TM 9-2350-314-20-1-1

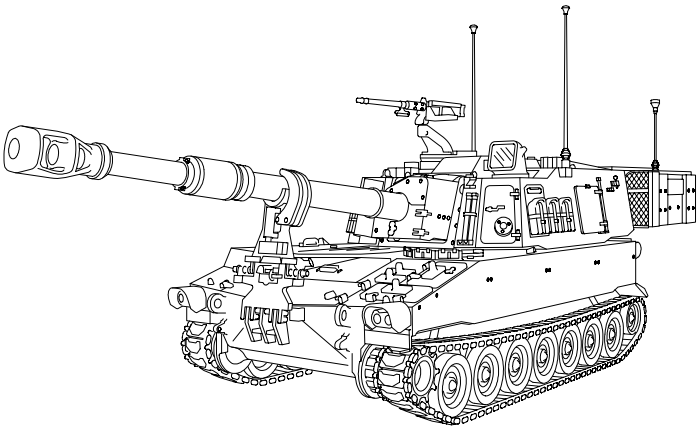
VOLUME 1

See page i for details.

UNIT MAINTENANCE MANUAL

FOR

HULL SYSTEMS AND COMPONENTS



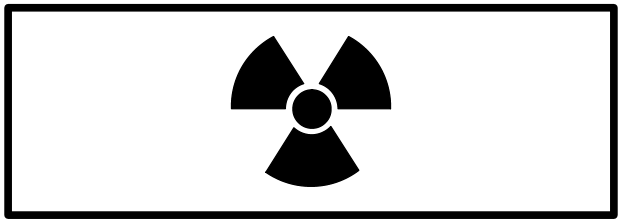
HOWITZER, MEDIUM, SELF-PROPELLED: 155MM, M109A6 (NSN 2350-01-305-0028) (EIC:3FC)

Distribution Statement A: Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY FEBRUARY 1999

WARNING

RADIOACTIVE MATERIAL(S)



TRITIUM (HYDROGEN-3) GAS

This item contains radioactive material. Control of this radioactive material is mandated by federal law. Immediately report any suspected lost or damaged items to your Radiation Safety Officer (RSO). If your RSO cannot be reached, contact the TACOM–RI safety office.

Handle with care. In the event the radioluminous source is broken, cracked, or there is no illumination, immediately wrap device in plastic bag (item 5, Appendix D) and notify the local RSO. Contact the base safety office for the name and telephone number of your local RSO:

LOCAL RSO: _____ TELEPHONE: _____

SAFETY PROCEDURES FOR NUCLEAR REGULATORY COMMISSION (NRC) TRITIUM FIRE CONTROL DEVICES

1. Purpose: To implement mandatory license requirements for use and maintenance of tritium radioluminous fire control devices used on howitzers, mortars, tanks, and rifles.

2. Scope: This procedure is applicable to all personnel working with tritium devices, including unit, direct support, general support maintenance, and operator levels.

3. Radiological hazard: The beta radiation emitted by tritium presents no external radiation hazard. However, if taken internally, it can damage soft tissue. If a capsule is broken, the tritium gas will dissipate into the surrounding air, and surfaces near the vicinity of the break may become contaminated. Tritium can be taken into the body by inhalation, ingestion, or skin absorption/injection.

4. Safety precautions:

   a. Check for illumination prior to use or service in low light or darkroom. If not illuminated, do not repair. Wrap the entire device in plastic bag (item 11, Appendix C) and notify the local RSO.

   b. No eating, drinking, or smoking will be allowed in tritium device work areas.

5. Emergency procedures: If a tritium source breaks, inform other personnel to vacate the area or move upwind. If skin contact is made with any area contaminated with tritium, wash immediately with nonabrasive soap and water. Report the incident to the local RSO. Actions below will be taken under supervision or direction of the local RSO.

a. Personnel handling the device should wear rubber or latex gloves (item 20, Appendix C). Device must be immediately double wrapped in plastic (item 11, Appendix C), sealed with tape (item 63, Appendix C), and marked as “Broken Tritium Device — Do Not Open” per RSO direction. Dispose of used gloves as radioactive waste, per instructions from local RSO and wash hands well.

b. Personnel who may have handled the broken tritium should report to health clinic for tritium bioassay. Optimum bioassay sample is at least 4 hours after exposure.

c. Broken tritium sources indoors may result in tritium contamination in the area, such as work bench or table. The area must be cordoned off, restricted until wipe tests indicate no contamination.

6. Further information:

a. Requirements for safe handling and maintenance are located in TM 9-254, General Maintenance Procedures for Fire Control Materiel.

b. If assistance is needed, contact your local or major command (MACOM) safety office(s) for information on safe handling, shipping, storage, maintenance, or disposal of radioactive devices.

c. The TACOM-RI RSO/licensee may be contacted by calling: DSN 793-2965/2969/2995, Commercial (309) 782-2965/2969/2995. After duty hours contact the Staff Duty Office through the operator at DSN 793-6001, Commercial (309) 782-6001. The following rules and regulations are available from TACOM-RI, ATTN: AMSTA-LC-SF, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. Copies may be requested, or further information obtained by contacting the TACOM-RI Radiation Safety Office (RSO).

(1) Title 10 CFR Part 19 - Notices, Instructions, and Reports to Workers.

(2) Title 10 CFR Part 20 - Standards for Protection Against Radiation.

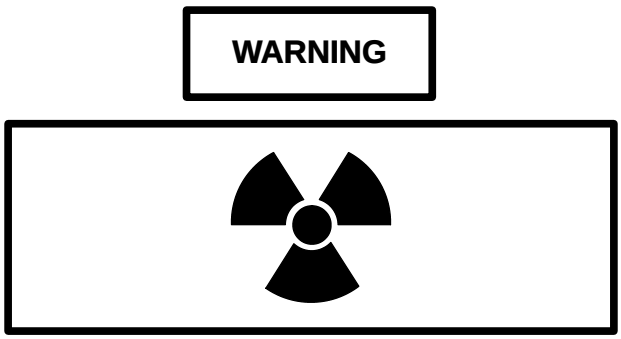
(3) Title 10 CFR Part 21 - Reporting of Defects and Noncompliance.

(4) NRC License, License Conditions, and License Application.

7. Safety, Care, and Handling:

WARNING

Nuclear, Biological, and Chemical (NBC) agents can kill you. If NBC exposure is suspected, all air filter media must be handled by personnel wearing full NBC protective equipment (FM 21-11).



RADIATION HAZARD

Fire control instruments containing Tritium are used as a part of a backup system for manual firing. Loss of illumination may indicate that leakage has occurred. Do not attempt to repair a non-illuminated device.

Pre-Maintenance Check:

a. Prior to taking any maintenance action on fire control devices (e.g., purging or charging M1A1 Collimator), check for broken/cracked reticle or loss of illumination as follows:

(1) Place device in the dark for at least four hours to prevent exterior light from activating the phosphor.

(2) Check for cracks/illumination in a low light environment after allowing sufficient time to accustom eyes to the dark.

b. If illumination is not observed, or illuminated but cracks are observed, take following actions:

(1) Personnel handling the device should wear rubber or plastic gloves (item 20, Appendix C).

(2) Seal entire device in two plastic bags (item 11, Appendix C).

(3) Mark the outer bag as “Broken Tritium Device – Do Not Open.”

(4) Dispose of used gloves as radioactive waste as per instructions from local Radiation Safety Officer (RSO). Wash hands well with nonabrasive soap and water.

c. If illumination is observed, maintenance actions may proceed.

WARNING

CARBON MONOXIDE POISONING IS DEADLY

Carbon monoxide is a colorless, odorless, deadly poisonous gas, which, when breathed, deprives the body of oxygen and causes suffocation. Exposure to carbon monoxide produces headache, dizziness, loss of muscular control, drowsiness, and coma. Permanent brain damage or death can result from severe exposure.

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

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS ADEQUATE VENTILATION

1. DO NOT operate heater or engine of vehicle in an enclosed area unless it is ADEQUATELY VENTILATED.
2. DO NOT idle engine for long periods without maintaining adequate ventilation in personnel compartments.
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 are present, IMMEDIATELY VENTILATE personnel compartments. If symptoms persist, remove affected personnel from vehicle and treat as follows: Expose to fresh air; keep warm; do not permit physical exercise; if necessary, administer artificial respiration. For detailed first aid instruction consult FM 21-11, First Aid for Soldiers.

WARNING

EXHAUST SYSTEM HAZARDS

EXHAUST GASES CAN KILL

Brain damage or death can result from heavy exposure. Precautions must be followed to ensure crew safety when personnel heater, main, or auxiliary engine of any vehicle is operated for any purpose.

1. Do not operate vehicle engine in enclosed areas.
2. Do not idle vehicle engine with vehicle windows closed.
3. Be alert at all times for exhaust odors.
4. Be alert for exhaust poisoning symptoms. They are:
    - Headache
    - Dizziness
    - Sleepiness
    - Loss of muscular control
5. If you see another person with exhaust poisoning symptoms:
    - Remove person from area
    - Expose to open air
    - Keep person warm
    - Do not permit physical exercise
    - Administer artificial respiration, if necessary*
    - Seek immediate medical attention

    *For artificial respiration, refer to FM 21-11.
6. BE AWARE, the field protective mask for nuclear-biological-chemical (NBC) protection will not protect you from carbon monoxide poisoning.

THE BEST DEFENSE AGAINST EXHAUST POISONING IS ADEQUATE VENTILATION.

- Allow engine to cool before performing maintenance on the muffler, exhaust pipe, exhaust manifold, or turbocharger. If necessary, use insulated pads and gloves.
- Do not touch hot exhaust system with bare hands; injury to personnel will result.

WARNING

ENGINE OIL HAZARD

Do not drain engine oil while engine is hot. Severe injury to personnel may result.

WARNING

NOISE HAZARDS

- Excessive noise levels are present any time the equipment is operating. Wear hearing protection while operating or working around equipment while it is running. Failure to do so could result in damage to your hearing. Seek medical aid should you suspect a hearing problem (ref. FM 21-11).
- Hearing protection is required for operator and also for all personnel working in and around this vehicle while engine is running.
- Personnel hearing can be PERMANENTLY DAMAGED if exposed to constant high noise levels of 85 dB (A) or greater. Wear approved hearing protection devices when working in high noise level areas. Personnel exposed to high noise levels shall participate in a hearing conservation program in accordance with TB MED 501. Hearing loss occurs gradually, but becomes permanent over time.

WARNING

FALLING EQUIPMENT HAZARDS

- Never crawl under equipment when performing maintenance unless equipment is securely blocked. Equipment may fall and cause serious injury or death to personnel.
- Keep clear of equipment when it is being raised or lowered. Equipment may fall and cause serious injury or death to personnel.
- Do not work on any item supported only by lift jacks or hoist. Always use blocks or proper stands to support the item prior to any work. Equipment may fall and cause serious injury or death to personnel.
- Do not allow heavy components to swing while suspended by lifting device. Equipment may strike personnel and cause injury.
- Exercise extreme caution when working near a cable or chain under tension. A snapped cable, shifting or swinging load may result in injury or death to personnel.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

WARNING

FIRE HAZARD

Diesel fuel and combustible materials are used in operation and maintenance of this equipment. Do not smoke or allow open flames or sparks in areas where diesel fuel and combustible materials are used or stored. DEATH or severe injury may result if personnel fail to observe this precaution. If you are burned, seek medical aid immediately (ref. FM 21–11).

WARNING

STEAM UNDER PRESSURE

- Do not remove the radiator cap when the engine is hot; steam and hot coolant can escape and burn personnel.
- Use extreme care when removing the radiator pressure cap. Sudden release of pressure can cause a steam flash which could seriously injure personnel. Slowly loosen cap to the first stop to relieve pressure before removing cap completely. After use, securely tighten cap.
- Use a clean, thick waste cloth or like material to remove the cap. Avoid using gloves. If hot water soaks through gloves, personnel could be burned.
- Extreme care should be taken when removing radiator filler cap if temperature gage reads above 180° F (82° C). Contact by steam or hot coolant may result in injury or death to personnel.

WARNING

DO NOT USE MINERAL SPIRITS OR PAINT THINNER TO CLEAN THE HOWITZER

Mineral spirits and paint thinners are highly toxic and combustible. Prolonged breathing can cause dizziness, nausea, and even death (ref. FM 21–11).

DO NOT USE THESE MATERIALS

WARNING

DRY-CLEANING SOLVENT

Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause SERIOUS INJURY. If you become dizzy while using cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash with water immediately, and obtain medical aid (ref. FM 21-11).

WARNING

BATTERY HAZARDS

- Batteries contain sulfuric acid which can cause severe burns. Avoid contact with skin, eyes, or clothing, and remove all metal or jewelry. If battery electrolyte is spilled, stop its burning effects immediately (ref. FM 21-11).
- Lead-acid battery gases can explode. Do not smoke, have open flames, or make sparks around a battery, especially if caps are off. If a battery is gassing, it can explode and cause injury to personnel.
    a. Ventilate when charging or using in an enclosed space.
    b. Wear safety goggles and acid-proof gloves when battery cover must be removed or when adding electrolyte.
    c. Avoid electrolyte contact with skin, eyes, or clothing. If battery electrolyte spills, take immediate action to stop burning effects:
        - External: Immediately flush with cold running water to remove all acid.
        - Eyes: Flush with cold water for at least 15 minutes. Seek immediate medical attention.
        - Internal: Drink large amounts of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Seek immediate medical attention.
        - Clothing or Vehicle: Wash at once with cold water. Neutralize with baking soda or household ammonia solution.
- Wear safety glasses or goggles when checking batteries. Always check electrolyte level with engine stopped. Do not smoke or use exposed flame when checking battery; explosive gases are present and severe injury to personnel can result.
- Remove or disconnect batteries and turn vehicle MASTER switch OFF prior to performing maintenance in immediate battery area or working on electrical system. Such disconnections prevent electrical shock to personnel or equipment.

WARNING

BATTERY HAZARDS - CONTINUED

- Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when performing maintenance on batteries. Injury will result if acid contacts skin or eyes. Wear rubber apron to prevent clothing being damaged.
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

WARNING

ELECTRICAL HAZARD

Be certain vehicle MASTER switch is OFF when working on hull electrical system to prevent injury due to electrical shock (ref. FM 21-11).

WARNING

NBC EXPOSURE AND VEHICLE AIR FILTER HAZARDS

- NBC-contaminated air filters must be handled and disposed of only by authorized and trained personnel. The unit commander or senior officer in charge of maintenance personnel must ensure that prescribed protective clothing (FM 3-4) is used, and prescribed safety measures and decontamination procedures (FM 3-5) are followed. The local unit SOP is responsible for final disposal of contaminated air filters. Failure to comply may cause severe injury or death to personnel.
- The NBC protection filters use a type of carbon that contains Chromium VI. This is a known carcinogen if inhaled or swallowed. Damaged or unusable filters are classified as hazardous waste.

  a. Do not throw away damaged or unusable filters as trash.

  b. Turn in damaged or unusable filters to your Hazardous Waste Management Office or Defense Reutilization and Marketing Office (DRMO).

  Filters are completely safe to handle and use if they are not damaged in such a way that carbon leaks from them. If carbon does leak, use protection such as a dust respirator to cover nose and mouth and put carbon in container such as a self-sealing plastic bag; turn in to Hazardous Waste Management Office or DRMO.

  Disposal of hazardous waste is restricted by law. Violation is subject to criminal penalties.

WARNING

FIRE EXTINGUISHING SYSTEM HAZARDS

- Fire extinguisher bottles can discharge and injure personnel. Insert antirecoil plugs, lock pins, and cotter pins before working on or near bottles.
- CO^2 can cause frostbite or eye injury. Wear protective clothing and goggles to avoid contact. If CO^2 contacts hands, hold hands under armpits or in warm water until warmed. If CO^2 contacts eyes, flush with large amounts of water and get medical attention immediately.

WARNING

FAN SCREEN HAZARD

Installed or removed, the rotation of the radiator cooling fans creates a hazard during maintenance on a running engine. A fan screen (12268262, NSN 2510-01-247-2976) must be installed prior to maintenance on a running engine (ref. FM 21-11).

WARNING

ROTATION HAZARD

- When working on a running engine, provide shielding for exposed rotating parts. Tools, clothing, or hands can get caught and cause serious injury to personnel.
- With engine running and driver's engine compartment access cover removed for maintenance, keep hands, clothing, and tools clear of generator pulley and belt. Injury or death could result.

WARNING

WASTE HAZARD

When servicing this vehicle, performing maintenance, or disposing of materials such as engine coolant, transmission fluid, lubricants, battery acids or batteries, and CARC paint, consult your unit/local regulatory guidance. If further information is needed, please contact the U.S. Army Environmental Hotline at 1-800-872-3845.

WARNING

FALLING EQUIPMENT/ROLLING VEHICLE HAZARD

Unless otherwise specified, perform all maintenance procedures with all equipment lowered to the ground, transmission in neutral, parking/emergency brake applied, and the engine stopped to prevent possible injury to personnel due to falling equipment or rolling vehicle (ref. FM 21–11).

WARNING

PARKING HAZARD

Do not park vehicles head to head. Personnel injury or damage to the vehicles could occur if one vehicle jumps (ref. FM 21–11).

WARNING

EXPLOSION HAZARD

Cylinders containing compressed gases must not be dropped, struck, or subjected to any temperature above +140°F (+60°C). This could result in an explosion and injury to personnel (ref. FM 21–11).

WARNING

COMPRESSED AIR HAZARD

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

WARNING

SNAP AND RETAINING RING HAZARD

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

WARNING

TURRET HAZARD

The turret can kill or injure personnel as it turns. Do not enter or exit turret unless turret traverse lock is locked and turret power is off.

WARNING

FASTENERS AND ATTACHING HARDWARE HAZARD

Always use the same fastener part number (or equivalent) when replacing fasteners. Do not risk using a fastener of less quality; do not mix metric and inch (customary) fasteners. Mismatched or incorrect fasteners can result in damage, malfunction, or injury.

WARNING

ADHESIVE HAZARDS

- Adhesive causes immediate bonding on contact with eyes, skin, or clothing and also gives off harmful vapors. Wear protective goggles and use it in a well-ventilated area. If adhesive gets in eyes, try to keep eyes open; flush eyes with water for 15 minutes and get immediate medical attention.
- Adhesive sealant MIL-S-46163 can damage your eyes. Wear safety goggles/glasses when using; avoid contact with eyes. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

WARNING

WASTE HAZARD

When servicing this vehicle, performing maintenance, or disposing of materials such as engine coolant, transmission fluid, lubricants, battery acids or batteries, and CARC paint, consult your unit/local regulatory guidance. If further informations is needed please contact the U.S. Army Environmental Hotline at 1-800-872-3845.

INSERT LATEST CHANGED PAGES.
DESTROY SUPERSEDED PAGES

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Date of issue for original and changed pages are:

Original . . . . . 0 . . . . . 8 February 1999
Change . . . . . 1 . . . . . 1 May 2001
Change . . . . . 2 . . . . . 1 Aug 2003

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 1722, CONSISTING OF THE FOLLOWING:

TM 9-2350-314-20-1-1 = 732 Pages TM 9-2350-314-20-1-2 = 972 Pages

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TM 9-2350-314-20-1-1
C2
HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 1 AUG 2003

CHANGE
NO. 2

TECHNICAL MANUAL
UNIT MAINTENANCE MANUAL
FOR
HULL SYSTEMS AND COMPONENTS
HOWITZER, MEDIUM,
SELF-PROPELLED: 155MM M109A6
(NSN 2350-01-305-0028) (EIC: 3FC)

TM 9-2350-314-20-1-1, February 1999, is changed as follows:

1. The purpose of this change is to update TM 9-2350-314-20-1-1.
2. New or changed material is indicated by a vertical bar in the outside margin of text changes and by a hand symbol beside illustration changes.
3. Remove the old page and insert the new page as indicated below:

Remove Pages	Insert Pages
a through d	a through d
A through C/D blank	A through D
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2-11 and 2-12	2-11 and 2-12
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5-21 through 5-28	5-21 through 5-28
5-31 through 5-34	5-31 through 5-34
7-13 and 7-14	7-13 and 7-14
Cover/blank	Cover/blank

4. File this change in front of the publication.

By Order of the Secretary of the Army:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
0211903

DISTRIBUTION: To be distributed in accordance with the initial distribution number (IDN) 371933, requirements for TM 9-2350-314-20-1-1.

TM 9–2350–314–20–1–1
C1
HEADQUARTERS
CHANGE DEPARTMENT OF THE ARMY
NO.1 WASHINGTON, D.C., 1 MAY 2001

TECHNICAL MANUAL
UNIT MAINTENANCE MANUAL
FOR
HULL SYSTEMS AND COMPONENTS
HOWITZER, MEDIUM,
SELF–PROPELLED: 155MM, M109A6
(NSN 2350–01–305–0028) (EIC: 3FC)

TM 9–2350–314–20–1–1, February 1999, is changed as follows:

1. The purpose of this change is to update TM 9–2350–314–20–1–1.
2. New or changed material is indicated by a vertical bar in the outside margin of text changes and by a hand symbol beside illustration changes.
3. Remove the old page and insert the new page as indicated below:

Remove Pages	Insert Pages
none	A through C/(D blank)
i through iv	i through iv
1–1 through 1–4	1–1 through 1–4
2–15 and 2–16	2–15 and 2–16
2–23 and 2–24	2–23 and 2–24
2–39 and 2–40	2–39 and 2–40
2–45 through 2–48	2–45 through 2–48
2–51 through 2–54	2–51 through 2–54
3–3 through 3–13/(3–14 blank)	3–3 through 3–13/(3–14 blank)
3–165 and 3–166	3–165 and 3–166
3–197 and 3–198	3–197 and 3–198
3–227 and 3–228	3–227 and 3–228
3–251 and 3–252	3–251 and 3–252
3–257 through 3–260	3–257 through 3–260
3–263 and 3–264	3–263 through 3–264.4
5–29 through 5–32	5–29 through 5–32
5–97 through 5–99/(5–100 blank)	5–97 through 5–99/(5–100 blank)
DA2028–2 sample form	DA2028–2 sample form
DA2028–2 form (4)	DA2028–2 form (4)
Cover/blank	Cover/blank

4. File this change in front of the publication.

By Order of the Secretary of the Army:

ERIC K. SHINSEKI
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
0105103

DISTRIBUTION: To be distributed in accordance with the initial distribution requirements for IDN: 371933 TM 9-2350-314-20-1-1.

TECHNICAL MANUAL
No. 9-2350-314-20-1-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 8 February 1999

UNIT MAINTENANCE MANUAL FOR HULL SYSTEMS AND COMPONENTS HOWITZER, MEDIUM, SELF-PROPELLED: 155MM, M109A6 (NSN 2350-01-305-0028)(EIC: 3FC)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028-2 (Recommended Changes to Equipment Technical Publications), through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is http://aeps.ria.army.mil. If you need a password, scroll down and click on "ACCESS REQUEST FORM". The DA Form 2028 is located in the ONLINE FORMS PROCESSING section of the AEPS. Fill out the form and click on SUBMIT. Using this form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or email your letter, DA Form 2028, or DA Form 2028-2 direct to: Technical Publication Information Office, TACOM-RI, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The email address is TACOM-TECH-PUBS@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

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VOLUME 1

*This manual supersedes TM 9-2350-314-20-1-1 dated 25 October 1993, including all changes

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HOW TO USE THIS MANUAL

Indexing

Five major indexing procedures are used in this manual to help the technician locate information rapidly.

1. Cover index: Lists sections of text and page number. Includes Index Mark ( ) which lines up with Index Marks on the actual page of reference.

   Example: Troubleshooting. 3-1

2. Table of Contents: Pages i through iii.

3. Chapter indexes: Lists data/information covered within the chapter and section.

4. Troubleshooting symptoms index: Identifies system malfunction and provides page reference for specific troubleshooting procedures.

5. Index, pages Index-1 through Index-6: Alphabetical listing of information.

Maintenance Text and Illustrations (Chapter 4 through 23)

1. Maintenance procedures are to be performed in the sequence shown in the text and illustrations. Step 1 must be performed before Step 2. Procedure a must be performed before Procedure b, and so on.

2. Equipment illustrations use numbers to identify parts of the system/components.

   Example:

   1. Remove both wiring harnesses (1) and (2).

   2. Remove four screws (3), four flat washers (4), four lockwashers (5) and four nuts (6).

CHAPTER 1
INTRODUCTION

GENERAL

This chapter provides a general introduction to the purpose, safe use, and capabilities of the M109A6 Howitzer. Section I describes procedures for destroying equipment to prevent enemy use, references to other technical manuals, and forms to recommend improvements. Sections II and III familiarize the mechanic with equipment data and operating principles of the howitzer's systems.

CONTENTS

Section I. GENERAL INFORMATION

1-1 SCOPE.

Type of manual: Unit Maintenance. This manual deals with maintenance for the hull and associated components. TM 9-2350-314-20-2 deals with maintenance of the cab and associated components.

Model number and equipment name: M109A6, Howitzer, Medium, Self-Propelled, 155MM.

Purpose of Equipment: Provides artillery fire in support of ground-gaining troops.

1-2 MAINTENANCE FORMS, RECORDS, AND REPORTS.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, The Army Maintenance Management System (TAMMS) as contained in Maintenance Management Update.

Accidents involving injury to personnel or damage to materiel will be reported on DA Form 285 (Accident Reporting) in accordance with AR 385-40.

1-3 DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.

Refer to TM 750-244-6 for procedures on how to destroy the M109A6 Howitzer. You will find procedures for destruction of munitions in TM 750-244-5-1 (conventional ammo) or TM 43-0002-33 (improved conventional munitions). Procedures for destruction of chemical munitions are outlined in TM 3-250.

Below are some general guidelines to follow in destruction of equipment to prevent enemy use.

Destruction of the vehicle, armament, and equipment, when subject to capture or abandonment in a combat zone, will be undertaken only when the unit commander decides such action is necessary in accordance with orders of, or policy established by, the Army commander.

In general, destruction of essential parts, followed by burning, will usually be sufficient to render the vehicle, armament, and equipment useless. Time is usually critical.

Materiel must be damaged so that it cannot be restored to usable condition by either repair or cannibalization. If lack of time or personnel prevents destruction of all parts, give priority to destruction of parts hardest to replace. It is important that the same parts be destroyed on all units to prevent construction of one complete unit from several damaged ones.

All items of sighting and fire control instruments and equipment, especially telescopes, gunner's quadrants, and binoculars, are costly and difficult to replace. They should be conserved whenever possible. If you cannot carry them with you, destroy them by smashing with your sledgehammer, pick, or mattock. Throw the pieces in all directions.

When time is short, a method of destroying the equipment with materials at hand is as follows:

Retrieve or smash sighting and fire control equipment.

Load cannon with projectile and full powder charge. Attach a 50-foot (15.2 m) or longer lanyard to firing mechanism. Disconnect recoil cylinder lines and fire the weapon.

Take a sledgehammer and bend the end of the counterrecoil buffer rod.

A second method is to close the breechblock and toss several thermite grenades down the tube. Elevate the tube so that the grenades will fall against the breechblock. This will melt the breech and the powder chamber, causing them to fuse together.

1-4 PREPARATION FOR STORAGE OR SHIPMENT.

Refer to Chapter 23 for the requirements for Administrative Storage. Refer to TM 9-2350-314-20-2 for the requirements for vehicle shipment.

1-5 QUALITY ASSURANCE (QA).

No particular quality assurance manual pertains specifically to the M109A6 Howitzer.

Defective material received through the supply system should be reported on Quality Deficiency Report (QDR) SF368. Instructions for preparing QDRs are provided in AR 702-7, Reporting of Quality Deficiency Data. QDRs should be mailed directly to:

Department of the Army
U.S. Army Tank-automotive and Armaments Command
ATTN: AMSTA-TR-E-PQDR MS 267
Warren, MI 48397-5000

A reply will be furnished directly to you.

1-6 NOMENCLATURE CROSS-REFERENCE LIST.

Nomenclature in this manual was chosen in accordance with the terms used for provisioning as they appear in the Repair Parts and Special Tools List (RPSTL) and Maintenance Allocation Chart (MAC) for unit maintenance.

A few tools and hull components are, however, referred to by names more common than those in the RPSTL. In many cases the more common name is a shorter name for the same component.

OFFICIAL PROVISIONING NOMENCLATURE	MORE COMMON NAME
Ammunition rack	Ammo rack
Cable assembly	Wiring harness
Gage rod	Dipstick, bayonet gage
Intercommunications power harness	Intercom wiring harness
Intercommunications system	Intercom system
155MM medium self-propelled howitzer M109A6	Howitzer (Modified 155MM)
Safety wire	Lockwire
Socket head screw key	Hex key

1-7 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS.

If your M109A6 Howitzer needs improvement, let us know. Send us an Equipment Improvement Recommendation (EIR). You, the user, are the only one who can tell us what you don't like about our equipment. Let us know why you don't like the design or performance. Put it on a SF 368 (Product Quality Deficiency Report). EIRs should be mailed to:

Department of the Army
U.S. Army Tank-automotive and Armaments Command
ATTN: AMSTA-LC-CIP-W
Rock Island, IL 61299-7630

1-8 WARRANTY INFORMATION.

The M109A6 is not warranted.

1-9 CORROSION PREVENTION AND CONTROL.

Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problem with the howitzer be reported so that improvements can be made to prevent the problem in the future. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem. Additional information concerning corrosion prevention and control is found in Appendix G of this manual. If a corrosion problem is identified, report the specific problem to the address specified in Appendix G.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-10 EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

1-10.1 Characteristics.

Refer to TM 9-2350-314-10 for Characteristics of the M109A6 Howitzer.

1-10.2 Capabilities and Features.

Refer to TM 9-2350-314-10 for Capabilities and Features of the M109A6 Howitzer.

1-11 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

Refer to TM 9-2350-314-10 for Location and Description of Major Components of the M109A6 Howitzer.

1-12 DIFFERENCES BETWEEN MODELS.

There is currently only one model of the M109A6 Howitzer.

1-13 EQUIPMENT DATA.

GENERAL

Crew	4
Weight (combat loaded)	62,960 lbs (28,583.84 kg)
Weight (empty)	56,400 lbs (25,605.6 kg)
Overall length (with baskets) to rear	423 inches (10.75 m)
Overall length (with baskets) forward	392 inches (9.96 m)
Overall width (with baskets) to rear	128 inches (3.25 m)
Overall width (with baskets) forward	154 inches (3.9 m)
Height (including machinegun)	143 inches (3.6 m)
Lowest operable height	128 inches (3.25 m)
Ground clearance	18 inches (0.45 m)
Shipping volume	3737 cu ft (104.64 cu m)
Bridge classification	26 ton (23,608 kg)

PERFORMANCE

High speed (max)	38 mph (governed) (61.1 kmph)
Low speed (max)	6 mph (9.6 kmph)
Reverse speed (max)	7 mph (11.26 kmph)
Maximum grade	60%
Maximum trench	72 inches (1.83 m)
Maximum vertical wall	21 inches (0.53 m)
Turn radius (min)	1 vehicle length
Cruising range	186 miles (299 km)
Fuel capacity	133 gallons (503.4 Ll)

ENGINE

Type/model	Detroit Diesel, Allison 8V71T, model 91, liquid cooled
Manufacturer	Detroit Diesel, Allison Div., GMC
Horsepower (gross)	440 at 2300 rpm
Displacement	568 cu. in. (9.32 Ll)
Bore	4.25 inches (108 mm)
Stroke	5 inches (127 mm)
Compression ratio	17:1
Torque (max gross)	980 lb-ft at 1700 (1328 N·m)
Torque (max net)	895 lb-ft at 1600 (1213 N·m)
Ignition	Compression
Fuel	Diesel: 40 octane, VV-F-800
Regular grade (DF-2) (NATO F-54)	Temperature range: +20° to +115° F (-7° to +46° C)
Winter grade (DF-1)	Temperature range: -20° to +20° F (-29° to -7° C)
Arctic grade (DF-A)	Temperature range: - 65° to -25° F (-54° to -35° C)
Fuel acceptance (safe max)	50 gpm (3.1 Ll/sec)
Lubrication oil system	
capacity (refill)	27 quarts (25.5 Ll) (approx)
capacity (dry)	38 quarts (36 Ll) (approx)
Cooling system	
capacity (refill)	14-1/2 gallons (55 Ll)
capacity (dry)	20-1/4 gallons (77 Ll)

1-13 EQUIPMENT DATA - CONTINUED

TRANSMISSION

Model XTG-411-4
- Manufacturer ..... Allison Div., GMC
- Usable ranges:
  - First (low range) 4.69:1
  - Second (low intermediate) 3.17:1
  - Third (low intermediate) 1.58:1
  - Fourth (high range) 0.79:1
  - Low reverse (R-1) 5.60:1
  - High reverse (R-1) 3.79:1
- Steer 1.475:1
- Steer control - first and second ..... Clutch brake
- Steer control - third and fourth ..... Geared
- Brakes ... Mechanical - applied
- Oil capacity (refill) ..... 12 gallons (45.5 LI)
- Oil capacity (dry) ..... 21 gallons (79 LI)

ELECTRICAL SYSTEM

Voltage (nominal) 24
- Batteries (12 volts each, series - parallel connected) 4
- Type ..... 6 TN
- Generator
  - Manufacturer ..... Bendix Corp.
  - Model ..... 30895-468 (P/N 12361436)
  - Amperage 650

SUSPENSION

Type ..... Independent torsion bar
- Roadwheel ..... 7 sets
- Size .. 24 inches (0.6 m)
- Loadings
  - 1, 2, and 7 positions ..... 4000 lbs (approx) (1816 kg)
  - Intermediate positions ..... 2600 lbs (approx) (1180 kg)

TRACK

Adjustment at idler wheel ..... Track adjuster
- Shoes per track 80
- Pitch ..... 6 inches (15.2 cm)
- Width ..... 15 inches (38 cm)

FINAL DRIVES AND SPROCKETS

Type ..... Spur gear
- Ratio 4.36:1
- Sprocket pitch diameter ..... 19.3 inches (49.5 cm)
- Number teeth per sprocket 10

FIRE EXTINGUISHER

Fixed - 10-pound bottles (CO^2) 2
- Portable - 5-pound bottles (Halon) 1

Section III. PRINCIPLES OF OPERATION

1-14 EQUIPMENT OPERATION AND DESCRIPTION.

Refer to TM 9-2350-314-10 for hull-related systems and components.

CHAPTER 2
GENERAL MAINTENANCE

GENERAL

This chapter presents instructions and information needed to keep the M109A6 hull equipment and components in good repair. These instructions provide a step-by-step, item-by-item, illustrated text describing M109A6 equipment, component service, and maintenance.

The maintenance functions described in this chapter are limited to those functions authorized by the MAC for Unit Maintenance level activities. If maintenance is needed on any hull equipment or components that are not discussed in this chapter, notify Support Maintenance.

CONTENTS

Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

2-1 GENERAL.

Repair parts, special tools, and support equipment are issued for maintaining the vehicle. Tools and equipment should not be used for purposes other than those prescribed. When not in use, they should be properly stowed.

2-2 COMMON TOOLS AND EQUIPMENT.

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE), CTA 50-970, or CTA 8-100, as applicable to your unit.

The tool kit (box) assigned to the mechanic (on a 1-per-mechanic-by-MOS basis) shall be identified in the individual maintenance paragraphs by nomenclature and supply catalog (SC) number. No tool in the kit shall be further identified. Other tools required for performance of all tasks for the maintenance levels covered in the manual shall be identified in the setup and shall be referenced to the Tool Identification List, Appendix F. "Other tools" includes tools which are part of components of shop sets authorized to sections/teams; tools authorized by RPSTL and CTA 50-970; special tools; and items of TMDE.

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

Special tools and equipment necessary to perform the maintenance described in this manual are listed in Appendix B for information only. Special tools and equipment are listed in TM 9-2350-314-24P-1, which is the authority requisitioning replacements. Fabricated tools are identified in the initial setup; manufacturing instructions have been written into the task which requires the fabricated tool.

2-4 REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list covering unit maintenance (TM 9-2350-314-24P-1). All mandatory replacement parts identified in the initial setup are listed in Appendix E of this manual.

Gaskets, packings, preformed packings, seals, lockwashers, locknuts, self-locking nuts, cotter pins, and spring pins must be replaced. Bushings must be replaced only if removed.

Springs must be replaced if broken, kinked, cracked, or do not conform to standards specified in the repair data.

Section II. SERVICE UPON RECEIPT

2-5 GENERAL.

This section covers the procedures for servicing M109A6 Howitzer upon receipt. A run-in of at least 5 miles will be performed on all new or reconditioned vehicles, and of a sufficient number of miles on used vehicles, to check their operation completely. This section may provide material which is duplicated in TM 9-2350-314-20-2. This duplication is limited only to activities which require crew and maintenance technicians' joint efforts.

2-6 INITIAL PROCEDURES.

NOTE

If the vehicle has been shipped by rail, unblock and unload the equipment according to TM 9-2350-314-20-2. Observe existing regulations.

2-6.1 Checking Unpacked Equipment.

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on SF 364 Form, Packing 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 on DA PAM 738-750.

c. Check whether the equipment has been modified. Reference shall be made to the authorized equipment configuration change list when applicable.

2-6.2 Deprocessing Unpacked Equipment.

a. Install fire control and sighting equipment as is. No cleaning is required.

b. Clean all other tools and equipment.

c. Store all basic issue items in their respective vehicle storage facility as indicated in TM 9-2350-314-10.

d. Clean the vehicle as follows:

WARNING

Dry-cleaning solvent (P-D-680) is toxic and flamable. To avoid injury, wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause SERIOUS INJURY. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (FM 21-11).

1. Remove any rust-preventive compound from exterior surfaces with dry-cleaning solvent (item 59, Appx C). Whenever possible, the vehicle crew will help in the cleaning.

2. Armament parts are coated with rust-preventive compound when received from storage. Clean these parts thoroughly with rags or a brush saturated with dry-cleaning solvent (item 59, Appx C). After complete removal of the rust-preventive compound, lubricate as specified in TM 9-2350-314-10. Component parts of each weapon should be cleaned separately where possible. Component parts are interchangeable; however, the parts originally assembled work best together.

2-6.3 Assembly of Equipment.

The M109A6 Howitzer equipment and systems are shipped as assembled units. Assembly is not required.

2-6.4 Equipment Installation Instructions.

a. Installation instructions for the M109A6 Howitzer require installation of on-board vehicle equipment, equipment racks, and stowage of equipment in the hull as shown in Chapter 16.

b. Follow all precautions on DD Form 1397 (Processing and Deprocessing Record for Shipment, Storage, and Issue of Vehicles and Spare Engines). One tag will be with the Records Book and one in an envelope attached to a headlamp.

2-7 PREOPERATIONAL PROCEDURES.

Inspect all wires/hydraulic lines/connectors, electrical connectors, welds, bolts, and seals.

2-7.1 Installation of Batteries.

a. Service batteries in accordance with TM 9-6140-200-14.

b. Install batteries in accordance with Chapter 8, Section VIII.

2-7.2 Checking Vehicle Systems.

Check for the following:

a. ENGINE COOLANT: Check level and specific gravity (item 31, Table 2-1).

b. ENGINE OIL: Check level (TM 9-2350-314-10).

c. FUEL: Fuel vehicle (TM 9-2350-314-10).

d. TRANSMISSION OIL: Check level (TM 9-2350-314-10).

e. FIRE EXTINGUISHER BOTTLES: Check valve safety wire (items 2 and 12, Table 2-1).

2-8 OPERATIONAL PROCEDURES.

2-8.1 Initial Starting and Break-In.

NOTE

Engine contains preservative oil upon receipt. Preservative engine oils PE1 and PE2 are identical to engine oils OE-10 and OE-30, except that they contain a preservative additive. PE1 and PE2 will be used in the same manner as the regularly used engine oils OE-10 or OE-30. PE1 or PE2 will also be used in the transmission until the first scheduled 2000-mile or semiannual oil change. Refer to TM 9-2350-314-10 for correct lubrication instructions.

a. Start and run engine (TM 9-2350-314-10) until preservative oil is out of combustion chambers and engine is operating smoothly. Check for fuel and oil leaks immediately.

NOTE

Due to international processing, engine may be hard to start, and may smoke and run rough. Let it run for 5 minutes and see if it improves. Perform troubleshooting procedures if engine fails to develop full power after 5 minutes.

b. Perform complete annual service (Table 2-1).

2-8.2 Operational Test.

Test vehicle systems for proper operation (TM 9-2350-314-10).

2-8.3 Road Test.

Road test vehicle to check and qualify all operational systems (TM 9-2350-314-10).

2-9 EQUIPMENT FAULTS.

Equipment faults disclosed during preliminary inspection and servicing or during break-in period will be corrected by the using unit or support maintenance.

2-9.1 Reporting Design and Material Faults.

Serious equipment faults which appear to involve unsatisfactory design or material will be reported on SF 368, Quality Deficiency Report (Category II), as prescribed in DA PAM 738-750.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-10 GENERAL.

This section contains Unit preventive maintenance checks and services.

Preventive maintenance is the step-by-step care, inspection, and service of equipment to maintain it in good condition and to find problems before extensive and time-consuming repairs or replacements are needed. Refer to DA PAM 738-750 for instructions on use of forms for preventive maintenance services.

2-10.1 Intervals.

The preventive maintenance checks and services listed in Table 2-1 are to be performed at Unit level at intervals determined by whichever comes first:

(a) semiannually, 1500 miles, or 150 hours;

(b) annually, 3000 miles, or 300 hours.

Preventive maintenance checks and services items and intervals have been determined by using Reliability Centered Maintenance (RCM) logic and are to be scheduled on DD Form 314 in accordance with DA PAM 738-750.

After operation in water, mud, or loose sand, the vehicle should be cleaned as soon as possible. Lubricate without waiting for the next scheduled service.

2-10.2 Lubrication Instructions.

Detailed lubrication steps and instructions covering locations, intervals, and lubricants for M109A6 vehicles are listed in Table 2-1.

Lubrication instructions are to be performed by Unit Maintenance personnel.

Intervals (on-condition or hard time) are based on normal operation. On-Condition (OC) oil sample intervals shall be applied unless changed by the Army Oil Analysis Program (AOAP) laboratory. Change the hard time interval if your lubricants are contaminated or if you are operating the equipment under adverse operating conditions, including longer than usual operating hours. The hard time interval may be extended during periods of low activity. If extended, adequate preservation precautions must be taken. Hard time intervals will be applied in the event AOAP laboratory support is not available.

Engine oil/transmission oil/hydraulic fluids must be sampled at 25 hours of operation or 60 days, whichever occurs first, as prescribed by DA PAM 738-750.

When AOAP analysis service is available, change oil and filters at the direction of the AOAP laboratory.

When AOAP analysis service is not available, change oil and filters at 75 hours or 750 miles of operation.

Always use the Expected Temperature Lubrication Table to determine seasonal lubrication requirements. When changing engine and transmission oil due to seasonal requirements, always change the oil filters.

Sound maintenance practice dictates that AOAP is not a maintenance substitute, but is used as an effective maintenance diagnostic tool. Therefore, if 12 months have elapsed since the last AOAP or seasonally directed oil and filter change, the oil and filters will be changed.

Clean parts with SOLVENT, DRY-CLEANING (P-D-680).

2-10 GENERAL - CONTINUED

WARNING

Dry-cleaning solvent (P-D-680) is toxic and flamable. To avoid injury, wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause SERIOUS INJURY. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (FM 21-11).

Before you start your lube service, observe the following:

NEVER

a. Use wrong type lubricant.
b. Use too much lubricant

ALWAYS

a. Clean grease fittings before lubrication.
b. Use these lubrication instructions as your guide.
c. Check for lubricant and fuel leaks along with daily services.

After water fording, you have to lubricate.

Make sure vehicle is level when checking oil levels: If it isn't, you'll get incorrect readings on dipsticks and sight gages.

Oil filters shall be serviced/cleaned/changed as applicable, when:

a. They are known to be contaminated or clogged;
b. Service is recommended by AOAP laboratory analysis; or
c. At prescribed hardtime intervals.

OE/HDO Lubricating Oil, ICE, Tactical Service (MIL-PRF-2104)
OEA Lubricating Oil, Internal Combustion Engine, Arctic (MIL-L-46167)
LOMD Lubricating Oil, Molybdenum Disulfide (DOD-L-25681) (9150-00-543-7220) NATO-S-1735
O-156 Lubricating Oil, Aircraft Turbine Engine (MIL-L-23699)

2-10 GENERAL - CONTINUED

2-10.2 Lubrication Instructions - Continued

LUBRICANT/COMPONENT	CAPACITIES	LUBRICANT FOR EXPECTED TEMPERATURE					INTERVALS
		Above +5_F (Above −15_C)	+5_F to −65_F (−15_C to −54_C)	Above +15_F (Above −9_C)	+40_F to −15_F (+4_C to −26_C)	+40_F to −65_F (+4_C to −54_C)	
OE/HDO (MIL−PRF−2104) Lubricating Oil, ICE, Tactical OEA (MIL−L−46167) Lubricating Oil, ICE, Arctic Engine Final Drive	27 Qts. (25.54 Ll) As Req.	OE/HDO−15/40 (0−1236) See NOTE 2	OEA	OE/HDO−15/40 (0−1236) or OE/HDO−30 (0−238) See NOTE 2	OE/HDO−15/40 (0−1236) or OE/HDO−10 (0−237) See NOTES 1&2	OEA (0−183)	For arctic operation, refer to FM 9−207
Transmission & Generator, 650 AMP	49 Qts. (46.35 Ll) As Req.	OE/HDO−15/40 (0−1236) See NOTE 2	OEA	OE/HDO−15/40 (0−1236) or OE/HDO−10 (0−237) See NOTES 1&2	OE/HDO−15/40 (0−1236) or OE/HDO−10 (0−237) See NOTES 1&2	OEA (0−183)	
GAA (MIL−PRF−10924) Grease, Automotive and Artillery LOMD NATO−S−1735 Lubricating Oil, Molybdenum Disulfide							
Engine Mount Screw	As Req.	GMD or LOMD All Temperatures					
0−156 (MIL−L−23699) Lubricating Oil, Aircraft Turbine Engine Fan Gear Case	As Req.						

NOTE

1. If OEA lubricant is required to meet the low expected-temperature range, OEA lubricant is to be used in lieu of OE/HDO-10 lubricant for all expected-temperature ranges where OE/HDO-10 is specified in the KEY.

2. Multigrade oil (15W-40) does not automatically replace single weight oils. Use 15W-40 oil to avoid seasonal oil changes if your operational conditions match the table.

2-10 GENERAL - CONTINUED

2-10.3 Procedures.

a. Routine applications. TM 9-2350-314-10 contains maintenance instructions which the Unit mechanic must use to perform his duties.

b. Crew participation. The crew will accompany the vehicle and help the Unit mechanics perform the Unit services.

CAUTION

Do not direct a stream of water or steam against the opening between the hull and cab (cab race ring), grilles, exhaust deflectors, fire control, or armament openings. Failure to comply may cause equipment damage.

c. Vehicle cleanliness. The crew should bring a clean vehicle to a scheduled preventive maintenance service. It should be dry and not caked with mud. Washing the vehicle should not be done just before an inspection. Some defects, such as loose parts and oil leaks, may not be noticed immediately after washing.

2-10.4 Services.

a. Unit level services are defined by, and limited to, the following general procedures. Approval to perform higher level services must be given by the supporting maintenance unit.

b. Adjustment. Make all needed adjustments using instructions in this manual and/or technical bulletins.

c. Cleaning. Clean the unit to remove old lubricant, dirt, and other foreign matter. Special cleaning instructions are given as needed.

d. Special lubrication. Special lubrication applies either to lubrication operations that do not appear in TM 9-2350-314-10 or to items that do appear, but which should be done with the annual service.

e. Service. Servicing covers operations such as adding battery water, draining and refilling units with oil, and changing or cleaning the oil filters, fuel filters, and air cleaners.

f. Tightening. All tightening operations should be done according to specified torque readings where noted in this manual. When torque isn't specified, care should be taken not to strip or distort threads by overtightening. Use a torque wrench where specified. Tightening includes the correct installing of lockwasher, nut, lockwire, or cotter pin needed to secure the tightened nut or bolt in place. Refer to Appendix D for torque requirements.

g. Repair. Restore an item to a serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting and strengthening.

2-11 PROCEDURES FOR SEMIANNUAL AND ANNUAL SERVICES.

DA Form 2404, Equipment Inspection and Maintenance Worksheet, is used by the mechanic to record periodic maintenance services performed and faults corrected. The item number on the DA Form 2404 must correspond to the item number of the preventive maintenance check.

Specified items to be checked SEMIANNUALLY and ANNUALLY are found in Table 2-1. Before you begin to check specific items, remember to check things common in all areas.

2-11 PROCEDURES FOR SEMIANNUAL AND ANNUAL SERVICES - CONTINUED

NOTE

Perform Unit Maintenance level repair or replacement as authorized. Report faulty equipment which is beyond Unit Maintenance level as prescribed in DA PAM 738-750.

2-11.1 Electrical Wires and Connectors.

Electrical wiring should be checked for cracks due to aging and for exposed wires which cause electrical shorts. Repair with electrical tape or replace. Check connectors and tighten if loose (complete hull wiring diagram, harnesses and detail in Chapter 8 and electrical schematics (foldout pages) of this manual). Notify support maintenance if further repair is required.

2-11.2 Welds.

Many items are attached to the hull with welds. Check for damaged welds by looking for chipped paint or oxidation. Notify support maintenance if further repair is required.

2-11.3 Seals.

Check for leaks around seals. Check gasket material. Check door and hatch seals. Check for deterioration, cracks, and tears.

2-11.4 Bolts.

Check for loose bolts. A loose bolt can be difficult to spot without actually applying a wrench. You can often tell by loose or chipped paint around the bolt head and bare metal or oxidation present at the base of the bolt head.

2-11.5 Hoses and Fluid Lines.

Check all hoses and lines for signs of wear (deterioration or cracks), leaks, loose clamps, and loose fittings. A stain around a fitting is a sign of a leak. Tighten, repair, or replace hoses and fittings.

2-11.6 Inserts.

If inserts are damaged when removing a component, notify support maintenance.

2-11.7 Corrosion Prevention and Control.

Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items. Refer to Appendix G of this manual for more information on unit level CPC.

2-11.8 Classification of Fluid Leaks.

The following definitions concern types/classes of fluid leakage. Each crewmember must be familiar with these definitions in order to determine whether or not the vehicle is mission capable.

2-11 PROCEDURES FOR SEMIANNUAL AND ANNUAL SERVICES - CONTINUED

CAUTION

Equipment operation is allowable with minor leakage (Class I or II). Consideration must be given to the fluid capacity in the item/system being checked/inspected. When in doubt, notify your supervisor. When operating with Class I or Class II leaks, continue to check fluid levels as required in your PMCS. Class III leaks should be reported to unit maintenance supervisor.

Class I: Seepage of fluid (indicated by wetness or discoloration) not great enough to form drops.

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

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

2-11.9 Warning and Cautions.

Always observe the WARNINGS and CAUTIONS appearing in your PMCS table. Warnings and cautions appear before applicable procedures. You must observe these WARNINGS and CAUTIONS to prevent serious injury to yourself and others or to prevent your equipment from being damaged.

2-11.10 Explanation of Table Entries.

a. Item Number column. Numbers in this column are for reference. When completing DA Form 2404 (Equipment Inspection and Maintenance Worksheet), include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services for the intervals listed.

b. Interval column. This column tells you when you must do the procedure listed in the procedure column. SEMIANNUAL procedures must be done every 6 months, or 1500 miles, or 150 hours of vehicle operation. ANNUAL procedures must be done every 12 months, or 3000 miles, or 300 hours, of vehicle operation.

c. Location, Item to Check/Service column. This column provides the location and the item to be checked or serviced. The item location is underlined.

d. Procedure column. This column gives the procedure you must do to check or service the item listed in the Check/Service column to know if the equipment is ready or available for its intended mission or for operation. You must do the procedure at the time stated in the interval column.

e. Not Fully Mission Capable If: column. Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If you make check and service procedures that show faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	EXTERIOR		
1		Lubrication	Perform lubrication as required by TM 9-2350-314-10.	
			WARNING	
2		Fire extinguisher system	Cylinders must not be dropped, struck, or subject to any temperature above +140° F (60° C). An explosion may result, causing severe injury or DEATH.	
			Disconnect fire extinguisher cylinders (para 21-1). Operate exterior discharge handle (1) to ensure cable does not bind. Check to ensure handle (1) is properly seated and new wire and seal (2) are laced and sealed.	Cable binds. Wire and seal (2) broken, missing, or extinguisher handle (1) is pulled.
3		Stencil markings	Restencil markings that are not legible (para 18-14). Refer to TM 9-2350-314-10 for stencil locations.	

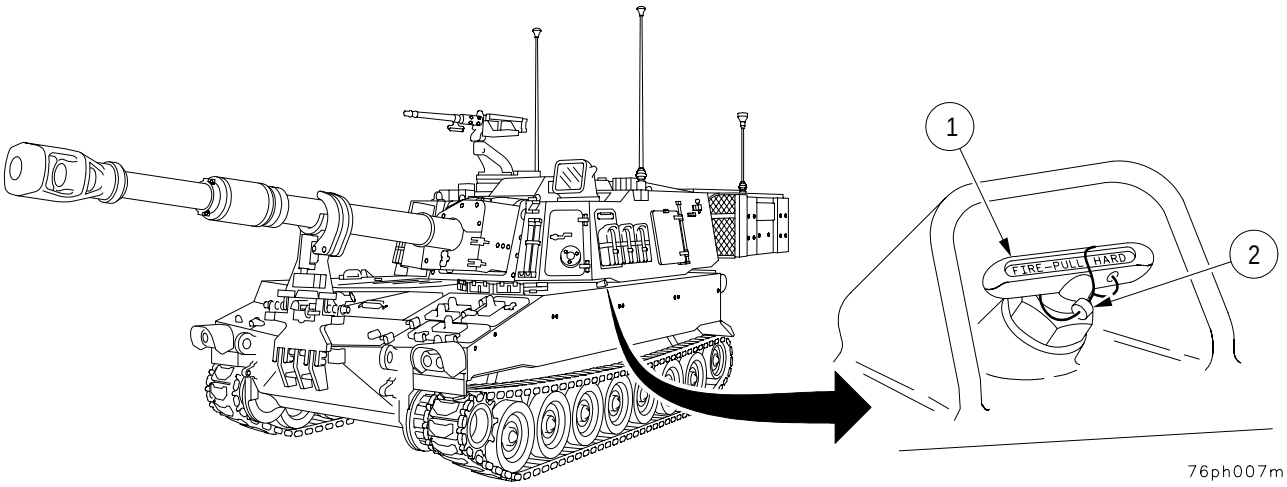


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

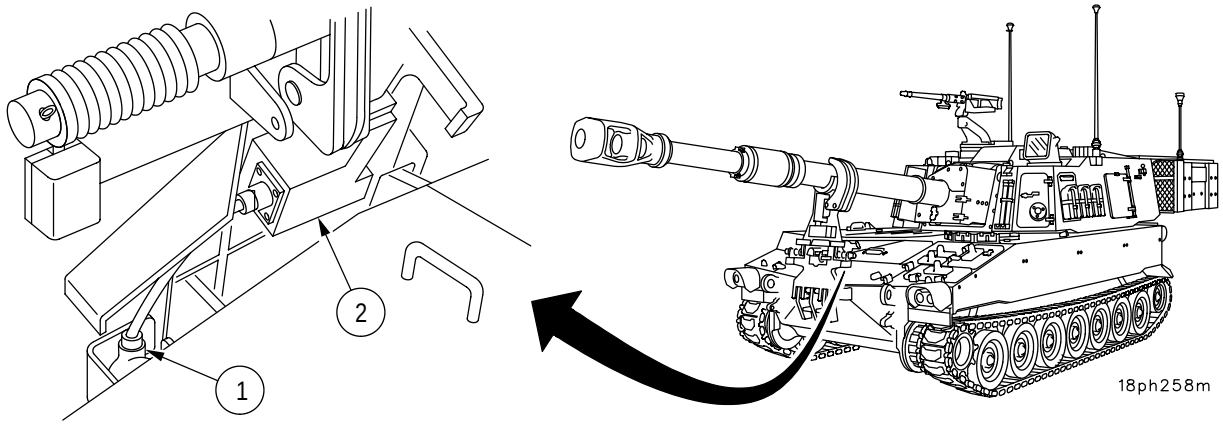
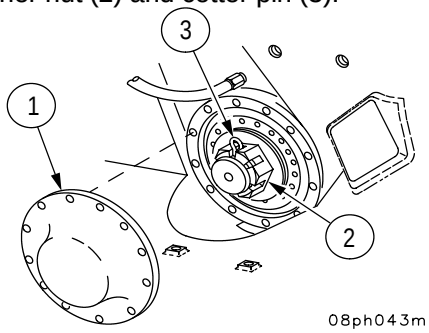
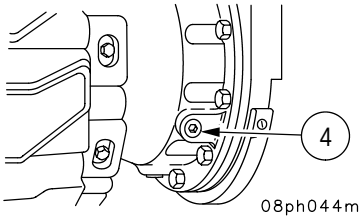
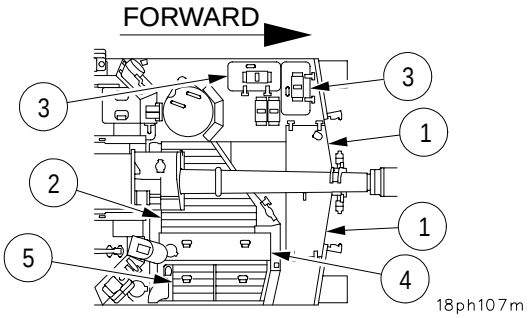
ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	EXTERIOR		
4		Travel lock electrical connectors	Check electrical wiring harness and connectors at front bulkhead (1) and actuator (2) for cuts, breaks, and proper mounting.	Wiring harness or connectors are broken.
				
4.1		Final Drive Drain and Refill	a. Remove end cover (1). Inspect bearing retainer nut (2) and cotter pin (3).  b. Add oil (item 30, Appendix C) at level-check opening. c. Clean level-check plugs (4), apply antiseizing tape (item 60, Appendix C) to threads, and install level-check plugs (4). 	Any visual signs of a loose nut or sheared cotter pin, final drive will be removed and replaced.

TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	BATTERY AND ENGINE COMPARTMENT		
5		Batteries	Open transmission access doors (1), air intake grille (2), and battery compartment access doors (3) (TM 9-2350-314-10). Remove fan access door (4) (para 16-26) and hull exhaust grille (5) (para 16-25).  **WARNING** Battery gasses can explode. Do not smoke, have open flame, or create sparks around a battery. Severe injury may result due to explosion. Remove all chains, rings, and watches. a. Remove battery caps (1) from all cells of four batteries (2). Each cell must be tested separately. b. Test specific gravity of each battery (2) with duo-tester (item 39, Appx F). If duo-tester indicates a specific gravity reading of 1.120 or less, battery (2) must be recharged.	If batteries are below 1.120 specific gravity, cracked or unserviceable.

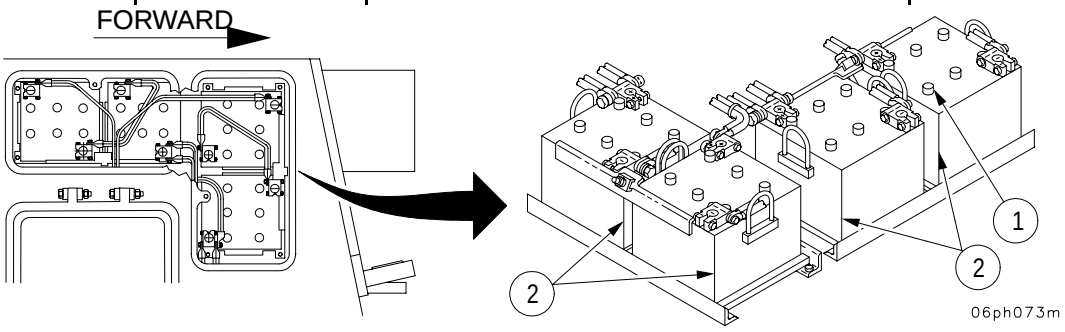


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	BATTERY AND ENGINE COMPARTMENT		
6		Fuel system	Check all connections (1) for evidence of leaks. Change fuel filter elements (primary and secondary) (2) (para 5-14).	Leaks as defined in para 5-14 exist.

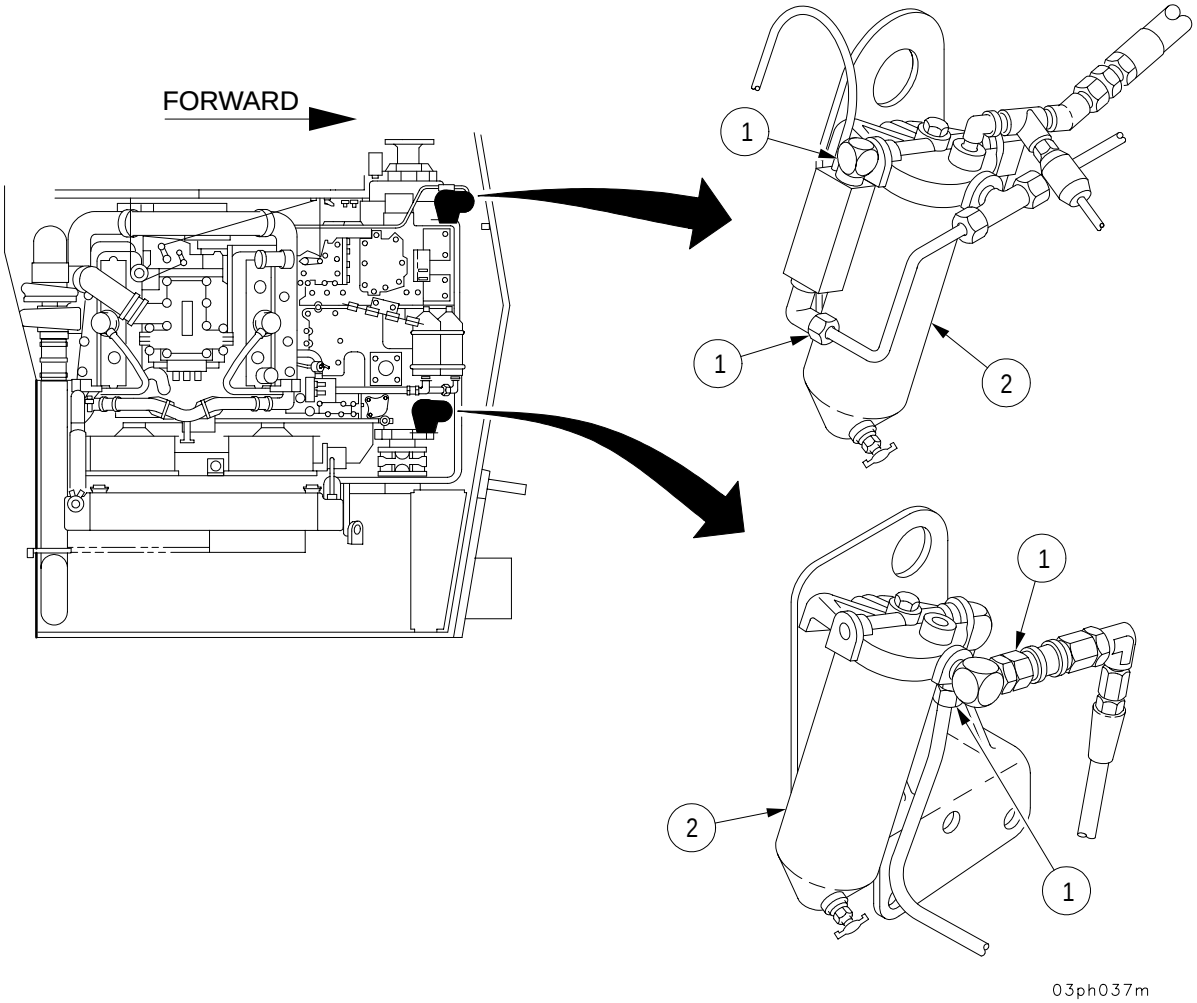


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	BATTERY AND ENGINE COMPARTMENT		
7		Engine fan drive system	Perform backlash test as follows: a. Remove powerpack (para 4-1). b. Mark any accessible blade (1). c. While holding opposite fan impeller, rotate marked blade as far left as possible. Mark fan housing directly above blade mark (2). d. While holding opposite fan impeller, rotate marked blade as far right as possible. Mark fan housing directly above blade mark (3). e. Measure distance between marks (2) and (3). If distance (4) is over 1 inch (2.5 cm), backlash is excessive. Notify support maintenance if this condition exists. f. By hand attempt to rotate nut (5). Ensure key washer locking tabs are fully bent into the slots of the lock nut (6). If any looseness is found, notify Support Maintenance.	Excessive backlash is measured. If locking hardware is missing or not secure.

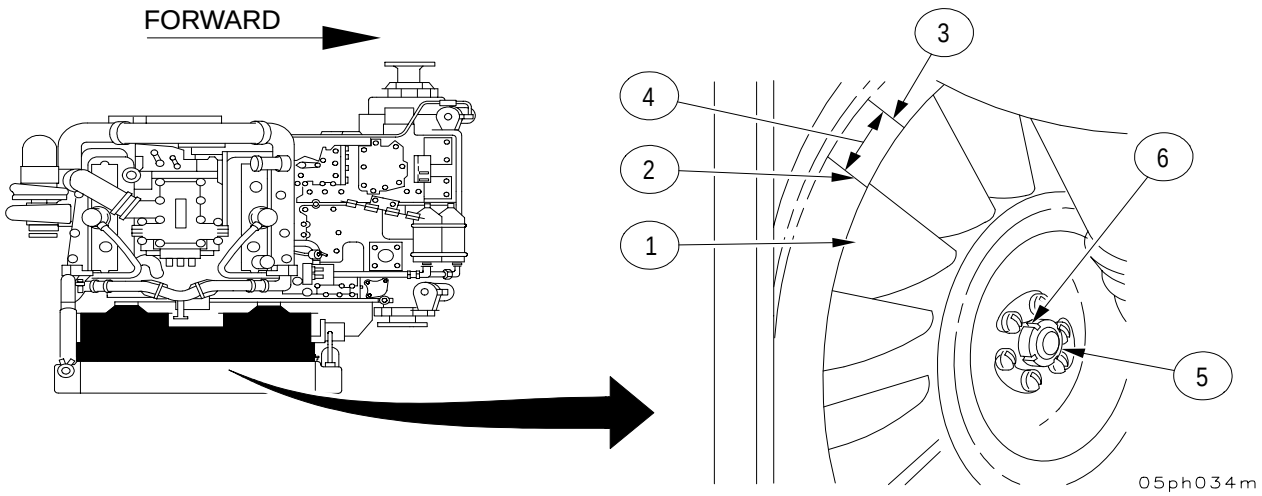


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	BATTERY AND ENGINE COMPARTMENT		
7		Engine fan drive system - Continued	g. Remove eight screws (5) and radiator shroud cover (6). Inspect two fan drive shafts (7) for cracked rubber boots (8) or loose retaining rings (9). If rubber boots (8) are cracked or retaining rings (9) are loose, replace fan drive shafts (para 7-11). h. Install radiator shroud cover (6) with eight screws (5).	

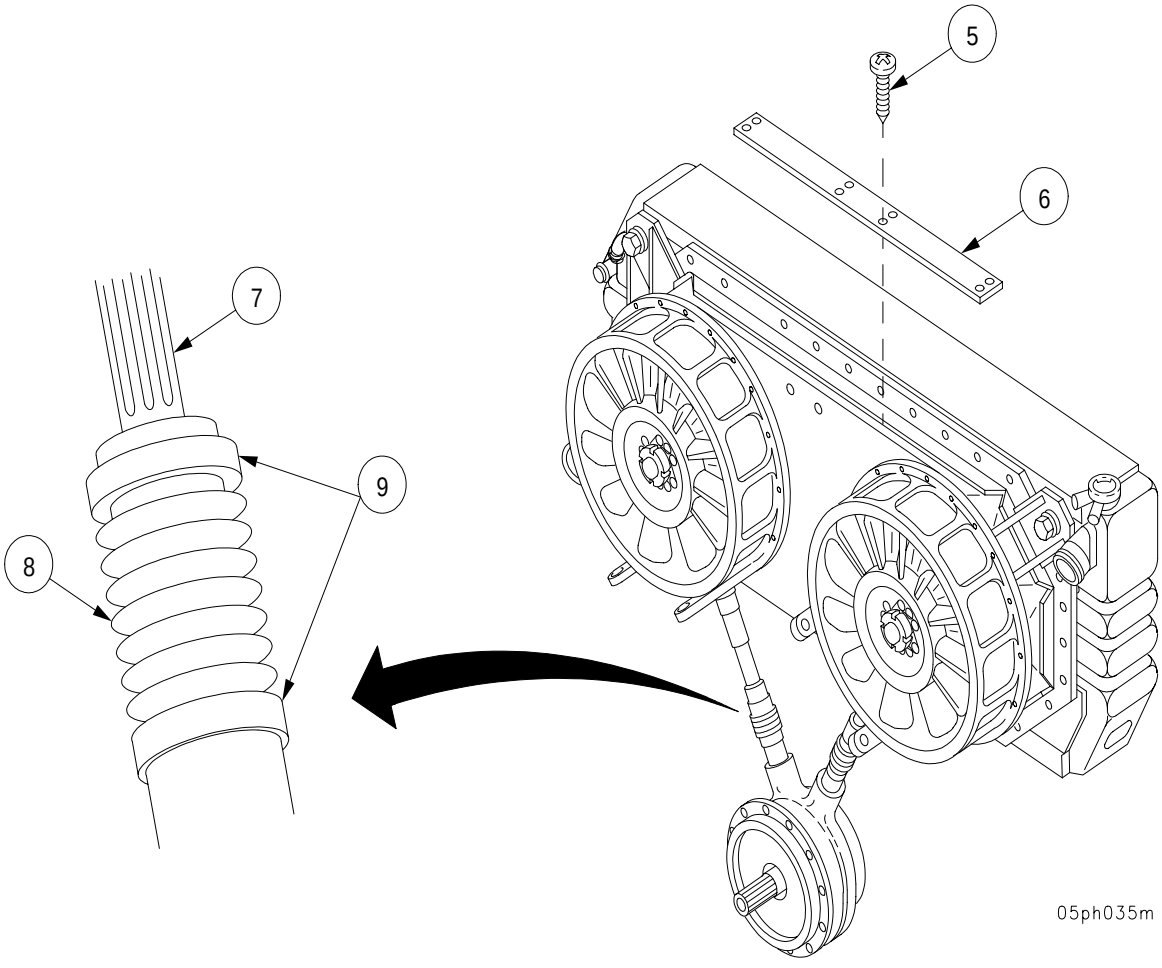


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	BATTERY AND ENGINE COMPARTMENT	**WARNING** Dry-cleaning solvent (P-D-680) is toxic and flamable. To avoid injury, wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause SERIOUS INJURY. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (FM 21-11).	
8		Fan gear case	Remove radiator from shroud (para 7-1). Clean area around plug (1) on fan gear box housing (2) with P-D-680 (item 59, Appx C). Remove plug (1). Check that oil level is up to bottom of hole. If not, add 0-156 (item 35, Appx C) until oil level reaches bottom of hole. Clean plug (1) with P-D-680 before installing.	

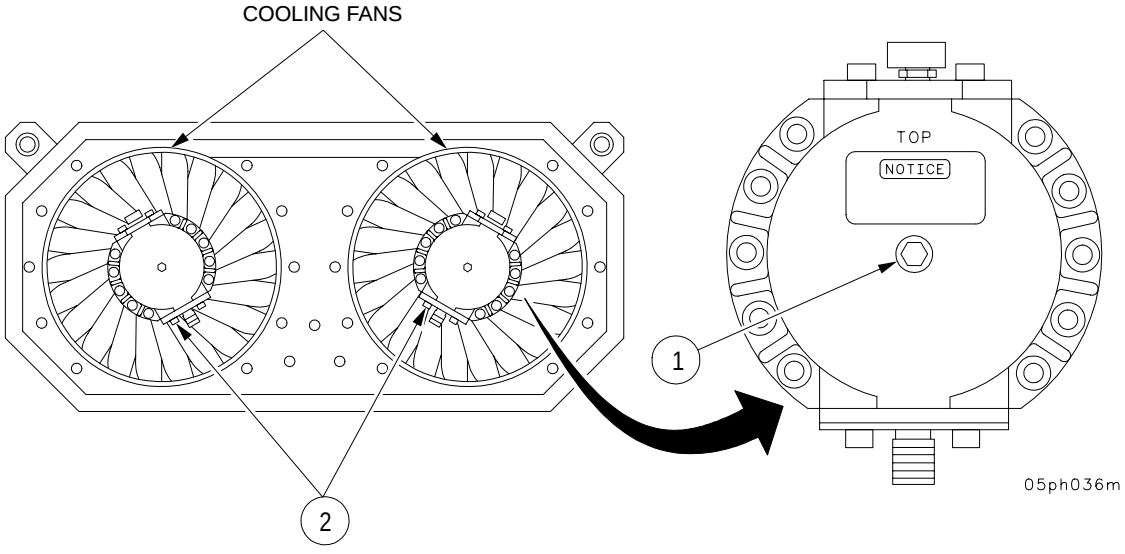
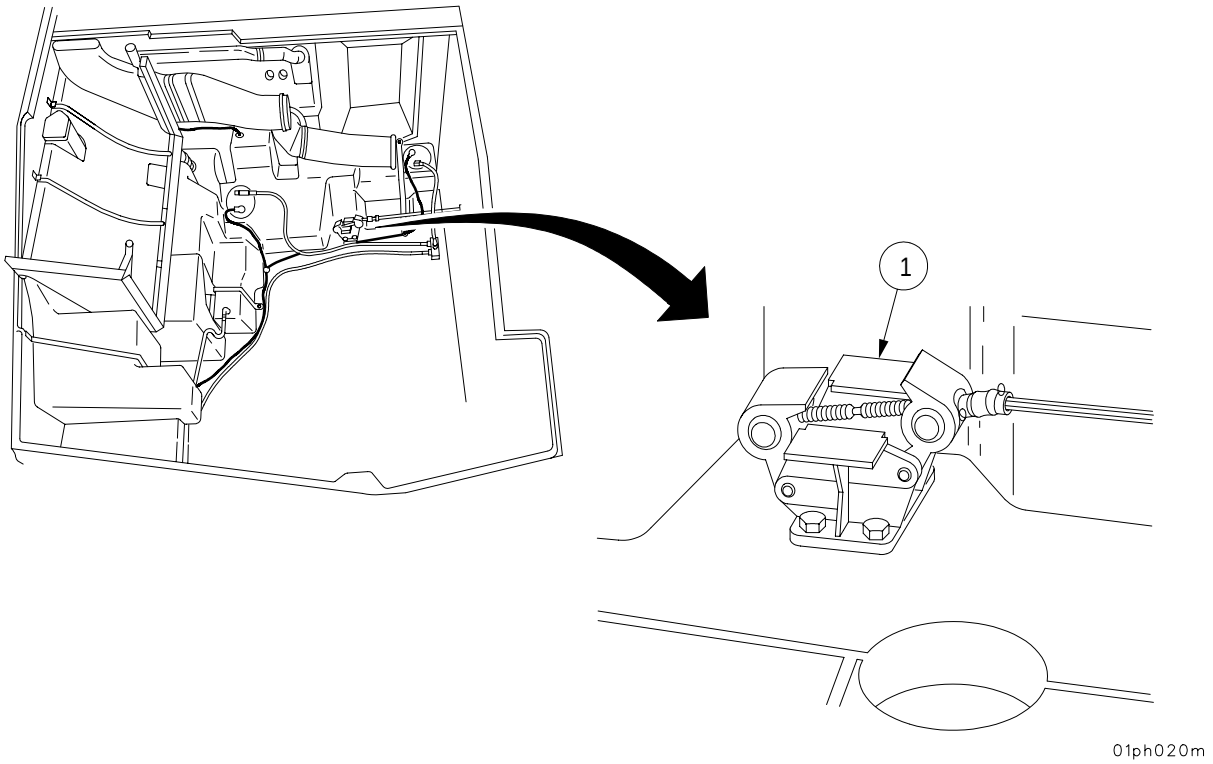


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	BATTERY AND ENGINE COMPARTMENT		
9		Engine mounting base	**NOTE** Powerpack must be removed to perform item number 9. Perform item number 9 at a time on or near the semi-annual service when the powerpack has been removed for maintenance or when evidence that a maintenance problem exists. Do not remove the powerpack just to perform this inspection. If powerpack is removed, lube screw (1) with GMD or LOMD.	



			Install powerpack (para 4-1).	

TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	BATTERY AND ENGINE COMPARTMENT		
10		Fuel tank and exhaust heat shield	Inspect upper fuel tank (1) and exhaust heat shield (2) for damage. Check condition and tightness of all seals and fasteners (paras 5-11, 5-12, and 6-3). Close transmission access doors (3), air intake grille (4), and battery compartment access doors (5) (TM 9-2350-314-10). Install hull exhaust grille (6) (para 16-25) and fan access door (7) (para 16-26).	

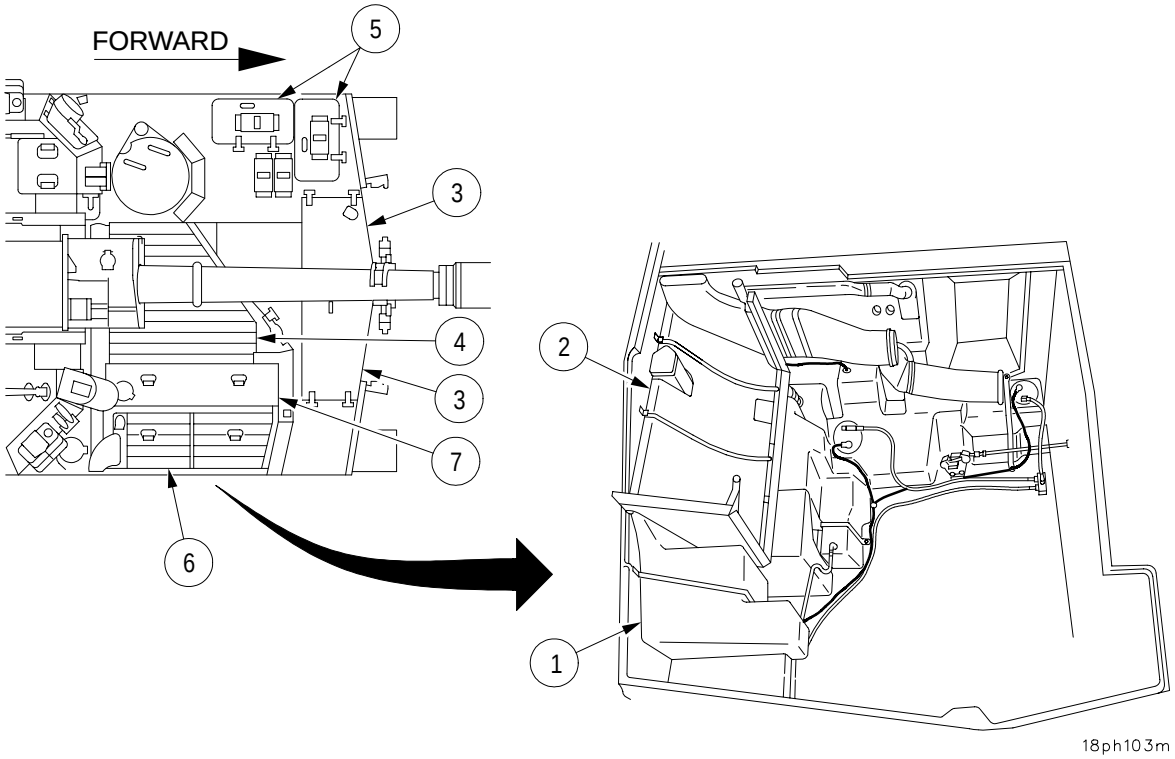


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	INTERIOR		
11		Lead particulate filter and ventilation system	a. Ensure ventilation intake/exhaust duct grille is clear of debris. b. Turn vehicle MASTER switch ON. c. Move ventilation fan selection switch (1) to LEAD FILTER (INTAKE). d. Check for air flow at filter cover (2). e. Cover the grille surface cover (2) with a 12”x12” piece of cardboard or wood. f. Press lamp test cover (3) and observe if LEAD FILTER CHANGE lamp illuminates. If LEAD FILTER CHANGE lamp illuminates with grille covered, this will indicate LEAD FILTER is clogged and CHANGE lamp is operating properly. g. Remove cardboard or wood from grille surface.	

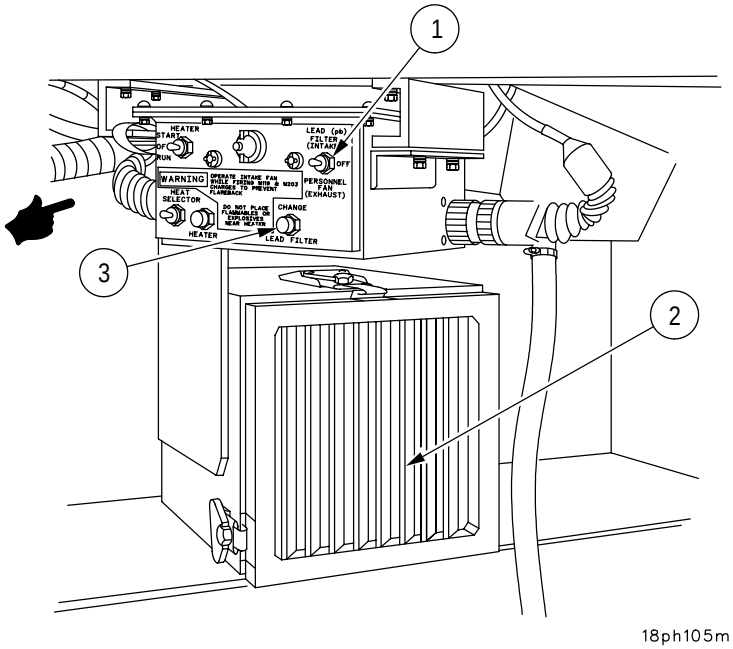


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	INTERIOR		
12		Fire extinguisher system	**WARNING** Cylinders must not be dropped, struck, or subject to any temperature above +140° F (60° C). An explosion may result causing severe injury or DEATH. Ensure fire extinguisher cylinders are disconnected (para 21-1). Operate driver's discharge handle (1) to ensure cable does not bind. Install new seal and wire (2) on control valve (3) and driver's discharge handle (1). Remove fixed fire extinguisher cylinders (4) (para 21-1). Take cylinders to appropriate maintenance activity IAW local SOP for serviceability determination. Install fixed fire extinguishers (4) (para 21-1). Make sure bottle hold down brackets (5) are properly latched. Check distribution lines (6) for loose fittings, tight mountings, and cracks.	Cables bind. Wire and seal (2) broken, missing, or extinguisher handle (1) is pulled. Distribution lines (6) loose, cracked, or not mounted tightly.

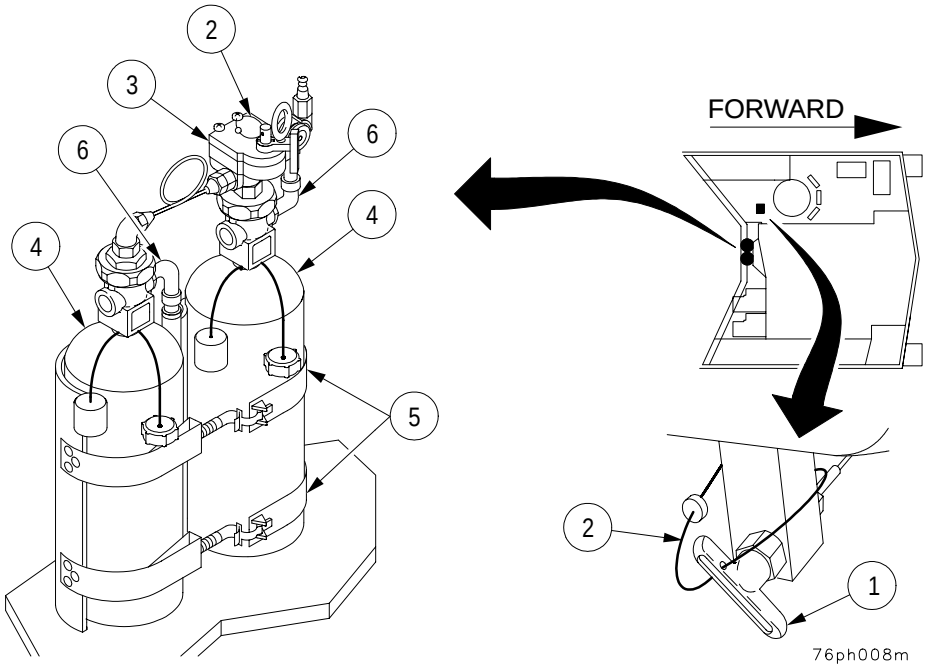


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
13	SEMIANNUALLY	INTERIOR Air cleaner filter	**WARNING** If NBC exposure is suspected, all air filter media will be handled by personnel wearing full NBC protective equipment and proper handling and disposal procedures followed. Check for worn or missing seals (1) and hoses (2). Check blower motors for operation. Troubleshoot if necessary (Chapter 3). Clean, repair, or replace motors, seals, and filter packs as required (para 5-5 and 5-8). Clean filter as follows: **WARNING** Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.). a. Shake out dust. Using compressed air, clean filter by applying compressed air to inside of filter and blowing dust outward away from filter. b. Replace filter elements which have holes or ruptures.	Any seals or hoses cracked, worn, or missing. Blower motors inoperative. Air cleaner filters clogged or wet. Air cleaner doors, filter elements, or hoses are missing. Air cleaner doors won't open or close properly.

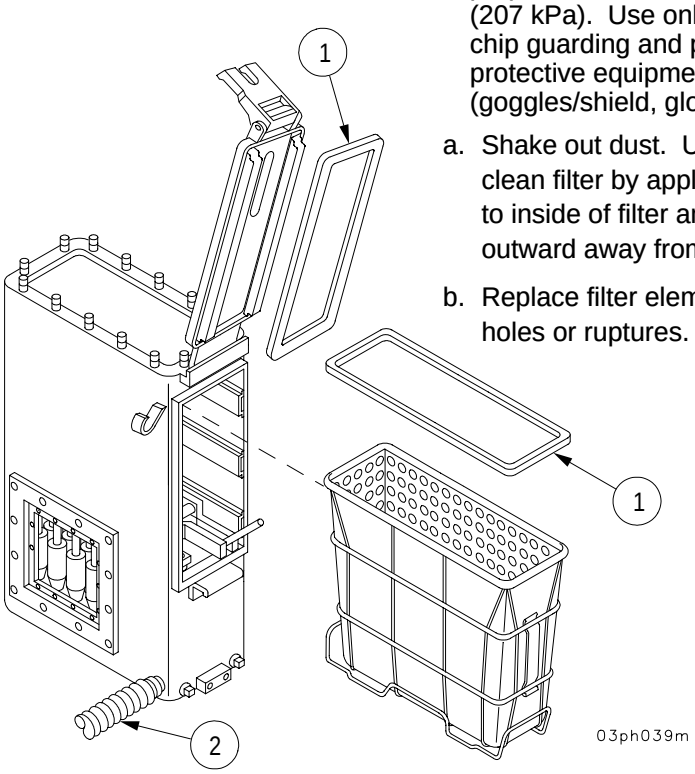
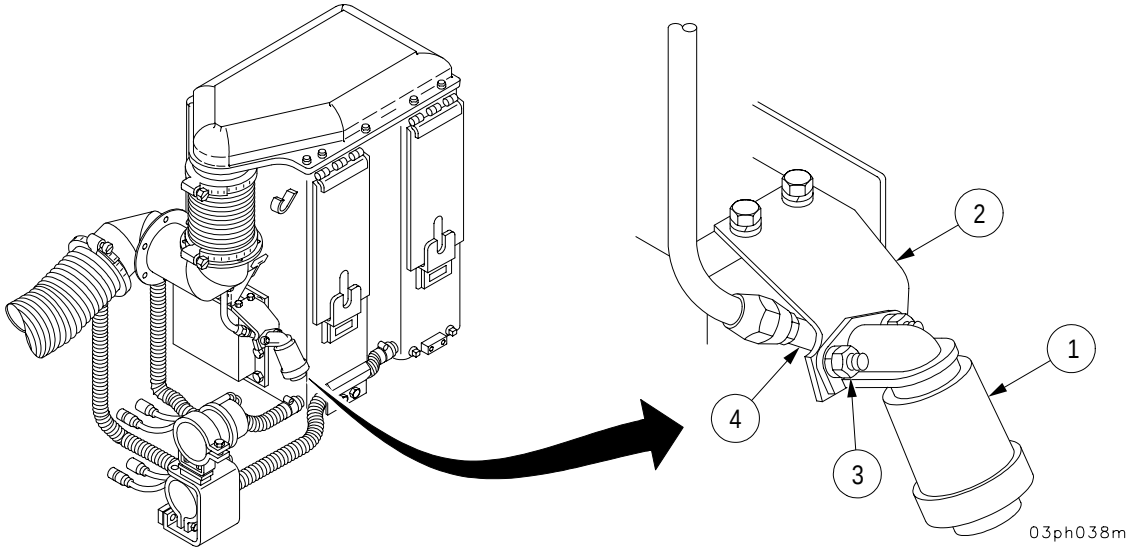


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	INTERIOR		
14		Air cleaner indicator	Check indicator (1) for damage and corrosion. Check to see that bracket (2) is secure. Check two nuts (3) for tightness. Check hose fitting (4) for leaks. Tighten as required.	



15		Generator belt, pulleys and belt tensioner	Remove engine compartment access cover (para 16-7). Inspect generator belt (1) for frays or cracks. Replace as required (para 8-1). Check belt tensioner (2) and pulley (3) for looseness or cracks. Replace as required (para 8-2). Tighten tensioner bolt (4) in accordance with para 8-2. Tighten pulley bolt (5) as required. Check generator pulley (6) and bracket (7) for looseness or cracks. Replace pulley (6) and bracket (7) as required. Tighten bracket bolts (8) in accordance with para 8-3.	Belt is frayed or cracked. Belt tensioner, pulleys or bracket is loose or cracked.

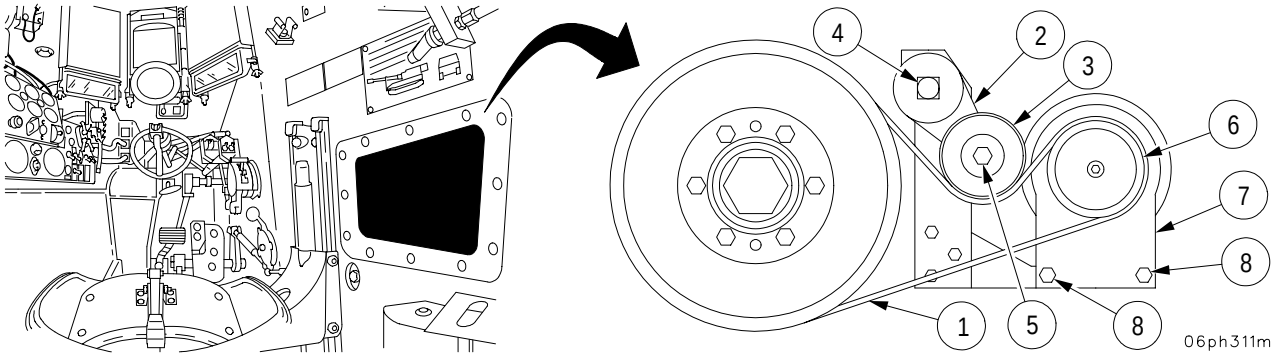


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	INTERIOR		
16		MCS equipment	**WARNING** If NBC exposure is suspected, all air filter media will be handled by personnel wearing full NBC protective equipment and proper handling and disposal procedures followed. a. Inspect condition of hose assemblies (1). Check for deterioration, loose connections, holes, and other damage (para 22-1 and 22-3). b. Inspect electrical cable assemblies (2) for damaged insulation and broken or damaged terminals. c. Operate ventilated face piece system (TM 9-2350-314-10). Check that air moves through each air hose outlet orifice connector (3). **NOTE** Allow M3 heater to operate for approximately 15 minutes before checking for warm air circulation. d. Check operation of M3 heater (4) by turning control knob (5) ON. Indicator light should be lit and air should get warmer as knob is turned clockwise. e. Troubleshoot MCS system if defective (Chapter 3).	

TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	INTERIOR		
16		MCS equipment–Continued		

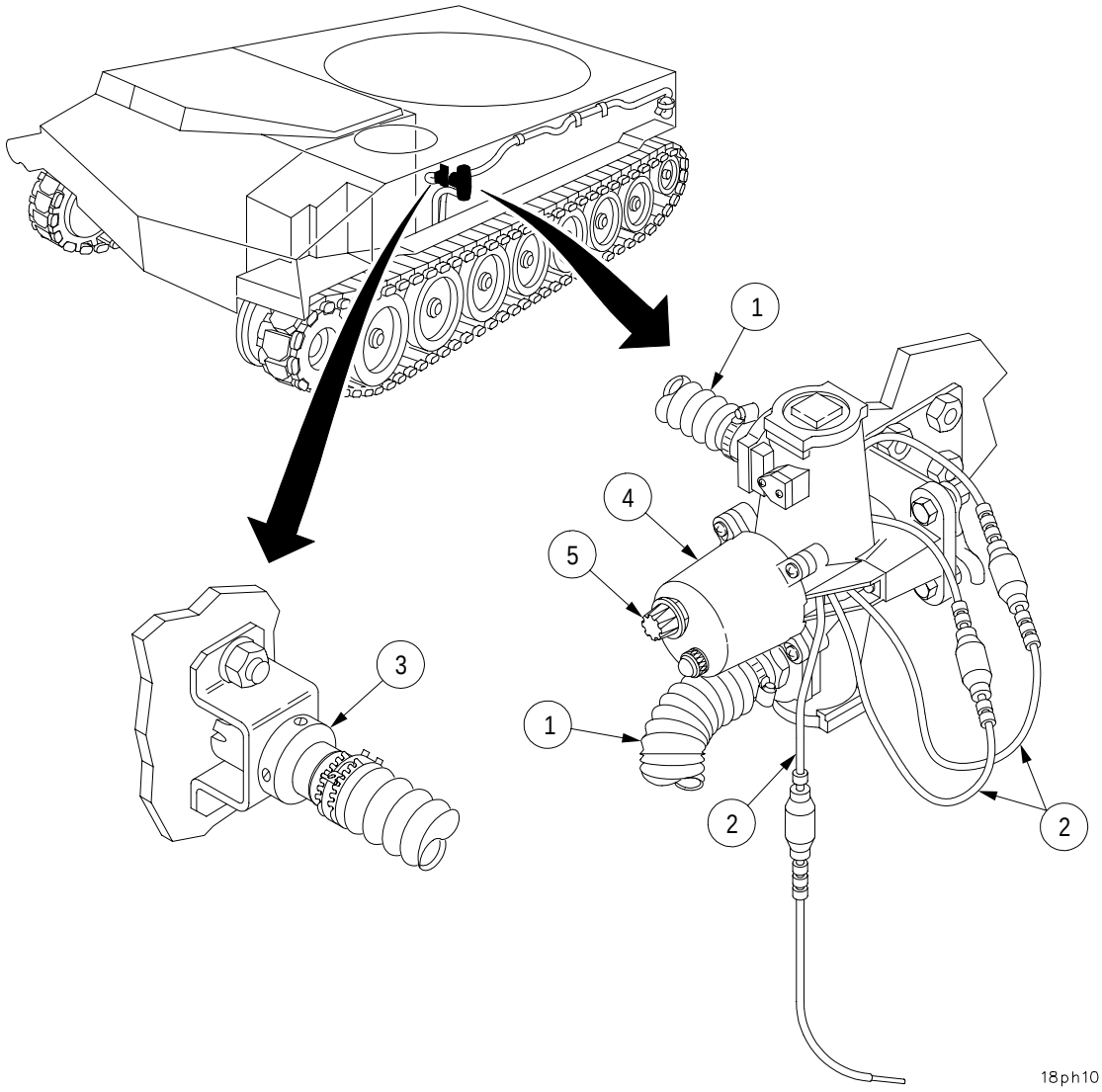


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

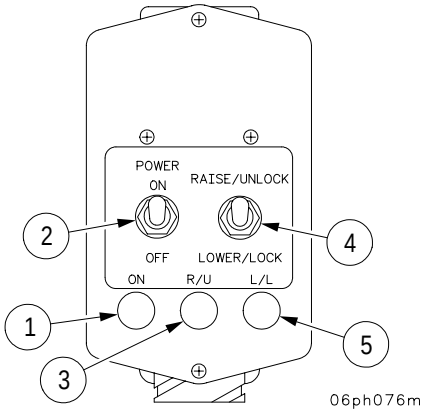
ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	INTERIOR		
17		Leakage from hydraulic systems or personnel heater	Check all areas inside of vehicle for fuel or hydraulic oil leaks.	Any Class III leak is present.
18		Decals, instruction plates, and stencil markings	Replace decals and instruction plates or stencils that are not legible (para 18-13 or 18-14).	
19		Travel lock control box	**WARNING** Clear all personnel and equipment from hull while travel lock controls are inspected. Check control box lights for proper operation. Follow troubleshooting procedures in Chapter 3 if malfunction occurs. a. Turn vehicle MASTER switch ON (TM 9-2350-314-10). b. POWER light (1) should light when ON/OFF switch (2) is ON. c. R/U light (3) should light when switch (4) is at RAISE/UNLOCK position. L/L light (5) should light when switch (4) is at LOWER/LOCK position. d. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).  	

TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	SEMIANNUALLY	INTERIOR		
20		Driver's seat	Inspect seat belt (1), seat, and backrest cushions (2 and 3) for deterioration. Make sure seat belt (1) buckle and end plate engage securely. Ensure seat adjustment levers (4 and 5) securely lock seat in all positions. Fold and unfold backrest (6) and check for binding. Check for loose or missing mounting hardware.	Seat belts (1) or buckles are worn or damaged.

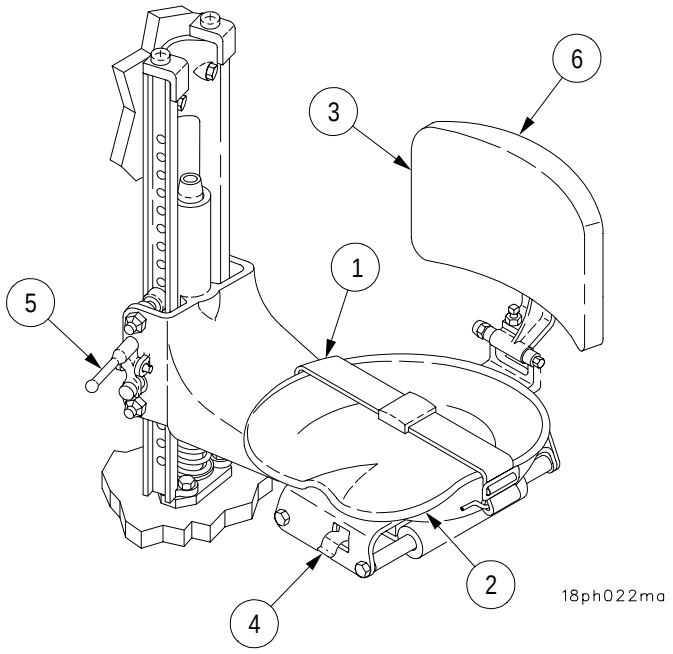


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	EXTERIOR		
21		Roadwheels and idler wheels	Inspect roadwheels for rubber separation (1) and missing rubber chunks that may cause thumping. Check for cracks in wheel (2). Tighten nuts (3) to 162-198 lb-ft (219-268 N·m) with torque wrench (item 87, Appx F). Measure roadwheel wear as follows: a. Pull out threaded rod (4) and place gage (5) (item 23, Appx F) over roadwheel as shown, backing off knurled knob (6) as required. b. When gaging balls (7) are in contact with wear ring (8) and inside of wheel disk (9), slowly turn knurled knob (6) clockwise until it just contacts rod housing. Do not tighten knob (6), since this will pull inner gage ball (7) away from wheel disk (9). c. Pull rod (4) back, without disturbing knob (6) until gage (5) can be removed from the wheel. d. Push rod (4) in until knob (6) contacts housing. Measure dimension between gaging balls (7). e. If the dimension between the balls (7) is 7/16 inch (11 mm) or less, roadwheel should be replaced (para 12-5).	Missing, bent or cracked roadwheel or idler wheel; elongated roadwheel or idler wheel mounting holes; separation of 1/2 of rubber contact from steel hub; chunking across 1/2 width of outer rubber surface on any pair of roadwheels (inner and outer); torsion bars missing or broken. Roadwheel (2) and idler wheel arms damaged, bent, broken, or missing. Dimension between gaging balls (7) is less than 7/16 inch (11 mm) (TM 9-2350-200-24).

TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	EXTERIOR		
21		Roadwheels and idler wheels - Continued		

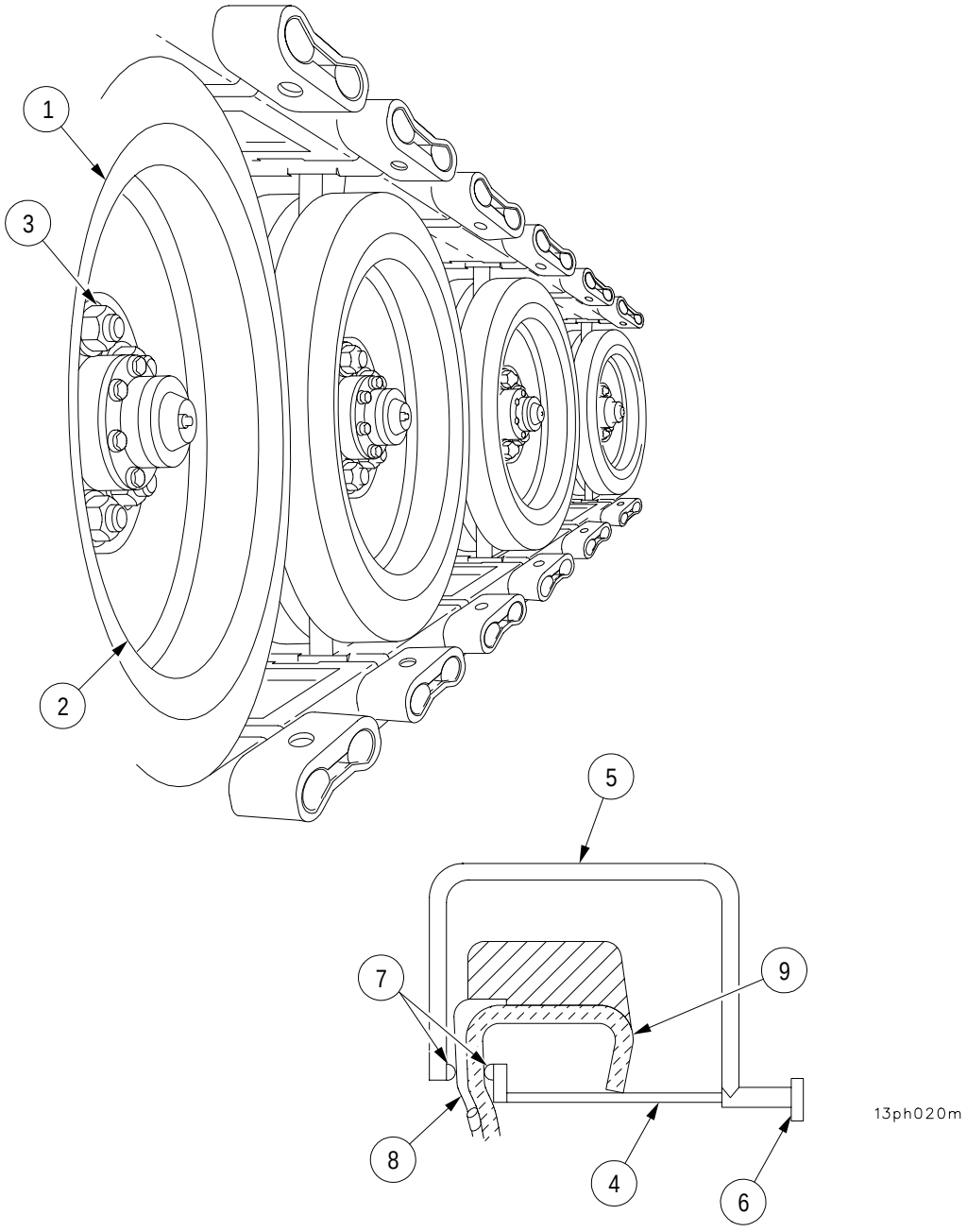


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	EXTERIOR		
22		Bumper stop mounting brackets	a. Tighten upper and lower bumper stop mounting bracket bolts (1) (para 15-2). b. Tighten hydraulic bumper stop mounting retaining nuts (2) (para15-3).	

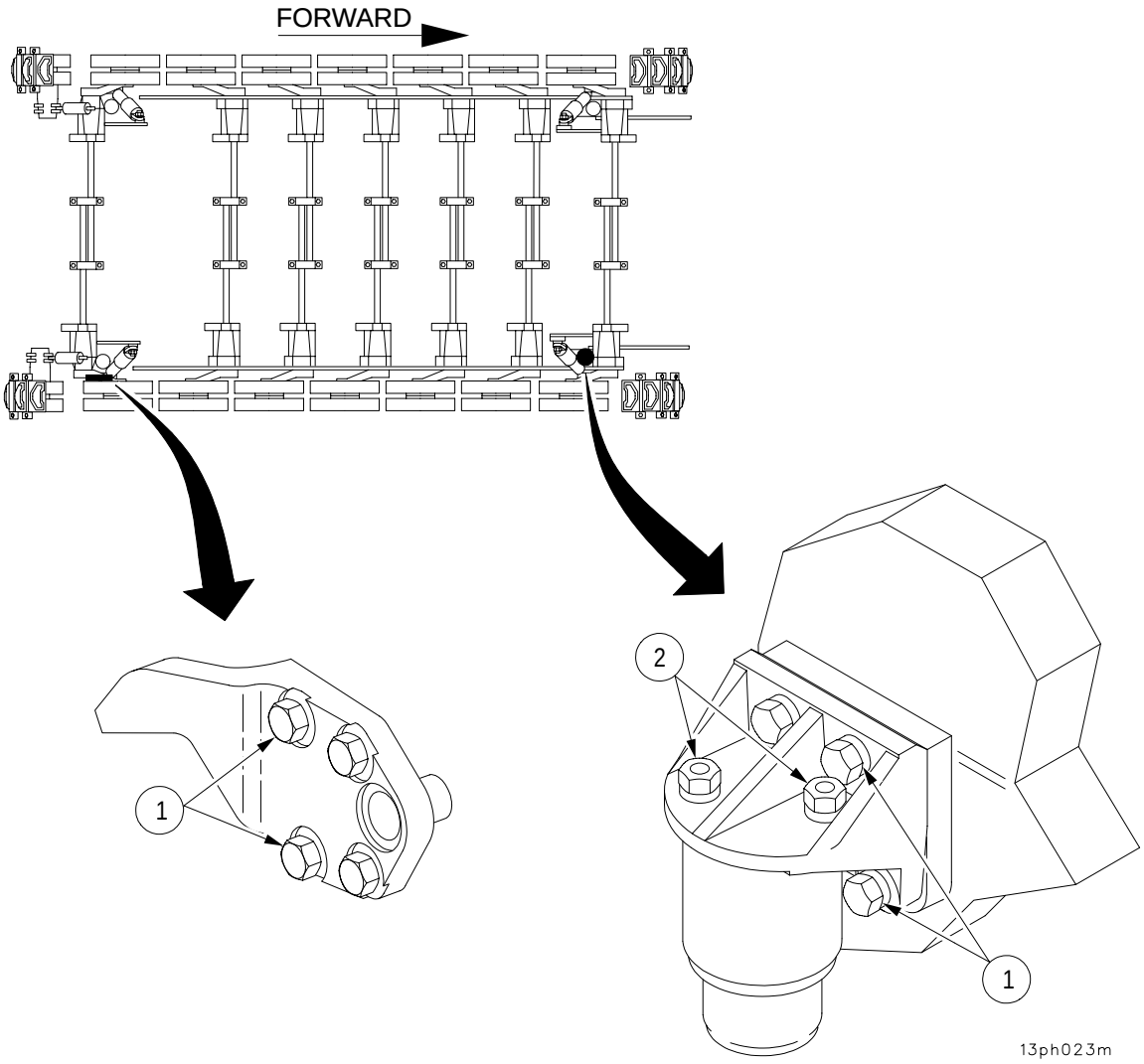
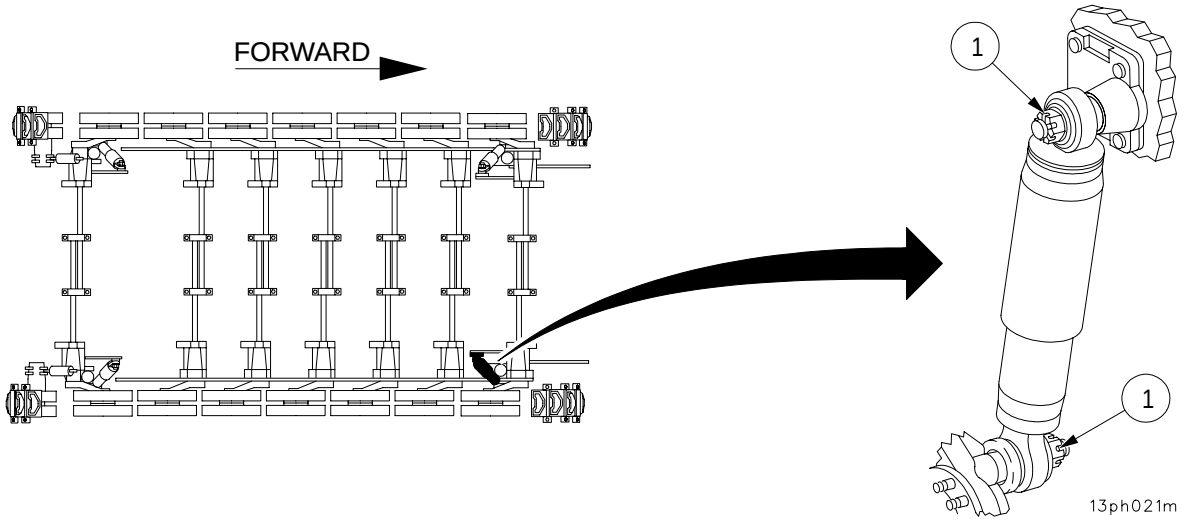


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	EXTERIOR		
23		Shock absorbers	Check for missing shock absorber cotter pins (1). If missing, check torque, and replace cotter pin in accordance with para 15-1.	



24		Torsion bars	Pry up each roadwheel (1) with crowbar (item 12, Appx F) to see if there are broken torsion bars. Check that torsion bar plugs (2) are fully seated and retaining screws (3) are in place.	Any torsion bar is broken.

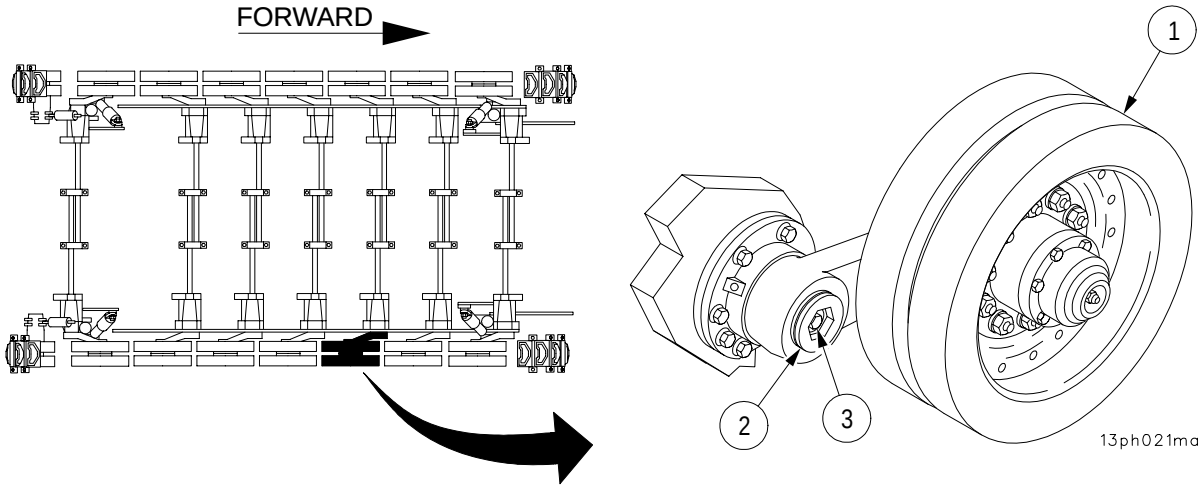


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

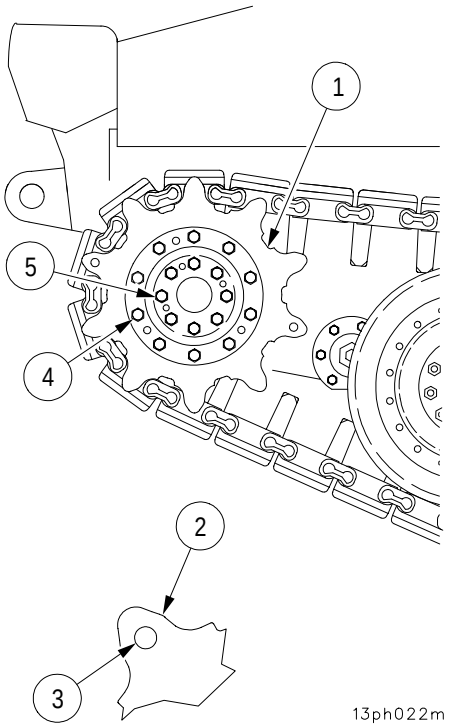
ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
25	ANNUALLY	EXTERIOR Drive sprocket and hubs	Each series drive sprocket (1) has two teeth (2) with wear marks. If either tooth is worn to edge of wear mark (3), replace drive sprocket (para 12-12). Tighten mounting bolts (4) to 90 lb-ft (122 N·m) with torque wrench (item 86, Appx F) and tighten hub bolts (5) to 450-475 lb-ft (610-644 N·m) with torque wrench (item 87, Appx F).  	Sprocket tooth is worn to edge of wear mark; mounting bolts are loose or missing.

TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

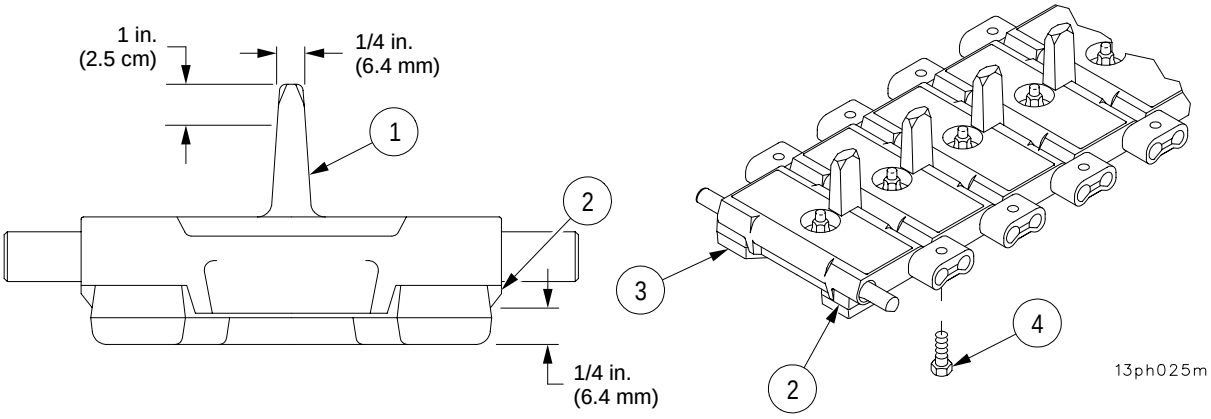
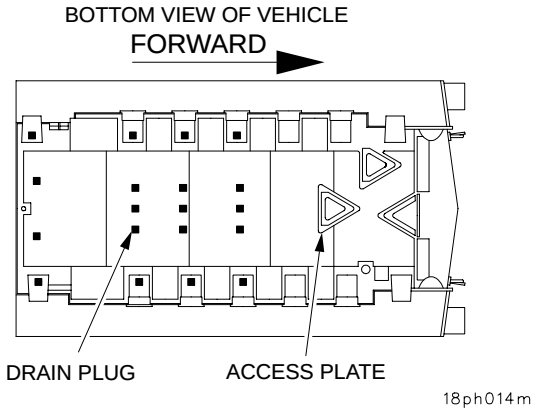
ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	EXTERIOR		
26		Tracks	Measure thickness of center guide (1) at a point 1 inch (2.5 cm) from end. Replace track block if center guide measures less than 1/4 inch (6.4 mm) or grouser (2) measures less than 1/4 inch (6.4 mm). Replace pads (3) when worn even with metal grouser (2) (para 12-13). Tighten connector screws (4) to 380-420 lb-ft (515-570 N·m) with torque wrench (item 87, Appx F).	Three or more distorted (dead) shoes indicating excessive rubber bushing wear, missing or cracked end connectors, two consecutive missing center guides, or any end connector bolts missing (TM 9-2350-200-24).
				
27		Drain covers and plugs	Check that 19 drain plugs and four access covers are present. Replace or secure access covers and plugs on underside of hull (para 16-39 and 16-41).	Any drain plugs or access covers are not present for fording operation.
				

TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	EXTERIOR		
28		Fuel filler neck seal	Check for cracks in rubber (1) and for missing screws (2).	

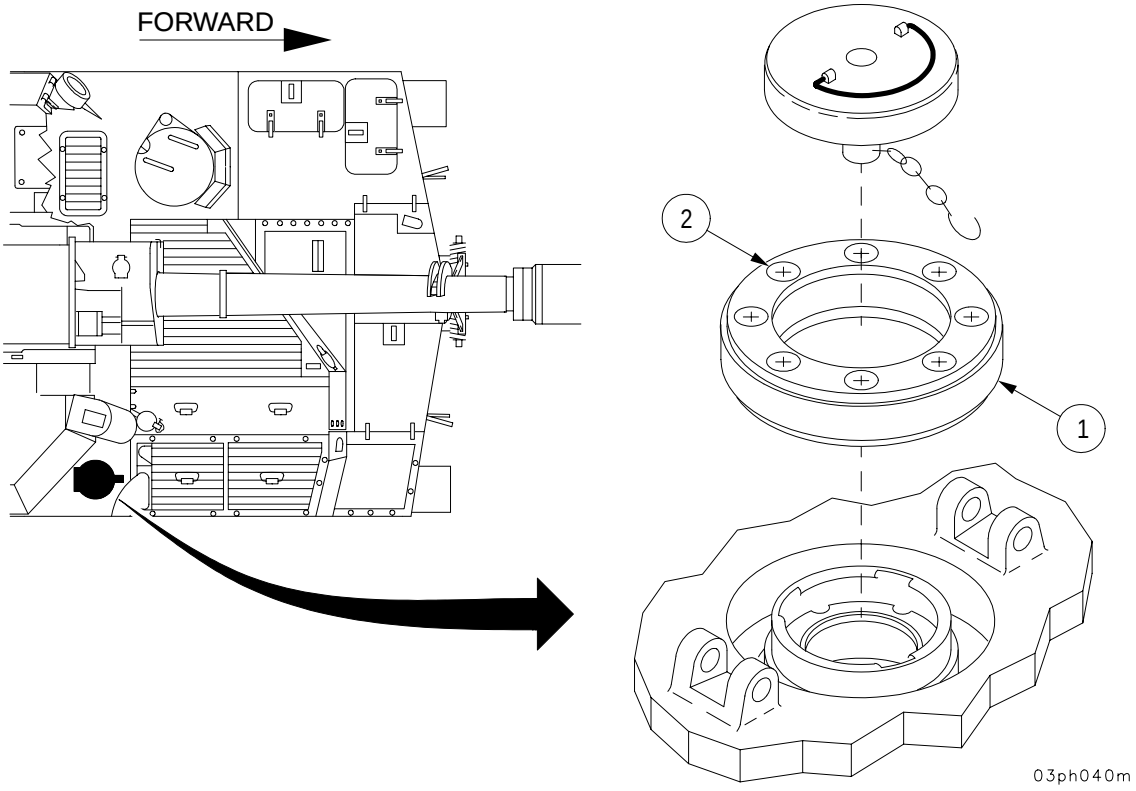


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	BATTERY AND ENGINE COMPARTMENT		
29		Cooling system, radiator hoses, and pumps	**WARNING** Do not remove a radiator cap from a warm engine. Coolant can burn severely. Check for cracked, weak, or broken hoses. Check coolant system for leakage. Check coolant level. Remove eight screws (1) and shroud cover (2). Clean radiator with oil cleaning tool (item 10, Appx F) and a cleaning agent which removes deposits of sand, oil, clay, and other debris from radiator cooling fins while installed in vehicle.	Coolant is not visible in filler neck; Class III leak is present or hoses are unserviceable.

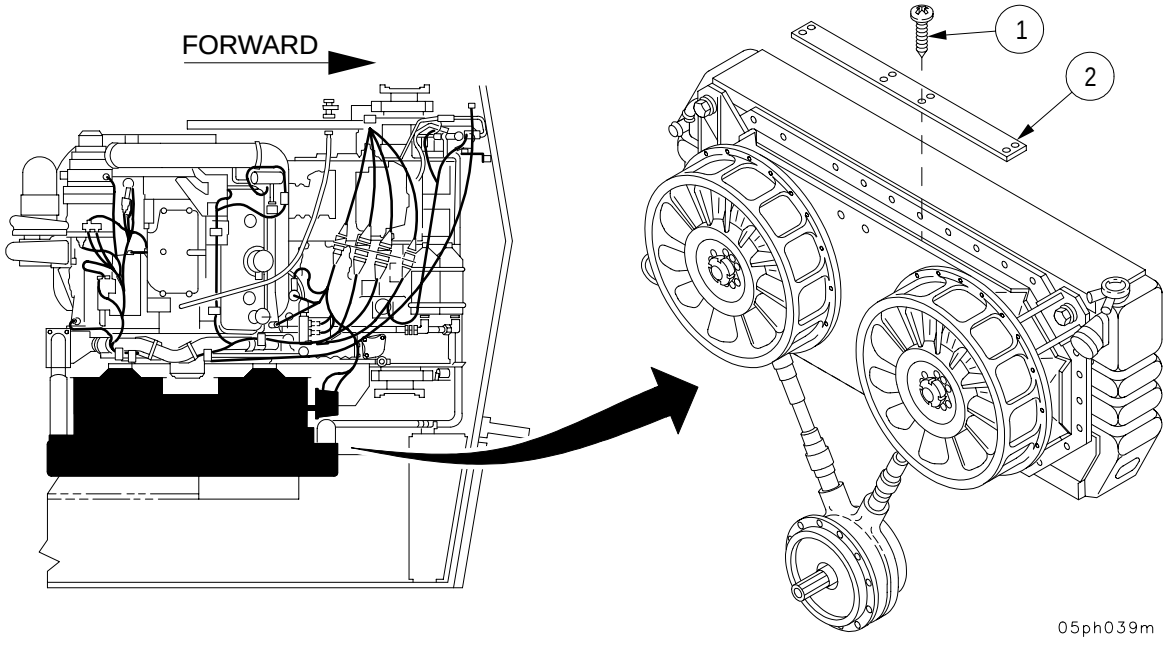


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	BATTERY AND ENGINE COMPARTMENT		
29		Cooling system, radiator hoses, and pumps - Continued	Clean radiator as follows: a. Open hull drains. b. Cover all exposed openings of engine. **NOTE** Cleaning agent can be a solution of detergent and water or of nontoxic, nonflammable solvent and water. The cleaning agent may be mixed one part detergent to five parts water. c. Connect tool (item 10, Appx F) to air supply. Insert liquid supply hose into container of cleaning solution. d. Insert tool through shroud cover opening and wet front and back of radiator with cleaning solution. Soak for approximately 10 minutes. e. Remove heavy deposits from face of radiator by brushing with medium stiff brush that will not damage fins. f. Blast radiator with air/solution mixture, holding head of tool approximately 1/2 inch (12.7 mm) from face of radiator. Alternate from back to front until cleaning solution flows smoothly through radiator. g. Drain the container and fill with clean water. Flush engine parts and radiator completely. Remove liquid supply hose from container and use air to complete operation. h. Uncover engine openings and install radiator shroud cover (2) with eight screws (1). Close hull drains.	Radiator is unserviceable.

TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	BATTERY AND ENGINE COMPARTMENT		
30		Cooling system pressure relief valve	Remove and clean pressure relief valve (para 7-3) as follows: a. Unscrew nut (1) and remove hose (2) from lower end of pressure relief valve block (3). b. Remove four screws (4). Lift off relief valve (5). Discard gasket (6). c. Wipe off accumulation of rust. Depress spring to ensure it is not broken. d. Install pressure relief valve (para 7-3).	Pressure relief valve (5) is unserviceable.

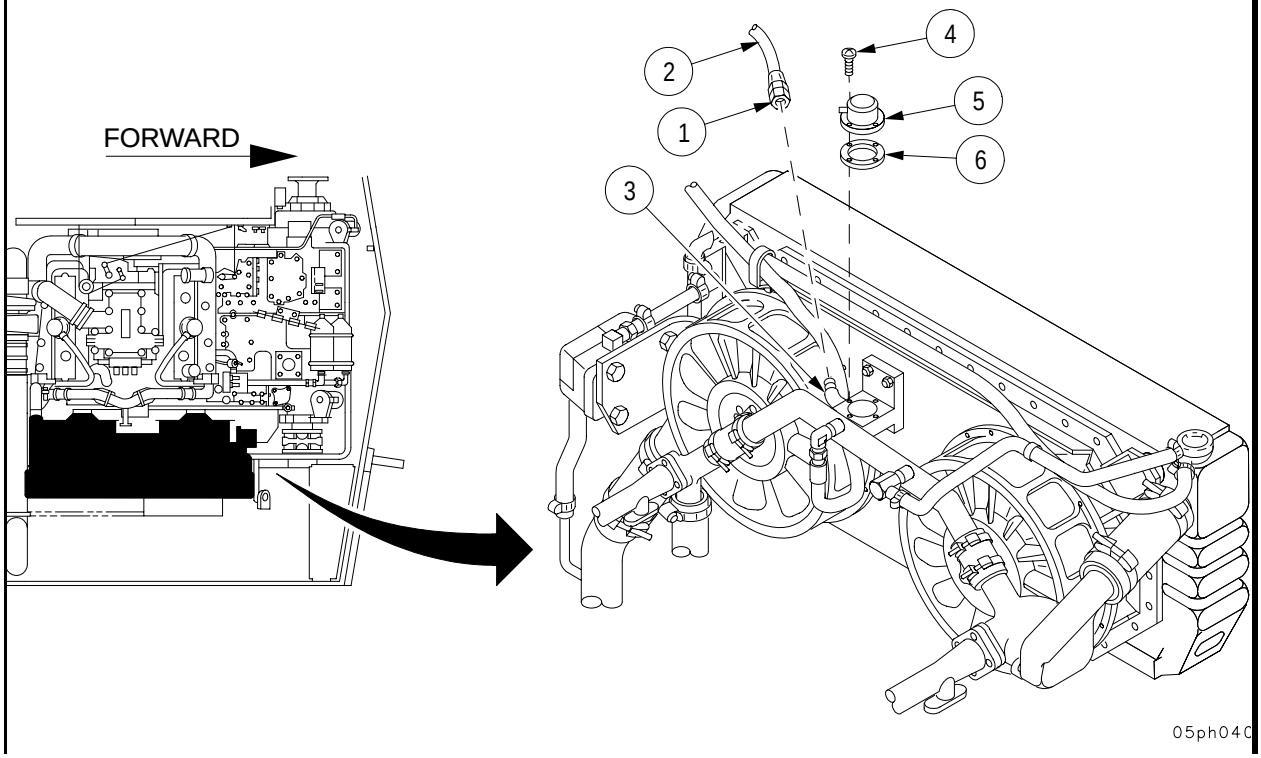


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	BATTERY AND ENGINE COMPARTMENT		
31		Coolant	**WARNING** Do not remove a radiator cap from a warm engine. Hot coolant can burn severely. Remove quick-release pin (1), open radiator access cover (2) and slowly remove radiator cap (3). Coolant should be visible. If not, start engine and slowly add coolant until it reaches the top of filler neck. Run engine until new coolant is mixed with old coolant. Use optical battery/antifreeze tester (item 39, Appx F) to test coolant protection. Test radiator coolant for proper protection (TB 750-651).	Does not pass alkalinity test in TB 750-651. Not protected to -20° F (-30° C).

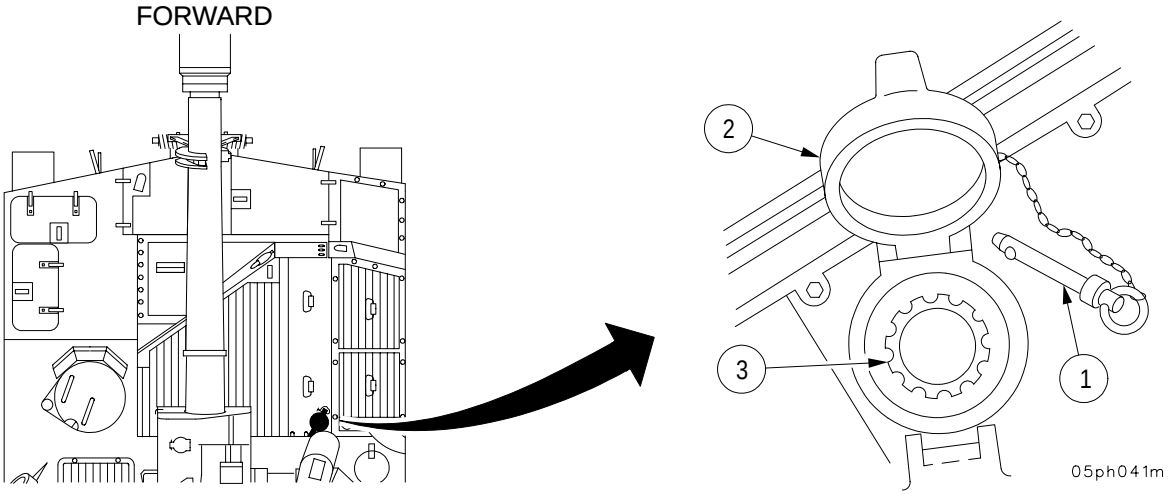


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	BATTERY AND ENGINE COMPARTMENT		
32		Engine	Perform STE PMCS testing (Chapter 3).	
33		Bilge pump	**CAUTION** Do not dry test bilge pump longer than 1 minute. Check bilge pump for proper operation. Turn vehicle MASTER switch (1) ON and turn bilge pump switch (2) ON. If engine compartment is dry, feel for air at bilge pump outlet (3).	

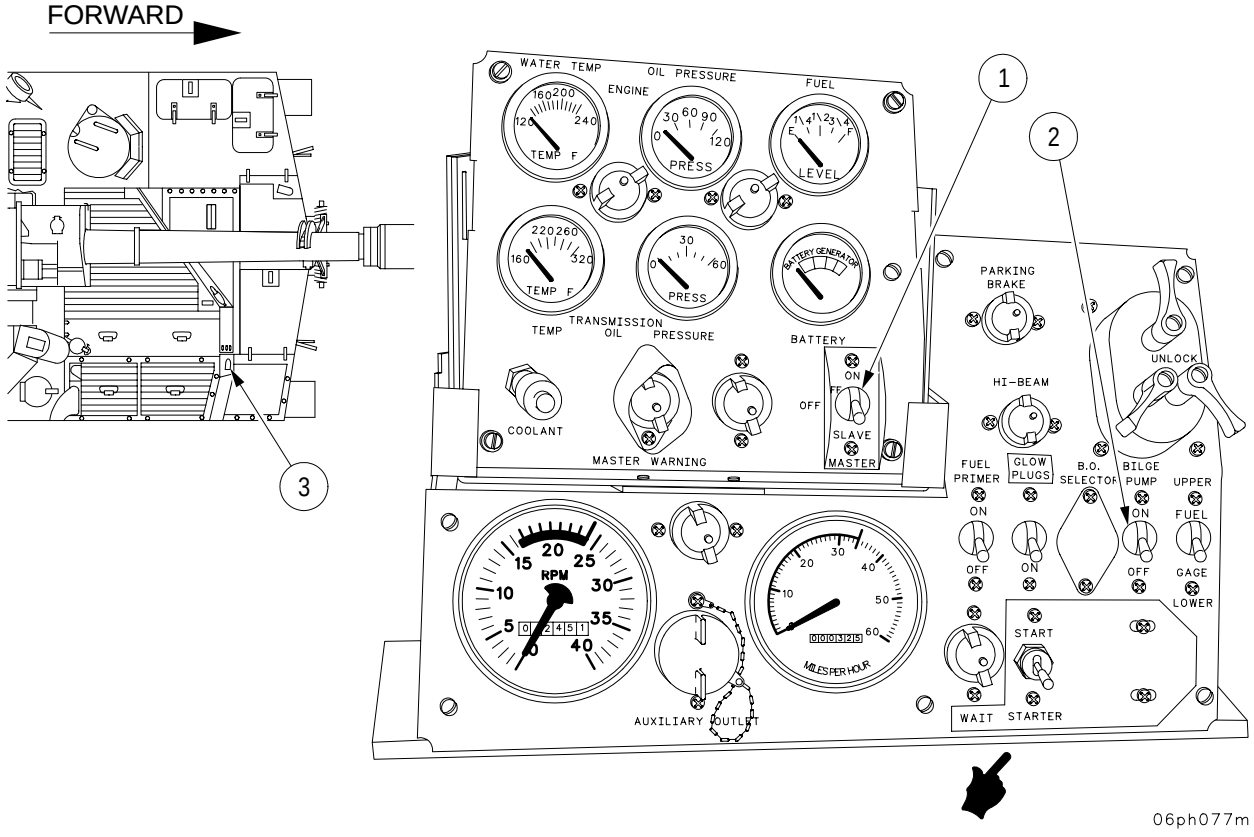


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	BATTERY AND ENGINE COMPARTMENT		
34		Exhaust outlet duct	Replace damaged components (Chapter 6). Check all clamps (1), mounting bolts (2), springs (3), and brackets (4).	Exhaust leak is present.

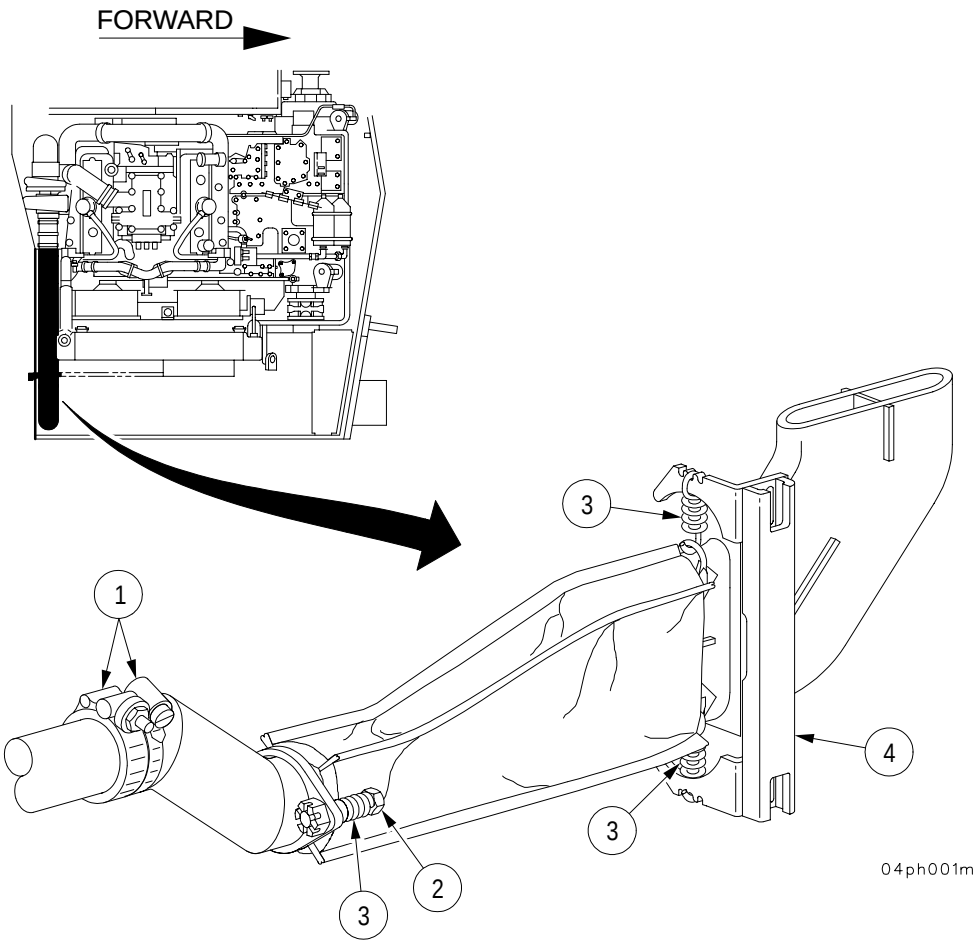
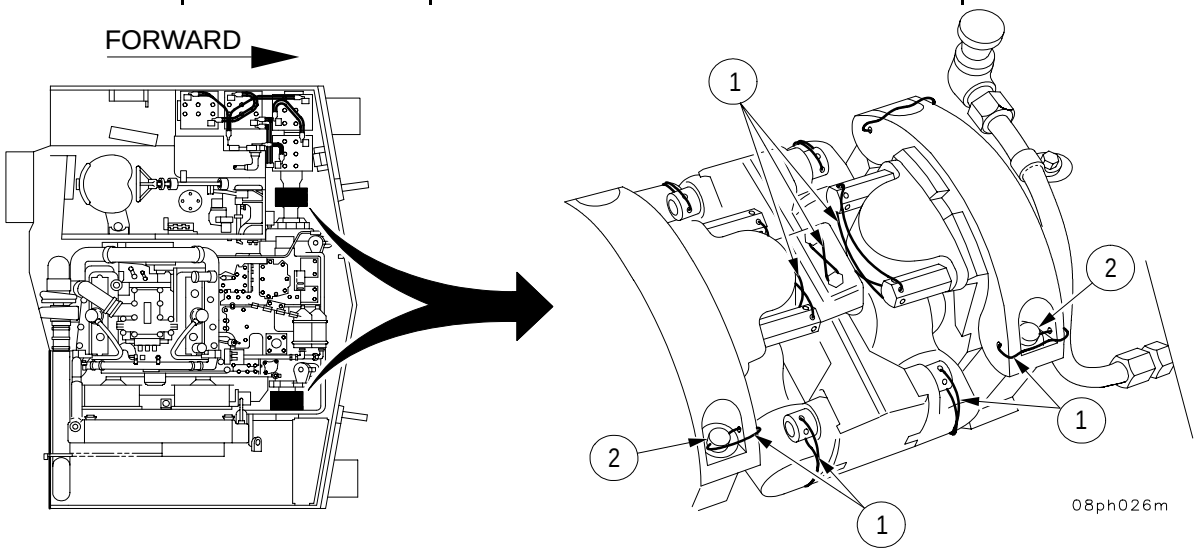


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	BATTERY AND ENGINE COMPARTMENT		
35		Final drive quick-disconnect and universal joint safety wiring (both sides)	Check for missing or broken wires (1). Tighten mounting bolts (2) to 37-42 lb-ft (50-57 N·m) with torque wrench (item 86, Appx F). Replace wires (1) if wires are missing, loose, or broken.	Any loose, broken, or missing bolts or wires.



Close transmission access doors (3), air intake grille (4), and battery compartment access doors (5) (TM 9-2350-314-10). Install exhaust grille (6) (para 16-25) and fan access cover (7) (para 16-26).

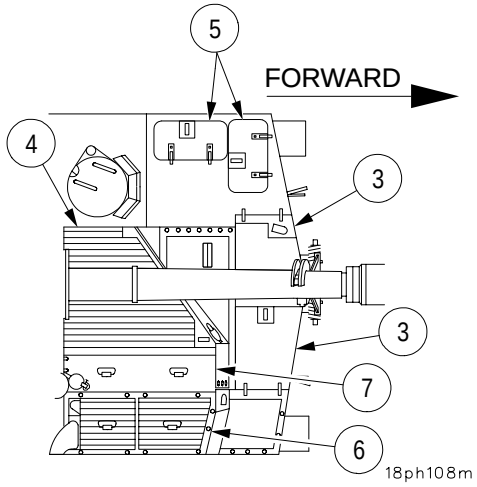
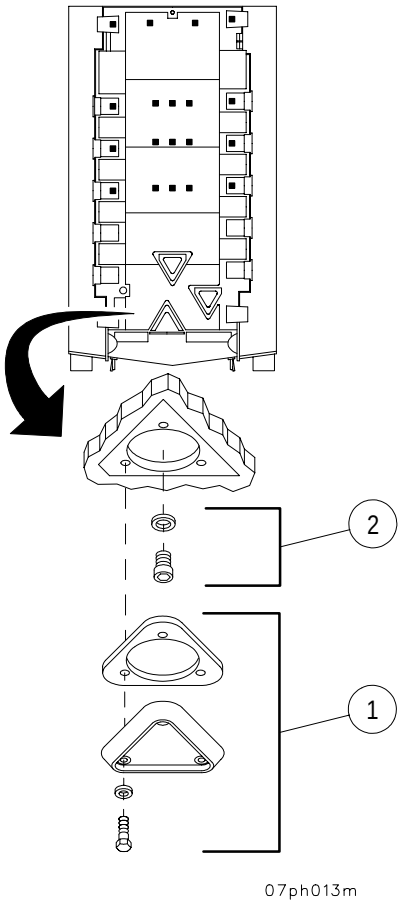


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	BATTERY AND ENGINE COMPARTMENT	**NOTE** Refer to Army Oil Analysis Program (AOAP) DA PAM 738-750.	
36		Transmission	Annually, drain transmission (only after operation). Place vehicle on level ground, remove cover plate (1) on bottom of hull, and remove drain plug (2). After draining, clean and reinstall plug and cover. Refill transmission with OE/HDO to within operating range on dipstick (TM 9-2350-314-10). Refill is approximately 49 qts (46.35 LI). For extreme cold operation with OEA this is a semi-annual check. **WARNING** Dry-cleaning solvent (P-D-680) is toxic and flamable. To avoid injury, wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause SERIOUS INJURY. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (FM 21-11). Remove cover (3) and then remove filter element. Inspect, clean with P-D-680, dry and reinstall. **NOTE** VMS Removed for clarity.	



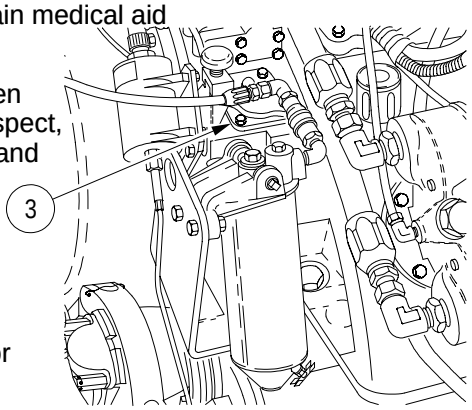
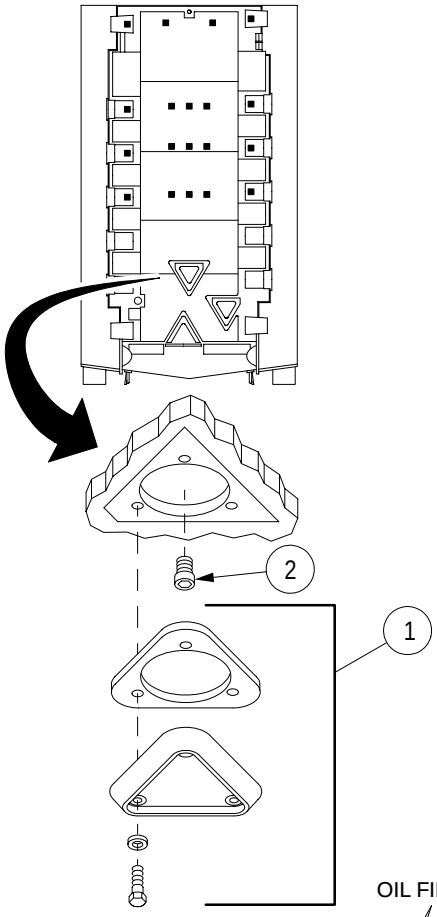
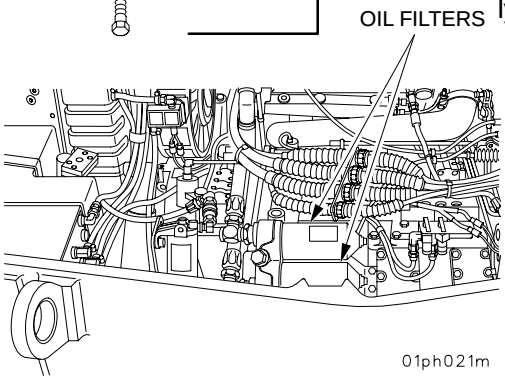


TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	BATTERY AND ENGINE COMPARTMENT	**NOTE** Refer to Army Oil Analysis Program (AOAP) DA PAM 738-750.	
37		Engine crankcase	Annually, drain engine crankcase (only after operation). Coordinate any required seasonal change of oil weight with this service, if possible. Place vehicle on level ground, remove cover plate (1) on bottom of hull, and remove oil drain plug (2). After draining, clean and reinstall plug and cover. Refill crankcase with OE/HDO up to ADD mark on dipstick (TM 9-2350-314-10). Refill is approximately 27 qts (25.54 LI) (dry 38 qts (36 LI)). For extreme cold operation with OEA this is a semi-annual check. **WARNING** Dry-cleaning solvent (P-D-680) is toxic and flamable. To avoid injury, wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause SERIOUS INJURY. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (FM 21-11).	





Drain oil filters, remove elements, clean shell parts with P-D-680. Dry, inspect, and reinstall with new elements.

NOTE
Travel lock assembly and grille removed for clarity.

TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

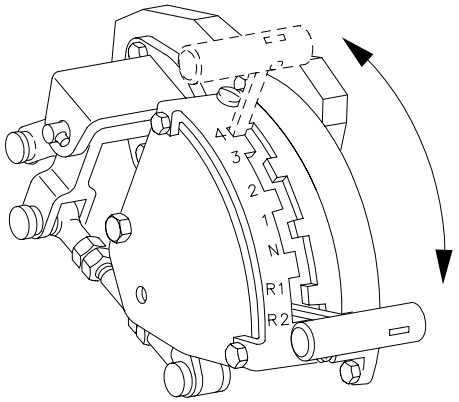
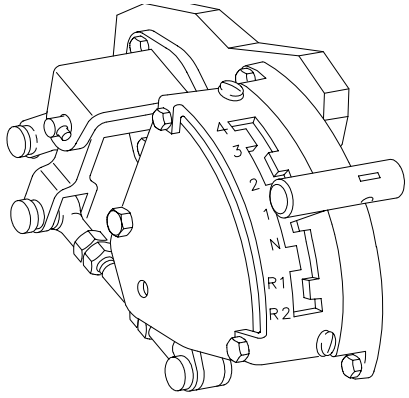
ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	INTERIOR		
38		Transmission shift control	Move transmission shift control lever to all positions. Shift control lever should not bind. If binding occurs, adjust as prescribed (para 9-1).  07ph014m	Transmission shift lever is unserviceable.
39		Neutral safety switch	Clear personnel and equipment from near vehicle. Apply brakes and pull out fuel shut-off control. Attempt to crank engine in gear. If starter engages, stop immediately and follow troubleshooting procedure (Chapter 3).  07ph002m	Neutral safety switch is defective.

TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

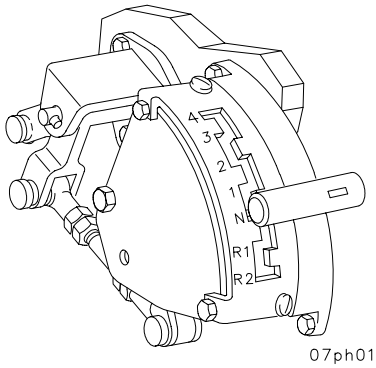
ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	INTERIOR		
40		Starter protection relay	Check for proper operation of starter protection relay (shift control lever in neutral position).  a. Pull fuel shutoff to prevent engine from starting during procedure (TM 9-2350-314-10). b. Engage starter (TM 9-2350-314-10). Note amount of time starter cranks and when it stops. **NOTE** During normal operation, when starter is cranking, the starter protection device should automatically cut starter off after cranking for the following period of time: a. 25-35 seconds at 50° F (10° C) or above. b. 55-65 seconds at 0° to 50° F (-18° to 10° C). c. 100-140 seconds at 0° to -50° F (-18° to -45° C). Starter protection device should reset in 105-140 seconds. If starter does not shut off as indicated or device will not reset, replace device. c. If starter cranks for more than 21 to 31 seconds, troubleshoot starter protection circuit (Chapter 3). d. If starter cranks 21 to 31 seconds, wait two minutes and try to engage engine again. If starter operates, troubleshoot starter protection circuit (Chapter 3).	

TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

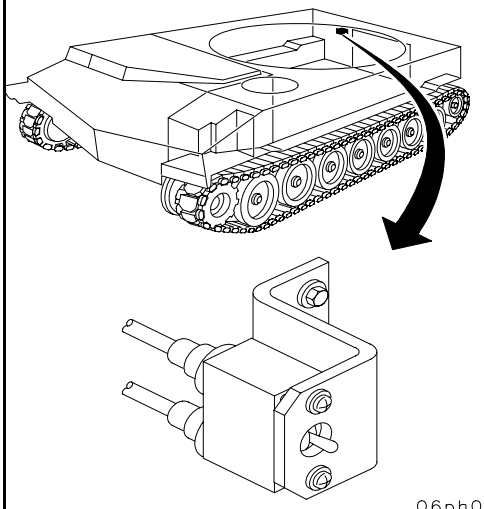
ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	INTERIOR		
40		Starter protection relay - Continued	**CAUTION** Combat override switch should be used only in an emergency or when tested as in this step. Excessive use may damage starter. e. Place combat override switch ON (TM 9-2350-314-10) and engage starter for five seconds or less. If starter does not operate, troubleshoot starter protection circuit (Chapter 3). f. Place combat override switch OFF. Release fuel shut-off handle and attempt to start engine. If starter engages before 2.0 minutes and 2.8 minutes have elapsed since step b, troubleshoot starter protection circuit (Chapter 3).  06ph078m	

TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

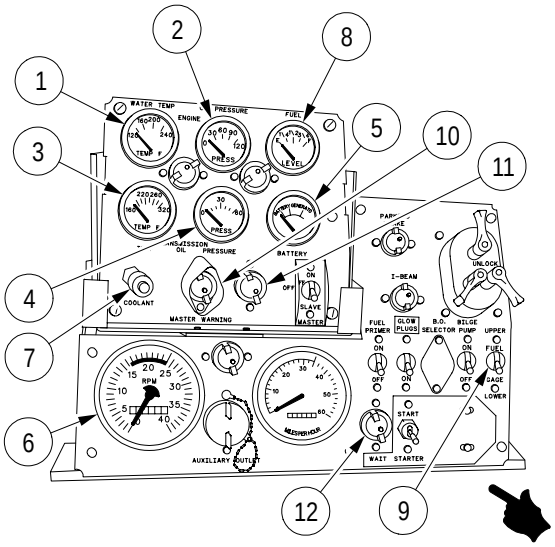
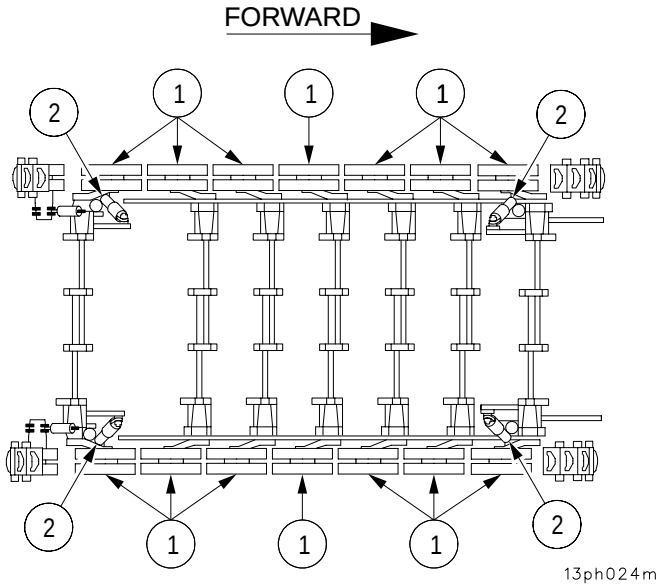
ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	INTERIOR		
41		Instrument panel	Check all lights and gages for proper operation. Follow troubleshooting procedures in Chapter 3 if malfunction appears. a. Engine water temperature gage (1): 170° -185° F (76-85° C). b. Engine oil pressure gage (2): 30-50 psi (207-345 kPa) at 1000 rpm, 50-70 psi (345-482 kPa) at 2100 rpm. (70 psi (482 kPa) is maximum.) c. Transmission oil temperature gage (3): 220° -240° F (104-115° C) is normal. (300° F (148° C) is maximum.) d. Transmission oil pressure gage (4): 10 psi (69 kPa) at 1000 rpm minimum. 18-45 psi (124-310 kPa) at 1835-1900 rpm. e. Battery-generator indicator gage (5): green zone (charging). f. Tachometer (6) should operate without excessive fluctuation or unusual noises. g. Low coolant level indicator (7): Press-to-test for proper operation.  06ph079m h. Fuel gage (8): indicates fuel quantity available in either tank. Use panel switch (9) to select tank. i. Master warning indicator lamp (10): Be sure lamp goes off within 15 seconds after engine starts. j. Master indicator light (11), is illuminated when vehicle MASTER switch is ON. k. Glowplug wait lamp (12): Will flash on briefly when temperature is above 50°F (10°C). Will turn on for 35 seconds, then flash on/off for a minute when temperature is below 50°F (10°C).	Any one of lights 7, 10, or 11 missing or not working. Any one of gages 1 thru 6, or 8 missing or not working.

TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	INTERIOR		
42		Steering control	Move steering wheel through its entire range. With vehicle operating at 15 to 20 mph (24 to 32 kmph) and steering wheel centered, observe if steering wanders or pulls to one side. Troubleshoot if required (Chapter 3).	Any binding or excessive looseness is detected.
43		Brakes	Accelerate vehicle to 15 mph (24 kmph). Release accelerator pedal, and apply brakes. Vehicle should stop without pulling to one side. With vehicle stopped on an incline and with transmission in neutral, depress brake pedal and apply parking brake. Brakes should lock securely and hold vehicle in place. Adjust brakes if required (para 11-1).	Brakes bind or do not stop vehicle; pedal sticks; defective, inoperative, or out of adjustment parking brake.
44		Engine governed speed and performance	Test again for acceleration and power in each gear. While testing in first gear, accelerate with wide open throttle from low speed to top speed. Governed speed under load should not exceed 2350 rpm. Maximum speeds are as follows: 1st 6 mph (9.6 kmph) 2nd 9 mph (14.5 kmph) 3rd 24 mph (38.6 kmph) 4th 35 mph (56.3 kmph) R1 5 mph (8.0 kmph) R2 7 mph (11.3 kmph)	Vehicle does not have at least one forward and reverse gear, and cannot attain a minimum forward speed of 10 mph (16.0 kmph) on a level, unimproved road.

TABLE 2-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR M109A6 SELF-PROPELLED HOWITZER - CONTINUED

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
	ANNUALLY	EXTERIOR		
45		Temperature of hubs and shock absorbers	**NOTE** Check item 45 immediately after road test. Feel all wheel hubs cautiously. Notice difference in temperature between hubs. An overheated hub (1) indicates a bearing problem. Feel lower end of shock absorber (2). Check for difference in temperature between hull and shock absorber (2). If shock absorber (2) is operating properly, it will be warmer than hull.	
				
46		Fuel/hydraulic oil leaks	Inspect all areas inside of vehicle for fuel or hydraulic oil leaks.	Any Class III leak found. Vehicle has damage or is missing items that would make operation hazardous.
47		Final road test	Check performance of items that were adjusted, repaired, or replaced as a result of road test.	

Section IV. SLAVE STARTING

2-12 STARTING INSTRUCTIONS.

This task covers: a. Pre-starting instructions b. Starting instructions

INITIAL SETUP

Tools
Special-purpose cable kit
(item 8, Appx F)

Personnel Required
Three

a. Pre-starting instructions.

1 Check batteries for damage. Replace damaged batteries (para 8-54).

2 Check electrolyte level in batteries. Replenish as required (TM 9-6140-200-14).

WARNING

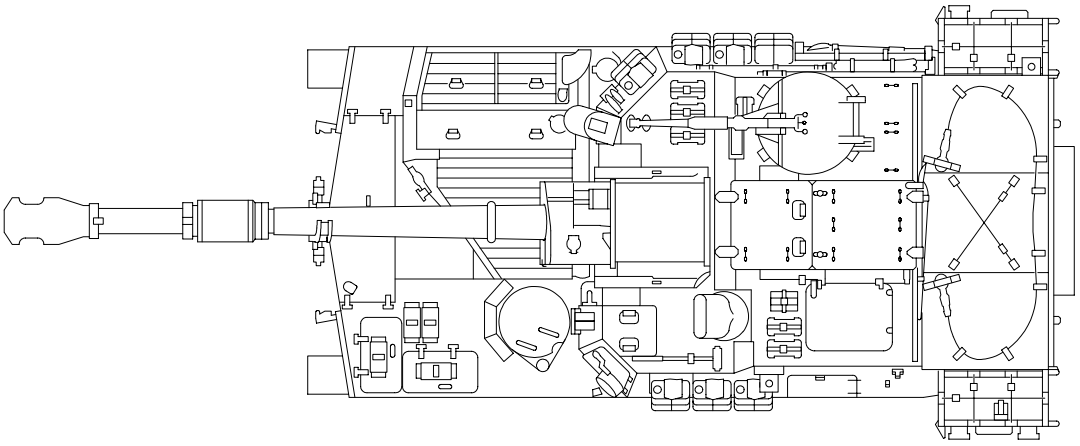
- Do not park vehicles head to head. Personnel injury or damage to the vehicles could occur if one vehicle jumps.
- Do not allow vehicles to touch and leave enough space between vehicles to permit working room for the technician. Shorted circuits could allow electricity to flow through the vehicles causing injury to personnel and/or damage to equipment.

Section IV. SLAVE STARTING - CONTINUED

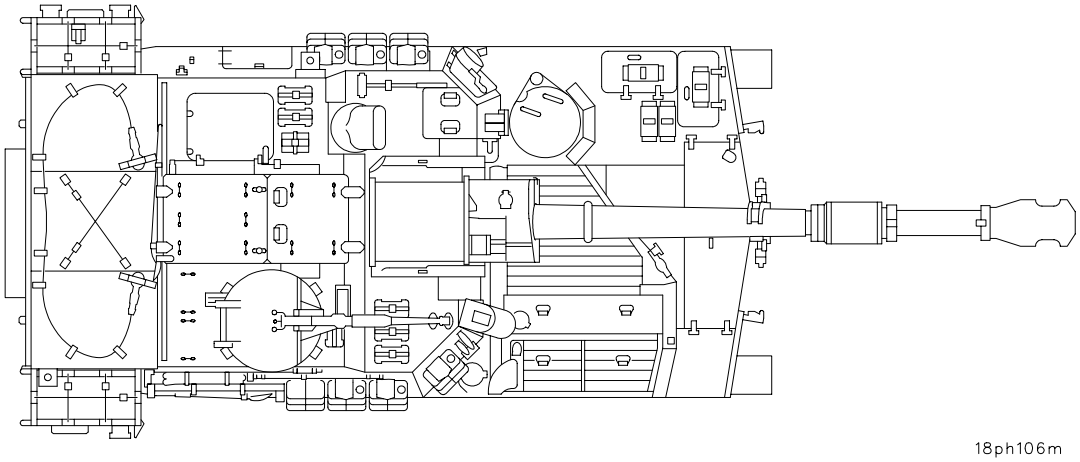
2-12 STARTING INSTRUCTIONS - CONTINUED

a. Pre-starting instructions - Continued

3 Park vehicles in a side-by-side position or park live vehicle in front of, and at right angles to, dead vehicle.



SAFE POSITION



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Section IV. SLAVE STARTING - CONTINUED

2-12 STARTING INSTRUCTIONS - CONTINUED

a. Pre-starting instructions - Continued

4 Place both vehicles' shift levers (1) in N (neutral) position.

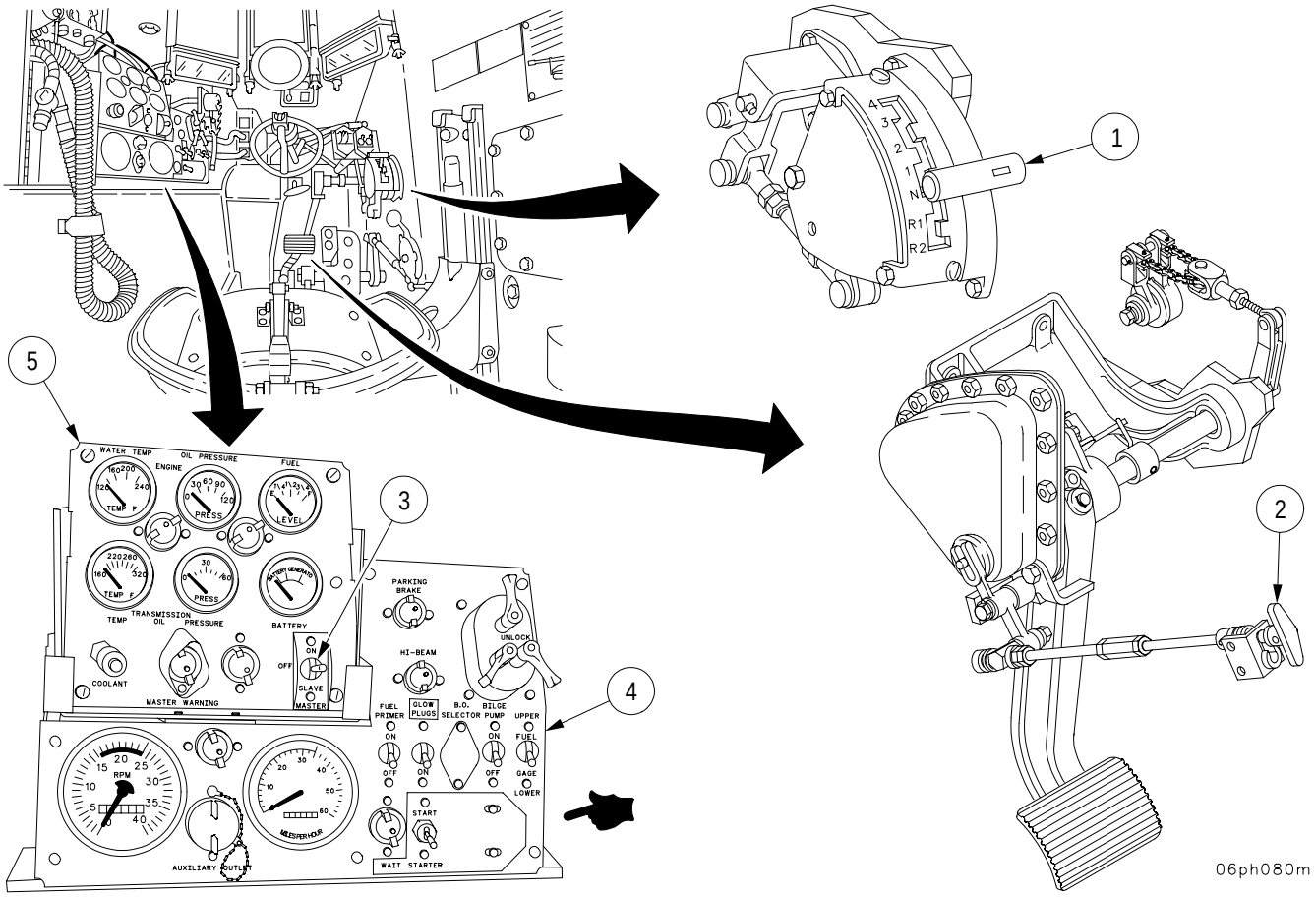
5 Set parking brakes (2) on both vehicles.

CAUTION

Make sure all electrical equipment and all switches are off in both vehicles to prevent damage to the electrical system.

6 Place vehicle MASTER switch (3) in OFF position.

7 Place all electrical switches in OFF position in driver's (4) and portable (5) instrument panels on both vehicles.



Section IV. SLAVE STARTING - CONTINUED

2-12 STARTING INSTRUCTIONS - CONTINUED

a. Pre-starting instructions - Continued

8 Attach slave cable (6) securely to slave receptacle (7) in both vehicles.

b. Starting instructions.

WARNING

Make sure vehicle MASTER switches are OFF in both vehicles after vehicles are fully charged.

1 Place vehicle MASTER switch (3) to OFF position on dead vehicle.

2 Place vehicle MASTER switch (3) to ON in live vehicle and run engine at 1000 to 1200 rpm.

3 Allow batteries in dead vehicle to charge for 5 minutes before trying to start the engine.

4 Idle engine of live vehicle and move vehicle MASTER switch (3) to SLAVE position.

5 Start up dead vehicle (TM 9-2350-314-10).

6 After engine in disabled vehicle is running smoothly, turn OFF vehicle MASTER switch (3).

7 Disconnect slave cable (6) from both vehicles.

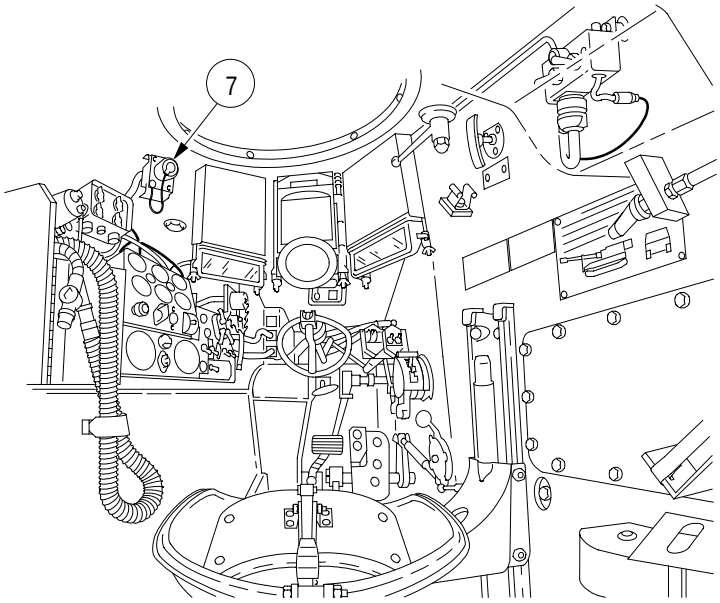
8 Turn both vehicle MASTER switches (3) ON again.

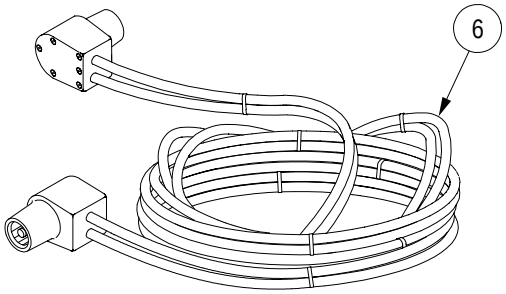
NOTE

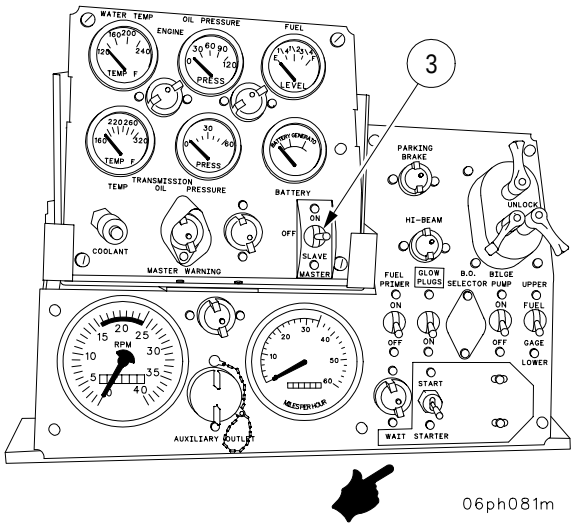
After disconnecting slave cable, run both engines at 1000 rpm to stabilize generators (alternators) and charge batteries.

Section IV. SLAVE STARTING - CONTINUED

2-12 STARTING INSTRUCTIONS - CONTINUED







CHAPTER 3
TROUBLESHOOTING

GENERAL

This chapter illustrates and provides specific instructions for troubleshooting the M109A6 hull assemblies.

CONTENTS

3-1 GENERAL TROUBLESHOOTING INSTRUCTIONS.

This chapter contains a “Quick Guide to Troubleshooting” index and troubleshooting chart. The Quick Guide to Troubleshooting is the master reference table for locating troubleshooting information. The Guide contains a list of various malfunctions which may occur during operation or inspection and provides a reference to the troubleshooting information on the troubleshooting chart or a solution. The troubleshooting chart provides step-by-step instructions for isolating and correcting malfunctions.

3-1.1 STE/ICE Troubleshooting.

NOTE

This test is now designated as STE-ICE-R (Reprogramable). The “R” indicates its circuit boards can now be reprogramed at depot. There are no other changes to this test set. For testing purposes, STE-ICE and STE-ICE-R are the same.

When a malfunction is recognized on the engine, the Quick Guide may reference paragraph 3-4. This means there is a STE/ICE (Simplified Test Equipment for Internal Combustion Engine) method for analyzing the malfunction. The STE/ICE method will be the primary troubleshooting procedure when referenced; the listed procedure should be used only when STE/ICE is unavailable.

3-1.2 Electrical Troubleshooting.

Electrical troubleshooting in this chapter provides schematic diagrams and pictorial diagrams to give insight to the harnesses involved.

When troubleshooting any electrical system or component, exercise extreme care to prevent electrical shock.

WARNING

Throughout troubleshooting of the electrical system or electrical components, be certain vehicle MASTER switch is OFF between every step unless otherwise directed. Remove all jewelry and metal objects when working on the electrical system to prevent injury due to electrical shock.

The multimeter is used throughout troubleshooting. Make sure when using the multimeter that it is used with a probe kit (item 35, Appx F).

3-1.3 Wiring Harness Shorts Test.

When doing a shorts test, make sure all connectors and/or leads are disconnected from their components. Probe the pins (or sockets) with a multimeter. This is done by placing the red lead on pin (or socket) A (or 1) and then placing the black lead on the next pin (or socket) in alphabetical (or numerical) order. Probe every pin (or socket) on the connector or lead with the black lead of the multimeter.

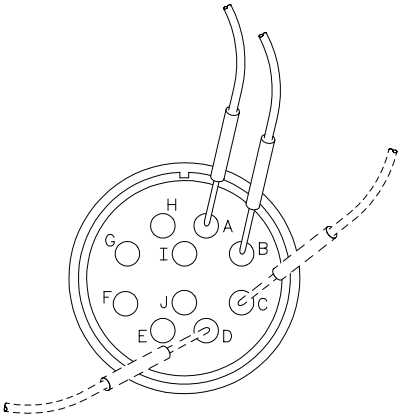
When this probing has been completed, place the red lead on the second pin (or connector) and do the probing with the black lead in order again. Do this until every pin has been probed with the red lead of the multimeter. Then place the black lead of the multimeter on the connector and place the red lead on each pin (or socket) on the connector.

3-1.3 Wiring Harness Shorts Test - Continued

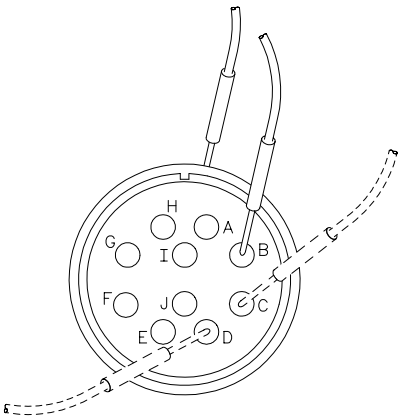
If continuity is present between any two points during probing, a short exists. Shorts must be repaired to continue any operation.

If instructed in a procedure to skip a pin (or socket) during a shorts test, that is because that pin (or socket) is not used or is shielded. Those pins (or sockets) will be covered in separate troubleshooting.

When a repair or replacement of a lead or harness has been done, do the shorts test again to make sure the problem has been corrected.



PIN TO PIN (SOCKET TO SOCKET)
HARNESS SHORTS TEST



CONNECTOR TO PIN (SOCKET)
HARNESS SHORTS TEST

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3-2 QUICK GUIDE TO TROUBLESHOOTING.

To effectively troubleshoot the M109A6 Howitzer, follow these steps;

a. Determine the symptom.

b. Locate the symptom in the Quick Guide to Troubleshooting.

c. Locate the troubleshooting reference for your symptom.

d. Turn to the chart identified in the Quick Guide to Troubleshooting.

e. Study the function description, pictorial view, and/or schematic located at the beginning of each troubleshooting section.

f. Perform the corrective action as required by troubleshooting chart.

g. Verify that the corrective action eliminated the symptom.

If any problem is not listed or will not correct through troubleshooting, notify direct support maintenance.

NOTE

Electrical harness views are included in the troubleshooting chart as reference guides only (refer to Chapter 8 for detailed information on the electrical harnesses).

3-2 QUICK GUIDE TO TROUBLESHOOTING - CONTINUED

ITEM	SYMPTOM	PAGE	PARAGRAPH
AIR CLEANER BLOWER MOTORS	AIR CLEANER BLOWER MOTORS FAIL TO OPERATE.	3-16	para 3-3.a(1)
	ONE AIR CLEANER BLOWER MOTOR FAILS TO OPERATE. Other blower motor operates properly.	3-28	para 3-3.a(2)
	AIR CLEANER BLOWER MOTORS FAIL TO SHUT OFF WHEN TRANSMISSION IS IN NEUTRAL AND ENGINE IS RUNNING.	3-29	para 3-3.a(3)
AUXILIARY OUTLET	AUXILIARY OUTLET FAILS TO OPERATE.	3-32	para 3-3.b(1)
BILGE PUMP	BILGE PUMP FAILS TO OPERATE. Other electrical components operate.	3-36	para 3-3.c(1)
CAB POWER	NO POWER TO CAB SEGMENT BOARDS.	3-42	para 3-3.d(1)
DRIVER'S MCS HEATER	DRIVER'S MCS ELECTRICAL AIR HEATER (M3) FAILS TO OPERATE.	3-50	para 3-3.e(1)
ENGINE	ENGINE DOES NOT CRANK.	3-54	para 3-3.f(1)
	ENGINE CRANKS SLOWLY - BATTERY INDICATOR IN LOW YELLOW OR RED.	3-68	para 3-3.f(2)
	ENGINE CRANKS BUT DOES NOT START.	3-69	para 3-3.f(3)
	COMBAT OVERRIDE SWITCH WILL NOT OVERRIDE.	3-73	para 3-3.f(4)
	ENGINE DOES NOT ACCELERATE PROPERLY OR DOES NOT DEVELOP FULL POWER.	3-75	para 3-3.f(5)
	ENGINE DOES NOT MAINTAIN STEADY RPM.	3-78	para 3-3.f(6)
	ENGINE USES EXCESSIVE OIL.		Check oil lines, oil filters, and engine cover for excessive leaks.
	ENGINE USES EXCESSIVE FUEL.	3-80	para 3-3.f(7).258.1

3-2 QUICK GUIDE TO TROUBLESHOOTING - CONTINUED

ITEM	SYMPTOM	PAGE	PARAGRAPH
ENGINE (CONTINUED)	BLACK EXHAUST SMOKE IS PRESENT.		Check air filters for restrictions and/or dirty filter elements. (TM 9-2350-314-10)
	WHITE EXHAUST SMOKE IS PRESENT.	3-82	para 3-3.f(8)
	EXHAUST FUMES PRESENT IN CREW COMPARTMENT.	3-83	para 3-3.f(9)
	ENGINE HAS LOW OR NO OIL PRESSURE.	3-85	para 3-3.f(10)
	ENGINE OVERHEATS.	3-87	para 3-3.f(11)
	ENGINE CRANKS BUT WILL NOT START IN COLD WEATHER. Temperature below 40° F(4° C).	3-91	para 3-3.f(12)
GAGES	ENGINE OIL PRESSURE GAGE FAILS TO OPERATE WITH ENGINE RUNNING. All other instruments operate.	3-101	para 3-3.g(1)
	ENGINE WATER TEMPERATURE GAGE FAILS TO OPERATE PROPERLY. Engine water gage needle does not move, is not steady, or is inaccurate. All other gages operate properly.	3-104	para 3-3.g(2)
	TRANSMISSION OIL PRESSURE GAGE FAILS TO OPERATE PROPERLY. All other instruments operate.	3-108	para 3-3.g(3)
	TRANSMISSION OIL TEMPERATURE GAGE FAILS TO INDICATE TRANSMISSION OIL TEMPERATURE. All other instruments operate.	3-111	para 3-3.g(4)
	FUEL GAGE FAILS TO INDICATE A LEVEL READING WITH BOTH FUEL TANKS FULL. All other instruments operate.	3-115	para 3-3.g(5)
	FUEL GAGE FAILS TO INDICATE LEVEL OF UPPER FUEL TANK. Indicates lower fuel tank level properly.	3-119	para 3-3.g(6)
	FUEL GAGE FAILS TO INDICATE FUEL LEVEL IN LOWER FUEL TANK. Indicates upper fuel tank level properly.	3-122	para 3-3.g(7)
	BATTERY/GENERATOR GAGE FAILS TO OPERATE PROPERLY – NO OR UNSTEADY READING. All other instruments operate.	3-125	para 3-3.g(8)

3-2 QUICK GUIDE TO TROUBLESHOOTING - CONTINUED

3-2 QUICK GUIDE TO TROUBLESHOOTING - CONTINUED

ITEM	SYMPTOM	PAGE	PARAGRAPH
LIGHTS (CONTINUED)	ENGINE LOW LEVEL COOLANT WARNING LIGHT FAILS TO LIGHT WHEN ENGINE COOLANT LEVEL IS LOW. Operates press-to-test.	3-180	para 3-3.k(9)
	ENGINE LOW LEVEL COOLANT LIGHT FAILS TO LIGHT WHEN PRESSED TO TEST. All other lights operate.	3-183	para 3-3.k(10)
	GLOW PLUG WAIT LIGHT DOES NOT ILLUMINATE Engine starts and all other electrical accessories operate properly.	3-188	para 3-3.k(11)
	MASTER SWITCH INDICATOR LIGHT FAILS TO OPERATE. Vehicle MASTER switch ON.	3-191	para 3-3.k(12)
	HIGH BEAM INDICATOR LIGHT FAILS TO OPERATE.	3-193	para 3-3.k(13)
	PARKING BRAKE INDICATOR LIGHT FAILS TO OPERATE. Parking brake set.	3-195	para 3-3.k(14)
	PERSONNEL HEATER INDICATOR LED FAILS TO OPERATE PRESS-TO-TEST OR HEATER OPERATING.	3-198	para 3-3.k(15)
	SERVICE DRIVE LIGHTS FAIL TO OPERATE.	3-199	para 3-3.k(16)
	HEADLIGHTS FAIL TO OPERATE. All other lights operate.	3-200	para 3-3.k(17)
	TAILLIGHT FAILS TO OPERATE. All other lights operate.	3-206	para 3-3.k(18)
	STOPLIGHT FAILS TO OPERATE. All other lights operate.	3-208	para 3-3.k(19)
	FRONT BLACKOUT (BO) MARKER LEDS FAIL TO OPERATE.	3-211	para 3-3.k(20)
	REAR BLACKOUT (BO) MARKERS LEDS FAIL TO OPERATE. All other lights operate.	3-214	para 3-3.k(21)
	BLACKOUT (BO) DRIVE LIGHT FAILS TO OPERATE.	3-216	para 3-3.k(22)
	BLACKOUT (BO) STOPLIGHT LED FAILS TO OPERATE. All other lights operate.	3-219	para 3-3.k(23)

3-2 QUICK GUIDE TO TROUBLESHOOTING - CONTINUED

ITEM	SYMPTOM	PAGE	PARAGRAPH
LIGHTS (CONTINUED)	ALL INSTRUMENT PANEL LIGHTS FAIL TO OPERATE. All other lights operate.	3-222	para 3-3.k(24)
	DRIVER'S INSTRUMENT PANEL LIGHTS FAIL TO OPERATE. All other lights operate.	3-223	para 3-3.k (25)
	PORTABLE INSTRUMENT PANEL LIGHTS FAIL TO OPERATE. All other lights operate.	3-224	para 3-3.k(26)
	ACCESSORY CONTROL BOX LEDS FAIL TO OPERATE. All other lights operate.	3-227	para 3-3.k(27)
	DOME LIGHT FAILS TO OPERATE. All other lights operate.	3-229	para 3-3.k(28)
	DRIVER'S NIGHT VIEWER FAILS TO OPERATE.	3-234	para 3-3.k(29)
NATO SLAVE RECEPTACLE	NO POWER TO SLAVED VEHICLE'S SLIP RING FROM NATO SLAVE RECEPTACLE. Slaved vehicle had power when operating.	3-236	para 3-3.l(1)
	BATTERIES FAIL TO RECHARGE WHEN VEHICLE IS SLAVED. All other electrical components operate.	3-239	para 3-3.l(2)
	NO POWER TO VEHICLE'S SLIP RING FROM EXTERNAL POWER RECEPTACLE.	3-245	para 3-3.l(3)
PERSONNEL HEATER (For vehicles with Accessory Control Box P/N 12268582)	PERSONNEL HEATER FAILS TO OPERATE. Other electrical components operate.	3-252	para 3-3.m(1)
	HEATER MOTOR RUNS BUT HEATER FAILS TO OPERATE. Sufficient fuel is in tank.	3-255	para 3-3.m(2)
	HEATER WILL NOT STOP RUNNING WITH SWITCH OFF. All other electrical components operate properly.	3-257	para 3-3.m(3)
PERSONNEL HEATER (For vehicles with Accessory Control Box P/N 12268547)	PERSONNEL HEATER FAILS TO OPERATE. Other electrical components operate.	3-258.1	para 3-3.m.1(1)
	HEATER MOTOR RUNS BUT HEATER FAILS TO OPERATE. Sufficient fuel is in tank.	3-258.4	para 3-3.m.1(2)
	HEATER WILL NOT STOP RUNNING WITH SWITCH OFF. All other electrical components operate properly.	3-258.6	para 3-3.m.1(3)

3-2 QUICK GUIDE TO TROUBLESHOOTING - CONTINUED

ITEM	SYMPTOM	PAGE	PARAGRAPH
PERSONNEL VENTILATION BLOWER AND LEAD FILTER FAN (For vehicles with Accessory Control Box P/N 12268582)	PERSONNEL VENTILATION BLOWER FAILS TO OPERATE. All other components operate properly.	3-260	para 3-3.n(1)
	LEAD FILTER FAN DOES NOT OPERATE. Personnel ventilation fan operates properly.	3-262	para 3-3.n(2)
PERSONNEL VENTILATION BLOWER AND LEAD FILTER FAN (For vehicles with Accessory Control Box P/N 12268547)	PERSONNEL VENTILATION BLOWER FAILS TO OPERATE. All other components operate properly.	3-264.1	para 3-3.n.1(1)
	LEAD FILTER FAN DOES NOT OPERATE. Personnel ventilation fan operates properly.	3-264.3	para 3-3.n.1(2)
STE DCA CIRCUIT	STE FAILS TO GIVE READING (WHILE PERFORMING TEST 10 OR 13). STE passed power-up and confidence tests (para 3-4.a(1)).	3-266	para 3-3.o(1)
	STE FAILS TO GIVE COMPRESSION UNBALANCE READING (WHILE PERFORMING TEST 14). STE passed power-up and confidence tests (para 3-4.a(1)).	3-267	para 3-3.o(2)
	STE FAILS TO GIVE FUEL SUPPLY PRESSURE READING (WHILE PERFORMING TEST 24). STE passed power-up and confidence tests (para 3-4.a(1)).	3-269	para 3-3.o(3)
	STE FAILS TO GIVE FUEL FILTER DIFFERENTIAL PRESSURE READING (WHILE PERFORMING TEST 26). STE passed power-up and confidence tests (para 3-4.a(1)).	3-272	para 3-3.o (4)
	STE FAILS TO GIVE AIR CLEANER PRESSURE DIFFERENTIAL READING (WHILE PERFORMING TEST 28). STE passed power-up and confidence tests (para 3-4.a(1)).	3-275	para 3-3.o(5)
	STE FAILS TO GIVE AIR BOX PRESSURE READING (WHILE PERFORMING TEST 32). STE passed power-up and confidence tests (para 3-4.a(1)).	3-277	para 3-3.o(6)

3-2 QUICK GUIDE TO TROUBLESHOOTING - CONTINUED

ITEM	SYMPTOM	PAGE	PARAGRAPH
STE DCA CIRCUIT (CONTINUED)	STE FAILS TO GIVE BATTERY VOLTAGE READING (WHILE PERFORMING TEST 67). STE passed power-up and confidence tests (para 3-4.a(1)).	3-281	para 3-3.o(7)
	STE FAILS TO GIVE STARTER MOTOR VOLTAGE READING (WHILE PERFORMING TEST 68). STE passed power-up and confidence tests (para 3-4.a(1)).	3-283	para 3-3.o(8)
	STE FAILS TO GIVE STARTER NEGATIVE CABLE DROP READING (WHILE PERFORMING TEST 69). STE passed power-up and confidence tests (para 3-4.a(1)).	3-285	para 3-3.o(9)
	STE FAILS TO GIVE STARTER SOLENOID VOLTAGE READING (WHILE PERFORMING TEST 70). STE passed power-up and confidence tests (para 3-4.a(1)).	3-287	para 3-3.o(10)
	STE FAILS TO GIVE STARTER CURRENT READING (WHILE PERFORMING TEST 71). STE passed power-up and confidence tests (para 3-4.a(1)).	3-290	para 3-3.o(11)
	STE FAILS TO GIVE READING (WHILE PERFORMING TESTS 72, 73, 74, or 75). STE passed power-up and confidence tests (para 3-4.a(1)).	3-291	para 3-3.o(12)
	STE FAILS TO GIVE ALTERNATOR/GENERATOR OUTPUT VOLTAGE READING (WHILE PERFORMING TEST 82). STE passed power-up and confidence tests (para 3-4.a(1)).	3-293	para 3-3.o(13)
	STE FAILS TO GIVE ALTERNATOR/GENERATOR FIELD VOLTAGE READING (WHILE PERFORMING TEST 83). STE passed power-up and confidence tests (para 3-4.a(1)).	3-296	para 3-3.o(14)
	STE FAILS TO GIVE ALTERNATOR/GENERATOR NEGATIVE CABLE DROP READING (WHILE PERFORMING TEST 84). STE passed power-up and confidence tests (para 3-4.a(1)).	3-300	para 3-3.o(15)
TRACKS AND SUSPENSION	VEHICLE BRAKES POORLY. Vehicle does not stop correctly when brake is applied.	3-304	para 3-3.p(1)
	VEHICLE PULLS TO ONE SIDE WITH STEERING WHEEL IN CENTER POSITION.	3-305	para 3-3.p(2)

3-2 QUICK GUIDE TO TROUBLESHOOTING - CONTINUED

ITEM	SYMPTOM	PAGE	PARAGRAPH
TRACKS AND SUSPENSION (CONTINUED)	VEHICLE THROWS TRACK.	3-307	para 3-3.p(3) Check for correct installation of torsion bars (paras 12-1 and 12-6)
	VEHICLE RIDE IS ROUGH OR SUSPENSION SYSTEM IS NOISY DURING OPERATION.		para 3-3.p(4)
TRANSMISSION AND DRIVING CONTROLS	HAND THROTTLE CONTROL DOES NOT MAINTAIN A CONSTANT RPM.	3-309	Check for loose mounting bolts on hand throttle control rod accelerator shaft (paras 5-19 and 5-21)
	ENGINE DOES NOT CHANGE RPM.		Adjust accelerator pedal and hand throttle control rod (paras 5-19 and 5-21)
	VEHICLE CREEPS FORWARD IN NEUTRAL.		Adjust transmission control linkage (para 5-21)
	TRANSMISSION OVERHEATS. Transmission oil temperature gage reads over 285° F (140° C). MASTER warning light is lit.	3-314	para 3-3.q(1)
	VEHICLE DRIVES, BUT NOT IN SELECTED RANGE.		Adjust transmission control linkage (para 5-21)
	VEHICLE DOES NOT DRIVE. Transmission does not operate in any shift position.	3-317	para 3-3.q(2)
	SHIFT CONTROL DOES NOT MOVE TO SELECTED RANGE.		Adjust transmission shift control linkage (para 5-21)
	VEHICLE DOES NOT STEER IN EITHER DIRECTION IN ANY RANGE.	3-320	para 3-3.q(3)
	VEHICLE STEERS WELL IN ONE DIRECTION ONLY.	3-322	para 3-3.q(4)

3-2 QUICK GUIDE TO TROUBLESHOOTING - CONTINUED

3-2 QUICK GUIDE TO TROUBLESHOOTING - CONTINUED

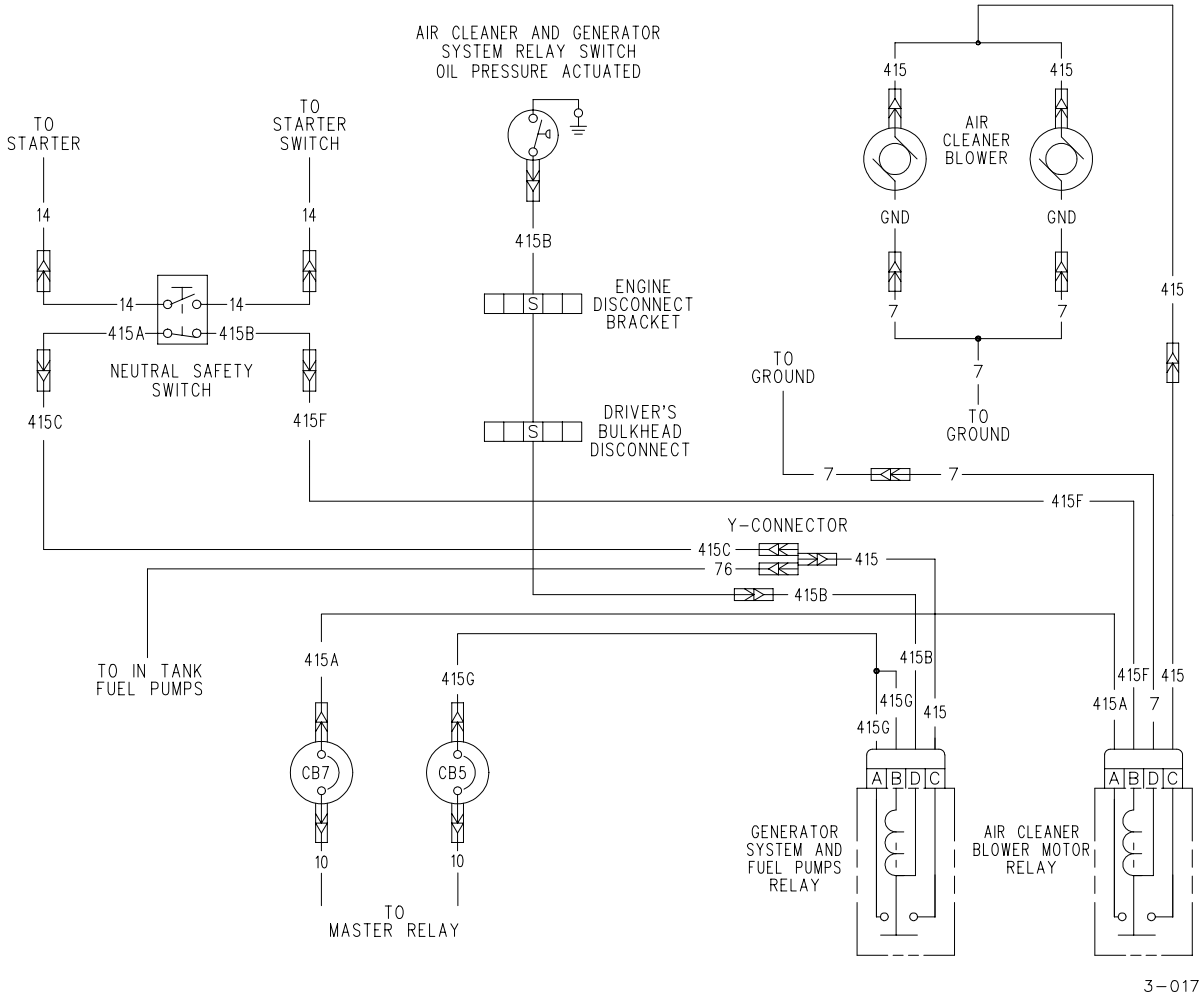
ITEM	SYMPTOM	PAGE	PARAGRAPH
STE/ICE TROUBLE-SHOOTING CONTINUED	GENERATOR NEGATIVE CABLE DROP - TEST 84.	3-384	para 3-4.b(1)
	STARTER CIRCUIT RESISTANCE - TEST 74.	3-385	para 3-4.b(2)
	BATTERY INTERNAL RESISTANCE (DCA) - TEST 73.	3-386	para 3-4.b(3)
	BATTERY RESISTANCE CHANGE - TEST 75.	3-387	para 3-4.b(4)
	STARTER NEGATIVE CABLE DROP - TEST 69.	3-388	para 3-4.b(5)
	GENERATOR FIELD VOLTAGE - TEST 83.	3-389	para 3-4.b(6)
	FUEL PRESSURE RETURN - TEST 49.	3-391	para 3-4.b(7)
	CHARGING CIRCUIT (at battery) - TEST 67.	3-392	para 3-4.b(8)
	ENGINE RPM - TEST 10.	3-394	para 3-4.b(9)
	COMPRESSION UNBALANCE - TEST 14.	3-395	para 3-4.b(10)
	ENGINE POWER PERCENTAGE - TEST 13.	3-396	para 3-4.b(11)
	GENERATOR OUTPUT VOLTAGE - TEST 82.	3-397	para 3-4.b(12)
	FUEL SUPPLY PRESSURE (DCA and TK) - TEST 24.	3-399	para 3-4.b(13)
	CRANKING CURRENT -TEST 71.	3-401	para 3-4.b(14)
	CURRENT FIRST PEAK -TEST 72.	3-402	para 3-4.b(15)
	STARTER SOLENOID VOLTAGE - TEST 70.	3-403	para 3-4.b(16)
	VEHICLE OIL PRESSURE - TEST 50.	3-404	para 3-4.b(17)
	AIR FILTER PRESSURE DIFFERENTIAL - TEST 28.	3-405	para 3-4.b(18)
	STARTER POSITIVE TERMINAL VOLTAGE - TEST 68.	3-406	para 3-4.b(19)
	INDIVIDUAL BATTERY VOLTAGE - TEST 89.	3-407	para 3-4.b(20)
	AIR BOX PRESSURE - TEST 32.	3-408	para 3-4.b(21)
	FUEL PRESSURE DROP - TEST 26.	3-409	para 3-4.b(22)

3-3 TROUBLESHOOTING CHART

a. AIR CLEANER BLOWER MOTORS

The air cleaner blower motor system consists of the blower motor, the air cleaner blower motor relay, air cleaner and generator system relay switch, neutral safety switch, circuit breaker numbers 5 (CB5) and 7 (CB7) and associated wiring. The relationship of these components is shown in the diagram below.

When the vehicle MASTER switch is turned ON, 24 V dc is supplied through the MASTER relay to circuit breaker CB5 and CB7. 24 V dc from circuit breaker CB5 is routed through the generator system and fuel pumps relay, the air cleaner and generator system relay switch (oil pressure activated) which provides a ground for that circuit, and through the neutral safety switch to the air cleaner blower motor relay (relay activation voltage). 24 V dc from circuit breaker CB7 is supplied to the air cleaner blower motors through the air cleaner blower motor relay.



3-3 TROUBLESHOOTING CHART - CONTINUED

a. AIR CLEANER BLOWER MOTORS - CONTINUED	(1) AIR CLEANER BLOWER MOTORS FAIL TO OPERATE.

INITIAL SETUP

Tools

General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
(Long test leads may be needed for some tests.
16 AWG wire may be used as an extension.)

Equipment Conditions

Air intake grille opened
(TM 9-2350-314-10)
Battery access doors open
(TM 9-2350-314-10)
Transmission access doors opened
(TM 9-2350-314-10)

Personnel Required

Two

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove engine compartment access cover (para 16-7).
3. Disconnect lead 415B from air cleaner/generator system relay switch.
4. Place a jumper lead from lead 415B connector socket to ground.
5. Place transmission lever in gear (not neutral) (TM 9-2350-314-10).
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Do air cleaner blower motors operate?

yes

Replace air cleaner/generator system relay switch (para 8-48).

no

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect lead 415B to air cleaner/generator system relay switch.
3. Disconnect harness W105 connector P1 from harness W104 connector J1.
4. Place a jumper wire from harness W105 connector P1 socket S to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Do air cleaner blower motors operate?

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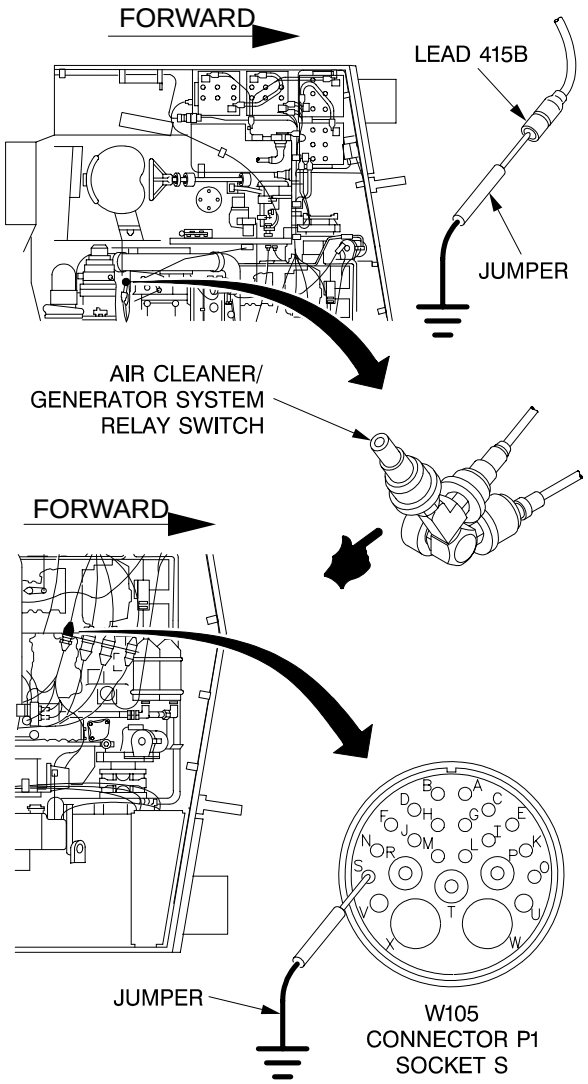

3-021A

3-3 TROUBLESHOOTING CHART - CONTINUED

a. AIR CLEANER BLOWER MOTORS - CONTINUED	(1) AIR CLEANER BLOWER MOTORS FAIL TO OPERATE. - CONTINUED

CONTINUED FROM STEP B

yes / no

Repair or replace harness W104 lead 415B from engine disconnect bracket to air cleaner/generator system relay switch (para 8-63).

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W114 connector P1 from harness W105 connector J1 at driver's bulkhead.
3. Check W105 for continuity by placing one multimeter lead in W105 J1 socket S and other lead to ground.

Is continuity present?

yes / no

Repair or replace harness W105 (para 8-64).

D

1. Reconnect harness W114 connector P1 to harness W105 connector J1.
2. Remove driver's instrument panel front cover (para 8-12).
3. Disconnect harness W114 lead 415B from harness W123 lead 415B behind driver's instrument panel.
4. Check W114 lead 415B for continuity by placing one multimeter lead in harness W114 lead 415B and other lead to ground.

Is continuity present?

yes / no

Repair or replace harness W114 lead 415B (para 8-73).

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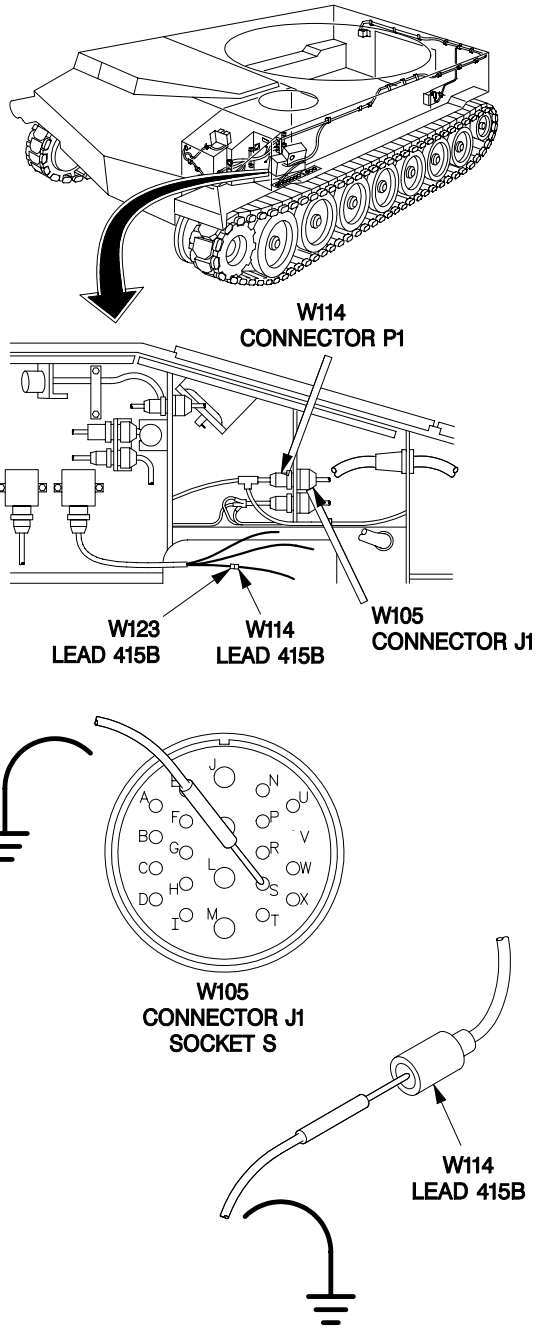

3-3 TROUBLESHOOTING CHART - CONTINUED

a. AIR CLEANER BLOWER MOTORS - CONTINUED	(1) AIR CLEANER BLOWER MOTORS FAIL TO OPERATE. - CONTINUED

CONTINUED FROM STEP D

E

1. Remove jumper from harness W105 and reconnect W105 connector P1 to harness W104 J1 at engine disconnect bracket.
2. Place a jumper in harness W123 lead 415B and to ground.
3. Disconnect harness W123 connector P1 from generator system and fuel pumps relay.
4. Place one multimeter lead in harness W123 connector P1 socket D and other lead to ground.
5. Check for continuity.

Is continuity present?

yes

no

Repair or replace harness W123 (para 8-81).

F

1. Place red multimeter lead in harness W123 P1 socket A and B (one at a time) and place black lead to ground.
2. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
3. Check for voltage.

Is voltage present?

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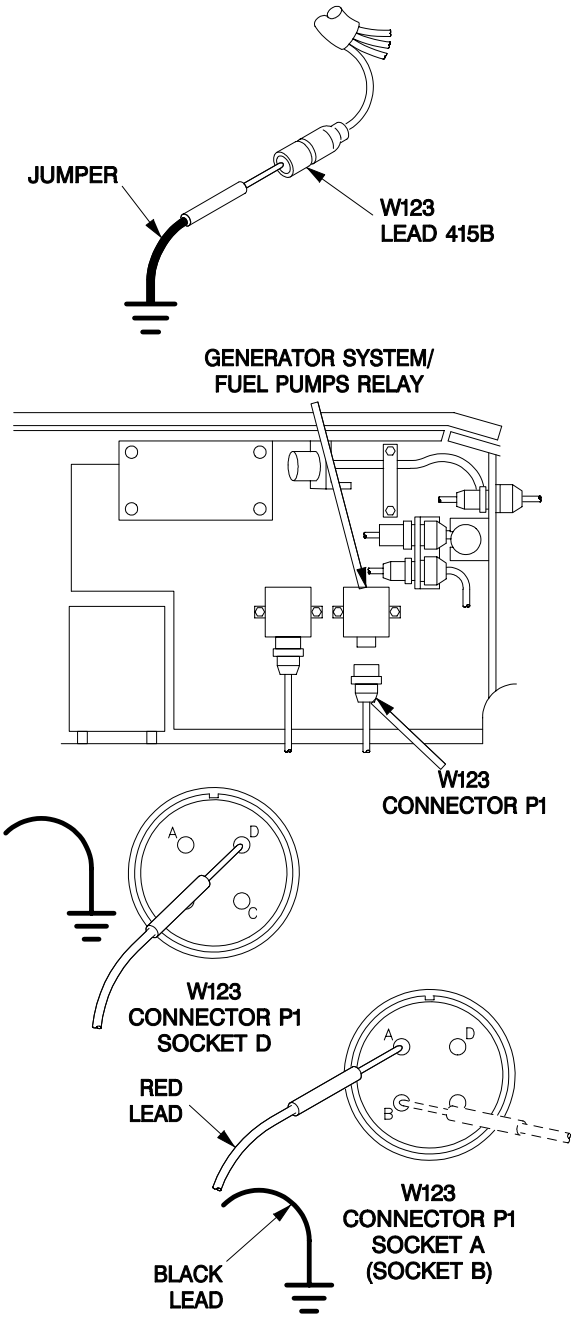

3-020C

3-3 TROUBLESHOOTING CHART - CONTINUED

a. AIR CLEANER BLOWER MOTORS - CONTINUED	(1) AIR CLEANER BLOWER MOTORS FAIL TO OPERATE. - CONTINUED

CONTINUED FROM STEP F

yes → Go to step I.

no

G

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W123 connector P1 to generator system and fuel pumps relay.
3. Disconnect harness W123 lead 415G from circuit breaker 5 (CB5).
4. Place red multimeter lead on circuit breaker pin and place black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
6. Check for voltage?

Is voltage present?

yes → Repair or replace harness W123 (para 8-81).

no

H

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W123 lead 415G to circuit breaker 5 (CB5).
3. Disconnect harness W124 lead 10 at circuit breaker 5 (CB5).
4. Place red multimeter lead in harness W124 lead 10 and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
6. Check for voltage.

Is voltage present?

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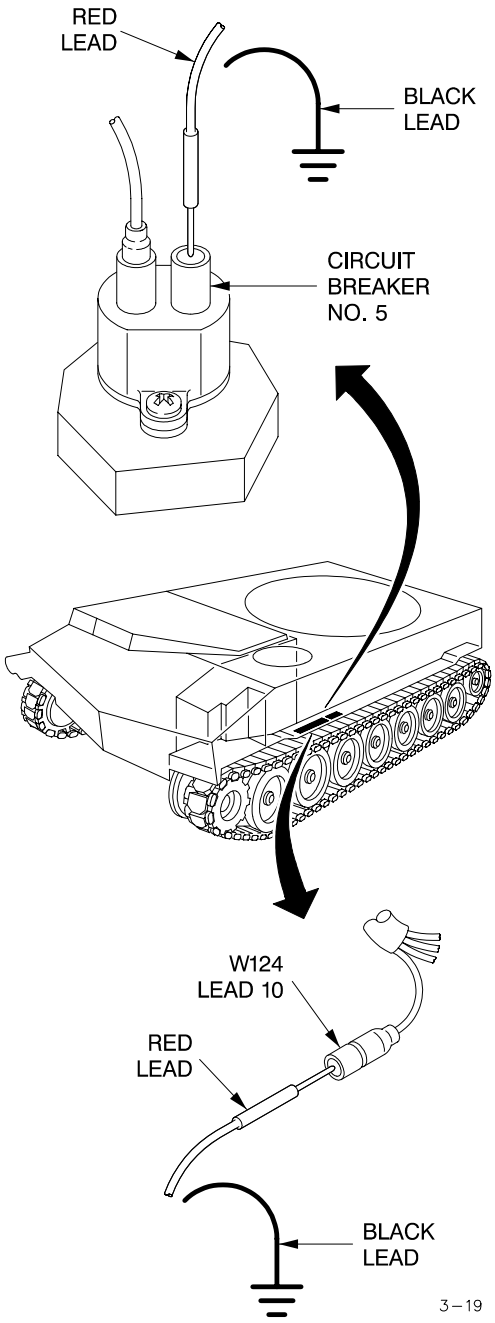

3-3 TROUBLESHOOTING CHART - CONTINUED

a. AIR CLEANER BLOWER MOTORS - CONTINUED	(1) AIR CLEANER BLOWER MOTORS FAIL TO OPERATE. - CONTINUED

CONTINUED FROM STEP H

yes / no

Replace circuit breaker 5 (CB5) (para 8-20).	Repair or replace harness W124 (para 8-82).

CONTINUED FROM STEP F

I

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W123 connector P1 to generator system and fuel pumps relay.
3. Disconnect harness W123 lead 415 from Y connector of harnesses W114 and W115.
4. Place red multimeter lead in harness W123 lead 415 and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
6. Check for voltage.

Is voltage present?

yes / no

Go to step K.

J

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W123 connector P1 from generator system and fuel pumps relay.
3. Check harness W123 lead 415 for continuity by placing one multimeter lead in harness W123 lead 415 and other lead in harness W123 connector P1 socket C.

Is continuity present?

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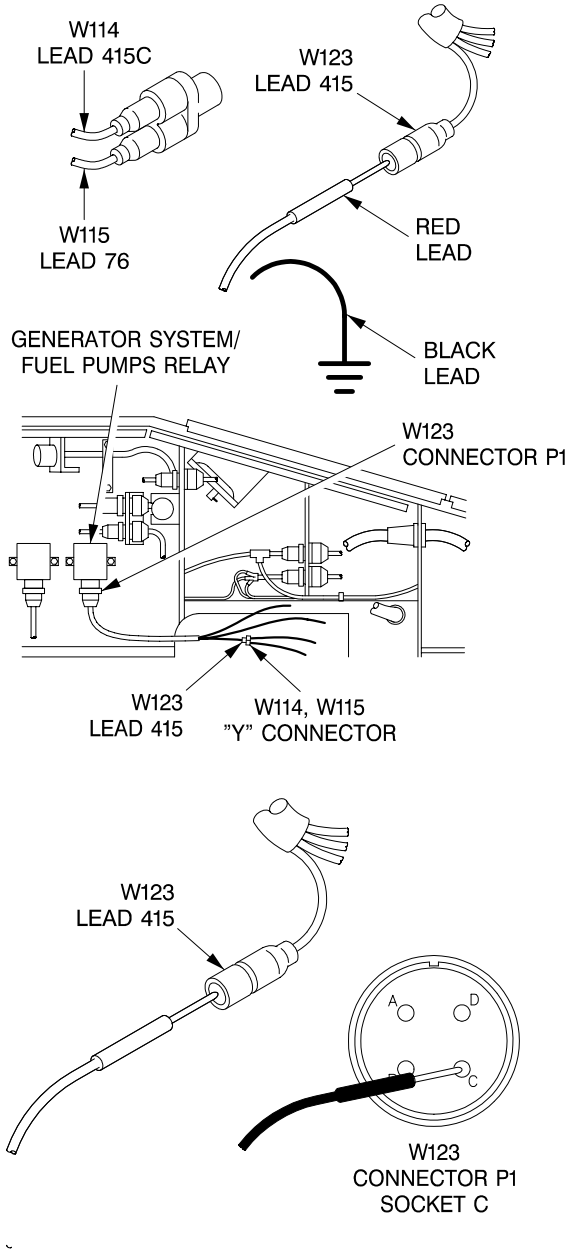

3-3 TROUBLESHOOTING CHART - CONTINUED

a. AIR CLEANER BLOWER MOTORS - CONTINUED	(1) AIR CLEANER BLOWER MOTORS FAIL TO OPERATE. - CONTINUED

CONTINUED FROM STEP J

yes

Replace generator system and fuel pumps relay (para 8-24).

no

Repair or replace harness W123 (para 8-81).

CONTINUED FROM STEP I

K

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W123 connector P1 to generator system and fuel pumps relay.
3. Reconnect harness W123 lead 415 to Y-connector of harnesses W114 and W115.
4. Disconnect harness W114 lead 415C from lead 415A of neutral safety switch.
5. Place multimeter red lead in harness W114 lead 415C and other lead to ground.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
7. Check for voltage.

Is voltage present?

yes

Repair or replace harness W114 (para 8-73).

no

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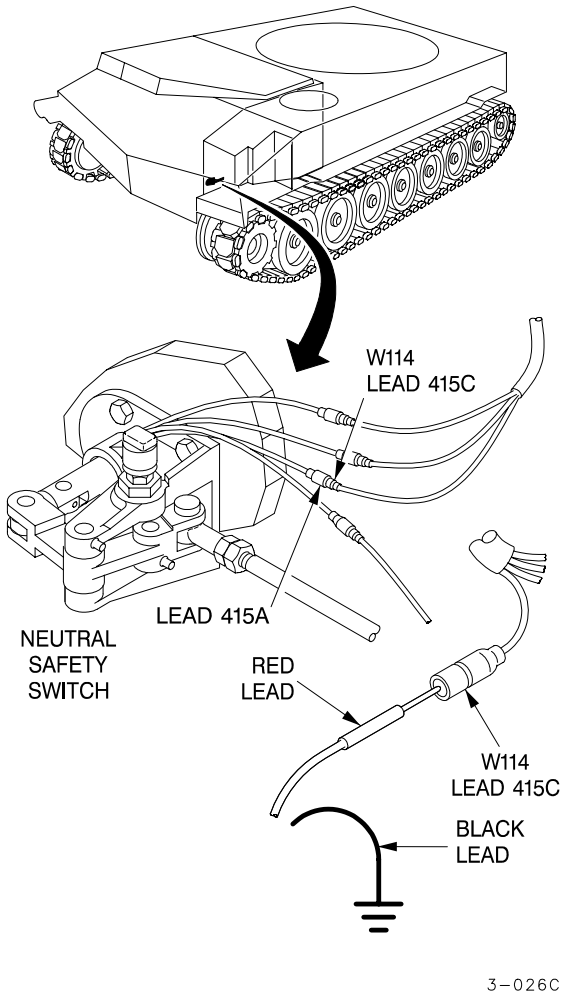


3-3 TROUBLESHOOTING CHART - CONTINUED

a. AIR CLEANER BLOWER MOTORS - CONTINUED	(1) AIR CLEANER BLOWER MOTORS FAIL TO OPERATE. - CONTINUED

CONTINUED FROM STEP K

L

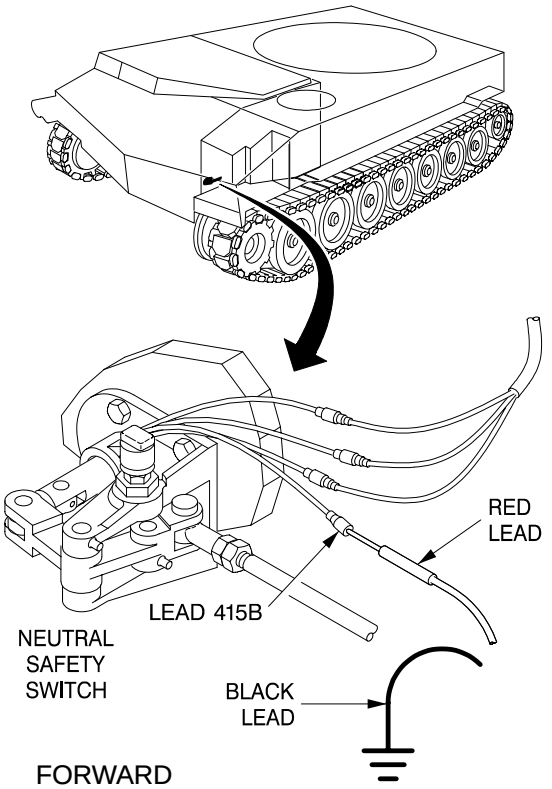
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W114 lead 415C to neutral safety switch lead 415A.
3. Disconnect neutral safety switch lead 415B from harness W122 lead 415F.
4. Place red multimeter lead in neutral safety switch lead 415B connector and other lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
6. Check for voltage.

Is voltage present?

yes

no

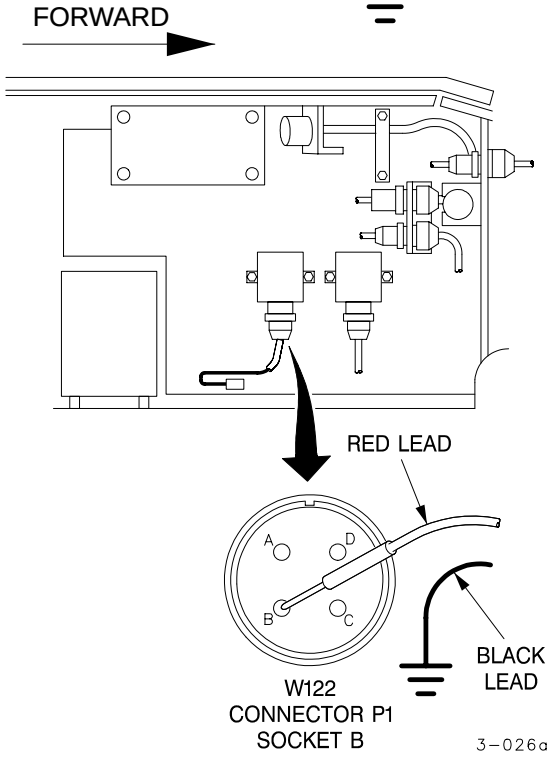
Replace neutral safety switch (para 9-1).



M

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W122 lead 415F to neutral safety switch lead 415B.
3. Disconnect harness W122 connector P1 from air cleaner blower motor relay.
4. Place multimeter red lead in harness W122 connector P1 socket B and other lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
6. Check for voltage.

Is voltage present?



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3-3 TROUBLESHOOTING CHART - CONTINUED

a. AIR CLEANER BLOWER MOTORS - CONTINUED	(1) AIR CLEANER BLOWER MOTORS FAIL TO OPERATE. - CONTINUED

CONTINUED FROM STEP M

yes / no

Repair or replace harness W122 (para 8-82).

N

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Place multimeter red lead in harness W122 connector P1 socket A and black lead to ground.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
4. Check for voltage.

Is voltage present?

yes / no

Go to step Q.

O

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W122 lead 415A from circuit breaker No. 7 (CB7).
3. Place multimeter red lead in circuit breaker No. 7 (CB7) connector and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
5. Check for voltage.

Is voltage present?

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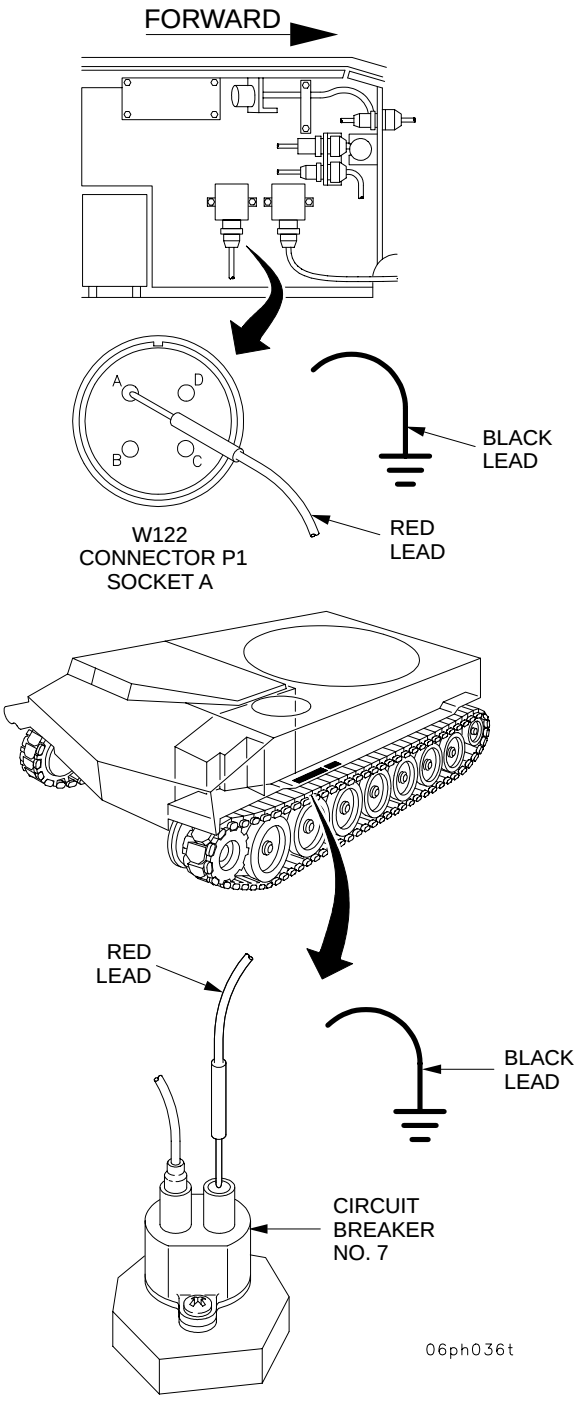


3-3 TROUBLESHOOTING CHART - CONTINUED

a. AIR CLEANER BLOWER MOTORS - CONTINUED	(1) AIR CLEANER BLOWER MOTORS FAIL TO OPERATE. - CONTINUED

CONTINUED FROM STEP O

yes / no

Repair or replace harness W122 (para 8-80).

P

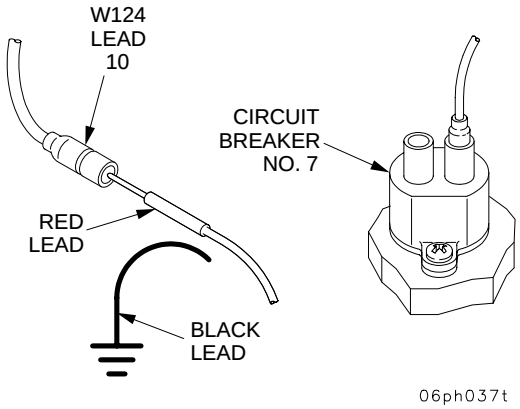
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W122 lead 415A to circuit breaker 7 (CB7).
3. Disconnect harness W124 lead 10 from circuit breaker 7 (CB7).
4. Place red multimeter lead in harness W124 lead 10 and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
6. Check for voltage.

Is voltage present?

yes / no

Replace circuit breaker 7 (para 8-20).

Repair or replace harness W124 (para 8-82).



3-3 TROUBLESHOOTING CHART - CONTINUED

a. AIR CLEANER BLOWER MOTORS - CONTINUED	(1) AIR CLEANER BLOWER MOTORS FAIL TO OPERATE. - CONTINUED

CONTINUED FROM STEP N

Q

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W122 connector P1 to air cleaner blower motor relay.
3. Disconnect harness W122 lead 415 from harness W119 lead 415.
4. Place multimeter red lead on harness W122 lead 415 connector pin and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
6. Check for voltage.

Is voltage present?

yes

Go to step U.

no

R

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W122 connector P1 from air cleaner blower motor relay.
3. Check for continuity by placing one multimeter lead in harness W122 lead 415 and the other lead in harness W122 connector P1 socket C.

Is continuity present?

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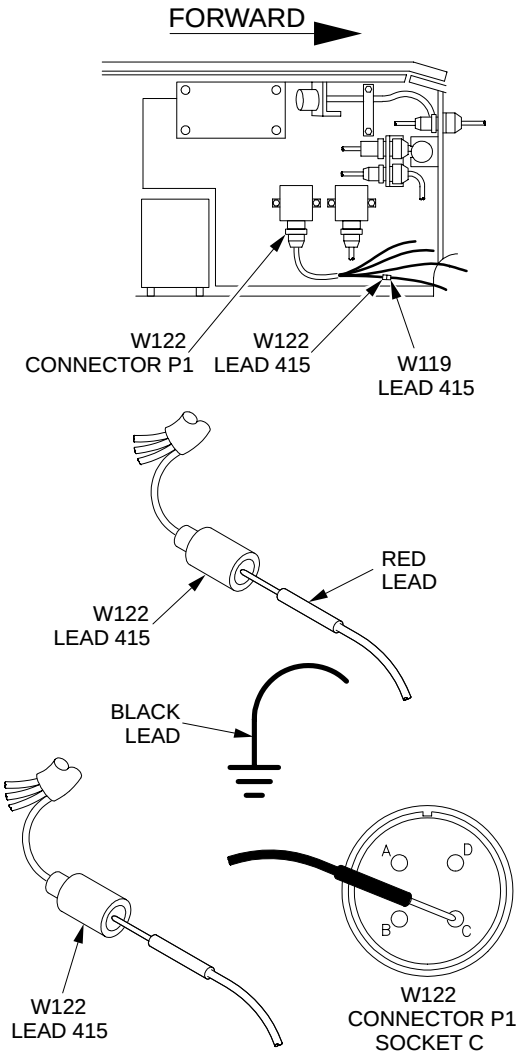


3-3 TROUBLESHOOTING CHART - CONTINUED

a. AIR CLEANER BLOWER MOTORS - CONTINUED	(1) AIR CLEANER BLOWER MOTORS FAIL TO OPERATE. - CONTINUED

CONTINUED FROM STEP R

yes / no

Repair or replace harness W122 (para 8-80).

S

1. Place one multimeter lead in harness W122 connector P1 socket D and the other lead to ground.
2. Check for continuity.

Is continuity present?

yes / no

Replace air cleaner blower motor relay (para 8-25).

T

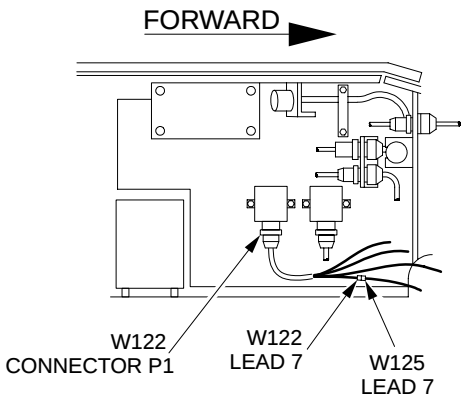
1. Disconnect harness W122 lead 7 from harness W125 lead 7.
2. Place one multimeter lead in harness W122 lead 7 and the other lead in harness W122 connector P1 socket D.
3. Check for continuity.

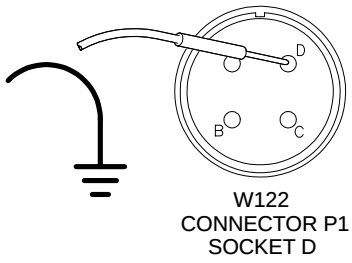
Is continuity present?

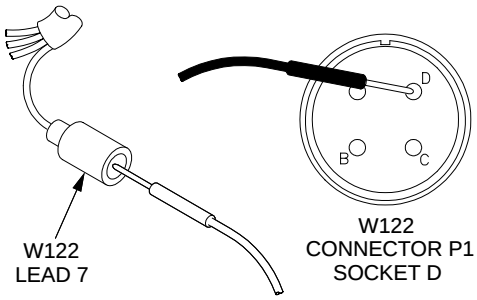
yes / no

Repair or replace harness W125 (para 8-83).

Repair or replace harness W122 (para 8-80).







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3-3 TROUBLESHOOTING CHART - CONTINUED

a. AIR CLEANER BLOWER MOTORS - CONTINUED	(1) AIR CLEANER BLOWER MOTORS FAIL TO OPERATE. - CONTINUED

CONTINUED FROM STEP Q

U

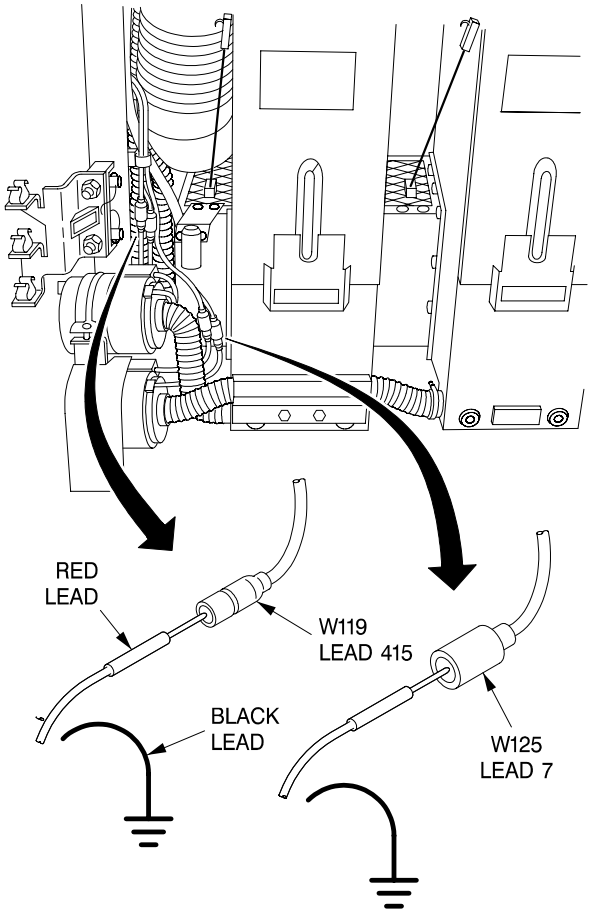
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W122 lead 415 to harness W119 lead 415.
3. Disconnect both harness W119 leads 415 from air cleaner blower motors.
4. Place red multimeter lead in each harness W119 lead 415 connectors (one at a time) and place black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
6. Check for voltage.

Is voltage present?

yes

no

Repair or replace harness W119 (para 8-78).



3-023B

V

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect both harness W119 leads 415 to air cleaner blower motors.
3. Remove jumper in harness W123 lead 415B and connector lead 415B to harness W114 lead 415.
4. Install driver's instrument panel front cover (para 8-14).
5. Disconnect harness W125 lead 7 from both air cleaner blower motors.
6. Place one multimeter lead in W125 lead 7 (one at a time) and other lead to ground.
7. Check for continuity.

Is continuity present?

yes

no

Replace air cleaner blower motors (para 5-6).

Repair or replace harness W125 (para 8-83).

END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

a. AIR CLEANER BLOWER MOTORS - CONTINUED	(2) ONE AIR CLEANER BLOWER MOTOR FAILS TO OPERATE. Other blower motor operates properly.

INITIAL SETUP

Tools

General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests.
16 AWG wire may be used as an extension)

A

1. Shut engine off and turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W119 lead 415 from faulty air cleaner blower motor.
3. Disconnect harness W119 lead 415 connector from W122 lead 415.
4. Check for continuity from faulty motor connector of W119 and lead 415 going to W122.

Is continuity indicated?

yes → Repair or replace harness W119 lead 415 to faulty air cleaner blower motor (para 8-78).

no

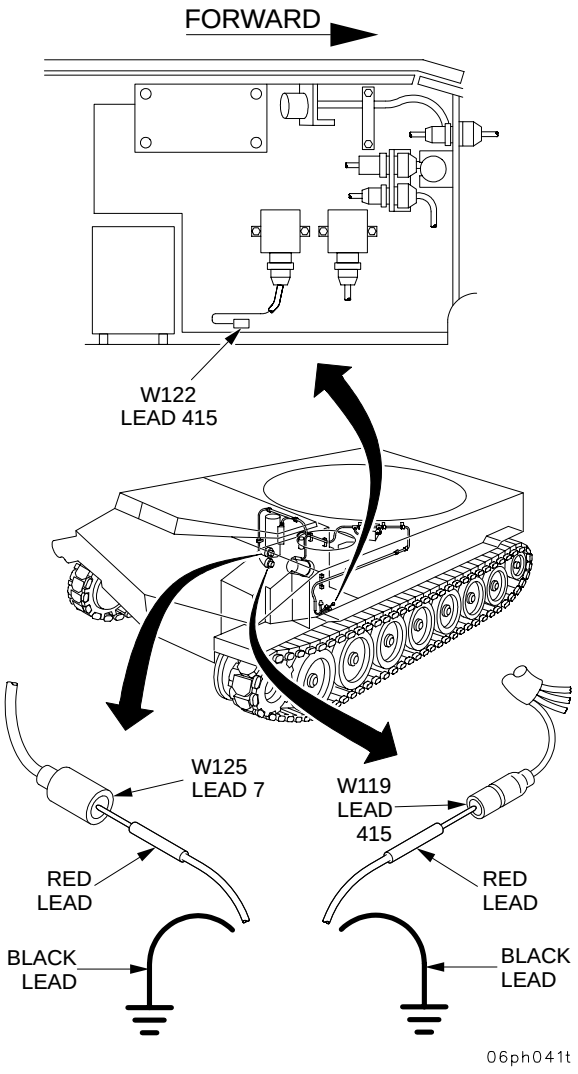
B

1. Reconnect harness W119 lead 415 to faulty air cleaner blower motor.
2. Disconnect harness W125 lead 7 from faulty air cleaner blower motor.
3. Check lead 7 for continuity from harness W125 connector pin to ground.

