throttle switch.	12-volts dc nominal	Go to step 10	Repair circuit 52D-WH (para 3-127).
10	Check for voltage at circuit 52E-GY terminal of engine retarder switch.	12-volts dc nominal	Go to step 11	Repair throttle switch (para 3-90).
11	Check for voltage at circuit 52F-GY terminal of engine retarder switch	12 volts dc nominal	Go to step 12	Replace circuit 52F-GY and/or 52E-GY (para 3-127).
12	Set engine retarder switch to HIGH range. (Refer to TM 9-2320-283-10) Go to step 13.			
13	Check for voltage at circuit 52G-LG terminal of engine retarder switch.	12 volts dc nominal	Notify direct support maintenance	Replace engine retarder switch (para 3-89).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

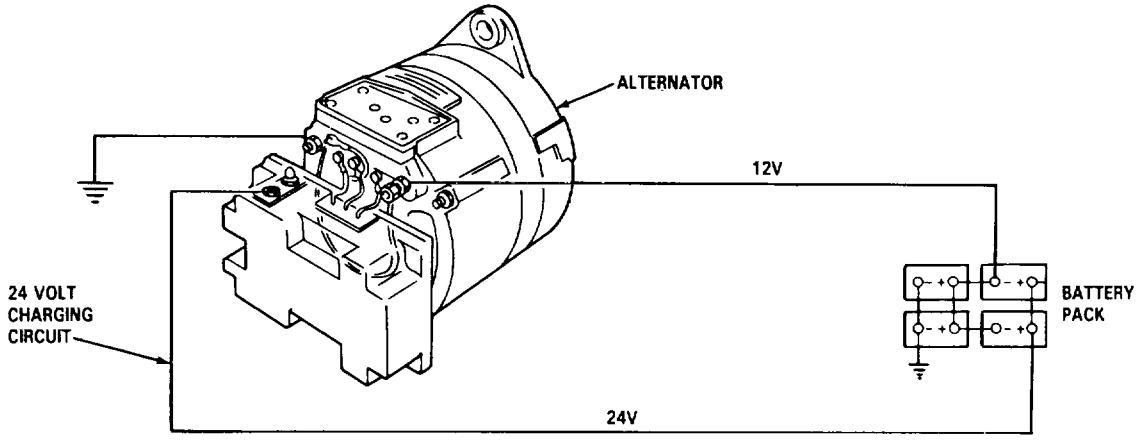
24. NO RETARDING ACTION (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
25. BATTERIES ARE BEING UNDERCHARGED OR OVERCHARGED.				
1	Check condition of batteries (Refer to malfunction 18).			
2	Check alternator drive belts for proper tension	a Loose	Tighten belts (para 3-71).	Go to step b.
		b Damaged	Replace belts (para 3-71).	Go to step 3.
3	Check all charging circuit wiring and connections	a Loose	Clean and tighten connections.	Go to step b.
		b Defective	Repair or replace wiring (para 3-127 or 3-126).	Go to step 4.
4	Notify to direct support maintenance.			



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

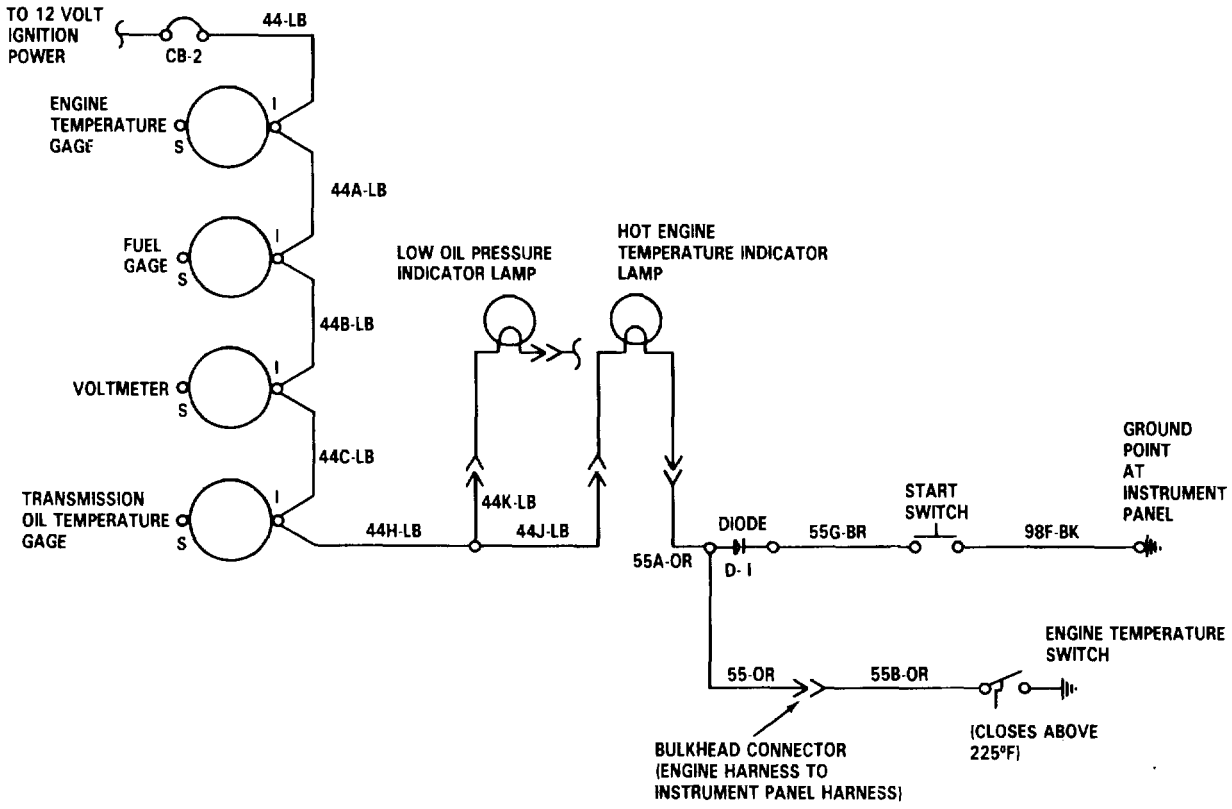
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

26. HOT ENGINE INDICATOR NOT WORKING.

1. Remove circuit breaker bracket far enough to access circuit breaker CB-2 (para 3-114), and go to step 2.

NOTE

Ignition switch must be in ON position and battery power connected when doing the following checks.



TROUBLESHOOTING.

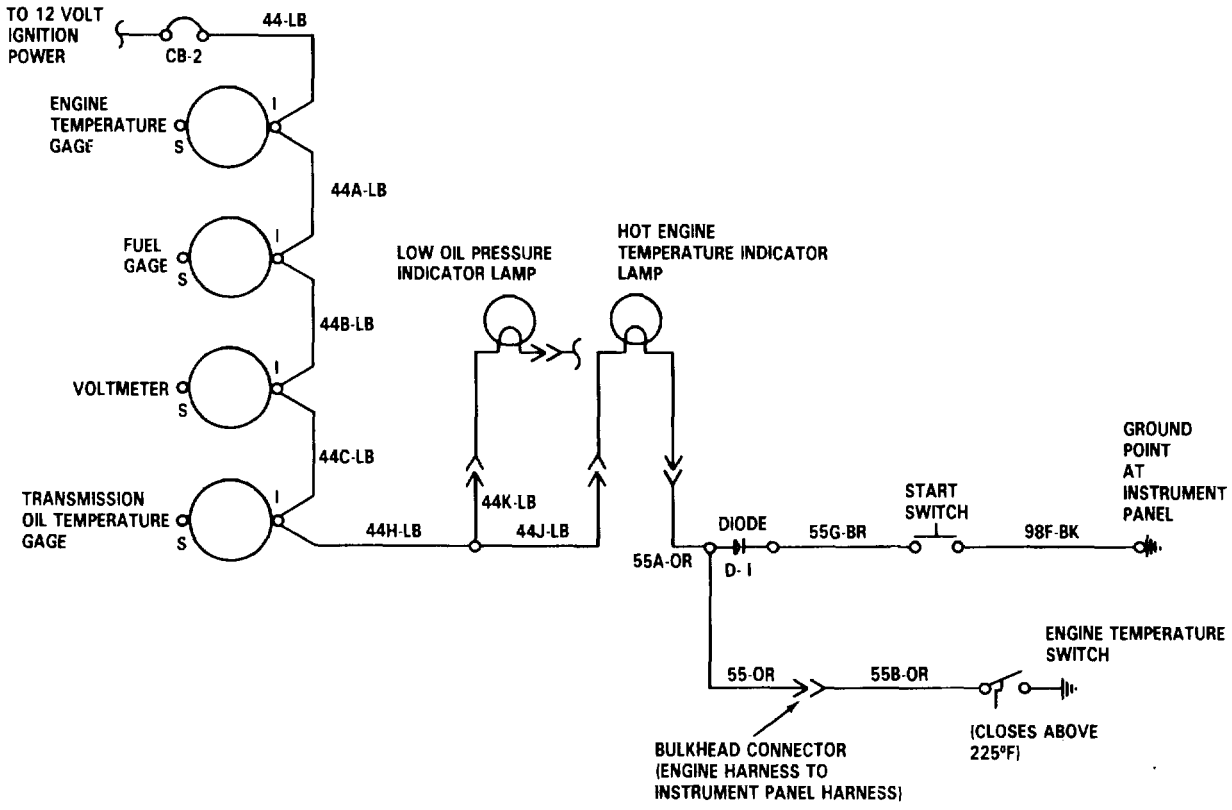
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
26. HOT ENGINE INDICATOR NOT WORKING (Continued).				
2	Check for voltage at circuit 44-LB terminal of circuit breaker CB-2 3-114), and go	12-volts dc nominal	Install circuit breaker bracket (para	Troubleshoot CB-2 circuit. (Refer to malfunction 33). to step 3.
3	Check for voltage at circuit 44-LB terminal of engine temperature gage.	12 volts dc nominal	Go to step 4	Repair circuit 44-LB (para 3-127).
4	Check for voltage at circuit 44A-LB terminal of fuel gage	12 volts dc nominal	Go to step 5	Repair circuit 44A-LB (para 3-127).
5	Check for voltage at circuit 44B-LB terminal -of voltmeter	12 volts dc nominal	Go to step 6	Repair circuit 44B-LB (para 3-127).
6	Check for voltage at circuit 44C-LB terminal of transmission oil temperature gage.	12 volts dc nominal	Go to step 7	Repair circuit 44C-LB (para 3-127).
7	Check for voltage at circuit 44J-LB terminal of hot engine indicator lamp socket	12 volts dc nominal	Go to step 8	Repair circuits 44H-LB and/or 44J-LB (para 3-127)
	NOTE With positive lead on circuit 44J-LB (or other suitable 12-volt source), check ground with negative lead when doing the following checks.			
8	Check for voltage at circuit 98F-BK ground point of instrument panel.	12-volts dc nominal	Go to step 9	Tighten and/or clean connection.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
26. HOT ENGINE INDICATOR NOT WORKING (Continued).				
9	Check for voltage at circuit 98F-BK terminal of start switch	12-volts dc nominal	Go to step 10	Repair circuit 98F-BK (para 3-127).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
26. HOT ENGINE INDICATOR NOT WORKING (Continued).				
10	To prevent starter motor from operating, disconnect circuit 46E-BR from starter solenoid.			
	NOTE The start switch must be pushed and held when doing steps 11 thru 14.			
11	Check for voltage at circuit 55C-BR terminal of start switch.	12-volts dc nominal	Go to step 11	Replace switch (para 3-75).
12	Check for voltage at circuit 55C-BR terminal of diode D-1	12-volts dc nominal	Go to step 12	Repair circuit 55C-BR (para 3-127).
13	Check for voltage at circuit 55A-OR terminal of diode D-1.	12-volts dc nominal	Go to step 13	Replace diode (para 3-116).
14	Check for voltage at circuit 55A-OR terminal of hot engine indicator lamp socket.	12-volts dc nominal	Go to step 14	Repair circuit 55A-OR (para 3-127).
15	Release and depress start switch, hot engine indicator lamp should light.	Lamp lights	Go to step 15	Replace bulb (para 3-87).
16	Remove circuit 55B-OR from engine temperature switch, and ground it to engine block	Hot engine indicator lamp lights	Replace engine temperature switch (para 3-100), and go to step 17	Repair circuits 55B-OR and/or 55-OR (para 3-127), +and go to step 17

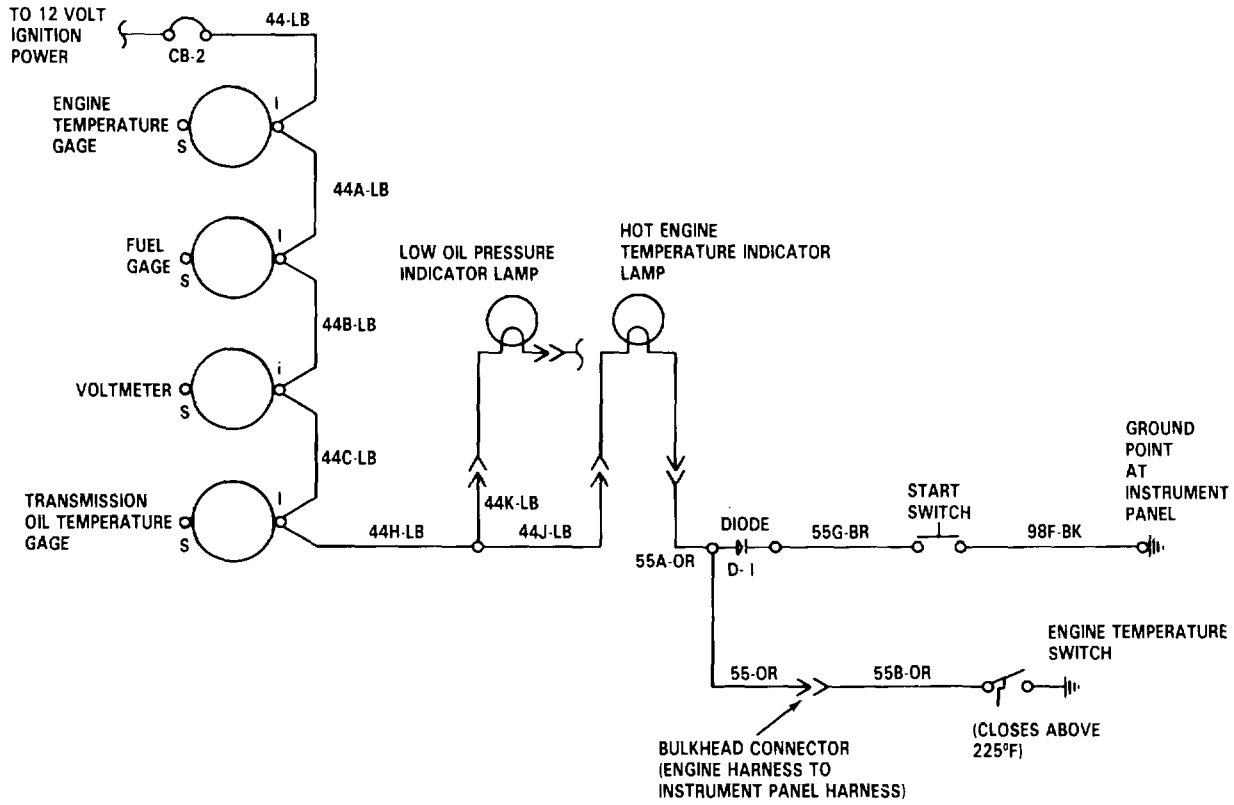
TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

26. HOT ENGINE INDICATOR NOT WORKING (Continued).

17 Reconnect circuit 46E-BR to starter solenoid.



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

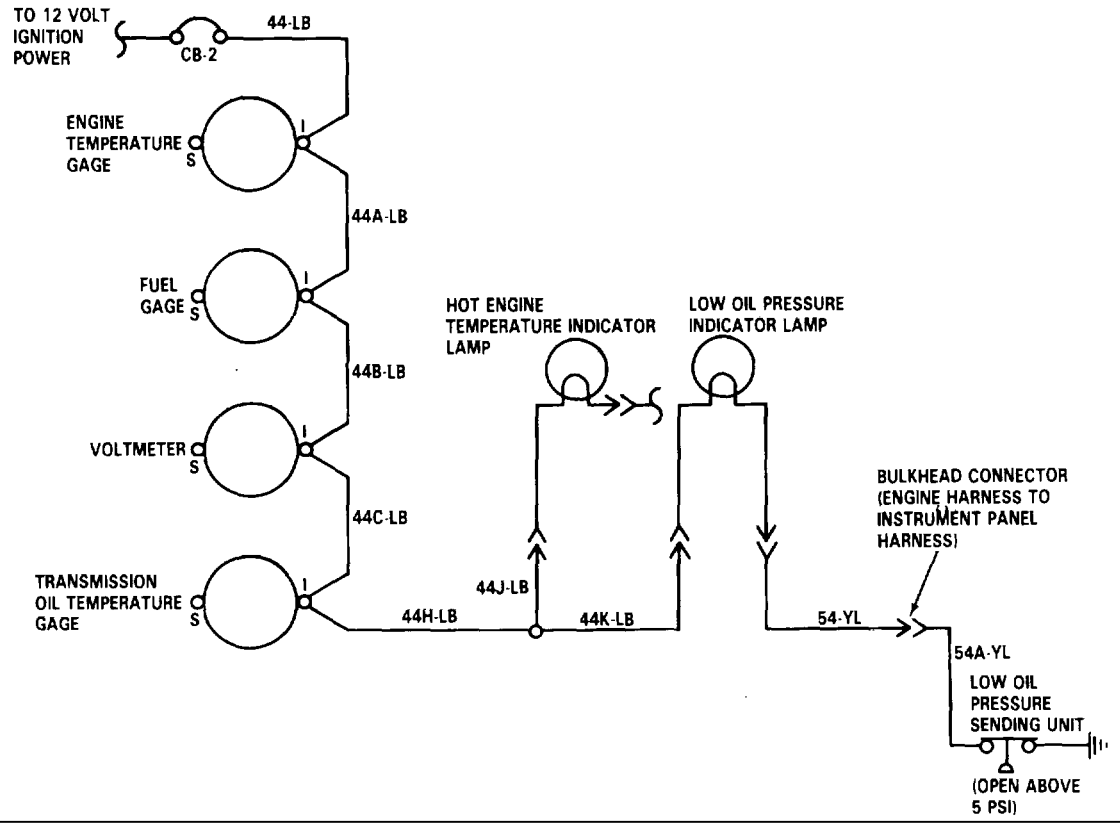
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
27. LOW ENGINE OIL INDICATOR NOT WORKING.				
1	Remove circuit breaker bracket far enough to access circuit breaker CB-2 (para 3-114), and go to step 2			
	NOTE Ignition switch must be in ON position and battery power connected when doing the following checks.			
2	Check for voltage at circuit 44-LB terminal of circuit breaker CB-2 ‘	12-volts dc nominal	Install circuit breaker bracket (para 3-114) and go to step 3	Reset circuit breaker CB-2 and/or troubleshoot CB-2 circuit (Refer to malfunction 33).
3	Check for voltage at circuit 44-LB terminal of engine temperature gage.	12-volts dc nominal	Go to step 4	Repair circuit 44-LB (para 3-127).
4	Check for voltage at circuit 44A-LB terminal of fuel gage	12-volts dc nominal	Go to step 5	Repair circuit 44A-LB (para 3-127).
5	Check for voltage at circuit 44B-LB terminal of voltmeter	12-volts dc nominal	Go to step 6	Repair circuit 448-LB (para 3-127).
6	Check for voltage at circuit 44C-LB terminal of transmission oil temperature gage.	12-volts dc nominal	Go to step 7	Repair circuit 44C-LB (para 3-127).
7	Check for voltage at circuit 44K-LB terminal of low oil pressure indicator lamp socket.	12-volts dc nominal	Go to step 8	Repair circuit 44H-LB and/or 44K-LB (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

27. LOW ENGINE OIL INDICATOR NOT WORKING (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

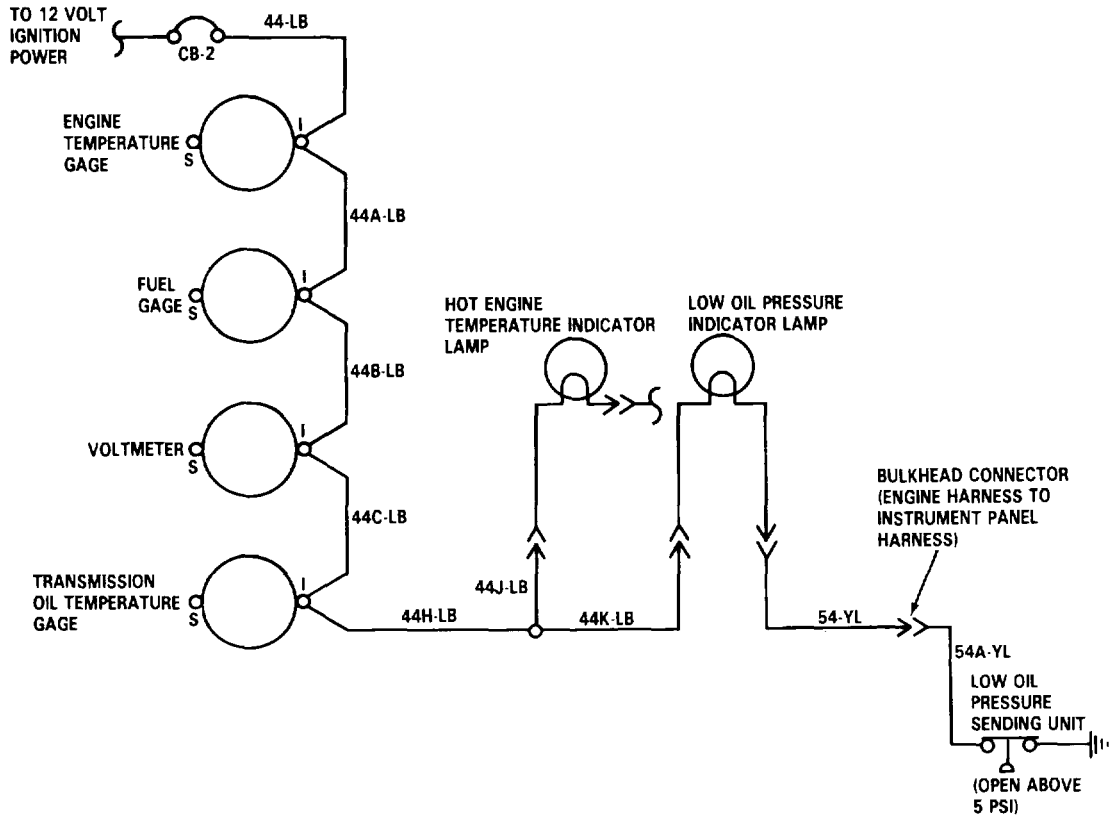
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
27. LOW ENGINE OIL INDICATOR NOT WORKING (Continued).				
	NOTE With positive lead on circuit 44K-LB, check ground with negative lead. *The following checks should be made with the engine shut off.			
8	Check for voltage at circuit 54A-YL terminal of oil pressure sending unit.	12-volts dc nominal	Go to step 9	Replace switch (para 3-104).
9	Check for voltage at circuit 54-YL terminal of low oil pressure indicator lamp socket.	12-volts dc nominal	Replace bulb (para 3-87), and go to step 10	Repair circults 54-YL and/or 54A-YL (para 3-127).
10	Start engine and monitor oil pressure gage	15-45 psi	Go to step 11	Stop engine. Replace oil pressure gage (para 3-73).
11	Start engine	Indicator lamp turns off	Low oil pressure indicator lamp circuit OK Go to step 12.	Replace low oil pressure sending unit (para 3-104).
12	With engine running oil pressure indicator should remain off	Indicator lamp lights irratically	Replace low oil pressure sending unit (para 3- 104).	Low oil pressure indicator lamp system OK.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

27. LOW ENGINE OIL INDICATOR NOT WORKING (Continued).



TROUBLESHOOTING.

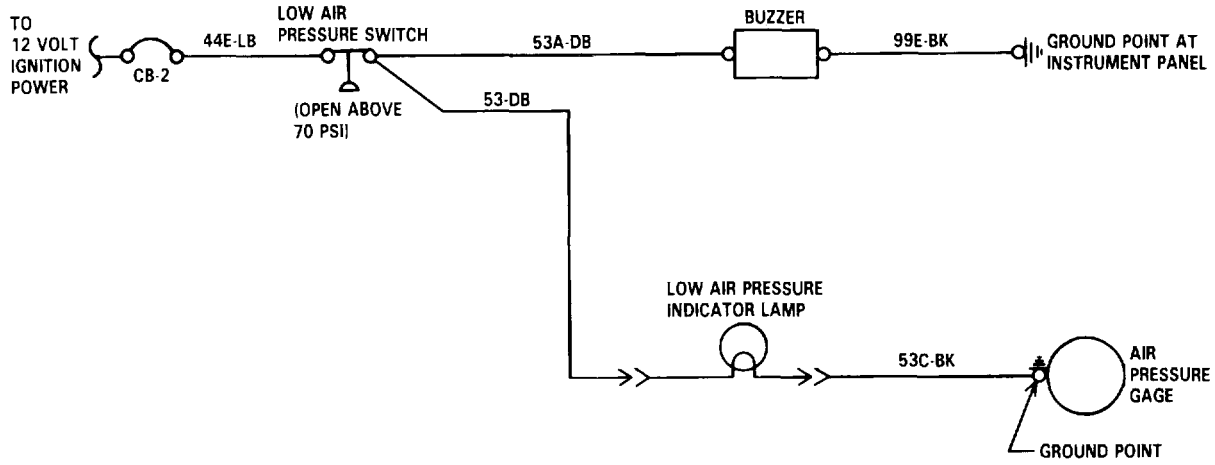
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
28. LOW AIR PRESSURE INDICATOR AND/OR BUZZER NOT WORKING.				
1.	Remove circuit breaker bracket far enough to access circuit breaker CB-2 (para 3-114), and go to step 2.			
	NOTE Ignition switch must be in ON position and battery power connected when doing the following checks.			
2	Check for voltage at circuit 44E-LB terminal of circuit breaker CB-2	12-volts dc nominal	Go to step 3	Reset circuit breaker CB-2 and/or troubleshoot CB-2 circuit (Refer to malfunction 33).
3	Check for voltage at circuit 44E-LB terminal of low air pressure switch.	12-volts dc nominal	Go to step 4	Repair circuit 44E-LB (para 3-127).
	NOTE When doing the following checks, make sure vehicle system air pressure is below 60 psi.			
4	Check for voltage at circuit 53A-DB terminal of low air pressure switch.	12-volts dc nominal	Go to step 5	Replace switch (para 3-109).
	NOTE If buzzer is operating properly, but indicator lamp will not light, proceed to step 8. Otherwise, begin with step 5.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
28. LOW AIR PRESSURE INDICATOR AND/OR BUZZER NOT WORKING (Continued).				
5	Check for voltage at circuit 53A-DB terminal of buzzer	12-volts dc nominal	Go to step 6	Repair circuit 53A-DB (para 3-127).
	NOTE With positive lead on circuit 53A-DB, check for ground with negative lead when doing the following checks.			
6	Check for voltage at circuit 99E-BK ground point of instrument panel	12-volts dc nominal	Go to step 7	Clean and/or tighten ground point connection.



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

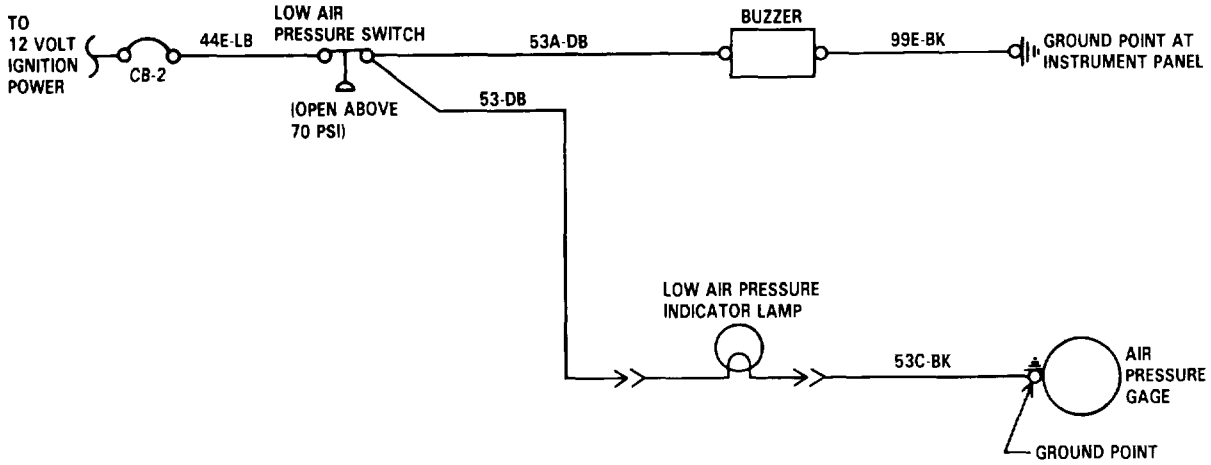
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
28. LOW AIR PRESSURE INDICATOR AND/OR BUZZER NOT WORKING (Continued).				
7	Check for voltage at circuit 99E-BK terminal of buzzer	12-volts dc nominal	Replace buzzer (para 3-110), and go to step 8.	Repair circuit 99E-BK (para 3-127).
	NOTE With negative lead connected to a good ground, use positive lead to check for voltage.			
8	Check for voltage at circuit 53-DB terminal of low air pressure indicator lamp socket.	12-volts dc nominal	Go to step 9	Repair circuit 53-DB (para 3-127).
	NOTE With positive lead on circuit 53-DB, check for ground with negative lead.			
9	Check for voltage at circuit 53C-BK ground point of air pressure gage	12-volts dc nominal point connection.	Go to step 10 tighten ground	Clean and/or
10	Check for voltage at circuit 53C-BK terminal of low air pressure indicator lamp socket.	12-volts dc nominal	Replace bulb (para 3-84)	Repair circuit 53C-BK (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

28. LOW AIR PRESSURE INDICATOR AND/OR BUZZER NOT WORKING (Continued).



TROUBLESHOOTING.

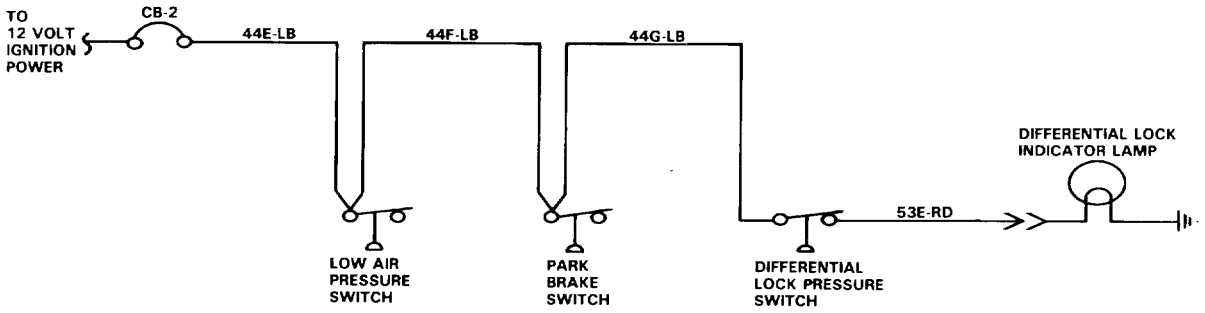
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
29. DIFFERENTIAL LOCK LAMP NOT WORKING.				
1	Remove circuit breaker bracket far enough to access circuit breaker CB-2 (para 3-114), and go to step 2.			
	NOTE Ignition switch must be in ON position and battery power connected when doing the following checks.			
2	Check for voltage at circuit 44E-LB terminal of circuit breaker CB-2	12-volts dc nominal	Install circuit breaker bracket (para 3-114), and go to step 2	Reset circuit breaker CB-2 and/or troubleshoot CB-2 circuit (Refer to malfunction 33).
3	Check for voltage at circuit 44E-LB terminal of low air pressure switch.	12-volts dc nominal	Go to step 4	Repair circuit 44E-LB (para 3-127).
4	Check for voltage at circuit 44F-LB terminal of park brake pressure switch.	12-volts dc nominal	Go to step 5	Repair circuit 44F-LB (para 3-127).
5	Check for voltage at circuit 44G-LB terminal of differental lock pressure switch.	12-volts dc nominal	Go to step 6	Repair circuit 44G-LB (para 3-127).
	NOTE .Lock pressure switch must be in LOCK position when doing the following checks. .With negative lead connected to a good ground, use positive lead to check for voltage.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
29.	**DIFFERENTIAL LOCK LAMP NOT WORKING (Continued).**			
6.	Check for voltage at circuit 53E-RD terminal of differential lock pressure switch.	12-volts dc nominal.	Go to step 7. (para 3-107).	Replace switch
7.	Check for voltage at circuit 53E-RD terminal differential lock indicator lamp.	12-volts dc nominal.	Go to step 8. 53E-RD (para 3-127).	Repair circuit



TA 236847

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

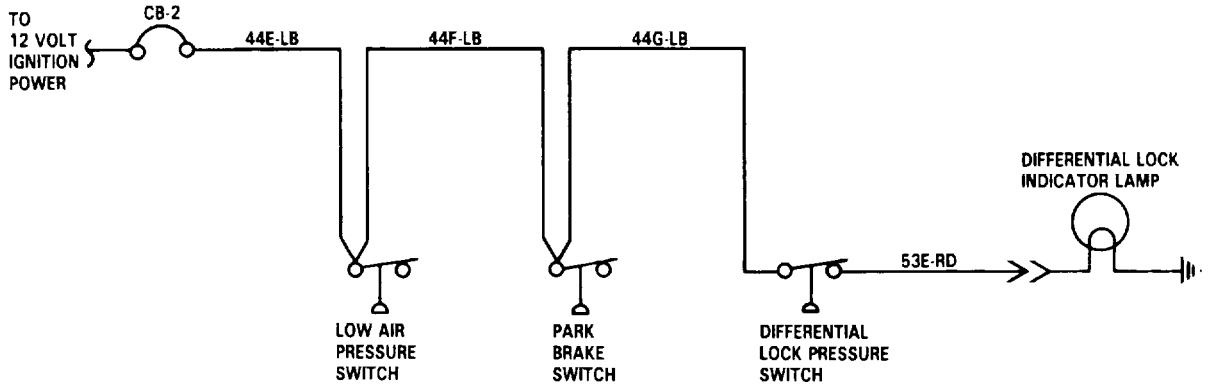
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

29. DIFFERENTIAL LOCK LAMP NOT WORKING (Continued).

NOTE

With positive lead on circuit 53E-RD, check ground with negative lead when doing the following checks.

8.	Check for voltage at differential lock indicator lamp ground point.	12-volts dc nominal.	Replace bulb (para 3-87).	Clean and/or tighten ground point connection.

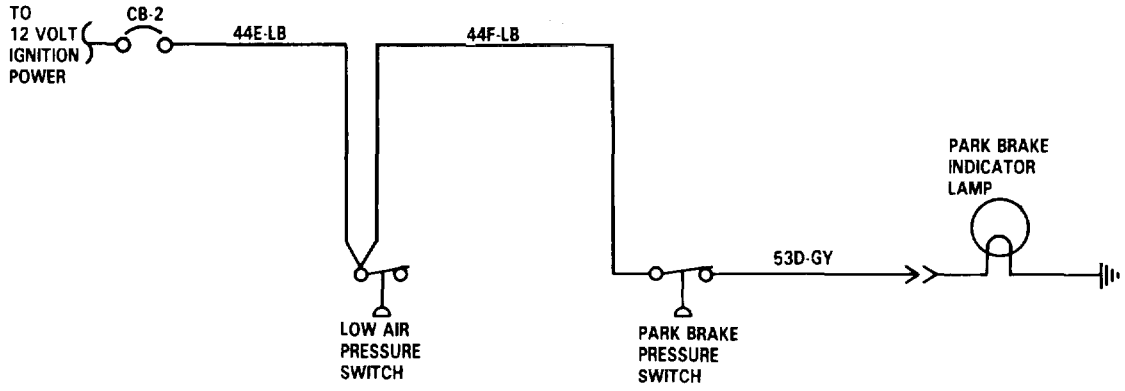


TA 236848

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
30. PARK BRAKE LAMP NOT WORKING.				
	1. Remove circuit breaker bracket far enough to access circuit breaker bracket CB-2 (para 3-114), and go to step 2.			
	NOTE Ignition switch must be in ON position and battery power connected when doing the following checks.			
	2. Check for voltage at circuit 44E-LB terminal of circuit breaker CB-2.	12-volts dc nominal.	Install circuit breaker bracket (para 3-114), and go to step 3.	Reset circuit breaker CB-2 and/or troubleshoot CB-2 circuit. (Refer to malfunction 33).
	3. Check for voltage at circuit 44E-LB terminal of low air	12-volts dc nominal.	Go to step 4.	Repair circuit 44E-LB (para 3-127).



TA 236849

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

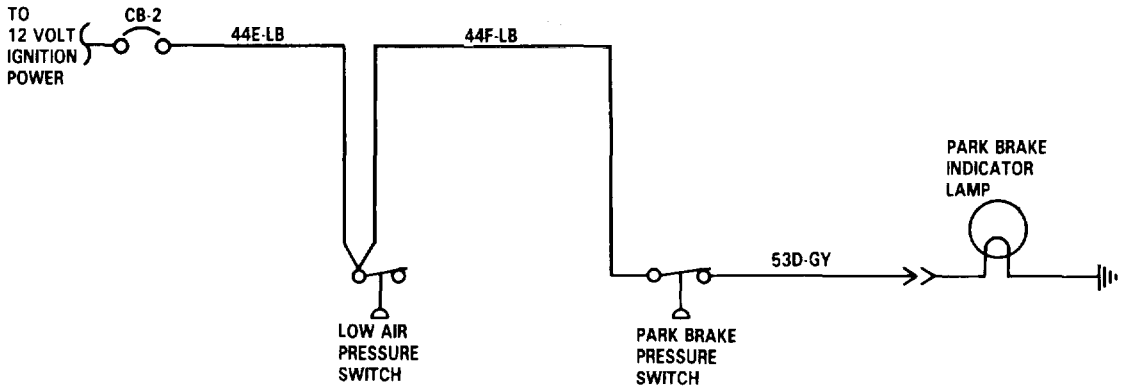
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
30. PARK BRAKE LAMP NOT WORKING (Continued).				
4.	Check for voltage at circuit 44F-LB terminal of park brake pressure switch.	12-volts dc nominal.	Go to step 5.	Repair circuit 44F-LB (para 3-127).
	NOTE • Park brake control must be pulled when doing the following checks. • With negative lead connected to a good ground, use positive lead to check for voltage.			
5.	Check for voltage at circuit 53D-GY terminal of park brake pressure switch.	12-volts dc nominal.	Go to step 6.	Replace switch (para 3-108).
6.	Check for voltage at circuit 53D-GY terminal of park brake indicator lamp.	12-volts dc nominal.	Go to step 7.	Replace circuit 53D-GY (para 3-127).
	NOTE With positive lead on circuit 53D-GY, check ground with negative lead when doing the following checks.			
7.	Check for voltage at park brake indicator lamp.	12-volts dc nominal.	Replace bulb (para 3-87).	Clean and/or tighten connection.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

30. PARK BRAKE LAMP NOT WORKING (Continued).



TA 236850

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

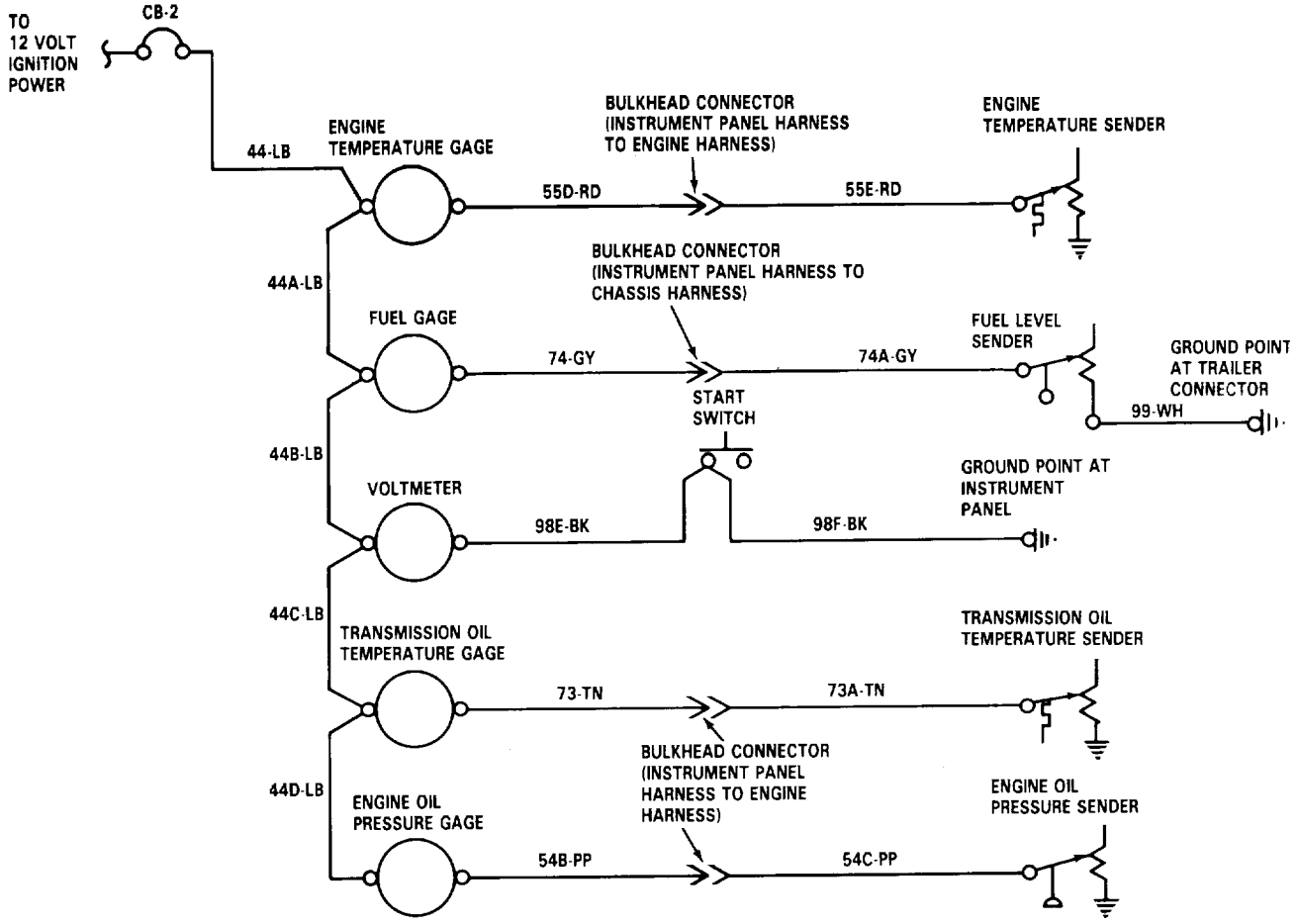
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
31.	**INSTRUMENT PANEL GAGES NOT WORKING.**			
	1. Remove circuit breaker bracket far enough to access circuit breaker CB-2 (para 3-114), and go the step 2.			
	NOTE Ignition switch must be in ON position and battery power connected when doing the following checks			
	2. Check for voltage at circuit 44-LB terminal of circuit breaker CB-2.	12-volts dc nominal.	Install circuit breaker bracket (para 3-114), and go to step 3.	Reset circuit breaker CB-2 and/or troubleshoot CB-2 circuit. (Refer to malfunction 33).
	3. Check for voltage at circuit 44-LB terminal of water temperature gage.	12-volts dc nominal.	Go to step 4.	Repair circuit 44-LB (para 3-127).
	4. Check for voltage at circuit 44A-LB terminal of fuel gage.	12-volts dc nominal.	Go to step 5.	Repair circuit 44A-LB (para 3-127).
	5. Check for voltage at circuit 44B-LB terminal of voltmeter.	12-volts dc nominal.	Go to step 6.	Repair circuit 44B-LB (para 3-127).
	6. Check for voltage at circuit 44C-LB terminal of transmission oil temperature gage.	12-volts dc nominal.	Go to step 7.	Repair circuit 44C-LB (para 3-127).
	7. Check for voltage at circuit 44D-LB terminal of engine oil pressure gage.	12-volts dc nominal.	Go to step 8.	Repair circuit 44D-LB (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

31. INSTRUMENT PANEL GAGES NOT WORKING (Continued).



TA 236851

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

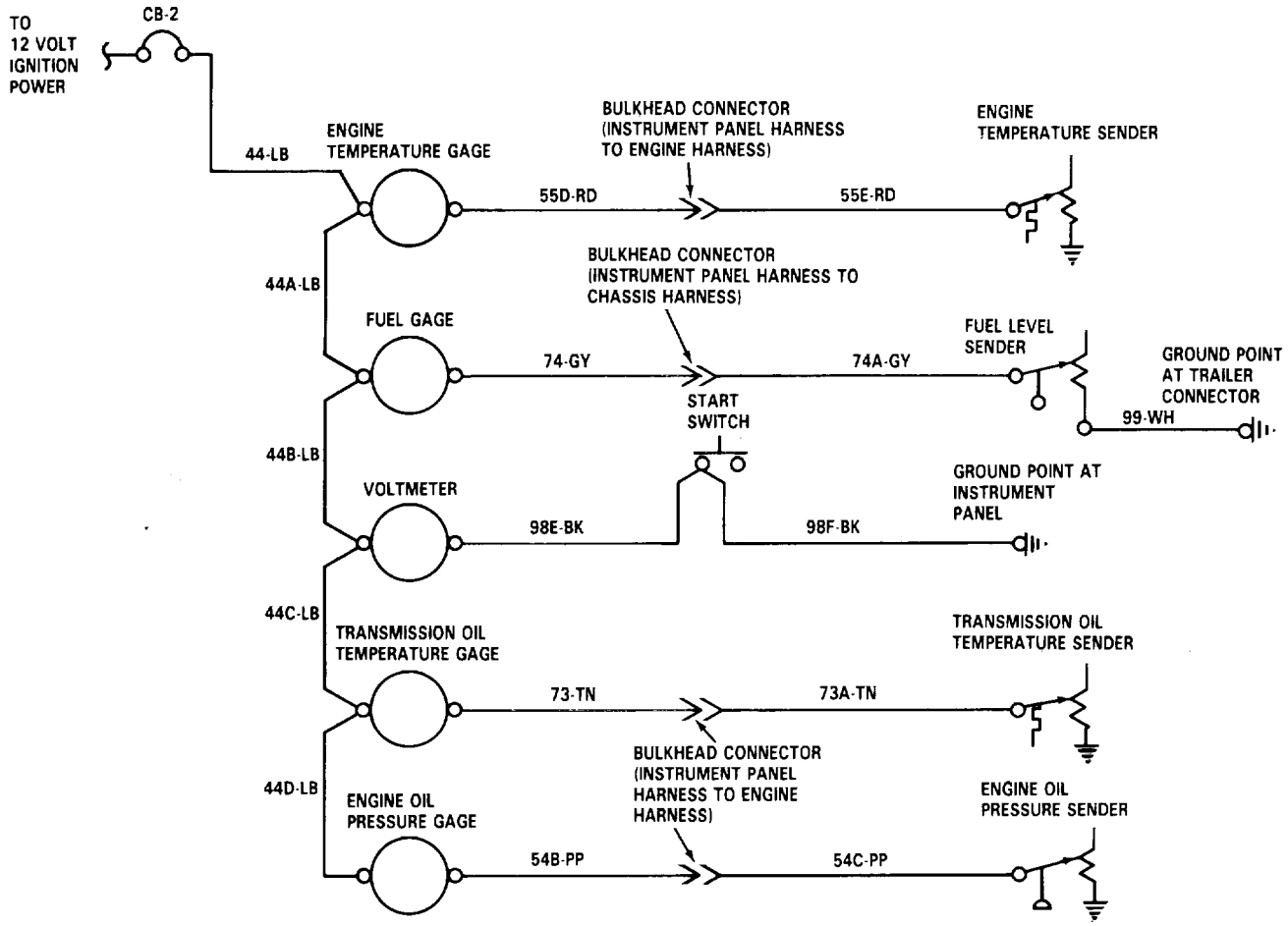
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
31. INSTRUMENT PANEL GAGES NOT WORKING (Continued).				
	NOTE • Determine which gage is not working by visual inspection, then go to the proper step as listed below. • If water temperature gage is not working, do step 8. • If fuel gage is not working, do step 9. • If voltmeter is not working, do step 10. • If transmission oil temperature gage is not working, do step 11. • If engine oil pressure gage is not working, do step 12.			
	8. Check water temperature gage:			
	a. With a jumper wire, momentarily ground circuit 55D-RD terminal of water temperature gage.	Gage operates.	Go to step b.	Replace gage (para 3-73).
	b. With a jumper wire momentarily ground circuit 55E-RD terminal of water temperature sending unit.	Gage operates.	Replace sending unit (para 3-101).	Repair circuit 55D-RD and/or 55D-RD (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

31. INSTRUMENT PANEL GAGES NOT WORKING (Continued).



TA 236852

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

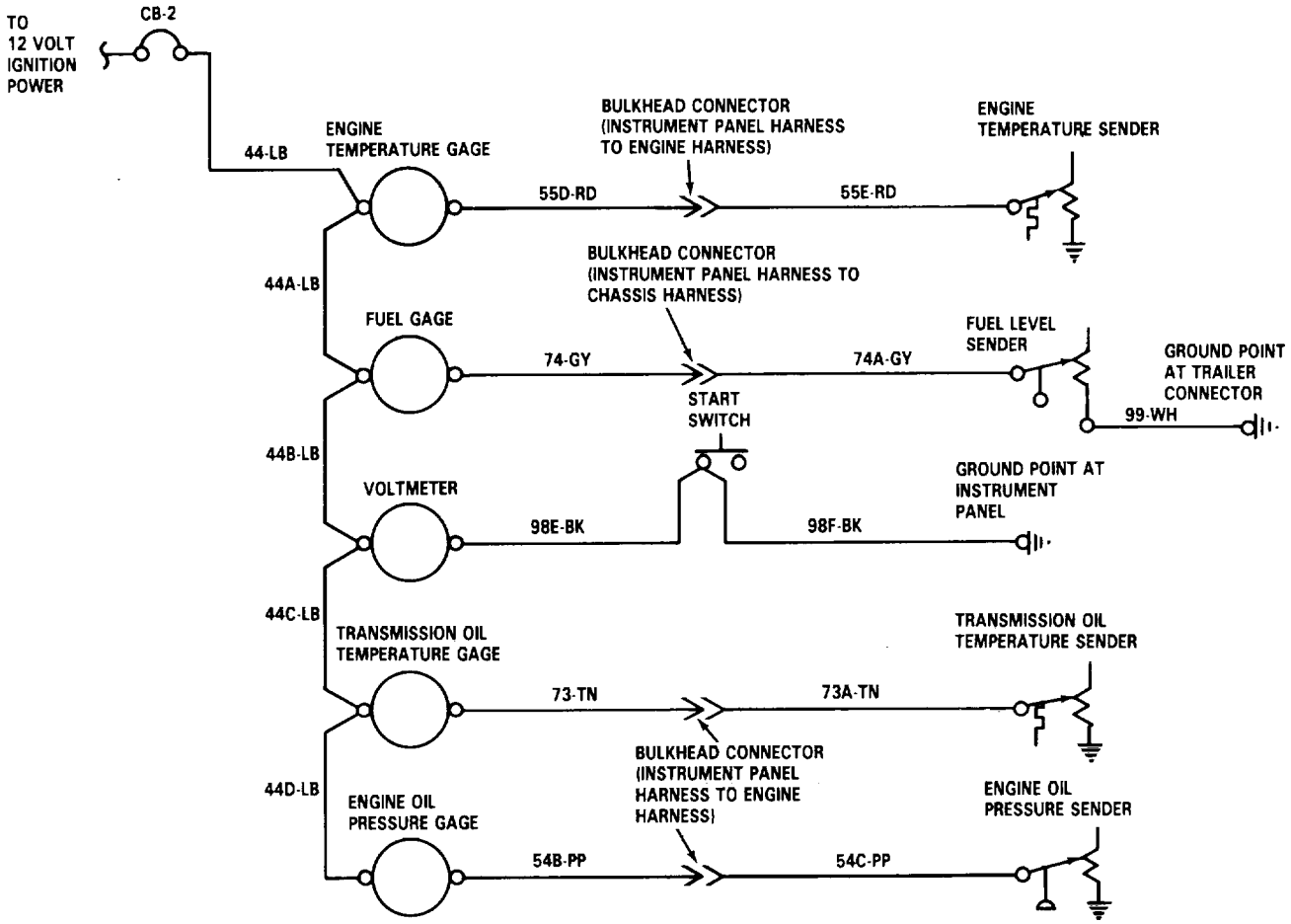
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
31.	**INSTRUMENT PANEL GAGES NOT WORKING (Continued).**			
9.	Check fuel gage:			
	a. With a jumper wire, momentarily ground circuit 74-GY terminal of fuel gage.	Gage operates.	Go to step b.	Replace gage (para 3-73).
	b. With a jumper wire, momentarily ground circuit 74A-GY terminal of fuel level sending unit.	Gage operates.	Replace sending unit (para 3-105).	Repair circuit 74-GY and/or 74A-GY (para 3-127).
10.	Check voltmeter:			
	a. With a jumper wire, momentarily ground circuit 98E-BK terminal of voltmeter.	Gage operates.	Go to step b.	Replace gage (para 3-73).
	b. With a jumper wire, momentarily ground circuit 98E-BK terminal of start switch.	Gage operates.	Go to step c.	Repair circuit 98E-BK (para 3-127).
	c. With a jumper wire, momentarily ground circuit 98F-BK at instrument panel ground point. panel.	Gage operates.	Tighten and/ or clean circuit 98F-BK connection to instrument	Repair circuit 98F-BK (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

31. INSTRUMENT PANEL GAGES NOT WORKING (Continued).



TA 236853

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

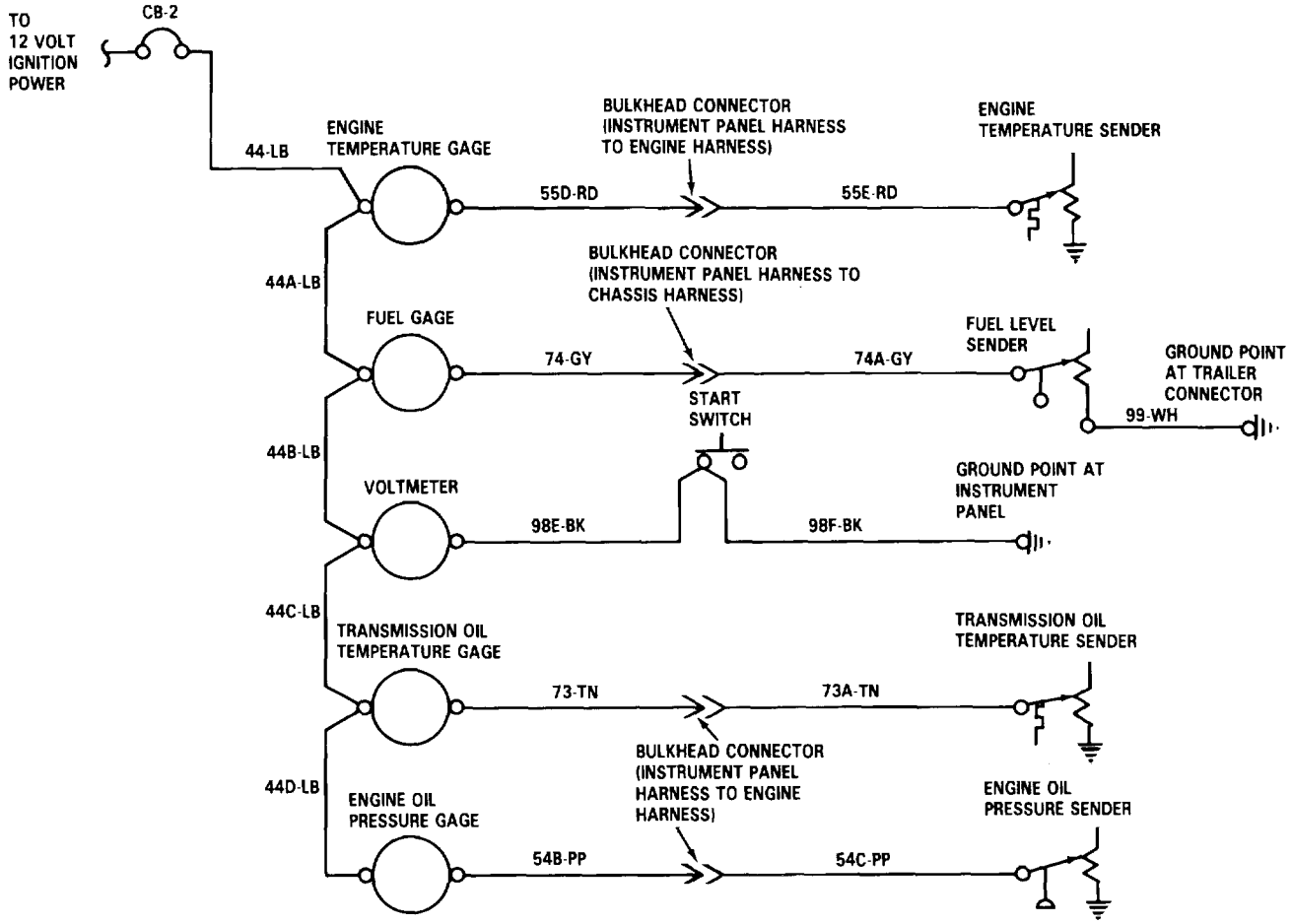
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
31.	**INSTRUMENT PANEL GAGES NOT WORKING (Continued).**			
11.	Check transmission oil temperature gage:			
a.	With a jumper wire, momentarily ground circuit 73-TN terminal of transmission oil temperature gage.	Gage operates.	Go to step b.	Replace gage (para 3-73).
b.	With a jumper wire, momentarily ground circuit 73A-TN terminal of transmission temperature sending unit.	Gage operates.	Replace sending unit (para 3-103).	Repair circuits 73-TN and/or 73A-TN (para 3-127).
12.	Check engine oil pressure gage:			
a.	With a jumper wire, momentarily ground circuit 54B-PP terminal of engine oil pressure gage.	Gage operates.	Go to step b.	Replace gage (para 3-73).
b.	With a jumper wire, momentarily ground circuit 54C-PP terminal of oil pressure sending unit.	Gage operates.	Replace sending unit (para 3-102).	Repair circuits 54B-PP and/or 54C-PP (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

31. INSTRUMENT PANEL GAGES NOT WORKING (Continued).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

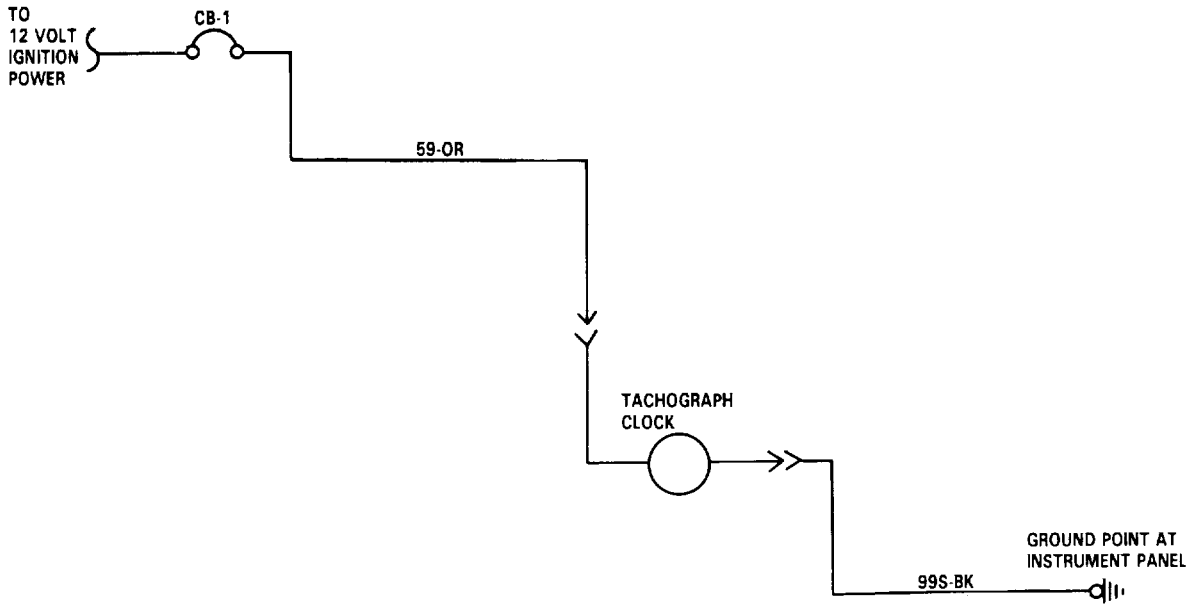
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
32.	**TACHOGRAPH CLOCK NOT WORKING.**			
1.	Remove circuit breaker bracket far enough to access circuit breaker CB-2 (para 3-114), and go to step 2.			
2.	Check for voltage at circuit 59-OR terminal of circuit breaker CB-1.	12-volts dc nominal.	Install circuit breaker bracket (para 3-114), and go to step 3.	Reset circuit breaker CB-1 and/or troubleshoot CB-1 circuit. (Refer to malfunction 34).
3.	Check for voltage at circuit 59-OR terminal of tachograph clock.	12-volts dc nominal.	Go to step 4.	Repair circuit 59-OR (para 3-127).
	NOTE With positive lead on circuit 59-OR, check ground with negative lead when doing the following checks.			
4.	Check for voltage at circuit 99S-BK ground point of instrument panel.	12-volts dc nominal.	Go to step 5.	Clean and tighten ground point connection.
5.	Check for voltage at circuit 99S-BK terminal of tachograph clock.	12-volts dc nominal.	Replace tachograph (para 3-309).	Repair circuit 99S-BK (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

32. TACHOGRAPH CLOCK NOT WORKING (Continued).



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TROUBLESHOOTING.

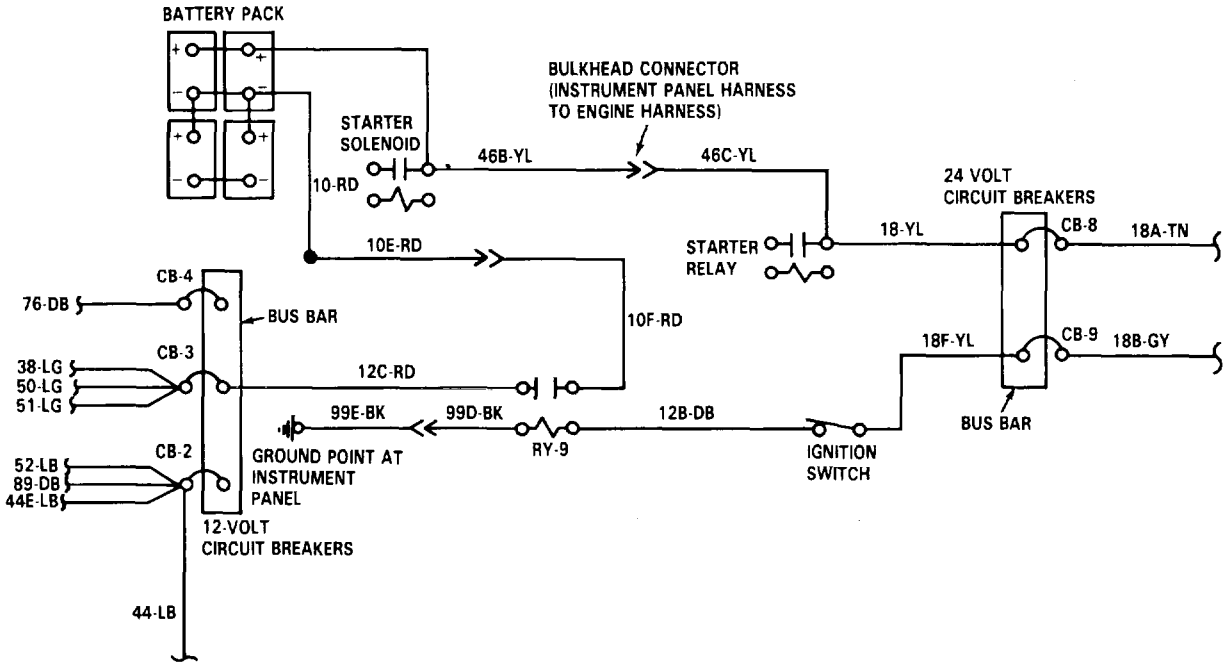
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
33.	**NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-2, CB-3, AND/OR CB-4.**			
1.	Check for voltage to circuit breakers CB-8 and CB-9. (Refer to malfunction 35). Leave circuit breaker bracket removed for access in later steps.			
2.	Check for voltage at circuit 18F-YL terminal of ignition switch.	24-volts dc nominal.	Go to step 3.	Repair circuit 18F-YL (para 3-127).
	NOTE Ignition switch must be in ON position when doing the following check.			
3.	Check for voltage at circuit 12B-DB terminal of ignition switch. (para 3-114).	24-volts dc nominal.	Go to step 4. (para 3-74). Install circuit	Replace switch
4.	Check for voltage at circuit 12B-DB terminal of relay RY-9.	24-volts dc nominal.	Go to step 5.	Repair circuit 12B-DB (para 3-127). Install bracket (para 3-114).
	NOTE With positive lead on circuit 12B-DG, check ground with negative lead when doing the following checks.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
33.	**NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-2, CB-3, AND/OR CB-4 (Continued).**			
	5. Check for voltage at ground point.	24-volts dc nominal.	Go to step 6.	Clean and tighten ground connection. Install circuit breaker bracket (para 3-114).
	6. Check for voltage at circuit 99D-BK terminal of relay RY-9.	24-volts dc nominal.	Go to step 7.	Repair circuit 99D-BK and/or 99E-BK (para 3-127). Install circuit breaker bracket (para 3-114).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

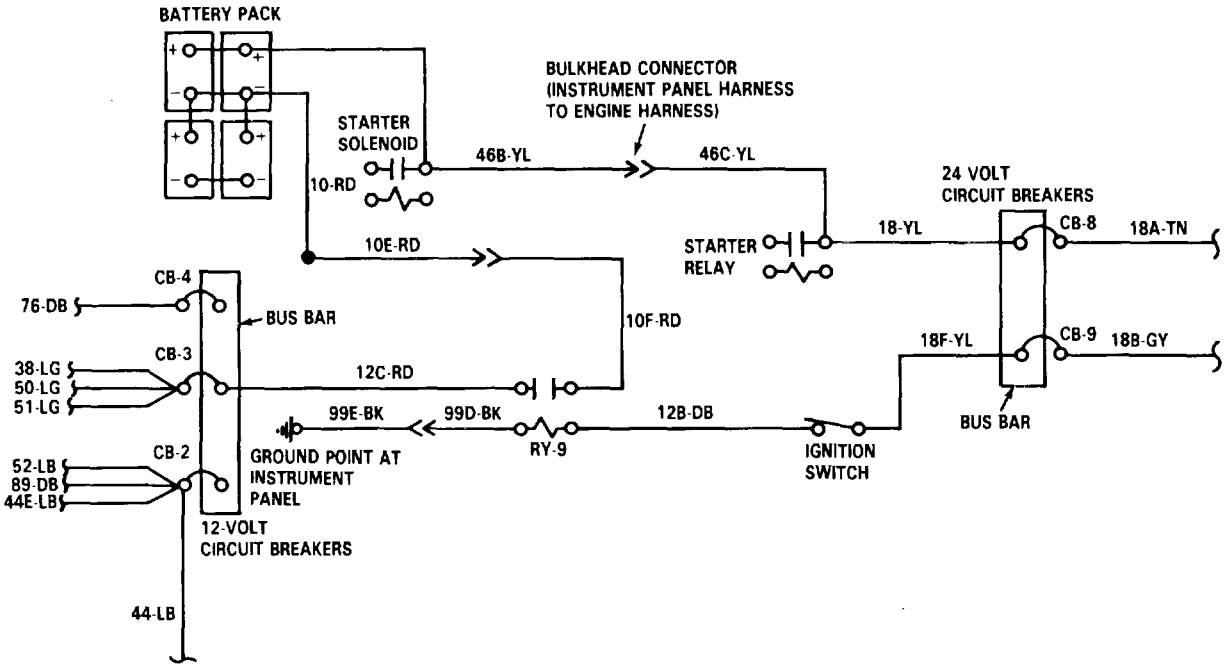
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
33.	**NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-2, CB-3, AND/OR CB-4 (Continued).**			
7.	Check for voltage at circuit 10-RD terminal of battery.	12-volts dc nominal.	Go to step 8.	Refer to malfunction 18.
8.	Check for voltage at circuit 1OF-RD of relay RY-9.	12-volts dc nominal.	Go to step 9.	Repair circuit 1OF-RD, 1bE-RD, and/or 10-RD (para 3-127). Install circuit breaker bracket (para 3-114).
	NOTE Ignition switch must be in ON position when doing the following checks.			
9.	Check for voltage at circuit 12C-RD terminal of relay RY-9.	12-volts dc nominal.	Go to step 10.	Replace relay RY-9 (para 3-115). Install circuit breaker bracket (para 3-114).
10.	Check for voltage at circuit 12C-RD terminal of circuit breaker CB-3. bracket (para 3-114).	12-volts dc nominal.	Go to step 11.	Repair circuit 12C-RD (para 3-127). Install circuit breaker
11.	Check for voltage at circuit 38-LG terminal of circuit breaker CB-3.	12-volts dc nominal.	Circuit breaker CB-3 is OK. Go to step 14.	Go to step 12.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

33. NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-2, CB-3, AND/OR CB-4 (Continued).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

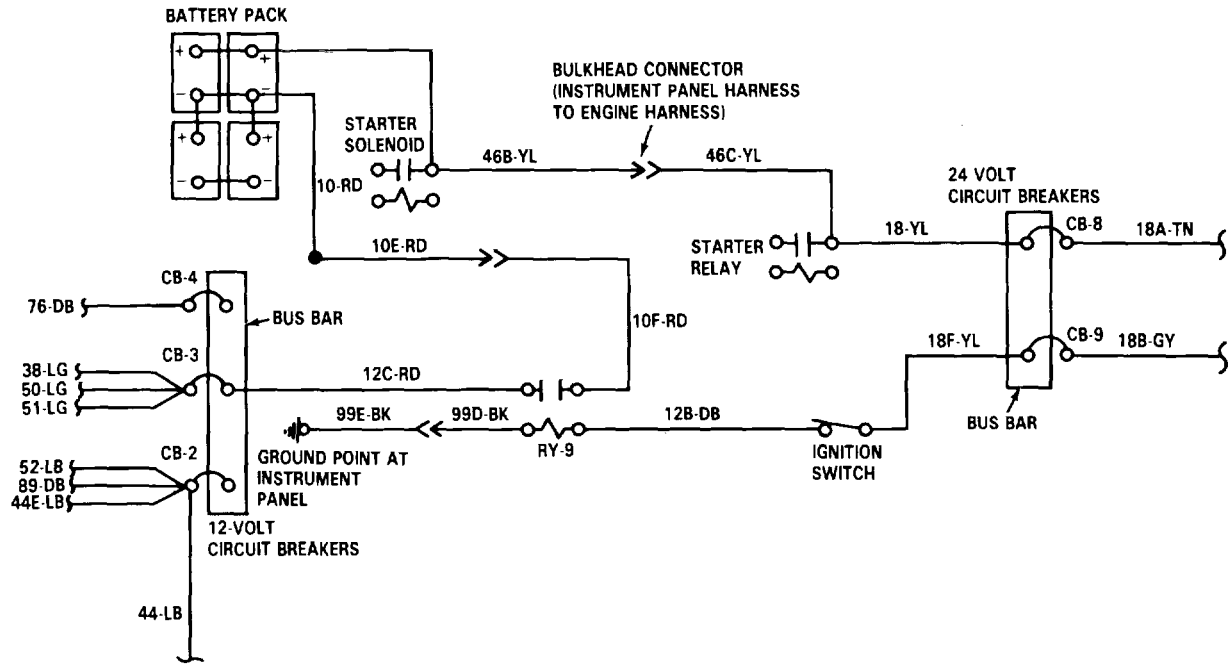
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
33.	**NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-2, CB-3, AND/OR CB-4 (Continued).**			
12.	Remove circuits 38-LG, 50-LG, and 31-LG from circuit breaker CB-3, and reset breaker. Check for voltage at circuit breaker terminal.	12-volts dc nominal.	Go to step 13.	Replace circuit breaker CB-3 (para 3-114).
13.	Reconnect circuit 38-LG, 50-LG, and 51-LG to circuit breaker CB-3. Check for voltage at terminal.	12-volts dc nominal.	Circuit breaker CB-2 is OK. Go to step 14.	If circuit breaker trips, circuit 38-LG, 50-LG, or 51-LG is shorted to ground. Refer to wiring diagram (Appendix D, figure FO-9) and malfunction of faulty system. Install circuit breaker bracket (para 3-114).
14.	Check for voltage at bus bar terminal of circuit breaker CB-4.	12-volts dc nominal.	Go to step 15.	Clean and tighten bus bar connections at circuit breaker ers CB-2, CB-3, and CB-4. Install circuit breaker bracket (para 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

33. NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-2, CB-3, AND/OR CB-4 (Continued).-



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

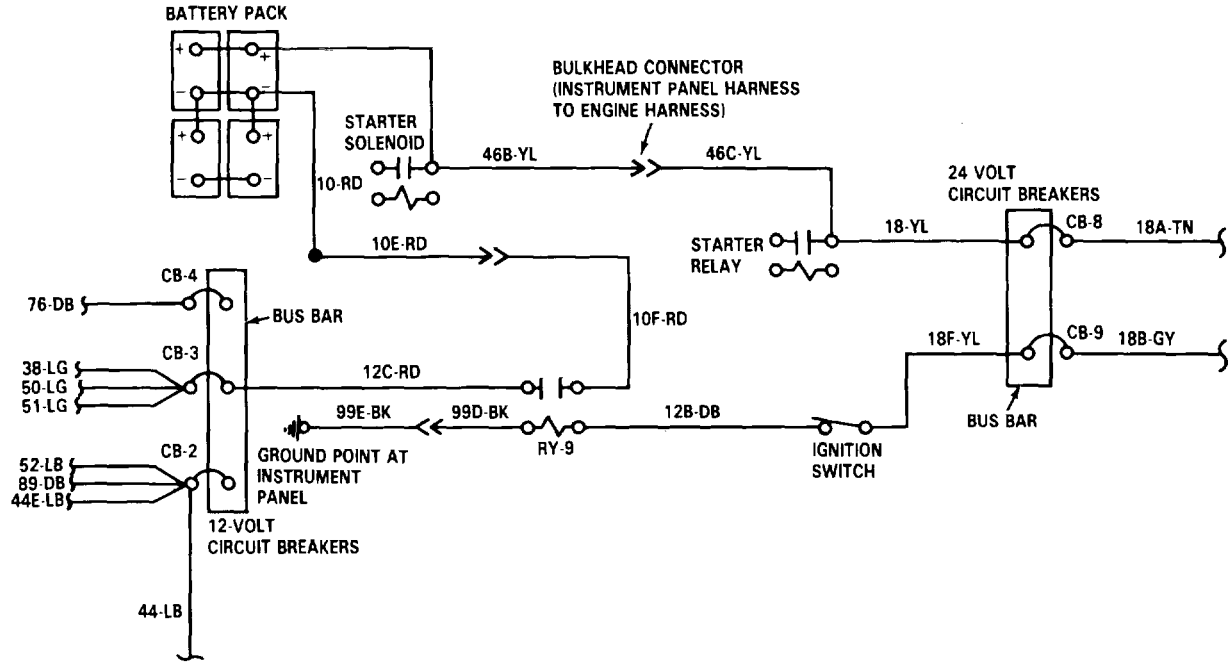
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
33.	**NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-2, CB-3, AND/OR CB-4 (Continued).**			
15.	Check for voltage at circuit 75-DB terminal of circuit breaker CB-4.	12-volts dc nominal.	Circuit breaker CB-4 is OK. Go to step 18.	Go to step 16.
16.	Remove circuit 76-DB from circuit breaker CB-4, and reset breaker. Check for voltage at circuit breaker terminal.	12-volts dc nominal.	Go to step 17.	Replace circuit breaker CB-4 (para 3-114).
17.	Reconnect circuit 76-DB to circuit breaker CB-4. Check for voltage at terminal.	12-volts dc nominal.	Circuit breaker CB-4 is OK, Go to step 18.	If circuit breaker trips, circuit 76-DB is shorted to ground. Refer to wiring diagram (Appendix D, figure FO-9) and malfunction of inoperative system. Install circuit breaker bracket (para 3-114).
18.	Check for voltage at bus bar terminal of circuit breaker CB-2.	12-volts dc nominal.	Go to step 19.	Clean and tighten bus bar connections at circuit breaker ers CB-2, CB-3, and CB-4.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

33. NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-2, CB-3, AND/OR CB-4 (Continued).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

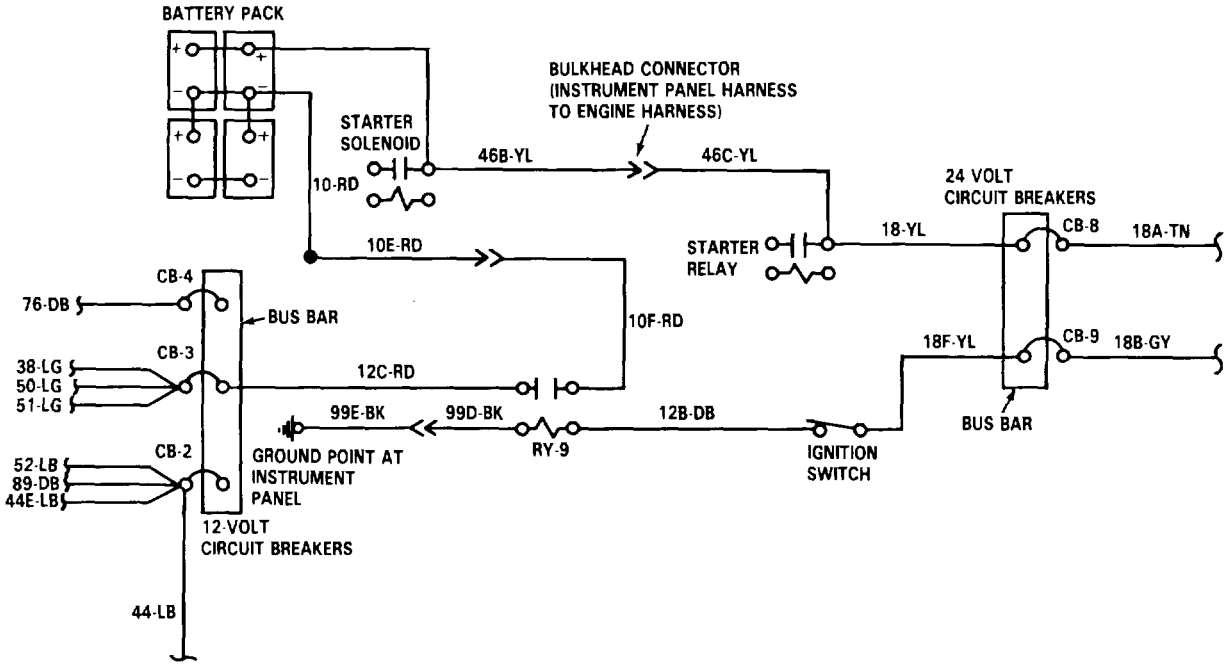
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
33.	**NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-2, CB-3, AND/OR CB-4 (Continued).**			
19.	Check for voltage at circuit 52-LB terminal of circuit breaker CB-2.	12-volts dc nominal.	Circuit breaker CB-2 is OK.	Go to step 20.
20.	Remove circuit 52-LB, 89-DB, 44E-LB, and 44-LB from circuit breaker CB-2, and reset breaker. Check for voltage at circuit breaker terminal.	12-volts dc nominal.	Go to step 21.	Replace circuit breaker CB-2 (para 3-114).
21.	Reconnect circuits 52-LB, 89-DB, 44E-LB, and 44-LB. Check for voltage at terminal.	12-volts dc nominal.	Circuit breaker CB-2 is OK.	If circuit breaker trips, circuit 52-DB, 89-DB, 44D-LB, or 44-LB is shorted to ground. Refer to wiring diagram (Appendix D, figure FO-9) and malfunction of inoperative system. Install circuit breaker bracket (para 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

33. NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-2, CB-3, AND/OR CB-4 (Continued).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

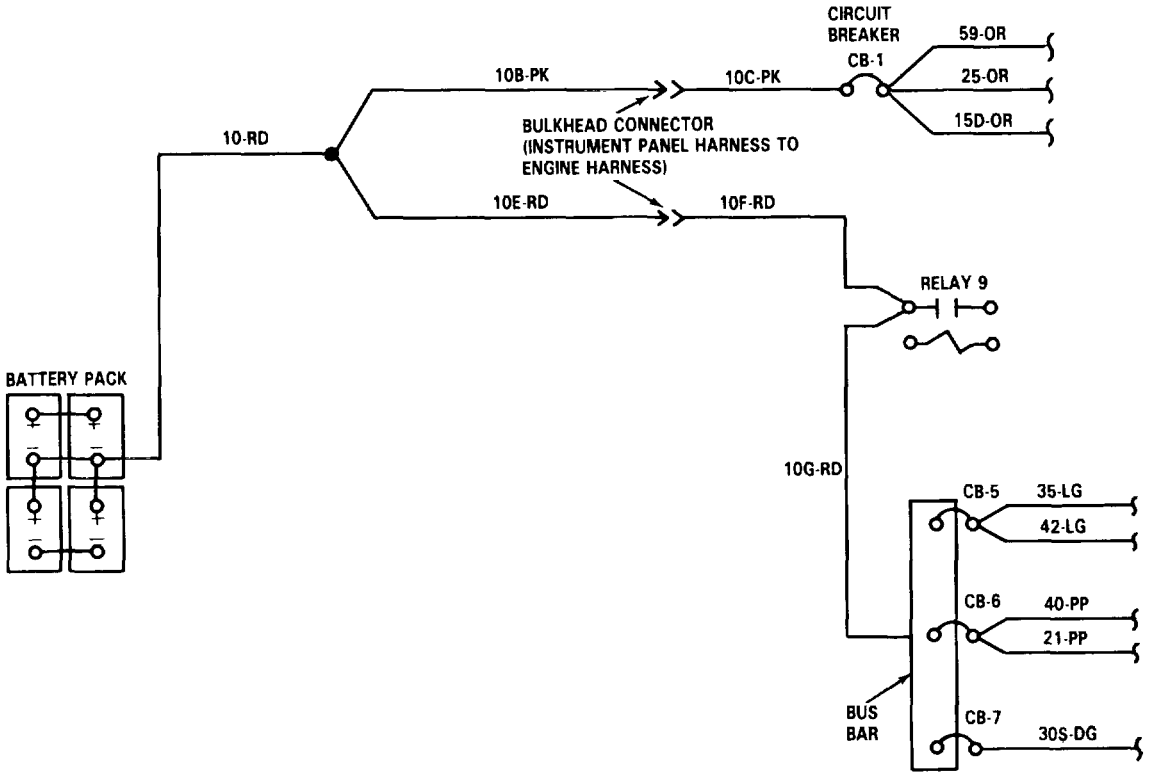
MALFUNCTION		INSTRUCTION	INDICATION	YES	NO
34.		**NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-1, CB-5, CB-6, AND/OR CB-7.**			
	1.	Check for voltage at circuit 10-RD terminal of battery.	12-volts dc nominal.	Go to step 2.	Refer to malfunction 18.
	2.	Remove circuit breaker bracket far enough to access circuit breaker CB-1 (para 3-114), and go to step 3.			
	3.	Check for voltage at circuit 1OC-PK terminal of circuit breaker CB-1.	12-volts dc nominal.	Go to step 4.	Repair circuits 10-RD, IOB-PK, and/or 1OC-PK (para 3-127). Install circuit breaker bracket (para 3-114).
	4.	Check for voltage at circuit 25-OR terminal of circuit breaker CB-1.	12-volts dc nominal.	Circuit breaker CB-1 is OK. Go to step 7.	Go to step 5.
	5.	Remove circuits 59-OR, 25-OR, and 15D-OR from circuit breaker CB-1, and reset breaker. Check for voltage at circuit breaker terminal.	12-volts dc nominal.	Go to step 6.	Replace circuit breaker CB-1 (para 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

34. NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-1, CB-5, CB-6, AND/OR CB-7 (Continued).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

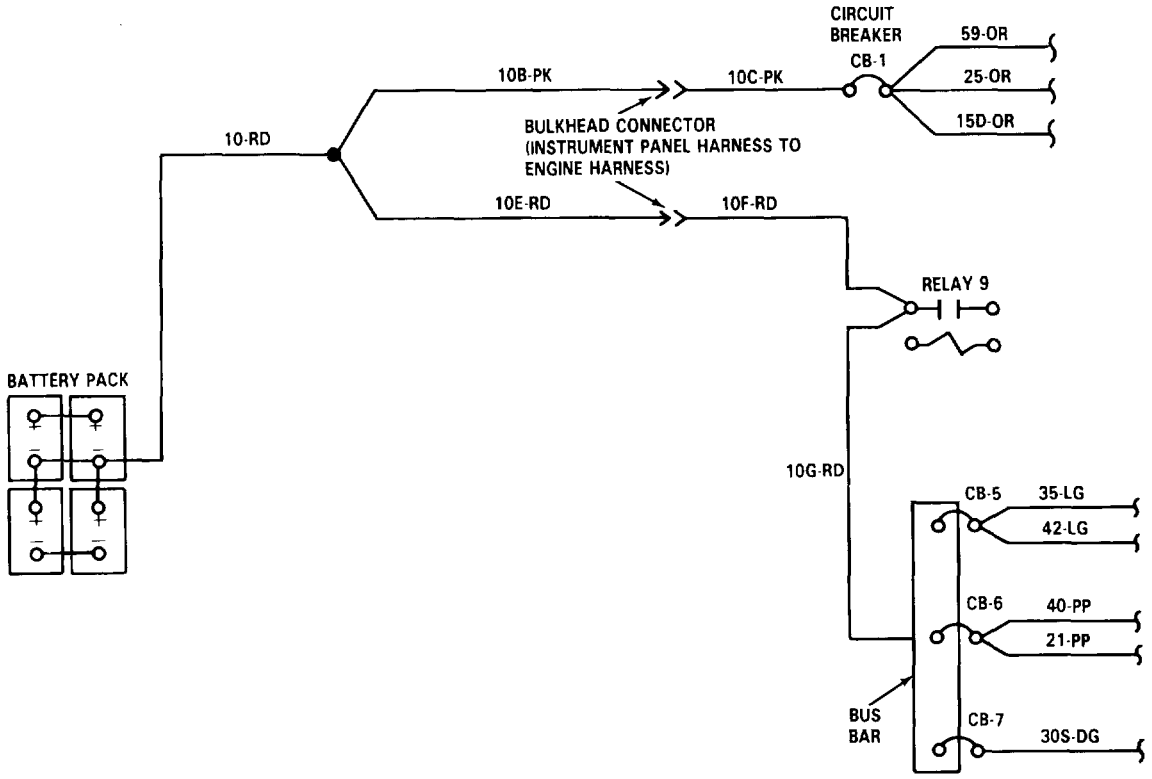
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
34. NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-1, CB-5, CB-6, AND/OR CB-7 (Continued).				
	6. Reconnect circuits 59-OR, 25-OR, and 15D-OR to circuit breaker CB-1. Check for voltage at terminal.	12-volts dc nominal.	Circuit breaker CB-1 is OK. Go to step 7.	If circuit breaker trips, circuit 59-OR, 25-OR, or 15D-OR is shorted to ground. Refer to wiring diagram (Appendix D, figure FO-8) and malfunction of faulty system. Install circuit breaker bracket (para 3-114).
	7. Check for voltage at circuit 10F-RD terminal of ignition relay RY-9. circuit breaker bracket (para 3-114).	12-volts dc nominal.	Go to step 8.	Repair circuits 10-RD and/or 10F-RD (para 3-127). Install

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

34. NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-1, CB-5, CB-6, AND/OR CB-7 (Continued).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

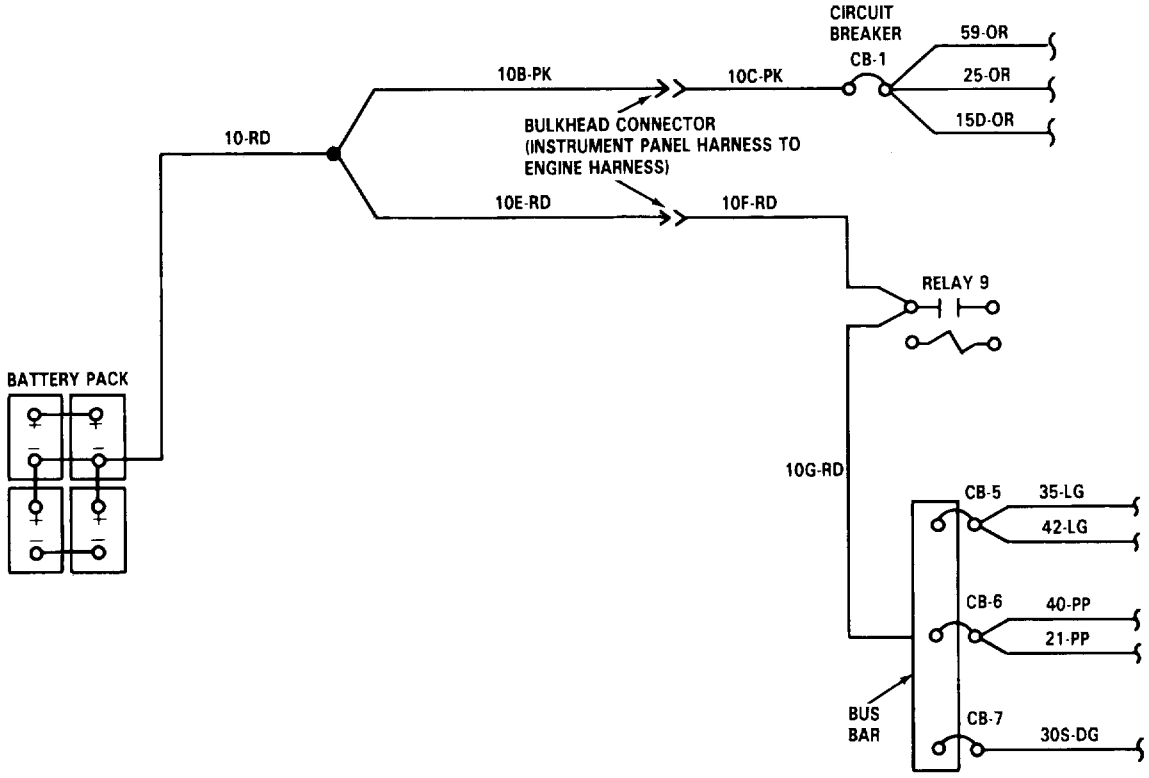
MALFUNCTION		INSTRUCTION	INDICATION	YES	NO
34.		**NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-1, CB-5, CB-6, AND/OR CB-7 (Continued).**			
	8.	Check for voltage at circuit 100G-RD terminal of circuit breaker CB-6. panel (para 3-114).	12-volts dc nominal.	Go to step 9.	Repair circuit 10G-RD (para 3-127). Install circuit breaker
	9.	Check for voltage at circuit 40-PP terminal of circuit breaker CB-6.	12-volts dc nominal.	Circuit breaker CB-6 is OK. Go to step 12.	Go to step 10.
	10.	Remove circuits 40-PP and 21-PP from circuit breaker CB-6 and, reset breaker. Check for voltage at circuit breaker terminal.	12-volts dc nominal.	Go to step 11.	Replace circuit breaker CB-6 (para 3-114).
	11.	Reconnect circuits 40-PP and 21-PP to circuit breaker CB-6. Check for voltage at terminal.	12-volts dc nominal.	Circuit breaker CB-6 is OK. Go to step 12.	If breaker trips, circuit 40-PP or 21-PP is shorted to ground. Refer to wiring diagram (Appendix D, figure FO-8) and malfunction of faulty system. Install circuit breaker bracket (para 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

34. NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-1, CB-5, CB-6, AND/OR CB-7 (Continued).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

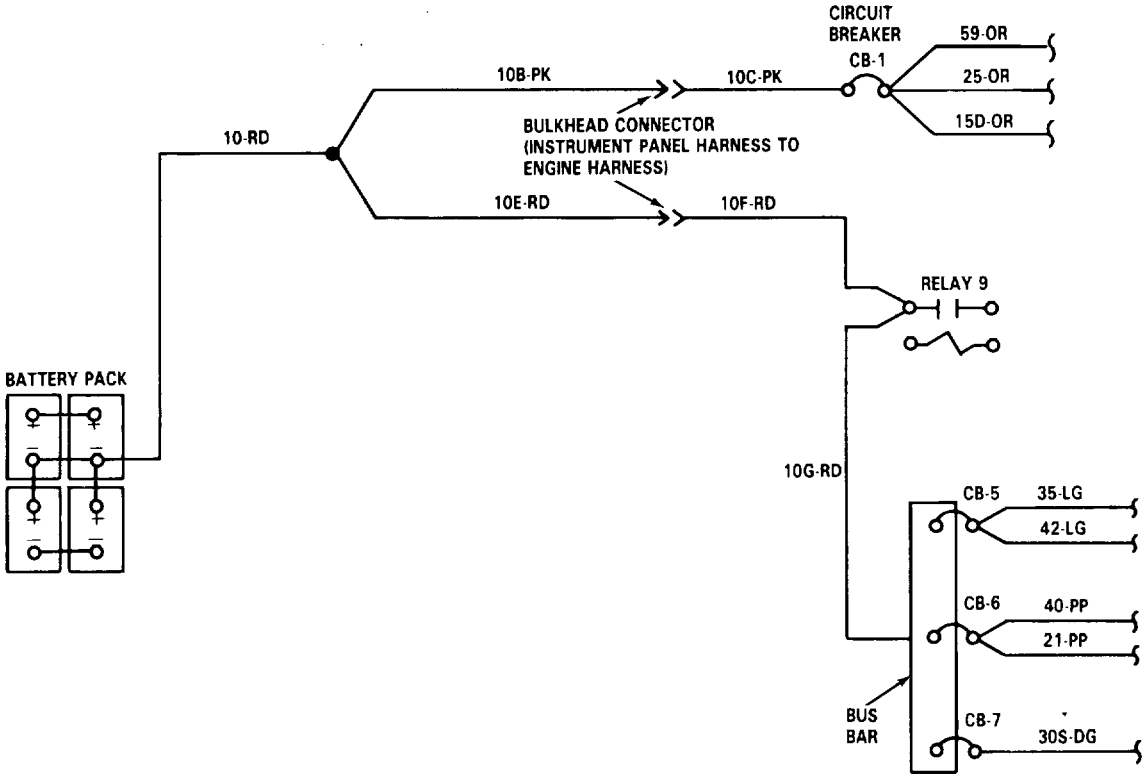
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
34.	**NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-1, CB-5, CB-6, AND/OR CB-7 (Continued).**			
	12. Check for voltage at bus bar terminal of circuit breaker CB-5.	12-volts dc nominal.	Go to step 13.	Clean and tighten bus bar connections at circuit breakers CB-5, CB-6, and CB-7. Install circuit breaker bracket (para 3-114).
	13. Check for voltage at circuit 35-LG terminal of circuit breaker CB-5.	12-volts dc nominal.	Circuit breaker CB-5 is OK. Go to step 16.	Go to step 14.
	14. Remove circuits 35-LG and 42-LG from circuit breaker CB-5, and reset breaker. Check for voltage at circuit breaker terminal.	12-volts dc nominal.	Go to step 15.	Replace circuit breaker CB-5 (para 3-114).
	15. Reconnect circuits 35-LG and 42-LG to circuit breaker CB-5. Check for voltage at terminal.	12-volts dc nominal.	Circuit breaker CB-5 is OK. Go to step 16.	If circuit breaker trips, circuit 35-LG or 42-LG is shorted to ground. Refer to wiring diagram (Appendix D, figure FO-8) and malfunction of faulty system. Install circuit breaker bracket (para 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

34. NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-1, CB-5, CB-6, AND/OR CB-7 (Continued).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

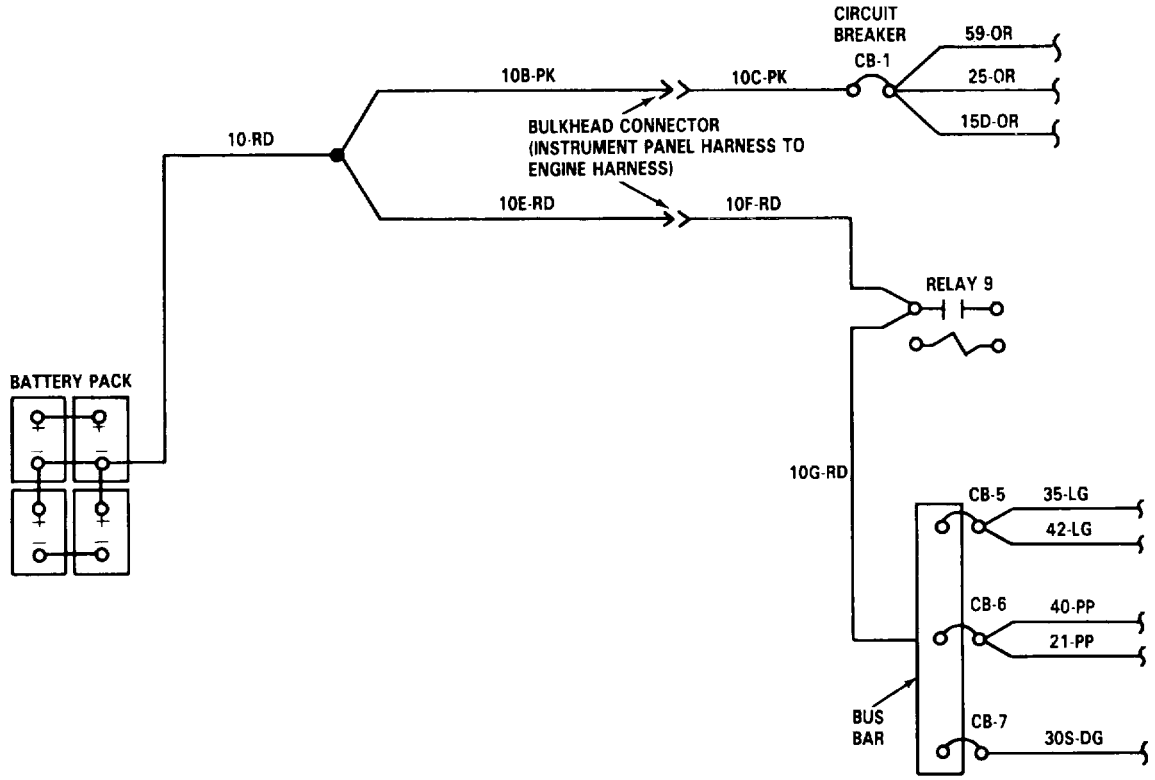
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
34. NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-1, CB-5, CB-6, AND/OR CB-7 (Continued).				
	16. Check for voltage at bus bar terminal of circuit breaker CB-7.	12-volts dc nominal.	Go to step 17.	Clean and tighten bus bar connections at circuit breakers CB-5, CB-6, and CB-7. Install circuit breaker bracket (para 3-114).
	17. Check for voltage at circuit 30S-DG terminal of circuit breaker CB-7.	12-volts dc nominal.	Circuit breaker CB-7 is OK.	Go to step 18.
	18. Remove circuit 30S-DG from circuit breaker CB-7, and reset breaker. Check for voltage at circuit breaker terminal.	12-volts dc nominal.	Go to step 19.	Replace circuit breaker CB-7 (para 3-114).
	19. Reconnect circuit 30S-DG to circuit breaker CB-7. Check for voltage at terminal.	12-volts dc nominal.	Circuit breaker CB-7 is OK.	If circuit breaker trips, circuit 30S-DG is shorted to ground. Refer to wiring diagram (Appendix D, figure FO-8) and malfunction of faulty system. Install circuit breaker bracket (para 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

34. NO POWER AT 12-VOLT CIRCUIT BREAKERS CB-1, CB-5, CB-6, AND/OR CB-7 (Continued).



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TROUBLESHOOTING.

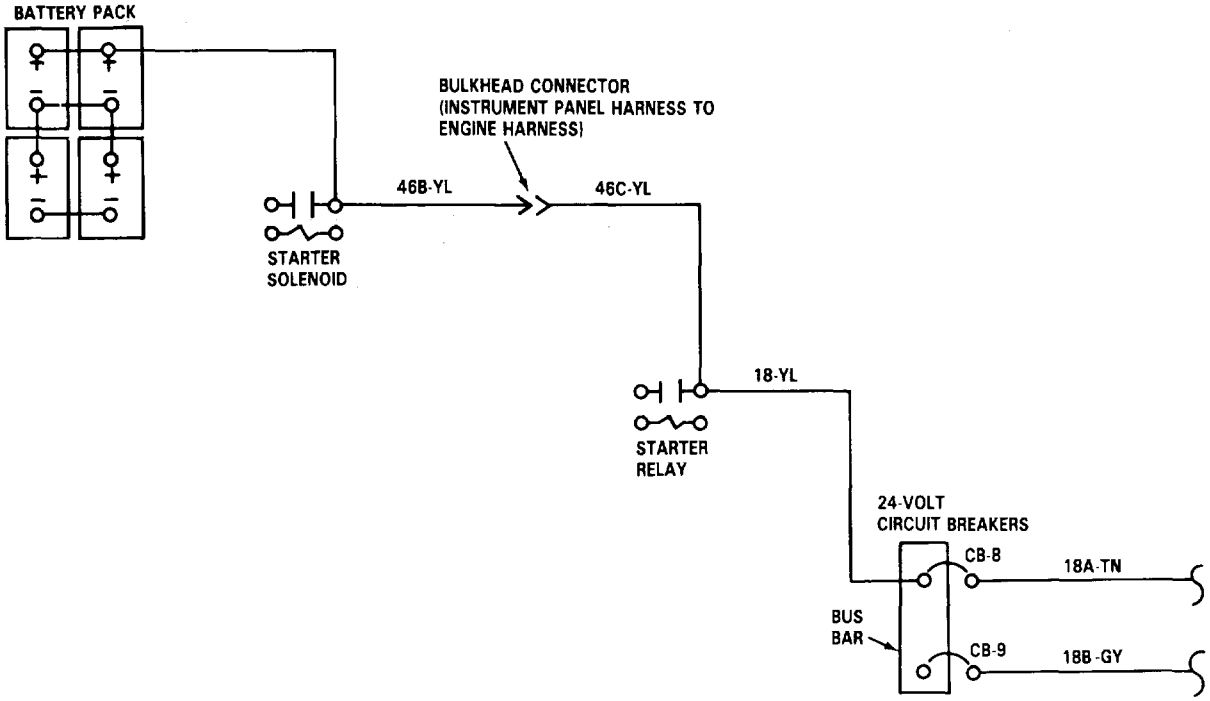
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
35.	**NO POWER AT 24-VOLT CIRCUIT BREAKERS CB-8 AND/OR CB-9.**			
1.	Check for voltage at starter solenoid main battery cable connection.	24-volts dc nominal.	Go to step 2.	Refer to malfunction 18.
2.	Check for voltage at circuit 46C-YL terminal of starter relay.	24-volts dc nominal.	Go to step 3.	Repair circuit 46B-YL and/or 46C-YL (para
3.	Remove circuit breaker bracket far enough to access circuit breaker CB-8 (para 3-114), and go to step 4.			
4.	Check for voltage at circuit 18-YL terminal of circuit breaker CB-8.	24-volts dc nominal.	Go to step 5.	Repair circuit 18-YL (para 3-127). Install circuit breaker bracket (para 3-114).
5.	Check for voltage at circuit 18A-TN terminal of circuit breaker CB-8.	24-volts dc nominal.	Circuit breaker CB-8 is OK. Go to step 8.	Go to step 6.
6.	Remove circuit 18A-TN from circuit breaker CB-8, and reset breaker. Check for voltage at circuit breaker terminal.	24-volts dc nominal.	Go to step 7.	Replace circuit breaker CB-8 (para 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
35. NO POWER AT 24-VOLT CIRCUIT BREAKERS CB-8 AND/OR CB-9 (Continued).				
	7. Reconnect circuit 18A-TN to circuit breaker CB-8. for voltage at terminal.	24-volts dc nominal. Check	Circuit breaker CB-8 is OK. Go	If circuit breaker trips, to step 8. circuit 18A-TN is shorted to ground. Refer to wiring diagram (Appendix D, figure FO-8) and malfunction of faulty system. Install circuit breaker panel (para 3-114).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

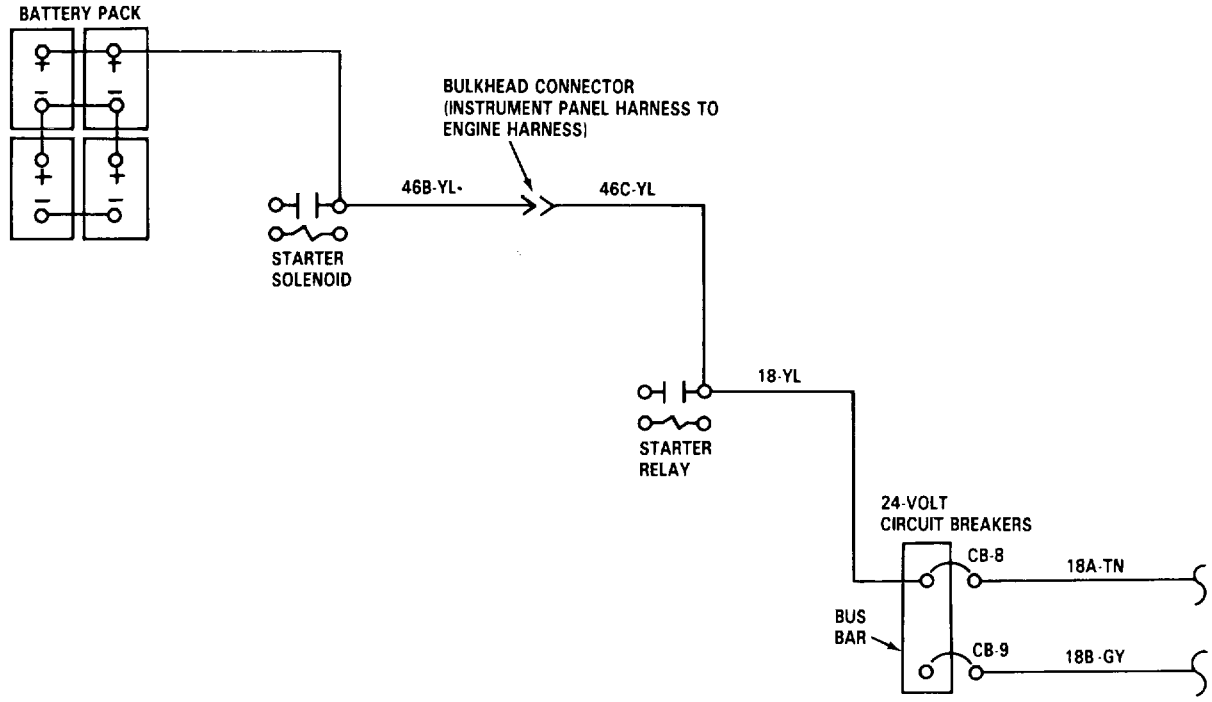
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
35.	**NO POWER AT 24-VOLT CIRCUIT BREAKERS CB-8 AND/OR CB-9 (Continued).**			
8.	Check for voltage at bus bar terminal of circuit breaker CB-9.	24-volts dc nominal.	Go to step 9.	Clean and tighten bus bar connections at circuit breakers CB-8 and CB-9. Install circuit breaker bracket (para 3-114).
9.	Check for voltage at circuit 18B-GY terminal of circuit breaker CB-9.	24-volts dc nominal.	Circuit breaker CB-9 is OK.	Go to step 10.
10.	Remove circuit 18B-GY from circuit breaker CB-9, and reset breaker. Check for voltage at circuit breaker terminal.	24-volts dc nominal.	Go to step 11.	Replace circuit breaker CB-9 (para 3-114).
11.	Reconnect circuit 18B-GY to circuit breaker CB-9. Check for voltage at terminal.	24-volts dc nominal.	Circuit breaker CB-9 is OK.	If circuit breaker trips, circuit 18B-GY is shorted to ground. Refer to wiring diagram (Appendix D, figure FO-8) and malfunction of faulty system. Install circuit breaker bracket (para 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

35. NO POWER AT 24-VOLT CIRCUIT BREAKERS CB-8 AND/OR CB-9 (Continued).

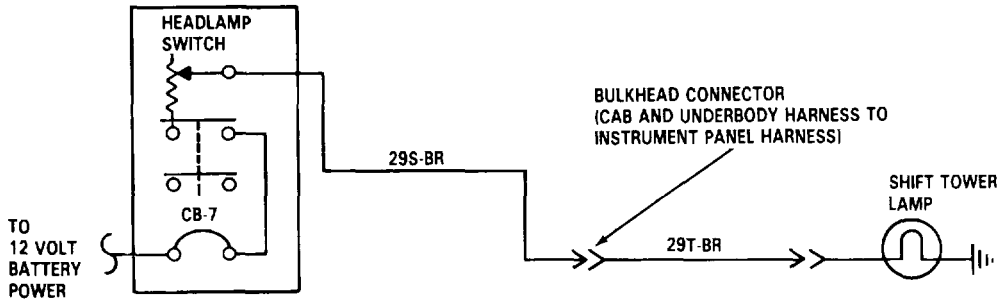


TA 236867

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
36. SHIFT TOWER LAMP NOT WORKING.				
	NOTE Headlamp rheostat switch must be rotated fully clockwise when doing the following checks.			
1.	Check for voltage at circuit 29S-BR terminal of headlamp switch.	12-volts dc nominal.	Go to step 2.	Refer to malfunction 44.
2.	Disconnect circuit 29S-BR from 29T-BR at connector. Check for voltage at circuit 29S-BR (pin k of connector).	12-volts dc nominal.	Connect circuit 29S-BR to 29T-BR, and go to step 3.	Repair circuit 29S-BR (para 3-127). Connect circuit 29S-BR to 29T-BR.
3.	Check for voltage at circuit 29S-BR terminal of shift tower lamp.	12-volts dc nominal.	Go to step 4.	Repair circuit 29T-BR (para 3-127).
4.	Remove bulb from shift tower lamp (para 3-87). Check for voltage at lamp socket.	12-volts dc nominal.	Replace bulb (para 3-87).	Clean socket and install bulb (para 3-87).



TA 236868

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

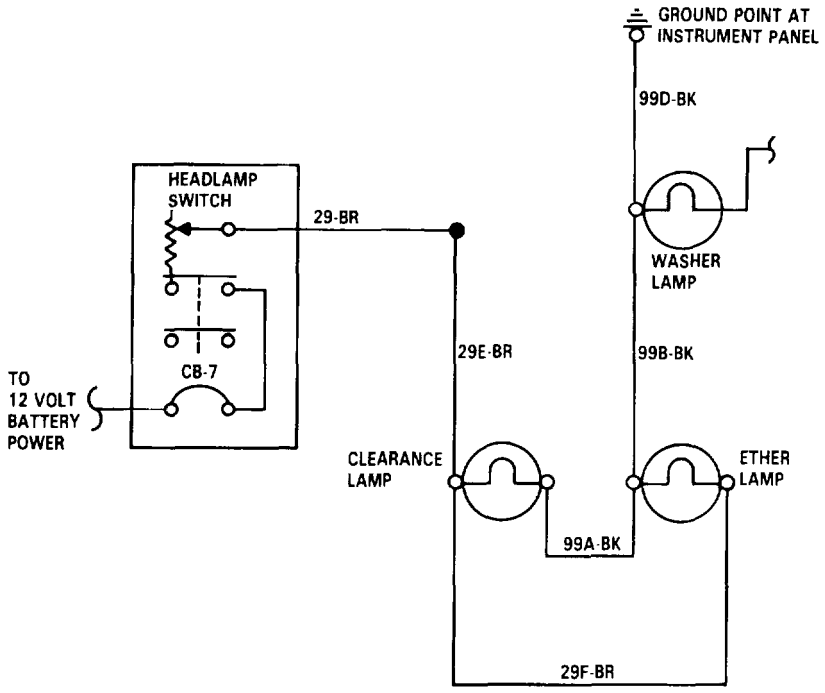
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

37. ETHER LAMP AND/OR CLEARANCE LAMP NOT WORKING.

NOTE

- Headlamp rheostat switch must be rotated fully clockwise when doing the following checks.
- Do steps 1 thru 6 only if clearance lamp is not working or if both lamps are not working.
- Do steps 3 thru 5 and step 7 only if ether lamp is not working.

1.	Check for voltage at circuit 29-BR terminal Of headlamp switch.	12-volts dc nominal.	Go to step 2.	Refer to malfunction 44.



TA 236869

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

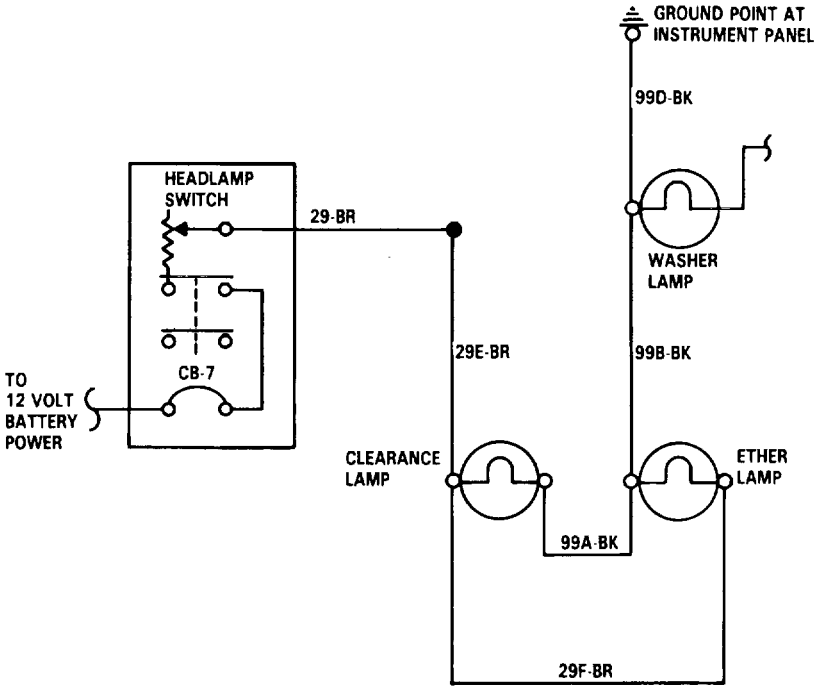
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
37. ETHER LAMP AND/OR CLEARANCE LAMP NOT WORKING (Continued).				
2.	Check for voltage at circuit 29E-BR terminal of clearance lamp.	12-volts dc nominal.	Go to step 3.	Repair circuit 29E-OR and/or 29-BR
	NOTE With positive lead on circuit 29E-BR, check ground with negative lead when doing the following checks.			
3.	Check for voltage at ground point of circuit 99D-BK.	12-volts dc nominal.	Go to step 4.	Clean and/or tighten ground con-
4.	Check for voltage at circuit 99D-BK terminal of washer lamp.	12-volts dc nominal.	Go to step 5.	Repair circuit 99D-BK (para 3-127).
5.	Check for voltage at circuit 99B-BK terminal of ether lamp.	12-volts dc nominal.	Go to step 6.	Repair circuit 99B-BK (para 3-127).
6.	Check for voltage at circuit 99A-BK terminal of clearance lamp.	12-volts dc nominal.	Replace bulb (para 3-85).	Repair circuit 99A-BK (para 3-127).
7.	Check for voltage at circuit 29F-BR terminal of ether lamp.	12-volts dc nominal.	Replace bulb (para 3-85).	Repair circuit 29F-BR (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

37. ETHER LAMP AND/OR CLEARANCE LAMP NOT WORKING (Continued).



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TROUBLESHOOTING.

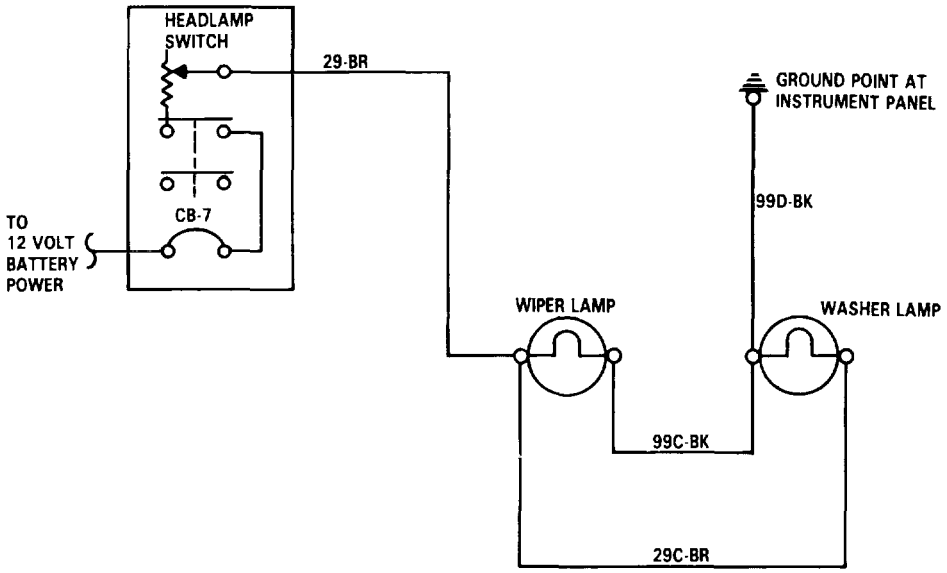
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
38. WASHER LAMP AND/OR WIPER LAMP NOT WORKING.				
	NOTE • Headlamp rheostat switch must be rotated fully clockwise when doing the following check. • Do steps 1 thru 5 only if wiper lamp is not working or if both lamps are not working. • Do steps 3, 4, and 6 only if washer lamp is not working.			
	1. Check for voltage at circuit 29-BR terminal of headlamp switch.	12-volts dc nominal.	Go to step 2.	Refer to malfunction 44.
	2. Check for voltage at circuit 29-BR terminal of wiper lamp.	12-volts dc nominal.	Go to step 3.	Repair circuit 29-BR (para 3-127).
	NOTE With positive lead on circuit 29-BR, check ground with negative lead when doing the following checks.			
	3. Check for voltage at ground point of circuit 99D-BK.	12-volts dc nominal.	Go to step 4.	Clean and/or tighten ground point connec-
	4. Check for voltage at circuit 99D-BK terminal of washer lamp.	12-volts dc nominal.	Go to step 5 or 6.	Repair circuit 99D-BK (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
38.	**WASHER LAMP AND/OR WIPER LAMP NOT WORKING (Continued).**			
5.	Check for voltage at circuit 99C-BK terminal of wiper lamp.	12-volts dc nominal.	Replace bulb (para 3-86).	Repair circuit 99C-BK (para 3-127).
6.	Check for voltage at circuit 29C-BR terminal of washer lamp.	12-volts dc nominal.	Replace bulb (para 3-86).	Repair circuit 29C-BR (para 3-127).



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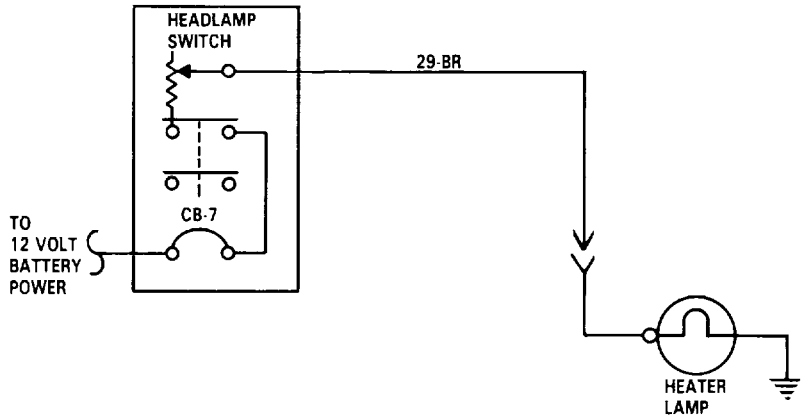
TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
39. HEATER LAMP NOT WORKING.				
	NOTE Headlamp rheostat switch must be rotated fully clockwise when doing the following checks.			
1	Check for voltage at circuit 29-BR terminal of headlamp switch.	12-volts dc nominal	Go to step 2	Refer to malfunction 44.
2	Check for voltage at circuit 29-BR terminal of heater lamp connector.	12-volts dc nominal 3-127).	Go to step 3 29-BR (para	Repair circuit
3	Remove bulb from heater lamp socket (para 3-87), and go to step 4.			
4	Check for voltage at socket	12-volts dc nominal	Replace bulb (para 3-87)	Clean socket and install bulb (para 3-87).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

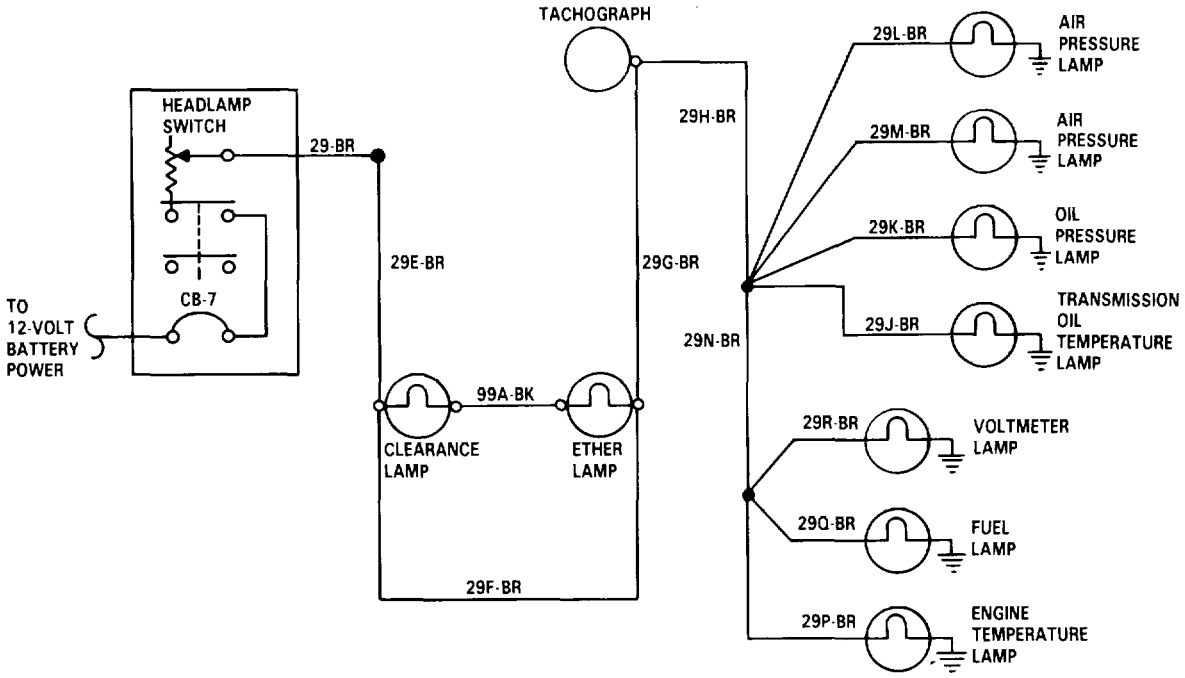
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

40. INSTRUMENT PANEL GAGE LAMP OR LAMPS NOT WORKING.

NOTE

- Headlamp rheostat switch must be rotated fully clockwise and pulled out to ON position when doing the following checks.
- Do steps 1 thru 5 only if all lamps are not working.
- Do steps 6 thru 8 only if one lamp is not working. Faulty fuel lamp is shown in this procedure.

1.	Check for voltage at circuit 29-BR terminal Of headlamp switch.	12-volts dc nominal.	Go to step 2.	Refer to malfunction 44.



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

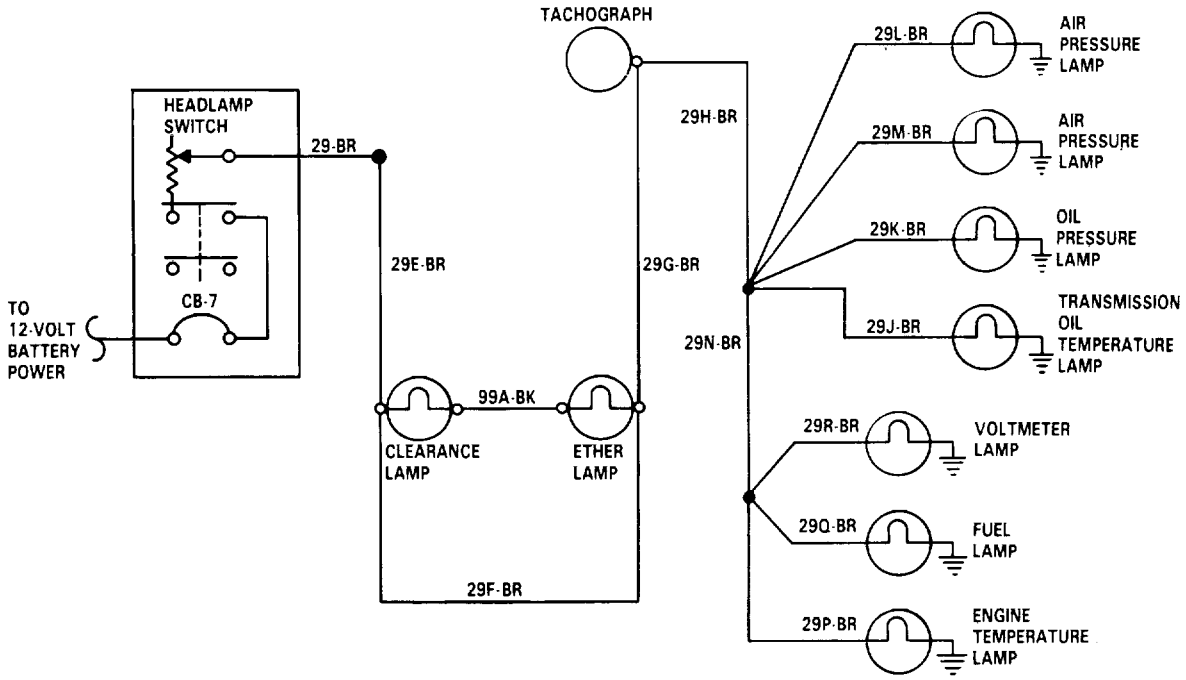
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
40.	**INSTRUMENT PANEL GAGE LAMP OR LAMPS NOT WORKING (Continued).**			
2	Check for voltage at circuit 29E-BR terminal of clearance lamp	12-volts dc nominal 29-BR (para	Go to step 3 29E-BR and/or	Repair circuit
3	Check for voltage at circuit 29F-BR terminal of ether lamp	12-volts dc nominal 3-127).	Go to step 4 29F-BR (para	Repair circuit
4	Check for voltage at circuit 29G-BR terminal of tachograph	12-volts dc nominal 3-127).	Go to step 5 29G-BR (para	Repair circuit
5	Check for voltage at circuit 29K-BR terminal of oil pressure lamp	12-volts dc nominal circuit OK	Instrument panel lamp 3-127).	Repair circuit 29H-BR (para
6	Check for voltage at circuit 29Q-BR terminal of fuel gage	12-volts dc nominal 29N-BR	Go to step 7 29Q-BR and/or (para	Repair circuit
7	Remove bulb from socket (para 3-73), and go to step 8.			
8	Check for voltage at circuit 29Q-BR socket of fuel lamp	12-volts dc nominal tion.	Replace bulb (para 3-73)	Clean lamp socket connec-

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

40. INSTRUMENT PANEL LAMP OR LAMPS NOT WORKING (Continued).



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TROUBLESHOOTING.

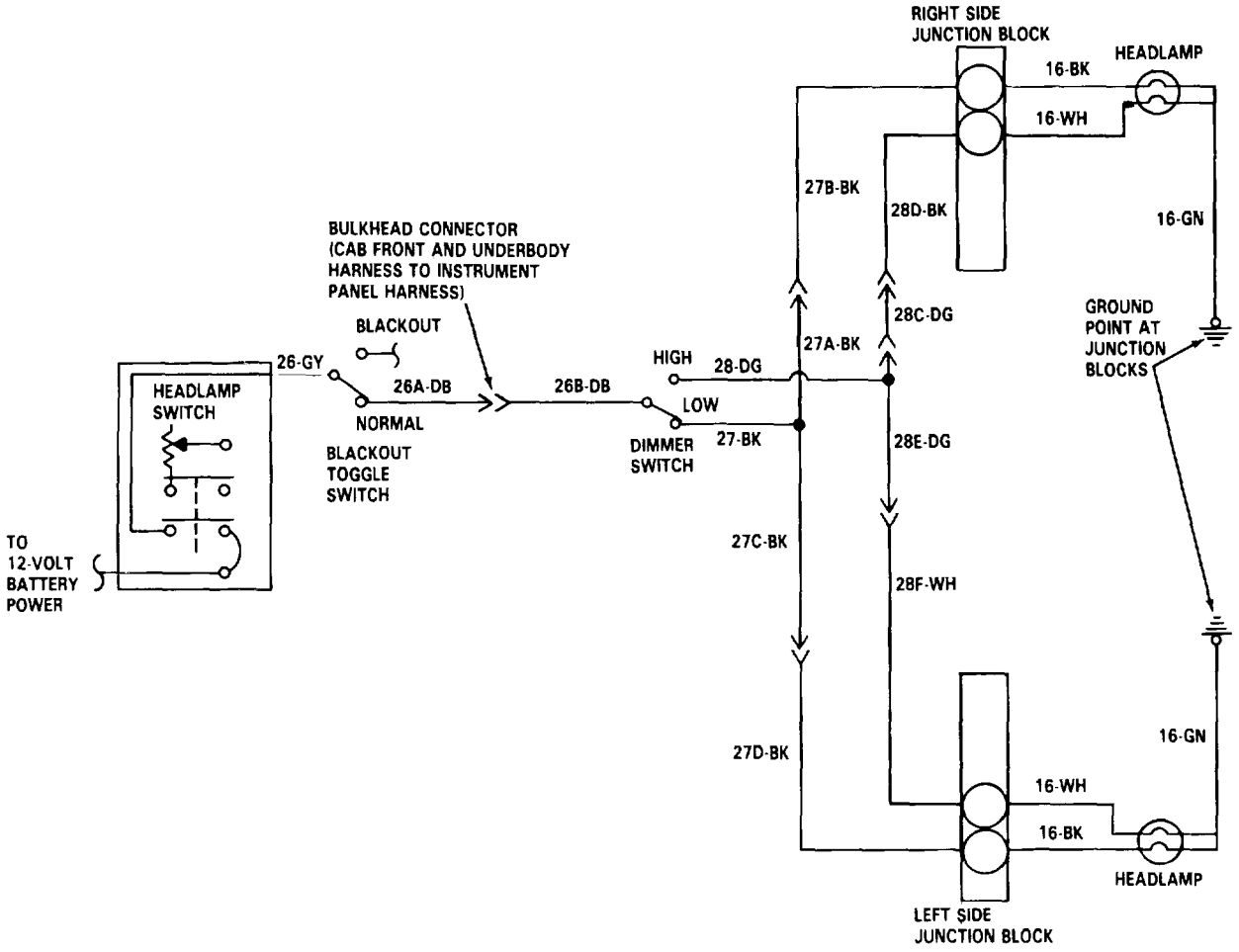
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
41.	**BOTH HEADLAMPS BLINK ON AND OFF.**			
	NOTE Blackout toggle switch must be set to NORMAL position and headlamp switch in ON position when doing steps 1 and 2.			
1.	Set dimmer switch to low beam position.	Lamp blinks on and off.	Go to step 3.	Go to step 2.
2.	Set dimmer switch to high beam position.	Lamp blinks on and off.	Go to step 13.	Headlamp OK.
3.	Set blackout toggle switch to BLACKOUT position.	Blackout headlamp blinks on and off.	Go to step 4.	Repair circuit 26-GY (para 3-127) and/or refer to malfunction 44.
4.	Set blackout toggle switch to NORMAL position. Check circuit 26A-DB terminal of blackout toggle switch.	Loose.	Tighten connection,	Go to step 5.
5.	Turn off headlamp switch, and go to step			
6.	Check circuit 26A-DB to circuit 26B-DB for continuity.	Infinity.	Repair circuit 26A-DB (para 3-127).	Go to step 7.
7.	Check circuit 26B-DB to dimmer switch for continuity.	Infinity.	Repair circuit 26B-DB (para 3-127).	Go to step 8.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
41. BOTH HEADLAMPS BLINK ON AND OFF (Continued).				
	8. Turn on headlamp switch, and go to step 9.			
	9. Check circuit 26B-DB terminal of dimmer switch.	Loose.	Tighten connection.	Go to step 10.



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TROUBLESHOOTING.

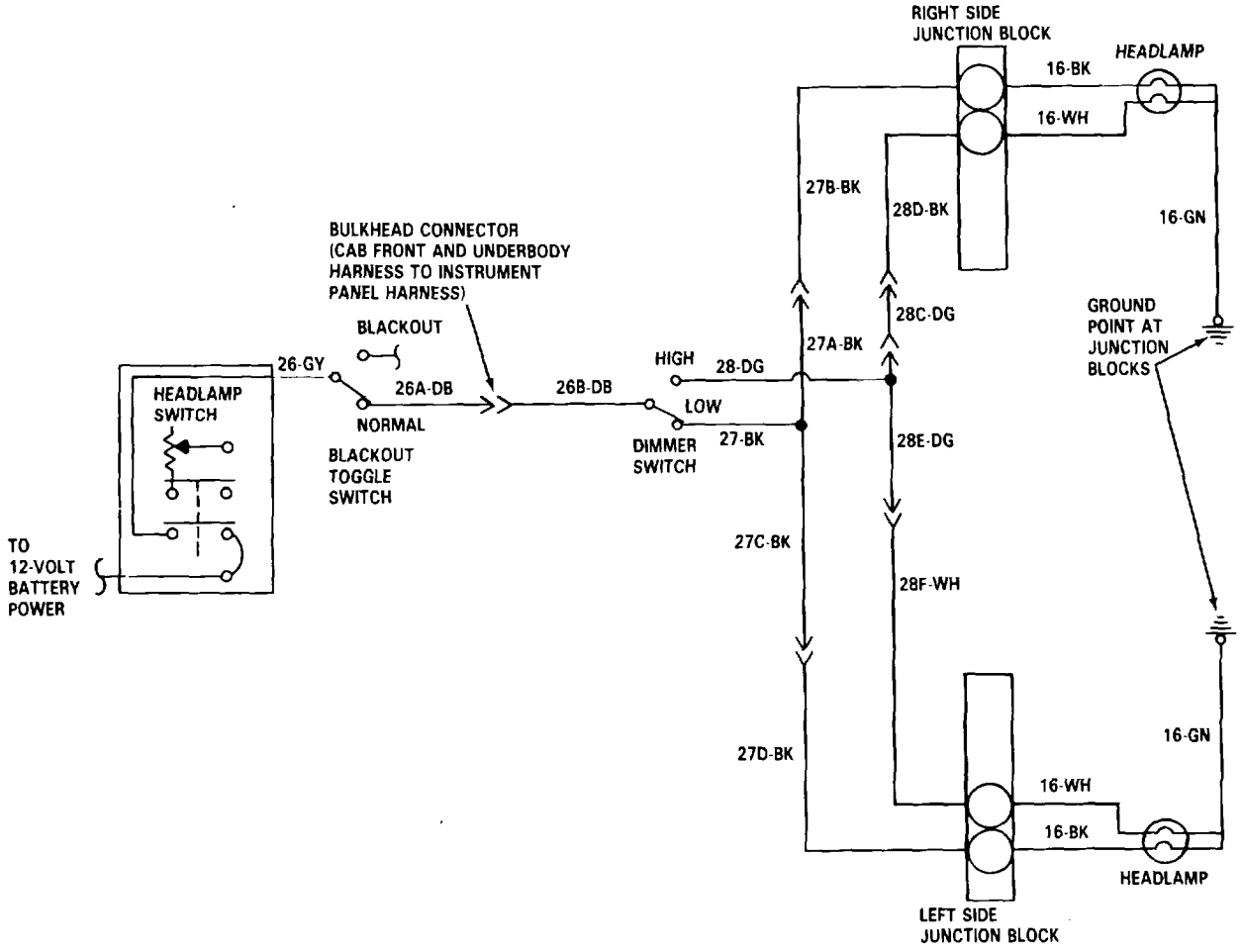
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
41.	**BOTH HEADLAMPS BLINK ON AND OFF (Continued).**			
10.	Check circuit 27-BK terminal of dimmer switch.	Loose.	Tighten connection.	Go to step 11.
11.	Turn off headlamp switch, and go to step 12.			
12.	Check circuit 27-BK for continuity.	Infinity.	Repair circuit 27-BK (para 3-127).	Low beam headlamp circuit OK.
13.	Set blackout toggle switch to BLACKOUT position.	Blackout headlamp blinks on and off	Repair circuit 26-GY (para 3-127).	Go to step 14.
14.	Set blackout toggle switch to NORMAL position. Check circuit 26A-DB terminal of operation switch. 15. Turn off headlamp switch, and go to step 16.	Loose.	Tighten connection.	Go to step 15.
16.	Check circuit 26A-DB to circuit 26B-DB for continuity.	Infinity.	Repair circuit 26A-DB (para 3-127).	Go to step 17.
17.	Check circuit 26B-DB to dimmer switch for continuity.	Infinity.	Repair circuit 26B-DB (para 3-127).	Go to step 18.
18.	Turn on headlamp switch, and go to step 19.		Go to step 20.	
19.	Check circuit 26B-DB terminal of dimmer switch.	Loose.	Tighten connections.	Go to step 20.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
41. BOTH HEADLAMPS BLINK ON AND OFF (Continued).				
20.	Check circuit 28-DG terminal of dimmer switch.	Loose. connection.	Tighten	Go to step 21.
21.	Turn off headlamp switch, and go to step 22.			
22.	Check circuit 28-DG for continuity.	Infinity. 28C-DG (para	Repair circuit lamp circuit	High beam head-



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TROUBLESHOOTING.

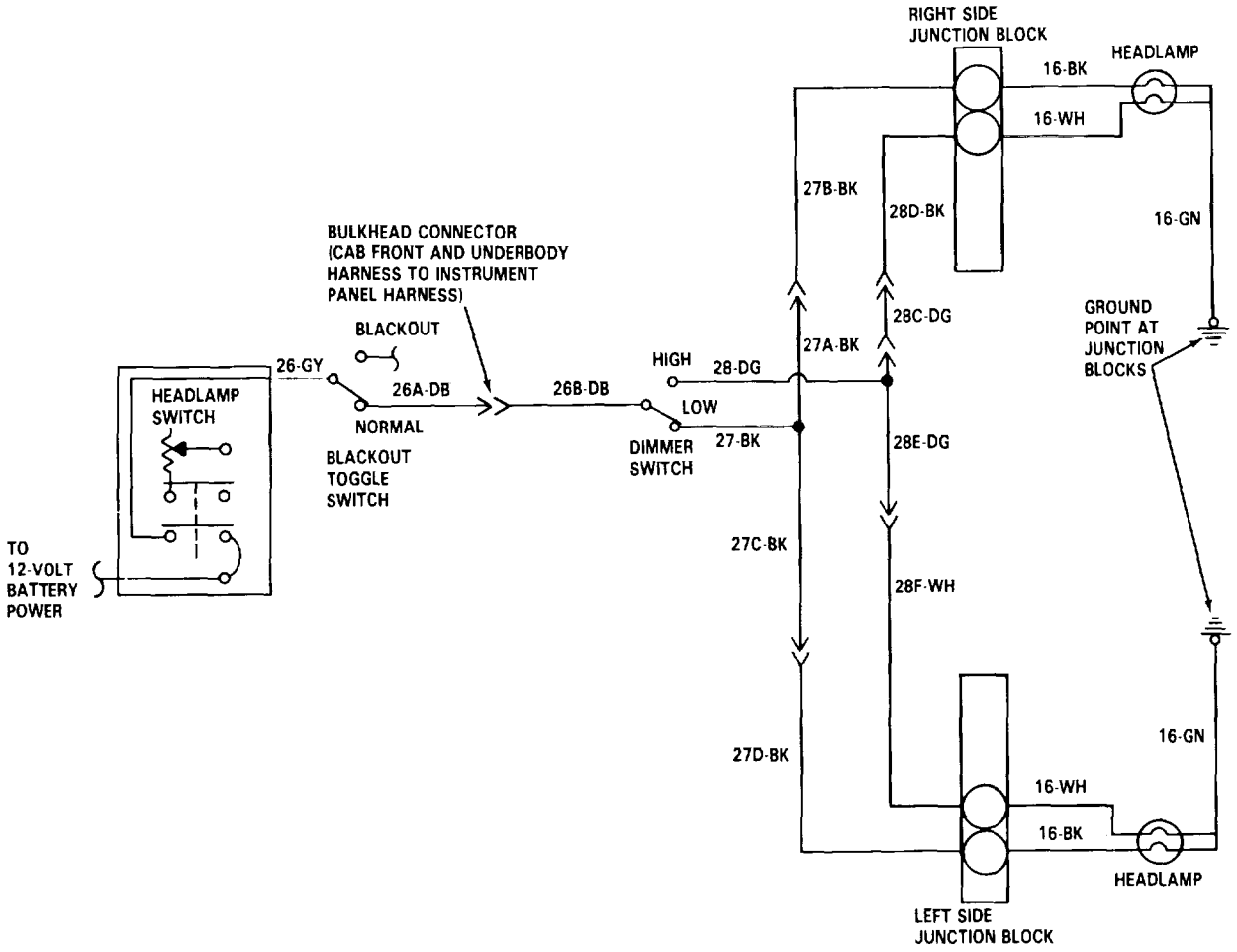
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
42. ONE HEADLAMP NOT WORKING.				
	NOTE • Blackout toggle switch must be set to NORMAL position and headlamp switch in ON position when doing the following checks. • Faulty right-side headlamp is shown in this procedure. Apply similar troubleshooting technique for left- side headlamp.			
1.	Set dimmer switch to low beam position. (para 3-91).	Headlamp works.	Replace headlamp	Go to step 2.
2.	Set dimmer switch to high beam position. (para 3-91).	Headlamp works.	Replace headlamp	Go to step 3.
3.	Remove right-side headlamp assembly far enough to expose junction block (para 3-91), and go to step 4.			
4.	With dimmer switch set on high beam, check for voltage at circuit 16-WH terminal of headlamp connector. side headlamp assembly (para 3-91).	12-volts dc nominal.	Go to step 5.	Repair circuit 28D-BK, 28C-DG, and/or 16-WH (para 3-127). Install right-
	NOTE With positive lead on circuit 16-WH, check ground using negative lead when doing the following checks.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
42. ONE HEADLAMP NOT WORKING (Continued).				
	5. Check for voltage of circuit 16-GN ground point at junction block.	12-volts dc nominal.	Go to step 6.	Clean and/or tighten connection.



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

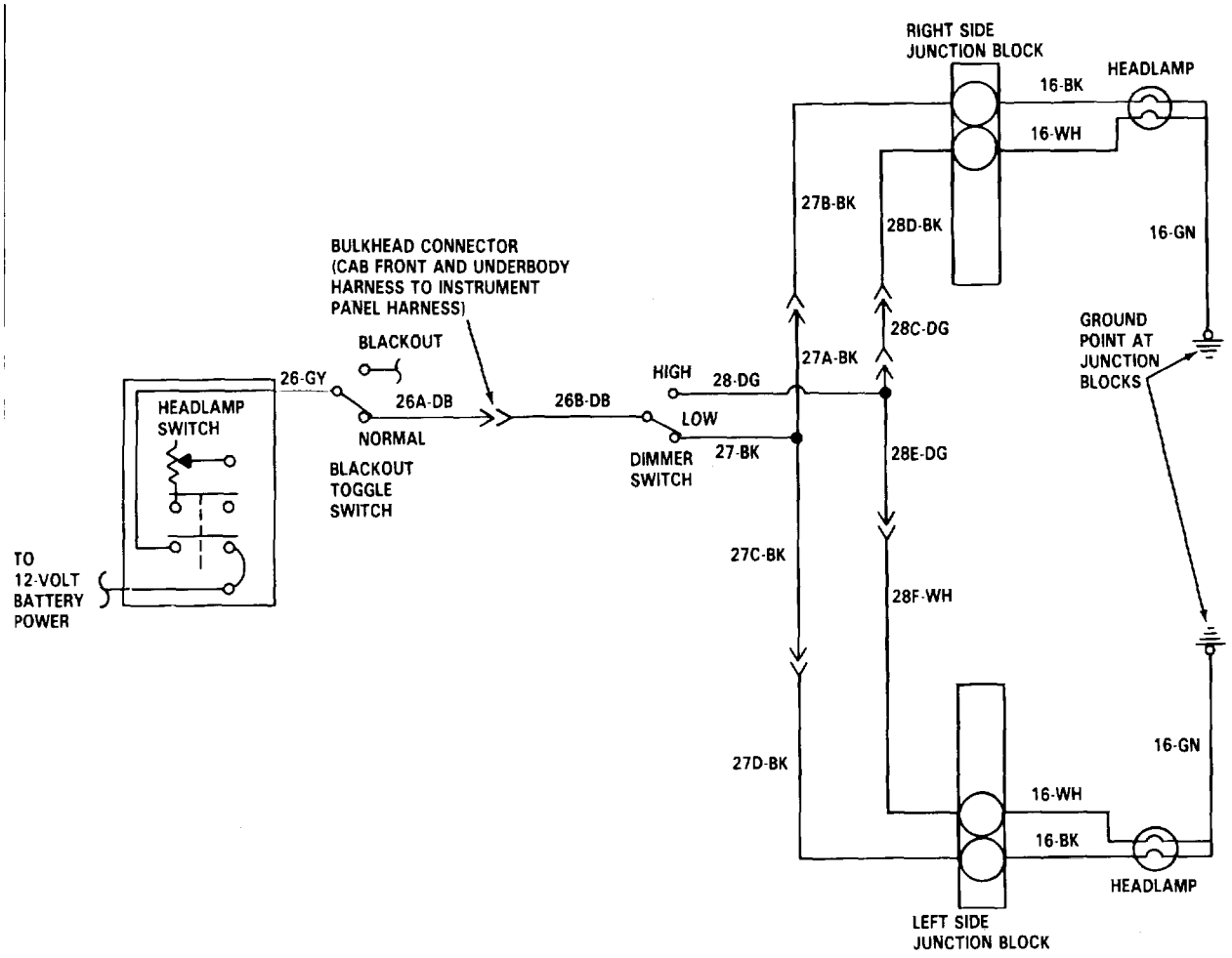
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
42. ONE HEADLAMP NOT WORKING (Continued).				
6.	Check for voltage at circuit 16-GN terminal of headlamp connector.	12-volts dc nominal.	Replace headlamp (para 3-91).	Repair circuit 16-GN (para 3-127).
43. BOTH HEADLAMPS NOT WORKING IN EITHER HIGH OR LOW BEAM POSITION.				
	NOTE Headlamp switch must be set to ON position when doing the following checks.			
1.	Set blackout toggle switch to BLACKOUT position.	Blackout headlamp lights.	Go to step 4.	Go to step 2.
2.	Check for voltage at circuit 26-GY terminal of headlamp switch.	12 volts dc nominal.	Go to step 3.	Refer to malfunction 44.
3.	Check for voltage at circuit 26-GY terminal of blackout toggle switch.	12-volts dc nominal.	Go to step 4.	Repair circuit 26-GY (para 3-127).
4.	Set blackout toggle switch to NORMAL position. Check for voltage at circuit 26A-DB terminal of blackout toggle switch.	12-volts dc nominal.	Go to step 5.	Replace blackout toggle switch (para 3-79).
5.	Check for voltage at circuit 26B-DB terminal of dimmer switch.	12-volts dc nominal.	Replace dimmer switch (para 3-82).	Repair circuit 26B-DB (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

43. BOTH HEADLAMPS NOT WORKING IN EITHER HIGH OR LOW BEAM POSITION (Continued).



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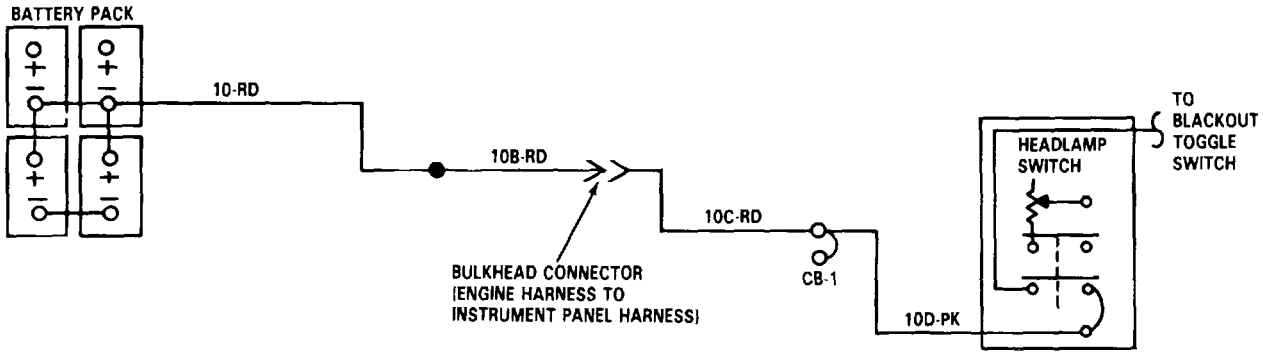
TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
44. HEADLAMP SWITCH NOT WORKING.				
1	Check for voltage at circuit 10-RD terminal of battery.	12-volts dc nominal	Go to step 2 function 18.	Refer to mal-
2	Disconnect circuit O1B-RD from 10OC-RD at engine harness connector, and go to step 3.			
3	Check for voltage at circuit 1OB-RD 10C-RD, and go to step 4	12-volts dc nominal 10-RD (para 3-127).	Connect circuit 1OB-RD to	Repair circuit 10B-RD and/or
4	Check for voltage at circuit 1OC-RD terminal of circuit breaker CB-1.	12-volts dc nominal 3-127).	Go to step 5 IOC-PK (para	Repair circuit
5	Check for voltage at circuit 1OD-PK terminal of headlamp switch	12-volts dc nominal (para 3-78)	Replace headlamp switch 3-127).	Repair circuit 1OD-PK (para



TA 236879

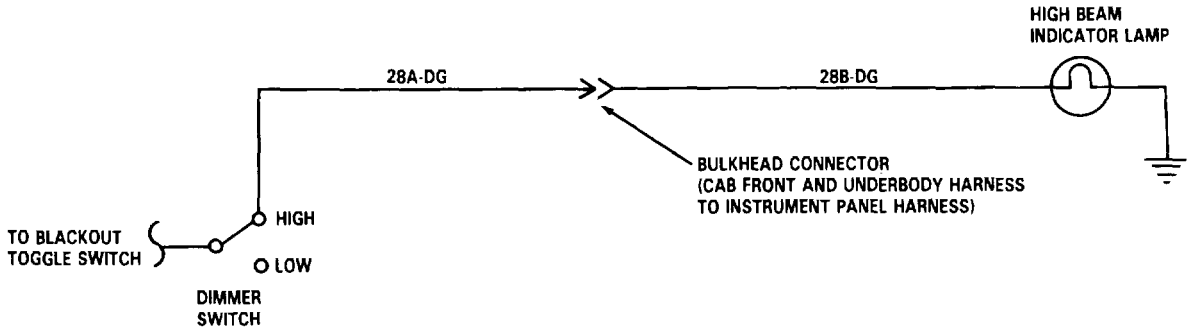
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

45. DIMMER SWITCH INDICATOR LAMP NOT WORKING

NOTE

Blackout toggle switch must be set to NORMAL position, headlamp switch must be set to ON position, and dimmer switch must be set on high beam when doing the following checks.

1.	Disconnect circuit 28A-DG from 28B-DG at connector, and go to step 2.			
2.	Check for voltage at circuit 28A-DG (pin G of connector). go to step 3.	12-volts dc nominal.	Connect circuit 28A-DG to 28B-DG, and	Repair circuit 28A-DG (para 3-127).
3.	Remove bulb from lamp socket (para 3-87), and go to step 4.			
4.	Check for voltage at circuit 28B-DG terminal of socket. (para 3-127).	12-volts dc nominal.	Replace bulb (para 3-87).	Clean socket and/or repair circuit 28B-DG



TA 236880

TROUBLESHOOTING.

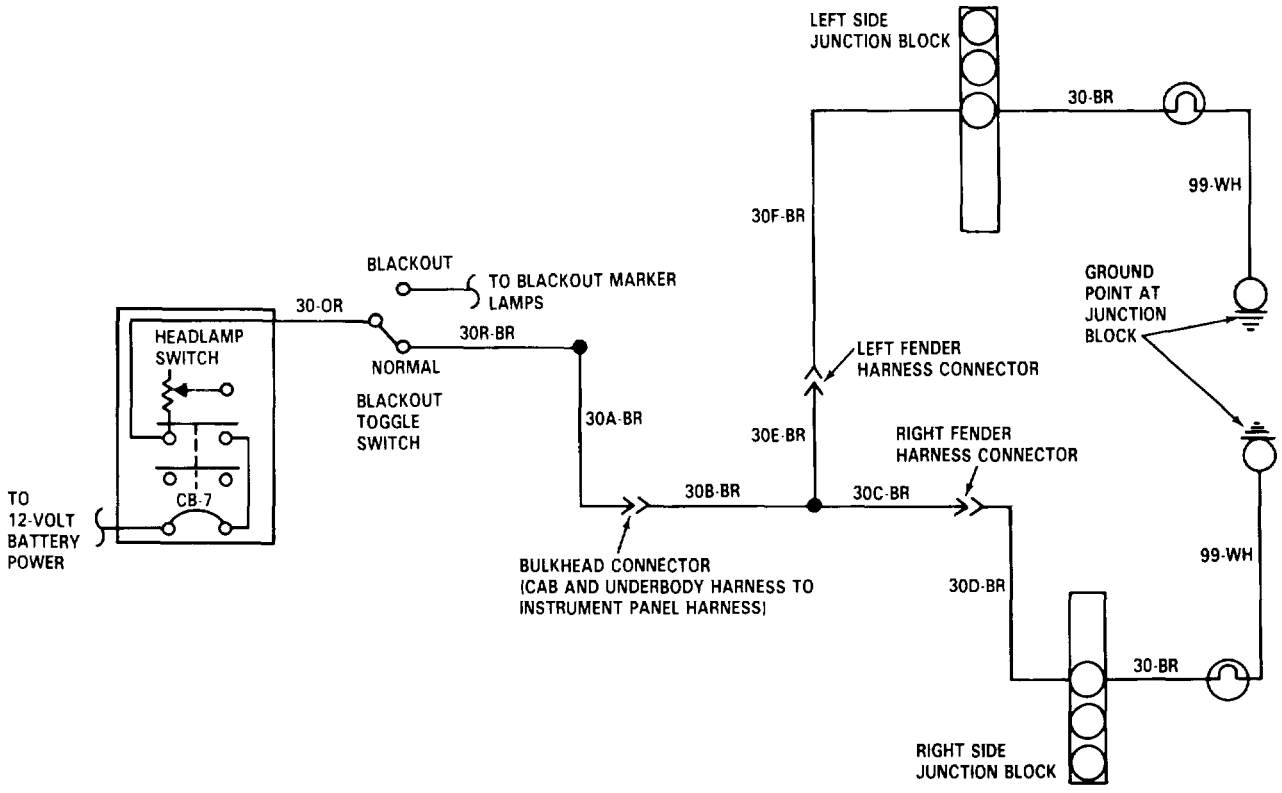
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
46. BOTH FRONT MARKER LAMPS NOT WORKING (FRONT TURN SIGNAL LAMPS OK).				
	NOTE Blackout toggle switch must be set to NORMAL position and headlamp switch must be set to ON position when doing the following checks.			
1.	Check for voltage at circuit 30-OR terminal of headlamp switch.	12-volts dc nominal.	Go to step 2.	Refer to malfunction 44.
2.	Check for voltage at circuit 30-OR terminal of blackout toggle switch.	12-volts dc nominal.	Go to step 3.	Repair circuit 30-OR (para 3-127).
3.	Check for voltage at circuit 30R-BR of blackout toggle switch.	12-volts dc nominal.	Go to step 4.	Replace blackout toggle switch (para
4.	Disconnect circuit 30A-BR from 30B-BR of connector, and go to step 6.			
5.	Check for voltage at circuit 30A-BR (pin B of connector).	12-volts dc nominal.	Connect circuit 30A-BR to 30B-BR, and go to step 6.	Repair circuit 30A-BR and/or 30R-BR (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
46. BOTH FRONT MARKER LAMPS NOT WORKING (FRONT TURN SIGNAL LAMPS OK) (Continued).				
	6. Disconnect circuit 30E-BR from 30F-BR of connector, and go to step 7.			
	7. Check for voltage at circuit 30E-BR (pin B of connector).	12-volts dc nominal.	Connect circuit 30E-BR to 30F-BR. Marker lamp circuit OK.	Repair circuit 30B-BR (para 3-127). Connect circuits 30E-BR and 30F-BR.



TA 236881

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

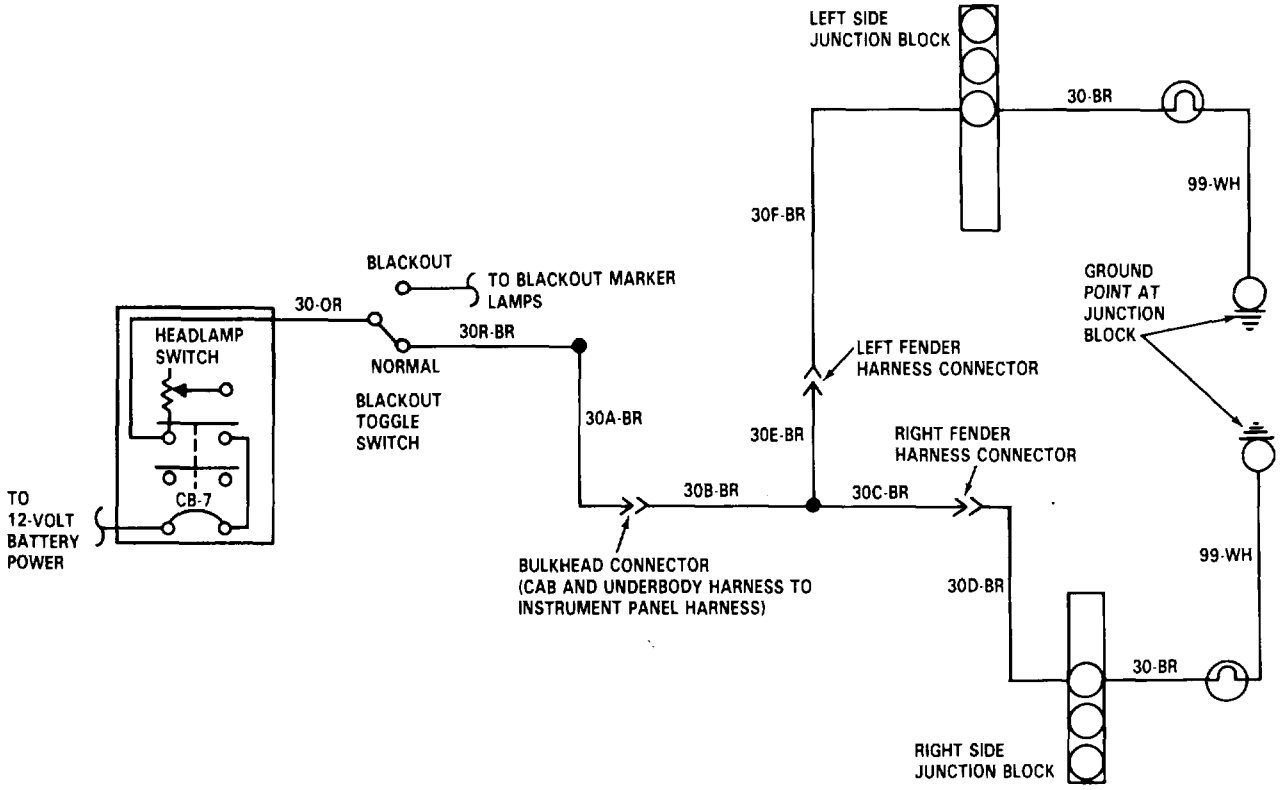
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
47. ONE FRONT MARKER LAMP NOT WORKING (FRONT TURN SIGNAL LAMP OK).				
	NOTE • Set blackout toggle switch to NORMAL position and headlamp switch to ON position when doing the following checks. • Faulty right marker lamp is shown in this procedure. Apply similar troubleshooting technique for left marker lamp.			
1.	Disconnect circuit 30C-BR from 30D-BR at connector, and go to step 2.			
2.	Check for voltage at 30C-BR terminal of connector. and go to step 3.	12-volts dc nominal.	Connect circuit 30C-BR to 30D-BR,	Repair circuit 30C-BR (para 3-127).
3.	Remove headlamp assembly (para 3-91), and go to step 4.			
4.	Check for voltage at circuit 30D-BR of junction block.	12-volts dc nominal.	Go to step 5.	Repair circuit 30D-BR (para 3-127). Install headlamp assembly (para 3-91).
5.	Remove marker lamp bulb (para 3-92), and go to step 6.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

47. ONE FRONT MARKER LAMP NOT WORKING (FRONT TURN SIGNAL LAMP OK) (Continued).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

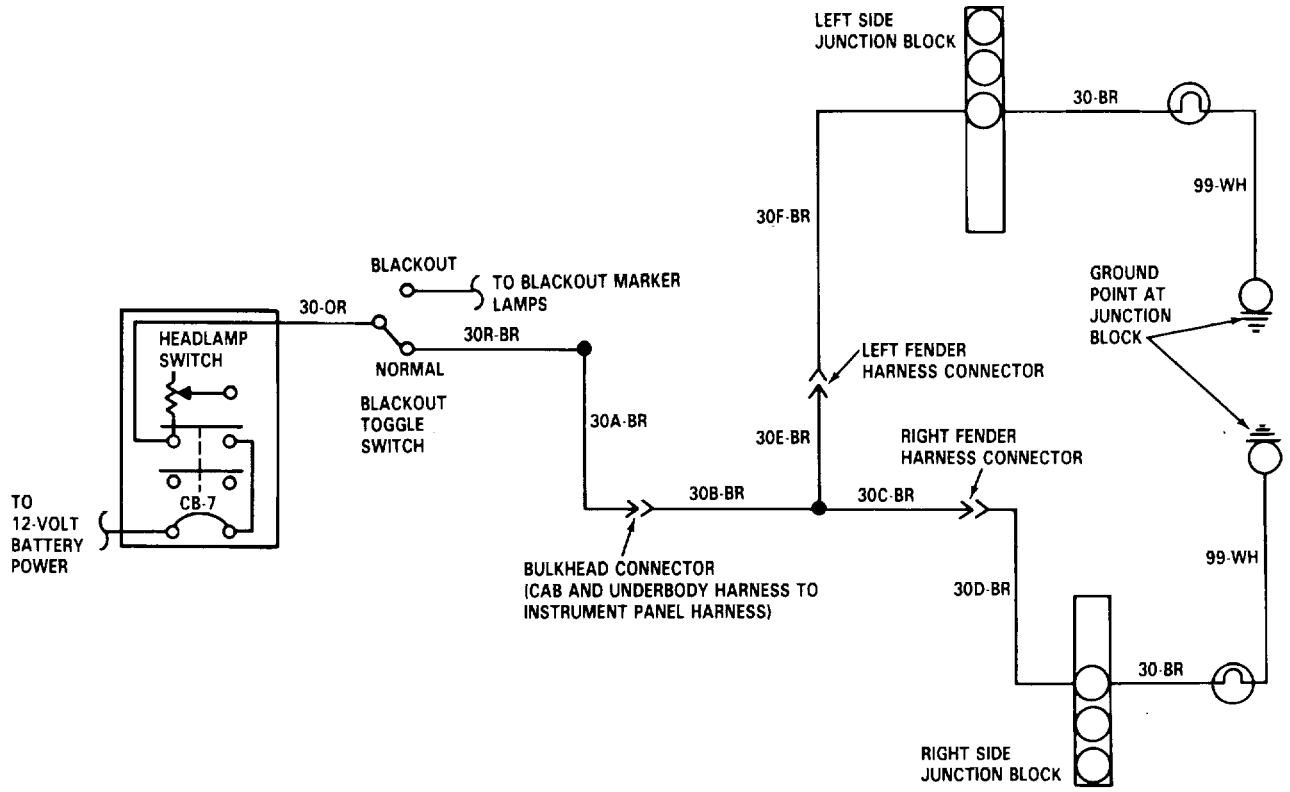
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
47. ONE FRONT MARKER LAMP NOT WORKING (FRONT TURN SIGNAL LAMP OK) (Continued).				
	NOTE With positive lead connected to circuit 30-BR, check ground with negative lead when doing the following checks.			
	6. Check for voltage at circuit 30-BR terminal of lamp socket.	12-volts dc nominal.	Install bulb (para 3-92), and go to step 7.	Repair circuit 30-BR (para 3-127). Install bulb (para 3-92). Install headlamp assembly (para 3-91).
	7. Check for voltage at circuit 99-WH terminal of ground point at junction block.	12-volts dc nominal.	Go to step 8.	Install headlamp assembly (para 3-91).
	8. Check for voltage at circuit 99-WH terminal of lamp socket.	12-volts dc nominal.	Replace bulb (para 3-92). Install headlamp assembly (para 3-91). Marker lamp circuit OK.	Repair circuit 99-WH (para 3-127). Replace bulb (para 3-92). Install headlamp assembly (para 3-91).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

47. ONE FRONT MARKER LAMP NOT WORKING (FRONT TURN SIGNAL LAMP OK) (Continued).



TA 236883

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

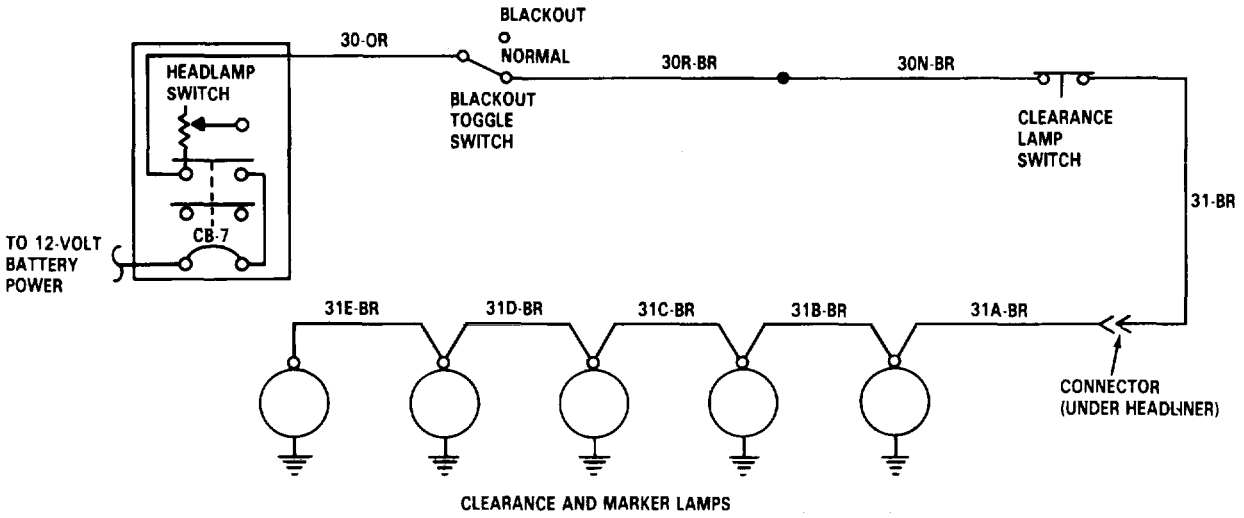
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
48.	**ONE OR MORE CAB CLEARANCE AND MARKER LAMPS NOT WORKING.**			
	NOTE • If all cab clearance and marker lamps do not work, go to malfunction 49. • Blackout toggle switch must be set to NORMAL position and headlamp switch in ON position when doing the following checks. • It is assumed here that lamp at circuit 31D-BR and 31E-BR is working. Apply similar troubleshooting technique for other lamp combinations.			
	1. Remove bulb at circuit 31E-BR (para 3-93), and go to step 2.			
	2. Check for voltage at circuit 31E-BR terminal of lamp socket.	12-volts dc nominal.	Replace bulb (para 3-93), and go to step 3.	Repair circuit 31E-BR (para 3-127). Install bulb (para 3-93), and go to step 3.
	3. Remove bulb at circuit 31A-BR (para 3-93), and go to step 4.			
	4. Check for voltage at circuit 31A-BR terminal of socket.	12-volts dc nominal.	Replace bulb (para 3-95), and go to step 5.	Repair circuit 31A-BR (para 3-127). Install bulb (para 3-93), and go to step 5.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

48. ONE OR MORE CAB CLEARANCE AND MARKER LAMPS NOT WORKING (Continued).



TA 236884

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

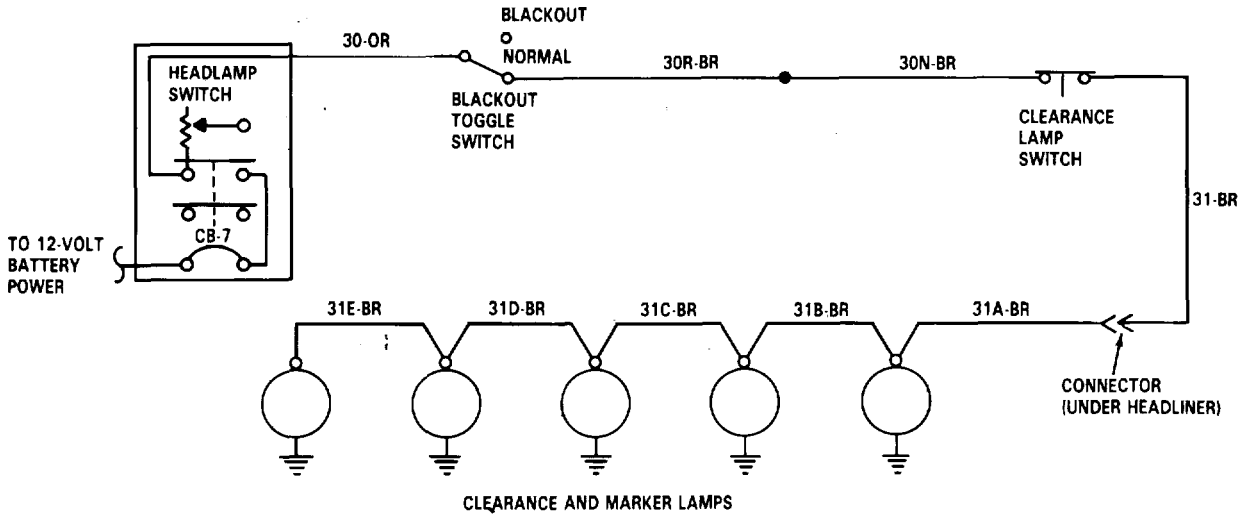
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
48.	**ONE OR MORE CAB CLEARANCE AND MARKER LAMPS NOT WORKING (Continued).**			
	5. Remove bulb at circuit 31B-BR and 31C-BR (para 3-93), and go to step 6.			
	6. Check for voltage at circuit 31B-BR terminal of socket.	12-volts dc nominal.	Replace bulb (para 3-93), and go to step 7.	Repair circuit 31B-BR (para 3-127). Install bulb (para 3-93), and go to step 7.
	7. Remove bulb at circuit 31C-BR and 31D-BR (para 3-93), and go to step 8.			
	8. Check for voltage at circuit 31C-BR terminal of socket.	12-volts dc nominal.	Replace bulb (para 3-93).	Repair circuit 31C-BR (para 3-127). Install bulb (para 3-93).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

48. ONE OR MORE CAB CLEARANCE AND MARKER LAMPS NOT WORKING (Continued).



TA 236885

TROUBLESHOOTING.

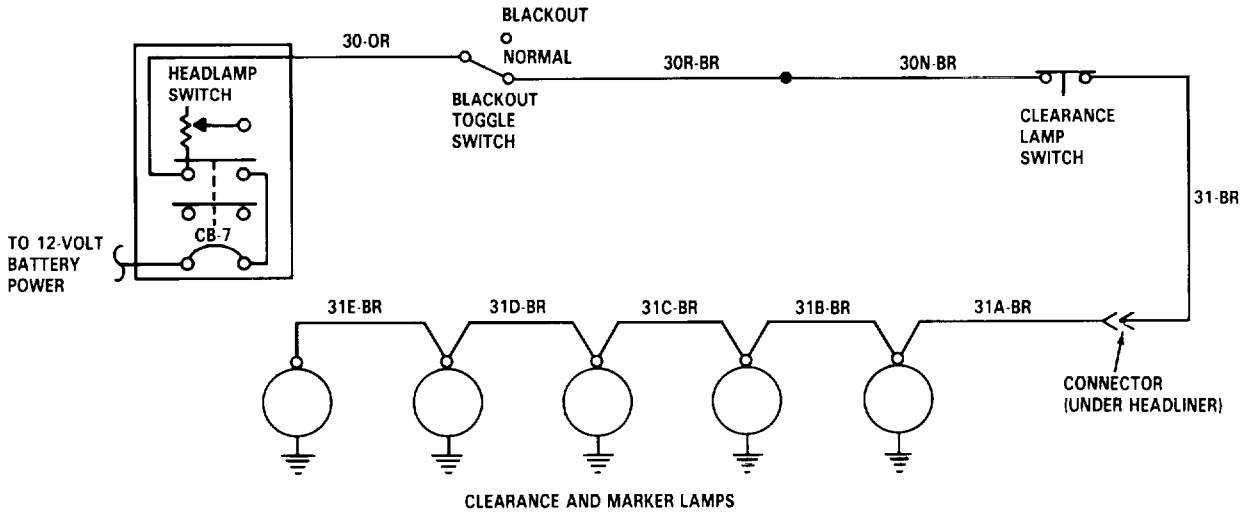
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
49.	**ALL CAB CLEARANCE AND MARKER LAMPS NOT WORKING.**			
	NOTE Blackout toggle switch must be set to NORMAL position and headlamp switch in ON position when doing the following checks.			
1.	Check for voltage at circuit 30-OR terminal of headlamp switch.	12-volts dc nominal.	Go to step 2.	Refer to malfunction 44.
2.	Check for voltage at circuit 30-OR terminal of blackout toggle switch.	12-volts dc nominal.	Go to step 3.	Repair circuit 30-OR (para 3-127).
3.	Check for voltage at circuit 30R-BR terminal of blackout toggle switch.	12-volts dc nominal.	Go to step 4.	Replace blackout toggle switch (para 3-79).
4.	Check for voltage at circuit 30N-BR terminal of clearance lamp switch.	12-volts dc nominal.	Go to step 5.	Repair circuit 30N-BR and/or 30R-BR (para 3-127).
5.	Check for voltage at circuit 31-BR terminal of clearance lamp switch.	12-volts dc nominal.	Go to step 6.	Replace clearance lamp switch (para 3-93).
6.	Remove four to six screws at upper left corner of cab headliner to access connector, and go to step 7.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
49.	**ALL CAB CLEARANCE AND MARKER LAMPS NOT WORKING (Continued).**			
7.	Disconnect circuit 31-BR from 31A-BR at connector, and go to step 8.			
8.	Check for voltage at circuit 31-BR terminal of connector.	12-volts dc nominal.	Connect circuit 31-BR and 31A-BR, and go to step 9.	Repair circuit 31-BR (para 3-127). Install headliner (para 3-275).
9.	Check for voltage at circuit 31A-BR terminal of lamp.	12-volts dc nominal.	Cab clearance and marker lamp circuit OK. Go to malfunction 48.	Repair circuit 31A-BR (para 3-127). Install headliner (para 3-275).



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TROUBLESHOOTING.

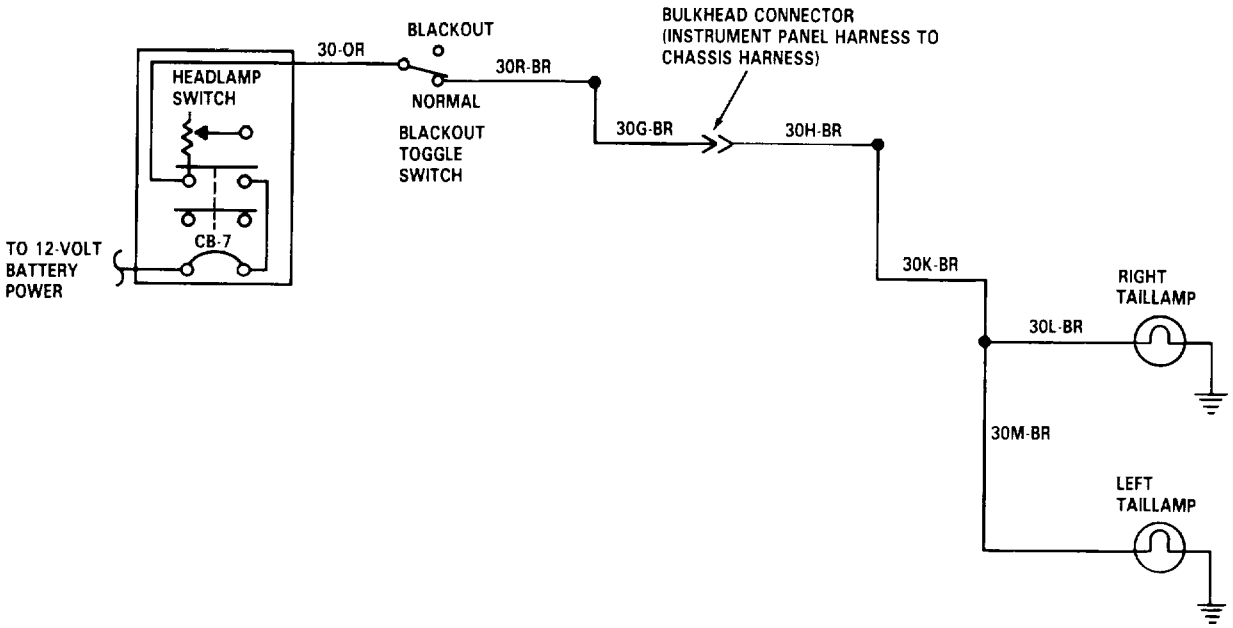
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
50.	**ONE TAILLAMP NOT WORKING.**			
	NOTE • Blackout toggle switch must be set to NORMAL position and headlamp switch in ON position when doing the following checks. • Faulty left taillamp is shown in this procedure. Apply similar troubleshooting technique for right taillamp.			
	1. Remove bulb (para 3-96), and go to step 2.			
	2. Check for voltage at lamp socket.	12-volts dc nominal.	Replace bulb (para 3-96).	Go to step 3.
	3. Check for voltage at circuit 30M-BR terminal of taillamp assembly.	12-volts dc nominal.	Clean connection at socket or replace taillamp (para 3-96).	Repair circuit 30M-BR (para 3-127). Install taillamp bulb (para 3-96).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
51. BOTH TAILLAMPS NOT WORKING.				
	NOTE Blackout toggle switch must be set to NORMAL position and headlamp switch in ON position when doing the following checks.			
1.	Check for voltage at circuit 30-OR terminal of headlamp switch.	12-volts dc nominal.	Go to step 2.	Refer to malfunction 44.
2.	Check for voltage at circuit 30-OR terminal of blackout toggle	12-volts dc nominal.	Go to step 3.	Repair circuit 30-OR (para 3-127).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

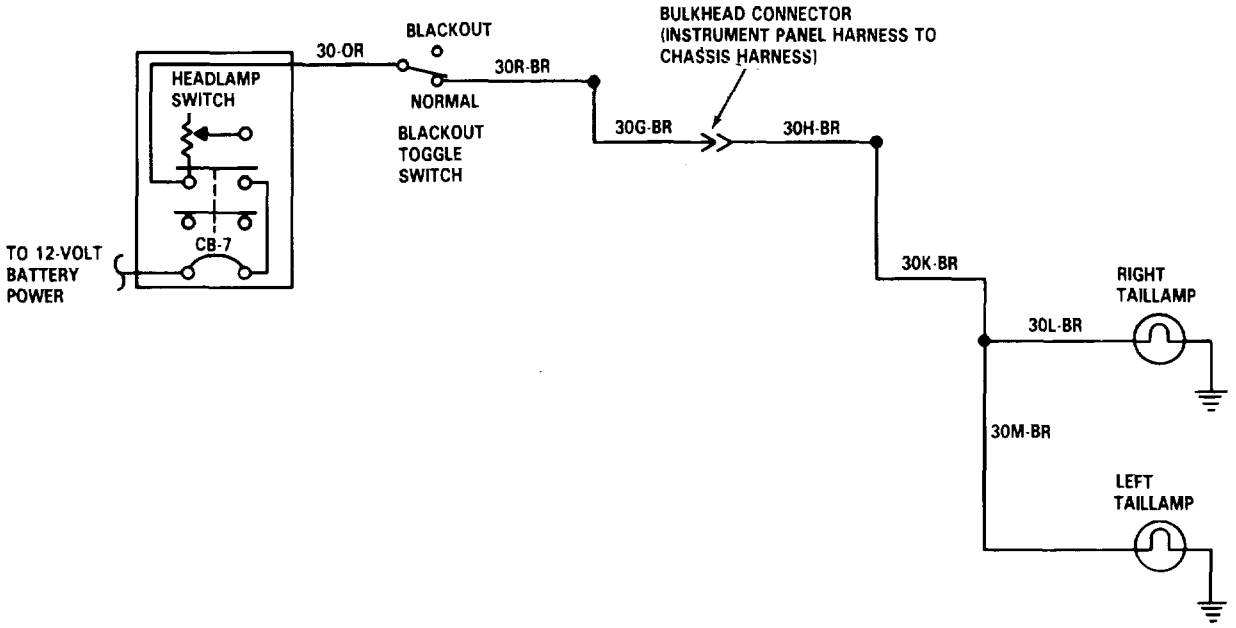
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
51. BOTH TAILLAMPS NOT WORKING (Continued).				
3.	Check for voltage at circuit 30R-BR terminal of blackout toggle switch.	12-volts dc nominal.	Go to step 4.	Replace black-out toggle switch (para 3-79).
4.	Disconnect 30G-GR from 30H-BR, and go to step 5.			
5.	Check for voltage at circuit 30G-BR terminal of connector.	12-volts dc nominal.	Connect circuit 30G-BR to 30H-BR, and go to step 6.	Repair circuit 30G-BR and/or 30R-BR (para 3-127).
6.	Check for voltage at circuit 30L-BR terminal of right taillamp. 3-96), and go to step 7.	12-volts dc nominal.	Clean socket and replace bulb (para	Go to step 7.
7.	Check for voltage at circuit 30M-BR terminal of left taillamp.	12-volts dc nominal.	Clean socket and replace bulb (para 3-96).	Repair circuit 30H-BR and/or 30K-BR (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

51. BOTH TAILLAMPS NOT WORKING (Continued).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

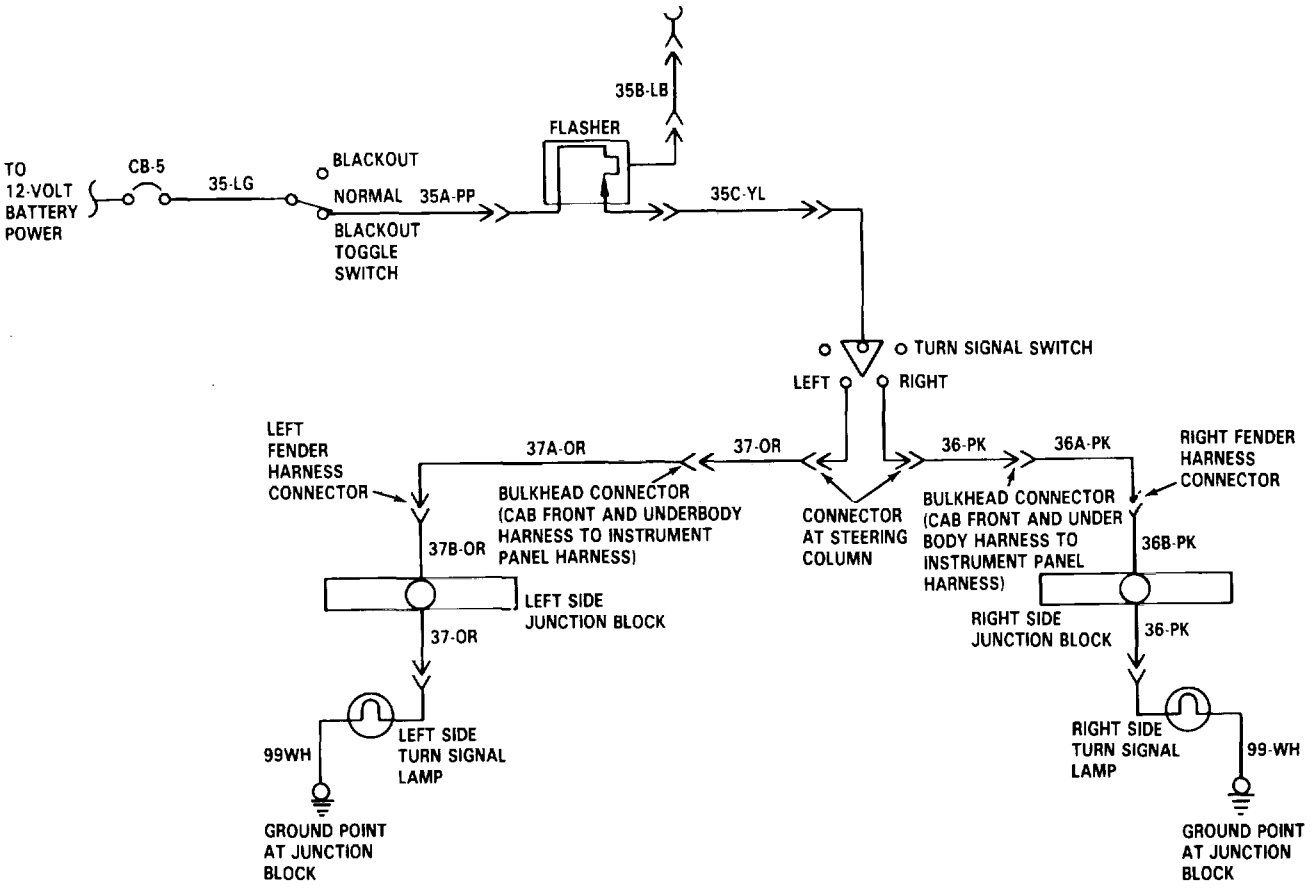
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
52. ONE FRONT TURN SIGNAL LAMP NOT WORKING.				
	NOTE • Blackout toggle switch must be set to NORMAL position and turn signal switch set for right turn. • Faulty right front turn signal lamp is shown in this procedure. Apply similar troubleshooting technique for left front turn signal.			
	1. Disconnect circuit 36-PK from 36A-PK at connector, and go to step 2.			
	2. Check for voltage at circuit 36-PK terminal of connector.	12-volts dc nominal.	Connect 36-PK to 36A-PK, and go to step 3.	Repair circuit 36-PK (para 3-127).
	3. Disconnect circuit 36B-PK from circuit 36A-PK at connector, and go to step 4.			
	4. Check for voltage at circuit 36A-PK terminal of connector. to step 5.	12-volts dc nominal.	Connect circuit 36A-PK to 36B-PK, and go	Repair circuit 36A-PK (para 3-127).
	5. Remove headlamp assembly far enough to access junction block (para 3-91), and go to step 6.			
	6. Check for voltage at circuit 36B-PK terminal of junction block.	12-volts dc nominal.	Go to step 7.	Repair circuit 36B-PK (para 3-127). Install headlamp assembly (para 3-91).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

52. ONE FRONT TURN SIGNAL LAMP NOT WORKING (Continued).



TA 236889

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

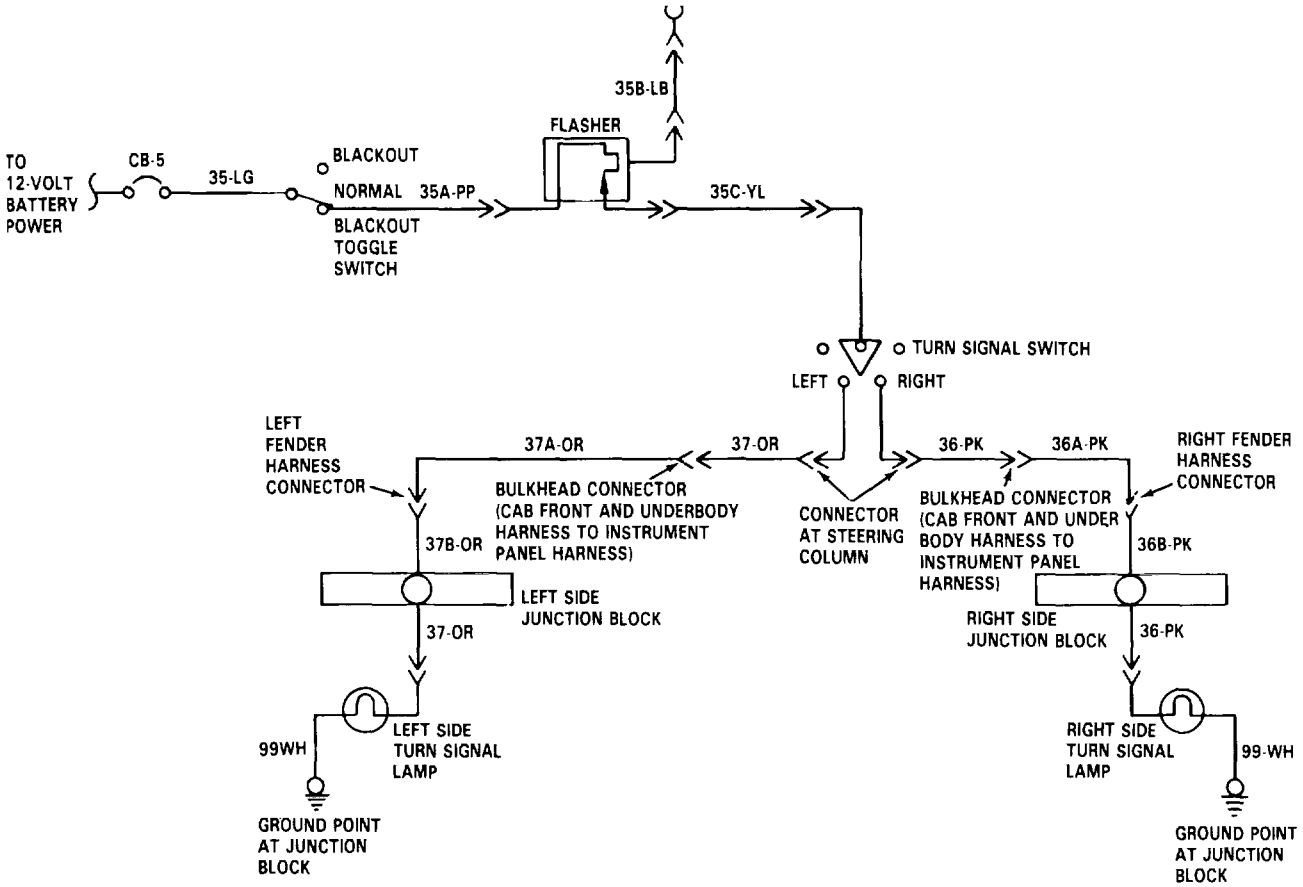
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
52.	**ONE FRONT TURN SIGNAL LAMP NOT WORKING (Continued).**			
7.	Remove bulb from socket, and go to step 8.			
8.	Check for voltage at turn signal lamp socket.	12-volts dc nominal.	Go to step 9.	Repair circuit 36-PK (para 3-127). Install headlamp assembly (para 3-91). Install turn signal bulb (para 3-92).
	NOTE With positive lead at socket, check ground with negative lead when doing the following checks.			
9.	Check for voltage at circuit 99-WH ground point of junction block.	12-volts dc nominal.	Go to step 10.	Clean and tighten ground point connection. Install assembly (para 3-78). Install turn signal bulb (para 3-92).
10.	Check for voltage at circuit 99-WH terminal of lamp socket.	12-volts dc nominal.	Replace bulb (para 3-92). Install headlamp assembly (para 3-91).	Repair circuit 99-WH (para 3-127). Install headlamp assembly (para 3-91). Install turn signal bulb (para 3-92).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

52. ONE FRONT TURN SIGNAL LAMP NOT WORKING (Continued).



TA 236890

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

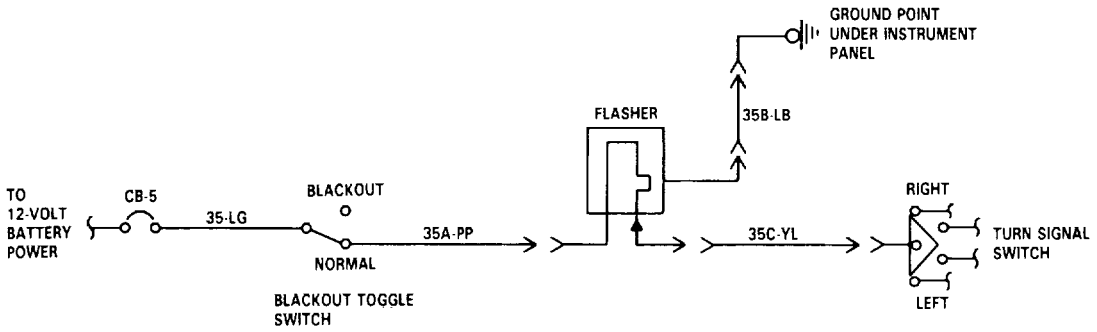
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
53.	**BOTH FRONT AND REAR TURN SIGNAL LAMPS NOT WORKING.**			
	NOTE Blackout toggle switch must be set to NORMAL position and turn signal switch set to hazard position.			
1.	Remove circuit breaker bracket far enough to access circuit breaker CB-5 (para 3-114), and go to step 2.			
2.	Check for voltage at circuit 35-LG terminal of circuit breaker CB-5.	12-volts dc nominal.	Install circuit breaker bracket (para 3-114), and go to step 3.	Reset circuit breaker and/or troubleshoot CB-5 circuit. (refer to mal-function 34).
3.	Check for voltage at circuit 35-LG terminal of blackout toggle switch.	12-volts dc nominal.	Go to step 4.	Replace circuit 35-LG (para 3-127).
4.	Check for voltage at circuit 35A-PP terminal of blackout toggle switch.	12-volts dc nominal.	Go to step 5.	Replace black-out toggle switch (para 3-79).
5.	Disconnect circuit 35A-PP from flasher, and go to step 6.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

53. BOTH FRONT AND REAR TURN SIGNAL LAMPS NOT WORKING (Continued).



TA 236891

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

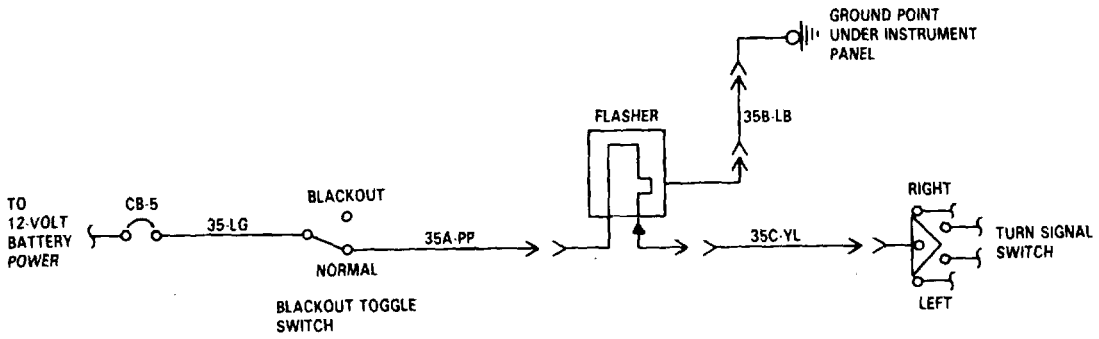
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
53. BOTH FRONT AND REAR TURN SIGNAL LAMPS NOT WORKING (Continued).				
6.	Check for voltage at circuit 35A-PP terminial of connector.	12-volts dc nominal.	Go to step 7.	Repair circuit 35A-PP (para connect circuit 35A-PP to flasher.
7.	Connect jumper wire from flasher terminal (X) to connector circuit 35A-PP, and go to step 8.			
8.	Check for voltage at flasher terminal (L).	12-volts dc nominal.	Connect circuit 35A-PP to flasher, and go to step 9.	Replace flasher (para 3-111).
9.	Disconnect circuit 35C-YL from turn signal switch, and go to step 10.			
10.	Check for voltage at circuit 35C-YL terminal of connector.	12-volts dc nominal.	Replace turn signal switch (para 3-80).	Repair circuit 35C-YL (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

53. BOTH FRONT AND REAR TURN SIGNAL LAMPS NOT WORKING (Continued).



TA 236892

TROUBLESHOOTING.