Is continuity present?

yes → Repair or replace harness W125 lead 7 from faulty air cleaner blower motor (para 8-83).

no → Replace faulty air cleaner blower motor (para 5-6).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

a. AIR CLEANER BLOWER MOTORS - CONTINUED	(3) AIR CLEANER BLOWER MOTORS FAIL TO SHUT OFF WHEN TRANSMISSION IS IN NEUTRAL AND ENGINE IS RUNNING.

INITIAL SETUP

Tools

General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

1. Install engine oil pressure switch jumper to ground.
2. Disconnect harness W122 lead 415F from neutral safety switch lead 415B.
3. Place multimeter red lead on neutral safety switch lead 415B connector pin and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
5. Check for voltage.

Is voltage present?

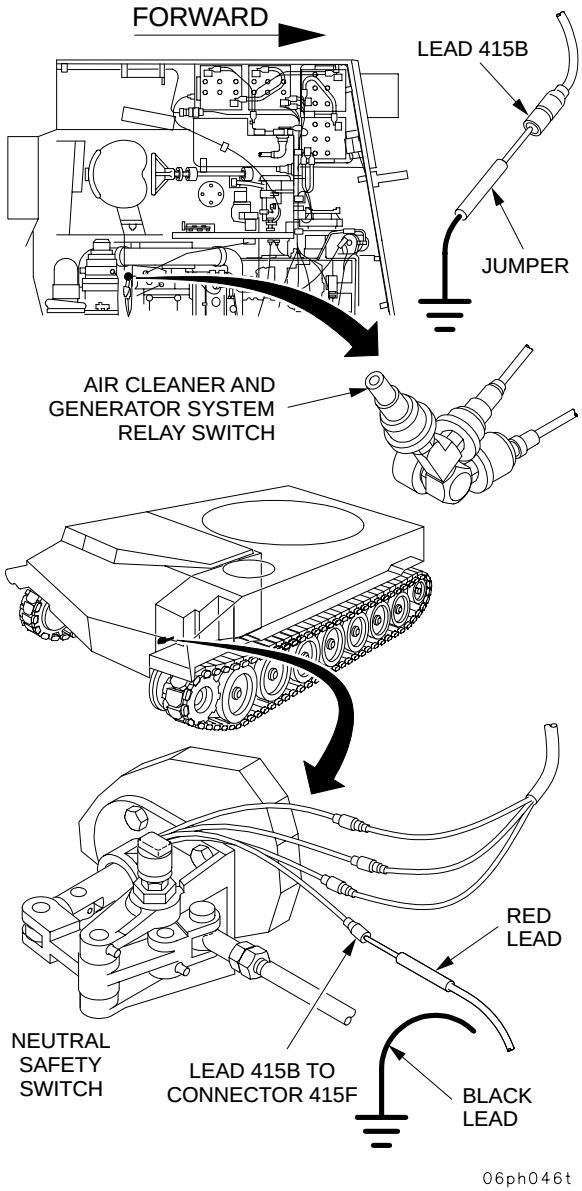
yes

Adjust or replace neutral safety switch (para 9-1).

no

Replace air cleaner blower motor relay (para 8-25).

END OF TASK

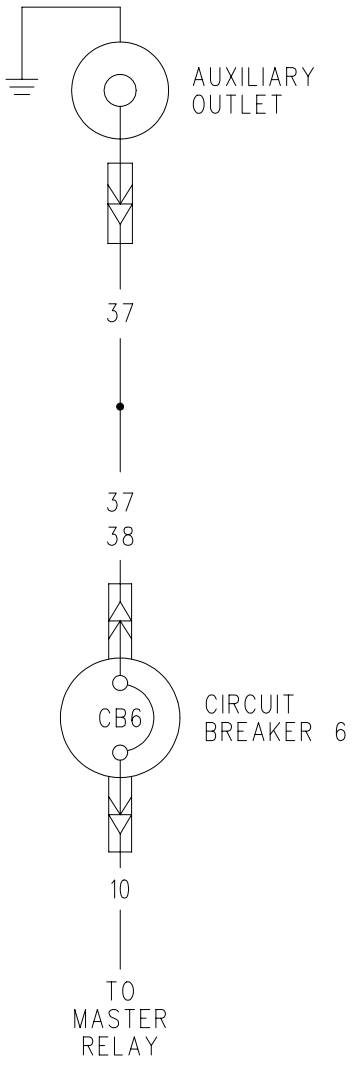


3-3 TROUBLESHOOTING CHART - CONTINUED

b. AUXILIARY OUTLET

The auxiliary outlet is located on the driver's control panel. The auxiliary outlet circuit consists of the outlet, circuit breaker number 6 (CB6) and related electrical wiring. The diagram below shows the relationship of these components.

The primary use of the auxiliary outlet is for the vehicle's night viewer. When the night viewer is installed, the power cord is plugged into the auxiliary outlet. By turning on the vehicle MASTER switch, 24 V dc from the batteries is applied through the master relay to circuit breaker 6 which supplies the voltage to the auxiliary outlet.



3-3 TROUBLESHOOTING CHART - CONTINUED

b. AUXILIARY OUTLET - CONTINUED (1) AUXILIARY OUTLET FAILS TO OPERATE.

INITIAL SETUP

Tools

General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)

A

1. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
2. Place multimeter red lead on auxiliary outlet center contact and black lead to ground.
3. Check for voltage.

Is voltage present?

yes

Troubleshoot item being connected to auxiliary outlet.

no

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove driver's instrument panel from mounting for access to auxiliary outlet socket connector (para 8-12).
3. Disconnect lead 37 from auxiliary outlet connector.
4. Place multimeter red lead in lead 37 connector socket and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Replace auxiliary outlet (para 8-12).

no

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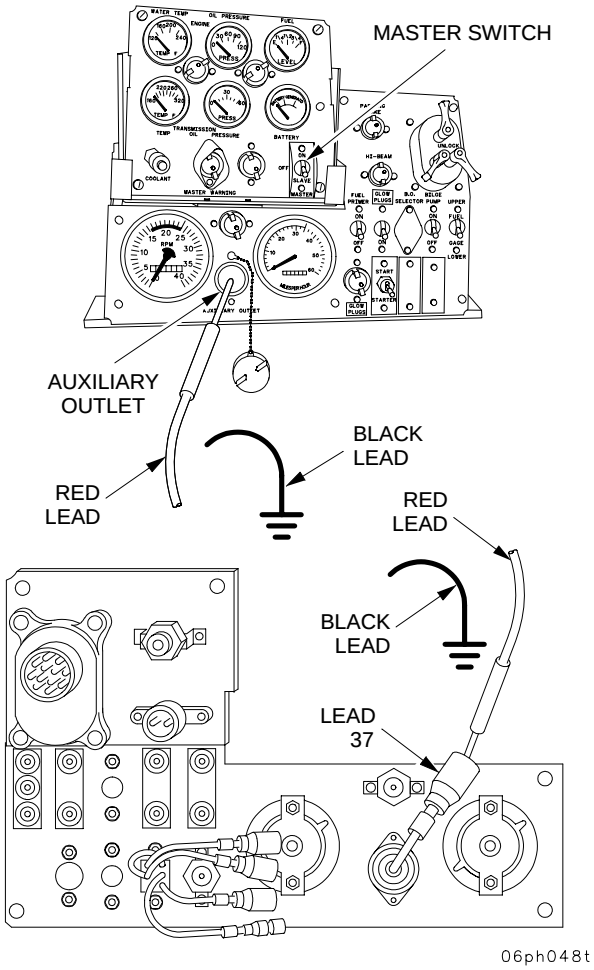


3-3 TROUBLESHOOTING CHART - CONTINUED

b. AUXILIARY OUTLET - CONTINUED (1) AUXILIARY OUTLET FAILS TO OPERATE. - CONTINUED

CONTINUED FROM STEP B

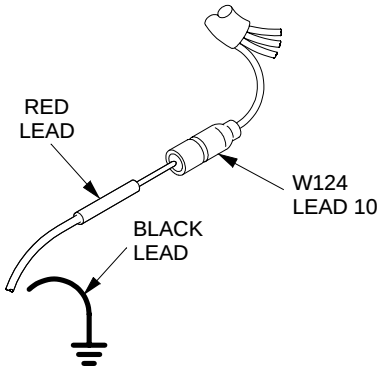
C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect lead 37 to auxiliary outlet connector.
3. Disconnect harness W124 lead 10 from circuit breaker no. 6 (CB6).
4. Place multimeter red lead in lead 10 connector socket and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes / no

Repair or replace harness W124 (para 8-82).



D

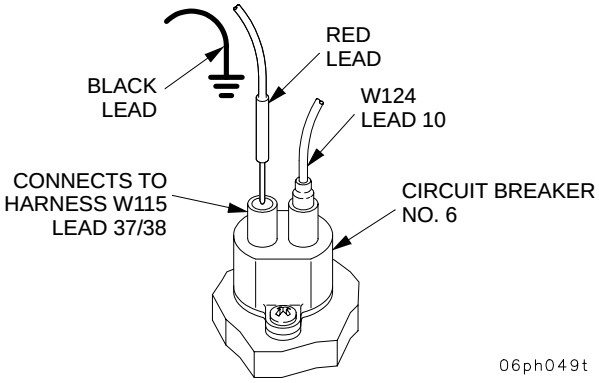
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W124 lead 10 to circuit breaker no. 6 (CB6) connector.
3. Disconnect harness W115 lead 37/38 from circuit breaker no. 6 (CB6).
4. Place multimeter red lead on circuit breaker connector pin and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes / no

Replace circuit breaker no. 6 (CB6) (para 8-20).

Repair or replace harness W115 (para 8-74).



END OF TASK

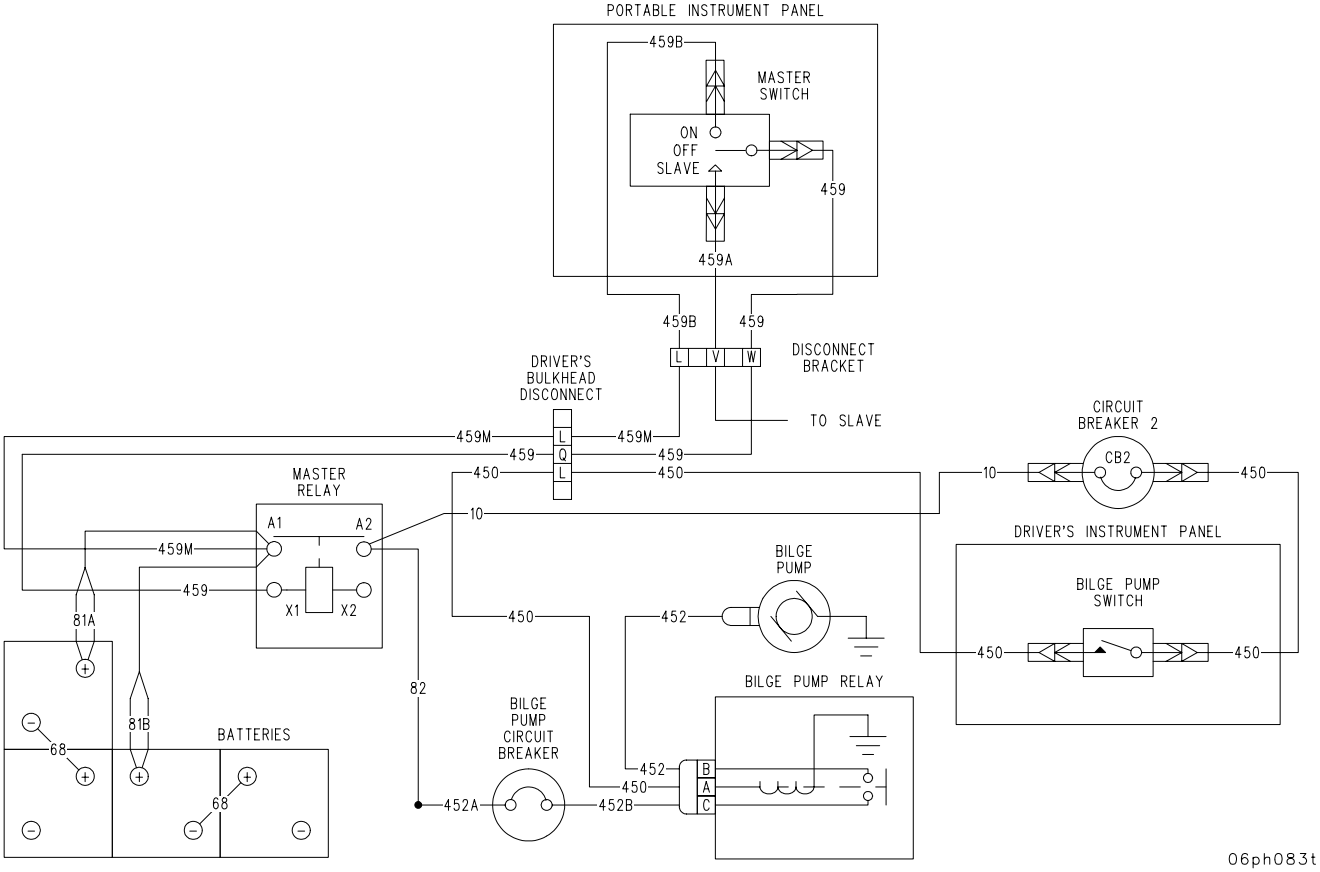
3-3 TROUBLESHOOTING CHART - CONTINUED

c. BILGE PUMP

The bilge pump is used to evacuate water from the engine compartment, usually after fording. The bilge pump is not to be run for more than one minute in a dry compartment or fifteen minutes in a wet compartment unless the engine is running.

The bilge pump system consists of the bilge pump, bilge pump relay, bilge pump circuit breaker, circuit breaker number 2 (CB2), and related electrical wiring.

To operate the bilge pump, the vehicle MASTER switch must be ON. By turning on the vehicle MASTER switch, power from the batteries travels through the MASTER relay to circuit breaker 2 (CB2). From circuit breaker 2 (CB2), the power travels to the bilge pump switch. Once the bilge pump switch is turned on, the power travels through the bilge pump circuit breaker to the bilge pump relay. The bilge pump relay sends the power to the bilge pump and the bilge pump is energized.



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3-3 TROUBLESHOOTING CHART - CONTINUED

c. BILGE PUMP - CONTINUED	(1) BILGE PUMP FAILS TO OPERATE. Other electrical components operate.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Powerpack removed (para 4-1)

Personnel Required
Two

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W113 lead 452 from bilge pump connector.
3. Place multimeter red lead on harness W113 lead 452 connector socket and black lead on ground.
4. Turn vehicle MASTER and BILGE PUMP switches ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Replace bilge pump (para 18-5).

no

NOTE

It may be necessary to remove the bilge pump relay from its mounting bracket to make it easier to disconnect and reconnect harness.

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W113 connector P3 from bilge pump relay.
3. Place multimeter red lead in harness W113 connector P3 socket C and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Go to step E.

no

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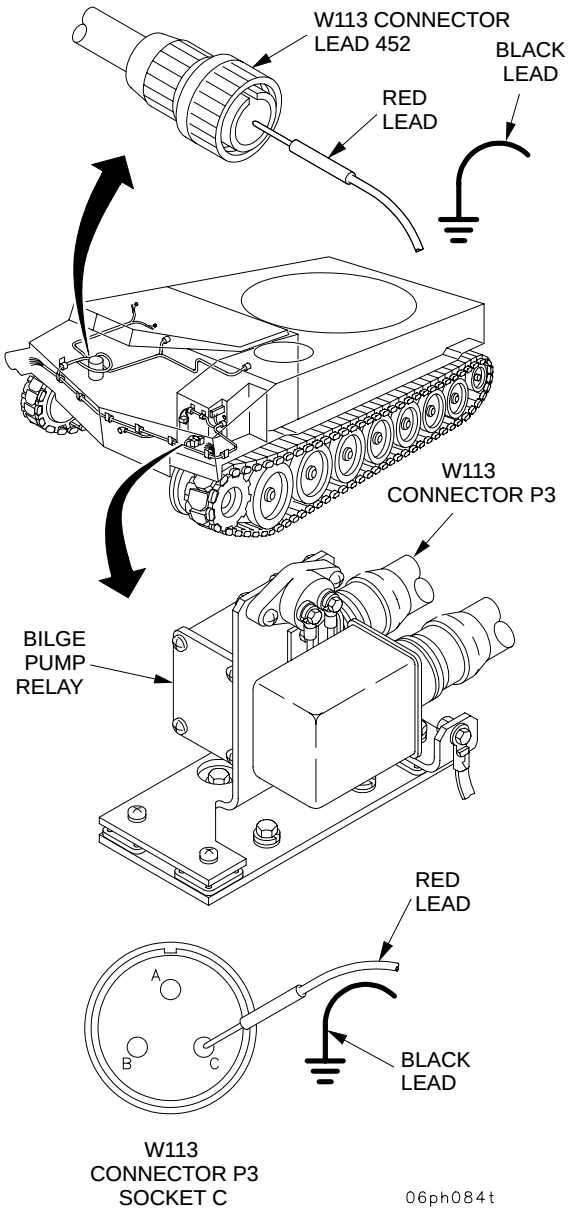


3-3 TROUBLESHOOTING CHART - CONTINUED

c. BILGE PUMP – CONTINUED	(1) BILGE PUMP FAILS TO OPERATE. Other electrical components operate. – CONTINUED

CONTINUED FROM STEP B

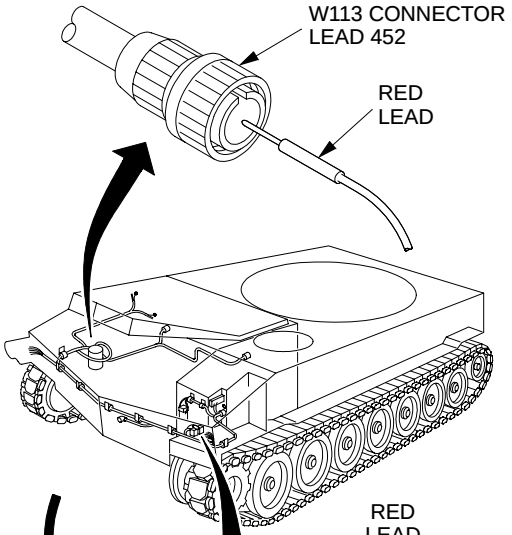
C

1. Turn BILGE PUMP switch ON (TM 9-2350-314-10).
2. Place multimeter red lead in harness W113 connector P3 socket A and black lead on ground and check for voltage.

Is voltage present?

yes

no → Go to step G.



D

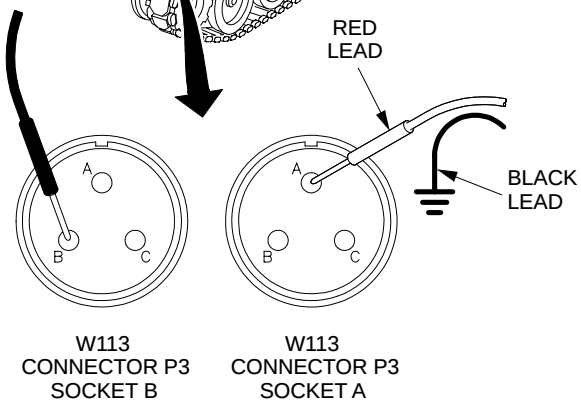
1. Turn vehicle MASTER and BILGE PUMP switches OFF (TM 9-2350-314-10).
2. Check continuity of harness W113, by placing one multimeter lead in harness W113 connector lead 452 at bilge pump and other lead in harness W113 connector P3 socket B.

Is continuity present?

yes

no → Repair or replace harness W113 (para 8-72).

Replace bilge pump relay (para 8-23).



CONTINUED FROM STEP B

E

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W105 lead 452A from bilge pump circuit breaker.
3. Place multimeter red lead on harness W105 lead 452A and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

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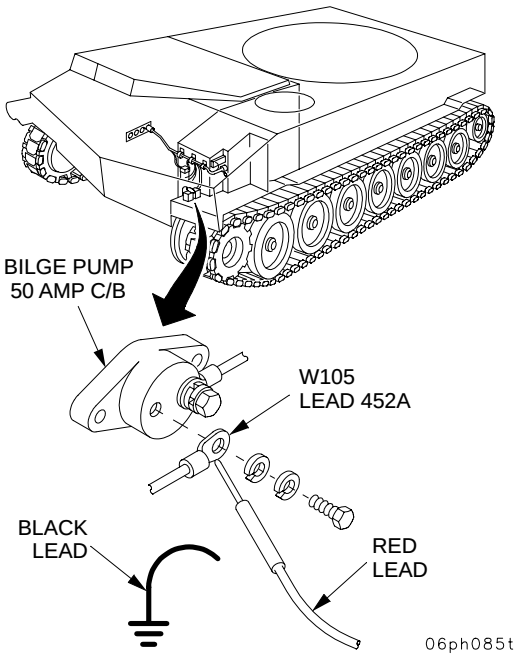

3-3 TROUBLESHOOTING CHART - CONTINUED

c. BILGE PUMP - CONTINUED	(1) BILGE PUMP FAILS TO OPERATE. Other electrical components operate. - CONTINUED

CONTINUED FROM STEP E

yes

no

Repair or replace harness W105 (para 8-64).

F

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W105 lead 452A to bilge pump circuit breaker connector.
3. Disconnect harness W113 lead 452B from bilge pump circuit breaker connector.
4. Place multimeter red lead on circuit breaker connector terminal and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

no

Repair or replace harness W113 (para 8-72).

Replace bilge pump circuit breaker (para 8-23).

CONTINUED FROM STEP C

G

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W124 lead 10 from circuit breaker no. 2.
3. Place multimeter red lead in harness W124 lead 10 connector socket and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

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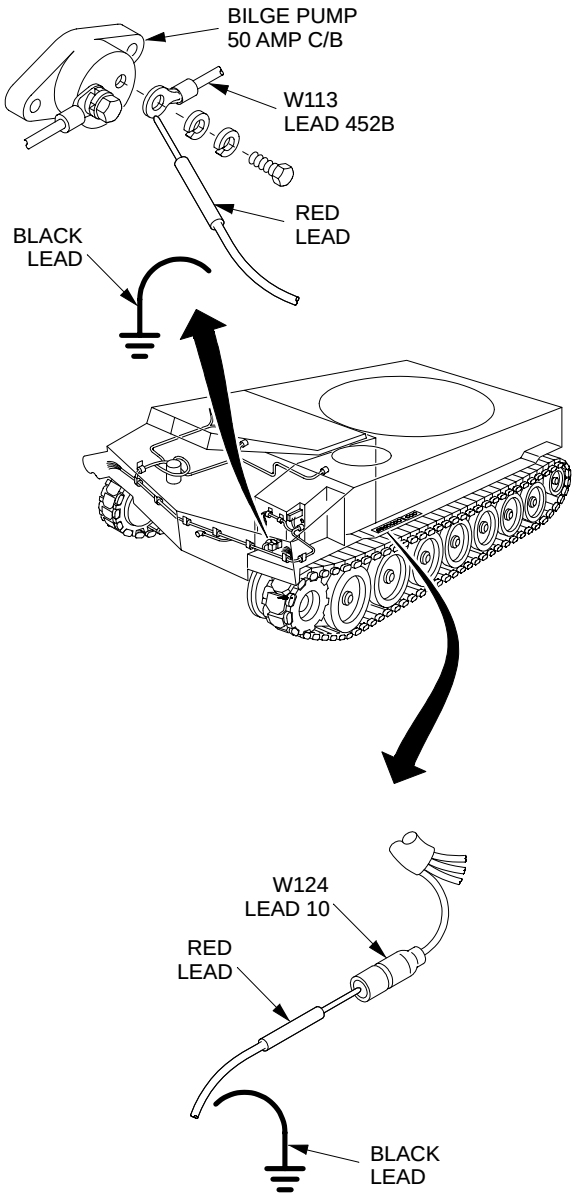

3-3 TROUBLESHOOTING CHART - CONTINUED

c. BILGE PUMP - CONTINUED	(1) BILGE PUMP FAILS TO OPERATE. Other electrical components operate. - CONTINUED

CONTINUED FROM STEP G

yes / no

Repair or replace harness W124 (para 8-82).

H

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W124 lead 10 to circuit breaker no. 2.
3. Disconnect harness W120 lead 450 from circuit breaker no. 2.
4. Place multimeter red lead on circuit breaker connector pin and black lead on ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes / no

Replace circuit breaker 2 (para 8-20).

I

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W120 lead 450 to circuit breaker no. 2.
3. Disconnect harness W120 lead 450 from bilge pump switch.
4. Place multimeter red lead in harness W120 lead 450 connector socket and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes / no

Repair or replace harness W120 (para 8-79).

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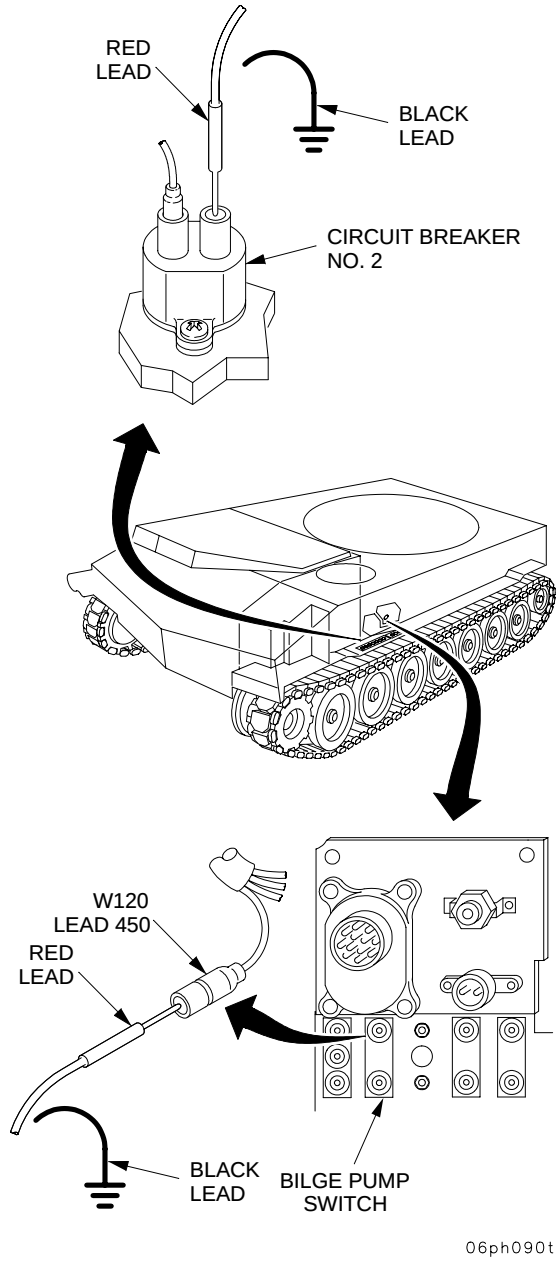


3-3 TROUBLESHOOTING CHART - CONTINUED

c. BILGE PUMP - CONTINUED	(1) BILGE PUMP FAILS TO OPERATE. Other electrical components operate. - CONTINUED

CONTINUED FROM STEP I

J

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 lead 450 from bilge pump switch.
3. Turn bilge pump switch ON (TM 9-2350-314-10).
4. Check for continuity across bilge pump switch.

Is continuity present?

yes

Replace bilge pump switch (para 8-12).

no

K

1. Reconnect harness W120 lead 450 to bilge pump switch connector.
2. Disconnect harness W115 connector P1 from harness W113 bulkhead connector J1.
3. Check harness W113 for continuity from connector P3 socket A to connector J1 pin L.

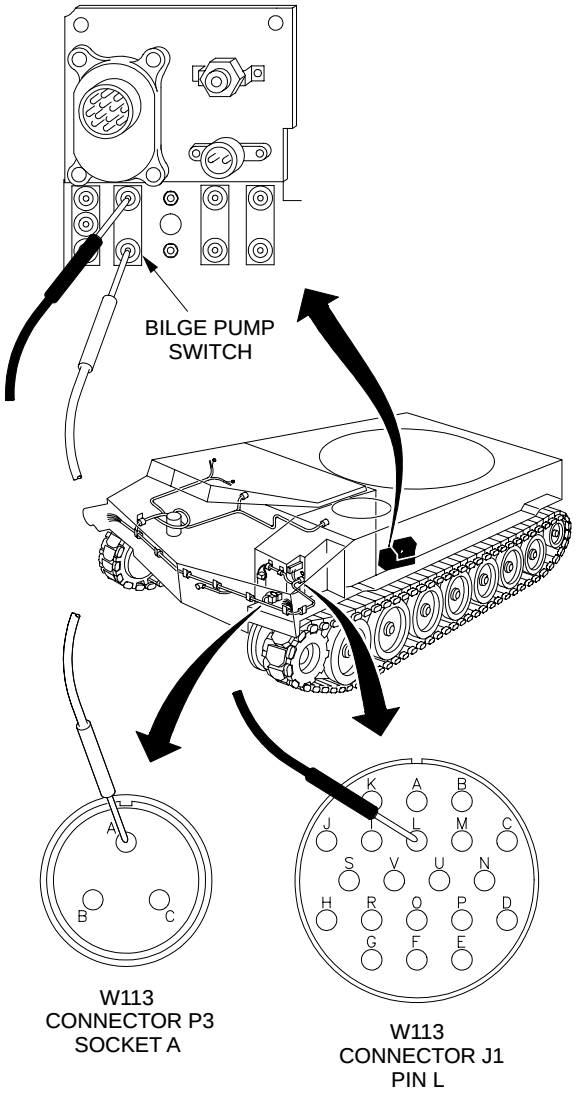
Is continuity present?

yes

Repair or replace harness W115 (para 8-74).

no

Repair or replace harness W113 (para 8-72).



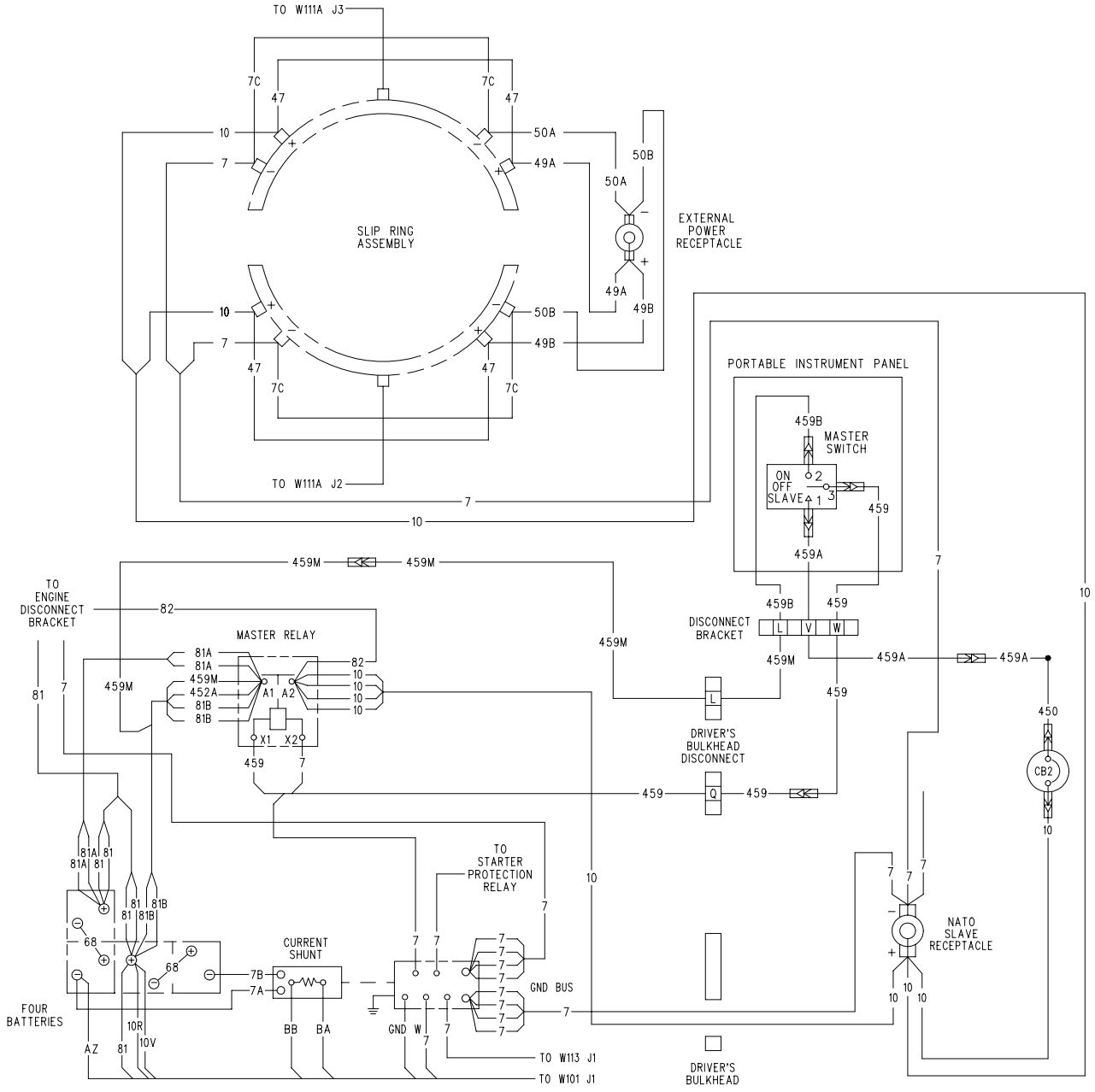
END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

d. CAB POWER

The cab power circuit consists of the vehicle batteries, the master relay, vehicle MASTER switch, external power and NATO slave receptacles, circuit breaker number 2 (CB2) , hull slip ring assembly, and related electrical wiring. The diagram below shows the relationship of these components.

When the vehicle MASTER switch is ON, 24 V dc is supplied from the batteries through the master relay to the hull slip ring providing power to the cab. The cab can also receive power from another vehicle by connecting a slave cable to either the vehicle's NATO slave or external power receptacles and turning on the other vehicle's MASTER switch.



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3-3 TROUBLESHOOTING CHART - CONTINUED

d. CAB POWER - CONTINUED	(1) NO POWER TO CAB SEGMENT BOARDS.

INITIAL SETUP

Tools

General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)

A

1. Check the NATO receptacle for voltage by placing multimeter red lead in NATO receptacle socket and black lead on ground.
2. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

yes

no

Go to para 3-3.a(1).

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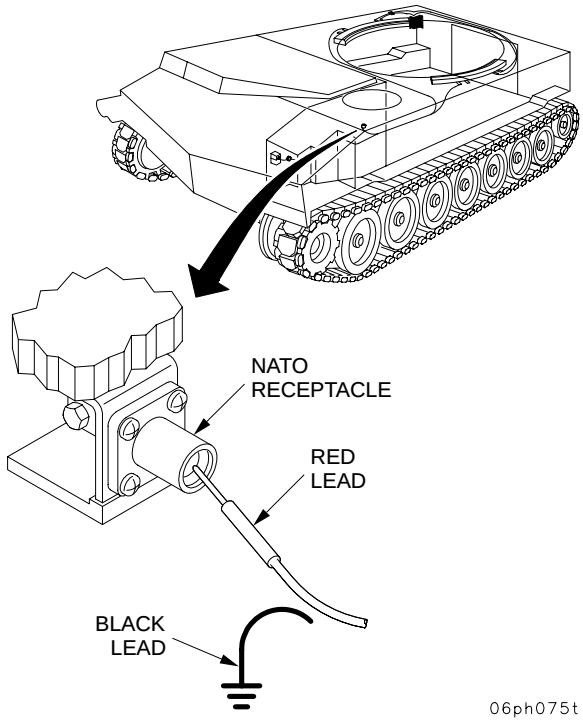

3-3 TROUBLESHOOTING CHART - CONTINUED

d. CAB POWER – CONTINUED	(1) NO POWER TO CAB SEGMENT BOARDS. – CONTINUED

CONTINUED FROM STEP A

B Check at left segment board for voltage by placing multimeter red lead on harness W117 leads 10 terminals (E5–E6) and black lead on harness W116 leads 7 terminals (E5–E6).

Is voltage present?

yes

no

Go to step H.

C Check at right segment board for voltage by placing multimeter red lead on harness W117 leads 10 terminal (E7–E8) and black lead on harness W116 leads 7 terminal (E7–E8).

Is voltage present?

yes

no

Go to step H.

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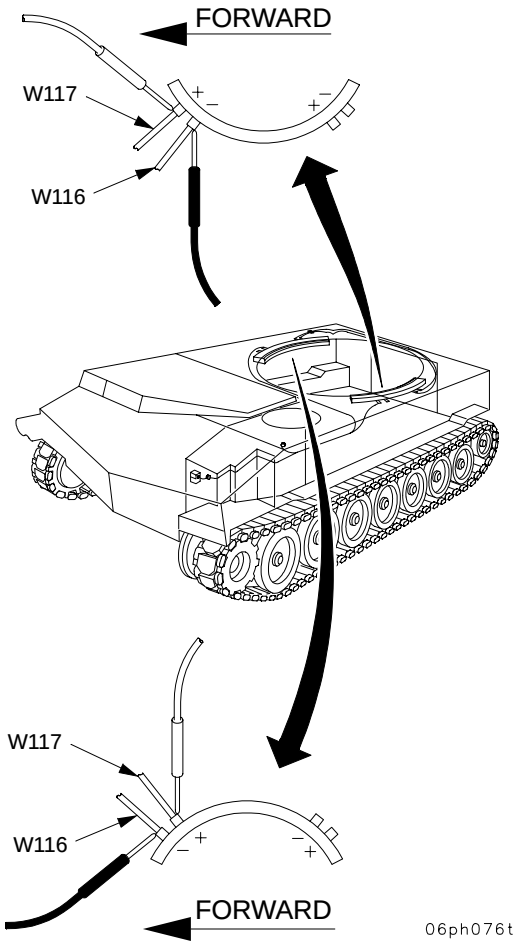


3-3 TROUBLESHOOTING CHART - CONTINUED

d. CAB POWER - CONTINUED (1) NO POWER TO CAB SEGMENT BOARDS. - CONTINUED

CONTINUED FROM STEP C

D

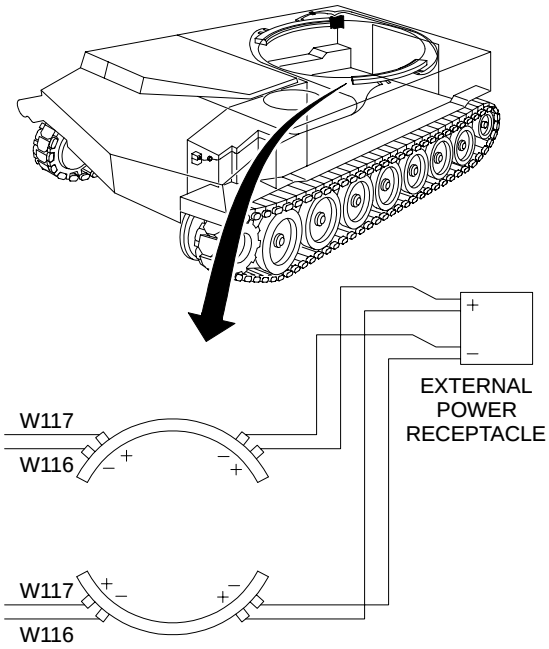
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect battery grounds from shunt located in battery compartment (para 8-33).
3. Disconnect leads E1-7C, E2-7C, E3-7C, and E4-7C from left and right segment boards (this is a dual wire lead).
4. Check leads for continuity by placing one multimeter lead on lead terminal E1-7C and other lead on lead terminal E2-7C.
5. Check leads for continuity by placing one multimeter lead on lead terminal E3-7C and other lead on lead terminal E4-7C.

Is continuity present at both points?

yes

no

Repair or replace faulty lead (para 8-86).



E

Using a multimeter, perform a shorts test (para 3-1.3) on leads by placing one multimeter lead on point one and other lead on point two.

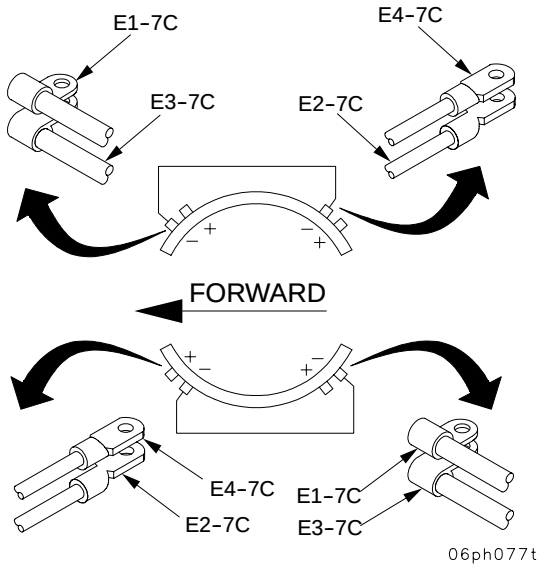
POINT ONE	POINT TWO	DO NOT CHECK
E1-7C	E3-7C, E4-7C	E2-7C
E2-7C	E3-7C, E4-7C	E1-7C
E3-7C	E1-7C, E2-7C	E4-7C
E4-7C	E1-7C, E2-7C	E3-7C

Are any shorts present?

yes

no

Repair or replace faulty lead (para 8-86).



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3-3 TROUBLESHOOTING CHART - CONTINUED

d. CAB POWER - CONTINUED (1) NO POWER TO CAB SEGMENT BOARDS. - CONTINUED

CONTINUED FROM STEP E

F

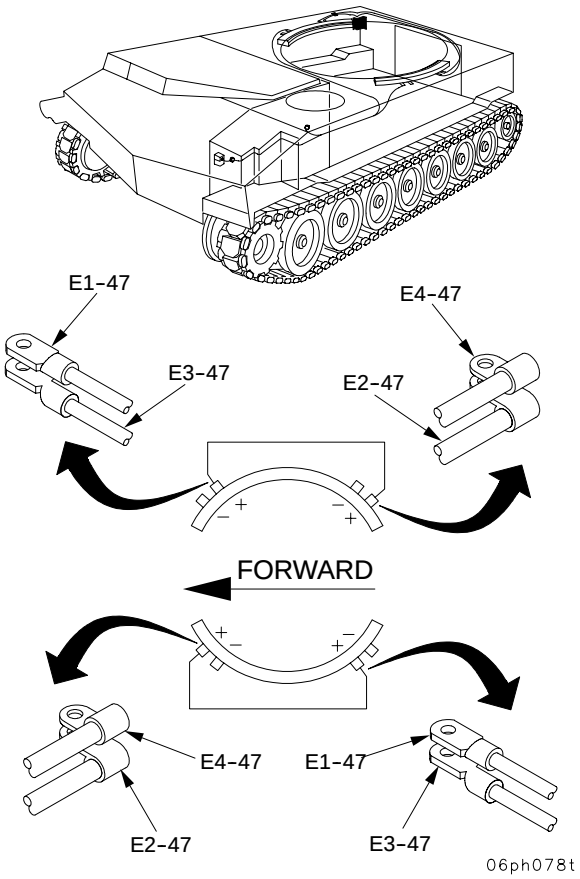
1. Remove leads E1-47, E2-47, E3-47, and E4-47 from left and right segment board (this is a dual wire lead).
2. Check leads for continuity by placing one multimeter lead on lead wire E1-47 and other lead on lead wire E2-47.
3. Check leads for continuity by placing one multimeter lead on lead wire E3-47 and other lead on lead wire E4-47.

Is continuity present at both points?

yes

no

Repair or replace faulty lead (para 8-85).



G Perform a shorts test (para 3-1.3) on leads by placing one multimeter lead on point one and other lead on point two.

POINT ONE	POINT TWO	DO NOT CHECK
E1-47	E3-47, E4-47	E2-47
E2-47	E3-47, E4-47	E1-47
E3-47	E1-47, E2-47	E4-47
E4-47	E1-47, E2-47	E3-47

Are any shorts present?

yes

no

Repair or replace lead (para 8-85).

Refer to TM 9-2350-314-20-2.

CONTINUED ON NEXT PAGE

3-3 TROUBLESHOOTING CHART - CONTINUED

d. CAB POWER - CONTINUED	(1) NO POWER TO CAB SEGMENT BOARDS. - CONTINUED

CONTINUED FROM STEP B OR C

H Check harness W117 wire 10 for voltage by placing multimeter red lead on harness W117 E7/E8 or E5/E6 and black lead to ground.

Is voltage present?

yes

no

Repair or replace harness W117 (para 8-76).

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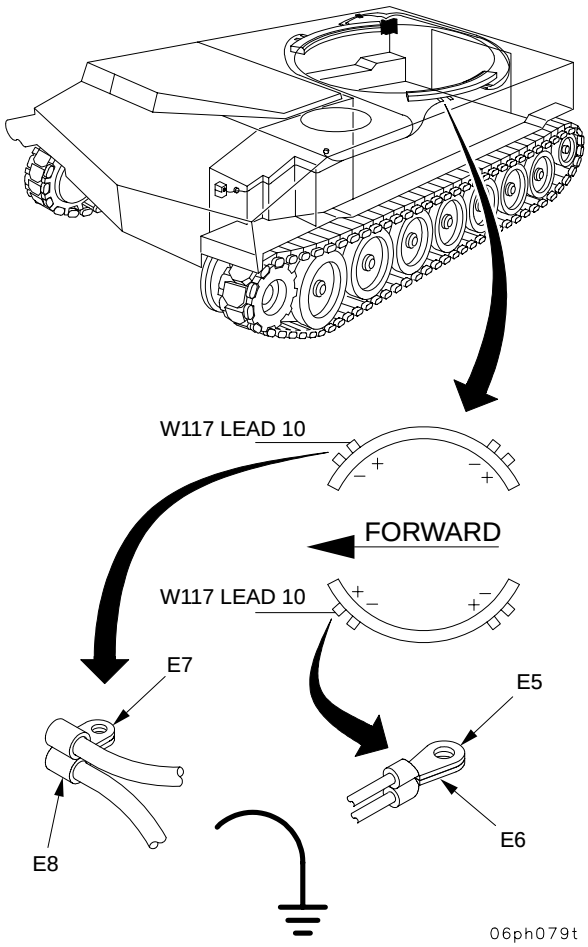


3-3 TROUBLESHOOTING CHART - CONTINUED

d. CAB POWER - CONTINUED	(1) NO POWER TO CAB SEGMENT BOARDS. - CONTINUED

CONTINUED FROM STEP H

I

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect battery ground (para 8-33).
3. Disconnect harnesses W116 lead 7 connector terminals E3, E4, E5, E6, E7, E8 (para 8-75) and W125 lead 7 connector terminal E12 (para 8-83).
4. Check each connector terminal (one at a time), except W125 lead 7 for continuity by placing one multimeter lead on connector terminal and placing other multimeter lead to ground.

Is continuity present?

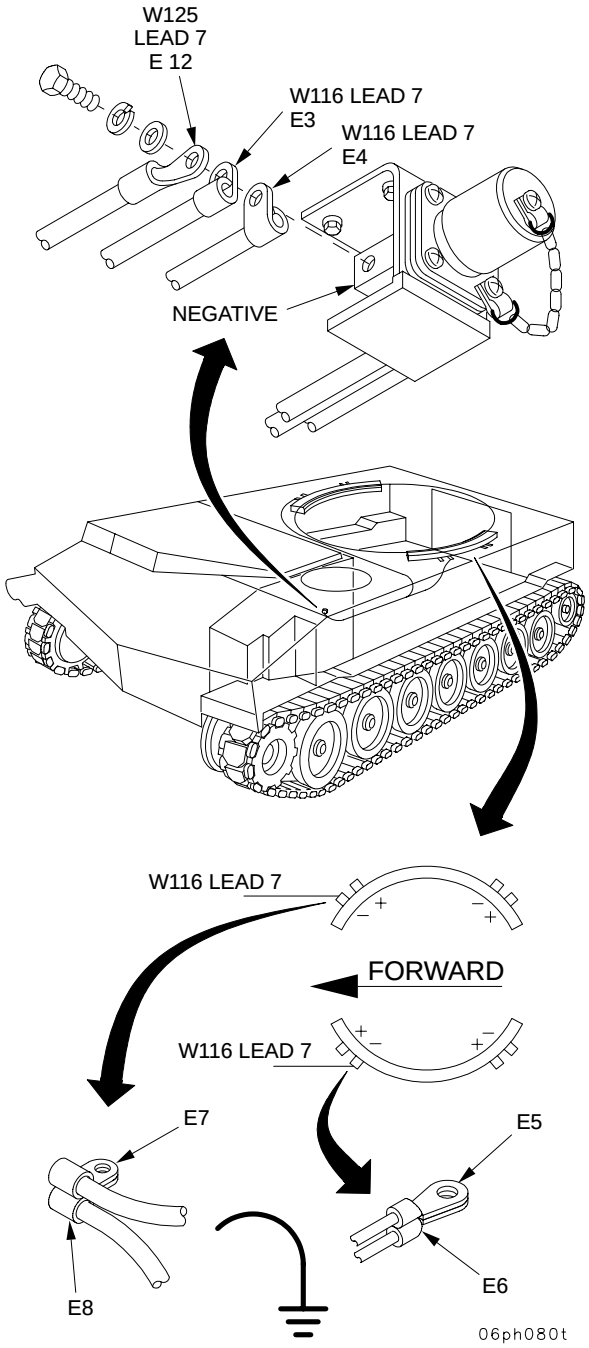
yes

Refer to TM 9-2350-314-20-2.

no

Repair or replace harness W116 (para 8-75).

END OF TASK

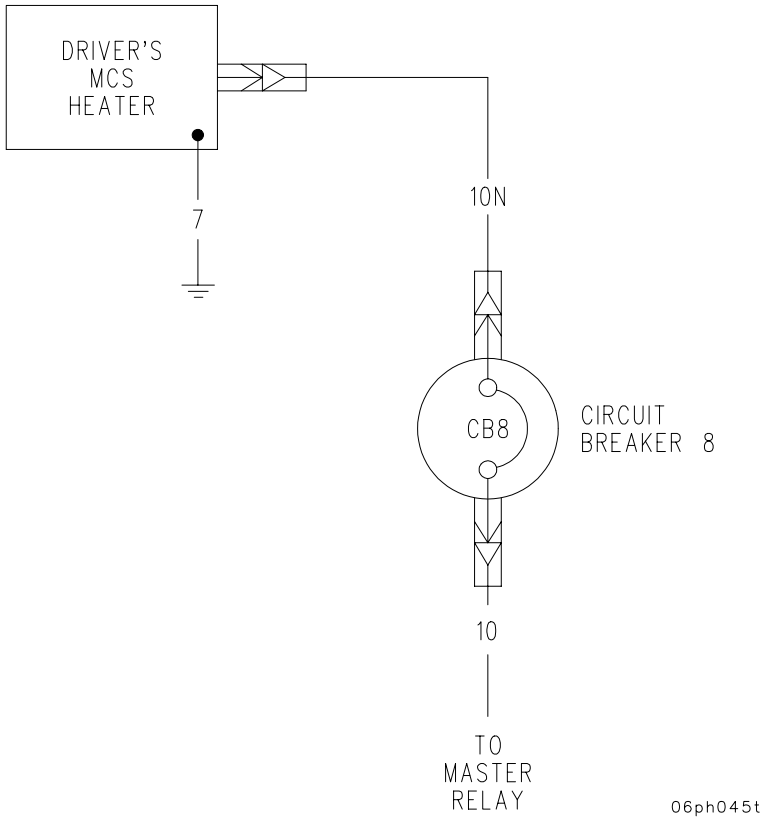


3-3 TROUBLESHOOTING CHART - CONTINUED

e. DRIVER'S MCS ELECTRICAL AIR HEATER (M3)

The driver's MCS heater system consists of the heater, circuit breaker number 8 (CB8), and related electrical wiring. The relationship of these components is shown in the diagram below.

To operate the MCS heater the vehicle MASTER switch must be ON. 24 V dc is supplied from the batteries, through the master relay to circuit breaker 8 (CB8). Circuit breaker 8 (CB8) applies the voltage to the MCS heater. The heater is controlled with a rheostat-type switch.



3-3 TROUBLESHOOTING CHART - CONTINUED

e. DRIVER'S MCS ELECTRICAL AIR HEATER (M3) – CONTINUED	(1) DRIVER'S MCS ELECTRICAL AIR HEATER (M3) FAILS TO OPERATE.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)

A

1. Disconnect harness lead 10N from driver's MCS heater connector.
2. Place multimeter red lead in lead 10N connector socket and black lead to ground.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Go to step D.

no

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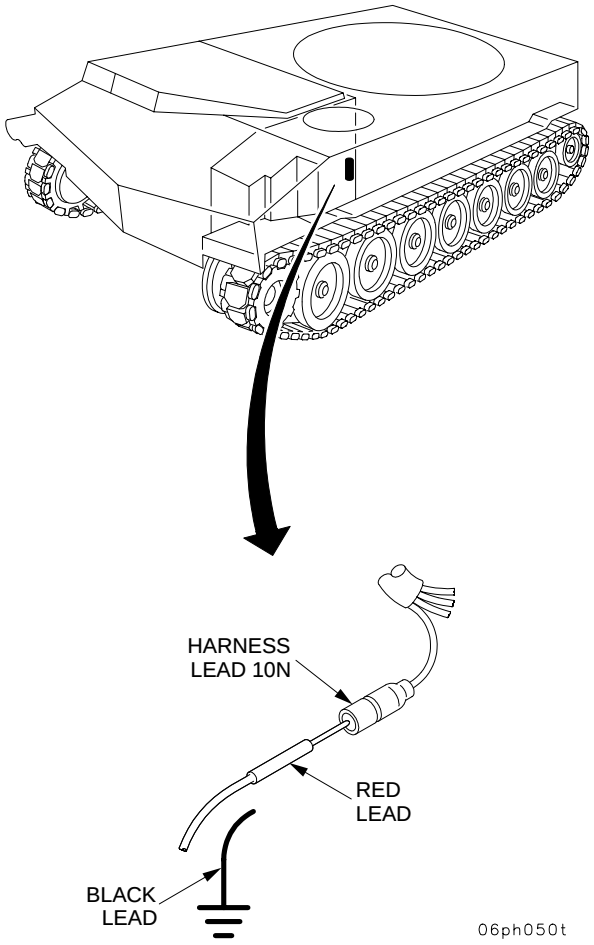

3-3 TROUBLESHOOTING CHART - CONTINUED

e. DRIVER'S MCS ELECTRICAL AIR HEATER (M3) - CONTINUED	(1) DRIVER'S MCS ELECTRICAL AIR HEATER (M3) FAILS TO OPERATE. - CONTINUED

CONTINUED FROM STEP A

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W124 lead 10 from circuit breaker no. 8 connector.
3. Place multimeter red lead in lead 10 connector socket and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

no

Repair or replace harness W124 (para 8-82).

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W124 lead 10 to circuit breaker no. 8 connector.
3. Disconnect lead 10N from circuit breaker no. 8 connector.
4. Place multimeter red lead on circuit breaker connector pin and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

no

Replace circuit breaker no. 8 (para 8-20).

Repair or replace lead 10N (para 8-94).

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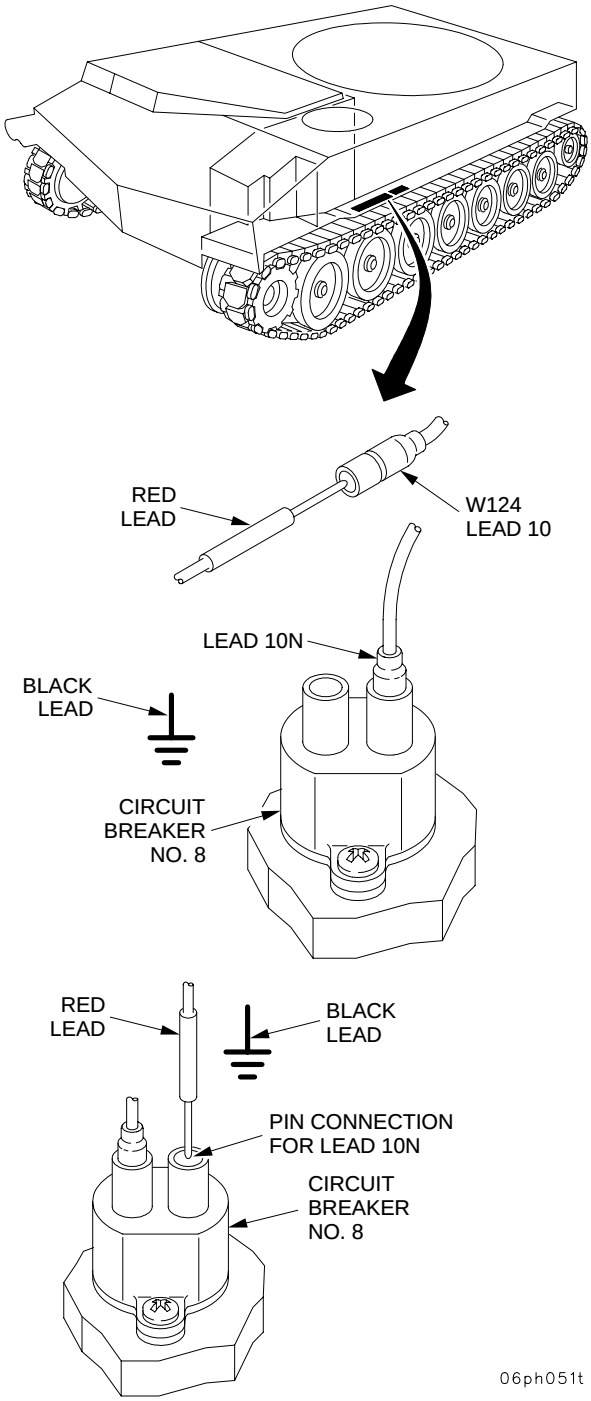


3-3 TROUBLESHOOTING CHART - CONTINUED

e. DRIVER'S MCS ELECTRICAL AIR HEATER (M3) - CONTINUED	(1) DRIVER'S MCS ELECTRICAL AIR HEATER (M3) FAILS TO OPERATE. - CONTINUED

CONTINUED FROM STEP A or C

D

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness lead 10N to driver's MCS heater connector.
3. Disconnect harness 125 lead 7 from MCS heater.
4. Check for continuity from driver's MCS heater ground point to ground.

Is continuity present?

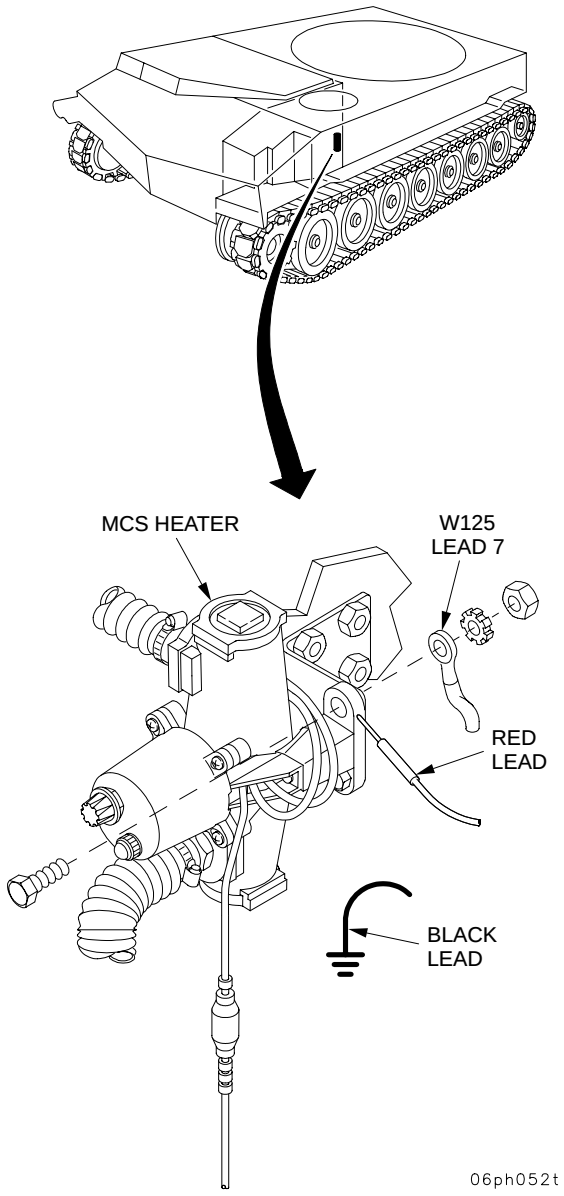
yes

Repair or replace driver's MCS heater (para 22-4).

no

Repair or replace harness W125 lead 7 to driver's MCS heater (para 8-83 and para 8-59).

END OF TASK

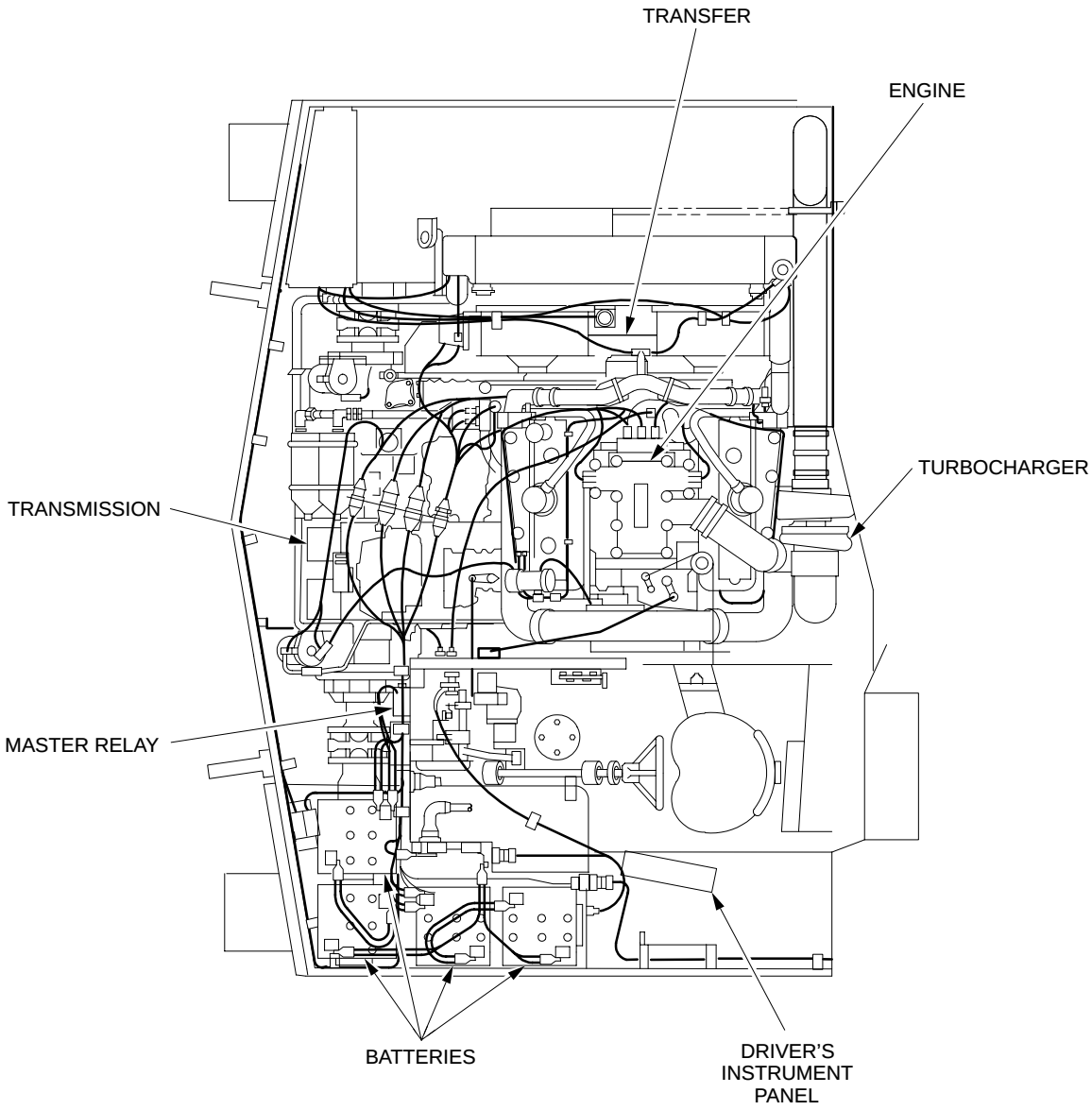


3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE

The engine is an internal-combustion, liquid-cooled, diesel engine with an exhaust-driven turbocharger. The engine is the main component of the vehicle drive train and has many components and associated wiring. The relationship of the engine and these components are shown below in the pictorial diagram.

The engine is started by turning on the vehicle MASTER switch which supplies voltage from the batteries through the master relay. When the START button is pushed, voltage is supplied to the starter which cranks and starts the engine. Once started, the engine can develop up to 440 horsepower at 2300 rpm and deliver this power to the transfer assembly. The transfer assembly will then send this power to the transmission.



3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE – CONTINUED	(1) ENGINE DOES NOT CRANK.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests.
16 AWC wire may be used as an extension.)

Personnel Required
Two

Equipment Conditions
Left transmission access door open
(TM 9-2350-314-10)

A

1. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
2. Check vehicle MASTER switch warning lamp (TM 9-2350-314-10).

Is lamp on?

yes

no → Go to step M.

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Loosen two screws and rotate master relay cover to right (para 8-22).
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
4. Check for voltage by placing multimeter red lead on master relay terminal X1 and black lead on ground.

Is voltage present?

yes

no → Go to step S.

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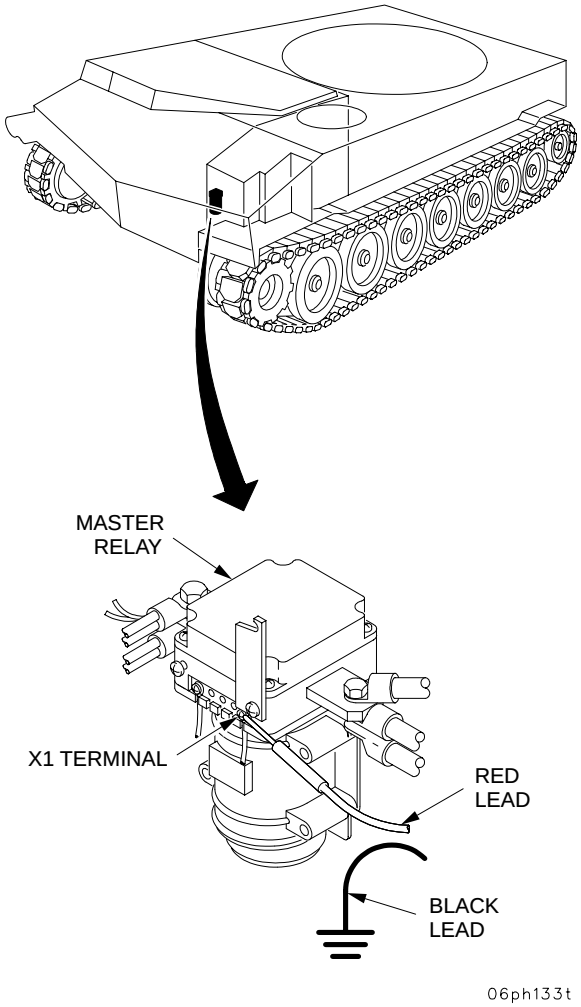


3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE – CONTINUED (1) ENGINE DOES NOT CRANK. – CONTINUED

CONTINUED FROM STEP B

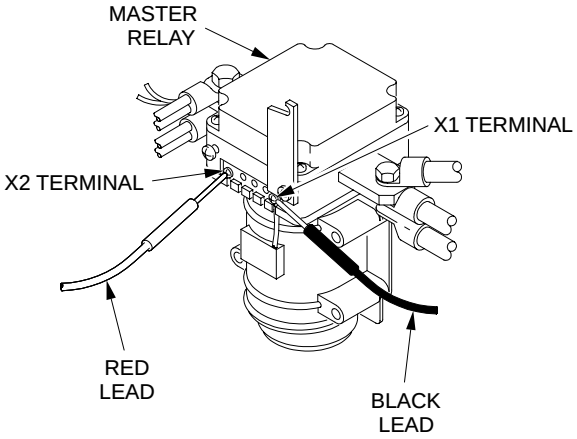
C

1. Turn vehicle MASTER switch OFF (TM 9–2350–314–10).
2. Disconnect harness W113 lead 7 from X2 of master relay (para 8–72).
3. Check for continuity from X1 to X2 of master relay.

Is continuity present?

yes

no → Replace master relay (para 8–22).



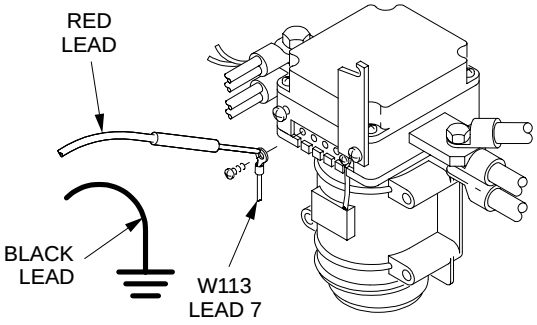
D

Check for continuity from harness W113 lead 7 to ground.

Is continuity present?

yes

no → Replace harness W113 lead 7 (para 8–72).



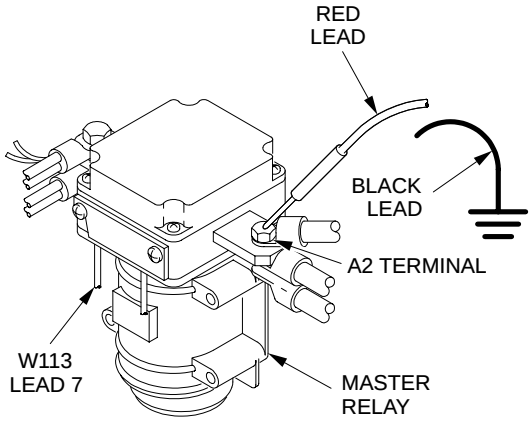
E

1. Reconnect harness W113 lead 7 to X2 (para 8–72).
2. Rotate cover to original position and tighten two screws (para 8–22).
3. Check for voltage by placing multimeter red lead on terminal A2 of master relay and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9–2350–314–10).

Is voltage present?

yes

no → Replace master relay (para 8–22).



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3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED (1) ENGINE DOES NOT CRANK. - CONTINUED

CONTINUED FROM STEP E

F

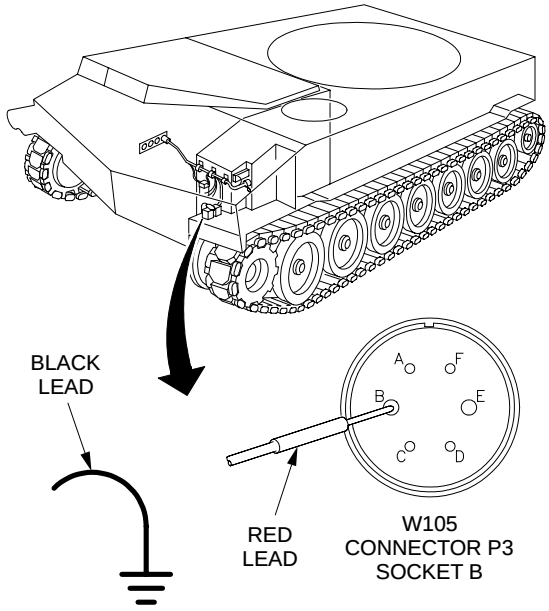
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W105 connector P3 from starter protection device.
3. Check for voltage by placing multimeter red lead in socket B of connector P3 and black lead to ground.

Is voltage present?

yes

no

Repair or replace harness W105 (para 8-64).



G

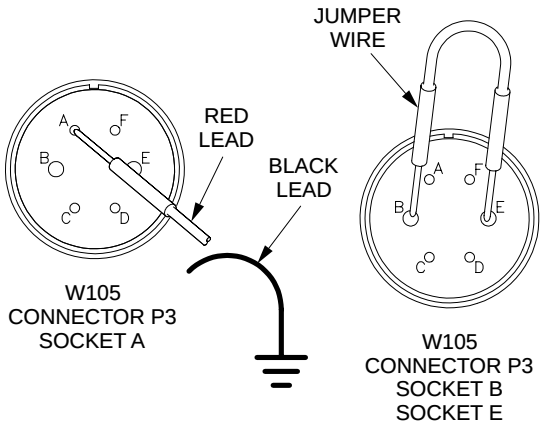
1. Check for voltage by placing multimeter red lead in socket A of harness W105 connector P3 and black lead to ground.
2. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
3. Place STARTER switch in the START position (TM 9-2350-314-10).

Is voltage present?

yes

no

Go to step V.



H

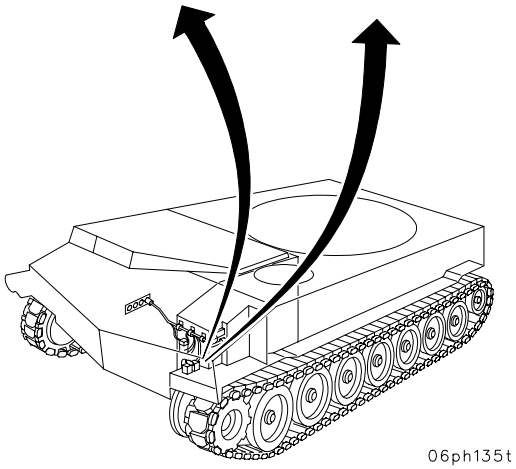
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Place a jumper lead between sockets B and E of connector P3 of harness W105.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Does engine crank?

yes

no

Replace starter protection relay (para 8-23).



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3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE – CONTINUED (1) ENGINE DOES NOT CRANK. – CONTINUED

CONTINUED FROM STEP H

I

1. Turn vehicle MASTER switch OFF (TM 9–2350–314–10).
2. Reconnect harness W105 connector P3 and disconnect harness W105 connector P1 at engine bracket.
3. Check for voltage by placing multimeter red lead in socket W or X of harness W105 connector P1 and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9–2350–314–10).

Is voltage present?

yes

no

Repair or replace harness W105 (para 8–64).

J

1. Check for voltage by placing multimeter red lead in socket T of harness W105 connector P1 and black lead to ground.
2. Place STARTER switch in the START position (TM 9–2350–314–10).

Is voltage present?

yes

no

Repair or replace harness W105 (para 8–64).

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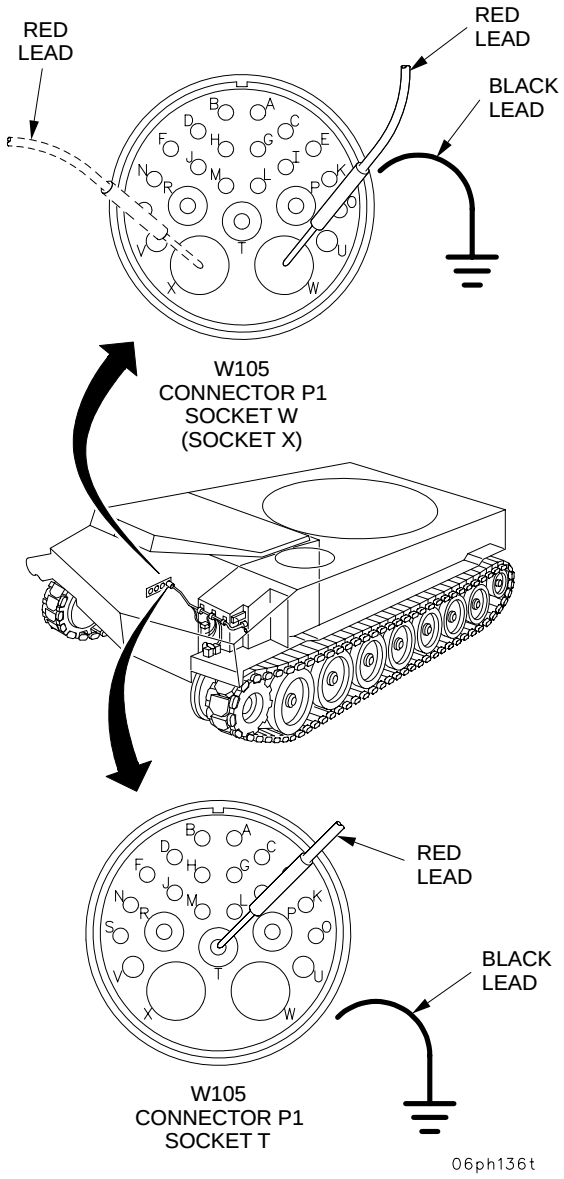


3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED (1) ENGINE DOES NOT CRANK. - CONTINUED

CONTINUED FROM STEP J

K

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W105.
3. Check for voltage at DCA connector (harness W100 connector J1) by placing multimeter red lead on socket S and black lead on socket M of harness W100 connector J1.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
5. Place STARTER switch in the START position (TM 9-2350-314-10).
6. Check for voltage.

Is voltage present?

yes

no

Repair or replace harness W104 (para 8-63).

L

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Check for voltage by placing multimeter red lead on socket T and black lead on socket M of harness W100 connector J1.
3. Place STARTER switch in the START position (TM 9-2350-314-10).

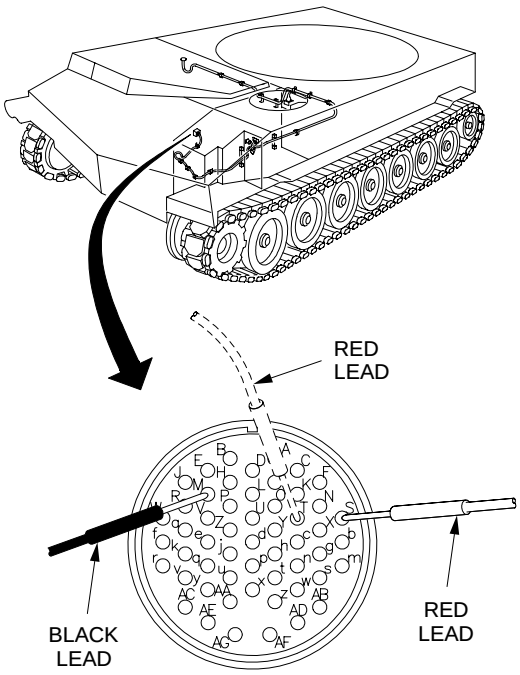
Is voltage present?

yes

no

Replace starter (para 8-11).

Repair or replace harness W104 (para 8-63).



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3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE – CONTINUED (1) ENGINE DOES NOT CRANK. – CONTINUED

CONTINUED FROM STEP A

M

1. Turn vehicle MASTER switch OFF (TM 9–2350–314–10).
2. Check for voltage at master relay by placing multimeter red lead on master relay terminal A1 and black lead to ground.

Is voltage present?

yes

no

Go to para 3–3.f(2).

N

1. Disconnect harness W114 connector P1 from harness W105 connector J1 at the driver's compartment bulkhead.
2. Check for voltage by placing multimeter red lead on socket L of harness W105 connector J1 and black lead to ground.

Is voltage present?

yes

no

Repair or replace harness W105 (para 8–64).

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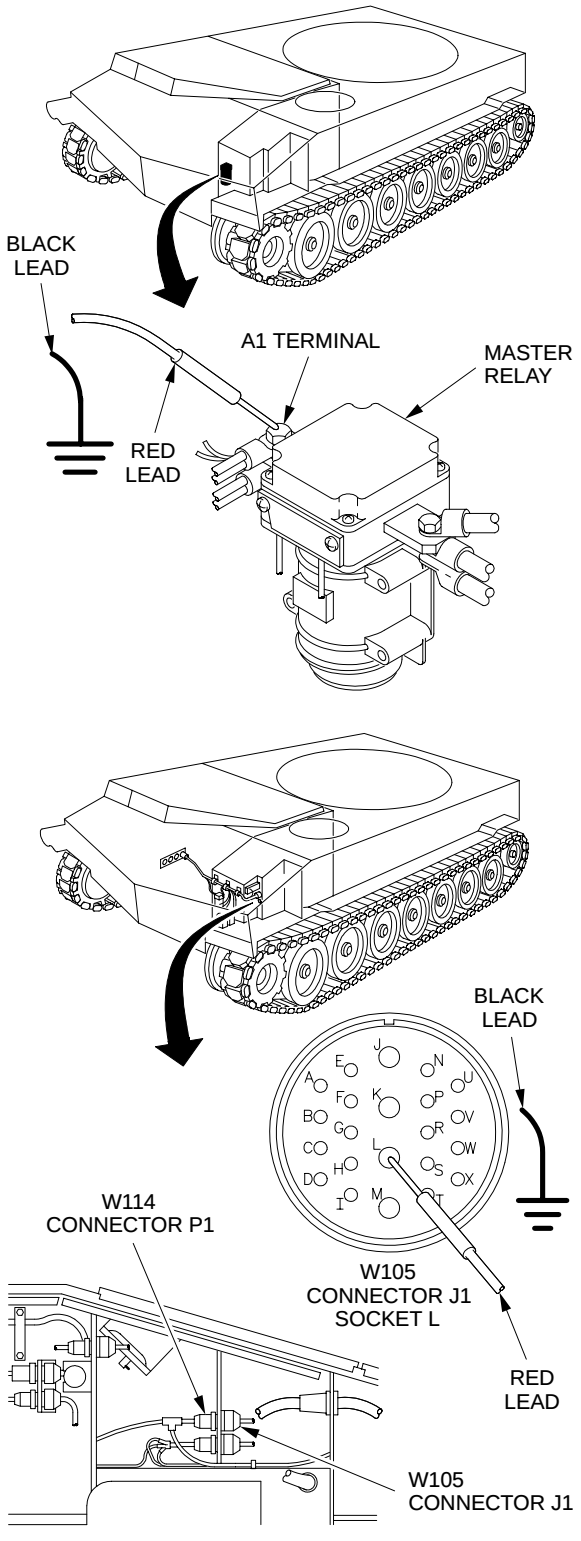


3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED (1) ENGINE DOES NOT CRANK. - CONTINUED

CONTINUED FROM STEP N

O

1. Reconnect harness W114 connector P1 to harness W105 connector J1.
2. Disconnect harness W112 connector P1 from harness W114 connector J1 at disconnect bracket.
3. Check for voltage by placing multimeter red lead on socket L of harness W114 connector J1 and black lead to ground.

Is voltage present?

yes

no

Repair or replace harness W114 (para 8-73).

P

1. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
2. Check for continuity between pins L and W of harness W112 connector P1.
3. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).

Is continuity good?

yes

no

Go to step S.

Q

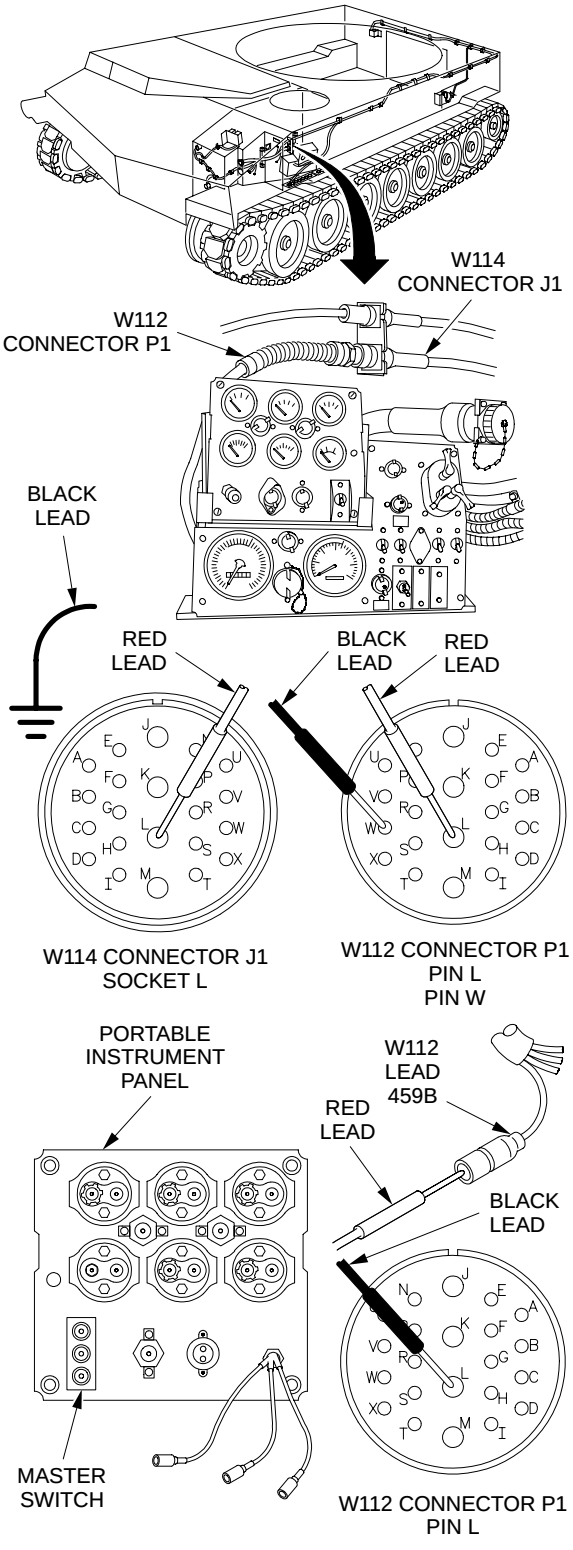
1. Remove portable instrument panel cover (TM 9-2350-314-10).
2. Disconnect lead 459B from vehicle MASTER switch.
3. Check for continuity from pin L harness W112 connector P1 to lead 459B connector.

Is continuity good?

yes

no

Repair or replace harness W112 (lead 459B) (para 8-71).



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3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED (1) ENGINE DOES NOT CRANK. - CONTINUED

CONTINUED FROM STEP Q

R

1. Disconnect lead 459 of harness W112 at vehicle MASTER switch.
2. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
3. Check for continuity between 459 and 459B connectors on the vehicle MASTER switch.

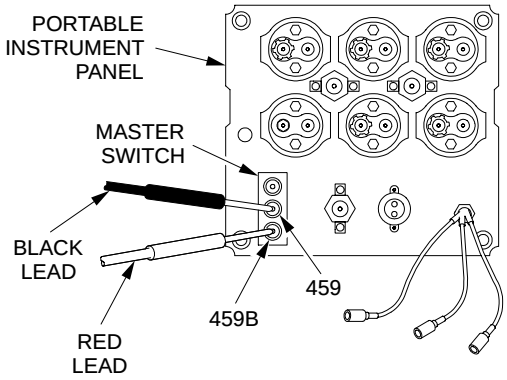
Is continuity good?

yes

Repair or replace harness W112 (lead 459) (para 8-71).

no

Replace vehicle MASTER switch (para 8-14).



CONTINUED FROM STEP B or P

S

1. Remove portable instrument panel cover (para 8-14).
2. Disconnect harness W112 connector P1 and lead 459 at vehicle MASTER switch.
3. Check continuity from harness W112 459 connector to pin W of harness W112 connector P1.

Is continuity good?

yes

Repair or replace harness W112 (lead 459) (para 8-71).

no

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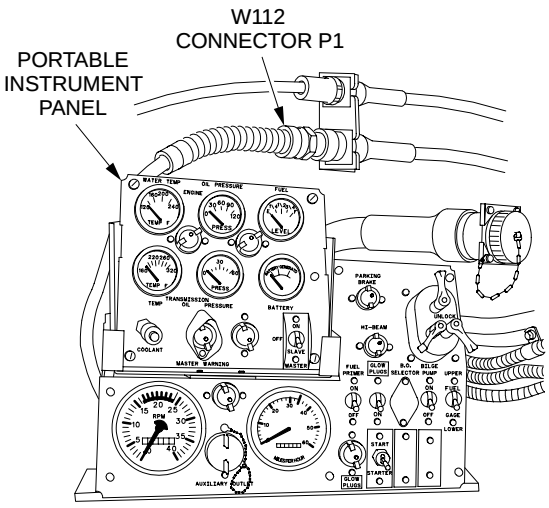

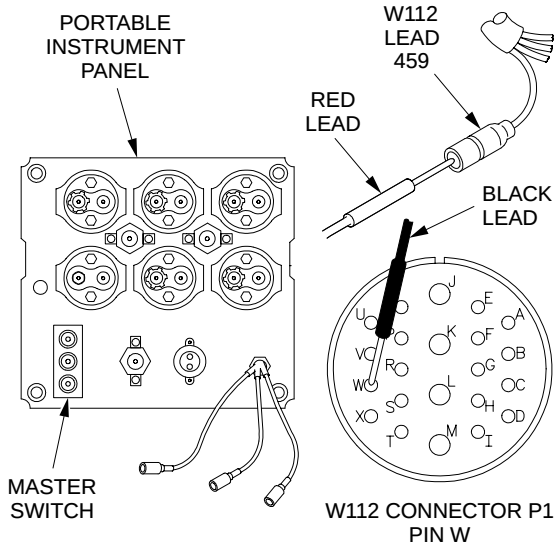

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3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED (1) ENGINE DOES NOT CRANK. - CONTINUED

CONTINUED FROM STEP S

T

1. Reconnect harness W112 connector P1 and lead 459 at vehicle MASTER switch.
2. Install portable instrument panel cover (para 8-14).
3. Remove driver's instrument panel (para 8-12).
4. Disconnect harness W114 lead 459 from harness W115 lead 459.
5. Check for voltage by placing multimeter red lead in harness W114 lead 459 connector and black lead to ground.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

yes

no

Repair or replace harness W114 (lead 459) (para 8-73).

U

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W114 lead 459 to harness W115 lead 459.
3. Install driver's instrument panel (para 8-12).
4. Disconnect harness W115 connector P1 at driver's compartment bulkhead.
5. Check for voltage by placing multimeter red lead in socket Q of harness W115 connector P1 and black lead to ground.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

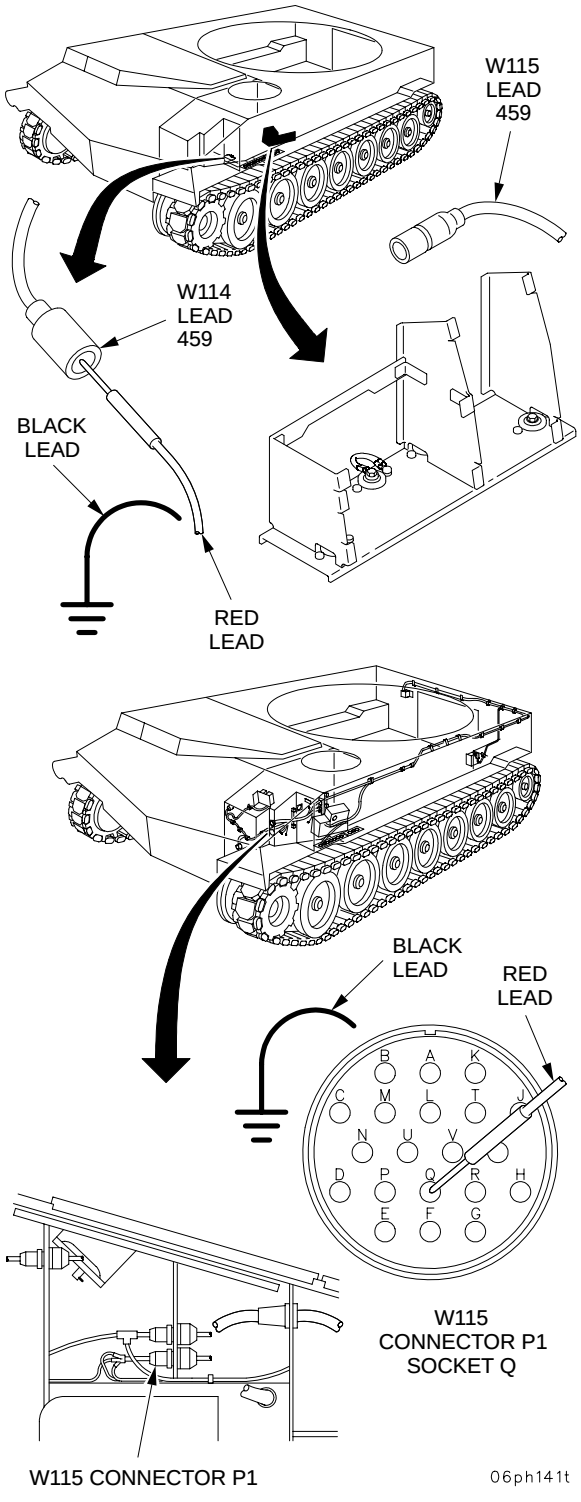
Is voltage present?

yes

no

Repair or replace harness W113 (para 8-72).

Repair or replace harness W115 (para 8-74).



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3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED (1) ENGINE DOES NOT CRANK. - CONTINUED

CONTINUED FROM STEP G

V

1. Disconnect harness W114 lead 14 from starter switch.
2. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
3. Check for voltage by placing multimeter red lead on starter switch pin where lead 14 was disconnected from and black lead to ground.
4. Place STARTER switch in the START position.

Is voltage present?

yes → Go to step AA.

no

W

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W114 lead 14 to starter switch.
2. Disconnect harness W120 lead 10S from the starter switch.
3. Check for voltage by placing multimeter red lead in harness W120 lead 10S connector and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

yes → Replace starter switch (para 8-12).

no

X

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W120 lead 10S to starter switch and disconnect harness W120 10S at circuit breaker no. 4.
3. Install driver's instrument panel (para 8-12).
4. Check for voltage by placing multimeter red lead in circuit breaker connector and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

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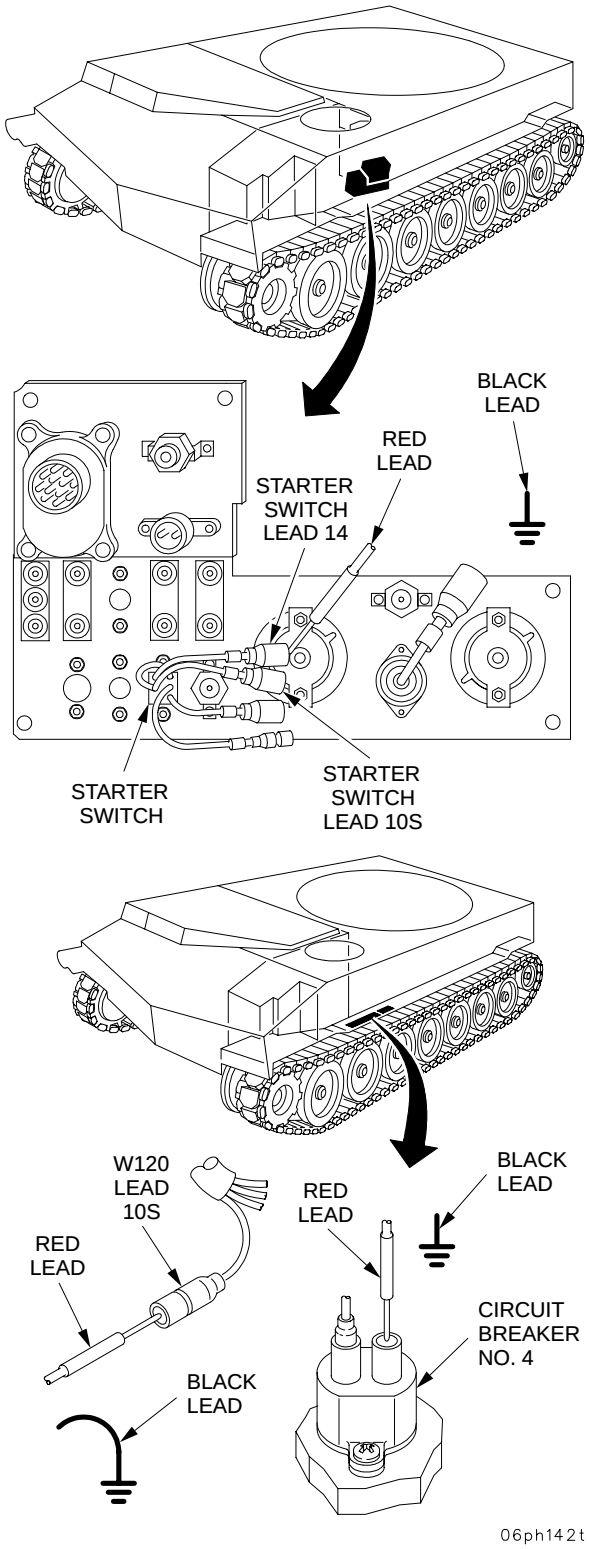


3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED (1) ENGINE DOES NOT CRANK. - CONTINUED

CONTINUED FROM STEP X

yes / no

Repair or replace harness W120 lead 10S (para 8-79).

Y

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W124 lead 10 from circuit breaker no. 4.
3. Check for voltage by placing multimeter red lead in harness W124 lead 10 connector and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

yes / no

Replace circuit breaker no. 4 (para 8-20).

Z

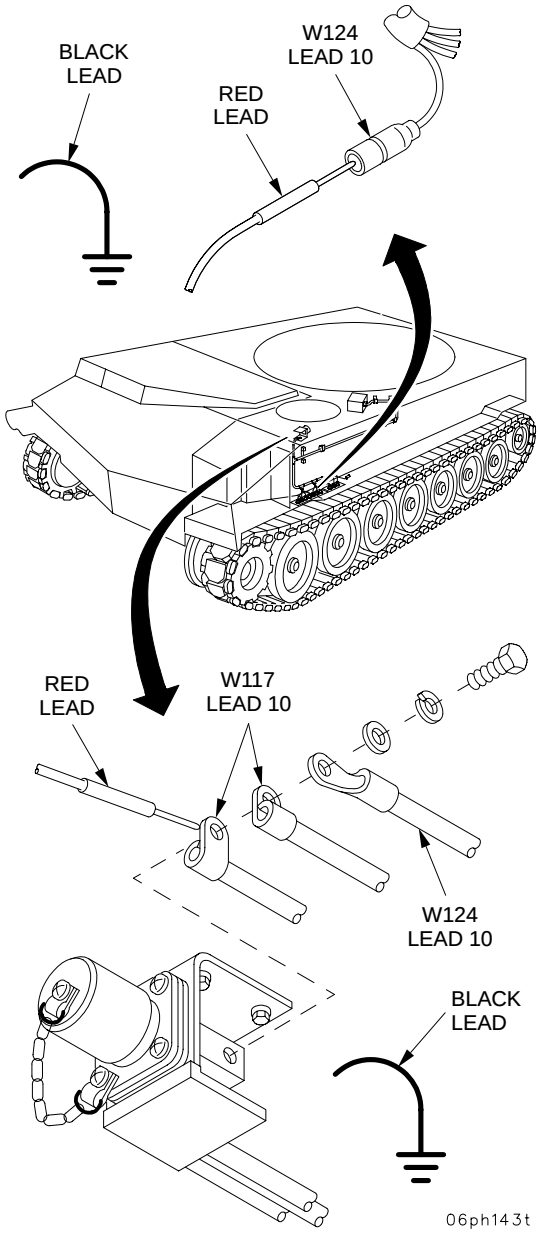
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect battery grounds from shunt located in battery compartment (para 8-33).
3. Disconnect harness W117 leads 10 at NATO slave receptacle.
4. Reconnect battery grounds to shunt located in battery compartment (para 8-33).
5. Check for voltage by placing red lead on lead 10 terminals, one at a time, black lead ground.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

yes / no

Replace harness W124 lead 10 (para 8-82).

Replace harness W117 lead 10 (para 8-76).



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3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE – CONTINUED (1) ENGINE DOES NOT CRANK. – CONTINUED

CONTINUED FROM STEP V

AA

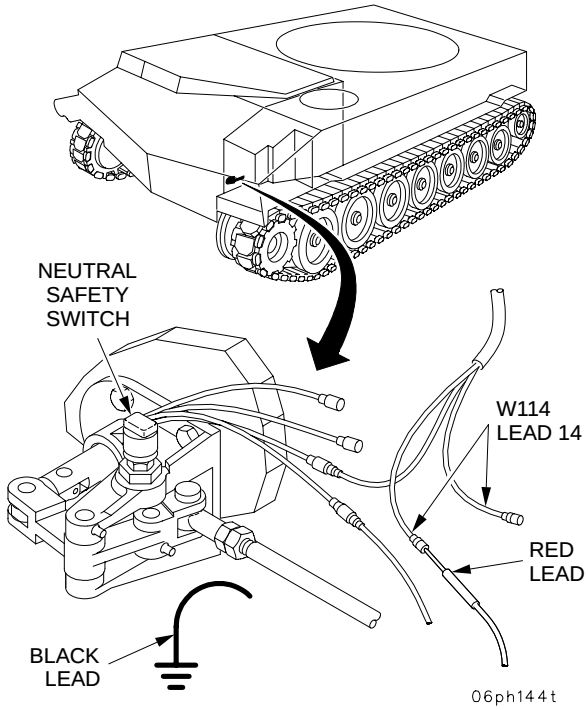
1. Turn vehicle MASTER switch OFF (TM 9–2350–314–10).
2. Reconnect harness W114 lead 14 to starter switch.
3. Disconnect both harness W114 leads 14 from the neutral safety switch.
4. Check for voltage by placing multimeter red lead in harness W114 lead 14 sockets, one at a time, and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9–2350–314–10).
6. Hold the STARTER switch in the START position (TM 9–2350–314–10).

Is voltage present in one of two leads 14?

yes

no

Repair or replace harness W114 lead 14 (para 8–73).



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3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED (1) ENGINE DOES NOT CRANK. - CONTINUED

CONTINUED FROM STEP AA

AB
1. Ensure engine transmission shift lever is in the neutral position (TM 9-2350-314-10).
2. Check continuity between both connector leads of the neutral safety switch.

Is continuity good?

yes → Go to step AD.

no

AC
1. Adjust neutral safety switch (para 9-1).
2. Recheck for continuity as in step AB.

Is continuity good?

yes

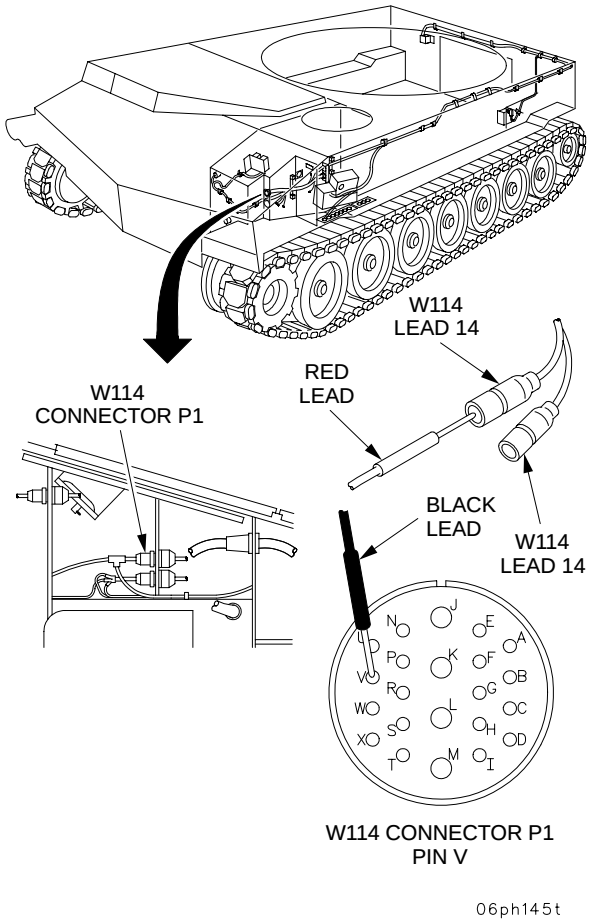
no → Replace neutral safety switch (para 9-1).

AD
1. Disconnect harness W114 connector P1 at driver's compartment bulkhead.
2. Check for continuity from pin V to lead 14 socket (opposite lead 14 socket that had voltage in step AA).

Is continuity good?

yes

no → Repair or replace harness W114 (para 8-73).



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3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED (1) ENGINE DOES NOT CRANK. - CONTINUED

CONTINUED FROM STEP AD

AE

1. Reconnect harness W114 connector P1 at driver's bulkhead.
2. Disconnect harness W105 connector P3 from starter protection device.
3. Check for continuity between harness W105 connector J1 pin V and harness W105 connector P3 socket A.

Is continuity present?

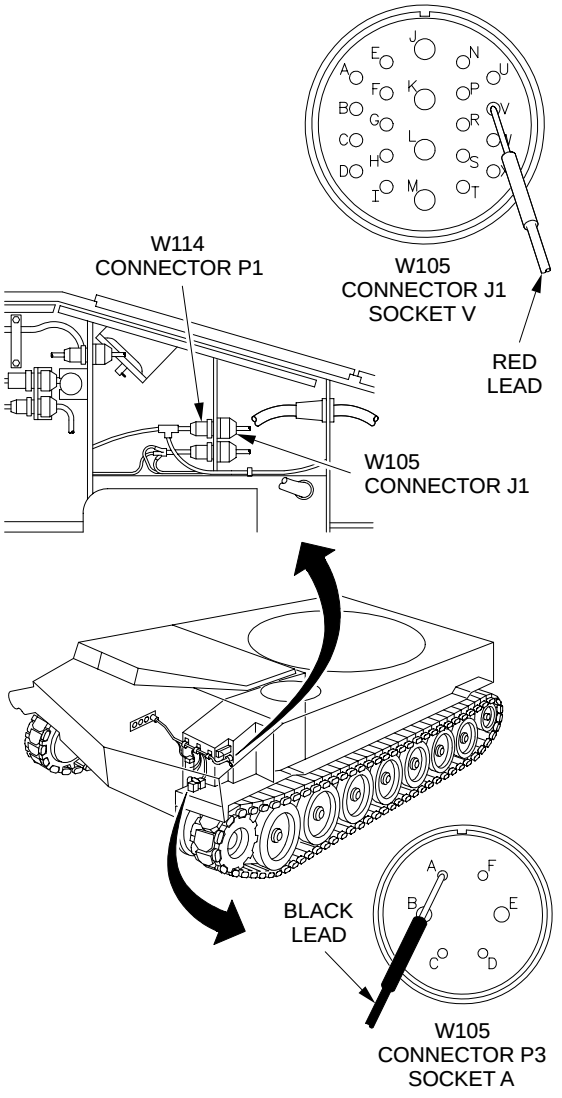
yes

Go to step H.

no

Replace harness W105 (para 8-64).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED	(2) ENGINE CRANKS SLOWLY - BATTERY INDICATOR IN LOW YELLOW OR RED.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)

Personnel Required
Two

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)

A

1. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
2. Place multimeter red lead on master relay terminal A1 (power-in terminal) and black lead to ground.
3. Pull and hold fuel shutoff handle (TM 9-2350-314-10) and check for voltage while cranking engine.

Are 18 to 24 volts present?

yes → Go to para 3-4.b(14).

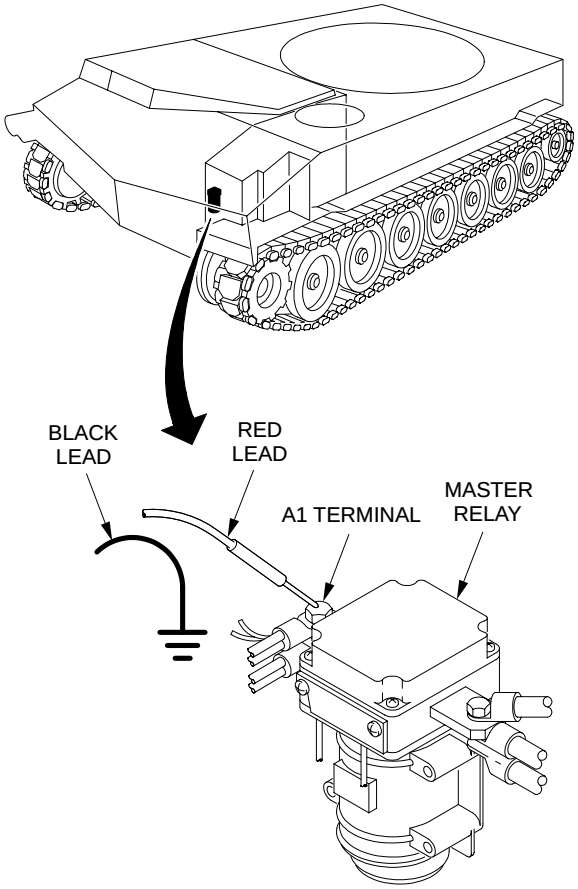
no → **B**

1. Clean, tighten, and repair or replace defective battery cables (para 8-56).
2. Charge batteries.
3. Check the specific gravity of each battery (Chap. 2 PMCS).

Do all batteries show full charge?

yes → Go to para 3-4.b(14).

no → Replace batteries (para 8-54).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

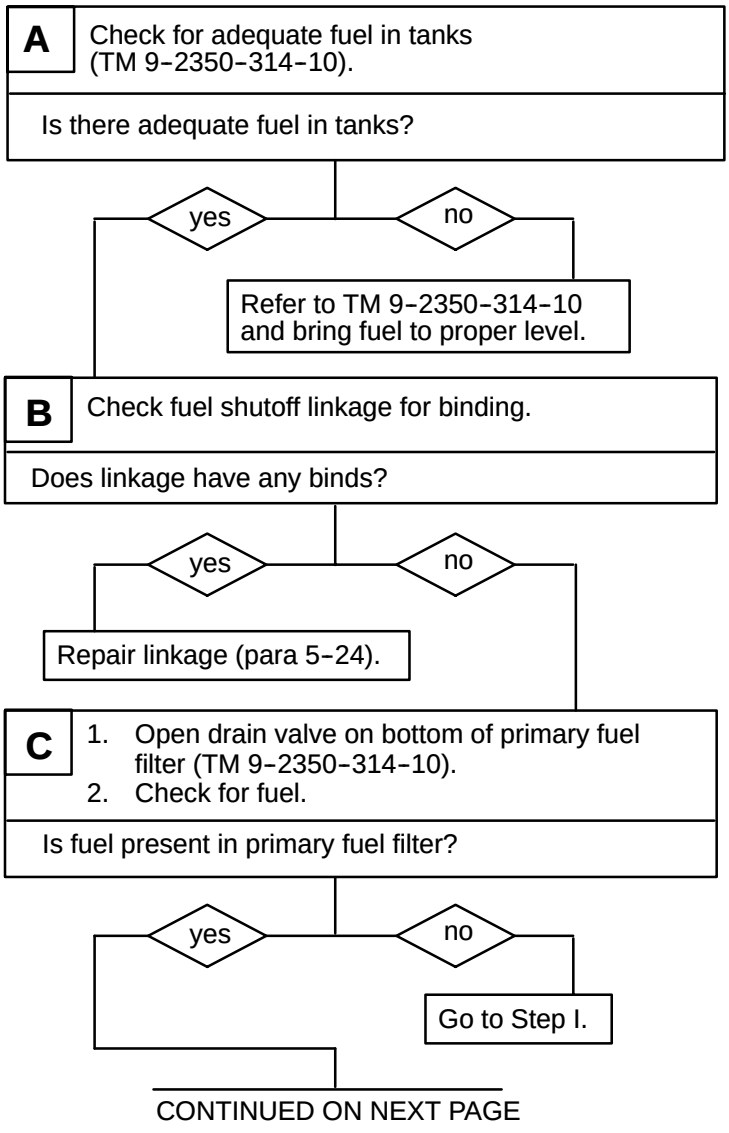
f. ENGINE – CONTINUED	(3) ENGINE CRANKS BUT DOES NOT START.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)

Personnel Required
Two

Equipment Conditions
Air intake grille opened (TM 9-2350-314-10)



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3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED (3) ENGINE CRANKS BUT DOES NOT START. - CONTINUED

CONTINUED FROM STEP C

D Check primary fuel filter for contamination (TM 9-2350-314-10).

Is primary fuel filter free of contamination?

yes

no

Replace primary fuel filter (para 5-16).

E

1. Open drain on bottom of secondary fuel filter (TM 9-2350-314-10).
2. Check for fuel.

Is fuel present in secondary fuel filter?

yes

no

Go to Step J.

F Check secondary fuel filter for contamination (TM 9-2350-314-10).

Is secondary fuel filter free of contamination?

yes

no

Replace secondary fuel filter (para 5-16).

G Check for pinched, kinked, clogged, or leaking fuel tubes or hoses (para 5-13 and 5-14).

Are fuel lines free of pinches, kinks, clogs, and leaks?

yes

no

Replace all pinched or kinked fuel lines. Open all clogged lines or replace them if they cannot be opened. Tighten all leaking lines. If leaks continue, replace lines (para 5-13 and 5-14).

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3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE – CONTINUED	(3) ENGINE CRANKS BUT DOES NOT START. – CONTINUED

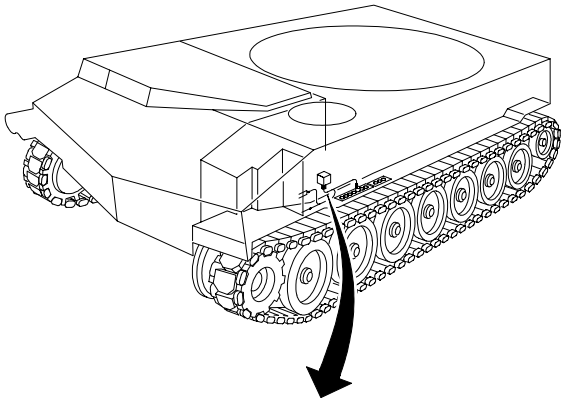
CONTINUED FROM STEP G

H Check the main fuel hose for proper connection at primary fuel filter (para 5–13).

Is main fuel line properly connected?

yes / no

Connect main fuel line properly (para 5–14).

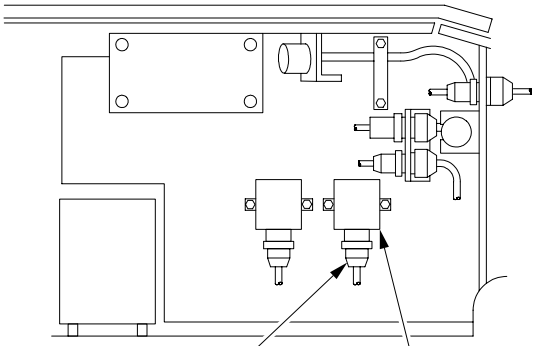


I
1. Disconnect harness W123 connector P1 from generator/fuel pump relay.
2. Place a jumper wire in harness W123 connector P1 from socket B to socket C.
3. Turn vehicle MASTER switch ON and crank engine.

Does engine start?

yes / no

Replace generator/fuel pump relay (para 8–24).

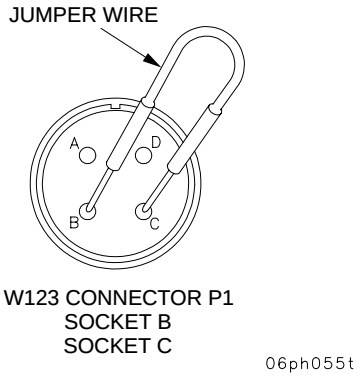


J
1. Turn vehicle MASTER switch OFF (TM 9–2350–314–10).
2. Reconnect harness W123 connector P1 to generator/fuel pump relay.
3. Turn vehicle MASTER switch ON (TM 9–2350–314–10).
4. Hold down fuel prime switch for 45 seconds.
5. Check secondary filter for fuel (TM 9–2350–314–10).

Is secondary filter full of fuel?

yes / no

Repair restriction between primary and secondary filters (para 5–14).



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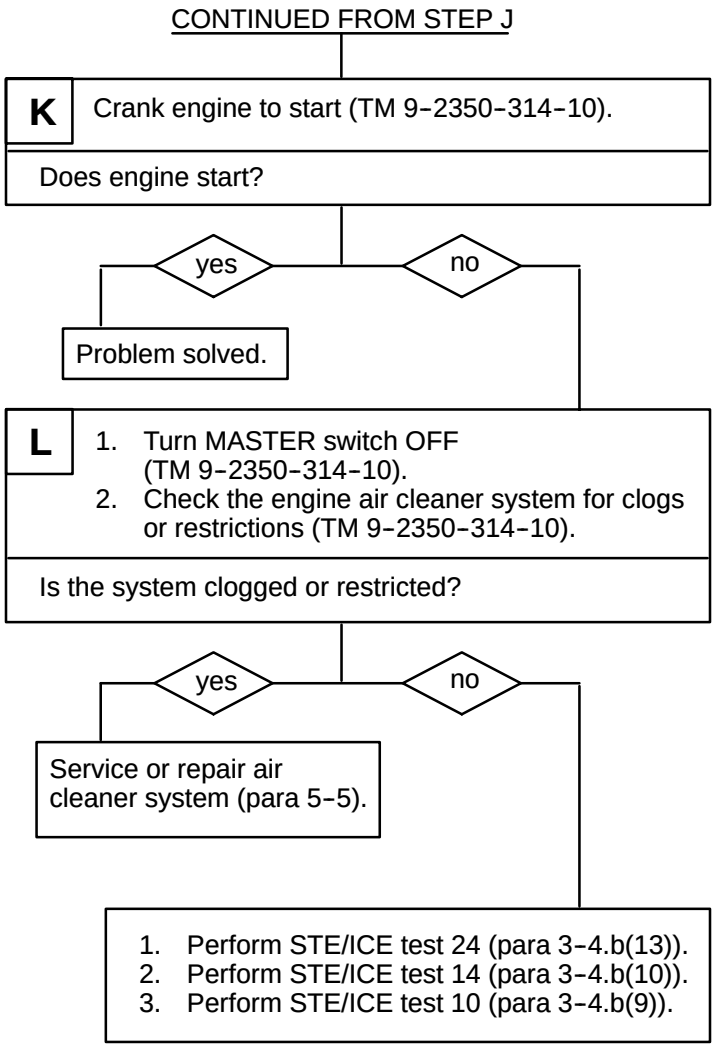
3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED	(3) ENGINE CRANKS BUT DOES NOT START. - CONTINUED



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE – CONTINUED (4) COMBAT OVERRIDE SWITCH WILL NOT OVERRIDE.

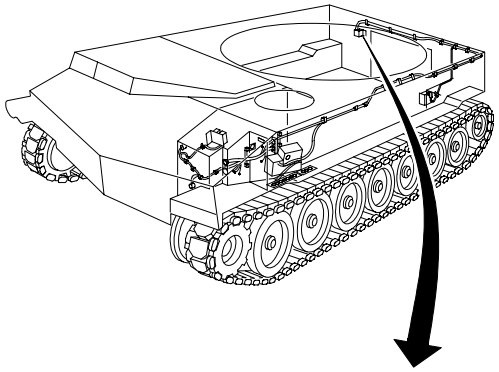
INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Transmission access doors opened (TM 9-2350-314-10)

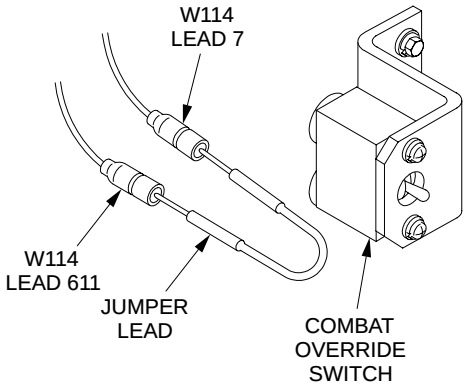
Personnel Required
Two

NOTE
When starter is cranking, the starter protection device should automatically cut starter off after cranking for the following period of time:
a. 25-35 seconds at 50°F (10°C) or above.
b. 55-65 seconds at 0° to 50°F (-17° to 10°C)
c. 100-140 seconds at 0° to -50° F (-17° to -45°C)
Starter protection device should reset in 105-140 seconds. If starter does not shut off as indicated or device will not reset, replace device.



A

1. Disconnect harness W114 lead 611 and harness W114 lead 7 from combat override switch.
2. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and pull fuel shutoff handle out (so engine will not start).
3. Press starter switch and crank engine until starter automatically shuts off (TM 9-2350-314-10).
4. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
5. Place a jumper lead between harness W114 lead 611 and harness W114 lead 7.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
7. Attempt to crank engine.



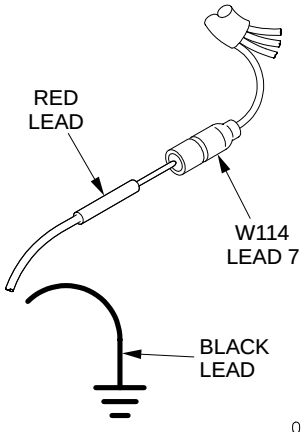
Does starter crank?

yes → Replace combat override switch (para 8-26).

no

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove jumper lead.
3. Place multimeter red lead in harness W114 lead 7 socket and black lead to ground.
4. Check continuity of harness W114 lead 7.



Is continuity present?

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3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED	(4) COMBAT OVERRIDE SWITCH WILL NOT OVERRIDE. - CONTINUED

CONTINUED FROM STEP B

yes / no

Repair or replace harness W114 from combat override switch to ground point (para 8-73).

C

1. Reconnect harness W114 lead 611 and harness W114 lead 7 to combat override switch.
2. Disconnect harness W114 connector P1 from harness W105 connector J1.
3. Make sure combat override switch is ON (TM 9-2350-314-10).
4. Using a multimeter, check continuity of harness W114 lead 611 by placing one multimeter lead on harness W114 connector P1 pin W and placing the other lead to ground.

Is continuity present?

yes / no

Repair or replace harness W114 from combat override switch to bulkhead connector (para 8-73).

D

1. Reconnect harness W114 connector P1 to harness W105 connector J1.
2. Disconnect harness W114 connector P3 from the starter protection device.
3. Make sure combat override switch is ON (TM 9-2350-314-10).
4. Using a multimeter, check continuity of lead 611 by placing one multimeter lead in harness W105 connector P3 socket F and placing the other lead to ground.

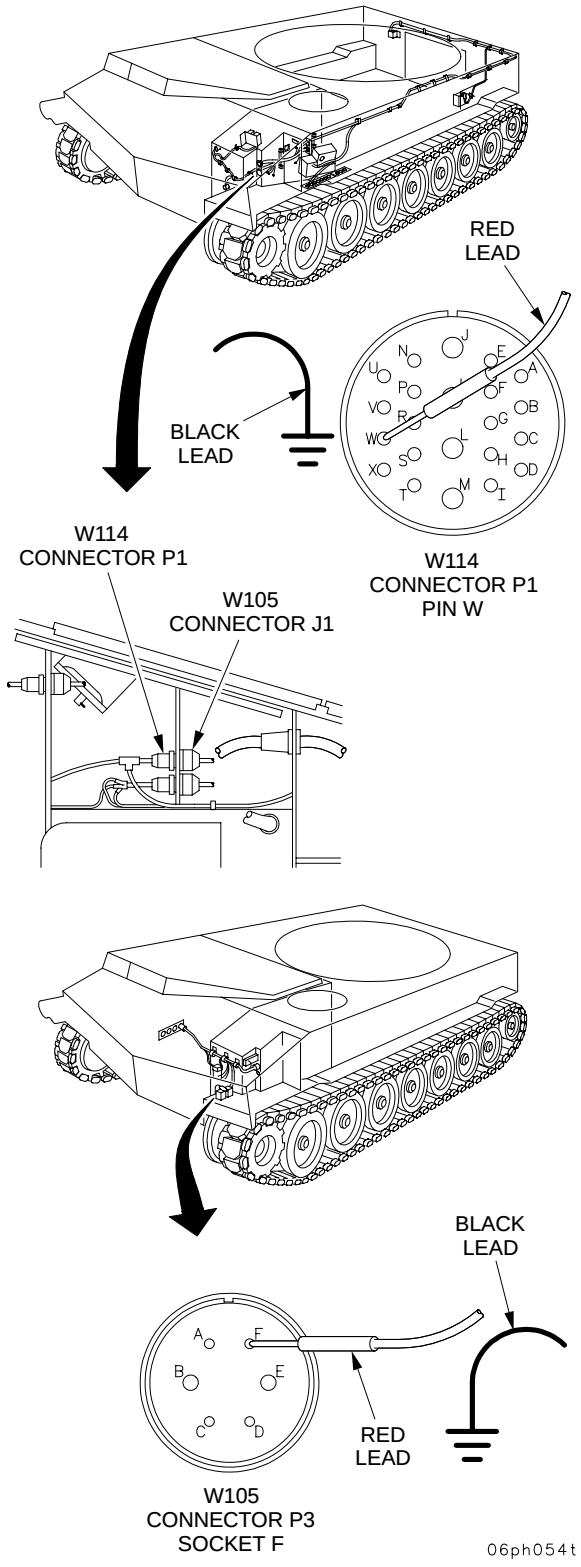
Is continuity present?

yes / no

Repair or replace harness W105 from bulkhead connector to starter protection device connector (para 8-64).

Replace starter protection relay (para 8-23).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE – CONTINUED	(5) ENGINE DOES NOT ACCELERATE PROPERLY OR DOES NOT DEVELOP FULL POWER.

INITIAL SETUP

Tools

General mechanic's tool kit
(SC 5180–90–N26)
Pressure gage tester (item 22, Appx F)

WARNING

Do not smoke or use open flame when working on fuel system. An explosion may occur, causing severe injury or death.

A Check hand throttle control rod and accelerator pedal adjustment (para 5–19 and para 5–20).

Are hand throttle control rod and accelerator pedal properly adjusted?

yes

no

Adjust hand throttle control rod and/or accelerator pedal linkage (para 5–19 and para 5–20).

B

1. Open engine access door (TM 9–2350–314–10).
2. Remove fuel supply pressure transducer at secondary fuel filter (para 8–43).
3. Install appropriate pressure gage from kit.
4. Start engine and increase idle to 1500 rpm (TM 9–2350–314–10). Pressure should be 40–70 psi at 1500 to 2300 rpm.
5. Remove pressure gage.
6. Install fuel supply pressure transducer at secondary fuel filter (para 8–43).

Is pressure on gage below 40 psi?

yes

no

Go to step F.

CONTINUED ON NEXT PAGE

3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED	(5) ENGINE DOES NOT ACCELERATE PROPERLY OR DOES NOT DEVELOP FULL POWER. - CONTINUED

CONTINUED FROM STEP B

C

1. Remove plug and install a 100 psi gage with a fitting in the primary fuel filter inlet.
2. Disconnect harness W123 connector P1 from the fuel pump relay.
3. Place a jumper wire from socket A to socket C of harness W123 connector P1.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and watch the gage.

Does gage show at least 4 psi?

yes

no → Go to para 3-3.j(1).

D Check fuel lines to secondary fuel filter for restrictions and/or leaks (para 5-13 and para 5-14).

Are fuel lines free of leaks and/or restrictions?

yes

no → Tighten lines that leak. If leaks persist, replace lines. Repair or replace restricted lines (para 5-13 and para 5-14).

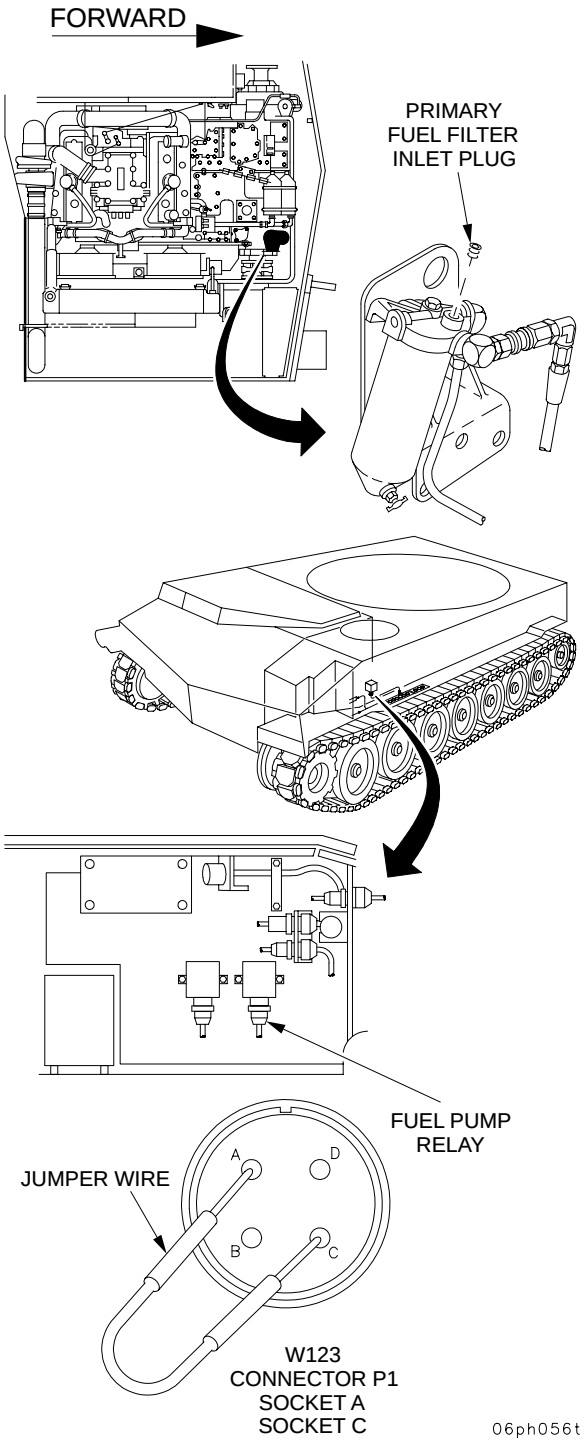
E Check primary and secondary fuel filters for restricted filter elements (para 5-16).

Are primary and secondary filter elements free of restrictions?

yes

no → Replace primary and/or secondary fuel filter elements (para 5-16).

Replace mechanical fuel pump (para 5-2).



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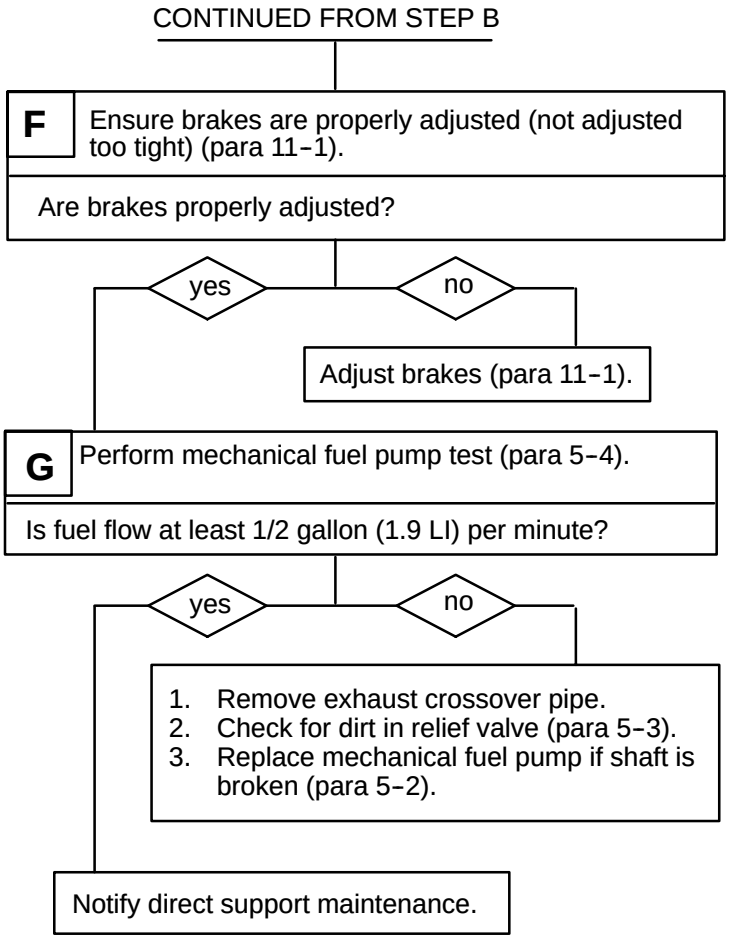
3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE – CONTINUED	(5) ENGINE DOES NOT ACCELERATE PROPERLY OR DOES NOT DEVELOP FULL POWER. – CONTINUED



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED (6) ENGINE DOES NOT MAINTAIN STEADY RPM.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)

Equipment Conditions
Air intake grille opened (TM 9-2350-314-10)

WARNING
Do not smoke or use open flame when working on fuel system. An explosion may occur, causing severe injury or death.

A Ensure that engine coolant is at operating temperature (170° F (77°C)) (TM 9-2350-314-10).

Is engine at operating temperature?

yes

no

Let engine operate until normal operating temperature is obtained.

B Check accelerator and throttle linkage for loose mounting hardware (para 5-22).

Are accelerator and throttle securely mounted?

yes

no

Securely mount all throttle and accelerator linkage (para 5-22).

C Check for pinched, kinked, clogged, or leaking fuel tubes or hoses (para 5-13 and 5-14).

Are fuel lines free of pinches, kinks, clogs, and leaks?

yes

no

Replace pinched or kinked fuel lines. Open all clogged lines or replace them if they cannot be opened (para 5-13 and para 5-14). Tighten all leaking lines. If leaks continue, replace lines (para 5-13 and para 5-14).

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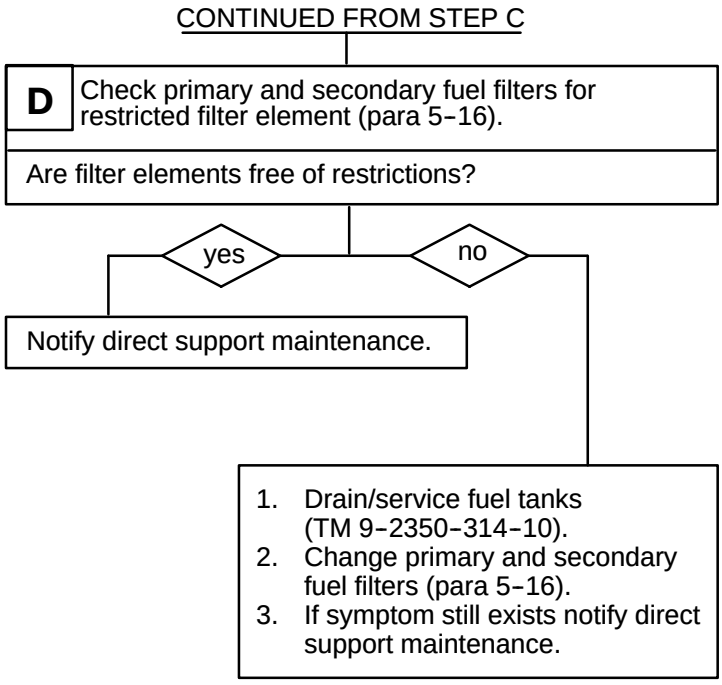
3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE – CONTINUED	(6) ENGINE DOES NOT MAINTAIN STEADY RPM. – CONTINUED



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED (7) ENGINE USES EXCESSIVE FUEL.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)

Equipment Conditions
Air intake grille opened (TM 9-2350-314-10)
Transmission access door opened (TM 9-2350-314-10)

WARNING

Do not smoke or use open flame when working on fuel system. An explosion may occur, causing severe injury or death.

A Start engine and check exhaust output (TM 9-2350-314-10).

Is exhaust black or gray?

yes

no

Go to Step C.

B Check air filters for restrictions or dirty filter elements (para 5-5 and TM 9-2350-314-10).

Are air filters free of restriction and dirty filter elements?

yes

no

Remove restrictions and/or replace air filter elements (para 5-5).

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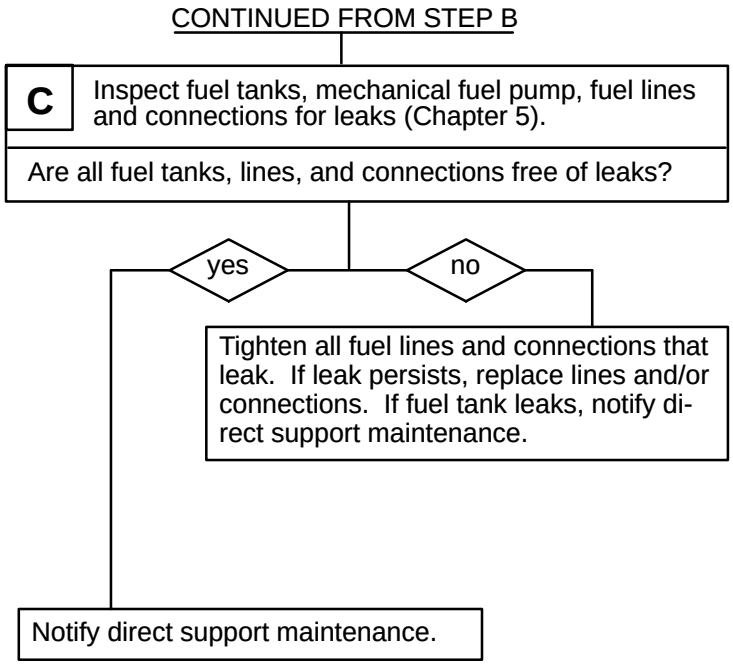
3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE – CONTINUED (7) ENGINE USES EXCESSIVE FUEL. – CONTINUED



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED	(8) WHITE EXHAUST SMOKE IS PRESENT.

INITIAL SETUP

Tools	Equipment Conditions
General mechanic's tool kit (SC 5180-90-N26)	Transmission access door opened (TM 9-2350-314-10)

WARNING

Do not smoke or use open flame when working on fuel system. An explosion may occur, causing severe injury or death.

A Check fuel filters for contaminated fuel and dirty filter elements (para 5-16).

Are fuel and filter elements clean?

yes

no

Drain fuel filter and change fuel filter elements (para 5-16).

B Check radiator for low coolant level. If low, check engine oil for contamination (TM 9-2350-314-10).

Is radiator coolant level low and oil contaminated?

yes

no

If smoke persists, notify direct support maintenance.

Notify direct support maintenance.

END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED	(9) EXHAUST FUMES PRESENT IN CREW COMPARTMENT.

INITIAL SETUP

Tools	Equipment Conditions
General mechanic's tool kit (SC 5180-90-N26)	Air intake grille opened (TM 9-2350-314-10)

WARNING

Make sure engine and exhaust systems are cool enough to permit handling. Failure to do so may cause serious burns to personnel.

A Check exhaust outlet pipe and connections for leaks (Table 2-1, PMCS item 34).

Are there any leaks in exhaust outlet pipe and connections?

yes

Repair or replace faulty parts as required (para 6-1).

no

B Remove engine compartment access cover and inspect seal (para 16-7).

Is access cover seal serviceable?

yes

Replace engine compartment access cover seal (para 16-7).

no

C Inspect all exhaust pipes and clamps for damage or looseness (para 6-1).

Are all exhaust pipes and clamps tight and serviceable?

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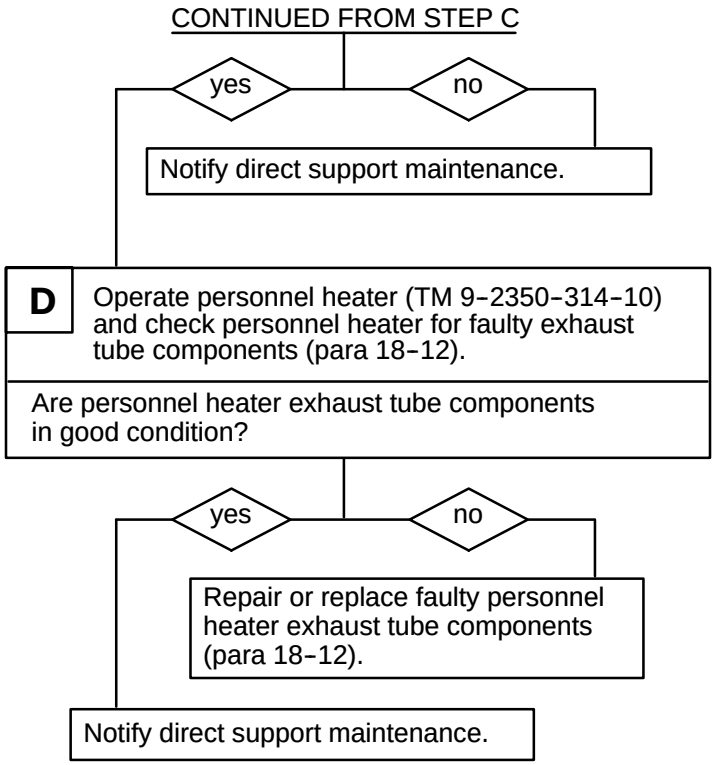
3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED	(9) EXHAUST FUMES PRESENT IN CREW COMPARTMENT. - CONTINUED



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE – CONTINUED	(10) ENGINE HAS LOW OR NO OIL PRESSURE.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Pressure gage tester (item 22, Appx F)

Equipment Conditions
Air intake grille opened (TM 9-2350-314-10)
Transmission access doors open (TM 9-2350-314-10)

CAUTION
If engine indicates low oil pressure (MASTER warning light on) or no oil pressure, shut engine off immediately. Failure to do so may result in serious damage to engine.

A Check engine oil level. Level should be between add and full marks (TM 9-2350-314-10).

Is oil level between add and full?

yes

no

Bring oil to proper level with proper grade of oil (TM 9-2350-314-10).

B Check oil lines, oil filter housing (para 4-6), and engine cover for oil leaks.

Is engine oil system free of leaks?

yes

no

Correct cause of any leak that can be repaired by unit maintenance (para 4-6). If leak cannot be corrected by unit maintenance, notify direct support maintenance.

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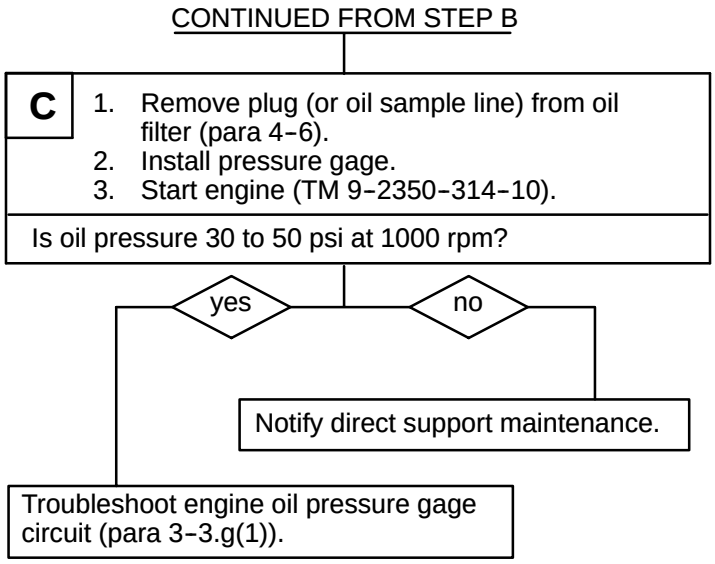
3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED	(10) ENGINE HAS LOW OR NO OIL PRESSURE. - CONTINUED



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE – CONTINUED	(11) ENGINE OVERHEATS.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Equipment Conditions
Air intake grille opened
(TM 9-2350-314-10)

WARNING

Do not remove radiator cap on a hot engine. Failure to follow this procedure may result in severe injury.

WARNING

To avoid burns, ensure engine and coolant have cooled before removing components. Failure to comply may result in severe injury.

WARNING

A protective fan screen must be installed prior to doing maintenance in the engine compartment when the engine is running or engine is in ground hop mode. Contact with rotating fan can cause injury.

A Check coolant in radiator for proper level (TM 9-2350-314-10).

Is coolant at proper level?

yes

no

Bring coolant in radiator to proper level (TM 9-2350-314-10).

B Check engine oil for proper level (TM 9-2350-314-10).

Is engine oil at proper level?

yes

no

Bring engine oil to proper level with proper grade oil (TM 9-2350-314-10).

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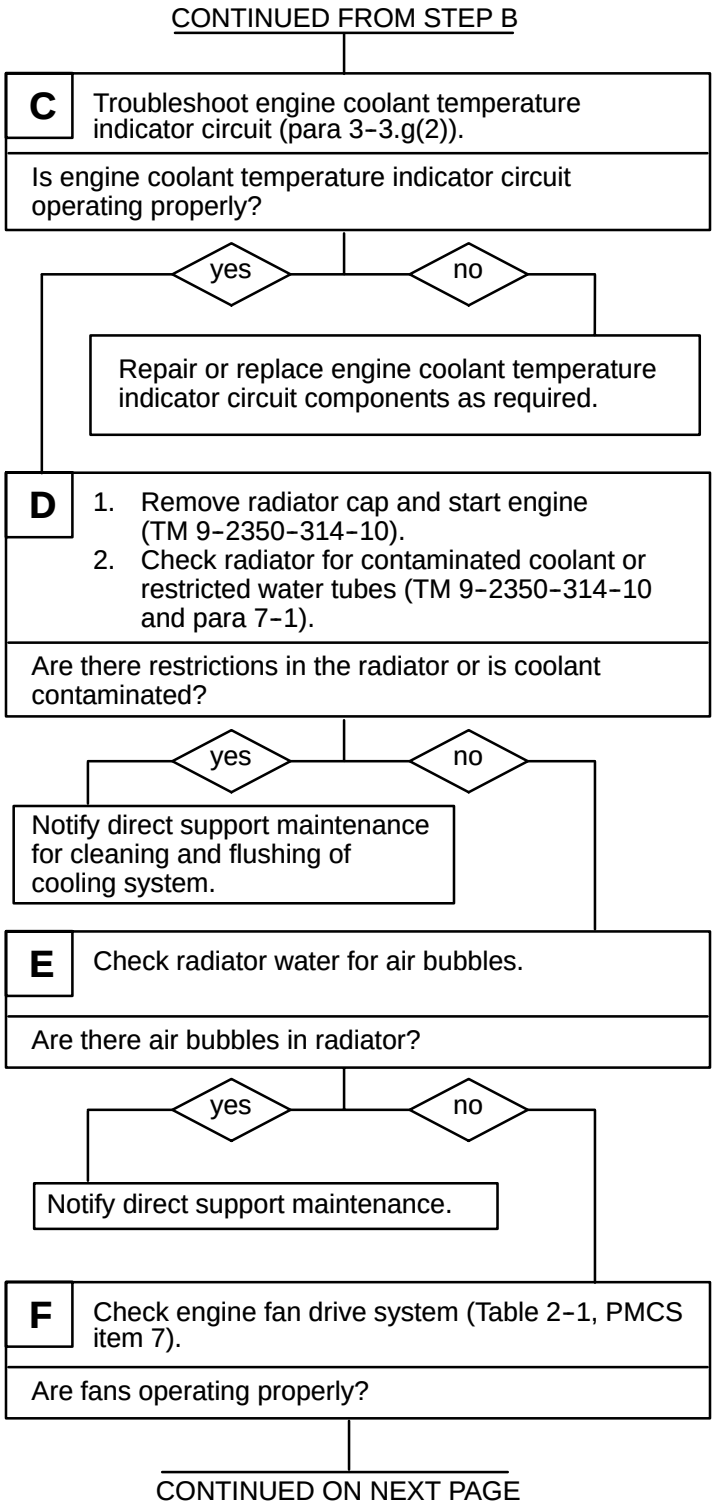
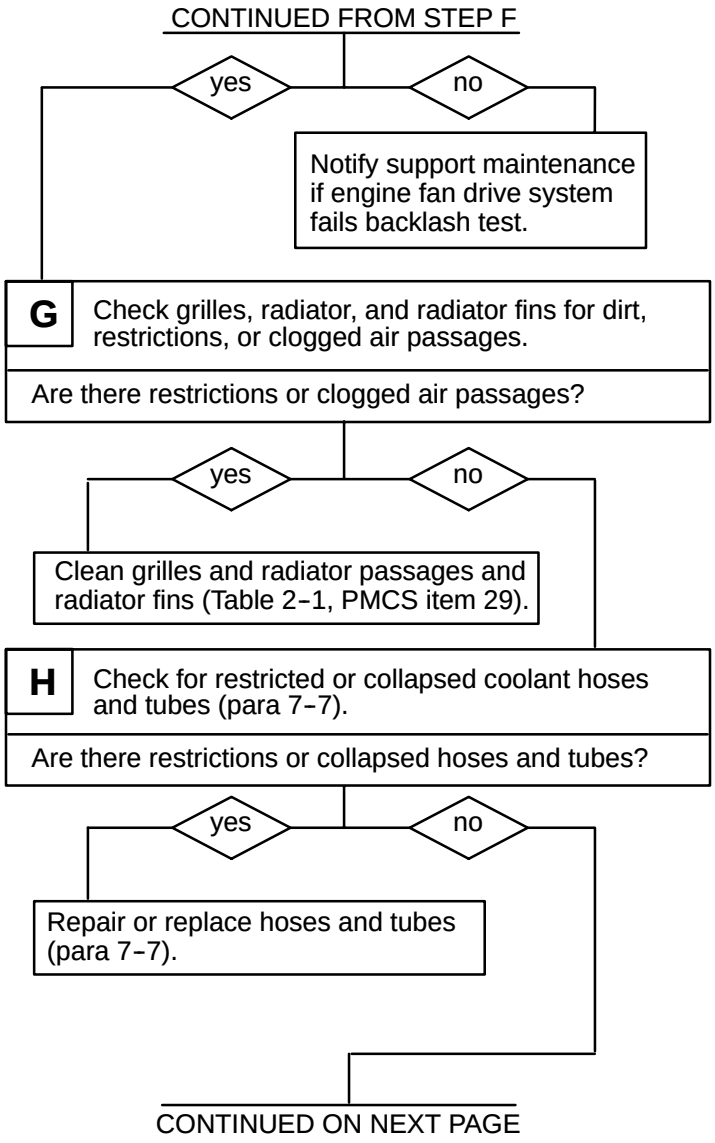
3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE – CONTINUED (11) ENGINE OVERHEATS. – CONTINUED



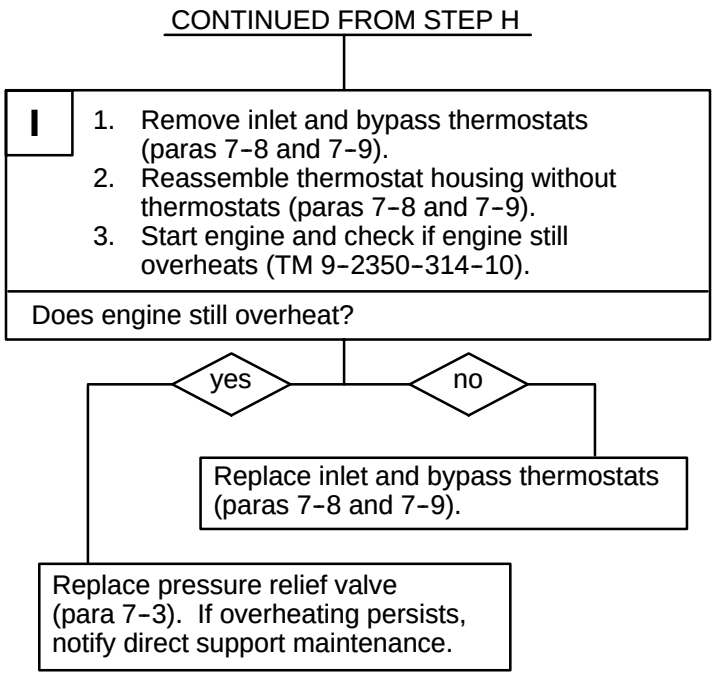
3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE – CONTINUED	(11) ENGINE OVERHEATS. – CONTINUED



3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED	(11) ENGINE OVERHEATS. - CONTINUED



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED	(12) ENGINE CRANKS BUT WILL NOT START IN COLD WEATHER. Temperature below 40°F (4°C).

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Engine grill cover open
(TM 9-2350-314-10)
Fan protective screens installed
(para 4-1.c)
Transmission access doors opened
(TM 9-2350-314-10)

Personnel Required
Two

A

1. Disconnect plug harness 12268389 from glow plug controller.
2. Using a multimeter, place red lead on positive terminal of batteries and black lead to sockets A thru H.
3. Check all eight sockets for 24 ± 3 V dc.

Is voltage indicated on all eight sockets?

no

yes

Go to step D.

B

1. Remove glow plug harness assembly 12268389 from glow plugs.
2. Perform continuity check between sockets A thru H and glow plug connector.

Is continuity indicated for each socket?

no

yes

Notify direct support maintenance to replace wiring harness 12268389.

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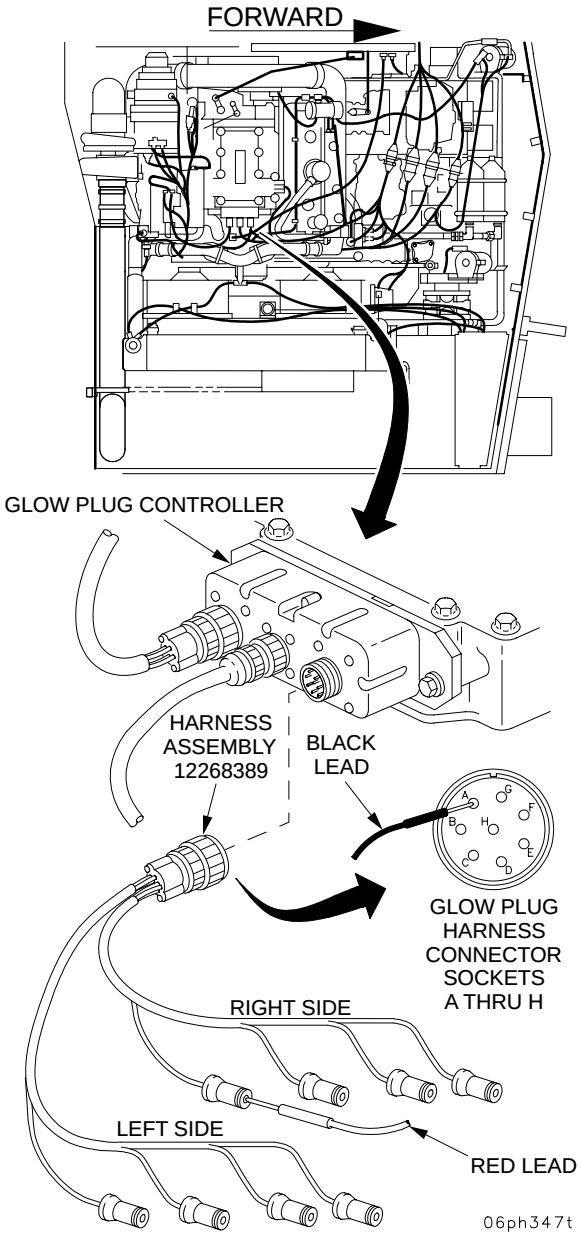


3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED	(12) ENGINE CRANKS BUT WILL NOT START IN COLD WEATHER. Temperature below 40°F (4°C). - CONTINUED

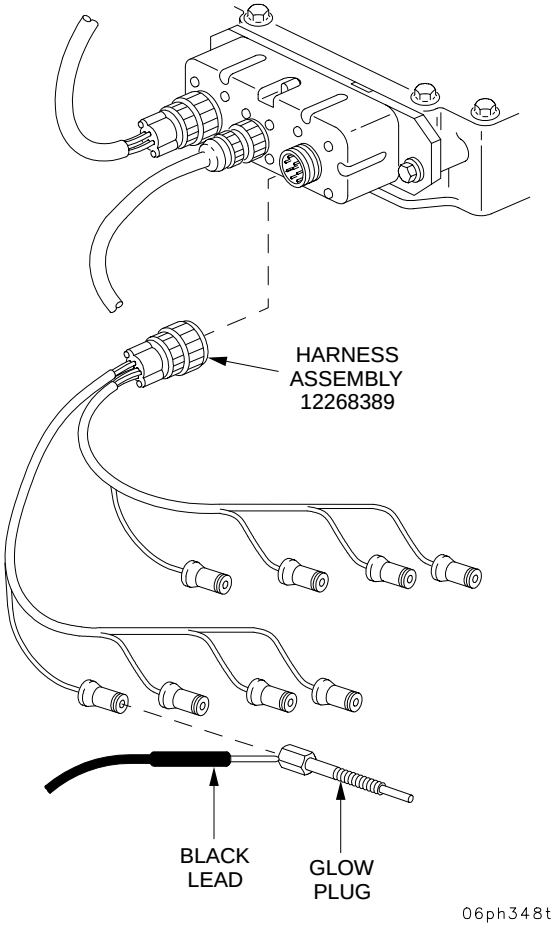
CONTINUED FROM STEP B

C

1. Place red lead of multimeter on positive terminal of batteries and black lead to each glow plug.
2. Check all eight glow plugs for vehicle voltage.

Is voltage indicated on all eight glow plugs?

- no → Notify direct support maintenance to replace bad glow plugs.
- yes → End of task. Verify problem is solved.



3-3 TROUBLESHOOTING CHART - CONTINUED

f.	ENGINE – CONTINUED	(12) ENGINE CRANKS BUT WILL NOT START IN COLD WEATHER. Temperature below 40°F (4°C) - CONTINUED

CONTINUED FROM STEP A

D

1. Reconnect harness assembly 12268389 to glow plug controller and glow plugs.
2. Disconnect glow plug controller to engine starter wiring harness 23506389 at glow plug controller.
3. Place red lead of multimeter in socket A and black lead to ground.
4. Check for continuity.

Is continuity indicated?

no

Notify direct support maintenance to replace wiring harness 23506389.

yes

E

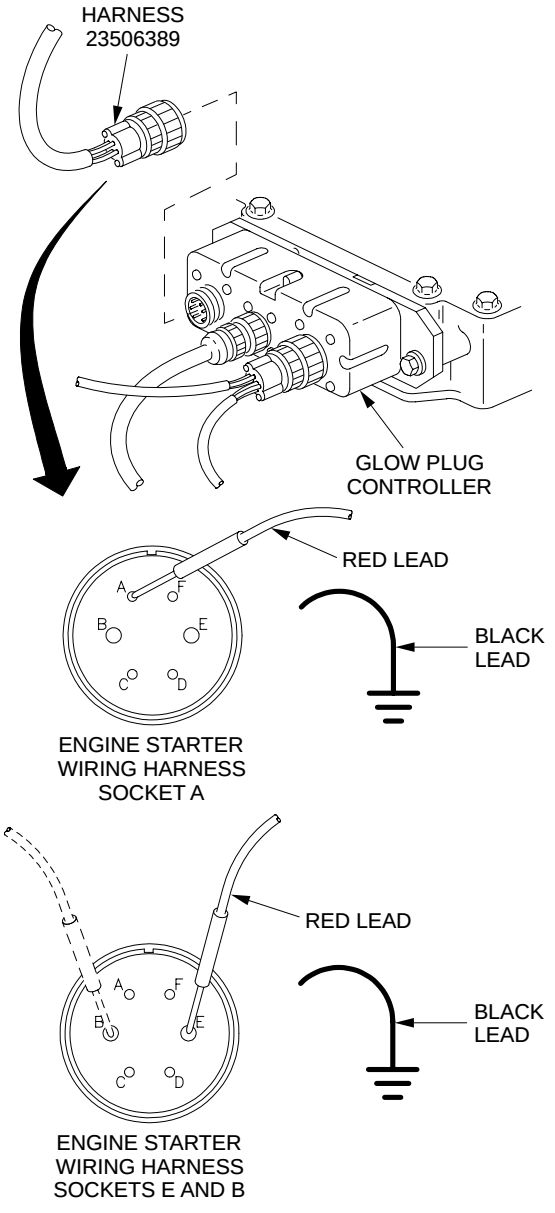
1. Place red lead of multimeter at sockets E and B and black lead to ground.
2. Check for 24 ± 3 V dc.

Is voltage indicated on both pins.

no

Notify direct support maintenance to replace wiring harness 23506389.

yes



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3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED	(12) ENGINE CRANKS BUT WILL NOT START IN COLD WEATHER. Temperature below 40°F (4°C). - CONTINUED

CONTINUED FROM STEP E

F

1. Place red lead of multimeter in socket F of wiring harness 23506389 and black lead to ground.
2. Turn MASTER switch ON.
3. Pull fuel shutoff handle and engage starter switch (refer to TM 9-2350-314-10).
4. Check for 24 ± 3 V dc.
5. Turn MASTER switch OFF (refer to TM 9-2350-314-10).

Is voltage indicated?

no

Notify direct support maintenance to replace wiring harness 23506389.

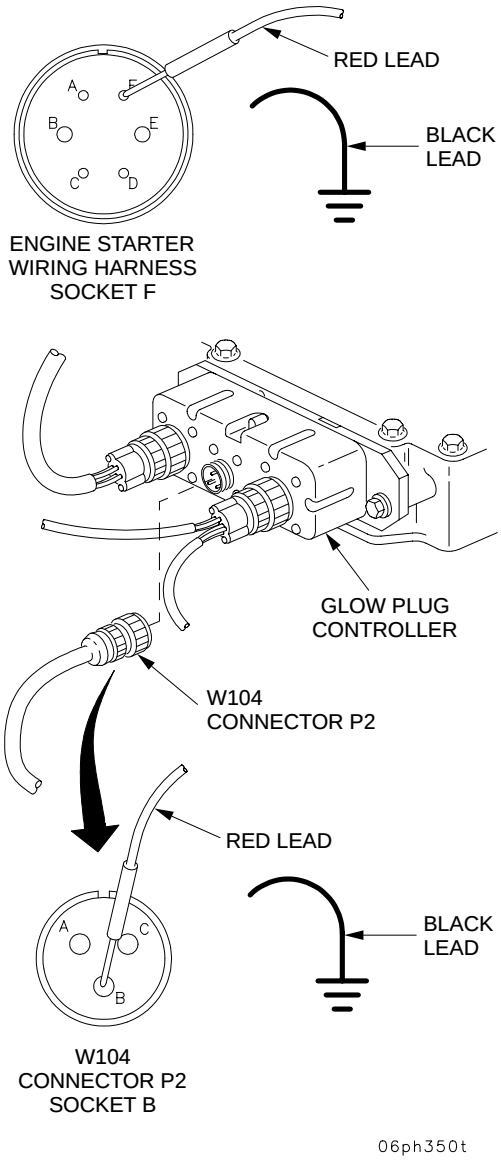
yes

G

1. Reconnect glow plug controller to engine starter wiring harness connector 23506389 to glow plug controller.
2. Disconnect harness assembly W104 connector P2 from glow plug controller.
3. Place red lead of multimeter in socket B (lead 486A) and black lead to ground.
4. Turn MASTER switch ON and hold glow plug switch on.
5. Check for 24 ± 3 V dc.
6. Turn MASTER switch OFF and release glow plug switch (refer to TM 9-2350-314-10).

Is voltage indicated?

NOTE: No voltage should be present on sockets A or C. Also, there should be continuity between A and C.



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3-3 TROUBLESHOOTING CHART - CONTINUED

f.	ENGINE – CONTINUED	(12) ENGINE CRANKS BUT WILL NOT START IN COLD WEATHER. Temperature below 40°F (4°C). – CONTINUED

CONTINUED FROM STEP G

no / yes

Go to Step I.

H

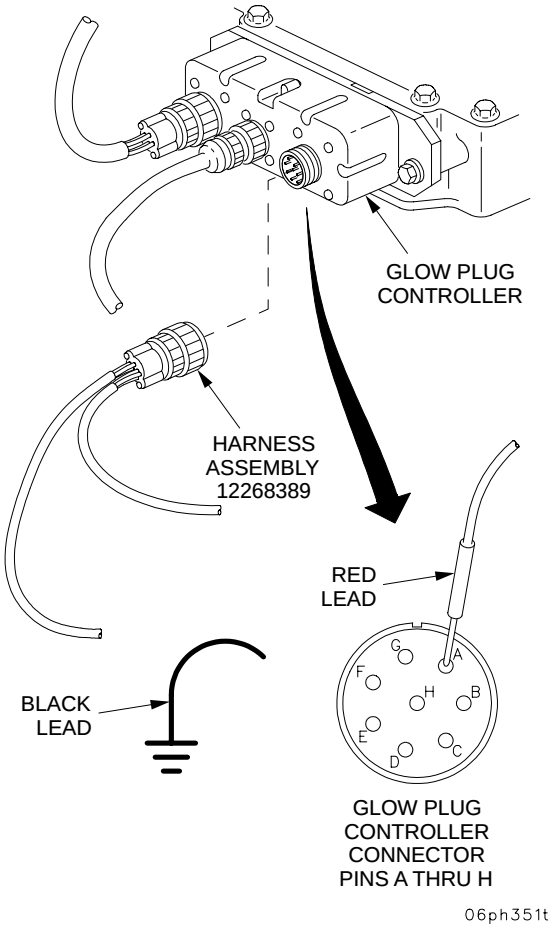
1. Reconnect harness assembly W104 connector P2 to glow plug controller.
2. Disconnect harness assembly 12268389 from glow plug controller.
3. Place red lead of multimeter on pin A thru H of connector on glow plug controller and black lead to ground.
4. Turn MASTER switch ON and hold glow plug switch ON (refer to TM 9-2350-314-10).
5. Check for 24 ± 3 V dc.
6. Turn MASTER switch OFF (refer to TM 9-2350-314-10).

Is voltage indicated?

no / yes

Notify direct support maintenance to replace glow plug controller.

Reconnect harness 12268389. Verify problem is solved.



3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED	(12) ENGINE CRANKS BUT WILL NOT START IN COLD WEATHER. Temperature below 40°F (4°C). - CONTINUED

CONTINUED FROM STEP G

I

1. Reconnect wiring harness assembly W104 connector P2 to glow plug controller.
2. Disconnect wiring harness W105 connector P1 from engine disconnect bracket.
3. Place red multimeter lead in harness W105 connector P1 sockets C and O (one at a time) and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
5. Hold GLOW PLUGS switch ON (TM 9-2350-314-10).
6. Check for voltage.

Is voltage present at point C and not present at pin C?

yes / no

Repair or replace harness W104 (para 8-63).

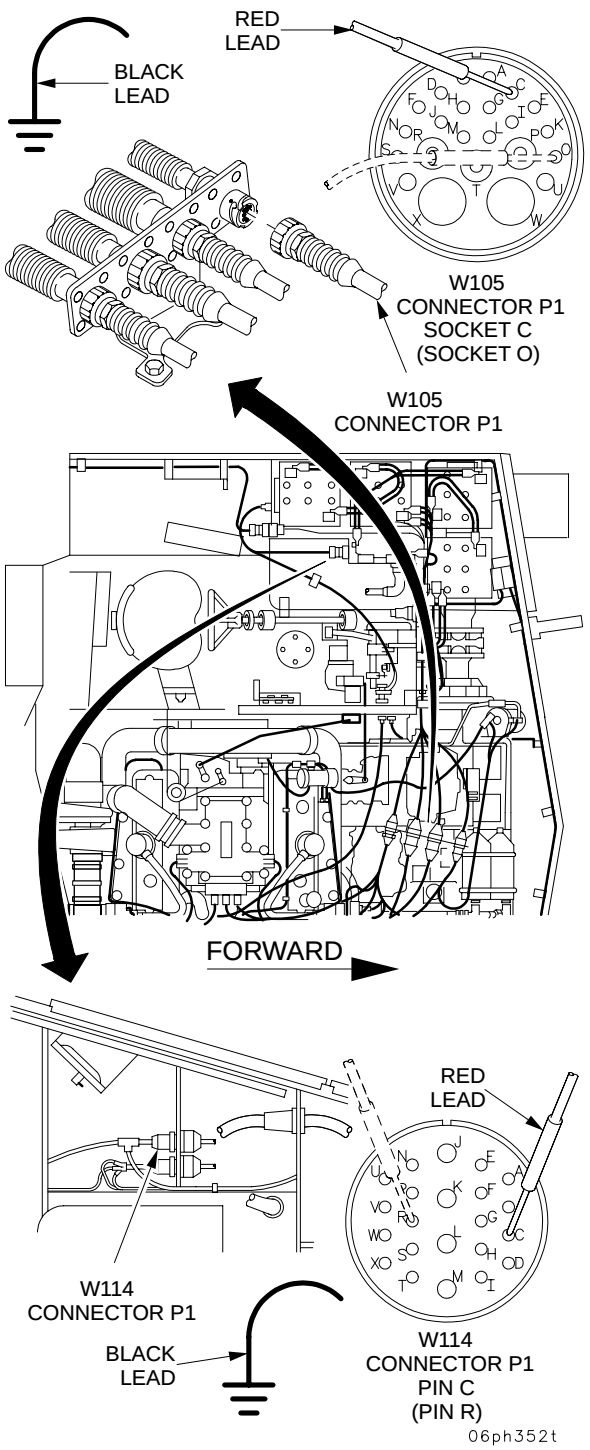
J

1. Release GLOW PLUGS switch (TM 9-2350-314-10).
2. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
3. Reconnect harness W105 connector P1 to engine disconnect bracket.
4. Disconnect wiring harness W114 connector P1 from driver's bulkhead.
5. Place red multimeter lead on harness W114 connector P1 pins C and R (one at a time) and black lead to ground.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
7. Hold GLOW PLUGS switch ON (TM 9-2350-314-10).
8. Check for voltage.

Is voltage present at pin C and not present at pin R?

yes / no

Repair or replace harness W105 (para 8-64).



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3-3 TROUBLESHOOTING CHART - CONTINUED

f.	ENGINE – CONTINUED	(12) ENGINE CRANKS BUT WILL NOT START IN COLD WEATHER. Temperature below 40°F (4°C). – CONTINUED

CONTINUED FROM STEP F

K Is voltage present at pin R?

yes / no

Repair or replace harness W114 (para 8-73).

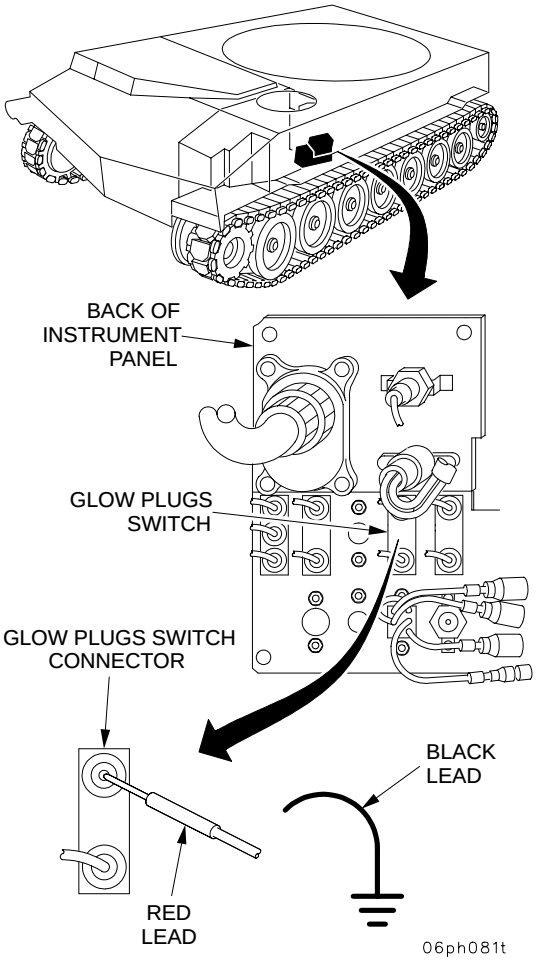
L

1. Release GLOW PLUGS switch (TM 9-2350-314-10).
2. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
3. Reconnect harness W114 connector P1 to driver's bulkhead.
4. Remove driver's instrument panel (para 8-12).
5. Disconnect lead 486A from GLOW PLUGS switch.
6. Place red multimeter lead in GLOW PLUGS switch connector and black lead to ground.
7. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
8. Hold GLOW PLUGS switch ON (TM 9-2350-314-10).
9. Check for voltage.

Is voltage present?

yes / no

Repair or replace harness W114 (para 8-73).



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3-3 TROUBLESHOOTING CHART - CONTINUED

f. ENGINE - CONTINUED	(12) ENGINE CRANKS BUT WILL NOT START IN COLD WEATHER. Temperature below 40°F (4°C). - CONTINUED

CONTINUED FROM STEP L

M

1. Release GLOW PLUGS switch (TM 9-2350-314-10).
2. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
3. Reconnect lead 486A to GLOW PLUGS switch.
4. Disconnect lead 10S from GLOW PLUGS switch.
5. Place red multimeter lead in lead 10S connector and black lead to ground.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
7. Check for voltage.

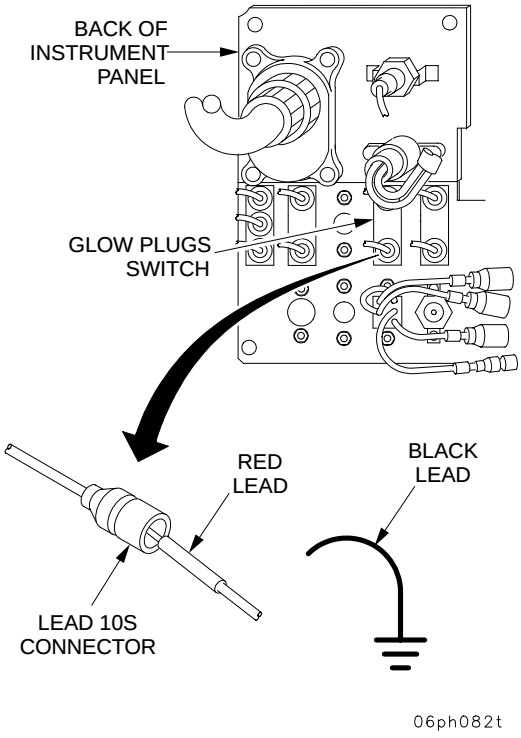
Is voltage present?

yes

Replace GLOW PLUGS switch (para 8-12).

no

Repair or replace W120 lead 10S from circuit breaker CB4 to GLOW PLUGS switch (para 8-59 or para 8-79).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES

The gages are located on the portable instrument panel and include the engine oil pressure gage, engine water temperature gage, transmission oil pressure gage, transmission oil temperature gage, fuel gage, and the battery/generator gage. Included in the gage system are the tachometer and speedometer, located on the driver's control panel.

The engine oil pressure gage circuit consists of the pressure gage, circuit breaker number 1 (CB1), pressure transmitter, and related wiring. The engine oil pressure gage should indicate engine oil pressure any time the vehicle MASTER switch is ON and the engine is running. The relationship of the engine oil pressure gage components is shown in the block diagram on the following page.

The engine water temperature gage circuit consists of the temperature gage, circuit breaker CB1, temperature transmitter, and related wiring. The engine water temperature gage should indicate engine coolant temperature any time the vehicle MASTER switch is ON. The relationship of the engine water temperature gage circuit is shown in the block diagram on the following page.

The transmission oil pressure gage circuit consists of the pressure gage, circuit breaker CB1, pressure transmitter, and related wiring. The transmission oil pressure gage should indicate transmission oil pressure any time the vehicle MASTER switch is ON and the engine is running. The relationship of the components in the transmission oil pressure gage circuit is shown in the block diagram on the following page.

The transmission oil temperature gage circuit consists of the temperature gage, circuit breaker CB1, temperature transmitter, and related wiring. The transmission oil temperature gage should indicate transmission oil temperature any time the vehicle MASTER switch is ON. The block diagram on the following page shows the relationship of the transmission oil temperature gage circuit components.

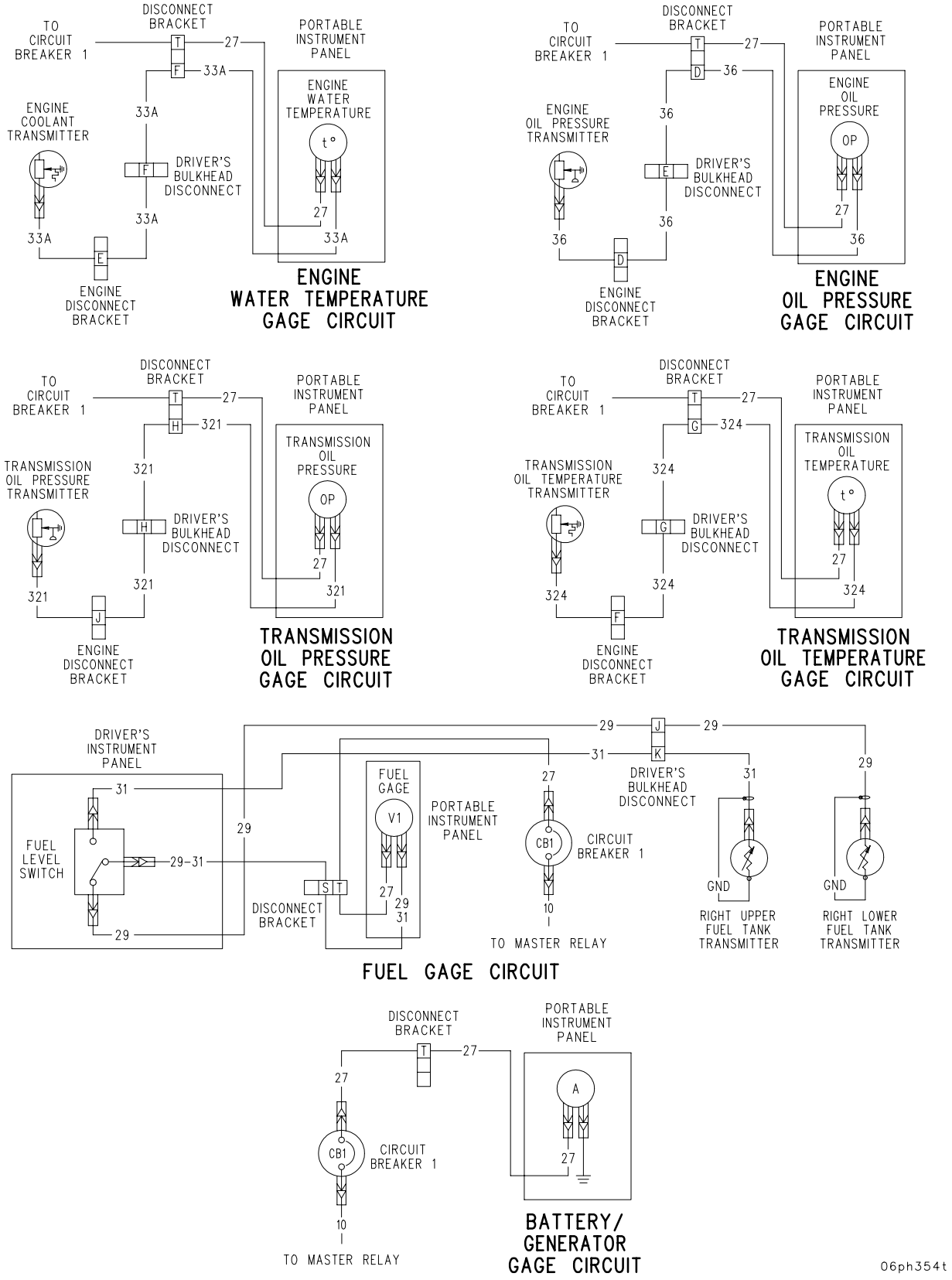
The fuel gage circuit consists of the fuel gage, circuit breaker CB1, fuel gage switch, upper and lower fuel tank transmitters, and related wiring. The fuel gage should indicate the level of fuel in the upper tank when the gage switch is set to UPPER and the vehicle MASTER switch is ON. Setting the gage switch to LOWER and turning the vehicle MASTER switch ON, the gage should indicate the fuel level in the lower tank. The relationship of the fuel gage circuit components is shown in the block diagram on the following page.

The battery/generator gage circuit consists of the gage, circuit breaker CB1, and related electrical wiring. The battery/generator gage should indicate vehicle voltage any time the vehicle MASTER switch is ON. See hull electrical schematic in fold-out pages (FP-1 through FP-9/FP-10 blank).

The tachometer system consists of the tachometer, flexible drive shaft, pulse tachometer, and drive output shaft. The tachometer should indicate engine revolutions per minute any time the vehicle MASTER switch is ON and the engine is running. See troubleshooting in-text art for pictorial description of components.

The speedometer system consists of the speedometer, flexible drive shaft, speedometer drive shaft, and speedometer drive. The speedometer should indicate vehicle speed in miles per hour any time the vehicle MASTER switch is ON with the engine running and the transmission in a forward gear. See troubleshooting chart for a pictorial description of components.

3-3 TROUBLESHOOTING CHART - CONTINUED



3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(1) ENGINE OIL PRESSURE GAGE FAILS TO OPERATE WITH ENGINE RUNNING. All other instruments operate.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests. 16 AWG wire may be used as an extension.)

Personnel Required
Two

Equipment Conditions
Air intake grille open (TM 9-2350-314-10)
Transmission access doors open (TM 9-2350-314-10)
Portable instrument panel cover removed (para 8-14)
Engine compartment access cover in driver's compartment removed (para 16-7)

A

1. Make sure vehicle MASTER switch is OFF (TM 9-2350-314-10).
2. Disconnect harness W104 lead 36 from engine oil pressure transmitter.
3. Place a jumper lead in harness W104 lead 36 connector socket. At this time, do not connect the other end of jumper.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10), oil pressure gage should read maximum.
5. Ground jumper lead. Oil pressure gage should read minimum.

Does engine oil pressure gage show maximum when not grounded and minimum when grounded?

yes

Replace engine oil pressure transmitter (para 8-49).

no

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W112 lead 27 from engine oil pressure gage.
3. Place multimeter red lead in harness W112 lead 27 socket and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Repair or replace wire 27 of harness W112 from instrument panel connector to engine oil pressure gage (para 8-71).

no

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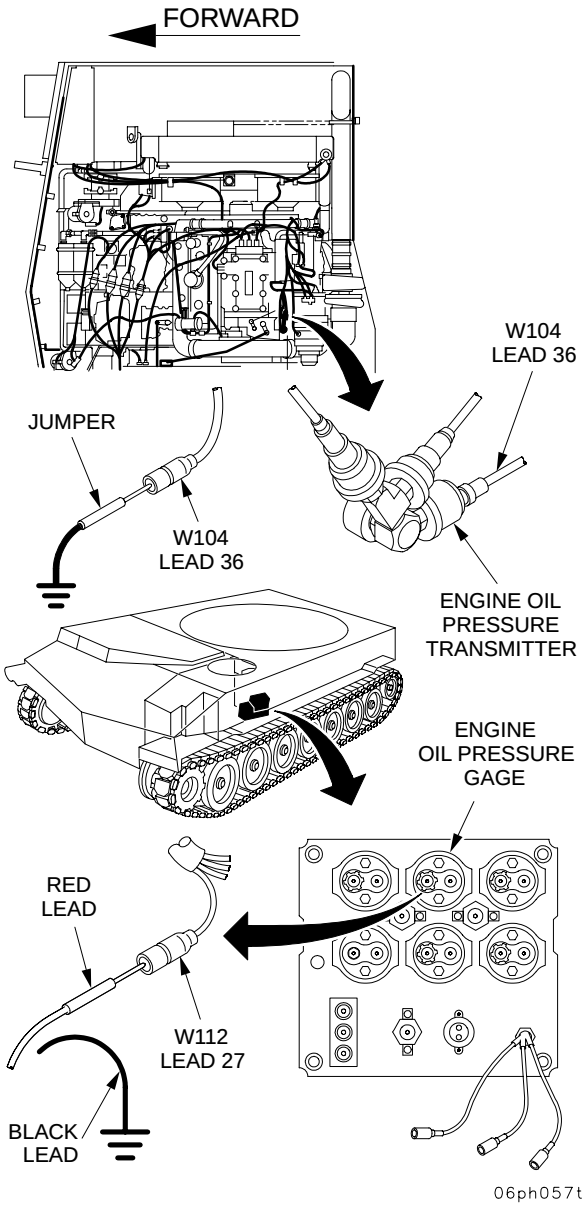

3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(1) ENGINE OIL PRESSURE GAGE FAILS TO OPERATE WITH ENGINE RUNNING. All other instruments operate. - CONTINUED

CONTINUED FROM STEP B

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W105 connector P1 from harness W104 connector J1.
3. Remove jumper lead from harness W104 lead 36.
4. Place one multimeter lead on harness W104 connector J1 pin D and other lead in harness W104 lead 36 connector socket. Check for continuity.

Is continuity present?

yes

no

Repair or replace harness W104 from engine oil pressure transmitter to engine connector (para 8-63).

D

1. Reconnect lead 36 to engine oil pressure transmitter.
2. Disconnect harness W114 connector P1 from harness W105 connector J1.
3. Place one multimeter lead in harness W105 connector P1 socket D and other lead in harness W105 connector J1 socket E. Check for continuity.

Is continuity present?

yes

no

Repair or replace harness W105 from engine connector to bulkhead connector (para 8-64).

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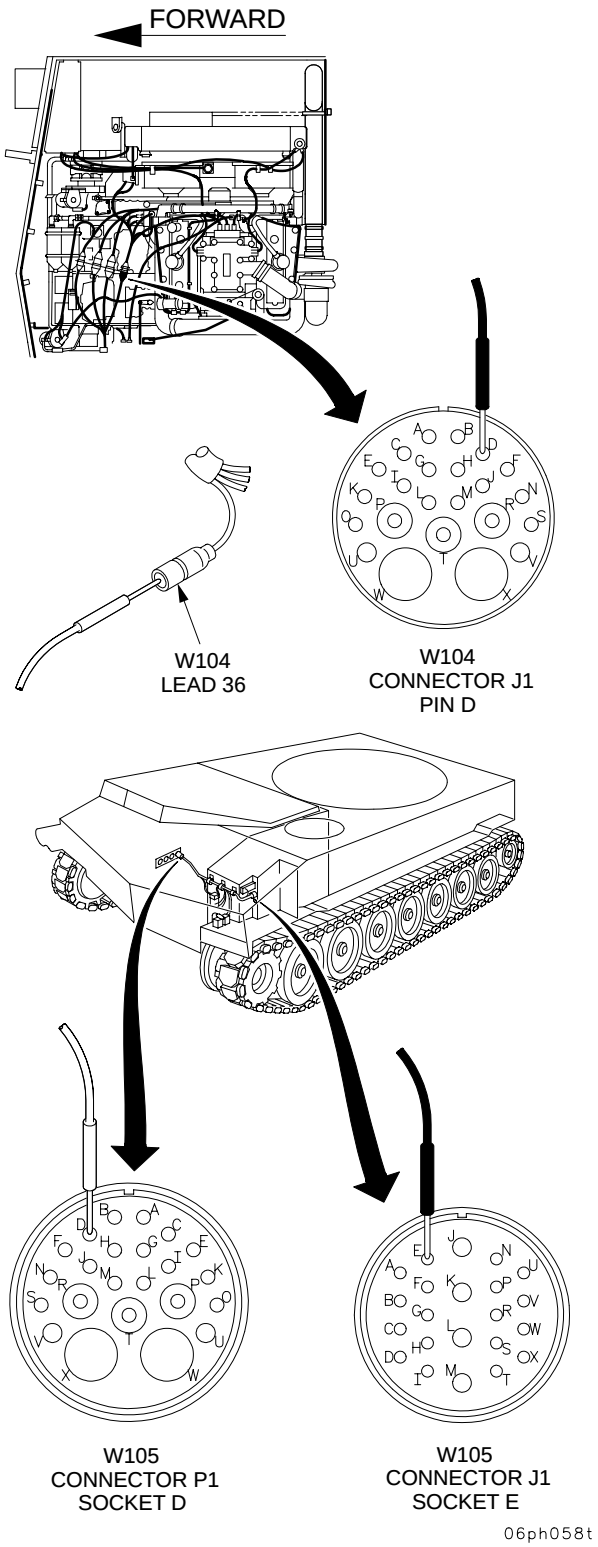

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3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(1) ENGINE OIL PRESSURE GAGE FAILS TO OPERATE WITH ENGINE RUNNING. All other instruments operate. - CONTINUED

CONTINUED FROM STEP D

E

1. Reconnect harness W105 connector P1 to harness W104 connector J1.
2. Disconnect harness W112 connector P1 from harness W114 connector J1.
3. Place one multimeter lead in harness W114 connector P1 pin E and other lead in harness W114 connector J1 socket D. Check for continuity.

Is continuity present?

yes

no

Repair or replace harness W114 from bulkhead connector to portable instrument panel connector (para 8-73).

F

1. Reconnect harness W114 connector P1 to bulkhead disconnect.
2. Disconnect harness W112 lead 36 from engine oil pressure gage connector.
3. Place one multimeter lead on harness W112 connector P1 pin D and other lead in harness W112 lead 36 connector socket. Check for continuity.

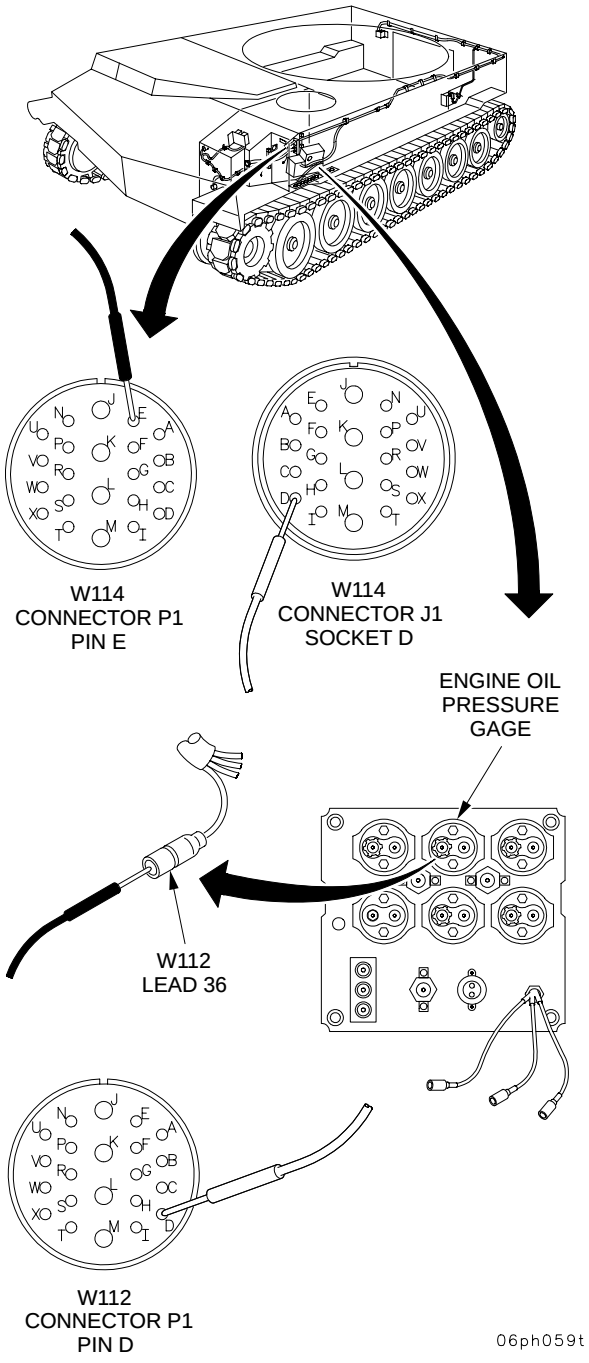
Is continuity present?

yes

no

Repair or replace harness W112 from instrument panel connector to engine oil pressure gage connector (para 8-71).

Replace engine oil pressure gage (para 8-14).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(2) ENGINE WATER TEMPERATURE GAGE FAILS TO OPERATE PROPERLY. Engine water gage needle does not move, is not steady, or is inaccurate. All other gages operate properly.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests. 16 AWG wire may be used as an extension.)

Equipment Conditions
Engine and transmission access doors open (TM 9-2350-314-10)
Portable instrument panel cover removed (para 8-14)

Personnel Required
Two

A

1. With engine not running and vehicle MASTER switch OFF, disconnect harness W104 lead 33A from engine coolant temperature transmitter.
2. Place a jumper lead in harness W104 lead 33A connector socket. At this time do not connect other end of jumper.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and observe engine water temperature gage. Gage should indicate minimum reading.
4. Place jumper lead connected to harness W104 lead 33A to ground and observe gage. Gage should indicate maximum reading.

Does water temperature gage show minimum when not grounded, and maximum when grounded?

yes

Replace engine coolant temperature transmitter (para 8-51).

no

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W105 connector P1 from harness W104 connector J1.
3. Remove jumper lead from harness W104 lead 33A.
4. Place one multimeter lead on harness W104 connector J1 pin E and other in harness W104 lead 33A connector socket. Check for continuity.

Is continuity present?

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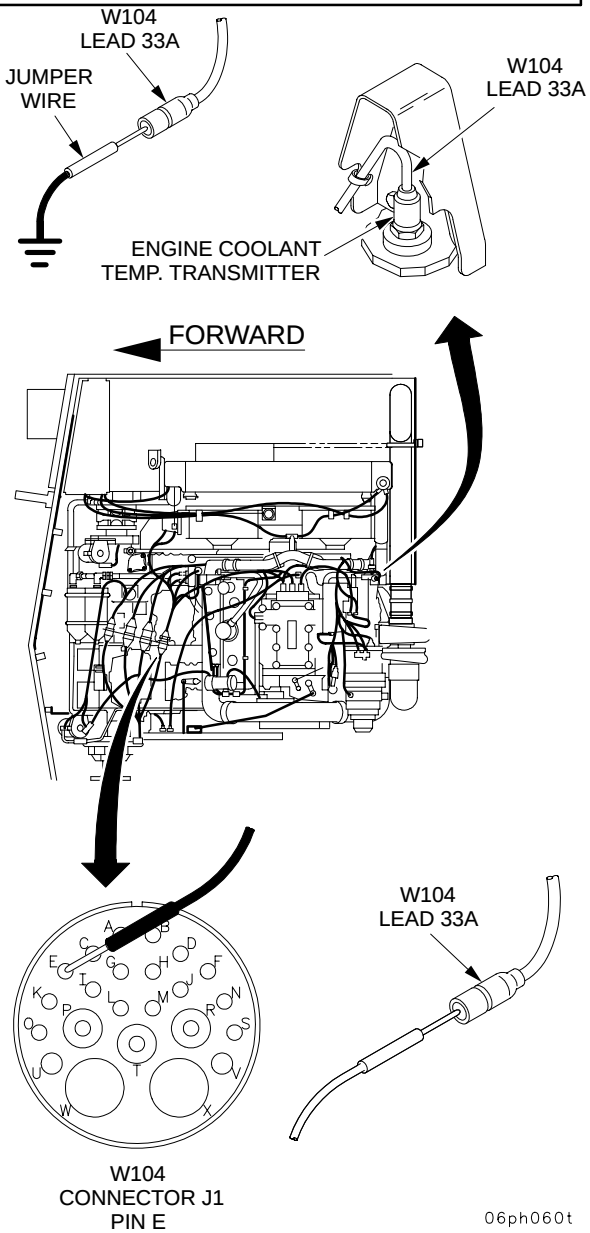

3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(2) ENGINE WATER TEMPERATURE GAGE FAILS TO OPERATE PROPERLY. Engine water gage needle does not move, is not steady, or is inaccurate. All other gages operate properly. - CONTINUED

CONTINUED FROM STEP B

yes

Repair or replace harness W104 from lead 33A to connector P1 (para 8-63).

no

C

1. Reconnect harness W104 lead 33A to coolant temperature transmitter.
2. Disconnect harness W114 connector P1 from harness W105 connector J1.
3. Check harness W105 lead 33A for continuity by placing one multimeter lead in harness W105 connector P1 socket E and the other lead in harness W105 connector J1 socket F.

Is continuity present?

yes

Repair or replace harness W105 from connector P1 to connector P2 (para 8-64).

no

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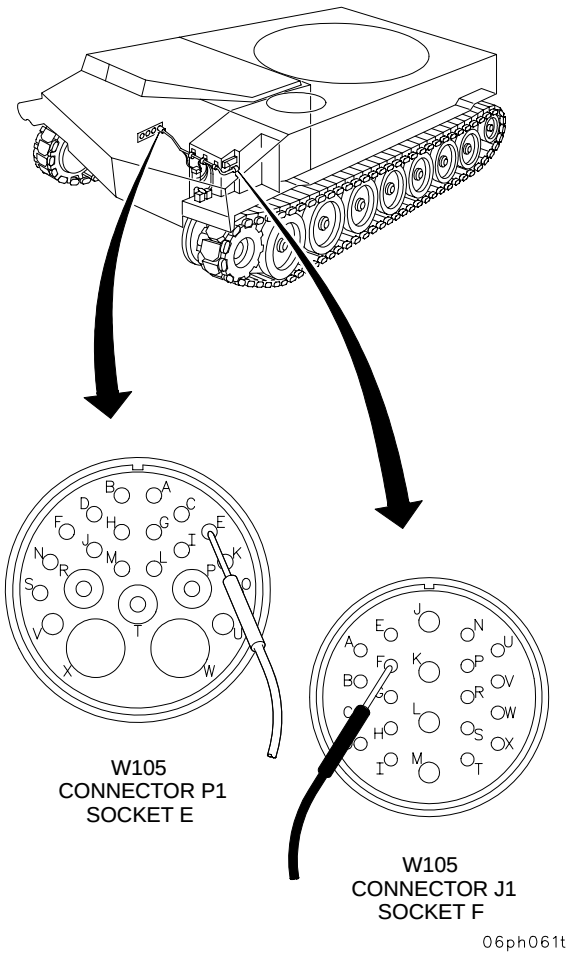

3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(2) ENGINE WATER TEMPERATURE GAGE FAILS TO OPERATE PROPERLY. Engine water gage needle does not move, is not steady, or is inaccurate. All other gages operate properly. - CONTINUED

CONTINUED FROM STEP C

D

1. Reconnect harness W105 connector P1 to harness W104 connector J1.
2. Disconnect harness W112 connector P1 from harness W114 connector J1.
3. Check lead 33A for continuity by placing one multimeter lead on harness W114 connector P1 pin F and other lead in harness W114 connector J1 socket F.

Is continuity present?

yes

no

Repair or replace harness W114 from connector P1 to connector P2 (para 8-73).

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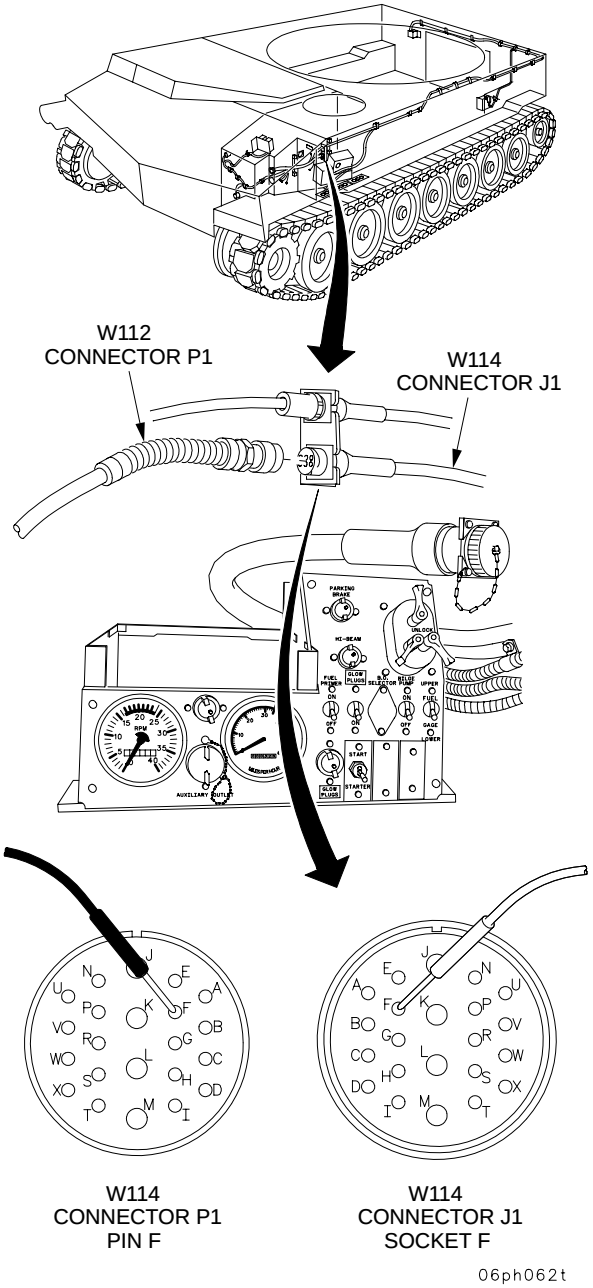


3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES – CONTINUED	(2) ENGINE WATER TEMPERATURE GAGE FAILS TO OPERATE PROPERLY. Engine water gage needle does not move, is not steady, or is inaccurate. All other gages operate properly. – CONTINUED

CONTINUED FROM STEP D

E

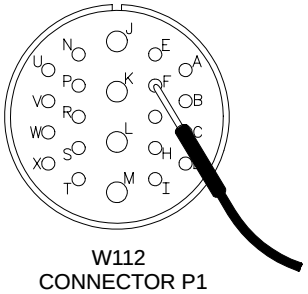
1. Reconnect harness W114 connector P1 to harness W105 connector J1.
2. Disconnect harness W112 lead 33A from engine water temperature gage.
3. Check lead 33A for continuity by placing one multimeter lead on harness W112 connector P1 pin F and the other lead in harness W112 lead 33A socket.

Is continuity present?

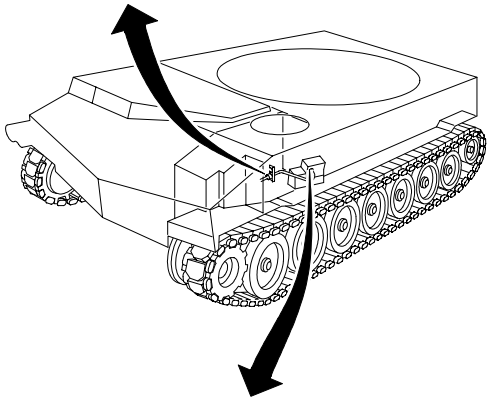
yes

no

Repair or replace harness W112 from connector P1 to lead 33A (para 8-71).



W112
CONNECTOR P1
PIN F



F

1. Reconnect harness W112 connector P1 to harness W114 connector P2.
2. Disconnect harness W112 lead 27 from engine water temperature gage.
3. Place multimeter red lead in harness W112 lead 27 connector and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present equal to battery voltage reading?

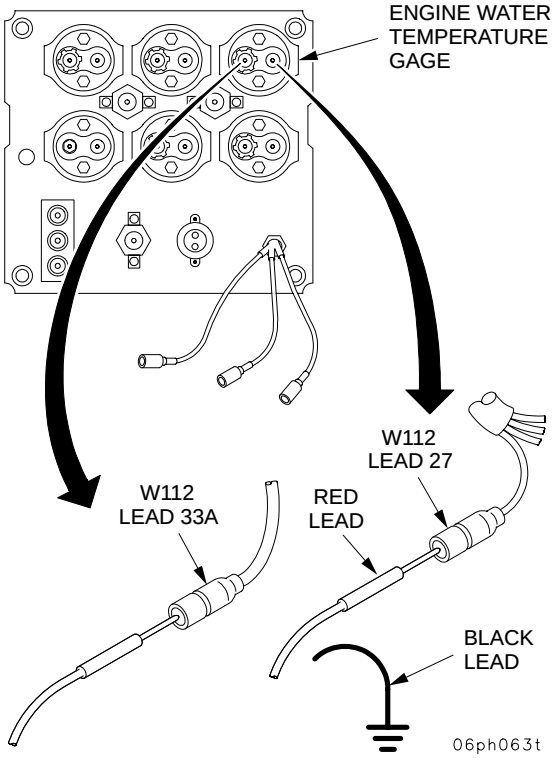
yes

no

Repair or replace harness W112 from connector P1 to lead 27 at the engine water temperature gage (para 8-71).

Replace engine water temperature gage (para 8-14).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(3) TRANSMISSION OIL PRESSURE GAGE FAILS TO OPERATE PROPERLY. All other instruments operate.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests. 16 AWG wire may be used as an extension.)

Equipment Conditions
Air intake grille open (TM 9-2350-314-10)
Transmission access doors open (TM 9-2350-314-10)
Portable instrument panel cover removed (para 8-16)

Personnel Required
Two

A

1. Make sure vehicle MASTER switch is OFF (TM 9-2350-314-10).
2. Disconnect harness W104 lead 321 at transmission oil pressure transmitter.
3. Place a jumper lead in harness W104 lead 321 connector socket.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10). Transmission oil pressure gage should indicate maximum reading.
5. Ground jumper lead. Transmission oil pressure gage should indicate minimum reading.

Does transmission oil pressure gage show maximum when not grounded and minimum when grounded?

yes / no

yes: Replace transmission oil pressure transmitter (para 8-46).

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W112 lead 27 at transmission oil pressure gage connector.
3. Place multimeter red lead in harness W112 lead 27 connector socket and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes / no

yes: Repair or replace harness W112 from connector P1 to leads 27 and 36 (para 8-71).

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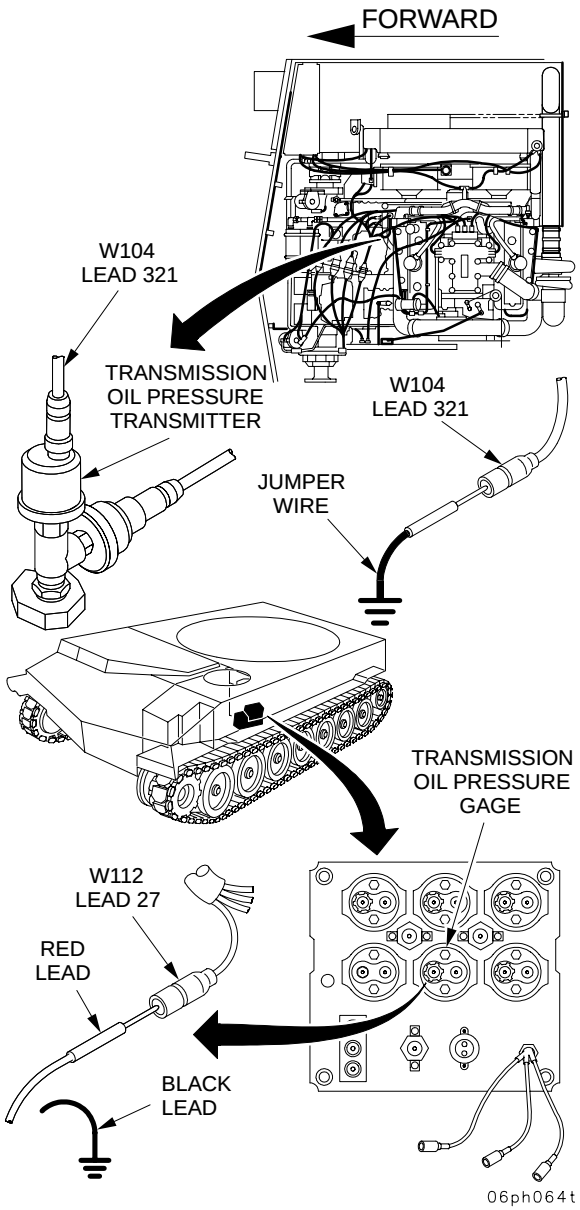

3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(3) TRANSMISSION OIL PRESSURE GAGE FAILS TO OPERATE PROPERLY. All other instruments operate. - CONTINUED

CONTINUED FROM STEP B

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W105 connector P1 from harness W104 connector J1.
3. Remove jumper lead from harness W104 lead 321 connector socket.
4. Place one multimeter lead on harness W104 connector J1 pin J and other lead in harness W104 lead 321 connector socket. Check for continuity.

Is continuity present?

yes

Repair or replace harness W104 from connector J1 to lead 321 (para 8-63).

no

D

1. Reconnect harness W104 lead 321 to transmission oil pressure transmitter.
2. Disconnect harness W114 connector P1 from harness W105 connector J1.
3. Place one multimeter lead in harness W105 connector P1 socket J and other lead in harness W105 connector J1 socket H. Check for continuity.

Is continuity present?

yes

Repair or replace harness W105 from connector P1 to connector J1 (para 8-64).

no

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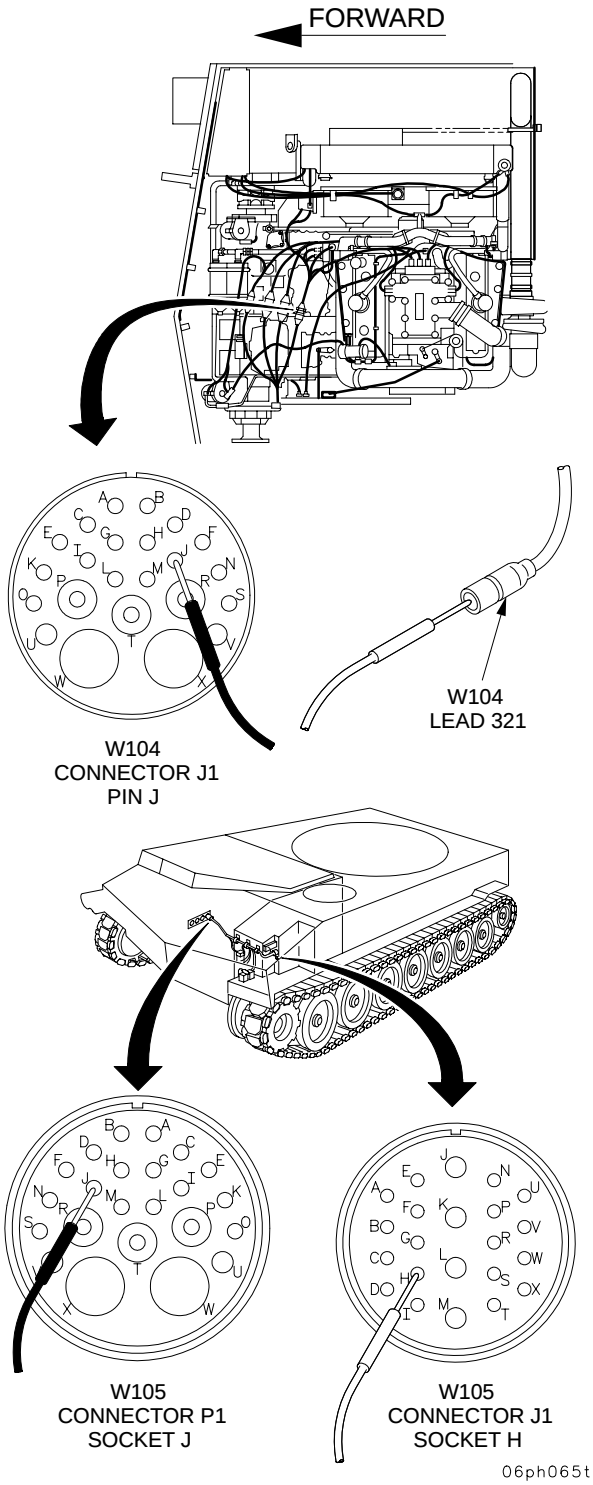


3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(3) TRANSMISSION OIL PRESSURE GAGE FAILS TO OPERATE PROPERLY. All other instruments operate. - CONTINUED

CONTINUED FROM STEP D

E

1. Reconnect harness W105 connector P1 to harness W104 connector P1.
2. Disconnect harness W112 connector P1 from harness W114 connector J1.
3. Place one multimeter lead on harness W114 connector P1 pin H and other lead in harness W114 connector J1 socket H. Check for continuity.

Is continuity present?

yes / no

Repair or replace harness W114 from connector P1 to connector J1 (para 8-73).

F

1. Reconnect harness W114 connector P1 to harness W105 connector J1.
2. Disconnect harness W112 lead 321 from transmission oil pressure gage connector.
3. Place one multimeter lead on harness W112 connector P1 pin H and other lead in harness W112 lead 321 connector socket. Check for continuity.

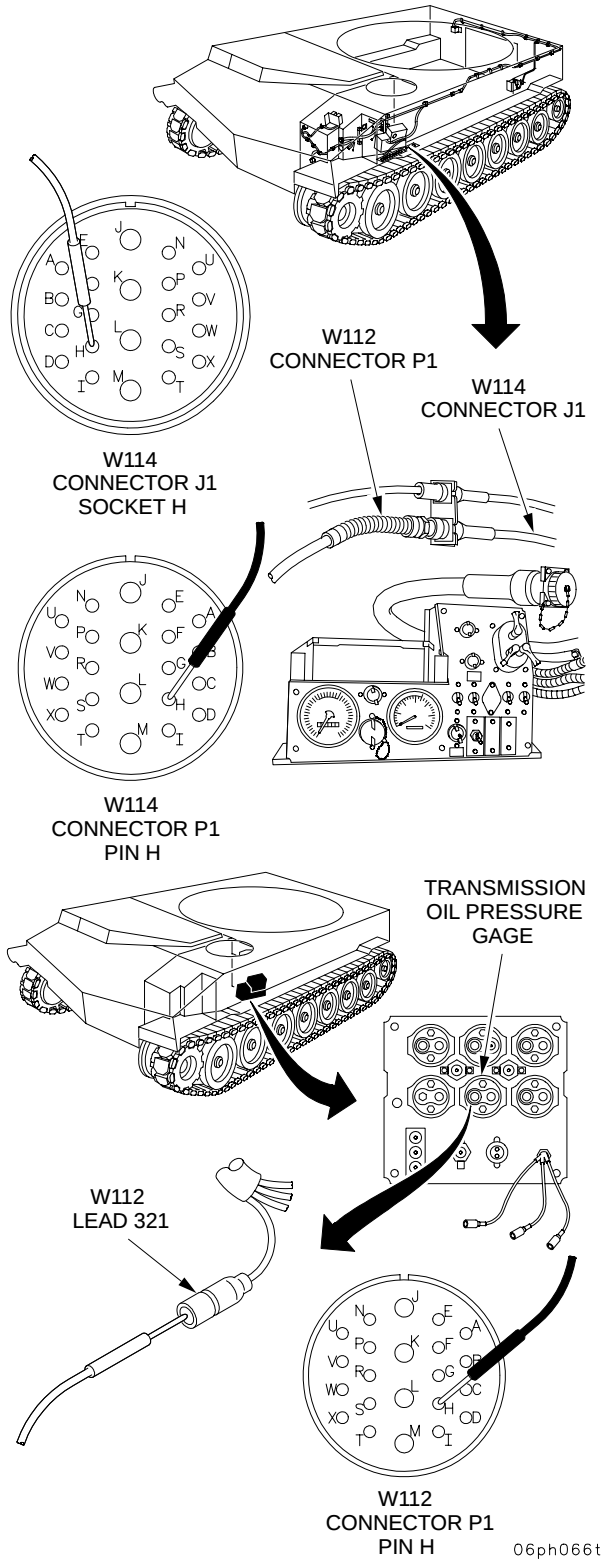
Is continuity present?

yes / no

Repair or replace harness W112 from connector P1 to lead 321 (para 8-71).

Replace transmission oil pressure gage (para 8-14).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(4) TRANSMISSION OIL TEMPERATURE GAGE FAILS TO INDICATE TRANSMISSION OIL TEMPERATURE. All other instruments operate.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests. 16 AWG wire may be used as an extension.)

Equipment Conditions
Air intake grille open
(TM 9-2350-314-10)
Transmission access doors
open (TM 9-2350-314-10)
Portable instrument panel cover removed
(para 8-14)
Driver's instrument panel removed
(para 8-12)

Personnel Required
Two

A

1. Turn engine and vehicle MASTER switch OFF (TM 9-2350-314-10), if ON.
2. Disconnect harness W104 lead 324 from transmission oil temperature transmitter.
3. Place a jumper lead in harness W104 lead 324 connector socket. Do not attach other end of jumper at this time.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10). Transmission oil temperature gage should indicate minimum.
5. Ground jumper lead. Transmission oil temperature gage should indicate maximum.

Does transmission oil temperature gage show minimum when not grounded and maximum when grounded?

yes

Replace transmission oil temperature transmitter (para 8-45).

no

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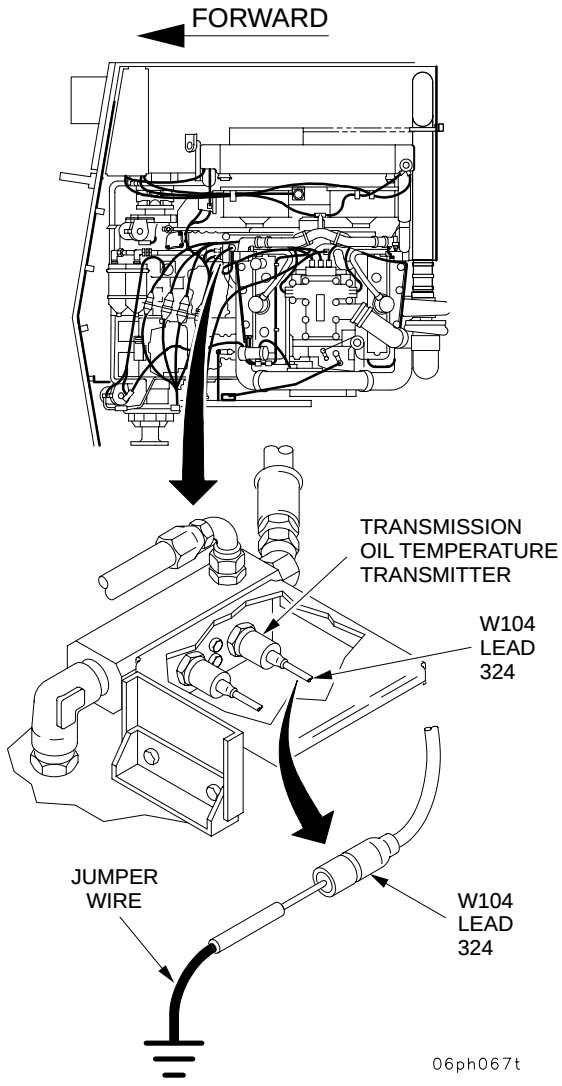

3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(4) TRANSMISSION OIL TEMPERATURE GAGE FAILS TO INDICATE TRANSMISSION OIL TEMPERATURE. All other instruments operate. - CONTINUED

CONTINUED FROM STEP A

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W112 lead 27 from transmission oil temperature gage.
3. Place multimeter red lead in harness W112 lead 27 connector socket and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present equal to battery voltage reading?

yes

no

Repair or replace harness W112 from transmission oil temperature gage to instrument panel connector (para 8-71).

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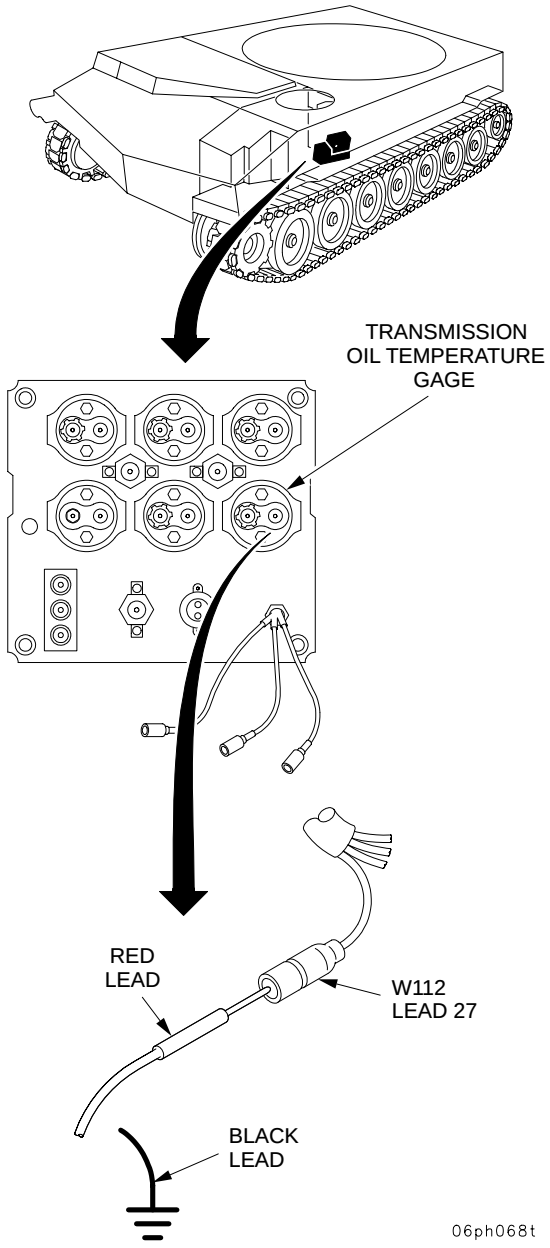

3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(4) TRANSMISSION OIL TEMPERATURE GAGE FAILS TO INDICATE TRANSMISSION OIL TEMPERATURE. All other instruments operate. - CONTINUED

CONTINUED FROM STEP B

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W105 connector P1 from harness W104 connector J1.
3. Remove jumper lead from harness W104 lead 324 connector socket.
4. Check harness W104 lead 324 for continuity by placing one multimeter lead in harness W104 lead 324 connector socket and other lead on harness W104 connector J1 pin F.

Is continuity present?

yes

no

Repair or replace harness W104 from transmission oil temperature transmitter to engine disconnect (para 8-63).

D

1. Reconnect harness W104 lead 324 to transmission oil temperature transmitter.
2. Disconnect harness W114 connector P1 from harness W105 connector J1.
3. Check harness W105 lead 324 for continuity by placing one multimeter lead in harness W105 connector P1 socket F and other lead in harness W105 connector J1 socket G.

Is continuity present?

yes

no

Repair or replace harness W105 from engine connector to bulkhead connector (para 8-64).

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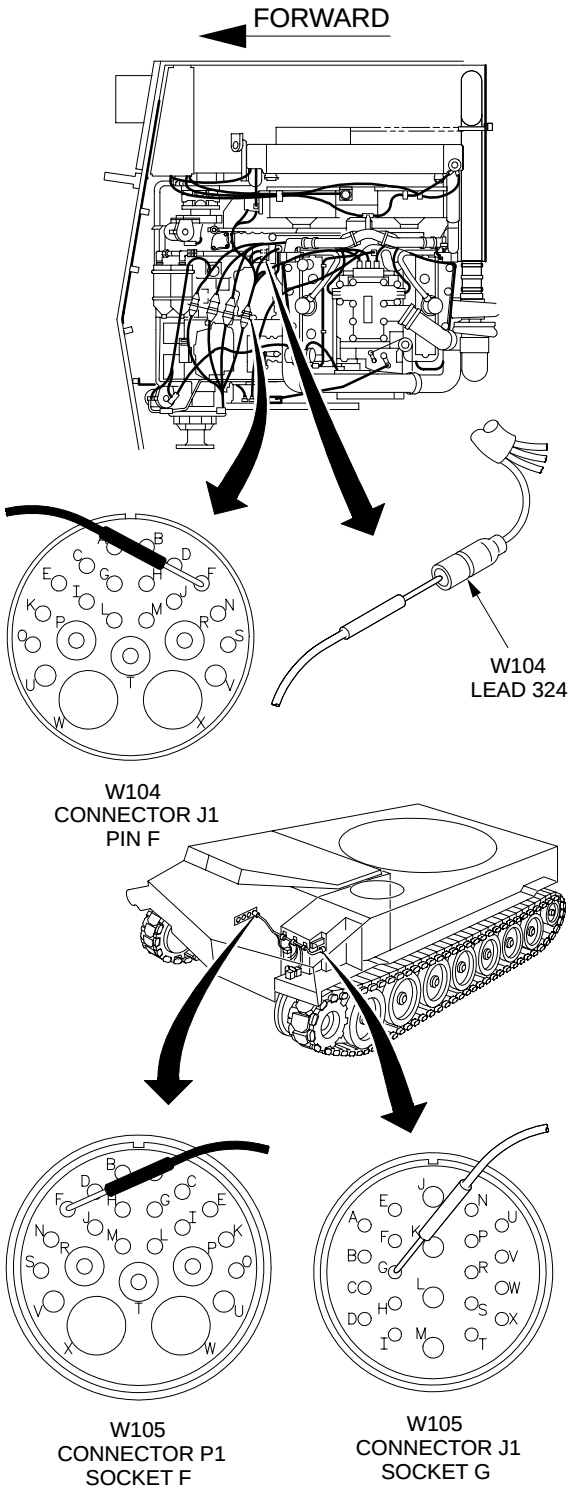

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3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(4) TRANSMISSION OIL TEMPERATURE GAGE FAILS TO INDICATE TRANSMISSION OIL TEMPERATURE. All other instruments operate. - CONTINUED

CONTINUED FROM STEP D

E

1. Reconnect harness W105 connector P1 to harness W104 connector J1.
2. Disconnect harness W112 connector P1 from harness W114 connector J1.
3. Check harness W114 lead 324 for continuity by placing one multimeter lead on harness W114 connector P1 pin G and other lead in harness W114 connector J1 socket G.

Is continuity present?

yes

no

Repair or replace harness W114 from bulkhead to disconnect bracket (para 8-73).

F

1. Reconnect harness W114 connector P1 to harness W105 connector J1.
2. Disconnect harness W112 lead 324 from transmission oil temperature gage connector.
3. Check harness W112 lead 324 for continuity by placing one multimeter lead on harness W112 connector P1 pin G and other lead in harness W112 lead 324 connector socket.

Is continuity present?

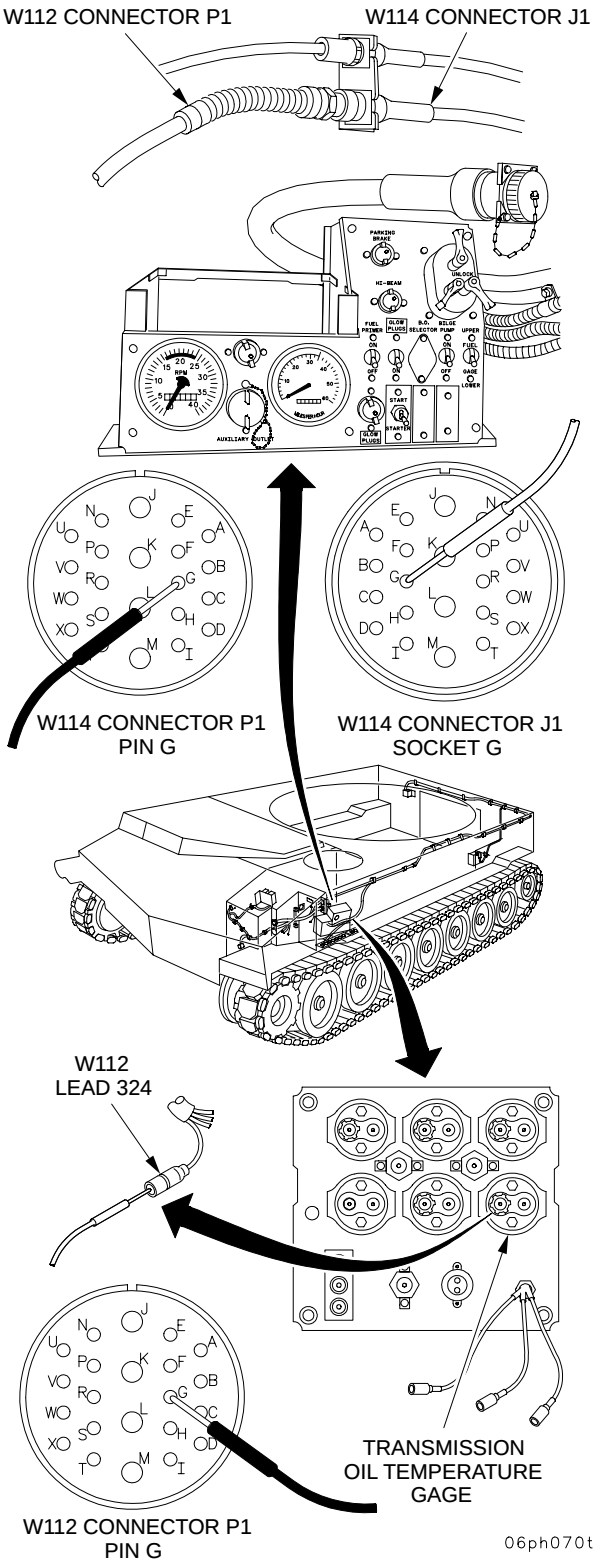
yes

no

Repair or replace harness W112 from disconnect bracket connector to transmission oil temperature gage (para 8-71).

Replace transmission oil temperature gage (para 8-14).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES – CONTINUED	(5) FUEL GAGE FAILS TO INDICATE A LEVEL READING WITH BOTH FUEL TANKS FULL. All other instruments operate.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests. 16 AWG wire may be used as an extension.)

Equipment Conditions
Engine and transmission access doors open (TM 9-2350-314-10)
Portable instrument panel cover removed (para 8-14)
Fuel tanks full (TM 9-2350-314-10)
Driver's instrument panel removed (para 8-12)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W112 lead 27 from fuel gage connector.
3. Place multimeter red lead in harness W112 lead 27 connector socket and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

no

Repair or replace harness W112 (para 8-71).

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W112 lead 27 to fuel gage connector.
3. Disconnect harness W112 lead 29-31 from fuel gage connector.
4. Connect jumper lead to fuel gage connector pin. (Do not attach jumper to ground.)

NOTE: Fuel gage should indicate FULL.

5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

NOTE: Fuel gage should indicate EMPTY.

6. Ground jumper lead.

Does fuel gage show FULL when not grounded and EMPTY when grounded?

yes

no

Replace fuel gage (para 8-14).

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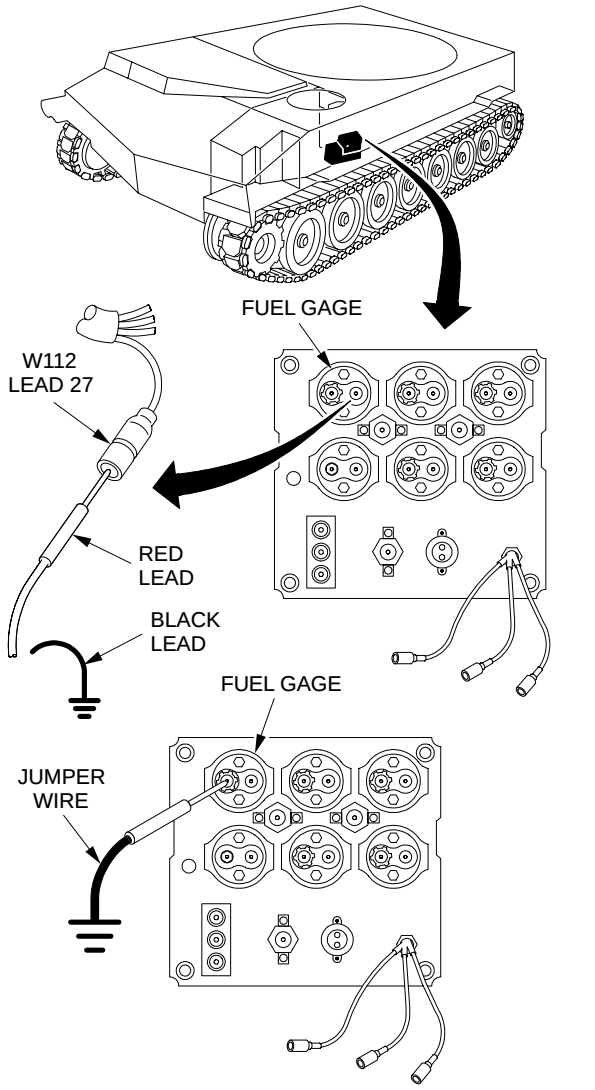

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3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(5) FUEL GAGE FAILS TO INDICATE A LEVEL READING WITH BOTH FUEL TANKS FULL. All other instruments operate. - CONTINUED

CONTINUED FROM STEP B

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W112 connector P1 from harness W114 connector J1.
3. Check harness W112 lead 29-31 for continuity by placing one multimeter lead in harness W112 lead 29-31 connector socket and other lead on wiring harness W112 connector P1 pin S.

Is continuity present?

yes / no

Repair or replace harness W112 (para 8-71).

D

1. Remove jumper lead from fuel gage.
2. Reconnect harness W112 lead 29-31 to fuel gage.
3. Disconnect harness W114 lead 29-31 from fuel level switch.
4. Check harness W114 lead 29-31 for continuity by placing one multimeter lead in harness W114 lead 29-31 connector socket to harness W114 connector J1 socket S.

Is continuity present?

yes / no

Repair or replace harness W114 (para 8-73).

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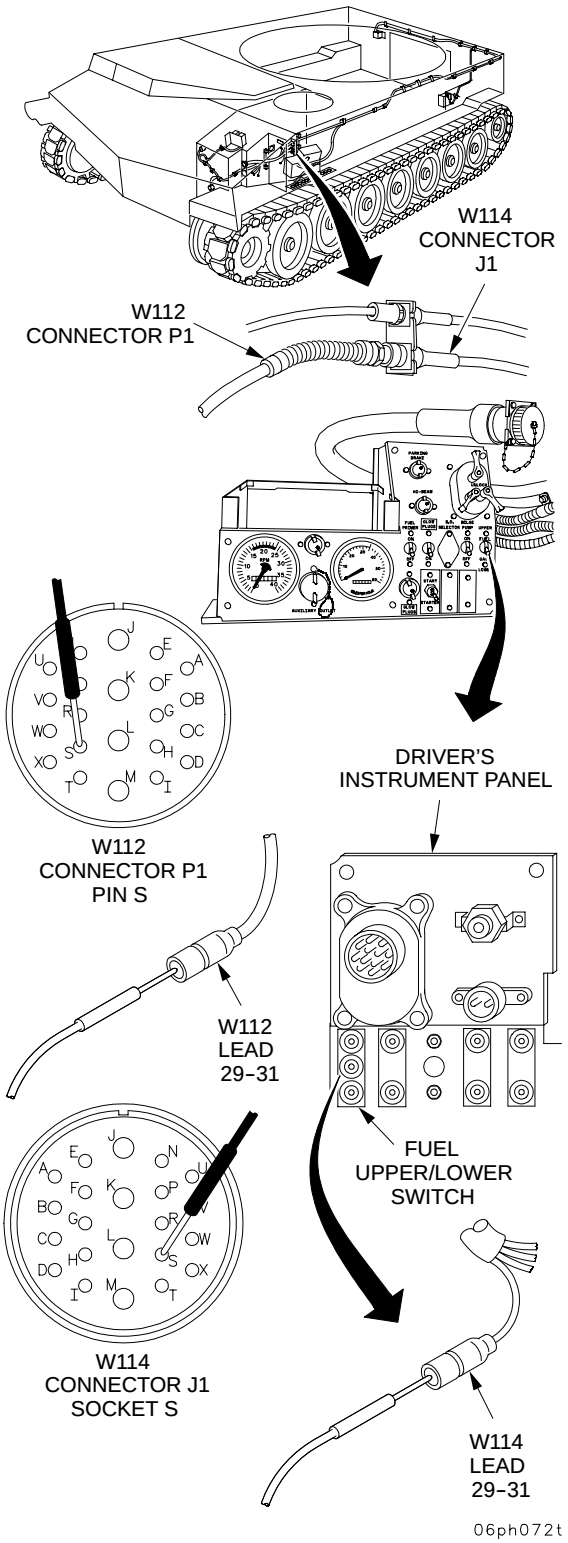

3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(5) FUEL GAGE FAILS TO INDICATE A LEVEL READING WITH BOTH FUEL TANKS FULL. All other instruments operate. - CONTINUED

CONTINUED FROM STEP D

E

1. Disconnect harness W115 leads 29 and 31 from fuel level switch.
2. Check fuel level switch for continuity by placing one multimeter lead in top connector and other lead to center connector, then place fuel level switch in UPPER position.
3. Check fuel level switch for continuity by placing one multimeter lead in lower connector and other lead in center connector , then place fuel level switch in LOWER position.

Is continuity present for both checks?

yes

no

Replace fuel level switch (para 8-12).

F

1. Remove exhaust grille (para 16-24).
2. Remove access covers from upper and lower fuel tank transmitters (para 5-12).
3. Disconnect harness W113 lead 31 from upper fuel tank transmitter and harness W113 lead 29 from lower fuel tank transmitter.
4. Place one multimeter lead in harness W115 lead 29 connector and other lead in harness W115 lead 31 connector.
5. Check for continuity.

Is continuity present?

yes

no

Replace upper and lower fuel tank transmitters (para 5-12).

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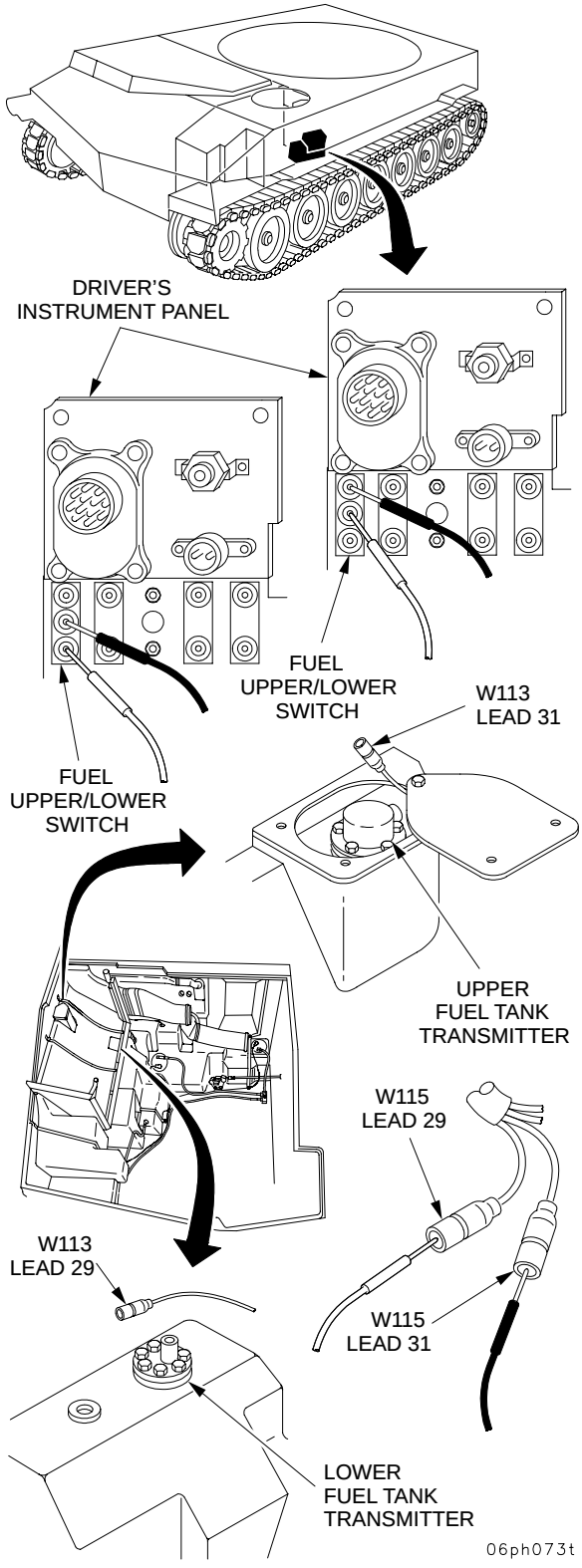


3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(5) FUEL GAGE FAILS TO INDICATE A LEVEL READING WITH BOTH FUEL TANKS FULL. All other instruments operate. - CONTINUED

CONTINUED FROM STEP F

G

1. Disconnect harness W115 connector P1 from harness W113 J1.
2. Place one multimeter lead in harness W115 lead 29 and the other multimeter lead in harness W115 lead 31.
3. Check for continuity.

Is continuity present?

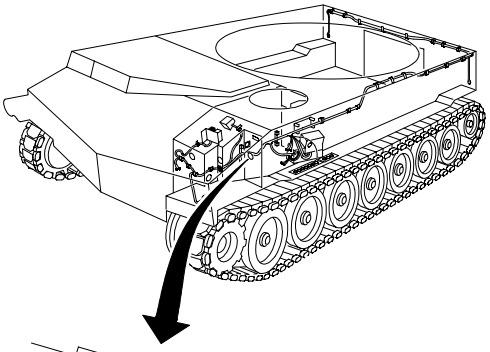
yes

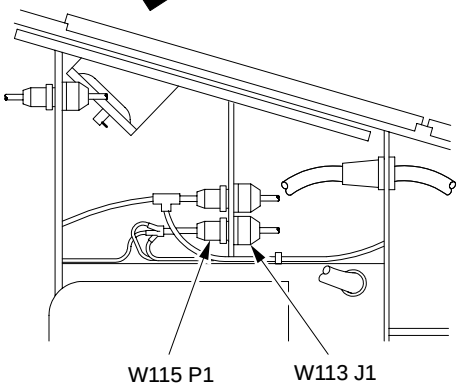
Repair or replace harness W115 (para 8-74).

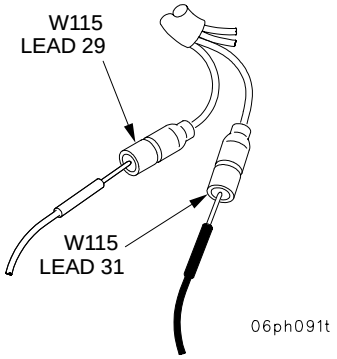
no

Repair or replace harness W113 (para 8-72).

END OF TASK







3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES – CONTINUED	(6) FUEL GAGE FAILS TO INDICATE LEVEL OF UPPER FUEL TANK. Indicates lower fuel tank level properly.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Driver's instrument panel removed (para 8-12)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 lead 29 from fuel UPPER/LOWER switch.
3. Ensure fuel UPPER/LOWER switch is in the UPPER position (TM 9-2350-314-10).
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Does fuel gage indicate FULL?

yes

no

Replace fuel UPPER/LOWER switch (para 8-12).

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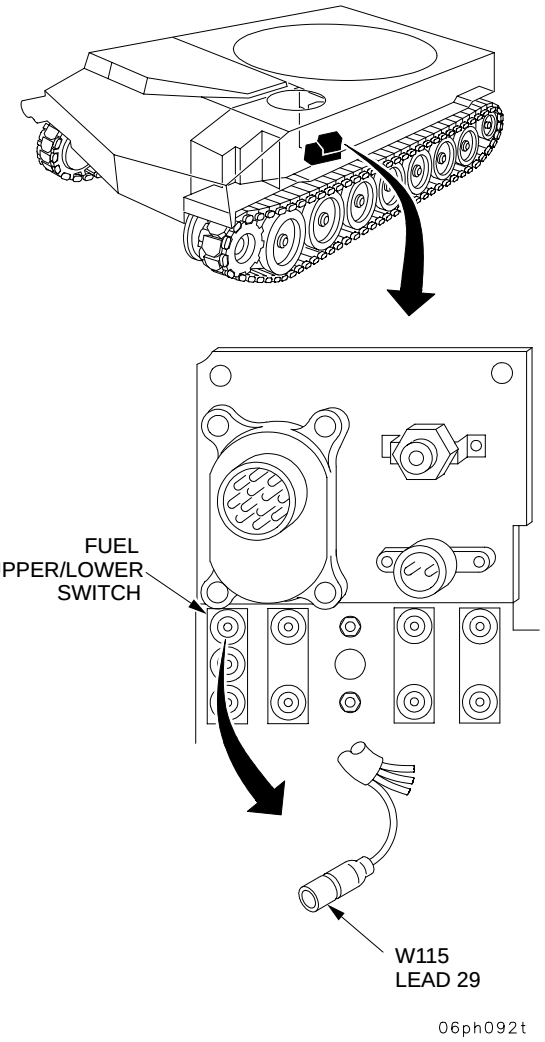

3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES – CONTINUED	(6) FUEL GAGE FAILS TO INDICATE LEVEL OF UPPER FUEL TANK. Indicates lower fuel tank level properly. – CONTINUED

CONTINUED FROM STEP A

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W115 lead 29 to fuel UPPER/LOWER switch.
3. Disconnect harness W115 connector P1 from harness W113 connector J1 at driver's compartment bulkhead.
4. Check for continuity by placing one lead in socket J of harness W115 connector P1 and other lead to ground.

Is continuity present?

yes

Repair or replace harness W115 (para 8-74).

no

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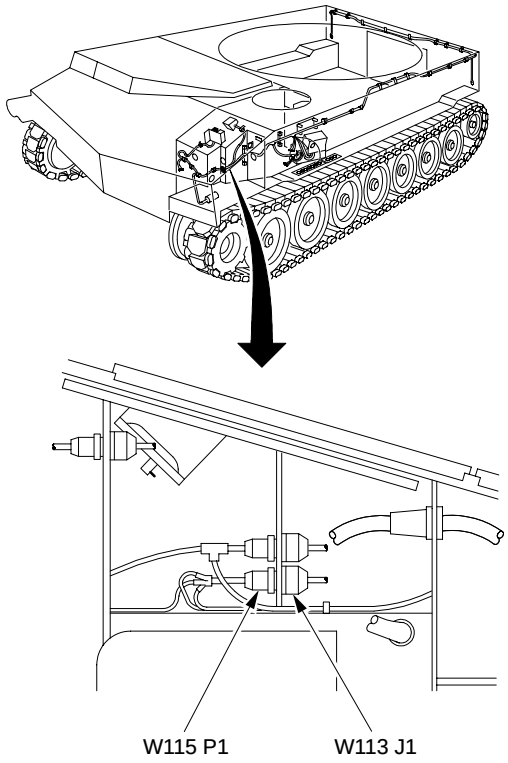

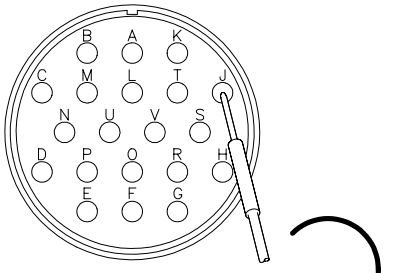

W115
CONNECTOR P1
SOCKET J

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3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(6) FUEL GAGE FAILS TO INDICATE LEVEL OF UPPER FUEL TANK. Indicates lower fuel tank level properly. - CONTINUED

CONTINUED FROM STEP B

C

1. Reconnect harness W115 connector P1 to harness W113 connector J1.
2. Remove exhaust grille (para 16-24).
3. Remove access cover from upper fuel tank transmitter (para 5-12).
4. Disconnect W113 lead 31 from upper fuel tank transmitter.
5. Ensure fuel switch is in the UPPER position (TM 9-2350-314-10).
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Does fuel gage indicate FULL?

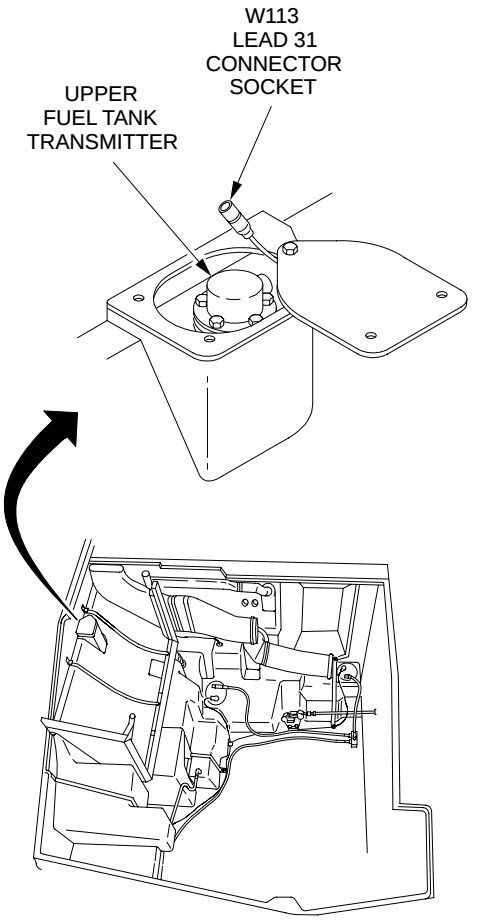
yes

Replace upper fuel tank transmitter (para 5-12).

no

Repair or replace harness W113 (para 8-72).

END OF TASK



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3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(7) FUEL GAGE FAILS TO INDICATE FUEL LEVEL IN LOWER FUEL TANK. Indicates upper fuel tank level properly.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Driver's instrument panel removed (para 8-12)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 lead 31 from fuel UPPER/LOWER switch.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
4. Ensure fuel UPPER/LOWER switch is in LOWER position (TM 9-2350-314-10).

Does fuel gage indicate FULL?

yes

no

Replace fuel UPPER/LOWER switch (para 8-12).

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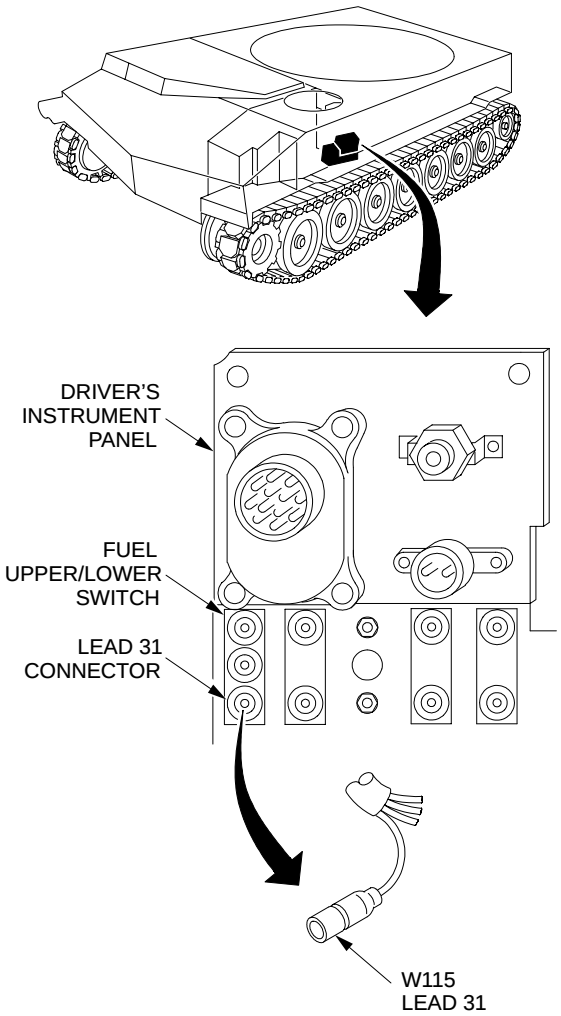

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3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES – CONTINUED	(7) FUEL GAGE FAILS TO INDICATE FUEL LEVEL IN LOWER FUEL TANK. Indicates upper fuel tank level properly. – CONTINUED

CONTINUED FROM STEP A

B

1. Turn vehicle MASTER switch OFF (TM 9–2350–314–10).
2. Reconnect harness W115 lead 31 to fuel UPPER/LOWER switch.
3. Disconnect harness W115 connector P1 from harness W113 connector J1 at driver's compartment.
4. Check for continuity by placing one multimeter lead on harness W115 connector P1 socket K and other lead to ground.

Is continuity present?

yes

Repair or replace harness W115 (para 8–74).

no

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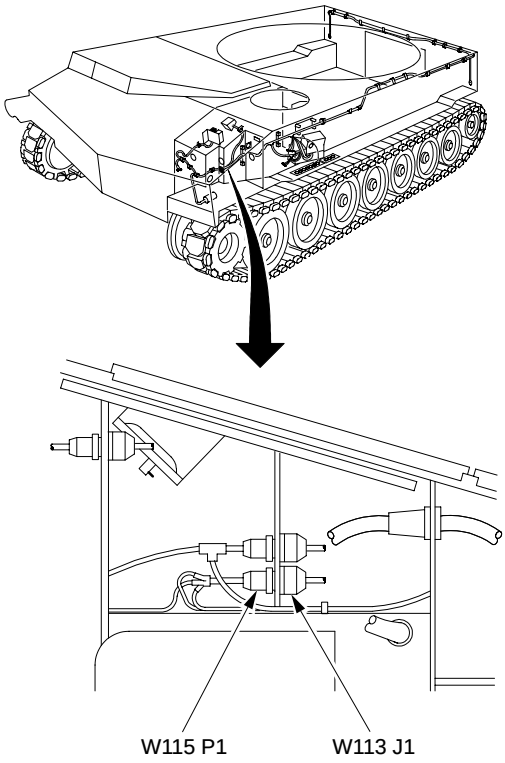


3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(7) FUEL GAGE FAILS TO INDICATE FUEL LEVEL IN LOWER FUEL TANK. Indicates upper fuel tank level properly. - CONTINUED

CONTINUED FROM STEP B

C

1. Reconnect harness W115 connector P1 to harness W113 connector J1.
2. Remove exhaust grille (para 16-24).
3. Remove access cover to lower fuel tank transmitter (para 5-12).
4. Disconnect harness W113 lead 29 from lower fuel tank transmitter.
5. Ensure fuel UPPER/LOWER switch is in LOWER position (TM 9-2350-314-10).
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Does fuel gage indicate FULL?

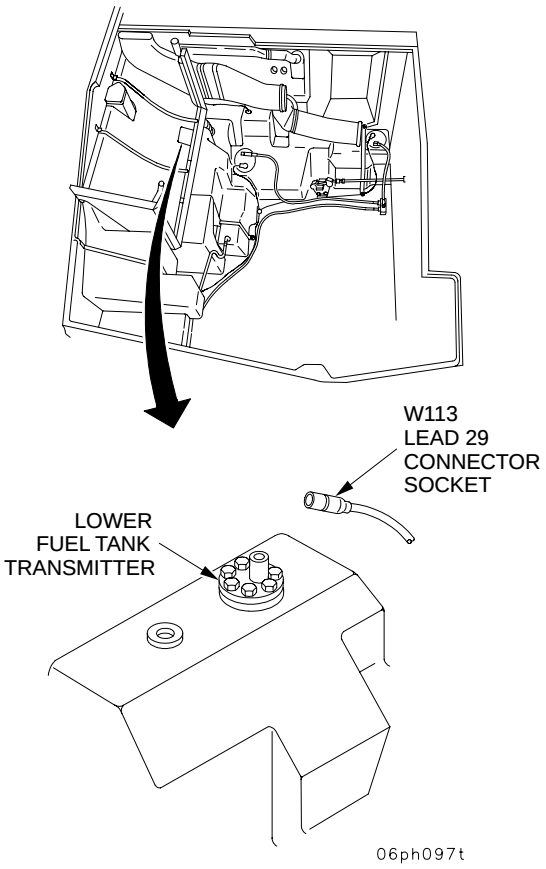
yes

Replace lower fuel tank transmitter (para 5-12).

no

Repair or replace harness W113 (para 8-72).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(8) BATTERY/GENERATOR GAGE FAILS TO OPERATE PROPERLY - NO OR UNSTEADY READING. Other instruments operate.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Battery access doors open (TM 9-2350-314-10)
Portable instrument panel removed (TM 9-2350-314-10)

NOTE
The battery/generator gage indicates battery voltage when the generator is not operating and generator output when generator is running. The color zones on gage indicate the following voltages:
a. low red (left side of gage) 18-22 volts.
b. yellow 22-26 volts.
c. green 26-30 volts.
d. high red (right side of gage) 30-34 volts.

A
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W112 lead 27 from battery/generator gage connector.
3. Place multimeter red lead in lead 27 connector socket and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Repair or replace harness W112 (para 8-71).

no

B
1. Start engine (TM 9-2350-314-10).
2. Place multimeter red lead on harness W109 lead 81 at battery and black lead to shunt.

Is voltage present?

yes

Troubleshoot generator system (para 3-3h).

no

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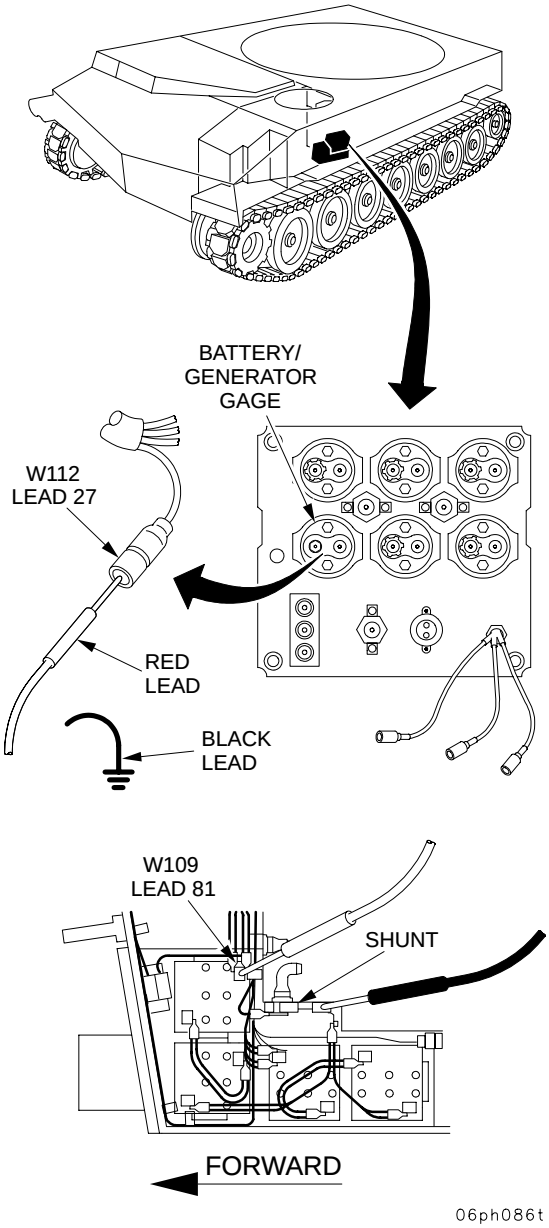
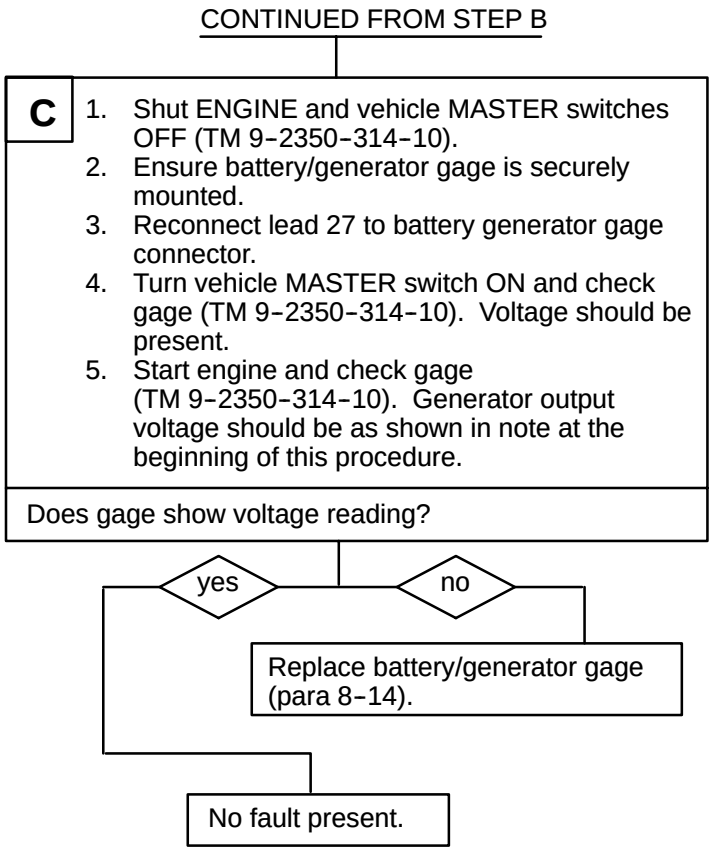


3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(8) BATTERY/GENERATOR GAGE FAILS TO OPERATE PROPERLY - NO OR UNSTEADY READING. Other instruments operate. - CONTINUED



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED

(9) TACHOMETER FAILS TO OPERATE WHEN ENGINE IS RUNNING. - CONTINUED

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Equipment Conditions
Engine and transmission access doors open (TM 9-2350-314-10)
Portable instrument panel removed (TM 9-2350-314-10)

Personnel Required
Two

A

1. Shut engine OFF, if running (TM 9-2350-314-10).
2. Disconnect tachometer drive shaft from tachometer (para 20-2).
3. Pull fuel shutoff out and hold so engine will not start (TM 9-2350-314-10).
4. Crank engine (TM 9-2350-314-10) and observe tachometer flexible drive shaft for rotation.

Does tachometer flexible drive shaft rotate?

yes

Replace tachometer (para 8-12).

no

WARNING
A protective fan screen must be installed prior to doing maintenance in the engine compartment when the engine is running or engine is in ground hop mode. Contact with a rotating fan can cause injury.

B

1. Install fan protective screens (para 4-1c.)
2. Disconnect tachometer drive shaft from tachometer drive on engine (para 20-2).
3. Have assistant hold fuel shutoff out and crank engine (TM 9-2350-314-10).
4. Observe tachometer drive output shaft for rotation.

Does tachometer drive output shaft rotate?

yes

Go to Step E.

no

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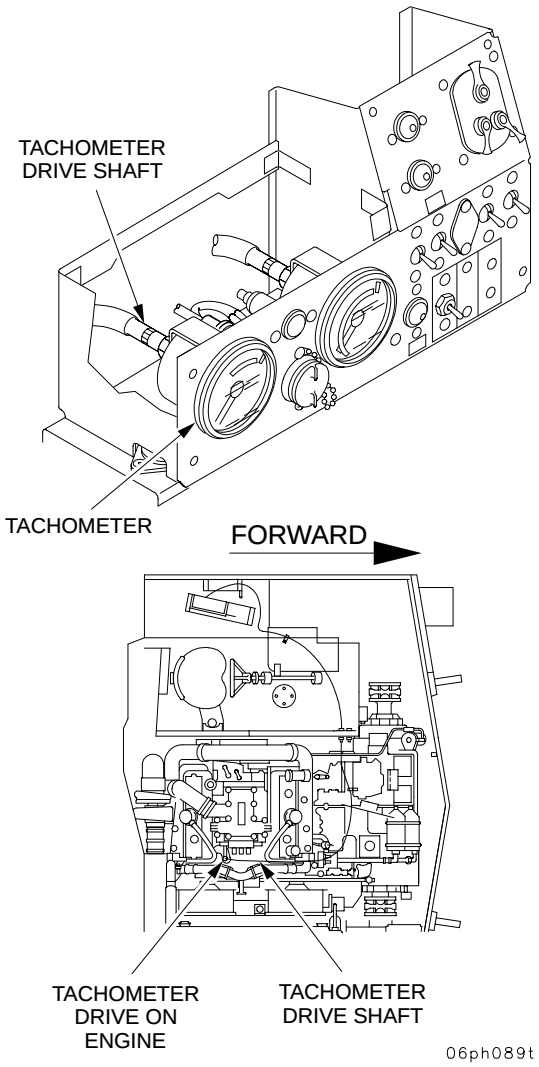

3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(9) TACHOMETER FAILS TO OPERATE WHEN ENGINE IS RUNNING. - CONTINUED

CONTINUED FROM STEP B

C

1. Reconnect tachometer drive shaft to tachometer drive on engine (para 20-2).
2. Disconnect tachometer drive shaft from bulkhead coupling (para 20-2).
3. Have assistant hold fuel shutoff handle out and crank engine (TM 9-2350-314-10).
4. Observe tachometer flexible drive shaft for rotation.

Does tachometer flexible drive shaft rotate?

yes

no

Repair or replace tachometer drive shaft from tachometer drive to bulkhead coupling (para 20-2).

D

1. Reconnect tachometer drive shaft to bulkhead coupling.
2. Disconnect tachometer drive shaft from pulse tachometer.
3. Have assistant hold fuel shutoff handle out. Crank engine (TM 9-2350-314-10).
4. Observe pulse tachometer for rotation.

Does pulse tachometer drive rotate?

yes

no

Replace pulse tachometer (para 20-3).

Replace tachometer drive shaft from pulse tachometer to tachometer (para 20-3).

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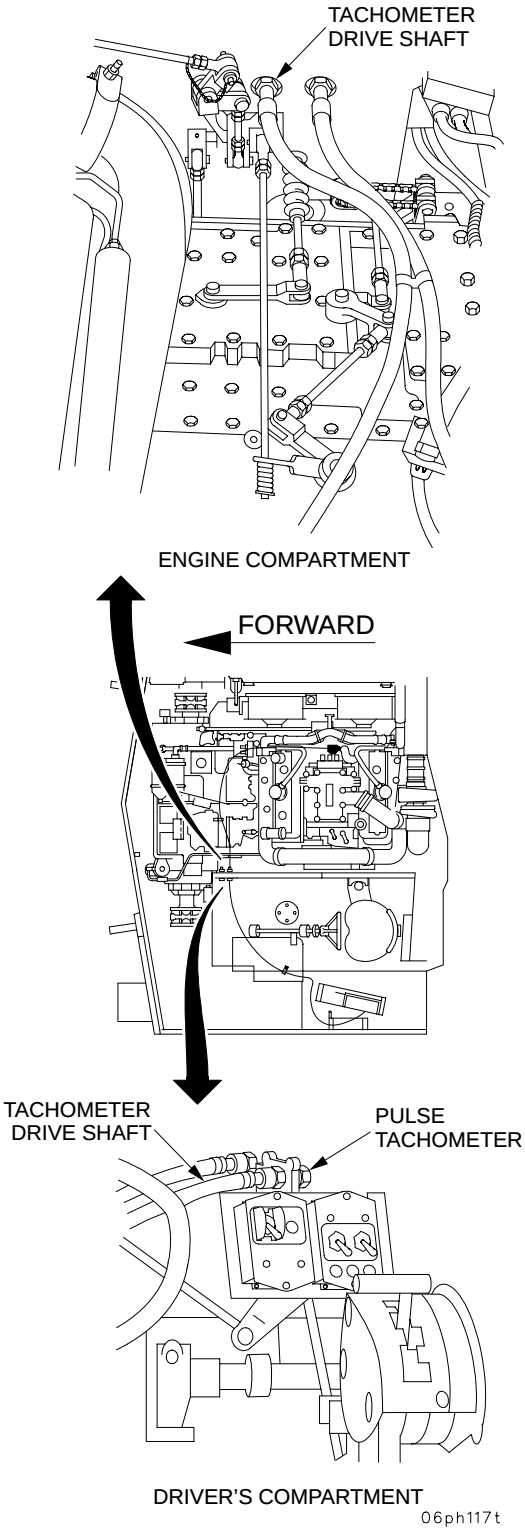
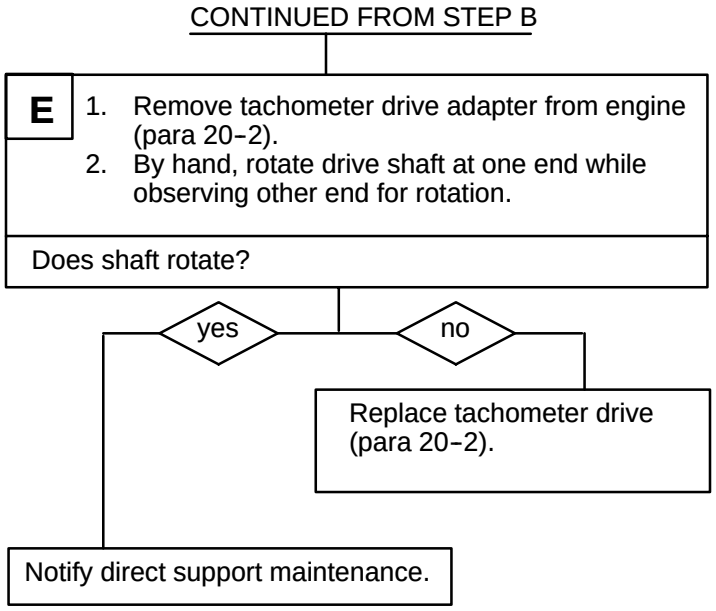


3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(9) TACHOMETER FAILS TO OPERATE WHEN ENGINE IS RUNNING. - CONTINUED



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(10) SPEEDOMETER FAILS TO OPERATE WHEN VEHICLE IS MOVING FORWARD.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Equipment Conditions
Portable instrument panel removed
(TM 9-2350-314-10)
Transmission access doors open
(TM 9-2350-314-10)

Personnel Required
Two

A

1. Disconnect speedometer drive shaft from speedometer drive on transmission (para 20-1).
2. By hand, rotate flexible drive shaft at one end (speedometer drive end) while observing speedometer for movement.

Does speedometer have movement?

yes → Go to Step D.

no

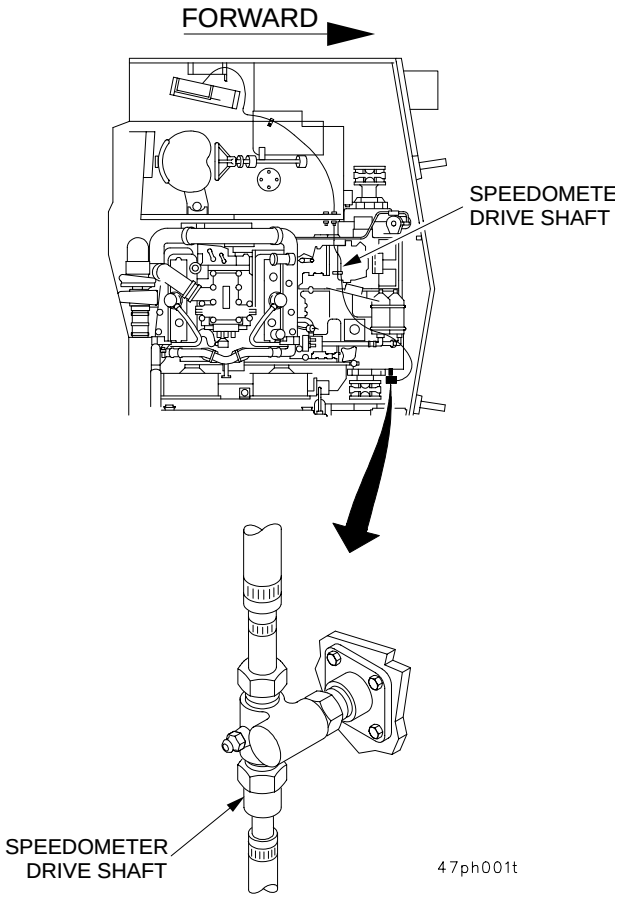
B

1. Disconnect speedometer drive shaft from speedometer (para 20-1).
2. By hand, rotate flexible drive shaft at one end (speedometer drive end) while observing other end for rotation.

Does flexible drive shaft rotate?

yes → Replace speedometer (para 8-12).

no



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3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES – CONTINUED	(10) SPEEDOMETER FAILS TO OPERATE WHEN VEHICLE IS MOVING FORWARD. – CONTINUED

CONTINUED FROM STEP B

C

1. Disconnect speedometer drive shaft from speedometer drive at bulkhead coupling (para 20–1).
2. By hand, rotate flexible drive shaft at one end (speedometer drive end) while observing other end for rotation.

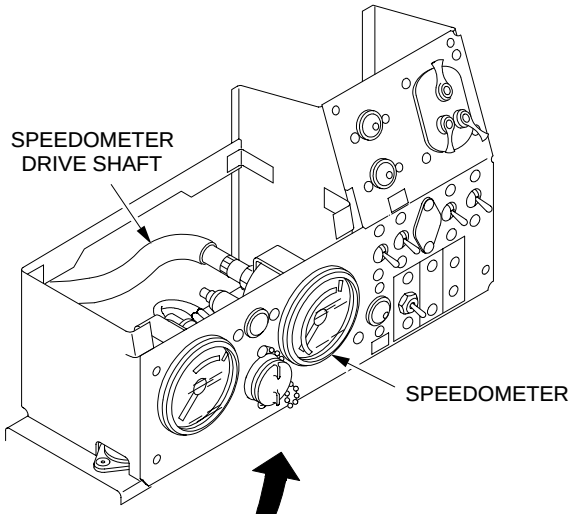
Does flexible drive shaft rotate?

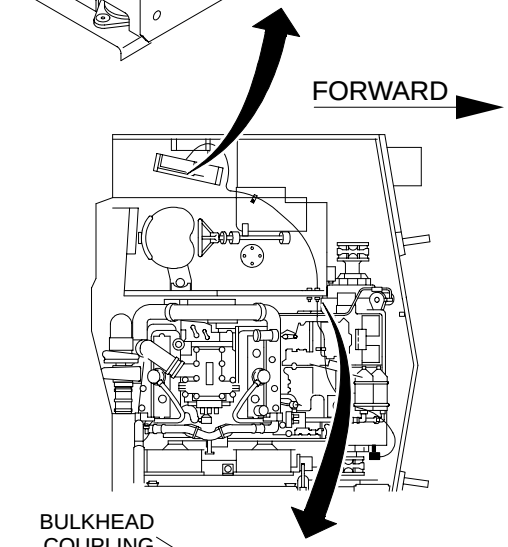
yes

Repair or replace flexible drive shaft from speedometer to bulkhead coupling (para 20–1).

no

Repair or replace flexible drive shaft from drive end of speedometer to bulkhead coupling (para 20–1).





CONTINUED FROM STEP A

D

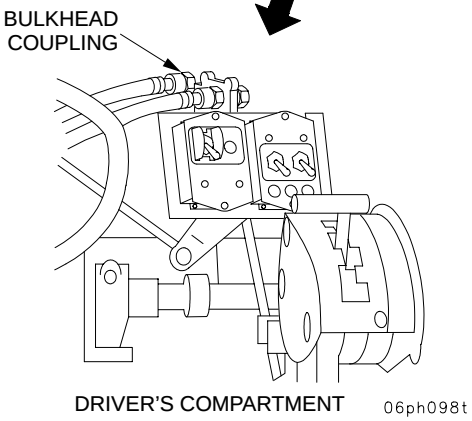
1. Remove speedometer angle drive adapter from straight drive adapter (para 20–1).
2. By hand, rotate flexible drive shaft at one end while observing other end for rotation.

Does shaft rotate?

yes

no

Replace speedometer drive (para 20–1).



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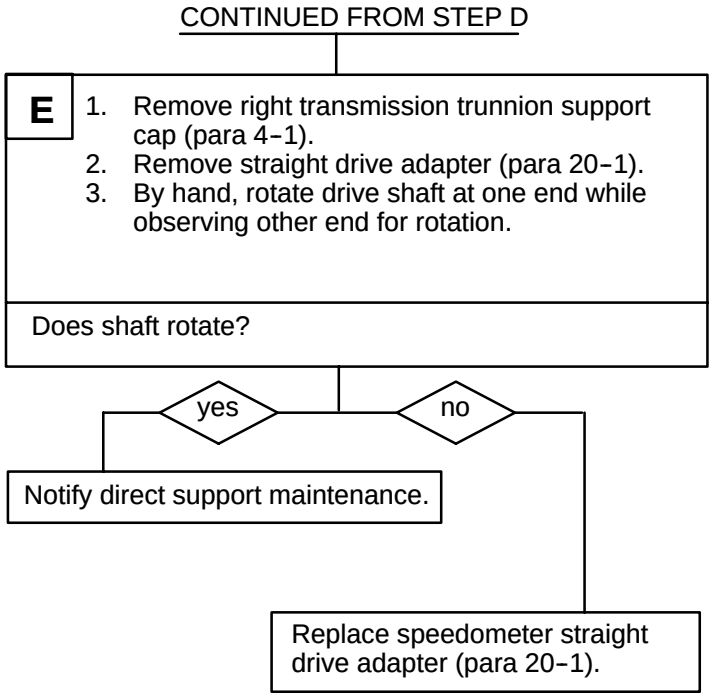
3-3 TROUBLESHOOTING CHART - CONTINUED

g. GAGES - CONTINUED	(10) SPEEDOMETER FAILS TO OPERATE WHEN VEHICLE IS MOVING FORWARD. - CONTINUED



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

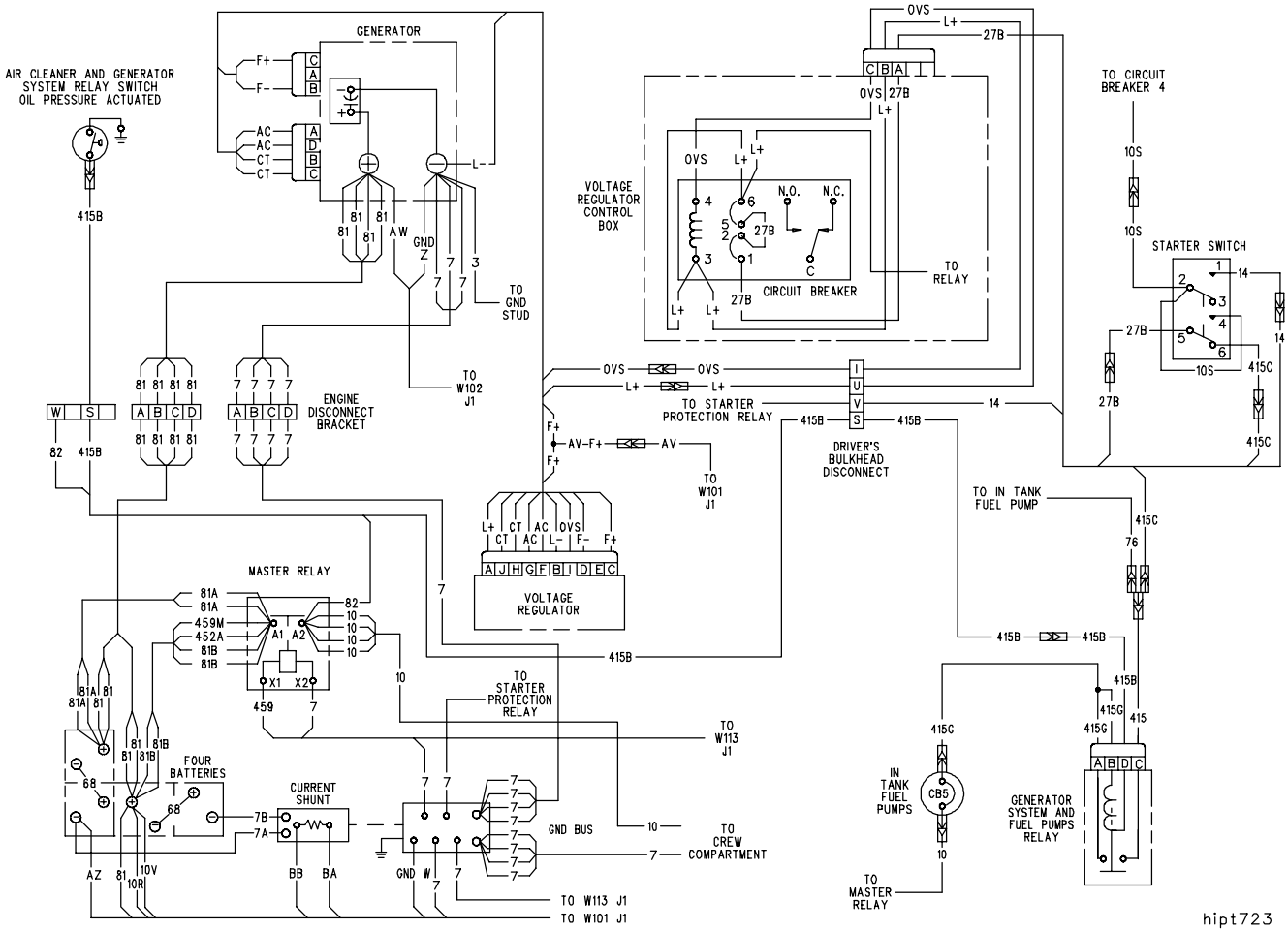
h. GENERATOR

The generator circuit consists of the generator, voltage regulator, vehicle batteries, master relay, generator system and fuel pumps relay, air cleaner/generator system relay switch, starter switch, circuit breaker number 5, and related electrical wiring. The relationship of these components is shown on the electrical diagram below.

When the vehicle MASTER switch is turned ON, 24 V dc is supplied through circuit breaker number 5 (CB5) to the generator system and fuel pumps relay. Voltage also is supplied to the voltage regulator through the starter switch. The air cleaner/generator system relay switch closes when the engine is cranked and oil pressure reaches 4–8 psi causing the generator system and fuel pumps relay to close. This closes a circuit in the voltage regulator and the generator begins operating and supplying voltage to charge the batteries and operate all electrical components on the vehicle.

WARNING

Probing the DIAGNOSTIC CONNECTOR ASSEMBLY (DCA) connector during voltage tests can result in equipment damage and/or injury to personnel due to high voltage peaks.



3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR – CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests. 16 AWG wire may be used as an extension.)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)
Battery box access doors open (TM 9-2350-314-10)
Engine compartment access cover removed (para 16-7)
Driver's instrument panel removed (para 8-12)
Air intake grille open (TM 9-2350-314-10)

WARNING

When engine is running and driver's compartment access panel has been removed for maintenance or troubleshooting use extreme care. Tools, clothing or hands can catch in generator belt and cause injury or death.

NOTE

- Ensure that circuit breaker on voltage regulator is in the ON position.
- Check ground strap (hull to transmission housing) for dirty/corroded/painted ground connections.
- Check generator for secure mounting.
- Check generator pulley for secure mounting and ensure proper tension is applied to the generator belt.

A

1. Start engine (TM 9-2350-314-10) and run at 1000 rpm.
2. Check for voltage by placing multimeter red lead on harness W109 lead 81 in the rear battery compartment and black lead on ground.

Are approximately 27.5 V dc present?

yes

no

Go to step C.

B

Check for voltage by placing multimeter red lead on lead 81 connector in the forward battery compartment and black lead on ground.

Are approximately 27.5 V dc present?

yes

Go to step Y.

no

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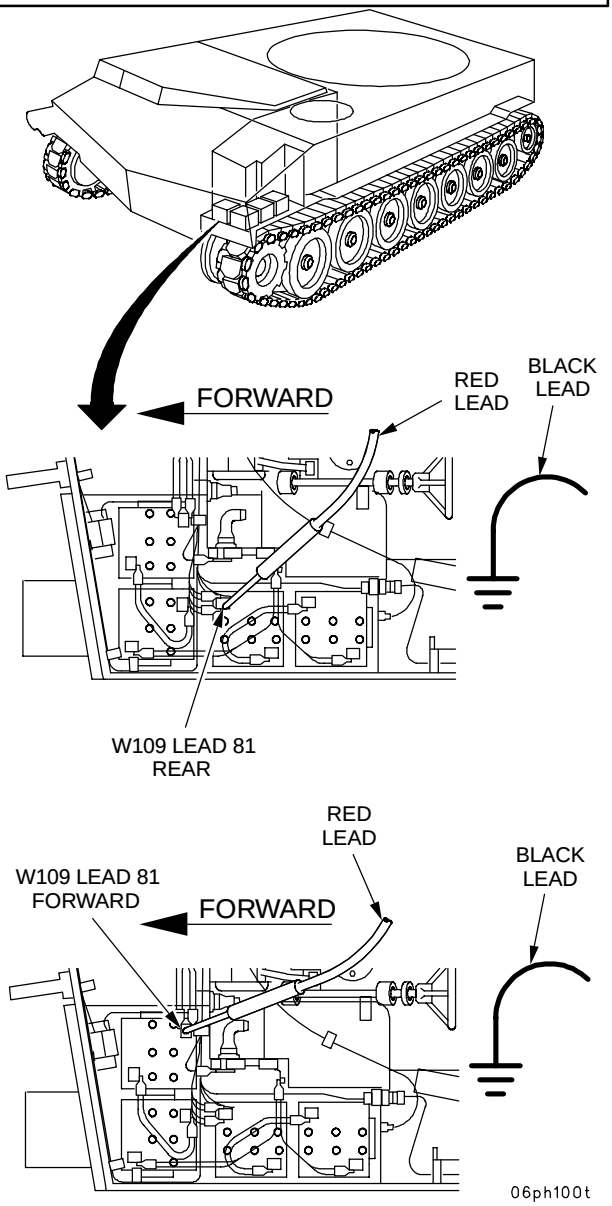

3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR - CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading. - CONTINUED

CONTINUED FROM STEP A OR B

C

1. Shut engine OFF (TM 9-2350-314-10).
2. Using a lead with an alligator clip, connect multimeter red lead to lead 81 (+) at generator and place black lead on ground.
3. Ensure all leads are clear of generator belt and pulley.
4. Start engine (TM 9-2350-314-10) and check for voltage.

Are approximately 27.5 V dc present?

yes → Go to step X.

no

D

1. Shut engine OFF (TM 9-2350-314-10).
2. Turn vehicle MASTER power switch OFF (TM 9-2350-314-10).
3. Leave multimeter connection from previous step in place.
4. Disconnect harness W104 lead 415B from air cleaner/generator relay switch.
5. Place a jumper lead from harness W104 lead 415B connector socket to ground.
6. Place multimeter black lead to ground.
7. Start engine (TM 9-2350-314-10) and check for voltage.

Are approximately 27.5 V dc present?

yes → Replace air cleaner/generator system relay switch (para 8-48).

no

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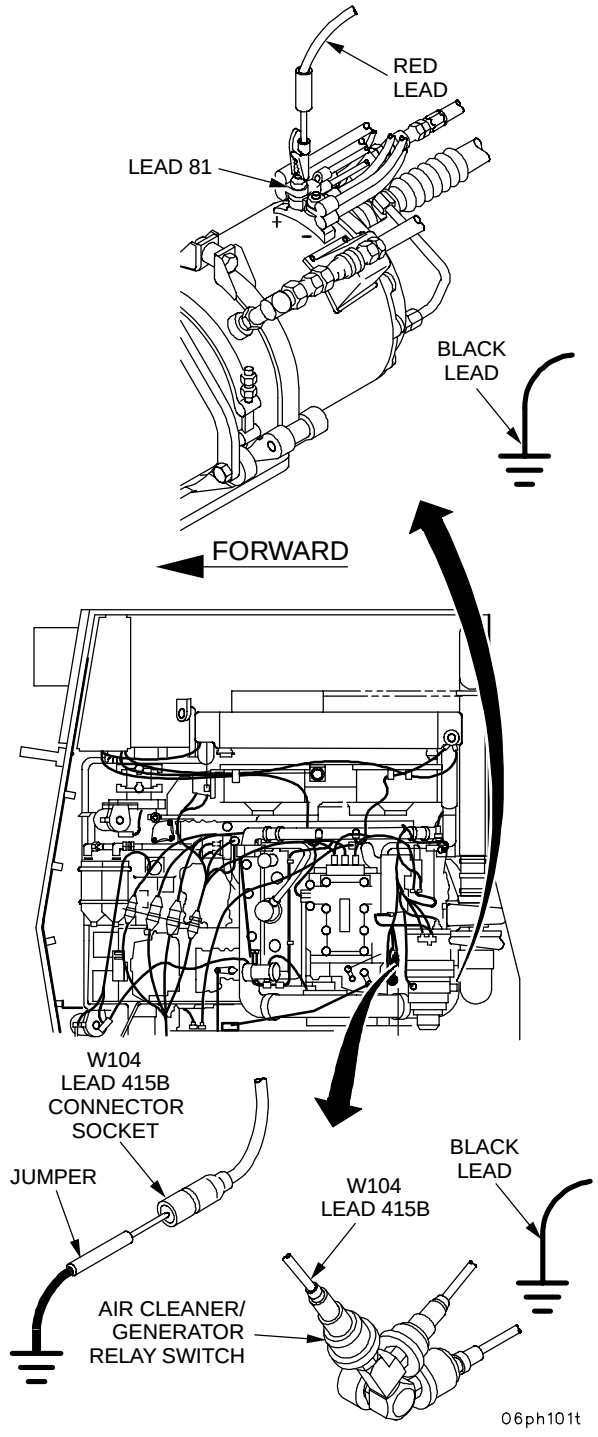

3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR - CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading. - CONTINUED

CONTINUED FROM STEP D

E

1. Shut ENGINE OFF and turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect multimeter red lead from generator.
3. Leave jumper from lead 415B to ground in place.
4. Disconnect harness W123 connector P1 at fuel pump/generator system relay.
5. Check continuity from socket D of harness W123 connector P1 to ground.

Is continuity good?

yes

Go to step I.

no

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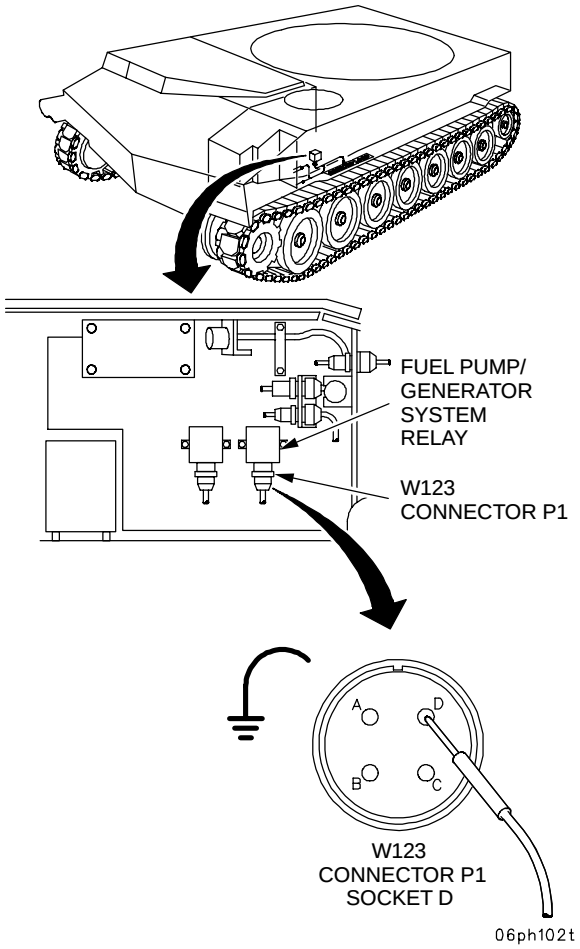

3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR – CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading. – CONTINUED

CONTINUED FROM STEP E

F

1. Reconnect harness W123 connector P1 to fuel pump/generator system relay.
2. Disconnect harness W123 lead 415B from harness W114 lead 415B.
3. Check continuity from harness W114 lead 415B connector to ground.

Is continuity good?

yes

Repair or replace W123 (lead 415B) (para 8-81).

no

G

1. Reconnect harness W123 lead 415B to harness W114 lead 415B.
2. Disconnect harness W114 connector P1 from harness W105 connector J1 at driver's compartment bulkhead.
3. Check continuity from socket S of harness W105 connector J1 to ground.

Is continuity good?

yes

Repair or replace harness W114 (para 8-73).

no

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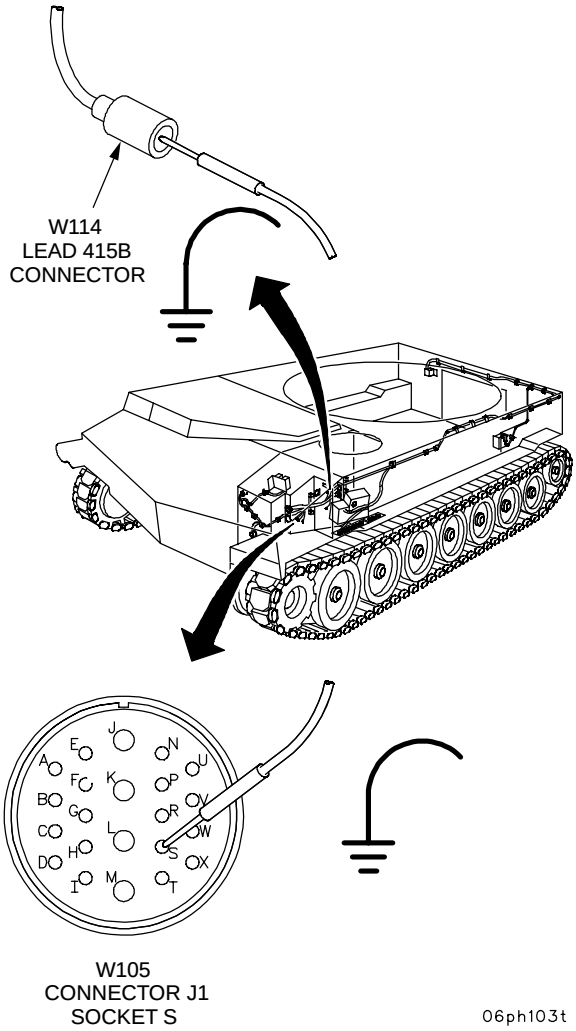

3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR - CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading. - CONTINUED

CONTINUED FROM STEP G

H

1. Reconnect harness W114 to harness W105.
2. Disconnect harness W105 connector J1 at engine electrical disconnect bracket.
3. Check continuity from pin S of harness W104 connector J1 to ground.

Is continuity good?

yes → Repair or replace harness W105 (para 8-64).

no → Repair or replace harness W104 (para 8-63).

CONTINUED FROM STEP E

I

1. Reconnect harness W123 connector P1 to fuel pump/generator system relay.
2. Disconnect lead 415C of harness W114 at three-way connector.
3. Check for voltage by placing multimeter red lead in three-way connector and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

yes → Go to step N.

no

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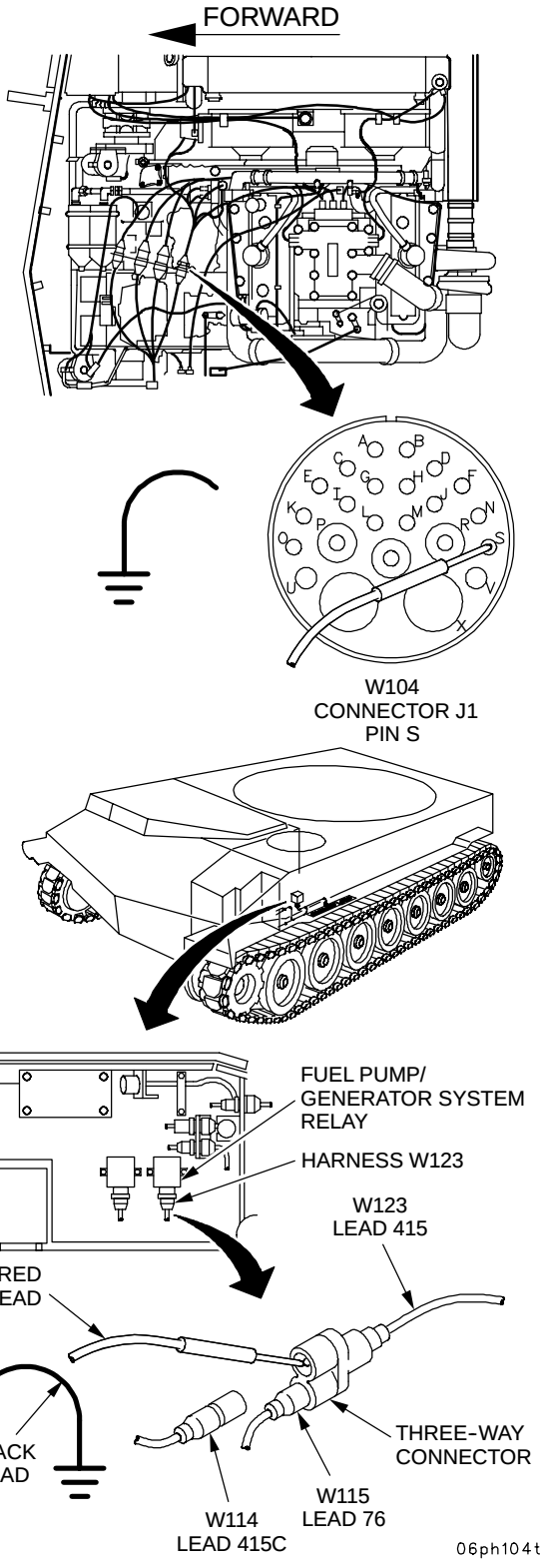

3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR - CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading. - CONTINUED

CONTINUED FROM STEP I

J

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W123 connector P1 at fuel pump/generator system relay.
3. Check for voltage by placing the multimeter red lead in sockets A and B (one at a time) and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

yes

no

Go to step L.

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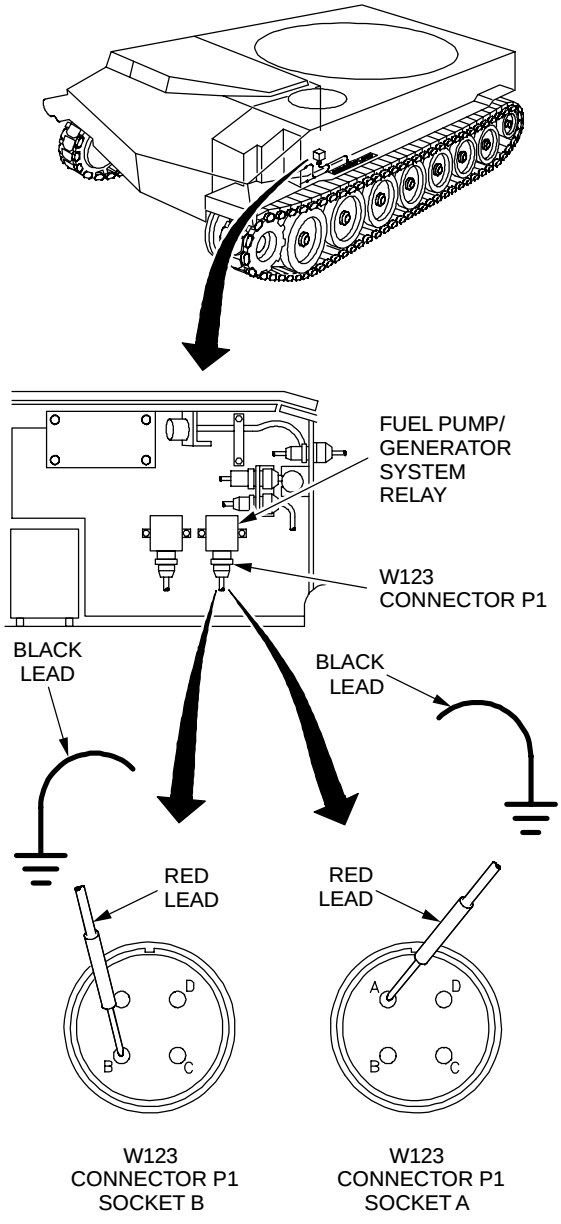

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3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR - CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading. - CONTINUED

CONTINUED FROM STEP J

K

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W123 lead 415 from three-way connector.
3. Check for continuity from socket C of harness W123 connector P1 to lead 415 connector.

Is continuity present?

yes

Replace fuel pump/ generator system relay (para 8-24).

no

Repair or replace harness W123 (lead 415) (para 8-81).

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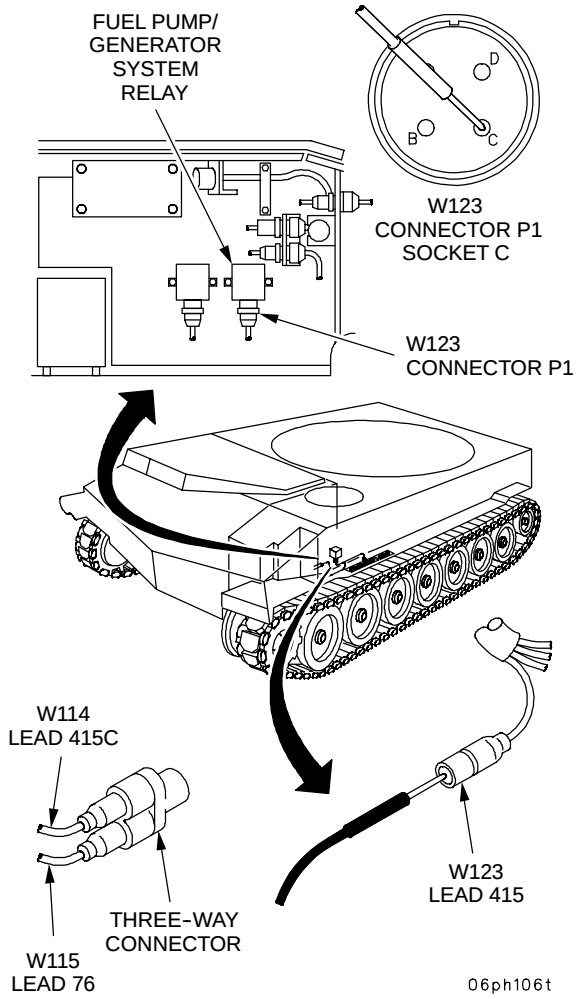


3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR – CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading. – CONTINUED

CONTINUED FROM STEP J

L

1. Turn vehicle MASTER switch OFF (TM 9–2350–314–10).
2. Disconnect harness W123 lead 415G at circuit breaker no. 5.
3. Check for voltage by placing multimeter red lead on circuit breaker connector and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9–2350–314–10).

Is voltage present?

yes → Repair or replace harness W123 (lead 415G) (para 8–81).

no

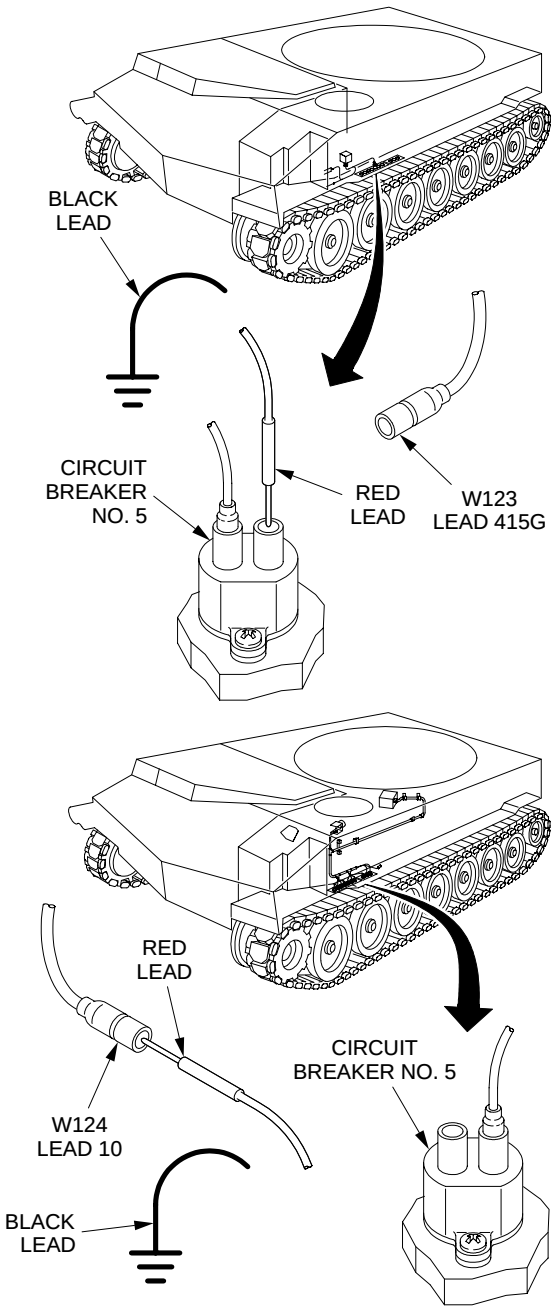
M

1. Turn vehicle MASTER switch OFF (TM 9–2350–314–10).
2. Disconnect harness W124 lead 10 at circuit breaker no. 5.
3. Check for voltage by placing multimeter red lead in lead 10 connector and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9–2350–314–10).

Is voltage present?

yes → Replace circuit breaker no. 5 (para 8–20).

no → Repair or replace harness W124 (para 8–82).



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3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR - CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading. - CONTINUED

CONTINUED FROM STEP I

N

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W123 leads 415C and 415 at three-way connector.
3. Disconnect harness W114 lead 415C at starter switch.
4. Check for voltage by placing the multimeter red lead in connector on harness W114 lead 415C and black lead on ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

yes

no

Repair or replace harness W114 lead 415C (para 8-73).

O

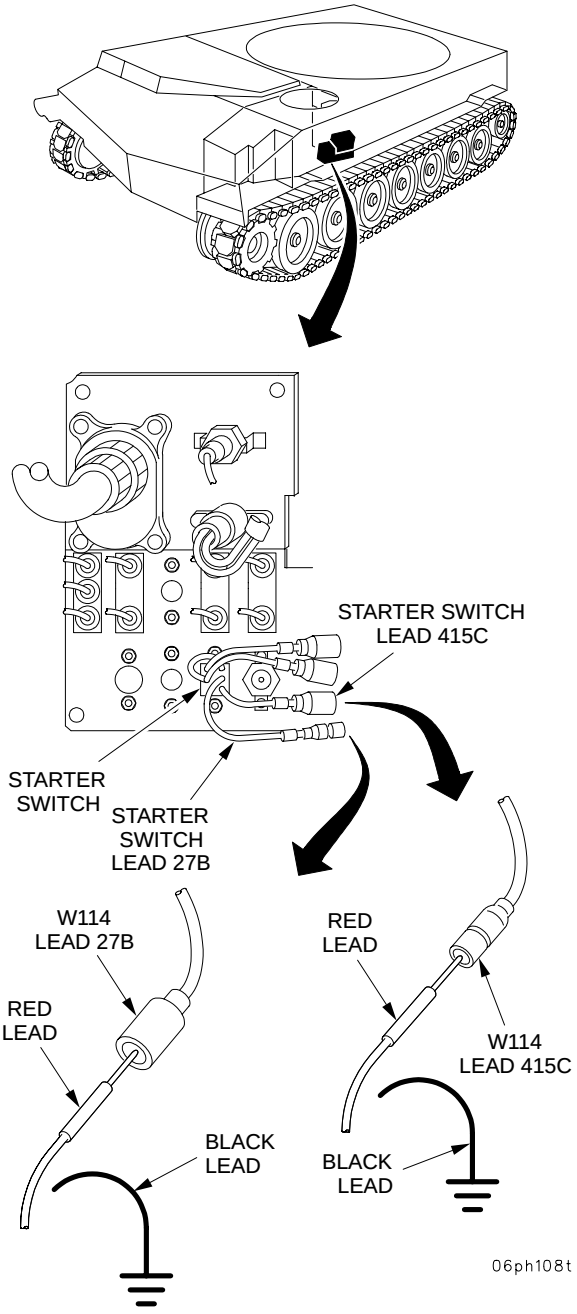
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W114 lead 415C at starter switch.
3. Disconnect harness W114 lead 27B from starter switch.
4. Check for voltage by placing multimeter red lead in starter switch lead 27B (lead coming from starter switch) and the black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

yes

no

Replace starter switch (para 8-12).



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3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR – CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading. – CONTINUED

CONTINUED FROM STEP O

P

1. Turn vehicle MASTER switch OFF (TM 9–2350–314–10).
2. Reconnect harness W114 lead 27B to starter switch.
3. Disconnect harness W114 connector P3 from voltage regulator control box.
4. Check for voltage by placing multimeter red lead in harness W114 connector P3 socket D and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9–2350–314–10).

Is voltage present?

yes

no

Repair or replace harness W114 (para 8–73).

Q

1. Turn vehicle MASTER switch OFF (TM 9–2350–314–10).
2. Place one multimeter lead on voltage regulator control box pin A and the other lead on pin B.
3. Ensure regulator control box switch is in the ON position.
4. Check for continuity.

Is continuity present?

yes

no

Replace voltage regulator control box (para 8–17).

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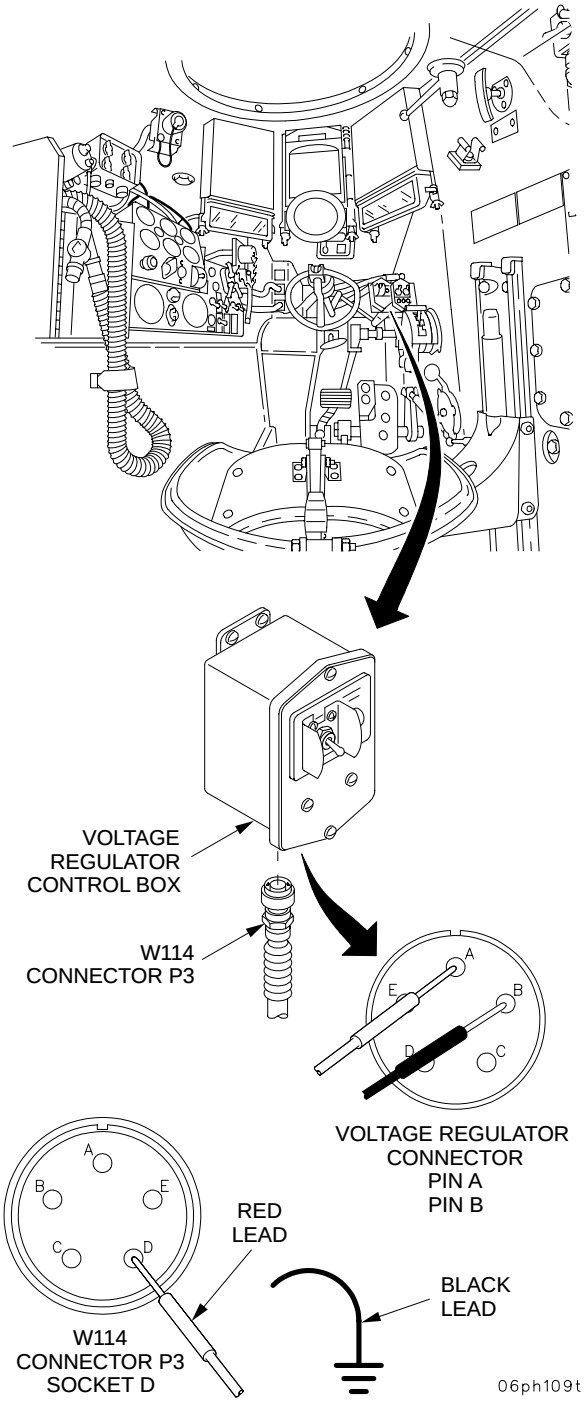

3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR - CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading. - CONTINUED

CONTINUED FROM STEP Q

R

1. Disconnect harness W114 connector P1 from harness W105 connector J1 at driver's compartment bulkhead.
2. Check for continuity by placing one multimeter lead on pin U of harness W114 connector P1 and the other lead in socket B of harness W114 connector P3.

Is continuity present?

yes

no

Repair or replace harness W114 (para 8-73).

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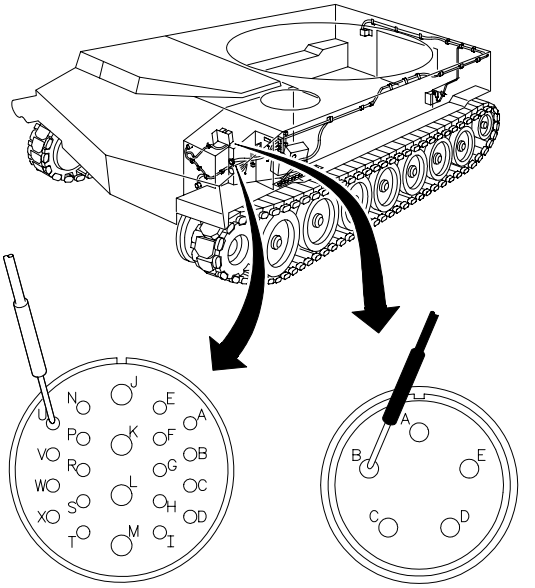

W114
CONNECTOR P1
PIN U

W114
CONNECTOR P3
SOCKET B

06ph110t

3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR - CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading. - CONTINUED

CONTINUED FROM STEP R

S

1. Reconnect harness W114 connector P1 to harness W105 J1 at driver's compartment bulkhead.
2. Reconnect harness W114 connector P3 to voltage regulator control box.
3. Place a three-way connector between harness W105 lead L+ and harness W106 lead L+.
4. Check for voltage by placing the multimeter red lead in the three-way connector and the black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

yes

no

Repair or replace harness W105 (para 8-64).

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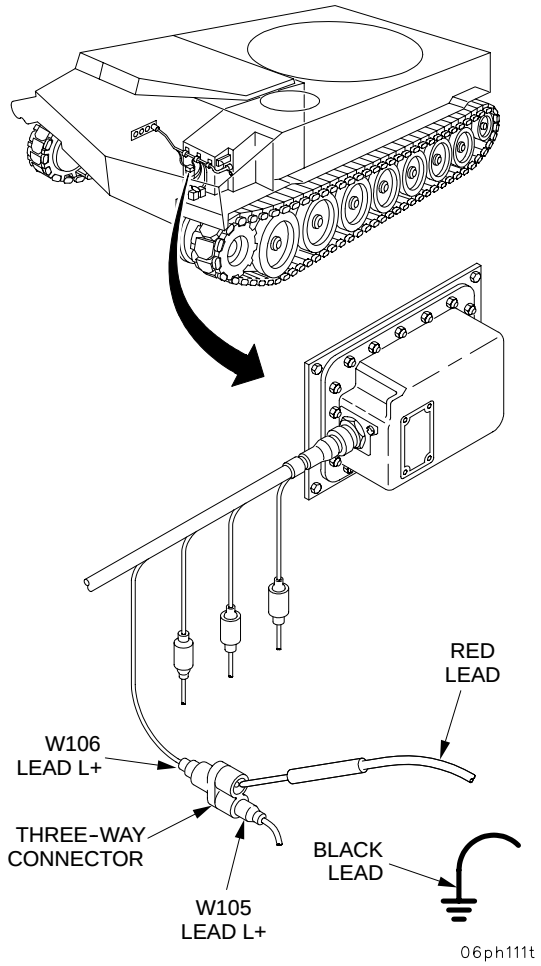

3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR - CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading. - CONTINUED

CONTINUED FROM STEP S

T

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove three-way connector.
3. Reconnect harness W106 lead L+ to harness W105 lead L+.
4. Disconnect harness W101 lead AV from harness W106 lead AV-F+.
5. Check for voltage by placing the multimeter red lead in harness W106 lead AV-F+ socket and black lead to ground.
6. Start engine (TM 9-2350-314-10) and run at 1000 rpm.

Is voltage present?

yes → Go to Step V.

no

U

1. Shut engine OFF and turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W106 connector P1 from voltage regulator.
3. Check continuity from socket C of harness W106 connector P1 to connector AV-F+.

Is continuity good?

yes → Replace voltage regulator (para 8-10).

no → Repair or replace harness W106 (para 8-65).

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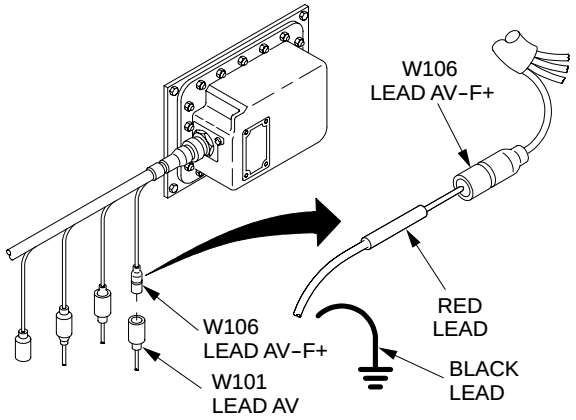
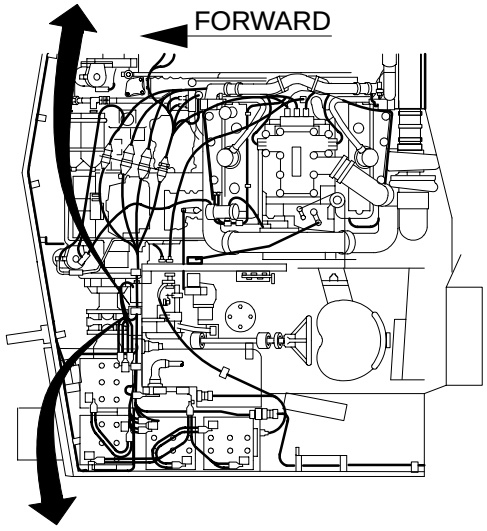
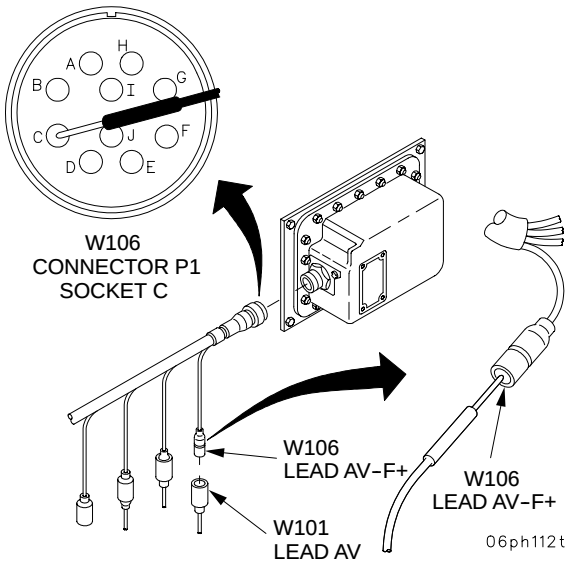






3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR – CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading. – CONTINUED

CONTINUED FROM STEP T

WARNING

Engine may be hot. Use care when leaning over engine. Severe injury may result.

V

1. Remove turbo inlet adapter from engine (para 4-1).
2. Disconnect harness W106 connectors P2 and P3 from generator.
3. Disconnect harness W106 connector P1.
4. Check harness W106 for continuity as follows:

FROM CONNECTOR	TO CONNECTOR
P1 socket C	P2 socket C
P1 socket D	P2 socket B
P1 socket F	P3 pin A
P1 socket G	P3 pin D
P1 socket H	P3 pin B
P1 socket J	P3 pin C

Is continuity present for all checks?

yes → no → Repair or replace harness W106 (para 8-65).

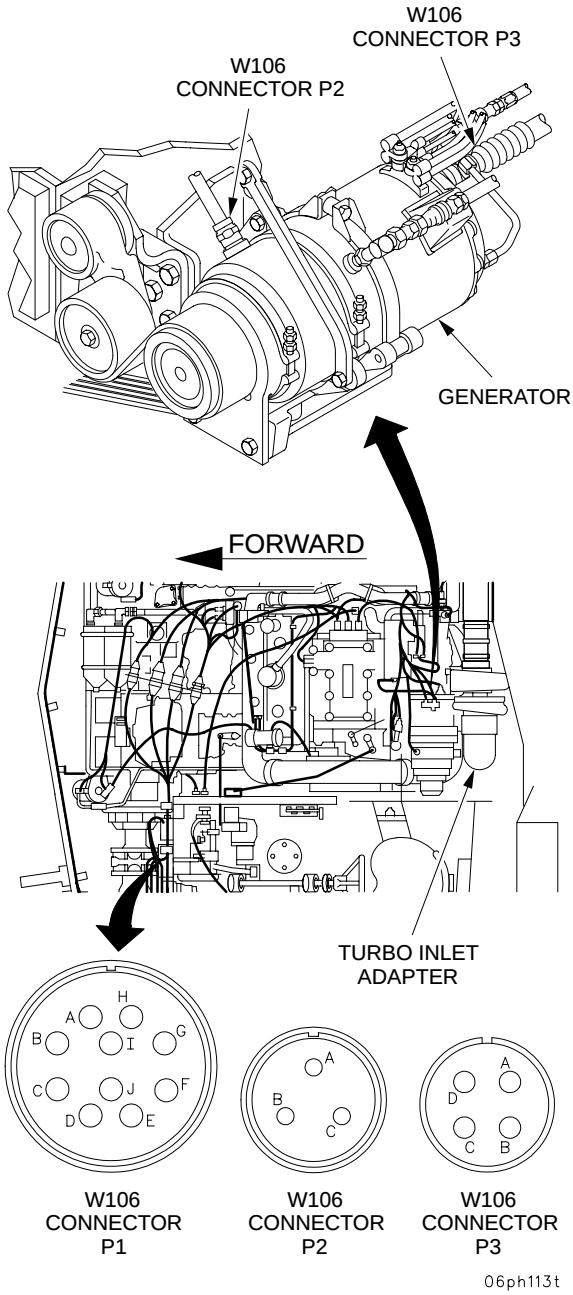
W

1. Disconnect W106 harness lead 605-AC.
2. Check for shorts to ground on harness W106 by placing one multimeter lead on ground and the other multimeter lead one at a time on pin C, D, F, G, H and J of harness W106 connector P1.

Is continuity present on any check?

yes → Repair or replace harness W106 (para 8-65).

no → Replace generator (para 8-4).



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3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR - CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading. - CONTINUED

CONTINUED FROM STEP C

X

1. Turn engine and vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W109 connector P1 from harness W110 connector J1.
2. Check for continuity between wire lead 81 at battery and W109 sockets A, B, C, and D.

Is continuity good at all points?

yes

Repair or replace harness W110 (para 8-69).

no

Repair or replace harness W109 (para 8-68).

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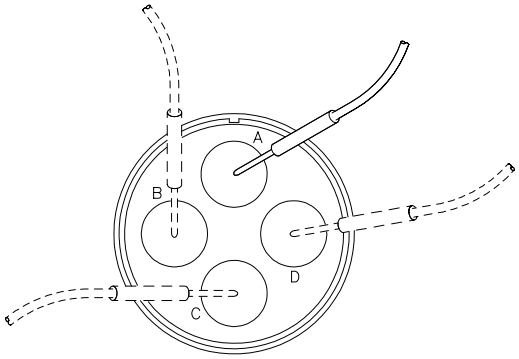
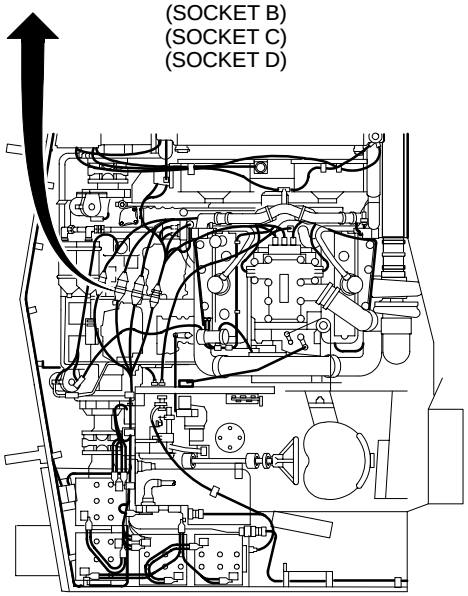
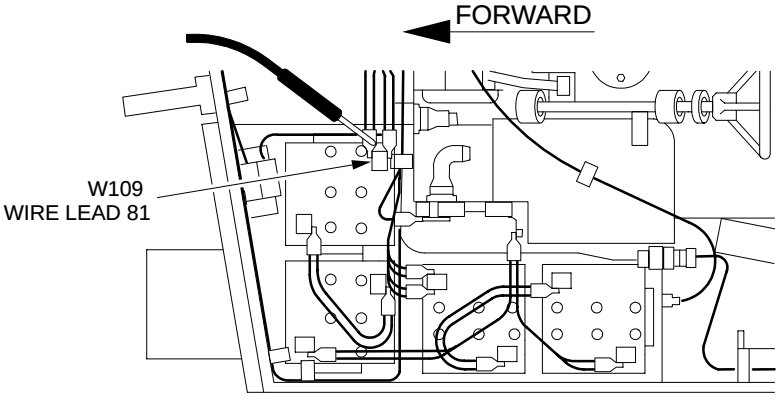


W109
CONNECTOR P1
SOCKET A
(SOCKET B)
(SOCKET C)
(SOCKET D)





06ph114t

3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR – CONTINUED	(1) GENERATOR FAILS TO CHARGE BATTERIES. Gage indication: not charging, unsteady, or inaccurate reading. – CONTINUED

CONTINUED FROM STEP B

Y

1. Disconnect harness W108 connector P1 from harness W107 connector J1.
2. Check for continuity between wire lead 7 at shunt and sockets A, B, C, and D of harness W108.

Is continuity good at all points?

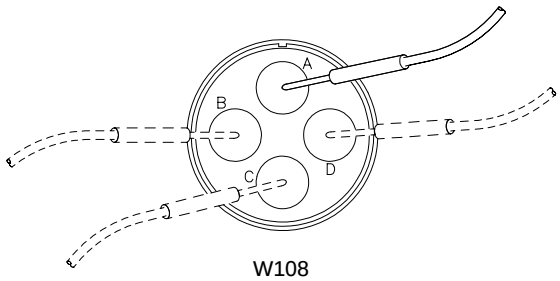
yes

Repair or replace harness W107 (para 8-66).

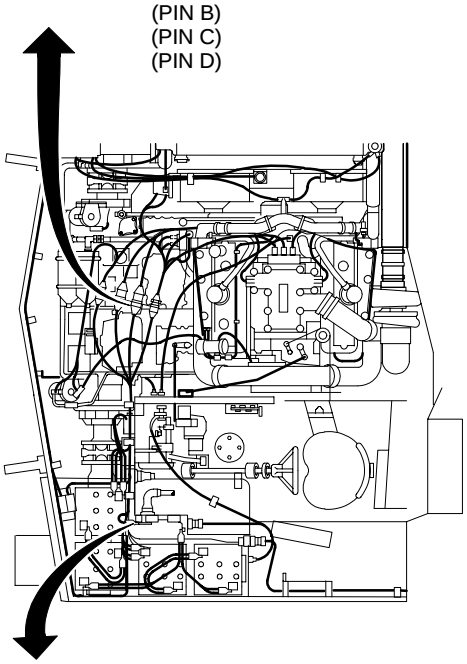
no

Repair or replace harness W108 (para 8-67).

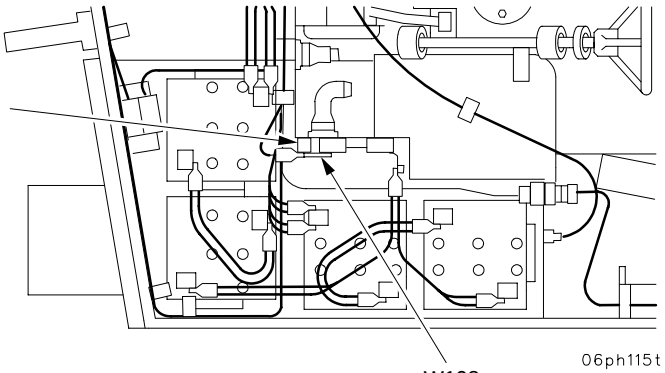
END OF TASK



W108
CONNECTOR P1
PIN A
(PIN B)
(PIN C)
(PIN D)



FORWARD



W108
LEAD 7

3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR - CONTINUED	(2) GENERATOR OVERCHARGING BATTERIES. Battery/generator gage in high red.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)
Battery compartment access doors open (TM 9-2350-314-10)

A

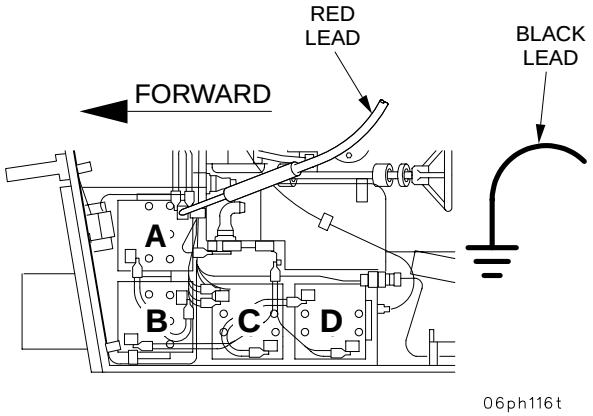
1. Shut engine and vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Place multimeter red lead on positive terminal on battery "A" and black lead to ground.
3. Start engine (TM 9-2350-314-10).
4. Check for voltage.

Is 33 V dc or more present?

yes

no

Go to para 3-3.g(8).



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3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR - CONTINUED	(2) GENERATOR OVERCHARGING BATTERIES. Battery/generator gage in high red. - CONTINUED

CONTINUED FROM STEP A

B

1. Shut engine and vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Place a three-way connector between harness W105 lead OVS, and harness W106 lead OVS.
3. Check for voltage by placing the red multimeter lead in the three-way connector and black lead to ground.
4. Start engine (TM 9-2350-314-10).

Is 33 V dc or more present?

yes

Replace voltage regulator control box (para 8-17).

no

If no voltage is present go to Step C.

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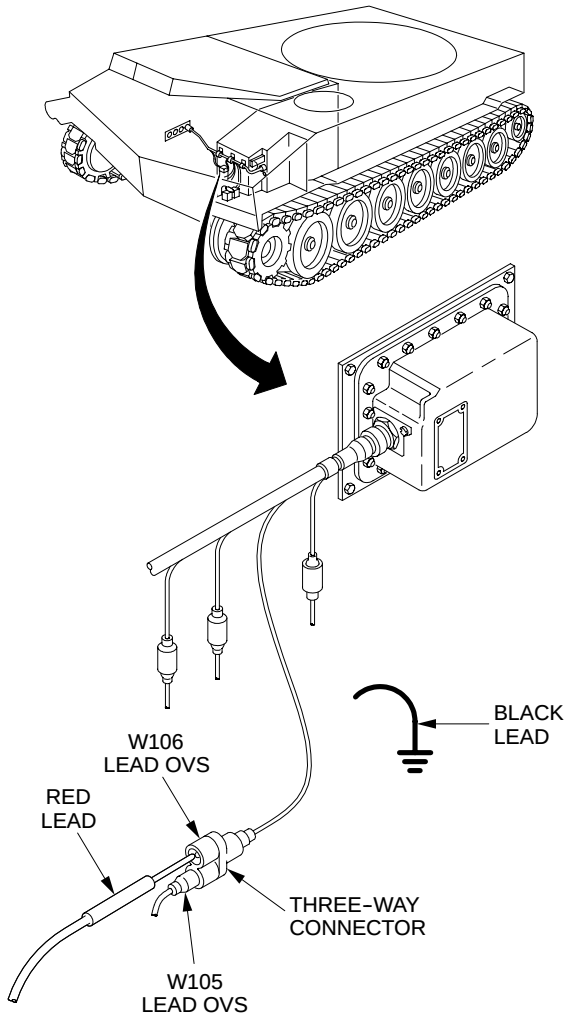

06ph119t

3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR - CONTINUED	(2) GENERATOR OVERCHARGING BATTERIES. Battery/generator gage in high red. - CONTINUED

CONTINUED FROM STEP B

C

1. Shut engine and vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove three-way connector from harness W105 lead OVS and harness W106 lead OVS.
3. Disconnect harness W106 connector P1 from voltage regulator.
4. Check for continuity by placing one multimeter lead in socket I of harness W106 connector P1 and the other lead in harness W106 lead OVS.

Is continuity present?

yes

no

Repair or replace harness W106 (para 8-65).

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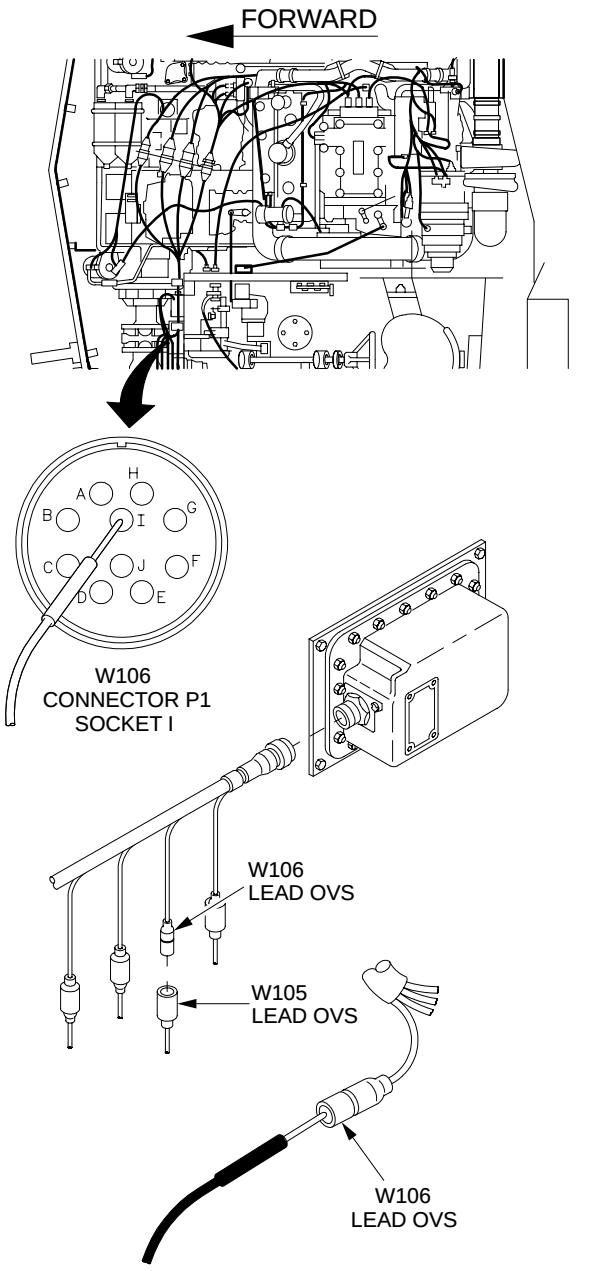

06ph120t

3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR - CONTINUED	(2) GENERATOR OVERCHARGING BATTERIES. Battery/generator gage in high red. - CONTINUED

CONTINUED FROM STEP C

D

1. Reconnect harness W106 connector P1 to voltage regulator.
2. Disconnect harness W114 connector P1 from harness W105 connector J1.
3. Check for continuity by placing one multimeter lead in socket I of harness W105 connector J1 and the other lead on harness W105 lead OVS pin.

Is continuity present?

yes

no

Repair or replace harness W105 (para 8-64).

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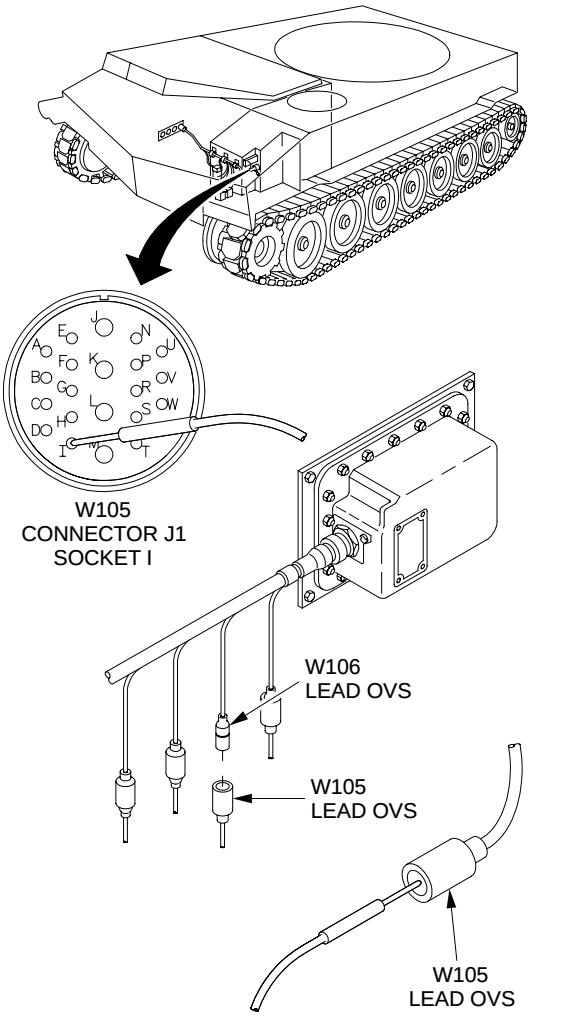


06ph121t

3-3 TROUBLESHOOTING CHART - CONTINUED

h. GENERATOR - CONTINUED	(2) GENERATOR OVERCHARGING BATTERIES. Battery/generator gage in high red. - CONTINUED

CONTINUED FROM STEP D

E

1. Reconnect harness W105 lead OVS to harness W106 lead OVS.
2. Disconnect harness W114 connector P3 from voltage regulator control box.
3. Check for continuity by placing one multimeter lead in harness W114 connector P3 socket C and the other lead on harness W114 connector P1 pin I.

Is continuity present?

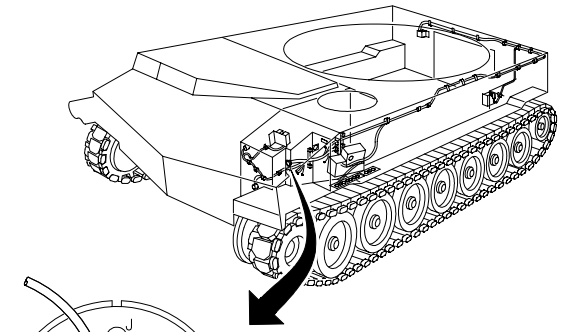
yes

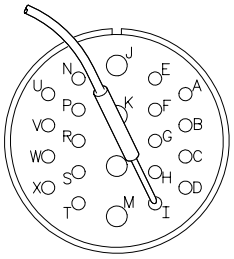
Replace voltage regulator (para 8-10).

no

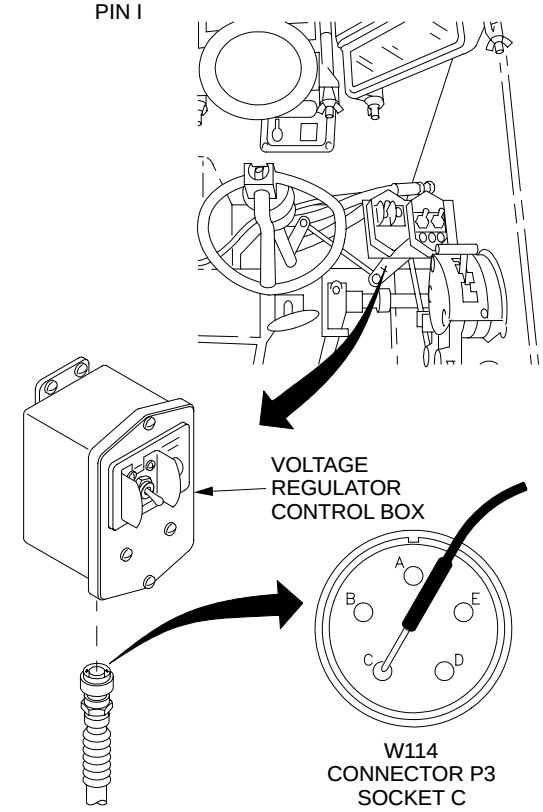
Repair or replace harness W114 (para 8-73).

END OF TASK





W114
CONNECTOR P1
PIN I



W114
CONNECTOR P3
SOCKET C

06ph122t

3-3 TROUBLESHOOTING CHART - CONTINUED

i. HULL INTERCOM CIRCUIT

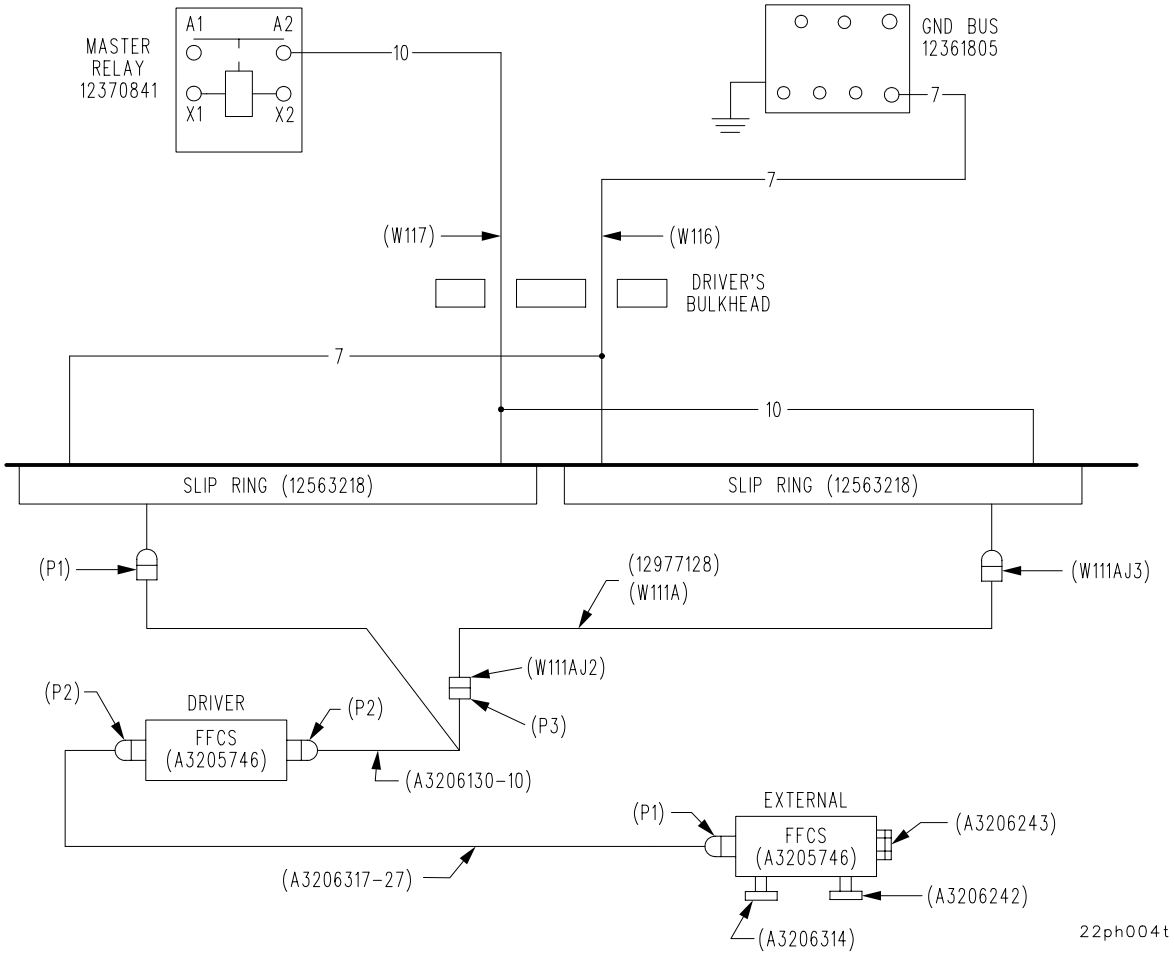
The vehicle is equipped with an AN/VIC-3(V)-6. The hull has two full function crew stations (FFCS): number 6 driver's and number 5 external.

The relationship of these components and wiring is shown in the diagrams below.

When the vehicle MASTER switch is turned ON, 24 V dc is supplied to the slip ring which distributes power to the driver's intercom, the exterior intercom, and the cab communications circuit. When power is supplied and the intercom boxes are turned ON, they are linked together and both stations (cab and hull) are able to communicate.

For AN/VIC-3(V)-6, refer to TM 11-5830-263-20&P.

INTERCOM INSTALLATION, HULL
AN/VIC-3 (V)-6



3-3 TROUBLESHOOTING CHART - CONTINUED

i.	HULL INTERCOM CIRCUIT - CONTINUED	(1)	DRIVER'S OR EXTERNAL INTERCOM FAILS TO OPERATE. Chief of Section and crew intercoms operate.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests. 16 AWG wire may be used as an extension.)

Personnel Required
Two

A Visually inspect harness W111A for any cuts, breaks, kinks, or missing segments.

Are there any cuts, breaks, kinks, or missing segments?

yes / no

Repair or replace harness W111A (para 8-70).

B
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W111A lead 48 from circuit breaker no. 9 connector.
3. Place multimeter red lead on circuit breaker connector pin and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes / no

Replace circuit breaker no. 9 (para 8-20).

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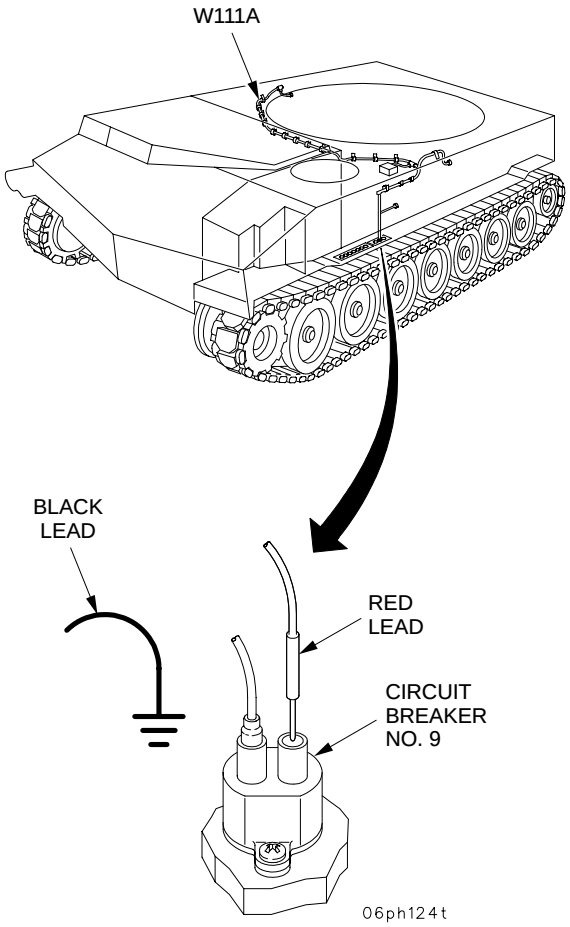


3-3 TROUBLESHOOTING CHART - CONTINUED

i. HULL INTERCOM CIRCUIT - CONTINUED	(1) DRIVER'S OR EXTERNAL INTERCOM FAILS TO OPERATE. Chief of Section and crew intercoms operate - CONTINUED

CONTINUED FROM STEP B

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W111A lead 48 to circuit breaker no. 9 connector.
3. Disconnect harness W111A lead 7 from harness W125 lead 7 connector.
4. Check harness W125 lead 7 for continuity. Place one multimeter lead in harness W125 lead 7 connector pin and other lead on ground.

Is continuity present?

yes

no

Repair or replace harness W125 (para 8-83).

D

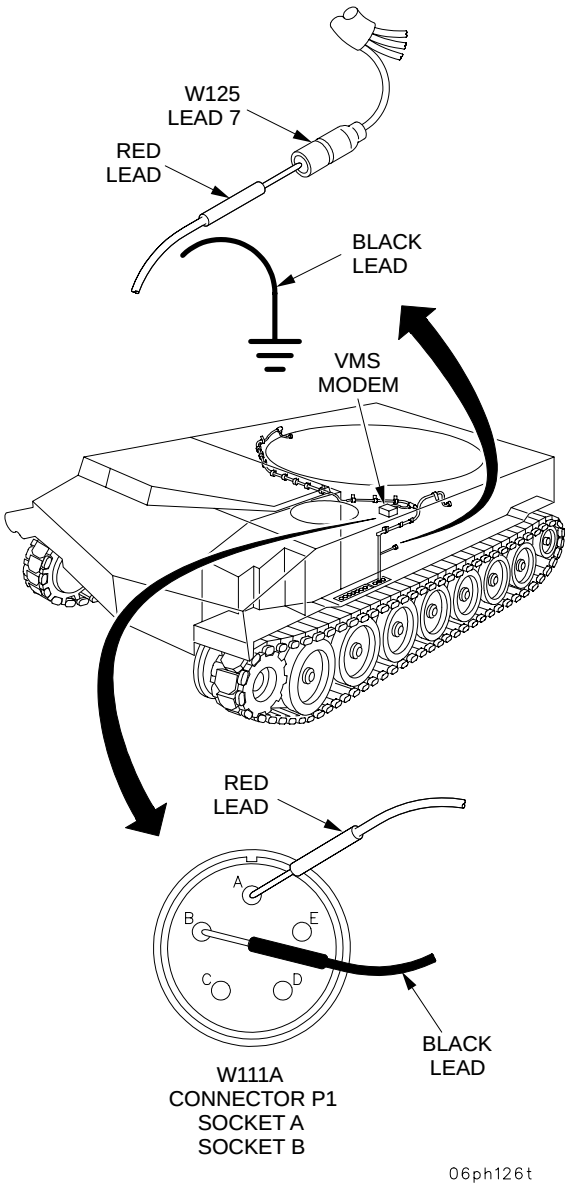
1. Reconnect harness W111A lead 7 to harness W125 lead 7 connector.
2. Disconnect harness W111A connector P1 at VMS hull side modem connector J2.
3. Make sure vehicle MASTER switch is ON.
4. Place multimeter red lead in harness W111A connector P1 socket A and black lead in harness W111A connector P1 socket B.
5. Check for voltage.

Is voltage present?

yes

no

Replace VMS hull side modem (TM 9-2350-314-20-2-2).



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3-3 TROUBLESHOOTING CHART - CONTINUED

i. HULL INTERCOM CIRCUIT - CONTINUED	(1) DRIVER'S OR EXTERNAL INTERCOM FAILS TO OPERATE. Chief of Section and crew intercoms operate - CONTINUED

CONTINUED FROM STEP D

E

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W111A connector J2 from harness A3206130-10 connector P3 and harness W111A connector J3 from right slipring connector.
3. Check harness W111A for continuity by placing one multimeter lead in connector P1 socket C and other lead first in connector J2 socket H and then in connector J3 socket H.
4. Place one multimeter lead in connector P1 socket D and other lead first in connector J2 socket G and then in connector J3 socket G.

Is continuity present at all points?

yes

no

Repair or replace harness W111A (para 8-70).

F

Do shorts test on harness W111A connectors P1, J2, and J3 (para 3-1.3).

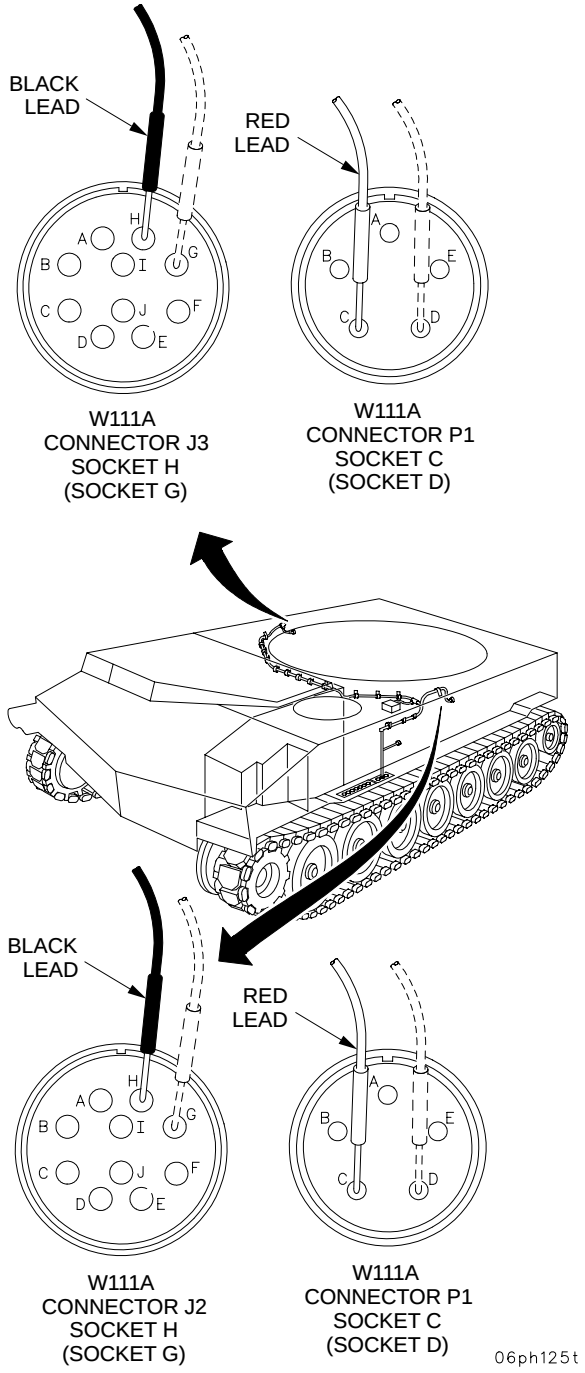
Are any shorts present?

yes

no

Repair or replace harness W111A (para 8-70).

Go to TM 11-5830-263-20&P and troubleshoot harness A3206130-10.



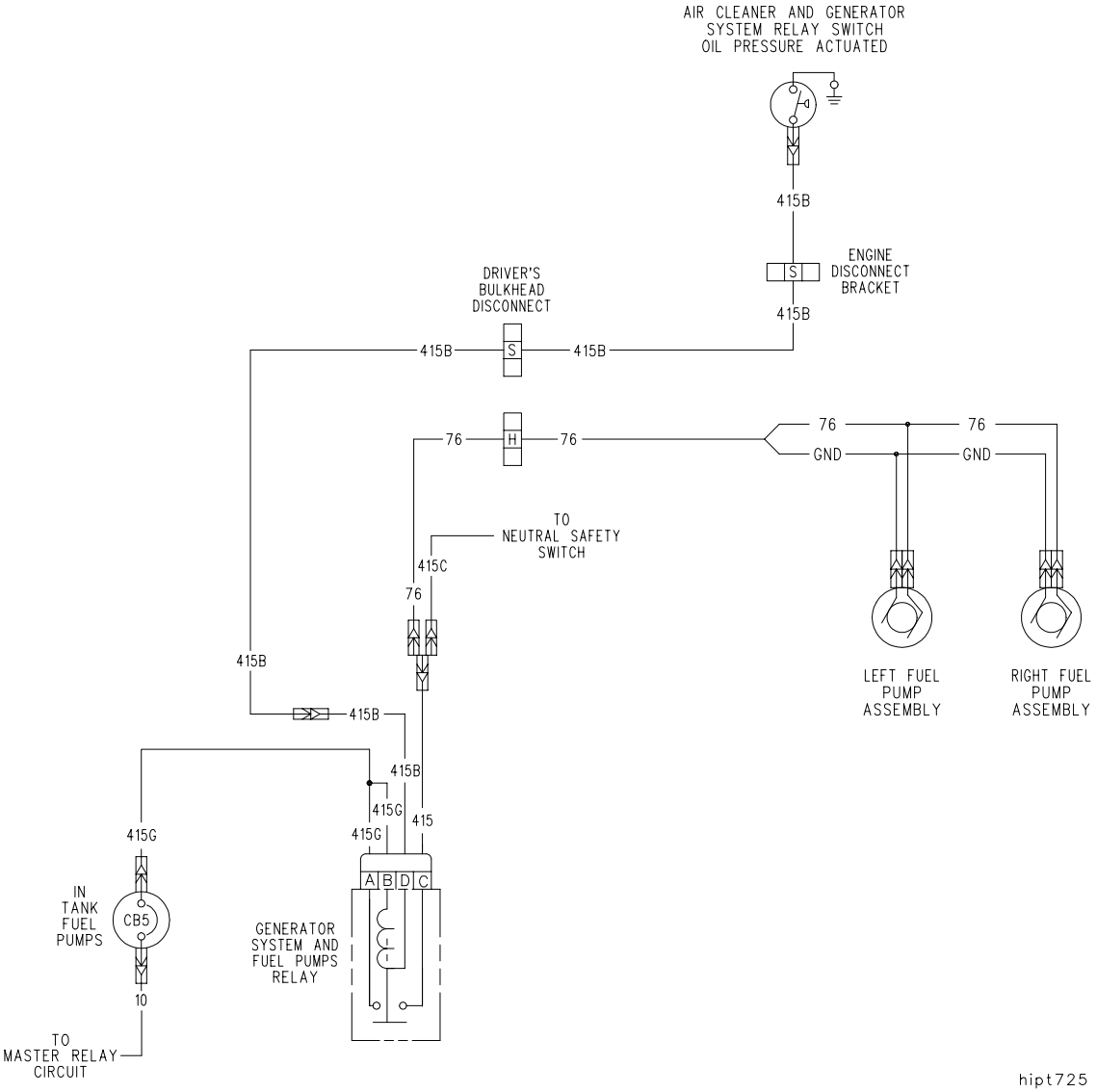
END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

j. IN-TANK FUEL PUMPS

The in-tank fuel pump system consists of circuit breaker number 5 (CB5), in-tank fuel pumps, generator system and fuel pumps relay, left and right fuel pump assembly, air cleaner and generator system switch, and associated wiring. The relationship of these components is shown in the diagram below.

When the vehicle MASTER switch is turned ON, 24 V dc is supplied through MASTER RELAY and CB5 to in-tank fuel pumps generator system relay. When the engine is cranked and oil pressure reaches 4-8 psi, the air-cleaner and generator system relay switch closes, causing the in-tank fuel pump generator system relay to close. When the relay closes, 24 V dc is supplied to the left and right in-tank fuel pumps.



3-3 TROUBLESHOOTING CHART - CONTINUED

j. IN-TANK FUEL PUMPS - CONTINUED	(1) ELECTRICAL IN-TANK FUEL PUMP FAILS TO OPERATE. Engine misses when low on fuel.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Driver's engine access cover removed (para 16-7).

WARNING

Do not use open flame or smoke when working on the fuel system. An explosion may occur, causing severe injury or death.

NOTE

Left fuel pump can be tested from driver's access panel. Powerplant must be removed to test right fuel pump.

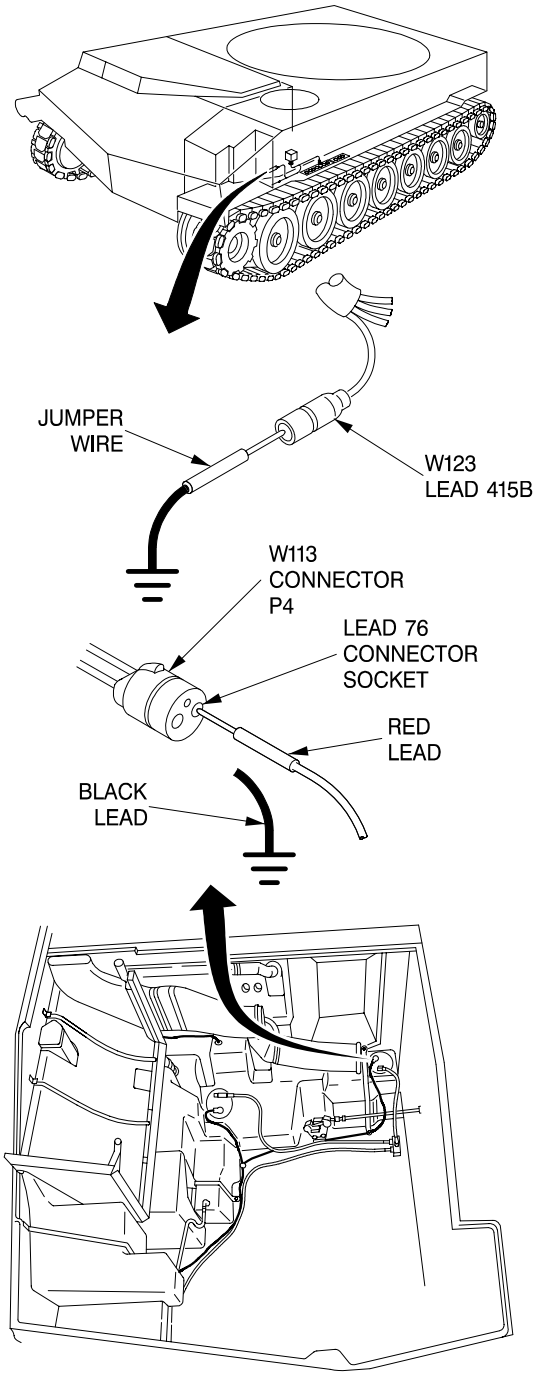
A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W123 lead 415B from harness W114 lead 415B.
3. Place a jumper lead from harness W123 lead 415B connector socket to ground.
4. Disconnect harness W113 connector P4 from left in-tank fuel pump connector.
5. Place multimeter red lead in harness W113 connector P4 lead 76 connector socket and black lead to ground.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes → Go to step C.

no → CONTINUED ON NEXT PAGE



3-164

3-3 TROUBLESHOOTING CHART - CONTINUED

j. IN-TANK FUEL PUMPS - CONTINUED	(1) ELECTRICAL IN-TANK FUEL PUMP FAILS TO OPERATE. Engine misses when low on fuel. - CONTINUED

CONTINUED FROM STEP A

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 lead 76 from harness W123 lead 415.
3. Disconnect harness W115 connector P1 from harness W113 connector J1.
4. Check harness W115 lead 76 for continuity by placing one multimeter lead in lead 76 connector socket and other lead in harness W115 connector P1 socket H.

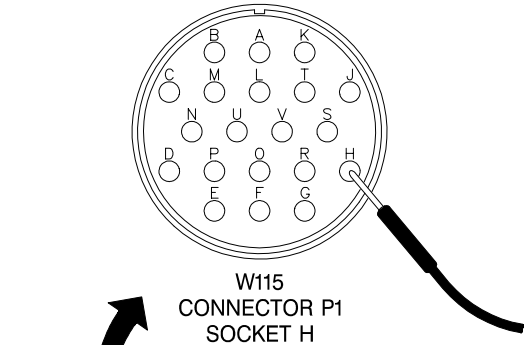
Is continuity present?

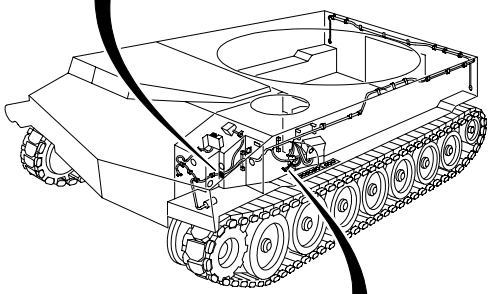
yes

Repair or replace harness W113 (para 8-72).

no

Repair or replace harness W115 (para 8-74).





CONTINUED FROM STEP A

C

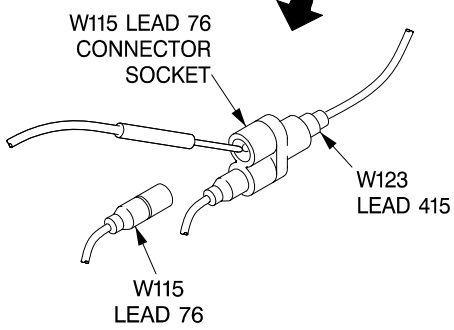
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Check for continuity by placing one multimeter lead in harness W113 connector P4 GND socket and other lead to ground.

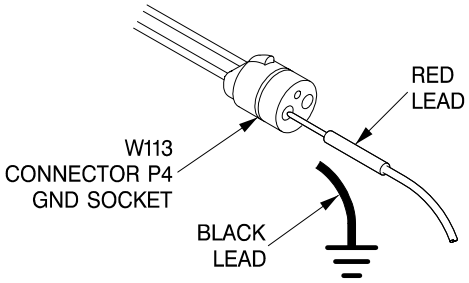
Is continuity present?

yes

Repair or replace harness W113 (para 8-72).

no





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3-165

3-3 TROUBLESHOOTING CHART - CONTINUED

j. IN-TANK FUEL PUMPS - CONTINUED	(1) ELECTRICAL IN-TANK FUEL PUMP FAILS TO OPERATE. Engine misses when low on fuel. - CONTINUED

CONTINUED FROM STEP C

D

1. Disconnect fuel inlet line at primary fuel filter (para 5-14).
2. Place fuel line in suitable container to catch fuel.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for fuel.

Is fuel pumped into container?

yes

Replace left in-tank fuel pump (para 5-1).

no

E

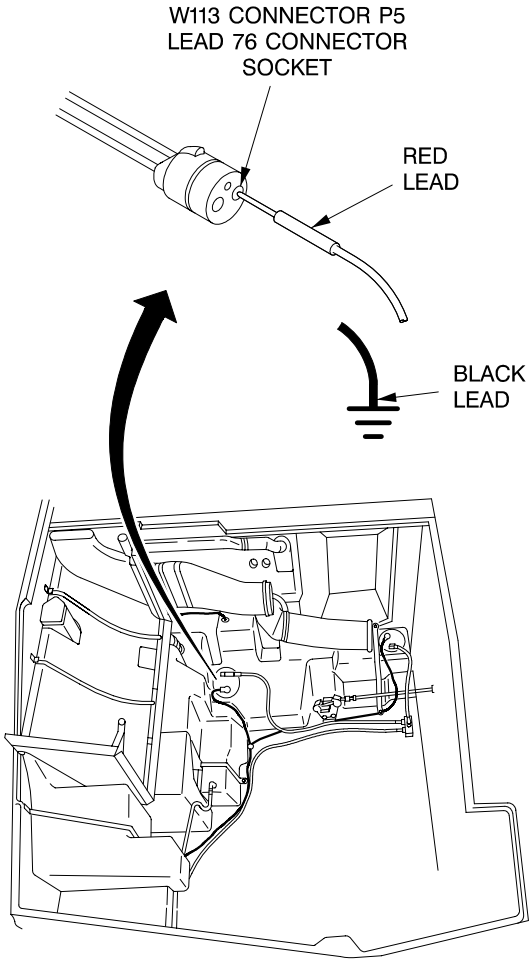
1. Remove powerpack (para 4-1).
2. Reconnect battery ground lead (para 8-33).
3. Place gear selector in neutral (TM 9-2350-314-10).
4. Disconnect harness W113 connector P5 from right in-tank fuel pump connector.
5. Place multimeter red lead in harness W113 connector P5 lead 76 connector socket and black lead on ground.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Repair or replace harness W113 (para 8-72).

no



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3-3 TROUBLESHOOTING CHART - CONTINUED

j. IN-TANK FUEL PUMPS - CONTINUED	(1) ELECTRICAL IN-TANK FUEL PUMP FAILS TO OPERATE. Engine misses when low on fuel. - CONTINUED

CONTINUED FROM STEP E

F

1. Turn MASTER switch OFF (TM 9-2350-314-10).
2. Check for continuity by placing one multimeter lead in harness W113 connector P5 GND socket and other lead to ground.

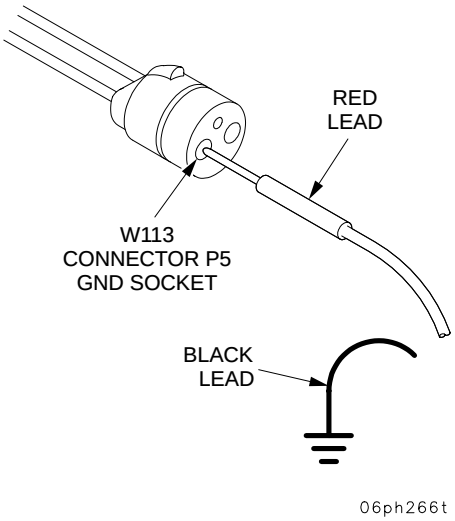
Is continuity present?

yes

Repair or replace harness W113 (para 8-72).

no

Replace right in-tank fuel pump (para 5-1).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS

The vehicle lighting system consists of left/right headlight assemblies, left/right taillight assemblies, stoplight switch, dimmer switch, dome light, driver's night vision unit, and light switch assembly.

Driver's instrument panel lights consist of: HIGH BEAM indicator light, GLOW PLUG WAIT light, PARKING BRAKE light, and one panel light for illumination of speedometer and tachometer.

Portable instrument panel lights consist of: master indicator light, MASTER WARNING light, LOW COOLANT light, and two panel lights for illumination of the portable instrument panel.

Lights associated with the accessory control box consist of HEATER indicator light, LEAD FILTER CHANGE indicator light, EXHAUST indicator light, and two panel lights for illumination of the accessory control box panel face.

Miscellaneous lighting consists of a master indicator light located on the steering shaft and another on the enclosure assembly in the crew compartment. The MCS heater (M3) is equipped with an on/off indicator light.

The travel lock control box consists of an ON indicator light, R/U light (raise/unlock) and L/L light (lower/lock).

Lighting on the voltage regulator control box consists of a VOLT REG OFF light.

Refer to HULL ELECTRICAL SCHEMATIC (FP-1 through FP-11/(FP-12 blank)) for the relationship of the lighting systems and individual components.

When the vehicle MASTER switch is turned ON, 24 V dc is supplied through the master relay to the circuit breaker panel. Circuit breakers numbered 1, 2, 4, and 6 distribute voltage to various lamps, LEDs, and controlling switches.

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(1) ALL ENGINE MASTER WARNING LEDS FAIL TO OPERATE WITH MASTER SWITCH ON. All gages operate.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)
Air intake grille open (TM 9-2350-314-10)

Personnel Required
Two

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W114 connector P1 from harness W105 connector J1 at driver's compartment bulkhead.
3. Check for continuity by placing one multimeter lead in socket N of harness W105 and other lead to ground.

Is continuity present?

yes

Repair or replace harness W114 (para 8-73).

no

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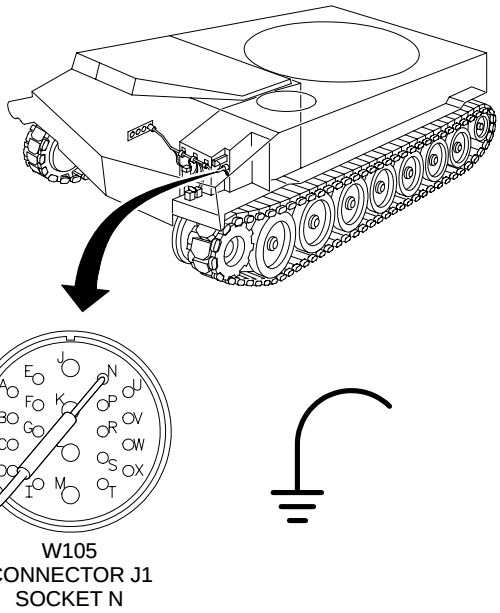

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(1) ALL ENGINE MASTER WARNING LEDS FAIL TO OPERATE WITH MASTER SWITCH ON. All gages operate. – CONTINUED

CONTINUED FROM STEP A

B

1. Reconnect harness W114 connector P1 to harness W105 connector J1.
2. Disconnect harness W105 connector P1 from harness W104 connector J1 at engine disconnect bracket.
3. Check for continuity by placing one multimeter lead on pin K of harness W104 connector J1 and the other lead to ground.

Is continuity present?

yes

Repair or replace harness W105 (para 8-64).

no

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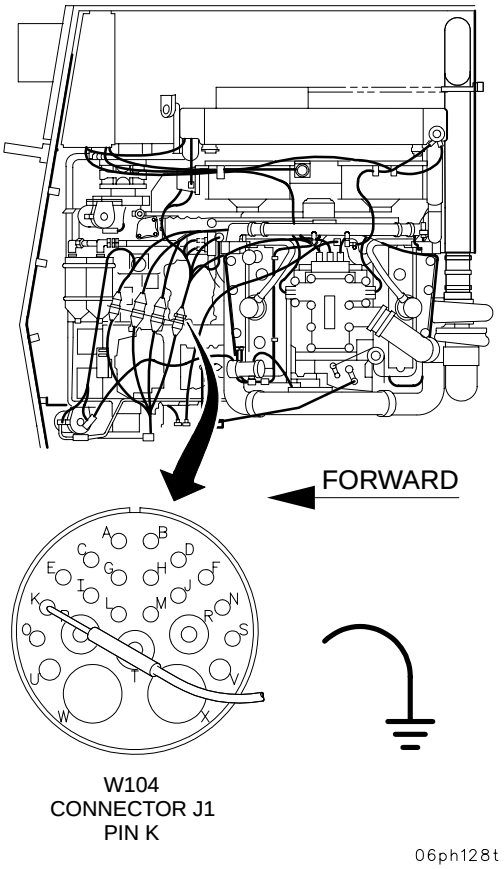

W104
CONNECTOR J1
PIN K

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3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(1) ALL ENGINE MASTER WARNING LEDS FAIL TO OPERATE WITH MASTER SWITCH ON. All gages operate. - CONTINUED

CONTINUED FROM STEP B

C

1. Remove driver's compartment engine access cover (para 16-7).
2. Disconnect harness W104 lead 509B from engine oil pressure switch and lead 509C from the transmission oil pressure switch.
3. One at a time, connect a jumper from harness W104 lead 509B and 509C to ground.
4. Check for continuity of each lead by placing one multimeter lead on pin K of harness W104 connector J1 and the other lead to ground.

Is continuity present with either check?

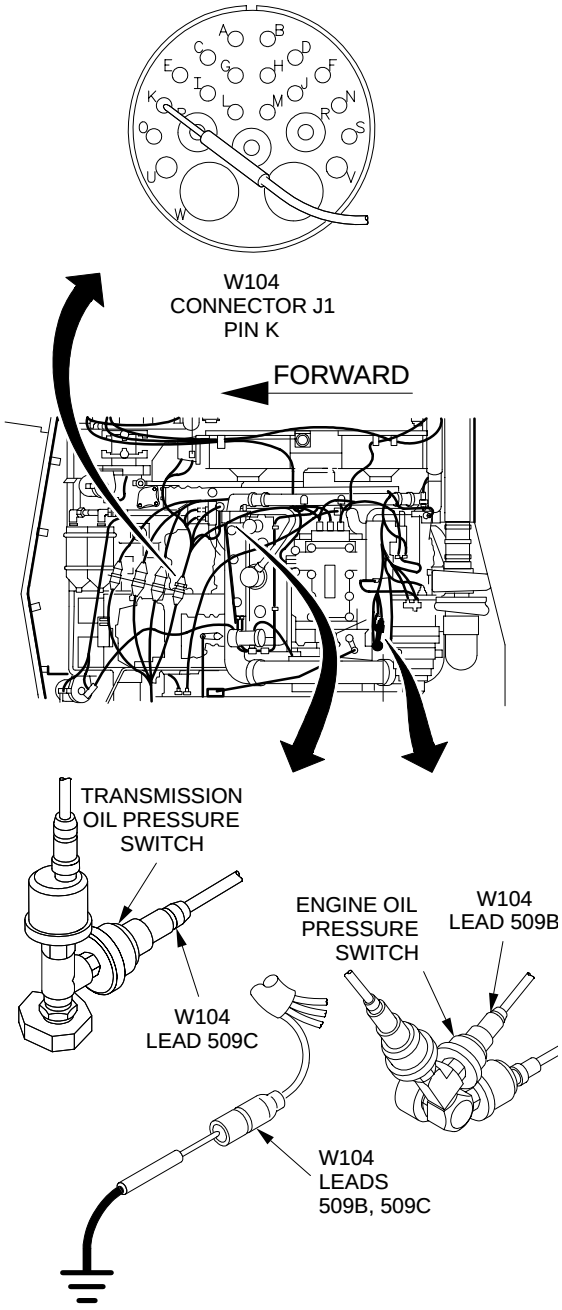
yes

If continuity is present on lead 509B replace engine oil pressure switch (para 8-47). If continuity is present on lead 509C replace transmission oil pressure switch (para 8-46).

no

Repair or replace harness W104 (para 8-63).

END OF TASK



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3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(2) PORTABLE INSTRUMENT PANEL MASTER WARNING LED FAILS TO OPERATE. Other warning lights operate properly.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Portable instrument panel cover removed (para 8-14)

Personnel Required
Two

A

1. Remove bulb from MASTER warning LED (para 8-14).
2. Place multimeter red lead on center contact of light socket and black lead on ground.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Replace LED (para 8-14) and ensure MASTER warning light operates (TM 9-2350-314-10).

no

B

1. Disconnect harness W112 leads 27/509 at master warning LED.
2. Place one multimeter lead in harness W112 lead 509 and other lead to ground.
3. Check for continuity.

Is continuity present?

yes

no

Go to Step D.

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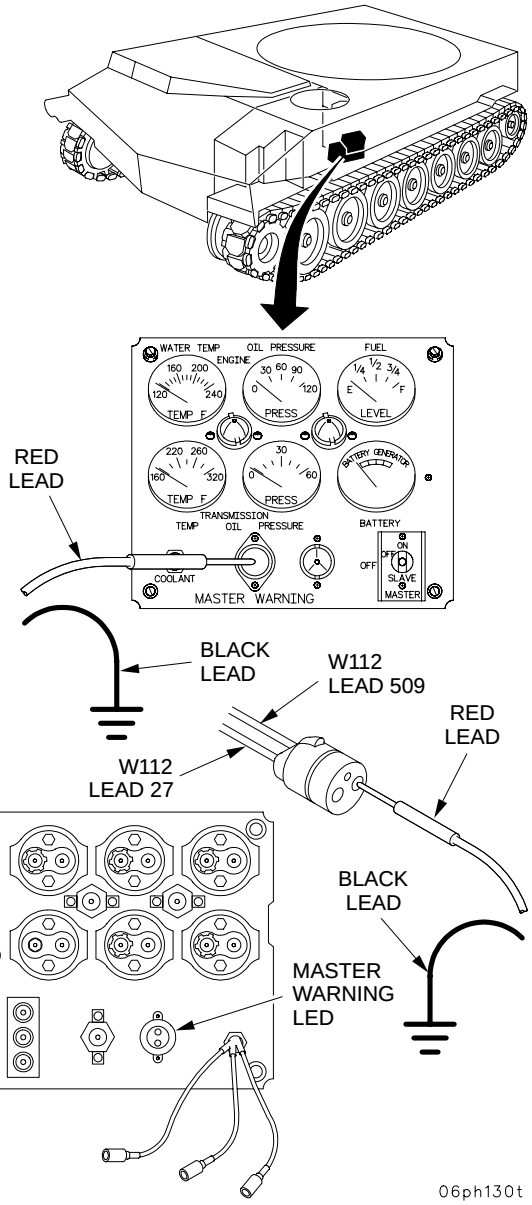


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(2) PORTABLE INSTRUMENT PANEL MASTER WARNING LED FAILS TO OPERATE. Other warning lights operate properly. - CONTINUED

CONTINUED FROM STEP B

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Place multimeter red lead in harness W112 lead 27 socket and black lead to ground.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

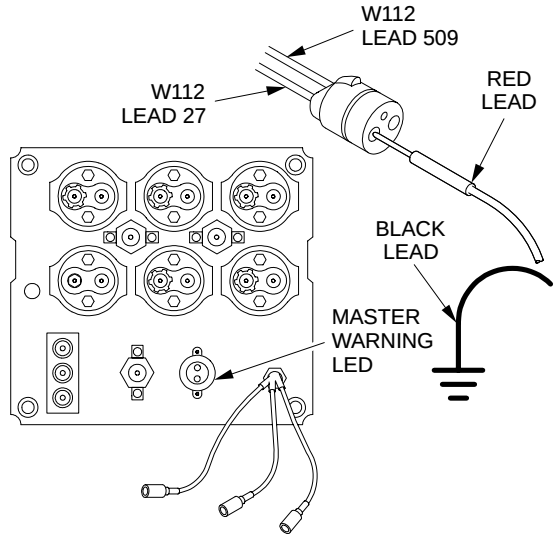
Is voltage present?

yes

Replace MASTER warning LED assembly (para 8-14).

no

Repair or replace harness W112 lead 27 (para 8-71).



CONTINUED FROM STEP B

D

1. Reconnect harness W112 leads 27/509 to master warning LED.
2. Disconnect harness W112 connector P1 from harness W114 J1.
3. Place one multimeter lead in socket P of harness W114 J1 and other lead to ground.
4. Check for continuity.

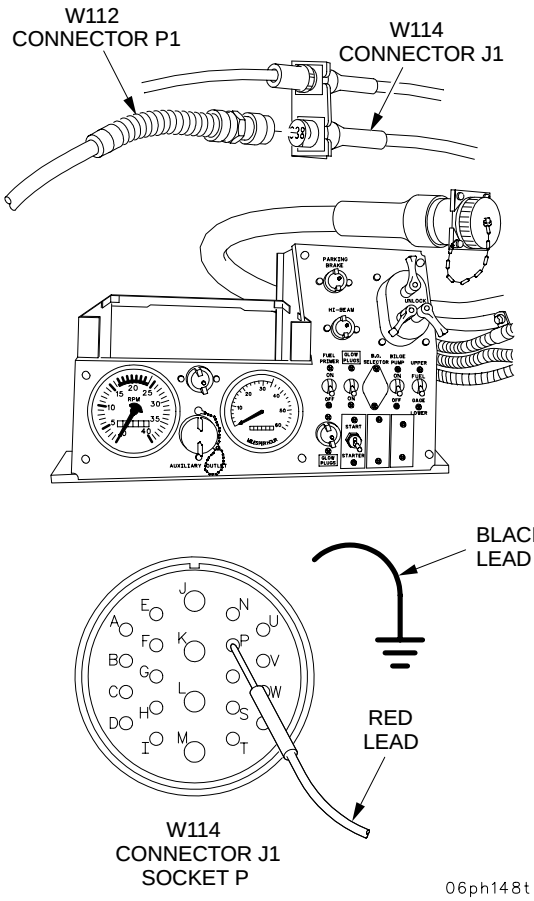
Is continuity present?

yes

Repair or replace W114 (lead 509) (para 8-73).

no

Repair or replace harness W112 (lead 509) (para 8-71).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(3) STEERING SHAFT MASTER WARNING LIGHT FAILS TO OPERATE. Other MASTER warning lights operate properly.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

A

1. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
2. Press to test bulb.

Does bulb light?

yes → Go to step C.

no →

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W114 lead 27 from steering shaft MASTER warning light.
3. Place multimeter red lead in harness W114 lead 27 connector socket and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Are 18 to 26 volts indicated?

yes → Repair or replace harness W114 from steering shaft MASTER warning light 27 connection (para 8-73).

no →

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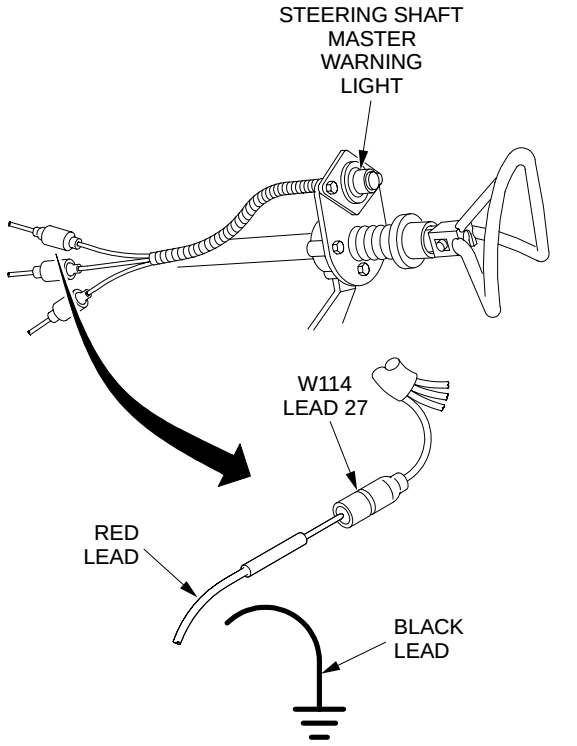

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3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(3) STEERING SHAFT MASTER WARNING LIGHT FAILS TO OPERATE. Other MASTER warning lights operate properly. - CONTINUED

CONTINUED FROM STEP A or B

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W114 lead 509 from steering shaft MASTER warning light.
3. Place multimeter red lead in harness W114 lead 509 connector socket and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

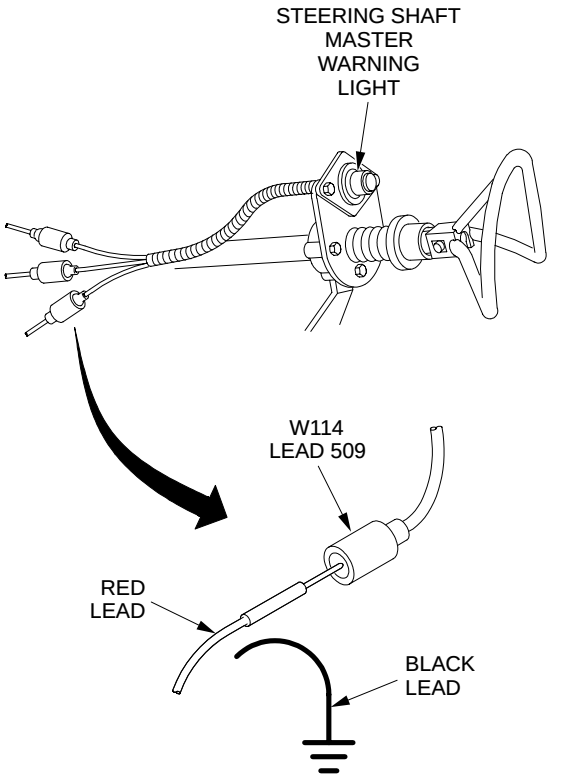
Is voltage present?

yes

Replace steering shaft MASTER warning light (para 8-40).

no

Repair or replace harness W114 from steering shaft MASTER warning light (para 8-73).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(4) CREW COMPARTMENT MASTER WARNING LIGHT FAILS TO OPERATE. Other MASTER warning lights operate properly.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Personnel Required
Two

A

1. Remove bulb from crew compartment MASTER warning light (para 8-21).
2. Place multimeter red lead on center contact in light socket and black lead on ground.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Replace bulb (para 8-21) and ensure crew compartment MASTER warning light operates. If light fails to operate, go to step C.

no

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W114 connector P2 from crew compartment MASTER warning light.
3. Place multimeter red lead on harness W114 connector P2 socket A and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Repair or replace harness W114 from crew compartment MASTER warning light connector (para 8-73). If warning light still does not operate, go to step C.

no

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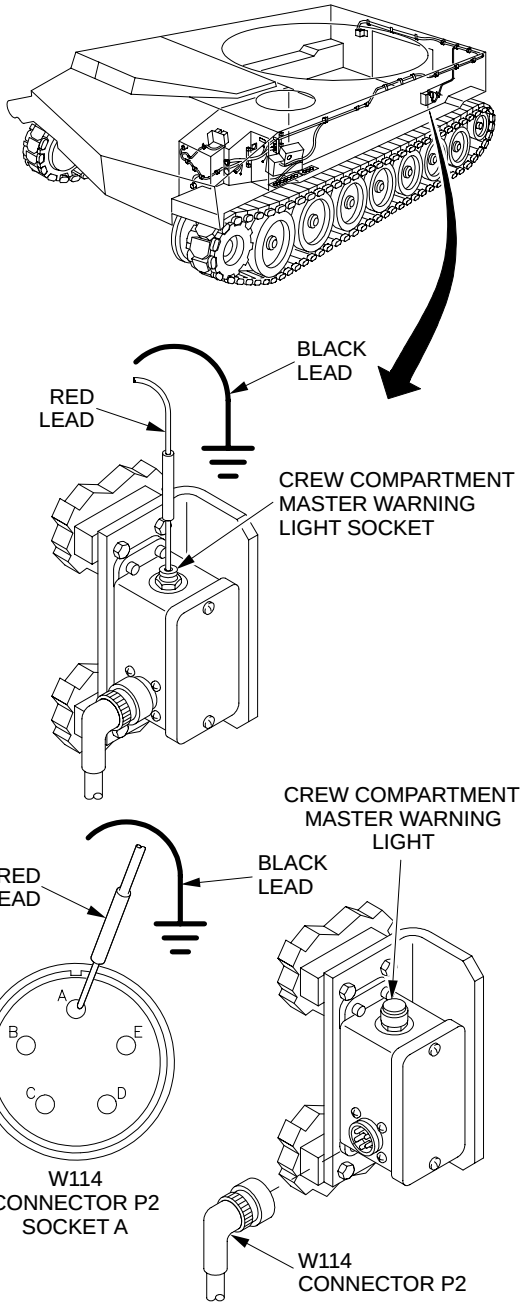


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(4) CREW COMPARTMENT MASTER WARNING LIGHT FAILS TO OPERATE. Other MASTER warning lights operate properly. - CONTINUED

CONTINUED FROM STEP A or B

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Place one multimeter lead in harness W114 connector P2 socket C and other lead on ground.
3. Check for continuity.

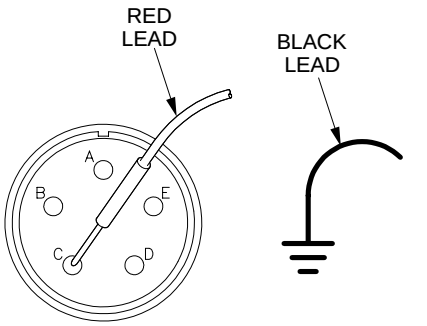
Is continuity present?

yes

Replace crew compartment MASTER warning light (para 8-21).

no

Repair or replace harness W114 from crew compartment MASTER warning light to circuit 509 connection (para 8-73).



W114
CONNECTOR P2
SOCKET C

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END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(5) CREW COMPARTMENT MASTER WARNING LIGHT FAILS TO OPERATE WITH COOLANT LIGHT ON.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Personnel Required
Two

A

1. Remove cover and bulb from crew compartment warning light (para 8-21).
2. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
3. Place multimeter red lead in the center of light socket and place black lead on ground.
4. Check for voltage.

Is voltage present?

yes

Replace light bulb (para 8-21).

no

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W114 connector P2 from crew compartment MASTER warning light connector.
3. Place multimeter red lead on harness W114 connector P2 pin B and place black lead on ground.
4. Check for continuity.

Is continuity present?

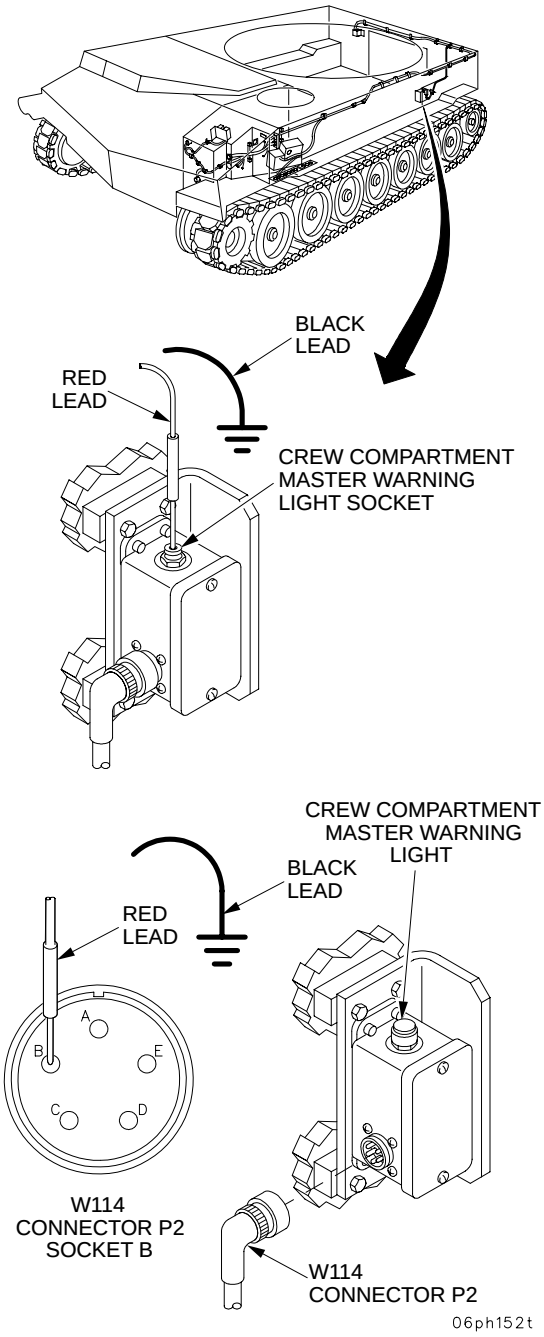
yes

Repair or replace harness W114 from instrument panel connector to crew compartment MASTER warning light connector (para 8-73).

no

Replace crew compartment MASTER warning light (para 8-21).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED

(6) MASTER WARNING LIGHTS FAIL TO OPERATE WHEN ENGINE IS OVERHEATED.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Probe kit (item 35, Appx F)

Equipment Conditions
Engine and transmission access doors open (TM 9-2350-314-10)

Personnel Required
Two

NOTE
Engine coolant temperature switch will close at 220° F to 230° F (104° C to 110° C) and will reopen when temperature goes below 220° F (104° C).

1. Disconnect harness W104 lead 509A from engine coolant temperature switch, harness W104 lead 509B from engine oil pressure switch, harness W104 lead 509C from transmission oil pressure switch, and harness W104 lead 509D from transmission oil temperature switch.
2. Place a jumper lead from harness W104 lead 509A socket to ground.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and observe MASTER warning light.

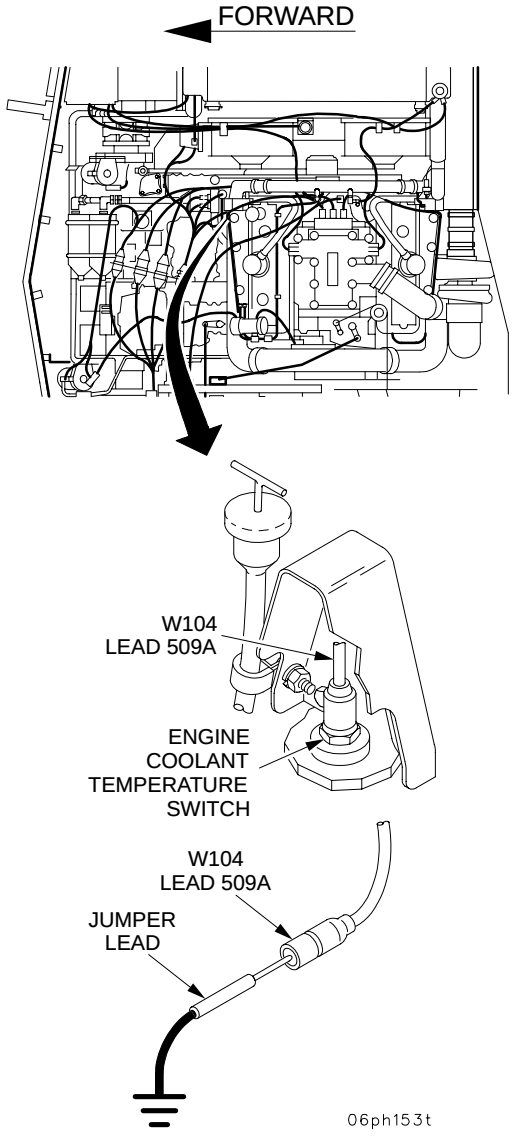
Does MASTER warning light operate?

yes

Repair or replace harness W104 from engine coolant temperature switch (para 8-63).

no

Replace engine coolant temperature switch (para 8-52).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(7) MASTER WARNING LIGHTS FAIL TO OPERATE WHEN TRANSMISSION OVERHEATS.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests.
16 AWG wire may be used as an extension.)

Equipment Conditions
Engine and transmission access doors
open (TM 9-2350-314-10)

Personnel Required
Two

NOTE
Transmission oil temperature switch will close at 300° F to 310° F (148° C to 154° C) and will re-open at 295° F (146° C).

1. Disconnect harness W104 lead 509A from engine coolant temperature switch, harness W104 lead 509B from engine oil pressure switch, harness W104 lead 509C from transmission oil pressure switch, and harness W104 lead 509D from transmission oil temperature switch.
2. Place a jumper lead from harness W104 lead 509D lead socket to ground.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and observe MASTER warning lights.

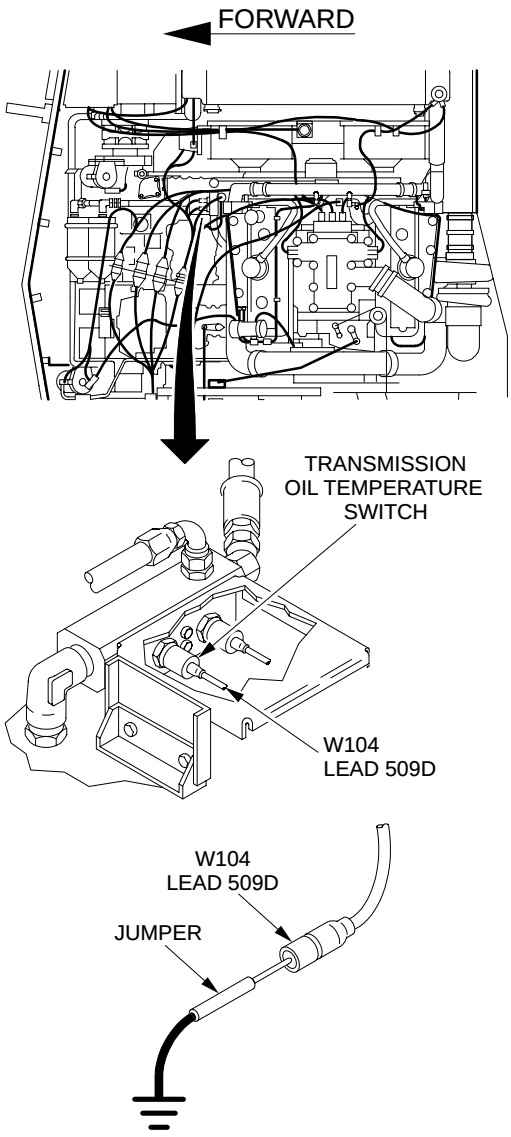
Do MASTER warning lights operate?

yes

Repair or replace harness W104 from transmission oil temperature switch (para 8-63).

no

Replace transmission oil high temperature switch (para 8-45).



END OF TASK

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3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(8) MASTER WARNING LIGHTS CONTINUE TO OPERATE WITH ENGINE OPERATING PROPERLY.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests. 16 AWG wire may be used as an extension.)

Equipment Conditions
Air intake grille open (TM 9-2350-314-10)
Transmission access doors open (TM 9-2350-314-10)
Fan protective screens installed (para 4-1c)

WARNING
Protective fan screens must be installed prior to doing maintenance in the engine compartment when the engine is running or engine is in ground hop mode. Contact with rotating fan can cause injury.

A
1. Start engine (TM 9-2350-314-10).
2. With engine running, disconnect harness W104 lead 509A at engine coolant temperature switch.

Do MASTER warning lights go out?

yes

Replace engine coolant temperature switch (para 8-52).

no

B
1. Reconnect harness W104 lead 509A to engine coolant temperature switch.
2. Shut off engine (TM 9-2350-314-10).
3. Disconnect harness W104 lead 509B from engine oil pressure switch.
4. Start engine (TM 9-2350-314-10).

Do MASTER warning lights go out?

yes

Replace engine oil pressure switch (para 8-47).

no

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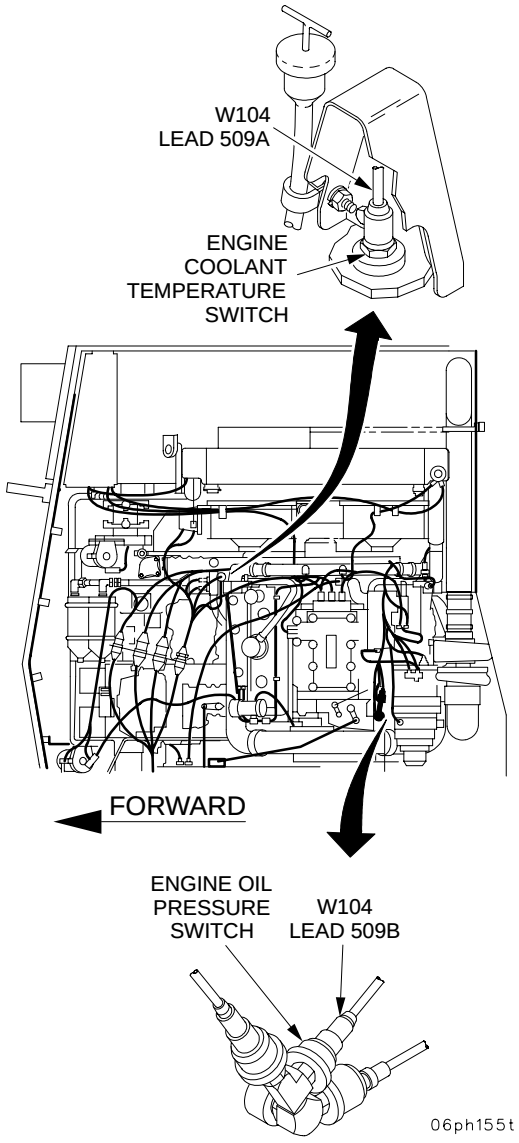


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(8) MASTER WARNING LIGHTS CONTINUE TO OPERATE WITH ENGINE OPERATING PROPERLY. - CONTINUED

CONTINUED FROM STEP B

C

1. Shut off engine (TM 9-2350-314-10).
2. Reconnect harness W104 lead 509B to engine oil pressure switch.
3. Start engine (TM 9-2350-314-10).
4. Disconnect harness W104 lead 509C from transmission oil pressure switch.

Do MASTER warning lights go out?

yes

Replace transmission oil low pressure switch (para 8-46).

no

D

1. Reconnect harness W104 lead 509C to transmission oil pressure switch.
2. Disconnect harness W104 lead 509D from transmission oil temperature switch.
3. Shut off engine (TM 9-2350-314-10).

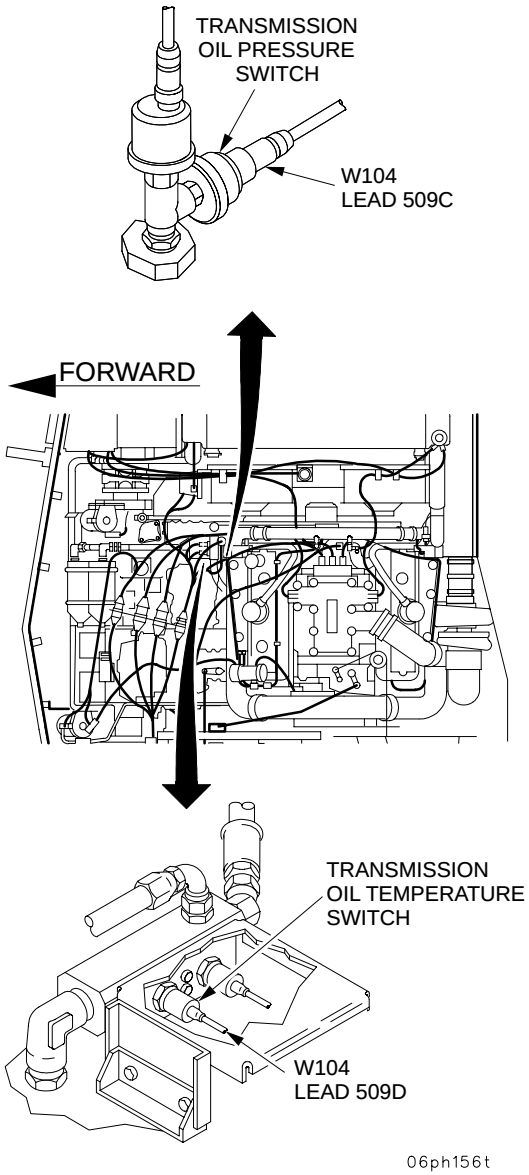
Do MASTER warning lights go out?

yes

Replace transmission oil high temperature switch (para 8-45).

no

Check circuit 509 for shorts to ground. Repair or replace as required.



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(9) ENGINE LOW LEVEL COOLANT WARNING LIGHT FAILS TO LIGHT WHEN ENGINE COOLANT LEVEL IS LOW. Operates press-to-test.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests.
16 AWG wire may be used as an extension)

Equipment Conditions
Air intake grille open
(TM 9-2350-314-10)

Equipment Conditions
Transmission access doors open
(TM 9-2350-314-10)
Portable instrument panel removed
(TM 9-2350-314-10)

Personnel
Two

A

1. Make sure engine is not running and vehicle MASTER switch is in the OFF position (TM 9-2350-314-10).
2. Disconnect harness W104 lead 352B from the engine aeration detector.
3. Place a jumper lead from harness W104 lead 352B to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and observe engine low level coolant warning light.

Does light come on?

yes

Replace low level coolant detector (para 7-10).

no

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove jumper from harness W104 lead 352B.
3. Disconnect harness W105 connector P1 from harness W104 connector J1.
4. Check harness W104 lead 352B for continuity by placing one multimeter lead in harness W104 lead 352B connector and other lead in harness W104 connector J1 pin A.

Is continuity present?

yes

Repair or replace harness W104 from aeration detector to engine disconnect (para 8-63).

no

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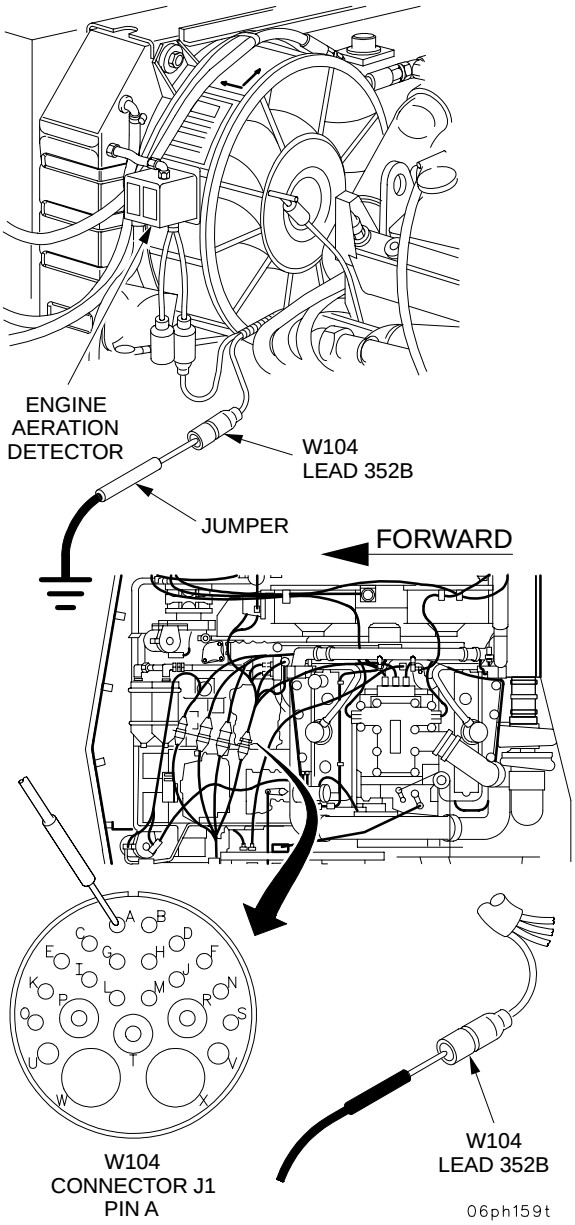

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(9) ENGINE LOW LEVEL COOLANT WARNING LIGHT FAILS TO LIGHT WHEN ENGINE COOLANT LEVEL IS LOW. Operates press-to-test. - CONTINUED

CONTINUED FROM STEP B

C

1. Reconnect lead 352B to aeration detector lead connector.
2. Disconnect harness W114 connector P1 from harness W105 connector J1.
3. Check lead 352B for continuity by placing one multimeter lead in harness W105 connector P1 socket A and other lead in harness W105 connector J1 socket A.

Is continuity present?

yes

no

Repair or replace harness W105 from engine connector to bulkhead connector (para 8-64).

D

1. Reconnect harness W105 connector P1 to harness W104 connector J1.
2. Disconnect harness W112 connector P1 from harness W114 connector J1.
3. Check lead 352B for continuity by placing one multimeter lead on harness W114 connector P1 pin A and other lead in harness W114 connector J1 socket B.

Is continuity present?

yes

no

Repair or replace harness W114 from bulkhead connector to portable instrument panel connector (para 8-73).

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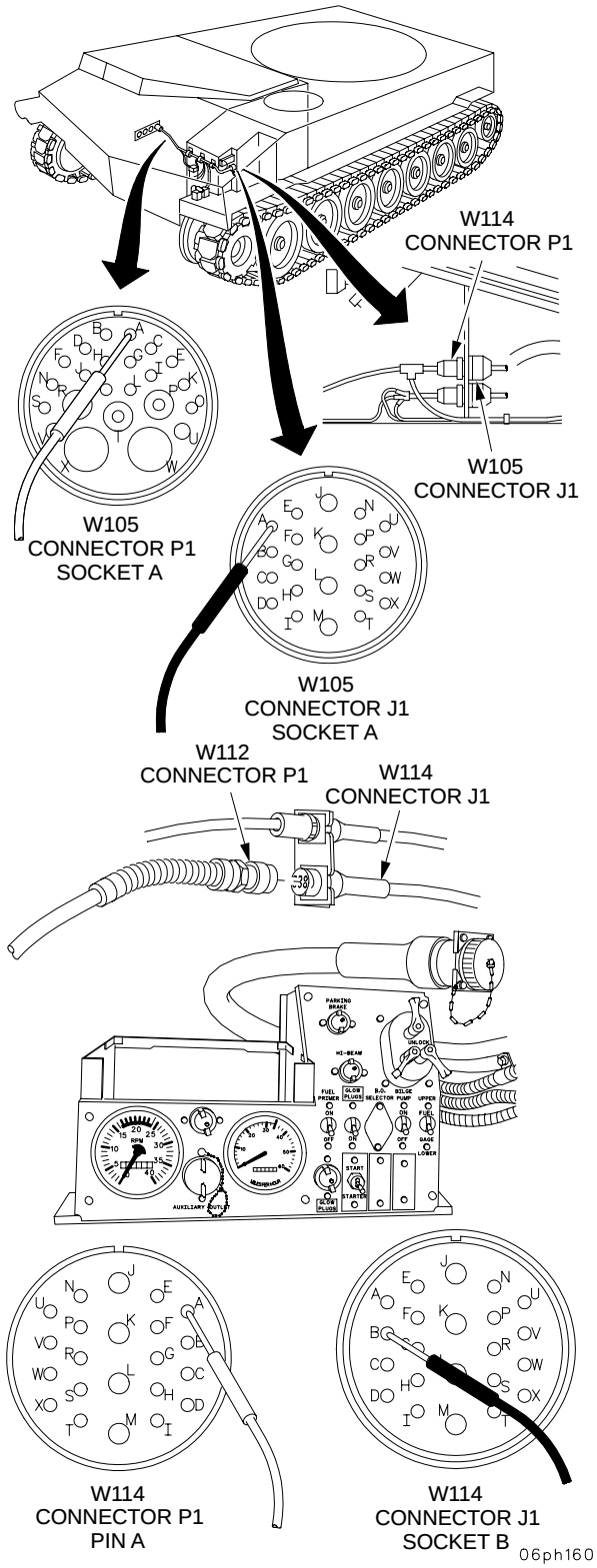


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(9) ENGINE LOW LEVEL COOLANT WARNING LIGHT FAILS TO LIGHT WHEN ENGINE COOLANT LEVEL IS LOW. Operates press-to-test. - CONTINUED

CONTINUED FROM STEP D

E

1. Reconnect harness W114 connector P1 to harness W105 connector J1.
2. Remove portable instrument panel front cover for access to harness W112 lead 352B.
3. Disconnect harness W112 lead 352B from low level coolant warning light lead connector.
4. Check lead 352B for continuity by placing one multimeter lead on harness W112 connector P1 pin B and other lead in harness W112 lead 352B connector socket.

Is continuity present?

yes

no

Repair or replace harness W112 from instrument panel connector to low level coolant warning light connector (para 8-71).

F

1. Reconnect harness W112 connector P1 to harness W114 connector J1.
2. Place a jumper lead from low level coolant warning light lead 352B connector pin to ground.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and observe low level coolant warning light.

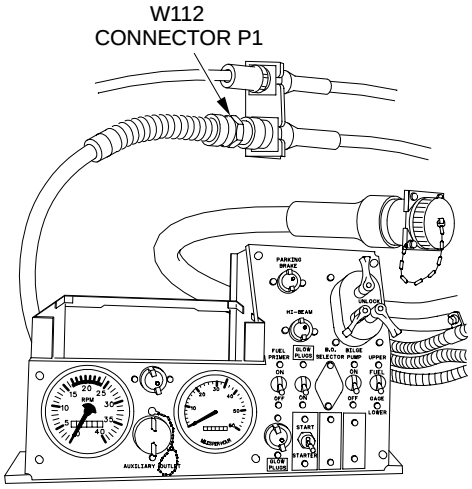
Does low level coolant warning light come on?

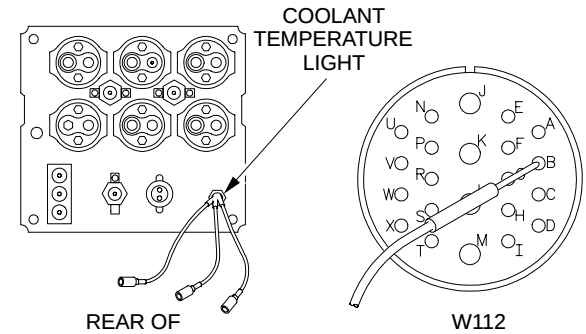
yes

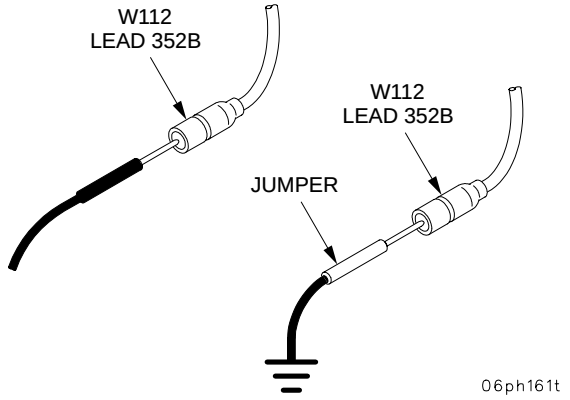
no

Replace engine low level coolant warning light (para 8-14).

No fault is present. recheck fault symptom.







END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(10) ENGINE LOW LEVEL COOLANT LIGHT FAILS TO LIGHT WHEN PRESSED TO TEST. All other lights operate.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests.
16 AWG wire may be used as an extension.)

Equipment Conditions
Air intake grille open
(TM 9-2350-314-10)
Transmission access doors open
(TM 9-2350-314-10)
Portable instrument panel removed
(para 8-14)

Personnel Required
Two

A

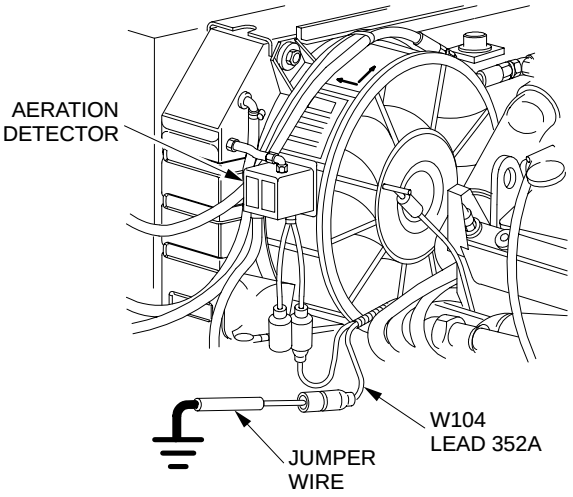
1. Make sure engine is not running and vehicle MASTER switch is in OFF position (TM 9-2350-314-10).
2. Disconnect W104 lead 352A from aeration lead 352A connector.
3. Place a jumper lead from W104 lead 352A connector socket to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and press low level coolant light to test.

Does engine low level coolant light come on?

yes

Replace low level coolant detector (para 7-10).

no



B

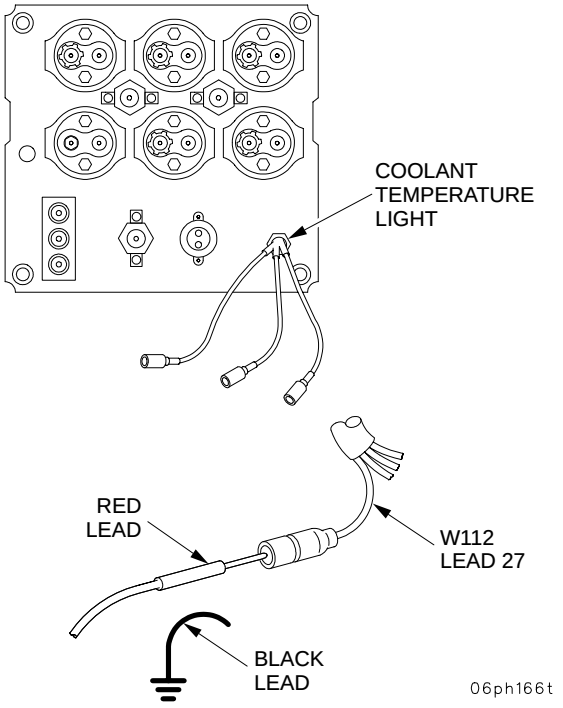
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove portable instrument panel front cover for access to harness W112 lead 27.
3. Disconnect harness W112 lead 27 from low level coolant light lead connector.
4. Place multimeter red lead in harness W112 lead 27 connector socket and black lead on ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Repair or replace harness W112 from instrument panel connector to coolant light lead connector (para 8-71).

no



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3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(10) ENGINE LOW LEVEL COOLANT LIGHT FAILS TO LIGHT WHEN PRESSED TO TEST. All other lights operate. - CONTINUED

CONTINUED FROM STEP B

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W112 lead 27 to coolant light lead connector.
3. Remove coolant light cover and bulb (para 8-14).
4. Place multimeter red lead on light socket center contact and black lead on ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Replace coolant light bulb (para 8-14). Turn vehicle MASTER switch ON and press-to-test light. If light illuminates, remove jumper lead and reconnect lead 352A at low level coolant detector lead connector.

no

Replace coolant light assembly (para 8-14).

D

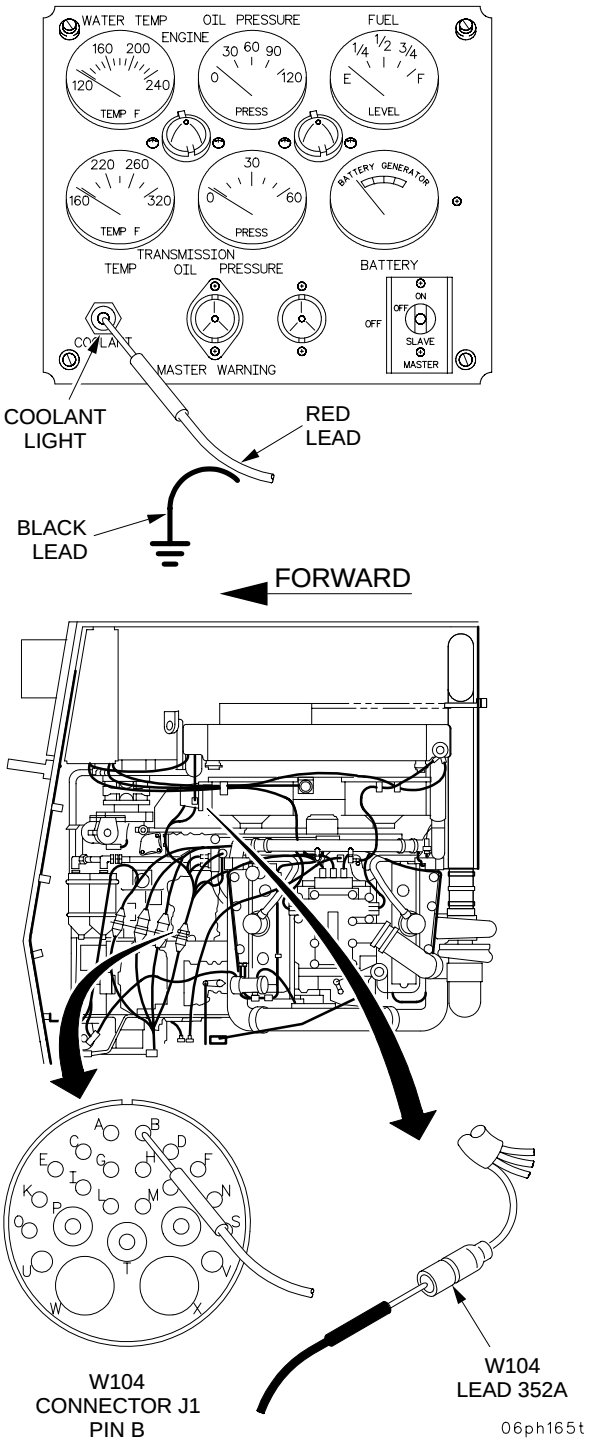
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W105 connector P1 from harness W104 connector P1.
3. Remove jumper lead.
4. Check lead 352A for continuity by placing one multimeter lead in W104 lead 352A connector socket and other lead on harness W104 connector J1 pin B.

Is continuity present?

yes

Repair or replace harness W104 from low level coolant detector to engine connector (para 8-63).

no



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3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(10) ENGINE LOW LEVEL COOLANT LIGHT FAILS TO LIGHT WHEN PRESSED TO TEST. All other lights operate. - CONTINUED

CONTINUED FROM STEP D

E

1. Reconnect lead 352A to low level coolant detector lead connector.
2. Disconnect harness W114 connector P1 from harness W105 connector J1.
3. Check lead 352A for continuity by placing one multimeter lead in harness W105 connector P1 socket B and other lead in harness W105 connector J1 socket B.

Is continuity present?

yes

no

Repair or replace harness W105 from engine connector to bulkhead connector (para 8-64).

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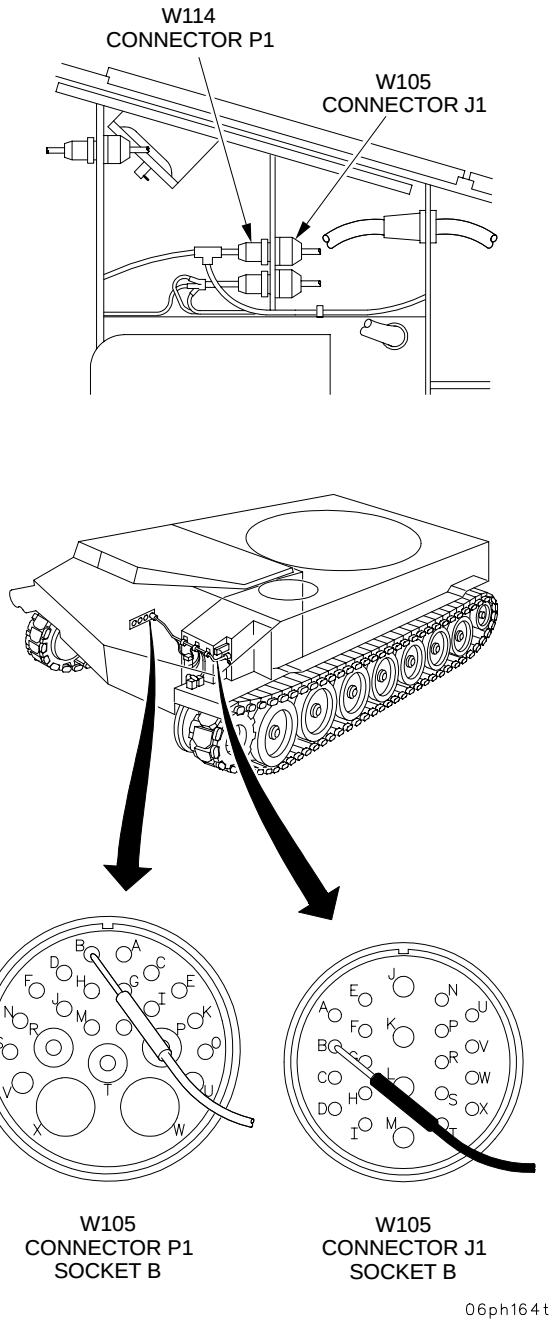

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(10) ENGINE LOW LEVEL COOLANT LIGHT FAILS TO LIGHT WHEN PRESSED TO TEST. All other lights operate. - CONTINUED

CONTINUED FROM STEP E

F

1. Reconnect harness W105 connector P1 to harness W104 connector J1.
2. Disconnect harness W112 connector P1 from harness W114 connector J1.
3. Check lead 352A for continuity by placing one multimeter lead on harness W114 connector P1 pin B and other lead in harness W114 connector J1 socket C.

Is continuity present?

yes

no

Repair or replace harness 114 from bulkhead connector to instrument panel connector (para 8-73).

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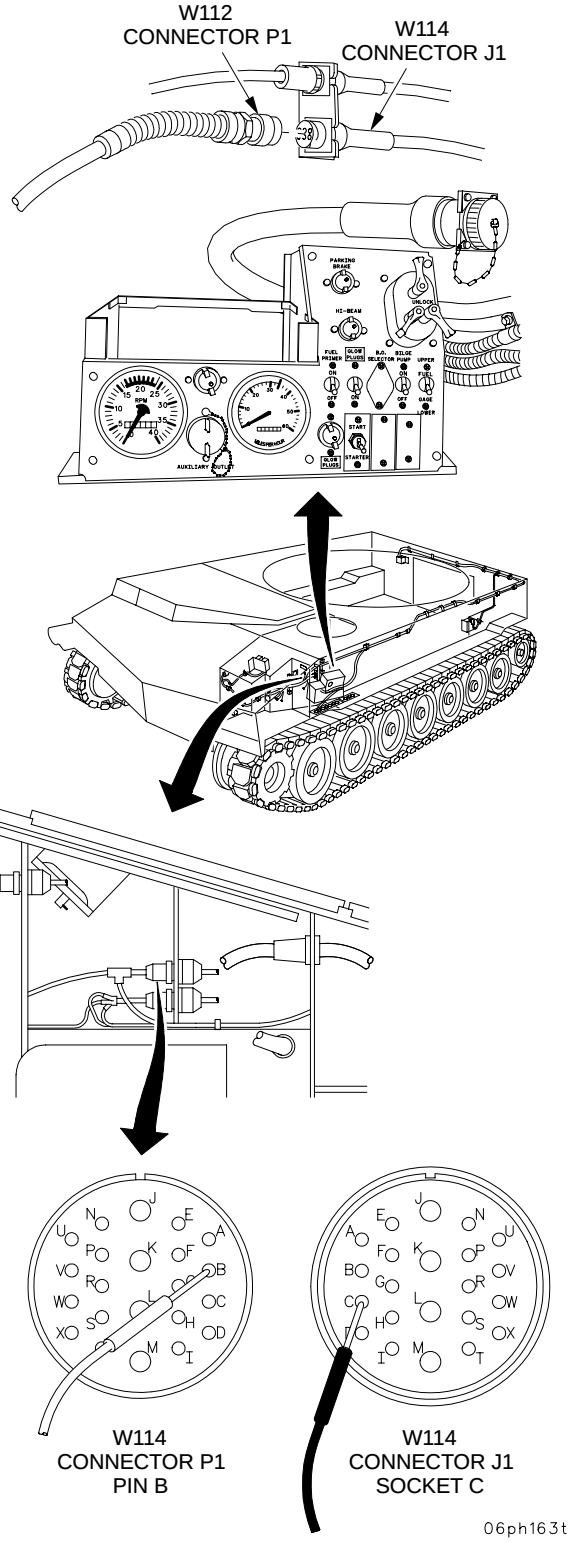


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(10) ENGINE LOW LEVEL COOLANT LIGHT FAILS TO LIGHT WHEN PRESSED TO TEST. All other lights operate. - CONTINUED

CONTINUED FROM STEP F

G

1. Reconnect harness W114 connector P1 to harness W105 connector J1.
2. Disconnect harness W112 lead 352A from coolant light lead 352A connector.
3. Check lead 352A for continuity by placing one multimeter lead on harness W112 connector P1 pin C and other lead in harness W112 lead 352A socket.

Is continuity present?

yes

no

Repair or replace harness W112 from instrument panel connector to coolant light connector (para 8-71).

H

1. Reconnect harness W112 connector P1 to harness W114 connector J1.
2. Place a jumper lead from coolant light lead 352A connector pin to ground.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and press light to test.

Does coolant light come on?

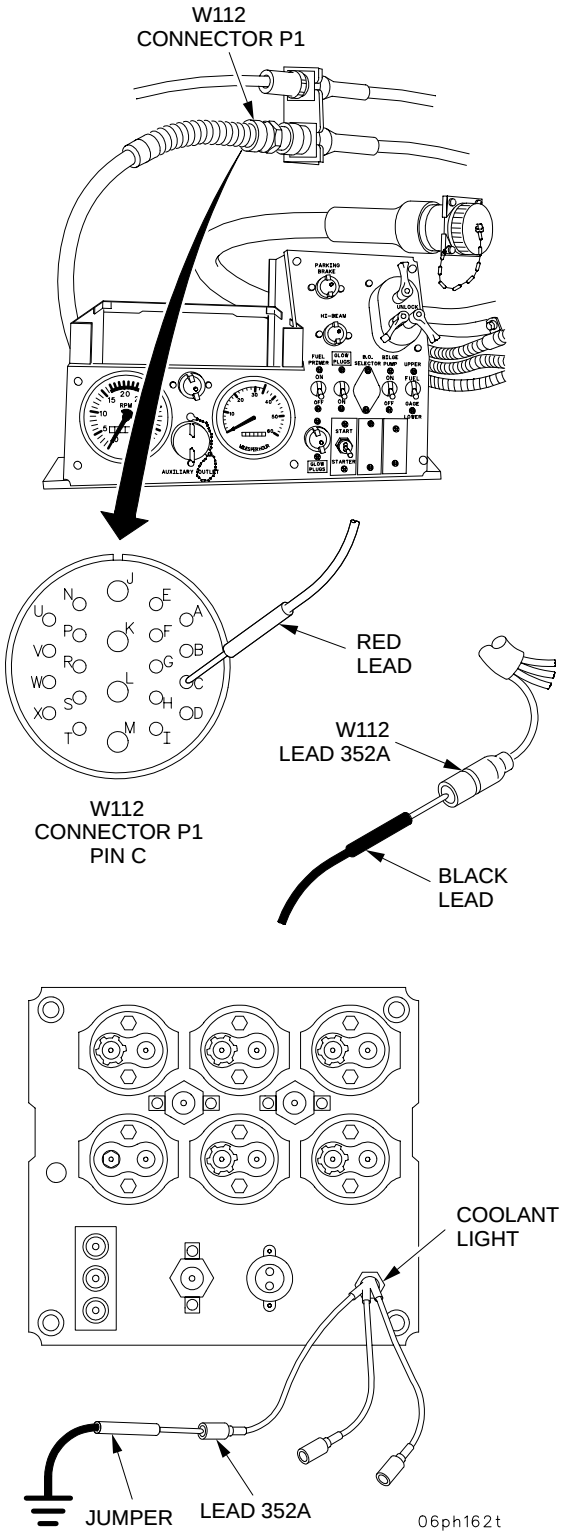
yes

no

Replace coolant light assembly (para 8-14).

No fault present.

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(11) GLOW PLUG WAIT LIGHT DOES NOT ILLUMINATE. Engine starts and all other electrical accessories operate properly.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Air intake grille open (TM 9-2350-314-10)
Transmission access doors open (TM 9-2350-314-10)

A

1. Remove LED from glow plug WAIT light on instrument panel (TM 9-2350-314-10).
2. Place red multimeter lead in glow plug WAIT light socket and black lead to ground.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
4. Turn GLOW PLUG ENABLE switch ON (TM 9-2350-314-10).
5. Check for voltage.

Is voltage present?

yes / no

Replace LED (TM 9-2350-314-10).

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Place LED back in glow plug WAIT light (TM 9-2350-314-10).
3. Remove driver's instrument panel (para 8-12).
4. Disconnect lead 486 from back of glow plug WAIT light.
5. Place red multimeter lead in lead 486 socket and black lead to ground.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
7. Turn GLOW PLUG ENABLE switch ON (TM 9-2350-314-10).
8. Check for voltage.

Is voltage present?

yes / no

Replace glow plug WAIT light fixture (para 8-12).

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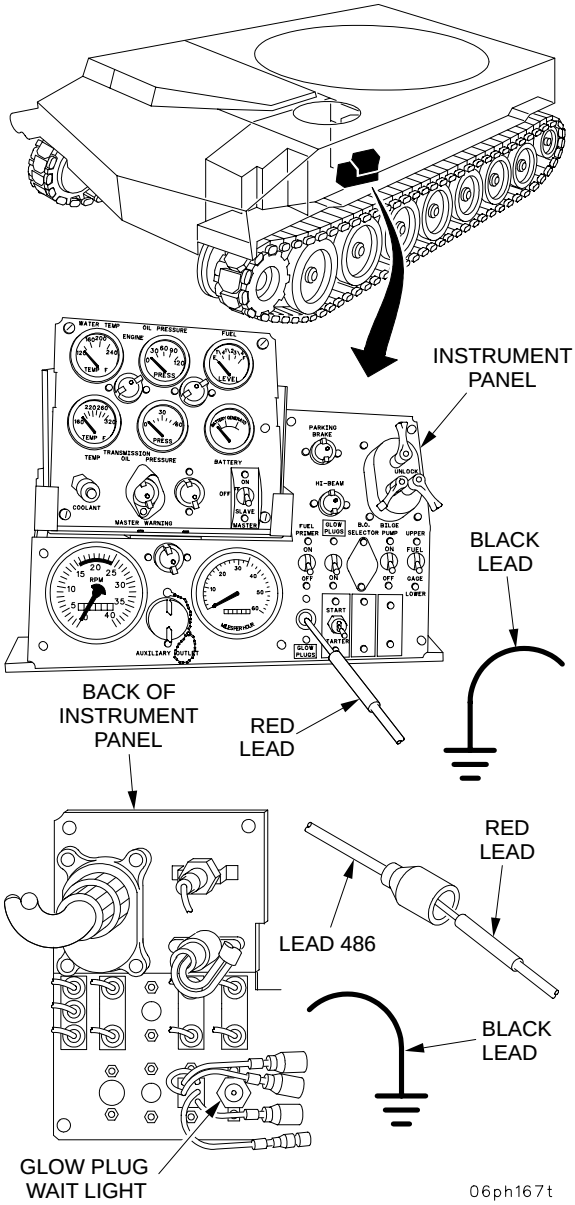

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(11) GLOW PLUG WAIT LIGHT DOES NOT ILLUMINATE. Engine starts and all other electrical accessories operate properly. - CONTINUED

CONTINUED FROM STEP B

C

1. Turn GLOW PLUG ENABLE switch OFF (TM 9-2350-314-10).
2. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
3. Disconnect harness W114 connector P1 from driver's bulkhead connector.
4. Place one multimeter lead on pin R of harness W114 connector P1 and other lead on socket lead 486 at WAIT light.
5. Check for continuity.
6. Place one multimeter lead on pin C of harness W114 connector P1 and other lead on socket lead 486A at GLOW PLUG ENABLE switch.
7. Check for continuity.

Is continuity present at both leads?

yes / no

Replace wiring harness W114 (para 8-73).

D

1. Disconnect harness W105 connector P1 from engine disconnect bracket.
2. Place one multimeter lead in socket O of harness W105 connector P1 and other lead in socket R of harness W105 connector J1 at driver's bulkhead.
3. Check for continuity.
4. Place one multimeter lead in socket C of harness W105 connector P1 and other lead in socket C of harness W105 connector J1 at driver's bulkhead.
5. Check for continuity.

Is continuity present at both points?

yes / no

Replace wiring harness W105 (para 8-64).

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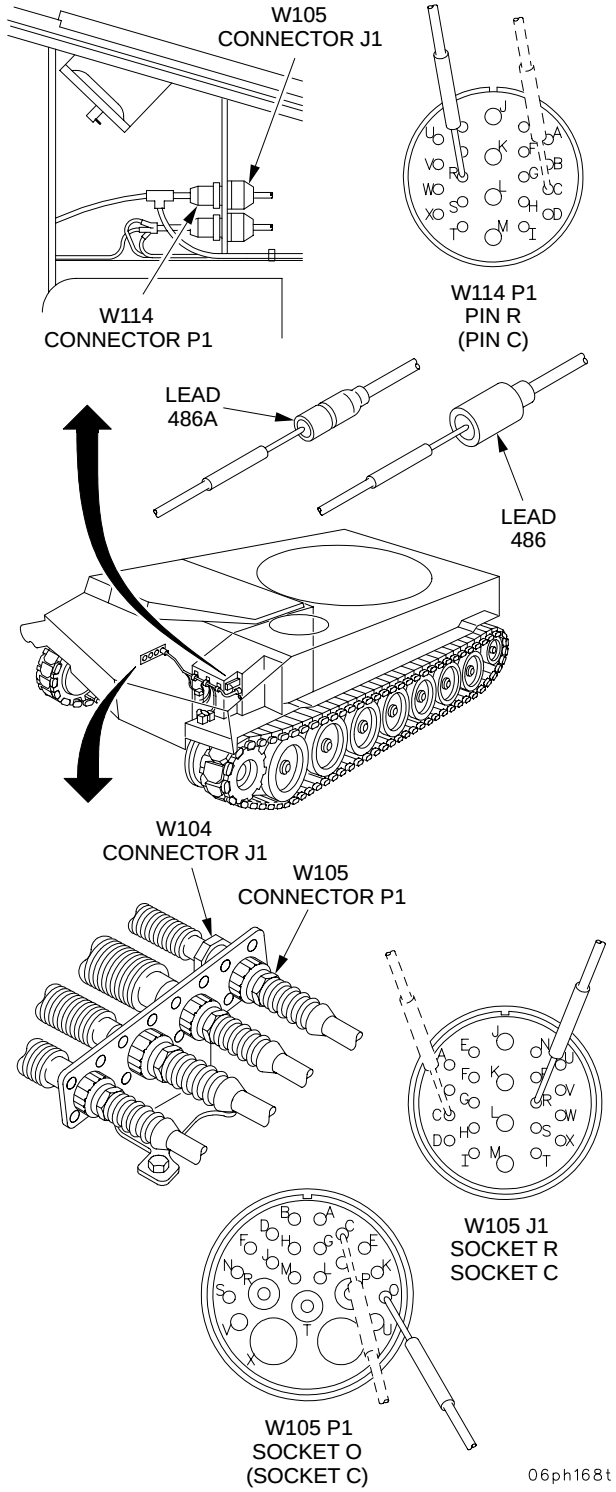


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(11) GLOW PLUG WAIT LIGHT DOES NOT ILLUMINATE. Engine starts and all other electrical accessories operate properly. - CONTINUED

CONTINUED FROM STEP D

E

1. Disconnect harness W104 connector P2 from glow plug controller.
2. Place one multimeter lead in sockets A and C (one at a time) of harness W104 connector P2 and other lead on pin O of harness W104 connector J1 at engine disconnect bracket.
3. Check for continuity.
4. Place one multimeter lead in socket B of harness W104 connector P2 and other lead on pin C of harness W104 connector J1 at engine disconnect bracket.
5. Check for continuity.

Is continuity present at all three points?

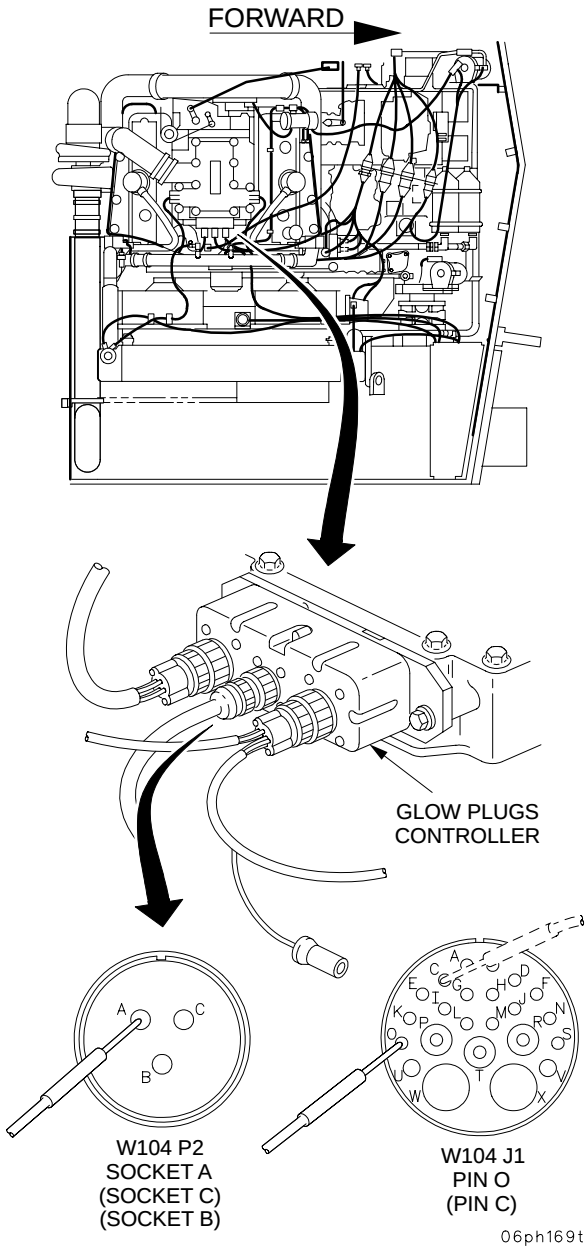
yes

Notify direct support maintenance.

no

Repair or replace wiring harness W104 (para 8-63).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(12) MASTER SWITCH INDICATOR LIGHT FAILS TO OPERATE. Vehicle MASTER switch ON.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect any disconnected leads.
3. Remove vehicle MASTER switch indicator LED (para 8-14).
4. Place multimeter red lead on light socket center contact and ground black lead.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Replace MASTER switch indicator LED (para 8-14).

no

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove portable instrument panel front cover (para 8-14).
3. Disconnect harness W112 lead 459L from vehicle MASTER switch warning lamp assembly.
4. Place multimeter red lead on harness W112 lead 459L and place black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Replace lamp assembly (para 8-14).

no

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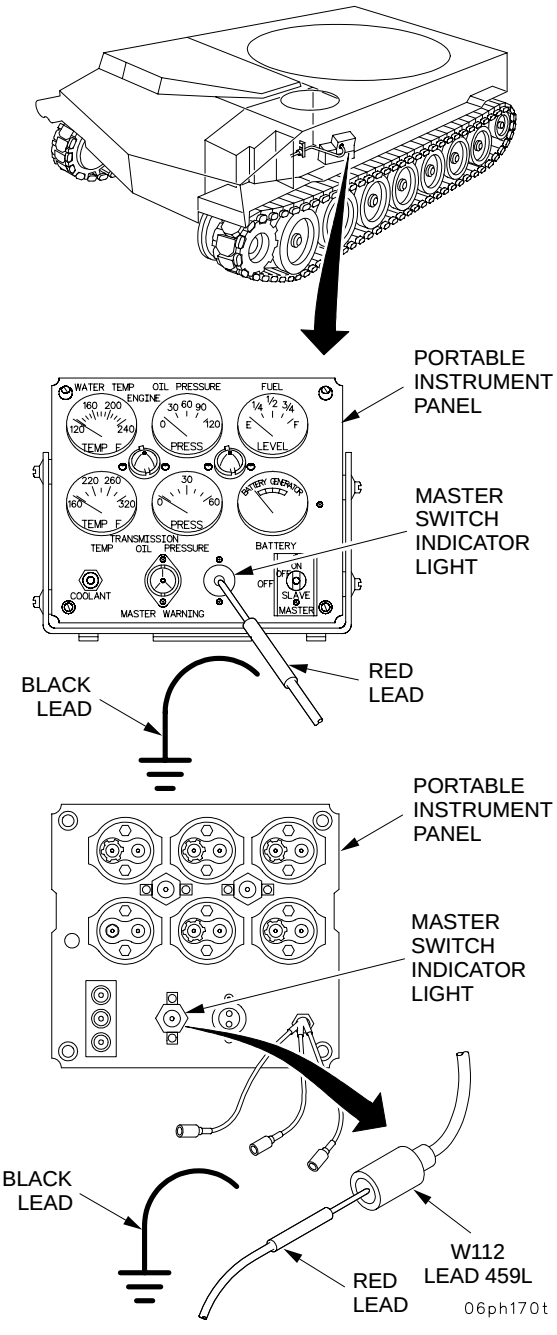


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(12) MASTER SWITCH INDICATOR LIGHT FAILS TO OPERATE. Vehicle MASTER switch ON. - CONTINUED

CONTINUED FROM STEP B

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W112 lead 459L to lamp assembly.
3. Install portable instrument panel cover (para 8-14).
4. Disconnect harness W112 connector P1 from harness W114 connector P2.
5. Place one lead of multimeter on harness W112 connector P1 pin W and place the other lead on harness W112 connector P1 pin L.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for continuity.

Is continuity present?

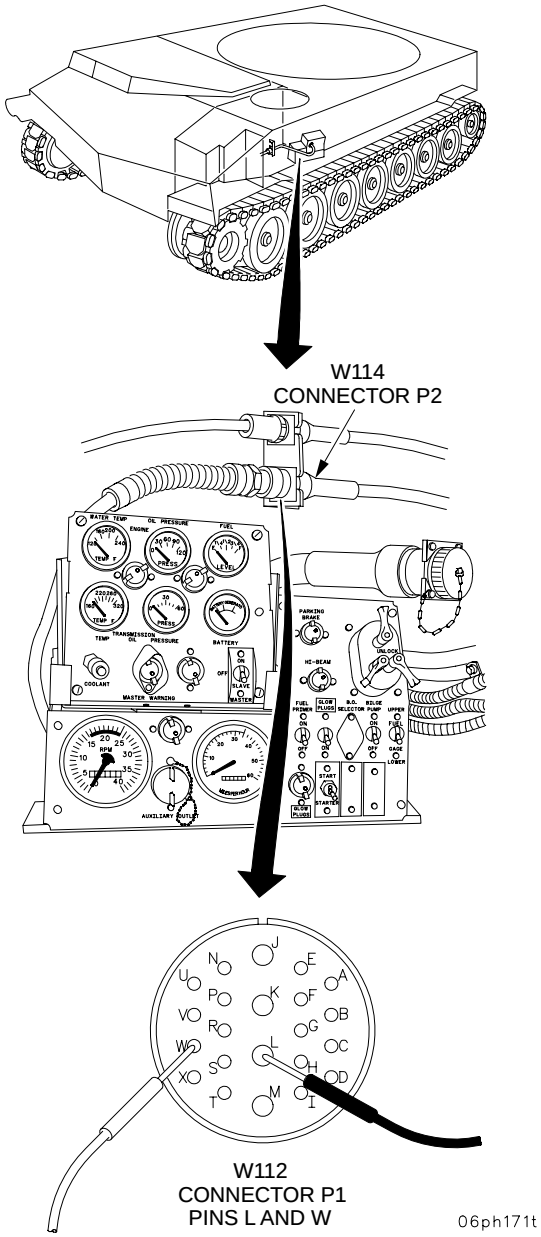
yes

Fault does not exist as indicated.

no

Repair or replace harness W112 from portable instrument panel to disconnect bracket (para 8-71).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(13) HIGH BEAM INDICATOR LIGHT FAILS TO OPERATE.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

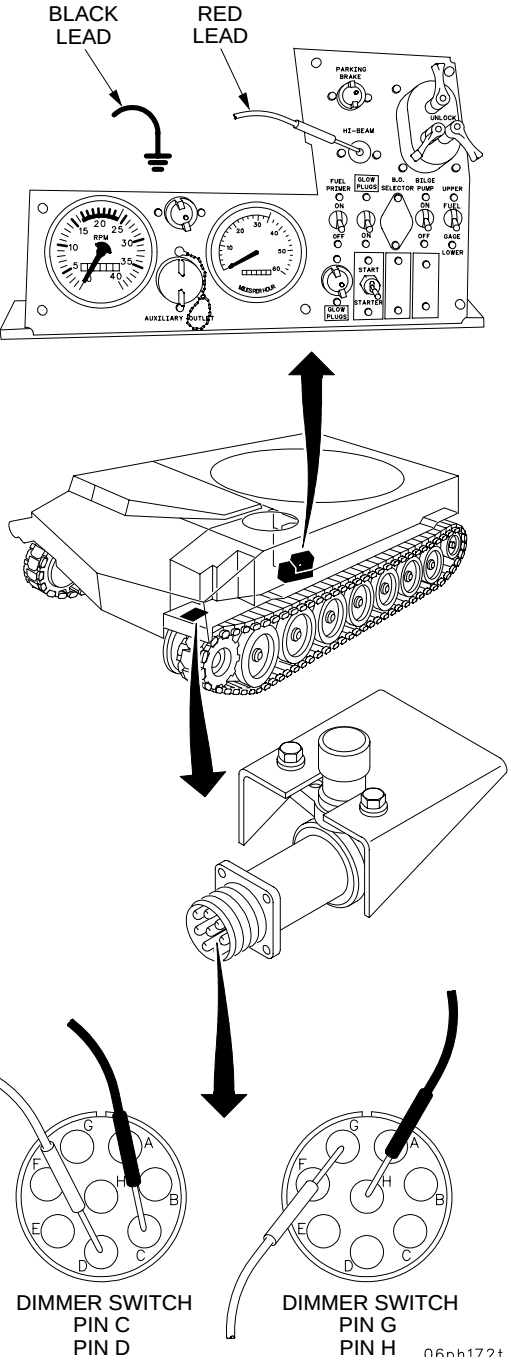
A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove high beam indicator light cover and LED (para 8-12).
3. Ensure that light switch is set to service drive and headlights are on high beam.
4. Place multimeter red lead in high beam indicator light socket and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

yes → Replace high beam indicator light LED (para 8-12).

no



B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 connector P4 from dimmer switch.
3. Remove dimmer switch for access to pins (para 8-27).
4. Place one multimeter lead on dimmer switch pin C and other lead on headlight dimmer switch pin D. Check for continuity.
5. Place one multimeter lead on headlight dimmer switch pin G and other lead on dimmer switch pin H. Check for continuity.

NOTE: If reading is not obtained, depress and release dimmer switch button.

Is continuity indicated?

yes → Replace headlight dimmer switch (para 8-27).

no

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3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(13) HIGH BEAM INDICATOR LIGHT FAILS TO OPERATE. - CONTINUED

CONTINUED FROM STEP B

NOTE

There are two leads 519 connected to the high beam indicator light. One lead is for service drive high beam and the other is for I.R. high beam.

C

1. Disconnect harness W115 leads 519 from high beam indicator light.
2. Place one multimeter lead in harness W115 connector P4 socket D and other lead in harness W115 lead 519 socket. Check for continuity.
3. Place one multimeter lead in harness W115 connector P4 socket H and other lead in harness W115 lead 519 socket. Check for continuity.

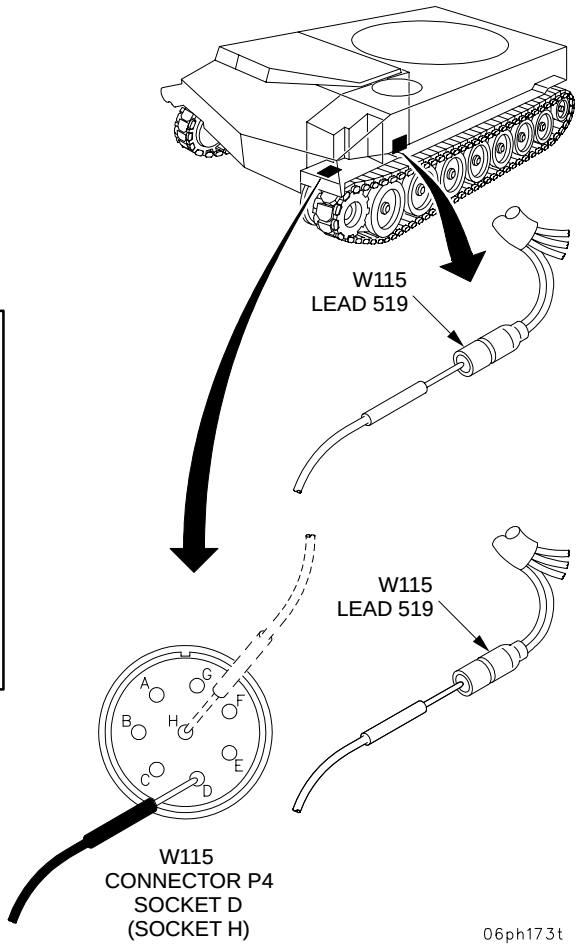
Is continuity indicated?

yes

Replace high beam indicator light assembly (para 8-12).

no

Repair or replace harness W115 (para 8-74).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(14) PARKING BRAKE INDICATOR LIGHT FAILS TO OPERATE. Parking brake set.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Driver's instrument panel cover removed (para 8-14)

Personnel Required
Two

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove parking brake light bulb
3. Place multimeter red lead on light socket center contact and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Replace parking brake light bulb (para 8-12).

no

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W114 lead 509E from parking brake light.
3. Place multimeter red lead on harness W114 lead 509E connector pin and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Repair or replace parking brake light assembly (para 8-12).

no

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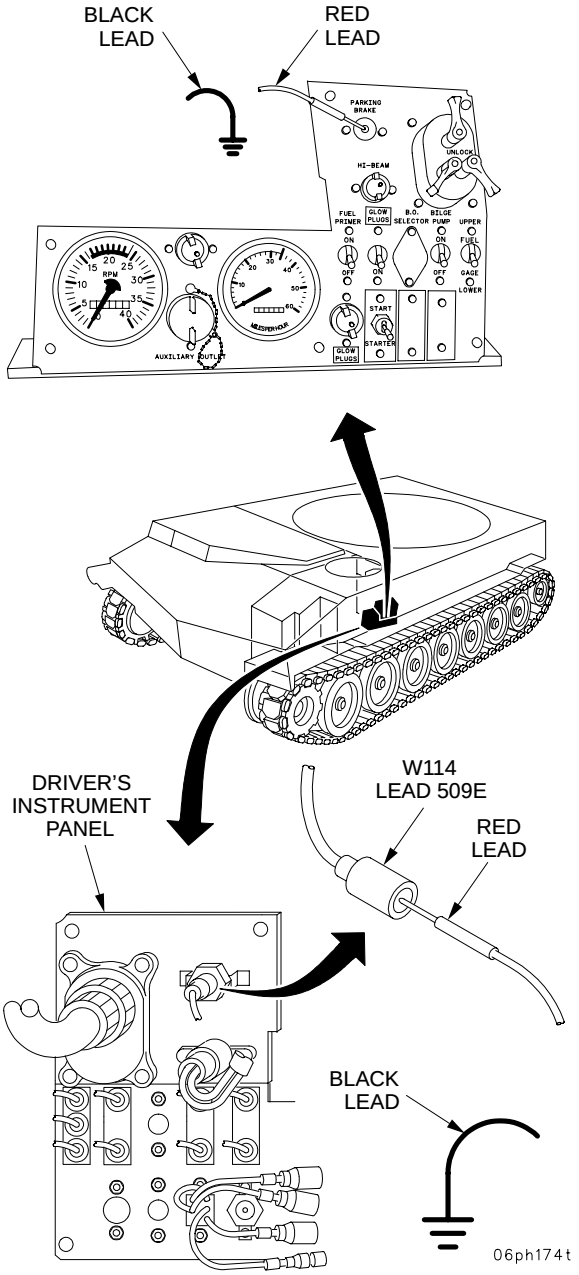


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(14) PARKING BRAKE INDICATOR LIGHT FAILS TO OPERATE. Parking brake set. - CONTINUED

CONTINUED FROM STEP B

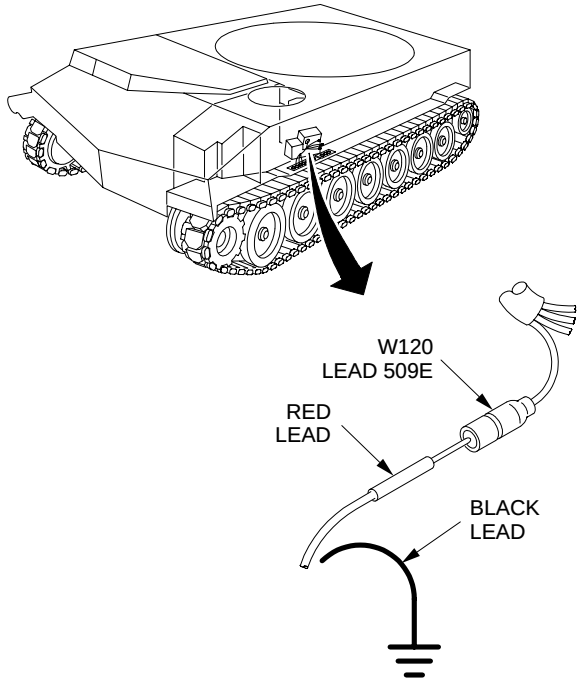
C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove driver's instrument panel from mounting for access to wiring (para 8-14).
3. Disconnect harness W114 lead 509E from harness W120 lead 509E.
4. Place multimeter red lead in harness W120 lead 509E connector socket and black lead on ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes / no

Repair or replace harness W120 (para 8-79).



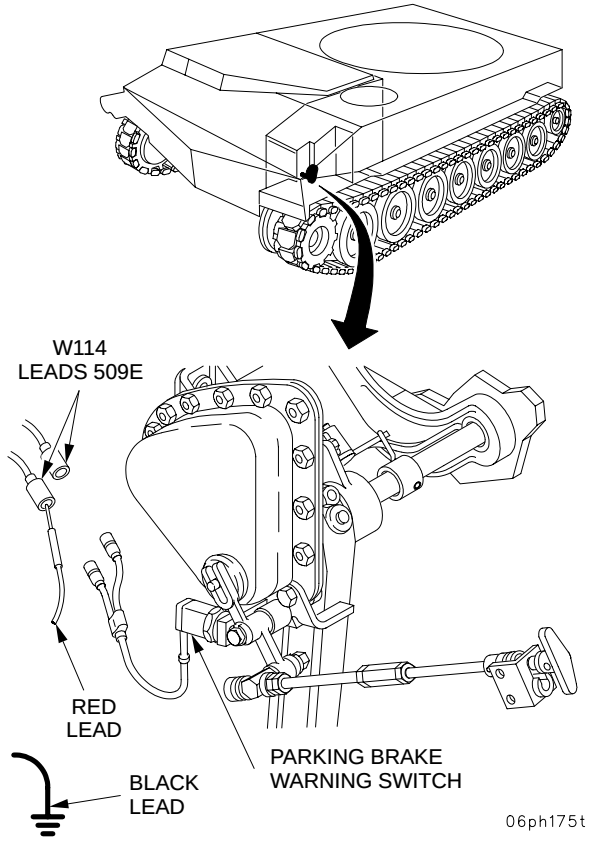
D

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W114 lead 509E to harness W120 lead 509E.
3. Disconnect harness W114 leads 509E from parking brake warning switch.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
5. Place multimeter black lead to ground and red lead in harness W114 leads 509E connector pins (one at a time). Check for voltage.

Is voltage present on one of the 509E leads?

yes / no

Repair or replace harness W114 (para 8-73).



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3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(14) PARKING BRAKE INDICATOR LIGHT FAILS TO OPERATE. Parking brake set. - CONTINUED

CONTINUED FROM STEP D

E

1. Ensure parking brake is still set (TM 9-2350-314-10).
2. Check continuity of parking brake warning switch by placing one multimeter lead in one parking brake warning switch connector and other lead in parking brake warning switch connector socket.

Is continuity present?

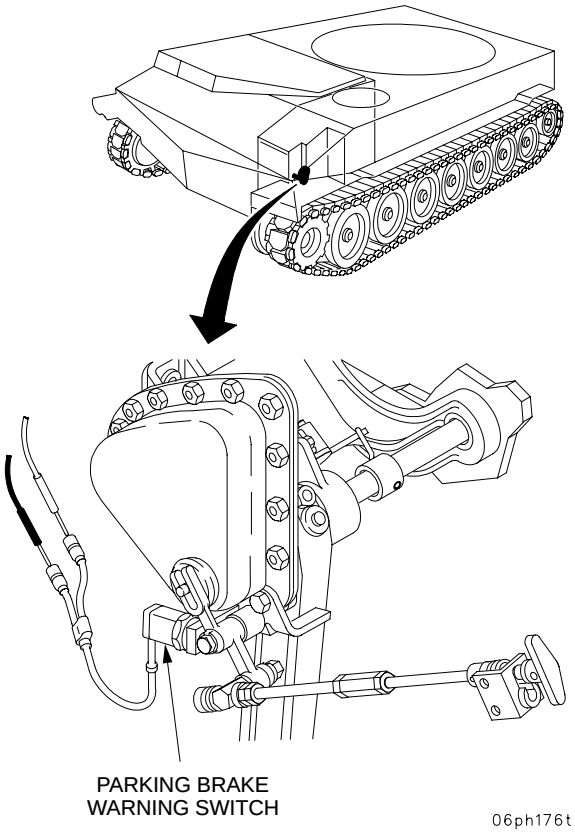
yes

Adjust parking brake warning switch (para 11-3).

no

Replace parking brake warning switch (para 11-3).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(15) PERSONNEL HEATER INDICATOR LED FAILS TO OPERATE PRESS-TO-TEST OR HEATER OPERATING.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

A

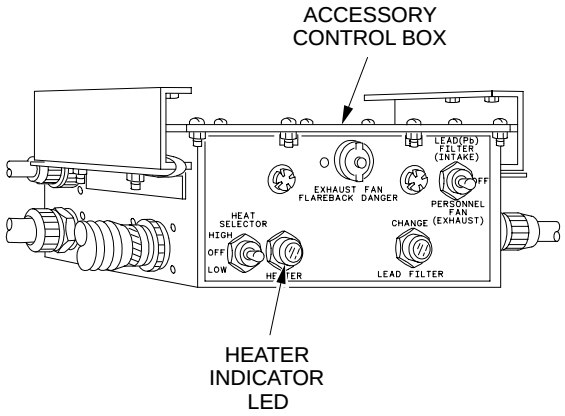
1. Remove press-to-test heater indicator LED on accessory control box (TM 9-2350-314-10).
2. Place multimeter red lead on light socket center contact and black lead on ground.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
4. Check for voltage.

Is voltage present?

yes

no

Notify direct support maintenance.



Note: For vehicles with Accessory Control Box P/N 12268582

B

Replace indicator LED and press-to-test heater indicator light on accessory control box (TM 9-2350-314-10).

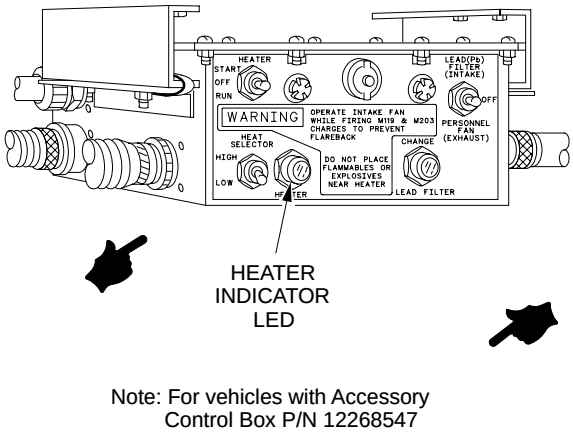
Does indicator LED come on?

yes

no

Fault corrected.

Replace indicator LED in press-to-test indicator (TM 9-2350-314-10).



Note: For vehicles with Accessory Control Box P/N 12268547

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END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(16) SERVICE DRIVE LIGHTS FAIL TO OPERATE.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests.
16 AWG wire may be used as an extension.)

Equipment Conditions
Driver's instrument panel removed
(para 8-12)

Personnel Required
Two

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 lead 15 from harness W124 lead 10.
3. Place multimeter red lead in harness W124 lead 10 connector socket and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

no

Repair or replace harness W124 (para 8-82).

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W115 lead 15 to harness W124 lead 10.
3. Disconnect harness W115 connector P3 from light switch connector.
4. Place multimeter red lead in harness W115 connector P3 socket F and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

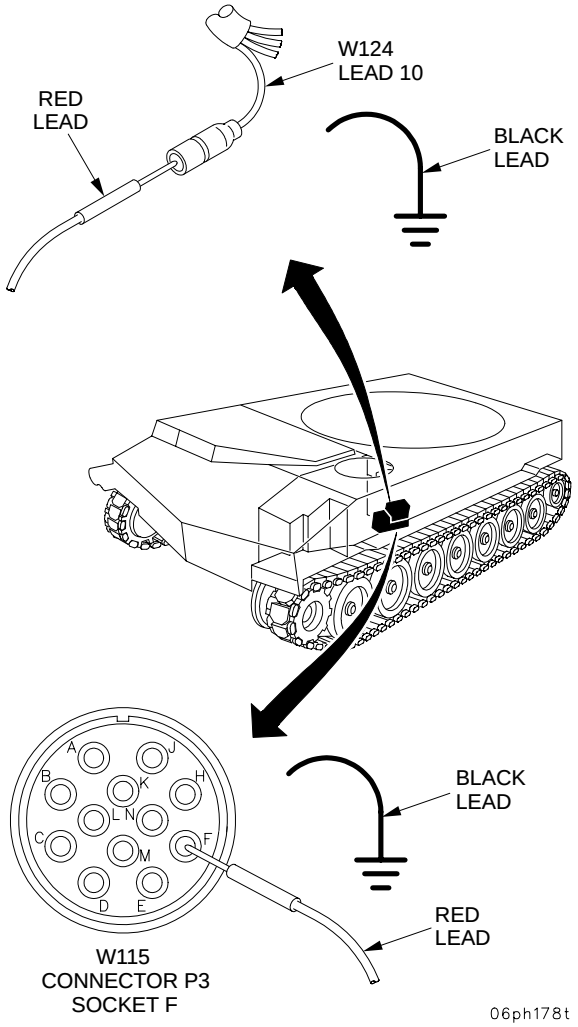
yes

no

Repair or replace harness W115 (para 8-74).

Replace light switch (para 8-12).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(17) HEADLIGHTS FAIL TO OPERATE. All other lights operate.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests.
16 AWG wire may be used as an extension.)

Equipment Conditions
Driver's instrument panel removed
(para 8-12)

Personnel Required
Two

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 connector P3 from light switch.
3. Turn light switch to service drive (TM 9-2350-314-10).
4. Place one multimeter lead on light switch pin F and other lead on light switch pin M. Check for continuity.

Is continuity present?

yes → Replace light switch (para 8-12).

no

B

1. Reconnect harness W115 connector P3 to light switch.
2. Disconnect harness W115 connector P4 from dimmer switch.
3. Ensure light switch is turned to service drive (TM 9-2350-314-10).
4. Place multimeter red lead in harness W115 connector P4 socket G and black lead on ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes → Repair or replace harness W115 (para 8-74).

no

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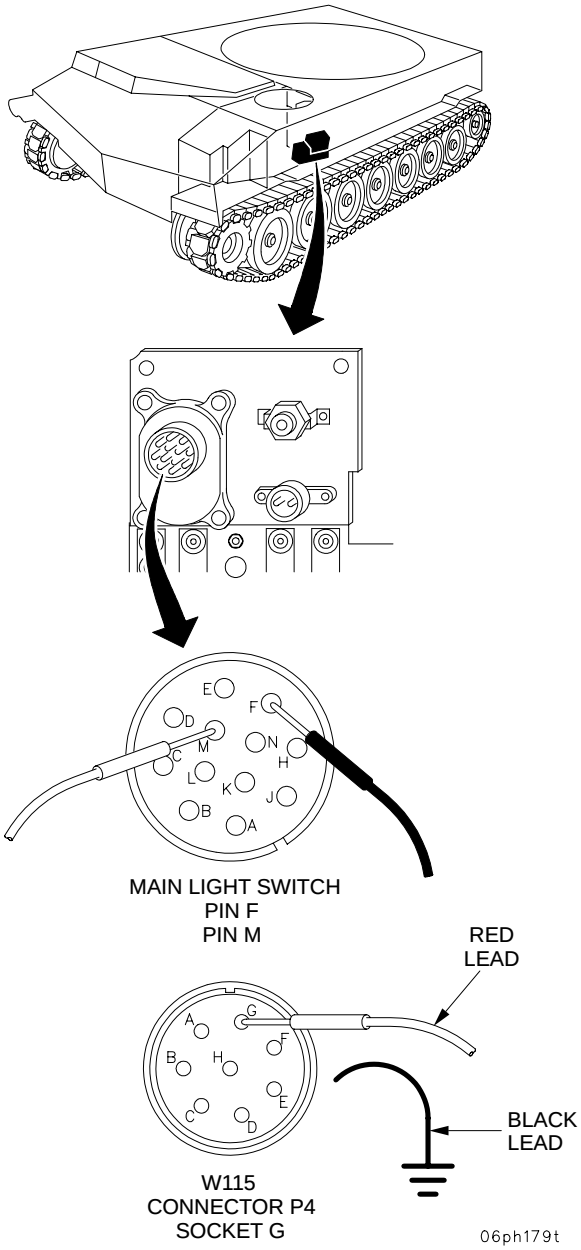


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(17) HEADLIGHTS FAIL TO OPERATE. All other lights operate. - CONTINUED

CONTINUED FROM STEP B

C

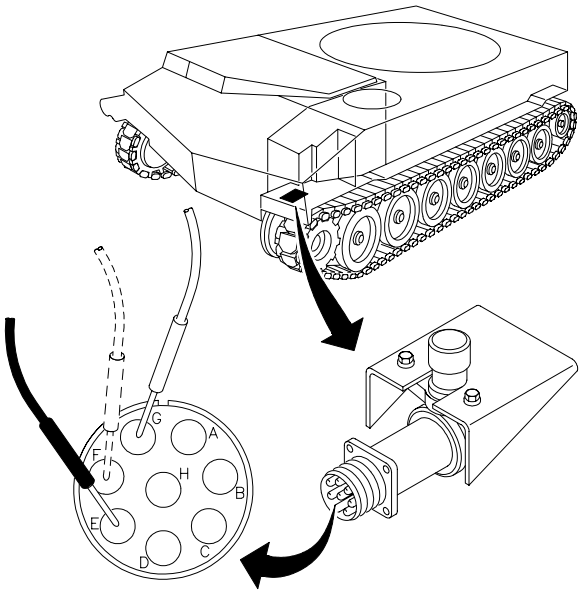
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Place one multimeter lead on headlight dimmer switch pin G and other lead on headlight dimmer switch pins E and F (one at a time). Check for continuity.
3. Depress headlight dimmer switch and repeat step 2.