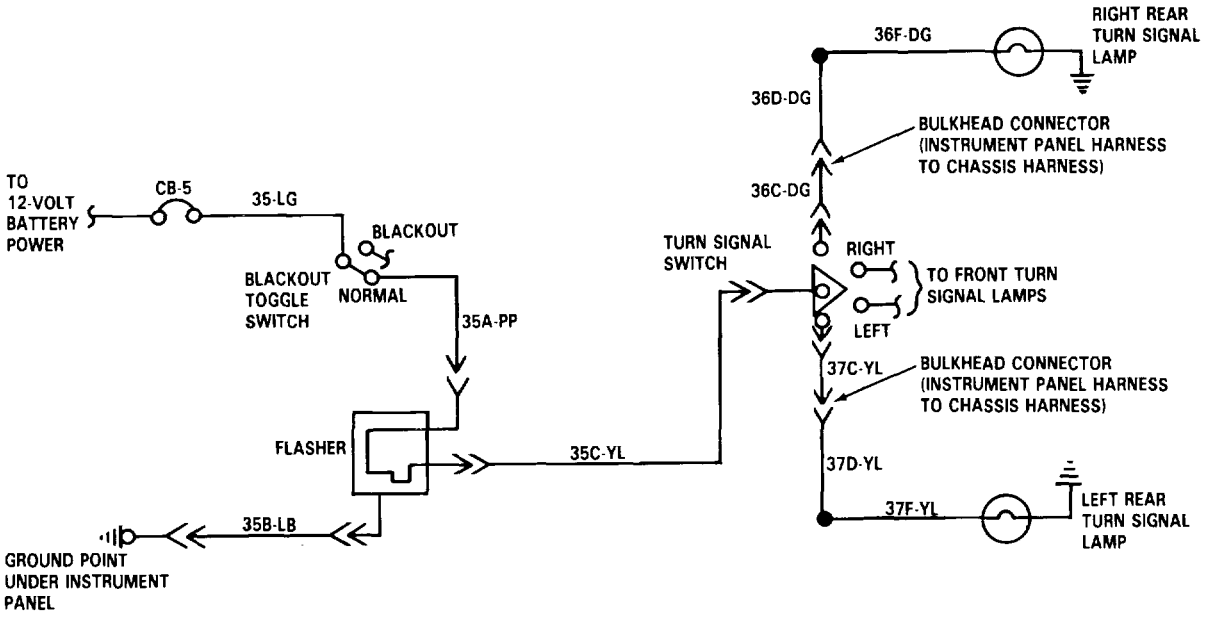
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
54. ONE REAR TURN SIGNAL LAMP NOT WORKING.				
	NOTE • Blackout toggle switch must be set to NORMAL position and turn signal switch set for right turn. • Faulty right rear turn signal lamp is not shown in this procedure. Apply similar troubleshooting technique for left rear turn signal lamp.			
	1. Disconnect circuit 36C-DG from turn signal switch, and go to step 2.			
	2. Connect jumper from circuit 35C-YL to yellow circuit of turn signal switch connector, and go to step 3.			
	3. Check for voltage at green circuit of turn signal switch connector.	12-volts dc nominal.	Connect circuit 35C-YL to turn signal switch connector and, go to step 2.	Replace turn signal switch (para 3-80).
	4. Disconnect circuit 36C-DG from 36D-DG at connector, and go to step 5.			
	5. Check for voltage at circuit 36C-DG terminal of connector.	12-volts dc nominal.	Connect circuit 36C-DG to 36D-DG and, go to step 6.	Repair circuit 36C-DG (para 3-127), and connect circuit 36C-DG to 36D-DG.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
54.	**ONE REAR TURN SIGNAL LAMP NOT WORKING (Continued).**			
	6. Remove lens at tail-lamp assembly (para 3-96), and go to step 7.			
	7. Check for voltage at circuit 36F-DG (top terminal inside taillamp assembly).	12-volts dc nominal.	Replace bulb (para 3-96) and/or clean socket connection.	Repair circuits 36F-DG and/or 36D-DG (para 3-127).
55.	**BOTH REAR TURN SIGNAL LAMPS NOT WORKING.**			
	Check turn signal switch circuit. (Refer to malfunction 53)			



TA 236893

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

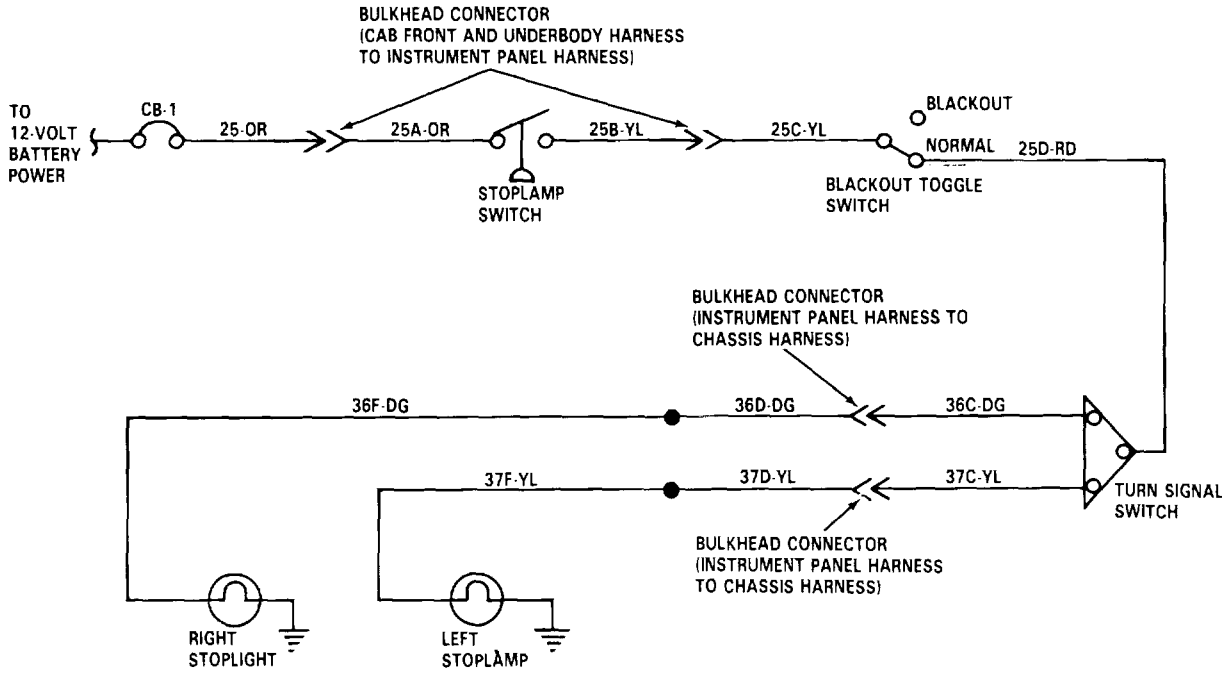
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
56.	**BOTH STOPLAMPS NOT WORKING.**			
1.	Remove circuit breaker bracket far enough to access circuit breaker CB-1 (para 3-114), and go to step 2.			
2.	Check for voltage at circuit 25-OR terminal of circuit breaker CB-1.	12-volts dc nominal.	Install circuit breaker bracket (para 3-114), and go to step 3.	Reset circuit breaker CB-1 and/or trouble-shoot CB-1 circuit. (Refer to malfunction 34).
3.	Disconnect circuit 25-OR from 25A-OR at connector, and go to step 4.			
4.	Check for voltage at circuit 25-OR terminal of connector.	12-volts dc nominal.	Connect circuit 25-OR to 25A-OR, and go to step 5.	Repair circuit 25-OR (para 3-127).
5.	Connect jumper wire from circuit 25-OR to 25A-OR, and go to step 6.			
6.	Check for voltage at circuit 25A-OR terminal of stoplamp switch.	12-volts dc nominal.	Go to step 7.	Repair circuit 25A-OR (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

56. BOTH STOPLAMPS NOT WORKING (Continued).



TA 236894

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

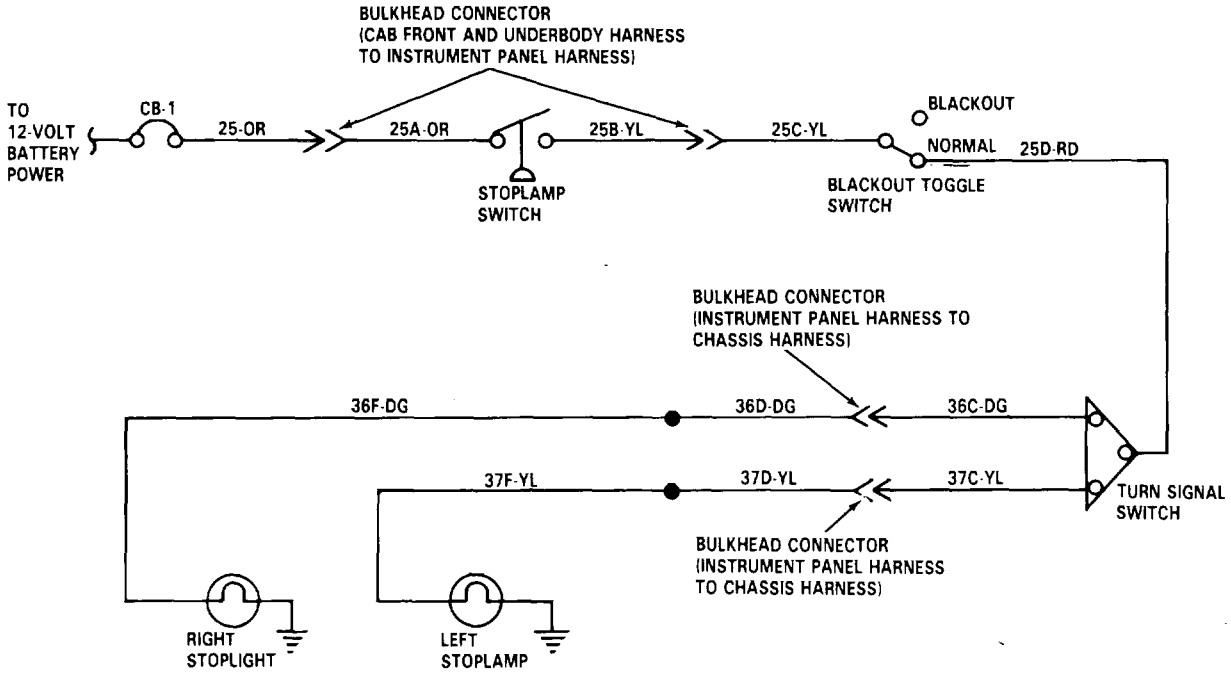
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
56. BOTH STOPLAMPS NOT WORKING (Continued).				
	NOTE Blackout toggle switch must be set to NORMAL position, air system pressurized to 105 psi, and brake pedal depressed by assistant when doing the following checks.			
7.	Check for voltage at circuit 25B-YL terminal of stoplamp switch.	12-volts dc nominal.	Go to step 8.	Replace stoplamp switch (para 3-183).
8.	Check for voltage at circuit 25B-YL terminal of connector. and go to step 9.	12-volts dc nominal.	Connect circuit 25B-LY to 25C-LY,	Repair circuit 25B-YL (para 3-127).
9.	Check for voltage at circuit 25C-YL terminal of blackout toggle switch.	12-volts dc nominal.	Go to step 10.	Repair circuit 25C-YL (para 3-127).
10.	Check for voltage at circuit 25D-RD terminal of blackout toggle switch.	12-volts dc nominal.	Go to step 11.	Replace blackout toggle switch (para 3-79).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

56. BOTH STOPLAMPS NOT WORKING (Continued).



TA 236895

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

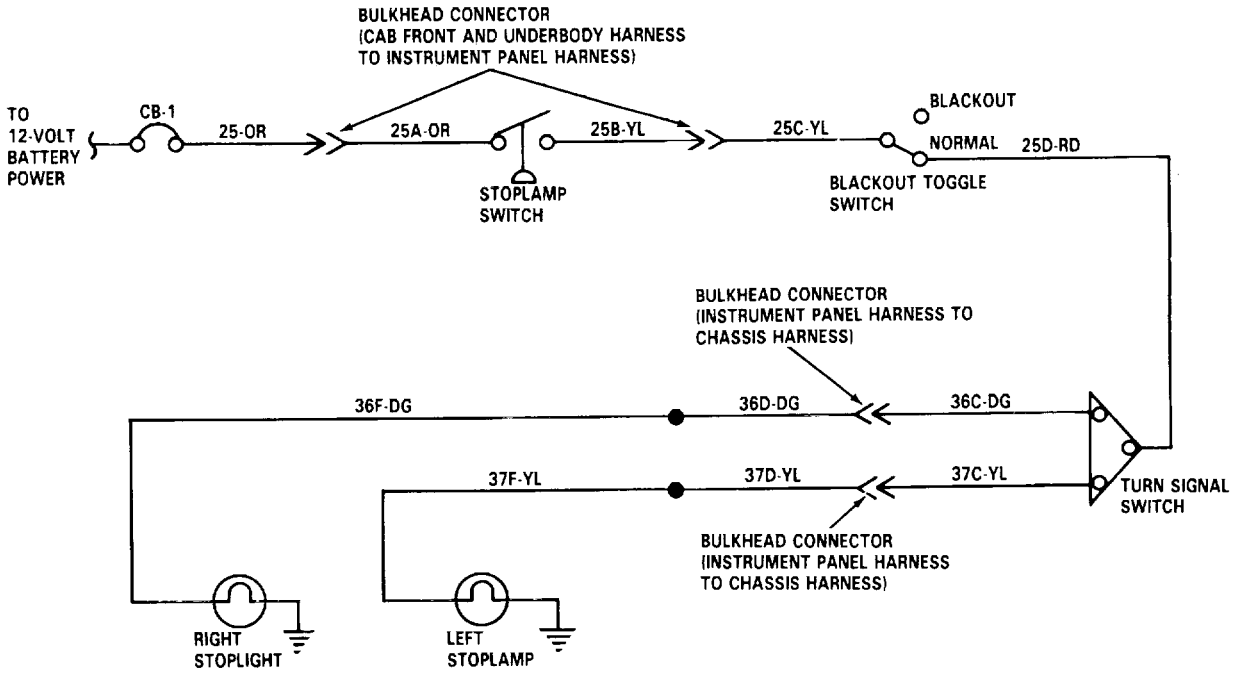
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
56.	**BOTH STOPLAMPS NOT WORKING (Continued).**			
11.	Disconnect turn signal switch connector, and go to step 12.			
12.	Check for voltage at circuit 25D-RD of connector.	12-volts dc nominal.	Go to step 13.	Repair circuit 25D-RD (para 3-127).
13.	Connect jumper across circuit 25D-RD to grey-black circuit, and go to step 14.			
14.	Check for voltage at either circuit 36C-DG or 37C-YL terminal of connector.	12-volts dc nominal.	Connect circuit 36C-DG and 37C-YL to circuit 25D-RD. Replace both stoplamp bulbs (para 3-96) and/or clean socket connections.	Replace turn signal switch (para 3-80).
57.	**ONE STOPLAMP NOT WORKING.**			

NOTE

- Blackout toggle switch must be set to NORMAL position, air system pressurized to 105 psi, and brake pedal depressed by assistant when doing the following checks.
- Faulty right stoplamp is shown in this procedure. Apply similar troubleshooting technique for left stoplamp.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
57 ONE STOPLAMP NOT WORKING (Continued).				
1	Disconnect turn signal switch connector, and go to step 2.			
2	Connect jumper across circuit 25D-RD to gray-black circuit, and go to step 3.			
3	Check for voltage at circuit 36C-DG terminal of connector	12-volts dc nominal	Connect circuit 36C-DG to 25D-RD, and go to step 4.	Replace turn signal switch (para 3-80).



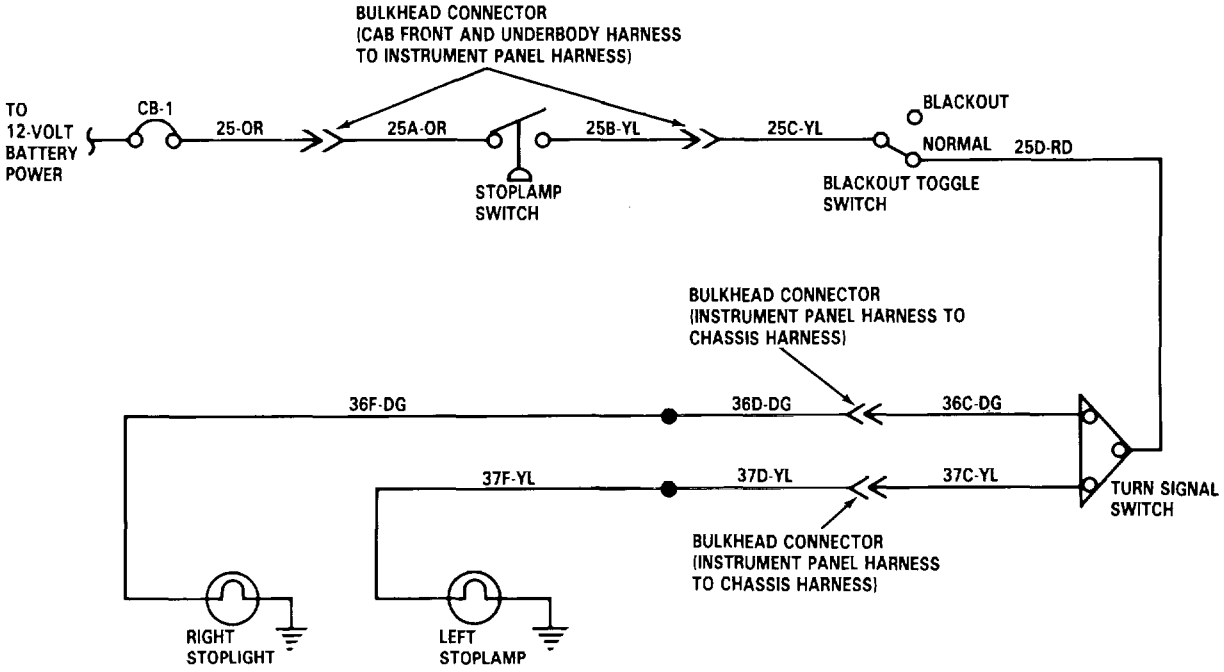
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
57	ONE STOPLAMP NOT WORKING (Continued).			
4	Disconnect circuit 36D-DG from 36C-DG at connector, and go to step 5.			
5	Check for voltage at circuit 36C-DG terminal of connector	12-volts dc nominal	Connect circuit 36D-DG to 36C-DG, and go to step 6.	Repair circuit 36C-DG (para 3-127).
6	Remove terminal cover at taillamp assembly (para 3-96), and go to step 7.			
7	Check for voltage at circuit 36F-DG terminal of taillamp assembly	12-volts dc nominal	Install cover (para 3-96), and go to step 8.	Repair circuit 36F-DG and/or 36D-DG (para 3-127).
	NOTE With positive lead on circuit 36F-DG, check ground with negative lead when doing the following checks.			
8	Remove lens at tail-lamp assembly (para 3-96), and go to step 9.			
9	Check for voltage at lamp socket	12-volts dc nominal taillamp	Replace bulb Install lens of socket assembly (para 3-96)	Clean connec-tions at Install lens of tail-lamp assembly (para 3-96).

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

57. ONE STOPLAMP NOT WORKING (Continued).



2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
58	BOTH REVERSE LAMPS NOT WORKING.			
	1 Remove circuit breaker bracket far enough to access circuit breaker CB-3 (para 3-114), and go to step 2			
	NOTE Ignition switch must be on, battery power connected, transmission shift control lever in reverse (R), and blackout toggle switch in NORMAL position when doing the following checks.			
	2 Check for voltage at circuit 38-LG terminal of circuit breaker CB-3	12-volts dc nominal	Go to step 3	Reset circuit breaker CB-3 and/or trouble-shoot CB-3 circuit. (Refer to malfunction 33).
	3 Disconnect circuit 38-LG from 38A-LG at connector, and go to step 4.			
	4 Check for voltage at circuit 38-LG terminal of connector	12-volts dc nominal	Go to step 5	Repair circuit 38-LG (para 3-127). Install circuit breaker bracket (para 3-114).
	5 Connect jumper wire from circuit 38-LG to 38A-LG, and go to step 6.			
	6 Access reverse switch, and disconnect circuit 38A-LG from switch (para 3-106).			

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
58. BOTH REVERSE LAMPS NOT WORKING (Continued).				
7. Check for voltage at circuit 38A-LG terminal of reverse switch.	12-volts dc nominal.	Go to step 8.	Repair circuit 38A-LG (para 3-127). Install circuit breaker bracket (para 3-114).	
8. Connect jumper wire from circuit 38A-LG to reverse switch, and go to step 9.				
9. Check for voltage at circuit 38B-OR terminal of reverse switch.	12-volts dc nominal.		Connect circuit 38A-LG and 38B-LG to reverse switch, and go to step 10.	Replace reverse switch (para 3-106). Install circuit breaker bracket (para 3-114).

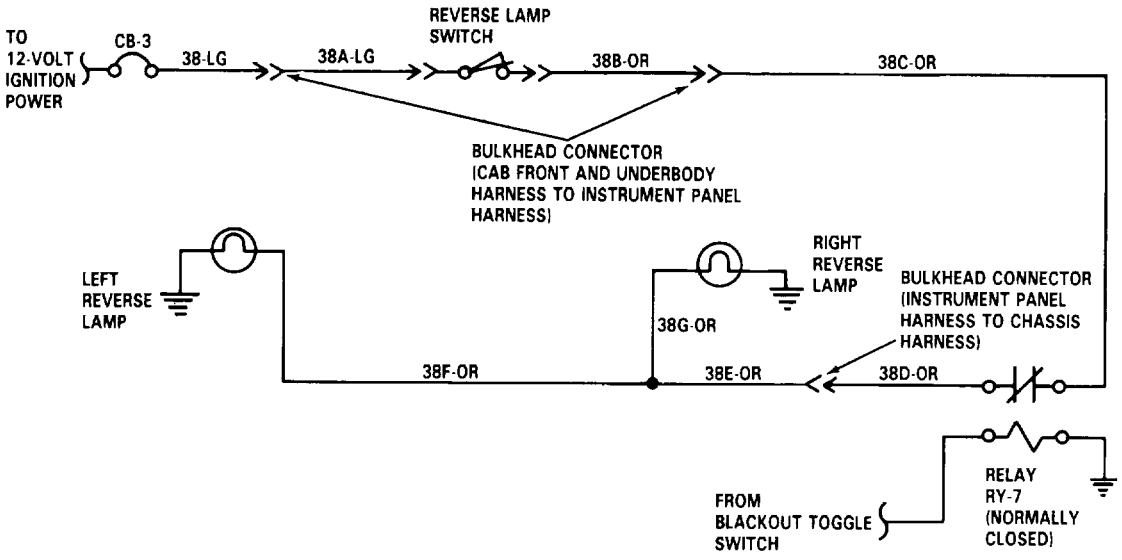
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
58	BOTH REVERSE LAMPS NOT WORKING (Continued).			
10	Check for voltage at circuit 38B-OR terminal of connector	12-volts dc nominal circuit 38B-OR	Remove jumper wire, install 3-127) to 38C-OR, and go to step 11	Repair circuit 38B-OR (para Install circuit breaker bracket (para 3-114).
11	Remove relay RY-7 (para 3-112), and go to step 12.			
12	Check for voltage at circuit 38C-BR terminal of relay RY-7	12-volts dc nominal 3-112), and go	Install relay RY-7 (para 3-127) to step 13	Repair circuit 38C-OR (para Install relay RY-7 (para 3-112). Install circuit breaker bracket (para 3-114).
13	Move blackout toggle switch from NORMAL to BLACKOUT and back to NORMAL position	Clicking sound at 'relay RY-7 and go to step	Install circuit breaker bracket (para 3-114), circuit breaker 14	Replace relay RY-7 (para 3-112) Install bracket (para 3-114).
14	Disconnect circuit 38E-OR from 38D-OR at connector, and go to step 15.			
15	Check for voltage at circuit 38D-OR terminal of connector	12-volts dc nominal	Go to step 16	Repair circuit 38D-OR (para 3-127).
16	Remove taillamp cover (para 3-96), and go to step 17.			
17	Check for voltage at circuit 38G-OR terminal of lamp	12-volts dc nominal	Reverse lamp circuit OK	Repair circuit 38E-OR (para 3-127).

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

58. BOTH REVERSE LAMPS NOT WORKING (Continued).



2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

59. ONE REVERSE LAMP NOT WORKING.

NOTE

•-Ignition switch must be on, transmission shift control lever in reverse (R), and blackout toggle switch in NORMAL position when doing the following checks.

•·Faulty right reverse lamp is shown in this procedure. Apply similar troubleshooting technique for left reverse lamp.

1.	Remove taillamp cover (para 3-96), and go to step 2.			
2.	Check for voltage at circuit 38G-OR terminal of taillamp.	12-volts dc nominal.	Install tail-lamp cover (para 3-96), and go to step 3.	Repair circuit 38G-OR (para 3-127). Install taillamp cover (para 3-96).

NOTE

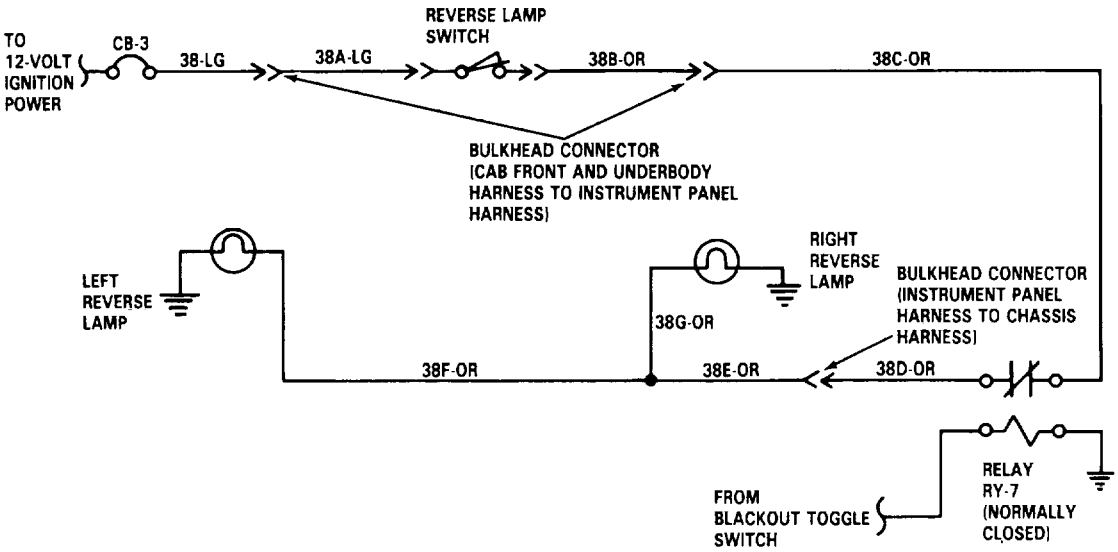
With positive lead on circuit 38G-OR, check ground with negative lead when doing the following checks. 3. Remove lens and bulb from taillamp assembly (para 3-96), and go to step 4.

4.	Check for voltage at socket ground of taillamp assembly.	12-volts dc nominal.	Replace bulb (para 3-96).	Clean socket connection, and install bulb (para 3-96).

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

59. ONE REVERSE LAMP NOT WORKING (Continued).



2-11. TROUBLESHOOTING PROCEDURES (Continued).

60. BLACKOUT HEADLAMP NOT WORKING.

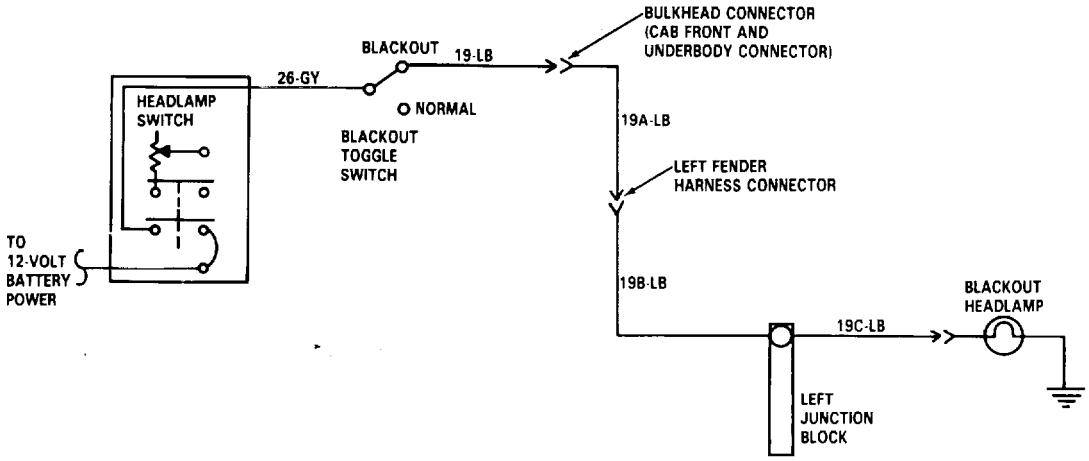
NOTE
Headlamp switch must be in ON position and blackout toggle switch set to BLACKOUT position when doing the following checks.

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
1	Check for voltage at circuit 26-GY terminal of headlamp switch.	12-volts dc nominal	Go to step 2	Refer to malfunction 44.
2	Check for voltage at circuit 26-GY terminal of blackout toggle switch.	12-volts dc nominal	Go to step 3	Repair circuit 26-GY (para 3-127).
3	Check for voltage at circuit 19-LB terminal of blackout toggle switch.	12-volts dc nominal	Go to step 4	Replace blackout toggle switch (para 3-79).
4	Disconnect circuit 19-LB from 19A-LB at connector, and go to step 5.			
5	Check for voltage at circuit 19-LB (pin E of connector)	12-volts dc nominal	Connect circuit 19-LB to 19A-LB, and go to step 6.	Repair circuit 19-LB (para 3-127).
6	Disconnect circuit 19A-LB from 19B-LB at connector, and go to step 7.			
7	Check for voltage at circuit 19A-LB terminal of connector	12-volts dc nominal	Connect circuit 19A-LB to 19B-LB, and go to step 8.	Repair circuit 19A-LB (para 3-127).

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

60. BLACKOUT HEADLAMP NOT WORKING (Continued).



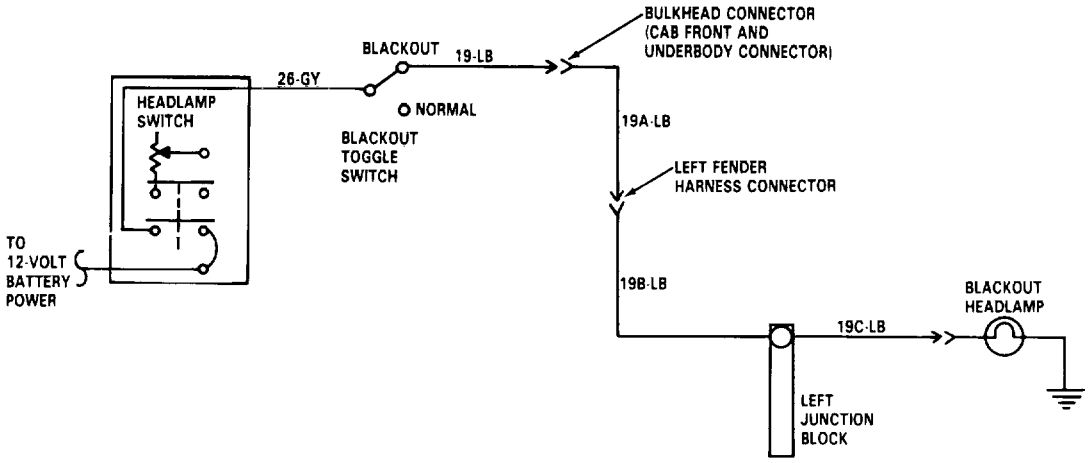
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
60. BLACKOUT HEADLAMP NOT WORKING (Continued).				
8. Access junction block by removing headlamp assembly (para 3-91), and go to step 9.				
9. Check for voltage at circuit 19B-LB of junction block.	12-volts dc nominal.		Install headlamp assembly (para 3-91), and go to step 10.	Repair circuit 19B-LB (para 3-127).
10. Disconnect circuit 19C-LB from blackout headlamp, and go to step 11.				
11. Check for voltage at circuit 19C-LB of connector.	12-volts dc nominal.	Go to step 12.	Repair circuit	19C-LB (para 3-127).
NOTE With positive lead on circuit 19C-LB, check ground with negative lead when doing the following checks.				
12. Remove lens and bulb from blackout headlamp (para 3-95), and go to step 13.				
13. Check for voltage and socket ground.	12-volts dc nominal.		Replace bulb (para 3-95).	Clean socket connection. Install bulb and lens to blackout headlamp (para 3-95).

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

60. BLACKOUT HEADLAMP NOT WORKING (Continued).



2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
61. BOTH BLACKOUT MARKER LAMPS NOT WORKING.				
	NOTE Headlamp switch must be in ON position and blackout toggle switch set to BLACKOUT position when doing the following checks.			
	1 Check for voltage at circuit 30-OR terminal of headlamp switch.	12-volts dc nominal	Go to step 2	Refer to malfunction 44.
	2 Check for voltage at circuit 30-OR terminal of blackout toggle switch.	12-volts dc nominal	Go to step 3	Repair circuit 30-OR (para 3-127).
	3 Check for voltage at circuit 23Z-TN terminal of blackout toggle switch	12-volts dc nominal	Go to step 4	Replace blackout toggle switch (para 3-79).
	4 Disconnect circuit 23-TN from 23A-TN at connector, and go to step 5.			
	5 Check for voltage at circuit 23-TN terminal of connector	12-volts dc nominal	Repair circuit 23A-TN (para 3-127)	Repair circuit 23-TN and/or 23Z-TN (para 3-127)
62 ONE BLACKOUT MARKER LAMP NOT WORKING.				
	NOTE -Headlamp switch must be in ON position and blackout toggle switch set to BLACKOUT position when doing the following checks.			

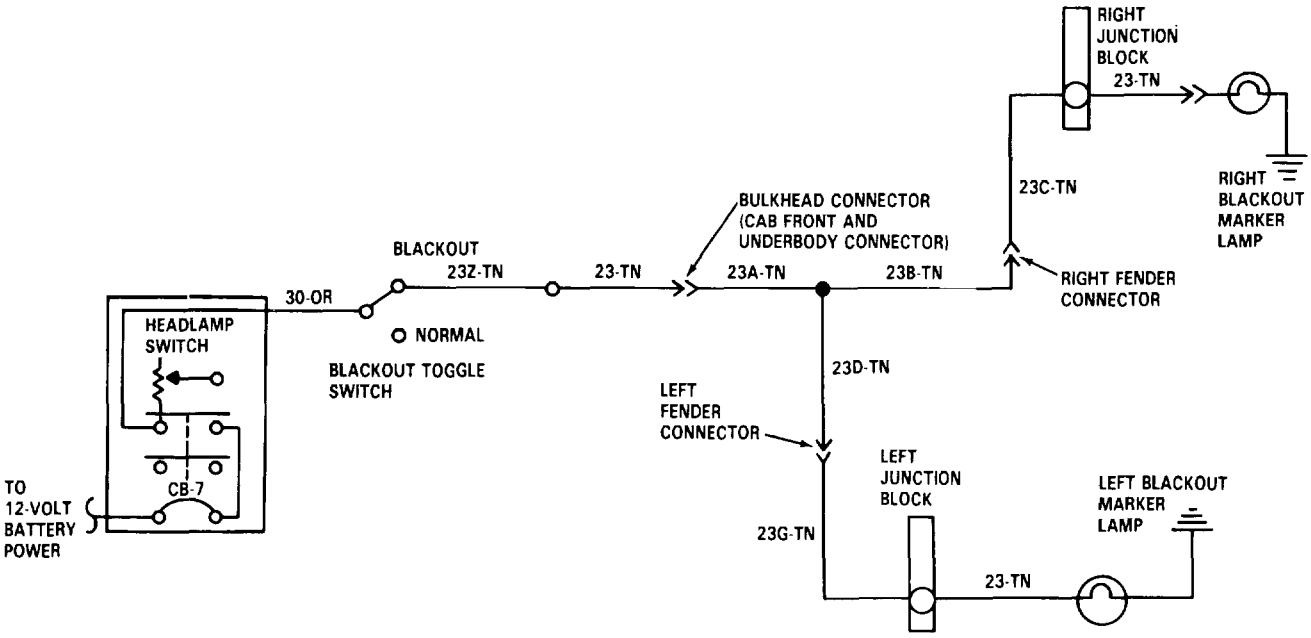
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

62. ONE BLACKOUT MARKER LAMP NOT WORKING (Continued).

•·Faulty right blackout marker lamp is shown in this procedure. Apply similar troubleshooting technique for left blackout marker lamp.

1	Disconnect circuit 23B-TN from 23C-TN at connector, and go to step 2.			
2	Check for voltage at circuit 23B-TN terminal of connector	12-volts dc nominal	Connect circuit 23B-TN to 23C-TN, and go To step 3.	Repair circuit 23B-TN (para 3-127).



2-11. TROUBLESHOOTING PROCEDURES (Continued).

62. ONE BLACKOUT MARKER LAMP NOT WORKING (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
	3 Remove right headlamp assembly (para 3-91), and go to step 4.			
	4 Check for voltage at circuit 23C-TN of junction block	12-volts dc nominal	Install headlamp assembly (para 3-91), and go to step 3	Repair circuit 23C-TN (para 3-127). Install headlamp assembly (para 3-91).
	5 Disconnect circuit 23-TN from right marker lamp, and go to step 6.			
	6 Check for voltage at circuit 23-TN terminal of connector	12-volts dc nominal 3-127).	Go to step 7 23-TN (para	Repair circuit

NOTE

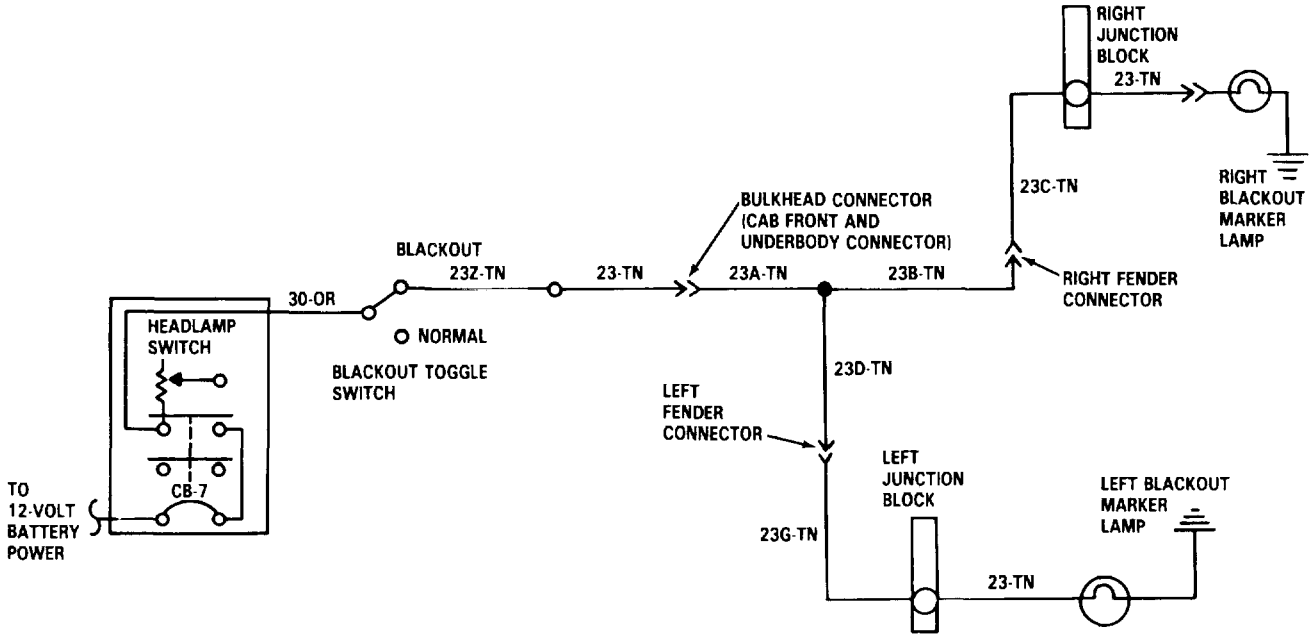
With positive lead on circuit 23-TN, check ground with negative lead when doing the following checks.

	7 Remove bulb from right marker lamp (para 3-94).			
	8 Check for voltage at socket ground	12-volts dc nominal	Replace bulb (para 3-94), and install lens (para 3-94)	Clean socket connection, and install bulb (para 3-94).

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

62. ONE BLACKOUT MARKER LAMP NOT WORKING (Continued).



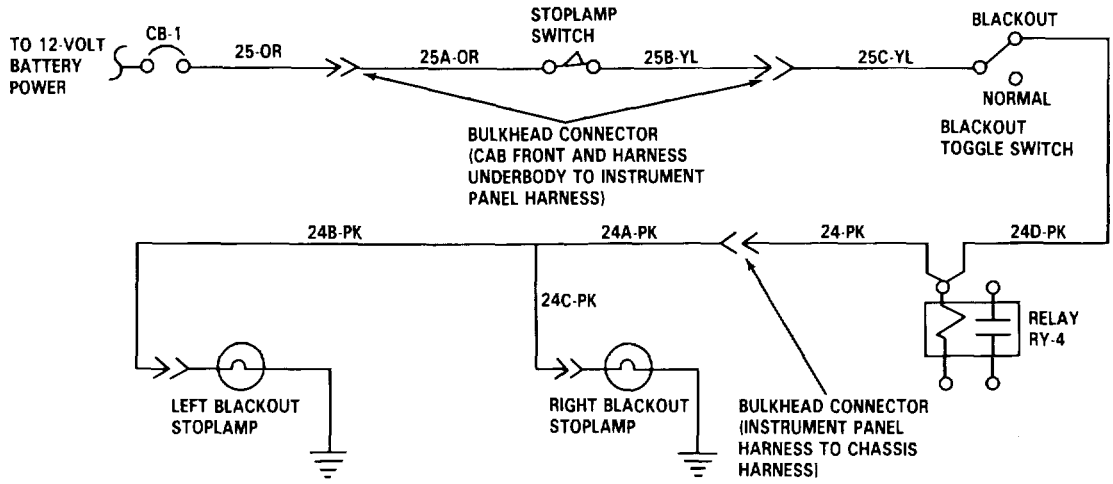
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
63	BOTH BLACKOUT STOPLAMPS NOT WORKING.			
	1 Remove circuit breaker bracket far enough to access circuit breaker CB-1 (para 3-114), and go to step 2.			
	2 Check for voltage at circuit 25-OR terminal of circuit breaker CB-1	12-volts dc nominal	Go to step 3	Reset circuit breaker CB-1 and/or trouble-shoot CB-1 circuit. (Refer to malfunction 33).
	3 Disconnect circuit 25-OR from 25A-OR at connector, and go to step 4.			
	4 Check for voltage at circuit 25-OR terminal of connector	12-volts dc nominal	Go to step 5	Repair circuit 25-OR (para 3-127). Install circuit breaker bracket (para 3-114).
	5 Connect jumper wire between 25-OR and 25A-OR, and go to step 6.			
	6 Check for voltage at circuit 25A-OR terminal of stoplamp switch	12-volts dc nominal	Go to step 7	Repair circuit 25A-OR (para 3-127). Remove jumper and connect circuit 25-OR to 25A-OR. Install circuit breaker bracket (para 3-114).

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

63. BOTH BLACKOUT STOPLAMPS NOT WORKING (Continued).



2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

63 BOTH BLACKOUT STOPLAMPS NOT WORKING (Continued).

NOTE

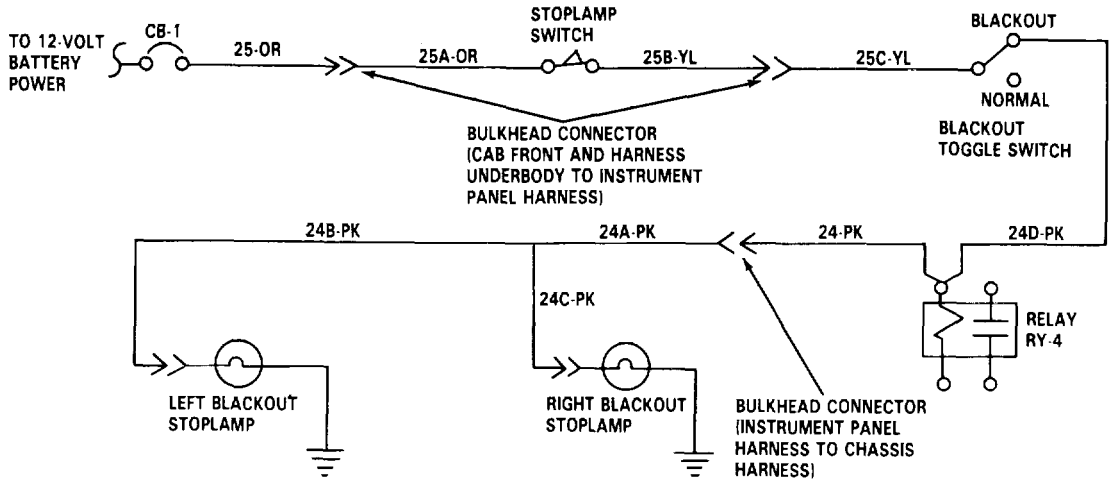
Blackout toggle switch must be set to BLACKOUT position, air system pressurized to 105 psi, and brake pedal depressed by assistant when doing the following checks.

7	Check for voltage at circuit 25B-YL terminal of stoplamp switch	12-volts dc nominal	Go to step 8	Replace stop-lamp switch (Para 3-97). Install circuit breaker bracket (para 3-114).
8	Check for voltage at circuit 25B-YL terminal of connector	12-volts dc nominal circuit 25B-YL	Remove jumper wire. Connect 3-127) to 25C-YL, and go to step 9	Repair circuit 25B-YL (para Install circuit breaker bracket (para 3-114).
9	Check for voltage at circuit 25C-YL terminal of blackout toggle switch.	12-volts dc nominal	Go to step 10	Repair circuit 25C-YL (para 3-127). Install circuit breaker bracket (para 3-114).

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

63. BOTH BLACKOUT STOPLAMPS NOT WORKING (Continued).



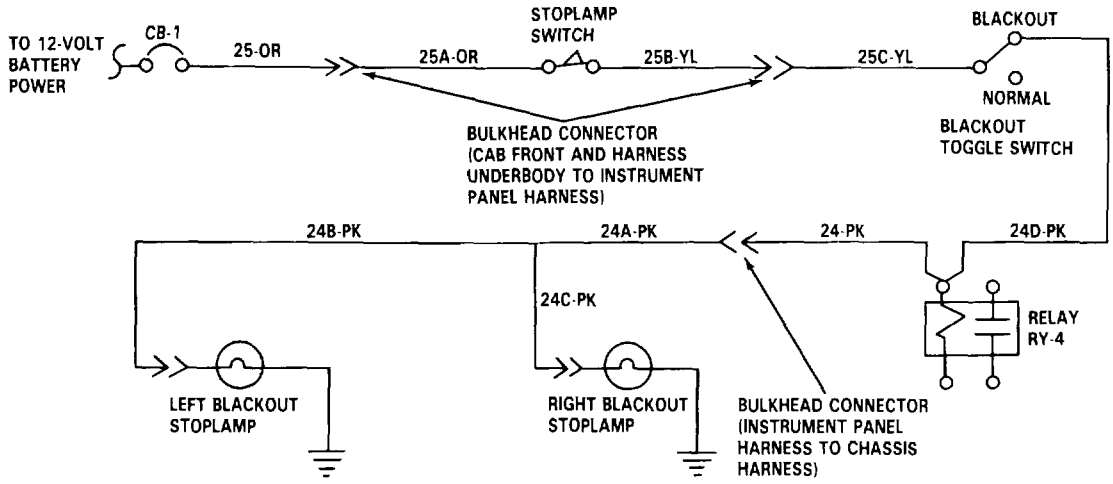
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
63. BOTH BLACKOUT STOPLAMPS NOT WORKING (Continued).				
10. Check for voltage at circuit 24D-PK terminal of blackout toggle switch.	12-volts dc nominal.		Go to step 11.	Replace blackout toggle switch (para 3-79). Install circuit breaker bracket (para 3-114).
11. Remove relay RY-4 (para 3-112), and go to step 12.				
12. Check for voltage at circuit 24D-PK terminal of relay RY-4.	12-volts dc nominal.		Install relay RY-4 (para 3-112). Install circuit breaker bracket (para 3-114).	Repair circuit 24D-PK (para 3-127). Install relay RY-4 (para 3-112). Install circuit breaker bracket (para 3-114).
13. Disconnect circuit 24-PK from 24A-PK at connector, and go to step 14.				
14. Check for voltage at circuit 24-PK (pin N of connector).	12-volts dc nominal.		Repair circuit 24A-PK (para 3-127).	Repair circuit 24-PK (para 3-127).

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

63. BOTH BLACKOUT STOPLAMPS NOT WORKING (Continued).



2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

64. ONE BLACKOUT STOPLAMP NOT WORKING.

NOTE

•·Blackout toggle switch must be set to BLACKOUT position, air system pressurized to 105 psi, and brake pedal depressed by assistant when doing the following checks.

•Faulty right blackout stoplamp is shown in this proceudre. Apply similar troubleshooting technique for left blackout stoplamp.

1.	Disconnect circuit 24C-PK from right blackout stoplamp, and go to step 2.			
2.	Check for voltage at circuit 24C-PK terminal of connector lamp and, go to step 3.	12-volts dc nominal blackout stop-	Connect circuit 24C-PK to 3-127).	Repair circuit 24C-PK (para

NOTE

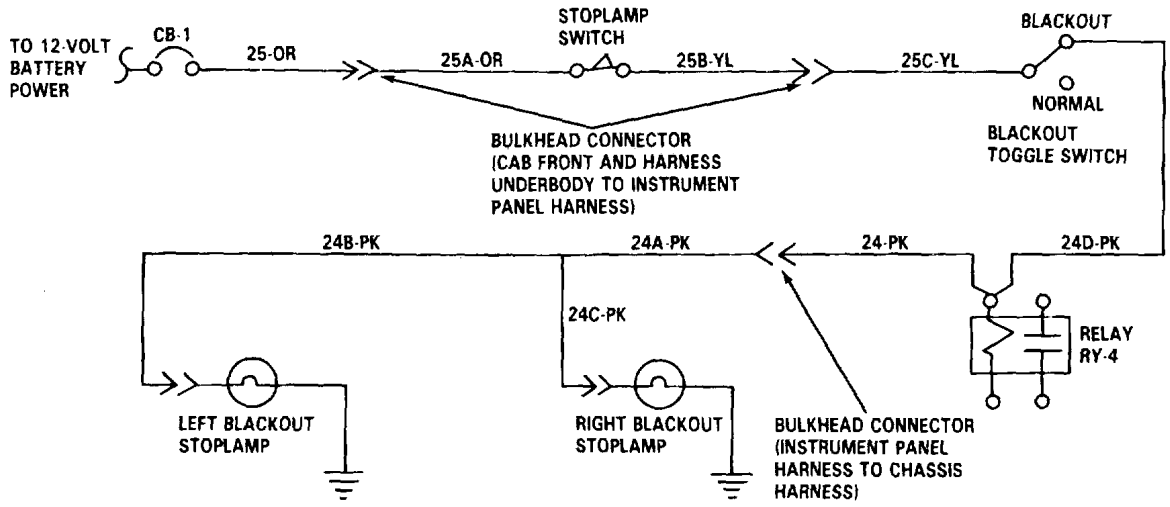
With positive lead on circuit 24C-PK, check ground with negative lead when doing the following checks.

3.	Remove door from blackout stoplamp (para 3-97), and go step 4.			
4.	Check for voltage at socket of stoplamp assembly	12-volts dc nominal	Replace bulb (para 3-97)	Clean socket connection, and install door to black-out stoplamp (para 3-97).

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

64. ONE BLACKOUT STOPLAMP NOT WORKING (Continued).



2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
65. BOTH BLACKOUT TAILLAMPS NOT WORKING.				
	NOTE Headlamp switch must be in ON position and blackout toggle switch in BLACKOUT position when doing the following checks.			
	1. Check for voltage at circuit 30-OR terminal of headlamp switch.	12-volts dc nominal.	Go to step 2.	Refer to malfunction 44.
	2. Check for voltage at circuit 30-OR terminal of blackout toggle switch.	12-volts dc nominal.	Go to step 3.	Repair circuit 30-OR (para 3-127).
	3. Check for voltage at circuit 23Z-TN terminal of blackout toggle switch.	12-volts dc nominal.	Go to step 4.	Replace blackout toggle switch (para 3-79).
	4. Disconnect 23L-TN from 23S-TN at connector and, go to step 5.			
	5. Check for voltage at circuit 23L-TN terminal of connector.	12-volts dc nominal.	Repair circuit 23S-TN (para 3-127).	Repair circuit 23L-TN and/or 23S-TN (para

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

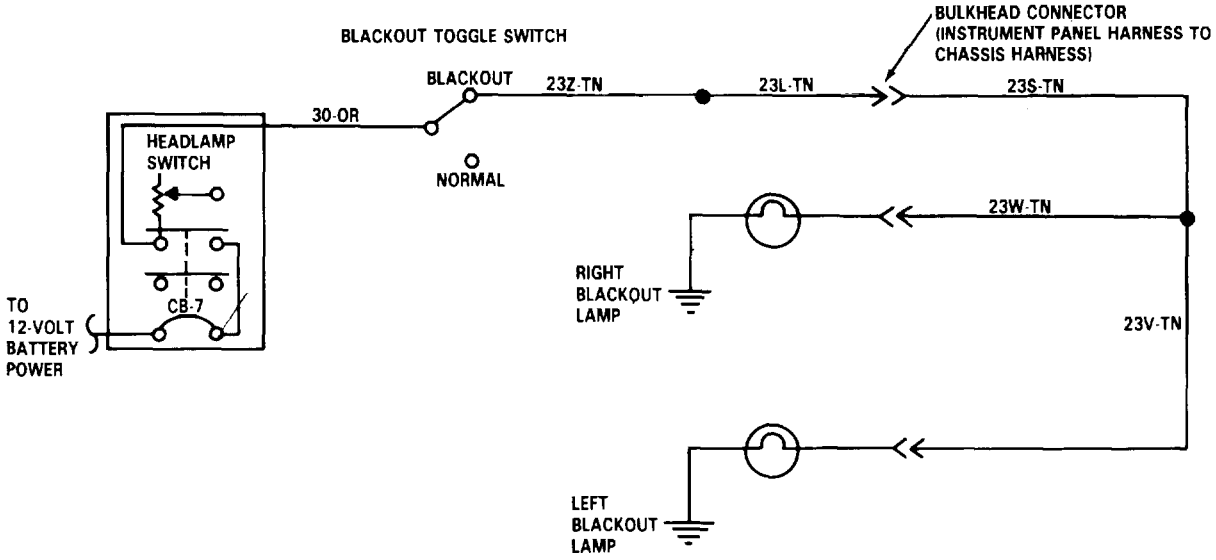
66. ONE BLACKOUT TAILLAMP NOT WORKING.

NOTE

•-Headlamp switch must be in ON position and blackout toggle switch in BLACKOUT position when doing the following checks.

•-Faulty right blackout taillamp is shown in this procedure. Apply similar troubleshooting technique for left blackout taillamp.

1.	Disconnect circuit 23W-TN from right blackout taillamp, and go to step 2.			
2.	Check for voltage at circuit 23W-TN terminal of connector.	12-volts dc nominal.	Go to step 3.	Repair circuit 23W-TN (para 3-127).3



2-11. TROUBLESHOOTING PROCEDURES (Continued).

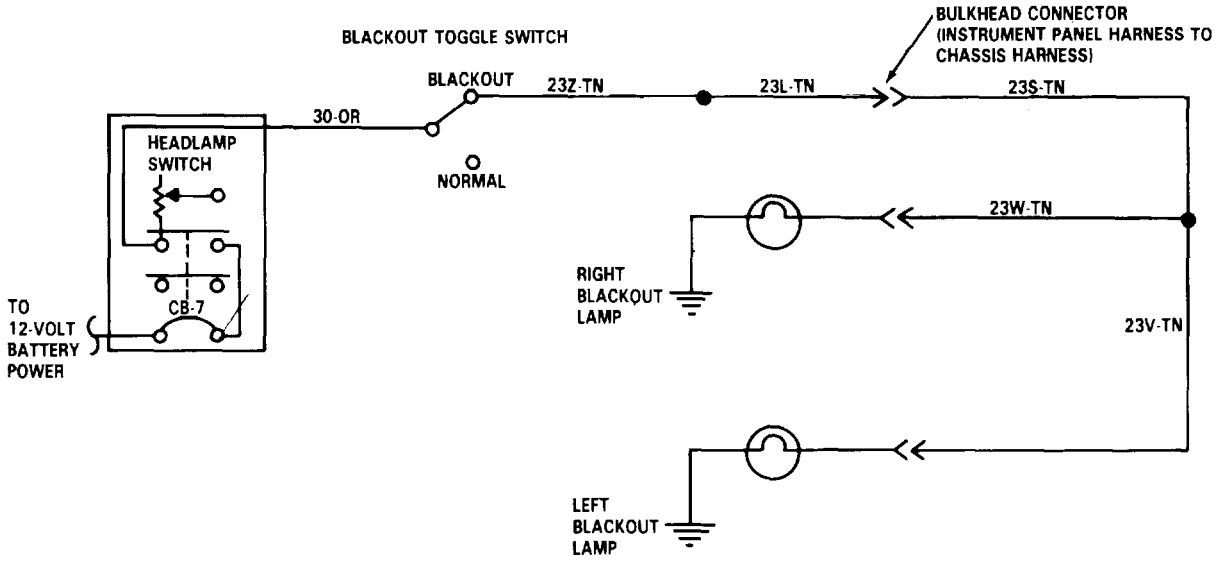
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

66. ONE BLACKOUT TAILLAMP NOT WORKING (Continued).

NOTE

With positive lead on circuit 23W-TN, check ground with negative lead when doing the following checks.

3.	Remove bulb from blackout taillamp (para 3-97), and go to step 4.			
4.	Check for ground at socket of blackout taillamp.	12-volts dc nominal.	Replace bulb (para 3-97).	Clean socket connector, and install bulb



2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
67. ALL BLACKOUT LAMPS NOT WORKING.				
	NOTE •-Headlamp switch must be in ON position and blackout toggle switch in BLACKOUT position when doing the following checks. •·It is assumed here that NORMAL lighting system is OK.			
Check BLACKOUT lighting system.	Blackout lamps light.	Blackout lighting system OK.	Replace blackout toggle switch (para 3-79).	

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

68. BOTH 12-VOLT TRAILER STOPLAMPS NOT WORKING.

NOTE

Blackout toggle switch must be set to NORMAL position, air system pressurized to 105 psi, and brake pedal depressed by assistant when doing the following checks.

1.	Disconnect 12-volt trailer connector, and go to step 2.			
2.	Check for voltage at circuit 36E-DG and 37E-YL (pins 3 and 5 of connector).	12-volts dc nominal.	Recheck trailer stoplamp circuit.	Refer to Malfunction 56.

69. ONE 12-VOLT TRAILER STOPLAMP NOT WORKING.

NOTE

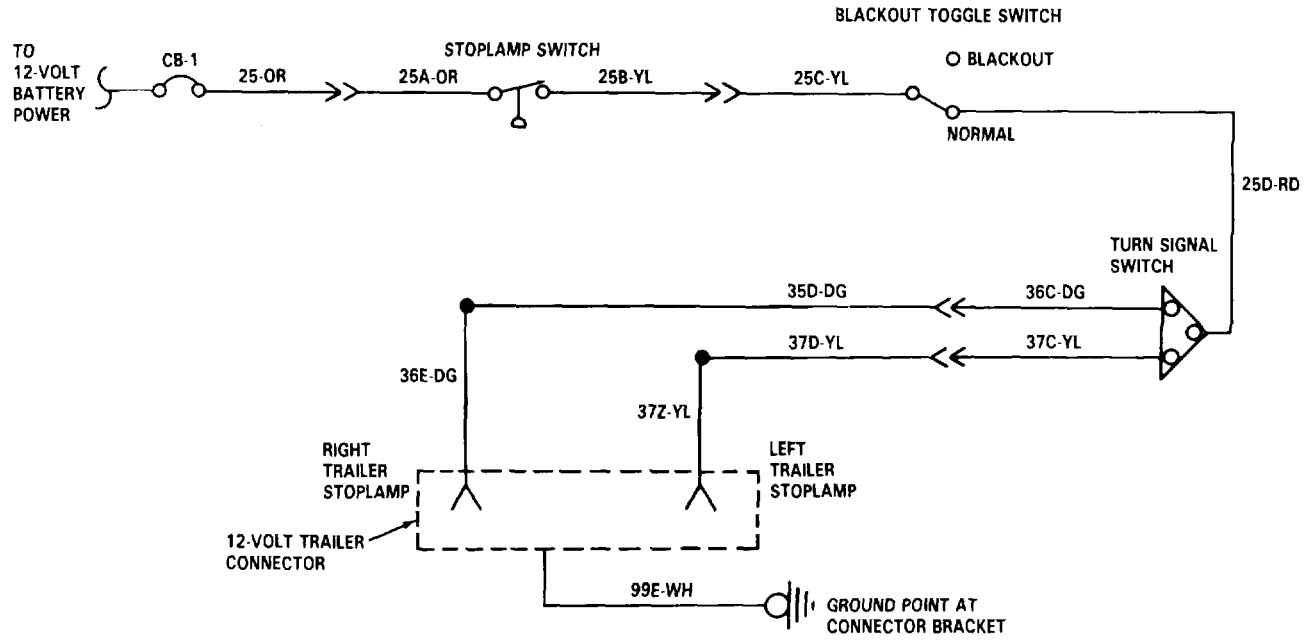
•-Blackout toggle switch must be set to NORMAL position, air system pressurized to 105 psi, and brake pedal depressed by assistant when doing the following checks.

•·It is assumed here that chassis stoplamp circuit is OK. Faulty right trailer stoplamp is shown in this procedure. Apply similar troubleshooting technique for left trailer stoplamp.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
69. ONE 12-VOLT TRAILER STOPLAMP NOT WORKING (Continued).				
	1. Disconnect 12-volt trailer connector, and go to step 2.			
	2. Check for voltage at circuit 36E-DG (pin 5 of connector). repair as necessary.	12-volts dc nominal.	Recheck trailer stoplamp circuit, and	Repair circuit 36E-DG (para 3-127).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

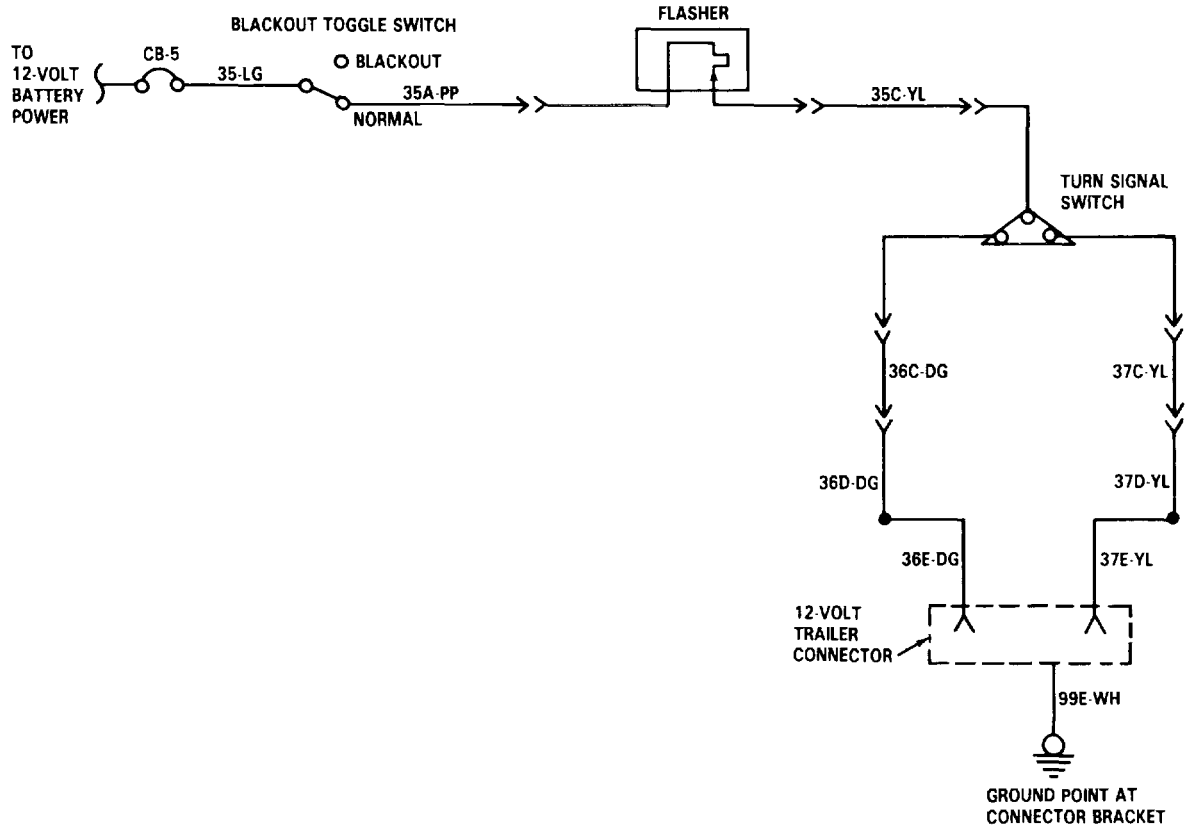
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
70. BOTh 12-VOLT TRAILER TURN SIGNAL LAMPS NOT WORKING.				
	NOTE Blackout toggle switch must be set to NORMAL position and turn signal switch set to hazard position when doing the following checks.			
	1. Disconnect 12-volt trailer connector, and go to step 2.			
	2. Check for voltage at circuit 36E-DG and 37E-YL (pins 3 and 5 of connector).	12-volts dc nominal.	Recheck trailer turn signal lamp circuit.	Refer to malfunction 53.
71. ONE 12-VOLT TRAILER TURN SIGNAL LAMP NOT WORKING.				
	NOTE • Blackout toggle switch must be set to NORMAL position and turn signal switch set for right turn when doing the following checks. • It is assumed here that chassis turn signal lamp circuit is OK. Faulty right-side trailer turn signal lamp is shown in this procedure. Apply same troubleshooting technique for left-side trailer turn signal lamp.			
	1. Disconnect 12-volt trailer connector, and go to step 2.			
	2. Check for voltage at circuit 36E-DG (pin 5 of connector). circuit.	12-volts dc nominal.	Recheck trailer right turn signal lamp	Repair circuit 36E-DG (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

71. ONE 12-VOLT TRAILER TURN SIGNAL LAMP NOT WORKING (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

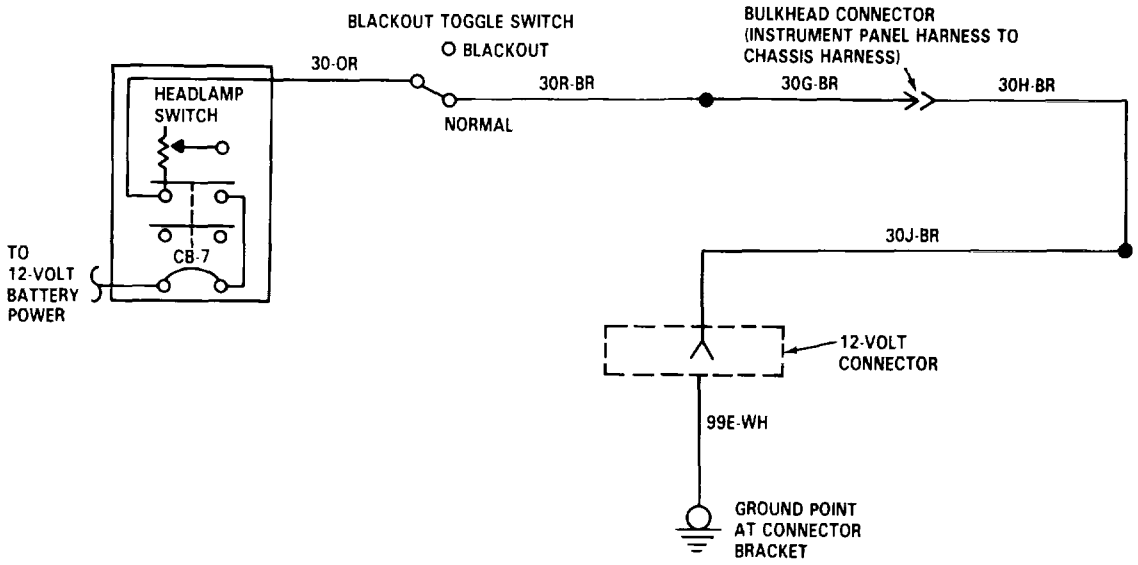
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

72. BOTH 12-VOLT TRAILER TAILLAMPS NOT WORKING.

NOTE

Headlamp switch must be in ON position and blackout toggle switch set to NORMAL position when doing the follow- ing checks.

1.	Disconnect 12-volts trailer connector, and go to step 2.			
2.	Check for voltage at circuit 30J-BR (pin 2 of connector).	12-volts dc nominal.	Recheck trailer taillamp cir- cuit.	Repair circuit 30J-BR (para 3-127).



TA 236913

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

73. ONE TRAILER TAILLAMP NOT WORKING.

NOTE

Headlamp switch must be in ON position and blackout toggle switch set to NORMAL position when doing the following checks.

Check trailer taillamp circuit for defects.				

74. ALL 12-VOLT TRAILER CLEARANCE AND MARKER LAMPS NOT WORKING.

NOTE

- Headlamp switch must be in ON position and blackout toggle switch set to NORMAL position when doing the following checks.
- It is assumed here that chassis clearance and marker lamps are OK.

	1. Disconnect circuit 31B-BK from 31C-BK at connector, and go to step 2.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

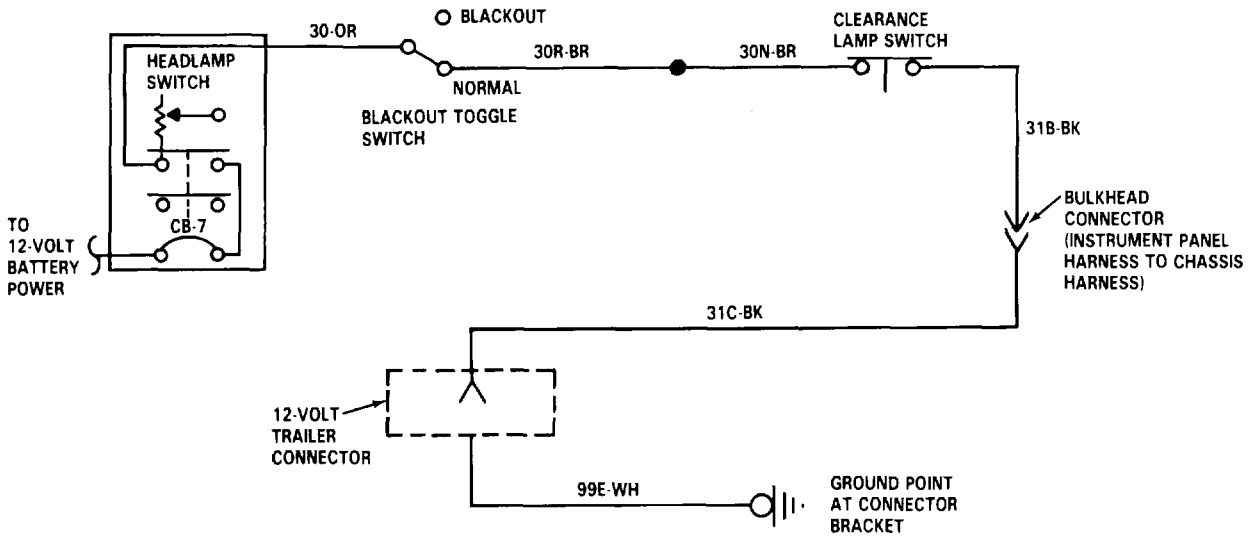
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
74. ALL 12-VOLT TRAILER CLEARANCE AND MARKER LAMPS NOT WORKING (Continued).				
	2. Check for voltage at circuit 31B-BK (pin A of connector). to step 3.	12-volts dc nominal.	Connect circuit 31B-BK to 31C-BK, and go	Repair circuit 31B-BK (para 3-127).
	3. Disconnect 12-volt trailer connector, and go to step 4.			
	4. Check for voltage at circuit 31C-BK (pin 2 of connector). circuit.	12-volts dc nominal.	Recheck trailer clearance and marker lamp	Repair circuit 31C-B (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

74. ALL 12-VOLT TRAILER CLEARANCE AND MARKER LAMPS NOT WORKING (Continued).



TA 236914

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

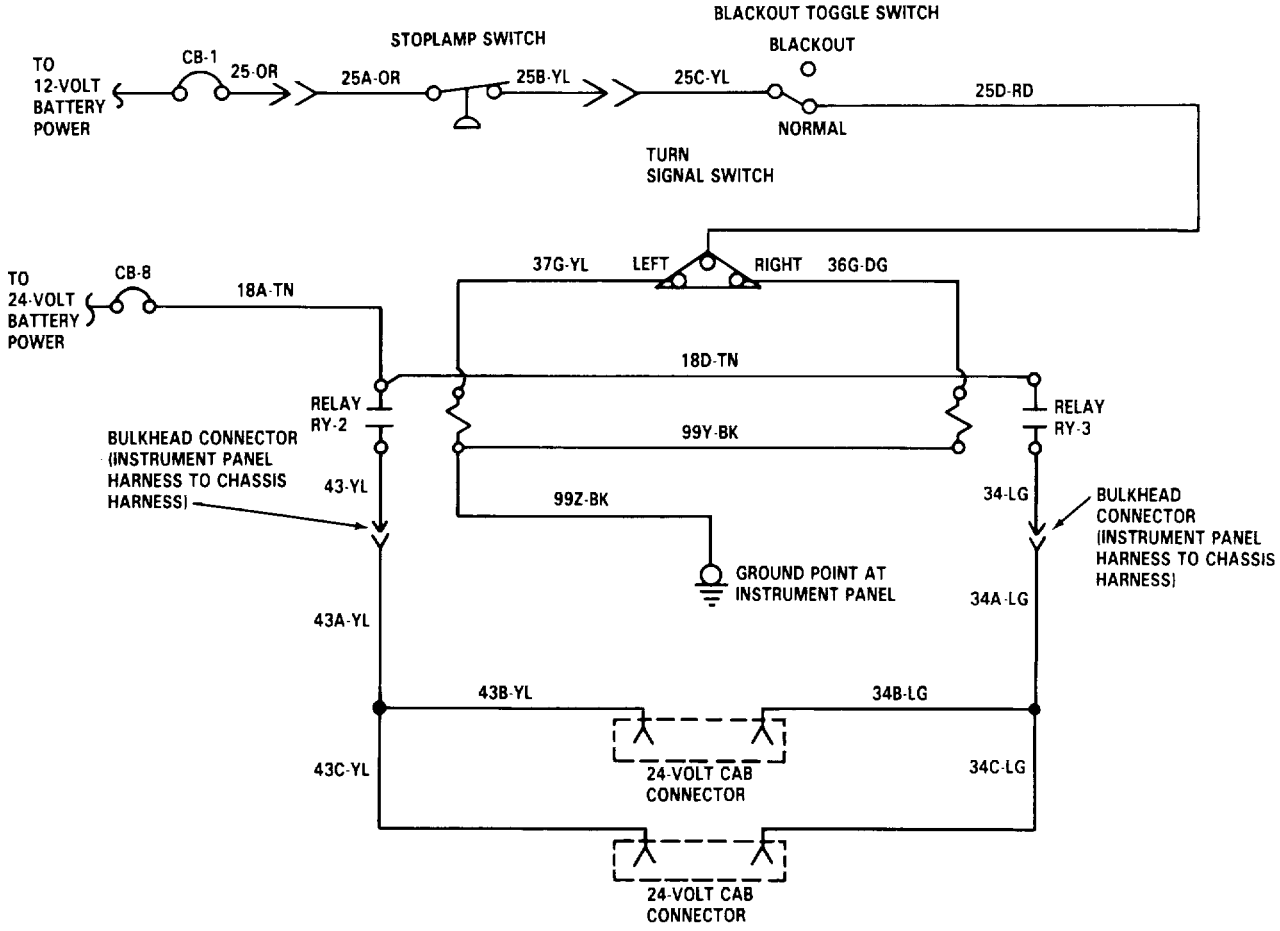
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
75. BOTH 24-VOLT TRAILER STOPLAMPS NOT WORKING.				
	NOTE • Blackout toggle switch must be set to NORMAL position, air system pressurized to 105 psi, and brake pedal depressed by assistant when doing the following checks. • It is assumed here that chassis stop- lamps are OK. Apply same trouble- shooting technique for either cab or chassis connector.			
	1. Disconnect turn signal switch connector, and go to step 2.			
	2. Connect jumper wire between circuit 25D-RD and gray-black wire terminal of turn signal switch, and go to step 3.			
	3. Check for voltage at either circuit 36G-DG or 37G-YL of turn signal switch connector.	12-volts dc nominal.	Go to step 4.	Replace turn signal switch (para 3-80).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

75. BOTH 24-VOLT TRAILER STOPLAMPS NOT WORKING (Continued).



TA 236915

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

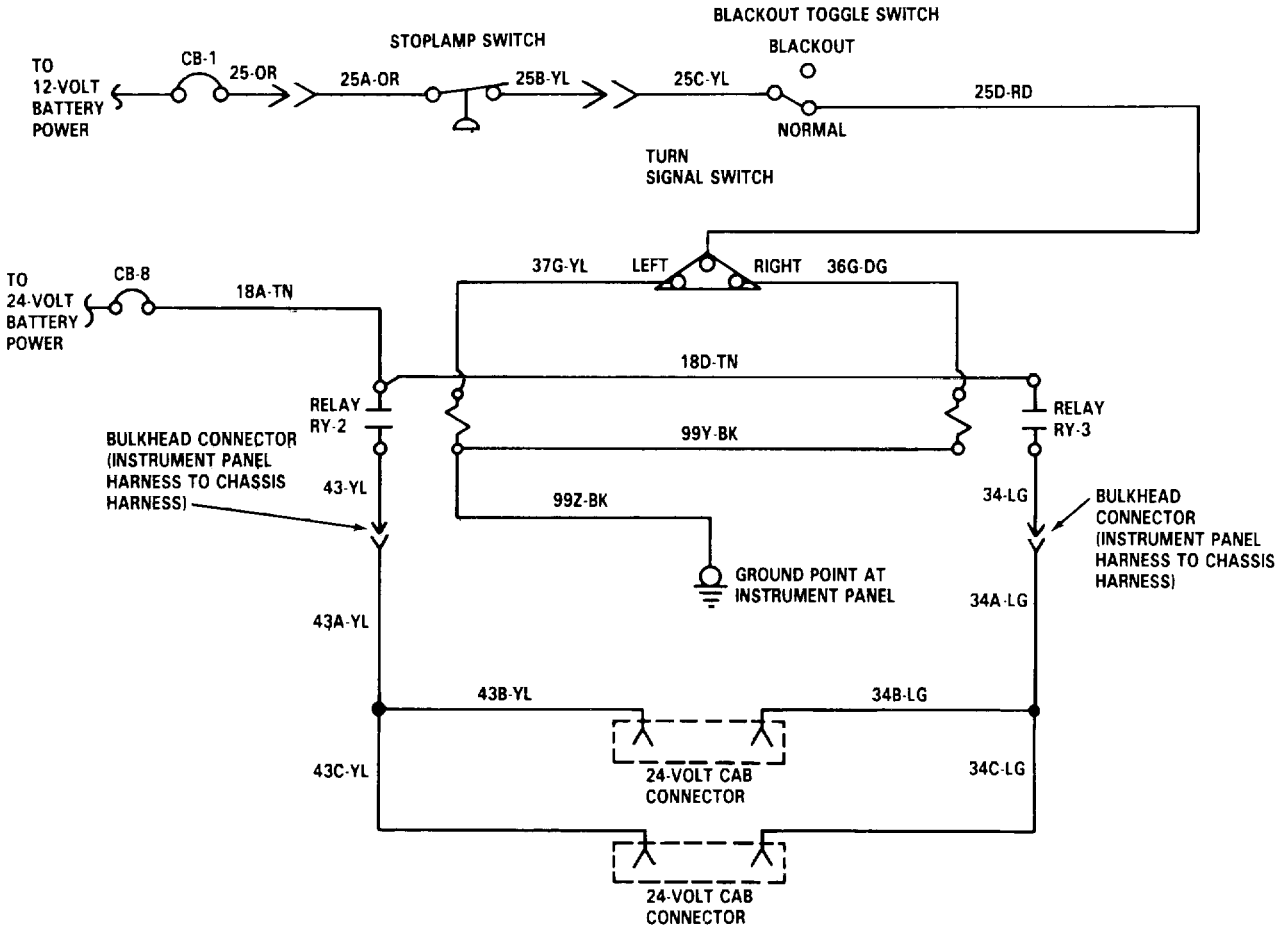
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
75. BOTH 24-VOLT TRAILER STOPLAMPS NOT WORKING (Continued).				
	NOTE With positive lead on circuit 36G-DG, check ground with negative lead for steps 4 thru 8.			
4.	Remove circuit breaker bracket far enough to access relay RY-3 and relay connector (para 3-114), and go to step 5.			
5.	Remove relay RY-3 (para 3-112), and go to step 6.			
6.	Check for voltage at circuit 99Z-BK ground point. Install relay RY-3, relay connector, and circuit breaker bracket (para 3-112 and	12-volts dc nominal.	Go to step 7.	Clean and tighten ground connection.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

75. BOTH 24-VOLT TRAILER STOPLAMPS NOT WORKING (Continued).



TA 236916

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

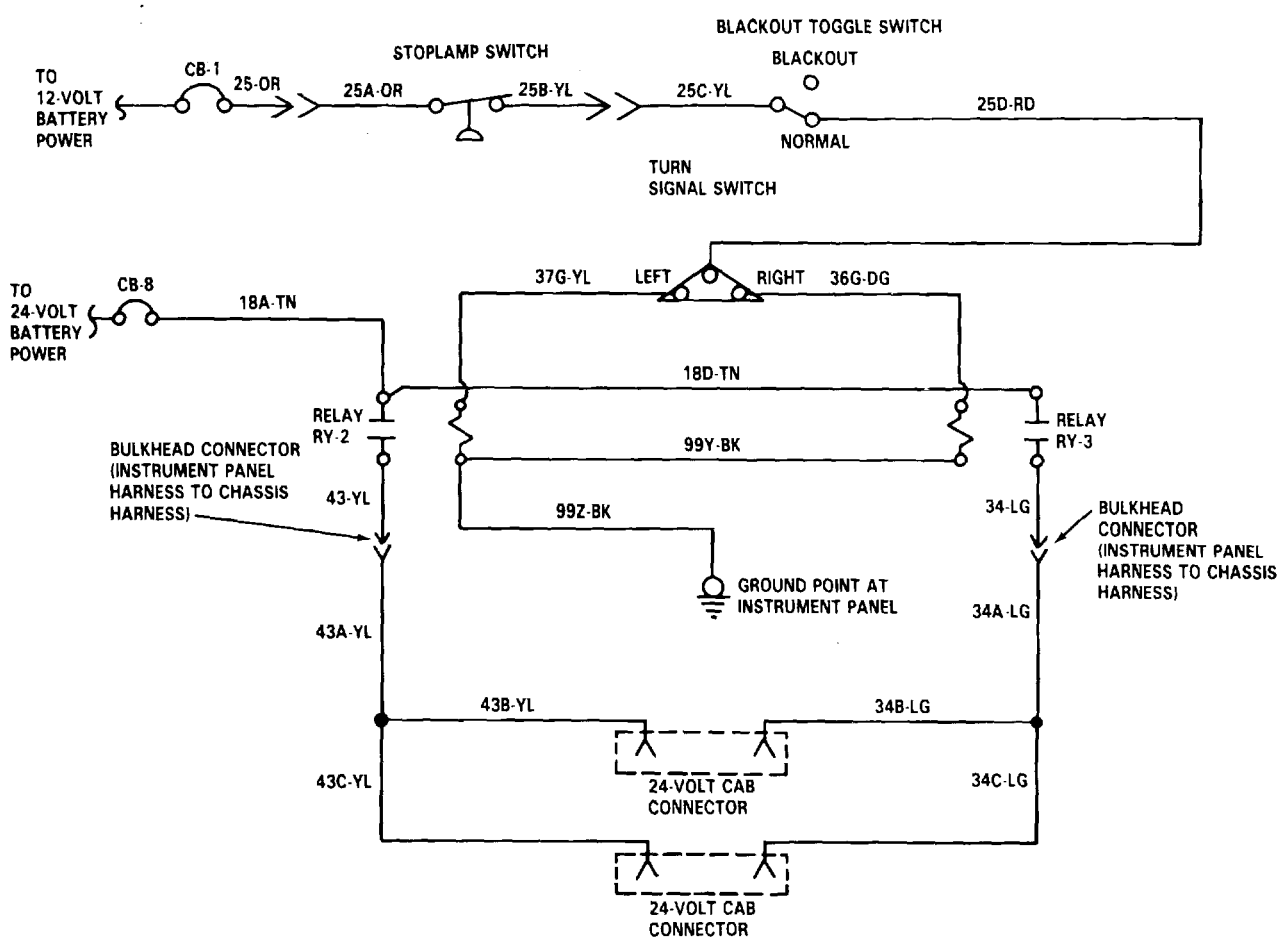
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
75. BOTH 24-VOLT TRAILER STOPLAMPS NOT WORKING (Continued).				
7.	Remove relay RY-2 (para 3-112), and go to step 8.			
8.	Check for voltage at circuit 99Z-BK terminal of relay RY-2.	12-volts dc nominal.	Go to step 9.	Repair circuit 99Z-BK (para 3-127). Install relays RY-2 and RY-3, relay connector, and circuit breaker bracket (para 3-112 and 3-114).
9.	Check for voltage at circuit 18A-TN terminal of circuit breaker CB-8.	24-volts dc nominal.	Go to step 10.	Reset circuit Breaker CB-8 and/or trouble Shoot CB-8 cir cuit. (Refer to malfunction 35).
10.	Check for voltage at circuit 18A-TN ter minal of relay connec tor.	24-volts dc nominal.	Install relays Ry-2 and RY-3, relay connec Tor, and cir cuit breaker bracket (para 3-112 and 3-114). Recheck trailer cir cuit.	Repair circuit 18A-TN (para 3-127). Install relaya RY-2 and RY-3, relay connector, and circuit breaker bracket (para 3-112 and 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

75. BOTH 24-VOLT TRAILER STOPLAMPS NOT WORKING (Continued).



TA 236917

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

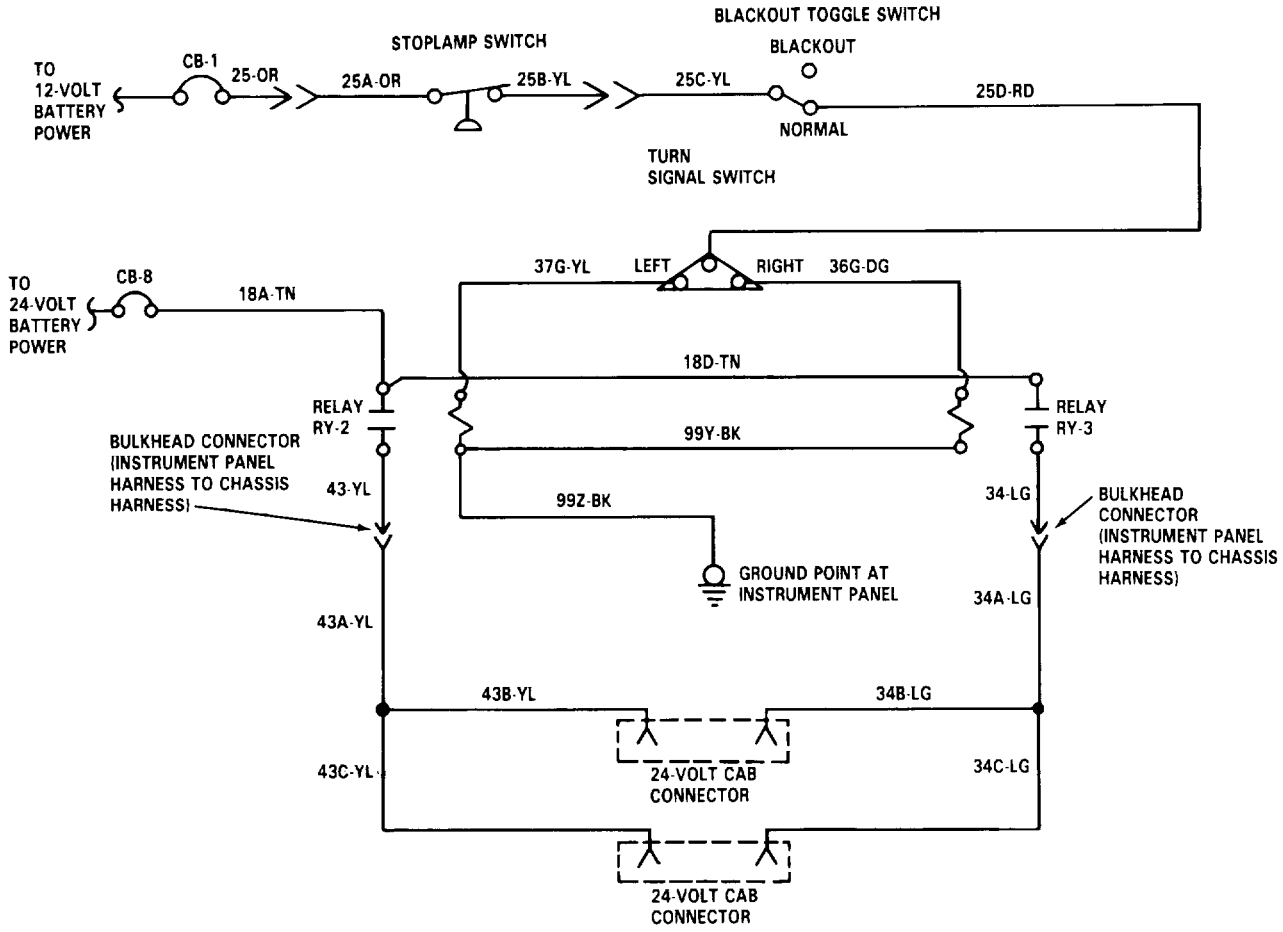
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
76. ONE 24-VOLT TRAILER STOPLAMP NOT WORKING.				
	NOTE • Blackout toggle switch must be set to NORMAL position, air system pressurized to 105 psi, and brake pedal depressed by assistant when doing the following checks. • It is assumed here that chassis stop- lamp circuit is OK. Faulty right trailer stoplamp is shown in this procedure. Apply similar trouble- shooting technique for left trailer stoplamp. • Do steps 1 thru 20 when troubleshooting 24-volt cab connector. • Do steps 1 thru 19 and steps 21 and 22 when troubleshooting 24-volt chassis connector.			
1.	Disconnect turn signal switch connector and, go to step 2.			
2.	Connect jumper wire between circuit 25D-RD and grey/black circuit, and go to step 3.			
3.	Check for voltage at circuit 36G-DG terminal of turn signal switch.	12-volts dc nominal.	Connect turn signal connec- tor, and go to step 4.	Replace turn signal switch (para 3-80).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

76. ONE 24-VOLT TRAILER STOPLAMP NOT WORKING (Continued).



TA 236918

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

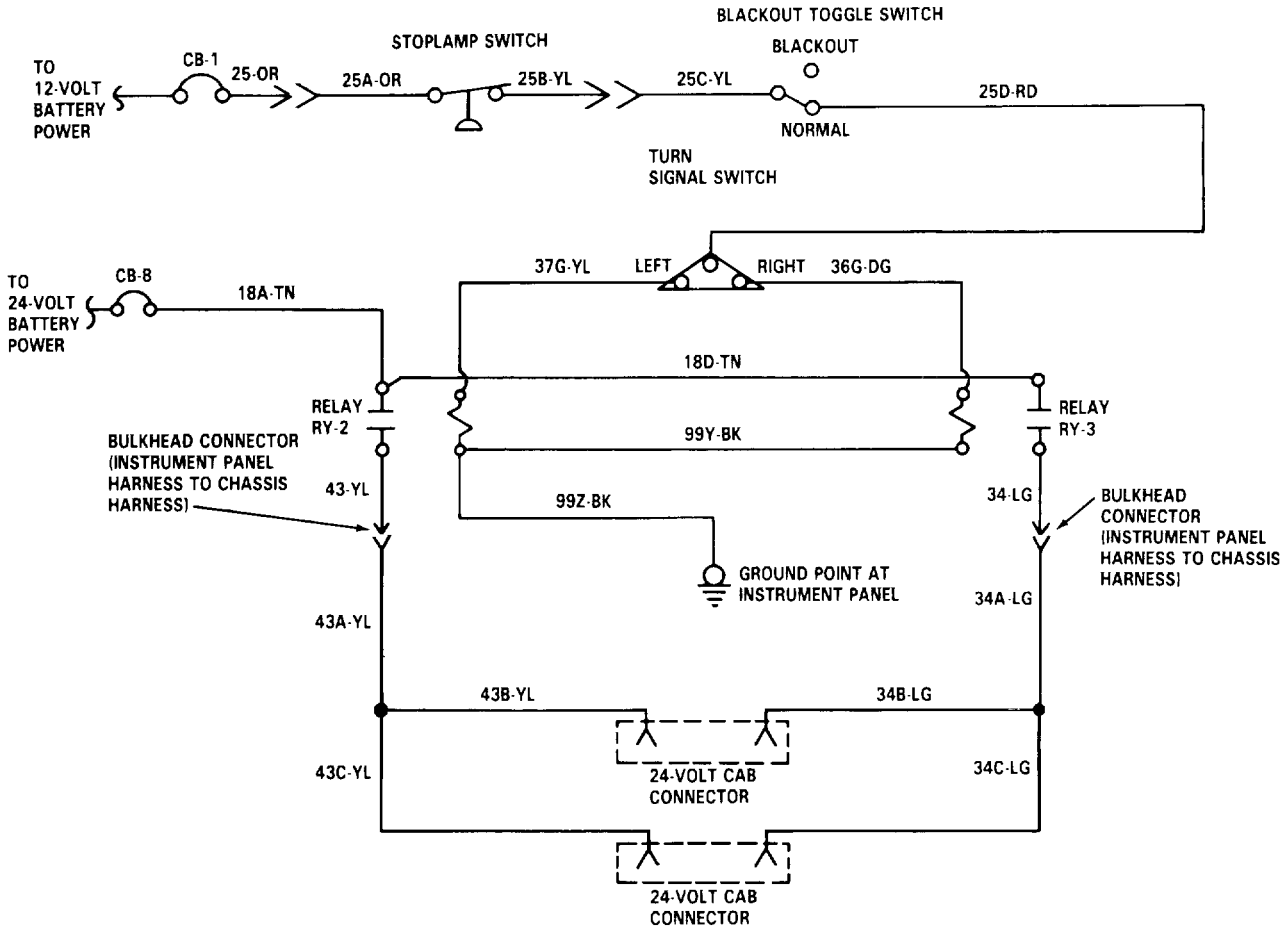
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
76. ONE 24-VOLT TRAILER STOPLAMP NOT WORKING (Continued).				
	4. Remove circuit breaker bracket far enough to access relay RY-3 and relay connector (para 3-114), and go to step 5.			
	5. Remove relay RY-3 (para 3-112), and go to step 6.			
	6. Check for voltage at circuit 36G-DG terminal of relay RY-3.	12-volts dc nominal.	Go to step 7.	Repair circuit 36G-DG (para 3-127). Install relay connector, and circuit breaker bracket (para 3-112 and 3-114).
	NOTE With positive lead on circuit 36G-DG, check ground with negative lead for steps 7 thru 10.			
	7. Check for voltage at circuit 99Z-BK ground point.	12-volts dc nominal.	Go to step 8.	Clean and tighten ground connection. Install relay RY-3, relay connector, and circuit breaker bracket (para 3-112 and 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

76. ONE 24-VOLT TRAILER STOPLAMP NOT WORKING (Continued).



TA 236919

TROUBLESHOOTING.

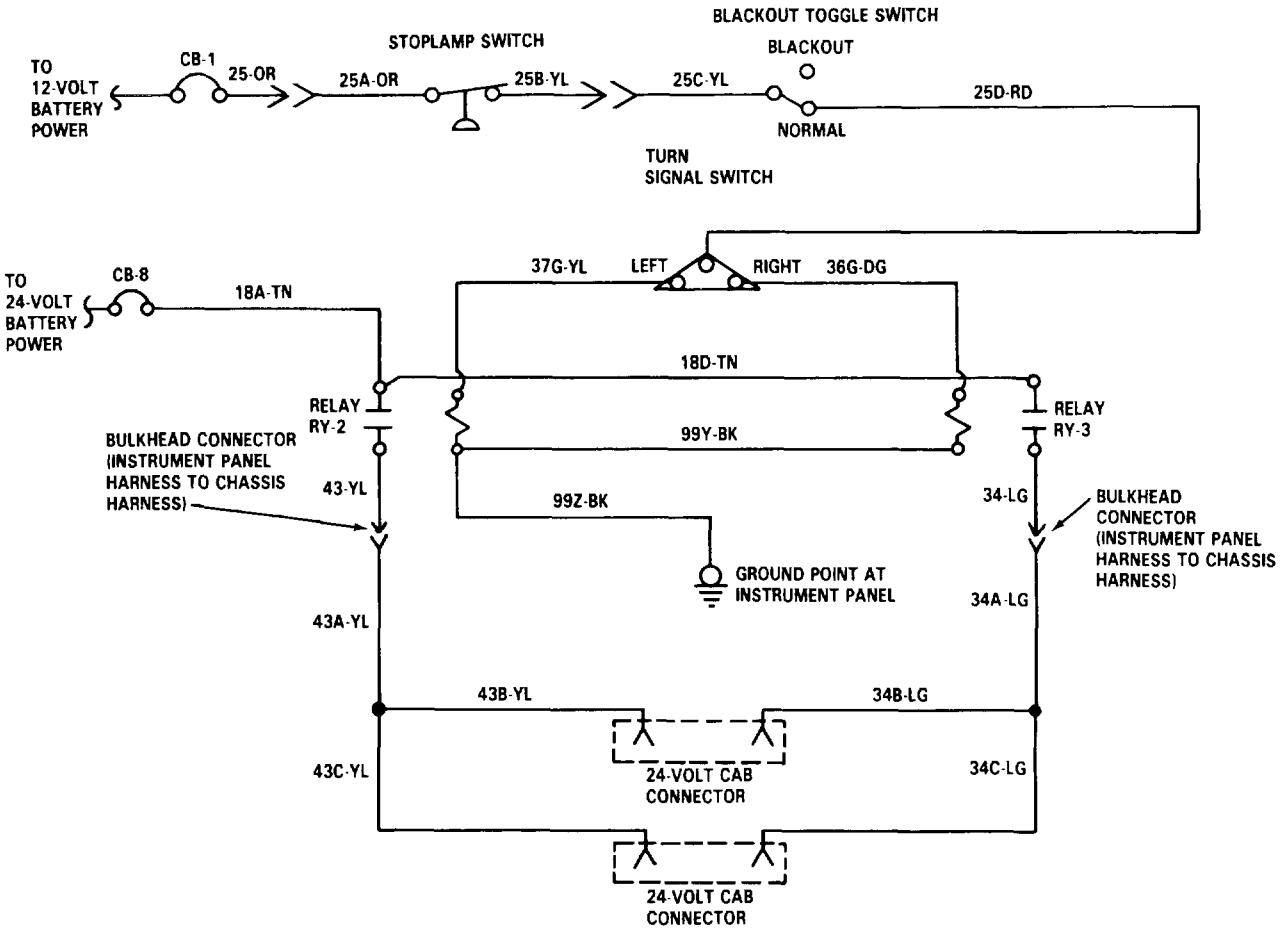
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
76. ONE 24-VOLT TRAILER STOPLAMP NOT WORKING (Continued).				
8	Remove relay RY-2 (para 3-112), and go to step 9.			
9	Check for voltage at circuit 99Z-BK terminal of relay connector	12-volts dc nominal 3-127)	Go to step 10	Repair circuit 99Z-BK (para Install relays RY-2 and RY-3, relay connector, and circuit breaker bracket (para 3-112 and 3-114).
10	Check for voltage at circuit 99Y-BK terminal of relay connector	12-volts dc nominal	Go to step 11	Repair circuit 99Y-BK (para 3-127) Install relays RY-2 and RY-3, relay connector, and circuit breaker bracket (para 3-112 and 3-114).
11	Check for voltage at circuit 18A-TN terminal of circuit breaker CB-8	24-volts dc nominal	Go to step 12	Reset circuit breaker CB-8 and/or troubleshoot CB-8 circuit (Refer to malfunction 35).

TROUBLESHOOTING.

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

76. ONE 24-VOLT TRAILER STOPLAMP NOT. WORKING (Continued).



TA 236920

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

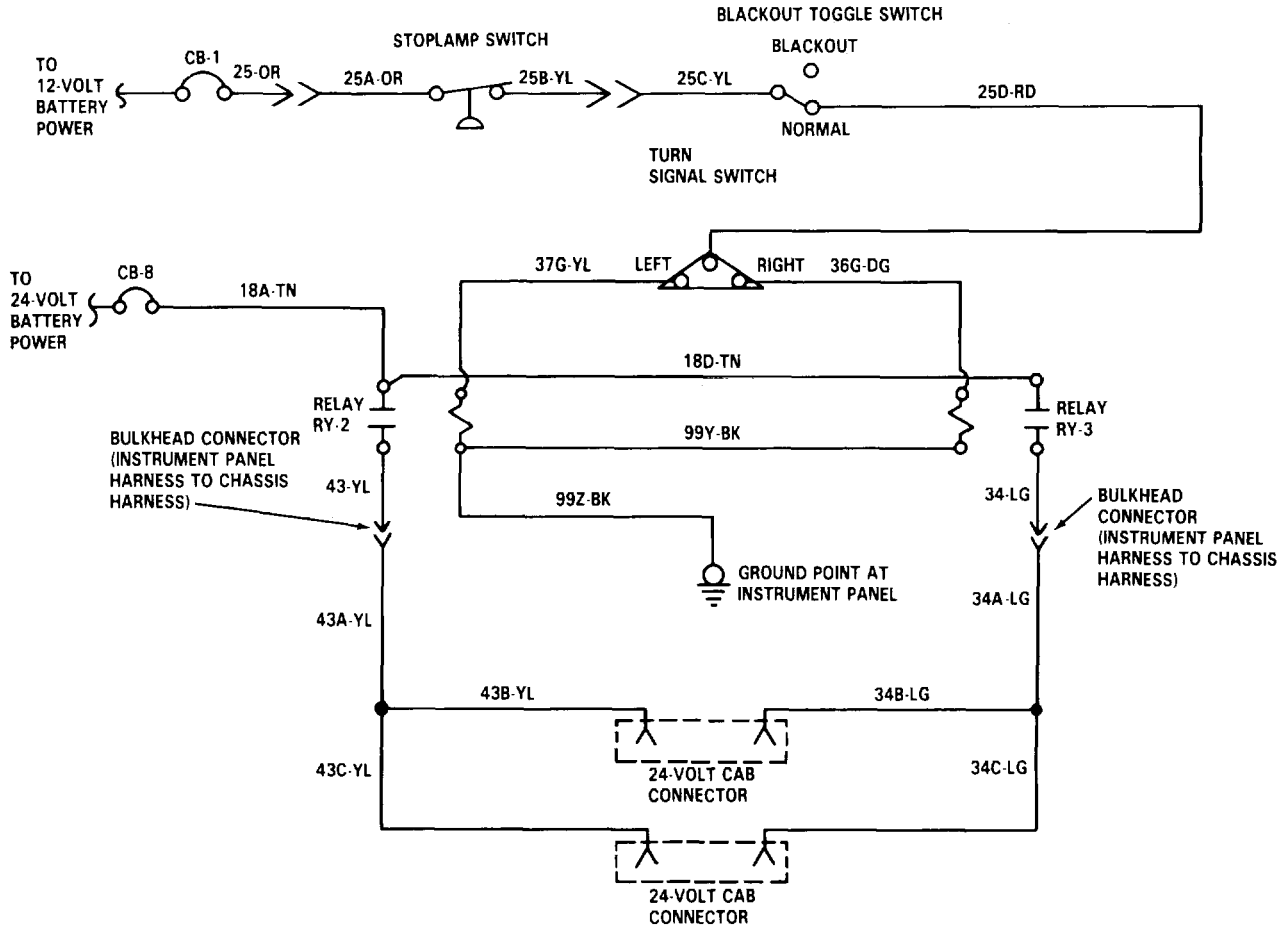
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
76. ONE 24-VOLT TRAILER STOPLAMP NOT WORKING (Continued).				
12.	Remove relay RY-2 (para 3-112), and go to step 13.			
13.	Check for voltage at circuit 18A-TN terminal of relay RY-2.	24-volts dc nominal.	Go to step 14.	Repair circuit 18A-TN (para 3-127).
14.	Check for voltage at circuit 18D-TN terminal of relay RY-3.	24-volts dc nominal.	Go to step 15.	Repair circuit 18D-TN (para 3-127). Install relay RY-3 and relay connector (para 3-112 and 3-114).
15.	Install relay RY-3 (para 3-112), and go to step 16.			
16.	Move blackout toggle switch from NORMAL to BLACKOUT and back to NORMAL position.	Listen for clicking sound at RY-3.	Install relay RY-3, relay connector, and circuit breaker bracket (para 3-112 and 3-114), and go to step 17.	Replace relay RY-3. Install relay connector and circuit breaker bracket (para 3-112 and 3-114).
17.	Disconnect circuit 34-LG from 34A-LG, and go to step 18.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

76. ONE 24-VOLT TRAILER STOPLAMP NOT WORKING (Continued).



TA 236921

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

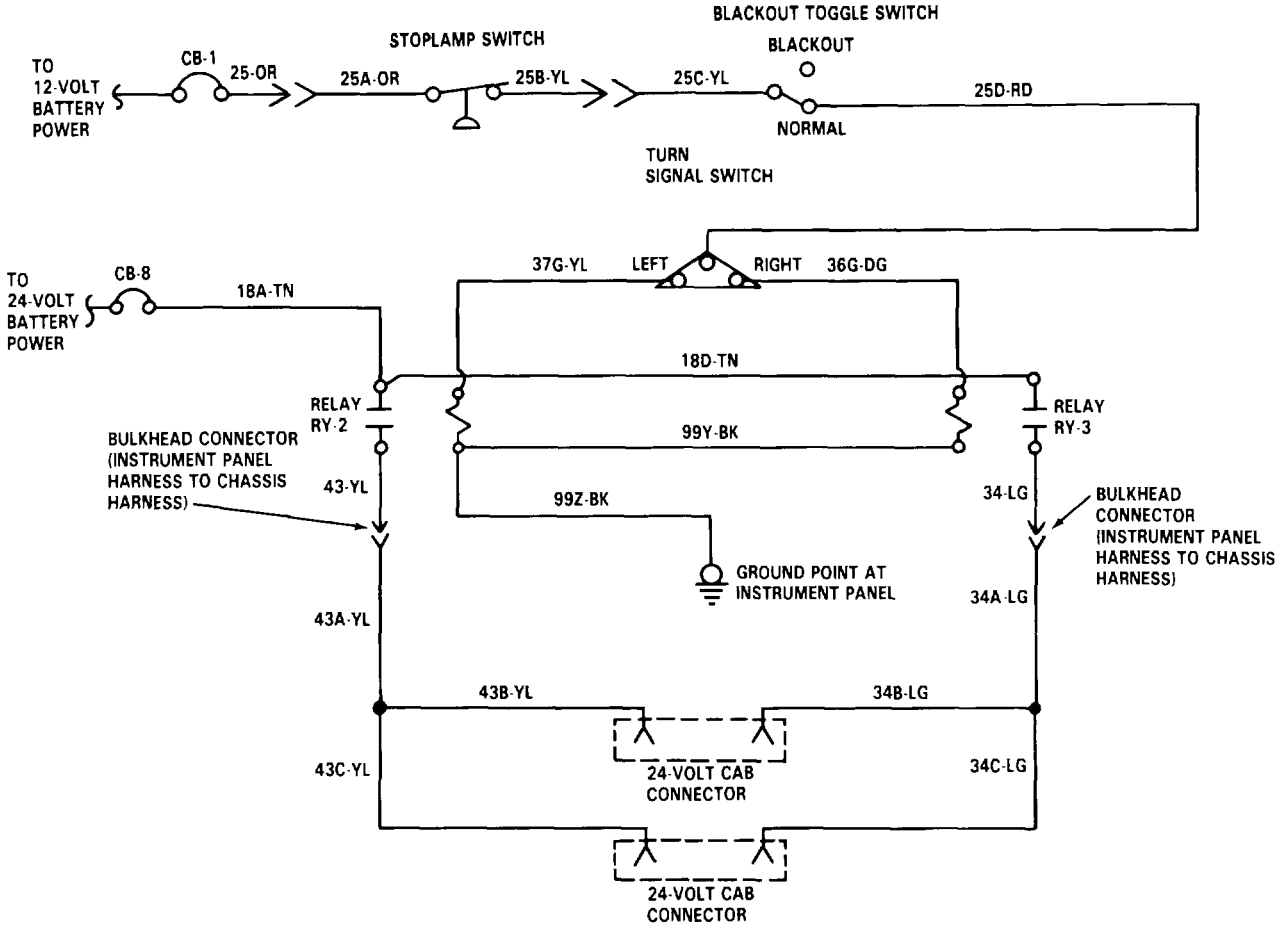
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
76. ONE 24-VOLT TRAILER STOPLAMP NOT WORKING (Continued).				
18.	Check for voltage at circuit 34-LG terminal of connector. to step 19.	24-volt dc nominal.	Connect circuit 34-LG to 34A-LG, and go	Repair circuit 34-LG (para 3-127).
19.	Remove trailer 24-volt cab connector, and go to step 20.			
20.	Check for voltage at 34B-LG terminal of connector.	24-volts dc nominal.	Recheck trailer circuit.	Repair circuit 34B-LG and/or 34A-LG (para
21.	Remove trailer 24-volt chassis connector, and go to step 22.			
22.	Check for voltage at 34C-LG terminal of connector.	24-volts dc nominal.	Recheck trailer circuit.	Repair circuit 34C-LG and/or 34A-LG (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

76. ONE 24-VOLT TRAILER STOPLAMP NOT WORKING (Continued).



TA 236922

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

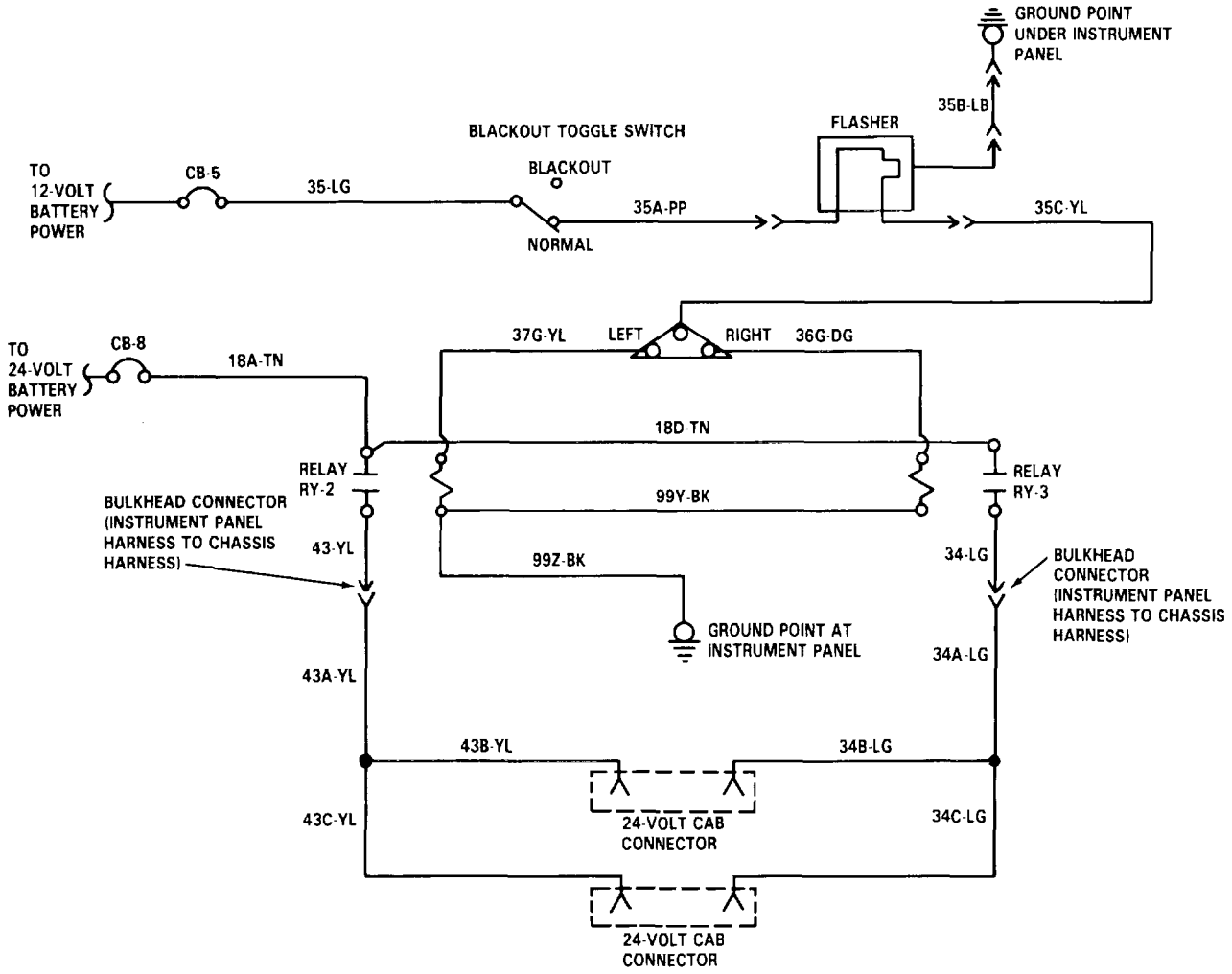
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
77. BOTH 24-VOLT TRAILER TURN SIGNAL LAMPS NOT WORKING.				
	NOTE • Blackout toggle switch must be set to NORMAL position and turn signal switch HAZARD control set to on position when doing the following checks. • It is assumed here that chassis turn signal lamps are OK. Apply same troubleshooting technique for either cab or chassis connector.			
	1. Disconnect turn signal switch connector, and go to step 2.			
	2. Connect jumper wire between circuit 35C-YL and yellow wire at turn signal connector, and go to step 3.			
	3. Check for voltage at circuit 37G-YL or 36G-DG of turn signal switch connector.	12-volts dc nominal.	Remove jumper wire, connect turn signal switch connector, and go to step 4.	Replace turn signal switch (para 3-80).
	4. Go to malfunction 75, step 4.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

77. BOTH 24-VOLT TRAILER TURN SIGNAL LAMPS NOT WORKING (Continued).



TA 236923

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

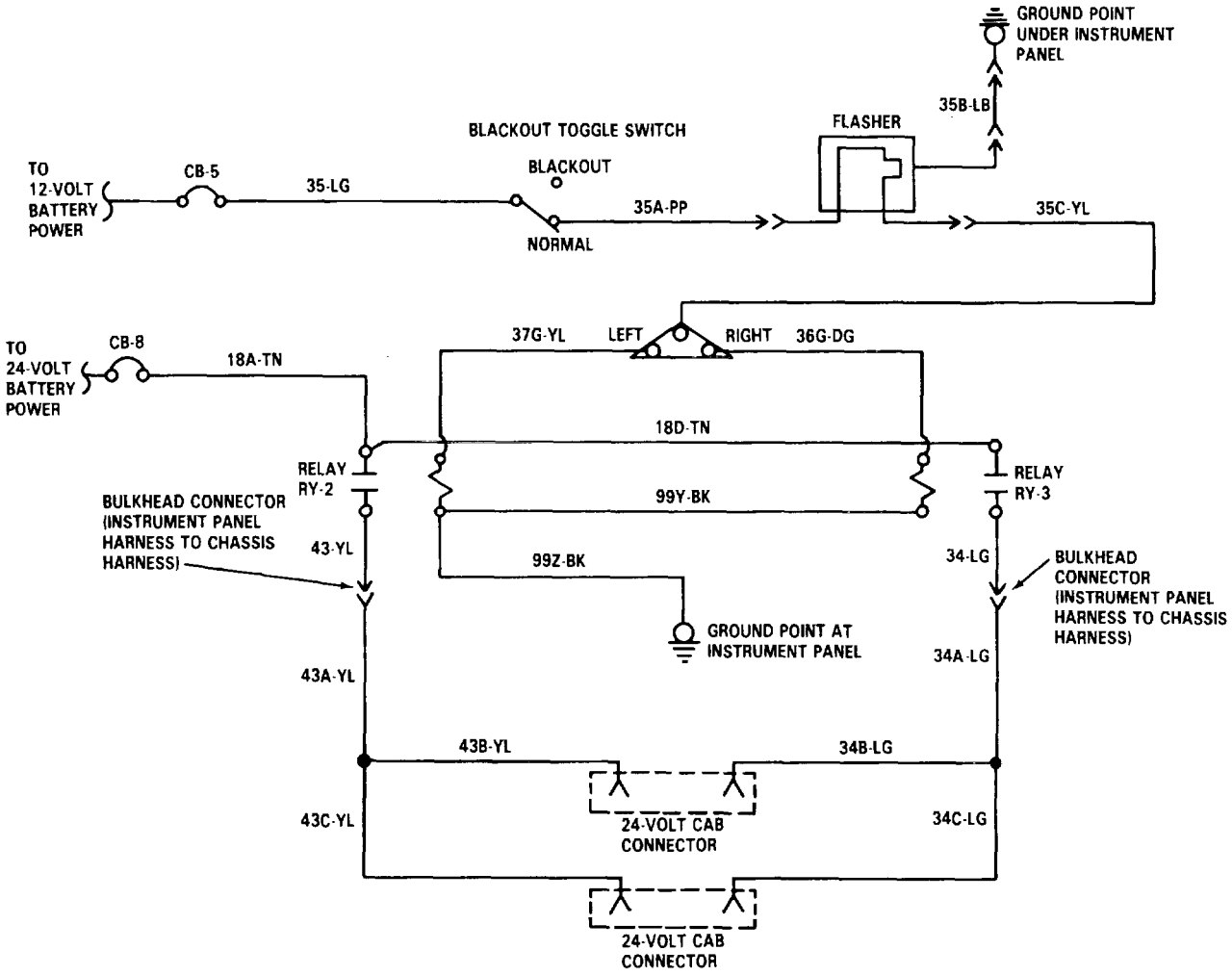
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
78. ONE 24-VOLT TRAILER TURN SIGNAL LAMP NOT WORKING.				
	NOTE • Blackout toggle switch must be set to NORMAL position and turn signal switch set for right turn when doing the following check. • It is assumed here that chassis turn signal lamps are OK. Faulty right trailer turn signal lamp is shown in this procedure. Apply similar troubleshooting technique for left trailer turn signal switch lamp.			
1.	Disconnect turn signal switch connector, and go to step 2.			
2.	Connect jumper wire between circuit 35C-YL and yellow wire at turn signal connector, and go to step 3.			
3.	Check for voltage at circuit 37G-YL or 36G-DG of turn signal switch connector.	12-volts dc nominal.	Remove jumper wire, connect turn signal switch connector, and go to step 4.	Replace turn signal switch (para 3-80).
4.	Go to malfunction 76, step 4.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

78. ONE 24-VOLT TRAILER TURN SIGNAL LAMP NOT WORKING (Continued).



TA 236924

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

79. BOTH 24-VOLT TRAILER TAILLAMPS NOT WORKING.

NOTE
- Headlamp switch must be in ON position and blackout toggle switch must be set to NORMAL position when doing the following check.
- It is assumed here that chassis tail lamps are OK.
- Do steps 1 thru 22 when troubleshooting 24-volt cab connector.
- Do steps 1 thru 20 and steps 23 and 24 when troubleshooting 24-volt chassis connector.

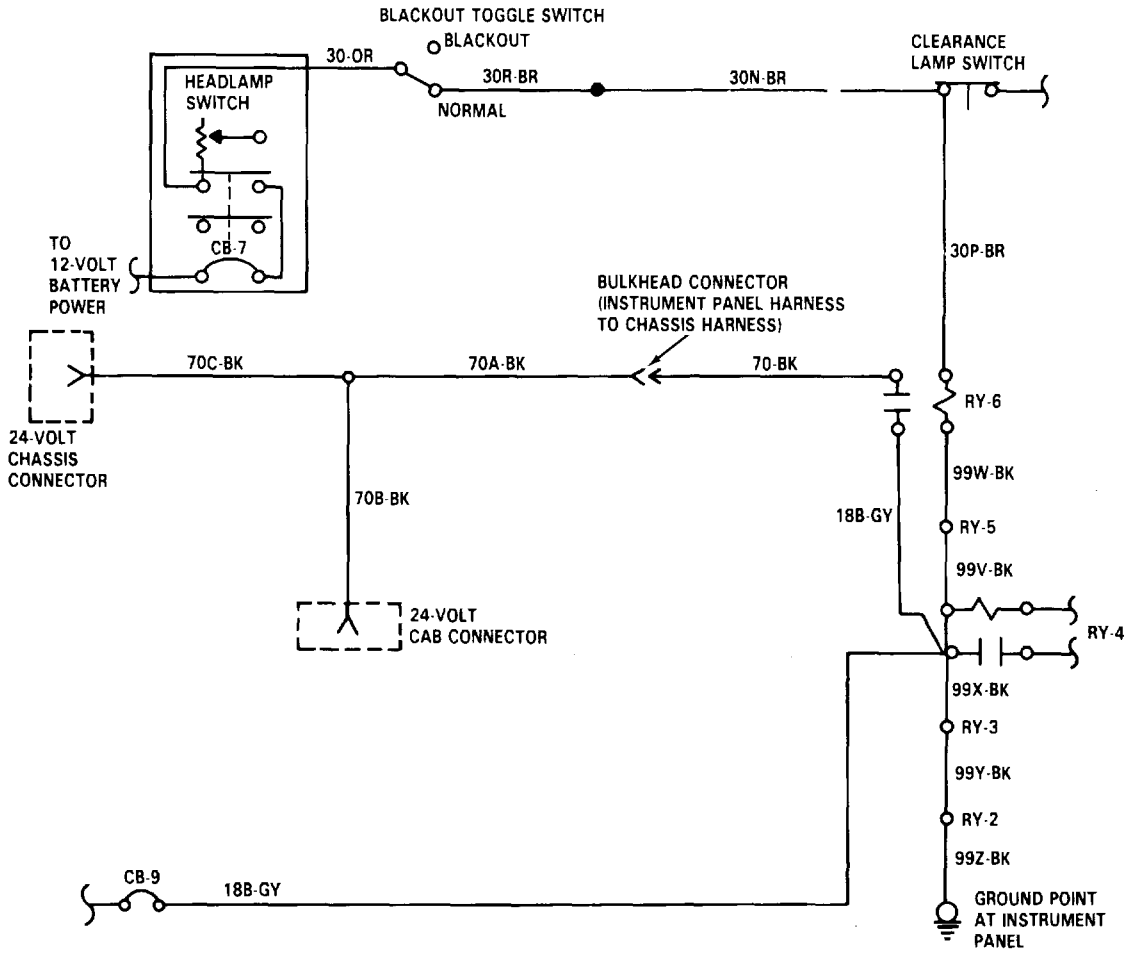
	MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
1.		Check for voltage at circuit 30N-BR terminal of clearance lamp switch.	12-volts dc nominal.	Go to step 2.	Repair circuit 30N-BR (para 3-127).
2.		Remove circuit breaker bracket far enough to access relay RY-6 and relay connector (para 3-114), and go to step 3.			
3.		Remove RY-6 (para 3-112), and go to step 4.			
4.		Check for voltage at circuit 30P-BR terminal of relay RY-6.	12-volts dc nominal.	Go to step 5.	Repair circuit 30P-BR (para 3-127). Install relay RY-6, relay connector, and circuit breaker bracket (para 3-112 and 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

79. BOTH 24-VOLT TRAILER TAILLAMPS NOT WORKING (Continued).



TA 236925

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

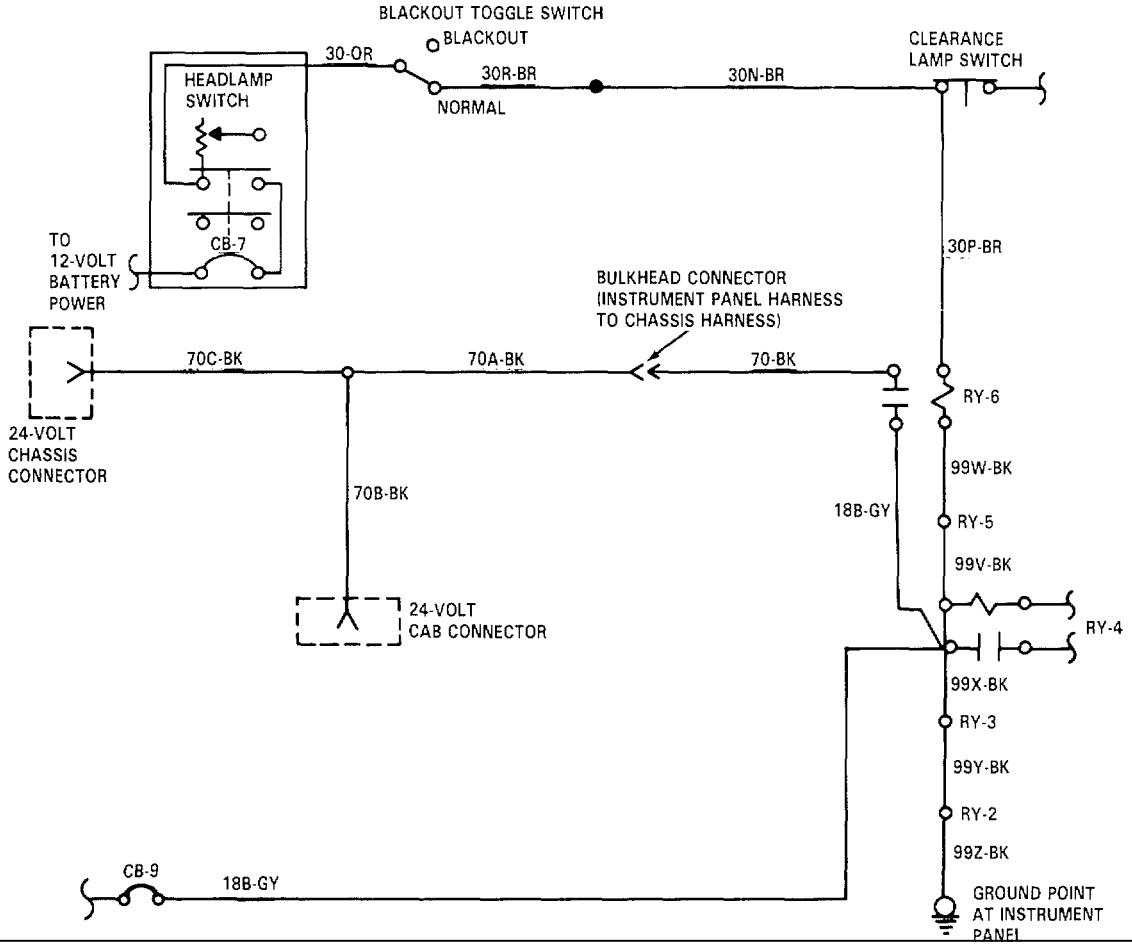
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
79. BOTH 24-VOLT TRAILER TAILLAMPS NOT WORKING (Continued).				
	NOTE With positive lead on circuit 30P-BR, check ground with negative lead for step 5 thru 13.			
5.	Check for voltage at circuit 99Z-BK ground point.	12-volts dc nominal.	Go to step 6.	Clean and tighten ground connection. Install relay RY-6, relay connector, and circuit breaker bracket (para 3-112 and 3-114).
6.	Remove relay RY-2 (para 3-112), and go to step 7.			
7.	Check for voltage at circuit 99Z-BK terminal of relay RY-2.	12-volts dc nominal.	Install relay RY-2, and go to step 8.	Repair circuit 99Z-BK (para 3-127). Install relays RY-3 and RY-6, relay connector, and circuit breaker bracket (para 3-112 and 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

79. BOTH 24-VOLT TRAILER TAILLAMPS NOT WORKING (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

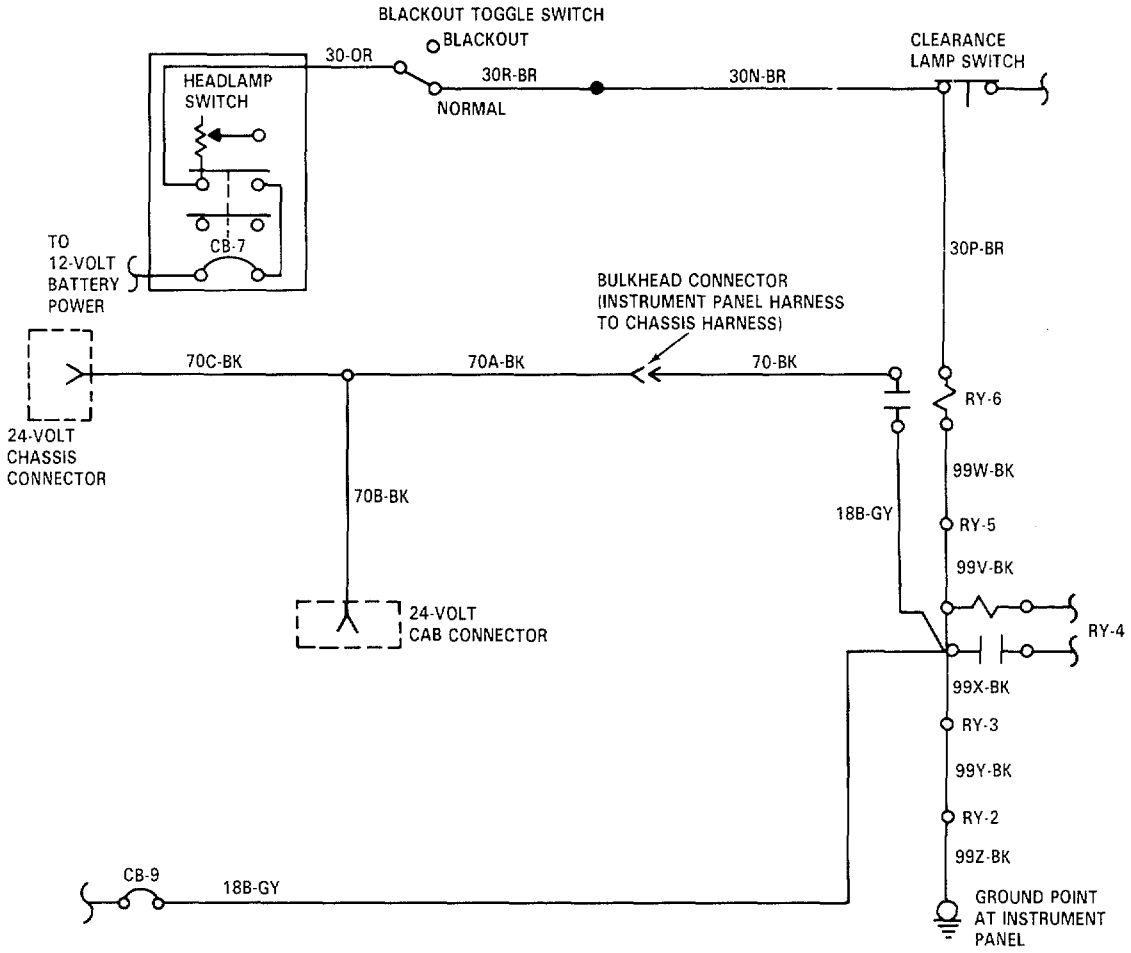
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
79. BOTH 24-VOLT TRAILER TAILLAMPS NOT WORKING (Continued).				
8	Remove relay RY-3 (para 3-112), and go to step 9.			
9	Check for voltage at circuit 99Y-BK terminal of relay RY-3	12-volts dc nominal	Install relay RY-3 (para 3-112), and go to step 10	Repair circuit 99Y-BK (para 3-127) Install relays RY-6 and RY-3, relay connector, and circuit breaker bracket (para 3-112 and 3-114).
10	Remove relay RY-4 (para 3-112), and go to step 11.			
11	Check for voltage at circuit 99X-BK terminal of relay RY-4	12-volts dc nominal	Go to step 12	Repair circuit 99X-BK (para 3-127) Install RY-6, relay connector, and circuit breaker bracket (para 3-112 and 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

79. BOTH 24-VOLT TRAILER TAILLAMPS NOT WORKING (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

79. BOTH 24-VOLT TRAILER TAILLAMPS NOT WORKING (Continued).

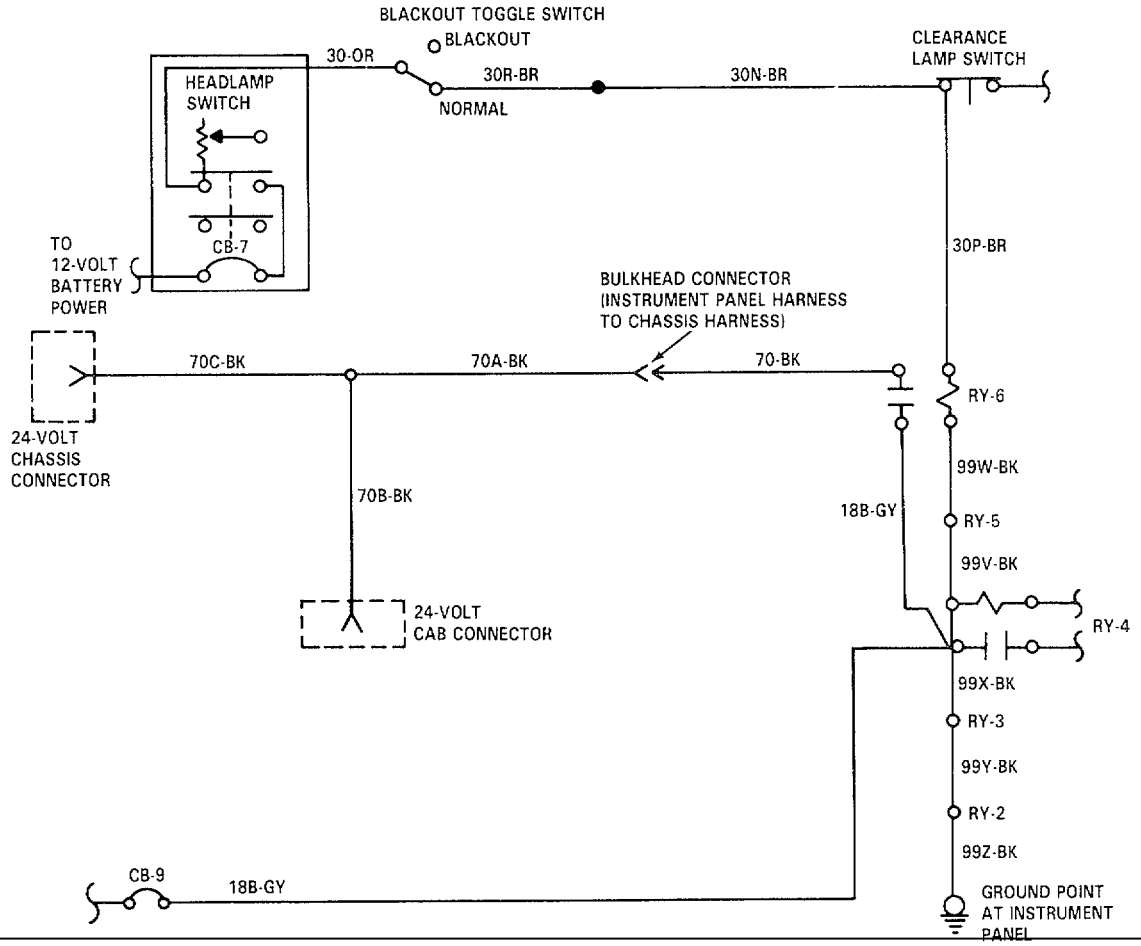
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
12	Remove relay RY-5 (para 3-112), and go to step 13.			
13	Check for voltage at circuit 99W-BK terminal of relay RY-5	12-volts dc nominal	Install relay RY-5 (para 3-112), and go to step 14	Repair circuit 99W-BK (para 3-127) Install relay RY-6 and RY-5, relay connector, and circuit breaker bracket (para 3-112 and 3-114).
14	Check for voltage at circuit 18B-GY terminal of circuit breaker CB-9	24-volts dc nominal	Go to step 15	Reset circuit breaker CB-9 and/or troubleshoot CB-9 circuit (Refer to malfunction 35).
15	Check for voltage at circuit 18B-GY terminal of relay RY-4	24-volts dc nominal	Install relay RY-4 (para 3-112), and go to step 16.	Repair circuit 18B-GY (para 3-127).
16	Check for voltage at circuit 18C-GY terminal of relay RY-6	24-volts dc nominal	Go to step 17	Repair circuit 18C-GY (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

79. BOTH 24-VOLT TRAILER TAILLAMPS NOT WORKING (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

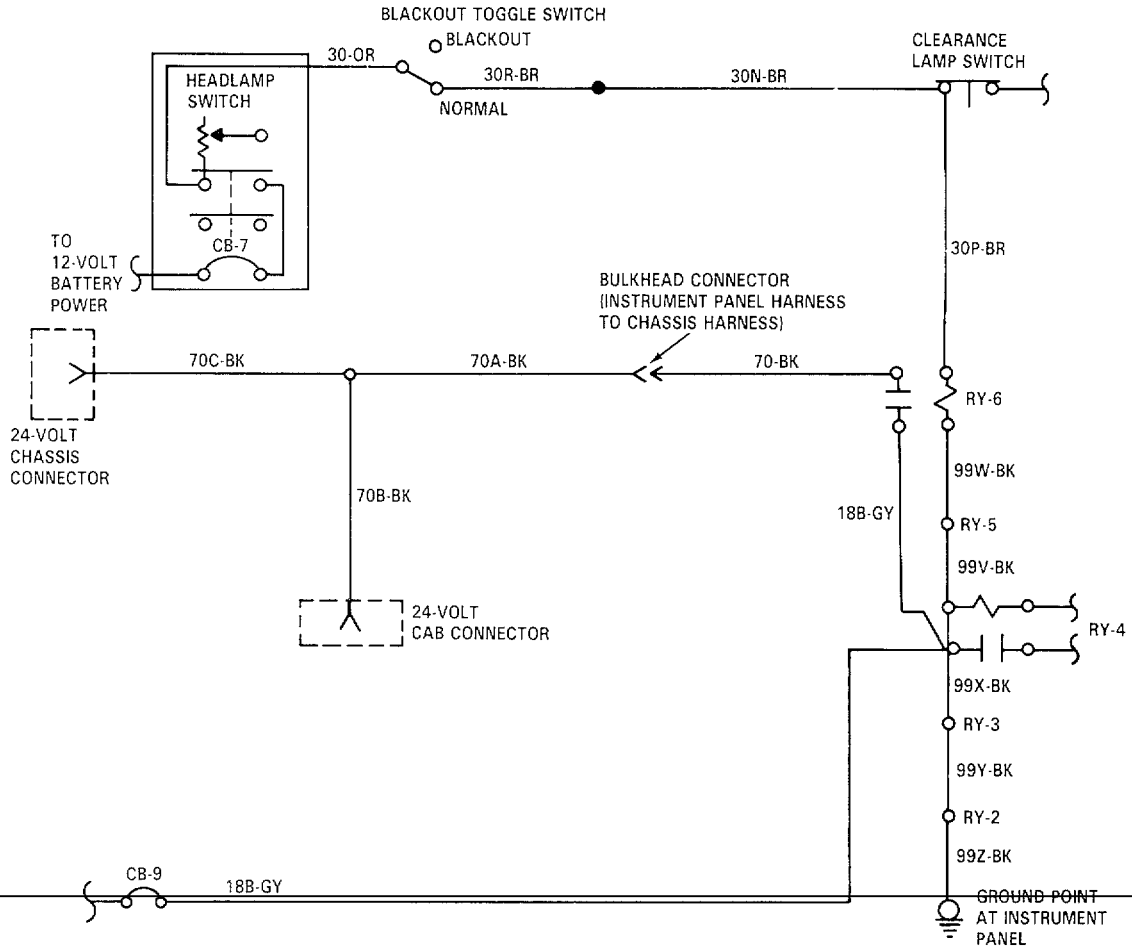
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
79. BOTH 24-VOLT TRAILER TAILLAMPS NOT WORKING (Continued).				
17	Install relay RY-6, and go to step 18.			
18	Set blackout toggle switch from NORMAL to BLACKOUT then back to NORMAL position	Listen for RY-6, and install relay relay RY-6	Install relay clicking sound at circuit breaker bracket (para 3-112 and 114), and go to step 19	Replace relay RY-6, relay connector, and connector and circuit breaker bracket (para 3-112 and 3-114).
19	Disconnect circuit 70A-BK from 70-BK at connector, and go to step 20.			
20	Check for voltage at circuit 70-BK (pin K of connector)	24-volts dc nominal	Connect circuit 7OA-BK to 70-BK, and go to step 21 or 22.	Repair circuit 70-BK (para 3-127).
21	Disconnect 24-volt cab connector, and go to step 22.			
22	Check for voltage at circuit 70B-BK (pin E of connector)	24-volts dc nominal	Recheck trailer taillamp cir-cuit	Repair circuit 70A-BK and/or 70B-BK (para 3-127)
23	Disconnect 24-volt chassis connector, and go to step 24.			
24	Check for voltag e at circuit 70C-BK (pin E of connector)	24-volts dc nominal	Recheck trailer taillamp cir-cuit	Repair circuit 70A-BK and/or 70C-BK (para 3-127)

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

79. BOTH 24-VOLT TRAILER TAILLAMPS NOT WORKING (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

80. BOTH 24-VOLT TRAILER BLACKOUT STOPLAMPS NOT WORKING.

NOTE

-Blackout toggle switch must be set to BLACKOUT position, air system pressurized to 105 psi, and brake pedal depressed by assistant when doing the following check.

·It is assumed here that chassis stop- lamp circuit is OK.
·Do steps 1 thru 17 when troubleshoot- ing 24-volt cab connector.
·Do steps 1 thru 15 and steps 18 and 19 when troubleshooting 24-volt chassis connector.

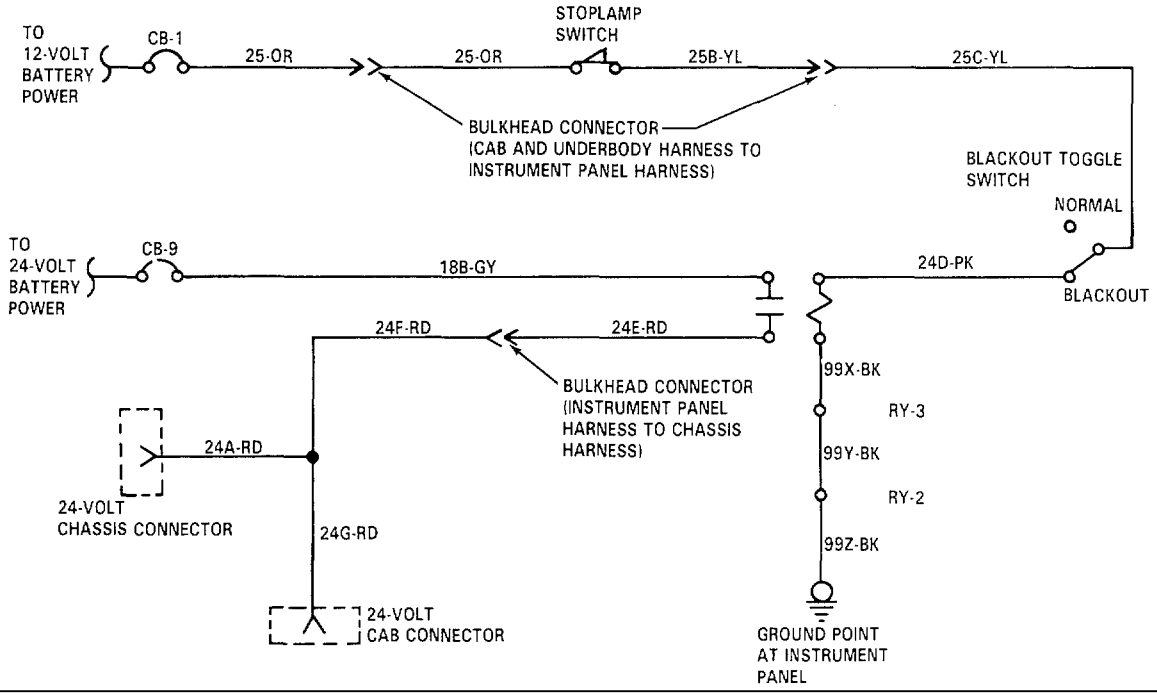
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
	1 Check for voltage at circuit 24D-PK terminal of blackout toggle switch	12-volts dc nominal	Go to step 2	Replace black-out toggle switch (para 3-79).
	2 Remove circuit breaker bracket far enough to access relay RY-4 and relay connector (para 3-114), and go to step 3.			
	3 Remove relay RY-4 (para 3-112), and go to step 4.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

80. BOTH 24-VOLT TRAILER BLACKOUT STOPLAMPS NOT WORKING (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

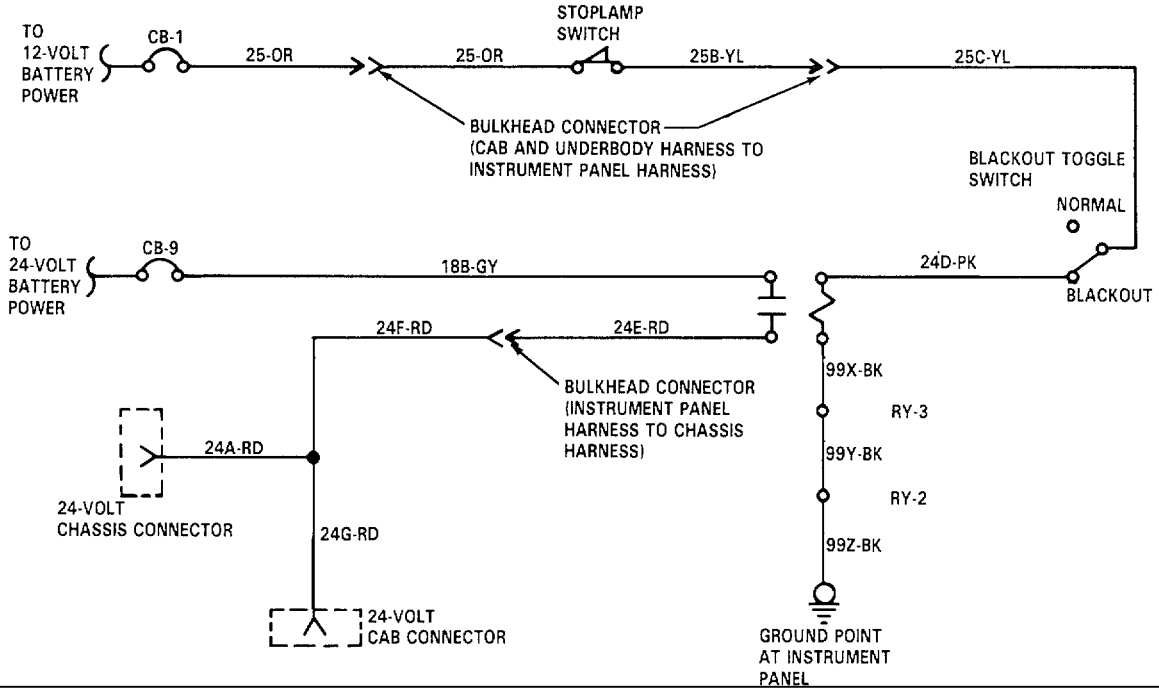
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
80. BOTH 24-VOLT TRAILER BLACKOUT STOPLAMPS NOT WORKING (Continued).				
	4	Check for voltage at circuit 24D-PK terminal of relay connector	12-volts dc nominal	Go to step 5	Repair circuit 924D-PK (para 3-127) Install relay RY-4, relay connector, and circuit breaker bracket (para 3-112 and 3-114).
		NOTE With positive lead on circuit 24D-PK, check ground with negative lead for steps 5 thru 10.			
	5	Check for voltage at circuit 99Z-BK ground point	12-volts dc nominal	Go to step 6	Clean and tighten ground point connection Install relay RY-4, relay connector, and circuit breaker bracket (para 3-112 and 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

80. BOTH 24-VOLT TRAILER BLACKOUT STOPLAMPS NOT WORKING (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

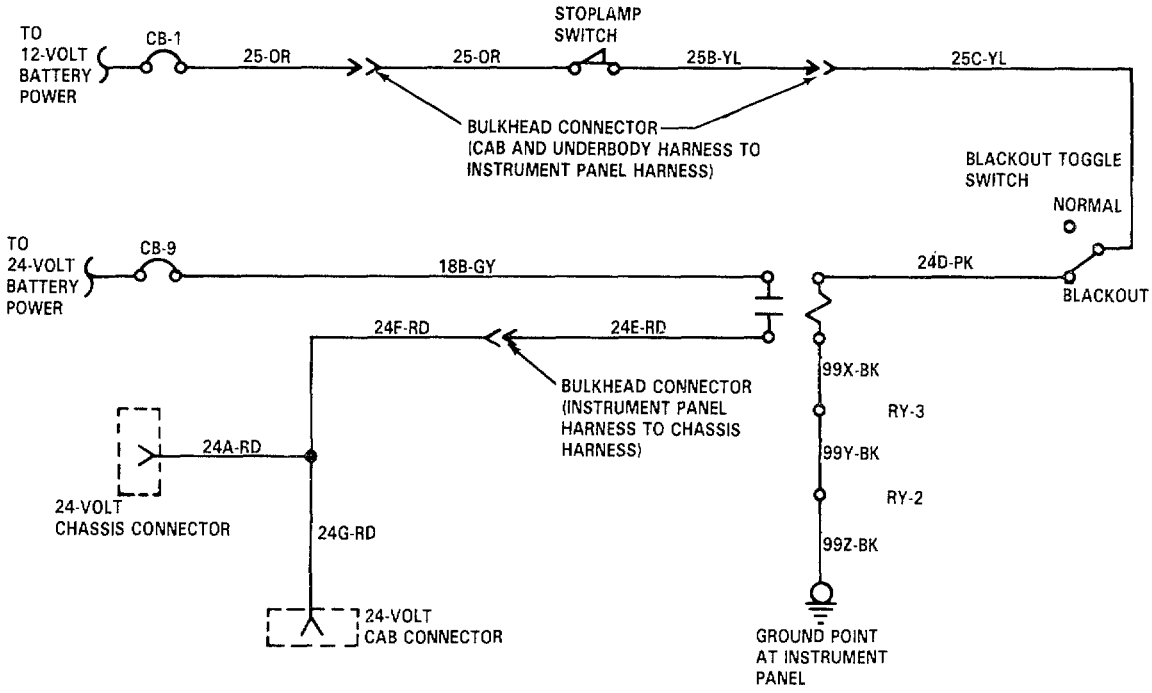
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
80. BOTH 24-VOLT TRAILER BLACKOUT STOPLAMPS NOT WORKING (Continued).				
6	Remove relay RY-2 (para 3-112), and go to step 7.			
7	Check for voltage at circuit 99Z-BK terminal of relay connector	12-volts dc nominal	Install relay RY-2 (para 3-112), and to to step 8	Repair circuit 99Z-BK (para 3-127) Install relays RY-2 and connector, and circuit breaker bracket (para 3-112 and 3-114).
8	Remove relay RY-3 (para 3-112), and go to step 9.			
9	Check for voltage at circuit 99Y-BK terminal of relay connector	12-volts dc nominal	Install relay RY-3 (para 3-112), and go to step 10	Repair circuit 99Y-BK (para 3-127) Install relays RY-3 and RY-4, relay connector, and circuit breaker bracket (para 3-112 and 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

80. BOTH 24-VOLT TRAILER BLACKOUT STOPLAMPS NOT WORKING (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

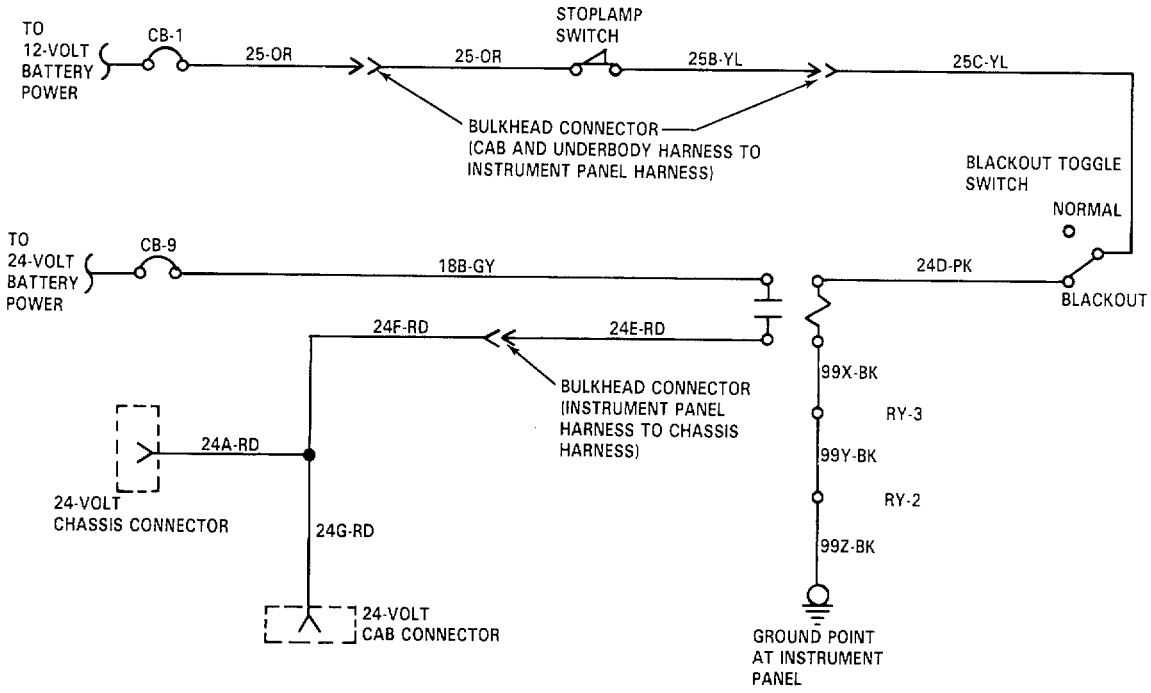
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
80. BOTH 24-VOLT TRAILER BLACKOUT STOPLAMPS NOT WORKING (Continued).				
10	Check for voltage at circuit 99X-BK terminal of relay connector	12-volts dc nominal	Go to step 11	Repair circuit 99X-BK (para 3-127) Install relay RY-4, relay connector, and circuit breaker bracket (para 3-112 and 3-114).
11	Check for voltage at circuit 18B-GY terminal of circuit breaker CB-g	24-volts dc nominal	Go to step 12	Reset circuit breaker CB-9 and/or trouble-circuit (Refer shoot CB-9 to malfunction 35).
12	Check for voltage at circuit 18B-GY terminal of relay RY-4	24-volts dc nominal step 13	Install relay RY-4, and go to 3-127)	Repair circuit 18B-GY (para Install relay connector, and circuit breaker bracket (para 3-112 and 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

80. BOTH 24-VOLT TRAILER BLACKOUT STOPLAMPS NOT WORKING (Continued).



TROUBLESHOOTING.

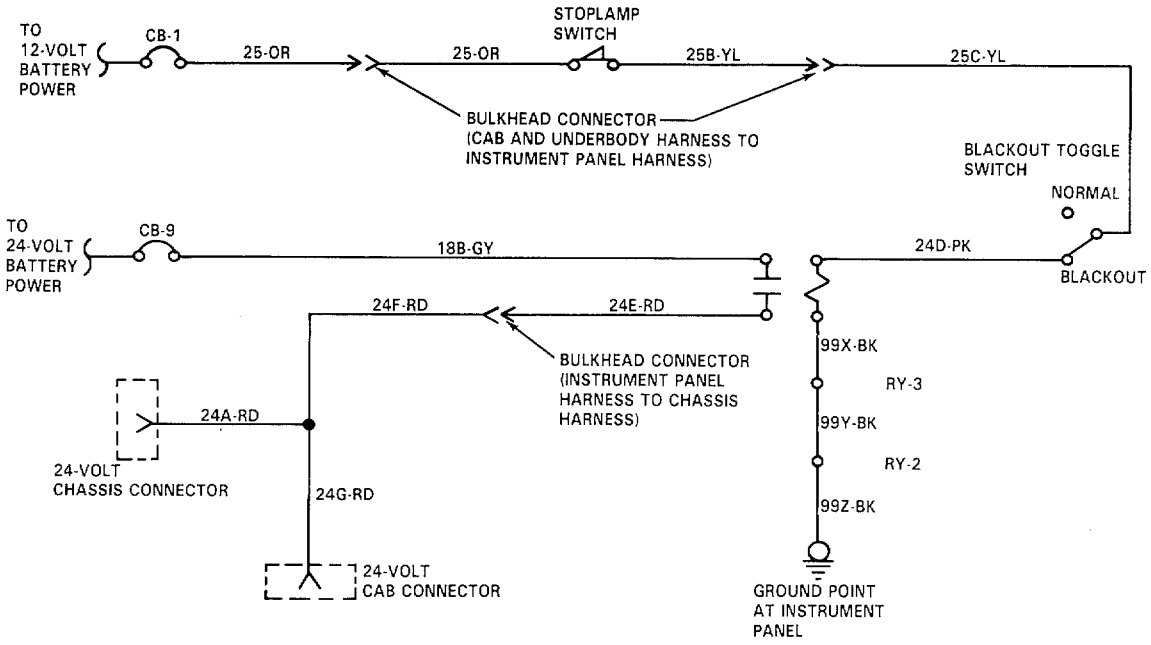
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
80. BOTH 24-VOLT TRAILER BLACKOUT STOPLAMPS NOT WORKING (Continued).				
	13	Move blackout toggle switch from BLACKOUT to NORMAL and back to BLACKOUT position relay RY-4	Listen for clicking sounds at relay RY-4 bracket (para 3-112 and 3-114), and go to step 14	Install relay connector and circuit breaker and circuit breaker bracket (para 3-112 and 3-114).
	14	Disconnect circuit 24F-RD from 24E-RD at connector, and go to step 15.		
	15	Check for voltage at circuit 24E-RD (pin H of connector)	24-volts dc nominal Connect circuit 24E-RD, and go to step 16.	Repair circuit 24F-RD to 24E-RD (para 3-127).
	16	Disconnect 24-volt cab connector, and go to step 17.		
	17	Check for voltage at circuit 24G-RD (pin F of connector)	24-volts dc nominal Recheck 24-volt out stoplamp circuit	Repair circuit trailer black-24G-RD and/or 24F-RD (para 3-127).
	18	Disconnect 24-volt chassis connector, and go to step 19.		

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
80. BOTH 24-VOLT TRAILER BLACKOUT STOPLAMPS NOT WORKING (Continued).				
19	Check for voltage at circuit 24H-RD (pin of connector)	24-volt dc Fnominal	Recheck 24-volt trailer black-out stoplamp circuit	Repair circuit 24H-RD and/or 24F-RD (para 3-127).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

81. 24-VOLT TRAILER BLACKOUT TAILLAMPS NOT WORKING.

NOTE

.Headlamp switch must be in ON position and blackout toggle switch set to BLACKOUT position when doing the fol- lowing checks.

·It is assumed here that chassis tail- lamp circuit is OK.

-Do steps 1 thru 23 when troubleshoot- ing 24-volt cab connector.

·Do steps 1 thru 21 and steps 24 and 25 when troubleshooting 24-volt chassis connector.

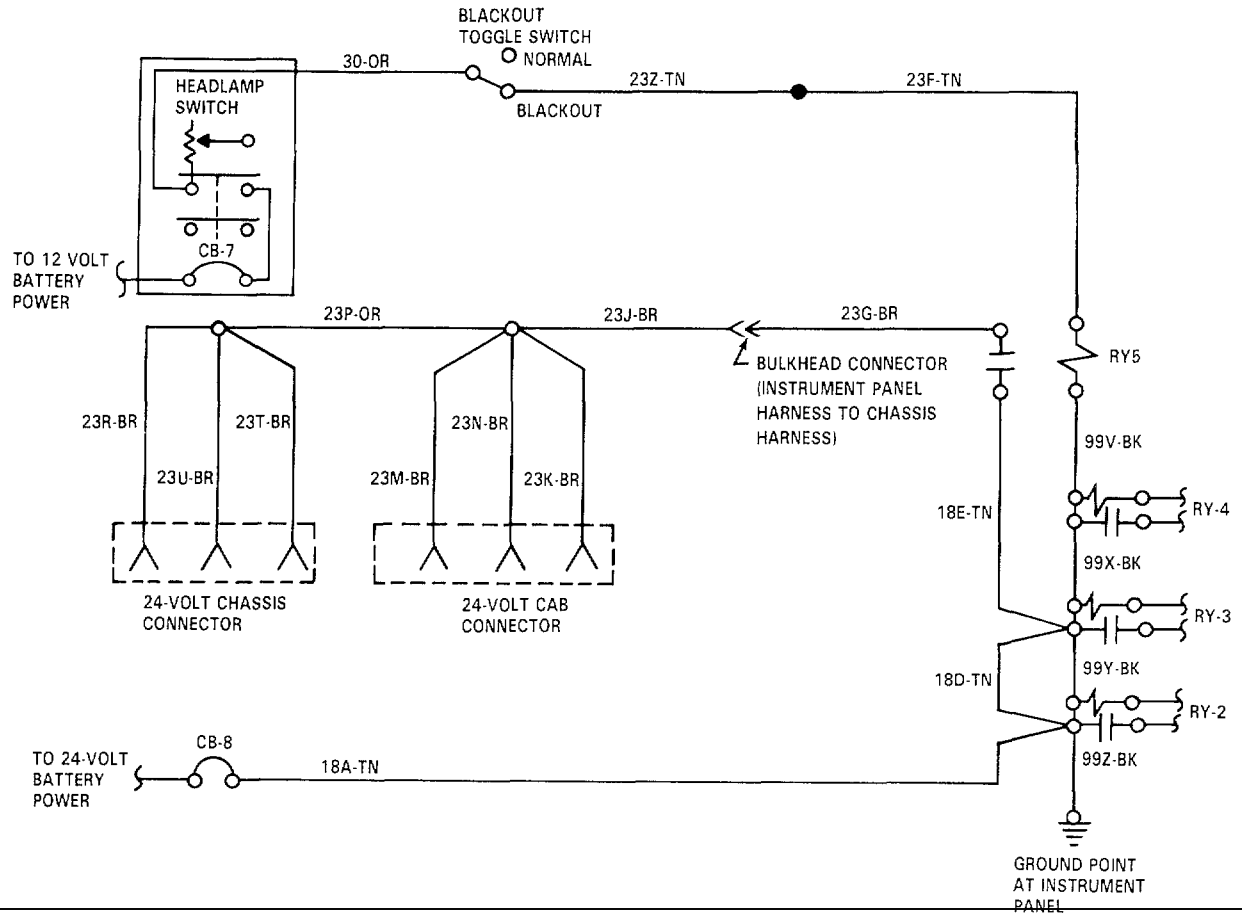
1	Check for voltage at circuit 23Z-TN blackout toggle switch	12-volts dc nominal	Go to step 2	Replace blackout toggle switch (para 3-79)
2	Remove circuit breaker bracket far enough to access relay RY-5 and relay connector (para 3-114), and go to step 3.			
3	Remove relay RY-5 (para 3-112), and go to step 4.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

81. 24-VOLT TRAILER BLACKOUT TAILLAMPS NOT WORKING (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

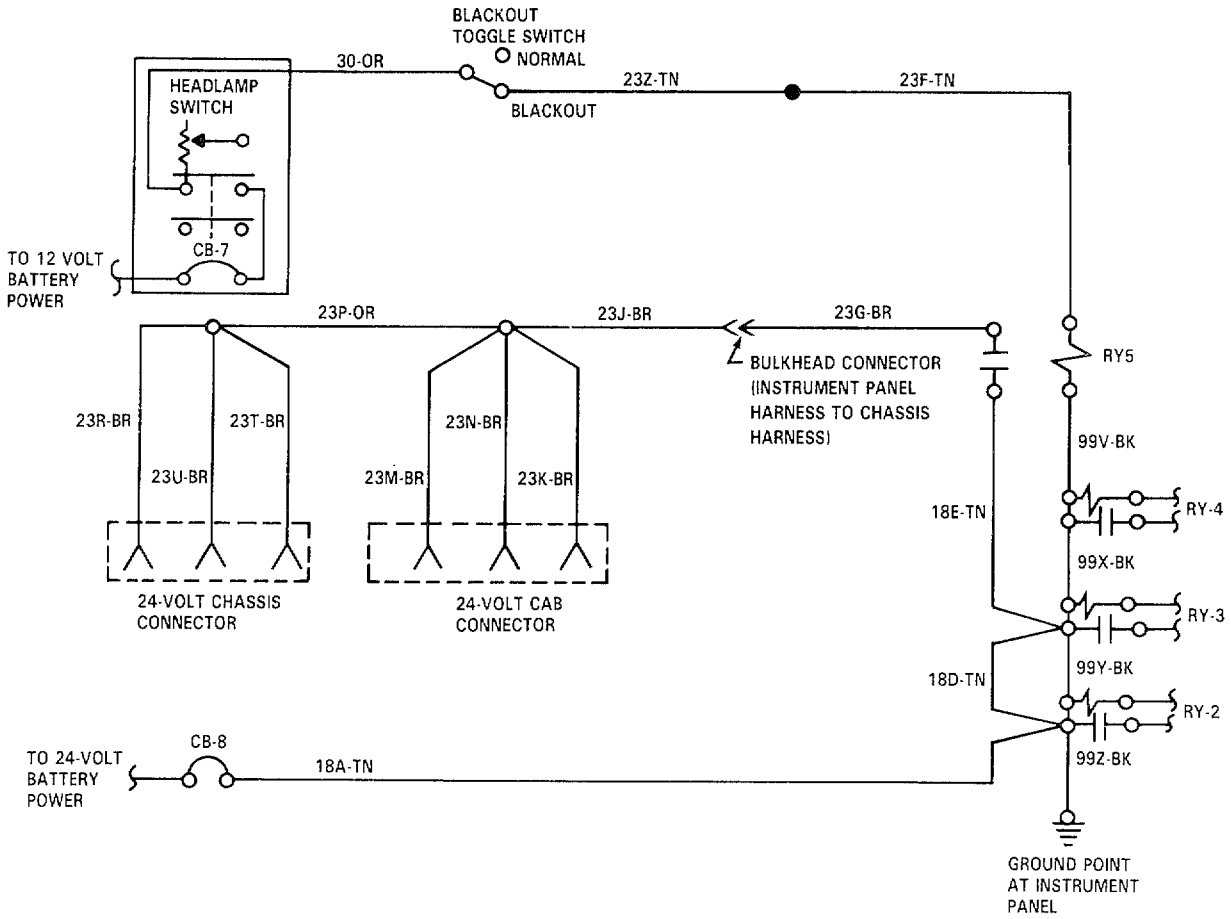
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
81. 24-VOLT TRAILER BLACKOUT TAILLAMPS NOT WORKING (Continued).				
	4	Check for voltage at circuit 23F-TN terminal of relay RY-5	12-volts dc nominal	Go to step 5	Repair circuit 23F-TN and/or 23Z-TN (para relay RY-5, relay connector, and circuit breaker bracket (para 3-112 and 3-114).
		NOTE			
	With positive lead on circuit 23F-TN, check ground with negative lead for steps 5 thru 12.				
	5	Check for voltage at circuit 99Z-BK ground point	12-volts dc nominal	Go to step 6	Clean and tighten ground connection. Install relay RY-5, relay connector, and circuit breaker bracket (para 3-112 and 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

81. 24-VOLT TRAILER BLACKOUT TAILLAMPS NOT WORKING (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

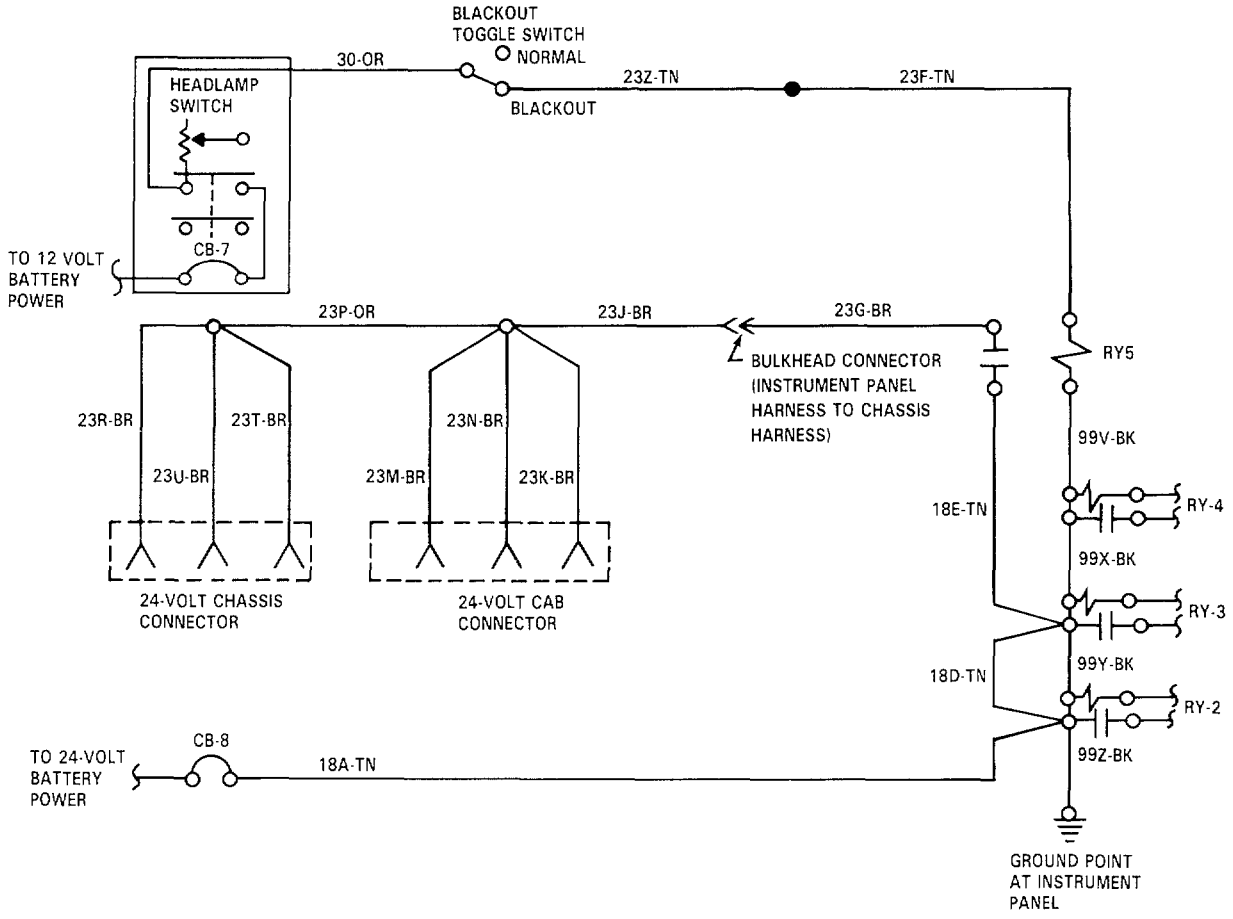
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
81. 24-VOLT TRAILER BLACKOUT TAILLAMPS NOT WORKING (Continued).				
	6	Remove relay RY-2 (para 3-112), and go to step 7.		
	7	Check for voltage at 99Z-BK (para 3-112) circuit 99Z-BK terminal of relay connector	Install relay nominal and go to step 8	Repair circuit RY-2 (para 3-127) Install relays RY-2 and RY-5, relay connector, and circuit breaker bracket (para 3-112 and 3-114).
	8	Remove relay RY-3 (para 3-112), and go to step 9.		
	9	Check for voltage at 99Y-BK (para 3-112) circuit 99Y-BK terminal of relay connector	Install relay nominal and go to step 10	Repair circuit RY-3 (para 3-127) Install relays RY-3 and RY-5, relay connector, and circuit breaker bracket (para 3-112 and 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

81. 24-VOLT TRAILER BLACKOUT TAILLAMPS NOT WORKING (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

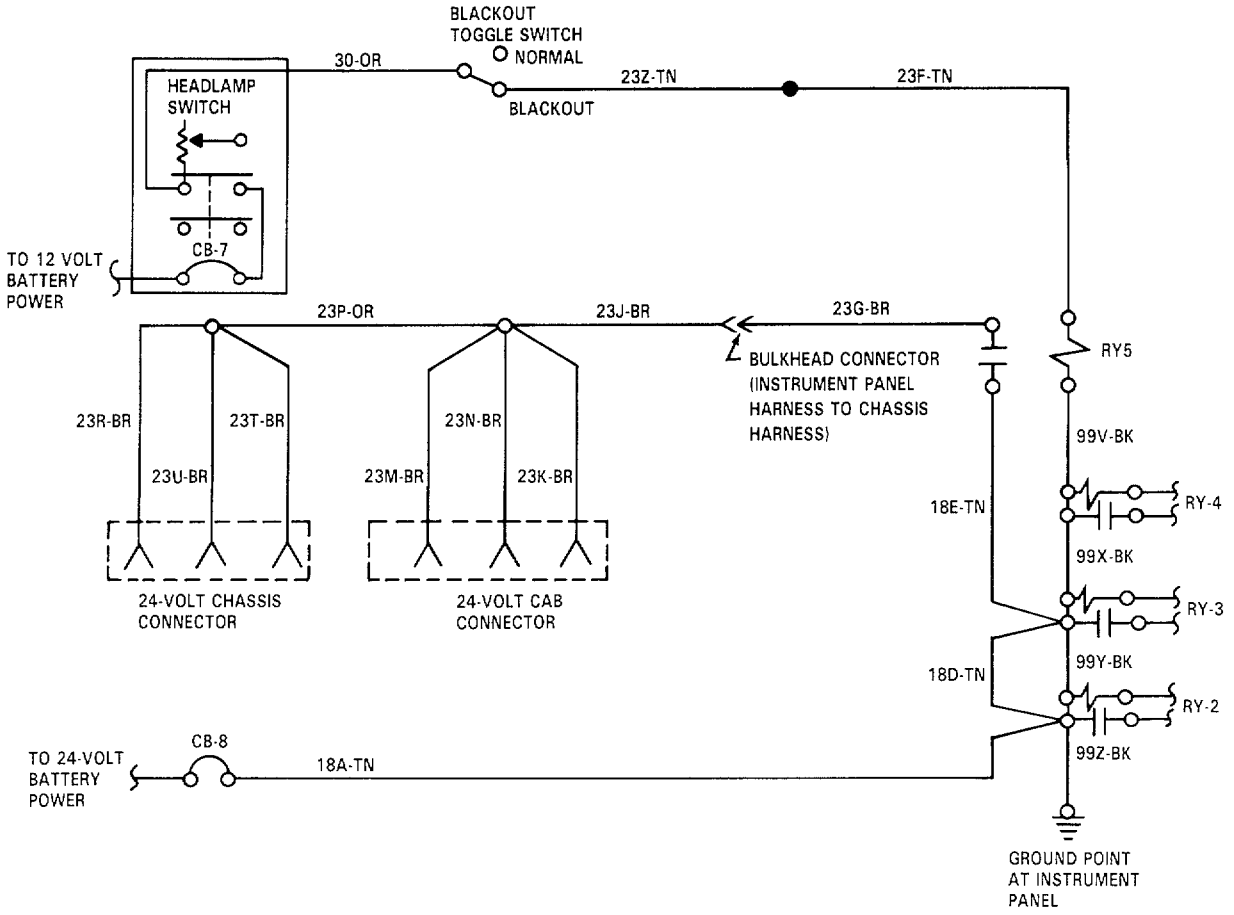
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
81. 24-VOLT TRAILER BLACKOUT TAILLAMPS NOT WORKING (Continued).				
10	Remove relay RY-4 (para 3-112), and go to step 11.			
11	Check for voltage at circuit 99X-BK of relay connector	12-volts dc nominal	Install relay RY-4 (para 3-112), and go to step 12	Repair circuit 99X-BK (para 3-127) Install relays RY-4 and RY-5, relay connector, and circuit breaker bracket (para 3-112 and 3-114).
12	Check for voltage at circuit 99V-BK terminal of relay connector	12-volts dc nominal	Go to step 13	Repair circuit 99V-BK (para 3-127) Install relay RY-5, relay connector, and circuit breaker bracket (para 3-112 and 3-114).
13	Check for voltage at circuit 18A-TN of circuit breaker CB-8	24-volts dc nominal	Go to step 14	Reset circuit breaker CB-8 and/or troubleshoot CB-2 circuit (Refer to malfunction 35).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

81. 24-VOLT TRAILER BLACKOUT TAILLAMPS NOT WORKING (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

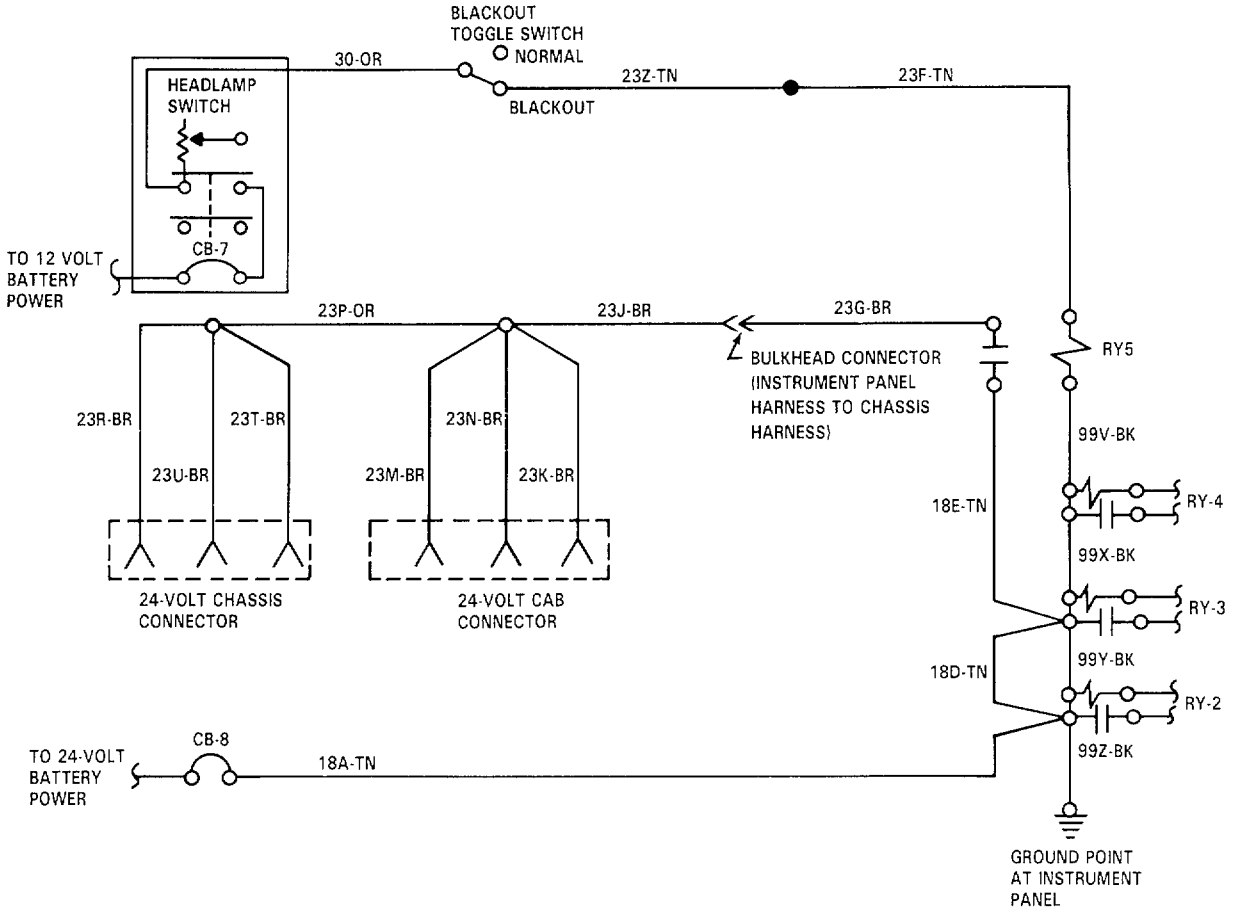
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
81. 24-VOLT TRAILER BLACKOUT TAILLAMPS NOT WORKING (Continued).				
14	Remove relay RY-2 (para 3-112), and go to step 15.			
15	Check for voltage at circuit 18A-TN terminal of relay connector	24-volts dc nominal	Install relay RY-2 (para 3-112), and go to step 16	Repair circuit 18A-TN (para 3-127) Install relays RY-2 and connector, and circuit breaker bracket (para 3-112 and 3-114).
16	Remove relay RY-3 (para 3-112), and go to step 17.			
17	Check for voltage at circuit 18D-TN terminal of relay connector	24-volts dc nominal	Install relay RY-3 (para 3-112), and go to step 18	Repair circuit 18D-TN (para 3-127) Install relays RY-3 and connector, and circuit breaker bracket (para 3-112 and 3-114).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

81. 24-VOLT TRAILER BLACKOUT TAILLAMPS NOT WORKING (Continued).



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

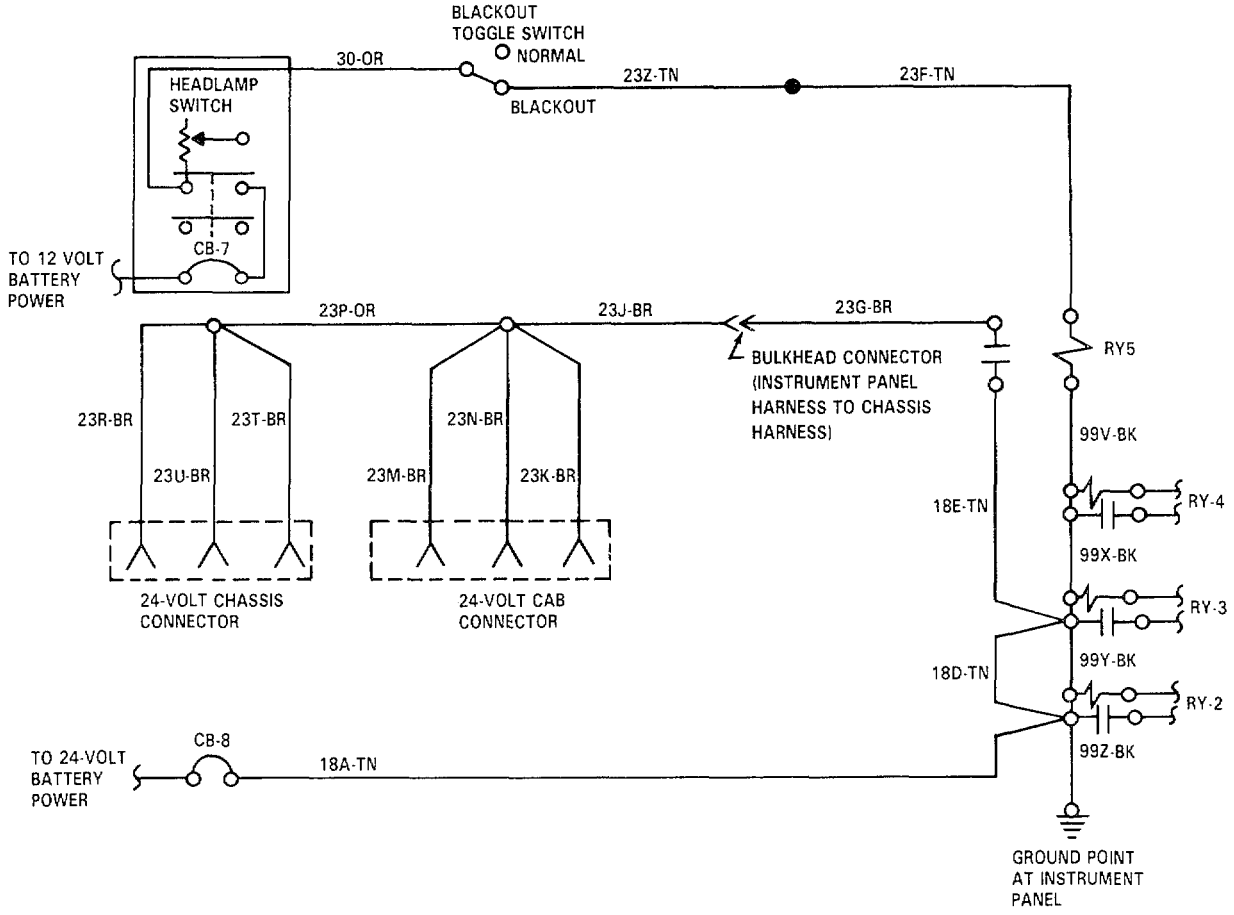
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
81. 24-VGLT TRAILER BLACKOUT TAILLAMPS NOT WORKING (Continued).				
18	Check for voltage at circuit 18E-TN of circuit breaker CB-8	24-volts dc nominal	Install RY-5 (para 3-112), and go to step 19	Repair circuit 18E-TN (para 3-127) Install RY-5, relay connector, and circuit breaker bracket (para 3-112 and 3-114).
19	Move blackout toggle switch from BLACKOUT to NORMAL and back to BLACKOUT position	Listen for clicking sounds at relay RY-5	Install bracket (para 3-112 and 3-114), and go to step 20	Replace relay RY-5 Install relay connector and circuit breaker and circuit breaker bracket (para 3-112 and 3-114).
20	Disconnect circuit 23G-BR from 23J-BR at connector, and go to step 21.			
21	Check for voltage at circuit 23G-BR (pin J of connector)	24-volts dc nominal	Connect circuit 23G-BR to 23J-BR, and go to step 22.	Repair circuit 23G-BR (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

81. 24-VOLT TRAILER BLACKOUT TAILLAMPS NOT WORKING (Continued).



TROUBLESHOOTING.

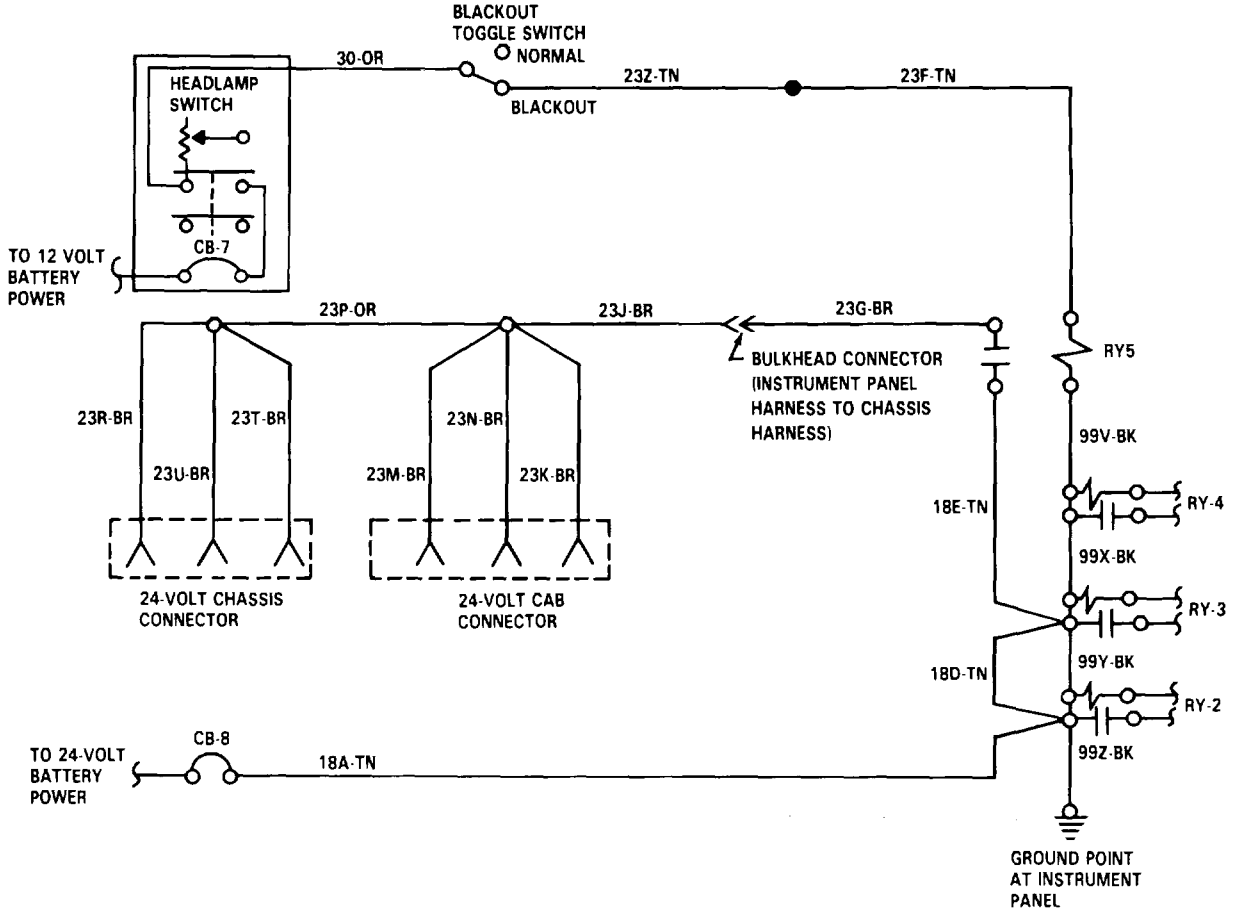
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
81. 24-VOLT TRAILER BLACKOUT TAILLAMPS NOT WORKING (Continued).				
22	Disconnect 24-volt cab connector, and go to step 23.			
23	Check for voltage at 24-volts dc circuit 23N-BR (pin H of connector)	nominal	Recheck trailer taillamp circuit	Repair circuit 23J-BR (para 3-127).
24	Disconnect 24-volt chassis connector, and go to step 25.			
25	Check for voltage at 24-volts dc circuit 23U-BR (pin A of connector)	nominal	Recheck trailer taillamp circuit	Repair circuit 23P-BR and/or 23J-BR (para

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

81. 24-VOLT TRAILER BLACKOUT TAILLAMPS NOT WORKING (Continued).



TOUBLESHOOTING.

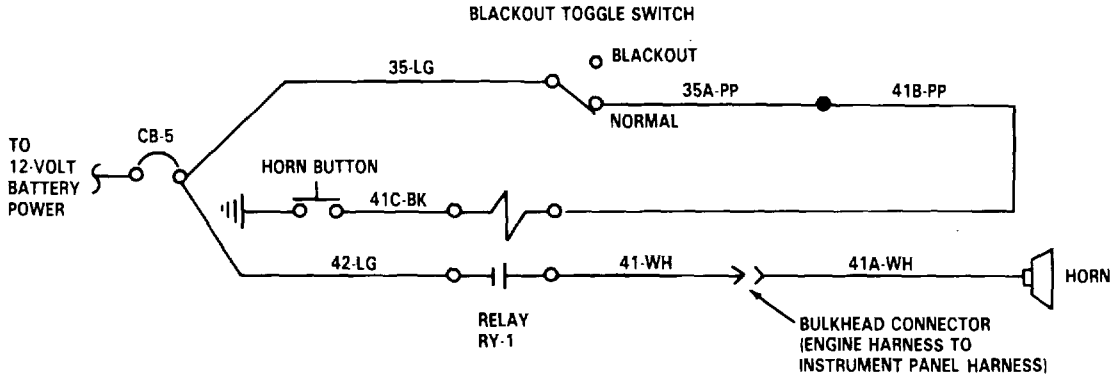
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
82.	ELECTRICAL HORN NOT WORKING.			
	NOTE Blackout toggle switch must be set to NORMAL position when doing the following checks.			
	1. Remove circuit breaker bracket far enough to access circuit breaker CB-5 (para 3-114), and go to step 2.			
	2. Check for voltage at circuit 35-LG or 42-LG terminal of circuit breaker CB-5.	12-volts dc nominal.	Go to step 3.	Reset circuit breaker CB-5 and/or trouble-shoot CB-5 circuit. (Refer to malfunction 34).
	3. Check for voltage at circuit 35-LG terminal of blackout toggle switch.	12-volts dc nominal.	Go to step 4.	Repair circuit 35-LG (para 3-127). Install circuit breaker bracket (para 3-114).
	4. Remove relay RY-1 (para 3-112), and go to step 5.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
82. ELECTRICAL HORN NOT WORKING (Continued).				
	5. Check for voltage at circuit 41B-PP terminal of relay connector.	12-volts dc nominal.	Go to step 6.	Repair circuit 41B-PP and/or 35A-PP (Para 3-127). Install relay RY-4 and circuit breaker bracket (para 3-112 and 3-114).



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TROUBLESHOOTING.

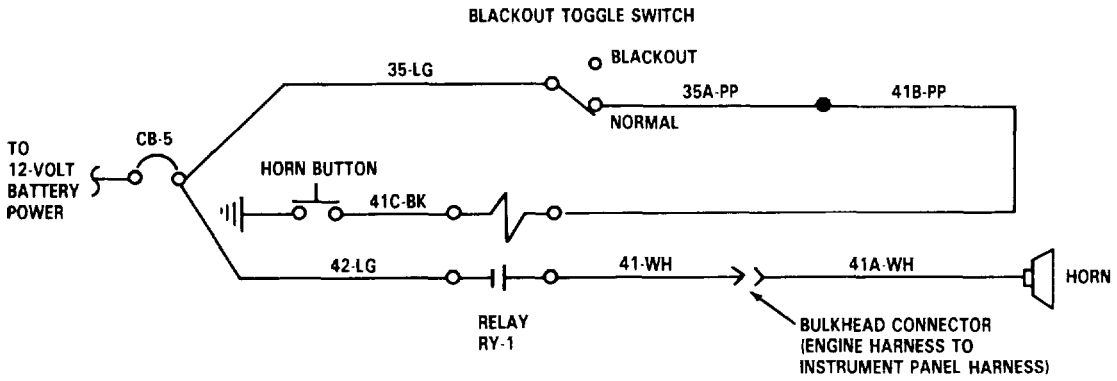
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
82.	ELECTRICAL HORN NOT WORKING (Continued).			
	NOTE With positive lead on circuit 41B-PP (or other suitable hot lead), check ground with negative lead for steps 6 thru 9.			
	6. Remove horn button (para 3-118), and go to step 7.			
	7. Check for voltage at horn button plate.	12-volts dc nominal.	Go to step 8.	Clean horn button plate. button (para 3-118). Install relay RY-1 and circuit breaker bracket (para 3-112 and 3-114).
	8. Check for voltage at circuit 41C-BK terminal at horn button.	12-volts dc nominal.	Install horn button (para 3-118), and go to step 9.	Clean horn button contact cups. Install relay RY-1 and circuit breaker bracket (para 3-112 and 3-114).
	NOTE Assistant must press and hold horn button when doing the following checks.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
82.	ELECTRICAL HORN NOT WORKING (Continued).			
	9. Check for ground at circuit 41C-BK terminal of relay connector.	12-volts dc nominal.	Go to step 10.	Repair circuit 41C-BK (para 3-127). Install circuit breaker bracket (para 3-112 and 3-114).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

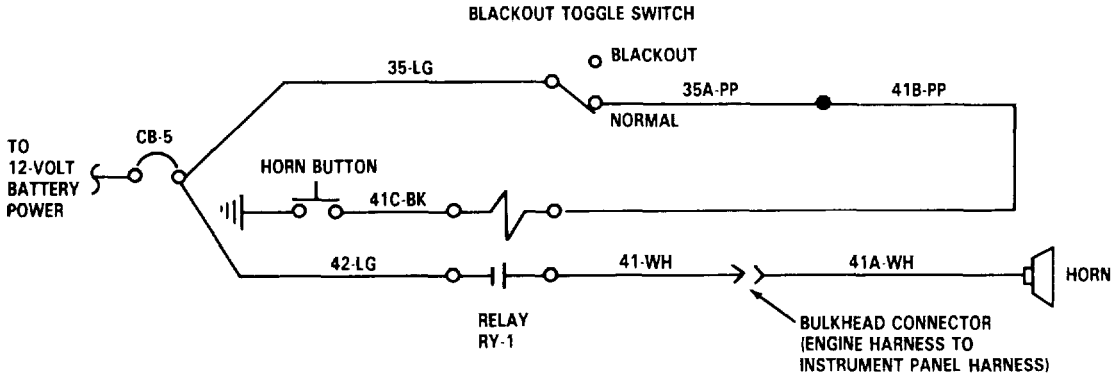
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
82.	ELECTRICAL HORN NOT WORKING (Continued).			
	10. Install relay RY-1 (para 3-112), and go to step 11.			
	11. Disconnect horn (para 3-117), and go to step 12.			
	12. Move blackout toggle switch from NORMAL to BLACKOUT and back to NORMAL position.	Listen for clicking sound at relay RY-1.	Install circuit breaker bracket (para 3-114), and go to step 13.	Replace relay RY-1. Install circuit breaker bracket (para 3-112 and 3-114). Connect horn (para 3-117).
	13. Disconnect circuit 41-WH from 41A-WH at connector, and go to step 14.			
	14. Check for voltage at circuit 41-WH (pin 17 of connector).	12-volts dc nominal.	Connect engine harness connector, and go to step 15.	Repair circuit 41-WH (para 3-127). Connect horn (para 3-117).
	15. Check for voltage at circuit 41A-WH terminal of horn.	12-volts dc nominal.	Replace horn (para 3-117).	Repair circuit 41A-WH (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

82. ELECTRICAL HORN NOT WORKING (Continued).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

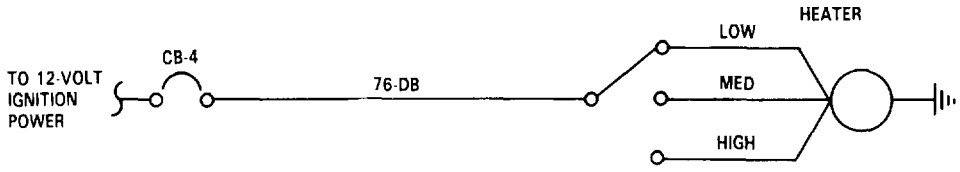
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
83. PERSONNEL HEATER FAN MOTOR NOT WORKING.				
	NOTE • Make sure ignition switch is in ON position and heater fan switch is set at speed being tested when doing the following checks. • If any speed is working, begin with step 3.			
	1. Remove circuit breaker bracket far enough to access circuit breaker CB-4 (para 3-114), and go to step 2.			
	2 Check for voltage at circuit 76-DB terminal of circuit breaker CB-4.	12-volts dc nominal. and go to step	Install circuit breaker panel (para 3-114), shoot CB-4 cir- 3.	Reset circuit breaker CB-4 and/or trouble- cuit. (Refer to malfunction 33).
	3. Check for voltage at circuit 76-DB terminal of heater fan switch.	12-volts dc nominal.	Go to step 4.	Repair circuit 76-DB (para 3-127).
	4. Check for voltage at LOW, MED, and HIGH terminals of heater fan switch.	12-volts dc nominal.	Replace personnel heater motor (para 3-299).	Replace heater fan switch (para 3-81).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

83. PERSONNEL HEATER FAN MOTOR NOT WORKING (Continued).



TA 236945

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

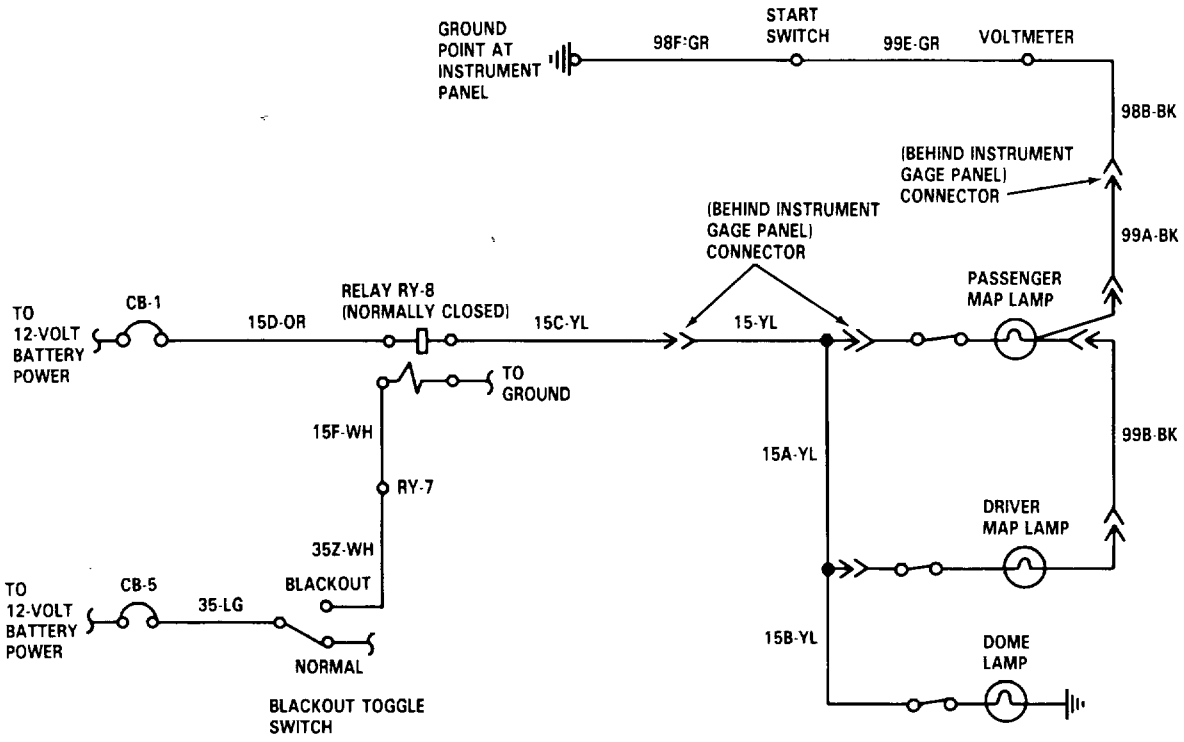
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
84. DOME LAMP NOT WORKING.				
	NOTE Blackout toggle switch must be set to NORMAL position and dome lamp switch set to ON position when doing the following checks.			
	1. Turn on map lamps.	Both light	Go to step 2	Go to step 4.
	2. Remove dome lamp bulb (para 3-98), and go to step 3.			
	3. Check for voltage at circuit 15B-YL terminal of dome lamp.	12-volt dc nominal.	Replace bulb (para 3-98). 3-127).	Repair circuit 15B-YL (para
	4. Remove circuit breaker bracket far enough to access circuit breaker CB-1 (para 3-114), and go to step 5.			
	5. Check for voltage at circuit 15D-OR terminal of circuit breaker CB-1.	12-volts dc nominal.	Go to step 6.	Reset circuit breaker CB-1 and/or trouble-shoot CB-1 to malfunction 34).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

84. DOME LAMP NOT WORKING (Continued).



TA 236946

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

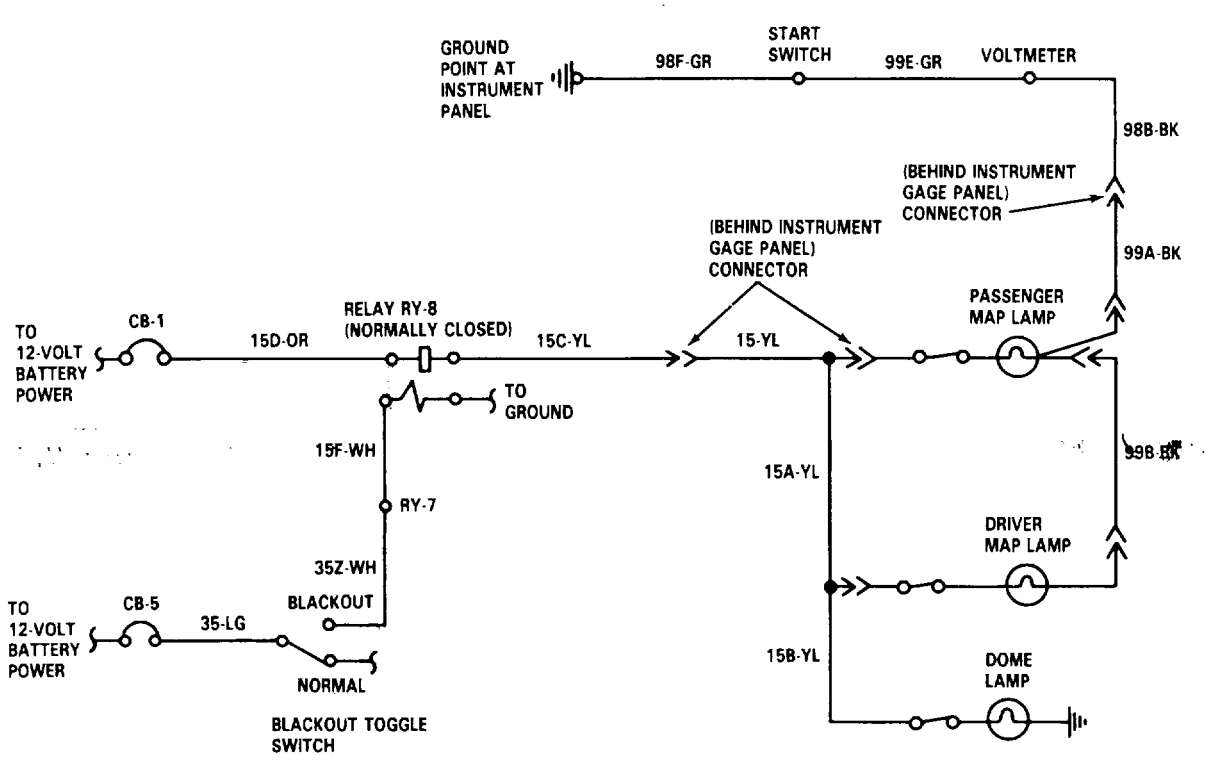
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
84.	DOME LAMP NOT WORKING (Continued).			
	6. Remove relay RY-8 (para 3-112), and go to step 7.			
	7. Check for voltage at circuit 15D-OR terminal of relay connector.	12-volts dc nominal.	Go to step 8.	Repair circuit 15D-OR (para 3-127). Install relay RY-8 and circuit breaker bracket (para 3-112 and 3-114).
	8. Connect jumper wire between circuit 15D-OR and pin 30 on relay RY-8, and go to step 9.			
	9. Check for voltage at pin 87A of relay RY-8.	12-volts dc nominal.	Install relay RY-8 and circuit breaker bracket (para 3-112 and 3-114), and go to step 10.	Replace relay RY,8 (para 3-112). Install circuit breaker bracket (para 3-114).
	10. Disconnect circuit 15C-YL from 15-YL at connector, and go to step 11.			
	11. Check for voltage at circuit 15G-YL terminal of connector.	12-volts dc nominal.	Repair circuit 15-YL (para 3-127).	Repair circuit 15C-YL (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

84. DOME LAMP NOT WORKING (Continued).



TA 236947

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

85. BOTH MAP LAMPS NOT WORKING.

NOTE

Blackout toggle switch must be set to NORMAL position and map lamp switch set to ON position when doing the following checks.