Is continuity present on one pin before headlight dimmer switch is depressed and on other pin after depressed?

yes

no

Replace headlight dimmer switch (para 8-27).



DIMMER SWITCH
PIN G
PIN E
(PIN F)

D

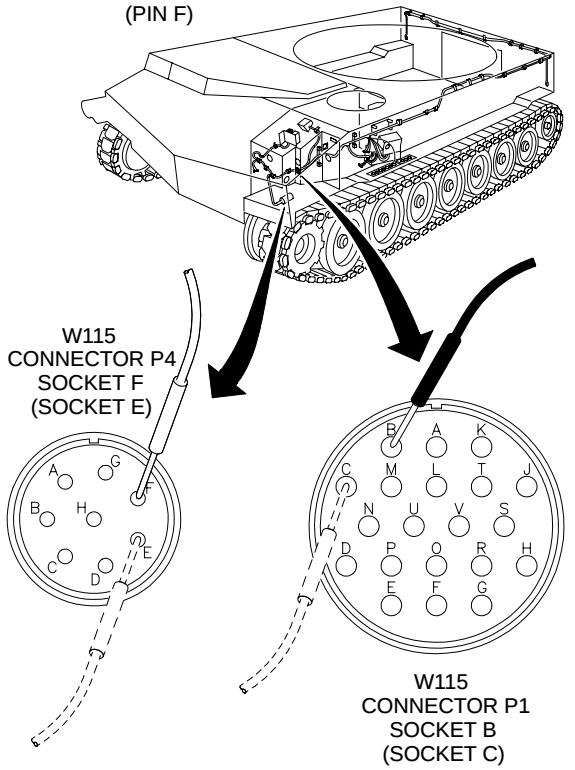
1. Disconnect harness W115 connector P1 from harness W113 connector J1.
2. Place one multimeter lead in harness W115 connector P4 socket F and other lead in harness W115 connector P1 socket B. Check continuity.
3. Place one multimeter lead in harness W115 connector P4 socket E and other lead in harness W115 connector P1 socket C. Check for continuity.

Is continuity present?

yes

no

Repair or replace harness W115 (para 8-74).



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3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(17) HEADLIGHTS FAIL TO OPERATE. All other lights operate. - CONTINUED

CONTINUED FROM STEP D

E

1. Reconnect harness W115 connector P4 to headlight dimmer switch and W115 connector P1 to driver's bulkhead connector.
2. Disconnect harness W113 leads 17 from both headlight mount lead 17 connectors.
3. Ensure main light switch is turned to service drive (TM 9-2350-314-10).
4. Place multimeter red lead in harness W113 lead 17 sockets (one at a time) and black lead to ground.
5. Turn vehicle MASTER switch ON and headlight dimmer switch to HIGH BEAM (high beam indicator light on) (TM 9-2350-314-10).
6. Check for voltage.

Is voltage present at both lead 17 connector sockets?

yes / no

Repair or replace harness W113 (para 8-72).

F

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W113 leads 17 to both headlight mount lead 17 connectors.
3. Disconnect harness W113 leads 18 from both headlight mount lead 18 connectors.
4. Place multimeter red lead in harness W113 lead 18 connector sockets (one at a time) and black lead to ground.
5. Turn vehicle MASTER switch ON and headlight dimmer switch to LOW BEAM position (high beam indicator light not lit) (TM 9-2350-314-10).
6. Check for voltage.

Is voltage present at both lead 18 connector sockets?

yes / no

Repair or replace harness W113 (para 8-72).

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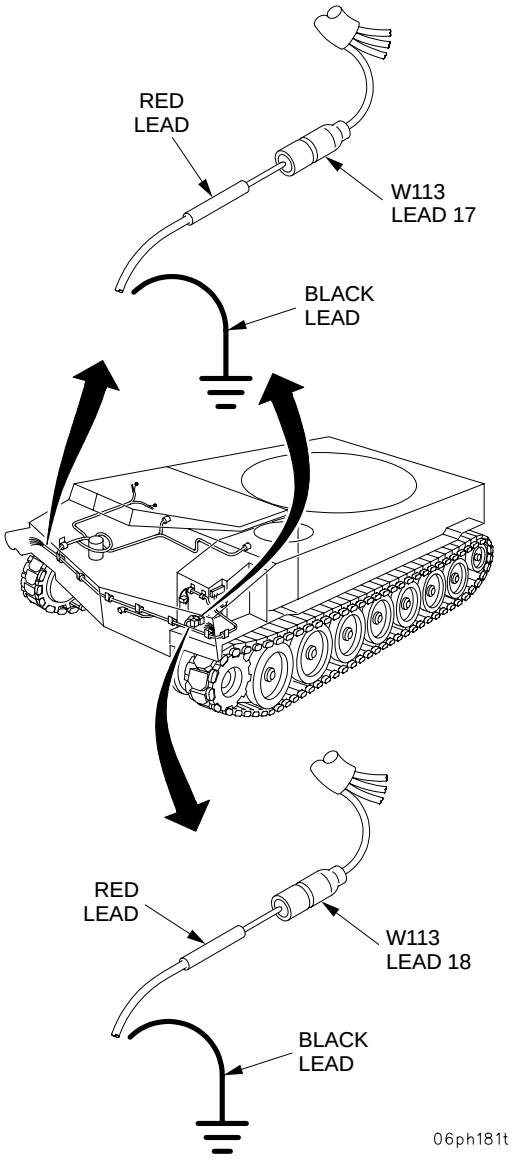

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(17) HEADLIGHTS FAIL TO OPERATE. All other lights operate. - CONTINUED

CONTINUED FROM STEP F

G

1. Depress headlight dimmer switch for high beam.
2. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
3. Reconnect harness W113 leads 18 to both headlight mount lead 18 connectors.
4. Remove both headlight assemblies from headlight mount assemblies (para 8-35).
5. Place multimeter red lead in both headlight mounts socket B (one at a time) and black lead on ground.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
7. Check for voltage.

Is voltage present at both headlight mounts?

yes / no

Repair or replace headlight mount assembly (para 8-36).

H

1. Place headlight dimmer switch in LOW BEAM position (high beam indicator light not lit) (TM 9-2350-314-10).
2. Place multimeter red lead in both headlight mount sockets A (one at a time) and black lead to ground.
3. Check for voltage.

Is voltage present at both headlight mounts?

yes / no

Repair or replace headlight mount assembly (para 8-36).

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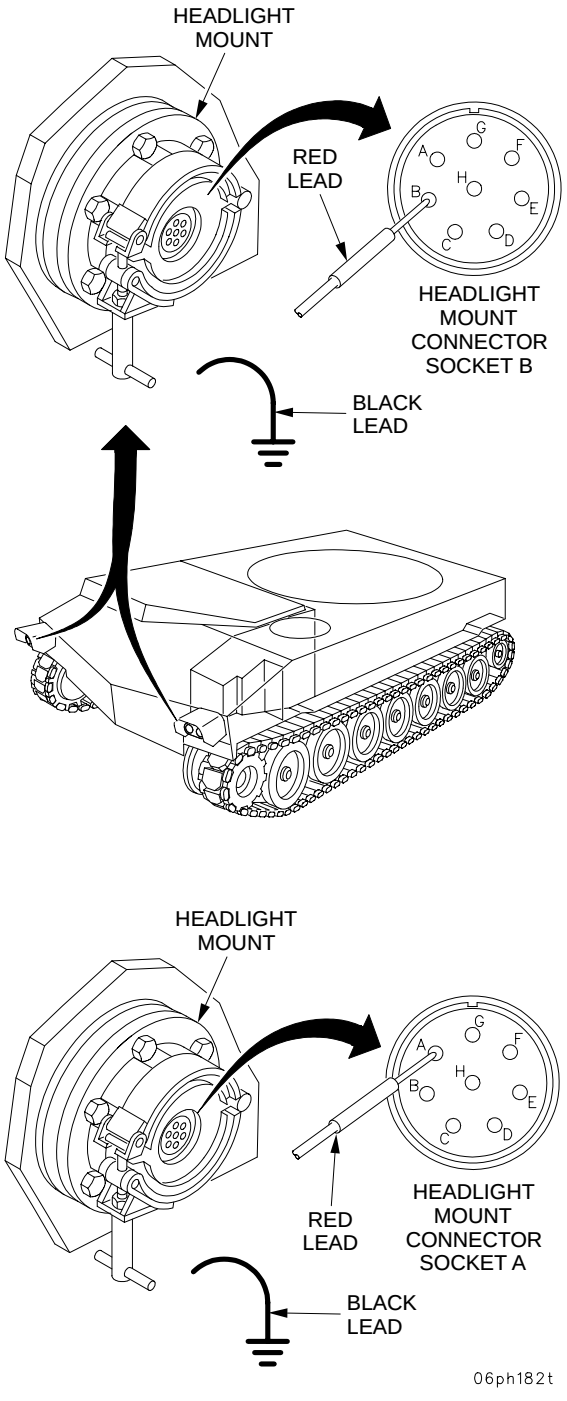

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(17) HEADLIGHTS FAIL TO OPERATE. All other lights operate. - CONTINUED

CONTINUED FROM STEP H

I

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Check lead 91 for continuity by placing one multimeter lead in both headlight mounts socket C one at a time and other lead on ground.

Is continuity present?

yes

no

Repair or replace headlight mount assembly (para 8-36).

J

1. Remount headlight assemblies to headlight mounting assemblies (para 8-35).
2. Remove service drive seal beam (para 8-35).
3. Place multimeter black lead to ground and red lead in light connector sockets (one at a time) until a voltage reading is obtained at both headlights.
4. Turn vehicle MASTER switch ON and place headlight dimmer switch to HIGH BEAM (high beam indicator light lit) (TM 9-2350-314-10).

Is voltage present at one socket?

yes

no

Repair or replace headlight(s) W113 harness (para 8-72).

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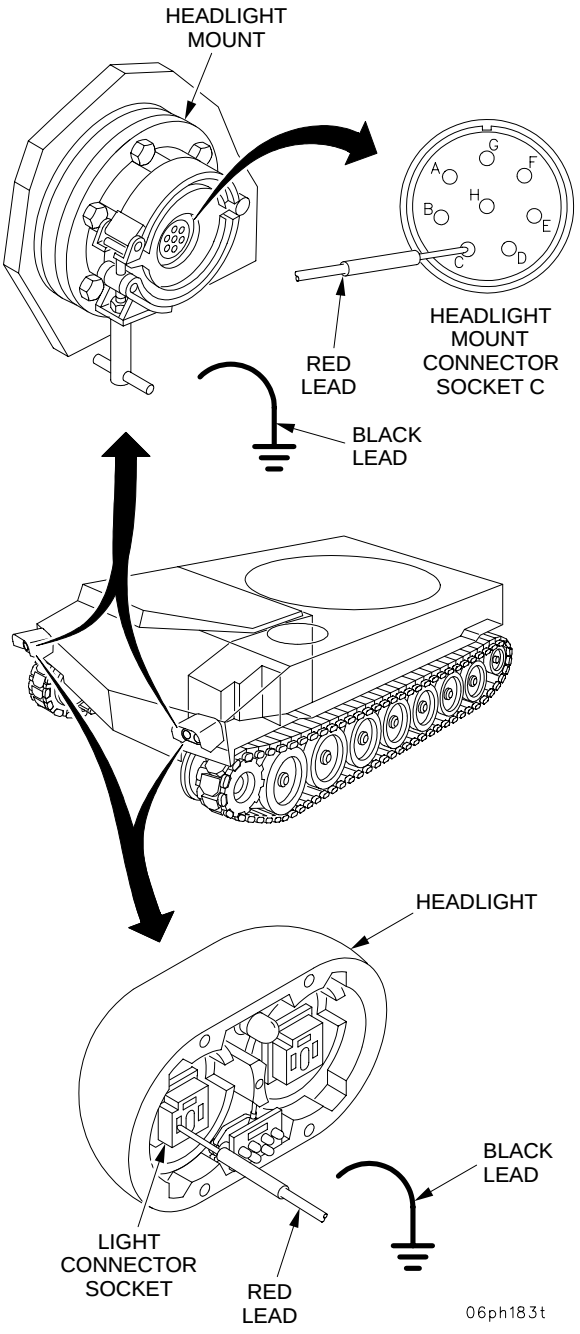


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(17) HEADLIGHTS FAIL TO OPERATE. All other lights operate. - CONTINUED

CONTINUED FROM STEP J

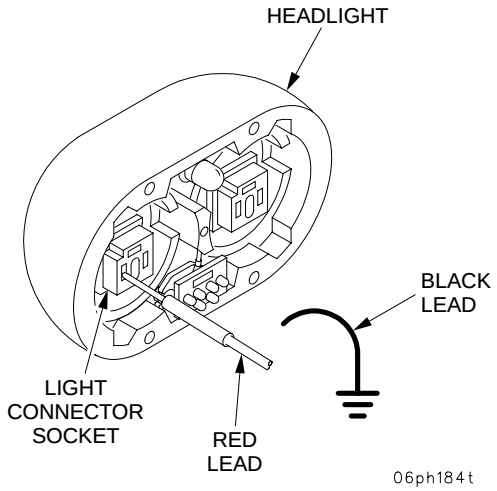
K

1. Place headlight dimmer switch to LOW BEAM (high beam indicator light not lit) (TM 9-2350-314-10).
2. Place multimeter black lead to ground and red lead in light connector sockets (one at a time) until a voltage reading is obtained at both headlights.

Is voltage present at one socket of each light?

yes / no

Repair or replace headlight(s) W113 harness (para 8-72).



L

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Place one multimeter lead on ground and other lead in each light connector socket (one at a time). Check for continuity.

Is continuity present?

yes / no

Repair or replace headlight(s) W113 harness (para 8-72).

Replace service drive seal beams (para 8-35).

END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(18) TAILLIGHT FAILS TO OPERATE. All other lights operate.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove service taillight bulb (para 8-37).
3. Place multimeter red lead on light socket center contact and black lead on ground.
4. Turn vehicle MASTER switch ON and light switch to SERVICE DRIVE (TM 9-2350-314-10).
5. Check for voltage.

Is voltage present?

yes → Replace service taillight bulb (para 8-37).

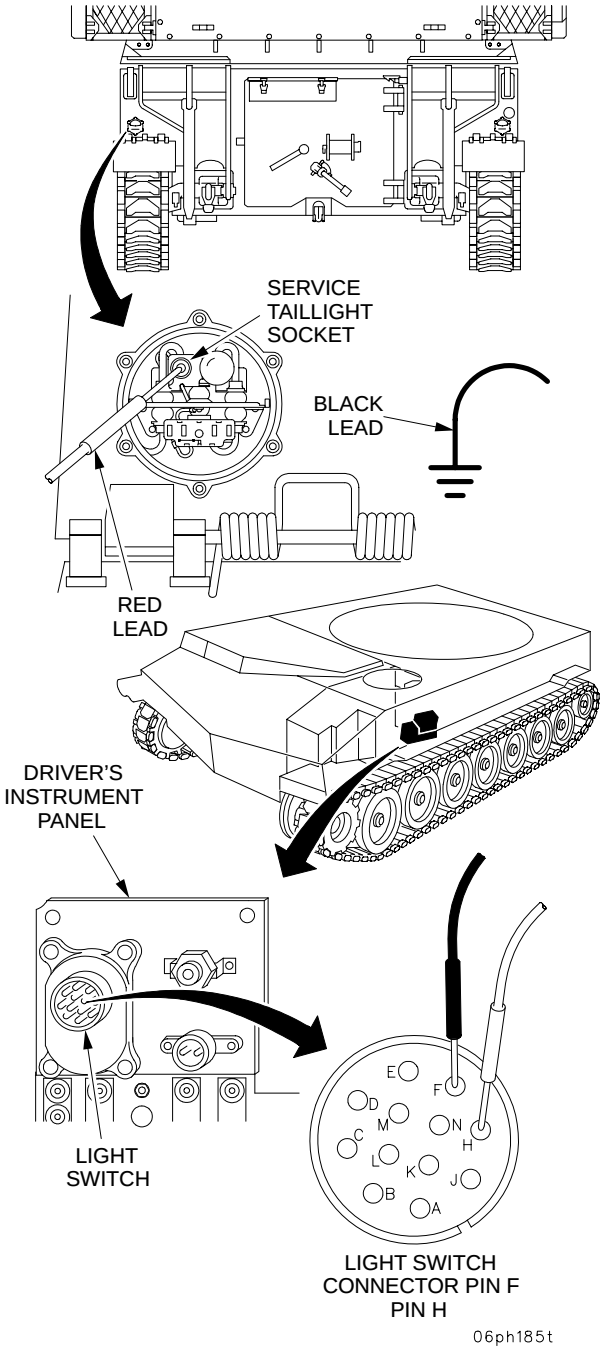
no → **B**

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 connector P3 from light switch.
3. Ensure light switch is in SERVICE DRIVE (TM 9-2350-314-10).
4. Check light switch for continuity by placing one multimeter lead on pin F and other lead on pin H.

Is continuity present?

yes → CONTINUED ON NEXT PAGE

no → Replace light switch (para 8-12).



3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(18) TAILLIGHT FAILS TO OPERATE. All other lights operate. – CONTINUED

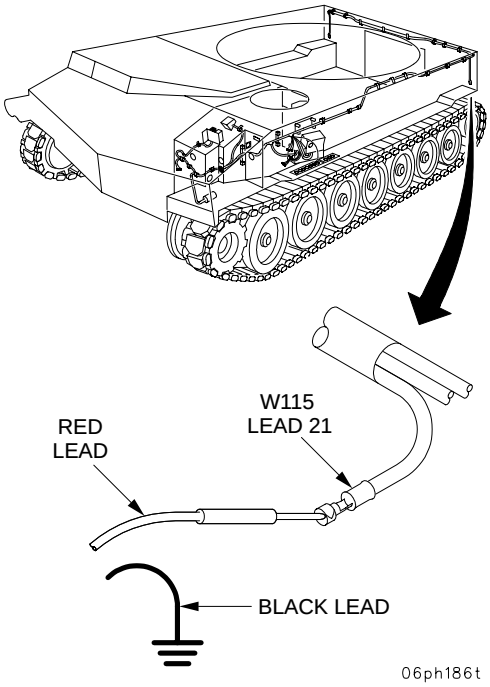
CONTINUED FROM STEP B

C

1. Reconnect harness W115 connector P3 to light switch.
2. Remove wiring harness hull rear access cover (para 8–102).
3. Disconnect harness W115 lead 21 from taillight harness W115 lead 21 connector.
4. Place multimeter red lead in harness W115 lead 21 connector socket and black lead on ground.
5. Turn vehicle MASTER switch ON (TM 9–2350–314–10) and check for voltage.

Is voltage present?

- yes → Repair or replace tail-light (para 8–37).
- no → Repair or replace harness W115 (para 8–74).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(19) STOPLIGHT FAILS TO OPERATE. All other lights operate.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Ensure brake pedal is depressed and locked (TM 9-2350-314-10).
3. Ensure light switch is in STOPLIGHT or SERVICE DRIVE position (TM 9-2350-314-10).
4. Remove stoplight bulb (para 8-37).
5. Place multimeter red lead on stoplight socket center contact and black lead to ground.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Replace service stoplight bulb (para 8-37).

no

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove driver's instrument panel (para 8-12).
3. Disconnect harness W115 connector P3 from light switch.
4. Ensure light switch is set for STOPLIGHT or SERVICE DRIVE (TM 9-2350-314-10).
5. Make the following continuity checks on light switch:
   a. Place one multimeter lead on pin F and other lead on pin A.
   b. Place one multimeter lead on pin C and other lead on pin K.

Is continuity present?

yes

Replace light switch (para 8-12).

no

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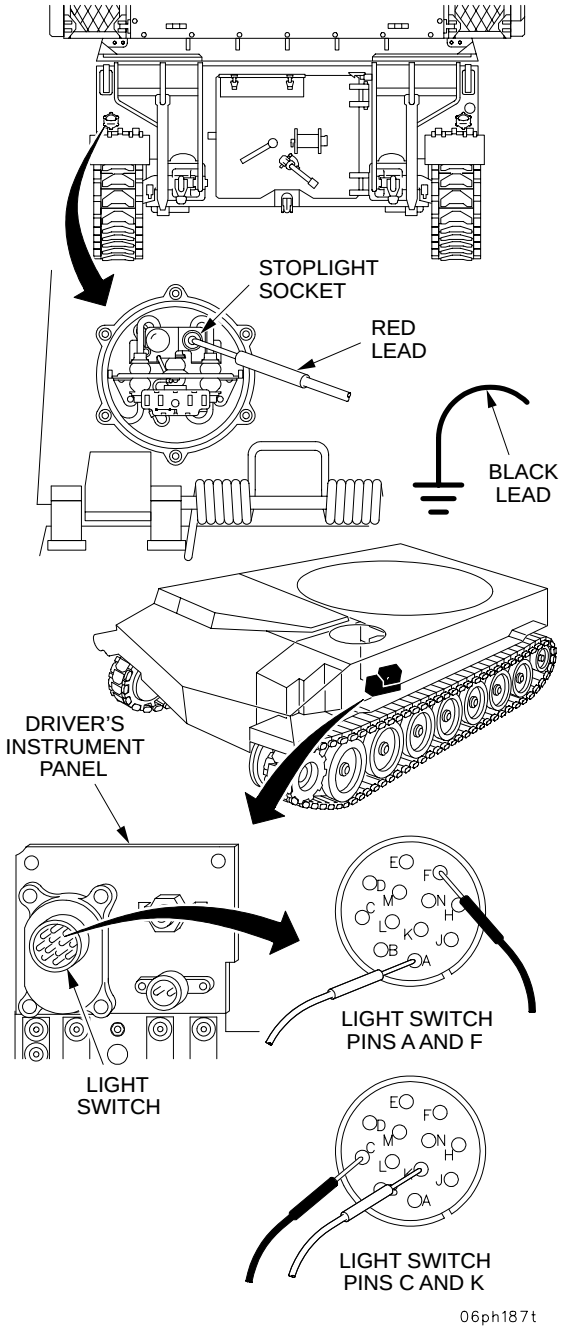

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(19) STOPLIGHT FAILS TO OPERATE. All other lights operate. - CONTINUED

CONTINUED FROM STEP B

C

1. Disconnect harness W115 leads 75 from stoplight switch.
2. Place one multimeter lead in harness W115 connector P3 socket A and other lead in harness W115 lead 75 socket. Check for continuity.
3. Place one multimeter lead in other harness W115 lead 75 socket and other lead in harness W115 connector P3 socket K. Check for continuity.

Is continuity present?

yes

no

Repair or replace harness W115 (para 8-74).

D

1. Reconnect harness W115 connector P3 to main light switch.
2. Place one multimeter lead on one stoplight switch pin and other lead on other stoplight switch pin. Check for continuity.

Is continuity present?

yes

no

Adjust or replace stoplight switch (para 11-6).

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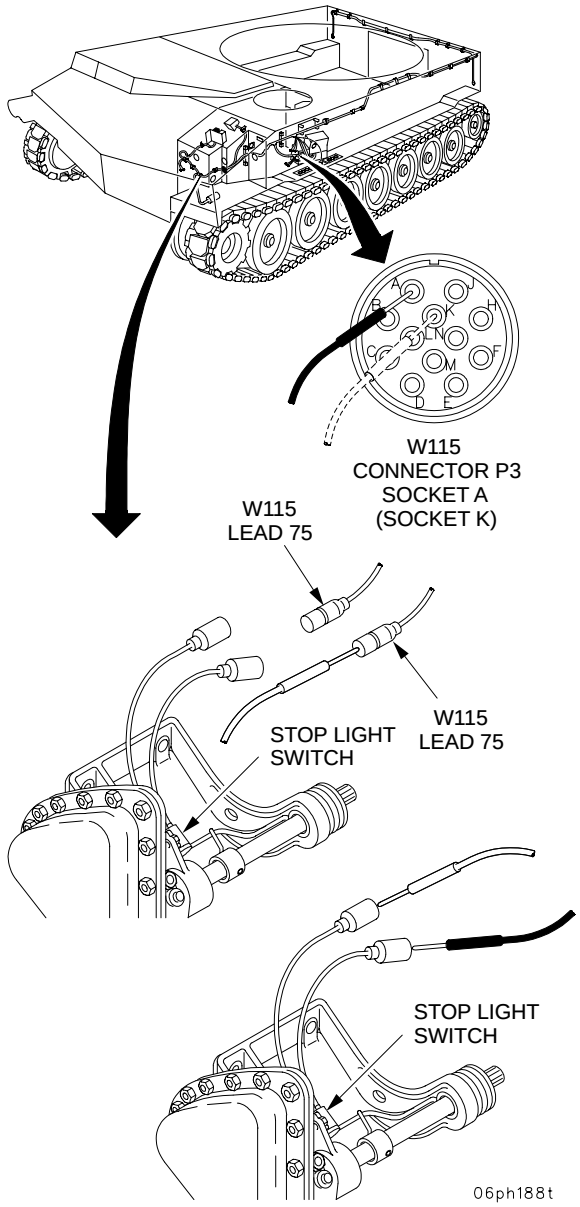


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(19) STOPLIGHT FAILS TO OPERATE. All other lights operate. - CONTINUED

CONTINUED FROM STEP D

E

1. Reconnect harness W115 leads 75 to stoplight switch connectors.
2. Remove wiring harness hull rear access cover (para 8-102).
3. Disconnect harness W115 lead 22 from left taillight connector.
4. Place multimeter red lead in harness W115 lead 22 connector socket and black lead on ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

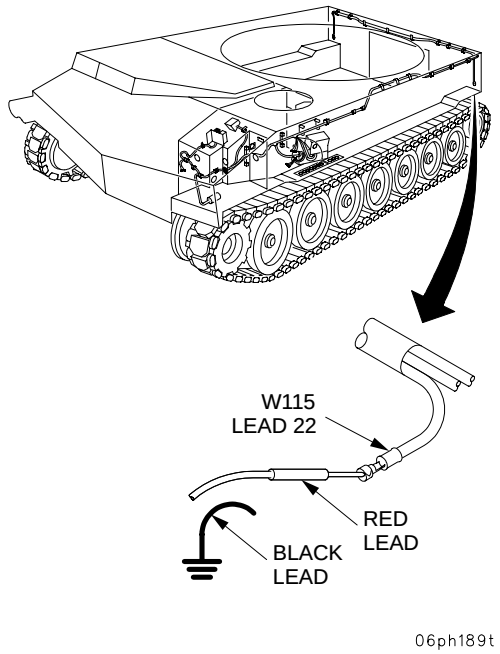
Is voltage present?

yes

Repair or replace harness W115 (para 8-74).

no

Repair or replace left taillight assembly (para 8-37).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(20) FRONT BLACKOUT (BO) MARKER LEDS FAIL TO OPERATE.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests.
16 AWG wire may be used as an extension.)

Personnel Required
Two

NOTE

Both right and left front blackout marker LEDs are checked in the same manner.

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove BO marker LEDs (para 8-34).
3. Ensure light switch is set to BO marker (TM 9-2350-314-10).
4. Place multimeter red lead on light socket center contact and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes → Replace BO marker LEDs (para 8-34).

no → **B**

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove driver's instrument panel (para 8-12).
3. Disconnect harness W115 connector P3 from light switch.
4. Place one multimeter lead on pin F of light switch and other lead on pin E of light switch. Check for continuity.

Is continuity present?

yes → Replace light switch (para 8-12).

no →

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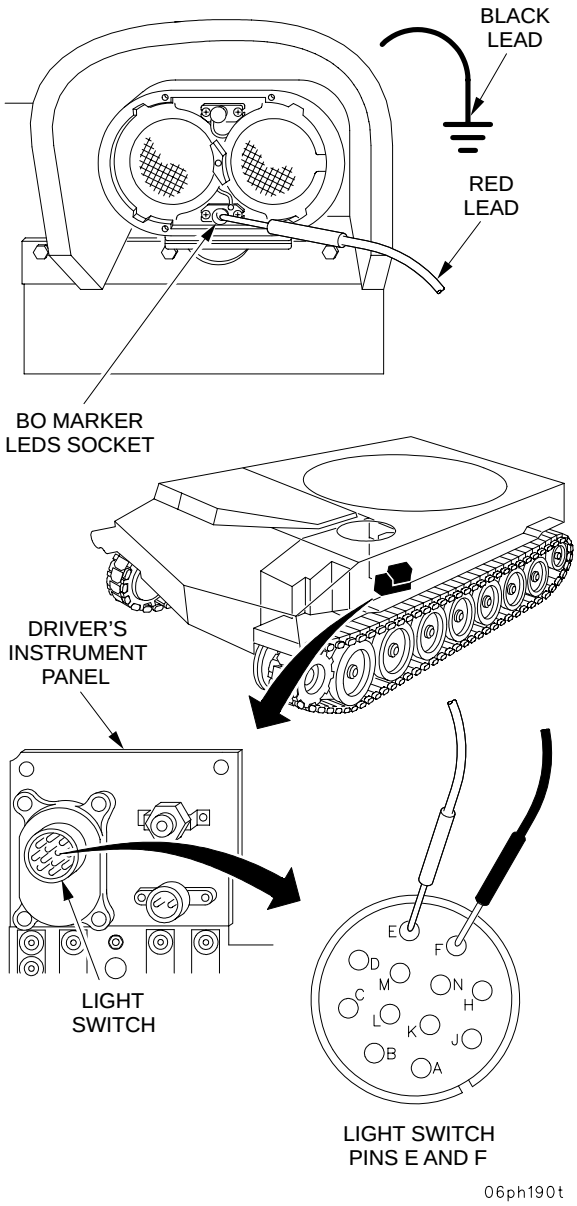

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(20) FRONT BLACKOUT (BO) MARKER LEDS FAIL TO OPERATE. - CONTINUED.

CONTINUED FROM STEP B

C

1. Disconnect harness W115 connector P1 from harness W113 connector J1.
2. Place one multimeter lead on harness W115 connector P3 socket E and other lead on W115 connector P1 socket D. Check for continuity.

Is continuity present?

yes

no

Repair or replace harness W115 (para 8-74).

D

1. Reconnect harness W115 connector P3 to main light switch and W115 connector P1 to harness W113 connector J1.
2. Disconnect harness W113 lead 20 from headlight mount lead 20 connector.
3. Place multimeter red lead in harness W113 lead 20 connector socket and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

no

Repair or replace harness W113 (para 8-72).

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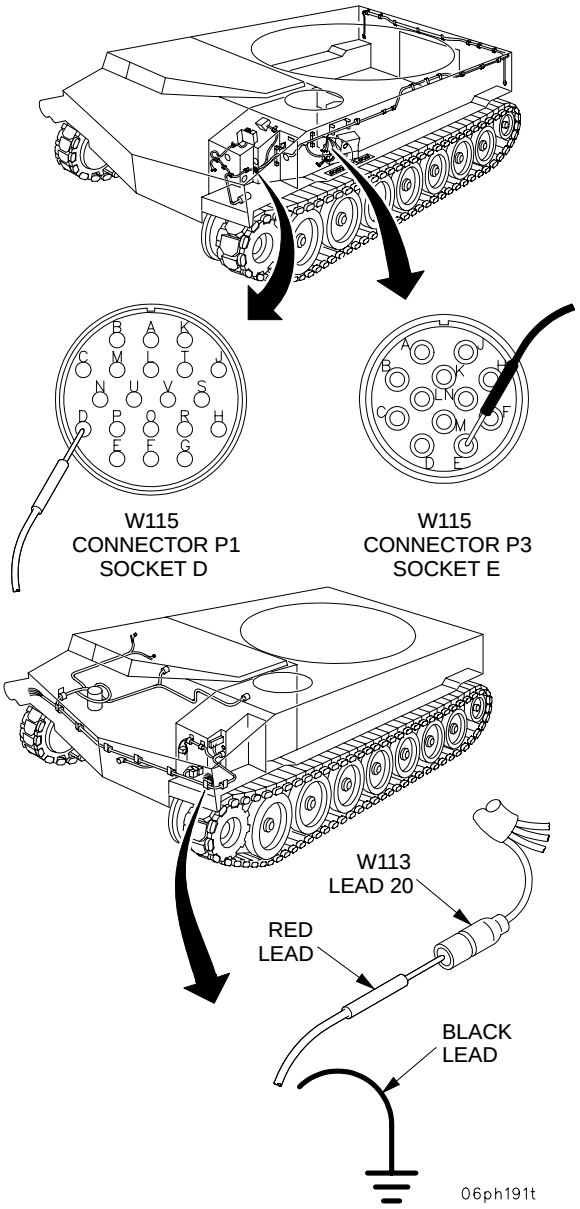


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(20) FRONT BLACKOUT (BO) MARKER LEDS FAIL TO OPERATE. - CONTINUED

CONTINUED FROM STEP D

E

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W113 lead 20 to headlight mount lead 20 connector.
3. Remove headlight assembly from headlight mount assembly (para 8-35).
4. Place multimeter red lead in headlight mount socket F and black lead on ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

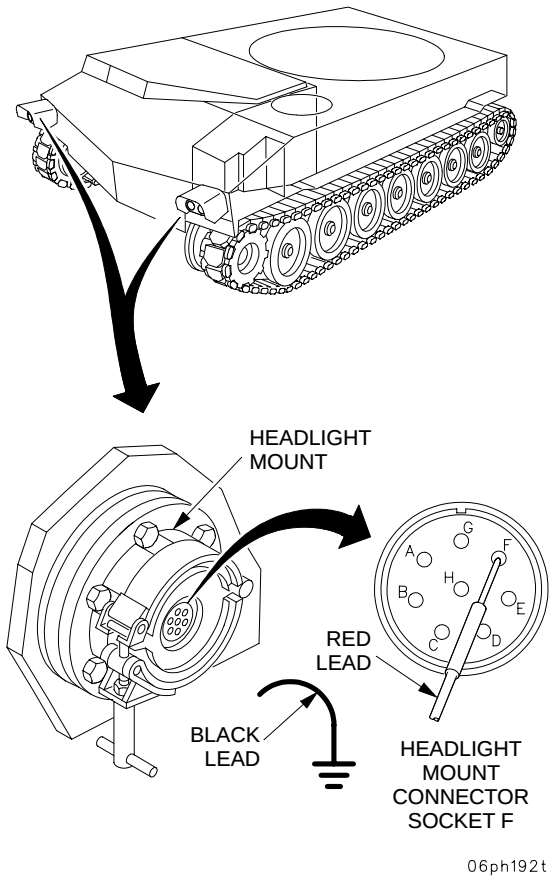
Is voltage present?

yes

Repair or replace headlight mount (para 8-36).

no

Repair or replace headlight assembly (para 8-35).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(21) REAR BLACKOUT (BO) MARKERS, LEDS FAIL TO OPERATE. All other lights operate.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Driver's instrument panel removed (para 8-12)
Wiring harness access cover (right only) removed (para 8-102)
Wiring harness access cover (left only) removed (para 8-102)

NOTE
Both right and left rear blackout marker LEDs are checked in the same manner.

A
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove BO marker LED (para 8-37).
3. Make sure light switch is set to BO marker (TM 9-2350-314-10).
4. Place multimeter red lead on BO light socket center contact and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes → Replace blackout marker LED (para 8-37).

no

B
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 connector P3 from light switch.
3. Place one multimeter lead on light switch pin F and other lead on light switch pin E. Check for continuity.

Is continuity present?

yes → Replace light switch (para 8-12).

no

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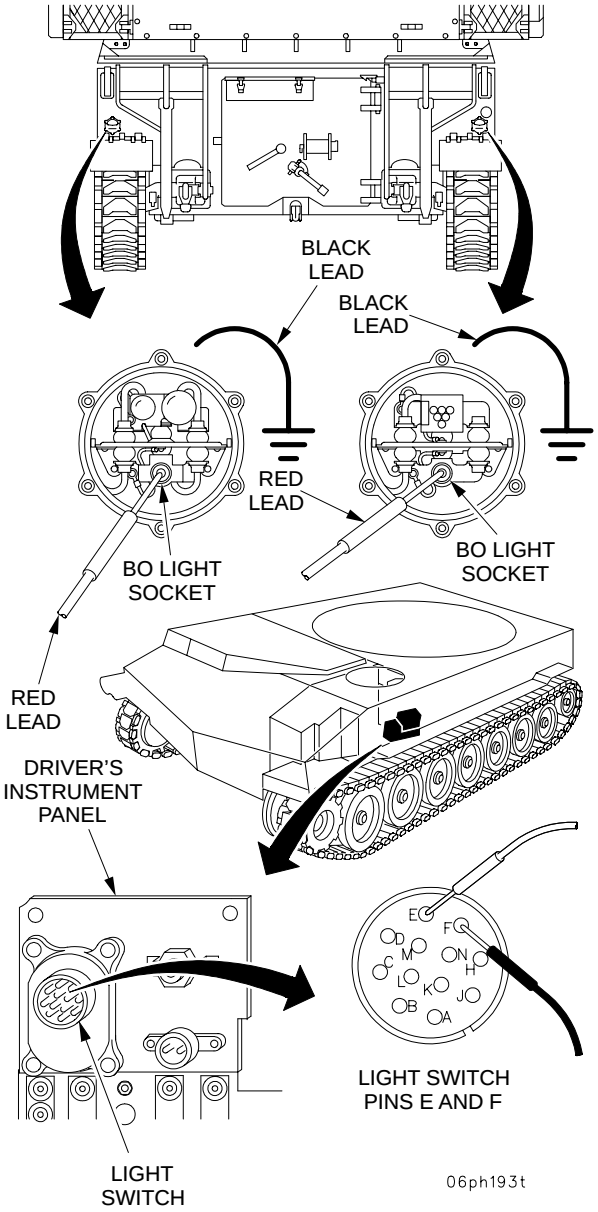


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(21) REAR BLACKOUT (BO) MARKERS LEDS FAIL TO OPERATE. All other lights operate. - CONTINUED

CONTINUED FROM STEP B

C

1. Reconnect harness W115 connector P3 to light switch.
2. Disconnect harness W115 lead 24 from taillight lead 24 connector.
3. Place multimeter red lead in harness W115 lead 24 connector socket and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

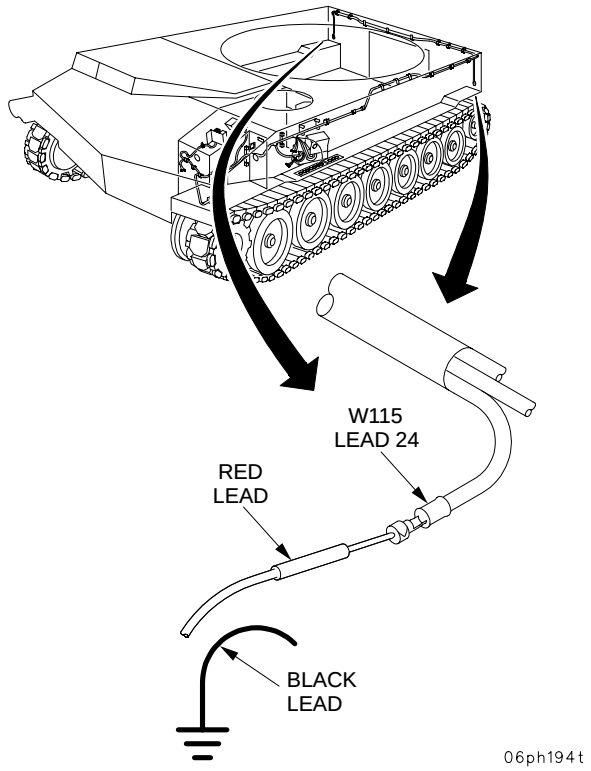
Is voltage present?

yes

Repair or replace harness W115 (para 8-74).

no

Repair or replace BO taillight assembly (para 8-37).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(22) BLACKOUT (BO) DRIVE LIGHT FAILS TO OPERATE.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests.
16 AWG wire may be used as an extension.)

Equipment Conditions
Driver's instrument panel cover
removed (para 8-12)

Personnel Required
Two

A

1. Turn vehicle MASTER switch OFF. (TM 9-2350-314-10).
2. Remove blackout drive light bulb (para 8-37).
3. Make sure that light switch is set to BO (TM 9-2350-314-10).
4. Place multimeter red lead on light socket center contact and black lead on ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Replace blackout drive light bulb (para 8-37).

no

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 connector P3 from light switch.
3. Place one multimeter lead on light switch pin F and other lead on light switch pin D. Check for continuity.

Is continuity present?

yes

Replace light switch (para 8-12).

no

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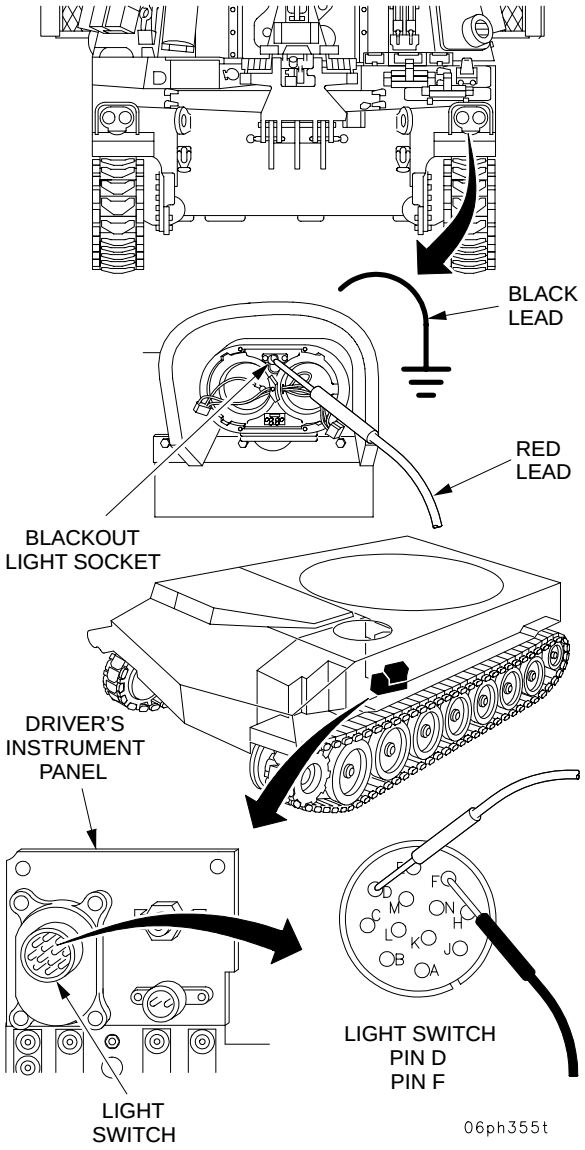

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(22) BLACKOUT (BO) DRIVE LIGHT FAILS TO OPERATE. - CONTINUED

CONTINUED FROM STEP B

C

1. Reconnect harness W115 connector P3 to light switch.
2. Disconnect harness W115 lead 520 from three-way connector from behind driver's instrument panel.
3. Place multimeter red lead in harness W115 lead 520 connector socket and black lead on ground.
4. Make sure light switch is set to BO drive (TM 9-2350-314-10).
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes / no

Repair or replace harness W115 (para 8-74).

D

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 connector P1 from harness W113 connector J1 and W115 lead 19 from three-way connector.
3. Place one multimeter lead in harness W115 connector P1 socket A and other lead in harness W115 lead 19. Check for continuity.

Is continuity present?

yes / no

Repair or replace harness W115 (para 8-74).

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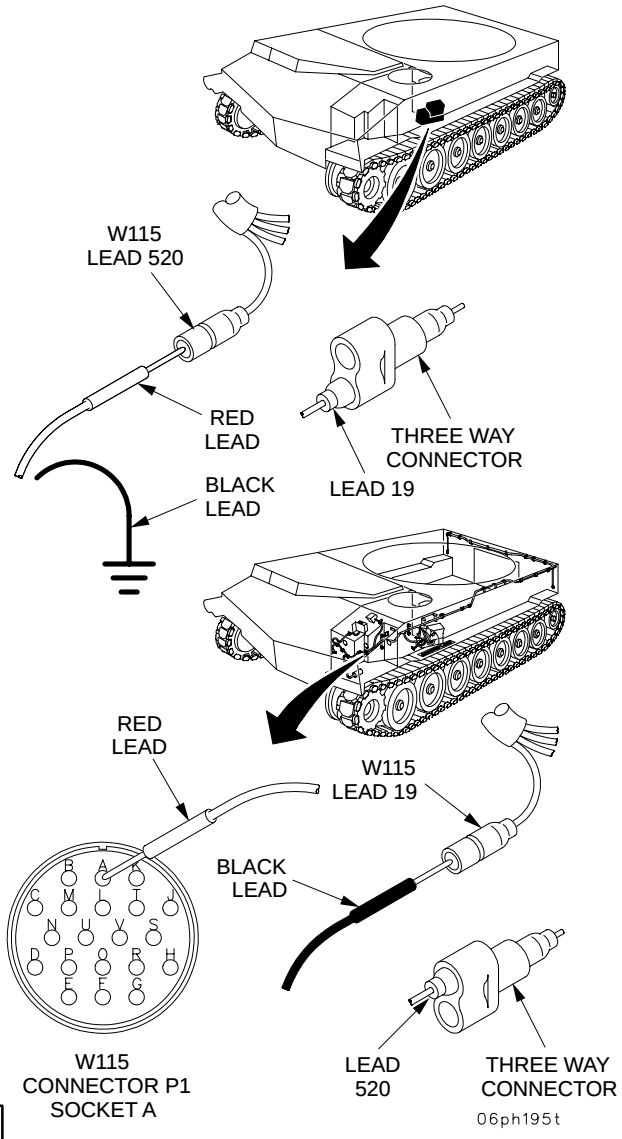


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(22) BLACKOUT (BO) DRIVE LIGHT FAILS TO OPERATE. - CONTINUED

CONTINUED FROM STEP D

E

1. Reconnect harness W115 connector P1 to harness W113 connector J1 and harness W115 lead 19 and 520 to three-way connector.
2. Disconnect harness W113 lead 19 from left headlight mount lead 19 connector.
3. Place multimeter red lead in harness W113 lead 19 connector socket and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Repair or replace harness W113 (para 8-72).

no

F

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W113 leads 19 to left headlight mount lead 19 connector.
3. Remove left headlight assembly from headlight mount assembly (para 8-36).
4. Place multimeter red lead in headlight mount connector socket G and black lead on ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

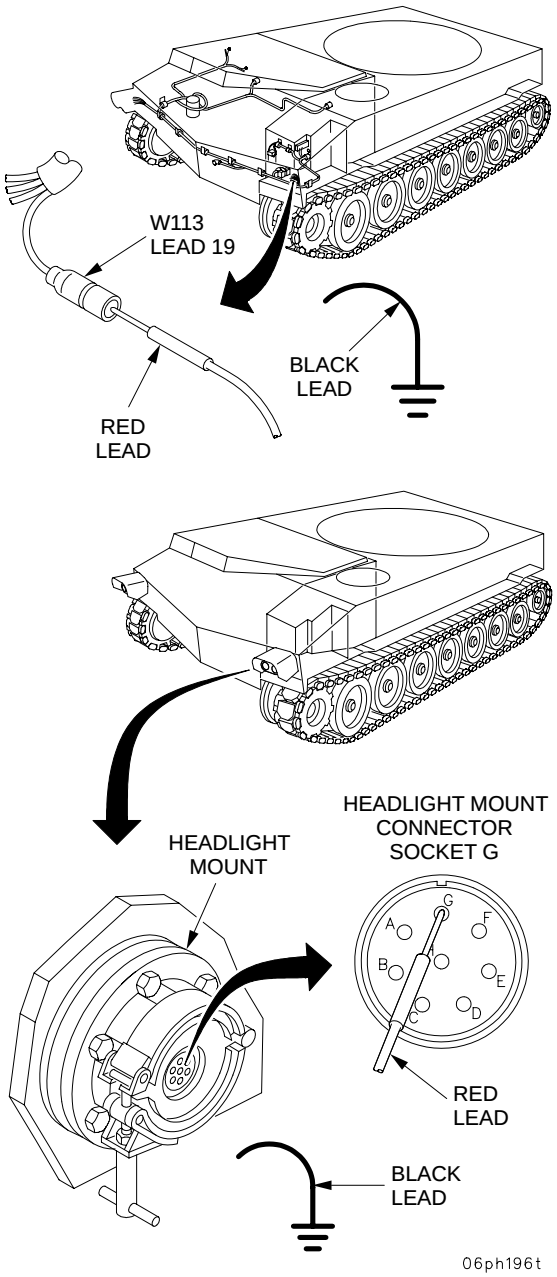
Is voltage present?

yes

Repair or replace left headlight mount assembly (para 8-36).

no

Repair or replace left headlight assembly (para 8-35).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(23) BLACKOUT (BO) STOPLIGHT LED FAILS TO OPERATE. All other lights operate.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Driver's instrument panel removed (para 8-12)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove blackout stoplight LED (para 8-37).
3. Ensure that light switch is set to BO MARKER or BO DRIVE and that brake pedal is depressed and locked (TM 9-2350-314-10).
4. Place multimeter red lead on light socket center contact and black lead on ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes → Replace blackout stoplight LED (para 8-37).

no →

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 connector P3 from light switch.
3. Make the following continuity checks at main light switch.
   a. Place one multimeter lead on pin F and other lead on pin A.
   b. Place one multimeter lead on pin K and other lead on pin N.

Is continuity present?

yes → Replace light switch (para 8-12).

no →

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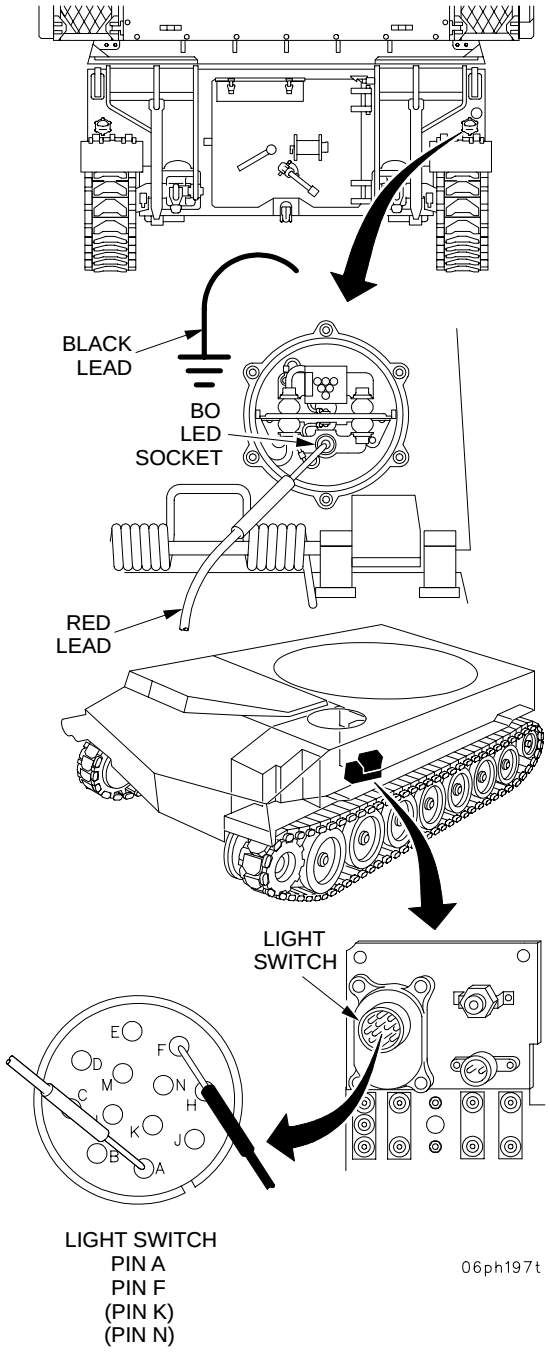

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(23) BLACKOUT (BO) STOPLIGHT LED FAILS TO OPERATE. All other lights operate. - CONTINUED

CONTINUED FROM STEP B

C

1. Disconnect harness W115 leads 75 from stoplight switch.
2. Make the following continuity checks:
   a. Place one multimeter lead in harness W115 connector P3 socket A and other lead in two harness W115 lead 75 connector sockets (one at a time).
   b. Place one multimeter lead in harness W115 connector P3 socket K and other lead in other harness W115 lead 75 connector sockets (one at a time).

Is continuity present?

yes / no

Repair or replace harness W115 (para 8-74).

D

1. Reconnect harness W115 connector P3 to light switch.
2. Ensure that brake pedal is depressed and locked (TM 9-2350-314-10).
3. Place one multimeter lead on one pin of stoplight switch connector pin and other lead on other stoplight switch connector pin. Check for continuity.

Is continuity present?

yes / no

Adjust or replace stoplight switch (para 11-6).

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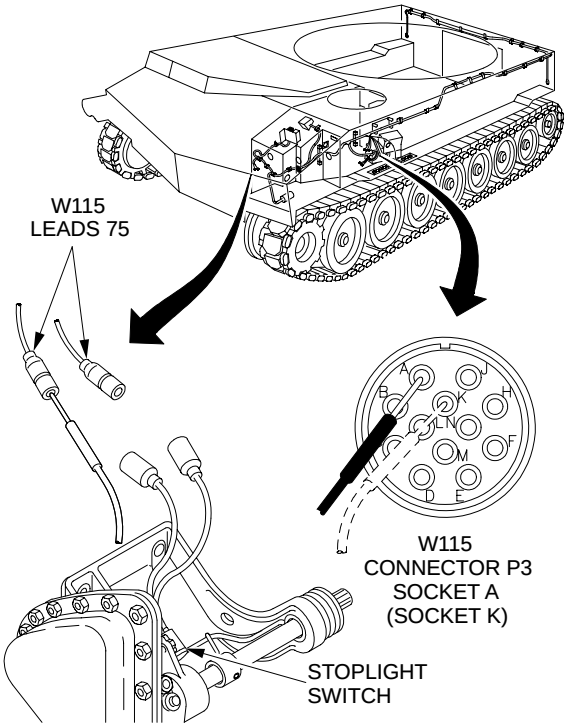
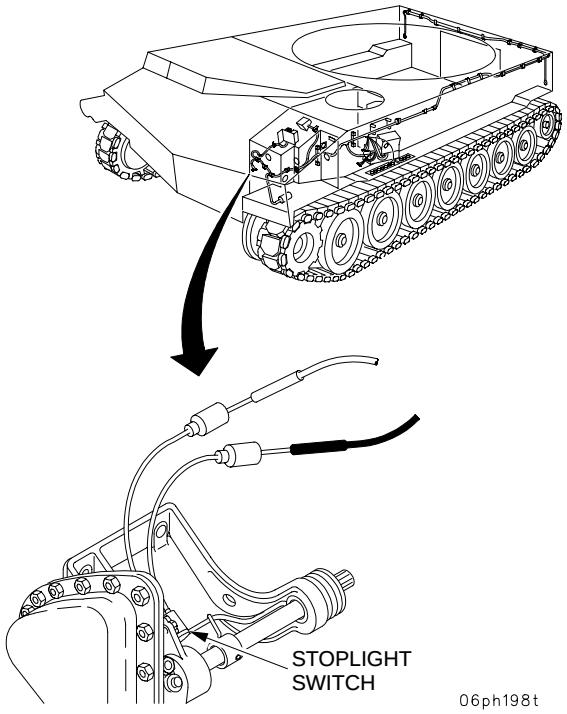




3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(23) BLACKOUT (BO) STOPLIGHT LED FAILS TO OPERATE. All other lights operate. – CONTINUED

CONTINUED FROM STEP D

E

1. Reconnect harness W115 leads 75 to stoplight switch.
2. Remove wiring harness hull rear access cover (para 8–102).
3. Disconnect harness W115 lead 23 from right taillight lead 23 connector.
4. Place multimeter red lead in harness W115 lead 23 connector socket and black lead on ground.
5. Ensure light switch is set to BO marker or BO drive (TM 9–2350–314–10).
6. Turn vehicle MASTER switch ON (TM 9–2350–314–10) and check for voltage.

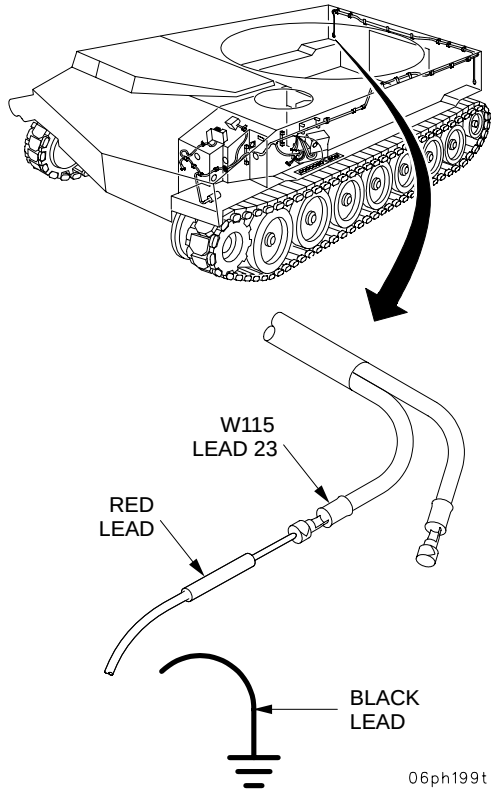
Is voltage present?

yes

Repair or replace harness W115 (para 8–74).

no

Repair or replace right taillight assembly (para 8–37).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(24) ALL INSTRUMENT PANEL LIGHTS FAIL TO OPERATE. All other lights operate.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Driver's instrument panel removed (para 8-12)

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 connector P3 from light switch.
3. Ensure light switch is in any position except OFF and auxiliary light switch is set to panel bright (BRT) or DIM (TM 9-2350-314-10).
4. Place one multimeter lead on light switch pin F and other lead on light switch pin B. Check for continuity.

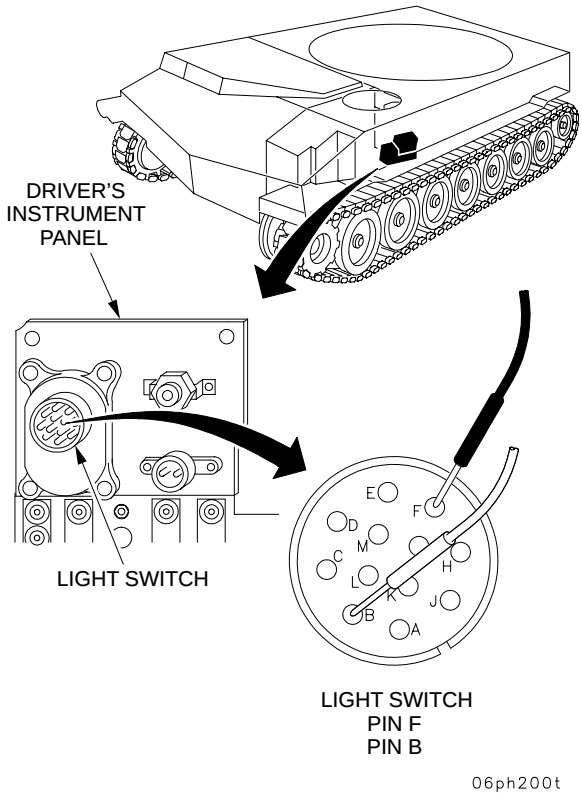
Is continuity present?

yes

Replace light switch (para 8-12).

no

Repair or replace harness W115 (para 8-74).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(25) DRIVER'S INSTRUMENT PANEL LIGHTS FAIL TO OPERATE. All other lights operate

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Driver's instrument panel removed (para 8-12)

A

1. Remove driver's instrument panel light bulb (para 8-12).
2. Ensure that light switch is in any position but OFF and AUXILIARY LIGHT switch is set to BRT or DIM (TM 9-2350-314-10).
3. Place multimeter red lead on light socket center contact and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Replace driver's panel light bulb (para 8-12).

no

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 lead 40 from panel light connector.
3. Place multimeter red lead in harness W115 lead 40 connector pin and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

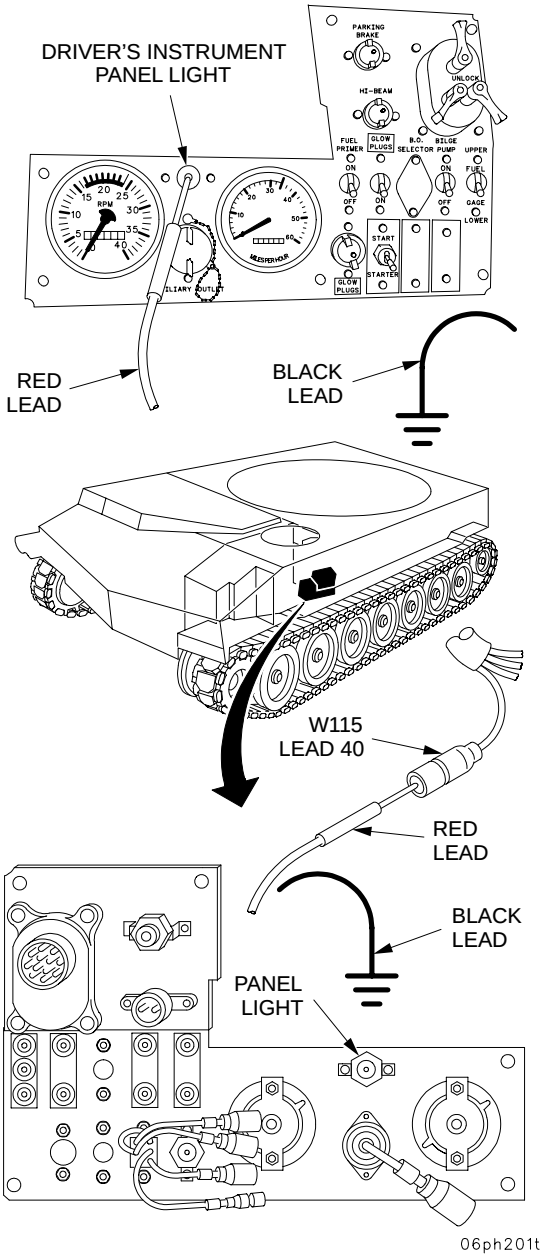
Is voltage present?

yes

Replace driver's instrument panel light socket (para 8-12).

no

Repair or replace harness W115 (para 8-74).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(26) PORTABLE INSTRUMENT PANEL LIGHTS FAIL TO OPERATE. All other lights operate

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Portable instrument panel removed from driver's instrument panel (TM 9-2350-314-10)

NOTE

Both portable instrument panel lights are checked in the same manner.

A

1. Remove portable instrument panel light bulb (TM 9-2350-314-10).
2. Place multimeter red lead on light socket center contact black lead on ground.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Replace portable instrument panel light bulb (TM 9-2350-314-10).

no

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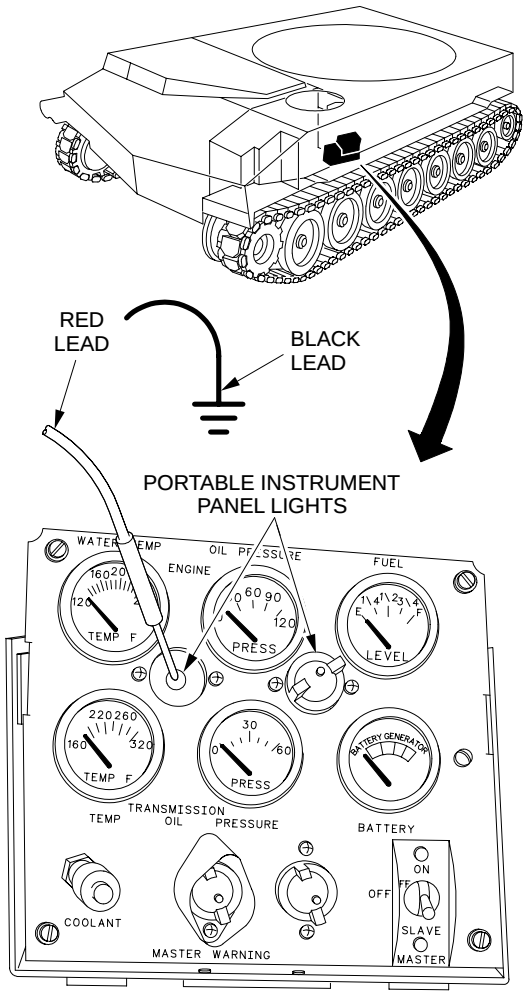

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3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(26) PORTABLE INSTRUMENT PANEL LIGHTS FAIL TO OPERATE. All other lights operate - CONTINUED

CONTINUED FROM STEP A

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W112 connector P1 from harness W114 connector J1.
3. Remove cover from portable instrument panel (para 8-14).
4. Disconnect harness W112 lead 40 from portable instrument panel light.
5. Place multimeter lead on harness W112 connector P1 pin R and other lead on harness W112 lead 40 connector pin. Check for continuity.

Is continuity present?

yes

no

Repair or replace harness W112 (para 8-71).

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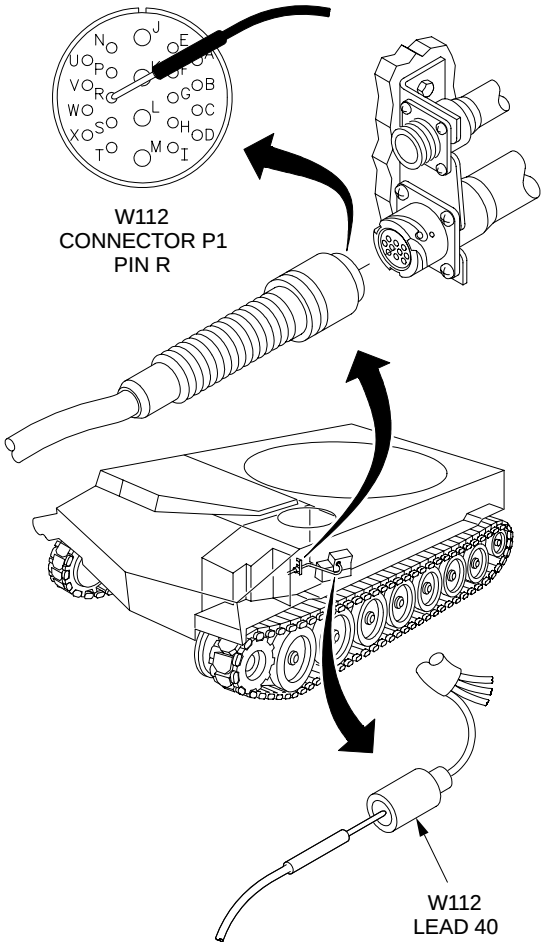

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3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(26) PORTABLE INSTRUMENT PANEL LIGHTS FAIL TO OPERATE. All other lights operate - CONTINUED

CONTINUED FROM STEP B

C

1. Reconnect harness W112 lead 40 in portable instrument panel light.
2. Install cover on portable instrument panel (para 8-14).
3. Remove driver's instrument panel (para 8-12).
4. Disconnect harness W114 lead 40 from harness W119 three-way connector.
5. Place one multimeter lead in W114 connector J1 socket R and other lead in harness W114 lead 40 connector socket. Check for continuity.

Is continuity present?

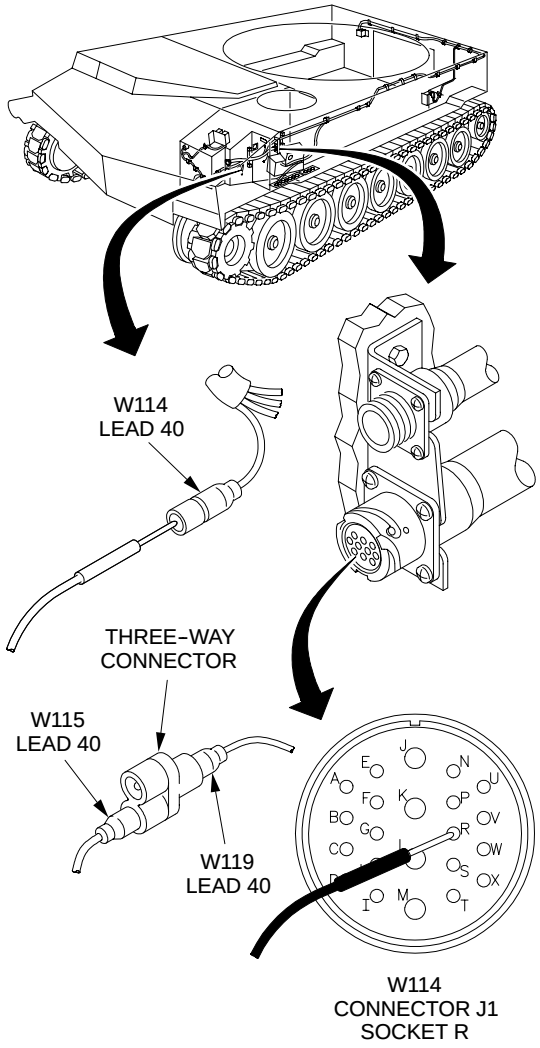
yes

Replace panel light assembly (para 8-14).

no

Repair or replace harness W114 (para 8-73).

END OF TASK



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3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(27) ACCESSORY CONTROL BOX LEDS FAIL TO OPERATE. All other lights operate

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

NOTE

Both accessory control box panel LEDs are checked in the same manner.

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Remove panel LED (TM 9-2350-314-10).
3. Place multimeter red lead on LED socket center contact and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.
5. Turn vehicle light switch to panel light position (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Replace panel LED (TM 9-2350-314-10).

no

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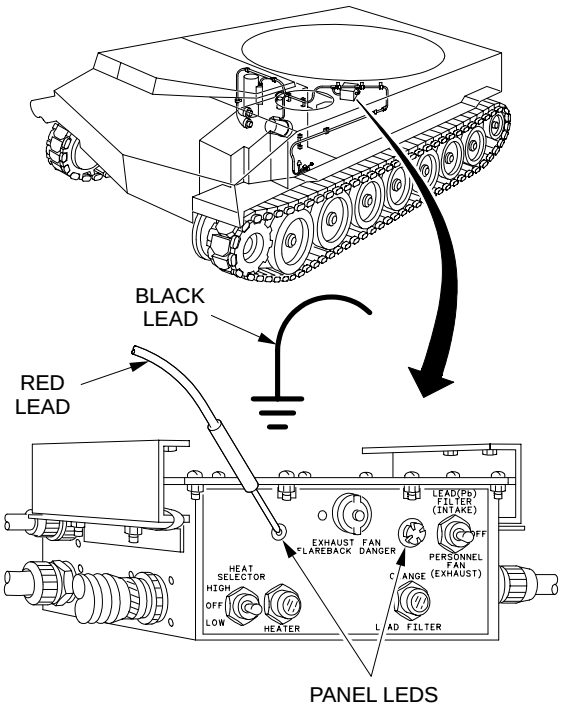
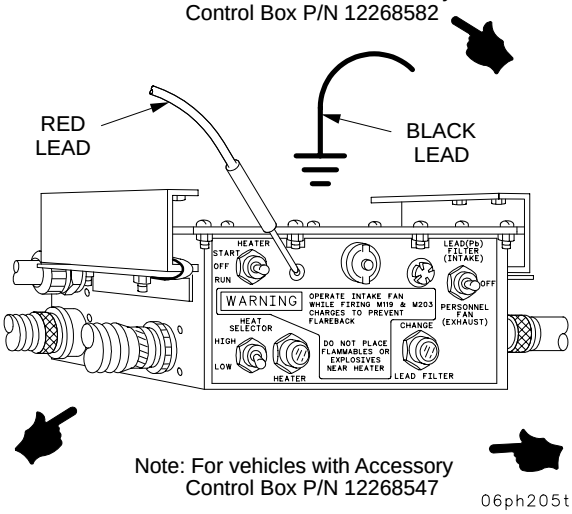


Note: For vehicles with Accessory Control Box P/N 12268582



Note: For vehicles with Accessory Control Box P/N 12268547

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3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(27) ACCESSORY CONTROL BOX LEDS FAIL TO OPERATE. All other lights operate - CONTINUED

CONTINUED FROM STEP A

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W119 connector P1 from accessory control box connector J1.
3. Place multimeter red lead on harness W119 connector P1 pin D and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

Replace accessory control box (para 8-19).

no

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W119 connector P1 to accessory control box connector J1.
3. Remove driver's instrument panel (para 8-12).
4. Disconnect harness W115 lead 40 from three-way connector.
5. Place multimeter red lead on harness W115 lead 40 connector socket and black lead on ground.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

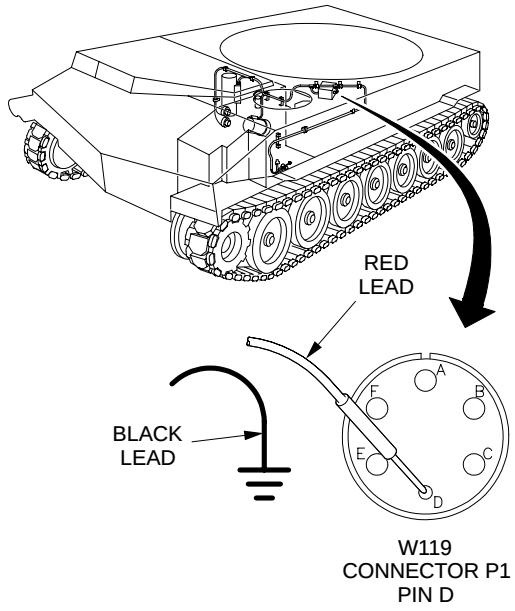
Is voltage present?

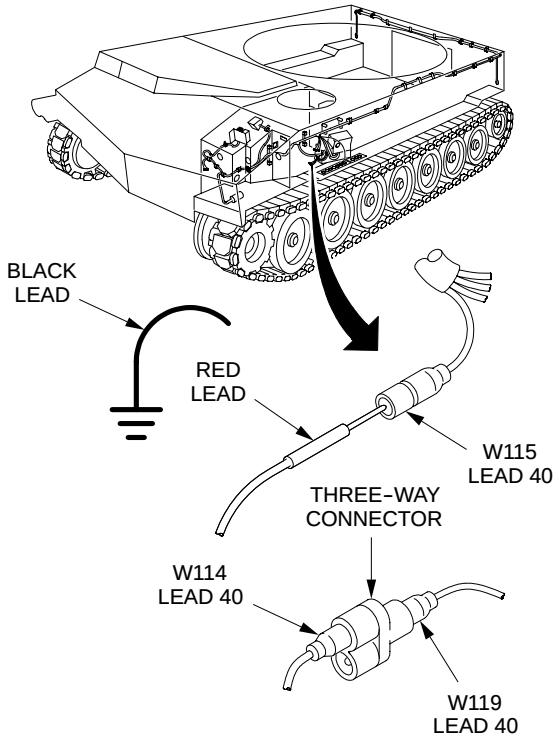
yes

Repair or replace harness W119 (para 8-59 or para 8-78).

no

Repair or replace harness W115 (para 8-59 or para 8-74).





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END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED (28) DOME LIGHT FAILS TO OPERATE. All other lights operate.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

NOTE

Move dome light switch to both positions. If dome light comes on in one position, go to step F.

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 lead 38 from dome light three-way connector.
3. Place multimeter red lead in W115 lead 38 connector socket and black lead on ground.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes → Go to Step E.

no

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 lead 37/38 from circuit breaker no. 6.
3. Place multimeter lead in harness W115 lead 38 at dome light and other multimeter lead in lead 37/38 at circuit breaker no. 6. Check for continuity.

Is continuity present?

yes

no → Repair or replace harness W115 (para 8-74).

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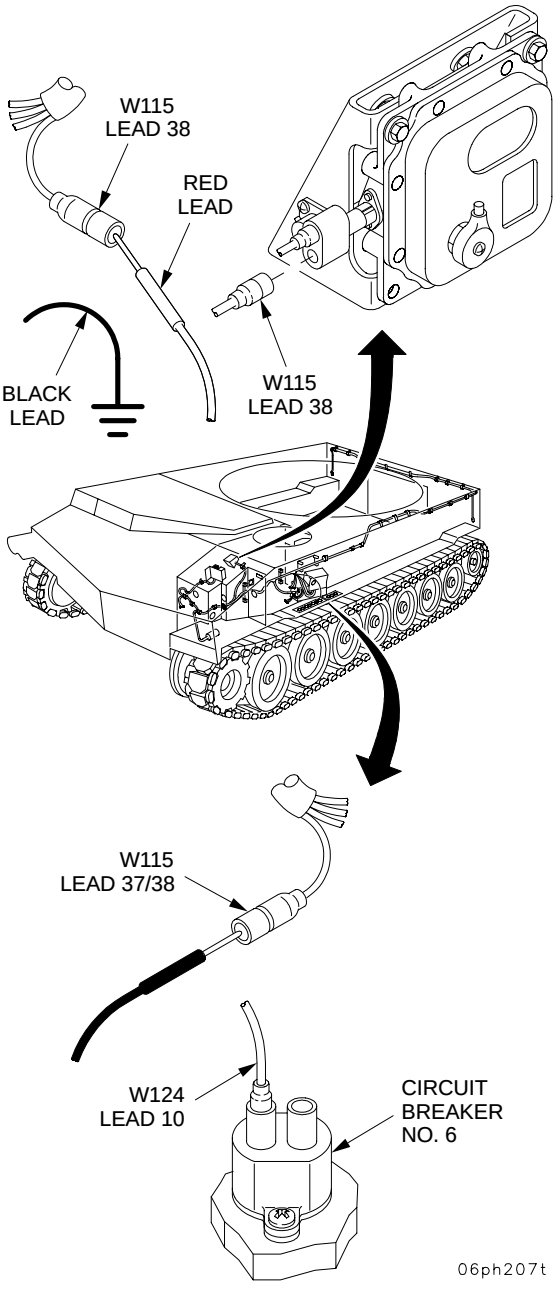


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(28) DOME LIGHT FAILS TO OPERATE. All other lights operate. - CONTINUED

CONTINUED FROM STEP B

C

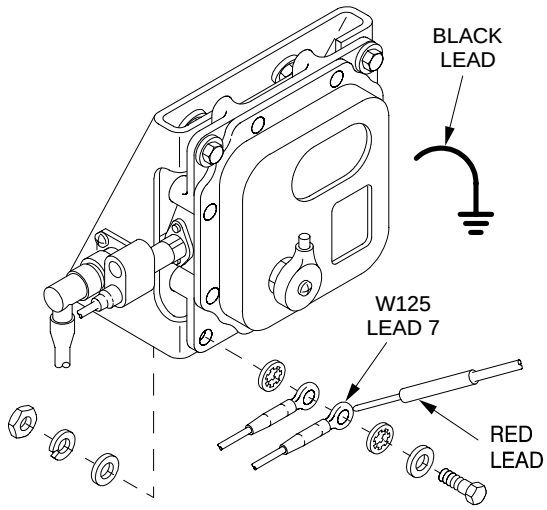
1. Disconnect harness W125 lead 7 from dome light (para 8-38).
2. Place multimeter lead on harness W125 lead 7 at dome light and other lead to ground.
3. Check for continuity.

Is continuity present?

yes

no

Repair or replace harness W125 (para 8-83).



D

1. Reconnect harness W125 lead 7 to dome light (para 8-38).
2. Reconnect harness W115 lead 37/38 to circuit breaker no. 6 and lead 38 at dome light.
3. Disconnect harness W124 lead 10 from circuit breaker no. 6.
4. Place multimeter red lead in harness W124 lead 10 connector socket and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

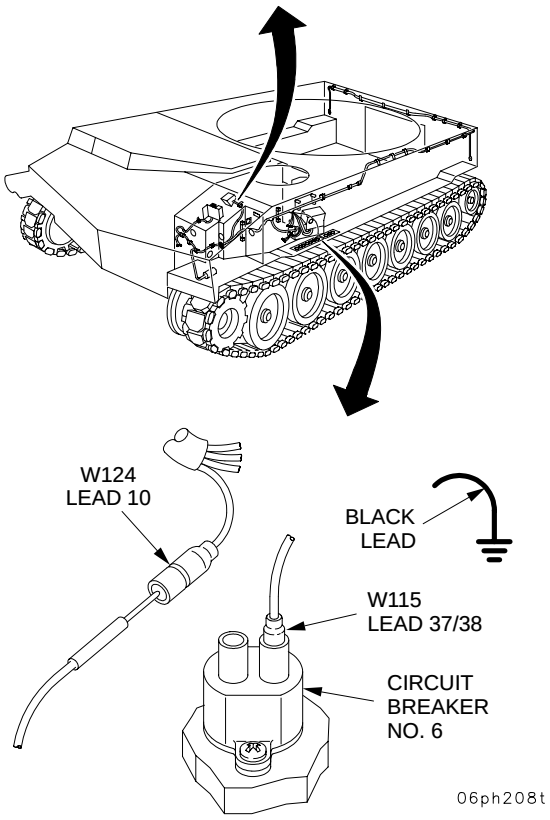
Is voltage present?

yes

no

Repair or replace harness W124 (para 8-82).

Replace circuit breaker no. 6 (para 8-20).



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3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS – CONTINUED	(28) DOME LIGHT FAILS TO OPERATE. All other lights operate. – CONTINUED

CONTINUED FROM STEP A

E

1. Turn vehicle MASTER switch OFF (TM 9–2350–314–10).
2. Reconnect harness W115 lead 38 to dome light three–way connector.
3. Remove dome light door (para 8–38).
4. Place multimeter red lead on switch power in terminal and black lead on ground.
5. Turn vehicle MASTER switch ON (TM 9–2350–314–10) and check for voltage.

Is voltage present?

yes

no

Repair or replace switch power supply lead (para 8–38).

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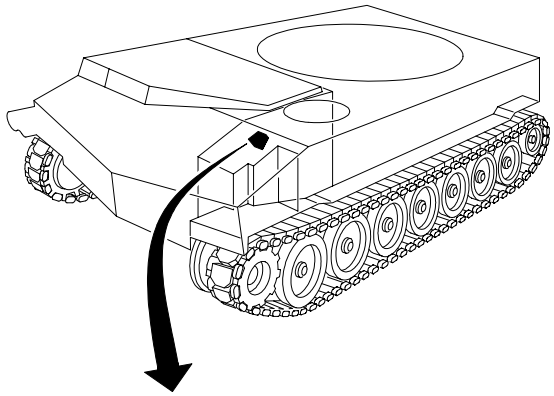

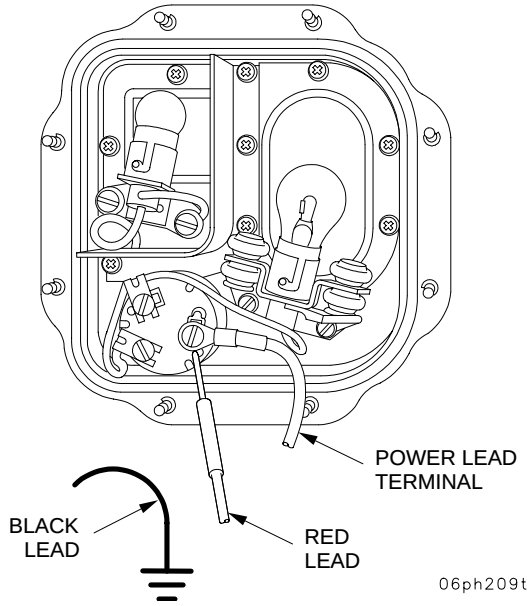

3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(28) DOME LIGHT FAILS TO OPERATE. All other lights operate. - CONTINUED

CONTINUED FROM STEP E

F

1. Turn dome light switch to white light position (TM 9-2350-314-10).
2. With multimeter black lead grounded, place red lead on switch terminal 1 and check for voltage.
3. Turn dome light switch to BO light position (TM 9-2350-314-10).
4. Place multimeter red lead on switch terminal 2 and check for voltage.

Is voltage present?

yes

no

Replace dome light switch (para 8-38).

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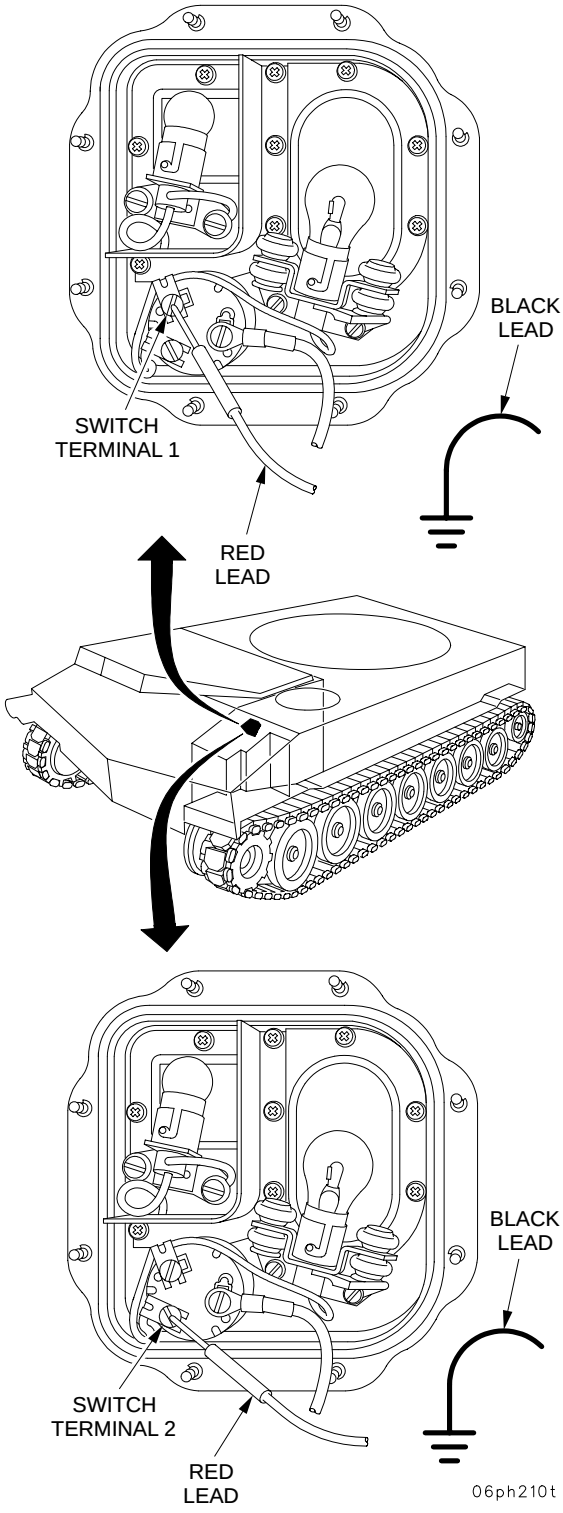


3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(28) DOME LIGHT FAILS TO OPERATE. All other lights operate. - CONTINUED

CONTINUED FROM STEP F

G

1. Turn dome light switch OFF (TM 9-2350-314-10).
2. Remove bulbs from BO and white light sockets (para 8-38).
3. Check for voltage by placing multimeter red lead on light socket center contact and black lead on ground.
4. Turn dome light switch to BO light position and check BO light socket for voltage (TM 9-2350-314-10).
5. Turn dome light switch to white light position (TM 9-2350-314-10) and check white light socket for voltage.

Is voltage present?

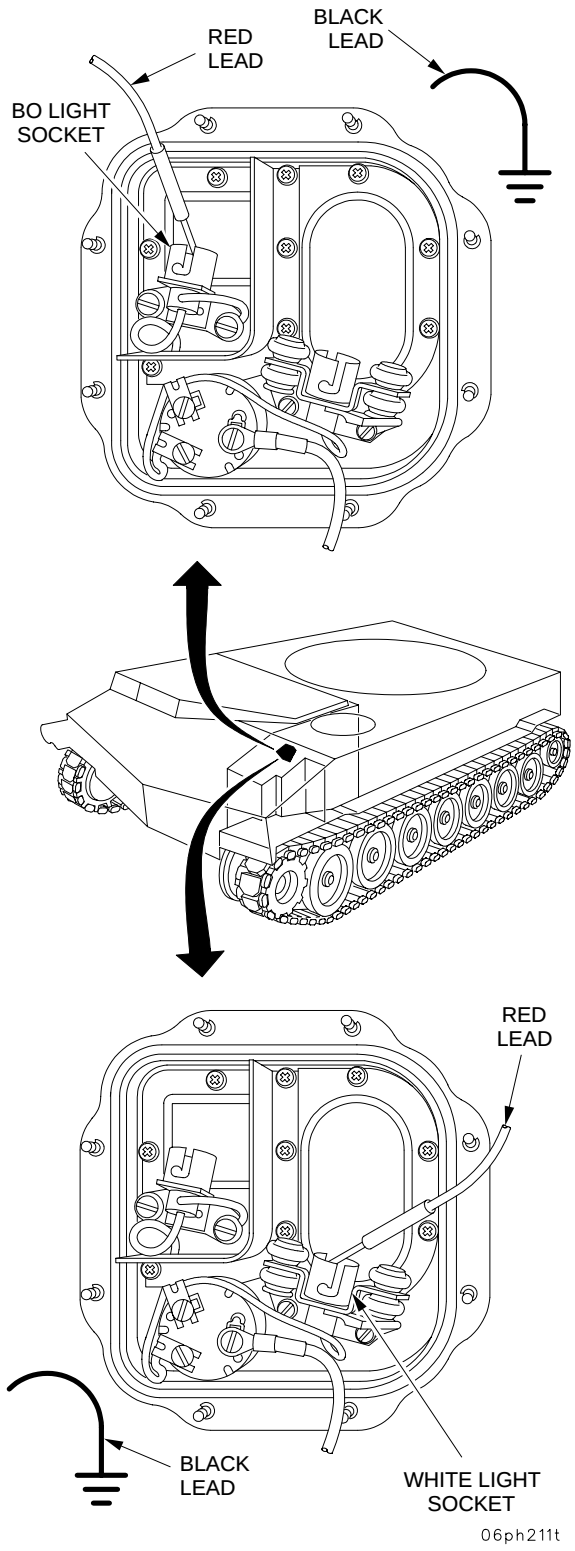
yes

Replace light socket(s) (para 8-38).

no

Replace light bulb(s) (para 8-38).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

k. LIGHTS - CONTINUED	(29) DRIVER'S NIGHT VIEWER FAILS TO OPERATE.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W118 connector P1 from driver's night viewer device.
3. Place multimeter red lead on harness W118 connector P1 socket A and black lead on socket B.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

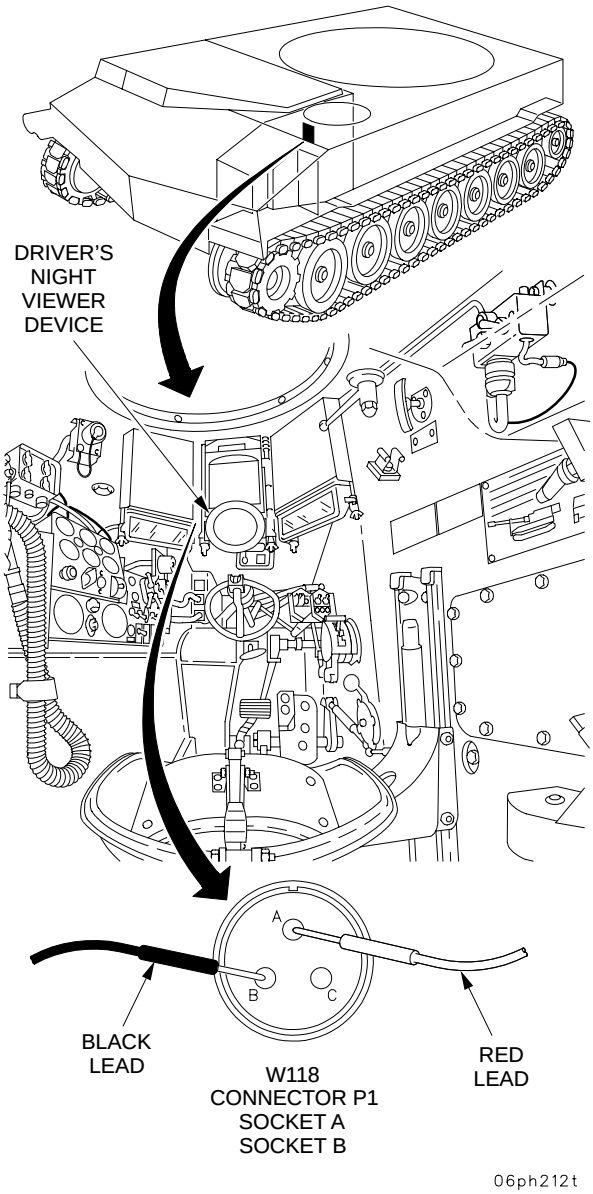
yes

Repair or replace harness W118 (para 8-77).

no

Notify direct support maintenance.

END OF TASK



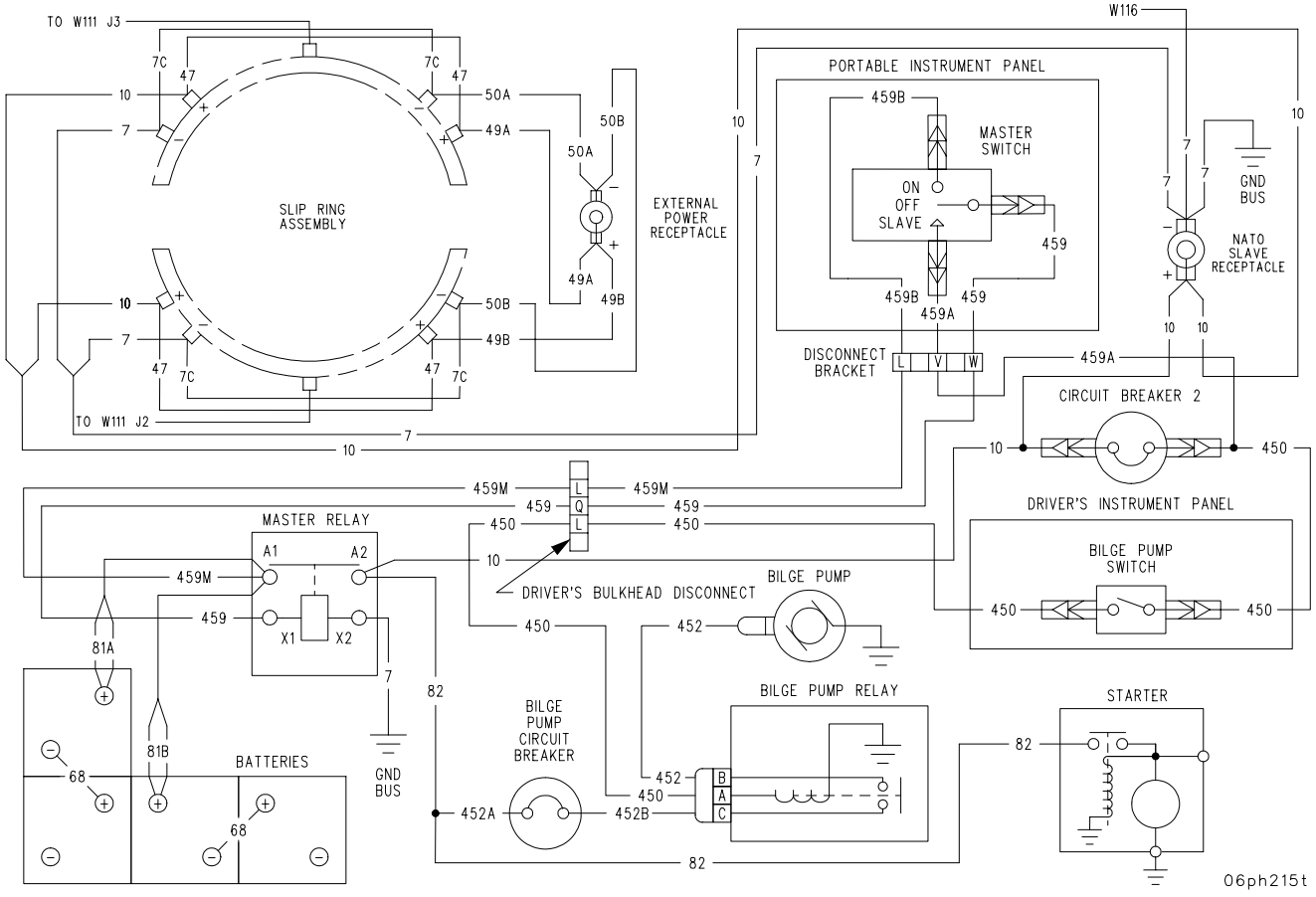
3-3 TROUBLESHOOTING CHART - CONTINUED

I. NATO SLAVE RECEPTACLE

The NATO slave receptacle is located in the driver's compartment. When a slave cable is connected between the NATO slave receptacles on two vehicles, one vehicle can power the other vehicle's system. With the vehicle MASTER switch set to ON in the master vehicle and the vehicle MASTER switch set to SLAVE in the slaved vehicle, 24 V dc is supplied to the slaved vehicle's master relay, energizing it, which supplies voltage to the batteries and starting system.

The external power receptacle is located at the right rear of the vehicle. This receptacle is used to provide power to the cab from another vehicle by connecting a slave cable to both vehicles' external power receptacles, and turning the other vehicle's MASTER switch to ON.

The diagram below shows the connection to the NATO slave and external power receptacles.



3-3 TROUBLESHOOTING CHART - CONTINUED

l.	NATO SLAVE RECEPTACLE - CONTINUED	(1)	NO POWER TO SLAVED VEHICLE'S SLIP RING FROM NATO SLAVE RECEPTACLE. Slaved vehicle had power when operating.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)

A

1. Disconnect NATO slave cable from disabled vehicle.
2. Place multimeter red lead on slave cable center contact and black lead to outer contact. Check for voltage.
3. Turn slaving POWER ON and check for voltage.

Is voltage present?

yes / no

Replace NATO slave cable or determine fault with slaving vehicle.

B

1. Reconnect NATO slave cable to disabled vehicle. Ensure NATO slave cable is fully seated in NATO slave receptacle.
2. Place multimeter red lead on NATO slave receptacle on W124 positive terminal and black lead on W116 negative terminal.

Is voltage present?

yes / no

Replace NATO slave receptacle (para 8-91).

C

1. Disconnect NATO slave cable from disabled vehicle.
2. Place one multimeter lead on NATO slave receptacle negative terminal and other lead on ground.

Is continuity present?

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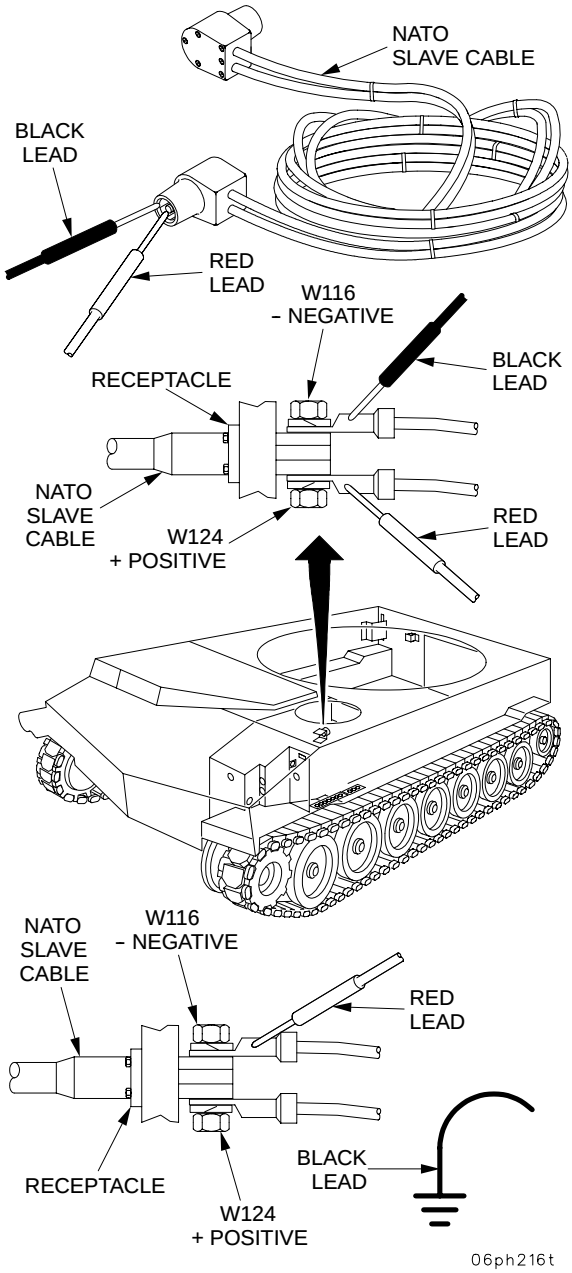

3-3 TROUBLESHOOTING CHART - CONTINUED

l.	NATO SLAVE RECEPTACLE - CONTINUED	(1)	NO POWER TO SLAVED VEHICLE'S SLIP RING FROM NATO SLAVE RECEPTACLE. Slaved vehicle had power when operating. - CONTINUED

CONTINUED FROM STEP C

yes / no

Go to step E.

D

1. Reconnect NATO slave cable to disabled vehicle. Ensure NATO slave cable is fully seated in NATO slave receptacle.
2. Check harness W117 wire 10 for voltage by placing multimeter red lead on harness W117 E7/E8 or E5/E6 and black lead to ground.

Is voltage present?

yes / no

Refer to TM 9-2350-314-20-2.

Repair or replace harness W117 (para 8-76).

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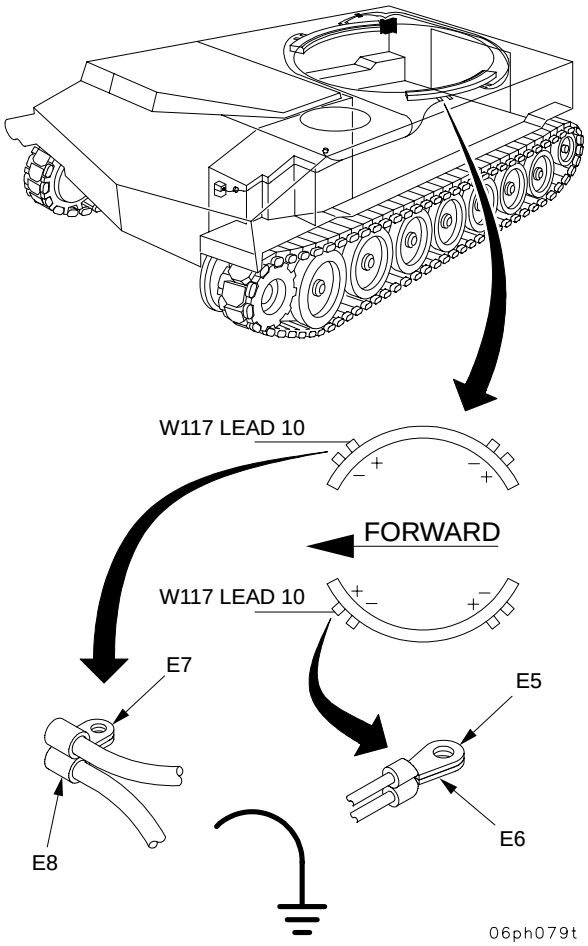


3-3 TROUBLESHOOTING CHART - CONTINUED

l.	NATO SLAVE RECEPTACLE - CONTINUED	(1)	NO POWER TO SLAVED VEHICLE'S SLIP RING FROM NATO SLAVE RECEPTACLE. Slaved vehicle had power when operating. - CONTINUED

CONTINUED FROM STEP C

E

1. Disconnect NATO slave cable from disabled vehicle.
2. Disconnect battery grounds from ground bus in battery compartment (para 8-33).
3. Disconnect harnesses W116 lead 7 connector terminals E3, E4, E5, E6, E7, E8 (para 8-75) and W125 lead 7 connector terminal E12 (para 8-83).
4. Check each connector terminal (one at a time) except W125 lead 7 for continuity by placing one multimeter lead in connector terminal and placing other multimeter lead to ground.

Is continuity present?

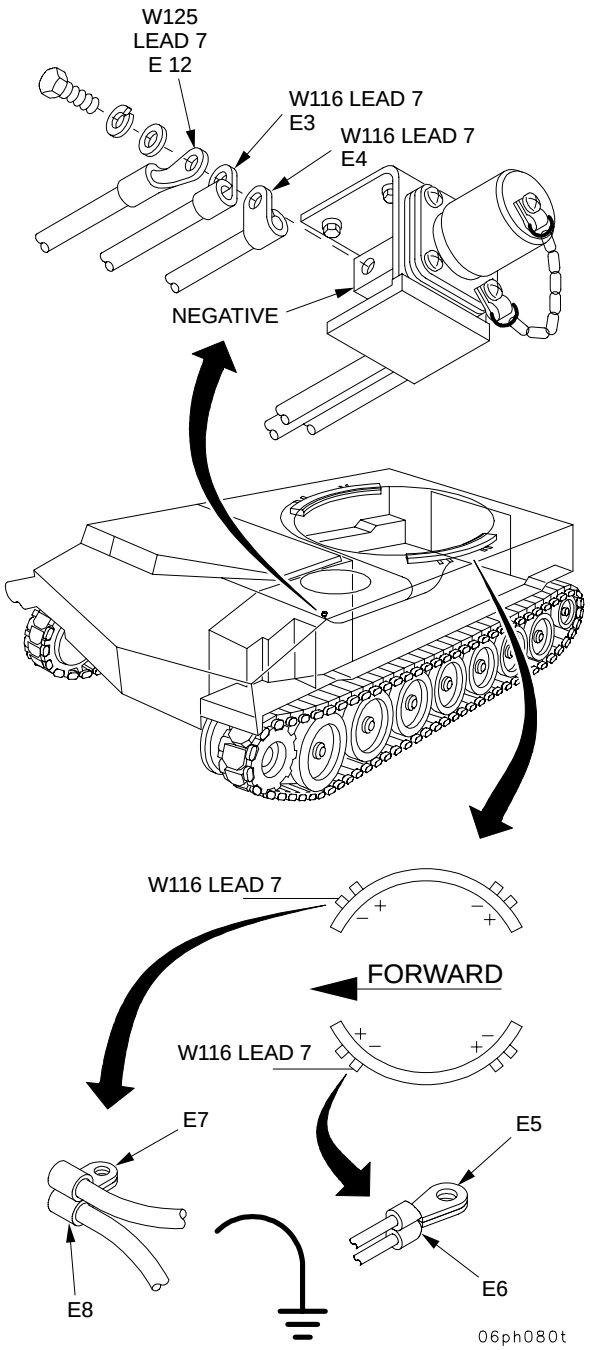
yes

no

Repair or replace harness W116 (para 8-75).

1. Reconnect harnesses W116 lead 7 connector terminals E3, E4, E5, E6, E7, E8 (para 8-75) and W125 lead 7 connector terminal E12 (para 8-83).
2. Reconnect battery grounds to ground bus in battery compartment (para 8-33).
3. Refer to TM 9-2350-314-20-2.

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

l. NATO SLAVE RECEPTACLE - CONTINUED	(2) BATTERIES FAIL TO RECHARGE WHEN VEHICLE IS SLAVED. All other electrical components operate.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)

Personnel Required
Two

Equipment Conditions
Transmission access doors open
(TM 9-2350-314-10)

A

1. Place MASTER switch to SLAVE and hold (TM 9-2350-314-10).
2. Place multimeter red lead on lead 81 connector terminal A1 at MASTER relay and black lead to ground.
3. Check for voltage.

Is a voltage of approximately 28 V dc present?

yes

no

Refer to para 3-4 a (4).

B

1. Loosen two screws and rotate cover to right (para 8-22).
2. Place multimeter red lead on lead 459 connector terminal X1 at master relay and black lead to ground.

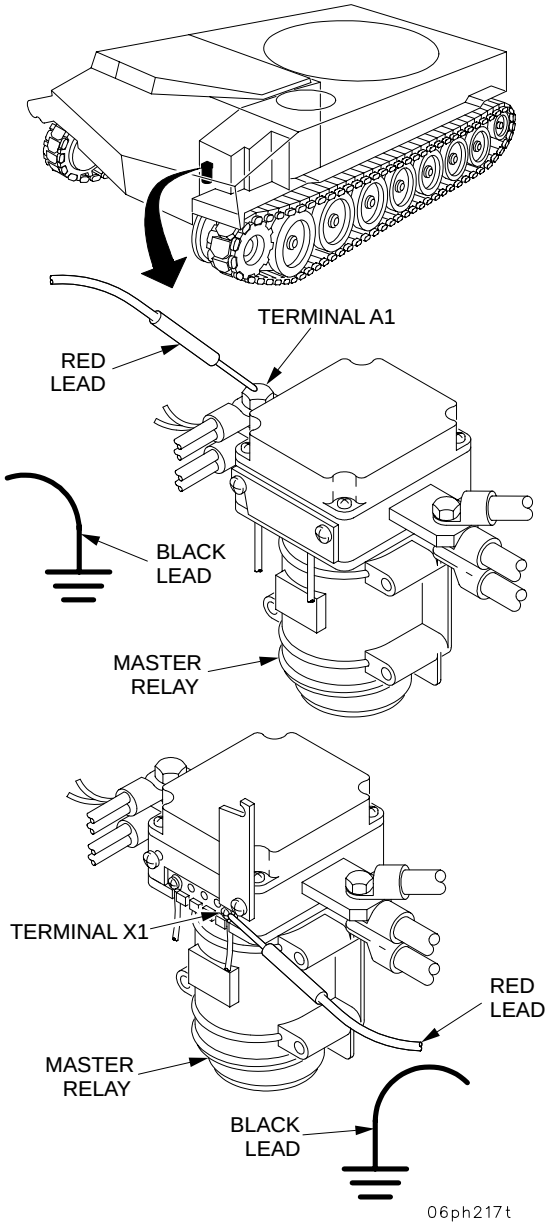
Is a voltage of approximately 28 V dc present?

yes

no

Go to step D.

CONTINUED ON NEXT PAGE



3-3 TROUBLESHOOTING CHART - CONTINUED

l. NATO SLAVE RECEPTACLE - CONTINUED	(2) BATTERIES FAIL TO RECHARGE WHEN VEHICLE IS SLAVED. All other electrical components operate. - CONTINUED

CONTINUED FROM STEP B

C Place one multimeter lead on MASTER relay terminal X2 and other lead on ground.

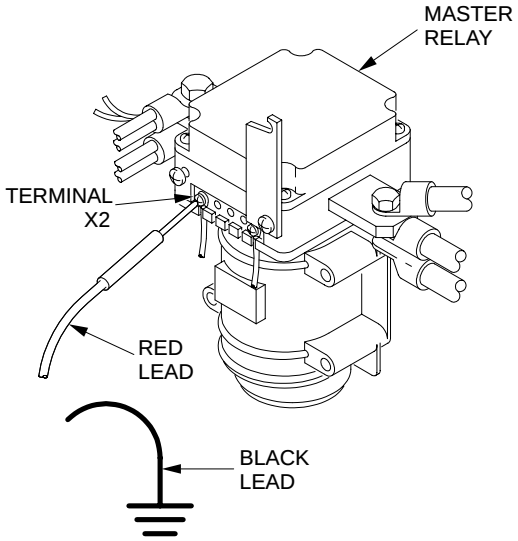
Is continuity present?

yes

Repair or replace harness W113 (para 8-72).

no

Replace MASTER relay (para 8-22).



CONTINUED FROM STEP B

D

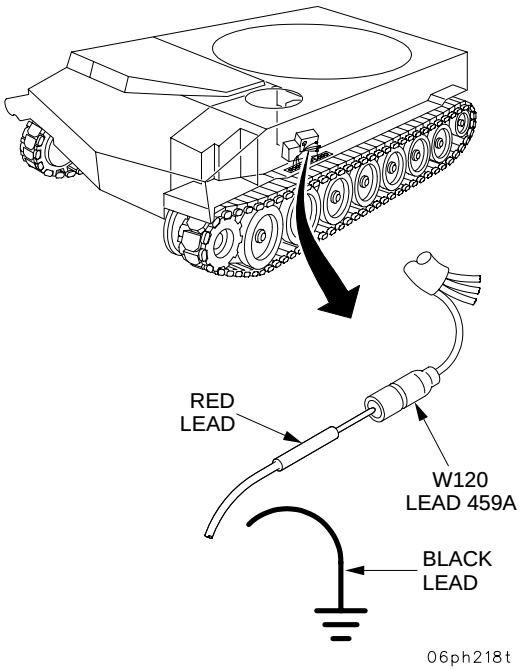
1. Disconnect slave cable (para 2-12).
2. Remove driver's instrument panel (para 8-12).
3. Disconnect harness W114 lead 459A from harness W120 lead 459A connector.
4. Place multimeter red lead in harness W120 lead 459A connector socket and black lead to ground.
5. Reconnect slave cable and check for voltage.

Is a voltage of approximately 28 V dc present?

yes

Repair or replace harness W120 (para 8-79).

no



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3-3 TROUBLESHOOTING CHART - CONTINUED

l. NATO SLAVE RECEPTACLE - CONTINUED	(2) BATTERIES FAIL TO RECHARGE WHEN VEHICLE IS SLAVED. All other electrical components operate. - CONTINUED

CONTINUED FROM STEP D

E

1. Disconnect harness W112 connector P1 from harness W114 connector J1.
2. Check harness W114 lead 459A for continuity by placing one multimeter lead in harness W114 lead 459A pin and placing the other lead in harness W114 connector J1 socket V.

Is continuity present?

yes

no

Repair or replace harness W114 (para 8-73).

F

1. Reconnect harness W114 lead 459A to harness W120 lead 459A connector.
2. Place MASTER switch to SLAVE and hold (TM 9-2350-314-10).
3. Check harness W112 for continuity by placing one multimeter lead on harness W112 connector P1 pin V and placing the other lead on pin W.

Is continuity present?

yes

no

Go to step J.

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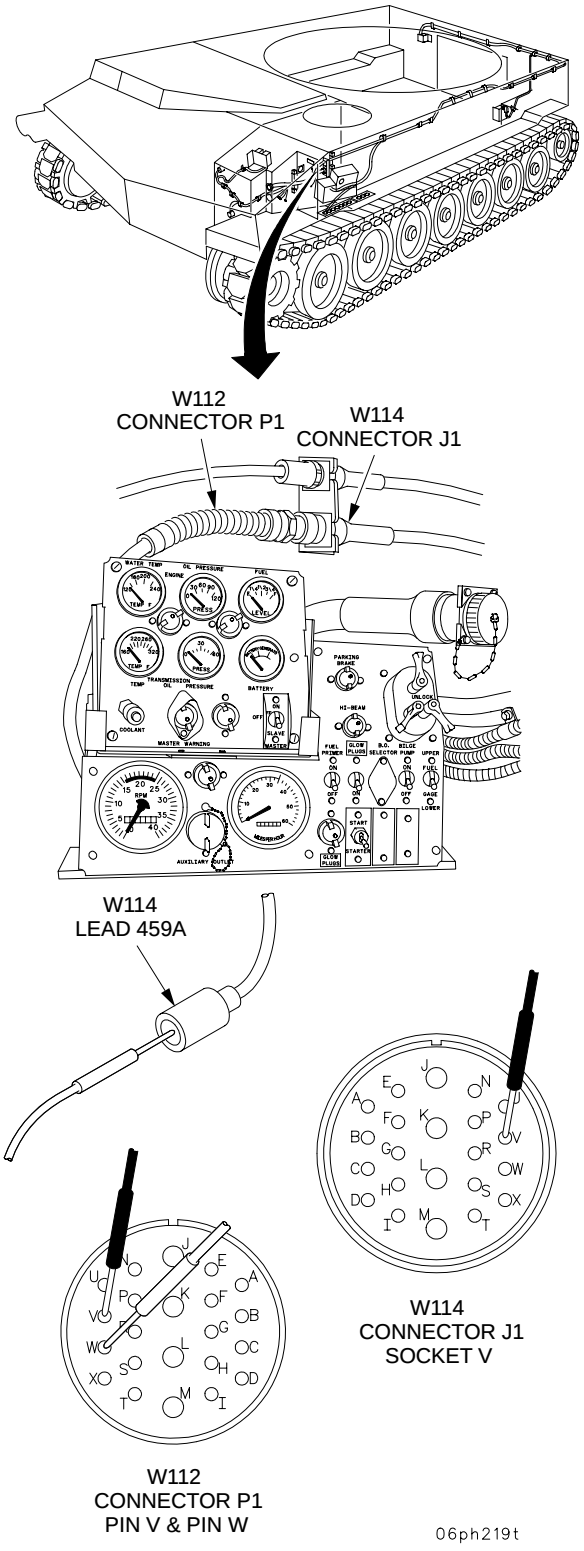

3-3 TROUBLESHOOTING CHART - CONTINUED

l.	NATO SLAVE RECEPTACLE - CONTINUED	(2)	BATTERIES FAIL TO RECHARGE WHEN VEHICLE IS SLAVED. All other electrical components operate. - CONTINUED

CONTINUED FROM STEP F

G

1. Remove driver's portable instrument panel cover (para 8-14).
2. Disconnect harness W112 lead 459A from MASTER switch connector.
3. Check harness W112 lead 459A for continuity by placing one multimeter lead in harness W112 lead 459A and placing the other lead on harness W112 connector P1 pin V.

Is continuity present?

yes / no

Repair or replace harness W112 (para 8-71).

H

1. Disconnect harness W112 lead 459 from MASTER switch.
2. Check harness W112 lead 459 for continuity by placing one multimeter lead on harness W112 lead 459 connector socket and placing the other lead on harness W112 connector P1 pin W.

Is continuity present?

yes / no

Repair or replace harness W112 (para 8-71).

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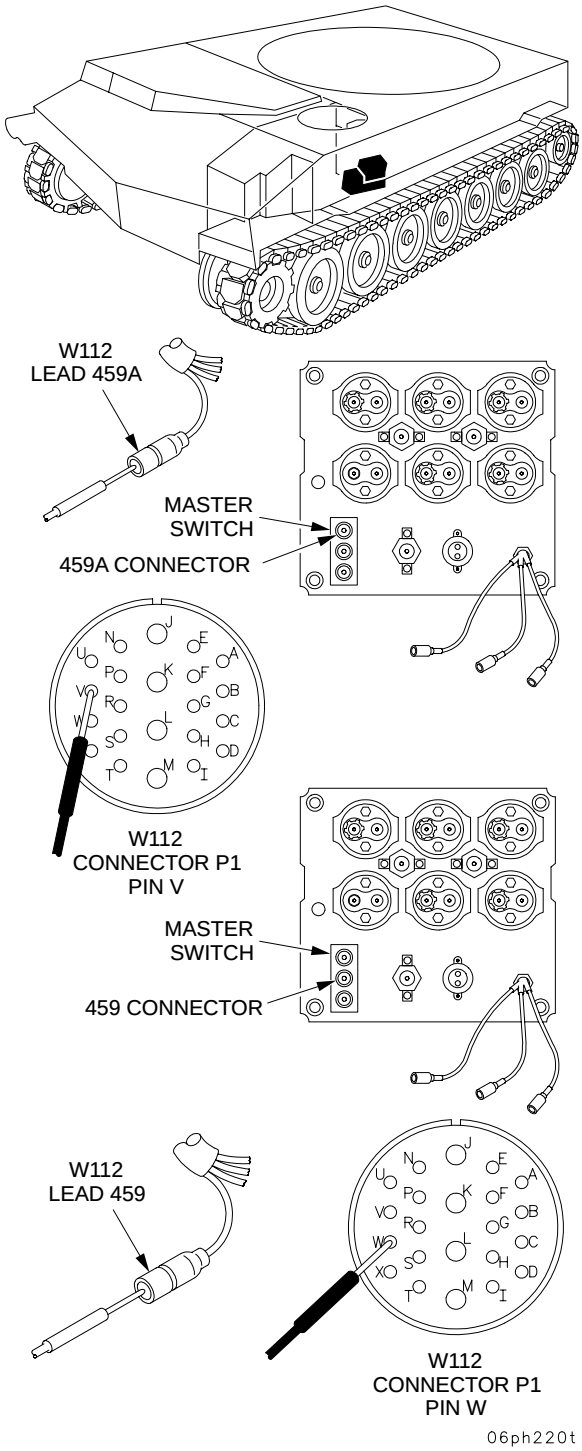


3-3 TROUBLESHOOTING CHART - CONTINUED

l. NATO SLAVE RECEPTACLE - CONTINUED	(2) BATTERIES FAIL TO RECHARGE WHEN VEHICLE IS SLAVED. All other electrical components operate. - CONTINUED

CONTINUED FROM STEP H

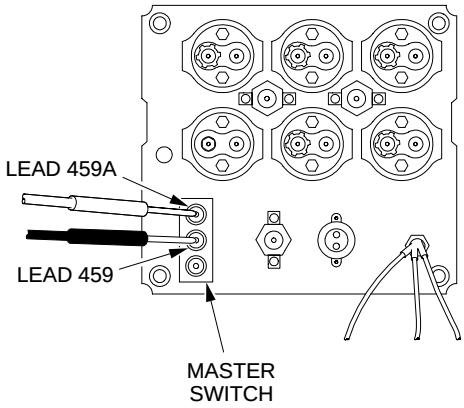
I

1. Place and hold the MASTER switch in the SLAVE position (TM 9-2350-314-10).
2. Check the MASTER switch for continuity by placing one multimeter lead in switch connector for harness W112 lead 459 and placing the other lead in switch connector for harness W112 lead 459A.

Is continuity present?

yes / no

Replace the vehicle MASTER switch (para 8-14).



CONTINUED FROM STEP F

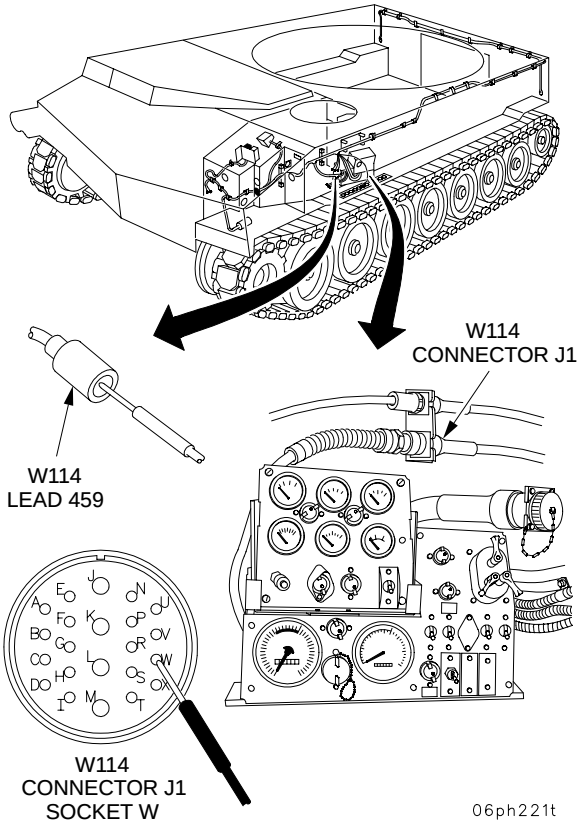
J

1. Install cover on driver's portable instrument panel.
2. Disconnect harness W114 lead 459 from harness W115 lead 459.
3. Check harness W114 lead 459 for continuity by placing one multimeter lead in harness W114 connector J1 socket W and placing the other lead in harness W114 lead 459 connector.

Is continuity present?

yes / no

Repair or replace harness W114 (para 8-73).



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3-3 TROUBLESHOOTING CHART - CONTINUED

l. NATO SLAVE RECEPTACLE - CONTINUED	(2) BATTERIES FAIL TO RECHARGE WHEN VEHICLE IS SLAVED. All other electrical components operate. - CONTINUED

CONTINUED FROM STEP J

K

1. Disconnect harness W115 connector P1 from harness W113 connector J1.
2. Check harness W115 for continuity by placing one multimeter lead in harness W115 connector P1 socket Q and other lead in harness W115 lead 459 connector socket.

Is continuity present?

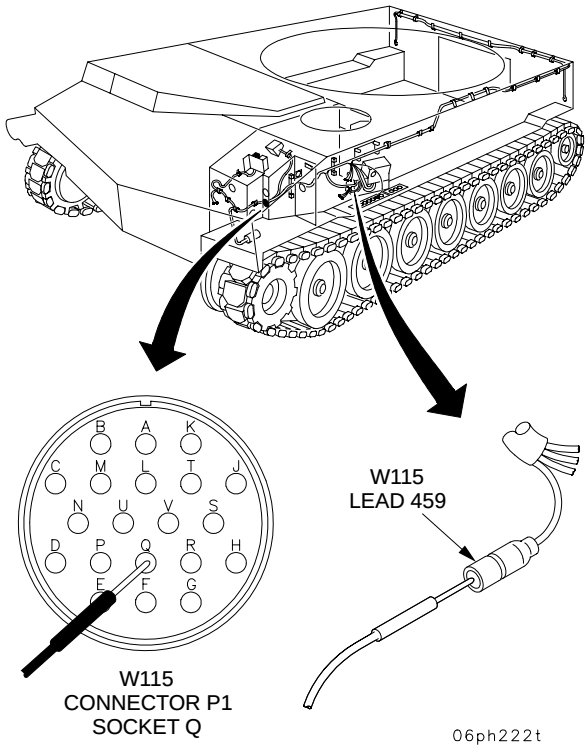
yes

Replace batteries (para 8-54).

no

Repair or replace harness W115 (para 8-74).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

l. NATO SLAVE RECEPTACLE - CONTINUED	(3) NO POWER TO VEHICLE'S SLIP RING FROM EXTERNAL POWER RECEPTACLE.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

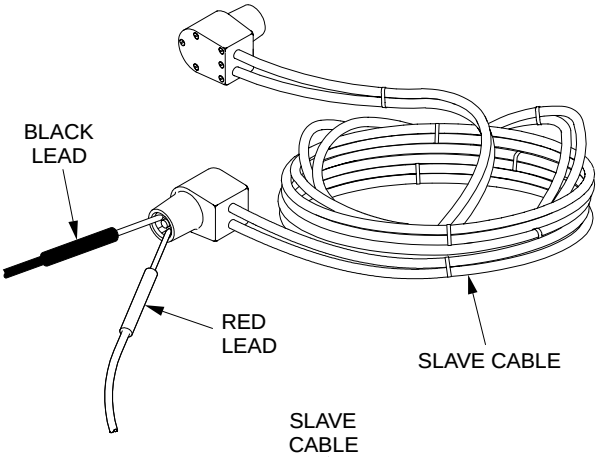
A

1. Disconnect slave cable from disabled vehicle.
2. Place multimeter red lead on slave cable center contact and black lead to outer contact.
3. Turn slaving power ON and check for voltage.

Is voltage present?

yes / no

Replace NATO slave cable or determine fault with slaving vehicle.



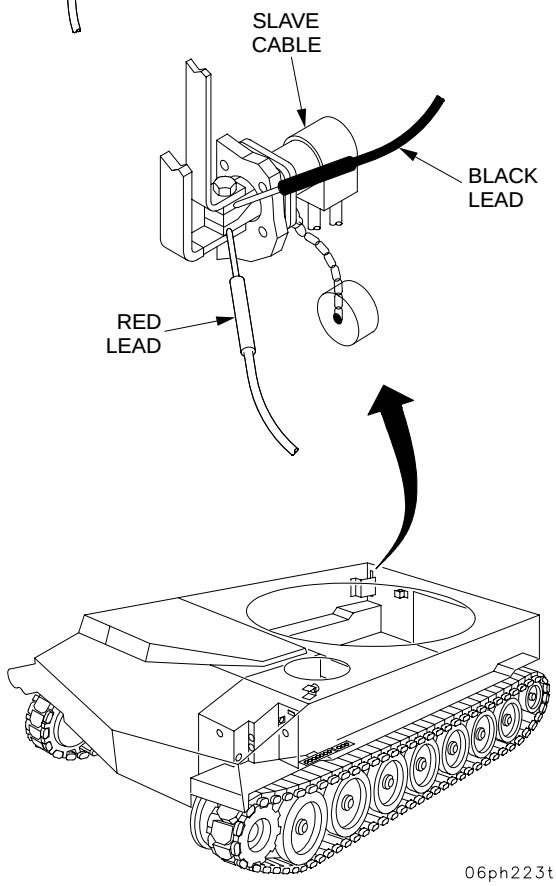
B

1. Disconnect slave cable from disabled vehicle.
2. Disconnect battery ground from ground bus located in battery compartment (para 8-33).
3. Remove external power receptacle guard (para 8-92).
4. Reconnect battery ground to ground bus located in battery compartment (para 8-33).
5. Reconnect NATO slave cable to disabled vehicle. Make sure cable is fully seated in the external power receptacle.
6. Place multimeter red lead on external power receptacle positive terminal and black lead on negative terminal. Check for voltage.

Is voltage present?

yes / no

Replace external power receptacle (para 8-91).



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3-3 TROUBLESHOOTING CHART - CONTINUED

l. NATO SLAVE RECEPTACLE - CONTINUED	(3) NO POWER TO VEHICLE'S SLIP RING FROM EXTERNAL POWER RECEPTACLE. - CONTINUED

CONTINUED FROM STEP B

C

1. Disconnect NATO slave cable from disabled vehicle.
2. Disconnect battery ground from ground bus located in battery compartment (para 8-33).
3. Disconnect leads 49B from left and 49A at right rear positive (+) ring segments.
4. Check leads one at a time from lead terminal connector to positive (+) bus bar.

Are bus bars and leads securely attached?

yes

no

Replace lead assemblies (para 8-87 and para 8-90).

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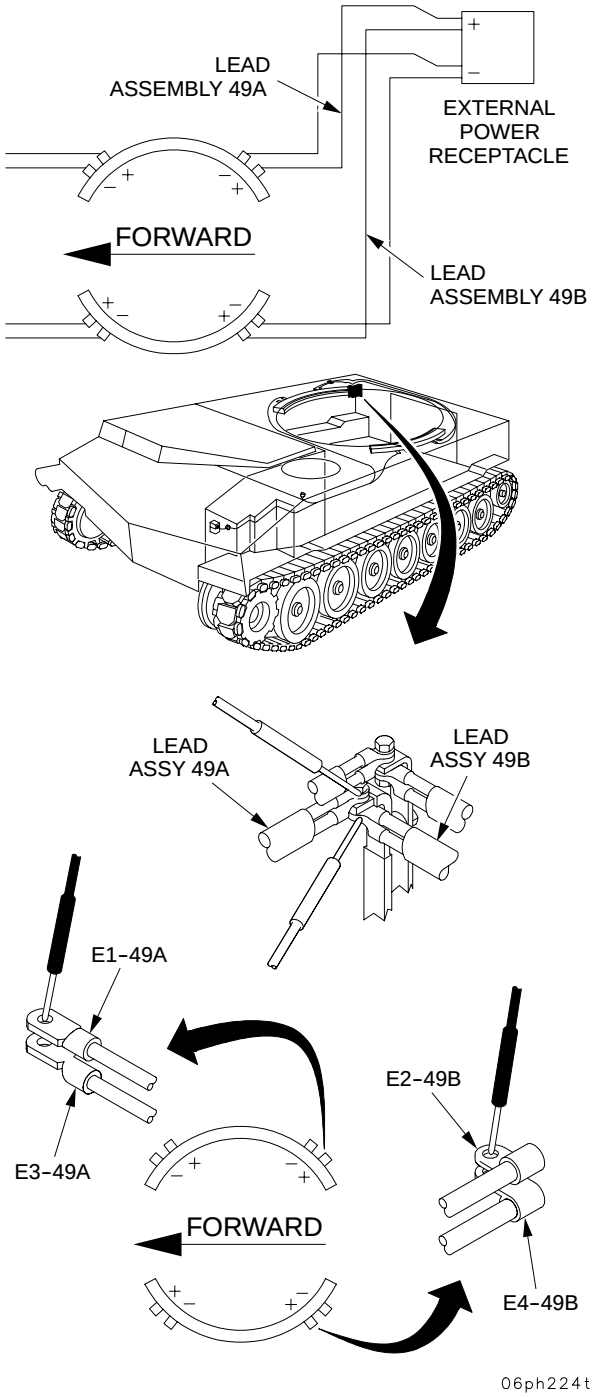


3-3 TROUBLESHOOTING CHART - CONTINUED

I. NATO SLAVE RECEPTACLE - CONTINUED	(3) NO POWER TO VEHICLE'S SLIP RING FROM EXTERNAL POWER RECEPTACLE. - CONTINUED

CONTINUED FROM STEP C

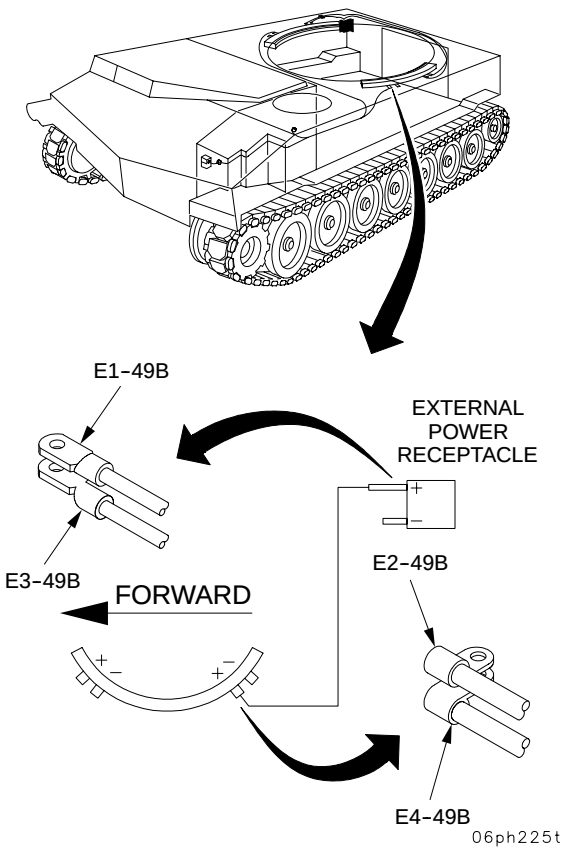
D

1. Disconnect lead 49B from left segment board and the external power receptacle.
2. Check lead for continuity by placing one multimeter lead on lead wire E1-49B and other lead on wire E2-49B.
3. Check lead 49B for continuity by placing one multimeter lead on lead wire E3-49B and other lead on wire E4-49B.

Is continuity present at both points?

yes / no

Replace lead assembly (para 8-88).



E

Perform a shorts test (para 3-1.3) on lead 49B by placing one multimeter lead on point one and other lead on point two.

POINT ONE	POINT TWO	DO NOT CHECK
E1-49B	E3-49B, E4-49B	E2-49B
E2-49B	E3-49B, E4-49B	E1-49B
E3-49B	E3-49B, E4-49B	E4-49B
E4-49B	E1-49B, E2-49B	E3-49B

Are any shorts present?

yes / no

Replace lead assembly (para 8-88).

CONTINUED ON NEXT PAGE

3-3 TROUBLESHOOTING CHART - CONTINUED

l.	NATO SLAVE RECEPTACLE - CONTINUED	(3)	NO POWER TO VEHICLE'S SLIP RING FROM EXTERNAL POWER RECEPTACLE. - CONTINUED

CONTINUED FROM STEP E

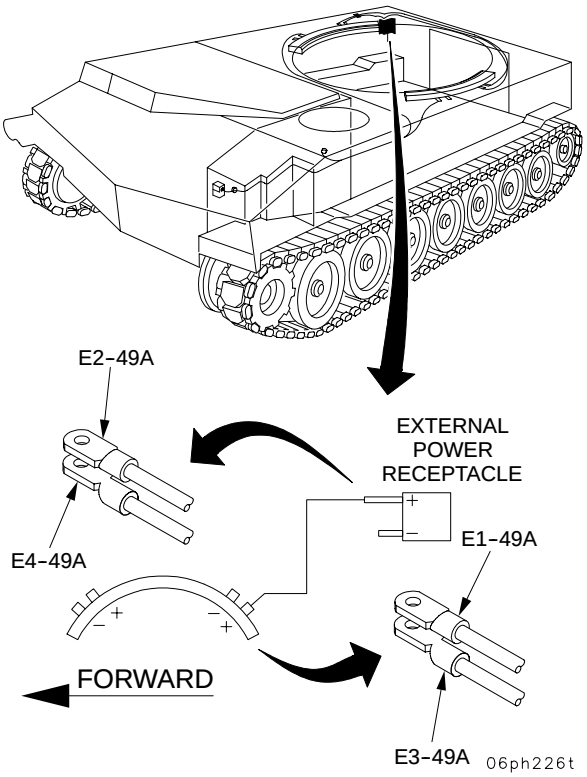
F

1. Disconnect lead 49A from right segment board and external power receptacle.
2. Check lead 49A for continuity by placing one multimeter lead on wire E1-49A and other lead on wire E2-49A.
3. Check lead 49A for continuity by placing one multimeter lead on lead wire E3-49A and other lead on wire E4-49A.

Is continuity present at both points?

yes / no

Replace lead assembly (para 8-87).



G

Perform a shorts test (para 3-1.3) on lead 49A by placing one multimeter lead on point one and other lead on point two.

POINT ONE	POINT TWO	DO NOT CHECK
E1-49A	E3-49A, E4-49A	E2-49A
E2-49A	E3-49A, E4-49A	E1-49A
E3-49A	E3-49A, E4-49A	E4-49A
E4-49A	E1-49A, E2-49A	E3-49A

Are any shorts present?

yes / no

Replace lead assembly (para 8-87).

CONTINUED ON NEXT PAGE

3-3 TROUBLESHOOTING CHART - CONTINUED

l. NATO SLAVE RECEPTACLE - CONTINUED	(3) NO POWER TO VEHICLE'S SLIP RING FROM EXTERNAL POWER RECEPTACLE. - CONTINUED

CONTINUED FROM STEP G

H

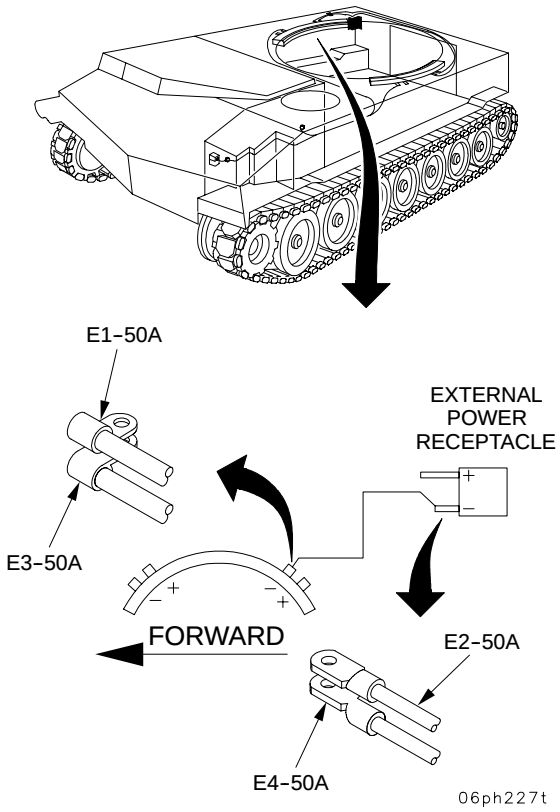
1. Disconnect lead 50A from right segment board and external power receptacle.
2. Check lead 50A for continuity by placing one multimeter lead on wire E1-50A and other lead on wire E2-50A.
3. Check lead 50A for continuity by placing one multimeter lead on lead wire E3-50A and other lead on wire E4-50A.

Is continuity present at both points?

yes

no

Replace lead assembly (para 8-89).



I

Perform a shorts test (para 3-1.3) on lead 50A by placing one multimeter lead on point one and other lead on point two.

POINT ONE	POINT TWO	DO NOT CHECK
E1-50A	E3-50A, E4-50A	E2-50A
E2-50A	E3-50A, E4-50A	E1-50A
E3-50A	E3-50A, E4-50A	E4-50A
E4-50A	E1-50A, E2-50A	E3-50A

Are any shorts present?

yes

no

Replace lead assembly (para 8-89).

CONTINUED ON NEXT PAGE

3-3 TROUBLESHOOTING CHART - CONTINUED

l. NATO SLAVE RECEPTACLE - CONTINUED	(3) NO POWER TO VEHICLE'S SLIP RING FROM EXTERNAL POWER RECEPTACLE. - CONTINUED

CONTINUED FROM STEP I

J

1. Disconnect lead 50B from right segment board and external power receptacle.
2. Check lead 50B for continuity by placing one multimeter lead on lead wire E1-50B and other lead on wire E2-50B.
3. Check lead 50B for continuity by placing one multimeter lead on lead wire E3-50B and other lead on wire E4-50B.

Is continuity present?

yes

Replace lead assembly (para 8-89).

no

K

Perform a shorts test (para 3-1.3) on lead 50B by placing one multimeter lead on point one and other lead on point two.

POINT ONE	POINT TWO	DO NOT CHECK
E1-50B	E3-50B, E4-50B	E2-50B
E2-50B	E3-50B, E4-50B	E1-50B
E3-50B	E1-50B, E2-50B	E4-50B
E4-50B	E1-50B, E2-50B	E3-50B

Are any shorts present?

yes

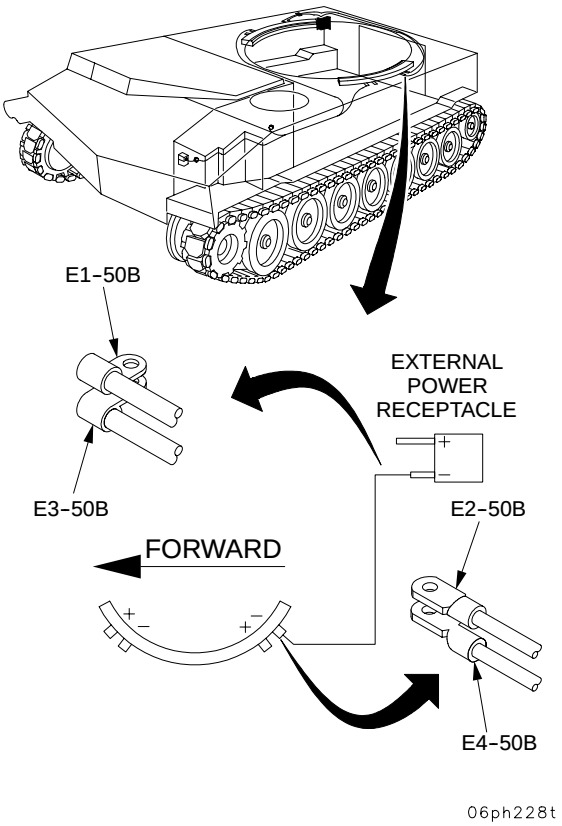
Replace lead assembly (para 8-89).

no

L

1. Reconnect leads 49A, 49B, 50A, 50B at segment boards and external power receptacle (para 8-87, 8-88, 8-89, and 8-90).
2. Reconnect battery ground at ground bus located in battery compartment (para 8-33).
3. Refer to TM 9-2350-314-20-2.

END OF TASK

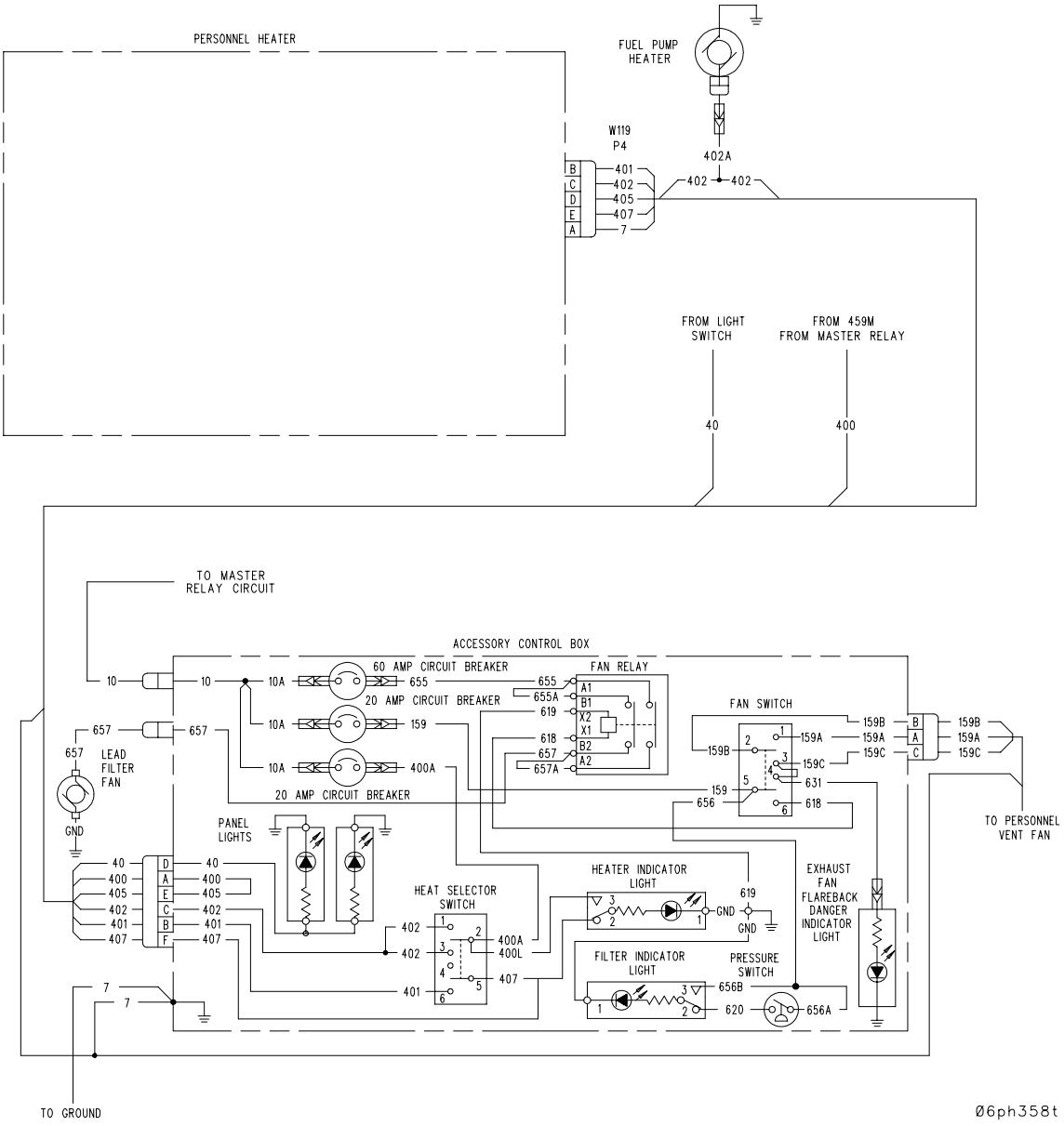


3-3 TROUBLESHOOTING CHART - CONTINUED

m. PERSONNEL HEATER (For vehicles with Accessory Control Box P/N 12268582)

The personnel heater system consists of the personnel heater, accessory control box, and heater fuel pump. The diagram below shows the relationship of these components.

When the vehicle MASTER switch is turned ON, 24 V dc is supplied to the accessory control panel. When the HEAT SELECTOR SWITCH is turned to LOW, voltage is applied to the heater fuel pump and personnel heater. After approximately 3 minutes, the heater indicator light will illuminate to indicate the heater is operating properly.



3-3 TROUBLESHOOTING CHART - CONTINUED

m. PERSONNEL HEATER - CONTINUED	(1) PERSONNEL HEATER FAILS TO OPERATE. Other electrical components operate.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Personnel Required
Two

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W124 P1 lead 10 from accessory control box connector.
3. Place multimeter red lead on harness W124 P1 lead 10 connector socket and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes → Repair or replace harness W124 (para 8-82).

no

WARNING
Harness W119 connector at lead 400 accessory control box has battery voltage if batteries are connected. Use care when removing connector to avoid electrical shock and burns.

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W119 connector P1 from accessory control box connector J1.
3. Place multimeter red lead on harness W119 connector P1 pin A and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
5. Check for voltage.

Is voltage present?

yes → Go to step D.

no

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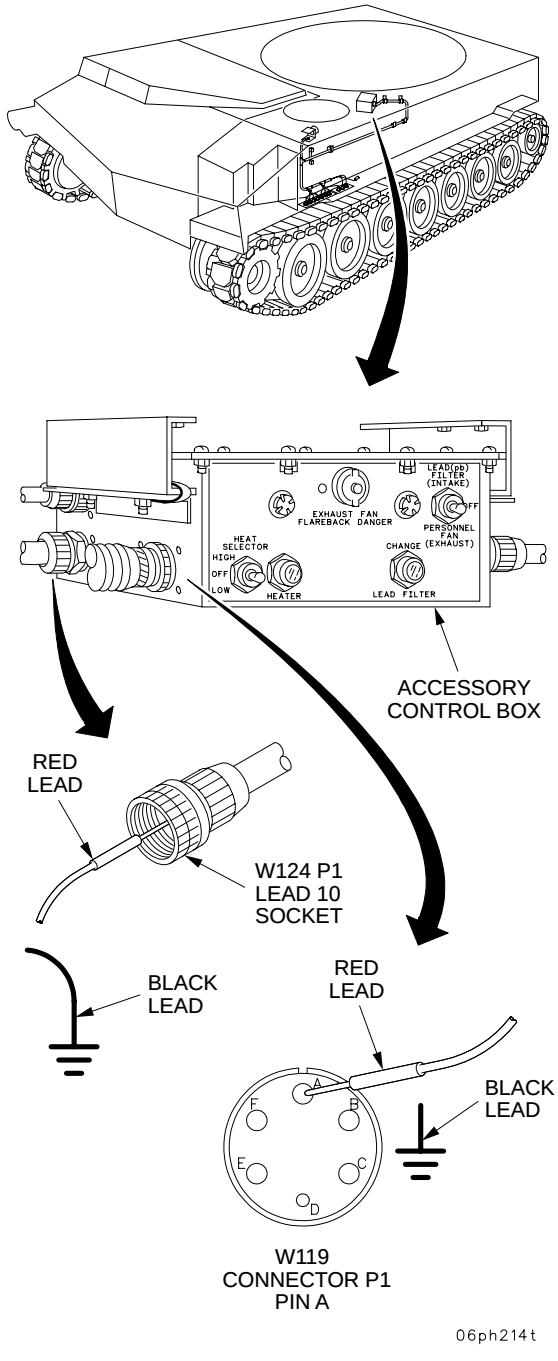


3-3 TROUBLESHOOTING CHART - CONTINUED

m. PERSONNEL HEATER - CONTINUED	(1) PERSONNEL HEATER FAILS TO OPERATE. Other electrical components operate. - CONTINUED

CONTINUED FROM STEP B

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W119 lead 400 from harness W114 lead 400 connector.
3. Place multimeter red lead in harness W114 lead 400 connector socket and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
5. Check for voltage.

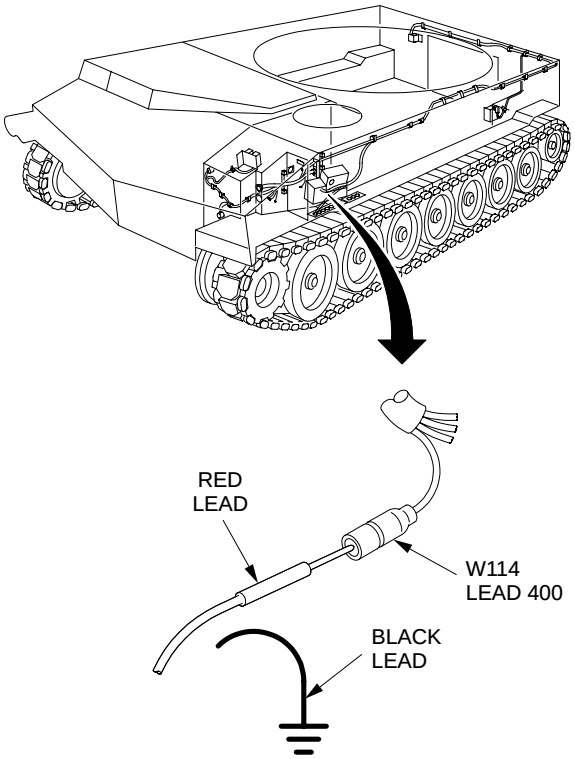
Is voltage present?

yes

Repair or replace harness W114 (para 8-73).

no

Repair or replace harness W119 (para 8-78).



CONTINUED FROM STEP B

D

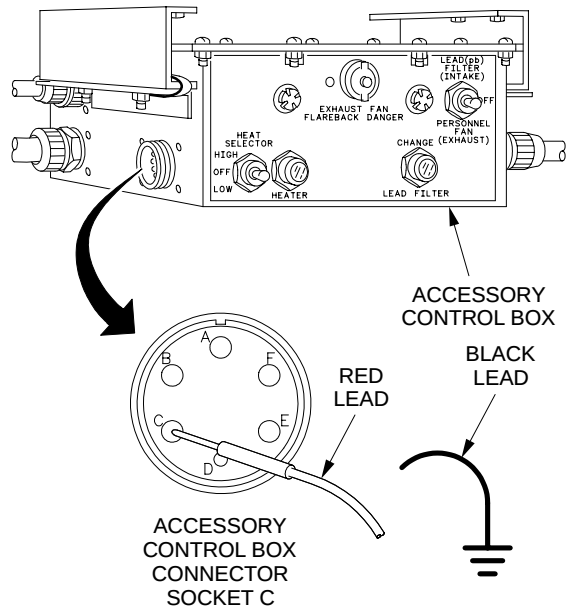
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W124 P1 lead 10 to accessory control box connector.
3. Turn heater selector switch to LOW or HIGH (TM 9-2350-314-10).
4. Place multimeter red lead in accessory control box connector socket C and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
6. Check for voltage.

Is voltage present?

yes

Replace accessory control box (para 8-19).

no



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3-3 TROUBLESHOOTING CHART - CONTINUED

m. PERSONNEL HEATER - CONTINUED	(1) PERSONNEL HEATER FAILS TO OPERATE. Other electrical components operate. - CONTINUED

CONTINUED FROM STEP D

E

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Make the following continuity checks of harness W119:

   Disconnect harness W119 connector P4 from personnel heater and:

   a. Place one multimeter lead on connector P1 pin B and other lead in connector P4 socket B.
   b. Place one multimeter lead on connector P1 pin C and other lead in connector P4 socket C.
   c. Place one multimeter lead on connector P1 pin E and other lead in connector P4 socket D.
   d. Place one multimeter lead on connector P1 pin F and other lead in connector P4 socket E.
   e. Place one multimeter lead on control box ground terminal and other lead in connector P4 socket A.

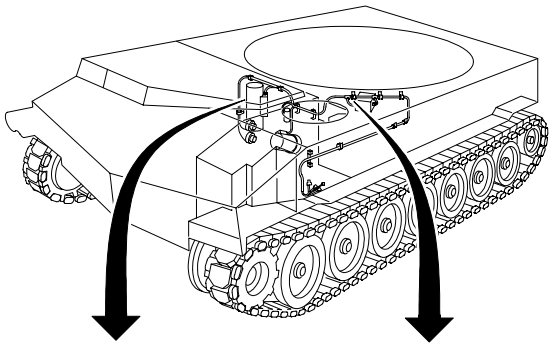
Is continuity present?

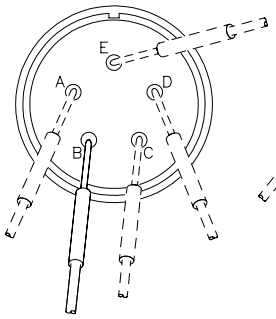
yes

Repair or replace harness W119 (para 8-78).

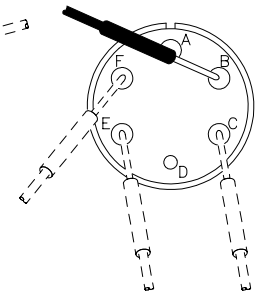
no

Troubleshoot personnel heater (TM 9-2540-205-24&P).

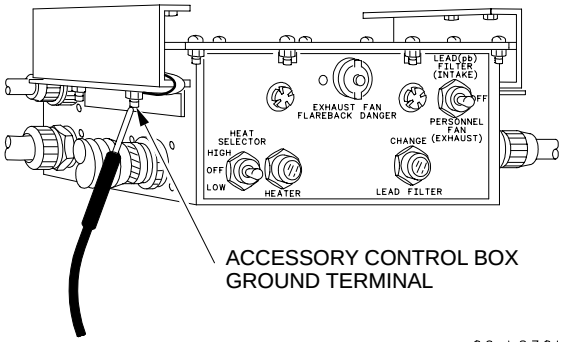




W119
CONNECTOR P4
SOCKET B
(SOCKET C)
(SOCKET D)
(SOCKET E)
(SOCKET A)



W119
CONNECTOR P1
PIN B
(PIN C)
(PIN E)
(PIN F)



ACCESSORY CONTROL BOX GROUND TERMINAL

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END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

m. PERSONNEL HEATER - CONTINUED	(2) HEATER MOTOR RUNS BUT HEATER FAILS TO OPERATE. Sufficient fuel is in tank.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W119 lead 402A from heater fuel pump connector.
3. Place multimeter red lead in harness W119 lead 402A connector socket and black lead to ground.
4. Make sure HEAT selector switch is on (HIGH or LOW) (TM 9-2350-314-10).
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes → Repair or replace harness W119 (para 8-78).

no

WARNING
Do not use open flame or smoke when working on the fuel system; an explosion may occur, causing severe injury or death.

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W119 lead 402A to heater fuel pump.
3. Disconnect fuel line from heater fuel pump at fuel filter (para 18-8).
4. Place fuel line in suitable container to catch fuel.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is fuel pumped into container?

yes → Go to step D.

no

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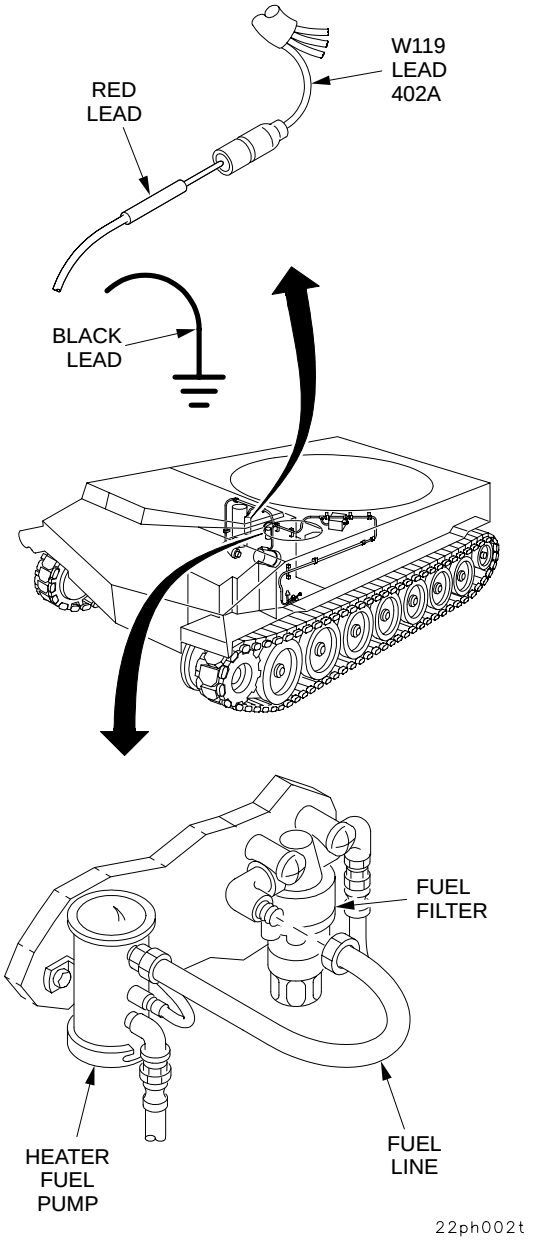


3-3 TROUBLESHOOTING CHART - CONTINUED

m. PERSONNEL HEATER - CONTINUED	(2) HEATER MOTOR RUNS BUT HEATER FAILS TO OPERATE. Sufficient fuel is in tank. - CONTINUED

CONTINUED FROM STEP B

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect heater fuel pump inlet fuel line from quick-disconnect.
3. Place line in suitable container of fuel.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is fuel pumped from container?

yes

Replace heater fuel pump (para 18-8).

no

Check fuel line from fuel pump to fuel filter for kinks, pinching, clogging, and leaks (para 18-9). Clean or replace as required.

CONTINUED FROM STEP B

D

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect fuel line from fuel pump to fuel filter.
3. Disconnect fuel line at personnel heater (para 18-9).
4. Place line in suitable container to catch fuel.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

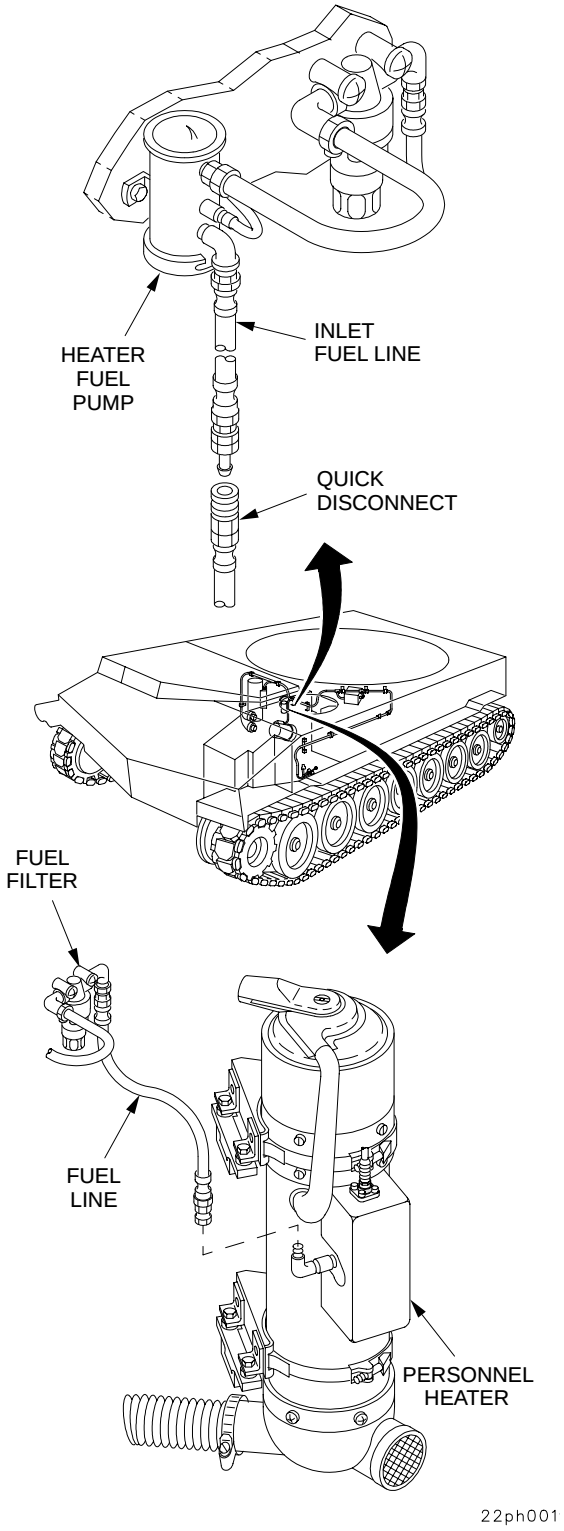
Is fuel pumped into container?

yes

Check fuel lines and filters for kinks, pinching, clogging, and leaks (para 18-9). Clean or replace as required.

no

Troubleshoot personnel heater (TM 9-2540-205-24&P).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

m. PERSONNEL HEATER - CONTINUED	(3) HEATER WILL NOT STOP RUNNING WITH SWITCH OFF. All other electrical components operate properly.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

WARNING
If heater is blowing hot air, do not disconnect any electrical leads to the heater. An explosion may occur causing severe injury or death.

1. If heater continues to blow hot air after switch is turned off and after cool down period has elapsed (one to two minutes), go to heater fuel pump and disconnect harness W119 lead 402A.
2. When heater blows cool air, turn vehicle MASTER switch OFF (TM 9-2350-314-10).

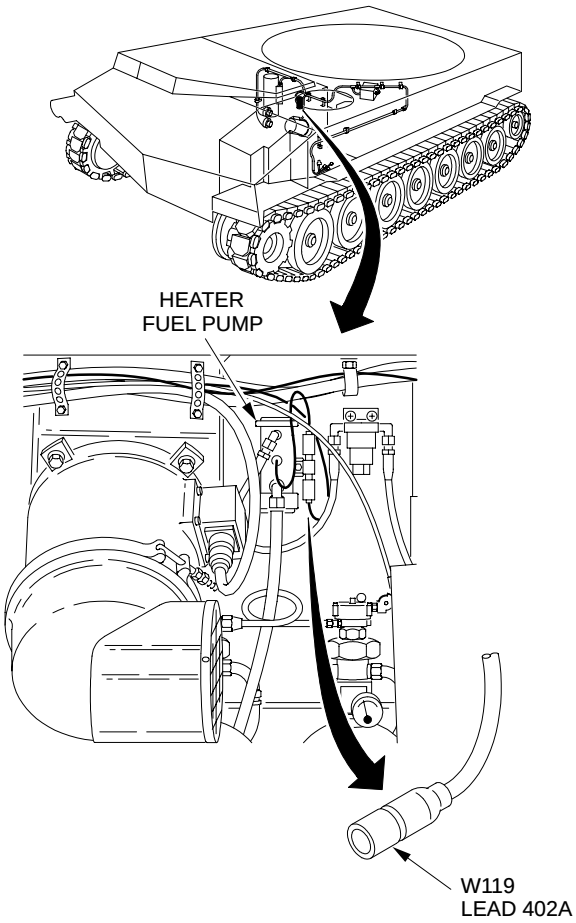
Does heater motor continue to operate?

yes

Disconnect harness W119 at personnel heater. Troubleshoot personnel heater (TM 9-2540-205-24&P).

no

Notify Direct Support Maintenance.



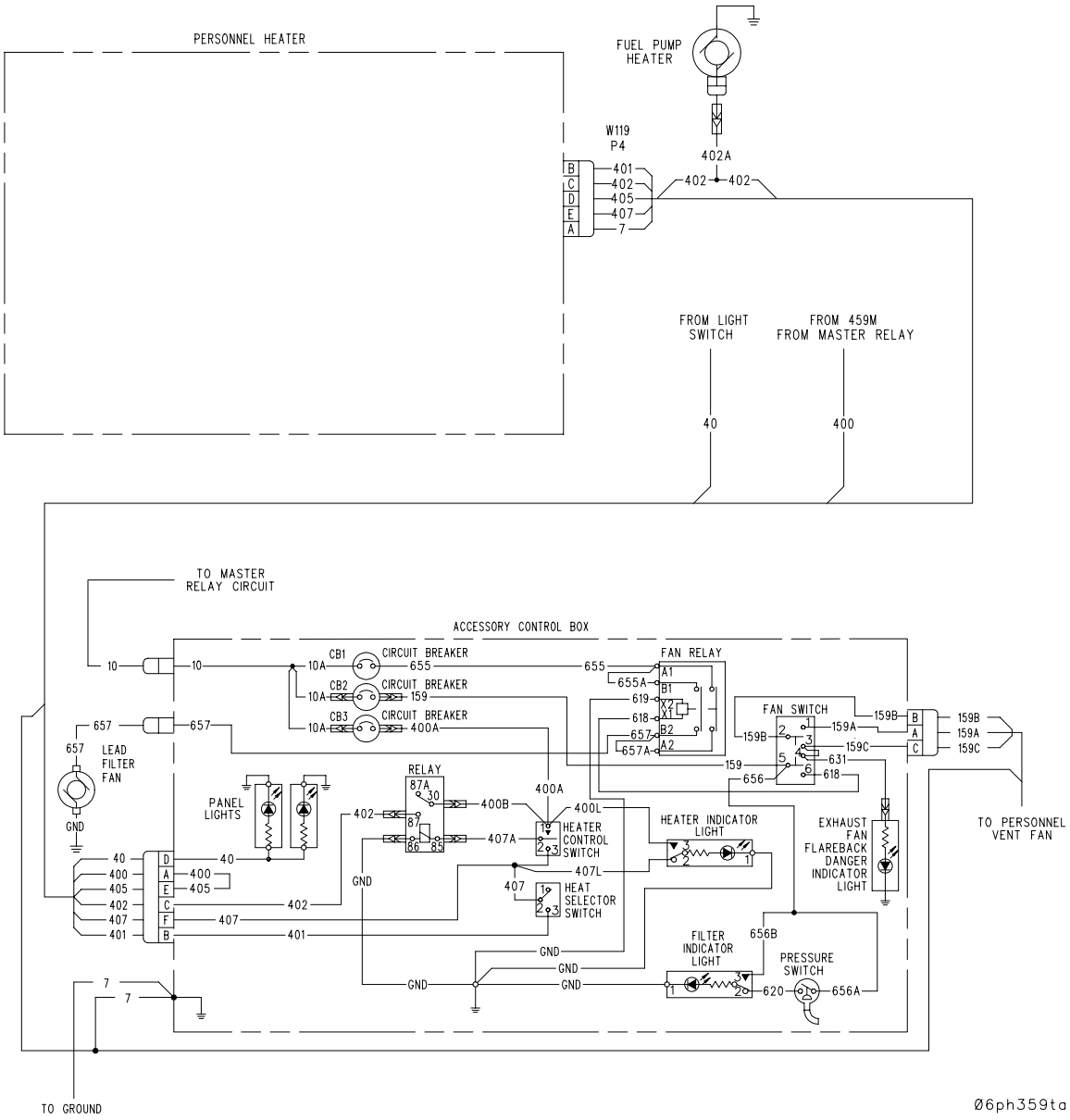
END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

m.1 PERSONNEL HEATER (For vehicles with Accessory Control Box P/N 12268547)

The personnel heater system consists of the personnel heater, accessory control box, and heater fuel pump. The diagram below shows the relationship of these components.

When the vehicle MASTER switch is turned ON, 24 V dc is supplied to the accessory control panel. When the HEAT SELECTOR SWITCH is turned to LOW, voltage is applied to the heater fuel pump and personnel heater. After approximately 3 minutes, the heater indicator light will illuminate to indicate the heater is operating properly.



3-3 TROUBLESHOOTING CHART - CONTINUED

m.1 PERSONNEL HEATER - CONTINUED	(1) PERSONNEL HEATER FAILS TO OPERATE. Other electrical components operate.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Personnel Required
Two

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W124 P1 lead 10 from accessory control box connector.
3. Place multimeter red lead on harness W124 P1 lead 10 connector socket and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

no

Repair or replace harness W124 (para 8-82).

WARNING
Harness W119 connector at lead 400 accessory control box has battery voltage if batteries are connected. Use care when removing connector to avoid electrical shock and burns.

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W119 connector P1 from accessory control box connector J1.
3. Place multimeter red lead on harness W119 connector P1 pin A and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
5. Check for voltage.

Is voltage present?

yes

no

Go to step D.

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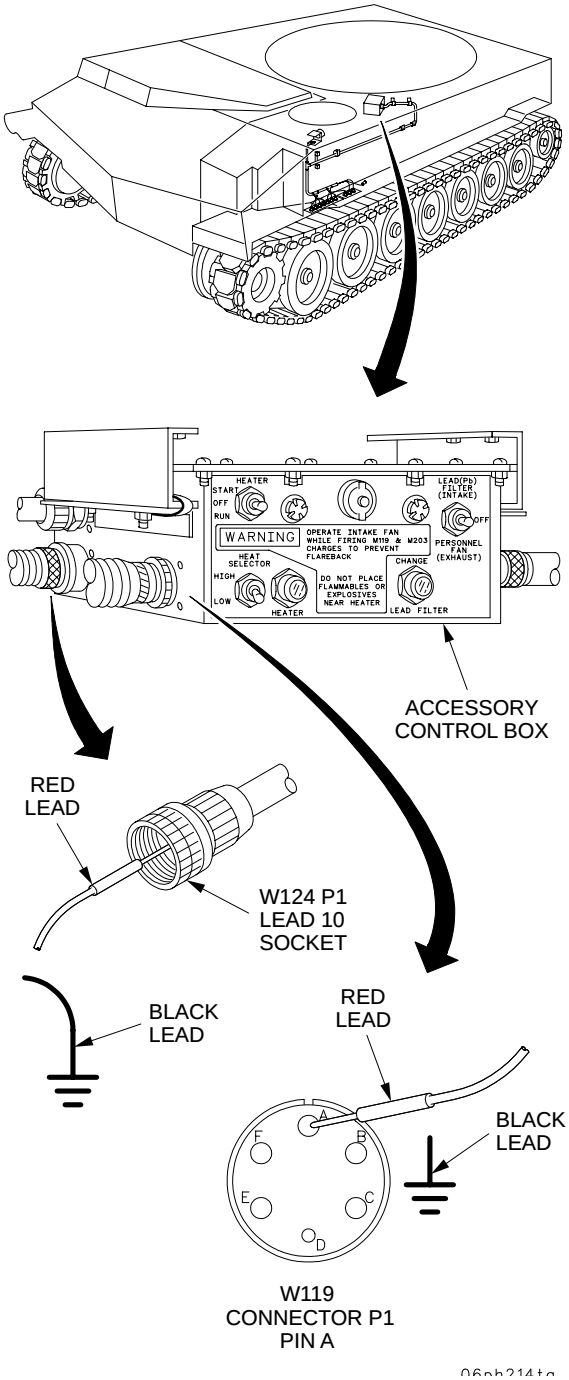


3-3 TROUBLESHOOTING CHART - CONTINUED

m.1 PERSONNEL HEATER - CONTINUED	(1) PERSONNEL HEATER FAILS TO OPERATE. Other electrical components operate. - CONTINUED

CONTINUED FROM STEP B

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W119 lead 400 from harness W114 lead 400 connector.
3. Place multimeter red lead in harness W114 lead 400 connector socket and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
5. Check for voltage.

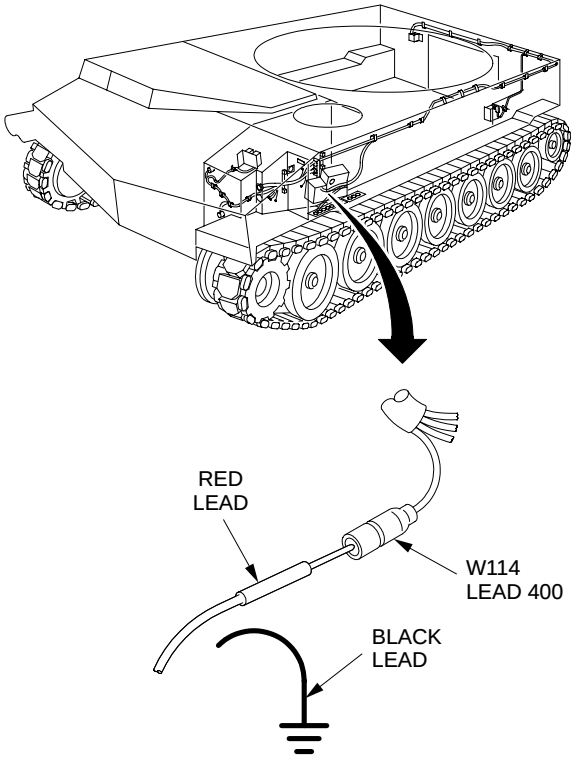
Is voltage present?

yes

Repair or replace harness W114 (para 8-73).

no

Repair or replace harness W119 (para 8-78).



CONTINUED FROM STEP B

D

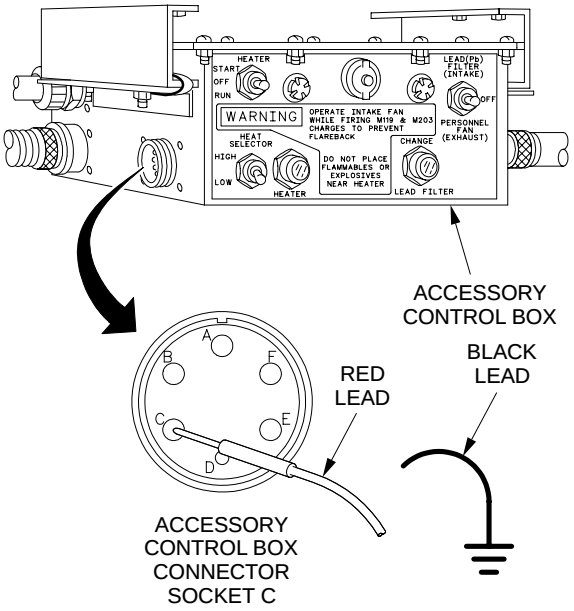
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W124 P1 lead 10 to accessory control box connector.
3. Turn HEATER switch to START or RUN (TM 9-2350-314-10).
4. Place multimeter red lead in accessory control box connector socket C and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
6. Check for voltage.

Is voltage present?

yes

Replace accessory control box (para 8-19).

no



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3-3 TROUBLESHOOTING CHART - CONTINUED

m.1 PERSONNEL HEATER - CONTINUED	(1) PERSONNEL HEATER FAILS TO OPERATE. Other electrical components operate. - CONTINUED

CONTINUED FROM STEP D

E

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Make the following continuity checks of harness W119:

   Disconnect harness W119 connector P4 from personnel heater and:

   a. Place one multimeter lead on connector P1 pin B and other lead in connector P4 socket B.
   b. Place one multimeter lead on connector P1 pin C and other lead in connector P4 socket C.
   c. Place one multimeter lead on connector P1 pin E and other lead in connector P4 socket D.
   d. Place one multimeter lead on connector P1 pin F and other lead in connector P4 socket E.
   e. Place one multimeter lead on control box ground terminal and other lead in connector P4 socket A.

Is continuity present?

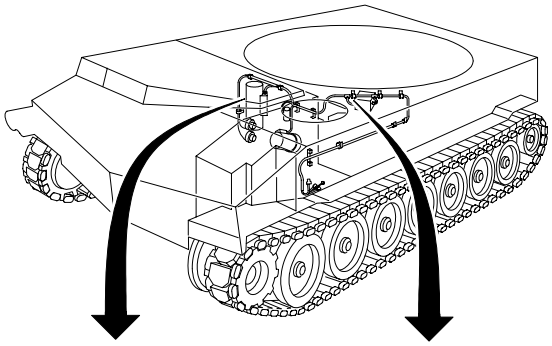
yes

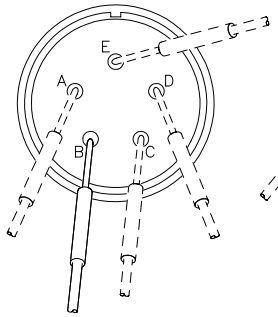
Repair or replace harness W119 (para 8-78).

no

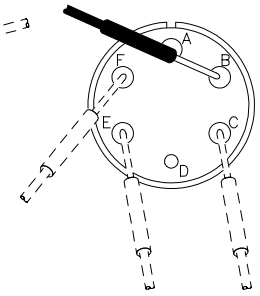
Troubleshoot personnel heater (TM 9-2540-205-24&P).

END OF TASK

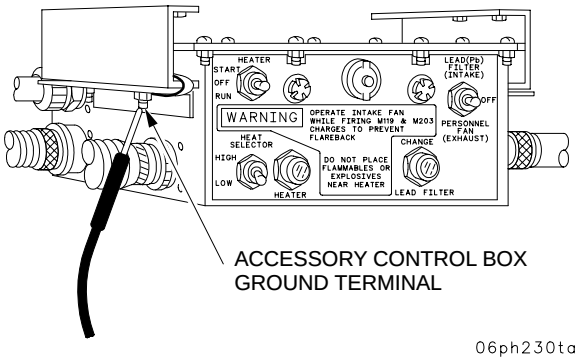




W119
CONNECTOR P4
SOCKET B
(SOCKET C)
(SOCKET D)
(SOCKET E)
(SOCKET A)



W119
CONNECTOR P1
PIN B
(PIN C)
(PIN E)
(PIN F)



ACCESSORY CONTROL BOX GROUND TERMINAL

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3-3 TROUBLESHOOTING CHART - CONTINUED

m.1 PERSONNEL HEATER - CONTINUED	(2) HEATER MOTOR RUNS BUT HEATER FAILS TO OPERATE. Sufficient fuel is in tank.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W119 lead 402A from heater fuel pump connector.
3. Place multimeter red lead in harness W119 lead 402A connector socket and black lead to ground.
4. Make sure HEATER control switch is on (START or RUN) (TM 9-2350-314-10).
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes

no

Repair or replace harness W119 (para 8-78).

WARNING
Do not use open flame or smoke when working on the fuel system; an explosion may occur, causing severe injury or death.

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W119 lead 402A to heater fuel pump.
3. Disconnect fuel line from heater fuel pump at fuel filter (para 18-8).
4. Place fuel line in suitable container to catch fuel.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is fuel pumped into container?

yes

no

Go to step D.

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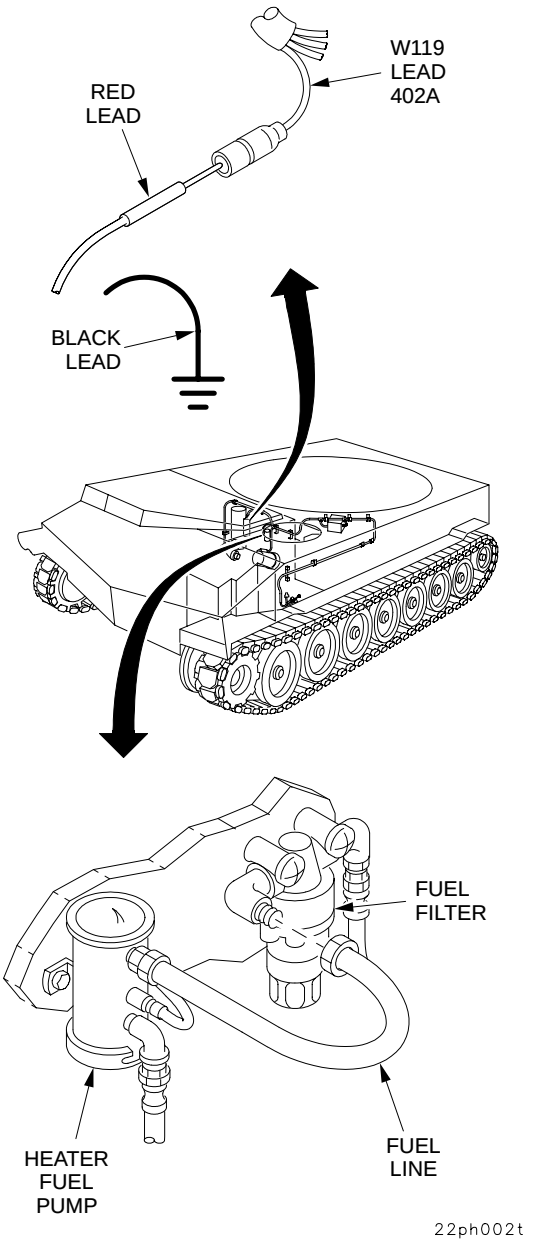


3-3 TROUBLESHOOTING CHART - CONTINUED

m.1 PERSONNEL HEATER - CONTINUED	(2) HEATER MOTOR RUNS BUT HEATER FAILS TO OPERATE. Sufficient fuel is in tank. - CONTINUED

CONTINUED FROM STEP B

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect heater fuel pump inlet fuel line from quick-disconnect.
3. Place line in suitable container of fuel.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is fuel pumped from container?

yes

Replace heater fuel pump (para 18-8).

no

Check fuel line from fuel pump to fuel filter for kinks, pinching, clogging, and leaks (para 18-9). Clean or replace as required.

CONTINUED FROM STEP B

D

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect fuel line from fuel pump to fuel filter.
3. Disconnect fuel line at personnel heater (para 18-9).
4. Place line in suitable container to catch fuel.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is fuel pumped into container?

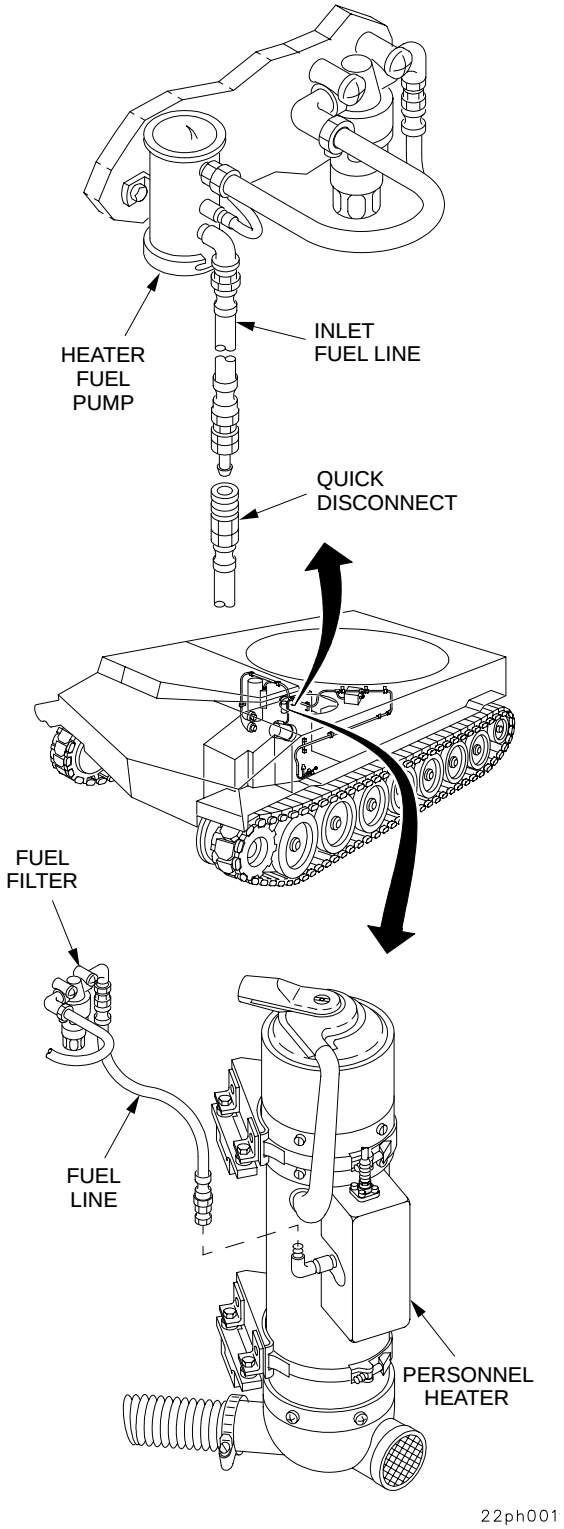
yes

Troubleshoot personnel heater (TM 9-2540-205-24&P).

no

Check fuel lines and filters for kinks, pinching, clogging, and leaks (para 18-9). Clean or replace as required.

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

m.1 PERSONNEL HEATER - CONTINUED	(3) HEATER WILL NOT STOP RUNNING WITH SWITCH OFF. All other electrical components operate properly.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

WARNING
If heater is blowing hot air, do not disconnect any electrical leads to the heater. An explosion may occur causing severe injury or death.

1. If heater continues to blow hot air after switch is turned off and after cool down period has elapsed (one to two minutes), go to heater fuel pump and disconnect harness W119 lead 402A.
2. When heater blows cool air, turn vehicle MASTER switch OFF (TM 9-2350-314-10).

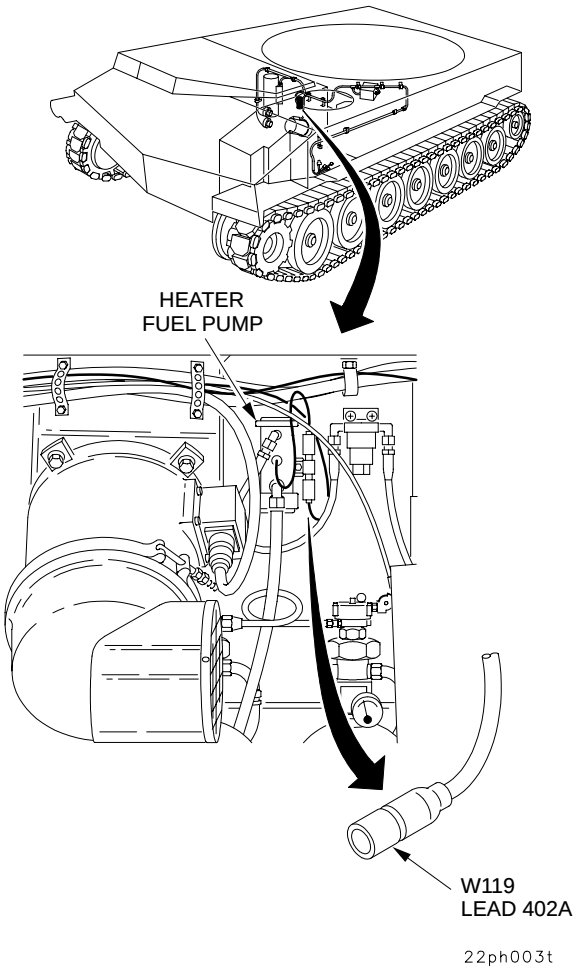
Does heater motor continue to operate?

yes

Disconnect harness W119 at personnel heater. Troubleshoot personnel heater (TM 9-2540-205-24&P).

no

Notify Direct Support Maintenance.



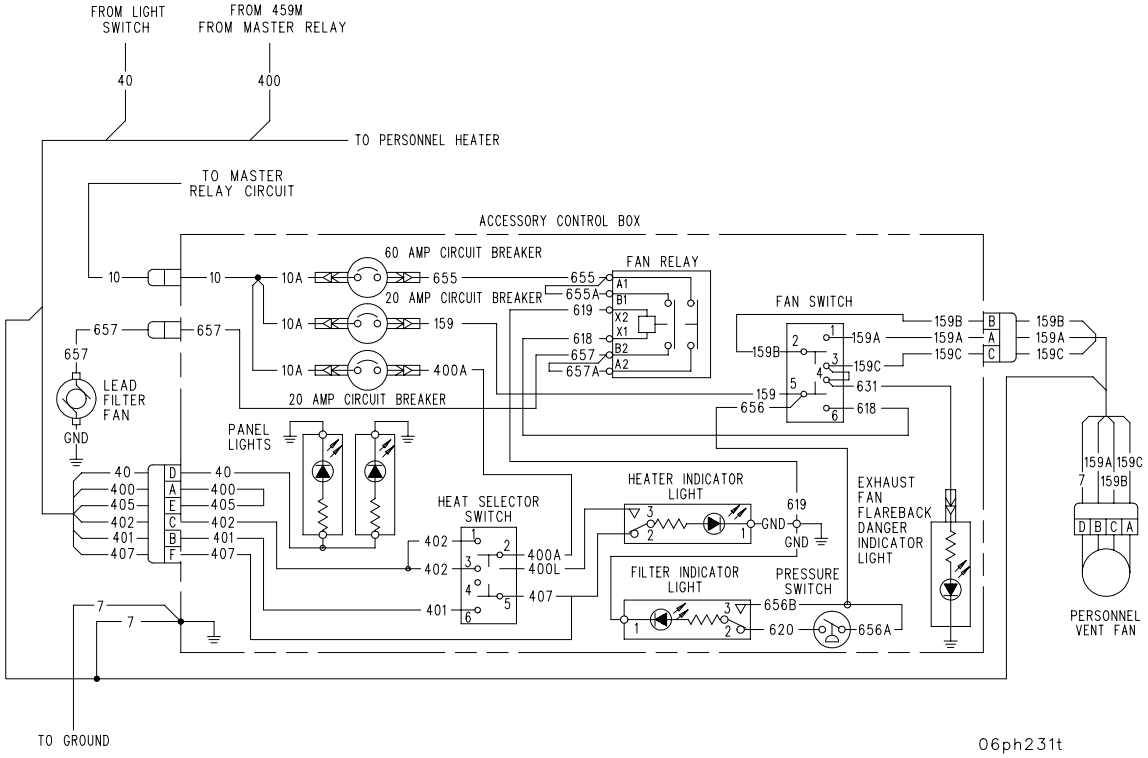
END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

n. PERSONNEL VENTILATION BLOWER AND LEAD FILTER FAN (For vehicles with Accessory Control Box P/N 12268582)

This system consists of the personnel vent fan, the lead filter fan, and the accessory control box. The diagram below shows the relationship of these components.

When vehicle MASTER switch is turned ON, 24 V dc is supplied from the batteries through the master relay to the accessory control box. When the ventilation blower switch is set to EXHAUST, voltage is applied to energize the personnel vent fan in either a forward or reverse direction. The lead filter fan operates when the vehicle MASTER switch is turned on, supplying power from the batteries, through the master relay to the accessory control box, and the ventilation blower switch is set to INTAKE.



3-3 TROUBLESHOOTING CHART - CONTINUED

n. PERSONNEL VENTILATION BLOWER – CONTINUED	(1) PERSONNEL VENTILATION BLOWER FAILS TO OPERATE. All other components operate properly.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

WARNING

Exercise care to prevent injury, especially to fingers and hands, during maintenance operations on personnel ventilation blower.

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W119 connector P3 from ventilation blower connector.
3. Turn ventilation blower switch to EXHAUST (TM 9-2350-314-10).
4. Place multimeter red lead in harness W119 connector P3 socket A and black lead on ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes → Go to step C.

no

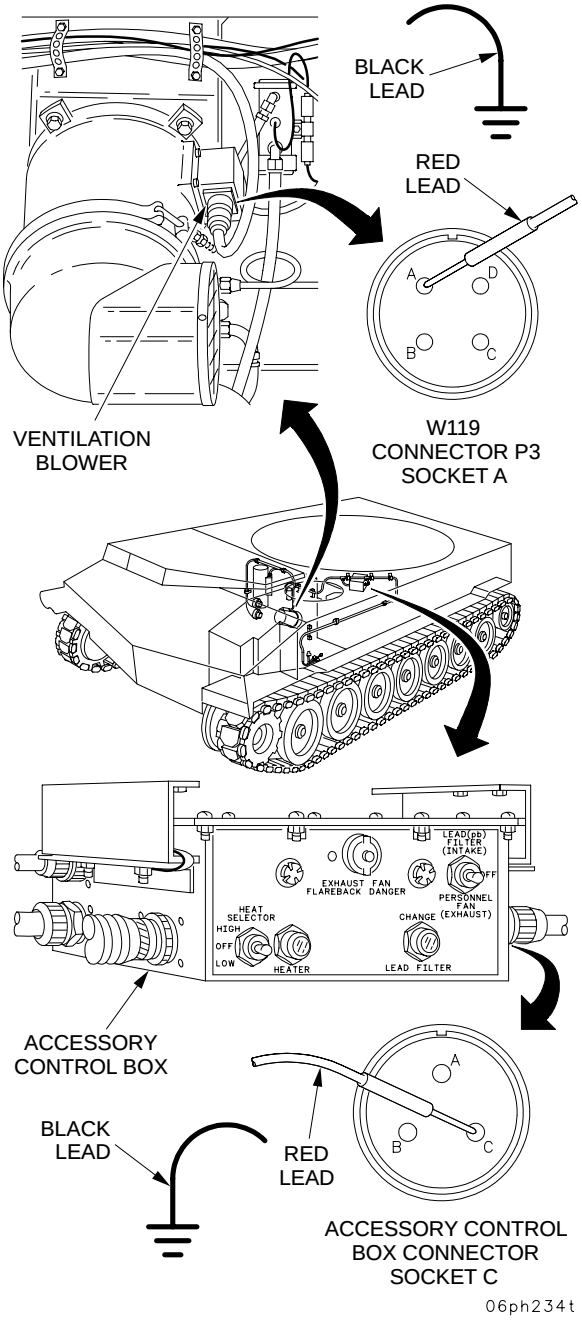
B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect W119 connector P2 from accessory control box.
3. Place red lead of multimeter on socket C of accessory control box and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes → Repair or replace harness W119 (para 8-78).

no → Go to step D.



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3-3 TROUBLESHOOTING CHART - CONTINUED

n. PERSONNEL VENTILATION BLOWER - CONTINUED	(1) PERSONNEL VENTILATION BLOWER FAILS TO OPERATE. All other components operate properly. - CONTINUED

CONTINUED FROM STEP A

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W119 lead 7 from the accessory control box.
3. Place one multimeter lead on lead 7 and place the other lead in socket D of harness W119 connector P3.

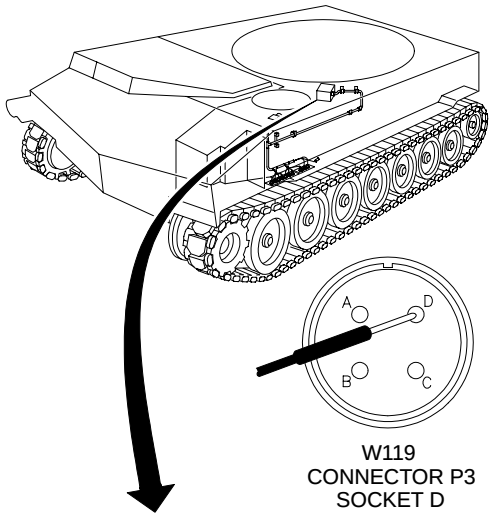
Is continuity present?

yes

Replace vent fan assembly (para 16-1).

no

Repair or replace harness W119 (para 8-78).



CONTINUED FROM STEP B

D

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W124 lead 10 from accessory control box.
3. Place red lead of multimeter in harness W124 lead 10 socket and place the black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

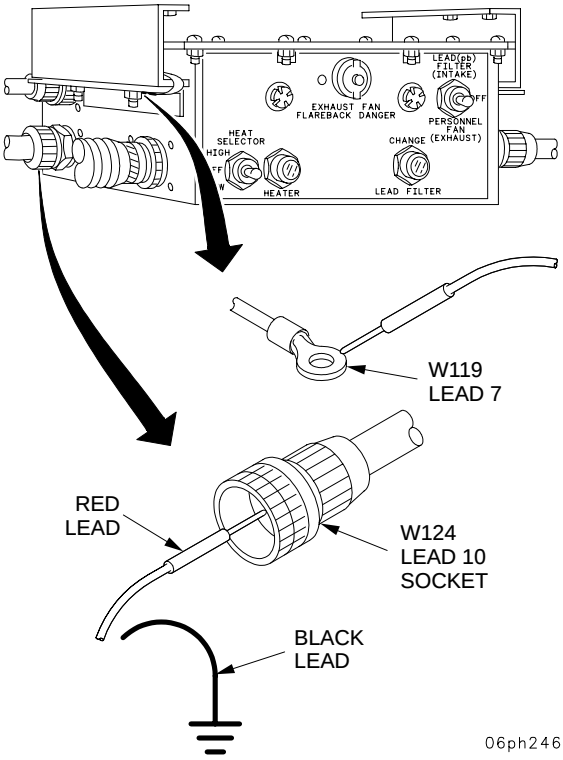
Is voltage present?

yes

Replace accessory control box (para 8-19).

no

Repair or replace harness W124 (para 8-82).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

n. LEAD FILTER FAN	(2) LEAD FILTER FAN DOES NOT OPERATE. Personnel ventilation fan operates properly.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)

Equipment Conditions
Vehicle MASTER switch OFF (TM 9-2350-314-10)

WARNING
Lead filter must be handled in accordance with local SOP complying with Occupational Safety Health Act (OSHA). Dust-sized lead particles are injurious to your health when ingested or absorbed.

A

1. Remove fan ground cable from fan and chassis ground (para 8-99).
2. Place one multimeter lead on one end of ground cable and other lead to other end of ground cable.
3. Check for continuity.

Is continuity present?

yes

no

Repair or replace ground cable (para 8-99).

B

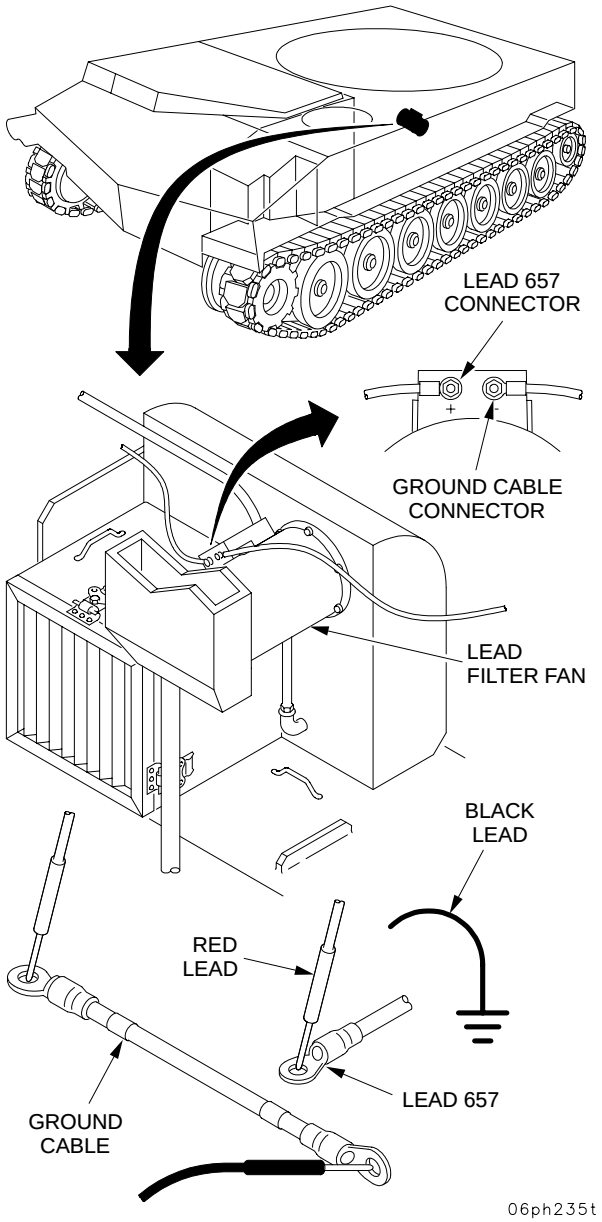
1. Reconnect ground cable to filter fan and chassis ground (para 8-99).
2. Disconnect lead 657 connector from fan motor (para 8-98).
3. Place red multimeter lead on lead 657 connector socket and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
5. Turn fan selector switch to INTAKE (TM 9-2350-314-10).
6. Check for voltage.

Is voltage present?

yes

no

Replace fan (para 8-106).



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3-3 TROUBLESHOOTING CHART - CONTINUED

n. LEAD FILTER FAN - CONTINUED	(2) LEAD FILTER FAN DOES NOT OPERATE. Personnel ventilation fan operates properly. - CONTINUED

CONTINUED FROM STEP B

C

1. Turn fan selector switch OFF (TM 9-2350-314-10).
2. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
3. Reconnect lead 657 to fan motor (para 8-98).
4. Disconnect lead 657 connector from accessory control box (para 8-98).
5. Place red multimeter lead on accessory control box connector socket and black lead to ground.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
7. Turn selector switch to INTAKE (TM 9-2350-314-10).
8. Check for voltage.

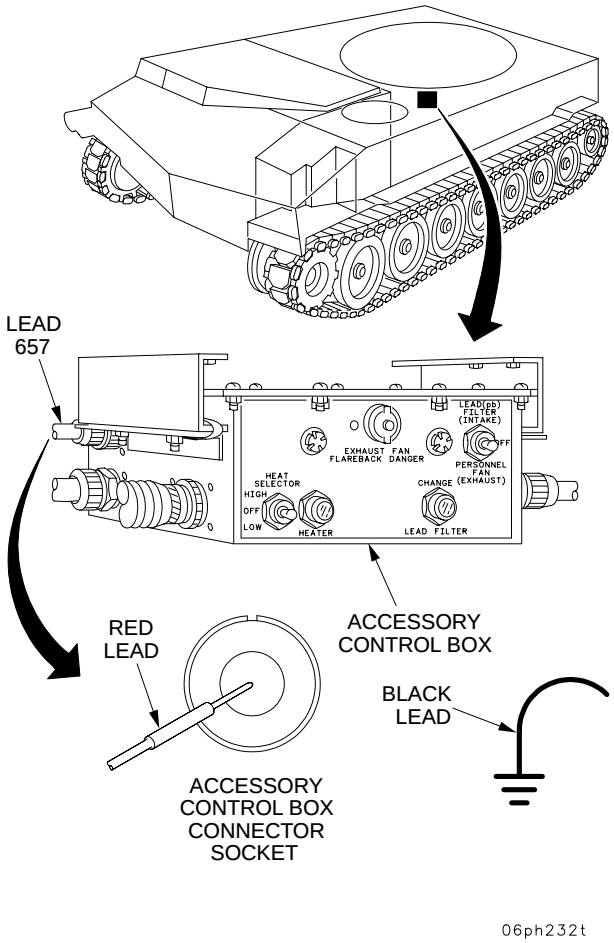
Is voltage present?

yes

Repair or replace lead 657 from accessory control box to fan motor (para 8-98).

no

Replace accessory control box (para 8-19).



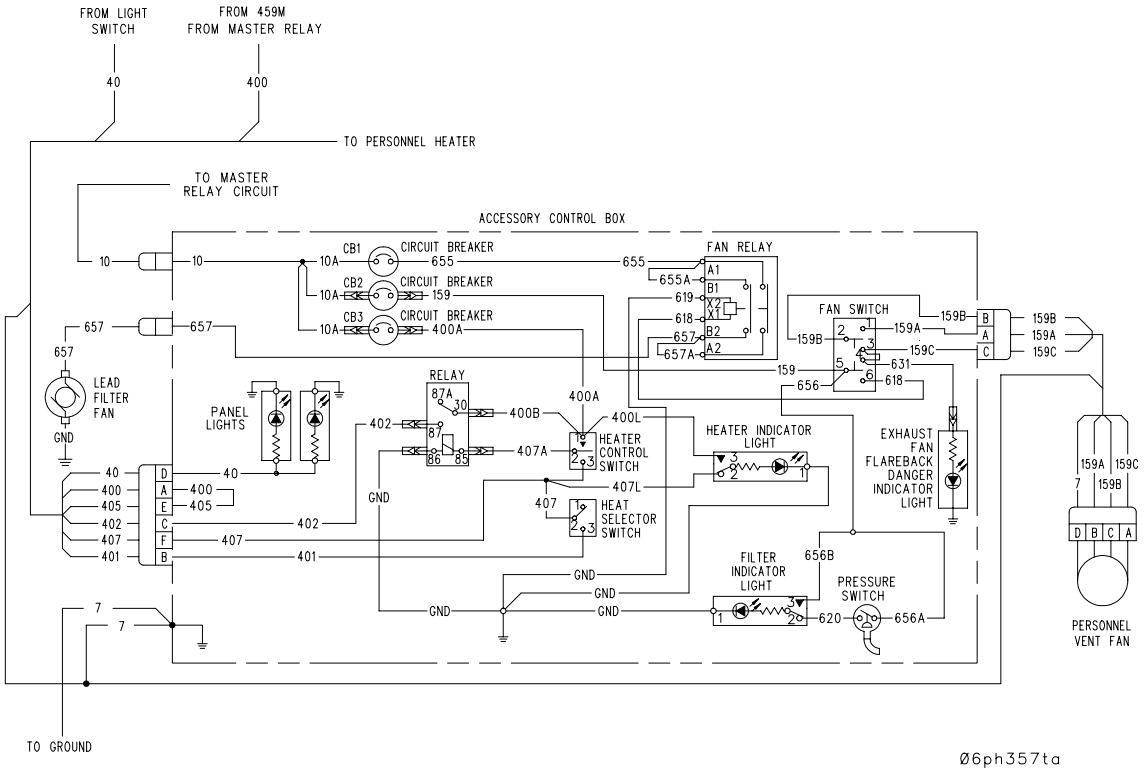
END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

n.1 PERSONNEL VENTILATION BLOWER AND LEAD FILTER FAN (For vehicles with Accessory Control Box P/N 12265847)

This system consists of the personnel vent fan, the lead filter fan, and the accessory control box. The diagram below shows the relationship of these components.

When vehicle MASTER switch is turned ON, 24 V dc is supplied from the batteries through the master relay to the accessory control box. When the ventilation blower switch is set to EXHAUST, voltage is applied to energize the personnel vent fan in either a forward or reverse direction. The lead filter fan operates when the vehicle MASTER switch is turned on, supplying power from the batteries, through the master relay to the accessory control box, and the ventilation blower switch is set to INTAKE.



3-3 TROUBLESHOOTING CHART - CONTINUED

n.1 PERSONNEL VENTILATION BLOWER - CONTINUED	(1) PERSONNEL VENTILATION BLOWER FAILS TO OPERATE. All other components operate properly.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

WARNING

Exercise care to prevent injury, especially to fingers and hands, during maintenance operations on personnel ventilation blower.

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W119 connector P3 from ventilation blower connector.
3. Turn ventilation blower switch to EXHAUST (TM 9-2350-314-10).
4. Place multimeter red lead in harness W119 connector P3 socket A and black lead on ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes → Go to step C.

no

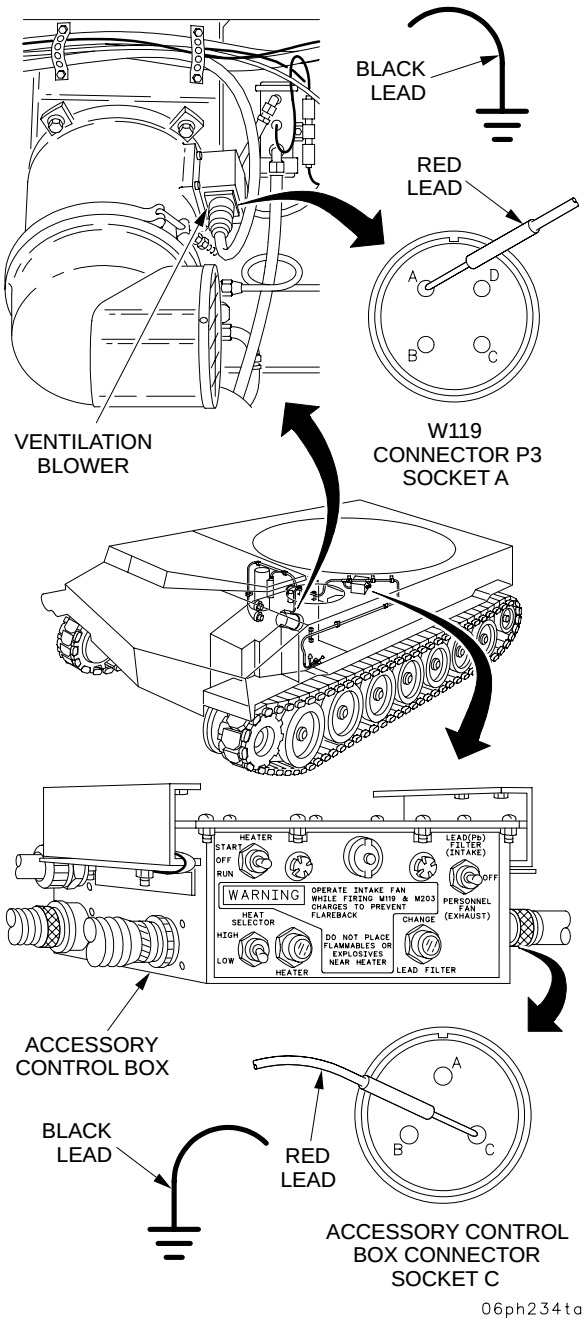
B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect W119 connector P2 from accessory control box.
3. Place red lead of multimeter on socket C of accessory control box and black lead on ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10) and check for voltage.

Is voltage present?

yes → Repair or replace harness W119 (para 8-78).

no → Go to step D.



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3-3 TROUBLESHOOTING CHART - CONTINUED

n.1 PERSONNEL VENTILATION BLOWER - CONTINUED	(1) PERSONNEL VENTILATION BLOWER FAILS TO OPERATE. All other components operate properly. - CONTINUED

CONTINUED FROM STEP A

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W119 lead 7 from the accessory control box.
3. Place one multimeter lead on lead 7 and place the other lead in socket D of harness W119 connector P3.

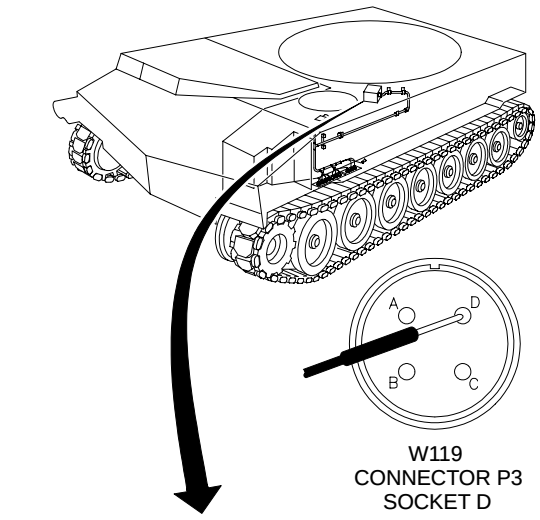
Is continuity present?

yes

Replace vent fan assembly (para 16-1).

no

Repair or replace harness W119 (para 8-78).



W119
CONNECTOR P3
SOCKET D

CONTINUED FROM STEP B

D

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W124 lead 10 from accessory control box.
3. Place red lead of multimeter in harness W124 lead 10 socket and place the black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

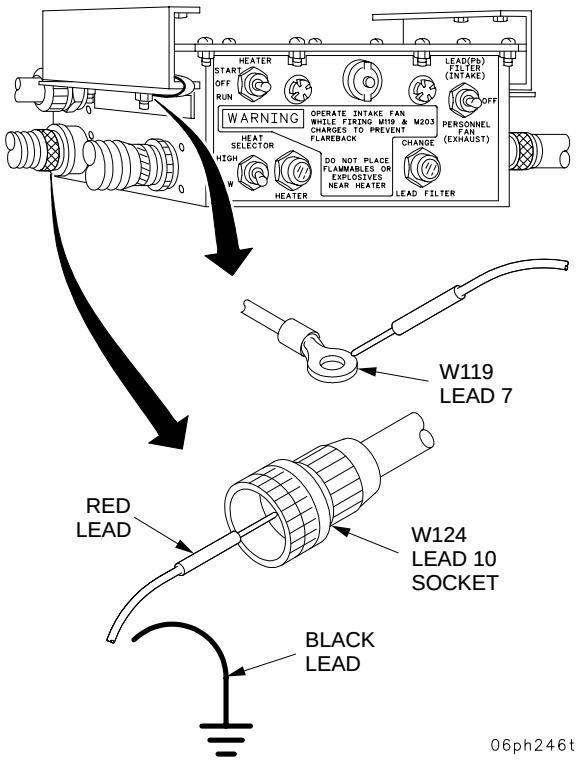
Is voltage present?

yes

Replace accessory control box (para 8-19).

no

Repair or replace harness W124 (para 8-82).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

n.1 LEAD FILTER FAN	(2) LEAD FILTER FAN DOES NOT OPERATE. Personnel ventilation fan operates properly.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)

Equipment Conditions
Vehicle MASTER switch OFF (TM 9-2350-314-10)

WARNING
Lead filter must be handled in accordance with local SOP complying with Occupational Safety Health Act (OSHA). Dust-sized lead particles are injurious to your health when ingested or absorbed.

A

1. Remove fan ground cable from fan and chassis ground (para 8-99).
2. Place one multimeter lead on one end of ground cable and other lead to other end of ground cable.
3. Check for continuity.

Is continuity present?

yes

no

Repair or replace ground cable (para 8-99).

B

1. Reconnect ground cable to filter fan and chassis ground (para 8-99).
2. Disconnect lead 657 connector from fan motor (para 8-98).
3. Place red multimeter lead on lead 657 connector socket and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
5. Turn fan selector switch to INTAKE (TM 9-2350-314-10).
6. Check for voltage.

Is voltage present?

yes

no

Replace fan (para 8-106).

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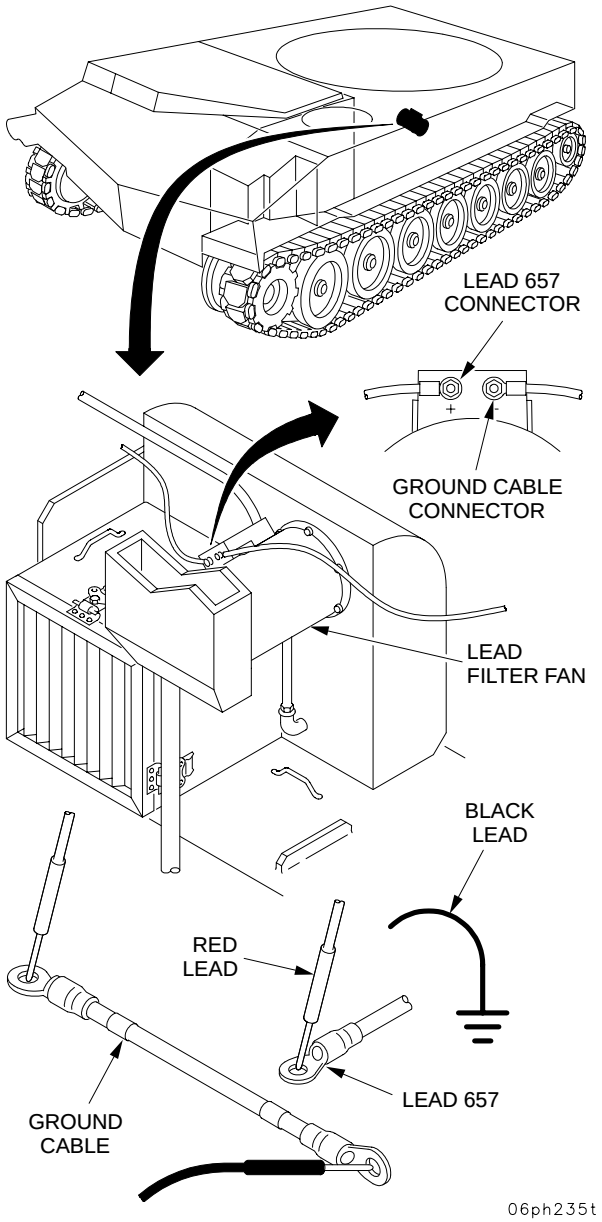


3-3 TROUBLESHOOTING CHART - CONTINUED

n.1 LEAD FILTER FAN - CONTINUED (2) LEAD FILTER FAN DOES NOT OPERATE. Personnel ventilation fan operates properly. - CONTINUED

CONTINUED FROM STEP B

C

1. Turn fan selector switch OFF (TM 9-2350-314-10).
2. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
3. Reconnect lead 657 to fan motor (para 8-98).
4. Disconnect lead 657 connector from accessory control box (para 8-98).
5. Place red multimeter lead on accessory control box connector socket and black lead to ground.
6. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
7. Turn selector switch to INTAKE (TM 9-2350-314-10).
8. Check for voltage.

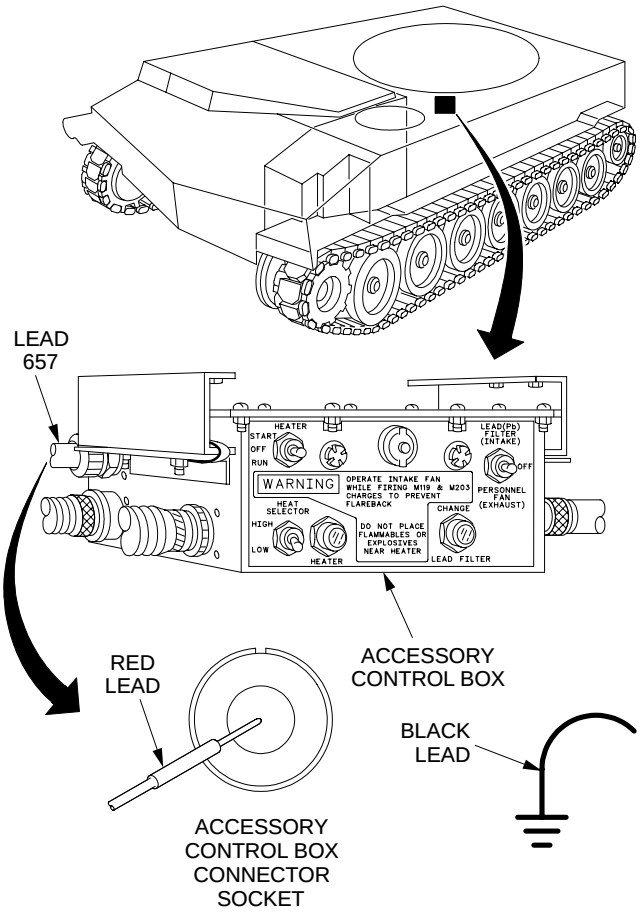
Is voltage present?

yes

Repair or replace lead 657 from accessory control box to fan motor (para 8-98).

no

Replace accessory control box (para 8-19).



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END OF TASK

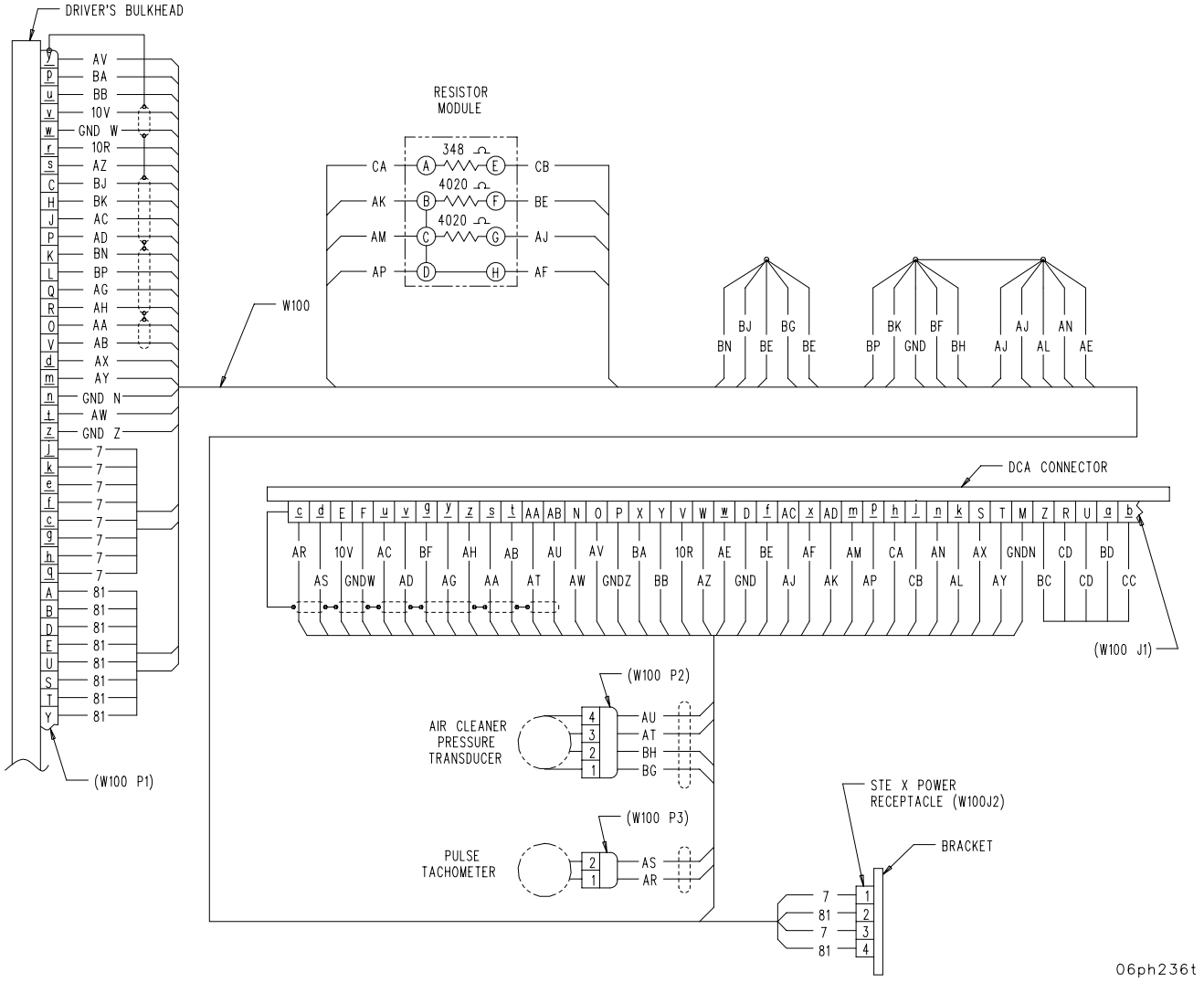
3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT

The Special Test Equipment Diagnostic Connector Assembly (STE DCA) circuit is used in conjunction with Special Test Equipment for Internal Combustion Engines (STE/ICE) when troubleshooting engine or related circuit problems.

When the vehicle MASTER switch is ON, 24 V dc is supplied through the STE DCA and STE cable W1 to the vehicle test meter (VTM). Using multiple types of STE cables and probes, the VTM can conduct a full spectrum of tests on the engine and all its sensors. The pictorial diagram below illustrates the VTM connected to the STE DCA with STE cable W1.

Refer to HULL ELECTRICAL SCHEMATIC (FP-1 through FP-9/FP-10 blank) for the relationship of the STE DCA circuit.



3-3 TROUBLESHOOTING CHART - CONTINUED

o.	STE DCA CIRCUIT - CONTINUED	(1) STE FAILS TO GIVE READING (WHILE PERFORMING TEST 10 OR 13). STE passed power-up and confidence tests (para 3-4.a(1)).

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26
Multimeter (item 38, Appx F)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect STE cable W1 from harness W100 connector J1 (DCA connector).
3. Disconnect harness W100 connector P3 from pulse tachometer.
4. Check harness W101 for continuity as follows:
   a. Place one multimeter lead in harness W100 J1 (DCA connector) secket c and other head on harness W100 connector P3 socket 1.
   b. Place one multimeter lead in harness W100 connector J1 (DCA connector) socket d and other lead on harness W100 connector P3 pin 2.

Is continuity present?

yes

no

Repair or replace cable W100 (para 8-60).

B

1. Reconnect W100 connector P3 to pulse tachometer.
2. Go to TM 9-4910-571-12&P and troubleshoot STE cable W1.

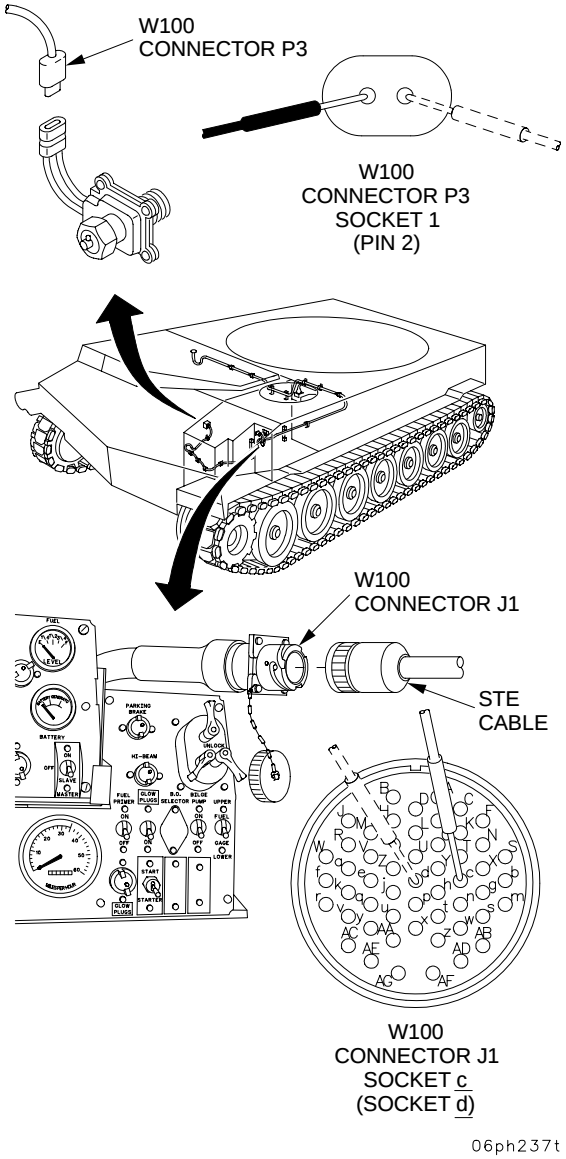
Is STE cable W1 in good condition?

yes

no

Replace pulse tachometer (para 20-3).

Repair or replace STE cable W1 (TM 9-4910-571-24&P).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT – CONTINUED	(2) STE FAILS TO GIVE COMPRESSION UNBALANCE READING (WHILE PERFORMING TEST 14). STE passed power-up and confidence tests (para 3-4.a(1)).

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Battery compartment access doors open (TM 9-2350-314-10)

A

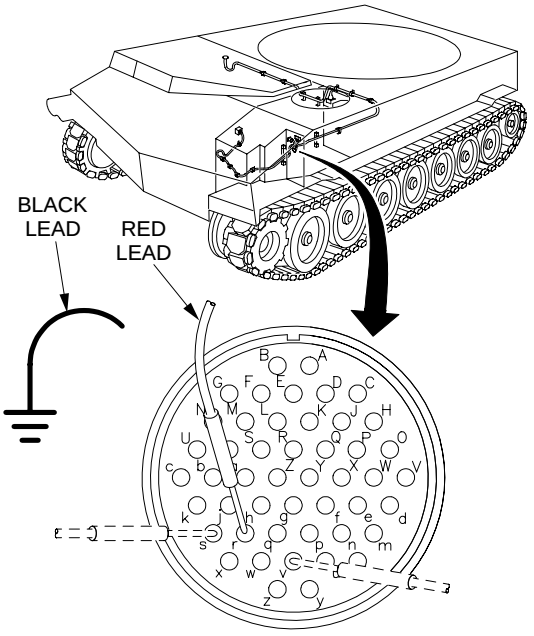
1. Shut engine and vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect STE cable W1 from harness W100 connector J1.
3. Disconnect harness W100 connector P1 from harness W101 connector J1.
4. Check harness W101 for voltage:
   a. Place multimeter red lead on connector J1 socket r and place black lead to ground.
   b. Place multimeter red lead on connector J1 socket v and place black lead to ground.

Is voltage present for both tests?

yes

no

Repair or replace harness W101 (para 8-61).



B

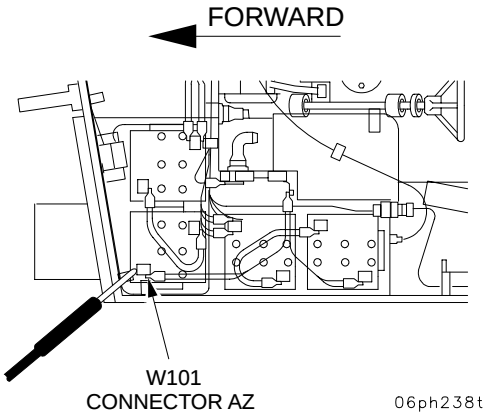
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Check harness W101 lead AZ for continuity by placing one multimeter lead on harness W101 connector AZ at battery negative (-) post and other lead in harness W101 connector J1 socket s.

Is continuity present?

yes

no

Repair or replace harness W101 (para 8-61).



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3-3 TROUBLESHOOTING CHART - CONTINUED

o.	STE DCA CIRCUIT - CONTINUED	(2) STE FAILS TO GIVE COMPRESSION UNBALANCE READING (WHILE PERFORMING TEST 14). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP B

C Make the following continuity checks on harness W100:

a. Place one multimeter lead on connector P1 pin r and other lead in connector J1 socket V.
b. Place one multimeter lead on connector P1 pin s and other lead in connector J1 socket W.
c. Place one multimeter lead on connector P1 pin v and other lead in connector J1 socket E.

Is continuity present?

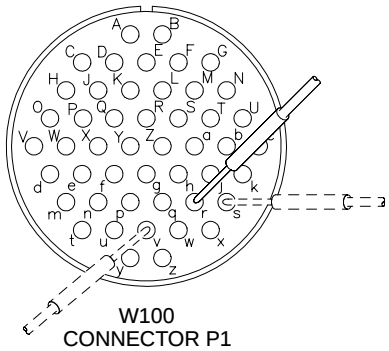
yes

no

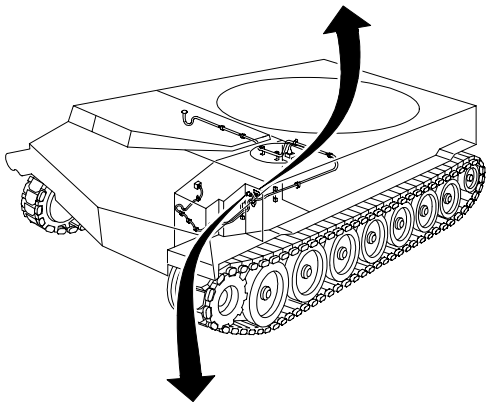
Repair or replace harness W100 (para 8-60).

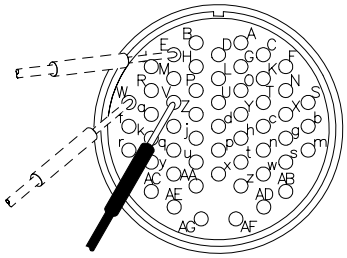
Go to TM 9-4910-571-12&P for fault isolation.

END OF TASK



W100
CONNECTOR P1
SOCKET r
(SOCKET s)
(SOCKET v)





W100
CONNECTOR J1
SOCKET V
(SOCKET W)
(SOCKET E)

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3-3 TROUBLESHOOTING CHART - CONTINUED

o.	STE DCA CIRCUIT - CONTINUED	(3) STE FAILS TO GIVE FUEL SUPPLY PRESSURE READING (TEST 24). STE passed power-up and confidence tests (para 3-4.a(1)).

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)

A

1. Shut engine and vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect STE cable W1 from harness W100 connector J1 (DCA connector).
3. Disconnect harness W101 connector P1 from harness W102 connector J1.
4. Disconnect harness W102 connector P2 from fuel supply pressure transducer.
5. Make the following continuity checks on harness W102:
   a. Place one multimeter lead in connector P2 socket 1 and other lead in connector J1 socket c.
   b. Place one multimeter lead in connector P2 socket 2 and other lead in connector J1 socket h.
   c. Place one multimeter lead in connector P2 pin 3 and other lead in connector J1 socket U.
   d. Place one multimeter lead in connector P2 pin 4 and other lead in connector J1 socket b.

Is continuity present?

yes

no

Repair or replace harness W102 (para 8-62).

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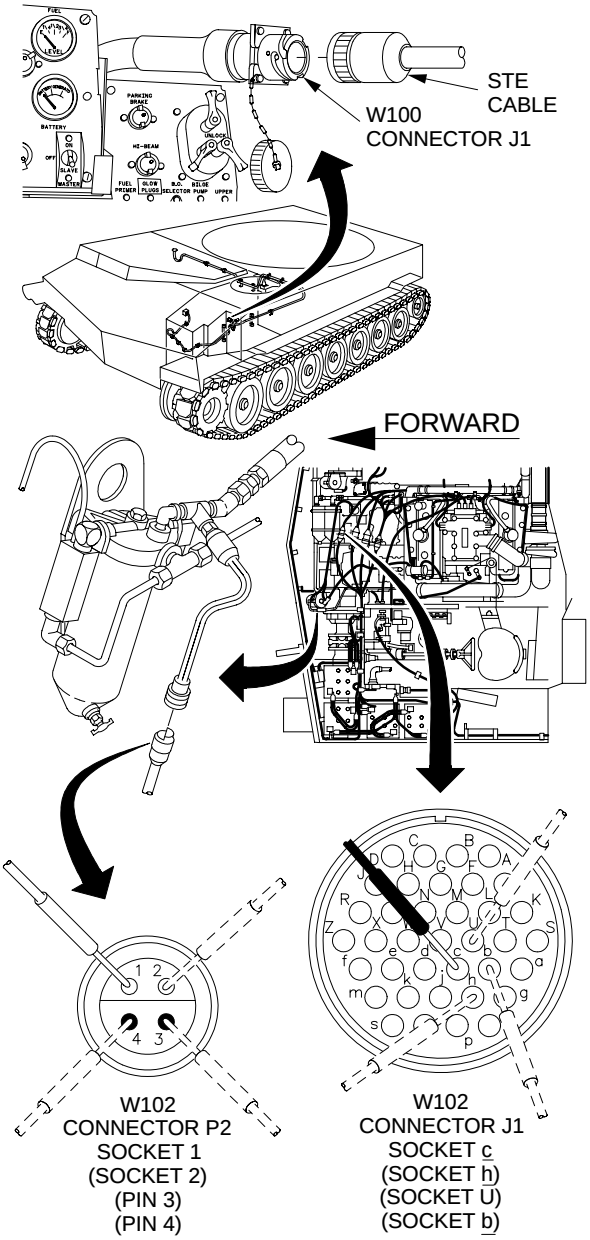

3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(3) STE FAILS TO GIVE FUEL SUPPLY PRESSURE READING (TEST 24). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP A

B

1. Reconnect harness W102 connector J1 to fuel supply pressure transducer.
2. Disconnect harness W100 connector P1 from harness W101 connector J1.
3. Make the following continuity checks on harness W101:
   a. Place one multimeter lead in connector P1 pin c and other lead in connector J1 socket C.
   b. Place one multimeter lead in connector P1 pin h and other lead in connector J1 socket H.
   c. Place one multimeter lead in connector P1 pin U and other lead in connector J1 socket J.
   d. Place one multimeter lead in connector P1 pin b and other lead in connector J1 socket P.

Is continuity present?

yes

no

Repair or replace harness W101 (para 8-61).

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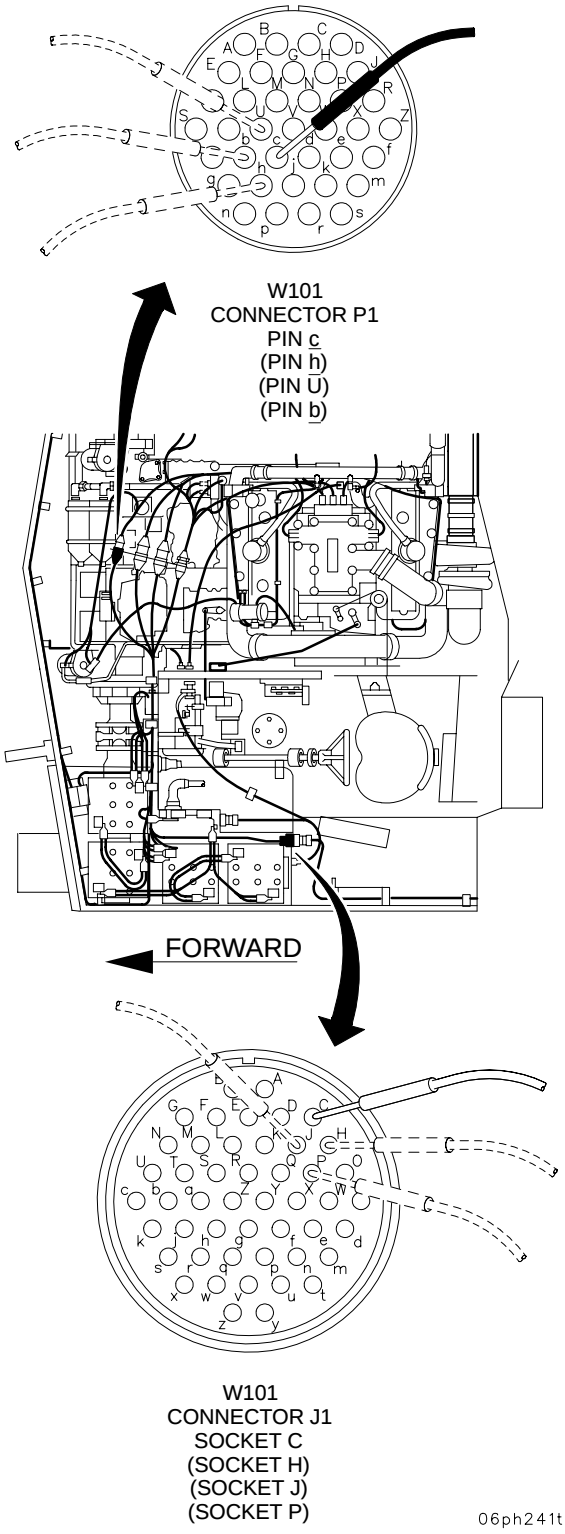


3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(3) STE FAILS TO GIVE FUEL SUPPLY PRESSURE READING (TEST 24). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP B

C

1. Reconnect harness W101 connector P1 to harness W102 connector J1.
2. Make the following continuity checks on harness W100:
   a. Place one multimeter lead on connector P1 pin C and other lead in connector J1 socket f.
   b. Place one multimeter lead on connector P1 pin H and other lead in connector J1 sockets D and g.
   c. Place one multimeter lead on connector P1 pin J and other lead in connector J1 socket u.
   d. Place one multimeter lead on connector P1 pin P and other lead in connector J1 socket v.

Is continuity present?

yes

no

Repair or replace harness W100 (para 8-60).

D Go to TM 9-4910-571-12&P and troubleshoot STE cable W1.

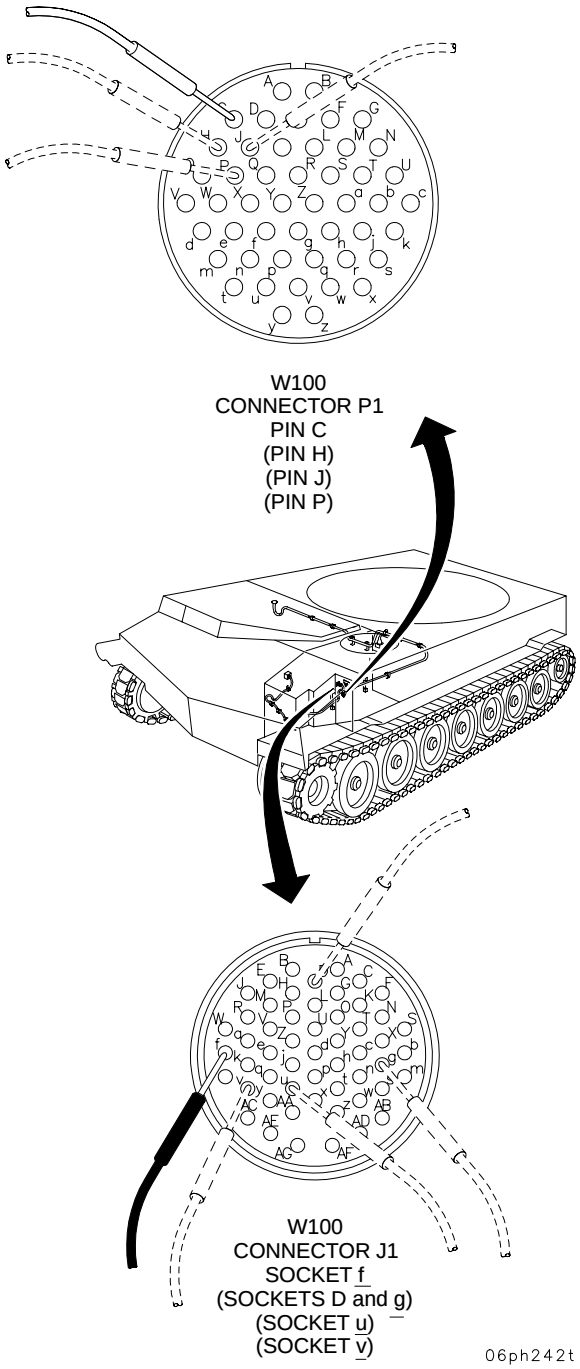
Is STE cable W1 in good condition?

yes

no

Replace fuel supply pressure transducer (para 8-43).

Repair or replace STE cable W1 (TM 9-4910-571-12&P).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(4)	STE FAILS TO GIVE FUEL FILTER DIFFERENTIAL PRESSURE READING (TEST 26). STE passed power-up and confidence tests (para 3-4.a(1)).

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)

Equipment Condition
Transmission access doors open (TM 9-2350-314-10)

Personnel Required
Two

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect STE cable W1 from harness W100 connector J1 (DCA connector).
3. Disconnect harness W101 connector P1 from harness W102 connector J1.
4. Disconnect harness W102 connector P4 from fuel filter differential pressure transducer.
5. Make the following continuity checks on harness W102:
   a. Place one multimeter lead in harness W102 connector P4 socket 1 and other lead in connector J1 socket a.
   b. Place one multimeter on harness W102 connector P4 pin 2 and other lead in connector J1 socket g.

Is continuity present?

yes

no

Repair or replace harness W102 (para 8-62).

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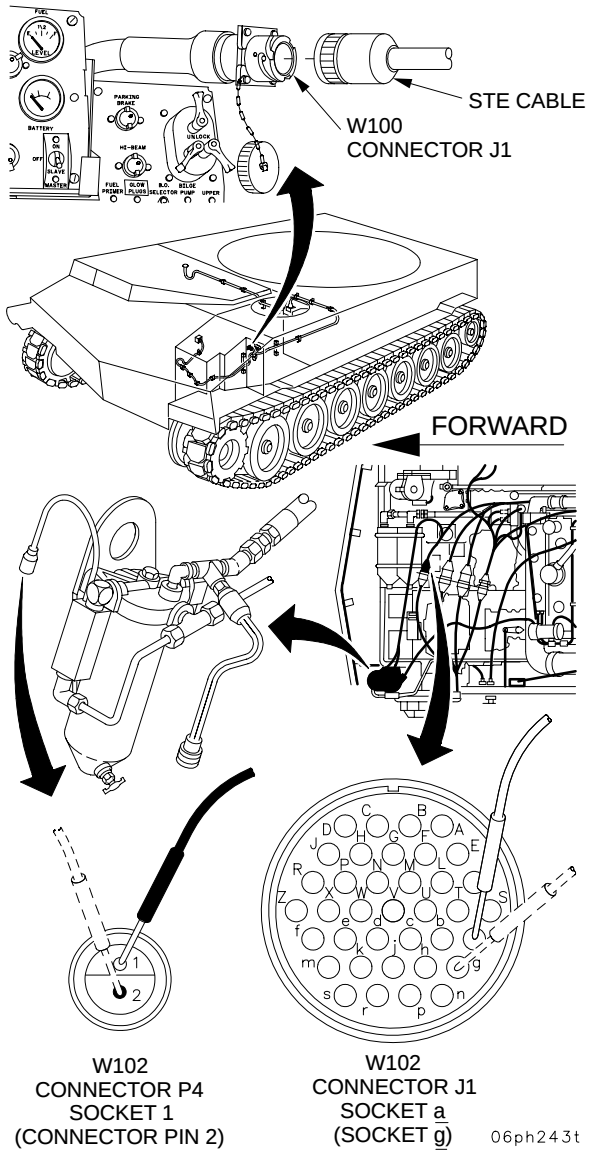

3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(4) STE FAILS TO GIVE FUEL FILTER DIFFERENTIAL PRESSURE READING (TEST 26). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP A

B

1. Reconnect harness W102 connector P4 to fuel filter differential pressure transducer.
2. Disconnect harness W100 connector P1 from harness W101 connector J1.
3. Make the following continuity checks on harness W101:
   a. Place one multimeter lead on connector P1 pin a and other lead in connector J1 socket O.
   b. Place one multimeter lead on connector P1 pin g and other lead in connector J1 socket V.

Is continuity present?

yes

no

Repair or replace harness W101 (para 8-61).

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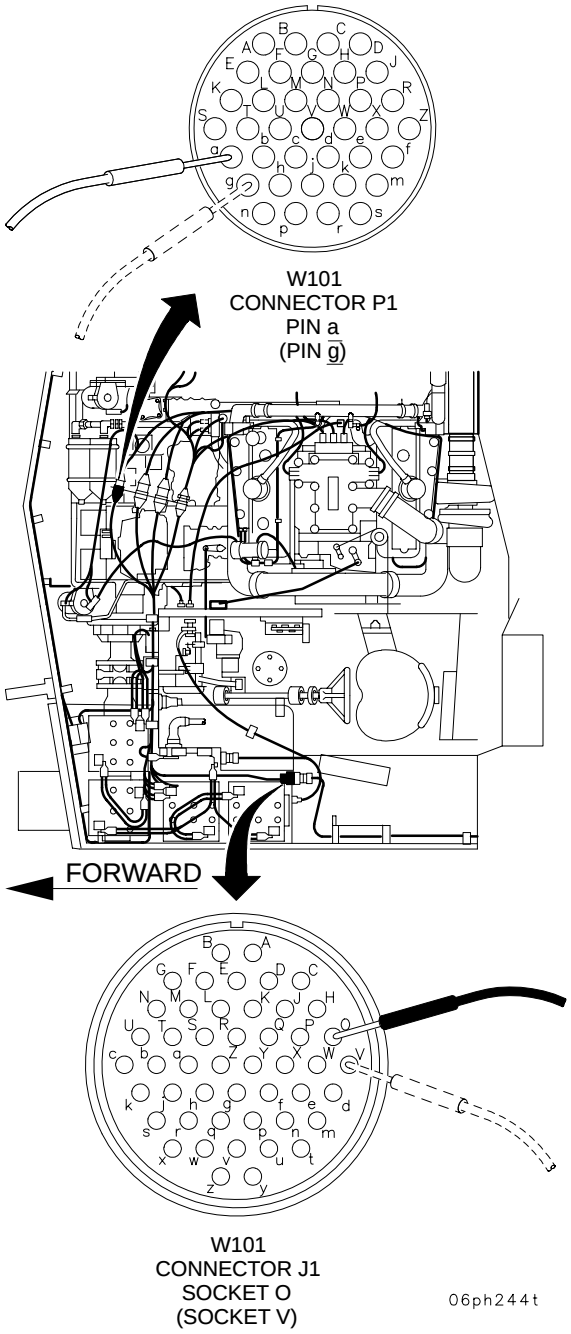


3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(4) STE FAILS TO GIVE FUEL FILTER DIFFERENTIAL PRESSURE READING (TEST 26). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP B

C

1. Reconnect harness W101 connector P1 to harness W102 connector J1.
2. Make the following continuity checks on harness W100:
   a. Place one multimeter lead on connector P1 pin O and other lead in connector J1 socket s.
   b. Place one multimeter lead on connector P1 pin V and other lead in connector J1 socket t.

Is continuity present?

yes

no

Repair or replace harness W100 (para 8-60).

D

1. Reconnect harness W100 connector P1 to harness W101 connector J1.
2. Go to TM 9-4910-571-12&P and troubleshoot STE cable W1.

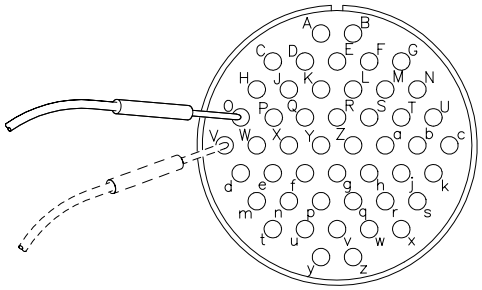
Is STE cable W1 in good condition?

yes

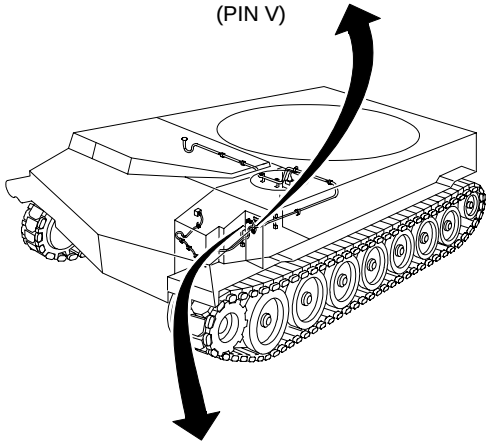
no

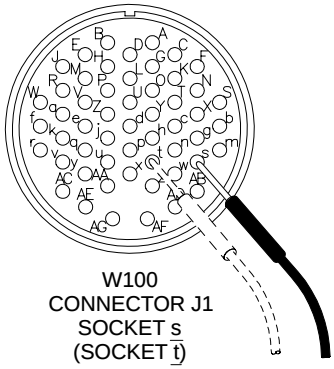
Replace fuel filter differential pressure transducer (para 8-42).

Repair or replace STE cable W1 (TM 9-4910-571-12&P).



W100
CONNECTOR P1
PIN O
(PIN V)





W100
CONNECTOR J1
SOCKET s
(SOCKET t)

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END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(5)	STE FAILS TO GIVE AIR CLEANER PRESSURE DIFFERENTIAL READING (WHILE PERFORMING TEST 28). STE passed power-up and confidence tests (para 3-4.a(1)).

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long test leads may be needed for some tests. 16 AWG wire may be used as an extension.)

Personnel Required
Two

A

1. Shut engine and vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect STE cable W1 from DCA connector.
3. Disconnect harness W100 connector P2 from air cleaner pressure transducer connector.
4. Make the following continuity checks on harness W100:
   a. Place one multimeter lead in harness W100 lead connector P2 socket 1 and other lead in harness W100 connector J1 socket f.
   b. Place one multimeter lead in harness W100 lead connector P2 socket 2 and other lead in harness W100 connector J1 socket D and g.
   c. Place one multimeter lead on W100 connector P2 pin 3 and other lead in harness W100 connector J1 socket AA.
   d. Place one multimeter lead on harness W100 connector P2 pin 4 and other lead in harness W100 connector J1 socket AB.

Is continuity present?

yes

no

Repair or replace cable W100 (para 8-60).

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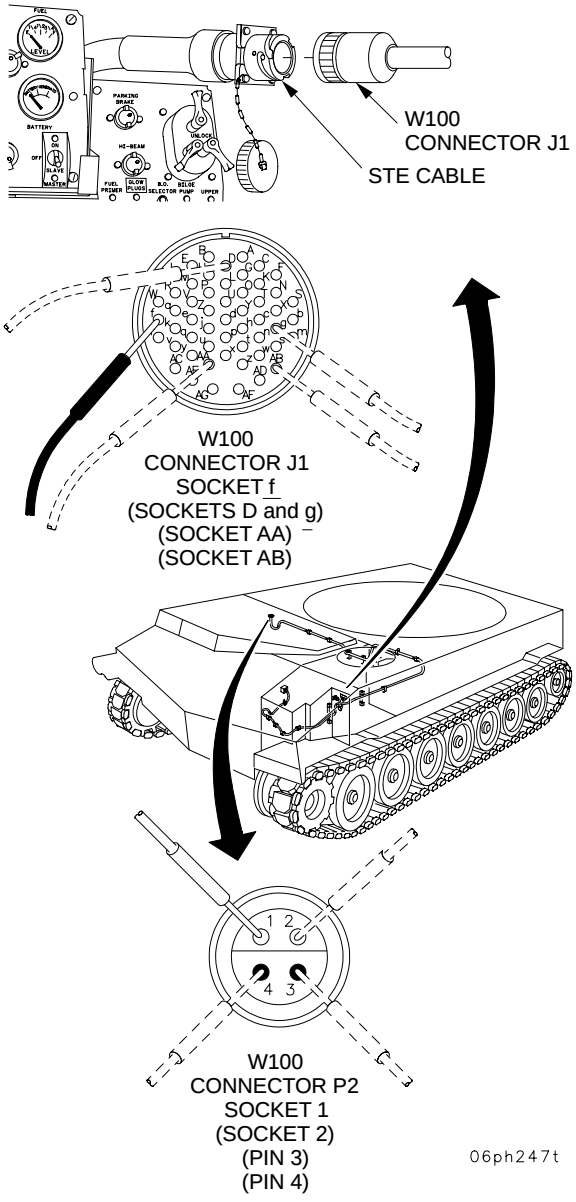
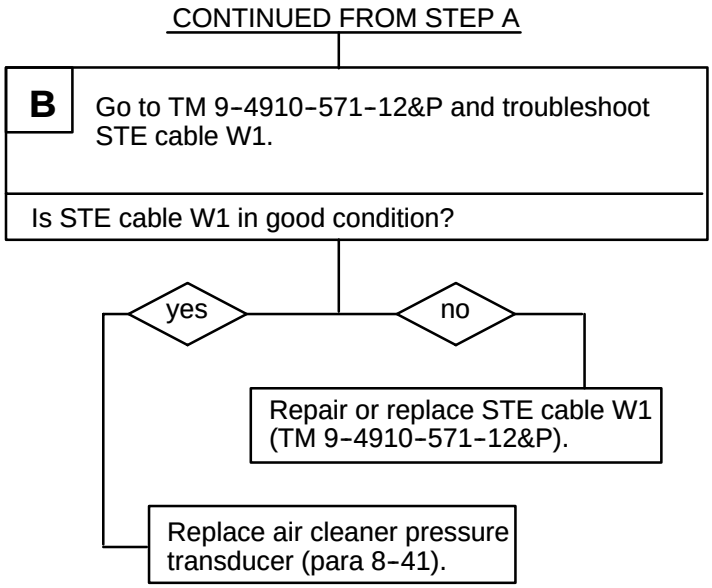


3-3 TROUBLESHOOTING CHART - CONTINUED

o.	STE DCA CIRCUIT - CONTINUED	(5) STE FAILS TO GIVE AIR CLEANER PRESSURE DIFFERENTIAL READING (WHILE PERFORMING TEST 28). STE passed power-up and confidence tests (para 3-4.a(1)) - CONTINUED.



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

o.	STE DCA CIRCUIT - CONTINUED	(6) STE FAILS TO GIVE AIR BOX PRESSURE READING (WHILE PERFORMING TEST 32). STE passed power-up and confidence tests (para 3-4.a(1)).

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Transmission access doors open
(TM 9-2350-314-10)

A Perform test on STE/ICE cable W1 (TM 9-4910-571-12&P).

Is STE cable W1 in good condition?

yes

no

Replace STE/ICE cable W1 (TM 9-4910-571-12&P).

CONTINUED ON NEXT PAGE

3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(6) STE FAILS TO GIVE AIR BOX PRESSURE READING (WHILE PERFORMING TEST 32). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP A

B

1. Disconnect harness W100 connector P1 from harness W101 J1 at driver's compartment bulkhead.
2. Make the following continuity checks on harness W100:
   a. Place one multimeter lead on harness W100 connector P1 pin K and other lead in harness W100 connector J1 socket f.
   b. Place one multimeter lead on harness W100 connector P1 pin L and other lead in harness W100 connector J1 sockets D and g (make checks one socket at a time).
   c. Place one multimeter lead on harness W100 connector P1 pin Q and other lead in harness W100 connector J1 socket y.
   d. Place one multimeter lead on harness W100 connector P1 pin R and other lead in harness W100 connector J1 socket z.

Is continuity present?

yes

no

Repair or replace harness W100 (para 8-60).

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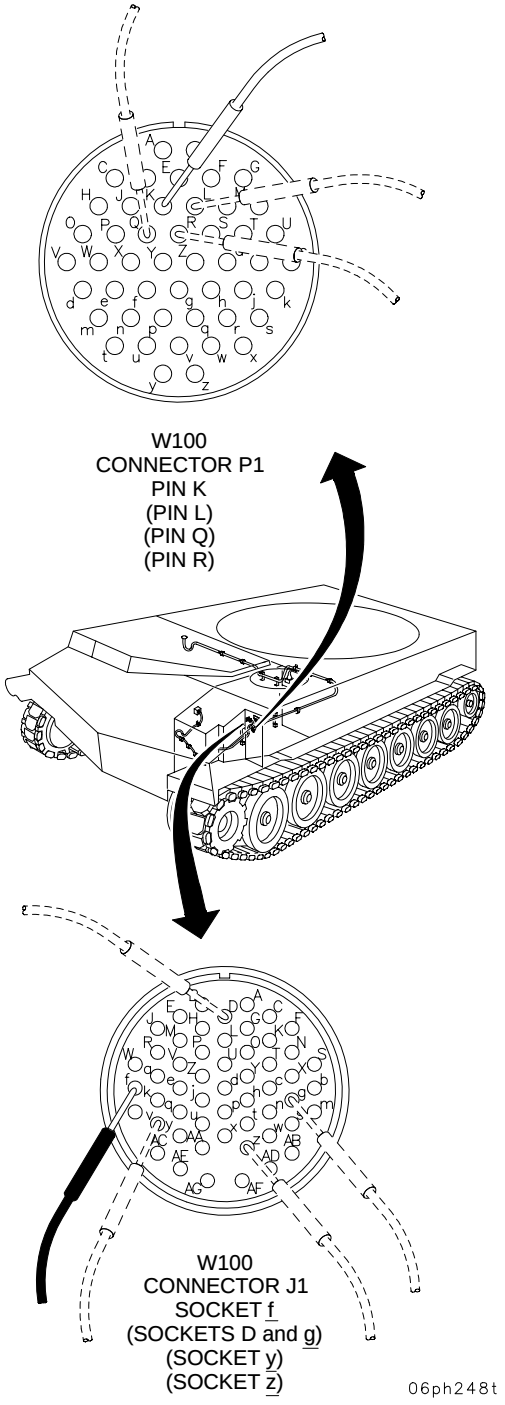

3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(6) STE FAILS TO GIVE AIR BOX PRESSURE READING (WHILE PERFORMING TEST 32). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP B

C

1. Disconnect harness W101 connector P1 at engine disconnect bracket.
2. Make the following continuity checks on harness W101:
   a. Place one multimeter lead on harness W101 connector P1 pin P and other lead in harness W101 connector J1 socket K.
   b. Place one multimeter lead on harness W101 connector P1 pin R and other lead in harness W101 connector J1 socket L.
   c. Place one multimeter lead on harness W101 connector P1 pin X and other lead in harness W101 connector J1 socket Q.
   d. Place one multimeter lead on harness W101 connector P1 pin Z and other lead in harness W101 connector J1 socket R.

Is continuity present?

yes

no

Repair or replace harness W101 (para 8-61).

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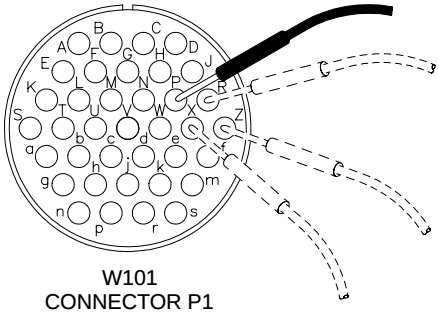
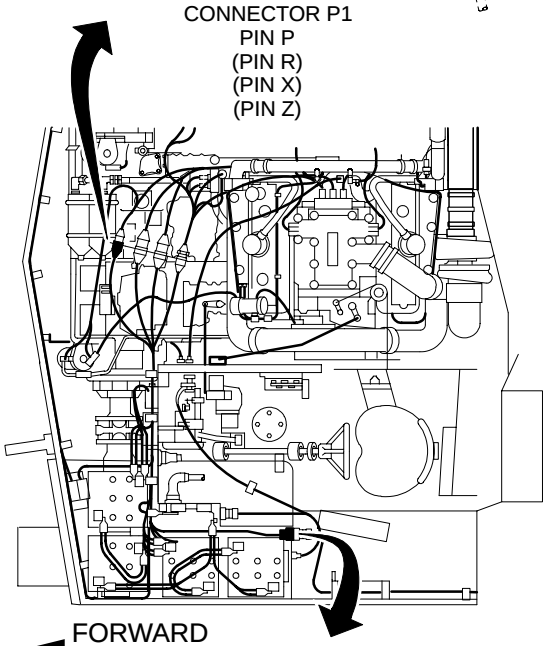
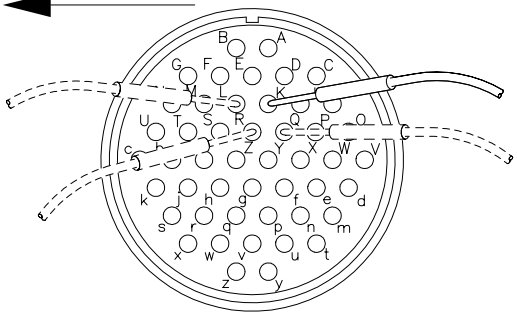


W101
CONNECTOR P1
PIN P
(PIN R)
(PIN X)
(PIN Z)





W101
CONNECTOR J1
SOCKET K
(SOCKET L)
(SOCKET Q)
(SOCKET R)

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3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(6) STE FAILS TO GIVE AIR BOX PRESSURE READING (WHILE PERFORMING TEST 32). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP C

D

1. Reconnect harness W100 connector P1 to harness W101 connector J1.
2. Remove powerpack (para 4-1).
3. Disconnect harness W102 connector P3 from the air box pressure transducer connector.
4. Make the following continuity checks on harness W102:
   a. Place one multimeter lead in harness W102 connector P3 socket 1 and other lead in harness W102 connector J1 socket P.
   b. Place one multimeter lead in harness W102 connector P3 socket 2 and other lead in harness W102 connector J1 socket R.
   c. Place one multimeter lead on harness W102 connector P3 pin 3 and other lead in harness W102 connector J1 socket X.
   d. Place one multimeter lead on harness W102 connector P3 pin 4 and other lead in harness W102 connector J1 socket Z.

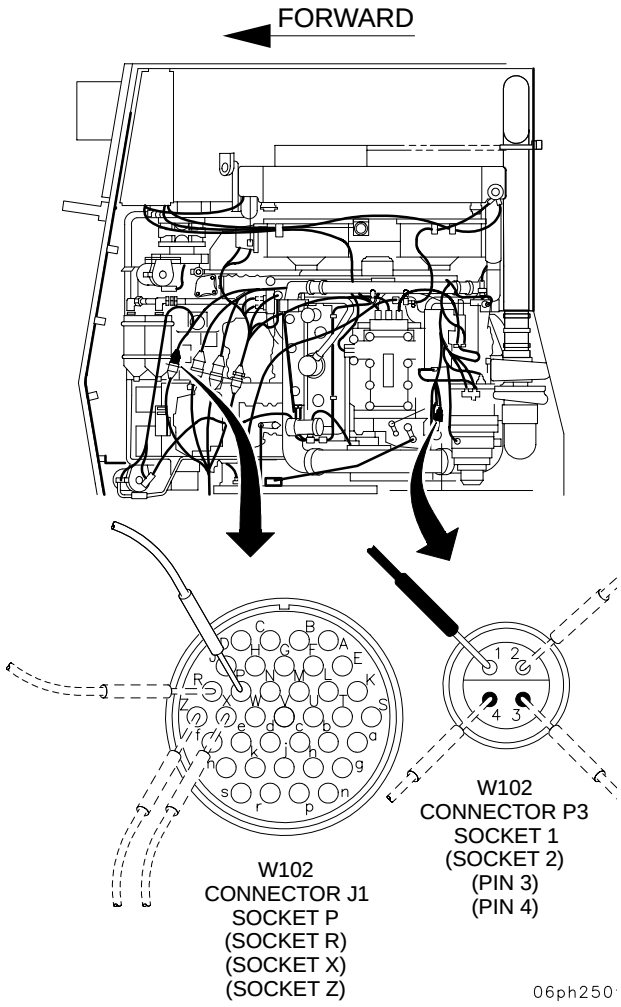
Is continuity present?

yes

Replace air box pressure transducer (para 8-44).

no

Repair or replace harness W102 (para 8-62).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(7) STE FAILS TO GIVE BATTERY VOLTAGE READING (WHILE PERFORMING TEST 67). STE passed power-up and confidence tests (para 3-4.a(1)).

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

A

1. Shut engine and vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect STE cable W1 from harness W100 connector J1 (DCA connector).
3. Disconnect harness W100 connector P1 from harness W101 connector J1.
4. Place multimeter red lead on harness W101 connector J1 socket v and black lead to ground.
5. Check for voltage.

Is voltage present?

yes / no

Repair or replace harness W101 (para 8-61).

B Check harness W101 lead AZ for continuity by placing red multimeter lead on harness W101 connector J1 socket s and black lead to ground.

Is continuity present?

yes / no

Repair or replace harness W101 (para 8-61).

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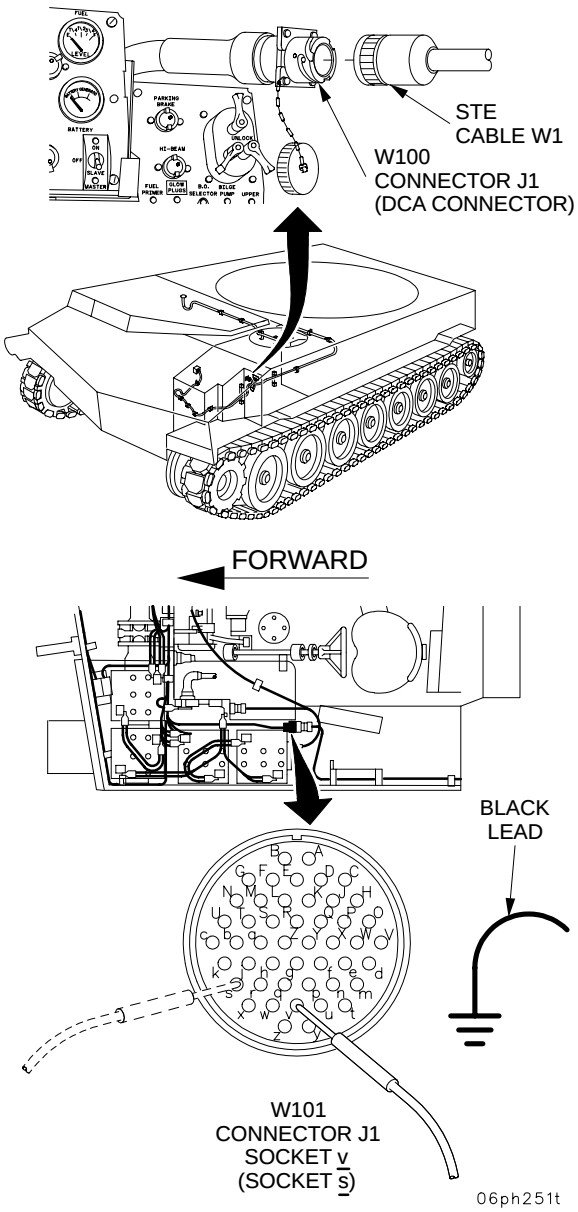


3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(7) STE FAILS TO GIVE BATTERY VOLTAGE READING (WHILE PERFORMING TEST 67). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP B

C Make the following continuity check on harness W100:

1. Place one multimeter lead on connector P1 pin v and other lead in connector J1 socket E.
2. Place one multimeter lead on connector P1 pin s and other lead in connector J1 socket W.

Is continuity present?

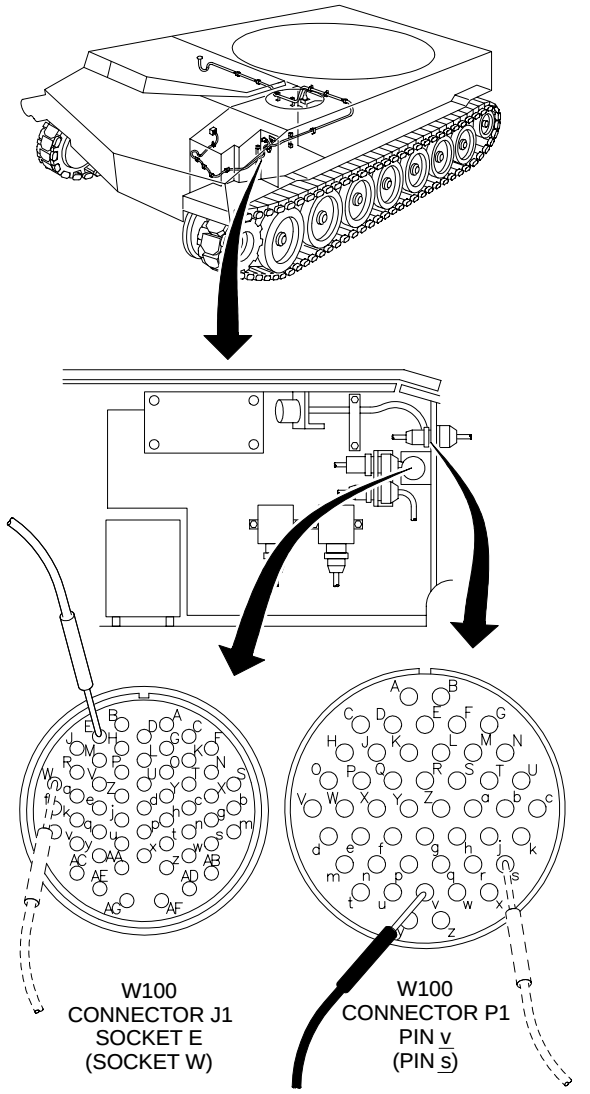
yes

Repair or replace harness W100 (para 8-60).

no

Go to TM 9-4910-571-12&P. Troubleshoot STE cable W1.

END OF TASK



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3-3 TROUBLESHOOTING CHART - CONTINUED

o.	STE DCA CIRCUIT - CONTINUED	(8) STE FAILS TO GIVE STARTER MOTOR VOLTAGE READING (WHILE PERFORMING TEST 68). STE passed power-up and confidence tests (para 3-4.a(1)).

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)

Personnel Required
Two

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect STE cable W1 from harness W100 connector J1 (DCA connector).
3. Disconnect harness W101 connector P1 from harness W102 connector J1.
4. Disconnect harness W100 connector P1 from harness W101 connector J1.
5. Check harness W101 for continuity as follows:
   a. Place one multimeter lead on connector P1 pin F and other lead in connector J1 socket m.
   b. Place one multimeter lead in connector J1 socket s and other lead to ground.

Is continuity present?

yes

no

Repair or replace harness W101 (para 8-61).

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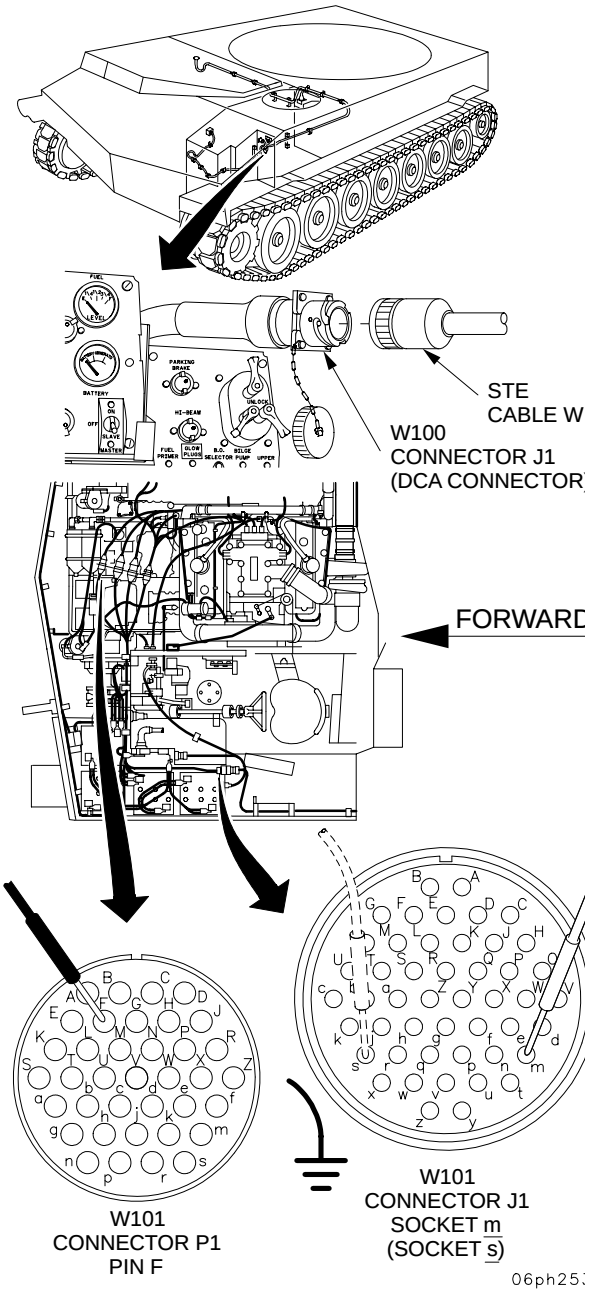


3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(8) STE FAILS TO GIVE STARTER MOTOR VOLTAGE READING (WHILE PERFORMING TEST 68). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP A

B Make the following continuity checks on harness W100:

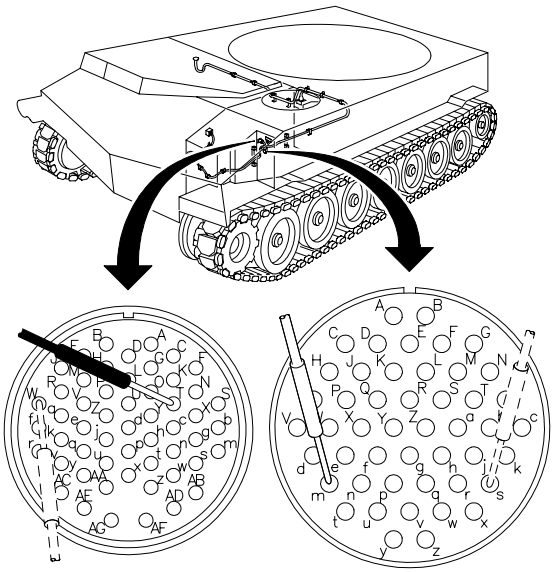
a. Place one multimeter lead on connector P1 pin m and other lead in connector J1 socket T.
b. Place one multimeter lead on connector P1 pin s and other lead in connector J1 socket W.

Is continuity present?

yes

Repair or replace harness W100 (para 8-60).

no



W100 CONNECTOR J1 SOCKET T (SOCKET W)

W100 CONNECTOR P1 PIN m (PIN s)

C
1. Reconnect harness W100 connector P1 to harness W101 connector J1.
2. Remove powerplant (para 4-1).
3. Check harness W102 lead AY for continuity by placing one multimeter lead on harness W102 lead AY at starter solenoid connection and other lead in harness W102 connector J1 socket F.

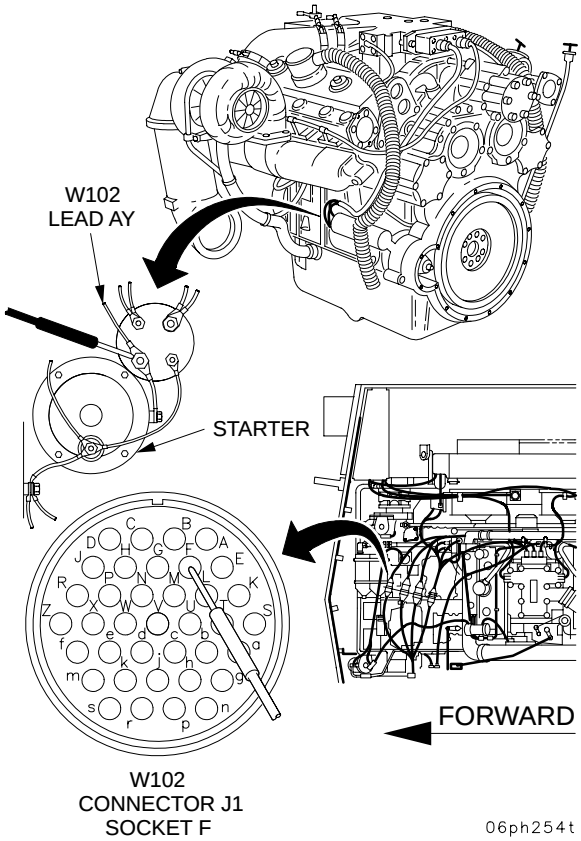
Is continuity present?

yes

Repair or replace harness W102 (para 8-62).

no

Go to TM 9-4910-571-12&P and troubleshoot STE cable W1.



W102 CONNECTOR J1 SOCKET F

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END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

o.	STE DCA CIRCUIT – CONTINUED	(9) STE FAILS TO GIVE STARTER NEGATIVE CABLE DROP READING (WHILE PERFORMING TEST 69). STE passed power-up and confidence tests (para 3-4.a(1)).

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Transmission access cover open (TM 9-2350-314-10)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect STE cable W1 from harness W100 connector J1 (DCA connector).
3. Disconnect harness W101 connector P1 from harness W102 connector J1.
4. Check harness W100 connector P1 from harness W101 connector J1.
5. Check harness W101 for continuity as follows:
   a. Place one multimeter lead on connector P1 pin E and other lead in connector J1 socket n.
   b. Place one multimeter lead in connector J1 socket w and other lead on ground.

Is continuity present?

yes

no

Repair or replace harness W101 (para 8-61).

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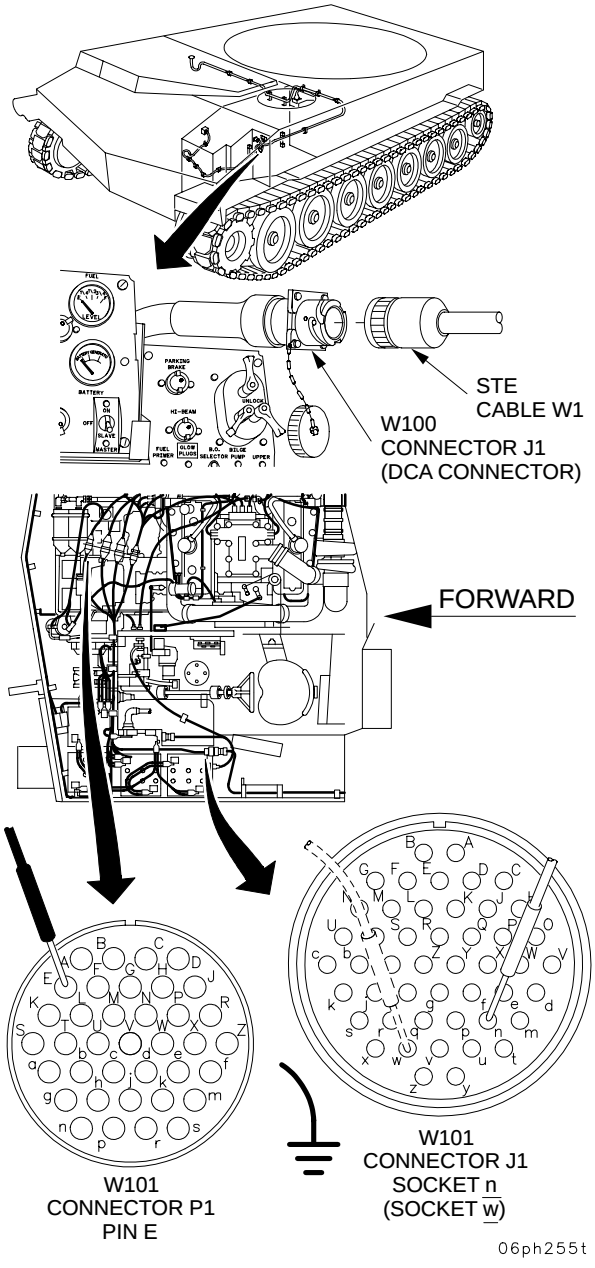


3-3 TROUBLESHOOTING CHART - CONTINUED

o.	STE DCA CIRCUIT - CONTINUED	(9) STE FAILS TO GIVE STARTER NEGATIVE CABLE DROP READING (WHILE PERFORMING TEST 69). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP A

B Make the following continuity checks on harness W100:

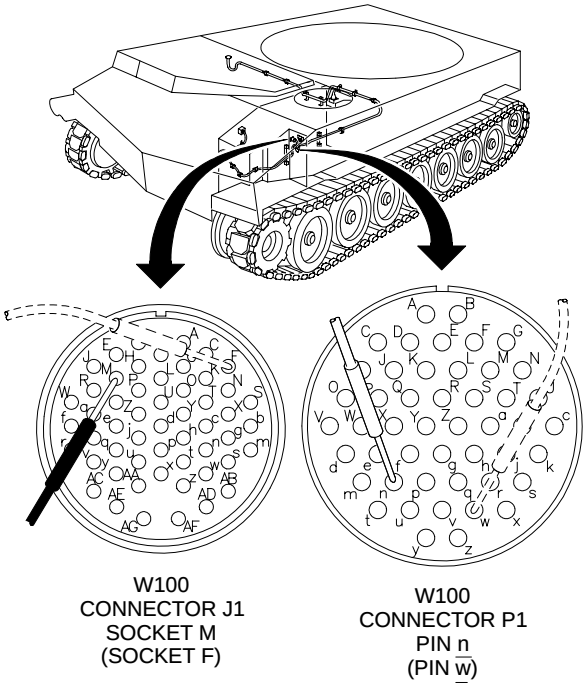
1. Place one multimeter lead on connector P1 pin n and other lead in connector J1 socket M.
2. Place one multimeter lead on connector P1 pin w and other lead in connector J1 socket F.

Is continuity present?

yes

no

Repair or replace harness W100 (para 8-60).



C

1. Reconnect harness W100 connector P1 to harness W101 connector J1.
2. Remove powerpack (Chapter 4).
3. Check harness W102 lead GND N for continuity by placing one multimeter lead on harness W102 lead GND N at starter ground terminal and other lead in harness W102 connector J1 socket E.

Is continuity present?

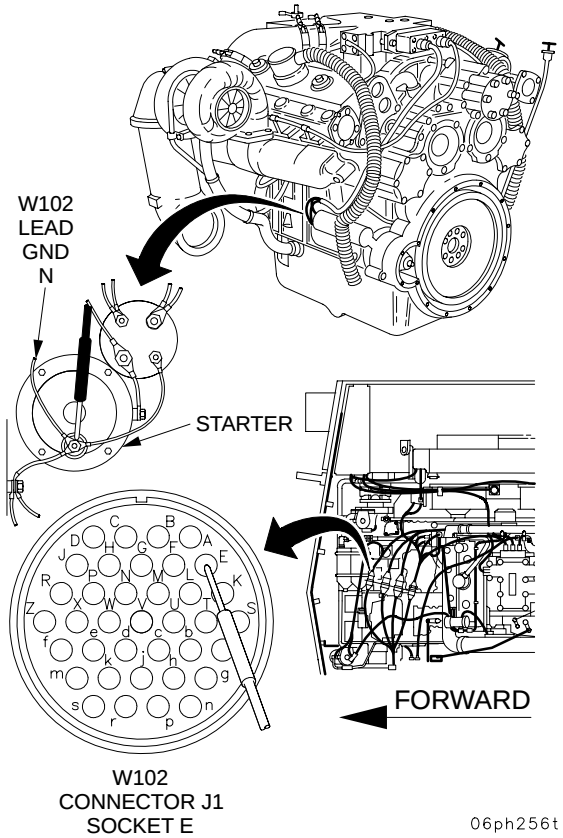
yes

no

Repair or replace harness W102 (para 8-62).

Go to TM 9-4910-571-12&P and troubleshoot STE cable W1.

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(10) STE FAILS TO GIVE STARTER SOLENOID VOLTAGE READING (WHILE PERFORMING TEST 70). STE passed power-up and confidence tests (para 3-4.a(1)).

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect STE cable W1 from harness W100 connector J1 (DCA connector).
3. Disconnect harness W101 connector P1 from harness W102 connector J1.
4. Disconnect harness W100 connector P1 from harness W101 connector J1.
5. Check harness W101 for continuity as follows:
   a. Place one multimeter lead on connector P1 pin B and other lead in connector J1 socket d.
   b. Place one multimeter lead on connector P1 pin E and other lead in connector J1 socket n.

Is continuity present?

yes

no

Repair or replace harness W101 (para 8-61).

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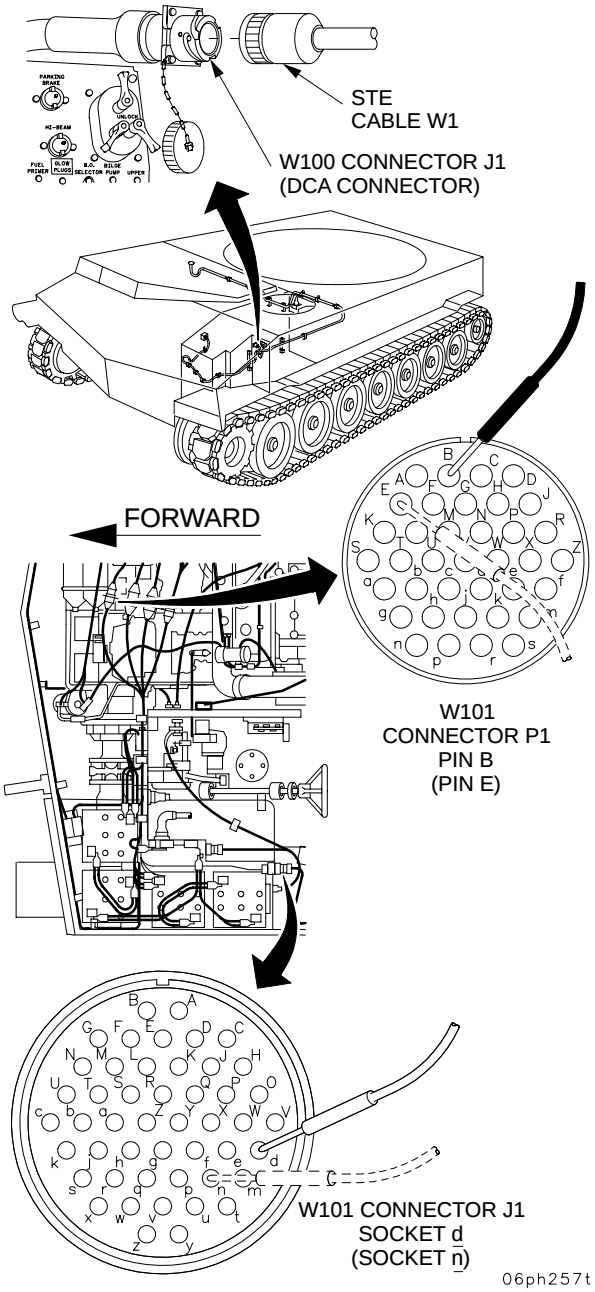

3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(10) STE FAILS TO GIVE STARTER SOLENOID VOLTAGE READING (WHILE PERFORMING TEST 70). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED.

CONTINUED FROM STEP A

B Make the following continuity checks on harness W100:

a. Place one multimeter lead on connector P1 pin d and other lead in connector J1 socket S.
b. Place one multimeter lead on connector P1 pin n and other lead in connector J1 socket M.

Is continuity present?

yes

no

Repair or replace harness W100 (para 8-60).

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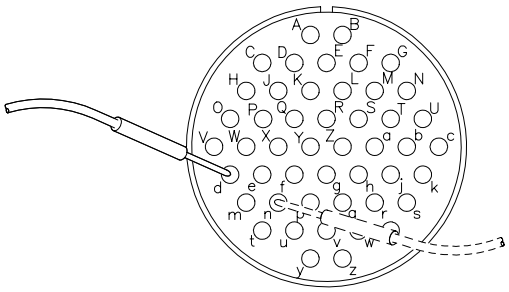
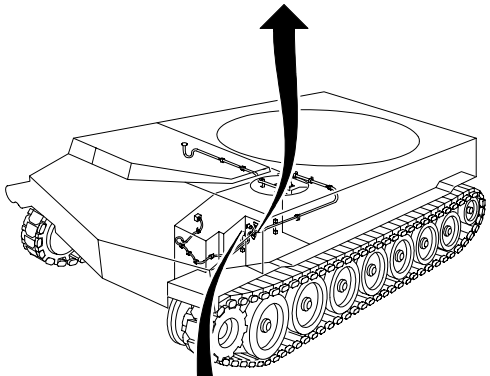
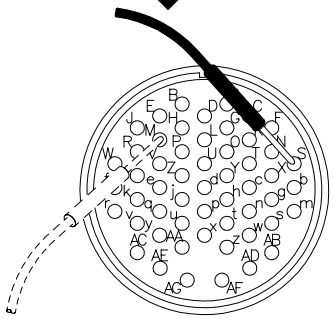


W100
CONNECTOR P1
PIN d
(PIN n)





W100
CONNECTOR J1
SOCKET S
(SOCKET M)

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3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(10) STE FAILS TO GIVE STARTER SOLENOID VOLTAGE READING (WHILE PERFORMING TEST 70). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP B

C

1. Reconnect harness W100 connector P1 to harness W101 connector J1.
2. Remove powerpack (para 4-1).
3. Check harness W102 for continuity as follows:
   a. Place one multimeter lead on starter solenoid terminal with harness W104 lead 14B and harness W102 lead AX and other lead in connector J1 socket B.
   b. Place one multimeter lead on starter ground terminal GND N and other lead in connector J1 socket E.

Is continuity present?

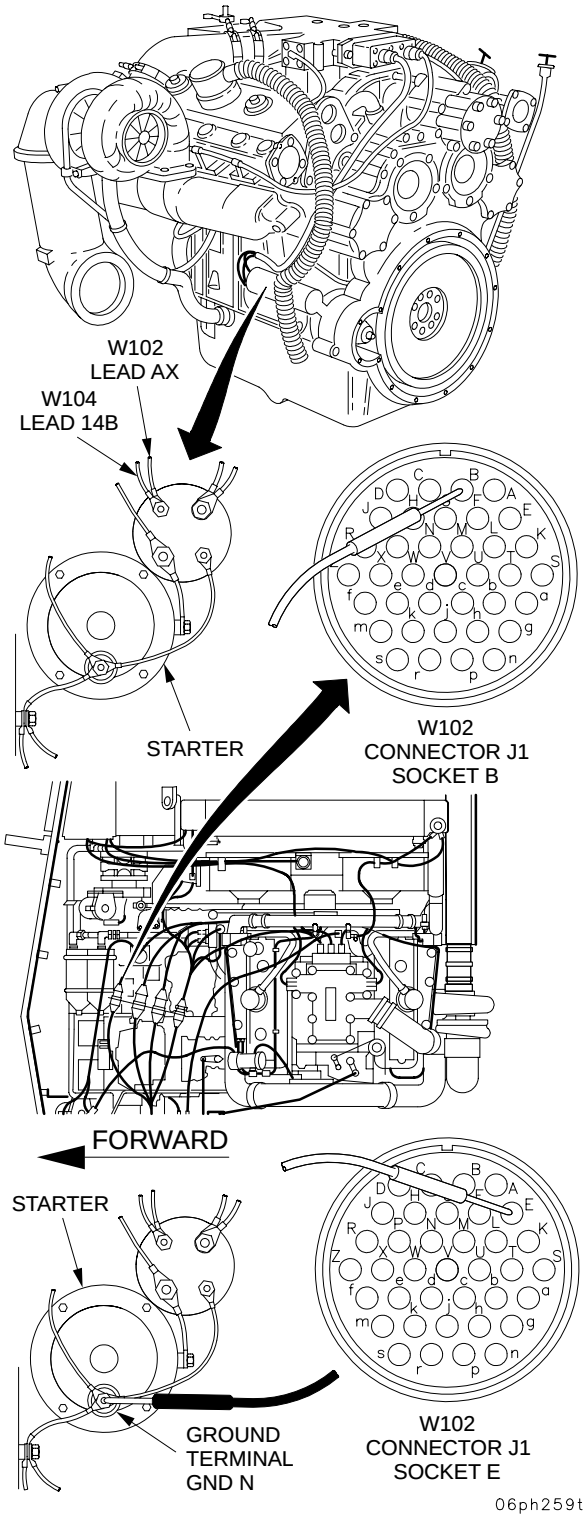
yes

no

Repair or replace harness W102 (para 8-62).

Go to TM 9-4910-571-12&P and troubleshoot STE cable W1.

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(11) STE FAILS TO GIVE STARTER CURRENT READING (WHILE PERFORMING TEST 71). STE passed power-up and confidence tests (para 3-4.a(1)).

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long leads may be needed for some tests. 16 AWG wire may be used as an extension.)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect STE cable W1 from harness W100 connector J1 (DCA connector).
3. Disconnect harness W100 connector P1 from harness W101 connector J1 at driver's bulkhead.
4. Place one multimeter lead on harness W101 connector J1 sockets p and u (one at a time) and other lead on ground and check for continuity.

Is continuity present?

yes → no

Repair or replace harness W101 (para 8-61).

B

Check harness W100 for continuity as follows:

a. Place one multimeter lead on connector P1 pin p and other lead in connector J1 socket X.
b. Place one multimeter lead on connector P1 pin u and other lead in connector J1 socket Y.

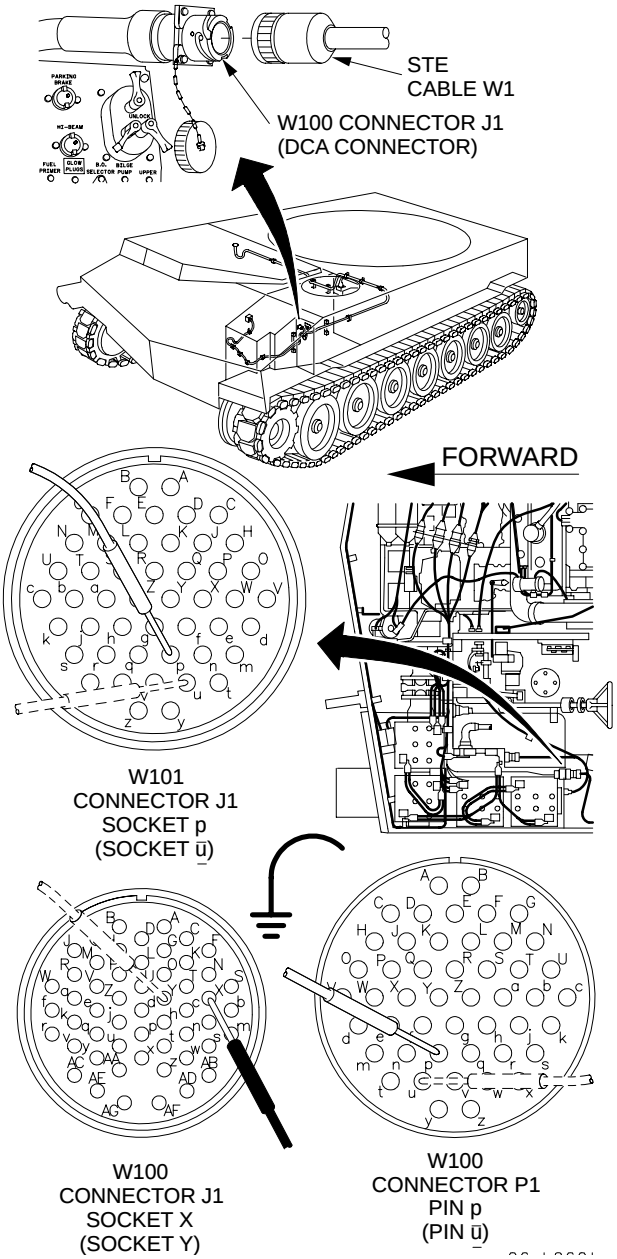
Is continuity present?

yes → no

Repair or replace harness W100 (para 8-60).

Go to TM 9-4910-571-12&P and troubleshoot STE cable W1.

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(12) STE FAILS TO GIVE READING (WHILE PERFORMING TEST 72, or 73, or 74, or 75). STE passed power-up and confidence tests (para 3-4.a(1)).

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect STE cable W1 from harness W100 connector J1 (DCA connector).
3. Disconnect harness W100 connector P1 from harness W101 connector J1 at driver's bulkhead.
4. Place multimeter red lead on harness W101 connector J1 sockets r and v (one at a time) and black lead to ground. Check for voltage.

Is voltage present?

yes

no

Repair or replace harness W101 (para 8-61).

B

Place one multimeter lead on harness W101 connector J1 sockets p , s, and u (one at a time) and other lead to ground. Check for continuity.

Is continuity present?

yes

no

Repair or replace harness W101 (para 8-61).

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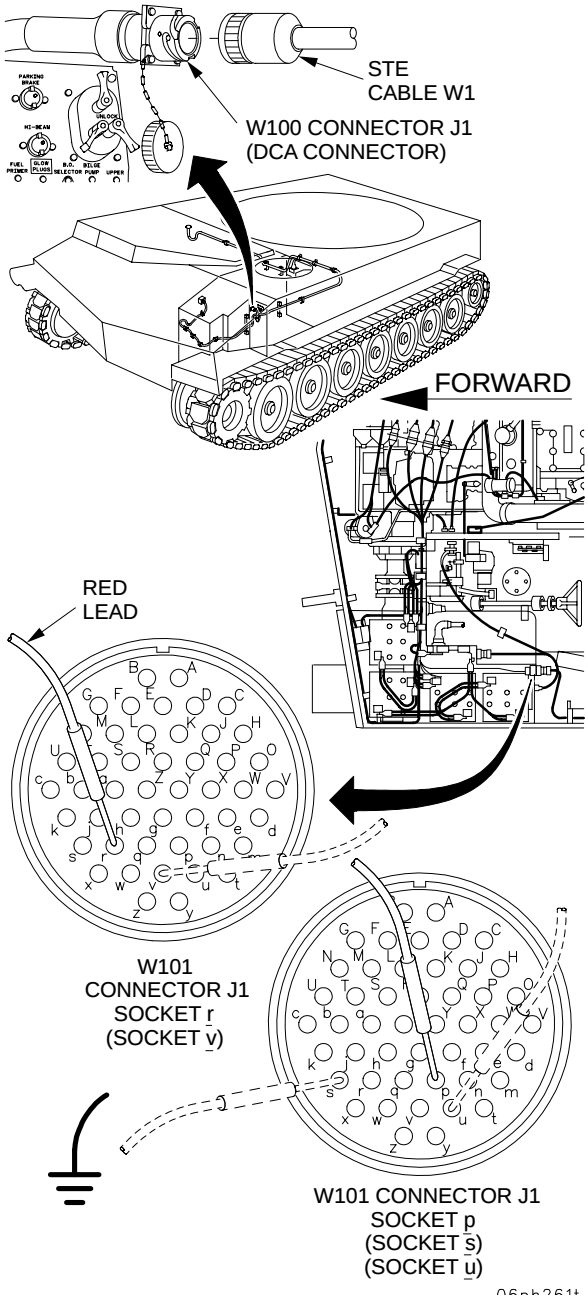


3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(12) STE FAILS TO GIVE READING (WHILE PERFORMING TEST 72, or 73, or 74, or 75). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP B

C

Check harness W100 for continuity as follows:

a. Place one multimeter lead on connector P1 pin p and other lead in connector J1 socket X.
b. Place one multimeter lead on connector P1 pin r and other lead in connector J1 socket V.
c. Place one multimeter lead on connector P1 pin s and other lead in connector J1 socket W.
d. Place one multimeter lead on connector P1 pin u and other lead in connector J1 socket Y.
e. Place one multimeter lead on connector P1 pin v and other lead in connector J1 socket E.

Is continuity present?

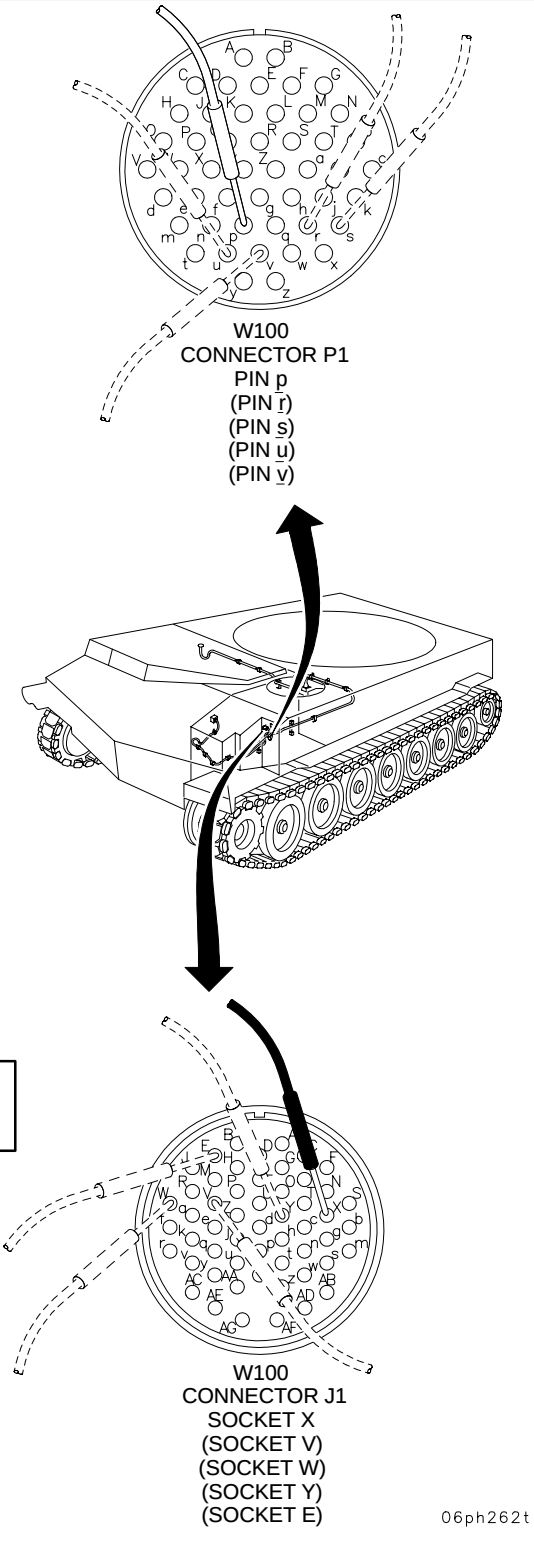
yes

no

Repair or replace harness W100 (para 8-60).

Go to TM 9-4910-571-12&P and troubleshoot STE cable W1.

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(13) STE FAILS TO GIVE ALTERNATOR/GENERATOR OUTPUT VOLTAGE READING (WHILE PERFORMING TEST 82). STE passed power-up and confidence tests (para 3-4.a(1)).

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect STE cable W1 from harness W100 connector J1 (DCA connector).
3. Disconnect harness W100 connector P1 from harness W101 connector J1 at driver's bulkhead.
4. Disconnect harness W101 connector P1 from harness W102 connector J1 at engine disconnect bracket.
5. Check harness W101 for continuity as follows:
   a. Place one multimeter on connector P1 pin p and other lead in connector J1 socket t.
   b. Place one multimeter lead in connector J1 socket s and other lead to ground.

Is continuity present?

yes

no

Repair or replace harness W101 (para 8-61).

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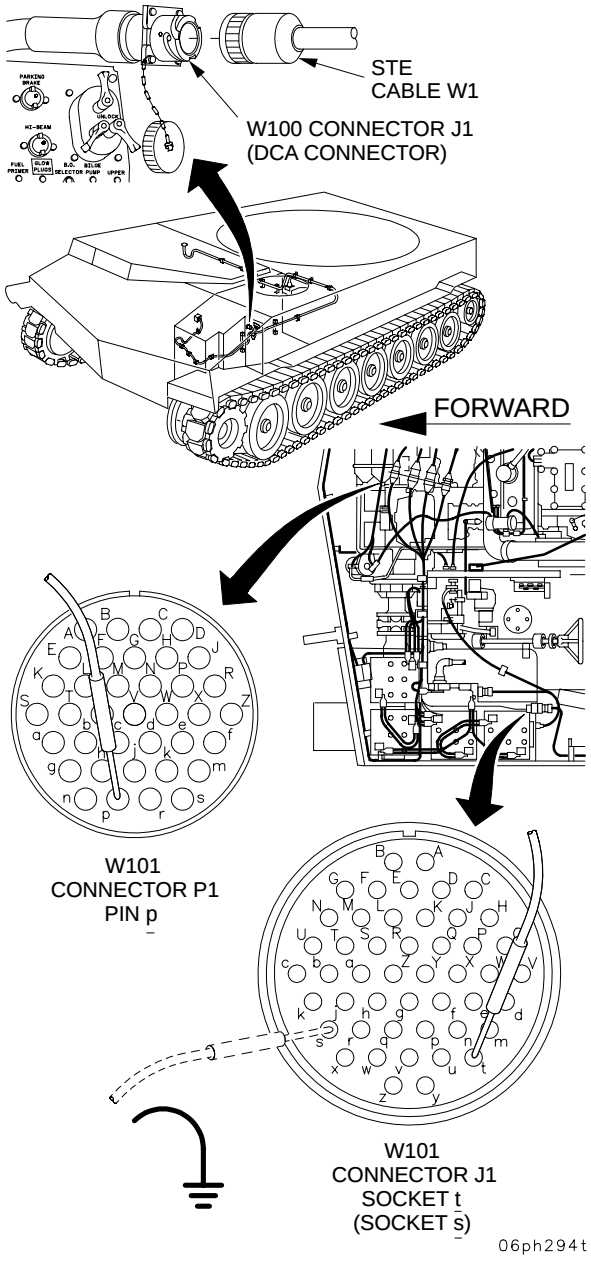

3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(13) STE FAILS TO GIVE ALTERNATOR/GENERATOR OUTPUT VOLTAGE READING (WHILE PERFORMING TEST 82). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP A

B

Check harness W100 for continuity as follows:

a. Place one multimeter lead on connector P1 pin s and other lead in connector J1 socket W.

b. Place one multimeter lead on connector P1 pin t and other lead in connector J1 socket N.

Is continuity present?

yes

no

Repair or replace harness W100 (para 8-60).

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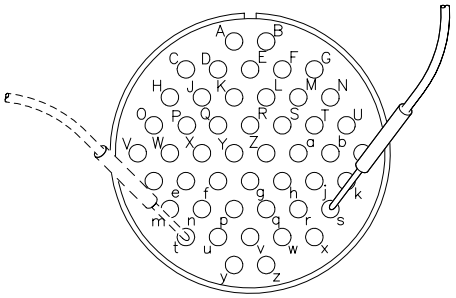
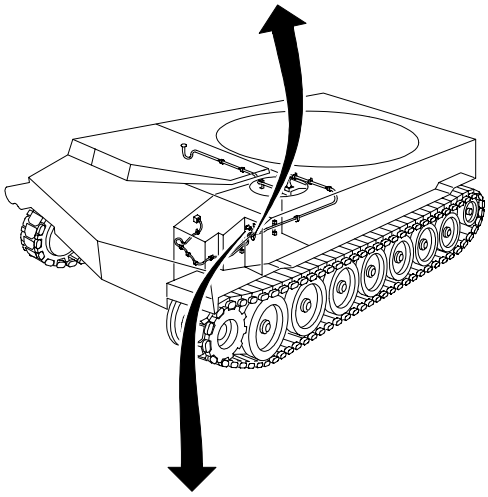
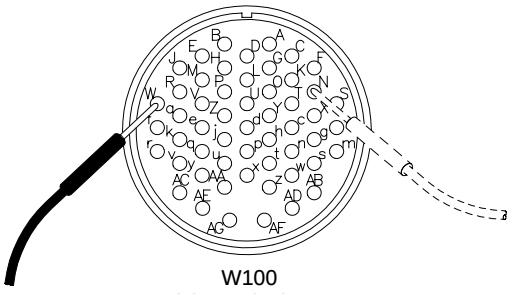


W100
CONNECTOR P1
PIN s
(PIN t)





W100
CONNECTOR J1
SOCKET W
(SOCKET N)

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3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(13) STE FAILS TO GIVE ALTERNATOR/GENERATOR OUTPUT VOLTAGE READING (WHILE PERFORMING TEST 82). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP B

C

1. Reconnect harness W100 connector P1 to harness W101 connector J1.
2. Check harness W102 lead AW for continuity by placing one multimeter lead on harness W102 lead AW at generator positive terminal and other lead in harness W102 connector J1 socket p.

Is continuity present?

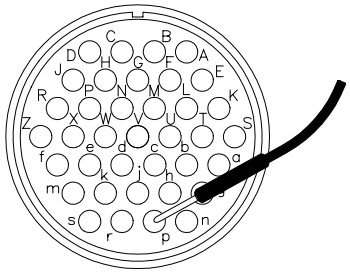
yes

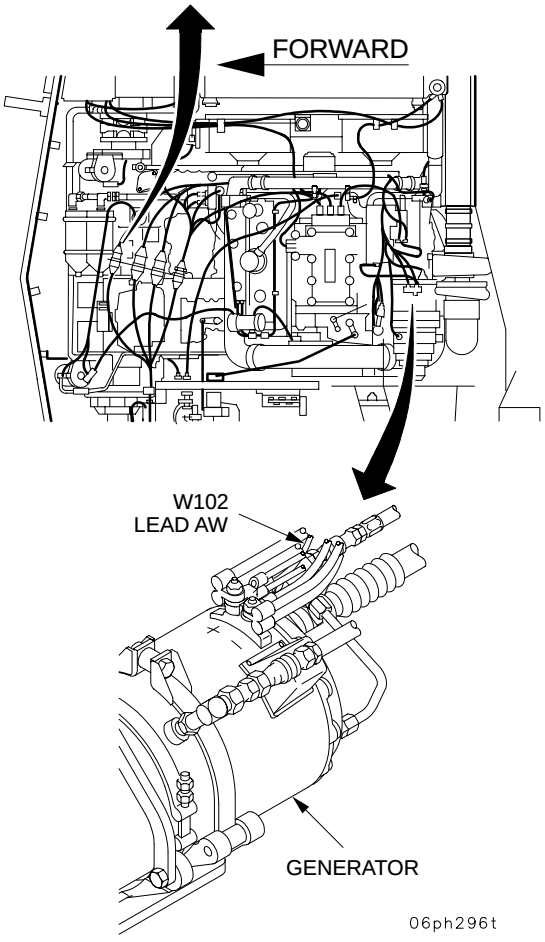
Go to TM 9-4910-571-12&P and troubleshoot STE cable W1.

no

Repair or replace harness W102 (para 8-62).

END OF TASK





3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(14) STE FAILS TO GIVE ALTERNATOR/GENERATOR FIELD VOLTAGE READING (WHILE PERFORMING TEST 83). STE passed power-up and confidence tests (para 3-4.a(1)).

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)

A

1. Shut engine and vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect STE cable W1 from harness W100 connector J1 (DCA connector).
3. Disconnect harness W101 connector P1 from harness W102 connector J1.
4. Disconnect harness W100 connector P1 from harness W101 connector J1.
5. Disconnect harness W101 lead AV from harness W106 lead F+ connector.
6. Check harness W101 for continuity as follows:
   a. Place one multimeter lead on connector P1 pin E and other lead in connector J1 socket n.
   b. Place one multimeter lead on lead AV connector pin and other lead in connector J1 socket y.

Is continuity present?

yes

no

Repair or replace harness W101 (para 8-61).

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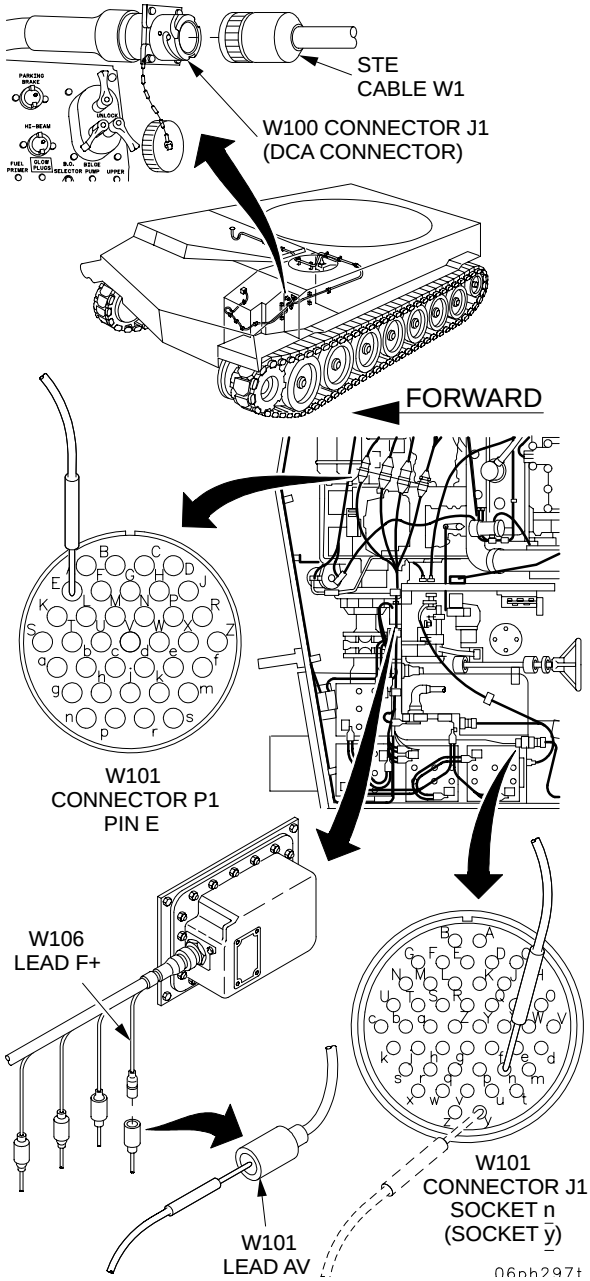

3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(14) STE FAILS TO GIVE ALTERNATOR/GENERATOR FIELD VOLTAGE READING (WHILE PERFORMING TEST 83). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP A

B Check harness W100 for continuity as follows:

a. Place one multimeter lead on connector P1 pin n and other lead in connector J1 socket M.

b. Place one multimeter lead on connector P1 pin y and other lead in connector J1 socket O.

Is continuity present?

yes

no

Repair or replace harness W100 (para 8-60).

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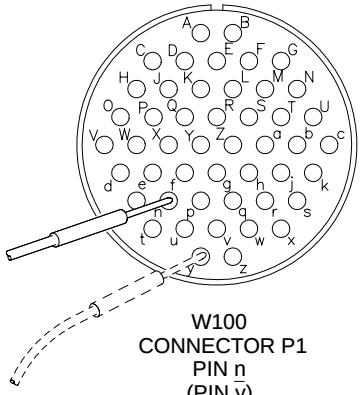
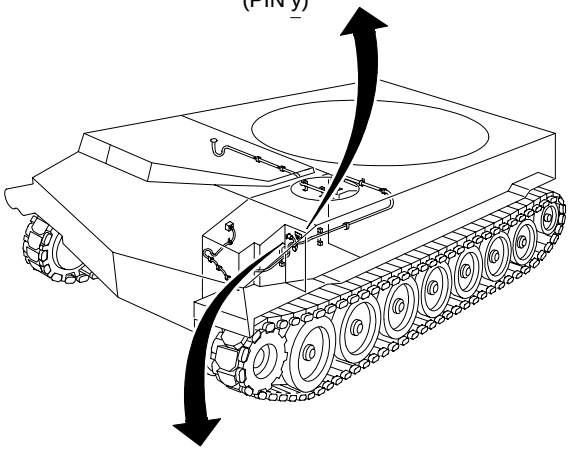
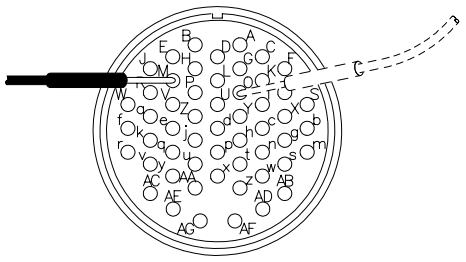


W100
CONNECTOR P1
PIN n
(PIN y)





W100
CONNECTOR J1
SOCKET M
(SOCKET O)

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3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(14) STE FAILS TO GIVE ALTERNATOR/GENERATOR FIELD VOLTAGE READING (WHILE PERFORMING TEST 83). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP B

C

1. Disconnect harness W106 connector P1 from voltage regulator.
2. Check harness W106 for continuity by placing one multimeter lead in harness W106 connector P1 socket C and other lead in harness W106 lead F+ connector socket.

Is continuity present?

yes

no

Repair or replace harness W106 (para 8-65).

D

1. Reconnect harness W100 connector P1 to harness W101 connector J1.
2. Reconnect harness W106 connector P1 voltage regulator and lead F+ to harness W101 lead AV.
3. Remove powerpack (para 4-1).
4. Check harness W102 for continuity by placing one multimeter lead on starter ground terminal GND-N and other lead in harness W102 connector J1 socket E.

Is continuity present?

yes

no

Repair or replace harness W102 (para 8-62).

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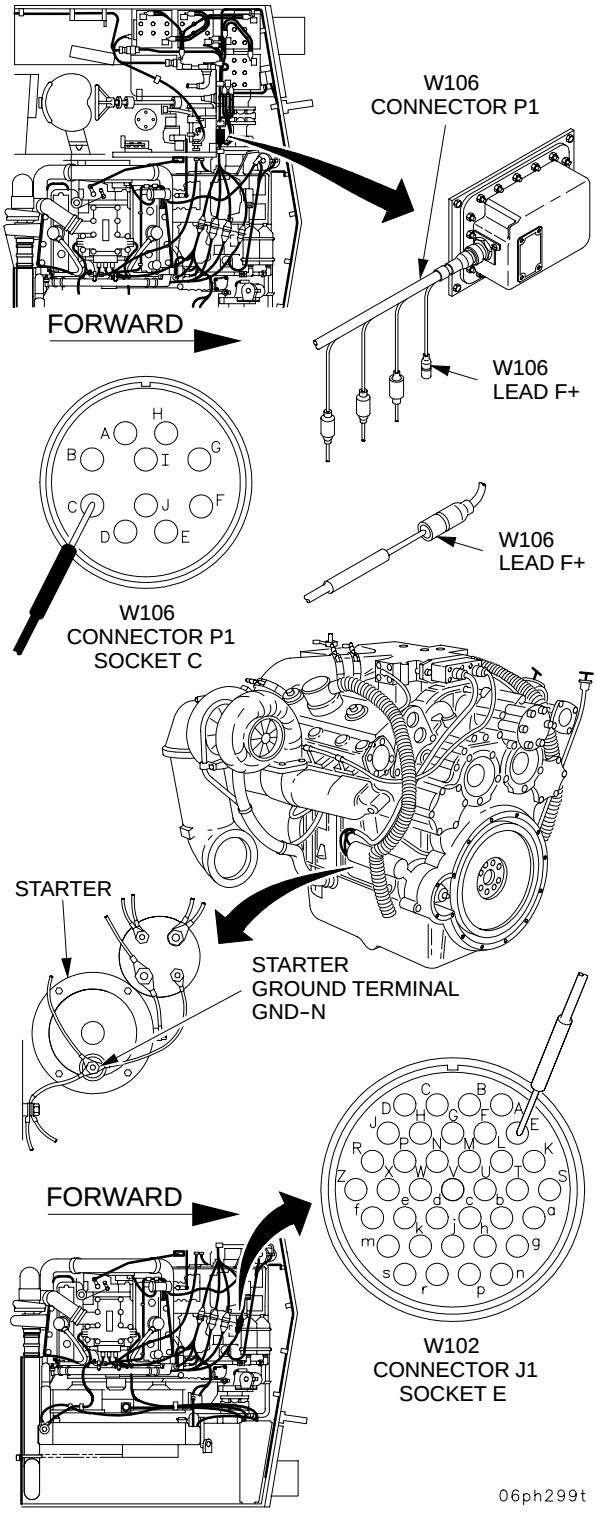


3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(14) STE FAILS TO GIVE ALTERNATOR/GENERATOR FIELD VOLTAGE READING (WHILE PERFORMING TEST 83). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP D

E

1. Disconnect harness W107 lead 3 at generator negative terminal.
2. Check harness W107 lead 3 by placing one multimeter lead on harness W107 lead 3 at generator negative terminal and other lead to ground.

Is continuity present?

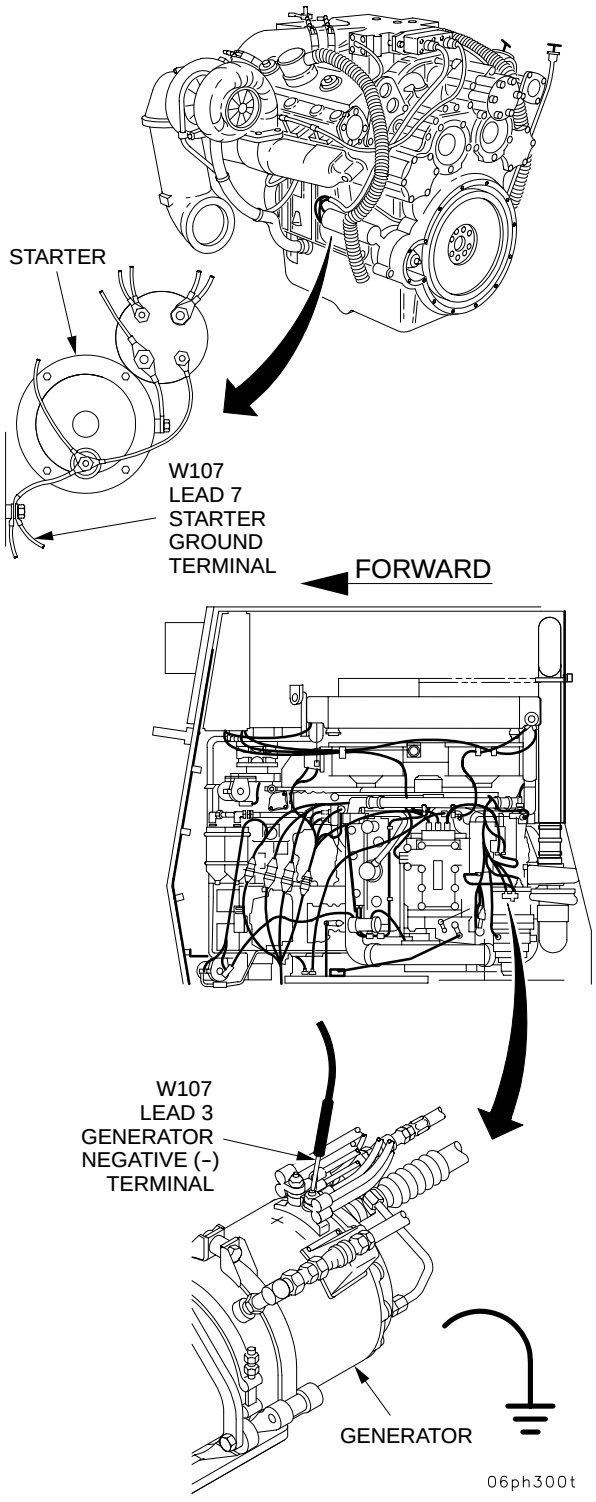
yes

Repair or replace lead 3 from generator to starter (para 8-97).

no

Go to TM 9-4910-571-12&P and troubleshoot STE cable W1.

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(15) STE FAILS TO GIVE ALTERNATOR/GENERATOR NEGATIVE CABLE DROP READING (WHILE PERFORMING TEST 84). STE passed power-up and confidence tests (para 3-4.a(1)).

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)
(Long leads may be needed for some tests. 16 AWG wire may be used as an extension.)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect STE cable W1 from harness W100 connector J1 (DCA connector).
3. Disconnect harness W101 connector P1 from harness W102 connector J1.
4. Disconnect harness W100 connector P1 from harness W101 connector J1 at driver's bulkhead.
5. Check harness W101 for continuity as follows:
   a. Place one multimeter lead on connector P1 pin S and other lead in connector J1 socket z.
   b. Place one multimeter lead in connector J1 socket s and other lead to ground.

Is continuity present?

yes

no

Repair or replace harness W101 (para 8-61).

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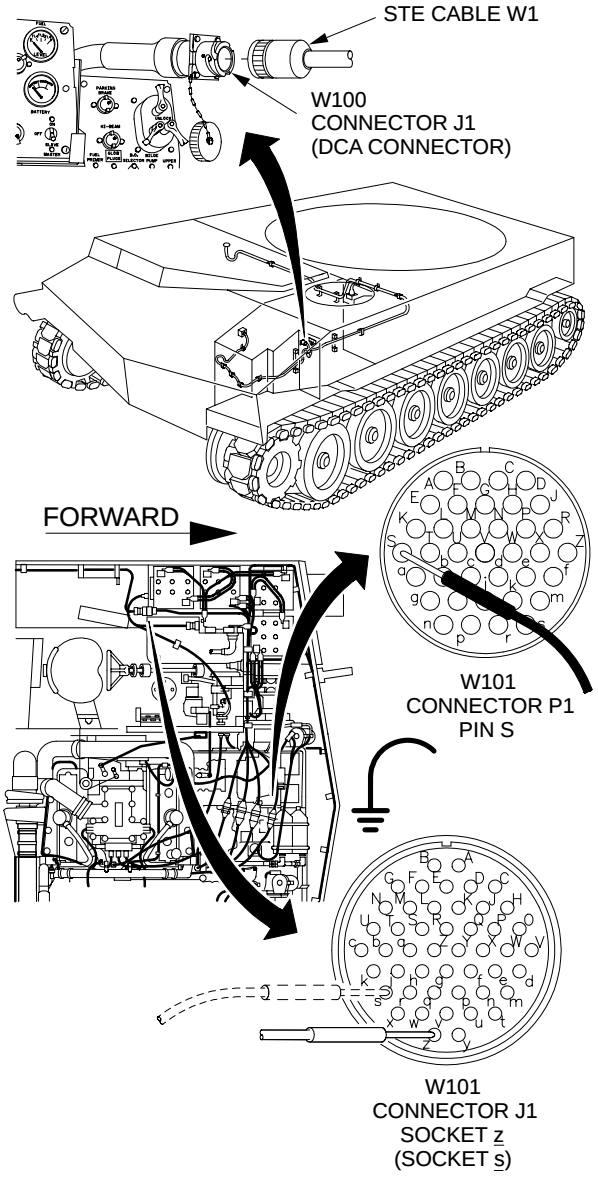

3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(15) STE FAILS TO GIVE ALTERNATOR/GENERATOR NEGATIVE CABLE DROP READING (WHILE PERFORMING TEST 84). STE passed power-up and confidence tests (para 3-4a.(1)). - CONTINUED

CONTINUED FROM STEP A

B Check harness W100 for continuity as follows:

a. Place one multimeter lead on connector P1 pin s and other lead in connector J1 socket W.

b. Place one multimeter lead on connector P1 pin z and other lead in connector J1 socket P.

Is continuity present?

yes

no

Repair or replace harness W100 (para 8-60).

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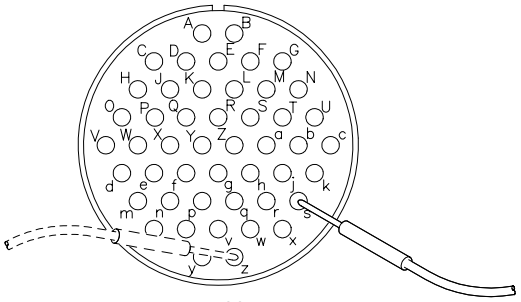
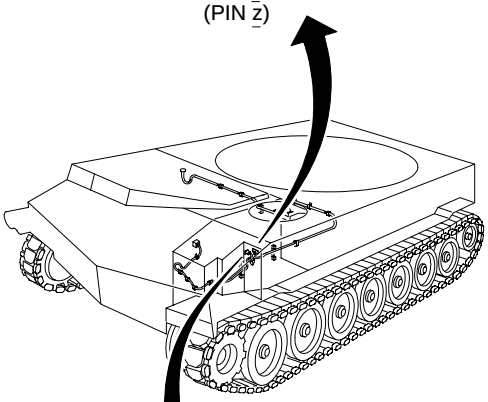
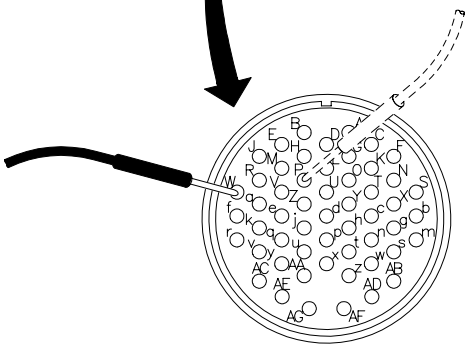


W100
CONNECTOR P1
PIN s
(PIN z)





W100
CONNECTOR J1
SOCKET W
(SOCKET P)

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3-3 TROUBLESHOOTING CHART - CONTINUED

o. STE DCA CIRCUIT - CONTINUED	(15) STE FAILS TO GIVE ALTERNATOR/GENERATOR NEGATIVE CABLE DROP READING (WHILE PERFORMING TEST 84). STE passed power-up and confidence tests (para 3-4.a(1)). - CONTINUED

CONTINUED FROM STEP B

C

1. Reconnect harness W100 connector P1 to harness W101 connector J1.
2. Check harness W102 by placing one multimeter lead on harness W102 lead GDN-2 at generator negative (-) terminal and other lead in harness W102 connector J1 socket S.

Is continuity present?

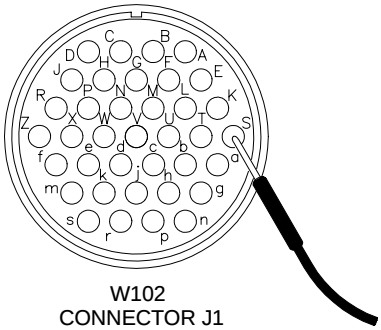
yes

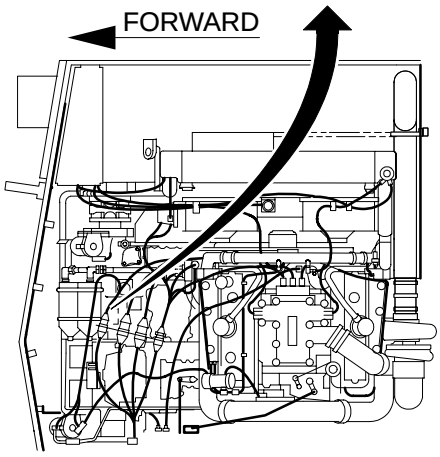
no

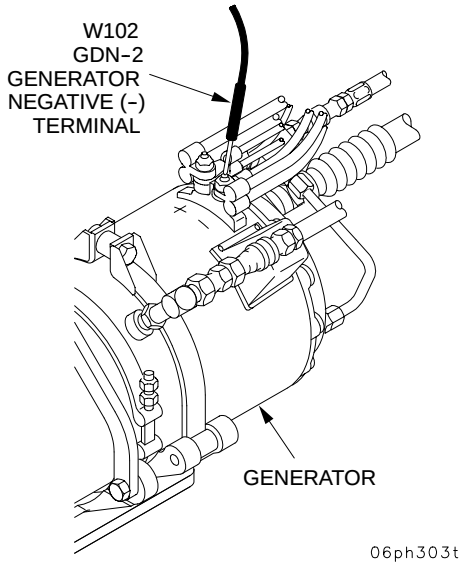
Repair or replace harness W102 (para 8-62).

Go to TM 9-4910-571-12&P and troubleshoot STE cable W1.

END OF TASK





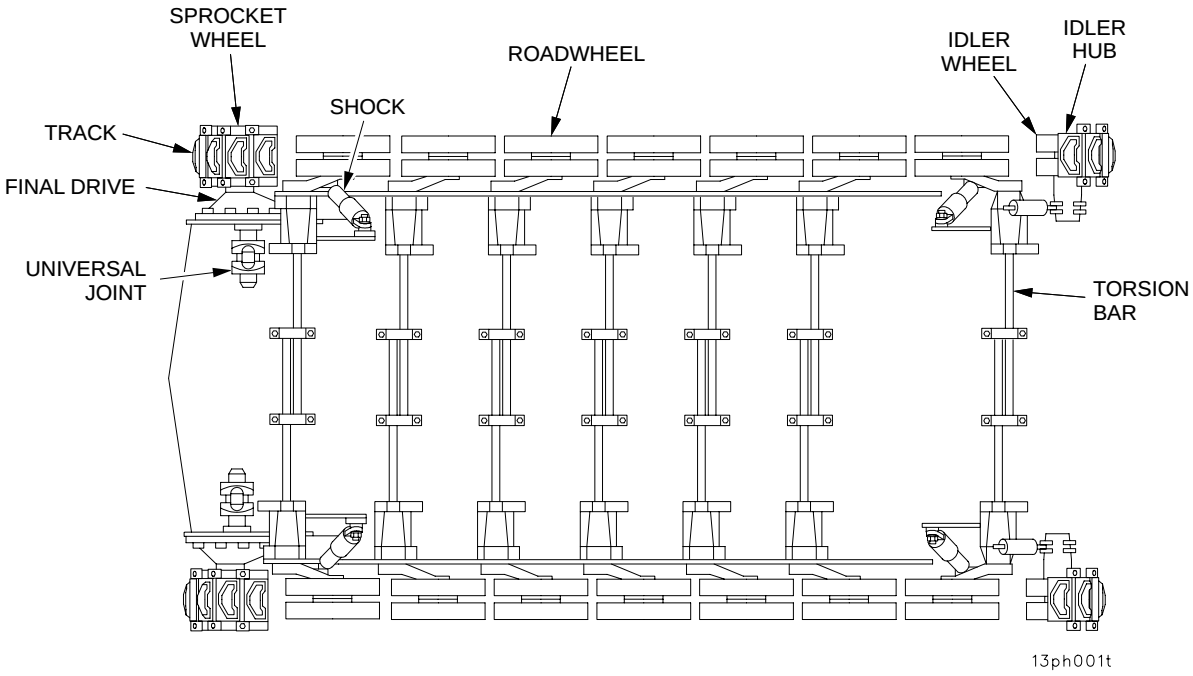


3-3 TROUBLESHOOTING CHART - CONTINUED

p. TRACK AND SUSPENSION

The track and suspension system consists of the vehicle tracks, final drives, sprocket wheel, universal joints, roadwheels, idler wheels, idler hubs, shocks, and torsion bars. The relationship of these components is shown in the diagram below.

When the track receives power from the transmission through the universal joints, final drives, and sprockets, the track begins to revolve around roadwheels, over the idler wheels and back to the sprockets. This propels the vehicle forward and backward, depending on selected transmission gear.

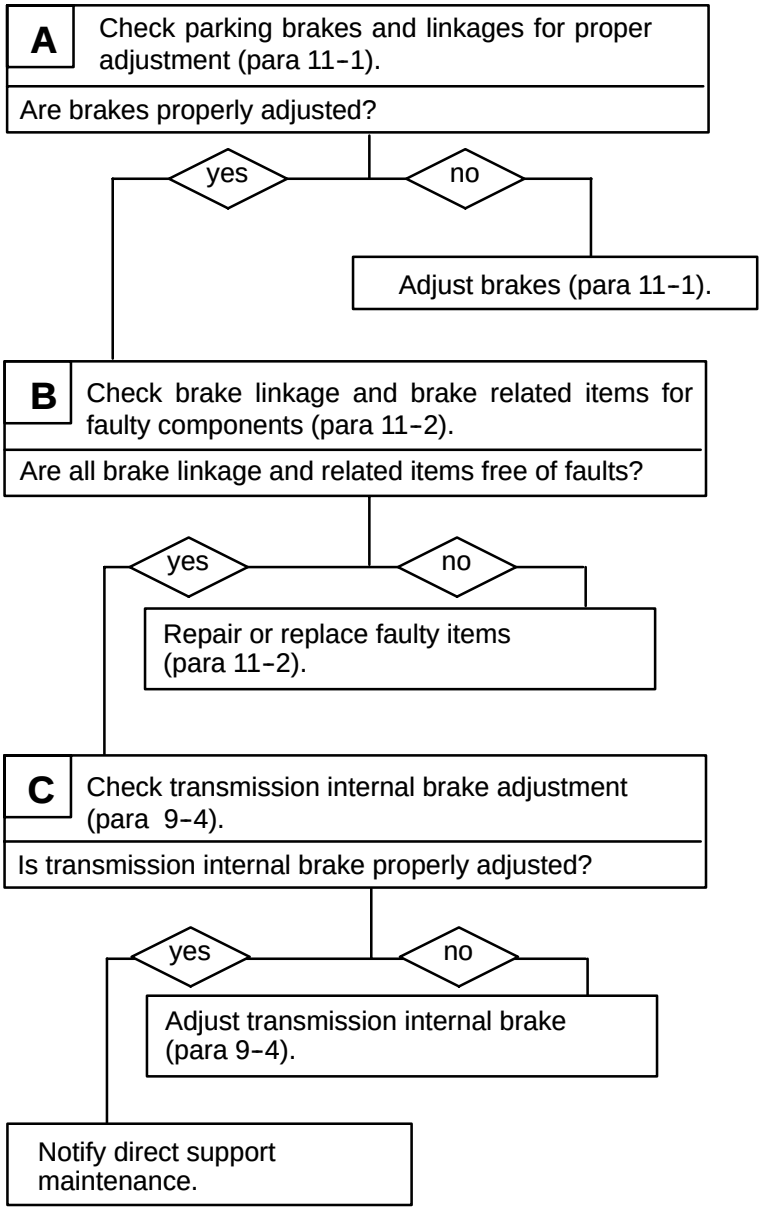


3-3 TROUBLESHOOTING CHART - CONTINUED

p. TRACK AND SUSPENSION - CONTINUED	(1) VEHICLE BRAKES POORLY. Vehicle does not stop correctly when brake is applied.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

p. TRACK AND SUSPENSION - CONTINUED	(2) VEHICLE PULLS TO ONE SIDE WITH STEERING WHEEL IN CENTER POSITION.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)

NOTE

Crown on road causes vehicle to pull away from center of road. Road test vehicle on flat surface.

A Check for disconnected or improperly adjusted steering control linkage (paras 13-1 and 13-2).

Is steering control linkage properly connected and adjusted?

yes

no

Properly connect and/or adjust steering linkage (para 13-1 and 13-2).

B Refer to para 3-3p (1) and check brake system.

Are brakes properly adjusted?

yes

no

Adjust brakes (para 11-1).

C Check tracks for proper adjustment (para 12-14).

Are tracks properly adjusted?

yes

no

Adjust tracks as required (para 12-14).

CONTINUED ON NEXT PAGE

3-3 TROUBLESHOOTING CHART - CONTINUED

p. TRACK AND SUSPENSION - CONTINUED	(2) VEHICLE PULLS TO ONE SIDE WITH STEERING WHEEL IN CENTER POSITION. - CONTINUED

CONTINUED FROM STEP C

D Refer to para 12-1 and check suspension system for broken, damaged, and/or binding suspension components.

Are suspension components in good condition?

yes

no

Repair or replace any damaged, broken, and/or binding suspension components as required (para 12-1).

E Check drive sprockets for even wear of all sprockets (para 12-12).

Are all sprockets worn the same?

yes

no

Reverse or replace drive sprockets as required (para 12-12).

F

1. Remove final drive quick-disconnects (para 10-3).
2. Start engine (TM 9-2350-314-10) and maintain 1000 to 1500 rpm.
3. Do STE/ICE test 50 (para 3-4.b(17)) using blue striped transducer.
4. Use the following test points (para 9-2):
   a. gear steer apply pressure; left 16, right 15.
   b. output clutch apply pressure; left 21, right 13.
5. Record results.

Are any pressures below specifications?

yes

no

If fault still exists, notify direct support maintenance.

Notify direct support maintenance.

END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

p.	TRACK AND SUSPENSION - CONTINUED	(3) VEHICLE THROWS TRACKS.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

NOTE

Improper driving or operation of vehicle (high speed turns) causes the vehicle to throw tracks.

A Check for loose, worn, or damaged tracks (paras 12-14 and 12-16).

Are tracks tight and in good condition?

yes

no

Adjust and/or replace tracks as required (paras 12-14 and 12-16).

B Check drive sprockets for excessive wear (Table 2-1, PMCS item 25).

Are drive sprockets free of excessive wear?

yes

no

Reverse or replace sprockets as required (para 12-12).

C Check for foreign objects wedged between roadwheels or idler wheels.

Are roadwheels and idler wheels free of foreign objects?

yes

no

Remove foreign objects from between roadwheels and idler wheels.

CONTINUED ON NEXT PAGE

3-3 TROUBLESHOOTING CHART - CONTINUED

p. TRACK AND SUSPENSION - CONTINUED	(3) VEHICLE THROWS TRACKS. - CONTINUED

CONTINUED FROM STEP C

D Check for broken torsion bars (Table 2-1, PMCS item 24).

Are all torsion bars in good condition?

yes

Disconnect track and lay out flat (para 12-16). Inspect track and track shoes (TM 9-2350-200-24). Replace as required (para 12-15).

no

Replace broken torsion bars as required (para 12-6).

END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

p. TRACK AND SUSPENSION - CONTINUED	(4) VEHICLE RIDE IS ROUGH OR SUSPENSION SYSTEM IS NOISY DURING OPERATION.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

WARNING

Use caution when feeling shock absorbers. They can get hot enough to cause burns.

NOTE

A defective shock absorber will be colder than the other shock absorbers.

A

1. Immediately after road test, place the back of your hand on shocks to feel for the presence of heat. Heat indicates shock absorbers are functioning properly (TM 9-2350-314-10, PMCS).
2. Check shock absorbers and hydraulic bumpers for oil leaks (TM 9-2350-314-10, PMCS).
3. Check shock absorbers and hydraulic bumpers for proper mounting (paras 15-1 and 15-3).

Are shock absorbers and hydraulic bumpers properly mounted, free of oil leaks, and are shock absorbers approximately the same temperature?

yes

no

Tighten loose and replace faulty shock absorbers and/or hydraulic bumpers as required (paras 15-1 and 15-3).

NOTE

Roadwheels which are hot to the touch indicate a bearing problem.

CONTINUED ON NEXT PAGE

3-3 TROUBLESHOOTING CHART - CONTINUED

p. TRACK AND SUSPENSION - CONTINUED	(4) VEHICLE RIDE IS ROUGH OR SUSPENSION SYSTEM IS NOISY DURING OPERATION. - CONTINUED

CONTINUED FROM STEP A

WARNING

Use caution when checking roadwheel hubs. They can get hot enough to cause burns.

B Immediately after road test, check roadwheel hubs with the back of your hand for excessive heat.

Are roadwheel hubs at normal operating temperature?

yes

no

Replace defective roadwheel hub components as required (para 12-4).

C Check drive sprockets for excessive wear (Table 2-1, PMCS item 25).

Are drive sprockets free of excessive wear?

yes

no

Reverse or replace drive sprockets as required (para 12-12).

D Refer to Table 2-1, PMCS item 24 and check for broken torsion bars.

Are all torsion bars in good condition?

yes

no

Replace broken torsion bars as required (para 12-6).

CONTINUED ON NEXT PAGE

3-3 TROUBLESHOOTING CHART - CONTINUED

p. TRACK AND SUSPENSION - CONTINUED	(4) VEHICLE RIDE IS ROUGH OR SUSPENSION SYSTEM IS NOISY DURING OPERATION. - CONTINUED

CONTINUED FROM STEP D

E Check for excessively worn track pads and roadwheels or idler wheels for missing rubber chunks (TM 9-2350-314-10).

Are track pads, roadwheels and idler wheels in good condition?

yes

no

Replace defective roadwheels, track pads, or idler wheels as necessary (para 12-5, 12-8, and/or 12-13).

Check track for worn or loose end connectors, center guides, and track shoes. Replace defective parts as required (Table 2-1, PMCS item 26).

END OF TASK

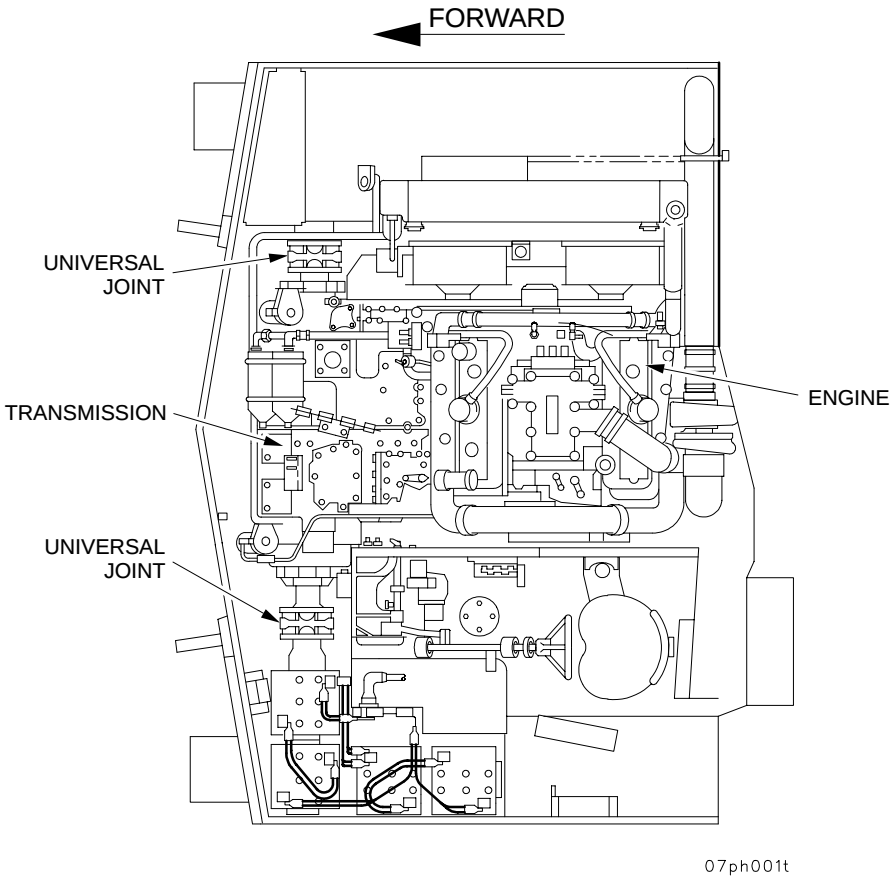
3-3 TROUBLESHOOTING CHART - CONTINUED

q. TRANSMISSION AND DRIVING CONTROLS

The transmission is mechanically and hydraulically operated and is oil cooled. Power to operate the transmission is delivered by the engine through the transfer assembly. See diagram below.

The transmission has 7 gears – 4 forward, 1 neutral, and 2 reverse. Once power is provided to the transmission, it delivers this power to the left and right drive sprockets through an output shaft, universal joints, and the final drive assemblies. The final drive assemblies reduce the transmission power and provide this reduced power to the sprockets and hubs.

The transmission also serves as the steering and braking mechanism for the vehicle.



3-3 TROUBLESHOOTING CHART - CONTINUED

q. TRANSMISSION AND DRIVING CONTROLS - CONTINUED	(1) TRANSMISSION OVERHEATS. Transmission oil temperature gage reads over 285° F (140° C). MASTER warning light is lit.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Gage (item 22, Appx F) or STE/ICE test set (item 72, Appx F)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)

WARNING

- Vehicle has no brakes when final drives are disconnected. Failure to securely block vehicle could injure personnel or damage vehicle equipment if vehicle rolls out of control.
- Transmission contains hot oil under high pressure. Stop engine before removing or installing pipe plugs and gage adapters in pressure test points. Install pipe plug as soon as gage adapter is removed. Remove only pipe plug at test point. Failure to comply with these precautions may result in equipment damage or personnel injury.

A Check transmission oil level (TM 9-2350-314-10).

Is transmission oil at proper level?

yes

no

Bring transmission oil to proper level (TM 9-2350-314-10).

B Check transmission oil cooler lines for leaks or restrictions (para 9-9).

Are transmission oil cooler lines free of leaks and restrictions?

yes

no

Tighten lines that leak. If leak persists, replace line. Repair or replace restricted lines (para 9-9).

CONTINUED ON NEXT PAGE

3-3 TROUBLESHOOTING CHART - CONTINUED

q. TRANSMISSION AND DRIVING CONTROLS - CONTINUED	(1) TRANSMISSION OVERHEATS. Transmission oil temperature gage reads over 285° F (140° C). MASTER warning light is lit. - CONTINUED

CONTINUED FROM STEP B

C Troubleshoot transmission oil temperature indicator circuit (para 3-3.g(4)).

Is transmission oil temperature indicator circuit operating properly?

yes

no → Repair or replace transmission oil temperature indicator circuit components as indicated (para 3-3.g(4)).

D Check transmission oil filter for cleanliness and proper installation (para 9-3).

Is transmission oil filter clean and properly installed?

yes

no → Replace filter element and properly install filter (para 9-3).

NOTE

To test transmission oil pressure, use a 400 psi (2758 kpa) gage or do STE/ICE test 50 (para 3-4.b(17)) using the blue striped transducer.

E Start the engine (TM 9-2350-314-10) and hold speed at 1000 to 1500 RPM and check the transmission oil pressures at test point 3 (para 9-2).

Is the transmission oil pressure below specifications?

yes

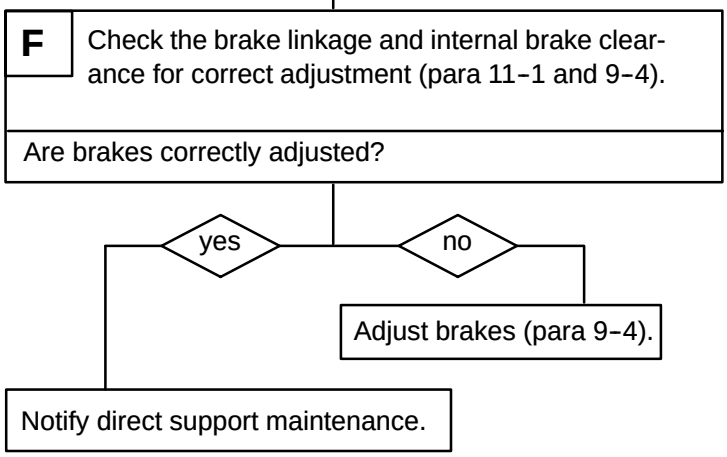
no → If transmission still overheats, notify direct support maintenance.

CONTINUED ON NEXT PAGE

3-3 TROUBLESHOOTING CHART - CONTINUED

q. TRANSMISSION AND DRIVING CONTROLS - CONTINUED	(1) TRANSMISSION OVERHEATS. Transmission oil temperature gage reads over 285° F (140° C). MASTER warning light is lit. - CONTINUED

CONTINUED FROM STEP E



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

q. TRANSMISSION AND DRIVING CONTROLS – CONTINUED	(2) VEHICLE DOES NOT DRIVE. Transmission does not operate in any shift position.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Gage (item 22, Appx F) or STE/ICE test set (item 72, Appx F)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)

WARNING

- Vehicle has no brakes when final drives are disconnected. Failure to securely block vehicle could injure personnel or damage vehicle equipment if vehicle rolls out of control.
- Transmission contains hot oil under high pressure. Stop engine before removing or installing pipe plugs and gage adapters in pressure test points. Install pipe plug as soon as gage adapter is removed. Remove only pipe plug at test point. Failure to comply with these precautions may result in equipment damage or personnel injury.

A Check transmission oil level (TM 9-2350-314-10).

Is transmission oil at proper level?

yes

no

NOTE

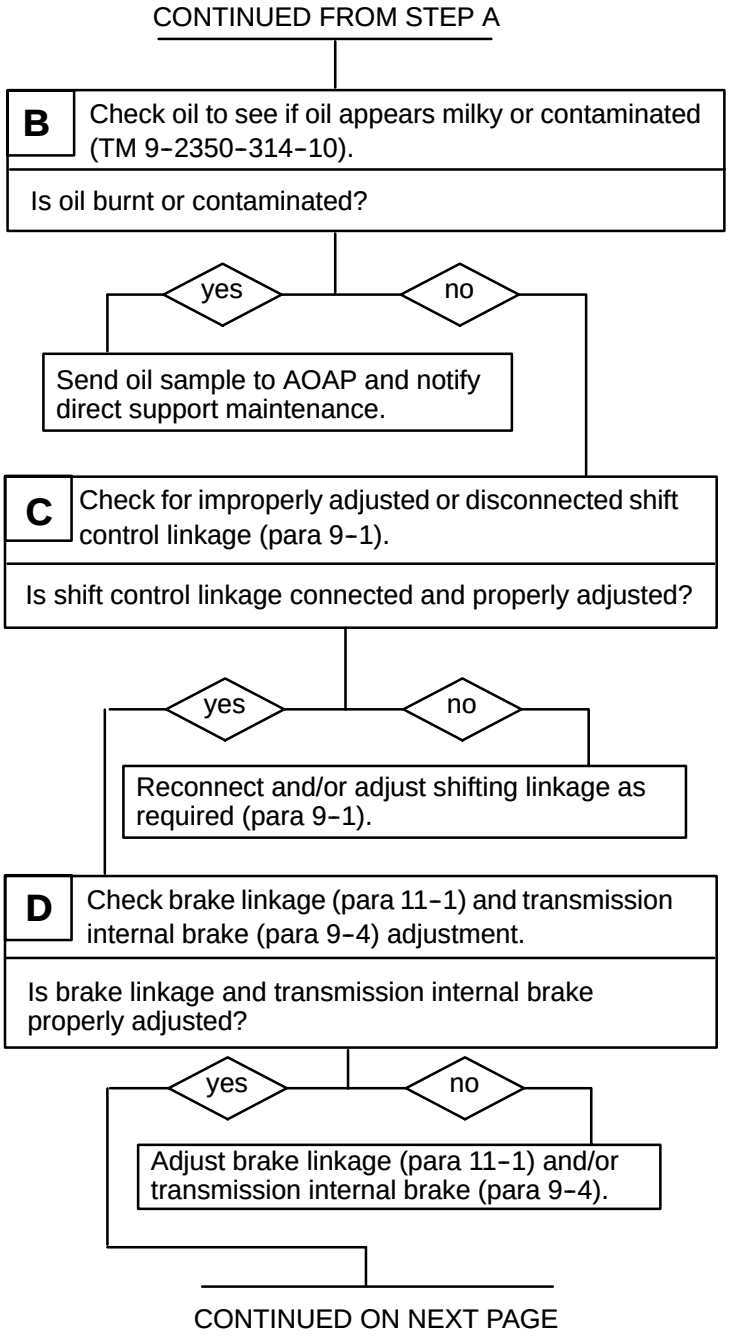
If oil level is low, check transmission seals, plugs, gaskets, and lines for oil leaks. Correct cause of leaks if within scope of unit maintenance. If repairs are beyond scope of unit, notify support maintenance.

Bring transmission oil to proper level (TM 9-2350-314-10).

CONTINUED ON NEXT PAGE

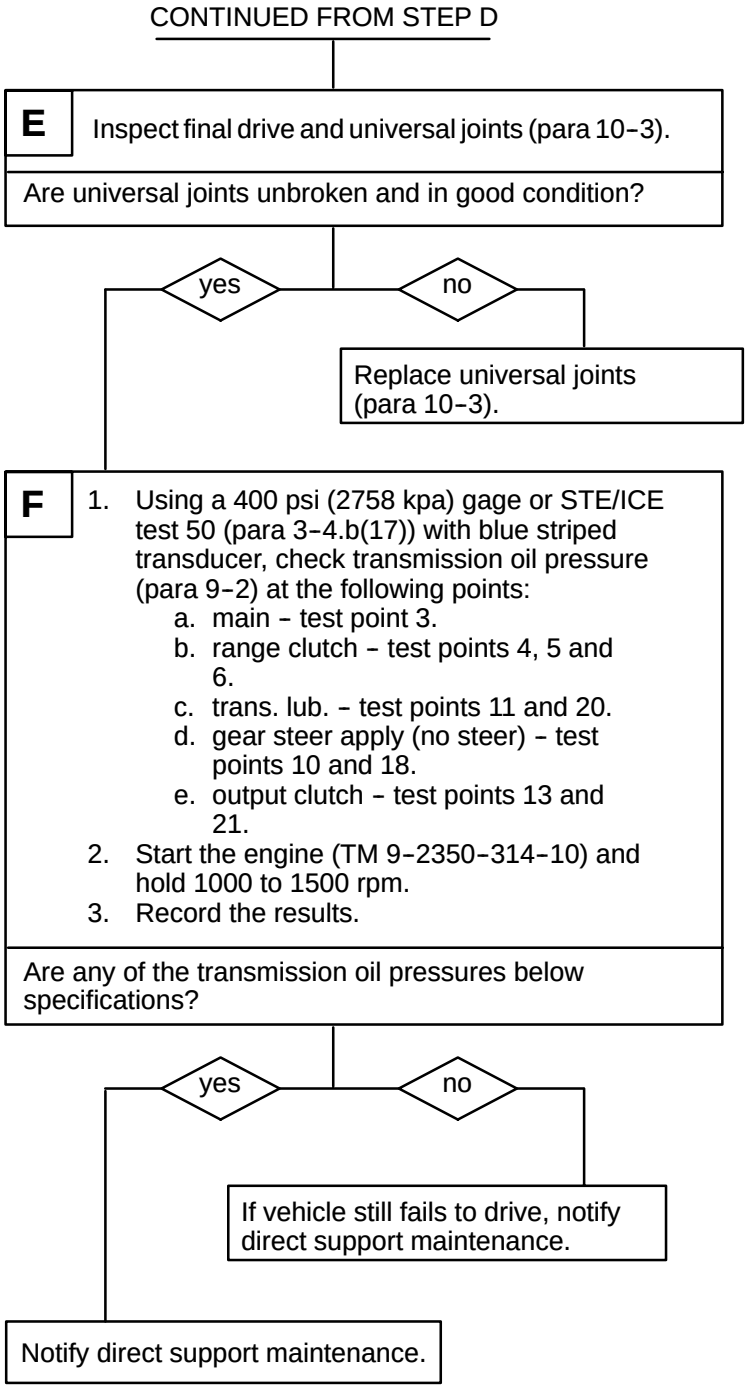
3-3 TROUBLESHOOTING CHART - CONTINUED

q. TRANSMISSION AND DRIVING CONTROLS - CONTINUED	(2) VEHICLE DOES NOT DRIVE. Transmission does not operate in any shift position. - CONTINUED



3-3 TROUBLESHOOTING CHART - CONTINUED

q. TRANSMISSION AND DRIVING CONTROLS - CONTINUED	(2) VEHICLE DOES NOT DRIVE. Transmission does not operate in any shift position. - CONTINUED



END OF TASK

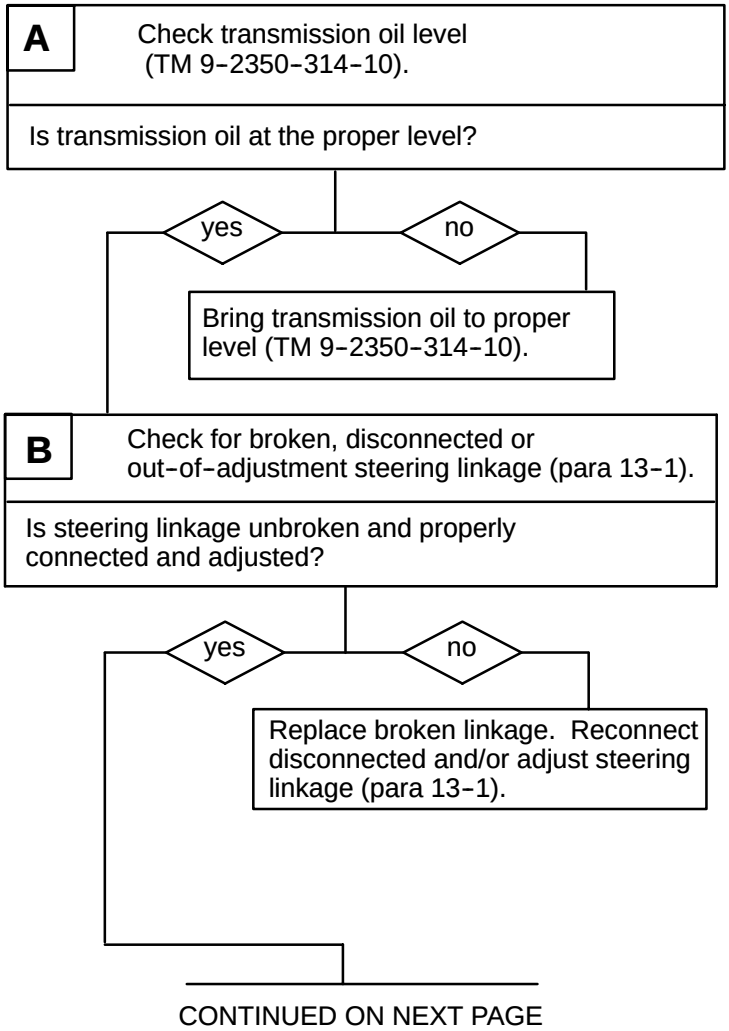
3-3 TROUBLESHOOTING CHART - CONTINUED

q. TRANSMISSION AND DRIVING CONTROLS - CONTINUED	(3) VEHICLE DOES NOT STEER IN EITHER DIRECTION IN ANY RANGE.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F) or Gage (item 22, Appx F)

Equipment Conditions
Transmission access door open (TM 9-2350-314-10)



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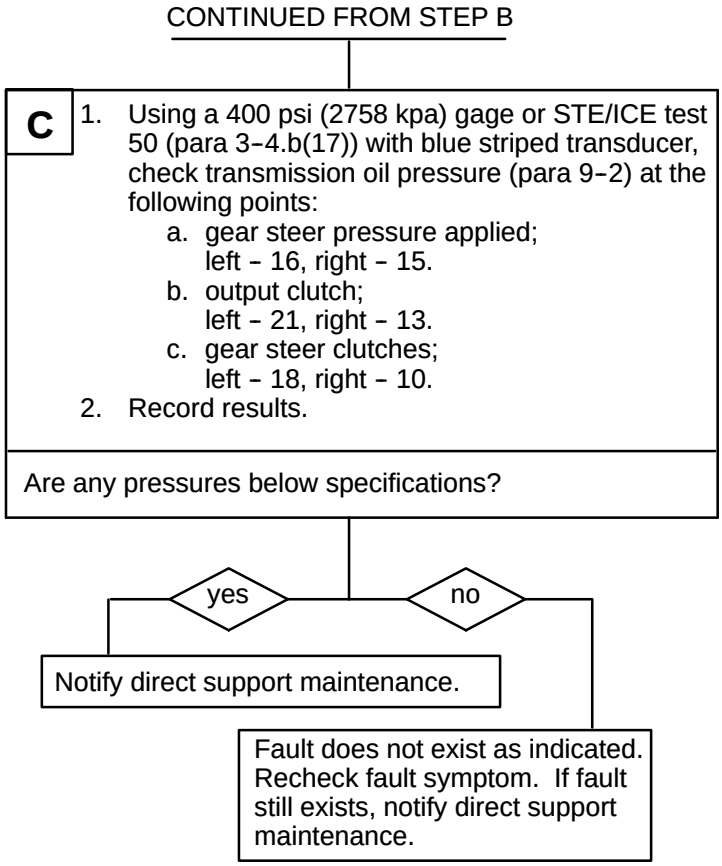
3-3 TROUBLESHOOTING CHART - CONTINUED

q. TRANSMISSION AND DRIVING CONTROLS - CONTINUED	(3) VEHICLE DOES NOT STEER IN EITHER DIRECTION IN ANY RANGE. - CONTINUED



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

q. TRANSMISSION AND DRIVING CONTROLS - CONTINUED

(4) VEHICLE STEERS WELL IN ONE DIRECTION ONLY.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx G) or Gage (item 22, Appx F)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)

WARNING

- Vehicle has no brakes when final drives are disconnected. Failure to securely block vehicle could injure personnel or damage vehicle equipment if vehicle rolls out of control.
- Transmission contains hot oil under high pressure. Stop engine before removing or installing pipe plugs and gage adapters in pressure test points. Install pipe plug as soon as gage adapter is removed. Remove only pipe plug at test point. Failure to comply with these precautions may result in equipment damage or personnel injury.

A Check steering control linkage adjustment (para 13-2).

Is steering control linkage properly adjusted?

yes

no

Adjust steering control linkage (para 13-2).

B Check brake linkage (para 11-1) and transmission internal brake (para 9-4) for correct adjustment.

Is brake linkage and transmission internal brake adjusted properly?

yes

no

Adjust brake linkage (para 11-1) and/or transmission internal brake (para 9-4).

CONTINUED ON NEXT PAGE

3-3 TROUBLESHOOTING CHART - CONTINUED

q. TRANSMISSION AND DRIVING CONTROLS - CONTINUED	(4) VEHICLE STEERS WELL IN ONE DIRECTION ONLY. - CONTINUED

CONTINUED FROM STEP B

C

1. Using a 400 psi (2758 kpa) gage or STE/ICE test 50 (para 3-4.b(17)) with blue striped transducer, check transmission oil pressure (para 9-2) at the following points:
   a. first gear, second gear, and reverse 1;
      brake pressure: left 16, right 15.
      steer gear: left 18, right 10.
      brake coolant: left 17, right 14.
   b. third gear, fourth gear, and reverse 2;
      output clutch: left 21, right 13.
      steer gear: left 18, right 10.
      steer gear coolant: left 19, right 12.
2. Record results.

Are any pressures below specifications?

yes

Notify direct support maintenance.

no

If fault still exists, notify direct support maintenance.

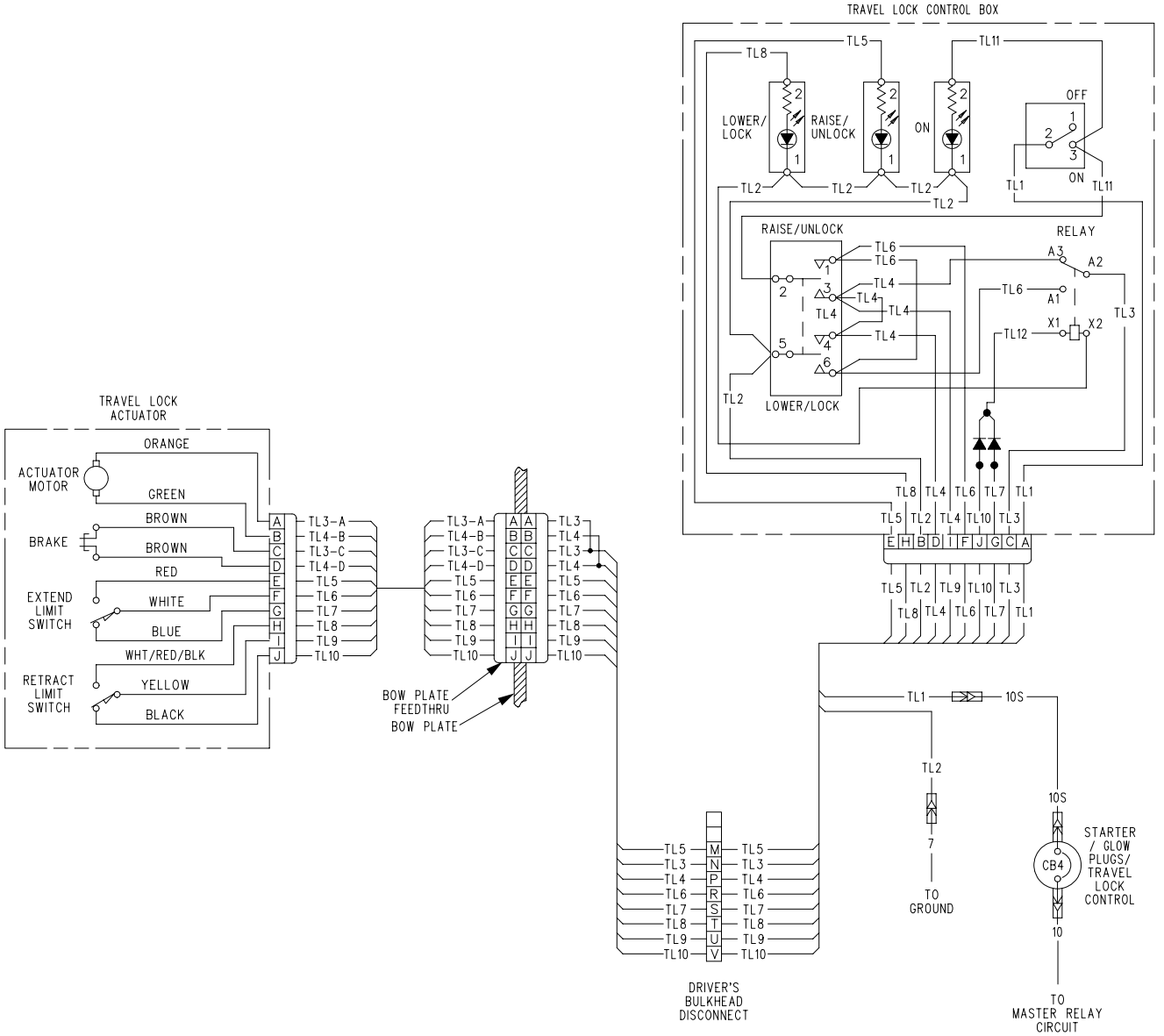
END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK

The travel lock consists of gun tube travel lock, travel lock control box, and circuit breaker number 4 (CB4). The relationship of these components is shown in the diagram below.

When vehicle MASTER power switch is turned ON, 24 V dc is applied through the master relay and CB4 to the travel lock control box. When POWER ON-OFF switch on the travel lock control box is turned ON, the travel lock may be raised or lowered using the RAISE/UNLOCK - LOWER/LOCK switch. The extend limit switch and retract limit switch will cause the RAISE/UNLOCK and LOWER/LOCK indicator lamps to illuminate when the travel lock reaches the end of travel.



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3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK - CONTINUED (1) CONTROL BOX WILL NOT POWER UP.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Transmission access doors open
(TM 9-2350-314-10)

Personnel Required
Two

A

1. Ensure vehicle MASTER switch is OFF (TM 9-2350-314-10).
2. Disconnect harness W115 connector P2 from travel lock control box.
3. Check for voltage by placing multimeter red lead in socket A and black lead in socket B.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

yes

Replace travel lock control box (para 8-16).

no

B Turn glow plug ENABLE switch ON (TM 9-2350-314-10).

Is glow plug WAIT LED on?

yes

Go to step E.

no

C

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W120 lead 10S from circuit breaker (CB4).
3. Check for voltage by placing multimeter red lead on lead 10S side of CB4 and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

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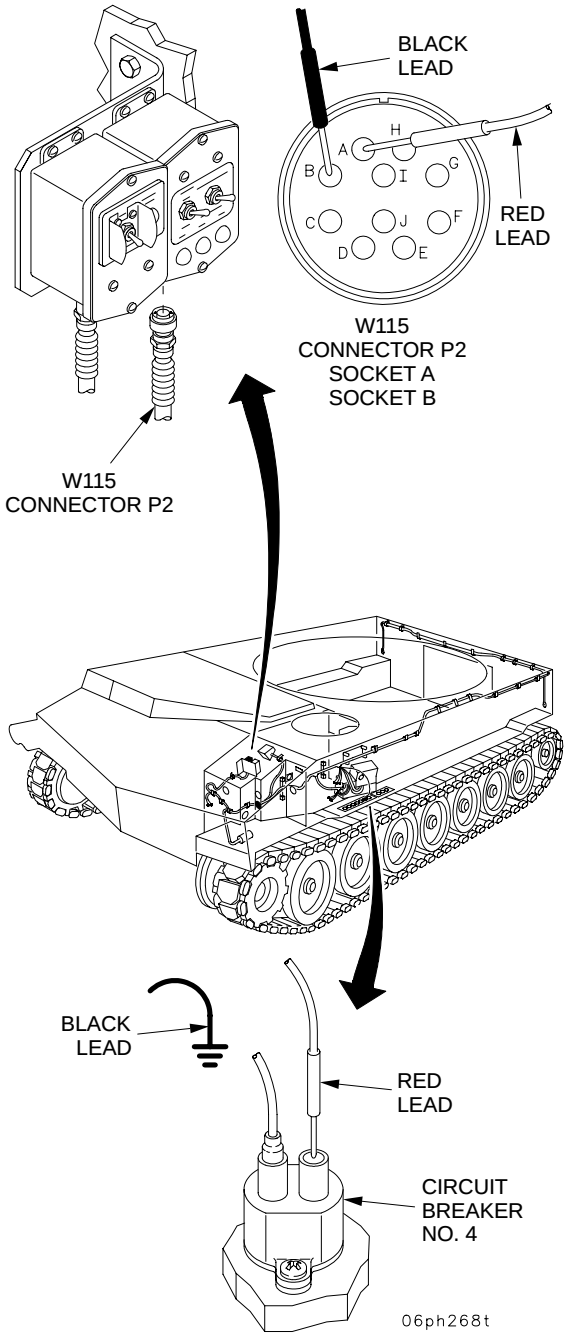


3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK - CONTINUED	(1) CONTROL BOX WILL NOT POWER UP. - CONTINUED

CONTINUED FROM STEP C

yes / no

Repair or replace harness W120 (para 8-79).

D

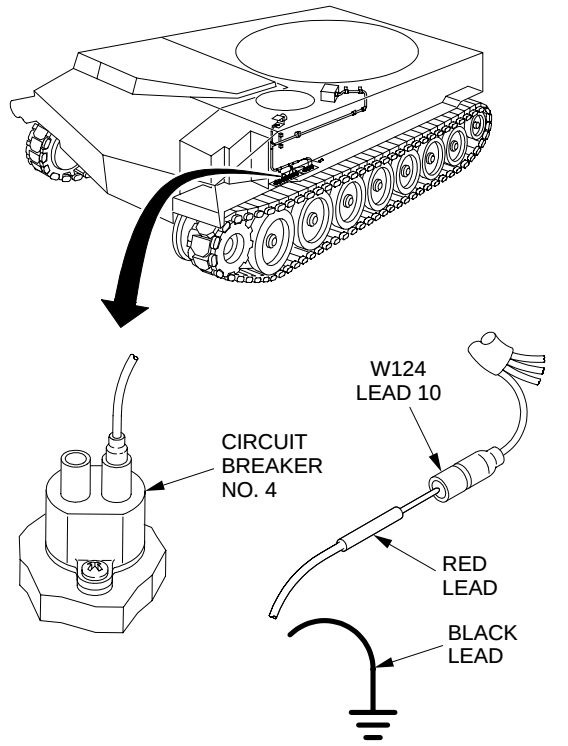
1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W120 lead 10S to CB4.
3. Disconnect lead 10 from other side of CB4.
4. Check for voltage by placing red multimeter lead in socket 10 of harness W124 and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

yes / no

Replace CB4 (para 8-20).

Repair or replace harness W124 (para 8-82).



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3-3 TROUBLESHOOTING CHART - CONTINUED

r.	TRAVEL LOCK - CONTINUED	(1) CONTROL BOX WILL NOT POWER UP. - CONTINUED

CONTINUED FROM STEP B

E

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 lead TL1 from harness W120 socket 10S.
3. Check for voltage by placing multimeter red lead in socket 10S and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

yes

no

Repair or replace harness W120 (para 8-79).

F

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect harness W115 lead TL1 to harness W120 lead 10S.
3. Check for voltage by placing multimeter red lead in socket A and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).

Is voltage present?

yes

no

Repair or replace harness W115 (para 8-74).

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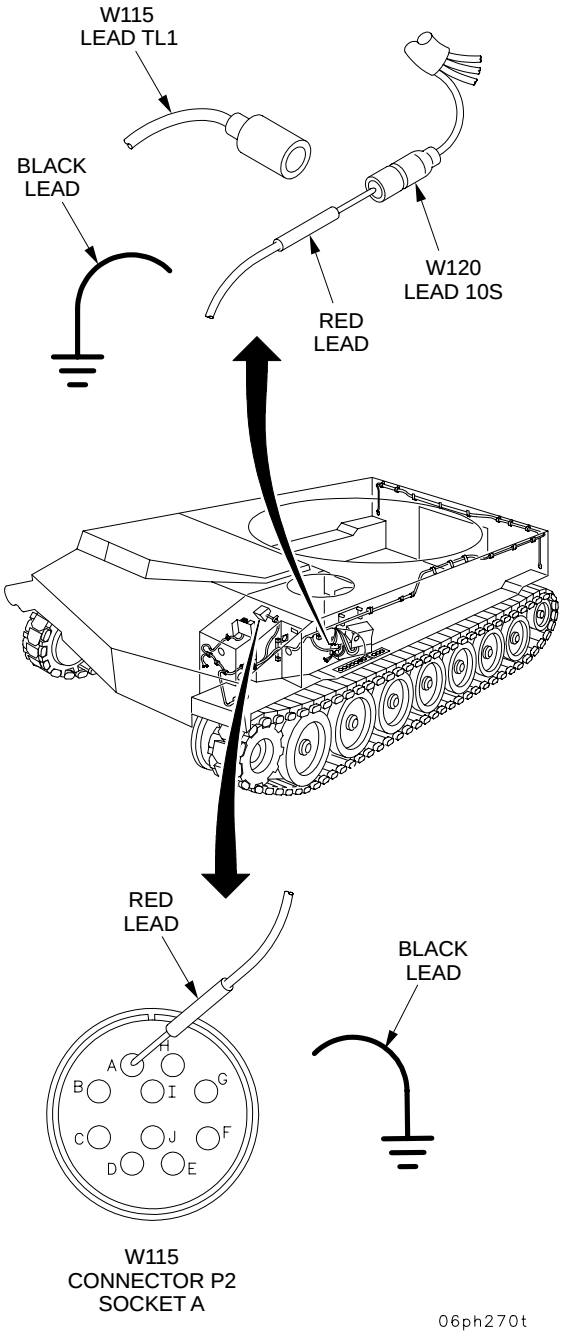


3-3 TROUBLESHOOTING CHART - CONTINUED

r.	TRAVEL LOCK - CONTINUED	(1) CONTROL BOX WILL NOT POWER UP. - CONTINUED

CONTINUED FROM STEP F

G

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect harness W115 lead TL2 from harness W125 lead 7.
3. Place one multimeter lead in harness W115 connector P2 socket B and other lead in TL2 and check for continuity.

Is continuity present?

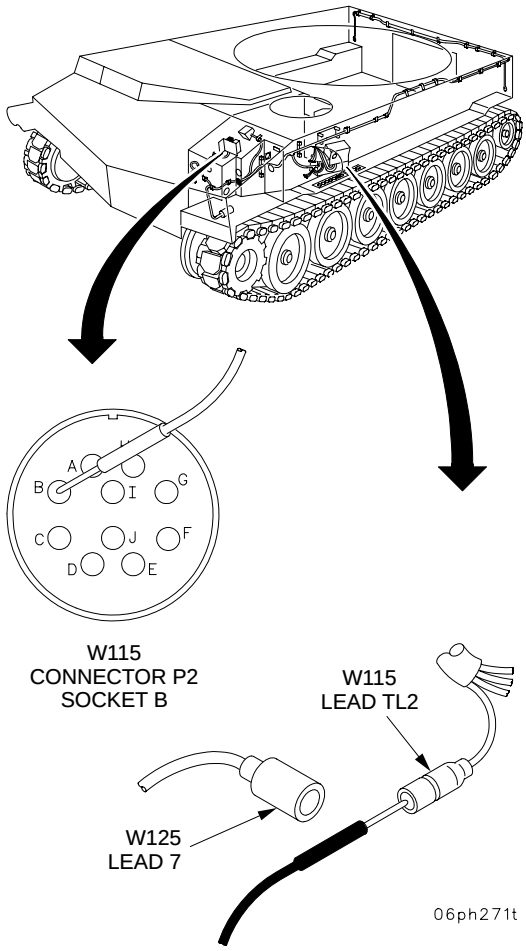
yes

Repair or replace harness W120 (para 8-79).

no

Repair or replace harness W115 (para 8-74).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK - CONTINUED	(2) TRAVEL LOCK WILL NOT RAISE/UNLOCK OR LOWER/LOCK.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)

Personnel Required
Two

A

1. Attempt to operate travel lock in RAISE/UNLOCK and LOWER/LOCK modes (TM 9-2350-314-10).
2. Listen to actuator motor.

Is actuator motor running?

yes

Adjust gun tube travel lock actuator (para 16-12).

no

B

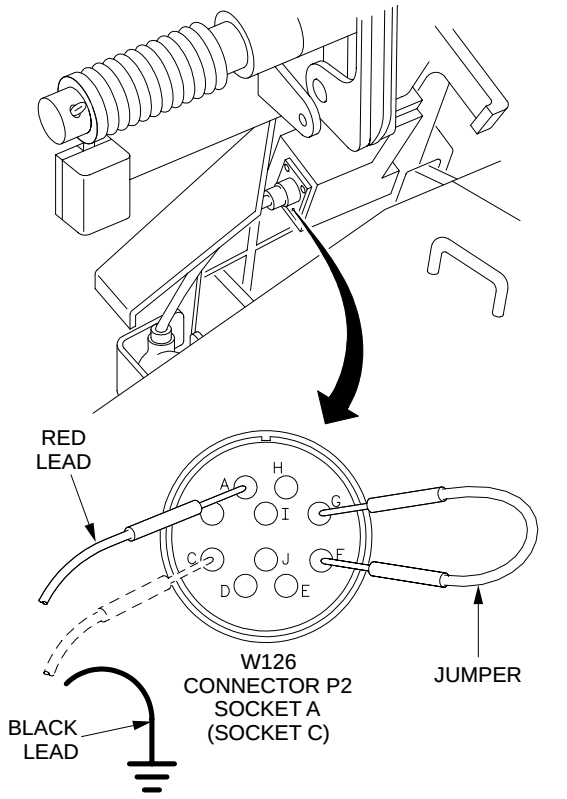
1. Turn vehicle MASTER and TRAVEL LOCK power switches OFF (TM 9-2350-314-10).
2. Disconnect harness W126 connector P2 from travel lock actuator.
3. Place a jumper from socket F to Socket G of harness W126 connector P2.
4. Check for voltage by placing multimeter red lead in sockets A and C one at a time and black lead to ground.
5. Turn vehicle MASTER and TRAVEL LOCK power switches ON (TM 9-2350-314-10).
6. Hold travel lock switch in RAISE/UNLOCK position (TM 9-2350-314-10).

Is voltage present?

yes

Replace travel lock actuator (para 16-10).

no



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3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK - CONTINUED (2) TRAVEL LOCK WILL NOT RAISE/UNLOCK OR LOWER/LOCK. - CONTINUED

CONTINUED FROM STEP B

C

1. Release travel lock switch.
2. Turn vehicle MASTER and TRAVEL LOCK power switches OFF (TM 9-2350-314-10).
3. Remove jumper from harness W126 connector P2.
4. Disconnect harness W126 connector P1 at bow plate feed through.
5. Check harness W126 for continuity as follows:

FROM CONNECTOR	TO CONNECTOR
P2 socket A	P1 pin A
P2 socket B	P1 pin B
P2 socket C	P1 pin C
P2 socket D	P1 pin D
P2 socket F	P1 pin F
P2 socket I	P1 pin I

Is continuity present?

yes

no

Replace harness W126 (para 8-84).

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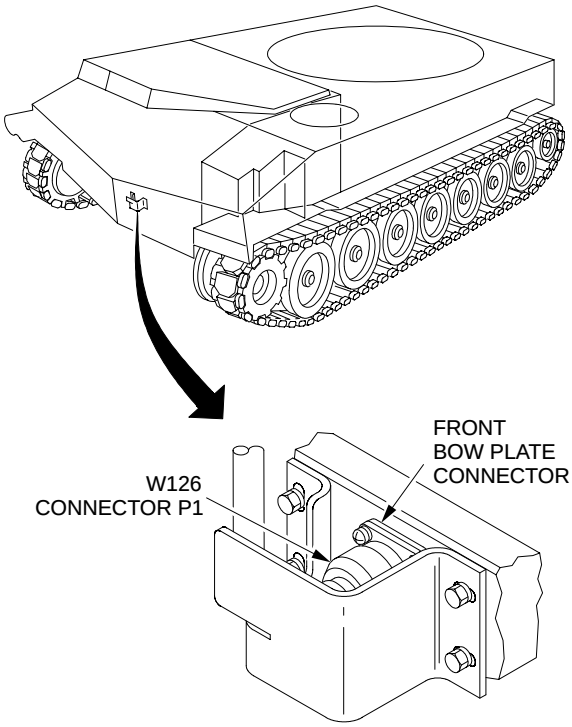

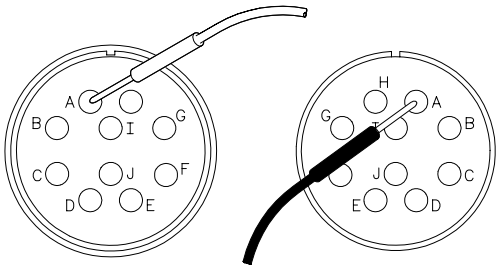

W126 CONNECTOR P2 SOCKET A (SOCKET B) (SOCKET C) (SOCKET D) (SOCKET F) (SOCKET I)

W126 CONNECTOR P1 PIN A (PIN B) (PIN C) (PIN D) (PIN F) (PIN I)

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3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK - CONTINUED	(2) TRAVEL LOCK WILL NOT RAISE/UNLOCK OR LOWER/LOCK. - CONTINUED

CONTINUED FROM STEP C

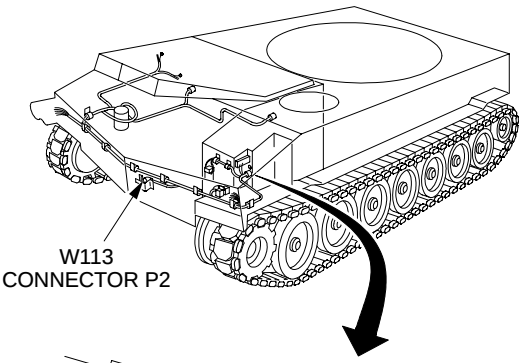
D

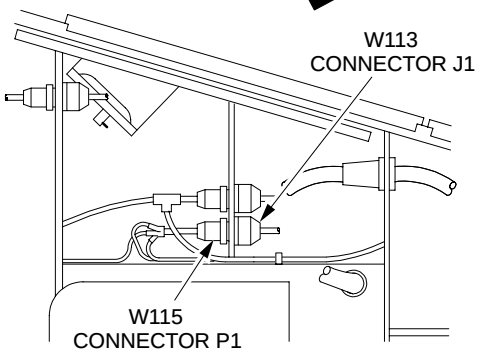
1. Reconnect harness W126 connector P2 to travel lock actuator.
2. Disconnect harness W113 connector P2 from the bow plate feed through.
3. Check bow plate feed through sockets and pins for damage.

Are pins and sockets in good condition?

yes / no

Repair or replace bow plate feed through (para 8-103).





E

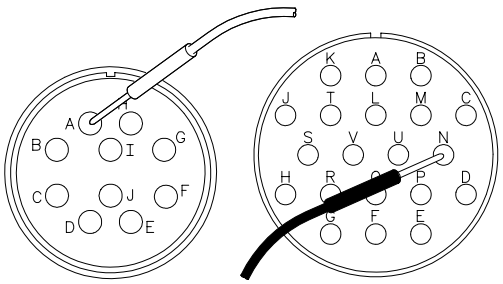
1. Reconnect harness W126 connector P1 to bow plate feed through.
2. Disconnect harness W115 connector P1 from harness W113 connector J1.
3. Check harness W113 for continuity as follows:

FROM CONNECTOR	TO CONNECTOR
P2 socket A	J1 pin N
P2 socket C	J1 pin N
P2 socket B	J1 pin P
P2 socket D	J1 pin P
P2 socket F	J1 pin R
P2 socket I	J1 pin U

Is continuity present?

yes / no

Replace harness W113 (para 8-72).



W113 CONNECTOR P2 SOCKET A (SOCKET C) (SOCKET B) (SOCKET D) (SOCKET F) (SOCKET I)

W113 CONNECTOR J1 PIN N (PIN N) (PIN P) (PIN P) (PIN R) (PIN U)

06ph274t

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3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK - CONTINUED	(2) TRAVEL LOCK WILL NOT RAISE/UNLOCK OR LOWER/LOCK. - CONTINUED

CONTINUED FROM STEP E

F

1. Reconnect harness W113 connector P2 to bow plate feed through.
2. Disconnect harness W115 connector P2 from travel lock control box.
3. Check harness W115 for continuity as follows:

FROM CONNECTOR	TO CONNECTOR
P1 socket N	P2 socket C
P1 socket P	P2 socket D
P1 socket R	P2 socket F

Is continuity present?

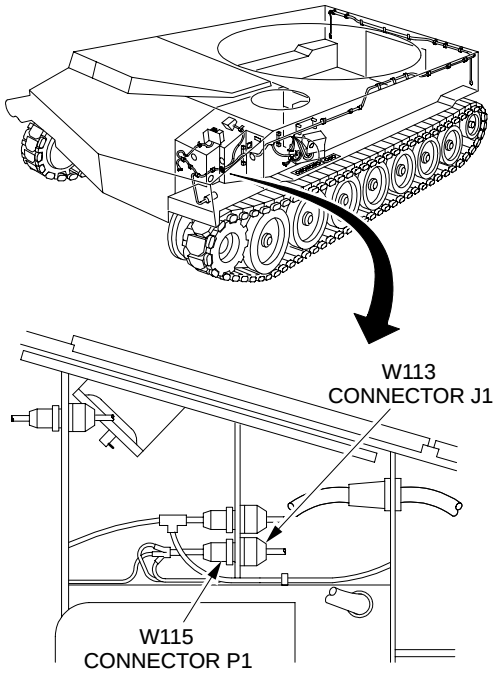
yes

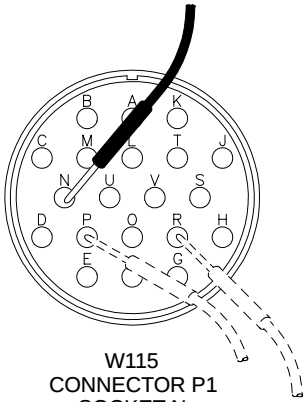
Replace travel lock control box (para 8-16).

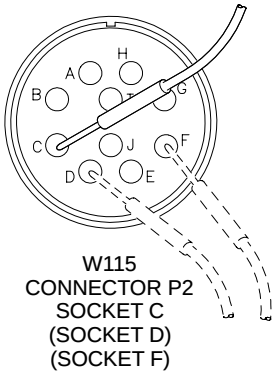
no

Repair or replace harness W115 (para 8-74).

END OF TASK







06ph275t

3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK - CONTINUED (3) LOWER/LOCK LED WILL NOT LIGHT.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Transmission access doors open
(TM 9-2350-314-10)

Personnel Required
Two

A

1. Turn vehicle MASTER and TRAVEL LOCK power switches OFF (TM 9-2350-314-10).
2. Remove LOWER/LOCK LED (TM 9-2350-314-10).
3. Place multimeter red lead in LED socket center contact and black lead on ground.
4. Turn vehicle MASTER and TRAVEL LOCK power switches ON (TM 9-2350-314-10).
5. Place and hold travel lock switch in LOWER/LOCK position and check for voltage.

Is voltage present?

yes

Replace travel lock LOWER/LOCK LED (TM 9-2350-314-10).

no

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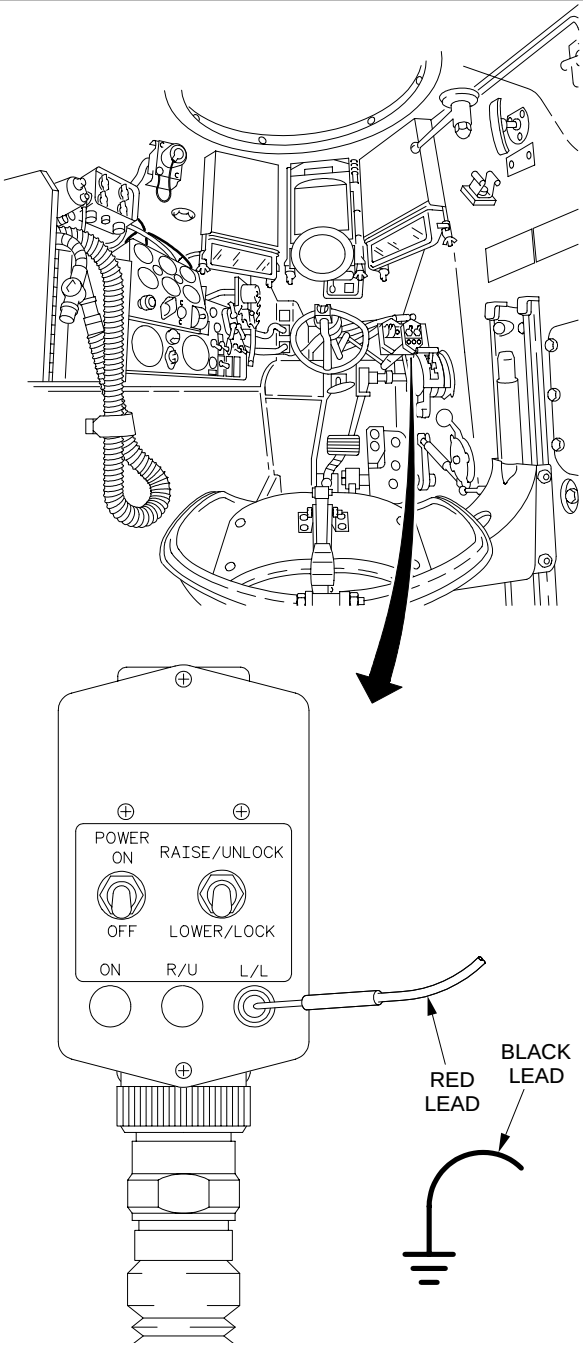

3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK - CONTINUED	(3) LOWER/LOCK LED WILL NOT LIGHT. - CONTINUED

CONTINUED FROM STEP A

B

1. Place and hold travel lock switch in LOWER/LOCK position.
2. Listen to actuator motor.

Is actuator motor running?

yes

Adjust LOWER/LOCK limit switch (para 16-12).

no

C

1. Release travel lock switch.
2. Turn vehicle MASTER and TRAVEL LOCK power switches OFF (TM 9-2350-314-10).
3. Disconnect harness W126 connector P2 from travel lock actuator.
4. Place jumper lead between socket I and socket H.
5. Turn vehicle MASTER and TRAVEL LOCK power switches ON (TM 9-2350-314-10).
6. Place and hold travel lock switch in LOWER/LOCK position.

Does LOWER/LOCK LED light?

yes

Replace travel lock actuator (para 16-10).

no

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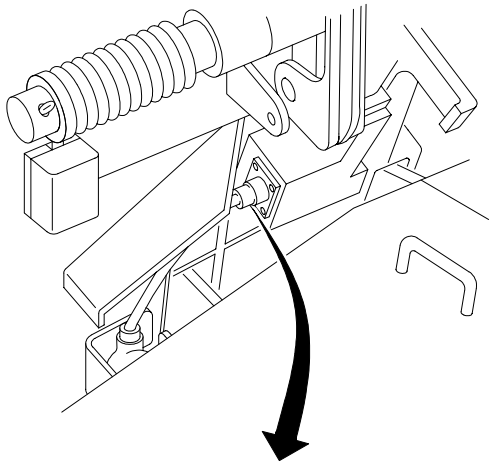

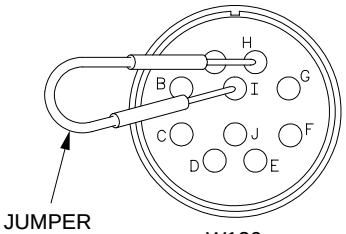

JUMPER

W126
CONNECTOR P2
SOCKET H
(SOCKET I)

06ph277t

3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK - CONTINUED	(3) LOWER/LOCK LED WILL NOT LIGHT. - CONTINUED

CONTINUED FROM STEP C

D

1. Release travel lock switch.
2. Turn vehicle MASTER and TRAVEL LOCK power switches OFF (TM 9-2350-314-10).
3. Remove jumper from harness W126 connector P2.
4. Disconnect harness W126 connector P1 at bow plate feed through.
5. Check harness W126 for continuity as follows:

FROM CONNECTOR	TO CONNECTOR
P2 socket H	P1 pin H
P2 socket I	P1 pin I

Is continuity present?

yes

no

Replace harness W126 (para 8-84).

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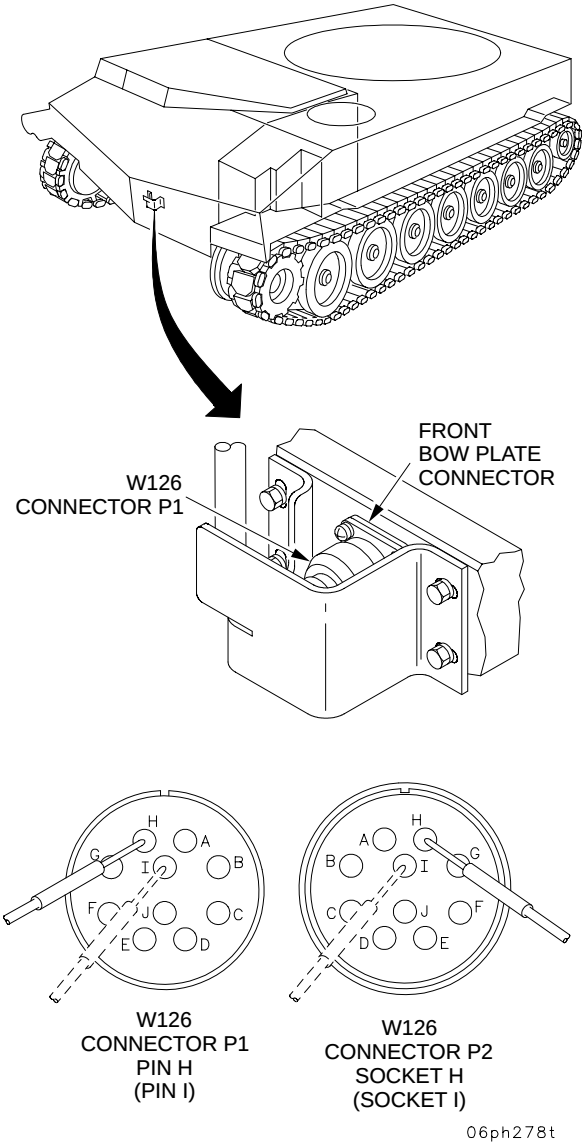


3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK - CONTINUED	(3) LOWER/LOCK LED WILL NOT LIGHT. - CONTINUED

CONTINUED FROM STEP D

E

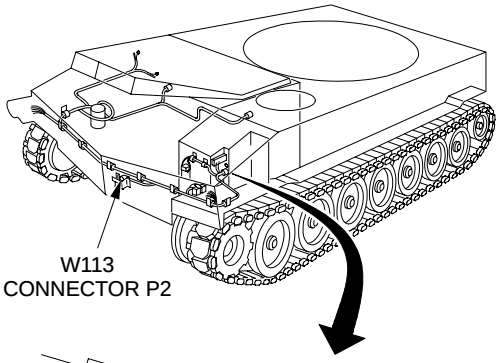
1. Reconnect harness W126 connector P2 to travel lock actuator.
2. Disconnect harness W113 connector P2 from the bow plate feed through.
3. Check bow plate feed through sockets and pins for damage.

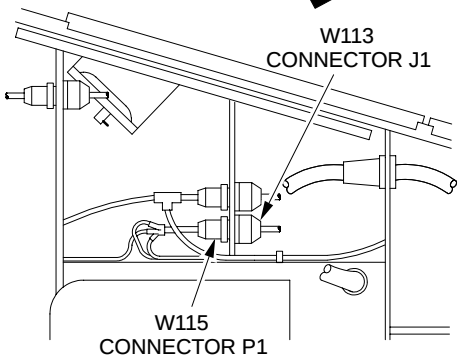
Are pins and sockets in good condition?

yes

no

Repair or replace bow plate feed through (para 8-103).





F

1. Reconnect harness W126 connector P1 to bow plate feed through.
2. Disconnect harness W115 connector P1 from harness W113 connector J1.
3. Check harness W113 for continuity as follows:

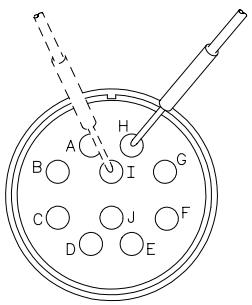
FROM CONNECTOR	TO CONNECTOR
P2 socket H	J1 pin T
P2 socket I	J1 pin U

Is continuity present?

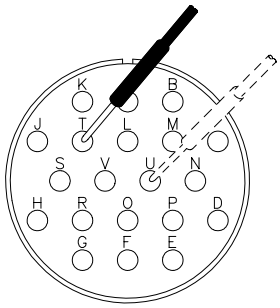
yes

no

Replace harness W113 (para 8-72).



W113
CONNECTOR P2
SOCKET H
(SOCKET I)



W113
CONNECTOR J1
PIN T
(PIN U)

06ph279t

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3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK - CONTINUED	(3) LOWER/LOCK LED WILL NOT LIGHT. - CONTINUED

CONTINUED FROM STEP F

G

1. Reconnect harness W113 connector P2 to bow plate feed through.
2. Disconnect harness W115 connector P2 from travel lock control box.
3. Check harness W115 for continuity as follows:

FROM CONNECTOR	TO CONNECTOR
P1 socket T	P2 socket H
P1 socket U	P2 socket I

Is continuity present?

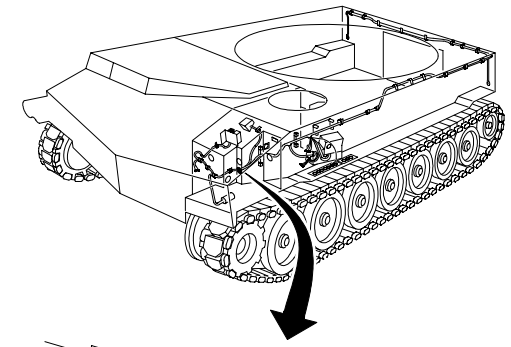
yes

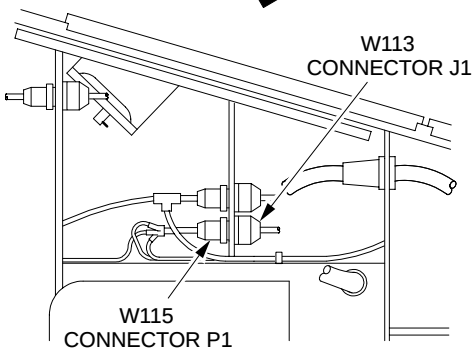
Replace travel lock control box (para 8-16).

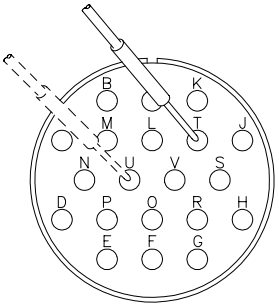
no

Replace harness W115 (para 8-74).

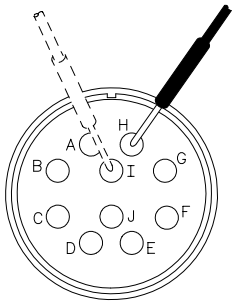
END OF TASK







W115
CONNECTOR P1
SOCKET T
(SOCKET U)



W115
CONNECTOR P2
SOCKET H
(SOCKET I)

06ph280t

3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK – CONTINUED (4) RAISE/UNLOCK LED WILL NOT LIGHT.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Transmission access doors open
(TM 9-2350-314-10)

Personnel Required
Two

A

1. Turn vehicle MASTER and TRAVEL LOCK power switches OFF (TM 9-2350-314-10).
2. Remove RAISE/UNLOCK LED (TM 9-2350-314-10).
3. Place multimeter red lead in LED socket center contact and black lead on ground.
4. Turn vehicle MASTER and TRAVEL LOCK power switches ON (TM 9-2350-314-10).
5. Place and hold travel lock switch in RAISE/UNLOCK position and check for voltage.

Is voltage present?

yes

Replace travel lock RAISE/UNLOCK LED (TM 9-2350-314-10).

no

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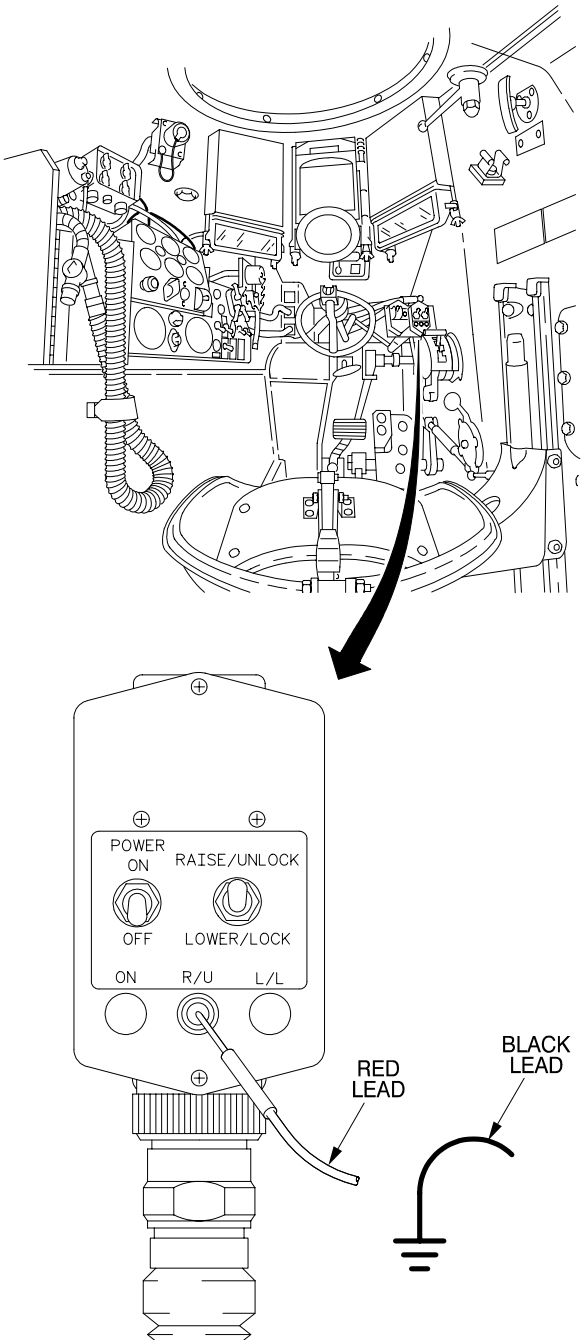

3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK - CONTINUED	(4) RAISE/UNLOCK LED WILL NOT LIGHT. - CONTINUED

CONTINUED FROM STEP A

B

1. Place and hold travel lock switch in RAISE/UNLOCK position.
2. Listen to actuator motor.

Is actuator motor running?

yes

Adjust RAISE/UNLOCK limit switch (para 16-12).

no

C

1. Release travel lock switch.
2. Turn vehicle MASTER and TRAVEL LOCK power switches OFF (TM 9-2350-314-10).
3. Disconnect harness W126 connector P2 from travel lock actuator.
4. Place jumper lead between socket E and socket F.
5. Turn vehicle MASTER and TRAVEL LOCK power switches ON (TM 9-2350-314-10).
6. Place and hold travel lock switch in RAISE/UNLOCK position.

Does LOWER/LOCK LED light?

yes

Replace travel lock actuator (para 16-10).

no

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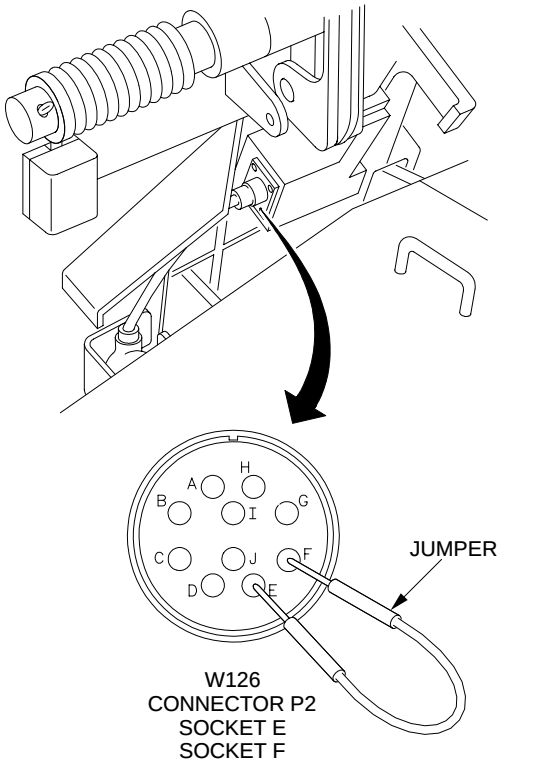

3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK - CONTINUED	(4) RAISE/UNLOCK LED WILL NOT LIGHT. - CONTINUED

CONTINUED FROM STEP C

D

1. Release travel lock switch.
2. Turn vehicle MASTER and TRAVEL LOCK power switches OFF (TM 9-2350-314-10).
3. Remove jumper from harness W126 connector P2.
4. Disconnect harness W126 connector P1 at bow plate feed through.
5. Check harness W126 for continuity as follows:

FROM CONNECTOR	TO CONNECTOR
P2 socket E	P1 pin E
P2 socket F	P1 pin F

Is continuity present?

yes

no

Replace harness W126 (para 8-84).

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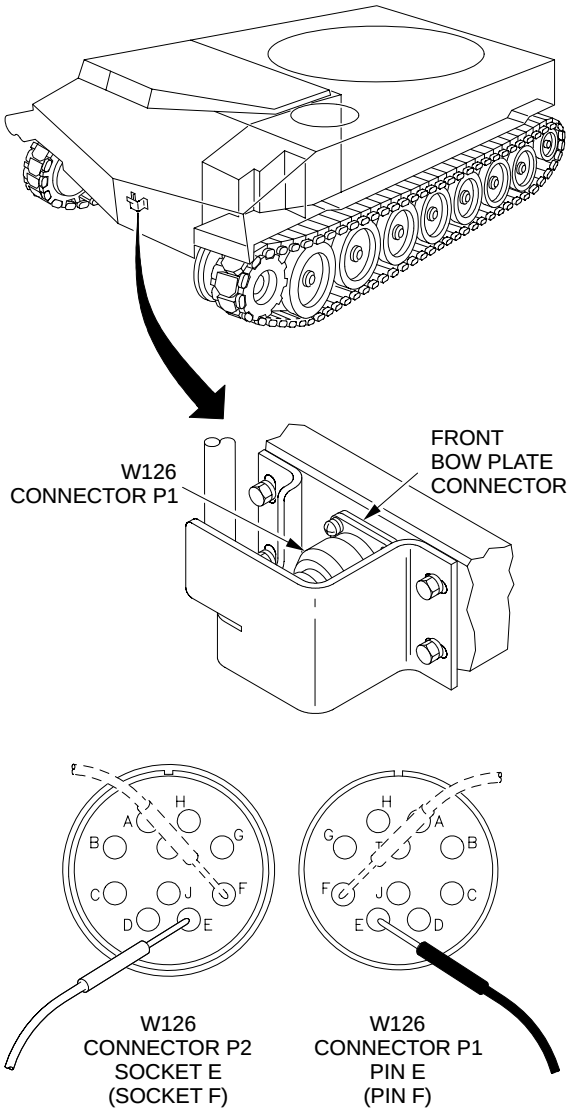

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3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK - CONTINUED (4) RAISE/UNLOCK LED WILL NOT LIGHT. - CONTINUED

CONTINUED FROM STEP D

E

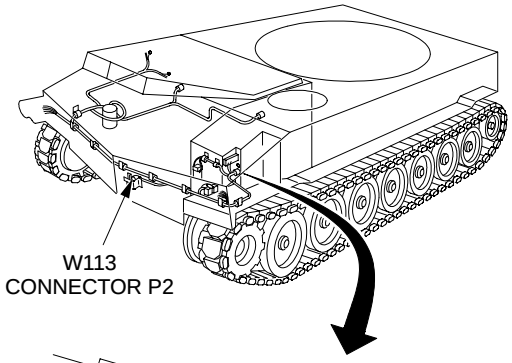
1. Reconnect harness W126 connector P2 to travel lock actuator.
2. Disconnect harness W113 connector P2 from the bow plate feed through.
3. Check bow plate feed through sockets and pins for damage.

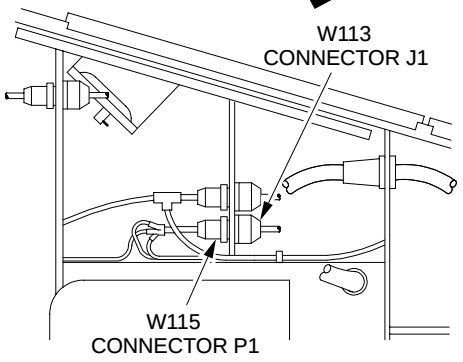
Are pins and sockets in good condition?

yes

no

Repair or replace bow plate feed through (para 8-103).





F

1. Reconnect harness W126 connector P1 to bow plate feed through.
2. Disconnect harness W115 connector P1 from harness W113 connector J1.
3. Check harness W113 for continuity as follows:

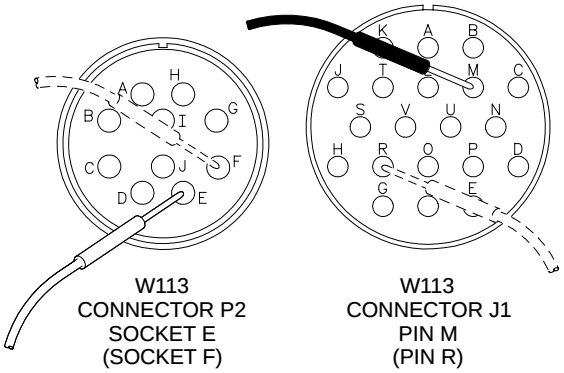
FROM CONNECTOR	TO CONNECTOR
P2 socket E	J1 pin M
P2 socket F	J1 pin R

Is continuity present?

yes

no

Replace harness W113 (para 8-72).



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3-3 TROUBLESHOOTING CHART - CONTINUED

r. TRAVEL LOCK - CONTINUED	(4) RAISE/UNLOCK LED WILL NOT LIGHT. - CONTINUED

CONTINUED FROM STEP F

G

1. Reconnect harness W113 connector P2 to bow plate feed through.
2. Disconnect harness W115 connector P2 from travel lock control box.
3. Check harness W115 for continuity as follows:

FROM CONNECTOR	TO CONNECTOR
P1 socket M	P1 socket E
P1 socket R	P2 socket F

Is continuity present?

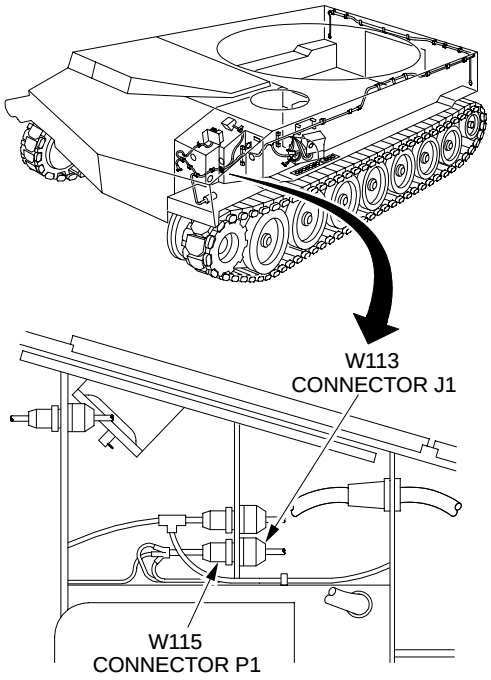
yes

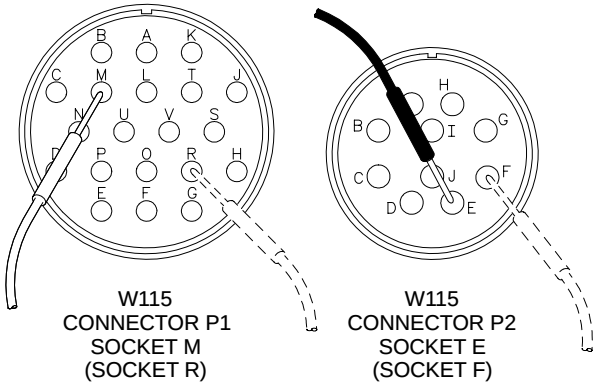
Replace travel lock control box (para 8-16).

no

Repair or replace harness W115 (para 8-74).

END OF TASK





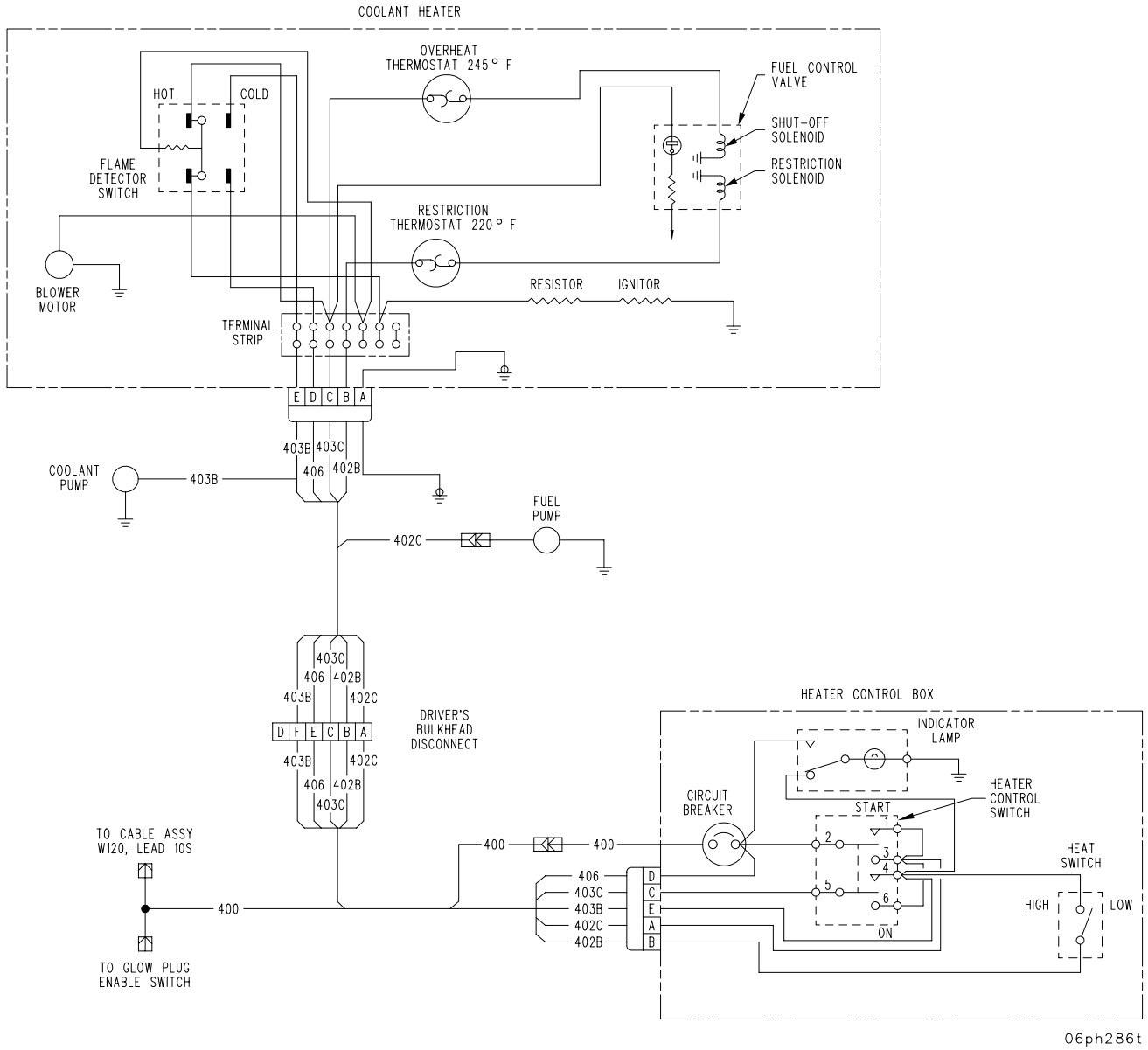
06ph285t

3-3 TROUBLESHOOTING CHART - CONTINUED

s. WINTERIZATION KIT CIRCUIT

The winterization kit consists of a coolant heater (blower motor, flame detector switch, overheat thermostat, restriction thermostat, resistor ignitor, fuel control valve, shutoff solenoid, restriction solenoid), coolant pump, fuel pump, and control box. The diagram below shows the relationship of these components.

The winterization kit works whether the vehicle MASTER switch is ON or OFF. Placing the START/OFF/RUN switch in the START position energizes the coolant heater and causes the indicator on the control box to illuminate. Placing the START/OFF/RUN switch in the RUN position energizes the coolant pump and blower motor, causing the coolant to be circulated through the engine and battery compartment.



3-3 TROUBLESHOOTING CHART - CONTINUED

s. WINTERIZATION KIT CIRCUIT - CONTINUED	(1) COOLANT HEATER DOES NOT OPERATE.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Engine and transmission access doors open (TM 9-2350-314-10)
Battery access doors open (TM 9-2350-314-10)

A

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect coolant heater to bulkhead harness connector from coolant heater.
3. Place multimeter red lead in coolant heater to bulkhead harness connector socket C and black lead to ground.
4. Turn vehicle MASTER switch ON and heater control switch to start (TM 9-2350-314-10).
5. Check for voltage.

Is voltage present?

yes

Repair or replace coolant heater (para 19-1).

no

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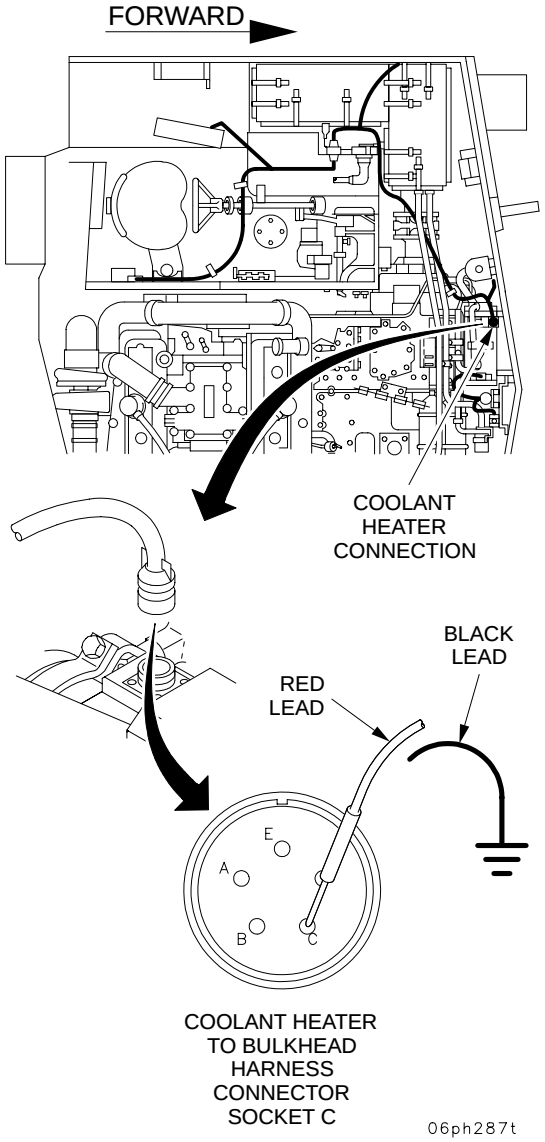

3-3 TROUBLESHOOTING CHART - CONTINUED

s. WINTERIZATION KIT CIRCUIT - CONTINUED	(1) COOLANT HEATER DOES NOT OPERATE. - CONTINUED

CONTINUED FROM STEP A

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect bulkhead to control box harness connector from coolant heater to bulkhead harness at driver's compartment bulkhead.
3. Check continuity by placing one multimeter lead in coolant heater to bulkhead harness connector pin C and other lead in coolant heater to bulkhead harness connector socket C.

Is continuity present?

yes

no

Repair or replace coolant heater to bulkhead wiring harness (para 19-10).

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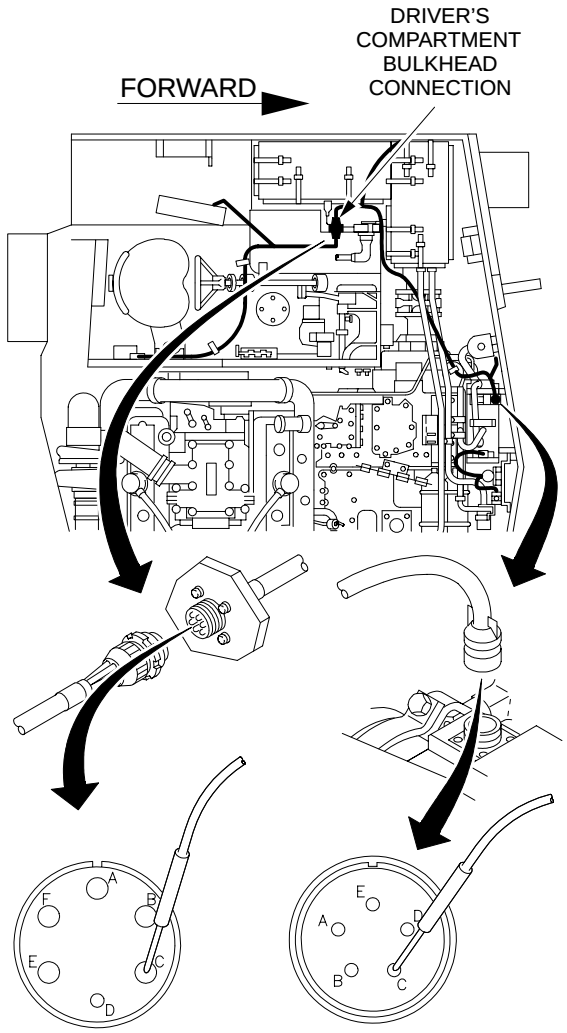

COOLANT HEATER TO BULKHEAD HARNESS CONNECTOR PIN C

COOLANT HEATER TO BULKHEAD HARNESS CONNECTOR SOCKET C

06ph288t

3-3 TROUBLESHOOTING CHART - CONTINUED

s. WINTERIZATION KIT CIRCUIT - CONTINUED	(1) COOLANT HEATER DOES NOT OPERATE. - CONTINUED

CONTINUED FROM STEP B

C

1. Disconnect bulkhead to control box harness lead 400 from heater control box connector.
2. Place multimeter red lead in bulkhead to control box harness lead 400 connector socket and black lead to ground.
3. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
4. Check for voltage.

Is voltage present?

yes

no

Repair or replace bulkhead to control box harness (para 19-8).

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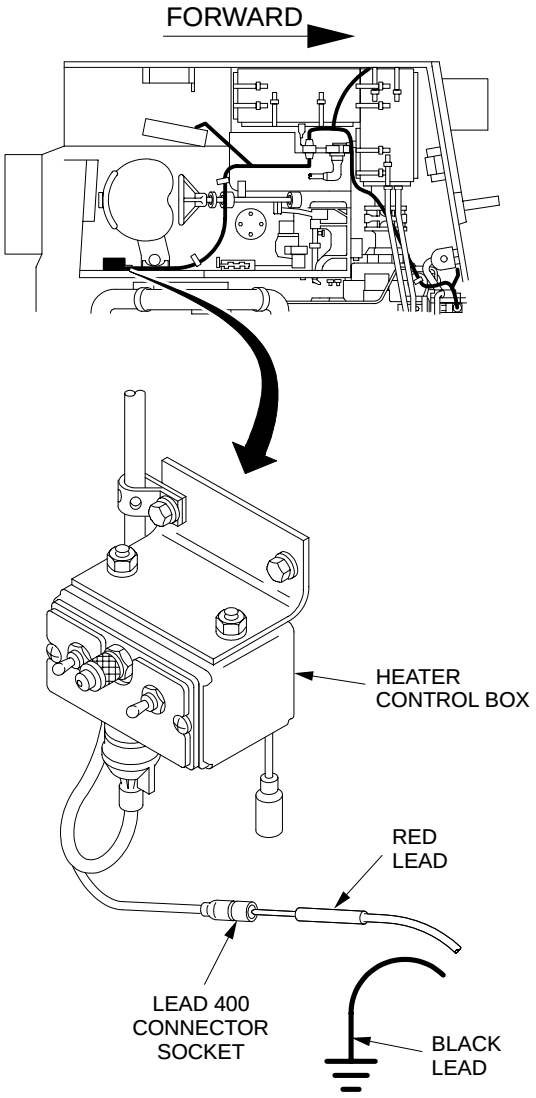


06ph289t

3-3 TROUBLESHOOTING CHART - CONTINUED

s. WINTERIZATION KIT CIRCUIT - CONTINUED	(1) COOLANT HEATER DOES NOT OPERATE. - CONTINUED

CONTINUED FROM STEP C

D

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Reconnect bulkhead to control box harness lead 400 to heater control box.
3. Disconnect bulkhead to control box harness connector from heater control box.
4. Place multimeter red lead on control box connector pin C and black lead to ground.
5. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
6. Turn heater control switch to START (TM 9-2350-314-10) and check for voltage.

Is voltage present?

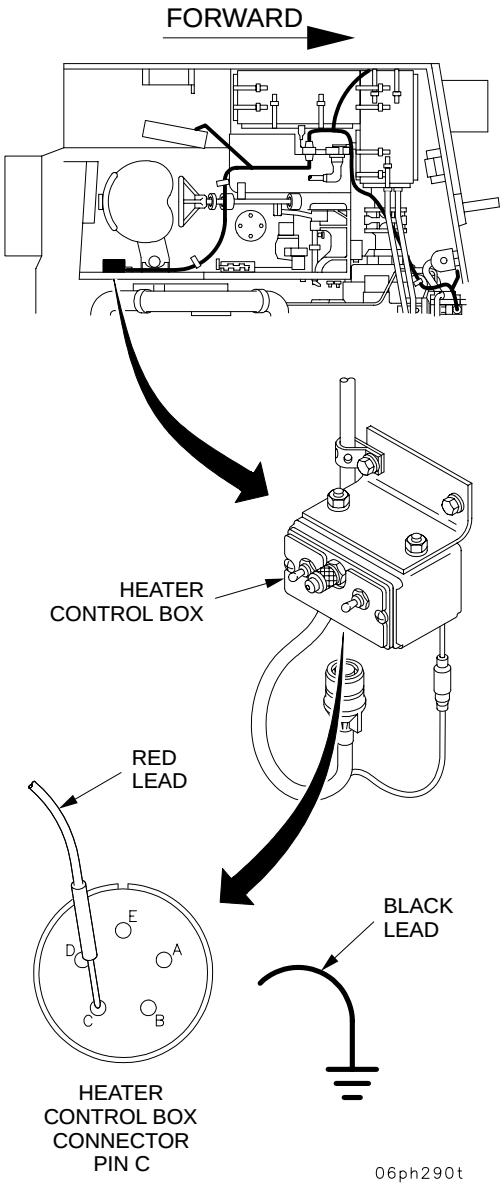
yes

Repair or replace bulkhead to control box harness (para 19-8).

no

Repair or replace heater control box (para 19-3).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

s. WINTERIZATION KIT CIRCUIT - CONTINUED	(2) HEATER BLOWER OPERATES BUT MOTOR DOES NOT.

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

A

1. Turn vehicle MASTER switch and heater control switch OFF (TM 9-2350-314-10).
2. Disconnect lead 402C from heater fuel pump.
3. Place multimeter red lead in lead 402C connector socket and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
5. Turn START/RUN switch to START (TM 9-2350-314-10).
6. Turn HIGH/LOW switch to LOW and then to HIGH (TM 9-2350-314-10).
7. Check for voltage in both positions.

Is voltage present in both positions?

yes → Replace heater fuel pump (para 19-2).

no

B

1. Turn vehicle MASTER switch OFF (TM 9-2350-314-10).
2. Disconnect bulkhead to control box harness connector from coolant heater to bulkhead harness at driver's compartment bulkhead.
3. Check continuity by placing one multimeter lead on coolant heater to bulkhead harness lead 402C and other lead on coolant heater to bulkhead harness connector pin A.

Is continuity present?

yes

no → Repair or replace wiring harness coolant heater to bulkhead wiring harness (para 19-10).

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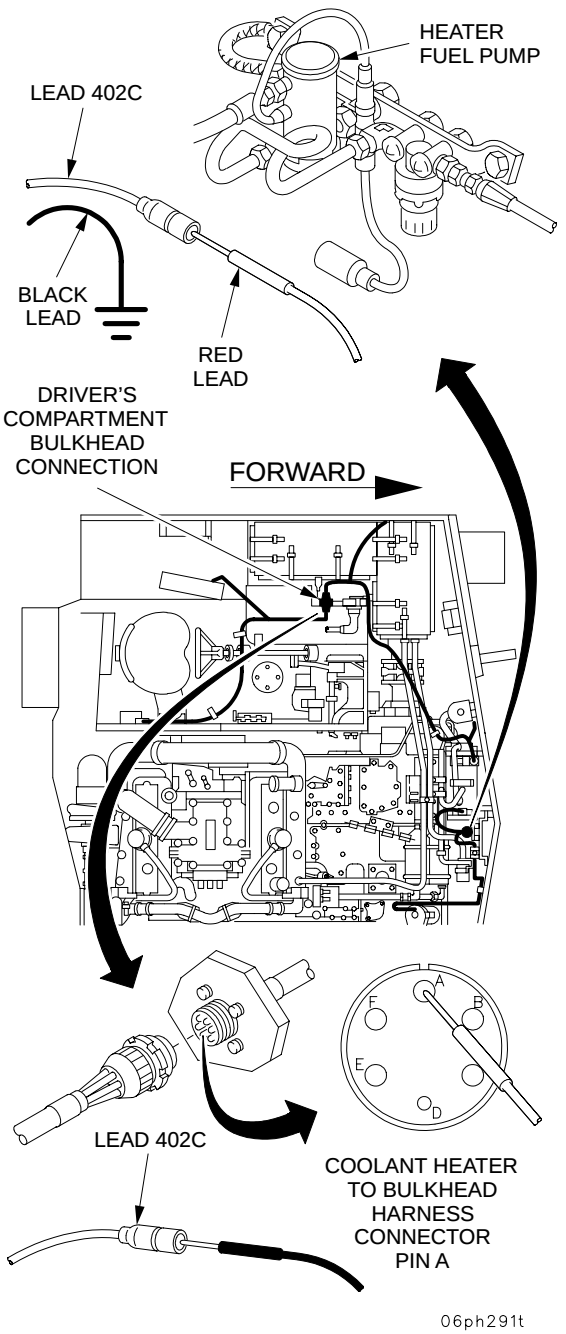


3-3 TROUBLESHOOTING CHART - CONTINUED

s. WINTERIZATION KIT CIRCUIT - CONTINUED	(2) HEATER BLOWER OPERATES BUT MOTOR DOES NOT. - CONTINUED

CONTINUED FROM STEP B

C

1. Turn heater START/RUN switch OFF (TM 9-2350-314-10).
2. Disconnect bulkhead to control box harness connector from heater control box.
3. Place multimeter red lead on control box connector pin A and black lead to ground.
4. Turn vehicle MASTER switch ON (TM 9-2350-314-10).
5. Turn START/RUN switch to START (TM 9-2350-314-10).
6. Turn HIGH/LOW switch to LOW and then to HIGH (TM 9-2350-314-10).
7. Check for voltage in both positions.

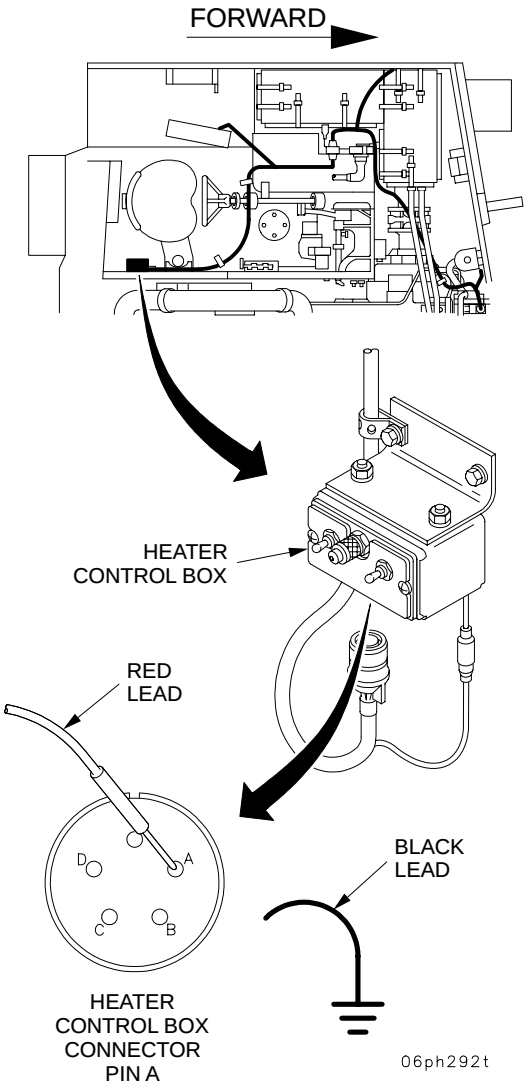
Is voltage present in both positions?

yes

Repair or replace bulkhead to control box harness (para 19-8).

no

Repair or replace heater control box (para 19-3).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

s. WINTERIZATION KIT CIRCUIT - CONTINUED	(3) HEATER MOTOR OVERHEATS.

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)
Probe kit (item 35, Appx F)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)

A

1. Disconnect lead 403B from coolant pump.
2. Place multimeter red lead on lead 403B connector and black lead to ground.
3. Start heater (TM 9-2350-314-10).
4. When heater indicator light comes on, turn HIGH/LOW switch to LOW (TM 9-2350-314-10).
5. Check for voltage.

Is voltage present?

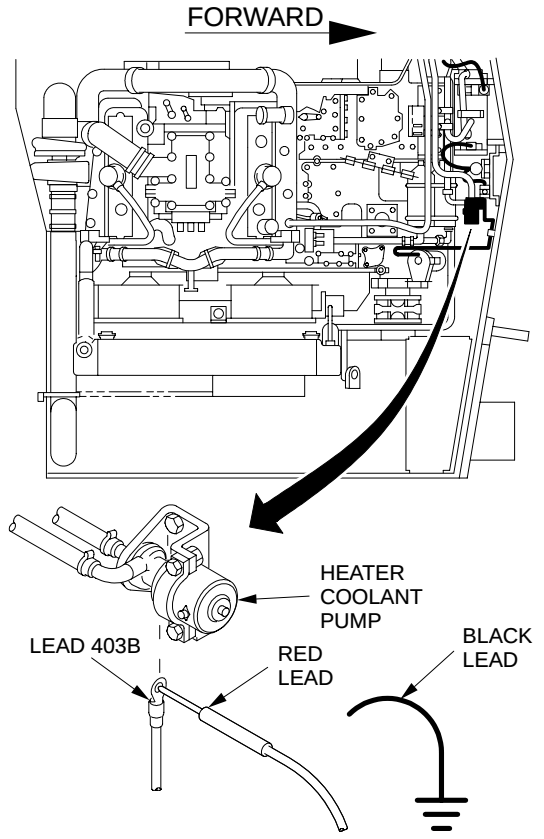
yes

no

Repair or replace coolant heater to bulkhead wiring harness (para 19-10).

Replace coolant pump (para 19-6).

END OF TASK



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3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE).

NOTE

This test set is now designated as STE-ICE-R (Reprogrammable). The "R" indicates its circuit boards can now be reprogrammed at depot. There are no other changes to this test set. For testing purposes, STE-ICE and STE-ICE-R are the same.

3-4.1 Introduction.

The Simplified Test Equipment for Internal Combustion Engines (STE/ICE) connects to the M109A6 Diagnostic Cable Assembly (DCA) located in the driver's compartment. The DCA reduces the mechanic's need to install test transducers and leads to perform engine and engine component diagnostic checks. This section covers STE/ICE setup, test procedures, and troubleshooting using the vehicle's DCA as well as tests involving the installation of transducer kits (TK).

3-4.2 General.

STE/ICE provides measurements on voltage resistance, pressure, temperature, and speed to analyze the condition of an engine system.

STE/ICE also provides a thorough preventive maintenance check on the M109A6 engine as part of service upon receipt and as an annual check in the PMCS.

3-4.3 Description of STE/ICE Equipment.

The STE/ICE set consists of a vehicle test meter (VTM), five cable assemblies, transducer kit (TK), test probe kit, manual, and transit case.

a. Vehicle Test Meter – The VTM is the diagnostic meter of STE/ICE used for testing electrical and mechanical components. The VTM has three switches, readout display, flip cards, and four cable connectors.

(1) Switches – The three switches are PUSH ON/PULL OFF, TEST SELECT, and TEST. The PUSH ON/PULL OFF switch controls power to the VTM. TEST SELECT is two switches with 10 positions used to select which test is to be done. The TEST button has two uses: when it is pressed and released, it initiates a selected test and when it is pressed and held, it initiates an offset test.

(2) Readout Display – During testing, the display can give five different types of messages with up to four characters per message. The messages are error, status, numerical, prompting, and confidence test error.

(3) Flip Cards – The flip cards are attached to the front of the VTM. The cards list test numbers, messages, and some procedures. They can be used as a quick reference.

(4) Cable Connectors – The four cable connectors on the VTM are DCA/PWR J1, transducer cable connectors J2TK and J3TK, and VOLTS/OHMS J4.

- DCA/PWR connector J1 – used to connect the VTM to either a vehicle diagnostic connector with the DCA cable W1 or to a DC power source with power cable W5.
- Transducer cable connectors J2TK and J3TK – used to connect transducer cables W4 to VTM. Power and signals are routed through these connectors. Both connectors may be used when a test requires two measurements to be made at the same time.
- VOLTS/OHMS connector J4 – used to connect test probe cable W2 to VTM for voltage and resistance tests.

3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

3-4.3 Description of STE/ICE Equipment - Continued

b. Cable Assemblies - The cables used with STE/ICE are:

(1) Diagnostic Connector Assembly (DCA) Cable W1 - This cable is used to power the VTM and provide access to test points and sensors connected to the DCA.

(2) Test Probe Cable W2 - The Test Probe cable is used for measuring voltages, frequency, resistance and continuity, first peak series, and compression unbalance tests.

(3) Ignition Adapter Cable W3 - This cable is used to measure dwell angle, points voltage, engine rpm, and power tests.

(4) Transducer Cables W4 - These cables are used as extensions to connect the VTM to a pressure transducer, pulse tachometer, current probe, or ignition adapter cable.

(5) Power Cable W5 - Used to power VTM when cable W1 is not being used.

c. Transducer Kit (TK) - The TK is stored in a tray in the top of the Transit Case and has transducer, adapters, and fittings to be used with the STE/ICE.

d. Test Probe Kit - The Test Probe Kit has a variety of probes and clips that can be attached to Test Probe Cable W2 to make it easier to take different types of measurements.

e. Manual - TM 9-4910-571-12&P has operating instructions, operator and organizational maintenance instructions, and repair parts and special tools information.

f. Transit Case - The STE/ICE with all necessary accessories and instructions is housed in this portable protective transit case.

3-4.4 Engine Testing.

The STE/ICE equipment is used for two different test methods. The PMCS tests check the general condition of the howitzer engine. Using STE/ICE for troubleshooting will isolate a malfunction down to the defective part or assembly.

3.4.4.1 PMCS Test Method.

The PMCS Test consists of a pre-test inspection and STE/ICE testing.

a. Pre-test Inspections - Before using STE/ICE do the following inspections:

(1) Fan Belts - Check for proper tension. Replace if cracked or frayed.

(2) Ignition Cables - Make sure they are in good condition and securely connected.

(3) Oil Level - Check oil. If low, fill to proper level.

(4) Fuel Level - Make sure there is enough fuel for testing.

(5) Radiator - Check water level. If low, fill to proper level.

(6) Battery - If the case is cracked or terminal post is damaged, replace battery. Clean off any corrosion. Make sure connections to ground and starter motor are clean and in good condition. Check electrolyte level. If low, fill to proper level with distilled water.

3-4.4 Engine Testing - Continued

b. STE/ICE Testing. STE/ICE testing has two different sequences of tests: PMCS and Troubleshooting. A PMCS tree is a logical sequence of tests performed to determine the general condition of the engine. PMCS trees are arranged so testing starts with PMCS-(1) and goes through each PMCS tree until the test is terminated by a pass or failure. If testing is terminated by the last PMCS tree, then the vehicle has no identifiable problem. If any test is terminated by a failure, you will be sent to a Troubleshooting tree for more testing and troubleshooting to determine the cause of the failure.

Rules to follow when using the PMCS test methods:

NOTE

The DCA PMCS trees are the primary troubleshooting trees. The TK PMCS trees are to be used only when the DCA connector and/or wiring is faulty.

(1) Select the proper PMCS (DCA or TK) tree.

(2) Always start with PMCS tree #1. Do not start in the middle of any tree.

(3) Complete each step in a tree. Do not skip any procedure or instructions.

(4) If a PMCS tree fails a test, go to the specified troubleshooting tree or higher level of maintenance.

(5) After correcting a failed test with a troubleshooting tree, return to PMCS test #1 and restart testing to make sure there are no other problems with the vehicle.

(6) Each PMCS tree test depends on the passing of a previous test. Do not skip any test under any circumstance.

c. Vehicle Test Card (VTC). When familiar with the STE/ICE procedures, the vehicle test card can be used as a quick reference. The front of the test card has all of the information the user will need to do common measurements on the vehicle. The card has logical order (from top to bottom) of steps from powering up the VTM to completing a series of tests.

The top of the card tells you how to power up STE/ICE for the vehicle. Next, a table lists many measurements that can be useful when troubleshooting the vehicle. This table has the VTM test number, required offset test limits, engine operating condition, required special connections, expected pass/fail limits, and units of measurement. The order of the measurements in this table allow for the first measurements to be taken with the engine off. This makes sure the starting system of the vehicle is in working order. Order of the other measurements are:

(1) Engine running but not warm

(2) Engine running and warm

(3) Engine not running but warm

(4) Miscellaneous

Hookups for measurements used to troubleshoot the vehicle are on the back of the VTC. Measurement that require special hookups are also done on the back of the VTC.

To begin the PMCS test method, do the pre-test inspections and then go to PMCS tree #1.

3-4.4 Engine Testing - Continued

3-4.4.2 STE/ICE Troubleshooting Method.

a. STE/ICE engine troubleshooting uses only troubleshooting trees. When an engine malfunction is recognized, using the “Quick Guide to Troubleshooting” index will send you to a specific troubleshooting tree to isolate the cause of the malfunction.

To start the STE/ICE troubleshooting method, do the following:

NOTE

The DCA troubleshooting trees are the primary troubleshooting trees. The TK troubleshooting trees are to be used only when the DCA connector and/or wiring is faulty.

(1) Select the proper troubleshooting (DCA or TK) tree.

(2) Do PMCS tree #1 to make sure STE/ICE is in working order.

(3) Do troubleshooting tree listed in “Quick Guide to Troubleshooting” for malfunction.

Follow the following rules when doing STE/ICE troubleshooting:

(1) Do not enter a troubleshooting tree in the middle. Always start at the beginning.

(2) Follow all instructions and procedures of a PMCS tree.

(3) After correcting a problem with a troubleshooting tree, do any testing necessary to make sure the problem no longer exists.

TEST INSPECTION	POWERING UP VTM	
	DCA MODE	TK MODE
1. Oil Level 2. Coolant Level 3. Fuel Level 4. Battery Electrolyte Level	1. Connect DCA cable W1 to VTM 2. Connect DCA cable W1 to DCA connector 3. Perform confidence test 66/99. 4. Enter vehicle VID number using test 60.	1. Connect VTM to cable W5 2. Connect cable W5 to batteries 3. Perform confidence test 66/99. 4. Enter vehicle VID number using test 60. (See note)
Keep a log of all performance parameters. This is the best indication of system deterioration or failure. NOTE: To use TK mode, remove the required DCA transducers to install STE/ICE Kit transducers.		

PMCS STE/ICE TEST CARD

MEASUREMENT NAME	DCA VTM TEST NOS.	VTM OFFSET LIMITS	OPERATING CONDITION	TK VTM TEST NOS.	SPECIAL CONNECTION REQUIRED	LIMITS MIN	LIMITS MAX	UNITS
Battery Voltage	67	-	Engine OFF	67	Fig.4	22	-	Volts
Current First Peak	72	+225	Crank On Go	72	Fig.4	875	1680	Amps
Vehicle Gage Oil Pressure	-	-	Idle-Use Test 10 to check IDM RPM	-	Pulse Tachometer	10	-	PSI
Charging Voltage	01, 67		Lights and ACC on 1000-1200 RPM	01, 67		26.5	28.5	Volts
Vehicle Gage Cool Temp	-	-	Warm Engine	-	-	170	185	_F
Vehicle Gage Oil Temp	-	-	Warm Engine	-		30	50	F
Engine RPM Average	10	-	Idle	10		550	600	RPM
Engine RPM Average	10	-	Governor	10		2350	2500	RPM
Power	13	-	Warm Engine	13		60**	-	%
Compression Unbalance	14	-	Warm Engine Crank on Go	14	-	-	10	%
Cranking RPM	10	-	Cranking	10		100	-	RPM
Cranking Voltage	67	-	Cranking	67		18	-	Volts
Cranking Current	71	±225	Cranking	90		350	550	Amps
Battery Pack Internal Resistance	73	±225	Crank on Go	73		-	13	Milliohms
Starter Circuit Resistance	74	±225	Crank on Go	74		3	25	Milliohms
Battery Pack Resistance Charge	75	±225	Crank on Go	75	Current Probe	-	50	Milliohms/sec

* Used when DCA is not operable or not applicable to test.

** Typical power % for engine with a turbocharger and fuel limiting device is 68%. If power % falls below 60%, you should investigate further.

VEHICLE TEST CARD - VID11

3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS (1) VTM CONNECTIONS AND CHECKOUT FOR DCA.

WARNING

Do not connect or disconnect VTM while engine is running.

CAUTION

Connect connector P1 of DCA cable W1 to J1 on the VTM before connecting to the diagnostic connector.

Connect battery to VTM:

1. Pull VTM power switch to the OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 connector P2 to harness W100 connector P4 (DCA receptacle).
4. Make sure all connections are correct and tightened.

NOTE

Place the VTM so only its rubber feet touch the vehicle, or do all testing with the vehicle MASTER switch ON. This will prevent sparking during testing. Sparking will interrupt testing, but will not hurt the VTM.

A

1. Push power switch on VTM to ON position.
2. Make sure VTM display shows ".8.8.8.8" for two seconds and then changes to "- - - -".

Does VTM display show ".8.8.8.8" and then change to "- - - -"?

yes

Go to step D.

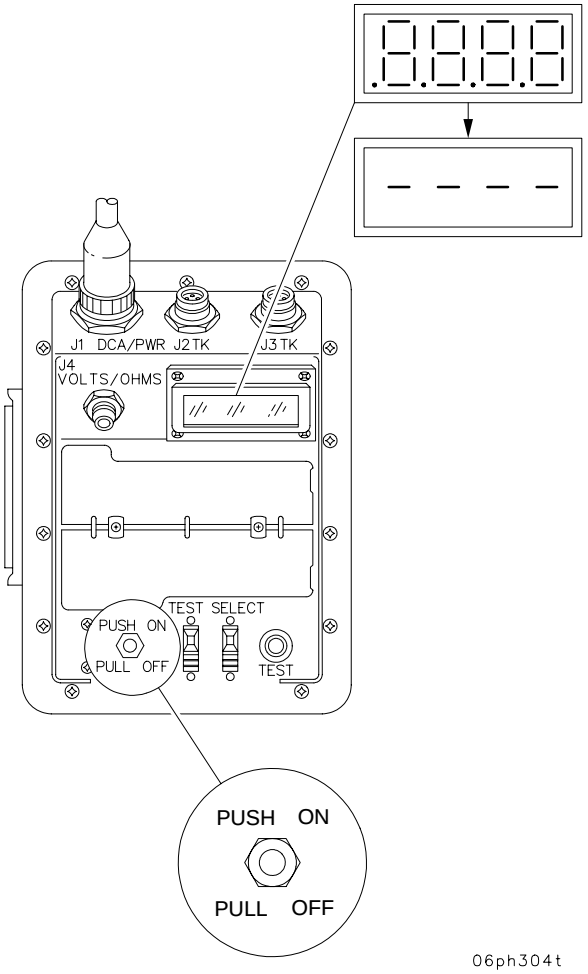
no

Does display light up?

yes

If only part of display shows, module may be burned out. Go to TM 9-4910-571-12&P for replacement.

no



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3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS - CONTINUED (1) VTM CONNECTIONS AND CHECKOUT FOR DCA. - CONTINUED

CONTINUED FROM STEP A

B

1. Pull VTM power switch to OFF position.
2. Check and clean battery connections and all interconnecting cables.
3. Push VTM power switch to ON.

Does VTM display show ".8.8.8.8" and then change to "- - - -"?

yes → Go to step D.

no

C

1. Pull VTM power switch to OFF.
2. Disconnect DCA cable W1 from harness W100 connector P4 (DCA receptacle) and from STE/ICE VTM connector J1.
3. Connect DCA cable W5 to VTM connector J1.
4. Connect DCA cable W5 to known good battery.
5. Push VTM power switch to ON.

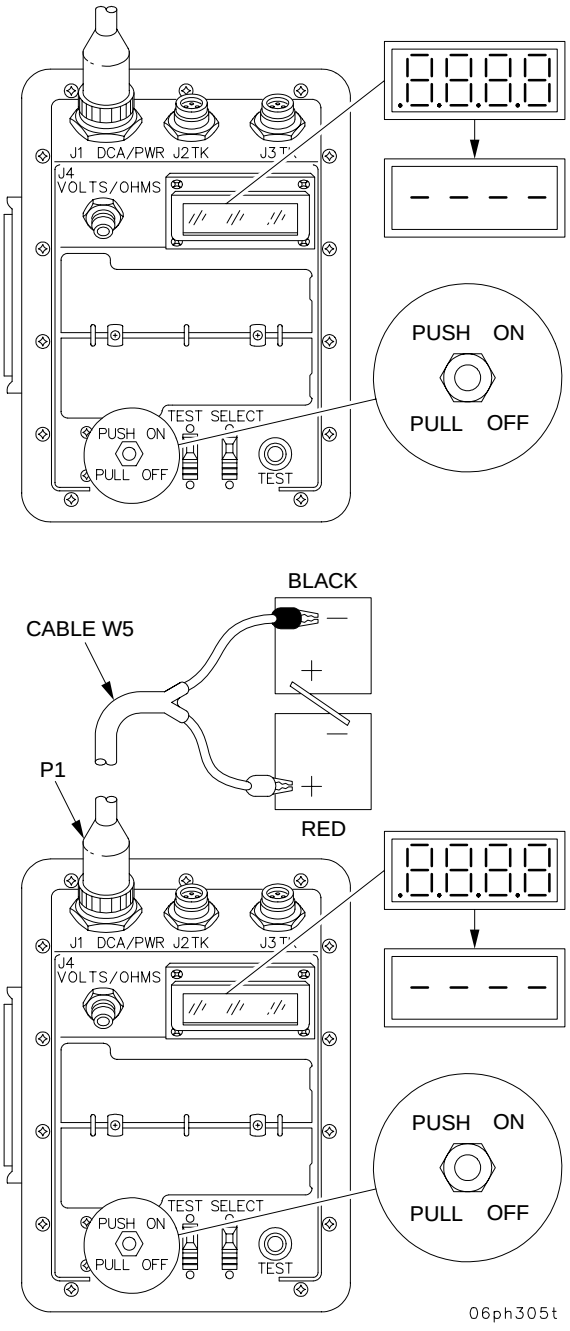
Does VTM display show ".8.8.8.8" and then change to "- - - -"?

yes → Go to TM 9-4910-571-12&P to fault isolate cable W5.

no

1. Check battery electrolyte level (TM 9-2350-314-10).
2. Clean battery terminals (TM 9-2350-314-10).
3. Check battery specific gravity (Table 2-1, PMCS, item 5)
4. If necessary, charge batteries.
5. Return to step A.

If the problem happens again, check for broken or loose connections in the DCA wiring from the battery or in cable W1.



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3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS – CONTINUED	(1) VTM CONNECTIONS AND CHECKOUT FOR DCA. – CONTINUED

CONTINUED FROM STEP B

D

1. Dial 66 into TEST SELECT to run confidence test.
2. Press and release TEST button.

Does VTM show and hold “0066”?

yes → Go to step F.

no

E

1. Pull VTM power switch to OFF.
2. Do step A one time.
3. Do step D again, one time.

Does VTM show and hold “0066”?

yes → Replace faulty STE/ICE (TM 9-4910-571-12&P).

no

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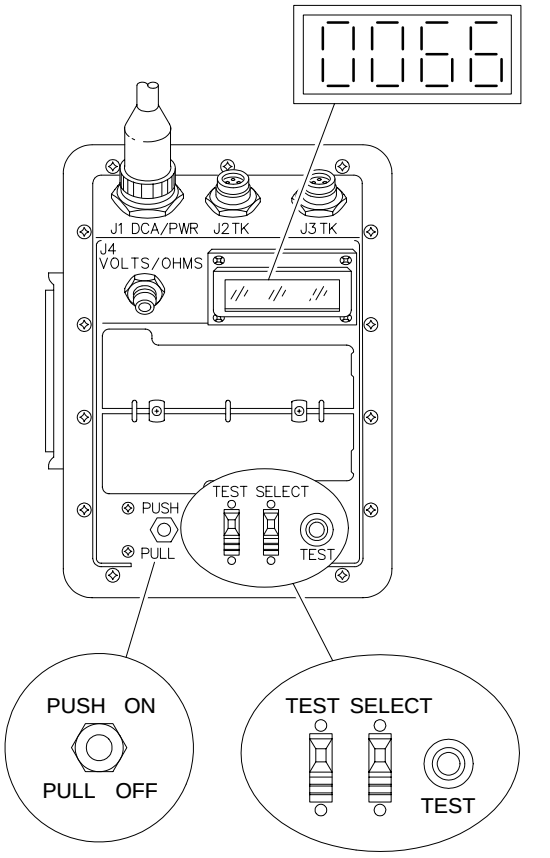


3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS - CONTINUED (1) VTM CONNECTIONS AND CHECKOUT FOR DCA. - CONTINUED

CONTINUED FROM STEPS D AND E

F

1. Dial 99 into TEST SELECT.
2. Press and release TEST button.

Does VTM show "0099" and ".8.8.8.8"?

NOTE

All numbers of the display should be lighted. If some parts are not, go to TM 9-4910-571-12&P to replace module.

yes / no

Go to step E.

G

1. Make sure several series of numbers are showing on display. This means the VTM is going through confidence test.
2. Look for VTM to show and hold the word "PASS".

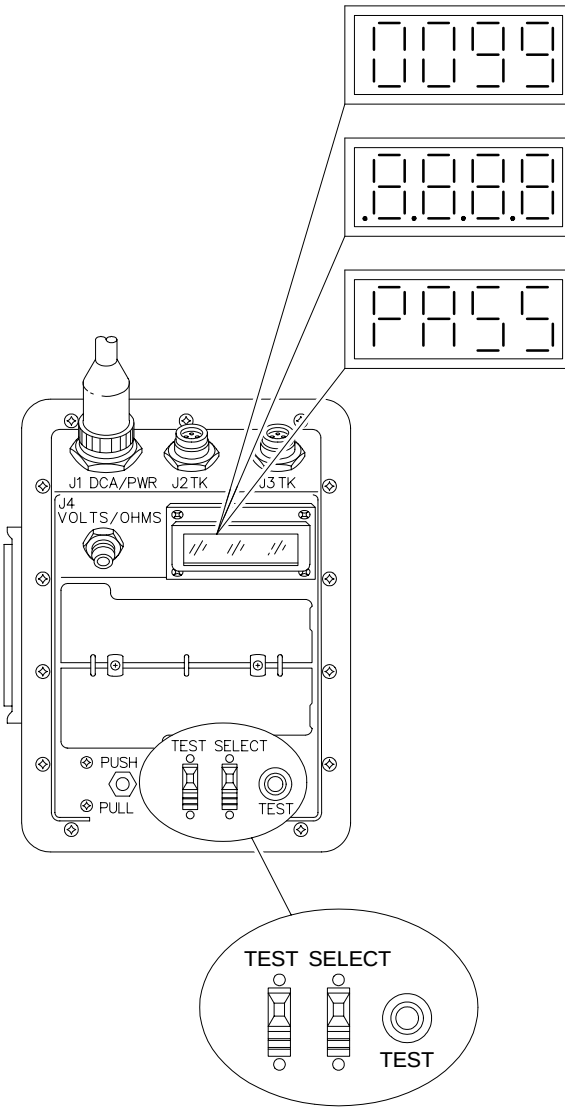
Does VTM show and hold the word "PASS"?

yes / no

Go to TM 9-4910-571-12&P for confidence test fault isolation.

NOTE

VTM can fail confidence test because of a bad transducer. If failure happens when connected with cable W1, disconnect all cables from VTM and connect only W5. Clip W5 to vehicle batteries. If VTM passes test, a transducer is bad in the DCA. Continue testing with TK PMCS troubleshooting trees starting with para 3-4.a(1a). If VTM still fails, VTM has failed internally.



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3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS – CONTINUED	(1) VTM CONNECTIONS AND CHECKOUT FOR DCA. – CONTINUED

CONTINUED FROM STEP G

H

1. Dial 60 into TEST SELECT.
2. Press and release TEST button. Message "UEH" should be shown.
3. When "UEH" message is shown, dial in the identification number 11.
4. Press and release TEST button.

Does VTM display identification number 11?

NOTE

If error message "E010" is shown, wrong VID has been entered.

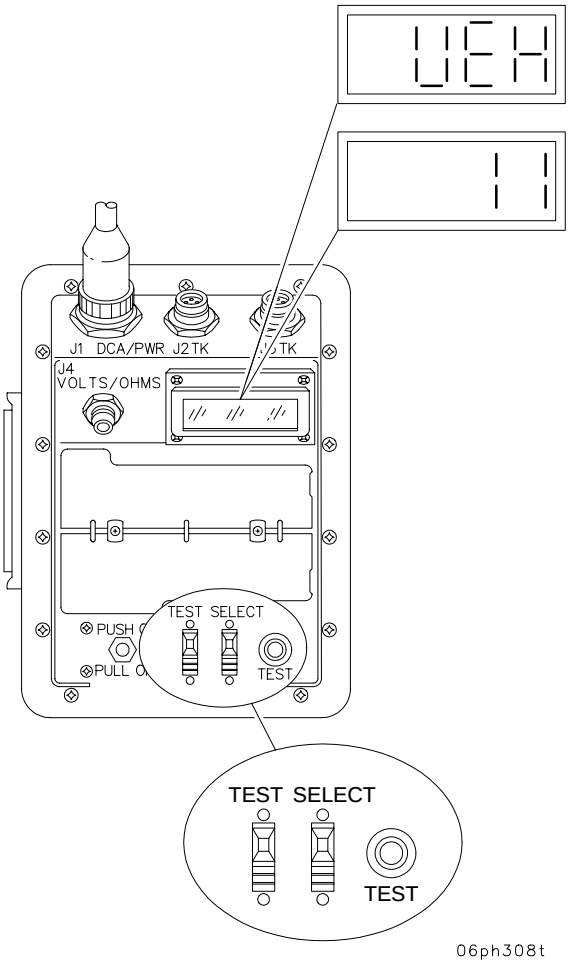
yes → Go to para 3-4.a(2).

no

I Does VTM show an error message?

yes → Do error message fault isolation per TM 9-4910-571-12&P.

no → Replace faulty STE/ICE (TM 9-4910-571-12&P).