Refer to malfunction 84, step 3.

86. ONE MAP LAMP NOT WORKING.

NOTE

- Blackout toggle switch must be set to NORMAL position and map lamp switch set to ON position when doing the following checks.
- Faulty driver's map lamp is shown in this procedure. Apply similar troubleshooting technique for passenger's map lamp.

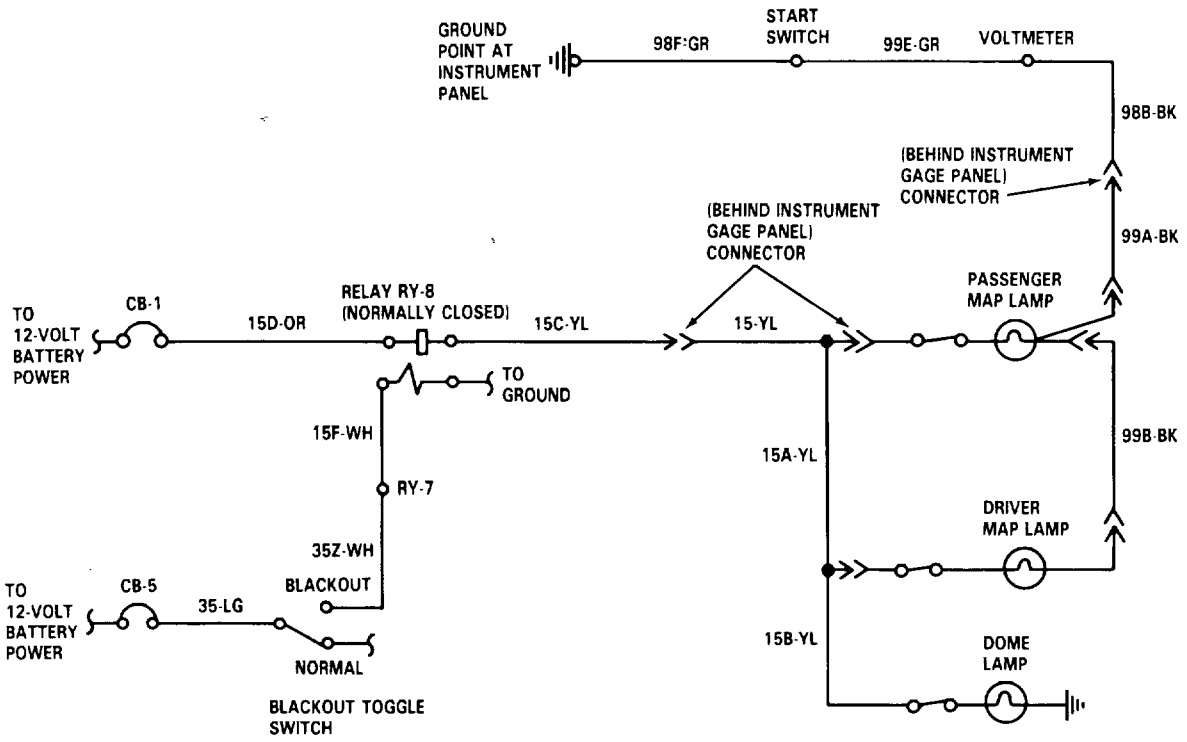
1.	Remove driver's map lamp (para 3-99).			
2	Check for voltage at circuit 15A-YL terminal of connector.	12-volts dc nominal.	Replace bulb (para 3-99).	Repair circuit 1SA-YL (para 3-127).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

86. ONE MAP'LAMP NOT WORKING (Continued).



TA 236948

TROUBLESHOOTING.

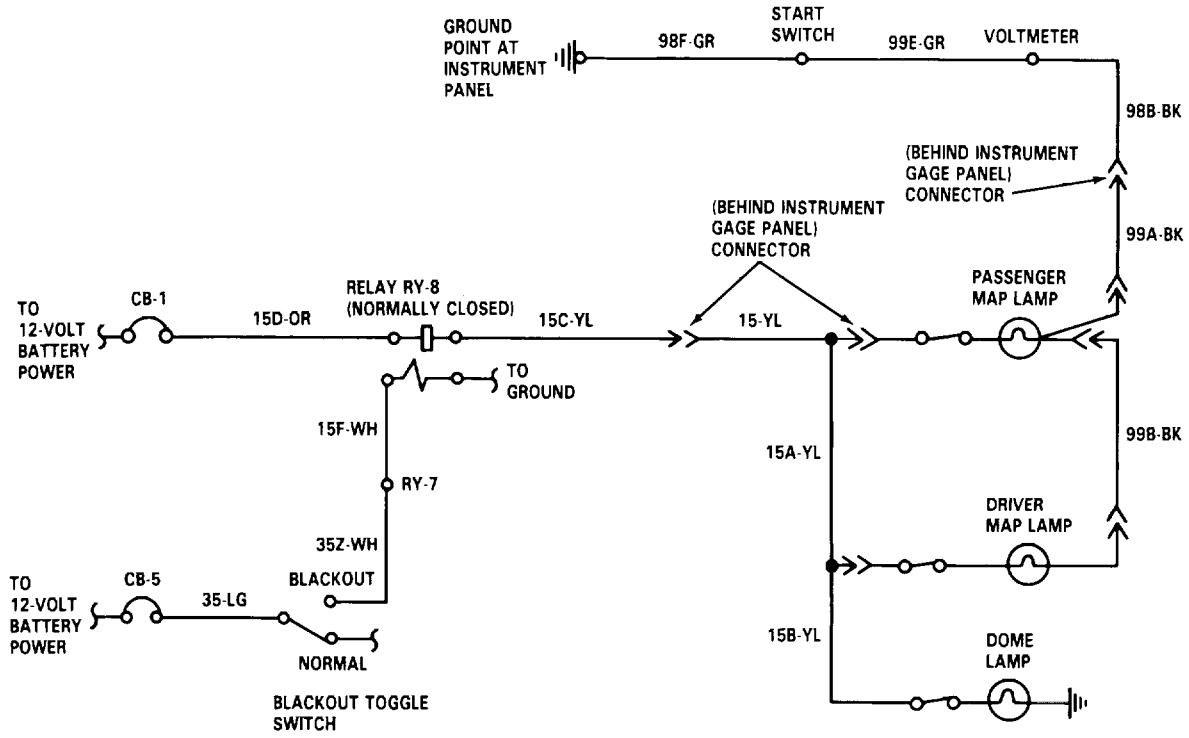
2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
87. MAP LAMPS LIGHT, BUT ARE DIM.				
	NOTE • Blackout toggle switch must be set to NORMAL position and map lamp switch set to ON position when doing the following checks. • With positive lead at known hot circuit, check ground with negative lead when doing the following checks.			
	1. Check for voltage at circuit 98F-BK ground point of instrument panel.	12-volts dc nominal.	Go to step 2.	Clean and tighten ground point connec-tion.
	2. Check for voltage at circuit 98F-BK terminal of start switch.	12-volts dc nominal.	Go to step 3.	Repair circuit 98F-BK (para 3-127).
	3. Check for voltage at circuit 99E-BK terminal of voltmeter.	12-volts dc nominal.	Go to step 4.	Repair circuit 99E-BK (para 3-127).
	4. Disconnect circuit 98B-BK from 99A-BK at connector, and go to step 5.			
	5. Check for voltage at circuit 98B-BK terminal of connector. to step 6.	12-volts dc nominal. 99A-BK, and go	Connect circuit 98B-BK to 3-127).	Repair circuit 98B-BK (para
	6. Remove passenger's map lamp (para 3-99).			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
87. MAP LAMPS LIGHT, BUT ARE DIM (Continued).				
	7. Check for voltage at circuit 99A-BK terminal of connector.	12-volts dc nominal.	Replace passenger's map lamp (para 3-99).	Repair circuit 99A-BK (para 3-127). Install lamp (para 3-99).

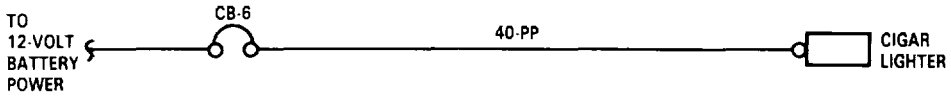


TA 236949

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
88. CIGAR LIGHTER RECEPTACLE NOT WORKING.				
	1. Remove circuit breaker bracket far enough to access circuit breaker CB-6 (para 3-114), and go to step 2.			
	2. Check for voltage at circuit 40-PP terminal of circuit breaker CB-6.	12-volts dc nominal.	Install circuit breaker bracket (para 3-114), and go to step 2.	Reset circuit breaker CB-6 and/or trouble-shoot CB-6 circuit. (Refer to malfunction 34).
	3. Disconnect circuit 40-PP from lighter receptacle, and go to step 4.			
	4. Check for voltage at circuit 40-PP terminal of connector.	12-volts dc nominal. 3-83).	Replace cigar lighter (para 3-127).	Repair circuit 40-PP (para



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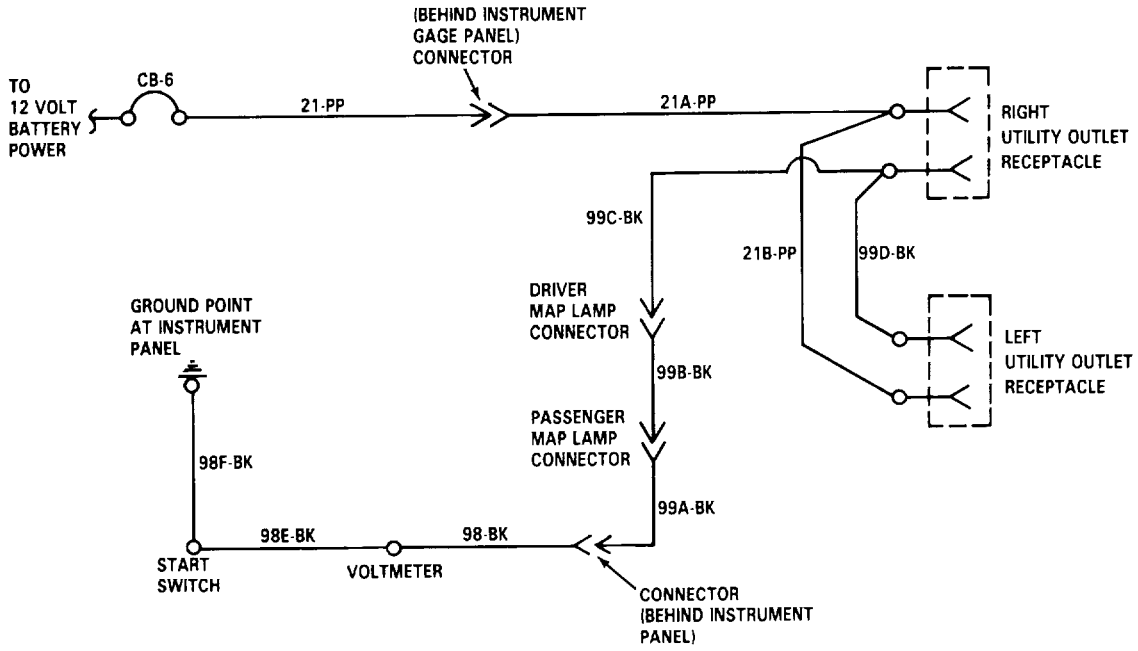
TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
89. LEFT SIDE UTILITY OUTLET RECEPTACLE NOT WORKING.				
	NOTE It is assumed here that right side utility outlet receptacle is OK.			
	1. Remove trim panel far enough to access utility outlet receptacle (para 3-276), and go to step 2.			
	2. Check for voltage at circuit 21B-PP terminal of utility outlet receptacle. (para 3-276).	12-volts dc nominal.	Go to step 3.	Repair circuit 21B-PP (para 3-127). Install trim panel



TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

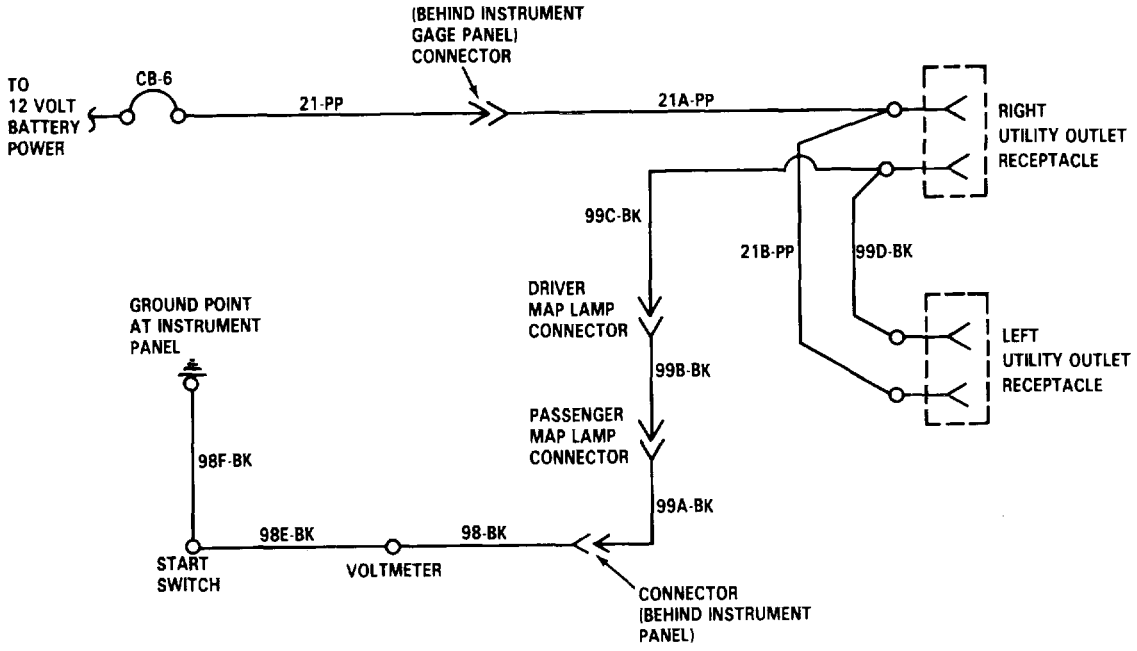
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
	NOTE With positive lead on circuit 21BPP, check ground with negative lead when doing the following checks.			
	3. Check for ground at circuit 99D-BK terminal of utility outlet receptacle.	12-volts dc nominal. (para 3-132).	Replace work-lamp receptacle 3-127).	Repair circuit 99D-BK (para
90.	BOTH UTILITY OUTLET RECEPTACLES NOT WORKING.			
	1. Remove circuit breaker bracket far enough to access circuit breaker CB-6 (para 3-114), and go to step 2.			
	2. Check for voltage at circuit 21-PP terminal of circuit breaker CB-6.	12-volts dc nominal.	Install circuit breaker bracket (para 3-114), and go to step 3.	Reset circuit breaker CB-6 and/or trouble-shoot CB-6 circuit. (Refer to malfunction 34).
	3. Disconnect circuit 21-PP from 21A-PP (located behind instru-ment gages), and go to step 4.			
	4. Check for voltage at circuit 21-PP terminal of connector.	12-volts dc nominal. 21A-PP, and go	Connect circuit 21-PP to 3-127).	Repair circuit 21-PP (para
	to step 5.			

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

90. BOTH UTILITY OUTLET RECEPTACLES NOT WORKING (Continued).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

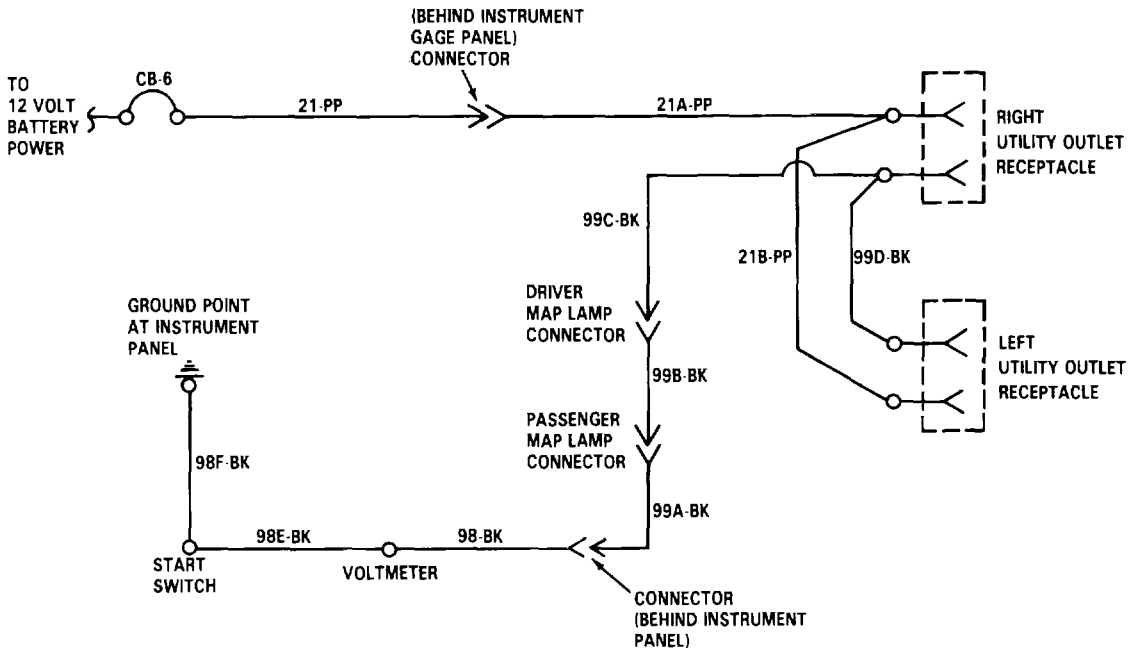
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
90. BOTH UTILITY OUTLET RECEPTACLES NOT WORKING (Continued).				
	5. Remove right side trim panel far enough to access utility outlet receptacle (para 3-276), and go to step 6.			
	6. Check for voltage at circuit 21A-PP terminal of utility outlet receptacle.	12-volts dc nominal.	Go to step 7. 21A-PP (para 3-127). Install trim panel	Repair circuit
	NOTE With positive lead on circuit 21APP (or suitable 12volt power lead), check ground with negative lead when doing the following checks.			
	7. Check for voltage at circuit 98F-BK ground point of instrument panel.	12-volts dc nominal.	Go to step 8.	Clean and tighten ground point connections. Install trim panel (para 3-276).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

90. BOTH UTILITY OUTLET RECEPTACLES NOT WORKING (Continued).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

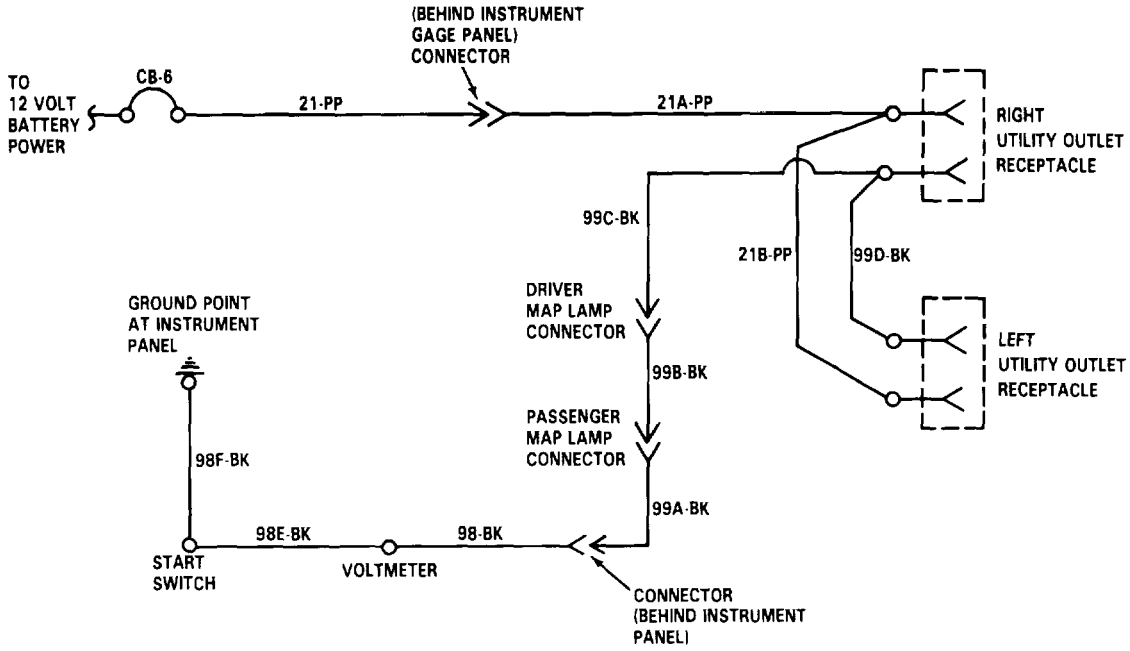
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
90.	BOTH UTILITY OUTLET RECEPTACLES NOT WORKING (Continued).			
	8. Check for ground at circuit 98F-BK terminal of start switch	12-volts dc nominal.	Go to step 9.	Repair circuit 98F-BK (para 3-127). Install trim panel (para 3-276).
	9. Check for ground at circuit 98E-BK terminal of voltmeter.	12-volts dc nominal.	Go to step 10.	Repair circuit 98E-BK (para 3-127). Install trim panel (para 3-276).
	10. Disconnect circuit 98-BK from 98A-BK at connector (located behind instrument gages), and go to step 12.			
	11. Check for ground at circuit 98-BK terminal of connector.	12-volts dc nominal.	Connect circuit 98-BK to 99A-BK, and go to step 12.	Repair circuit 98-BK (para 3-127). Connect circuit 98-BK to 99A-BK, and install trim panel (para 3-276).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

90. BOTH UTILITY OUTLET RECEPTACLES NOT WORKING (Continued).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

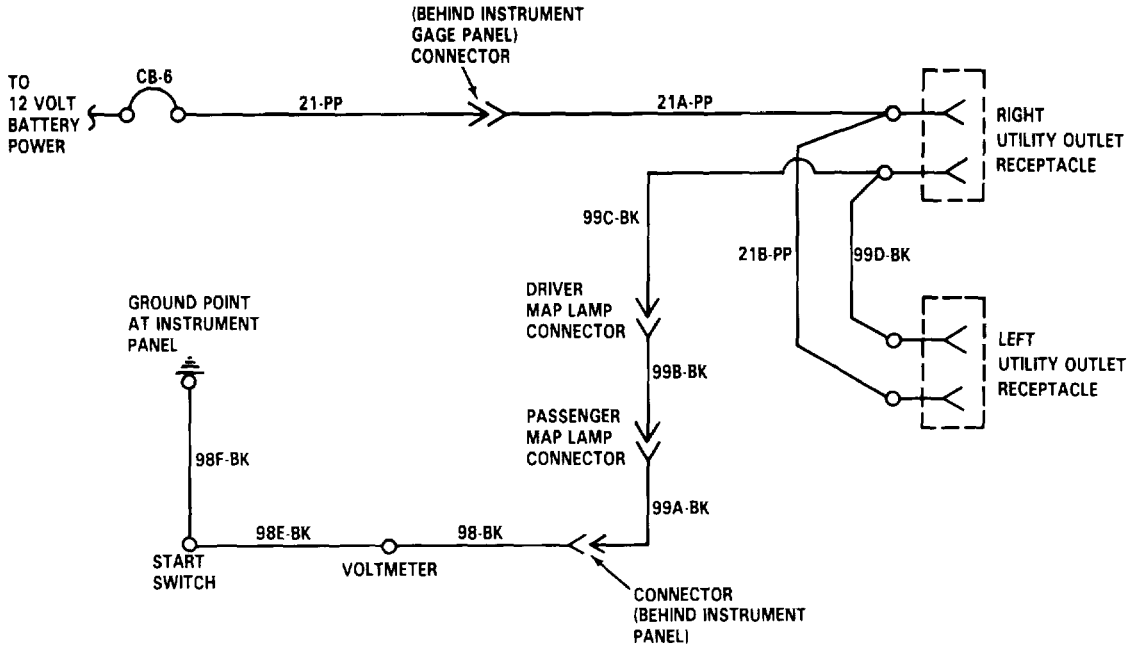
MALFUNCTION	INSTRUCTION	INDICATION	YES	NO
90.	BOTH UTILITY OUTLET RECEPTACLES NOT WORKING (Continued).			
	12. Remove passenger's map lamp (para 3-99), and go to step 13.			
	13. Check for ground at circuit 99A-BK terminal of connector.	12-volts dc nominal.	Install driver's map lamp (para 3-99), and go to step 14.	Repair circuit 99A-BK (para 3-127). Install passenger's map lamp (para 3-99). Install trim panel (para 3-276).
	14. Remove driver's map lamp (para 3-99), and go to step 15.			
	15. Check for ground at circuit 99B-BK terminal of connector. and go to step driver's map	12-volts dc nominal.	Install passenger's map lamp (para 3-99),	Repair circuit 99B-BK (para 3-127). Install 3-99). Install trim panel (para 3-276).
	16. lamp (para circuit 99C-BK terminal of utility outlet receptacle. (para 3-276).	12-volts dc nominal.	Utility outlet receptacle circuit OK.	Repair circuit 99C-BK (para 3-127). Install trim panel

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION	INSTRUCTION	INDICATION	YES	NO

90. BOTH UTILITY OUTLET RECEPTACLES NOT WORKING (Continued).



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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
TRANSMISSION	
91. TRANSMISSION SHIFTS AT TOO HIGH A SPEED.	
Step 1. Check adjustment of modulator linkage.	Adjust modulator linkage (para 3-140).
Step 2. Notify direct support maintenance.	
92. TRANSMISSION SHIFTS AT TOO LOW A SPEED.	
Step 1. Check adjustment of modulator linkage.	Adjust modulator linkage (para 3-140).
Step 2. Notify direct support maintenance.	
93. TRANSMISSION OVERHEATING IN ALL RANGES.	
Step 1. Check oil level.	a. Oil level low; add oil (para 3-135). b. Oil level high; drain oil to proper level (para 3-135).
Step 2. Notify direct support maintenance.	
94. NO RESPONSE TO SHIFT LEVER MOVEMENT.	
Step 1. Check oil level.	Oil level low; add oil (para 3-135).
Step 2. Check for disconnected or damaged shifter control cable.	a. Connect or replace shifter control cable (para 3-138). b. Notify direct support maintenance.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
95. ROUGH SHIFTING.	
Step 1. Check shifter control cable adjustment.	Adjust shifter control cable (para 3-138).
Step 2. Check modulator control adjustment.	Adjust modulator control (para 3-140).
Step 3. Check shifter control.	a. Replace shifter control (para 3-137). b. Notify direct support maintenance.
96. TRANSMISSION OIL DIRTY, FOAMY, AND/OR MILKY.	
NOTE • Dirt and grit in transmission oil indicates oil needs changing. • Foaminess indicates contamination of oil by air. • Milkiness indicates contamination of oil by coolant.	
Step 1. Inspect oil for dirt and grit.	a. Service transmission (para 3-135). b. Tighten all fittings (para 3-141). c. Notify direct support maintenance.
Step 2. Inspect for excessive foaminess.	a. Oil low; add oil (para 3-135). b. Replace transmission oil filter (para 3-135). c. Notify direct support maintenance.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
96. TRANSMISSION OIL DIRTY, FOAMY, AND/OR MILKY (Continued).	Step 3. Inspect for milkiness in oil.	Notify direct support maintenance.
97. LOSS OF POWER.	Check oil level.	a. Oil level low; add oil (para 3-135). b. Notify direct support maintenance.
98. CLUTCH SLIPPAGE IN ALL FORWARD GEARS.	Check oil level.	a. Oil level low; add oil (para 3-135). b. Notify direct support maintenance.
99. VEHICLE MOVES IN NEUTRAL.	Check shifter control cable adjustment.	a. Adjust shifter control cable (para 3-138). b. Notify direct support maintenance.
100. OIL THROWN FROM FILLER TUBE.	Step 1. Check fit of oil level gage (dipstick) in filler tube.	a. Secure oil level gage. b. Replace oil level gage, if necessary (para 3-136).
	Step 2. Check for worn gasket at oil level gage.	Replace oil level gage (para 3-136).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

100. OIL THROWN FROM FILLER TUBE (Continued).

Step 3. Check part number on oil level gage against part number shown in TM 9-2320-283-20P.

Replace oil level gage (para 3-136).

Step 4. Check for high oil level.

Drain oil to proper level (para 3-135).

Step 5. Check for clogged breather.

Clean breather.

PROPELLER SHAFTS AND UNIVERSAL JOINTS

101. EXCESSIVE SHAFT NOISE OR VIBRATION.

Step 1. Check torque of yoke nuts at universal joints.

Torque nuts to 300 lb-ft.

Step 2. Check torque of capscrews.

Torque capscrews to 100-110 lb-ft.

Step 3. Inspect propeller shafts and universal joints for evidence of damage or excessive wear.

Replace worn or damaged components (para 3-144 or 3-145).

Step 4. Check universal joints for adequate lubrication.

Lubricate. (Refer to LO 9-2320-283-12).

Step 5. Check for proper shaft alinement (propeller shafts are properly phased when cross and bearing in yokes at each end of shaft are in same place).

Disassemble and aline as necessary (para 3-144 or 3-145).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

101. EXCESSIVE SHAFT NOISE OR VIBRATION (Continued).

NOTE

Look for arrow marks on propeller shaft and slip yoke. Arrows will point toward each other. If marks are not visible, punch mark in each member insuring reassembly in same relative position.

Step 6. Remove propeller shaft from vehicle (para 3-144 or 3-145). Check freedom of motion of splines by moving shaft from fully retracted to fully extended. If excessive force is required to retract or extend shaft, or it does not reach full travel, separate shaft halves and balance weight, and inspect splines for wear, damage, and lubrication.

Replace shaft assembly, if required (para 3-144 or 3-145).

102. EXCESSIVE BACKLASH.

Step 1. Check all universal joints.

Lubricate and replace as necessary (para 3-144 or 3-145).

Step 2. Check drive axle capscrews on universal joints for tightness.

Torque to 100-110 lb-ft (para 3-144 or 3-145). If problem continues, notify direct support maintenance.

103. CONTINUOUS AXLE OR WHEEL NOISE.

Step 1. Check lube level in axle housing.

Fill axle housing to proper level. (Refer to LO 9-2320-283-12).

Step 2. Check lube pump cover (forward rear axle) for visible damage.

Notify direct support maintenance.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

103. CONTINUOUS AXLE OR WHEEL NOISE (Continued).

Step 3. Check that brake shoes are not dragging. Check for overheating of brake drum. Using jack, raise wheel until it is clear of ground. Use tanker bar to pry up under wheel to check for loose bearings. Any movement of wheels indicates loose bearings. With brakes released, spin wheels to check for tight bearings. Wheel should spin freely and smoothly. Remove hub and drum to check condition of bearings (para 3-205).

a. Adjust dragging brakes (para 3-157).
b. Replace bearings, if necessary (para 3-205).

Step 4. Visually inspect tires.

Inflate tires to proper pressure or replace, if necessary. (Refer to TM 9-2320-283-10).

Step 5. Check wheel balance.

Notify direct support maintenance.

104. LUBRICANT LEAKING.

Step 1. Check all cover plate bolts for tightness.

Tighten bolts or notify direct support maintenance.

Step 2. Check vent breathers in forward-rear and rear-rear axles.

Clean or replace as necessary (para 3-153).

105. EXCESSIVE OR UNEVEN TIRE WEAR.

Step 1. Check front axle wheel alinement.

Aline front wheels (para 3-203).

Step 2. Check brake adjustment.

Adjust brake, if required (para 3-157).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

105. EXCESSIVE OR UNEVEN TIRE WEAR (Continued).

Step 3. Check cold tire pressure.

Inflate to proper pressure. (Refer to TM 9-2320-283-10).

REAR AXLE

106. REAR AXLE ASSEMBLY NOT TRACKING PROPERLY.

Step 1. Check fifth wheel for secure mounting (this step applies only if a trailer is attached).

Tighten and torque (para 3-245).

Step 2. Check torque rods for looseness and damage.

Notify direct support maintenance.

Step 3. Check for dragging brakes by jacking vehicle and rotating wheels by hand.

Adjust or replace (para 3-157 or 3-159).

Step 4. Check wheel bearing adjustment using a pry bar. No movement is allowable. Check for damage and proper lubrication.

Adjust, lubricate, or replace (para 3-207).

Step 5. Check hubs and drums for damage.

Replace (para 3-207).

BRAKE SYSTEM

107. AIR PRESSURE LOW.

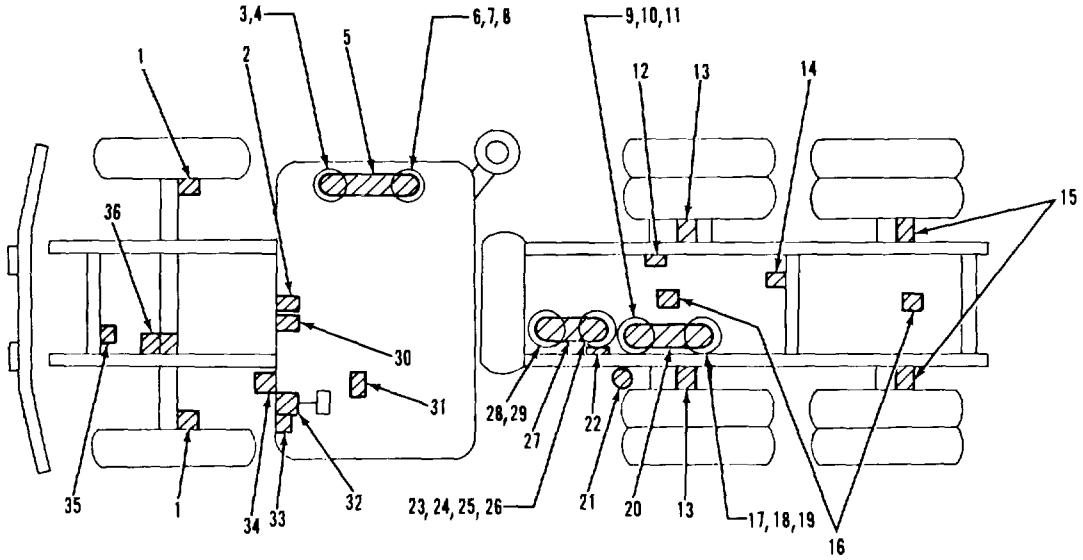
Step 1. Check for air exhausting through open or damaged air reservoir drain valves.

a. Close primary or secondary air reservoir draincock.
b. Replace drain valve or primary reservoir (para 3-169 or 3-188).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION



LEGEND:

1. FRONT AXLE BRAKE CHAMBER (2)
2. PARKING BRAKE VALVE
3. DRAINCOCK
4. PLUG (2)
5. SECONDARY RESERVOIR
6. DOUBLE CHECK VALVE
7. 90° CHECK VALVE
8. 90° ELBOW
9. DRAINCOCK
10. 45° ELBOW
11. 45° CHECK VALVE
12. DOUBLE CHECK AND QUICK RELEASE VALVE
13. FORWARD-REAR AXLE BRAKE CHAMBER (2)
14. RELAY VALVE
15. REAR-REAR AXLE AIR BRAKE CHAMBER (2)
16. QUICK RELEASE VALVE (2)
17. ADAPTER
18. 90° ELBOW
19. PLUG
20. PRIMARY RESERVOIR
21. AIR DRYER
22. TRACTOR PROTECTION VALVE
23. AUTOMATIC DRAIN VALVE
24. 90° ELBOW
25. QUICK RELEASE COUPLER
26. SAFETY VALVE
27. SUPPLY RESERVOIR
28. 90° ELBOW (2)
29. CHECK VALVE
30. TRAILER SUPPLY VALVE
31. TRAILER HAND CONTROL BRAKE VALVE
32. BRAKE TREADLE VALVE
33. DOUBLE CHECK VALVE
34. DOUBLE CHECK AND STOPLAMP VALVE
35. FRONT AXLE RATIO VALVE
36. AIR COMPRESSOR/GOVERNOR

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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

107. AIR PRESSURE LOW (Continued).

Step 2. Check for loose air connections between the compressor, governor, and air reservoirs.

Tighten any loose air connections and replace damaged components, air lines, and connectors (para 3-163).

Step 3. Check air governor by noting on air gages when air compressor shuts off and starts up again. Air compressor should shut off no higher than 125 psi and start when air pressure drops 25 psi after shut off.

Notify direct support maintenance if air compressor does not operate within the pressure specifications above.

Step 4. With the engine not running, loosen the compressor output line at compressor and listen for escaping air.

a. If air escapes continuously, replace the check valve in that line at the supply reservoir (para 3-191).
b. If the check valve is OK, notify direct support maintenance.

Step 5. Check air line connections for tightness and air lines for cracks or breaks.

Tighten or replace connections and lines as necessary (para 3-163).

108. AIR PRESSURE HIGH.

Step 1. Check for inoperative pressure safety relief valve on the supply reservoir.

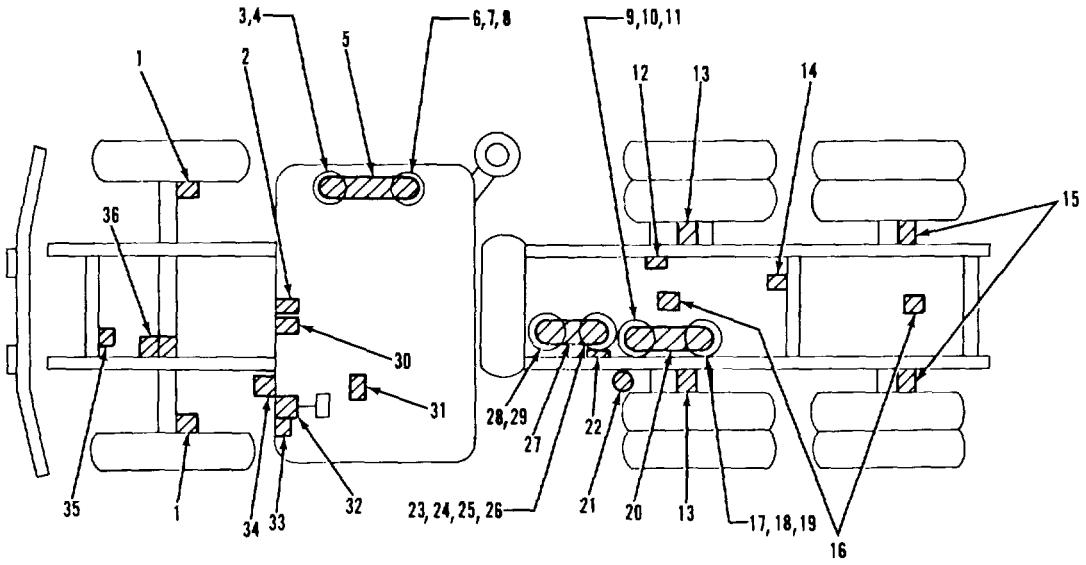
If reservoir exceeds 150 psi, replace safety release valve (para 3-186).

Step 2. Refer to malfunction 107, step 3.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION



LEGEND:

1. FRONT AXLE BRAKE CHAMBER (2)
2. PARKING BRAKE VALVE
3. DRAINCOCK
4. PLUG (2)
5. SECONDARY RESERVOIR
6. DOUBLE CHECK VALVE
7. 90° CHECK VALVE
8. 90° ELBOW
9. DRAINCOCK
10. 45° ELBOW
11. 45° CHECK VALVE
12. DOUBLE CHECK AND QUICK RELEASE VA
13. FORWARD-REAR AXLE BRAKE CHAMBER (;
14. RELAY VALVE
15. REAR-REAR AXLE AIR BRAKE CHAMBER
16. QUICK RELEASE VALVE (2)
17. ADAPTER
18. 90° ELBOW
19. PLUG
20. PRIMARY RESERVOIR
21. AIR DRYER
22. TRACTOR PROTECTION VALVE
23. AUTOMATIC DRAIN VALVE
24. 90° ELBOW
25. QUICK RELEASE COUPLER
26. SAFETY VALVE
27. SUPPLY RESERVOIR
28. 90° ELBOW (2)
29. CHECK VALVE
30. TRAILER SUPPLY VALVE
31. TRAILER HAND CONTROL BRAKE VALVE
32. BRAKE TREADLE VALVE
33. DOUBLE CHECK VALVE
34. DOUBLE CHECK AND STOPLAMP VALVE
35. FRONT AXLE RATIO VALVE
36. AIR COMPRESSOR/GOVERNOR

TA 236957

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

109. PARK BRAKES WILL NOT RELEASE.

Step 1. Check reservoir pressure gage and verify that LOW PRESSURE warning lamp is out.

Refer to malfunction 107.

Step 2. Verify PARK BRAKE manual valve is closed.

Close valve. Replace valve if it will not close (para 3-171).

Step 3. Check air lines for leakage or damage. Use a soap solution to check for leakage at connections (watch for bubbles).

Replace damaged lines and tighten loose connections (para 3-163).

Step 4. Check the air line between forward-rear and rear-rear axle quick release valves for damage or leaks using a soap solution.

a. Replace line if damaged, and tighten connections (para 3-163).
b. Replace the park brake valve (para 3-171).

110. TRAILER BRAKES WILL NOT RELEASE.

Step 1. Check vehicle air hoses for proper connections. Close trailer supply valve and disconnect hoses.

Reconnect hoses and open supply valve.

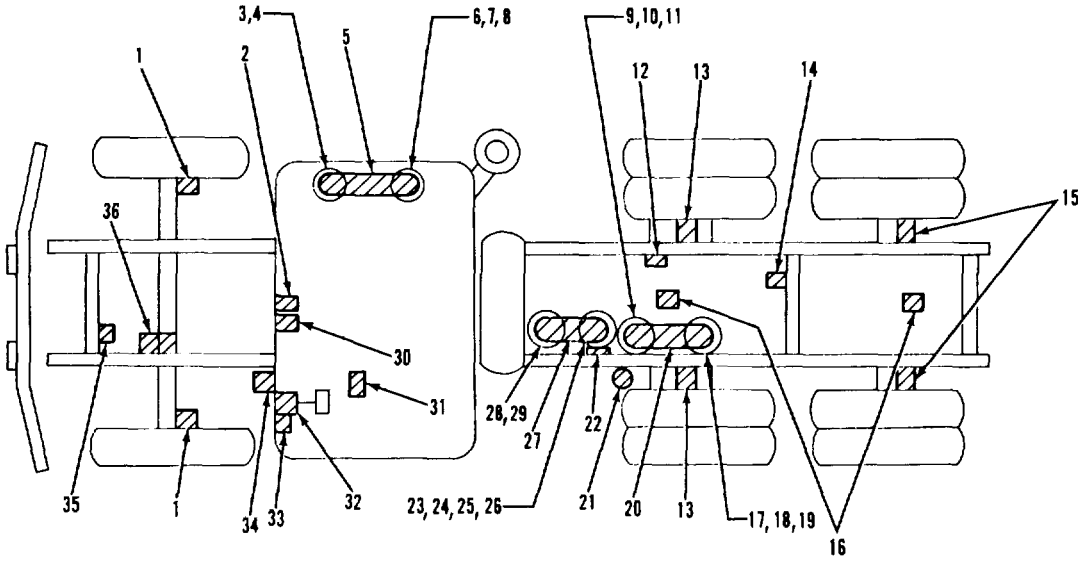
Step 2. Check trailer for air leaks or defective brakes.

Troubleshoot trailer.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION



LEGEND:

1. FRONT AXLE BRAKE CHAMBER (2)
2. PARKING BRAKE VALVE
3. DRAINCOCK
4. PLUG (2)
5. SECONDARY RESERVOIR
6. DOUBLE CHECK VALVE
7. 90° CHECK VALVE
8. 90° ELBOW
9. DRAINCOCK
10. 45° ELBOW
11. 45° CHECK VALVE
12. DOUBLE CHECK AND QUICK RELEASE *VP*
13. FORWARD-REAR AXLE BRAKE CHAMBER (
14. RELAY VALVE
15. REAR-REAR AXLE AIR BRAKE CHAMBER
16. QUICK RELEASE VALVE (2)
17. ADAPTER
18. 90° ELBOW
19. PLUG
20. PRIMARY RESERVOIR
21. AIR DRYER
22. TRACTOR PROTECTION VALVE
23. AUTOMATIC DRAIN VALVE
24. 90° ELBOW
25. QUICK RELEASE COUPLER
26. SAFETY VALVE
27. SUPPLY RESERVOIR
28. 90° ELBOW (2)
29. CHECK VALVE
30. TRAILER SUPPLY VALVE
31. TRAILER HAND CONTROL BRAKE VALVE
32. BRAKE TREADLE VALVE
33. DOUBLE CHECK VALVE
34. DOUBLE CHECK AND STOPLAMP VALVE
35. FRONT AXLE RATIO VALVE
36. AIR COMPRESSOR/GOVERNOR

TA236958

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

111. SERVICE BRAKES WILL NOT RELEASE (ONE WHEEL ONLY).

Troubleshoot brakes.

Refer to brake malfunctions 109 and 110.

112. SERVICE BRAKES WILL NOT APPLY.

Step 1. Check pressure gages in cab.

Operate engine to build up proper pressure. (Refer to TM 9-2320-283-10).

Step 2. Check position of parking brake and trailer supply valves.

Position correctly. (Refer to TM 9-2320-283-10).

Step 3. Check intervehicle connections.

Connect air hoses correctly and open trailer supply valve.

Step 4. Check for leakage at dual brake treadle valve using a soap solution.

Tighten connections or replace defective brake treadle valve (para 3-174).

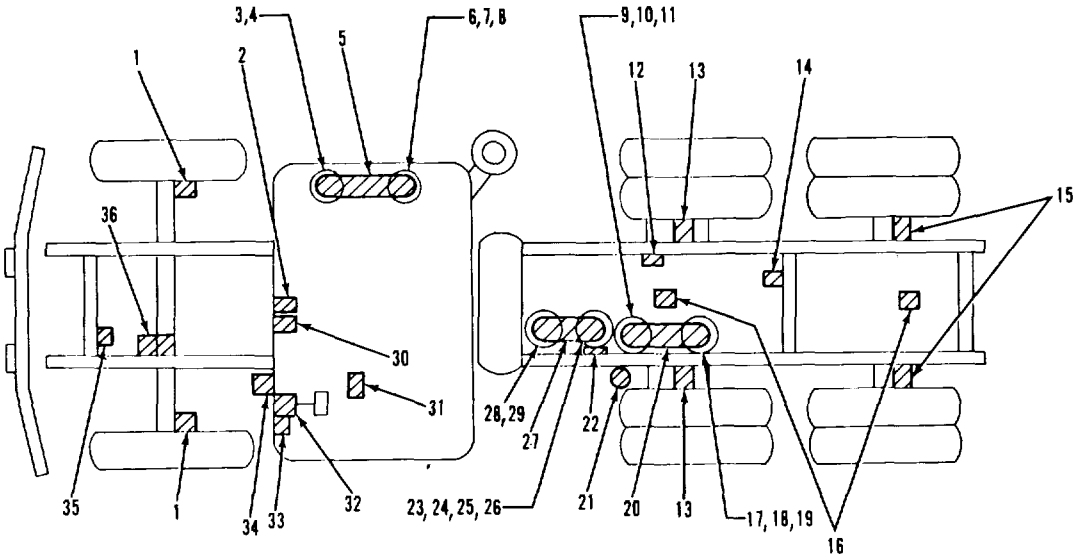
Step 5. Check brakes for proper adjustment and worn linings.

a. Adjust brakes (para 3-157).
b. Replace brakes shoes (para 3-159).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION



LEGEND:

1. FRONT AXLE BRAKE CHAMBER (2)
2. PARKING BRAKE VALVE
3. DRAINCOCK
4. PLUG (2)
5. SECONDARY RESERVOIR
6. DOUBLE CHECK VALVE
7. 90° CHECK VALVE
8. 90° ELBOW
9. DRAINCOCK
10. 45° ELBOW
11. 45° CHECK VALVE
12. DOUBLE CHECK AND QUICK RELEASE VW
13. FORWARD-REAR AXLE BRAKE CHAMBER (
14. RELAY VALVE
15. REAR-REAR AXLE AIR BRAKE CHAMBER
16. QUICK RELEASE VALVE (2)
17. ADAPTER
18. 90° ELBOW
19. PLUG
20. PRIMARY RESERVOIR
21. AIR DRYER
22. TRACTOR PROTECTION VALVE
23. AUTOMATIC DRAIN VALVE
24. 90° ELBOW
25. QUICK RELEASE COUPLER
26. SAFETY VALVE
27. SUPPLY RESERVOIR
28. 90° ELBOW (2)
29. CHECK VALVE
30. TRAILER SUPPLY VALVE
31. TRAILER HAND CONTROL BRAKE VALVE
32. BRAKE TREADLE VALVE
33. DOUBLE CHECK VALVE
34. DOUBLE CHECK AND STOPLAMP VALVE
35. FRONT AXLE RATIO VALVE
36. AIR COMPRESSOR/GOVERNOR

TA 236959

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

113. NO SERVICE BRAKES ON TRAILER ONLY.

Step 1. Check service air hose connection and position of trailer supply valve.

Reconnect hose properly and open trailer supply valve.

Step 2. Check trailer supply valve for damage or leakage using a soap solution.

Replace defective valve (para 3-175).

Step 3. Check double check valve(s) for damage or leakage using a soap solution.

Replace defective valve(s) (para 3-182, 3-183, 3-185, and 3-193).

114. TRAILER HAND CONTROL WILL NOT APPLY TRAILER SERVICE BRAKES.

Step 1. Check air lines between trailer hand control and double check valve for leakage using a soap solution.

Repair leaks.

Step 2. Check tractor protection valve for damage or leaks using a soap solution.

Tighten connections or replace valve (para 3-192).

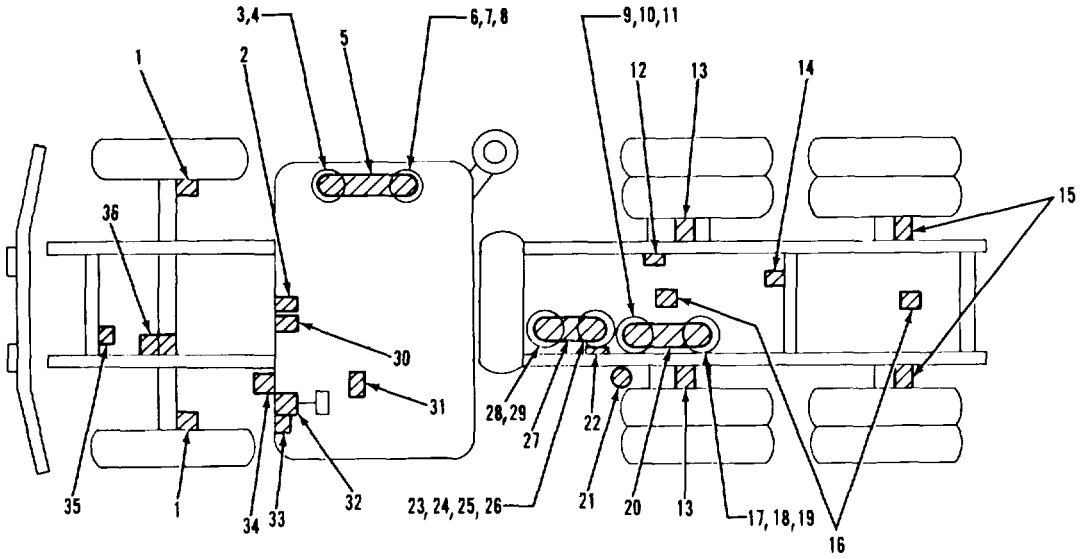
Step 3. Check double check valve for damage or leaks using a soap solution.

Tighten connections or replace valve (para 3-183).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION



LEGEND:

1. FRONT AXLE BRAKE CHAMBER (2)
2. PARKING BRAKE VALVE
3. DRAINCOCK
4. PLUG (2)
5. SECONDARY RESERVOIR
6. DOUBLE CHECK VALVE
7. 900 CHECK VALVE
8. 90° ELBOW
9. DRAINCOCK
10. 45° ELBOW
11. 45° CHECK VALVE
12. DOUBLE CHECK AND QUICK RELEASE V
13. FORWARD-REAR AXLE BRAKE CHAMBER
14. RELAY VALVE
15. REAR-REAR AXLE AIR BRAKE CHAMBER
16. QUICK RELEASE VALVE (2)
17. ADAPTER
18. 90° ELBOW
19. PLUG
20. PRIMARY RESERVOIR
21. AIR DRYER
22. TRACTOR PROTECTION VALVE
23. AUTOMATIC DRAIN VALVE
24. 90° ELBOW
25. QUICK RELEASE COUPLER
26. SAFETY VALVE
27. SUPPLY RESERVOIR
28. 90° ELBOW (2)
29. CHECK VALVE
30. TRAILER SUPPLY VALVE
31. TRAILER HAND CONTROL BRAKE VALVE
32. BRAKE TREADLE VALVE
33. DOUBLE CHECK VALVE
34. DOUBLE CHECK AND STOPLAMP VALVE
35. FRONT AXLE RATIO VALVE
36. AIR COMPRESSOR/GOVERNOR

TA 236960

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

115. PARK BRAKES WILL NOT APPLY.

Step 1. Inspect vent on park brake valve for damage or clogging.

Clean vent or replace valve (para 3-171).

Step 2. Check air brake chambers for proper position of caging bolt.

Uncage bolt. (Refer to TM 9-2320-283-10).

116. SERVICE BRAKES ARE WEAK OR SLOW WORKING (ALL WHEELS).

Step 1. Check for low reservoir pressure. Pressure should not be below 70 lbs. (Buzzer sounds at pressure below 70 lbs).

See malfunction 106.

Step 2. Check service air lines for damage and leakage using a soap solution.

Tighten loose connections and replace damaged lines.

Step 3. Check brake linings and adjustment.

Replace brake shoes and/or adjust as necessary (para 3-157 and 3-159).

117. FRONT SERVICE BRAKES ARE WEAK OR SLOW WORKING.

Step 1. Check air lines between brake pedal valve and front brake chambers for damage and leakage using a soap solution.

Tighten loose connections and replace damaged lines.

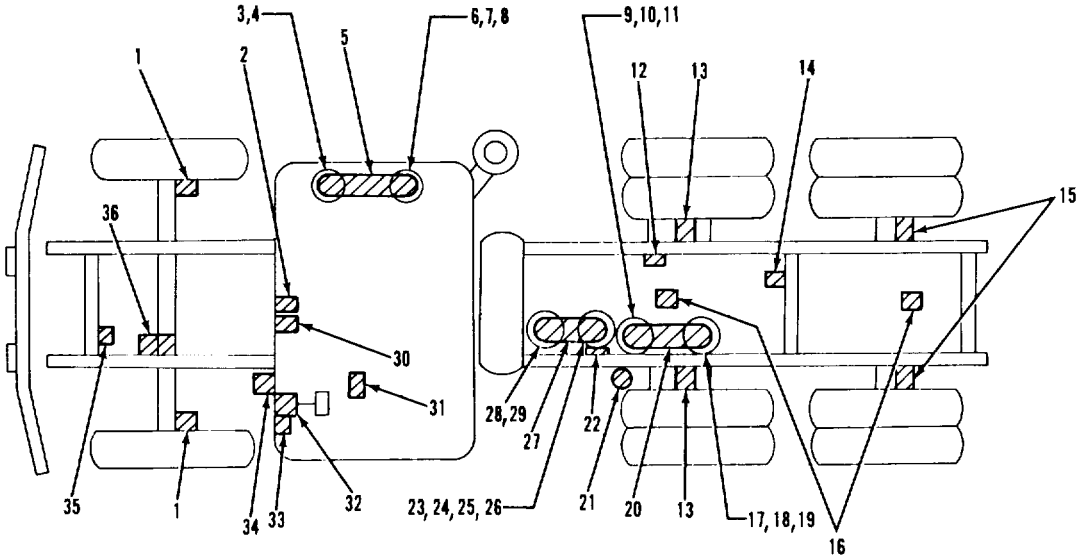
Step 2. Check the ratio valve for damage and leakage using a soap solution.

Replace defective ratio valve (para 3-181).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION



LEGEND:

1. FRONT AXLE BRAKE CHAMBER (2)
2. PARKING BRAKE VALVE
3. DRAINCOCK
4. PLUG (2)
5. SECONDARY RESERVOIR
6. DOUBLE CHECK VALVE
7. 90° CHECK VALVE
8. 90° ELBOW
9. DRAINCOCK
10. 45° ELBOW
11. 45° CHECK VALVE
12. DOUBLE CHECK AND QUICK RELEASE *VI*
13. FORWARD-REAR AXLE BRAKE CHAMBER
14. RELAY VALVE
15. REAR-REAR AXLE AIR BRAKE CHAMBER
16. QUICK RELEASE VALVE (2)
17. ADAPTER
18. 90° ELBOW
19. PLUG
20. PRIMARY RESERVOIR
21. AIR DRYER
22. TRACTOR PROTECTION VALVE
23. AUTOMATIC DRAIN VALVE
24. 90° ELBOW
25. QUICK RELEASE COUPLER
26. SAFETY VALVE
27. SUPPLY RESERVOIR
28. 90° ELBOW (2)
29. CHECK VALVE
30. TRAILER SUPPLY VALVE
31. TRAILER HAND CONTROL BRAKE VALVE
32. BRAKE TREADLE VALVE
33. DOUBLE CHECK VALVE
34. DOUBLE CHECK AND STOPLAMP VALVE
35. FRONT AXLE RATIO VALVE
36. AIR COMPRESSOR/GOVERNOR

TA 236961

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

117. FRONT SERVICE BRAKES ARE WEAK OR SLOW WORKING (Continued).

Step 3. Check brake pedal valve for damage and leakage using a soap solution.

Replace defective valve (para 3-174).

Step 4. Check front brakes for worn linings (shoes) and proper adjustments.

Adjust brakes and replace linings, if necessary (para 3-157 or 3-159).

118. REAR SERVICE BRAKES ARE UNEVEN OR ERRATIC.

Step 1. Check for leakage in air lines between service brake relay valve and wheel air chambers using a soap solution.

Step 2. Check for air leakage between air reservoir and rear service brake relay valve.

Tighten loose connections or replace damaged lines.

Step 3. Leak test rear brake part of the brake treadle valve.

Tighten loose connections or replace brake treadle valve (para 3-174)

Step 4. Check brake shoes for proper adjustment.

Adjust brake shoes (para 3-157).

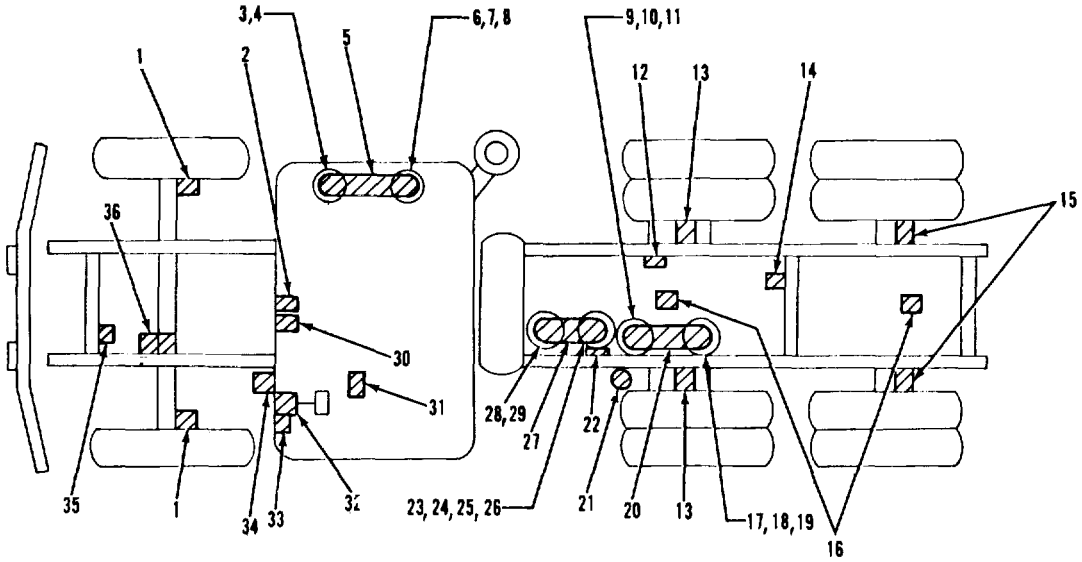
119. SERVICE BRAKES ARE UNEVEN OR ERRATIC ON ONE OR MORE WHEELS.

Step 1. Have an assistant press and hold brake pedal down and perform leakage test on air lines at affected wheels using a soap solution.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION



LEGEND:

1. FRONT AXLE BRAKE CHAMBER (2)
2. PARKING BRAKE VALVE
3. DRAINCOCK
4. PLUG (2)
5. SECONDARY RESERVOIR
6. DOUBLE CHECK VALVE
7. 90° CHECK VALVE
8. 90° ELBOW
9. DRAINCOCK
10. 45° ELBOW
11. 45° CHECK VALVE
12. DOUBLE CHECK AND QUICK RELEASE VAL
13. FORWARD-REAR AXLE BRAKE CHAMBER (2
14. RELAY VALVE
15. REAR-REAR AXLE AIR BRAKE CHAMBER (
16. QUICK RELEASE VALVE (2)
17. ADAPTER
18. 90° ELBOW
19. PLUG
20. PRIMARY RESERVOIR
21. AIR DRYER
22. TRACTOR PROTECTION VALVE
23. AUTOMATIC DRAIN VALVE
24. 90° ELBOW
25. QUICK RELEASE COUPLER
26. SAFETY VALVE
27. SUPPLY RESERVOIR
28. 90° ELBOW (2)
29. CHECK VALVE
30. TRAILER SUPPLY VALVE
31. TRAILER HAND CONTROL BRAKE VALVE
32. BRAKE TREADLE VALVE
33. DOUBLE CHECK VALVE
34. DOUBLE CHECK AND STOPLAMP VALVE
35. FRONT AXLE RATIO VALVE
36. AIR COMPRESSOR/GOVERNOR

TA 236962

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

119. SERVICE BRAKES ARE UNEVEN OR ERRATIC ON ONE OR MORE WHEELS (Continued).

Step 2. Loosen line fitting at affected wheel air chamber and have an assistant lightly depress brake pedal. Listen for air exhausting from line. No air indicates a clogged line.

Replace damaged or clogged line.

Step 3. Check brake adjustment (para 3-157).

Step 4. Press brake pedal down and listen for air leakage around wheel air chamber clamp.

Tighten clamp or replace brake chamber (para 3-165 for front brakes, para 3-165 or 3-166 for rear brakes).

Step 5. Remove drum to inspect (para 3-204 or 3-206).

a. Clean, repair, or replace defective brake components (para 3-158 thru 3-162).
b. Check brake shoes (linings) for grease, glazing, and proper installation (para 3-159).

120. BRAKES OVERHEAT.

Step 1. Check for low reservoir pressure.

If below 70 psi, see malfunction 107 (forward-rear axle only).

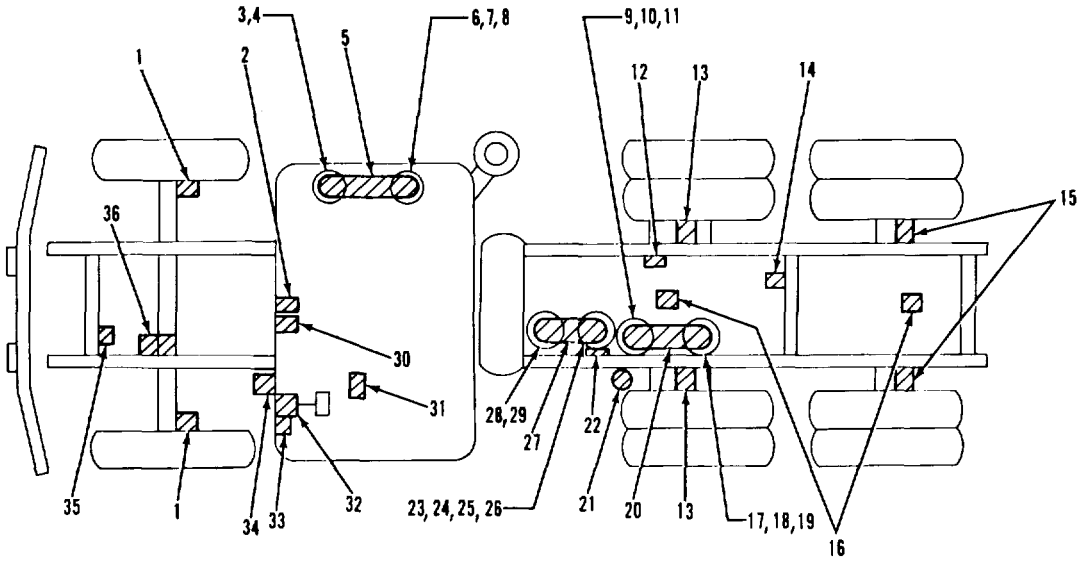
Step 2. Check for damaged or leaking front ratio valve or rear relay valves.

Tighten loose connections or replace defective valve (para 3-181 or 3-177, as applicable).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION



LEGEND:

1. FRONT AXLE BRAKE CHAMBER (2)
2. PARKING BRAKE VALVE
3. DRAINCOCK
4. PLUG (2)
5. SECONDARY RESERVOIR
6. DOUBLE CHECK VALVE
7. 90° CHECK VALVE
8. 90° ELBOW
9. DRAINCOCK
10. 45° ELBOW
11. 45° CHECK VALVE
12. DOUBLE CHECK AND QUICK RELEASE VAL
13. FORWARD-REAR AXLE BRAKE CHAMBER (2
14. RELAY VALVE
15. REAR-REAR AXLE AIR BRAKE CHAMBER (;
16. QUICK RELEASE VALVE (2)
17. ADAPTER
18. 90° ELBOW
19. PLUG
20. PRIMARY RESERVOIR
21. AIR DRYER
22. TRACTOR PROTECTION VALVE
23. AUTOMATIC DRAIN VALVE
24. 90° ELBOW
25. QUICK RELEASE COUPLER
26. SAFETY VALVE
27. SUPPLY RESERVOIR
28. 90° ELBOW (2)
29. CHECK VALVE
30. TRAILER SUPPLY VALVE
31. TRAILER HAND CONTROL BRAKE VALVE
32. BRAKE TREADLE VALVE
33. DOUBLE CHECK VALVE
34. DOUBLE CHECK AND STOPLAMP VALVE
35. FRONT AXLE RATIO VALVE
36. AIR COMPRESSOR/GOVERNOR

TA 236963

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

120. BRAKES OVERHEAT (Continued).

Step 3. Check for dragging brakes.

Adjust brakes (para 3-157).

Step 4. Remove drum (para 3-204 thru 3-206), and inspect brake assembly. Apply brakes lightly and observe shoe movement for smooth operation.

Clean, repair, or replace defective components (para 3-158 thru 3-162).

Step 5. Inspect wheel bearings for damage and proper lubrication.

Adjust, lube, or replace bearings (para 3-204 thru 3-207, as applicable).

121. STOPLAMPS DO NOT OPERATE (BRAKES NORMAL).

Check for defective wiring or electrical connectors.

Refer to malfunction 56.

122. PRESSURE GAGE(S) NOT INDICATING OR NOT ACCURATE (BRAKES NORMAL).

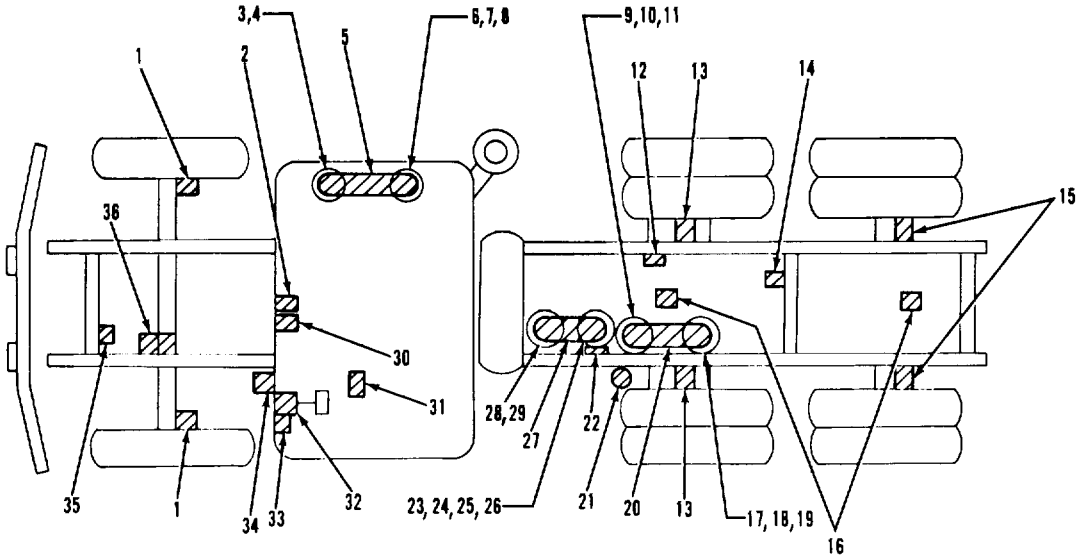
Step 1. Disconnect affected air line(s) at gage(s), and press brake pedal. If no air exhausts, the line is clogged or broken.

Replace defective line or gage (para 3-163).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION



LEGEND:

1. FRONT AXLE BRAKE CHAMBER (2)
2. PARKING BRAKE VALVE
3. DRAINCOCK
4. PLUG (2)
5. SECONDARY RESERVOIR
6. DOUBLE CHECK VALVE
7. 90° CHECK VALVE
8. 90° ELBOW
9. DRAINCOCK
10. 45° ELBOW
11. 45° CHECK VALVE
12. DOUBLE CHECK AND QUICK RELEASE V
13. FORWARD-REAR AXLE BRAKE CHAMBER
14. RELAY VALVE
15. REAR-REAR AXLE AIR BRAKE CHAMBER
16. QUICK RELEASE VALVE (2)
17. ADAPTER
18. 90° ELBOW
19. PLUG
20. PRIMARY RESERVOIR
21. AIR DRYER
22. TRACTOR PROTECTION VALVE
23. AUTOMATIC DRAIN VALVE
24. 90° ELBOW
25. QUICK RELEASE COUPLER
26. SAFETY VALVE
27. SUPPLY RESERVOIR
28. 90° ELBOW (2)
29. CHECK VALVE
30. TRAILER SUPPLY VALVE
31. TRAILER HAND CONTROL BRAKE VALVE
32. BRAKE TREADLE VALVE
33. DOUBLE CHECK VALVE
34. DOUBLE CHECK AND STOPLAMP VALVE
35. FRONT AXLE RATIO VALVE
36. AIR COMPRESSOR/GOVERNOR

TA 236964

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

123. AIR HORN NOT WORKING.

Step 1. Check air gage for low pressure reading.

If air pressure is below 20 psi, operate engine until air pressure is back to 125 psi. See malfunction 107.

Step 2. Inspect air lines for damage or clogging.

a. Replace damaged or clogged lines (para 3-163).
b. Replace defective manually operated horn valve (para 3-289).

124. WINDSHIELD WIPERS NOT WORKING.

Step 1. Check for air leakage in lines to wiper control valve using a soap solution.

Tighten loose connections and replace damaged lines (para 3-163).

Step 2. Check to see if wiper mechanical linkage is binding or broken.

Replace defective linkage (para 3-294).

Step 3. Loosen air lines at wiper motor and turn control to RUN position. Air should exhaust from line.

a. If no air exhausts, replace control valve (para 3-192).
b. If air exhausts, replace motor (para 3-295).

125. INTERAXLE DIFFERENTIAL LOCKOUT NOT WORKING.

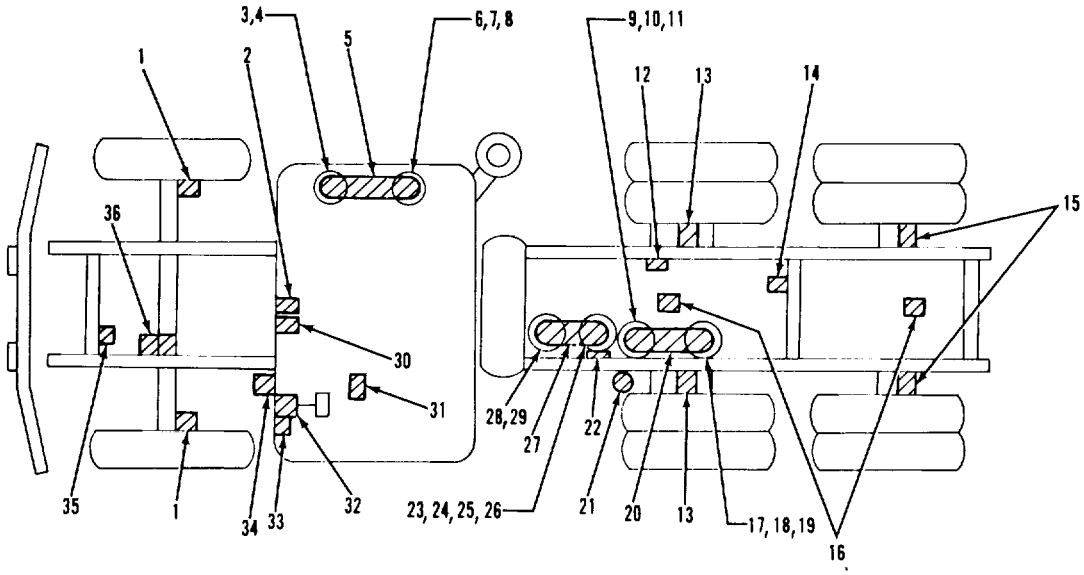
Step 1. Check air system pressure.

Charge air system to 105 psi.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION



LEGEND:

1. FRONT AXLE BRAKE CHAMBER (2)
2. PARKING BRAKE VALVE
3. DRAINCOCK
4. PLUG (2)
5. SECONDARY RESERVOIR
6. DOUBLE CHECK VALVE
7. 90° CHECK VALVE
8. 90° ELBOW
9. DRAINCOCK
10. 45° ELBOW
11. 45° CHECK VALVE
12. DOUBLE CHECK AND QUICK RELEASE VAL
13. FORWARD-REAR AXLE BRAKE CHAMBER (2
14. RELAY VALVE
15. REAR-REAR AXLE AIR BRAKE CHAMBER (
16. QUICK RELEASE VALVE (2)
17. ADAPTER
18. 90° ELBOW
19. PLUG
20. PRIMARY RESERVOIR
21. AIR DRYER
22. TRACTOR PROTECTION VALVE
23. AUTOMATIC DRAIN VALVE
24. 90° ELBOW
25. QUICK RELEASE COUPLER
26. SAFETY VALVE
27. SUPPLY RESERVOIR
28. 90° ELBOW (2)
29. CHECK VALVE
30. TRAILER SUPPLY VALVE
31. TRAILER HAND CONTROL BRAKE VALVE
32. BRAKE TREADLE VALVE
33. DOUBLE CHECK VALVE
34. DOUBLE CHECK AND STOPLAMP VALVE
35. FRONT AXLE RATIO VALVE
36. AIR COMPRESSOR/GOVERNOR

TA 236965

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

125. INTERAXLE DIFFERENTIAL LOCKOUT NOT WORKING (Continued).

Step 2. Disconnect air lines at rear axle; then engage lockout control valve on instrument panel. Check for air pressure at rear axle. No air indicates clogged lines or defective lockout control valve.

a. Replace clogged lines (para 3-163).
b. Replace defective control valve (para 3-195).
c. If air controls are working normally, notify direct support maintenance.

WHEELS

126. TIRES WEARING UNEVENLY.

Step 1. Refer to malfunction 105.

Step 2. Check wheel bearings for adjustment, lubrication, and damage.

Adjust bearings (para 3-204 or 3-207).

127. NOISY OR BUMPING SOUND WHILE TRAVELING ON ROAD.

Step 1. Check lug wheel stud capnuts for proper torque.

Torque lug nuts to 350 lb-ft.

Step 2. Inspect U-bolts for tightness.

Torque U-bolts to 125-165 lb-ft.

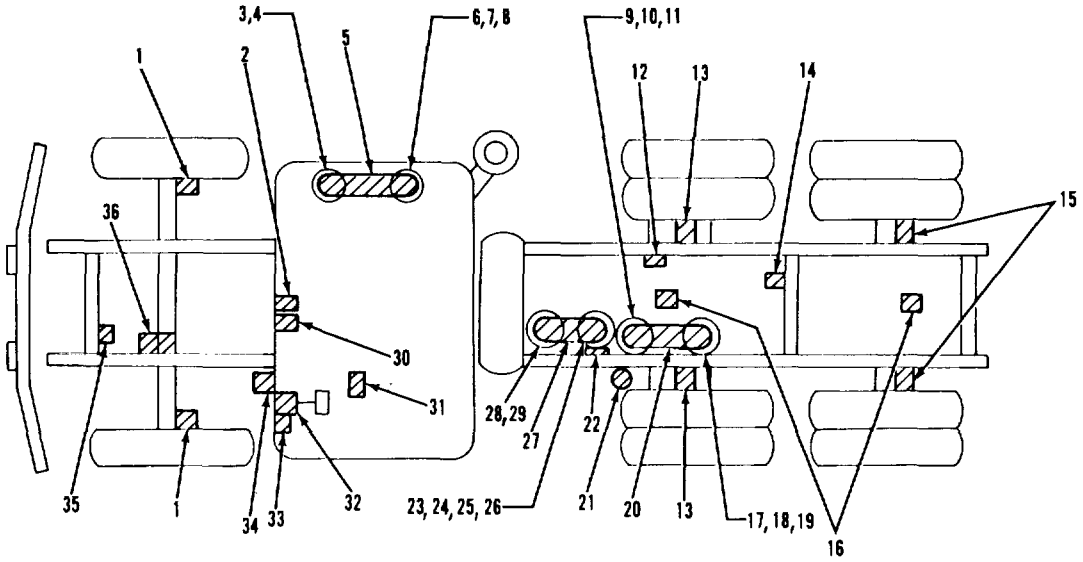
Step 3. Inspect spring shackle pins for looseness using a pry bar. No noticeable movement is allowable.

Refer to direct support maintenance.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION



LEGEND:

1. FRONT AXLE BRAKE CHAMBER (2)
2. PARKING BRAKE VALVE
3. DRAINCOCK
4. PLUG (2)
5. SECONDARY RESERVOIR
6. DOUBLE CHECK VALVE
7. 90° CHECK VALVE
8. 90° ELBOW
9. DRAINCOCK
10. 45° ELBOW
11. 45° CHECK VALVE
12. DOUBLE CHECK AND QUICK RELEASE VAL
13. FORWARD-REAR AXLE BRAKE CHAMBER (2
14. RELAY VALVE
15. REAR-REAR AXLE AIR BRAKE CHAMBER
16. QUICK RELEASE VALVE (2)
17. ADAPTER
18. 90° ELBOW
19. PLUG
20. PRIMARY RESERVOIR
21. AIR DRYER
22. TRACTOR PROTECTION VALVE
23. AUTOMATIC DRAIN VALVE
24. 90° ELBOW
25. QUICK RELEASE COUPLER
26. SAFETY VALVE
27. SUPPLY RESERVOIR
28. 90° ELBOW (2)
29. CHECK VALVE
30. TRAILER SUPPLY VALVE
31. TRAILER HAND CONTROL BRAKE VALVE
32. BRAKE TREADLE VALVE
33. DOUBLE CHECK VALVE
34. DOUBLE CHECK AND STOPLAMP VALVE
35. FRONT AXLE RATIO VALVE
36. AIR COMPRESSOR/GOVERNOR

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TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

127. NOISY OR BUMPING SOUND WHILE TRAVELING ON ROAD (Continued).

Step 4. Check wheel bearings for vertical looseness using a pry bar beneath tire. Check for proper lubrication and damage.

Adjust, lubricate, or replace bearing (para 3-204 or 3-207).

Step 5. Inspect rear axle shaft for damage by jacking up both wheels. Turn wheel while listening for a rumbling or grinding sound at the axle. Repeat on other wheel.

Replace axle shaft (para 3-154).

STEERING SYSTEM

128. FRONT TIRES WEARING UNEVENLY.

Step 1. Inspect U-bolts for tightness.

Torque U-bolts to 125-165 lb-ft.

Step 2. Inspect spring shackle pins for looseness using a pry bar. No noticeable movement is allowable.

Refer to direct support maintenance.

Step 3. Check wheel bearings for vertical looseness using a pry bar beneath the tire. Check for proper lubrication and damage.

Adjust, lubricate, or replace bearing (para 3-204 or 3-207, as applicable).

Step 4. Check for proper toe-in (1/32-inch ± 1/32-inch).

Adjust toe-in (para 3-203).

Step 5. Check brakes for proper adjustment.

Adjust brakes (para 3-157).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

129. VEHICLE DOES NOT FULLY STEER FROM STOP TO STOP.

Step 1. Check all steering linkage for proper lubrication.

Lubricate. (Refer to LO 9-2320-283-12).

Step 2. Check steering arm for damage.

Replace steering arm (para 3-217).

Step 3. Check vertical link for damage or looseness. No play is allowable.

Replace vertical link (para 3-216).

Step 4. Check the tie rod for damage or loose end. No play is allowable.

Replace tie rod end, if loose (para 3-218).

Step 5. Check steering gear mounting bolts for tightness.

Notify direct support maintenance.

130. FRONT END WANDERS.

Step 1. Check tire pressure.

Bring tires to proper pressure. (Refer to TM 9-2320-283-10).

Step 2. Check for insufficient front end lubrication.

Lubricate. (Refer to LO 9-2320-283-12).

Step 3. Check for loose wheel stud capnuts.

Torque nuts to 475 lb-ft.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

130. FRONT END WANDERS (Continued).

Step 4. Check for insufficient fifth wheel lubrication (only if trailer is attached).

Lubricate. (Refer to LO 9-2320-283-12).

Step 5. Check for loose spring U-bolts.

Torque nuts on U-bolts to 125-165 lb-ft.

Step 6. Check wheel bearings for play using a pry bar.

Adjust or replace bearing (para 3-205).

Step 7. Inspect tie rod for damaged and loose ends. No play is allowable.

Replace tie rod end, if loose (para 3-218).

Step 8. Inspect vertical link for damage.

Replace vertical link (para 3-216).

Step 9. Check propeller shafts and universal joints for wear and damage. Wear is indicated by any movement between shaft and joint in any direction.

Replace (para 3-144 or 3-145).

Step 10. Check spring pins for wear using a pry bar. No noticable movement is allowed.

Notify direct support maintenance.

Step 11. Check steering gear for looseness.

Notify direct support maintenance.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

131. FRONT END SHIMMIES.

Step 1. Check for badly worn or unevenly worn tires.

Replace tires (para 3-208).

Step 2. Check for improperly mounted tire or wheel.

Replace tire (para 3-208).

Step 3. Check wheel bearings for play using a pry bar.

Adjust or replace bearing (para 3-205 or 3-207).

Step 4. Check all steering linkage for proper lubrication. (Refer to LO 9-2320-283-12).

Step 5. Inspect tie rod for damaged and loose ends. No play is allowable.

Replace tie rod end, if loose or damaged (para 3-218).

Step 6. Inspect vertical link for damage.

Replace vertical link (para 3-216).

Step 7. Check wheel and brake drums for proper balance.

Balance or replace wheel or brake drums (para 3-204 or 3-206).

Step 8. Check for proper toe-in (1/32-inch ± 1/32-inch).

Adjust toe-in (para 3-203).

Step 9. Check for air in hydraulic system.

Start engine. Turn steering wheel right then left several times until shimmy is eliminated. Shut down engine. Check fluid level and add to full mark. (Refer to LO 9-2320-283-12).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

132. VEHICLE OVERSTEERS.

Step 1. Check fifth wheel lubrication.

Lubricate. (Refer to LO 9-2320-283-12).

Step 2. Check all steering linkage for proper lubrication.

(Refer to LO 9-2320-283-12).

Step 3. Inspect tie rod for damaged and loose ends. No end play is allowable.

Replace tie rod end, if loose or damaged (para 3-218).

Step 4. Inspect vertical link for damage.

Replace vertical link (para 3-216).

Step 5. Check upper and lower steering column for binding.

Repair or replace (para 3-214 or 3-215, as applicable).

Step 6. Check steering gear for looseness.

Notify direct support maintenance.

Step 7. Check rear axle mounts for looseness.

Notify direct support maintenance.

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

133. HARD STEERING IN ONE DIRECTION.
Step 1. Check tire pressure.
Inflate tires to proper pressure. (Refer to TM 9-2320-283-10).

Step 2. Inspect vehicle for overload.
Reduce load.
Step 3. Check hydraulic system pressure (para 3-212).
a. Replace pump (para 3-219).
b. Notify direct support maintenance.

134. HARD STEERING IN BOTH DIRECTIONS.
Step 1. Refer to malfunction 133, steps 1 and 2.
Step 2. Check hydraulic fluid level.
Add fluid as necessary (Refer to LO 9-2320-283-12).
Step 3. Check for low pump pressure and flow (para 3-212).
a. Replace pump (para 3-219).
b. Notify direct Support maintenance.
Step 4. Check for restrictions in return line.
Replace (para 3-220).
Step 5. Check for oversized tires. (Refer to TM 9-2320-283-10).
Replace tires (para 3-208).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

135. LOST MOTION OR EXCESSIVE PLAY IN STEERING WHEEL.

Step 1. Check for loose steering wheel.
Repair or replace steering wheel (para 3-213).

Step 2. Check for loose steering gear on frame.
Notify direct support maintenance.

Step 3. Check for loose steering arm on steering gear.
Notify direct support maintenance.

Step 4. Inspect tie rod for damaged and loose ends. No play is allowable. ii
Replace tie rod end, if loose or damaged (para 3-218).

Step 5. Inspect vertical link for damage.
Replace vertical link (para 3-216).

Step 6. Check upper and lower steering column for binding.
Repair or replace (para 3-214 or 3-215, as applicable).

FRAME AND TOWING ATTACHMENTS

136. TOWING PINTLE DOES NOT PIVOT OR LATCH, OR JAW IS STUCK.

Step 1. Check for proper lubrication.
Lubricate. (Refer to LO 9-2320-283-12).

Step 2. Check lock for damage.
Replace pintle hook (para 3-238).

TROUBLESHOOTING.

2-11. TROUBLESHOOTING PROCEDURES (Continued).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

137. EXCESSIVE JERKING OF TOWED TRAILER.

Step 1. Check for proper lubrication of fifth wheel.

Lubricate. (Refer to LO 9-2320-283-12).

Step 2. Check bolts and brackets on fifth wheel for tightness.

Tighten and torque (para 3-245).

Step 3. Inspect coupler jaw and locks for damage.

Replace fifth wheel (para 3-245).

138. EXCESSIVE NOISE OR POPPING SOUNDS FROM FIFTH WHEEL WHEN TURNING.

Step 1. Check for proper lubrication of fifth wheel.
Lubricate. (Refer to LO 9-2320-283-12).

Step 2. Check all mounting bolts on fifth wheel for tightness.
Tighten and torque (para 3-245).

Step 3. Inspect locks for damage.
Replace fifth wheel (para 3-245).

SECTION V. STE/ICE TROUBLESHOOTING

2-12. GENERAL.

a. This SECTION is applicable only if STE/ICE (Simplified Test Equipment for Internal Combustion Engines) is available. This SECTION contains information and tests which may be used with STE/ICE to locate malfunctions which develop in the M915A1 truck. The tests can be used during troubleshooting, PMCS, or prior to replacing parts to help isolate malfunctions, anticipate failures, and to make sure that proper repairs have been made.

b. STE/ICE is used primarily with the M915A1 truck's electrical system. Tests can also be performed on certain mechanical systems. These tests cannot cover all possible troubles which may occur. If a particular malfunction is not covered, refer to paragraph 2-10, Troubleshooting Symptom Index, to locate the conventional troubleshooting procedure for the malfunction observed. To obtain the maximum number of observed symptoms of the malfunction, question the truck' s operator.

2-13. HOW TO USE THE STE/ICE TEST INDEX.

The Troubleshooting Symptom Index (para 2-10) contains a list of various troubles which may occur during operation or inspection of the M915A1 truck and which can be diagnosed with conventional test equipment. If STE/ICE equipment can also be used to determine the cause of the trouble, a STE/ICE GO or NO-GO chain Test Index number will immediately follow the listed malfunction. When one of the STE/ICE Test Index Numbers appears, go to either paragraph 2-17 or 2-18 and do the test called for.

STE/ICE tests cannot be done for all the malfunctions listed in the Troubleshooting System Index. Not all STE/ICE diagnostic tests, where the primary fault is unknown, relate to the observed malfunctions listed in paragraph 2-10. Refer to Test Index paragraphs 2-17 and 2-18 for additional tests which can only be performed with STE/ICE equipment.

2-14. VEHICLE TEST MEIER TROUBLESHOOIING.

a. The Vehicle Test Meter (VTM) is the heart of the STE/ICE system. VTM Troubleshooting Procedures are found in paragraphs 2-19 and 2-20. Additional VTM troubleshooting can be found in TM 9-4910-571-12&P.

STE/ICE TROUBLESHOOTING.

2-14. VEHICLE TEST METER TROUBLESHOOTING (Continued).

b. The STE/ICE VTM operator may follow either of two test procedures when using STE/ICE as follows:

(1) Diagnostic Test Procedures.

The GO/NO-GO diagnostic test procedures are used for troubleshooting malfunctioning vehicles where the primary fault is unknown. In the GO logic chain, the satisfactory result (yes) from each test leads to a GO to the next test. If the truck fails the test in the GO chain, the unsatisfactory result leads to a corrective action, higher level of maintenance, or to the NO-GO chain. The NO-GO logic chain contains procedures to determine the cause of failure and is arranged in steps detailing fault isolation and corrective action. When using a GO or NO-GO diagnostic procedure, the VTM operator must start at the beginning of the logic chain because the limits and steps for each test depend on previous steps.

(2) General Purpose Test Procedures.

The general purpose test procedures are used for making individual measurements when primary fault diagnosis has been done through the use of a troubleshooting table and verification of a malfunctioning part or system is desireable before parts replacement. Refer to this test procedure method when performing one specific STE/ICE test or when you do not want to follow the diagnostic GO/NO-GO logic chains. All VTM general purpose test procedures applicable to the M915A1 truck are found in TM 9-4910-571-12&P. General purpose test procedures may also be done using the M915A1 Truck Test Card found at the back of this TM.

c. The GO chain index, paragraph 2-17, contains a list of GO test numbers and titles. Refer to this paragraph for locating a specific GO chain test.

d. The NO-GO chain index, paragraph 2-18, contains a list of NO-GO test numbers and titles. Refer to this paragraph for locating a specific NO-GO chain test.

e. The M915A1 Truck Test Cards are found at the back of this TM. Use the sheet for reference purposes when doing general purpose test procedures. As you become more experienced you can rely solely on the Test Cards for doing GO/NO-GO chain and general purpose test procedures.

STE/ICE TROUBLESHOOTING.

2-15. STE/ICE VTM SET-UP PROCEDURE TEST NUMBER GO1.

The STE/ICE VTM set-up and internal checks must be done before performing any truck tests. Do test number G01 to checkout the proper function of the VTM and associated cables.

2-16. STE/ICE DESCRIPTION AND OPERATION.

a. General. The following describes the operation of the Simplified Test Equipment/Internal Combustion Engines (STE/ICE) system and contains detailed operating procedures.

STE/ICE is used to test the serviceability of M915A1 trucks and to perform primary fault detection and isolation. After the MOS has identified a faulty part or subsystem, he/she is referred to a paragraph number for replacement or repair procedures for individual parts.

b. Description and Operation. STE/ICE is a testing system that performs tests and measurements on internal combustion engines. STE/ICE measures standard voltage, current, resistance, pressure, temperature, and speed (RPM). Special tests, such as compression unbalance test and starter system evaluations, are performed by STE/ICE. Standard equipment functions including vacuum pressure gage, compression gage, low-current tester, and multimeter are features of the STE/ICE set.

STE/ICE is portable and operates on either 12 or 24-volt truck batteries or equivalent power source. The STE/ICE system consists of a Vehicle Test Meter (VTM), a Transducer Kit (TK), four electrical cables, a transit case, and technical publications.

c. Personnel Required. One mechanic is required to perform most tests. An additional mechanic is required to perform certain specific tests.

d. Vehicle Test Meter.

(1) General. The VTM provides a method for the MOS to test M915A1 truck electrical and mechanical components. Readings are either pass/fail indications or digital displays in units familar to the mechanic (psi, rpm, volts, ohms, amps, etc.). The Diagnostic Connector Assembly (DCA) is mounted on a bracket attached to the left hand (driver's side). of the engine block, and provides accessability to the most frequently needed test points. The use of the VTM through the DCA is referred to as DCA mode. The VTM interfaces with the vehicle directly with transducers installed on the vehicle in the DCA mode. The use of the VTM through the TK is referred to as TK mode. The VTM interfaces with the vehicle with transducers from the transducer kit (TK). The DCA and the TK can be used at the same time. This may be necessary when the diagnostic connector assembly has a missing transducer, such as when doing the oil pressure test. If a transducer is missing, a no sensor indication (E002) is displayed when a measurement is made. If this happens, the TK mode can be

STE/ICE TROUBLESHOOTING.

2-16. STE/ICE DESCRIPTION AND OPERATION (Continued).

used to make the measurement. The use of the VTM through the DCA and TK is referred to as the combined mode. Additional tests can be done that involve manually probing and/or connecting transducers to appropriate test points. Operating power for the VTM is drawn from the M915A1 truck batteries or some equivalent source. Power is routed to the VTM through the DCA connected to the batteries. The STE/ICE general purpose testing capabilities that may be applied to the M915A1 truck are 0-1000 psig pressure, 0 to 45-volts dc, and 0-40k ohms resistance. The following control functions can be performed in conjuction with the special test: interleave (displays rpm with next test), display maximum value, display minimum value, and display peak-to-peak value.

(2) Controls and Indicators. The controls and readout display on the VTM are illustrated. The following paragraphs describe how the controls are used and how the display functions.

(a) Power Switch (PUSH ON/PULL OFF). The power switch controls DC power to the VTM. The VTM can operate from a 12 volt or 24 volt battery system. When the power switch is pushed in (PUSH ON), the VTM power is on. To shut the VTM off, pull out the power switch (PULL OFF). The power switch contains a 4-ampere circuit breaker. The power switch will pop out automatically if something is wrong which causes the VTM to use more power than it should. If the switch pops out, check your hookup carefully and try again before returning the VTM to Direct Support Maintenance.

(b) TEST SELECT Switches. The TEST SELECT switches are used to select the actual test to be performed. There are ten positions on each switch numbered 0 through 9. The number dialed into these switches is read by the VTM when you press the test button. Changing the TEST SELECT switch position has no effect until the TEST button is pushed.

(c) TEST Button. Depressing and releasing the TEST button causes the test measurement to begin. Observe the measured value on the readout display. The reading will be in units normally used for the particular truck measurement. These units are listed on the VTM's flip cards, in the GO/NO-GO test pages, and on the Vehicle Test Card Sheets in the back of this TM. The TEST button must be pressed and immediately released. Depressing and holding the TEST button down initiates an offset test. Offset tests are described in paragraphs 2-20 and 2-21, and in TM 9-4910-571-12&P.

(d) Readout Display. The readout display will show different types of readouts during testing up to a maximum of 4-characters (for example .8.8.8.8). The types of readouts are described in detail in paragraph 2-16, d., (3) "Readouts", with a summary following:

STE/ICE TROUBLESHOOTING.

2-16. STE/ICE DESCRIPTION AND OPERATION (Continued).

1. Status Readout. This type of readout keeps the mechanic informed of what is happening such as power applied, failed test, etc.

2. Numerical Readout. This type of readout is the measured value in units of the measurement being made. If you are measuring on the 0-45 dc range, the number 24 on the display indicates 24-volts.

3. Error Readout. This type of readout indicates that the wrong test number was selected, the transducer is not connected, or the VTM is faulty.

(e) Flip Cards. The flip cards list the 2-digit test number system for selecting the various tests. The cards also summarize the test and operating instructions contained herein.

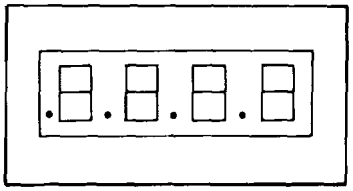
(f) Power/DCA Connector J1. Connector J1 connects the VTM to either the M915A1 truck diagnostic connector using the DCA cable or the truck batteries using the power cable. Operating power and signals from installed transducers are supplied to the VTM through the DCA cable.

(g) Transducer Cable Connectors J2 and J3. Connector J2 or J3 connects the VTM to any transducer in the transducer kit. Operating power is supplied to the transducer, and signals from the transducers are supplied to the VTM through the cable. Connectors J2 and J3 are identical and can be interchanged with each other or used in combination.

(h) Test Probe Cable Connector J4. Connector J4 connects test leads to the VTM when doing manual or general purpose voltage and resistance tests.

(3) Readouts. The following paragraphs describe the different types of readout that can occur during testing.

(a) Status Readout. A status readout keeps the mechanic informed of what is happening. For example, .8.8.8.8 is displayed each time the power switch is pushed on. It means that power is applied and that all elements of the display are operative. It changes to ---- 1-1/2 seconds later, indicating that the VTM



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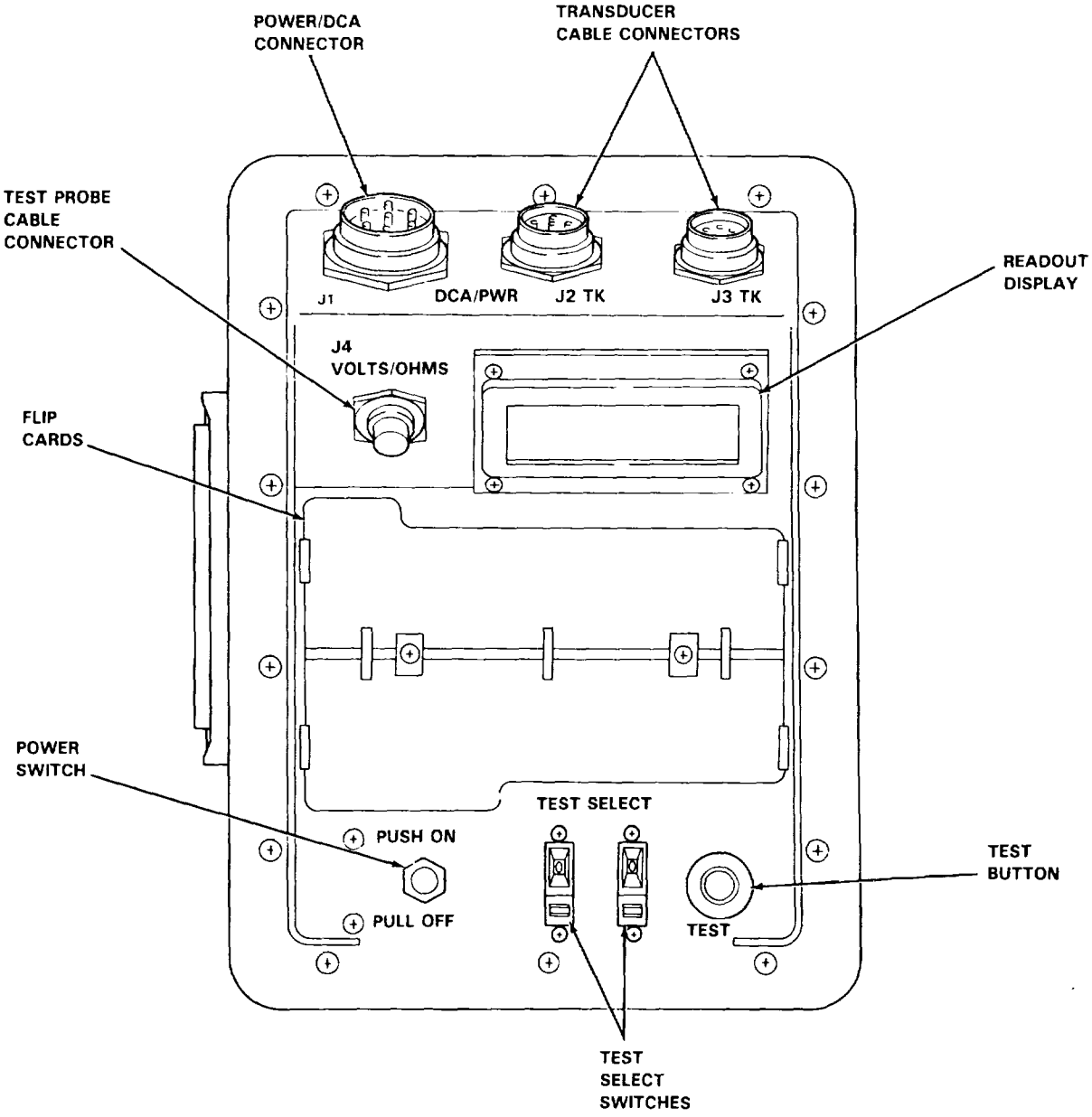
STE/ICE TROUBLESHOOTING.

2-16. STE/ICE DESCRIPTION AND OPERATION (Continued).



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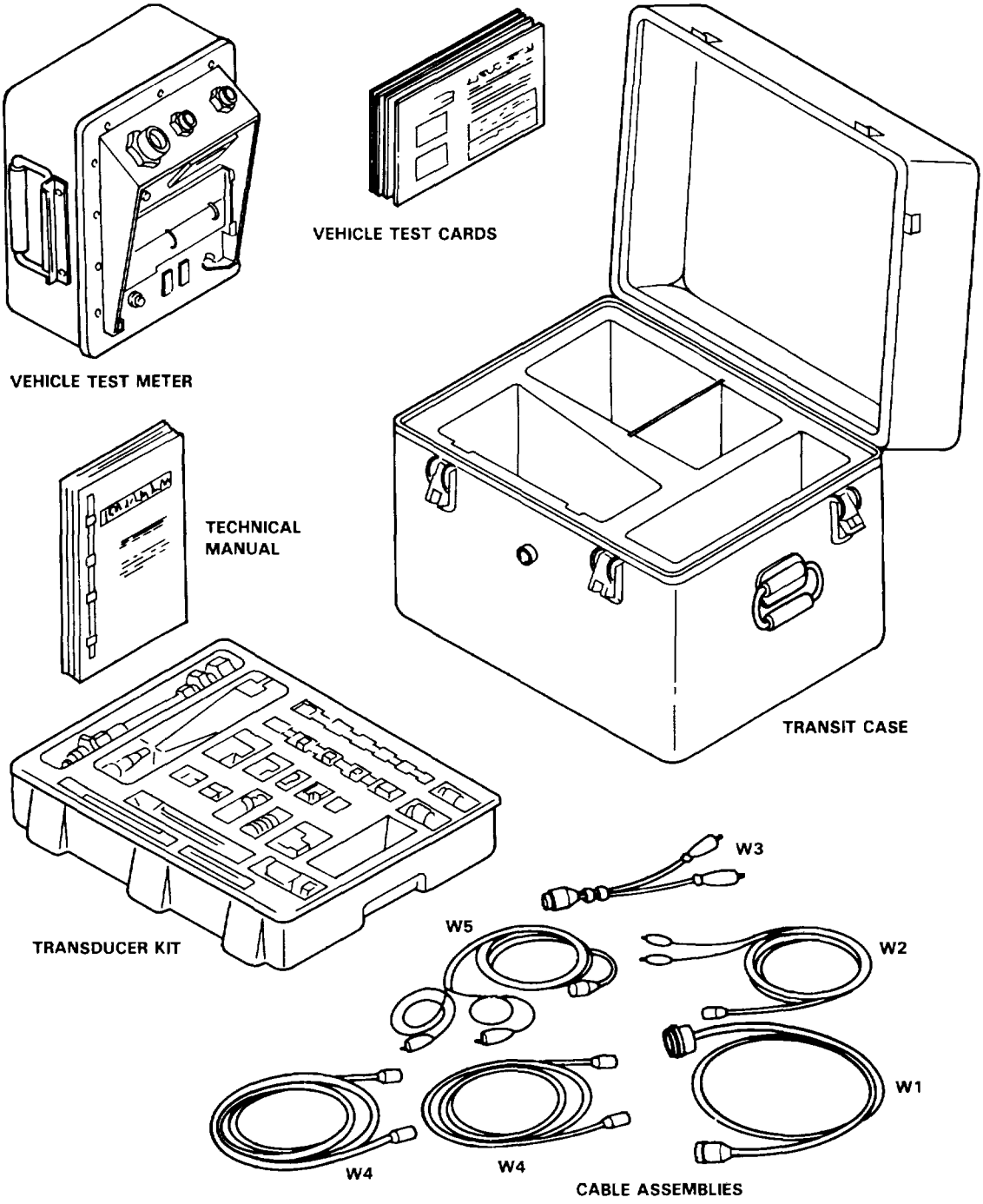
VTM Controls and Readout Display.

STE/ICE TROUBLESHOOTING.



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Simplified Test Equipment Internal Combustion Engine (STE/ICE) System.

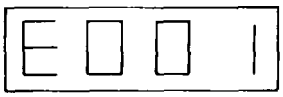
STE/ICE TROUBLESHOOTING.

2-16. STE/ICE DESCRIPTION AND OPERATION (Continued).

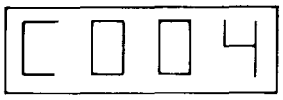
(b) Prompting Message. A prompting message is any action message to the mechanic. It is a signal for you to do something such as crank the engine. For example, UEH tells you to enter the vehicle type identification number into the VTM. After the operator action is performed, the test will automatically continue. Prompting messages are listed on page 2-338.

(c) Numerical Readout. A numerical readout is the measured value in units of the measurement being made. For example, if you are measuring 0-45 VDC, 12.7 is volts dc. If you are measuring 0-25 psig pressure, 12.7 is psig. The units for each test are listed on the flip card. The numbers displayed in the VTM are always sensitive unless there is a minus shown to make them negative.

(d) Error Readout. E001 is a representative error readout. There are 17 different error readouts. All error readouts start with E. An error readout is a warning that you forgot to connect the transsducer, selected a wrong test number, failed to start the engine, etc. All of the error messages mean you must correct the problem before continuing testing. If the error message does



(e) Confidence Error Readouts. EUU4 is a representative error readout resulting from the detection of a faulty VTM during confidence test. For detailed information concerning confidence error readouts, refer to TM 9-4910-571-12&P.



STE/ICE TROUBLESHOOTING.

2-16. STE/ICE DESCRIPTION AND OPERATION (Continued).

STATUS READOUTS

VTM Readout	Interpretation
.8.8.8.8	A readout of .8.8.8.8 appears for I to 2 seconds each time the power is applied to the VTM. It means that there is power to the VTM, and that all elements of the readout display are operative. A readout of ---- indicates the following: (1) After power turn on, it signifies that the VTM is ready for testing. (2) During a compression unbalance test, it signifies testing is in progress.
.9.9.9.9	A readout of .9.9.9.9 indicates that the VTM is reading a test value beyond the range of its measurement capability. Either (1) the wrong test number is selected for the parameter being measured, or (2) there is a fault in the truck.
PASS FAIL	A PASS or FAIL readout is the result of a test that checks the condition of a component being measured. A PASS/FAIL readout means just that the component either passes the test or fails the test.

STE/ICE TROUBLESHOOTING.

2-16. STE/ICE DESCRIPTION AND OPERATION (Continued).

PROMPTING MESSAGES

VTM Readout	Interpretation
UEH	Signal to mechanic to enter vehicle type identification number (VID) on the TEST SELECT switches. Vehicle ID number, when available, is found under TEST DATA on the flip card, and on the vehicle test card sheet.
CYL	Signal to mechanic to enter number of cylinders on the TEST select switches.
GO	Signal to mechanic to crank engine in compression unbalance or first peak tests.
CIP	Signal to operator to apply full throttle in a CI power test.
OFF	Signal to mechanic to stop cranking in compression unbalance test or to release the accelerator in the CI power test.
CAL	Signal to the mechanic to release the TEST button during an offset test.
66	Numbers are used for prompting messages in two tests. In confidence test 66 signals the mechanic to dial in 99 and wait for readout display of PASS. In CI power test 12, the first number to appear on the VTM is the signal to release the accelerator.

ERROR READOUT

VTM Readout	Interpretation
EOOO	Occurs if you request the VTM for information it does not have. For example, if you request the vehicle ID and it has not been entered.
EOO1	Occurs in either the DCA or TK mode of operation. It indicates that a non-existent test number has been dialed into the TEST SELECT switches.

STE/ICE TROUBLESHOOTING.

2-16. STE/ICE DESCRIPTION AND OPERATION (Continued).

ERROR READOUT (Continued)

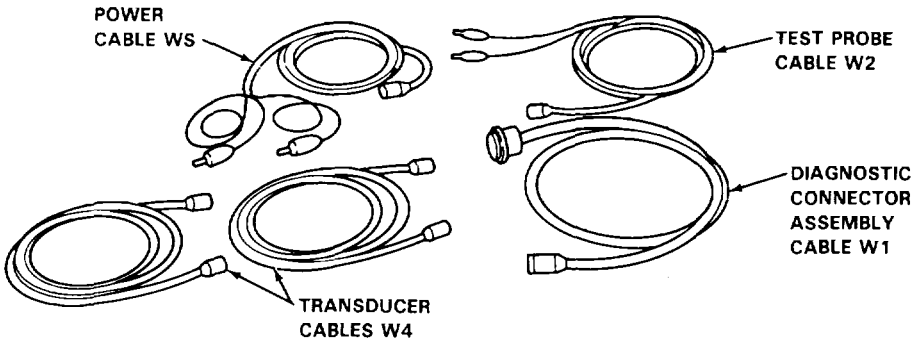
VTM Readout	Interpretation
E002	Indicates that the required transducer is not connected or installed.
E003	Indicates that a test number has been dialed which does not apply to the vehicle under test. It can only occur in the DCA mode.
E004	Indicates that a vehicle identification number or number of cylinders information has not been entered.
EO5	Indicates that the transducer offset test was not performed.
E007	Indicates conflict between the vehicle identification number (VID) dialed in and the number of cylinders dialed in. It may occur in response to either VID entry or number of cylinders entry.
E008	Indicates the VTM is not receiving the required voltage signal for the test selected. This error code is related only to starter and compression balance tests.
EOO9	Indicates that the engine was not running at the start of the test.
EO1O	A wrong vehicle number was dialed into the VTM.
EO11	Indicates that the throttle control was operated incorrectly during power test taking; too much time to either accelerate or decelerate.
E013	Indicates bad data was taken for the test in progress. Repeat the test one (1) time.
E014	Indicates that a wrong number of cylinders was dialed into the. VTM.
E018	Indicates that an engine RPM or AC frequency test was terminated automatically to protect the VTM. Termination is only after several minutes of no-signal operation. Most likely, the VTM was left on the truck and the engine stalled.

STE/ICE TROUBLESHOOTING.

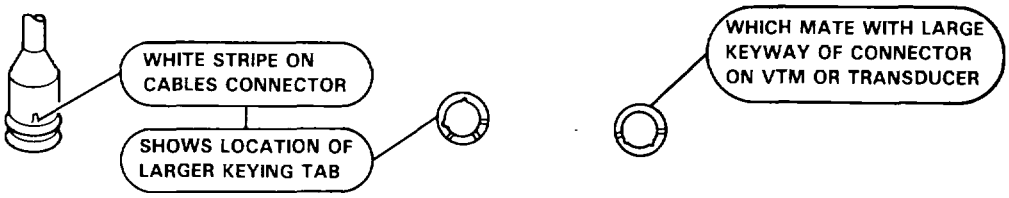
2-16. STE/ICE DESCRIPTION AND OPERATION (Continued).

e. Cable Assemblies.

(1) General. The cable assemblies are shown below and are referred to by the cable number and by a name which describes how the cable is used. If necessary, the two transducer cables (W4) can be joined with the adapter



(2) Installation. When cables are connected, a large key on the cable connector mates with a keyway on the transducer connector or the VTM connector for proper installation. If you experience any difficulty during testing and



f. Transducer Kit.

(1) General. The transducer kit contains a pulse tachometer transducer, a pressure, and a vacuum transducer plus the necessary adapters (bushings, plugs, tees, etc.). Also included in the kit is a current probe for measuring current and a test probe cable for measuring voltage and resistance.

All fittings do not have part number markings. The legend will help to identify the items.

Before installing any transducer kit item on the truck, be sure to clean the mounting surfaces. This is particularly important if you are going to open fuel lines or tap into manifolds. Dirt particles entering the engine can cause damage to both the engine and the transducer kit item.

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STE/ICE TROUBLESHOOTING.

2-16. STE/ICE DESCRIPTION AND OPERATION (Continued).

The transducers should be kept clean, free of dirt and grease, and handled with reasonable care.

NOTE

Transducers for measuring engine RPM (pulse tachometer) and fuel pressure are permanently installed on the M915A1 truck. The following material is for reference only or when trouble- shooting a faulty transducer.

(2) Pressure Transducers. The pressure transducers have a small breather hole on the side of the housing which should be kept unplugged. Do not use high pressure.

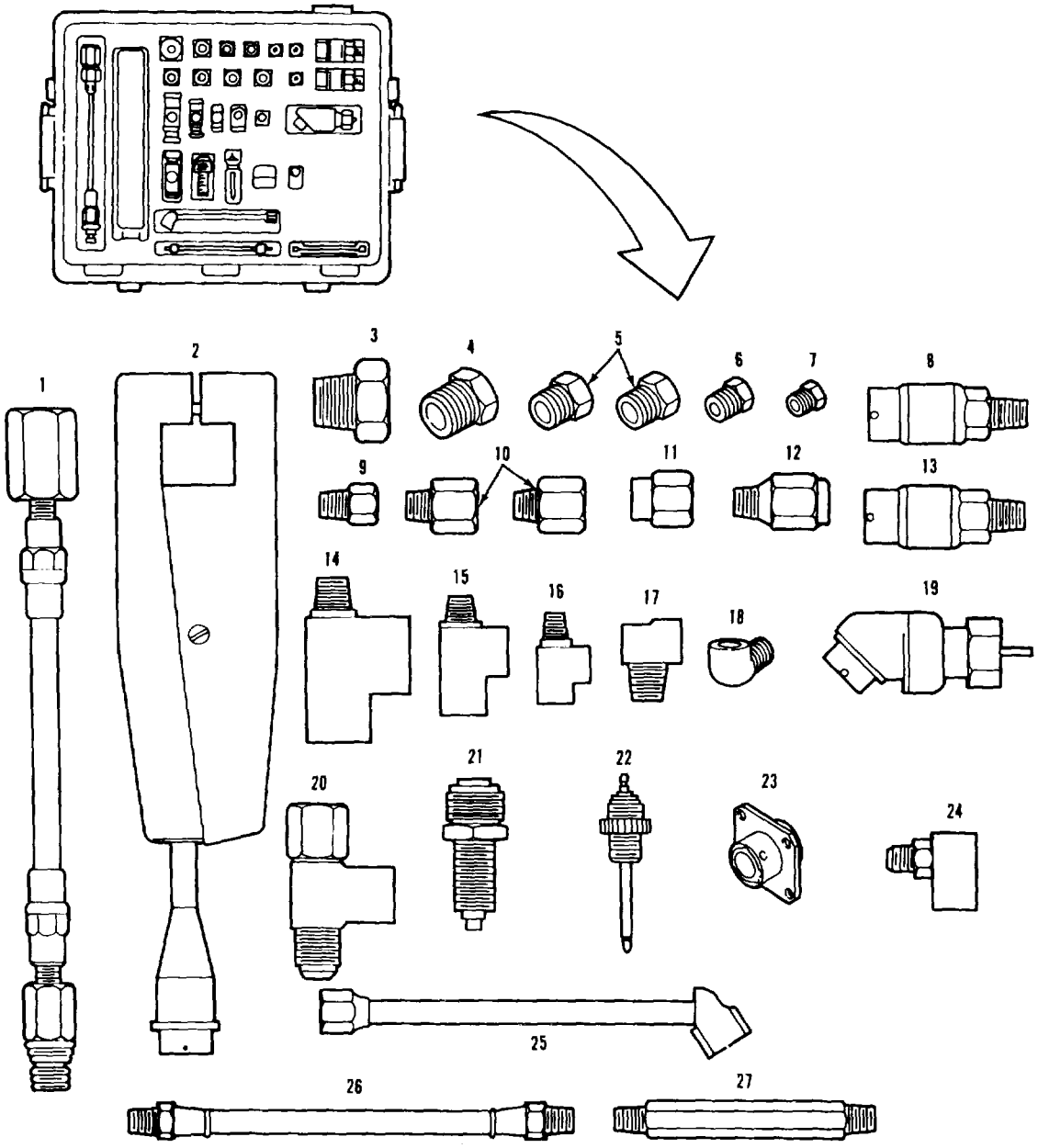
(3) Pulse Tachometer. Make sure that the slotted hole in the engine tachometer drive shaft is clear and not hard packed before installing the pulse tachometer.

(4) Threaded Adapters. Observe threaded fittings carefully to avoid engaging straight threads with pipe threads.

Each measurement device (transducer) in the transducer kit has its own identification resistor. The VTM uses this identification resistor to check that the correct transducer is connected for the measurement being made. If the correct transducer is not connected, error code E002 will be displayed.

STE/ICE TROUBLESHOOTING.

2-16. STE/ICE DESCRIPTION AND OPERATION (Continued).



Transducer Kit.

STE/ICE TROUBLESHOOTING.

2-16. STE/ICE DESCRIPTION AND OPERATION (Continued).

TRANSDUCER KIT COMPONENTS

ITEM NO	TK NO.	PART NUMBER	QTY	ITEMS
1	10	11669227	1	Hose & fitting assembly (spark plug
2	11	112258878	1	Current probe
3	12	12258853-1	1	Pipe thread reducer, 3/4 MPT to 1/4 FPT
4	13	12258853-3	1	Pipe thread reducer, 1/2 MPT to 1/4 FPT
5	14	12258853-2	2	Pipe thread reducer, 3/8 MPT to 1/4 FPT
6	15	444620	1	Hex head plug, 1/4 MPT
7	16	5327970	1	Hex head plug, 1/8 MPT
8	17	12258876	1	Pressure transducer, 0-1000 psi
10	20	3204X2	2	Adapter, 1/8 MPT to 1/4 FPT
11	19	3304X2	1	Coupling reducer, 1/8 FPT to 1/4 FPT
9	21	12258881	1	Snubber
12	18	234X5	1	Male connector, 5/16 tube to 1/4 MPT
13	22	12258877	1	Pressure transducer, -30 in. Hg to 25 psig
14	23	444152	1	Street tee, 1/2 pipe thread
15	24	3750X4	1	Street tee, 1/4 pipe thread
16	25	547002	1	Street tee, 1/8 pipe thread
17	26	12258879-2	1	Street elbow, 1/4 pipe thread
18	27	12258879-1	1	Street elbow, 1/8 pipe thread
19	34	12258875	1	Pulse tachometer
20	32	12258880	1	Fuel line adapter
21	31	MS53099-2	1	Tachometer drive adapter
23	29	MS3119E14-19	1	Adapter (connector-to-connector)
22	30	7540877	1	Ignition adapter
24	28	12258762	1	Tee, inverted flare
25	33	8840543	1	Air chuck
26	35	11669236	1	Hose assembly, 1/8 MPT
27	36	12258852	1	Pipe nipple, 1/8 MPT

STE/ICE TROUBLESHOOTING.

2-17. CI ENGINE GO CHAIN INDEX.

2-18. CI ENGINE NO-GO CHAIN INDEX.

STE/ICE TROUBLESHOOTING.

2-19. VEHICLE TESTING TROUBLESHOOTING PROCEDURES.

a. General. To troubleshoot an M915A1 truck problem, the mechanic can use the STE/ICE (vehicle test meter and transducers) and the truck test cards found in the back of this TM.

b. Data Entry Tests. For information regarding Data Entry, Cylinder Entry, Vehicle ID Entry, and Data Display Tests, refer to TM 9-4910-571-12&P.

c. Offset Tests. The STE/ICE VTM performs a test by setting the TEST SELECT switches to the test number and pressing the TEST button. For some tests, an offset is required before the test itself can be performed. This is done by selecting the number of the desired test and holding the TEST button down for several seconds.

The offset test nulls out characteristic differences in the VTM, test leads, and transducers. It zeros the meter. Once the offset is performed, the VTM automatically corrects for the offset before displaying measured values. The displayed offset value should be checked against limits on the vehicle test card sheet. If the displayed value is outside these limits, either the transducer or the test cable is faulty and must be replaced. This is another form of self-test. The offset is performed when each transducer is connected. All tests requiring offset are identified by a (*) on the flip cards and by OFFSET LIMITS on the vehicle test card sheet. The offset test is performed with the test probe cable or transducer connected to the VTM. Care should be taken to see that no stimulus is applied to the transducer. Test probe cable leads should be shorted together. To perform an offset test, dial the test number into the TEST SELECT switches. Press and hold the TEST button until the prompting message CAL appears on the display. In a few seconds after release of the TEST button, a number will appear. This is the measured offset value associated with the test probe cable or transducer and cable.

d. Control Tests. These tests are used to change (or control) the way a vehicle test is displayed or the way it is run. There are four (4) control tests:

01 Interleave (alternates back and forth to display RPM with next test).
02 Display minimum value for next test.
03 Display maximum value for next test.
04 Display peak-to-peak value for next test.

Control tests 01, 02, 03, and 04 specify the action to be taken by the next test only. A subsequent test will reset the control.

(1) Interleave (Test 01). This test alternately measures engine speed and a second parameter such as fuel pressure or alternator voltage. To initiate interleave, dial 01 into the TEST SELECT switches and press and release the TEST button. The prompting message PASS will signal the mechanic to dial in the second test number and again press and release the TEST button.

STE/ICE TROUBLESHOOTING.

2-19. VEHICLE TESTING TROUBLESHOOTING PROCEDURES (Continued).

(2) Minimum Value (Test 02). This test displays the minimum value measured during a test. To initiate a minimum value display, dial 02 into the TEST SELECT switches and press and release the TEST button. The prompting message PASS will signal the mechanic to dial the desired test number and again press and release the TEST button. The minimum value is displayed and updated whenever a lower minimum value is measured. Entering 02 and the test number again will reset the process and a new minimum value will be displayed.

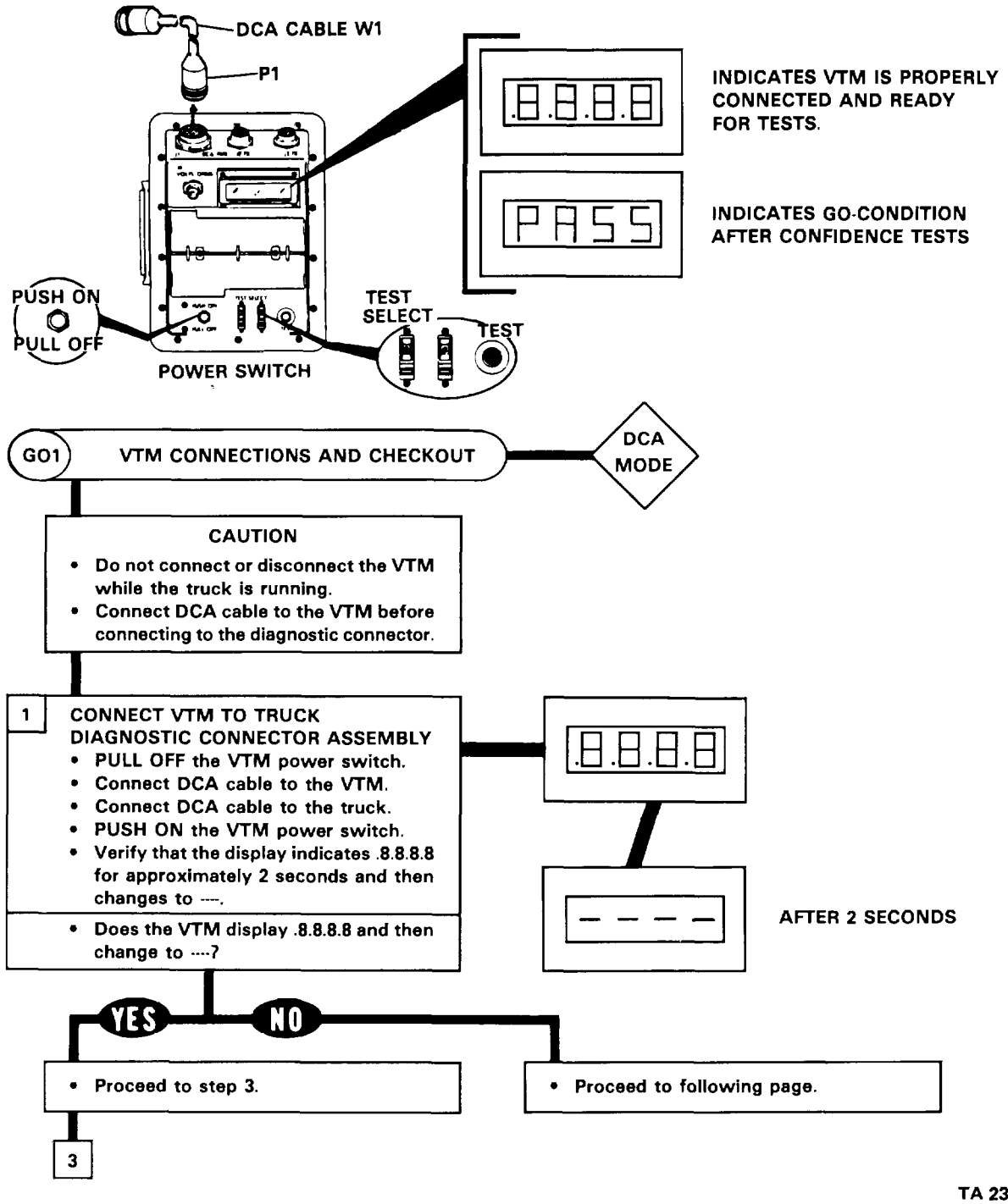
(3) Maximum Value (Test 03). This test displays the maximum value measured during a test. To initiate a maximum value display, dial 03 into the TEST SELECT switches and press and release the TEST button. The maximum value is displayed and updated whenever a higher maximum value is measured. Entering 03 and the test number again will reset the process and a new maximum value will be displayed.

(4) Peak-to Peak Value (Test 04). This test displays the peak-to-peak value of alternator/generator output volts (82), 45 volts DC (89), 1500 amps DC (90), and battery volts (67). To start a peak-to-peak measurement, dial 04 into the TEST SELECT switches and press the test button. The prompting message PASS will signal the operator to dial in one of the four numbers (82, 89, 90, or 67) and again press the TEST button.

STE/ICE TROUBLESHOOTING.

2-20. STE/ICE GO CHAIN TESTS.

a. Table 2-9 contains the STE/ICE GO-Chain tests necessary to troubleshoot the M915A1 truck.



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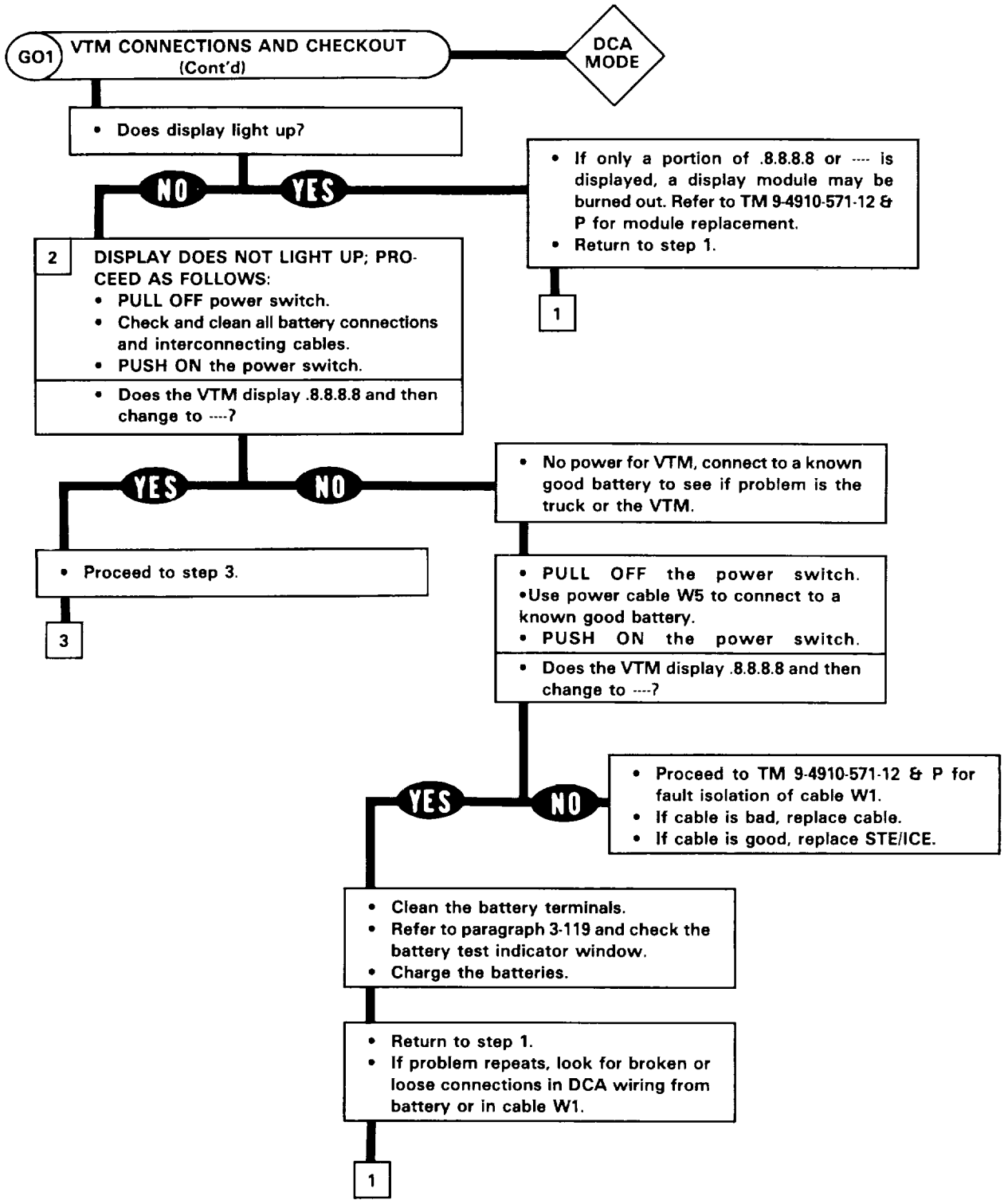
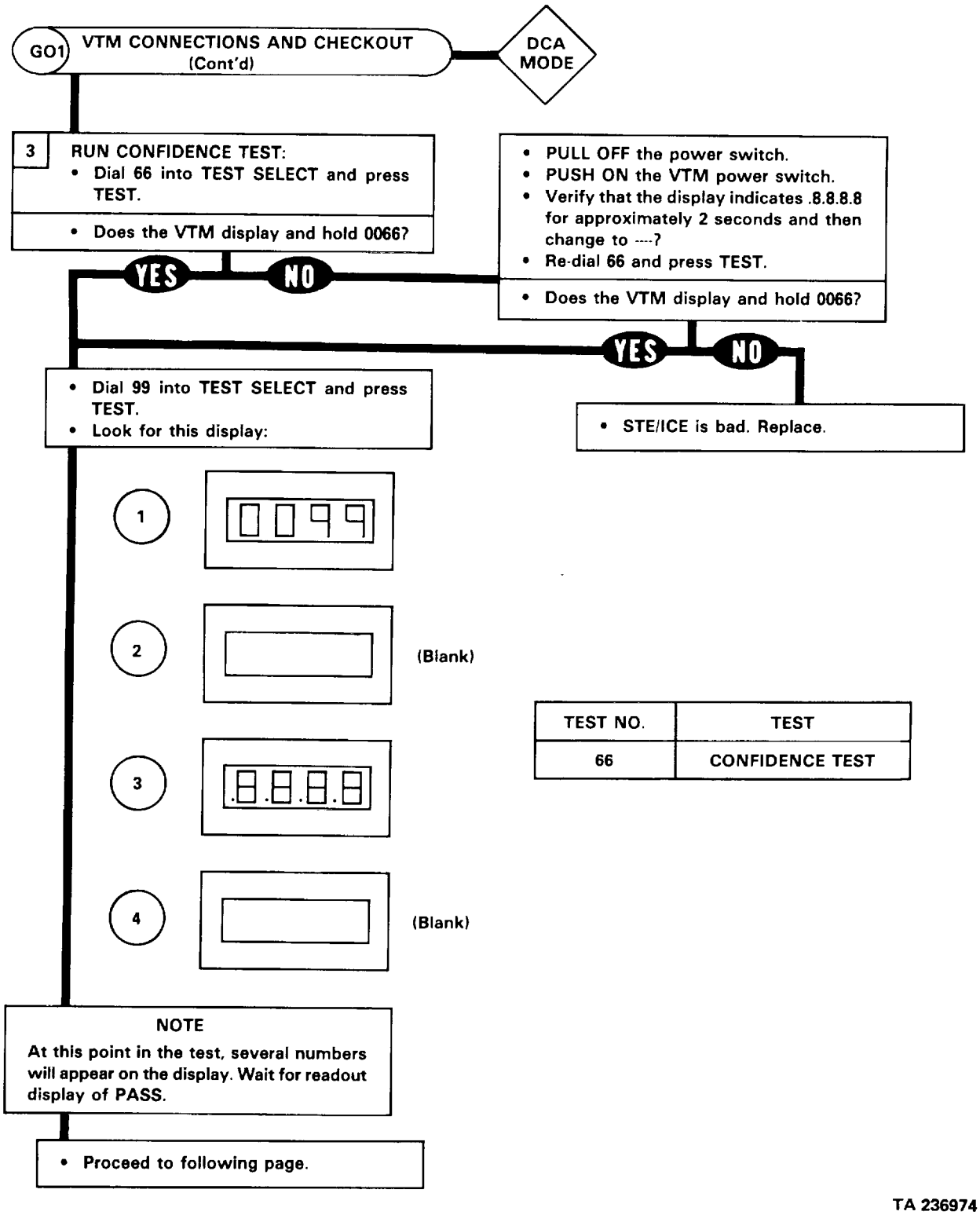
STE/ICE TROUBLESHOOTING.

2-20. STE/ICE GO CHAIN TESTS (Continued).



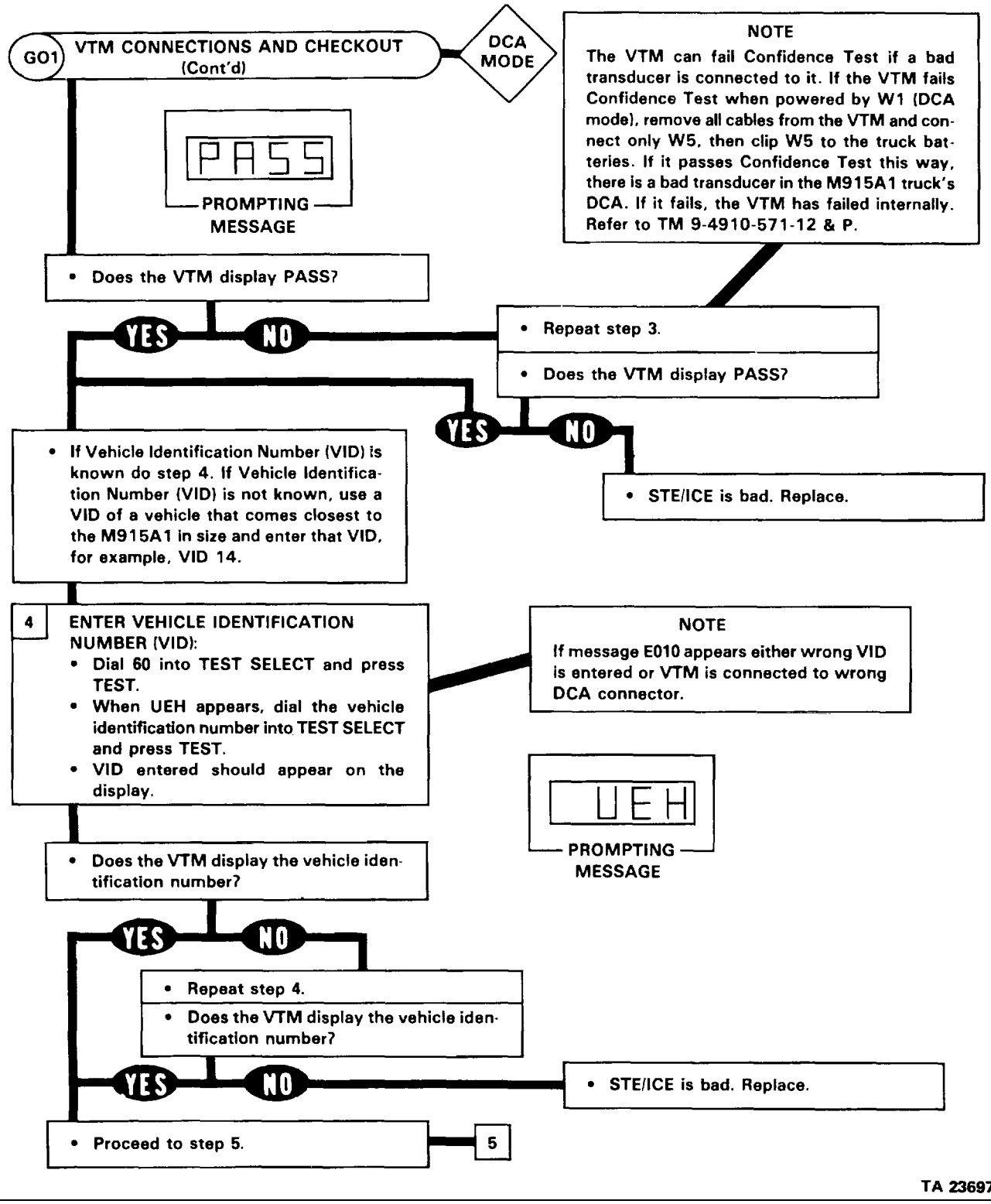
STE/ICE TROUBLESHOOTING.

2-20. STE/ICE GO CHAIN TESTS (Continued).



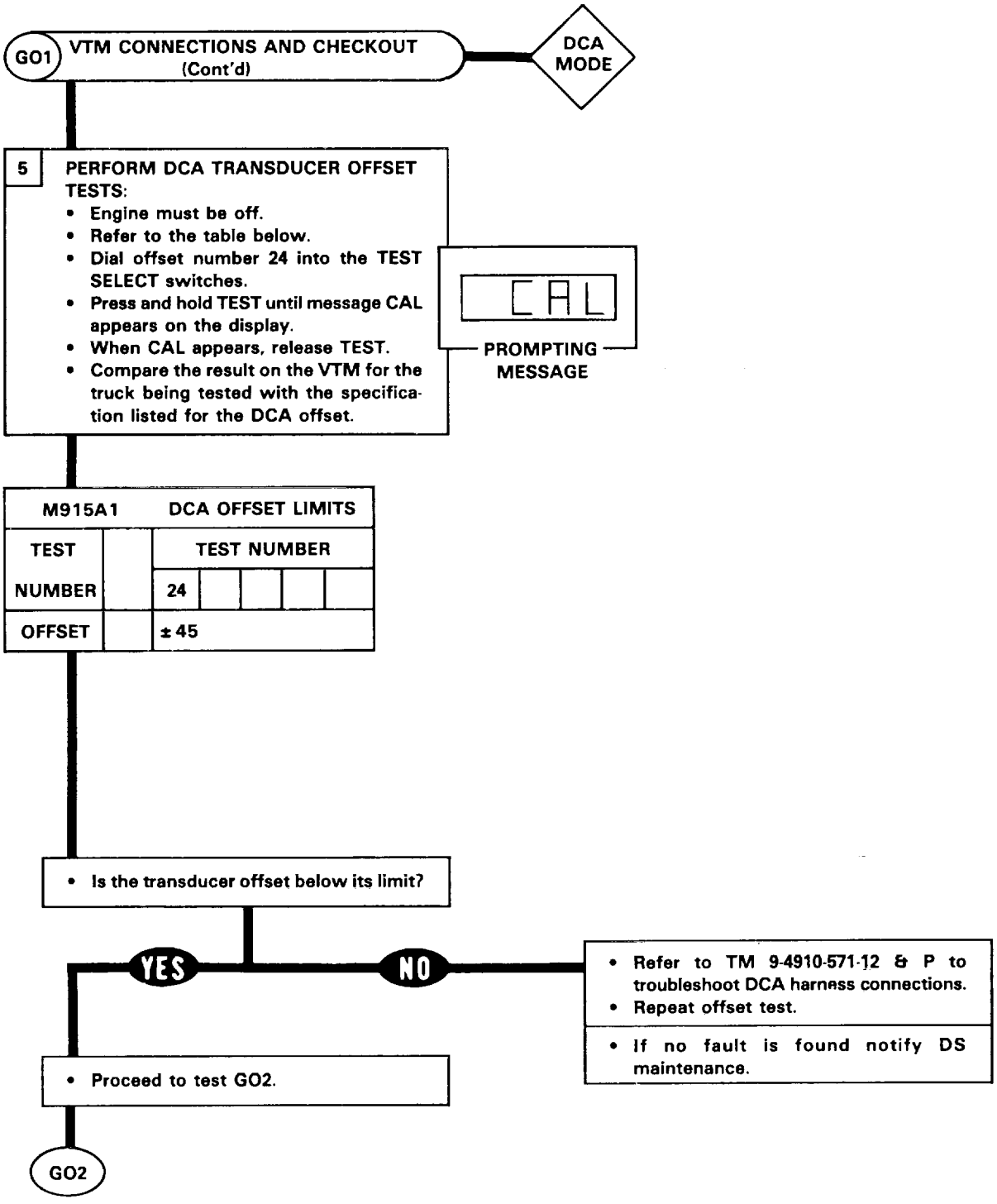
STE/ICE TROUBLESHOOTING.

2-20. STE/ICE GO CHAIN TESTS (Continued).



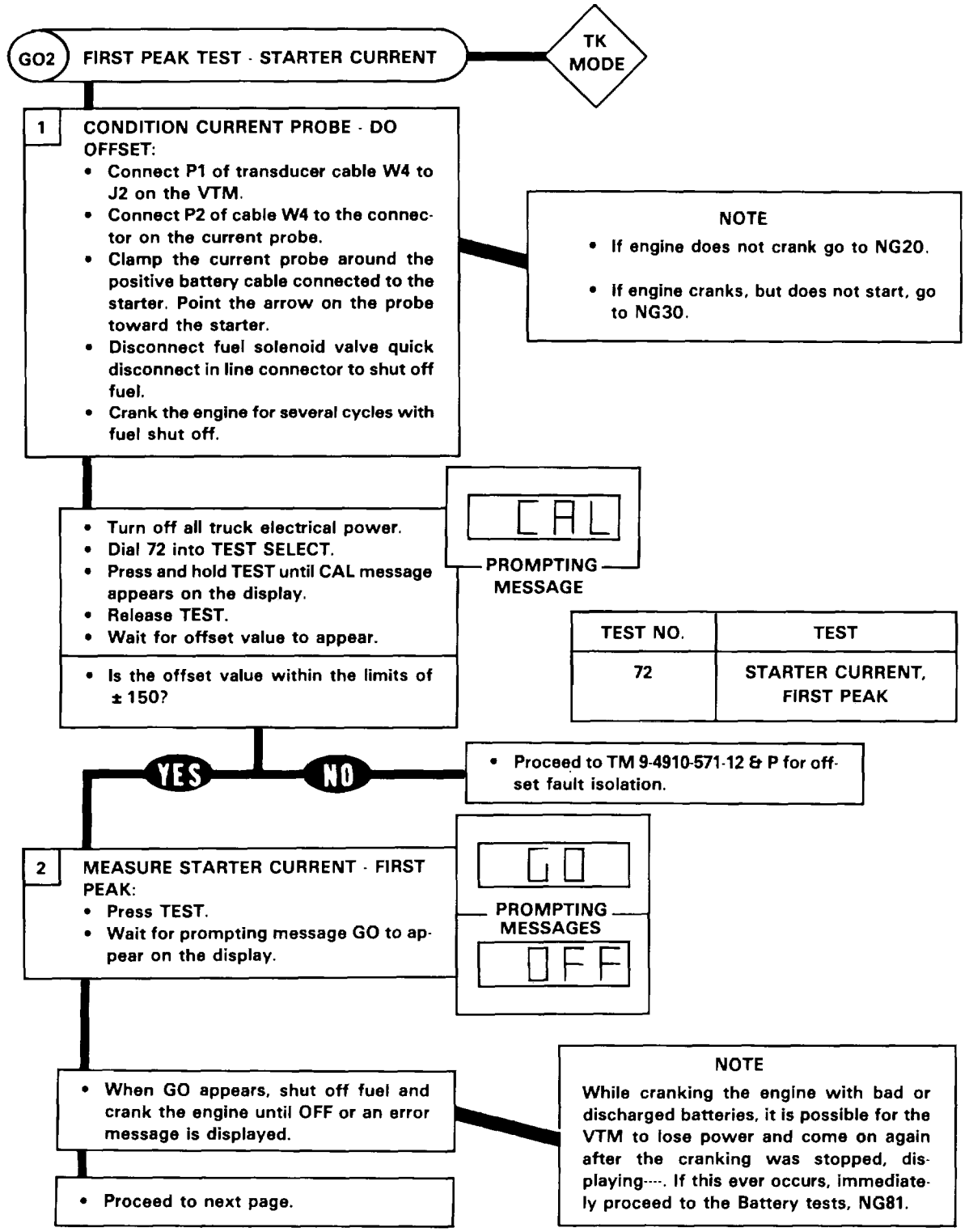
STE/ICE TROUBLESHOOTING.

2-20. STE/ICE GO CHAIN TESTS (Continued).



STE/ICE TROUBLESHOOTING.

2-20. STE/ICE GO CHAIN TESTS (Continued).



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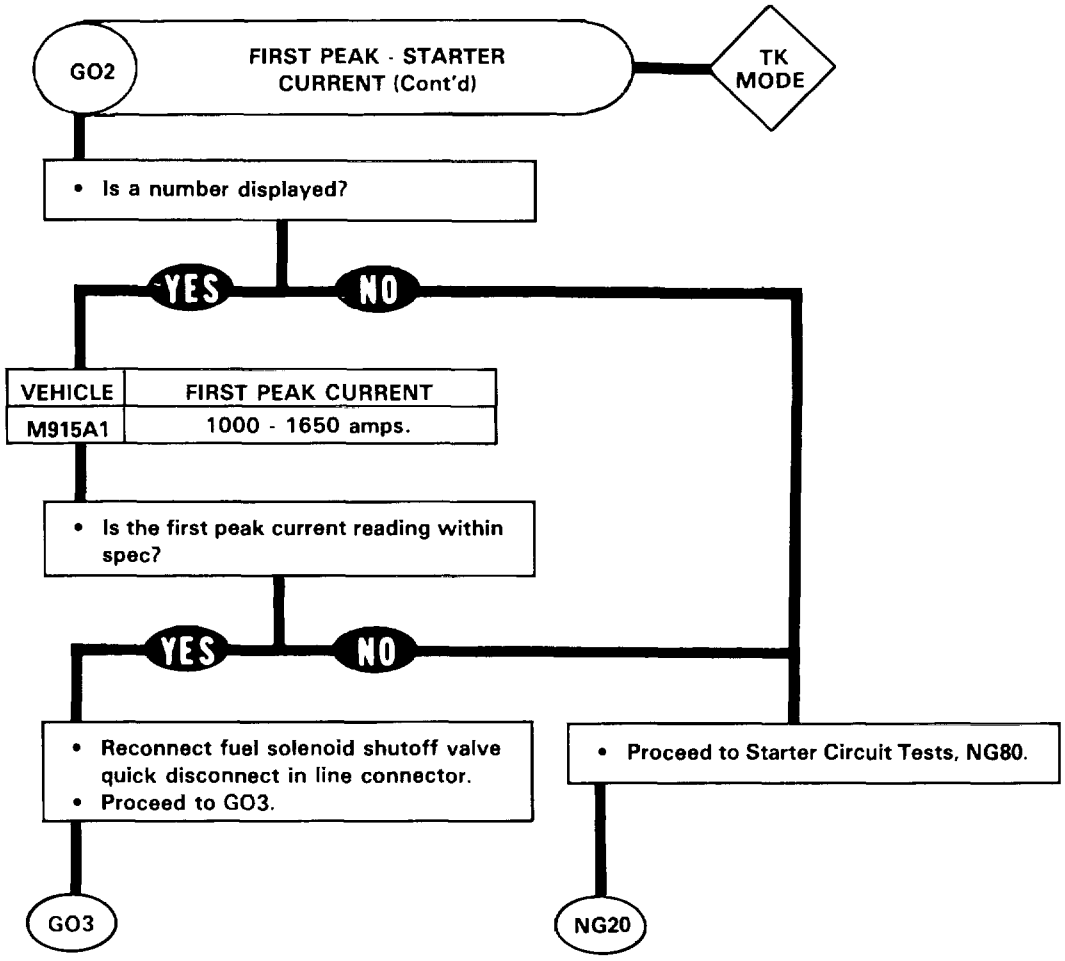
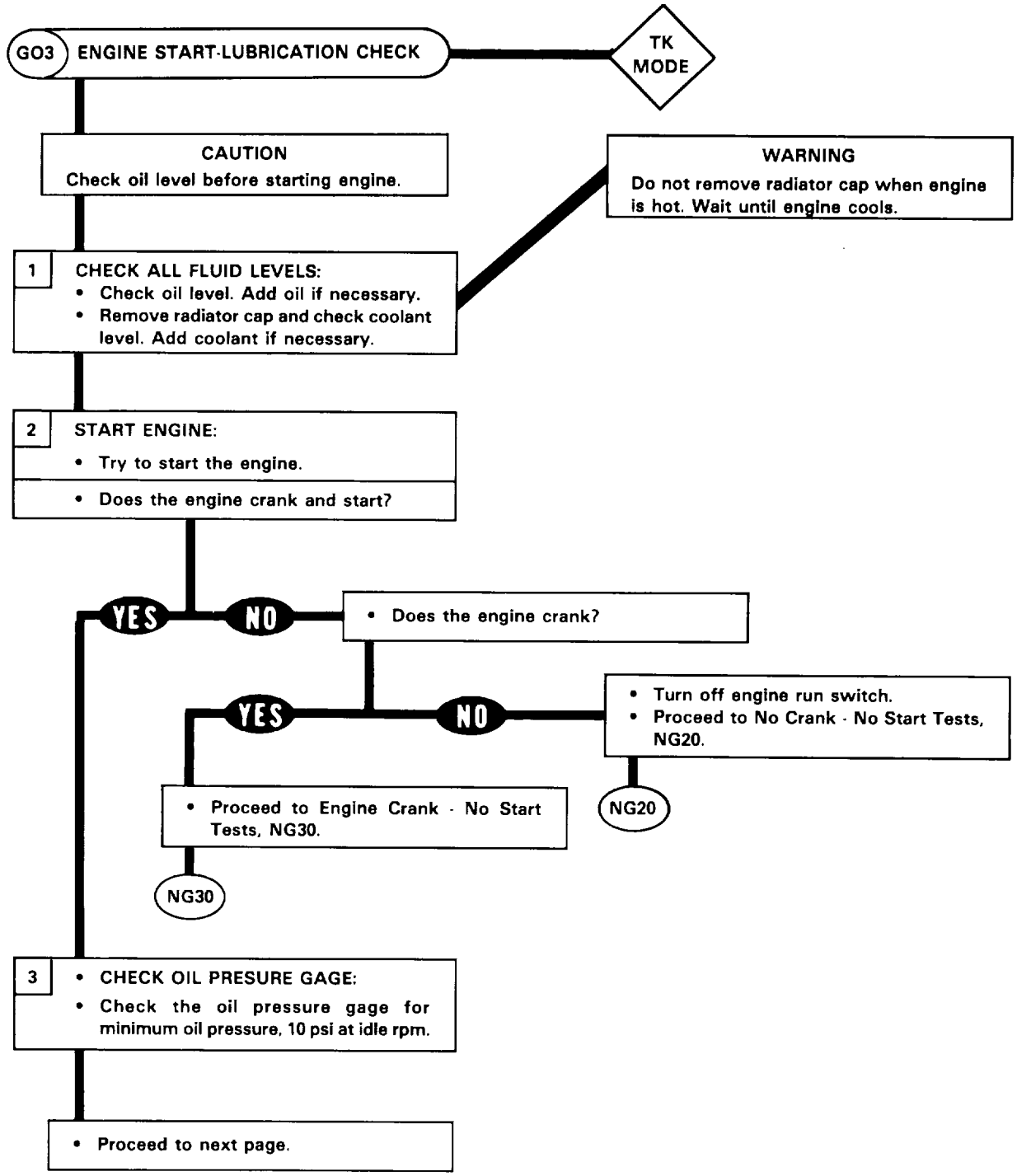
STE/ICE TROUBLESHOOTING.

2-20. STE/ICE GO CHAIN TESTS (Continued).



STE/ICE TROUBLESHOOTING.

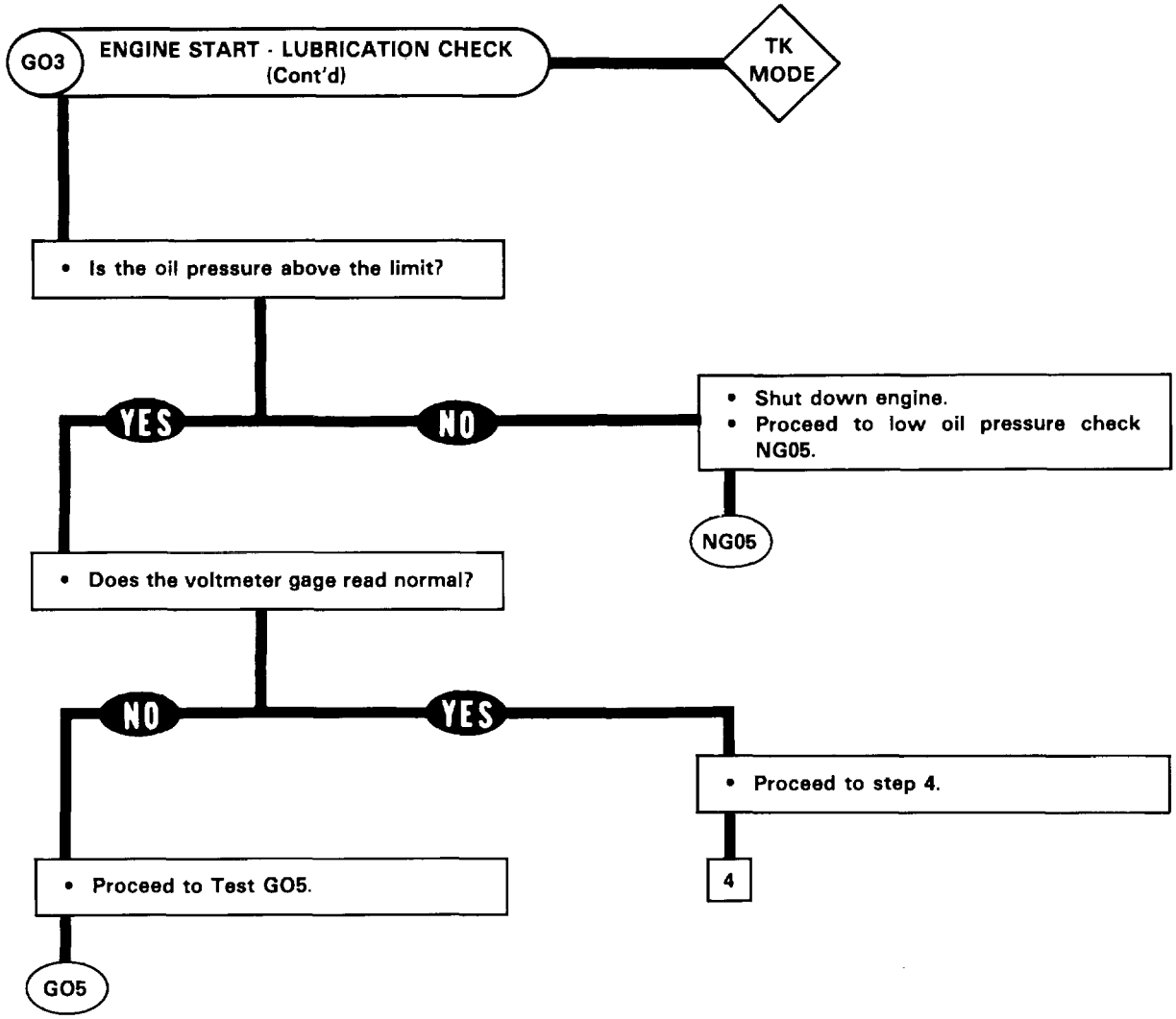
2-20. STE/ICE GO CHAIN TESTS (Continued).



STE/ICE TROUBLESHOOTING.

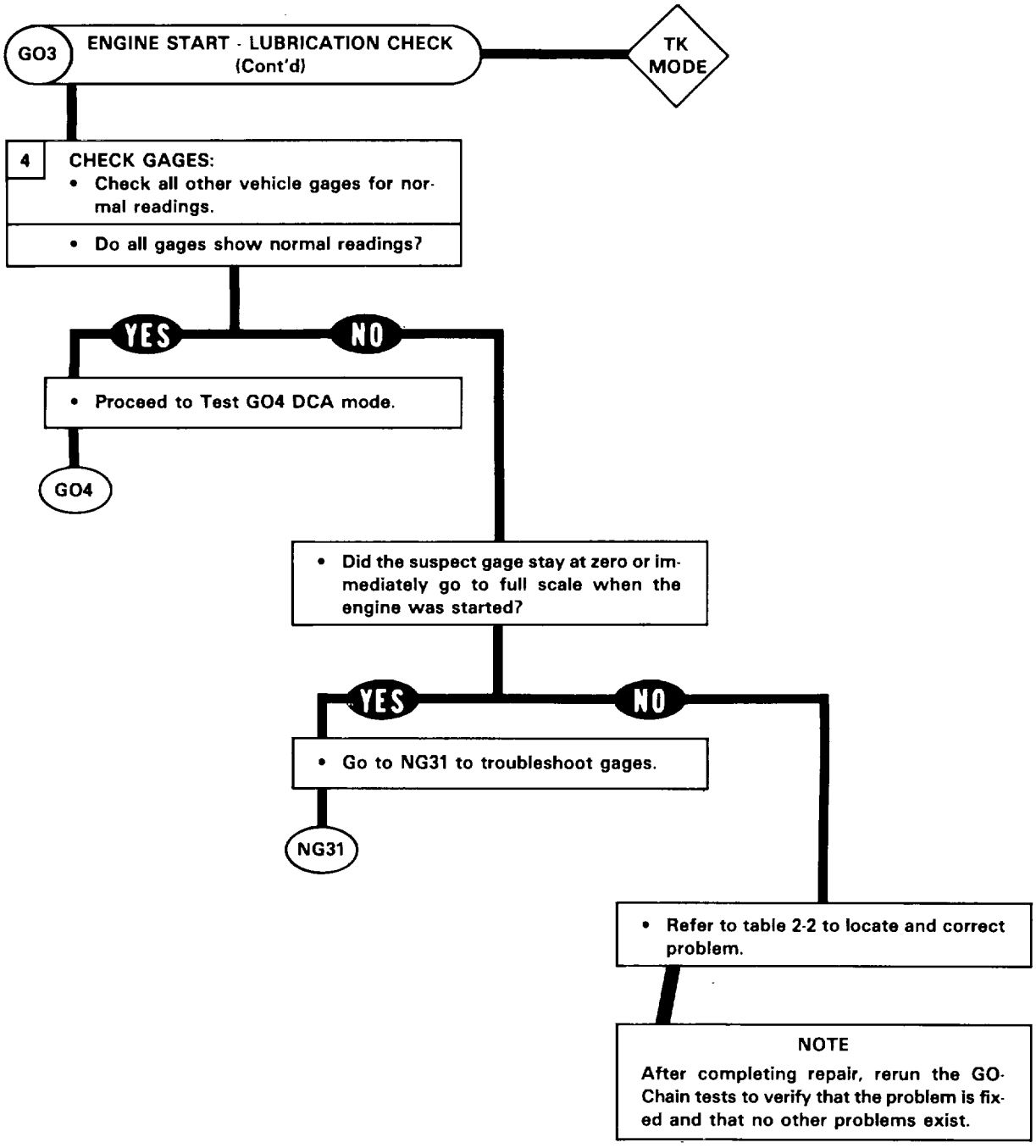
2-20. STE/ICE GO CHAIN TESTS (Continued).

Table 2-9. STE/ICE GO-Chain Test (Cont'd)



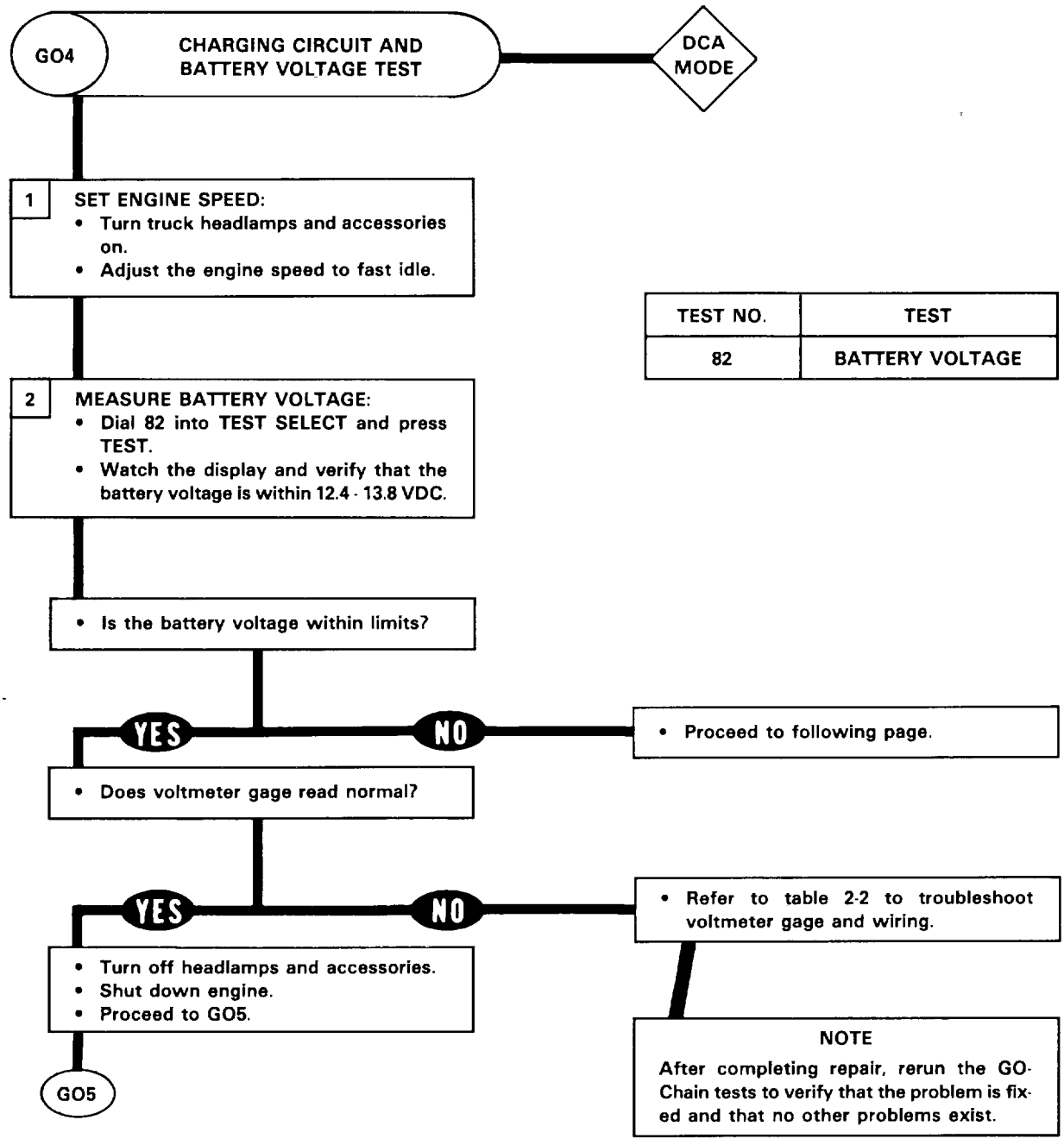
2-20. STE/ICE GO CHAIN TESTS (Continued).

Table 2-9. STE/ICE GO-Chain Test (Cont'd)



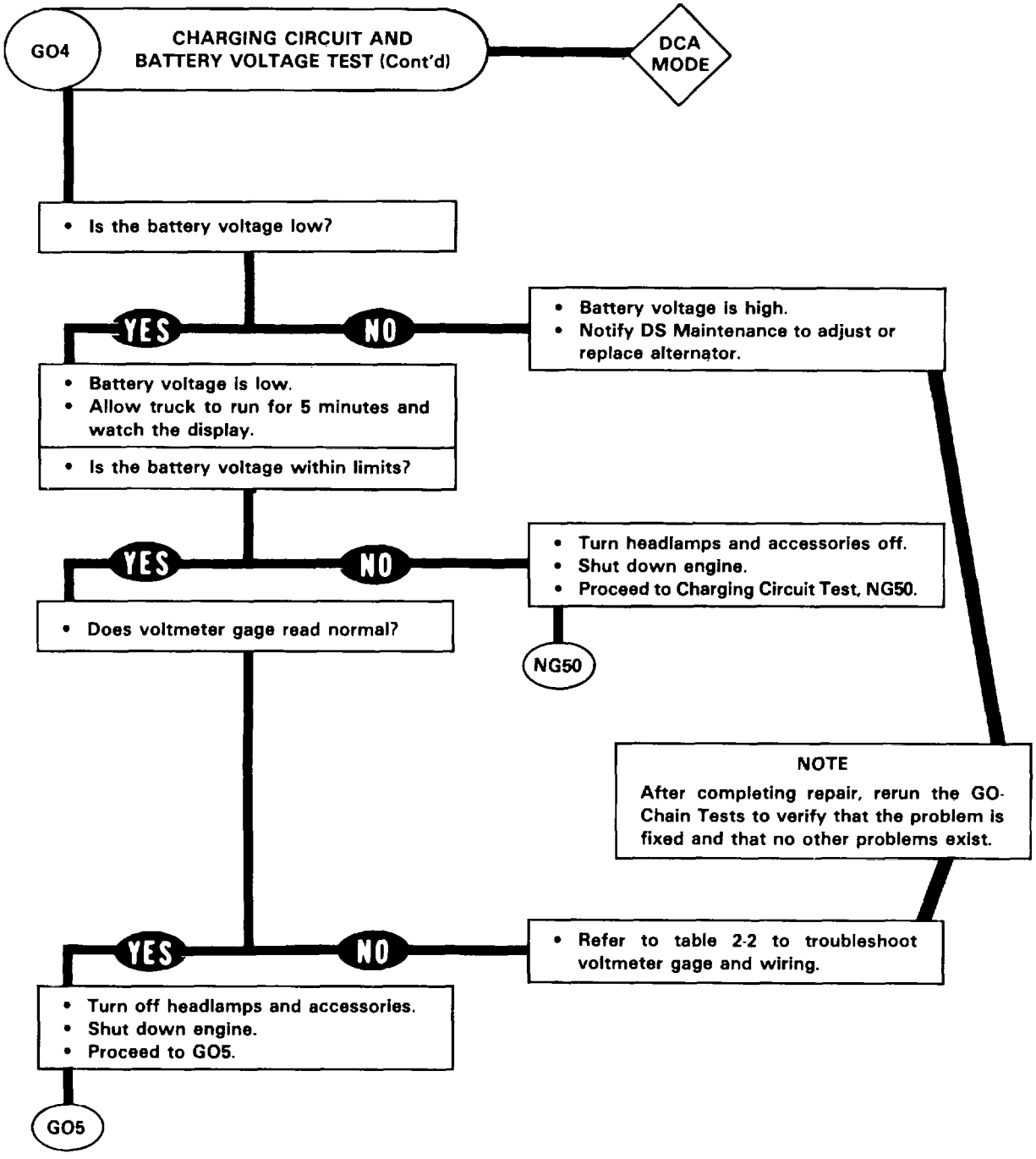
2-20. STE/ICE GO CHAIN TESTS (Continued).

Table 2-9. STE/ICE GO-Chain Test (Cont'd)



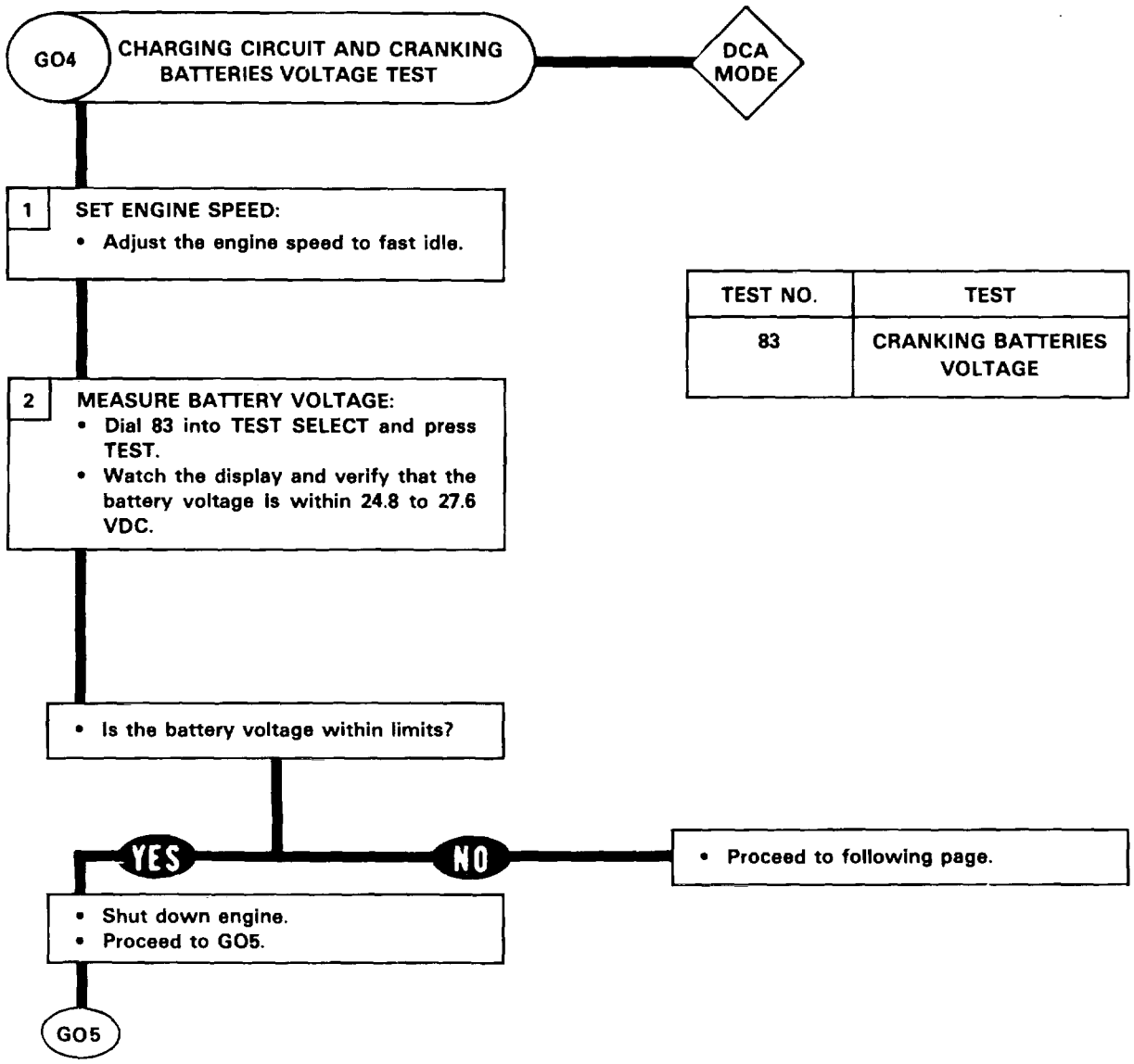
2-20. STE/ICE GO CHAIN TESTS (Continued).

Table 2-9. STE/ICE GO-Chain Test (Cont'd)



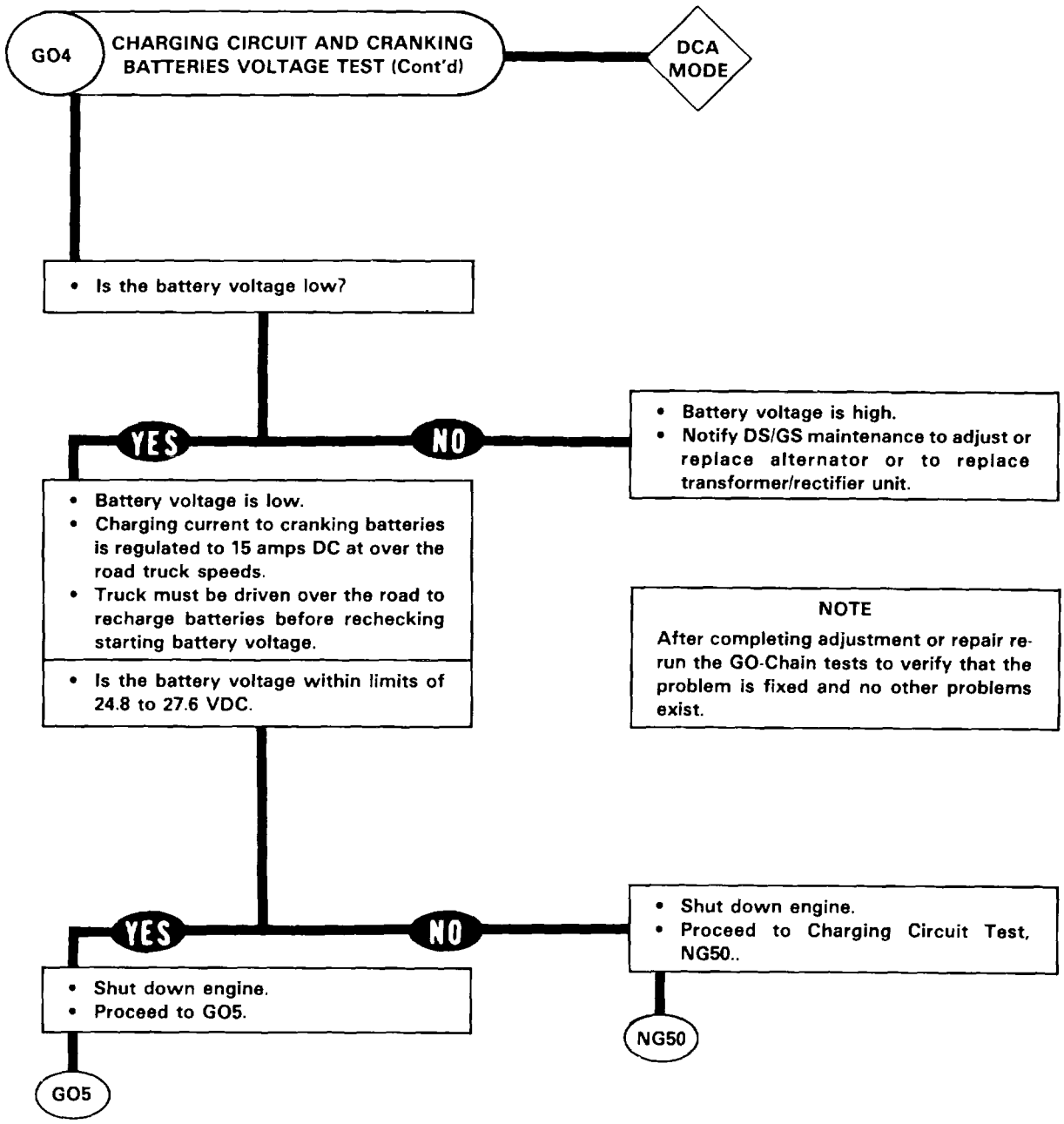
2-20. STE/ICE GO CHAIN TESTS (Continued).

Table 2-9. STE/ICE GO-Chain Test (Cont'd)



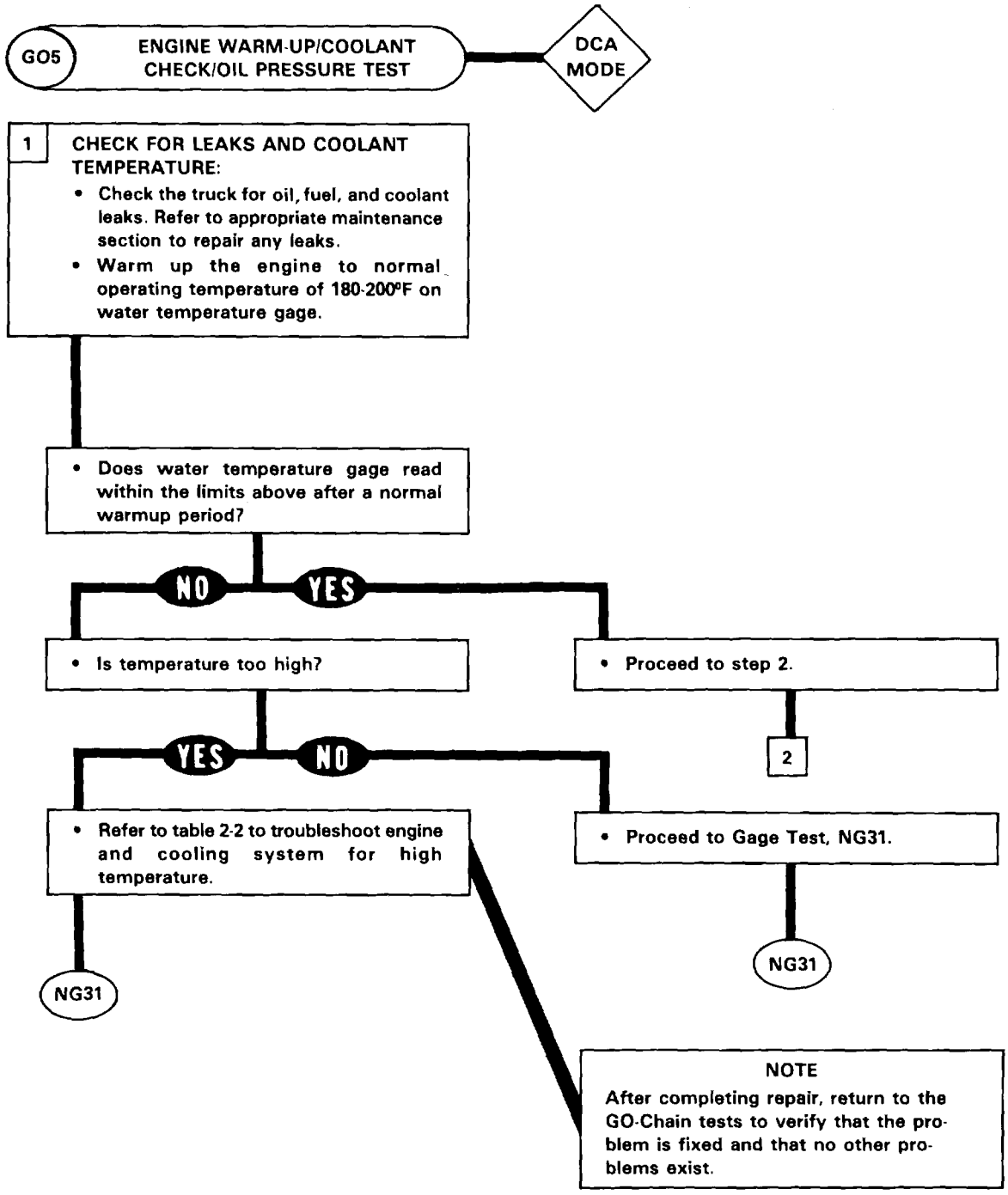
2-20. STE/ICE GO CHAIN TESTS (Continued).

Table 2-9. STE/ICE GO-Chain Test (Cont'd)



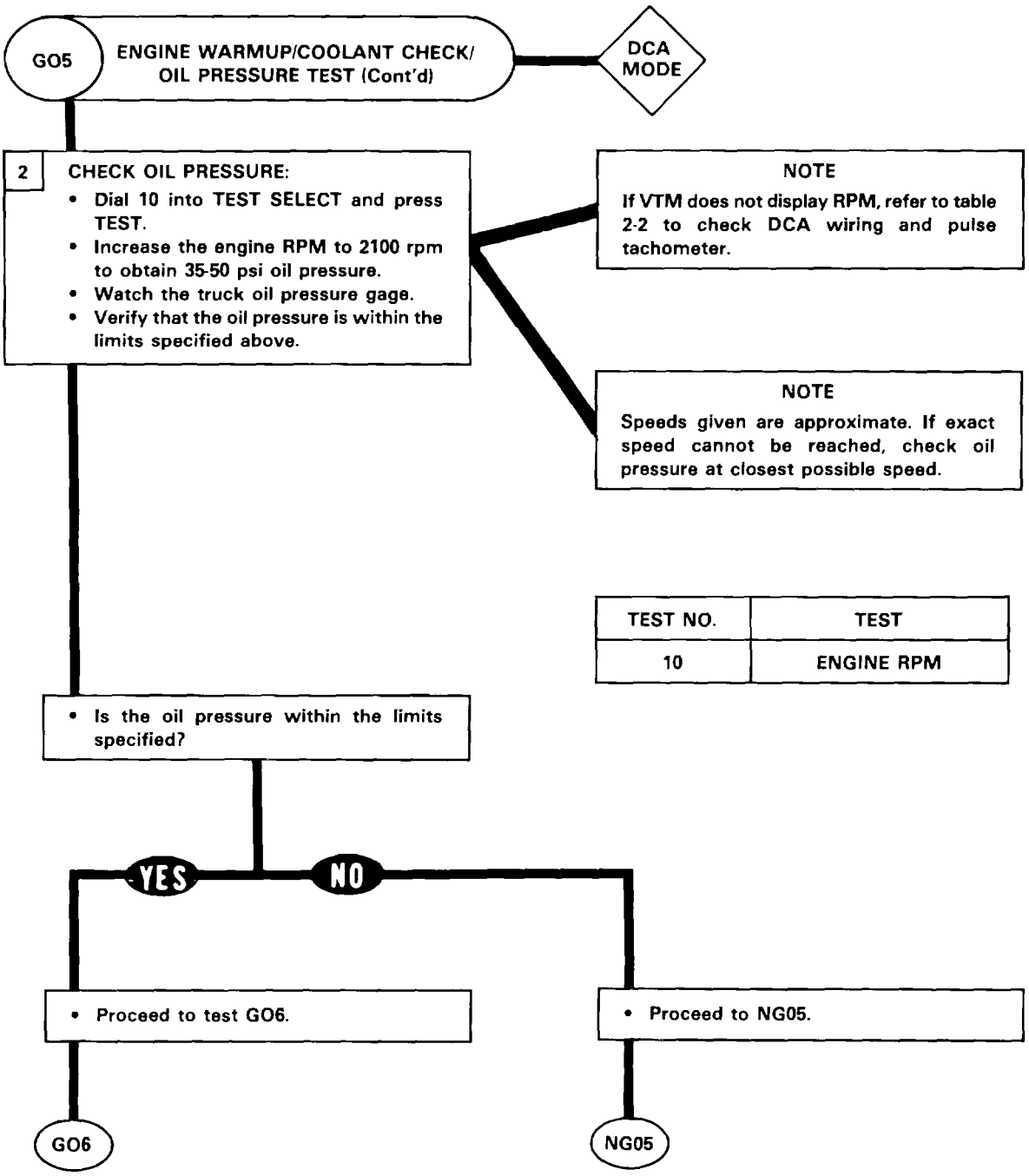
2-20. STE/ICE GO CHAIN TESTS (Continued).

Table 2-9. STE/ICE GO-Chain Test (Cont'd)



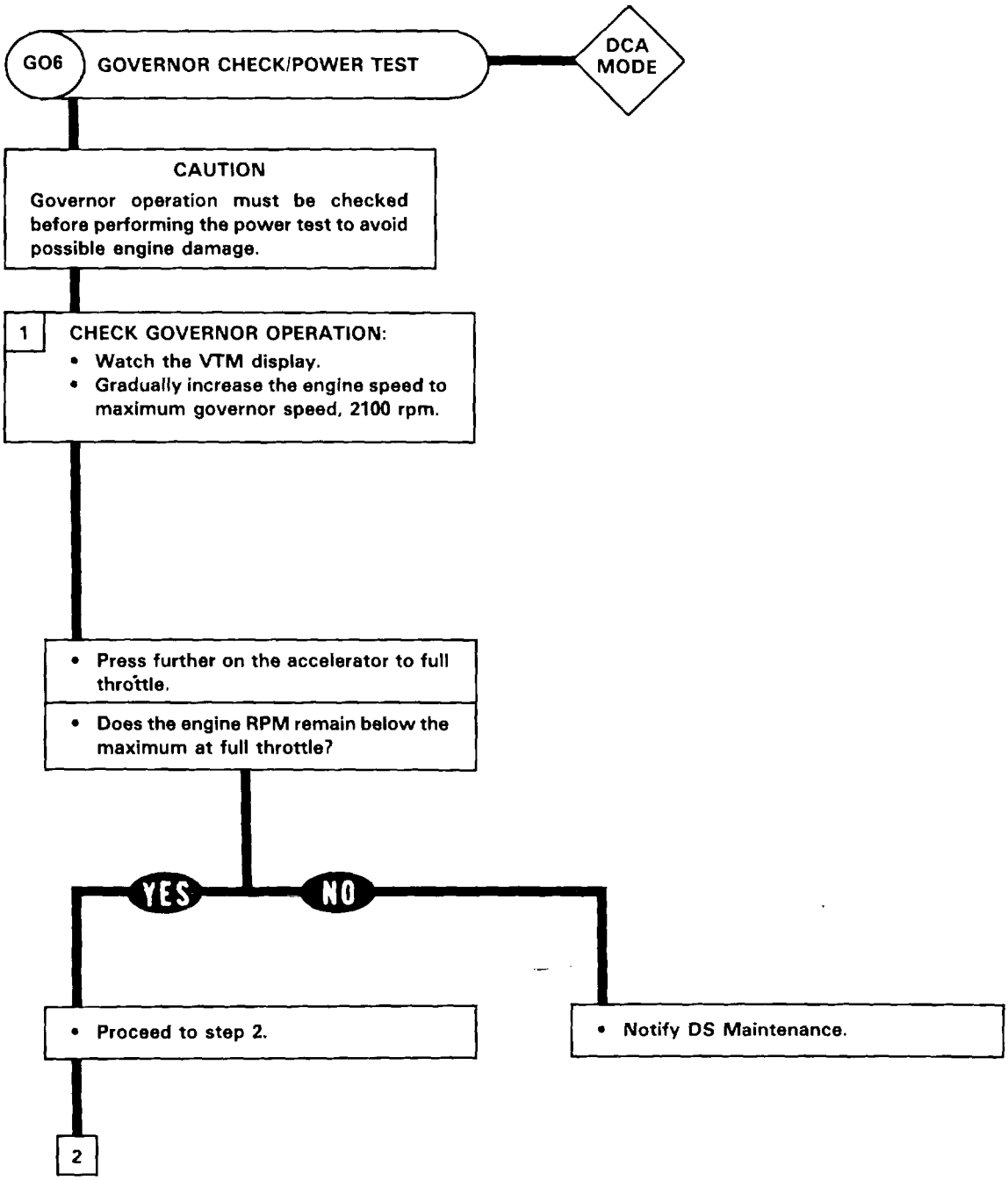
2-20. STE/ICE GO CHAIN TESTS (Continued).

Table 2-9. STE/ICE GO-Chain Test (Cont'd)



2-20. STE/ICE GO CHAIN TESTS (Continued).

Table 2-9. STE/ICE GO-Chain Test (Cont'd)



2-20. STE/ICE GO CHAIN TESTS (Continued).

Table 2-9. STE/ICE GO-Chain Test (Cont'd)

GO6 — GOVERNOR CHECK/ POWER TEST (Cont'd)

DCA MODE

CAUTION

Do not perform the power test if the engine temperature is above normal operating temperature. However, the engine should be at operating temperature before performing the power test.

NOTE

The vehicle identification number must have been entered prior to the power test. This will prevent an error message (E004) and unsuccessful completion of the power test. If you do not have a vehicle ID number, enter the number of cylinders, test 58, and use test 12 for power (RPM/sec) instead of test 13. If using Test No. 12, the first number to appear on VTM is the signal to release the accelerator.

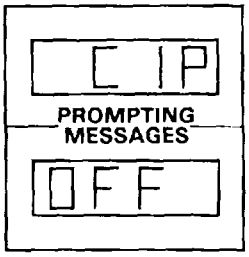
% POWER: MINIMUM TEST LIMIT			
VEHICLE	ALTITUDE		
	0 to 2000 ft.	2000 to 4000 ft.	Above 4000 ft.
M915A1	75%	66%	60%

RPM/SEC: MINIMUM TEST LIMIT			
VEHICLE	ALTITUDE		
	0 to 2000 ft.	2000 to 4000 ft.	Above 4000 ft.
M915A1	1160		

- Dial 58 into TEST SELECT and press TEST.
- When PASS appears dial 12 into TEST SELECT and go to step 3.

2 PERFORM POWER TEST:

- Dial 13 or 12 into TEST SELECT and press TEST.
- Wait for prompting message CIP to appear.
- When CIP appears, press down on the accelerator and hold it to floor until VTM displays OFF.
- When OFF appears, release the accelerator.
- The displayed number is the power test result.



TEST NO.	TEST
13	POWER TEST (%Power)
12	POWER TEST (rpm/sec)

- Is the power within limits.

YES — NO

- Proceed to test GO7.

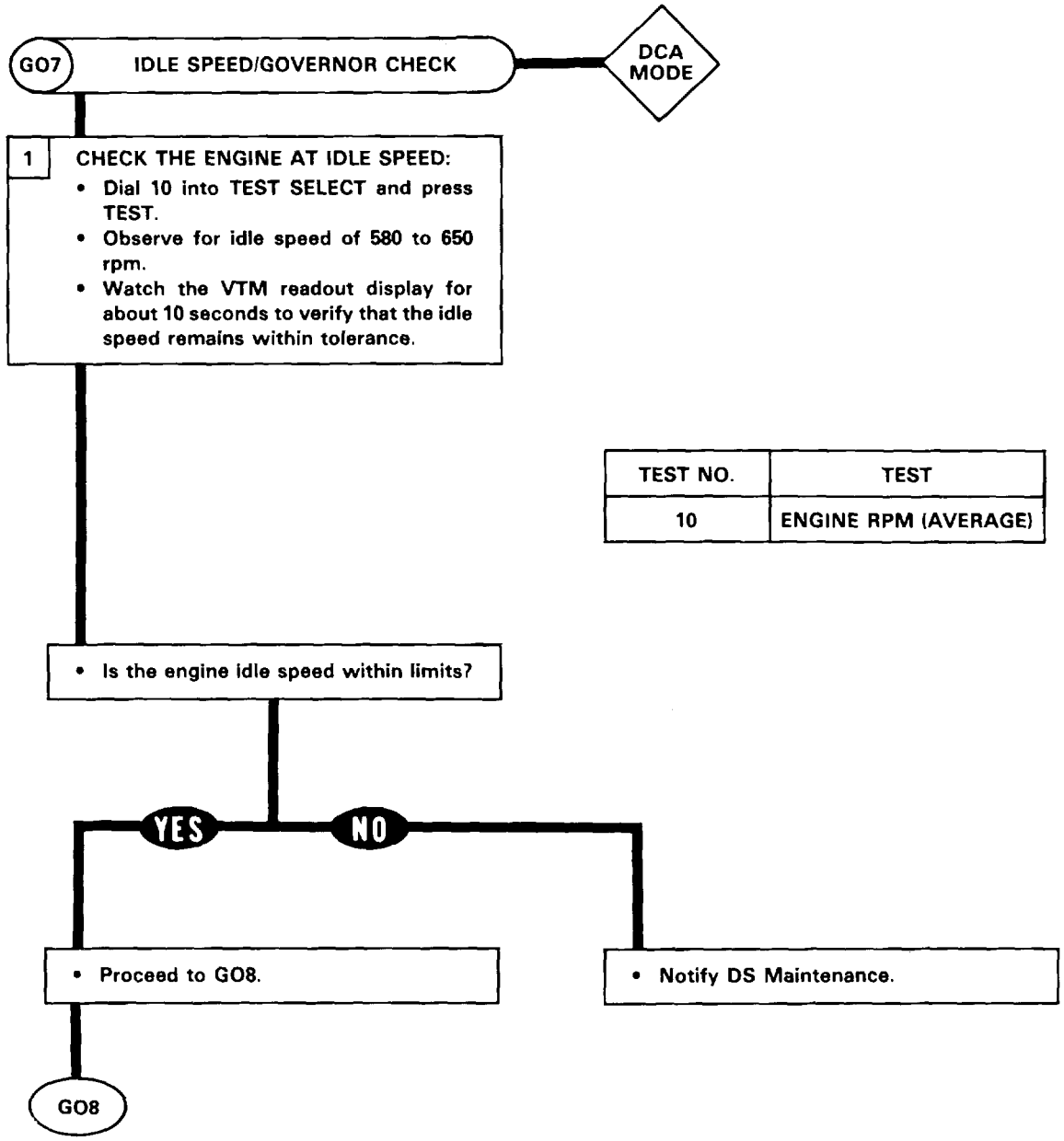
GO7

- Proceed to Governor/Power Test Fault Isolation, NG90.

NG90

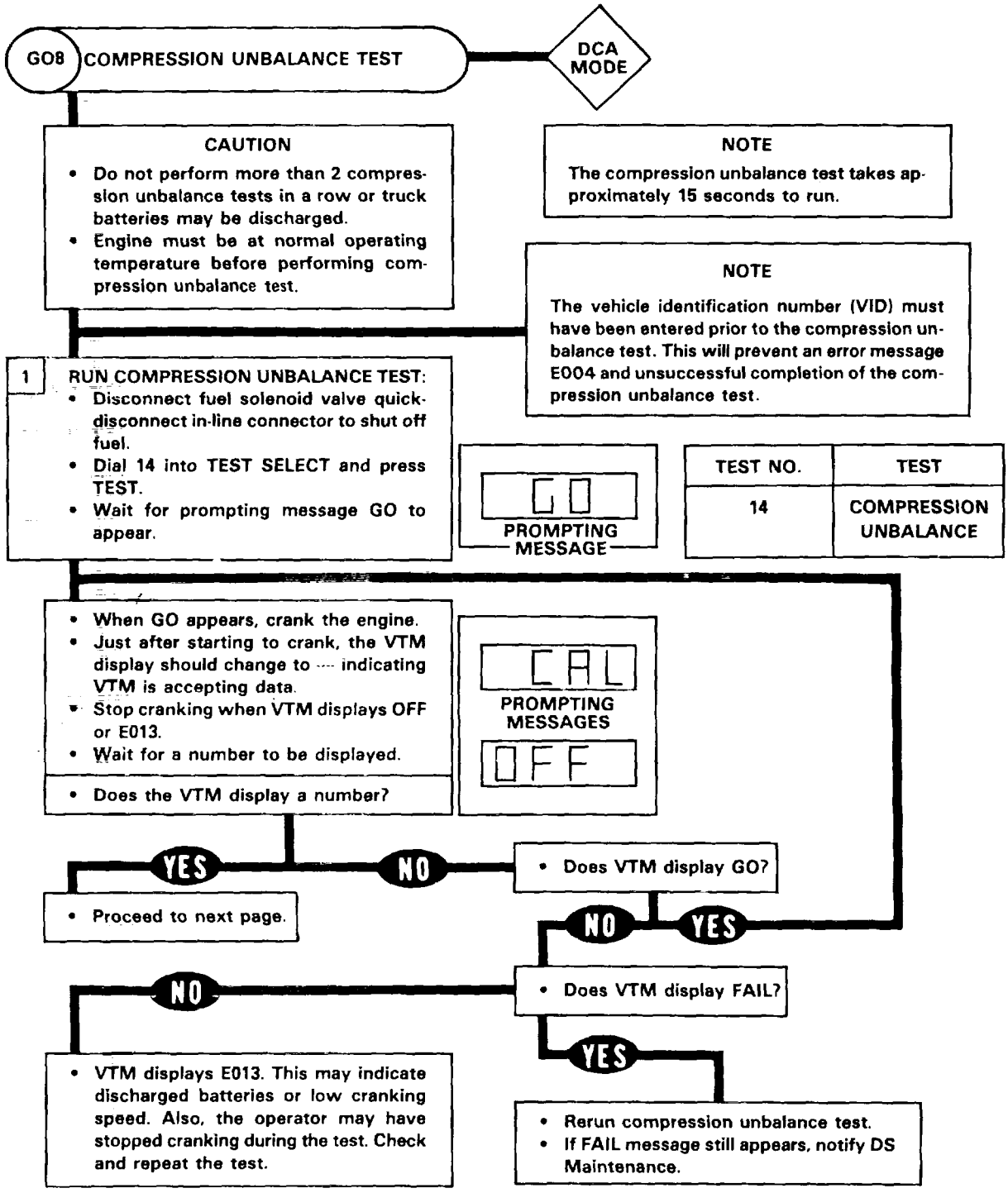
2-20. STE/ICE GO CHAIN TESTS (Continued).