END OF TASK

3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS – CONTINUED (1a) VTM CONNECTIONS AND CHECKOUT FOR TK.

WARNING
Do not connect or disconnect VTM while engine is running.

CAUTION
Connect connector P1 of power cable W5 to J1 on the VTM before connecting clip leads to battery.

Connect battery to VTM:
1. Pull VTM power switch to the OFF position.
2. Connect cable W5 connector P1 to VTM connector J1.
3. Connect red clip lead to positive terminal of battery and connect black lead to negative terminal.

NOTE
Place the VTM so only its rubber feet touch the vehicle, or do all testing with the vehicle MASTER switch on. This will prevent sparking during testing. Sparking will interrupt testing, but will not hurt the VTM.

A
1. Push power switch on VTM to ON position.
2. Make sure VTM display shows ".8.8.8.8" for two seconds and then changes to "- - - -".

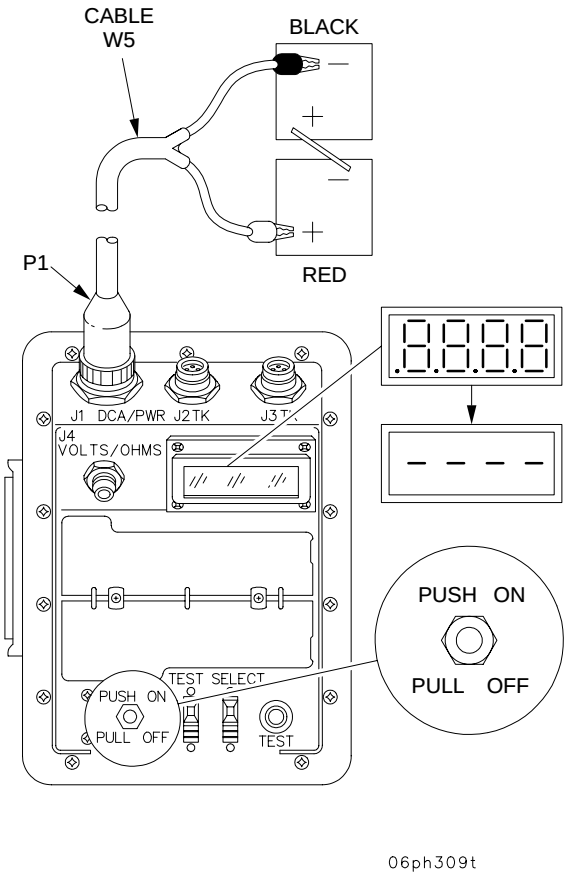
Does VTM display show ".8.8.8.8" and then change to "- - - -"?

yes → Go to step D.

no → Does display light up?

yes → If only part of display shows, module may be burned out. Go to TM 9-4910-571-12&P for replacement.

no



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3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS – CONTINUED	(1a) VTM CONNECTIONS AND CHECKOUT FOR TK. – CONTINUED

CONTINUED FROM STEP A

B

1. Pull VTM power switch to OFF position.
2. Check and clean battery connections and all interconnecting cables.
3. Push VTM power switch to ON.

Does VTM display show ".8.8.8.8" and then change to "- - - -"?

yes → Go to step D.

no

C

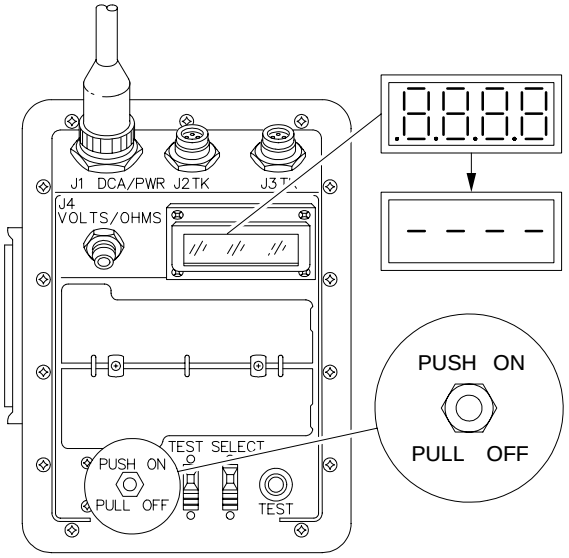
1. Pull VTM power switch to OFF.
2. Disconnect DCA cable W5 from battery and connect to a known good battery.
3. Push VTM power switch to ON.

Does VTM display show ".8.8.8.8" and then change to "- - - -"?

yes → Go to TM 9-4910-571-12&P to fault isolate cable W5. If W5 is good, replace STE/ICE.

no

1. Check battery electrolyte level (TM 9-2350-314-10).
2. Clean battery terminals (TM 9-2350-314-10).
3. Check battery specific gravity (Table 2-1, PMCS item 5).
4. If necessary, charge batteries.
5. Return to step A.



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3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS - CONTINUED (1a) VTM CONNECTIONS AND CHECKOUT FOR TK. - CONTINUED

CONTINUED FROM STEPS A AND C

D

1. Dial 66 into TEST SELECT to run confidence test.
2. Press and release TEST button.

Does VTM show and hold "0066"?

yes → Go to step F.

no

E

1. Pull VTM power switch to OFF.
2. Do step A one time.
3. Do step D again, one time.

Does VTM show and hold "0066"?

yes

no → Replace faulty STE/ICE. (TM 9-4910-571-12&P)

F

1. Dial 99 into TEST SELECT.
2. Press and release TEST button.

Does VTM show "0099" and ".8.8.8.8"?

NOTE

All numbers of the display should be lighted. If some parts are not, go to TM 9-4910-571-12&P to replace module.

yes

no → Return to step E.

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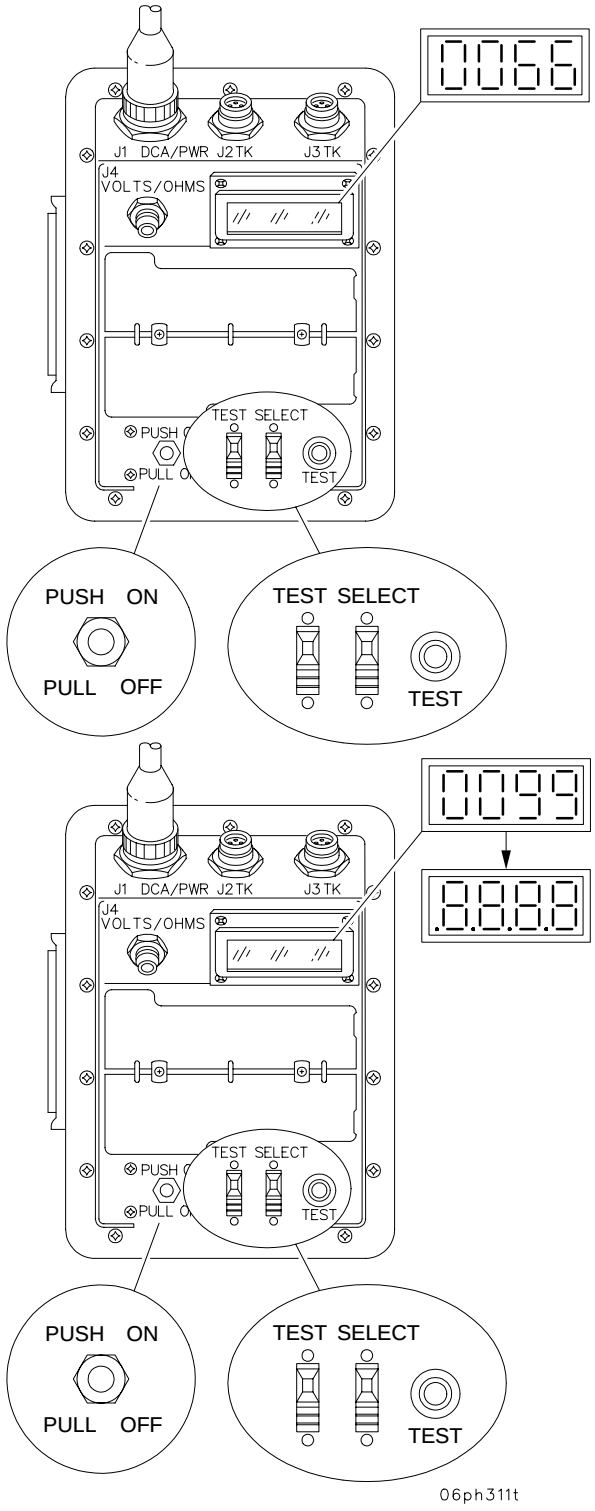

3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS - CONTINUED (1a) VTM CONNECTIONS AND CHECKOUT FOR TK. - CONTINUED

CONTINUED FROM STEP F

G

1. Make sure several numbers are showing on display. This means the VTM is going through confidence test.
2. Look for VTM to show and hold the word "PASS".

Does VTM show and hold the word "PASS"?

yes / no

Go to TM 9-4910-571-12&P for confidence test fault isolation.

NOTE

VTM can fail confidence test because of a bad transducer. If failure happens when connected with cable W5, disconnect all cables from J2, J3, and J4 and try again. If it passes, a transducer is bad. If it fails, the VTM has failed internally.

H

1. Dial 60 into TEST SELECT.
2. Press and release TEST button. Message "UEH" should be shown.
3. When "UEH" message is shown, dial in the identification number 11.
4. Press and release TEST button.

Does VTM display identification number "11"?

yes / no

Go to step J.

I Does VTM show an error message?

yes / no

Replace faulty STE/ICE. (TM 9-4910-571-12&P)

Do error message fault isolation per TM 9-4910-571-12&P.

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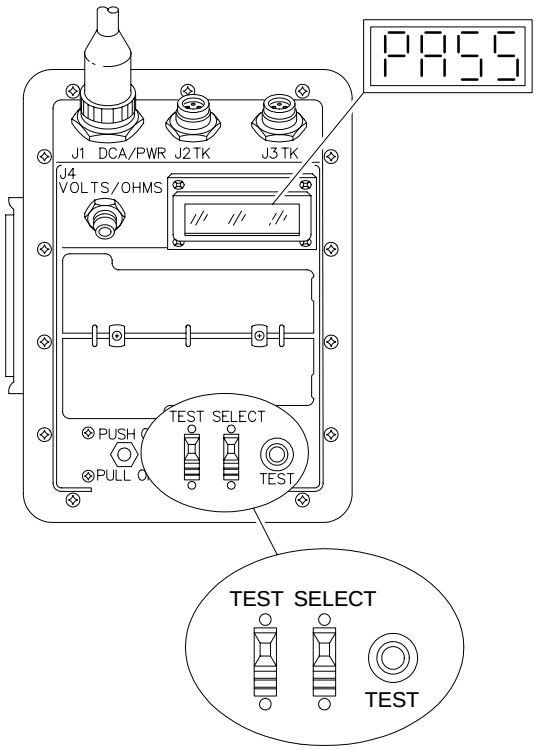

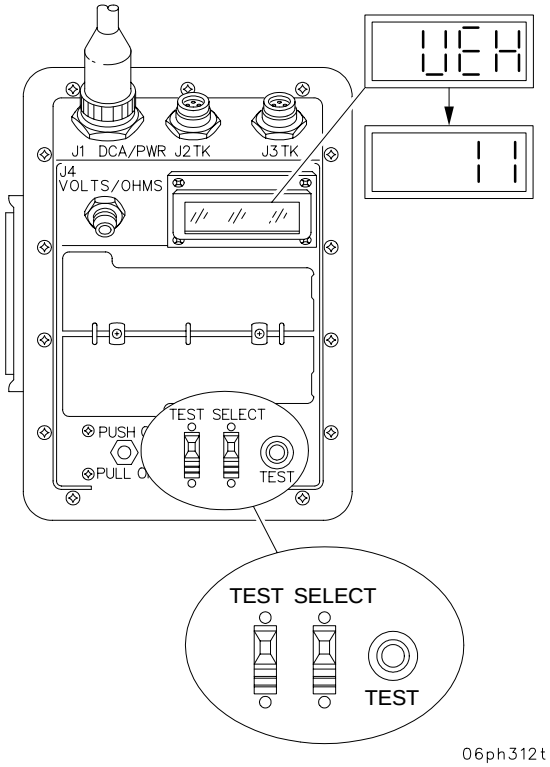

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3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS - CONTINUED (1a) VTM CONNECTIONS AND CHECKOUT FOR TK. - CONTINUED

CONTINUED FROM STEP H

J

1. Dial 67 into TEST SELECT, press and release TEST button.
2. Make sure VTM shows battery voltage is above +22 Vdc.

Is voltage above +22 V dc?

yes / no

Check VTM connections, clean battery connections, check specific gravity, and charge batteries, if necessary. Troubleshoot W5 in accordance with TM 9-4910-571-12&P. After repairs, start para 3-4.a(1a) over.

WARNING

Protective fan screens must be installed prior to doing maintenance in the engine compartment when the vehicle is running or engine is in ground hop mode. Contact with rotating fan can cause injury.

WARNING

To prevent injury to personnel, turn engine OFF before installing pulse tachometer.

CAUTION

Clean all mounting surfaces before you install the transducer to keep foreign substances from damaging the engine or the transducer.

NOTE

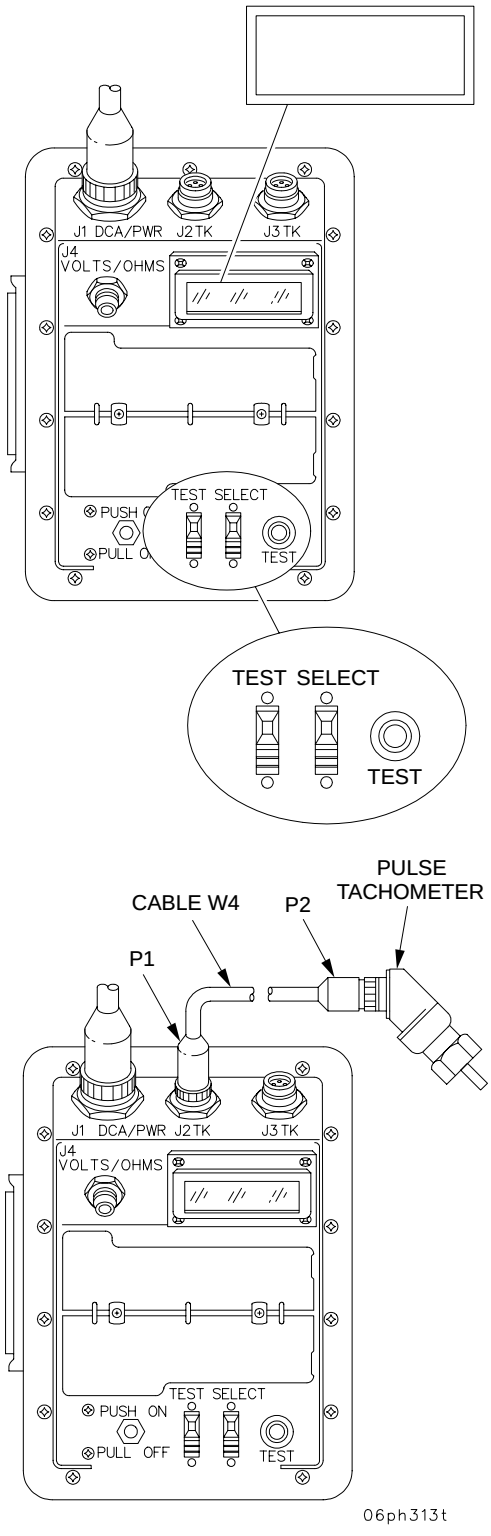
If RPM or power tests vary more than ±5%, tach drive adapter and pulse tachometer should be removed. You might have to rotate the tach speed adapter to connect the pulse tachometer.

K

1. Install fan protective screens (para 4-1.c).
2. Disconnect tachometer cable from engine (para 20-2).
3. Install pulse tachometer on engine.
4. Connect cable W4 connector P1 to VTM connector J2.
5. Connect cable W4 connector P2 to the connector on the pulse tachometer. Make sure cable W4 is clear of belts and fans.

Go to para 3-4.a (2a).

END OF TASK



3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS – CONTINUED (2) CURRENT FIRST PEAK TEST – DCA.

A

1. Turn vehicle MASTER switch OFF.
2. Dial 72 into TEST SELECT.
3. Press and hold TEST until the message “CAL” appears on the display and release TEST button.
4. Wait for offset value to appear.

Is offset value in the limits of –225 to +225?

yes

no

Go to TM 9–4910–571–12&P for offset fault isolation.

B

1. Press and release TEST button.
2. Wait for message “GO” to show on display.

NOTE

If “.9.9.9.9” shows, go to TM 9–4910–571–12&P for offset fault isolation.

3. When “GO” shows on display, pull and hold engine fuel shutoff handle and depress the starter switch until “OFF” or “E013” is on display.

NOTE

If VTM loses power and comes on again showing “– – – –” on display after cranking, go to para 3–4.b(4).

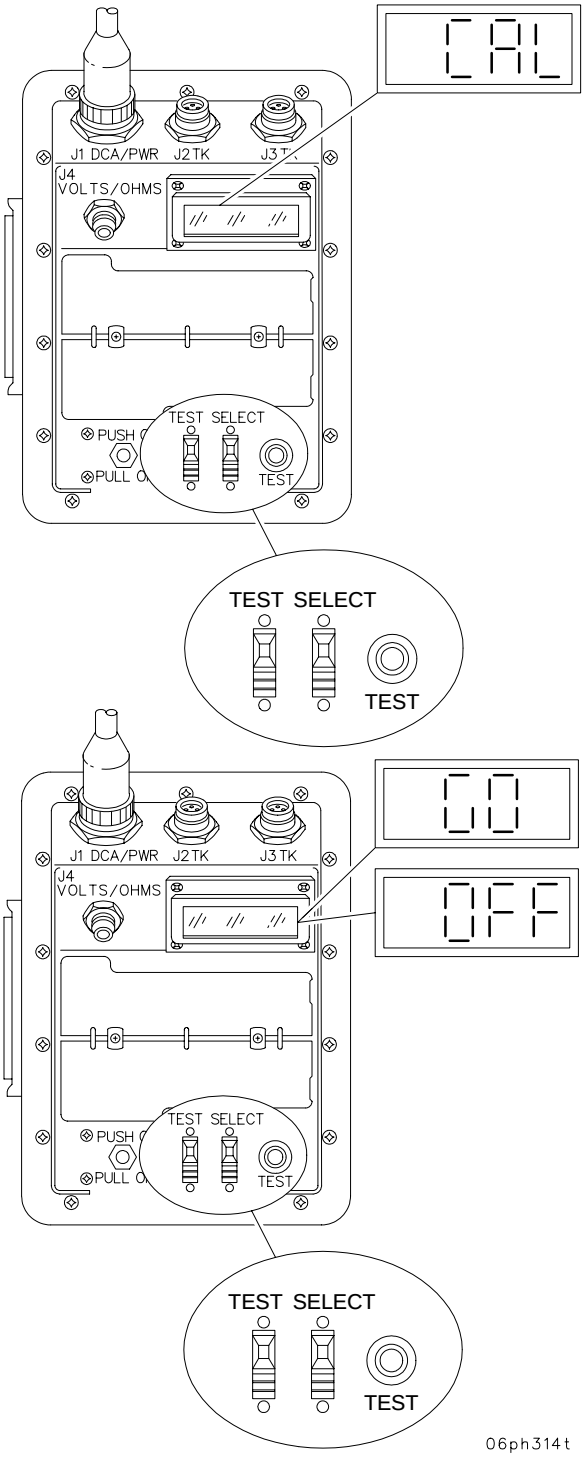
Is current within 875–1680 amps?

yes

no

Go to para 3–4.a(3).

Go to para 3–4.b(2).



END OF TASK

3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS - CONTINUED (2a) CURRENT FIRST PEAK TEST - TK.

A

1. Turn vehicle MASTER switch OFF.
2. Connect cable W4 connector P1 to VTM connector J3 and connect cable W4 connector P2 to connector on current probe.
3. Clamp the current probe around leads 81A from battery to master relay. Point arrow on the probe to the starter.
4. Make sure the probe is closed.
5. Dial 72 into TEST SELECT.
6. Press and hold TEST until the message "CAL" appears on the display, and release TEST button.
7. Wait for offset value to appear.

Is offset value in the limits of -225 to +225?

yes / no

Go to TM 9-4910-571-12&P for offset fault isolation.

B

1. Press and release TEST button.
2. Wait for message "GO" to show on display.

NOTE

If ".9.9.9.9" shows, go to TM 9-4910-571-12&P for offset fault isolation.

3. When "GO" shows on display, pull and hold engine fuel shut off handle and depress the starter switch until "OFF" or "E013" is on display.

NOTE

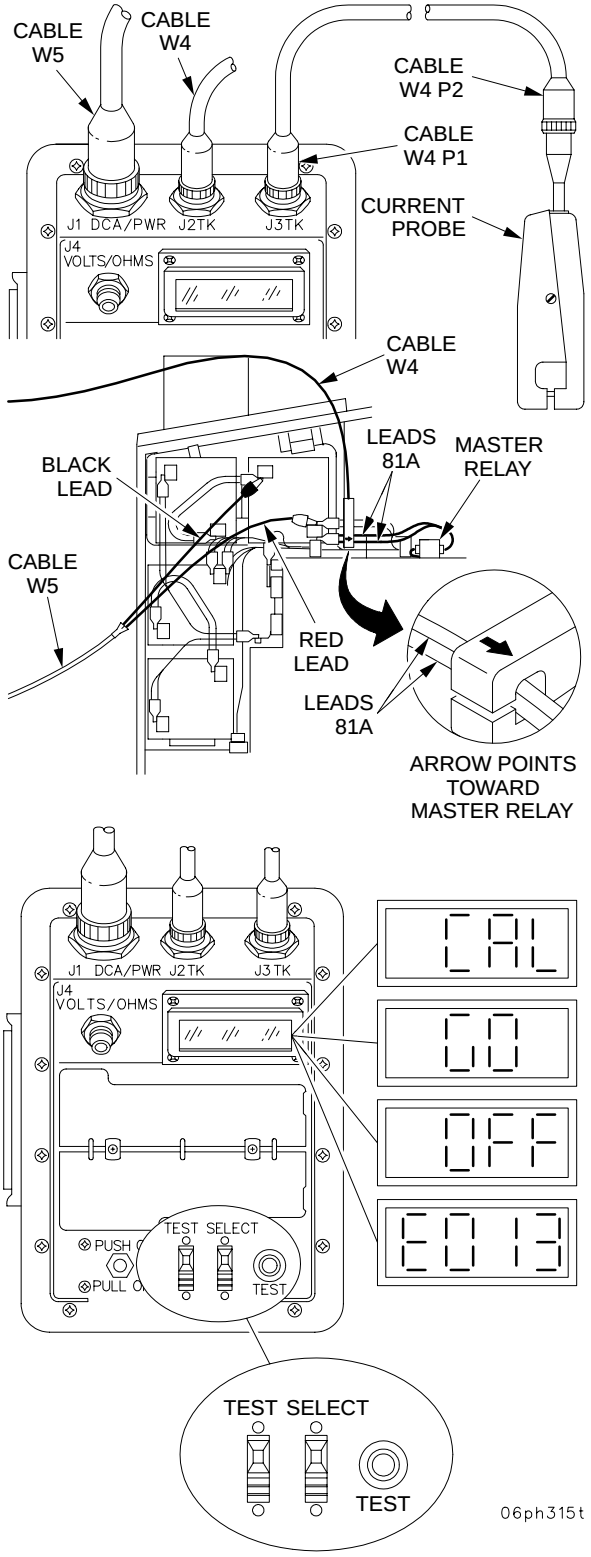
If VTM loses power and comes on again showing "- - - -" on display after cranking, go to para 3-4.b(20).

Is current within 875-1680 amps?

yes / no

Go to para 3-4.a(3a). | Go to para 3-4.b(20).

END OF TASK



3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS – CONTINUED (3) ENGINE START AND LUBRICATION CHECK – DCA.

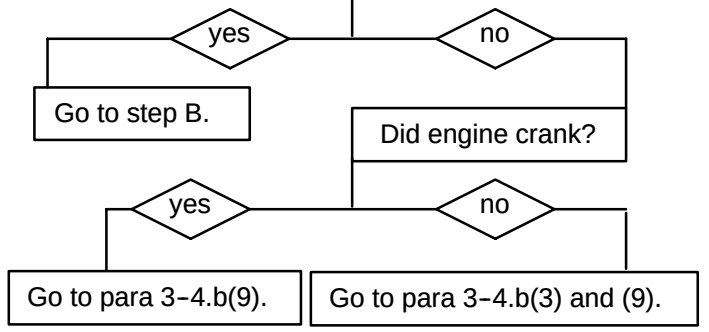
WARNING
Do not remove radiator cap when engine is hot to prevent serious injury to personnel.

CAUTION
To prevent equipment damage, check oil level and turn all hydraulic power switches OFF before starting the engine.

NOTE
Check coolant level and battery electrolyte level. Add coolant and distilled water as necessary.

A Start engine using the proper procedures in TM 9-2350-314-10.

Does engine start?



3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS - CONTINUED (3) ENGINE START AND LUBRICATION CHECK - DCA. - CONTINUED

CONTINUED FROM STEP A

B Check engine oil pressure gage to make sure pressure is at least 10 psi.

Is pressure at least 10 psi?

yes

no

Go to para 3-4.b(17).

C Check battery gage for proper voltage (TM 9-2350-314-10).

Does battery gage read normal (TM 9-2350-314-10)?

yes

no

Go to para 3-4.a(4).

D Check the rest of the vehicle gages for normal readings (TM 9-2350-314-10).

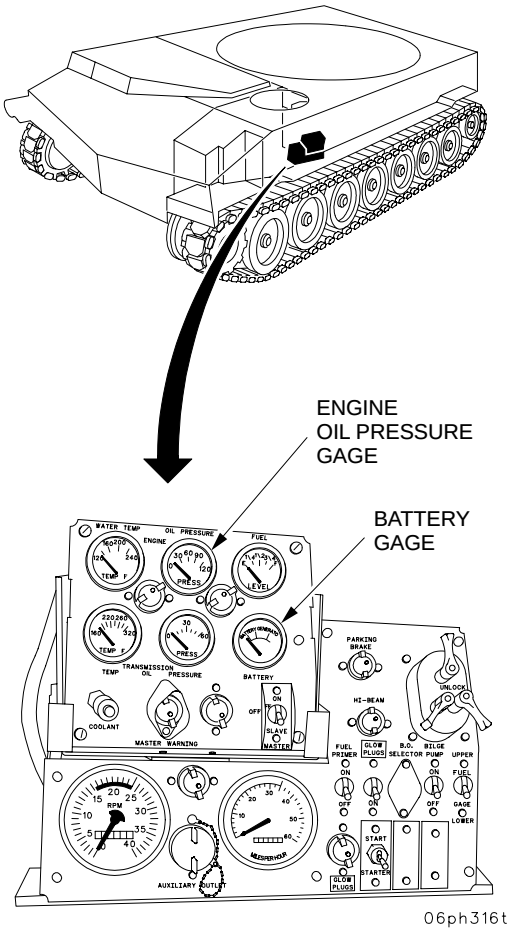
Do gages have normal readings (TM 9-2350-314-10)?

yes

Go to para 3-4.a(4).

no

Go to QUICK GUIDE for troubleshooting to find fault symptom and correct fault. Then return to para 3-4.a(2) to make sure no further problems exist.



END OF TASK

3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS - CONTINUED (3a) ENGINE START AND LUBRICATION CHECK - TK.

WARNING

To prevent serious injury to personnel, do not remove radiator cap when engine is hot.

CAUTION

To prevent equipment damage, check oil level and turn all hydraulic power switches OFF before starting the engine.

NOTE

Check coolant level and battery electrolyte level. Add coolant and distilled water as necessary.

A Start engine using the proper procedures in TM 9-2350-314-10.

Does engine start?

yes → Go to step B.

no → Did engine crank?

yes → Go to para 3-3.f(3).

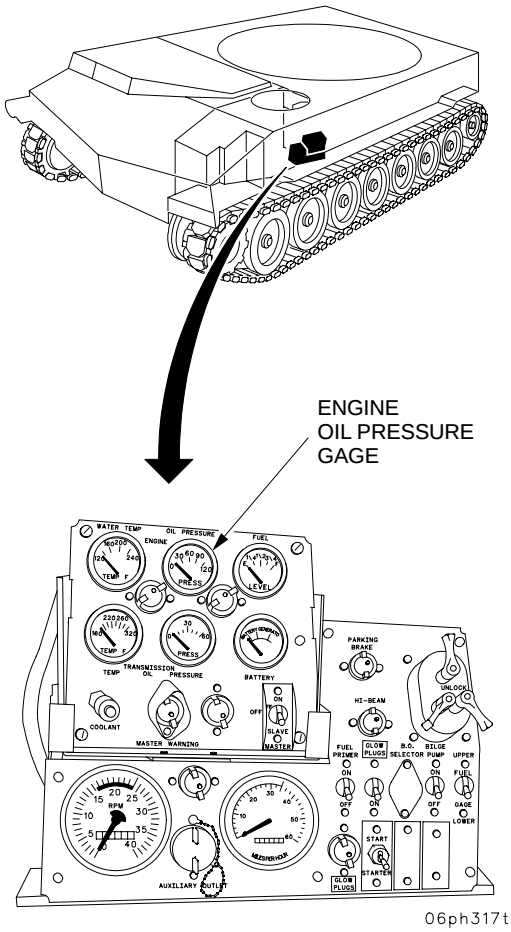
no → Go to para 3-3.f(1).

B Check engine oil pressure gage to make sure pressure is at least 10 psi.

Is pressure at at least 10 psi?

yes → CONTINUED ON NEXT PAGE

no → Go to para 3-4.b(17).



3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS - CONTINUED	(3a) ENGINE START AND LUBRICATION CHECK - TK. - CONTINUED

CONTINUED FROM STEP B

C Check battery gage for proper voltage (TM 9-2350-314-10).

Does battery gage read normal (TM 9-2350-314-10)?

yes

no

Go to para 3-4.a(4a).

D Check the rest of the vehicle gages for normal readings (TM 9-2350-314-10).

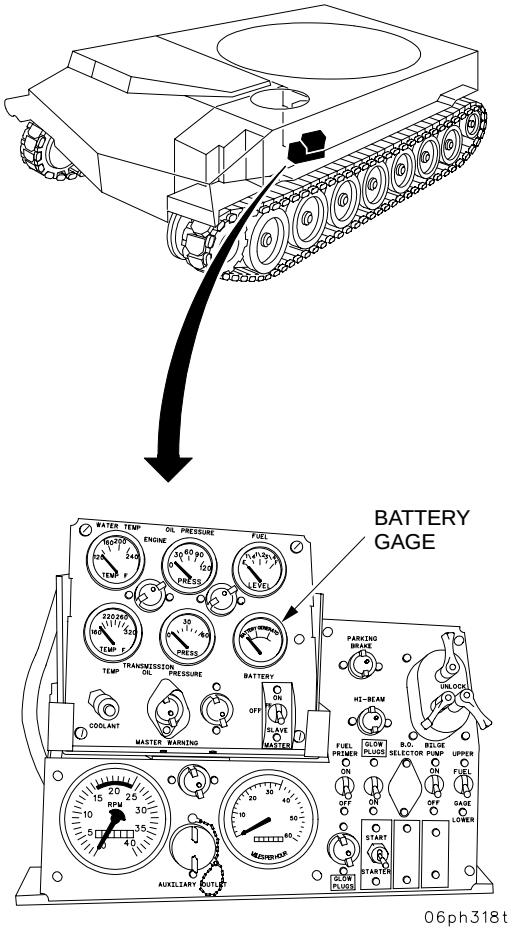
Do gages have normal readings (TM 9-2350-314-10)?

yes

no

Go to para 3-4.a(4a).

Go to QUICK GUIDE for trouble-shooting to find fault symptom and correct fault. Then return to para 3-4.a(2a) to make sure no further problems exist.



END OF TASK

3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS - CONTINUED (4) CHARGING VOLTAGE TEST - DCA.

A

1. Dial 01 into TEST SELECT and press and release TEST button.
2. When VTM shows "CON" on display, dial 67 into TEST SELECT and press and release TEST button.

NOTE

VTM will show battery voltage and rpm alternately. If VTM does not show rpm, a connection may be loose. Check connection between STE/ICE and pulse tachometer in driver's compartment. If rpm is still not displayed, replace pulse tachometer.

3. Start engine (TM 9-2350-314-10).
4. Adjust rpm to 1000-1200 rpm.
5. Turn ON headlights and accessories to load charging system.
6. Watch the display to make sure battery voltage is between 26.5 and 28.5 V dc.

Is voltage between 26.5 and 28.5 V dc?

yes

no

Go to para 3-4.b(12).

B Check battery gage for normal reading (TM 9-2350-314-10).

Does battery gage indicate normal (TM 9-2350-314-10)?

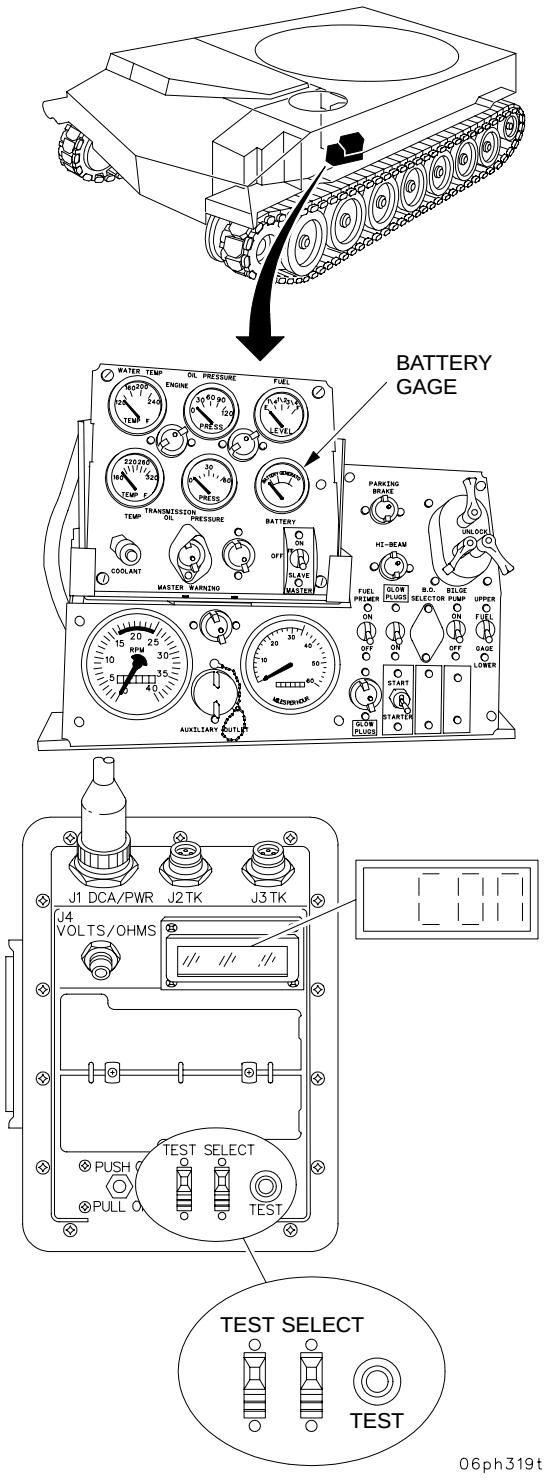
yes

no

Go to para 3-4.a(5).

Go to para 3-4.b(20).

END OF TASK



3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS - CONTINUED (4a) CHARGING VOLTAGE TEST - TK.

A

1. Dial 01 into TEST SELECT and press and release TEST button.
2. When VTM SHOWS "CON" on display, dial 67 into TEST SELECT and press and release TEST button.

NOTE

VTM will show battery voltage and rpm alternately. If VTM does not show rpm, a connection may be loose. Check connection between STE/ICE and pulse tachometer in driver's compartment. If rpm is still not displayed, replace pulse tachometer.

3. Start engine (TM 9-2350-314-10).
4. Adjust rpm to 1000-1200 rpm.
5. Turn ON headlights and accessories to load charging system.
6. Watch the display to make sure battery voltage is between 27.5 and 28.5 V dc.

Is voltage between 27.5 and 28.5 V dc?

yes

no

Go to step C.

B Check battery gage for a normal reading (TM 9-2350-314-10).

Does battery gage indicate normal (TM 9-2350-314-10)?

yes

no

Go to para 3-4.a(5a).

C Is battery voltage low?

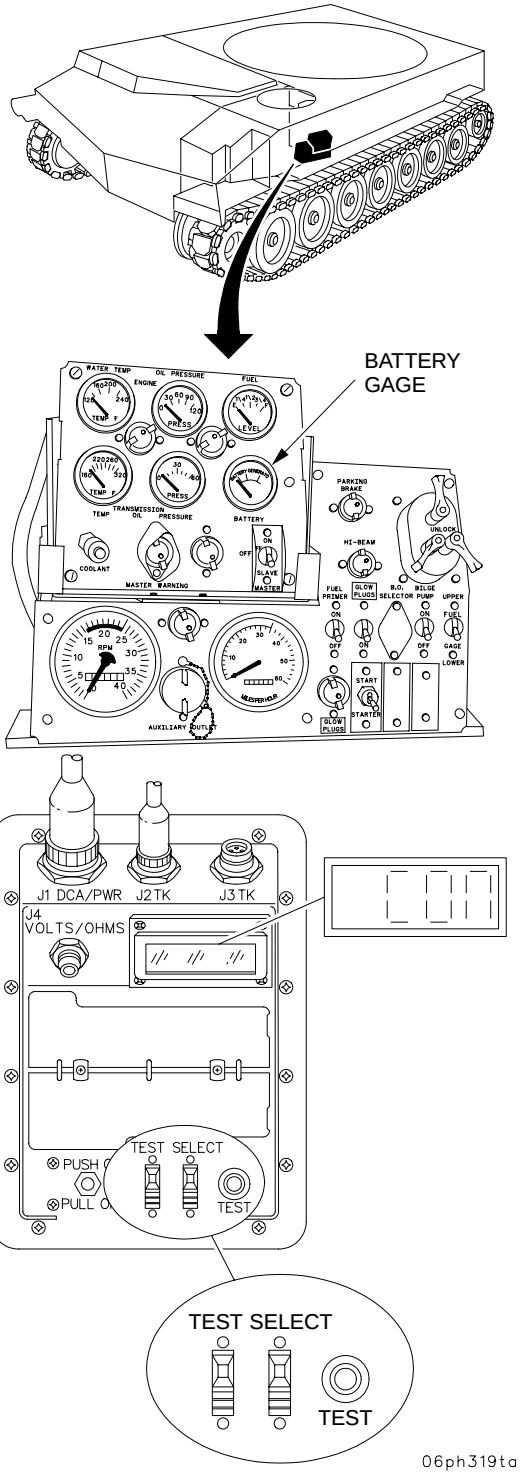
Is voltage low?

yes

no

Go to QUICK GUIDE for additional troubleshooting.

If too high, notify direct support. After repairs, do PMCS trees again.



END OF TASK

3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS – CONTINUED	(5) COOLANT CHECK/ENGINE OIL PRESSURE GAGE TEST – DCA.

A

1. Check vehicle for oil, fuel, and coolant leaks, repair as necessary.
2. Warm up the engine and check ENGINE WATER TEMP gage.

Does ENGINE WATER TEMP gage read between 170° and 185° F (76° and 85° C)?

yes

no

If temperature is above 185° F (85° C), go to QUICK GUIDE and troubleshoot for engine and cooling system high temperature. If temperature is below 170° F (76° C), go directly to para 3-4.b(21).

B

1. Dial 10 into TEST SELECT; press and release TEST.
2. Increase engine rpm to 2100 rpm on VTM display.
3. Check engine OIL PRESSURE gage.

Is oil pressure between 50 and 70 psi (344.75 and 482.65 kpa).

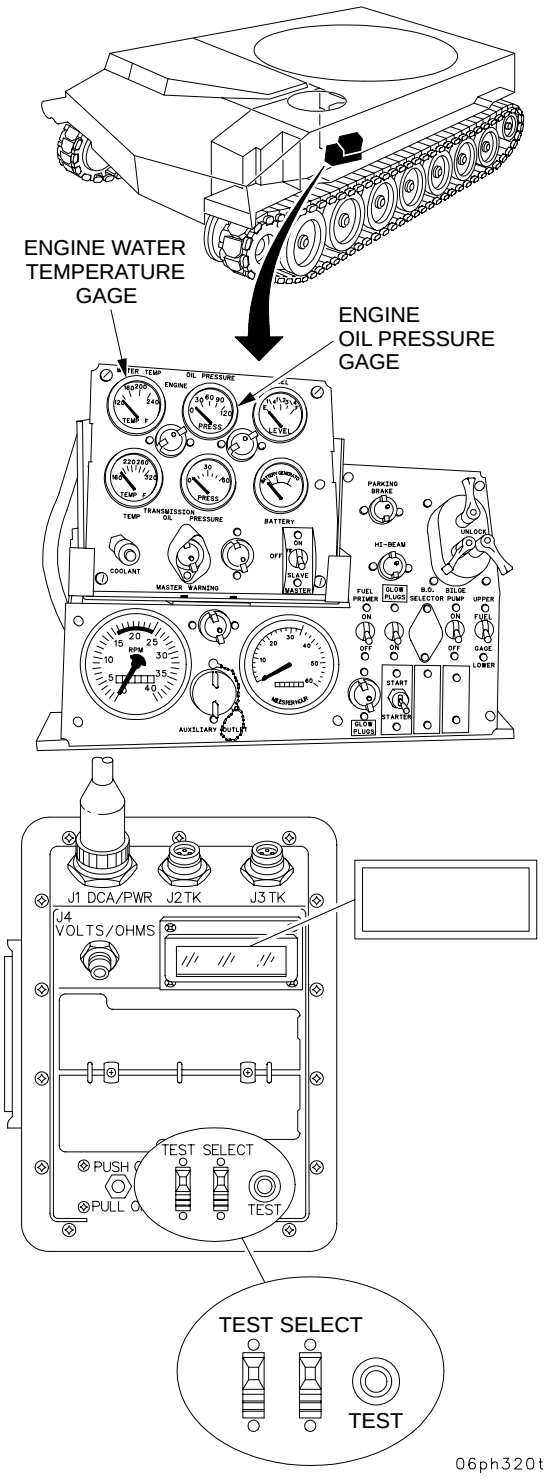
yes

no

Go to para 3-4.a(6).

Go to para 3-4.b(17).

END OF TASK



3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS - CONTINUED (5a) COOLANT CHECK/ENGINE OIL PRESSURE GAGE TEST - TK.

NOTE
If VTM does not display engine rpm, isolate fault is pulse tachometer (TM 9-4910-571-12&P).

A
1. Check vehicle for oil, fuel, and coolant leaks, repair as necessary.
2. Warm up the engine and check water temperature gage.

Does temperature gage read between 170° and 185° F (76° and 85° C)?

yes

no

If temperature is above 185° F (85° C), go to QUICK GUIDE and troubleshoot for engine and cooling system high temperature. If temperature is below 170° F (76° C), go directly to para 3-4.b(21).

B
1. Dial 10 into TEST SELECT; press and release TEST.
2. Increase engine rpm to 2100 rpm on VTM display.
3. Check engine oil pressure gage.

Is oil pressure between 50 and 70 psi (344.75 and 482.65 kpa.

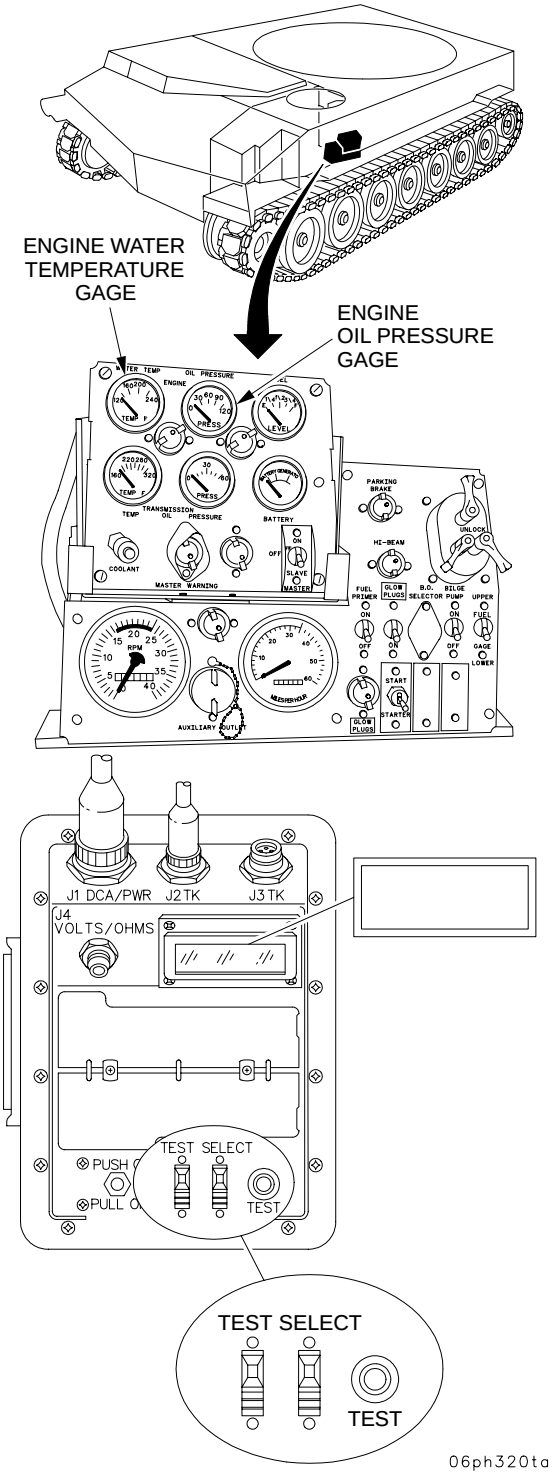
yes

no

Go to para 3-4.a(6a).

Go to para 3-4.b(17).

END OF TASK



3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS - CONTINUED (6) GOVERNOR CHECK/POWER TEST - DCA.

CAUTION
To avoid possible damage to the engine, check governor operation before doing Power Test.

NOTE
Before doing Power Test, engine must be at normal operating temperature.

A

1. While watching the VTM, increase engine speed to maximum governor speed of 2350-2500 rpm.
2. Press accelerator to full throttle.

Does engine rpm stay between 2350-2500 rpm?

yes

no

If rpm is higher, notify direct support maintenance. If rpm is lower, go to para 3-4.b(13).

CAUTION
Do not do Power Test if engine temperature is above the normal operating temperature to avoid possible engine damage.

B

1. Dial 13 into TEST SELECT; press and release TEST.
2. When prompting message "CIP" shows on display, press down and hold accelerator until the VTM shows "OFF". Then release accelerator.
3. A number will show on VTM. This number is equal to the percentage of power. Compare this number with the following table:

% POWER: MINIMUM TEST LIMIT		
0-2000 FT	2000-4000 FT	ABOVE 4000 FT
75%	68%	60%

Is power limit in the above table?

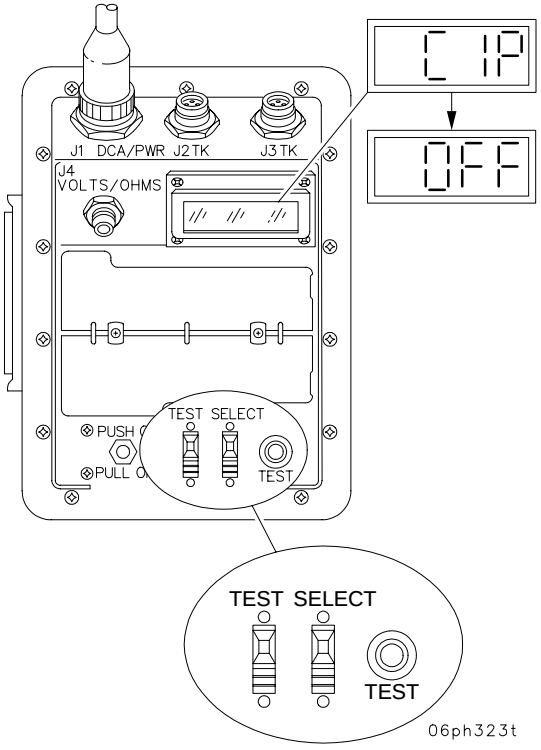
yes

no

Go to para 3-4.a(7).

Go to para 3-4.b(13).

END OF TASK



3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS – CONTINUED (6a) GOVERNOR CHECK/POWER TEST – TK.

CAUTION
To avoid possible damage to the engine, check governor operation before doing Power Test.

NOTE
Before doing Power Test, engine must be at normal operating temperature.

A
1. While watching the VTM, increase engine speed to maximum governor speed of 2350–2500 rpm.
2. Press accelerator to full throttle.

Does engine rpm stay between 2350–2500 rpm?

yes / no

If rpm is higher, notify direct support maintenance. If rpm is lower, remove air cleaner filters and repeat Step A. If rpm stays between 2350–2500, replace air cleaner filter (TM 9–2350–314–10). If rpm is still lower than 2350, run test 24 (para 3–4.b(13)).

CAUTION
Do not do Power Test if engine temperature is above the normal operating temperature to avoid possible engine damage.

NOTE
Engine speed must be below 1000 rpm.

B
1. Dial 13 into TEST SELECT; press and release TEST.
2. When prompting message “CIP” shows on display, press down and hold accelerator until the VTM shows “OFF”. Then release accelerator.
3. A number will show on VTM. This number is equal to the percentage of power. Compare this number with the following table:

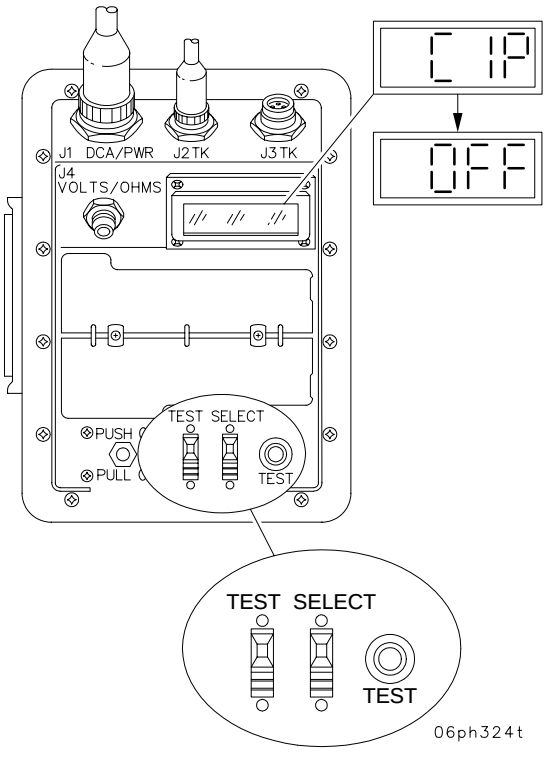
% POWER: MINIMUM TEST LIMIT		
0–2000 FT	2000–4000 FT	ABOVE 4000 FT
75%	68%	60%

Is power limit in the above table?

yes / no

Go to para 3–4.a(7a).

Remove air cleaner filters and perform Power Test again. If test fails, reinstall air cleaner filters, then run test 24 (para 3–4.b(13)).



END OF TASK

3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS - CONTINUED (7) IDLE SPEED CHECK - DCA.

A

1. Dial 10 into TEST SELECT; press and release TEST.
2. Adjust engine idle to 550-600 rpm.
3. Watch the VTM display for 10 seconds to make sure idle speed stays between 550 and 600 rpm.

Does idle speed stay between 550-600 rpm?

yes

Go to para 3-4.a(8).

no

B Check throttle linkage (para 5-17).

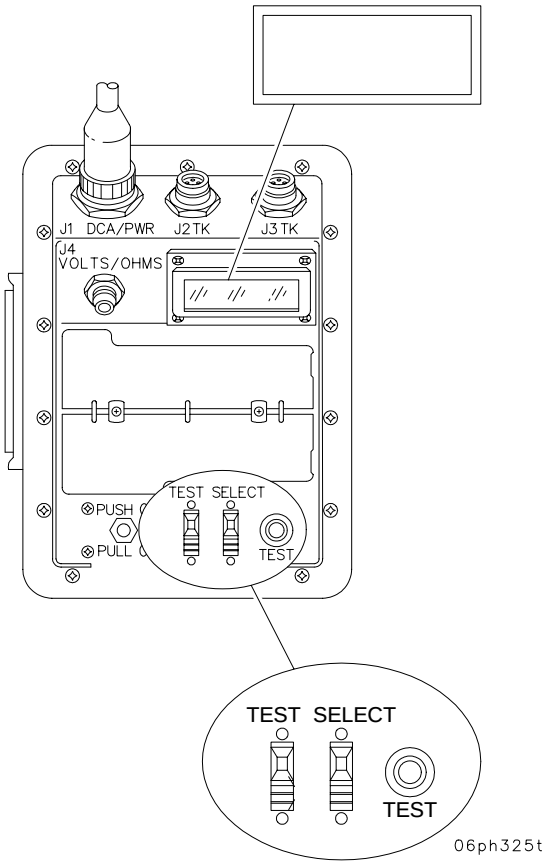
Is linkage correct?

yes

Notify direct support maintenance.

no

Correct linkage and run para 3-4.a(7) again.



END OF TASK

3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS – CONTINUED (7a) IDLE SPEED CHECK – TK.

A

1. Dial 10 into TEST SELECT; press and release TEST.
2. Adjust engine idle to 550–600 rpm.
3. Watch the VTM display for 10 seconds to make sure idle speed stays between 550 and 600 rpm.

Does idle speed stay between 550–600 rpm?

yes

End of PMCS (TK) trees.

no

B Check throttle linkage (para 5-19).

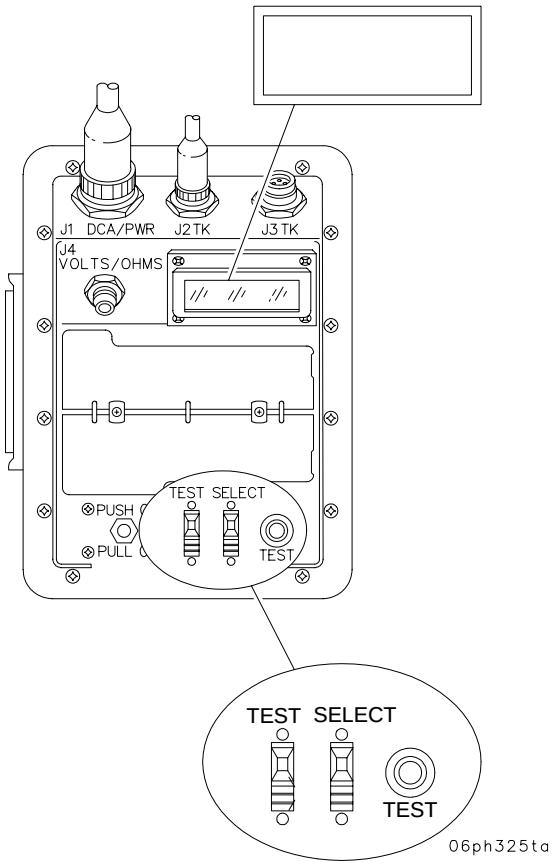
Is throttle linkage correct?

yes

Notify direct support maintenance.

no

Correct linkage and perform para 3-4.a(7a) again.



END OF TASK

3-4 SIMPLIFIED TEST EQUIPMENT FOR INTERNAL COMBUSTION ENGINES (STE/ICE) - CONTINUED

a. STE/ICE PMCS – CONTINUED (8) COMPRESSION UNBALANCE TEST – DCA.

NOTE

- Before doing compression unbalance test, engine must be at normal operating temperature.
- To prevent discharging batteries, do not do more than two (2) compression unbalance tests in a row.

A

1. Shut off fuel supply (TM 9-2350-314-10).
2. Crank engine with no fuel for 5 seconds to clear cylinders.
3. Dial 14 into TEST SELECT and press and release TEST button.

Does prompting message "GO" show on display?

yes / no

Make sure VTM is operating properly (TM 9-4910-571-12&P).

B

1. Pull and hold fuel shut off handle (TM 9-2350-314-10).
2. Crank engine and watch VTM to make sure it shows "- - - -" on display.
3. Stop cranking engine when VTM shows "OFF" or "E013".
4. Wait for VTM to display a number.

Is a number on VTM display?

yes / no

If the number is between 0 and 10, PMCS trees are completed.

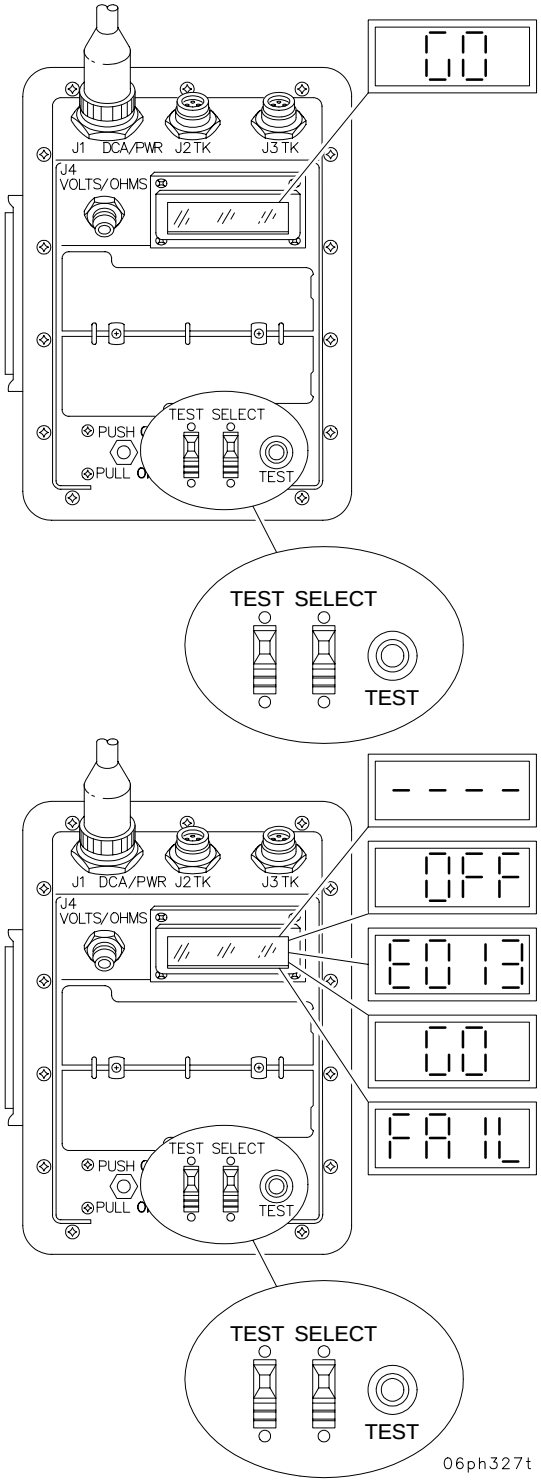
Does the VTM display "GO" or "FAIL"?

yes / no

If "GO", do step "B" again. If "FAIL", warm up engine and charge batteries, then do Step "B" again.

If a number higher than 10 or if "GO" or "FAIL" did not appear, notify direct support maintenance.

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING (1) GENERATOR NEGATIVE CABLE DROP - TEST 84.

Tools
General mechanic's tool kit
(SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Vehicle MASTER switch ON
(TM 9-2350-314-10)

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 DCA receptacle.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial GO into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11.
9. Enter 01 into TEST SELECT to view rpm and voltage alternately on the VTM during testing. Press TEST and "CON" should show on VTM.
10. Enter 84 into TEST SELECT and press TEST. Record test results and check limits on VTM.
11. Start engine (TM 9-2350-314-10). Increase engine rpm to 1000 to 1200 rpm.
12. Record test results and check limits on VTM.

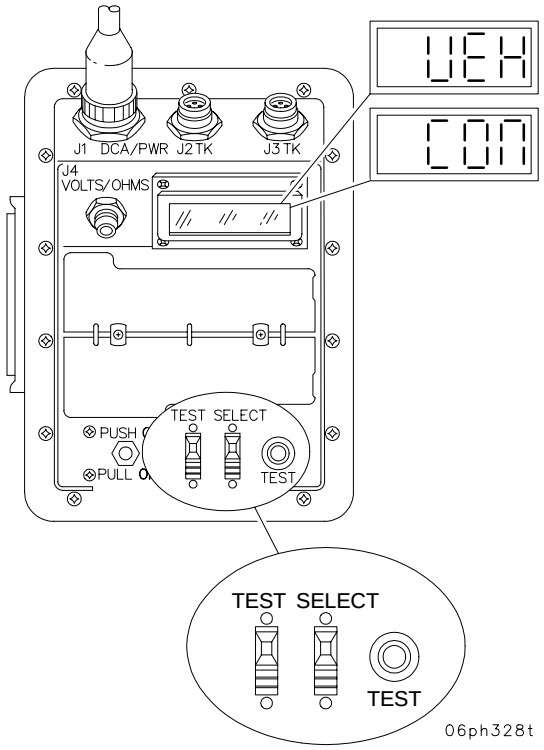
Are results more than 0.2 V dc?

yes

Do test 91 (TM 9-4910-571-12&P) on cable. If cable is bad, repair or replace wiring harness W101 (para 8-61).

no

Fault does not exist as indicated. Recheck fault symptom.



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

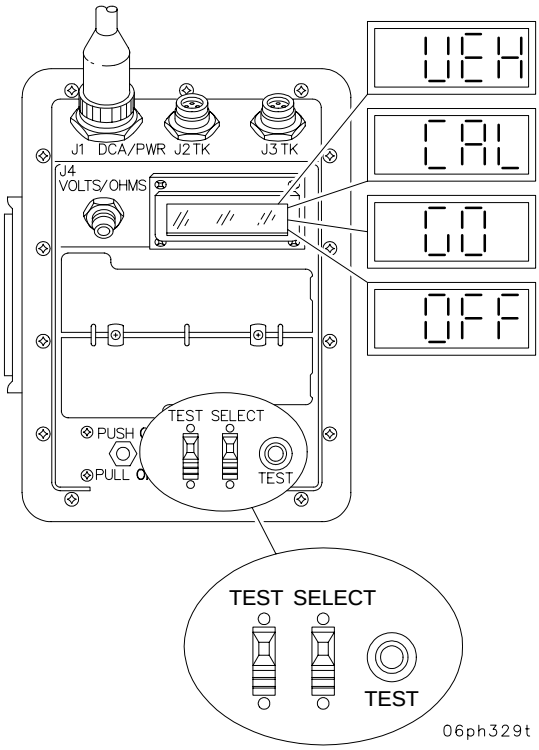
b. STE/ICE TROUBLESHOOTING - CONTINUED

(2) STARTER CIRCUIT RESISTANCE - TEST 74.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
MASTER switch ON (TM 9-2350-314-10)

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 (DCA receptacle).
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11.
9. Enter 74 into TEST SELECT; press TEST until "CAL" appears.
10. Press and release TEST.
11. When "GO" shows on VTM, crank engine while holding fuel shutoff control handle.
12. When VTM shows "OFF", stop cranking engine. Record results and check limits.



Are results between 3 and 25 milliohms?

yes

Fault does not exist as indicated. Recheck fault symptom.

no

Do test 67 (para 3-4.b(8)), 68 (para 3-4.b(19)), 69 (para 3-4.b(5)), and 70 (para 3-4.b(16)). If tests are good, replace engine starter.

END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

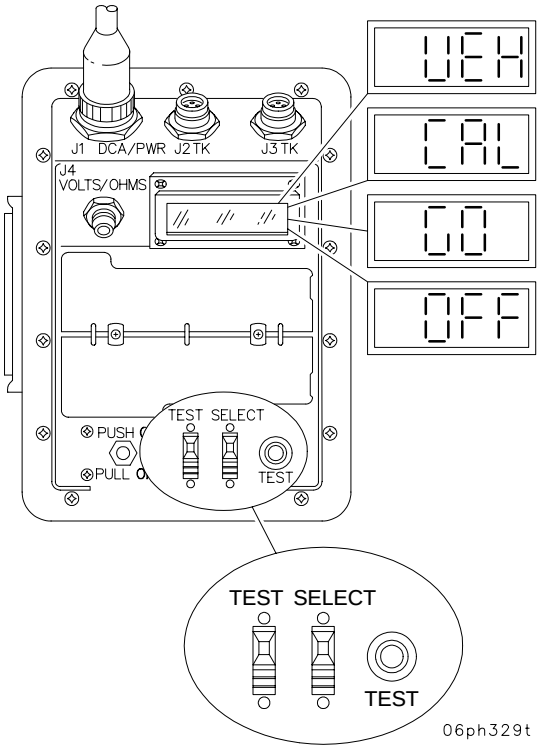
b. STE/ICE TROUBLESHOOTING - CONTINUED

(3) BATTERY INTERNAL RESISTANCE (DCA) - TEST 73.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Vehicle MASTER switch ON (TM 9-2350-314-10)

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 connector to harness W100 connector J1.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11.
9. Enter 73 into TEST SELECT; press and hold TEST until "CAL" appears.
10. Press and release TEST.
11. When "GO" shows on VTM, crank engine while holding fuel shutoff control handle out.
12. When VTM shows "OFF", stop cranking engine.
13. Record results and check limits.



Is reading less than 13 milliohms?

yes

Fault does not exist as indicated. Recheck fault index.

no

Check battery terminals and connections, and battery electrolyte level. Perform test second time. If test fails the second time, perform individual battery voltage checks using STE/ICE test 89 para 3-4.b(20).

END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

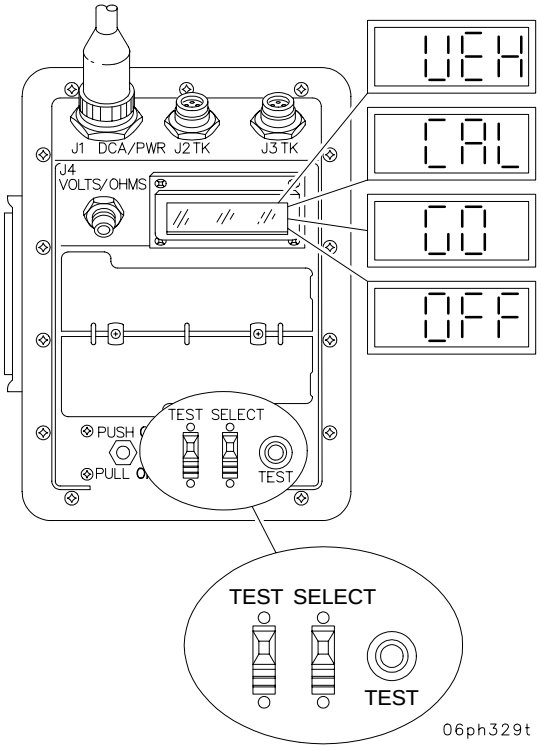
b. STE/ICE TROUBLESHOOTING - CONTINUED

(4) BATTERY RESISTANCE CHANGE - TEST 75.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Vehicle MASTER switch ON (TM 9-2350-314-10)

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W100 connector J1 (DCA receptacle).
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11.
9. Enter 75 into TEST SELECT; press and hold TEST until "CAL" appears.
10. Press and release TEST.
11. When "GO" shows on VTM, crank engine while holding fuel shutoff control handle out.
12. When VTM shows "OFF", stop cranking engine.
13. Record results and check limits.



Is reading less than 50 milliohms?

yes → Go to test 73 (para 3-4.b(3)).

no → Check battery terminals and connections and battery electrolyte level. Recharge batteries and run test again. If test fails the second time, go to para 3-4.b(20) and run individual battery voltage check using STE/ICE test 89.

END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(5) STARTER NEGATIVE CABLE DROP - TEST 69.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Vehicle MASTER switch ON (TM 9-2350-314-10)

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 (DCA receptacle).
4. Push power on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) 11.
9. Enter 69 into TEST SELECT.
10. Press and release TEST.
11. Crank engine while holding fuel shutoff control handle. Record results.

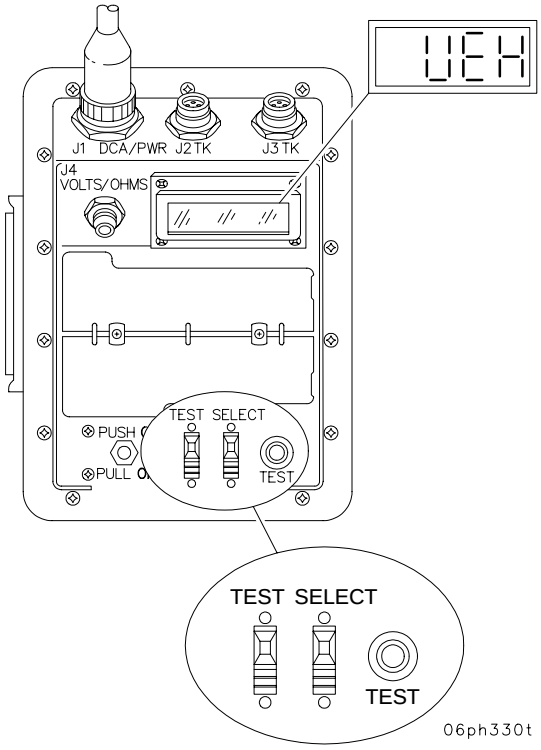
Is reading higher than 1.2 V dc?

yes

Do test 91 on cable (TM 9-4910-571-12&P). If cable is bad, repair or replace wiring harness W101 (para 8-61).

no

Fault does not exist as indicated. Recheck fault symptom.



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(6) GENERATOR FIELD VOLTAGE - TEST 83.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)
Electrical contact tool kit (item 73, Appx F)

Equipment Conditions
Air intake grille open (TM 9-2350-314-10)
Transmission access doors open (TM 9-2350-314-10)
Battery compartment access doors open (TM 9-2350-314-10)
Vehicle MASTER switch ON (TM 9-2350-314-10)

A

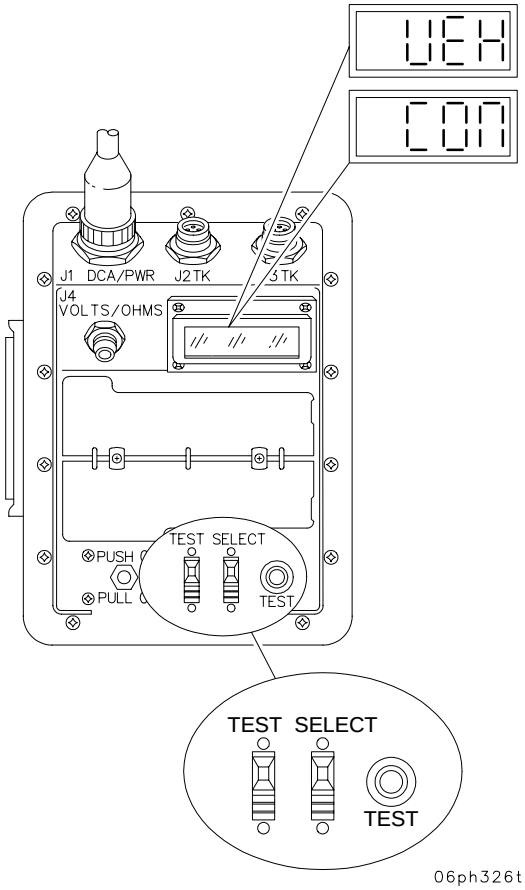
1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 (DCA receptacle).
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) 11.
9. Start engine (TM 9-2350-314-10); turn on vehicle headlights, hydraulic pump, and increase engine rpm to 1000 to 1200 rpm.
10. Enter 01 into TEST SELECT to see rpm and test limits alternately on VTM and press TEST. Message "CON" on VTM should appear.
11. Enter 83 into TEST SELECT; press and release TEST.
12. Record results (Limits: maximum 22 V dc.

Is reading higher than 22 V dc or does reading stay at 0?

yes

no

Go to step C.



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3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED	(6) GENERATOR FIELD VOLTAGE - TEST 83. - CONTINUED

CONTINUED FROM STEP A

B

1. Shut engine OFF (TM 9-2350-314-10). Turn vehicle MASTER switch OFF.
2. Disconnect harness W106 lead L+ from harness W105 lead L+.
3. Install a 3-way connector between harness W105 lead L+ and harness W106 lead L+.
4. Connect cable W2 to VTM connector J4.
5. Place red lead in open socket of 3-way connector and black lead to ground.
6. Turn vehicle MASTER switch ON.
7. Enter 89 into TEST SELECT and press TEST.
8. Start engine (TM 9-2350-314-10) and read voltage on VTM.

Is battery voltage present?

yes

Do test 84 3-4.b(1). If results are good, replace voltage regulator (para 8-12).

no

Go to para 3-3.h(1).

CONTINUED FROM STEP A

C

Do individual battery tests 75 (para 3-4.b(4)), 73 (para 3-4.b(3)), and test 89 (para 3-4.b(20)).

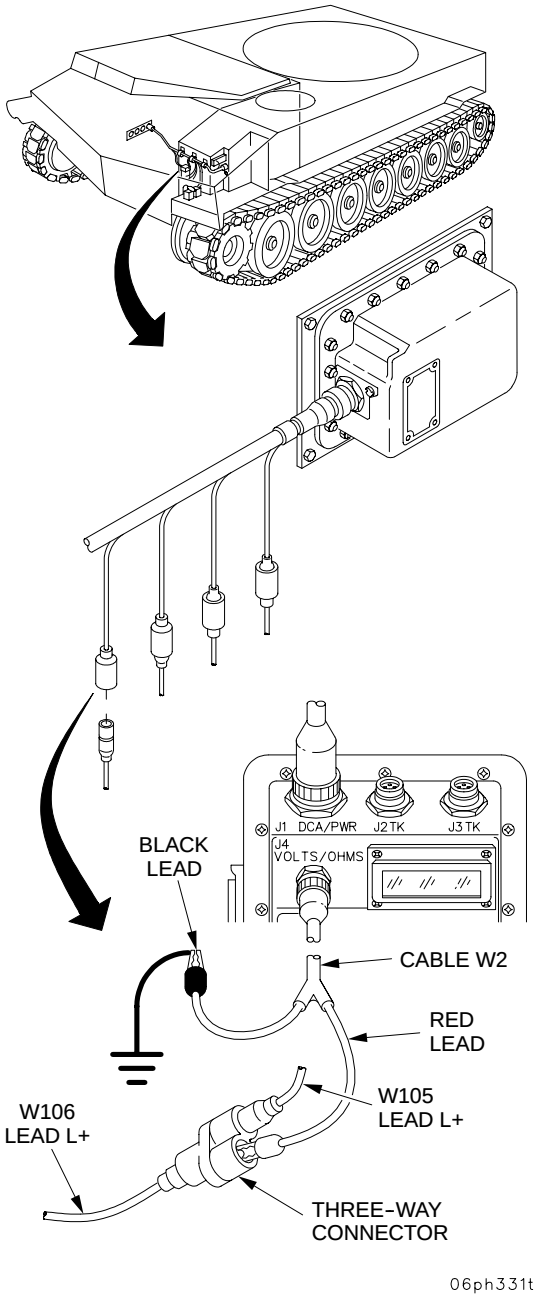
Are batteries good?

yes

Make sure battery cables are clean and serviceable (TM 9-2350-314-10). Go to para 3-3.h(2).

no

Replace faulty batteries (para 8-54).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(7) FUEL PRESSURE RETURN - TEST 49.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Air intake grille open (TM 9-2350-314-10)
Transmission access doors open (TM 9-2350-314-10)
Vehicle MASTER switch ON (TM 9-2350-314-10)

WARNING

Protective fan screens must be installed prior to doing maintenance in the engine compartment when the engine is running, or engine is in ground hop mode. Contact with rotating fan can cause injury.

1. Install fan protective screens (para 4-1.c)
2. Pull power switch on VTM to OFF position.
3. Connect DCA cable W1 connector P1 to VTM connector J1 .
4. Connect DCA cable W1 to harness W101 connector P4 DCA receptacle.
5. Install red striped transducer TK22 and adapter TK24 at the engine fuel return line quick-disconnect.
6. Connect cable W4 connector P1 to VTM connector J3.
7. Connect cable W4 connector P2 to transducer TK22.
8. Push power switch on VTM to ON position.
9. Do confidence test 66/99 (para 3-4.a(1)).
10. Dial 60 into TEST SELECT.
11. Press and release TEST; message "UEH" should be displayed.
12. Enter Vehicle ID (VID) number 11.
13. Enter 01 into TEST SELECT; press TEST to see RPM and test limits alternately.
14. When "CON" shows on VTM, enter 49 into TEST SELECT; press TEST until "CAL" appears.
15. Press and release TEST.
16. Start engine (TM 9-2350-314-10). Record the results (in psi).

Is reading on VTM less than 2 psi (13.79 kpa)?

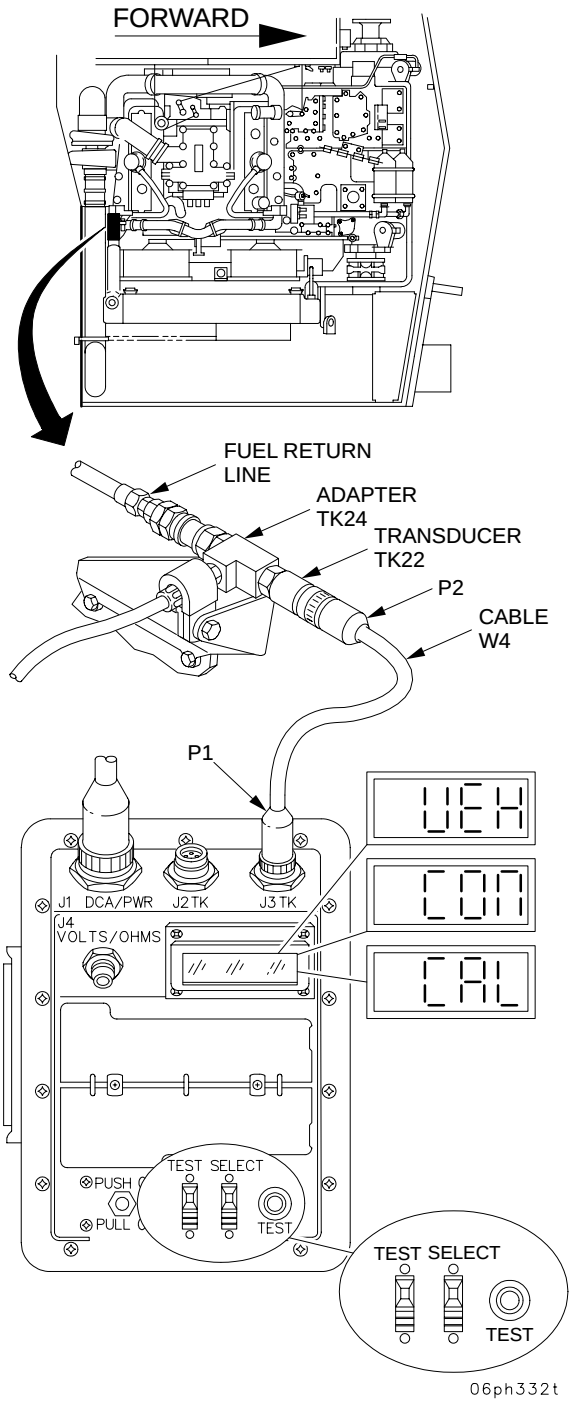
yes

no

Notify direct support maintenance.

Fault does not exist as indicated. Recheck fault symptom.

END OF TASK



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3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(8) CHARGING CIRCUIT (at battery) - TEST 67.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Vehicle MASTER switch ON (TM 9-2350-314-10)

A

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 DCA receptacle.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11.
9. Enter 67 into TEST SELECT; press TEST to check for static voltage.

Is static voltage at least 22 volts?

yes

no

Do individual battery tests 75 (para 3-4.b(4)), 73 (para 3-4.b(3)), and test 89 (para 3-4.b(20)).

B

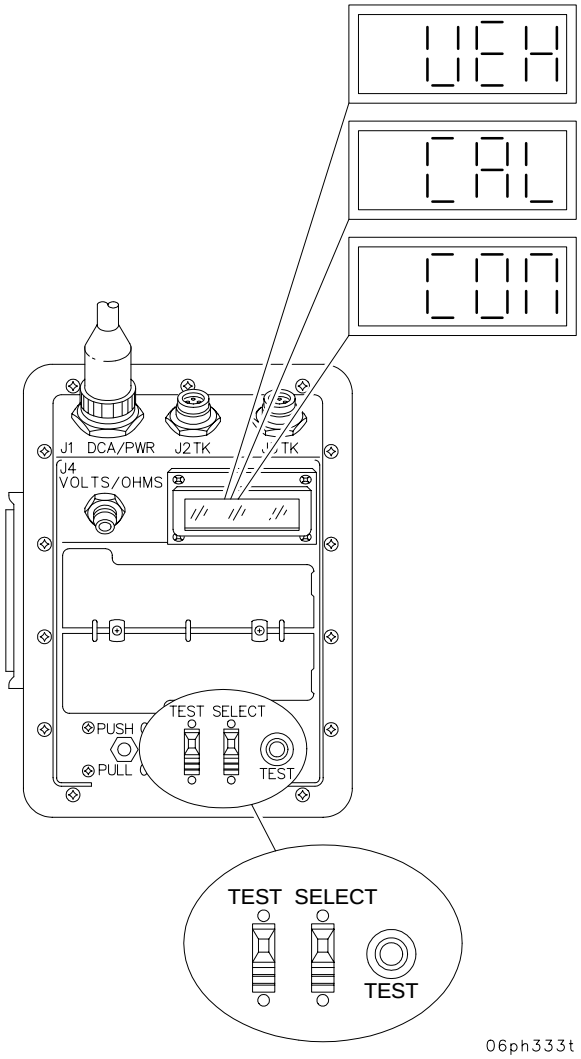
1. Enter 02 into TEST SELECT and press TEST. When VTM shows "CON", enter 67 into TEST SELECT and press TEST.
2. Crank engine while holding fuel shutoff control handle.
3. Record the results of cranking test.

Is cranking voltage at least 18 volts?

yes

no

Do battery tests 75 (para 3-4.b(4)) and 73 (para 3-4.b(3)). If necessary, do test 89 (para 3-4.b(20)).



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3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(8) CHARGING CIRCUIT (at battery) - TEST 67. - CONTINUED

CONTINUED FROM STEP B

C

1. Enter 01 into TEST SELECT and press TEST. When "CON" shows on VTM, enter 67 into TEST SELECT and press TEST.
2. Start engine (TM 9-2350-314-10).
3. Record reading at idle (550 rpm) and at governor (2300 rpm).
4. Turn engine off (TM 9-2350-314-10).

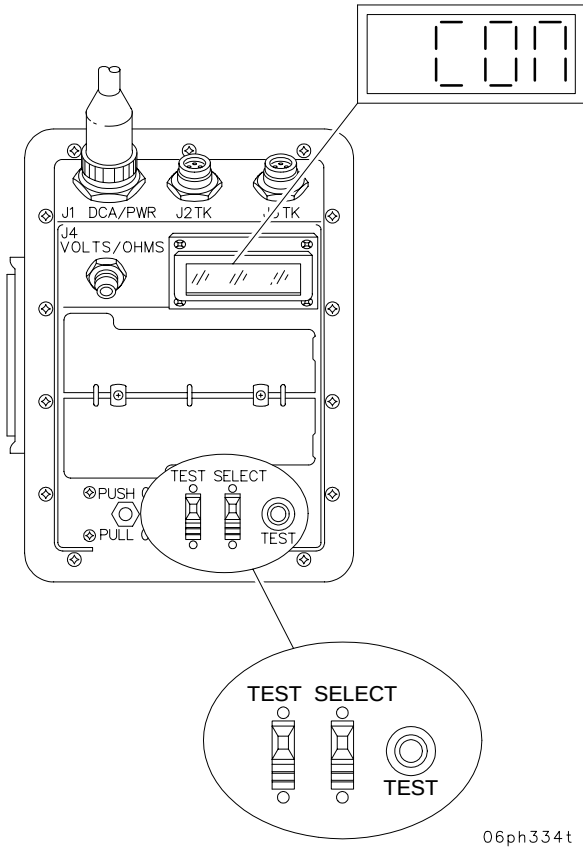
Is charging voltage between 26.5 and 28.5 V dc?

yes

Fault does not exist as indicated. Recheck fault symptom.

no

Go to para 3-4.b(12).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(9) ENGINE RPM - TEST 10.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Vehicle MASTER switch ON (TM 9-2350-314-10)

A

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 DCA receptacle.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11. Enter 10 into TEST SELECT; press TEST.
9. Crank engine while holding fuel shutoff control handle.

Is cranking rpm at least 100 rpm?

yes / no

Notify direct support maintenance.

B

1. Release fuel shutoff and start the engine (TM 9-2350-314-10).
2. Let the engine warm up for about 1 minute and then read rpm.

Is idle between 550 and 600 rpm?

yes / no

Notify direct support maintenance.

C

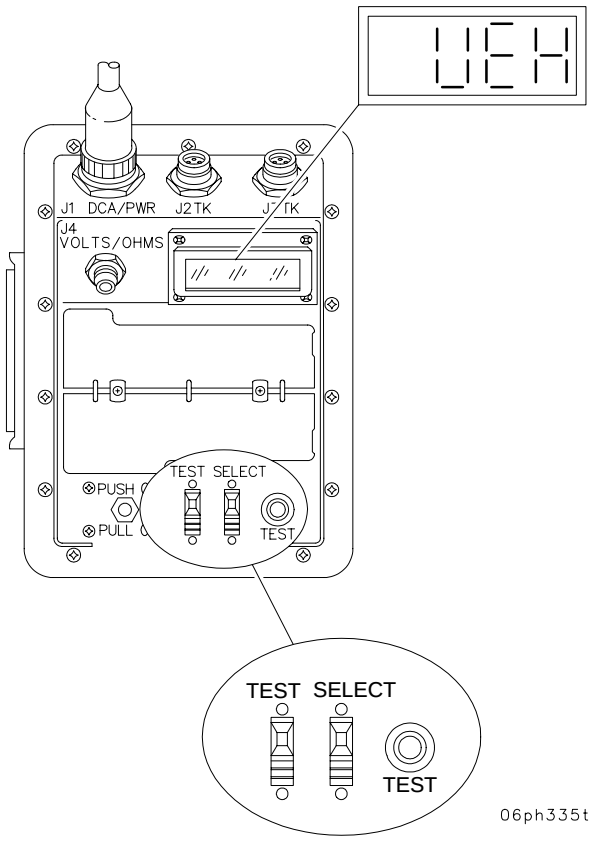
Slowly accelerate engine for governor test.

Is governor rpm between 2350 and 2500 rpm?

yes / no

Notify direct support maintenance.

Fault does not exist as indicated. Recheck fault symptom.



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(10) COMPRESSION UNBALANCE - TEST 14.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Vehicle MASTER switch ON (TM 9-2350-314-10)

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 DCA receptacle.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11.
9. Enter 14 into TEST SELECT; press TEST.
10. When "GO" shows on VTM, crank engine.
11. While holding fuel shutoff control handle (TM 9-2350-314-10), when VTM shows "OFF", stop cranking engine.
12. Read VTM.

Is reading 10% or less?

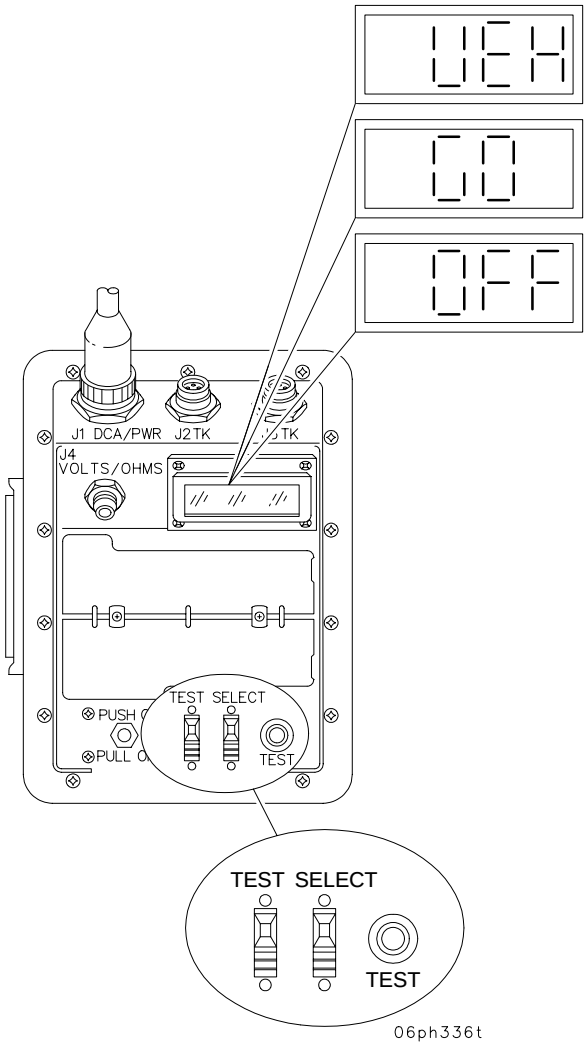
yes

no

Notify direct support maintenance.

Fault does not exist as indicated. Recheck fault symptom.

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(11) ENGINE POWER PERCENTAGE - TEST 13.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Vehicle MASTER switch ON (TM 9-2350-314-10)

A

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 DCA receptacle.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11.
9. Start engine (TM 9-2350-314-10).
10. Enter 13 into TEST SELECT; press TEST.
11. When "CIP" shows on VTM, quickly accelerate engine. Release accelerator when VTM shows "OFF".
12. Run this test twice and then record results.

Is engine limit at least 60%?

yes

Fault does not exist as indicated. Recheck fault symptom.

no

B

1. Do the following tests using control function 01:
   - 24 - Fuel supply pressure (para 3-4.b(13))
   - 26 - Fuel pressure drop (para 3-4.b(22))
   - 49 - Fuel pressure return (para 3-4.b(7))
   - 32 - Air box pressure (para 3-4.b(21))
   - 28 - Air filter pressure differential (para 3-4.b(18))
   - 14 - Compression unbalance (para 3-4.b(10))
2. Do mechanical fuel pump test (para 5-4).

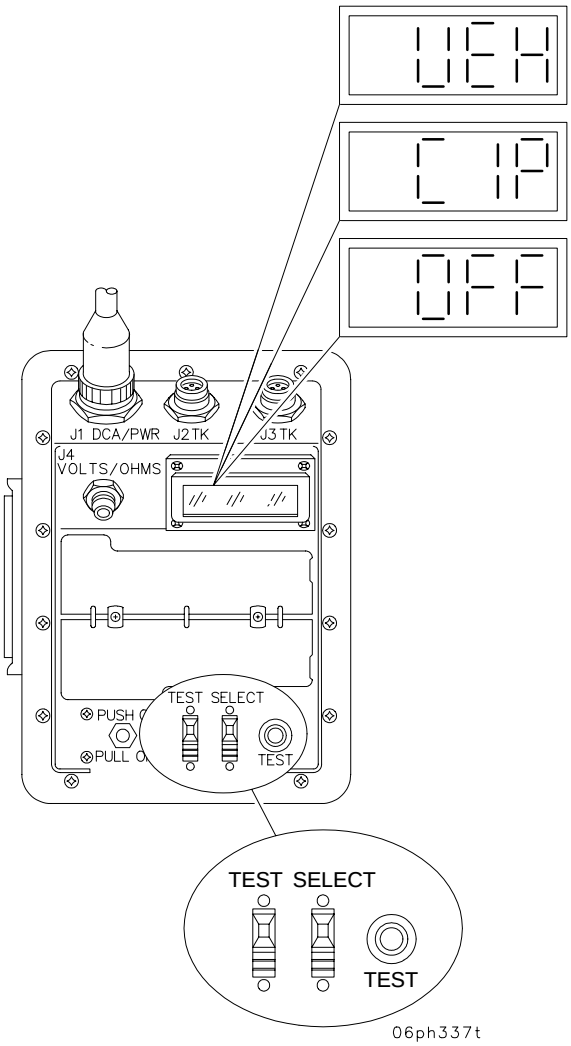
Does fault still exist?

yes

Recheck fault symptom.

no

Notify direct support maintenance.



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(12) GENERATOR OUTPUT VOLTAGE - TEST 82.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Vehicle MASTER switch ON (TM 9-2350-314-10)

A

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 DCA receptacle.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11.
9. Enter 01 into TEST SELECT; press TEST.
10. When "CON" shows on VTM, enter 82 into TEST SELECT; press TEST.
11. Record the results.

Is reading on VTM below 26.5 V dc?

yes

no → Go to step C.

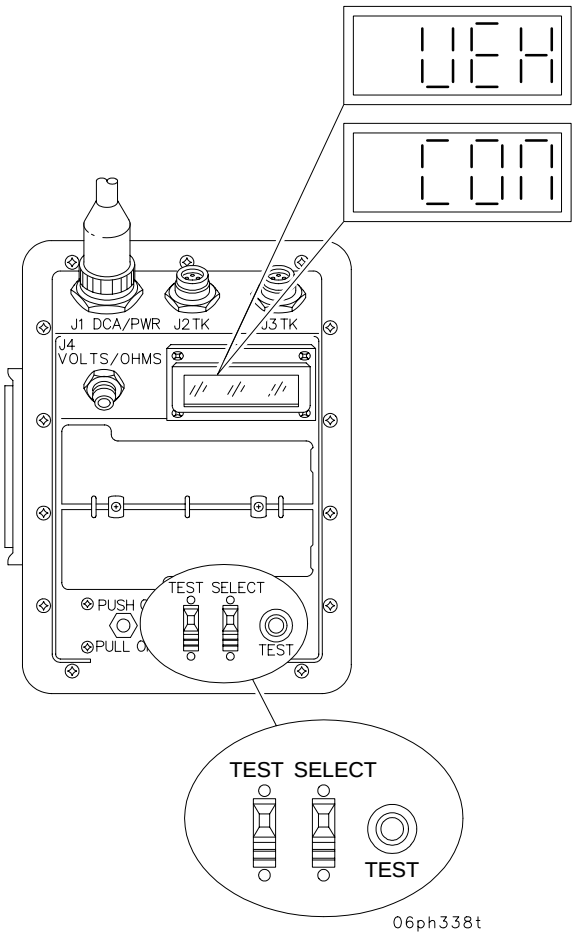
B

1. Enter 01 into TEST SELECT and press TEST. When "CON" shows on VTM, enter 83 into TEST SELECT and press TEST (para 3-4.b(6)).
2. Enter 01 into TEST SELECT and press TEST. When "CON" shows on VTM, enter 84 into TEST SELECT and press TEST (para 3-4.b(1)).

Do these tests pass?

yes → Go to para 3-3.h(1).

no → Replace indicated faulty components.



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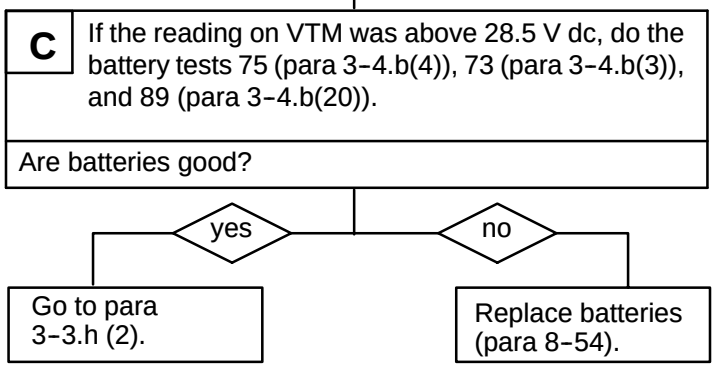
3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED	(12) GENERATOR OUTPUT VOLTAGE - TEST 82. - CONTINUED

CONTINUED FROM STEP A



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(13) FUEL SUPPLY PRESSURE (DCA AND TK) -TEST 24.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Air intake grille open (TM 9-2350-314-10)
Transmission access doors open (TM 9-2350-314-10)
Vehicle MASTER switch ON (TM 9-2350-314-10)

A

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 DCA receptacle.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11.
9. Enter 01 into TEST SELECT; press TEST.
10. When VTM shows "CON", enter 24 into TEST SELECT; press TEST until "CAL" appears.
11. Press and release TEST.
12. Crank engine for 10 seconds while holding fuel shutoff control handle. Record the results.
13. Release fuel shutoff control handle and start engine (TM 9-2350-314-10). Record results.

Is reading on VTM between 40 and 70 psi (275.8 and 482.65 kpa)?

yes

Fault does not exist as indicated. Recheck fault symptom.

no

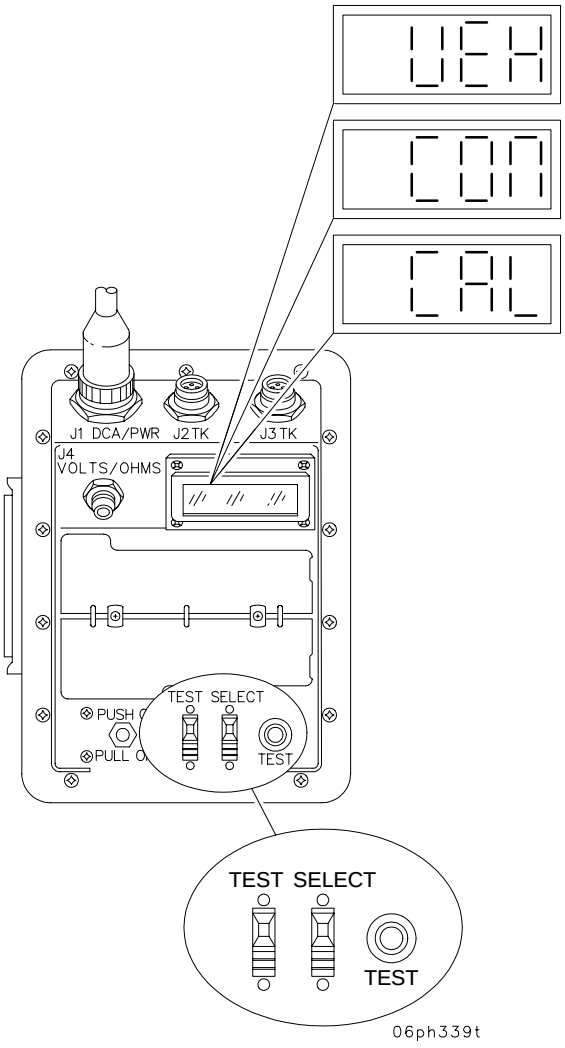
B Check results recorded during 10-second crank.

Was VTM reading at least 4 psi (27.58 kpa)?

yes

Do test 26 (para 3-4.b(22)) and if no pressure, do test 49 (para 3-4.b(7)). If engine will not start and pressure is zero, check mechanical fuel pump shaft (para 5-4).

no



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3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(13) FUEL SUPPLY PRESSURE (DCA AND TK) TEST 24. - CONTINUED

C

1. Remove harness W123 connector P1 from pump generator relay and place a jumper wire from sockets A and C.
2. Install red striped transducer TK22 and adapter TK24 at the inlet side of the primary fuel filter.
3. Connect calbe W4 connector P1 to connector J3 on VTM.
4. Connect cable W4 connector P2 to transducer TK22.
5. Turn vehicle MASTER switch ON.
6. Enter 49 into TEST SELECT and press TEST.

Is 4 psi (27.58 kpa) showing on VTM?

yes

no

Go to para 3-3.g(5).

D

1. Remove the jumper wire and reconnect W123 connector P1.
2. Turn vehicle MASTER switch ON and start engine (TM 9-2350-314-10).
3. Enter 49 into TEST SELECT and press TEST.
4. Hold engine rpm at 1200 rpm.

Is a pressure of 1.2 psi (8.274 kpa) held?

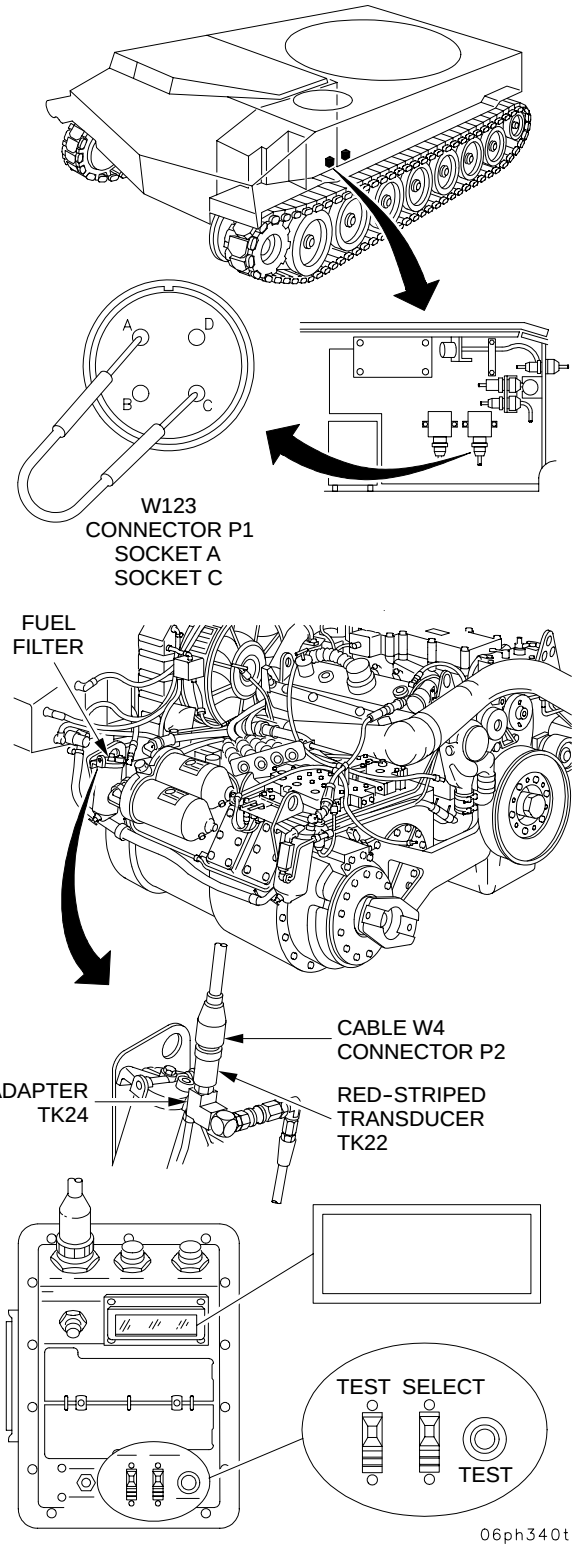
yes

no

Fault does not exist as indicated. Recheck fault symptom.

Do test 26 (para 3-4.b(22)). If it does not pass, replace the mechanical fuel pump (para 5-2).

END OF TASK



3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(14) CRANKING CURRENT - TEST 71.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Vehicle MASTER switch ON (TM 9-2350-314-10)

A

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 DCA receptacle.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11.
9. Enter 71 into TEST SELECT; press TEST and hold "CAL" appears.
10. Press and release TEST.
11. Crank the enigne while holding fuel shutoff control handle. Record the results.

Is VTM reading between 350 and 500 amps?

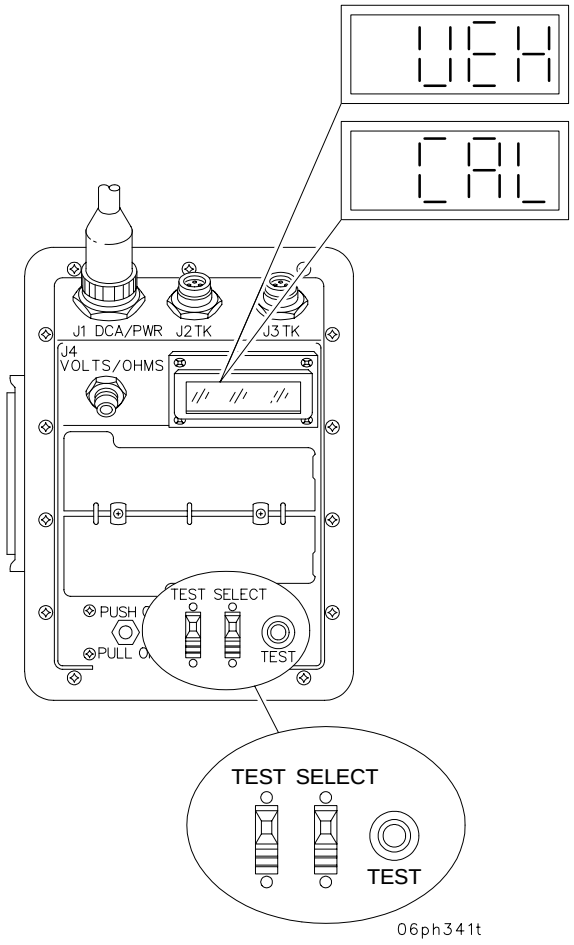
yes

Fault does not exist as indicated. Recheck fault symptom.

no

B

1. Perform the following tests:
   72 - Current first peak (para 3-4.b(15)).
   73 - Battery internal resistance (para 3-4.b(3))
   74 - Starter circuit resistance (para 3-4.b(2))
   75 - Battery resistance charge (para 3-4.b(4))
2. If tests are good, perform the following tests:
   68 - Starter positive terminal voltage (para 3-4.b(19))
   69 - Starter negative cable drop (para 3-4.b(5))
   70 - Starter solenoid voltage (para 3-4.b(16))
3. If fault still exists, do individual battery voltage test 89 (para 3-4.b(20)).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(15) CURRENT FIRST PEAK - TEST 72.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Vehicle MASTER switch ON (TM 9-2350-314-10)

A

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 DCA receptacle.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11.
9. Enter 72 into TEST SELECT; press TEST.
10. When "GO" shows on VTM, crank engine while holding fuel shutoff control handle until "OFF" or ".9.9.9.9" show on VTM. Record results.

Is VTM reading between 875 and 1800 amps?

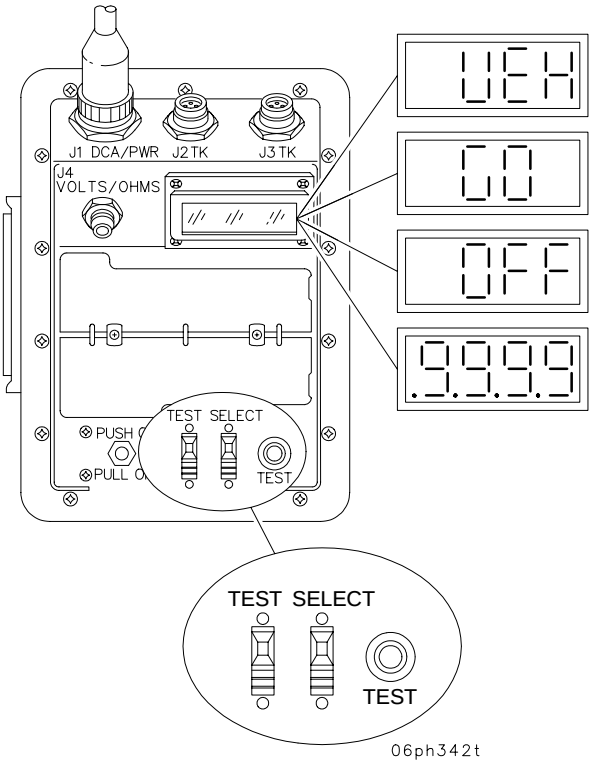
yes

Fault does not exist as indicated. Recheck fault symptom.

no

B

1. Perform the following tests:
   72 - Current first peak (para 3-4.b(14)).
   73 - Battery internal resistance (para 3-4.b(3))
   74 - Starter circuit resistance (para 3-4.b(2))
   75 - Battery resistance charge (para 3-4.b(4))
2. If tests are good, perform the following tests:
   68 - Starter positive terminal voltage (para 3-4.b(19))
   69 - Starter negative cable drop (para 3-4.b(5))
   70 - Starter solenoid voltage (para 3-4.b(16))
3. If fault still exists, do individual battery voltage test 89 (para 3-4.b(20)).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(16) STARTER SOLENOID VOLTAGE - TEST 70.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Vehicle MASTER switch ON (TM 9-2350-314-10)

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 DCA receptacle.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11.
9. Enter 70 into TEST SELECT; press TEST.
10. Crank engine while holding fuel shutoff control handle. Record results.

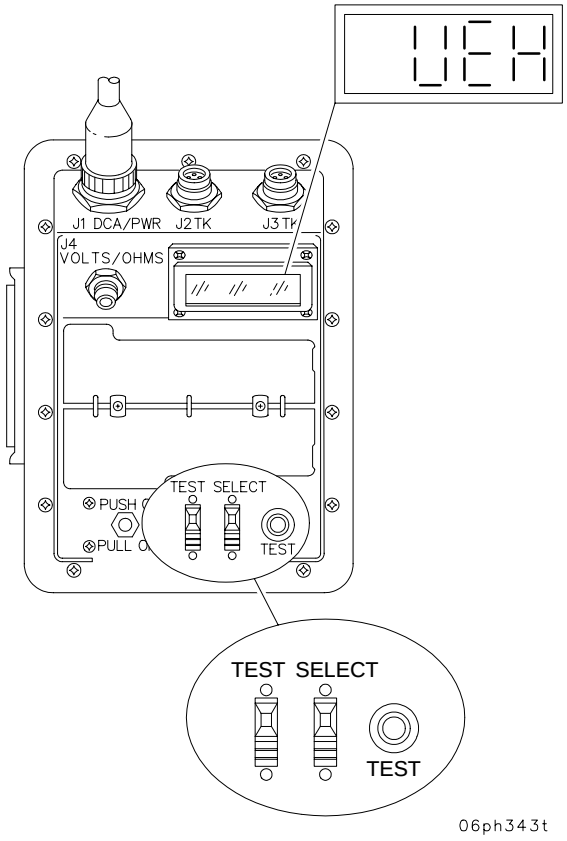
Does VTM show at least 18 V dc?

yes

Fault does not exist as indicated. Recheck fault symptom.

no

Do tests 67 (para 3-4.b(8)) and 69 (para 3-4.b(5)) with control function 02. If tests are good, notify direct support maintenance to replace starter solenoid.



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(17) VEHICLE OIL PRESSURE - TEST 50.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Air intake grille open (TM 9-2350-314-10)
Transmission access doors open (TM 9-2350-314-10)
Vehicle MASTER switch ON (TM 9-2350-314-10)

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 DCA receptacle.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter vehicle ID (VID) number 11.
9. Install blue-striped transducer TK17 with TK26 elbow installed between W4 and manifold sampling port or plug.
10. Enter 01 into TEST SELECT and press TEST.
11. When "CON" shows on VTM, enter 50 into TEST SELECT; press TEST until "CAL" is displayed.
12. Press and release TEST.
13. Start engine (TM 9-2350-314-10) and let run for 5 minutes.
14. Accelerate engine to 1000 rpm and record results.

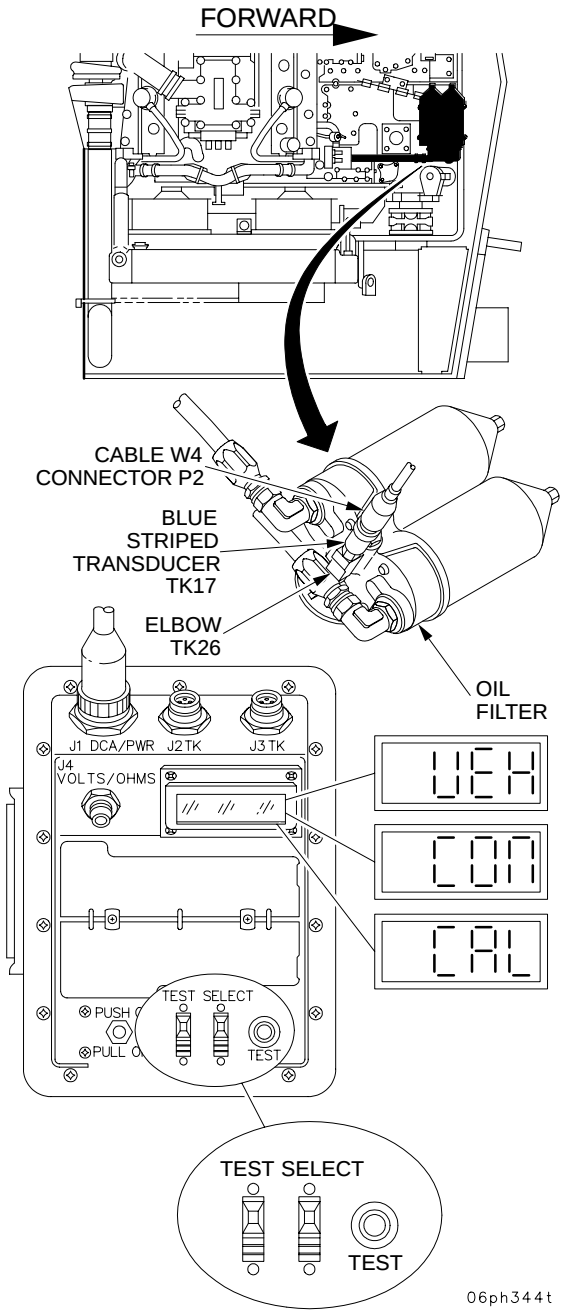
Is VTM reading between 30 and 50 psi (206.85 and 344.75 kpa)?

yes

Fault does not exist as indicated. Recheck fault symptom.

no

Check oil level (TM 9-2350-314-10) and notify direct support maintenance.



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED	(18) AIR FILTER PRESSURE DIFFERENTIAL - TEST 28.

Tools
General mechanic's tool kit
(SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 DCA receptacle.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11.
9. Enter 28 into TEST SELECT; press TEST until "CAL" is diplayed.
10. Press and release TEST.
11. Turn vehicle MASTER switch ON and start engine (TM 9-2350-314-10).
12. Record the results.

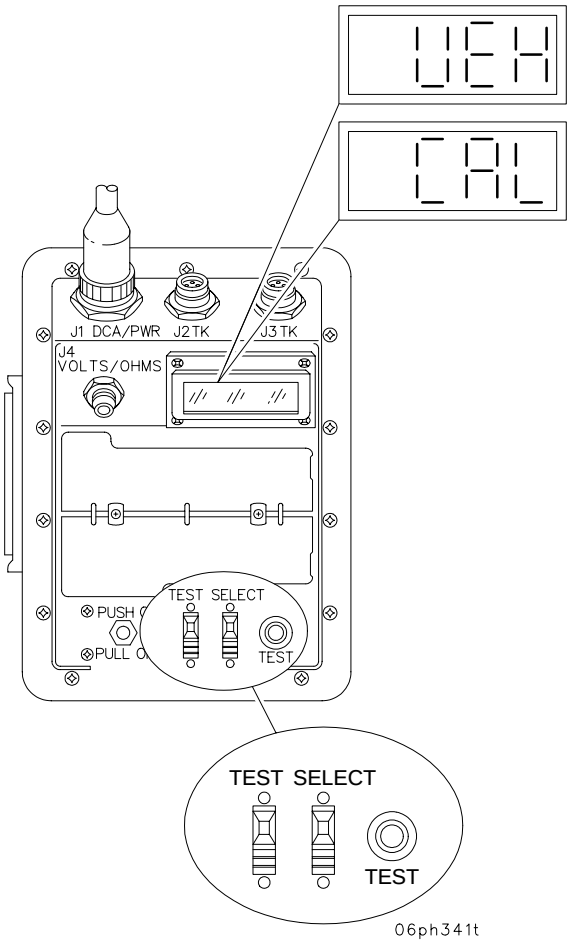
Is VTM reading above - 20 H_2O?

yes

Fault does not exist as indicated. Recheck fault symptom.

no

Check air cleaner indicator and air cleaner assemblies (TM 9-2350-314-10). Replace filters as needed (para 5-5).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(19) STARTER POSITIVE TERMINAL VOLTAGE - TEST 68.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Vehicle MASTER switch ON (TM 9-2350-314-10)

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 DCA receptacle.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11.
9. Enter 68 into TEST SELECT and press TEST until "CAL" is displayed.
10. Press and release TEST.
11. Crank engine while holding fuel shutoff control handle. Record results.

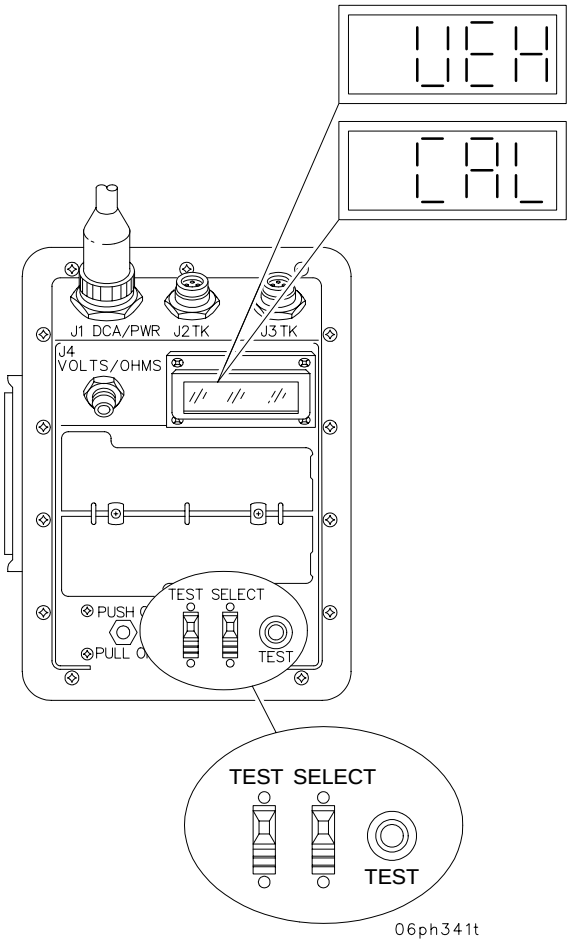
Is VTM readling at least 18 V dc?

yes

Fault does not exist as indicated. Recheck fault symptom.

no

Do test 67 (para 3-4.b(8)) with control function 02. If test passes, replace wiring harness W101 (para 8-61).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

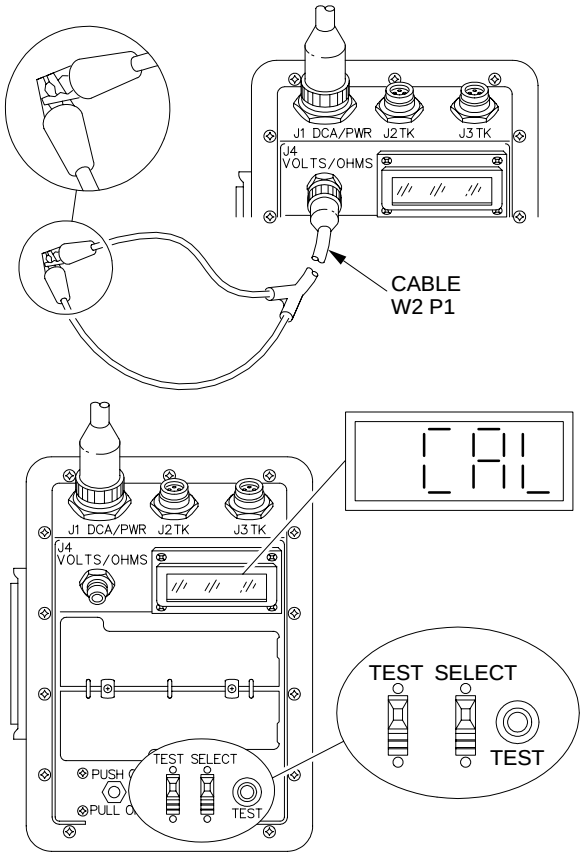
b. STE/ICE TROUBLESHOOTING - CONTINUED

(20) INDIVIDUAL BATTERY VOLTAGE - TEST 89.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Battery access doors open (TM 9-2350-314-10)

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W100 J1.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/69 (para 3-4a(1)).
6. Connect STE-ICe cable W2 connector P1 to VTM connector J4.
7. Attach red clip of cable W2 to black clip of cable W2.
8. Enter 89 into TEST SELECT.
9. Press and hold TESt button until "CAL" appears on the display.
10. Release TESt button and wait for offset value to appear on the display.
11. If offset value is between -6.8 and +6.8, connect red clip of cable W2 to positive terminal of battery "A" and black clip on negative terminal of battery "A".
12. Crank engine while holding fuel shutoff control handle out.
13. Record value displayed while cranking engine.
14. Test batteries B, C, and D one at a time by connecting red clip on positive terminal and black clip on negative terminal and repeat steps 12 and 13.



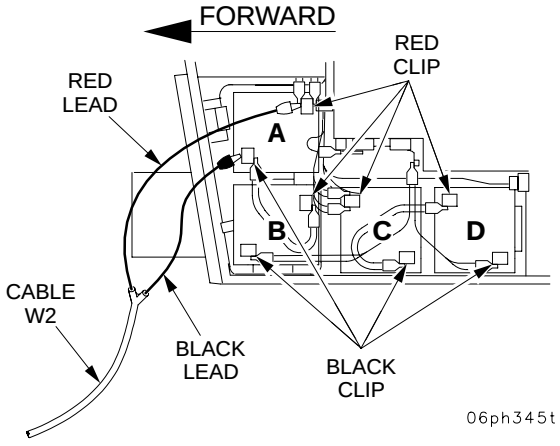
Is each battery value at least 9.5 V dc?

yes

Fault does not exist as indicated. Recheck fault symptom.

no

Check battery electrolyte level. Perform specific gravity checks (Table 2-1, PMCS item 5). Replace batteries as needed (para 8-54).



END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

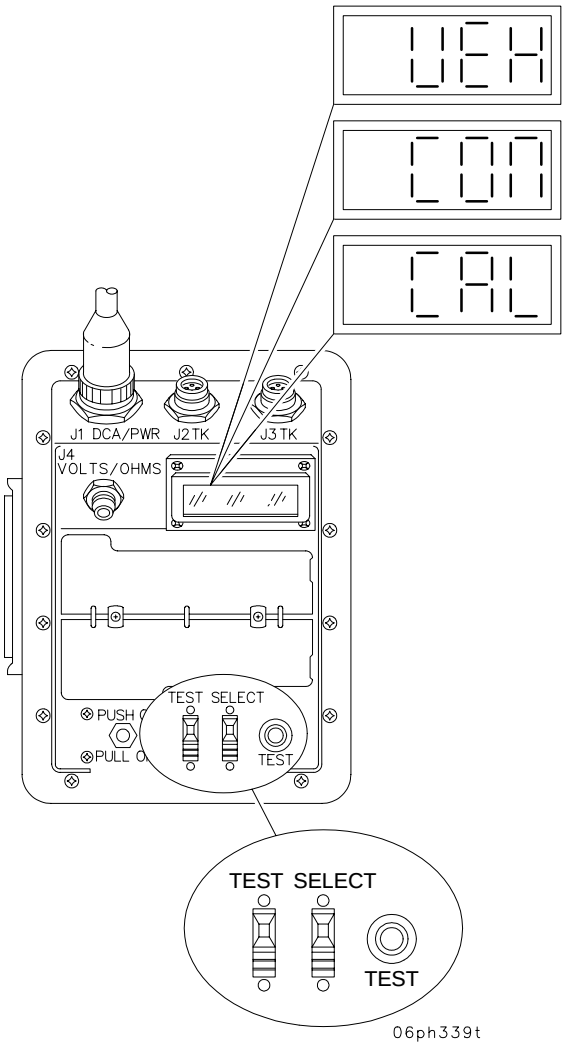
b. STE/ICE TROUBLESHOOTING - CONTINUED

(21) AIR BOX PRESSURE - TEST 32.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Vehicle MASTER switch ON (TM 9-2350-314-10)
Final drive quick-disconnects removed (para 10-3)

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W100 J1.
4. Push power switch on VTM to ON position.
5. Do confidence test 66/69 (para 3-4a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter vehicle ID (VID) number 11.
9. Enter 01 into TEST SELECT; press TEST.
10. When VTM shows "CON", enter 32 into TEST SELECT and press TEST until "CAL" is displayed.
11. Press and release TEST.
12. Start engine (TM 9-2350-314-10), apply brakes and place tranmission in 4th gear. Increase engine to FULL THROTTLE.
13. When VTM shows peak readling, record results and slow engine to 1000 rpm.
14. Place transmission in NEUTRAL and let engine run for 3 to 5 minutes.



Were the following results shown?

1550-1800 RPM/21-28 in. Hg.

yes

Fault does not exist as indicated. Recheck fault symptom.

no

Do tests 13 (para 3-4.b(11)) and 14 (para 3-4.b(10)). If tests fail, check blower, blower seals, air box seals, and turbohcarger. If faulty, notify direct support maintenance.

END OF TASK

3-3 TROUBLESHOOTING CHART - CONTINUED

b. STE/ICE TROUBLESHOOTING - CONTINUED

(22) FUEL PRESSURE DROP - TEST 26.

Tools
General mechanic's tool kit (SC 5180-90-N26)
STE/ICE test set (item 72, Appx F)

Equipment Conditions
Air intake grille open (TM 9-2350-314-10)
Vehicle MASTER switch ON (TM 9-2350-314-10)

1. Pull power switch on VTM to OFF position.
2. Connect DCA cable W1 connector P1 to VTM connector J1.
3. Connect DCA cable W1 to harness W101 connector P4 DCA receptacle.
4. Push power switch on VTM to ON posotion.
5. Do confidence test 66/99 (para 3-4.a(1)).
6. Dial 60 into TEST SELECT.
7. Press and release TEST; message "UEH" should be displayed.
8. Enter Vehicle ID (VID) number 11.
9. Enter 26 into TEST SELECT.
10. Start engine (TM 9-2350-314-10) and increase engine speed to 2400-2500 rpm.
11. Press TEST and record results.

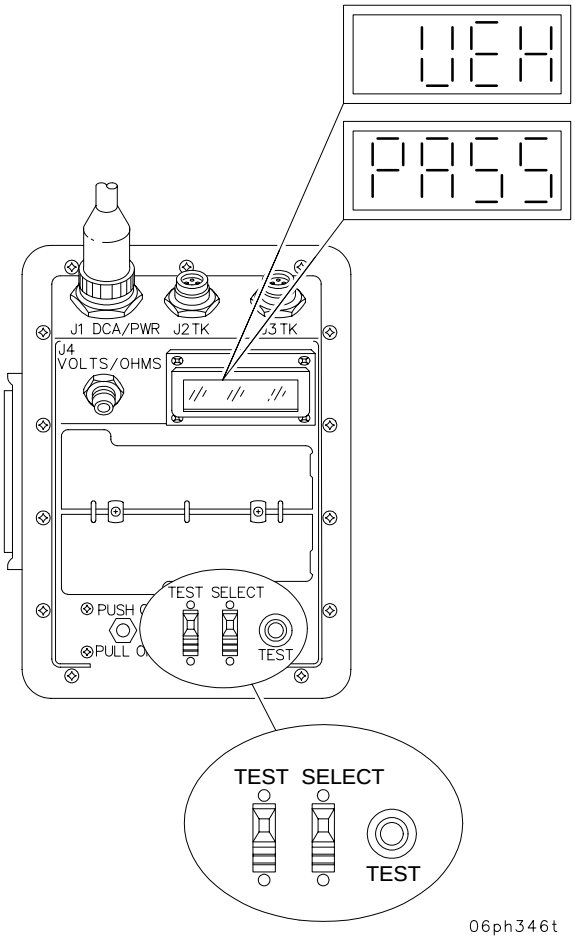
Does VTM show "PASS"?

yes

Fault does not exist as indicated. Recheck fault symptom.

no

Replace both fuel filters (para 5-16) and do test again to make sure there are not problems.



END OF TASK

CHAPTER 4
POWERPACK

GENERAL

This chapter illustrates and defines procedures for removal and installation of the powerpack consisting of the engine, transfer case and transmission assemblies, and related components. Procedures for operating the powerpack after removal from the vehicle are also given.

The powerpack shall be given periodic checks to find possible fire hazards. Inspections for foreign matter shall be performed on the powerpack cooling components, air shrouding, wiring, and powerpack hull compartment during each maintenance service.

Whenever the powerpack is removed for maintenance, the powerpack should be given a general cleaning and inspection of wiring, hoses, and piping.

This chapter also illustrates and defines maintenance procedures for various engine components, including instructions for removal, disassembly, assembly, installation, and inspection.

CONTENTS

Section I. POWERPACK

4-1 POWERPACK.

This task covers: a. Removal b. Inspection c. Special Equipment Hookups d. Testing e. Special Equipment Removal f. Installation

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Lifting sling (item 62, Appx F)
Suitable lifting device (5000 lb min.)
Box wrench (item 80, Appx F)
Torque wrench (item 86, Appx F)
Ground hop kit (item 34, Appx F)
Torque wrench (item 87, Appx F)
Fan protective screens (2) (item 56, Appx F)

Materials/Parts
Lumber (item 38, Appx C) (3) (4 x 4 x 18 in.)
Lockwashers (2) (item 47, Appx E)
Lockwashers (2) (item 20, Appx E)
Lock wire (item 310, Appx E)
Cotter pin (item 8, Appx E)
Assembled screws (2) (item 298, Appx E)
Self-locking nuts (9) (item 120, Appx E)

Equipment Conditions
Vehicle parked on level surface (TM 9-2350-314-10)
Tracks blocked (TM 9-2350-314-10)
Gun tube travel lock in maintenance position (TM 9-2350-314-10)

Equipment Conditions - Continued
Cab traversed to 90° (TM 9-2350-314-10)
Vehicle MASTER switch OFF (TM 9-2350-314-10)
Parking brake released (TM 9-2350-314-10)
Throttle in idle position (TM 9-2350-314-10)
Air intake grille open and secured (TM 9-2350-314-10)
Battery ground leads disconnected (para 8-33)
Hull front slope and exhaust grille support plate removed (para 16-30)
Grille adjustable support assembly removed (para 16-31)
Exhaust outlet pipe removed (para 6-1)
Steering control rod removed from engine compartment (para 13-1)

Personnel Required
Three

References
TM 9-2350-314-10

a. Removal.

WARNING

Track must be blocked so that the vehicle will not roll out of control. When powerpack is disconnected, vehicle is without brakes. Failure to securely block vehicle tracks may result in severe injury to personnel or equipment damage.

Section I. POWERPACK - CONTINUED

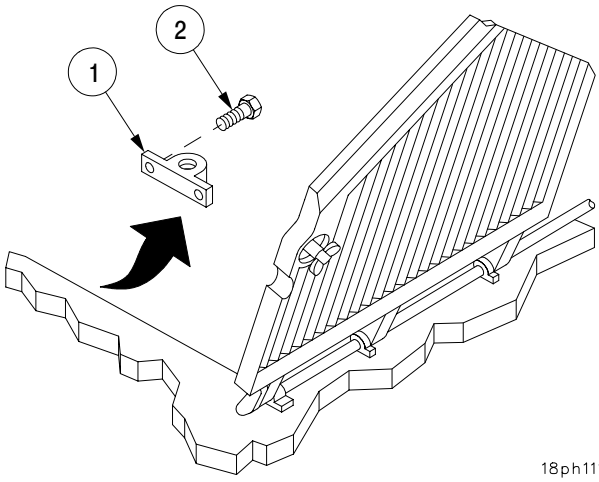
4-1 POWERPACK - CONTINUED

a. Removal - Continued

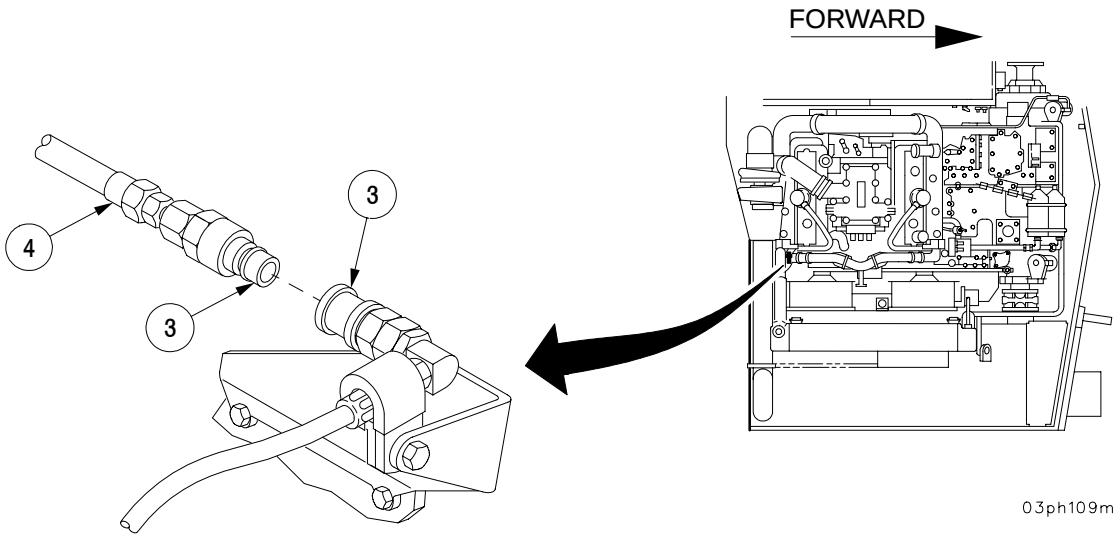
NOTE

Provide an area 8 feet by 10 feet (2.0 by 3.0 m) near the track for the powerpack after removal.

1 Remove air intake grille handle bracket (1) by removing two screws (2).



2 Disconnect quick-disconnect assembly (3) at engine to lower fuel tank return hose (4).



Section I. POWERPACK - CONTINUED

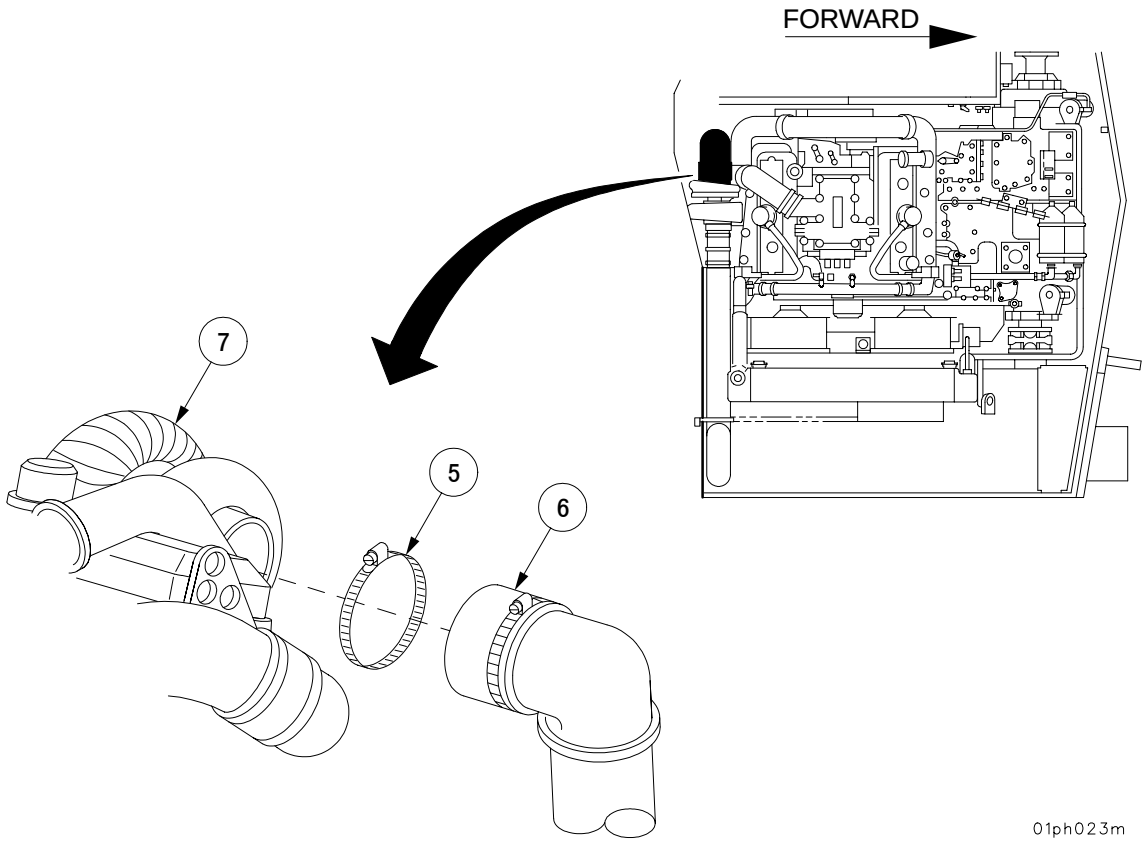
4-1 POWERPACK - CONTINUED

a. Removal - Continued

NOTE

To ease removal of flange, remove cotter pin, nut, washer, spring, and screw; then rotate flange to access other nut.

3 Loosen hose clamp (5) and disconnect turbocharger inlet duct (6) from turbocharger (7).



Section I. POWERPACK - CONTINUED

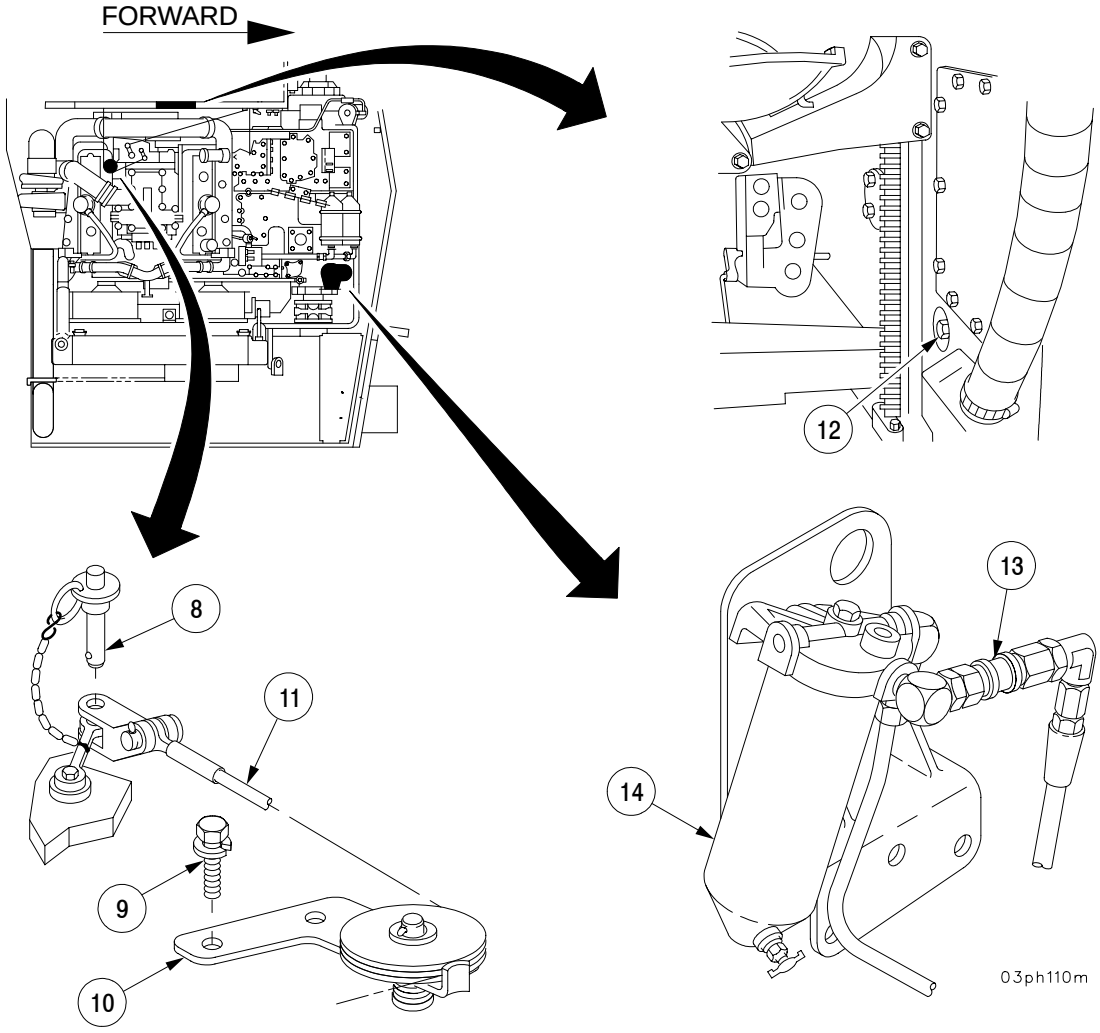
4-1 POWERPACK - CONTINUED

a. Removal - Continued

4 Disconnect engine fuel shutoff control by pulling quick-release pin (8). Remove two assembled screws (9) from pulley bracket (10). Lay cable (11) and pulley bracket (10) on hull. Discard assembled screws.

5 From inside driver's compartment, loosen engine mount release shaft (12) by turning counterclockwise.

6 Disconnect fuel line quick-disconnect (13) at the primary fuel filter (14).



Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

a. Removal - Continued

CAUTION

Do not turn clevis nuts during handling of quick disconnect clamping devices.

NOTE

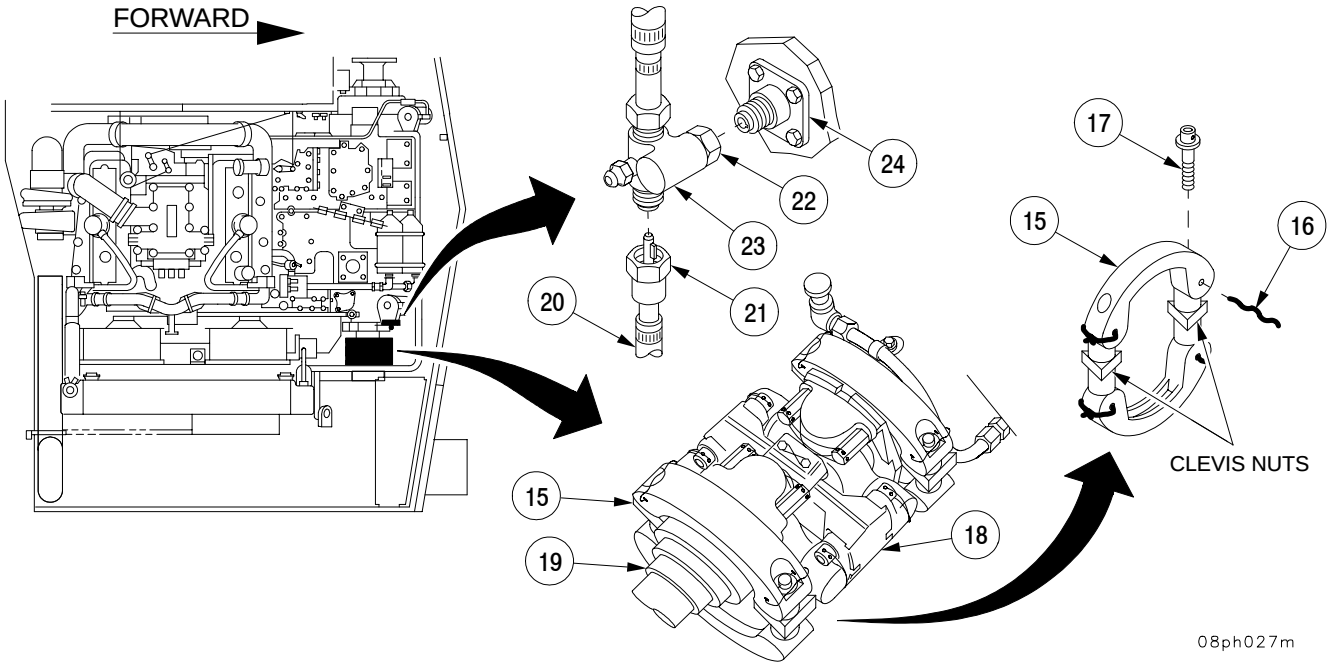
- The final drive clamping clevises (quick-disconnects) for left and right of engine are removed the same way. Right side is shown.
- Remove only clamping devices located on the transmission side of each final drive.

7 At the clamping clevis (15) (transmission side), cut and discard one locking wire (16). Remove one bolt (17).

8 Separate universal joint (18) from transmission flange (19).

9 Disconnect speedometer cable (20) by unscrewing nut (21).

10 Loosen nut (22) and disconnect speedometer adapter drive (23) from transmission adapter (24).



Section I. POWERPACK - CONTINUED

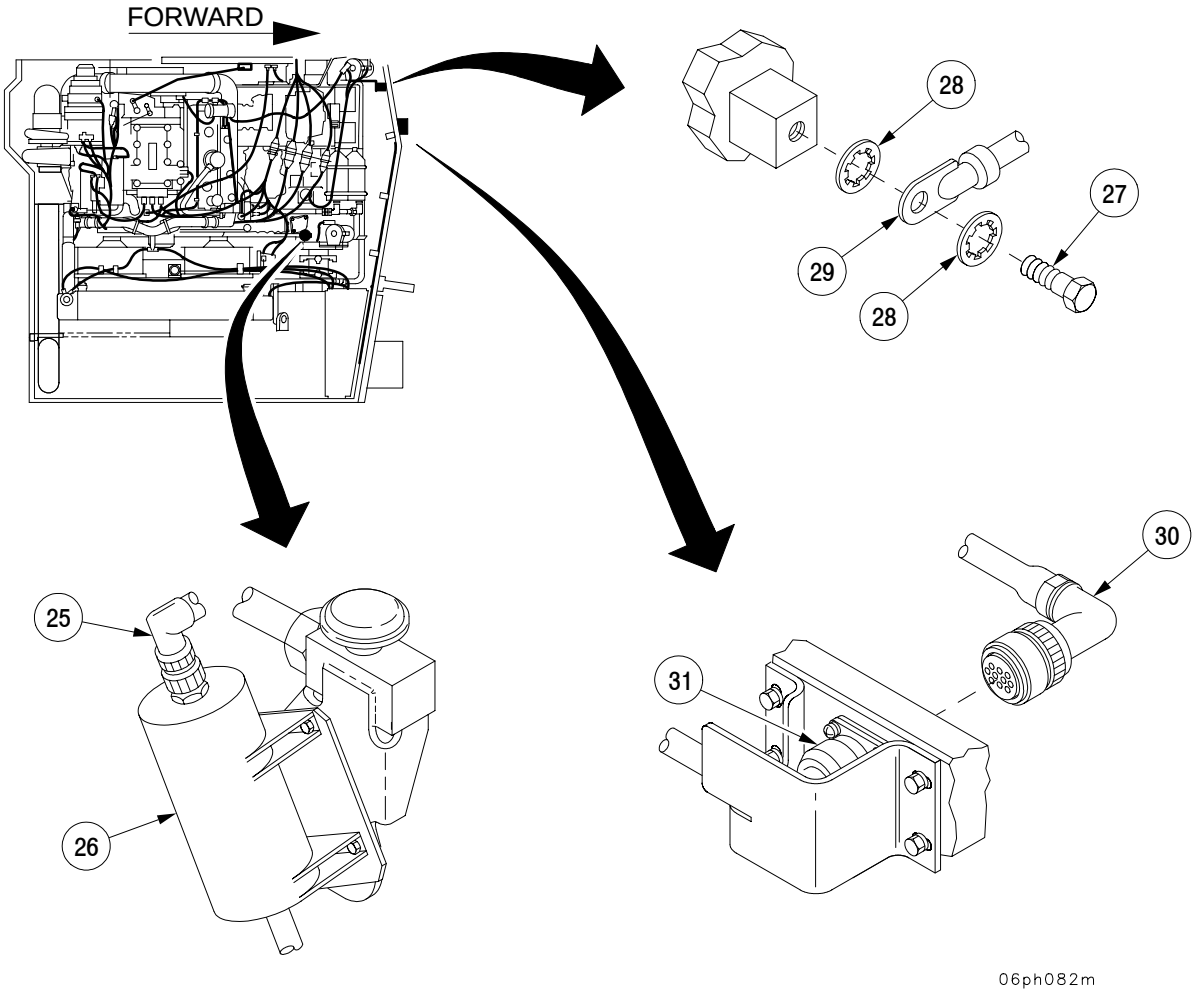
4-1 POWERPACK - CONTINUED

a. Removal - Continued

11 Disconnect wiring harness W28 connector P1 (25) from top of vehicle motion sensor (VMS) (26).

12 Remove screw (27), two lockwashers (28), and ground cable (29). Discard lockwashers.

13 Disconnect wiring harness W113 connector P2 (30) from travel lock power cable (31).



Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

a. Removal - Continued

CAUTION

After disconnecting, make sure steer and shift control rods are in the driver's compartment wall to prevent damage when the powerpack is hoisted or reinstalled.

14 Release throttle governor control rod (32) by moving throttle control to full open position and pulling out quick-release pin (33).

NOTE

Tag cables before removing shafts to avoid wrong connections during installation.

15 Remove tachometer and speedometer flexible drive shafts (34) by unscrewing two nuts (35).

16 Disconnect throttle valve control rod (36) by removing lockpin (37) and headed pin (38).

17 Disconnect shift control rod (39) by pulling out quick-release pin (40). Move control rod into hull to prevent damage, place shift control in R2 position.

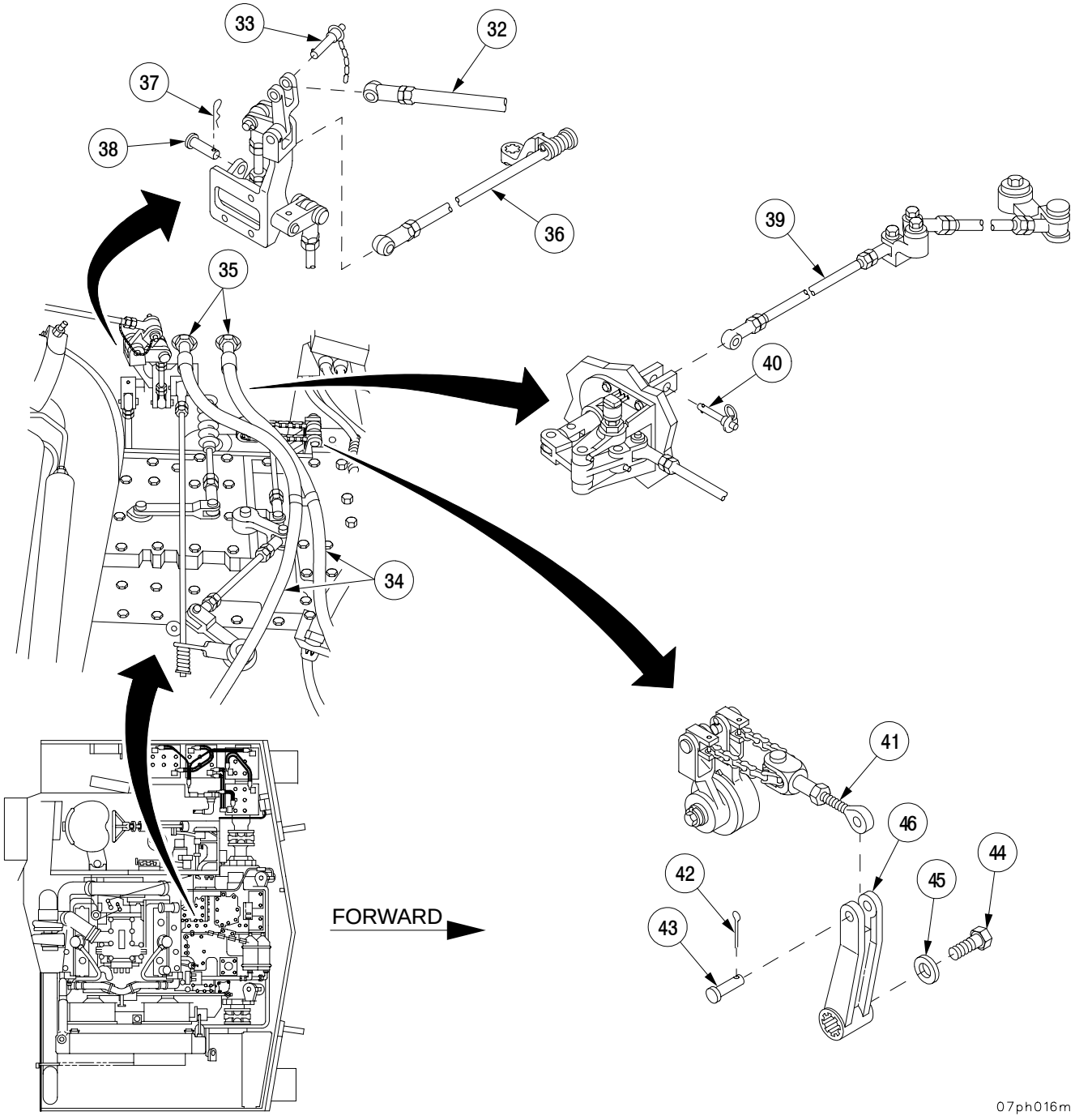
18 Disconnect brake control sprocket and shaft (41) by removing cotter pin (42) and retainer pin (43). Discard cotter pin.

19 Remove screw (44), flat washer(45), and remote control lever (46).

Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

a. Removal - Continued



Section I. POWERPACK - CONTINUED

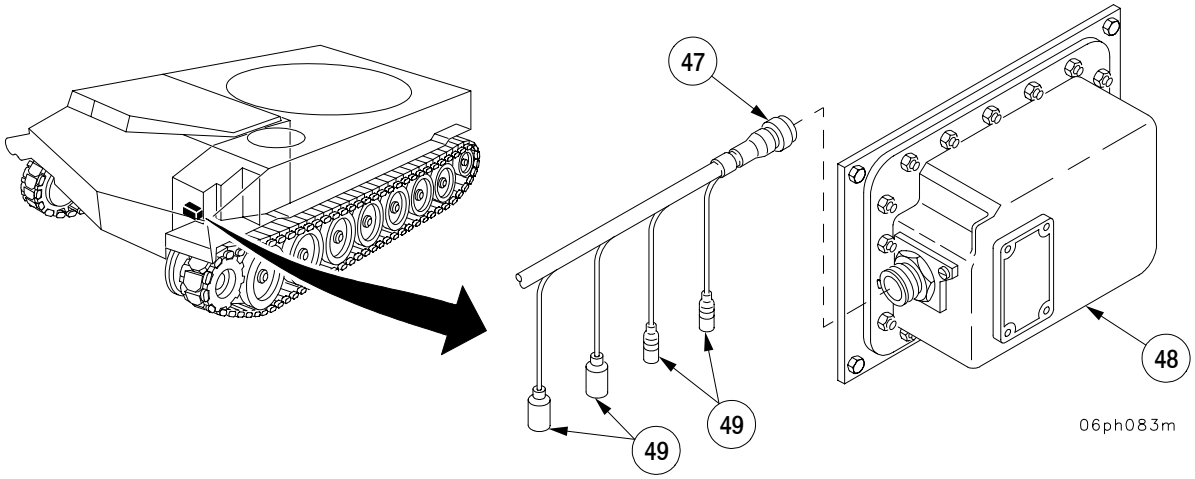
4-1 POWERPACK - CONTINUED

a. Removal - Continued

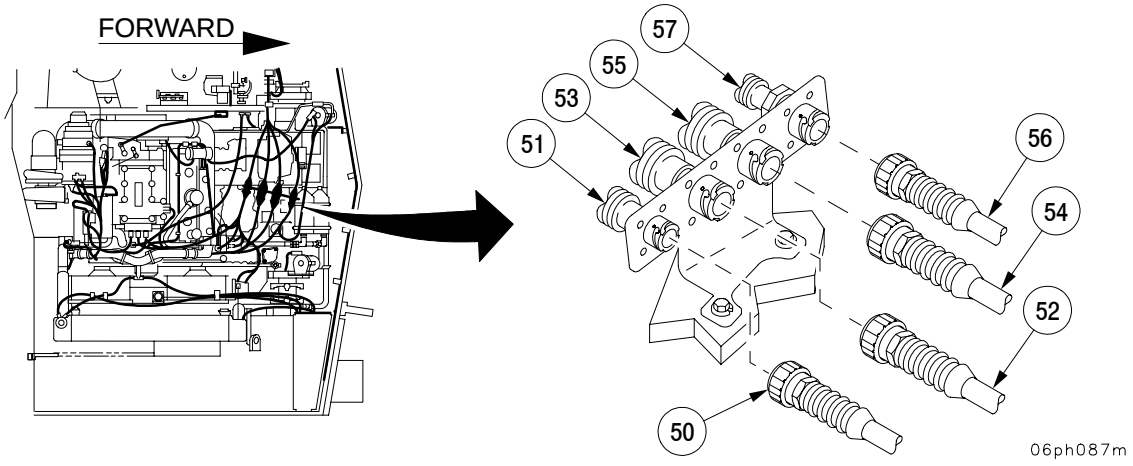
NOTE

Tag electrical wires to ensure proper installation.

19 Disconnect wiring harness W106 connector P1 (47) from voltage regulator (48). Disconnect four connectors (49) from hull wiring harnesses.



20 Disconnect harness W101 connector P1 (50) from harness W102 connector J1 (51), harness W109 connector P1 (52) from harness W110 connector J1 (53), harness W108 connector P1 (54) from harness W107 connector J1 (55), and harness W105 connector P1 (56) from harness W104 connector J1 (57). Secure cables to hull.



Section I. POWERPACK - CONTINUED

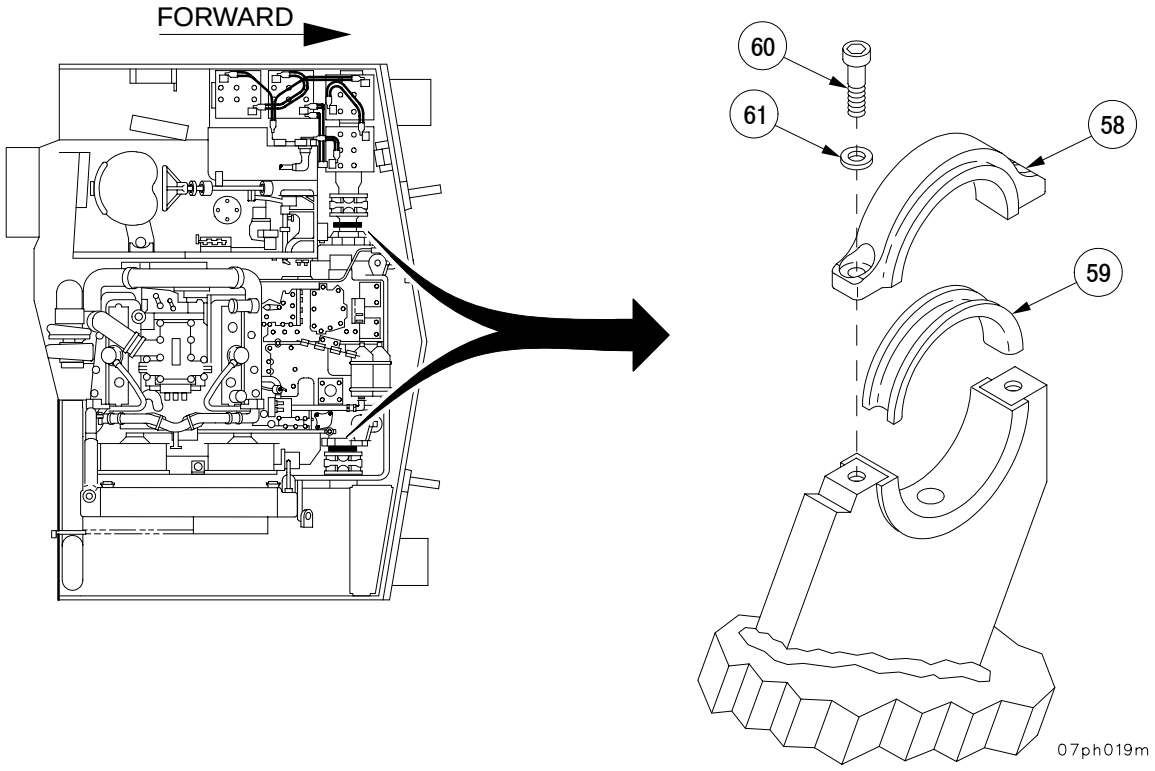
4-1 POWERPACK - CONTINUED

a. Removal - Continued

NOTE

- Trunnion caps must be marked for proper location.
- If shims are present with caps, they must be retained for the same location as they were removed.

21 Remove trunnion support caps (58) and two upper inserts (59) from support assembly by removing four screws (60) and four flat washers (61).

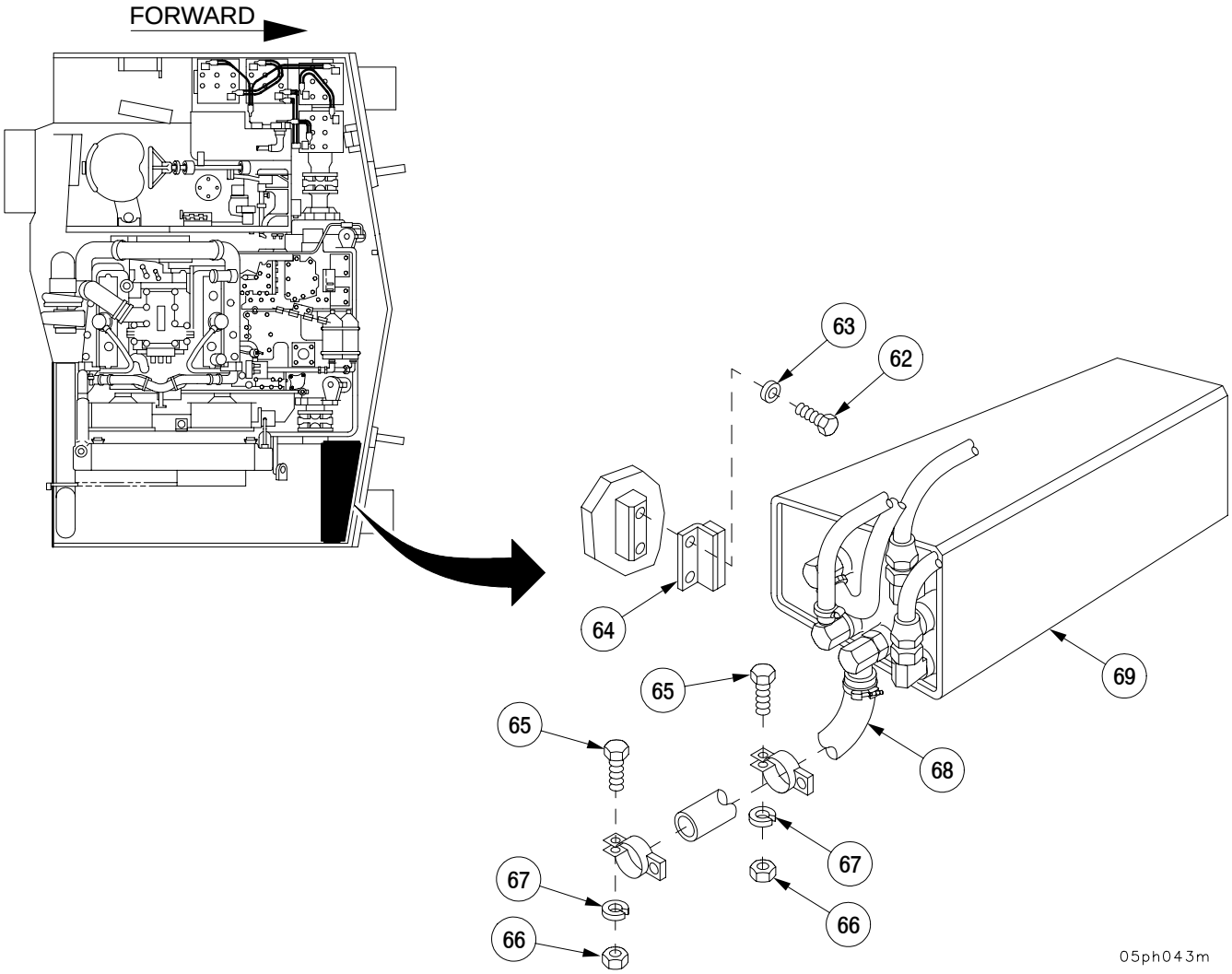


Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

a. Removal - Continued

22 At the coolant surge tank, remove two screws (62), two flat washers (63), and retainer pad (64). Remove two screws (65), two nuts (66), and two lockwashers (67) on the coolant pump to surge tank hose (68). Remove coolant surge tank (69) and place on top of transmission. Discard lockwashers.



Section I. POWERPACK - CONTINUED

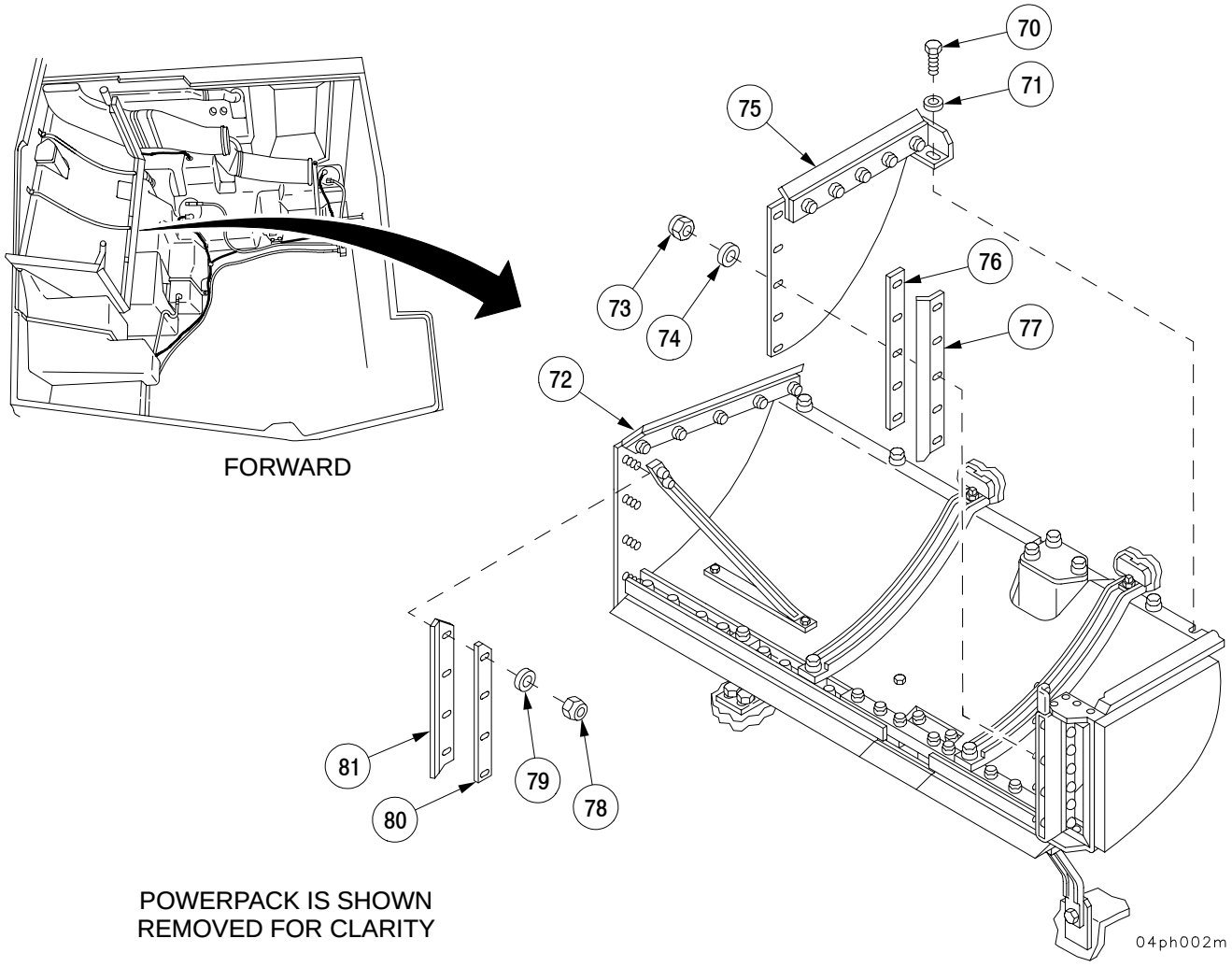
4-1 POWERPACK - CONTINUED

a. Removal - Continued

23 Remove screw (70) and washer (71) from heat shield (72).

24 Remove five self-locking nuts (73), five flat washers (74), baffle (75), plate (76), and seal (77). Discard self-locking nuts.

25 Remove four self-locking nuts (78), four flat washers (79), plate (80), and seal (81). Discard self-locking nuts.



Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

a. Removal - Continued

WARNING

- Perform visual inspection and check load test date on lifting sling. Never crawl under equipment when performing maintenance unless equipment is securely blocked.
- Keep clear of equipment when it is being raised or lowered. Do not allow heavy components to swing while suspended by lifting device.
- Exercise extreme caution when working near a cable or chain under tension.

CAUTION

Use extreme care when removing/installing the powerpack to avoid damaging the fuel tanks, radiator, and transmission/generator oil line.

26 Secure coolant surge tank (69) to powerpack (82).

27 Attach lifting sling to suitable lifting device and powerpack (82) at four lifting eyes (83).

28 Lift powerpack (82) out of hull slowly. After lifting powerpack several inches, shift it towards front of vehicle for clearance. Watch all sides of powerpack to ensure clearance during removal.

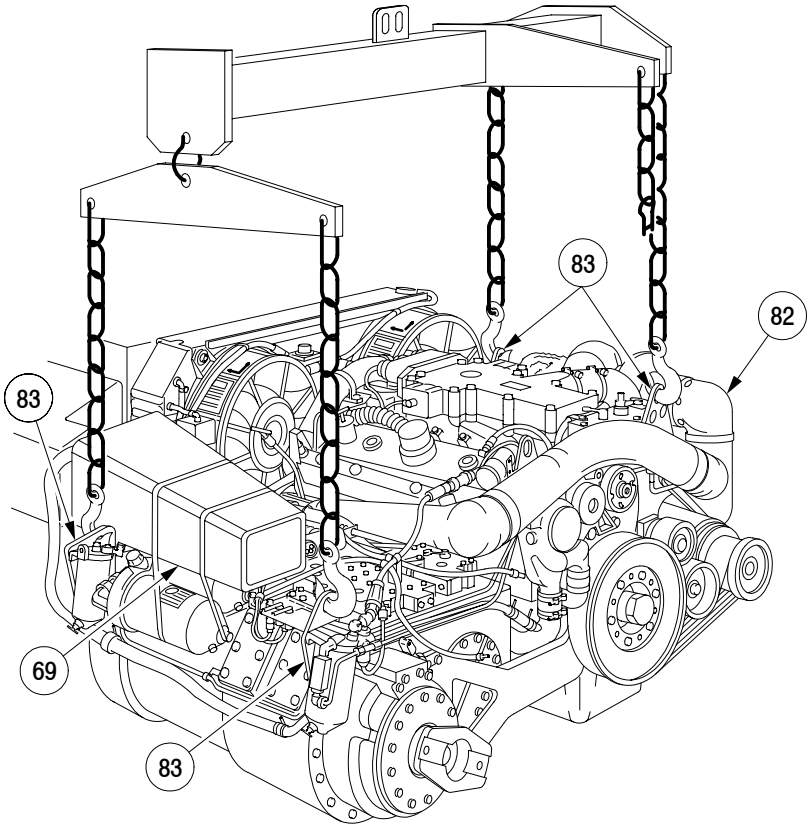
29 Place powerpack (82) on wooden blocks.

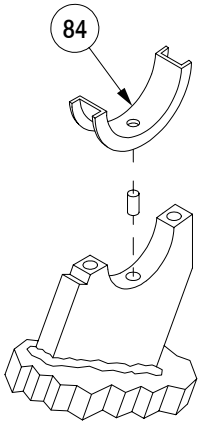
30 Remove two lower trunnion inserts (84) from support assembly.

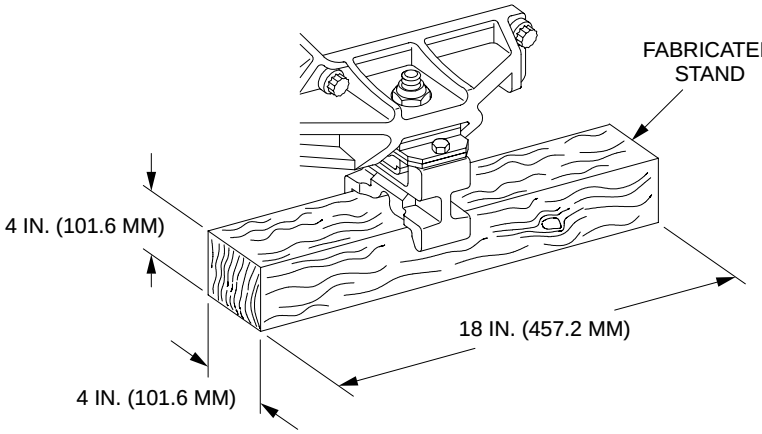
Section I. POWERPACK - CONTINUED

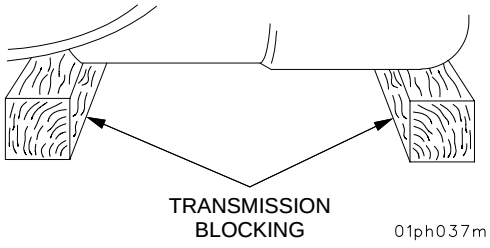
4-1 POWERPACK - CONTINUED

a. Removal - Continued









Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

b. Inspection.

Powerpack should be given a general inspection in the following areas, whenever the powerpack is removed from the vehicle:

NOTE

Replace or repair any defective or damaged item or component as required. If replacement or repair is beyond scope of unit level maintenance, notify support maintenance.

1 Check gaskets, seals, and covers for seepage of fuel and oil.

2 Check for damaged, distorted, or broken hose, tube, or line connector assemblies (nuts, adapters, reduction fittings, and couplers).

3 Check fuel hoses, tubes, and connectors for cracks, leaks, and/or seepage of fuel (para 5-14).

4 Check oil hoses, tubes, and connectors for cracks, leaks, and/or seepage of oil (para 4-6).

5 Check for stripped or damaged threads on connector assemblies and retaining bolts, nuts, or studs. Repair threads or replace components/items as appropriate.

6 Check electrical wires, leads, and connectors for cracked insulation, oil, and grease on cables/connectors.

7 Check for broken screws or bolts. Replace broken screws or bolts.

8 Check for damaged, burred, pitted, or gummed-up seal, gasket, or preformed packing seals. Clean, remove burrs, or replace components as required.

9 Check hull engine compartment floor for pools of oil, fuel, and coolant.

WARNING

Be sure engine is cool before removing radiator cap. Hot coolant can cause severe burns.

10 Check radiator for coolant level. Check coolant for serviceability (para 2-7).

11 Check coolant hoses and tubes for cracks, deterioration, and signs of coolant seepage (Table 2-1, PMCS item 29).

12 Check oil filters (para 4-7) and fuel filters (para 5-16) for collection of sediment on filter elements.

Operating the powerpack out of the vehicle lets maintenance personnel inspect the control and drive components of the powerpack unit by hand-operating the control linkages on the transmission. Components can be checked for proper functioning and performance with the powerpack unit outside the vehicle without harm to the unit.

Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

c. Special Equipment Hookups.

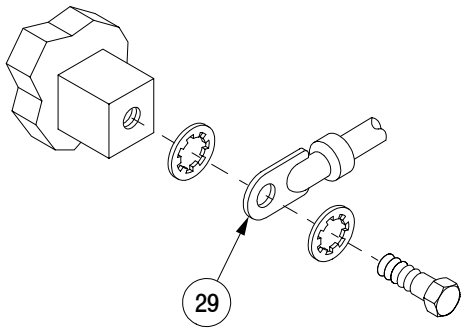
CAUTION

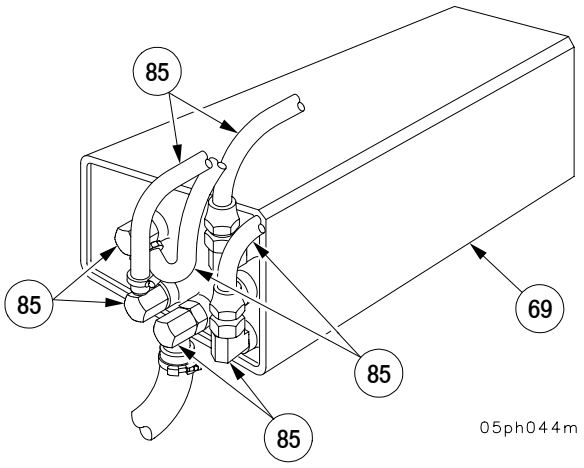
Ensure all hoses are connected and secure.

1 Check hoses and connectors (85) of surge tank (69) connections. Make sure hoses are not kinked.

2 Position surge tank (69) next to powerpack transmission left side at final drive universal joints.

3 Connect ground cable (29) to appropriate grounding device. Be certain paint or rust is removed at connection point.



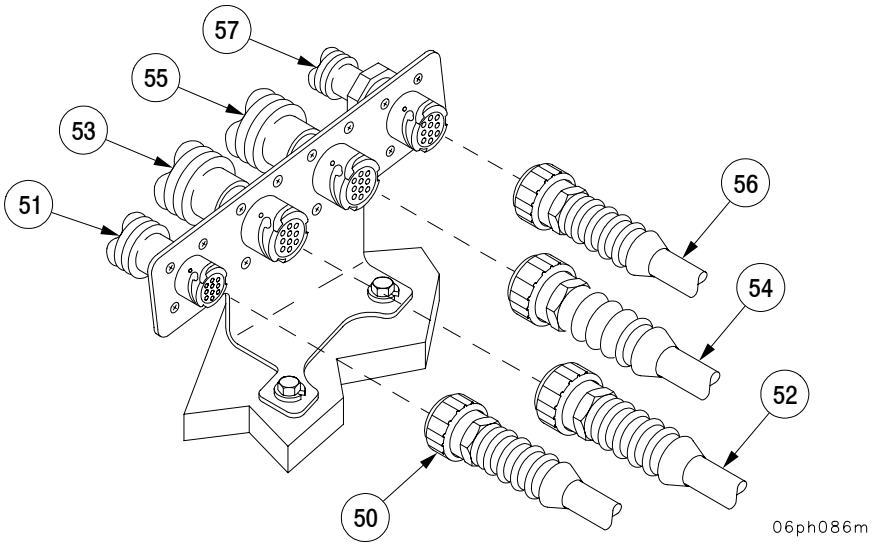


Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

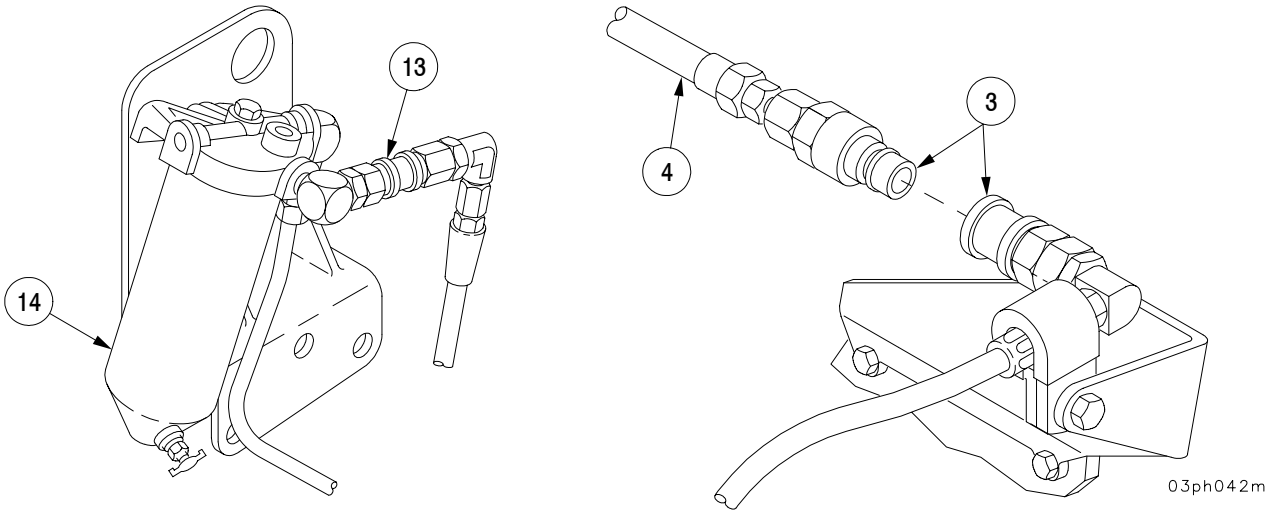
c. Special Equipment Hookups - Continued

4 Connect harness W101 connector P1 (50) to harness W102 connector J1 (51), harness W109 connector P1 (52) to harness W110 connector J1 (53), harness W108 connector P1 (54) to harness W107 connector J1 (55), and harness W105 connector P1 (56) to harness W104 connector J1 (57) using ground hop kit.



5 At the primary fuel filter (14), connect fuel line quick-disconnect (13).

6 Connect quick-disconnect (3) at engine to lower fuel tank return hose (4).



Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

c. Special Equipment Hookups - Continued

7 Install turbocharger air inlet safety screen (86).

8 Attach tachometer (87) to tachometer flexible drive shaft assembly (34) and position it where it will not be affected by engine vibration.

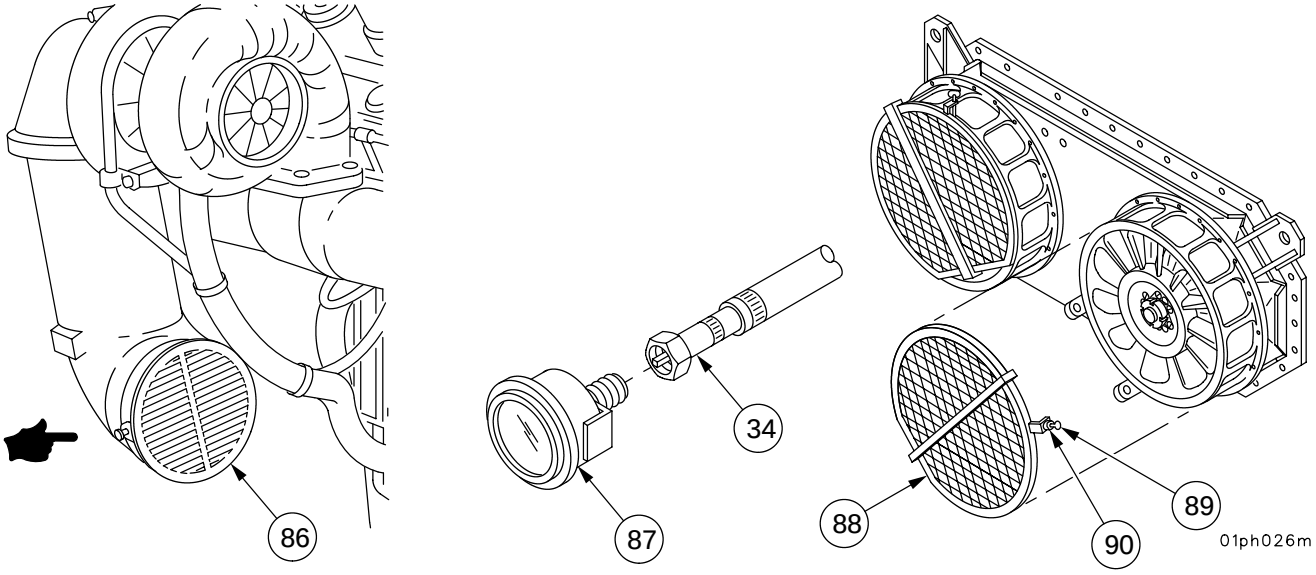
WARNING

A protective fan screen must be installed prior to doing maintenance in the engine compartment when engine is running or when engine is in ground hop mode. Contact with rotating fan can cause injury.

NOTE

Flat side of screen should align with two lower mounting bolts of fan housing.

9 Install two fan protective screens (88), thumb or hex head screw (89), and locknut (90).



Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

d. Testing.

WARNING

- A protective fan screen must be installed prior to doing maintenance in the engine compartment when engine is running or when engine is in ground hop mode. Contact with rotating fan can cause injury.
- Excessive noise levels are present any time the equipment is operating. Wear hearing protection while it is running. Failure to do so could result in damage to your hearing.

CAUTION

- Make sure coolant and engine lubricants are replenished before starting engine.
- When operating the powerpack while mounted on blocks, watch closely. Prevent powerpack from vibrating off the blocks.

1 Start engine (TM 9-2350-314-10) and operate at 1200 to 1400 rpm until engine coolant temperature is 169° F (76° C) and transmission oil temperature is 160° F (71° C). Allow engine to return to normal idle speed (650 rpm).

2 Check engine operation.

3 Check for leaks, excess smoke, or strange noises. Try to locate the source of leaks. If any problems persist, notify support maintenance.

4 Shut down engine (TM 9-2350-314-10).

Section I. POWERPACK - CONTINUED

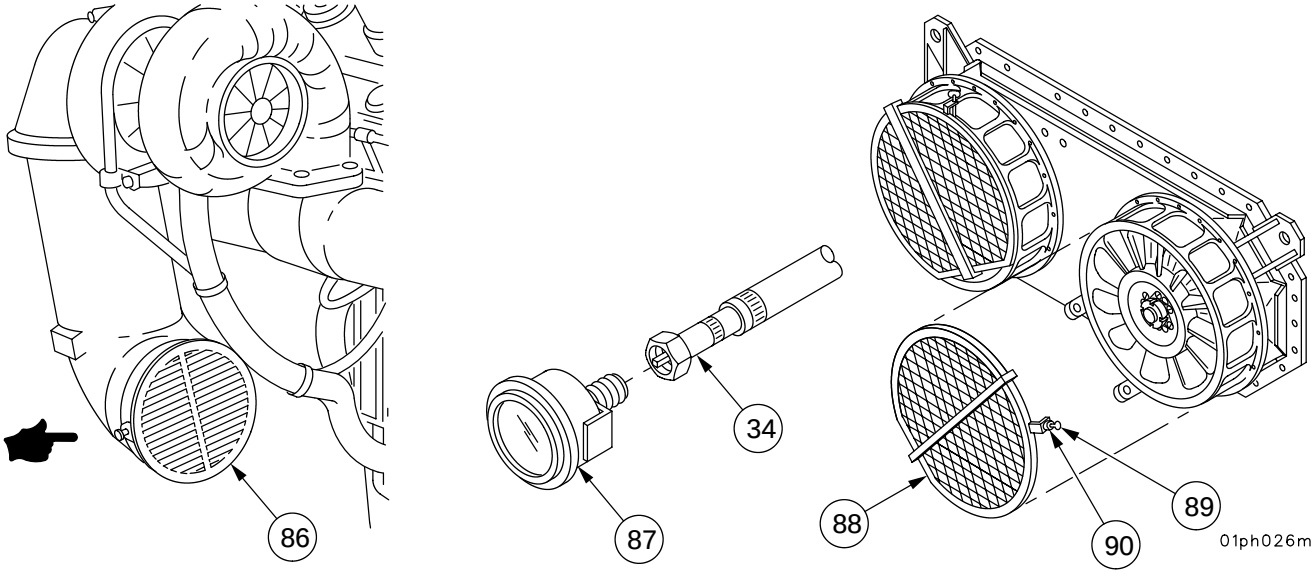
4-1 POWERPACK - CONTINUED

e. Special Equipment Removal.

1 Loosen locknut (90) and thumb or hex head screw (89) on each fan protective screen (88). Remove two fan protective screens (88).

2 Remove tachometer (87) from tachometer flexible drive shaft assembly (34).

3 Remove turbocharger air inlet safety screen (86).



Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

e. Special Equipment Removal - Continued

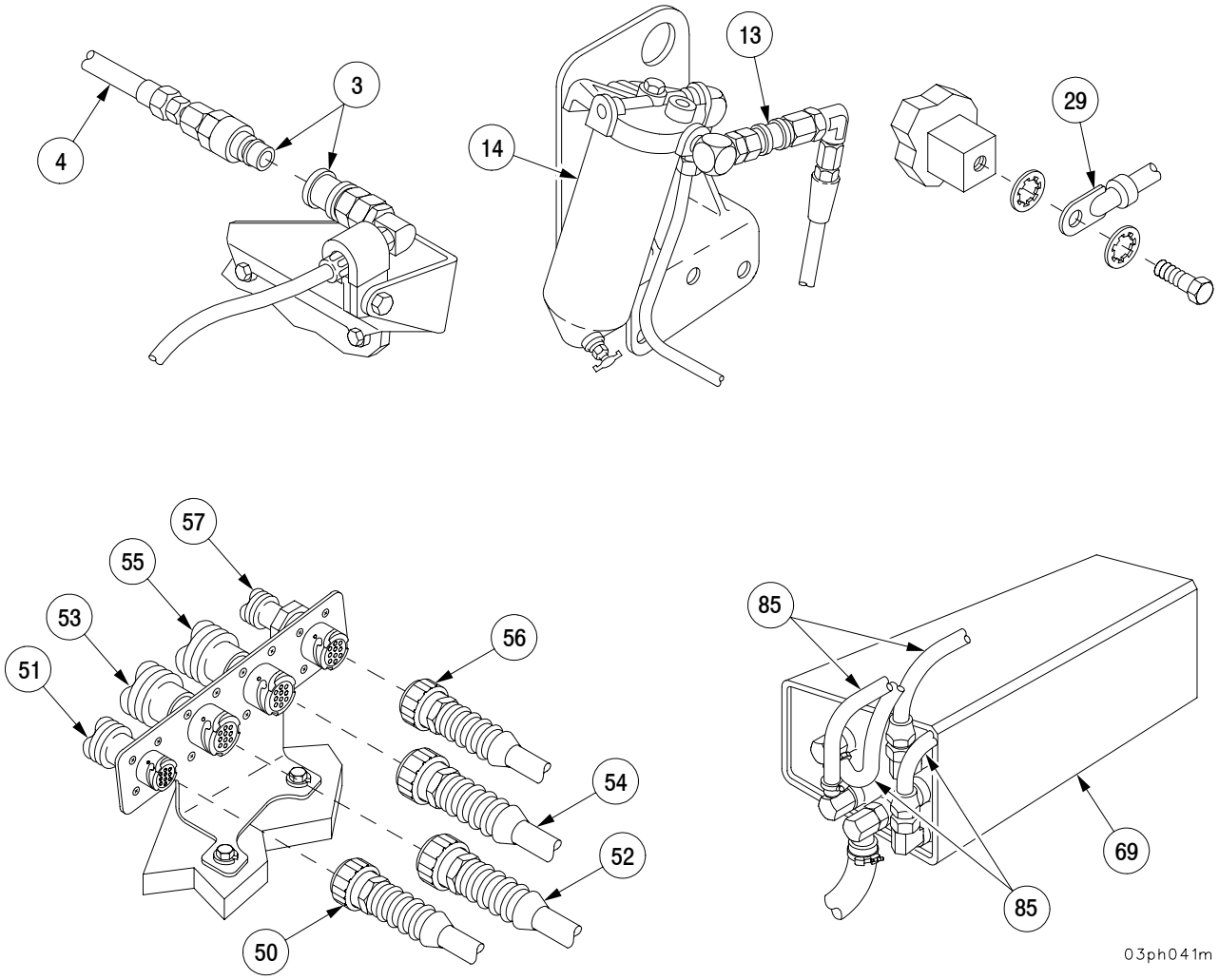
4 Disconnect quick-disconnect assembly (3) at engine to lower fuel tank return hose (4).

5 At primary fuel filter (14), disconnect fuel line quick-disconnect (13).

6 Disconnect ground hop kit harness W101 connector P1 (50) from harness W102 connector J1 (51), harness W109 connector P1 (52) from harness W110 connector J1 (53), harness W108 connector P1 (54) from harness W107 connector J1 (55), and harness W105 connector P1 (56) from harness W104 connector J1 (57).

7 Disconnect ground cable (29) from appropriate grounding device.

8 Position surge tank (69) on top of transmission. Make sure hoses (85) are not kinked.



Section I. POWERPACK - CONTINUED

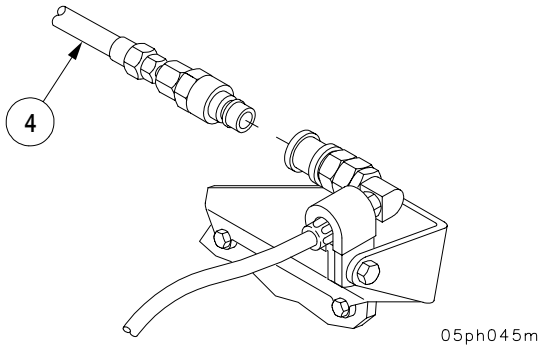
4-1 POWERPACK - CONTINUED

f. Installation.

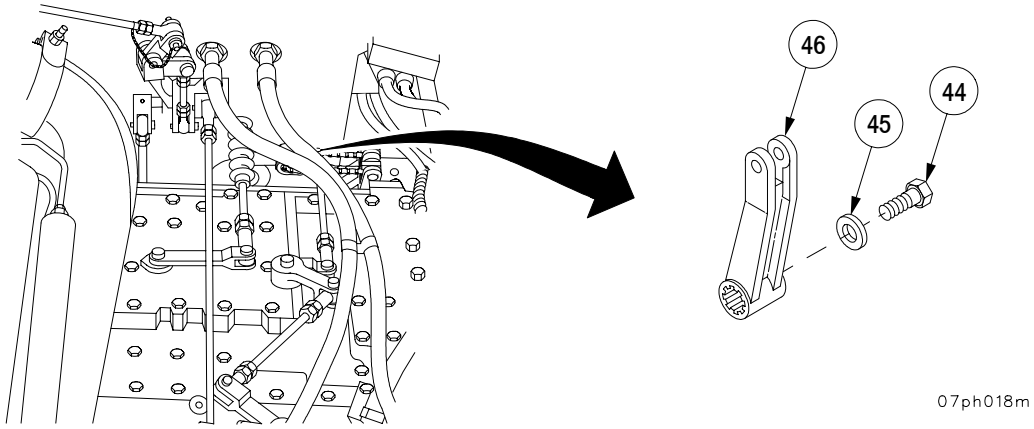
NOTE

Be sure to lubricate engine and exercise engine mounting bracket prior to installing powerpack (TM 9-2350-314-10).

1 Position fuel return hose (4) against powerpack compartment wall.



2 Install remote control lever (46) with screw (44) and flat washer (45).



Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

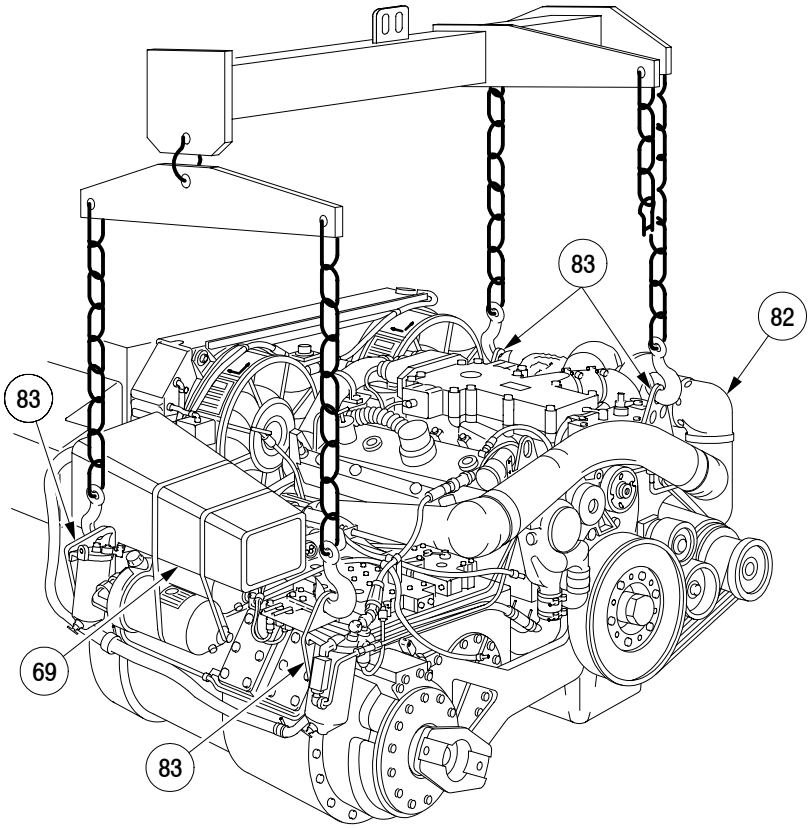
f. Installation - Continued

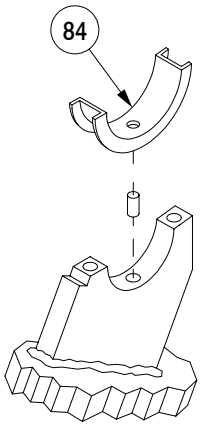
3 Install two lower trunnion inserts (84) in support assembly.

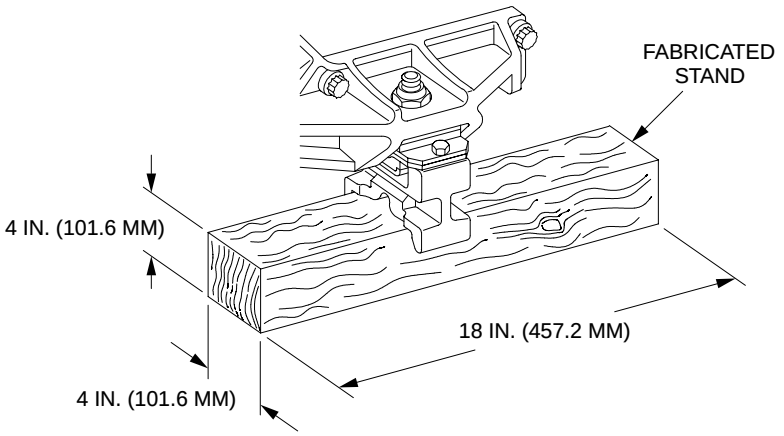
4 Secure surge tank (69) to powerpack (82).

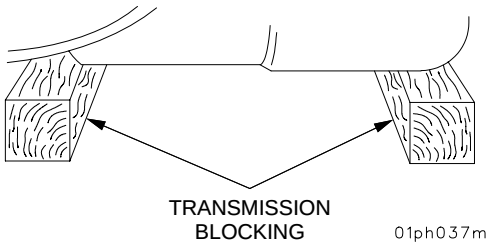
5 Position lift vehicle for powerpack (82) installation.

6 Attach lifting sling to powerpack (82) at four lifting eyes (83).









Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

f. Installation - Continued

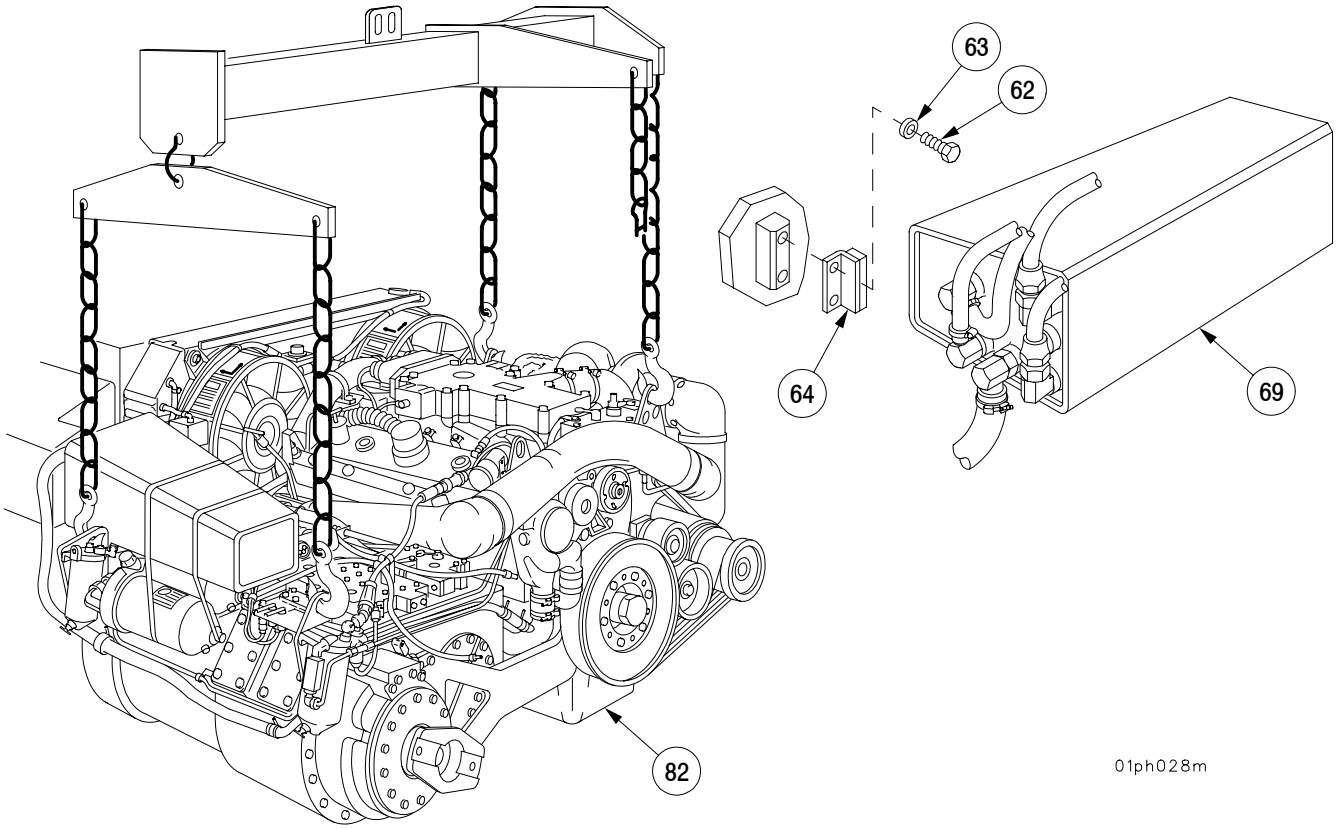
CAUTION

Watch all sides of the powerpack, making sure it clears the hull. Have one person observe from the driver's compartment through the engine compartment access to ensure air intake duct, generator oil lines, and fuel tank are not damaged.

7 Lift and set powerpack (82) in vehicle hull.

8 Remove lifting sling from powerpack (82).

9 Install surge tank (69), retainer pad (64), two screws (62), and two flat washers (63).



Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

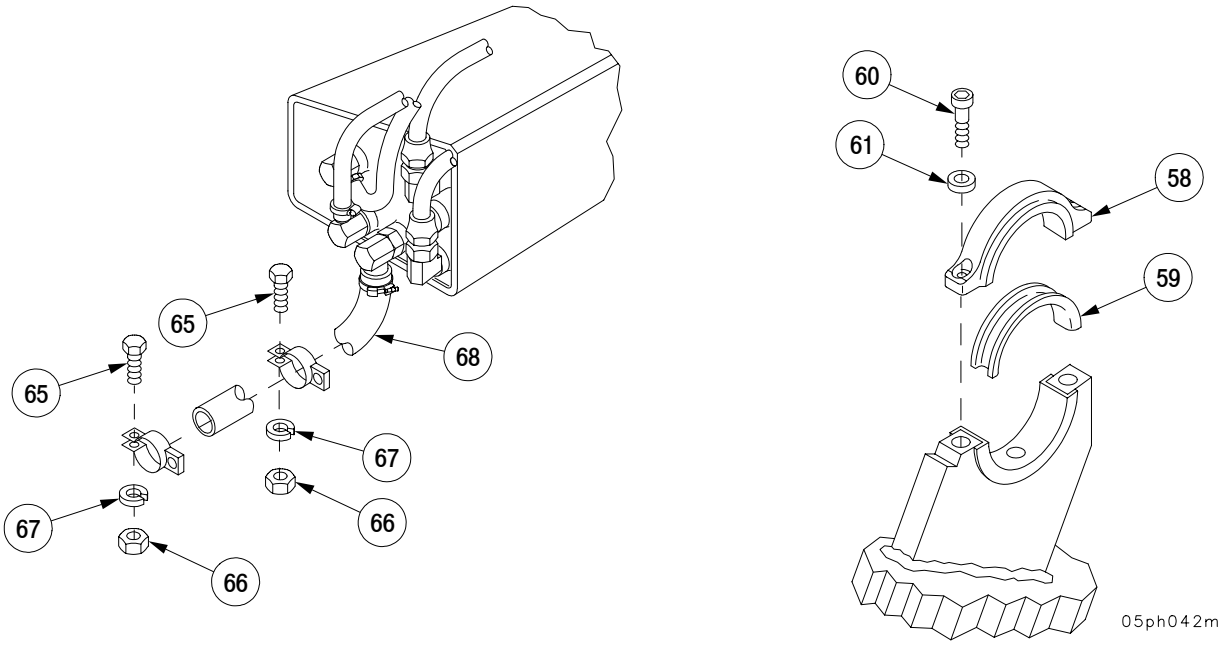
f. Installation - Continued

10 Install two screws (65), two new lockwashers (67), and two nuts (66) on coolant pump to surge tank hose (68).

NOTE

- Make sure trunnion cap inserts are installed at the original locations from which they were removed.
- Make sure trunnion caps are installed in proper location as marked on caps (left front and right front) with stamp facing towards front of vehicle.
- Primary fuel pump bracket (lifting eye) must be disconnected and removed to install and properly torque right front trunnion capscrews.

11 Install two upper inserts (59) and two trunnion support caps (58) with four screws (60) and four flat washers (61). Torque screws to 85-90 lb-ft (115-122 N·m).



Section I. POWERPACK - CONTINUED

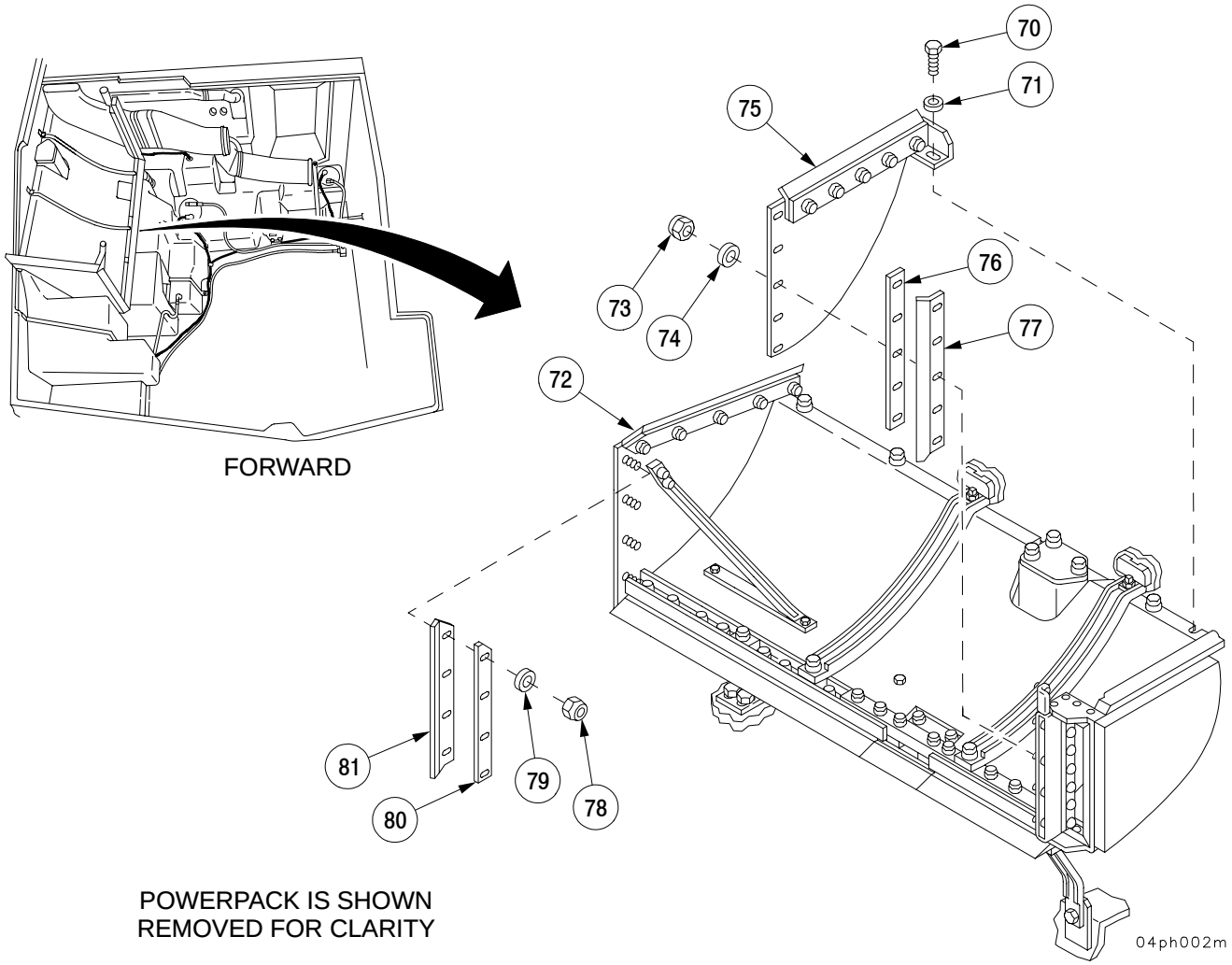
4-1 POWERPACK - CONTINUED

f. Installation - Continued

12 Install seal (81), plate (80), four flat washers (79), and four new self-locking nuts (78).

13 Install baffle (75) with plate (76), seal (77), five flat washers (74), and five new self-locking nuts (73).

14 Install screw (70) and washer (71) in heat shield (72).

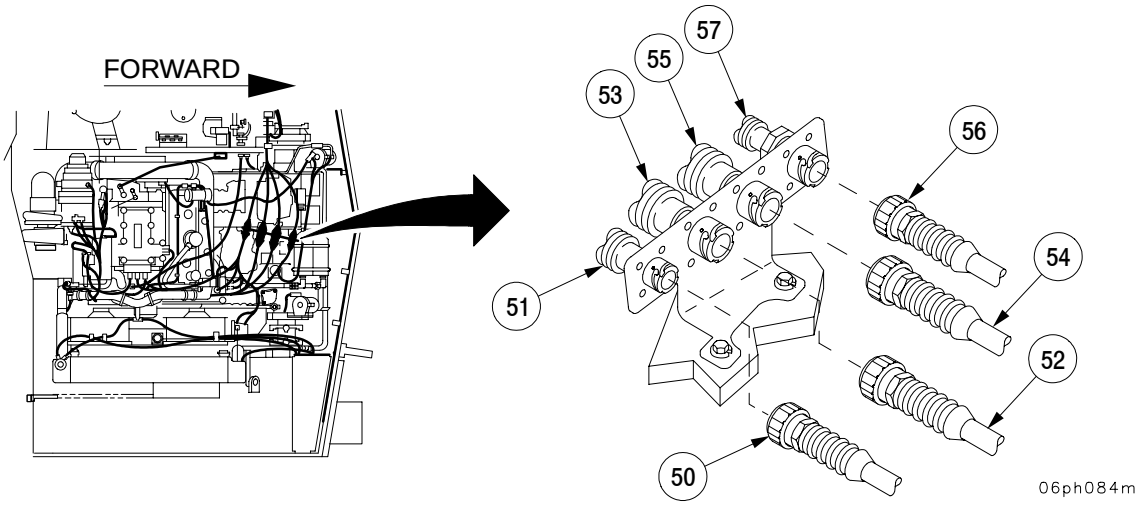


Section I. POWERPACK - CONTINUED

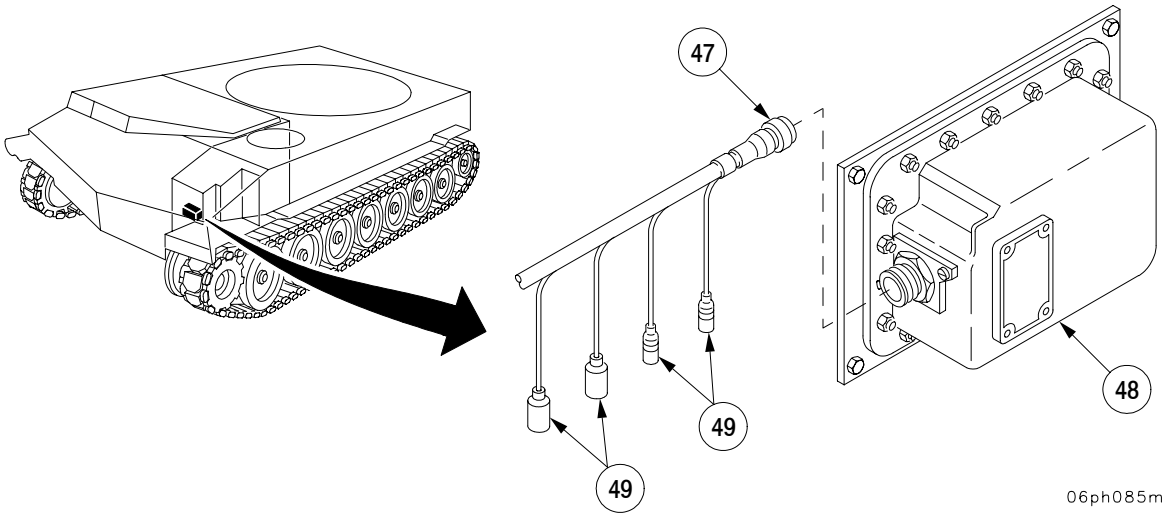
4-1 POWERPACK - CONTINUED

f. Installation - Continued

15 Connect harness W101 connector P1 (50) to harness W102 connector J1 (51), harness W109 connector P1 (52) to harness W110 connector J1 (53), harness W108 connector P1 (54) to harness W107 connector J1 (55), and harness W105 connector P1 (56) to harness W104 connector J1 (57).



16 Connect wiring harness W106 connector P1 (47) to voltage regulator (48). Connect four connectors (49) to hull wiring harnesses.



Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

f. Installation - Continued

17 Connect brake control sprocket and shaft (41) by installing retainer pin (43) and new cotter pin (42).

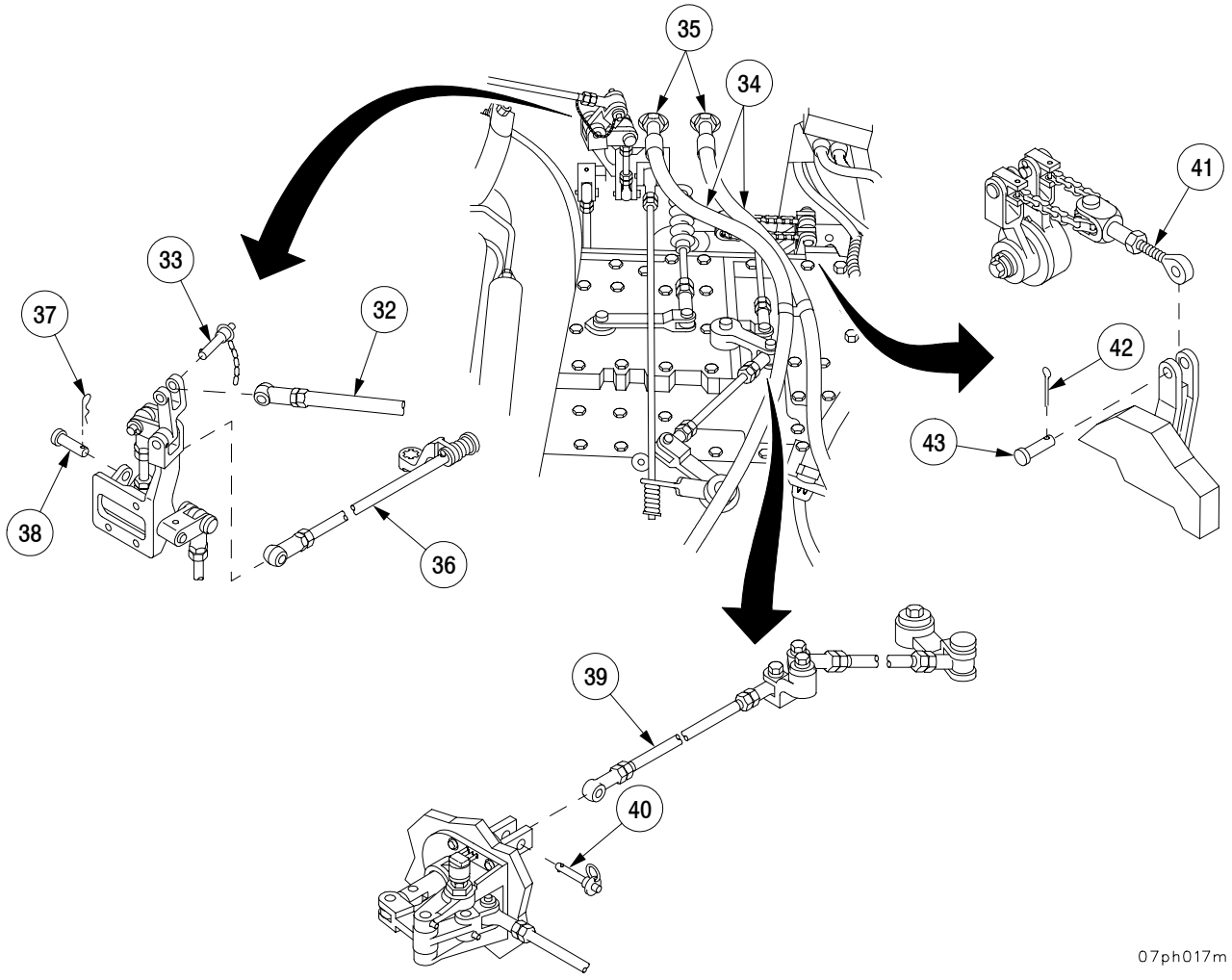
18 Place shift control in N position. Connect shift control rod (39) by installing quick-release pin (40).

19 Install steering control rod in engine compartment (para 13-1).

20 Connect throttle valve control rod (36) with headed pin (38) and lock pin (37).

21 Connect tachometer and speedometer flexible drive shafts (34) by tightening two nuts (35).

22 Connect throttle governor control rod (32) by installing quick-release pin (33).



Section I. POWERPACK - CONTINUED

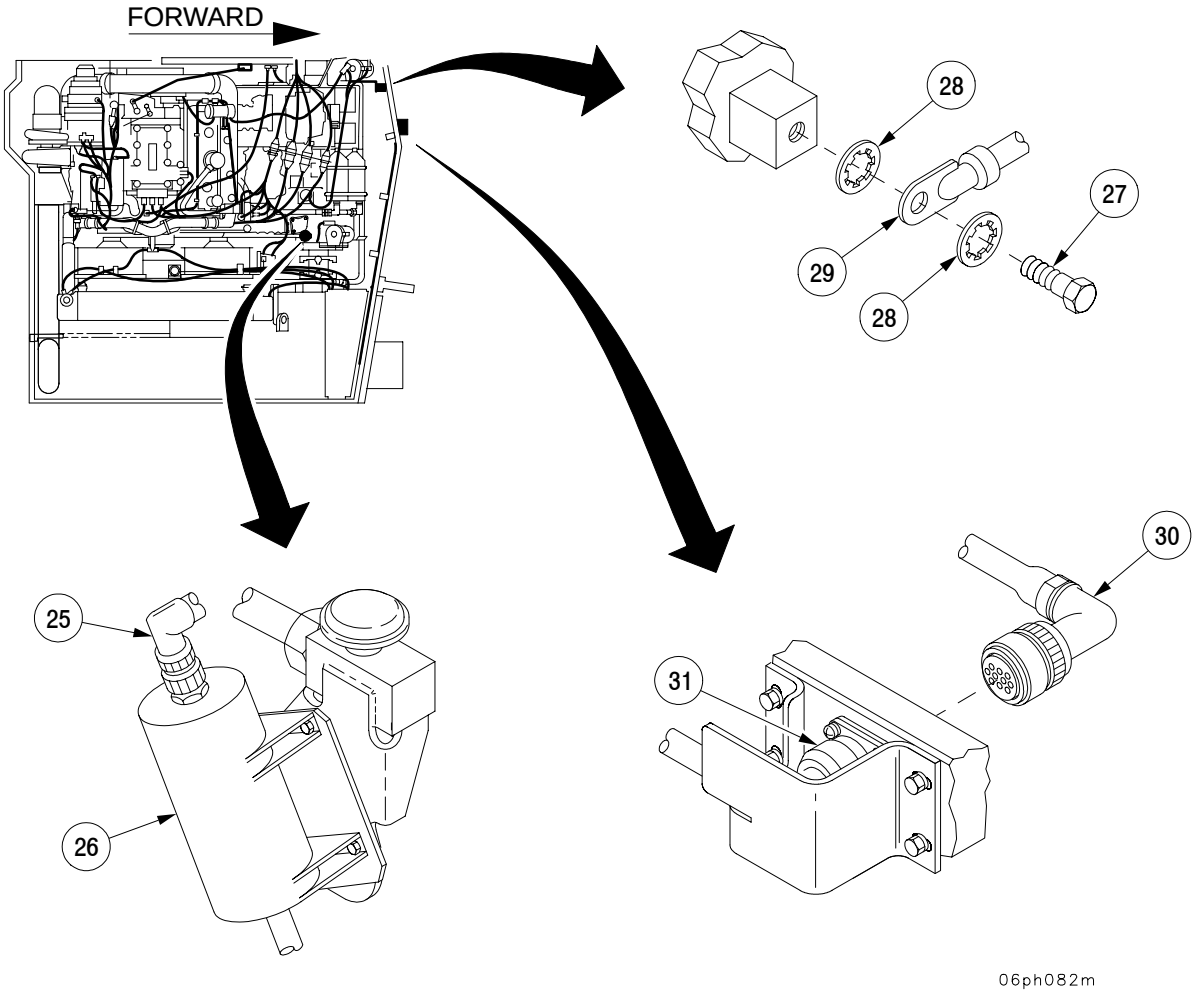
4-1 POWERPACK - CONTINUED

f. Installation - Continued

23 Connect wiring harness W113 connector P2 (30) to travel lock power cable (31).

24 Connect powerpack ground cable (29) by installing screw (27) and two new lockwashers (28).

25 Connect wiring harness W28 connector P1 (25) to top of vehicle motion sensor (26).



Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

f. Installation - Continued

CAUTION

Do not turn clevis nuts during handling of quick disconnect clamping devices.

NOTE

Quick-disconnects for left and right side of engine are installed the same way. Right side is shown.

26 Connect universal joint (18) to transmission flange (19).

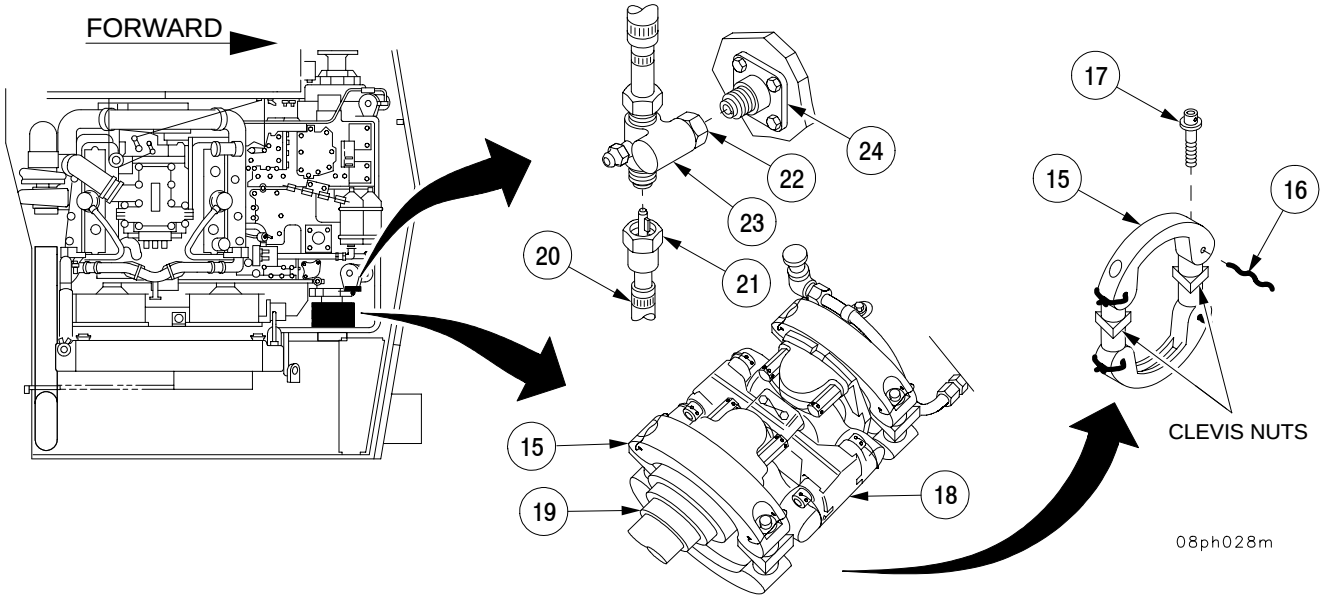
27 Install clamping clevis (quick-disconnect) (15) and bolt (17). Torque bolt (17) to 37-42 lb-ft (50-56.9 N·m) and install new locking wire (16).

CAUTION

Speedometer adapter drive must be installed so that it does not contact rotating quick-disconnect or equipment damage will result.

28 Install speedometer adapter drive (23) on transmission adapter (24) by tightening nut (22).

29 Connect speedometer cable (20) by tightening nut (21).



Section I. POWERPACK - CONTINUED

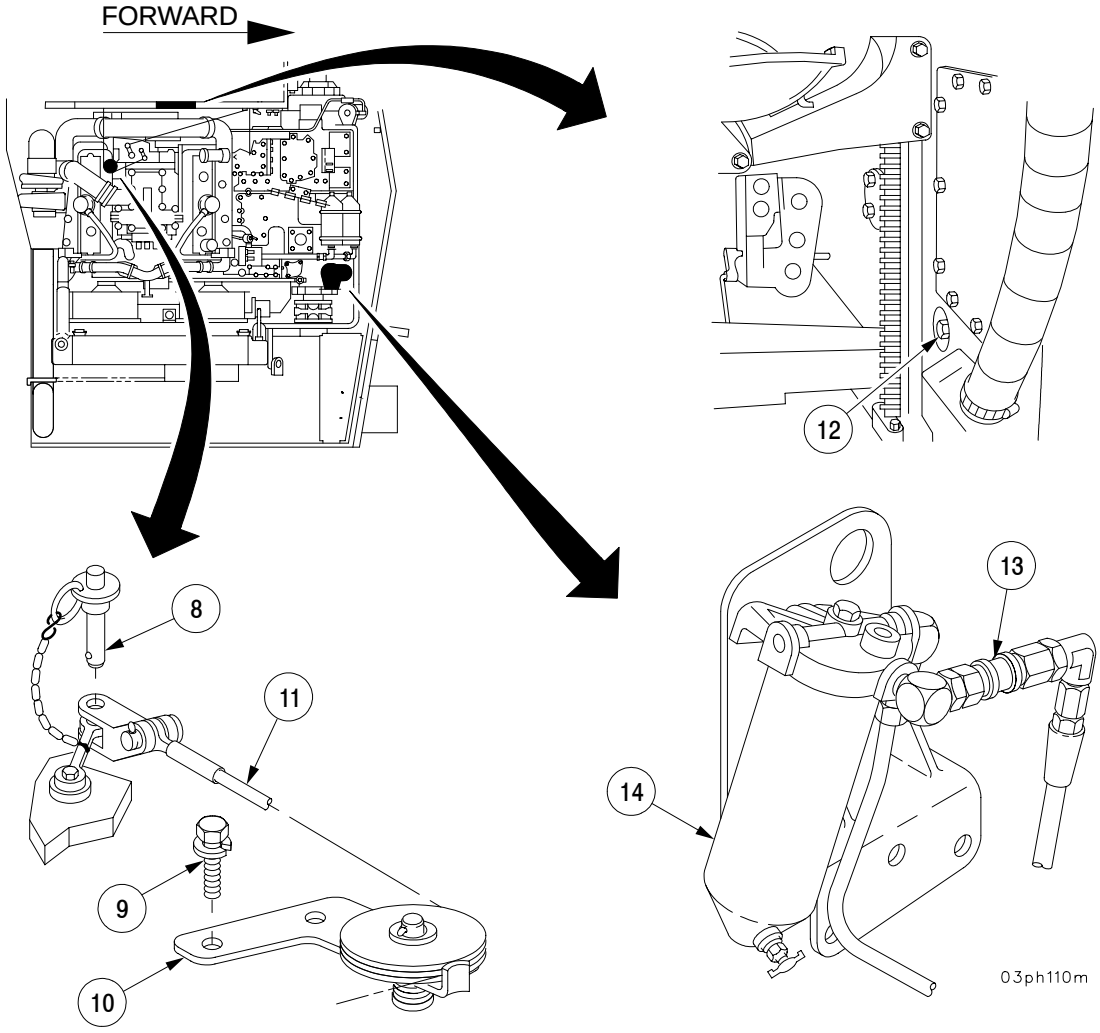
4-1 POWERPACK - CONTINUED

f. Installation - Continued

30 Connect fuel line quick-disconnect (13) at the primary fuel filter (14).

31 Tighten engine mount release shaft (12) by turning clockwise. Torque shaft to 174 lb-ft (236 N·m).

32 Install governor fuel shutoff cable (11) and quick-release pin (8). Install pulley bracket (10) with two new assembled screws (9).



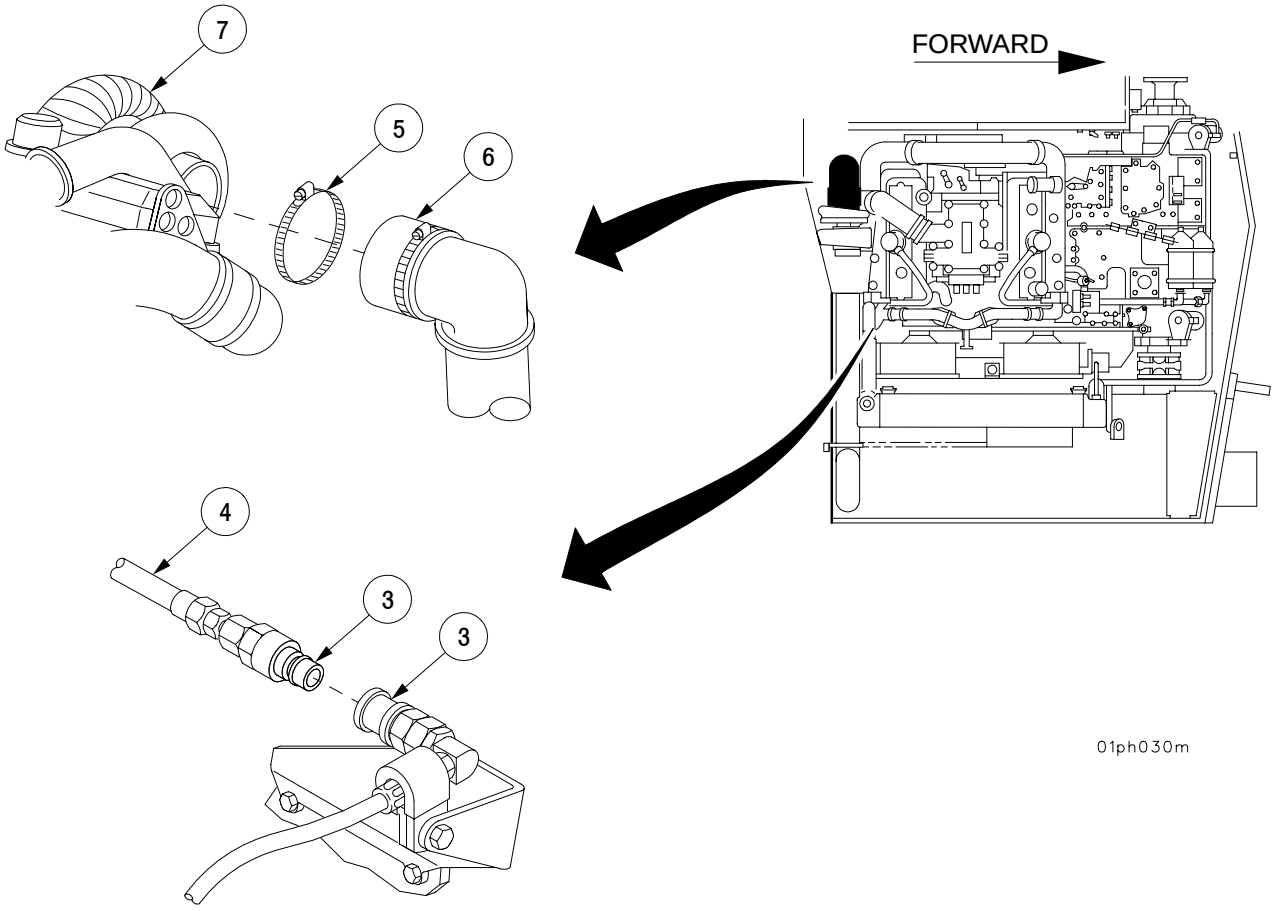
Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

f. Installation - Continued

33 Connect turbocharger inlet duct (6) to turbocharger (7) and tighten hose clamp (5).

34 Connect quick-disconnect assembly (3) at engine to lower fuel tank return hose (4).



Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

f. Installation - Continued

35 Install exhaust outlet pipe (para 6-1).

WARNING

- A protective fan screen must be installed prior to doing maintenance in the engine compartment when engine is running or when engine is in ground hop mode. Contact with rotating fan can cause injury.
- Excessive noise levels are present any time the equipment is operating. Wear hearing protection while it is running. Failure to do so could result in damage to your hearing.