Table 2-9. STE/ICE GO-Chain Test (Cont'd)



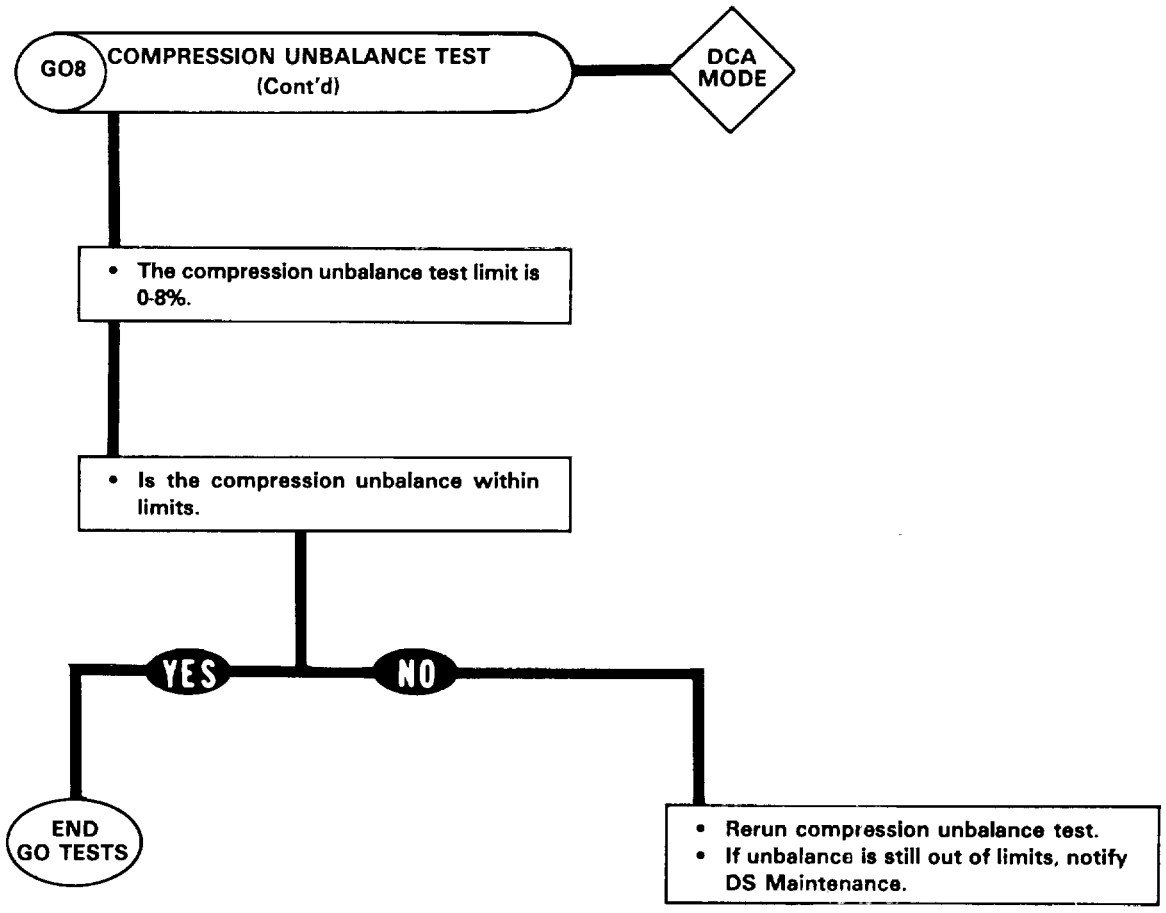
2-20. STE/ICE GO CHAIN TESTS (Continued).

Table 2-9. STE/ICE GO-Chain Test (Cont'd)



2-20. STE/ICE GO CHAIN TESTS (Continued).

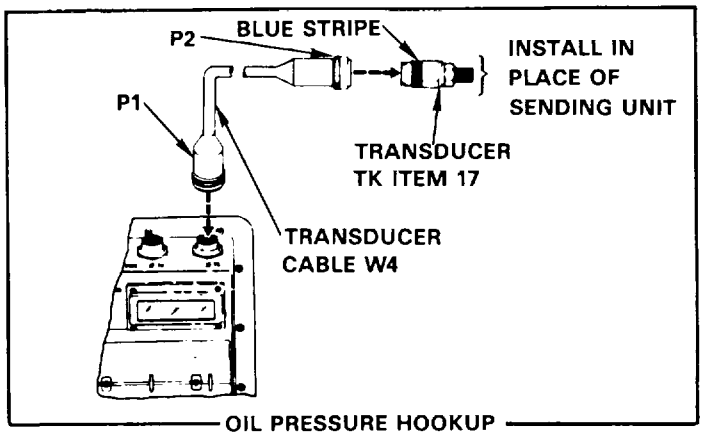
Table 2-9. STE/ICE GO-Chain Test (Cont'd)



2-20. STE/ICE GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO GO-Chain Test (Cont'd)

b. Table 2-10 contains the STE/ICE NO-GO Chain Tests necessary to troubleshoot the M915A1 truck.



NG05 — LOW OIL PRESSURE CHECK — TK MODE

1 **INSTALL TRANSDUCER - DO OFFSET:**
- Stop truck engine.
- Remove oil pressure sending unit.
- Install pressure transducer TK item 17 (blue stripe) with suitable adapter in place of sending unit on engine.
- Connect P1 of the transducer cable W4 to J1 or J2 on the VTM.
- Connect P2 of the transducer cable to the connector on the pressure transducer.

TEST NO.	TEST
01	INTERLEAVE
50	0-1000 PSIG PRESSURE

- Dial 50 into TEST SELECT.
- Press and hold TEST until CAL message appears on display.
- Release TEST.
- Wait for offset value to appear on the display.

CAL — PROMPTING MESSAGE

- Is the offset value within the limits −150 to +150?

YES — 2

NO — Proceed to TM 9-4910-571-12 & P for offset fault isolation.

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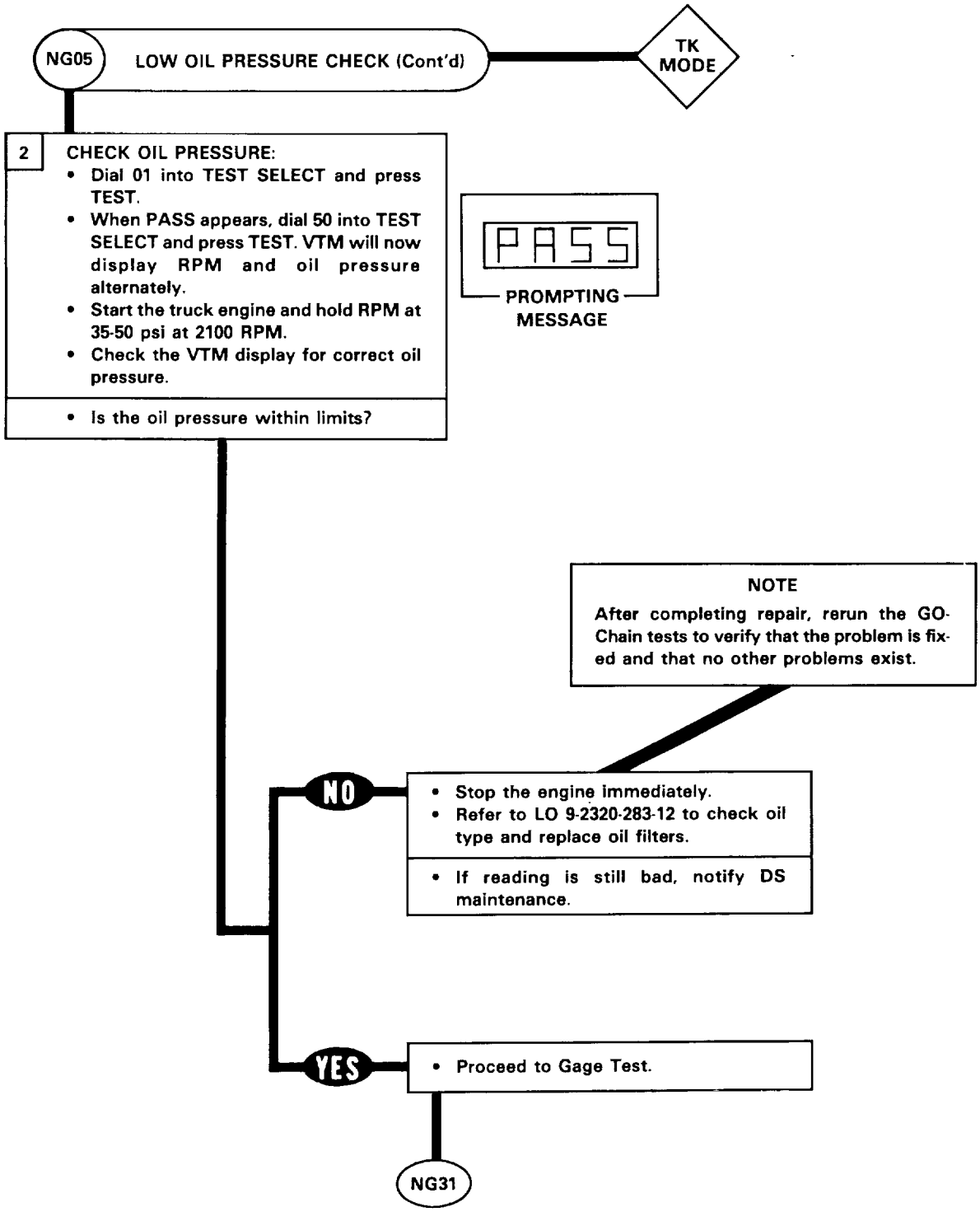
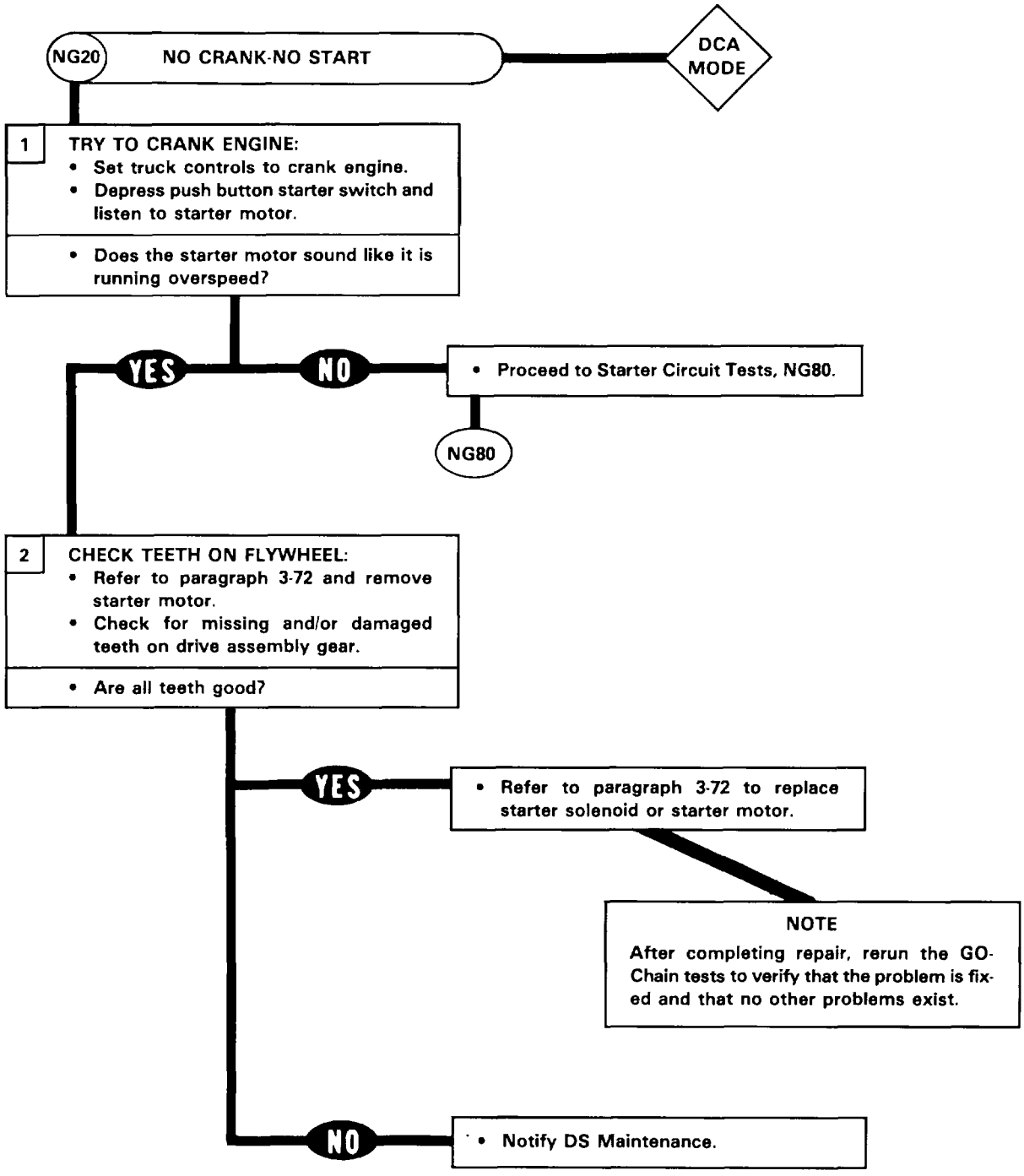
2-21. STE/ICE GO CHAIN TESTS.

Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)



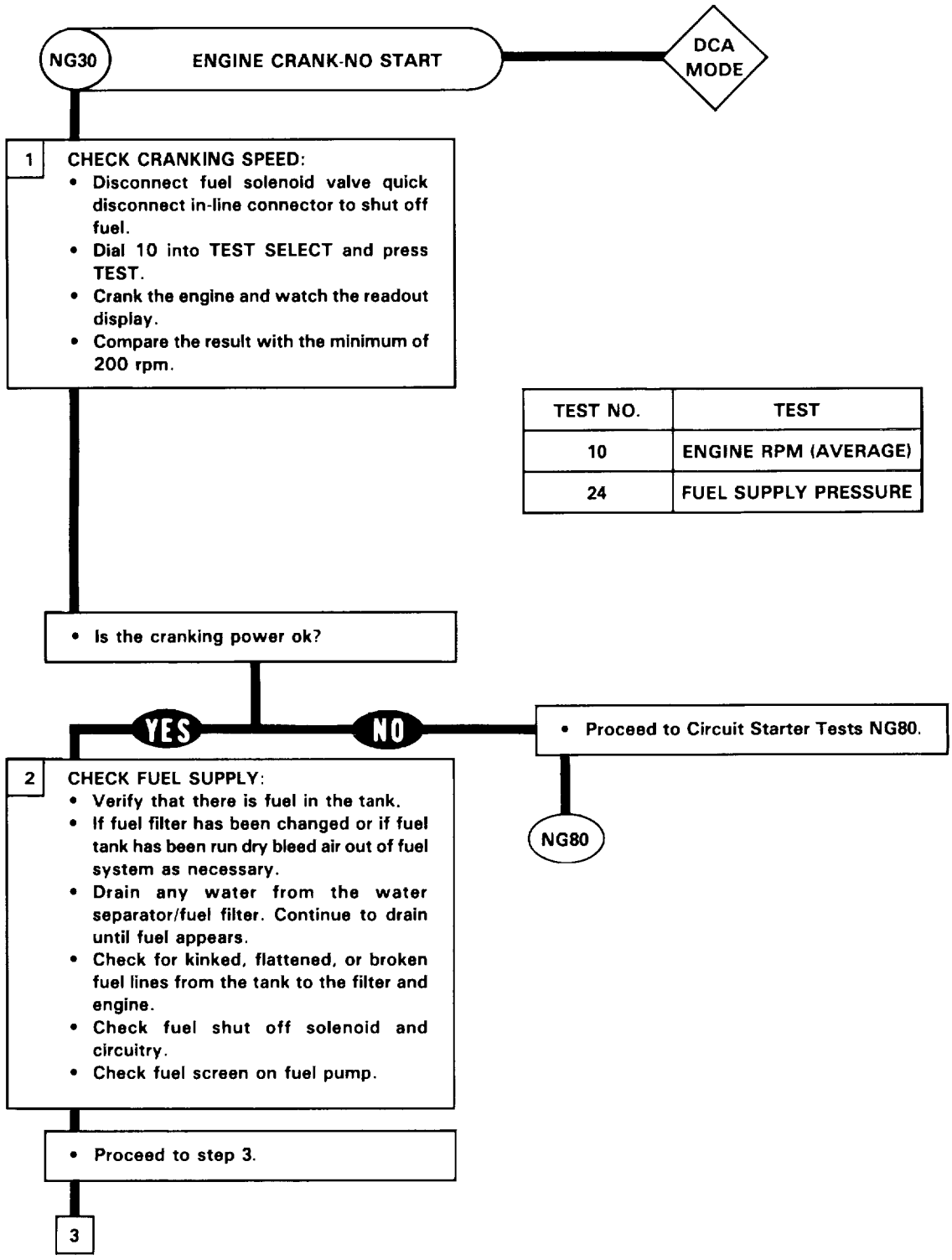
2-21. STE/ICE GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)



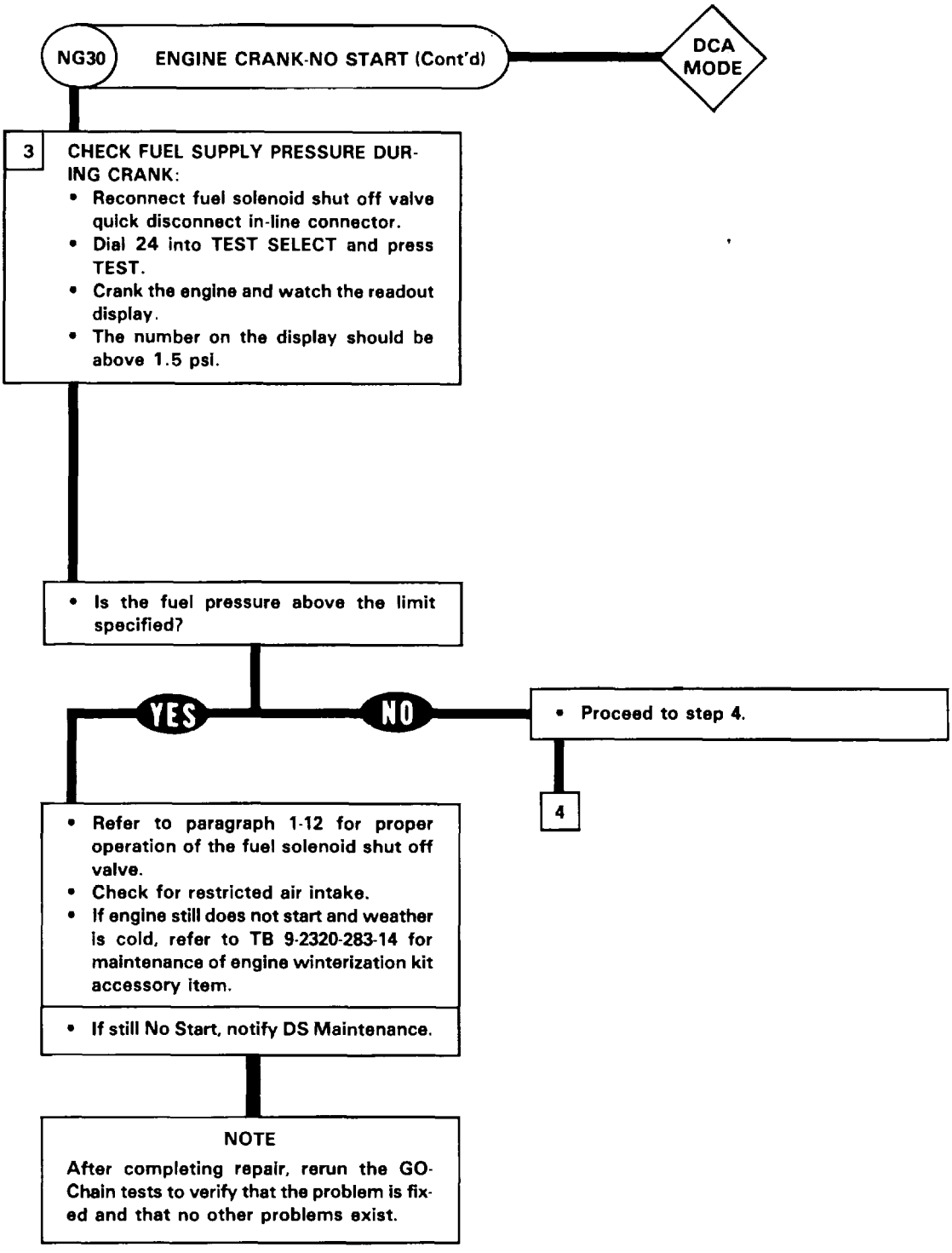
2-21. STE/ICE GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)



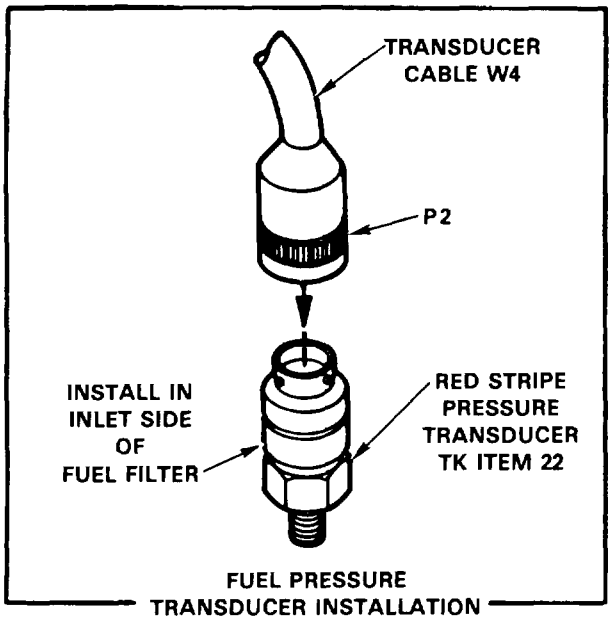
2-21. STE/ICE GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)



2-21. STE/ICE GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)



NG30 ENGINE CRANK-NO START (Cont'd) → TK MODE

CAUTION

Before opening the fuel line, make sure that the area around the fuel line is clean.

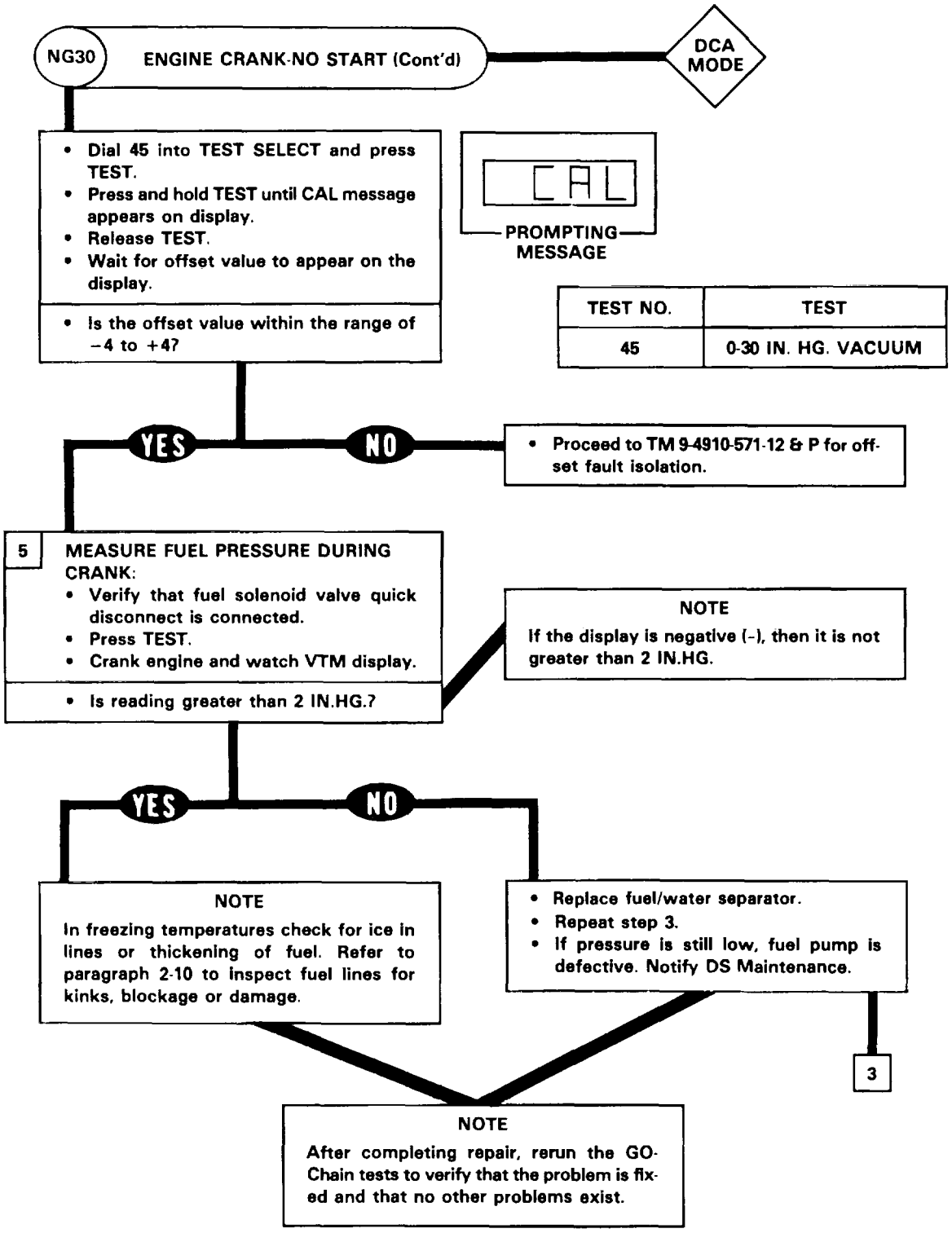
4 **INSTALL TRANSDUCER:**

- Using suitable adapter install pressure transducer (red stripe) in the inlet side of the fuel filter.
- Connect P1 of transducer cable W4 to J2 on the VTM.
- Connect P2 of the transducer cable to the connector on the transducer.

• Proceed to next page.

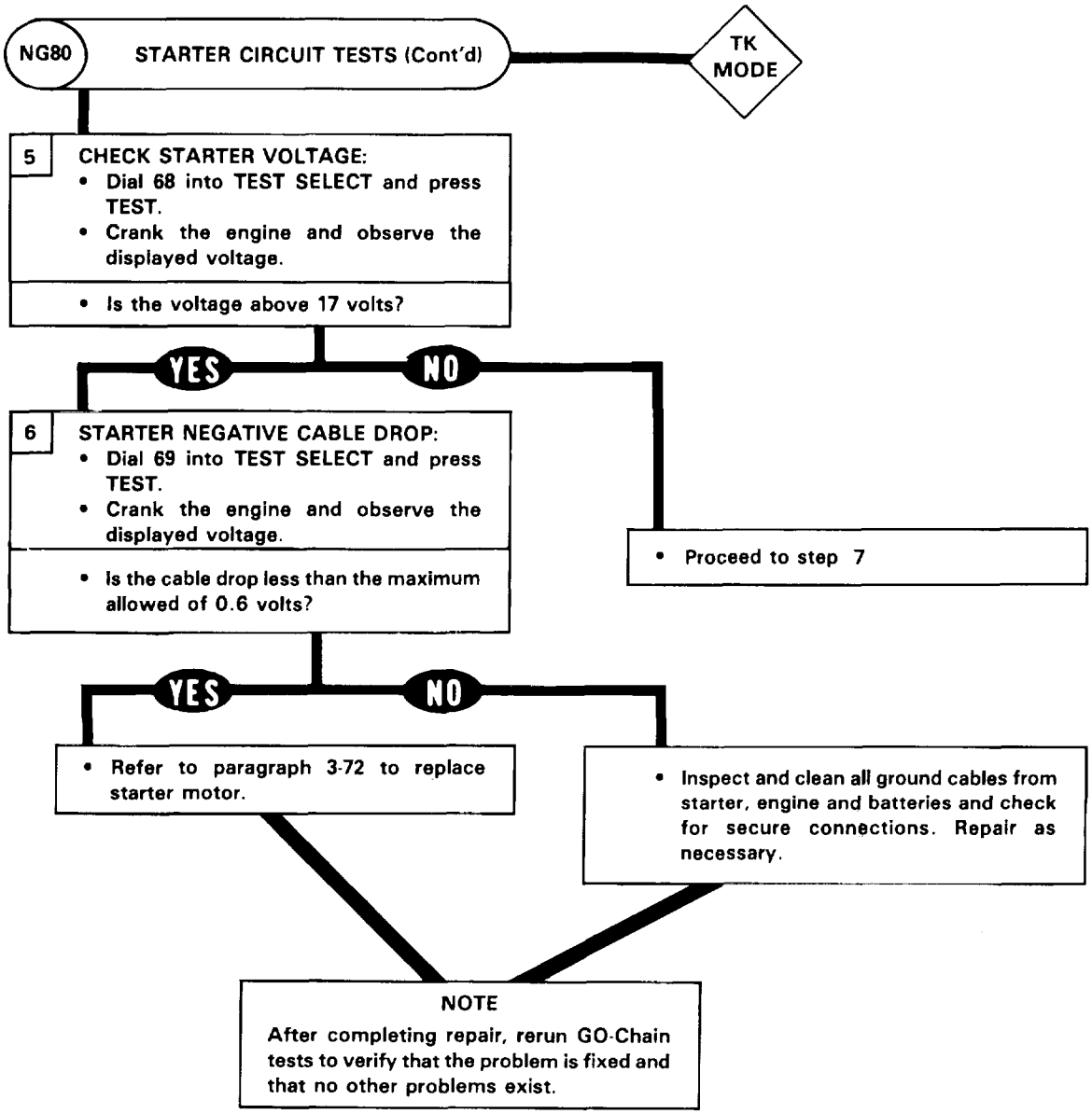
2-21. STE/ICE GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)



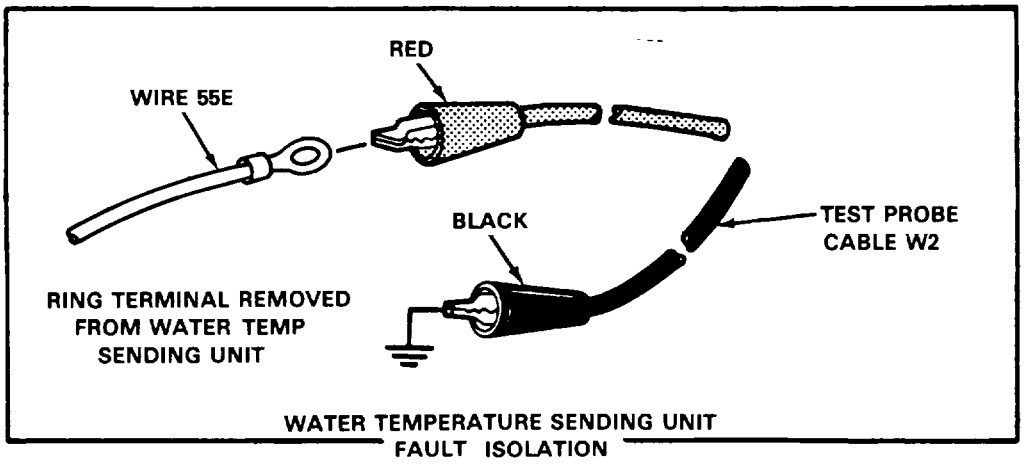
2-21. STE/ICE GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)



2-21. STE/ICE GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)



NG31 GAGE TEST (Cont'd) — DCA MODE

3 ISOLATE FAULT TO SENDING UNIT OR GAGE:
- Remove the ring terminal from the water temperature sending unit on the engine.
- Connect the red clip lead of W2 to the wire removed from the sending unit.
- Connect the black clip lead to a good ground.
- Turn the engine run switch to the accessory position.

- Does the VTM indicate the battery voltage?

YES
- Refer to paragraph 3-101 to replace the water temperature sending unit.

NO
- Refer to paragraph 2-10 to check and isolate fault to temperature gage or wiring harness or gage.

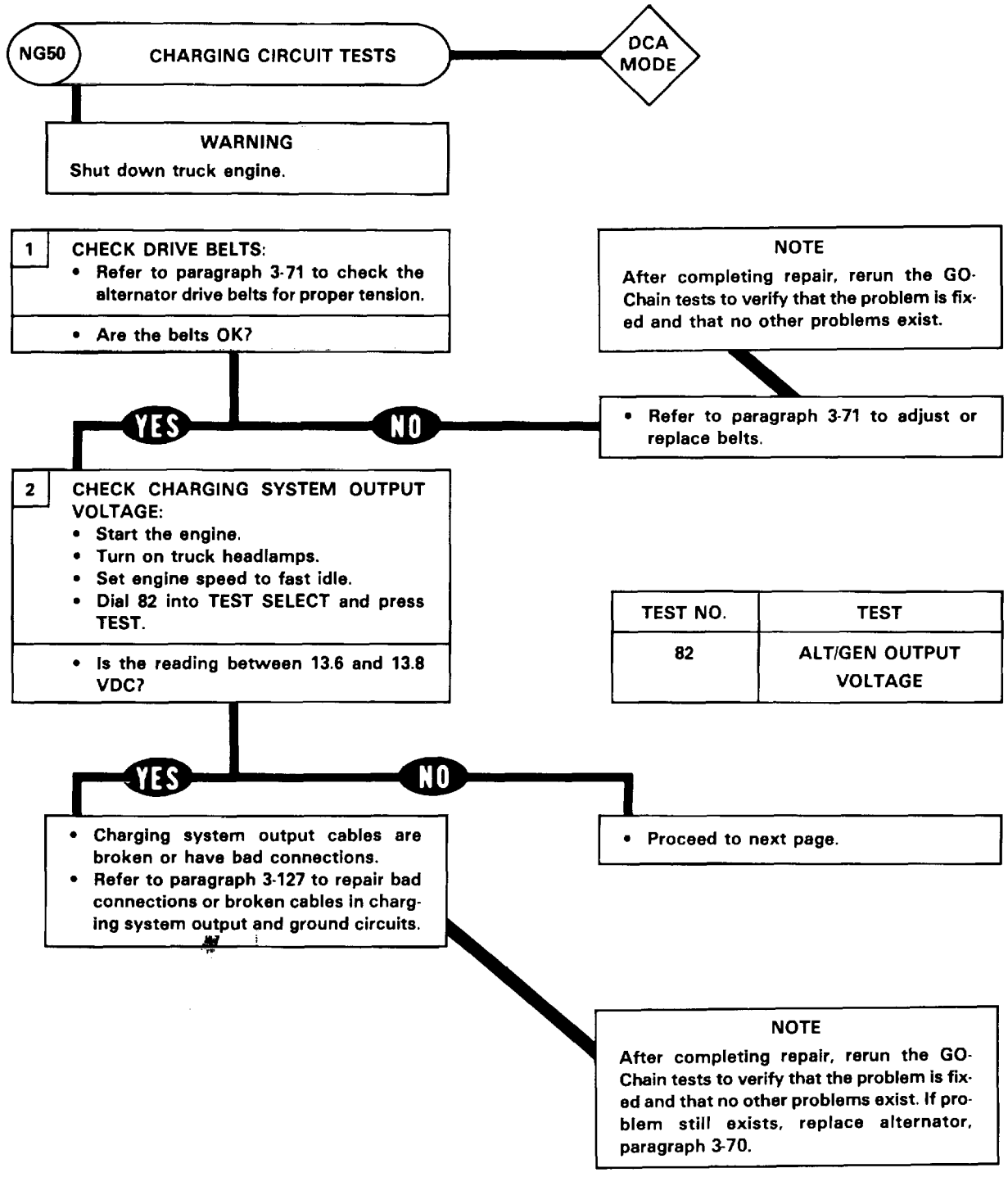
NOTE

After completing repair, rerun the GO-Chain tests to verify that the problem is fixed and that no other problems exist.

TA 236985

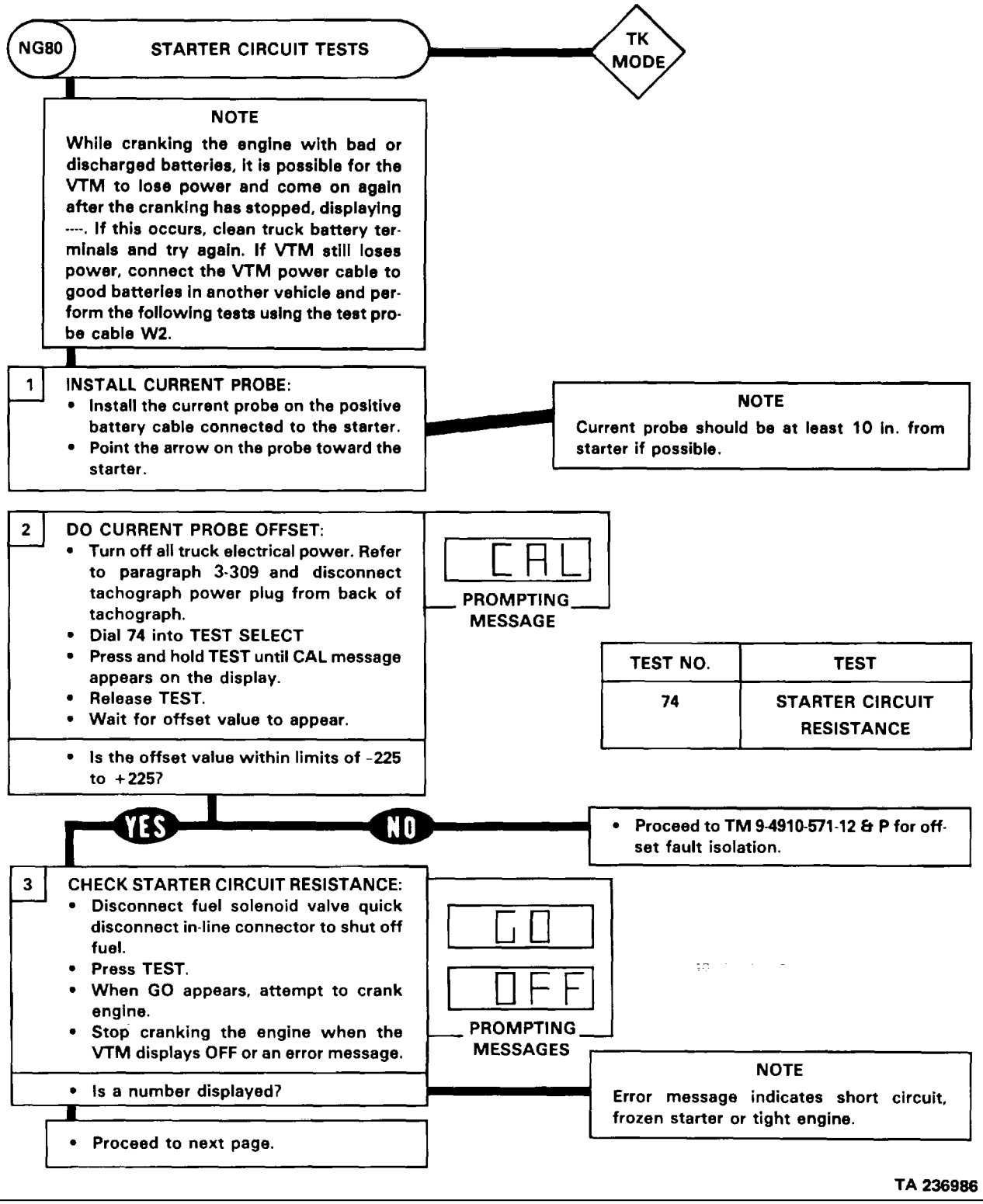
2-21. STE/ICE GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)



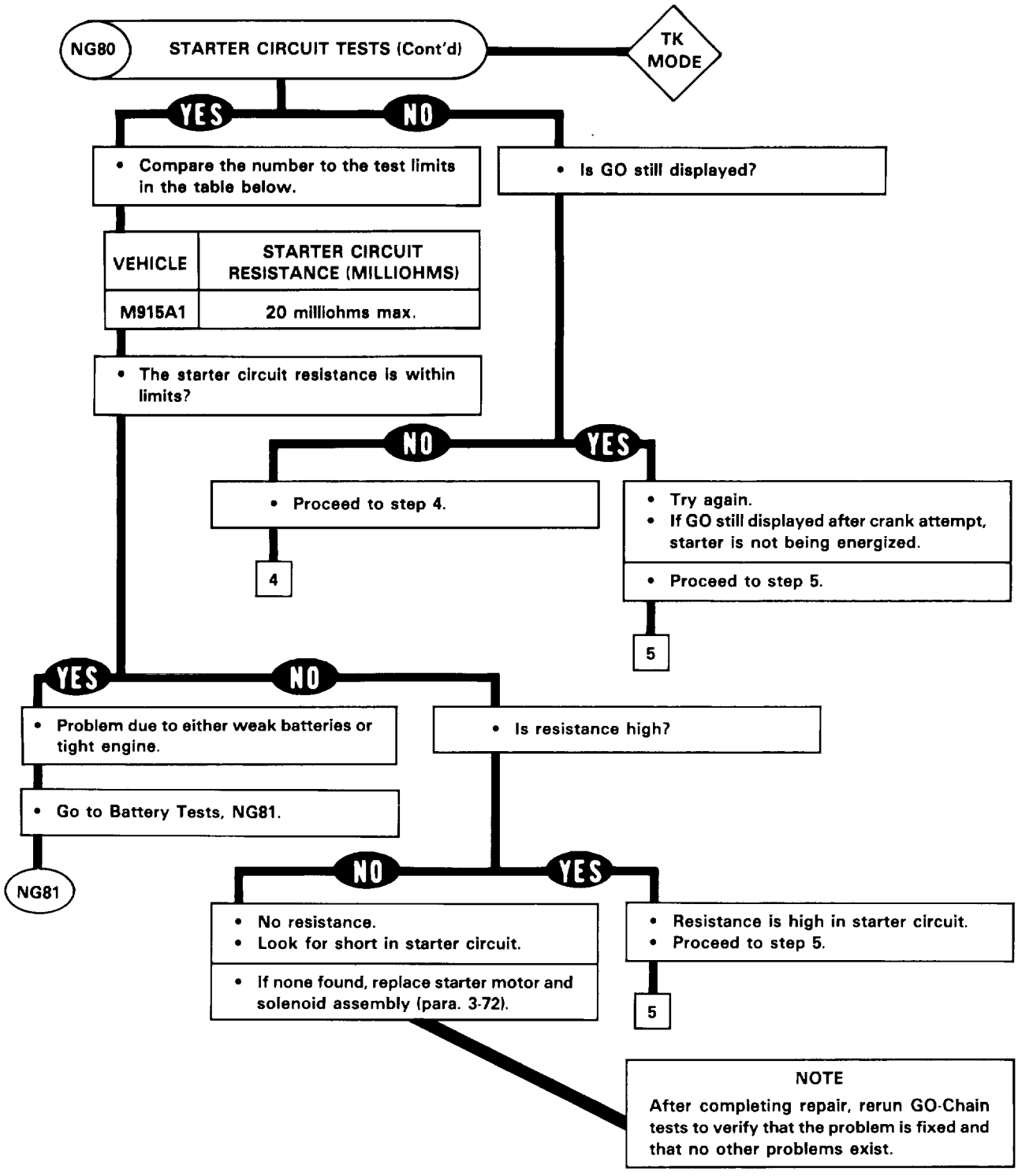
2-21. STE/ICE GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)



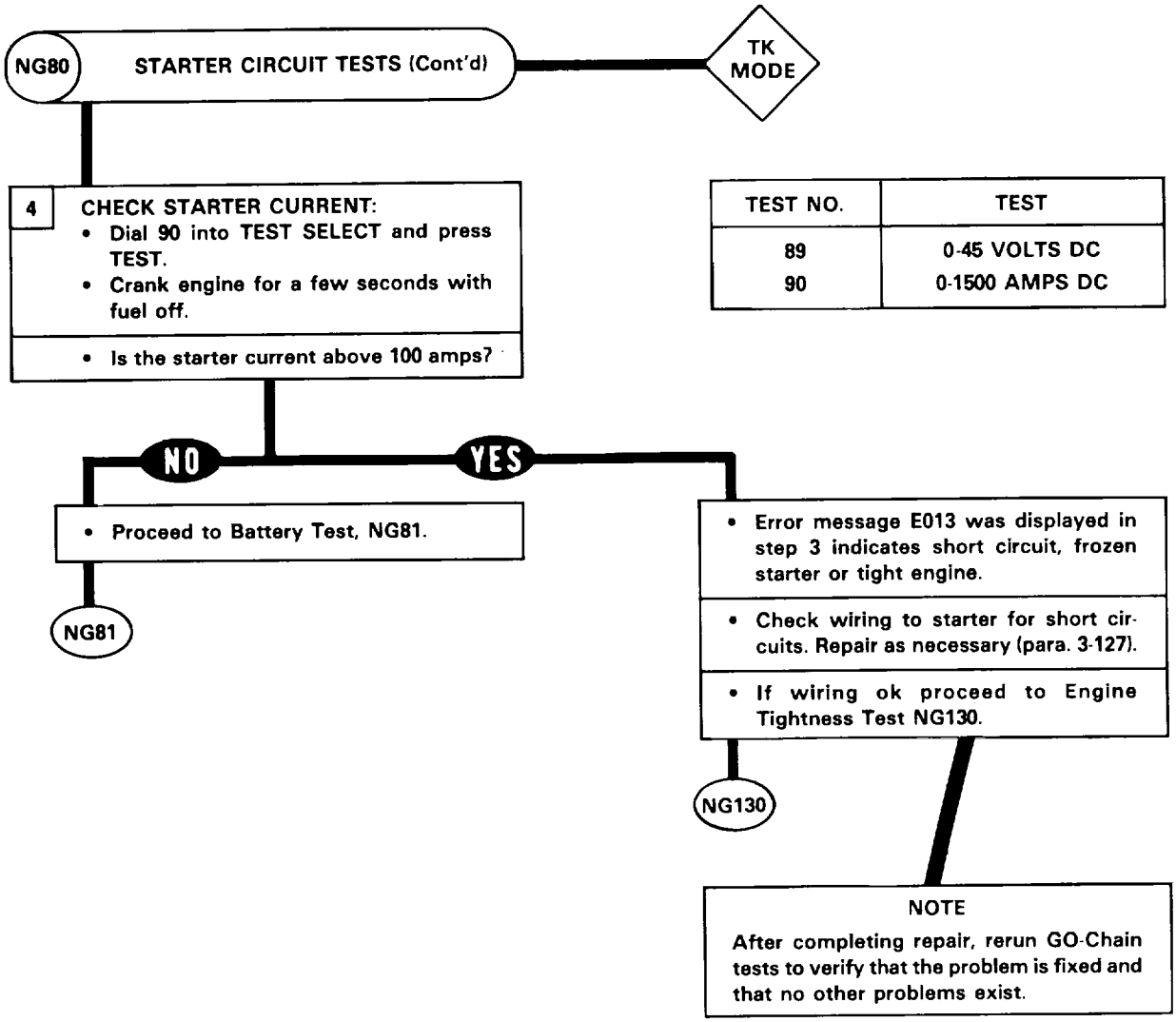
2-21. STE/ICE GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)



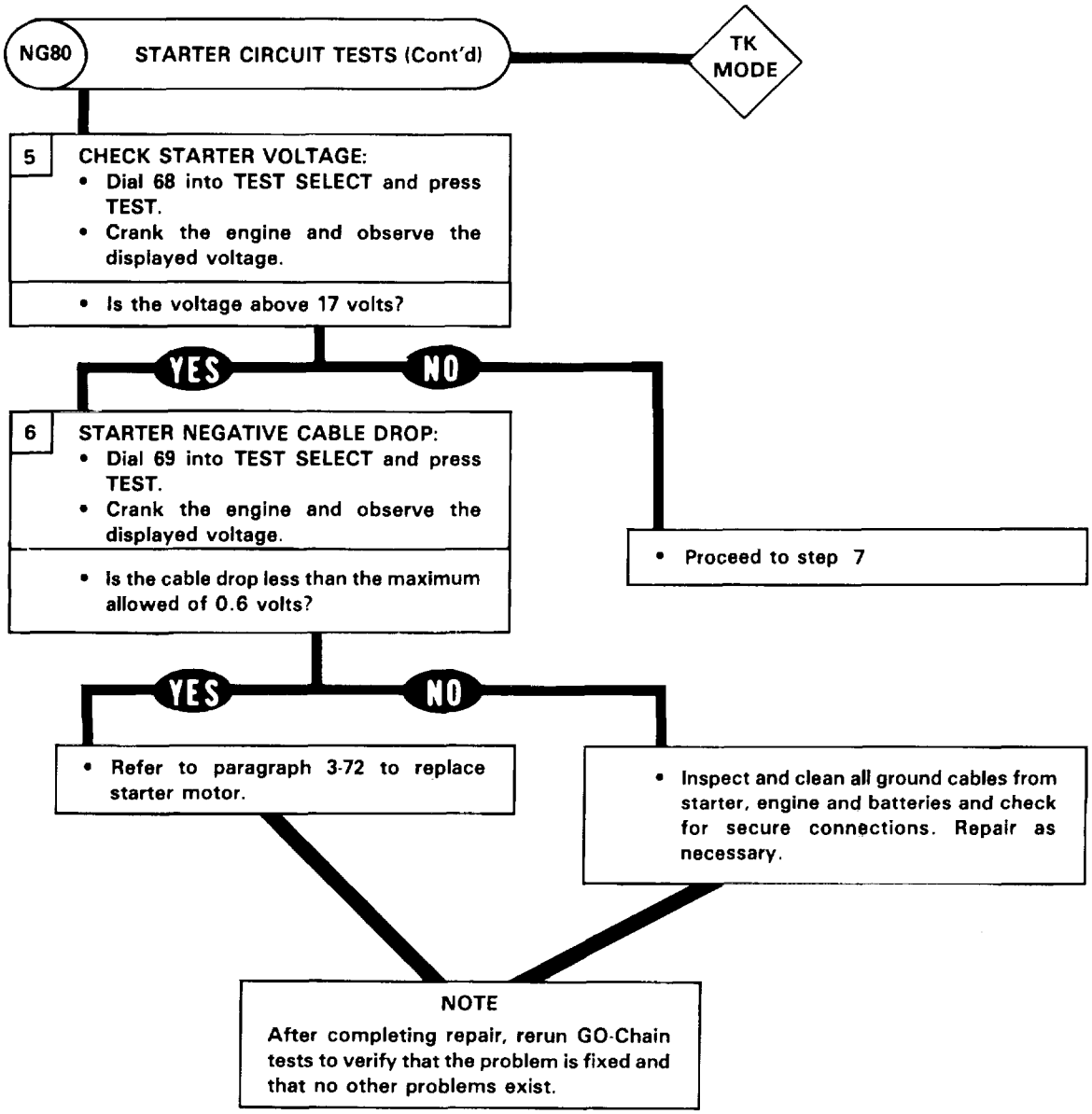
2-21. STE/ICE GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)



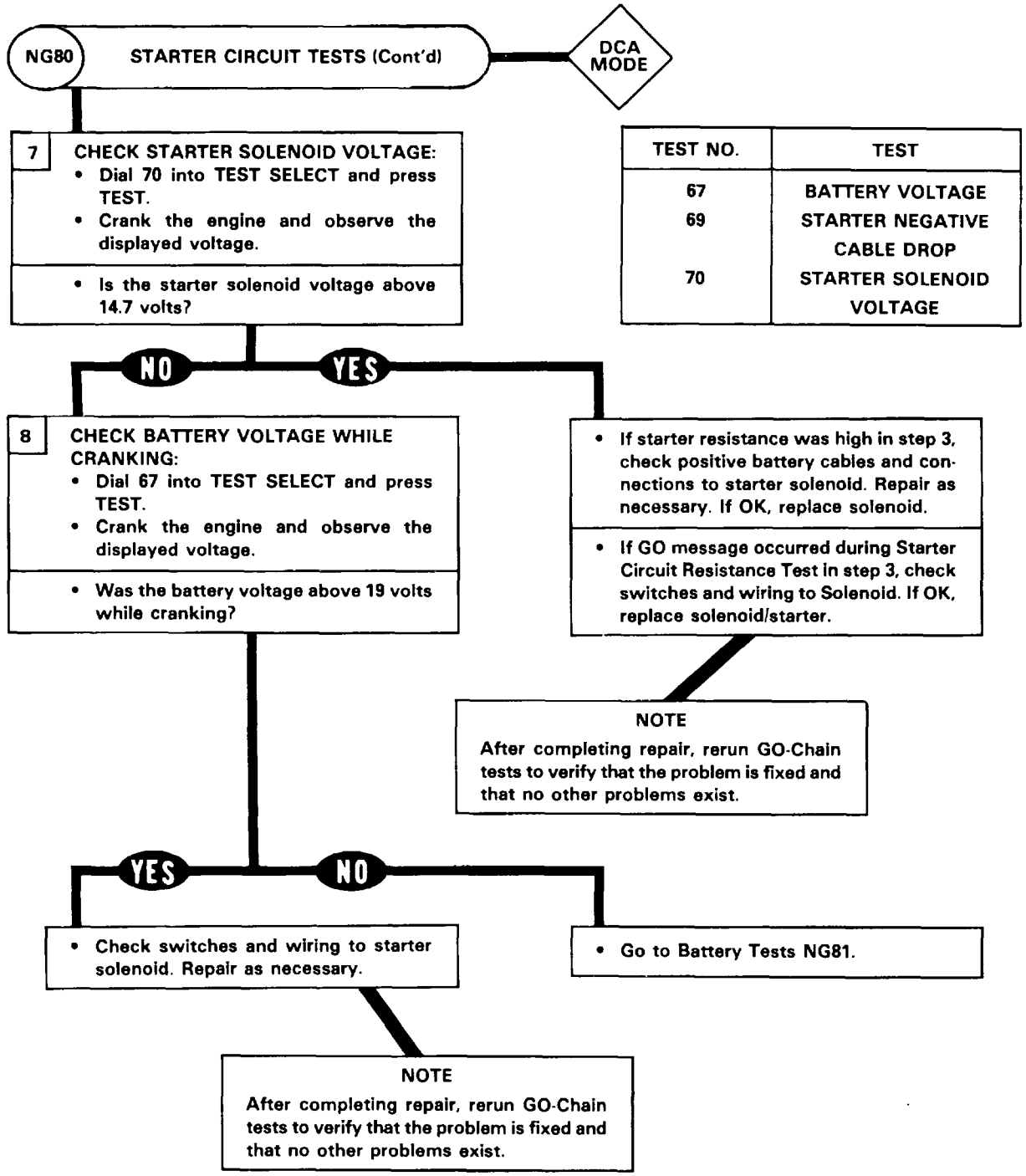
2-21. STE/ICE GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)



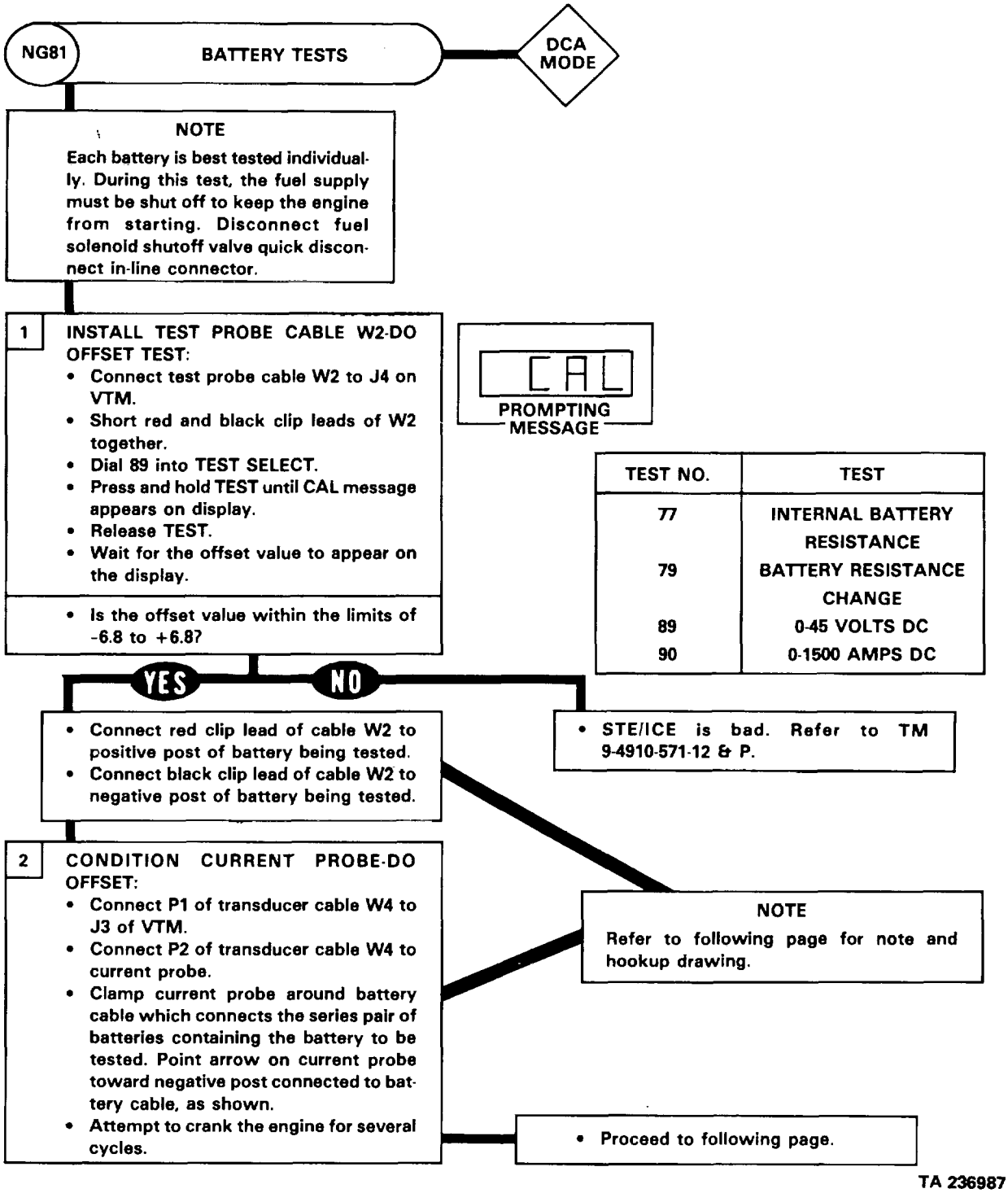
2-21. STE/ICE GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)



2-21. STE/ICE GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)



STE/ICE TROUBLESHOOTING.

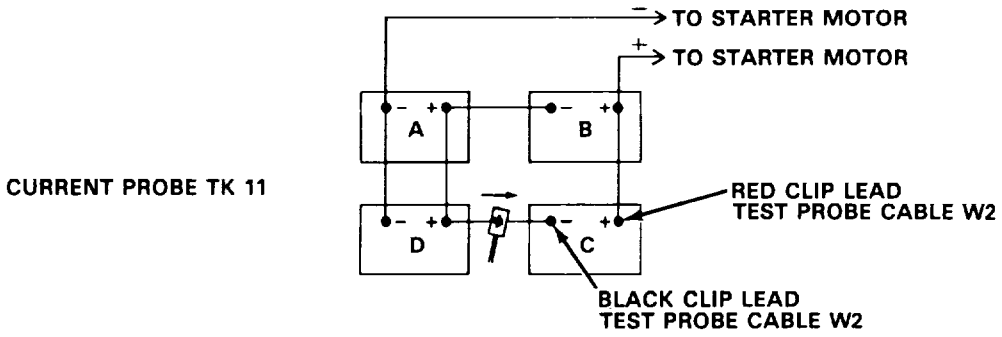
2-21. STE/ICE GO CHAIN TESTS (Continued).

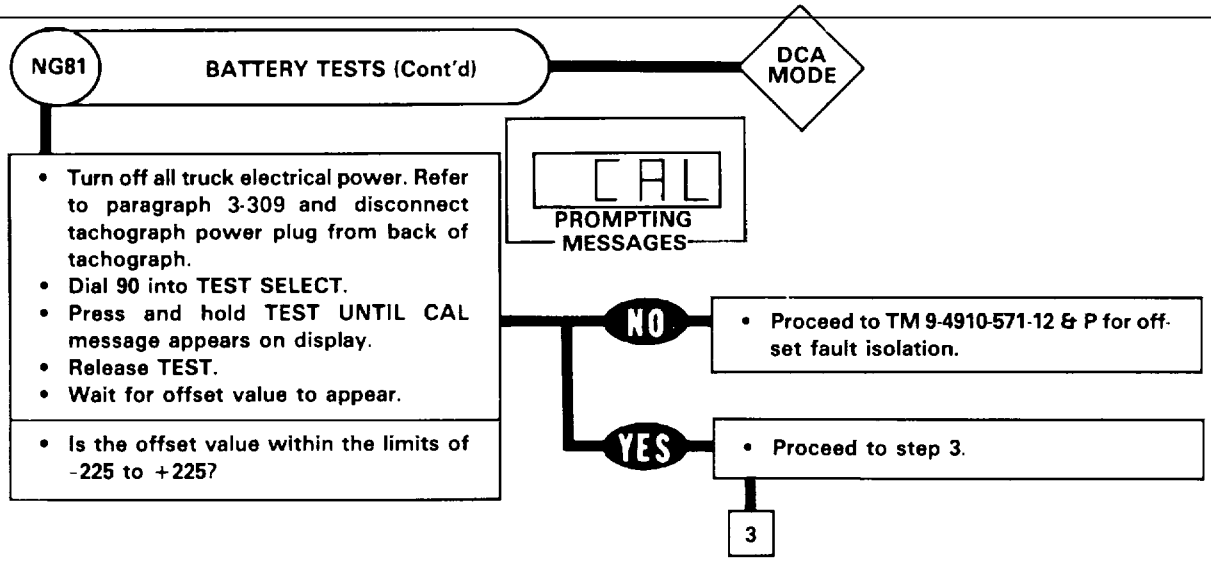
Table 2-10. STE/ICE NO-GO-Chain Test (Cont'd)

NOTE

TEST PROCEDURE FOR COMMERCIAL MAINTENANCE-FREE BATTERIES

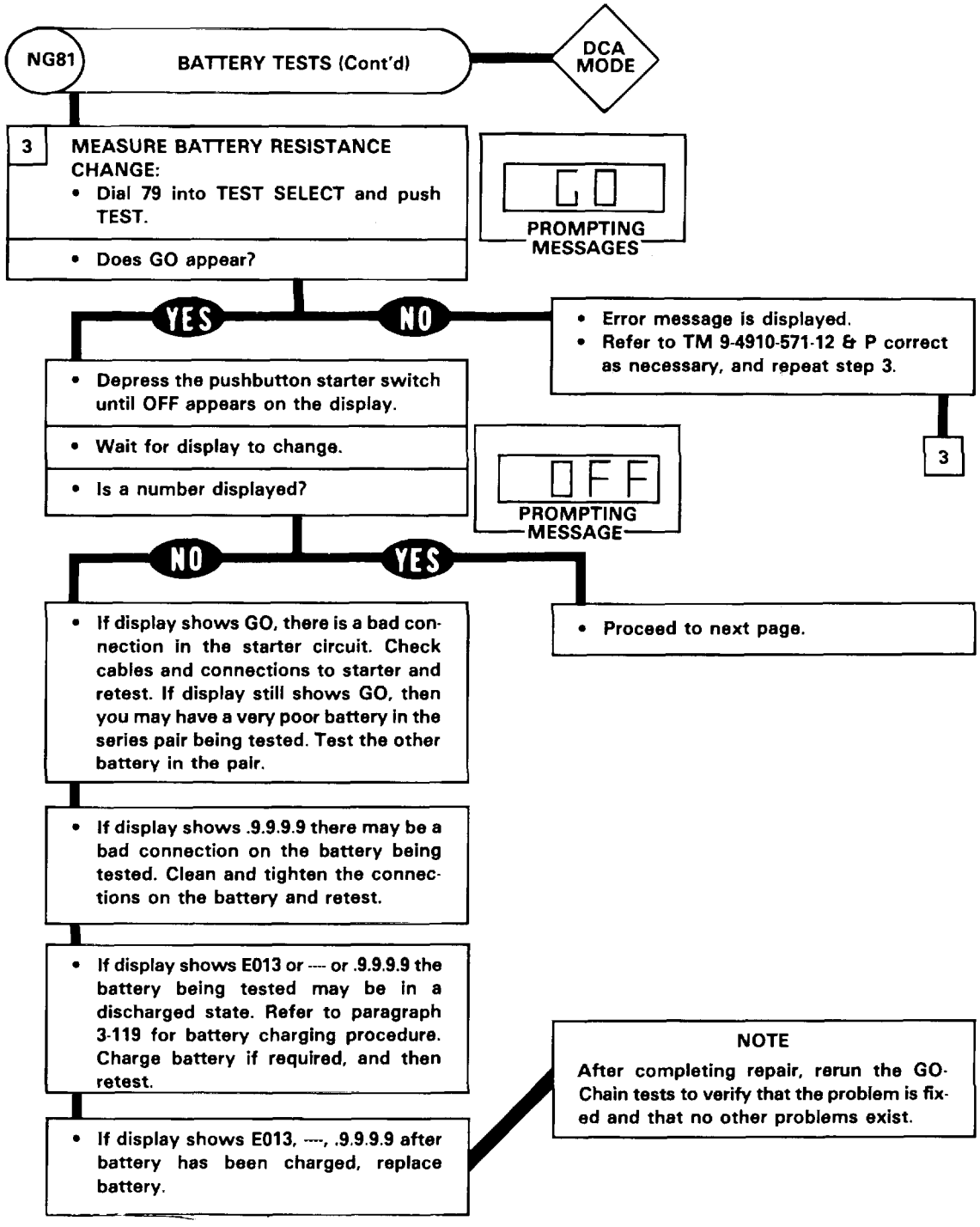
1. Test each battery of a series pair, then proceed to batteries of next series pair.
2. To find the series pairs of batteries, find pairs for which the negative terminal of one battery is connected by a cable to the positive terminal of another battery. This makes the two batteries a series pair. For example in the figure below, batteries A and B are a series pair, and batteries C and D are also a series pair.
3. To test battery C or D. clamp current probe around cable connecting battery C and battery D. Point arrow on current probe in the direction of the negative post connected to the cable.
4. The test probe cable W2 is first connected to battery C for testing battery C.
5. The test probe cable W2 is then connected to battery D for testing battery D. (Current probe in same place as for testing battery C.)
6. To test battery A or B, clamp current probe around cable connecting battery A and battery B. Point arrow on current probe in the direction of the negative post connected to the cable.
7. The test probe cable W2 is then connected to battery B for testing battery B.





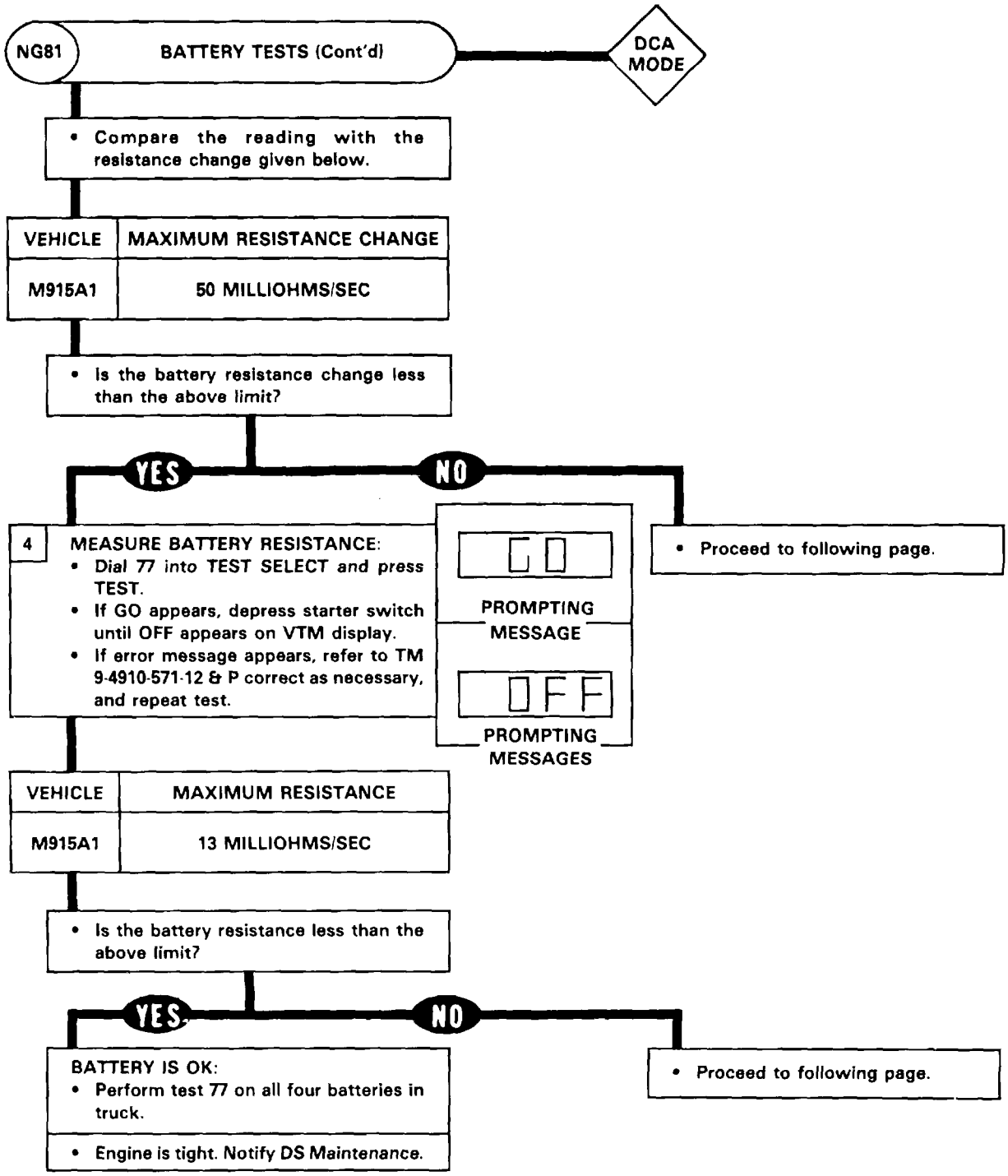
2-21. STE/ICE NO-GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO Chain Tests (Cont'd)



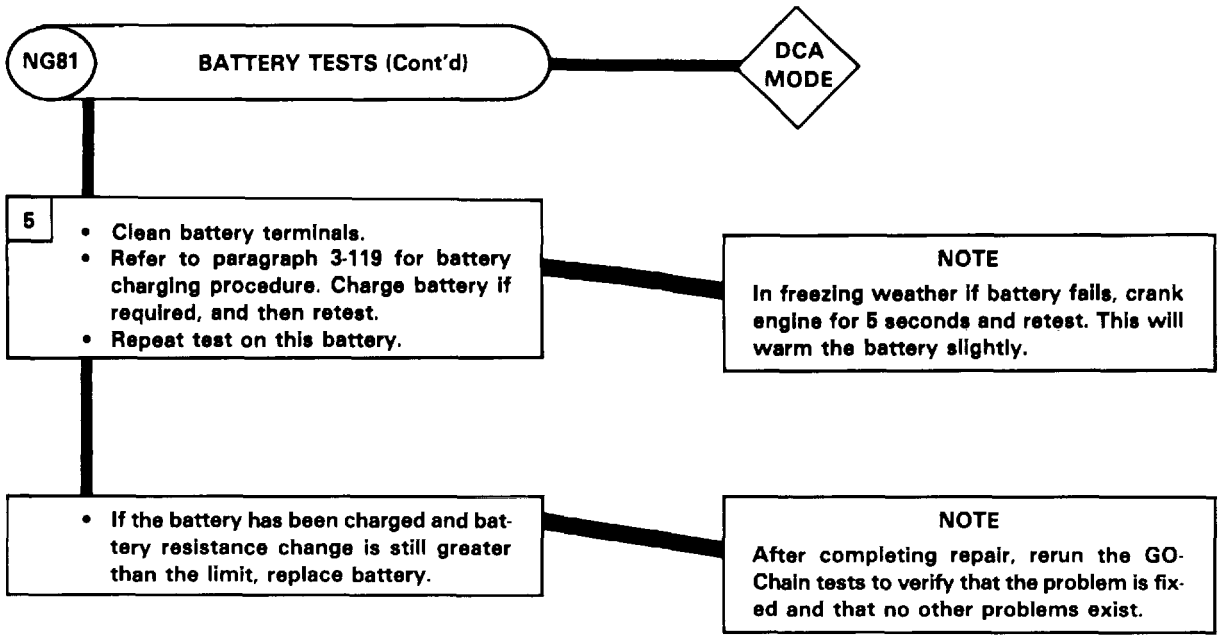
2-21. STE/ICE NO-GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO Chain Tests (Cont'd)



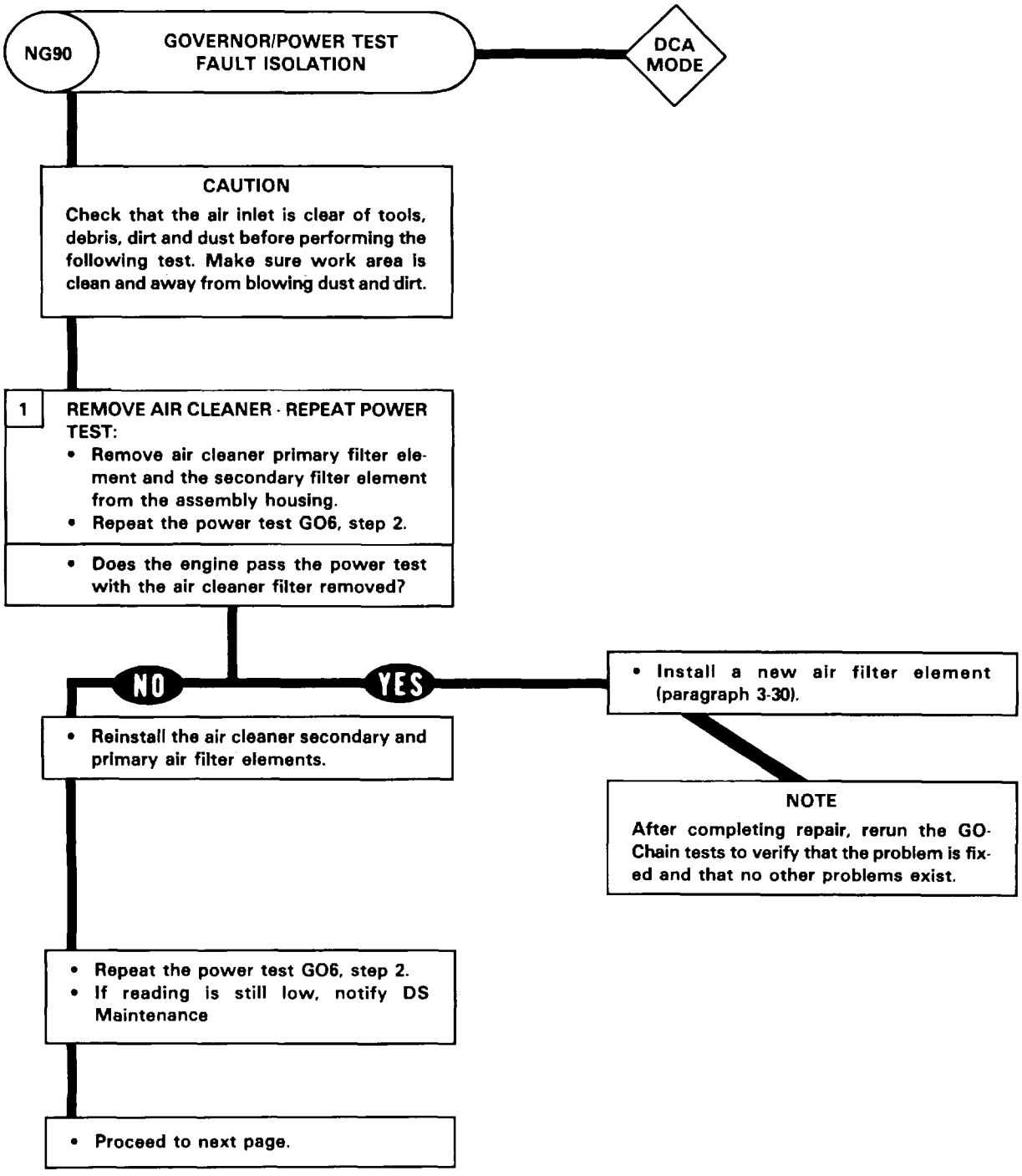
2-21. STE/ICE NO-GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO Chain Tests (Cont'd)



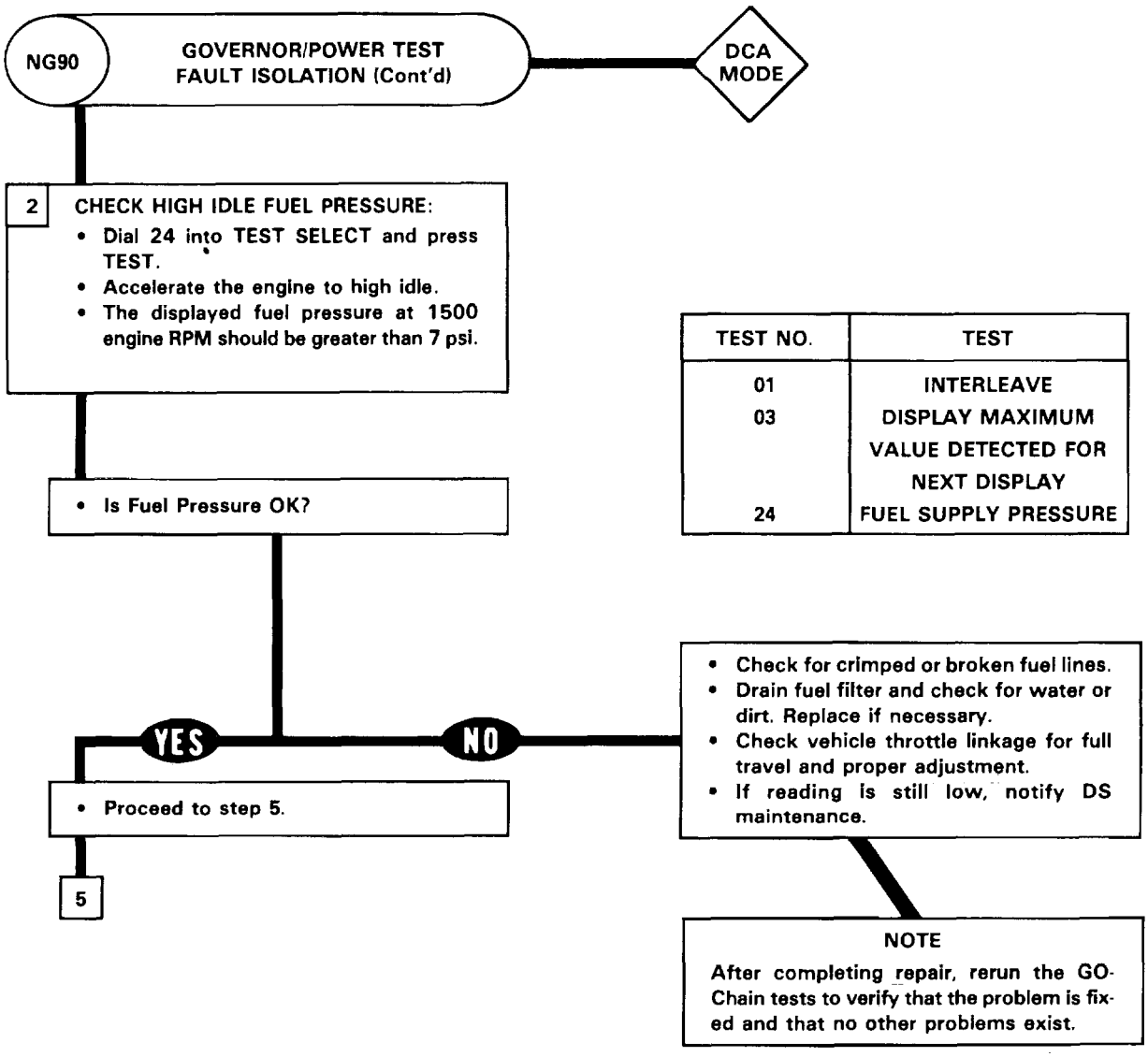
2-21. STE/ICE NO-GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO Chain Tests (Cont'd)



2-21. STE/ICE NO-GO CHAIN TESTS (Continued).

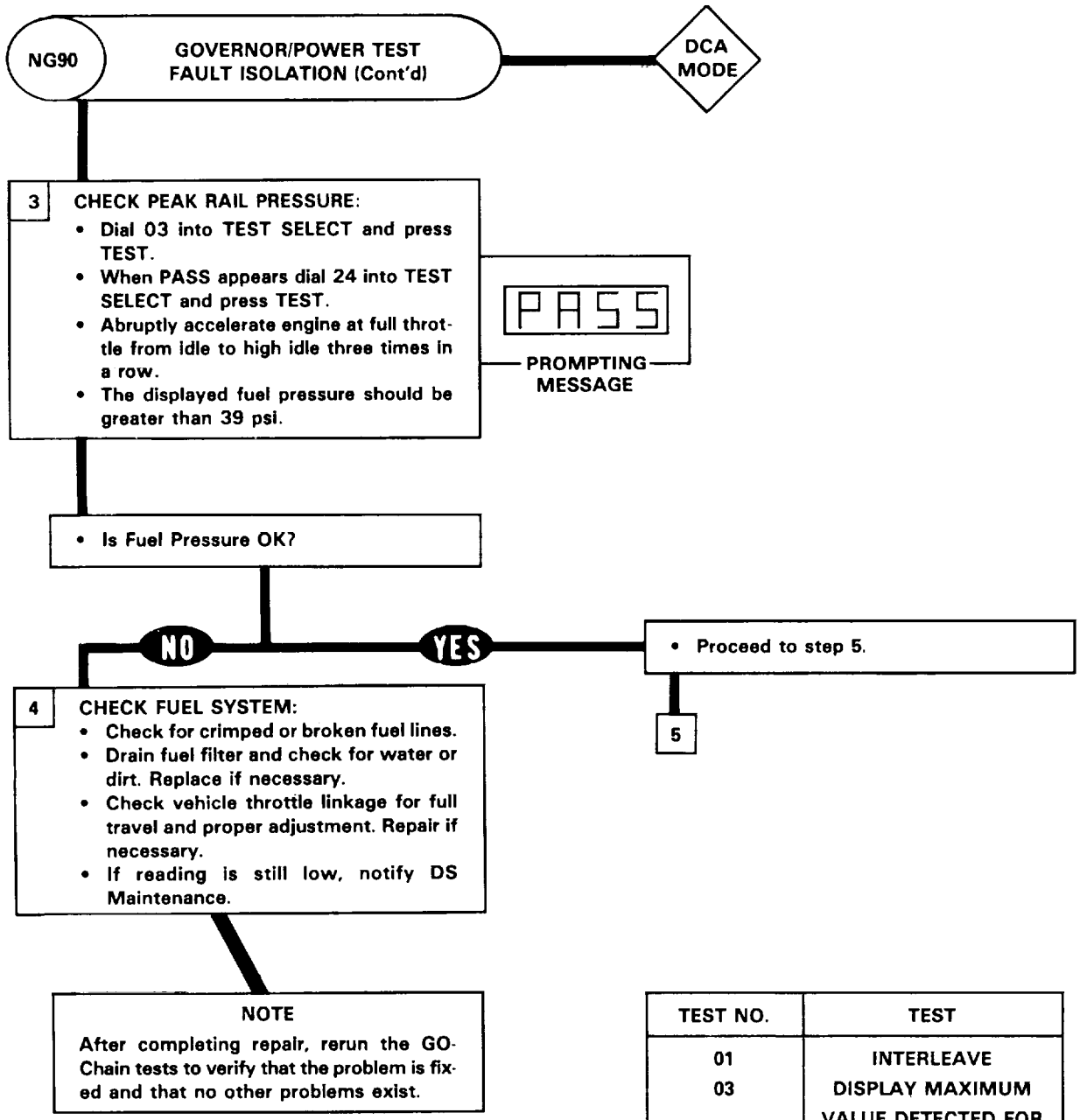
Table 2-10. STE/ICE NO-GO Chain Tests (Cont'd)



TEST NO.	TEST
01	INTERLEAVE
03	DISPLAY MAXIMUM VALUE DETECTED FOR NEXT DISPLAY
24	FUEL SUPPLY PRESSURE

2-21. STE/ICE NO-GO CHAIN TESTS (Continued).

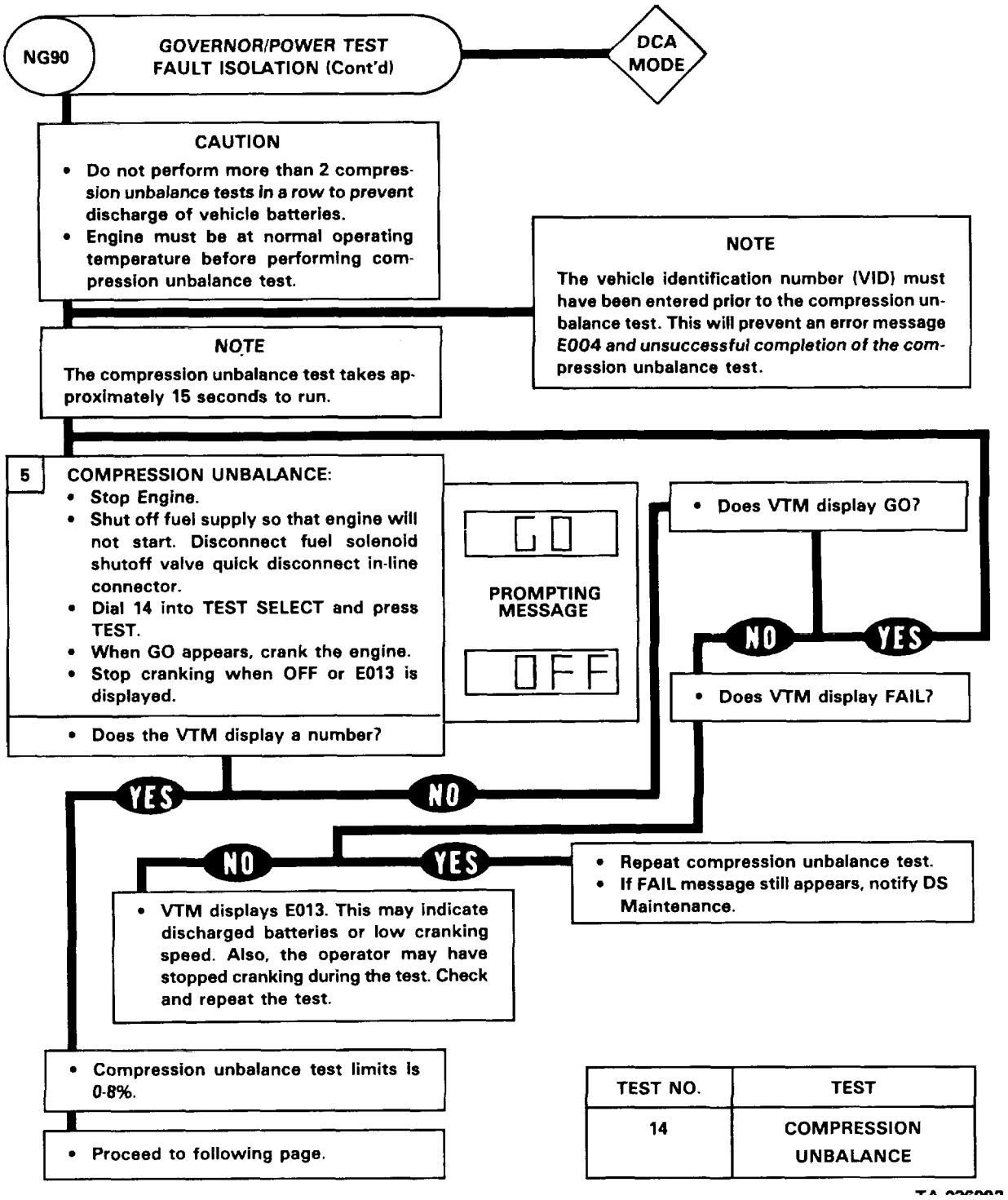
Table 2-10. STE/ICE NO-GO Chain Tests (Cont'd)



TEST NO.	TEST
01	INTERLEAVE
03	DISPLAY MAXIMUM VALUE DETECTED FOR NEXT TEST
24	FUEL SUPPLY PRESSURE

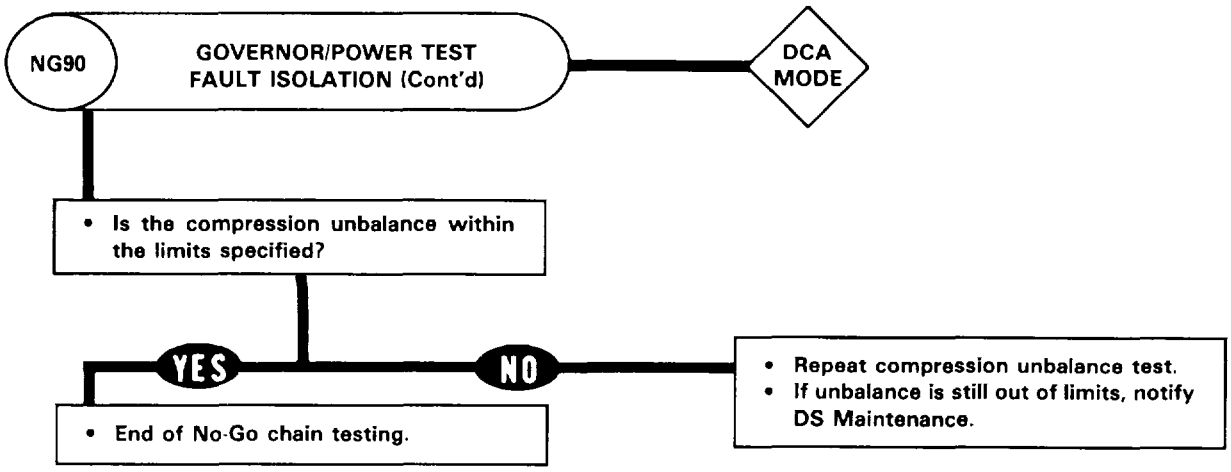
2-21. STE/ICE NO-GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO Chain Tests (Cont'd)



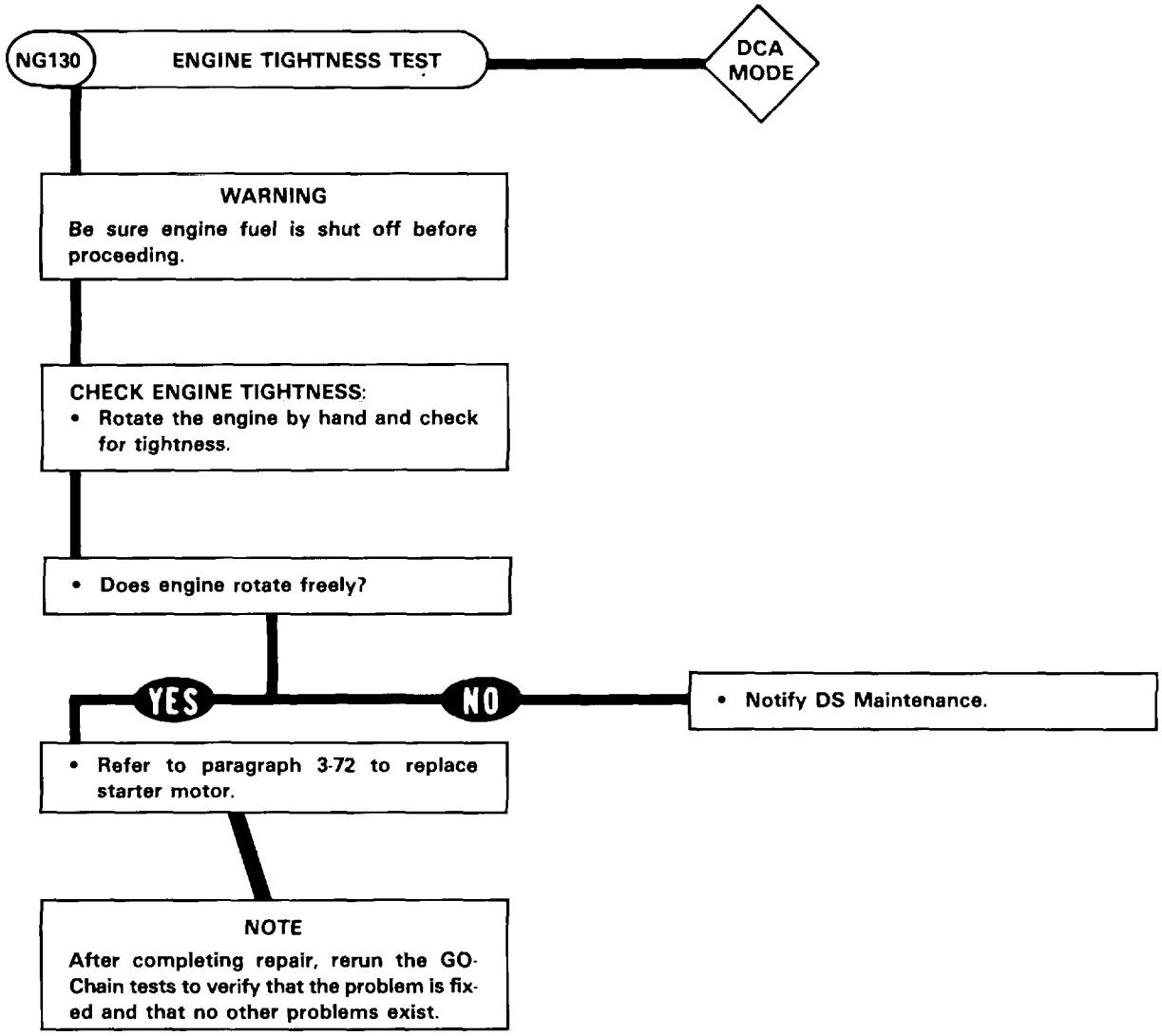
2-21. STE/ICE NO-GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO Chain Tests (Cont'd)



2-21. STE/ICE NO-GO CHAIN TESTS (Continued).

Table 2-10. STE/ICE NO-GO Chain Tests (Cont'd)



CHAPTER 3

3-1. OVERVIEW.

a. This chapter provides information on cleaning, inspection, testing, adjustment, replacement, and repair of components. Torque limits are provided in paragraph 3-9.

b. This information is divided into the following Sections:

Section I.	General Maintenance Instructions
Section II.	Engine
Section III.	Fuel System
Section IV.	Exhaust System
Section V.	Cooling System
Section VI.	Electrical System
Section VII.	Transmission
Section VIII.	Propeller Shafts and Universal Joints
Section IX.	Front Axle
Section X.	Rear Axle
Section XI.	Brake System
Section XII.	Wheels
Section XIII.	Steering System
Section XIV.	Frame and Towing Attachments
Section XV.	Springs, Shock Absorbers, and Torque Rods
Section XVI.	Cab and Body
Section XVII.	Accessory Items
Section XVIII.	Gages (Non-Electrical)
Section XIX.	STE/ICE Components

3-2. SECTION I. GENERAL.

a. This section provides general instructions for:

(1) Cleaning, inspection, repair, and assembly of vehicle component parts.

(2) Operational checks after performing maintenance.

b. Publications which provide additional information on general shop practice techniques, preservation, welding, sheet metal work, etc. are listed in appendix A of this manual. To find a particular general service instruction, use the task summary below.

3-3. TASK SUMMARY.

GENERAL MAINTENANCE INSTRUCTIONS.

3-4. CLEANING.

a. General Instructions. Cleaning procedures will be the same for the majority of parts and components which makeup the vehicle and vehicle subassemblies. General cleaning procedures are detailed in "b" through "h" below.

b. The Importance of Cleaning. Great care and effort are required in all cleaning operations. The presence of dirt and foreign material is a constant threat to satisfactory vehicle operation and maintenance. The following will apply to all cleaning operations:

(1) Clean all parts before inspection, after repair, and before assembly.

(2) Hands must be kept free of any accumulation of grease which can collect dust and grit.

(3) After cleaning, all parts must be covered or wrapped in plastic or paper to protect them from dust and/or dirt.

WARNING

Particles blown by compressed air are hazardous. Always direct air stream away from the user and other persons in the area. User must wear a safety eyeshield when using compressed air in cleaning.

c. External Engine Cleaning. All electrical equipment and other parts that could be damaged by steam cleaning or moisture must be removed, and all openings covered before cleaning. Dry with compressed air.

d. Disassembled Parts Cleaning. Place all disassembled parts in suitable wire baskets for cleaning.

(1) Dry and cover all cleaned parts.

(2) Place on or in "racks" and hold for inspection or repair.

(3) All parts subject to rusting must be lightly oiled and wrapped.

(4) Keep all related parts and components together. Do not mix parts.

WARNING

Improper cleaning methods and use of unauthorized cleaning solvents will injure personnel and damage equipment. See TM 9-247 for correct information.

GENERAL MAINTENANCE INSTRUCTIONS.

3-4. CLEANING (Continued).

e. Castings.

(1) Clean inner and outer surfaces of castings and all areas subject to grease and oil with cleaning solvents. (Refer to TM 9-247).

(2) Use a stiff brush to remove sludge and gum deposits.

WARNING

Particles blown by compressed air are hazardous. Always direct air stream away from the user and other persons in the area. User must wear safety eyeshield when using compressed air in cleaning.

(3) Use compressed air to blow out all tapped holes and to dry castings after cleaning.

f. Oil Passages. Particular attention must be given to all oil passages in castings and machined parts. All oil passages must be clean and free of any obstructions.

(1) Clean passages with wire probes to break up any sludge or gum deposits.

(2) Wash passages by flushing with solvents. (Refer to TM 9-247).

(3) Dry passages with compressed air.

CAUTION

Do not allow drycleaning solvents to come in contact with seals, cables, or flexible hoses. These cleaners cause leather, rubber, and synthetic materials to dry out, rot, and lose pliability, making them unserviceable.

g. Oil Seals, Electrical Cables, and Flexible Hoses. Clean with soap and water.

h. Ball-Roller Bearings.

(1) Bearings require special cleaning. After removing surface oil and gum deposits, place bearing in hot oil (140°F) to loosen congealed oil and grease. Wipe bearings dry (do not use compressed air). After cleaning, coat bearings with oil, wrap in paper, and hold for inspection.

(2) Refer to TM 9-214 for information on and care of bearings.

GENERAL MAINTENANCE INSTRUCTIONS.

3-5. INSPECTION.

a. General Instructions. The procedures for inspection will be the same for many of the parts and components which makeup the vehicle and vehicle subassemblies. The general procedures are detailed in "b" through "g" below. Use specified inspection equipment for inspection where cracks and other damage cannot be spotted visually. Exercise extreme care in all phases of inspection.

b. Castings.

(1) Inspect all ferrous and non-ferrous castings for cracks using a magnifying glass and strong light.

(2) Refer to MIL-I-6866 (Inspection Process, Penetrant Methods) and MIL-I-6868 (Inspection Process, Magnetic Particles).

(3) Closely check areas around studs, pipe plugs, threaded inserts, and sharp corners. Replace all cracked castings.

(4) Inspect machined surfaces for nicks, hurrs, or raised metal. Mark damaged areas for repair or replacement.

(5) Inspect all pipe plugs, pipe plug openings, capscrews, and capscrew openings for damaged or stripped threads.

(6) Check all gasket mating surfaces for warpage with a straightedge or surface plate. Inspect mating flanges for discolorations which may indicate persistent oil leakage.

(7) Check all castings for conformance to applicable repair standards.

c. Ball-Roller Bearings. Refer to TM 9-214 for inspection of bearings. Check all bearings for conformance to applicable repair standards.

d. Studs, Bolts and Capscrews. Replace if bent, loose, stretched, or if threads are damaged.

e. Gears.

NOTE

There are no established wear limits on gear teeth. Good judgment is required to determine if gears require replacement.

(1) Inspect all gears for cracks, using a magnifying glass and strong light. No cracks are allowed.

GENERAL MAINTENANCE INSTRUCTIONS.

3-5. INSPECTION (Continued). I

(2) Inspect gear teeth for wear, sharp fins, burrs, and galled or pitted surfaces.

(3) Check keyway slots for wear and/or damage.

f. Bushings and Bushing Type Bearings.

(1) Check all bushings and bushing type bearings for secure fit, evidence of heating, wear, burrs, nicks, and out-of-round conditions.

(2) Check for dirt in lubrication holes or grooves. Holes and grooves must be clean and free from damage.

g. Oil Seals. Oil seals are mandatory replacement items.

3-6. REPAIR.

a. General Instructions. Repair of most parts and components is limited to procedures outlined in applicable maintenance instructions and the following general procedures detailed in "b" through "h" below.

CAUTION

Repaired items must be thoroughly cleaned to remove metal chips and abrasives to prevent them from entering working parts of vehicle.

b. Castings.

(1) All cracked castings will be replaced.

(2) Only minor repairs to machined surfaces, flanges, and gasket mating surfaces are permitted. Remove minor nicks, burrs, and/or scratches with:

(a) Fine mill file.

(b) Crocus cloth dipped in cleaning solvent.

(c) Lapping across a surface plate.

(3) Remachining of machined surfaces to repair damage, warpage, or uneven surfaces is not permitted.

(4) Repair damaged threaded holes with a thread tap. Repair oversize holes with threaded inserts.

c. Ball-Roller Bearings. Refer to TM 9-214.

3-6. REPAIR (Continued).

d. Studs. Repair minor thread damage with a thread chaser. Replace all bent, stretched, stripped, or damaged studs as outlined below:

(1) Remove with a stud remover. Back studs out slowly to avoid heat buildup and seizure which can cause studs to break off.

(2) If a stud is broken off too short to use a stud remover, use an extractor or the "welding method" to remove.

CAUTION

Refer to TM 9-237 (Welding Instructions) to avoid damage to castings if "welding method" is used.

(3) A broken stud can be removed by welding bar stock or a nut to stud and removing with wrench.

NOTE

Standard studs may have a coarse thread on one end and a fine thread on the other end. The coarse thread end is installed in the aluminum casting. Studs having coarse threads on both ends are used in some applications. The shorter threaded end goes into the casting. Refer to TM 9-2320-283-20P for correct part numbers.

(4) All replacement studs have special coating and must have a small amount of anti-seize compound (MIL-A-13881) applied on threads before stud is installed. Install replacement studs slowly to prevent heat build-up and snapping off.

e. Gears.

(1) Remove gears using suitable pullers.

(2) Use the same methods described in paragraph 3-6 b (2) to remove minor nicks, burrs, or scratches on gear teeth.

f. Bushings and Bushing Type Bearings. When bushings and bushing type bearings seize to a shaft and spin in the bore, the associated parts must also be replaced.

3-6. REPAIR (Continued).

g. Oil Seals.

(1) Remove oil seals by pressing or prying out, being careful not to damage casting or adapter bore.

(2) Always install new seal in bore using proper seal replacing tool.

3-7. ASSEMBLY.

a. General. Extreme care must be exercised in all component assembly operations to ensure satisfactory vehicle performance. Precautionary rules for assembly are outlined below. Step-by-step procedures for assembly of various components are covered in the paragraph relating to the specific component.

b. Precautionary Rules.

(1) Cleanliness is essential in all component assembly operations. Dirt and dust, even in minute quantities, are abrasive. Parts must be cleaned as specified, and kept clean. Wrap or cover parts and components when assembly procedures are not immediately completed.

(2) Coat all bearings and contact surfaces with operating oil (axle oil for axle parts, transmission oil for transmission parts, etc.) to ensure lubrication of parts during initial operation after repair.

(3) Use new gaskets and preformed packings during assembly of all components.

c. Using Thread Sealing Tape. Certain fittings have a thin strip of thread sealing tape applied to the pipe threads before installation. This is done to provide a better seal and also to permit easier removal of fitting. Fittings requiring a thread sealing tape are identified in the particular assembly procedure calling for the installation of such fittings. The method of wrapping fittings with thread sealing tape is as follows:

(1) Be sure the fitting is thoroughly clean and dry before applying the thread sealing tape. All dirt, grease, oil, and scale must be removed.

(2) Start the tape one or two threads from the small or leading edge of the fitting, joining the tape together with an overlap of approximately 1/8-inch.

(3) Wrap the tape tightly in the same direction as you would turn a nut. Press the tape into the minor diameter of threads without cutting or ripping the tape.

(4) Torque the fittings to their specified torque. Do not use power tools.

GENERAL MAINTENANCE INSTRUCTIONS.

3-8. OPERATIONAL CHECKS.

a. General. After any maintenance action, always check your work. Be sure vehicle or applicable vehicle system is fully operational and safe before returning equipment to operator. General operational checks are listed below. Specific operational checks are covered in the paragraph relating to the component or system, where necessary.

b. Operational Checks.

(1) Operate applicable vehicle systems in accordance with TM 9-2320283-10.

(2) Start and run engine. Be sure all gages read normal.

(3) Visually check all fluid connections (tubes, hoses, and fittings) that were loosened, for leakage. Eliminate all leakage by tightening or replacing parts.

(4) Check all air connections (tubes, hoses, and fittings), that were loosened, for leakage by applying soap solution. Eliminate all leakage by tightening or replacing parts.

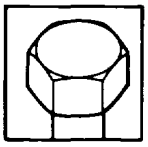
(5) Road test vehicle. Be sure all gages read normal. Listen for unusual noises. Be sure vehicle may be operated safely (e.g. steering, brakes, etc.) and that performance is satisfactory.

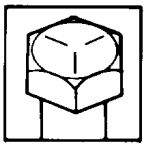
(6) Check for "tripped" circuit breakers. Look for smoke that may indicate an electrical short.

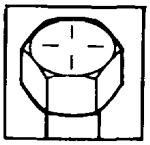
GENERAL MAINTENANCE INSTRUCTIONS.

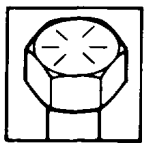
3-9. TORQUE LIMITS.

USAGE	MUCH USED	MUCH USED	USED AT TIMES	USED AT TIMES
CAPSCREW DIAMETER AND MINIMUM TENSILE STRENGTH (PSI)	To 1/2-69,000 To 3/4-64,000 To 1-55,000	To 3/4-120,000 To 1-115,000	To 5/8-140,000 To 3/4-133,000	150,000
QUALITY OF MATERIAL	INDETERMINATE	MINIMUM COMMERCIAL	MEDIUM COMMERCIAL	BEST COMMERCIAL
SAE GRADE NUMBER CAPSCREW HEAD MARKINGS: Manufacturer's marks may vary. These are all SAE Grade 5:	1 or 2	5	6 or 7	8









CAPSCREW BODY SIZE (Inches)-(Thread)	TORQUE (lb-ft)	TORQUE (lb-ft)	TORQUE (lb-ft)	TORQUE (lb-ft)
1/4 - 20	5	8	10	12
- 28	6	10	14	
5/16 - 18	11	17	19	24
- 24	13	19	27	
3/8 - 16	18	31	34	44
- 24	20	35	49	
7/16 - 14	28	49	55	70
- 20	30	55	78	
1/2 - 13	39	75	85	105
- 20	41	85	120	
9/16 - 12	51	110	120	155
- 18	55	120	170	
5/8 - 11	83	150	167	210
- 18	95	170	240	
3/4 - 10	105	270	280	375
- 16	115	295	420	
7/8 - 9	160	395	440	605
- 14	175	435	675	
1 - 8	235	590	660	910
- 14	250	660	990	

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3-9. TORQUE LIMITS (Continued).

1. Always use the torque values listed above when specific specifications are not available.

NOTE

Do not use above values in place of those specified in this manual; special attention should be observed in case of SAE Grade 6, 7, and 8 capscrew.

2. The above is based on use of clean and dry threads.
3. Reduce torque by 10% when oil is used as a lubricant.
4. Reduce torque by 20% if new plated capscrews are used.

CAUTION

Capscrews threaded into aluminum may require reductions in torque of 30% or more, unless inserts are used.

SECTION II. ENGINE

3-10. GENERAL.

This section provides procedures authorized at the organizational maintenance level to replace engine components. To find a specific procedure contained in this section, see the task summary below.

3-11. TASK SUMMARY.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION

PARAGRAPH	CONDITION DESCRIPTION
(Refer to specific paragraph for this information).	

TEST EQUIPMENT
None.

SPECIAL TOOLS
Wrench, oil and fuel filter, spin-on
(15434) 3375049.

MATERIALS/PARTS (P/N)
Tape, thread sealing
Item 32, Appendix C.
Container(s), 40 quart capacity.
Element, oil filter, spin-on
(15434) 299670.
Element, oil filter, spin-on
(15434) 3304232.
Gasket, rocker cover
(15434) 3016453.
Grommet (4)
(15434) S-1003-S.
Gasket
(15434) 157911.
Hose, connection (2)
(15434) 155789.
Screw, nameplate (5)
(15434) S-2286.
Gasket, water inlet connection
(15434) 3032348.
Gasket, water outlet
(15434) 215045.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

REFERENCES (TM)
TM 9-2320-283-10.
LO 9-2320-283-12.
TM 9-2320-283-20P.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

ENGINE.

3-11. TASK SUMMARY (Continued).

LIST OF TASKS

TASK NO.	TASK	TASK REF	TROUBLESHOOTING REF NO. (PARA)
1	Engine Oil Service	3-12	2-11
	a. Draining Oil.	3-12a	
	b. Oil Filter Element Replacement.	3-12b	
2	Rocker Cover and Gasket Replacement	3-13	2-11
	a. Removal.	3-13a	
	b. Cleaning and Inspection.	3-13b	
	c. Installation.	3-13c	
3	Rocker Cover Filler Cap Replacement	3-14	
	a. Removal.	3-14a	
	b. Cleaning and Inspection.	3-14b	
	c. Installation.	3-14c	
4	Breather Tubes and Hoses Replacement	3-15	2-11
	a. Removal.	3-15a	
	b. Cleaning and Inspection.	3-15b	
	c. Installation.	3-15c	
5	Oil Level Dipstick Replacement	3-16	2-11
	a. Removal.	3-16a	
	b. Cleaning and Inspection.	3-16b	
	c. Installation.	3-16c	
6	Oil Level Dipstick Tube Brace and Clamp Replacement	3-17	
	a. Removal.	3-17a	
	b. Cleaning and Inspection.	3-17b	
	c. Installation.	3-17c	
7	Air Compressor Cooling Tubes Replacement	3-18	2-11
	a. Removal.	3-18a	
	b. Cleaning and Inspection.	3-18b	
	c. Installation.	3-18c	

ENGINE.

3-11. TASK SUMMARY (Continued).

LIST OF TASKS

TASK NO.	TASK	TASK REF	TROUBLESHOOTING REF NO. (PARA)
8	Air Compressor Intake Tube Replacement	3-19	2-11
	a. Removal.	3-19a	
	b. Cleaning and Inspection.	3-19b	
	c. Installation.	3-19c	
9	Water Crossover Tube and Connections Replacement	3-20	2-11
	a. Removal.	3-20a	
	b. Cleaning and Inspection.	3-20b	
	c. Installation.	3-20c	
10	Water Transfer Tube and Bracket Replacement	3-21	2-11
	a. Removal.	3-21a	
	b. Cleaning and Inspection.	3-21b	
	c. Installation.	3-21c	
11	Engine Lifting Bracket Replacement	3-22	
	a. Removal.	3-22a	
	b. Cleaning and Inspection.	3-22b	
	c. Installation.	3-22c	
12	Engine Dataplate Replacement	3-23	2-11
	a. Removal.	3-23a	
	b. Installation.	3-23b	
13	Fan Brace, Bracket, and Spacers Replacement	3-24	
	a. Brace and Spacers Removal.	3-24a	
	b. Bracket Removal.	3-24b	
	c. Cleaning and Inspection.	3-24c	
	d. Bracket Installation.	3-24d	
	e. Brace and Spacers Installation.	3-24e	

ENGINE.

3-12. ENGINE OIL SERVICE.

THIS TASK COVERS

a. Draining Oil.
b. Oil Filter Element Replacement.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	None.	None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
Wrench, oil and fuel filter, spin-on
(15434) 3375049.

MATERIALS/PARTS (P/N)
Element, oil filter, spin-on
(15434) 299670.
Element, oil filter, spin-on
(15434) 3304232.
Container(s), 40 quart capacity.

PERSONNEL REQUIRED
One (MOS-63S).
One (MOS-64C).

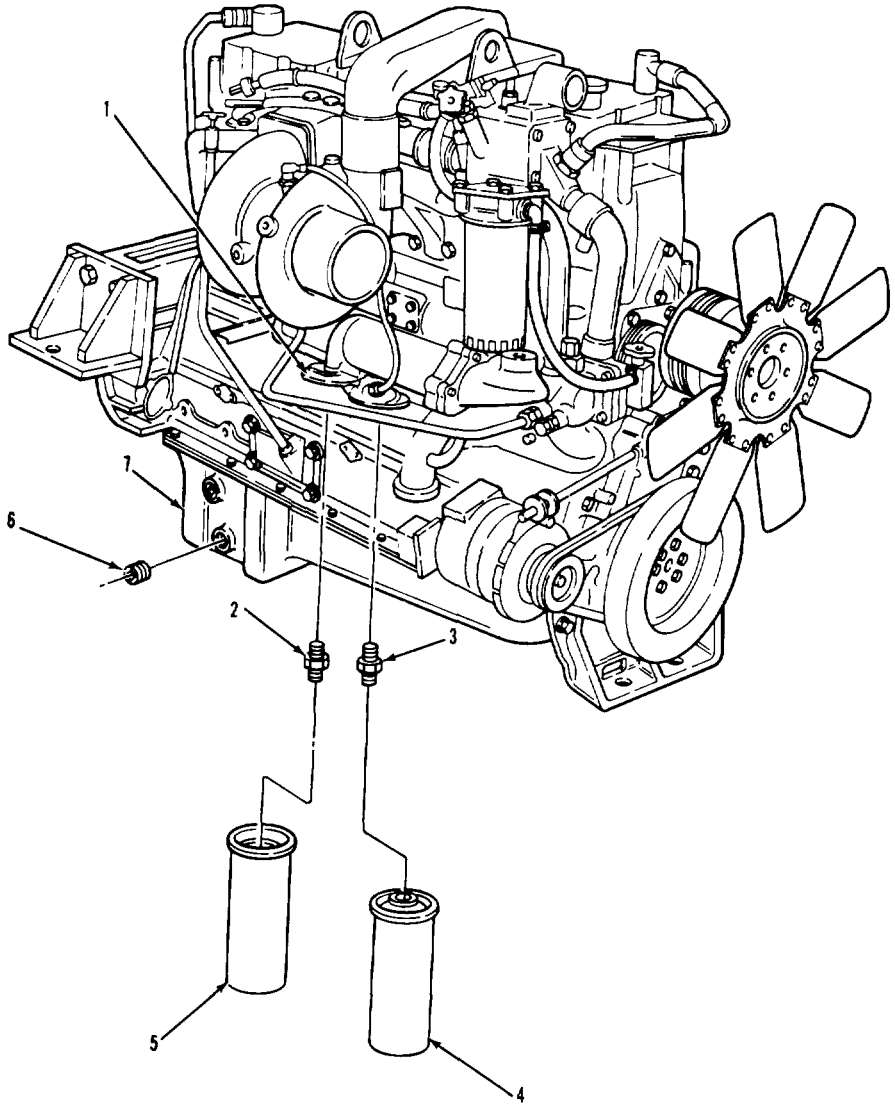
SPECIAL ENVIRONMENTAL CONDITIONS
None.

REFERENCES (TM)
TM 9-2320-283-10.
LO 9-2320-283-12.
TM 9-2320-283-20P.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

3-12. ENGINE OIL SERVICE (Continued).



LEGEND:

1. OIL COOLER ASSEMBLY
2. HEAD FILTER ADAPTER
3. FILTER HEAD ADAPTER
4. OIL FILTER SPIN-ON ELEMENT (FULL-FLOW)
5. OIL FILTER SPIN-ON ELEMENT (BYPASS)
6. OIL DRAIN PLUG
7. DRAIN PLUG WASHER
8. ENGINE OIL PAN ASSEMBLY

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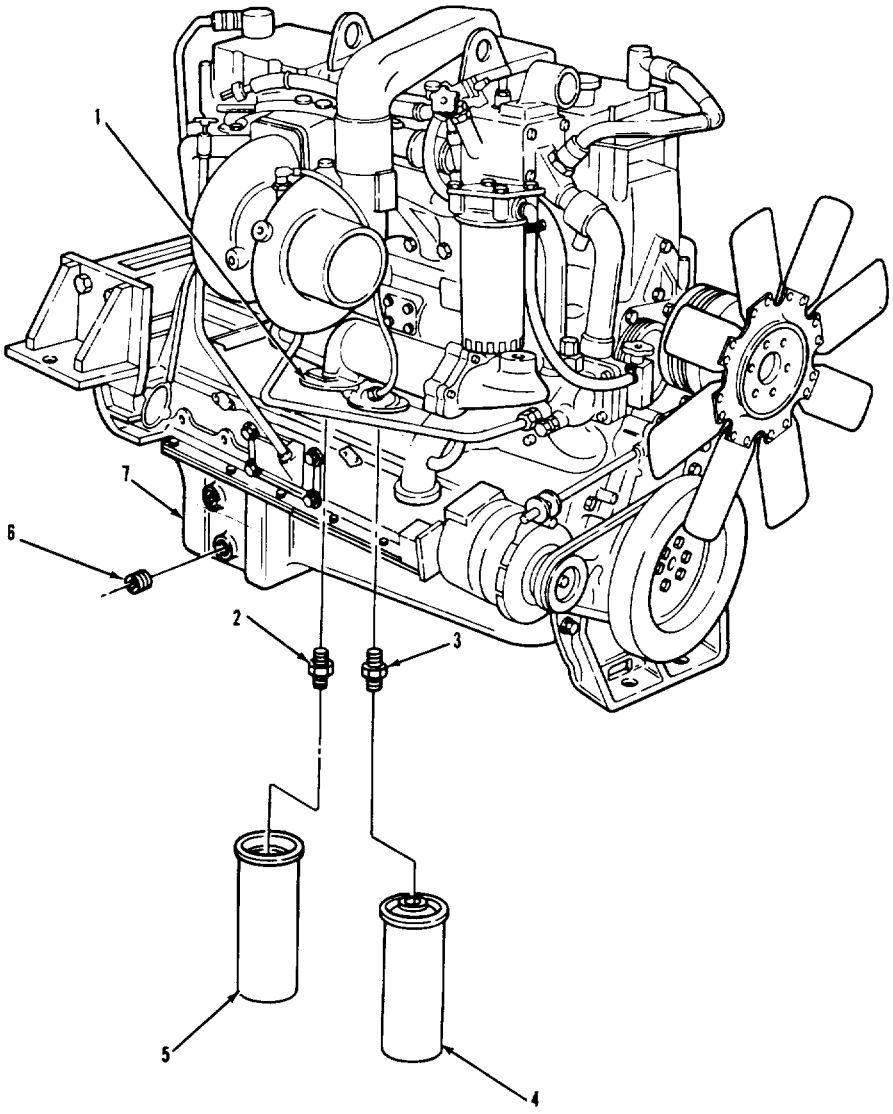
ENGINE.

3-12. ENGINE OIL SERVICE (Continued).

LOCATION/ITEM		ACTION	REMARKS
A.	**DRAINING OIL.**		
		NOTE • Have suitable container(s) ready to catch oil. • Engine should be warm.	
1.	Drain plug (6) and washer (7).	a. Remove from item (8).	Allow all oil to drain out.
		b. Inspect for metal chips.	If chips are found notify DS/GS maintenance.
		c. Install in item (8).	
B.	OIL FILTER ELEMENT REPLACEMENT.		
		NOTE Have a suitable container ready to catch any spilled oil.	
2.	Element (4) and element (5).	Remove from item (1) using spin-on filter wrench.	Discard item (4) and item (5).
3.	Adapter (3) and adapter (2).	a. Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
		b. Remove from item (1).	Only remove if damaged.
		c. Install in item (1).	

3-12. ENGINE OIL SERVICE (Continued).



LEGEND:

1. OIL COOLER ASSEMBLY
2. HEAD FILTER ADAPTER
3. FILTER HEAD ADAPTER
4. OIL FILTER SPIN-ON ELEMENT (FULL-FLOW)
5. OIL FILTER SPIN-ON ELEMENT (BYPASS)
6. OIL DRAIN PLUG
7. DRAIN PLUG WASHER
8. ENGINE OIL PAN ASSEMBLY

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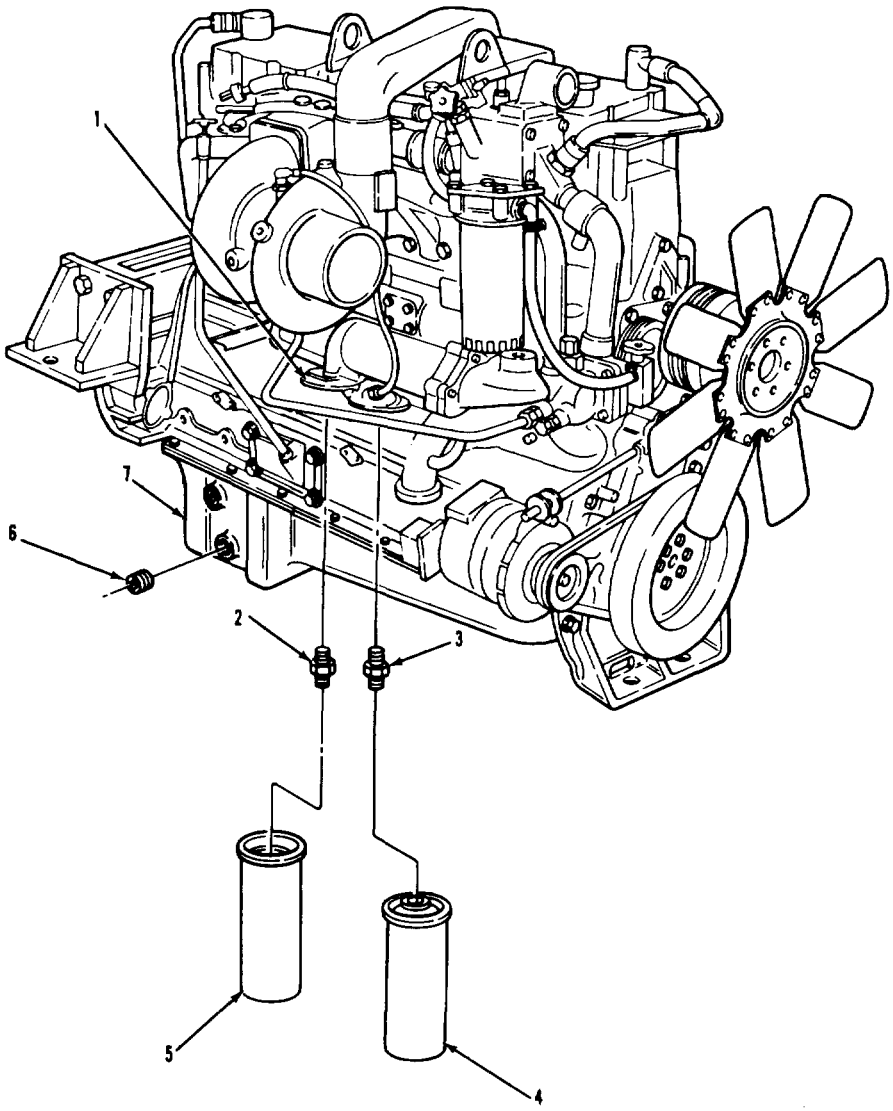
ENGINE.

3-12. ENGINE OIL SERVICE (Continued).

LOCATION/ITEM	ACTION	REMARKS
B. OIL FILTER ELEMENT REPLACEMENT (Continued).		
	NOTE Look at illustration to be sure elements are installed in correct location. The full-flow element has seven holes around the threaded hole for the adapter. The bypass element has only two holes in this area.	
4. New element (4) and new element (5).	a. Fill with proper oil and put oil on gaskets. b. Screw on item (2) and item (3) until gaskets touch item (1). c. Using spin-on filter wrench, tighten item (4) and item (5) one turn after gaskets contact item (1).	Refer to LO 9-2320-283-12.
5. Engine oil pan (8).	Fill with proper oil based on temperature range.	Refer to LO 9-2320-283-12.
6. Engine.	a. Start up and check for leaks; retighten as necessary. b. Shut down and check dip-stick for correct oil level.	Refer to TM 9-2320-283-10.
	NOTE Follow-on maintenance action required: None.	

ENGINE.

3-12. ENGINE OIL SERVICE (Continued).



LEGEND:

1. OIL COOLER ASSEMBLY
2. HEAD FILTER ADAPTER
3. FILTER HEAD ADAPTER
4. OIL FILTER SPIN-ON ELEMENT (FULL-FLOW)
5. OIL FILTER SPIN-ON ELEMENT (BYPASS)
6. OIL DRAIN PLUG
7. DRAIN PLUG WASHER
8. ENGINE OIL PAN ASSEMBLY

ENGINE.

3-13. ROCKER COVER AND GASKET REPLACEMENT

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All

TEST EQUIPMENT
None

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Gasket, rocker cover
(15434) 3016453.

PERSONNEL REQUIRED
One (MOS-63S).

REFERENCES (TM)
TM 9-2320-283-20P.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

EQUIPMENT CONDITION

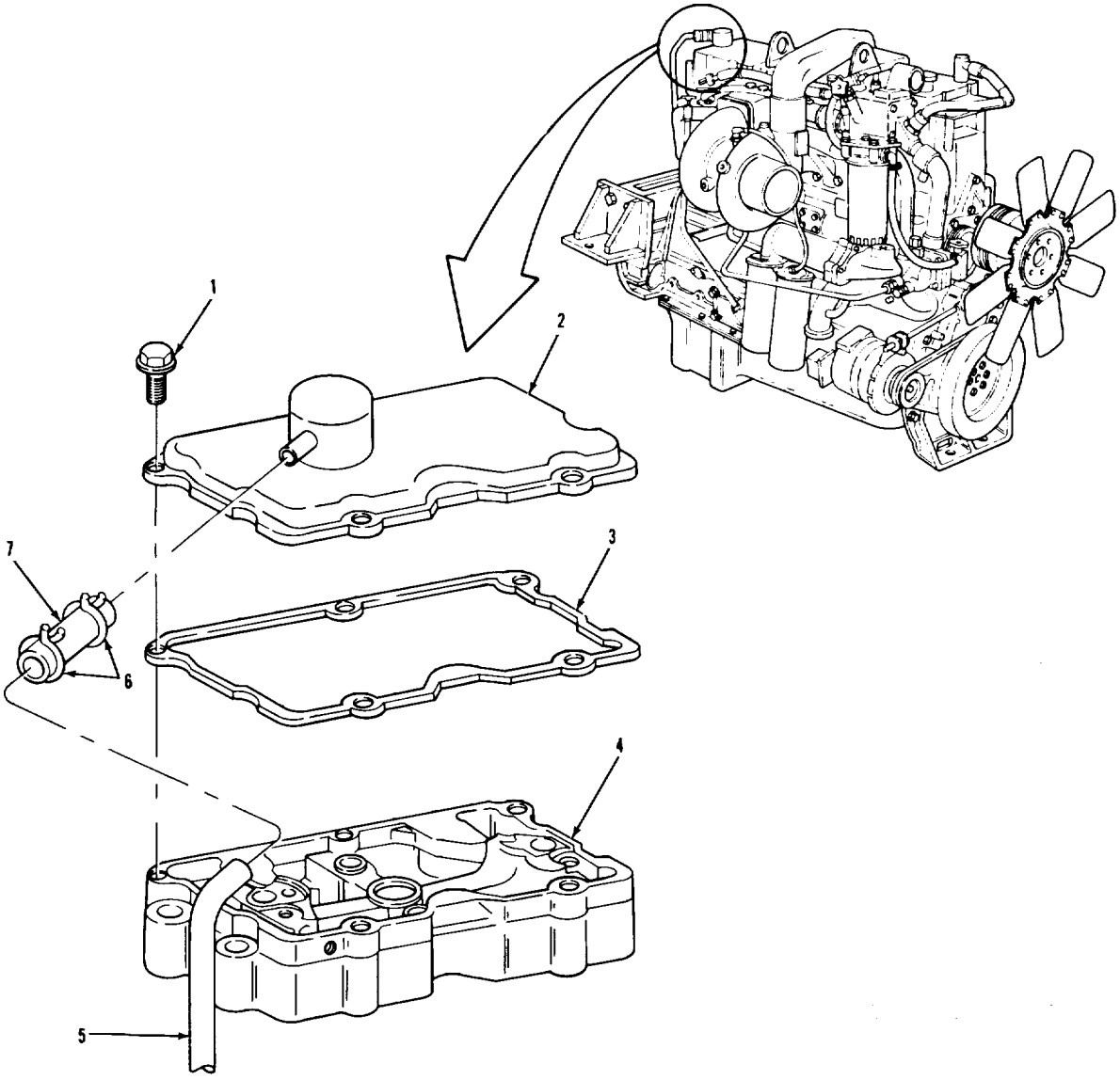
PARAGRAPH	CONDITION DESCRIPTIONS
Front cover and gasket:	
3-14	Rocker cover filler cap removed.
Center cover and gasket:	
3-31.	Turbocharger air crossover connection removed.
Rear cover and gasket:	
None.	None.

SPECIAL ENVIRONMENT CONDITIONS
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

ENGINE.

3-13. ROCKER COVER AND GASKET REPLACEMENT (Continued).



LEGEND:

1. CAPTIVE WASHER SCREW (5)
2. REAR ROCKER COVER
3. ROCKER COVER GASKET
4. ENGINE BRAKE RETARDER
5. BREATHER TUBE
6. HOSE CLAMP (2)
7. BREATHER HOSE

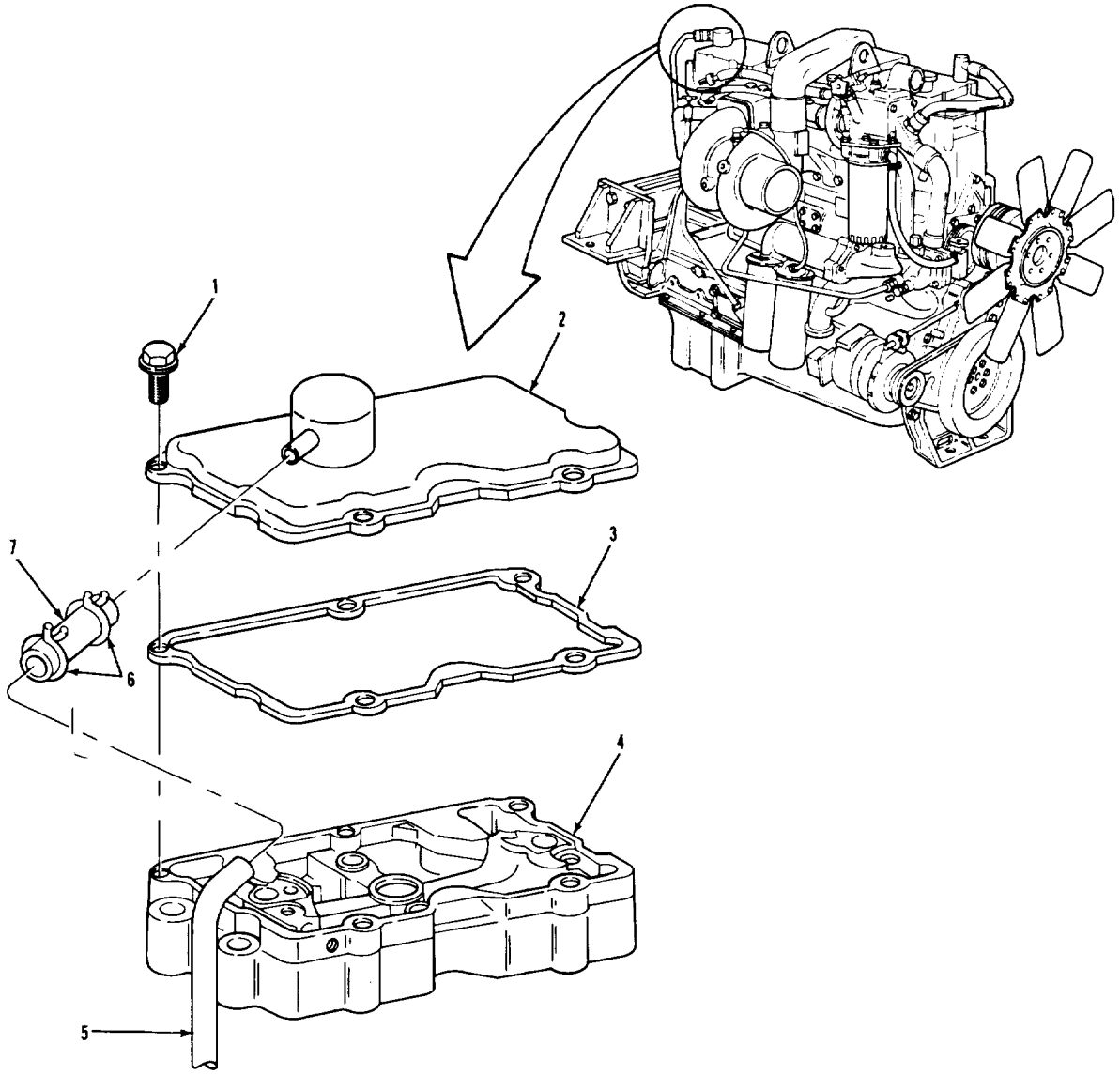
ENGINE.

3-13. ROCKER COVER AND GASKET REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
	NOTE Replacement is similar for any of the three rocker covers. Rear cover replacement is shown here.	
A. REMOVAL.		
1. Hose (7) and two clamps (6).	Remove from item (2) and item (5).	
2. Five screws (1).	Remove from item (2).	
3. Cover (2) and gasket (3).	Remove from item (4).	Discard item (3).
B. CLEANING AND INSPECTION.		
4. All parts.	Clean and inspect.	a. Refer to paragraphs 3-4 and 3-5. b. Be sure all of old gasket is scraped off.
C. INSTALLATION.		
5. Cover (2) and new gasket (3).	Put on item (4).	
6. Five screws (1).	Secure item (2) and item (3) to item (4).	
7. Hose (7) and two clamps (6).	Install on item (5) and item (2).	

ENGINE.

3-13. ROCKER COVER AND GASKET REPLACEMENT (Continued).



LEGEND:

1. CAPTIVE WASHER SCREW (5)
2. REAR ROCKER COVER
3. ROCKER COVER GASKET
4. ENGINE BRAKE RETARDER
5. BREATHER TUBE
6. HOSE CLAMP (2)
7. BREATHER HOSE

ENGINE.

3-13. ROCKER COVER AND GASKET REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		

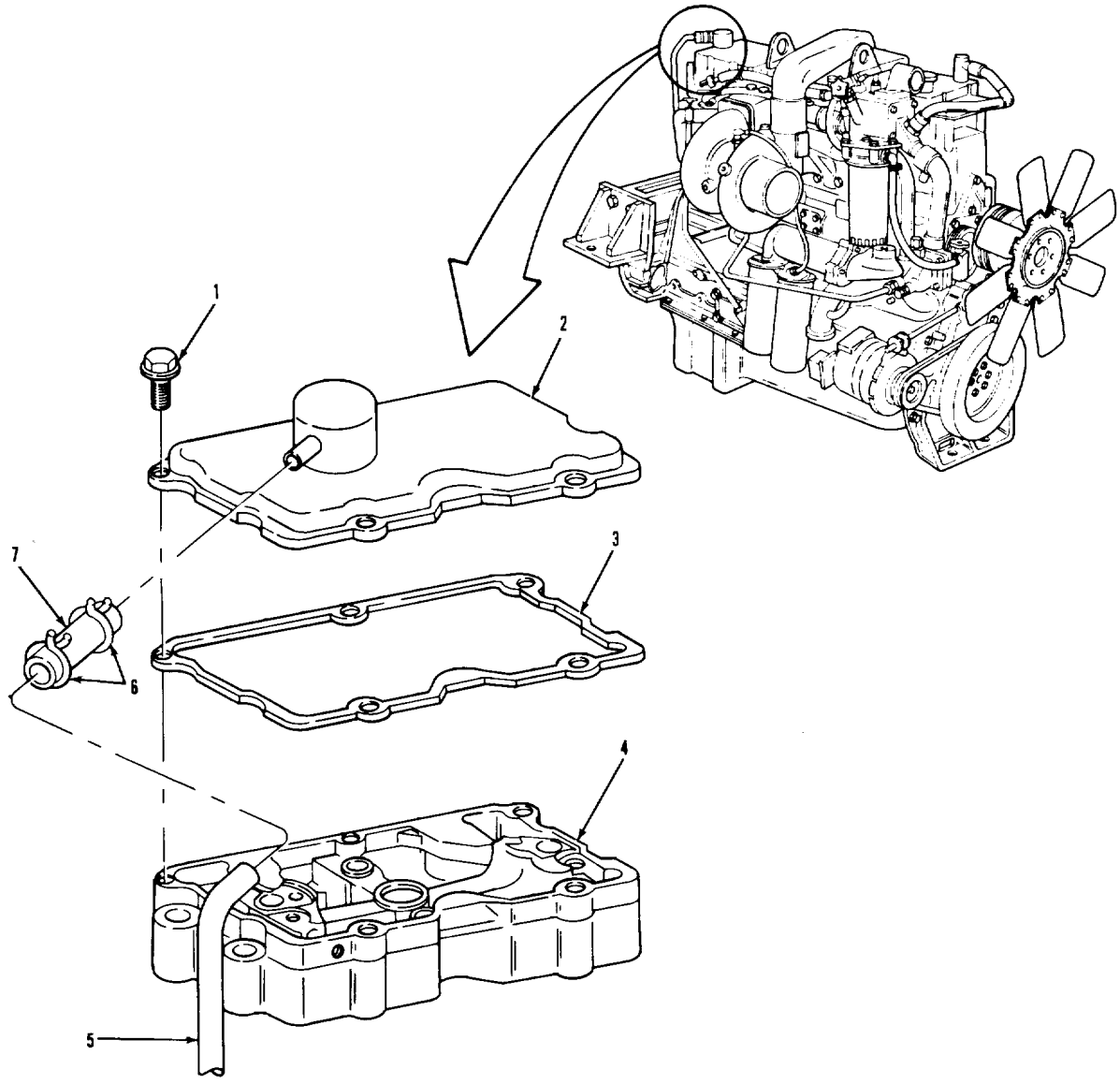
NOTE

Follow-on maintenance action required:

Front cover and gasket:
Install rocker cover filler cap (para 3-14).
Center cover and gasket:
Install turbocharger air cross-over connection (para 3-31).
Rear cover and gasket:
None.

ENGINE.

3-13. ROCKER COVER AND GASKET REPLACEMENT (Continued).



LEGEND:

1. CAPTIVE WASHER SCREW (5)
2. REAR ROCKER COVER
3. ROCKER COVER GASKET
4. ENGINE BRAKE RETARDER
5. BREATHER TUBE
6. HOSE CLAMP (2)
7. BREATHER HOSE

ENGINE.

3-14. ROCKER COVER FILLER CAP REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
None.

CONDITION DESCRIPTION
None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
None.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

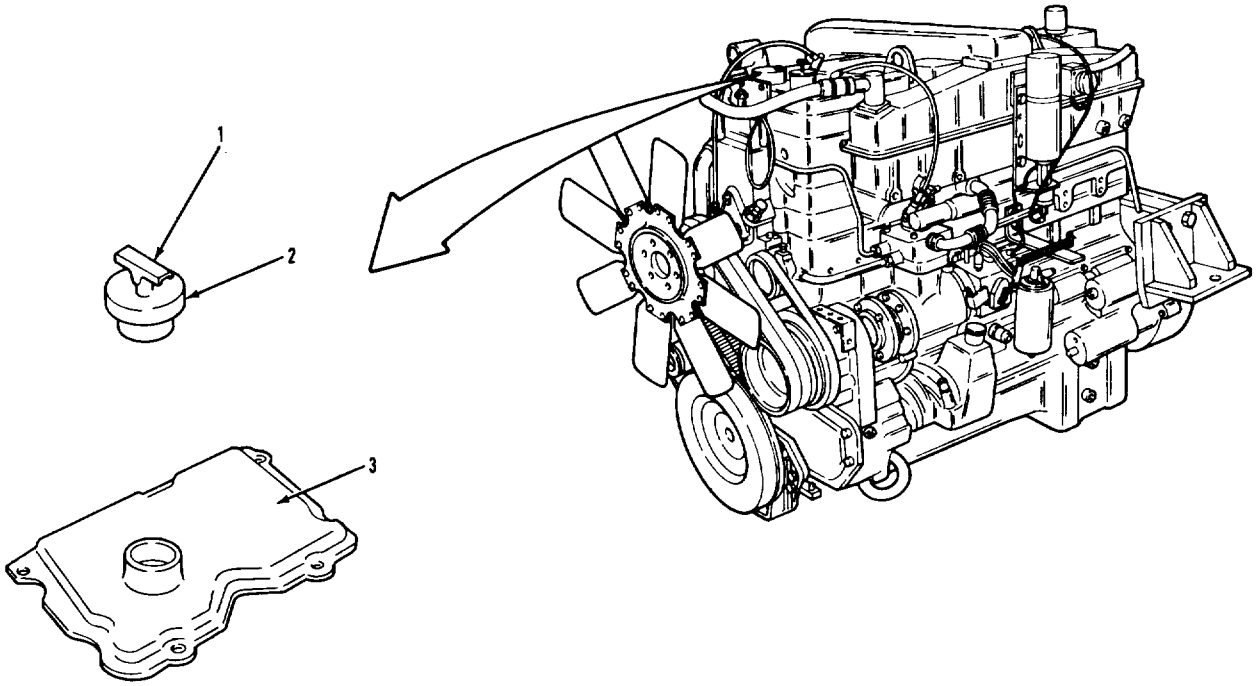
REFERENCES (TM)
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
None.

ENGINE.

3-14. ROCKER COVER FILLER CAP REPLACEMENT (Continued).



LEGEND:
1. LOCK SCREW
2. FILLER CAP
3. FRONT ROCKER COVER

ENGINE.

3-14. ROCKER COVER FILLER CAP REPLACEMENT (Continued).

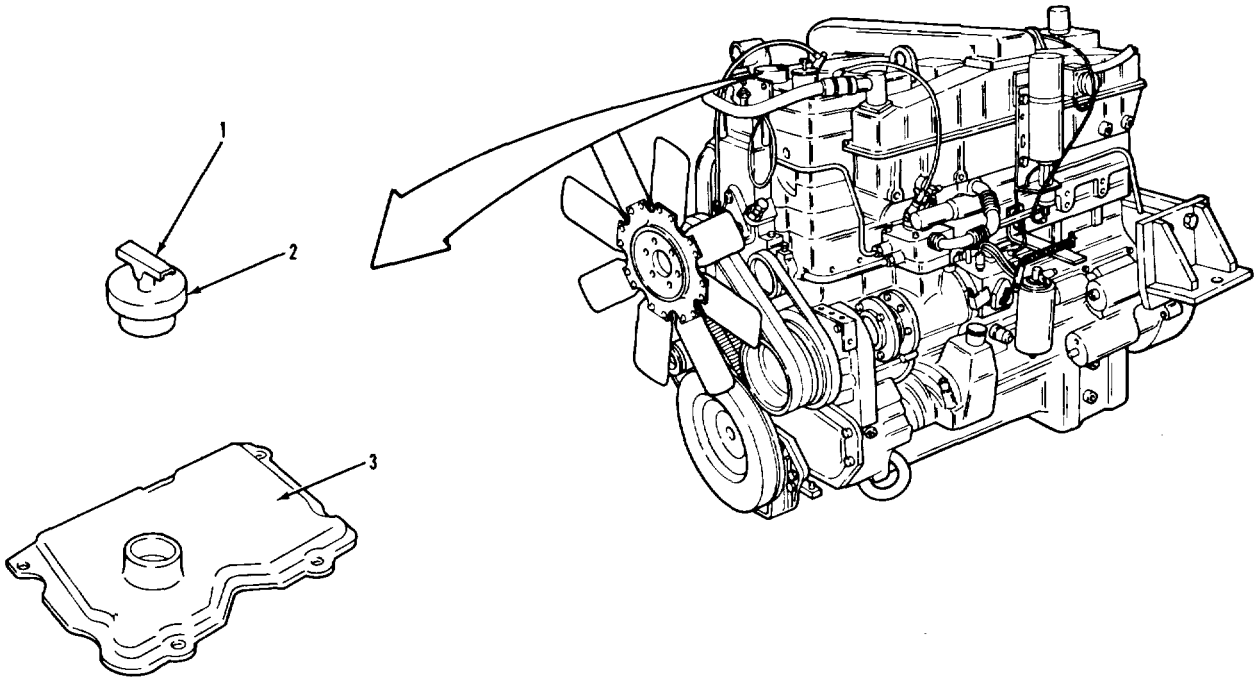
LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Lock screw (1).	Loosen.	
2. Cap (2).	Remove from item (4).	
B. CLEANING AND INSPECTION.		
3. All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
C. INSTALLATION.		
4. Cap (2).	Place in item (4).	
5. Lock screw (1).	Tighten.	Finger tight only.

NOTE

Follow-on maintenance action required:
None.

ENGINE.

3-14. ROCKER COVER FILLER CAP REPLACEMENT (Continued).



LEGEND:
1. LOCK SCREW
2. FILLER CAP
3. FRONT ROCKER COVER

ENGINE.

3-15. BREATHER TUBES AND HOSES REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
None.

CONDITION DESCRIPTION
None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
None.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

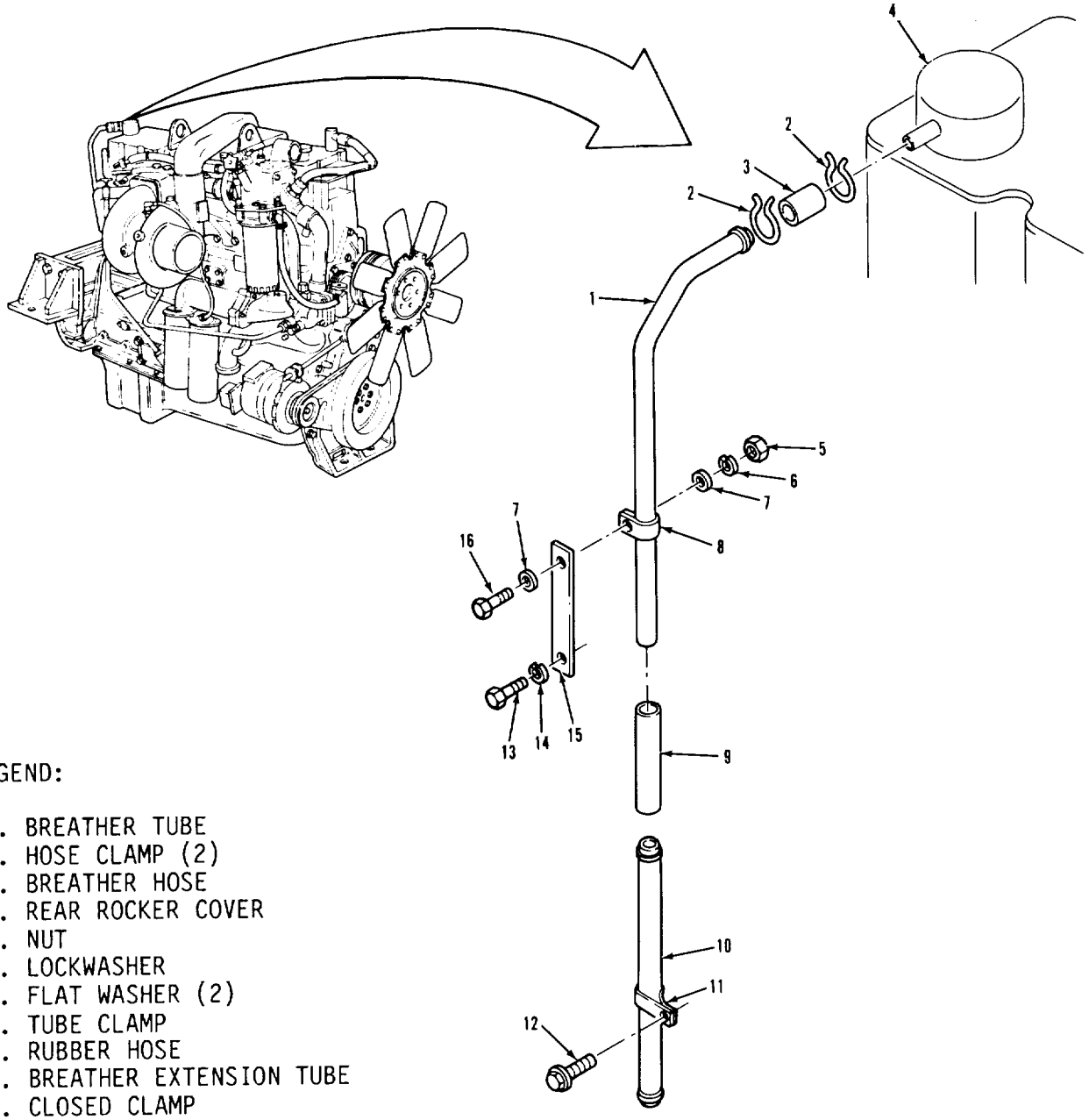
REFERENCES (TM)
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

ENGINE.

3-15. BREATHER TUBES AND HOSES REPLACEMENT (Continued).



LEGEND:

1. BREATHER TUBE
2. HOSE CLAMP (2)
3. BREATHER HOSE
4. REAR ROCKER COVER
5. NUT
6. LOCKWASHER
7. FLAT WASHER (2)
8. TUBE CLAMP
9. RUBBER HOSE
10. BREATHER EXTENSION TUBE
11. CLOSED CLAMP
12. SELF-TAPPING SCREW
13. SCREW
14. LOCKWASHER
15. CROSSOVER BRACE
16. SCREW

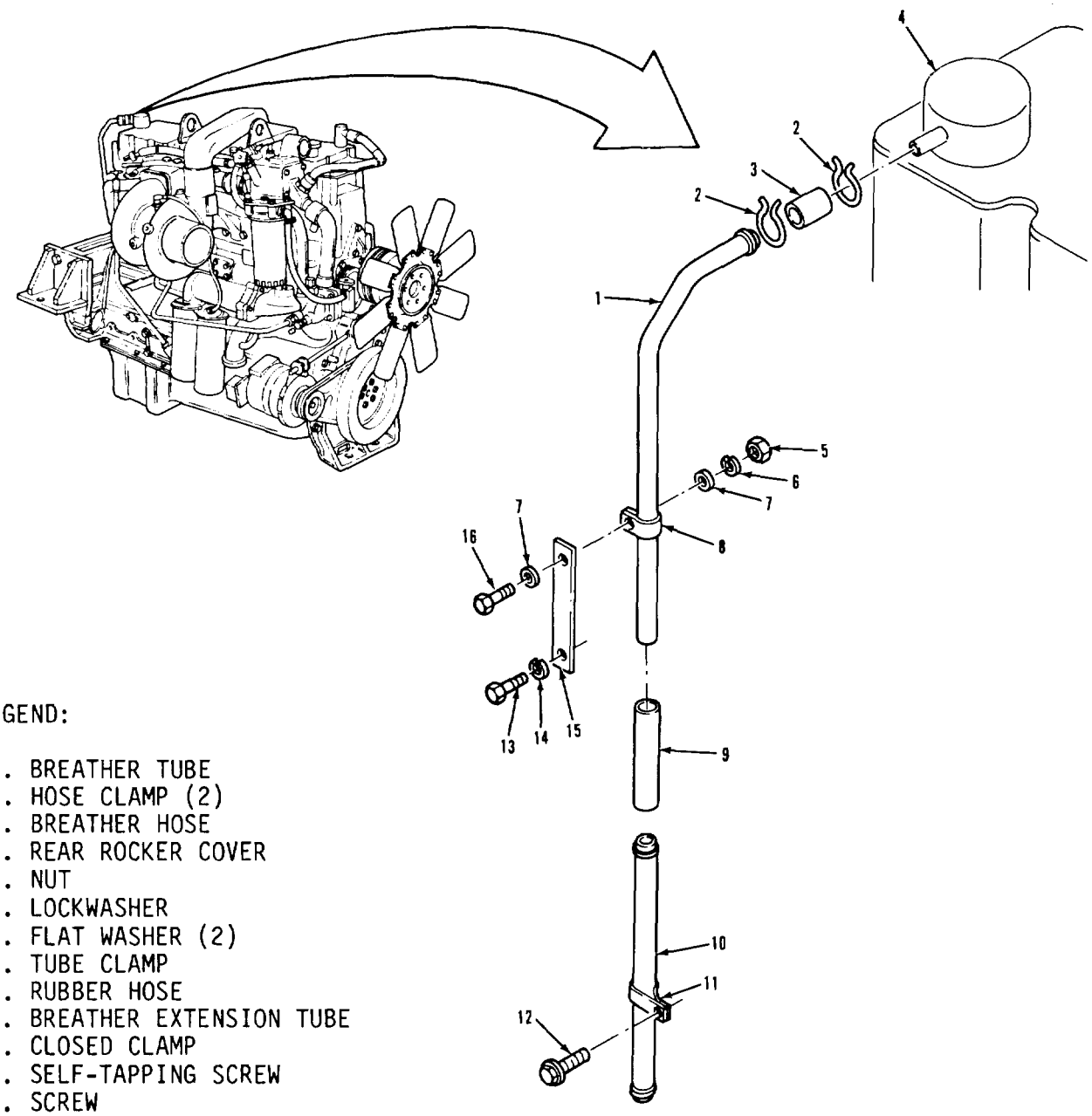
ENGINE.

3-15. BREATHER TUBES AND HOSES REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Two clamps (2).	Squeeze and slide from item (3) to item (1).	
2. Hose (3).	Pull from item (4).	
3. Screw (13) and lockwasher (14).	Remove from item (15).	
4. Screw (12).	Remove from item (11).	
5. Tube (1), hose (3), tube (10), and hose (9).	Remove.	Access from under vehicle.
6. Screw (16), two washers (7), lockwasher (6), and nut (5).	Remove from item (15) and item (8).	
7. Hose (3).	Remove from item (1).	
8. Hose (9).	Remove from item (1) and item (10).	
9. Clamp (11), clamp (8), and two clamps (2).	Remove from item (1) and item (10).	

ENGINE.

3-15. BREATHER TUBES AND HOSES REPLACEMENT (Continued).



LEGEND:

1. BREATHER TUBE
2. HOSE CLAMP (2)
3. BREATHER HOSE
4. REAR ROCKER COVER
5. NUT
6. LOCKWASHER
7. FLAT WASHER (2)
8. TUBE CLAMP
9. RUBBER HOSE
10. BREATHER EXTENSION TUBE
11. CLOSED CLAMP
12. SELF-TAPPING SCREW
13. SCREW
14. LOCKWASHER
15. CROSSOVER BRACE
16. SCREW

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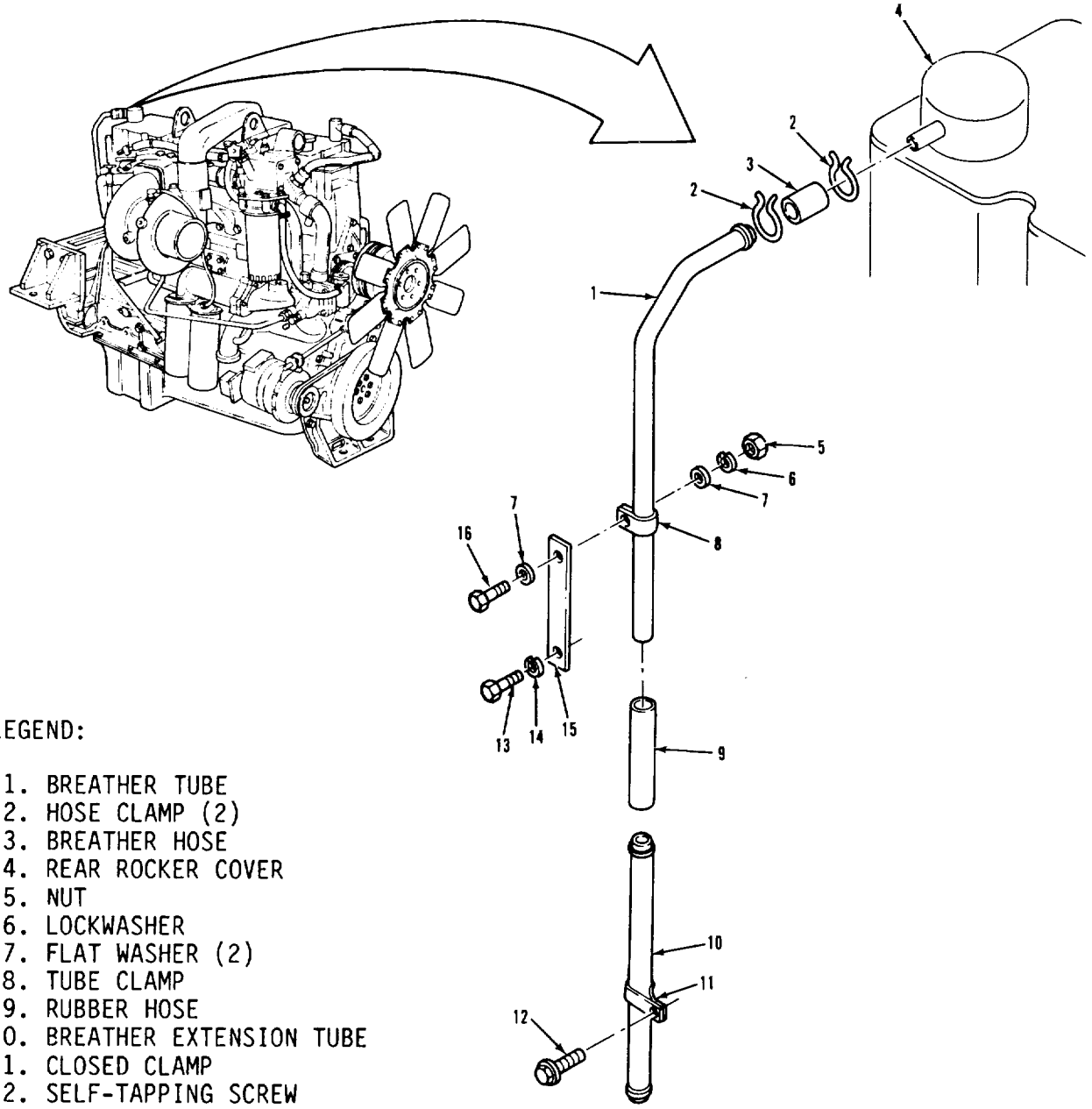
ENGINE.

3-15. BREATHER TUBES AND HOSES REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
B. CLEANING AND INSPECTION.		
10. All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
C. INSTALLATION.		
11. Clamp (11), clamp (8), and two clamps (2).	Put on item (1) and item (10).	
12. Hose (9).	Install on item (1) and item (10).	
13. Hose (3).	Install on item (1).	
14. Screw (16), two washers (7), lockwasher (6), and nut (5).	Install item (15) on item (8).	Do not tighten.
15. Hose (3), tube (1), hose (9), and tube (10).	Put in place on engine.	
16. Hose (3).	Install on item (4).	
17. Two clamps (2). (4) and item (1).	Secure item (3) to item	

ENGINE.

3-15. BREATHER TUBES AND HOSES REPLACEMENT (Continued).



LEGEND:

1. BREATHER TUBE
2. HOSE CLAMP (2)
3. BREATHER HOSE
4. REAR ROCKER COVER
5. NUT
6. LOCKWASHER
7. FLAT WASHER (2)
8. TUBE CLAMP
9. RUBBER HOSE
10. BREATHER EXTENSION TUBE
11. CLOSED CLAMP
12. SELF-TAPPING SCREW
13. SCREW
14. LOCKWASHER
15. CROSSOVER BRACE
16. SCREW

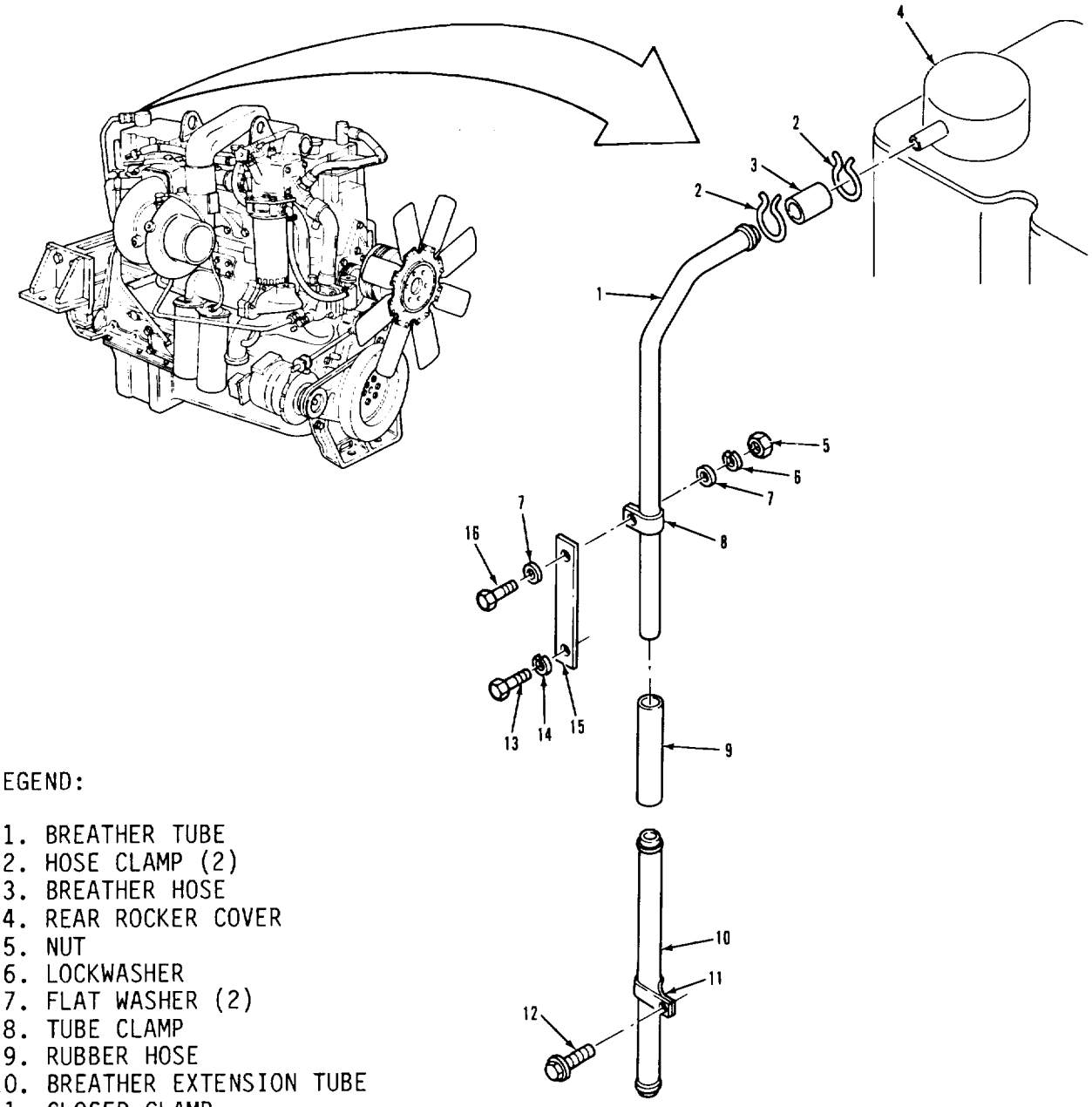
ENGINE.

3-15. BREATHER TUBES AND HOSES REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
18. Screw (13) and lockwasher (14).	Secure item (15) to engine.	
19. Screw (16) and nut (5).	Tighten.	
20. Screw (12).	Secure item (11) to engine.	
	NOTE Follow-on maintenance action required: None.	

ENGINE.

3-15. BREATHER TUBES AND HOSES REPLACEMENT (Continued).



LEGEND:

1. BREATHER TUBE
2. HOSE CLAMP (2)
3. BREATHER HOSE
4. REAR ROCKER COVER
5. NUT
6. LOCKWASHER
7. FLAT WASHER (2)
8. TUBE CLAMP
9. RUBBER HOSE
10. BREATHER EXTENSION TUBE
11. CLOSED CLAMP
12. SELF-TAPPING SCREW
13. SCREW
14. LOCKWASHER
15. CROSSOVER BRACE
16. SCREW

ENGINE.

3-16. OIL LEVEL DIPSTICK REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
None.

CONDITION DESCRIPTION
None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
None.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

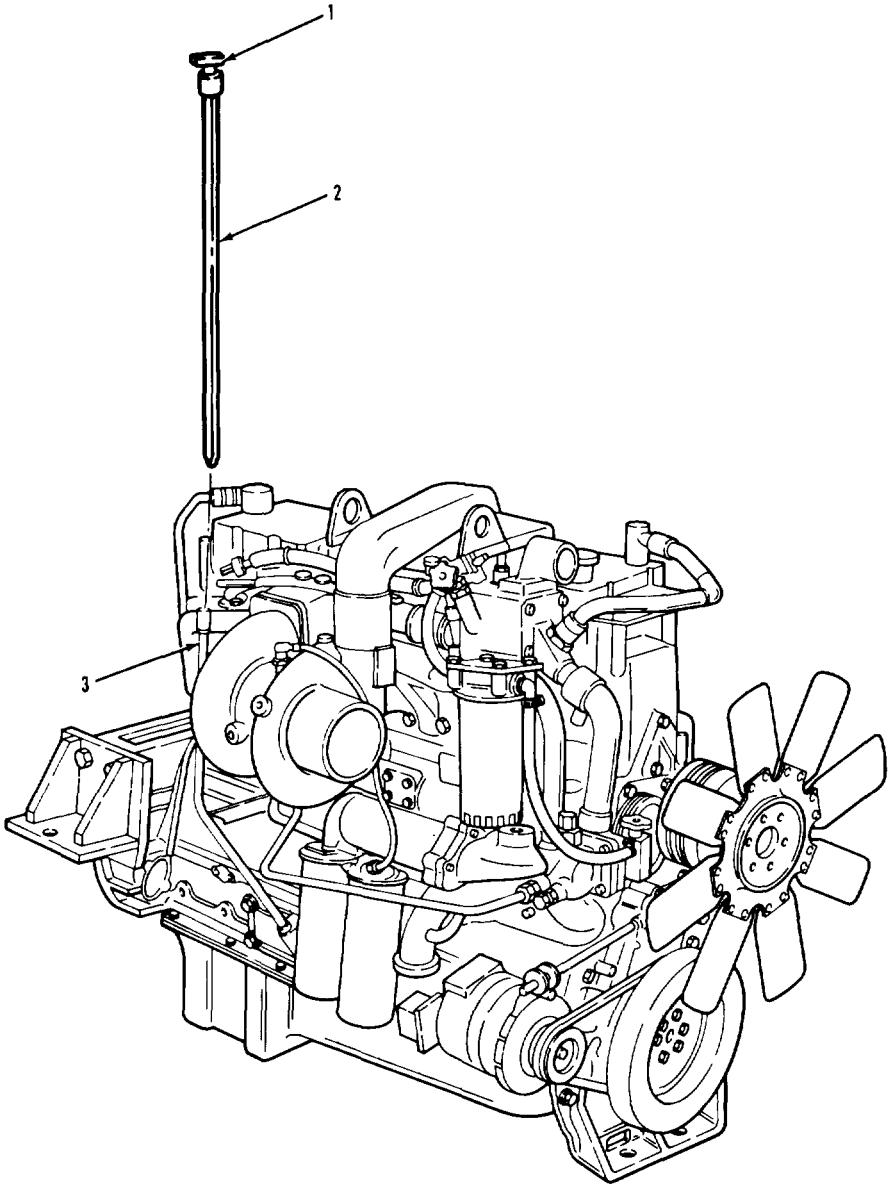
REFERENCES (TM)
None.
Transmission in neutral.
Park brake set.

GENERAL SAFETY INSTRUCTIONS
Engine off.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

ENGINE.

3-16. OIL LEVEL DIPSTICK REPLACEMENT (Continued).



LEGEND:
1. LOCK SCREW
2. OIL LEVEL DIPSTICK
3. OIL LEVEL DIPSTICK TUBE

ENGINE.

3-16. OIL LEVEL DIPSTICK REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Lock screw (1).	Loosen.	
2. Dipstick (2).	Remove from item (3).	
B. CLEANING AND INSPECTION.		
3. Dipstick (2).	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
C. INSTALLATION.		
4. Dipstick (2).	Install in item (3).	
5. Lock screw (1).	Tighten.	Finger tight only.

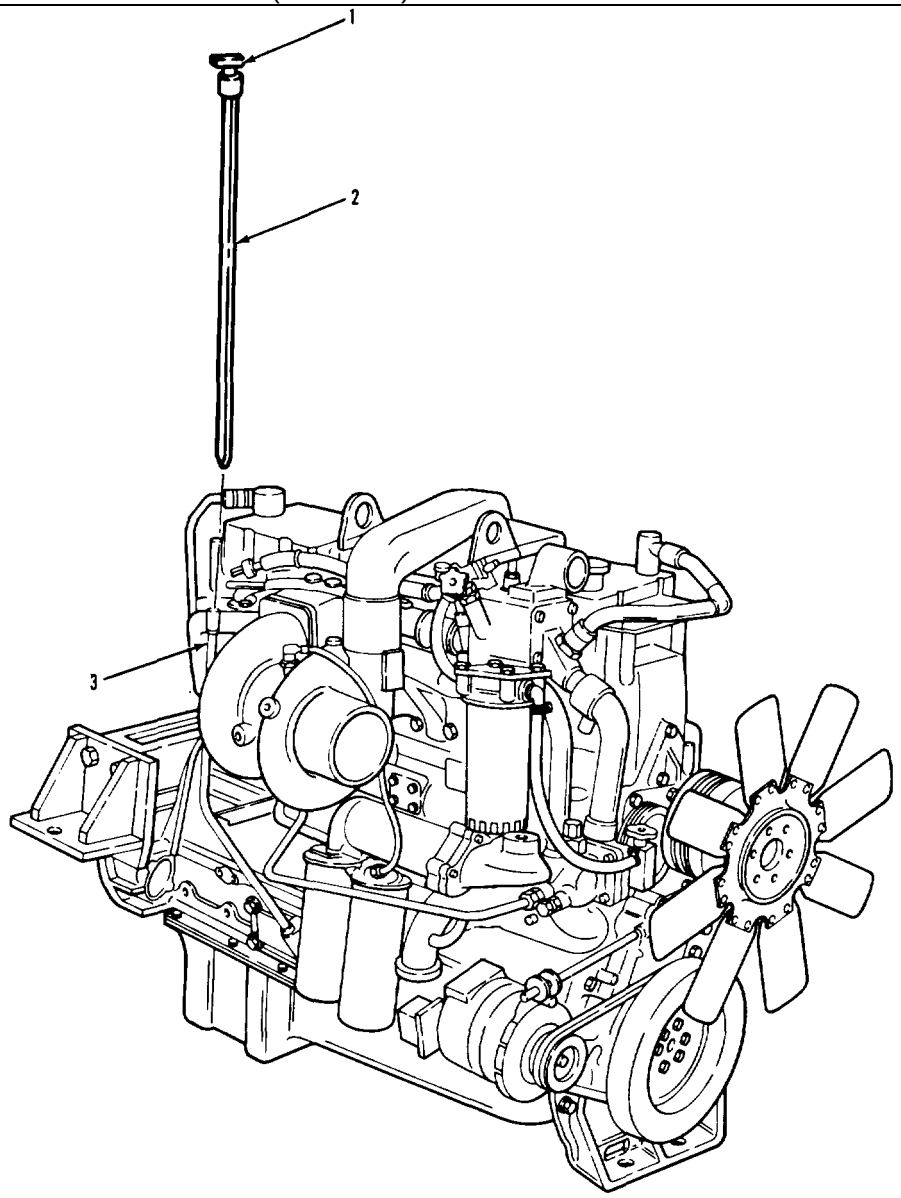
NOTE

Follow-on maintenance action required:

None.

ENGINE.

3-16. OIL LEVEL DIPSTICK REPLACEMENT (Continued).



LEGEND:
1. LOCK SCREW
2. OIL LEVEL DIPSTICK
3. OIL LEVEL DIPSTICK TUBE

ENGINE.

3-17. OIL LEVEL DIPSTICK TUBE BRACE AND CLAMP REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
None.

CONDITION DESCRIPTION
None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
None.

PERSONNEL REQUIRED
One (MOS-63S5.

SPECIAL ENVIRONMENTAL CONDITIONS
None.

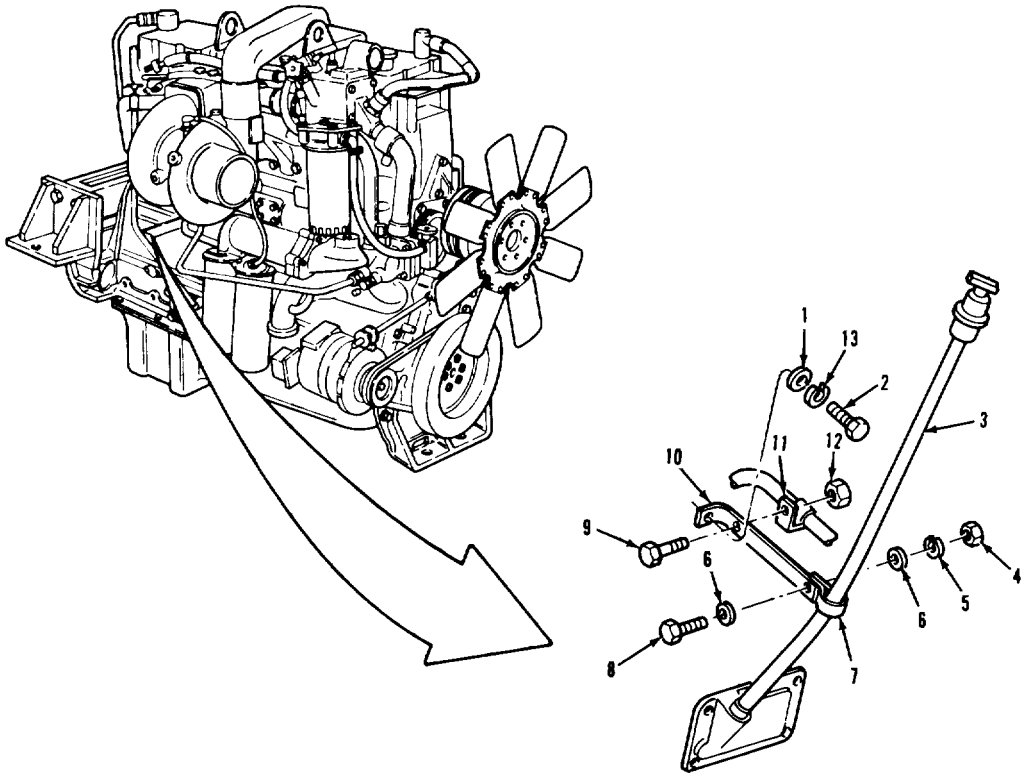
REFERENCES (TM)
None.
Transmission in neutral.
Park brake set.

GENERAL SAFETY INSTRUCTIONS
Engine off.

TROUBLESHOOTING REFERENCES
None.

ENGINE.

3-17. OIL LEVEL DIPSTICK TUBE BRACE AND CLAMP REPLACEMENT (Continued).



LEGEND:

1. WASHER
2. SCREW
3. OIL LEVEL DIPSTICK TUBE
4. NUT
5. LOCKWASHER
6. FLAT WASHER (2)
7. CLAMP
7. CLAMP
8. SCREW
9. SCREW
10. TUBE BRACE
11. COOLANT RETURN HOSE BRACKET
12. NUT
13. LOCKWASHER

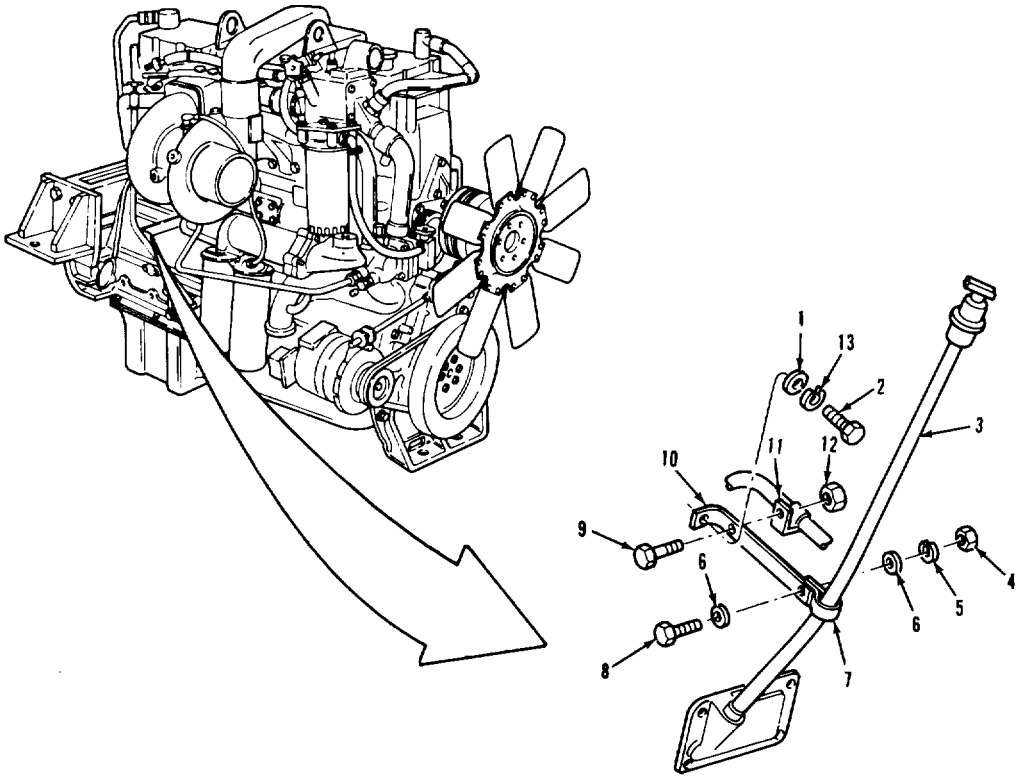
ENGINE.

3-17. OIL LEVEL DIPSTICK TUBE BRACE AND CLAMP REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Screw (8), two washers (6), lock-washer (5), and nut (4).	Remove from item (10) and item (7).	
2. Clamp (7).	Remove from item (3).	
3. Screw (9) and nut (12).	Remove from item (10) and item (11).	
4. Screw (2), lock-washer (13), and washer (1).	Remove from item (10).	
B. CLEANING AND INSPECTION.		
5. All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
C. INSTALLATION.		
6. Screw (2), lock-washer (13), and washer (1).	Secure item (10) to engine.	
7. Screw (9) and nut (12).	Secure item (11) to item (10).	

ENGINE.

3-17. OIL LEVEL DIPSTICK TUBE BRACE AND CLAMP REPLACEMENT (Continued).



LEGEND:

1. WASHER
2. SCREW
3. OIL LEVEL DIPSTICK TUBE
4. NUT
5. LOCKWASHER
6. FLAT WASHER (2)
7. CLAMP
8. SCREW
9. SCREW
10. TUBE BRACE
11. COOLANT RETURN HOSE BRACKET
12. NUT
13. LOCKWASHER

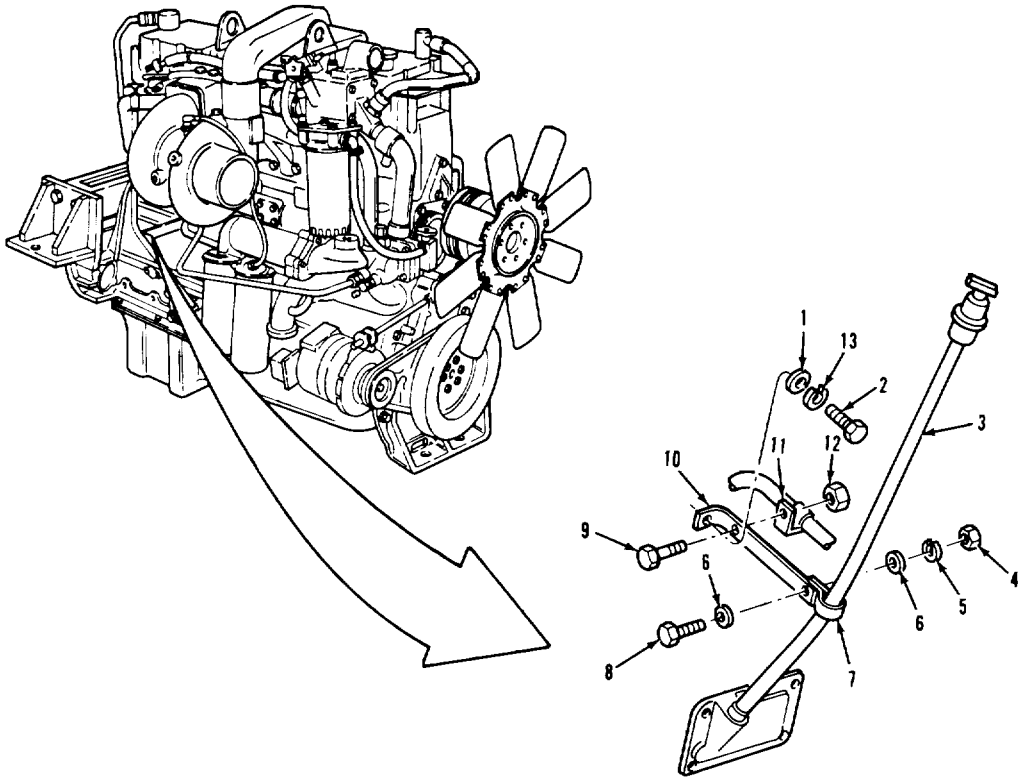
ENGINE.

3-17. OIL LEVEL DIPSTICK TUBE BRACE AND CLAMP REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
8. Clamp (7).	Install on item (3).	
9. Screw (8), two washers (6), lockwasher (5), and nut (4).	Secure item (7) to item (10).	
	NOTE Follow-on maintenance action required: None.	

ENGINE.

3-17. OIL LEVEL DIPSTICK TUBE BRACE AND CLAMP REPLACEMENT (Continued).



LEGEND:

1. WASHER
2. SCREW
3. OIL LEVEL DIPSTICK TUBE
4. NUT
5. LOCKWASHER
6. FLAT WASHER (2)
7. CLAMP
8. SCREW
9. SCREW
10. TUBE BRACE
11. COOLANT RETURN HOSE BRACKET
12. NUT
13. LOCKWASHER

ENGINE.

3-18. AIR COMPRESSOR COOLING TUBES REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	3-52.	Coolant drained.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Tape, thread sealing
Item 32, Appendix C.
Grommet (4)
(15434) S-1003-A.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

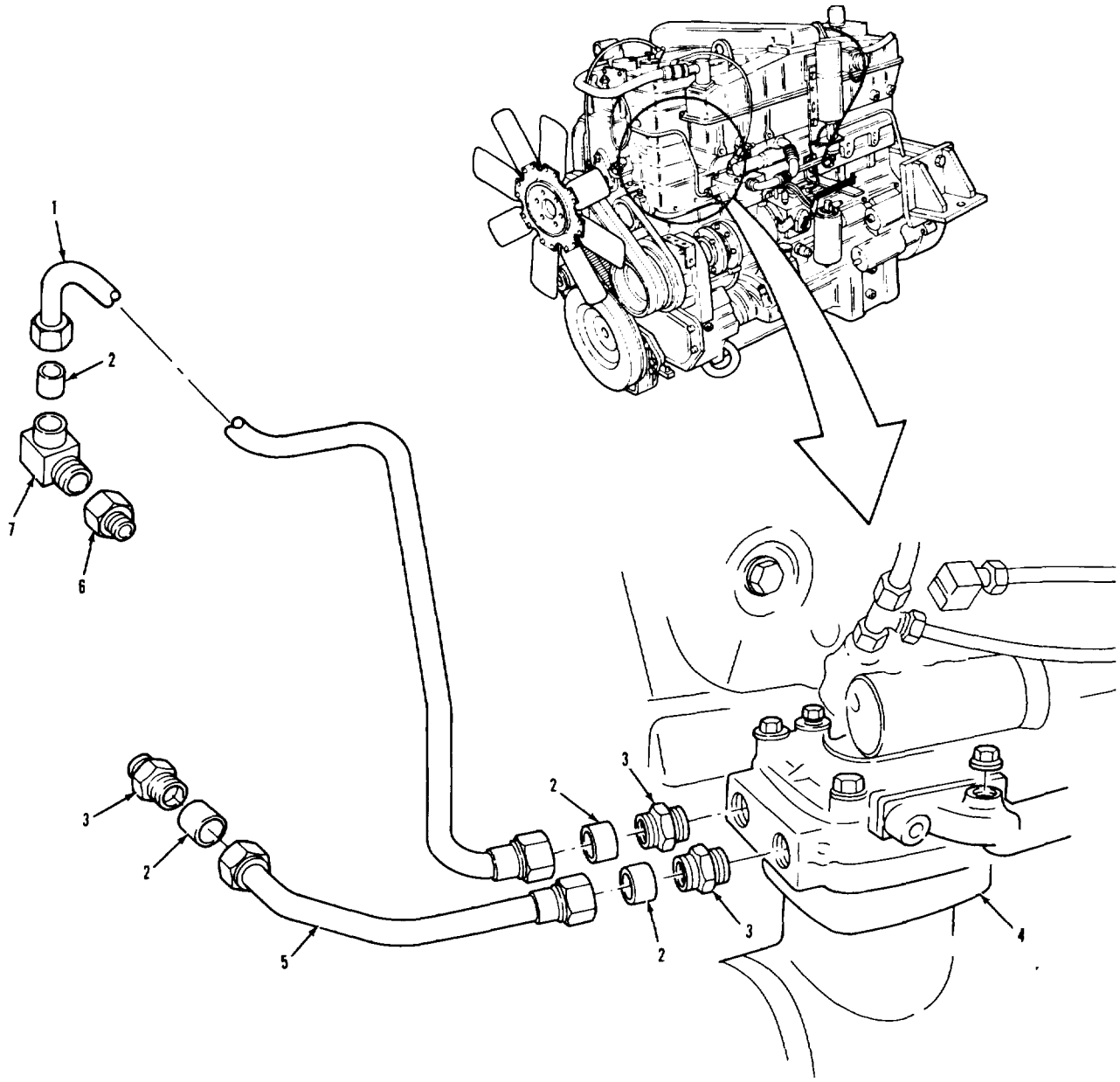
REFERENCES (TM)
TM 9-2320-283-10.
TM 9-2320-283-20P.
Park brake set.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

ENGINE.

3-18. AIR COMPRESSOR COOLING TUBES REPLACEMENT (Continued).



1. COMPRESSOR COOLING WATER TUBE
2. GROMMET (4)
3. NIPPLE (3)
4. AIR COMPRESSOR
5. COMPRESSOR COOLING WATER TUBE
6. PLAIN STRAIGHT ADAPTER
7. MALE ELBOW ADAPTER

TA 237011

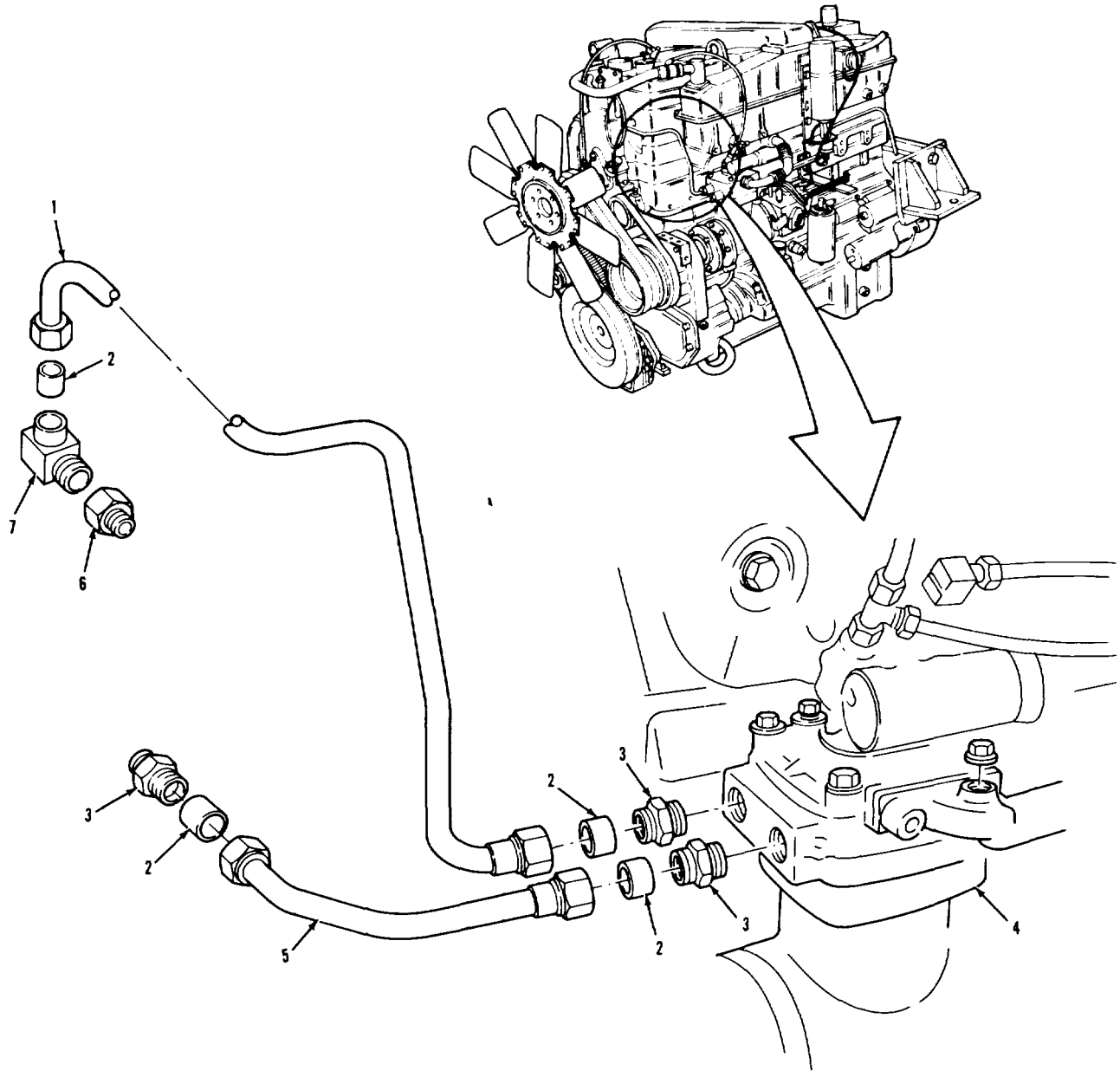
ENGINE.

3-18. AIR COMPRESSOR COOLING TUBES REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
	NOTE	
	*	To replace adapter (7) and adapter (6), refer to paragraph 3-58 (Water Bypass Tube Replacement).
	*	It may be necessary to loosen idler pulley for clearance.(Refer to para 3-63).
A. REMOVAL.		
1. Tube (5) and two grommets (2).	Remove from two items (3).	Discard two items (2).
2. Tube (1) and two grommets (2).	Remove from item (3) and item (7).	Discard two items (2).
3. Three nipples (3).	Remove from item (4) and engine.	
B. CLEANING AND INSPECTION.		
4. All parts.	Clean and inspect.	Refer to paragraph 3-4
C. INSTALLATION.		
5. Three nipples (3).	Install in item (4) and engine.	Put thread sealing tape on pipe threads.
6. Tube (1) and two new grommets (2).	Install on item (7) and item (3).	
7. Tube (5) and two new grommets (2).	Install on two items (3).	

ENGINE.

3-18. AIR COMPRESSOR COOLING TUBES REPLACEMENT (Continued).



1. COMPRESSOR COOLING WATER TUBE
2. GROMMET (4)
3. NIPPLE (3)
4. AIR COMPRESSOR
5. COMPRESSOR COOLING WATER TUBE
6. PLAIN STRAIGHT ADAPTER
7. MALE ELBOW ADAPTER

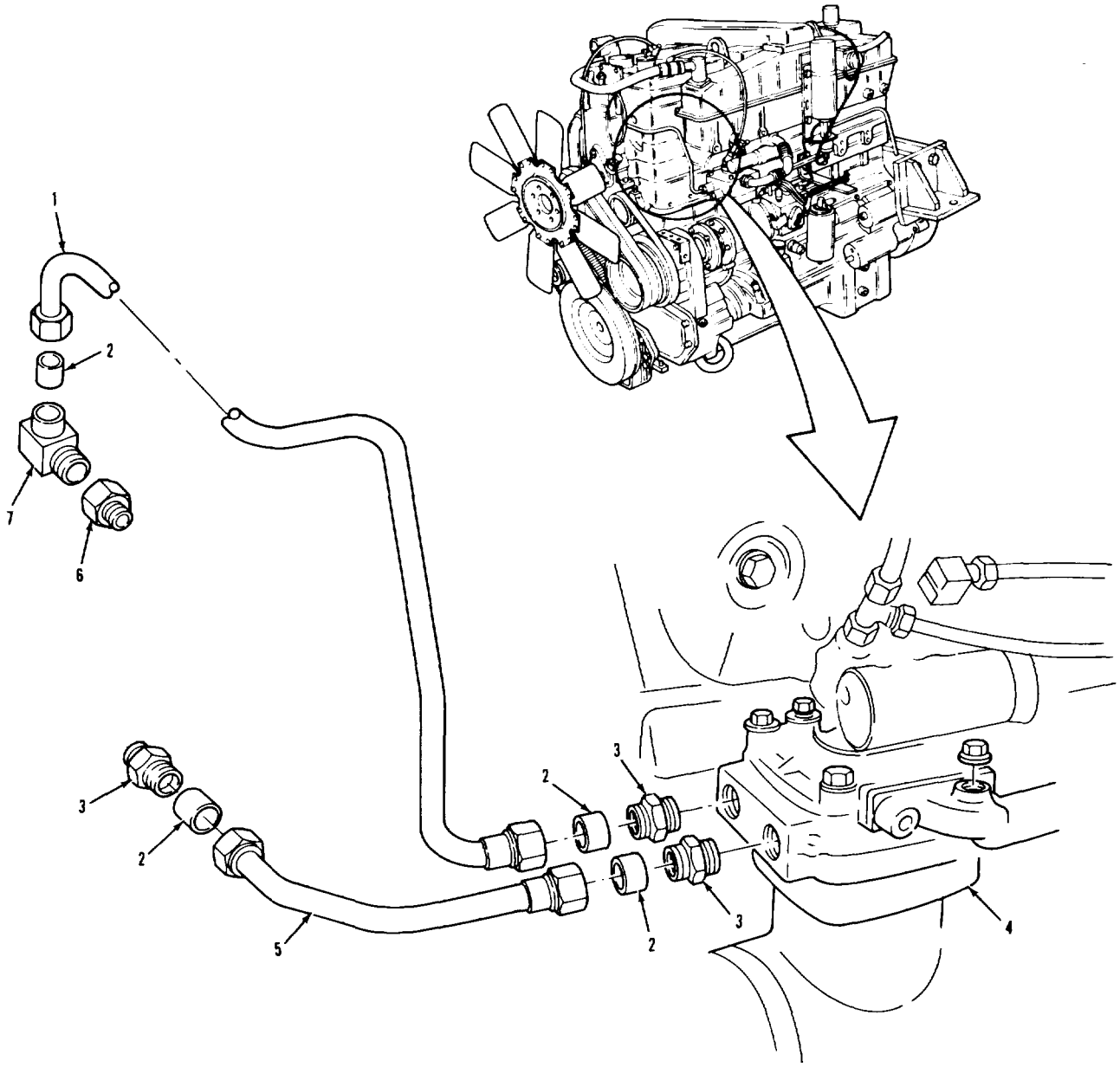
TA 237012

ENGINE.

3-18. AIR COMPRESSOR COOLING TUBES REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
	NOTE	Follow-on maintenance action required: Fill cooling system (TM 9-2320-283-10).

3-18. AIR COMPRESSOR COOLING TUBES REPLACEMENT (Continued).



LEGEND:

1. COMPRESSOR COOLING WATER TUBE
2. GROMMET (4)
3. NIPPLE (3)
4. AIR COMPRESSOR
5. COMPRESSOR COOLING WATER TUBE
6. PLAIN STRAIGHT ADAPTER
7. MALE ELBOW ADAPTER

TA 237013

ENGINE.

3-19. AIR COMPRESSOR INTAKE TUBE REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
ALI.

EQUIPMENT CONDITION
PARAGRAPH
None.

CONDITION DESCRIPTION
None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Tape, thread sealing
Item 32, Appendix C.
Gasket
(15434) 157911.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

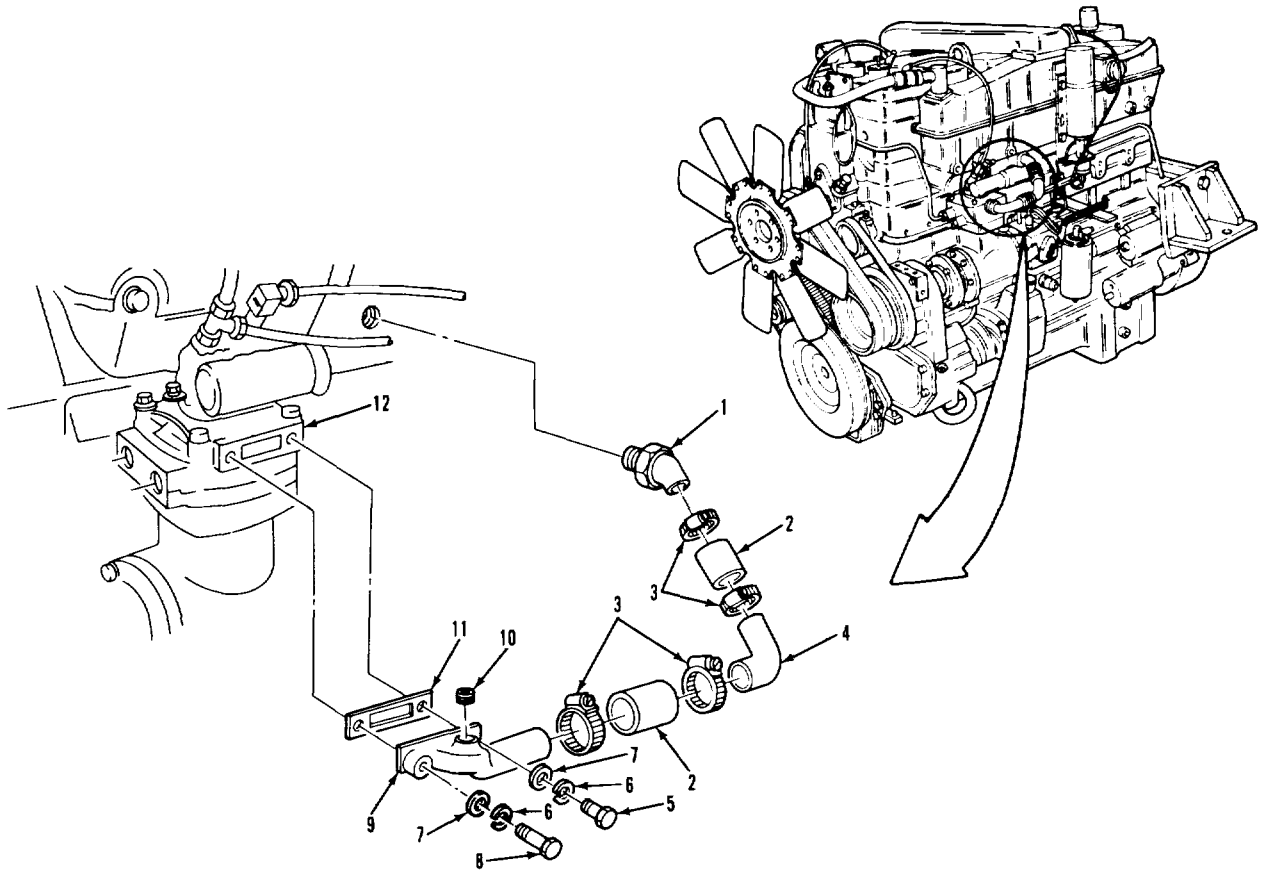
REFERENCES (TM)
TM 9-2320-283-20P.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

ENGINE.

3-19. AIR COMPRESSOR INTAKE TUBE REPLACEMENT.



LEGEND:

1. AIR INTAKE CONNECTOR
2. AIR INTAKE HOSE (2)
3. HOSE CLAMP (4)
4. AIR INTAKE TUBE
5. SCREW
6. LOCKWASHER (2)
7. PLAIN WASHER (2)
8. SCREW
9. AIR COMPRESSOR INTAKE CONNECTOR
10. PIPE PLUG
11. GASKET
12. AIR COMPRESSOR

TA 237014

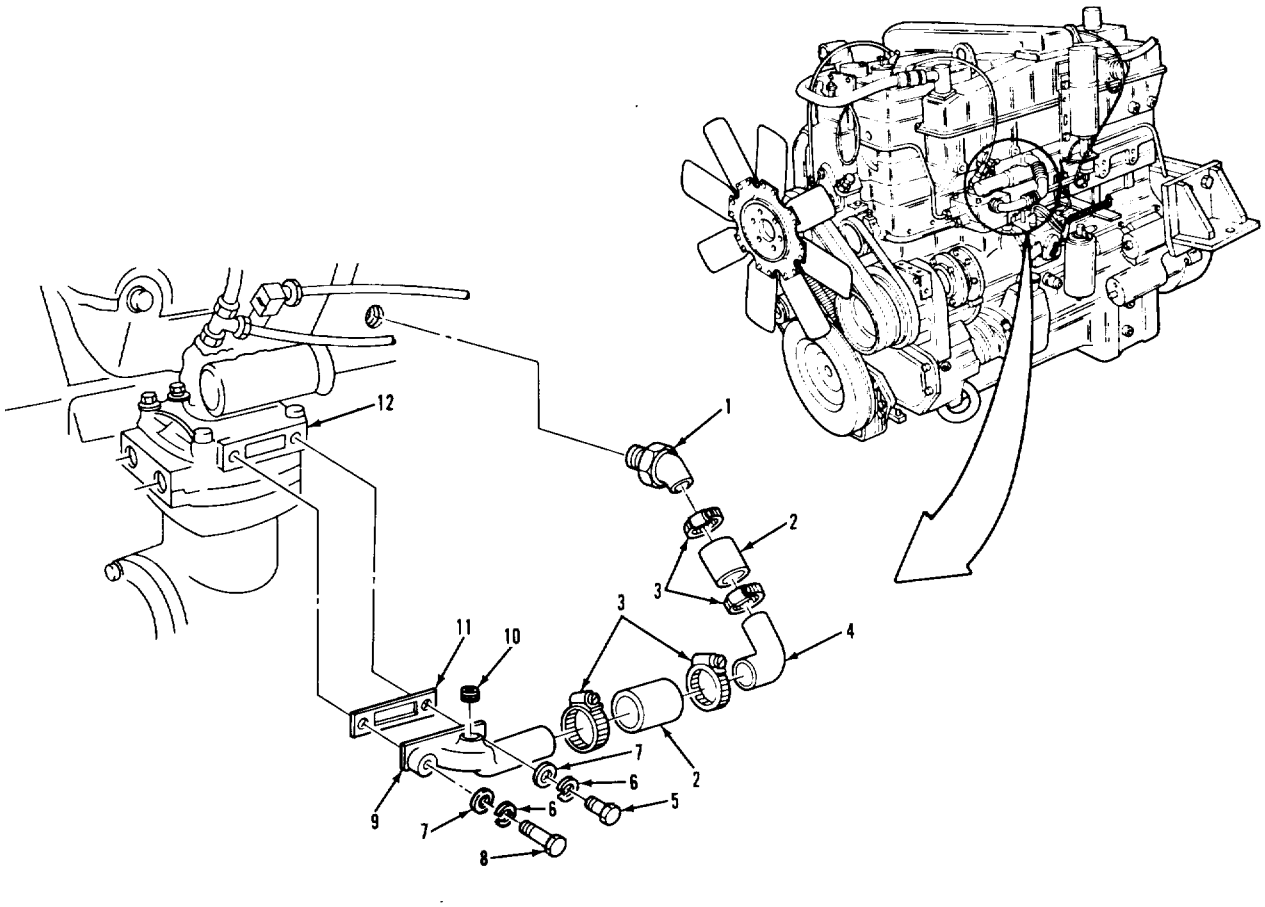
ENGINE.

3-19. AIR COMPRESSOR INTAKE TUBE REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Four clamps (3).	Loosen.	
2. Plug (10).	Remove from item (9).	
3. Screw (5), screw (8), two lock-washers (6), and two washers (7).	Remove from item (9).	
4. Connector (9) and gasket (11).	Remove from item (12) and item (2).	Discard item (11).
5. Hose (2) and two clamps (3).	Remove from item (4).	
6. Tube (4).	Remove from item (2).	
7. Hose (2) and two clamps (3).	Remove from item (1).	
8. Connector (1).	Remove from engine.	
B. CLEANING AND INSPECTION.		
9. All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
C. INSTALLATION.		
10. Connector (1).	Install in engine.	Put thread sealing tape

ENGINE.

3-19. AIR COMPRESSOR INTAKE TUBE REPLACEMENT (Continued).



LEGEND:

1. AIR INTAKE CONNECTOR
2. AIR INTAKE HOSE (2)
3. HOSE CLAMP (4)
4. AIR INTAKE TUBE
5. SCREW
6. LOCKWASHER (2)
7. PLAIN WASHER (2)
8. SCREW
9. AIR COMPRESSOR INTAKE CONNECTOR
10. PIPE PLUG
11. GASKET
12. AIR COMPRESSORTA23715

TA 237015

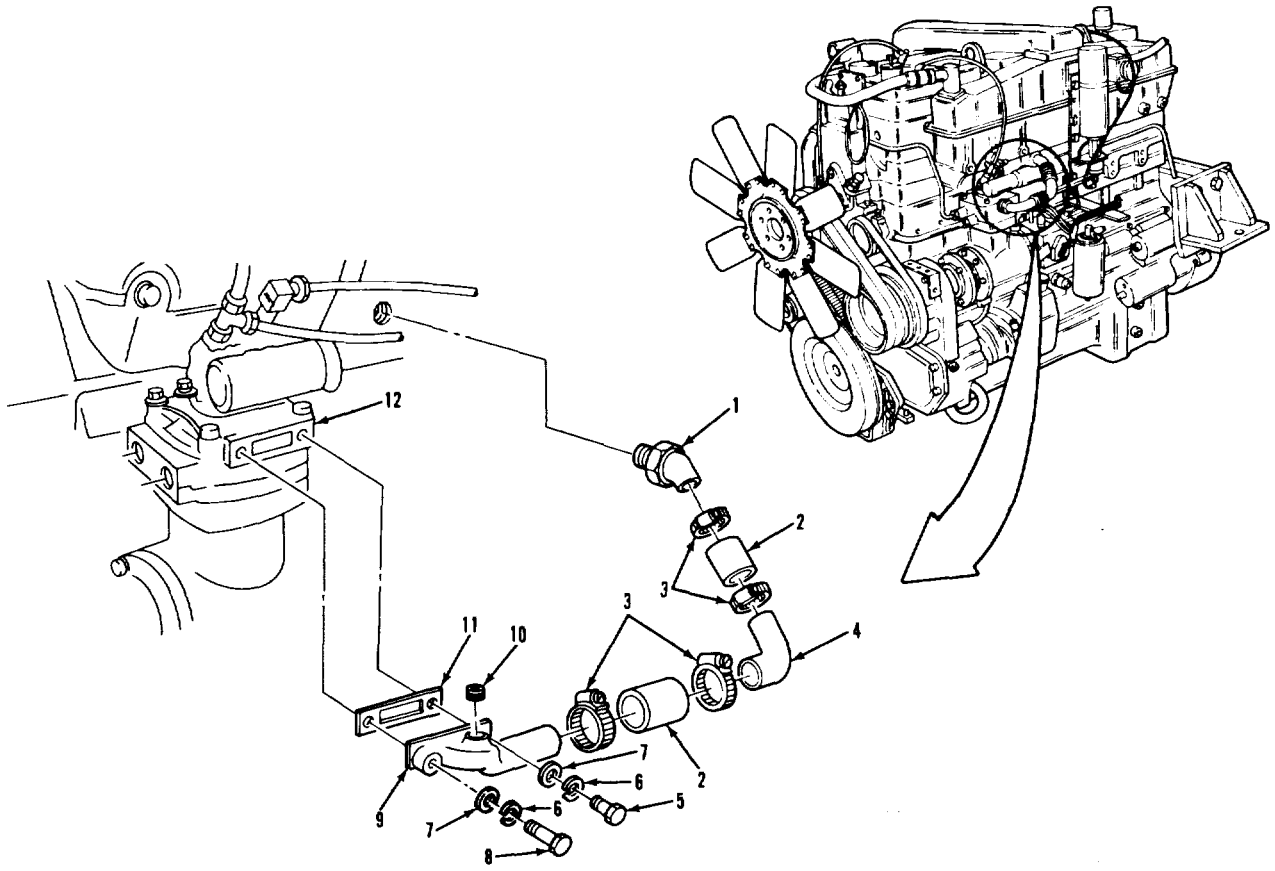
ENGINE.

3-19. AIR COMPRESSOR INTAKE TUBE REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
11. Hose (2) and two clamps (3).	Install on item (1).	Do not tighten clamps (3).
12. Tube (4).	Install in item (2).	
13. Hose (2) and two clamps (3).	Install on item (4).Do not tighten.	
14. Connector (9) and new gasket (11).	Install in item (2) and on item (12).	
15. Screw (5), screw (8), two lock-washers (6), and two washers (7).	Secure item (9) and item (11) to item (12).	
16. Plug (10).	Install in item (9).	Put thread sealing tape on threads.
17. Four clamps (3).Tighten.		
	NOTE	
		Follow-on maintenance action required:
		None.

ENGINE.

3-19. AIR COMPRESSOR INTAKE TUBE REPLACEMENT (Continued).



LEGEND:

1. AIR INTAKE CONNECTOR
2. AIR INTAKE HOSE (2)
3. HOSE CLAMP (4)
4. AIR INTAKE TUBE
5. SCREW
6. LOCKWASHER (2)
7. PLAIN WASHER (2)
8. SCREW
9. AIR COMPRESSOR INTAKE CONNECTOR
10. PIPE PLUG
11. GASKET
12. AIR COMPRESSOR

TA237016

ENGINE.

3-20. WATER CROSSOVER TUBE AND CONNECTIONS REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Tape, thread sealing
Item 32, Appendix C.
Hose, connection (2)
(15434) 155789.
Gasket, water inlet connection
(15434) 3032348.
Gasket, water outlet
(15434) 215045.

PERSONNEL REQUIRED
Two (MOS-63S).

REFERENCES (TM)
TM 9-2320-283-10.
TM 9-2320-283-20P.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

EQUIPMENT CONDITION

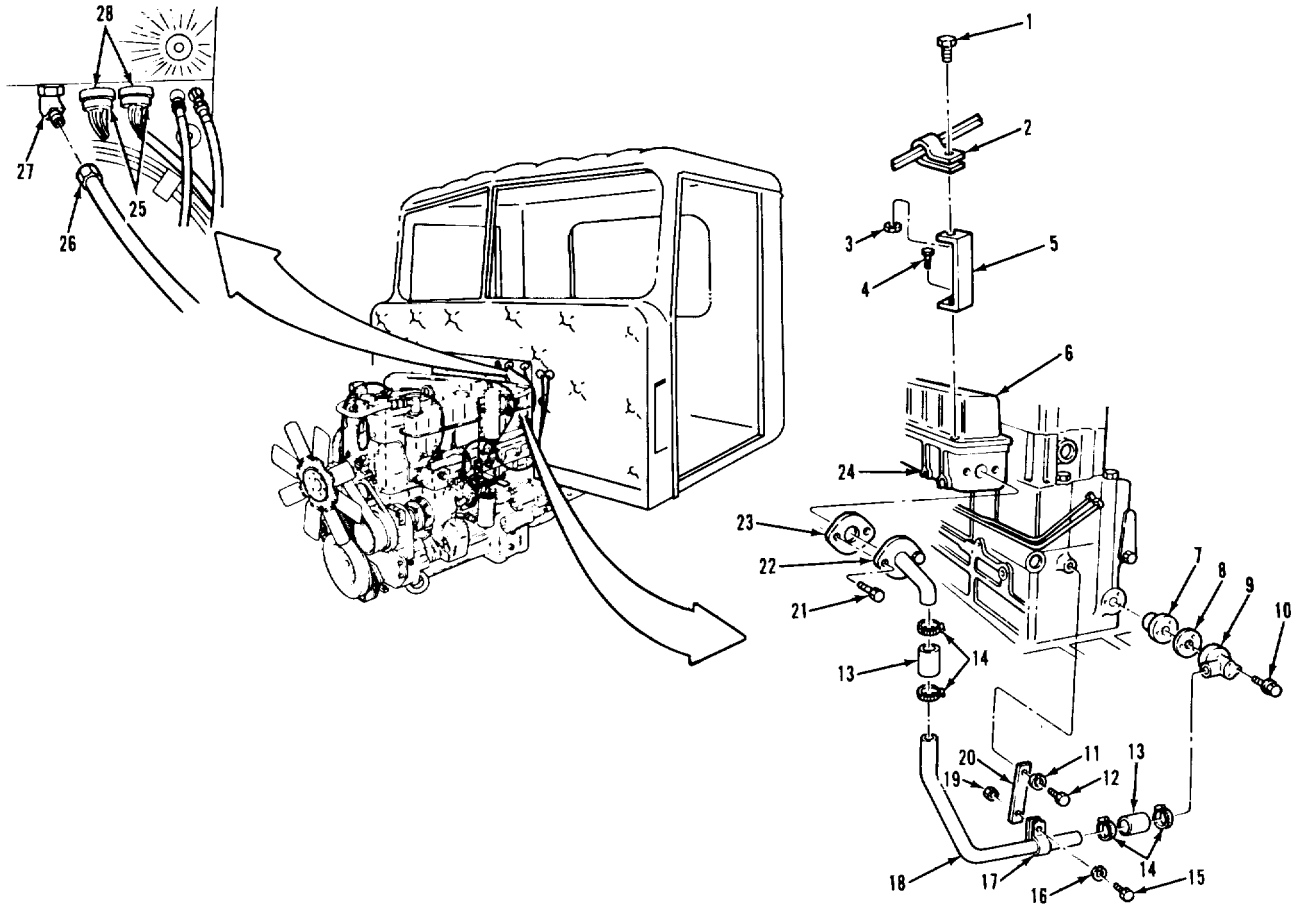
PARAGRAPH	CONDITION DESCRIPTION
3-52.	Coolant drained.
TM 9-2320-283-10.	Air system drained.
3-29.	Air cleaner assembly removed.

SPECIAL ENVIRONMENTAL CONDITIONS
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

ENGINE.

3-20. WATER CROSSOVER TUBE AND CONNECTIONS REPLACEMENT (Continued).



LEGEND:

1. SCREW
2. LOOP CLAMP
3. NUT
4. SCREW WITH CAPTIVE WASHER
5. BRACKET
6. AFTERCOOLER COVER
7. WATER OUTLET ADAPTER
8. WATER OUTLET GASKETTUBE
9. WATER OUTLET CONNECTION
10. SCREW WITH CAPTIVE WASHER (3)
11. LOCKWASHER
12. SCREW
13. CONNECTION HOSE (2)
14. HOSE CLAMP (4)
15. SCREW
16. LOCKWASHER
17. HOSE CLAMP
18. WATER CROSSOVER
27. ELBOW
19. NUT
20. CROSSOVER BRACE
21. SCREW WITH CAPTIVE WASHER (2)
22. WATER INLET CONNECTION
23. WATER INLET CONNECTION GASKET
24. INTAKE MANIFOLD
25. ELECTRICAL CONNECTOR (2)
26. AIR TUBE
28. ELECTRICAL RECEPTACLE (2)

TA237017

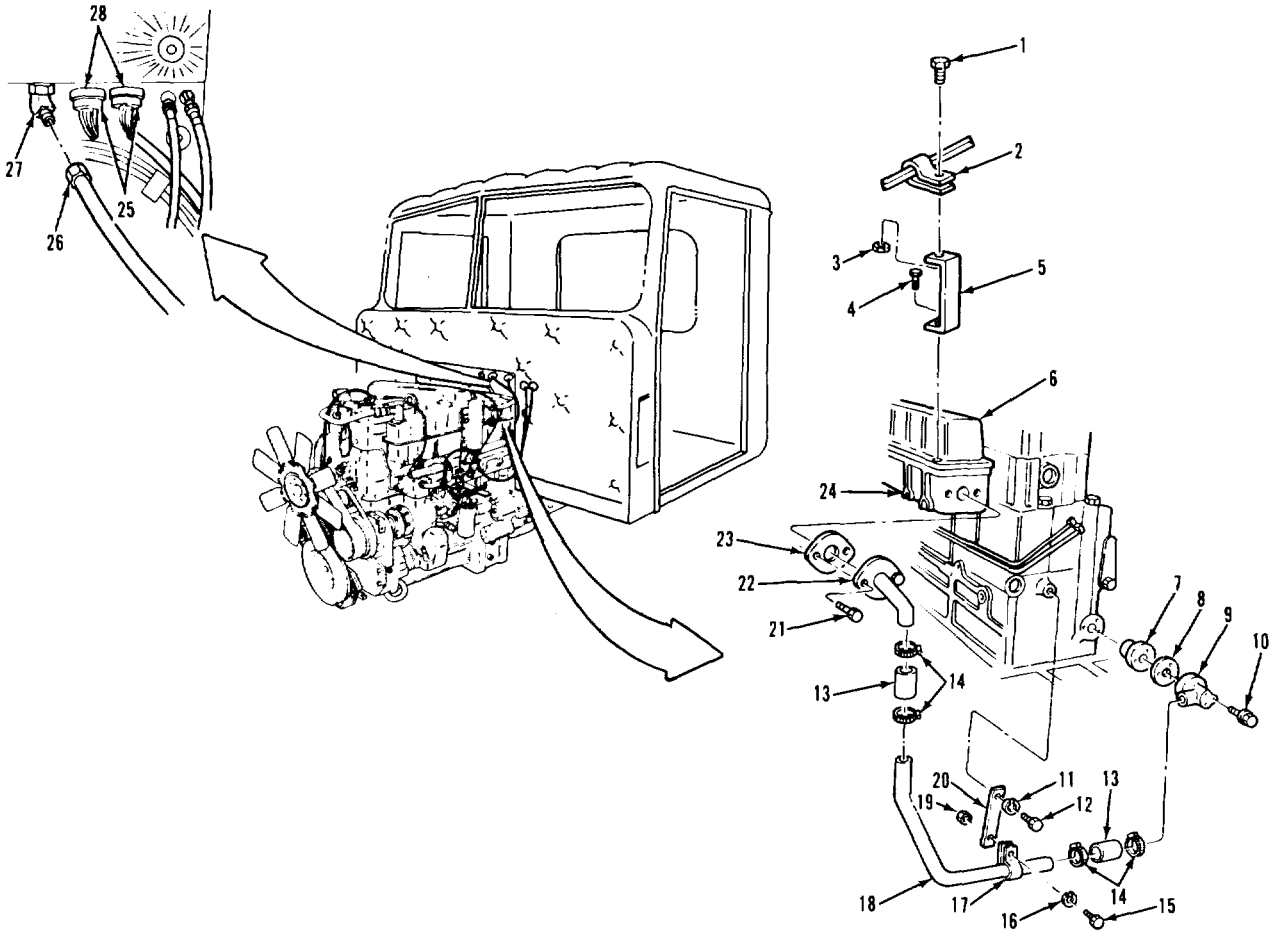
ENGINE.

3-20. WATER CROSSOVER TUBE AND CONNECTIONS REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Two connectors (25).	Disconnect from two items (28).	
2. Tube (26).	Disconnect from item (27).	
3. Screw (1) and nut (3).	Remove from item (2) and item (5).	
4. Screw (4).	Remove from item (5) and item (6).	
5. Screw (12) and washer (11).	Remove from item (20).	
6. Four clamps (14).	Loosen.	
7. Tube (18) and two hoses (13).	Remove from item (22) and item (9).	
8. Screw (15), lock-washers (16), and nut (19).	Remove from item (17) and item (20).	
9. Clamp (17) and two hoses (13).	Remove from item (18).	Discard two items (13).
10. Three screws (10).	Remove from item (9).	
11. Connection (9) and gasket (8).	Remove from item (7).	Discard item (8).

ENGINE.

3-20. WATER CROSSOVER TUBE AND CONNECTIONS REPLACEMENT (Continued).



LEGEND:

1. SCREW
2. LOOP CLAMP
3. NUT
4. SCREW WITH CAPTIVE WASHER
5. BRACKET
6. AFTERCOOLER COVER
7. WATER OUTLET ADAPTER
8. WATER OUTLET GASKET
9. WATER OUTLET CONNECTION
10. SCREW WITH CAPTIVE WASHER (3)
11. LOCKWASHER
12. SCREW
13. CONNECTION HOSE (2)
14. HOSE CLAMP (4)
15. SCREW
16. LOCKWASHER
17. HOSE CLAMP
18. WATER CROSSOVER TUBE
19. NUT
20. CROSSOVER BRACE
21. SCREW WITH CAPTIVE WASHER (2)
22. WATER INLET CONNECTION
23. WATER INLET CONNECTION GASKET
24. INTAKE MANIFOLD
25. ELECTRICAL CONNECTOR (2)
26. AIR TUBE
27. ELBOW
28. ELECTRICAL RECEPTACLE (2)

TA 237018

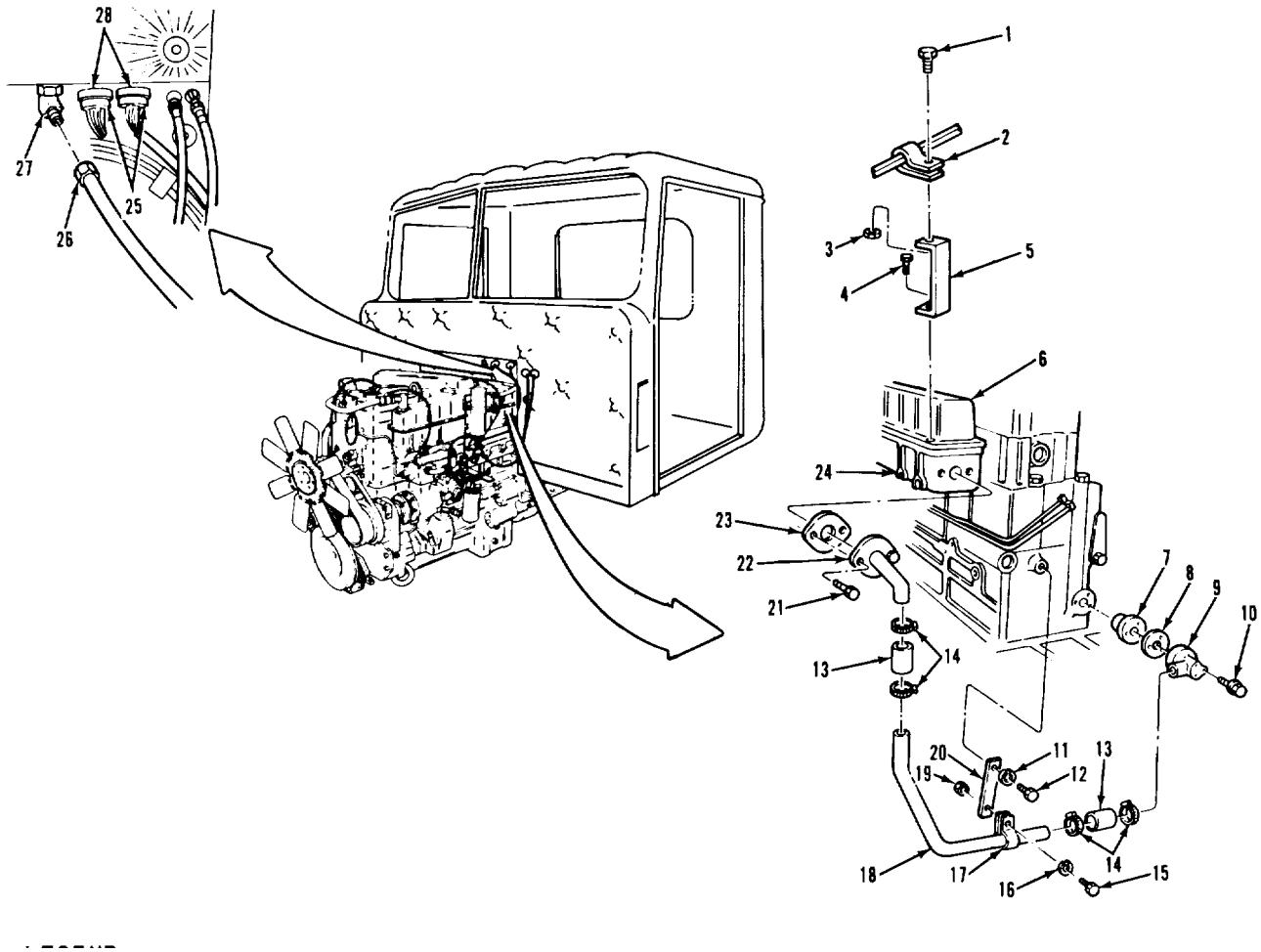
ENGINE.

3-20. WATER CROSSOVER TUBE AND CONNECTIONS REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL (Continued).		
12. Adapter (7).	Remove from engine block.	
13. Two screws (21).	Remove from item (22).	
14. Connection (22) and gasket (23).	Remove from item (24).	Discard item (23).
B. CLEANING AND INSPECTION.		
15. All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
C. INSTALLATION.		
16. Connection (22) and new gasket (23).	Put in place on item (24).	
17. Two screws (21).	Secure item (22) to item (24).	
18. Adapter (7).	Install in engine block.	Put thread sealing tape on threads.
19. Connection (9) and new gasket (8).	Put in place on item (7).	
20. Two screws (10).	Secure item (9) to item (7).	

ENGINE.

3-20. WATER CROSSOVER TUBE AND CONNECTIONS REPLACEMENT (Continued).



LEGEND:

1. SCREW
2. LOOP CLAMP
3. NUT
4. SCREW WITH CAPTIVE WASHER
5. BRACKET
6. AFTERCOOLER COVER
7. WATER OUTLET ADAPTER
8. WATER OUTLET GASKET
9. WATER OUTLET CONNECTION
10. SCREW WITH CAPTIVE WASHER (3)
11. LOCKWASHER
12. SCREW
13. CONNECTION HOSE (2)
14. HOSE CLAMP (4)
15. SCREW
16. LOCKWASHER
17. HOSE CLAMP
18. WATER CROSSOVER TUBE
19. NUT
20. CROSSOVER BRACE
21. SCREW WITH CAPTIVE WASHER (2)
22. WATER INLET CONNECTION
23. WATER INLET CONNECTION GASKET
24. INTAKE MANIFOLD
25. ELECTRICAL CONNECTOR (2)
26. AIR TUBE
27. ELBOW
28. ELECTRICAL RECEPTACLE (2)

TA 237019

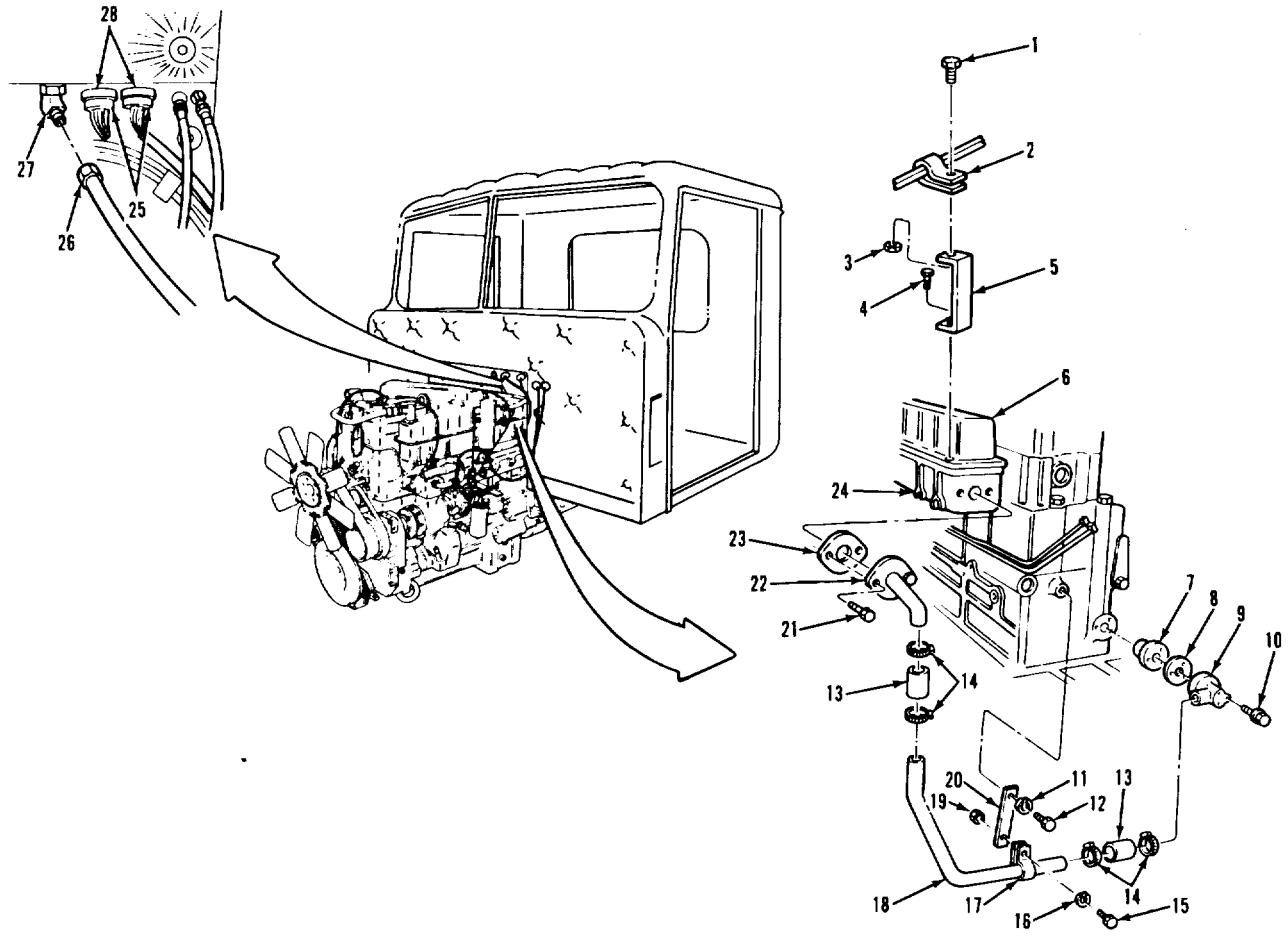
ENGINE.

3-20. WATER CROSSOVER TUBE AND CONNECTIONS REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
21. Clamp (17) and two new hoses (13).	Install on item (18).	
22. Screw (15), lock-washer (16), and nut (19).	Install item (20) on item (17).	Do not tighten.
23. Two clamps (14).	Secure two items (13) to item (18).	
24. Two clamps (14).	Slip over two items (13).	
25. Two hoses (13).	Install on item (22) and item (9).	
26. Screw (12) and washer (11).	Secure item (20) to engine block.	
27. Screw (15), lock-washer (16), and nut (19).	Tighten.	
28. Two clamps (14).	Tighten.	
29. Screw (4).	Secure item (5) to item (6).	
30. Screw (1) and nut (3).	Secure item (2) to item (5).	

ENGINE.

3-20. WATER CROSSOVER TUBE AND CONNECTIONS REPLACEMENT (Continued).



LEGEND:

1. SCREW
2. LOOP CLAMP
3. NUT
4. SCREW WITH CAPTIVE WASHER
5. BRACKET
6. AFTERCOOLER COVER
7. WATER OUTLET ADAPTER
8. WATER OUTLET GASKET
9. WATER OUTLET CONNECTION
10. SCREW WITH CAPTIVE WASHER (3)
11. LOCKWASHER
12. SCREW
13. CONNECTION HOSE (2)
14. HOSE CLAMP (4)
15. SCREW
16. LOCKWASHER
17. HOSE CLAMP
18. WATER CROSSOVER TUBE
19. NUT
20. CROSSOVER BRACE
21. SCREW WITH CAPTIVE WASHER (2)
22. WATER INLET CONNECTION
23. WATER INLET CONNECTION GASKET
24. INTAKE MANIFOLD
25. ELECTRICAL CONNECTOR (2)
26. AIR TUBE
27. ELBOW
28. ELECTRICAL RECEPTACLE (2)

TA 237020

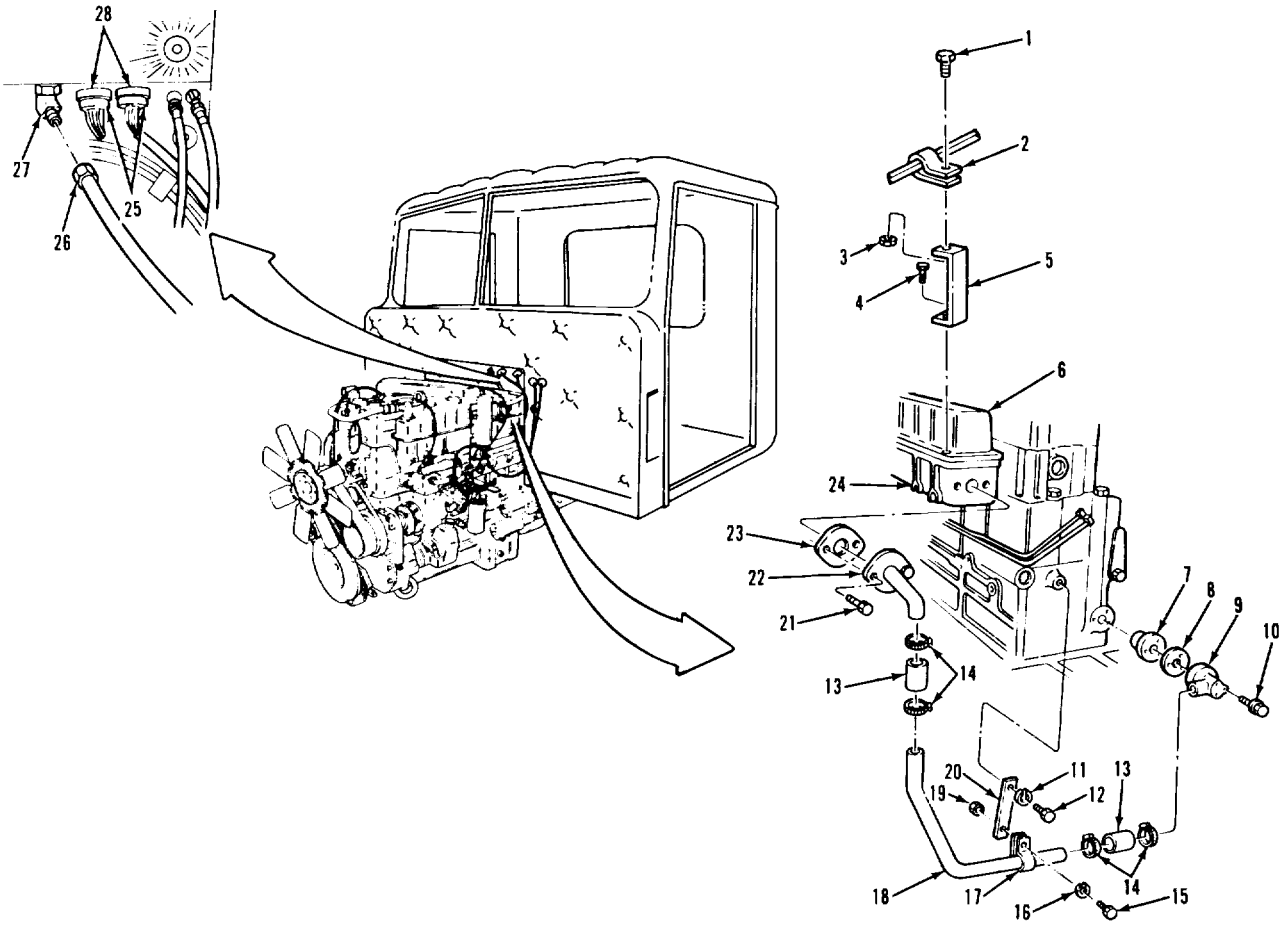
ENGINE.

3-20. WATER CROSSOVER TUBE AND CONNECTIONS REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
31. Tube (26).	Connect to item (27).	
32. Two connectors (25).	Connect to two items (28).	
	NOTE	
		Follow-on maintenance action required: Install air cleaner assembly (para 3-39). Fill cooling system (TM 9-2320-283-10).

ENGINE.

3-20. WATER CROSSOVER TUBE AND CONNECTIONS REPLACEMENT (Continued).



LEGEND:

1. SCREW
2. LOOP CLAMP
3. NUT
4. SCREW WITH CAPTIVE WASHER
5. BRACKET
6. AFTERCOOLER COVER
7. WATER OUTLET ADAPTER
8. WATER OUTLET GASKET
9. WATER OUTLET CONNECTION
10. SCREW WITH CAPTIVE WASHER (3)
11. LOCKWASHER
12. SCREW
13. CONNECTION HOSE (2)
14. HOSE CLAMP (4)
15. SCREW
16. LOCKWASHER
17. HOSE CLAMP
18. WATER CROSSOVER TUBE
19. NUT
20. CROSSOVER BRACE
21. SCREW WITH CAPTIVE WASHER (2)
22. WATER INLET CONNECTION
23. WATER INLET CONNECTION GASKET
24. INTAKE MANIFOLD
25. ELECTRICAL CONNECTOR (2)
26. AIR TUBE
27. ELBOW
28. ELECTRICAL RECEPTACLE (2)

TA 237021

ENGINE.

3-21. WATER TRANSFER TUBE AND BRACKET REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	3-52.	Cooling system drained.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
None.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

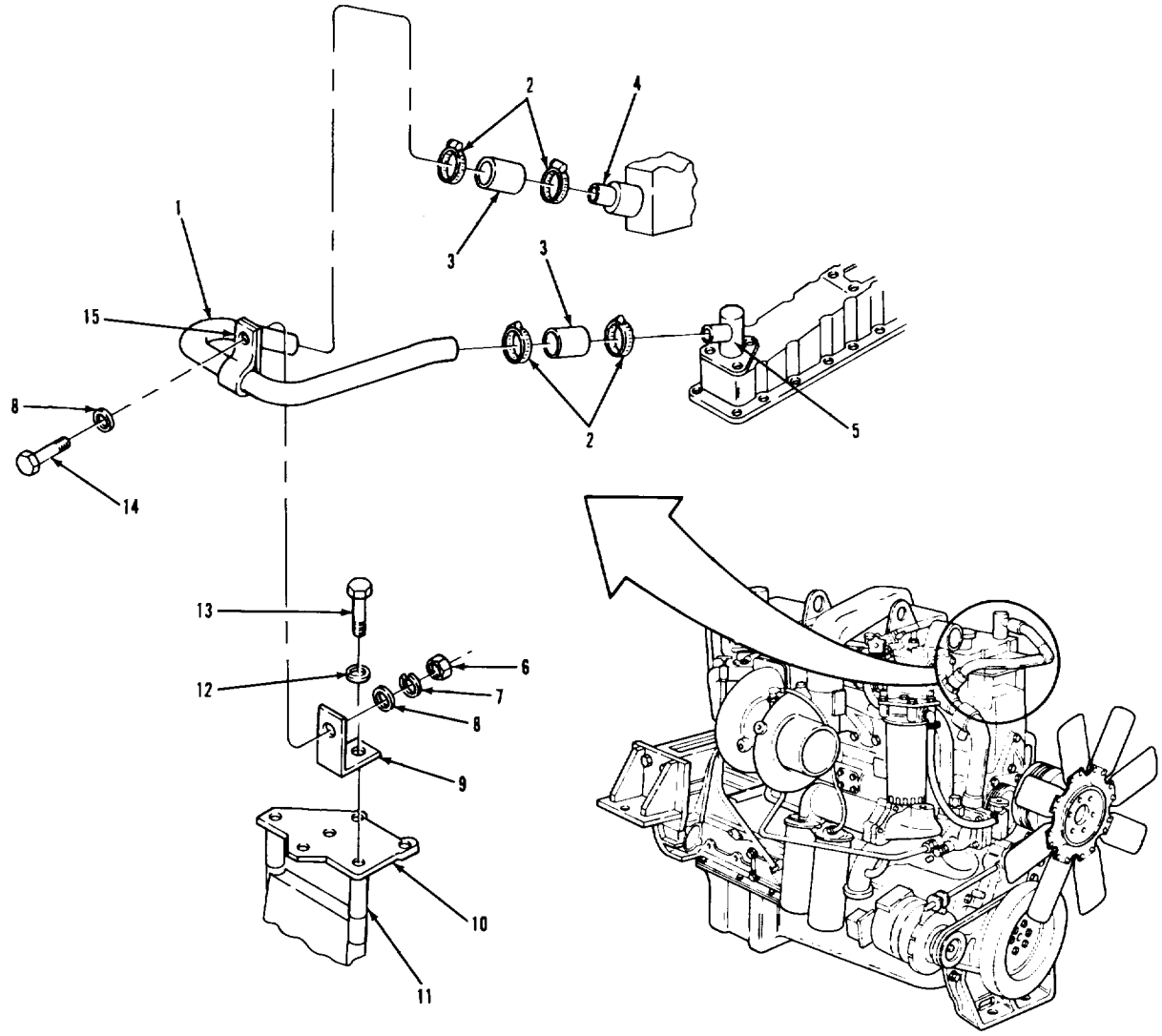
REFERENCES (TM)
TM 9-2320-283-10.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

ENGINE.

3-21. WATER TRANSFER TUBE AND BRACKET REPLACEMENT (Continued).



1. WATER TRANSFER TUBE
2. HOSE CLAMPS (4)
3. CONNECTION HOSE (2)
4. THERMOSTAT HOUSING HOSE NIPPLE
5. CONNECTION WATER OUTLET
6. HEXAGON NUT
7. LOCKWASHER
8. PLAIN WASHER (2)
9. TUBE SUPPORT BRACKET
10. FAN BRACE
11. LONG SPACER
12. PLAIN WASHER
13. SCREW
14. HEXAGON CAPSCREW
15. HOSE CLAMP

TA 237022

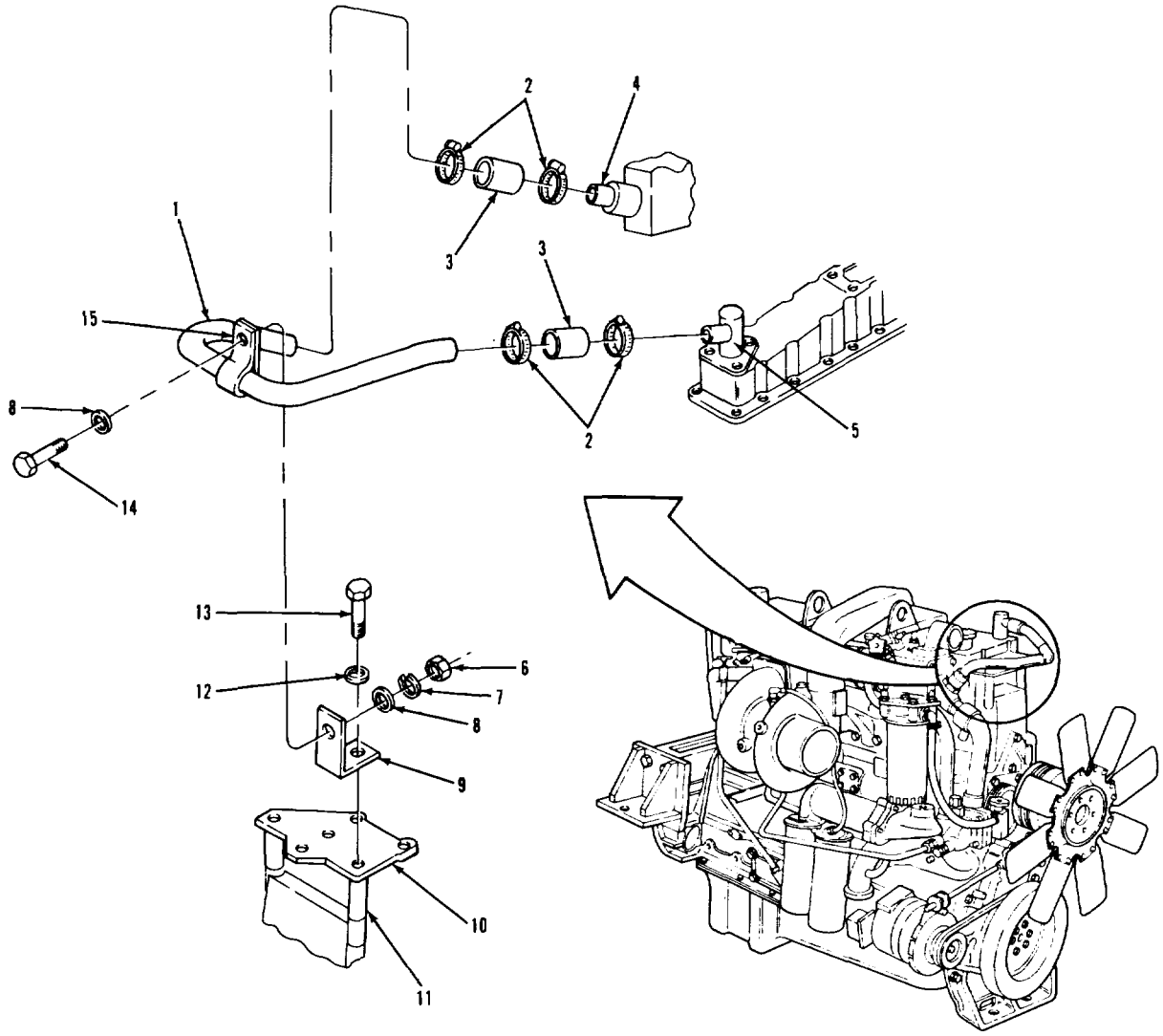
ENGINE.

3-21. WATER TRANSFER TUBE AND BRACKET REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Screw (14), two washers (8), lock-washer (7), and nut (6).	Remove from item (15) and item (9).	
2. Clamp (15).	Remove from item (1).	
3. Four clamps (2).	Loosen.	
4. Tube (1), two hoses (3), and four clamps (2).	Remove from item (4) and item (5).	Cut off and discard any cable tie straps from item (1).
5. Screw (13) and washer (12).	Remove from item (9).	Item (11) may fall out.
B. CLEANING AND INSPECTION.		
6. All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
C. INSTALLATION.		
7. Bracket (9).	Place in position on item (10).	

ENGINE.

3-21. WATER TRANSFER TUBE AND BRACKET REPLACEMENT (Continued).



1. WATER TRANSFER TUBE
2. HOSE CLAMPS (4)
3. CONNECTION HOSE (2)
4. THERMOSTAT HOUSING HOSE NIPPLE
5. CONNECTION WATER OUTLET
6. HEXAGON NUT
7. LOCKWASHER
8. PLAIN WASHER (2)
9. TUBE SUPPORT BRACKET
10. FAN BRACE
11. LONG SPACER
12. PLAIN WASHER
13. SCREW
14. HEXAGON CAPSCREW
15. HOSE CLAMP

TA 237023

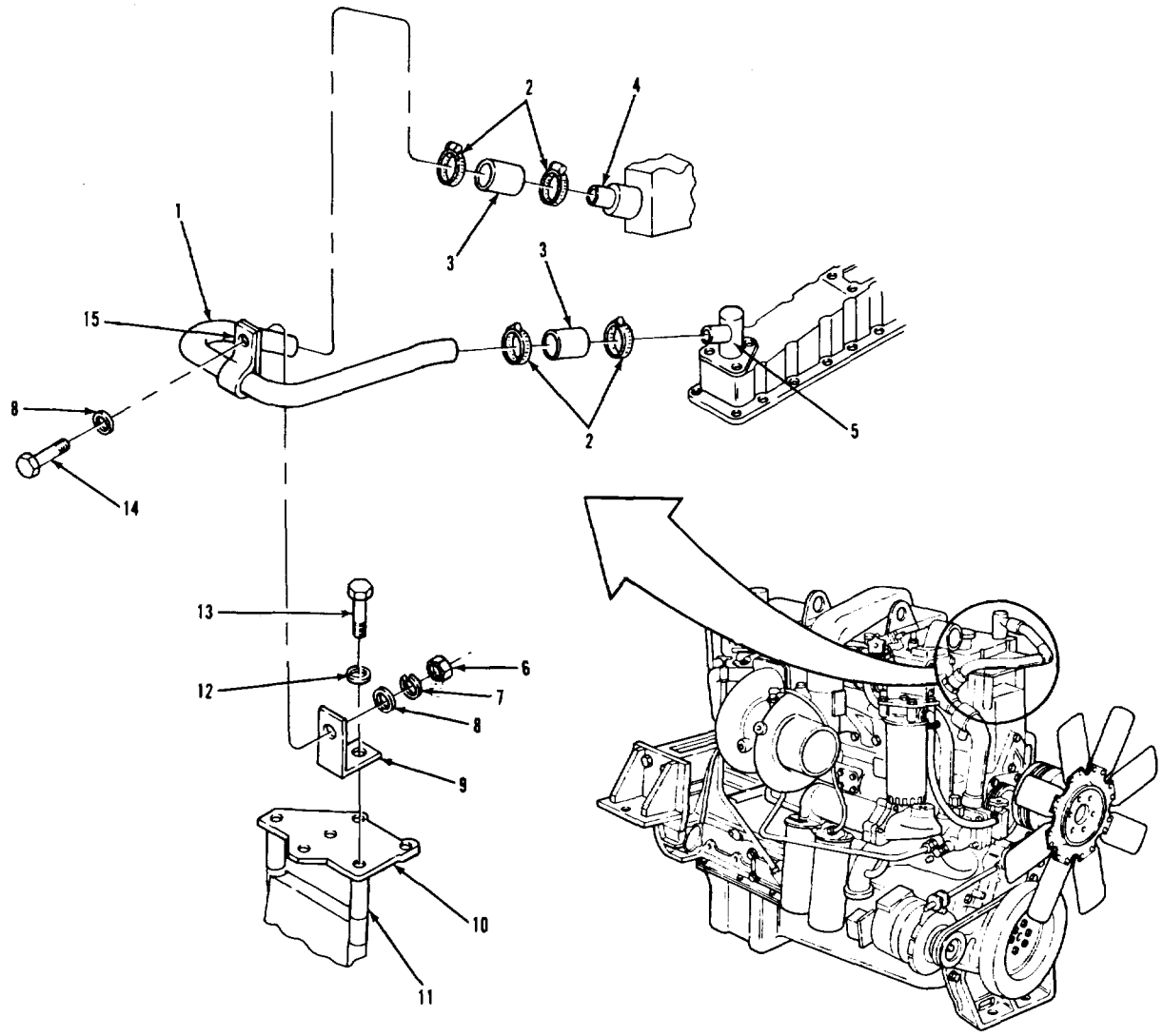
ENGINE.

3-21. WATER TRANSFER TUBE AND BRACKET REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
8. Screw (13) and washer (12).	Secure item (9), item (10), and item (11).	Torque to 44-49 lb-ft.
9. Tube (1), two hoses (3), and four clamps (2).	Install on item (4) and item (5).	a. Do not tighten clamps (2). b. Install new cable tie straps to replace any that were removed in step 4.
10. Clamp (15).	Install on item (1).	
11. Screw (14), two washers (8), lockwasher (7), and nut (6).	Secure item (15) to item (9).	
12. Four clamps (2).	Tighten.	
	NOTE	
		Follow-on maintenance action required: Add coolant, and check for leaks and proper operation (TM 9-2320-283-10).

ENGINE.

3-21. WATER TRANSFER TUBE AND BRACKET REPLACEMENT (Continued).



1. WATER TRANSFER TUBE
2. HOSE CLAMPS (4)
3. CONNECTION HOSE (2)
4. THERMOSTAT HOUSING HOSE NIPPLE
5. CONNECTION WATER OUTLET
6. HEXAGON NUT
7. LOCKWASHER
8. PLAIN WASHER (2)
9. TUBE SUPPORT BRACKET
10. FAN BRACE
11. LONG SPACER
12. PLAIN WASHER
13. SCREW
14. HEXAGON CAPSCREW
15. HOSE CLAMP

TA 237024

ENGINE.

3-22. ENGINE LIFTING BRACKET REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	None.	None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
None.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

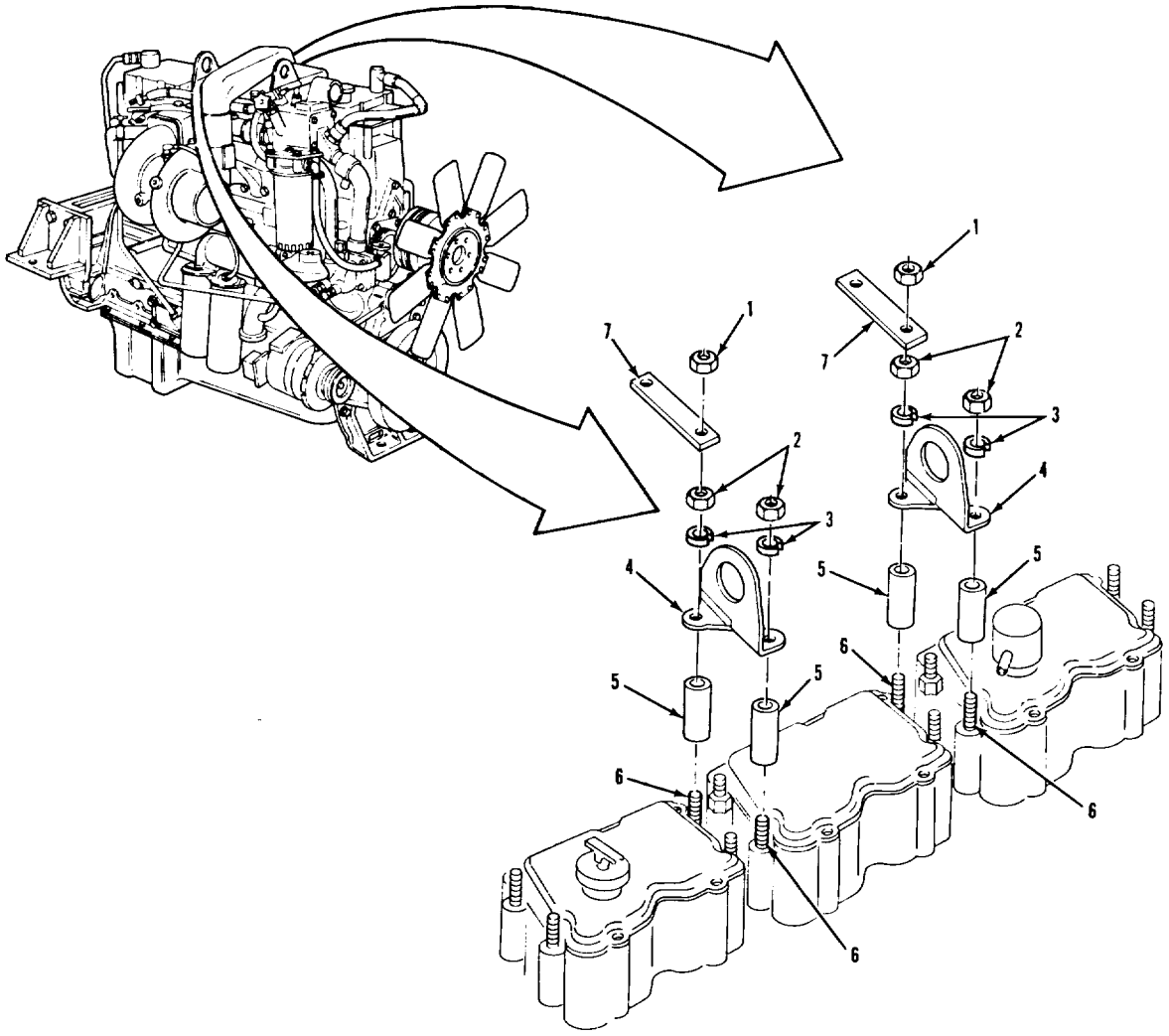
REFERENCES (TM)
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
None.

ENGINE.

3-22. ENGINE LIFTING BRACKET REPLACEMENT (Continued).



LEGEND:

1. HEX NUT (2)
2. HEXAGON FLANGE NUT (4)
3. LOCKWASHER (4)
4. ENGINE LIFTING BRACKET (2)
5. SHORT SPACER (4)
6. STUD (4)
7. HEATER TUBE SUPPORT BRACKET (2)

TA237025

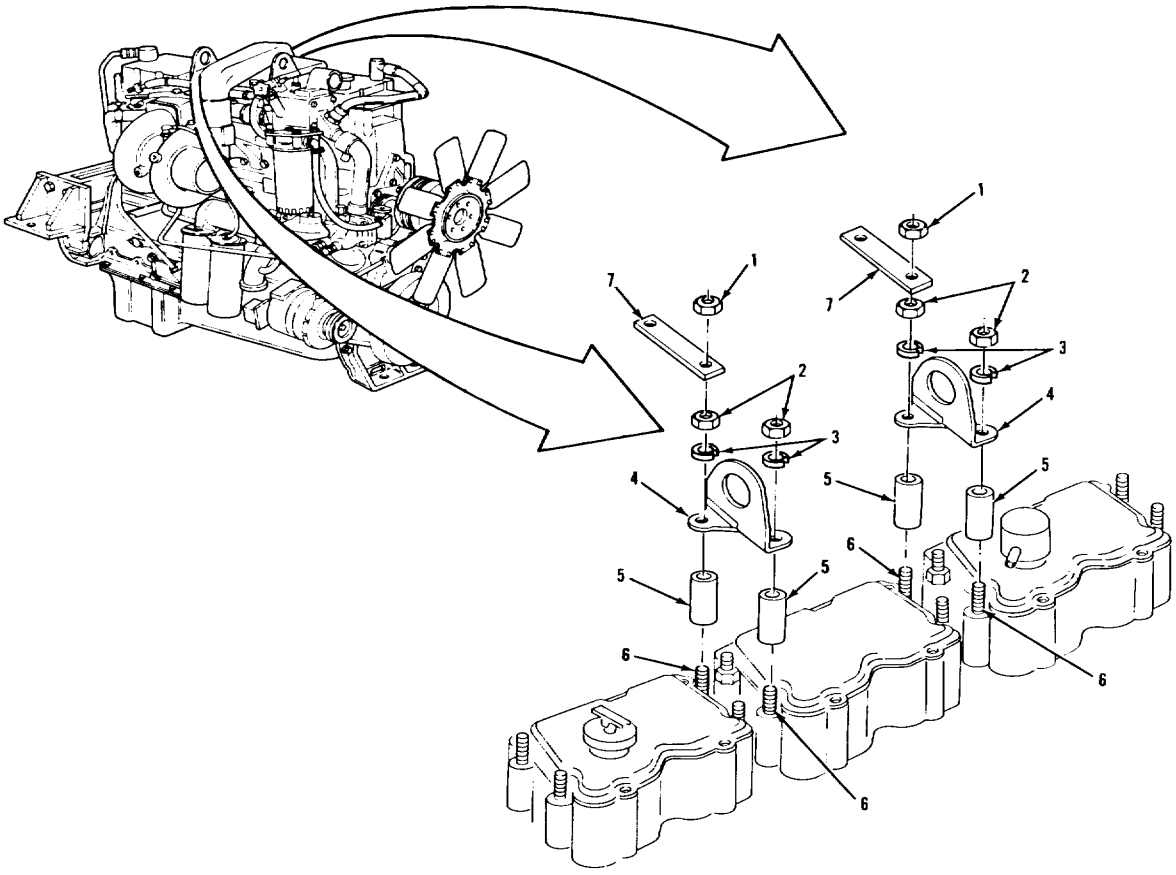
ENGINE.

3-22. ENGINE LIFTING BRACKET REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Two nuts (1).	Remove from two items (6) and two items (7).	
2. Two brackets (7).	Remove from two items (6).	
3. Four nuts (2), lockwashers (3), two brackets (4), and spacers (5).	Remove from four items (6).	
B. CLEANING AND INSPECTION		
4. All parts.	a. Clean.	Refer to paragraph 3-4.
	NOTE	
		If studs (6) are found to be defective, refer to DS/GS maintenance.
	b. Inspect.	Refer to paragraph 3-5.
D. INSTALLATION.		
5. Four spacers (5) and two brackets (4).	Install on four items (6).	
6. Four nuts (2) and lockwashers (3).	Secure two items (4).	Torque to 60 lb-ft.

ENGINE.

3-22. ENGINE LIFTING BRACKET REPLACEMENT (Continued).



LEGEND

1. HEX NUT (2)
2. HEXAGON FLANGE NUT (4)
3. LOCKWASHER (4)
4. ENGINE LIFTING BRACKET
5. SHORT SPACER (4)
6. STUD (4)
7. HEATER TUBE SUPPORT BRACKET (2)

TA237026

ENGINE.

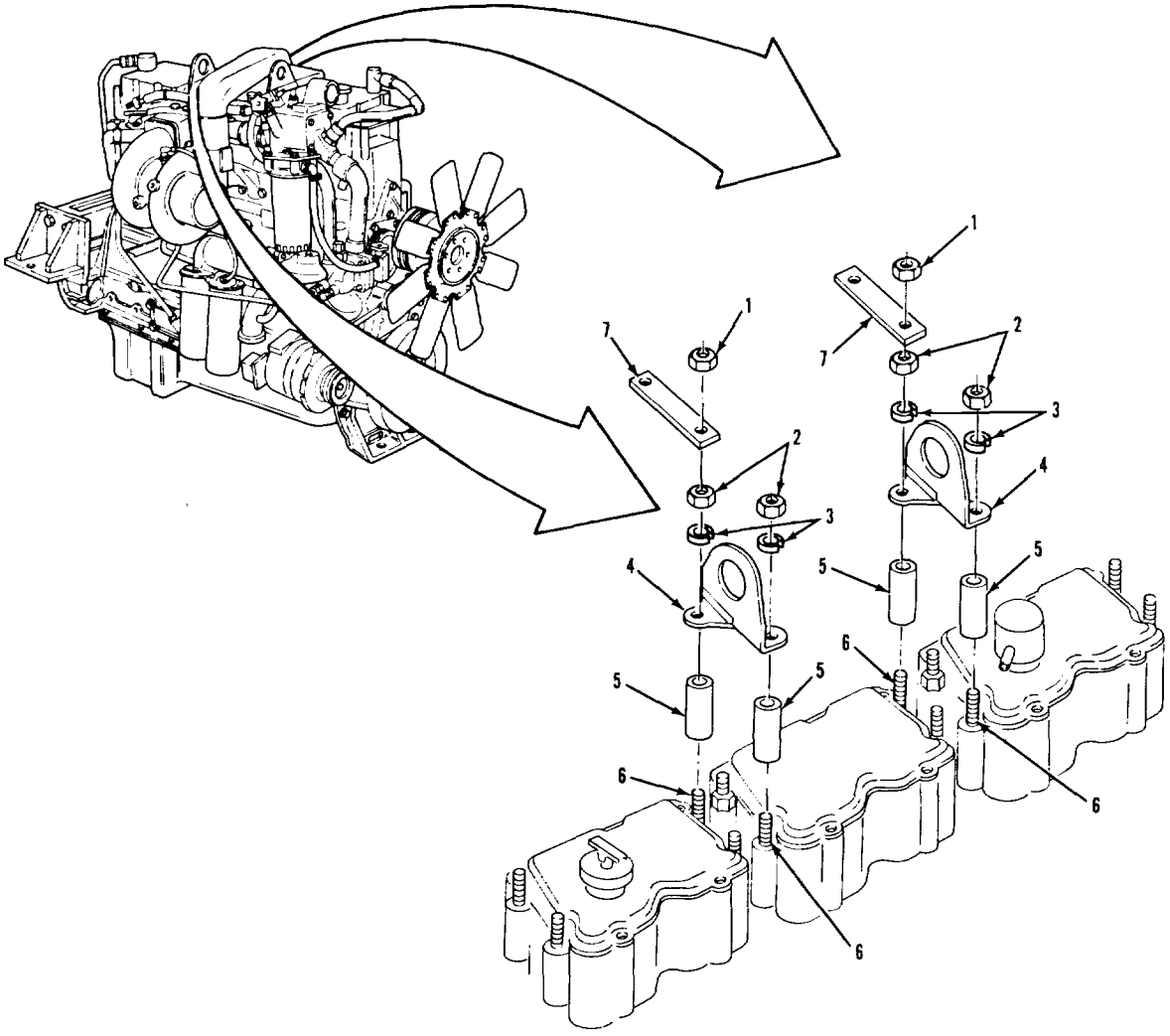
3-22. ENGINE LIFTING BRACKET REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
7. Two brackets (7).	Position on two items (6).	
8. Two nuts (1).	Secure two items (7).	

NOTE
Follow-on maintenance action required: None.

ENGINE.

3-22. ENGINE LIFTING BRACKET REPLACEMENT (Continued).



LEGEND:

1. HEX NUT (2)
2. HEXAGON FLANGE NUT (4)
3. LOCKWASHER (4)
4. ENGINE LIFTING BRACKET (2)
5. SHORT SPACER (4)
6. STUD (4)
7. HEATER TUBE SUPPORT BRACKET (2)

TA237027

ENGINE.

3-23. ENGINE DATAPLATE REPLACEMENT.

THIS TASK COVERS
a. Removal.
b. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	None.	None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Screw, nameplate (5)
(15434) S-2286.

PERSONNEL REQUIRED
One (MOS-63S .

SPECIAL ENVIRONMENTAL CONDITIONS
None.

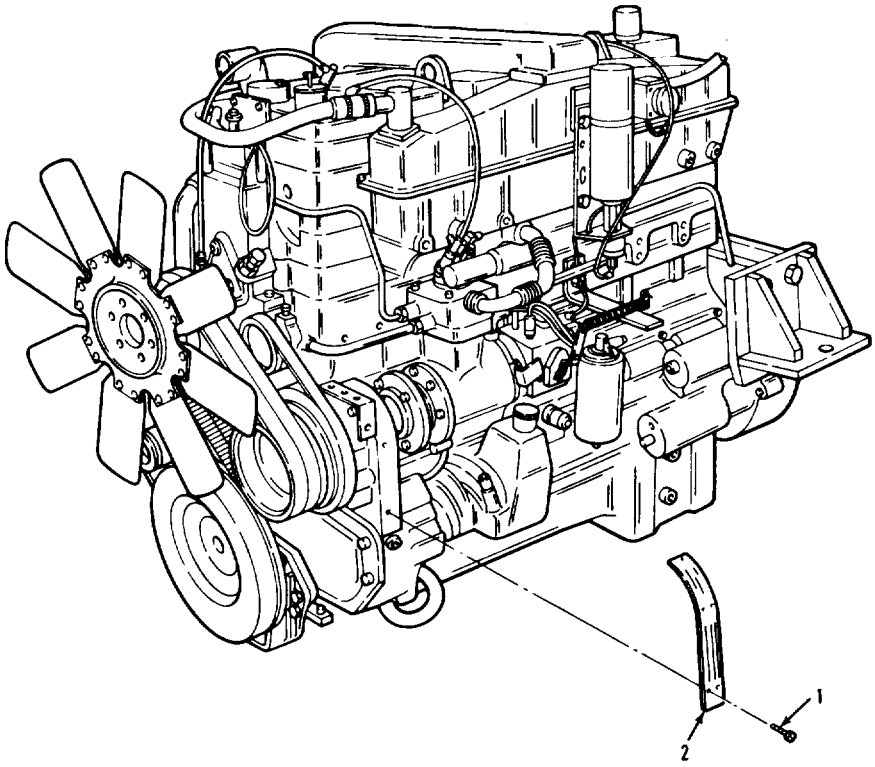
REFERENCES (TM)
TM 9-2320-283-20P.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

ENGINE.

3-23. ENGINE DATAPLATE REPLACEMENT (Continued).



LEGEND:

1. NAMEPLATE SCREW (5)
2. DATAPLATE

TA 237028

ENGINE.

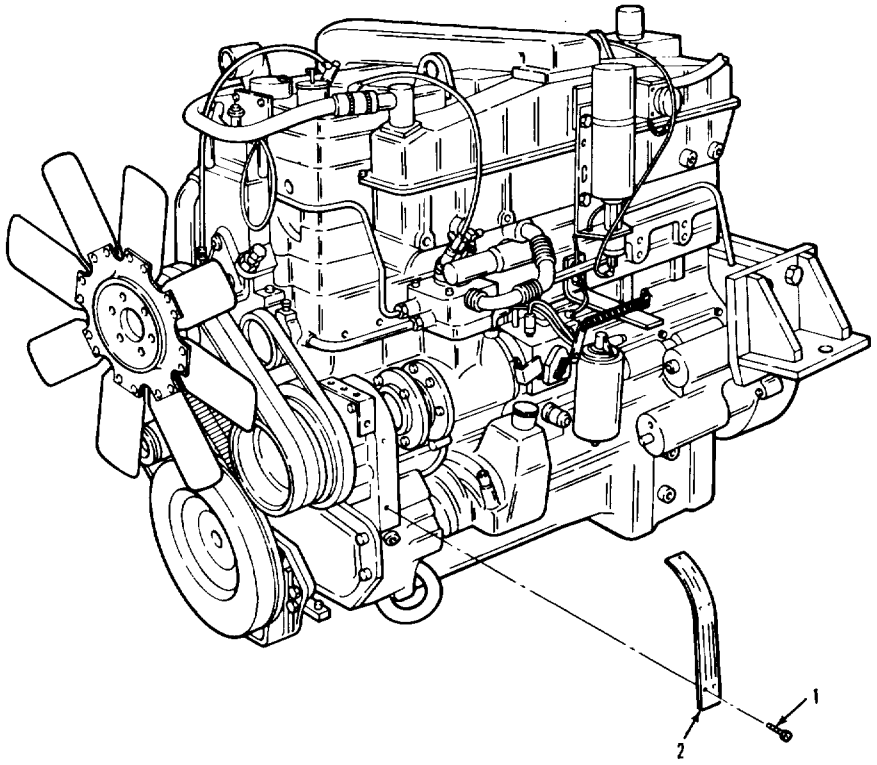
3-23. ENGINE DATAPLATE REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Five screws (1).	Pry from item (2).	Discard five items (1).
2. Dataplate (2).	Remove from engine.	
B. INSTALLATION.		
3. Dataplate (2).	Put in place on engine.	
4 screws (1).	Secure item (2) in engine	Use a hammer.

NOTE
Follow-on maintenance action required: None.

ENGINE.

3-23. ENGINE DATAPLATE REPLACEMENT (Continued).



LEGEND:

1. NAMEPLATE SCREW (5)
2. DATAPLATE

TA 237029

ENGINE.

3-24. FAN BRACE, BRACKET, AND SPACERS REPLACEMENT.

THIS TASK COVERS

a. Brace and Spacers Removal.
b. Bracket Removal.
c. Cleaning and Inspection.
d. Bracket Installation.
e. Brace and Spacers Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	None.	None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
None.

PERSONNEL REQUIRED
One (MOS-63S}.

SPECIAL ENVIRONMENTAL CONDITIONS
None.

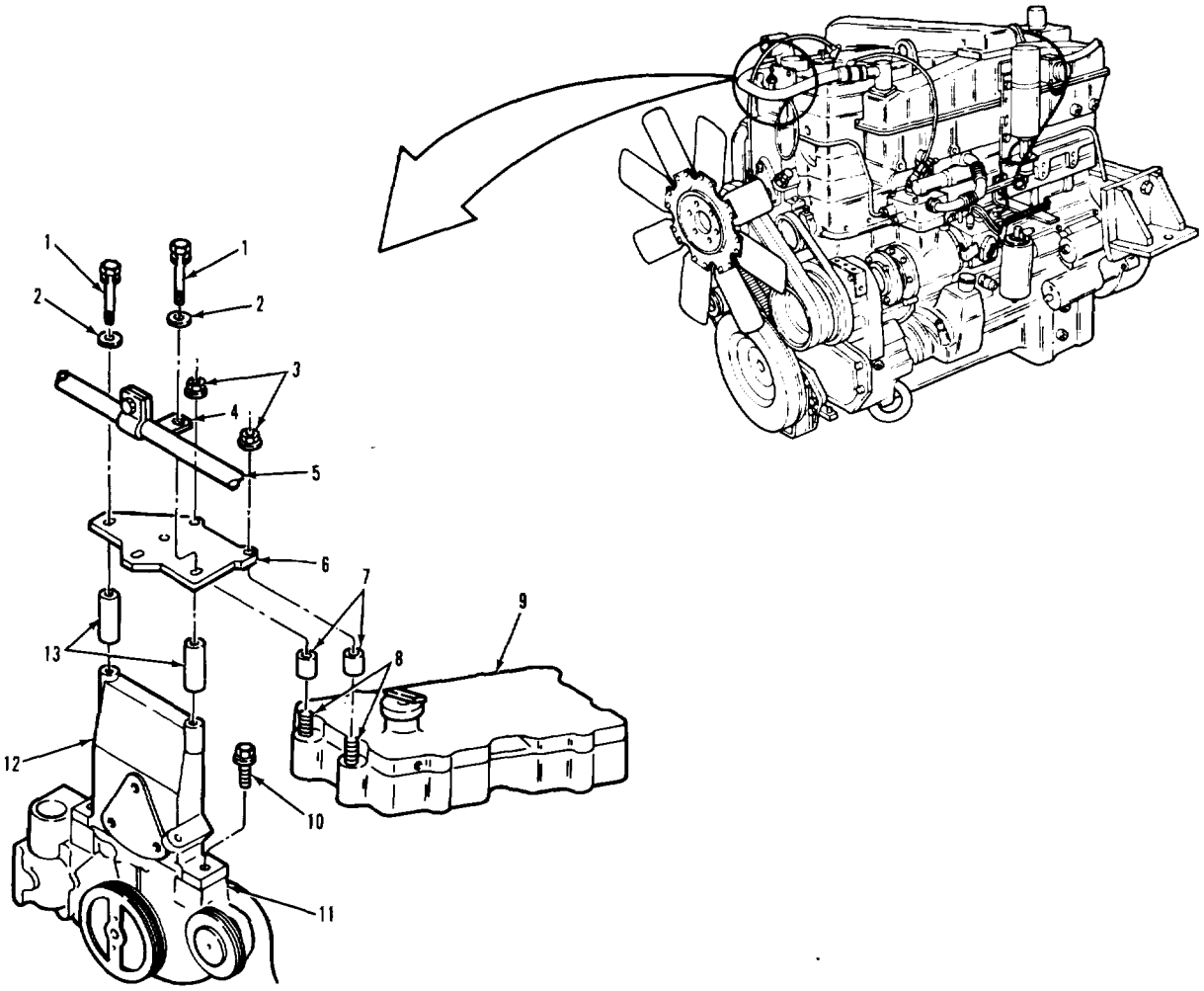
REFERENCES (TM)
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
None.

ENGINE.

3-24. FAN BRACE, BRACKET, AND SPACERS REPLACEMENT (Continued).



1. SCREW (2)
2. PLAIN WASHER (2)
3. HEXAGON FLANGE NUT (2)
4. TUBE SUPPORT BRACKET
5. WATER TRANSFER TUBE
6. FAN BRACE
7. SHORT SPACER (2)
8. STUD (2)
9. FRONT ROCKER COVER
10. SCREW WITH CAPTIVE WASHER (2)
11. WATER PUMP
12. FAN BRACKET
13. LONG SPACER (2)

TA 2370

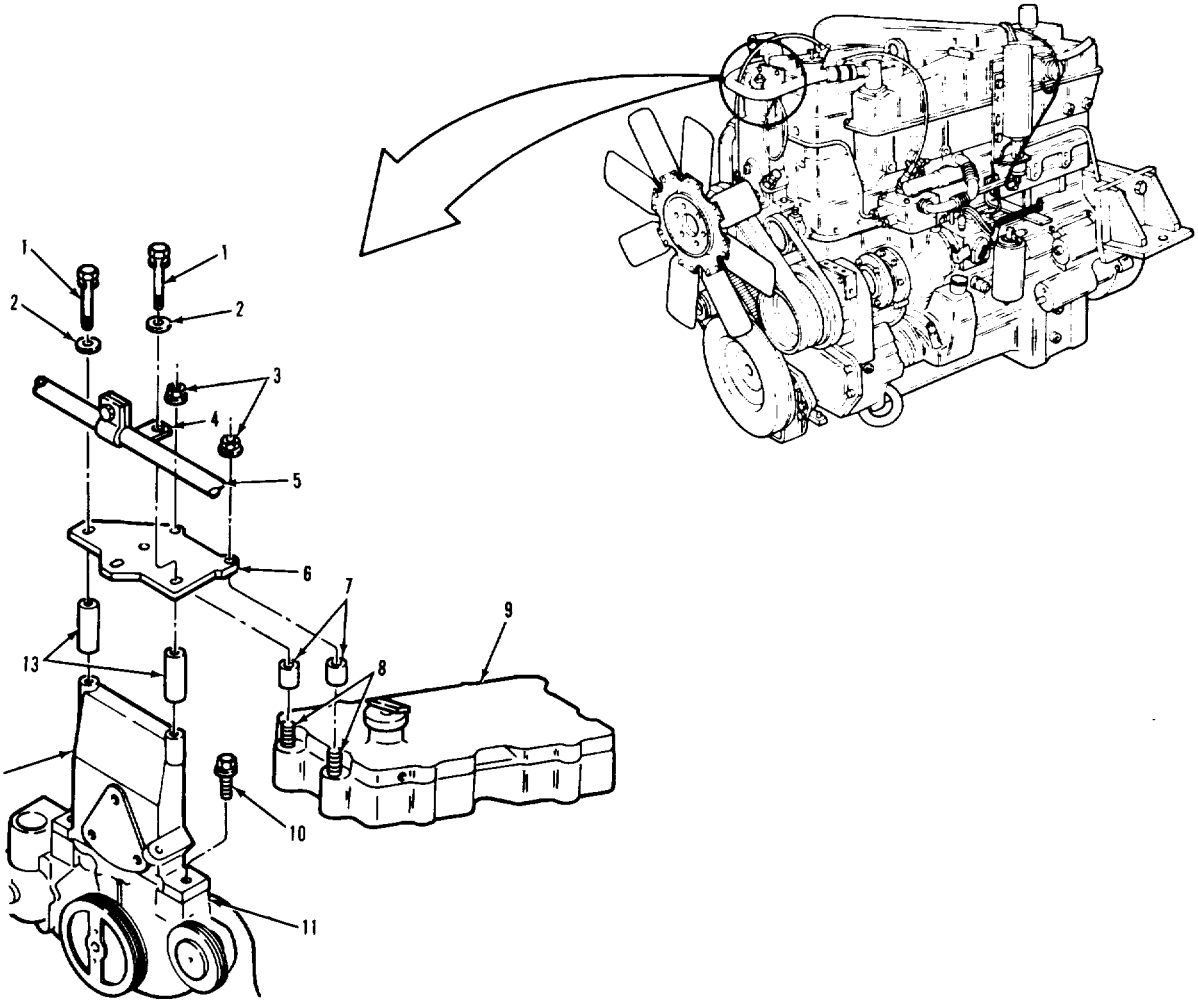
ENGINE.

3-24. FAN BRACE, BRACKET, AND SPACERS REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. BRACE AND SPACERS REMOVAL.		
	NOTE It may be necessary to loosen rocker cover for clearance. (Refer to para 3-24).	
1. Two screws (1), washers (2), and spacers (13).	Remove from item (4), item (6), and item (12).	Remove left side first so that item (5) can be moved out of the way.
2. Two nuts (3), brace (6), and two spacers (7).	Remove from two items (8).	
B. RACKET REMOVAL.		
3. Fan and fan clutch.	Remove.	Refer to paragraph 3-65.
4. Two screws (10).	Remove from item (12).	
5. Bracket (12).	Remove from item (11).	
C. CLEANING AND INSPECTION.		
6. All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
D. BRACKET INSTALLATION. I		
7. Bracket (12).	Put in place on item (11).	

ENGINE.

3-24. FAN BRACE, BRACKET, AND SPACERS REPLACEMENT (Continued).



1. SCREW (2)
2. PLAIN WASHER (2)
3. HEXAGON FLANGE NUT (2)
4. TUBE SUPPORT BRACKET
5. WATER TRANSFER TUBE
6. FAN BRACE
7. SHORT SPACER (2)
8. STUD (2)
9. FRONT ROCKER COVER
10. SCREW WITH CAPTIVE WASHER (2)
11. WATER PUMP
12. FAN BRACKET
13. LONG SPACER (2)

TA237031

ENGINE.

3-24. FAN BRACE, BRACKET, AND SPACERS REPLACEMENT (Continued).

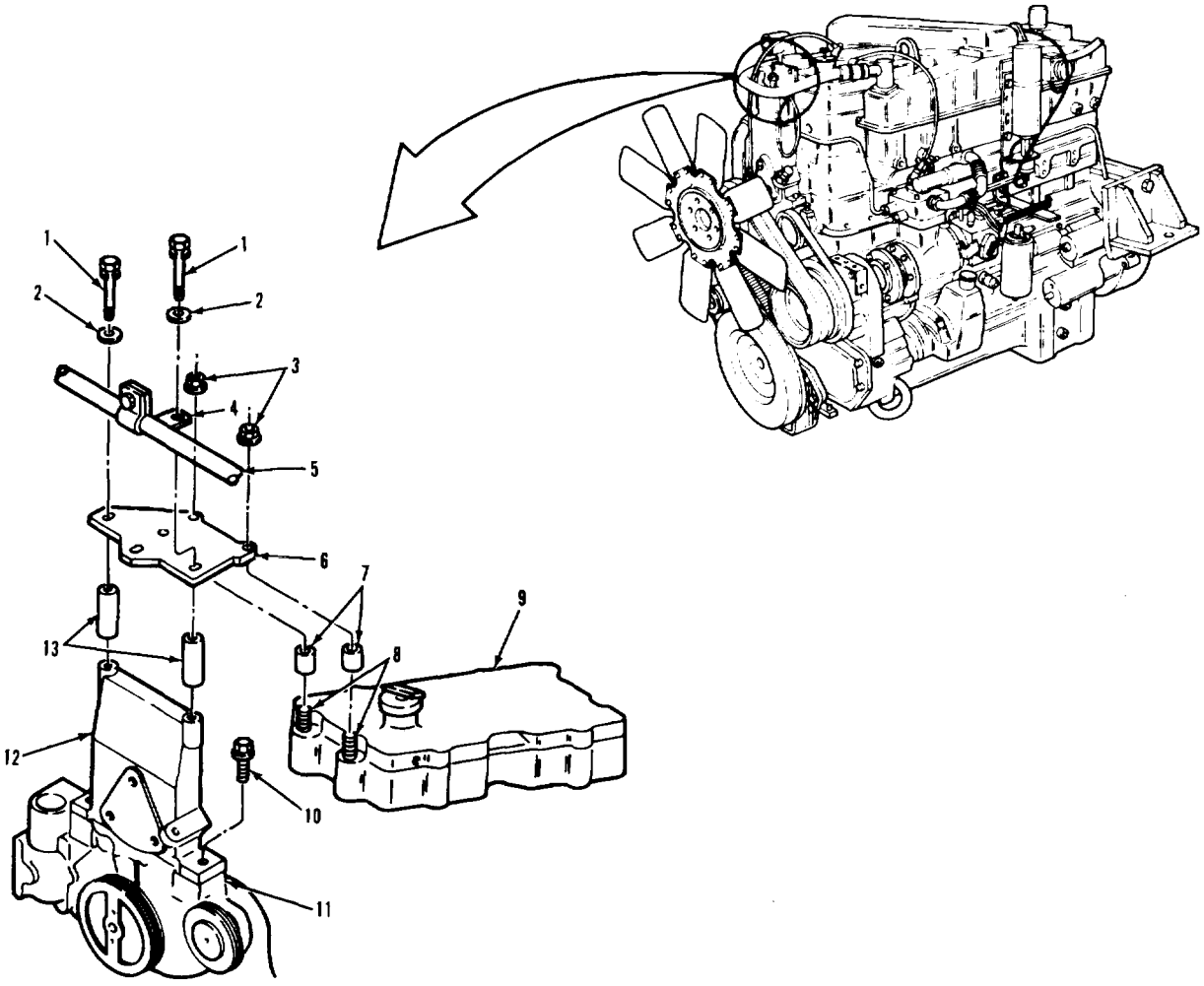
LOCATION/ITEM	ACTION	REMARKS
D. BRACKET INSTALLATION (Continued		
8. Two screws (10).	Secure item (12) to item (11).	
9. Fan and fan clutch.	Install	Refer to paragraph 3-65.
E. BRACE AND SPACERS INSTALLATION		
10. Two spacers (7) And brace (6).	Place on two items (8).	
11. Two screws (1), washers (2), and spacers (13).	Secure item (6) and item (4) to item (12).	Torque to 49 lb-ft.
12. Two nuts (3).	Secure item (6) and two items (7) to item (9).	Torque to 60 lb-ft.

NOTE

Follow-on maintenance action required: None.

ENGINE.

3-24. FAN BRACE, BRACKET, AND SPACERS REPLACEMENT (Continued).



LEGEND:

1. SCREW (2)
2. PLAIN WASHER (2)
3. HEXAGON FLANGE NUT (2)
4. TUBE SUPPORT BRACKET
5. WATER TRANSFER TUBE
6. FAN BRACE
7. SHORT SPACER (2)
8. STUD (2)
9. FRONT ROCKER COVER
10. SCREW WITH CAPTIVE WASHER (2)
11. WATER PUMP
12. FAN BRACKET
13. LONG SPACER (2)

TA237032

SECTION III. FUEL SYSTEM

3-25. GENERAL

This section provides procedures authorized at the organizational maintenance level to replace fuel system components. To find a specific procedure contained in this section, see the task summary below.

3-26. TASK SUMMARY.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
(Refer to specific paragraph for this information).

CONDITION DESCRIPTION

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Solvent, drycleaning, SD-2
Item 29, Appendix C.
Tape, thread sealing
Item 32, Appendix C.
Rags, wiping
Item 22, Appendix C.
Solution, soap
Item 28, Appendix C.
Adhesive, liquid, rubber, Type II
Item 1, Appendix C.
Containers for draining fuel (AR).
Oil, fuel: diesel (match oil in vehicle)
Item 12, 13, or 14, Appendix C.
Grease, automotive and artillery
Item 7, Appendix C.
Ring, cap seal
(15434) 154088.
Gasket, crossover mounting
(15434) 216487.
Seal, rectangular ring
(15434) 154087.
Seal, rectangular ring
(15434) 129888.
Filter, fuel, water separator
(33457) FS1212.
Seal, ring
(15434) 255622.
Gasket, cylinder
(06991) 111025.
Pin, cotter (2)
(24617) 103362.

PERSONNEL REQUIRED
Three (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
Darkened area for element inspection.

Work area clean and away from blowing dirt and dust.

FUEL SYSTEM.

3-26. TASK SUMMARY (Continued).

INITIAL SETUP (Continued)

REFERENCES (TM)
TM 9-2320-283-10.
TM 9-2320-283-20P.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.
Guard against flame or sparks in work area.

LIST OF TASKS

TASK NO.	TASK	TASK REF	TROUBLESHOOTING REF NO. (PARA)
1	Fuel Filter Screen Replacement	3-27	2-11
	a. Removal.	3-27a	
	b Cleaning and Inspection.	3-27b	
	c. Installation.	3-27c	
2	Engine Fuel Lines and Fittings Replacement	3-28	2-11
	a Actuating Line Removal.	3-28a	
	b. Air Actuating Line Installation	3-28b	
	c. Fuel Pump Return Line Removal.	3-28c	
	d. Fuel Pump Return Line Installation.	3-28d	
	e. Manifold Fuel Return Line Removal.	3-28e	
	f. Manifold Fuel Return Line Installation.	3-28f	
	g. Fuel Delivery Line Removal.	3-289	
	h. Fuel Delivery Line Installation.	3-28h	
3	Air Cleaner Assembly Replacement	3-29	2-11
	a. Removal.	3-29a	
	b. Cleaning and Inspection.	3-29b	
	c. Installation.	3-29c	

FUEL SYSTEM.

3-26. TASK SUMMARY (Continued).

LIST OF TASKS

TASK NO.	TASK	TASK REF	TROUBLESHOOTING REF NO. (PARA)
4	Air Cleaner Filter Element Replacement	3-30	2-11
	a. Removal.	3-30a	
	b. Cleaning.	3-30b	
	c. Inspection.	3-30c	
	d. Installation.	3-30d	
5	Turbocharger Air Crossover Connection Replacement	3-31	2-11
	a. Removal.	3-31a	
	b. Cleaning and Inspection.	3-31b	
	c. Installation.	3-31c	
6	Air Cleaner Tube Replacement	3-32	2-11
	a. Removal.	3-32a	
	b. Cleaning and Inspection.	3-32b	
	c. Installation.	3-32c	
7	Solenoid Valve Replacement	3-33	2-11
	a. Removal.	3-33a	
	b. Disassembly.	3-33b	
	c Cleaning and Inspection.	3-33c	
	d. Assembly.	3-33d	
	e. Installation.	3-33e	
	f. Operational Check.	3-33f	
8	Fuel Tank Replacement	3-34	2-11
	a. Removal.	3-34a	
	b. Cleaning and Inspection.	3-34b	
	c. Installation.	3-34c	
9	Fuel Heater Replacement	3-35	2-11
	a. Removal.	3-35a	
	b. Cleaning and Inspection.	3-35b	
	c. Installation.	3-35c	

FUEL SYSTEM.

3-26. TASK SUMMARY (Continued).

LIST OF TASKS

TASK NO.	TASK	TASK REF	TROUBLESHOOTING REF NO. (PARA)
10	Fuel Hoses and Fittings Replacement	3-36	2-11
	a. Fuel Supply Hose Removal.	3-36a	
	b. Fuel Supply Hose Installation.	3-36b	
	c. Fuel Supply to Engine Hose Removal.	3-36c	
	d. Fuel Supply to Engine Hose Installation.	3-36d	
	e. Fuel Return Hose Removal.	3-36e	
	f. Fuel Return Hose Installation.	3-36f	
11	Water Separator Fuel Filter Replacement	3-37	2-11
	a. Removal.	3-37a	
	b. Installation.	3-37b	
12	Ether Cylinder Replacement	3-38	2-11
	a. Removal.	3-38a	
	b. Installation.	3-38b	
13	Ether Quick Start Thermostat Replacement	3-39	2-11
	a. Removal.	3-39a	
	b. Cleaning and Inspection.	3-39b	
	c. Installation.	3-39c	
14	Ether Quick Start Kit Replacement	3-40	2-11
	a. Removal.	3-40a	
	b. Cleaning and Inspection.	3-40b	
	c. Installation.	3-40c	
15	Accelerator Pedal and Linkage Replacement	3-41	2-11
	a. Removal.	3-41a	
	b. Cleaning and Inspection.	3-41b	
	c. Installation.	3-41c	
16	Fuel Control Lever Replacement	3-42	2-11
	a. Removal.	3-42a	
	b. Cleaning and Inspection.	3-42b	
	c. Installation.	3-42c	

FUEL SYSTEM.

3-27. FUEL FILTER SCREEN REPLACEMENT.

THIS TASK COVERS
a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	3-314.	Pressure transducer

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Solvent, drycleaning, SD-2
Item 29, Appendix C.
Ring, cap seal
(15434) 154088.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

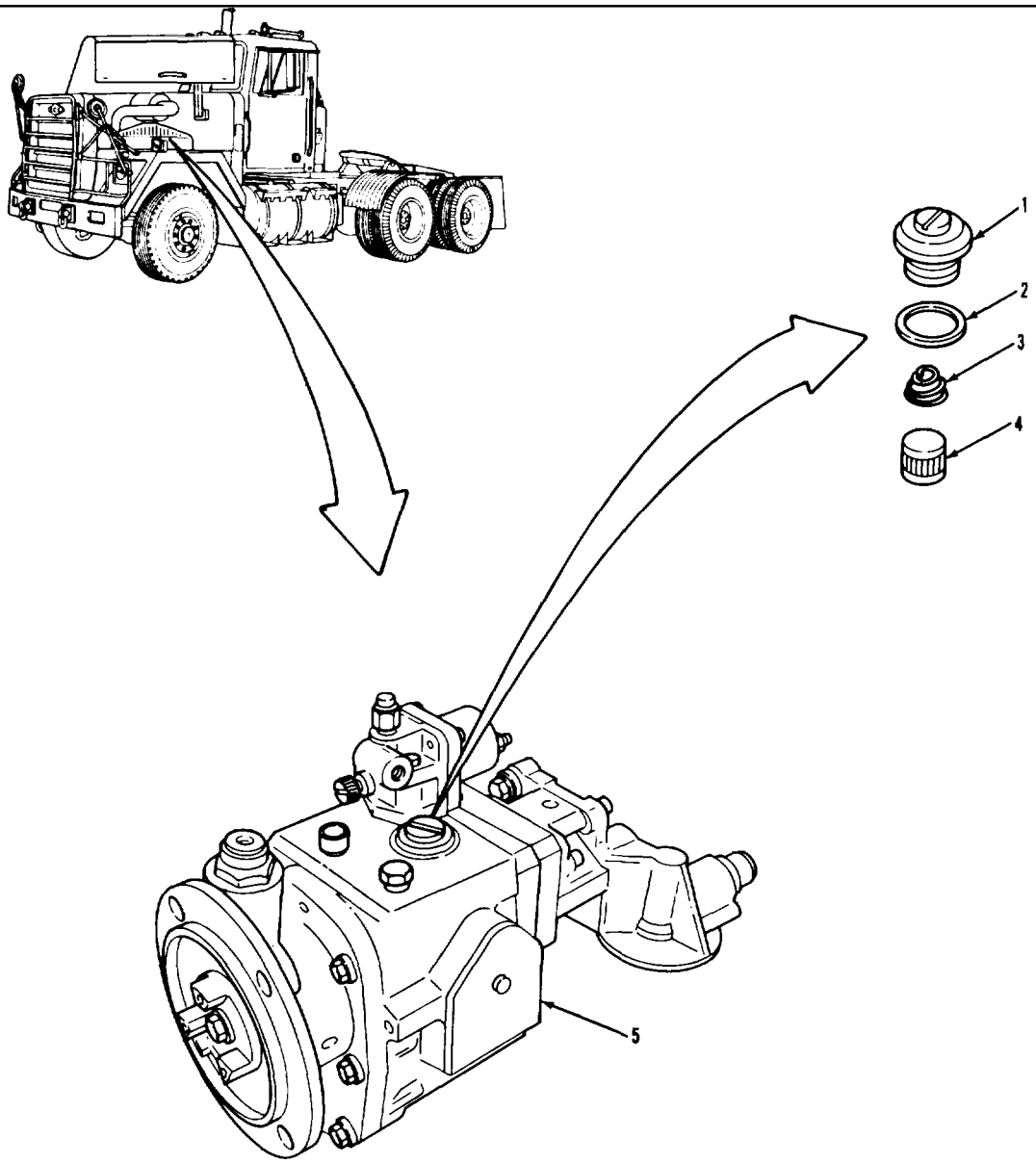
REFERENCES (TM)
TM 9-2320-283-20P.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

FUEL SYSTEM.

3-27. FUEL FILTER SCREEN REPLACEMENT (Continued).



1. FILTER SCREEN CAP
2. SEAL CAP RING
3. FILTER SPRING
4. FUEL FILTER SCREEN
5. FUEL PUMP HOUSING

FUEL SYSTEM.

3-27. FUEL FILTER SCREEN REPLACEMENT (Continued).

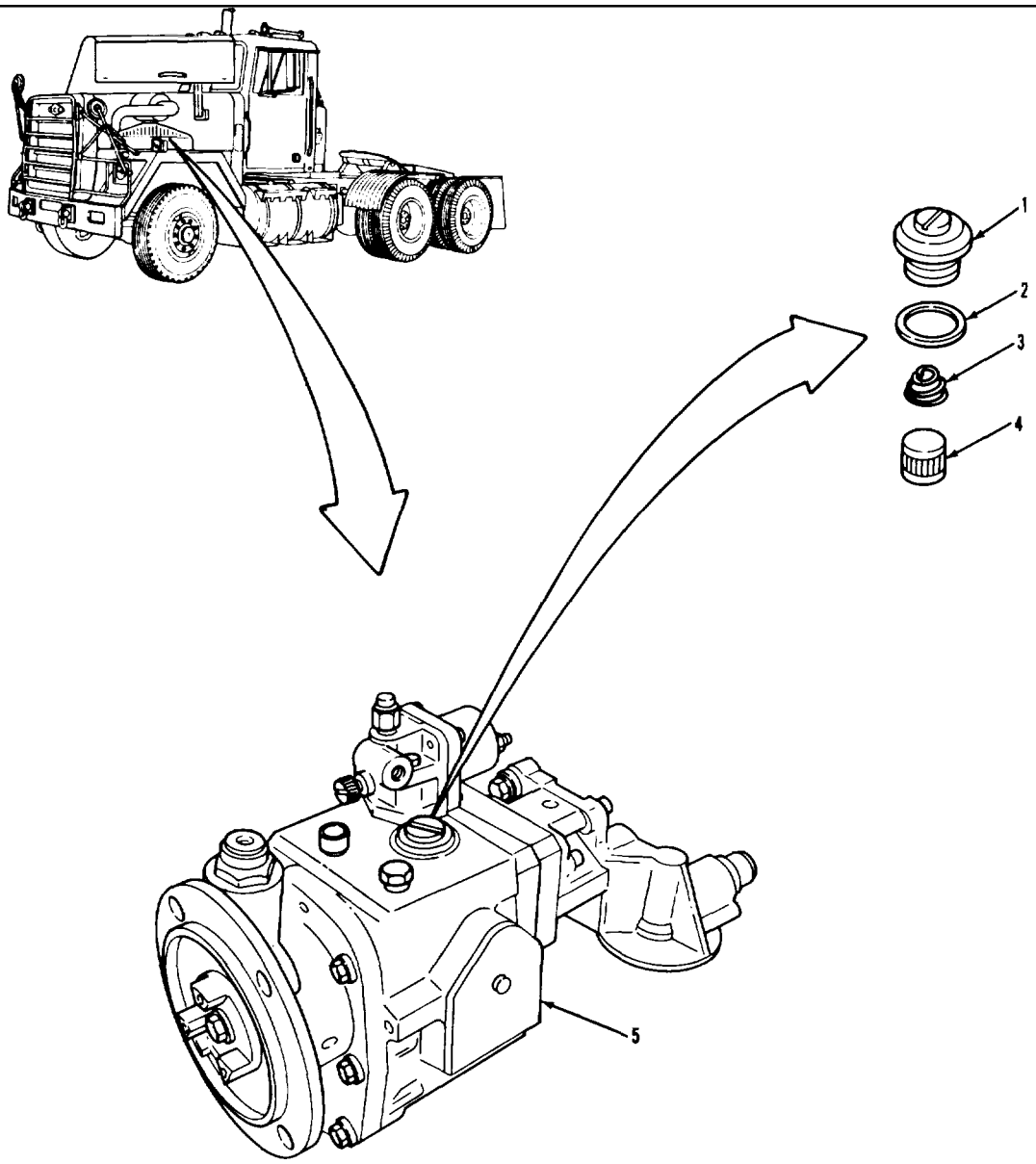
LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Cap (1).	Unscrew from item (5).	
2. Ring (2).	a. Remove from item (1).	
	b. Discard item (2).	
3. Spring (3) and screen (4).	Remove from item (5).	
B. LEANING AND INSPECTION		
4. All parts.	a. Clean with solvent.	Refer to paragraph 3-4.
	b. Inspect.	Refer to paragraph 3-5.
C. INSTALLATION.		
5. Screen (4) and spring (3).	Set in item (5).	Opening in item (4) must face item (5) when installed.
6. New ring (2).	Put on item (1).	
7. Cap (1).	Screw in item (5) and tighten, until fully seated.	

NOTE

Follow-on maintenance action required: Install pressure transducer (para 3-314).

FUEL SYSTEM.

3-27. FUEL FILTER SCREEN REPLACEMENT (Continued).



1. FILTER SCREEN CAP
2. SEAL CAP RING
3. FILTER SPRING
4. FUEL FILTER SCREEN
5. FUEL PUMP HOUSING

FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENT.

THIS TASK COVERS

a. Air Actuating Line Removal.
b. Air Actuating Line Installation.
c. Fuel Pump Return Line Removal.
d. Fuel Pump Return Line Installation.
e. Manifold Fuel Return Line Removal.
f. Manifold Fuel Return Line Installation.
g. Fuel Delivery Line Removal.
h. Fuel Delivery Line Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	None.	None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Tape, thread sea ing
Item 32, Appendix C.

PERSONNEL REQUIRED
One (MOS-63S}.

SPECIAL ENVIRONMENTAL CONDITIONS
None.

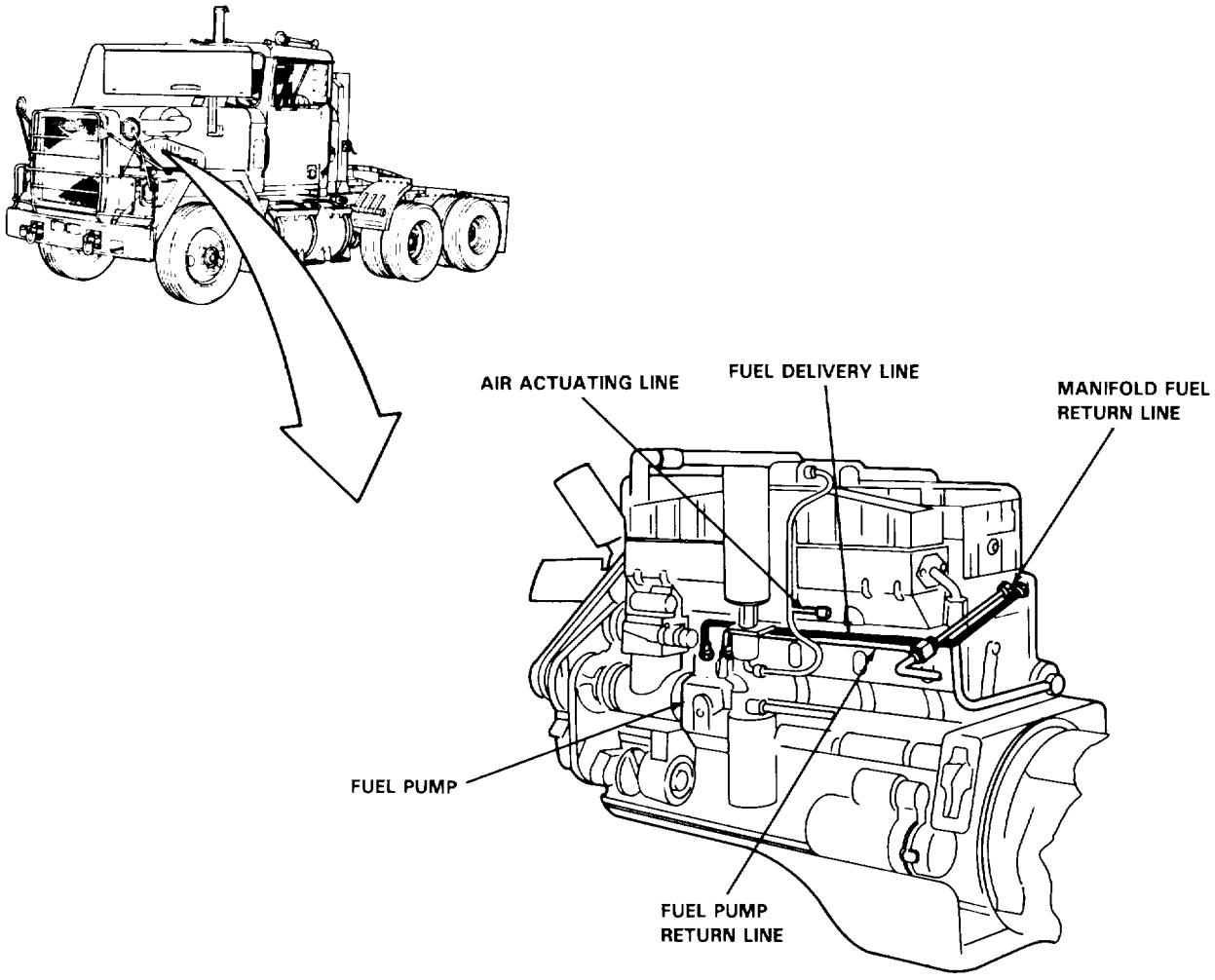
REFERENCES (TM)
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENTS (Continued).



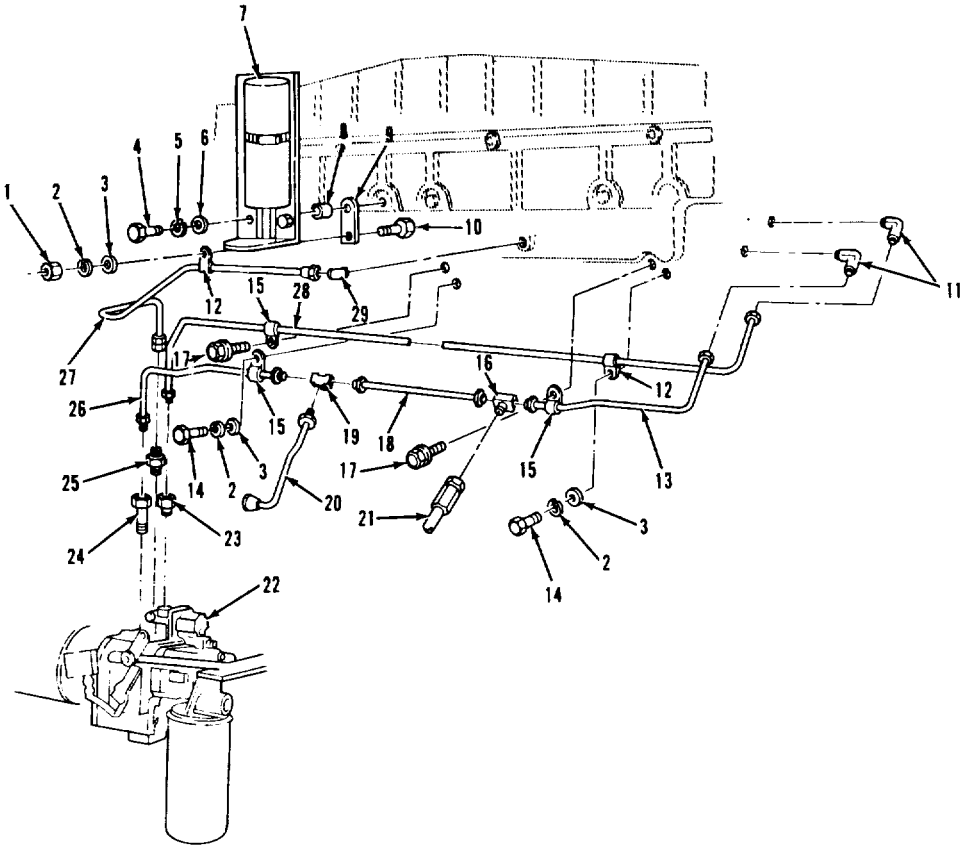
FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENTS (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. AIR ACTUATING LINE REMOVAL		
1. Screw (4), lockwasher (5), washer (6), and spacer (8).	Remove from item (7) and item (9).	
2. Tube (27).	Remove from item (25) and item (29).	
3. Screw (10), lockwasher (2), washer (3), and nut (1).	Remove from item (12) and item (9).	
4. Clamp (12).	Remove from item (27).	
5. T-Fitting (29).	Remove from engine.	
6. Fitting (25).	Remove from item (22).	
B. AIR ACTUATING LINE INSTALLATION.		
7. Fitting (25).	Install in item (22).	Put thread sealing tape
8. T-Fitting (29).	Install in engine.	a. Put thread sealing tape on pipe threads. b. Point towards front of vehicle.
9. Clamp (12).	Put on item (27).	
10. Screw (10), lockwasher (2), washer (3), and nut (1).	Install item (12) on item (9).	Do not tighten.

FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENTS (Continued).



1. HEX NUT
2. LOCKWASHER (3)
3. WASHER (3)
4. SCREW
5. LOCKWASHER
6. WASHER
7. ETHER QUICK START KIT
8. SPACER
9. SUPPORT BRACKET
10. SCREW
11. ELBOW (2)
12. TUBE CLAMP (2)
13. FUEL TUBE
14. SCREW (2)
15. TUBE CLAMP (3)
16. MALE BRANCH TEE
17. SCREW WITH CAPTIVE WASHER (2)
18. FUEL TUBE
19. FEMALE UNION TEE
20. FUEL TUBE
21. FUEL RETURN HOSE
22. FUEL PUMP
23. FUEL FITTING
24. ASA VALVE
25. FUEL FITTING
26. FUEL TUBE
27. FUEL TUBE
28. FUEL TUBE
29. T-FITTING WITH ADAPTER AND PLUG

TA 237026

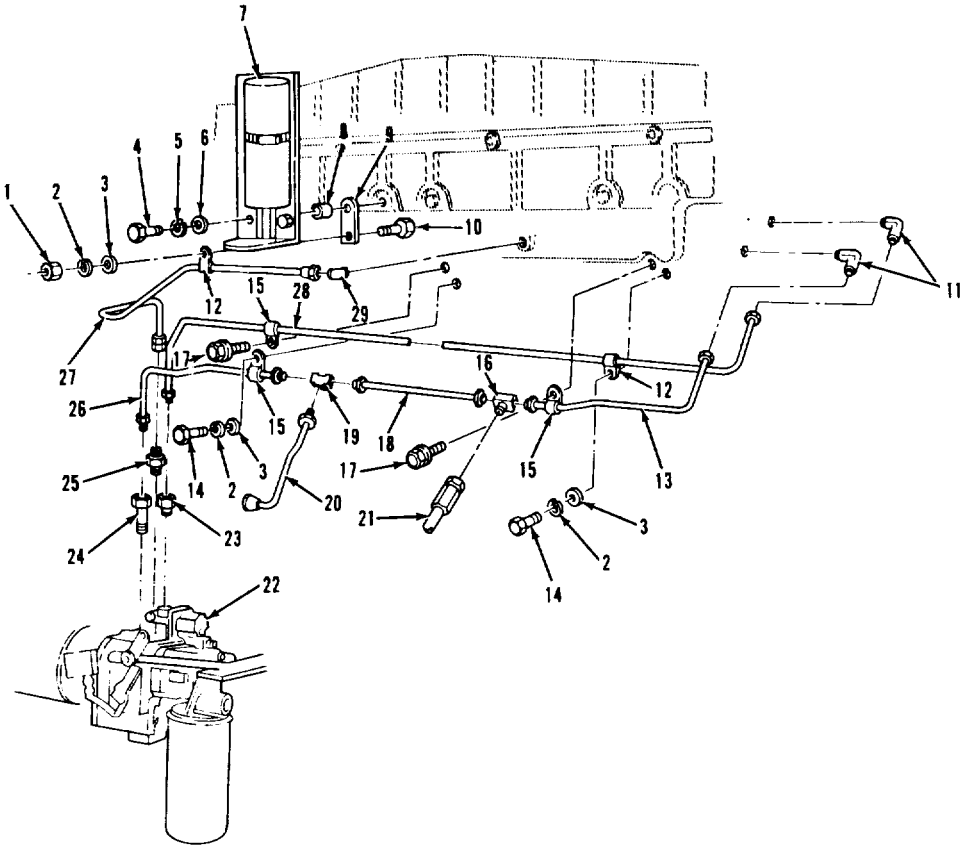
FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENTS (Continued).

LOCATION/ITEM	ACTION	REMARKS
B. AIR ACTUATING LINE INSTALLATION (Continued).		
11. Tube (27), clamp (12), and bracket (9).	a. Put in place in item (29) and item (25). b. Line up item (9) with hole in engine. c. Remove.	Hold item (12) in place on item (27) or mark location.
12. Screw (10) and nut (1).	Tighten.	
13. Tube (27). item (29).	Install on item (25) and	
14. Screw (4), lock-washer (5), washer (6), and spacer (8).	Install in item (7) and item (9).	
C. FUEL PUMP RETURN LINE REMOVAL		
15. Screw (14), lock-washer (2), and washer (3).	Remove from item (15).	
16. Tube (26). item (19).	Remove from item (24) and	
17. Valve (24).	Remove from item (22).	
18. Tube (20). item (22).	Remove from item (19) and	
19. Tube (18). item (16).	Remove from item (19) and	
20. Hose (21).	Remove from item (16).	
21. Tee (16).	Remove from item (13).	

FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENTS (Continued).



1. HEX NUT
2. LOCKWASHER (3)
3. WASHER (3)
4. SCREW
5. LOCKWASHER
6. WASHER
7. ETHER QUICK START KIT
8. SPACER
9. SUPPORT BRACKET
10. SCREW
11. ELBOW (2)
12. TUBE CLAMP (2)
13. FUEL TUBE
14. SCREW (2)
15. TUBE CLAMP (3)
16. MALE BRANCH TEE
17. SCREW WITH CAPTIVE WASHER (2)
18. FUEL TUBE
19. FEMALE UNION TEE
20. FUEL TUBE
21. FUEL RETURN HOSE
22. FUEL PUMP
23. FUEL FITTING
24. ASA VALVE
25. FUEL FITTING
26. FUEL TUBE
27. FUEL TUBE
28. FUEL TUBE
29. T-FITTING WITH ADAPTER AND PLUG

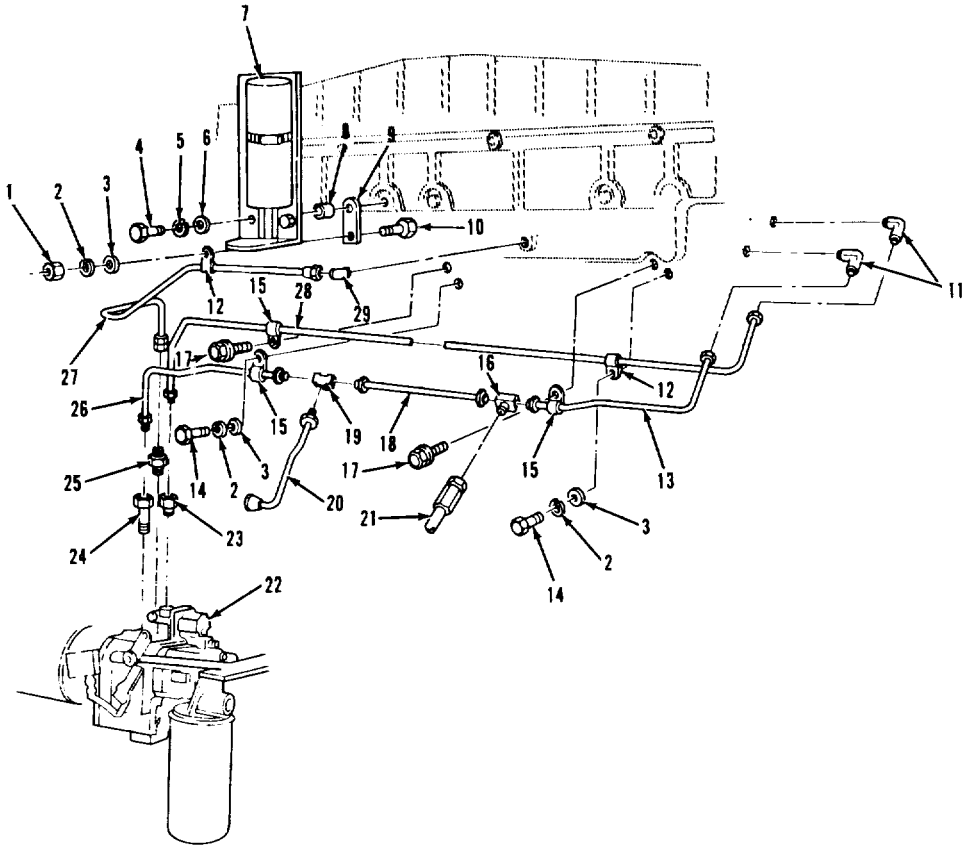
FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENTS (Continued).

LOCATION/ITEM	ACTION	REMARKS
D. FUEL PUMP RETURN LINE INSTALLATION.		
22. Tee (16).	Install on item (13).	
23. Hose (21).	Install on item (16).	
24. Tube (18).	Install on item (16).	
25. Tee (19).	Install on item (18).	Do not tighten.
26. Tube (20).	Install on item (22) and item (19).	
27. Tube (18).	Tighten in item (19).	
28. Clamp (15).	Put on item (26).	
29. Valve (24).	Install in item (22).	Put thread sealing tape on pipe threads.
30. Tube (26).-	Install in item (24) and item (19).	
31. Screw (14), lock-washer (2), and washer (3).	Secure item (15) to engine.	
E. MANIFOLD FUEL RETURN LINE REMOVAL		
32. Air cleaner assembly.	Remove.	Refer to paragraph 3-29.
33. Screw (17).	Remove from item (15).	
34. Tube (13).	Remove from item (16) and item (11).	
35. Clamp (15).	Remove from item (13)	
36. Elbow (11).	Remove from engine	Note position for installation.

FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENTS (Continued).



1. HEX NUT
2. LOCKWASHER (3)
3. WASHER (3)
4. SCREW
5. LOCKWASHER
6. WASHER
7. ETHER QUICK START KIT
8. SPACER
9. SUPPORT BRACKET
10. SCREW
11. ELBOW (2)
12. TUBE CLAMP (2)
13. FUEL TUBE
14. SCREW (2)
15. TUBE CLAMP (3)
16. MALE BRANCH TEE
17. SCREW WITH CAPTIVE WASHER (2)
18. FUEL TUBE
19. FEMALE UNION TEE
20. FUEL TUBE
21. FUEL RETURN HOSE
22. FUEL PUMP
23. FUEL FITTING
24. ASA VALVE
25. FUEL FITTING
26. FUEL TUBE
27. FUEL TUBE
28. FUEL TUBE
29. T-FITTING WITH ADAPTER AND PLUG

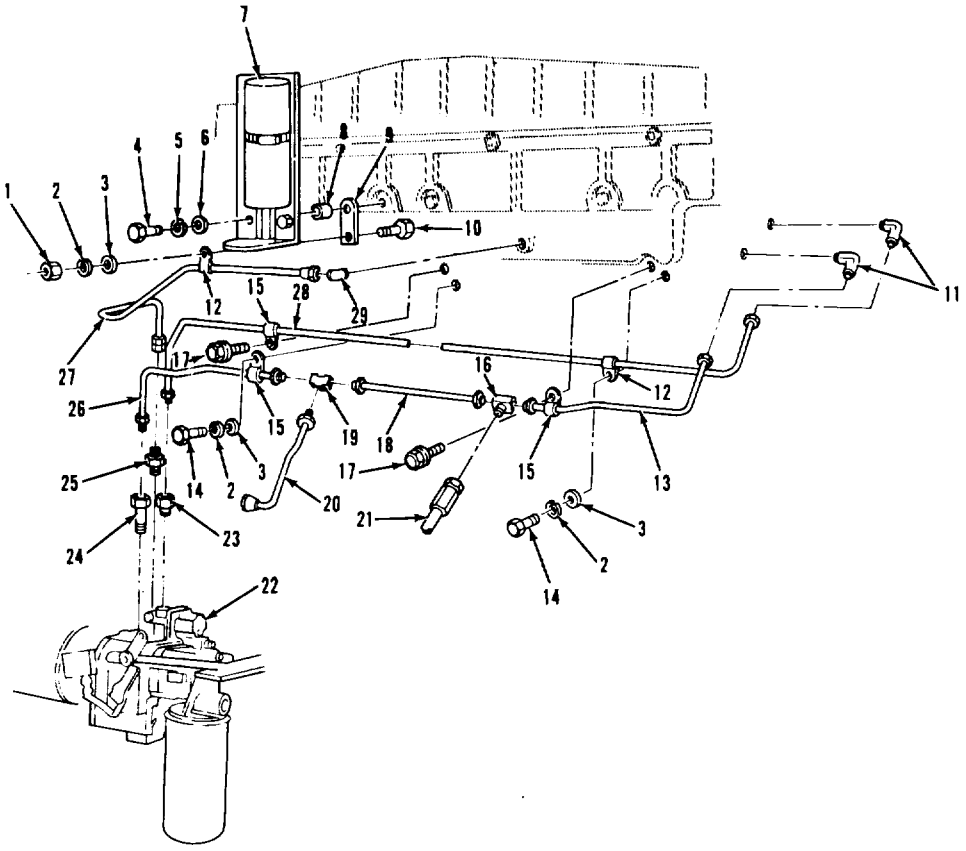
FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENTS (Continued).

LOCATION/ITEM	ACTION	REMARKS
F. MANIFOLD FUEL RETURN LINE INSTALLATION.		
37. Elbow (11).	Install in engine.	Put thread sealing tape on pipe threads.
38. Clamp (15).	Put on item (13).	
39 Tube (13).	Install in item (11) and item (16).	
40. Screw (17).	Secure item (15) to engine.	
41. Air cleaner assembly.	Install.	Refer to paragraph 3-29.
G. FUEL DELIVERY LINE REMOVAL.		
42. Fuel pump return line.	Remove.	Refer to subparagraph C.
43. Manifold fuel return line.	Remove.	Refer to subparagraph E.
44. Screw (14), lock-washer (2), and washer (3).	Remove from item (12).	
45. Screw (17).	Remove from item (15).	
46. Tube (28).	Remove from item (23) and item (11).	
47. Clamp (12) and clamp (15).	Remove from item (28).	
48. Elbow (11).	Remove from engine.	Note position of elbow for installation.
49. Fitting (23).	Remove from item (22).	

FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENTS (Continued).



LEGEND

1 HEX NUT
2 LOCKWASHER (3)
3 WASHER (3)
4 SCREW
5 LOCKWASHER
6 WASHER
7 ETHER QUICK START KIT
8 SPACER
9 SUPPORT BRACKET
10 SCREW
11 ELBOW (2)
12 TUBE CLAMP (2)
13 FUEL TUBE
14 SCREW (2)
15 TUBE CLAMP (3)
16 MALE BRANCH TEE
17 SCREW WITH CAPTIVE WASHER (2)
18 FUEL TUBE
19 FEMALE UNION TEE
20 FUEL TUBE
21 FUEL RETURN HOSE
22 FUEL PUMP
23 FUEL FITTING
24 ASA VALVE
25 FUEL FITTING
26 FUEL TUBE
27 FUEL TUBE
28 FUEL TUBE
29 T-FITTING WITH ADAPTER AND PLUG

TA 237039

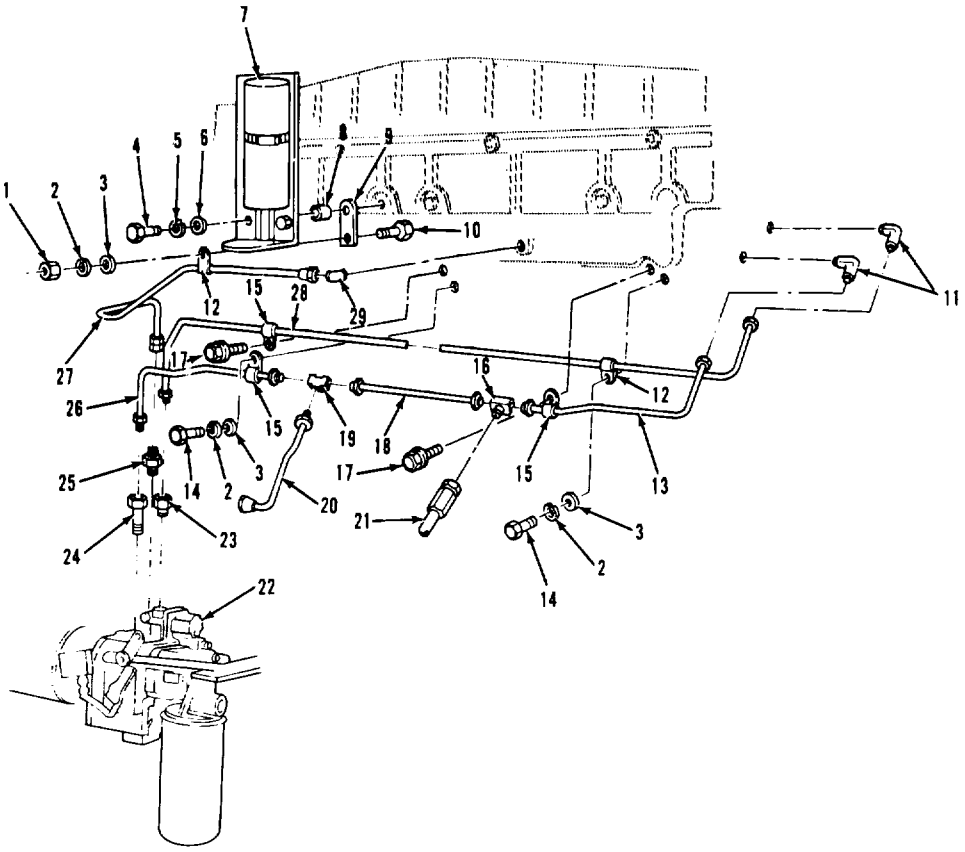
FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENTS (Continued).

	LOCATION/ITEM	ACTION	REMARKS
H. FUEL DELIVERY LINE INSTALLATION.			
50	Fitting (23)	Install in item (22)	Put thread sealing tape on pipe threads.
51	Elbow (11)	Install in engine	Put thread sealing tape on pipe threads.
52	Clamp (12) and clamp (15).	Put on item (28).	
53	Tube (28)	Install on item (11) and item (23).	
54	Screw (17)	Secure item (15) to engine.	
55	Screw (14), lock-washer (2), and washer (3).	Secure item (12) to engine.	
56	Manifold return line.	Install	Refer to subparagraph F.
57	Fuel pump return line.	Install	Refer to subparagraph D.
		NOTE Follow-on maintenance action required. None.	

FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENTS (Continued).



LEGEND

1 HEX NUT
2 LOCKWASHER (3)
3 WASHER (3)
4 SCREW
5 LOCKWASHER
6 WASHER
7 ETHER QUICK START KIT
8 SPACER
9 SUPPORT BRACKET
10 SCREW
11. ELBOW (2)
12 TUBE CLAMP (2)
13 FUEL TUBE
14 SCREW (2)
15 TUBE CLAMP (3)
16 MALE BRANCH TEE
17 SCREW WITH CAPTIVE WASHER (2)
18 FUEL TUBE
19 FEMALE UNION TEE
20 FUEL TUBE
21 FUEL RETURN HOSE
22 FUEL PUMP
23 FUEL FITTING
24 ASA VALVE
25 FUEL FITTING
26 FUEL TUBE
27 FUEL TUBE
28 FUEL TUBE
29 T-FITTING WITH ADAPTER AND PLUG

TA 237040

FUEL SYSTEM.

3-29. AIR CLEANER ASSEMBLY REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	None.	None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Rags, wiping
Item 22, Appendix C.
Solvent, dry cleaning, SD-2
Item 29, Appendix C.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

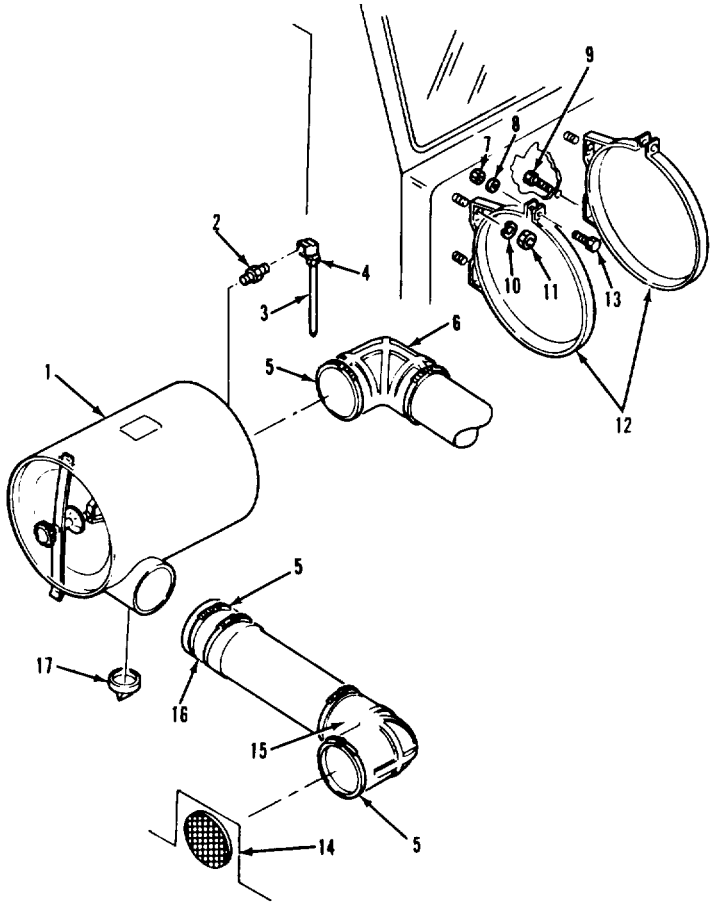
REFERENCES (TM)
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

FUEL SYSTEM.

3-29. AIR CLEANER ASSEMBLY REPLACEMENT (Continued).



LEGEND:

1	AIR CLEANER ASSEMBLY	10	LOCKWASHER (4)
2	NIPPLE AND FILTER ASSEMBLY	11	HEX NUT (4)
3	TUBE	12	BRACKET (2)
4	ELBOW	13	SCREW (2)
5	AIR INTAKE TUBE CLAMP (3)	14	HOOD SEAL RIGHT-HAND RETAINER
6	90° AIR TUBE ELBOW	15	900 AIR INTAKE ELBOW
7	HEX NUT (2)	16	SPECIAL 220 ELBOW
8	LOCKWASHER (2)	17	DUST AND MOISTURE BOOT
9.	SCREW		

TA 237041

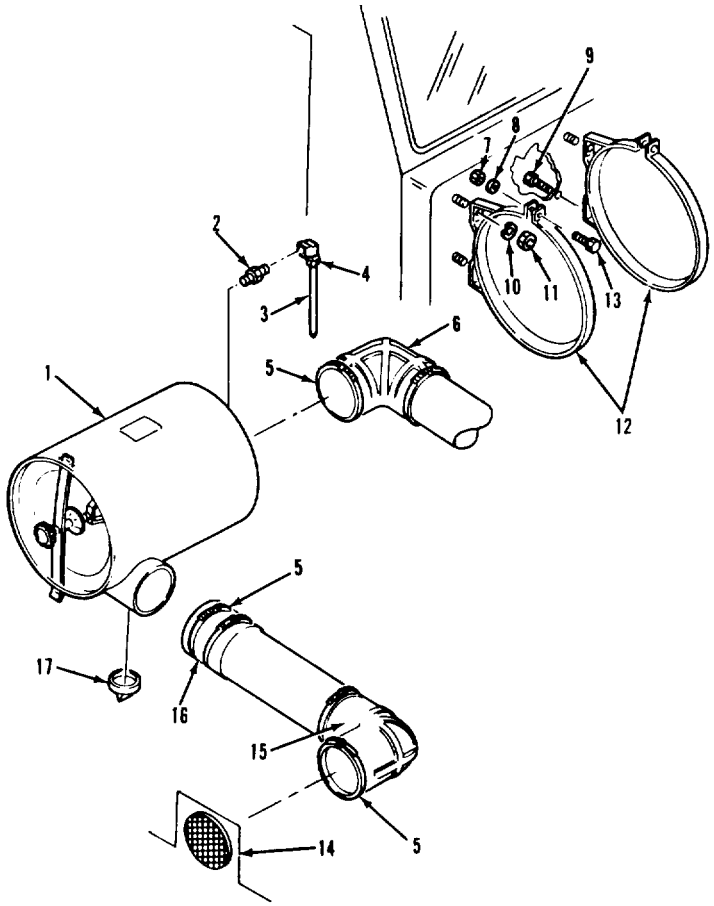
FUEL SYSTEM.

3-29. AIR CLEANER ASEMBLY REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Three clamps (5).	Loosen.	
2. Elbow (6).	Pull from item (1).	
3. Tube (3).	Remove from item (4).	
4. Elbow (15).	Pull from item (14).	
5. Elbow (16).	Pull from item (1).	
6. Two screws (13), lockwashers (8), and nuts (7).	Remove from two items (12).	
7. Air cleaner assembly (1).	Remove from two items (12).	
8. Elbow (4).	Remove from item (2).	
9. Nipple and filter assembly (2).	Remove from item (1).	
10. Boot (17).	Remove from item (1).	
11. Screw (9), four nuts (11), and lockwashers (10).	Remove from two items (12).	
12. Two brackets (12).	Remove from firewall.	
B. CLEANING AND INSPECTION.		
13. Air cleaner assembly (1) and boot (17).	Wipe clean with damp rag.	

FUEL SYSTEM.

3-29. AIR CLEANER ASSEMBLY REPLACEMENT (Continued).



LEGEND:

1	AIR CLEANER ASSEMBLY	10	LOCKWASHER (4)
2	NIPPLE AND FILTER ASSEMBLY	11	HEX NUT (4)
3	TUBE	12	BRACKET (2)
4	ELBOW	13	SCREW (2)
5	AIR INTAKE TUBE CLAMP (3)	14	HOOD SEAL RIGHT-HAND RETAINER
6	90° AIR TUBE ELBOW	15	90° AIR INTAKE ELBOW
7	HEX NUT (2)	16	SPECIAL 220 ELBOW
8	LOCKWASHER (2)	17	DUST AND MOISTURE BOOT
9.	SCREW		

TA 237042

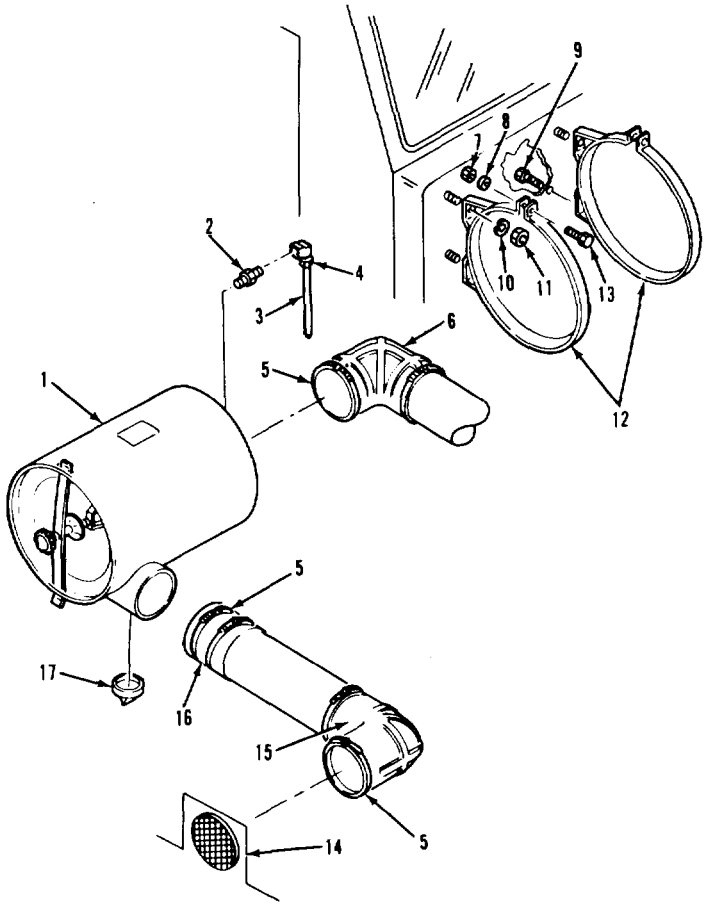
FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENTS (Continued).

	LOCATION/ITEM	ACTION	REMARKS
B. CLEANING AND INSPECTION (Continued).			
14	Two brackets (12), elbow (4), and nipple and filter assembly (2).	Clean with solvent and rags	Refer to paragraph 3-4.
15	All parts	Inspect	Refer to paragraph 3-5.
C. INSTALLATION.			
16	Boot (17)	Install on item (1).	
17	Nipple and filter assembly (2).	Install in item (1).	
18	Elbow (4)	Install on item (2).	
19	Two brackets (12).	Put in position on firewall.	
20	Screw (9), four nuts (11), and four lockwashers (10).	Secure two items (12).	
21	Air cleaner assembly (1).	Put in two items (12).	
22	Two screws (13), lockwasher (8), and nuts (7).	Install in two items (12)	Do not tighten.
23	Elbow (16)	Push on item (1).	
24	Elbow (15)	Push on item (14).	

FUEL SYSTEM.

3-29. AIR CLEANER ASSEMBLY REPLACEMENT (Continued).



LEGEND

1	AIR CLEANER ASSEMBLY	10	LOCKWASHER (4)
2	NIPPLE AND FILTER ASSEMBLY	11	HEX NUT (4)
3	TUBE	12	BRACKET (2)
4	ELBOW	13	SCREW (2)
5	AIR INTAKE TUBE CLAMP (3)	14	HOOD SEAL RIGHT-HAND RETAINER
6	900 AIR TUBE ELBOW	15	900 AIR INTAKE ELBOW
7	HEX NUT (2)	16	SPECIAL 220 ELBOW
8	LOCKWASHER (2)	17	DUST AND MOISTURE BOOT
9	SCREW		

TA 237043

FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENTS (Continued).

LOCATION/ITEM		ACTION	REMARKS
C. INSTALLATION (Continued).			
25	Tube (3)	Install on item (4).	
26	Elbow (6)	Push on item (1).	
27	Three clamps (5)	Tighten.	
28	Two screws (13), lockwashers (8), and nuts (7).	Tighten.	

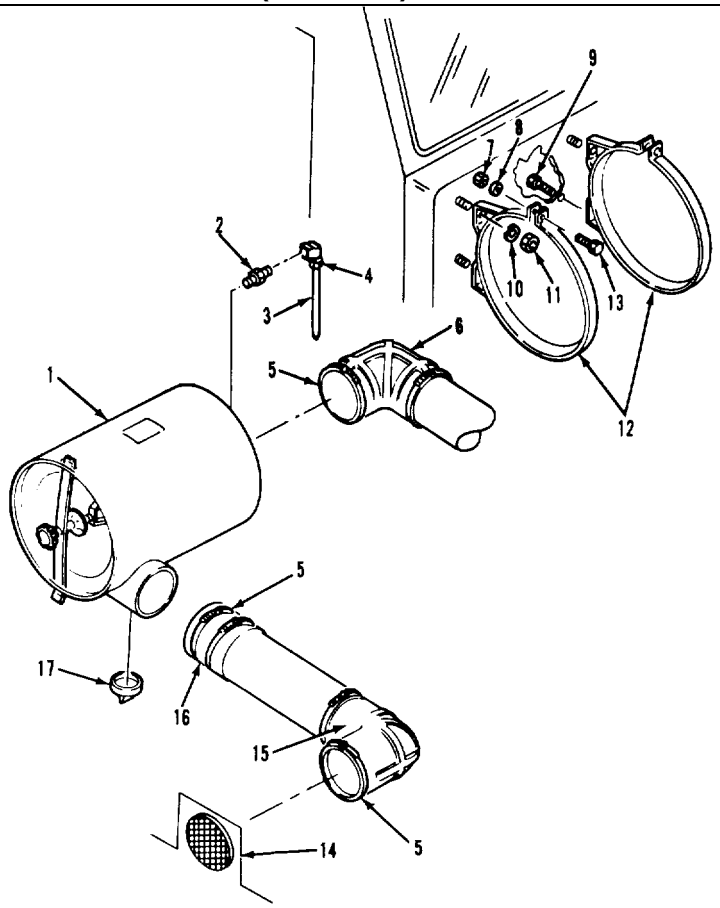
NOTE

Follow-on maintenance action required:

None.

FUEL SYSTEM.

3-29. AIR CLEANER ASSEMBLY REPLACEMENT (Continued).



LEGEND

1	AIR CLEANER ASSEMBLY	10	LOCKWASHER (4)
2	NIPPLE AND FILTER ASSEMBLY	11	HEX NUT (4)
3	TUBE	12	BRACKET (2)
4	ELBOW	13	SCREW (2)
5	AIR INTAKE TUBE CLAMP (3)	14	HOOD SEAL RIGHT-HAND RETAINER
6	900 AIR TUBE ELBOW	15	900 AIR INTAKE ELBOW
7	HEX NUT (2)	16	SPECIAL 22° ELBOW
8	LOCKWASHER (2)	17	DUST AND MOISTURE BOOT
9	SCREW		

FUEL SYSTEM.

3-30. AIR CLEANER ASSEMBLY REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	None.	None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Rags, wiping
Item 22, Appendix C.
Solution, soap
Item 28, Appendix C.

PERSONNEL REQUIRED
One (MOS-63SJ.

SPECIAL ENVIRONMENTAL CONDITIONS
Darkened area for element inspection.

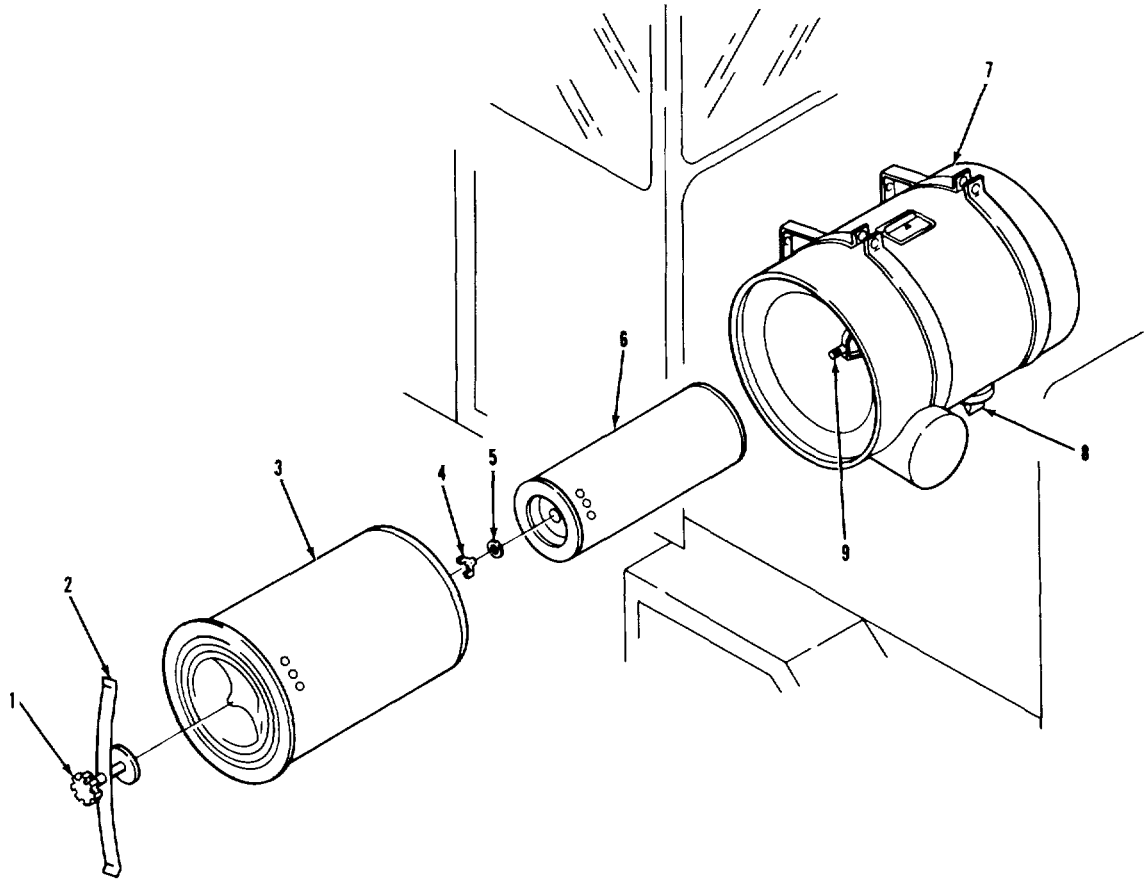
REFERENCES (TM)
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

FUEL SYSTEM.

3-30. AIR CLEANER FILTER ELEMENT REPLACEMENT (Continued).



LEGEND:

1	HANDLE	6	SECONDARY FILTER ELEMENT
2	RETAINER BAR ASSEMBLY	7	CANISTER
3	FILTER ELEMENT	8	DUST AND MOISTURE BOOT
4	WINGNUT	9	THREADED ROD
5	WASHER		

TA 237045

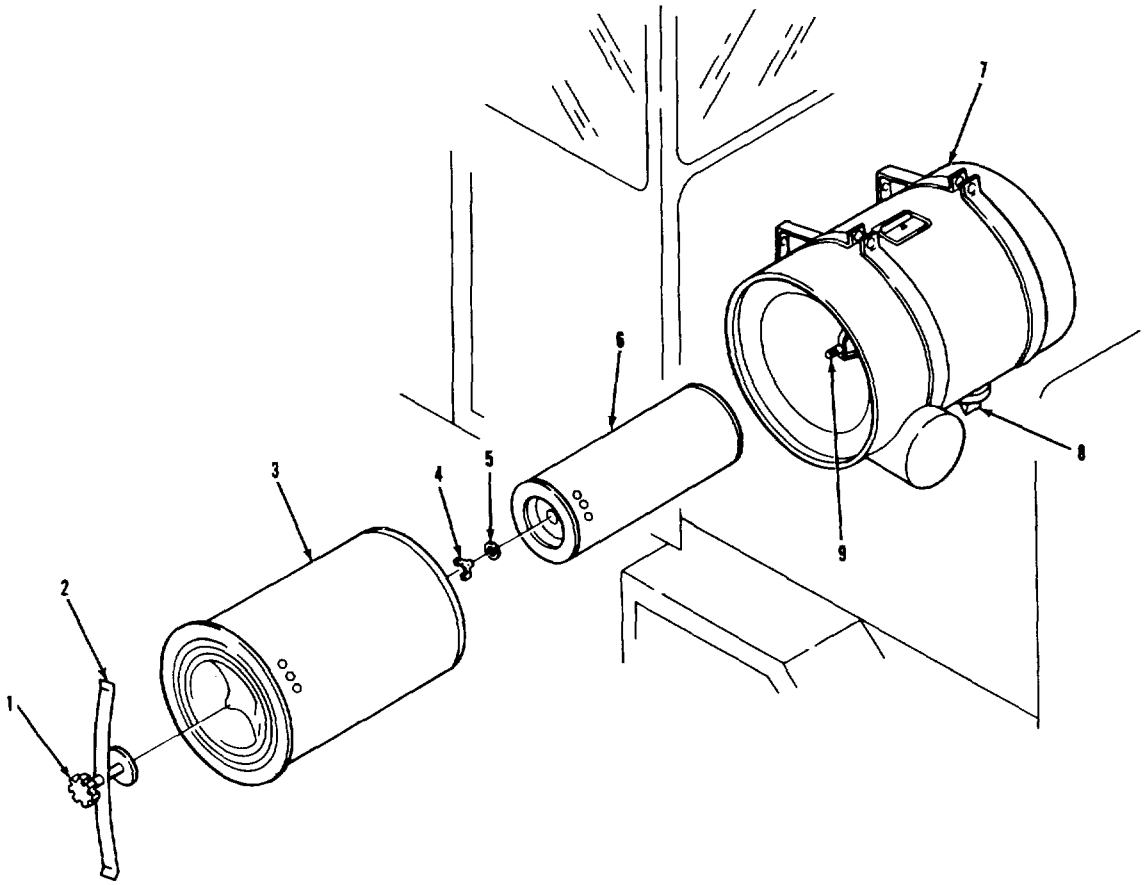
FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENTS (Continued).

	LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.			
1	Handle (1)	Loosen.	
2	Retainer bar assembly (2).	Remove from item (7).	
3	Element (3)	Remove from item (7).	
		NOTE	
	Do not clean secondary filter element. Do not remove unless to replace with a new element. This should be done after the outside element has been cleaned five times.		
4	Wingnut (4) and washer (5).	Remove from rod (9).	
5	Element (6)	Remove from rod (9)	Rubber seal may stick making removal difficult Work back and forth to free.
B. CLEANING.			
		WARNING	
	Do not use more than 30 psi of compressed air for cleaning purposes. Use protective equipment (goggles/- shield, gloves, etc.) to prevent injury.		

FUEL SYSTEM.

3-30. AIR CLEANER FILTER ELEMENT REPLACEMENT (Continued).



LEGEND:

1 HANDLE
2 RETAINER BAR ASSEMBLY
3 FILTER ELEMENT
4 WINGNUT
5 WASHER
6 SECONDARY FILTER ELEMENT
7 CANISTER
8 DUST AND MOISTURE BOOT
9 THREADED ROD

TA 237046

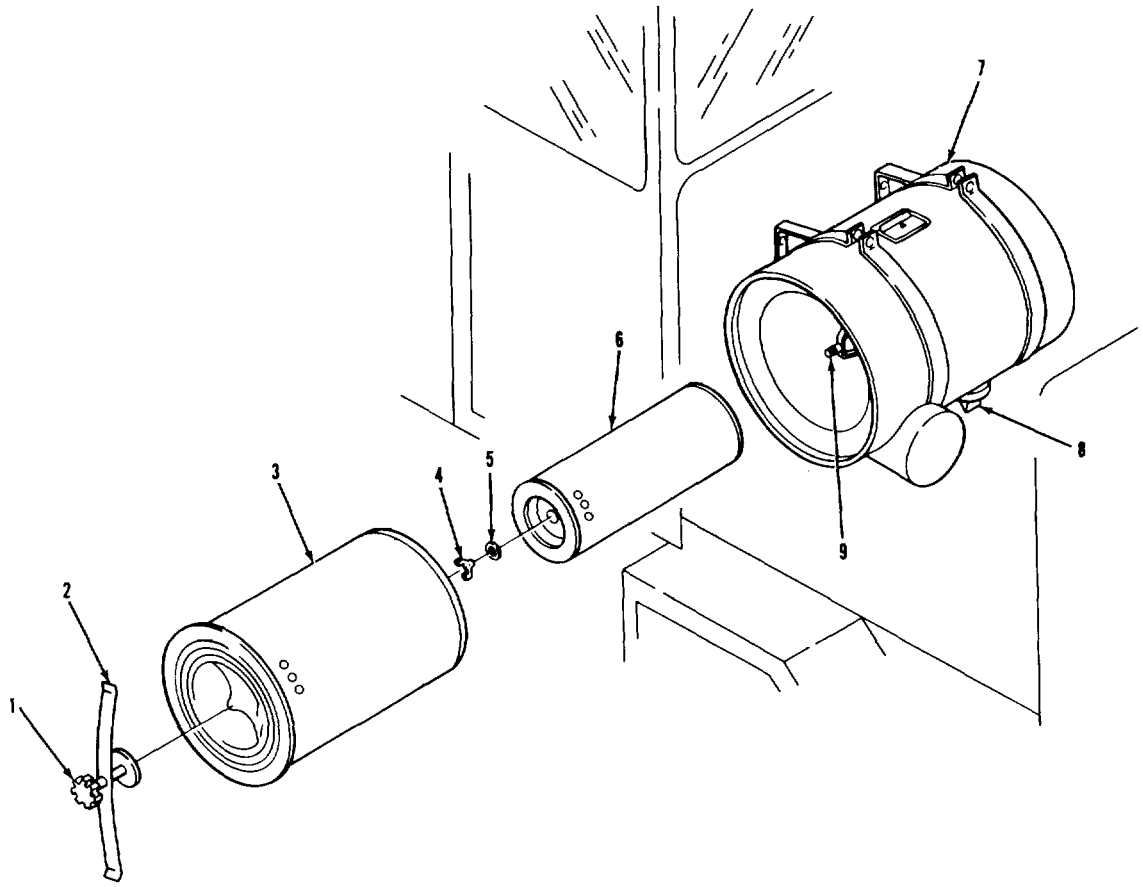
FUEL SYSTEM.

3-30. AIR CLEANER FILTER ELEMENT REPLACEMENT (Continued).

	LOCATION/ITEM		ACTION	REMARKS
B. CLEANING (Continued).				
6	Element (3)	a	Tap to shake dust loose.	
		b	Blow out dust with compressed air.	
		c	Wash with soap solution and water, rinse with clean water, and allow to air dry.	Skip this step if item (3) seems clean after steps a and b.
7	Boot (8)	a	Remove from item (7).	
		b	Wipe inside clean with a damp rag.	
		c	Install on item (7).	
8	Canister (7)		Wipe inside clean with a damp rag.	
C. INSPECTION.				
9	All parts		Inspect	Refer to paragraph 3-5.
10	Element (3)		Shine light inside element Watch outside for light shining through leaks.	If item (3) is damaged, replace.
D. INSTALLATION.				
11	Element (6)		Place in item (7).	
12	Wingnut (4) and washer (5).		Secure item (6).	

FUEL SYSTEM.

3-30. AIR CLEANER FILTER ELEMENT REPLACEMENT (Continued).



LEGEND:

1	HANDLE	6	SECONDARY FILTER ELEMENT
2	RETAINER BAR ASSEMBLY	7	CANISTER
3	FILTER ELEMENT	8	DUST AND MOISTURE BOOT
4	WINGNUT	9	THREADED ROD
5	WASHER		

TA 237047

FUEL SYSTEM.

3-30. AIR CLEANER FILER ELEMEN REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
D. INSTALLATION (Continued).			
13	Element (3)	Place in item (7).	
14	Retainer bar assembly (2).	Put in slots in item (7).	
15	Handle (1)	Tighten.	

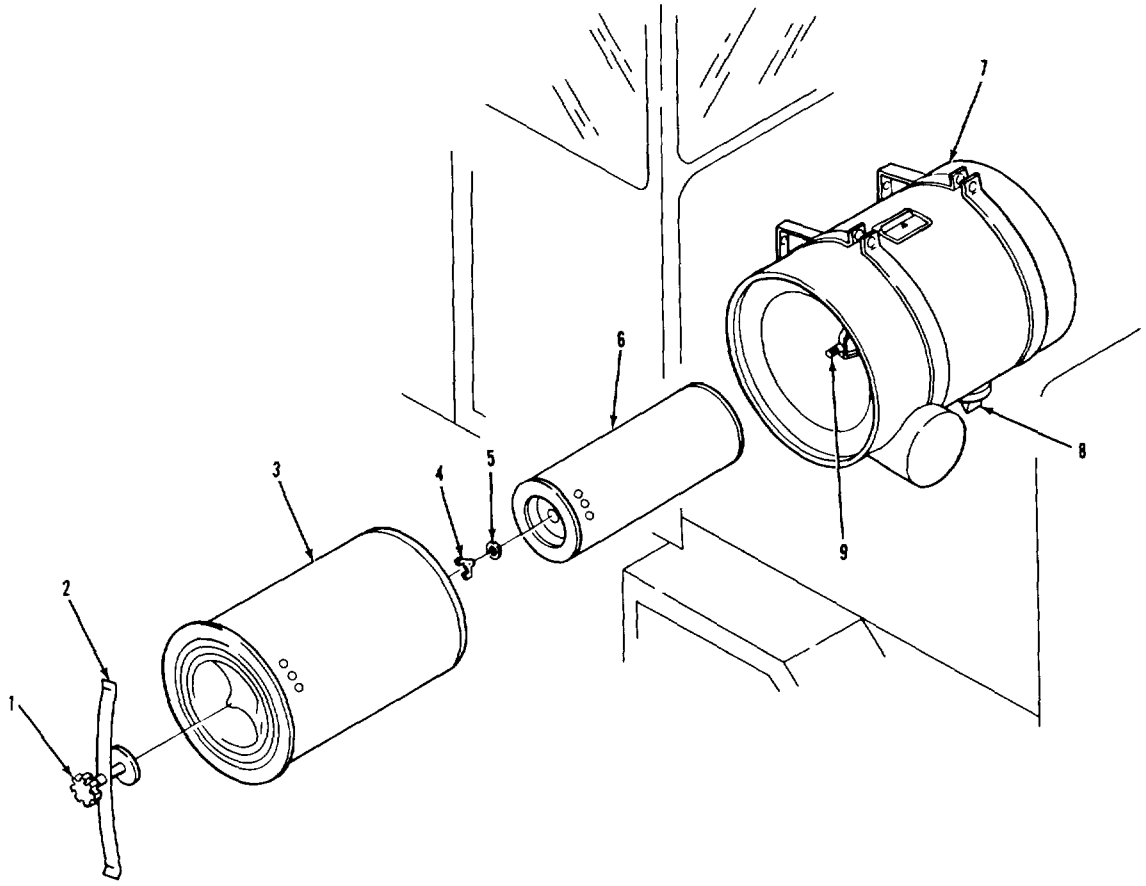
NOTE

Follow-on maintenance action required:

None.

FUEL SYSTEM.

3-30. AIR CLEANER FILTER ELEMENT REPLACEMENT (Continued).



LEGEND:

1 HANDLE
2 RETAINER BAR ASSEMBLY
3 FILTER ELEMENT
4 WINGNUT
5 WASHER
6 SECONDARY FILTER ELEMENT
7 CANISTER
8 DUST AND MOISTURE BOOT
9 THREADED ROD

TA 237048

FUEL SYSTEM.

3-31. TURBOCHARER AIR CROSSOVER CONNECTION REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	None.	None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Solvent, dry cleaning, SD-2
Item 29, Appendix C.
Rags, wiping
Item 22, Appendix C.
Tape, thread sealing
Item 32, Appendix C.
Gasket, crossover mounting
(15434) 216487.

PERSONNEL REQUIRED
One (MOS-63S.

SPECIAL ENVIRONMENTAL CONDITIONS
Work area clean and away from blowing dirt and dust.

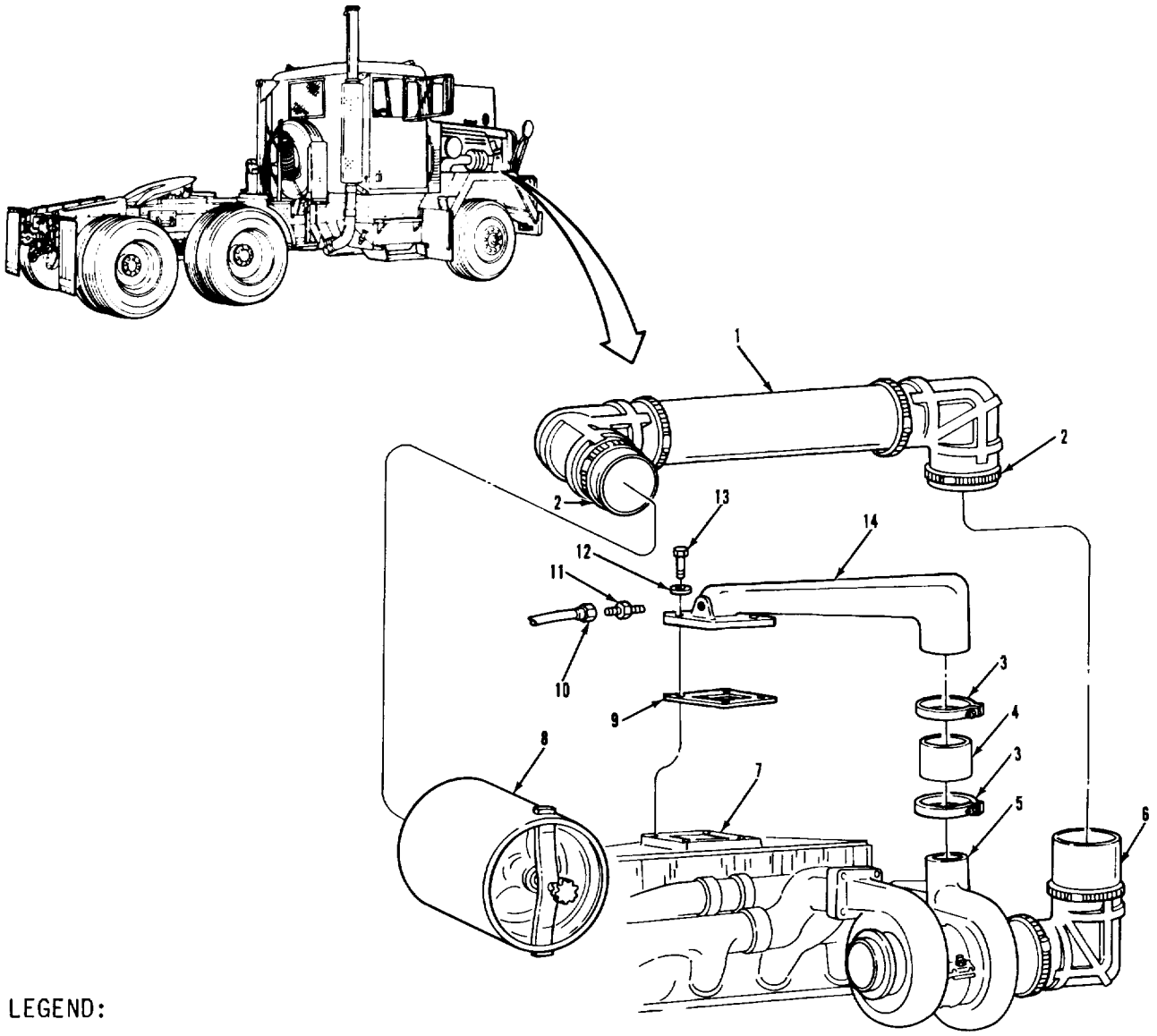
REFERENCES (TM)
TM 9-2320-283-20P.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

FUEL SYSTEM.

3-31. TURBOCHARGER AIR CROSSOVER CONNECTION REPLACEMENT (Continued).



LEGEND:

LEGEND

1	ELBOW AND TUBE ASSEMBLY	8	AIR CLEANER ASSEMBLY
2	CLAMP (2)	9	CROSSOVER MOUNTING GASKET
3	HOSE CLAMP (2)	10	NYLON TUBE
4	HOSE	11	ATOMIZER
5	TURBOCHARGER	12	PLAIN WASHER (4)
6	LOWER AIR CLEANER TUBE	13	SCREW (4)
7	AFTERCOOLER COVER	14	AIR CROSSOVER CONNECTION

TA237049

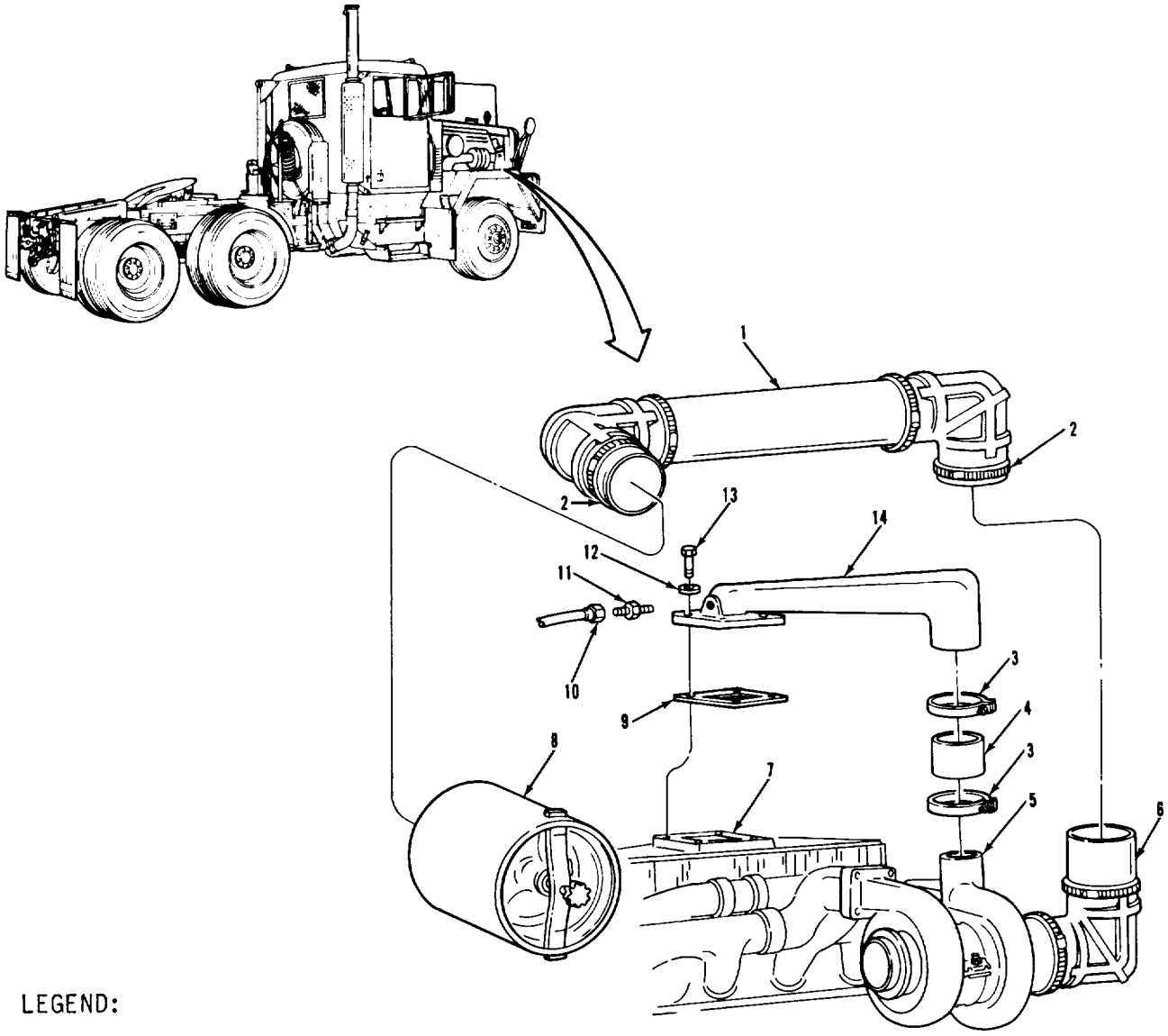
FUEL SYSTEM.

3-31. TURBOCHARER AIR CROSSOVER CONNECTION REPLACEMENT (Continued).

	LOCATION/ITEM	ACTION	REMARKS
		CAUTION Dirt in the air passages can severely damage the turbocharger and engine. Be sure your work area is clean. Clean parts before installation. Cover openings to keep out dust while you are working.	
	A. REMOVAL		
1	Two clamps (2)	Loosen.	
2	Elbow and tube assembly (1)	Remove from item (8) and item (6).	
3	Two clamps (3)	Loosen.	
4	Tube (10)	Remove from item (11).	
5	Four screws (13) and washers (12).	Remove from item (14).	
6	Connection (14), asket (9), hose 4), and two clamps (3).	Remove from item (5) and item (7).	Discard gasket.
7	Atomizer (11)	Remove from item (14).	
	B. CLEANING AND INSPECTION.		
8	All parts	a Clean with solvent and rags	a Refer to paragraph 3-4. b Be sure all old gasket is cleaned from item (14) and item (7).

FUEL SYSTEM.

3-31. TURBOCHARGER ATR CROSSOVER CONNECTION REPLACEMENT (Continued).



LEGEND:

1	ELBOW AND TUBE ASSEMBLY	8	AIR CLEANER ASSEMBLY
2	CLAMP (2)	9	CROSSOVER MOUNTING GASKET
3	HOSE CLAMP (2)	10	NYLON TUBE
4	HOSE	11	ATOMIZER
5	TURBOCHARGER	12	PLAIN WASHER (4)
7	AFTERCOOLER COVER	14	AIR CROSSOVER CONNECTION

FUEL SYSTEM.

3-31. TURBOCHARER AIR CROSSOVER CONNECTION REPLACEMENT (Continued).

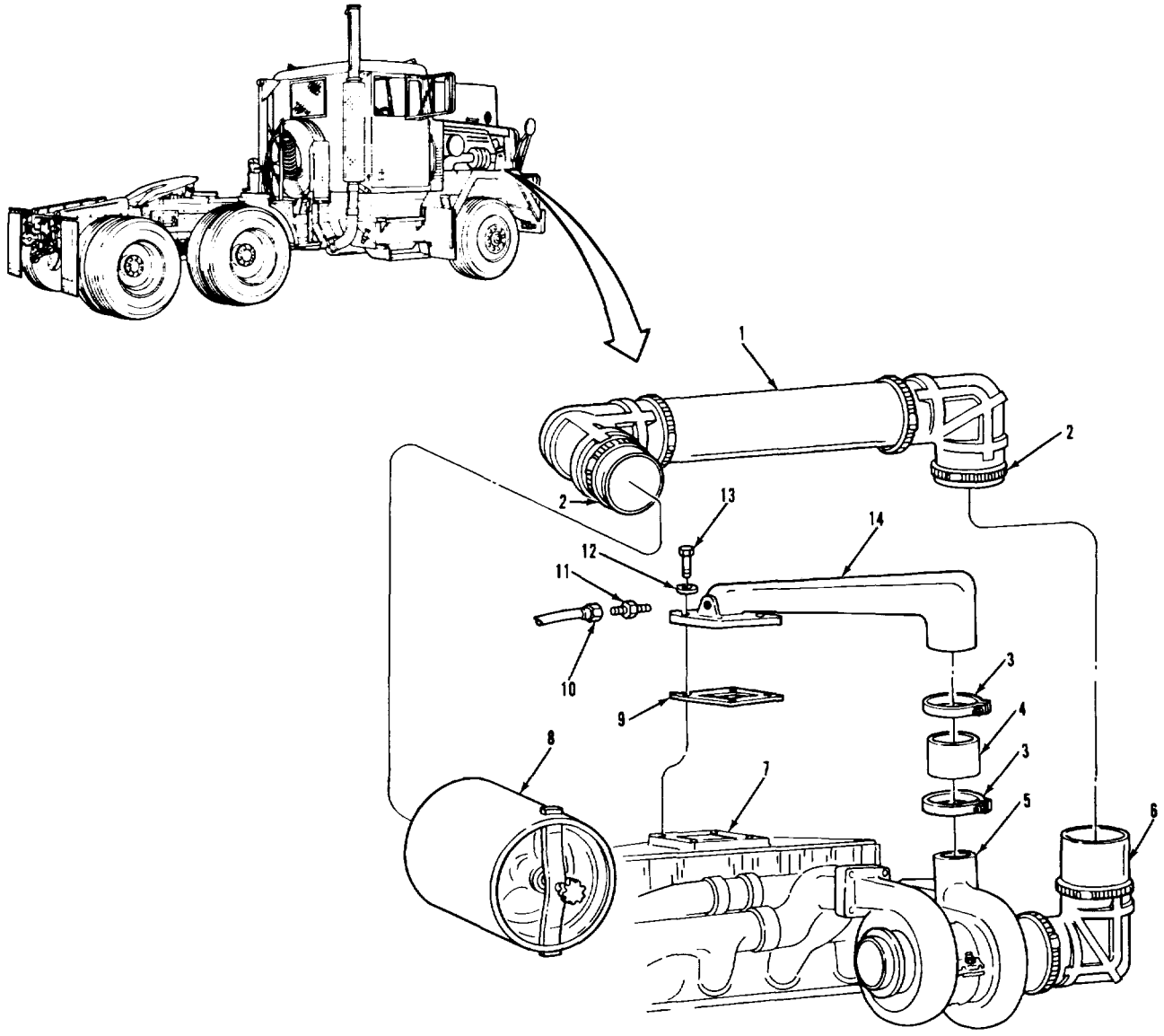
	LOCATION/ITEM		ACTION	REMARKS
B. CLEANING AND INSPECTION (Continued).				
8	All parts (continued).	b	Inspect	Refer to paragraph 3-5.
C. INSTALLATION.				
9	Atomizer (11)		Install in item (14)	Put thread sealing tape on threads.
10	Hose (4) and two clamps (3).		Put on item (5).	
11	Connection (14) and new gasket (9).		Put in place on item (7) and in item (4).	
12	Four screws (13) and washers (12)		Secure item (14) to item (7).	
13	Two clamps (3)		Tighten.	
14	Tube (10)		Install on item (11).	
15	Elbow and tube assembly (1)		Put on item (6) and item (8).	
16	Two clamps (2)		Tighten.	

NOTE

Follow-on maintenance action required:
None.

FUEL SYSTEM.

3-31. TURBOCHARGER AIR CROSSOVER CONNECTION REPLACEMENT (Continued).



1 ELBOW AND TUBE ASSEMBLY
2 CLAMP (2)
3 HOSE CLAMP (2)
4 HOSE
5 TURBOCHARGER
6 LOWER AIR CLEANER TUBE
7 AFTERCOOLER COVER
8 AIR CLEANER ASSEMBLY
9 CROSSOVER MOUNTING GASKET
10 NYLON TUBE
11 ATOMIZER
12 PLAIN WASHER (4)
13 SCREW (4)
14 AIR CROSSOVER CONNECTION

TA 237051

FUEL SYSTEM.

3-32. AIR CLEANER TUBE REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
None.

CONDITION DESCRIPTION
None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Rags, wiping
Item 22, Appendix C.

PERSONNEL REQUIRED
One (MOS-63SR.

SPECIAL ENVIRONMENTAL CONDITIONS
Work area clean and away from blowing dirt and dust.

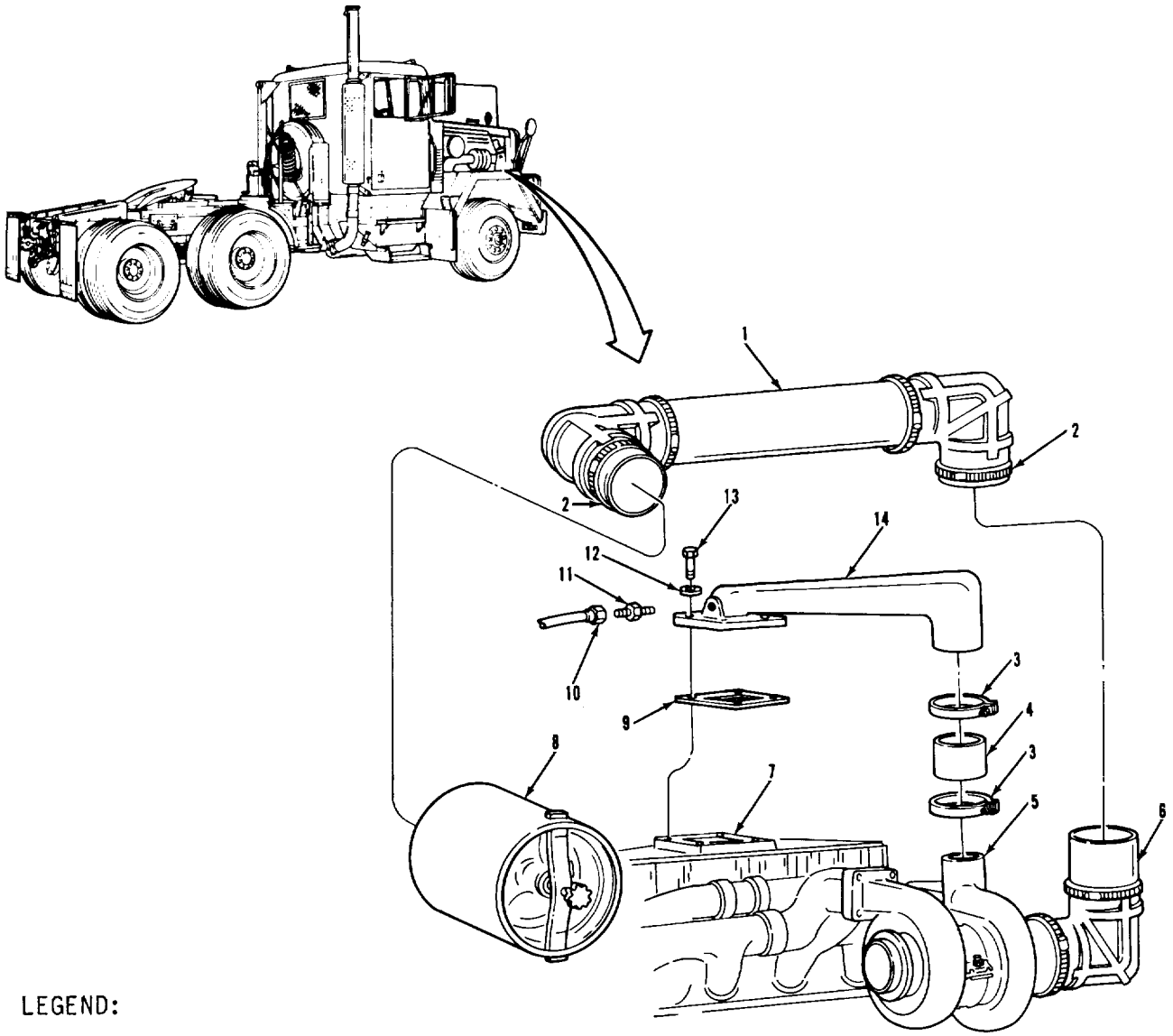
REFERENCES (TM)
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

FUEL SYSTEM.

3-32. AIR CLEANER TUBE REPLACEMENT (Continued).



LEGEND:

1 90^0 AIR INTAKE ELBOW (3)
2 AIR INIAKE TUBE LAMP (1U)
3 UPPER AIR CLEANER TUBE
4 LOWER AIR CLEANER TUBE
5 90" AIR INTAKE ELBOW
6 HOOD SEAL RIGHT HAND RETAINER
7 TURBOCHARGER
8 AIR CLEANER INLET TUBE
9 SPECIAL 220 ELBOW
10 AIR CLEANER ASSEMBLY

TA 237052

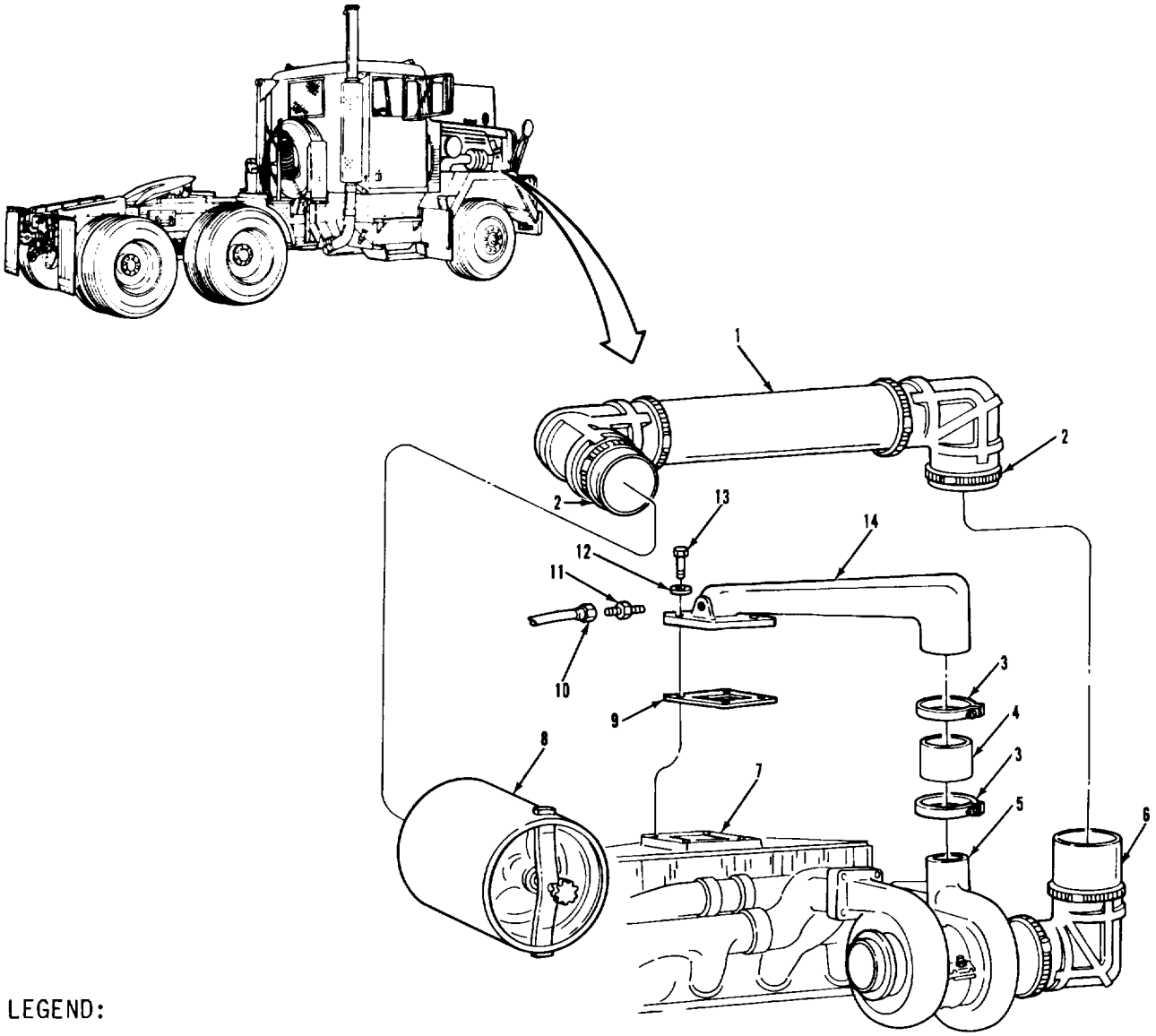
FUEL SYSTEM.

3-32. AIR CLEANER TUBE REPLACEMENT (Continued).

LOCATION/ITEM		ACTION		REMARKS
		CAUTION Dirt in the air passages can severely damage the turbocharger and engine. Be sure your work area is clean. Clean parts before installation. Cover openings to keep out dust while you are working.		
A. REMOVAL				
1	Ten clamps (2)	Loosen.		
2	Three elbows (1), elbow (5), elbow (9), tube (3), tube (4), tube (8), and ten clamps (2).	Remove from item (6), item (7), and item (10).		
B. CLEANING AND INSPECTION.				
3	All parts	a	Wipe clean with damp rag	Refer to paragraph 3-4.
		b	Inspect	Refer to paragraph 3-5.
C. INSTALLATION.				
4,	Three elbows (1), elbow (5), elbow (9), tube (3), tube (4), tube (8), and ten clamps (2).	Install between item (10), item (7), and item (6).		

FUEL SYSTEM.

3-32. AIR INTAKE TUBE REPLACEMENT (Continued).



LEGEND:

1 90O AIR INTAKE ELBOW (3)
2 AIR INTAKE TUBE CLAMP (10)
3 UPPER AIR CLEANER TUBE
4 LOWER AIR CLEANER TUBE
5 900 AIR INTAKE ELBOW
6 HOOD SEAL RIGHT HAND RETAINER
7 TURBOCHARGER
8 AIR CLEANER INLET TUBE
9 SPECIAL 220 ELBOW
10 AIR CLEANER ASSEMBLY

TA237053

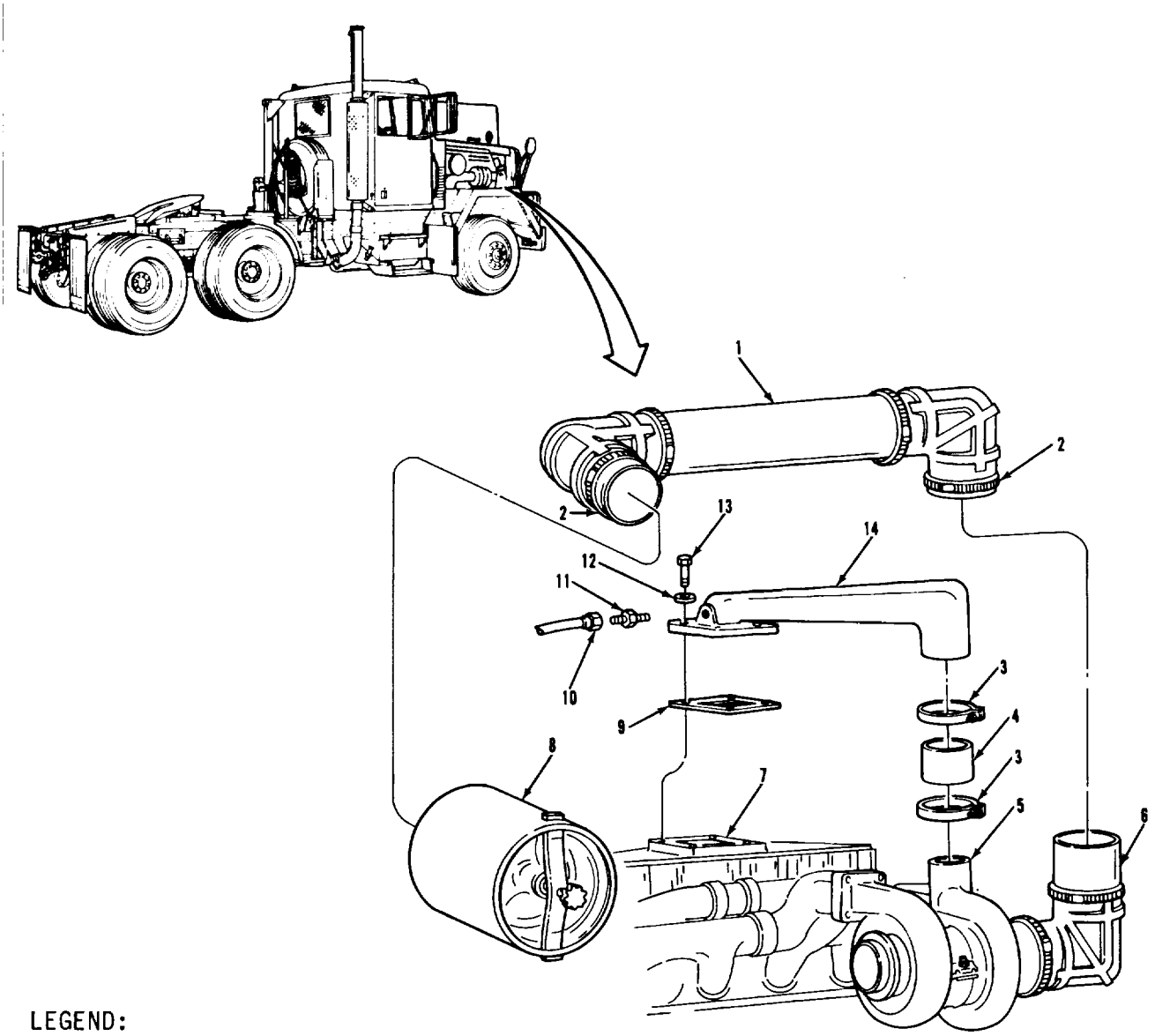
FUEL SYSTEM.

3-28. ENGINE FUEL LINES AND FITTINGS REPLACEMENTS (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued)		
5 Ten clamps (2)	Tighten.	
	NOTE Follow-on maintenance action required: None.	

FUEL SYSTEM.

3-32. AIR CLEANER TUBE REPLACEMENT (Continued).



LEGEND:

1. 90° AIR INTAKE ELBOW (3)
2. AIR INTAKE TUBE CLAMP (10)
3. UPPER AIR CLEANER TUBE
4. LOWER AIR CLEANER TUBE
5. 90° AIR INTAKE ELBOW
6. HOOD SEAL RIGHT HAND RETAINER
7. TURBOCHARGER
8. AIR CLEANER INLET TUBE
9. SPECIAL 22° ELBOW
10. AIR CLEANER ASSEMBLY

TA 237054

FUEL SYSTEM.

3-33. SOLENOID VALVE REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Disassembly.
c. Cleaning and Inspection.
d. Assembly
e. Installation.
f. Operational Check

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
3-314.

CONDITION DESCRIPTION
Pressure transducer removed.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Rags, wiping
Item 32, Appendix C.
Solvent, drycleaning, SD-2
Item 29, Appendix C.
Seal, rectangular ring
(15434) 154087.
Seal, rectangular ring
(15434) 129888.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

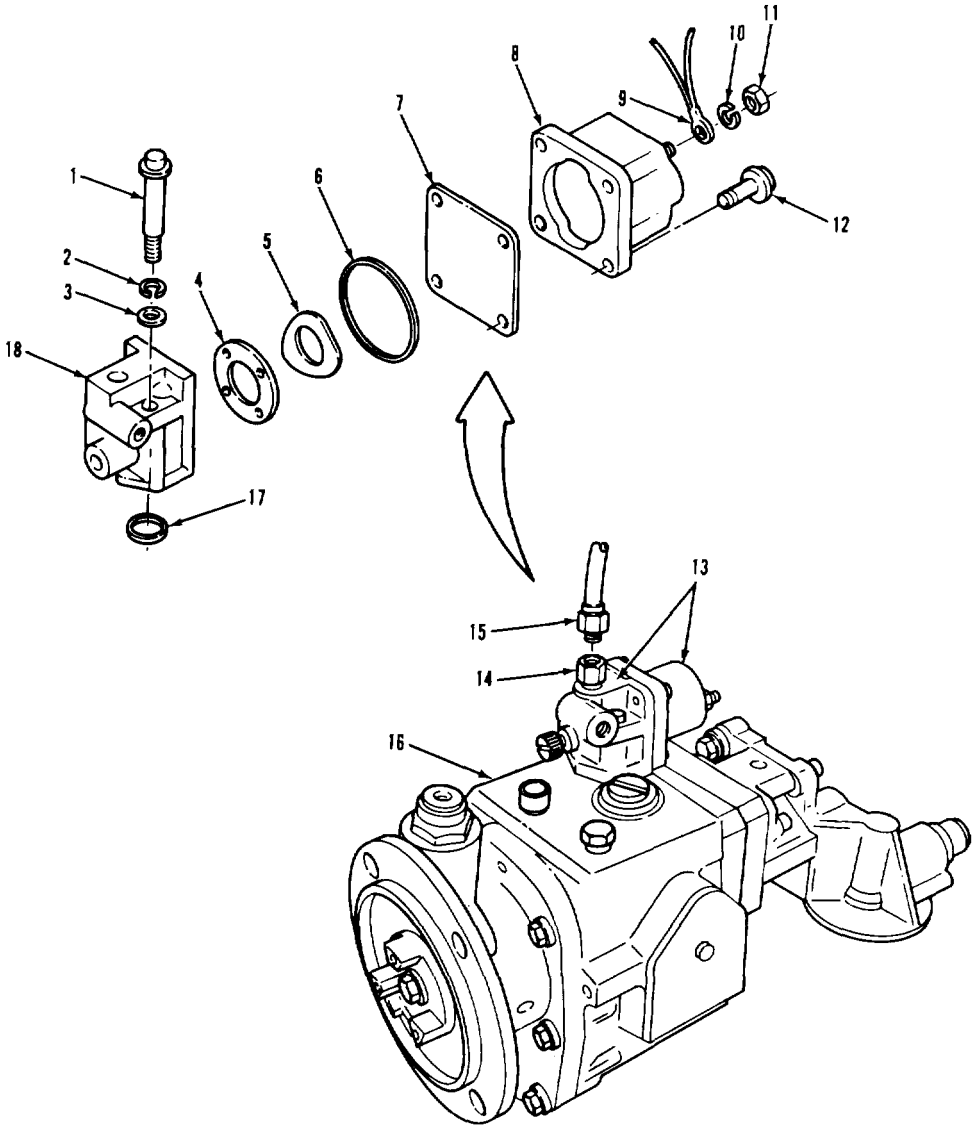
REFERENCES (TM)
TM 9-2320-283-20P.
TM 9-2320-283-10.
Park brake set.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

FUEL SYSTEM.

3-33. SOLENOID VALVE REPLACEMENT (Continued).



LEGEND:

1. SOCKET HEAD CAPSCREW (2)
2. LOCKWASHER (2)
3. PLAIN WASHER (2)
4. VALVE DISK
5. SHUTOFF VALVE SPRING
6. RECTANGULAR RING SEAL
7. SHUTOFF VALVE SHIELD
8. ELECTRICAL SOLENOID
9. WIRE
10. LOCKWASHER
11. NUT
12. SOLENOID MOUNTING SCREW (4)
13. SOLENOID VALVE
14. FUEL FITTING
15. FUEL TUBE
16. FUEL PUMP ASSEMBLY
17. RECTANGULAR RING SEAL
18. VALVE BODY

TA 237055

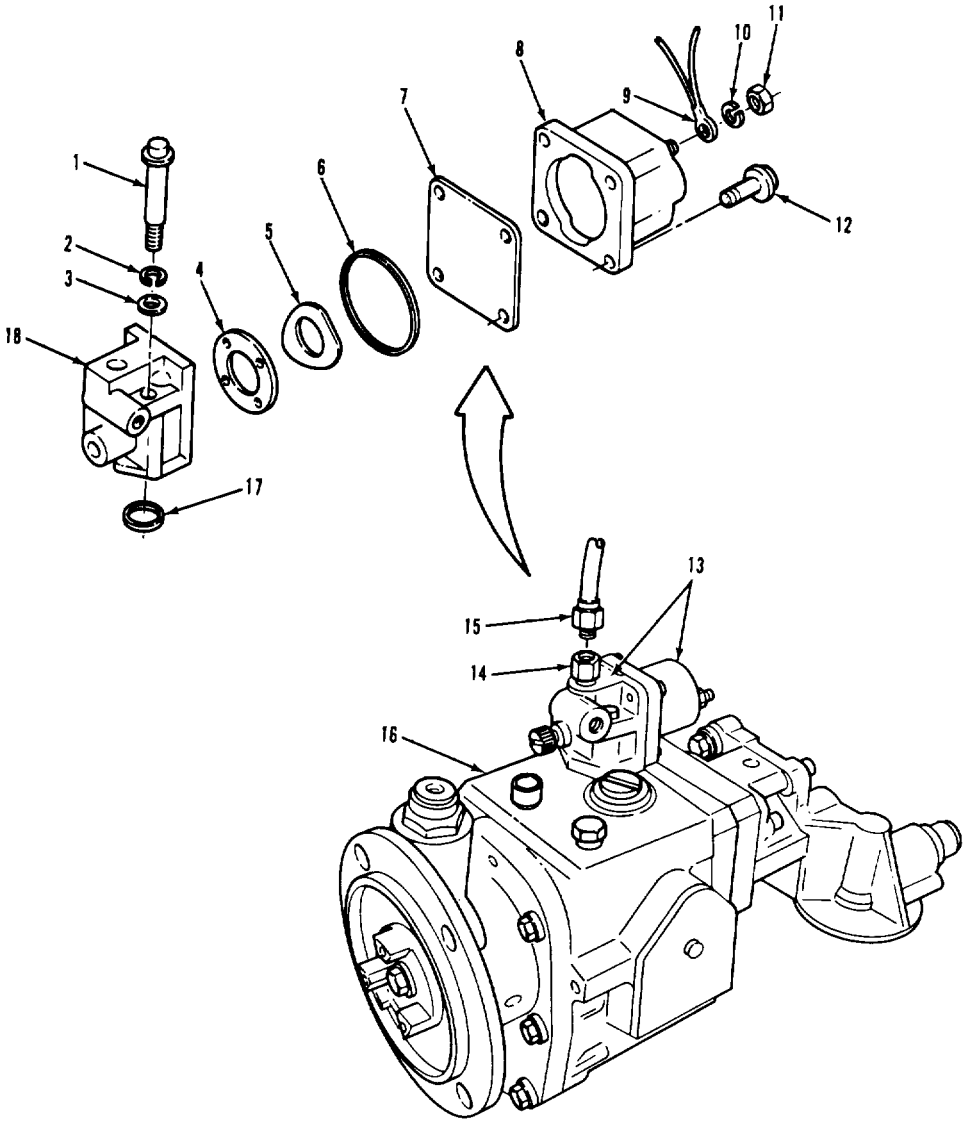
FUEL SYSTEM.

3-33. SOLENOID VALVE REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Nut (11), lockwasher (10), and wire (9).	Remove from item (8).	
2. Tube (15).	Remove from item (14).	
3. Two screws (1), lockwashers (2), and washers (3).	Remove from item (13).	
4. Valve (13) and seal (17).	a. Remove from item (16). b. Discard item (17).	
5. Fitting (14).	Remove from item (13).	
B. DISASSEMBLY.		
6. Four screws (12).	Remove from item (8).	Scribe alinement marks on items (8) and (9) before disassembly.
7. Solenoid (8), shield (7), spring (5), disk (4), and seal (6).	a. Remove from item (18). b. Discard item (6).	
C. CLEANING AND INSPECTION.		
8. Solenoid (8).	Wipe with clean dry rag.	
9. All parts (except solenoid (8)).	Clean with solvent and a stiff brush.	Refer to paragraph 3-4.
10. All parts.	Inspect.	Refer to paragraph 3-5.

FUEL SYSTEM.

3-33. SOLENOID VALVE REPLACEMENT (Continued).



LEGEND:

1. SOCKET HEAD CAPSCREW (2)
2. LOCKWASHER (2)
3. PLAIN WASHER (2)
4. VALVE DISK
5. SHUTOFF VALVE SPRING
6. RECTANGULAR RING SEAL
7. SHUTOFF VALVE SHIELD
8. ELECTRICAL SOLENOID
9. WIRE
10. LOCKWASHER
11. NUT
12. SOLENOID MOUNTING SCREW (4)
13. SOLENOID VALVE
14. FUEL FITTING
15. FUEL TUBE
16. FUEL PUMP ASSEMBLY
17. RECTANGULAR RING SEAL
18. VALVE BODY

TA 237056

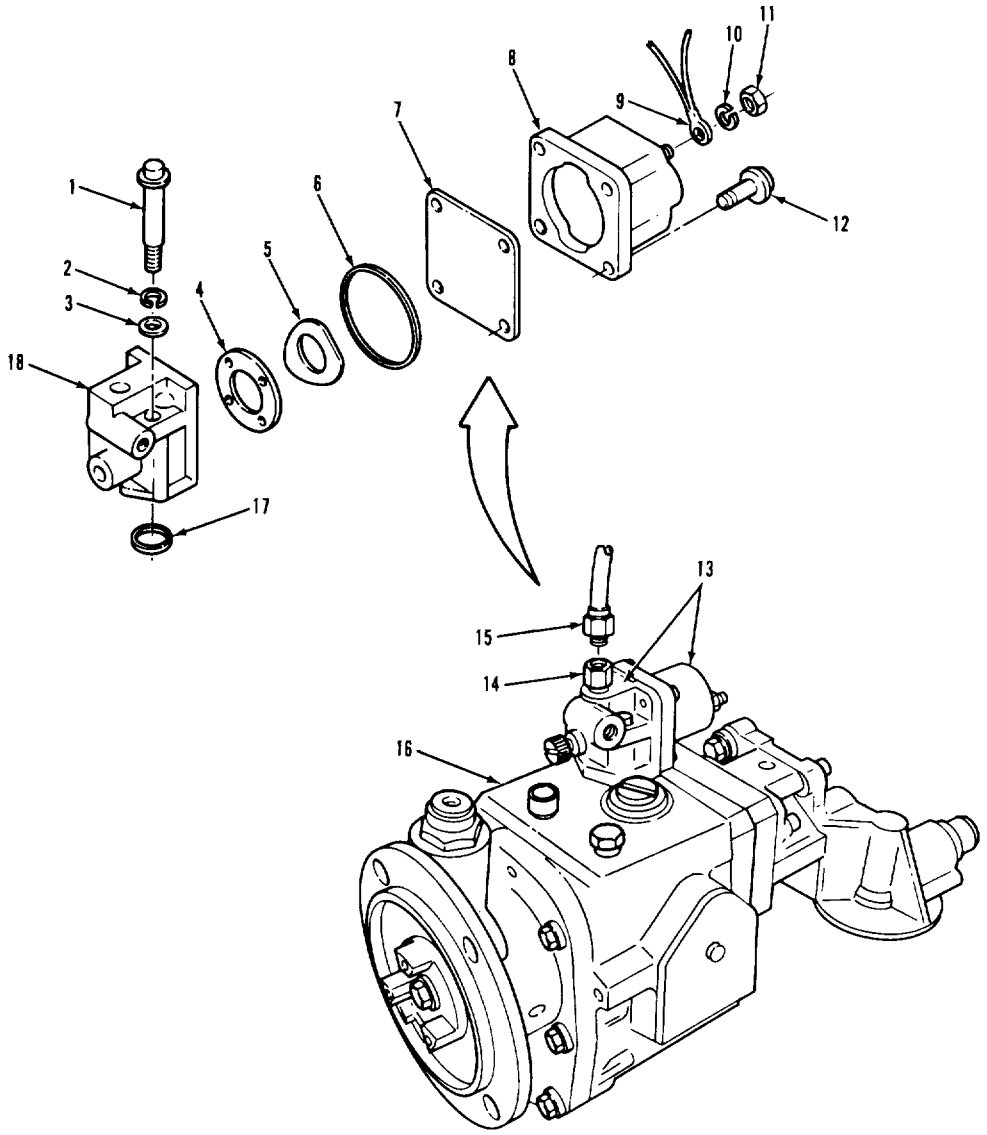
FUEL SYSTEM.

3-33. SOLENOID VALVE REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
D. ASSEMBLY.		
11. Disk (4).	Put in item (18).	Rubber side of item (4) faces in.
12. Spring (5).	Put on item (4).	
13. New seal (6).	Put in item (18).	
14. Shield (7).	Put on item (8).	
15. Solenoid (8) and shield (7).	Put on item (18).	
16. Four screws (12).	Secure item (8) to item (18).	Insure that scribe marks are alined.
E. INSTALLATION.		
17. Fitting (14).	Install in item (13).	
18. New seal (17).	Put in item (13).	
19. Valve (13).	Position on item (16).	
20. Two screws (1), lockwashers (2), and washers (3).	Secure item (13) to item (17).	
21. Tube (15).	Install in item (14).	
22. Wire (9), lock-washers (10), and nut (11).	Install on item (8).	Install on longer stud.

FUEL SYSTEM.

3-33. SOLENOID VALVE REPLACEMENT (Continued).



LEGEND:

1. SOCKET HEAD CAPSCREW (2)
2. LOCKWASHER (2)
3. PLAIN WASHER (2)
4. VALVE DISK
5. SHUTOFF VALVE SPRING
6. RECTANGULAR RING SEAL
7. SHUTOFF VALVE SHIELD
8. ELECTRICAL SOLENOID
9. WIRE
10. LOCKWASHER
11. NUT
12. SOLENOID MOUNTING SCREW (4)
13. SOLENOID VALVE
14. FUEL FITTING
15. FUEL TUBE
16. FUEL PUMP ASSEMBLY
17. RECTANGULAR RING SEAL
18. VALVE BODY

TA 237057

FUEL SYSTEM.

3-33. SOLENOID VALVE REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
F. OPERATIONAL CHECK.		
23. Pressure transducer.	Install.	Refer to paragraph 3-314.
24. Engine run switch.	Turn ON and OFF serveral times.283-10.	a. Refer to TM 9-2320- b. Assistant turns switch.
25. Solenoid valve (13).	Listen for "click" when run switch is turned ON or OFF.	
26. Engine.	Start up.	a. Refer to TM 9-2320-283-10. b. Engine will not start if solenoid is not working.
27. Solenoid valve (13).	Check for leaks.	
28. Engine.	Shut down.	Refer to TM 9-2320-283-10.