CAUTION

- Ensure coolant and engine lubricants are replenished before starting engine.
- While performing test run, check coolant and oil temperatures. Coolant temperature should not exceed 180° F (82° C). Oil temperature should not exceed 259° F (126° C). If either condition exists, run engine at 1000-1200 rpm for 2 minutes before shutdown.

36 Connect both battery ground leads (para 8-33). Place vehicle MASTER switch in ON position. Start engine and operate at 1200-1400 rpm until engine coolant temperature is 169° F (76° C) and transmission oil temperature is 160° F (71° C). Allow engine to return to normal idle speed (650 rpm) (TM 9-2350-314-10).

37 Check engine operation. If engine is not operating properly, perform engine Troubleshooting (Chapter 3).

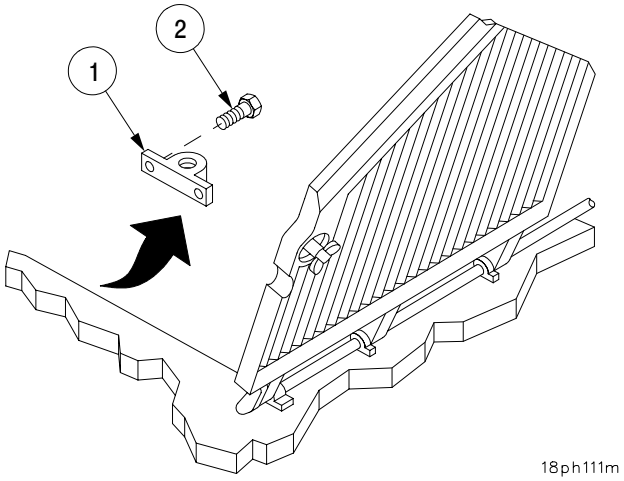
38 Check for leaks, excess smoke, or strange noises. Try to locate the source of leaks. If any problems persist, notify support maintenance.

Section I. POWERPACK - CONTINUED

4-1 POWERPACK - CONTINUED

f. Installation - Continued

39 Install air intake grille handle bracket (1) with two screws (2).



40 Set parking brake and remove blocks from under tracks (TM 9-2350-314-10).

NOTE

FOLLOW-ON MAINTENANCE:
Install grille adjustable support assembly (para 16-31)
Install hull front slope and exhaust grille support plate (para 16-30)
Perform transmission throttle control adjustment (para 5-21)
Position gun tube travel lock in travel position (TM 9-2350-314-10)
Secure gun tube in travel lock (TM 9-2350-314-10)
Operate vehicle (TM 9-2350-314-10)

Section II. ENGINE ASSEMBLY

4-2 SHOCK MOUNT AND ENGINE BRACKETS.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Torque wrench (item 86, Appx F)

Equipment Conditions
Cradle mounting bracket
removed (para 8-8)

Materials/Parts
Antiseize compound (item 10, Appx C)
Lockwashers (3) (item 3, Appx E)
Lockwashers (2) (item 85, Appx E)
Self-locking nut (item 86, Appx E)
Screws, self-locking (8) (item 87, Appx E)

a. Removal.

1 Remove self-locking nut (1) securing engine mount group (2). Discard self-locking nut.

2 Remove two screws (3) and two lockwashers (4) from shock mount plates (5). Discard lockwashers.

3 Separate two engine shock mount plates (5), spacer (6), spacer plate (7), screw (8), and flat washer (8.1) from engine bracket (9).

4 Remove three screws (10) and three lockwashers (11) from engine bracket (12). Discard lockwashers.

5 Remove eight self-locking screws (13) and engine bracket (12) from engine. Discard self-locking screws.

b. Installation.

1 Apply antiseize compound to threads of eight new self-locking screws (13) before installing.

2 Install engine bracket (12) to engine with eight new self-locking screws (13). Torque screws to 60-65 lb-ft (81-88 N·m).

3 Install three screws (10) and three new lockwashers (11) into engine bracket (12).

NOTE

Add up to three flat washers to avoid screw interference with starter.

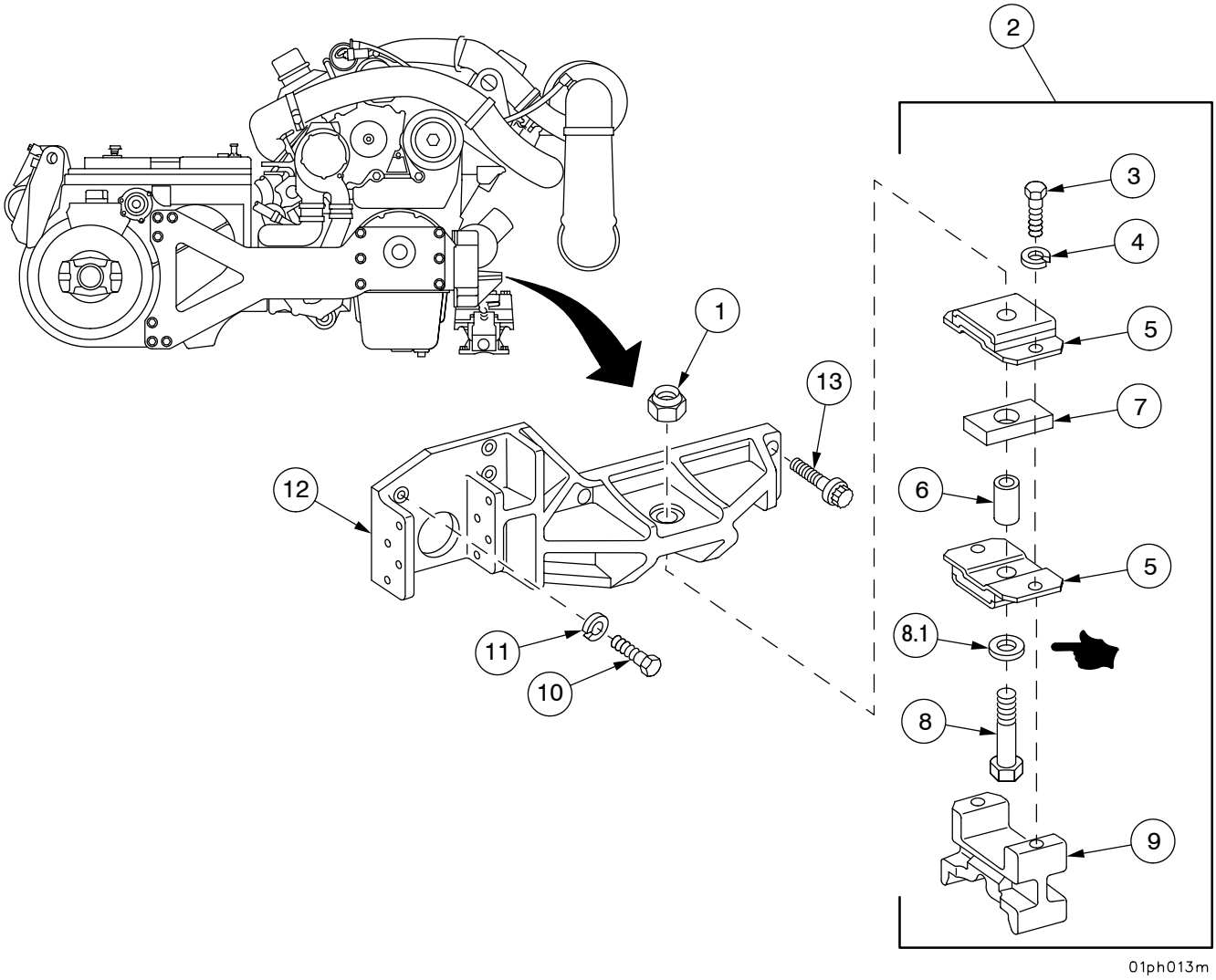
4 Install shock mount plates (5), spacer (6), spacer plate (7), screw (8), and flat washer (8.1) onto engine bracket (9) with two screws (3) and two new lockwashers (4).

5 Install shock mount group (2) to engine with new self-locking nut (1).

Section II. ENGINE ASSEMBLY - CONTINUED

4-2 SHOCK MOUNT AND ENGINE BRACKETS - CONTINUED

b. Installation - Continued



NOTE

FOLLOW-ON MAINTENANCE:
Install cradle mounting bracket (para 8-8)

Section II. ENGINE ASSEMBLY - CONTINUED

4-3 ENGINE MOUNTING BRACKET, LOWER ENGINE BAR, AND UNIVERSAL JOINT.

This task covers: a. Removal b. Disassembly c. Assembly d. Installation

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Box wrench (item 80, Appx F)

Equipment Conditions
Powerpack removed (para 4-1)

Materials/Parts
Cotter pins (2) (item 88, Appx E)
Cotter pins (4) (item 1, Appx E)
Lockwashers (4) (item 9, Appx E)

NOTE

- Perform Removal steps 1 and 4 and Installation steps 1 and 5 for maintenance of engine mounting bracket.
- Perform Removal steps 1 and 2 and Installation steps 4 and 5 for maintenance of universal joint.
- Perform Removal steps 2 and 3 and Installation steps 2 thru 4 for maintenance of lower engine bar.

a. Removal.

1 Remove cotter pin (1) from universal joint (2). Separate universal joint (2) from tensioning tie rod (3). Discard cotter pin.

2 Remove cotter pin (4) from universal joint (2) and remove universal joint (2) from lower engine bar (5). Discard cotter pin.

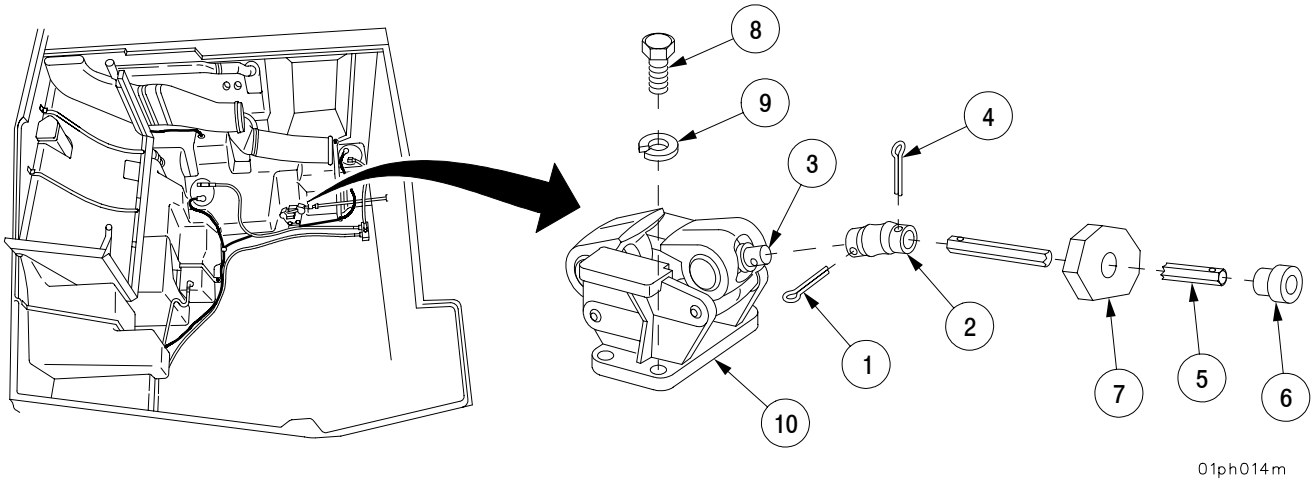
3 Remove lower engine bar (5) and bushing (6) through driver's compartment bulkhead (7). Separate bushing (6) from lower engine bar (5).

4 Remove four screws (8), four lockwashers (9), and engine mounting bracket (10). Discard lockwashers.

Section II. ENGINE ASSEMBLY - CONTINUED

4-3 ENGINE MOUNTING BRACKET, LOWER ENGINE BAR, AND UNIVERSAL JOINT - CONTINUED

a. Removal - Continued



b. Disassembly.

1 Remove four cotter pins (11) and two jaw pins (12) from base (13). Discard cotter pins.

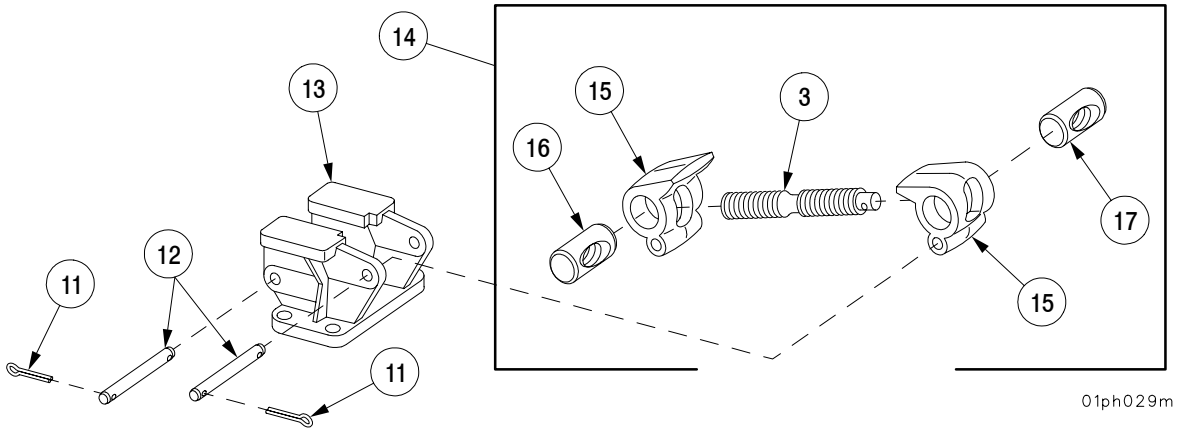
2 Remove jaw assembly (14) from base (13).

NOTE

One end of tensioning tie rod and one nut have left-handed threads.

3 Remove two jaws (15) from tensioning tie rod (3).

4 Remove two nuts (16 and 17) from two jaws (15).



Section II. ENGINE ASSEMBLY - CONTINUED

4-3 ENGINE MOUNTING BRACKET, LOWER ENGINE BAR, AND UNIVERSAL JOINT - CONTINUED

c. Assembly.

1 Install two nuts (16 and 17) in two jaws (15).

CAUTION

Make sure jaws are spaced evenly on tensioning tie rod. Damage to equipment may occur if jaws are not adjusted properly prior to jaw assembly installation.

2 Install two jaws (15) on tensioning tie rod (3).

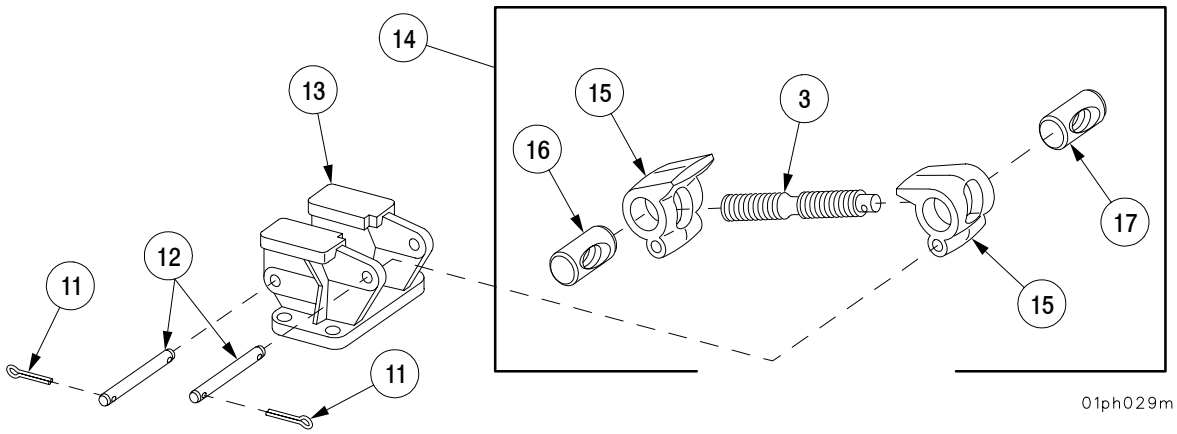
NOTE

Make sure that hex head end of rod is on high side of base.

3 Install jaw assembly (14) in base (13).

4 Install two jaw pins (12) in base (13) and through jaws (15).

5 Install four new cotter pins (11) in jaw pins (12).



Section II. ENGINE ASSEMBLY - CONTINUED

4-3 ENGINE MOUNTING BRACKET, LOWER ENGINE BAR, AND UNIVERSAL JOINT - CONTINUED

d. Installation.

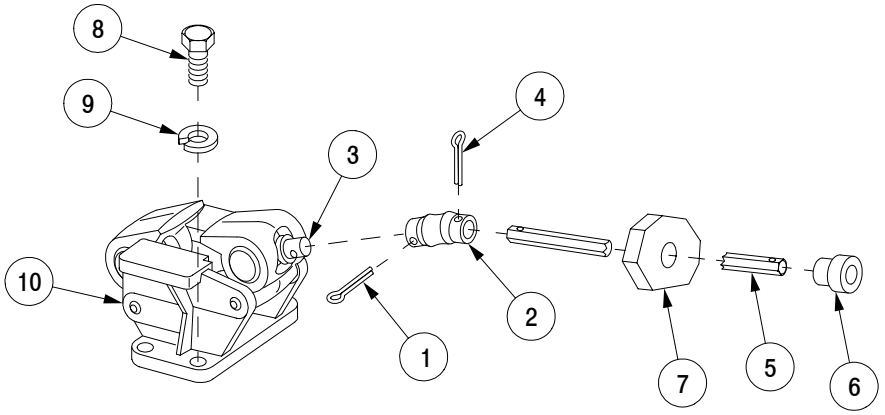
1 Install engine mounting bracket (10) with four screws (8) and four new lockwashers (9).

2 Install bushing (6) on lower engine bar (5).

3 Install lower engine bar (5) through driver's bulkhead (7).

4 Install universal joint (2) on lower engine bar (5) with new cotter pin (4).

5 Install universal joint (2) on tensioning tie rod (3) with new cotter pin (1).



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NOTE

FOLLOW-ON MAINTENANCE:
Install powerpack (para 4-1)

Section II. ENGINE ASSEMBLY - CONTINUED

4-4 FLYWHEEL HOUSING COVER AND GASKET.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)

Materials/Parts
Gasket (item 45, Appx E)
Lockwashers (6) (item 5, Appx E)

Equipment Conditions
Air intake grille open and secured (TM 9-2350-314-10)

References
TM 9-2350-314-10

NOTE

Length of screws will vary. Note length and location of screws to aid in installation.

a. Removal.

1 Remove five screws (1) and five lockwashers (2) from cover (3). Discard lockwashers.

2 Remove screw (4), nut (5), lockwasher (6), flat washer (7), cover (3), and gasket (8). Discard lockwasher and gasket.

b. Installation.

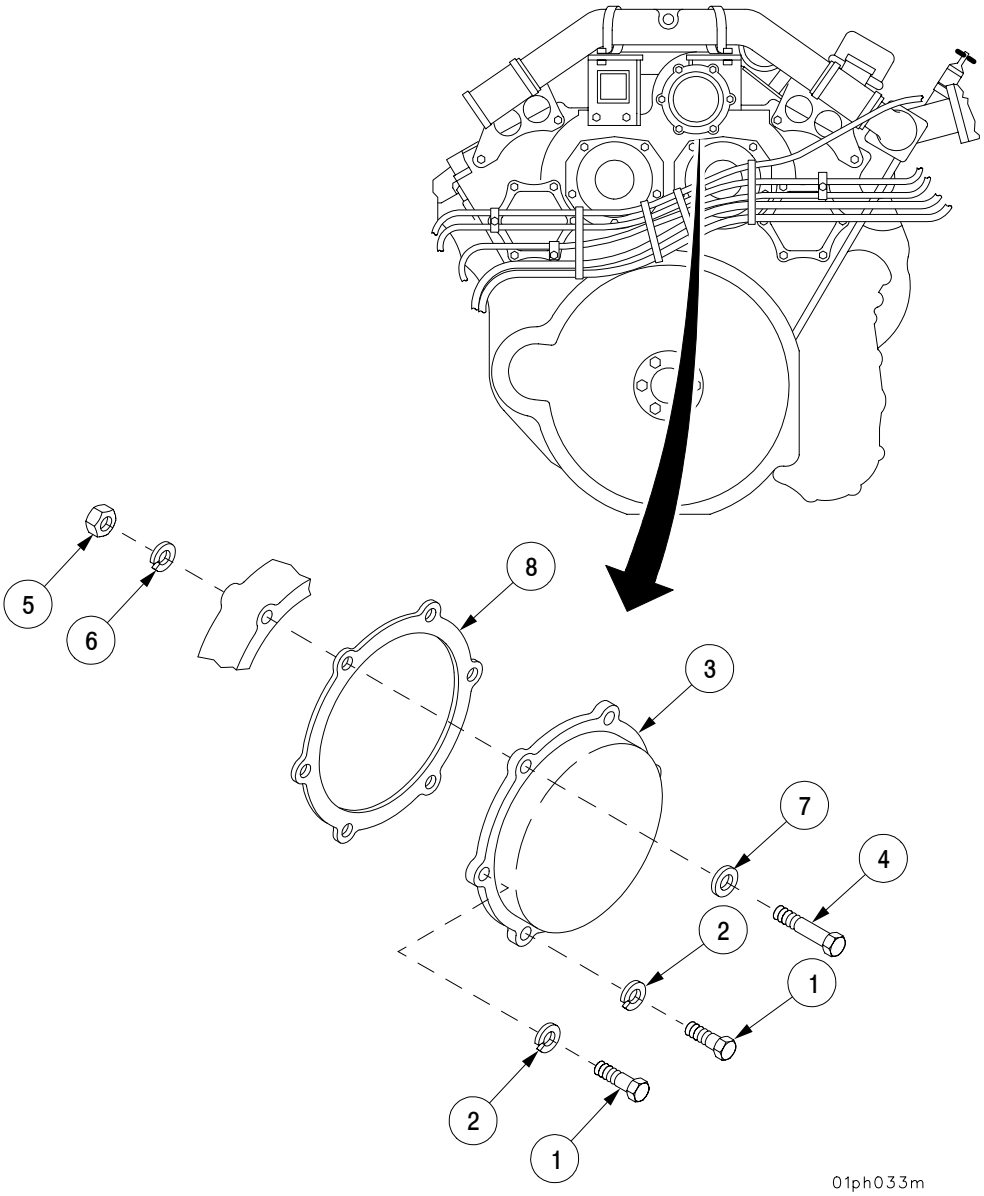
1 Install cover (3) and new gasket (8) with screw (4), flat washer (7), new lockwasher (6), and nut (5).

2 Install five screws (1) with five new lockwashers (2) in cover (3).

Section II. ENGINE ASSEMBLY - CONTINUED

4-4 FLYWHEEL HOUSING COVER AND GASKET - CONTINUED

b. Installation - Continued



NOTE

FOLLOW-ON MAINTENANCE:
Close and secure air intake grille
(TM 9-2350-314-10)

Section II. ENGINE ASSEMBLY - CONTINUED

4-5 BREATHER TUBES.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Equipment Conditions
Air intake grille open and secured
(TM 9-2350-314-10)

Materials/Parts
Tiedown straps (4) (item 90, Appx E)
Tiedown strap (item 167, Appx E)

References
TM 9-2350-314-10

NOTE

- Perform Removal steps 1 and 3 and Installation steps 1 and 3 for maintenance of left bank breather tube.
- Perform Removal steps 1, 2, and 3 and Installation steps 1, 2, and 3 for maintenance of right bank breather tube.

a. Removal.

1 Remove two tiedown straps (1) securing hose (2) to lifting bracket (3) and breather elbow (4). Discard tiedown straps.

2 Remove tiedown strap (5) securing hose (2) to glow plug wiring harness (6). Discard tiedown straps.

3 Remove clamp (7) securing hose (2) to breather retainer (8).

b. Installation.

1 Install hose (2) on breather retainer (8) with clamp (7).

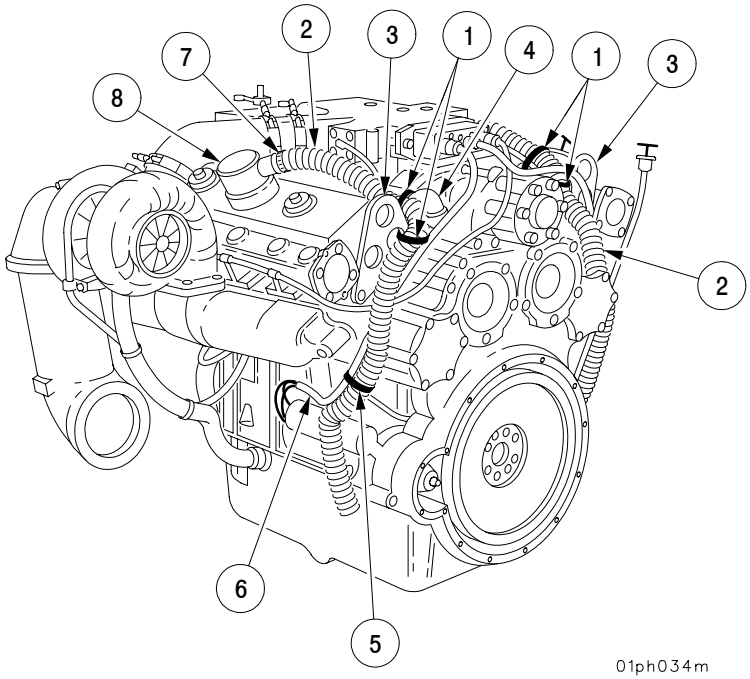
2 Secure hose (2) to glow plug wiring harness (6) with new tiedown strap (5).

3 Secure hose (2) to lifting bracket (3) and breather elbow (4) with two new tiedown straps (1).

Section II. ENGINE ASSEMBLY - CONTINUED

4-5 BREATHER TUBES - CONTINUED

b. Installation - Continued



NOTE

FOLLOW-ON MAINTENANCE:
Close and secure air intake grille
(TM 9-2350-314-10)

Section III. ENGINE LUBRICATION SYSTEM

4-6 ENGINE OIL FILTER LINES, MOUNTING BRACKET, FITTINGS, ENGINE OIL SAMPLING VALVE, AND ENGINE OIL SENSOR FITTINGS.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Materials/Parts
Lockwashers (4) (item 3, Appx E)
Lockwashers (8) (item 4, Appx E)
Preformed packings (2) (item 6, Appx E)
Self-locking nuts (2) (item 7, Appx E)
Lockwashers (4) (item 91, Appx E)
Lockwasher (item 5, Appx E)

Equipment Conditions
Transmission access doors open
(TM 9-2350-314-10)
Air intake grille open and secured
(TM 9-2350-314-10)
Engine oil pressure switch removed
(para 8-47)
In-tank fuel pumps and generator system
relay switch removed (para 8-48)
Engine oil pressure transmitter removed
(para 8-49)
Generator oil cooling line removed at
oil filter (para 8-9)

References
TM 9-2350-314-10

a. Removal.

NOTE

- Remove only those hoses, tubes, and brackets which must be replaced. Use legend reference guide only.
- Tag all hoses, tubes, brackets, and fittings prior to removal to aid in installation.

1 Remove hoses, tubes, brackets, and fittings in accordance with the following legend and illustration.

2 Remove straps, clamps, and attaching hardware securing hoses and tubes to vehicle as shown in legend and illustration. Discard lockwashers, self-locking nuts, and preformed packing.

b. Installation.

1 Install hoses and tubes with straps, clamps, attaching hardware, new lockwashers, new self-locking nuts, and new preformed packing as shown in illustration and legend.

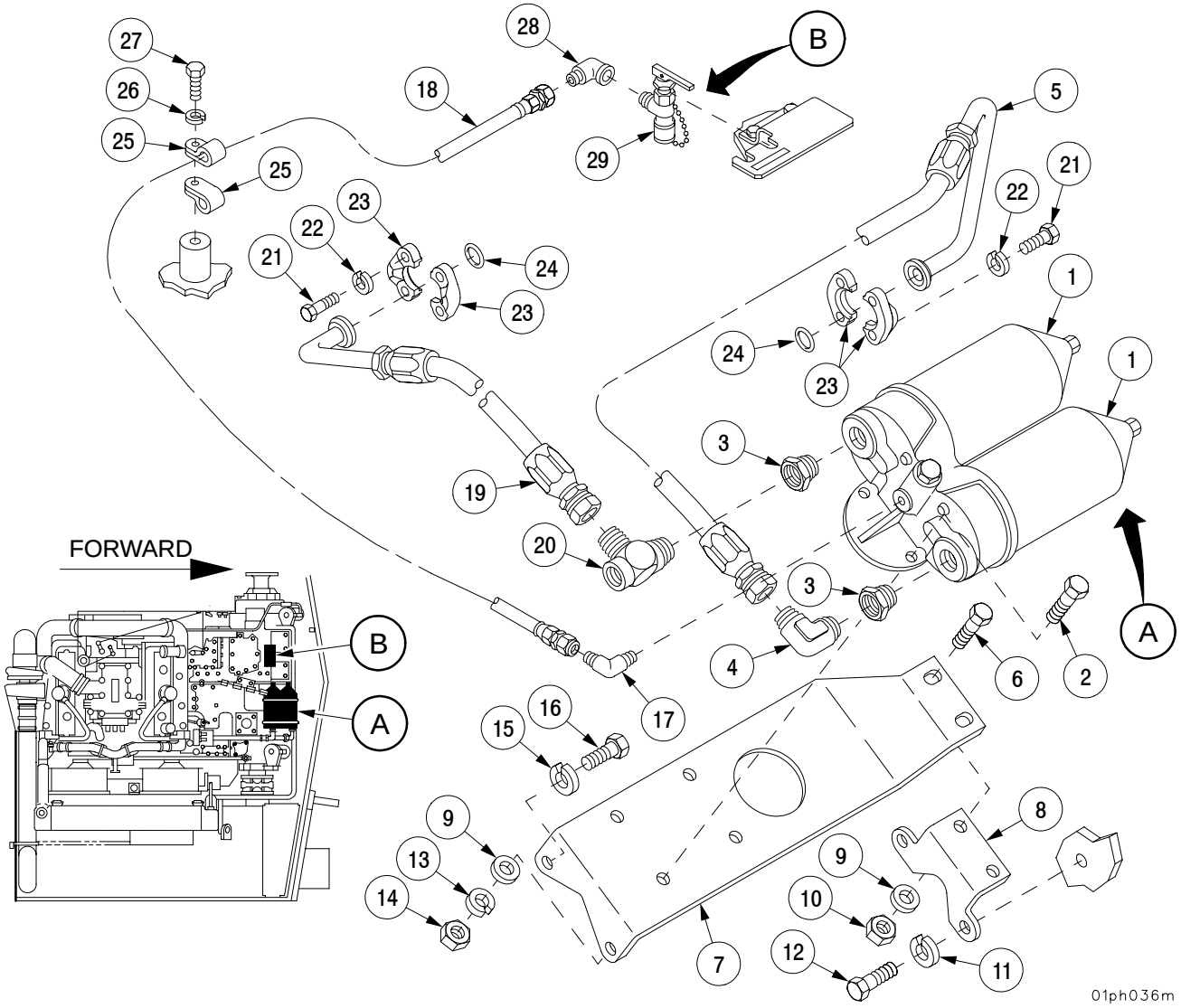
2 Install hoses, tubes, fittings, and brackets in accordance with the following illustration and legend.

Section III. ENGINE LUBRICATION SYSTEM - CONTINUED

4-6 ENGINE OIL FILTER LINES, MOUNTING BRACKET, FITTINGS, ENGINE OIL SAMPLING VALVE, AND ENGINE OIL SENSOR FITTINGS - CONTINUED

b. Installation - Continued

1. Oil Filters (para 4-7)
2. Screws (4)
3. Pipe Bushings (2)
4. Elbow
5. Hose Assembly (para 4-1)
6. Screws (2)
7. Mounting Bracket
8. Angle Bracket
9. Flat Washers (6)
10. Self-Locking Nuts (2)
11. Lockwashers (2)
12. Screws (2)
13. Lockwashers (4)
14. Nuts (4)
15. Lockwashers (2)
16. Screws (2)
17. Elbow
18. Hose Assembly
19. Hose Assembly (para 4-1)
20. Tee
21. Screws (8)
22. Lockwashers (8)
23. Pipe Flanges (4)
24. Preformed Packings (2)
25. Clamps (2)
26. Lockwasher
27. Screw
28. Elbow
29. Valve

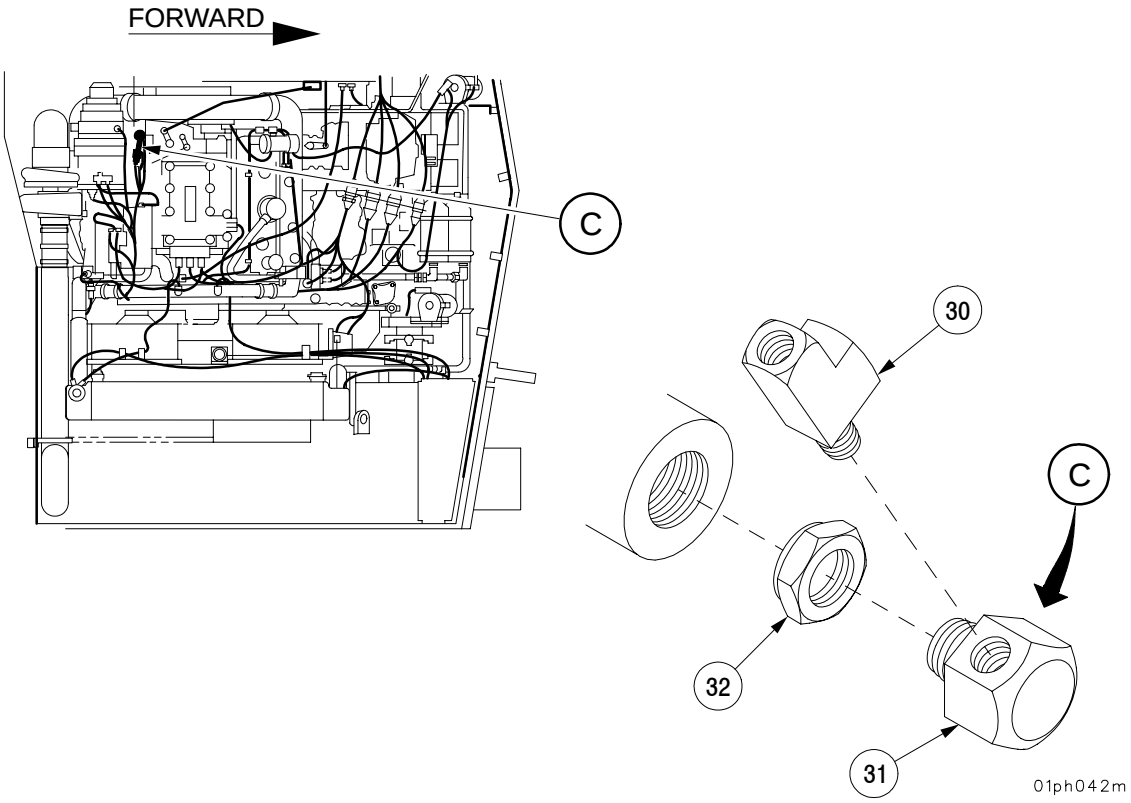


Section III. ENGINE LUBRICATION SYSTEM - CONTINUED

4-6 ENGINE OIL FILTER LINES, MOUNTING BRACKET, FITTINGS, ENGINE OIL SAMPLING VALVE, AND ENGINE OIL SENSOR FITTINGS - CONTINUED

b. Installation - Continued

30. Tee
31. Cluster Fitting
32. Pipe Nut



NOTE

FOLLOW-ON MAINTENANCE:
Install engine oil pressure transmitter (para 8-49)
Install In-tank fuel pumps and generator system relay switch (para 8-48)
Install engine oil pressure switch (para 8-47)
Close and secure air intake grille (TM 9-2350-314-10)
Close and secure transmission access doors (TM 9-2350-314-10)
Install generator oil cooling line to oil filter (para 8-9)

Section III. ENGINE LUBRICATION SYSTEM - CONTINUED

4-7 ENGINE OIL FILTER.

This task covers: a. Removal b. Disassembly c. Assembly d. Installation

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Torque wrench (item 86, Appx F)
Suitable container

Materials/Parts
Lockwashers (4) (item 3, Appx E)
Gaskets (2) (item 96, Appx E)
Preformed packings (2) (item 99, Appx E)
Gasket sets (2) (item 98, Appx E)
Retaining rings (2) (item 100, Appx E)
Gaskets (2) (item 97, Appx E)

Equipment Conditions
Transmission access doors open (TM 9-2350-314-10)
Generator oil cooling line at oil filter disconnected (para 8-9)

References
TM 9-2350-314-10

Section III. ENGINE LUBRICATION SYSTEM - CONTINUED

4-7 ENGINE OIL FILTER - CONTINUED

a. Removal.

1 Remove two drain plugs (1) and drain oil from two oil filters (2) into suitable container.

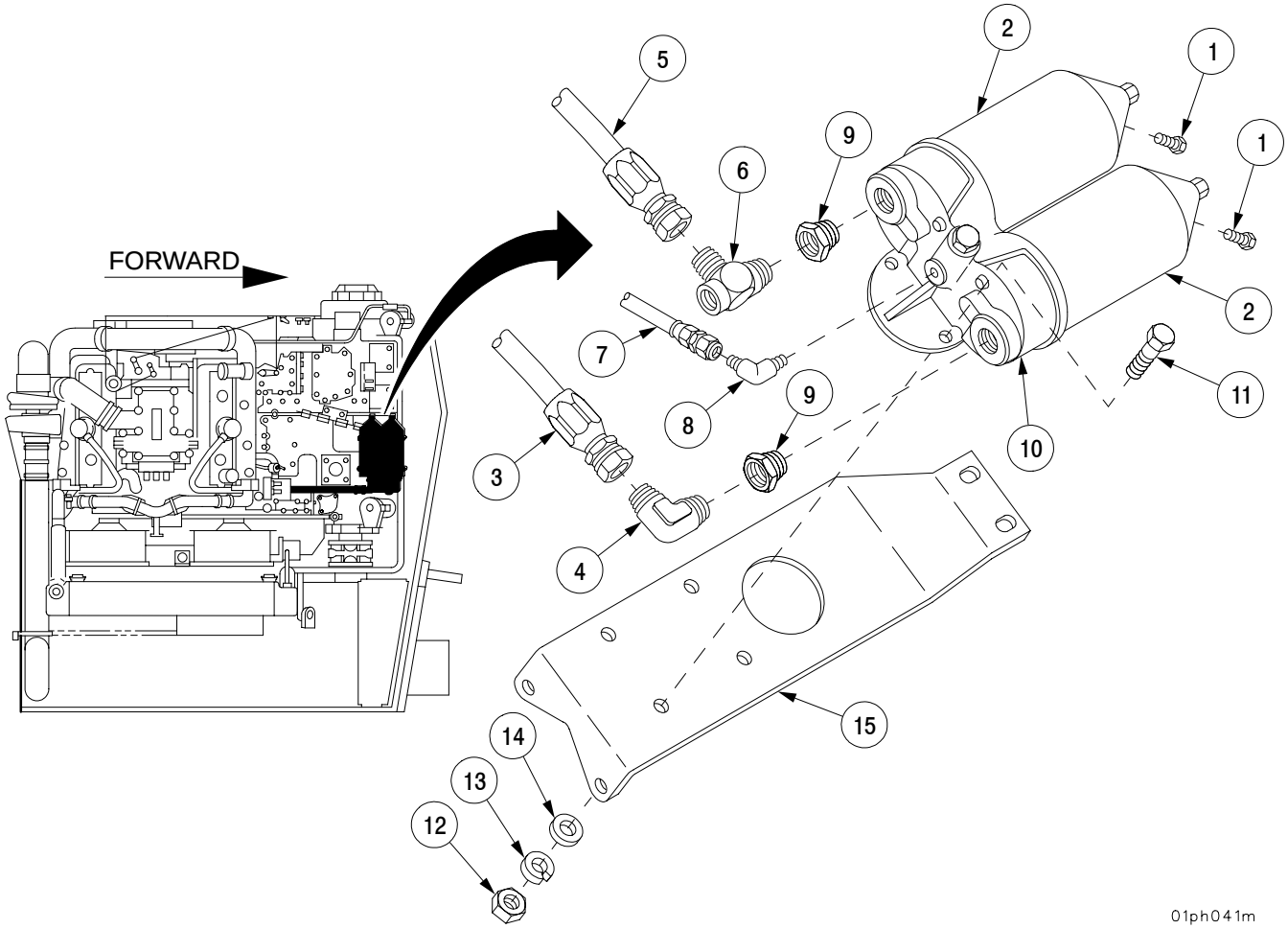
2 Disconnect hose (3) from elbow (4) and hose (5) from tee (6).

3 Disconnect hose (7) from elbow (8).

4 Remove elbow (4), tee (6), and two bushings (9) from filter adapter (10).

5 Remove elbow (8) from filter adapter (10).

6 Remove four screws (11), four nuts (12), four lockwashers (13), four flat washers (14), two oil filters (2), and filter adapter (10) from bracket (15). Discard lockwashers.



Section III. ENGINE LUBRICATION SYSTEM - CONTINUED

4-7 ENGINE OIL FILTER - CONTINUED

b. Disassembly.

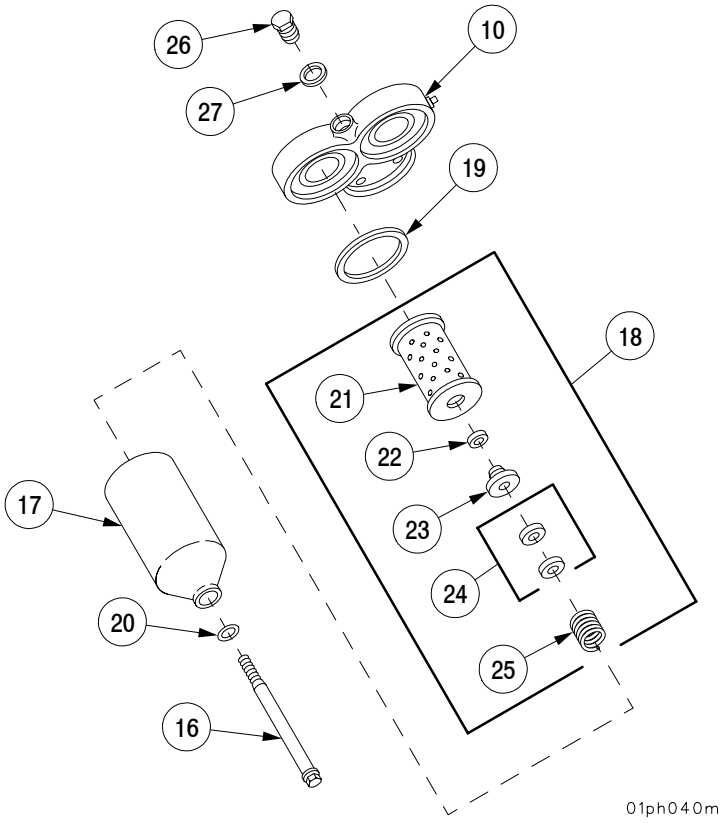
NOTE

- Both oil filters are disassembled and assembled in the same manner.
- This task disassembles and assembles only one oil filter.

1 Unscrew center stud (16) and remove cover (17) with filter element assembly (18) and gasket (19) from filter adapter (10). Discard gasket.

2 Remove center stud (16), preformed packing (20), filter element (21), retaining ring (22), retainer (23), gasket set (24), and spring (25) from cover (17). Discard gasket set, preformed packing, and retaining ring.

3 Remove plug (26) and gasket (27). Discard gasket.



Section III. ENGINE LUBRICATION SYSTEM - CONTINUED

4-7 ENGINE OIL FILTER - CONTINUED

c. Assembly.

1 Install center stud (16) with new preformed packing (20) into cover (17).

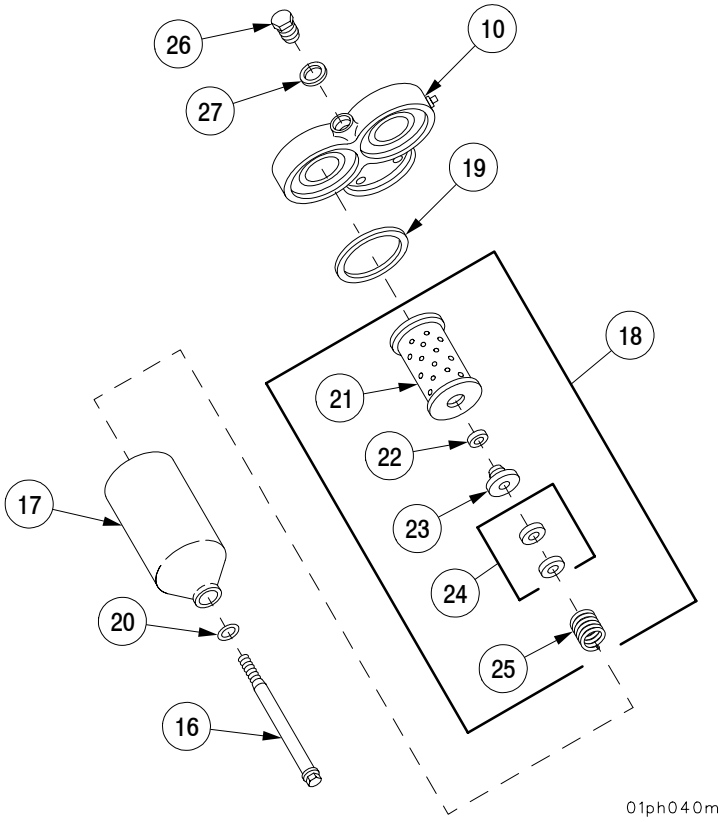
2 Install spring (25), new gasket set (24), retainer (23), new retaining ring (22), and filter element (21) on center stud (16).

NOTE

To allow for proper draining of oil filter, the plug must be installed with the drain plug hole positioned downward.

3 Install cover (17) with filter element assembly (18) and new gasket (19) on filter adapter (10). Torque center stud to 40-50 lb-ft (54-68 N·m).

4 Install plug (26) and new gasket (27).



Section III. ENGINE LUBRICATION SYSTEM - CONTINUED

4-7 ENGINE OIL FILTER - CONTINUED

d. Installation.

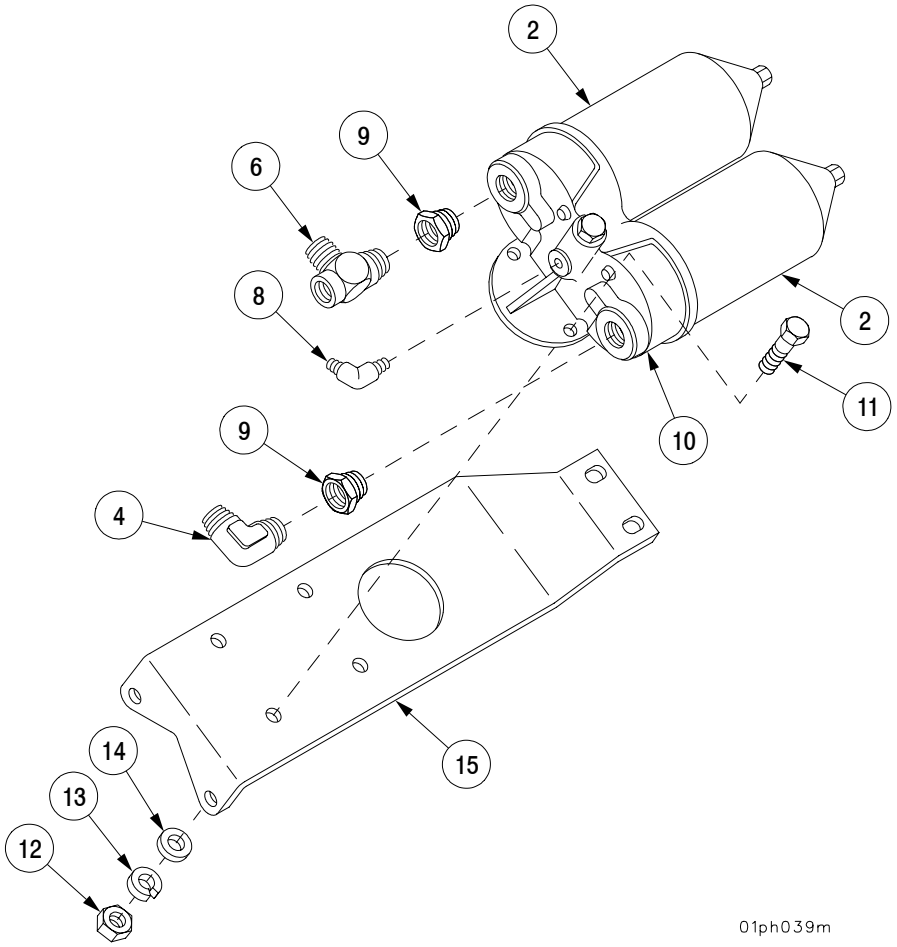
1 Install two oil filters (2) with filter adapter (10) on filter bracket (15) with four screws (11), four flat washers (14), four new lockwashers (13), and four nuts (12).

NOTE

Before elbow can be installed in filter adapter, remove and discard shipping plug.

2 Install elbow (8) in filter adapter (10).

3 Install two bushings (9), elbow (4), and tee (6) in filter adapter (10).



Section III. ENGINE LUBRICATION SYSTEM - CONTINUED

4-7 ENGINE OIL FILTER - CONTINUED

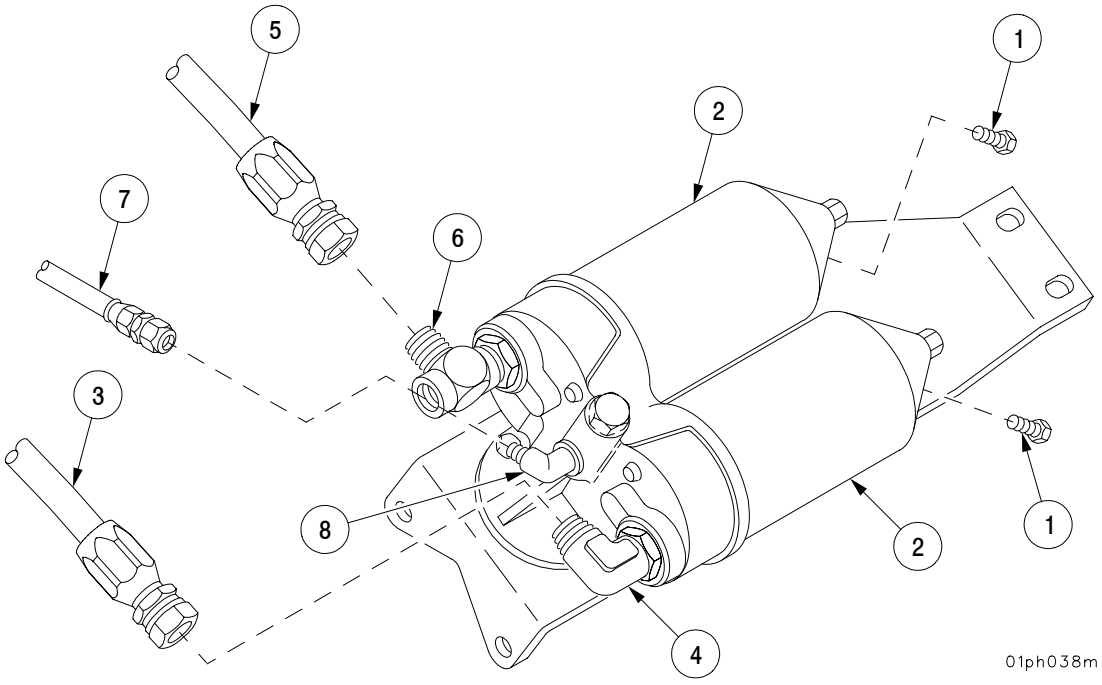
d. Installation - Continued

4 Connect hose (7) to elbow (8).

5 Connect hose (3) to elbow (4) and hose (5) to tee (6).

6 Install two drain plugs (1) in two filters (2).

7 Check engine oil level (TM 9-2350-314-10).



NOTE

FOLLOW-ON MAINTENANCE:
Close and secure transmission access doors (TM 9-2350-314-10)
Connect generator oil cooling line at oil filter (para 8-9)

CHAPTER 5
FUEL SYSTEM

GENERAL

This chapter illustrates and defines procedures for removal, disassembly, assembly, installation, and service of the fuel system, turbocharger, air cleaners, and accelerator, throttle, or choke controls, and related components.

CONTENTS

Section I. FUEL PUMPS

5-1 RIGHT AND LEFT FUEL PUMP AND HANGER ASSEMBLIES.

This task covers: a. Removal b. Inspection c. Disassembly
d. Assembly e. Installation

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Multimeter (item 38, Appx F)

Materials/Parts
Gasket (item 101, Appx E)
Gasket (item 240, Appx E)
Gasket (item 221, Appx E)
Lockwashers (3) (item 48, Appx E)
Lockwashers (4) (item 314, Appx E)
Preformed packing (item 251, Appx E)
Lockwasher (item 315, Appx E)
Compression sleeve (right fuel pump) (item 216, Appx E)

Equipment Conditions
Vehicle MASTER switch OFF (TM 9-2350-314-10)
Powerpack removed (right fuel pump only) (para 4-1)
Fuel tanks drained (TM 9-2350-314-10)
Engine compartment access cover removed (left fuel pump only) (para 16-7)

References
TM 9-2350-314-10

NOTE

- Two fuel pump and hanger assemblies are installed in the fuel system.
- Both fuel pump and hanger assemblies are removed and installed in the same manner. This task removes only one.

a. Removal.

WARNING

Do not smoke or use open flame when working on fuel systems. An explosion may occur, causing serious injury or death.

1 Disconnect electrical wiring harness W113 connector P4 or P5 (1) from fuel pump and hanger assembly (2).

2 Remove fuel hose (3) from check valve (4).

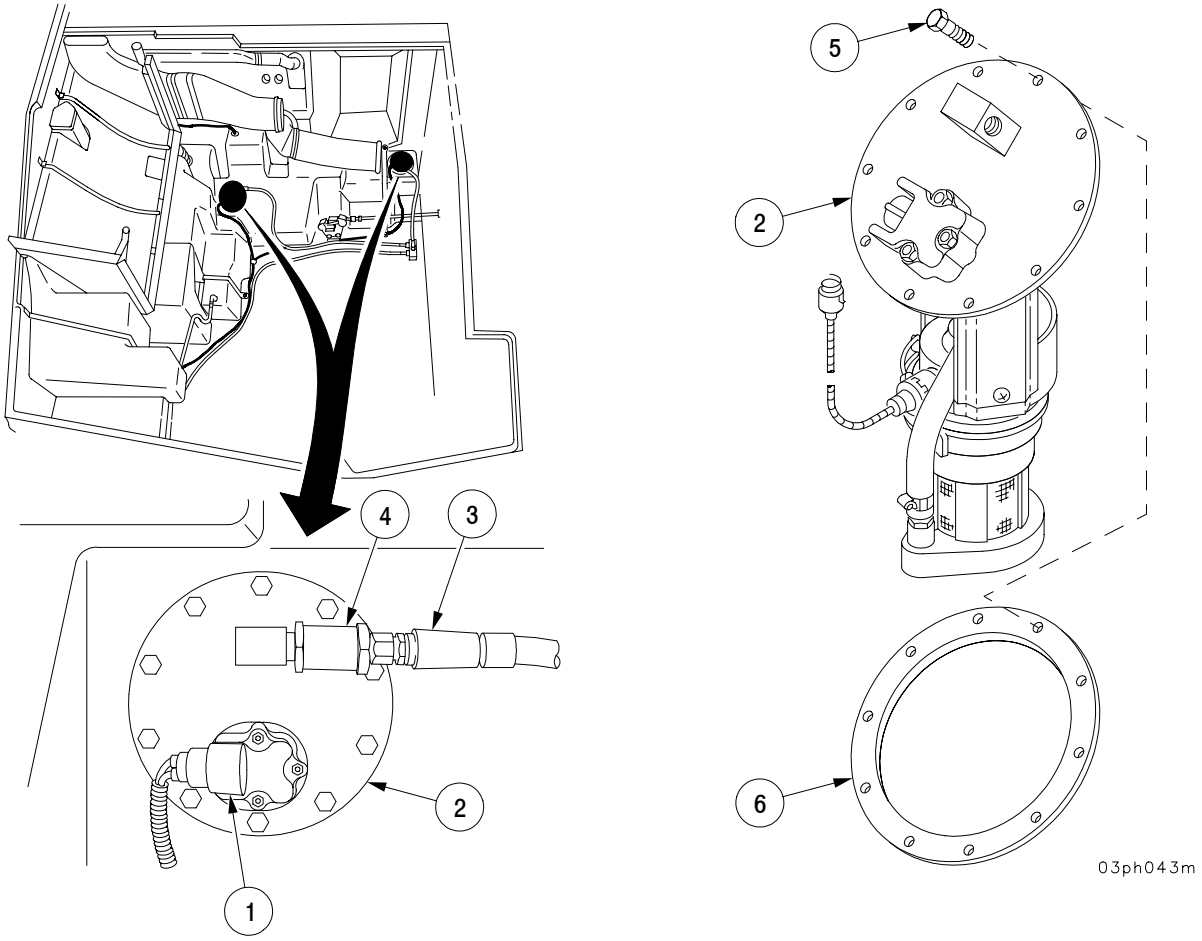
3 Remove check valve (4) from fuel pump and hanger assembly (2).

4 Remove ten screws (5), fuel pump and hanger assembly (2), and gasket (6). Discard gasket.

Section I. FUEL PUMPS - CONTINUED

5-1 RIGHT AND LEFT FUEL PUMP AND HANGER ASSEMBLIES - CONTINUED

a. Removal - Continued



Section I. FUEL PUMPS - CONTINUED

5-1 RIGHT AND LEFT FUEL PUMP AND HANGER ASSEMBLIES - CONTINUED

b. Inspection.

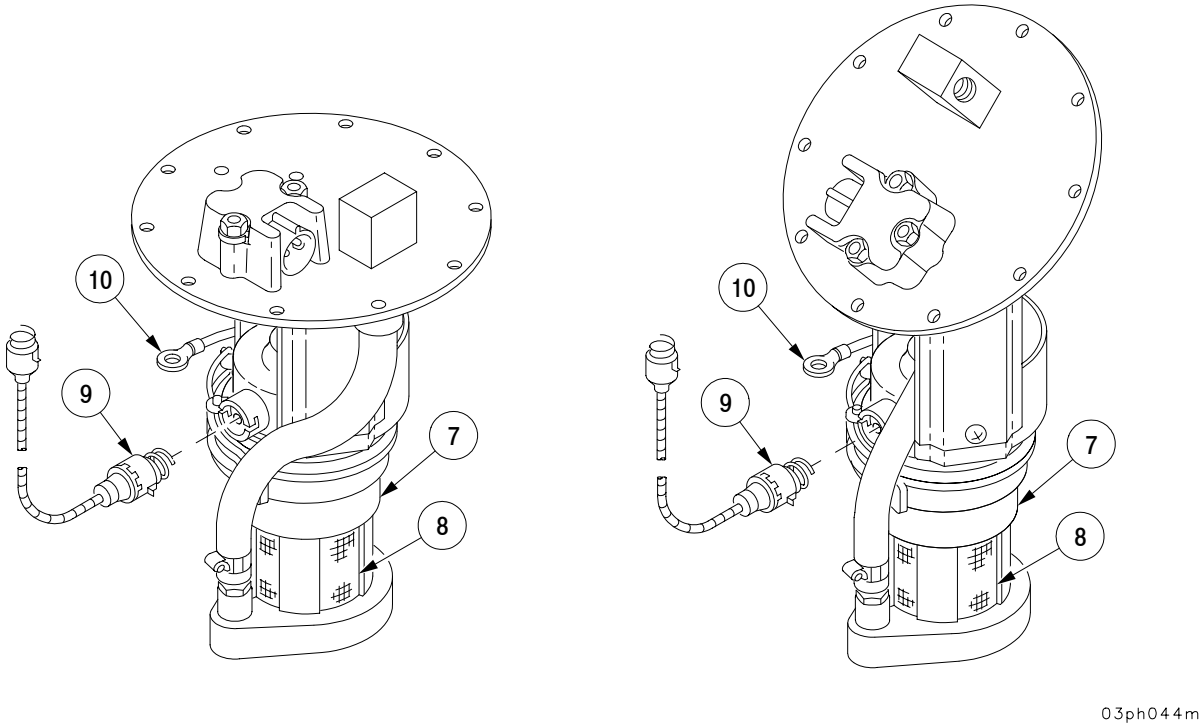
1 Inspect fuel pump housing (7). Replace if damaged or defective.

2 Inspect fuel pump inlet screens (8). Clean if clogged.

3 Inspect electrical cable (9). Replace if frayed or damaged.

4 Disconnect and test electrical cable (9) for continuity (para 3-1.3). Replace if shorted or defective.

5 Test ground lead (10) for continuity (para 3-1.3). Replace if defective.



LEFT FUEL PUMP

RIGHT FUEL PUMP

Section I. FUEL PUMPS - CONTINUED

5-1 RIGHT AND LEFT FUEL PUMP AND HANGER ASSEMBLIES - CONTINUED

b. Inspection - Continued

6 Inspect connector assembly (11). Replace if damaged or deteriorated.

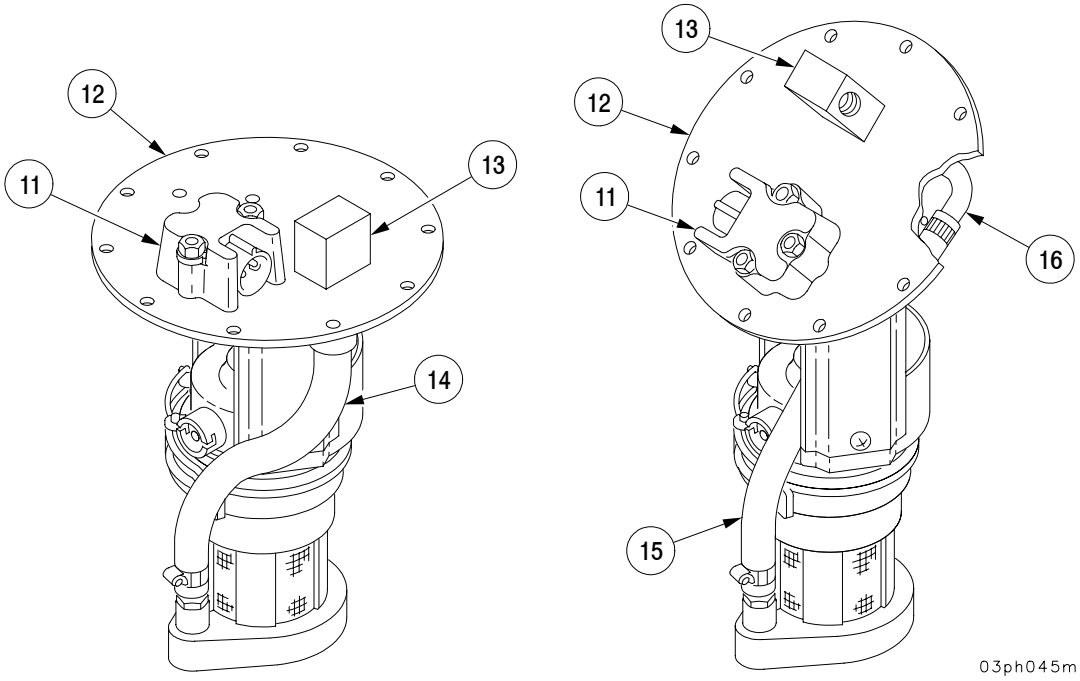
7 Test connector assembly (11) for continuity. Replace if shorted or defective.

8 Inspect access cover (12). Replace if damaged or defective.

9 Inspect discharge fitting (13). Replace if damaged or defective.

10 Inspect hose (14 and 15) and tube (16). Replace if cracked or deteriorated.

11 Inspect all other components for damage. Replace if damaged.



LEFT FUEL PUMP

RIGHT FUEL PUMP

Section I. FUEL PUMPS - CONTINUED

5-1 RIGHT AND LEFT FUEL PUMP AND HANGER ASSEMBLIES - CONTINUED

c. Disassembly.

NOTE

- Left and right fuel pumps have the same basic components and are disassembled in the same sequence. The right fuel pump has a canted access cover.
- Perform Disassembly steps 1, 2, 4, 5, 7, and 8 and Assembly steps 1, 2, 4, 5, and 7 thru 9 for maintenance of left fuel pump.
- Perform Disassembly steps 1, 3, 4, and 6 thru 8, and Assembly steps 1, 3, 5, 6, 8, and 9 for maintenance of right fuel pump.

1 Remove three nuts (17), three lockwashers (18), connector assembly (11), gasket (19), plate (20), and gasket (21) from access cover (12). Discard lockwashers and gaskets.

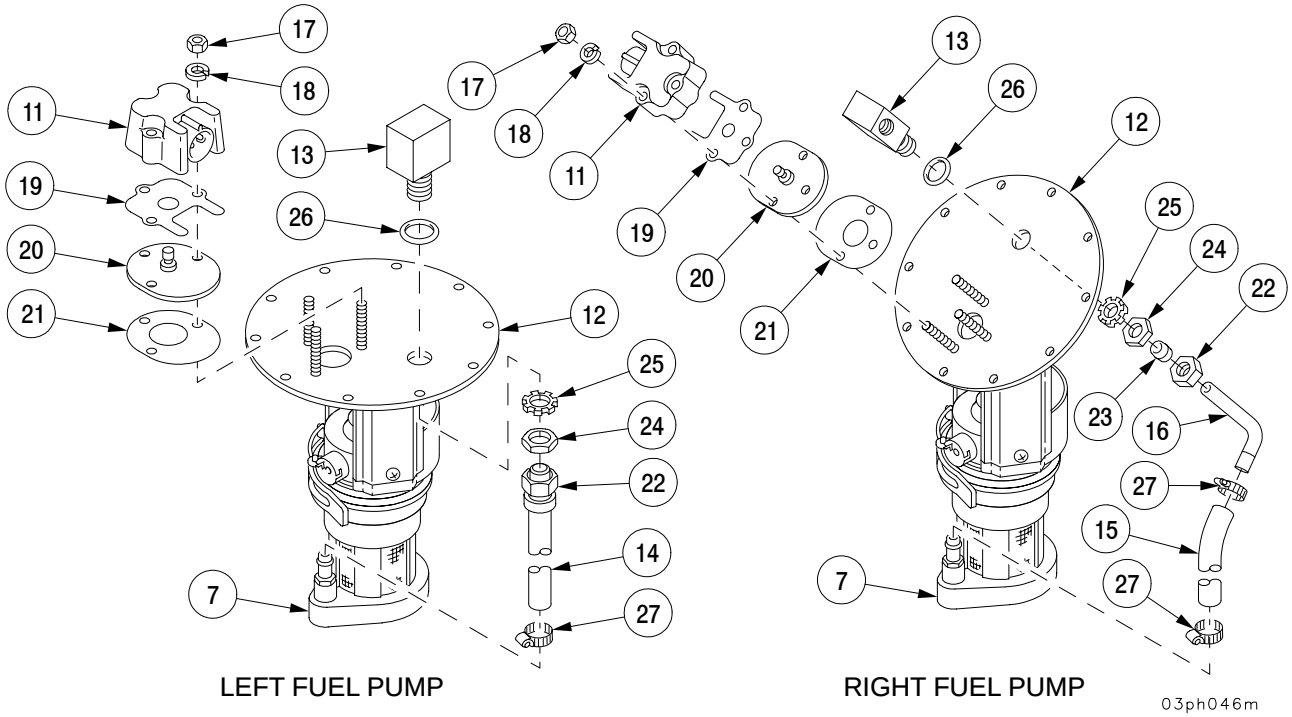
2 Remove nut (22) from discharge fitting (13). (Left fuel pump).

3 Remove nut (22), sleeve (23), and tube (16) from discharge fitting (13). Discard sleeve. (Right fuel pump).

4 Remove nut (24), lockwasher (25), preformed packing (26), and discharge fitting (13) from access cover (12). Discard preformed packing and lockwasher.

5 Remove clamp (27) and hose (14 or 15) from fuel pump (7).

6 Remove clamp (27) and separate hose (15) from tube (16).



Section I. FUEL PUMPS - CONTINUED

5-1 RIGHT AND LEFT FUEL PUMP AND HANGER ASSEMBLIES - CONTINUED

c. Disassembly - Continued

7 Open latch (28) and separate fuel pump (7) and access cover (12).

NOTE

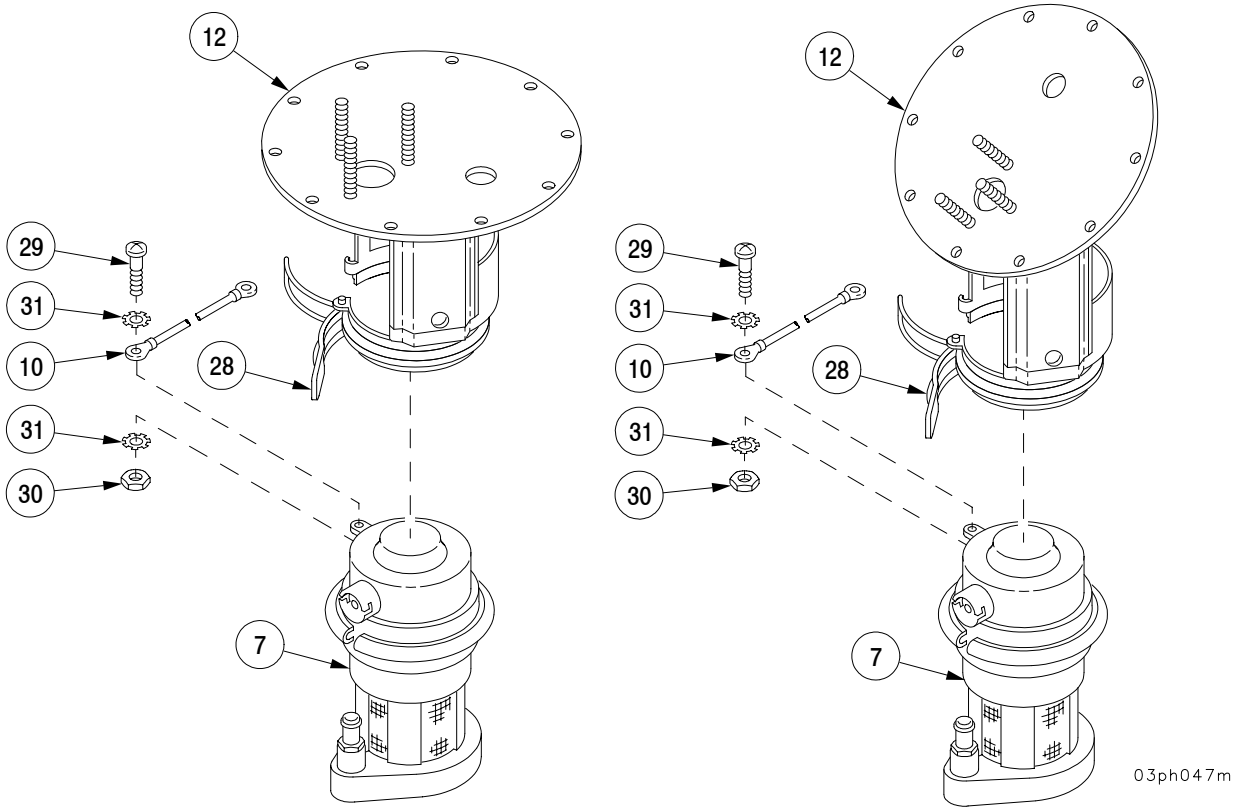
No further disassembly of the fuel pump is possible. If fuel pump is defective, replace pump.

8 Remove two screws (29), two nuts (30), four lockwashers (31), and ground lead (10) from access cover (12) and fuel pump (7). Discard lockwashers.

d. Assembly.

1 Install ground lead (10) on access cover (12) and fuel pump (7) with two screws (29), four new lockwashers (31), and two nuts (30).

2 Install fuel pump (7) in access cover (12) and close latch (28).



LEFT FUEL PUMP

RIGHT FUEL PUMP

Section I. FUEL PUMPS - CONTINUED

5-1 RIGHT AND LEFT FUEL PUMP AND HANGER ASSEMBLIES - CONTINUED

d. Assembly - Continued

3 Install hose (15) on tube (16) with clamp (27).

4 Install hose (14 or 15) on fuel pump (7) with clamp (27).

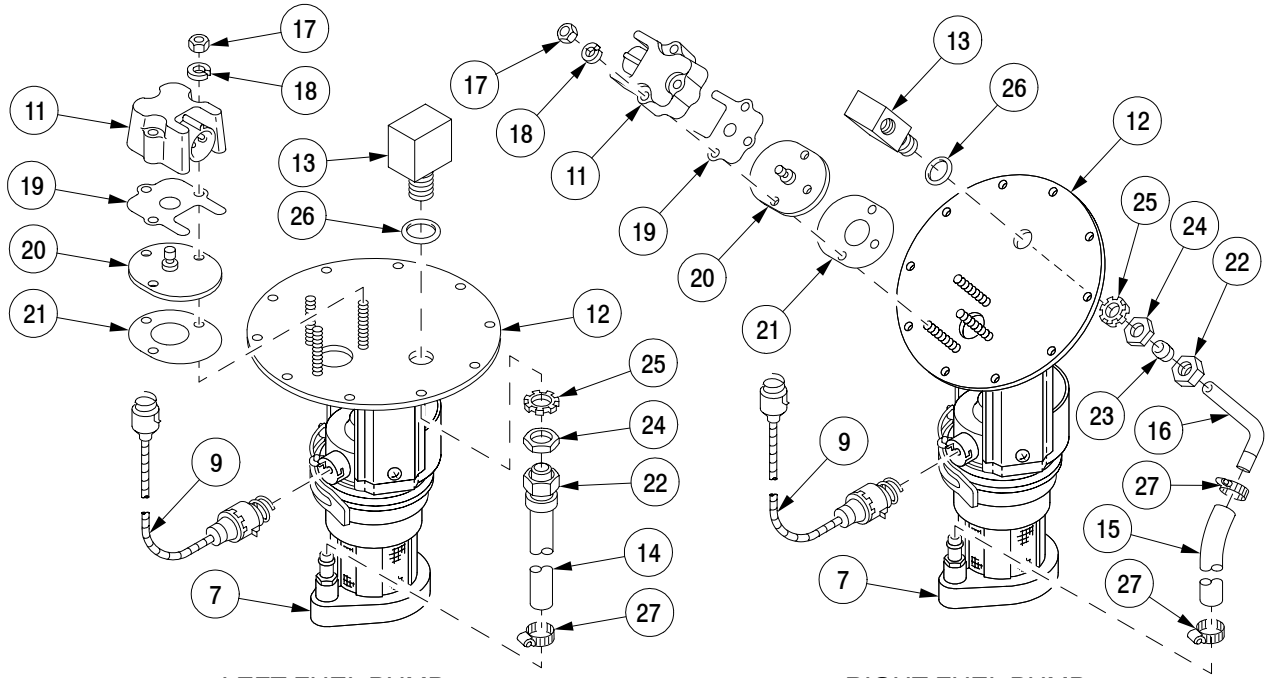
5 Install discharge fitting (13) on access cover (12) with new preformed packing (26), new lockwasher (25), and nut (24).

6 Install new sleeve (23) and tube (16) on discharge fitting (13) with nut (22). (Right fuel pump).

7 Install hose (14) on discharge fitting (13) with nut (22). (Left fuel pump).

8 Install new gasket (21), plate (20), new gasket (19), and connector assembly (11) with three new lockwashers (18) and three nuts (17) on access cover (12).

9 Connect shielded electrical cable (9) to connector assembly (11) and fuel pump (7).



Section I. FUEL PUMPS - CONTINUED

5-1 RIGHT AND LEFT FUEL PUMP AND HANGER ASSEMBLIES - CONTINUED

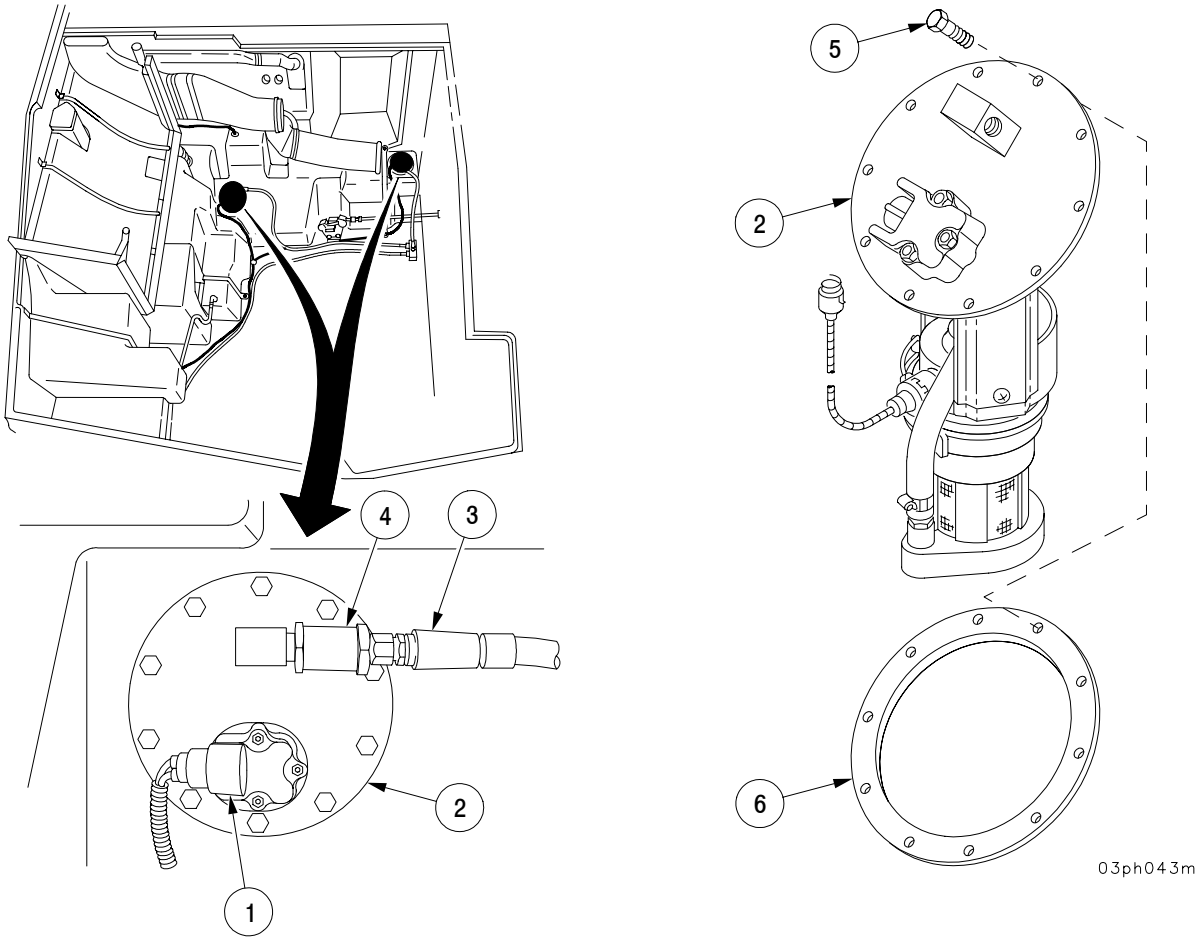
e. Installation.

1 Install fuel pump and hanger assembly (2) and new gasket (6) with ten screws (5).

2 Install check valve (4) in fuel pump and hanger assembly (2).

3 Install fuel hose (3) in check valve (4).

4 Connect wiring harness W113 connector P4 or P5 (1) to fuel pump and hanger assembly (2).



NOTE

FOLLOW-ON MAINTENANCE:
Install engine compartment access cover (left fuel pump only) (para 16-7)
Install powerpack (right fuel pump only) (para 4-1)
Fill fuel tanks (TM 9-2350-314-10)

Section I. FUEL PUMPS - CONTINUED

5-2 MECHANICAL FUEL PUMP.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC-5180-90-N26)
Torque wrench (item 84, Appx F)

Equipment Conditions
Front slope plate removed
(para 16-30)

Materials/Parts
Gasket (item 102, Appx E)

a. Removal.

WARNING

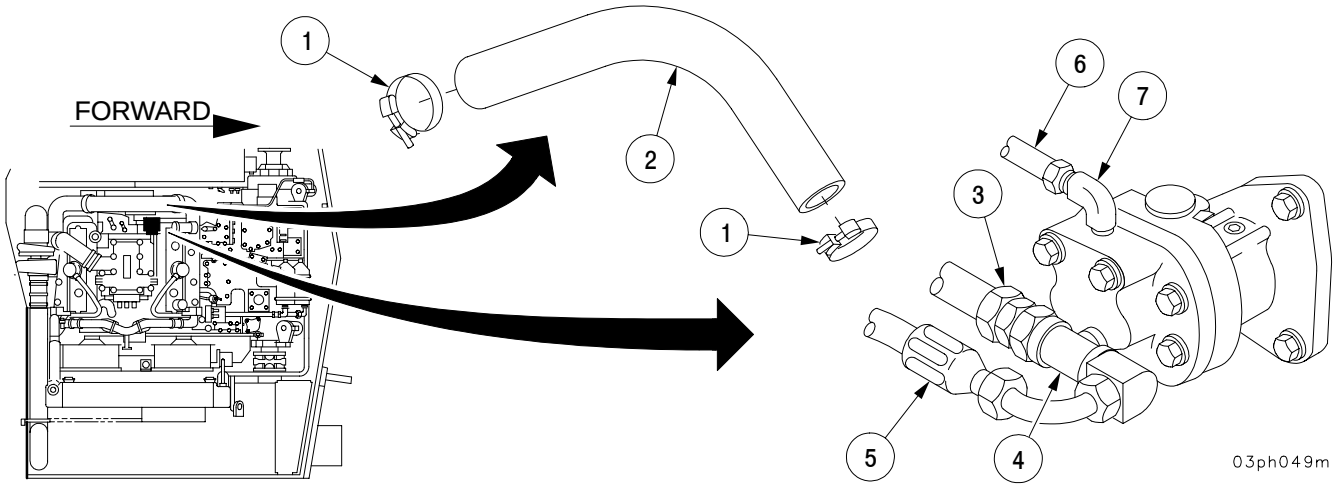
Do not smoke or use open flame when working on fuel system. An explosion may occur, causing severe injury or death.

1 Loosen two exhaust clamps (1) and remove exhaust crossover tube (2).

2 Disconnect primary filter-to-mechanical fuel pump tube (3) at tee (4).

3 Disconnect mechanical fuel pump to electric fuel pump hose (5) at tee (4).

4 Disconnect mechanical fuel pump to secondary filter tube (6) at elbow (7).



Section I. FUEL PUMPS - CONTINUED

5-2 MECHANICAL FUEL PUMP - CONTINUED

a. Removal - Continued

5 Remove three bolts (8), mechanical fuel pump assembly (9), and gasket (10). Discard gasket.

6 Remove coupling fork (11) from drive shaft (12).

7 Remove tee (4) and elbow (7) from mechanical fuel pump assembly (9).

b. Installation.

1 Install elbow (7) and tee (4) on mechanical fuel pump assembly (9).

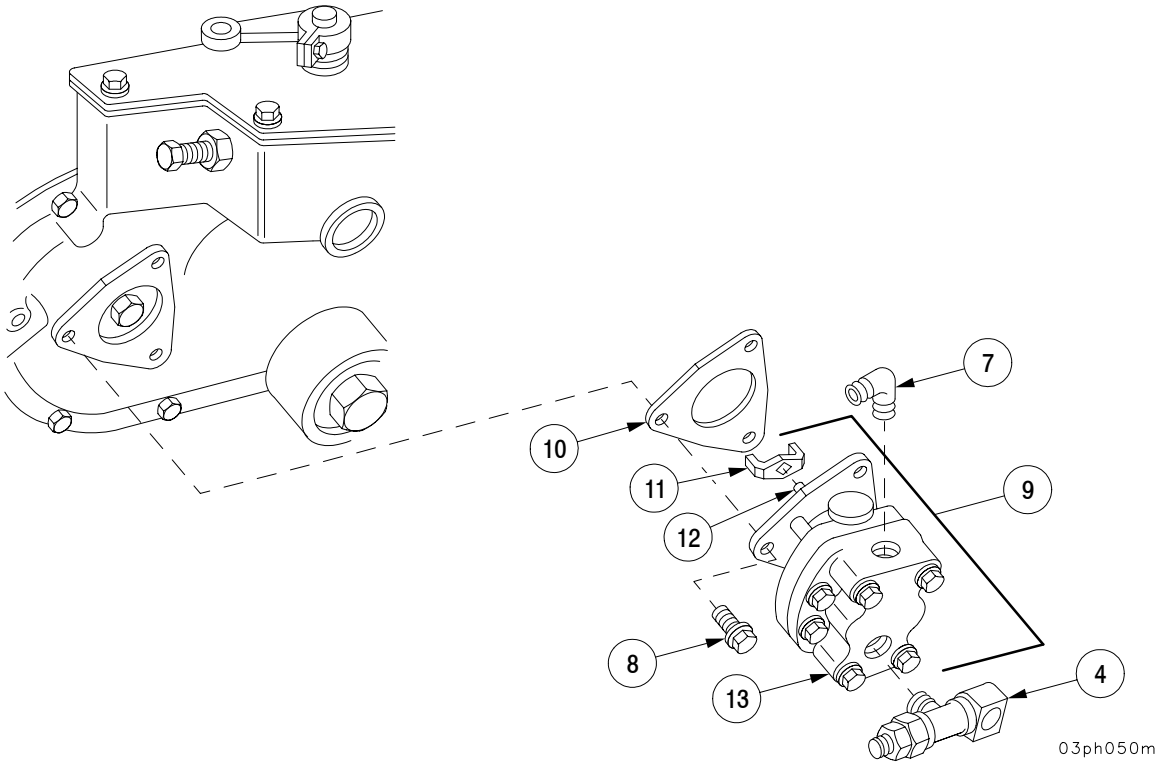
2 Install new gasket (10) on mechanical fuel pump assembly (9).

3 Install coupling fork (11) on drive shaft (12).

4 Position inlet port on pump body cover (13) (marked “L.H.IN”) facing down.

NOTE

Make sure coupling fork is aligned with contact slot in drive disc.



Section I. FUEL PUMPS - CONTINUED

5-2 MECHANICAL FUEL PUMP - CONTINUED

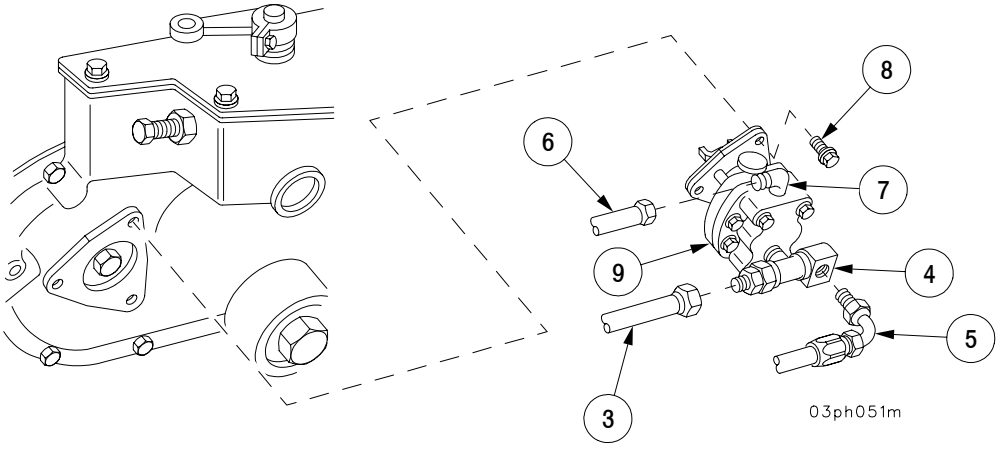
b. Installation - Continued

5 Install mechanical fuel pump assembly (9) with three bolts (8). Torque bolts to 13-17 lb-ft (18-23 N·m).

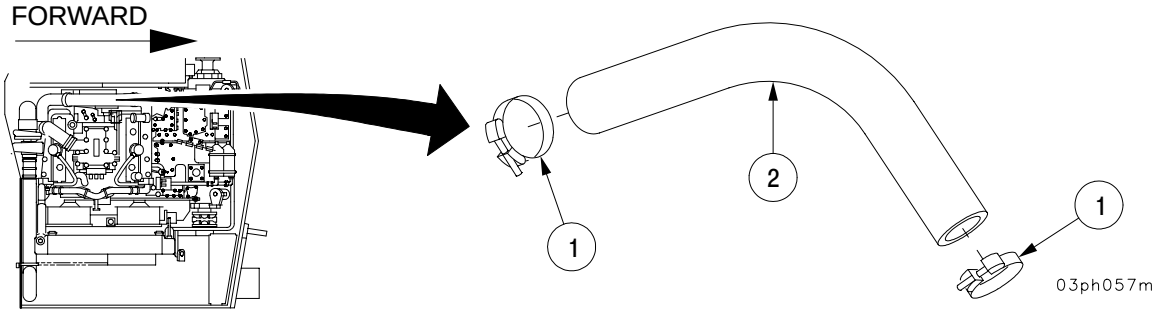
6 Connect mechanical fuel pump-to-secondary filter tube (6) at elbow (7).

7 Connect mechanical fuel pump-to-electric fuel pump hose (5) at tee (4).

8 Connect primary filter-to-mechanical fuel pump tube (3) at tee (4).



9 Install exhaust crossover tube (2) and tighten two exhaust clamps (1).



NOTE

FOLLOW-ON MAINTENANCE:
Install front slope plate (para 16-30)

Section I. FUEL PUMPS - CONTINUED

5-3 MECHANICAL FUEL PUMP RELIEF VALVE.

This task covers: Servicing

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Torque wrench (item 86, Appx F)

Equipment Conditions
Mechanical fuel pump removed
(para 5-2)

Materials/Parts
Gasket (item 103, Appx E)
Dry-cleaning solvent (item 59, Appx C)
Lubricating oil (item 30, Appx C)

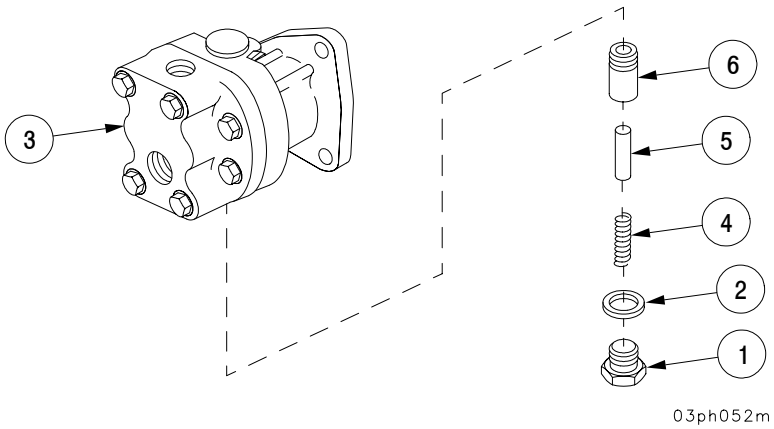
Servicing.

WARNING

Do not smoke or use open flame when working on fuel systems. An explosion may occur, causing severe injury or death.

1 Remove plug (1) and gasket (2) from mechanical fuel pump (3). Discard gasket.

2 Remove spring (4), pin (5), and valve (6) from mechanical fuel pump (3).



Section I. FUEL PUMPS - CONTINUED

5-3 MECHANICAL FUEL PUMP RELIEF VALVE - CONTINUED

Servicing - Continued

WARNING

Dry-cleaning solvent (P-D-680) is toxic and flamable. To avoid injury, wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause SERIOUS INJURY. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (FM 21-11).

3 Wash valve (6), pin (5), and spring (4) with dry-cleaning solvent.

WARNING

- Compressed air used for cleaning purposes will not exceed 30 psi (207 kpa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.)
- Air pressure may create airborne debris. Use eye protection or injury to personnel may result.

4 Blow out fuel pump valve port (7) with compressed air.

Section I. FUEL PUMPS - CONTINUED

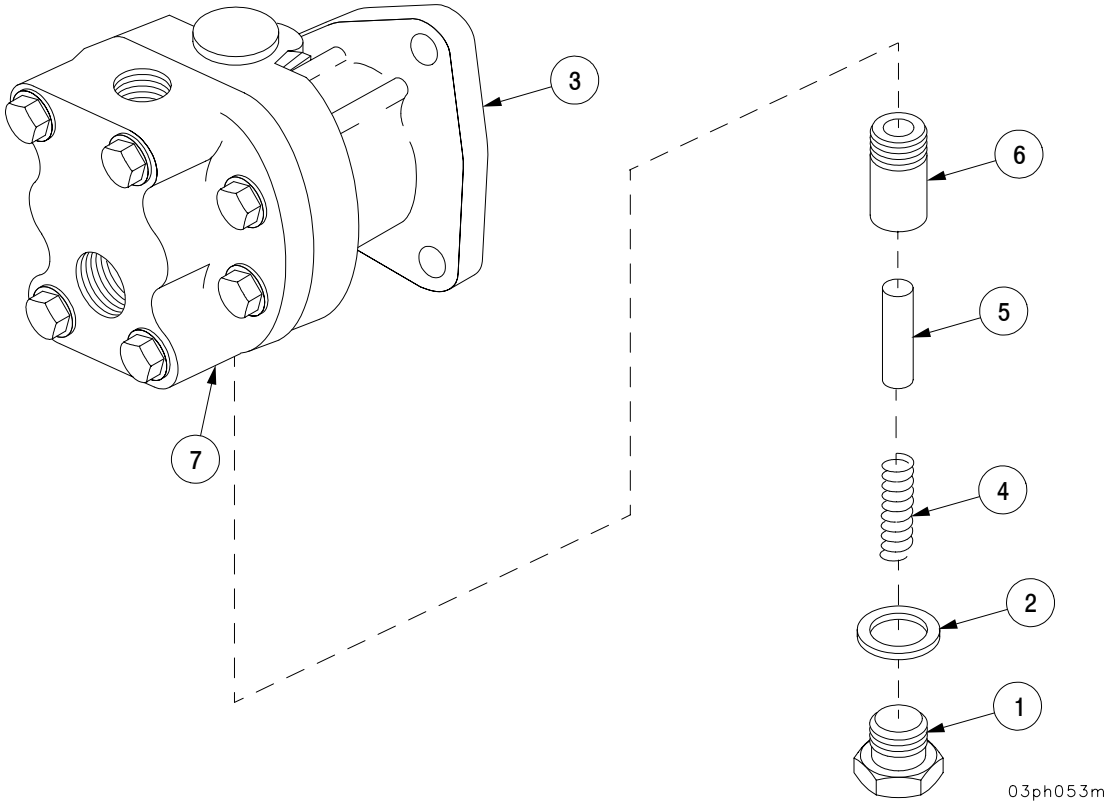
5-3 MECHANICAL FUEL PUMP RELIEF VALVE - CONTINUED

Servicing - Continued

5 Lubricate outside diameter of valve (6) with clean lubricating oil.

6 Install valve (6), pin (5), and spring (4) in mechanical fuel pump (3).

7 Install new gasket (2) and plug (1) in mechanical fuel pump. Torque plug to 18-22 lb-ft (24-30 N·m).



NOTE

FOLLOW-ON MAINTENANCE:
Install mechanical fuel pump (para 5-2)
Perform mechanical fuel pump test (para 5-4)

Section I. FUEL PUMPS - CONTINUED

5-4 MECHANICAL FUEL PUMP TEST.

This task covers: a. Test b. Shaft Check

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Fan protective screens (item 56, Appx F)
Utility pail (item 40, Appx F)
Liquid measure (item 37, Appx F)
Hose assembly (item 30, Appx F)

Materials/Parts
Nonelectrical wire (item 310 or 311 or 312, Appx E)

Equipment Conditions
Air intake grille open and secured
(TM 9-2350-314-10)
New fuel filter elements installed
(para 5-16)

Personnel Required
Two

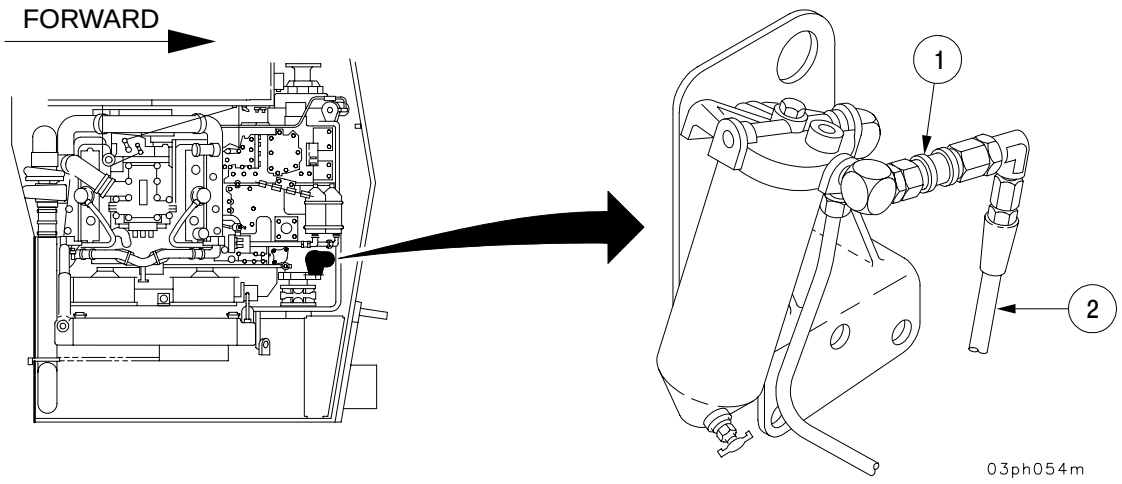
References
TM 9-2350-314-10

a. Test.

WARNING

Do not smoke or use open flame when working on fuel systems. An explosion may occur, causing severe injury or death.

1 Check coupling assembly (1) to be certain main fuel hose (2) connection is secure. Coupling assembly located at primary fuel filter.



Section I. FUEL PUMPS - CONTINUED

5-4 MECHANICAL FUEL PUMP TEST - CONTINUED

a. Test - Continued

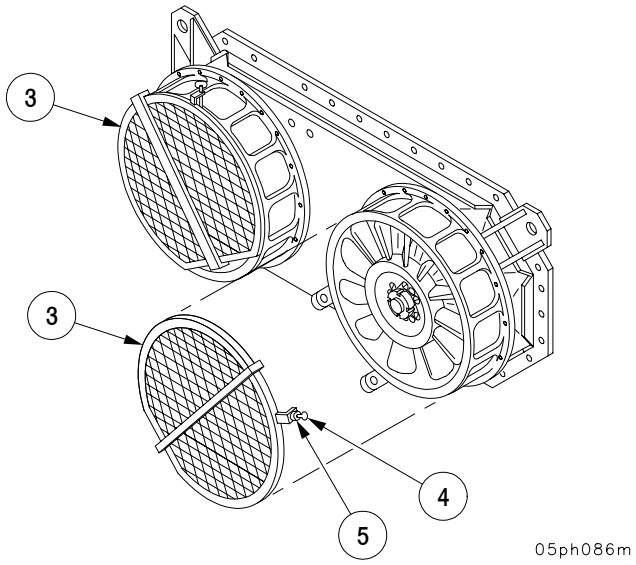
WARNING

Protective fan screen must be installed prior to doing maintenance in the engine compartment when engine is running or when engine is in ground hop mode. Contact with rotating fan can cause injury.

NOTE

Flat side of screen should align with two lower mounting bolts of fan housing.

2 Install two fan protective screens (3) with thumb or hex head screw (4), and locknut (5).



Section I. FUEL PUMPS - CONTINUED

5-4 MECHANICAL FUEL PUMP TEST - CONTINUED

a. Test - Continued

WARNING

- The rotation of the radiator cooling fan creates a hazard during maintenance on a running engine. Exercise care to prevent injury, especially to fingers and hands, during maintenance operations on a running engine.
- Excessive noise levels are present any time equipment is operating. Wear hearing protection while it is running. Failure to do so could result in damage to your hearing.

3 Start and warm up engine to 170°F (77°C) (TM 9-2350-314-10).

4 Disconnect fuel return hose (6) at coupling assembly (7), and attach ground hop hose assembly to coupling assembly (7). Coupling assembly is located at rear and radiator side of engine.

5 Place ground hop hose assembly in utility pail to catch fuel.

6 Set engine speed at 1200 rpm (TM 9-2350-314-10).

NOTE

Make sure valve in coupling assembly is fully depressed during test for an accurate measurement of fuel flow.

7 Depress valve of ground hop hose assembly for one minute and catch fuel in utility pail.

8 Shutdown engine (TM 9-2350-314-10).

NOTE

Dispose of drained fuel in an appropriate manner.

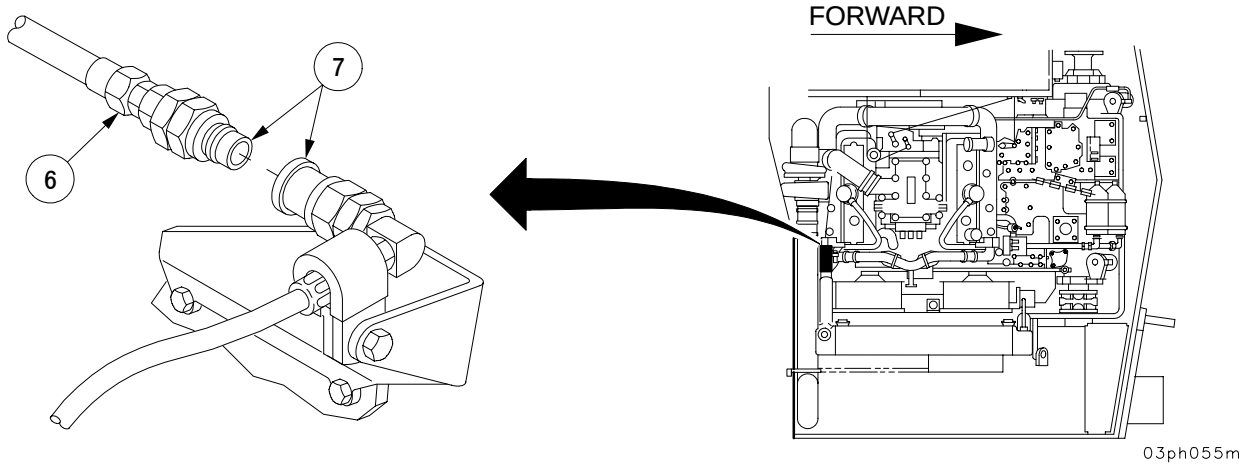
9 Measure fuel in 2 qt liquid measure. If fuel flow is less than 1/2 gallon (1.9 liter) per minute, perform shaft check. If fuel flow is 1/2 gallon (1.9 liter) or more per minute, go to next step.

Section I. FUEL PUMPS - CONTINUED

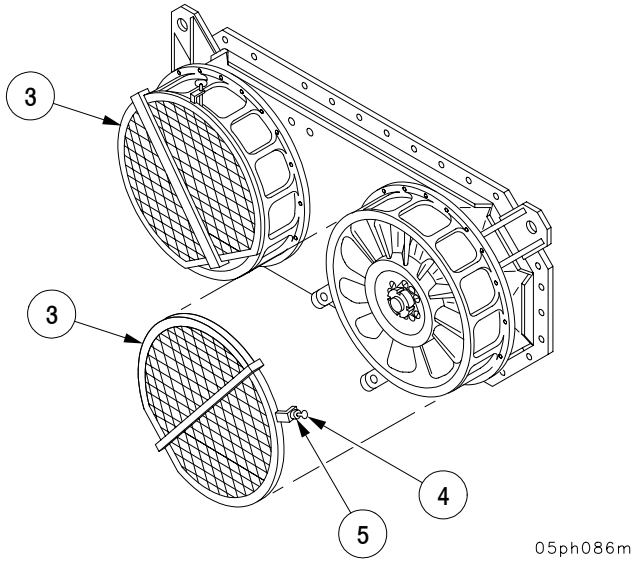
5-4 MECHANICAL FUEL PUMP TEST - CONTINUED

a. Test - Continued

10 Disconnect ground hop hose assembly, and connect fuel return hose (6) at coupling assembly (7).



11 Loosen locknut (5) and thumb or hex head screw (4). Remove two fan protective screens (3).



Section I. FUEL PUMPS - CONTINUED

5-4 MECHANICAL FUEL PUMP TEST - CONTINUED

b. Shaft check.

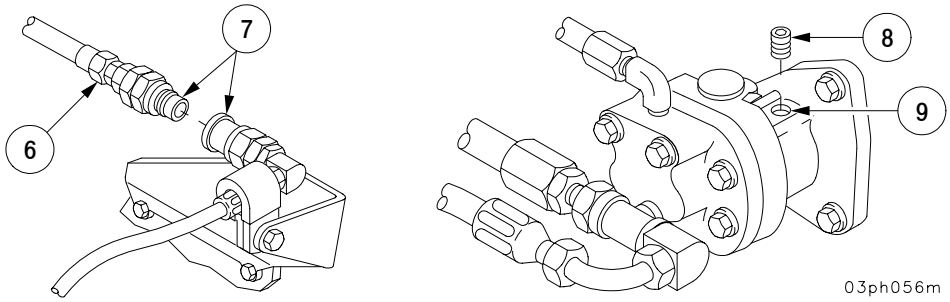
1 Remove top pump body drain plug (8).

2 Insert a small wire (approximate size and length of a straightened paper clip) in pump body hole (9).

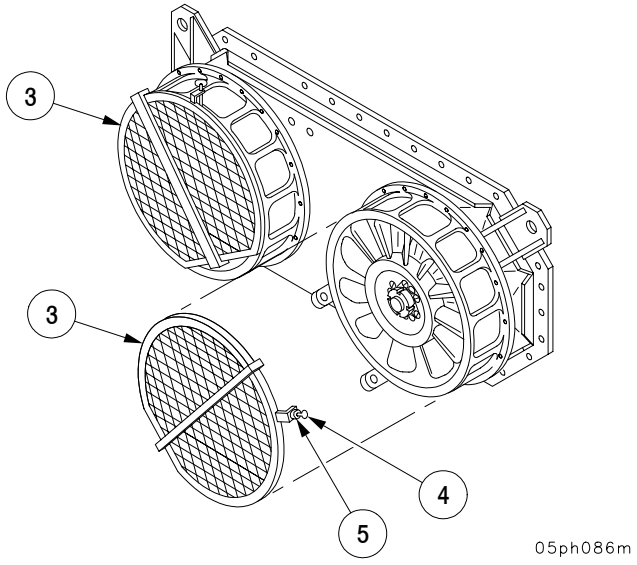
3 While holding wire, rotate shaft by momentarily cranking engine. If no vibration is felt, replace mechanical fuel pump (para 5-2). If vibration is felt, shaft is good. Check and clean mechanical fuel pump relief valve (para 5-3).

4 Install drain plug (8).

5 Connect fuel return hose (6) at coupling assembly (7).



6 Loosen locknut (5) and thumb or hex head screw (4). Remove two fan protective screens (3).



NOTE

FOLLOW-ON MAINTENANCE:
Close and secure air intake grille
(TM 9-2350-314-10)

Section II. AIR CLEANER

5-5 AIR CLEANER ASSEMBLY.

This task covers: a. Removal b. Disassembly c. Assembly d. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Materials/Parts
Nonmetallic seals (2) (item 109, Appx E)
Gaskets (2) (item 110, Appx E)
Gaskets (2) (item 107, Appx E)
Gaskets (2) (item 106, Appx E)
Gaskets (2) (item 105, Appx E)
Adhesive (item 4, Appx C)
Self-locking nuts (28) (item 15, Appx E)
Lockwasher (item 9, Appx E)
Lockwashers (2) (item 22, Appx E)
Lockwashers (8) (item 3, Appx E)
Lockwashers (22) (item 20, Appx E)

Equipment Conditions
Filter packs removed
(TM 9-2350-314-10)
Air cleaner duct and hoses disconnected
(para 5-7)

References
TM 9-2350-314-10

Section II. AIR CLEANER - CONTINUED

5-5 AIR CLEANER ASSEMBLY - CONTINUED

a. Removal.

1 Remove screw (1), lockwasher (2), and clamp (3). Discard lockwasher.

2 Disconnect hose (4) from adapter (5) and remove adapter (5).

NOTE

Support air cleaner boxes prior to performing step 3.

3 Remove eight screws (6), eight flat washers (7), and eight lockwashers (8). Discard lockwashers.

CAUTION

Damage to air cleaner duct may result if duct is not supported during removal of air cleaner.

4 Lower air cleaner box assemblies (9) to hull deck.

5 Remove 28 self-locking nuts (10) and 28 flat washers (11) securing air cleaner duct (12) to air cleaner box assemblies (9). Discard self-locking nuts.

6 Lift air cleaner duct (12) clear of lugs (13).

7 Remove left and right air cleaner box assemblies (9) from vehicle.

b. Disassembly.

1 Remove and discard two gaskets (14).

2 Disconnect hose (4) from indicator (15).

3 Remove two screws (16), two nuts (17), two lockwashers (18), and indicator (15) from bracket (19). Discard lockwashers.

4 Remove two screws (20), two flat washers (21), two lockwashers (22), and bracket (19) from left box assembly (23). Discard lockwashers.

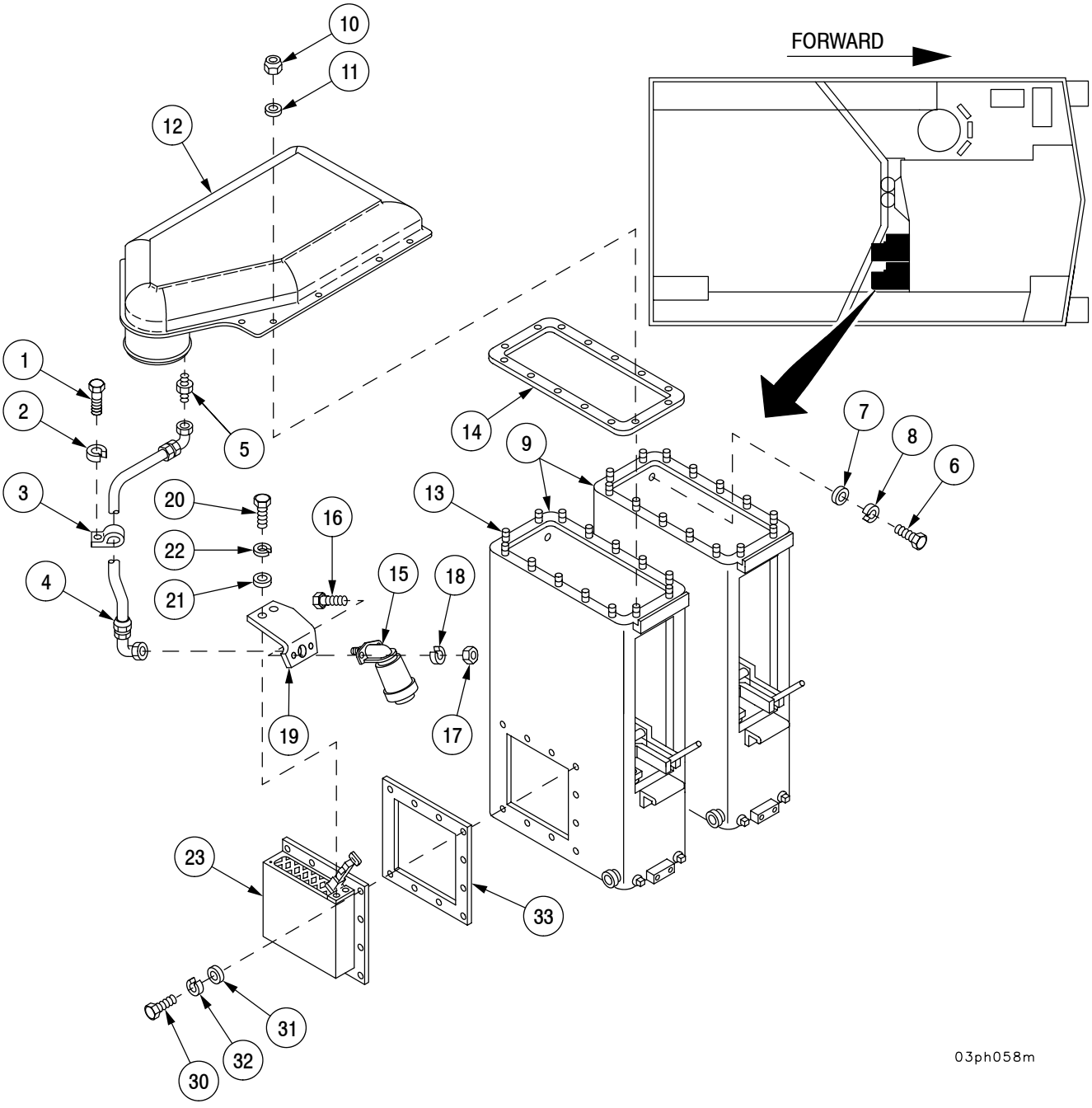
5 Deleted

6 Remove 20 screws (30), 20 flat washers (31), 20 lockwashers (32), two box assemblies (23), and two gaskets (33). Discard lockwashers and two gaskets.

Section II. AIR CLEANER - CONTINUED

5-5 AIR CLEANER ASSEMBLY - CONTINUED

b. Disassembly - Continued



Section II. AIR CLEANER - CONTINUED

5-5 AIR CLEANER ASSEMBLY - CONTINUED

b. Disassembly - Continued

7 Remove nonmetallic seal (34) from each box assembly (23). Discard nonmetallic seal.

8 Remove gasket (35) from each air cleaner assembly door (36). Discard gaskets.

9 Remove gasket (37) from each air cleaner box assembly (9). Discard gaskets.

10 Remove eight screws (38) and latch assembly (39) from each air cleaner box assembly (9).

c. Assembly.

1 Install latch assembly (39) with eight screws (38) in each air cleaner box assembly (9).

NOTE

Apply adhesive to gaskets 35 minutes prior to installation.

2 Install new gasket (37) in each air cleaner box assembly (9).

3 Install new gasket (35) in each air cleaner assembly door (36).

4 Install new nonmetallic seal (34) on each box assembly (23).

5 Install two box assemblies (23) and two new gaskets (33) with 20 screws (30), 20 new lockwashers (32), and 20 flat washers (31).

6 Step deleted.

7 Step deleted.

8 Install bracket (19) on left box assembly (23) with two screws (20), two new lockwashers (22), and two flat washers (21).

9 Install indicator (15) on bracket (19) with two screws (16), two new lockwashers (18), and two nuts (17).

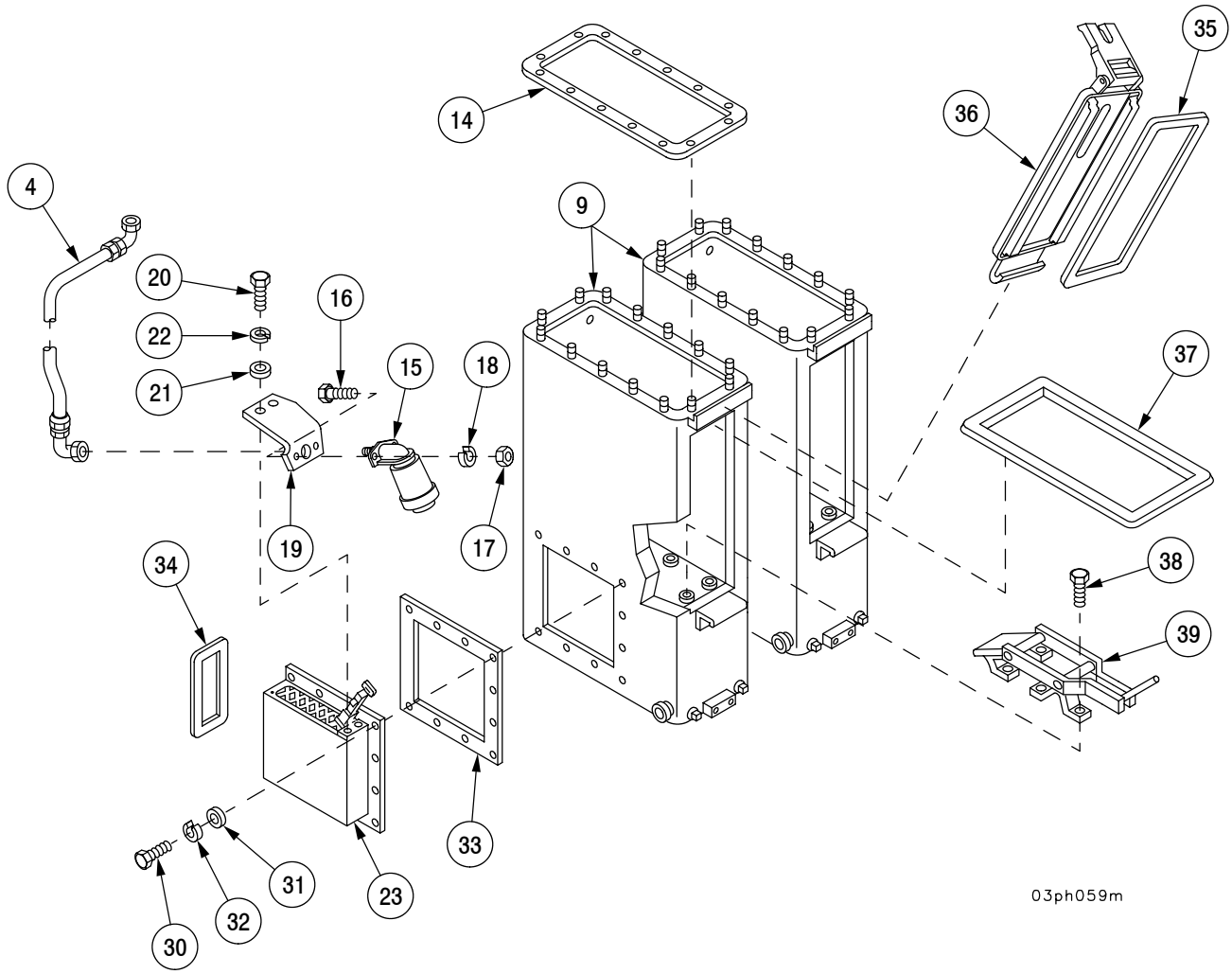
10 Connect hose (4) to indicator (15).

11 Install two new gaskets (14).

Section II. AIR CLEANER - CONTINUED

5-5 AIR CLEANER ASSEMBLY - CONTINUED

c. Assembly - Continued



Section II. AIR CLEANER - CONTINUED

5-5 AIR CLEANER ASSEMBLY - CONTINUED

d. Installation.

1 Position left and right air cleaner box assemblies (9) so air cleaner duct (12) can be installed.

2 Place air cleaner duct (12) over lugs (13) and install 28 flat washers (11) and 28 new self-locking nuts (10).

NOTE

Supports under air cleaner boxes may help position assembly for installation.

3 Install air cleaner box assemblies (9) on hull wall with eight screws (6), eight new lockwashers (8), and eight flat washers (7).

4 Install adapter (5) and connect hose (4) to adapter (5).

5 Install clamp (3) with screw (1) and new lockwasher (2).

NOTE

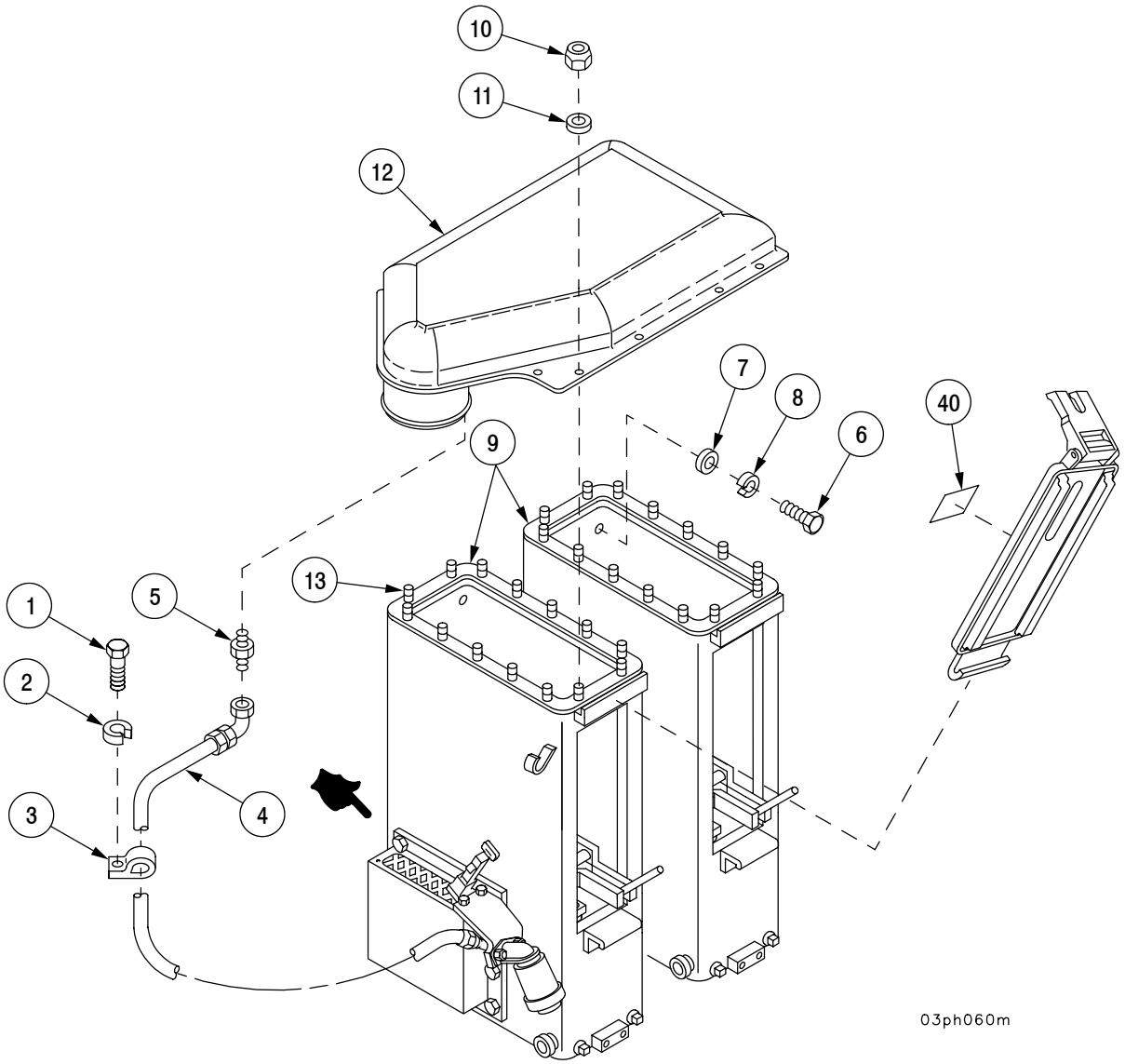
Apply new decal only if illegible or if air cleaner door is replaced.

6 Apply new decal (40) (para 18-13).

Section II. AIR CLEANER - CONTINUED

5-5 AIR CLEANER ASSEMBLY - CONTINUED

d. Installation - Continued



NOTE

FOLLOW-ON MAINTENANCE:
Connect air cleaner ducts and hoses (para 5-7)
Install filter packs (TM 9-2350-314-10)

Section II. AIR CLEANER - CONTINUED

5-6 AIR CLEANER BOX ASSEMBLY.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Materials/Parts
Spring pin (item 112, Appx E)
Adhesive (item 1 or 2, Appx C)
Nonmetallic seal (item 113, Appx E)
Lockwashers (2) (item 20, Appx E)

Equipment Conditions
Air box removed from air cleaner
(para 5-5)
Clogged filter indicator bracket
removed (left side box) (para 5-5)

a. Disassembly.

NOTE

- Screws, lockwashers, and flat washers are removed with indicator bracket for left side box.
- Right side is illustrated.

1 For right side box, remove two screws (1), two lockwashers (2), and two flat washers (3).

2 Remove spring pin (4) from pin (5). Discard spring pin.

3 Remove pin (5), spring (6), and two spacers (7) from baffle (8).

4 Remove baffle (8) from box (9).

5 Remove seal (10) from baffle (8). Discard seal.

b. Assembly.

NOTE

Apply adhesive to seal 35 minutes prior to assembly.

1 Install new seal (10) in baffle (8).

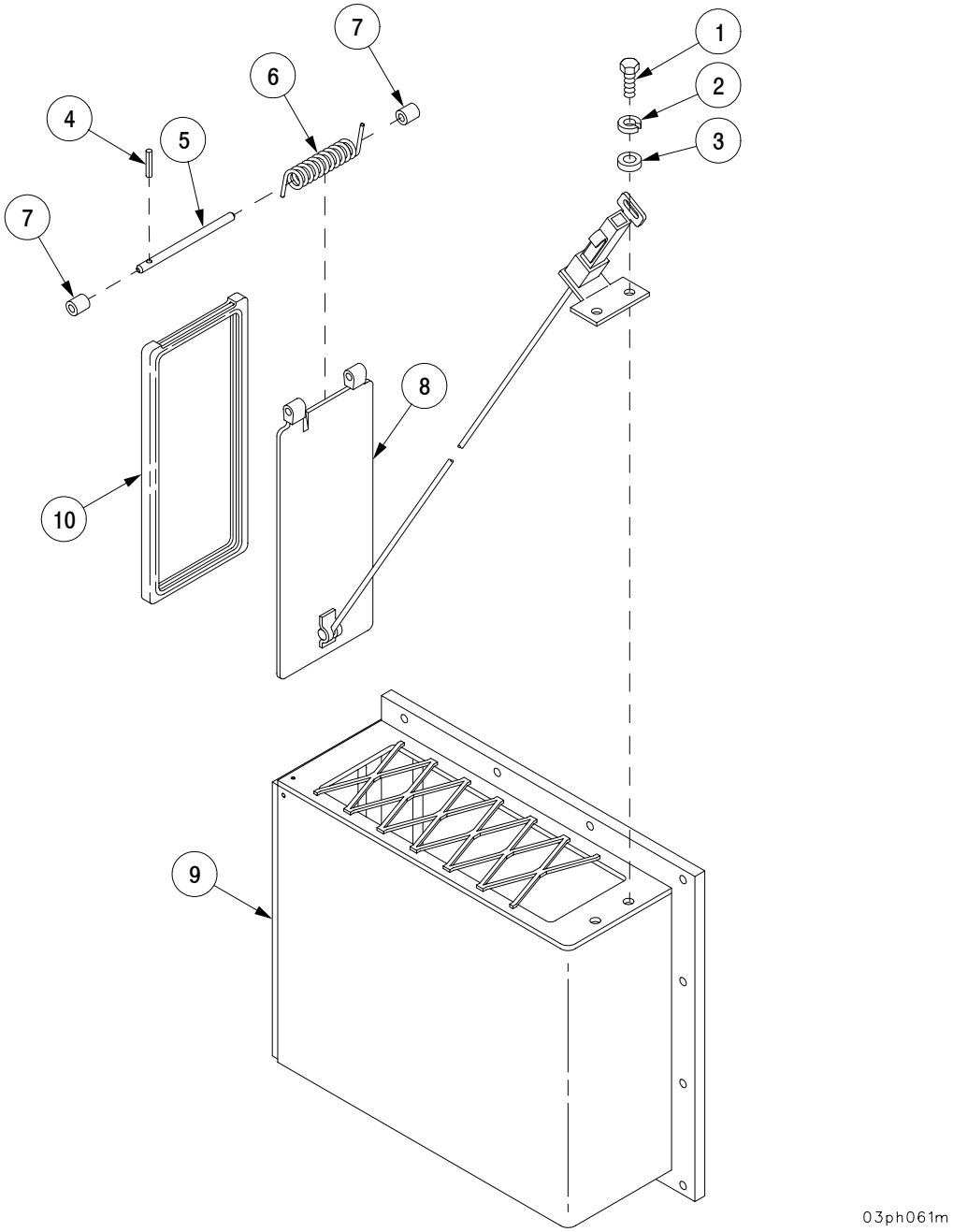
2 Install baffle (8) in box (9) with pin (5), spring (6), two spacers (7), and new spring pin (4).

3 For right side box, install two flat washers (3), two new lockwashers (2), and two screws (1).

Section II. AIR CLEANER - CONTINUED

5-6 AIR CLEANER BOX ASSEMBLY - CONTINUED

b. Assembly - Continued



NOTE

FOLLOW-ON MAINTENANCE:
Install clogged filter indicator (left side box) bracket (para 5-5)
Install air box on air cleaner (para 5-5)

Section II. AIR CLEANER - CONTINUED

5-7 AIR CLEANER DUCT AND HOSES.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)

Materials/Parts
Gasket (item 108, Appx E)
Lockwashers (10) (item 3, Appx E)

Equipment Conditions
Powerpack removed (For elbow duct and turbocharger hose only) (para 4-1)

a. Removal.

NOTE

Note the different length and location of screws being removed for proper installation and brackets.

1 Remove two screws (1), two flat washers (2), two lockwashers (3), and bracket (4) from right air cleaner (4.1). Discard lockwashers.

1.1 Remove screw (4.2), lockwasher (4.3), and flat washer (4.4). Discard lockwasher.

2 Remove two screws (5), six flat washers (6) and shield (7) from left air cleaner (7.1).

2.1 Remove screw (7.2), lockwasher (7.3), flat washer (7.4) and bracket (7.5). Discard lockwasher.

3 Remove four hose clamps (8) and two air cleaner-to-duct exhaust hoses (9).

4 Remove two hose clamps (10) and air cleaner duct-to-elbow duct hose (11).

5 Remove four hose clamps (12) and two duct exhaust-to-elbow hoses (13).

6 Remove hose clamp (14), coupling (15), and turbocharger hose (16).

7 Remove six screws (17), six flat washers (18), and six lockwashers (19). Discard lockwashers.

8 Remove elbow duct (20) and gasket (21) through bulkhead into engine compartment. Discard gasket.

b. Installation.

1 Install elbow duct (20) and new gasket (21) with six screws (17), six new lockwashers (19), and six flat washers (18).

2 Install turbocharger hose (16) with hose clamp (14) and coupling (15).

3 Install two exhaust-to-elbow hoses (13) with four hose clamps (12).

4 Install air cleaner duct-to-elbow duct hose (11) with two hose clamps (10).

5 Install two air cleaner-to-duct exhaust hoses (9) with four hose clamps (8).

5.1 Install bracket (7.5), flat washer (7.4), new lockwasher (7.3) and screw (7.2).

6 Install shield (7) with two screws (5) and six flat washers (6) to left air cleaner (7.1).

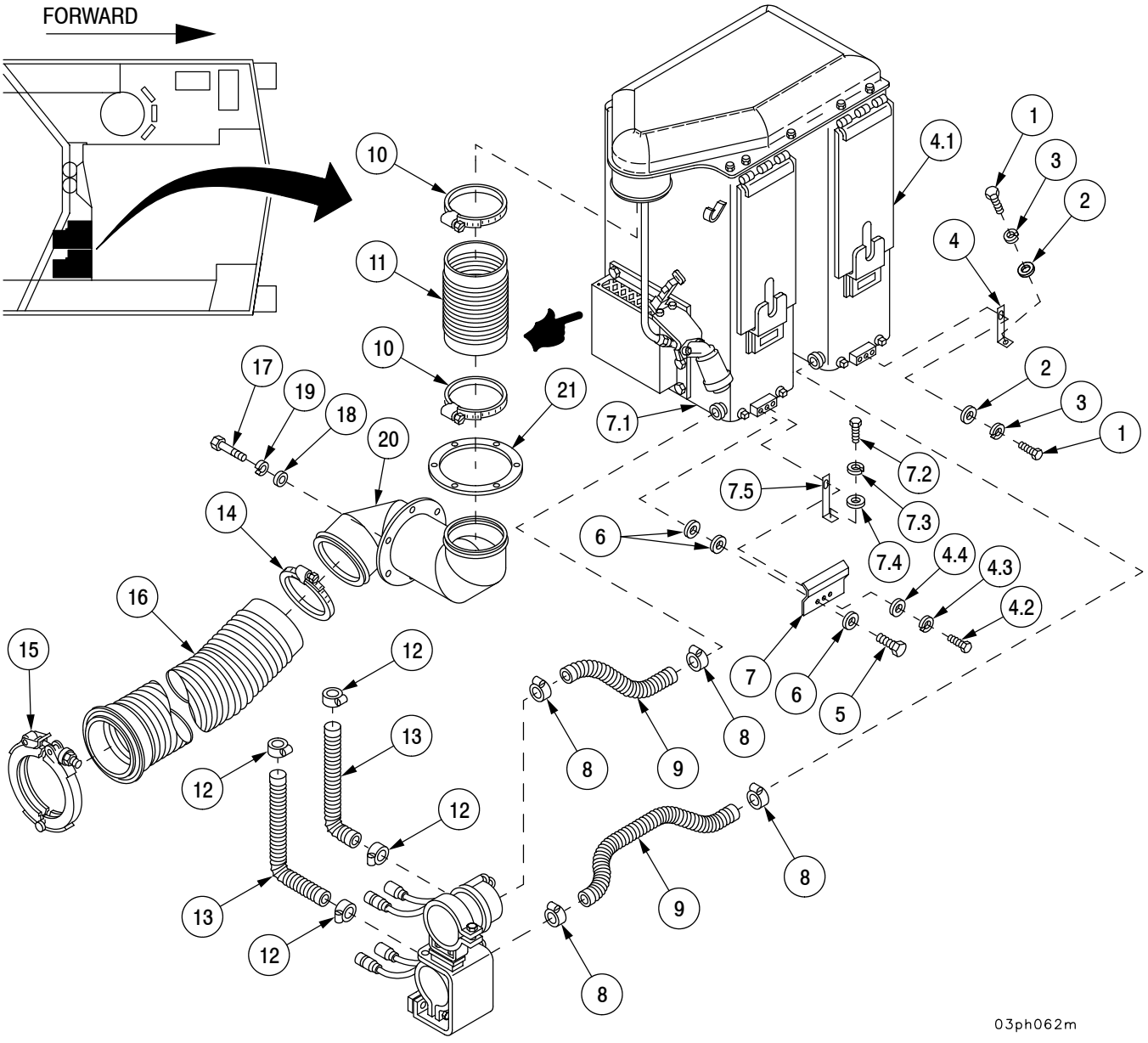
6.1 Install flat washer (4.4), new lockwasher (4.3) and screw (4.2).

7 Install bracket (4), two new lockwashers (3), two flat washers (2), and two screws (1) to right air cleaner (4.1).

Section II. AIR CLEANER - CONTINUED

5-7 AIR CLEANER DUCT AND HOSES - CONTINUED

b. Installation - Continued



NOTE

FOLLOW-ON MAINTENANCE:
Install powerpack (For elbow duct and turbocharger hose only) (para 4-1)

Section II. AIR CLEANER - CONTINUED

5-8 AIR CLEANER BRACKET AND BLOWER.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Materials/Parts
Lockwashers (4) (item 3, Appx E)
Lockwashers (4) (item 5, Appx E)
Self-locking nuts (2) (item 115, Appx E)

a. Removal.

1 Disconnect four electrical leads (1) at air cleaner blower motors (2).

2 Loosen four clamps (3) and disconnect four hoses (4) from air cleaner blower motors (2).

3 Loosen two screws (5) on two clamps (6).

4 Pull air cleaner blower motors (2) out of two clamps (6).

5 Remove four screws (7), four lockwashers (8), two clamps (6), and two pads (9). Discard lockwashers.

6 Remove two screws (10), two flat washers (11), and two lockwashers (12). Discard lockwashers.

7 Remove two screws (13), four flat washers (14), two lockwashers (15), two nuts (16), and bracket (17). Discard lockwashers.

8 Remove two screws (5) and two self-locking nuts (18). Discard self-locking nuts.

b. Installation.

1 Install bracket (17) with two screws (13), two new lockwashers (15), four flat washers (14), and two nuts (16).

2 Install two screws (10), two new lockwashers (12), and two flat washers (11).

3 Install two screws (5) and two new self-locking nuts (18) in two clamps (6). Do not tighten.

4 Install two clamps (6) and two pads (9) with four new lockwashers (8) and four screws (7).

5 Install air cleaner blower motors (2) in two clamps (6).

6 Tighten two screws (5) in two clamps (6).

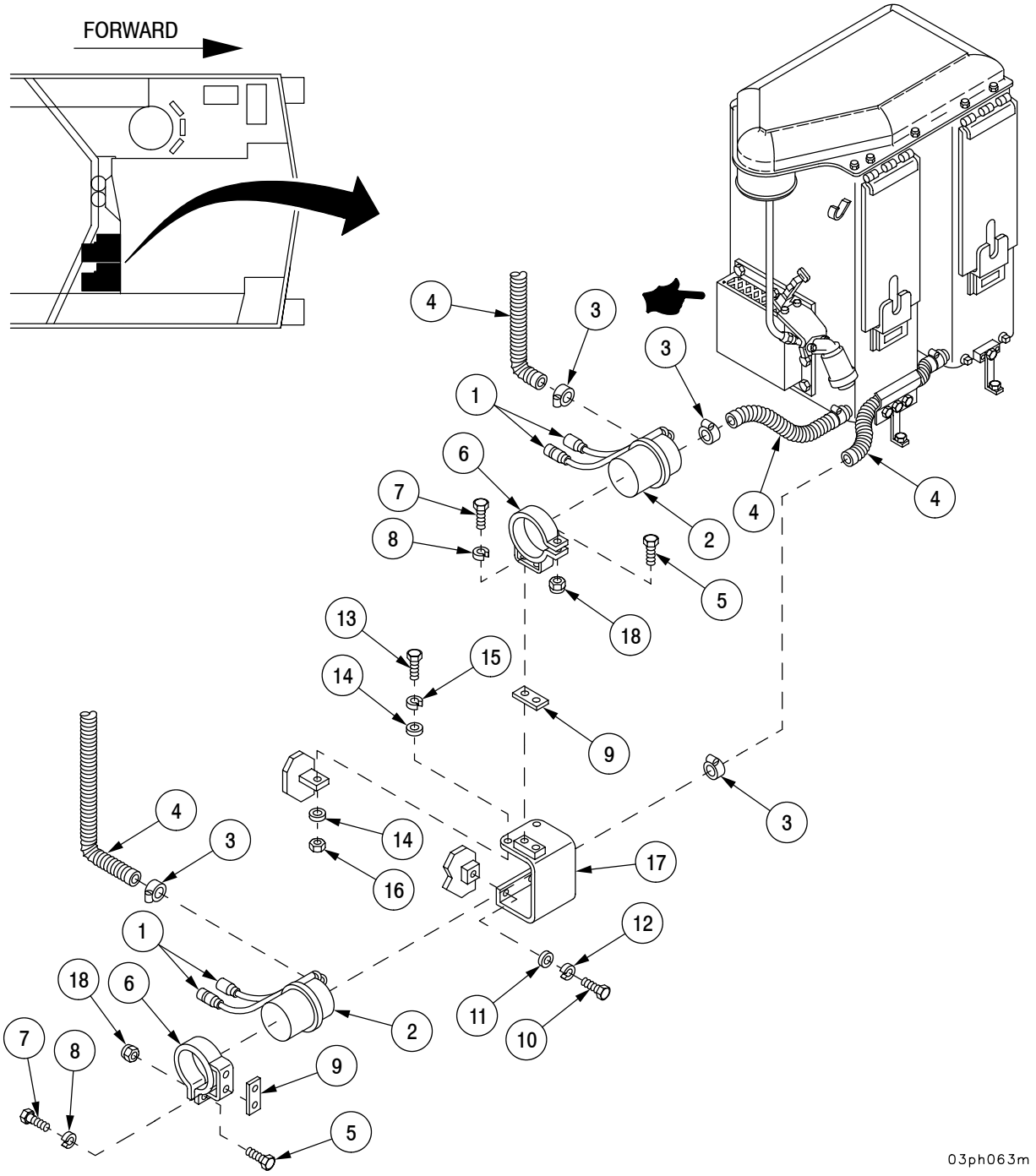
7 Connect four hoses (4) to air cleaner blower motors (2) and tighten four clamps (3).

8 Connect four electrical leads (1) of air cleaner blower motors (2).

Section II. AIR CLEANER - CONTINUED

5-8 AIR CLEANER BRACKET AND BLOWER - CONTINUED

b. Installation - Continued



Section III. SUPERCHARGER, BLOWER, OR TURBOCHARGER.

5-9 TURBOCHARGER OIL LINE.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Materials/Parts
Tiedown straps (2) (item 43, Appx E)

Equipment Conditions
Engine oil drained
(Table 2-1; PMCS item 37)
Powerpack removed (para 4-1)

a. Removal.

1 Remove two tiedown straps (1). Discard tiedown straps.

2 Loosen two clamps (2) and remove oil line (3).

b. Installation.

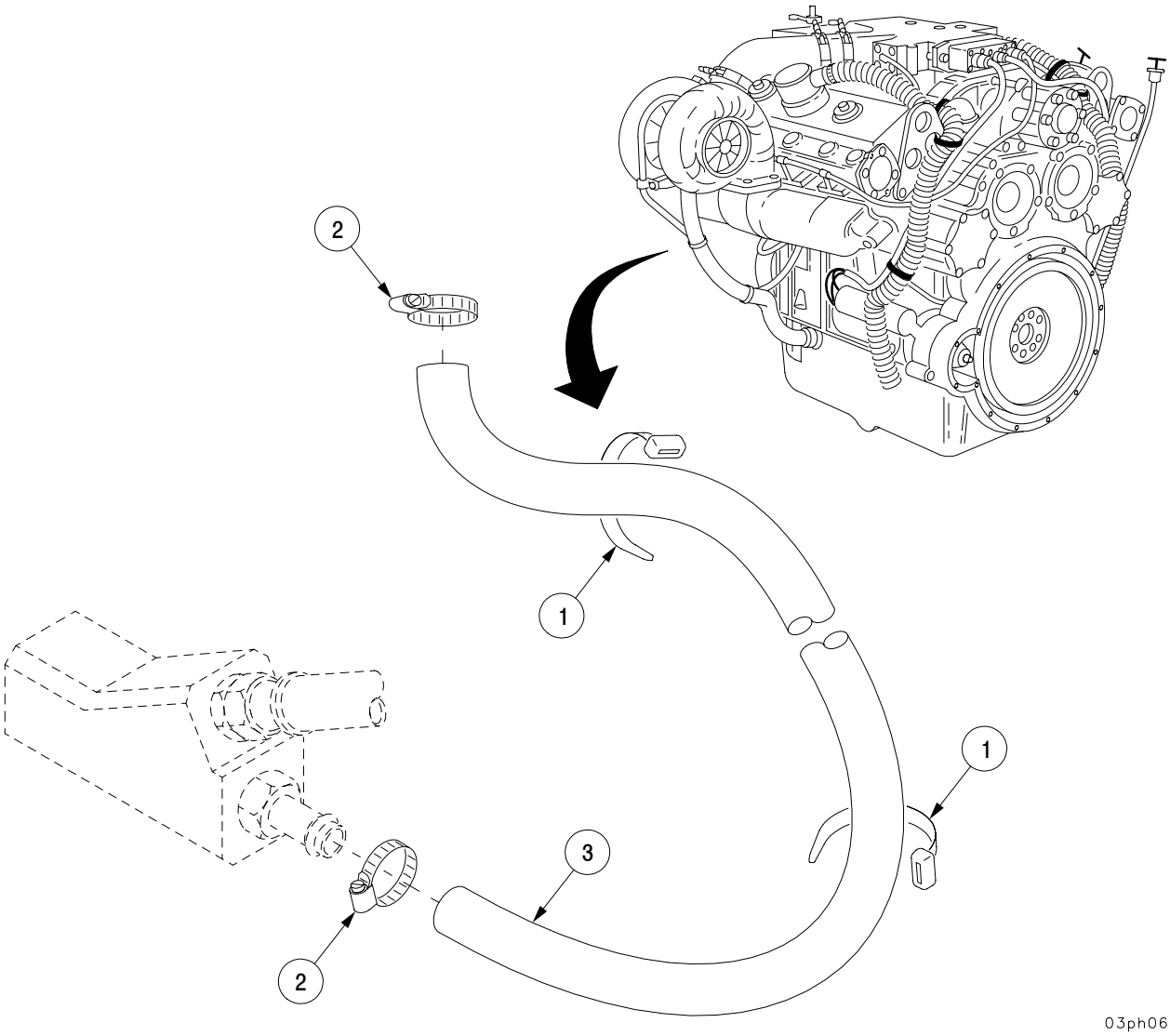
1 Install oil line (3) with two clamps (2).

2 Install two new tiedown straps (1).

Section III. SUPERCHARGER, BLOWER, OR TURBOCHARGER - CONTINUED

5-9 TURBOCHARGER OIL LINE - CONTINUED

b. Installation - Continued



NOTE

FOLLOW-ON MAINTENANCE:
Install powerpack (para 4-1)
Fill engine with oil
(Table 2-1; PMCS item 37)

Section IV. TANKS, LINES, FITTINGS, AND HEADERS.

5-10 DRAIN FUEL TANKS.

This task covers: a. Draining b. Refueling

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Hose assembly (item 30, Appx F)
Adapter (item 3, Appx F)
Suitable container
Probe kit (item 35, Appx F)

Materials/Parts
Gasket (item 116, Appx E)

Equipment Conditions
Vehicle MASTER switch OFF
(TM 9-2350-314-10)
Transmission access doors open
(TM 9-2350-314-10)

References
TM 9-2350-314-10

WARNING

Do not smoke or use open flame when working on fuel system. An explosion may occur, causing serious injury or death.

NOTE

- Fuel tank capacity is 133 gallons (503.4 liters). Fuel tank(s) may be drained by removing drain plug at bottom of vehicle or by using fuel tank electric fuel pumps to pump fuel from tanks. Pumping requires one-and-a-half to two hours to drain a full system. Using drain plug at bottom of vehicle allows draining the system in less than 30 minutes.
- Perform Draining steps 1 thru 3 and 16 and Refueling steps 1 thru 3 for manually draining fuel system.
- Perform Draining steps 4 thru 16 and Refueling step 3 for draining fuel system using electric fuel pumps.

Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

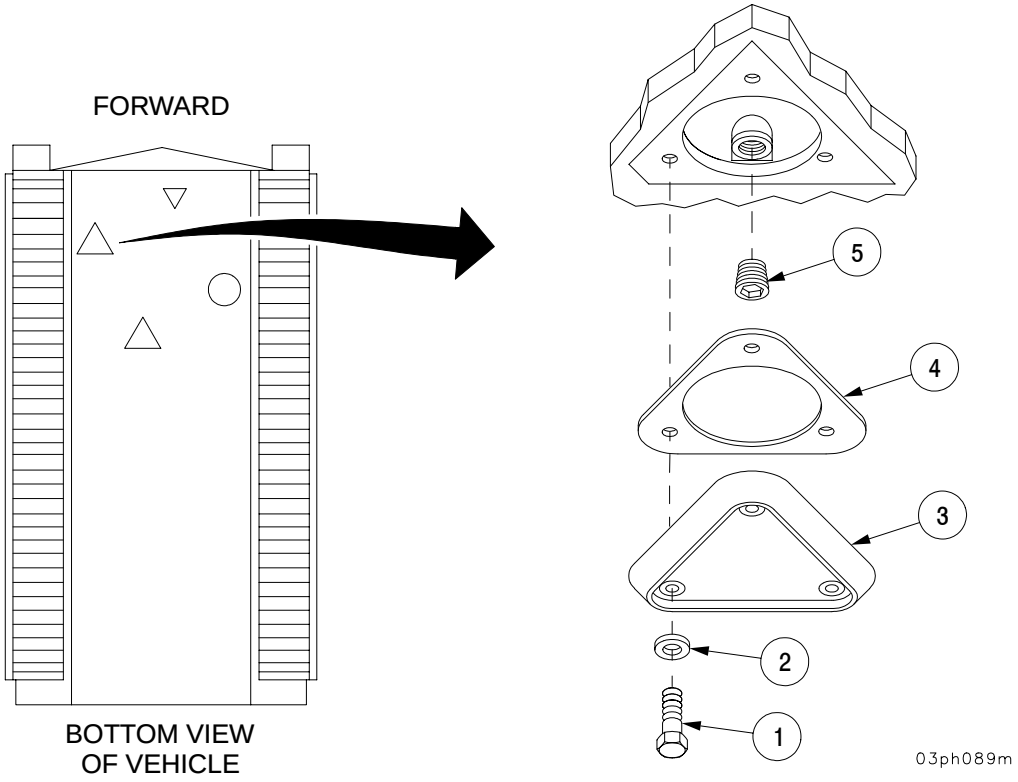
5-10 DRAIN FUEL TANKS - CONTINUED

a. Draining.

1 Drive vehicle (TM 9-2350-314-10) over pit to provide clearance for suitable container used to catch fuel.

2 Remove three screws (1), three flat washers (2), access cover (3), and gasket (4). Discard gasket.

3 Remove fuel plug (5) and drain fuel into suitable container.



Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-10 DRAIN FUEL TANKS - CONTINUED

a. Draining - Continued

4 Attach adapter (6) and fuel hose extension (7) to main fuel line at quick-disconnect (8).

5 Place open end of fuel hose extension (7) in 55-gallon drum to catch fuel.

NOTE

If powerpack has been removed perform steps 7 thru 11 and steps 13 thru 16.

6 Disconnect harness W105 connector P1 (9) from harness W104 connector J1 (10) at engine disconnect bracket (11).

7 Connect a jumper wire (12) from socket S of harness W105 connector P1 (9) to ground.

8 Connect battery ground cables, if disconnected (para 8-35).

9 Place vehicle MASTER switch in ON position (TM 9-2350-314-10) to operate fuel pumps and drain fuel tanks.

10 Place vehicle MASTER switch in OFF position (TM 9-2350-314-10) to stop fuel pumps when fuel tanks are empty.

11 Remove jumper wire (12) from ground and socket S of harness W105 connector P1 (9).

12 Connect harness W105 connector P1 (9) to harness W104 connector J1 (10) at engine disconnect bracket (11).

13 Disconnect adapter (6) and fuel hose extension (7) from quick-disconnect (8).

14 Connect quick-disconnect (8) to main fuel line.

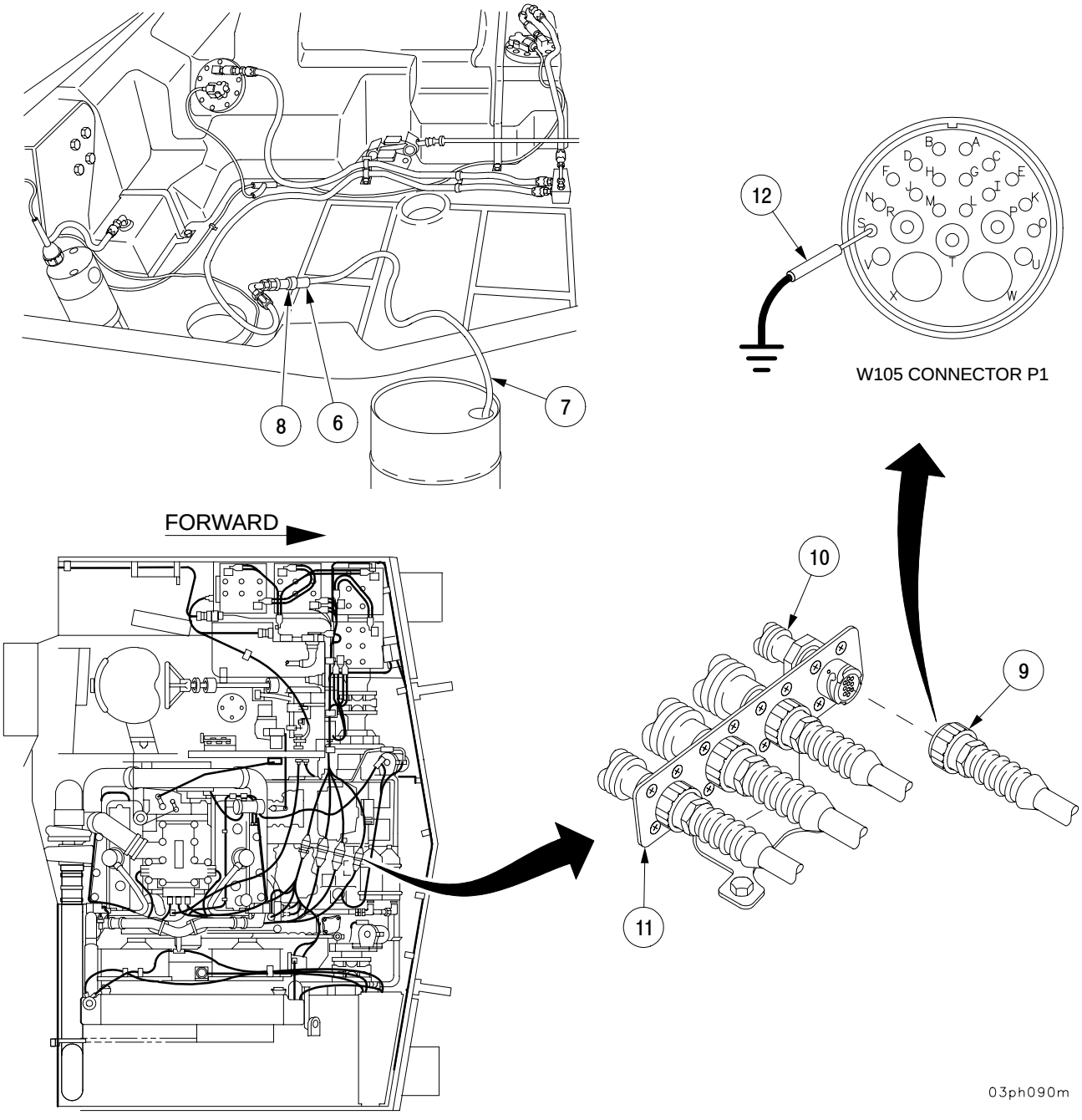
15 Disconnect battery ground cables (para 8-33), if required, prior to performance of refueling maintenance.

16 Dispose of drained fuel in an appropriate manner.

Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-10 DRAIN FUEL TANKS - CONTINUED

a. Draining - Continued



Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

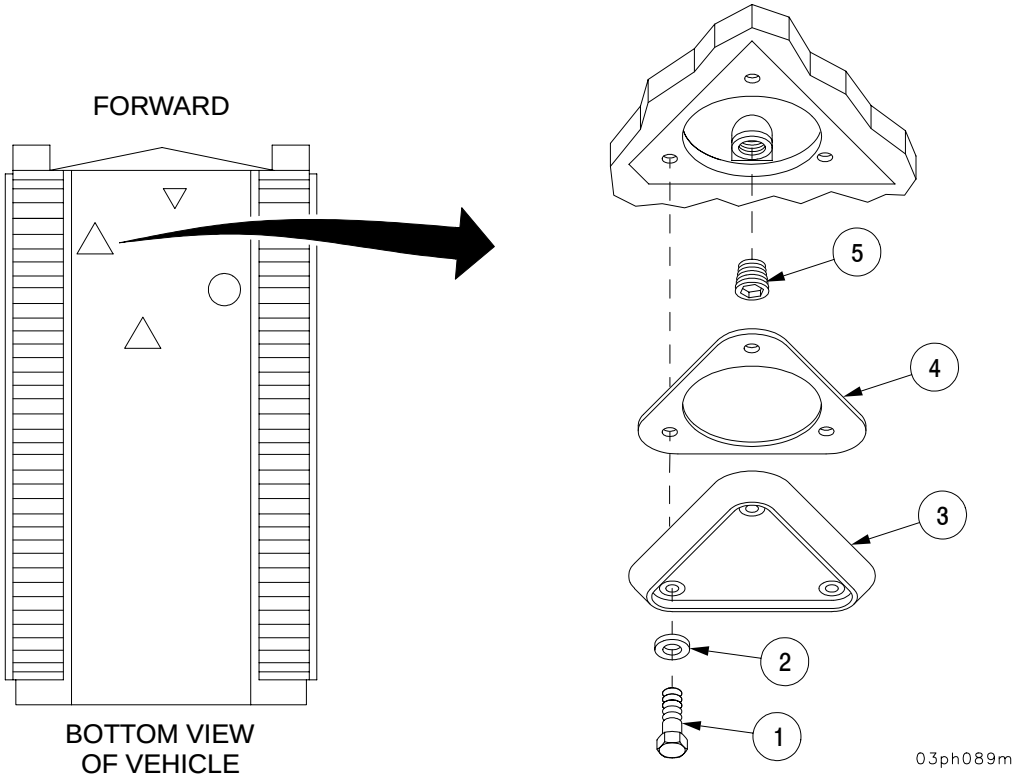
5-10 DRAIN FUEL TANKS - CONTINUED

b. Refueling.

1 Install fuel plug (5).

2 Install access cover (3) and new gasket (4) with three flat washers (2) and three screws (1).

3 Refuel vehicle (TM 9-2350-314-10).



Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-11 FUEL TANK FILLER ASSEMBLY (CAP, SEAL, AND FILLER).

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Equipment Conditions
Fuel fill access door removed
(para 16-32)

Materials/Parts
Dry-cleaning solvent (item 59, Appx C)
Gaskets (2) (item 117, Appx E)
Lockwashers (6) (item 3, Appx E)

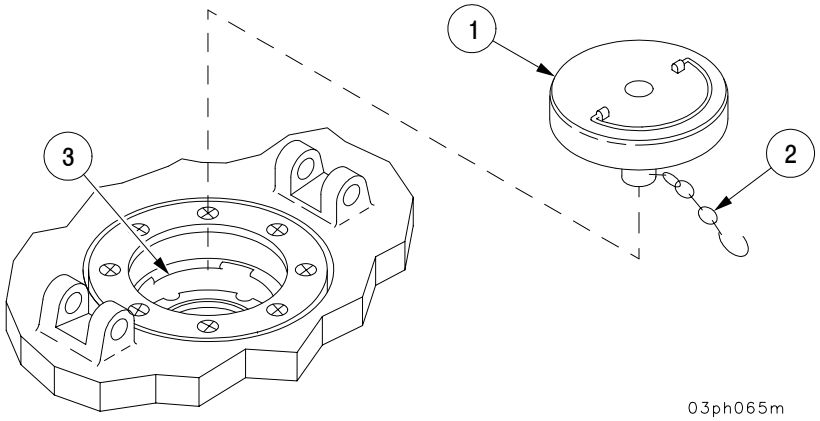
WARNING

Do not smoke or use open flame when working on fuel system. An explosion may occur, causing severe injury or death.

a. Removal.

1 Remove filler cap (1).

2 Remove filler cap chain (2) from fuel strainer element (3).



Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-11 FUEL TANK FILLER ASSEMBLY (CAP, SEAL, AND FILLER) - CONTINUED

a. Removal - Continued

NOTE

Top washer, outer seal, inner seal, and bottom washer can be removed as an assembly.

3 Remove eight screws (4), top washer (5), outer seal (6), inner seal (7), and bottom washer (8).

4 Remove six screws (9), six flat washers (10), and six lockwashers (11). Discard lockwashers.

WARNING

Dry-cleaning solvent (P-D-680), used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause SERIOUS INJURY. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash with water immediately, and obtain medical aid (ref. FM 21-11).

5 Remove fuel strainer element (3). Clean with dry-cleaning solvent.

6 Remove filler neck (12), gasket (13), spacer (14), and gasket (15). Discard gaskets.

b. Installation.

1 Install fuel strainer element (3) in filler neck (12).

2 Install new gasket (15), spacer (14), new gasket (13), filler neck (12), and fuel strainer element (3) with six screws (9), six new lockwashers (11), and six flat washers (10).

Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-11 FUEL TANK FILLER ASSEMBLY (CAP, SEAL, AND FILLER) - CONTINUED

b. Installation - Continued

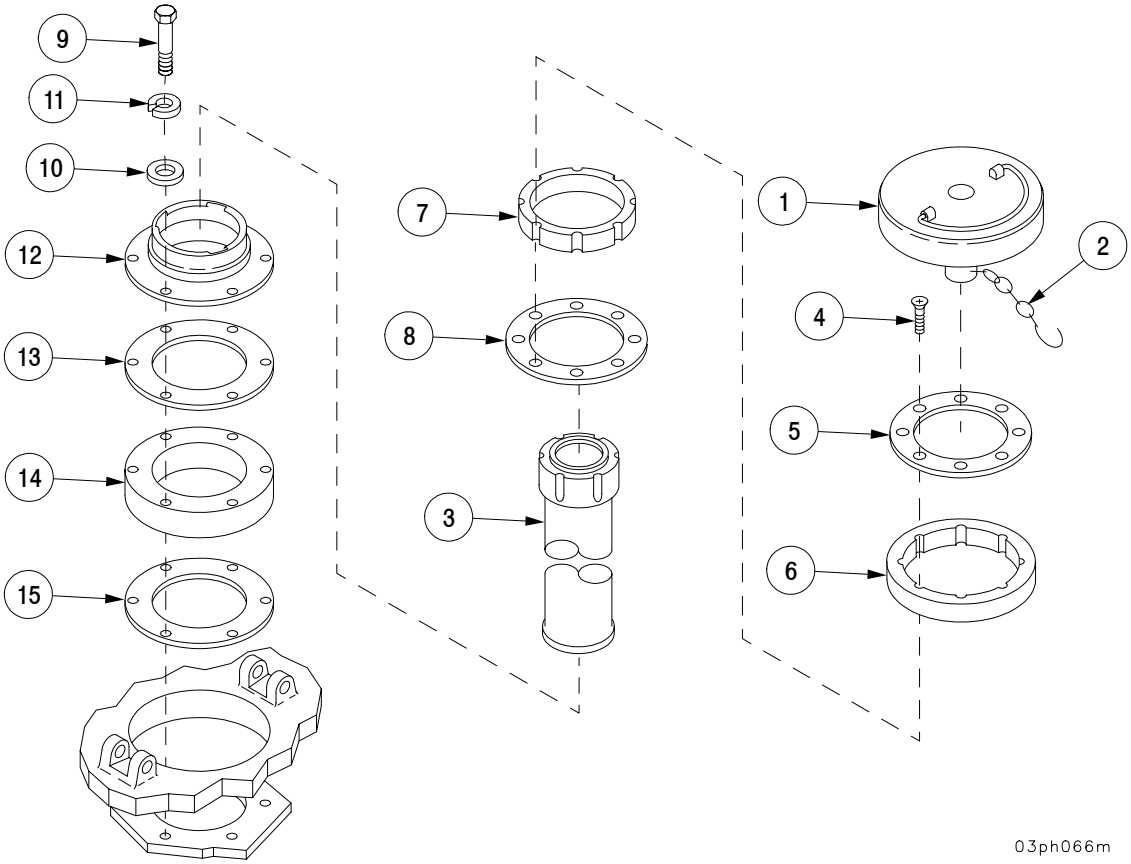
NOTE

Bottom washer, inner seal, outer seal, and top washer can be installed as an assembly.

3 Install bottom washer (8), inner seal (7), outer seal (6), and top washer (5) with eight screws (4).

4 Secure filler cap chain (2) to fuel strainer element (3).

5 Install filler cap (1).



NOTE

FOLLOW-ON MAINTENANCE:
Install fuel fill access door (para 16-32)

Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-12 FUEL TANK LEVEL TRANSMITTERS (UPPER AND LOWER).

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Torque wrench (item 84, Appx F)

Equipment Conditions
Exhaust grille removed
(para 16-25)
Fuel tank drained (lower transmitter only)
(para 5-10)

Materials/Parts
Lockwashers (3) (item 9, Appx E)
Self-locking nuts (7) (item 120, Appx E)
Self-locking nuts (2) (item 118, Appx E)
Sealing compound (item 51, Appx C)
Gaskets (2) (upper level transmitter) (item 119, Appx E)
Sealing compound (item 50, Appx C)
Gasket (lower level transmitter) (item 119, Appx E)

NOTE

- Perform Removal steps 1 thru 4 and Installation steps 7 thru 10 for maintenance of upper fuel tank transmitter.
- Perform Removal steps 5 thru 9 and Installation steps 1 thru 6 for maintenance of lower fuel tank level transmitter.

a. Removal.

WARNING

Do not smoke or use open flame when working on the fuel system. An explosion may occur, causing severe injury or death.

1 Remove three screws (1), three lockwashers (2) and cover (3). Discard lockwashers.

2 Disconnect electrical connector (4).

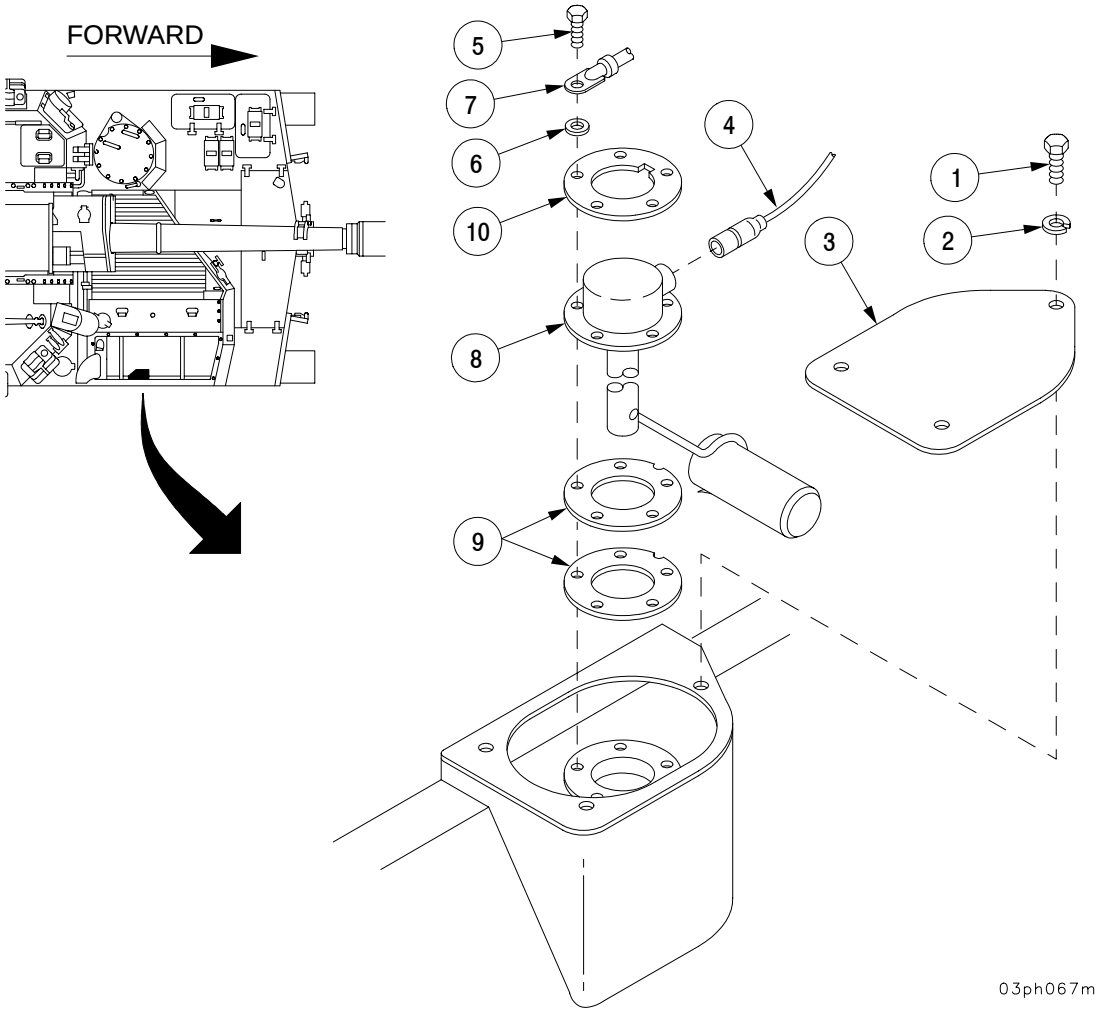
Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-12 FUEL TANK LEVEL TRANSMITTERS (UPPER AND LOWER) - CONTINUED

a. Removal - Continued

3 Remove five screws (5), five flat washers (6), and ground lead (7).

4 Remove transmitter (8), two gaskets (9), and spacer (10). Discard gaskets.



Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-12 FUEL TANK LEVEL TRANSMITTERS (UPPER AND LOWER) - CONTINUED

a. Removal - Continued

5 Remove seven self-locking nuts (11), flat washer (12), screw (13), flat washer (14), bar (15), retainer (16), and seal (17). Discard self-locking nuts.

6 Remove two self-locking nuts (18), two flat washers (19), and plate (20). Discard self-locking nuts.

7 Remove electrical connector (21).

8 Remove five screws (22), five flat washers (23), and ground lead (24).

9 Remove transmitter (25) and gasket (26). Discard gasket.

b. Installation.

1 Apply sealing compound (item 51, Appx C) to mating surfaces of new gasket (26).

NOTE

Notch in gasket must be aligned with transmitter electrical connector for proper installation.

2 Install transmitter (25), new gasket (26), and ground lead (24) with five screws (22) and five flat washers (23). Torque screws to 28-32 lb-in. (3.1-3.6 N·m).

3 Connect electrical connector (21).

4 Install plate (20) with two new self-locking nuts (18) and two flat washers (19).

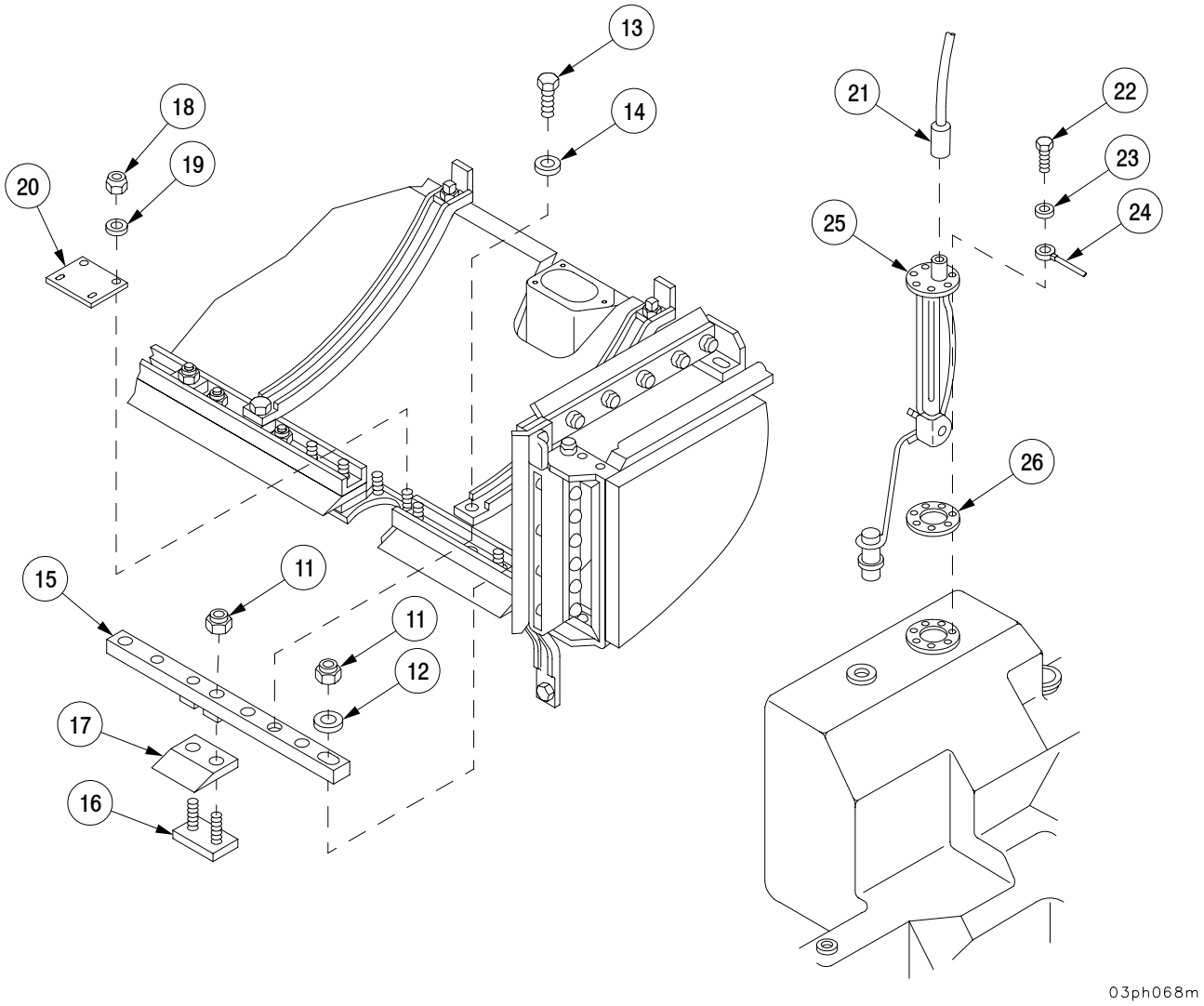
5 Apply sealing compound (item 50, Appx C) to screw (13).

6 Install bar (15), seal (17), and retainer (16) with seven new self-locking nuts (11), flat washer (12), flat washer (14), and screw (13).

Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-12 FUEL TANK LEVEL TRANSMITTERS (UPPER AND LOWER) - CONTINUED

b. Installation - Continued



Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-12 FUEL TANK LEVEL TRANSMITTERS (UPPER AND LOWER) - CONTINUED

b. Installation - Continued

7 Apply sealing compound (item 51, Appx C) to mating surfaces of two new gaskets (9).

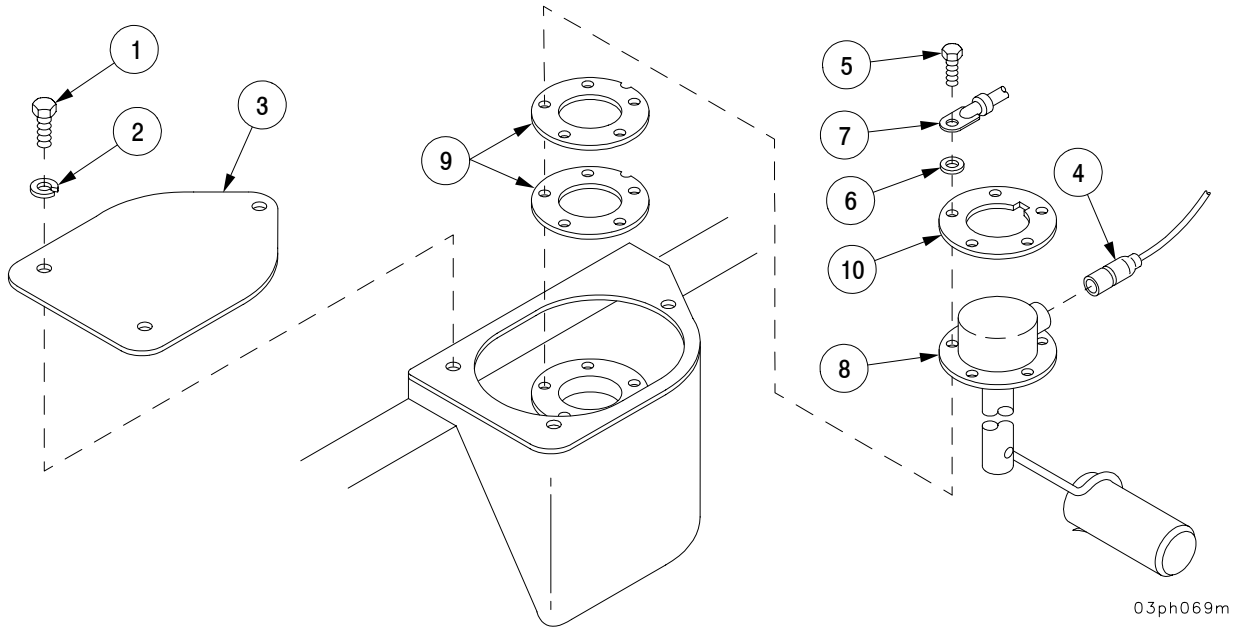
NOTE

Notch in gaskets and spacer must be aligned with transmitter electrical connector for proper installation.

8 Install transmitter (8), two new gaskets (9), spacer (10), and ground lead (7) with five screws (5) and five flat washers (6). Torque screws to 22-26 lb-in. (2.5-2.9 N·m).

9 Connect electrical connector (4).

10 Install cover (3) with three screws (1) and three new lockwashers (2).



NOTE

FOLLOW-ON MAINTENANCE:
Install exhaust grille (para 16-25)
Fill fuel tank (TM 9-2350-314-10)

Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-13 LINES AND FITTINGS (UPPER AND LOWER FUEL TANKS).

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Torque wrench (item 84, Appx F)

Materials/Parts
Sealing compound (item 52, Appx C)
Antiseizing tape (item 60, Appx C)
Lockwashers (10) (item 9, Appx E)
Lockwasher (item 22, Appx E)

Equipment Conditions
Powerpack removed (para 4-1)
Fuel tanks drained (para 5-10)

a. Removal.

WARNING

Do not use open flame or smoke when working on the fuel system. An explosion may occur, causing severe injury or death.

NOTE

- Remove only those hoses and tubes which must be replaced.
- Tag all hoses, tubes, brackets, and fittings prior to removal to aid in installation.

1 Remove exhaust heat shield (para 6-3), if required.

2 Remove hoses, tubes, brackets, and fittings in accordance with the following legend and illustration.

3 Remove clamps and attaching hardware securing hoses, tubes, and brackets to vehicle as shown in legend and illustration. Discard lockwashers.

Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-13 LINES AND FITTINGS (UPPER AND LOWER FUEL TANKS) - CONTINUED

b. Installation.

NOTE

Apply antiseize tape or sealing compound to all pipe threads during installation.

1 Install hoses, tubes, brackets, and fittings in accordance with the following legend and illustration.

2 Secure hoses, tubes, and brackets to vehicle with clamps, attaching hardware, and new lockwashers as shown in legend and illustration.

3 Tighten hose clamp (32) to 35 - 40 lb-in (3.9 - 4.5 N·m).

4 Install exhaust heat shield (para 6-3), if required.

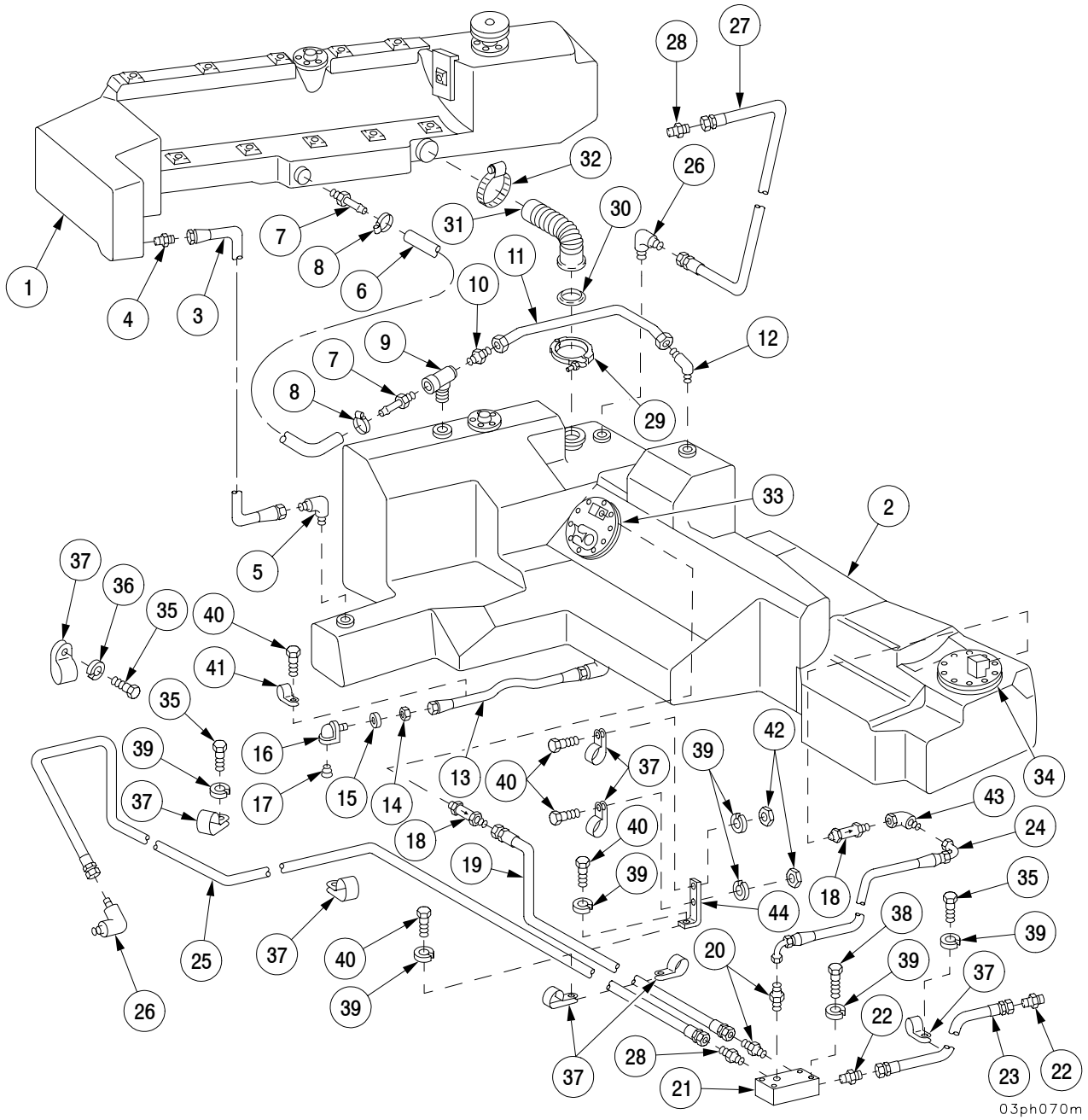
LEGEND

1. Upper fuel tank
2. Lower fuel tank
3. Upper-to-lower fuel tank drain hose
4. Adapter
5. Elbow
6. Upper-to-lower fuel tank breather hose
7. Adapters (2)
8. Clamps (2)
9. Tee
10. Adapter
11. Lower fuel tank breather tube
12. Elbow
13. Fuel tank drain hose
14. Nut
15. Washer
16. Elbow
17. Plug
18. Fuel pump discharge check valves (2)
19. Fuel tank pump hose
20. Adapters (2)
21. Fuel distribution terminal fitting
22. Adapters (2)
23. Personnel heater hose
24. Fuel tank pump hose
25. Terminal fitting to primary fuel filter hose
26. Elbows (2)
27. Lower fuel tank return hose
28. Adapters (2)
29. Coupling clamp
30. Hose flange
31. Upper-to-lower drain tank main drain
32. Hose clamp
33. Fuel pump
34. Fuel pump
35. Screws (3)
36. Lockwasher
37. Loop clamps (8)
38. Screws (4)
39. Lockwashers (10)
40. Screws (5)
41. Loop clamp
42. Nuts (2)
43. Elbow
44. Bracket

Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-13 LINES AND FITTINGS (UPPER AND LOWER FUEL TANKS) - CONTINUED

b. Installation - Continued



NOTE

FOLLOW-ON MAINTENANCE:
Install powerpack (para 4-1)
Fill fuel tank (TM 9-2350-314-10)

Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-14 ENGINE FUEL LINES AND FITTINGS.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Materials/Parts
Antiseizing tape (item 60, Appx C)
Lockwashers (6) (item 91, Appx E)
Lockwashers (4) (item 5, Appx E)
Preformed packings (4) (item 124, Appx E)
Lockwashers (2) (item 22, Appx E)
Lockwashers (2) (item 122, Appx E)
Lockwasher (item 20, Appx E)
Lockwashers (2) (item 123, Appx E)

Equipment Conditions
Transmission access doors
open (TM 9-2350-314-10)
Air intake grille open and
secured (TM 9-2350-314-10)

References
TM 9-2350-314-10

a. Removal.

WARNING

Do not smoke or use open flame when working on fuel system. An explosion may occur, causing severe injury or death.

NOTE

- Remove only those hoses and tubes which must be replaced.
- Tag all hoses, tubes, brackets, and fittings prior to removal to aid in installation.

1 Remove hoses, tubes, brackets, and fittings in accordance with the following legend and illustration.

2 Remove clamps and attaching hardware securing hoses, tubes, and brackets as shown in legend and illustration. Discard lockwashers.

Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-14 ENGINE FUEL LINES AND FITTINGS - CONTINUED

b. Installation.

NOTE

Apply antiseizing tape to all male pipe threads during installation.

1 Install hoses, tubes, brackets, and fittings in accordance with the following legend and illustration.

2 Secure hoses, tubes, and brackets with clamps, attaching hardware, and new lockwashers as shown in legend and illustration.

Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-14 ENGINE FUEL LINES AND FITTINGS - CONTINUED

b. Installation - Continued

LEGEND:

1. Screws (4)
2. Bracket (para 5-17)
3. Lockwashers (6)
4. Screws (6)
5. Plugs (2)
6. Primary fuel filter (para 5-17)
7. Elbows (2)
8. Elbow
9. Flat washers (4)
10. Lockwashers (4)
11. Nuts (4)
12. Adapters (2)
13. Packings (4)

NOTE

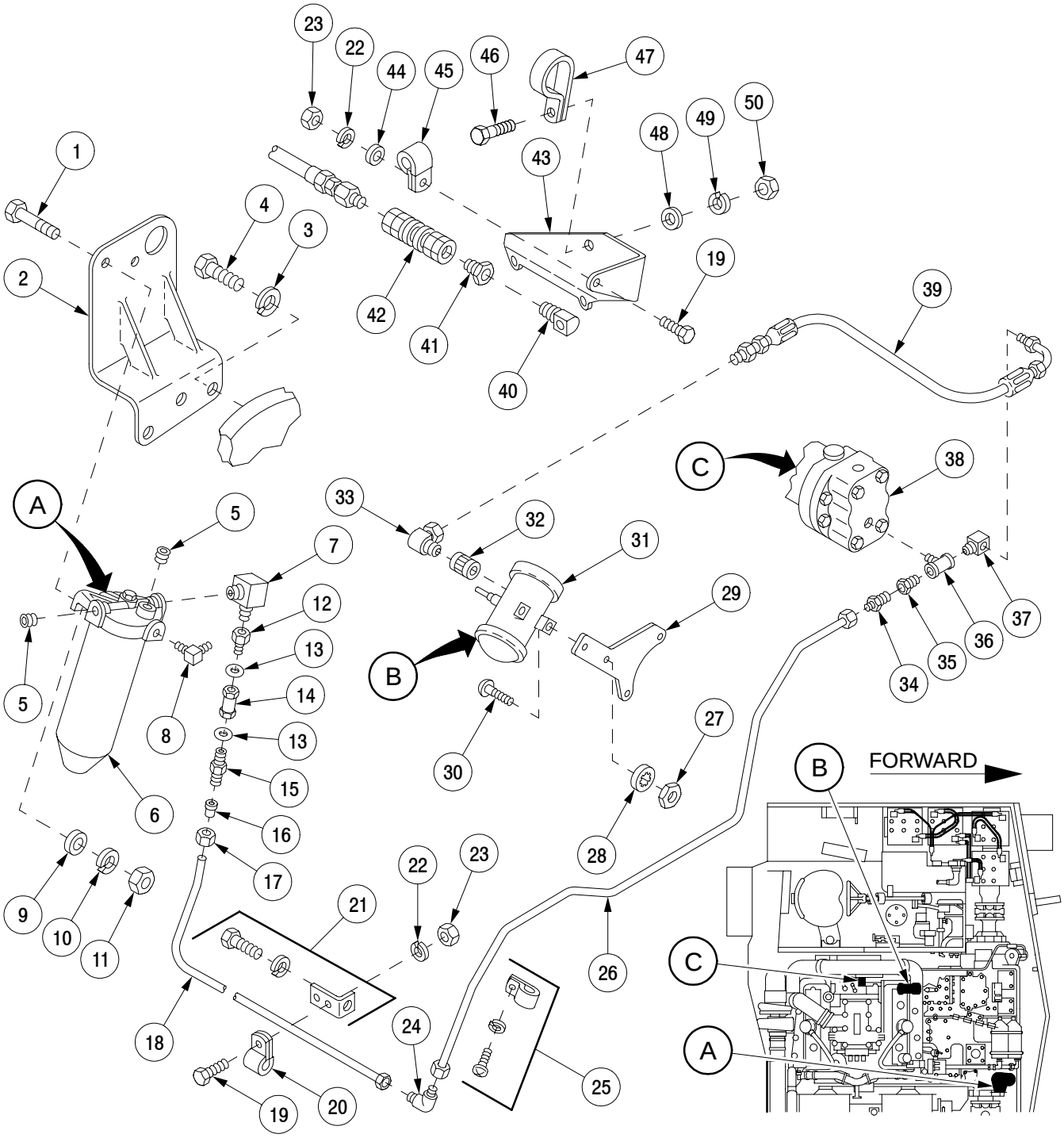
- Install one check valve with free flow direction indicator toward fuel pump.
- Install one check valve with free flow direction indicator toward secondary filter.

14. Check valves (2)
15. Nipples (2)
16. Sleeve
17. Nut
18. Primary fuel filter to engine-driven fuel pump tube
19. Screws (2)
20. Clamp
21. Bracket with attaching hardware
22. Lockwashers (2)
23. Nuts (2)
24. Elbow
25. Clamps (7) with attaching hardware
26. Primary fuel filter to engine-driven fuel pump tube (para 4-1)
27. Nuts (2)
28. Lockwashers (2)
29. Bracket (para 5-15)
30. Screws (2)
31. Electric fuel pump (para 5-15)
32. Coupler
33. Elbow
34. Adapters (2)
35. Bushing (para 5-2)
36. Tee (para 5-2)
37. Elbow (para 5-2)
38. Engine-driven fuel pump (para 5-2)
39. Engine-driven fuel pump to electric fuel pump hose assembly (para 5-2)
40. Elbow
41. Bushing
42. Coupling assembly
43. Bracket
44. Flat washer
45. Clamp
46. Screw
47. Clamp
48. Flat washer
49. Lockwasher
50. Nut
51. Bracket (para 5-18)
52. Clamp
53. Fuel hose assembly
54. Elbow
55. Tee
56. Elbow
57. Elbow
58. Fuel supply pressure transducer (para 8-45)
59. Secondary fuel filter (para 5-18)
60. Fuel pressure differential transducer (para 8-44)
61. Elbow
62. Fuel line
63. Tee
64. Nuts (2)
65. Lockwashers (2)
66. Clamps (4)
67. Screws (2)
68. Flat washers (3)
69. Fuel line (para 4-1)
70. Fuel line (para 4-1)
71. Elbow (para 5-2)
72. Elbow

Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-14 ENGINE FUEL LINES AND FITTINGS - CONTINUED

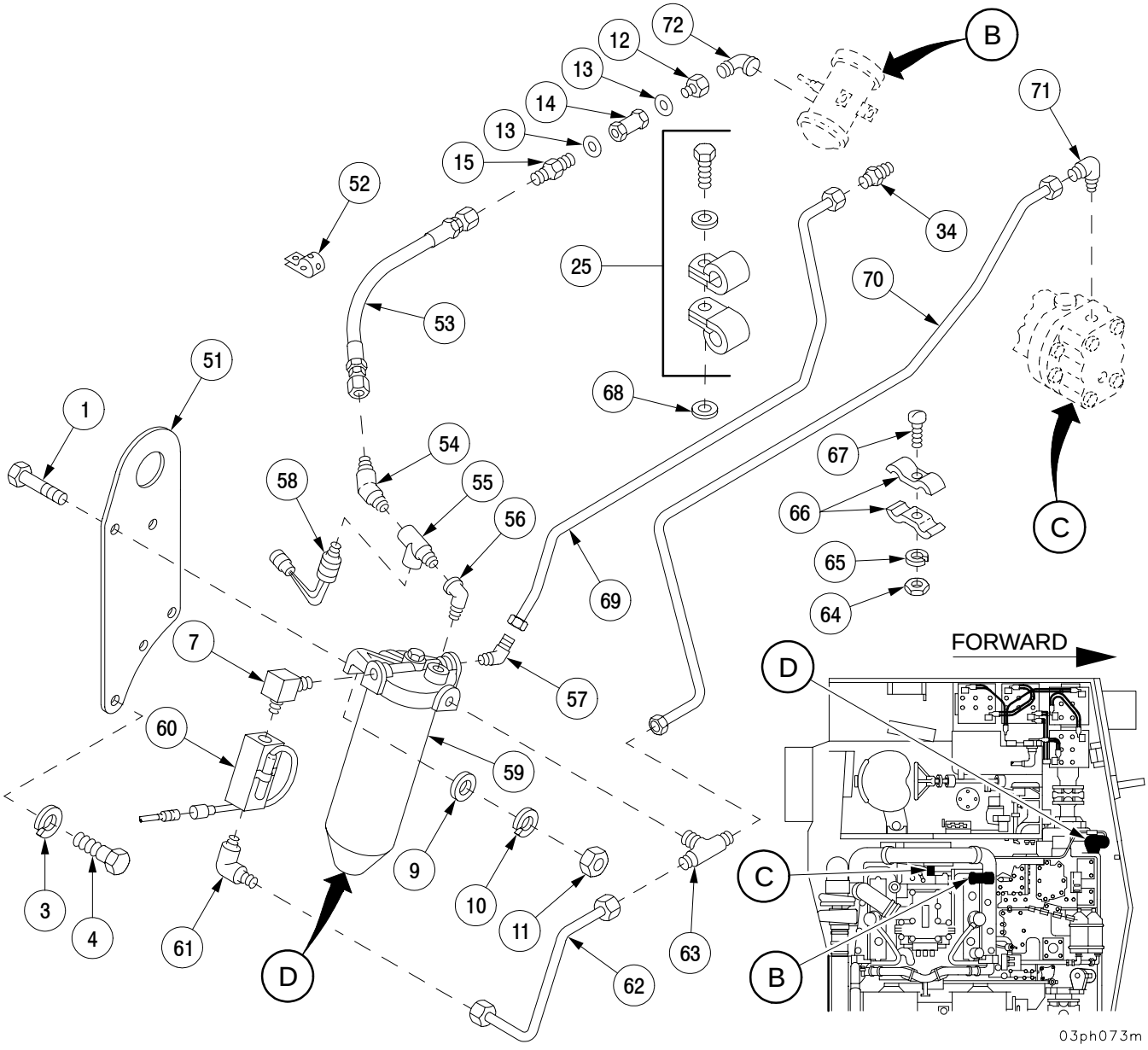
b. Installation - Continued



Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-14 ENGINE FUEL LINES AND FITTINGS - CONTINUED

b. Installation - Continued



NOTE

FOLLOW-ON MAINTENANCE:
Close and secure air intake grille
(TM 9-2350-314-10)
Close and secure transmission access doors
(TM 9-2350-314-10)

Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-15 ELECTRIC FUEL PUMP.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Materials/Parts
Lockwashers (2) (item 122, Appx E)
Preformed packings (2) (item 124, Appx E)

Equipment Conditions
Air intake grille open and secured
(TM 9-2350-314-10)
Front slope plate removed (para 16-30)

References
TM 9-2350-314-10

Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-15 ELECTRIC FUEL PUMP - CONTINUED

a. Removal.

WARNING

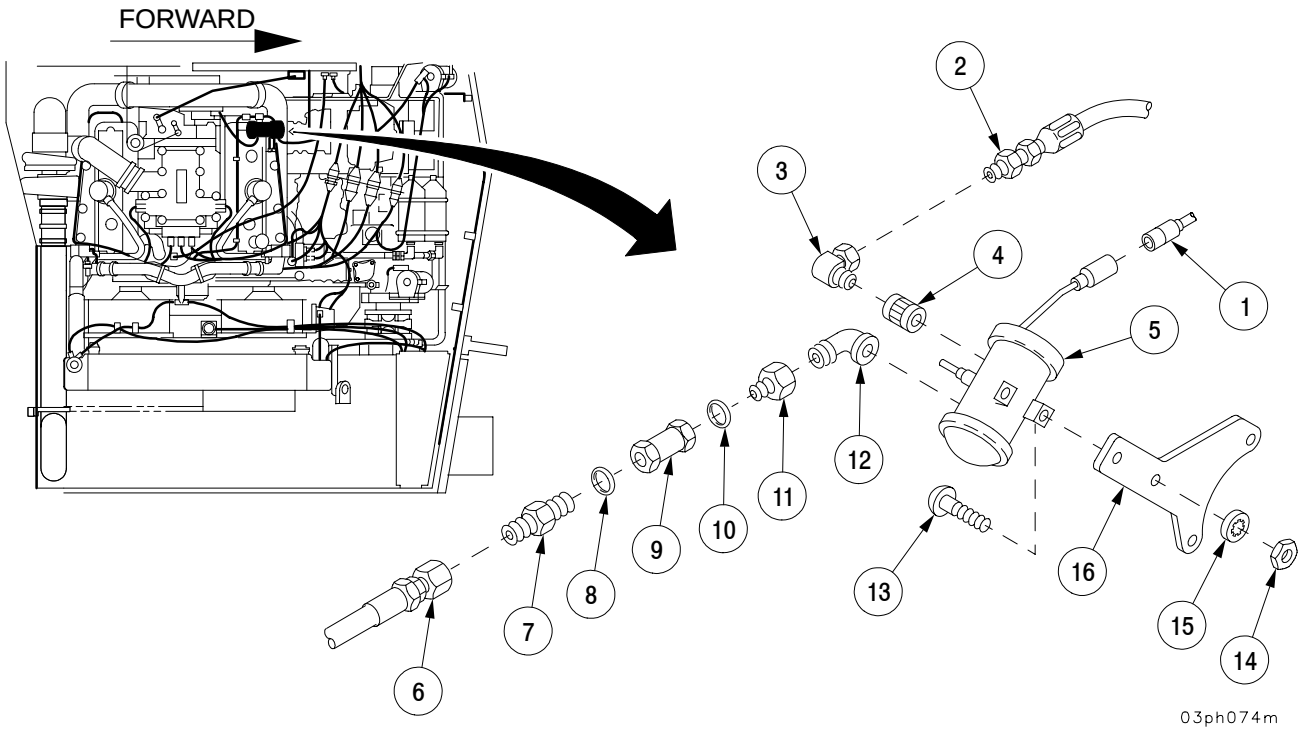
Do not smoke or use open flame when working on fuel system. An explosion may occur, causing severe injury or death.

1 Disconnect wiring harness W104 wire 588 (1) from electric fuel pump lead.

2 Remove hose (2), elbow (3), and coupling (4) from electric fuel pump (5).

3 Remove hose (6), nipple (7), preformed packing (8), check valve (9), preformed packing (10), adapter (11), and elbow (12) from electric fuel pump (5). Discard preformed packings.

4 Remove two screws (13), two nuts (14), two lockwashers (15), and electric fuel pump (5) from bracket (16). Discard lockwashers.



Section IV. TANKS, LINES, FITTINGS, AND HEADERS - CONTINUED

5-15 ELECTRIC FUEL PUMP - CONTINUED

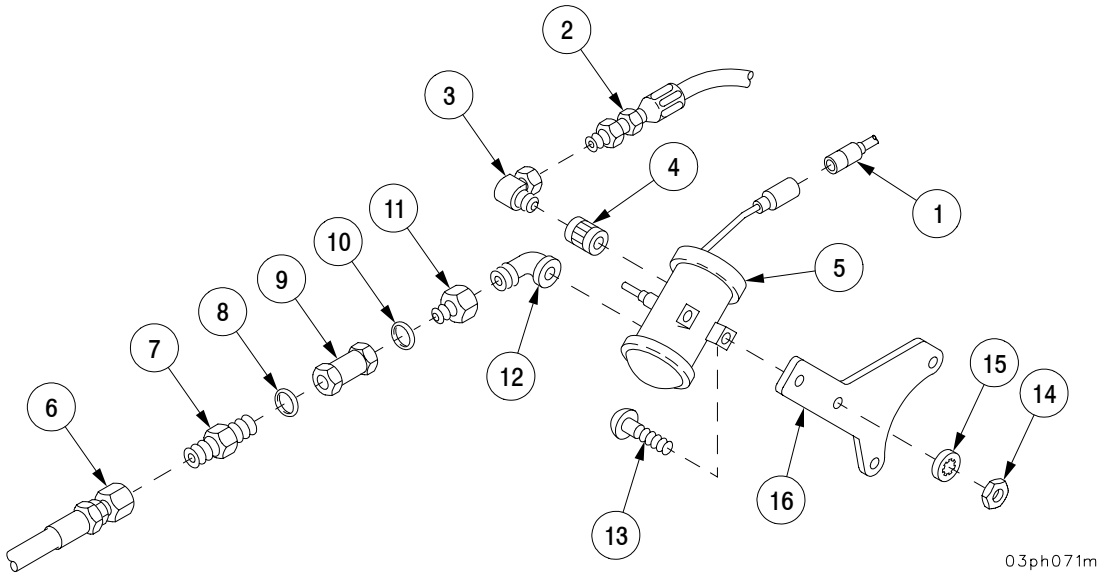
b. Installation.

1 Install electric fuel pump (5) on bracket (16) with two screws (13), two new lockwashers (15), and two nuts (14).

2 Install elbow (12), adapter (11), new preformed packing (10), check valve (9), new preformed packing (8), nipple (7), and hose (6) to electric fuel pump (5).

3 Install coupling (4), elbow (3), and hose (2) to electric fuel pump (5).

4 Connect wiring harness W104 wire 588 (1) to electric fuel pump lead.



NOTE

FOLLOW-ON MAINTENANCE:
Install front slope plate (para 16-30)
Close and secure air intake grille
(TM 9-2350-314-10)

Section V. FUEL FILTERS

5-16 FUEL FILTERS (PRIMARY AND SECONDARY).

This task covers: Service

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Utility pail (item 40, Appx F)

Materials/Parts
Dry-cleaning solvent
(item 59, Appx C)
Filter element with gaskets (primary)
(item 125, Appx E)
Filter element with gaskets (secondary)
(item 126, Appx E)

Equipment Conditions
Transmission access doors
open (TM 9-2350-314-10)
Fuel supply line disconnected
(para 4-1)

References
TM 9-2350-314-10

Service.

WARNING

Do not smoke or use open flame when working on fuel system. An explosion may occur, causing severe injury or death.

1 Open fuel filter draincock (1) and drain fuel into utility pail. Close fuel filter draincock (1).

2 Remove bolt (2), gasket (3), and fuel filter canister (4) from filter head (5). Discard gasket.

3 Remove filter element (6) from filter canister (4) and gasket (7) from filter head (5). Discard element and gasket.

Section V. FUEL FILTERS - CONTINUED

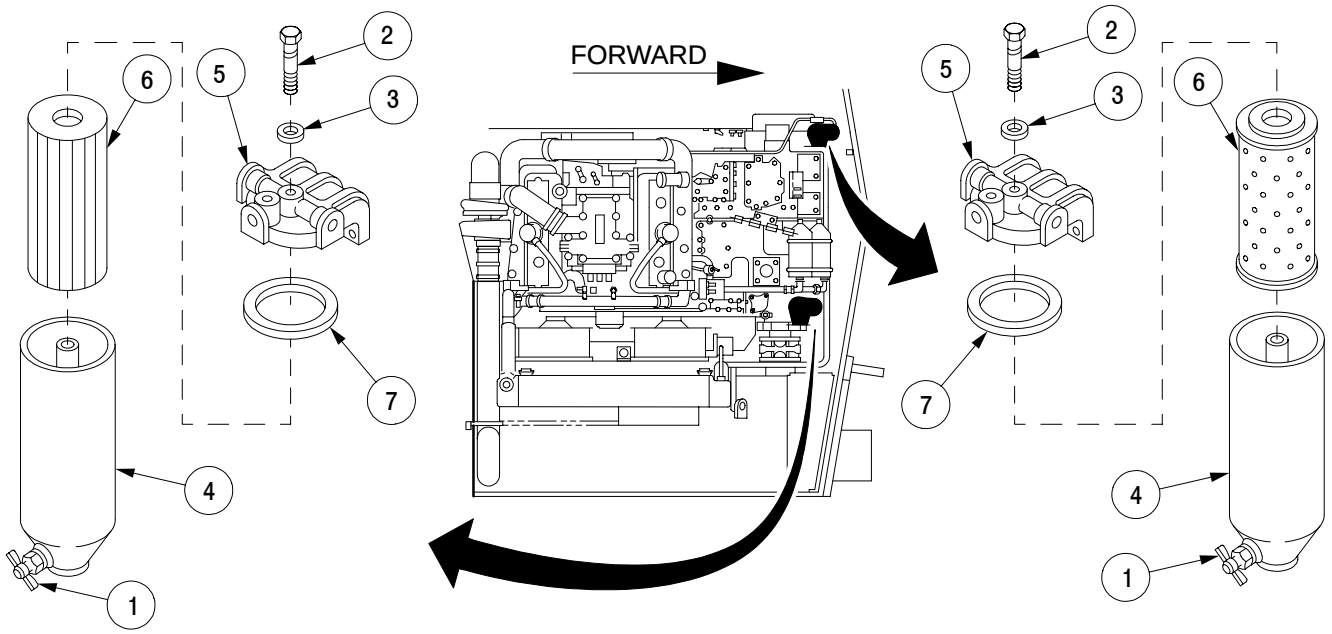
5-16 FUEL FILTERS (PRIMARY AND SECONDARY) - CONTINUED

Service - Continued

WARNING

Dry-cleaning solvent (P-D-680) is toxic and flamable. To avoid injury, wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause SERIOUS INJURY. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (FM 21-11).

4 Wash fuel filter canister (4) with dry-cleaning solvent.



PRIMARY FUEL FILTER SECONDARY FUEL FILTER

03ph075m

Section V. FUEL FILTERS - CONTINUED

5-16 FUEL FILTERS (PRIMARY AND SECONDARY) - CONTINUED

Service - Continued

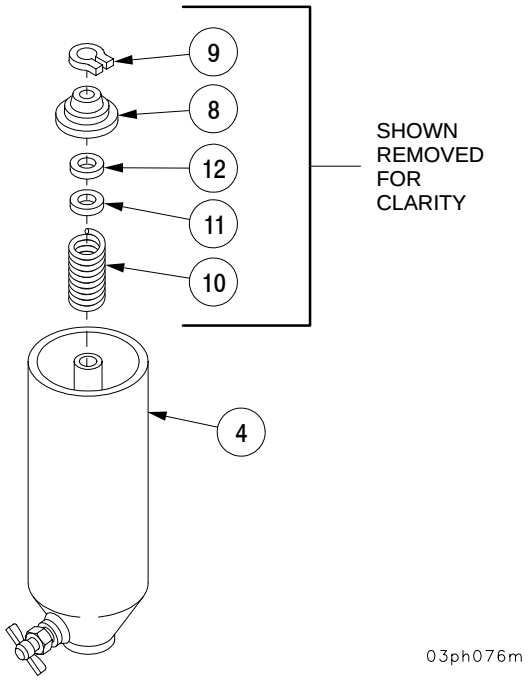
WARNING

- Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).
- Air pressure may create airborne debris. Use eye protection or injury to personnel may result.

5 Blow out fuel filter canister (4) with compressed air.

6 Make sure element seat (8) and retaining ring (9) have not slipped out of place. Check spring (10) by pressing on element seat (8). When spring (10) is released, the element seat (8) must return against retaining ring (9).

7 Check spring seat (11) and gasket (12) for wear or deterioration.



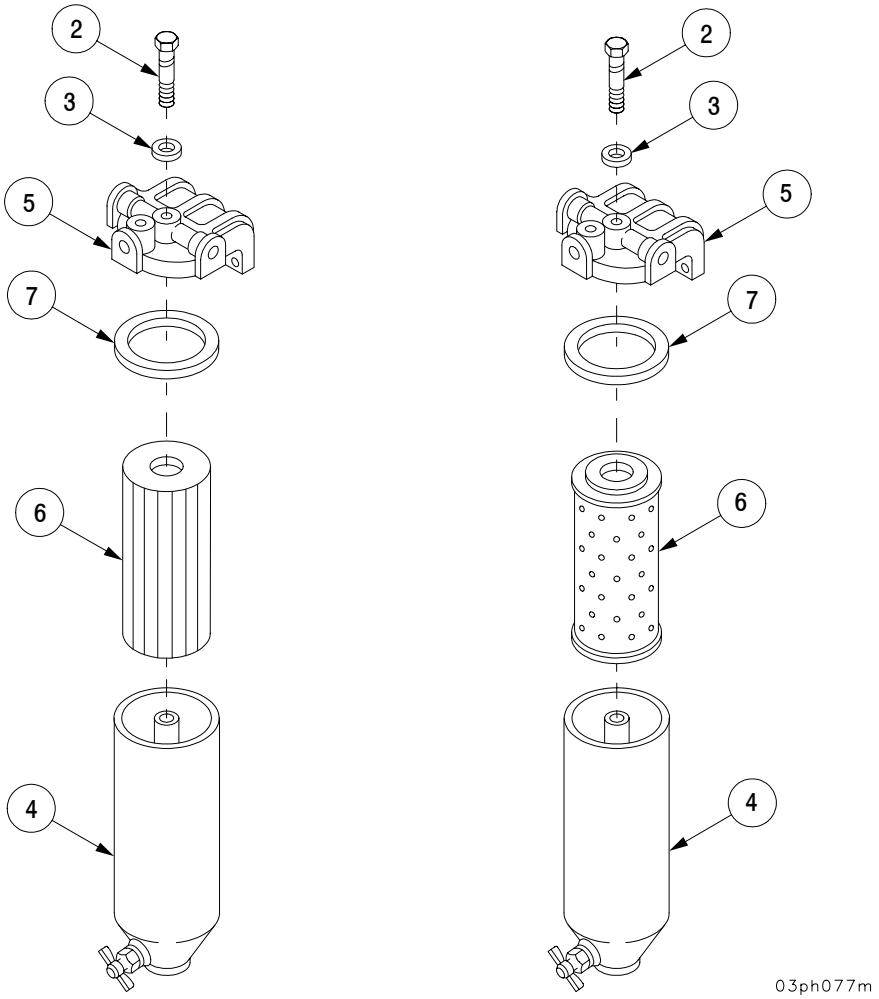
Section V. FUEL FILTERS - CONTINUED

5-16 FUEL FILTERS (PRIMARY AND SECONDARY) - CONTINUED

Service - Continued

8 Install new gasket (7), new filter element (6), and filter canister (4) on filter head (5).

9 Install bolt (2) and new gasket (3) securing filter canister (4) with new fuel filter element (6) to filter head (5). Tighten bolt (2) enough to prevent fuel leakage.



NOTE

FOLLOW-ON MAINTENANCE:
Close and secure transmission access doors (TM 9-2350-314-10)
Connect fuel supply line (para 4-1)

Section V. FUEL FILTERS - CONTINUED

5-17 PRIMARY FUEL FILTER AND BRACKET.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Suitable container

Equipment Conditions
Right transmission access door opened (TM 9-2350-314-10)

Materials/Parts
Antiseizing tape (item 60, Appx C)
Lockwashers (3) (item 91, Appx E)
Lockwashers (2) (item 5, Appx E)

References
TM 9-2350-314-10

a. Removal.

WARNING

Do not smoke or use open flame when working on fuel system. An explosion may occur, causing severe injury or death.

1 Open fuel filter draincock (1) and drain fuel into suitable container. Remove fuel filter draincock (1).

2 Disconnect fuel line (2) from elbow (3).

3 Remove elbow (3) from fuel filter (4).

4 Disconnect fuel line (5) from check valve (6).

5 Remove check valve (6) from elbow (7).

6 Remove elbow (7) and two plugs (8) from fuel filter (4).

7 Remove two bolts (9), two nuts (10), two lockwashers (11), two flat washers (12), and fuel filter (4) from bracket (13). Discard lockwashers.

8 Remove three bolts (14), three lockwashers (15), and bracket (13). Discard lockwashers.

Section V. FUEL FILTERS - CONTINUED

5-17 PRIMARY FUEL FILTER AND BRACKET - CONTINUED

b. Installation.

1 Install bracket (13) with three bolts (14) and three new lockwashers (15).

2 Install fuel filter (4) with two bolts (9), two flat washers (12), two new lockwashers (11), and two nuts (10).

3 Install two plugs (8) and elbow (7) in fuel filter (4).

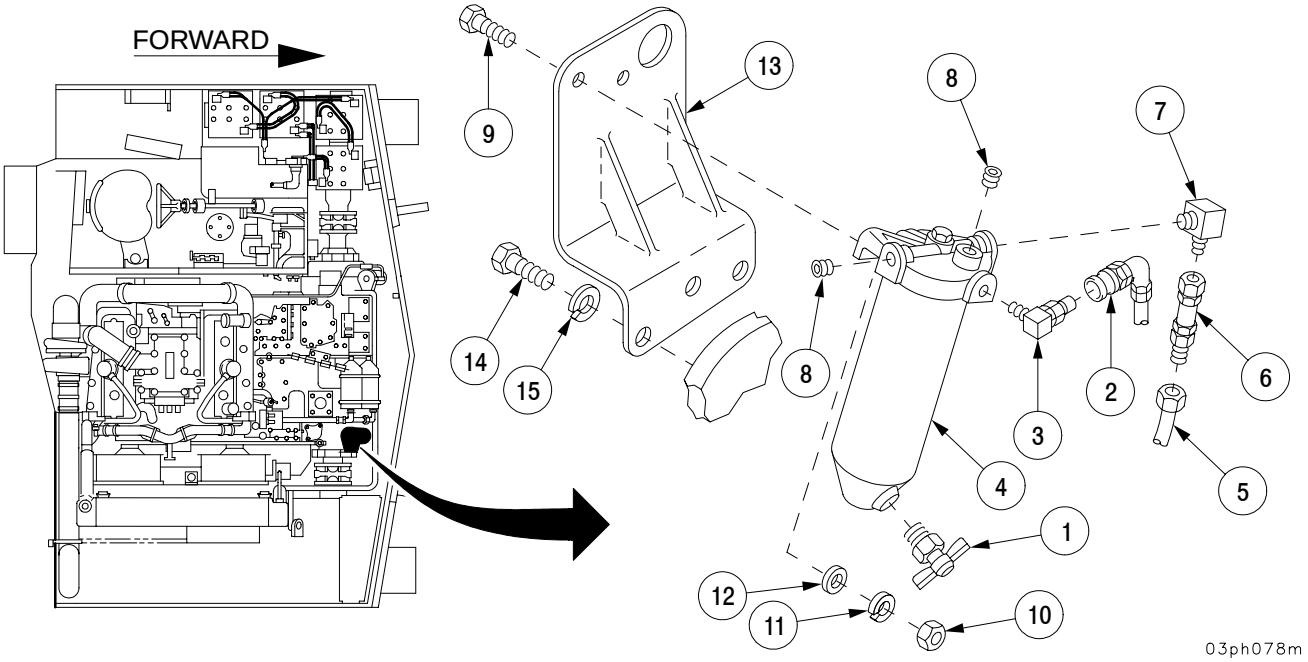
NOTE

Apply antiseizing tape to all male pipe threads during installation.

4 Install check valve (6) on elbow (7) and connect fuel line (5).

5 Install elbow (3) on fuel filter (4) and connect fuel line (2) to elbow (3).

6 Install fuel filter draincock (1) in fuel filter (4).



NOTE

FOLLOW-ON MAINTENANCE:
Close and secure right transmission access door (TM 9-2350-314-10)
Prime fuel system (TM 9-2350-314-10)

Section V. FUEL FILTERS - CONTINUED

5-18 SECONDARY FUEL FILTER AND BRACKET.

This task covers: a. Removal b. Disassembly c. Assembly d. Installation

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Suitable container

Equipment Conditions
Fuel supply pressure transducer removed (para 8-43)

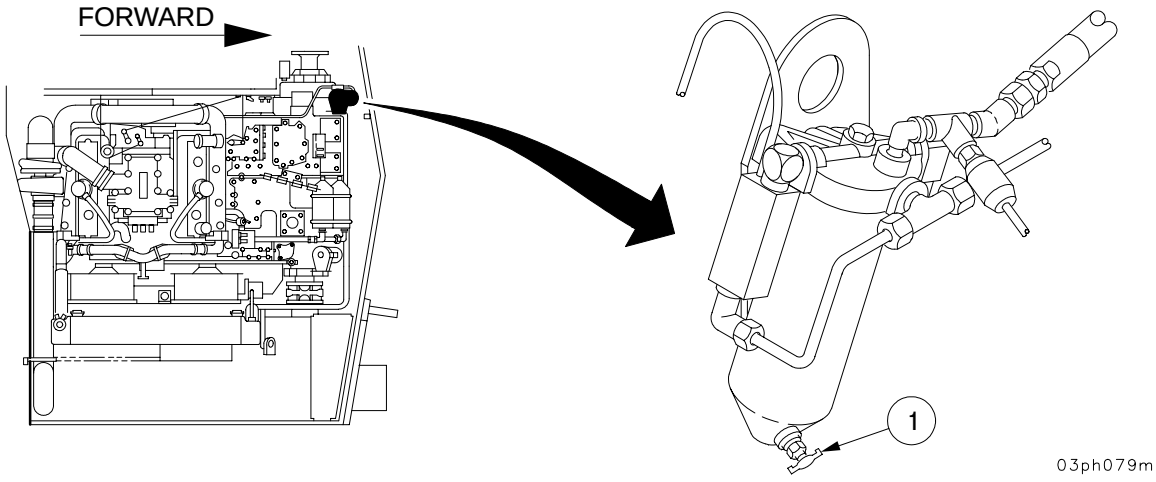
Materials/Parts
Antiseizing tape (item 60, Appx C)
Lockwashers (2) (item 5, Appx E)
Lockwashers (3) (item 91, Appx E)
Filter element with gaskets (item 126, Appx E)
Gasket (item 128, Appx E)
Helical spring (item 129, Appx E)
Retaining ring (item 270, Appx E)

a. Removal.

WARNING

Do not smoke or use open flame when working on fuel system. An explosion may occur, causing severe injury or death.

1 Open fuel filter draincock (1) and drain fuel into utility pail. Remove fuel filter draincock (1).



Section V. FUEL FILTERS - CONTINUED

5-18 SECONDARY FUEL FILTER AND BRACKET - CONTINUED

a. Removal - Continued

2 Disconnect fuel line hose (2) at elbow (3).

3 Remove elbow (3), tee (4), and elbow (5) from fuel filter (6).

4 Disconnect tube (7) from elbow (8).

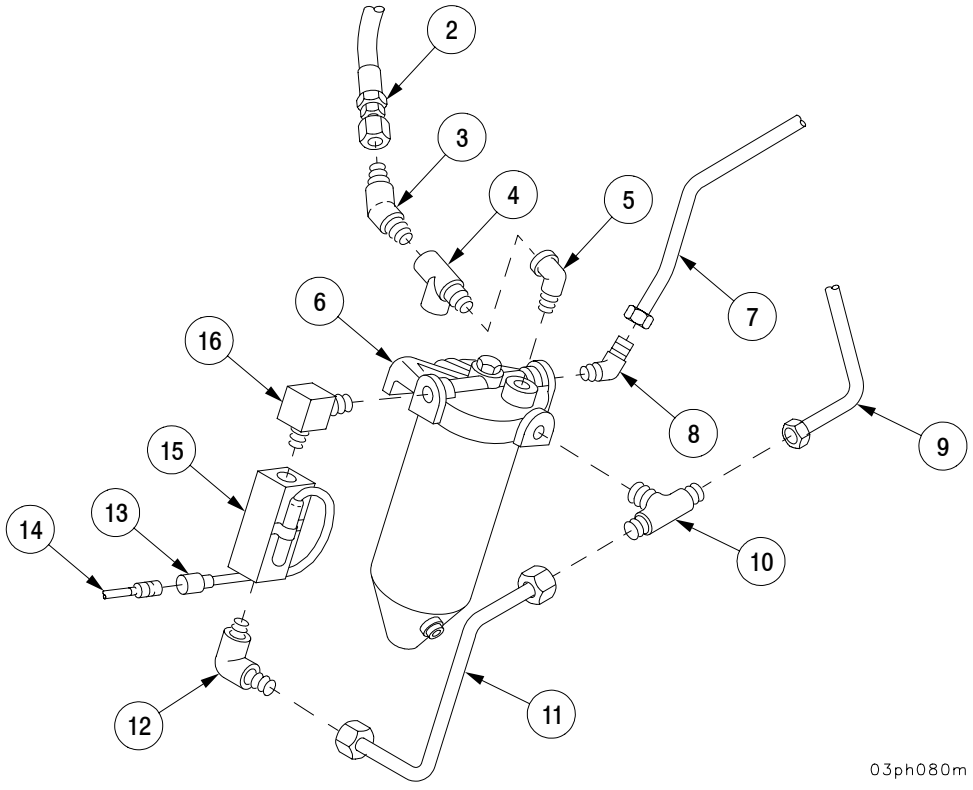
5 Remove elbow (8) from fuel filter (6).

6 Disconnect tube (9) from tee (10).

7 Remove tube (11) from tee (10) and elbow (12).

8 Disconnect connector (13) from wiring harness W102 connector P4 (14).

9 Remove elbow (12), transducer (15), elbow (16), and tee (10) from fuel filter (6).



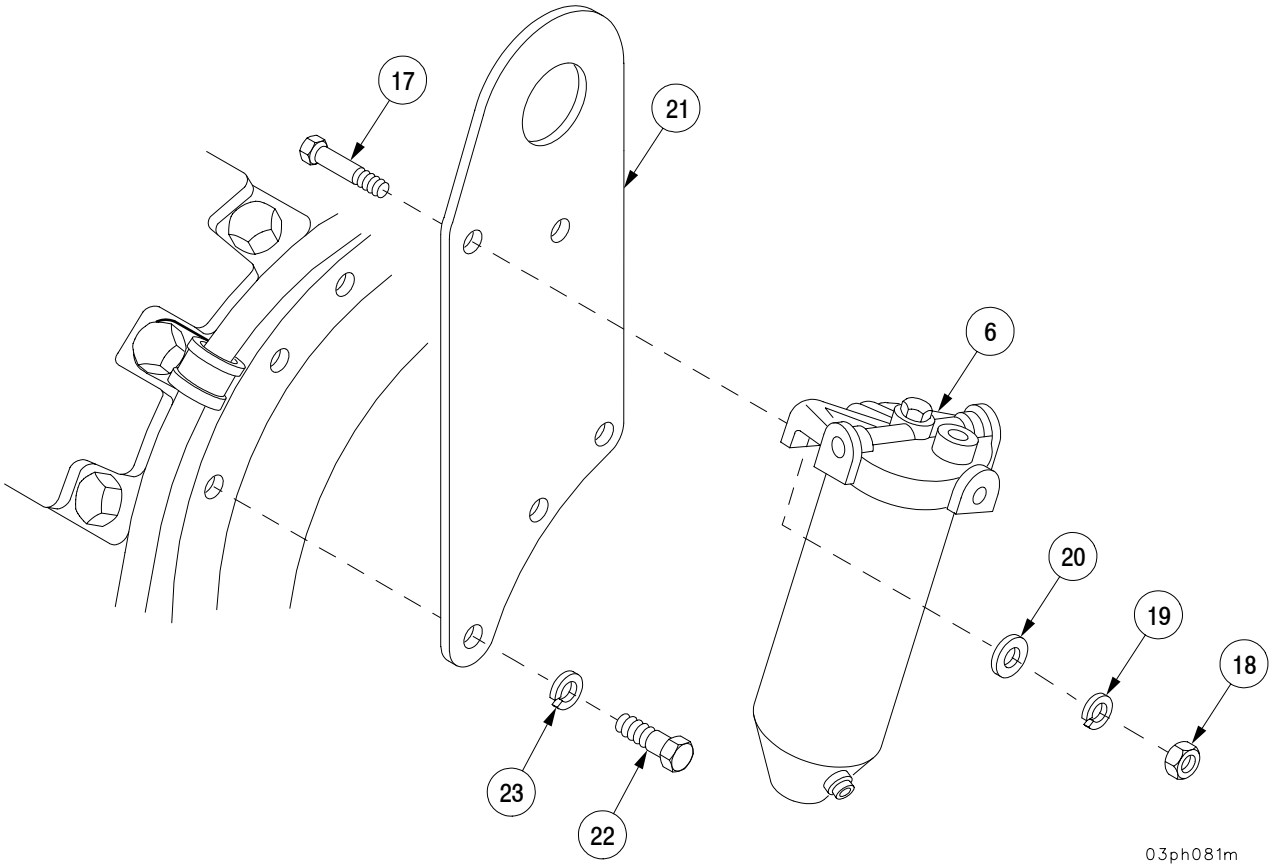
Section V. FUEL FILTERS - CONTINUED

5-18 SECONDARY FUEL FILTER AND BRACKET - CONTINUED

a. Removal - Continued

10 Remove two bolts (17), two nuts (18), two lockwashers (19), two flat washers (20), and fuel filter (6) from bracket (21). Discard lockwashers.

11 Remove three bolts (22), three lockwashers (23), and bracket (21). Discard lockwashers.



Section V. FUEL FILTERS - CONTINUED

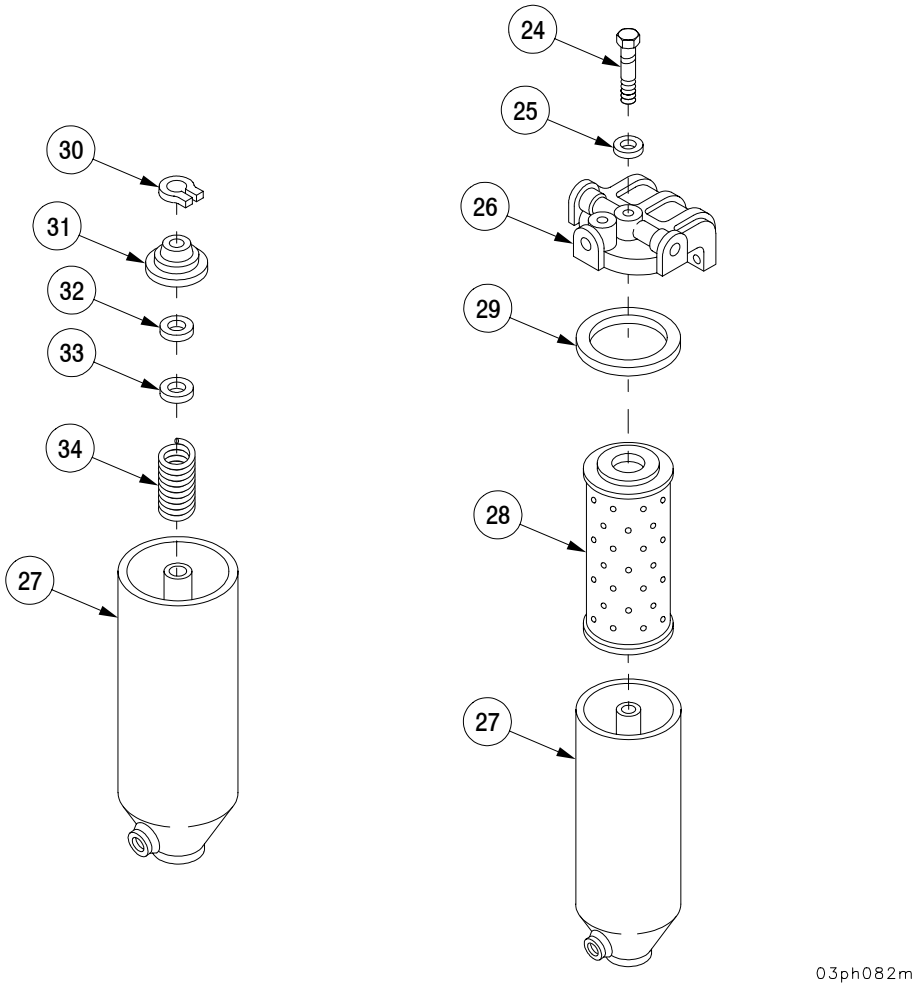
5-18 SECONDARY FUEL FILTER AND BRACKET - CONTINUED

b. Disassembly.

1 Remove bolt (24), gasket (25), and filter head (26) from fuel filter canister (27). Discard gasket.

2 Remove filter element (28) from fuel filter canister (27). Remove gasket (29) from filter head (26). Discard element and gasket.

3 Remove retaining ring (30), element seat (31), gasket (32), spring seat (33), and spring (34) from fuel filter canister (27). Discard retaining ring, gasket, and spring seat.



Section V. FUEL FILTERS - CONTINUED

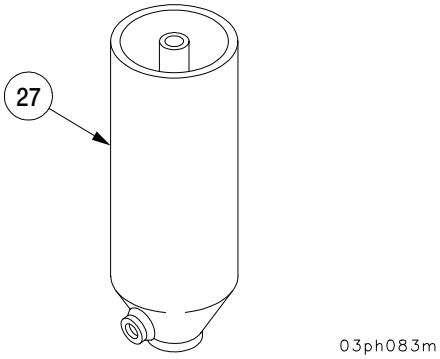
5-18 SECONDARY FUEL FILTER AND BRACKET - CONTINUED

c. Assembly.

WARNING

Dry-cleaning solvent (P-D-680) is toxic and flamable. To avoid injury, wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause SERIOUS INJURY. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (FM 21-11).

1 Wash fuel filter canister (27) with dry-cleaning solvent.



Section V. FUEL FILTERS - CONTINUED

5-18 SECONDARY FUEL FILTER AND BRACKET - CONTINUED

c. Assembly - Continued

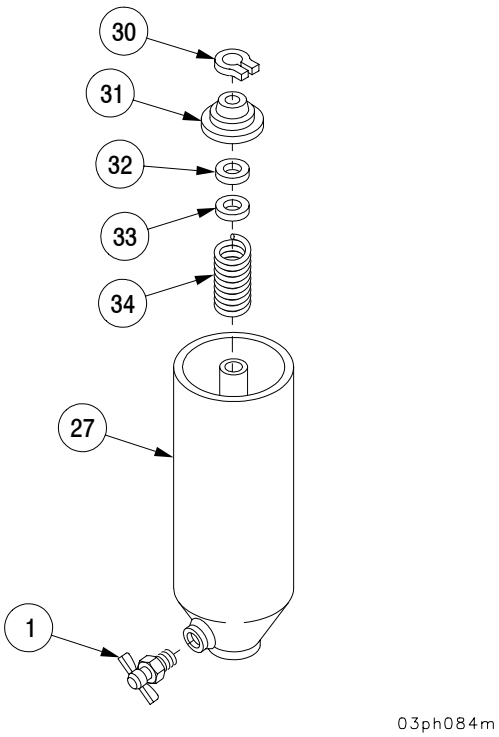
WARNING

- Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment.
- Air pressure may create airborne debris. Use eye protection or injury to personnel may result.

2 Blow out fuel filter canister (27) with compressed air.

3 Install spring (34), new spring seat (33), new gasket (32), element seat (31), and new retaining ring (30) in fuel filter canister (27).

4 Install drain cock (1) in fuel filter canister (27).



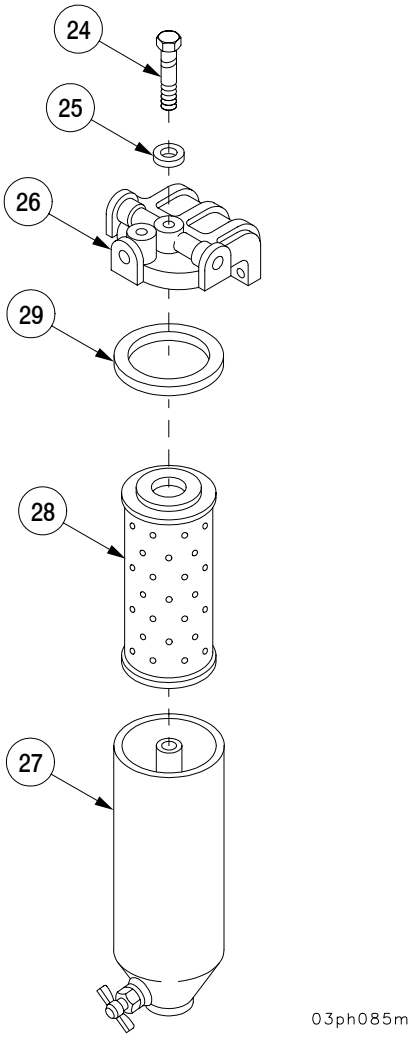
Section V. FUEL FILTERS - CONTINUED

5-18 SECONDARY FUEL FILTER AND BRACKET - CONTINUED

c. Assembly - Continued

5 Install new gasket (29), new fuel filter element (28), and fuel filter canister (27) on filter head (26).

6 Install bolt (24) and new gasket (25) securing filter canister (27) with fuel filter element (28) to filter head (26). Tighten bolt (24) enough to prevent fuel leakage.