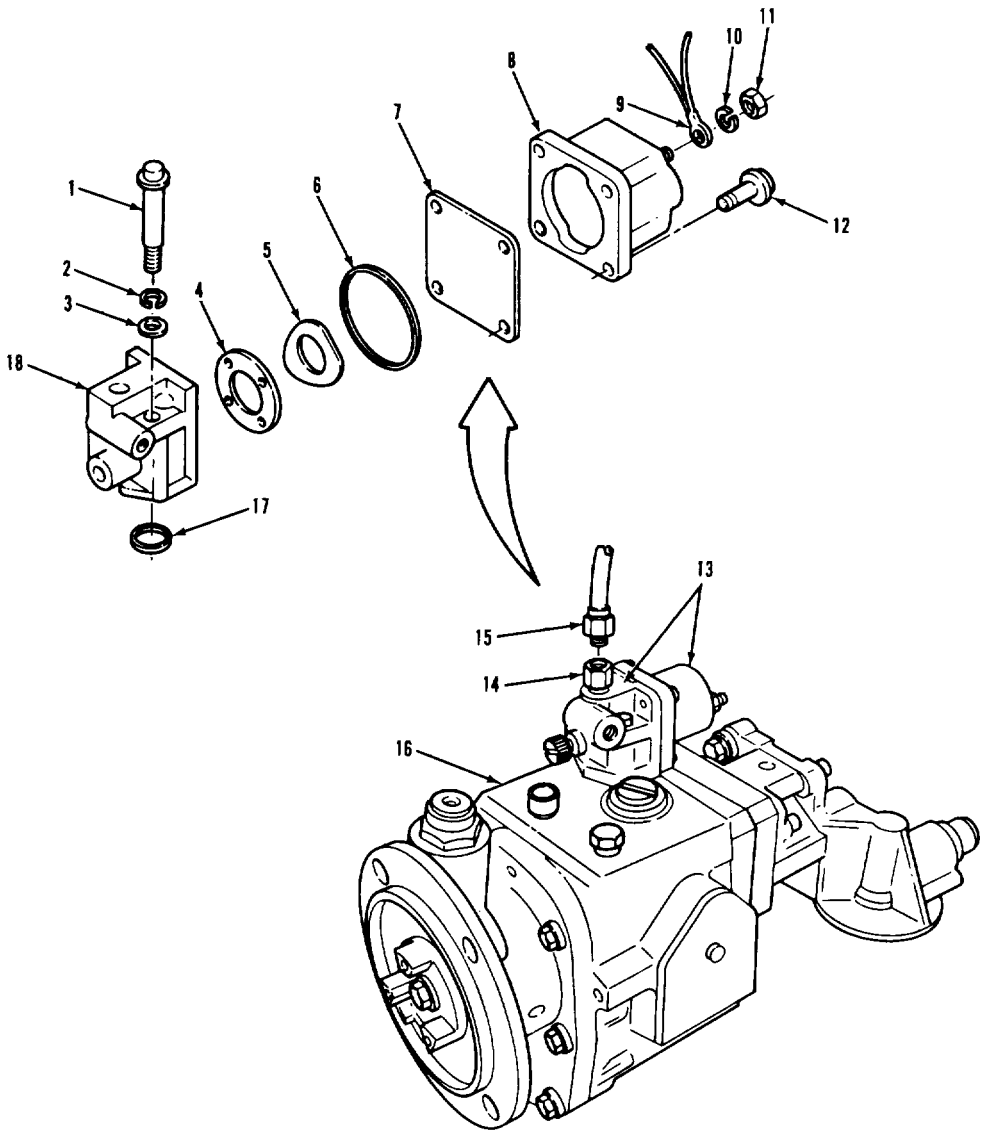
NOTE

Follow-on maintenance action required:

None.

FUEL SYSTEM.

3-33. SOLENOID VALVE REPLACEMENT (Continued).



LEGEND:

1. SOCKET HEAD CAPSCREW (2)
2. LOCKWASHER (2)
3. PLAIN WASHER (2)
4. VALVE DISK
5. SHUTOFF VALVE SPRING
6. RECTANGULAR RING SEAL
7. SHUTOFF VALVE SHIELD
8. ELECTRICAL SOLENOID
9. WIRE
10. LOCKWASHER
11. NUT
12. SOLENOID MOUNTING SCREW (4)
13. SOLENOID VALVE
14. FUEL FITTING
15. FUEL TUBE
16. FUEL PUMP ASSEMBLY
17. RECTANGULAR RING SEAL
18. VALVE BODY

TA 237058

FUEL SYSTEM.

3-34. FUEL TANK REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	3-105.	Fuel level sending unit removed.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Rags, wiping
Item 22, Appendix C.
Solvent, drycleaning, SD-2
Item 29, Appendix C.
Tape, thread sealing
Item 32, Appendix C.
Adhesive, liquid, rubber, Type II
Item 1, Appendix C.
Container for draining fuel (AR).

PERSONNEL REQUIRED
Two (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

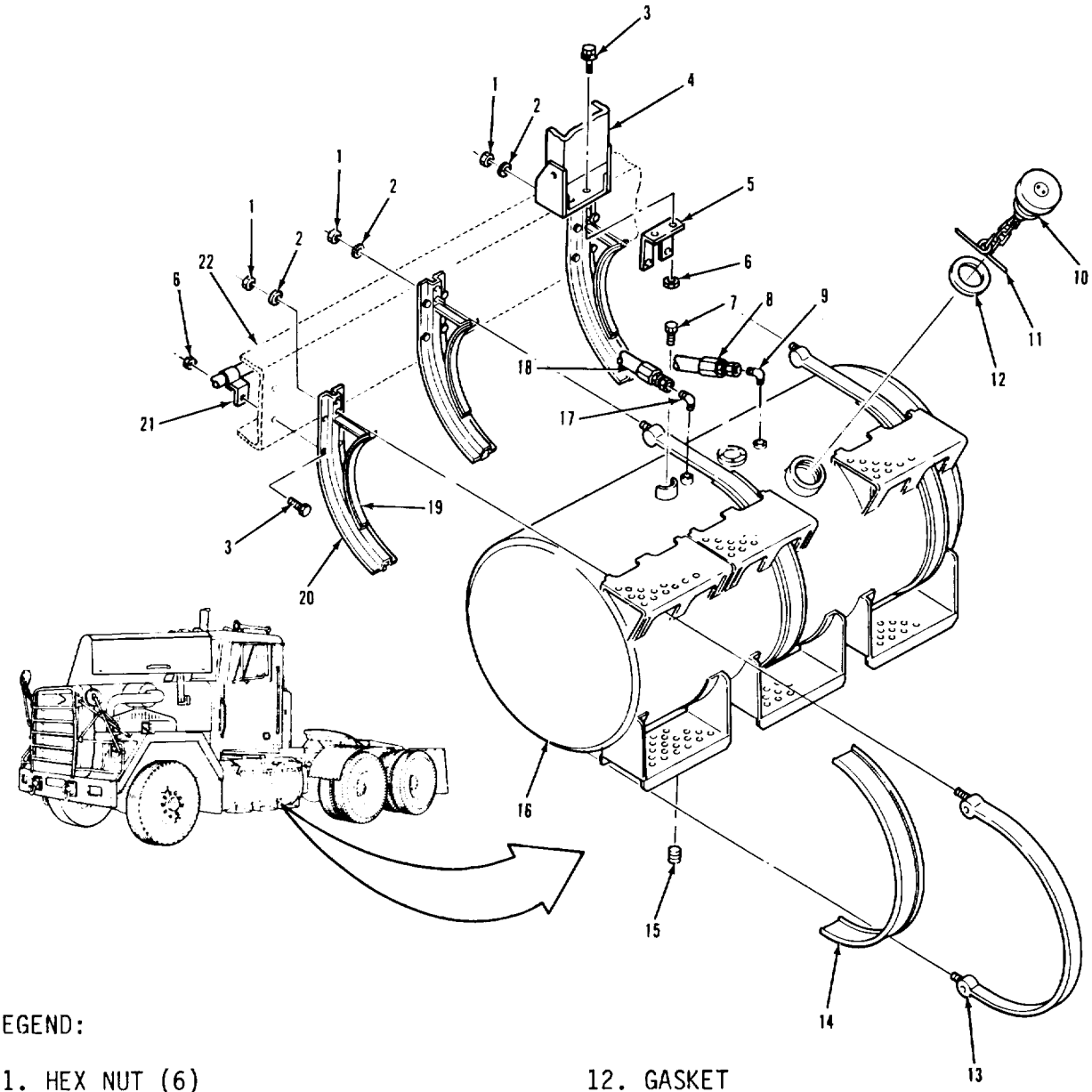
REFERENCES (TM)
TM 9-2320-283-10.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
None.

FUEL SYSTEM.

3-34. FUEL TANK REPLACEMENT (Continued).



LEGEND:

1. HEX NUT (6)
2. WASHER (6)
3. HEX FLANGED SCREW (14)
4. SPARE TIRE CARRIER ASSEMBLY
5. TIRE CARRIER MOUNTING BRACKET
6. HEX FLANGED NUT (14)
7. VENT PLUG
8. FUEL RETURN HOSE
9. ELBOW
10. CAP ASSEMBLY
11. BAR
12. GASKET
13. FUEL TANK STRAP ASSEMBLY (3)
14. FUEL TANK STRAP INSULATOR (3)
15. DRAIN PLUG
16. FUEL TANK ASSEMBLY
17. ELBOW
18. FUEL SUPPLY HOSE
19. FUEL TANK BRACKET INSULATOR (3)
20. FUEL TANK MOUNTING BRACKET (3)
21. TUBE SUPPORT (3)
22. FRAME

TA 237059

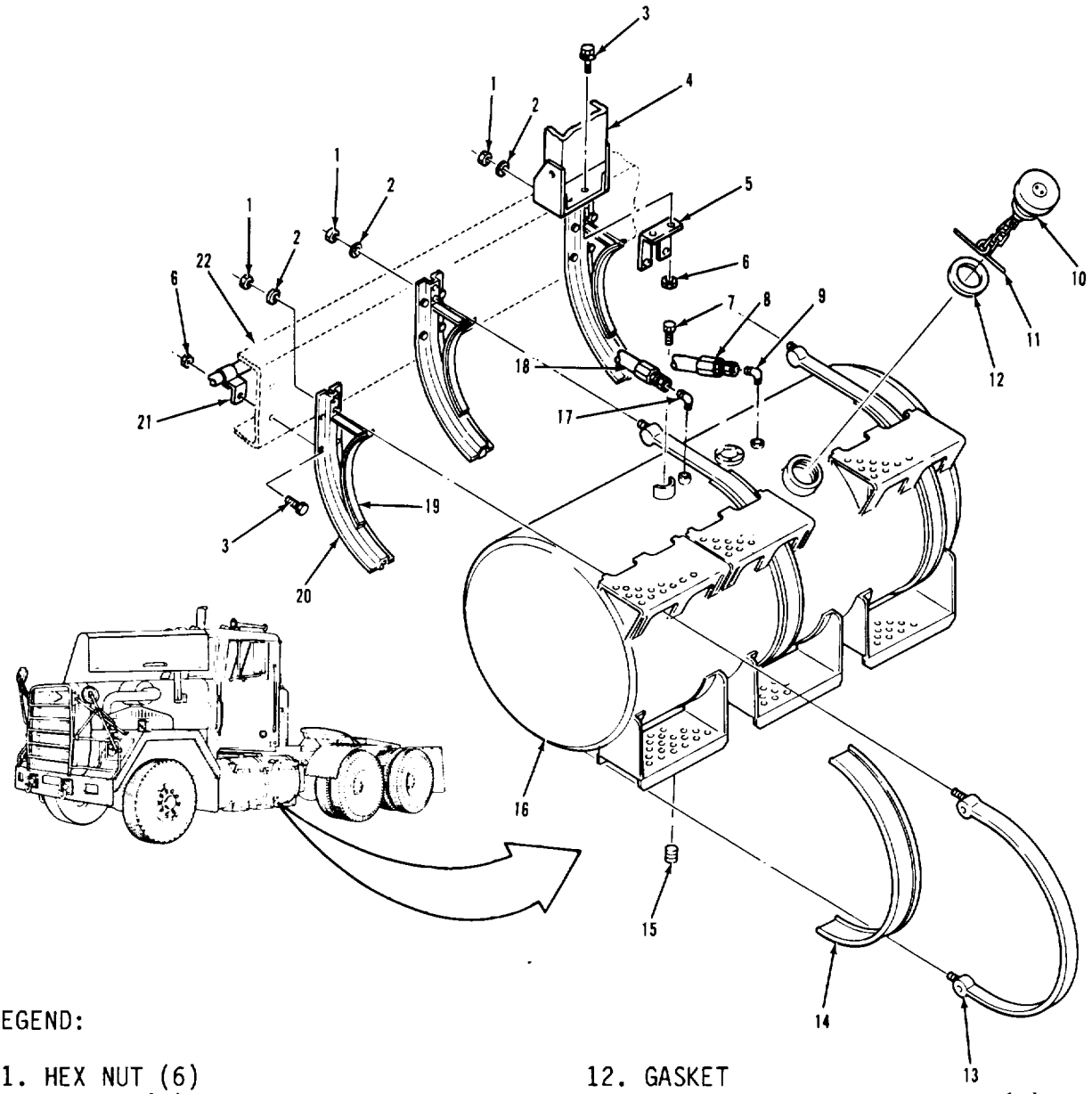
FUEL SYSTEM.

3-34. FUEL TANK REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
	NOTE Have suitable container ready to catch fuel.	
1. Plug (15).	a. Remove from item (16). b. Drain fuel into suitable container.	
2. Hose (8) and hose (18).	Remove from item (9) and item (17).	
3. Elbow (9) and elbow (17).	Remove from item (16).	
	WARNING Be sure tank is supported so it cannot fall.	
4. Six nuts (1) and lockwashers (2).	Remove from three items (13).	
5. Three straps (13).	Remove from item (16).	
6. Tank assembly (16).	Lower to ground.	
7. Three insulators (14).	Remove from three items (13).	
8. Vent (7).	Remove from item (16).	

FUEL SYSTEM.

3-34. FUEL TANK REPLACEMENT (Continued).



LEGEND:

1. HEX NUT (6)
2. WASHER (6)
3. HEX FLANGED SCREW (14)
4. SPARE TIRE CARRIER ASSEMBLY
5. TIRE CARRIER MOUNTING BRACKET
6. HEX FLANGED NUT (14)
7. VENT PLUG
8. FUEL RETURN HOSE
9. ELBOW
10. CAP ASSEMBLY
11. BAR
12. GASKET
13. FUEL TANK STRAP ASSEMBLY (3)
14. FUEL TANK STRAP INSULATOR (3)
15. DRAIN PLUG
16. FUEL TANK ASSEMBLY
17. ELBOW
18. FUEL SUPPLY HOSE
19. FUEL TANK BRACKET INSULATOR (3)
20. FUEL TANK MOUNTING BRACKET (3)
21. TUBE SUPPORT (3)
22. FRAME

TA 237060

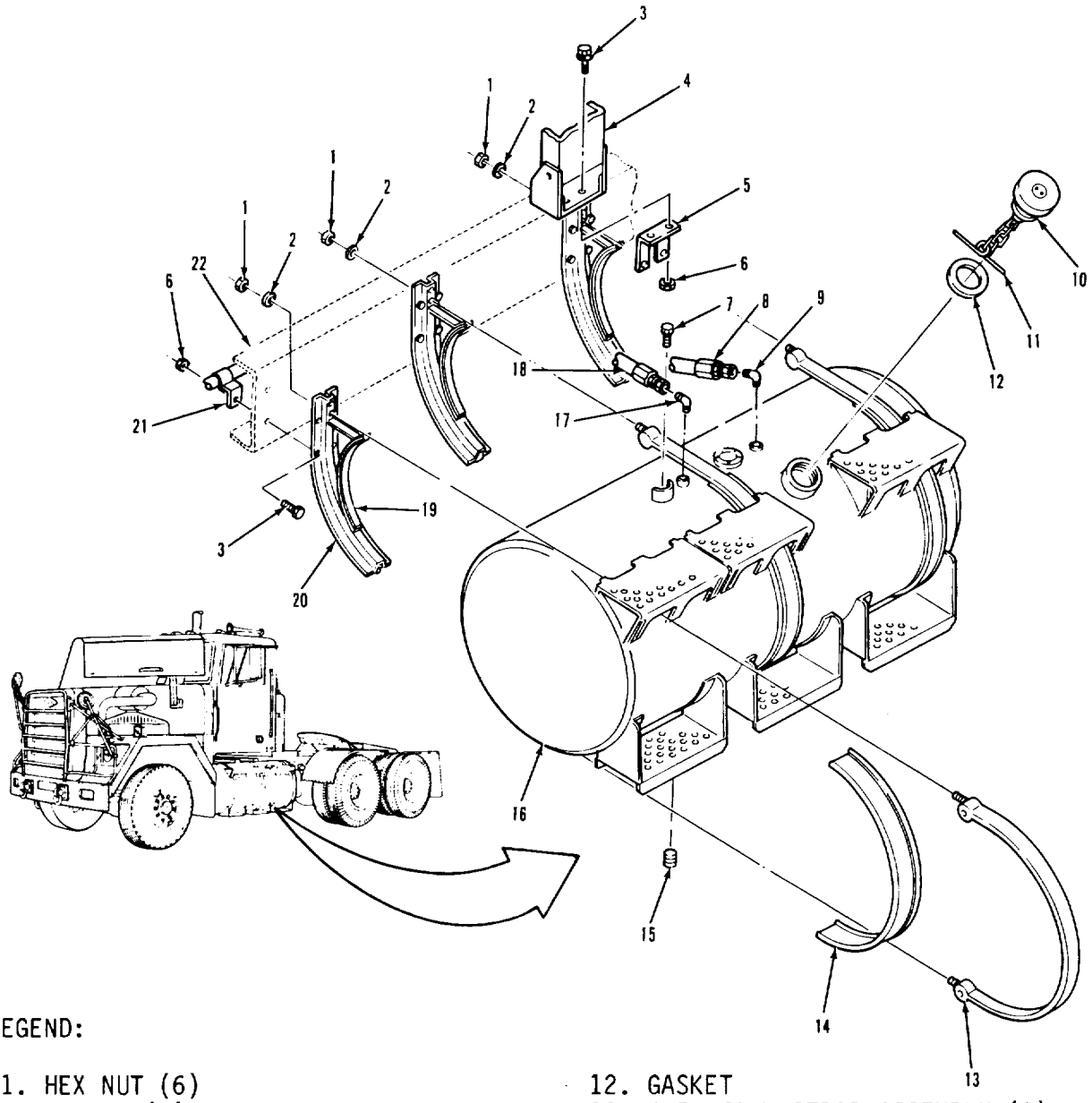
FUEL SYSTEM.

3-34. FUEL TANK REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL (Continued).		
9. Cap assembly (10).	Remove from item (16).	Use long round nose pliers to remove item (11) from screen of item (16).
10. Gasket (12).	Remove from item (10).	
11. Two screws (3) and nuts (6).	Remove from item (4) and item (5).	
12. Twelve screws (3) and nuts (6).	Unscrew and remove three items (20), item (5), and three items (21) from item (22).	
13. Three insulators (19).	Remove from three items (20).	
B. CLEANING AND INSPECTION.		
14. All parts except insulators (14) and (19).	Clean with solvent and rags.	Refer to paragraph 3-4.
15. All parts.	Inspect.	Refer to paragraph 3-5.
C. INSTALLATION.		
16. Twelve screws (3) and nuts (6).	Secure three items (20), item (5), and three items (21) to item (22).	
17. Two screws (3) and nuts (6).	Secure item (5) to item (4).	
18. Three insulators (19).	Install on three items (20) with adhesive.	
19. Gasket (12).	Put on item (10).	

FUEL SYSTEM.

3-34. FUEL TANK REPLACEMENT (Continued).



LEGEND:

1. HEX NUT (6)
2. WASHER (6)
3. HEX FLANGED SCREW (14)
4. SPARE TIRE CARRIER ASSEMBLY
5. TIRE CARRIER MOUNTING BRACKET
6. HEX FLANGED NUT (14)
7. VENT PLUG
8. FUEL RETURN HOSE
9. ELBOW
10. CAP ASSEMBLY
11. BAR
12. GASKET
13. FUEL TANK STRAP ASSEMBLY (3)
14. FUEL TANK STRAP INSULATOR (3)
15. DRAIN PLUG
16. FUEL TANK ASSEMBLY
17. ELBOW
18. FUEL SUPPLY HOSE
19. FUEL TANK BRACKET INSULATOR (3)
20. FUEL TANK MOUNTING BRACKET (3)
21. TUBE SUPPORT (3)
22. FRAME

TA 237061

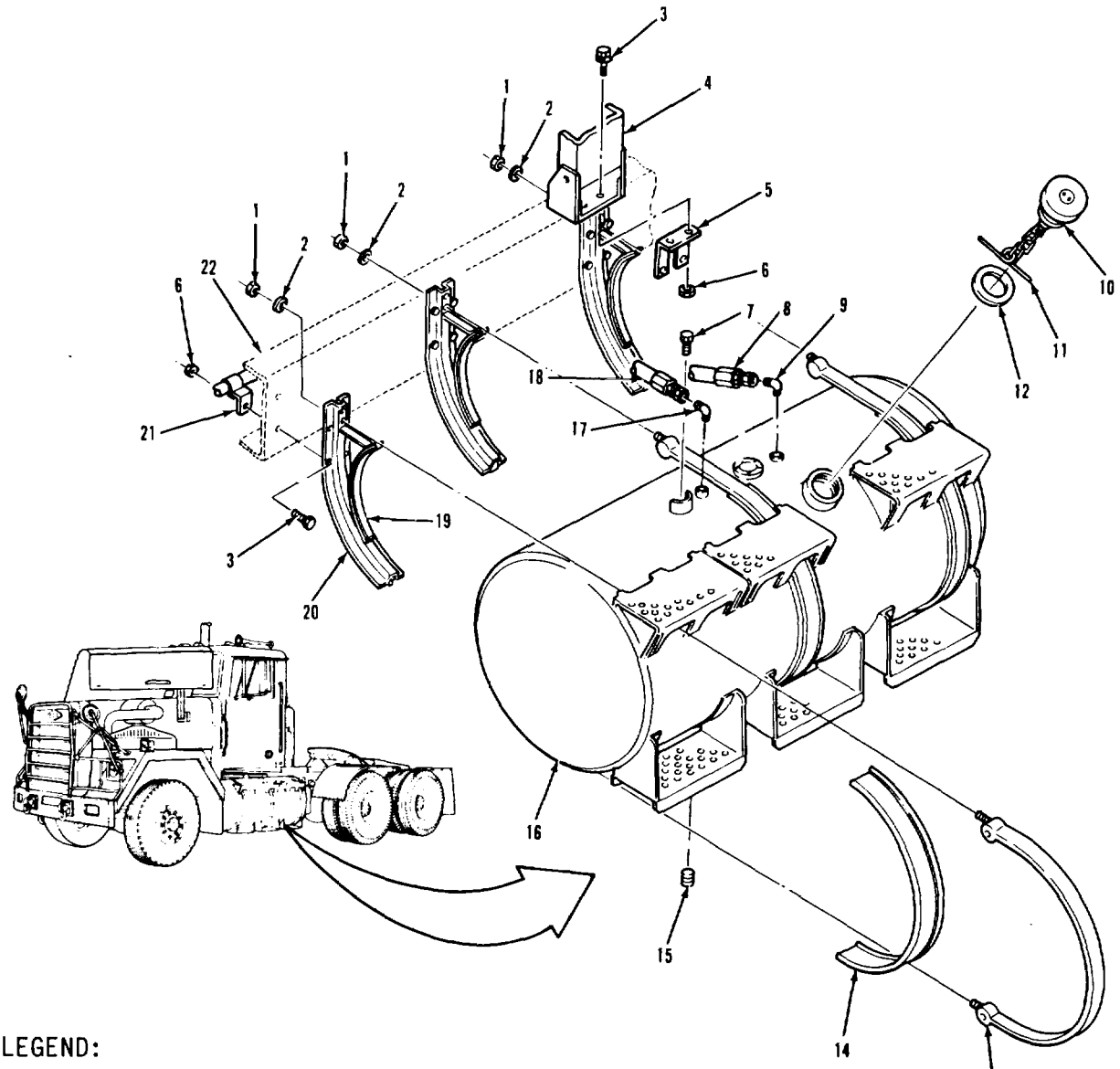
FUEL SYSTEM.

3-34. FUEL TANK REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C INSTALLATION (Continued).		
20. Cap assembly (10).	Install in item (16).	Use long round nose pliers to install item (11) in screen of item (16).
21. Vent (7).	Install in item (16).	
22. Three insulators (14).	Install on three items (13).	
23. Tank assembly (16).	Install on three items (20). (16) are level with ground.	Be sure steps on item
24. Three straps (13). into three items (20).	Install around item (16) and	
25. Six nuts (1) and lockwashers (2).	Secure three items (13) to three items (20).	
26. Elbow (9) and elbow (17).	Install in item (16).	a. Put thread sealing tape on pipe threads. b. Point item (9) and item (17) toward frame.
27. Hose (8) and hose (18).	Install on item (9) and item (17).	
28. Plug (15).	Install in item (16).	
	NOTE	
	Follow-on maintenance action required: Install fuel level sending unit (para 3-105). Fill fuel tank with proper diesel fuel (TM 9-2320-283-10). Start engine, check for leaks, retighten connections as necessary, shut down engine (TM 9-2320-283-10).	

FUEL SYSTEM.

3-34. FUEL TANK REPLACEMENT (Continued).



LEGEND:

1. HEX NUT (6)
2. WASHER (6)
3. HEX FLANGED SCREW (14)
4. SPARE TIRE CARRIER ASSEMBLY
5. TIRE CARRIER MOUNTING BRACKET
6. HEX FLANGED NUT (14)
7. VENT PLUG
8. FUEL RETURN HOSE
9. ELBOW
10. CAP ASSEMBLY
11. BAR
12. GASKET
13. FUEL TANK STRAP ASSEMBLY (3)
14. FUEL TANK STRAP INSULATOR (3)
15. DRAIN PLUG
16. FUEL TANK ASSEMBLY
17. ELBOW
18. FUEL SUPPLY HOSE
19. FUEL TANK BRACKET INSULATOR (3)
20. FUEL TANK MOUNTING BRACKET (3)
21. TUBE SUPPORT (3)
22. FRAME

TA 237062

FUEL SYSTEM.

3-35. FUEL HEATER REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	3-52.	Radiator drained.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Rags, wiping
Item 22, Appendix C.
Solvent, drycleaning, SD-2
Item 29, Appendix C.
Tape, thread sealing
Item 32, Appendix C.

PERSONNEL REQUIRED
One (MOS-63S .

SPECIAL ENVIRONMENTAL CONDITIONS
None.

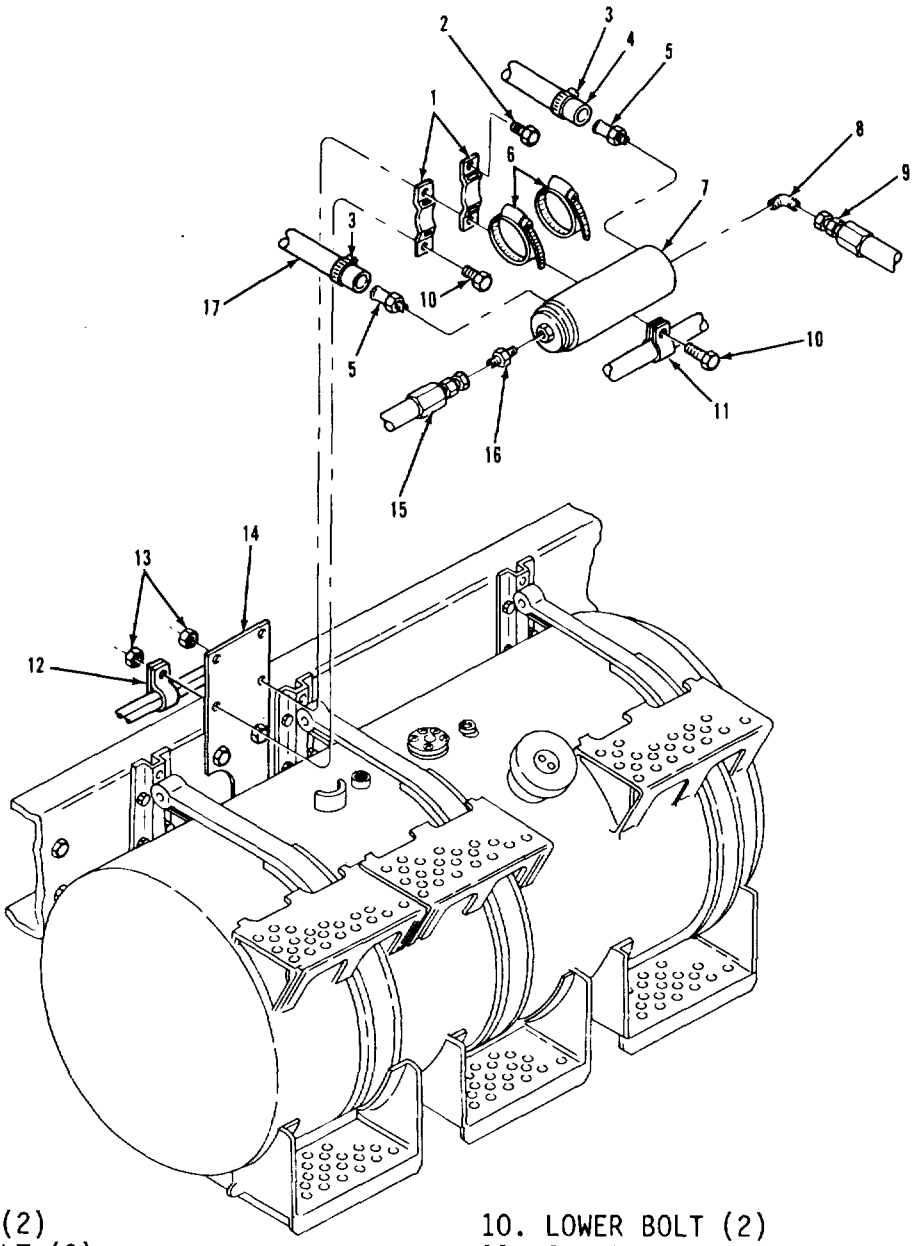
REFERENCES (TM)
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

FUEL SYSTEM.

3-35. FUEL HEATER REPLACEMENT (Continued).



LEGEND:

1. BRACKET (2)
2. UPPER BOLT (2)
3. HOSE CLAMP (2)
4. FUEL HEATER TO ENGINE HOSE
5. FUEL HEATER HOSE NIPPLE (2)
6. CLAMP (2)
7. FUEL HEATER
8. ELBOW
9. FUEL SUPPLY HOSE
10. LOWER BOLT (2)
11. CLAMP
12. CLAMP
13. NUT (4)
14. OIL FILTER MOUNTING BRACKET
15. FUEL SUPPLY TO ENGINE HOSE
16. CONNECTOR
17. HEATER TO FUEL HEATER HOSE

TA 237063

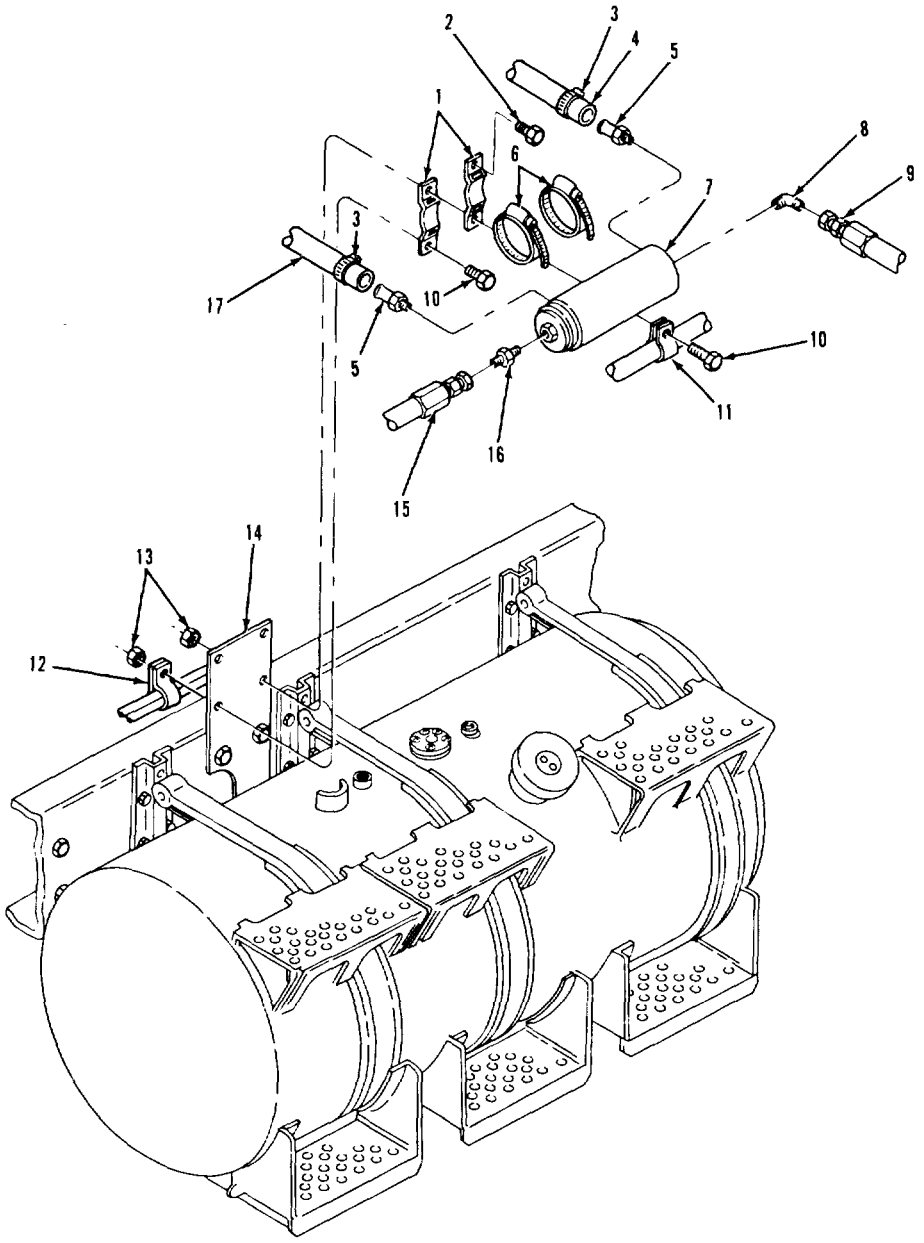
FUEL SYSTEM.

3-35. FUEL HEATER REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
	NOTE	
	For the next two steps have suitable plugs available.	
1. Hose (9).	Remove from item (8).	Hold up and plug end to prevent fuel spillage.
2. Hose (15).	Remove from item (16).	Hold up and plug end to prevent fuel spillage.
3. Two clamps (6).	Open all the way.	
4. Two clamps (3).	Loosen.	
5. Hose (4) and hose (17).	Pull from two items (5).	Have a drain pan ready to catch any spillage.
6. Heater (7).	Remove from two items (6).	Handle carefully to prevent excess coolant and fuel spillage.
7. Two nipples (5), connector (16), and elbow (8).	Remove from item (7).	
8. Two screws (10), two screws (2), and four nuts (13).	Remove from two items (1), item (11), and item (12).	
9. Two brackets (1).	Remove from item (14).	
10. Two clamps (6).	Remove from two items (1).	
B. CLEANING AND INSPECTION.		
11. All parts.	Clean with solvent and rags.	Refer to paragraph 3-4.

FUEL SYSTEM.

3-35. FUEL HEATER REPLACEMENT (Continued).



LEGEND:

1. BRACKET (2)
2. UPPER BOLT (2)
3. HOSE CLAMP (2)
4. FUEL HEATER TO ENGINE HOSE
5. FUEL HEATER HOSE NIPPLE (2)
6. CLAMP (2)
7. FUEL HEATER
8. ELBOW
9. FUEL SUPPLY HOSE
10. LOWER BOLT (2)
11. CLAMP
12. CLAMP
13. NUT (4)
14. OIL FILTER MOUNTING BRACKET
15. FUEL SUPPLY TO ENGINE HOSE
16. CONNECTOR
17. HEATER TO FUEL HEATER HOSE

TA 237064

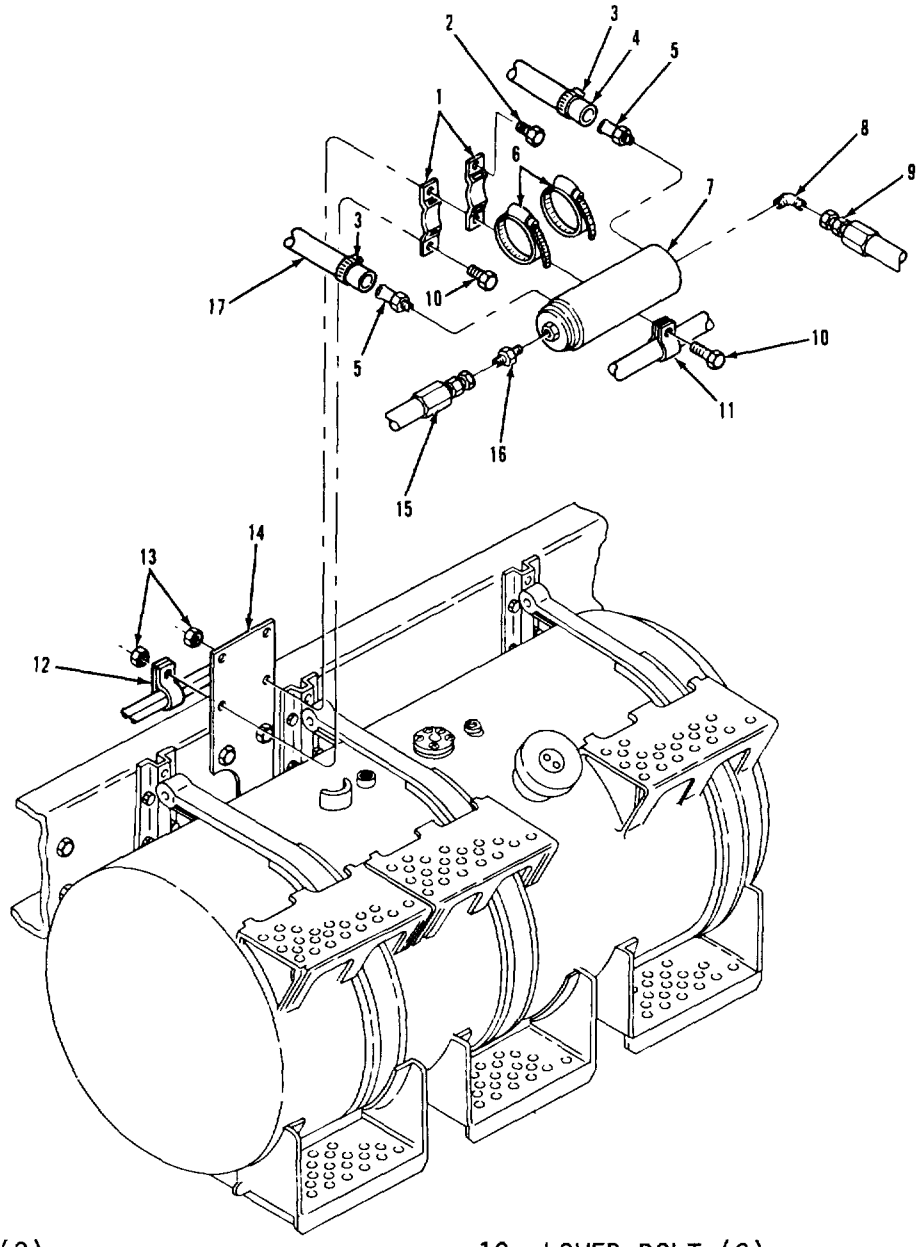
FUEL SYSTEM.

3-35. FUEL HEATER REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
B. CLEANING AND INSPECTION (Continued).		
12. Heater (7).	Flush out with clean running water.	a. Only run water through ports on side of item (7). b. If water comes out of ends of item (7), replace item (7).
13. All parts.	Inspect.	Refer to paragraph 3-5.
C. INSTALLATION.		
14. Two clamps (6).	Put through two items (1).	
15. Two brackets (1).	Place on item (14).	
16. Two screws (10), two screws (2), and four nuts (13).	Secure two items (1), item (11), and item (12) to item (14).	Longer screws go on bottom.
17. Two nipples (5), connector (16), and elbow (8).	Install in item (7).	a. Put thread sealing tape on pipe threads. b. Point item (8) away from two items (5).
18. Two clamps (3).	Slip over item (4) and item (17).	
19. Heater (7).	Place in two items (6).	
20. Hose (4) and hose (17).	Push on two items (5).	
21. Two clamps (3).	Tighten.	
22. Two clamps (6).	Tighten around item (7).	

FUEL SYSTEM.

3-35. FUEL HEATER REPLACEMENT (Continued).



LEGEND:

1. BRACKET (2)
2. UPPER BOLT (2)
3. HOSE CLAMP (2)
4. FUEL HEATER TO ENGINE HOSE
5. FUEL HEATER HOSE NIPPLE (2)
6. CLAMP (2)
7. FUEL HEATER
8. ELBOW
9. FUEL SUPPLY HOSE
10. LOWER BOLT (2)
11. CLAMP
12. CLAMP
13. NUT (4)
14. OIL FILTER MOUNTING BRACKET
15. FUEL SUPPLY TO ENGINE HOSE
16. CONNECTOR
17. HEATER TO FUEL HEATER HOSE

TA 237065

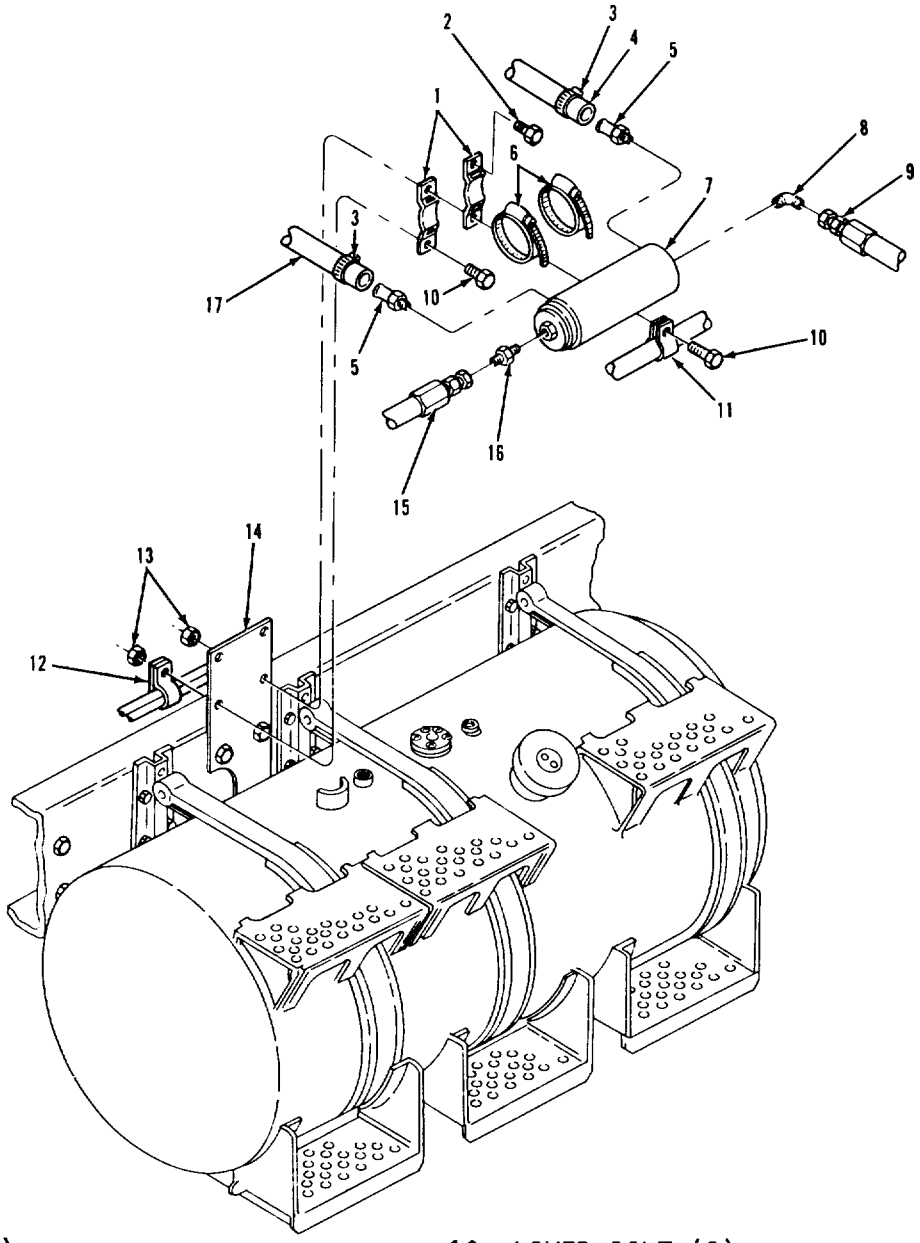
FUEL SYSTEM.

3-35. FUEL HEATER REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
23. Hose (15).	Unplug and install on item (16).	
24. Hose (9).	Unplug and install on item (8).	
	NOTE	
	Follow-on maintenance action required:	
	Service cooling system (para 3-52).	

FUEL SYSTEM.

3-35. FUEL HEATER REPLACEMENT (Continued).



LEGEND:

1. BRACKET (2)
2. UPPER BOLT (2)
3. HOSE CLAMP (2)
4. FUEL HEATER TO ENGINE HOSE
5. FUEL HEATER HOSE NIPPLE (2)
6. CLAMP (2)
7. FUEL HEATER
8. ELBOW
9. FUEL SUPPLY HOSE
10. LOWER BOLT (2)
11. CLAMP
12. CLAMP
13. NUT (4)
14. OIL FILTER MOUNTING BRACKET
15. FUEL SUPPLY TO ENGINE HOSE
16. CONNECTOR
17. HEATER TO FUEL HEATER HOSE

TA 237066

FUEL SYSTEM.

3-36. FUEL HOSES AND FITTINGS REPLACEMENT.

THIS TASK COVERS

a. Fuel Supply Hose Removal.
b. Fuel Supply Hose Installation.
c. Fuel Supply to Engine Hose Removal.
d. Fuel Supply to Engine Hose Installation.
e. Fuel Return Hose Removal.
f. Fuel Return Hose Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
None.

CONDITION DESCRIPTION
None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Tape, thread sealing
Item 32, Appendix C.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

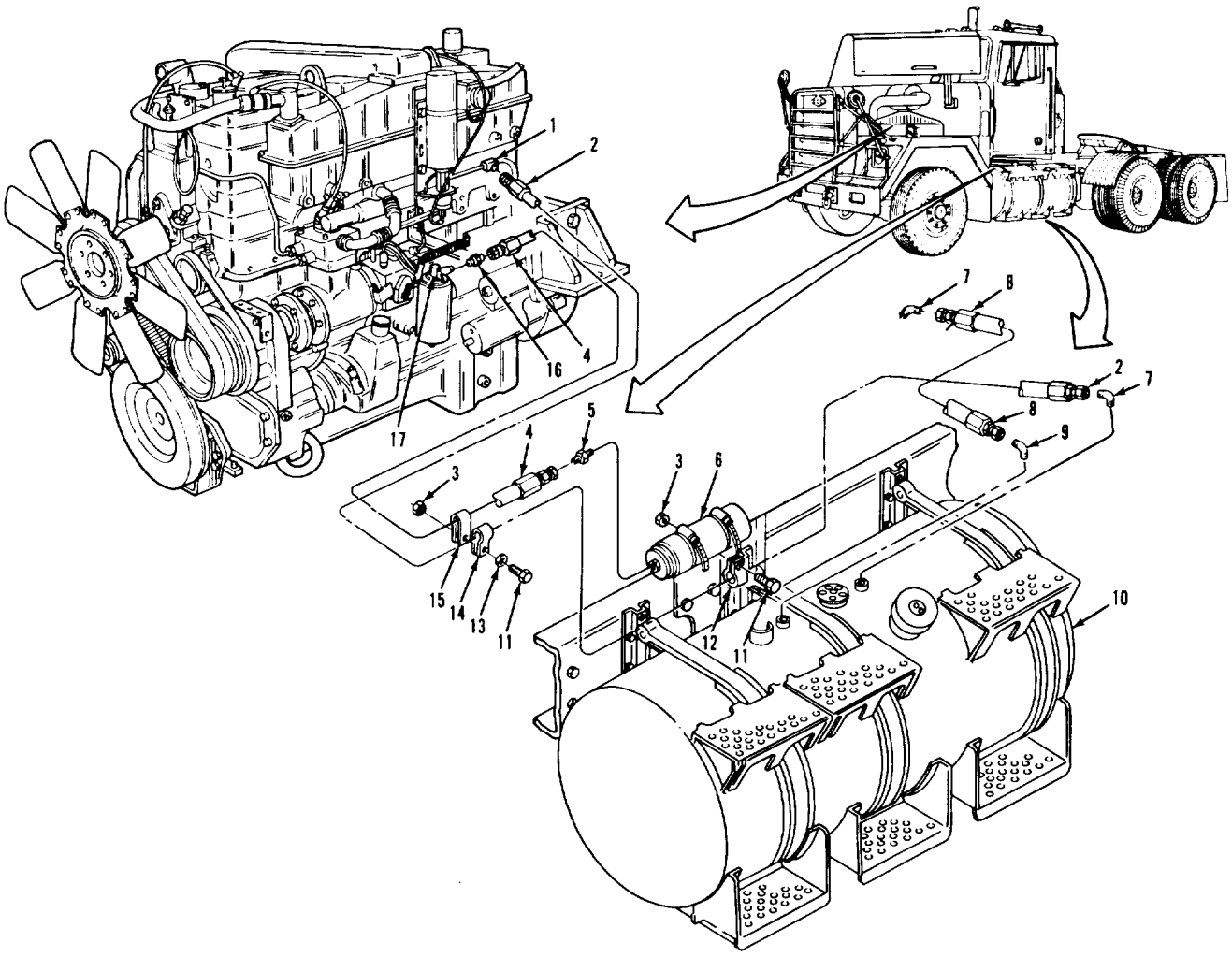
REFERENCES (TM)
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

FUEL SYSTEM.

3-36. FUEL HOSES AND FITTINGS REPLACEMENT (Continued).



LEGEND:

1. MALE BRANCH TEE
2. FUEL RETURN HOSE
3. NUT (2)
4. FUEL SUPPLY TO ENGINE HOSE
5. CONNECTOR
6. FUEL HEATER ASSEMBLY
7. ELBOW (2)
8. FUEL SUPPLY HOSE
9. ELBOW
10. FUEL TANK
11. SCREW (2)
12. CLAMP
13. WASHER
14. FUEL RETURN HOSE CLIP
15. FUEL SUPPLY HOSE CLIP
16. FUEL INLET NIPPLE
17. FUEL FILTER HEAD

TA 237067

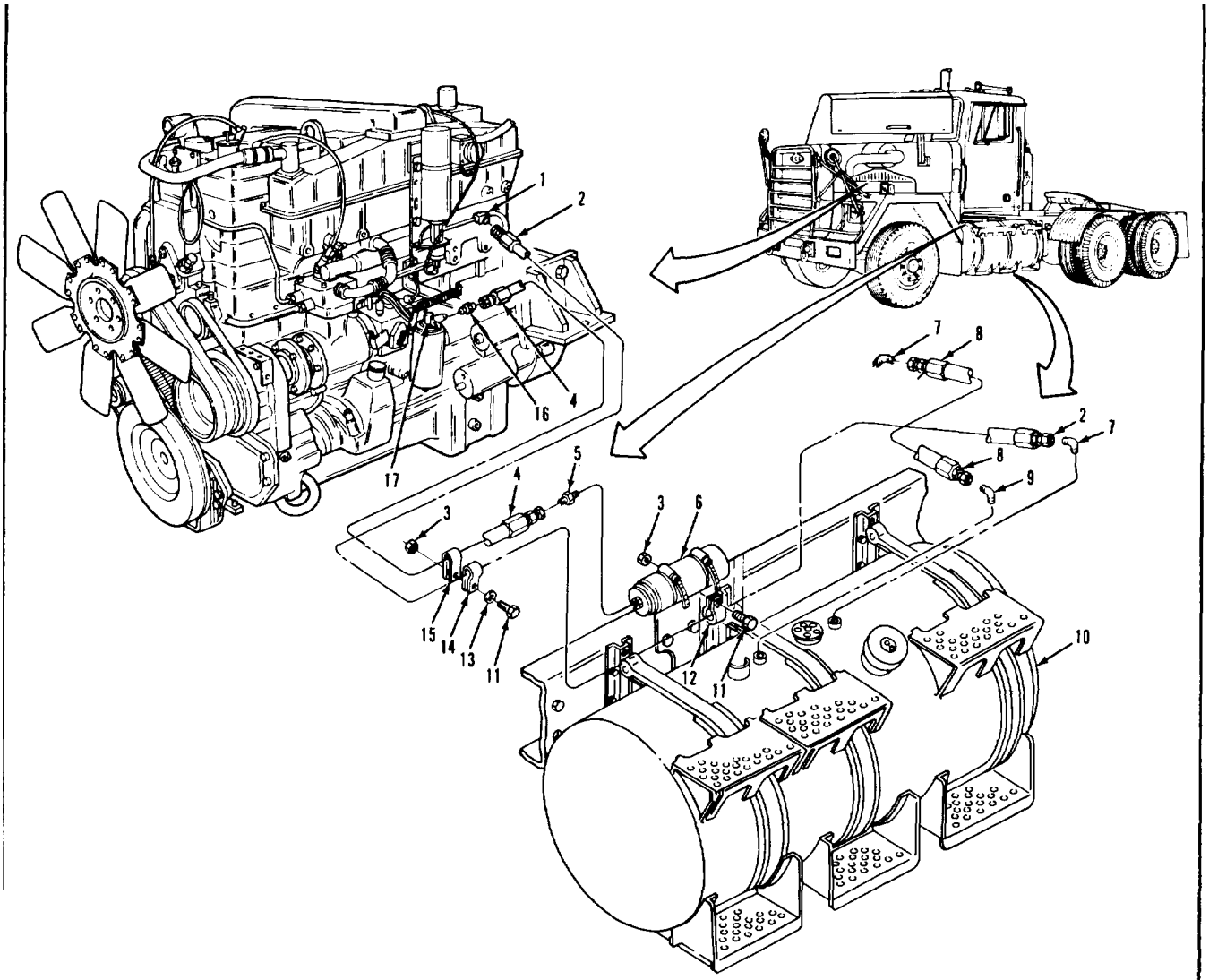
FUEL SYSTEM.

3-36. FUEL HOSES AND FITTINGS REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. FUEL SUPPLY HOSE REMOVAL.		
1. Hose (8).	Remove from item (7) and item (9).	
2. Elbow (7).	Remove from item (6).	
3. Elbow (9).	Remove from item (10).	
B. FUEL SUPPLY HOSE INSTALLATION.		
4. Elbow (9).	Install in item (10).	a. Put thread sealing tape on pipe threads. b. Point towards frame.
5. Elbow (7).	Install on item (6).	a. Put thread sealing tape on pipe threads. b. Point to left side of vehicle.
6. Hose (8).	Install on item (7) and item (9).	
C. FUEL SUPPLY TO ENGINE HOSE REMOVAL.		
7. Hose (4).	Remove from item (5).	
8. Connector (5).	Remove from item (6).	
9. Screw (11), washer (13), and nut (3).	Remove from item (14) and item (15).	
10. Hose (4).	Remove from item (16).	
11. Nipple (16).	Remove from item (17).	
12. Clip (15).	Remove from item (4).	

FUEL SYSTEM.

3-36. FUEL HOSES AND FITTINGS REPLACEMENT (Continued).



LEGEND:

1. MALE BRANCH TEE
2. FUEL RETURN HOSE
3. NUT (2)
4. FUEL SUPPLY TO ENGINE HOSE
5. CONNECTOR
6. FUEL HEATER ASSEMBLY
7. ELBOW (2)
8. FUEL SUPPLY HOSE
9. ELBOW
10. FUEL TANK
11. SCREW (2)
12. CLAMP
13. WASHER
14. FUEL RETURN HOSE CLIP
15. FUEL SUPPLY HOSE CLIP
16. FUEL INLET NIPPLE
17. FUEL FILTER HEAD

TA 237068

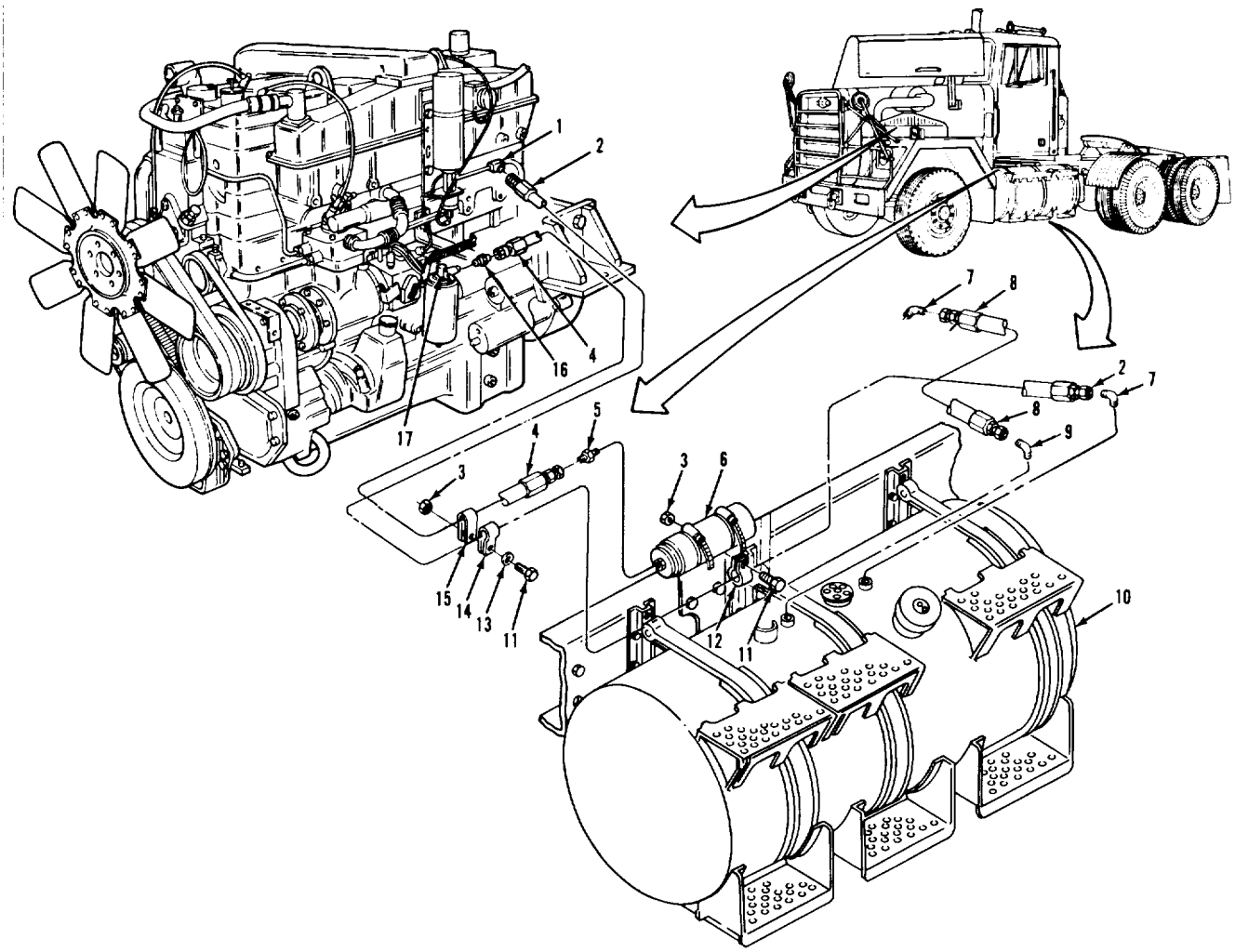
FUEL SYSTEM.

3-36. FUEL HOSES AND FITTINGS REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
D. FUEL SUPPLY TO ENGINE HOSE INSTALLATION.		
13. Nipple (16).	Install in item (17).	Put thread sealing tape on pipe threads.
14. Hose (4).	Install on item (16).	
15. Clip (15).	Put on item (4).	
16. Screw (11), washer (13), and nut (3).	Secure item (14) and item (15) to frame.	
17. Connector (5).	Install in item (6).	Put thread sealing tape on pipe threads.
18. Hose (4).	Install on item (5).	
E. FUEL RETURN HOSE REMOVAL.		
19. Screw (11) and nut (3).	Remove from item (12).	
20. Hose (2).	Remove from item (7).	
21. Elbow (7).	Remove from item (10).	
22. Screw (11), washer (13), and nut (3).	Remove from item (14) and item (15).	
23. Hose (2).	Remove from item (1).	
24. Clip (14) and clamp (12).	Remove from item (2).	

FUEL SYSTEM

3-36. FUEL HOSES AND FITTINGS REPLACEMENT (Continued).



LEGEND:

1. MALE BRANCH TEE
2. FUEL RETURN HOSE
3. NUT (2)
4. FUEL SUPPLY TO ENGINE HOSE
5. CONNECTOR
6. FUEL HEATER ASSEMBLY
7. ELBOW (2)
8. FUEL SUPPLY HOSE
9. ELBOW
10. FUEL TANK
11. SCREW (2)
12. CLAMP
13. WASHER
14. FUEL RETURN HOSE CLIP
15. FUEL SUPPLY HOSE CLIP
16. FUEL INLET NIPPLE
17. FUEL FILTER HEAD

FUEL SYSTEM

3-36. FUEL HOSES AND FITTINGS REPLACEMENT (Continued).

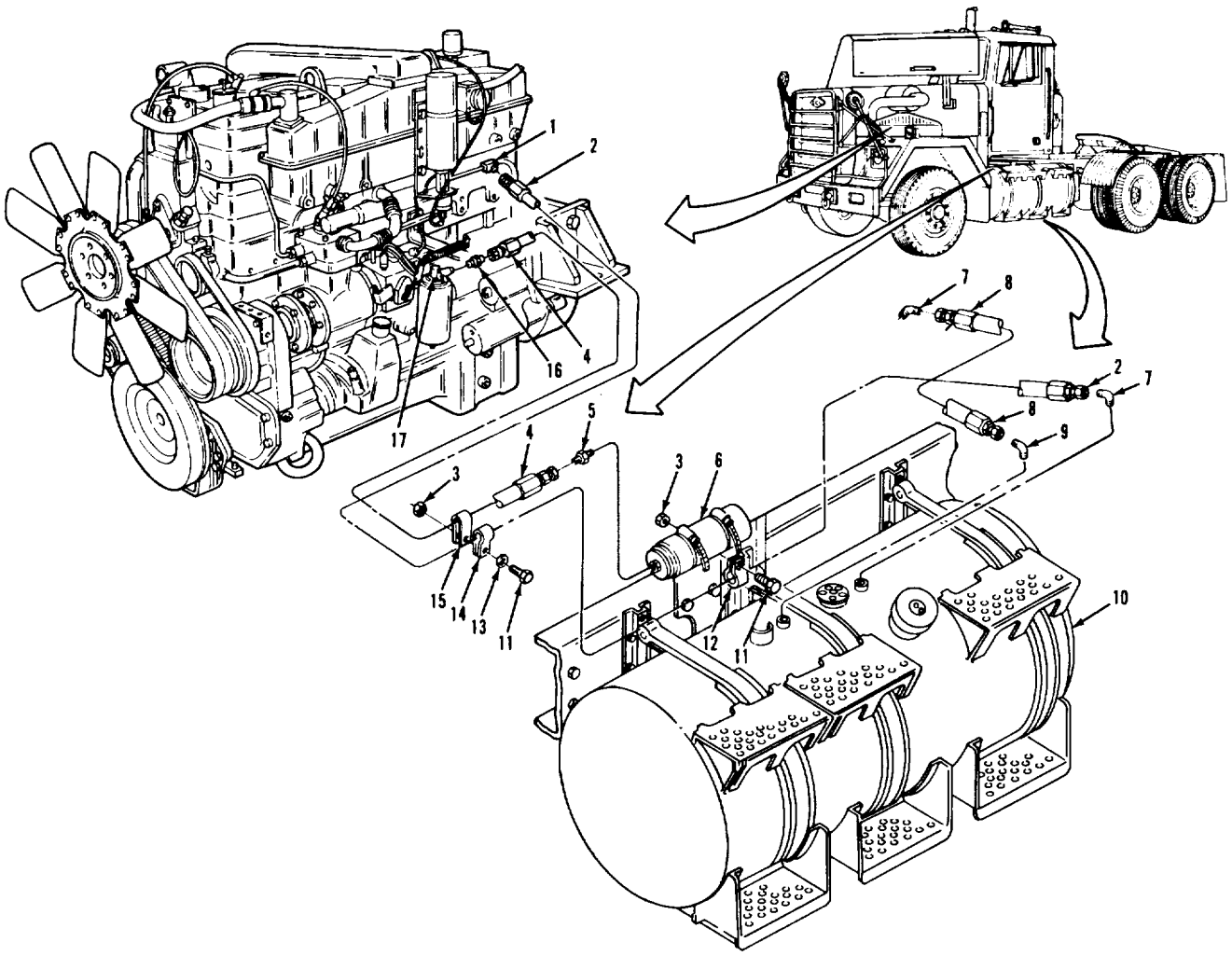
LOCATION/ITEM		ACTION	REMARKS
F.	FUEL RETURN HOSE INSTALLATION.		
25.	Hose (2).	Install on item (1).	
26.	Clip (14).	Put on item (2).	
27.	Screw (11), washer (13), and nut (3).	Secure item (14) and item (15) to frame.	
28.	Elbow (7).	Install in item (10).	a. Put thread sealing tape on pipe threads.
		b.	Point toward frame.
29.	Hose (2).	Install on item (7).	
30.	Clamp (12).	Put on item (2).	
31.	Screw (11) and nut (3).	Secure item (12).	

NOTE

Follow-on maintenance action required:
None.

FUEL SYSTEM

3-36. FUEL HOSES AND FITTINGS REPLACEMENT (Continued).



LEGEND:

1. MALE BRANCH TEE
2. FUEL RETURN HOSE
3. NUT (2)
4. FUEL SUPPLY TO ENGINE HOSE
5. CONNECTOR
6. FUEL HEATER ASSEMBLY
7. ELBOW (2)
8. FUEL SUPPLY HOSE
9. ELBOW
10. FUEL TANK
11. SCREW (2)
12. CLAMP
13. WASHER
14. FUEL RETURN HOSE CLIP
15. FUEL SUPPLY HOSE CLIP
16. FUEL INLET NIPPLE
17. FUEL FILTER HEAD

FUEL SYSTEM

3-37. WATER SEPARATOR FUEL FILTER REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.

INITIAL SETUP

EQUIPMENT CONDITION

APPLICABLE CONFIGURATIONS	PARAGRAPH	CONDITION DESCRIPTION
All.	None.	None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Filter, fuel, water separator
(33457) FS1212.
Seal, ring
(15434) 255622.
Oil, fuel: diesel (match oil in vehicle)
Item 12, 13, or 14, Appendix C.

PERSONNEL REQUIRED
One (MOS-63S .

SPECIAL ENVIRONMENTAL CONDITIONS
None.

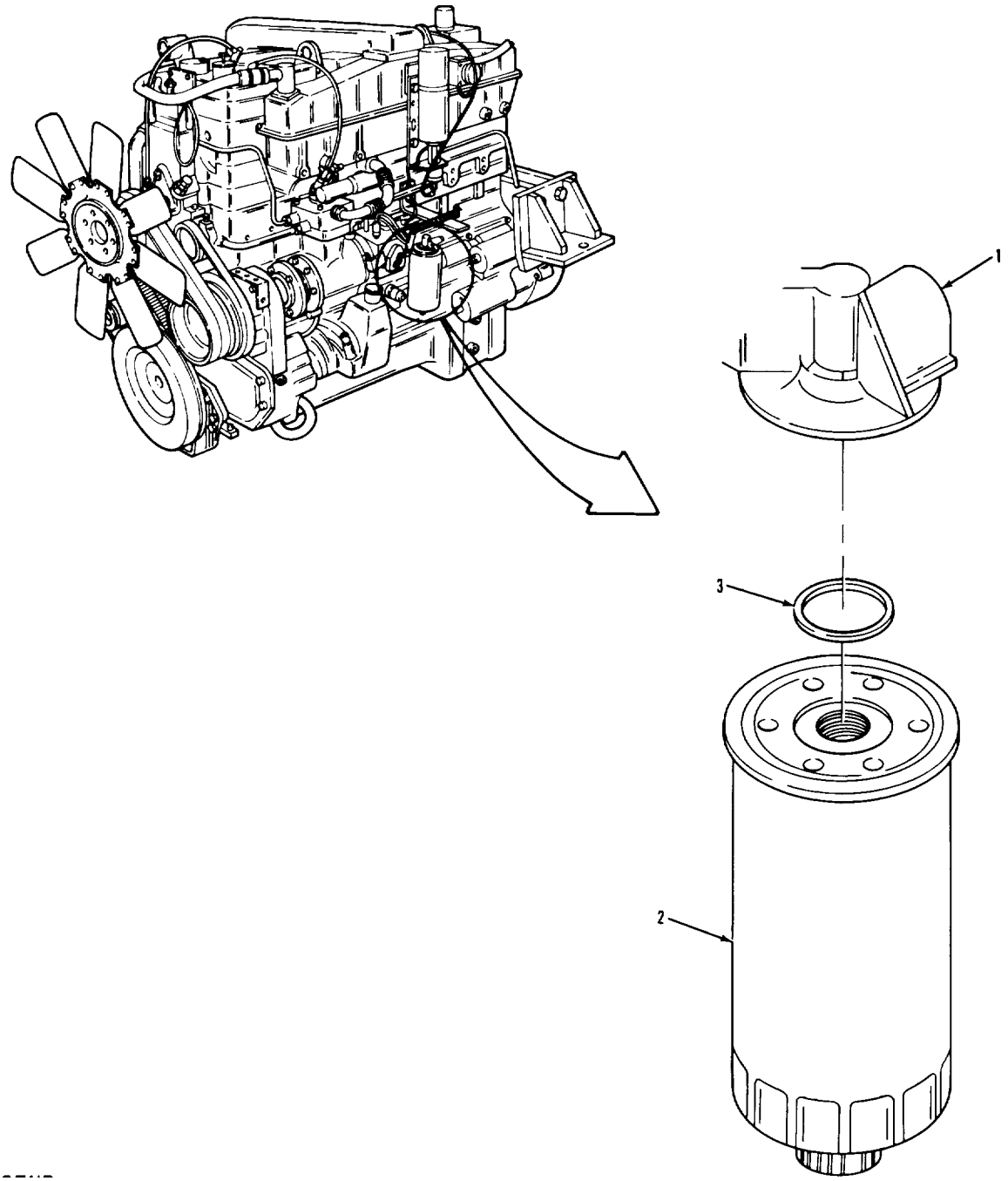
REFERENCES (TM)
IM 9-2320-2 3-10.
TM 9-2320-283-20P.
Park brake set.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

FUEL SYSTEM

3-37. WATER SEPARATOR FUEL FILTER REPLACEMENT (Continued).



LEGEND:

1. FUEL FILTER HEAD
2. WATER SEPARATOR FUEL FILTER
3. RING SEAL

TA 237071

FUEL SYSTEM

3-37. WATER SEPARATOR FUEL FILTER REPLACEMENT (Continued).

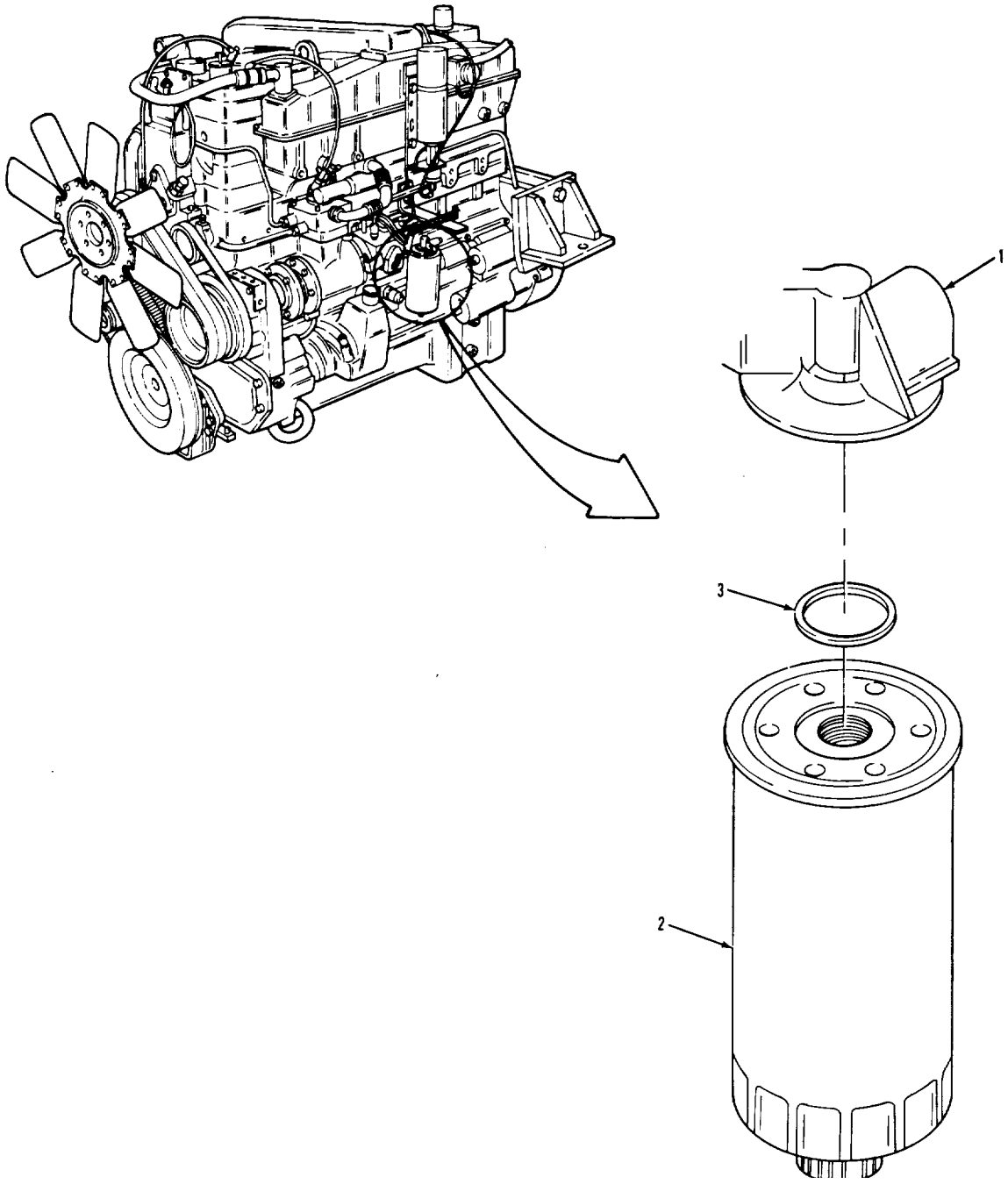
LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Filter (2) and seal (3).	Unscrew and remove from item (1).	a. Empty fuel into a suitable container for disposal.
	b.	Discard item (2) and item (3).
B. INSTALLATION.		
2. New filter (2).	Fill with clean fuel.	Be sure drain on bottom of item (2) is closed.
3. Filter (2) and new seal (3).	Screw on item (1) by hand until snug.	Do not tighten with wrench.
4. Filter (2).	Start engine and check for leaks.	Refer to TM 9-2320-283-10.

NOTE

Follow-on maintenance action required:
None.

FUEL SYSTEM

3-37. WATER SEPARATOR FUEL FILTER REPLACEMENT (Continued).



LEGEND:

1. FUEL FILTER HEAD
2. WATER SEPARATOR FUEL FILTER
3. RING SEAL

TA 237072

FUEL SYSTEM

3-38. ETHER CYLINDER REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
None.

CONDITION DESCRIPTION
None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Gasket, cylinder
(06991) 111025.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

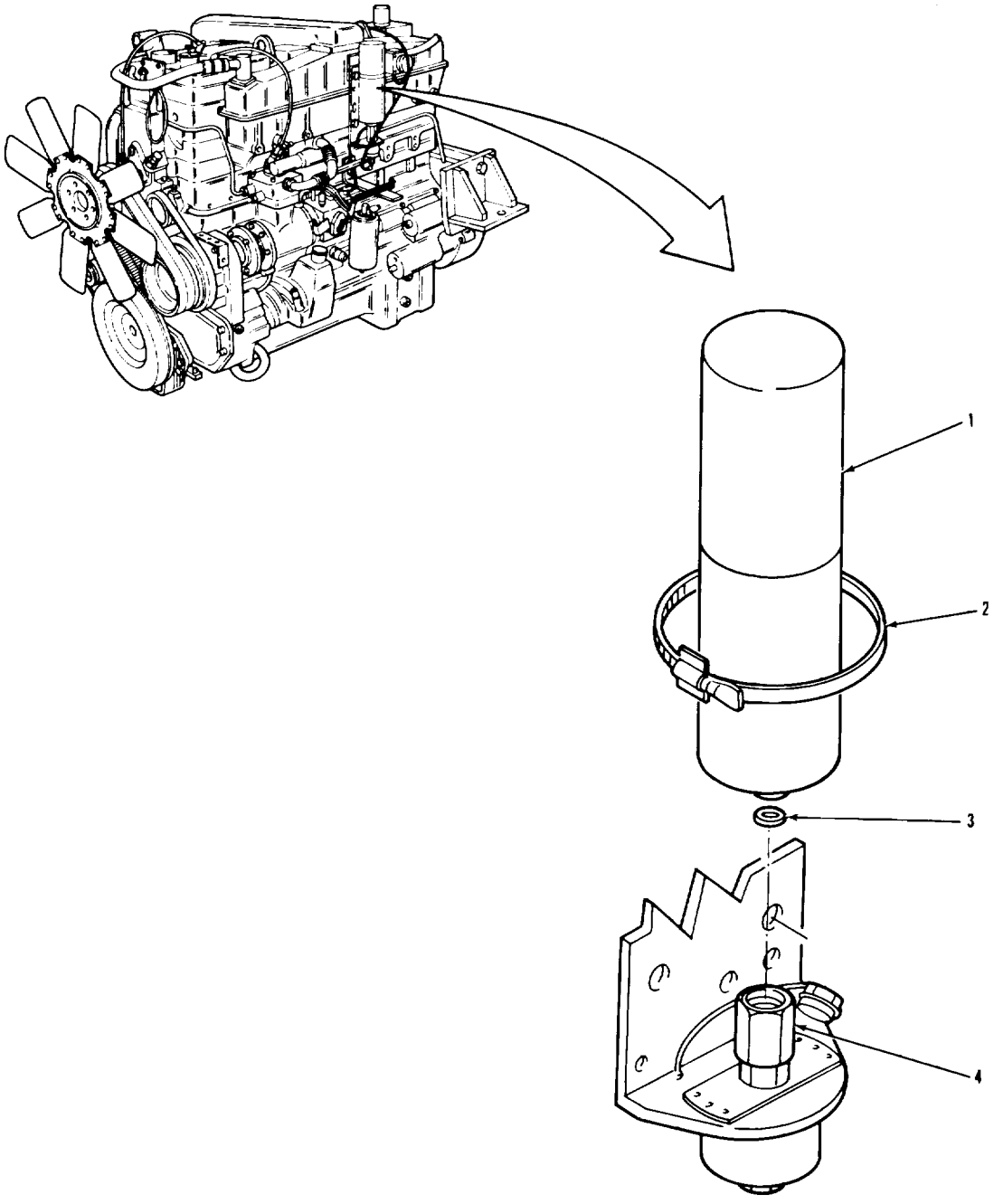
REFERENCES (TM)
TM 9-2320-283-20P.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.
Guard against flame or sparks in work area.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

FUEL SYSTEM

3-38. ETHER CYLINDER REPLACEMENT (Continued).



LEGEND:
2. CYLINDER CLAMP
3. CYLINDER GASKET
4. VALVE AND BRACKET ASSEMBLY

TA 237073

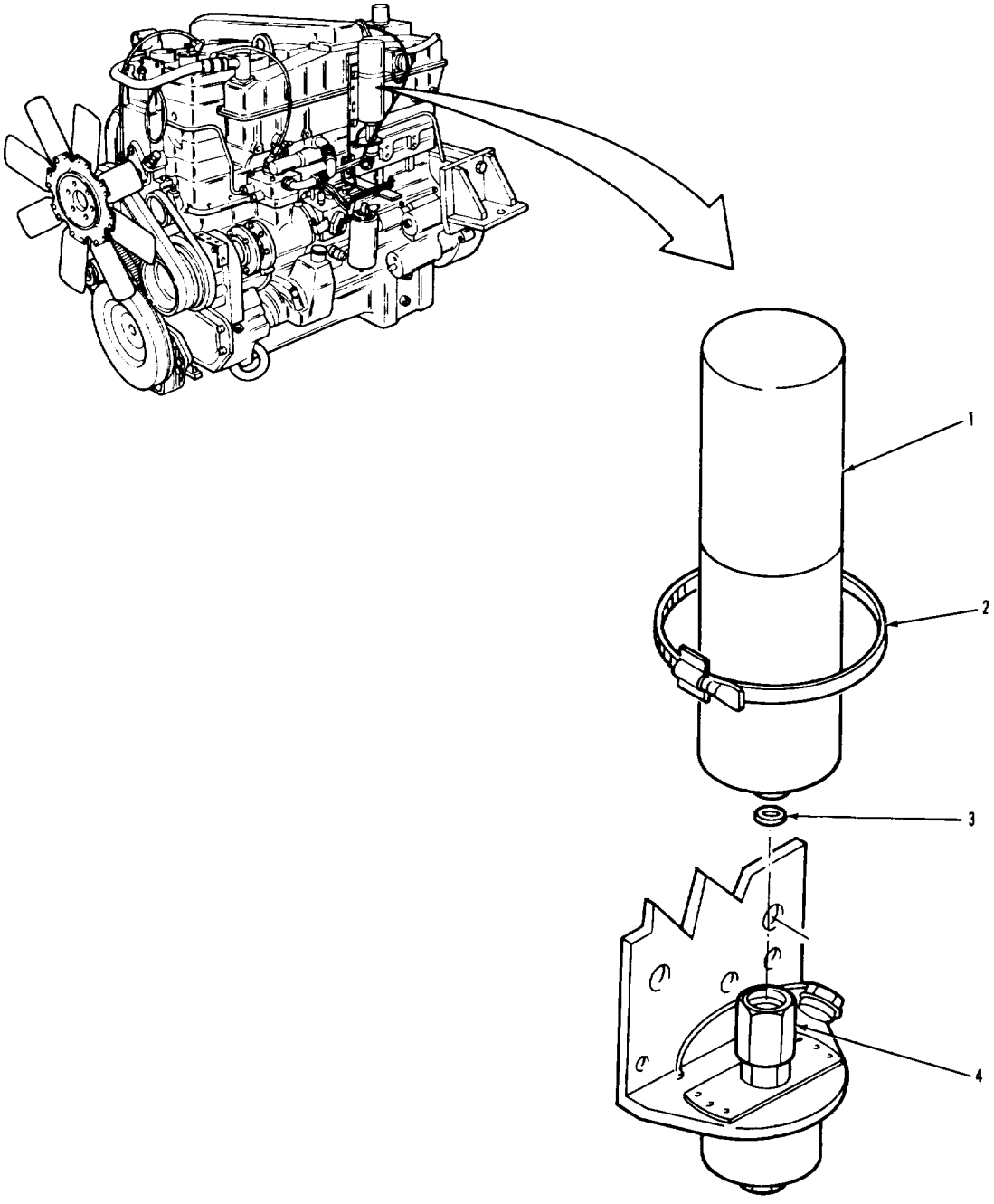
FUEL SYSTEM

3-38. ETHER CYLINDER REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
	WARNING Ether is highly explosive. Dispose of cylinder properly. Be alert for the strong odor of spilled ether. Guard against flame or sparks in work area.	
A. REMOVAL.		
1. Clamp (2).	Loosen.	
2. Cylinder (1) and gasket (3).	Unscrew and remove from item (4).	Discard item (3).
B. INSTALLATION.		
	NOTE Check opening of cylinder and valve for dirt or lint before installation.	
3. Cylinder (1) and new gasket (3).	Install in item (4).	
4. Clamp (2).	Tighten.	
	NOTE Follow-on maintenance action required: None.	

FUEL SYSTEM

3-38. ETHER CYLINDER REPLACEMENT (Continued).



LEGEND:
1. ETHER CYLINDER
2. CYLINDER CLAMP
3. CYLINDER GASKET
4. VALVE AND BRACKET ASSEMBLY

TA 237074

FUEL SYSTEM

3-39. ETHER QUICK START THERMOSTAT REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	3-52.	Radiator drained.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Tape, thread sealing
Item 32, Appendix C.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

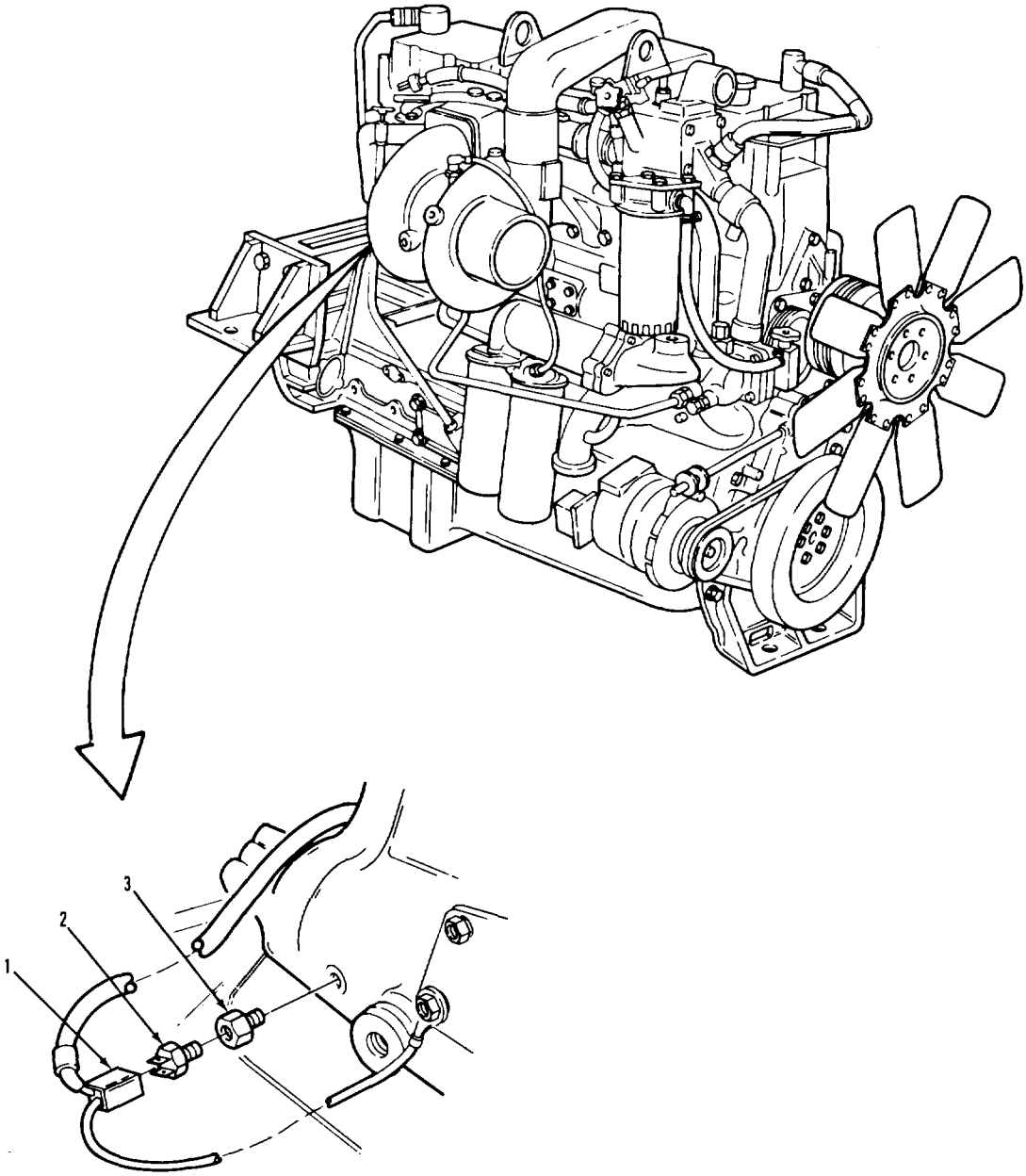
REFERENCES (TM)
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

FUEL SYSTEM

3-39. ETHER QUICK START THERMOSTAT REPLACEMENT (Continued).



LEGEND:
1. ELECTRICAL CONNECTOR
2. THERMOSTAT
3. REDUCER

TA 237075

FUEL SYSTEM

3-39. ETHER QUICK START THERMOSTAT REPLACEMENT (Continued).

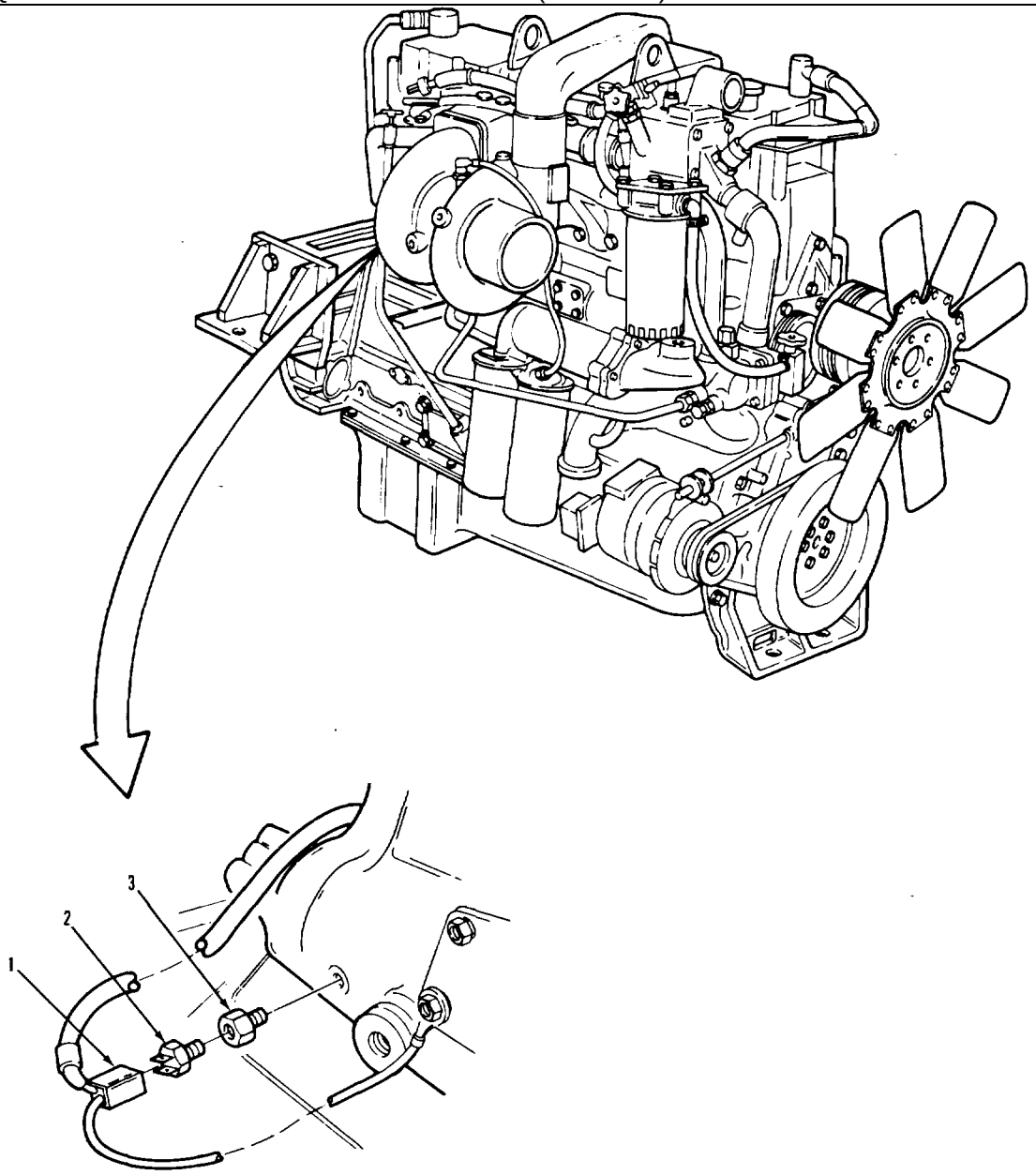
LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Connector (1).	Pull from item (2).	
2. Thermostat (2).	Remove from item (3).	
3. Reducer (3).	Remove from engine.	
B. CLEANING AND INSPECTION.		
4. All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
C. INSTALLATION.		
5. Reducer (3).	Install in engine.	Put thread sealing tape on threads.
6. Thermostat (2).	Install in item (3).	Put thread sealing tape on threads.
7. Connector (1).	Push on item (2).	

NOTE

Follow-on maintenance action required:
Service cooling system (para 3-52).

FUEL SYSTEM

3-39. ETHER QUICK START THERMOSTAT REPLACEMENT (Continued).



LEGEND:
1. ELECTRICAL CONNECTOR
2. THERMOSTAT
3. REDUCER

TA 237076

FUEL SYSTEM

3-40. ETHER QUICK START KIT REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	3-38.	Ether cylinder removed.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Rags, wiping
Item 22, Appendix C.
Solvent, drycleaning, SD-2
Item 29, Appendix C.
Tape, thread sealing
Item 32, Appendix C.

PERSONNEL REQUIRED
One (MOS-63S .

SPECIAL ENVIRONMENTAL CONDITIONS
None.

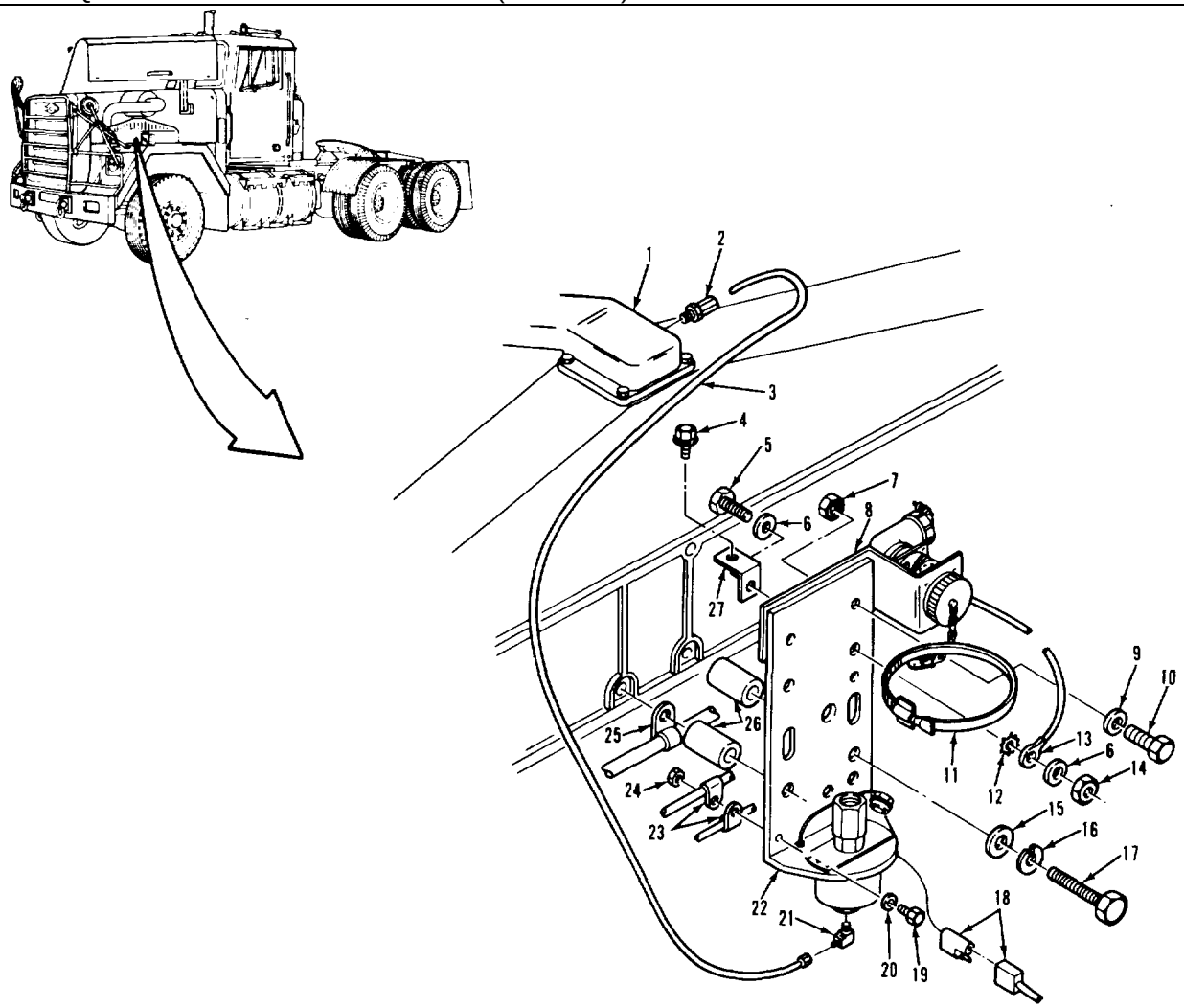
REFERENCES (TM)
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

FUEL SYSTEM

3-40. ETHER QUICK START KIT REPLACEMENT (Continued).



LEGEND:

1. TURBOCHARGER CROSSOVER CONNECTION
2. ATOMIZER
3. NYLON TUBE
4. SCREW WITH CAPTIVE WASHER
5. SCREW
6. WASHER (2)
7. NUT (2)
8. STE/ICE CONNECTOR BRACKET
9. WASHER (2)
10. SCREW (2)
11. CYLINDER CLAMP
12. WASHER
13. WIRE
14. NUT
15. WASHER (2)
16. LOCKWASHER (2)
17. SCREW (2)
18. PLUG (2)
19. SCREW
20. WASHER
21. ELBOW
22. VALVE AND BRACKET ASSEMBLY
23. CLAMP (2)
24. NUT
25. SUPPORT BRACKET
26. MOUNTING SPACER (2)
27. TUBE CLIP

TA 237077

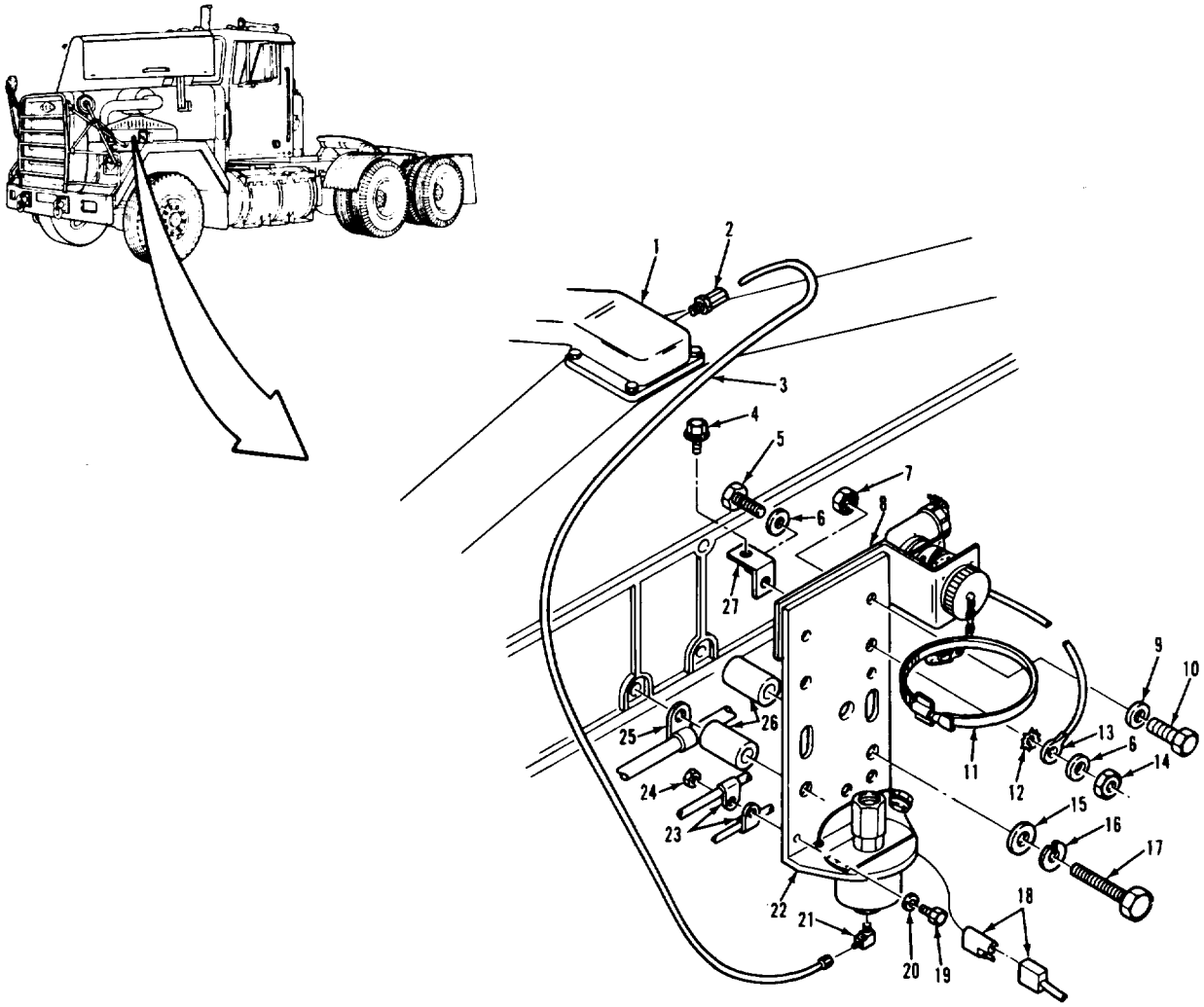
FUEL SYSTEM

3-40. ETHER QUICK START KIT REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
A.	REMOVAL.		
1.	Two plugs (18).	Disconnect.	
2.	Tube (3).	Remove from item (2) and item (21).	
3.	Atomizer (2).	Remove from item (1).	
4.	Two screws (10), washers (9), and nuts (7).	Remove from item (22) and item (8).	
5.	Screw (4).	Remove from item (27).	
6.	Two screws (17), lockwashers (16), washers (15), and spacers (26).	Remove from item (22) and item (25).	
7.	Screw (19), water (20), and nut (24).	Remove from item (22) and two items (23).	
8.	Screw (5), two washers (6), washer (12), wire (13), and nut (14).	Remove from item (22) and item (27).	
9.	Clamp (11).	Remove from item (22).	
10.	Elbow (21).	Remove from item (22).	
B.	CLEANING AND INSPECTION.		
11.	All parts.	a. Clean with solvent and rags.	Refer to paragraph 3-4.
		b. Inspect.	Refer to paragraph 3-5.

FUEL SYSTEM

3-40. ETHER QUICK START KIT REPLACEMENT (Continued).



LEGEND:

1. TURBOCHARGER CROSSOVER CONNECTION
2. ATOMIZER
3. NYLON TUBE
4. SCREW WITH CAPTIVE WASHER
5. SCREW
6. WASHER (2)
7. NUT (2)
8. STE/ICE CONNECTOR BRACKET
9. WASHER (2)
10. SCREW (2)
11. CYLINDER CLAMP
12. WASHER
13. WIRE
14. NUT
15. WASHER (2)
16. LOCKWASHER (2)
17. SCREW (2)
18. PLUG (2)
19. SCREW
20. WASHER
21. ELBOW
22. VALVE AND BRACKET ASSEMBLY
23. CLAMP (2)
24. NUT
25. SUPPORT BRACKET
26. MOUNTING SPACER (2)
27. TUBE CLIP

TA 237078

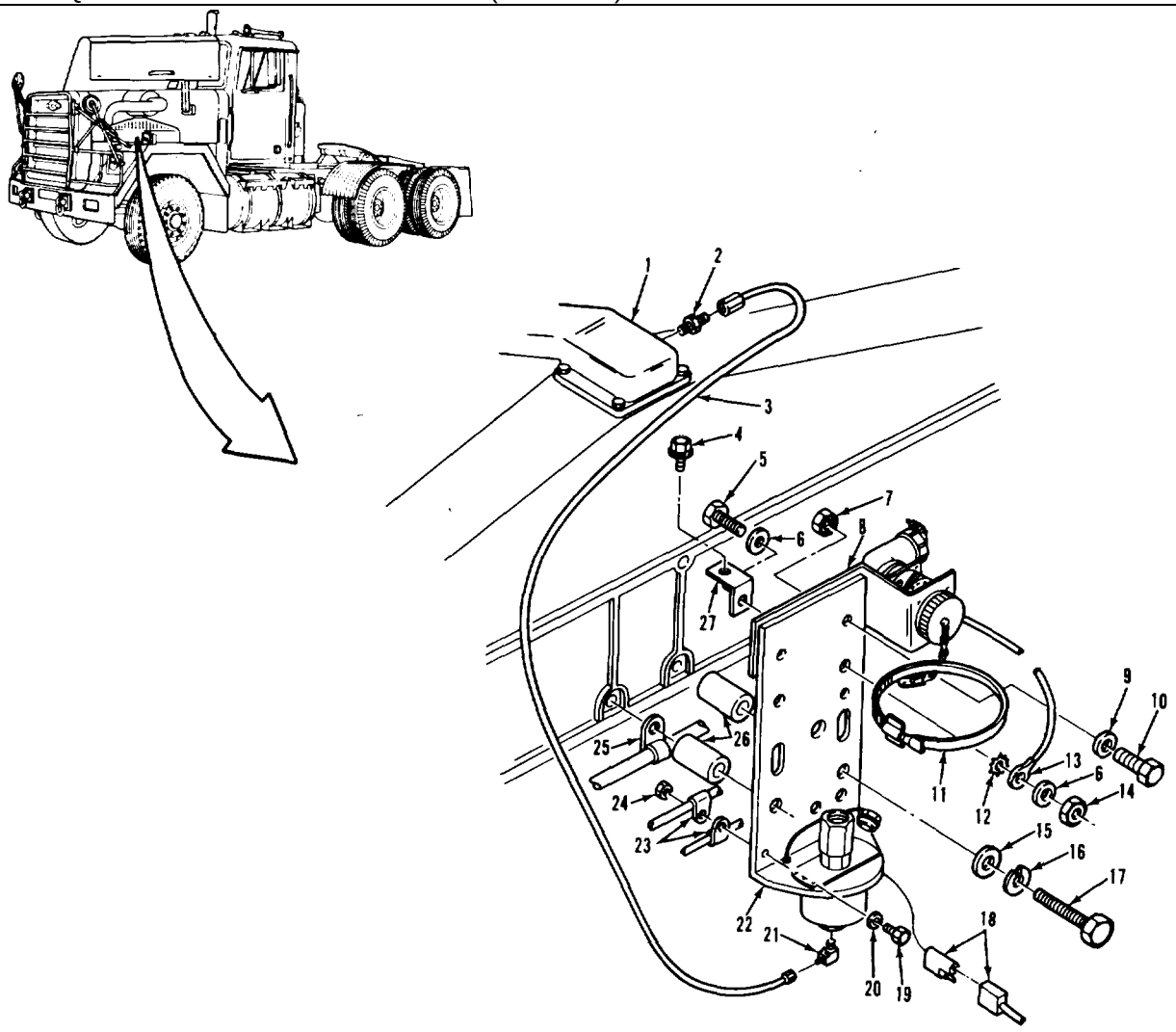
FUEL SYSTEM

3-40. ETHER QUICK START KIT REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION.		
12. Elbow (21).	Install in item (22).	a. Put thread sealing tape on threads
	b.	Point towards front of vehicle.
13. Screw (5), two washers (6), washer (12), wire (13), and nut (14).	Install in item (22) and item (27).	Do not tighten.
14. Screw (4).	Install in item (27) and engine.	
15. Screw (19), washer (20), and nut (24).	Install in item (22) and two items (23).	
16. Two screws (17), lockwashers (16), washers (15), and spacers (26).	Install in item (22) and item (25).	
17. Screw (5) and nut (14).	Tighten.	
18. Clamp (11).	Install in item (22).	
19. Two screws (10), washers (9), and and nuts (7).	Install in item (22) and item (8).	
20. Atomizer (2).	Install in item (1).	Put thread sealing tape
	on threads.	
21. Tube (3). item (21).	Install on item (2) and	

FUEL SYSTEM

3-40. ETHER QUICK START KIT REPLACEMENT (Continued).



LEGEND:

1. TURBOCHARGER CROSSOVER CONNECTION
2. ATOMIZER
3. NYLON TUBE
4. SCREW WITH CAPTIVE WASHER
5. SCREW
6. WASHER (2)
7. NUT (2)
8. STE/ICE CONNECTOR BRACKET
9. WASHER
1U. SCREW (Z)
11. CYLINDER CLAMP
12. WASHER
13. WIRE
14. NUT
15. WASHER (2)
16. LOCKWASHER (2)
17. SCREW (2)
18. PLUG (2)
19. SCREW
2O. WASHER
21. ELBOW
22. VALVE AND BRACKET ASSEMBLY
23. CLAMP (2)
24. NUT
25. SUPPORT BRACKET
26. MOUNTING SPACER (2)
27. TUBE CLIP

TA 237079

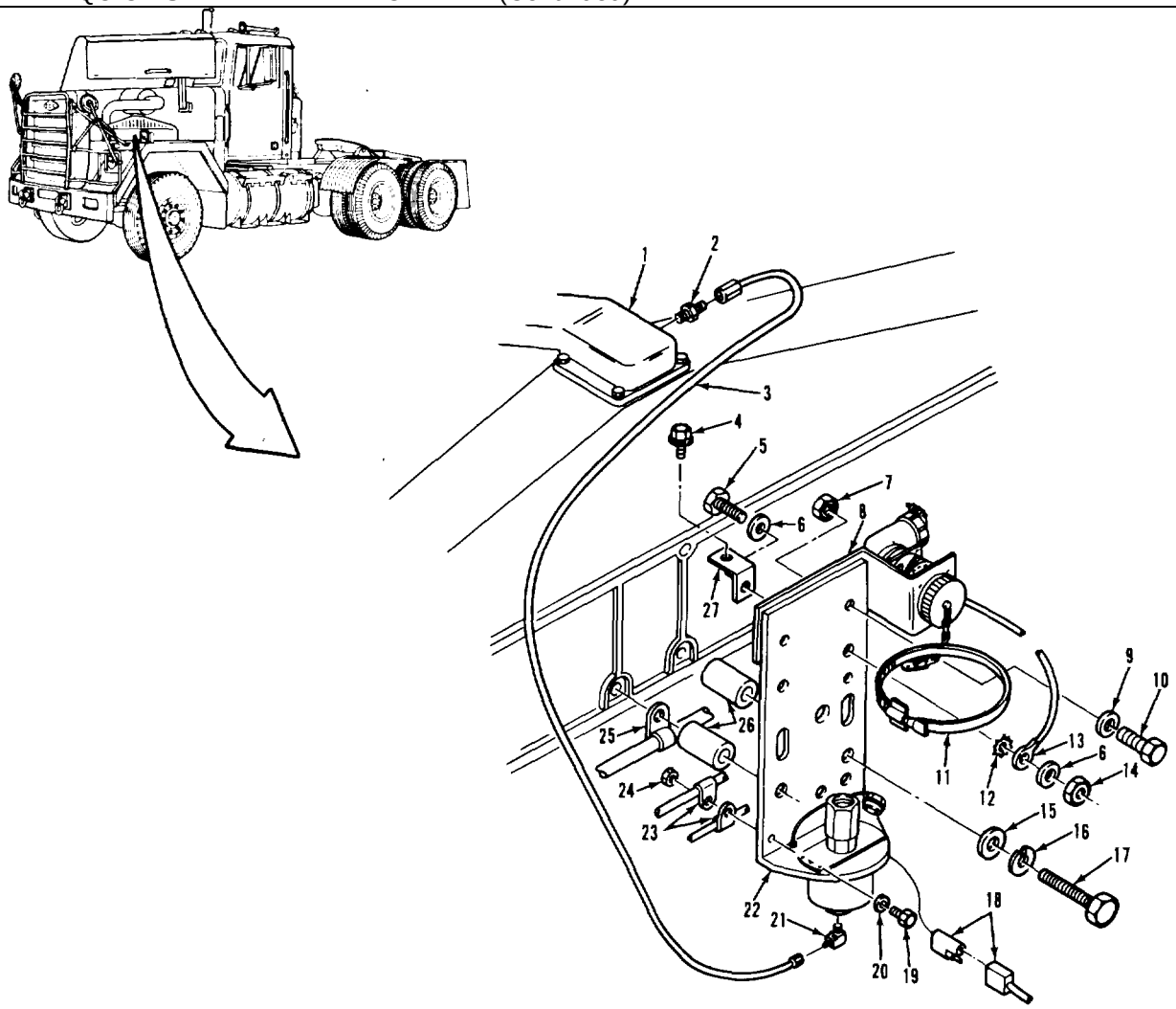
FUEL SYSTEM

3-40. ETHER QUICK START KIT REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
22. Two plugs (18).	Connect.	
	NOTE Follow-on maintenance action required: Install ether cylinder (para 3-38).	

FUEL SYSTEM

3-40. ETHER QUICK START KIT REPLACEMENT (Continued) .



LEGEND:

1. TURBOCHARGER CROSSOVER CONNECTION
2. ATOMIZER
3. NYLON TUBE
4. SCREW WITH CAPTIVE WASHER
5. SCREW
6. WASHER (2)
7. NUT (2)
8. STE/ICE CONNECTOR
9. WASHER (2)
10. SCREW (2)
11. CYLINDER CLAMP
12. WASHER
13. WIRE
14. NUT
15. WASHER (2)
16. LOCKWASHER (2)
17. SCREW (2)
18. PLUG (2)
19. SCREW
20. WASHER
21. ELBOW
22. VALVE AND BRACKET ASSEMBLY
23. CLAMP (2)
24. NUT
25. SUPPORT BRACKET
26. MOUNTING SPACER (2)
27. TUBE CLIP

TA 237080

FUEL SYSTEM

3-41. ACCELERATOR PEDAL AND LINKAGE REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	None.	None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Rags, wiping
Item 22, Appendix C.
Solvent, drycleaning, SD-2
Item 29, Appendix C.
Pin, cotter (2)
(24617) 103362.
Grease, automotive and artillery
Item 7, Appendix C.

PERSONNEL REQUIRED
Two (MOS-63Sj.

SPECIAL ENVIRONMENTAL CONDITIONS
None.

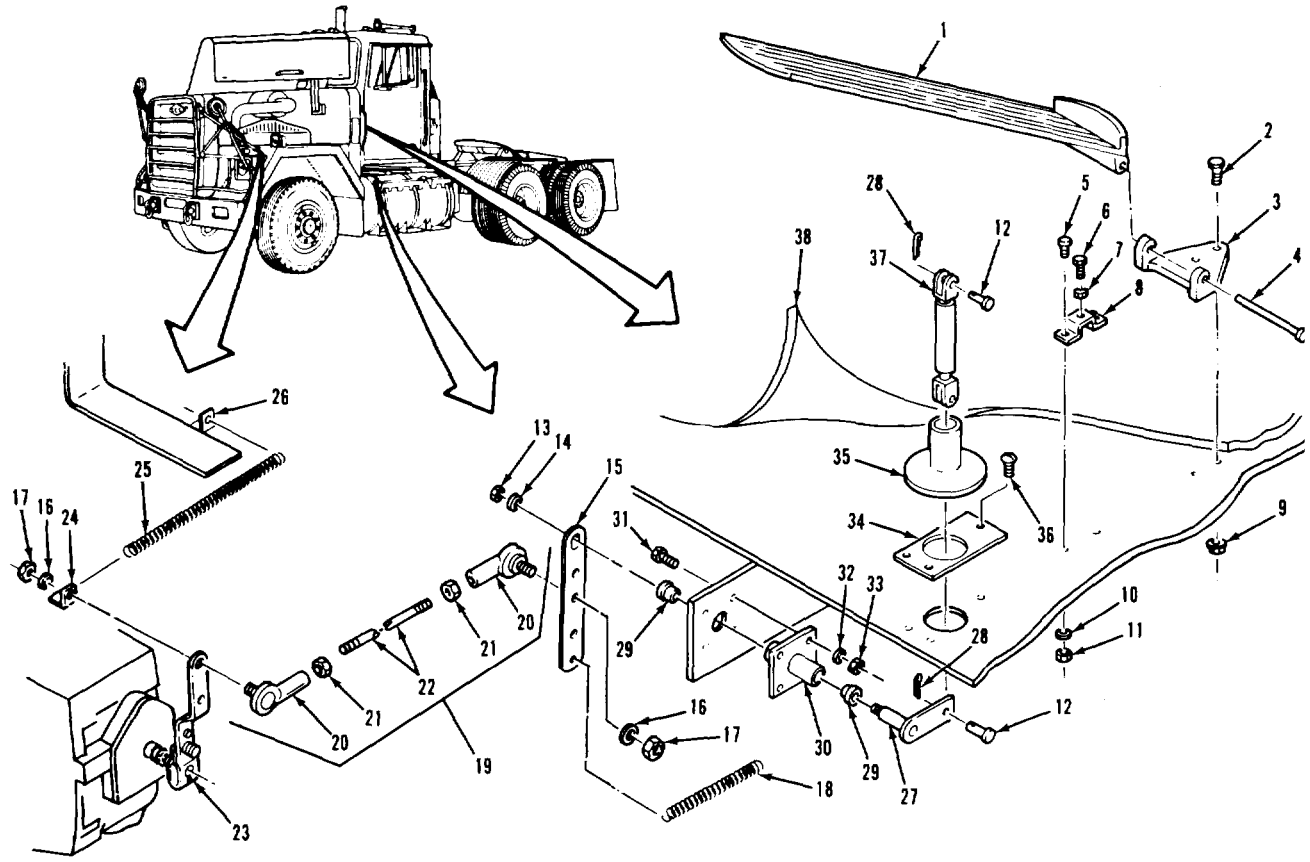
REFERENCES (TM)
TM 9-2320-283-20P.
Transmission in neutral.
Park brake set.

GENERAL SAFETY INSTRUCTIONS
Engine off.

TROUBLESHOOTING REFERENCES
None.

FUEL SYSTEM

3-41. ACCELERATOR PEDAL AND LINKAGE REPLACEMENT (Continued).



LEGEND:

1. ACCELERATOR PEDAL
2. OVAL HEAD SCREW (2)
3. PEDAL BRACKET
4. STRAIGHT PIN
5. PAN HEAD SCREW (2)
6. HEX HEAD SCREW
7. HEX NUT
8. PEDAL STOP BRACKET
9. NUT (2)
10. LOCKWASHER (2)
11. HEX NUT (2)
12. CLEVIS PIN (2)
13. PT NUT
14. WASHER
15. ACCELERATOR BELLCRANK LEVER
16. WASHER (2)
17. HEX NUT (2)
18. LEVER RETURN SPRING
19. ACCELERATOR LINK ASSEMBLY
20. BALL JOINT (2)
21. JAM NUT (2)
22. LINK
23. FUEL CONTROL LEVER
24. SPRING CLIP
25. ACCELERATOR RETURN SPRING
26. MODULATOR BRACKET ASSEMBLY
27. LEVER AND PIVOT ASSEMBLY
28. COTTER PIN (2)
29. FLANGED BEARING (2)
30. BELLCRANK BRACKET
31. SCREW (4)
32. PLAIN WASHER (4)
33. PT NUT (4)
34. SEAL RETAINER
35. ACCELERATOR SEAL
36. SELF-TAPPING SCREW (3)
37. ROD ASSEMBLY
38. FLOOR MAT

TA 237081

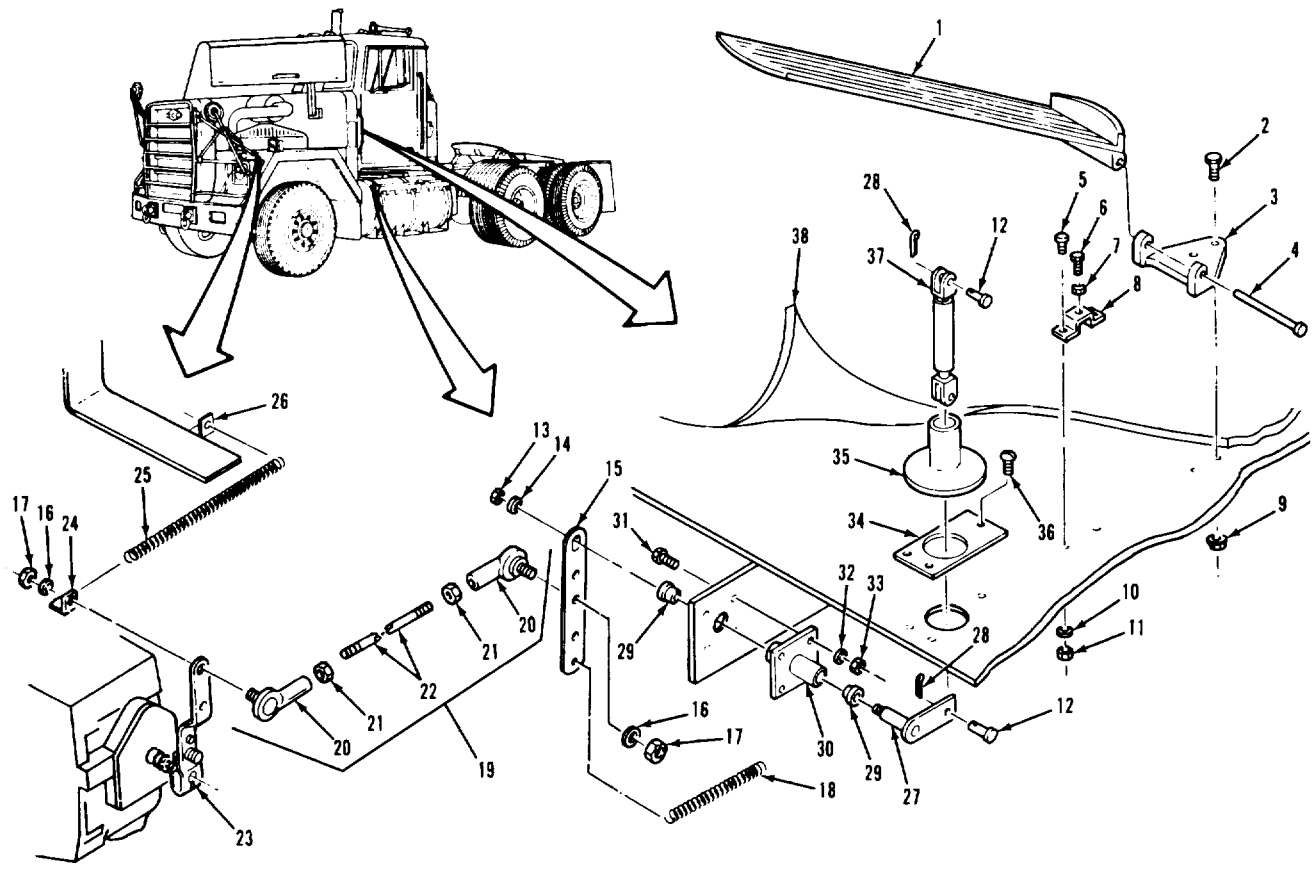
FUEL SYSTEM

3-41. ACCELERATOR PEDAL AND LINKAGE REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
A.	REMOVAL.		
1.	Pin (28) inside cab.	Remove from item (12)	Discard item (28).
2.	Pin (12)	Remove from item (37) and item (1).	
3.	Pin (4)	Drive from item (3) and item (1).	
4.	Pedal (1)	Remove.	
5.	Mat (38)	Pull back, out of way.	
6.	Two screws (2) and nuts (9).	Remove from item (3).	
7.	Bracket (3)	Remove.	
8.	Two screws (5), lockwashers (10), and nuts (11).	Remove from item (8).	
9.	Bracket (8)	Remove.	
10.	Screw (6) and nut (7).	Remove from item (8).	
11.	Three screws (36)	Remove from item (34).	
12.	Retainer (34) and seal (35).	Remove.	
13.	Pin (28)	Remove from item (12)	Discard item (28).
14.	Pin (12)	Remove from item (37) and item (27).	
15.	Rod (37)	Remove.	

FUEL SYSTEM

3-41. ACCELERATOR PEDAL AND LINKAGE REPLACEMENT (Continued).



LEGEND:

1. ACCELERATOR PEDAL
2. OVAL HEAD SCREW (2)
3. PEDAL BRACKET
4. STRAIGHT PIN
5. PAN HEAD SCREW (2)
6. HEX HEAD SCREW
7. HEX NUT
8. PEDAL STOP BRACKET
9. NUT (2)
10. LOCKWASHER (2)
11. HEX NUT (2)
12. CLEVIS PIN (2)
13. PT NUT
14. WASHER
15. ACCELERATOR BELLCRANK LEVER
16. WASHER (2)
17. HEX NUT (2)
18. LEVER RETURN SPRING
19. ACCELERATOR LINK ASSEMBLY
20. BALL JOINT (2)
21. JAM NUT (2)
22. LINK
23. FUEL CONTROL LEVER
24. SPRING CLIP
25. ACCELERATOR RETURN SPRING
26. MODULATOR BRACKET ASSEMBLY
27. LEVER AND PIVOT ASSEMBLY
28. COTTER PIN (2)
29. FLANGED BEARING (2)
30. BELLCRANK BRACKET
31. SCREW (4)
32. PLAIN WASHER (4)
33. PT NUT (4)
34. SEAL RETAINER
35. ACCELERATOR SEAL
36. SELF-TAPPING SCREW (3)
37. ROD ASSEMBLY
38. FLOOR MAT237082

TA 237082

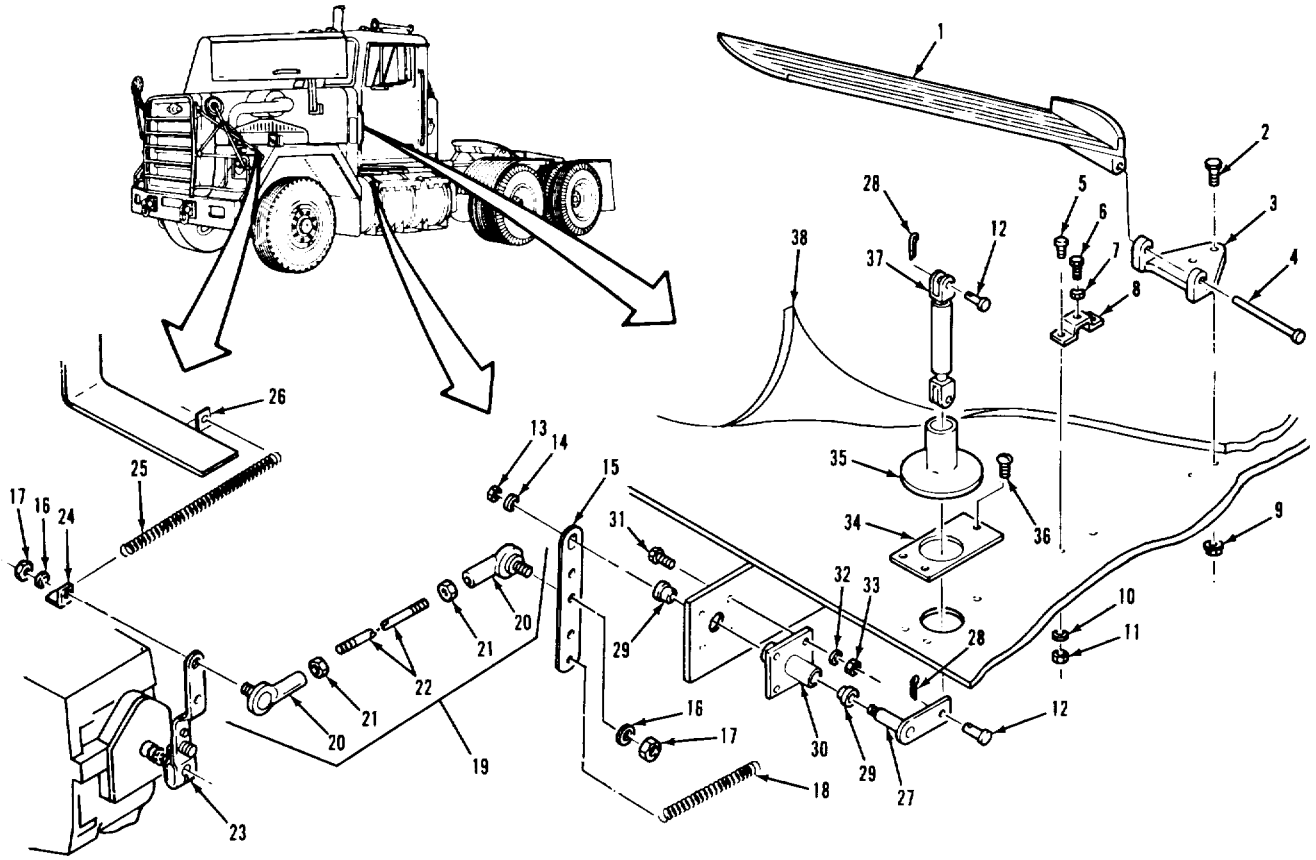
FUEL SYSTEM

3-41. ACCELERATOR PEDAL AND LINKAGE REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
A.	REMOVAL (Continued).		
16.	Spring (18).	Unhook and remove from item (15) and bottom of cab.	
17.	Nut (13), washer (14), and lever (15).	Remove from item (27).	
18.	Lever and pivot assembly (27) and two bearings (29).	Remove from item (30).	
19.	Spring (25).	Unhook and remove from item (24) and item (26).	
20.	Nut (17), washer (16), and clip (24).	Remove from item (23).	
21.	Link assembly (19) and lever (15).	Remove.	
22.	Nut (17), washer (16), and lever (15).	Remove from item (20).	
23.	Two nuts (21).	Loosen from two items (20).	
24.	(20) and nuts (21).	Two ball joints	Remove from item (22).
25.	Four screws (31), washers (32), and nuts (33).	Remove from item (30). mechanic.	Assistant helps
26.	Bracket (30).	Remove.	

FUEL SYSTEM

3-41. ACCELERATOR PEDAL AND LINKAGE REPLACEMENT (Continued).



LEGEND:

1. ACCELERATOR PEDAL
2. OVAL HEAD SCREW (2)
3. PEDAL BRACKET
4. STRAIGHT PIN
5. PAN HEAD SCREW (2)
6. HEX HEAD SCREW
7. HEX NUT
8. PEDAL STOP BRACKET
9. NUT (2)
10. LOCKWASHER (2)
11. HEX NUT (2)
12. CLEVIS PIN (2)
13. PT NUT
14. WASHER
15. ACCELERATOR BELLCRANK LEVER
16. WASHER (2)
17. HEX NUT (2)
18. LEVER RETURN SPRING
19. ACCELERATOR LINK ASSEMBLY
20. BALL JOINT (2)
21. JAM NUT (2)
22. LINK
23. FUEL CONTROL LEVER
24. SPRING CLIP
25. ACCELERATOR RETURN SPRING
26. MODULATOR BRACKET ASSEMBLY
27. LEVER AND PIVOT ASSEMBLY
28. COTTER PIN (2)
29. FLANGED BEARING (2)
30. BELLCRANK BRACKET
31. SCREW (4)
32. PLAIN WASHER (4)
33. PT NUT (4)
34. SEAL RETAINER
35. ACCELERATOR SEAL
36. SELF-TAPPING SCREW (3)
37. ROD ASSEMBLY
38. FLOOR MAT

TA 237083

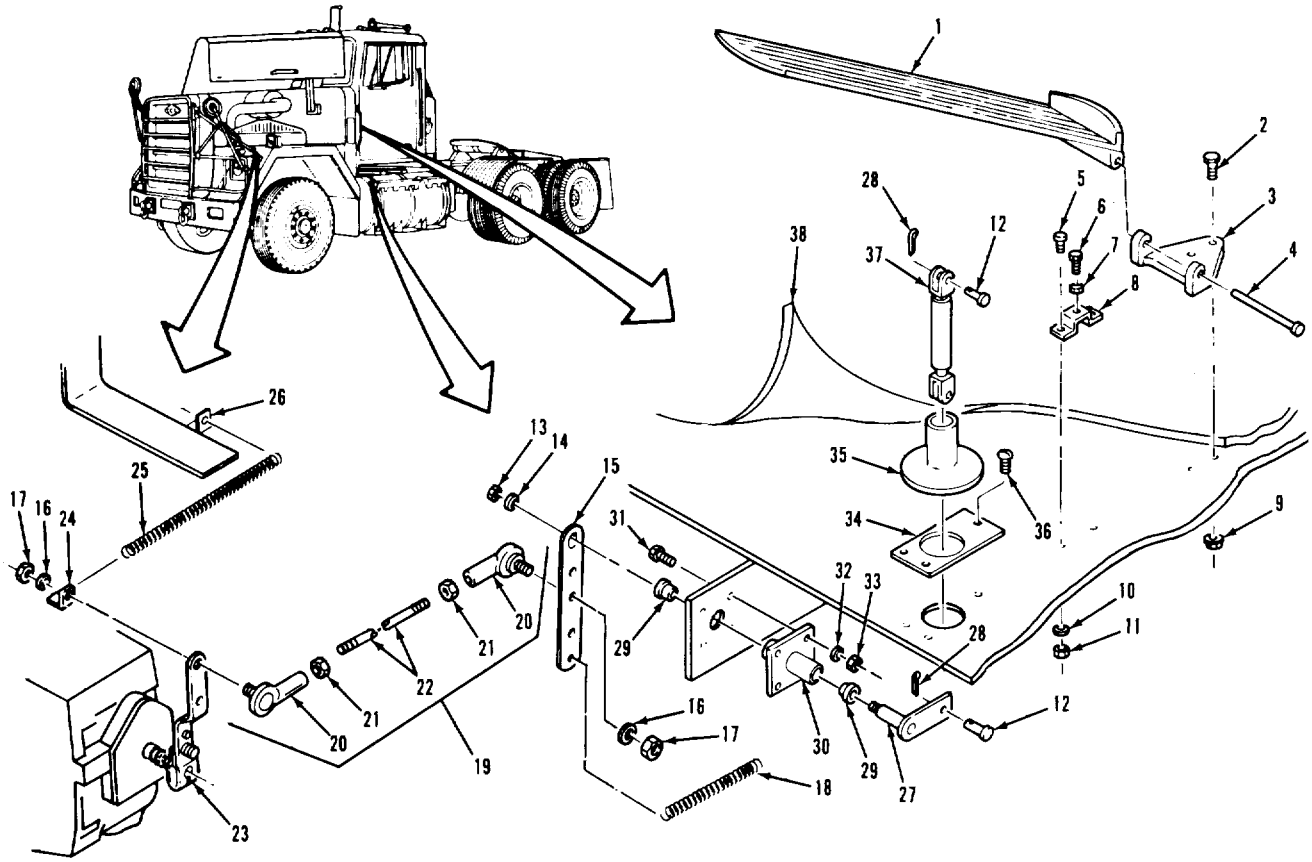
FUEL SYSTEM

3-41. ACCELERATOR PEDAL AND LINKAGE REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
B.	CLEANING AND INSPECTION.		
27.	All parts except seal (35).	Clean with solvent and rags	Refer to paragraph 3-4.
28.	Seal (35)	Wipe clean with damp rag.	
29.	All parts	Inspect	Refer to paragraph 3-5.
C.	INSTALLATION.		
30.	Bracket (30)	Put in place under cab.	
31.	Four screws (31), washers (32), and nuts (33).	Secure item (30) mechanic.	Assistant helps
32.	Nut (21) and ball joint (20)	a. Screw on item (22) as far as possible. b. Secure item (20) with item (21).	
33.	Lever (15)	Put on item (20).	
34.	Nut (17) and washer (16)	Secure item (15) to item (20).	
35.	Lever and pivot assembly (27) and two bearings (29).	Put in item (30) (23).	Put grease on two items
36.	Lever (15)	Put on item (27).	
37.	Washer (14) and nut (13)	Secure item (15) to item (27).	
38.	Rod (37) and pin (12).	Install in item (27).	
39.	New pin (28)	Install in item (12).	

FUEL SYSTEM.

3-41. ACCELERATOR PEDAL AND LINKAGE REPLACEMENT (Continued).



LEGEND:

1. ACCELERATOR PEDAL
2. OVAL HEAD SCREW (2)
3. PEDAL BRACKET
4. STRAIGHT PIN
5. PAN HEAD SCREW (2)
6. HEX HEAD SCREW
7. HEX NUT
8. PEDAL STOP BRACKET
9. NUT (2)
10. LOCKWASHER (2)
11. HEX NUT (2)
12. CLEVIS PIN (2)
13. PT NUT
14. WASHER
15. ACCELERATOR BELLCRANK LEVER
16. WASHER (2)
17. HEX NUT (2)
18. LEVER RETURN SPRING
19. ACCELERATOR LINK ASSEMBLY
20. BALL JOINT (2)
21. JAM NUT (2)
22. LINK
23. FUEL CONTROL LEVER
24. SPRING CLIP
25. ACCELERATOR RETURN SPRING
26. MODULATOR BRACKET ASSEMBLY
27. LEVER AND PIVOT ASSEMBLY
28. COTTER PIN (2)
29. FLANGED BEARING (2)
30. BELLCRANK BRACKET
31. SCREW (4)
32. PLAIN WASHER (4)
33. PT NUT (4)
34. SEAL RETAINER
35. ACCELERATOR SEAL
36. SELF-TAPPING SCREW (3)
37. ROD ASSEMBLY
38. FLOOR MAT

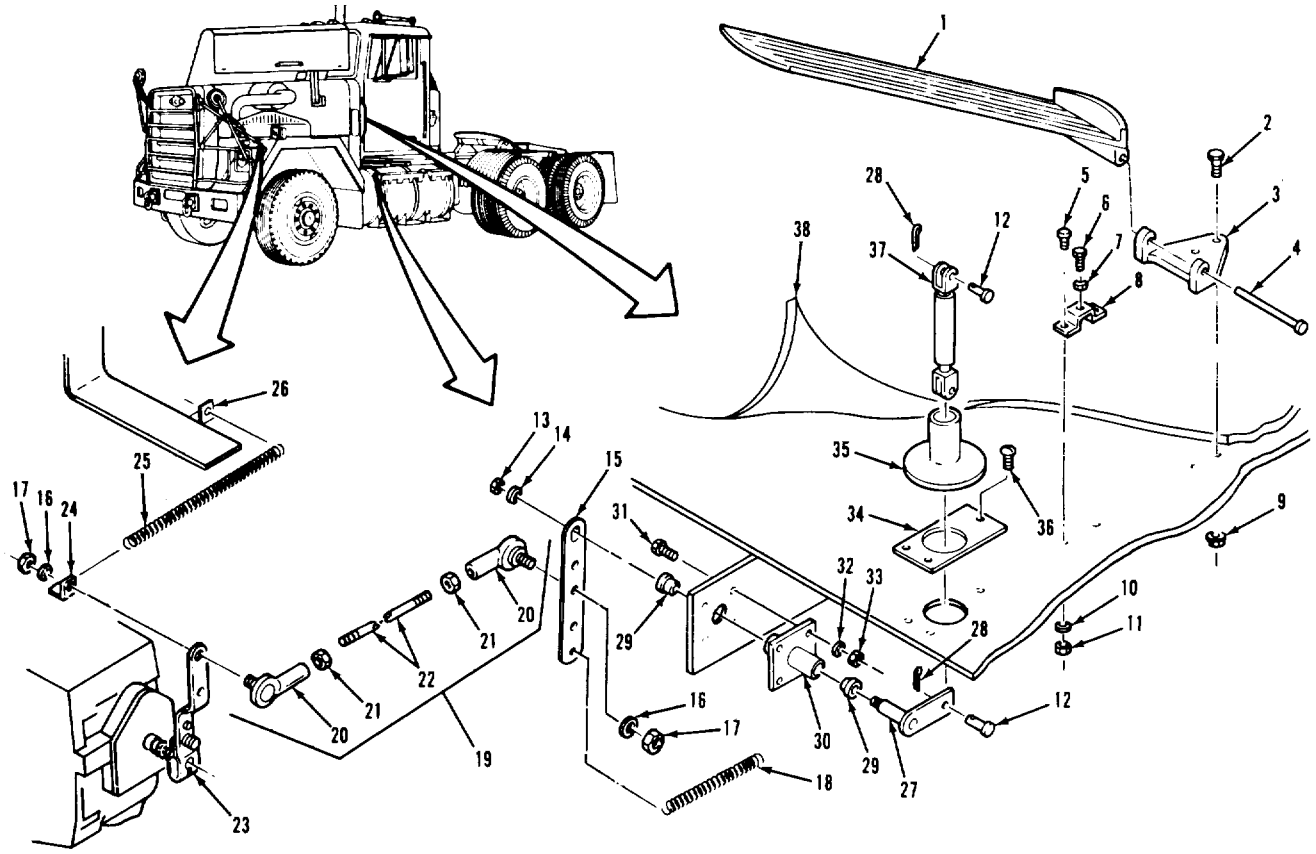
TA 237084

3-41. ACCELERATOR PEDAL AND LINKAGE REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
40. Spring (18).	Hook to item (15) and to bottom of cab.	
41. Seal (35) and retainer (34).	Slide over item (37).	
42. Three screws (36).	Secure item (34) and item (35) to cab floor.	
43. Screw (6) and nut (7).	Screw in bracket (8) as far as it will go.	Do not tighten item (7).
44. Two screws (5), washers (10), and nuts (11).	Secure item (8) to cab floor.	
45. Two screws (2) and nuts (9).	Secure item (3) to cab floor.	
46. Mat (38).	Put back in place.	
47. Pedal (1).	Put in bracket (3).	
48. Pin (4).	Drive in item (3) and item (1).	
49. Pin (12).	Put in item (37) and item (1).	
50. New pin (28).	Install in item (12).	
51. Lever (23).	Push toward rear of vehicle as far as it will go.	
52. Nut (21) and ball joint (20).	Screw on item (22) until alined with hole in item (23).	Do not pull on item (22).
53. Nut (17), washer (16), and clip (24).	Secure item (20) to item (23).	

FUEL SYSTEM.

3-41. ACCELERATOR PEDAL AND LINKAGE REPLACEMENT (Continued).



LEGEND:

1. ACCELERATOR PEDAL
2. OVAL HEAD SCREW (2)
3. PEDAL BRACKET
4. STRAIGHT PIN
5. PAN HEAD SCREW (2)
6. HEX HEAD SCREW
7. HEX NUT
8. PEDAL STOP BRACKET
9. NUT (2)
10. LOCKWASHER (2)
11. HEX NUT (2)
12. CLEVIS PIN (2)
13. PT NUT
14. WASHER
15. ACCELERATOR BELLCRANK LEVER
16. WASHER (2)
17. HEX NUT (2)
18. LEVER RETURN SPRING
19. ACCELERATOR LINK ASSEMBLY
20. BALL JOINT (2)
21. JAM NUT (2)
22. LINK
23. FUEL CONTROL LEVER
24. SPRING CLIP
25. ACCELERATOR RETURN SPRING
26. MODULATOR BRACKET ASSEMBLY
27. LEVER AND PIVOT ASSEMBLY
28. COTTER PIN (2)
29. FLANGED BEARING (2)
30. BELLCRANK BRACKET
31. SCREW (4)
32. PLAIN WASHER (4)
33. PT NUT (4)
34. SEAL RETAINER
35. ACCELERATOR SEAL
36. SELF-TAPPING SCREW (3)
37. ROD ASSEMBLY
38. FLOOR MAT

TA 237085

FUEL SYSTEM.

3-41. ACCELERATOR PEDAL AND LINKAGE REPLACEMENT (Continued).

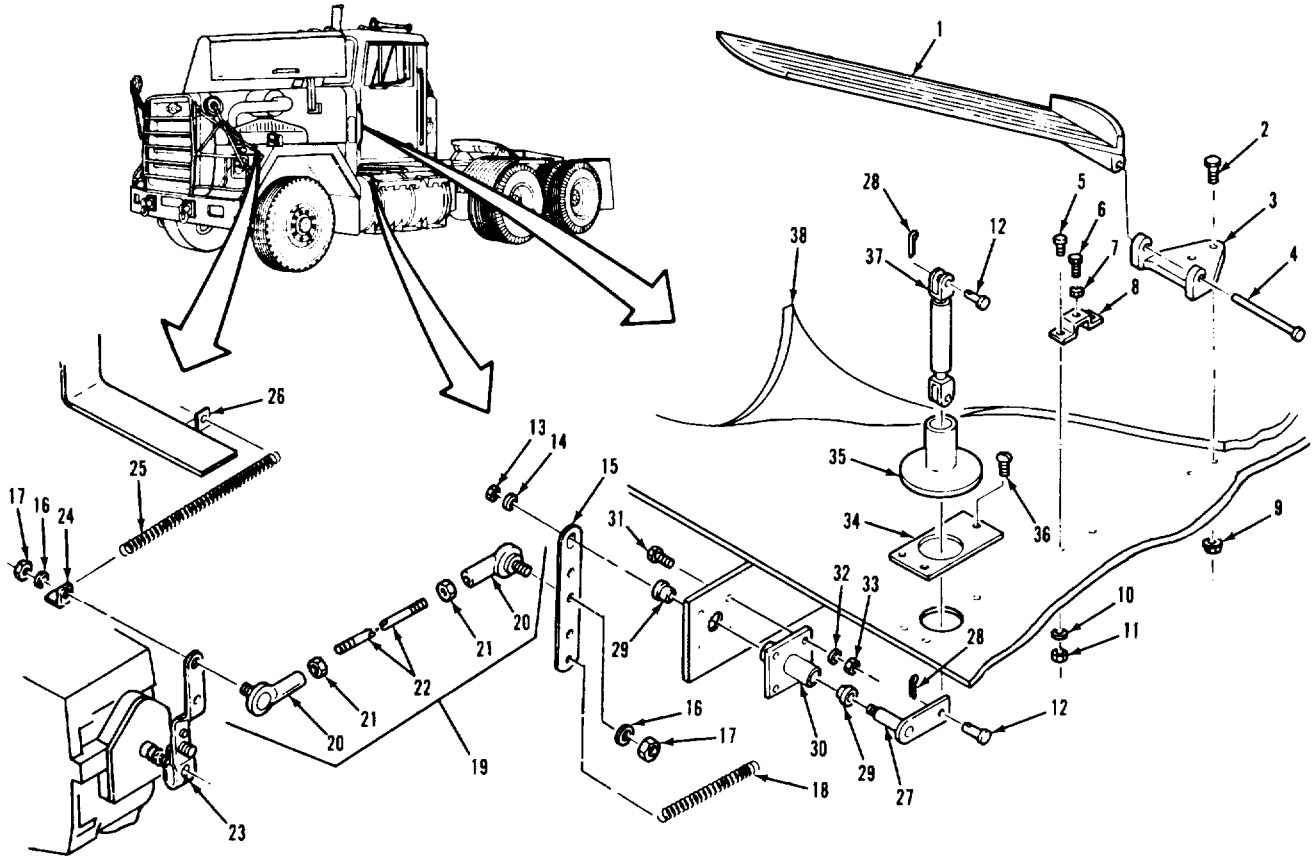
LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
54. Nut (21).	Tight against item (20).	
55. Spring (25).	Hook to item (24) and item (26).	
56. Lever (23).	Push toward front of vehicle as far as it will go without bending.	Hold in this position while assistant does step 57.
57. Screw (6).	Unscrew until it is against item (1).	
58. Nut (7).	Secure against item (8).	

NOTE

Follow-on maintenance action required:
None.

FUEL SYSTEM.

3-41. ACCELERATOR PEDAL AND LINKAGE REPLACEMENT (Continued).



LEGEND:

1. ACCELERATOR PEDAL
2. OVAL HEAD SCREW (2)
3. PEDAL BRACKET
4. STRAIGHT PIN
5. PAN HEAD SCREW (2)
6. HEX HEAD SCREW
7. HEX NUT
8. PEDAL STOP BRACKET
9. NUT (2)
10. LOCKWASHER (2)
11. HEX NUT (2)
12. CLEVIS PIN (2)
13. PT NUT
14. WASHER
15. ACCELERATOR BELLCRANK LEVER
16. WASHER (2)
17. HEX NUT (2)
18. LEVER RETURN SPRING
19. ACCELERATOR LINK ASSEMBLY
20. BALL JOINT (2)
21. JAM NUT (2)
22. LINK
23. FUEL CONTROL LEVER
24. SPRING CLIP
25. ACCELERATOR RETURN SPRING
26. MODULATOR BRACKET ASSEMBLY
27. LEVER AND PIVOT ASSEMBLY
28. COTTER PIN (2)
29. FLANGED BEARING (2)
30. BELLCRANK BRACKET
31. SCREW (4)
32. PLAIN WASHER (4)
33. PT NUT (4)
34. SEAL RETAINER
35. ACCELERATOR SEAL
36. SELF-TAPPING SCREW (3)
37. ROD ASSEMBLY
38. FLOOR MAT

TA 237086

FUEL SYSTEM.

3-42. FUEL CONTROL LEVER REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
None.

CONDITION DESCRIPTION
None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Rags, wiping
Item 22, Appendix C.
Solvent, drycleaning, SD-2
Item 29, Appendix C.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

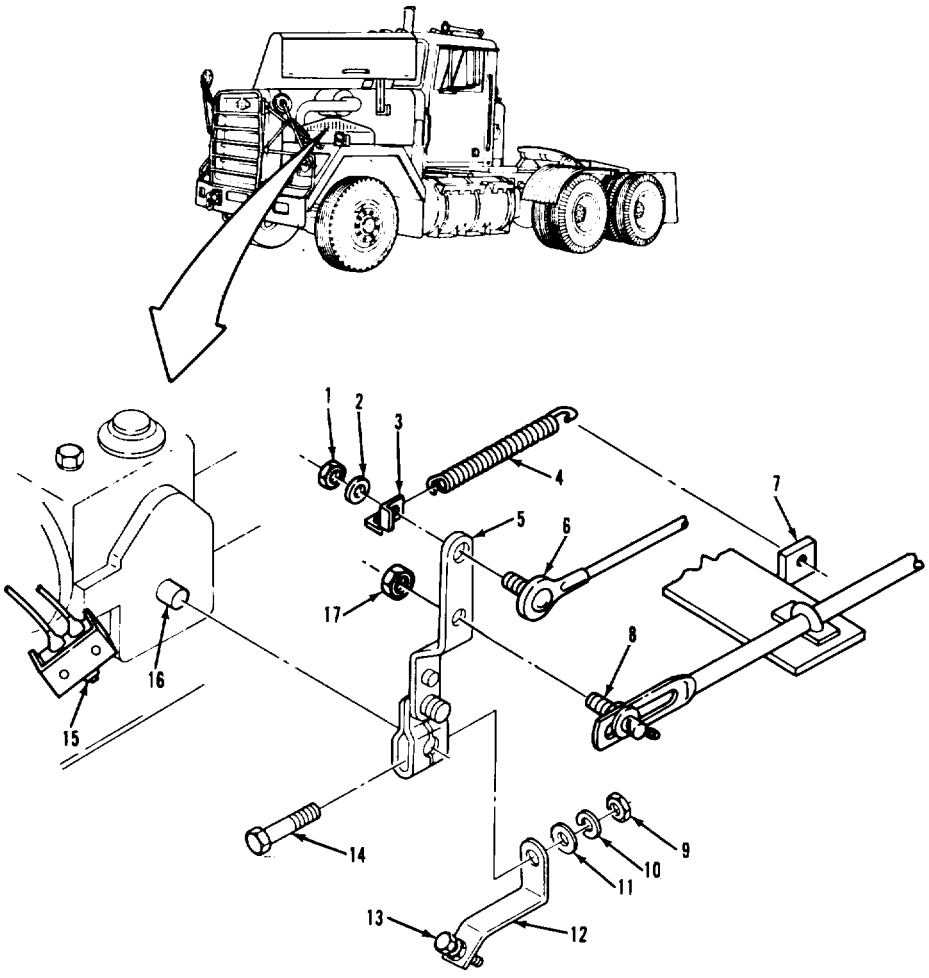
REFERENCES (TM)
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

FUEL SYSTEM.

3-42. FUEL CONTROL LEVER REPLACEMENT (Continued).



LEGEND:

1. HEX NUT
2. LOCKWASHER
3. SPRING CLIP
4. ACCELERATOR RETURN SPRING
5. FUEL CONTROL LEVER
6. ACCELERATOR LINK ASSEMBLY
7. MODULATOR BRACKET ASSEMBLY
8. LINK PIN
9. JAM NUT
10. LOCKWASHER
11. PLAIN WASHER
12. LIMIT SWITCH PIVOT LEVER
13. SCREW
14. SCREW
15. SWITCH
16. THROTTLE SHAFT
17. LOCKNUT

TA 237087

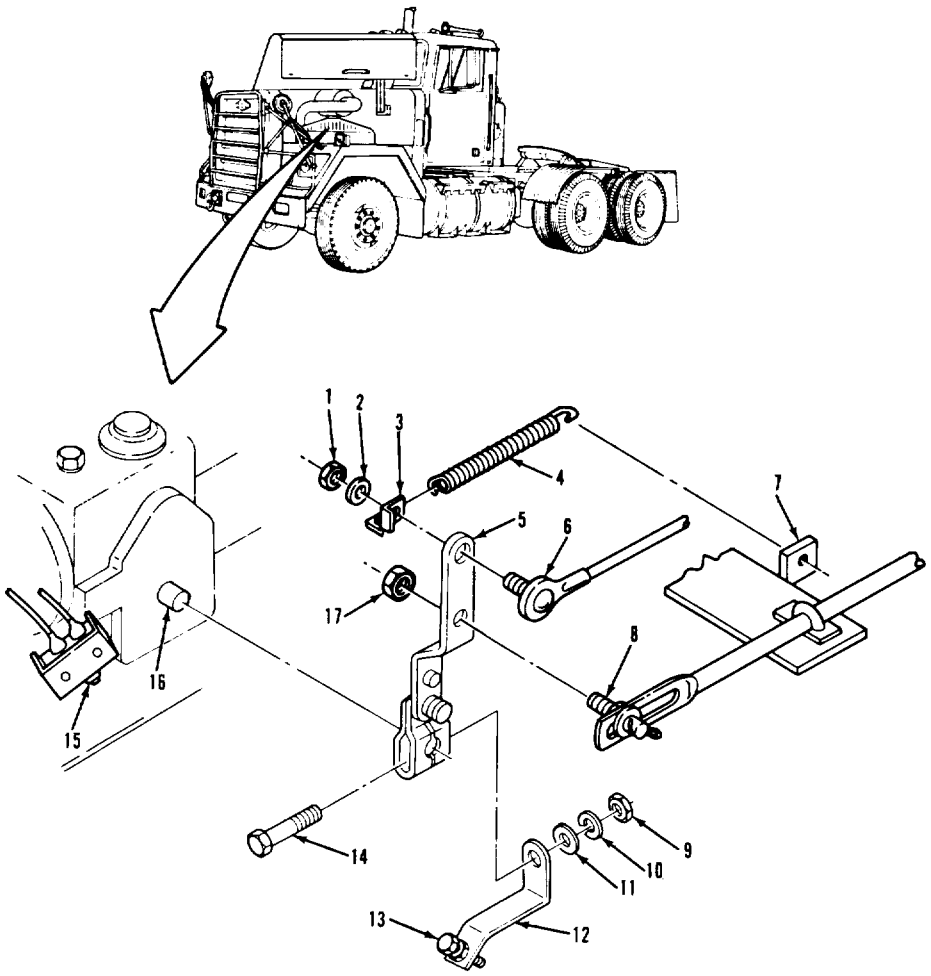
FUEL SYSTEM.

3-42. FUEL CONTROL LEVER REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Spring (4). item (7).	Unhook from item (3) and	
2. Nut (1), lock-washer (2), and clip (3).	Remove from item (6).	
3. Link assembly (6).	Remove from item (5).	
4. Nut (17).	Remove from item (8).	
5. Pin (8).	Remove from item (5).	
6. Nut (9), lock-washer (10), washer (11), lever (12), and and screw (14).	Remove from item (5).	
7. Lever (5).	Remove from item (16).	
B. CLEANING AND INSPECTION.		
8. All parts.	a. Clean with solvent and rags.	Refer to paragraph 3-4.
	b. Inspect.	Refer to paragraph 3-5.
C. INSTALLATION.		
9. Shaft (16).	Turn clockwise as far as it will go.	
10. Lever (5).	Put on item (16) so item (6) will go in hole.	Do not pull on item (6).

FUEL SYSTEM.

3-42. FUEL CONTROL LEVER REPLACEMENT (Continued).



LEGEND:

1. HEX NUT
2. LOCKWASHER
3. SPRING CLIP
4. ACCELERATOR RETURN SPRING
5. FUEL CONTROL LEVER
6. ACCELERATOR LINK ASSEMBLY
7. MODULATOR BRACKET ASSEMBLY
8. LINK PIN
9. JAM NUT
10. LOCKWASHER
11. PLAIN WASHER
12. LIMIT SWITCH PIVOT LEVER
13. SCREW
14. SCREW
15. SWITCH
16. THROTTLE SHAFT
17. LOCKNUT

TA 237088

FUEL SYSTEM.

3-42. FUEL CONTROL LEVER REPLACEMENT (Continued).

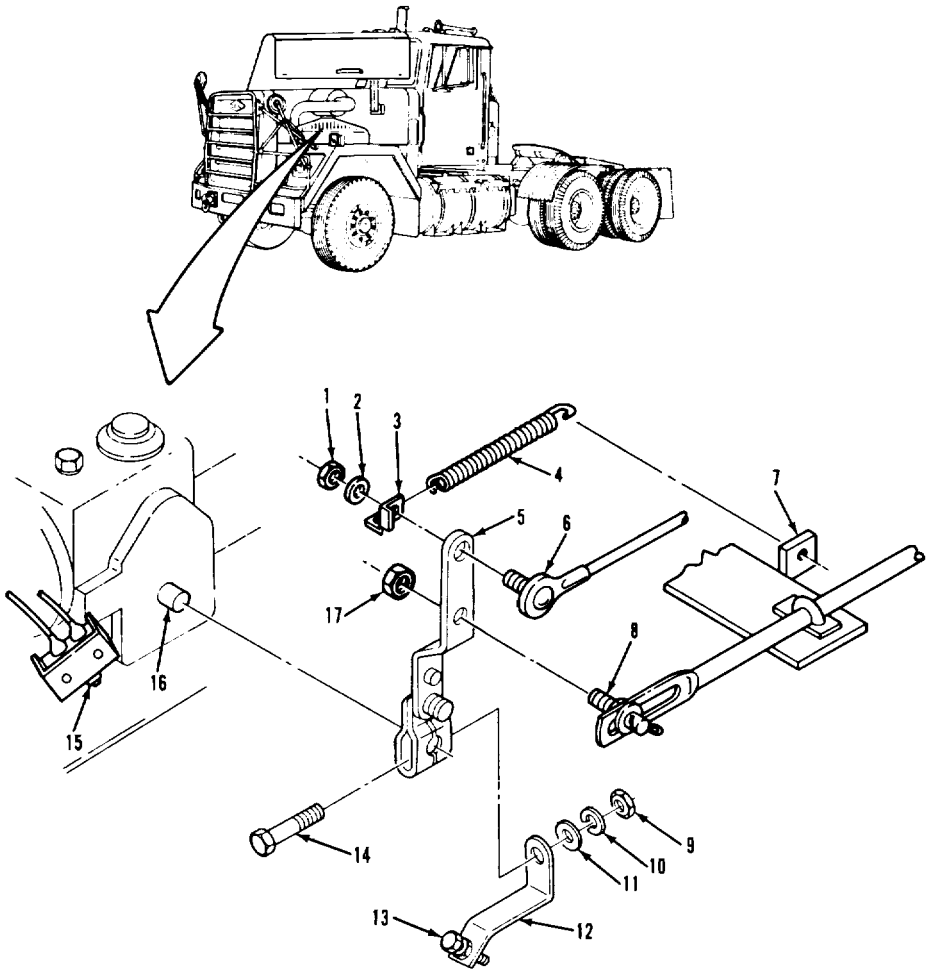
LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
11. Screw (14), lever (12), washer (11), lockwasher (10), and nut (9).	Secure item (5) to item (16).	When item (16) is turned clockwise as far as it will go, item (13) should just depress item (15) until it "clicks". Turn item (13) as needed.
12. Pin (8).	Put in item (5).	
13. Nut (17).	Secure item (8) to item (5).	
14. Link assembly (6).	Put in item (5).	
15. Clip (3), lock-washer (2), and nut (1).	Secure item (6) to item (5).	
16. Spring (4).	Hook to item (3) and item (7).	

NOTE

Follow-on maintenance action required:
None.

FUEL SYSTEM.

3-42. FUEL CONTROL LEVER REPLACEMENT (Continued).



LEGEND:

1. HEX NUT
2. LOCKWASHER
3. SPRING CLIP
4. ACCELERATOR RETURN SPRING
5. FUEL CONTROL LEVER
6. ACCELERATOR LINK ASSEMBLY
7. MODULATOR BRACKET ASSEMBLY
8. LINK PIN
9. JAM NUT
10. LOCKWASHER
11. PLAIN WASHER
12. LIMIT SWITCH PIVOT LEVER
13. SCREW
14. SCREW
15. SWITCH
16. THROTTLE SHAFT
17. LOCKNU

TA 237089

SECTION IV. EXHAUST SYSTEM

3-43. GENERAL.

This section provides procedures authorized at the organizational maintenance level to replace exhaust system components. To find a specific procedure contained in this section, see the task summary below.

3-44. TASK SUMMARY.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION

PARAGRAPH	CONDITION DESCRIPTION
(Refer to specific paragraph for this information).	

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Rags, wiping
Item 22, Appendix C.
Solvent, drycleaning, SD-2
Item 29, Appendix C.
Coupling, reducer
(34623) 5932836.
Coupling (3)
(34623) 5932837.

PERSONNEL REQUIRED
Two (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

REFERENCES (TM)
TM 9-2320-283-20P.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.
Wait until exhaust components are cool.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

EXHAUST SYSTEM.

3-44. TASK SUMMARY (Continued).

LIST OF TASKS

TASK NO.	TASK	TASK REF	TROUBLESHOOTING REF NO. (PARA)
1	Muffler and Heat Shield Replacement	3-45	2-11
	a. Removal.	3-45a	
	b. Cleaning and Inspection.	3-45b	
	c. Installation.	3-45c	
2	Exhaust Stack Pipe Replacement	3-46	2-11
	a. Removal.	3-46a	
	b. Cleaning and Inspection.	3-46b	
	c. Installation.	3-46c	
3	Exhaust Flex Pipe Replacement	3-47	2-11
	a. Removal.	3-47a	
	b. Cleaning and Inspection.	3-47b	
	c. Installation.	3-47c	
4	Turbocharger Outlet Pipe Replacement	3-48	2-11
	a. Removal.	3-48a	
	b. Cleaning and Inspection.	3-48b	
	c. Installation.	3-48c	
5	Muffler Inlet Pipe Replacement	3-49	2-11
	a. Removal.	3-49a	
	b. Cleaning and Inspection.	3-49b	
	c. Installation.	3-49c	

EXHAUST SYSTEM.

3-45. MUFFLER AND HEAT SHIELD REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
3-46.

CONDITION DESCRIPTION
Exhaust stack pipe removed.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Coupling, reducer
(34623) 5932836.

PERSONNEL REQUIRED
Two (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

REFERENCES (TM)
TM 9-2320-283-20P.

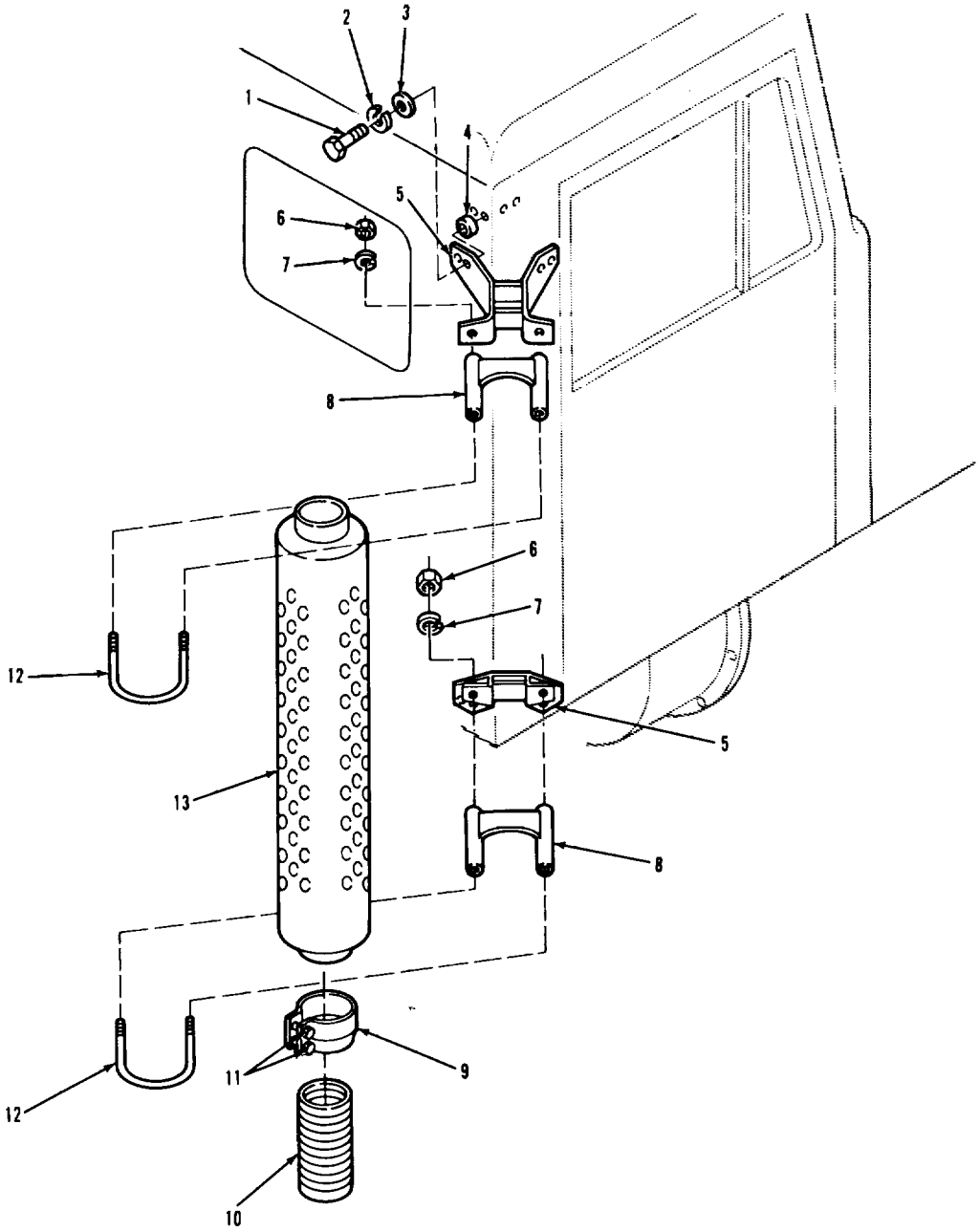
GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

Wait until exhaust components are cool.

EXHAUST SYSTEM.

3-45. MUFFLER AND HEAT SHIELD REPLACEMENT (Continued).



LEGEND:

1. HEX HEAD SCREW (8)
2. LOCKWASHER (8)
3. WASHER (8)
4. INSULATOR (8)
5. MUFFLER MOUNTING BRACKET ASSEMBLY (2)
6. NUT (4)
7. LOCKWASHER (4)
8. CLAMP (2)
9. REDUCER COUPLING
10. EXHAUST FLEX PIPE
11. COUPLING SCREW (2)
12. U-BOLT (2)
13. MUFFLER AND HEAT SHIELD ASSEMBLY

TA 237090

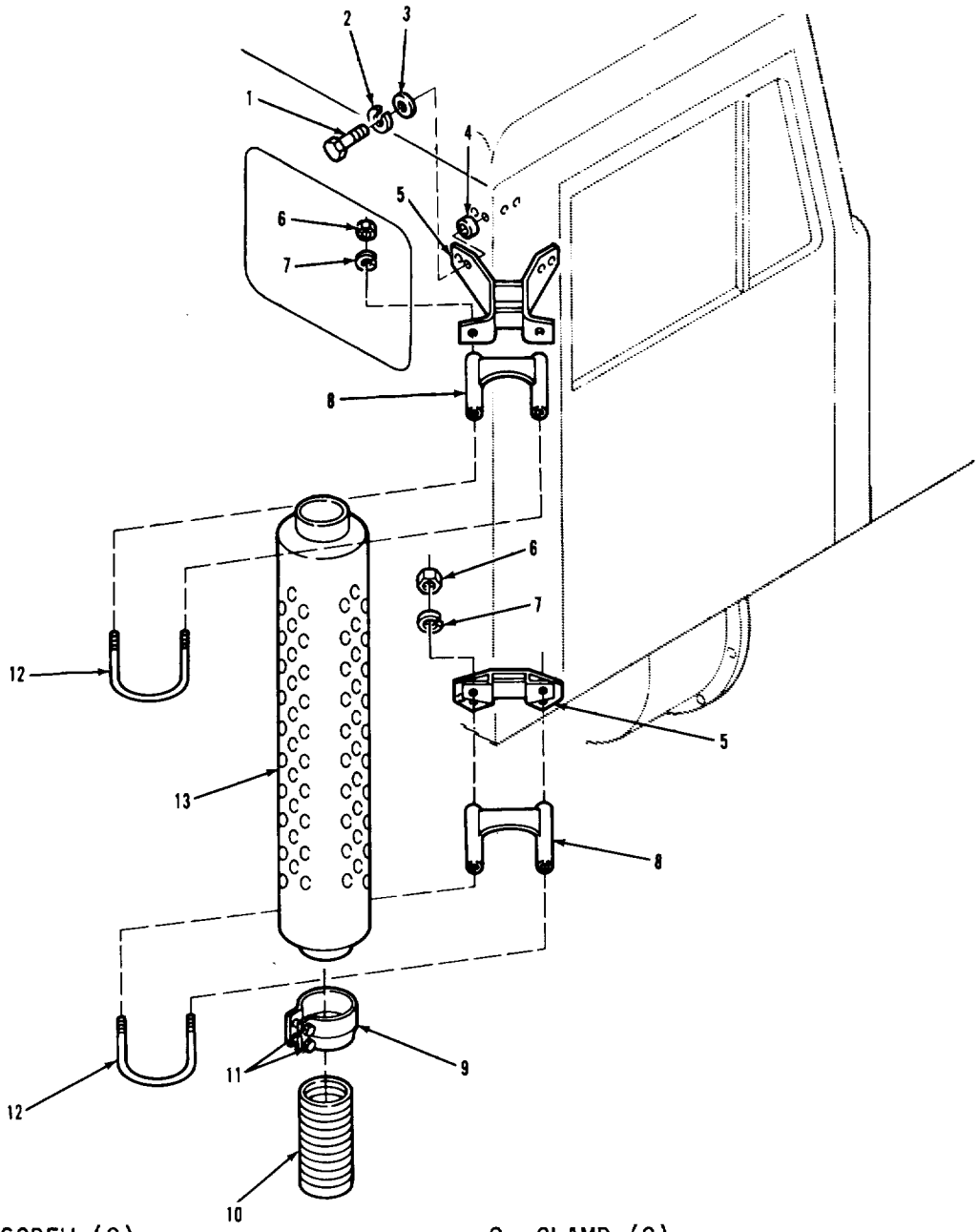
EXHAUST SYSTEM.

3-45. MUFFLER AND HEAT SHIELD REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
	WARNING During normal operation, the exhaust pipes and muffler can become very hot. Be careful not to touch these components with your bare hands. Do not allow your body to come in contact with the hot pipes or muffler. Exhaust system components may be hot enough to cause serious burns.	
A. REMOVAL.		
1. Two screws (11).	Loosen.	
2. Coupling (9).	Slide down over item (10).	
3. Four nuts (6), four lockwashers (7), two U-bolts (12), and two clamps (8).	Remove from item (13) and two items (5).	Assistant holds item (13).
4. Muffler and heat shield assembly (13).	Lift from item (10). removal.	Assistant aids in
5. Eight screws (1), lockwashers (2), washers (3), and two brackets (5).	Remove.	
6. Eight insulators (4) .	Press from two items (5).	
7. Coupling (9).	a. Lift from item (10). b. Discard item (9).	

EXHAUST SYSTEM.

3-45. MUFFLER AND HEAT SHIELD REPLACEMENT (Continued).



LEGEND:

1. HEX HEAD SCREW (8)
2. LOCKWASHER (8)
3. WASHER (8)
4. INSULATOR (8)
5. MUFFLER MOUNTING BRACKET ASSEMBLY (2)
6. NUT (4)
7. LOCKWASHER (4)
8. CLAMP (2)
9. REDUCER COUPLING
10. EXHAUST FLEX PIPE
11. COUPLING SCREW (2)
12. U-BOLT (2)
13. MUFFLER AND HEAT SHIELD ASSEMBLY

TA 237091

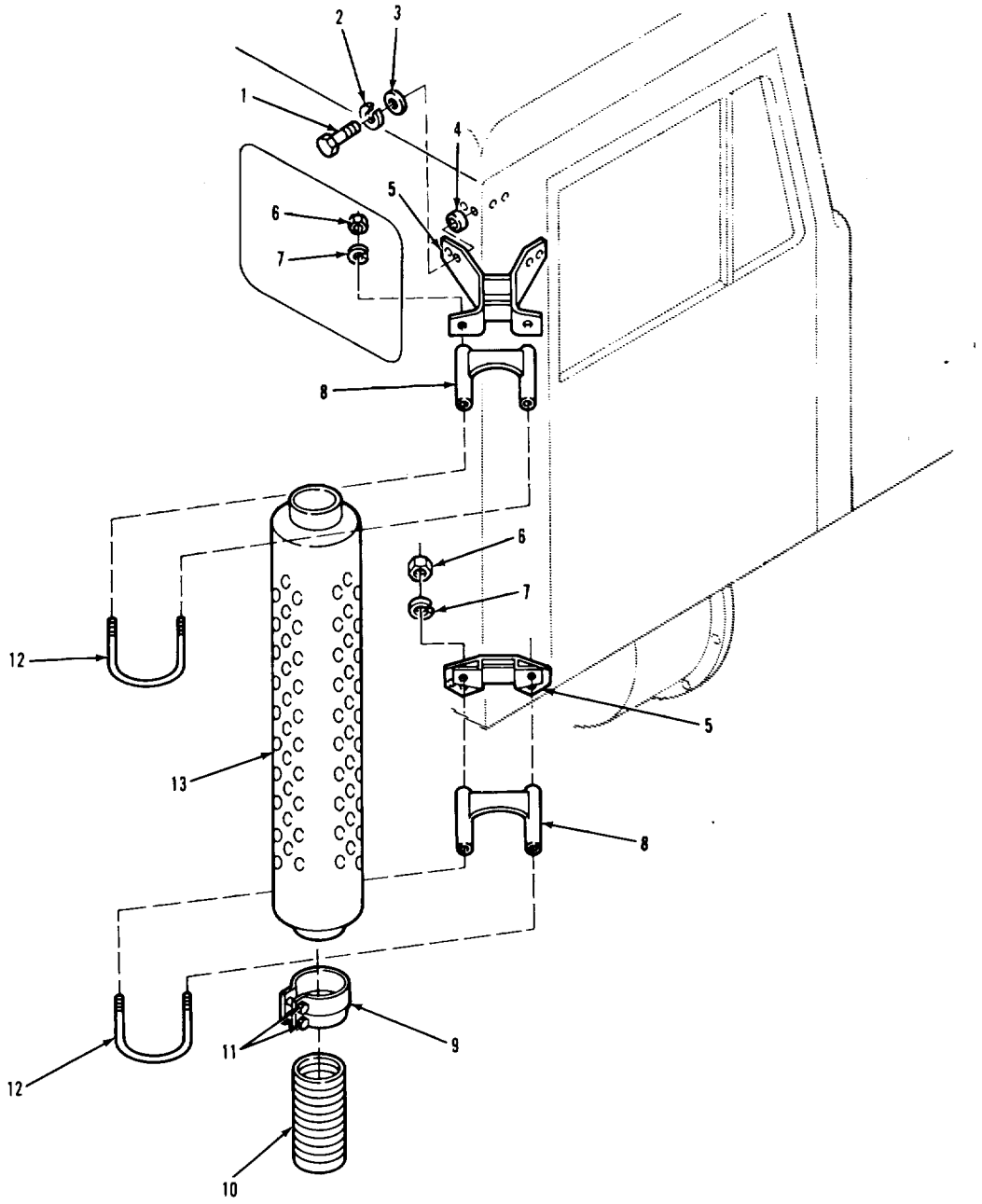
EXHAUST SYSTEM.

3-45. MUFFLER AND HEAT SHIELD REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
B. CLEANING AND INSPECTION.		
8. All parts.	a. Clean.	Refer to paragraph 3-4.
	b. Inspect for burrs, cracks, holes, or dents.	Refer to paragraph 3-5.
C. INSTALLATION.		
9. Eight insulators (4).	a. Lubricate with grease. b. Press into two items (5).	
10. Two brackets (5).	a. Position on cab.	
	b. Secure with eight items (1), items (2), and items (3).	
11. Two clamps (8), two U-bolts (12), four lockwashers (7), and four nuts (6).	Install in two items (5).	Do not tighten four items (6).
12. New coupling (9).	Slide over item (10).	
13. Muffler and heat shield assembly (13).	Slide in two items (8) and two items (12).	a. Position item (13) so heat shield faces door and step. b. Assistant holds item (13) in place until it is secure.
14. Coupling (9).	Position over item (10) and item (13).	

EXHAUST SYSTEM.

3-45. MUFFLER AND HEAT SHIELD REPLACEMENT (Continued).



LEGEND:

1. HEX HEAD SCREW (8)
2. LOCKWASHER (8)
3. WASHER (8)
4. INSULATOR (8)
5. MUFFLER MOUNTING BRACKET ASSEMBLY (2)
6. NUT (4)
7. LOCKWASHER (4)
8. CLAMP (2)
9. REDUCER COUPLING
10. EXHAUST FLEX PIPE
11. COUPLING SCREW (2)
12. U-BOLT (2)
13. MUFFLER AND HEAT SHIELD ASSEMBLY

TA 237092

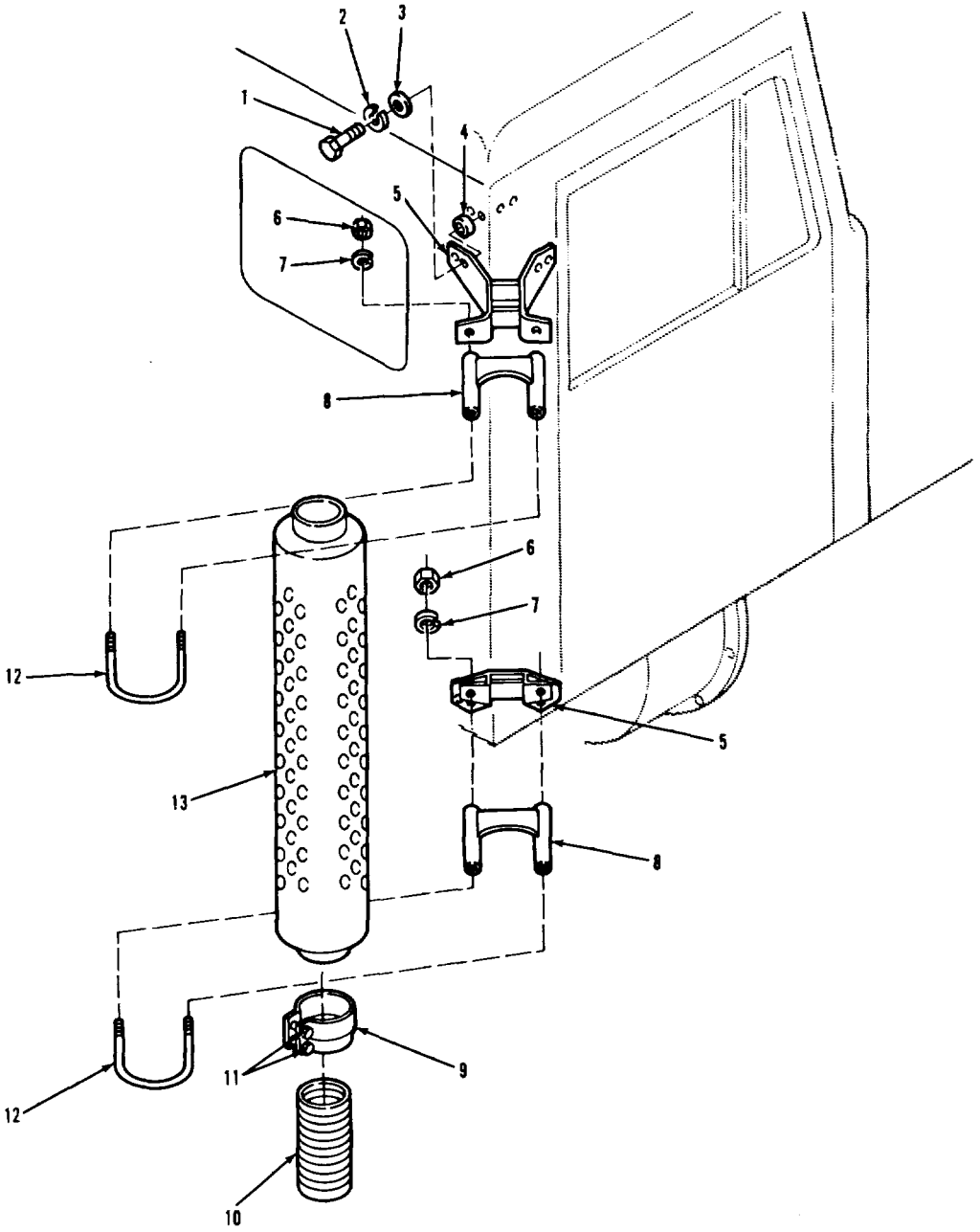
EXHAUST SYSTEM.

3-45. MUFFLER AND HEAT SHIELD REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
15. Two screws (9).	Tighten to 31-42 lb-ft.	
16. Four nuts (6).	Tighten.	
	NOTE Follow-on maintenance action required: Install exhaust stack pipe (para 3-46).	

EXHAUST SYSTEM.

3-45. MUFFLER AND HEAT SHIELD REPLACEMENT (Continued).



LEGEND:

1. HEX HEAD SCREW (8)
2. LOCKWASHER (8)
3. WASHER (8)
4. INSULATOR (8)
5. MUFFLER MOUNTING BRACKET ASSEMBLY (2)
6. NUT (4)
7. LOCKWASHER (4)
8. CLAMP (2)
9. REDUCER COUPLING
10. EXHAUST FLEX PIPE
11. COUPLING SCREW (2)
12. U-BOLT (2)
13. MUFFLER AND HEAT SHIELD ASSEMBLY

TA 237093

EXHAUST SYSTEM.

3-46. EXHAUST STACK PIPE REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	None.	None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Rags, wiping
Item 22, Appendix C.
Solvent, drycleaning, SD-2
Item 29, Appendix C.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

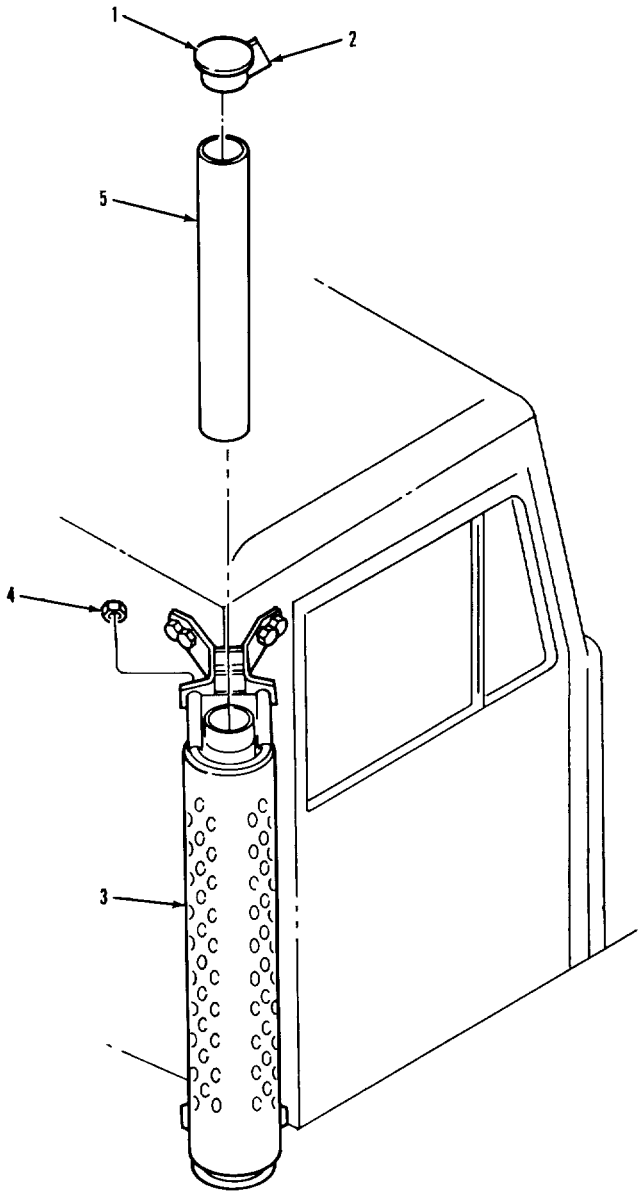
REFERENCES (TM)
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.
Wait until exhaust components are cool.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

EXHAUST SYSTEM.

3-46. EXHAUST STACK PIPE REPLACEMENT (Continued).



LEGEND:

1. EXHAUST STACK CAP ASSEMBLY
2. EXHAUST STACK CAP ASSEMBLY NUT
3. MUFFLER AND HEAT SHIELD ASSEMBLY
4. CLAMP NUT (2)
5. EXHAUST STACK PIPE

TA 237094

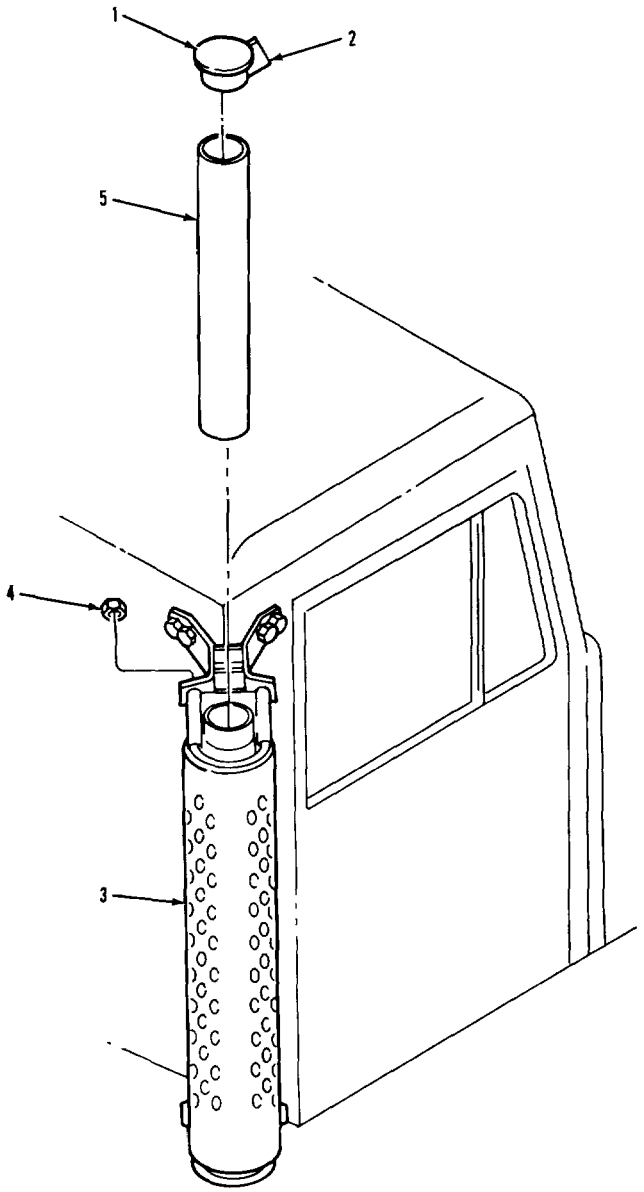
EXHAUST SYSTEM.

3-46. EXHAUST STACK PIPE REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
	WARNING During normal operation, the exhaust pipes and muffler can become very hot. Be careful not to touch these components with your bare hands. Do not allow your body to come in contact with the hot pipes or muffler. Exhaust system components may be hot enough to cause serious burns.	
A. REMOVAL.		
1. Two nuts (4).	Loosen.	
2. Pipe (5).	Lift up out of item (3).	
3. Nut (2).	Loosen.	
4. Cap assembly (1).	Remove from item (5).	
B. CLEANING AND INSPECTION.		
5. All parts.	a. Clean with solvent and rags.	Refer to paragraph 3-4.
	b. Inspect for burrs, cracks, or distortions.	Refer to paragraph 3-5.
6. Cap assembly (1).	Check for free movement.	
C. INSTALLATION.		
7. Cap assembly (1).	Put on item (5).	
8. Nut (2).	Tighten.	

EXHAUST SYSTEM.

3-46. EXHAUST STACK PIPE REPLACEMENT (Continued).



LEGEND:

1. EXHAUST STACK CAP ASSEMBLY
2. EXHAUST STACK CAP ASSEMBLY NUT
3. MUFFLER AND HEAT SHIELD ASSEMBLY
4. CLAMP NUT (2)
5. EXHAUST STACK PIPE

TA 237095

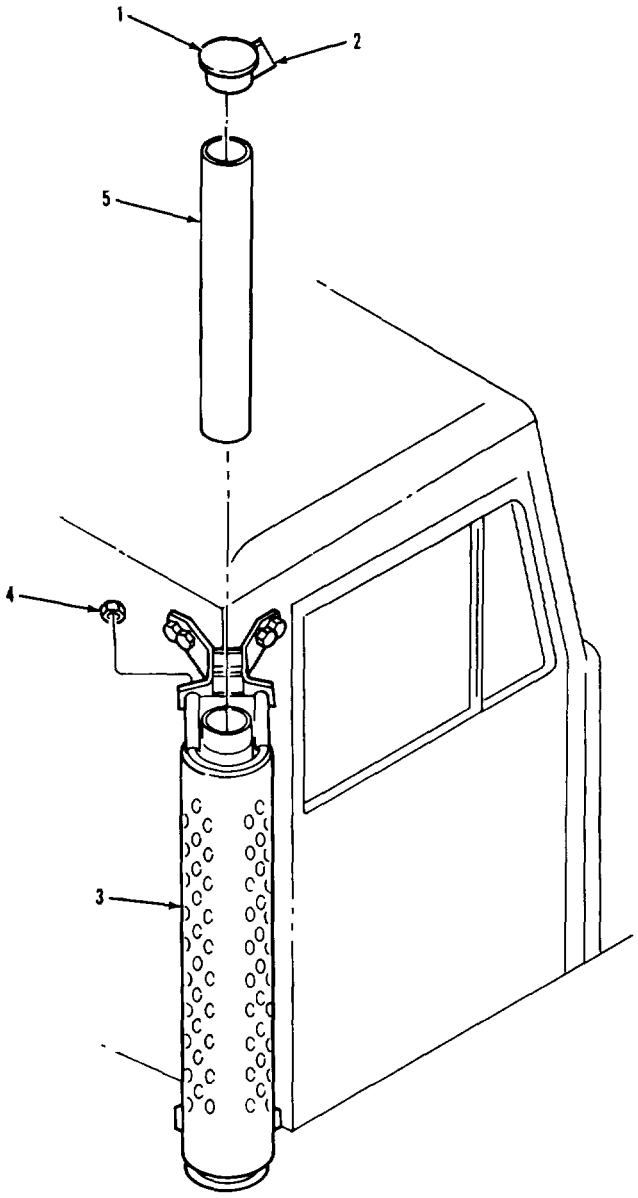
EXHAUST SYSTEM.

3-46. EXHAUST STACK PIPE REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
9. Pipe (5).	Put in item (3).	
10. Two nuts (4).	Tighten.	
	NOTE	
	Follow-on maintenance action required:	
	None.	

EXHAUST SYSTEM.

3-46. EXHAUST STACK PIPE REPLACEMENT (Continued).



LEGEND:

1. EXHAUST STACK CAP ASSEMBLY
2. EXHAUST STACK CAP ASSEMBLY NUT
3. MUFFLER AND HEAT SHIELD ASSEMBLY
4. CLAMP NUT (2)
5. EXHAUST STACK PIPE

TA 237096

EXHAUST SYSTEM.

3-47. EXHAUST FLEX PIPE REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
None.

CONDITION DESCRIPTION
None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Coupling
(34623) 5932837.
Coupling, reducer
(34623) 5932836.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

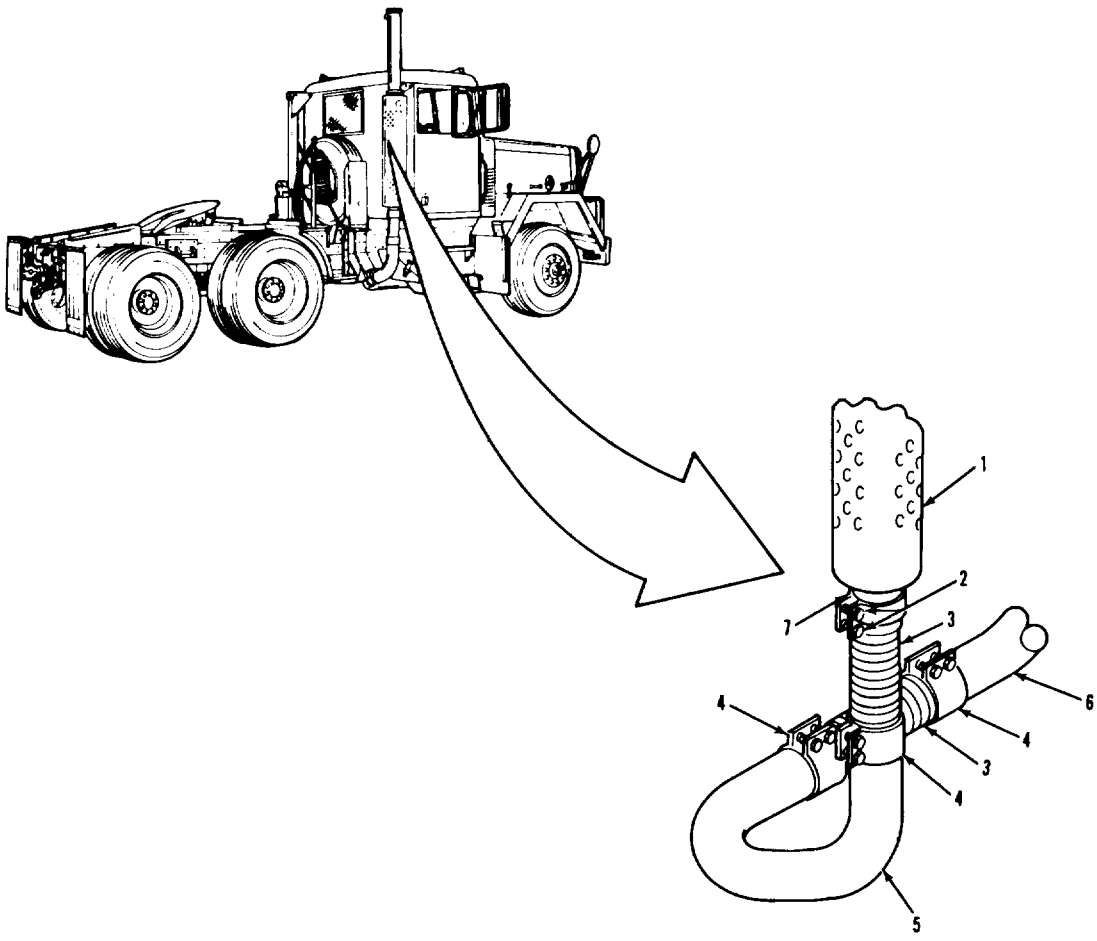
REFERENCES (TM)
TM 9-2320-283-20P.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.
Wait until exhaust components are cool.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

EXHAUST SYSTEM.

3-47. EXHAUST FLEX PIPE REPLACEMENT (Continued).



LEGEND:

1. MUFFLER AND HEAT SHIELD ASSEMBLY
2. COUPLING SCREW (8)
3. EXHAUST FLEX PIPE (2)
4. COUPLING (3)
5. MUFFLER INLET PIPE
6. TURBO OUTLET PIPE
7. REDUCER COUPLING

TA 237097

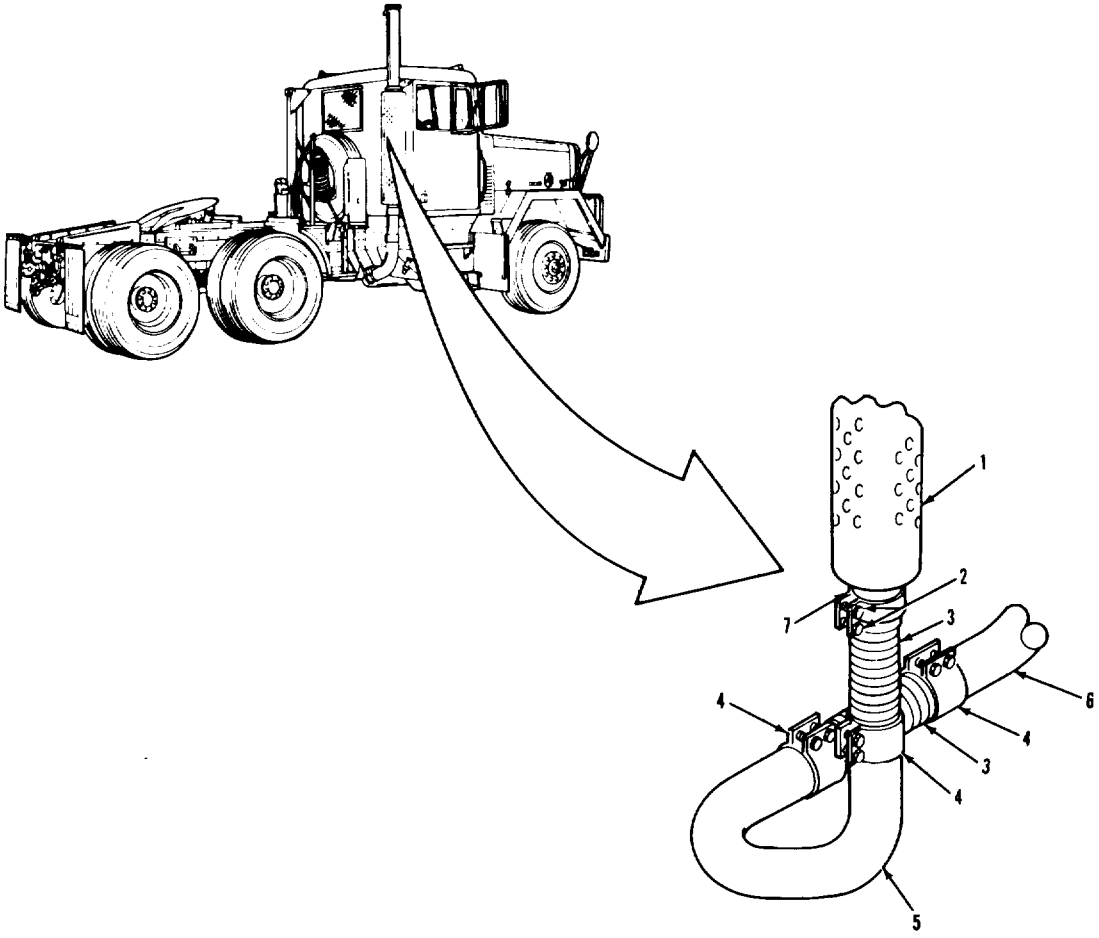
EXHAUST SYSTEM.

3-47. EXHAUST FLEX PIPE REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
	WARNING During normal operation, the exhaust pipes and muffler can become very hot. Be careful not to touch these components with your bare hands. Do not allow your body to come in contact with the hot pipes or muffler. Exhaust system components may be hot enough to cause serious burns.	
A. REMOVAL.		
1. Eight screws (2).	Loosen.	
2. Coupling (7) and three couplings (4).	Slide over two items (3).	
3. Two pipes (3).	Remove.	
4. Coupling (7) and three couplings (4).	Remove from two items (3). three items (4).	Discard item (7) and
B. CLEANING AND INSPECTION.		
5. All parts.	a. Clean.	Refer to paragraph 3-4.
	b. Inspect.	Refer to paragraph 3-5.
C. INSTALLATION.		
6. New coupling (7), and three new couplings (4).	Slide over two items (3).	

EXHAUST SYSTEM.

3-47. EXHAUST FLEX PIPE REPLACEMENT (Continued).



LEGEND:

1. MUFFLER AND HEAT SHIELD ASSEMBLY
2. COUPLING SCREW (8)
3. EXHAUST FLEX PIPE (2)
4. COUPLING (3)
5. MUFFLER INLET PIPE
6. TURBO OUTLET PIPE
7. REDUCER COUPLING

TA 237098

EXHAUST SYSTEM.

3-47. EXHAUST FLEX PIPE REPLACEMENT (Continued).

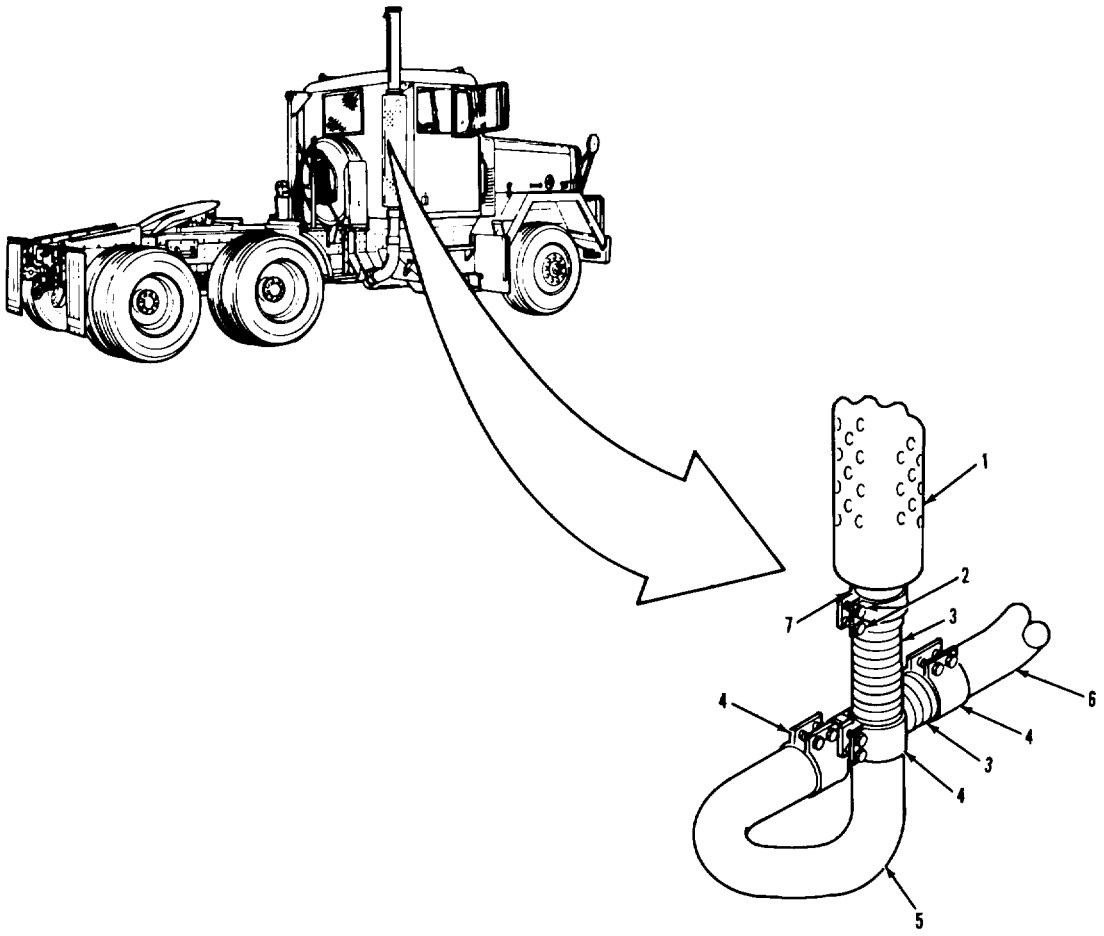
LOCATION/ITEM		ACTION	REMARKS
C.	INSTALLATION (Continued).		
7.	Two pipes (3).	Put in place between item (1), item (5), and item (6).	
8.	Coupling (7) and three couplings (4).	Slide in position to secure two items (3).	
9.	Eight screws (2).	Torque to 31-42 lb-ft.	

NOTE

Follow-on maintenance action required:
None.

EXHAUST SYSTEM.

3-47. EXHAUST FLEX PIPE REPLACEMENT (Continued).



LEGEND:

1. MUFFLER AND HEAT SHIELD ASSEMBLY
2. COUPLING SCREW (8)
3. EXHAUST FLEX PIPE (2)
4. COUPLING (3)
5. MUFFLER INLET PIPE
6. TURBO OUTLET PIPE
7. REDUCER COUPLING

EXHAUST SYSTEM.

3-48. TURBOCHARGER OUTLET PIPE REPLACEMENT.

THIS TASK COVERS
a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

EQUIPMENT CONDITION

APPLICABLE CONFIGURATIONS	PARAGRAPH	CONDITION DESCRIPTION
All.	TM 9-2320-283-10.	Right front of vehicle raised on safety stands.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Rags, wiping
Item 22, Appendix C.
Solvent, drycleaning, SD-2
Item 29, Appendix C.
Coupling, reducer
(34623) 5932837.

PERSONNEL REQUIRED
Two (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

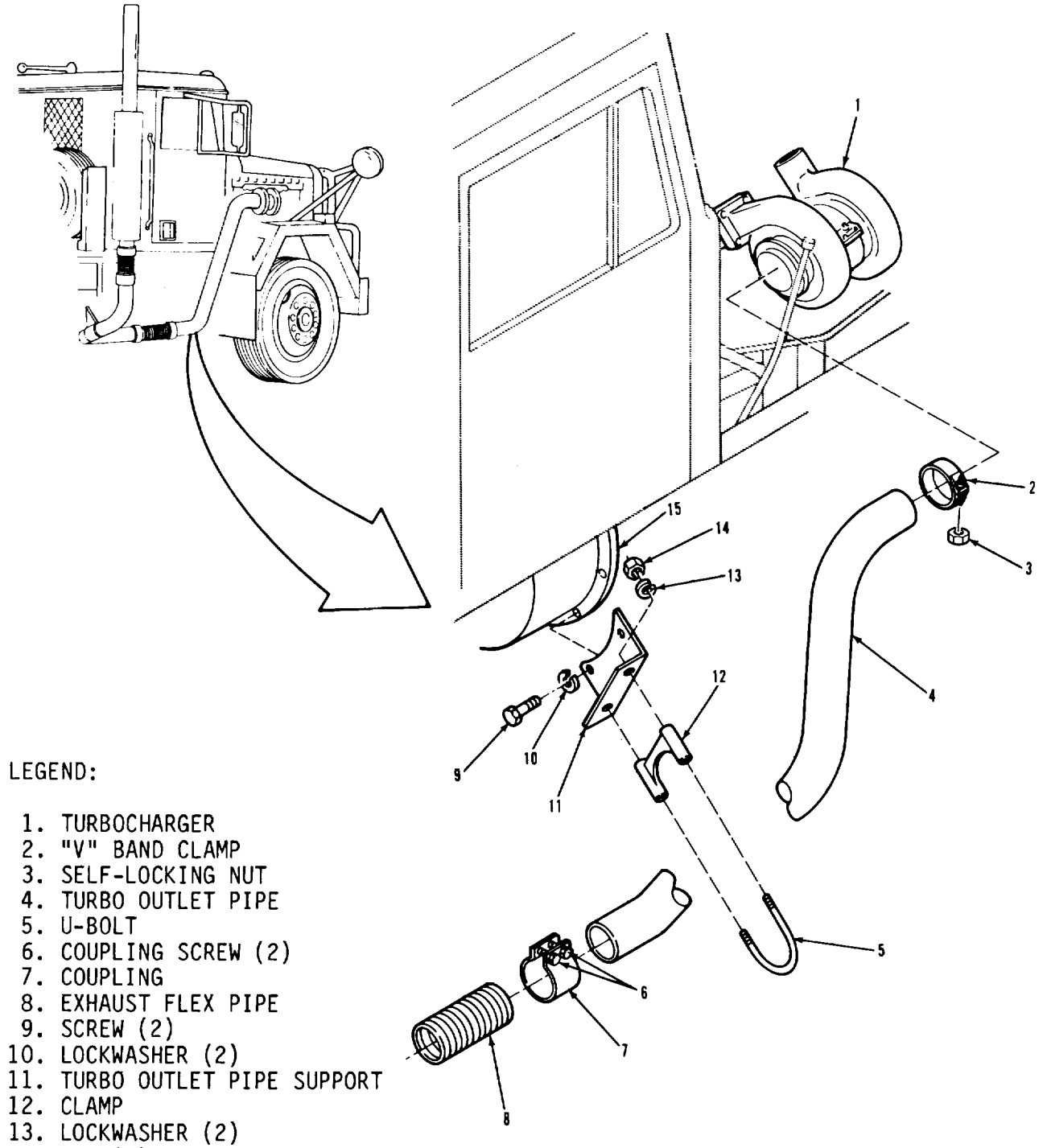
REFERENCES (TM)
TM 9-2320-283-10.
TM 9-2320-283-20P.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.
Wait until exhaust components are cool.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

EXHAUST SYSTEM.

3-48. TURBOCHARGER OUTLET PIPE REPLACEMENT (Continued).



LEGEND:

1. TURBOCHARGER
2. "V" BAND CLAMP
3. SELF-LOCKING NUT
4. TURBO OUTLET PIPE
5. U-BOLT
6. COUPLING SCREW (2)
7. COUPLING
8. EXHAUST FLEX PIPE
9. SCREW (2)
10. LOCKWASHER (2)
11. TURBO OUTLET PIPE SUPPORT
12. CLAMP
13. LOCKWASHER (2)
14. NUT (2)
15. TRANSMISSION

TA 237100

TA 237100

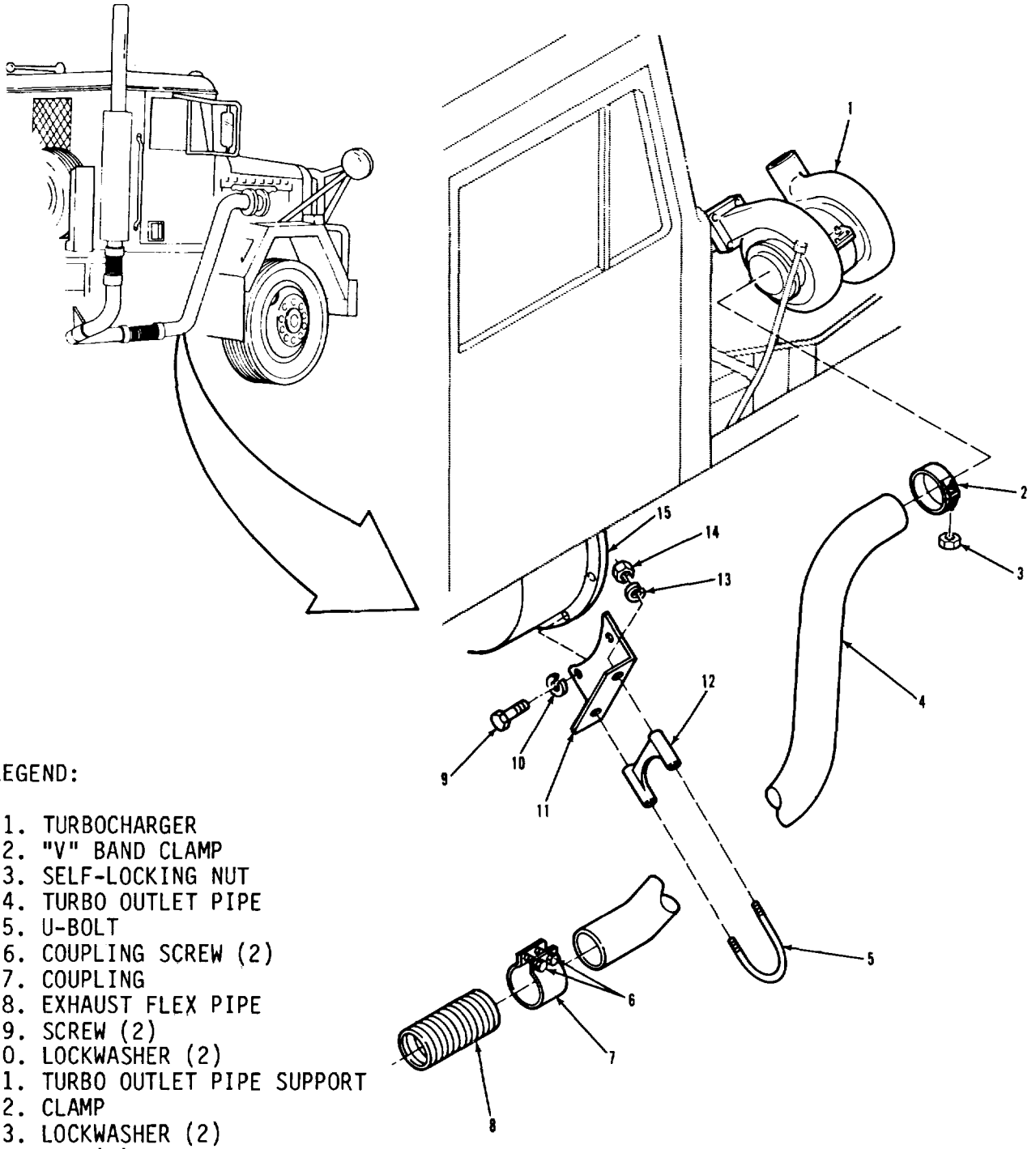
EXHAUST SYSTEM.

3-47. EXHAUST FLEX PIPE REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
		WARNING During normal operation, the exhaust pipes and muffler can become very hot. Be careful not to touch these components with your bare hands. Do not allow your body to come in contact with the hot pipes or muffler. Exhaust system components may be hot enough to cause serious burns.	
A.	REMOVAL.		
1.	Nut (3).	Remove from item (2).	
2.	Clamp (2).	Slide on item (4).	
3.	Two screws (7).	Loosen item (7).	
4.	Coupling (6).	Slide on item (8).	
5.	Two nuts (14), two lockwashers (13), clamp (12), and U-bolt (5).	Remove from item (4) and item (11).	
6.	Pipe (3).	Remove from item (8) and item (1).	Discard item (7).
7.	Two screws (9) and lockwashers (10).	Remove from item (11).	
8.	Support (11).	Remove from item (15).	
B.	CLEANING AND INSPECTION.		
9.	All parts.	Clean with solvent and rags.	Refer to paragraph 3-4.
10.	All parts.	Inspect.	Refer to paragraph 3-5.

EXHAUST SYSTEM.

3-48. TURBOCHARGER OUTLET PIPE REPLACEMENT (Continued).



LEGEND:

1. TURBOCHARGER
2. "V" BAND CLAMP
3. SELF-LOCKING NUT
4. TURBO OUTLET PIPE
5. U-BOLT
6. COUPLING SCREW (2)
7. COUPLING
8. EXHAUST FLEX PIPE
9. SCREW (2)
10. LOCKWASHER (2)
11. TURBO OUTLET PIPE SUPPORT
12. CLAMP
13. LOCKWASHER (2)
14. NUT (2)
15. TRANSMISSION

TA 237101

TA 237101

EXHAUST SYSTEM.

3-48. TURBOCHARGER OUTLET PEPE REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
C.	INSTALLATION. I		
11.	Support (11).	Put in place on item (15).	
12.	Two screws (8) and lockwashers (10).	Secure item (11) to item (15).	
13.	Clamp (12), U-bolt (5), two lockwashers (13), and two nuts (14).	Install on item (11).	Do not tighten.
14.	New coupling (7).	Slip over item (8).	
15.	Clamp (2).	Slip over item (1).	
16.	Pipe (3).	a. Put in position through item (5) and item (12). b. Line up with item (1).	
17.	Clamp (2) and nut (3).	Secure item (4) to item (1).	
18.	Coupling (7).	Position over item (4) and item (8).	
19.	Two screws (6).	Torque to 31-42 lb-ft.	
20.	Two nuts (14).	Tighten.	

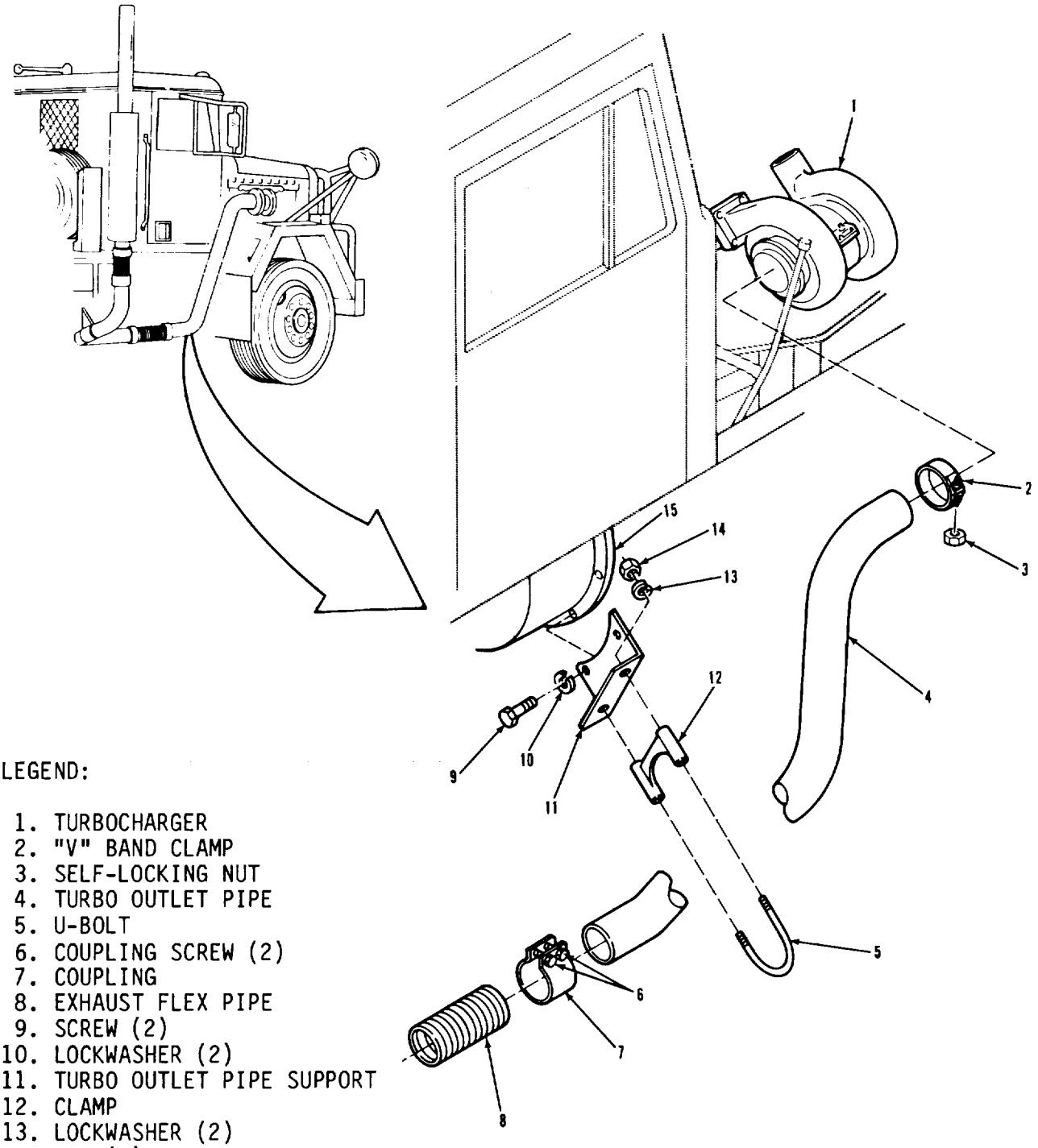
NOTE

Follow-on maintenance action required:

None.

EXHAUST SYSTEM.

3-48. TURBOCHARGER OUTLET PIPE REPLACEMENT (Continued).



LEGEND:

1. TURBOCHARGER
2. "V" BAND CLAMP
3. SELF-LOCKING NUT
4. TURBO OUTLET PIPE
5. U-BOLT
6. COUPLING SCREW (2)
7. COUPLING
8. EXHAUST FLEX PIPE
9. SCREW (2)
10. LOCKWASHER (2)
11. TURBO OUTLET PIPE SUPPORT
12. CLAMP
13. LOCKWASHER (2)
14. NUT (2)
15. TRANSMISSION

TA 237102

TA 237102

EXHAUST SYSTEM.

3-49. MUFFLER INLET PIPE REPLACEMENT.

THIS TASK COVERS
a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	PARAGRAPH	EQUIPMENT CONDITION CONDITION DESCRIPTION
All.	None.	None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Rags, wiping
Item 22, Appendix C.
Solvent, dry cleaning, SD-2
Item 29, Appendix C.
Coupling
(34623) 5932837.

PERSONNEL REQUIRED
One (MOS-63S .

SPECIAL ENVIRONMENTAL CONDITIONS
None.

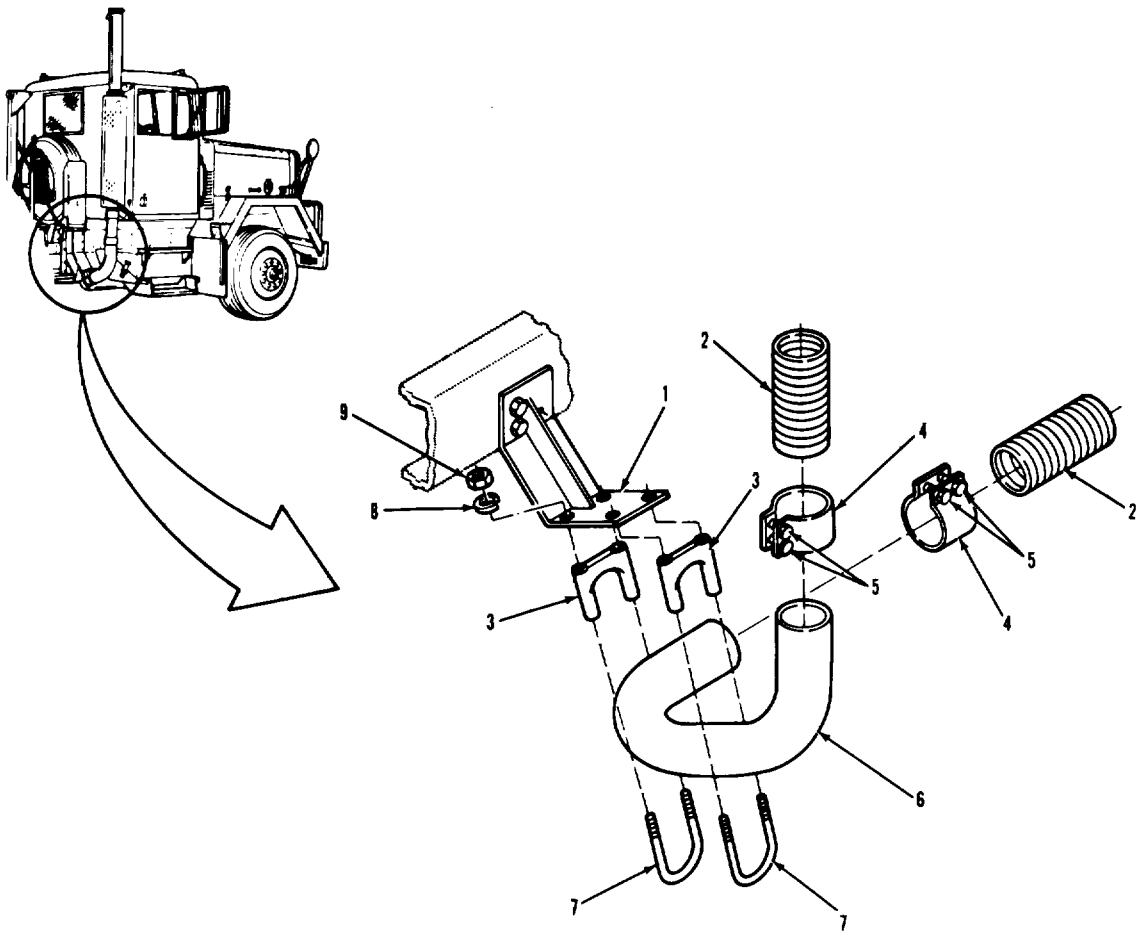
REFERENCES (TM)
TM 9-2320-283-2OP.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.
Wait until exhaust components are cool.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

EXHAUST SYSTEM.

3-49. MUFFLER INLET PIPE REPLACEMENT (Continued).



TA237103

LEGEND:

1. MUFFLER INLET PIPE SUPPORT ASSEMBLY
2. EXHAUST FLEX PIPE (2)
3. CLAMP (2)
4. COUPLING (2)
5. COUPLING SCREW (4)
6. MUFFLER INLET PIPE
7. U-BOLT (2)
8. LOCKWASHER (4)
9. NUT (4)

EXHAUST SYSTEM.

3-49. MUFFLER INLET PIPE REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS

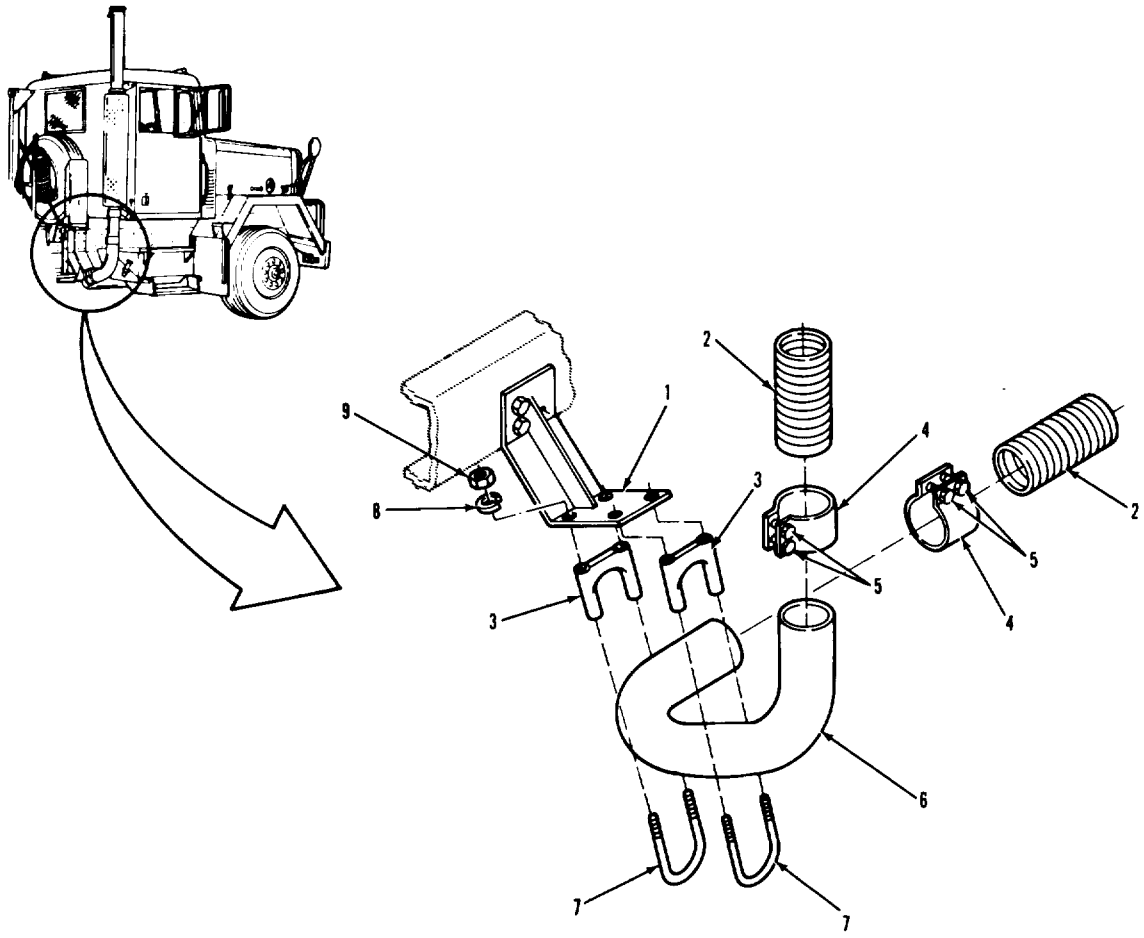
WARNING

During normal operation, the exhaust pipes and muffler can become very hot. Be careful not to touch these components with your bare hands. Do not allow your body to come in contact with the hot pipes or muffler. Exhaust system components may be hot enough to cause serious burns.

A.	REMOVAL.		
1.	Four nuts (9), four lockwashers (8), two clamps (3), and two U-bolts (7).	Remove from item (6) and item (1).	
2.	Four screws (5).	Loosen two items (4).	
3.	Two couplings (4).	Slide on item (6).	
4.	Pipe (6) and two couplings (4).	Remove from two items (2).	Discard two items (4).
B.	CLEANING AND INSPECTION.		
5.	All parts. rags.	a. Clean with solvent and	Refer to paragraph 3-4.
	b.	Inspect.	Refer to paragraph 3-5.

EXHAUST SYSTEM.

3-49. MUFFLER INLET PIPE REPLACEMENT (Continued).



TA 237104

LEGEND:

1. MUFFLER INLET PIPE SUPPORT ASSEMBLY
2. EXHAUST FLEX PIPE (2)
3. CLAMP (2)
4. COUPLING (2)
5. COUPLING SCREW (4)
6. MUFFLER INLET PIPE
7. U-BOLT (2)
8. LOCKWASHER (4)
9. NUT (4)

EXHAUST SYSTEM.

3-49. MUFFLER INLET PIPE REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
C.	INSTALLATION.		
6.	Two new couplings (4).	Slide on item (6).	
7.	Pipe (6).	Put in position between two items (2).	
8.	Two clamps (3), two U-bolts (7), four lockwashers (8), and four nuts (9).	Install on item (1) and item (6).	Do not tighten two items (9).
9.	Two couplings (4).	Position on two items (2) and item (6).	
10.	Four screws (3).	Torque to 31-42 lb-ft.	
11.	Two nuts (9).	Tighten.	

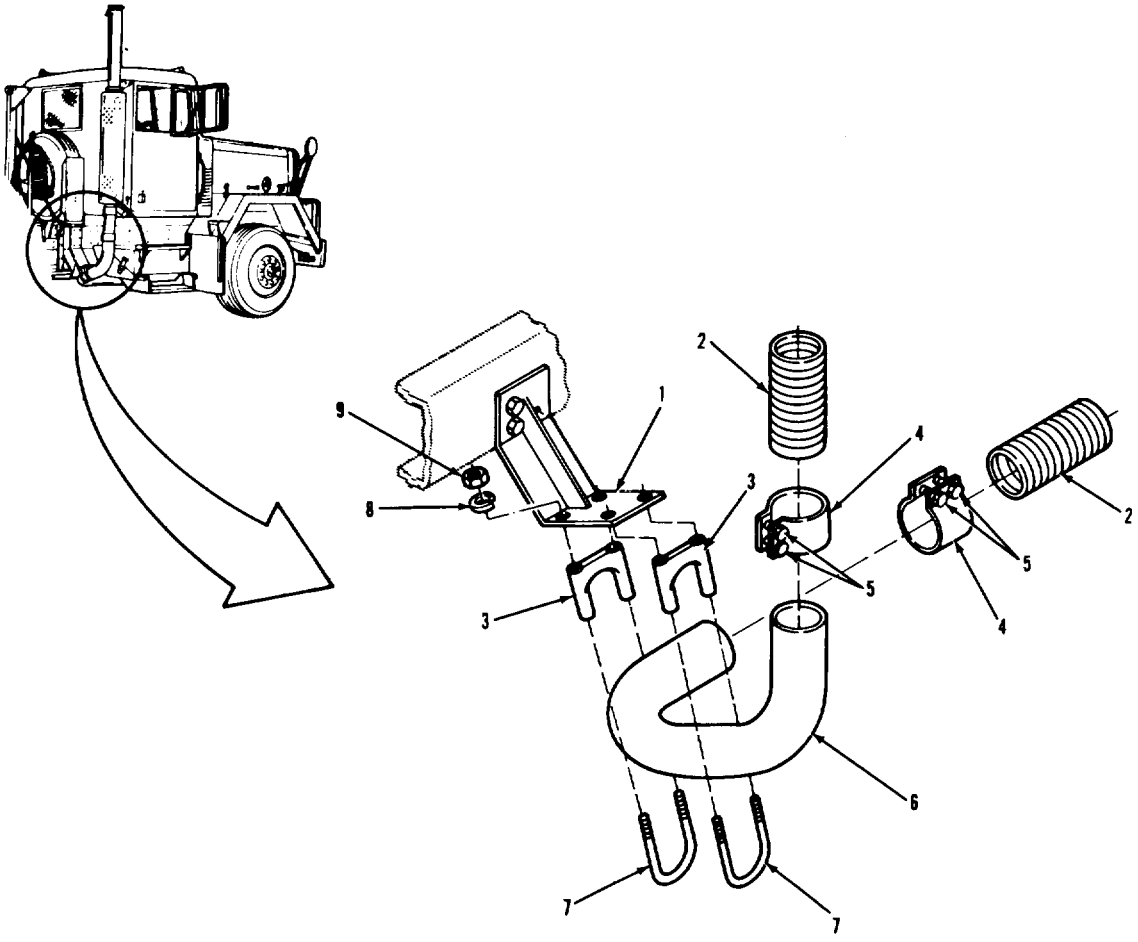
NOTE

Follow-on maintenance action required:

None.

EXHAUST SYSTEM.

3-49. MUFFLER INLET PIPE REPLACEMENT (Continued).



LEGEND:

1. MUFFLER INLET PIPE SUPPORT ASSEMBLY
2. EXHAUST FLEX PIPE (2)
3. CLAMP (2)
4. COUPLING (2)
5. COUPLING SCREW (4)
6. MUFFLER INLET PIPE
7. U-BOLT (2)
8. LOCKWASHER (4)
9. NUT (4)

SECTION V. COOLING SYSTEM

3-50. GENERAL.

This section provides procedures authorized at the organizational maintenance level to service and replace cooling system components. To find a specific procedure contained in this section, see the task summary below.

3-51. TASK SUMMARY.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	(Refer to specific paragraph for this information).	

TEST EQUIPMENT
None.

SPECIAL TOOLS
Seal mandrel
(15434) ST-1225.

MATERIALS/PARTS (P/N)

Tape, thread sealing	Gasket, water connection
Item 32, Appendix C.	(15434) 3024960.
Antifreeze	Gasket, thermostat housing
Item 2 or 3, Appendix C.	(15434) 208128.
Oil, lubricating: OE/HDO-30	Seal, housing
Item 16, Appendix C.	(15434) 186780.
Grease, automotive and artillery	Gasket, water outlet connection
Item 7, Appendix C.	(15434) 3019158.
Insulator (2)	Ring, sealing (6)
(76005) CBA 24-500.	(15434) 3024709.
0-ring	O-ring, coulping (4)
(15434) 43463-A.	(15434) 70624.
0-ring (2)	Gasket, water pump
(15434) 212161.	(15434) 3002385.

PERSONNEL REQUIRED	SPECIAL ENVIRONMENTAL CONDITIONS
Two (MOS-63S).	Vehicle parked on level ground.

COOLING SYSTEM.

3-51. TASK SUMMARY (Continued).

INITIAL SETUP (Continued)

REFERENCES (TM)	GENERAL SAFETY INSTRUCTIONS
TM 9-2320-283-10.	Engine off.
TM 9-2320-283-20P.	Transmission in neutral.
TM 750-254.	Park brake set.
	Wait until cooling system components are cool.
	Wear eye protection.
TROUBLESHOOTING REFERENCES	Wait until transmission and steering
Paragraph 2-11.	fluids are cool.

LIST OF TASKS

TASK NO.	TASK	TASK REF	TROUBLESHOOTING REF NO. (PARA)
1	Cooling System Service	3-52	2-11
	a. Draining.	3-52a	
	b. Cleaning and Flushing.	3-52b	
	c. Inspection of Draincocks.	3-52c	
	d. Sight Glass Replacement.	3-52d	
	e. Filling.	3-52d	
	f. Operational Checks.	3-52e	
2	Radiator Replacement	3-53	2-11
	a. Removal.	3-53a	
	b. Cleaning and Inspection.	3-53b	
	c. Installation.	3-53c	
3	Radiator Support Rods Replacement	3-54	
	a. Removal.	3-54a	
	b. Cleaning and Inspection.	3-54b	
	c. Installation.	3-54c	
4	Transmission and Steering System Cooler Replacement	3-55	2-11
	a. Removal.	3-55a	
	b. Cleaning and Inspection.	3-55b	
	c. Installation.	3-55c	

COOLING SYSTEM.

3-51. TASK SUMMARY (Continued).

LIST OF TASKS

TASK NO.	TASK	TASK REF	TROUBLESHOOTING REF NO. (PARA)
5	Upper Fan Shroud Replacement	3-56	
	a. Removal.	3-56a	
	b. Cleaning and Inspection.	3-56b	
	c. Installation.	3-56c	
6	Lower Fan Shroud Replacement	3-57	
	a. Removal.	3-57a	
	b. Cleaning and Inspection.	3-57b	
	c. Installation.	3-57c	
7	Lines, Fittings, and Hoses Replacement	3-58	2-11
	a. Inspection.	3-58a	
	b. Deaeration Line Replacement.	3-58b	
	c. Radiator Inlet Hose Replacement.	3-58c	
	d. Water Pump Bypass Hose Replacement.	3-58d	
	e. Overflow Tube Replacement.	3-58e	
	f. Radiator Outlet Hoses and Tube Replacement.	3-58f	
	g. Water Bypass Tube Replacement.	3-589	
	h. Water Transfer Tube Replacement.	3-58h	
	i. Water Pump to Radiator Connection Replacement.	3-58i	
8	Thermostat and Thermostat Housing Replacement	3-59	2-11
	a. Removal.	3-59a	
	b. Disassembly.	3-59b	
	b. Cleaning and Inspection.	3-59c	
	d. Testing.	3-59d	
	e. Assembly.	3-59e	
	f. Installation.	3-59f	
9	Water Manifolds Replacement	3-60	2-11
	a. Removal.	3-60a	
	b. Cleaning and Inspection.	3-60b	
	c. Installation.	3-60c	

COOLING SYSTEM.

3-51. TASK SUMMARY (Continued).

LIST OF TASKS

TASK NO.	TASK	TASK REF	TROUBLESHOOTING REF NO. (PARA)
10	Water Shutoff Valves and Lines Replacement	3-61	2-11
	a. Removal.	3-61a	
	b. Cleaning and Inspection.	3-61b	
	c. Installation.	3-61c	
11	Water Filter and Bracket Replacement	3-62	2-11
	a. Removal.	3-62a	
	b. Cleaning and Inspection.	3-62b	
	c. Installation.	3-62c	
12	Water Pump Drive Belt Replacement	3-63	2-11
	a. Removal.	3-63a	
	b. Installation.	3-63b	
	c. Adjustment.	3-63c	
13	Water Pump Replacement	3-64	2-11
	a. Removal.	3-64a	
	b. Cleaning and Inspection.	3-64b	
	c. Installation.	3-64c	
14	Fan and Fan Clutch Replacement	3-65	2-11
	a. Removal.	3-65a	
	b. Cleaning and Inspection.	3-65b	
	c. Installation.	3-65c	
	d. Operational Check.	3-65d	
15	Fan Clutch Air Valve Replacement	3-66	
	a. Removal.	3-66a	
	b. Cleaning and Inspection.	3-66b	
	c. Installation.	3-66c	
	d. Operational Check.	3-66d	
16	Fan Clutch Drive Belts Replacement	3-67	2-11
	a. Removal.	3-67a	
	b. Installation.	3-67b	
	c. Adjustment.	3-67c	

COOLING SYSTEM.

3-52. COOLING SYSTEM SERVICE.

THIS TASK COVERS

a. Draining.
b. Cleaning and Flushing.
c. Inspection of Draincocks.
d. Sight Glass Replacement.
e. Filling.
f. Operational Checks.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
None.

CONDITION DESCRIPTION
None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS IP/N)
Tape, thread sea ing
Item 32, Appendix C.
Antifreeze
Item 2 or 3, Appendix C.
O-ring (subparagraph d only)
(23705) 241-04.

PERSONNEL REQUIRED
One (MOS-63SR.

SPECIAL ENVIRONMENTAL CONDITIONS
Vehicle parked on level ground.

REFERENCES (TM)
IM 9-2320-283-10.
TM 750-254.
Park brake set.
Wait until cooling system

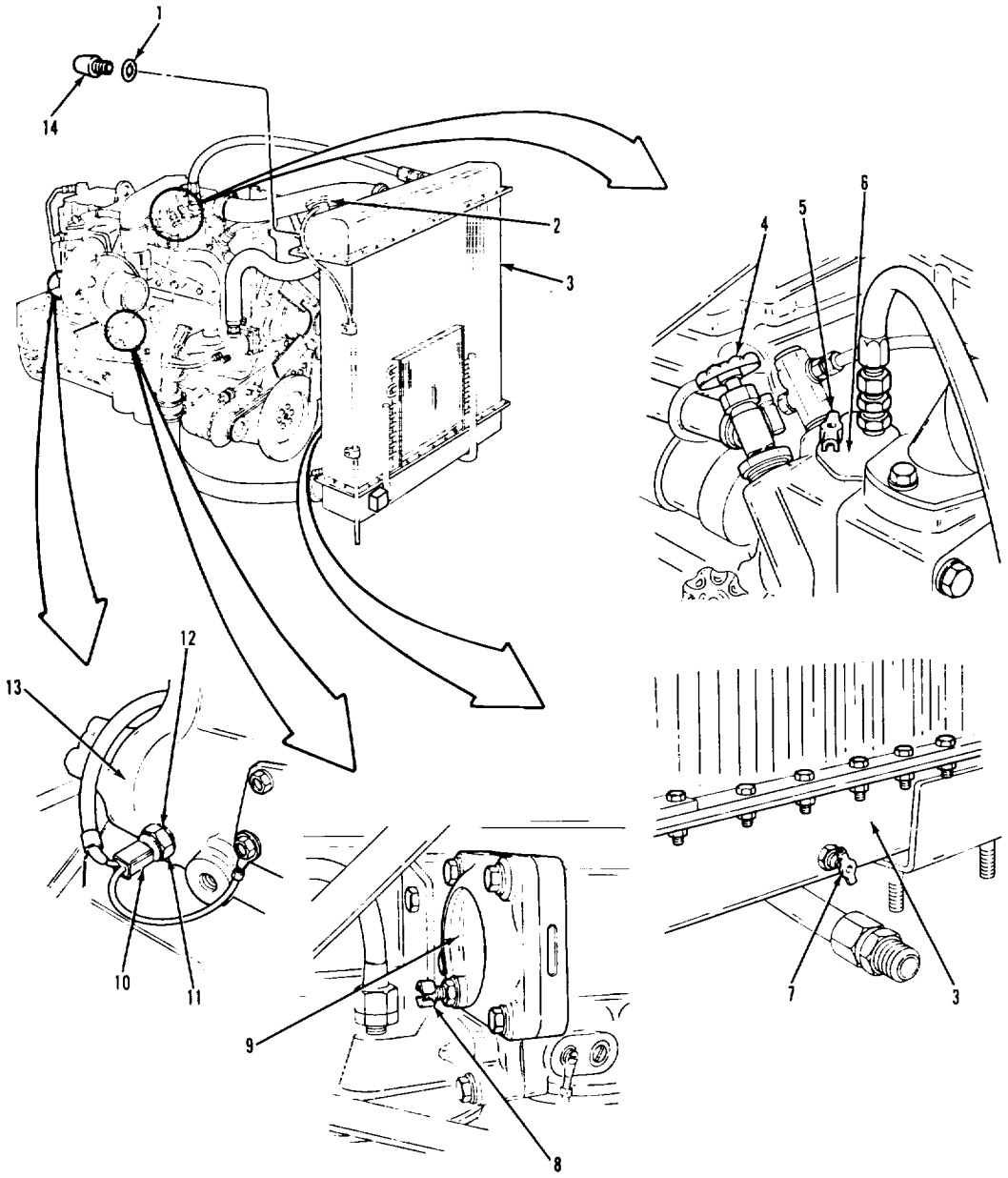
GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

components are cool.
Wear eye protection.

COOLING SYSTEM.

3-52. COOLING SYSTEM SERVICE (Continued).



TA 237106

1. O-RING
2. RADIATOR CAP
3. RADIATOR ASSEMBLY
4. HEATER SHUTOFF VALVE
5. FRONT WATER MANIFOLD DRAINCOCK
6. FRONT WATER MANIFOLD
7. RADIATOR DRAINCOCK
8. OIL COOLER DRAINCOCK
9. OIL COOLER
10. THERMOSTAT PLUG
11. ETHER QUICK START THERMOSTAT
12. REDUCER
13. ENGINE BLOCK
14. SIGHT GLASS

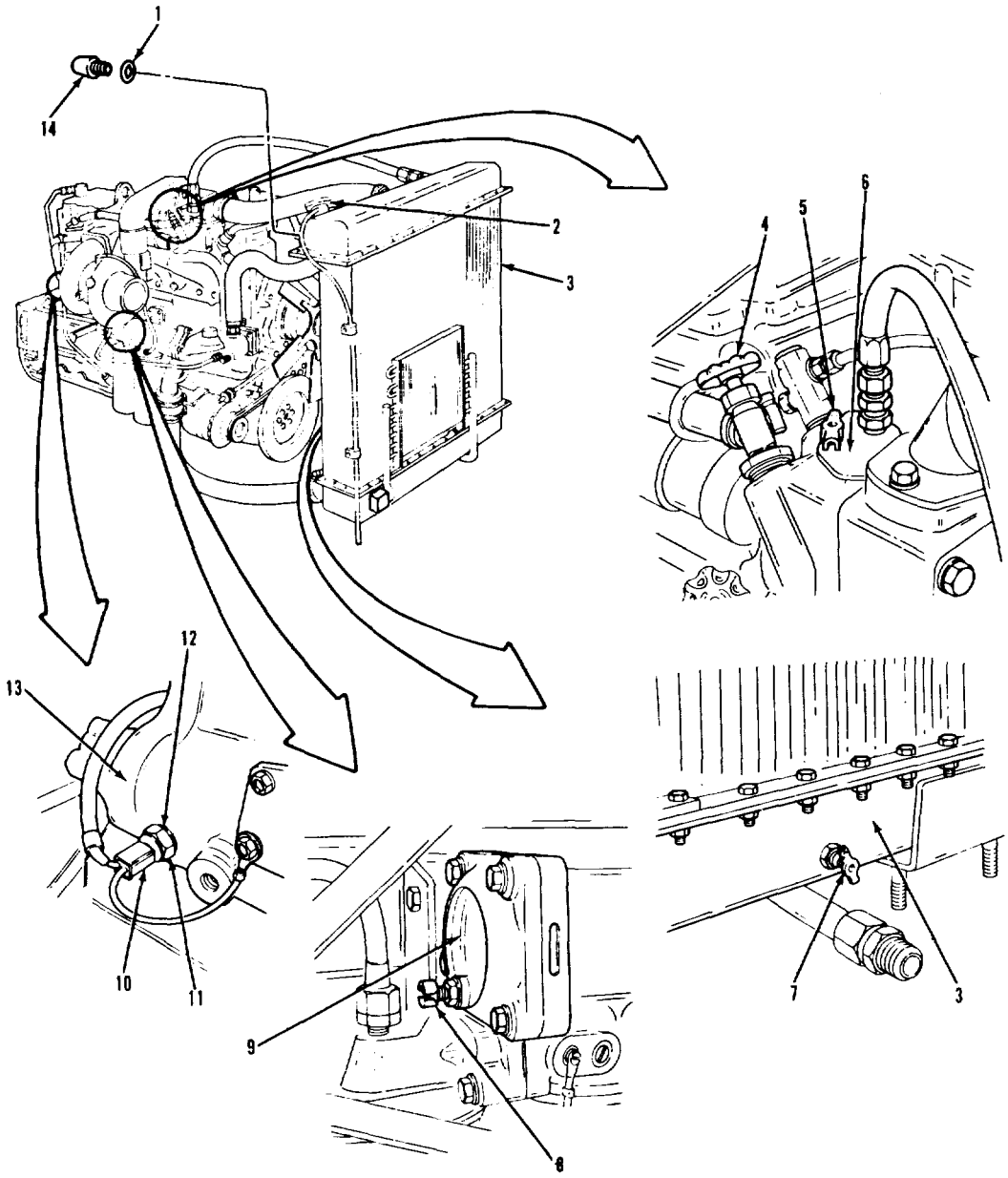
COOLING SYSTEM.

3-52. COOLING SYSTEM SERVICE (Continued).

LOCATION/ITEM		ACTION	REMARKS
A.	DRAINING.		
		WARNING Let radiator cool before removing cap. Be sure to follow step 1 when removing cap. Failure to do so could result in serious burns and other injury to personnel.	
1.	Cap (2).	a. .Cover with a thick cloth and turn counterclockwise to first stop. b. Allow pressure to escape from cooling system. c. When all pressure has escaped, remove from item (3).	
2.	Valve (4).	Open by turning counterclockwise as far as possible.	
3.	Draincock (7).	a. Place a suitable container underneath. b. Open and let coolant drain out.	
4.	Draincock (5).	Open when level of coolant goes below item (6). when five gallons of coolant have drained from item (3).	Level of coolant is below level of item (6)
5.	Draincock (8).	a. Place a suitable container underneath. b. Open and let coolant drain out. c. When coolant stops draining, close.	

COOLING SYSTEM.

3-52. COOLING SYSTEM SERVICE (Continued).



1. O-RING
2. RADIATOR CAP
3. RADIATOR ASSEMBLY
4. HEATER SHUTOFF VALVE
5. FRONT WATER MANIFOLD DRAINCOCK
6. FRONT WATER MANIFOLD
7. RADIATOR DRAINCOCK
8. OIL COOLER DRAINCOCK
9. OIL COOLER
10. THERMOSTAT PLUG
11. ETHER QUICK START THERMOSTAT
12. REDUCER
13. ENGINE BLOCK
14. SIGHT GLASS

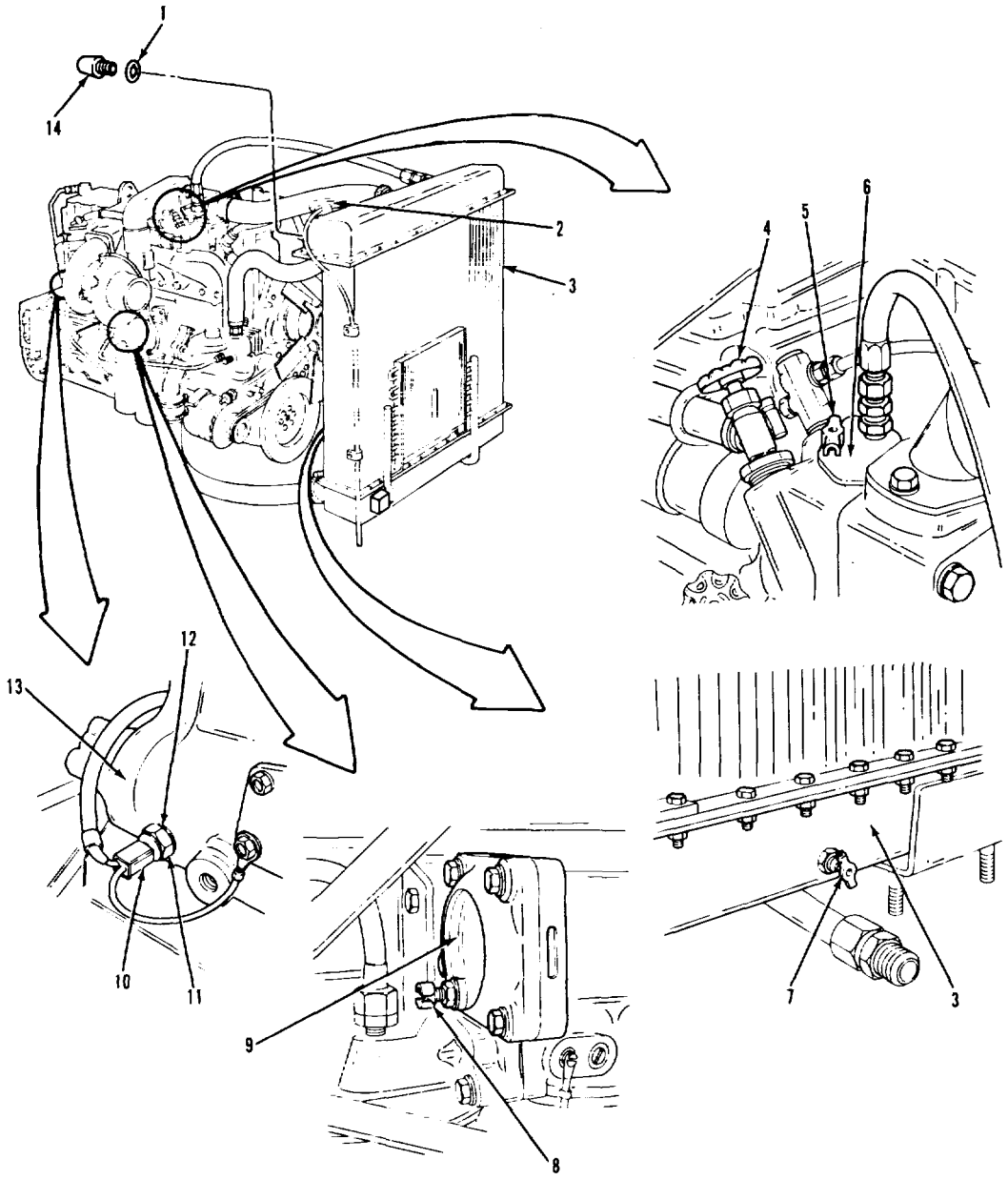
COOLING SYSTEM.

3-52. COOLING SYSTEM SERVICE (Continued).

LOCATION/ITEM		ACTION	REMARKS
A.	DRAINING (Continued).		
6.	Plug (10).	Remove from item (11).	
7.	Thermostat (11). underneath.	a. Place a suitable container	
		b. Remove from item (12) and let coolant drain out.	Do not remove item (12) from item (13).
		c. When coolant stops draining, wrap threads with thread sealing tape, and reinstall into item (12).	
8.	Heater control valve.	Open, and let coolant drain out of heating system.	Refer to TM 9-2320-283-10.
B.	CLEANING AND FLUSHING.		
		NOTE If it is necessary to clean and flush the cooling system, refer to TM 750- 254 (Cooling Systems: Tactical Vehicles).	
C.	INSPECTION OF DRAINCOCKS.		
9.	Three draincocks (5), (7), and (8).	a. Remove from items (6), (3), and (9).	
		b. Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
		c. Wrap threads with thread sealing tape.	Refer to paragraph 3-7.
		d. Install into items (6), (3), and (9), and close.	

COOLING SYSTEM.

3-52. COOLING SYSTEM SERVICE (Continued).



TA 7108

1. O-RING
2. RADIATOR CAP
3. RADIATOR ASSEMBLY
4. HEATER SHUTOFF VALVE
5. FRONT WATER MANIFOLD DRAINCOCK
6. FRONT WATER MANIFOLD
7. RADIATOR DRAINCOCK
8. OIL COOLER DRAINCOCK
9. OIL COOLER
10. THERMOSTAT PLUG
11. ETHER QUICK START THERMOSTAT
12. REDUCER
13. ENGINE BLOCK
14. SIGHT GLASS

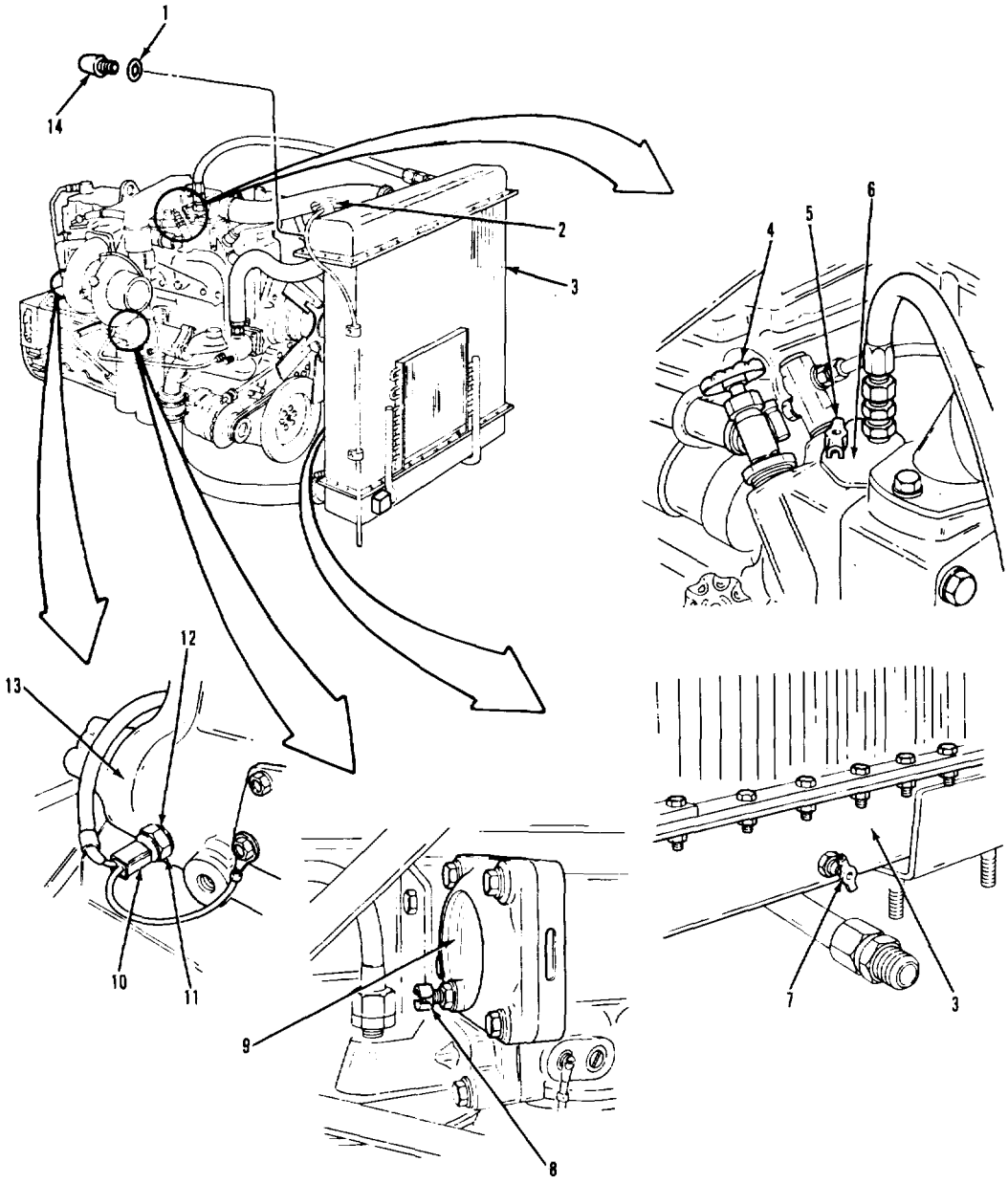
COOLING SYSTEM.

3-52. COOLING SYSTEM SERVICE (Continued).

LOCATION/ITEM		ACTION	REMARKS
D.	SIGHT GLASS REPLACEMENT.		
10.	Sight glass (14).	Unscrew from item (3).	
11.	0-ring (1).	Remove from item (14).	Discard item (1).
12.	Sight glass (14).	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
13.	New 0-ring (1).	Install on item (14).	
14.	Sight glass (14).	Install in item (3).	
E.	FILLING.		
15.	Draincock (5).	Open.	
16.	Radiator (3).	Add coolant until it overflows out of item (5).	Refer to TM 750-254 (Cooling Systems: Tactical Vehicles) for proper antifreeze mixture. Never use more than a 60 percent antifreeze solution. Use arctic antifreeze for subzero temperatures.
17.	Draincock (5).	Close.	
18.	Radiator (3).	Add coolant until item (1) is filled.	
F.	OPERATIONAL CHECKS.		
19.	Engine.	Start.	
20.	Cooling system.	Check for leaks.	Refer to TM 9-2320-283-10. Make sure heater control valve is open.

COOLING SYSTEM.

3-52. COOLING SYSTEM SERVICE (Continued).



TA 237109

1. O-RING
2. RADIATOR CAP
3. RADIATOR ASSEMBLY
4. HEATER SHUTOFF VALVE
5. FRONT WATER MANIFOLD DRAINCOCK
6. FRONT WATER MANIFOLD
7. RADIATOR DRAINCOCK
8. OIL COOLER DRAINCOCK
9. OIL COOLER
10. THERMOSTAT PLUG
11. ETHER QUICK START THERMOSTAT
12. REDUCER
13. ENGINE BLOCK
14. SIGHT GLASS

COOLING SYSTEM.

3-52. COOLING SYSTEM SERVICE (Continued).

LOCATION/ITEM		ACTION	REMARKS
F.	OPERATIONAL CHECKS (Continued).		
21.	Radiator (3). to top of item (14).	Make sure coolant level is needed.	Add more coolant, if
22.	Cap (2).	Install on item (3).	
23.	Engine.	Shutdown.	Refer to TM 9-2320-283-10.

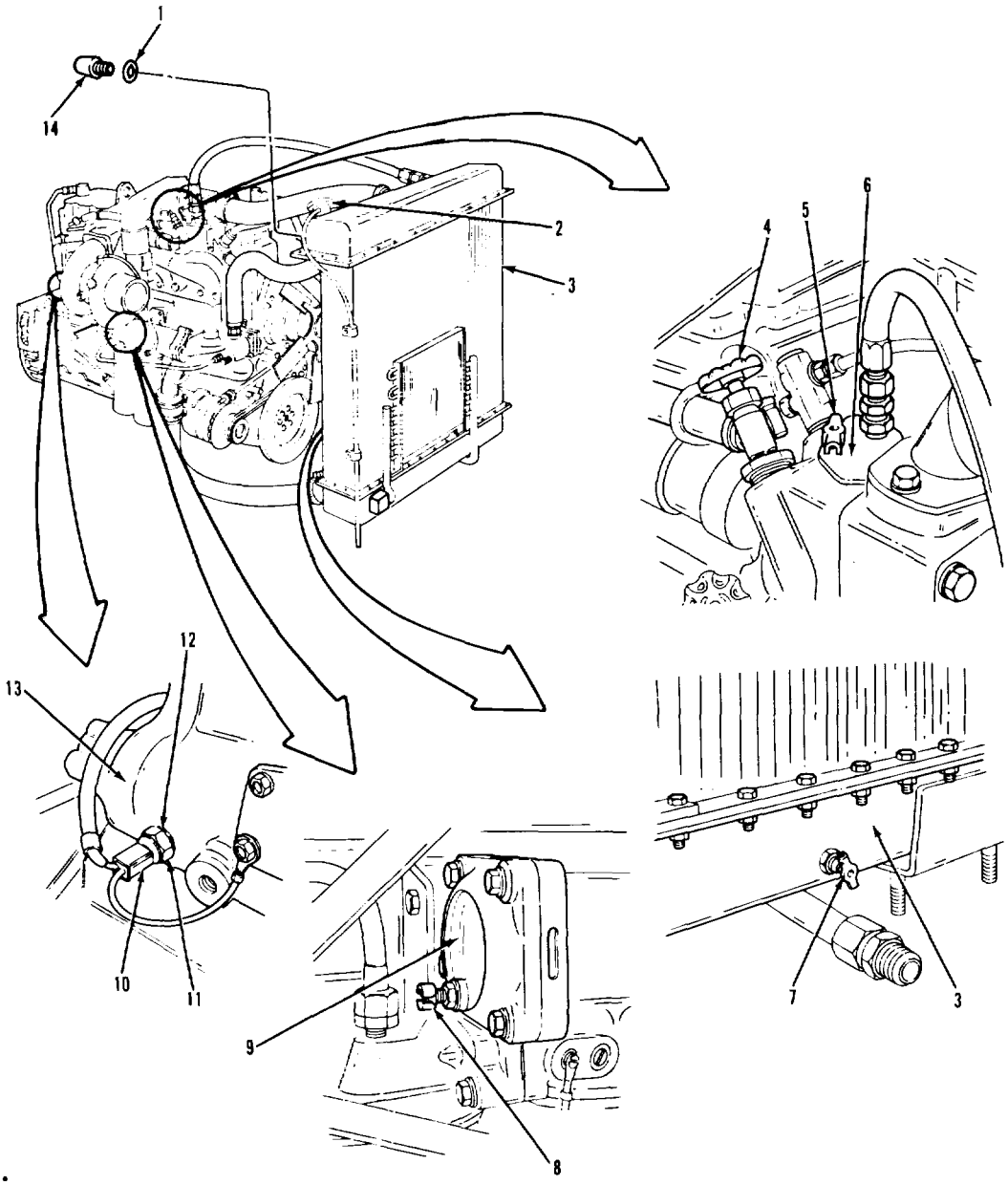
NOTE

Follow-on maintenance action required:

None.

COOLING SYSTEM.

3-52. COOLING SYSTEM SERVICE (Continued).



LEGEND:

1. O-RING
2. RADIATOR CAP
3. RADIATOR ASSEMBLY
4. HEATER SHUTOFF VALVE
5. FRONT WATER MANIFOLD DRAINCOCK
6. FRONT WATER MANIFOLD
7. RADIATOR DRAINCOCK
8. OIL COOLER DRAINCOCK
9. OIL COOLER
10. THERMOSTAT PLUG
11. ETHER QUICK START THERMOSTAT
12. REDUCER
13. ENGINE BLOCK
14. SIGHT GLASS

TA 237110

TA 237110

COOLING SYSTEM.

3-53. RADIATOR REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

None.

EQUIPMENT CONDITION

PARAGRAPH	CONDITION DESCRIPTION
3-52.	Coolant drained.
3-269.	Hood removed.
3-236.	Brush guard removed.
3-268.	Grill removed.

SPECIAL TOOLS
None.

MATERIALS/PARTS I P/N)
Tape, thread sealing
Item 32, Appendix C.
Insulator (2)
(76005) CBA 24-500.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

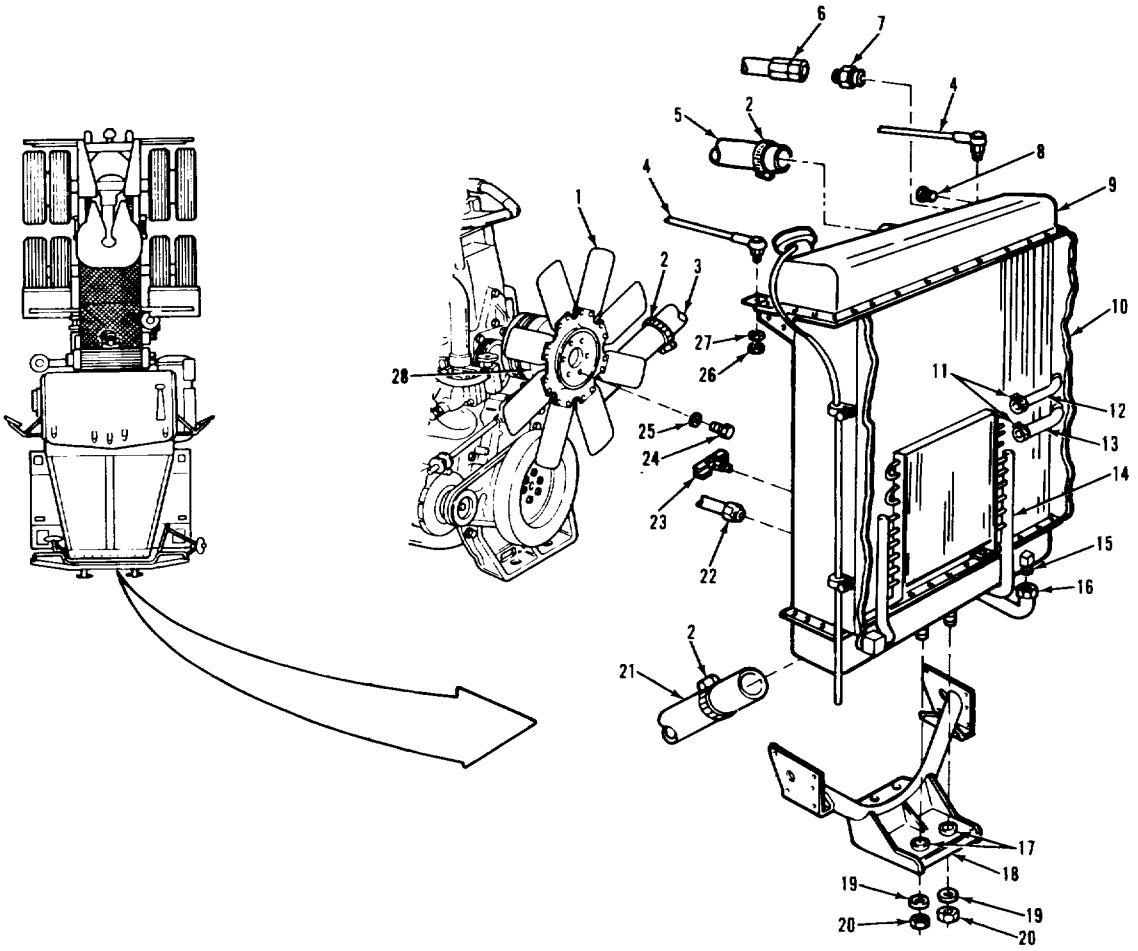
REFERENCES (TM)
TM 9-2320-283-10.
TM 9-2320-283-20P.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.
Wait until cooling system components are cool.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

COOLING SYSTEM.

3-53. RADIATOR REPLACEMENT (Continued).



LEGEND:

1. FAN ASSEMBLY
2. RADIATOR HOSE CLAMP (3)
3. WATER PUMP BYPASS HOSE
4. RADIATOR SUPPORT ROD (2)
5. RADIATOR INLET HOSE
6. DEAERATION LINE HOSE ASSEMBLY
7. REDUCER
8. PIPE PLUG
9. RADIATOR ASSEMBLY
10. RADIATOR GRILLE SUPPORT BRACKET
11. HOSE CLAMP (2)
12. COOLER TO GEAR HOSE
13. COOLER TO PUMP HOSE
14. OIL COOLER ASSEMBLY
15. 90 DEGREE ELBOW
16. COOLER SUPPLY HOSE ASSEMBLY
17. INSULATOR (2)
18. FRONT CROSSMEMBER ASSEMBLY
19. HARDENED WASHER (2)
20. HEXAGON HEAD NUT (2)
21. RADIATOR OUTLET HOSE
22. COOLER RETURN HOSE ASSEMBLY
23. DRAINCOCK
24. HEXAGON HEAD SCREW (6)
25. LOCKWASHER (6)
26. HEXAGON HEAD NUT (2)
27. LOCKWASHER (2)
28. FAN CLUTCH ASSEMBLY

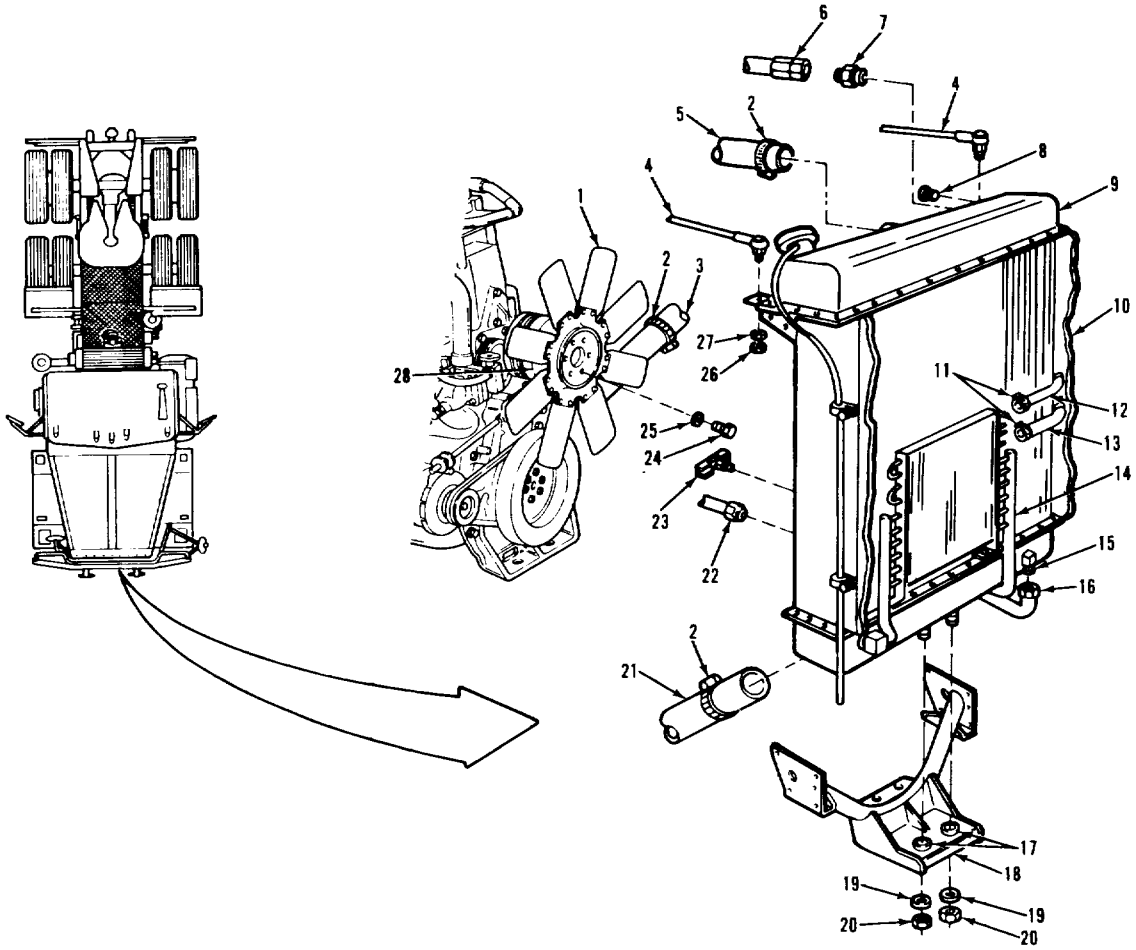
TA237111

3-53. RADIATOR REPLACEMENT (Continued)

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL		
1. Hose (12), hose (13), and two clamps (11).	a. Loosen screws on two items (11).	
	b. Pull items (12) and (13) off of item (14).	Have suitable container ready to catch oil
	c. Remove item (11) from items (12) and (13).	
	d. Pull items (12) and (13) out of item (10).	
2. Hoses (16) and hose (22).	Remove from items (14) and (15).	Have suitable container ready to catch oil.
3. Hose (6).	Remove from item (7).	
4. Hose (3), hose (5), hose (21), (2).	a. Loosen screws on three items (2). b. Pull items (3), (5), and (21) off of item (9).	Have suitable container ready to catch coolant from item (21). Leave items (2) on items (3), (5), and (21).
5. Radiator (9). lifting device. bracket.	Support with suitable radiator support rod	Use side bolt holes in
6. Two nuts (26), lockwashers (27), and rods (4).	Remove from item (9).	
7. Two nuts (20) and washers (19).	Remove from studs of item (9).	

COOLING SYSTEM.

3-53. RADIATOR REPLACEMENT (Continued).



LEGEND:

1. FAN ASSEMBLY
2. RADIATOR HOSE CLAMP (3)
3. WATER PUMP BYPASS HOSE
4. RADIATOR SUPPORT ROD (2)
5. RADIATOR INLET HOSE
6. DEAERATION LINE HOSE ASSEMBLY
7. REDUCER
8. PIPE PLUG
9. RADIATOR ASSEMBLY
10. RADIATOR GRILLE SUPPORT BRACKET
11. HOSE CLAMP (2)
12. COOLER TO GEAR HOSE
13. COOLER TO PUMP HOSE
14. OIL COOLER ASSEMBLY
15. 90 DEGREE ELBOW
16. COOLER SUPPLY HOSE ASSEMBLY
17. INSULATOR (2)
18. FRONT CROSSMEMBER ASSEMBLY
19. HARDENED WASHER (2)
20. HEXAGON HEAD NUT (2)
21. RADIATOR OUTLET HOSE
22. COOLER RETURN HOSE ASSEMBLY
23. DRAINCOCK
24. HEXAGON HEAD SCREW (6)
25. LOCKWASHER (6)
26. HEXAGON HEAD NUT (2)
27. LOCKWASHER (2)
28. FAN CLUTCH ASSEMBLY

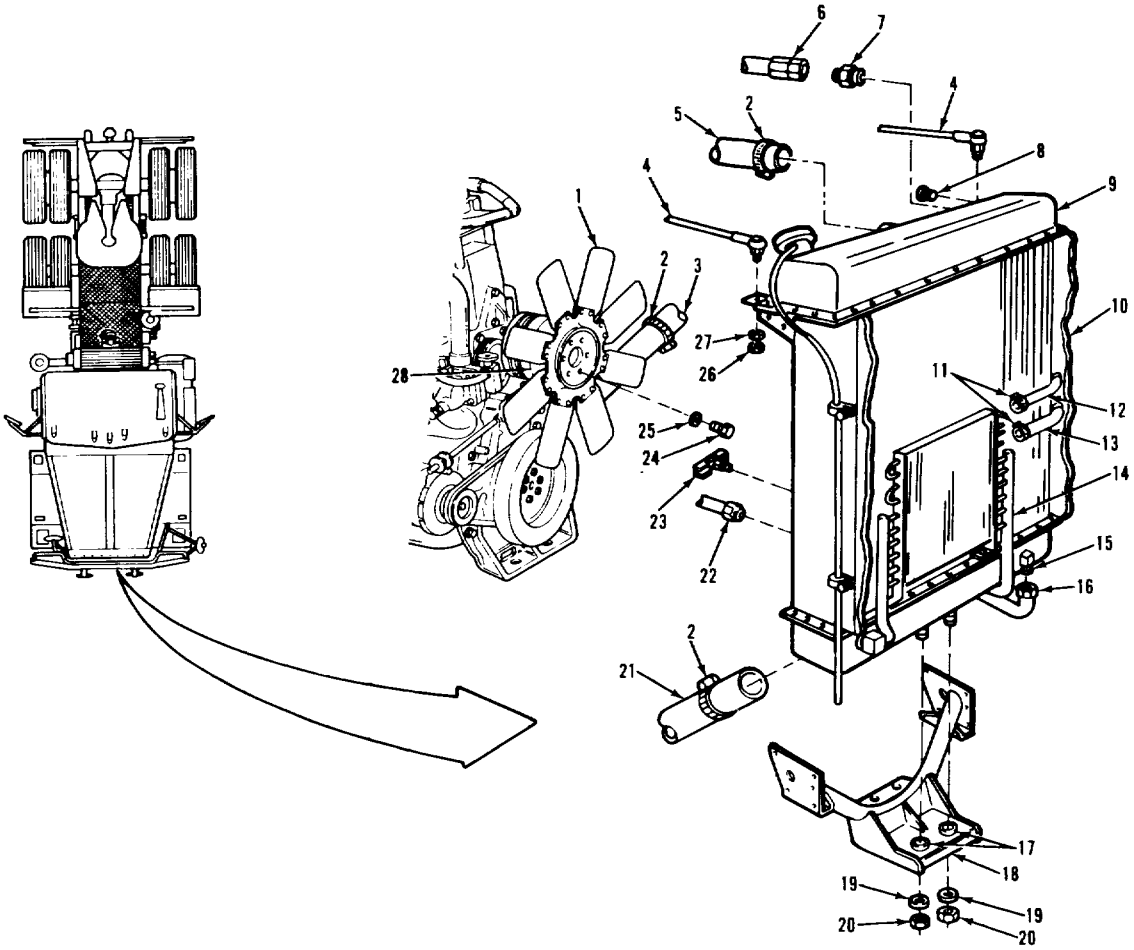
TA237112

3-53. RADIATOR REPLACEMENT (Continued)

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL (Continued).		
8. Radiator (9). forward so that item (1) can be removed.	Using lifting device, tilt	
9. Six screws (24) and lock-washers (25).	Remove from items (1) and (28).	
10. Fan (1).	Remove from item (28).	
11. Radiator (9) and two insulators (17).	Using lifting device, lift off of item (18).	Discard two items (17).
NOTE If radiator was removed for access only, skip steps 12 thru 24.		
12. Upper shroud.	Remove.	Refer to paragraph 3-56.
13. Lower shroud.	Remove.	Refer to paragraph 3-57.
14. Overflow tube.	Remove.	Refer to paragraph 3-58.
15. Transmission and steering system cooler.	Remove.	Refer to paragraph 3-55. Reinstall mounting hard-ware into item (9), and note location.
16. Two radiator grille support brackets.	Remove.	Refer to paragraph 3-268.

COOLING SYSTEM.

3-53. RADIATOR REPLACEMENT (Continued).



LEGEND:

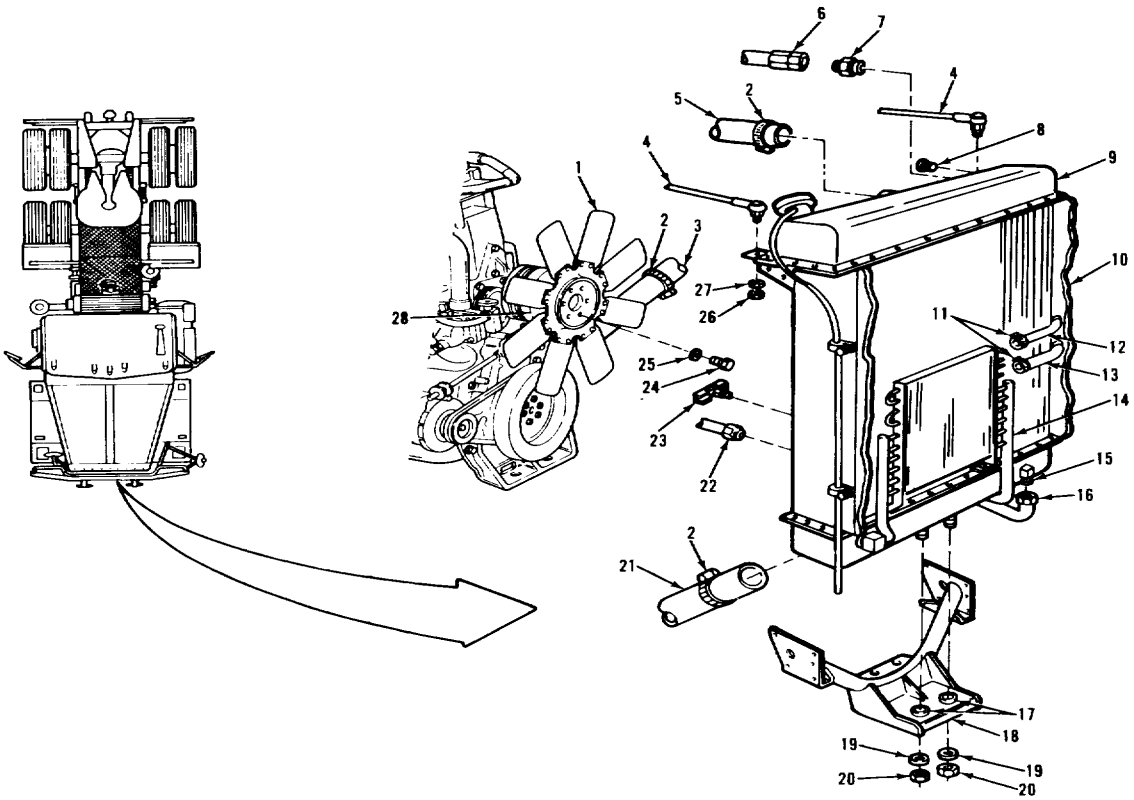
1. FAN ASSEMBLY
2. RADIATOR HOSE CLAMP (3)
3. WATER PUMP BYPASS HOSE
4. RADIATOR SUPPORT ROD (2)
5. RADIATOR INLET HOSE
6. DEAERATION LINE HOSE ASSEMBLY
7. REDUCER
8. PIPE PLUG
9. RADIATOR ASSEMBLY
10. RADIATOR GRILLE SUPPORT BRACKET
11. HOSE CLAMP (2)
12. COOLER TO GEAR HOSE
13. COOLER TO PUMP HOSE
14. OIL COOLER ASSEMBLY
15. 90 DEGREE ELBOW
16. COOLER SUPPLY HOSE ASSEMBLY
17. INSULATOR (2)
18. FRONT CROSSMEMBER ASSEMBLY
19. HARDENED WASHER (2)
20. HEXAGON HEAD NUT (2)
21. RADIATOR OUTLET HOSE
22. COOLER RETURN HOSE ASSEMBLY
23. DRAINCOCK
24. HEXAGON HEAD SCREW (6)
25. LOCKWASHER (6)
26. HEXAGON HEAD NUT (2)
27. LOCKWASHER (2)
28. FAN CLUTCH ASSEMBLY

TA237113

3-53. RADIATOR REPLACEMENT (Continued)

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL (Continued).		
17. Draincock (23), reducer (7), and plug (8).	Remove from item (9).	
B. CLEANING AND INSPECTION		
18. All parts	Clean and inspect.	Refer to paragraphs 3-4 and 3-5. If item (9) is damaged, refer to DS/GS maintenance.
C. INSTALLATION.		
19. Draincock (23), reducer (7), and plug (8).	a. Wrap with thread sealing tape. b. Install into item (9).	Refer to paragraph 3-7.
20. Two radiator grille support brackets.	Install. 3-268.	Refer to paragraph
21. Transmission and steering system cooler	Install. .	Refer to paragraph 3-55. Make sure cooler is installed in same location as it was removed.
22. Overflow tube.	Install.	Refer to paragraph 3-58.
23. Lower shroud.	Install.	Refer to paragraph 3-57.
24. Upper shroud.	Install.	Refer to paragraph 3-56.

3-53. RADIATOR REPLACEMENT (Continued).



LEGEND:

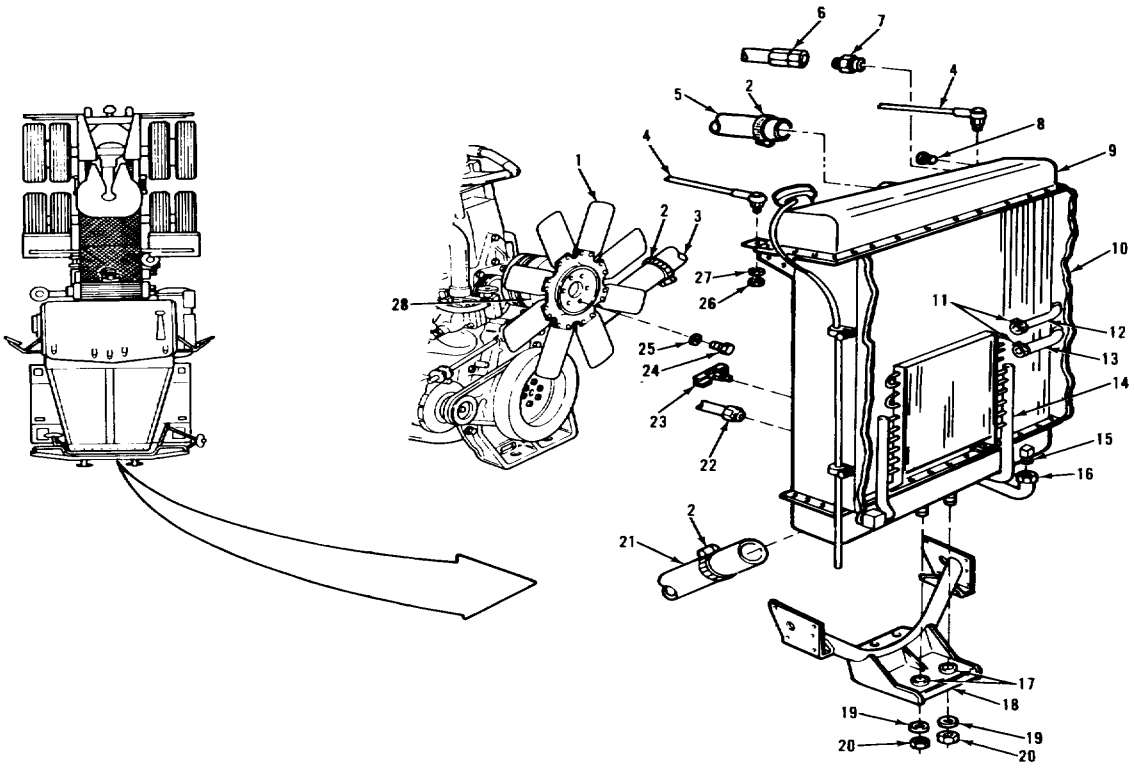
1. FAN ASSEMBLY
2. RADIATOR HOSE CLAMP (3)
3. WATER PUMP BYPASS HOSE
4. RADIATOR SUPPORT ROD (2)
5. RADIATOR INLET HOSE
6. DEAERATION LINE HOSE ASSEMBLY
7. REDUCER
8. PIPE PLUG
9. RADIATOR ASSEMBLY
10. RADIATOR GRILLE SUPPORT BRACKET
11. HOSE CLAMP (2)
12. COOLER TO GEAR HOSE
13. COOLER TO PUMP HOSE
14. OIL COOLER ASSEMBLY
15. 90 DEGREE ELBOW
16. COOLER SUPPLY HOSE ASSEMBLY
17. INSULATOR (2)
18. FRONT CROSSMEMBER ASSEMBLY
19. HARDENED WASHER (2)
20. HEXAGON HEAD NUT (2)
21. RADIATOR OUTLET HOSE
22. COOLER RETURN HOSE ASSEMBLY
23. DRAINCOCK
24. HEXAGON HEAD SCREW (6)
25. LOCKWASHER (6)
26. HEXAGON HEAD NUT (2)
27. LOCKWASHER (2)
28. FAN CLUTCH ASSEMBLY

TA237114

3-53. RADIATOR REPLACEMENT (Continued)

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued)		
25. Two new insulators (17).	Install on studs of item (9).	Use tape to hold items (17) in place.
26. Radiator (9).	a. Line up studs with holes in item (18).	
	b. Using lifting device, lower onto item (18) and tilt forward so that item (1) can be installed.	
27. Fan (1)	a. Position on item (28).	
	b. Secure with six items (24) and (25).	Torque six items (24) to 25-31 lb-ft.
28. Radiator (9).	Using lifting device, tilt back to normal position on item (18).	
29. Two nuts (20) and washers (19).	Install onto studs of item (9), and tighten.	
30. Two rods (4).	a. Install into item (9).	
	b. Secure with two nuts (26) and lockwashers (27).	
31. Radiator (9).	Remove lifting device.	
32. Hose (3), hose (5), hose (21), and three clamps (2).	a. Push items (3), (5), and (21) onto item (9).	
	b. Position items (2) on ends of items (3), (5), and (21), and tighten screws.	

3-53. RADIATOR REPLACEMENT (Continued).



LEGEND:

1. FAN ASSEMBLY
2. RADIATOR HOSE CLAMP (3)
3. WATER PUMP BYPASS HOSE
4. RADIATOR SUPPORT ROD (2)
5. RADIATOR INLET HOSE
6. DEAERATION LINE HOSE ASSEMBLY
7. REDUCER
8. PIPE PLUG
9. RADIATOR ASSEMBLY
10. RADIATOR GRILLE SUPPORT BRACKET
11. HOSE CLAMP (2)
12. COOLER TO GEAR HOSE
13. COOLER TO PUMP HOSE
14. OIL COOLER ASSEMBLY
15. 90 DEGREE ELBOW
16. COOLER SUPPLY HOSE ASSEMBLY
17. INSULATOR (2)
18. FRONT CROSSMEMBER ASSEMBLY
19. HARDENED WASHER (2)
20. HEXAGON HEAD NUT (2)
21. RADIATOR OUTLET HOSE
22. COOLER RETURN HOSE ASSEMBLY
23. DRAINCOCK
24. HEXAGON HEAD SCREW (6)
25. LOCKWASHER (6)
26. HEXAGON HEAD NUT (2)
27. LOCKWASHER (2)
28. FAN CLUTCH ASSEMBLY

TA 237115

3-53. RADIATOR REPLACEMENT (Continued)

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
33. Hose (6). on item (7).	Install onto item (7).	Use thread sealing tape
34. Hose (16) and hose (22).	Install onto items (14) and (15).	
35. Hose (12), hose (13), and two clamps (11).	a. Push items (12) and (13) through item (10). b. Put one item (11) on each item (12) or (13). c. Push items (12) and (13) onto item (14). d. Position item (11) on ends of items (12) and (13), and tighten screws.	

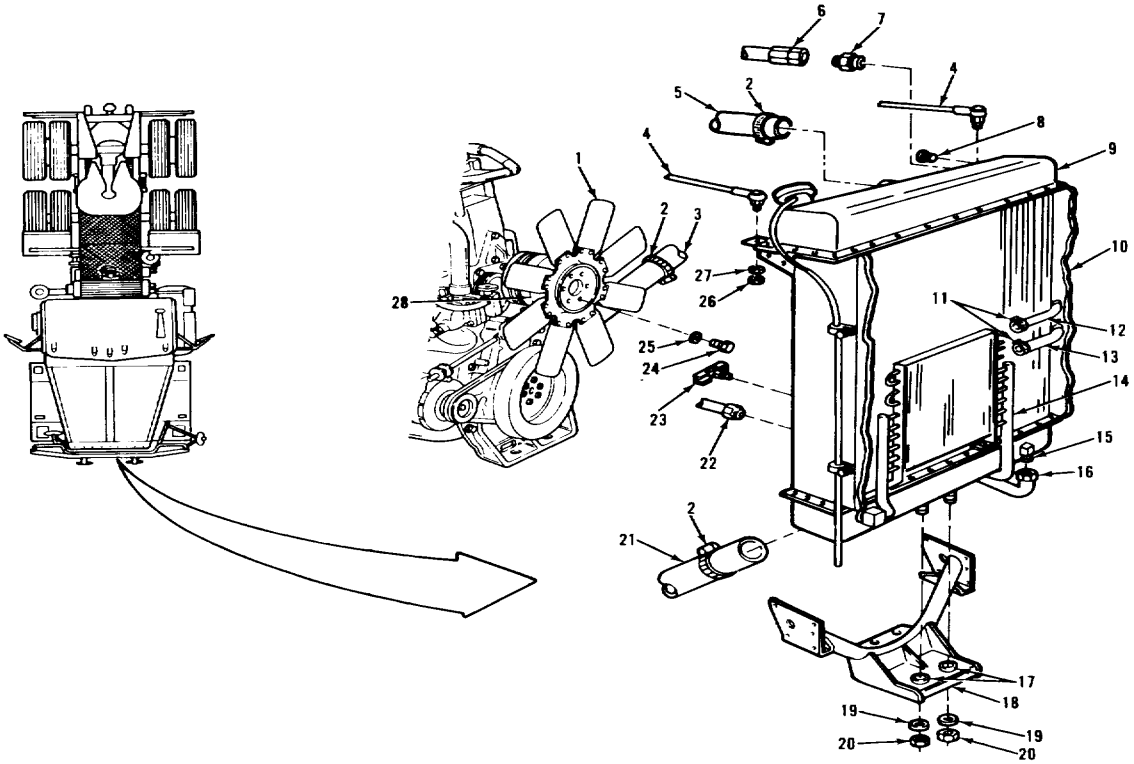
NOTE

Follow-on maintenance action required:

Install grille (para 3-268).
Install brush guard (para 3-236).
Fill cooling system (para 3-52).
Install hood (para 3-269).
Check transmission fluid level and fill as required (para 3-135).
Start vehicle and check for leaks (TM 9-2320-283-10).

COOLING SYSTEM.

3-53. RADIATOR REPLACEMENT (Continued).



LEGEND:

1. FAN ASSEMBLY
2. RADIATOR HOSE CLAMP (3)
3. WATER PUMP BYPASS HOSE
4. RADIATOR SUPPORT ROD (2)
5. RADIATOR INLET HOSE
6. DEAERATION LINE HOSE ASSEMBLY
7. REDUCER
8. PIPE PLUG
9. RADIATOR ASSEMBLY
10. RADIATOR GRILLE SUPPORT BRACKET
11. HOSE CLAMP (2)
12. COOLER TO GEAR HOSE
13. COOLER TO PUMP HOSE
14. OIL COOLER ASSEMBLY
15. 90 DEGREE ELBOW
16. COOLER SUPPLY HOSE ASSEMBLY
17. INSULATOR (2)
18. FRONT CROSSMEMBER ASSEMBLY
19. HARDENED WASHER (2)
20. HEXAGON HEAD NUT (2)
21. RADIATOR OUTLET HOSE
22. COOLER RETURN HOSE ASSEMBLY
23. DRAINCOCK
24. HEXAGON HEAD SCREW (6)
25. LOCKWASHER (6)
26. HEXAGON HEAD NUT (2)
27. LOCKWASHER (2)
28. FAN CLUTCH ASSEMBLY

TA 237116

3-53. RADIATOR REPLACEMENT (Continued)

This task covers:

a. Removal
b. Cleaning and Inspection
c. Installation

INITIAL SETUP:

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
None.

CONDITION DESCRIPTION
None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
None.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

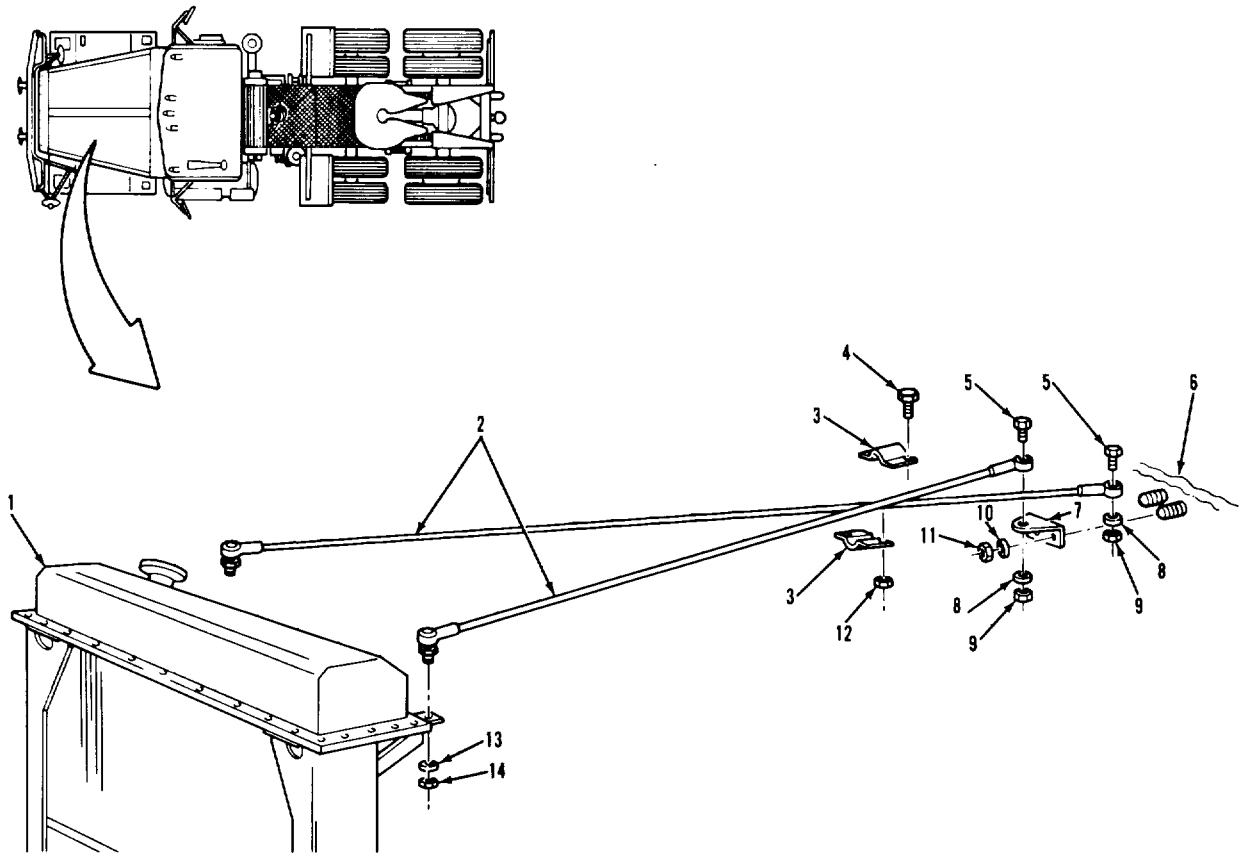
REFERENCES (TM)
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
None.

COOLING SYSTEM.

3-54. RADIATOR SUPPORT RODS REPLACEMENT (Continued).



LEGEND:

1.	RADIATOR ASSEMBLY	8.	WASHER (2)
2.	RADIATOR SUPPORT ROD (2)	9.	HEXAGON HEAD LOCKNUT (2
3.	RADIATOR SUPPORT ROD CLAMP (2)	10.	WASHER (4)
4.	HEXAGON HEAD SCREW (2)	11.	HEXAGON HEAD NUT (4)
5.	HEXAGON HEAD SCREW (2)	12	HEXAGON HEAD NUT (2)
6.	CAB	13.	LOCKWASHER (2)
7.	RADIATOR SUPPORT ROD MOUNTING BRACKET	14.	HEXAGON HEAD NUT (2)

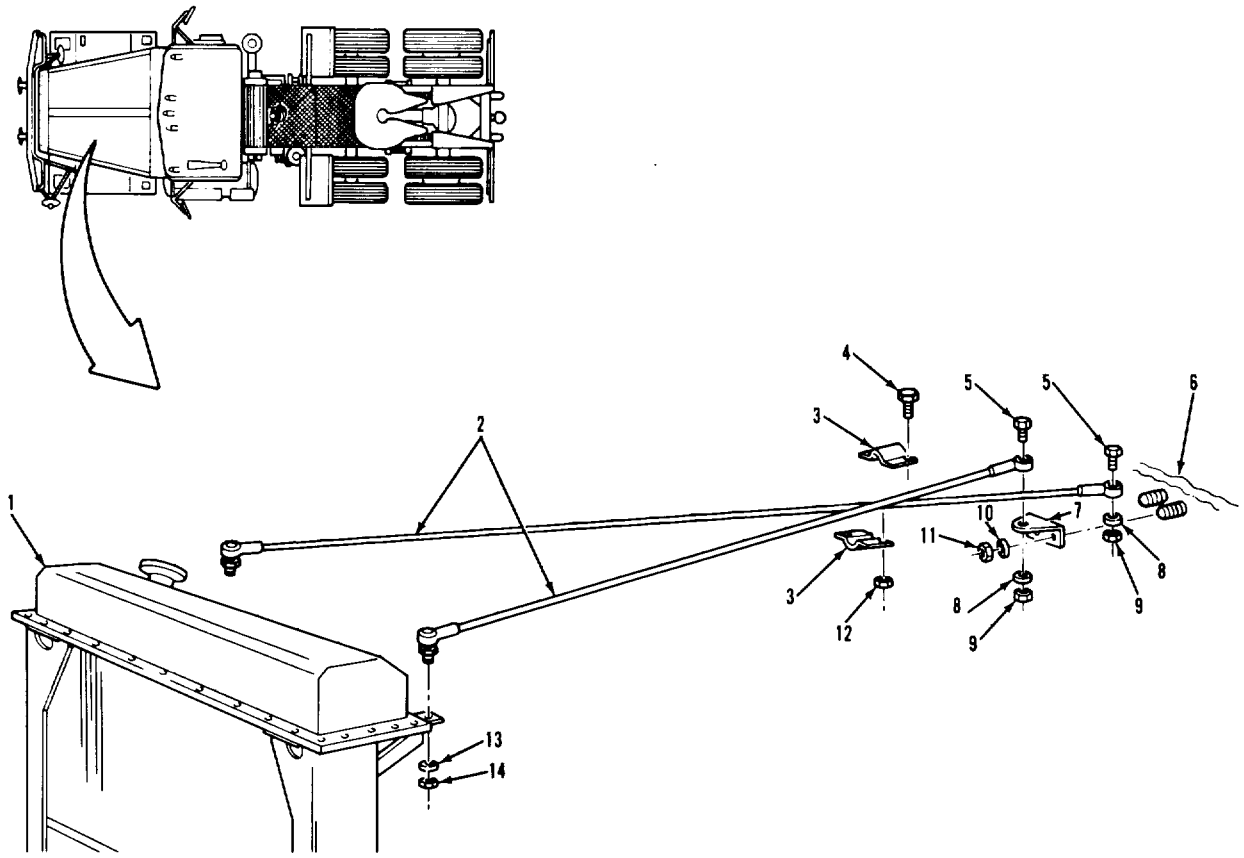
TA 297117

3-53. RADIATOR REPLACEMENT (Continued)

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Two nuts (14) and lockwashers (13).	Remove from front end of two items (2).	
2. Two nuts (9), washers (8), and screws (5).	Remove from two items (7) and rear of two items (2).	
3. Two rods (2).	Remove from items (1) and (7).	
	NOTE If support rods were removed for access only, skip steps 4 thru 8.	
4. Four nuts (11), washers (10), and two brackets (7).	Remove from item (6).	Pull insulation back as far as needed to remove two items (7).
5. Two nuts (12), screws (4), clamps (3), and rods (2).	Remove items (12) and (4), and separate items (3) and (2).	
B. CLEANING AND INSPECTION.		
6. All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
C. INSTALLATION.		
7. Two rods (2), clamps (3), screws (4), and nuts (12).	a. Hold items (2) together, and position items (3) so they are centered on items (2). b. Secure with items (4) and (12).	

COOLING SYSTEM.

3-54. RADIATOR SUPPORT RODS REPLACEMENT (Continued).



LEGEND:

1.	RADIATOR ASSEMBLY	8.	WASHER (2)
2.	RADIATOR SUPPORT ROD (2)	9.	HEXAGON HEAD LOCKNUT (20
3.	RADIATOR SUPPORT ROD CLAMP (2)	10.	WASHER (4)
4.	HEXAGON HEAD SCREW (2)	11.	HEXAGON HEAD NUT (4)
5.	HEXAGON HEAD SCREW (2)	12	HEXAGON HEAD NUT (2)
6.	CAB	13.	LOCKWASHER (2)
7.	RADIATOR SUPPORT ROD MOUNTING BRACKET	14.	HEXAGON HEAD NUT (2)

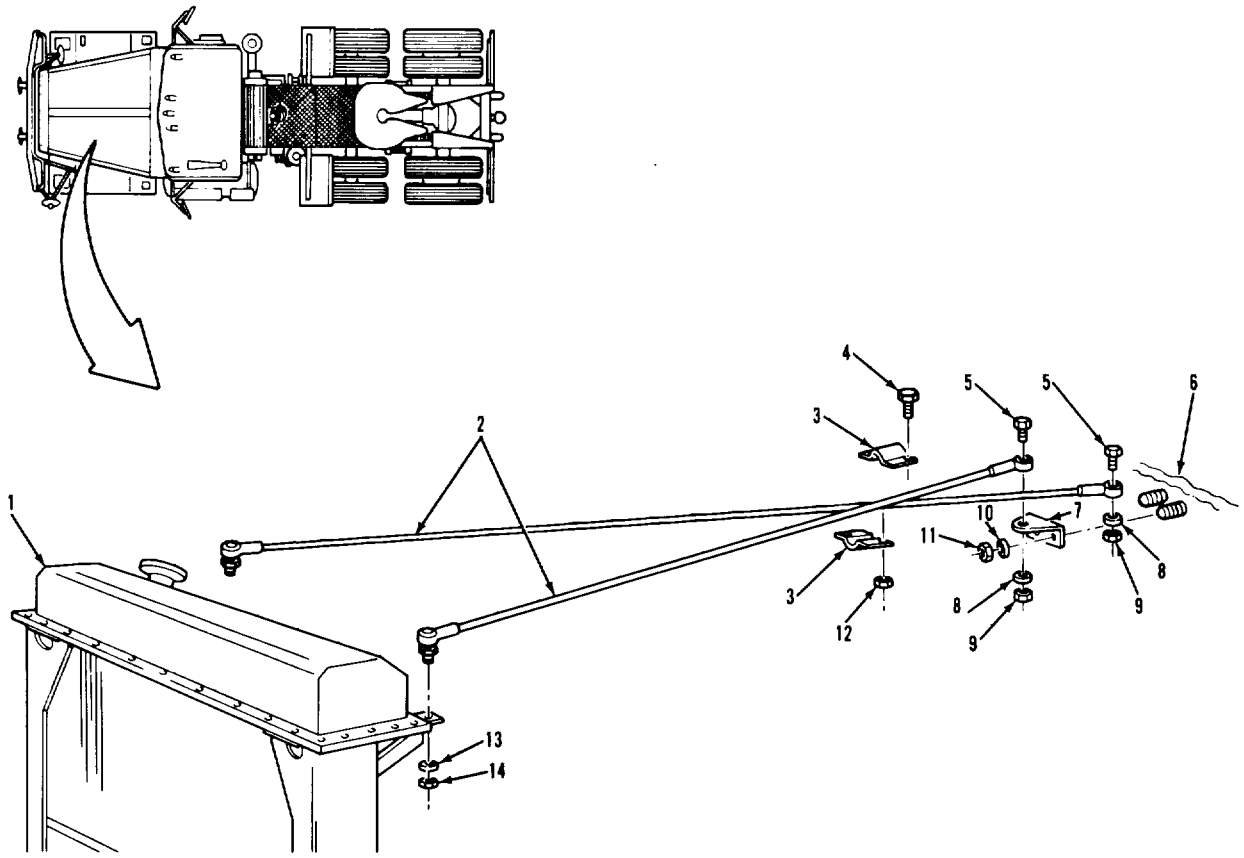
TA 297118

3-54. RADIATOR SUPPORT RODS REPLACEMENT (Continued)

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
8. Two brackets (7).	a. Place on studs of item (6).	
	b. Secure with four items (11) and (10).	
9. Two rods (2).	a. Place on two items (7) and in bracket of item (1).	
	b. Secure rear with two items (5), (8), and (9).	
	c. Secure front with two items (13) and (14).	
	NOTE Follow-on maintenance action required: None.	

COOLING SYSTEM.

3-54. RADIATOR SUPPORT RODS REPLACEMENT (Continued).



LEGEND:

1.	RADIATOR ASSEMBLY	8.	WASHER (2)
2.	RADIATOR SUPPORT ROD (2)	9.	HEXAGON HEAD LOCKNUT (20
3.	RADIATOR SUPPORT ROD CLAMP (2)	10.	WASHER (4)
4.	HEXAGON HEAD SCREW (2)	11.	HEXAGON HEAD NUT (4)
5.	HEXAGON HEAD SCREW (2)	12	HEXAGON HEAD NUT (2)
6.	CAB	13.	LOCKWASHER (2)
7.	RADIATOR SUPPORT ROD MOUNTING BRACKET	14.	HEXAGON HEAD NUT (2)

TA 297119

3-55 TRANSMISSION AND STEERING SYSTEM COOLER REPLACEMENT.

This task covers:

a. **Removal**
b. **Cleaning and Inspection**
c. **Installation**

INITIAL SETUP:

APPLICABLE CONFIGURATIONS
All.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
None.

PERSONNEL REQUIRED
One (MOS-63S

REFERENCES (TM)
TM 9-2320-283-10.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

EQUIPMENT CONDITION

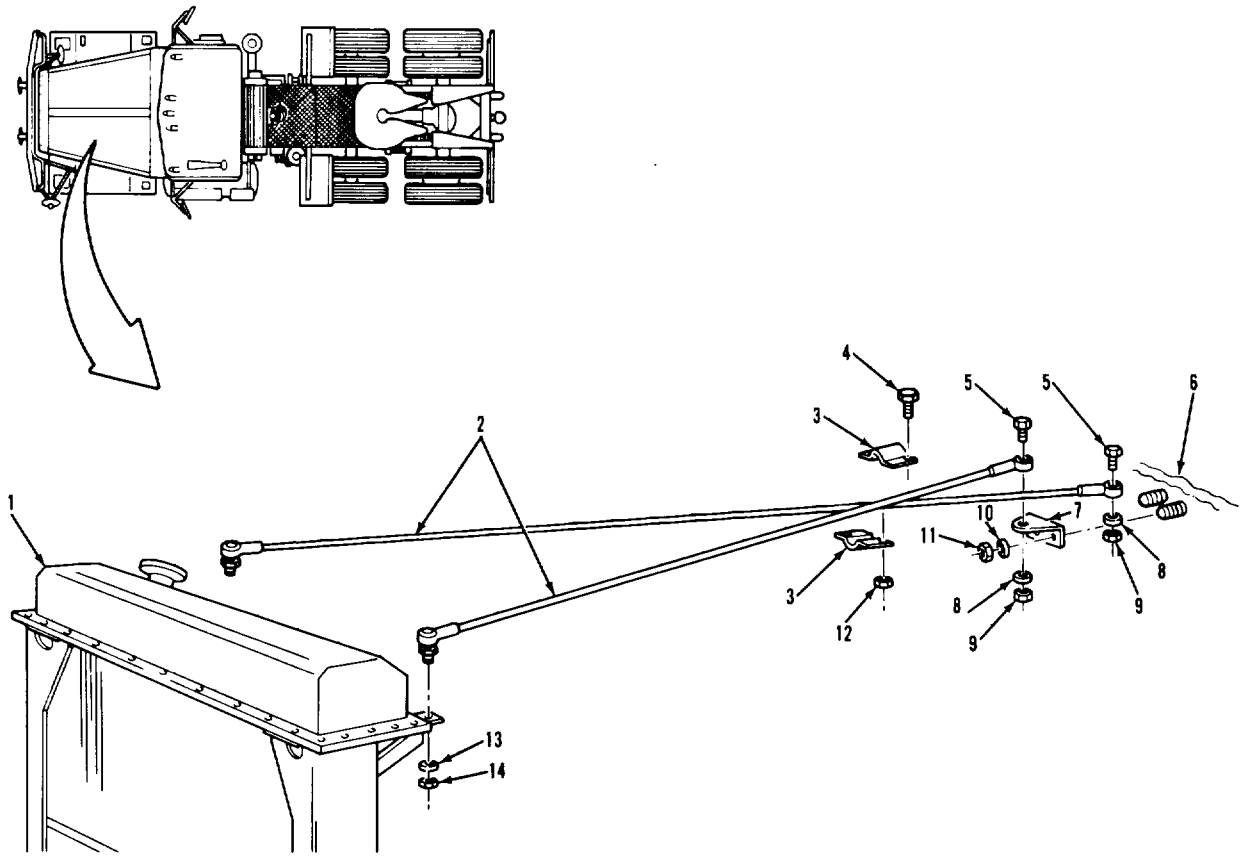
PARAGRAPH	CONDITION DESCRIPTION
3-236.	Brush guard removed.
3-268.	Grille removed
3-237.	Bumper removed.

SPECIAL ENVIRONMENTAL CONDITIONS
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.
Wait until transmission and steering fluids are cool.

COOLING SYSTEM.

3-53. TRANSMISSION AND STEERING SYSTEM COOLER REPLACEMENT (Continued).



LEGEND:

1.	RADIATOR ASSEMBLY	8.	WASHER (2)
2.	RADIATOR SUPPORT ROD (2)	9.	HEXAGON HEAD LOCKNUT (20
3.	RADIATOR SUPPORT ROD CLAMP (2)	10.	WASHER (4)
4.	HEXAGON HEAD SCREW (2)	11.	HEXAGON HEAD NUT (2)
5.	HEXAGON HEAD SCREW (2)	12	HEXAGON HEAD NUT (2)
6.	CAB	13.	LOCKWASHER (2)
7.	RADIATOR SUPPORT ROD MOUNTING BRACKET	14.	HEXAGON HEAD NUT (2)

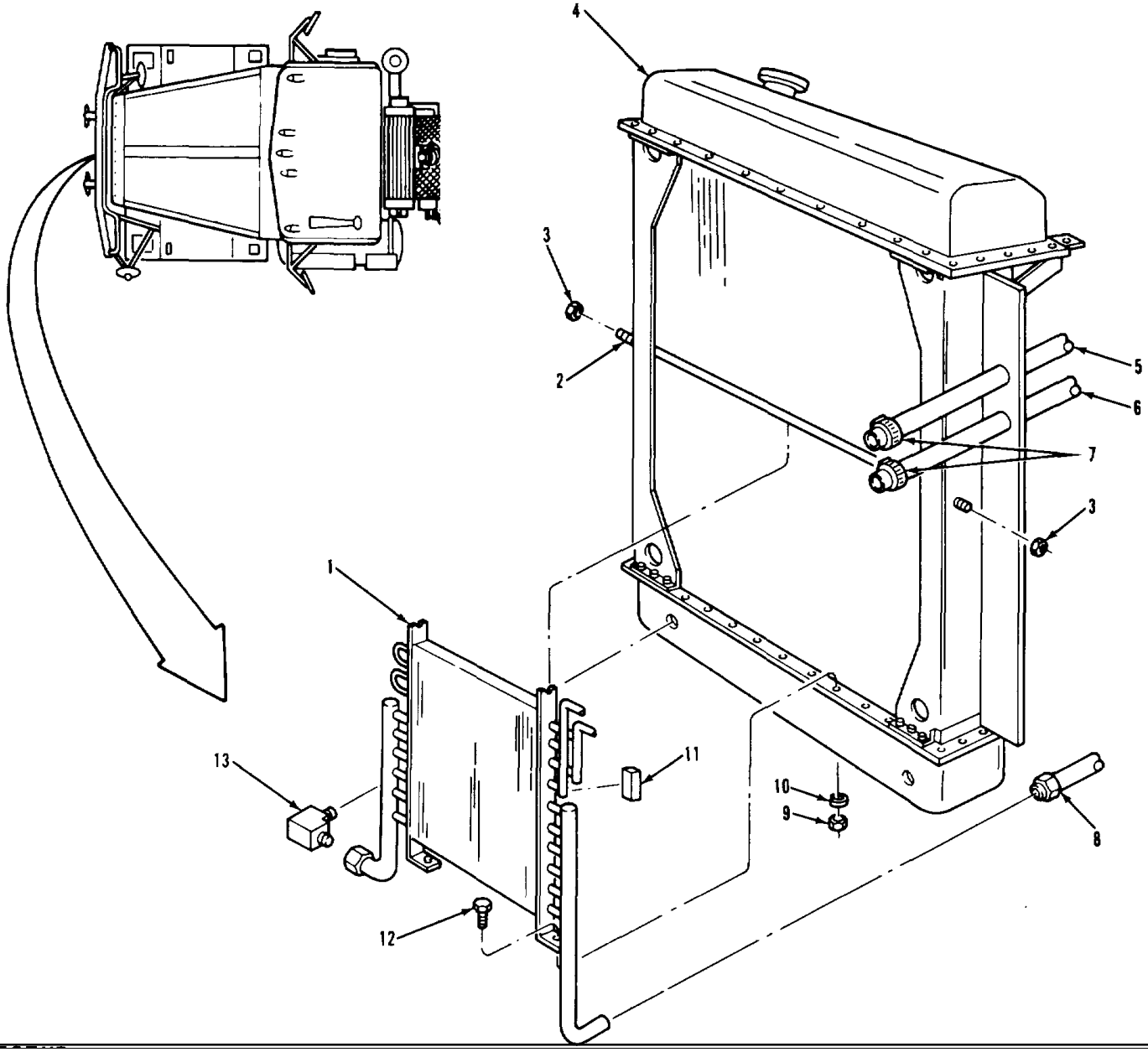
TA 297120

3-53. RADIATOR REPLACEMENT (Continued)

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Hose (5), hose (6), and two clamps (7).	a. Loosen screws on two items (7). b. Pull items (5) and (6) off of item (1).	Have suitable container ready to catch oil. Leave items (7) on items (5) and (6).
2. Hose (8).	Remove from item (1).	Have suitable container ready to catch oil.
3. Two nuts (9), lock-washers (10), and screws (12).	Remove from items (4) and (1).	
4. Rod (2) and two nuts (3).	a. Unscrew item (3) on right side of item (2) while pulling item (2) out of item (4). b. Remove other item (3) from item (2).	
5. Two dampers (11).	Remove from item (1).	
6. Cooler (1).	a. Remove from item (13). b. Pull bottom away from item (4).	
7. Elbow (13).	Remove from item (4).	
8. Left side radiator grille support bracket.	Remove.	Refer to paragraph 3-268.

COOLING SYSTEM.

3-55. TRANSMISSION AND STEERING SYSTEM COOLER REPLACEMENT (Continued).



LEGEND:

1.	RADIATOR ASSEMBLY	8.	WASHER (2)
2.	RADIATOR SUPPORT ROD (2)	9.	HEXAGON HEAD LOCKNUT (20
3.	RADIATOR SUPPORT ROD CLAMP (2)	10.	WASHER (4)
4.	HEXAGON HEAD SCREW (2)	11.	HEXAGON HEAD NUT (2)
5.	HEXAGON HEAD SCREW (2)	12	HEXAGON HEAD NUT (2)
6.	CAB	13.	LOCKWASHER (2)
7.	RADIATOR SUPPORT ROD MOUNTING BRACKET	14.	HEXAGON HEAD NUT (2)

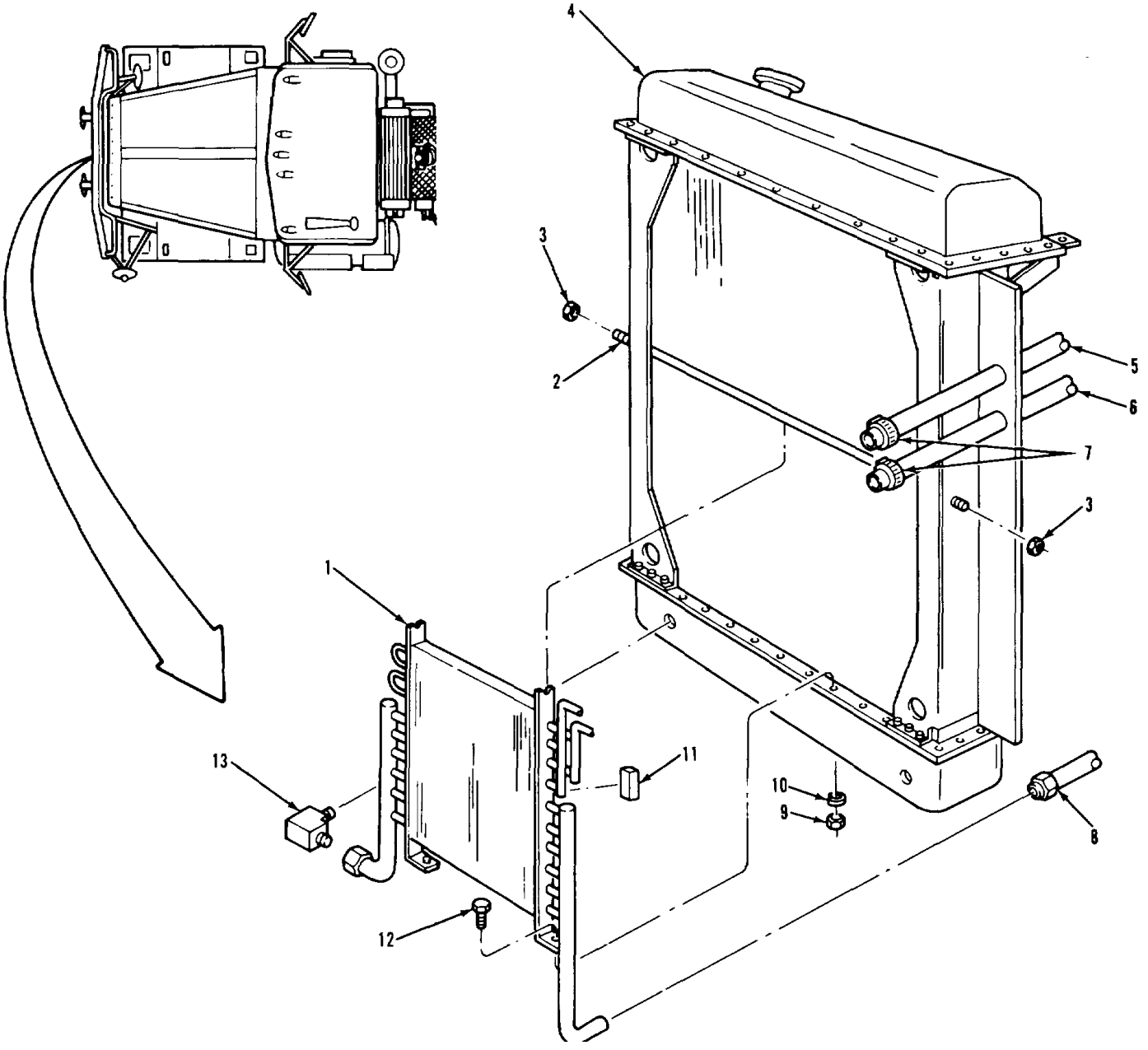
TA 297117

3-53. RADIATOR REPLACEMENT (Continued)

LOCATION/ITEM		ACTION	REMARKS
B.	CLEANING AND INSPECTION.		
9.	All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
10.	Cooler (1).	Inspect for leaks, broken fins, and other damage.	Discard if leaking or damaged.
C.	INSTALLATION		
11.	Left side radiator grill support bracket.	Install.	Refer to paragraph 3-268.
12.	Elbow (13).	Install into item (4).	
13.	Two dampers (11).	Install onto item (1).	
14.	Cooler (1). (4).	a. Position bottom on item	
		b. Install onto item (13).	
		c. Secure to item (4) with two items (12), (10), and (9).	
15.	Rod (2).	a. Install in item (4) and on item (1).	
		b. Secure in place with two items (3).	When properly installed, item (2) should stick out past two items (3) the same amount on both sides.

COOLING SYSTEM.

3-55. TRANSMISSION AND STEERING COOLER SYSTEM REPLACEMENT (Continued).



LEGEND:

1.	RADIATOR ASSEMBLY	8.	WASHER (2)
2.	RADIATOR SUPPORT ROD (2)	9.	HEXAGON HEAD LOCKNUT (20
3.	RADIATOR SUPPORT ROD CLAMP (2)	10.	WASHER (4)
4.	HEXAGON HEAD SCREW (2)	11.	HEXAGON HEAD NUT (2)
5.	HEXAGON HEAD SCREW (2)	12	HEXAGON HEAD NUT (2)
6.	CAB	13.	LOCKWASHER (2)
7.	RADIATOR SUPPORT ROD MOUNTING BRACKET	14.	HEXAGON HEAD NUT (2)

TA 297122

3-55. TRANSMISSION AND STEERING COOLER SYSTEM REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
16. Hose (8).	Install onto item (1).	
17. Hose (5), hose (6), and two clamps (7).	a. Push items (5) and (6) onto item (1). b. Position items (7) on ends of items (5) and (6), and tighten screws.	

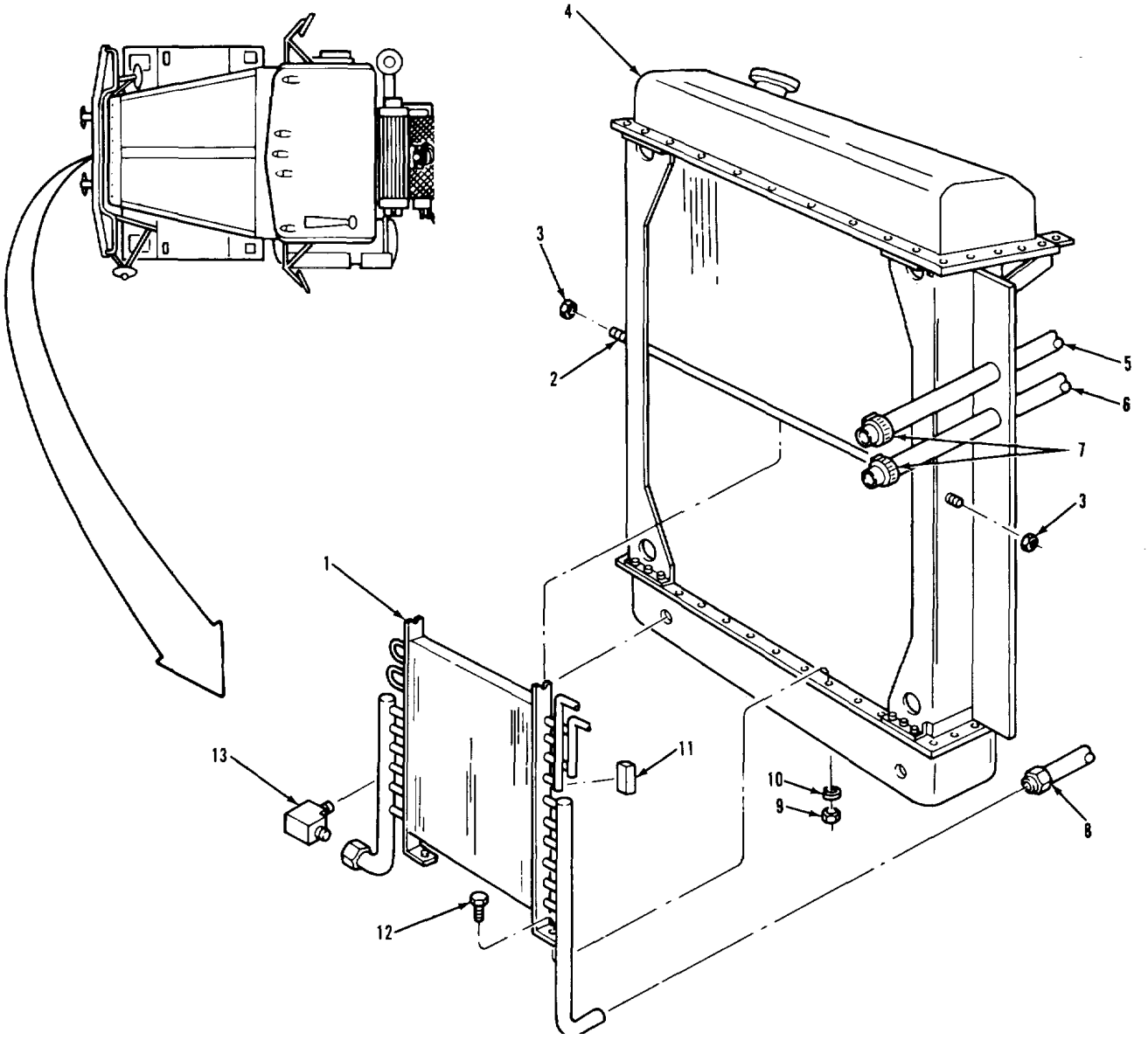
NOTE

Follow-on maintenance action required:

Install bumper (para 3-237).
Install grille (para 3-268).
Install brush guard (para 3-236).
Start vehicle and check for leaks (TM 9-2320-283-10).

COOLING SYSTEM.

3-55 RADIATOR REPLACEMENT (Continued).



LEGEND:

1.	RADIATOR ASSEMBLY	8.	WASHER (2)
2.	RADIATOR SUPPORT ROD (2)	9.	HEXAGON HEAD LOCKNUT (20
3.	RADIATOR SUPPORT ROD CLAMP (2)	10.	WASHER (4)
4.	HEXAGON HEAD SCREW (2)	11.	HEXAGON HEAD NUT (2)
5.	HEXAGON HEAD SCREW (2)	12	HEXAGON HEAD NUT (2)
6.	CAB	13.	LOCKWASHER (2)
7.	RADIATOR SUPPORT ROD MOUNTING BRACKET	14.	HEXAGON HEAD NUT (2)

TA 297123

3-56. UPPER FAN SHROUD REPLACEMENT (Continued)

This task covers:

a. Removal
b. Cleaning and Inspection
c. Installation

INITIAL SETUP:

APPLICABLE CONFIGURATIONS
All.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Tape, thread sealing
Item 32, Appendix C.

PERSONNEL REQUIRED
One (MOS-63S5

REFERENCES (TM)
TM 9-2320-283-10.

TROUBLESHOOTING REFERENCES
None.

EQUIPMENT CONDITION

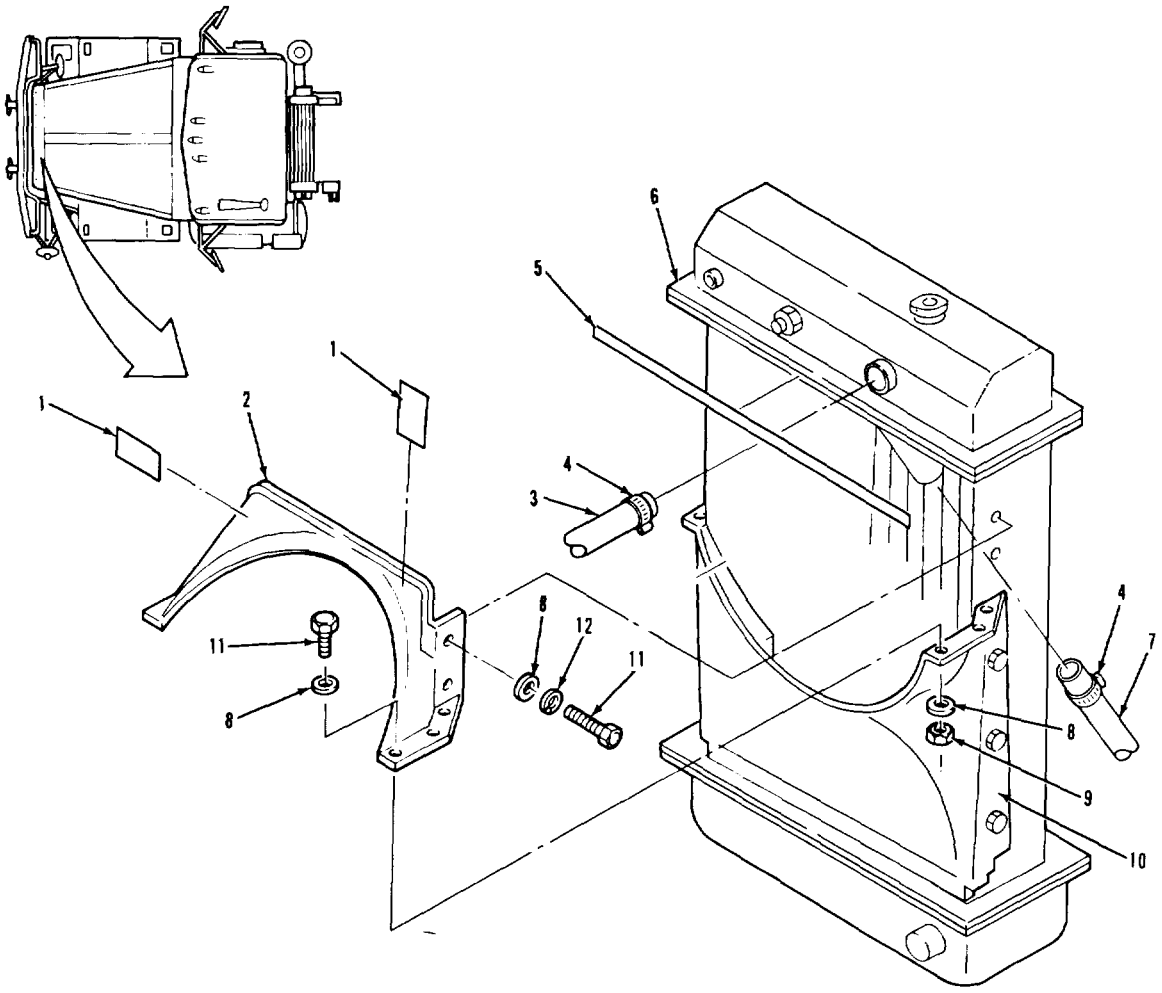
PARAGRAPH	CONDITION DESCRIPTION
3-52.	Coolant drained below level of radiator top tank.
3-58.	Deaeration line removed.

SPECIAL ENVIRONMENTAL CONDITIONS
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

COOLING SYSTEM.

3-56. UPPER FAN SHROUD REPLACEMENT (Continued).



LEGEND:

1. DECAL (2)
2. UPPER SHROUD
3. RADIATOR INLET HOSE
4. RADIATOR HOSE CLAMP (2)
5. UPPER RADIATOR FAN SHROUD SEAL
6. RADIATOR ASSEMBLY
7. WATER PUMP BYPASS HOSE
8. FLAT WASHER (16)
9. HEXAGON HEAD NUT (6)
10. LOWER SHROUD
11. SCREW (10)
12. LOCKWASHER (4)

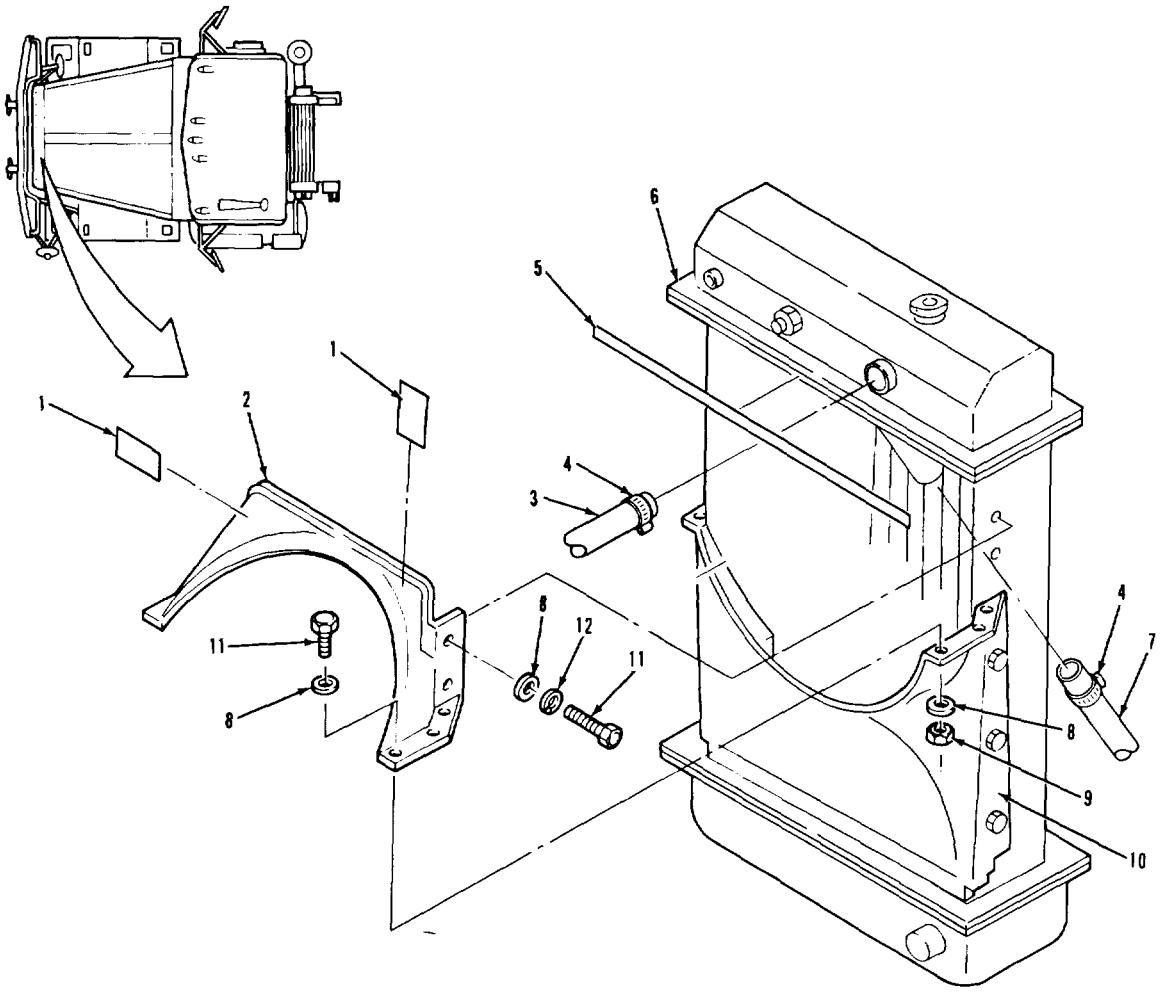
TA 237124

3-56. UPPER FAN SHROUD REPLACEMENT (Continued)

LOCATION	ACTION	REMARKS
A. REMOVAL.		
1. Hose (3), hose (7), and two clamps (4).	a. Loosen screws on two items (4). b. Pull items (3) and (7) from item (6).	Leave items (4) on items (3) and (7).
2. Four screws (11), lockwashers (12), and washers (8).	Remove from items (2) and (6).	
3. Six nuts (9), twelve washers (8), and six screws (11).	Remove from items (2) and (10).	
4. Shroud (2).	Remove from engine compartment.	Be careful not to bend item (2) too much during removal, or cracks could occur. It may be necessary to completely remove item (3) before removing item (2).
B. CLEANING AND INSPECTION.		
5. All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
6. Seal (5) and two decals (1)	Inspect for damage.	Remove and replace only if damaged.
C. INSTALLATION.		
7. Shroud (2).	a. Install into engine compartment and put into position on items (6) and (10).	Be careful not to bend item (2) too much during installation, or cracks could occur.

COOLING SYSTEM.

3-56. UPPER FAN SHROUD REPLACEMENT (Continued).



LEGEND:

1. DECAL (2)
2. UPPER SHROUD
3. RADIATOR INLET HOSE
4. RADIATOR HOSE CLAMP (2)
5. UPPER RADIATOR FAN SHROUD SEAL
6. RADIATOR ASSEMBLY
7. WATER PUMP BYPASS HOSE
8. FLAT WASHER (16)
9. HEXAGON HEAD NUT (6)
10. LOWER SHROUD
11. SCREW (10)
12. LOCKWASHER (4)

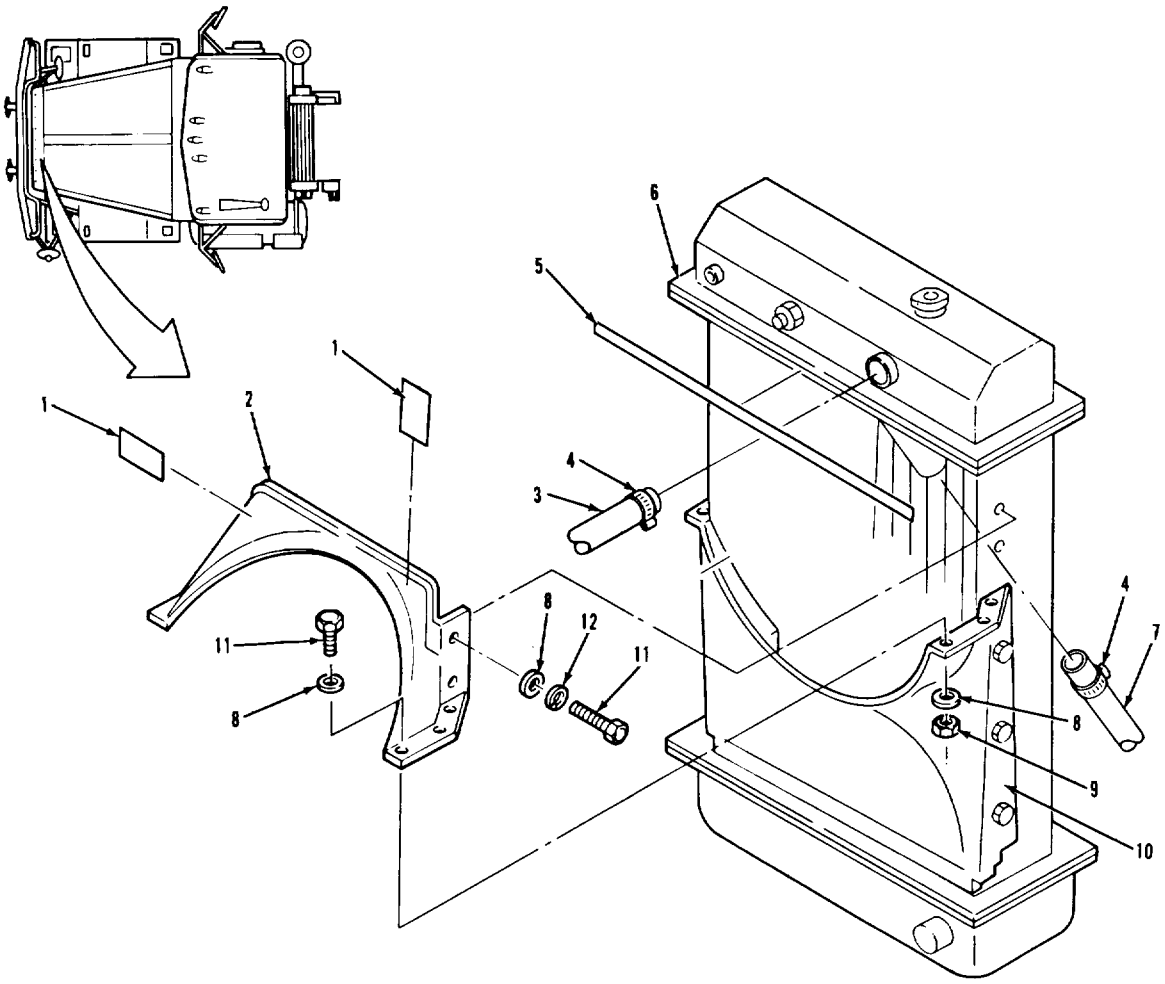
TA 237125

3-53. UPPER FAN SHROUD REPLACEMENT (Continued)

LOCATION	ACTION	REMARKS
C. INSTALLATION (Continued).		
8. Shroud (2) (continued).	b. Secure to item (10) with six items (11), twelve items (8), and six items (9). c. Secure to item (6) with four items (11), (12), and (8).	
9. Hose (3), hose (7), and two clamps (4).	a. Push items (3) and (7) onto item (6).	Install other end of item (3) to thermostat housing if removed during step 4.
	b. Position items (4) on end of items (3) and (7), and tighten screws.	
	NOTE Follow-on maintenance action required: Install deaeration line (para 3-58). Fill cooling system (para 3-52). Start vehicle and check for leaks (TM 9-2320-283-10).	

COOLING SYSTEM.

3-56. UPPER FAN SHROUD REPLACEMENT (Continued).



LEGEND:

1. DECAL (2)
2. UPPER SHROUD
3. RADIATOR INLET HOSE
4. RADIATOR HOSE CLAMP (2)
5. UPPER RADIATOR FAN SHROUD SEAL
6. RADIATOR ASSEMBLY
7. WATER PUMP BYPASS HOSE
8. FLAT WASHER (16)
9. HEXAGON HEAD NUT (6)
10. LOWER SHROUD
11. SCREW (10)
12. LOCKWASHER (4)

COOLING SYSTEM.

3-57. LOWER FAN SHROUD REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS	EQUIPMENT CONDITION PARAGRAPH	CONDITION DESCRIPTION
All.	3-53.	Radiator removed.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
None.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

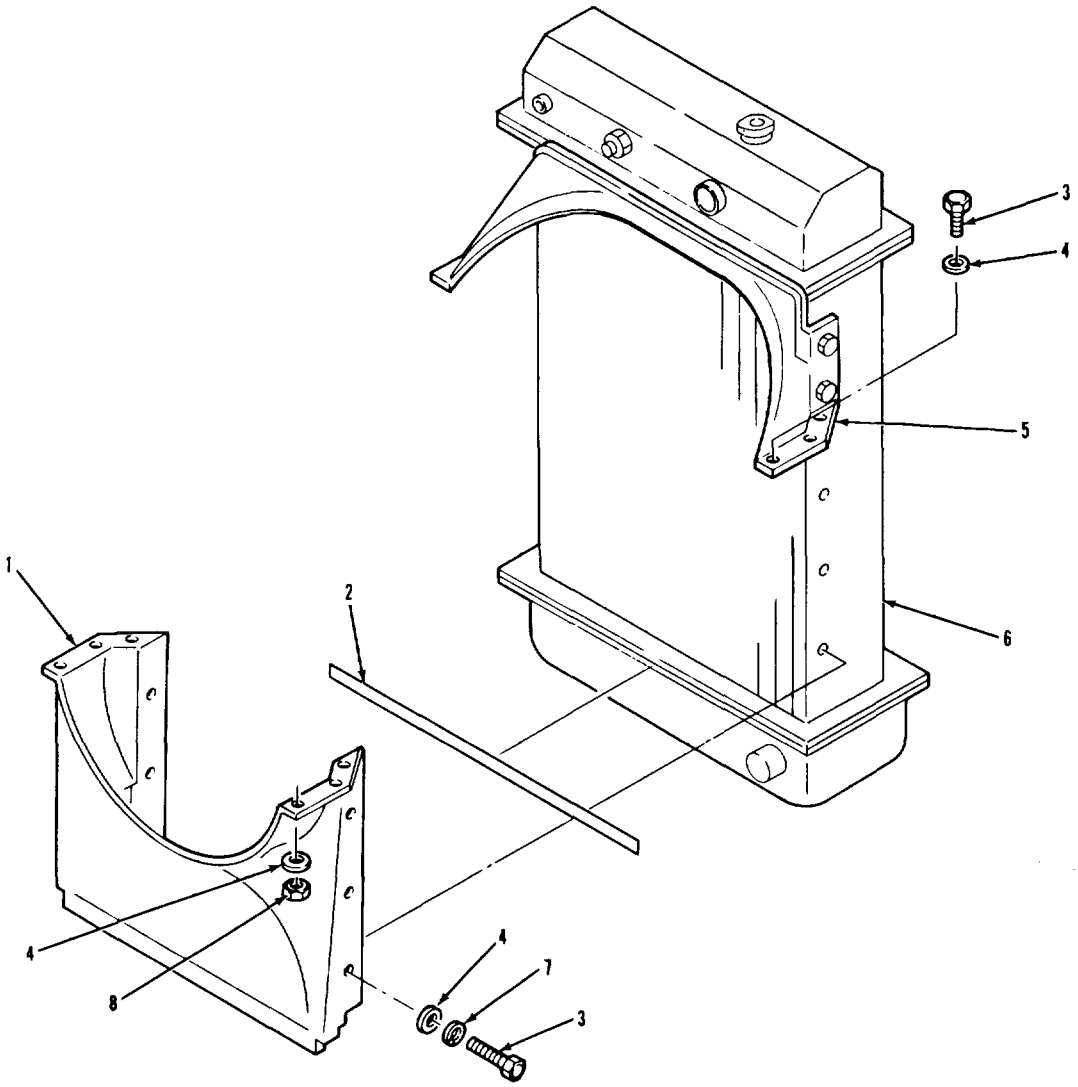
REFERENCES (TM)
None.
Transmission in neutral.
Park brake set.

GENERAL SAFETY INSTRUCTIONS
Engine off.

TROUBLESHOOTING REFERENCES
None.

COOLING SYSTEM.

3-57. LOWER FAN SHROUD REPLACEMENT (Continued).



LEGEND:

1. LOWER SHROUD
2. LOWER RADIATOR FAN SHROUD SEAL
3. SCREW (12)
4. FLAT WASHER (18)
5. UPPER SHROUD
6. RADIATOR ASSEMBLY
7. LOCKWASHER (6)
8. HEXAGON HEAD NUT (6)

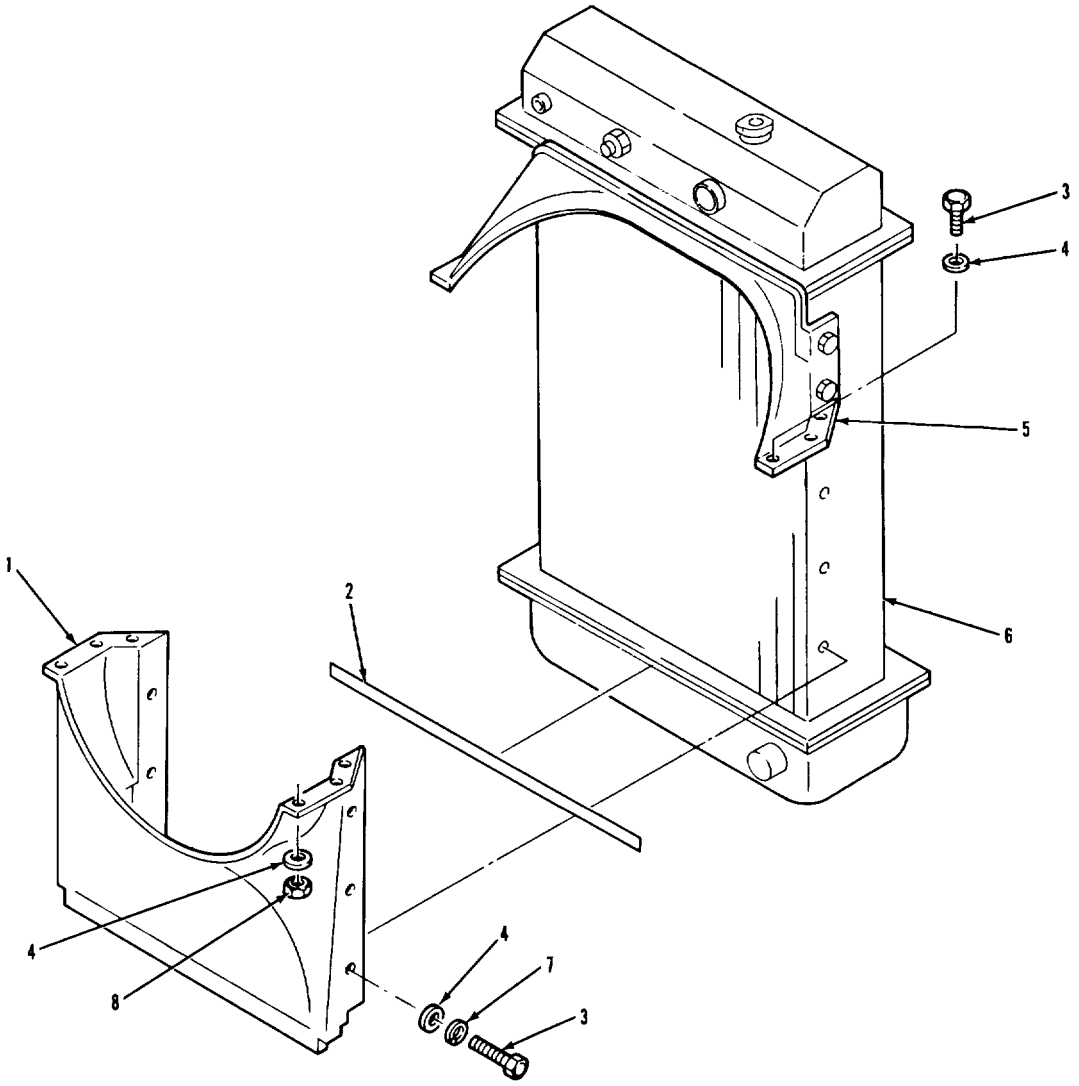
COOLING SYSTEM.

3-57. LOWER FAN SHROUD REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Six nuts (8), twelve washers (4), and six screws (3).	Remove from items (1) and (5).	
2. Six screws (3), lockwashers (7), and washers (4).	Remove from items (1) and (6).	
3. Shroud (1).	Remove from items (5) and (6).	
B. CLEANING AND INSPECTION.		
4. All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
5. Seal (2)	Inspect for damage.	Remove and replace only if damaged.
C. INSTALLATION.		
6. Shroud (1).	a. Position on items (5) and (6). b. Secure to item (6) with six items (3), (7), and (4). c. Secure to item (5) with six items (3), twelve items (4), and six items (8).	
	NOTE Follow-on maintenance action required: Install radiator (para 3-53).	

COOLING SYSTEM.

3-57. LOWER FAN SHROUD REPLACEMENT (Continued).



LEGEND:

1. LOWER SHROUD
2. LOWER RADIATOR FAN SHROUD SEAL
3. SCREW (12)
4. FLAT WASHER (18)
5. UPPER SHROUD
6. RADIATOR ASSEMBLY
7. LOCKWASHER (6)
8. HEXAGON HEAD NUT (6)

COOLING SYSTEM.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.
d. Water Pump Bypass Hose Replacement.
e. Overflow Tube Replacement.
f. Radiator Outlet Hoses and Tube Replacement.
g. Water Bypass Tube Replacement.
h. Water Transfer Tube Replacement.
i. Water Pump to Radiator Connection Replacement

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
None.

CONDITION DESCRIPTION
None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Tape, thread sealing (subparagraph b, d, g, and i only)
Item 32, Appendix C.
Oil, lubricating: OE/HDO-30 (subparagraph g and h only)
Item 16, Appendix C.
Grease, automotive and artillery (subparagraph i only)
Item 7, Appendix C.
O-ring (subparagraph g only)
(15434) 43463-A.
O-ring (2) (subparagraph h only)
(15434) 212161.
Gasket, water connection (subparagraph i only)
(15434) 3024960.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

REFERENCES (TM)
TM 9-2320-283-10.
TM 9-2320-283-20P.

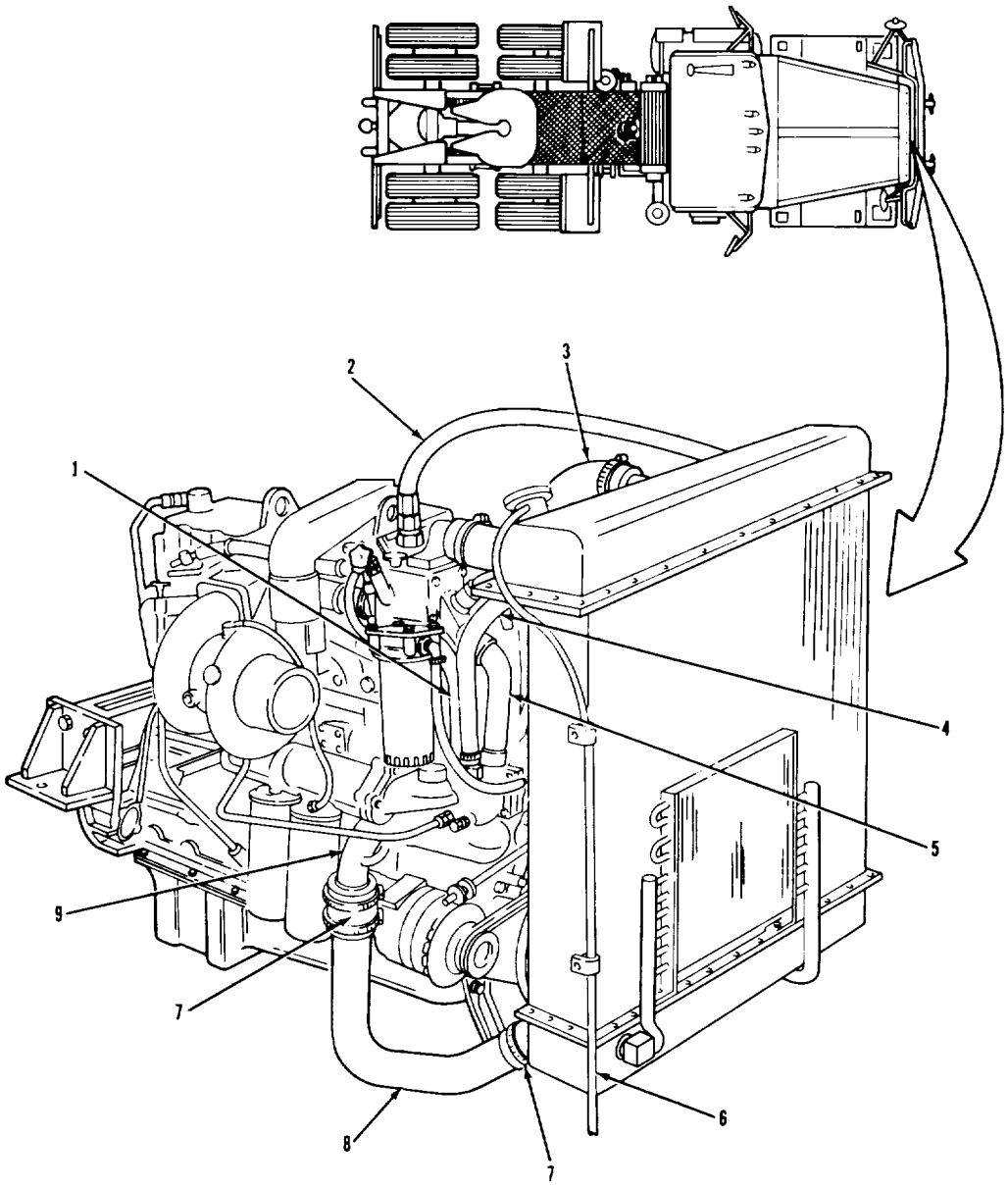
GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

Wait until cooling system components are cool.

COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).



LEGEND

1. WATER TRANSFER TUBE
2. DEAERATION LINE HOSE ASSEMBLY
3. RADIATOR INLET HOSE
4. WATER PUMP BYPASS HOSE
5. WATER BYPASS TUBE
6. OVERFLOW TUBE
7. RADIATOR OUTLET HOSE (2)
8. RADIATOR OUTLET TUBE
9. WATER PUMP TO RADIATOR CONNECTION

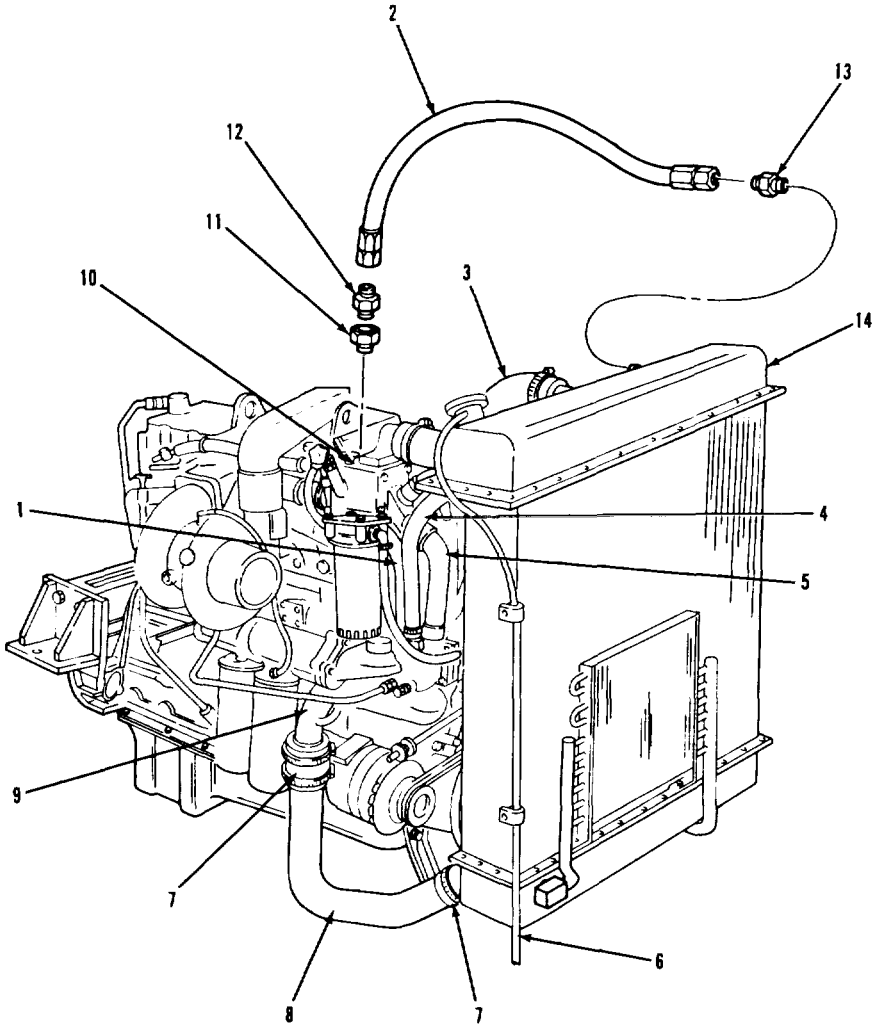
COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
A.	INSPECTION.		
1.	All hoses and tubes (1) thru (9)	Inspect for leaks, cracks, kinks, stains, and other damage	If any item (1) thru (9) is damaged, do the following:
		a.	Drain coolant to level below damaged part.
		b.	Replace damaged part as shown in subparagraphs b thru i.
		c.	Go to follow-on maintenance.
B.	DEAERATION LINE REPLACEMENT.		
2.	Hose (2)	Remove from items (12) and (13).	
3.	Reducer (13)	Remove from item (14).	
4.	Reducer (12) and connector (11)	Remove from item (10) and separate.	
5.	All parts	Clean and inspect	Refer to paragraphs 3-4 and 3-5.
6.	Reducer (12) and connector (11)	a. Wrap threads with thread sealing tape.	Refer to paragraph 3-7.
		b. Screw together and install into item (10).	
7.	Reducer (13)	a. Wrap threads with thread sealing tape.	
		b. Screw into item (14).	
8.	Hose (2)	Install on items (12) and (13).	

COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).



LEGEND:

1. WATER TRANSFER TUBE
2. DEAERATION LINE HOSE ASSEMBLY
3. RADIATOR INLET HOSE
4. WATER PUMP BYPASS HOSE
5. WATER BYPASS TUBE
6. OVERFLOW TUBE
7. RADIATOR OUTLET HOSE (2)
8. RADIATOR OUTLET TUBE
9. WATER PUMP TO RADIATOR CONNECTION
10. FRONT WATER MANIFOLD
11. REDUCER
12. MALE CONNECTOR
13. REDUCER
14. RADIATOR ASSEMBLY

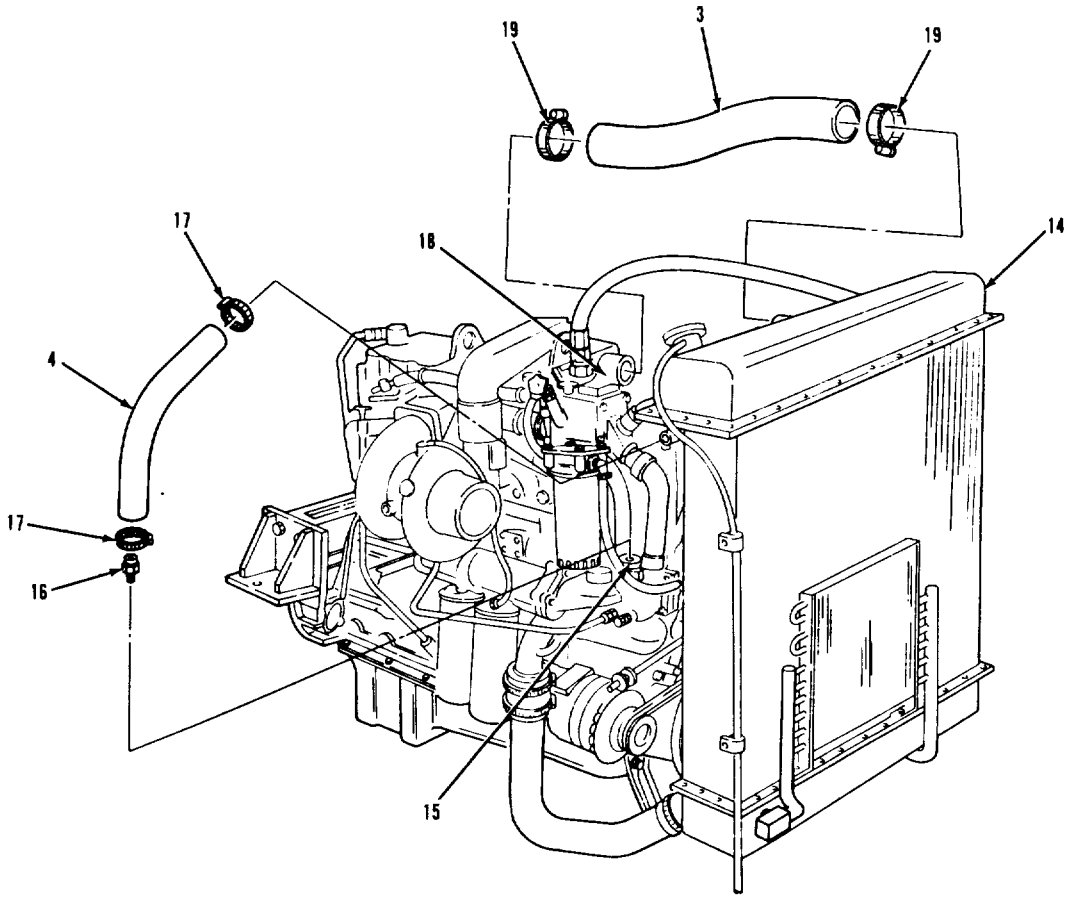
COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
C.	RADIATOR INLET HOSE REPLACEMENT.		
9.	Hose (3) and two clamps (19)	a. Loosen screws on two items (19). b. Pull ends of item (3) off of item (14) and (18). c. Remove two items (19) from item (3). d. Clean and inspect e. Install two items (19) onto item (3). f. Push ends of item (3) onto items (14) and (18). g. Push two items (19) to ends of item (3), and tighten screws.	Refer to paragraphs 3-4 and 3-5.
D.	WATER PUMP BYPASS HOSE REPLACEMENT.		
10.	Hose (4) and two clamps (17)	a. Loosen screws on two items (17). b. Pull ends of item (4) off of items (14) and (15). c. Remove two items (17) from item (4).	
11.	Nipple (16)	Remove from item (15).	
12.	All parts	Clean and inspect	Refer to paragraphs 3-4 and 3-5.

COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).



LEGEND:

3. RADIATOR INLET HOSE
4. WATER PUMP BYPASS HOSE
14. RADIATOR ASSEMBLY
15. WATER PUMP RADIATOR CONNECTION
16. STRAIGHT HOSE NIPPLE
17. HOSE CLAMP (2)
18. THERMOSTAT HOUSING
19. RADIATOR HOSE CLAMP (2)

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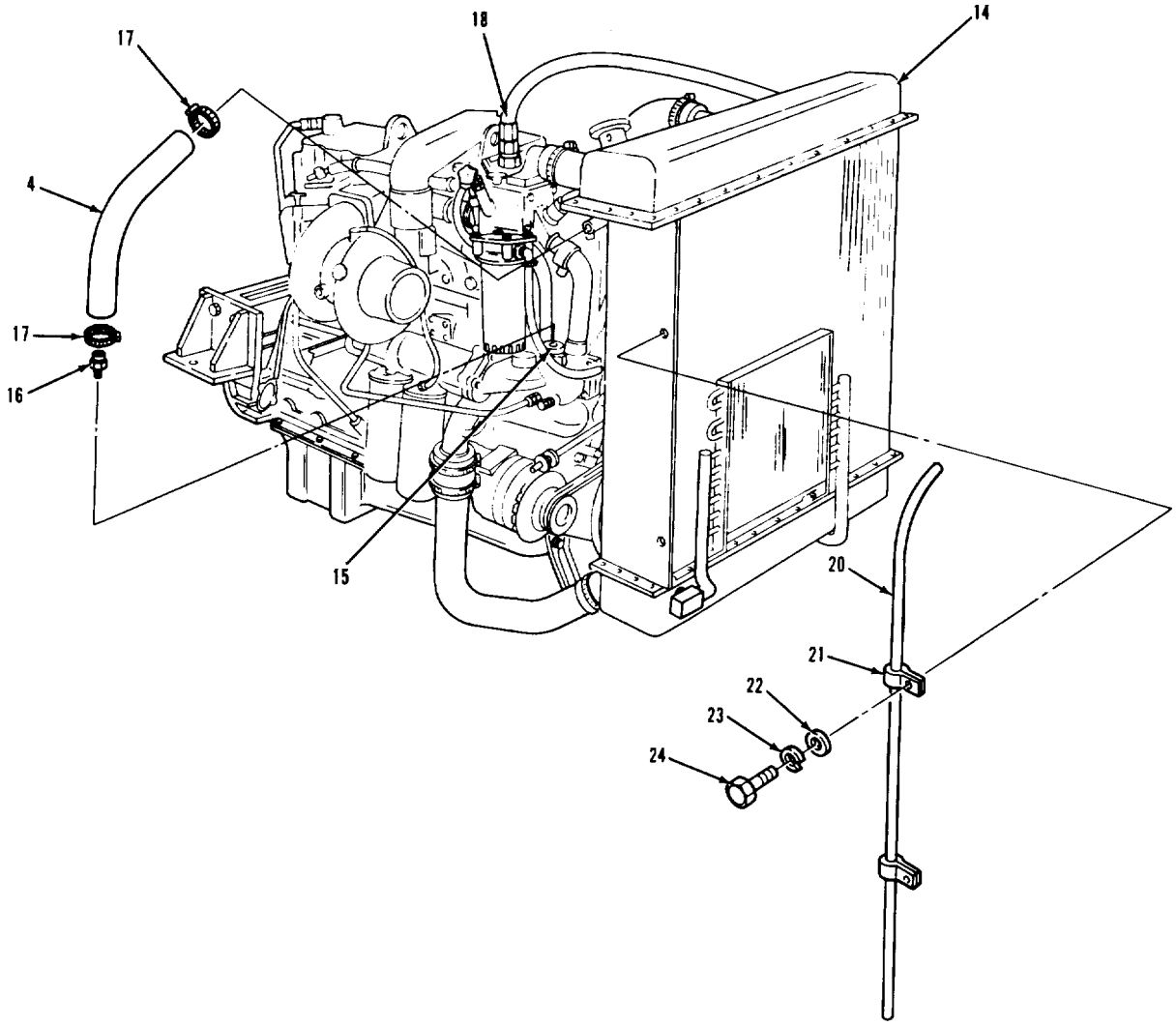
COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
D.	WATER PUMP BYPASS HOSE REPLACEMENT (Continued).		
13.	Nipple (16)	a. Wrap threads with thread sealing tape. b. Install into item (15).	
14.	Hose (4) and two clamps (17)	a. Install two items (17) onto item (4). b. Push ends of item (4) onto items (14) and (15). c. Push two items (17) to ends of item (4), and tighten screws.	
E.	OVERFLOW TUBE REPLACEMENT.		
15.	Two screws (24), lockwashers (23), and washers (22).	Remove from two items (21) and item (14).	
16.	Tube (20)	Remove from item (14) by turning and pulling.	
17.	Two clips	Remove from item (20).	
18.	All parts	Clean and inspect	Refer to paragraphs 3-4 and 3-5.
19.	Tube (20)	Install onto item (14) by turning and pushing.	
20.	Two clips (21)	Install on item (20).	
21.	Two screws (24), lockwashers (23), and nuts (22).	Install into two items (21) and item (14), and tighten.	

COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).



LEGEND:

4.	WATER PUMP BYPASS TUBE	20.	OVERFLOW TUBE
14.	RADIATOR ASSEMBLY	21.	OVERFLOW TUBE CLIP (2)
15.	WATER PUMP RADIATOR CONNECTION	22.	WASHER (2)
16.	STRAIGHT HOSE NIPPLE	23.	LOCKWASHER (2)
17.	HOSE CLAMP (2)	24.	HEXAGON HEAD SCREW (2)

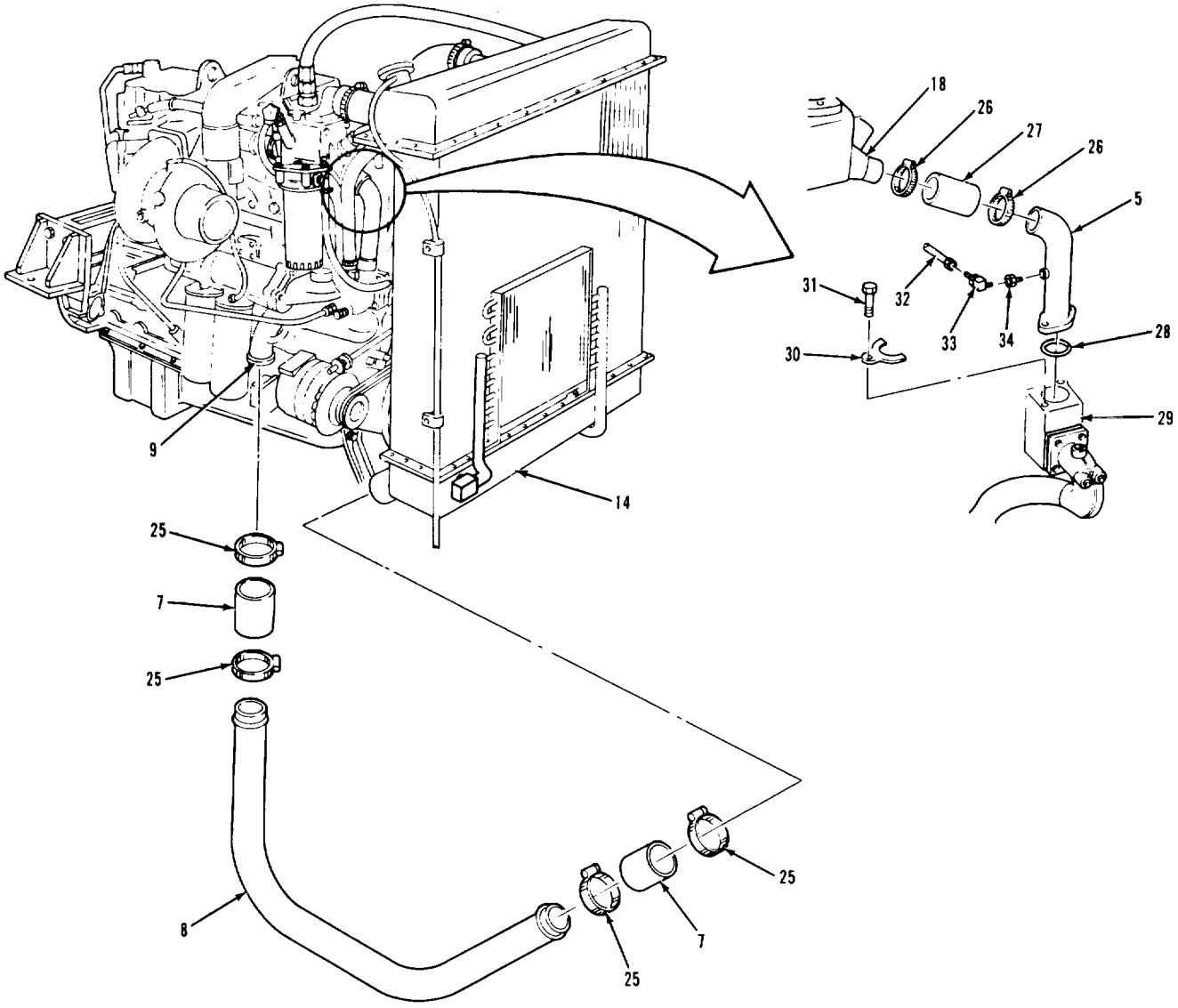
COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
F. RADIATOR OUTLET HOSES AND TUBE REPLACEMENT.		
22. Tube (8), two hoses (7), and four clamps (25).	a. Loosen screws on four items (25). b. Pull assembly off of items (9) and (14) from item (8). c. Separate. d. Clean and inspect and 3-5. e. Install two items (25) on each item (7). f. Push one item (7) onto each end of item (8). g. Push assembly onto items (9) and (14). h. Push four items (25) to ends of two items (7) and tighten screws.	Have suitable container ready to catch coolant Refer to paragraphs 3-4
G. WATER BYPASS TUBE REPLACEMENT.		
23. Screw (31) and clamp (30).	Remove from item (29).	
24. Tube (32)	Remove from item (33).	
25. Hose (27) and two clamps (26)	a. Loosen screws on two items (26). b. Pull item (27) off of item (18).	
26. Tube (5)	Wiggle out of item (29).	

COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).



LEGEND:

5. WATER BYPASS TUBE
7. RADIATOR OUTLET HOSE (2)
8. RADIATOR OUTLET TUBE
9. WATER PUMP TO RADIATOR CONNECTION
18. THERMOSTAT HOUSING
25. RADIATOR HOSE CLAMP (4)
26. HOSE CLAMP (2)
27. HOSE
28. O-RING
29. WATER PUMP ASSEMBLY
30. TUBE CLAMP
31. HEXAGON HEAD SCREW WITH CAPTIVE WASHER
32. COMPRESSOR COOLING WATER TUBE
33. MALE ELBOW ADAPTER
34. PLAIN STRAIGHT ADAPTER

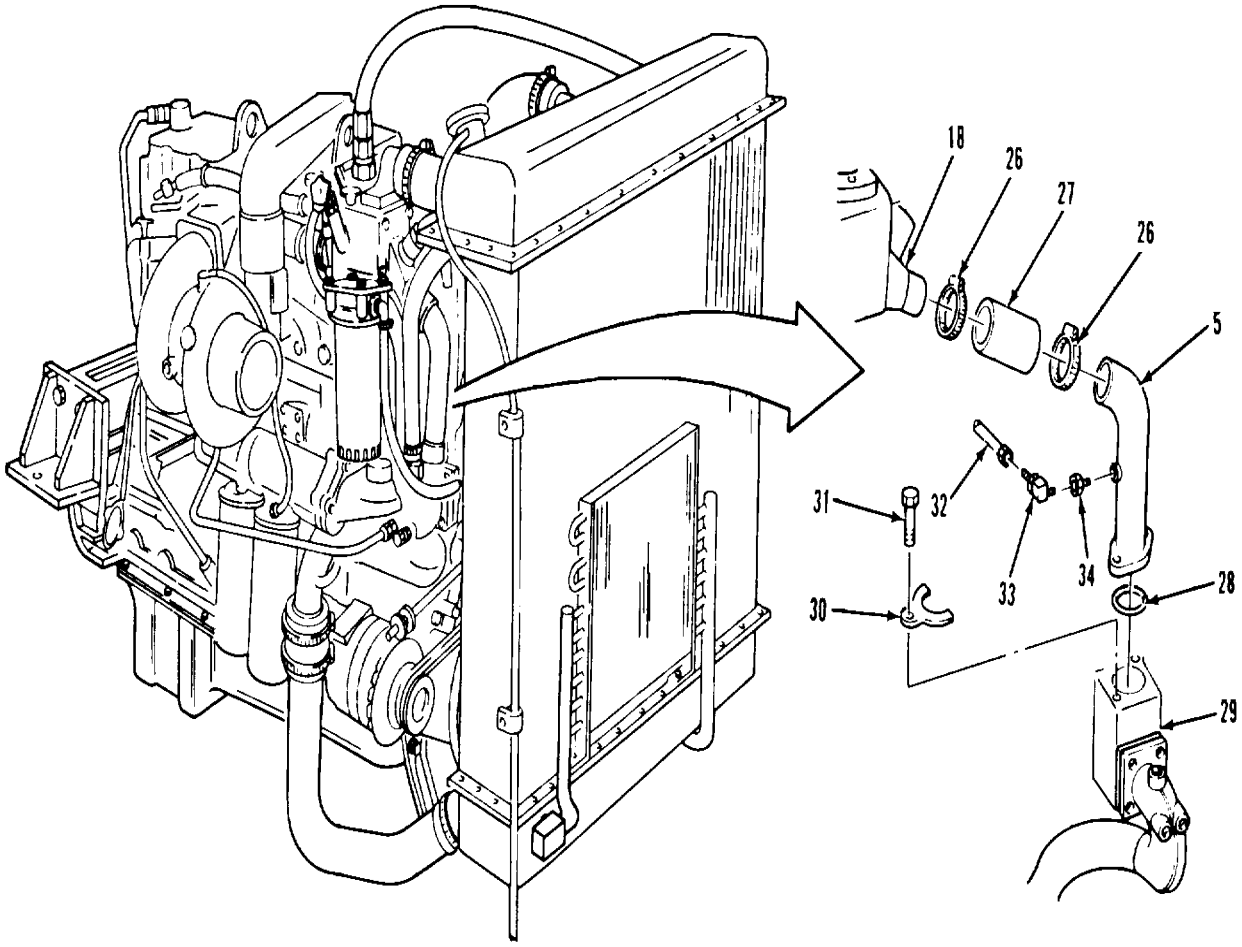
COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
G.	WATER BYPASS TUBE REPLACEMENT (Continued).		
27.	Hose (27) and two clamps (26)	Remove from item (5) and separate.	
28.	0-ring (28), adapter (33), and adapter (34).	Remove from item (5)	Discard item (28).
29.	All parts and 3-5.	Clean and inspect	Refer to paragraphs 3-4
30.	adapter (33) and adapter (34)	a. Wrap threads with thread sealing tape. b. Install into item (5).	
31.	Hose (27) and two clamps (26)	a. Install two items (26) on item (27). b. Push item (27) onto end of item (5).	
32.	New 0-ring (28)	Coat with lubricating oil and install on end of item (5).	
33.	Tube (5) and 0-ring (28)	Wiggle into item (29) item (28) during instal-lation.	Be careful not to damage
34.	Hose (27) and two clamps (26)	a. Push end of item (27) onto item (18). b. Push two items (26) to ends of item (27), and tighten.	
35.	Tube (32)	Install onto item (33).	
36.	Clamp (30)	a. Position on item (29) b. Secure with item (31).	

COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).



LEGEND:

5. WATER BYPASS TUBE
18. THERMOSTAT HOUSING
26. HOSE CLAMP (2)
27. HOSE
28. O-RING
29. WATER PUMP ASSEMBLY
30. TUBE CLAMP
31. HEXAGON HEAD SCREW WITH CAPTIVE WASHER
32. COMPRESSOR COOLING WATER TUBE
33. MALE ELBOW ADAPTER
34. PLAIN STRAIGHT ADAPTER

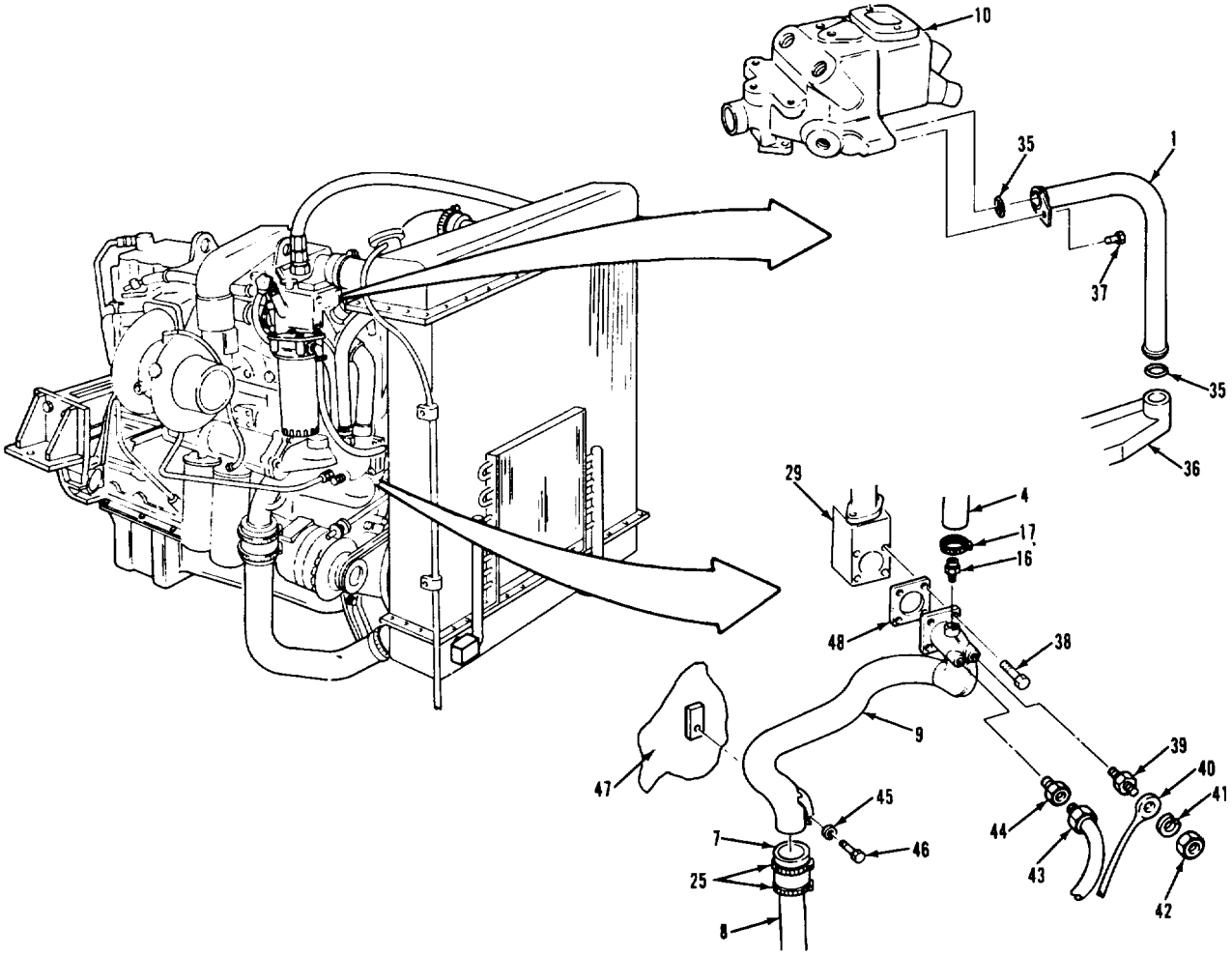
COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
H.	WATER TRANSFER TUBE REPLACEMENT.		
37.	Screw (37) (10).	Remove from items (1) and	
38.	Tube (1) and (36).	Wiggle out of items (10)	
39.	Two 0-rings (35)	Remove from item (1)	Discard items (35).
40.	All parts	Clean and inspect and 3-5.	Refer to paragraphs 3-4
41.	Two new 0-rings (35) item (1).	Coat with lubricating oil and install one on each end of	
42.	Tube (1) and 0-rings (35) installation.	Wiggle into items (10) and (36) items (35) during	Be careful not to damage
43.	Screw (37)	Install into items (1) and (10).	Torque to 30-35 lb-ft.
I.	WATER PUMP TO RADIATOR CONNECTION REPLACEMENT.		
44.	Hose (7) and two clamps (25)	a. Loosen screws on two items (25).	
		b. Pull item (7) off of item (9) item (7), and leave item (7) on item (8).	Leave two items (25) on
45.	Screw (46) and washer (45)	Remove from items (9) and (47).	

COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).



LEGEND:

1. WATER TRANSFER TUBE
4. WATER PUMP BYPASS HOSE
7. RADIATOR OUTLET HOSE (2)
8. RADIATOR OUTLET TUBE
9. WATER PUMP TO RADIATOR CONNECTION
10. FRONT WATER MANIFOLD
16. STRAIGHT HOSE NIPPLE
17. HOSE CLAMP
25. RADIATOR HOSE CLAMP (4)
35. O-RING (2)
36. OIL COOLER SUPPORT
37. SCREW WITH CAPTIVE W ASHER
38. SCREW (4)
39. WATER TEMPERATURE SENDING UNIT
40. WIRE
41. LOCKWASHER
42. NUT
43. HEATER RETURN TUBE ASSEMBLY
44. CONNECTOR
45. PLAIN WASHER
46. SCREW WITH CAPTIVE WASHER
47. ENGINE BLOCK
48. WATER CONNECTION GASKET TA 237135

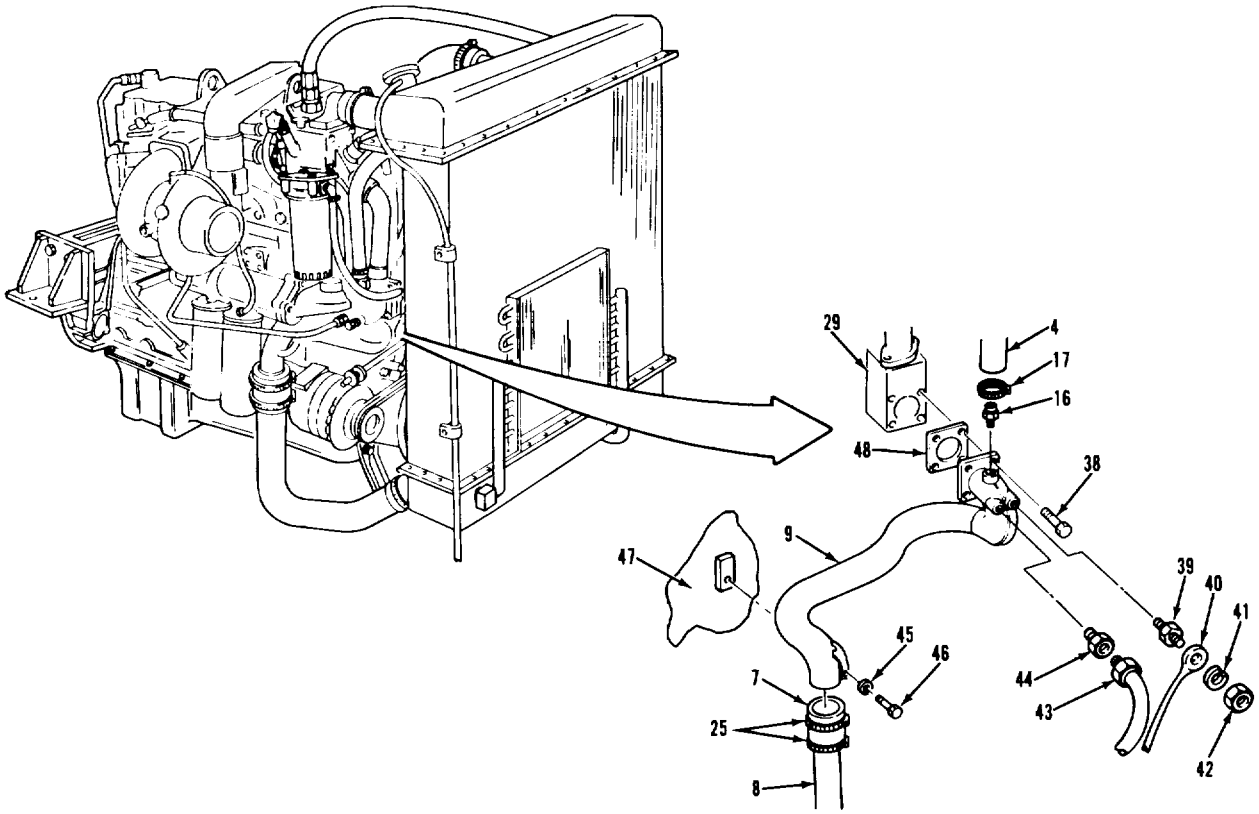
COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
I.	WATER PUMP TO RADIATOR CONNECTION REPLACEMENT (Continued).		
46.	Nut (42), lock-washer (41), and wire (40).	Remove from item (39).	
47.	Tube (43)	Remove from item (44).	
48.	Hose (4) and clamp (17)	a. Loosen screw on item (17). b. Pull item (4) off of item (16)	Leave item (17) on item (4).
49.	Four screws (38)	Remove from items (9) and (29).	
50.	Connection (9) and gasket (48)	Remove from item (29) and lift out of engine compartment item (9) (48).	Be careful not to damage any wires when removing Discard item
51.	Nipple (16), sending unit (39), and connector (44).	Remove from item (9).	
52.	All parts	Clean and inspect and 3-5. Be sure to clean all gasket material off items (9) and (29).	Refer to paragraph 3-4
53.	Nipple (16), sending unit (39), and connector (44)	a. Wrap threads with thread sealing tape. b. Install into item (9).	Refer to paragraph 3-7.
54.	New gasket (48)	Hold in place on item (9) with grease.	

COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).



LEGEND:

4. WATER PUMP BYPASS HOSE
7. RADIATOR OUTLET HOSE (2)
8. RADIATOR OUTLET TUBE
9. WATER PUMP TO RADIATOR CONNECTION
16. STRAIGHT HOSE NIPPLE
17. HOSE CLAMP
25. RADIATOR HOSE CLAMP (4)
38. SCREW (4)
39. WATER TEMPERATURE SENDING UNIT
40. WIRE
41. LOCKWASHER
42. NUT
43. HEATER RETURN TUBE ASSEMBLY
44. CONNECTOR
45. PLAIN WASHER
46. SCREW WITH CAPTIVE WASHER
47. ENGINE BLOCK
48. WATER CONNECTION GASKET

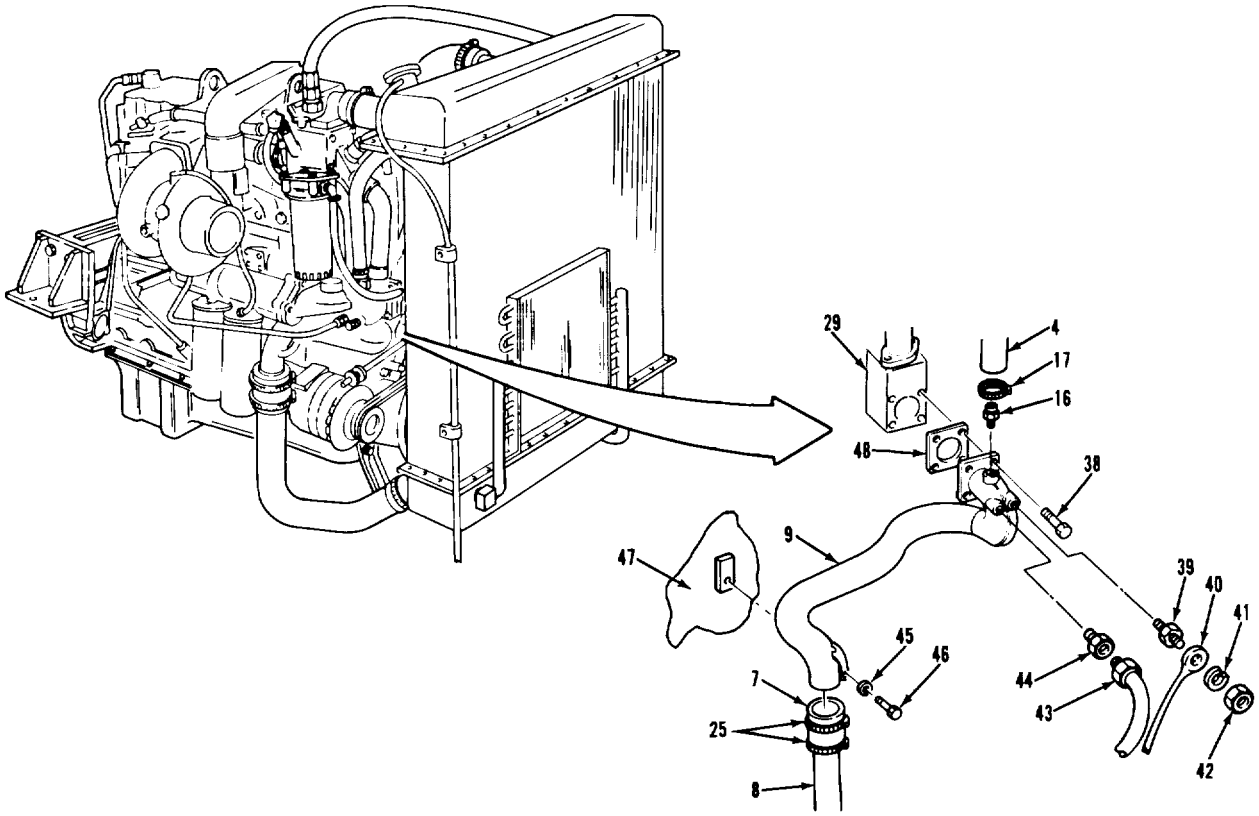
COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
I. WATER PUMP TO RADIATOR CONNECTION REPLACEMENT (Continued).		
55. Connection (9) and gasket (48)	a. Lower into engine compartment and hold in place on item (29) b. Secure with four items (38) 35 lb-ft.	Be careful not to damage any wires when installing item (9). Torque items (38) to 30-
56. Hose (4) and clamp (17)	a. Push end of item (4) onto item (16). b. Push item (17) to end of item (4), and tighten screw.	
57. Tube (43)	a. Wrap threads with thread sealing tape. b. Install into item (44).	
58. Wire (40)	a. Position on item (39). b. Secure with items (42) and (41).	
59. Screw (46) and washer (45)	Install into items (9) and (47), and tighten.	
60. Hose (7) and two clamps (25)	a. Push end of item (7) onto item (9). b. Push two items (25) to ends of item (7), and tighten screws.	
	NOTE Follow-on maintenance action required: Fill cooling system (para 3-52). Start vehicle and check for leaks (TM 9-2320-283-10).	

COOLING SYSTEM.

3-58. LINES, FITTINGS, AND HOSES REPLACEMENT (Continued).



LEGEND:

4. WATER PUMP BYPASS HOSE
7. RADIATOR OUTLET HOSE (2)
8. RADIATOR OUTLET TUBE
9. WATER PUMP TO RADIATOR CONNECTION
16. STRAIGHT HOSE NIPPLE
17. HOSE CLAMP
25. RADIATOR HOSE CLAMP (4)
38. SCREW (4)
39. WATER TEMPERATURE SENDING UNIT
40. WIRE
41. LOCKWASHER
42. NUT
43. HEATER RETURN TUBE ASSEMBLY
44. CONNECTOR
45. PLAIN WASHER
46. SCREW WITH CAPTIVE WASHER
47. ENGINE BLOCK
48. WATER CONNECTION GASKET

COOLING SYSTEM.

3-59. THERMOSTAT AND THERMOSTAT HOUSING REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.
d. Testing
e Assembly
f. Installation

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
3-52.

CONDITION DESCRIPTION
Coolant drained below level of thermostat housing.

TEST EQUIPMENT
None.

SPECIAL TOOLS
Seal mandrel
(15434) ST-1225.

MATERIALS/PARTS (P/N)
Tape, thread sealing
Item 32, Appendix C.
Grease, automotive and artillery
Item 7, Appendix C.
Gasket, thermostat housing
(15434) 208128.
Seal, housing
(15434) 186780.
Gasket, water outlet connection
(15434) 3019158.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

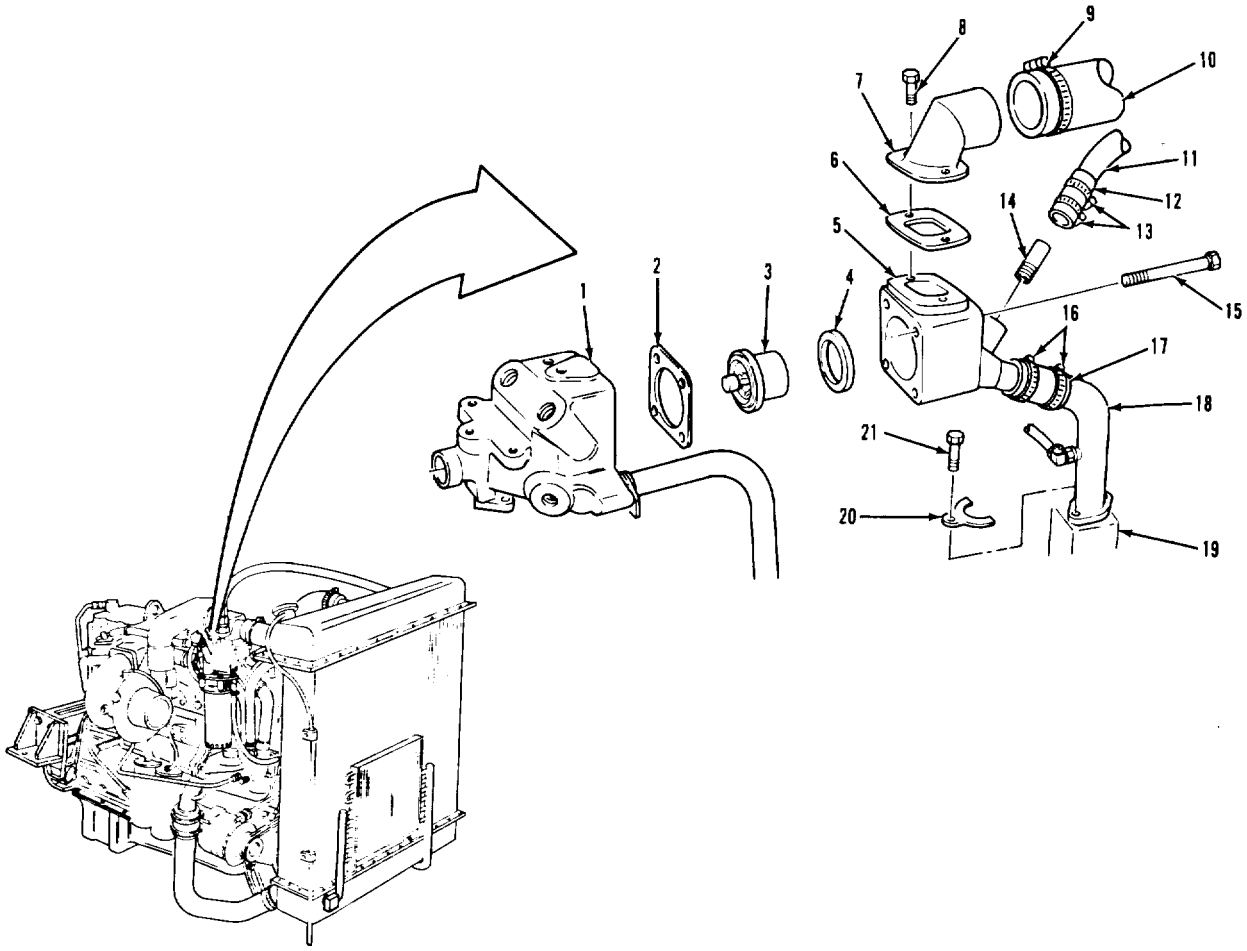
REFERENCES (TM)
TM 9-2320-283-10.
TM 9-2320-283-20P.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.
Wait until cooling system components are cool.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

COOLING SYSTEM.

3-59. THERMOSTAT AND THERMOSTAT HOUSING REPLACEMENT (Continued).



LEGEND:

1. FRONT WATER MANIFOLD
2. THERMOSTAT HOUSING GASKET
3. 180 DEGREE THERMOSTAT
4. HOUSING SEAL
5. THERMOSTAT HOUSING
6. WATER OUTLET CONNECTION GASKET
7. WATER OUTLET CONNECTION
8. SCREW (2)
9. RADIATOR HOSE CLAMP
10. RADIATOR INLET HOSE
11. WATER TRANSFER TUBE
12. CONNECTION HOSE
13. HOSE CLAMP (2)
14. HOSE NIPPLE
15. SCREW WITH CAPTIVE WASHER (4)
16. HOSE CLAMP (2)
17. HOSE
18. WATER BYPASS TUBE
19. WATER PUMP ASSEMBLY
20. TUBE CLAMP
21. HEXAGON HEAD SCREW WITH CAPTIVE WASHER

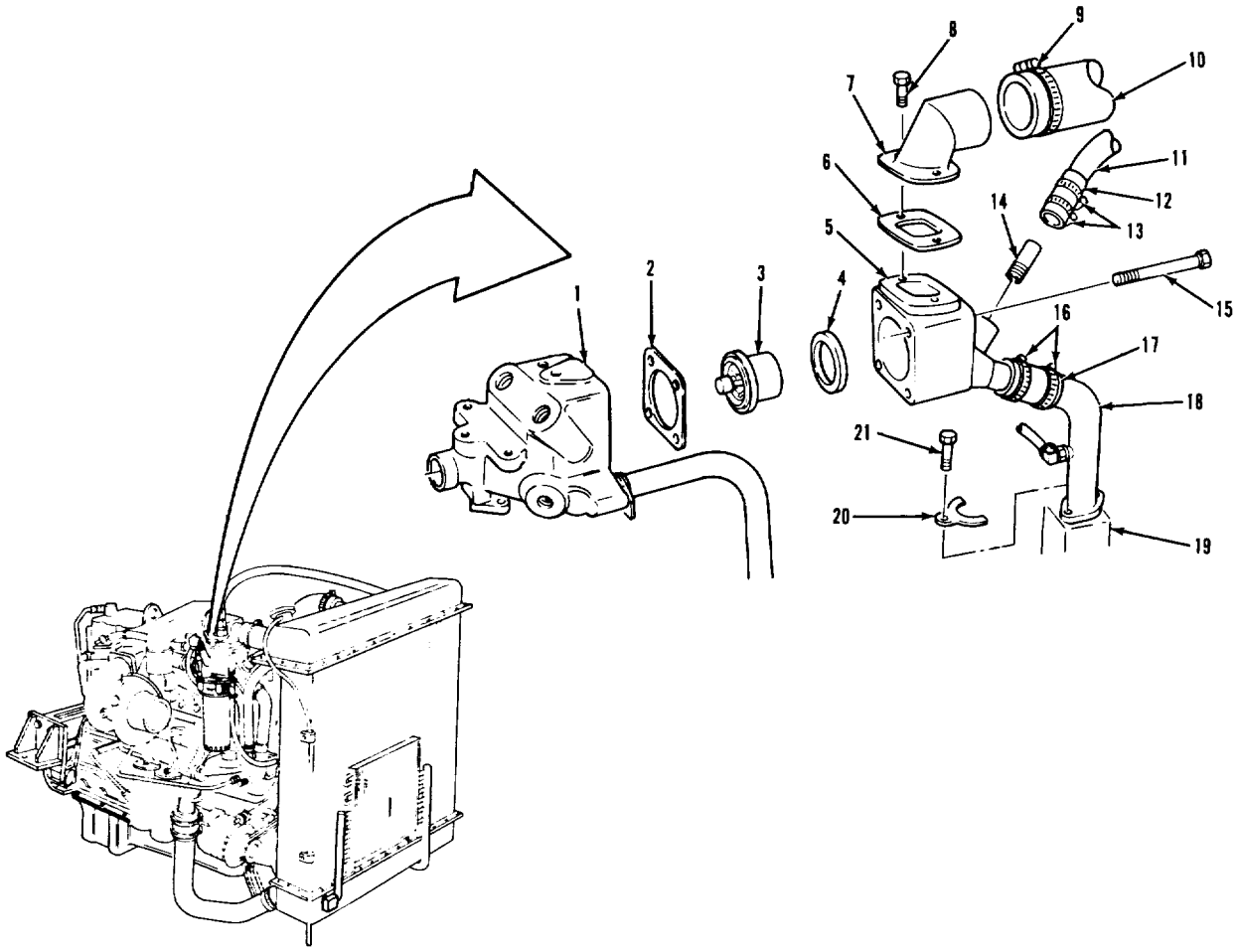
COOLING SYSTEM.

3-59. THERMOSTAT AND THERMOSTAT HOUSING REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Hose (10) and clamp (9) item (7)	a. Loosen screw on item (9). b. Pull item (10) off of (10).	Leave item (9) on item
2. Hose (12) and two clamps (13)	a. Loosen screws on two items (13). b. Pull item (12) off of item (14) item (12) on item (11).	Leave two items (13) on item (12), and leave
3. Screw (21) and clamp (20).	Remove from item (19).	
4. Hose (17) and two clamps (16)	a. Loosen screws on two items (16). b. Pull item (17) off of item (5) Leave two items (16) on item (17), and leave item (17) on item (18).	Do not pull item (18) out of item (19).
5. Four screws (15)	Remove from items (5) and (1).	
6. Housing (5) and gasket (2)	Remove from item (1) or mallet, if needed. Discard item (2).	Use soft-faced hammer
B. DISASSEMBLY.		
7. Thermostat (3)	Remove from item (5).	

COOLING SYSTEM.

3-59. THERMOSTAT AND THERMOSTAT HOUSING REPLACEMENT (Continued).



LEGEND:

1. FRONT WATER MANIFOLD
2. THERMOSTAT HOUSING GASKET
3. 180 DEGREE THERMOSTAT
4. HOUSING SEAL
5. THERMOSTAT HOUSING
6. WATER OUTLET CONNECTION GASKET
7. WATER OUTLET CONNECTION
8. SCREW (2)
9. RADIATOR HOSE CLAMP
10. RADIATOR INLET HOSE
11. WATER TRANSFER TUBE
12. CONNECTION HOSE
13. HOSE CLAMP (2)
14. HOSE NIPPLE
15. SCREW WITH CAPTIVE WASHER (4)
16. HOSE CLAMP (2)
17. HOSE
18. WATER BYPASS TUBE
19. WATER PUMP ASSEMBLY
20. TUBE CLAMP
21. HEXAGON HEAD SCREW WITH CAPTIVE WASHER

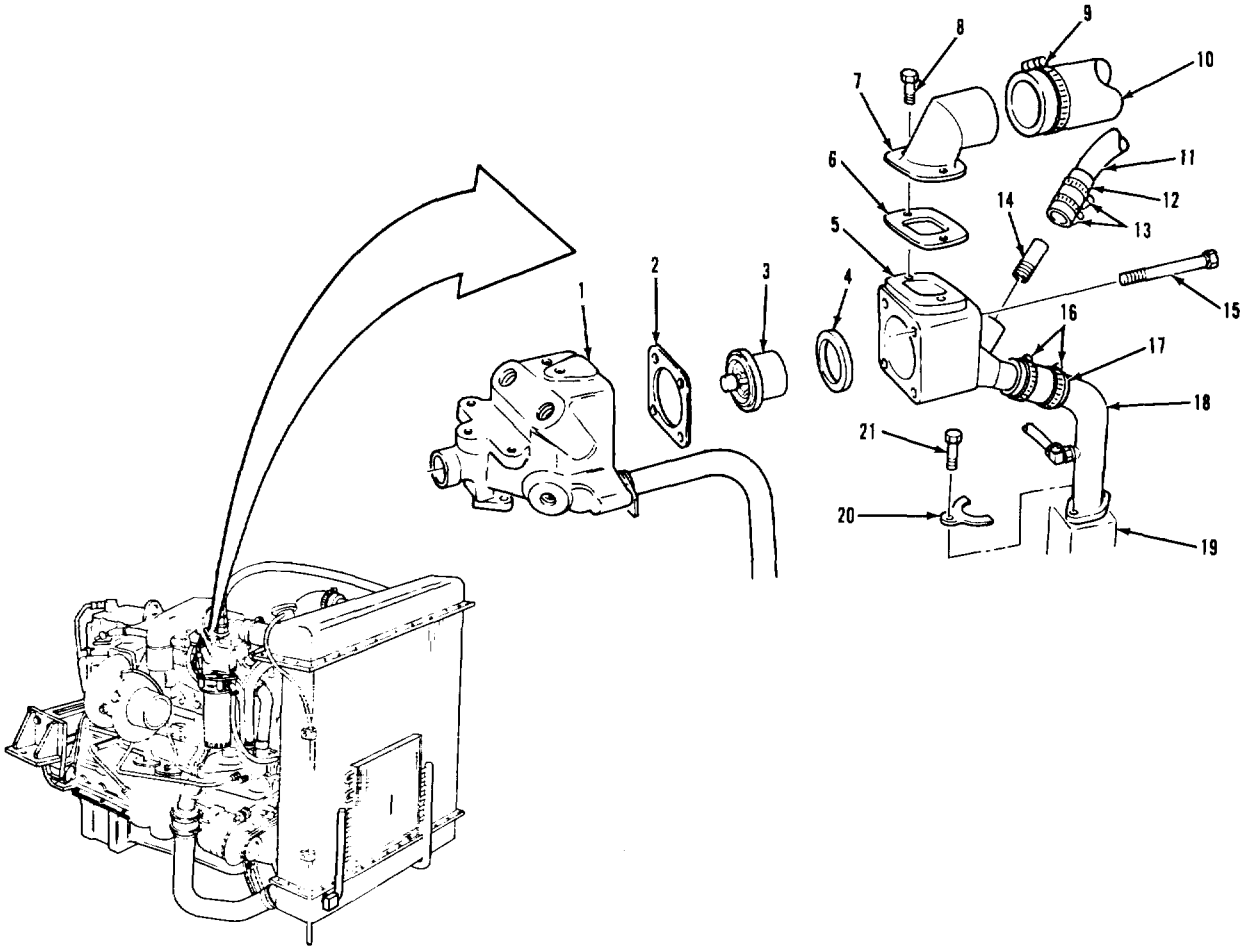
COOLING SYSTEM.

3-59. THERMOSTAT AND THERMOSTAT HOUSING REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
B. DISASSEMBLY (Continued).		
8. Seal (4)	Pry out of item (5) item (5) Discard item (4).	Be careful not to damage
9. Two screws (8), connection (7), and gasket (6).	Remove from item (5)	Discard item (6).
10. Nipple (14)	Remove from item (5).	
C. CLEANING AND INSPECTION.		
11. All parts	Clean and inspect and 3-5 Be sure to clean all gasket material off items (1), (5), and (7).	Refer to paragraph 3-4
D. TESTING.		
12. Thermostat (3)	a. Check that it is closed at room temperature ture.	Replace item (3) if it is open at room tempera-
	b. Put item (3) and a thermometer into a suitable container of water not touch the container.	Use a device to hold item (3) and thermometer so that they do
	c. Heat the water and observe item (3) at 180°F.	Replace item (3) if it does not begin to open
	d. Continue to heat the water until thermostat reads 195'-200'F if there is not at least a 0.375 inch space between seal sleeve and the brass part of item (3).	Item (3) must be fully open at this temperature. Replace item (3)

COOLING SYSTEM.

3-59. THERMOSTAT AND THERMOSTAT HOUSING REPLACEMENT (Continued).



LEGEND:

1. FRONT WATER MANIFOLD
2. THERMOSTAT HOUSING GASKET
3. 180 DEGREE THERMOSTAT
4. HOUSING SEAL
5. THERMOSTAT HOUSING
6. WATER OUTLET CONNECTION GASKET
7. WATER OUTLET CONNECTION
8. SCREW (2)
9. RADIATOR HOSE CLAMP
10. RADIATOR INLET HOSE
11. WATER TRANSFER TUBE
12. CONNECTION HOSE
13. HOSE CLAMP (2)
14. HOSE NIPPLE
15. SCREW WITH CAPTIVE WASHER (4)
16. HOSE CLAMP (2)
17. HOSE
18. WATER BYPASS TUBE
19. WATER PUMP ASSEMBLY
20. TUBE CLAMP
21. HEXAGON HEAD SCREW WITH CAPTIVE WASHER

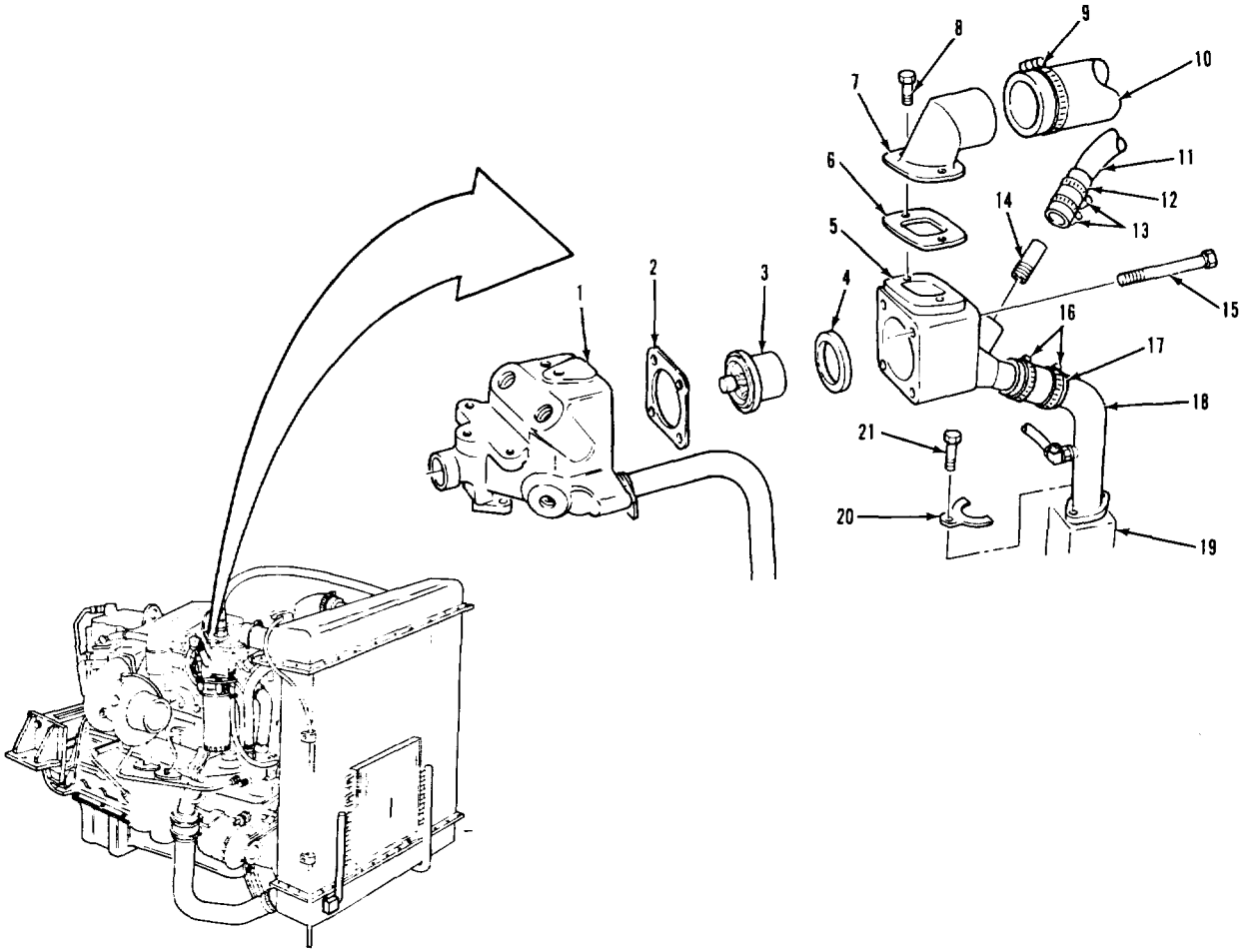
COOLING SYSTEM.

3-59. THERMOSTAT AND THERMOSTAT HOUSING REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
E. ASSEMBLY.		
13. Nipple (14)	a. Coat threads with thread sealing tape. b. Install into item (5).	Refer to paragraph 3-7.
14. Connection (7) and new gasket (6).	a. Position on item (5). b. Secure with two items (8).	
15. New seal (4)	Using seal mandrel, install into item (5) is toward mandrel to insure proper sealing. If item (5) is incorrectly installed, coolant can leak past seal, causing engine temperature to be colder than normal.	Make sure part number or metal side of item (5)
16. Thermostat (3) it seats in item (4).	Push into item (5) until	
F. INSTALLATION.		
17. New gasket (2)	Hold in place on item (5) with grease.	
18. Housing (5) and gasket (2)	a. Position on item (1). b. Secure with four items (15) 30-35 lb-ft.	Torque items (15) to
19. Hose (17) and two clamps (16) onto item (5).	a. Push end of item (17) b. Push two items (16) to ends of item (17), and tighten screws.	

COOLING SYSTEM.

3-59. THERMOSTAT AND THERMOSTAT HOUSING REPLACEMENT (Continued).



LEGEND:

1. FRONT WATER MANIFOLD
2. THERMOSTAT HOUSING GASKET
3. 18° DEGREE THERMOSTAT
4. HOUSING SEAL
5. THERMOSTAT HOUSING
6. WATER OUTLET CONNECTION GASKET
7. WATER OUTLET CONNECTION
8. SCREW (2)
9. RADIATOR HOSE CLAMP
10. RADIATOR INLET HOSE
11. WATER TRANSFER TUBE
12. CONNECTION HOSE
13. HOSE CLAMP (2)
14. HOSE NIPPLE
15. SCREW WITH CAPTIVE WASHER (4)
16. HOSE CLAMP (2)
17. HOSE
18. WATER BYPASS TUBE
19. WATER PUMP ASSEMBLY
20. TUBE CLAMP
21. HEXAGON HEAD SCREW WITH CAPTIVE WASHER

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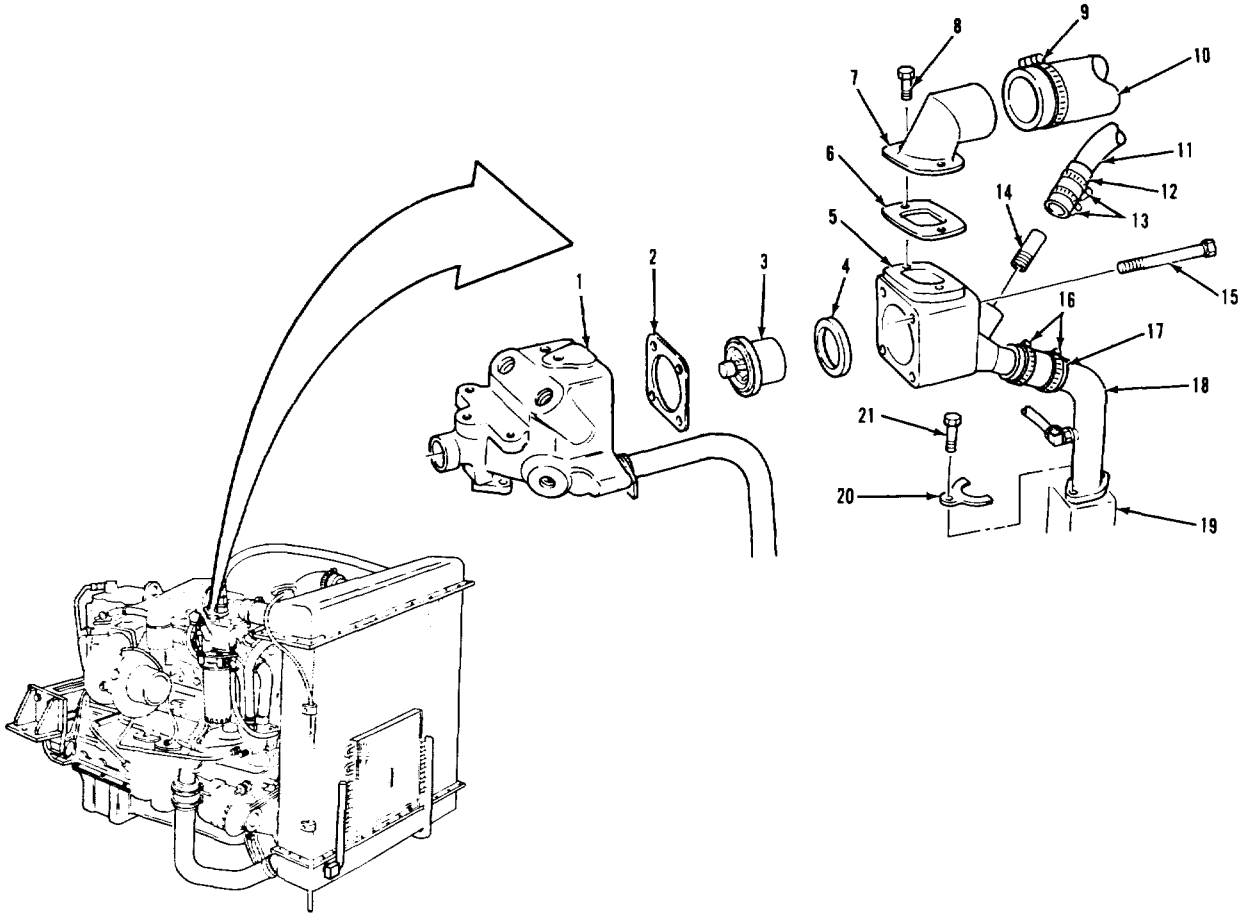
COOLING SYSTEM.

3-59. THERMOSTAT AND THERMOSTAT HOUSING REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
F. INSTALLATION (Continued).		
20. Clamp (20).	a. Position on item (19).	
	b. Secure with item (21).	
21. Hose (12) and two clamps (13).	a. Push end of item (12) onto item (14).	
	b. Push two items (13) to ends of item (12), and tighten screws.	
22. Hose (10) and	a. Push end of item (10) clamp (9).onto item (7).	
	b. Push item (9) to end of item (10), and tighten screw.	
	NOTE	
	Follow-on maintenance action required: Fill cooling system (para 3-52). Start vehicle and check for leaks (TM 9-2320-283-10).	

COOLING SYSTEM.

3-59. THERMOSTAT AND THERMOSTAT HOUSING REPLACEMENT (Continued).



LEGEND:

1. FRONT WATER MANIFOLD
2. THERMOSTAT HOUSING GASKET
3. 180 DEGREE THERMOSTAT
4. HOUSING SEAL
5. THERMOSTAT HOUSING
6. WATER OUTLET CONNECTION GASKET
7. WATER OUTLET CONNECTION
8. SCREW (2)
9. RADIATOR HOSE CLAMP
10. RADIATOR INLET HOSE
11. WATER TRANSFER TUBE
12. CONNECTION HOSE
13. HOSE CLAMP (2)
14. HOSE NIPPLE
15. SCREW WITH CAPTIVE WASHER (4)
16. HOSE CLAMP (2)
17. HOSE
18. WATER BYPASS TUBE
19. WATER PUMP ASSEMBLY
20. TUBE CLAMP
21. HEXAGON HEAD SCREW WITH CAPTIVE WASHER

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COOLING SYSTEM.

3-60. WATER MANIFOLDS REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Tape, thread sealing
Item 32, Appendix C.
Grease, automotive and artillery
Item 7, Appendix C.
Oil, lubricating: OE/HDO-30
Item 16, Appendix C.
Ring, sealing (6)
(15434) 3024709.
0-ring, coupling (4)
(15434) 70624.
0-ring
(15434) 212161.
Gasket thermostat housing
(154345 208128.

PERSONNEL REQUIRED
One (MOS-63S}.

REFERENCES (TM)
TM 9-2320-283-10.
TM 9-2320-283-20P.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

EQUIPMENT CONDITION

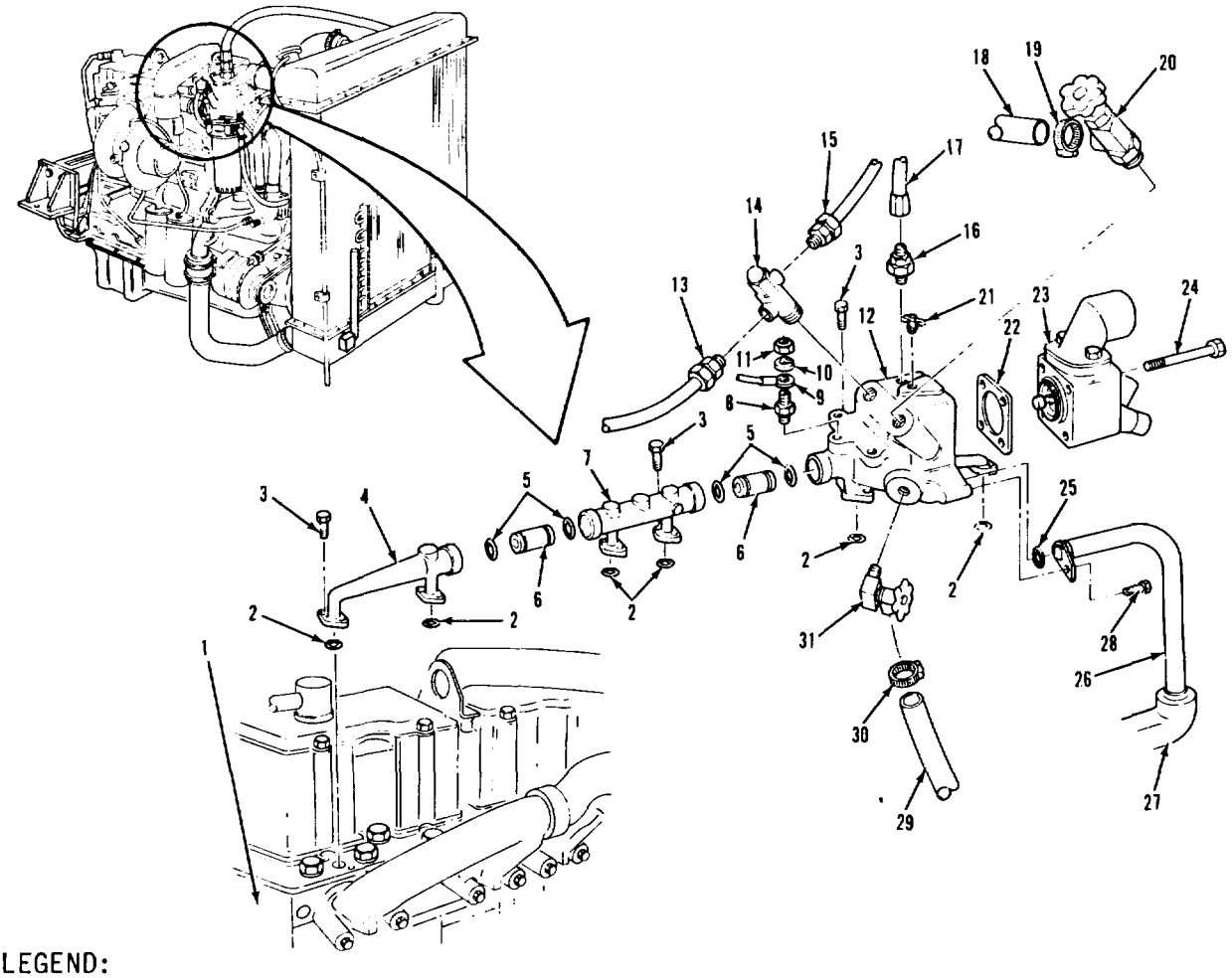
PARAGRAPH	CONDITION DESCRIPTION
3-52.	Coolant drained below level of manifolds.
3-29.	Air cleaner assembly removed.
3-31.	Turbocharger air intake removed.

SPECIAL ENVIRONMENTAL CONDITIONS
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.
Wait until cooling system components are cool.

COOLING SYSTEM.

3-60. WATER MANIFOLDS REPLACEMENT (Continued).



LEGEND:

1. ENGINE BLOCK
2. SEALING RING (6)
3. HEXAGON HEAD SCREW WITH CAPTIVE WASHER (12)
4. REAR WASHER MANIFOLD
5. COUPLING O-RING (4)
6. MANIFOLD COUPLING (2)
7. CENTER WATER MANIFOLD
8. HOT ENGINE TEMPERATURE SWITCH
9. WIRE
10. LOCKWASHER
11. NUT
12. FRONT WATER MANIFOLD
13. NONMETALLIC TUBE
14. AIR VALVE
15. NONMETALLIC TUBE
16. REDUCER AND MALE CONNECTOR
17. DEAERATION LINE
18. HEATER HOSE
19. HOSE CLAMP
20. HEATER SHUTOFF VALVE AND REDUCER
21. DRAINCOCK
22. THERMOSTAT HOUSING GASKET
23. THERMOSTAT HOUSING
24. SCREW WITH CAPTIVE WASHER (4)
25. O-RING
26. WATER TRANSFER TUBE
27. OIL COOLER SUPPORT
28. SCREW WITH CAPTIVE WASHER
29. WATER HOSE
30. HOSE CLAMP
31. WATER SHUTOFF VALVE AND STREET ELBOW

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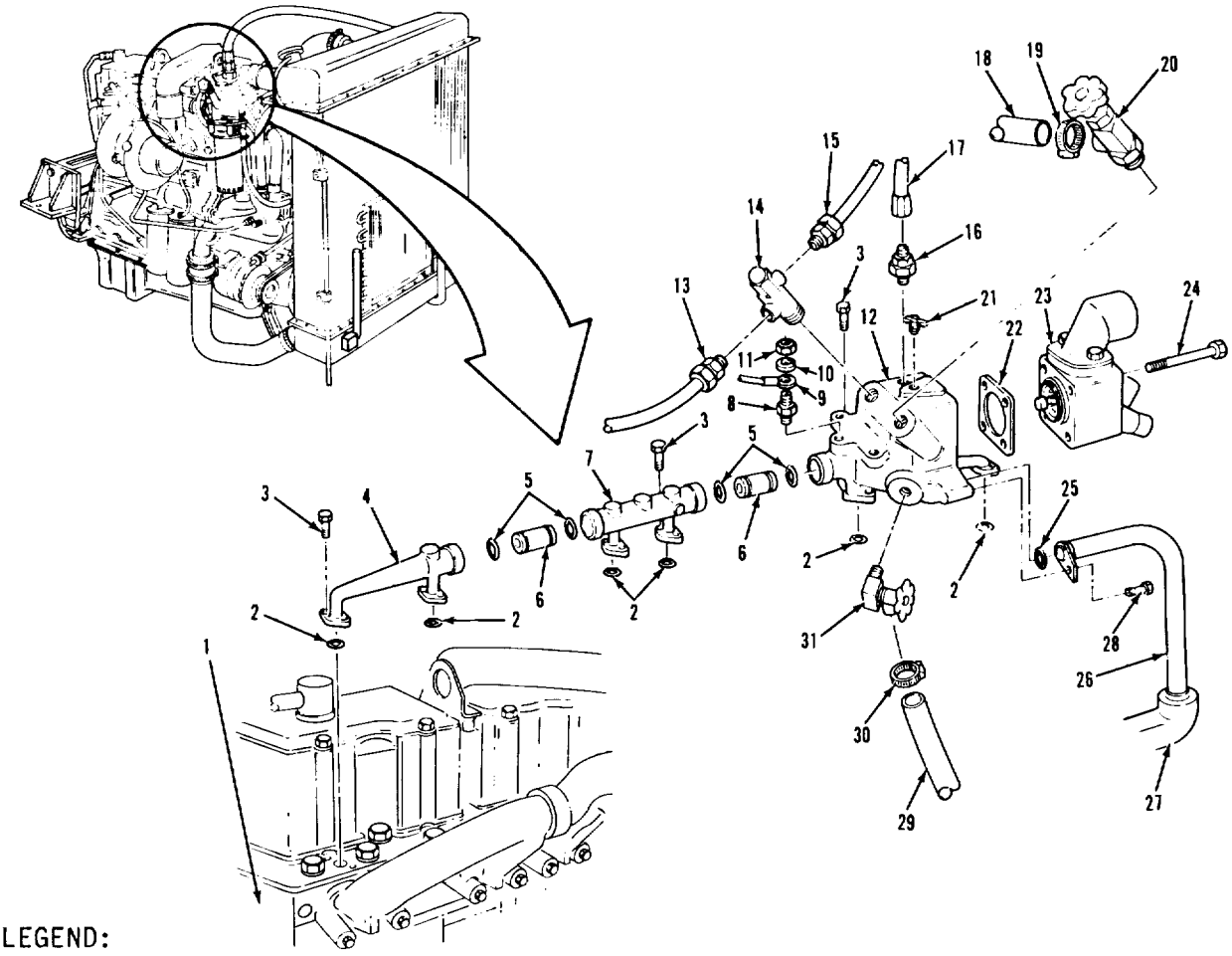
COOLING SYSTEM.

3-60. WATER MANIFOLDS REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Four screws (3).	Remove from items (4) and (1).	Use a universal joint socket and an extension to reach items (3).
2. Manifold (4) and coupling (6) (assembled).	Wiggle out of item (7).	
3. Two rings (2).	Remove from item (1).	Discard items (2).
4. Coupling (6).	Wiggle out of item (4).	
5. Two 0-rings (5).	Remove from item (6).	Discard items (5).
6. Four screws (3).	Remove from items (7) and (1).	Use a universal joint socket and an extension to reach items (3).
7. Manifold (7) and coupling (6) (assembled).	Wiggle out of item (12).	
8. Two rings (2).	Remove from item (1).	Discard items (2).
9. Coupling (6).	Wiggle out of item (7).	
10. Two 0-rings.	Remove from item (6).	Discard items (5).
11. Nut (11), lock-washer (10), and wire (9).	Remove from item (8).	

COOLING SYSTEM.

3-60. WATER MANIFOLDS REPLACEMENT (Continued).



LEGEND:

1. ENGINE BLOCK
2. SEALING RING (6)
3. HEXAGON HEAD SCREW WITH CAPTIVE WASHER (12)
4. REAR WASHER MANIFOLD
5. COUPLING O-RING (4)
6. MANIFOLD COUPLING (2)
7. CENTER WATER MANIFOLD
8. HOT ENGINE TEMPERATURE SWITCH
9. WIRE
10. LOCKWASHER
11. NUT
12. FRONT WATER MANIFOLD
13. NONMETALLIC TUBE
14. AIR VALVE
15. NONMETALLIC TUBE
16. REDUCER AND MALE CONNECTOR
17. DEAERATION LINE
18. HEATER HOSE
19. HOSE CLAMP
20. HEATER SHUTOFF VALVE AND REDUCER
21. DRAINCOCK
22. THERMOSTAT HOUSING GASKET
23. THERMOSTAT HOUSING
24. SCREW WITH CAPTIVE WASHER (4)
25. O-RING
26. WATER TRANSFER TUBE
27. OIL COOLER SUPPORT
28. SCREW WITH CAPTIVE WASHER
29. WATER HOSE
30. HOSE CLAMP
31. WATER SHUTOFF VALVE AND STREET ELBOW

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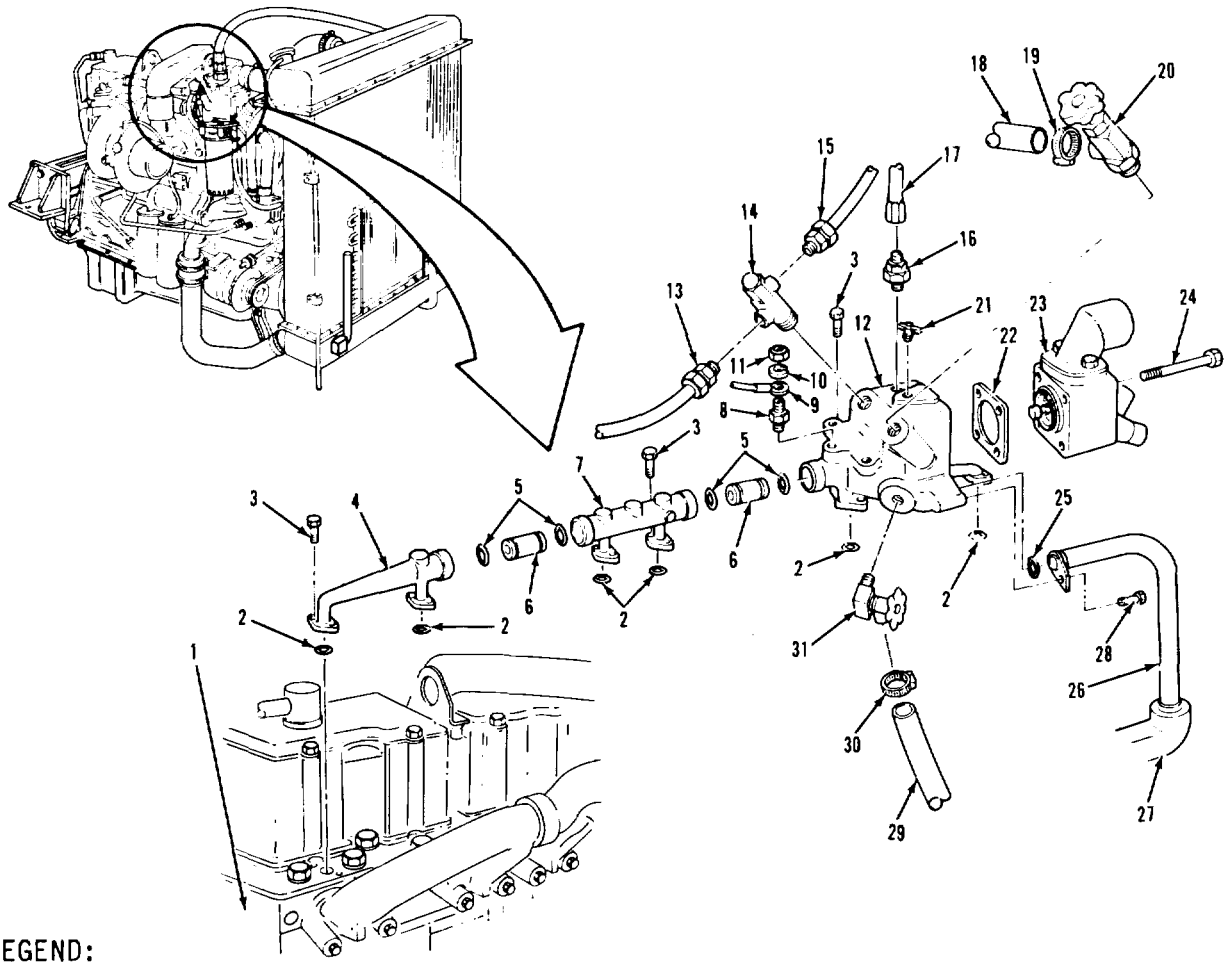
COOLING SYSTEM.

3-60. WATER MANIFOLDS REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL (Continued).		
12. Hose (18) and clamp (19).	a. Loosen screw on item (19). b. Pull item (18) off of item (20).	Leave item (19) on item (18).
13. Tube (13) and tube (15).	Remove from item (14).	
14. Hose (17).	Remove from item (16).	
15. Hose (29) and clamp (30). item (31).	a. Loosen screw on item (30). b. Pull item (29) off of (29).	Leave item (30) on item
16. Screw (28).	Remove from items (26) and (12).	
17. Tube (26).	Wiggle out of item (12).	Do not remove item (26) from item (27).
18. 0-ring (25).	Remove from item (26).	Discard item (25).
19. Four screws (3).	Remove from items (12) and (1).	Use a universal joint socket and an extension to reach items (3).
20. Four screws (24).	Remove from items (23) and (12).	
21. Manifold (12) and gasket (22).	Remove from item (23).	Use soft face hammer or mallet, if needed. Discard item (22).

COOLING SYSTEM.

3-60. WATER MANIFOLDS REPLACEMENT (Continued).



LEGEND:

1. ENGINE BLOCK
2. SEALING RING (6)
3. HEXAGON HEAD SCREW WITH CAPTIVE WASHER (12)
4. REAR WASHER MANIFOLD
5. COUPLING O-RING (4)
6. MANIFOLD COUPLING (2)
7. CENTER WATER MANIFOLD
8. HOT ENGINE TEMPERATURE SWITCH
9. WIRE
10. LOCKWASHER
11. NUT
12. FRONT WATER MANIFOLD
13. NONMETALLIC TUBE
14. AIR VALVE
15. NONMETALLIC TUBE
16. REDUCER AND MALE CONNECTOR
17. DEAERATION LINE
18. HEATER HOSE
19. HOSE CLAMP
20. HEATER SHUTOFF VALVE AND REDUCER
21. DRAINCOCK
22. THERMOSTAT HOUSING GASKET
23. THERMOSTAT HOUSING
24. SCREW WITH CAPTIVE WASHER (4)
25. O-RING
26. WATER TRANSFER TUBE
27. OIL COOLER SUPPORT
28. SCREW WITH CAPTIVE WASHER
29. WATER HOSE
30. HOSE CLAMP
31. WATER SHUTOFF VALVE AND STREET ELBOW

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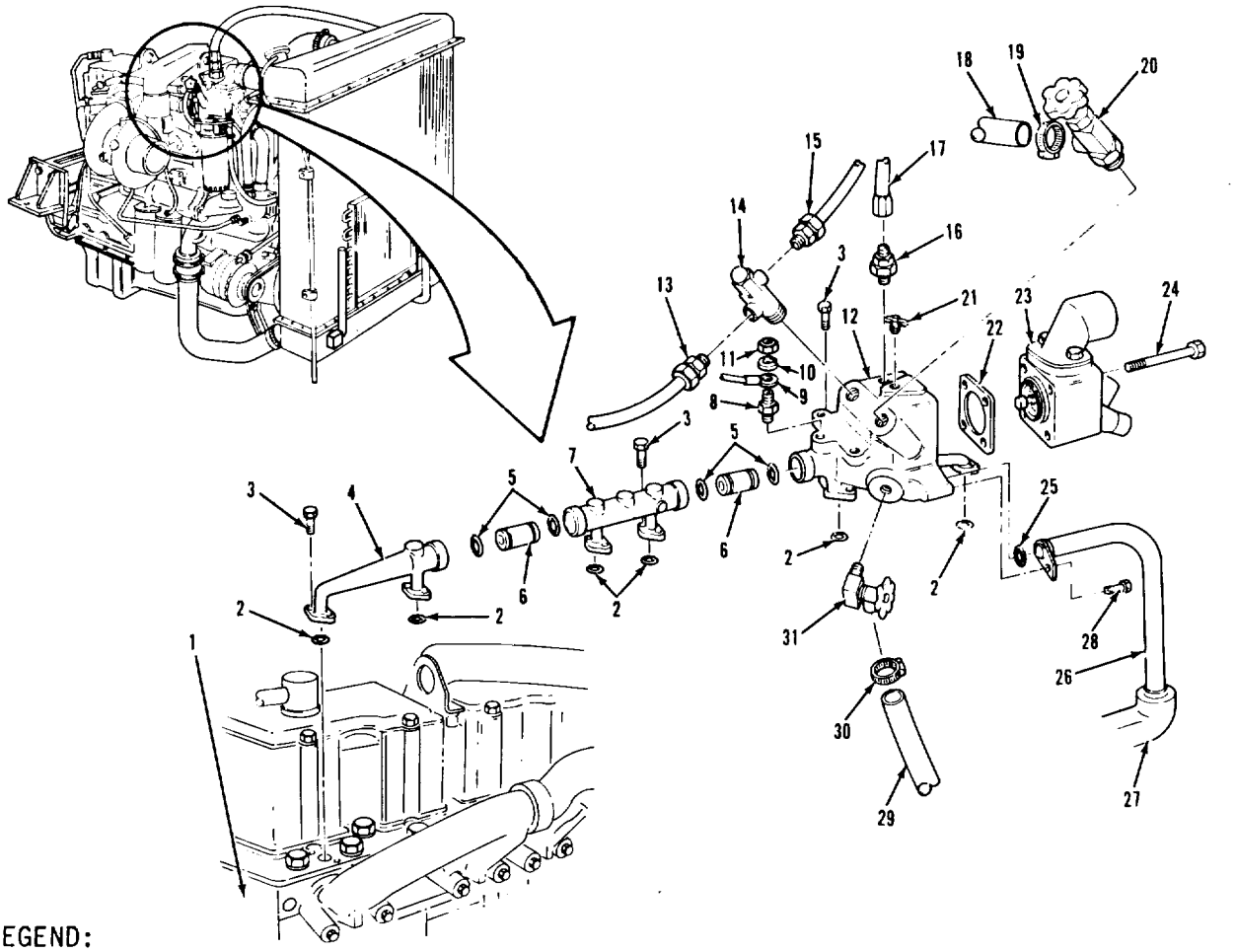
COOLING SYSTEM.

3-60. WATER MANIFOLDS REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL (Continued).		
22. Two rings (2).	Remove from item (1).	Discard items (2).
23. Switch (8), valve (14), valve and elbow (31), valve and reducer (20), reducer and connector (16), and draincock (21).	Remove from item (12).	
B. CLEANING AND INSPECTION.		
24. All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.Be sure to clean all gasket material off items (12) and (23).
C. INSTALLATION.		
25. Switch (8), valve (14), valve and elbow (31), valve and reducer (20),	a. Wrap threads with thread sealing tape. b. Install into item (12). reducer and connector (16), and draincock (21).	Refer to paragraph 3-7.
26. Two new rings (2).	Coat with grease and install into item (1).	Make sure rubber side of items (2) face up.
27. New gaskets (22).	Hold in place on item (12) with grease.	
28. Manifold (12)	a. Position on item (23). and gasket (22). b. Secure with four items- (24).	

COOLING SYSTEM.

3-60. WATER MANIFOLDS REPLACEMENT (Continued).



LEGEND:

1. ENGINE BLOCK
2. SEALING RING (6)
3. HEXAGON HEAD SCREW WITH CAPTIVE WASHER (12)
4. REAR WASHER MANIFOLD
5. COUPLING O-RING (4)
6. MANIFOLD COUPLING (2)
7. CENTER WATER MANIFOLD
8. HOT ENGINE TEMPERATURE SWITCH
9. WIRE
10. LOCKWASHER
11. NUT
12. FRONT WATER MANIFOLD
13. NONMETALLIC TUBE
14. AIR VALVE
15. NONMETALLIC TUBE
16. REDUCER AND MALE CONNECTOR
17. DEAERATION LINE
18. HEATER HOSE
19. HOSE CLAMP
20. HEATER SHUTOFF VALVE AND REDUCER
21. DRAINCOCK
22. THERMOSTAT HOUSING GASKET
23. THERMOSTAT HOUSING
24. SCREW WITH CAPTIVE WASHER (4)
25. O-RING
26. WATER TRANSFER TUBE
27. OIL COOLER SUPPORT
28. SCREW WITH CAPTIVE WASHER
29. WATER HOSE
30. HOSE CLAMP
31. WATER SHUTOFF VALVE AND STREET ELBOW

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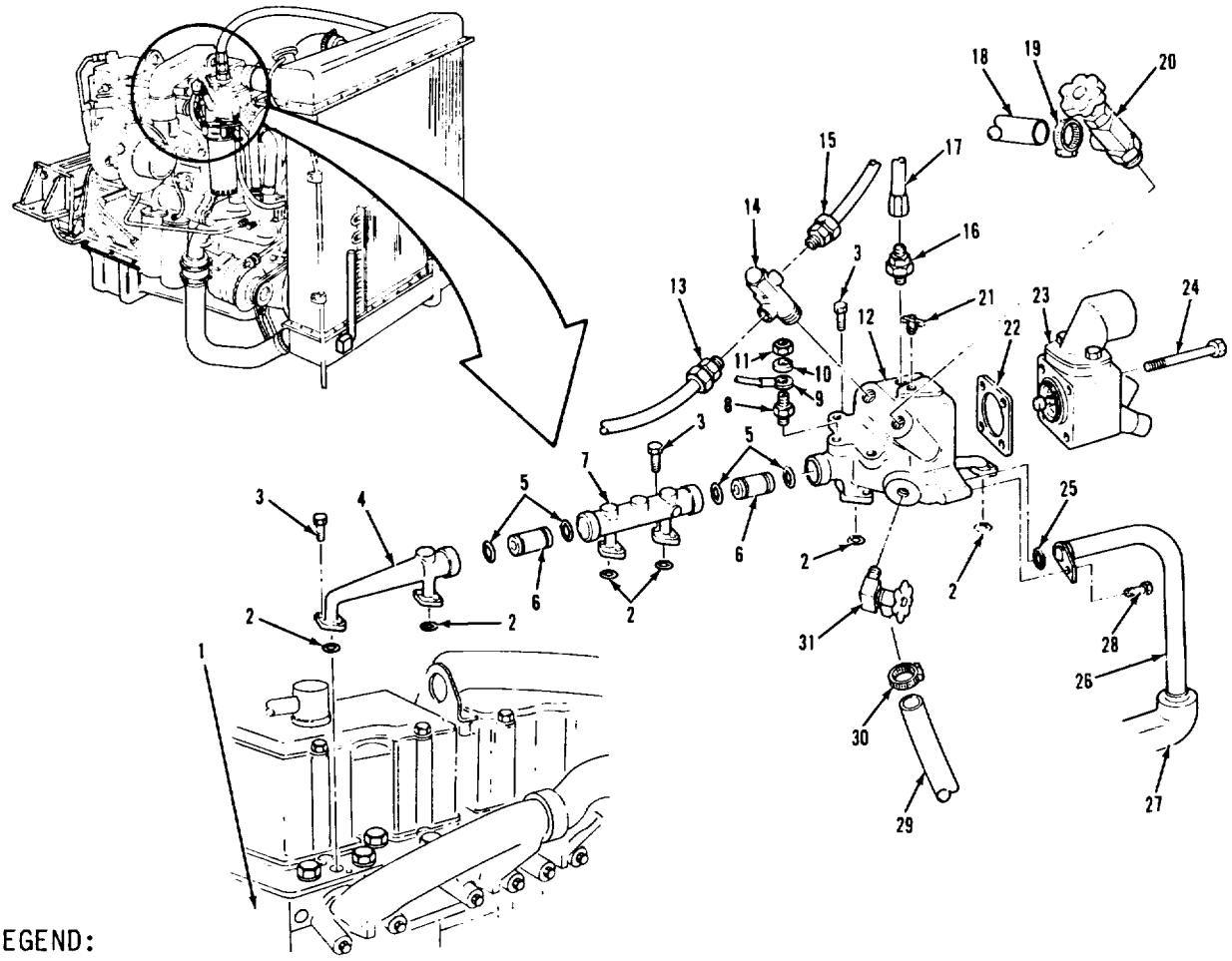
COOLING SYSTEM.

3-60. WATER MANIFOLDS REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
29. Four screws (3).	Install into items (12) and (1).	Torque items (3) to 30-35 lb-ft.
30. New 0-ring (25).	Coat with lubricating oil and install on item (26).	
31. Tube (26) and O-ring (25).	Wiggle into item (12).	Be careful not to damage item (25) during installation
32. Screw (28).	Install into items (26) and (12).	Torque to 30-35 lb-ft.
33. Hose (29) and	a. Push end of item (29) clamp (30).onto item (31). b. Push item (30) to end of item (29) and tighten screw.	
34. Hose (17).	Install on item (16).	
35. Tube (13) and tube (15).	Install on item (14).	Wrap threads of item (14) with thread sealing tape.
36. Hose (18) and clamp (19).	a. Push end of item (18) onto item (20). b. Push item (19) to end of item (18) and tighten screw.	
37. Wire (9).	a. Position on item (8). b. Secure with items (10) and (11).	

COOLING SYSTEM.

3-60. WATER MANIFOLDS REPLACEMENT (Continued).



LEGEND:

1. ENGINE BLOCK
2. SEALING RING (6)
3. HEXAGON HEAD SCREW WITH CAPTIVE WASHER (12)
4. REAR WASHER MANIFOLD
5. COUPLING O-RING (4)
6. MANIFOLD COUPLING (2)
7. CENTER WATER MANIFOLD
8. HOT ENGINE TEMPERATURE SWITCH
9. WIRE
10. LOCKWASHER
11. NUT
12. FRONT WATER MANIFOLD
13. NONMETALLIC TUBE
14. AIR VALVE
15. NONMETALLIC TUBE
16. REDUCER AND MALE CONNECTOR
17. DEAERATION LINE
18. HEATER HOSE
19. HOSE CLAMP
20. HEATER SHUTOFF VALVE AND REDUCER
21. DRAINCOCK
22. THERMOSTAT HOUSING GASKET
23. THERMOSTAT HOUSING
24. SCREW WITH CAPTIVE WASHER (4)
25. O-RING
26. WATER TRANSFER TUBE
27. OIL COOLER SUPPORT
28. SCREW WITH CAPTIVE WASHER
29. WATER HOSE
30. HOSE CLAMP
31. WATER SHUTOFF VALVE AND STREET ELBOW

TA 237147

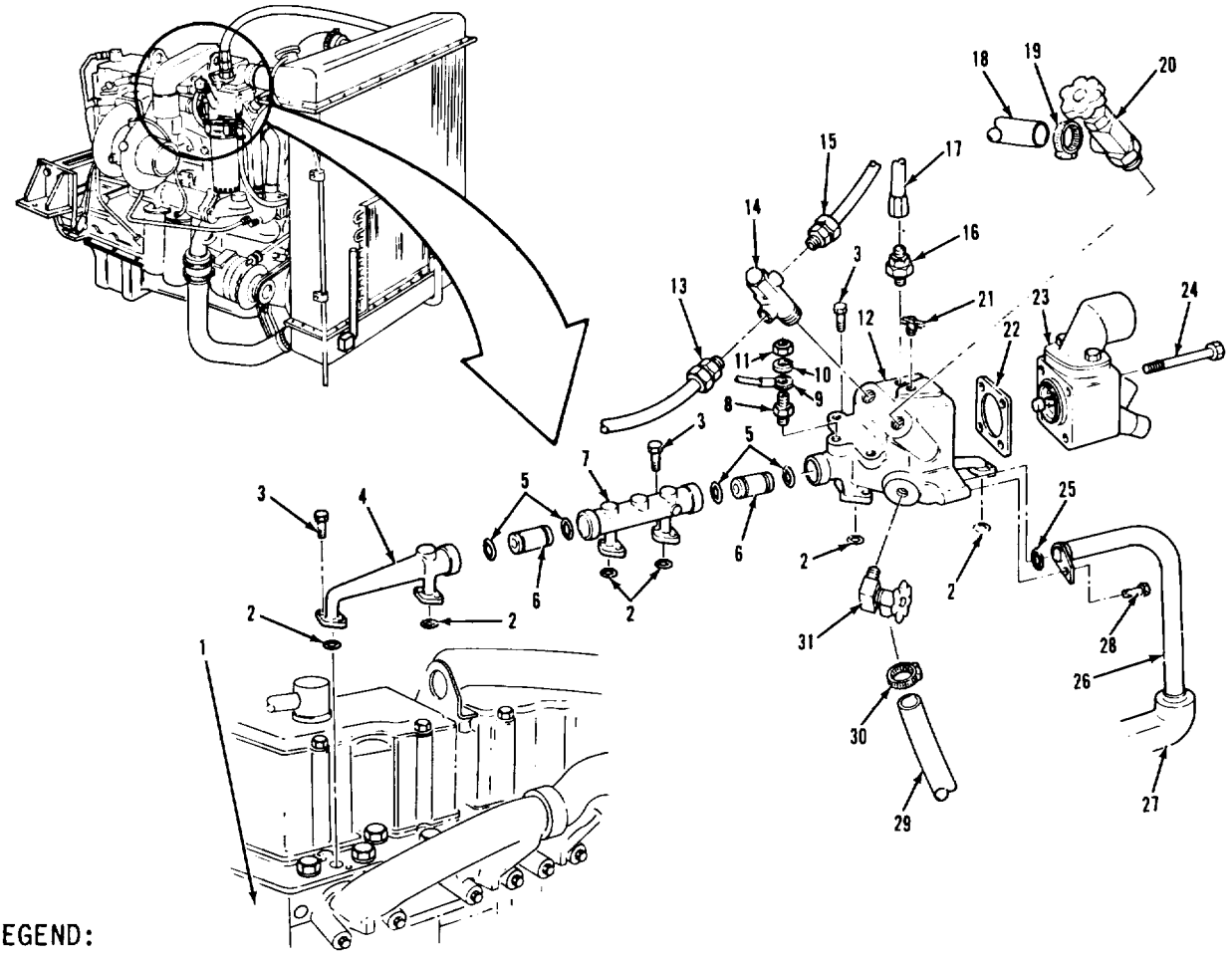
COOLING SYSTEM.

3-60. WATER MANIFOLDS REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
38. Two new 0-rings (5).	Coat with lubricating oil and install on item (6).	
39. Coupling (6) and O-ring (5).	Wiggle into item (7).	Be careful not to damage item (5) during installation.
40. Two new rings (2).	Coat with grease and install into item (1).	Make sure rubber side of items (2) face up.
41. Manifold (7), coupling (6), and O-ring (5).	Wiggle into item (12).	Be careful not to damage item (5) during installation.
42. Four screws (3).	Install into items (7) and (11).	Torque items (3) to 30-35 lb-ft.
43. Two new O-rings (5).	Coat with lubricating oil and install on item (6).	
44. Coupling (6) and O-ring (5).	Wiggle into item (4).	Be careful not to damage item (5) during installation.
45. Two new rings (2).	Coat with grease and install into item (1).	Make sure rubber side of items (2) face up.
46. Manifold (4), coupling (6), and O-ring (5).	Wiggle into item (7).	Be careful not to damage item (5) during installation.
47. Four screws (3).	Install into items (4) and (1).	Torque items (3) to 30-35 lb-ft.

COOLING SYSTEM.

3-60. WATER MANIFOLDS REPLACEMENT (Continued).



LEGEND:

1. ENGINE BLOCK
2. SEALING RING (6)
3. HEXAGON HEAD SCREW WITH CAPTIVE WASHER (12)
4. REAR WASHER MANIFOLD
5. COUPLING O-RING (4)
6. MANIFOLD COUPLING (2)
7. CENTER WATER MANIFOLD
8. HOT ENGINE TEMPERATURE SWITCH
9. WIRE
10. LOCKWASHER
11. NUT
12. FRONT WATER MANIFOLD
13. NONMETALLIC TUBE
14. AIR VALVE
15. NONMETALLIC TUBE
16. REDUCER AND MALE CONNECTOR
17. DEAERATION LINE
18. HEATER HOSE
19. HOSE CLAMP
20. HEATER SHUTOFF VALVE AND REDUCER
21. DRAINCOCK
22. THERMOSTAT HOUSING GASKET
23. THERMOSTAT HOUSING
24. SCREW WITH CAPTIVE WASHER (4)
25. O-RING
26. WATER TRANSFER TUBE
27. OIL COOLER SUPPORT
28. SCREW WITH CAPTIVE WASHER
29. WATER HOSE
30. HOSE CLAMP
31. WATER SHUTOFF VALVE AND STREET ELBOW

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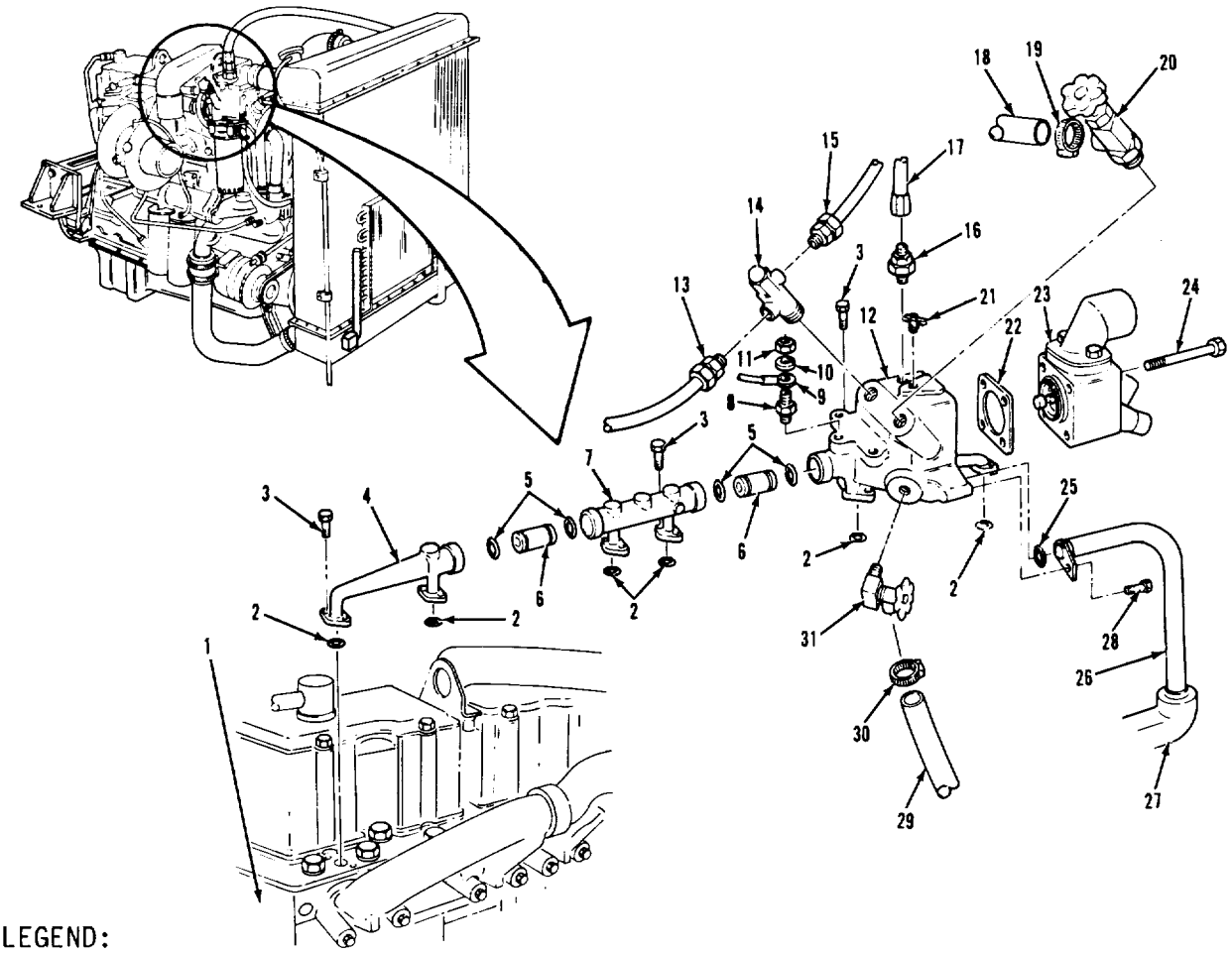
COOLING SYSTEM.

3-60. WATER MANIFOLDS REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
	NOTE Follow-on maintenance action required: Install turbocharger air intake (para 3-31). Install air cleaner assembly (para 3-29). Fill cooling system (para 3-52). Start vehicle and check for leaks (TM 9-2320-283-10).	

COOLING SYSTEM.

3-60. WATER MANIFOLDS REPLACEMENT (Continued).



LEGEND:

1. ENGINE BLOCK
2. SEALING RING (6)
3. HEXAGON HEAD SCREW WITH CAPTIVE WASHER (12)
4. REAR WASHER MANIFOLD
5. COUPLING O-RING (4)
6. MANIFOLD COUPLING (2)
7. CENTER WATER MANIFOLD
8. HOT ENGINE TEMPERATURE SWITCH
9. WIRE
10. LOCKWASHER
11. NUT
12. FRONT WATER MANIFOLD
13. NONMETALLIC TUBE
14. AIR VALVE
15. NONMETALLIC TUBE
16. REDUCER AND MALE CONNECTOR
17. DEAERATION LINE
18. HEATER HOSE
19. HOSE CLAMP
20. HEATER SHUTOFF VALVE AND REDUCER
21. DRAINCOCK
22. THERMOSTAT HOUSING GASKET
23. THERMOSTAT HOUSING
24. SCREW WITH CAPTIVE WASHER (4)
25. O-RING
26. WATER TRANSFER TUBE
27. OIL COOLER SUPPORT
28. SCREW WITH CAPTIVE WASHER
29. WATER HOSE
30. HOSE CLAMP
31. WATER SHUTOFF VALVE AND STREET ELBOW

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COOLING SYSTEM.

3-61. WATER SHUTOFF VALVES AND LINES REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION

PARAGRAPH	CONDITION DESCRIPTION
3-52.	Coolant drained below level of water shutoff valves and lines.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Tape, thread sealing
Item 32, Appendix C.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

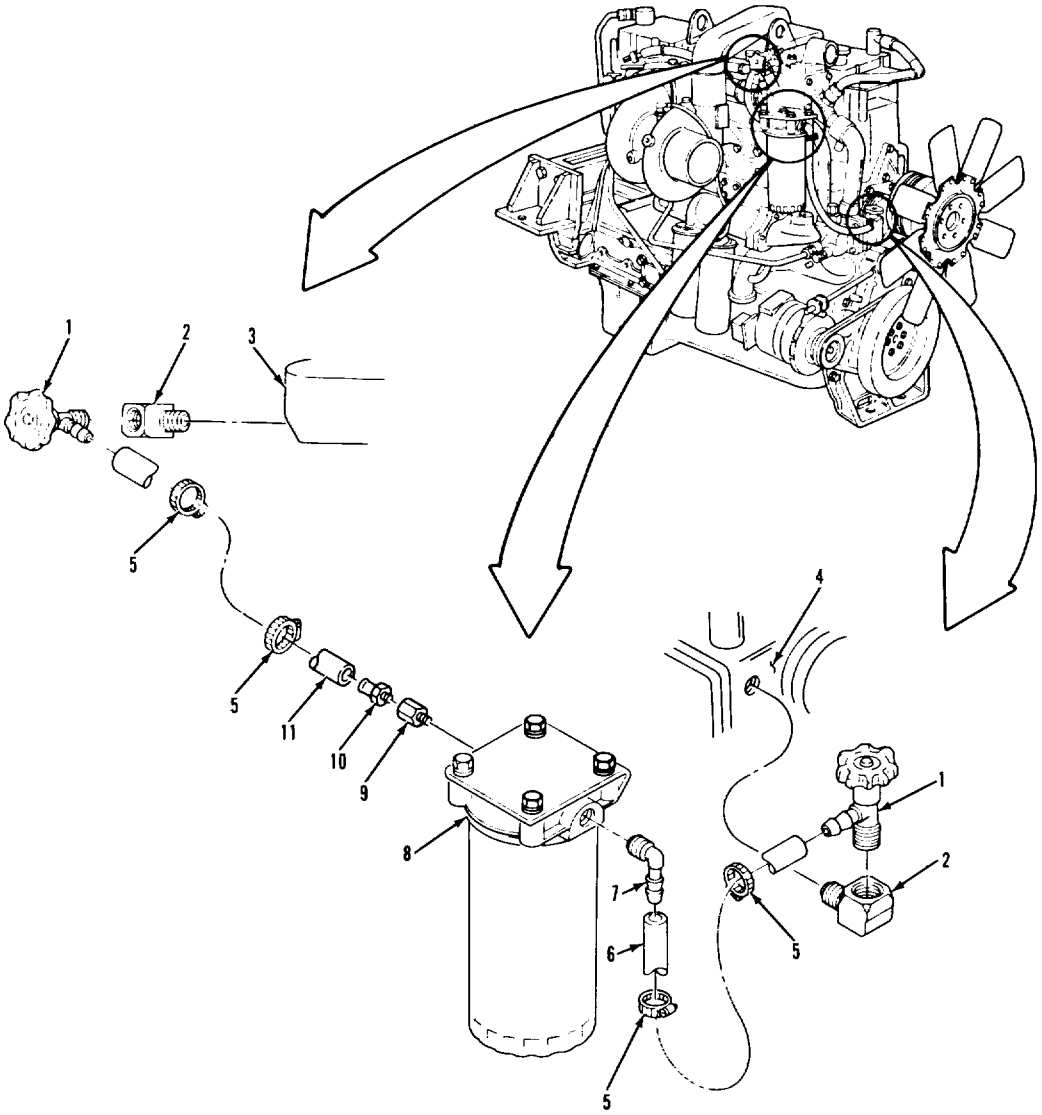
REFERENCES (TM)
TM 9-2320-283-10.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

COOLING SYSTEM.

3-61. WATER SHUTOFF VALVES AND LINES REPLACEMENT (Continued).



LEGEND:

1. WATER SHUTOFF VALVE (2)
2. STREET ELBOW (2)
3. FRONT WATER MANIFOLD
4. WATER PUMP ASSEMBLY
5. HOSE CLAMP (4)
6. WATER HOSE
7. ELBOW
8. FILTER HEAD
9. REDUCER
10. STRAIGHT-NOSED NIPPLE
11. WATER HOSE

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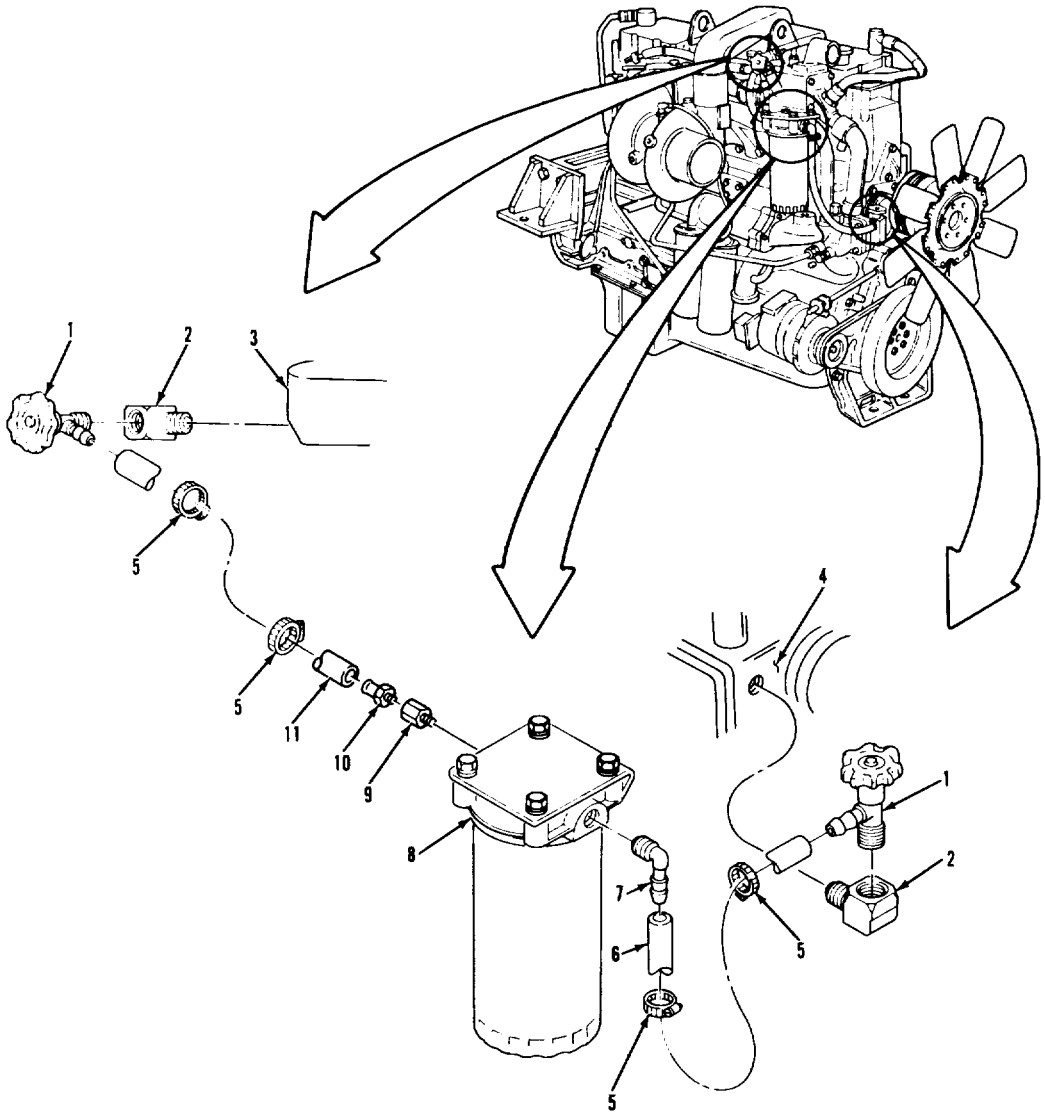
COOLING SYSTEM.

3-61. WATER SHUTOFF VALVES AND LINES REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Hose (6) and two clamps (5).	a. Loosen screws on item (5). b. Pull item (6) off of items (1) and (7). c. Remove items (5) from item (6).	
2. Elbow (7).	Remove from item (8).	
3. Valve (1) and elbow (2).	Remove from item (4) and separate item (1) from item (2).	
4. Hose (11) and two	a. Loosen screws on items clamps (5).(5). b. Pull item (11) off of items (1) and (10). c. Remove items (5) from item (11).	
5. Nipple (10) and reducer (9).	Remove from item (8) and separate item (10) and item (9).	
6. Valve (1) and elbow (2).	Remove from item (3) and separate item (1) from item (2).	
B. CLEANING AND INSPECTION.		
7. All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.

COOLING SYSTEM.

3-61. WATER SHUTOFF VALVES AND LINES REPLACEMENT (Continued).



LEGEND:

1. WATER SHUTOFF VALVE (2)
2. STREET ELBOW (2)
3. FRONT WATER MANIFOLD
4. WATER PUMP ASSEMBLY
5. HOSE CLAMP (4)
6. WATER HOSE
7. ELBOW
8. FILTER HEAD
9. REDUCER
10. STRAIGHT-NOSED NIPPLE
11. WATER HOSE

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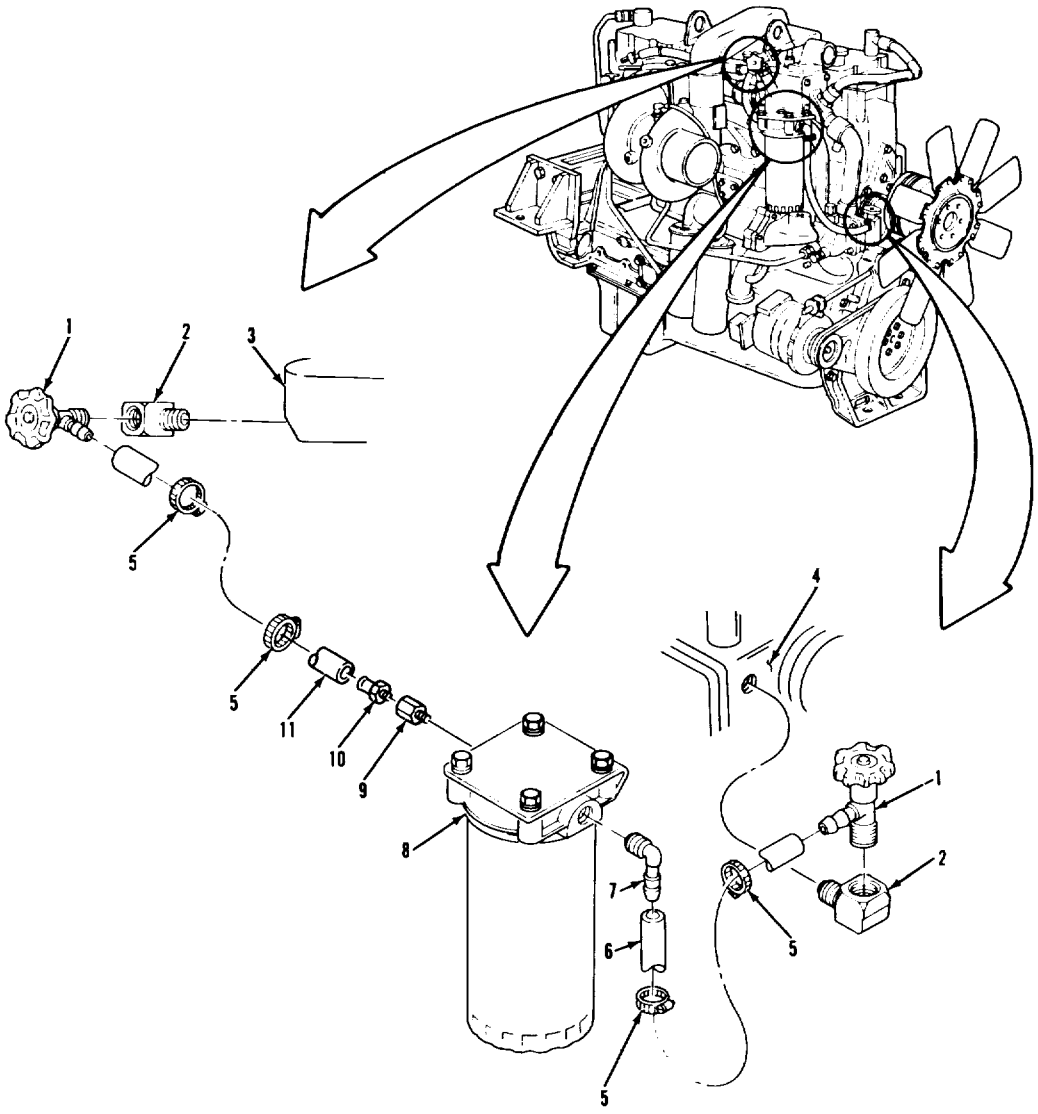
COOLING SYSTEM.

3-61. WATER SHUTOFF VALVES AND LINES REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION.		
8. Valve (1) and elbow (2).	a. Wrap threads with thread sealing tape. b. Screw together and install into item (3).	Refer to paragraph 3-7.
9. Nipple (10) and reducer (9).	a. Wrap threads with thread sealing tape. b. Screw together and install into item (8).	Refer to paragraph 3-7.
10. Hose (11) and two clamps (5).	a. Install items (5) on item (11). b. Push ends of item (11) onto items (1) and (10). c. Push items (5) to ends of item (11), and tighten screws.	
11. Valve (1) and elbow (2).	a. Wrap threads with thread sealing tape. b. Screw together and install into item (4).	Refer to paragraph 3-7.
12. Elbow (7).	a. Wrap threads with thread sealing tape. b. Install into item (8).	Refer to paragraph 3-7.

COOLING SYSTEM.

3-61. WATER SHUTOFF VALVES AND LINES REPLACEMENT (Continued).



LEGEND:

1. WATER SHUTOFF VALVE (2)
2. STREET ELBOW (2)
3. FRONT WATER MANIFOLD
4. WATER PUMP ASSEMBLY
5. HOSE CLAMP (4)
6. WATER HOSE
7. ELBOW
8. FILTER HEAD
9. REDUCER
10. STRAIGHT-NOSED NIPPLE
11. WATER HOSE

TA 237152

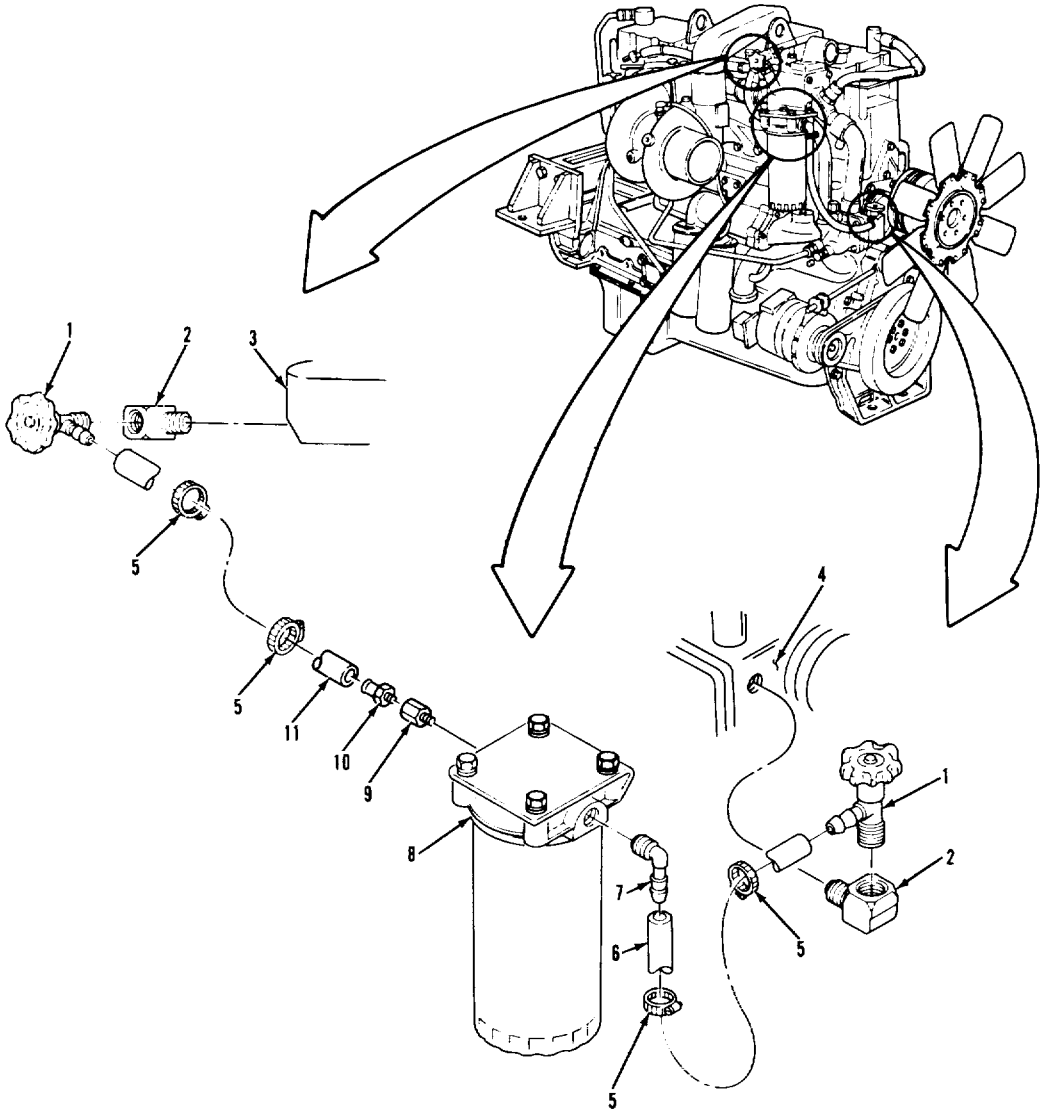
COOLING SYSTEM.

3-61. WATER SHUTOFF VALVES AND LINES REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
13. Hose (6) and two	a. Install items (5) on item clamps (5).(6). b. Push ends of item (6) into items (1) and (7). c. Push items (5) to ends of item (6), and tighten screws. **NOTE** Follow-on maintenance action required: Fill cooling system (para 3-52). Start vehicle and check for leaks (TM 9-2320-283-10).	

COOLING SYSTEM.

3-61. WATER SHUTOFF VALVES AND LINES REPLACEMENT (Continued).



LEGEND:

1. WATER SHUTOFF VALVE (2)
2. STREET ELBOW (2)
3. FRONT WATER MANIFOLD
4. WATER PUMP ASSEMBLY
5. HOSE CLAMP (4)
6. WATER HOSE
7. ELBOW
8. FILTER HEAD
9. REDUCER
10. STRAIGHT-NOSED NIPPLE
11. WATER HOSE

TA 237153

COOLING SYSTEM.

3-62. WATER FILTER AND BRACKET REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
None.

CONDITION DESCRIPTION
None.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Tape, thread sealing
Item 32, Appendix C.
Anti-freeze
Item 2 or 3, Appendix C.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

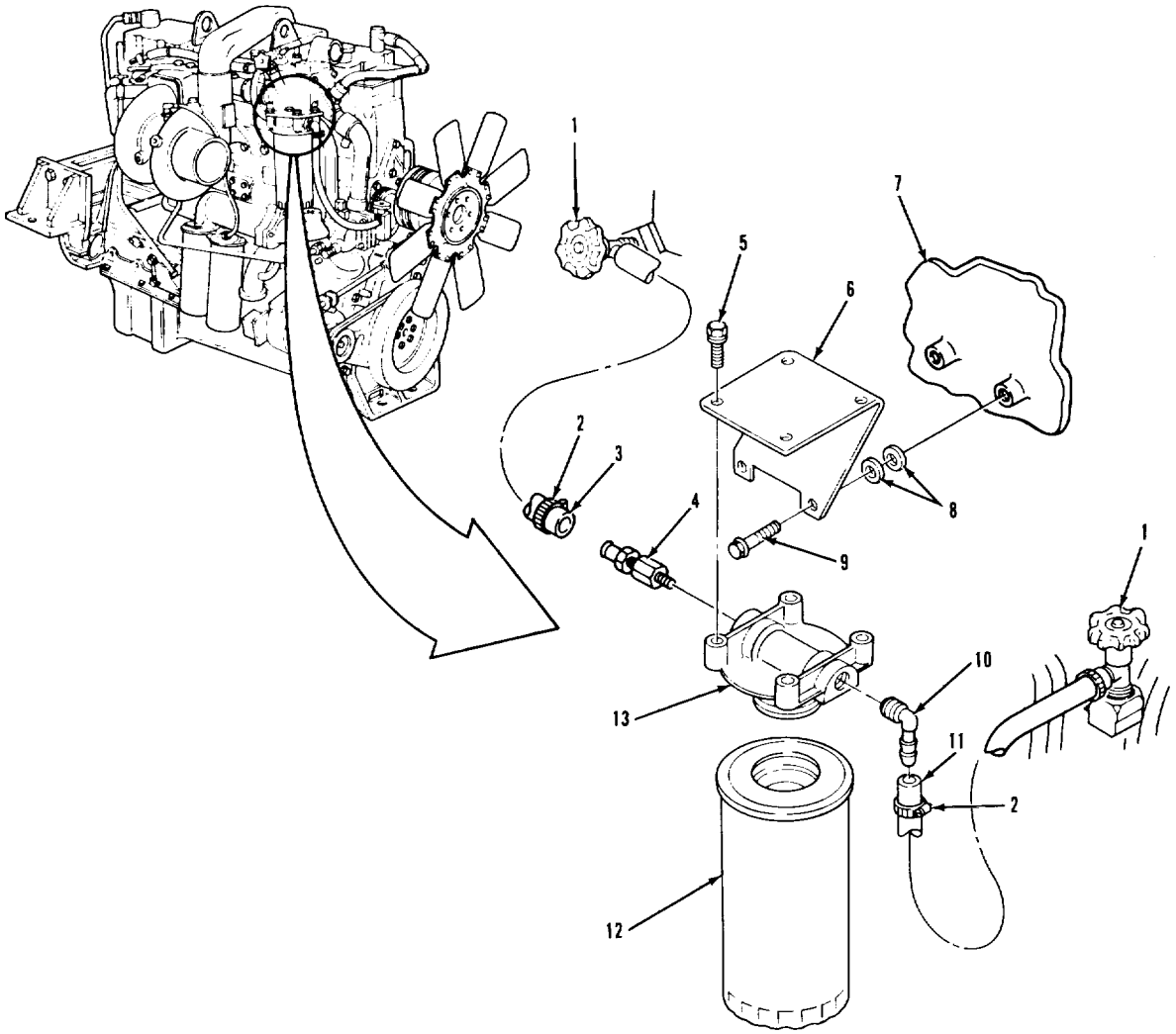
REFERENCES (TM)
TM 9-2320-283-10.
TM 9-750-254.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

COOLING SYSTEM.

3-62. WATER FILTER AND BRACKET REPLACEMENT (Continued).



LEGEND:

1. WATER SHUTOFF VALVE (2)
2. HOSE CLAMP (2)
3. WATER HOSE
4. STRAIGHT HOSE NIPPLE AND REDUCER
5. HEXAGON HEAD SCREW WITH CAPTIVE WASHER (4)
6. FILTER MOUNTING BRACKET
7. EXHAUST MANIFOLD
8. PLAIN WASHER (4)
9. HEXAGON HEAD SCREW (2)
10. ELBOW
11. WATER HOSE
12. WATER FILTER
13. FILTER HEAD

TA237154

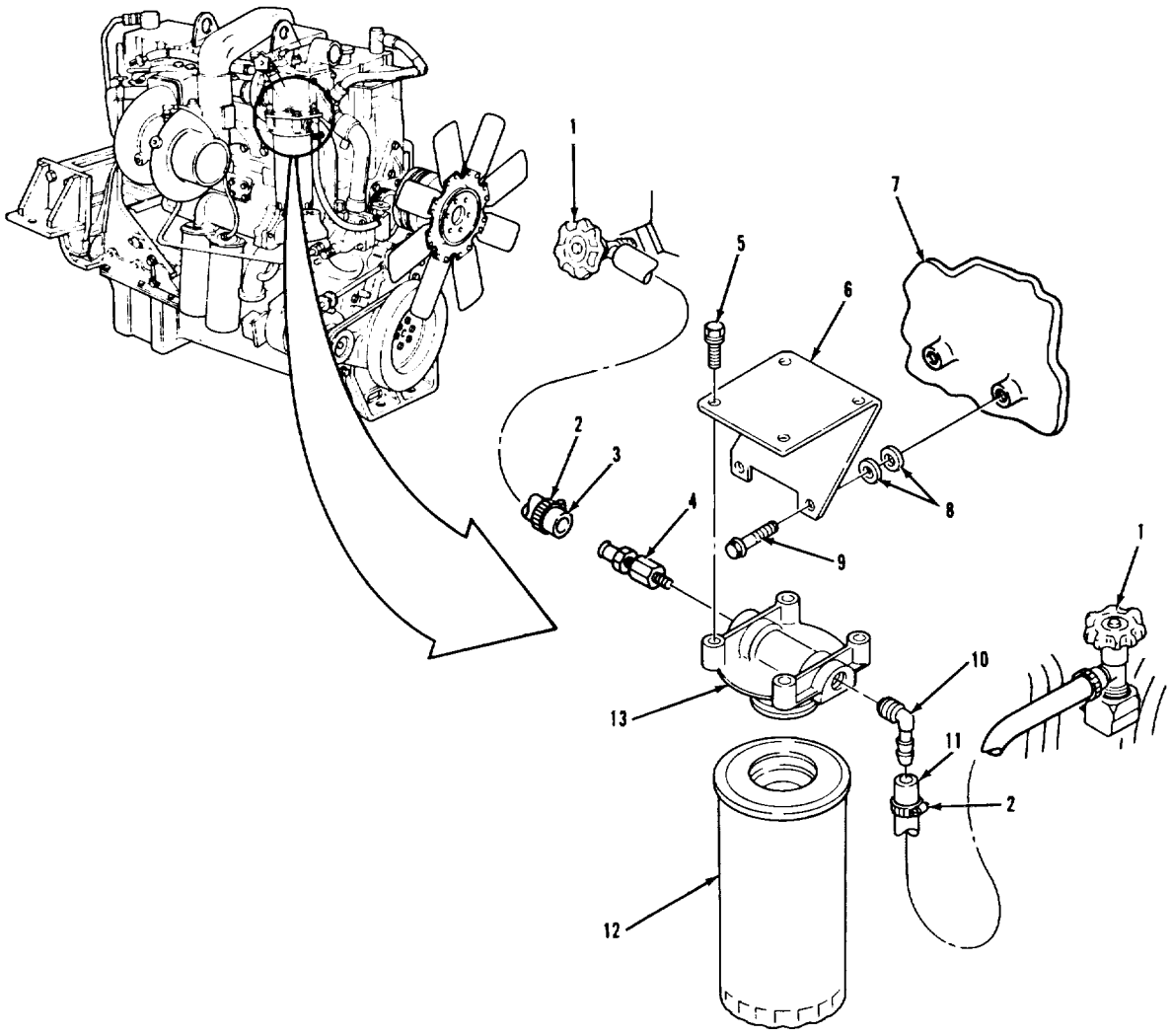
COOLING SYSTEM.

3-62. WATER FILTER AND BRACKET REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
A. REMOVAL.		
1. Two valves (1).	Close by turning clockwise as far as possible.	
2. Filter (12).	a. Unscrew and remove from item (13).	Have a suitable container ready to catch any coolant from item (12).
	b. Dump coolant into suitable container.	
3. Hose (3) and clamp (2).	a. Loosen screw on item (2). b. Pull item (3) off of item (4).	Leave item (2) on item (3).
4. Hose (11) and clamp (2).	a. Loosen screw on item (2). b. Pull item (11) off of item (10).	Leave item (2) on item (11).
5. Four screws (5) and head (13).	Remove from item (6).	
6. Elbow (10) and nipple and reducer (4).	Remove from item (13).	
7. Two screws (9), four washers (8), and bracket (6).	Remove from item (7).	
B. CLEANING AND INSPECTION.		
8. All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
C. INSTALLATION.		
9. Bracket (6).	a. Position on item (7).	
	b. Secure with two items (9) and four items (8).	Four items (8) are installed between items (6) and (7).

COOLING SYSTEM.

3-62. WATER FILTER AND BRACKET REPLACEMENT (Continued).



LEGEND:

1. WATER SHUTOFF VALVE (2)
2. HOSE CLAMP (2)
3. WATER HOSE
4. STRAIGHT HOSE NIPPLE AND REDUCER
5. HEXAGON HEAD SCREW WITH CAPTIVE WASHER (4)
6. FILTER MOUNTING BRACKET
7. EXHAUST MANIFOLD
8. PLAIN WASHER (4)
9. HEXAGON HEAD SCREW (2)
10. ELBOW
11. WATER HOSE
12. WATER FILTER
13. FILTER HEAD

TA 237155

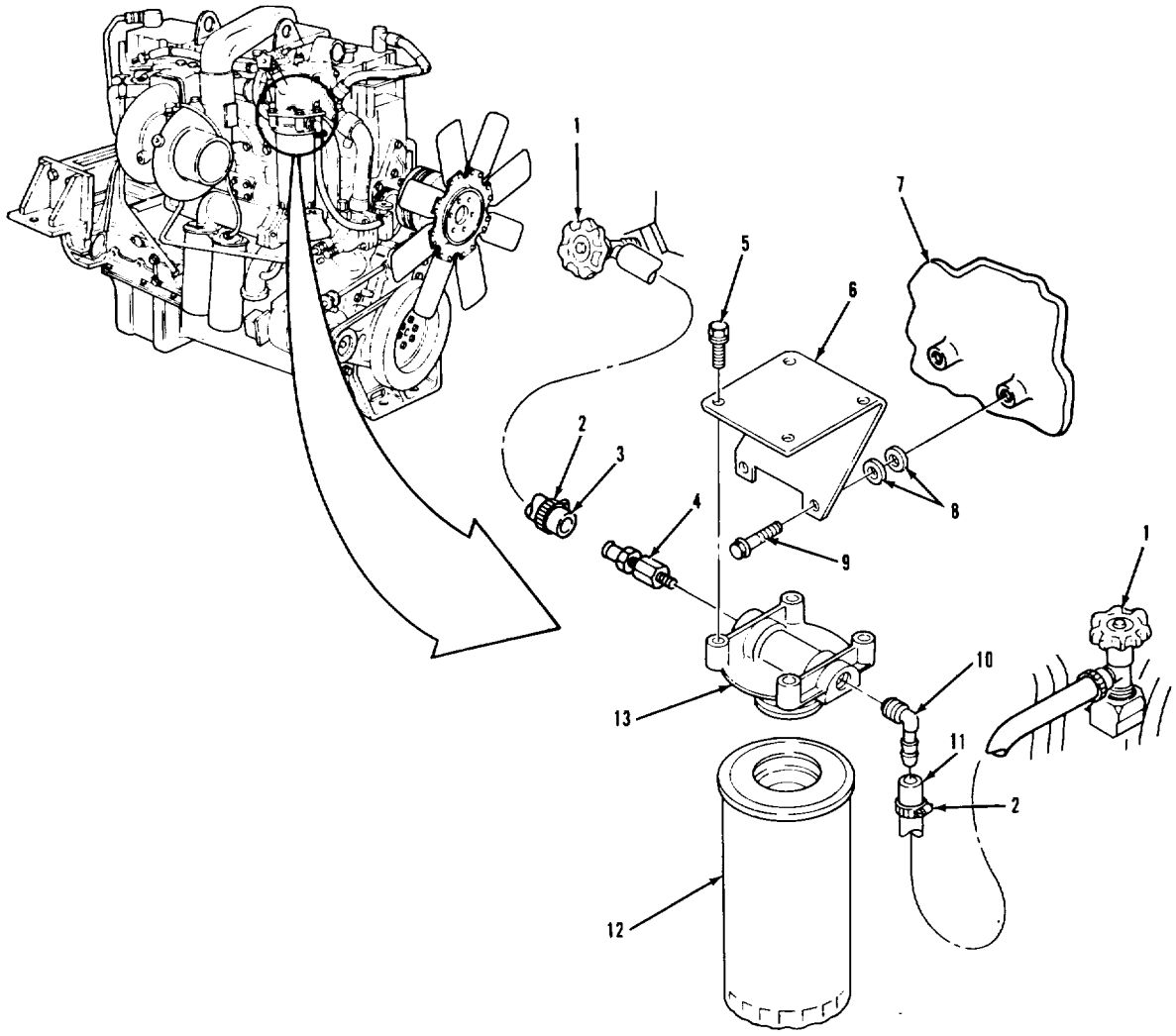
COOLING SYSTEM.

3-62. WATER FILTER AND BRACKET REPLACEMENT (Continued).

LOCATION/ITEM	ACTION	REMARKS
C. INSTALLATION (Continued).		
10. Elbow (10) and nipple and reducer (4).	a. Wrap threads with thread sealing tape.	Refer to paragraph 3-7.
	b. Install into item (13).	
11. Head (13).	a. Position under item (6).	
	b. Secure with four items (5).	
12. Hose (11) and clamp (2).	a. Push end of item (11) onto item (10).	
	b. Push item (2) to end of item (11), and tighten screw.	
13. Hose (3) and clamp (2).	a. Push end of item (3) onto item (4).	
	b. Push item (2) to end of item (3), and tighten screw.	
14. Filter (12).	a. Fill with clean coolant.	See TM 9-750-254 for proper mixture.
	b. Screw onto item (13) until gasket seal makes contact, then screw on 3/4 of a turn further.	Do not overtighten item (12).
15. Two valves (1).	Open by turning counterclockwise as far as possible.	
	NOTE	
	Follow-on maintenance action required: Fill cooling system (para 3-52). Start vehicle and check for leaks (TM 9-2320-283-10).	

COOLING SYSTEM.

3-62. WATER FILTER AND BRACKET REPLACEMENT (Continued).



TA 237156

LEGEND:

1 WATER SHUTOFF VALVE (2)
2 HOSE CLAMP (2)
3 WATER HOSE
4 STRAIGHT HOSE NIPPLE AND REDUCER
5 HEXAGON HEAD SCREW WITH CAPTIVE WASHER (4)
6 FILTER MOUNTING BRACKET
7 EXHAUST MANIFOLD
8 PLAIN WASHER (4)
9 HEXAGON HEAD SCREW (2)
10 ELBOW
11 WATER HOSE
12 WATER FILTER
13 FILTER HEAD

COOLING SYSTEM.

3-63. WATER PUMP DRIVE BELT REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Installation.
c. Adjustment.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
3-67.

CONDITION DESCRIPTION
Fan clutch drive belts removed.

TEST EQUIPMENT
Belt tension gage.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
None.

PERSONNEL REQUIRED
One (MOS-63S .

SPECIAL ENVIRONMENTAL CONDITIONS
None.

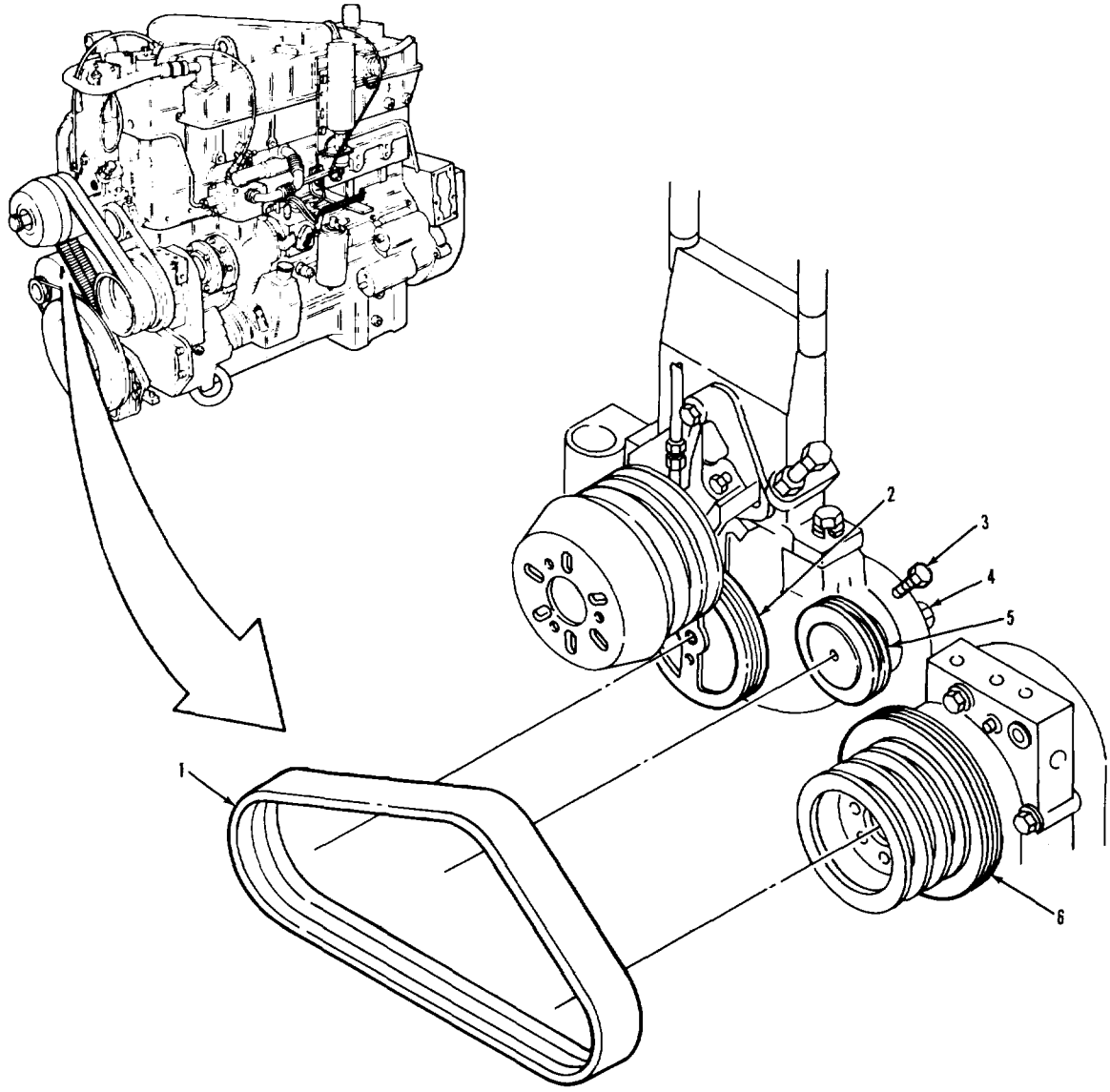
REFERENCES (TM)
TM 9-2320-283-20P.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

COOLING SYSTEM.

3-63. WATER PUMP DRIVE BELT REPLACEMENT (Continued).



LEGEND:

1	V-RIBBED BELT	4	HEXAGON NUT
2	WATER PUMP PULLEY ASSEMBLY	5	IDLER PULLEY
3	HEXAGON SCREW	6	ACCESSORY DRIVE PULLEY ASSEMBLY

COOLING SYSTEM.

3-63. WATER PUMP DRIVE BELT REPLACEMENT (Continued).

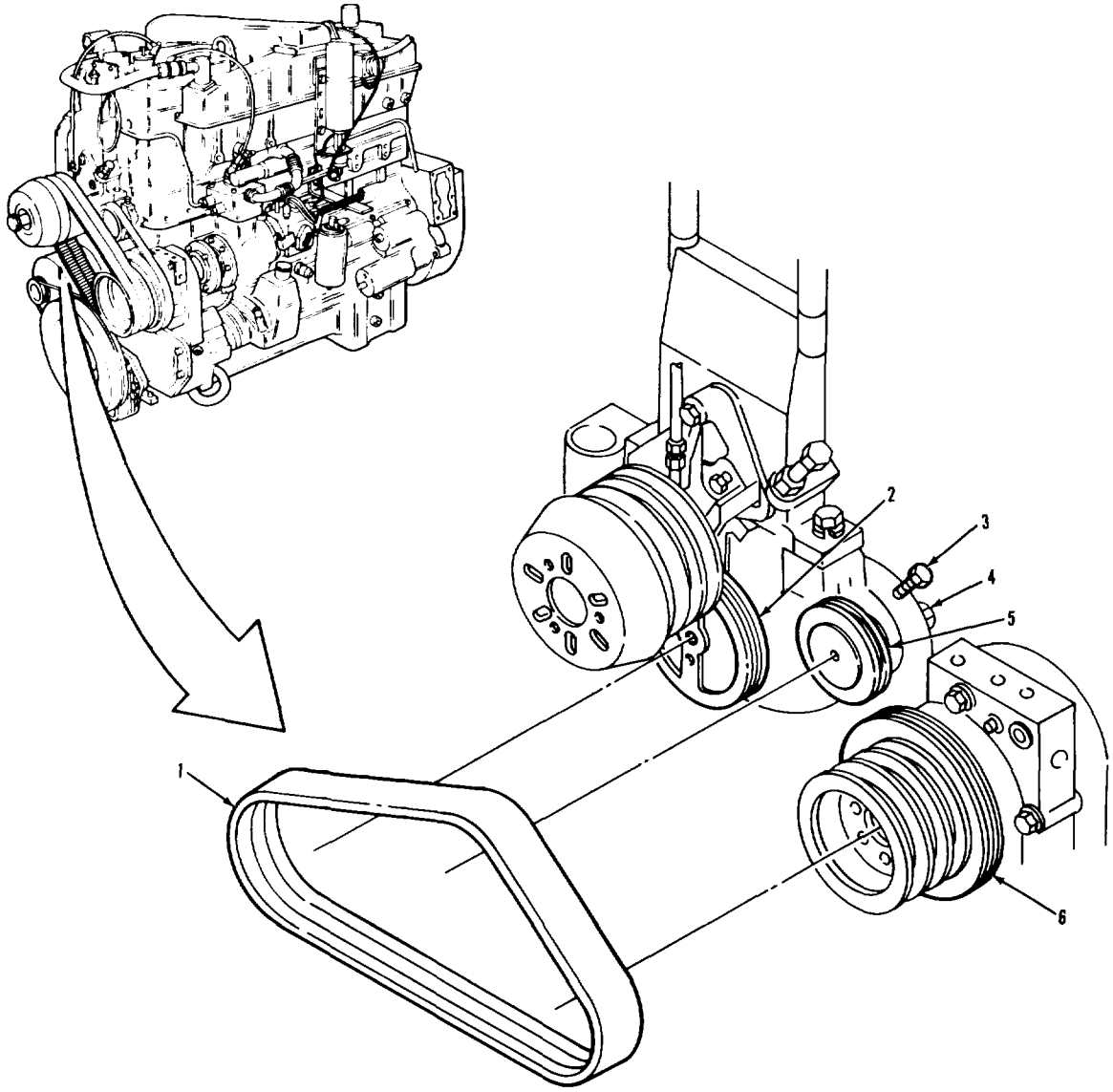
LOCATION/ITEM		ACTION	REMARKS
A.	REMOVAL. I		
1.	Nut (4).	Loosen, but do not remove.	
2.	Screw (3).	Unscrew until item (1) can be removed.	
3.	Belt (1).	a. Remove from items (2), (5), and (6). b. Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
B.	INSTALLATION.		
4.	Belt (4).	Install on items (2), (5), and (6).	Do not use a screwdriver to force item (1) on items (2), (5), and (6)
C.	ADJUSTMENT.		
5.	Screw (3) and belt (1).	Adjust until belt tension is 90-100 lb-ft on belt tension gage.	Loosen item (4), if not already done.
6.	Nut (4).	Torque to 50 lb-ft.	

NOTE
Follow-on maintenance action required:

Install and adjust fan clutch drive belts (para 3-63).

COOLING SYSTEM.

3-63. WATER PUMP DRIVE BELT REPLACEMENT (Continued).



LEGEND:

1	V-RIBBED BELT	4	HEXAGON NUT
2	WATER PUMP PULLEY ASSEMBLY	5	IDLER PULLEY
3	HEXAGON SCREW	6	ACCESSORY DRIVE PULLEY ASSEMBLY

COOLING SYSTEM.

3-64. WATER PUMP REPLACEMENT.

THIS TASK COVERS
- a. Removal.
- b. Cleaning and Inspection.
- c. Installation.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

EQUIPMENT CONDITION

PARAGRAPH	CONDITION DESCRIPTION
3-65.	Fan and fan clutch removed.
3-63.	Water pump drive belts removed.
3-52.	Coolant drained.

MATERIALS/PARTS (P/N)
Oil, lubricating: OE/HDO-30
Item 16, Appendix C.
Tape, thread sealing
Item 32, Appendix C.
Grease, automotive and artillery
Item 7, Appendix C.
Gasket, water pump
(15434) 3002385.
Gasket, water connection
(15434) 3024960.
O-ring
(15434) 43463-A.

PERSONNEL REQUIRED
One (MOS-63S).

SPECIAL ENVIRONMENTAL CONDITIONS
None.

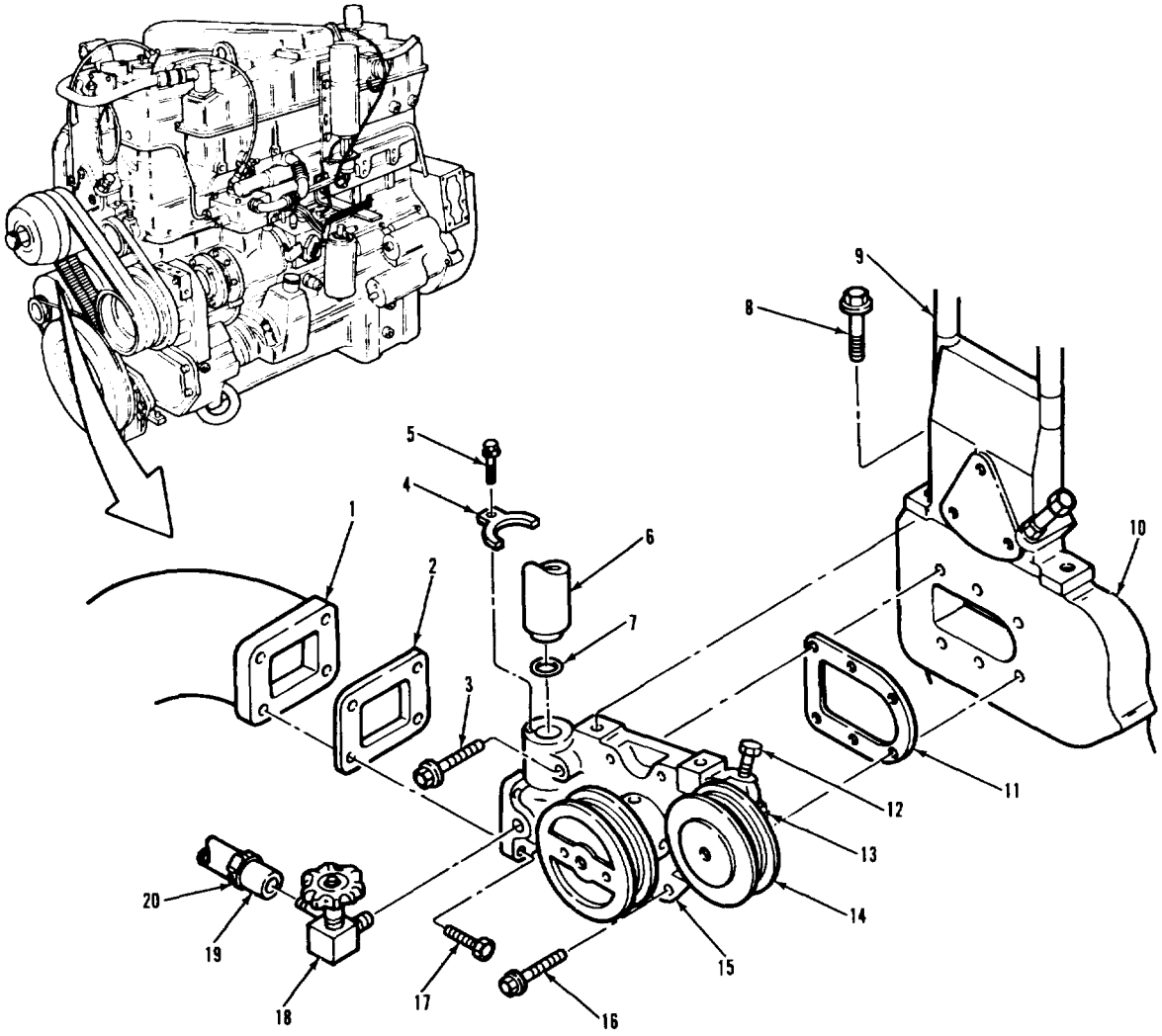
REFERENCES (TM)
TM 9-2320-283-10.
TM 9-2320-283-20P.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

COOLING SYSTEM.

3-64. WATER PUMP REPLACEMENT (Continued).



TA 237159

1 WATER PUMP TO RADIATOR CONNECTION
2 WATER CONNECTION GASKET
3 SCREW WITH CAPTIVE WASHER (2)
4 TUBE CLAMP
5 HEXAGON HEAD SCREW WITH CAPTIVE WASHER
6 WATER BYPASS TUBE
7 O-RING
8 SCREW WITH CAPTIVE WASHER (2)
9 FAN BRACKET
10. ENGINE BLOCK
11 WATER PUMP GASKET
12 HEXAGON SCREW
13 HEXAGON NUT
14 IDLER PULLEY
15 WATER PUMP ASSEMBLY
16 SCREW WITH CAPTIVE WASHER (4)
17 SCREW (4)
18 WATER SHUTOFF VALVE AND STREET ELBOW
19 WATER HOSE
20. HOSE CLAMP

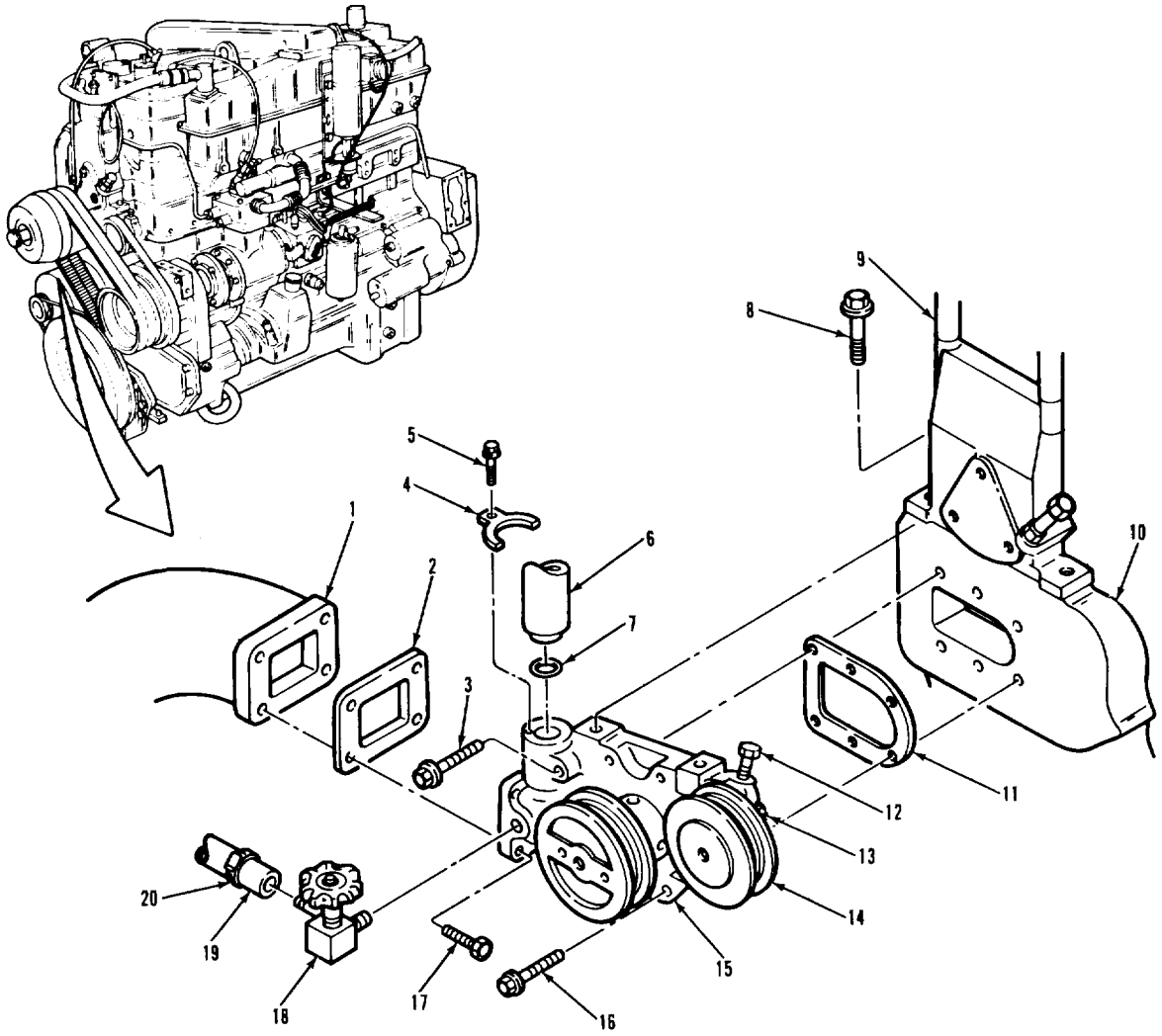
COOLING SYSTEM.

3-64. WATER PUMP REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
A.	REMOVAL.		
1.	Hose (19) and clamp (20).	a. Loosen screw on item (20).	
		b. Pull item (19) off of item (18).	Leave item (20) on item (19).
2.	Two screws (8).	Remove from items (9) and (15).	
3.	Nut (13).	Loosen, but do not remove.	
4.	Screw (12).	Screw in, raising item (14) until it is clear of all items (16).	
5.	Four screws (16) and two screws (3).	Remove from items (15) and (10).	
6.	Screw (5) and clamp (4).	Remove from item (15).	
7.	Four screws (17).	Remove from items (15) and (1).	
8.	Pump (15), gasket (2), and gasket (11).	Remove from items (1), (6), and (10).	Have suitable container ready to catch coolant from item (15). Use soft faced mallet to remove item (15). Discard items (2) and (11).

COOLING SYSTEM.

3-64. WATER PUMP REPLACEMENT (Continued).



TA 237160

1 WATER PUMP TO RADIATOR CONNECTION
2 WATER CONNECTION GASKET
3 SCREW WITH CAPTIVE WASHER (2)
4 TUBE CLAMP
5 HEXAGON HEAD SCREW WITH CAPTIVE WASHER
6 WATER BYPASS TUBE
7 O-RING
8 SCREW WITH CAPTIVE WASHER (2)
9 FAN BRACKET
10. ENGINE BLOCK
11 WATER PUMP GASKET
12 HEXAGON SCREW
13 HEXAGON NUT
14 IDLER PULLEY
15 WATER PUMP ASSEMBLY
16 SCREW WITH CAPTIVE WASHER (4)
17 SCREW (4)
18 WATER SHUTOFF VALVE AND STREET ELBOW
19 WATER HOSE
20. HOSE CLAMP

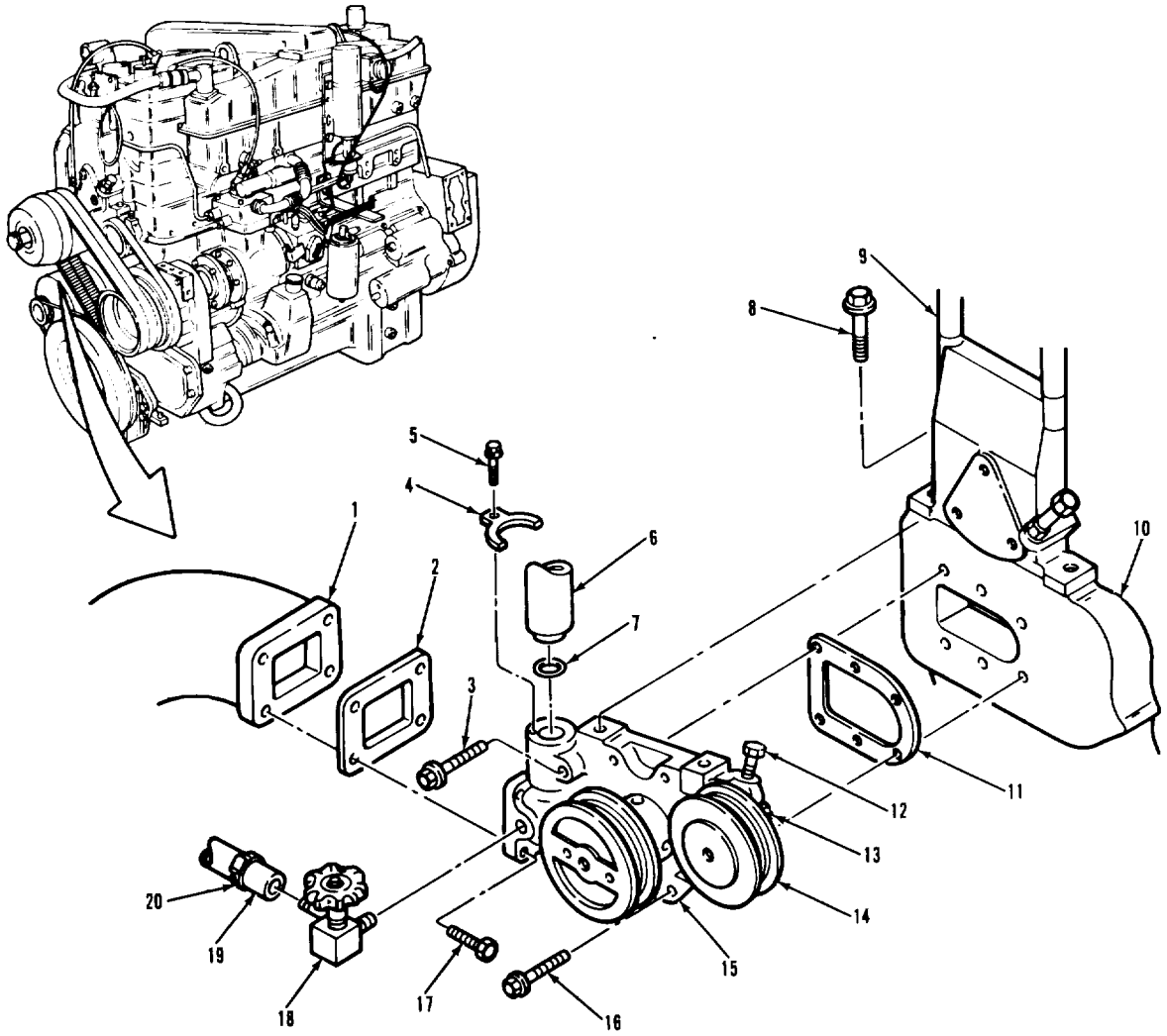
COOLING SYSTEM.

3-64. WATER PUMP REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
A.	REMOVAL (Continued).		
9.	Valve and elbow (18).	Remove from item (15).	
10.	0-ring (7).	Remove from item (6).	Discard item (7).
B.	CLEANING AND INSPECTION.		
11.	All parts.	Clean and inspect and 3-5.	Refer to paragraphs 3-4 If item (15) is damaged, refer to DS/GS maintenance.
C.	INSTALLATION.		
12	New 0-ring (7)	Lubricate and install onto item (6).	
13	Valve and elbow (18)	a Wrap threads with thread sealing tape. b Install into item (15).	Refer to paragraph 3-7.
14	New gasket (2) and new gasket (11).	Hold in place on item (15) with grease.	
15	Pump (15), gasket (2), and gasket (11)	a Position on items (1), (6), and (10) b Secure to item (1) with four items (17) c Secure to item (10) with two items (3) and four items (16).	Be careful not to damage item (7) during installation. Torque items (17) to 30-35 lb-ft. Torque items (3) and (16) 30-35 lb-ft.

COOLING SYSTEM.

3-64. WATER PUMP REPLACEMENT (Continued).



TA 237161

1	WATER PUMP TO RADIATOR CONNECTION	11	WATER PUMP GASKET
2	WATER CONNECTION GASKET	12	HEXAGON SCREW
3	SCREW WITH CAPTIVE WASHER (2)	13	HEXAGON NUT
4	TUBE CLAMP	14	IDLER PULLEY
5	HEXAGON HEAD SCREW WITH CAPTIVE WASHER	15	WATER PUMP ASSEMBLY
		16	SCREW WITH CAPTIVE WASHER (4)
6	WATER BYPASS TUBE	17	SCREW (4)
7	O-RING	18	WATER SHUTOFF VALVE AND STREET ELBOW
8	SCREW WITH CAPTIVE WASHER (2)		
9	FAN BRACKET	19	WATER HOSE
10	ENGINE BLOCK	20	HOSE CLAMP

COOLING SYSTEM.

3-64. WATER PUMP REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
C.	INSTALLATION (Continued).		
16.	Clamp (4).	a. Position on item (15). b. Secure with item (5).	
17.	Screw (12).	Unscrew until item (14) is at its lowest position in item (15).	
18.	Two screws (8).	Screw into items (9) and (15), and tighten.	
19.	Hose (19) and clamp (20).	a. Push end of item (19) onto item (18). b. Push item (20) to end of item (19), and tighten screw.	

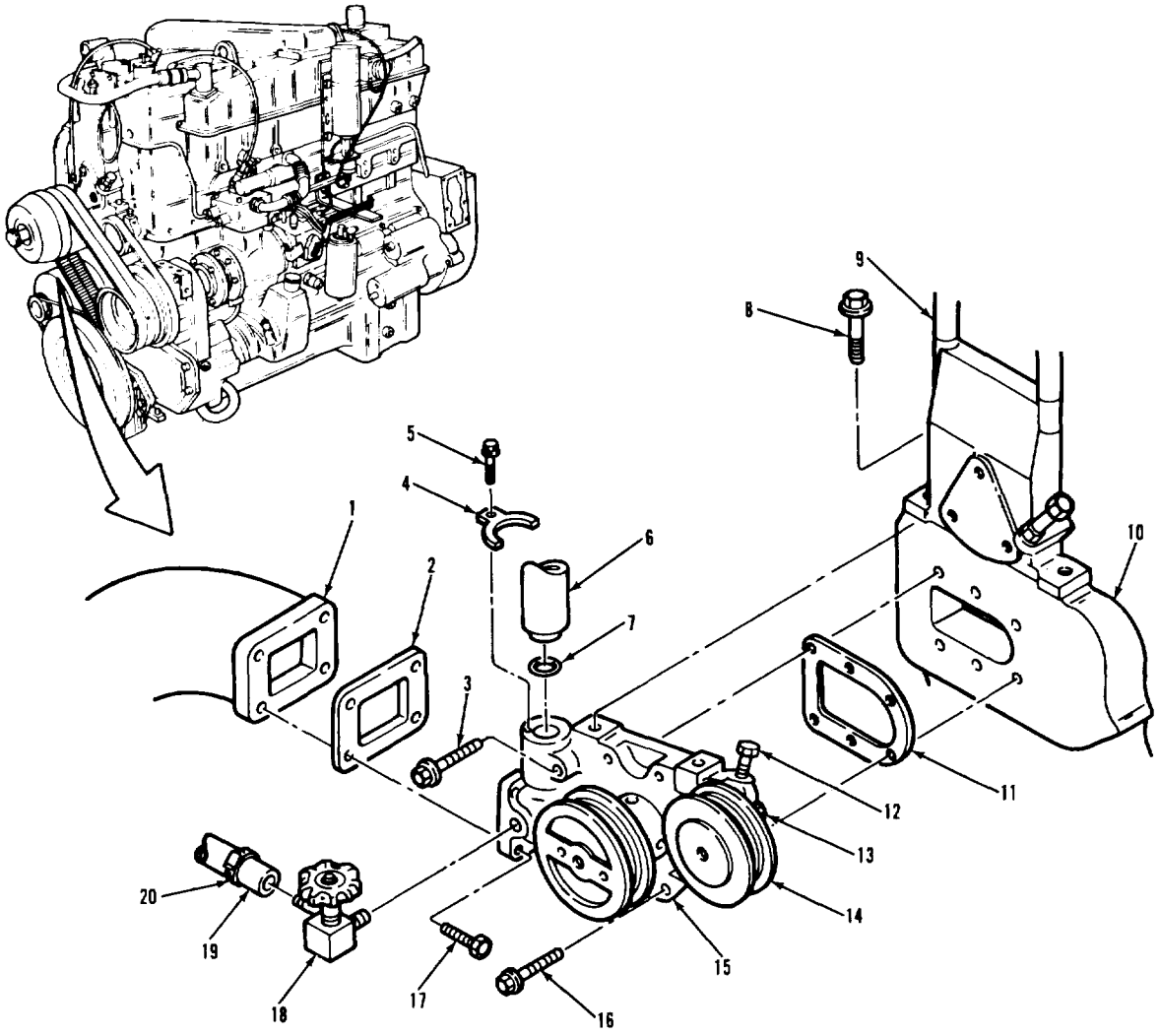
NOTE

Follow-on maintenance action required:

Install and adjust water pump drive belt (para 3-63).
Install fan and fan clutch (para 3-65).
Adjust fan clutch drive belts (para 3-67).
Fill cooling system (para 3-52).
Start vehicle and check for leaks (TM 9-2320-283-10).

COOLING SYSTEM.

3-64. WATER PUMP REPLACEMENT (Continued).



TA237162

1 WATER PUMP TO RADIATOR CONNECTION
2 WATER CONNECTION GASKET
3 SCREW WITH CAPTIVE WASHER (2)
4 TUBE CLAMP
5 HEXAGON HEAD SCREW WITH CAPTIVE WASHER
6 WATER BYPASS TUBE
7 O-RING
8 SCREW WITH CAPTIVE WASHER (2)
9 FAN BRACKET
10. ENGINE BLOCK
11 WATER PUMP GASKET
12 HEXAGON SCREW
13 HEXAGON NUT
14 IDLER PULLEY
15 WATER PUMP ASSEMBLY
16 SCREW WITH CAPTIVE WASHER (4)
17 SCREW (4)
18 WATER SHUTOFF VALVE AND STREET ELBOW
19 WATER HOSE
20. HOSE CLAMP

COOLING SYSTEM.

3-65. FAN AND FAN CLUTCH REPLACEMENT.

THIS TASK COVERS
- a. Removal.
- b. Cleaning and Inspection.
- c. Installation.
- d. Operational Check.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

EQUIPMENT CONDITION
PARAGRAPH
3-56.

CONDITION DESCRIPTION
Upper fan shroud removed.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
Tape, thread sealing
Item 32, Appendix C.

PERSONNEL REQUIRED
Two (MOS-63S .

SPECIAL ENVIRONMENTAL CONDITIONS
None.

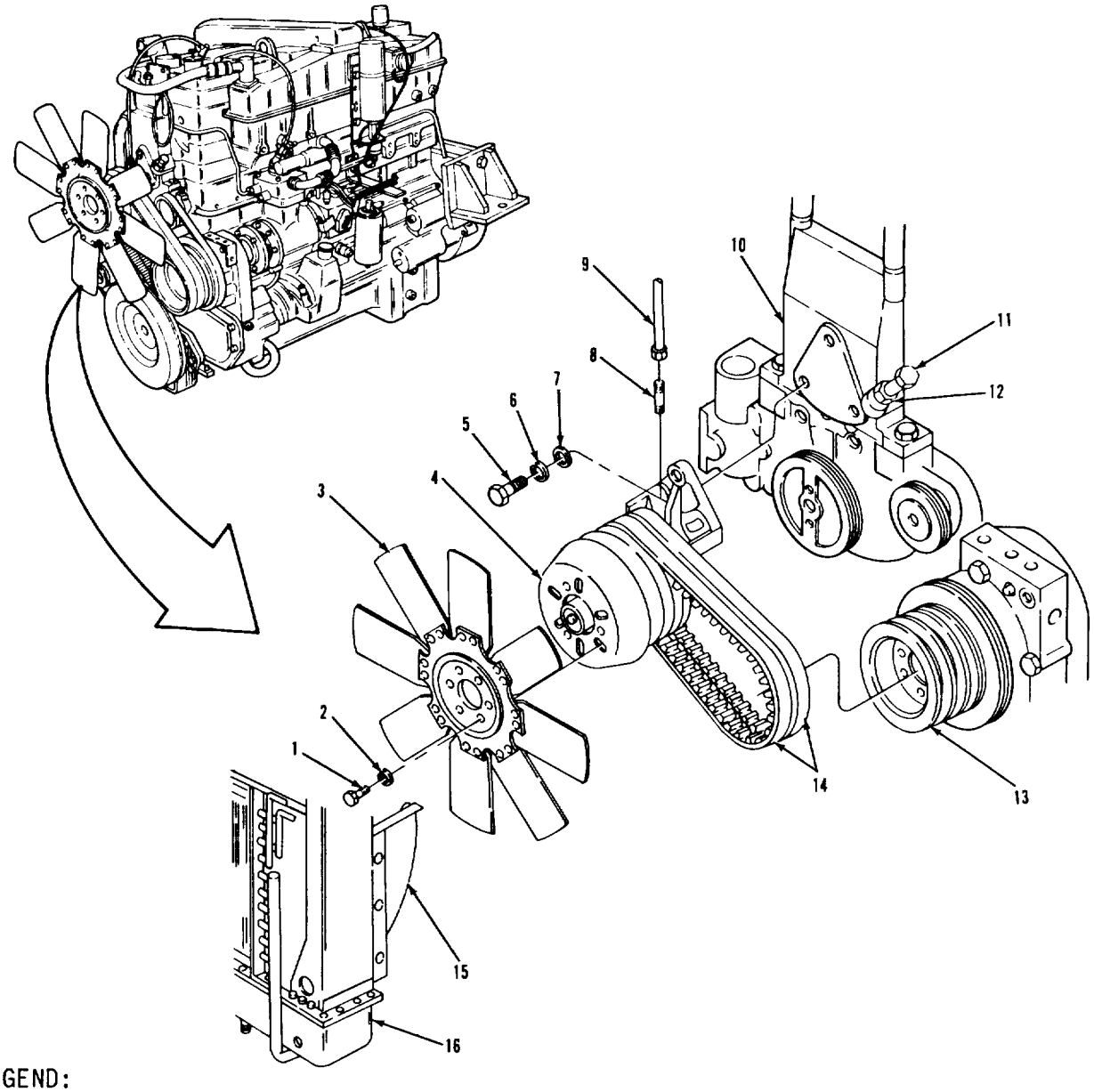
REFERENCES (TM)
TM 9-2320-283-10.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

COOLING SYSTEM.

3-65. FAN AND FAN CLUTCH REPLACEMENT (Continued).



LEGEND:

1. HEXAGON HEAD SCREW (6)
2. LOCKWASHER (6)
3. FAN ASSEMBLY
4. FAN CLUTCH ASSEMBLY
5. HEXAGON HEAD SCREW (3)
6. LOCKWASHER (3)
7. HARDENED WASHER (2)
8. NIPPLE
9. NONMETALLIC TUBE
10. FAN BRACKET
11. ADJUSTING SCREW
12. HEXAGON JAM NUT
13. ACCESSORY DRIVE PULLEY
14. FAN DRIVE BELT (2)
15. LOWER FAN SHROUD
16. RADIATOR ASSEMBLY

TA 237163

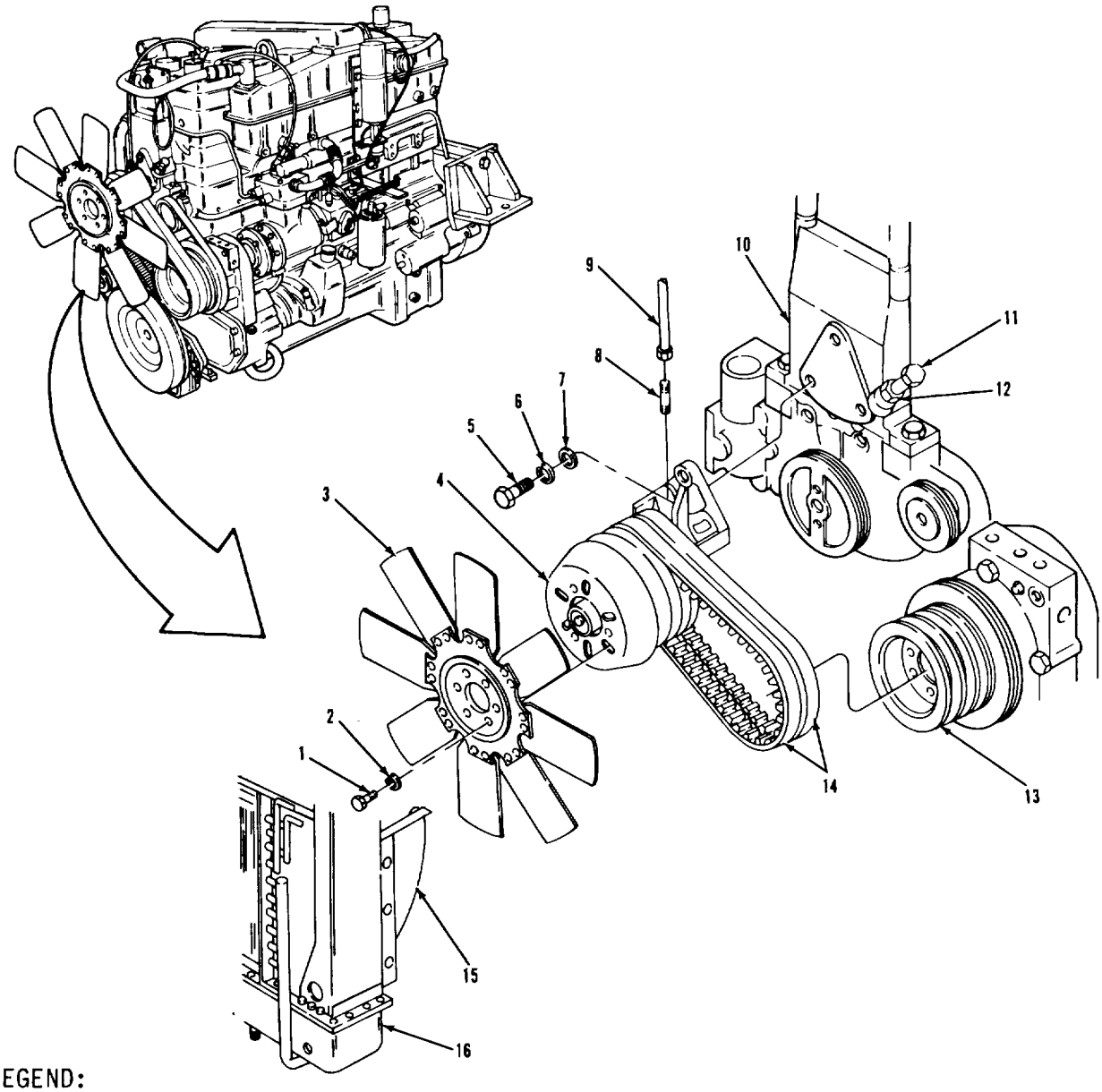
COOLING SYSTEM.

3-65. FAN AND FAN CLUTCH REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
A:	REMOVAL.		
1	Six screws (1) and lockwashers (2)	Remove from items (3) and (4).	
2	Fan (3) set inside item (15)	Remove from item (4) and item (16).	Be careful not to damage
3	Tube (9)	Remove from item (8).	
4	Three screws (5)	Loosen, but do not take out.	
5	Nut (12) and screw (11)	Loosen until two items (14) can be removed.	
6	Two belts (14)	Remove from item (13).	
		WARNING Fan clutch is very heavy. To avoid injury to personnel or damage to radiator, have assistant hold fan clutch during steps 7 and 8.	
7	Three screws (5), lockwashers (6), and two washers (7).	Remove from items (4) and (10)	Have assistant use two items (14) to hold item (4).
8	Clutch (4)	Remove from item (10)	Remove items (14) from item (4).
9	Nipple (8)	Remove from item (4).	
10	Fan (3)	Remove from item (15).	

COOLING SYSTEM.

3-65. FAN AND FAN CLUTCH REPLACEMENT (Continued).



LEGEND:

1. HEXAGON HEAD SCREW (6)
2. LOCKWASHER (6)
3. FAN ASSEMBLY
4. FAN CLUTCH ASSEMBLY
5. HEXAGON HEAD SCREW (3)
6. LOCKWASHER (3)
7. HARDENED WASHER (2)
8. NIPPLE
9. NONMETALLIC TUBE
10. FAN BRACKET
11. ADJUSTING SCREW
12. HEXAGON JAM NUT
13. ACCESSORY DRIVE PULLEY
14. FAN DRIVE BELT (2)
15. LOWER FAN SHROUD
16. RADIATOR ASSEMBLY

TA 237164

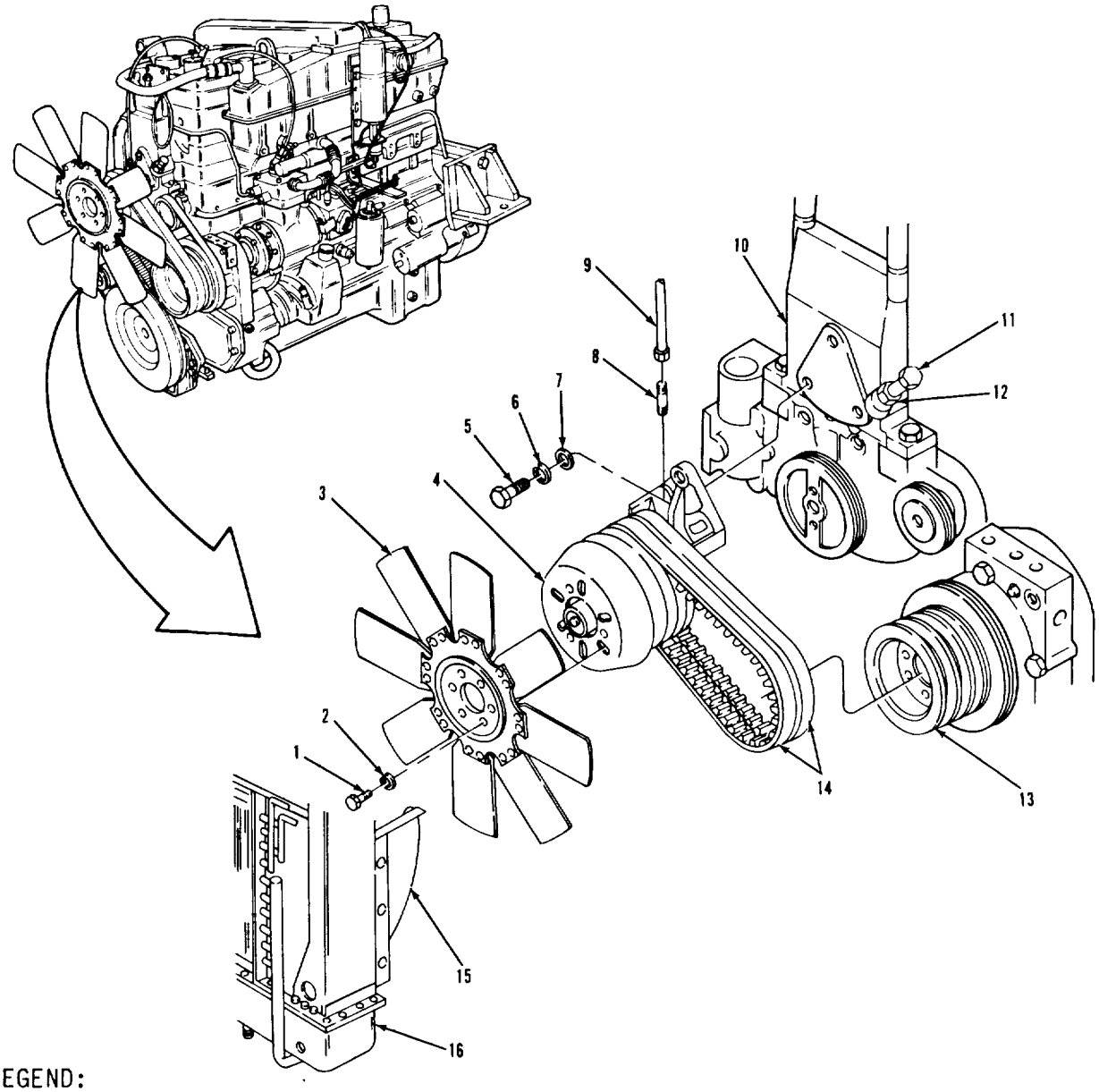
COOLING SYSTEM.

3-65. FAN AND FAN CLUTCH REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
B.	CLEANING AND INSPECTION.		
11	All parts	Clean and inspect	Refer to paragraphs 3-4 and 3-5 If item (4) is damaged, refer to DS/GS maintenance. If either item (14) is damaged, replace both items (14).
C.	INSTALLATION.		
12	Fan (3)	Set inside item (15)	Be careful not to damage item (16) Numbers on item (3) must face item (16).
13	Nipple (8)	a Wrap threads with thread sealing tape.	Refer to paragraph 3-7.
		b Install into item (4).	
		WARNING	
		Fan clutch is very heavy. To avoid injury to personnel or damage to radiator, have assistant hold fan clutch during step 14.	
14	Clutch (4)	a Position on item (10)	Have assistant use two items (14) to hold item (4).
		b Secure with three items (5), (6), and two items (7).	Two items (7) are used with lower two items (5). Do not tighten items (5).

COOLING SYSTEM.

3-65. FAN AND FAN CLUTCH REPLACEMENT (Continued).



LEGEND:

1. HEXAGON HEAD SCREW (6)
2. LOCKWASHER (6)
3. FAN ASSEMBLY
4. FAN CLUTCH ASSEMBLY
5. HEXAGON HEAD SCREW (3)
6. LOCKWASHER (3)
7. HARDENED WASHER (2)
8. NIPPLE
9. NONMETALLIC TUBE
10. FAN BRACKET
11. ADJUSTING SCREW
12. HEXAGON JAM NUT
13. ACCESSORY DRIVE PULLEY
14. FAN DRIVE BELT (2)
15. LOWER FAN SHROUD
16. RADIATOR ASSEMBLY

TA 237165

COOLING SYSTEM.

3-65. FAN AND FAN CLUTCH REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
C.	INSTALLATION (Continued).		
15	Two belts (14)	a Install on items (4) and (13).	
		b Adjust	Refer to paragraph 3-67.
16	Tube (9)	Install on item (8).	
17	Fan (3)	a Lift out of item (15) and position on item (4).	
		b Secure with six items (1) and (2)	Torque items (1) to 25-31 lb-ft.
18	Upper fan shroud	Install	Refer to paragraph 3-56.
D.	OPERATIONAL CHECK.		
19	Engine	Start	Refer to TM 9-2320-283-10.
20	Fan (3)	a With temperature below 190°F and air system pressure below 75 psi, item (3) should be rotating	
		b When air system pressure reaches 70-75 psi or more, item (3) should not be rotating.	
		c With temperatures at or above 1900F, item (3) should rotate.	
21	Engine	Shutdown.	

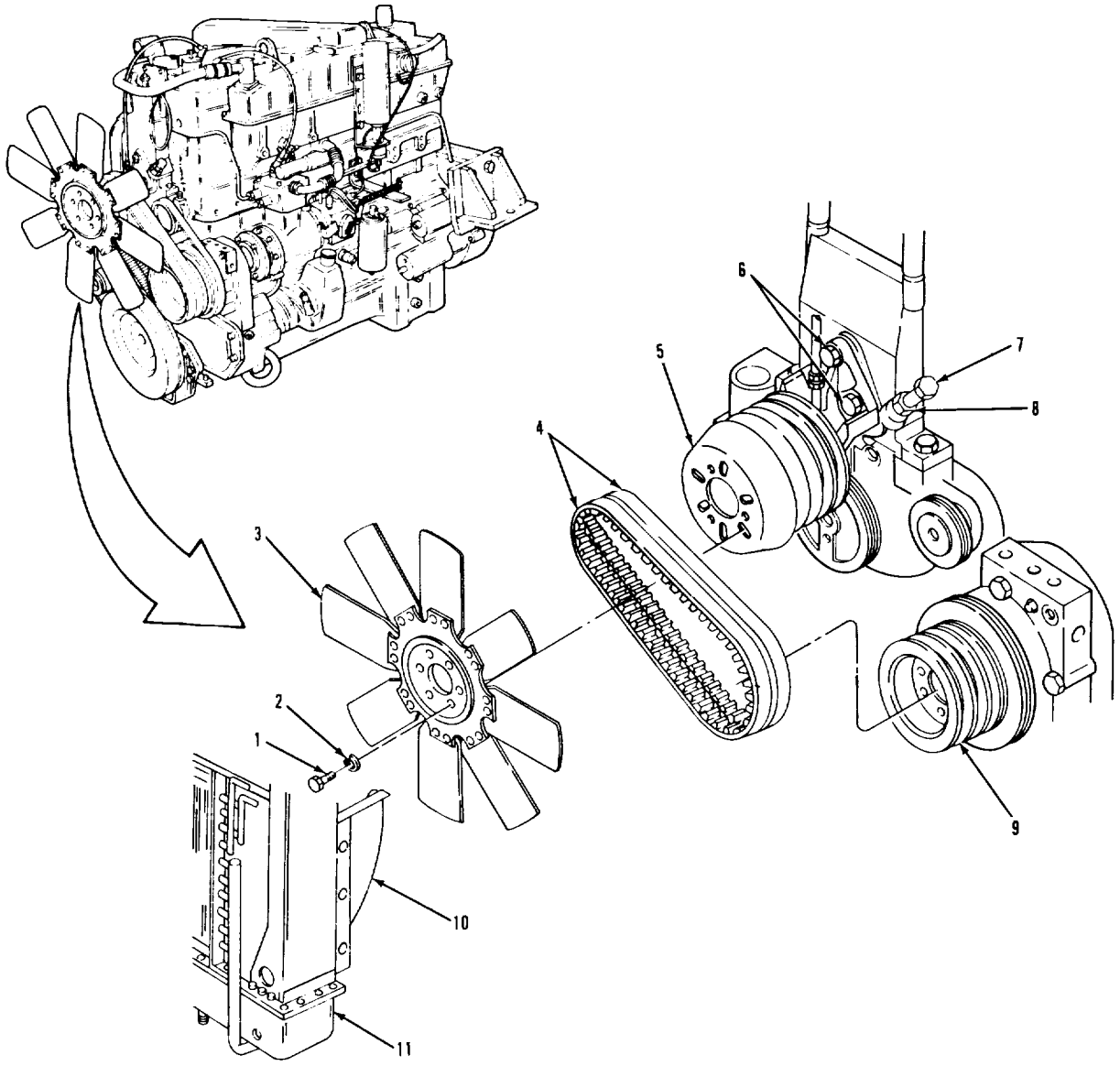
NOTE

Follow-on maintenance action required:

None.

COOLING SYSTEM.

3-65. FAN AND FAN CLUTCH REPLACEMENT (Continued).



LEGEND:

1. HEXAGON HEAD SCREW (6)
2. LOCKWASHER (6)
3. FAN ASSEMBLY
4. FAN CLUTCH ASSEMBLY
5. HEXAGON HEAD SCREW (3)
6. LOCKWASHER (3)
7. HARDENED WASHER (2)
8. NIPPLE
9. NONMETALLIC TUBE
10. FAN BRACKET
11. ADJUSTING SCREW
12. HEXAGON JAM NUT
13. ACCESSORY DRIVE PULLEY
14. FAN DRIVE BELT (2)
15. LOWER FAN SHROUD
16. RADIATOR ASSEMBLY

TA 237166

COOLING SYSTEM.

3-66. FAN CLUTCH AIR VALVE REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Cleaning and Inspection.
c. Installation.
d. Operational Check.

INITIAL SETUP

APPLICABLE CONFIGURATIONS
All.

TEST EQUIPMENT
None.

SPECIAL TOOLS
None.

MATERIALS/PARTS 5P/N)
Tape, thread sealing
Item 32, Appendix C.

PERSONNEL REQUIRED
One (MOS-63S).

REFERENCES (TM)
TM 9-2320-283-10.

TROUBLESHOOTING REFERENCES
Paragraph 2-11.

EQUIPMENT CONDITION

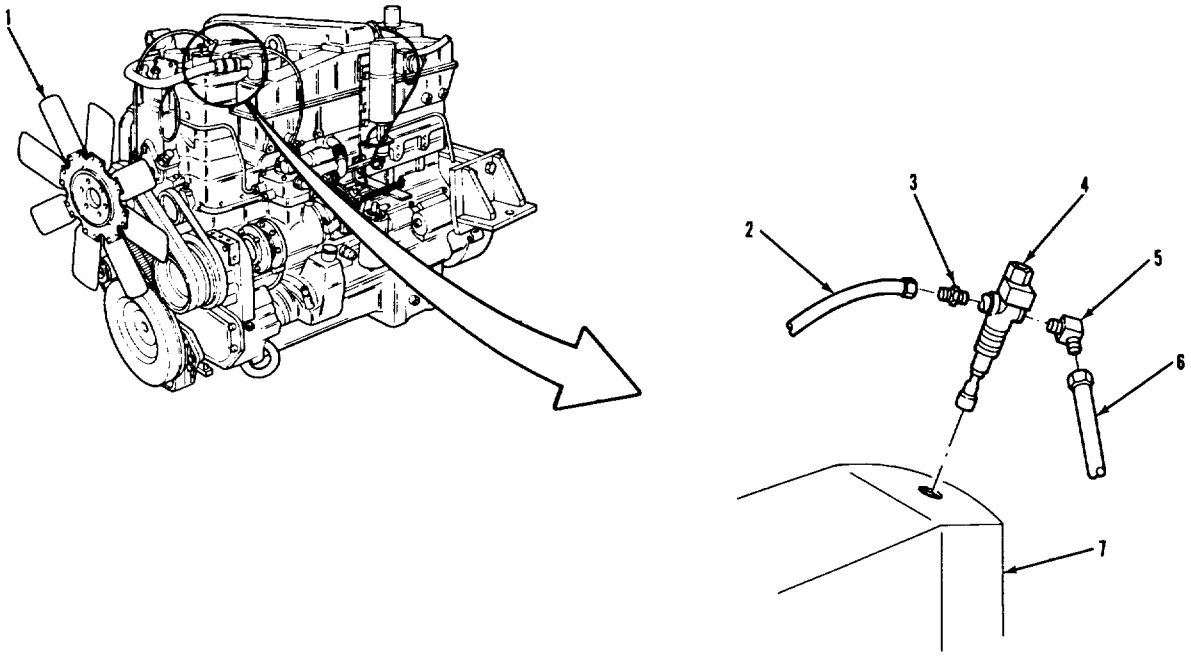
PARAGRAPH	CONDITION DESCRIPTION
TM 9-2320-283-10.	Air drained from air system.
3-52.	Coolant drained below level of fan clutch air valve.

SPECIAL ENVIRONMENTAL CONDITIONS
None.

GENERAL SAFETY INSTRUCTIONS
Engine off.
Transmission in neutral.
Park brake set.

COOLING SYSTEM.

3-66. FAN CLUTCH AIR VALVE REPLACEMENT (Continued).



TA 237167

LEGEND:

1. FAN ASSEMBLY
2. NONMETALLIC TUBE
3. MALE CONNECTOR
4. AIR SHUTTERSTAT VALVE
5. ELBOW
6. NONMETALLIC TUBE
7. FRONT WATER MANIFOLD

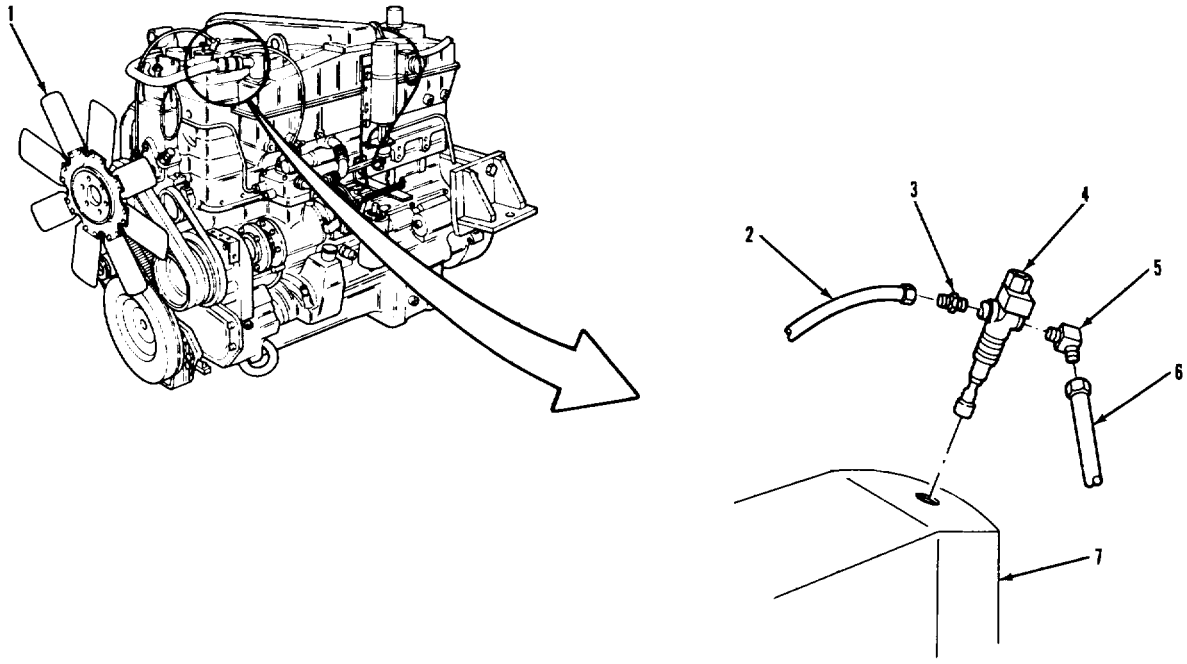
COOLING SYSTEM.

3-66. FAN CLUTCH AIR VALVE REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
A.	REMOVAL.		
1	Tube (2) and tube (6)	Remove from items (3) and (5)	Tag items (2) and (6) to insure proper installation.
2	Valve (4) with connector (3) and elbow (5) attached.	Remove from item (7).	
3	Connector (3) and elbow (5).	Remove from item (4).	
B.	CLEANING AND INSPECTION.		
4.	All parts.	Clean and inspect.	Refer to paragraphs 3-4 and 3-5.
C.	INSTALLATION.		
5.	Connector (3) and elbow (5).	a. Wrap threads with thread sealing tape. b. Install into item (4).	
6.	Valve (4) with connector (3) and elbow (5) attached.	a. Wrap threads with thread sealing tape. b. Install into item (7).	
7.	Tube (2) and tube (6).	Install on items (3) and (5).	
8.	Cooling system.	Fill.	Refer to paragraph 3-52.

COOLING SYSTEM.

3-66. FAN CLUTCH AIR VALVE REPLACEMENT (Continued).



TA 237168

LEGEND:

1 FAN ASSEMBLY
2 NONMETALLIC TUBE
3 MALE CONNECTOR
4 AIR SHUTTERSTAT VALVE
5 ELBOW
6 NONMETALLIC TUBE
7 FRONT WATER MANIFOLD

COOLING SYSTEM.

3-66. FAN CLUTCH AIR VALVE REPLACEMENT (Continued).

LOCATION/ITEM		ACTION	REMARKS
D.	OPERATIONAL CHECK.		
9	Engine	Start	Refer to TM 9-2320-283-10.
10	Fan (1)	a With air system pressure above 75 psi and engine water temperature below 190°F, item (1) should not be rotating.	
		b When engine water temperature reaches 190°F, item (1) should begin rotating.	
11	Engine	Shutdown	Refer to TM 9-2320-283-10.

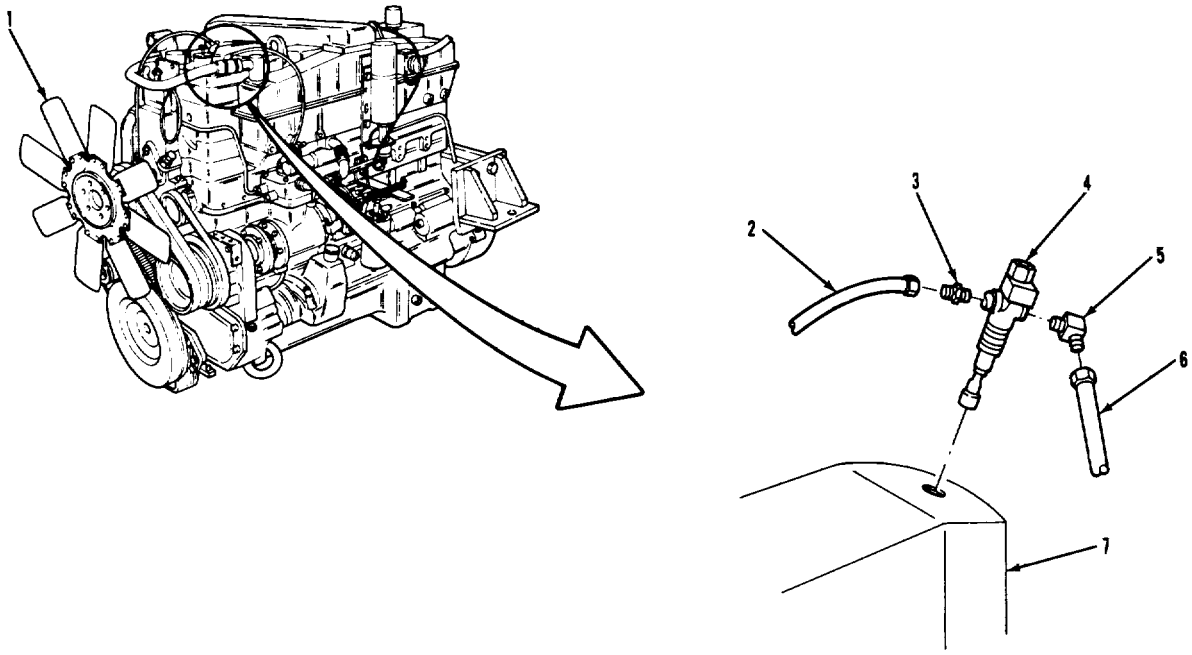
NOTE

Follow-on maintenance action required:

None.

COOLING SYSTEM.

3-66. FAN CLUTCH AIR VALVE REPLACEMENT (Continued).



TA 237169

LEGEND:

1	FAN ASSEMBLY	5	ELBOW
2	NONMETALLIC TUBE	6	NONMETALLIC TUBE
3	MALE CONNECTOR	7	FRONT WATER MANIFOLD
4	AIR SHUTTERSTAT VALVE		

COOLING SYSTEM.

3-67. FAN CLUTCH DRIVE BELTS REPLACEMENT.

THIS TASK COVERS

a. Removal.
b. Installation.
c. Adjustment.

INITIAL SETUP

EQUIPMENT CONDITION

APPLICABLE CONFIGURATIONS	PARAGRAPH	CONDITION DESCRIPTION
All.	None.	None.

TEST EQUIPMENT
Belt tension gage.

SPECIAL TOOLS
None.

MATERIALS/PARTS (P/N)
None.

PERSONNEL REQUIRED
One (MOS-63S .

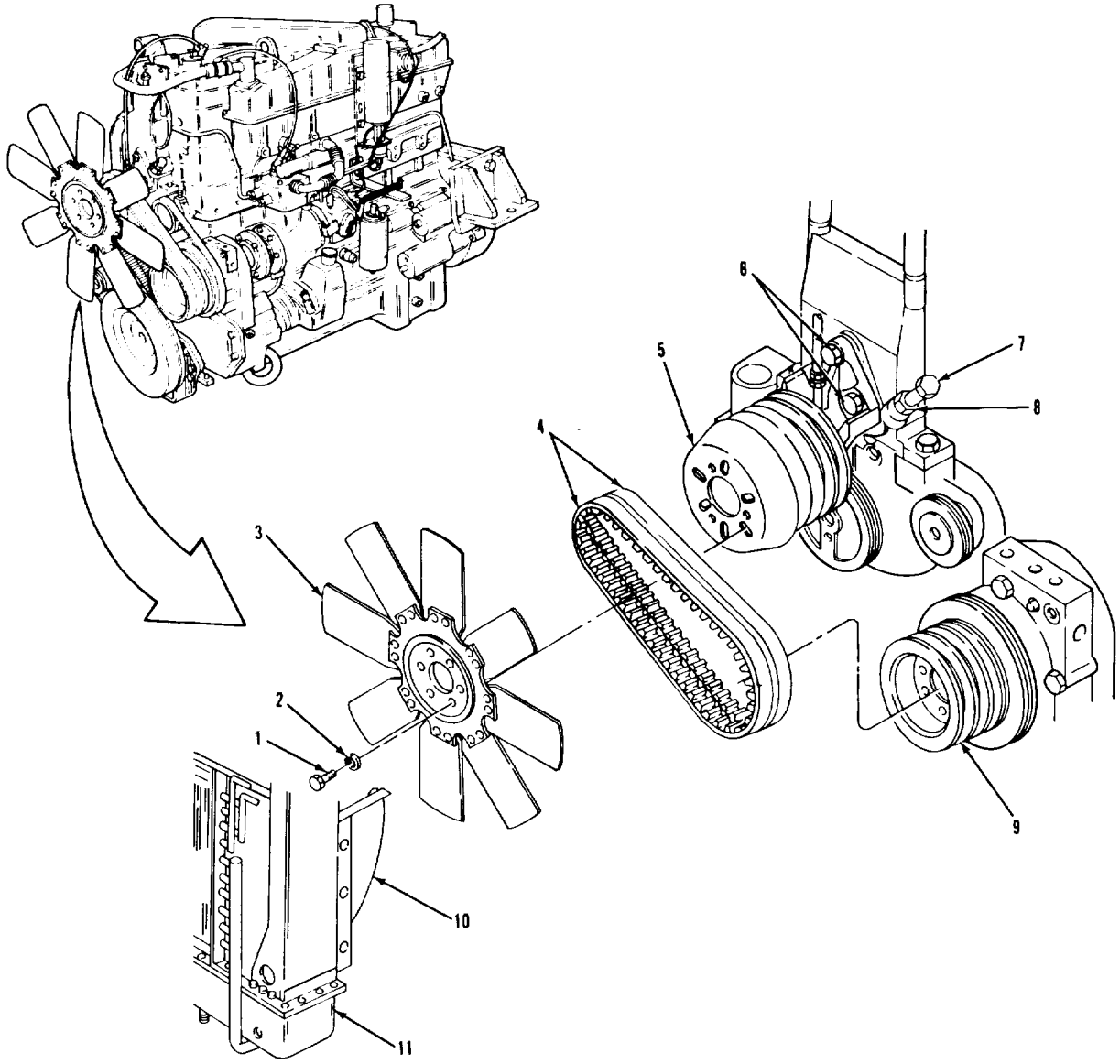
SPECIAL ENVIRONMENTAL CONDITIONS
None.

REFERENCES (TM)
TM 9-2320-283-20P.
Transmission in neutral.
Park brake set.
TROUBLESHOOTING REFERENCES
Paragraph 2-11.

GENERAL SAFETY INSTRUCTIONS
Engine off.

COOLING SYSTEM.

3-67. FAN CLUTCH DRIVE BELTS REPLACEMENT (Continued).



TA 237170

LEGEND:

1 HEXAGON HEAD SCREW (6)
2 LOCKWASHER (6)
3 FAN ASSEMBLY
4 FAN DRIVE BELT (2)
5 FAN CLUTCH ASSEMBLY
6 HEXAGON HEAD SCREW (3)
7 ADJUSTING SCREW
8 HEXAGON JAM NUT
9 ACCESSORY DRIVE PULLEY
10 LOWER FAN SHROUD
11 RADIATOR ASSEMBLY

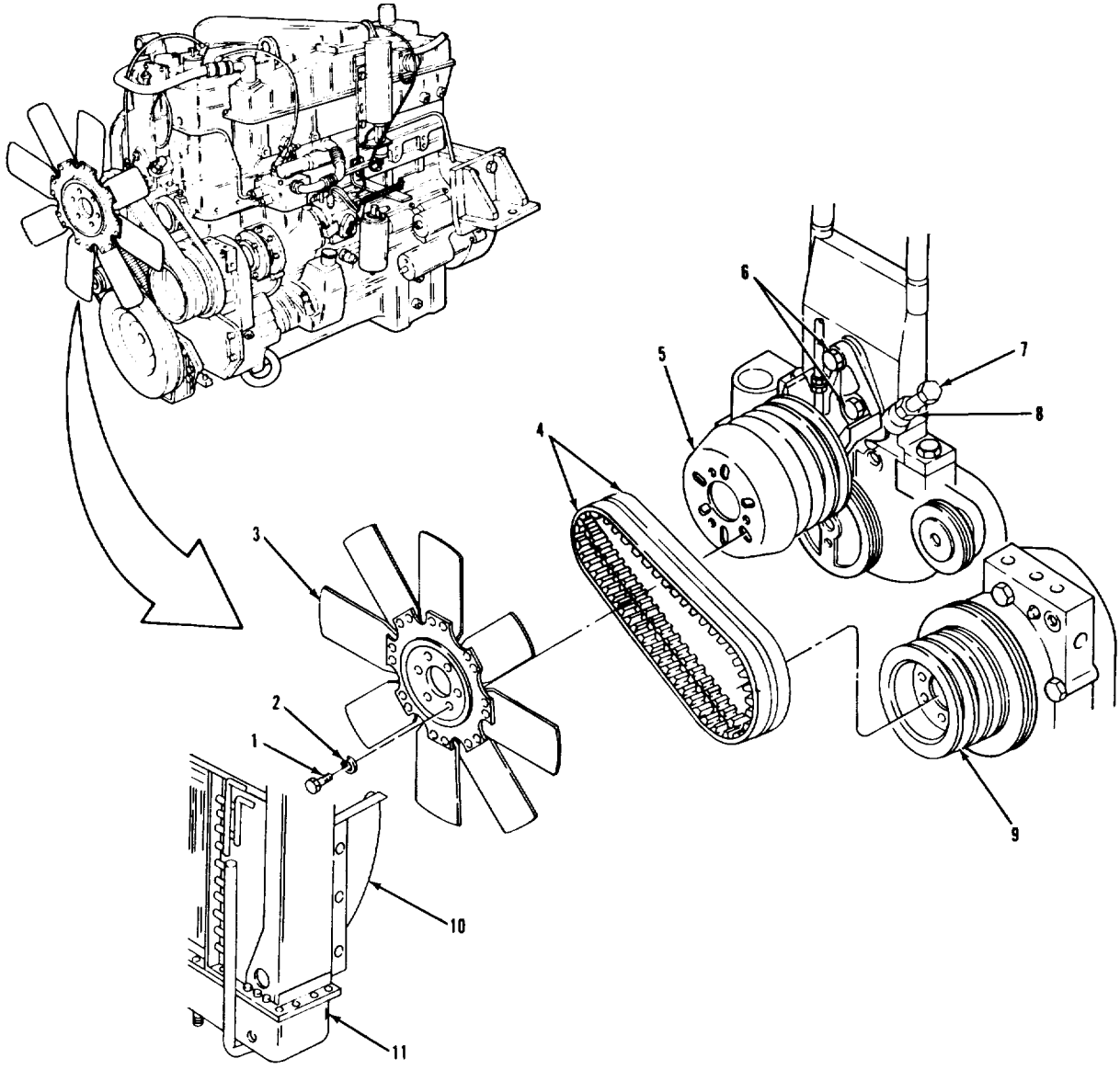
COOLING SYSTEM.

3-67. FAN CLUTCH DRIVE BELTS REPLACEMENT (Continued).

LOCATION/ITEM		ACTION		REMARKS
A.	REMOVAL.			
1	Upper fan shroud	Remove		Refer to paragraph 3-56.
2	Six screws (1) and lockwashers (2)	Remove from items (3) and (5).		
3	Fan (3)	Remove from item (5) and set inside item (10)		Be careful not to damage item (11).
4	Three screws (6)	Loosen, but do not remove.		
5	Nut (8) and screw (7)	Loosen until two items (4) can be removed.		
6	Two belts (4) and (9).	a	Remove from items (5)	
		b	Clean and inspect	Refer to paragraphs 3-4 and 3-5. If either item (4) is damaged, replace both items (4).
B.	INSTALLATION.			
7	Two belts (4) (9).	Install on item (5) and		
8	Fan (3)	a	Lift out of item (10) and position on item (5).	
		b	Secure with six items (1) and (2)	Torque items (1) to 25-31 lb-ft.
9	Upper fan shroud	Install		Refer to paragraph 3-56.

COOLING SYSTEM.

3-67. FAN CLUTCH DRIVE BELTS REPLACEMENT (Continued).



LEGEND:

1 HEXAGON HEAD SCREW (6)
2 LOCKWASHER (6)
3 FAN ASSEMBLY
4 FAN DRIVE BELT (2)
5 FAN CLUTCH ASSEMBLY
6 HEXAGON HEAD SCREW (3)
7 ADJUSTING SCREW
8 HEXAGON JAM NUT
9 ACCESSORY DRIVE PULLEY
10 LOWER FAN SHROUD
11 RADIATOR ASSEMBLY

TA 237171

COOLING SYSTEM.

3-67. FAN CLUTCH DRIVE BELTS REPLACEMENT (Continued).

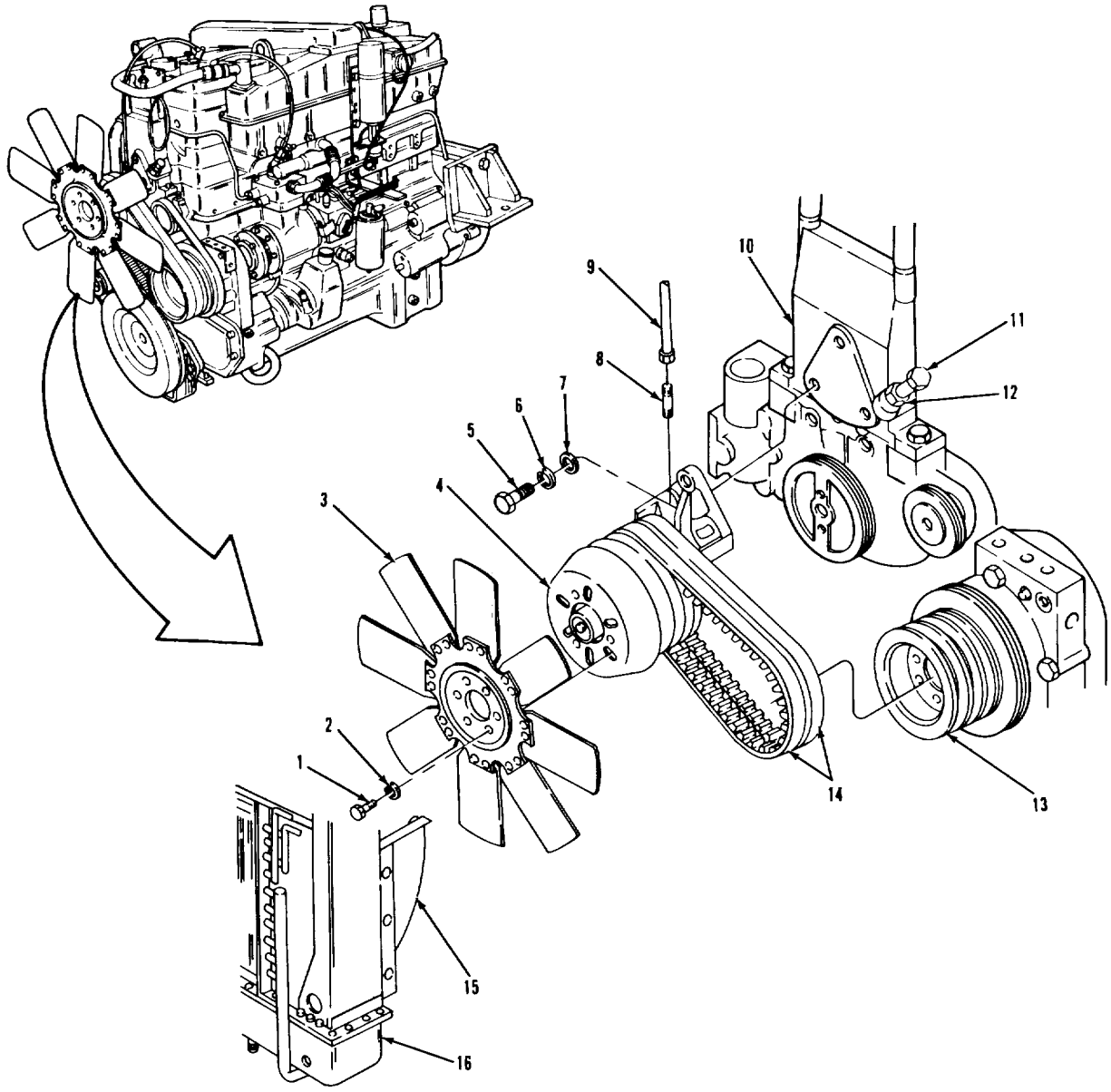
C. ADJUSTMENT.

	LOCATION/ITEM	ACTION	REMARKS
10	Screw (7) and two belts (4)	Adjust until belt tension is 120 lb-ft for new belts or 100 lb-ft for used belts as measured with belt tension Gage.	Loosen three items (6), if not already done. Make sure item (8) is loose during adjustment. Used belts are those that have more than 1,000 miles of use.
11	Three screws (6)	Torque to 70-85 lb-ft.	
12	Two belts (4)	Recheck tension using belt tension gage	Belt tension should be the same as measured in step 10 If not, repeat steps 10, 11, and 12.
13	Nut (8)	Tighten with holding item 1(7).	

NOTE
Follow-on maintenance action required:
None.

COOLING SYSTEM.

3-67. FAN CLUTCH DRIVE BELTS REPLACEMENT (Continued).



LEGEND:

1	HEXAGON HEAD SCREW (6)	7	ADJUSTING SCREW
2	LOCKWASHER (6)	8	HEXAGON JAM NUT
3	FAN ASSEMBLY	9	ACCESSORY DRIVE PULLEY
4	FAN DRIVE BELT (2)	10	LOWER FAN SHROUD
5	FAN CLUTCH ASSEMBLY	11	RADIATOR ASSEMBLY
6	HEXAGON HEAD SCREW (3)		

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ALPHATICAL INDEX

ALPHABETIC INDEX (Continued)

Subject, Para

B

Subject, Para

ALPHABETIC INDEX (Continued)

ALPHABETIC INDEX (Continued)

ALPHABETIC INDEX (Continued)

ALPHABETIC INDEX

ALPHABETIC INDEX (Continued)

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G

ALPHABETIC INDEX (Continued)

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Subject, Para

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ALPHABETIC INDEX (Continued)

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ALPHABETIC INDEX (Continued)

ALPHABETIC INDEX (Continued)

ALPHABETIC INDEX (Continued)

PRE-TEST INSPECTION

1. FAN BELTS/ALTERNATOR BELTS
2. OIL LEVEL
3. RADIATOR COOLANT LEVEL
4. FUEL TANK FUEL LEVEL
5. BATTERIES

TEST NO.	PERFORMANCE CHECKS
VISUAL	OIL AND COLLANT LEVEL
VISUAL	OIL PRESSURE (GAGE RADING) 10 PSI MIN @ IDLE 35-50 PSI @ HIGH IDLE
VISUAL	COLLANT TEMPERATURE (GAGE READING) 180-200°F
10	IDLE SPEED 580-650 RPM MAX GOVERNOR SPEED 2100 RPM CRANING SPEED 200 RPM
12	POWER 1160 RPM/SEC MIN
13	POWER (% POWER) - 75%
14	COMPRESSION UNBALANCE 0-8%
67	BATTERY VOLTAGE @ HIGH IDLE 24.8 - 27.6 VDC
72	STARTER CURRENT, FIRST PEAK 1000-1650 AMPS @ CRANKING
83	CRANKING BATTERY VOLTAGE 24.8 - 27.6 VDC @ HIGH IDLE

CONTROL OF NEXT TEST

01	INTERLEAVE WITH SPEED (RPM)
02	DISPLAY MIN VALUE
03	DISPLAY MAX VALUE
04	DISPLAY PEAK TO PEAK VALUE

INITIAL ENTRY

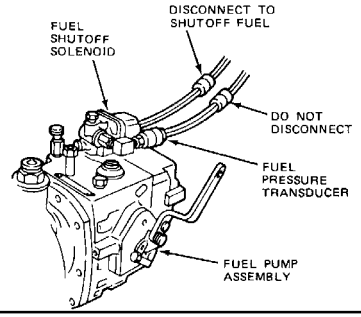
58	NUMBER OF CYLINDERS ENTRY (6)
59	NUMBER OF CYLINDERS DISPLAY (6)
60	VID ENTRY (TO BE SUPPLIED)
61	VID DISPLAY
66	CONFIDENCE TEST (SECOND ENTRY 99)

OPERATOR MESSAGES

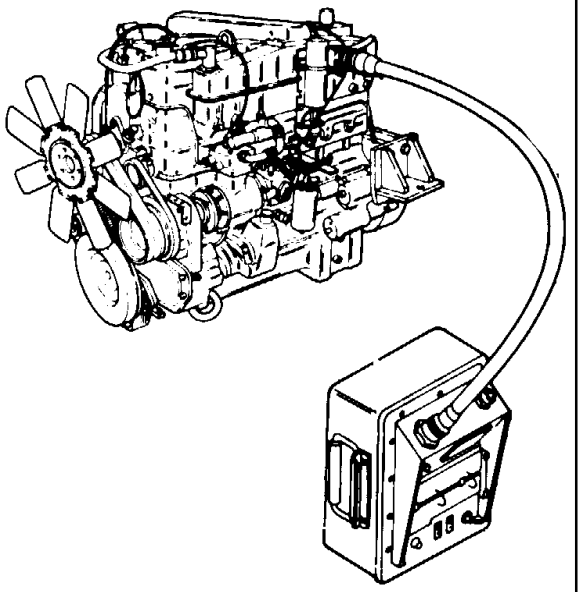
PASS	TEST SUCCESSFULLY COMPLETED
CAL	OFFSET TEST IN PROGRESS RELEASE TEST BUTTON
CIP	INITIATE CI POWER SIMULATION
CYL	ENTER NUMBER OF CYLINDERS OR CYLINDER PAIRS
FAIL	TEST FAILED
GO	CRANK ENGINE
OFF	IF CI POWER DECELERATE
UEH	ENTER VEHICL IDENTIFICATION NUMBER
----	VTM ACCEPTING DATA OR INITIAL TURN-ON
0066	DIAL 99 PUSH TEST BUTTON
8888	CHECK DISPLAY

ERROR MESSAGES

E000	INFORMATION NOT AVAILABLE
E001	TEST NON-EXISTENT
E002	TANSDUCER NOT CONNECTED
E004	VID OR NUMBER OF CYL NOT ENTERED
E005	CAL NOT PREFORMED
E006	NUMBER OF CYL NOT VALID
E007	NUMBER OF CYL CONFLICTS WITH VID
E008	TEST PROBE NOT CONNECTED
E009	ENGINE NOT RUNNING
E010	BAD VID
E011	ACCED/DECL TIME TOO LARGE
E012	TACH PICKUP MISSING
E013	BAD DATA
E014	BAD NUMBER OF CYLINDERS
E018	TEST DISCONTINUED EXCESSIVE TIME
9999	OVERLOAD OR NUMBER EXCEEDS DISPLAY CAPABILITY



DCA CONNECTOR LOCATION AND HOOK-UP

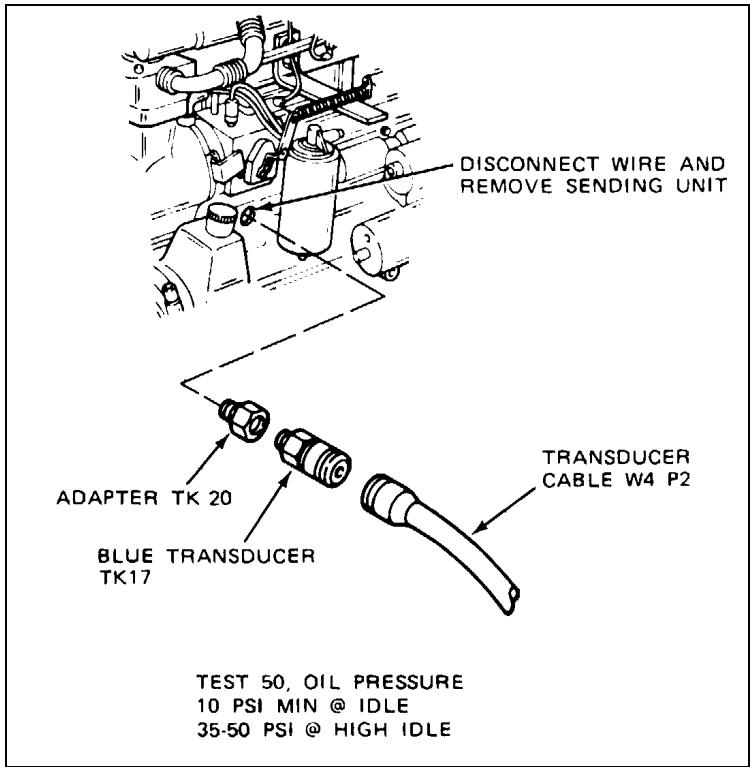


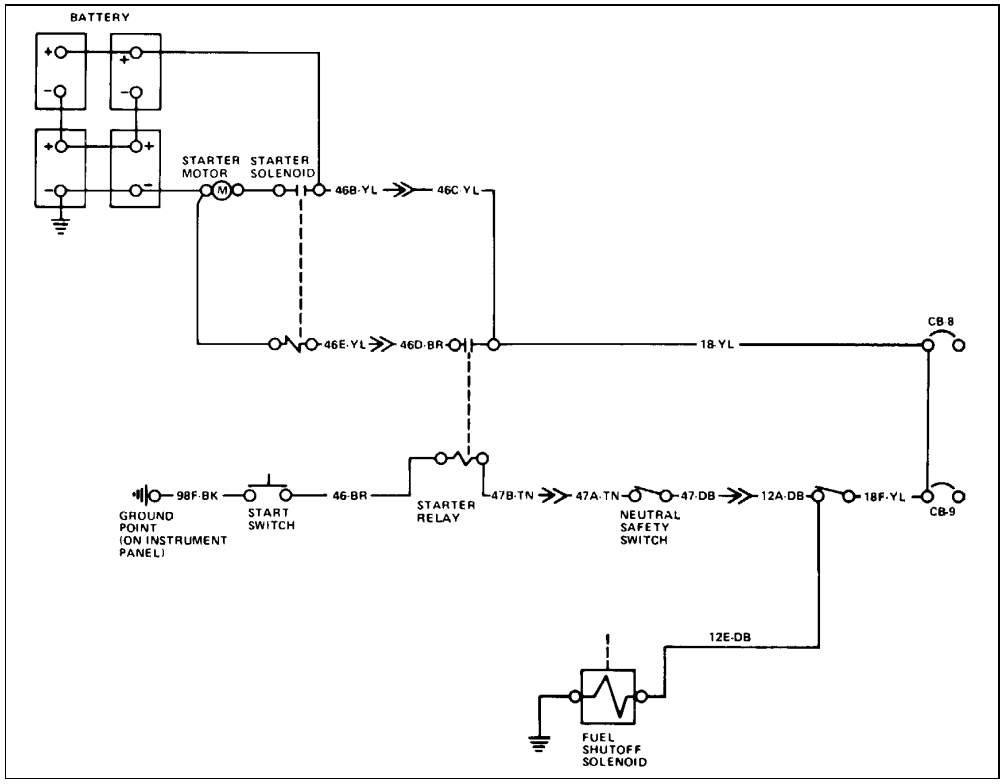
POWER AND COMPRESSION TEST

TEST 13	% POWER (VID - VEHICLE IDENTIFICATION NUMBER REQUIRED)
TEST 12	RPM/SEC (ENTER NUMBER OF CYLINDERS - TEST SELECT 58, ENTER 6)
TEST 14	COMPRESSION UNBALANCE (FUEL SOLENOID VALVE IN-LINE CONNECTOR DISCONNECTED -0 FUEL SHUTOFF)

TEST LIST

TEST NO.	OFFSET LIMITS	TEST MODE	TITLE	TEST NO.	OFFSET LIMITS	TEST MODE	TITLE
10		DCA	ENGINE RPM (AVERAGE)	72	±225	DCA/TK	STARTER CURRENT FIRST PEAK
12		DCA	POWER TEST (RPM/SEC)	73	±225	DCA/TK	INTERNAL BATTERY RESISTANCE
13		DCA	POWER TEST (% POWER-VID REQ'D)	74	±225	DCA/TK	STARTER CIRCUIT RESISTANCE
14		DCA	COMPRESSION UNBALANCE	75	±225	TK	BATTERY RESISTANCE CHANGE
24	±45	DCA	FUEL SUPPLY PRESSURE	77	±225	DCA/TK	INTERNAL BATTERY RESISTANCE
45	±4	TK	INLET FUEL PRESSURE (VACUUM 0-30" HG)	79	±225	DCA/TK	BATTERY RESISTANCE CHANGE (WHILE CRANKING)
50	±150	TK	LOW OIL PRESSURE	82		DCA	ALT/GEN OUTPUT VOLTAGE
67		DCA	BATTERY VOLTAGE	83		DCA	CRANKING BATTERIES VOLTAGE
68		DCA	STARTER VOLTAGE (WHILE CRANKING)	89	±6.8	TK	0-45 VDC
69		DCA	STARTER NEGATIVE CABLE DROP (WHILE CRANKING)	90	±225	TK	0-1500 AMPS DC
70		DCA	STARTER SOLENOID VOLTAGE (WHILE CRANKING)				





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BATTERY/CABLE TESTS

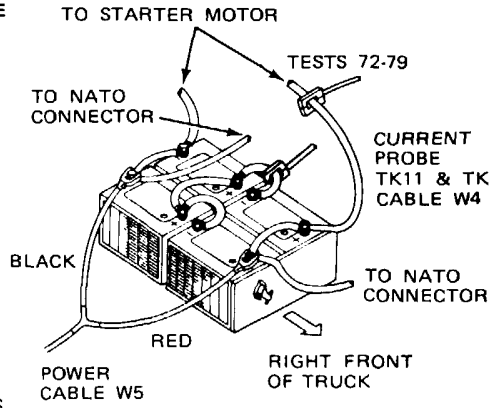
WITH POWER CABLE OR DCA CABLE AND CURRENT PROBE

TEST 90	AVERAGE CRANKING CURRENT 300-400 AMPS
TEST 72	STARTER CURRENT FIRST PEAK 1000-1650 AMPS
TEST 73, 77	INTERNAL BATTERY RESISTANCE 13 MILLIOHMS MAX*
TEST 74	STARTER CIRCUIT RESISTANCE 20 MILLIOHMS MAX
TEST 75, 79	BATTERY RESISTANCE CHANGE 50 MILLIOHMS/SEC MAX PER BATTERY*

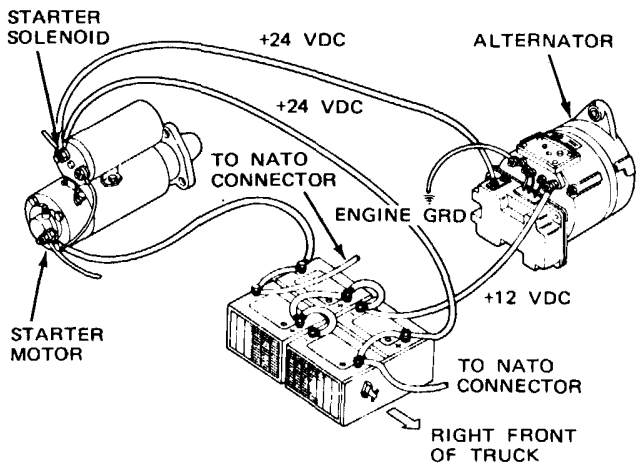
WITH POWER CABLE OR DCA CABLE

TEST 67	BATTERY VOLTS, 22 VOLTS MIN @ ENGINE OFF
TEST 67	CHARGING VOLTS, 24.8-27.6 VOLTS @ HIGH IDLE

*TEST LIMITS ARE FOR DELCO 1200 TYPE BATTERIES AS ORIGINALLY SUPPLIED WITH TRUCK. IF TRUCK CONTAINS OTHER TYPE BATTERIES SEE STE/ICE BATTERY TEST CARD FOR FURTHER INFORMATION.

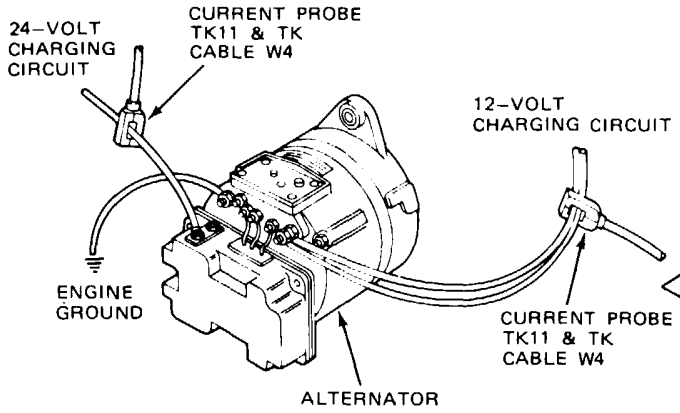


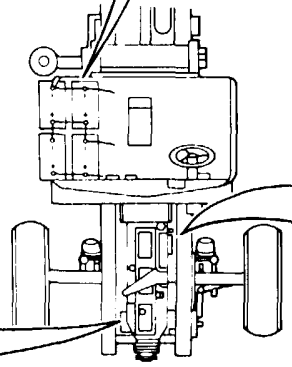
BATTERY CHARGING CIRCUIT



ALTERNATOR & TESTS

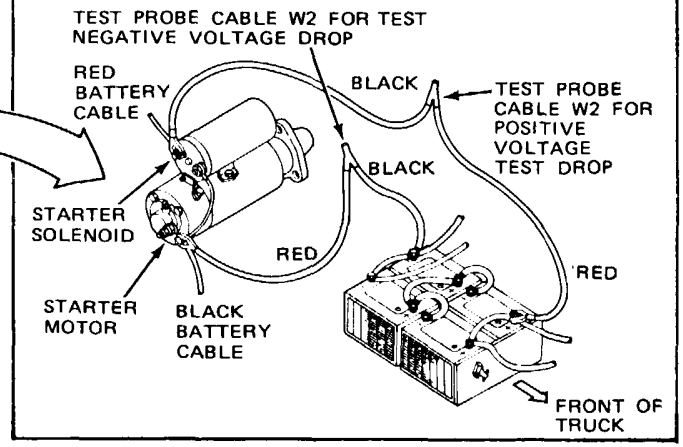
TEST 90	ALTERNATOR OUTPUT CURRENT (PARTIALLY DISCHARGED BATTERIES AND TRUCK HEADLAMPS ON @ FAST IDLE
1.	+24 VDC OUTPUT LINE 15 AMPS MAXIMUM
2.	+12 VDC OUTPUT LINE (CURRENT PROBE AROUND BOTH WIRES) 40 AMPS MINIMUM





STARTER CIRCUIT TESTS

TEST 10	CRANKING RPM. 200 RPM MIN
TEST 69	STARTER MOTOR NEGATIVE CABLE VOLTAGE DROP. 0.6 VOLTS MAX. (DCA MODE)
TEST 70	STARTER SOLENOID VOLTAGE 14.7 VOLTS MIN
TEST 72	STARTER CURRENT. 1000-1650 AMPS FIRST PEAK
TEST 74	STARTER CIRCUIT RESISTANCE. 20 MILLIOHMS MAX
TEST 89	STARTER MOTOR POSITIVE CABLE VOLTAGE DROP. 0.6 VOLTS MAX.
TEST 89	STARTER MOTOR NEGATIVE CABLE VOLTAGE DROP. 0.6 VOLTS MAX.



TA 238331

By Order of the Secretary of the Army:

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

Official:

JOHN A. WICKHAM, JR.
Brigadier General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-38, (qty rqr block No. 330), organizational maintenance requirements for Truck, Tractor, Line Haul, 6 x 4, 14-ton, M915A1.

U.S. GOVERNMENT PRINTING OFFICE : 1994 O0 - 300-421 (82635)

THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches

1 Meter = 100 Centimeters = 1,000 Millimeters = 39.37 Inches

1 Kilometer = 1,000 Meters = 0.621 Miles

SQUARE MEASURE

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches

1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet

1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles

CUBIC MEASURE

1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches

1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces

1 Liter = 1,000 Milliliters = 33.82 Fluid Ounces

TEMPERATURE

5/9 (°F -32) = °C

212° Fahrenheit is equivalent to 100° Celsius

90° Fahrenheit is equivalent to 32.2° Celsius

32° Fahrenheit is equivalent to 0° Celsius

9/5 C° +32 = F°

WEIGHTS

1 Gram = 0.001 Kilograms = 1,000 Milligrams = 0.035 Ounces

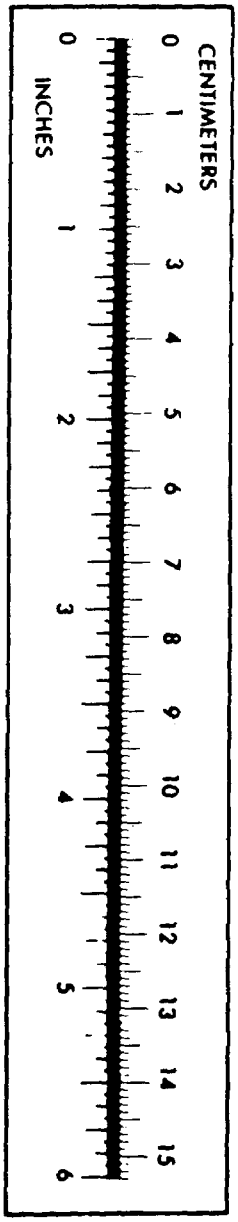
1 Kilogram = 1,000 Grams = 2.2 Lb.

1 Metric Ton = 1,000 Kilograms = 1 Megagram = 1.1 Short Tons

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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