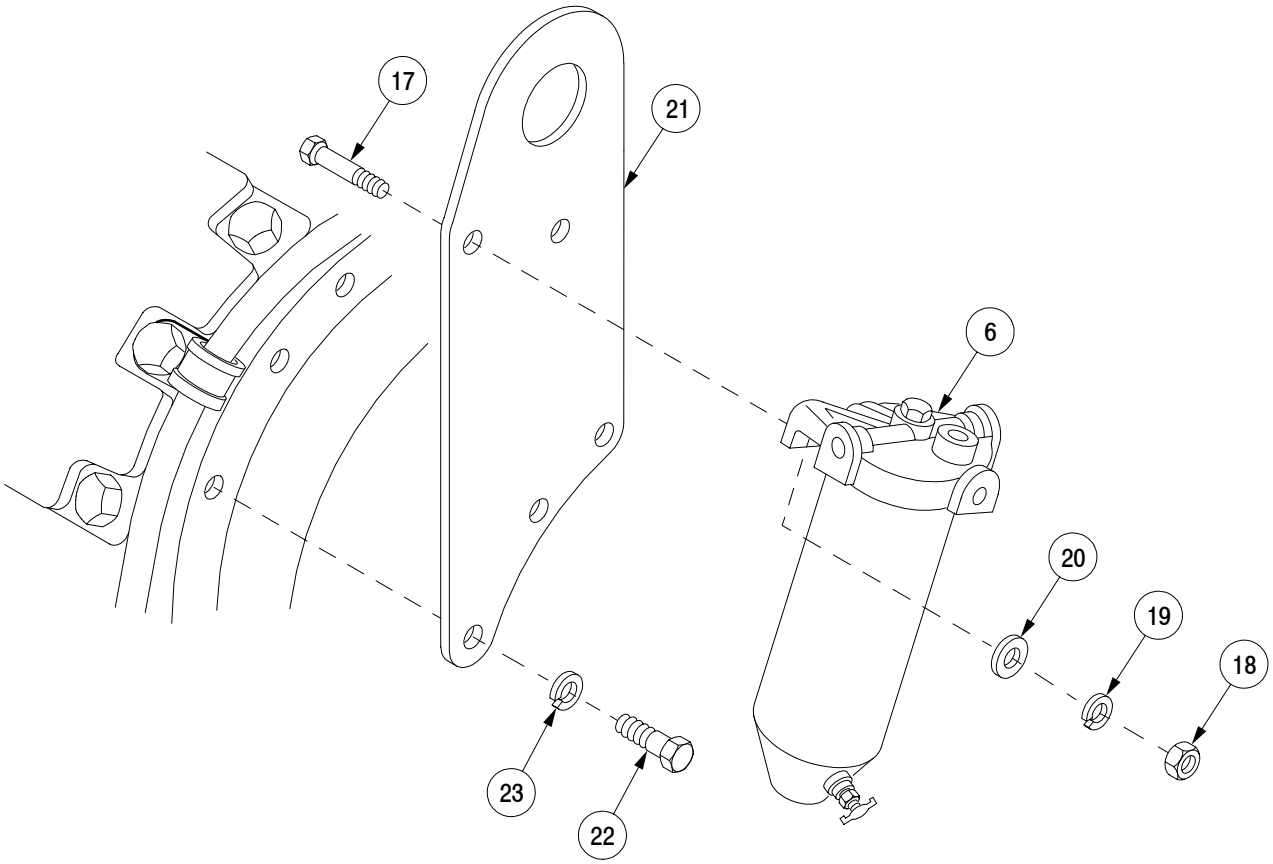
Section V. FUEL FILTERS - CONTINUED

5-18 SECONDARY FUEL FILTER AND BRACKET - CONTINUED

d. Installation.

1 Install bracket (21) with three bolts (22) and three new lockwashers (23).

2 Install fuel filter (6) on bracket (21) with two bolts (17), two flat washers (20), two new lockwashers (19), and two nuts (18).



Section V. FUEL FILTERS - CONTINUED

5-18 SECONDARY FUEL FILTER AND BRACKET - CONTINUED

d. Installation - Continued

NOTE

Apply antiseizing tape to all male pipe fittings during installation.

3 Install elbow (16), elbow (8), tee (10), and elbow (5) in fuel filter (6).

4 Install transducer (15) on elbow (16).

5 Install elbow (12) in transducer (15).

6 Connect connector (13) to wiring harness W102 connector P4 (14).

7 Install tube (11) in elbow (12) and tee (10).

8 Connect tube (9) to tee (10).

9 Connect tube (7) to elbow (8).

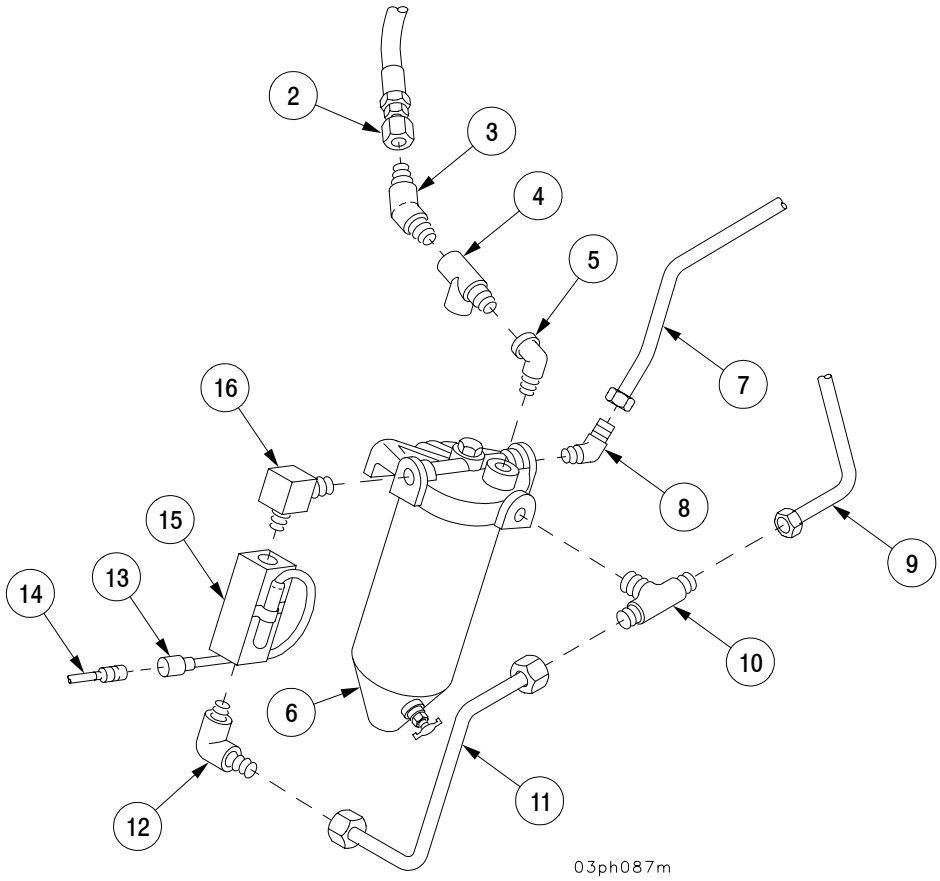
10 Install tee (4) and elbow (3) on elbow (5).

11 Connect fuel line hose (2) to elbow (3).

Section V. FUEL FILTERS - CONTINUED

5-18 SECONDARY FUEL FILTER AND BRACKET - CONTINUED

d. Installation - Continued



NOTE

FOLLOW-ON MAINTENANCE:
Install fuel supply pressure transducer
(para 8-43)

Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS.

5-19 HAND THROTTLE GOVERNOR CONTROL ROD.

This task covers: Adjustment

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Materials/Parts
Cotter pin (item 127, Appx E)

Adjustment.

1 Position hand throttle lever (1) so positioning hole in lever is in line with positioning hole "X" in cover (2). Insert drive pin punch.

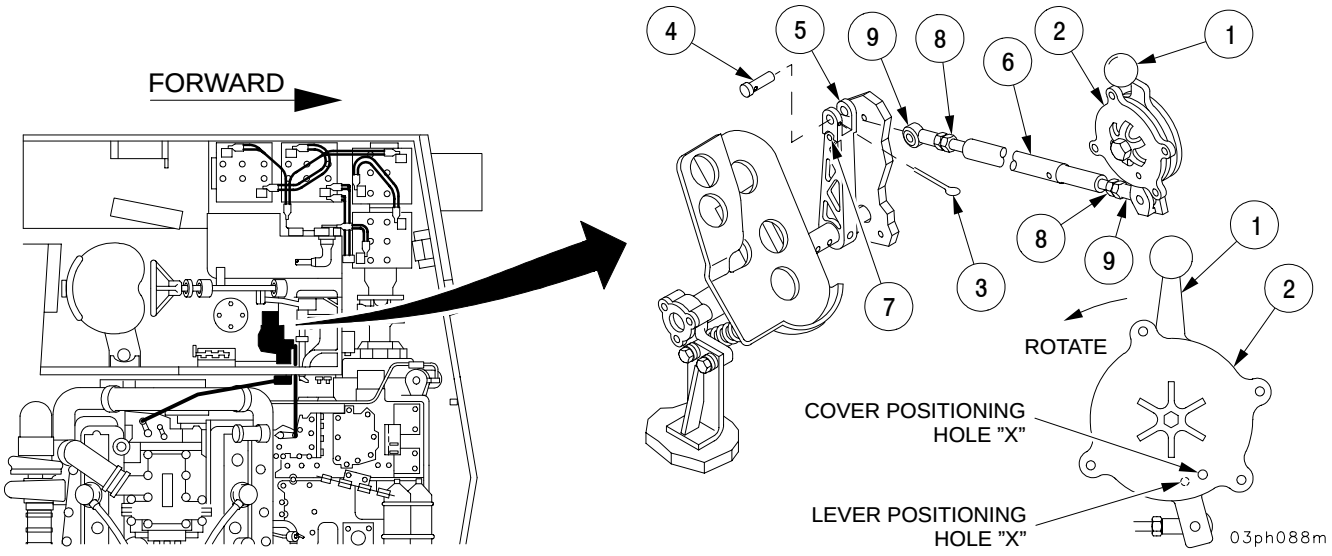
2 Remove cotter pin (3) and headed pin (4) from throttle lever (5). Remove rod assembly (6) from throttle lever (5). Discard cotter pin.

3 Position throttle lever (5) so positioning hole (7) in throttle lever (5) is in line with positioning hole in driver's bulkhead. Insert drive pin punch.

4 Loosen two nuts (8) and adjust rod ends (9) so that headed pin (4) can be easily inserted through lever (5) and rod end (9).

5 Install headed pin (4) and new cotter pin (3).

6 Tighten two nuts (8) and remove two drive pin punches.



Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-20 ENGINE THROTTLE GOVERNOR CONTROL ROD.

This task covers: Adjustment

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

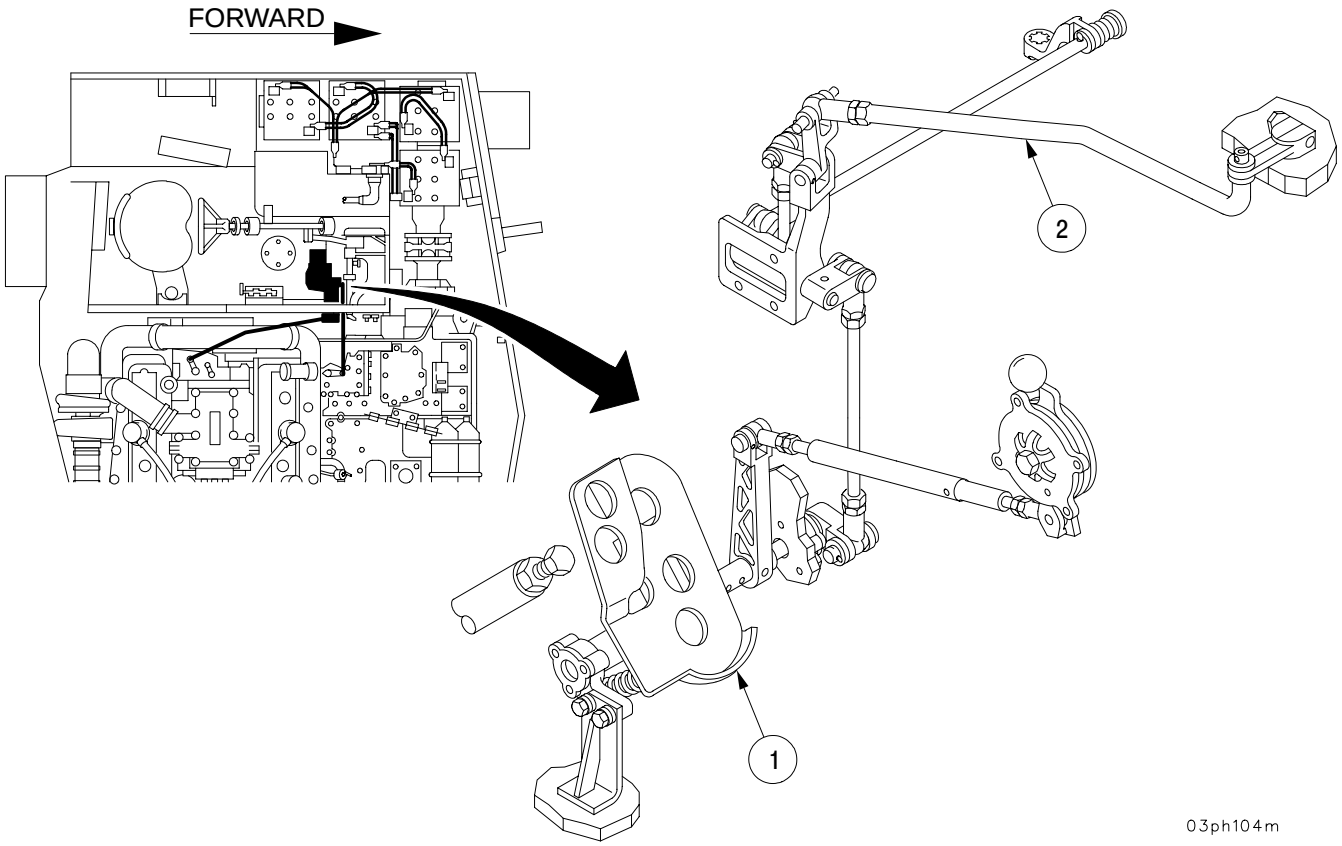
Equipment Conditions
Air intake grille open and secured
(TM 9-2350-314-10)

Personnel Required
Two

References
TM 9-2350-314-10

Adjustment.

1 Fully depress accelerator pedal (1) to move engine throttle governor control rod assembly (2) away from driver's bulkhead.



Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-20 ENGINE THROTTLE GOVERNOR CONTROL ROD - CONTINUED

Adjustment - Continued

2 Remove quick-release pin (3) and disconnect engine throttle governor control rod assembly (2) from lever (4).

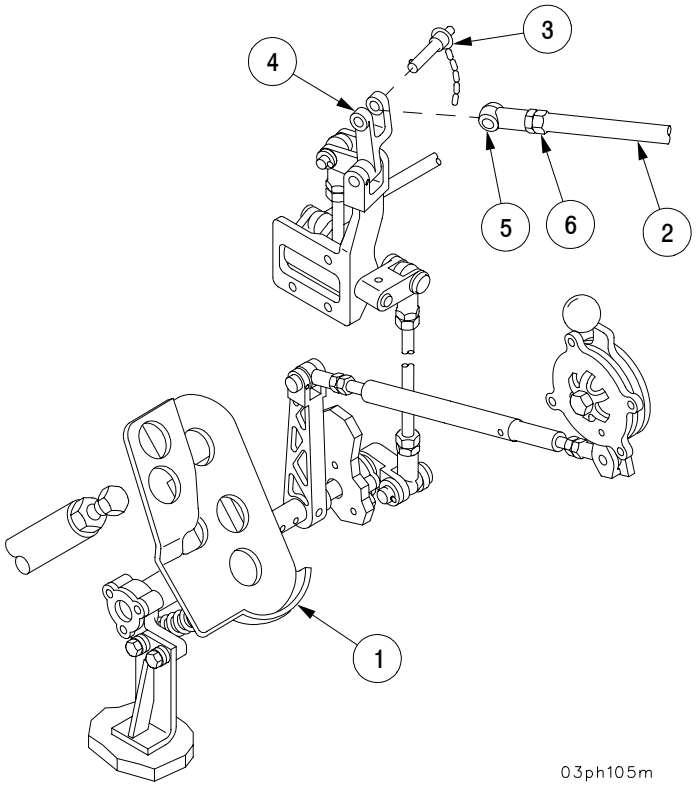
3 Push engine throttle governor control rod assembly (2) toward rear of vehicle (accelerator still depressed).

NOTE

Make sure engine throttle governor control rod lever does not bottom out bracket.

4 Note whether quick-release pin (3) can be easily inserted in lever (4) and engine throttle governor control rod end (5). If it cannot, loosen nut (6) on engine throttle governor control rod assembly (2) and rotate engine throttle governor control rod end (5) 1/2 turn at a time until quick-release pin (3) can be easily inserted into lever (4) and engine throttle governor control rod end (5).

5 Install quick-release pin (3) and tighten nut (6). Release accelerator pedal (1). Throttle should release fully to idle position.

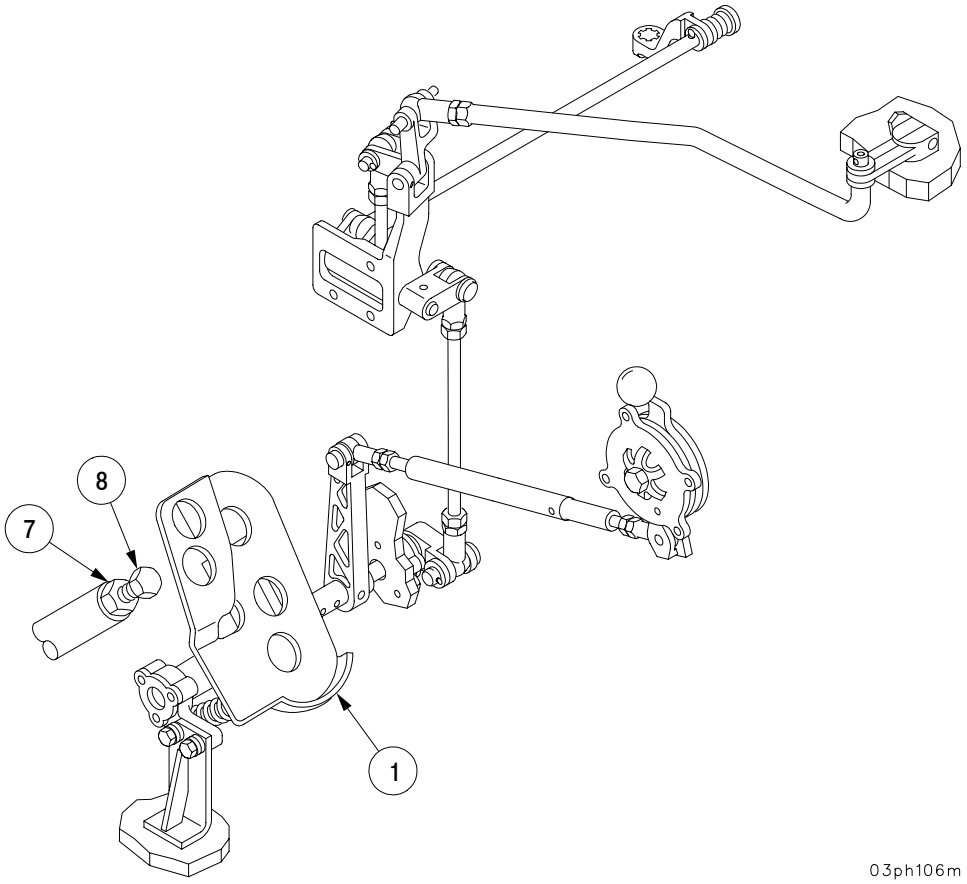


Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-20 ENGINE THROTTLE GOVERNOR CONTROL ROD - CONTINUED

Adjustment - Continued

6 Fully depress accelerator pedal (1). Loosen nut (7) and adjust pedal stop screw (8) to allow 0 to 1/16” (0 to 0.15 cm) clearance from pedal (1) at wide open throttle. Governor operating range is 32°/30 min. Tighten nut (7) against bulkhead.



NOTE

FOLLOW-ON MAINTENANCE:
Close and secure air intake grille
(TM 9-2350-314-10)

Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-21 TRANSMISSION THROTTLE CONTROL ADJUSTMENT.

This task covers: Adjustment

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Personnel Required
Two

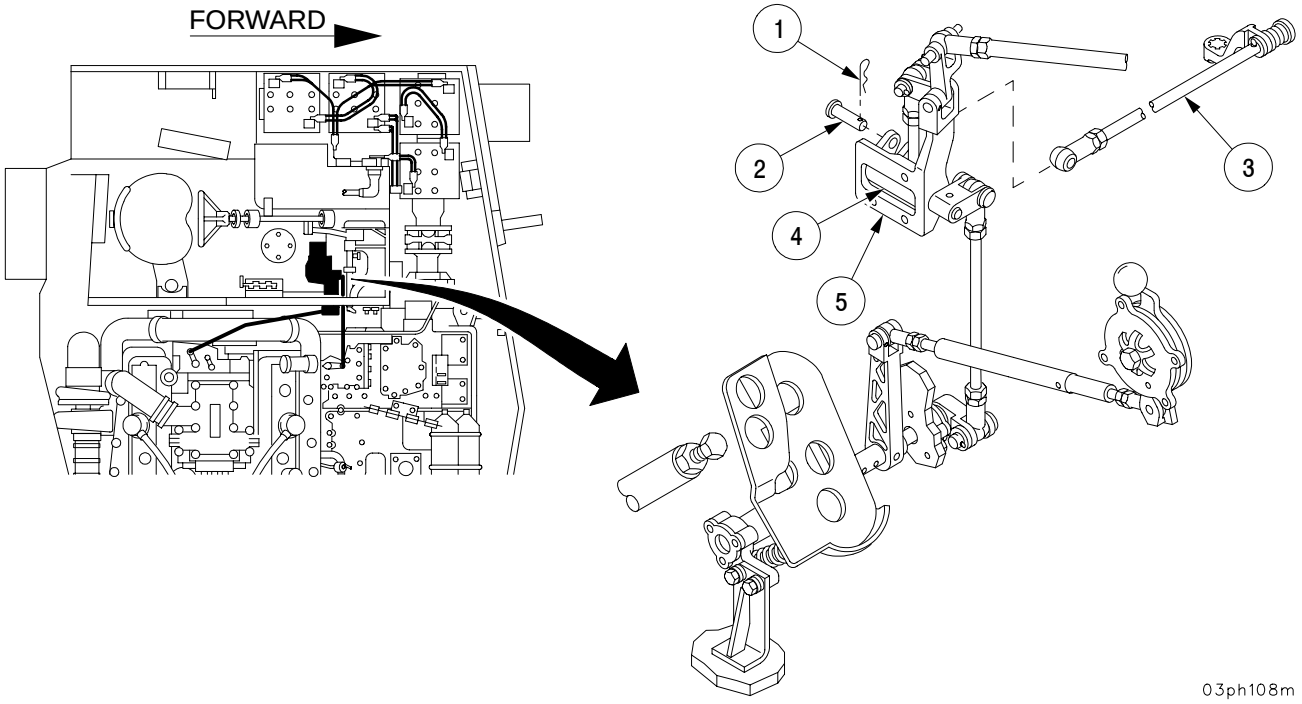
References
TM 9-2350-314-10

Equipment Conditions
Air intake grille open and secured
(TM 9-2350-314-10)
Hull front slope plate removed (para 16-30)

Adjustment.

1 Perform engine throttle governor control rod adjustment (para 5-20).

2 Remove locking pin (1), headed pin (2) and disconnect transmission throttle valve control rod assembly (3) from lever (4) on throttle control lever bracket (5).



Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-21 TRANSMISSION THROTTLE CONTROL ADJUSTMENT - CONTINUED

Adjustment - Continued

3 Fully depress accelerator pedal (6) and hold in depressed position (lever on throttle control lever bracket will move toward driver's bulkhead).

4 Move transmission throttle valve lever (7) against internal stop (toward driver's bulkhead).

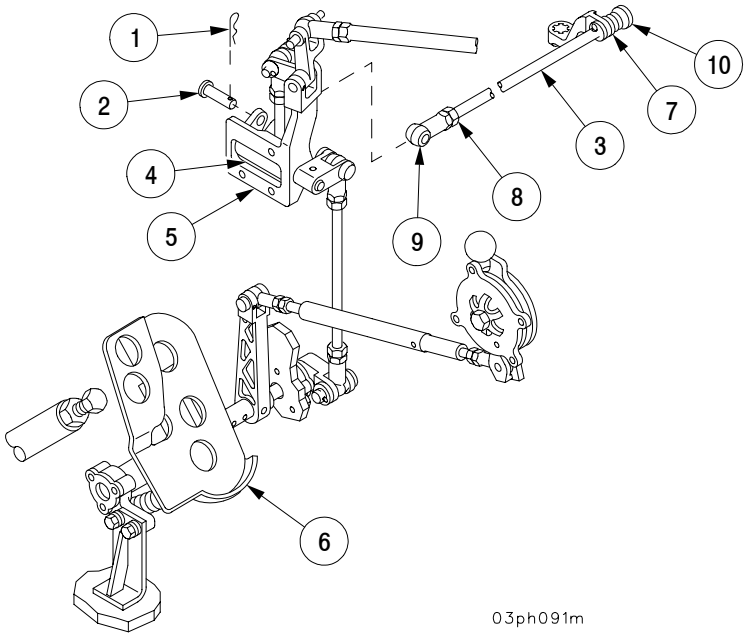
5 Loosen nut (8) on transmission throttle valve control rod assembly (3) and rotate rod 1/2 turn at a time until pin (2) fits freely in rod end (9) and lever (4) with zero compression on spring (10).

6 Release accelerator pedal (6).

7 Remove pin (2) and rod end (9) from lever (4).

8 Adjust rod end (9) approximately two turns shorter clockwise and tighten nut (8) against rod end (9). This prevents positive stop (located in transmission selector valve body) from acting as engine stop.

9 Secure transmission throttle valve control rod assembly (3) to lever (4) on throttle control bracket (5) with headed pin (2) and locking pin (1). Transmission valve operating range - 32°/30 min.



NOTE

FOLLOW-ON MAINTENANCE:
Install hull front slope plate (para 16-30)
Close and secure air intake grille
(TM 9-2350-314-10)

Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-22 ACCELERATOR, THROTTLE, AND ENGINE CONTROL GOVERNOR.

This task covers: a. Removal b. Disassembly c. Assembly d. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Materials/Parts
Cotter pins (2) (item 130, Appx E)
Cotter pins (5) (item 8, Appx E)
Cotter pin (item 127, Appx E)
Spring pins (2) (item 134, Appx E)
Spring pins (2) (item 133, Appx E)
Spring pins (2) (item 135, Appx E)
Spring pin (item 132, Appx E)
Lockwashers (5) (item 3, Appx E)
Lockwashers (8) (item 9, Appx E)
Lockwire (item 160, Appx E)

Equipment Conditions
Air intake grille open and secured
(TM 9-2350-314-10)
Powerpack removed (para 4-1)
(required for vertical rod assembly, lever, accelerator support assembly, and pedal and shaft assembly only)

Personnel Required
Four

Reference
TM 9-2350-314-10

a. Removal.

1 Remove locking pin (1) and headed pin (2) at bellcrank (3).

2 Remove two cotter pins (4), three flat washers (5), spring (6), and rod assembly (7) from throttle control lever (8). Discard cotter pins.

3 Remove throttle control lever (8), if damaged.

4 Remove wire (9), chain (10), and quick-release pin (11) at bellcrank (12). Discard wire.

5 Remove cotter pin (13) and two flat washers (14) from end of governor control rod assembly (15). Discard cotter pin.

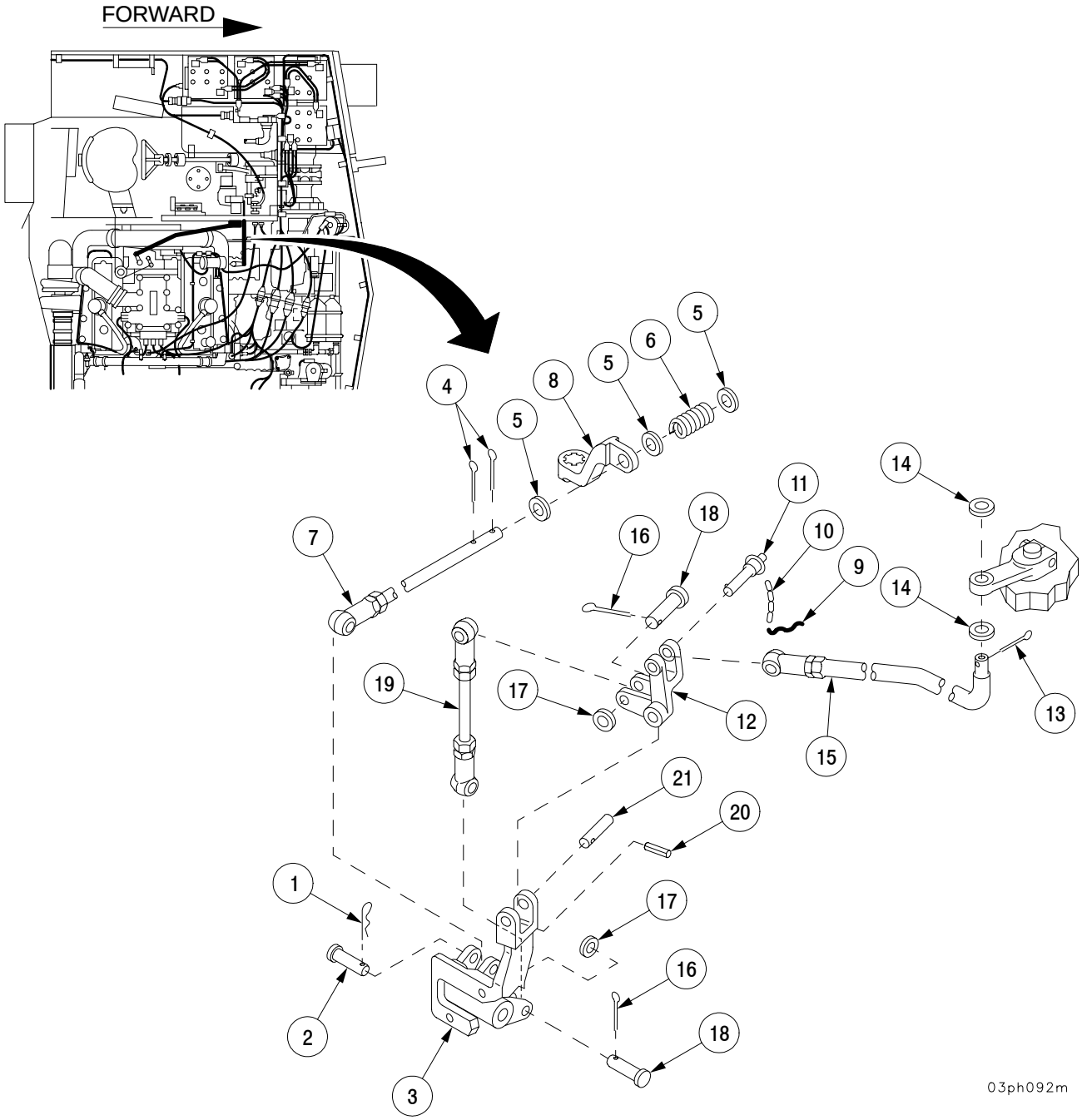
6 Remove two cotter pins (16), two flat washers (17), and two headed pins (18) at bellcrank (12) and bellcrank (3) and remove rod assembly (19). Discard cotter pins.

7 Remove spring pin (20) and pin (21) and remove bellcrank (12). Discard spring pin.

Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-22 ACCELERATOR, THROTTLE, AND ENGINE CONTROL GOVERNOR - CONTINUED

a. Removal - Continued



Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-22 ACCELERATOR, THROTTLE, AND ENGINE CONTROL GOVERNOR - CONTINUED

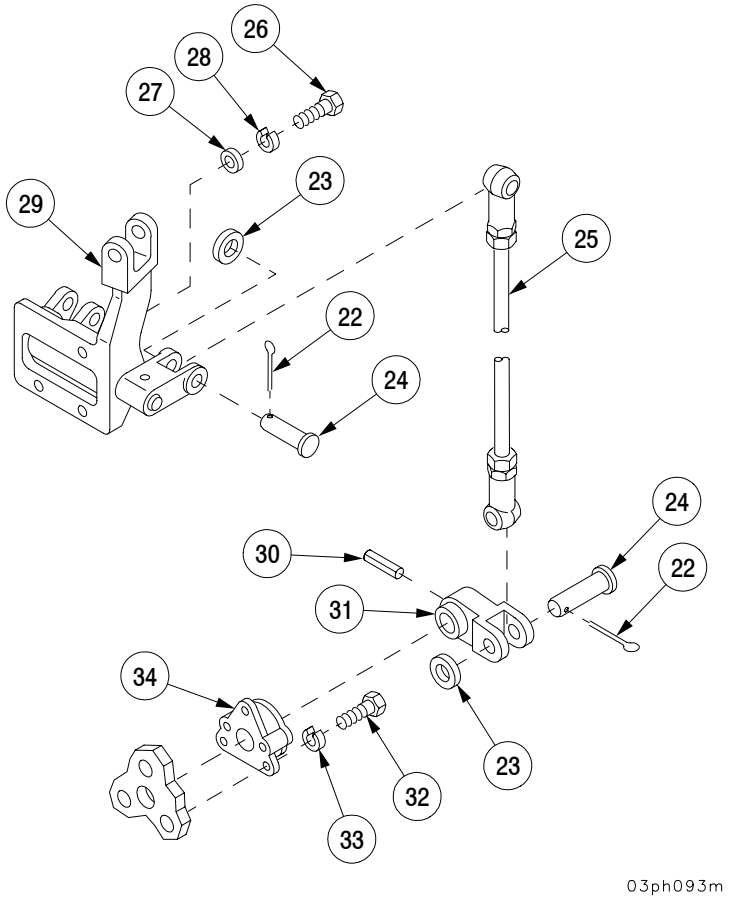
a. Removal - Continued

8 Remove two cotter pins (22), two flat washers (23), two headed pins (24), and rod assembly (25). Discard cotter pins.

9 Remove three screws (26), three flat washers (27), three lockwashers (28), and bracket (29) from hull bulkhead.

10 Remove spring pin (30) and lever (31). Discard spring pin.

11 Remove three screws (32), three lockwashers (33), and accelerator support assembly (34) from bulkhead. Discard lockwashers.



Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-22 ACCELERATOR, THROTTLE, AND ENGINE CONTROL GOVERNOR - CONTINUED

a. Removal - Continued

NOTE

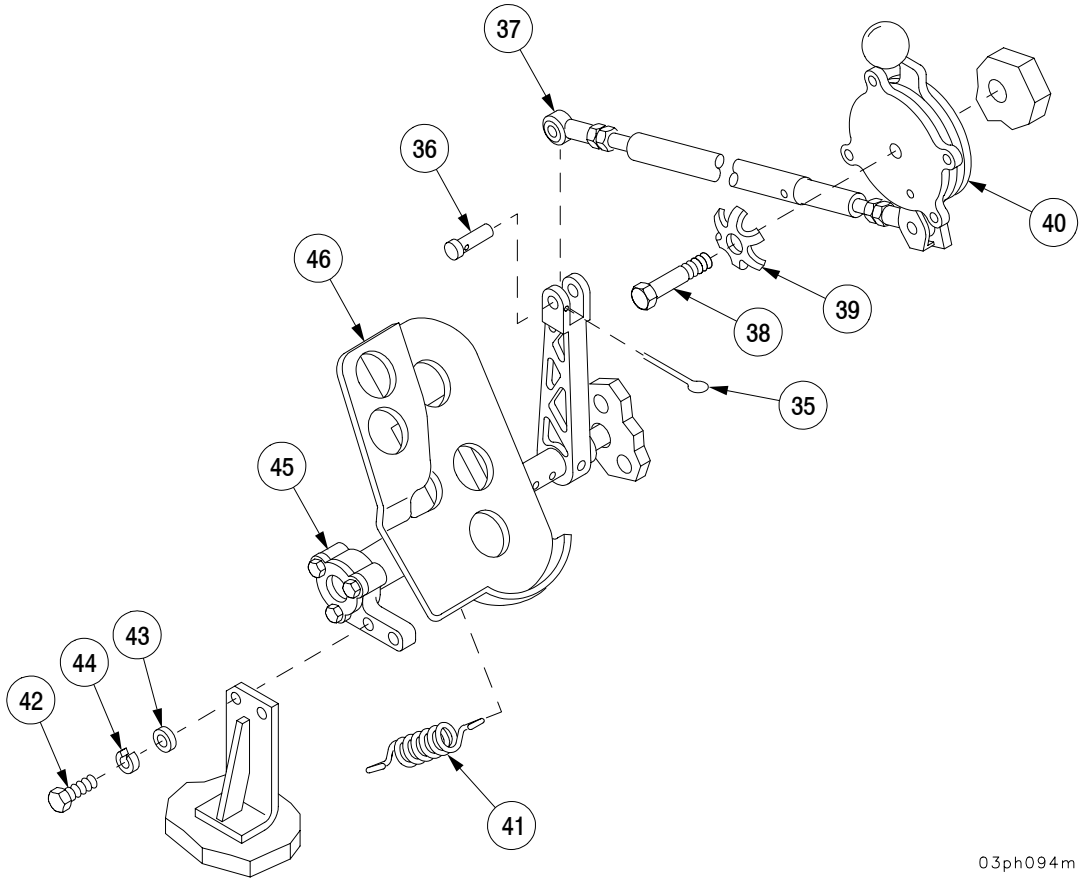
Throttle control rod is part of hand throttle control assembly.

12 Remove cotter pin (35), headed pin (36), and throttle control rod (37) from driver's compartment. Discard cotter pin.

13 Remove screw (38), star spring washer (39), and throttle control assembly (40).

14 Remove spring (41), two screws (42), two flat washers (43), two lockwashers (44), support bracket (45), and pedal and shaft assembly (46).

15 Twist pedal and shaft assembly (46) to clear bracket and withdraw from bulkhead.

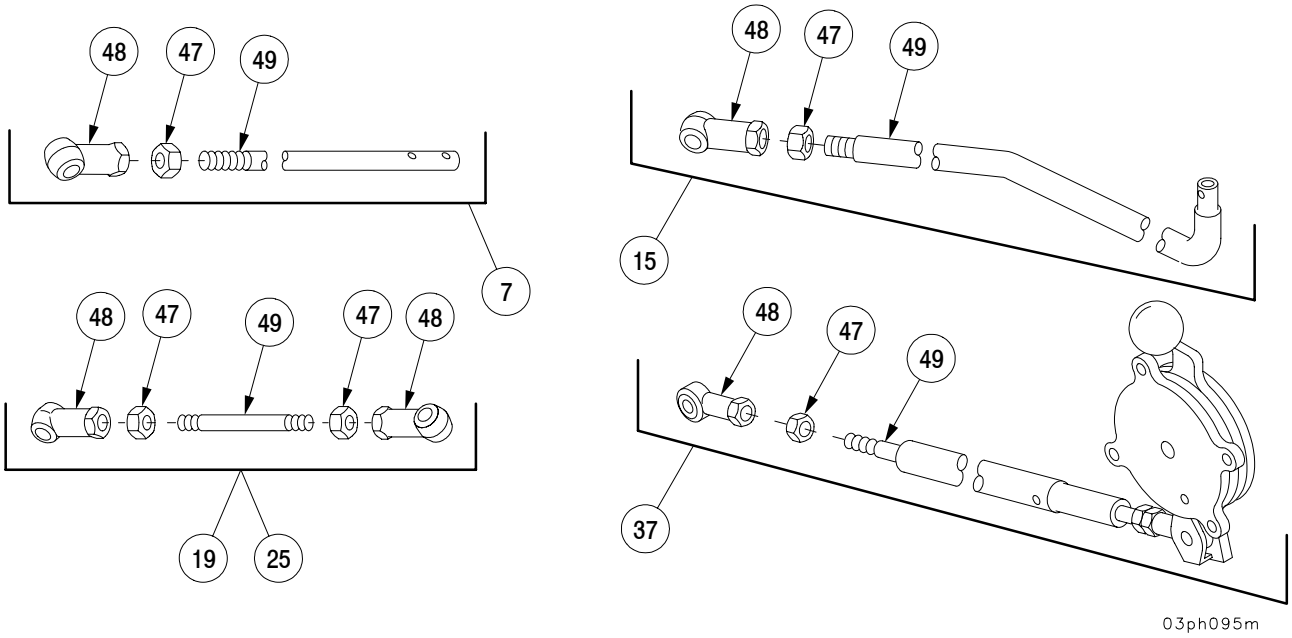


Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-22 ACCELERATOR, THROTTLE, AND ENGINE CONTROL GOVERNOR - CONTINUED

b. Disassembly.

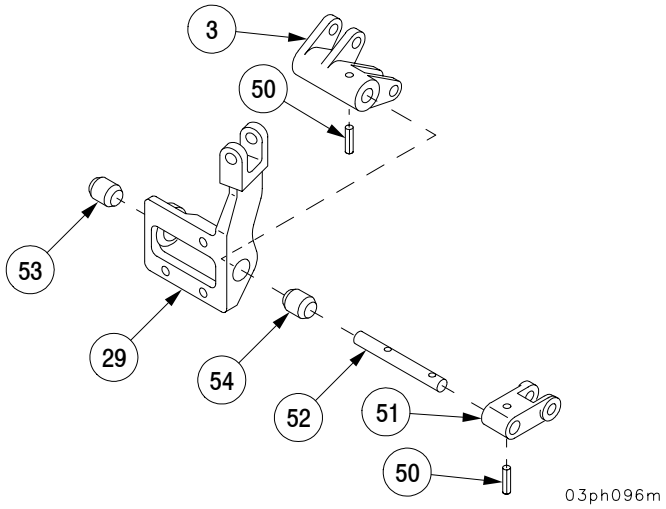
1 Loosen seven nuts (47) and remove seven rod ends (48) from five shafts (49) on five rod assemblies (7, 15, 19, 25, and 37). Remove seven nuts (47) from five shafts (49).



NOTE

Bearings are to be removed only if damaged.

2 Remove two spring pins (50), lever (51), bellcrank (3), and shaft (52) from bracket (29). Remove two bearings (53 and 54) from bracket (29). Discard spring pins.

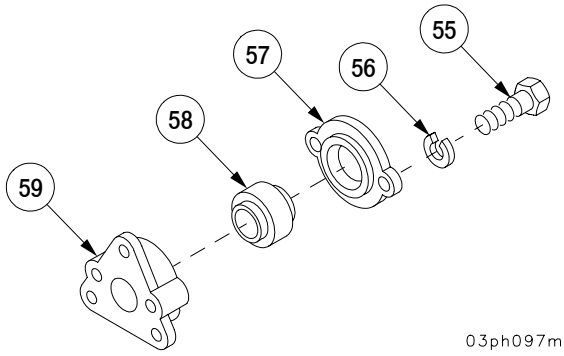


Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-22 ACCELERATOR, THROTTLE, AND ENGINE CONTROL GOVERNOR - CONTINUED

b. Disassembly - Continued

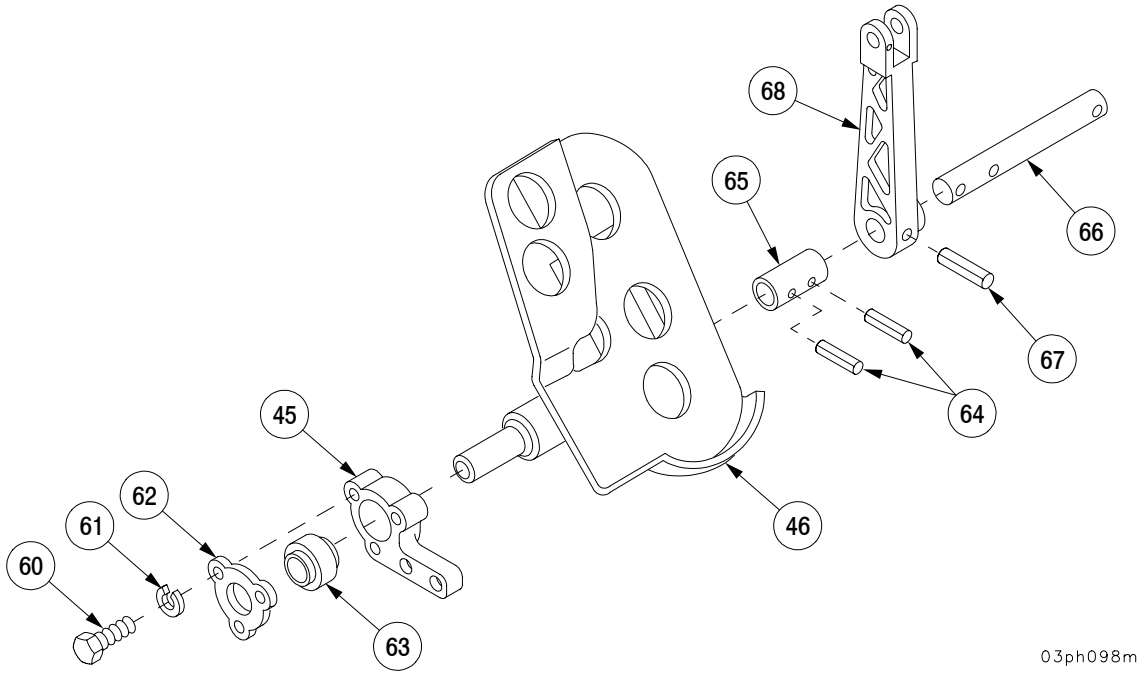
3 Remove two screws (55), two lockwashers (56), cap (57), and bearing (58) from bracket (59). Discard lockwashers.



4 Remove three screws (60), three lockwashers (61), cap (62), and bearings (63) from bracket (45). Discard lockwashers.

5 Remove two spring pins (64), collar (65), and pedal (46) from shaft (66). Discard spring pins.

6 Remove spring pin (67) and shaft (66) from lever (68). Discard spring pin.



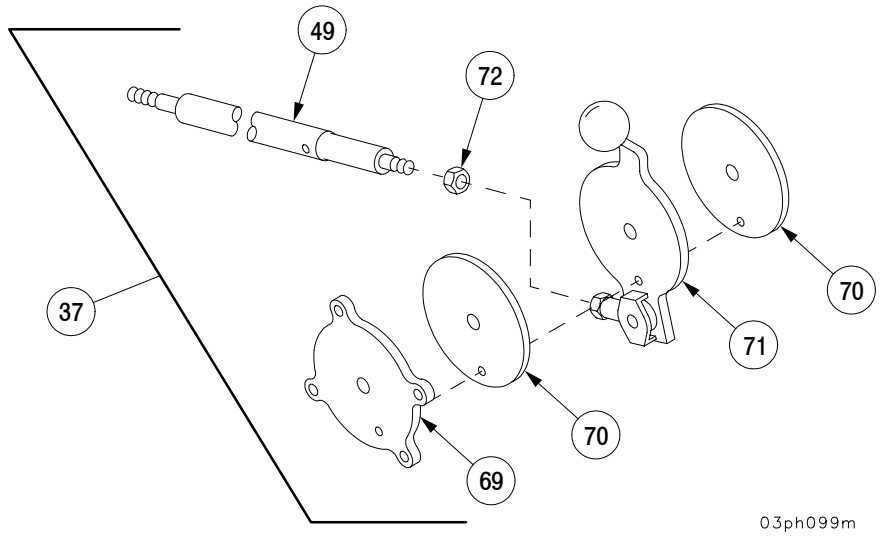
Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-22 ACCELERATOR, THROTTLE, AND ENGINE CONTROL GOVERNOR - CONTINUED

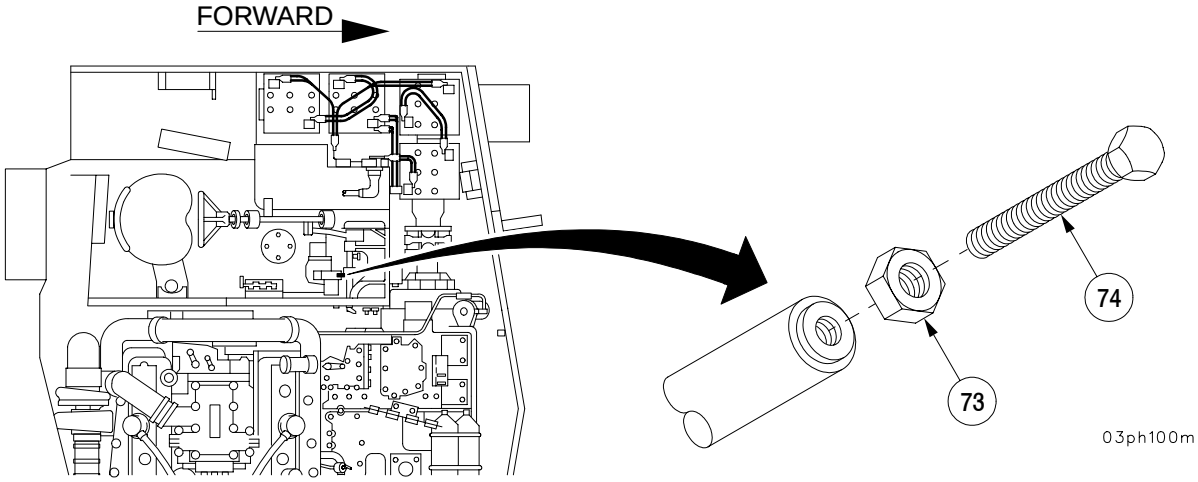
b. Disassembly - Continued

7 Separate cover (69) and two disks (70) from lever (71) with rod assembly (37).

8 Loosen nut (72) and remove lever (71) from shaft (49). Remove nut (72) from shaft (49).



9 Loosen nut (73) and remove screw (74) from accelerator stop. Separate nut (73) from screw (74).

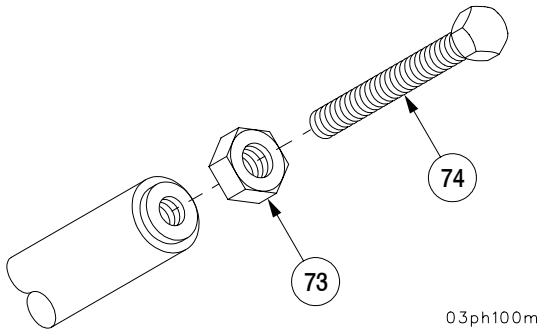


Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-22 ACCELERATOR, THROTTLE, AND ENGINE CONTROL GOVERNOR - CONTINUED

c. Assembly.

1 Install nut (73) on screw (74) and install screw (74) in accelerator stop. Tighten nut (73) onto accelerator stop.

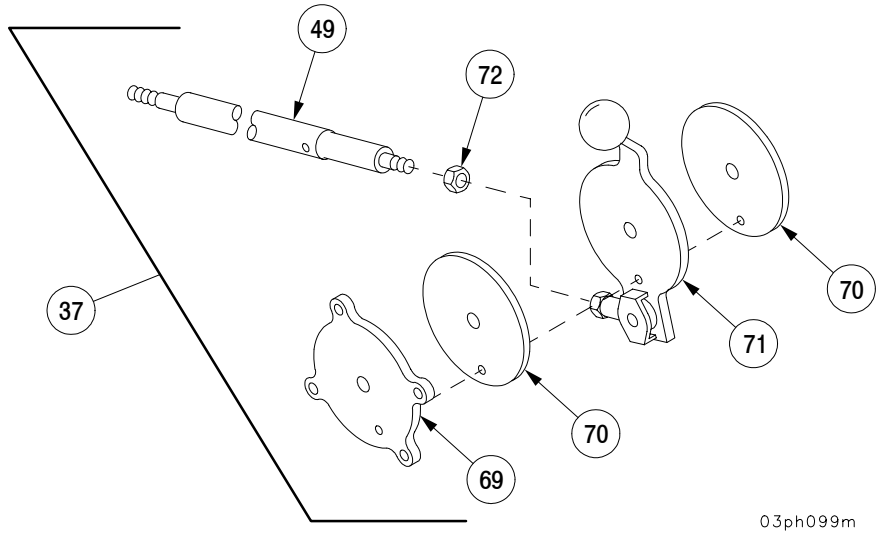


2 Install nut (72) on shaft (49) and install lever (71) on shaft (49).

NOTE

Make sure alignment holes are aligned properly during assembly.

3 Attach two disks (70) and cover (69) to lever (71) with rod assembly (37).



Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

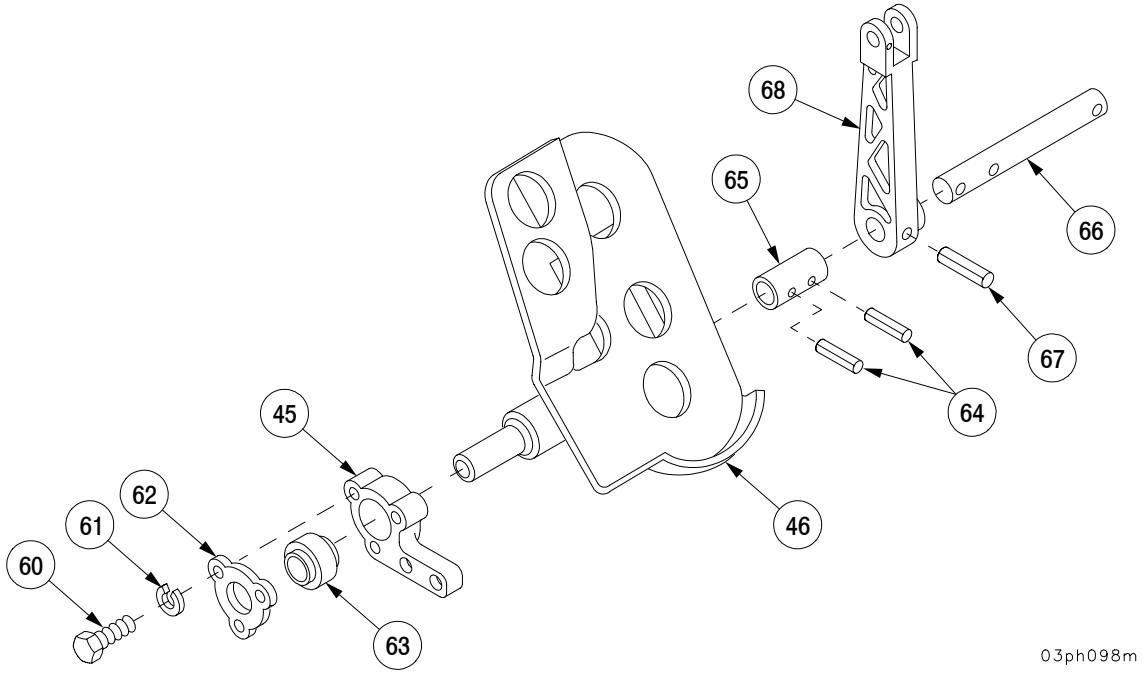
5-22 ACCELERATOR, THROTTLE, AND ENGINE CONTROL GOVERNOR - CONTINUED

c. Assembly - Continued

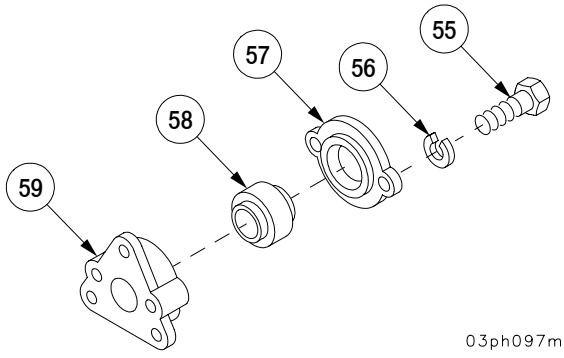
4 Install shaft (66) in lever (68) with new spring pin (67).

5 Install pedal (46) on shaft (66) with collar (65) and two new spring pins (64).

6 Install bearing (63), if removed, in bracket (45) with cap (62), three screws (60), and three new lockwashers (61).



7 Install bearing (58), if removed, in bracket (59), with cap (57), two screws (55), and two new lockwashers (56).

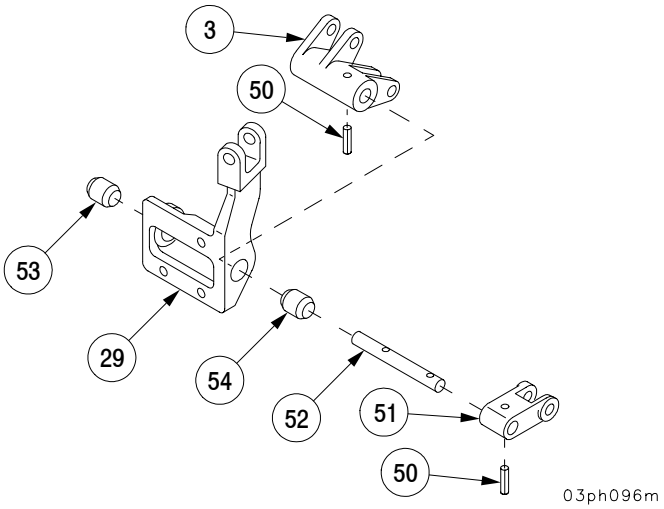


Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-22 ACCELERATOR, THROTTLE, AND ENGINE CONTROL GOVERNOR - CONTINUED

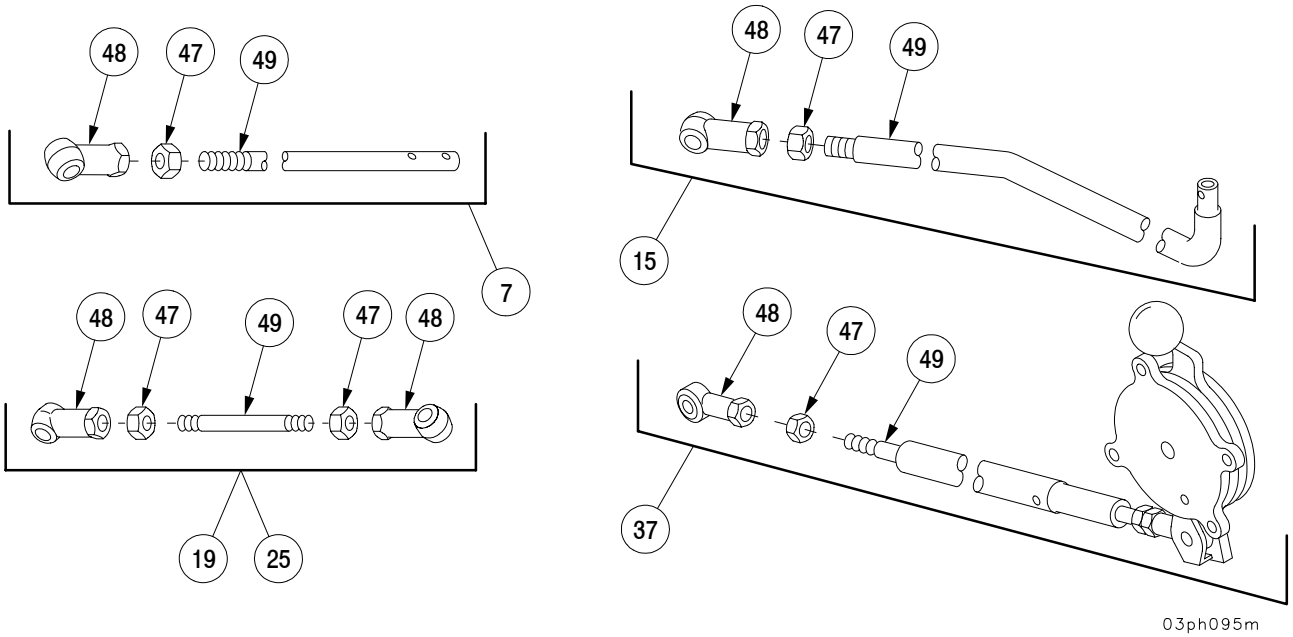
c. Assembly - Continued

8 Install two bearings (53 and 54), if removed, shaft (52), lever (51), and bell crank (3) on bracket (29) with two new spring pins (50).



9 Install seven nuts (47) on five shafts (49).

10 Install seven rod ends (48) on five rod assemblies (7, 15, 19, 25, and 37). Tighten nuts (47) against rod ends (48).



Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

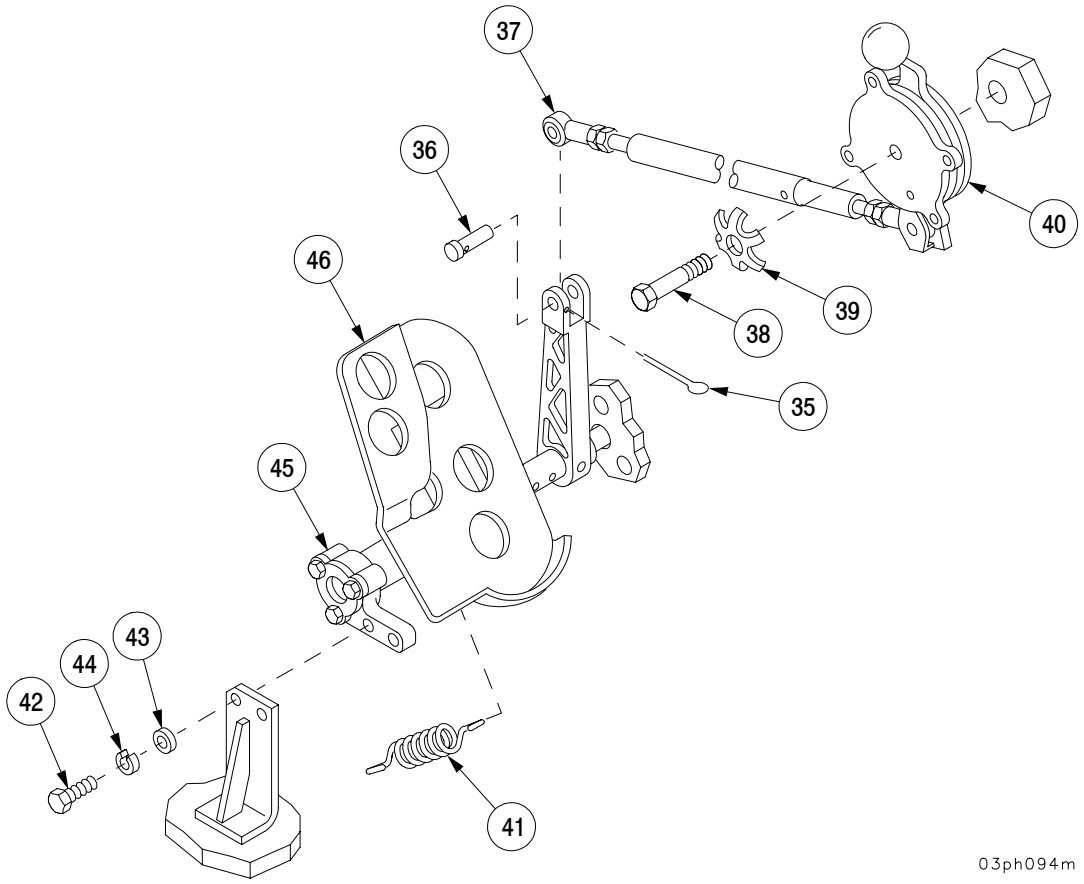
5-22 ACCELERATOR, THROTTLE, AND ENGINE CONTROL GOVERNOR - CONTINUED

d. Installation.

1 Install pedal and shaft assembly (46) to support bracket (45) with spring (41), two screws (42), two new lockwashers (44), and two flat washers (43).

2 Install throttle control assembly (40) with screw (38) and star spring washer (39).

3 Install throttle control rod assembly (37) in driver's compartment with headed pin (36) and new cotter pin (35).



Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-22 ACCELERATOR, THROTTLE, AND ENGINE CONTROL GOVERNOR - CONTINUED

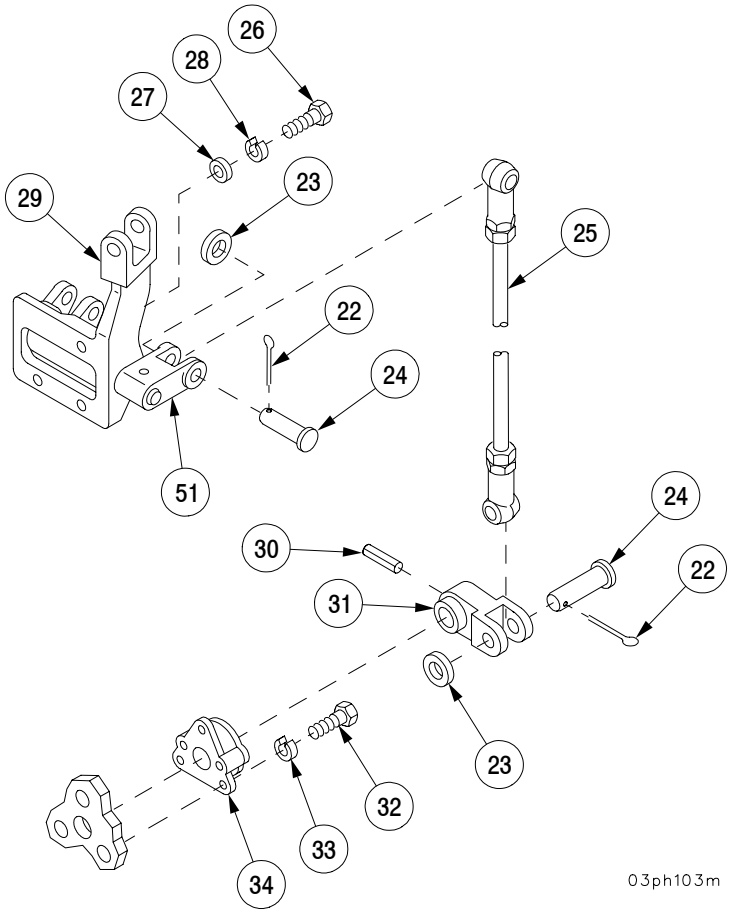
d. Installation - Continued

4 Install accelerator support assembly (34) at bulkhead with three screws (32) and three new lockwashers (33).

5 Install lever (31) and new spring pin (30).

6 Install bracket (29) to bulkhead with three screws (26), three lockwashers (28), and three flat washers (27).

7 Install rod assembly (25) in levers (51 and 31) with two headed pins (24), two flat washers (23), and two new cotter pins (22).



Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-22 ACCELERATOR, THROTTLE, AND ENGINE CONTROL GOVERNOR - CONTINUED

d. Installation - Continued

8 Install bellcrank (12) with pin (21) and new spring pin (20).

9 Install rod assembly (19) in bellcrank (12) and bellcrank (3) with two headed pins (18), two flat washers (17), and two new cotter pins (16).

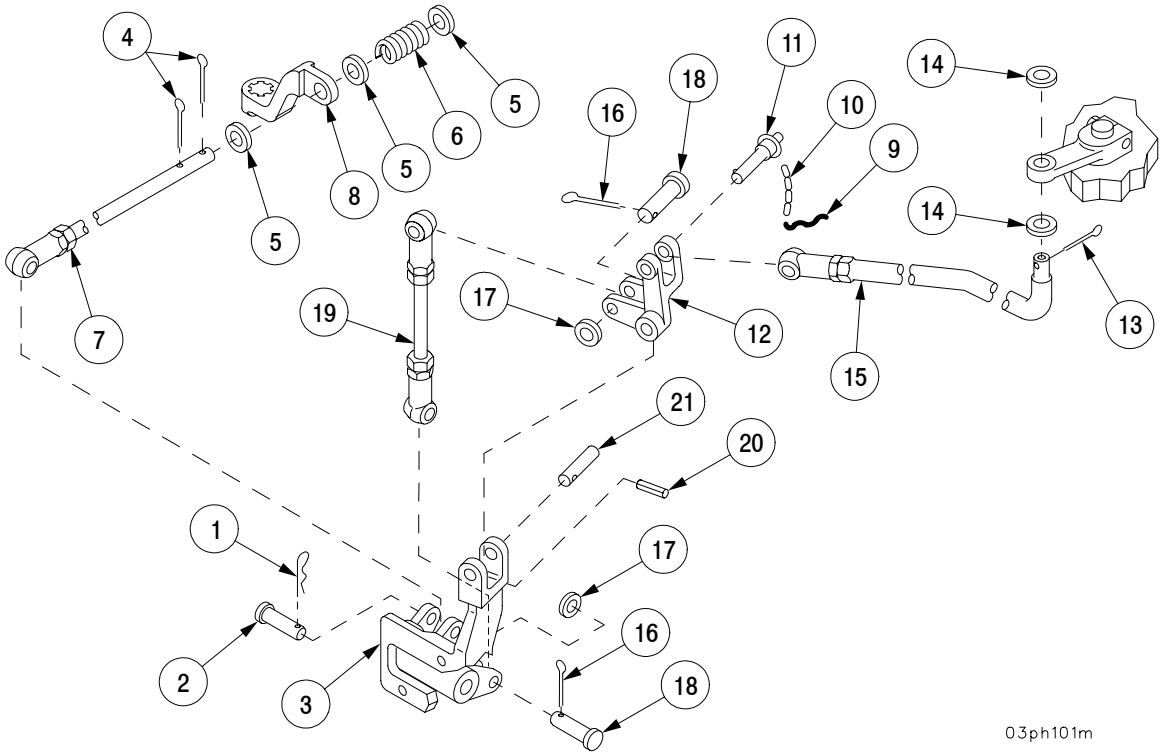
10 Install two flat washers (14) and new cotter pin (13) at end of governor control rod assembly (15).

11 Install quick-release pin (11), new wire (9), and new chain (10), if necessary, at bellcrank (12).

12 Install throttle control lever (8), if removed due to damage.

13 Install rod assembly (7), spring (6), three flat washers (5), and two new cotter pins (4).

14 Install headed pin (2) and locking pin (1) at bellcrank (3).



NOTE

FOLLOW-ON MAINTENANCE:
Install powerpack (para 4-1), if removed
Close and secure air intake grille
(TM 9-2350-314-10)
Adjust hand throttle governor control rod (para 5-19)
Adjust transmission throttle control (para 5-21)

Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-23 FUEL SHUTOFF IDENTIFICATION PLATE.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Electric drill (item 15, Appx F)
Twist drill set (item 16, Appx F)

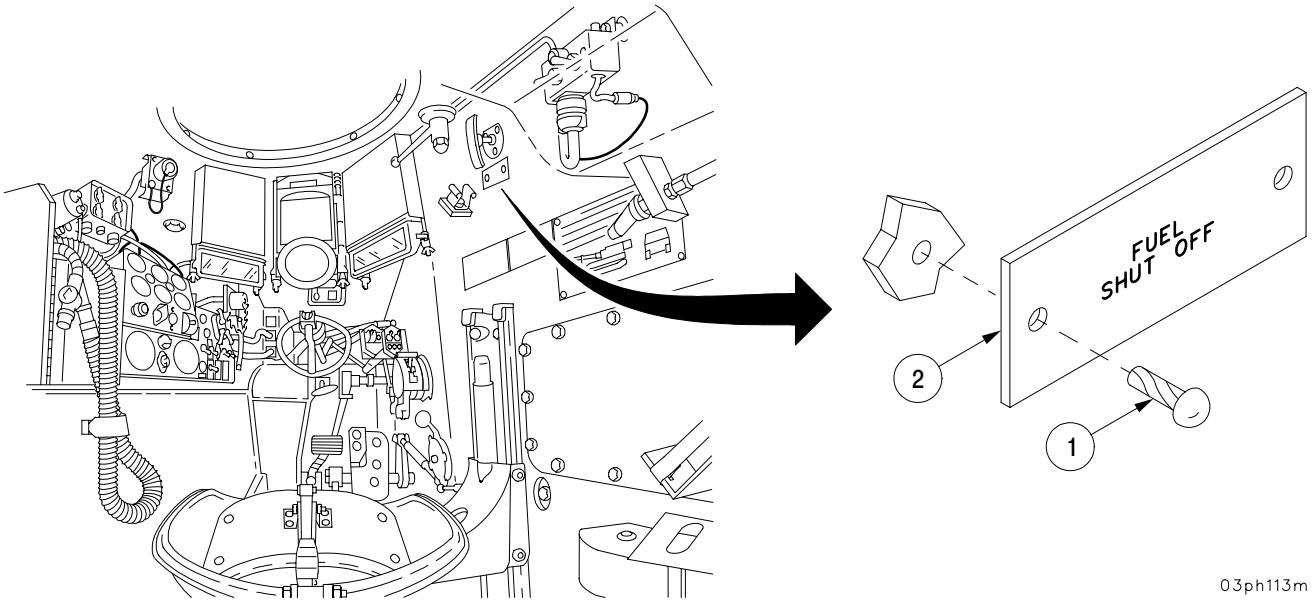
Materials/Parts
Drive screws (2) (item 136, Appx E)

a. Removal.

Remove two screws (1) and identification plate (2) from engine compartment bulkhead in driver's compartment. Discard drive screws.

b. Installation.

Install identification plate (2) on engine compartment bulkhead in driver's compartment with two new drive screws (1).



Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-24 FUEL SHUTOFF CONTROL.

This task covers: a. Disassembly b. Assembly

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Equipment Conditions
Air intake grille open and secured
(TM 9-2350-314-10)

Materials/Parts
Cotter pins (2) (item 137, Appx E)
Lockwashers (3) (item 9, Appx E)
Assembled screws (2) (item 298, Appx E)

References
TM 9-2350-314-10

a. Disassembly.

1 Remove cotter pin (1) and headed pin (2) from engine lever clevis (3). Discard cotter pin.

2 Remove chain (4) from cable (5).

3 Remove quick-release pin (6) and fuel shutoff clevis (3) from engine governor.

4 Remove hook (7) with chain (4) from quick-release pin (6).

5 Remove cotter pin (8) from headed pin (9). Discard cotter pin.

6 Remove flat washer (10), pulley (11), cable (5), headed pin (9), and spring (12) from bracket (13).

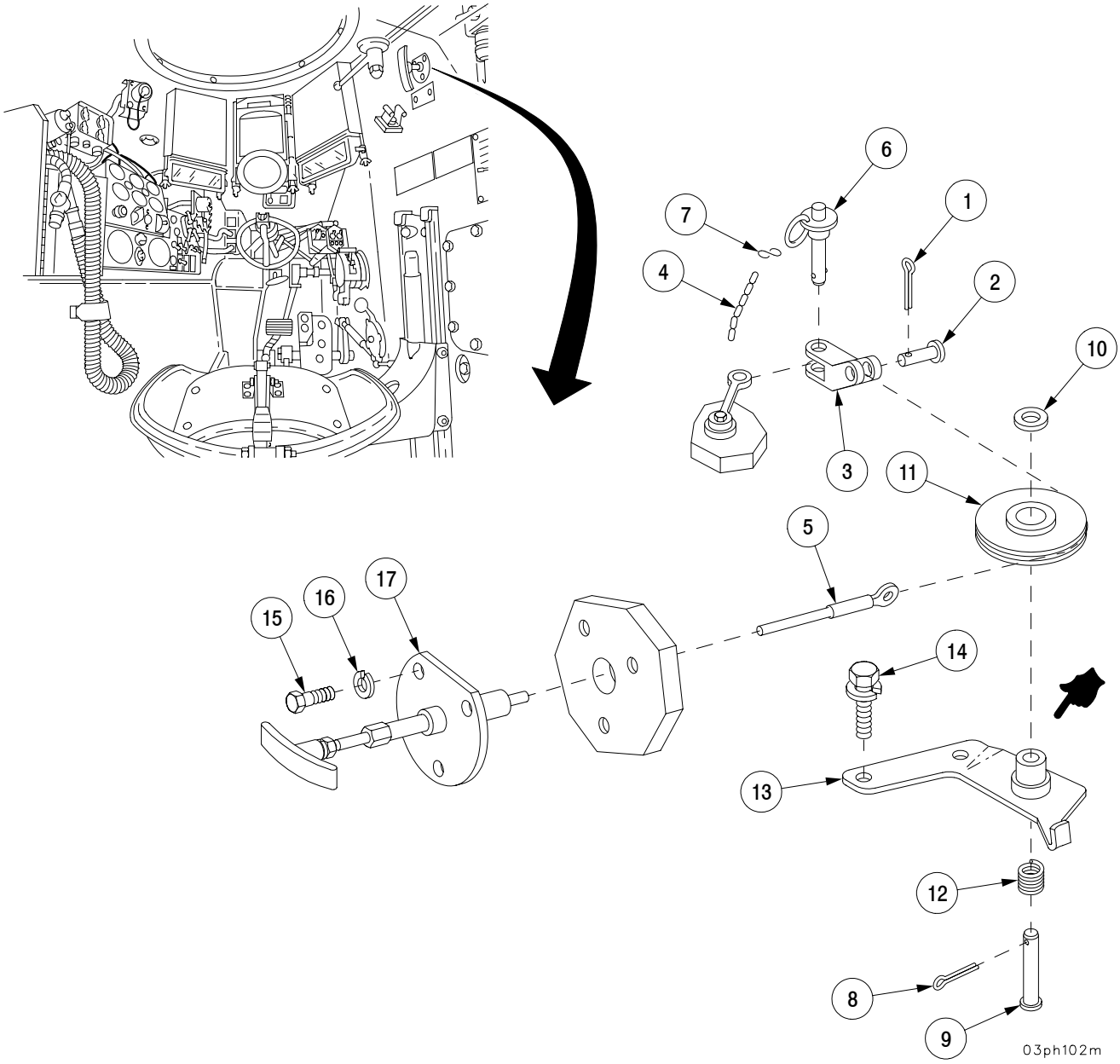
7 Remove two assembled screws (14) and bracket (13) from engine governor. Discard assembled screws.

8 Remove three screws (15), three lockwashers (16), and mounting plate (17) with cable (5) from engine bulkhead. Discard lockwashers.

Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-24 FUEL SHUTOFF CONTROL - CONTINUED

a. Disassembly - Continued



Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-24 FUEL SHUTOFF CONTROL - CONTINUED

b. Assembly.

1 Insert cable (5) through engine bulkhead and install bracket (17) with three screws (15) and three new lockwashers (16).

2 Install bracket (13) with two new assembled screws (14) on engine governor.

3 Place cable (5) around pulley (11) and install pulley (11), flat washer (10), spring (12), headed pin (9), and new cotter pin (8) to bracket (13).

4 Attach chain (4) to quick-release pin (6) with hook (7).

5 Install fuel shutoff clevis (3) and quick-release pin (6) on engine governor.

6 Install cable (5) in fuel shutoff clevis (3) with headed pin (2).

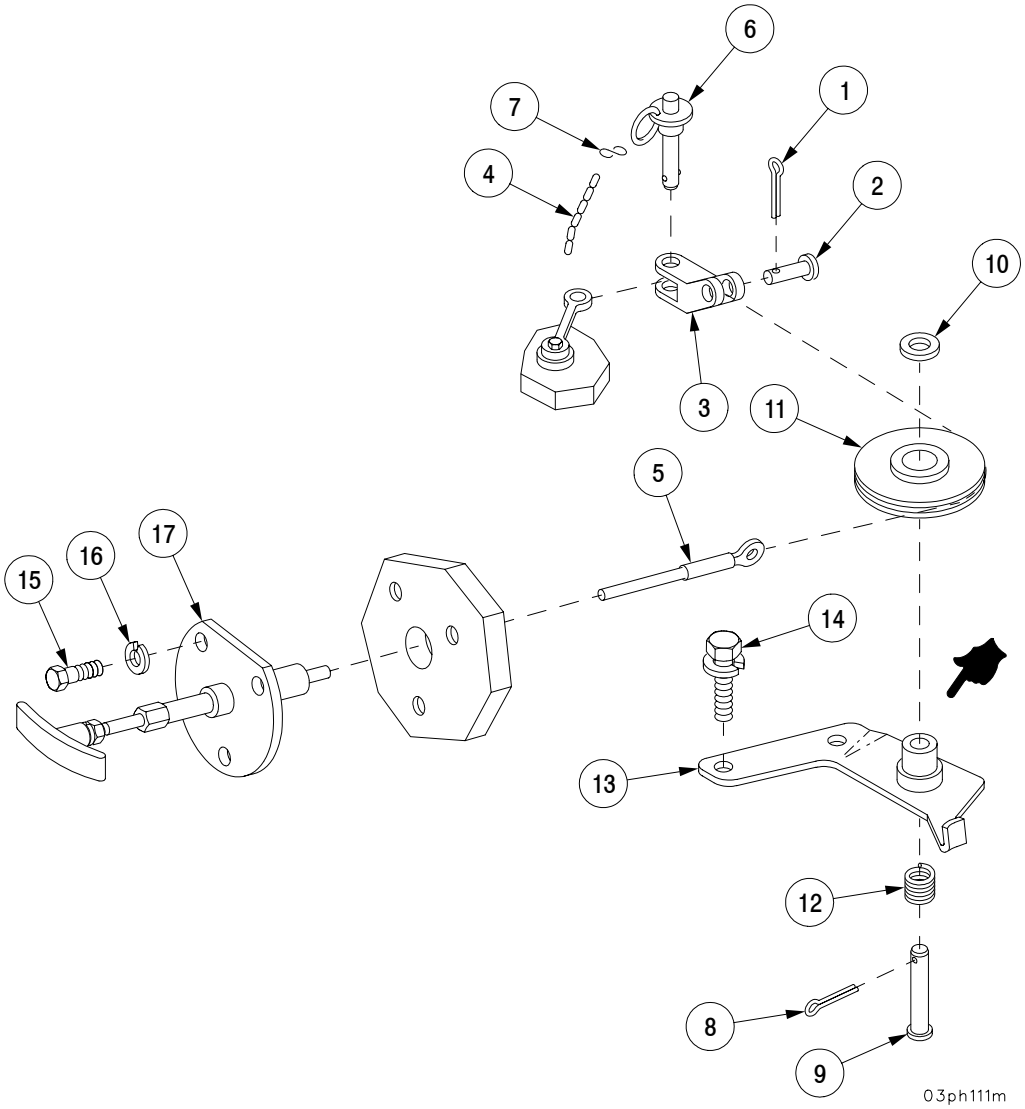
7 Secure headed pin (2) with new cotter pin (1).

8 Install chain (4) around cable (5).

Section VI. ACCELERATOR, THROTTLE, OR CHOKE CONTROLS - CONTINUED

5-24 FUEL SHUTOFF CONTROL - CONTINUED

b. Assembly - Continued



NOTE

FOLLOW-ON MAINTENANCE:
Close and secure air intake grille
(TM 9-2350-314-10)

CHAPTER 6
EXHAUST SYSTEM

GENERAL

This chapter illustrates and defines procedures for removal, disassembly, assembly, and installation of the exhaust system, insulation, and related components.

CONTENTS

6-1 EXHAUST OUTLET PIPE AND INSULATION.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)

Materials/Parts
Cotter pins (2) (item 93, Appx E)

Equipment Conditions
Powerpack removed (para 4-1)

a. Removal.

WARNING

Make sure engine and exhaust systems are cool enough to permit handling. Failure to do so may cause serious burns to personnel.

NOTE

To ease removal of flange, remove one cotter pin, castle nut, washer, spring, and screw; then rotate flange to access other castle nut.

1 Remove two cotter pins (1), two castle nuts (2), two screws (3), two flat washers (4), and two springs (5) from engine exhaust outlet pipe (6) and exhaust duct (7) flanges. Discard cotter pins.

2 Remove clamp (8) and remove exhaust outlet pipe (6) from turbocharger (9).

3 Remove three clamps (10) and two insulation blanket halves (11) from exhaust outlet pipe (6).

b. Installation.

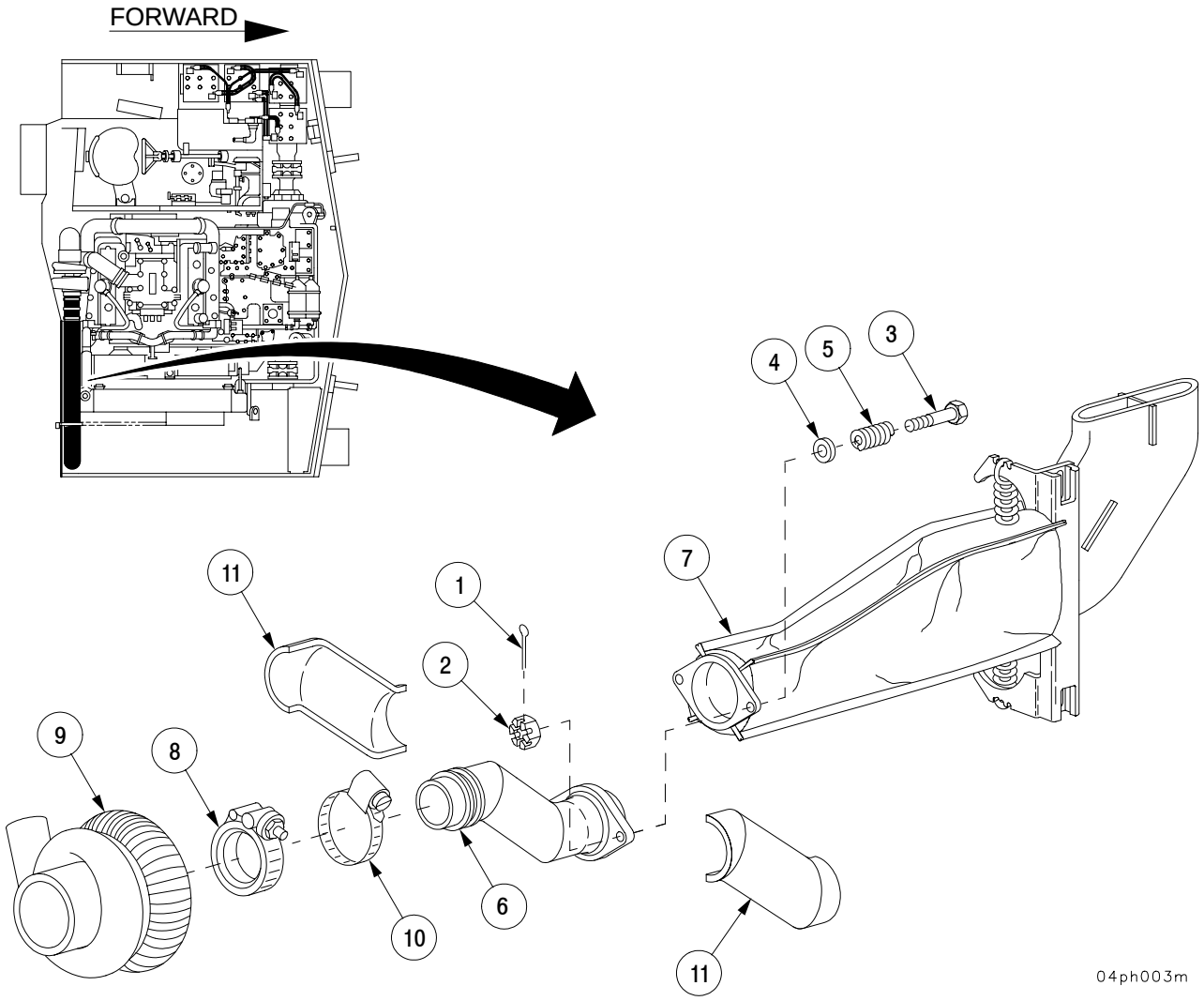
1 Install two insulation blanket halves (11) on exhaust outlet pipe (6) with three clamps (10).

2 Install exhaust outlet pipe (6) on turbocharger (9) with clamp (8).

3 Align and secure engine exhaust outlet pipe (6) and exhaust duct (7) flanges with two screws (3), two springs (5), two flat washers (4), two castle nuts (2), and two new cotter pins (1).

6-1 EXHAUST OUTLET PIPE AND INSULATION - CONTINUED

b. Installation - Continued



NOTE

FOLLOW-ON MAINTENANCE:
Install powerpack (para 4-1)

6-2 EXHAUST DUCT, INSULATION BLANKET, AND HANGER.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Wire twisting pliers (item 43, Appx F)

Materials/Parts
Lock wire (item 310, Appx E)

Equipment Conditions
Powerpack removed
(para 4-1)

a. Removal.

1 Disconnect two springs (1) from hanger (2) and remove exhaust duct (3).

2 Remove two springs (1) from exhaust duct (3).

3 Remove two screws (4), two flat washers (5), and hanger (2) from engine bulkhead.

4 Remove ten lock wires (6) and insulation blanket (7) from exhaust duct (3). Discard wires.

b. Installation.

1 Install insulation blanket (7) with ten new lock wires (6) on exhaust duct (3).

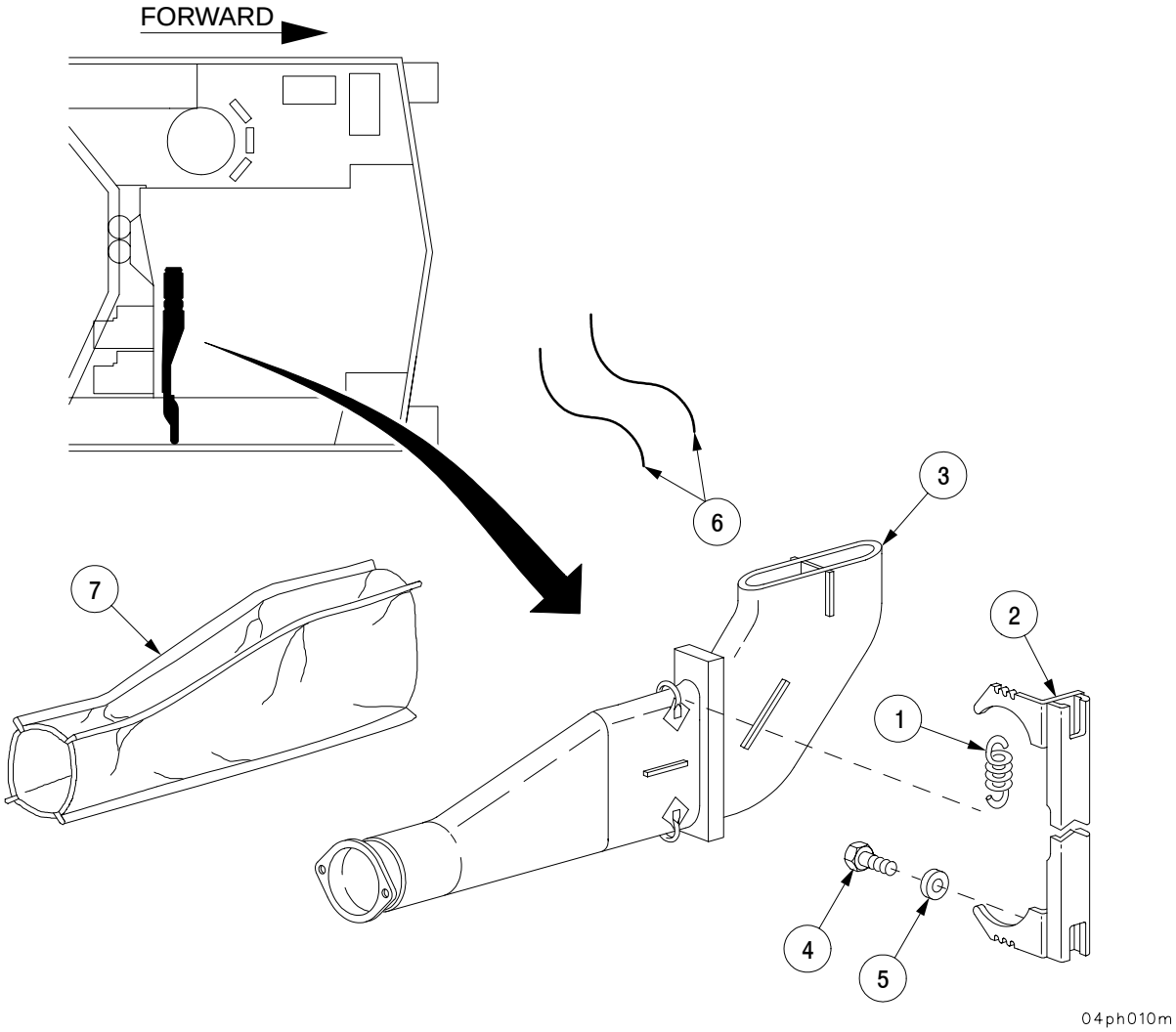
2 Install hanger (2) on engine bulkhead with two screws (4) and two flat washers (5).

3 Install two springs (1) on exhaust duct (3).

4 Position exhaust duct (3) at hanger (6) and connect two springs (1).

6-2 EXHAUST DUCT, INSULATION BLANKET, AND HANGER - CONTINUED

b. Installation - Continued



NOTE

FOLLOW-ON MAINTENANCE:
Install powerpack (para 4-1)

6-3 EXHAUST HEAT SHIELD AND INSULATION PAD.

This task covers: a. Removal b. Disassembly c. Assembly d. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Hand riveter (item 55, Appx F)

Equipment Conditions
Fan access door removed (para 16-26)
Hull exhaust grille removed (para 16-25)
Exhaust outlet pipe removed (para 6-1)

Materials/Parts
Sealing compound (item 51, Appx C)
Adhesive (item 3, Appx C)
Dry-cleaning solvent (item 59, Appx C)
Self-locking nuts (3) (item 118, Appx E)
Self-locking nuts (4) (item 16, Appx E)
Self-locking nuts (35) (item 120, Appx E)
Lockwashers (17) (item 9, Appx E)
Nonmetallic seal (item 140, Appx E)
Seals (2) (item 141, Appx E)
Seals (2) (item 142, Appx E)
Seal (item 143, Appx E)
Seal (item 144, Appx E)
Seal (item 145, Appx E)
Seal (item 146, Appx E)
Seals (2) (item 147, Appx E)
Solid rivets (18) (item 139, Appx E)
Blind rivets (5) (item 138, Appx E)
Seal (item 148, Appx E)
Seal (item 149, Appx E)
Insulation pad (item 150, Appx E)

Personnel Required
Two

6-3 EXHAUST HEAT SHIELD AND INSULATION PAD - CONTINUED

a. Removal.

1 Remove two screws (1), two jamnuts (2), and two brackets (3).

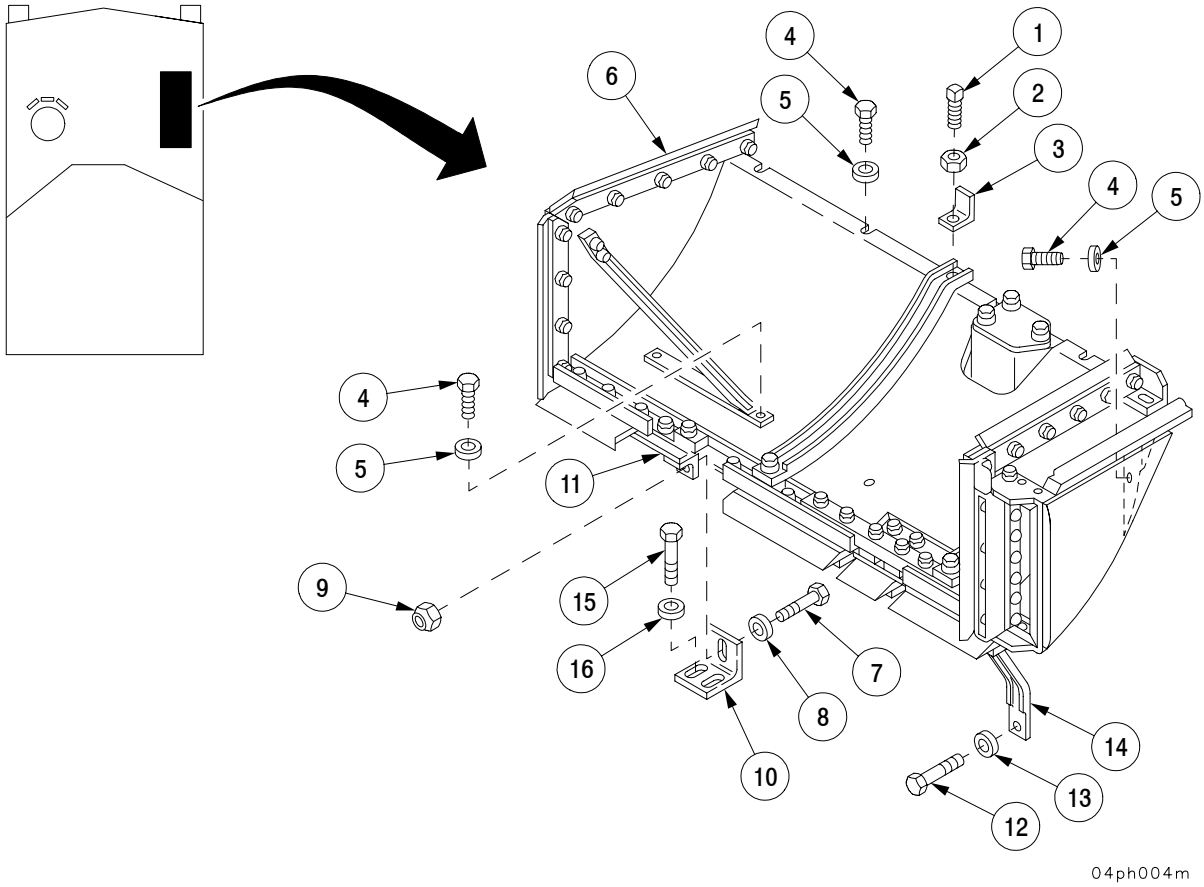
2 Remove 11 screws (4) and 11 flat washers (5) from exhaust heat shield (6).

3 Remove screw (7), flat washer (8), and self-locking nut (9) to separate bracket (10) from support stiffener (11). Discard self-locking nut.

4 Remove screw (12) and flat washer (13) from bracket (14).

5 Remove exhaust heat shield (6) from vehicle.

6 Remove two screws (15), two flat washers (16), and bracket (10) from vehicle.



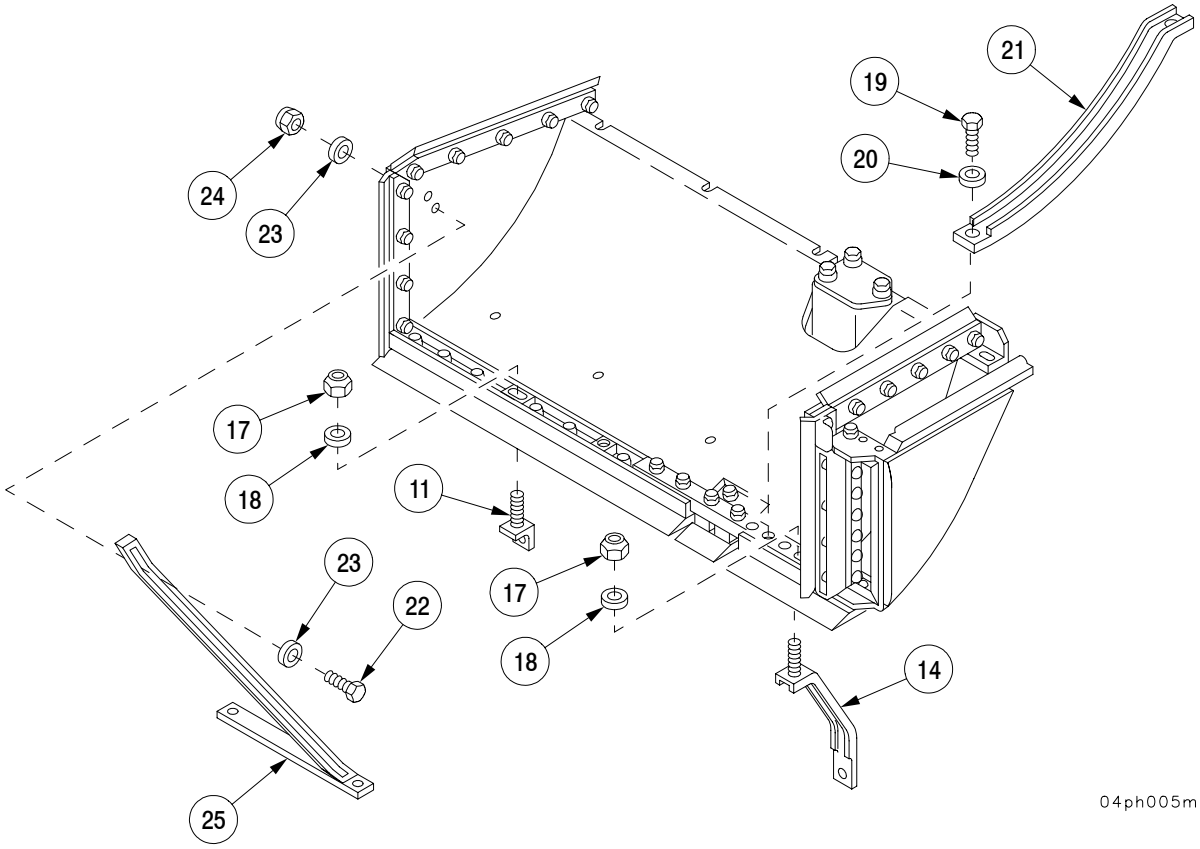
6-3 EXHAUST HEAT SHIELD AND INSULATION PAD - CONTINUED

b. Disassembly.

1 Remove two self-locking nuts (17), two flat washers (18), support stiffener (11), and bracket (14). Discard self-locking nuts.

2 Remove two screws (19), two flat washers (20), and two stiffeners (21).

3 Remove two screws (22), four flat washers (23), two self-locking nuts (24), and support (25). Discard self-locking nuts.



6-3 EXHAUST HEAT SHIELD AND INSULATION PAD - CONTINUED

b. Disassembly - Continued

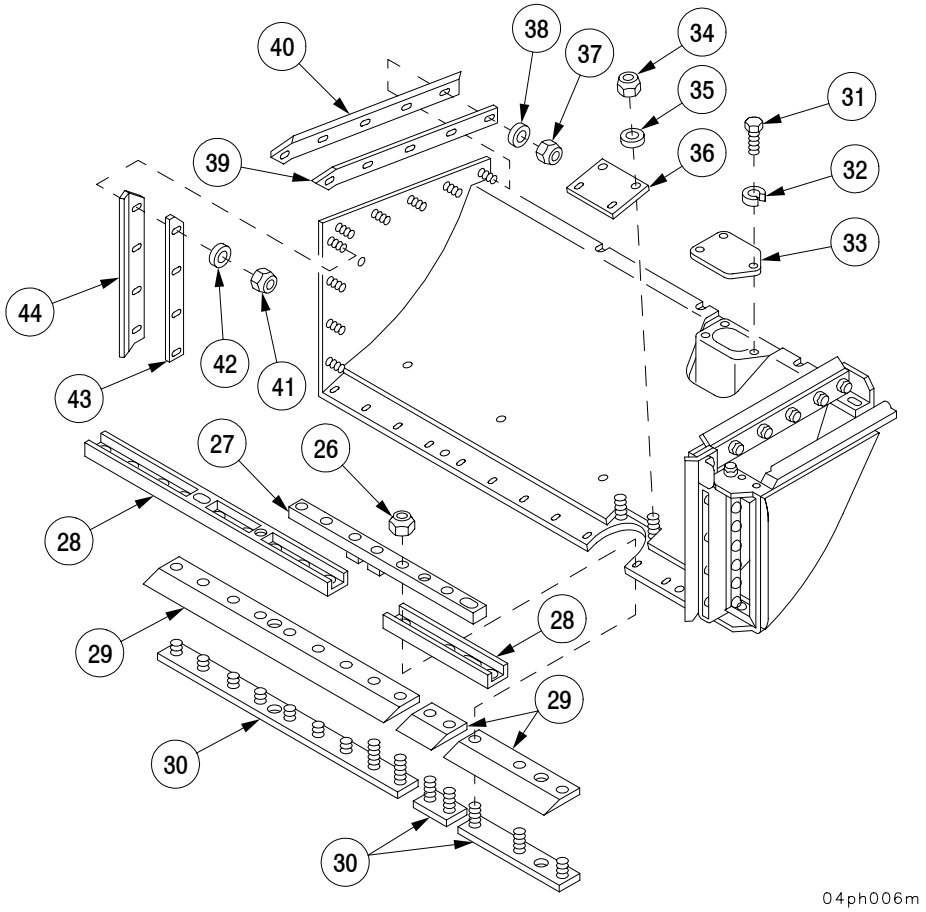
4 Remove 14 self-locking nuts (26), bar (27), two stiffeners (28), three seal segments (29), and three retainer segments (30). Discard self-locking nuts and seal segments.

5 Remove three screws (31), three lockwashers (32), and cover (33). Discard lockwashers.

6 Remove two self-locking nuts (34), two flat washers (35), and cover (36). Discard self-locking nuts.

7 Remove five self-locking nuts (37), five flat washers (38), plate (39), and seal (40). Discard self-locking nuts and seal.

8 Remove four self-locking nuts (41), four flat washers (42), plate (43), and seal (44). Discard self-locking nuts and seal.



6-3 EXHAUST HEAT SHIELD AND INSULATION PAD - CONTINUED

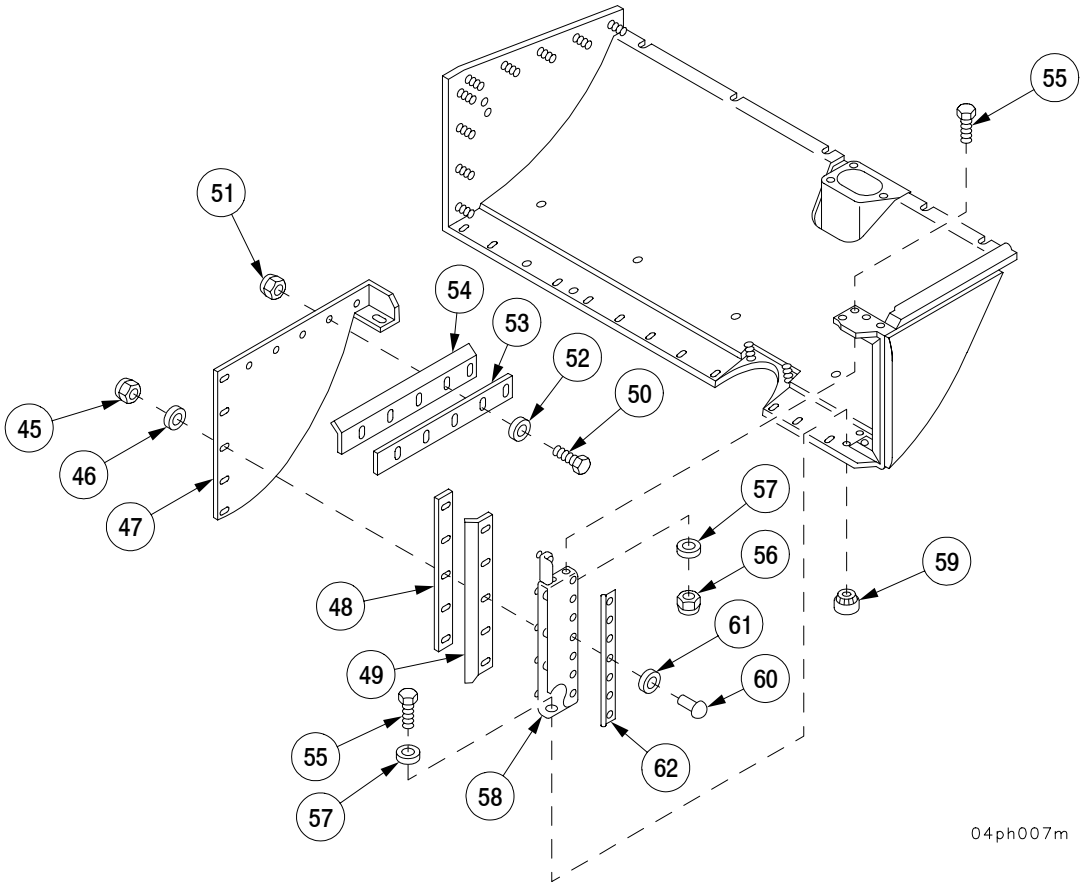
b. Disassembly - Continued

9 Remove five self-locking nuts (45), five flat washers (46), baffle (47), plate (48), and seal (49). Discard self-locking nuts and seal.

10 Remove five screws (50), five self-locking nuts (51), five flat washers (52), separating plate (53), and seal (54) from baffle (47). Discard self-locking nuts and seal.

11 Remove four screws (55), two self-locking nuts (56), four flat washers (57), retainer (58), and two plug nuts (59). Discard self-locking nuts.

12 Remove seven rivets (60), seven flat washers (61), and seal (62) from retainer (58). Discard rivets and seal.



6-3 EXHAUST HEAT SHIELD AND INSULATION PAD - CONTINUED

b. Disassembly - Continued

13 Remove insulation pad (63).

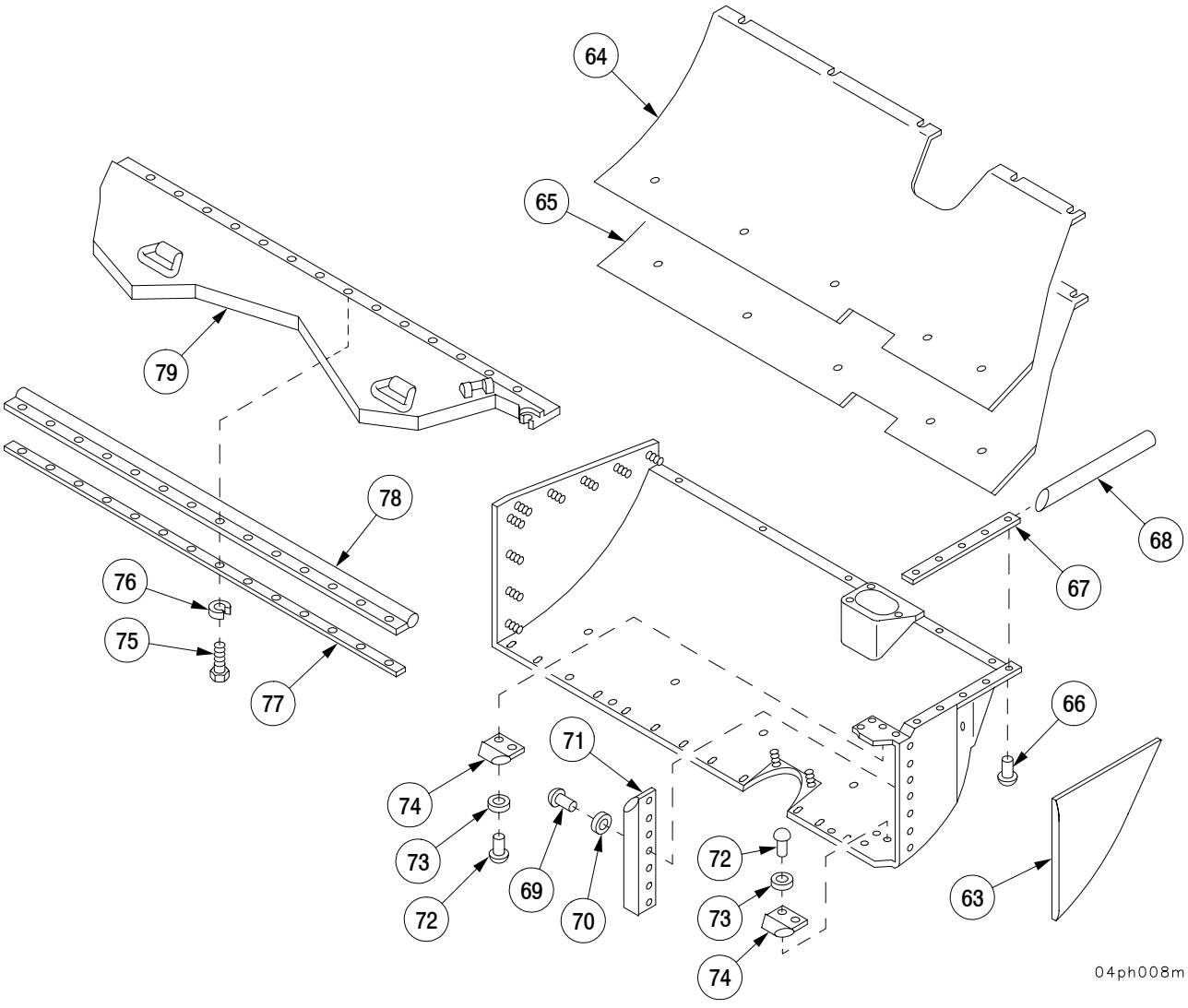
14 Remove retainer (64) and insulation (65).

15 Remove five rivets (66), retainer (67), and seal (68). Discard rivets and seal.

16 Remove seven rivets (69), seven flat washers (70), and seal (71). Discard rivets and seal.

17 Remove four rivets (72), four flat washers (73), and two seals (74). Discard rivets and seals.

18 Remove 14 screws (75), 14 lockwashers (76), retainer (77), and seal (78) from access cover (79). Discard lockwashers and seal.



6-3 EXHAUST HEAT SHIELD AND INSULATION PAD - CONTINUED

c. Assembly.

NOTE

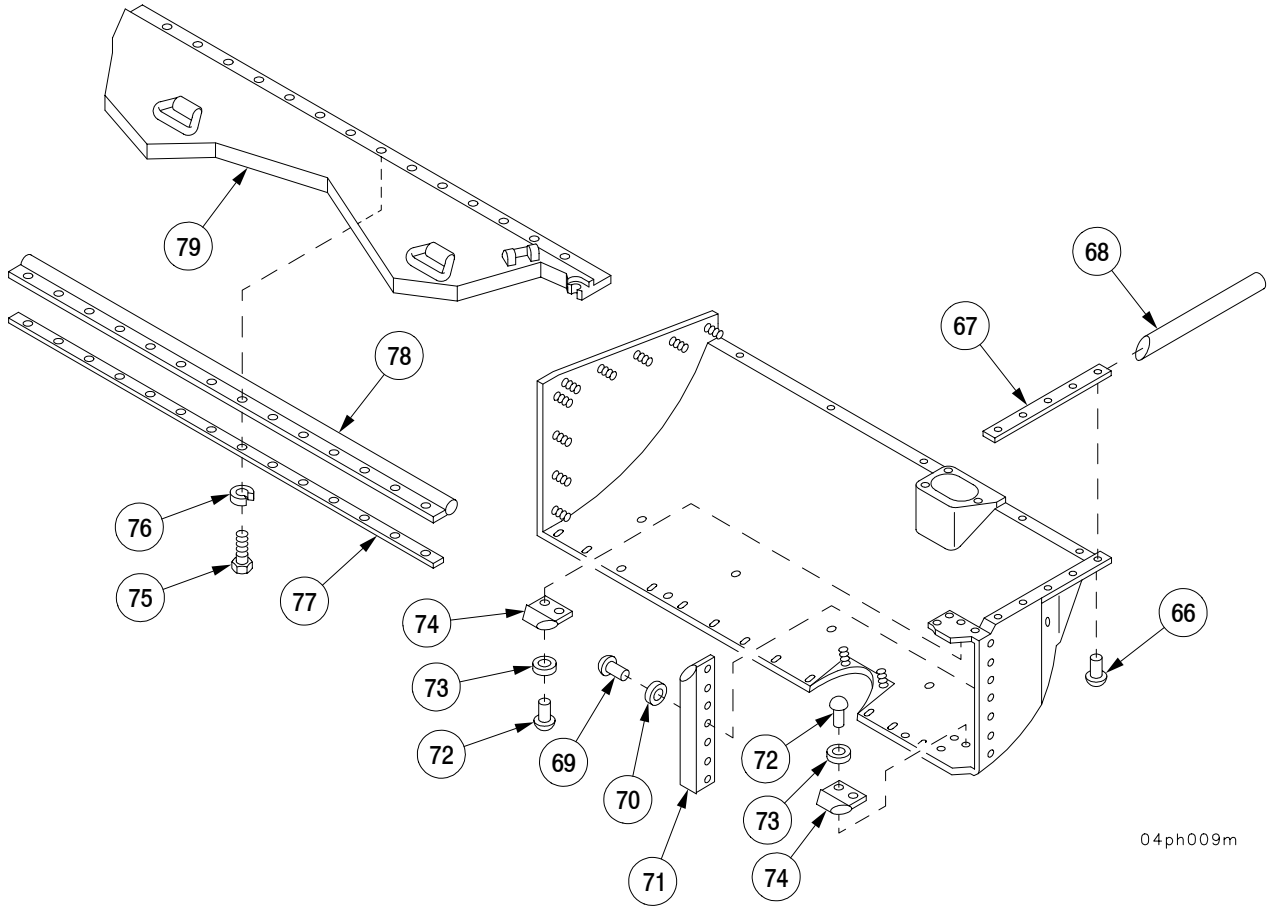
- Tighten all nuts and screws attaching rubber seals to show slight compression of seal.
- Apply a thin coating of sealing compound to threads of screws that do not use a self-locking nut.

1 Install new seal (78), retainer (77), 14 screws (75), and 14 new lockwashers (76) on access cover (79).

2 Install two new seals (74), four flat washers (73), and four new rivets (72).

3 Install new seal (71), seven flat washers (70), and seven new rivets (69).

4 Install new seal (68), retainer (67), and five new rivets (66).



6-3 EXHAUST HEAT SHIELD AND INSULATION PAD - CONTINUED

c. Assembly - Continued

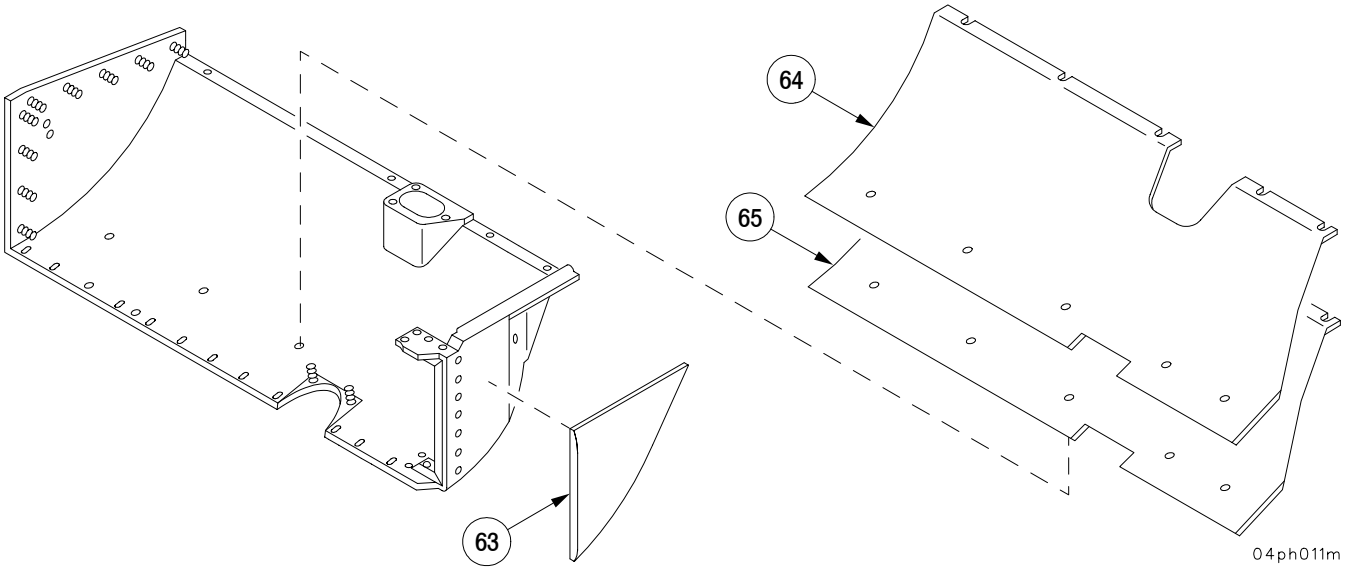
WARNING

Dry-cleaning solvent (P-D-680) is toxic and flamable. To avoid injury, wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause SERIOUS INJURY. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (FM 21-11).

5 Clean insulation pad mounting surface with dry-cleaning solvent.

6 Install insulation (65) and retainer (64).

7 Install insulation pad (63) with adhesive.



6-3 EXHAUST HEAT SHIELD AND INSULATION PAD - CONTINUED

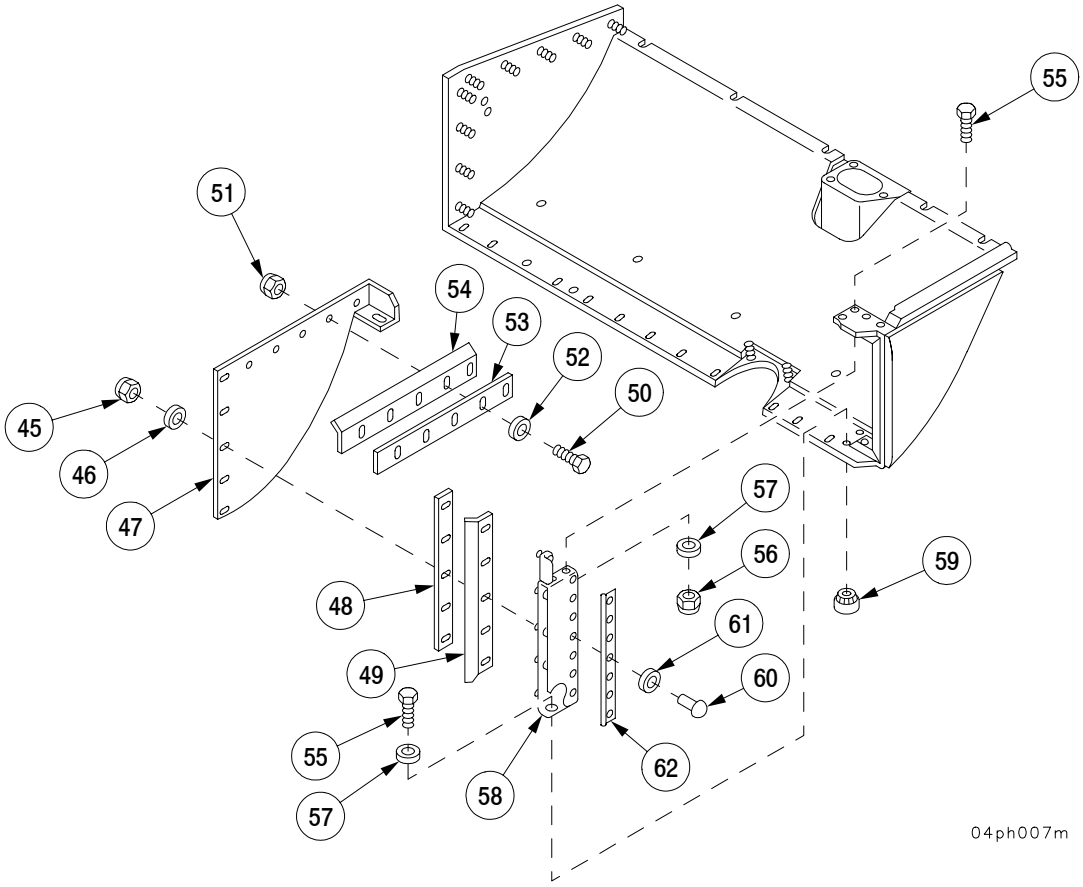
c. Assembly - Continued

8 Install new seal (62), seven flat washers (61), and seven new rivets (60) on retainer (58).

9 Install retainer (58), four screws (55), four flat washers (57), and two new self-locking nuts (56) and two plug nuts (59).

10 Install new seal (54), plate (53), five screws (50), five flat washers (52), and five new self-locking nuts (51) to baffle (47).

11 Install baffle (47) with plate (48) and seal (49), five flat washers (46), and five new self-locking nuts (45).



6-3 EXHAUST HEAT SHIELD AND INSULATION PAD - CONTINUED

c. Assembly - Continued

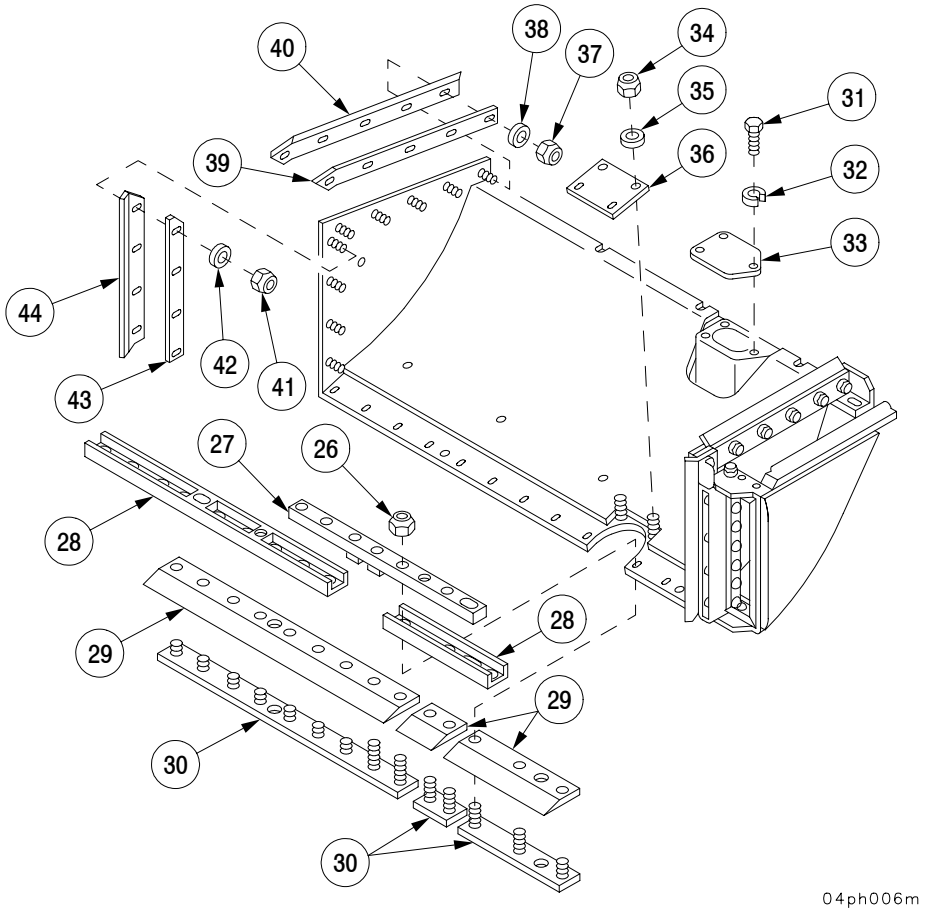
12 Install new seal (44), plate (43), four flat washers (42), and four new self-locking nuts (41).

13 Install new seal (40), plate (39), five flat washers (38), and five new self-locking nuts (37).

14 Install cover (36), two flat washers (35), and two new self-locking nuts (34).

15 Install cover (33), three screws (31), and three new lockwashers (32).

16 Install three retainer segments (30), three new seal segments (29), two stiffeners (28), bar (27), and fourteen new self-locking nuts (26).



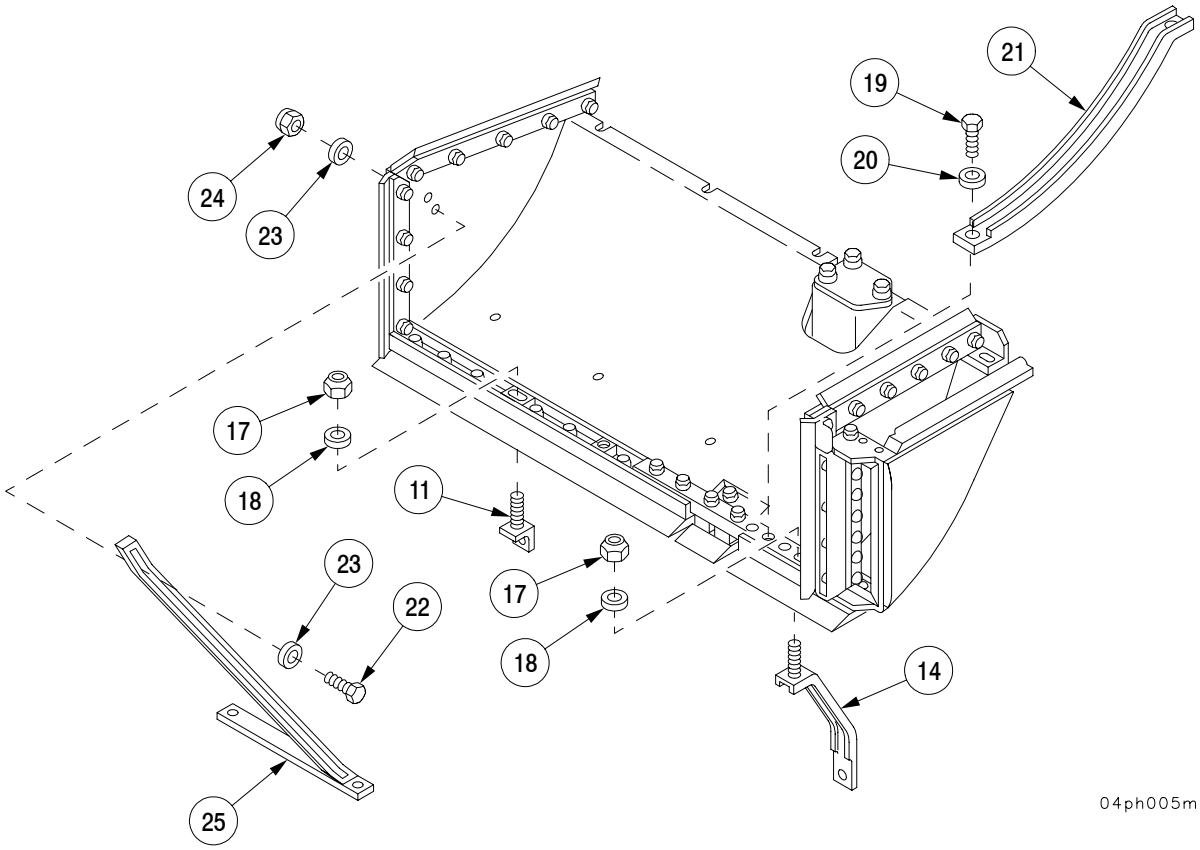
6-3 EXHAUST HEAT SHIELD AND INSULATION PAD - CONTINUED

c. Assembly - Continued

17 Install support (25), two screws (22), four flat washers (23), and two new self-locking nuts (24).

18 Install two stiffeners (21), two screws (19), and two flat washers (20).

19 Install support stiffener (11) and bracket (14), two flat washers (18), and two new self-locking nuts (17).



6-3 EXHAUST HEAT SHIELD AND INSULATION PAD - CONTINUED

d. Installation.

1 Install bracket (10) on vehicle with two screws (15) and two flat washers (16).

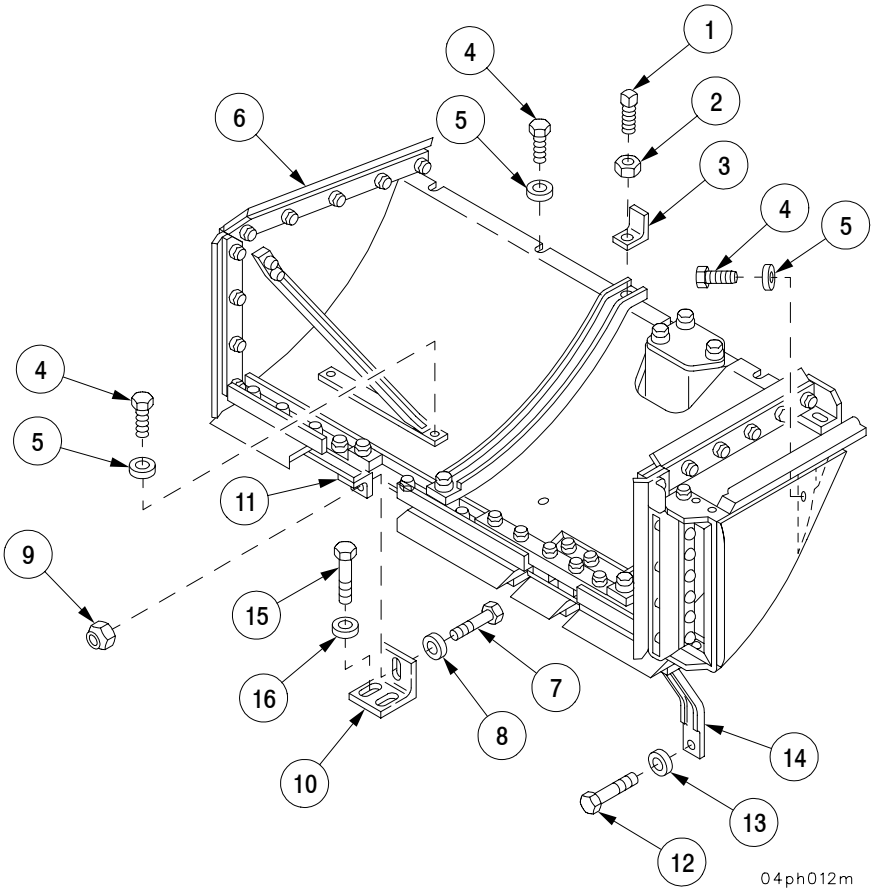
2 Install exhaust heat shield (6) in vehicle.

3 Install bracket (14) with screw (12) and flat washer (13).

4 Install bracket (10) on support stiffener (11) with screw (7), flat washer (8), and new self-locking nut (9).

5 Install 11 screws (4) and 11 flat washers (5) securing exhaust heat shield (6).

6 Install two brackets (3), two screws (1), and two jamnuts (2).



NOTE

FOLLOW-ON MAINTENANCE:
Install hull exhaust grille (para 16-25)
Install exhaust outlet pipe (para 6-1)
Install fan access door (para 16-26)

CHAPTER 7
COOLING SYSTEM

GENERAL

This chapter illustrates and defines procedures for removal, disassembly, assembly, and installation of engine cooling system components.

CONTENTS

Section I. RADIATOR

7-1 RADIATOR.

This task covers: a. Removal b. Disassembly c. Assembly d. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Torque wrench (item 85, Appx F)

Materials/Parts
Adhesive (item 4, Appx C)
Lockwashers (2) (item 151, Appx E)
Gasket (item 152, Appx E)

Equipment Conditions
Cooling system drained
(TM 9-2350-314-10)
Fan access door removed (para 16-26)

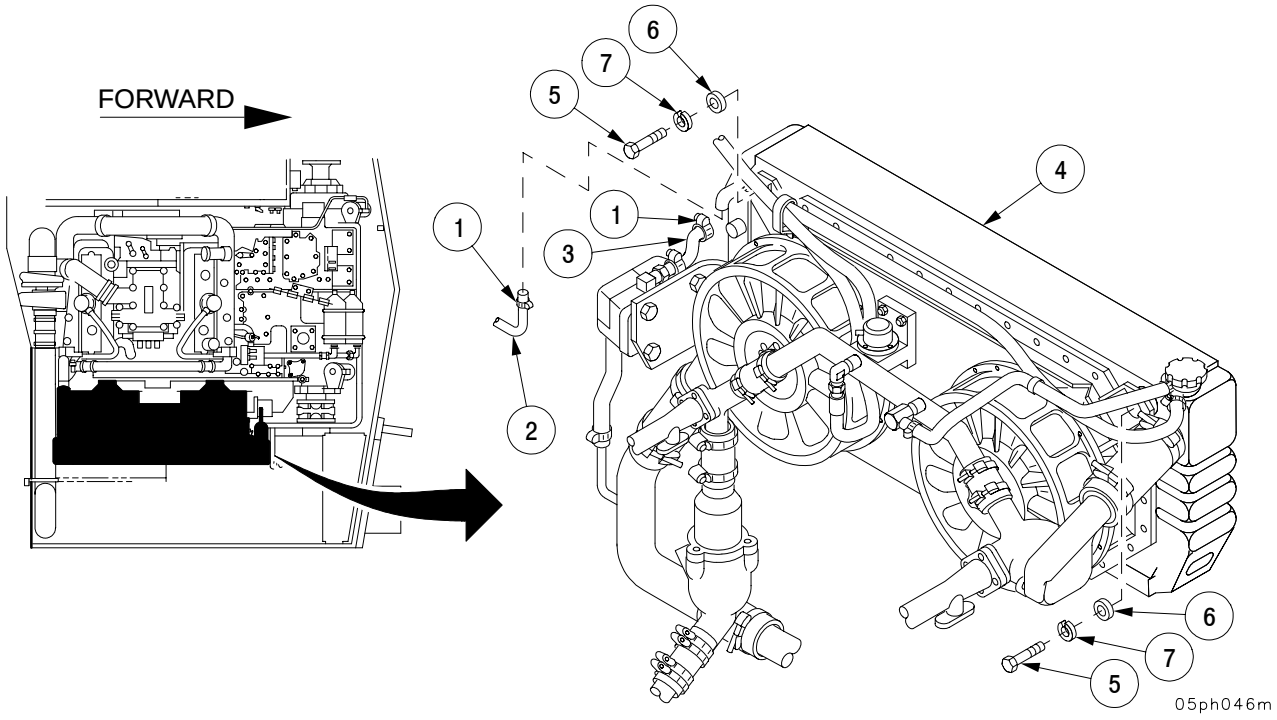
Personnel Required
Two

References
TM 9-2350-314-10

a. Removal.

1 Loosen two clamps (1) and remove surge-tank-to-radiator hose (2) and radiator-to-aeration-detector hose (3) from radiator (4).

2 Remove two screws (5), two flat washers (6), two lockwashers (7) securing radiator (4). Discard lockwashers.



Section I. RADIATOR – CONTINUED

7-1 RADIATOR – CONTINUED

a. Removal – Continued

3 Loosen clamp (8) and remove radiator outlet hose (9) from radiator (4).

4 Loosen two clamps (10) and remove two radiator vent hoses (11) from radiator (4).

5 Loosen clamp (12) and remove radiator inlet hose (13) from radiator (4).

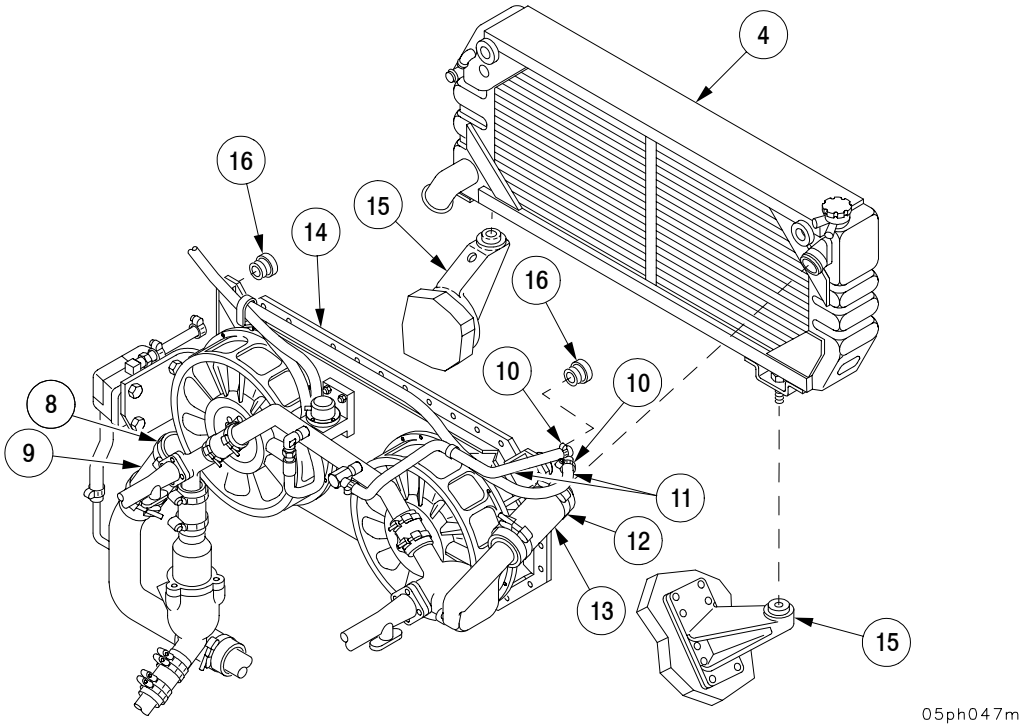
WARNING

Radiator weighs 88 lbs (40 kg). Two persons are needed during removal to prevent serious injury to personnel.

6 Lift radiator (4) up and away from shroud (14) and two radiator mounts (15).

7 If damaged, remove two bushings (16) from shroud (14).

8 Remove radiator brackets from radiator (4) (para 7-2).



Section I. RADIATOR - CONTINUED

7-1 RADIATOR - CONTINUED

b. Disassembly.

1 Remove radiator cap (17) and gasket (18) from radiator (4). Discard gasket.

2 Remove drain plug (19) from radiator (4).

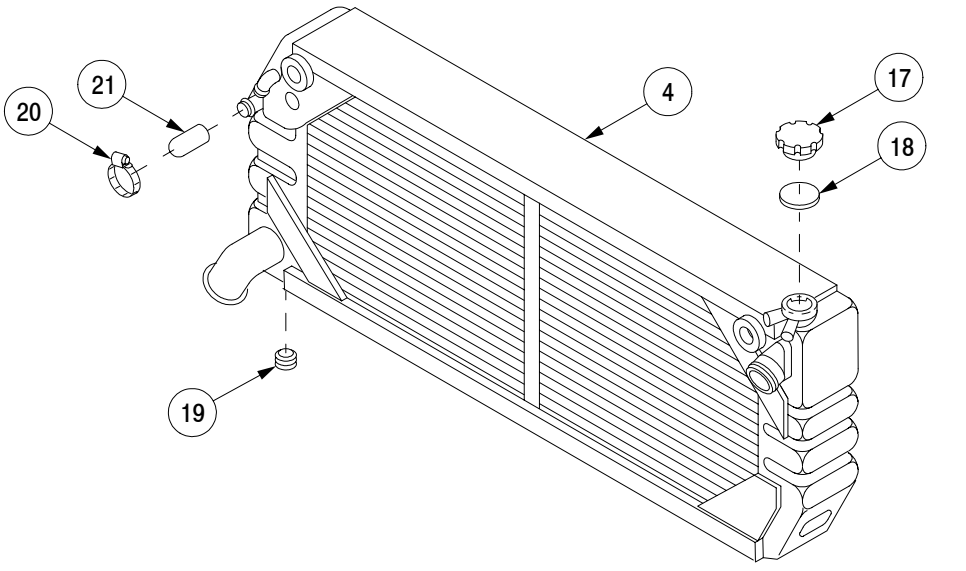
3 Remove clamp (20) and cap (21) from radiator (4).

c. Assembly.

1 Install cap (21) and clamp (20) to radiator (4).

2 Install drain plug (19) in radiator (4).

3 Install new gasket (18) on cap (17) and install cap (17) on radiator (4).



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Section I. RADIATOR - CONTINUED

7-1 RADIATOR - CONTINUED

d. Installation.

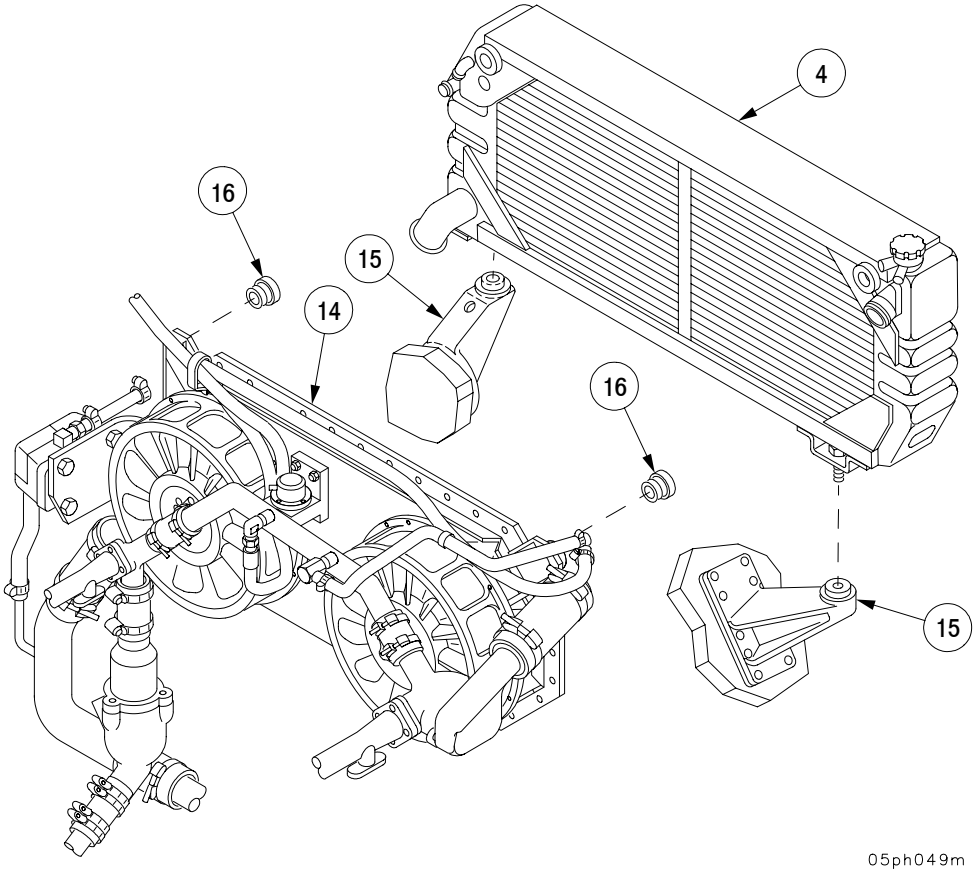
WARNING

Radiator weighs 88 lbs (40 kg). Two persons are needed during installation to prevent serious injury to personnel.

1 Install two radiator brackets on radiator (4) (para 7-2).

2 Install two bushings (16) in shroud (14), if removed.

3 Position radiator (4) on shroud (14) and two radiator mounts (15).



Section I. RADIATOR - CONTINUED

7-1 RADIATOR - CONTINUED

d. Installation - Continued

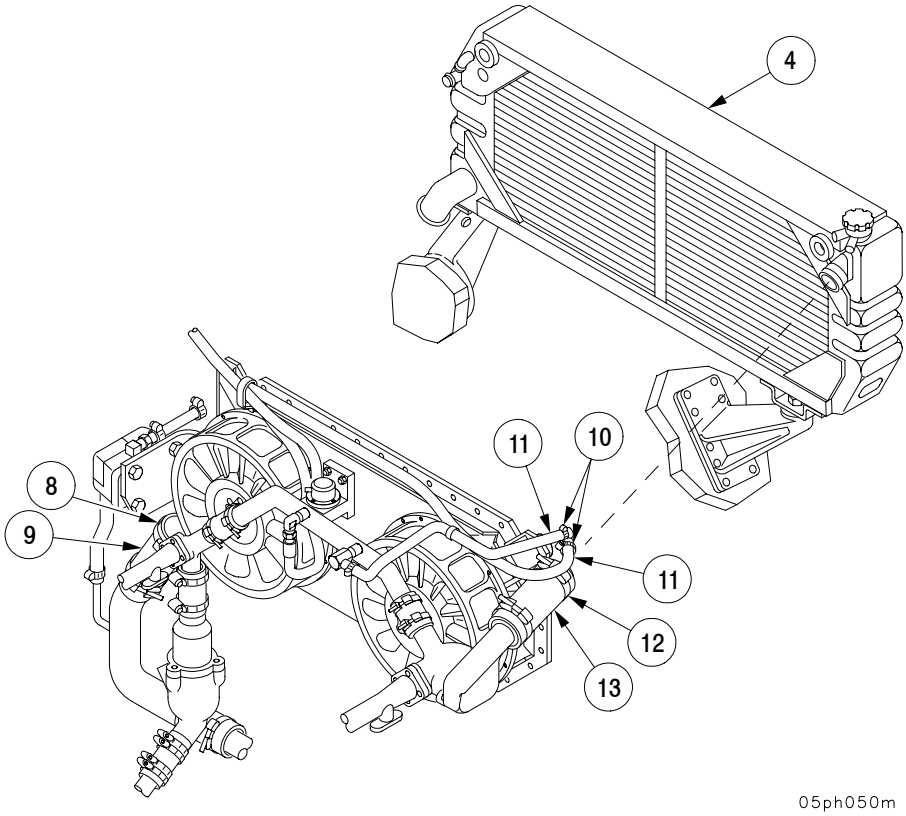
NOTE

- Use adhesive at connectors between hoses and mating tubes or castings.
- Hoses must cover unpainted areas of tubes and fittings or be positioned evenly between red bands on tubes and housings.

4 Connect radiator inlet hose (13) to radiator (4) and tighten clamp (12).

5 Connect two radiator vent hoses (11) to radiator (4) and tighten two clamps (10).

6 Connect radiator outlet hose (9) to radiator (4) and tighten clamp (8).



Section I. RADIATOR - CONTINUED

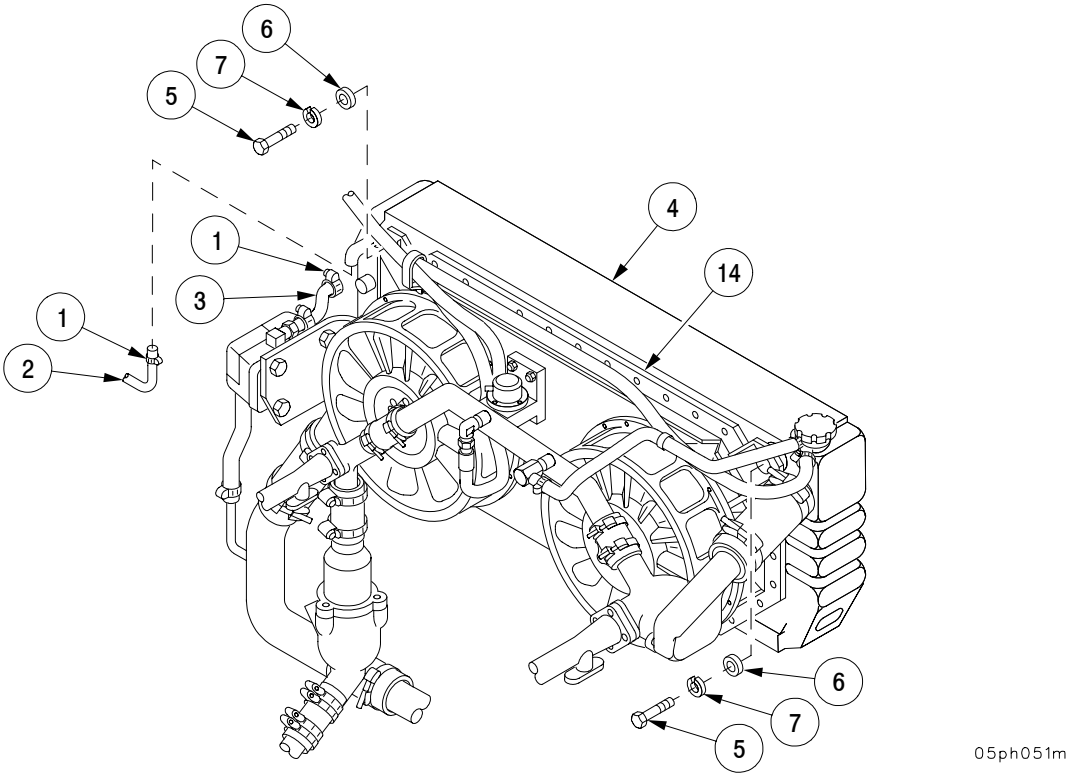
7-1 RADIATOR - CONTINUED

d. Installation - Continued

7 Secure radiator (4) to shroud (14) with two new lockwashers (7), two flat washers (6), and two screws (5).

8 Connect radiator-to-aeration-detector hose (3) and surge-tank-to-radiator hose (2) to radiator (4) and tighten two clamps (1).

9 Fill cooling system (TM 9-2350-314-10).



Section I. RADIATOR - CONTINUED

7-1 RADIATOR - CONTINUED

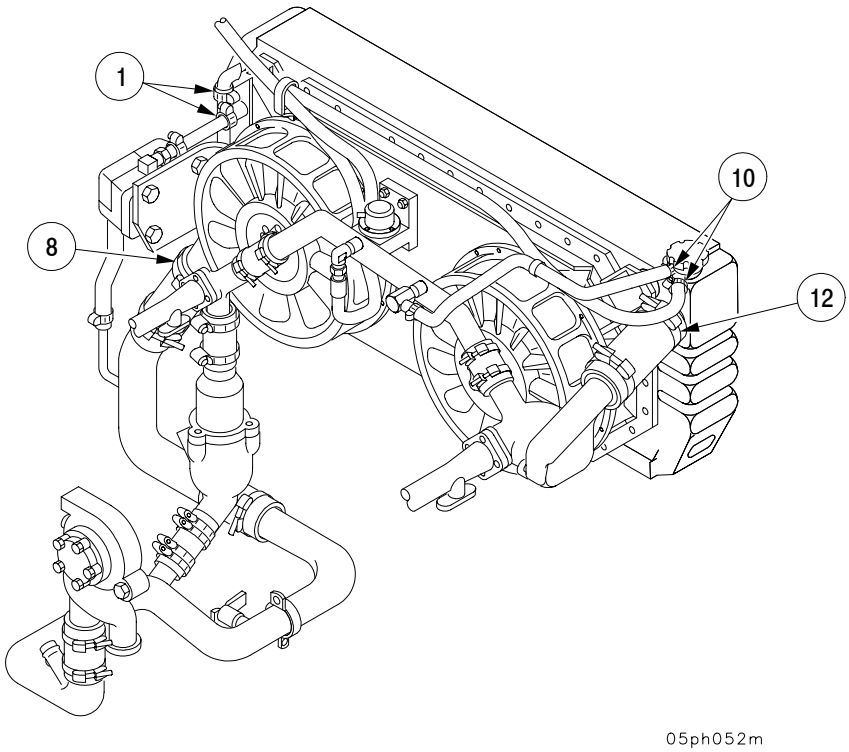
d. Installation - Continued

10 Operate engine (TM 9-2350-314-10) a minimum of 5 minutes at 165° F (74° C) minimum coolant temperature.

11 Shut down engine (TM 9-2350-314-10) and check for leaks and level.

12 Torque six clamps (1, 8, 10, 12) as follows:

Hose OD (in.)	Hose OD (mm)	lb-in.	N·m
Less than 1.0	Less than 25.4	15 to 25	1.7 to 2.8
1.0 to 2.0	25.4 to 50.8	20 to 40	2.3 to 4.5
Greater than 2.0	Greater than 50.8	40 to 60	4.5 to 6.8



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NOTE

FOLLOW-ON MAINTENANCE:
Install fan access door (para 16-26)

Section I. RADIATOR - CONTINUED

7-2 RADIATOR MOUNTS AND BRACKETS.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Materials/Parts
Lockwashers (21) (item 3, Appx E)
Gasket (item 153, Appx E)

Equipment Conditions
Radiator removed (para 7-1)

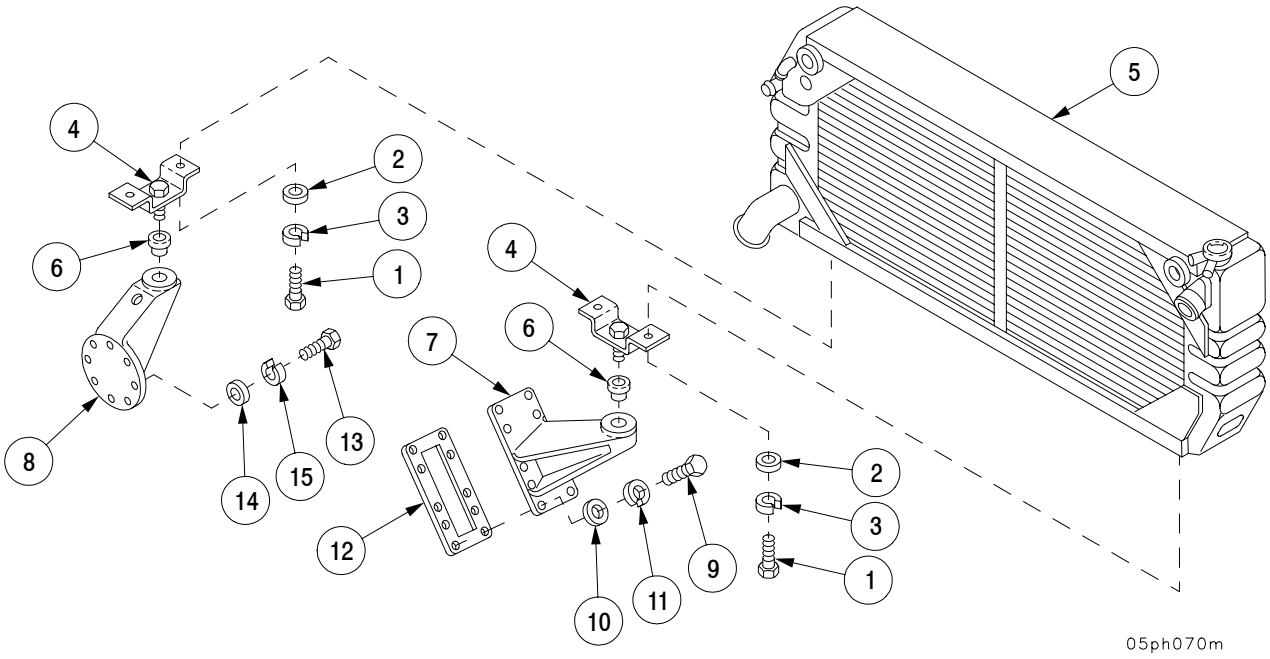
a. Removal.

1 Remove four screws (1), four flat washers (2), four lockwashers (3), and two brackets (4) from radiator (5). Discard lockwashers.

2 Remove two radiator bracket bushings (6) from mounts (7 and 8).

3 Remove nine screws (9), nine flat washers (10), nine lockwashers (11), mount (7), and gasket (12). Discard lockwashers and gasket.

4 Remove eight screws (13), eight flat washers (14), eight lockwashers (15), and mount (8). Discard lockwashers.



Section I. RADIATOR - CONTINUED

7-2 RADIATOR MOUNTS AND BRACKETS - CONTINUED

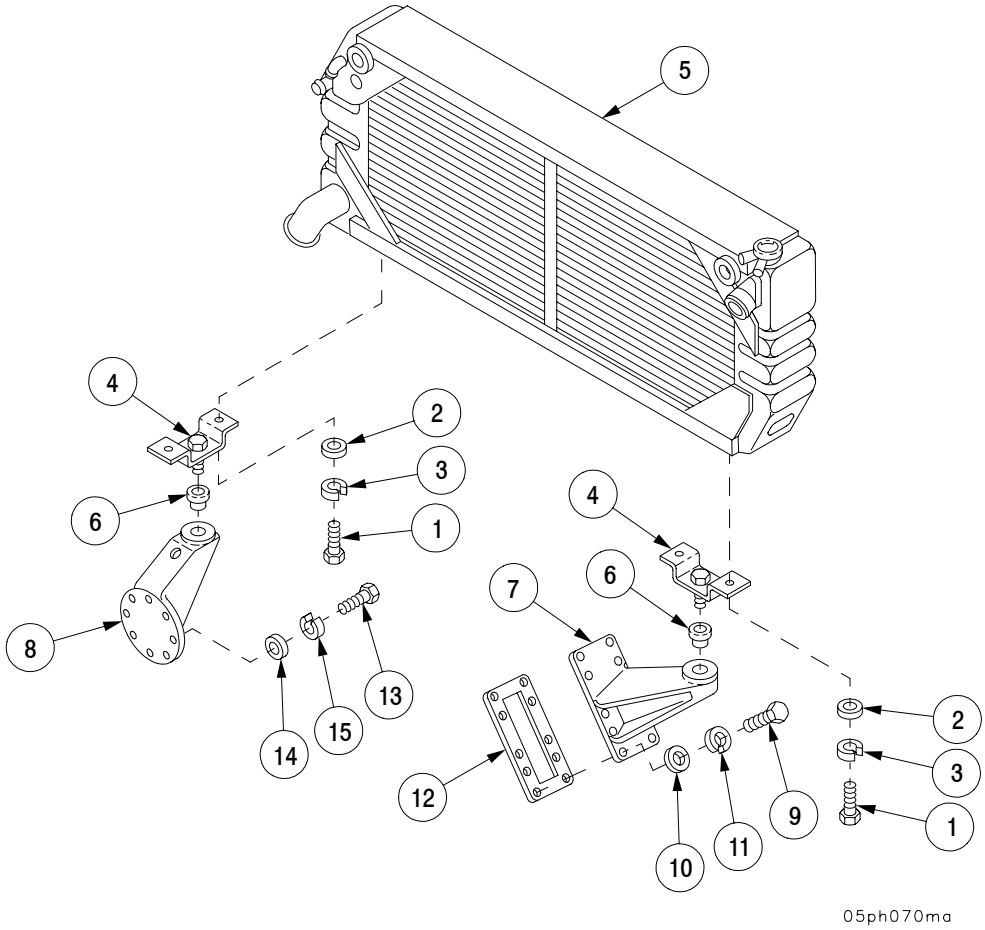
b. Installation.

1 Install mount (8) with eight screws (13), eight new lockwashers (15), and eight flat washers (14).

2 Install mount (7) and new gasket (12) with nine screws (9), nine new lockwashers (11), and nine flat washers (10).

3 Install two radiator bracket bushings (6) in mounts (7 and 8).

4 Install two brackets (4) on radiator (5) with four screws (1), four new lockwashers (3), and four flat washers (2).



NOTE

FOLLOW-ON MAINTENANCE:
Install radiator (para 7-1)

Section I. RADIATOR - CONTINUED

7-3 RADIATOR SURGE TANK AND PRESSURE RELIEF VALVE.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Torque wrench (item 85, Appx F)

Materials/Parts
Gasket (item 154, Appx E)
Adhesive (item 4, Appx C)
Antiseizing tape (item 60, Appx C)

Equipment Conditions
Hull front slope plate and exhaust grille support plate removed (para 16-30)
Cooling system drained (TM 9-2350-314-10)

References
TM 9-2350-314-10

a. Removal.

1 Remove two screws (1), two flat washers (2), and retainer (3).

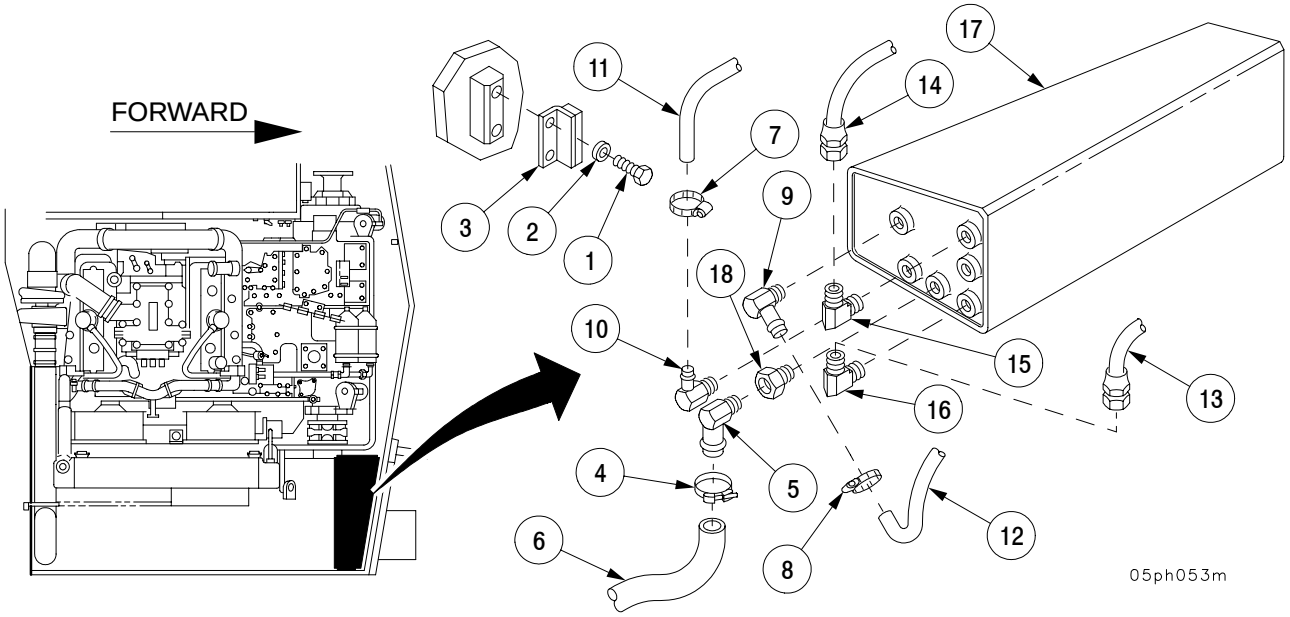
2 Loosen clamp (4) at elbow (5) and remove hose (6) from elbow (5).

3 Loosen two clamps (7 and 8) at two elbows (9 and 10) and remove two hoses (11 and 12) from two elbows (9 and 10).

4 Remove two hoses (13 and 14) from two elbows (15 and 16).

5 Lift surge tank (17) up and out of vehicle.

6 Remove five elbows (5, 9, 10, 15, and 16) and pipe coupling (18) from surge tank (17).



Section I. RADIATOR - CONTINUED

7-3 RADIATOR SURGE TANK AND PRESSURE RELIEF VALVE - CONTINUED

a. Removal - Continued

7 Remove hose (14) and elbow (19) from relief valve block (20).

8 Remove four screws (21), relief valve (22), and gasket (23) from relief valve block (20). Discard gasket.

b. Installation.

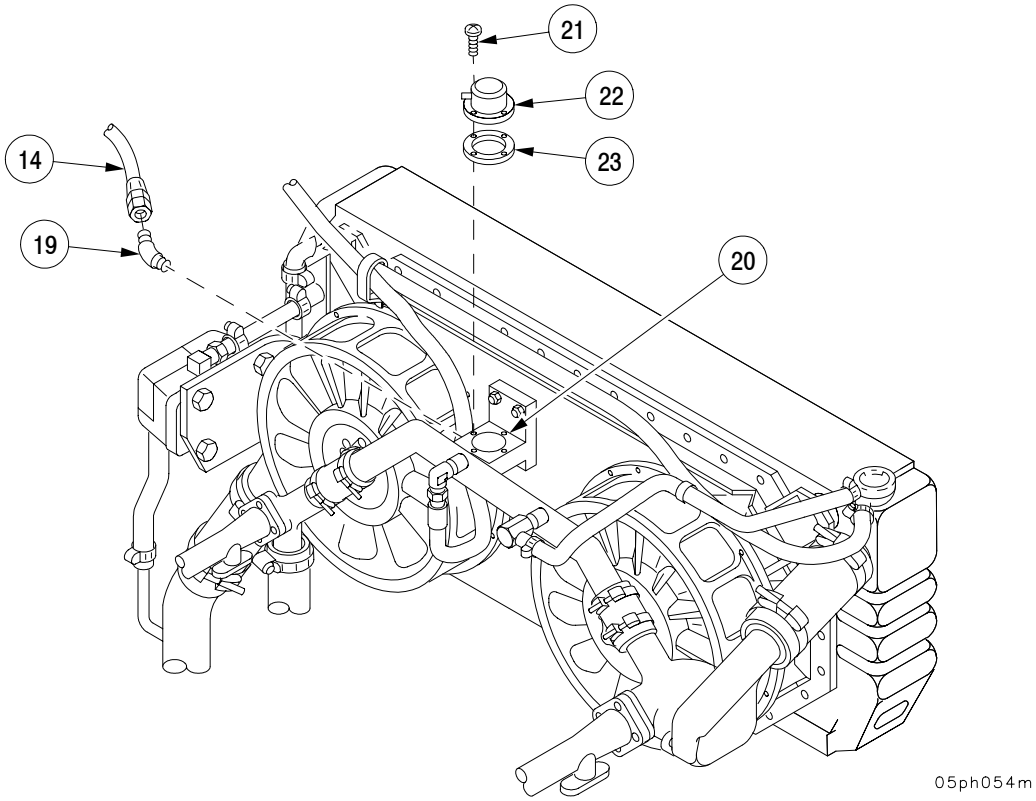
NOTE

- Use adhesive at connectors between hoses and mating tubes or castings.
- Hoses must cover unpainted areas of tubes and fittings or be positioned evenly between red bands on tubes and housings.

1 Install relief valve (22) with new gasket (23) and four screws (21) on relief valve block (20).

2 Apply antiseizing tape to threads of elbow (19).

3 Install elbow (19) and hose (14) in relief valve block (20).



Section I. RADIATOR - CONTINUED

7-3 RADIATOR SURGE TANK AND PRESSURE RELIEF VALVE - CONTINUED

b. Installation - Continued

4 Install pipe coupling (18) and five elbows (5, 9, 10, 15, and 16) into surge tank (17).

5 Place surge tank (17) in position.

6 Install two hoses (13 and 14) on two elbows (15 and 16).

7 Install two hoses (11 and 12) on two elbows (9 and 10) and tighten two clamps (7 and 8).

8 Install hose (6) on elbow (5) and tighten clamp (4).

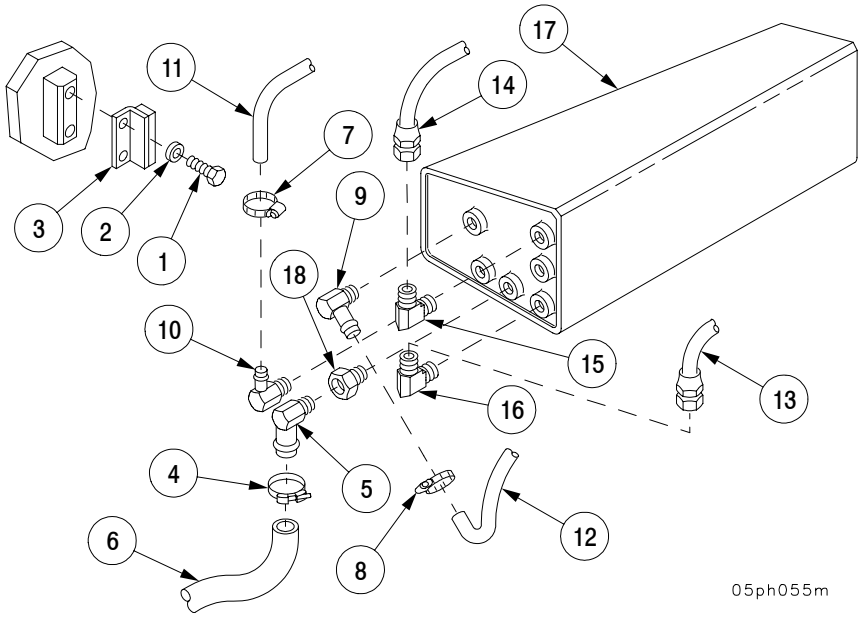
9 Install retainer (3), two flat washers (2), and two screws (1).

10 Fill cooling system (TM 9-2350-314-10).

11 Operate engine (TM 9-2350-314-10) a minimum of 5 minutes at 165°F (74°C) minimum coolant temperature.

12 Shut down engine (TM 9-2350-314-10) and check for leaks and level.

13 Torque three clamps (4, 7, and 8) to 15-25 lb-in. (1.7-2.8 N·m).



NOTE

FOLLOW-ON MAINTENANCE:
Install hull front slope plate and exhaust grille support plate (para 16-30)

Section II. SHROUDS

7-4 RADIATOR FAN SHROUD.

This task covers: a. Removal b. Disassembly c. Assembly d. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Materials/Parts
Insulation tape (item 61, Appx C)
Lockwashers (25) (item 9, Appx E)
Rivets (36) (item 157, Appx E)
Nonmetallic seals (2) (item 155, Appx E)
Nonmetallic seals (2) (item 156, Appx E)
Self-locking nuts (2) (item 29, Appx E)

Equipment Conditions
Powerpack removed (para 4-1)
Radiator removed (para 7-1)
Surge tank pressure relief
valve hose disconnected (para 7-3)
Fan drive shafts removed (para 7-11)
Low level coolant detector bracket removed
(para 7-10)

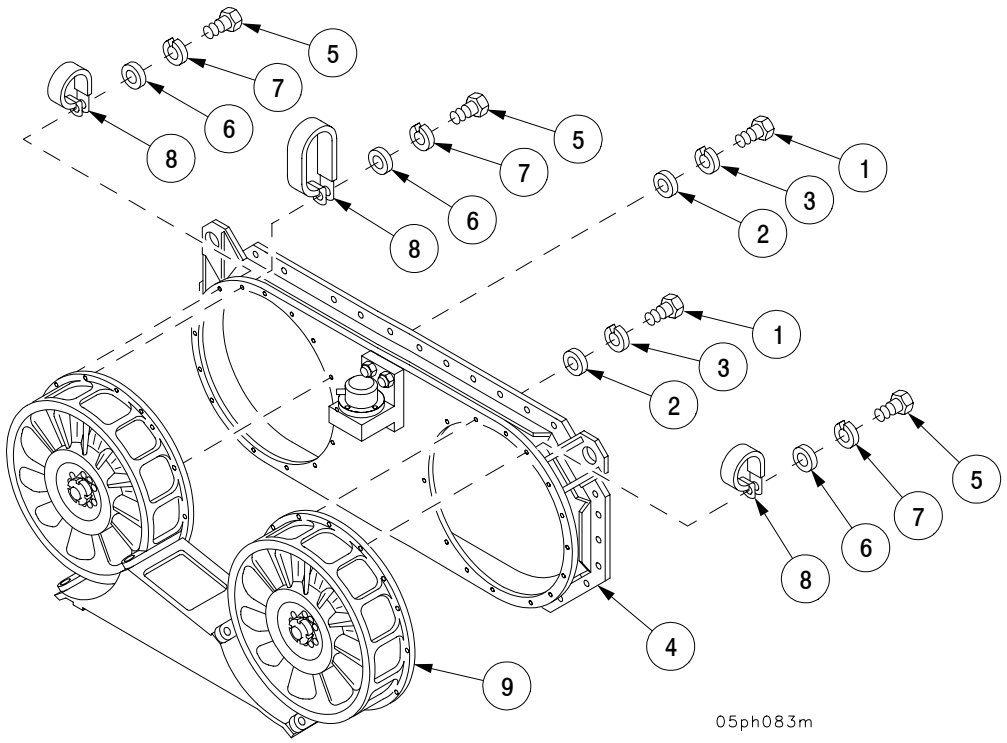
Personnel Required
Two

a. Removal.

1 Remove 22 screws (1), 22 flat washers (2), and 22 lockwashers (3) from shroud (4). Discard lockwashers.

2 Remove three screws (5), three flat washers (6), three lockwashers (7), and three clamps (8) from shroud (4). Discard lockwashers.

3 Remove shroud (4) from two fan assemblies (9).



Section II. SHROUDS - CONTINUED

7-4 RADIATOR FAN SHROUD - CONTINUED

b. Disassembly.

1 Remove 22 rivets (10) and two seals (11) from shroud (4). Discard rivets.

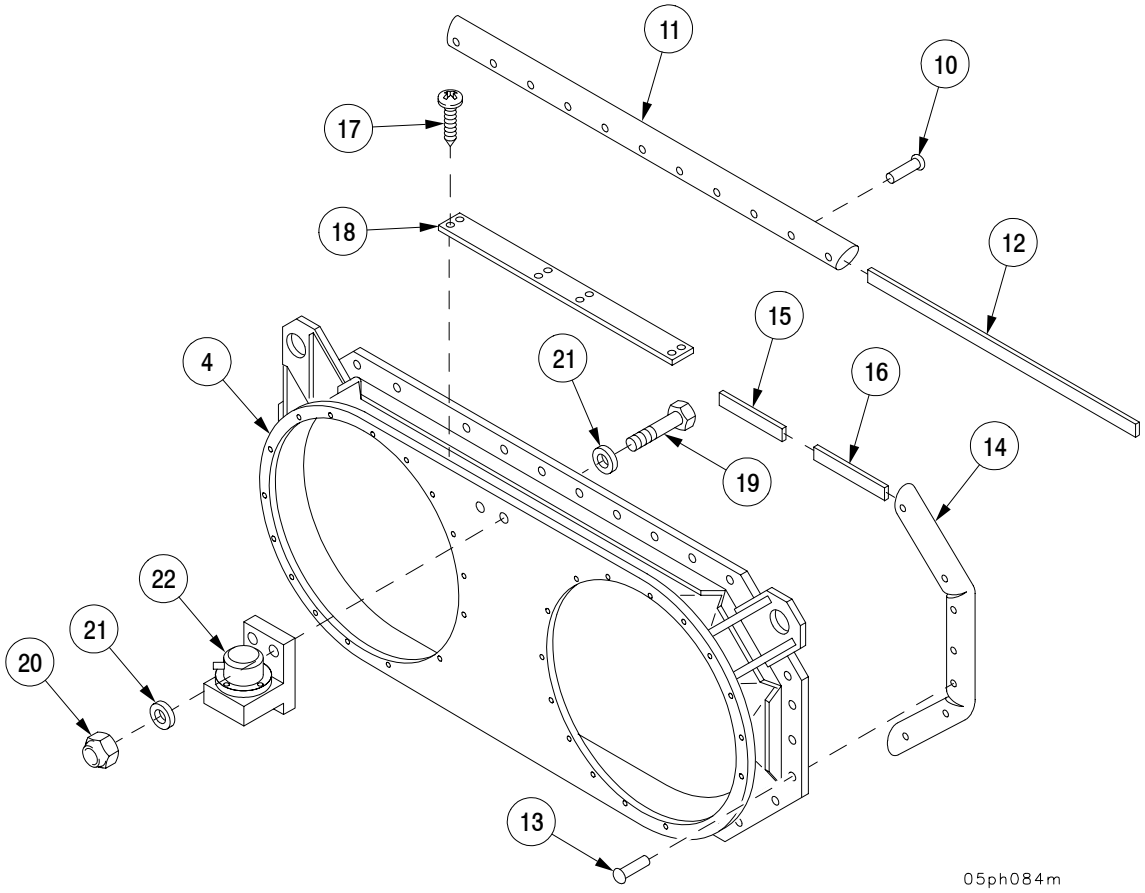
2 Remove two strips (12) from two seals (11). Discard seals.

3 Remove 14 rivets (13) and two seals (14) from shroud (4). Discard rivets.

4 Remove four strips (15) and two strips (16) from two seals (14). Discard seals.

5 Remove eight screws (17) and cover (18) from shroud (4).

6 Remove two screws (19), two locknuts (20), four flat washers (21), and relief valve block (22). Discard locknuts.



Section II. SHROUDS - CONTINUED

7-4 RADIATOR FAN SHROUD - CONTINUED

c. Assembly.

1 Install relief valve block (22) with two screws (19), four flat washers (21), and two new locknuts (20).

2 Install cover (18) on shroud (4) with eight screws (17).

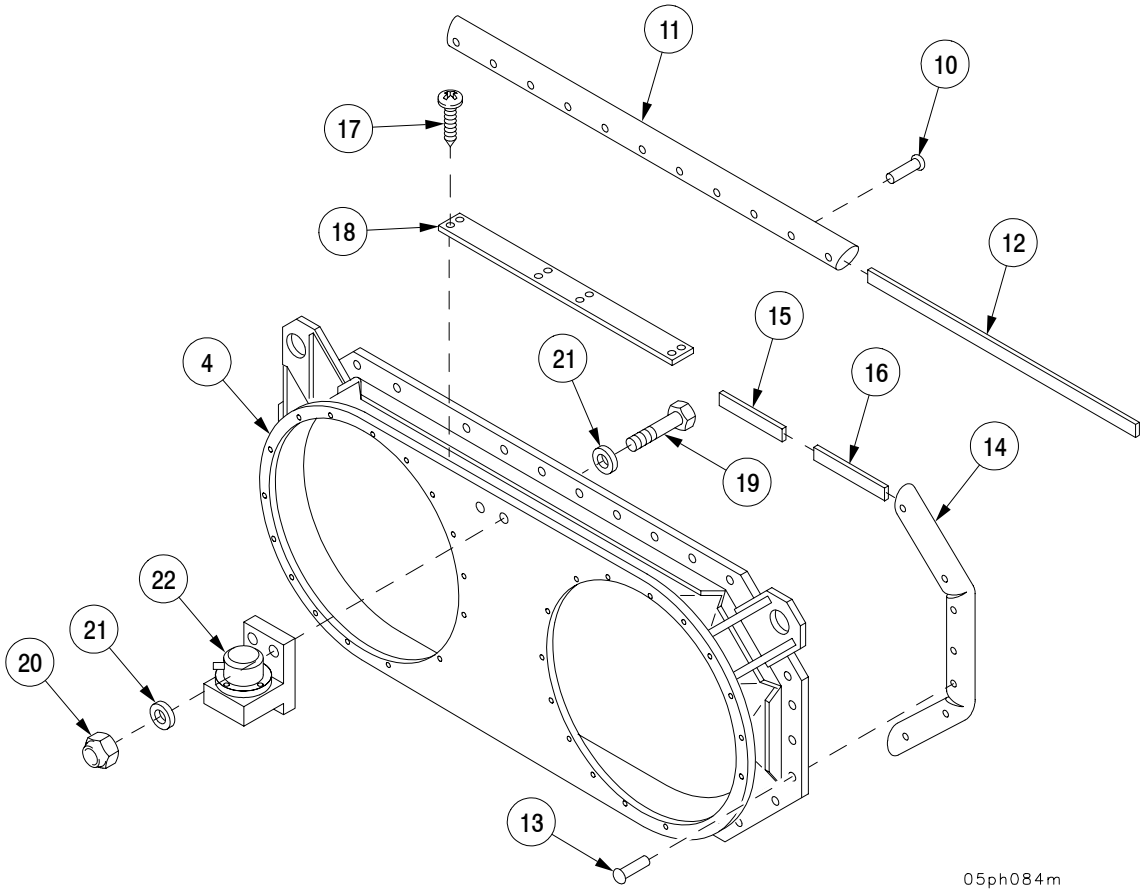
3 Install four strips (15) and two strips (16) in two new seals (14).

4 Install two new seals (14) on shroud (4) with 14 new rivets (13).

5 Install two strips (12) in two new seals (11).

6 Install two new seals (11) on shroud (4) with 22 new rivets (10).

7 Wrap each seal joint with tape (eight places).



Section II. SHROUDS - CONTINUED

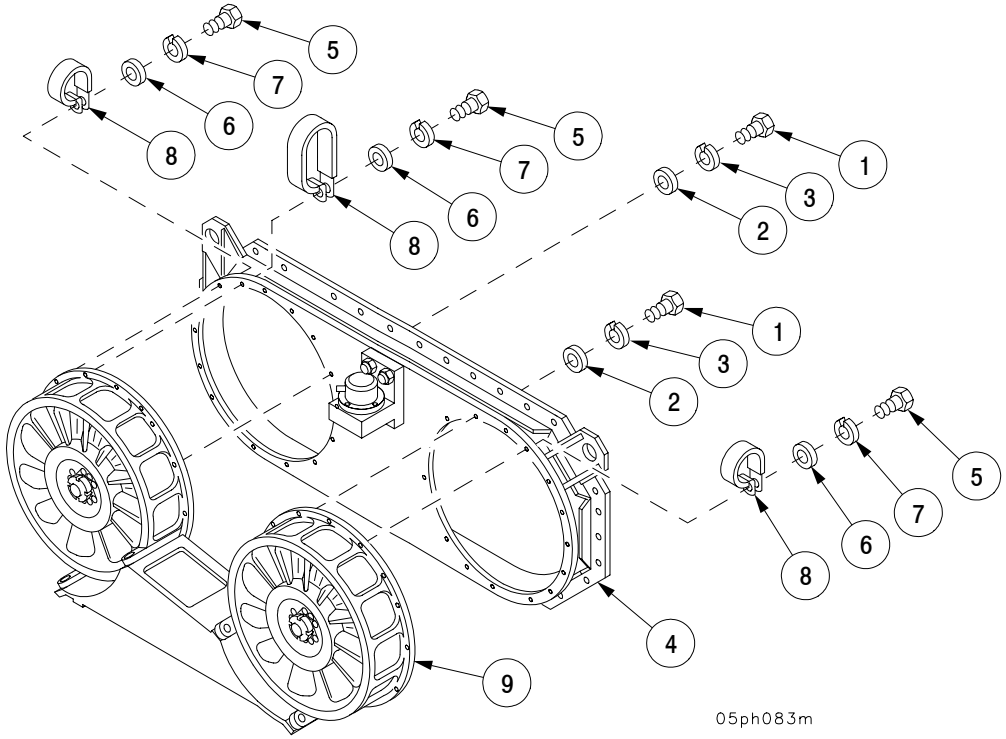
7-4 RADIATOR FAN SHROUD - CONTINUED

d. Installation.

1 Install shroud (4) on two fan assemblies (9).

2 Install three screws (5), three new lockwashers (7), three flat washers (6), and three clamps (8) on shroud (4).

3 Install 22 screws (1), 22 new lockwashers (3), and 22 flat washers (2) on shroud (4).



NOTE

FOLLOW-ON MAINTENANCE:
Install fan drive shafts (para 7-11)
Install surge tank pressure relief valve hose (para 7-3)
Install radiator (para 7-1)
Install powerpack (para 4-1)
Install low level coolant detector bracket (para 7-10)

Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING

7-5 ENGINE COOLANT TUBES (MAIN).

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Torque wrench (item 85, Appx F)

Equipment Conditions
Powerpack removed (para 4-1)
Cooling system drained
(TM 9-2350-314-10)

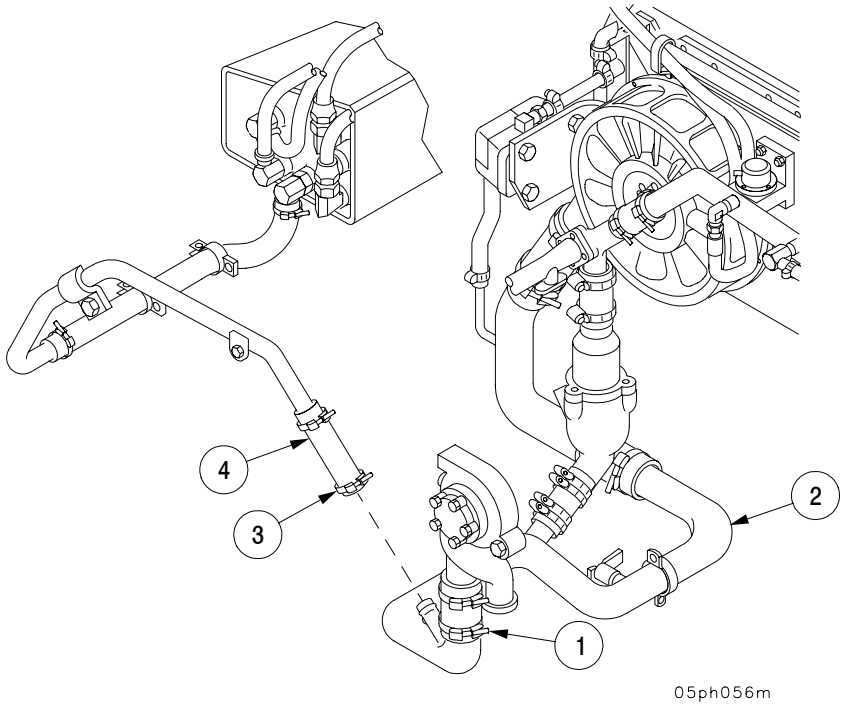
Materials/Parts
Adhesive (item 4, Appx C)
Lockwasher (item 20, Appx E)

References
TM 9-2350-314-10

a. Removal.

1 Loosen clamp (1) on main coolant tube (2).

2 Loosen clamp (3) on surge tank tube-to-engine coolant main tube inlet hose (4) and remove hose (4).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-5 ENGINE COOLANT TUBES (MAIN) - CONTINUED

a. Removal - Continued

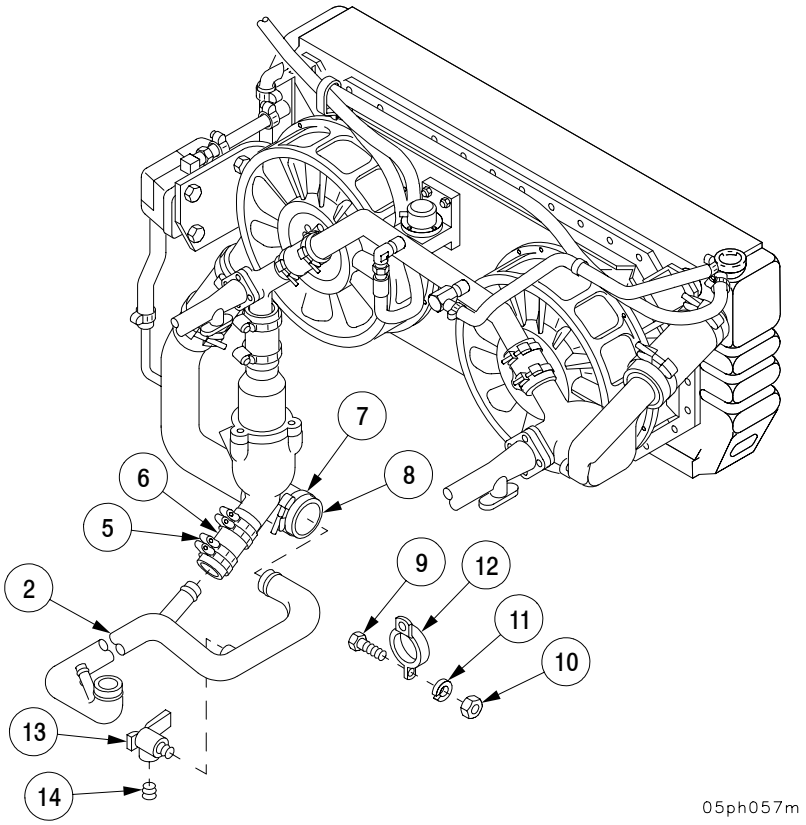
3 Loosen two clamps (5) on lower end of bypass thermostat lower housing-to-engine coolant main tube inlet hose (6).

4 Loosen clamp (7) at radiator lower tube assembly (8).

5 Remove screw (9), nut (10), lockwasher (11), and clamp (12) from main coolant tube (2). Discard lockwasher.

6 Remove main coolant tube (2).

7 Remove valve (13) and plug (14) from main coolant tube (2).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-5 ENGINE COOLANT TUBES (MAIN) - CONTINUED

b. Installation.

1 Install plug (14) and valve (13) in main coolant tube (2).

NOTE

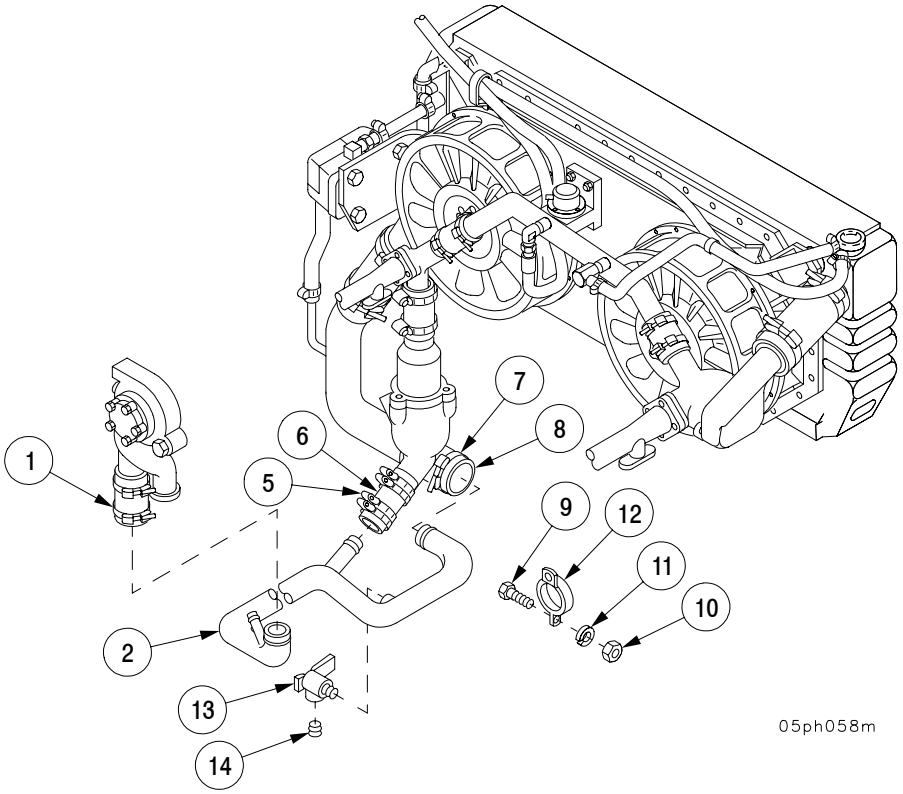
- Use adhesive at connectors between hoses and mating tubes or castings.
- Hoses must cover unpainted areas of tubes and fittings or be positioned evenly between red bands on tubes and housings.

2 Install main coolant tube (2) at hose clamp connections (1, 5, and 7).

3 Install clamp (12) on main coolant tube (2) with screw (9), new lockwasher (11), and nut (10).

4 Tighten clamp (7) at radiator lower tube assembly (8).

5 Tighten two clamps (5) on lower end of bypass thermostat lower housing-to-engine coolant main tube inlet hose (6).



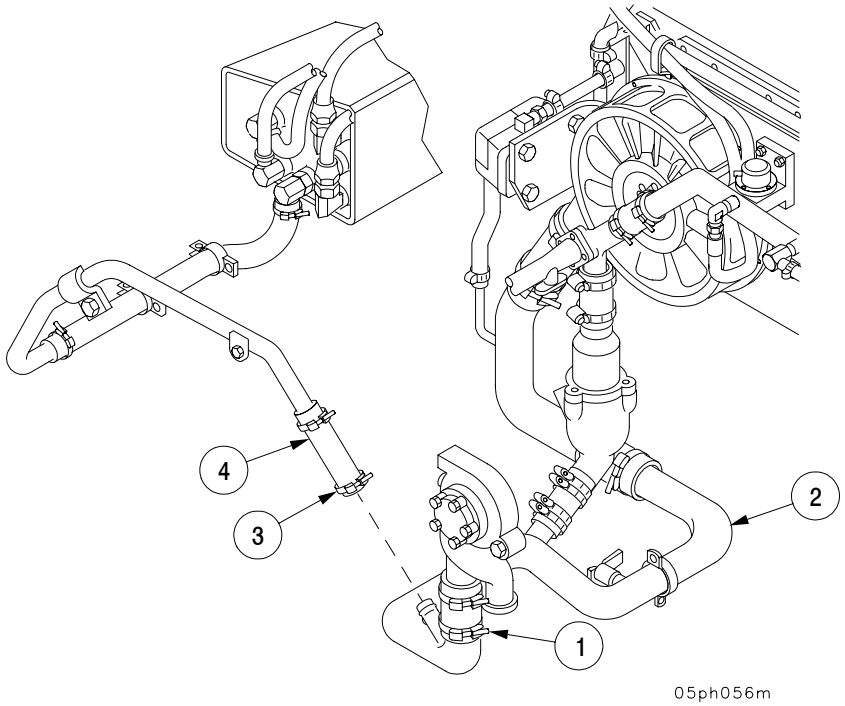
Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-5 ENGINE COOLANT TUBES (MAIN) - CONTINUED

b. Installation - Continued

6 Install surge tank tube-to-engine coolant main tube inlet hose (4) and tighten clamp (3).

7 Tighten clamp (1) on main coolant tube (2).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-5 ENGINE COOLANT TUBES (MAIN) - CONTINUED

b. Installation - Continued

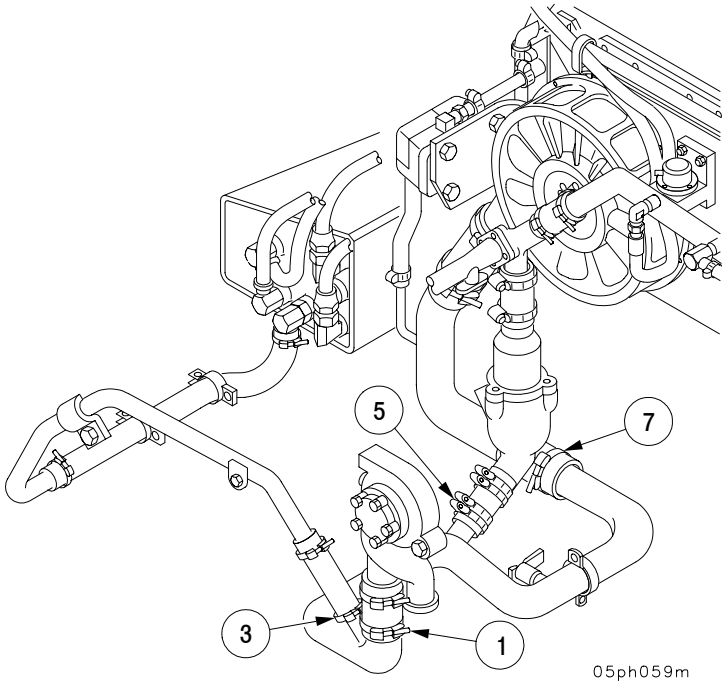
8 Fill cooling system (TM 9-2350-314-10).

9 Operate engine (para 4-1) a minimum of 5 minutes at 165°F (74°C) minimum coolant temperature.

10 Shut down engine (para 4-1) and check for leaks and level.

11 Torque clamp (1), clamp (7), and two clamps (5) to 40-60 lb-in. (4.5-6.8 N·m).

12 Torque clamp (3) to 20-40 lb-in. (2.3-4.5 N·m).



NOTE

FOLLOW-ON MAINTENANCE:
Install powerpack (para 4-1)

Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-6 ENGINE COOLANT TUBES (LOWER).

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Torque wrench (item 85, Appx F)

Equipment Conditions
Powerpack removed (para 4-1)
Cooling system drained
(TM 9-2350-314-10)

Materials/Parts
Adhesive (item 4, Appx C)

References
TM 9-2350-314-10

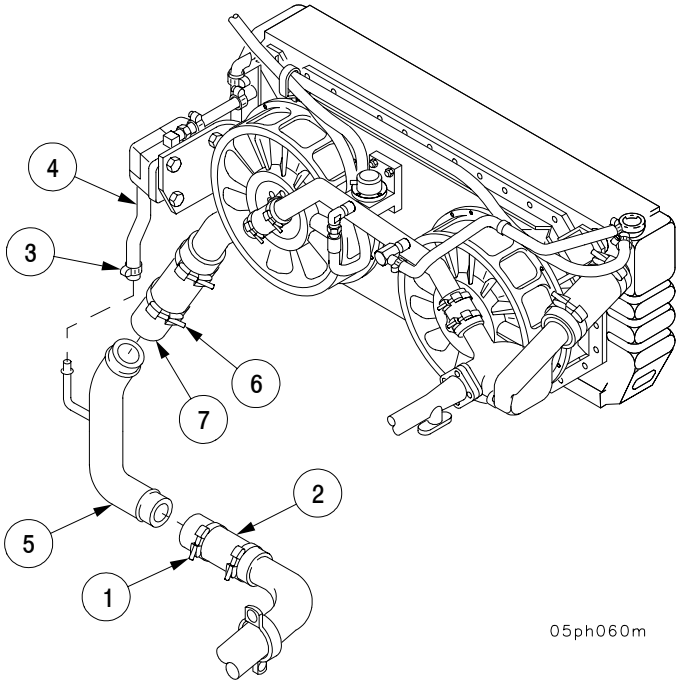
a. Removal.

1 Loosen clamp (1) on engine coolant lower tube-to-engine coolant main hose (2).

2 Loosen clamp (3) on aeration detector hose (4) and remove hose (4) from tube (5).

3 Loosen clamp (6) on radiator outlet-to-engine coolant lower tube hose (7).

4 Remove engine coolant lower tube (5).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-6 ENGINE COOLANT TUBES (LOWER) - CONTINUED

b. Installation.

NOTE

- Use adhesive at connectors between hoses and mating tubes or castings.
- Hoses must cover unpainted areas of tubes and fittings or be positioned evenly between red bands on tubes and housings.

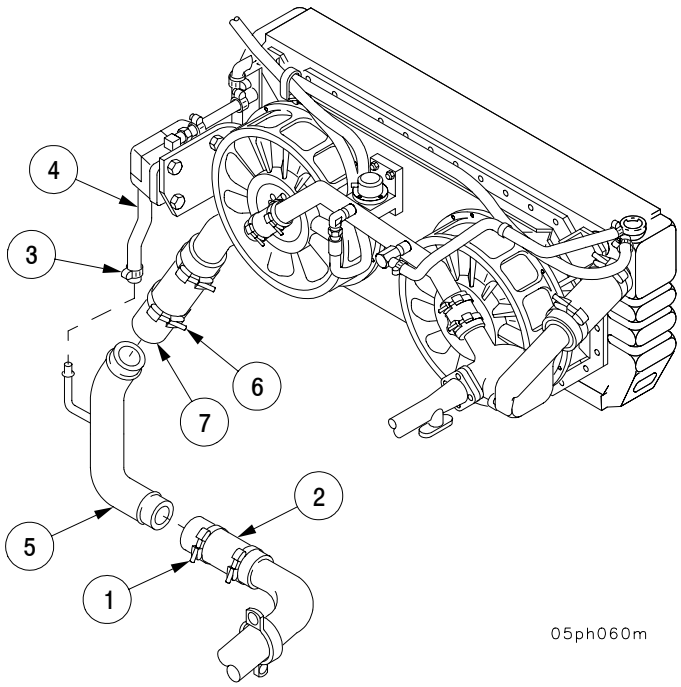
1 Install engine coolant lower tube (5).

2 Tighten clamp (6) on radiator outlet-to-engine coolant lower tube hose (7).

3 Install aeration detector hose (4) on tube (5) and tighten clamp (3).

4 Tighten clamp (1) on engine coolant lower tube-to-engine coolant main hose (2).

5 Fill cooling system (TM 9-2350-314-10).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-6 ENGINE COOLANT TUBES (LOWER) - CONTINUED

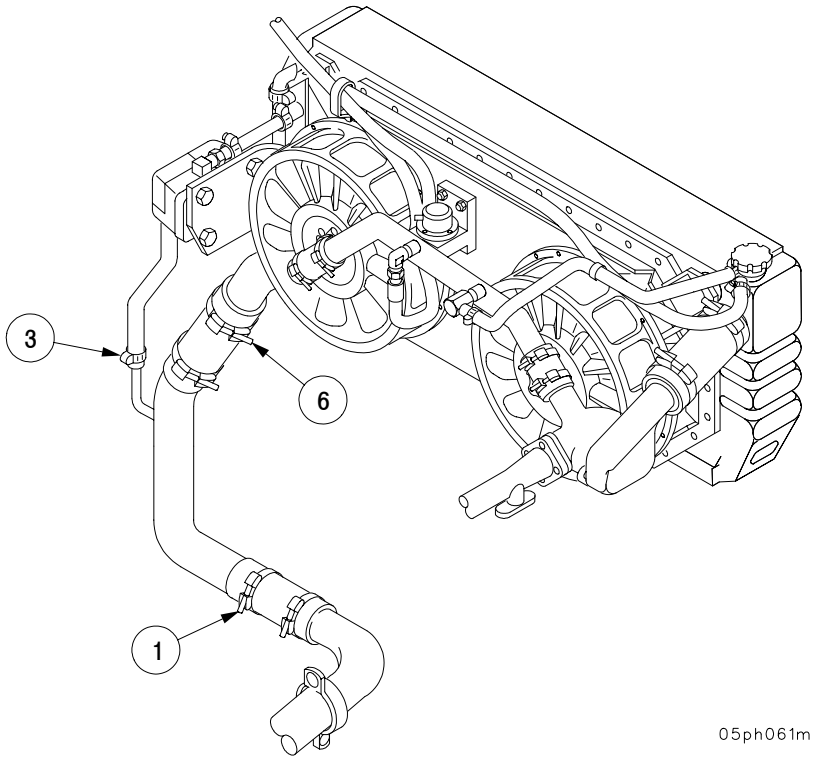
b. Installation - Continued

6 Operate engine (para 4-1) a minimum of 5 minutes at 165°F (74°C) minimum coolant temperature.

7 Shut down engine (para 4-1) and check for leaks.

8 Torque two clamps (1 and 6) to 40-60 lb-in. (4.5-6.8 N·m).

9 Torque clamp (3) to 15-25 lb-in. (1.7-2.8 N·m).



NOTE

FOLLOW-ON MAINTENANCE:
Install powerpack (para 4-1)

Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-7 ENGINE COOLANT HOSES AND TUBES.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Torque wrench (item 85, Appx F)
Socket (item 63, Appx F)
Hacksaw (item 25, Appx F)
Hacksaw blade (item 5, Appx F)
Socket (item 64, Appx F)
Bent trimmer shears (item 58, Appx F)

Materials/Parts
Lockwashers (4) (item 159, Appx E)
Adhesive (item 4, Appx C)
Antisiezing tape (item 60, Appx C)

Equipment Conditions
Fan access door removed (para 16-26)
Cooling system drained (TM 9-2350-314-10)

References
TM 9-2350-314-10

a. Removal.

1 Remove two clamps (1) and hose (2).

2 Remove two clamps (3), screw (4), flat washer (5), lockwasher (6), clamp (7), and hose (8). Discard lockwasher.

3 Remove elbow (9) from tube (10).

4 Remove hose (11) from elbow (12).

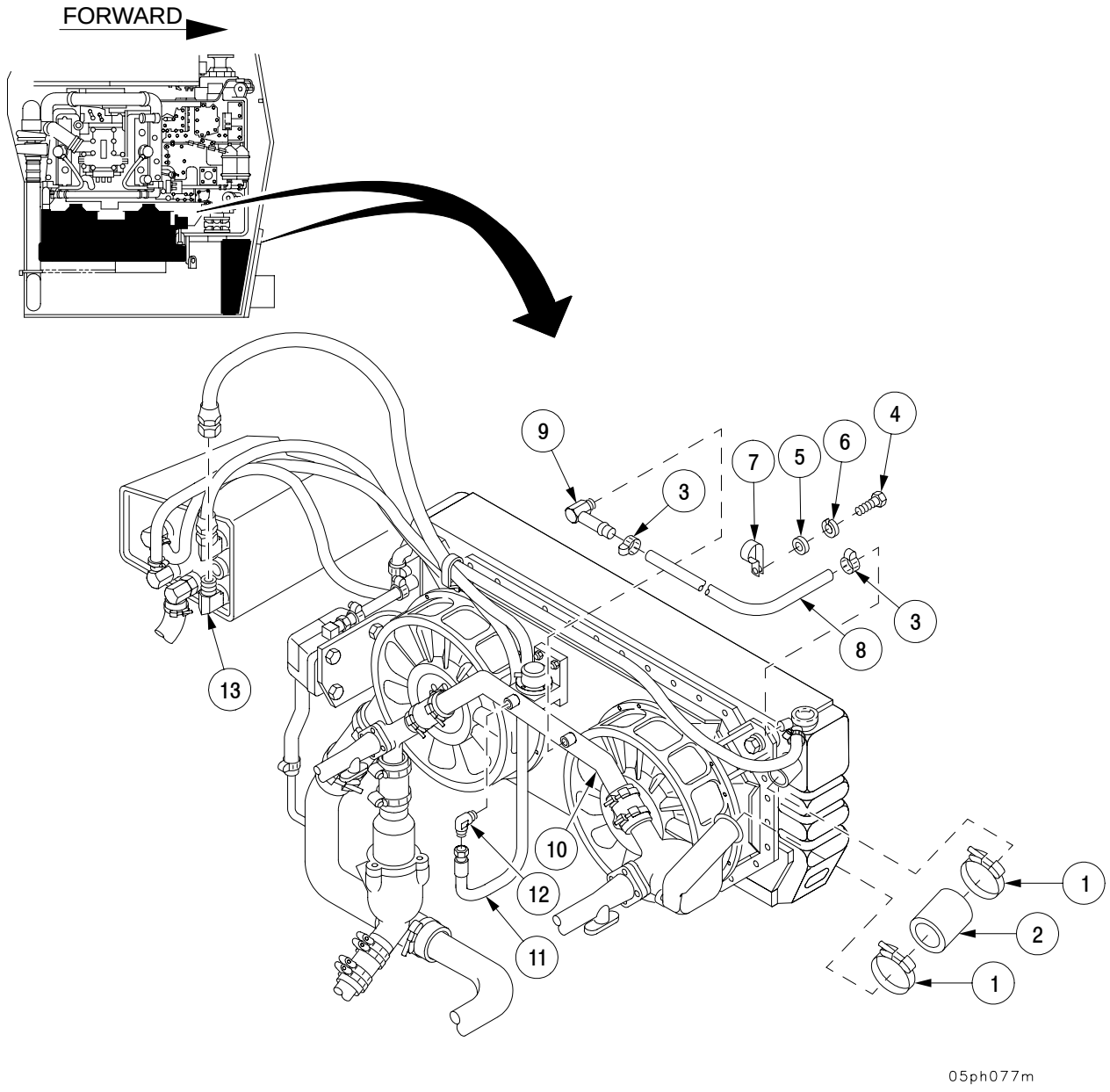
5 Remove elbow (12) from tube (10).

6 Remove hose (11) from elbow (13).

Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-7 ENGINE COOLANT HOSES AND TUBES - CONTINUED

a. Removal - Continued

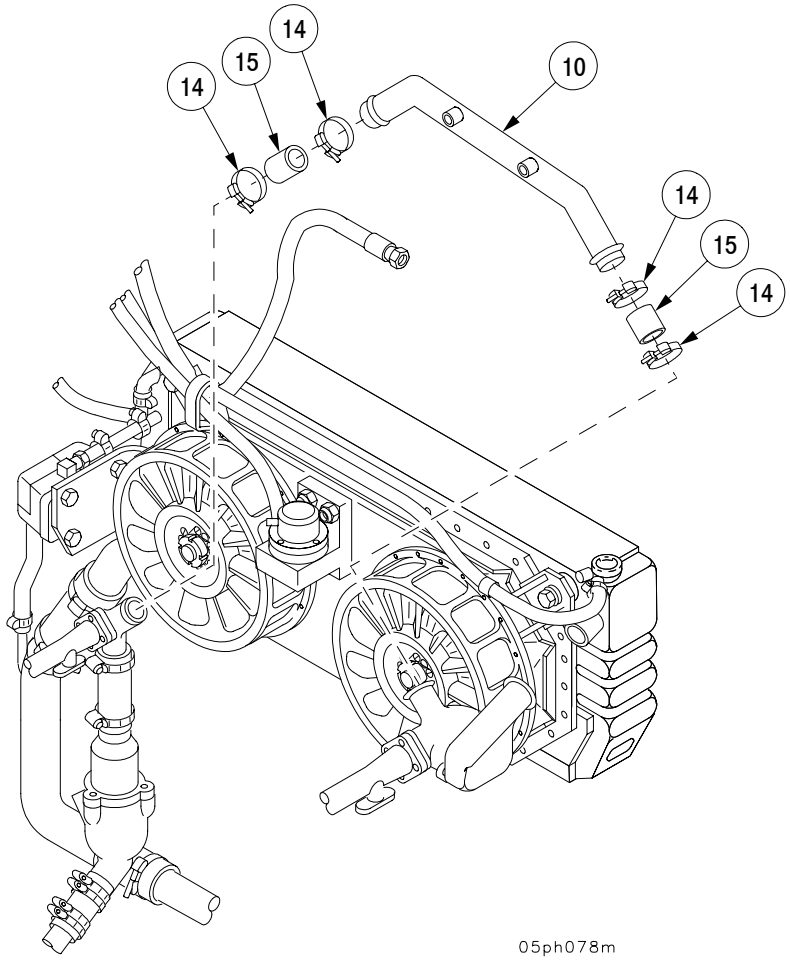


Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-7 ENGINE COOLANT HOSES AND TUBES - CONTINUED

a. Removal - Continued

7 Remove four clamps (14), tube (10), and two hoses (15).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-7 ENGINE COOLANT HOSES AND TUBES - CONTINUED

a. Removal - Continued

8 Remove screw (16), flat washer (17), lockwasher (18), and clamp (19). Discard lockwasher.

9 Remove two clamps (20) and hose (21).

10 Remove hose (22) from two elbows (23 and 24).

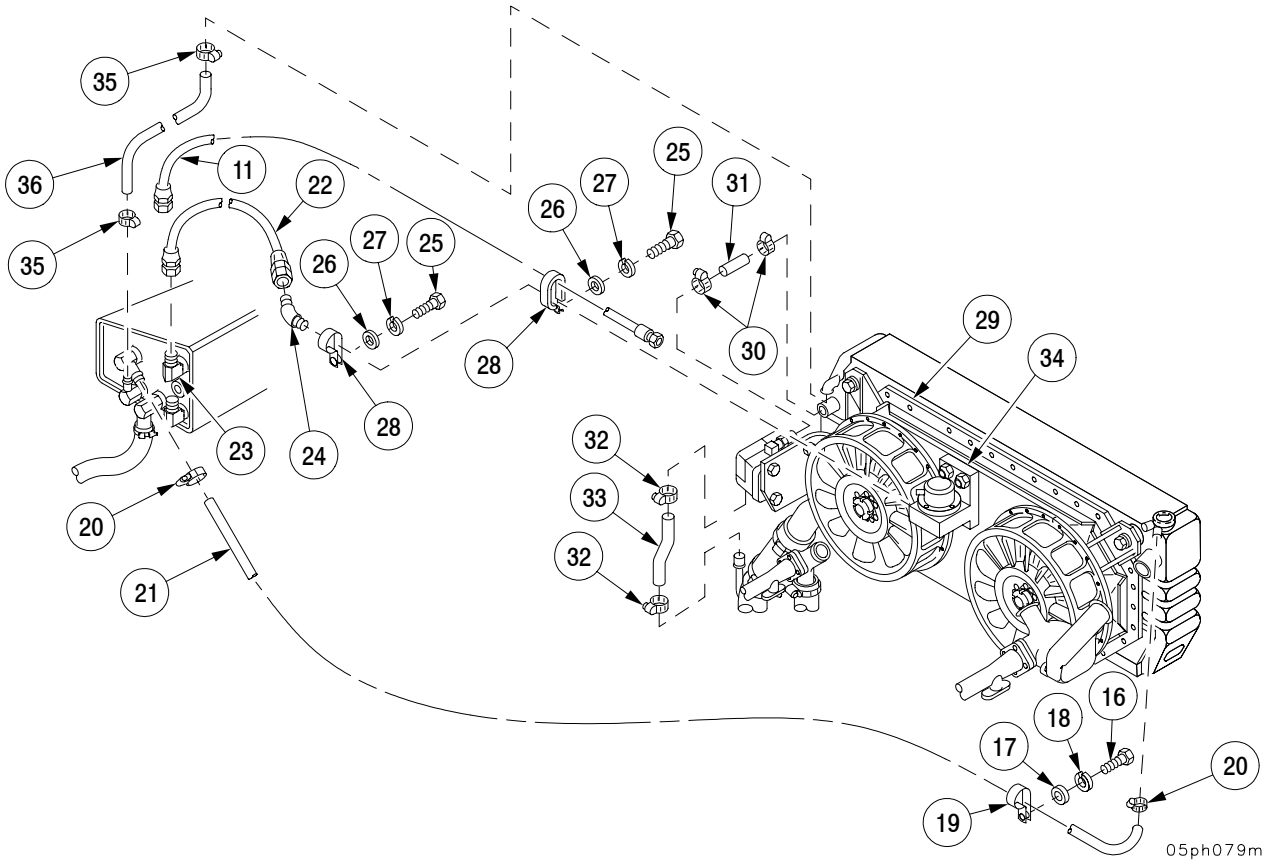
11 Remove two screws (25), two flat washers (26), two lockwashers (27), two clamps (28), and three hoses (21, 22, and 11) from radiator fan shroud (29). Discard lockwashers.

12 Remove two clamps (30) and hose (31).

13 Remove two clamps (32) and hose (33).

14 Remove elbow (24) from valve (34).

15 Remove two clamps (35) and hose (36).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-7 ENGINE COOLANT HOSES AND TUBES - CONTINUED

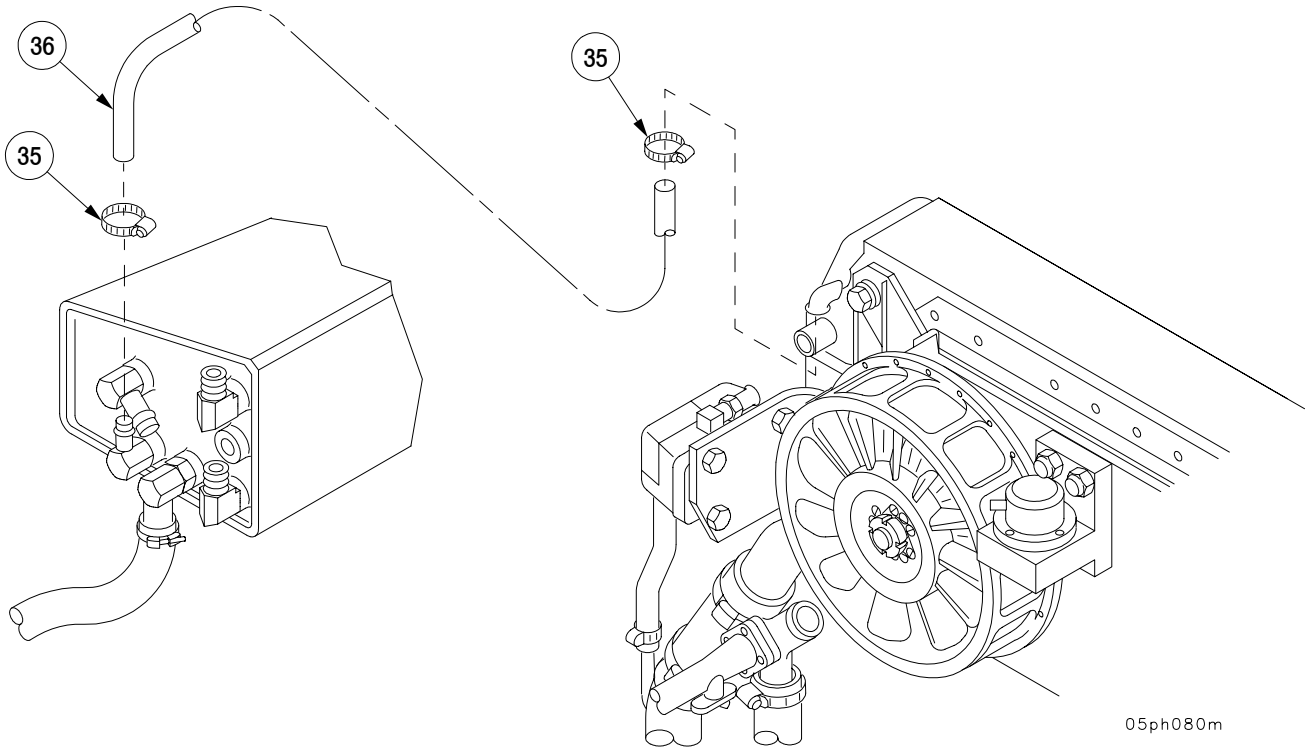
b. Installation.

NOTE

- Use adhesive at connection between hoses and mating tubes.
- Hoses must cover unpainted areas of tubes and fittings or be positioned evenly between red bands on tubes and housings.
- Use tape on all male pipe threads.

1 Cut length of new hose (36) to 32.00 $\pm$ 0.25 in. (812.8 $\pm$ 6.3 mm).

2 Install new hose (36) with two clamps (35).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-7 ENGINE COOLANT HOSES AND TUBES - CONTINUED

b. Installation - Continued

3 Cut length of new hose (33) to 16.25 ± 0.25 in. (412.7 ± 6.3 mm).

4 Install new hose (33) with two clamps (32).

5 Cut length of new hose (31) to 6.25 ± 0.25 in. (158.7 ± 6.3 mm).

6 Install new hose (31) with two clamps (30).

7 Install elbow (24) on valve (34).

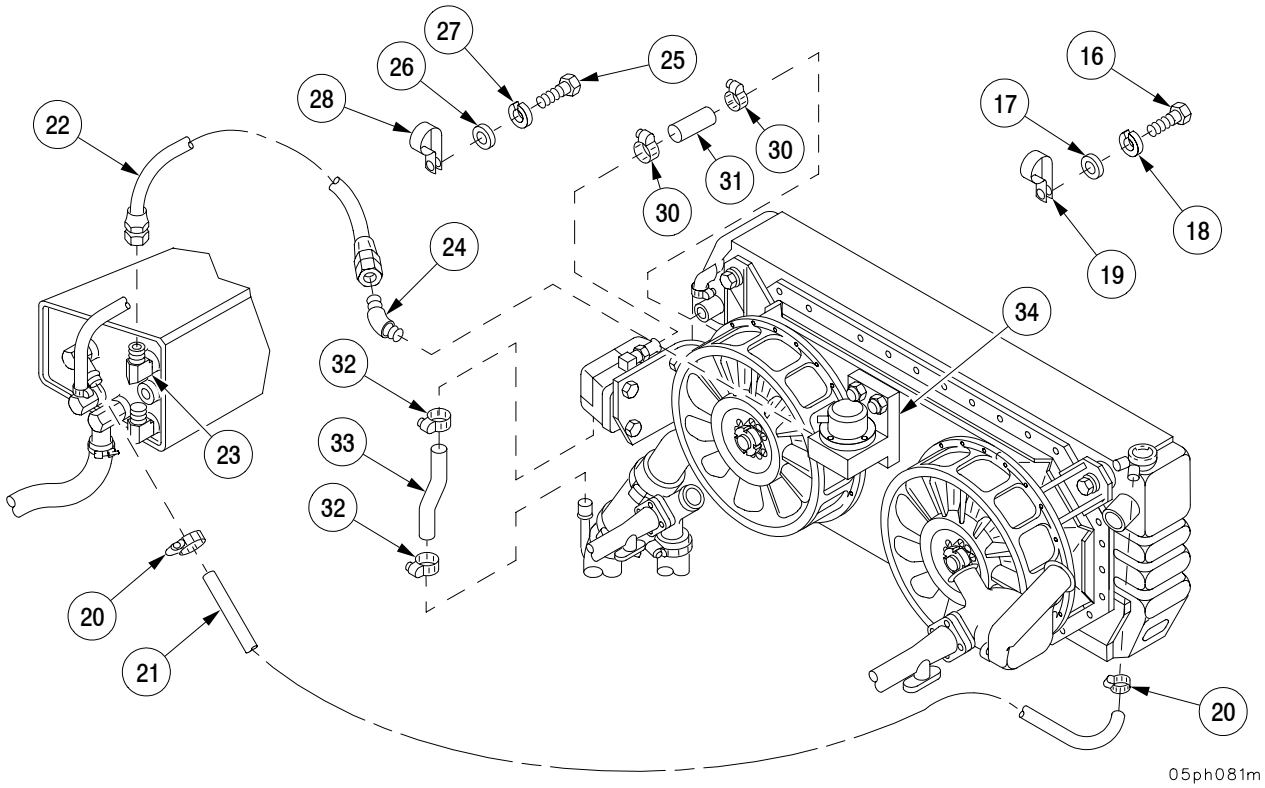
8 Install hose (22) on two elbows (23 and 24).

9 Secure hose (22) with clamp (28), screw (25), new lockwasher (27), and flat washer (26).

10 Cut length of new hose (21) to 86.00 ± 0.25 in. (2184.4 ± 6.3 mm).

11 Install new hose (21) with two clamps (20).

12 Secure hose (21) with clamp (19), screw (16), new lockwasher (18), and flat washer (17).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

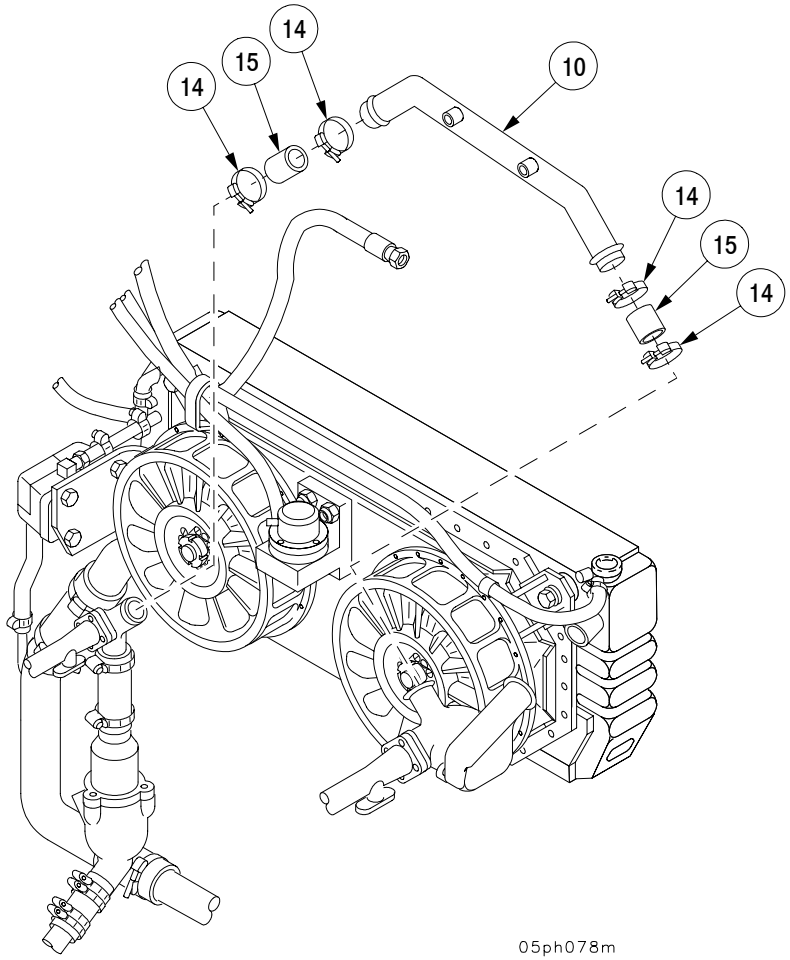
7-7 ENGINE COOLANT HOSES AND TUBES - CONTINUED

b. Installation - Continued

13 Cut two lengths of new hose (15) to 4.75 in. (120.6 mm).

14 Install two new hoses (15) with two clamps (14).

15 Install tube (10) with two clamps (14).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

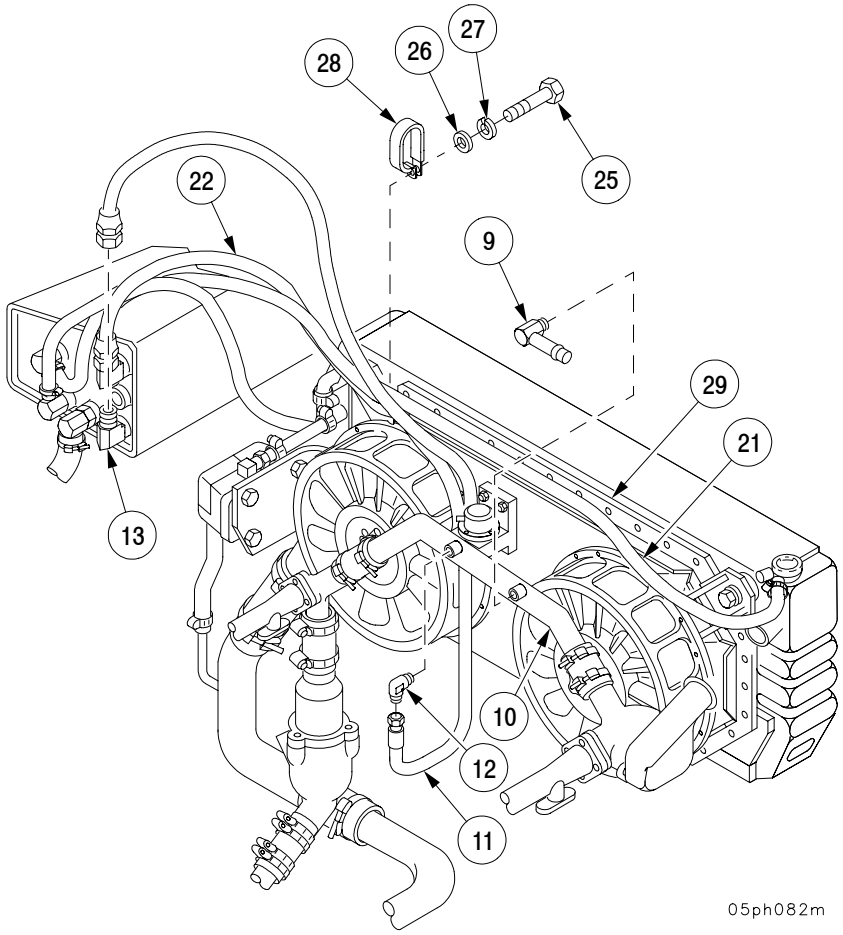
7-7 ENGINE COOLANT HOSES AND TUBES - CONTINUED

b. Installation - Continued

16 Install two elbows (9 and 12) in tube (10).

17 Connect hose (11) to elbows (12 and 13).

18 Secure three hoses (11, 21, and 22) to radiator shroud (29) with clamp (28), screw (25), new lockwasher (27), and flat washer (26).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-7 ENGINE COOLANT HOSES AND TUBES - CONTINUED

b. Installation - Continued

19 Cut length of new hose (8) to 30.00 ± 0.25 in. (762 ± 6.3 mm).

20 Install new hose (8) with two clamps (3).

21 Secure hose (8) to radiator fan shroud (29) with clamp (7), screw (4), new lockwasher (6), and flat washer (5).

22 Cut length of new hose (2) to 7.50 ± 0.12 in. (190.5 ± 3 mm).

23 Install new hose (2) with two clamps (1).

24 Fill cooling system (TM 9-2350-314-10).

25 Operate engine (TM 9-2350-314-10) a minimum of 5 minutes at 165°F (74°C) minimum coolant temperature.

26 Shut down engine (TM 9-2350-314-10) and check for leaks and level.

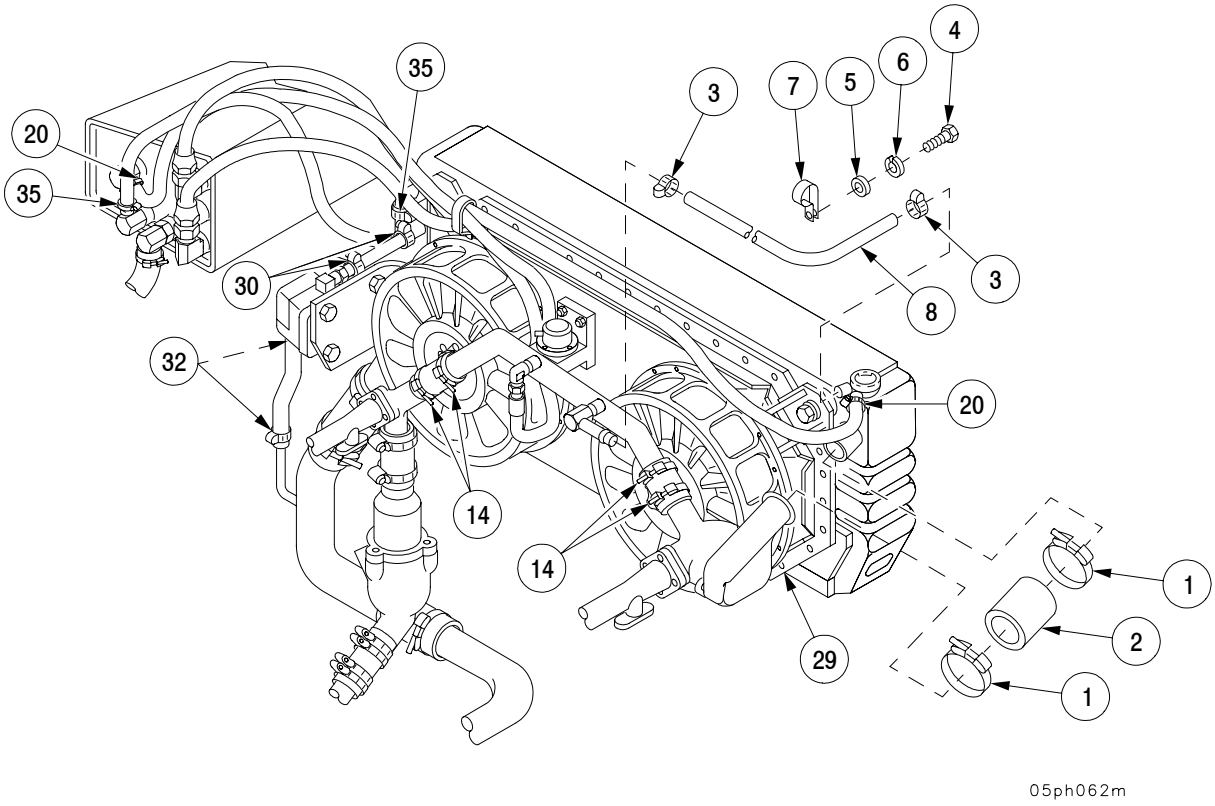
27 Torque hose clamps (1, 3, 14, 20, 30, 32, and 35) as follows:

Hose OD (in.)	Hose OD (mm)	lb-in.	N·m
Less than 1.0	Less than 25.4	15 to 25	1.7 to 2.8
1.0 to 2.0	25.4 to 50.8	20 to 40	2.3 to 4.5
Greater than 2.0	Greater than 50.8	40 to 60	4.5 to 6.8

Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-7 ENGINE COOLANT HOSES AND TUBES - CONTINUED

b. Installation - Continued



NOTE

FOLLOW-ON MAINTENANCE:
Install fan access door (para 16-26)

Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-8 INLET THERMOSTAT AND HOUSING ASSEMBLY.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit (SC 5180-90-N26)
Installer handle (item 26, Appx F)
Torque wrench (item 85, Appx F)
Seal installer (item 31, Appx F)

Equipment Conditions
Cooling system drained (TM 9-2350-314-10)
Fan access door removed (para 16-26)
Rear protective cover removed (para 8-50)

Materials/Parts
Gasket (item 56, Appx E)
Lockwashers (10) (item 20, Appx E)
Gasket (item 158, Appx E)
Encased plain seals (2) (item 58, Appx E)
Adhesive (item 4, Appx C)

References
TM 9-2350-314-10

a. Removal.

1 Loosen two clamps (1) and remove housing-to-radiator hose (2).

2 Remove six screws (3), six flat washers (4), six lockwashers (5), thermostat housing (6), and gasket (7) from thermostat housing (8). Discard gasket and lockwashers.

3 Remove two thermostats (9) and two seals (10). Discard seals.

NOTE

Note location of screws being removed to ensure screws are installed in same position.

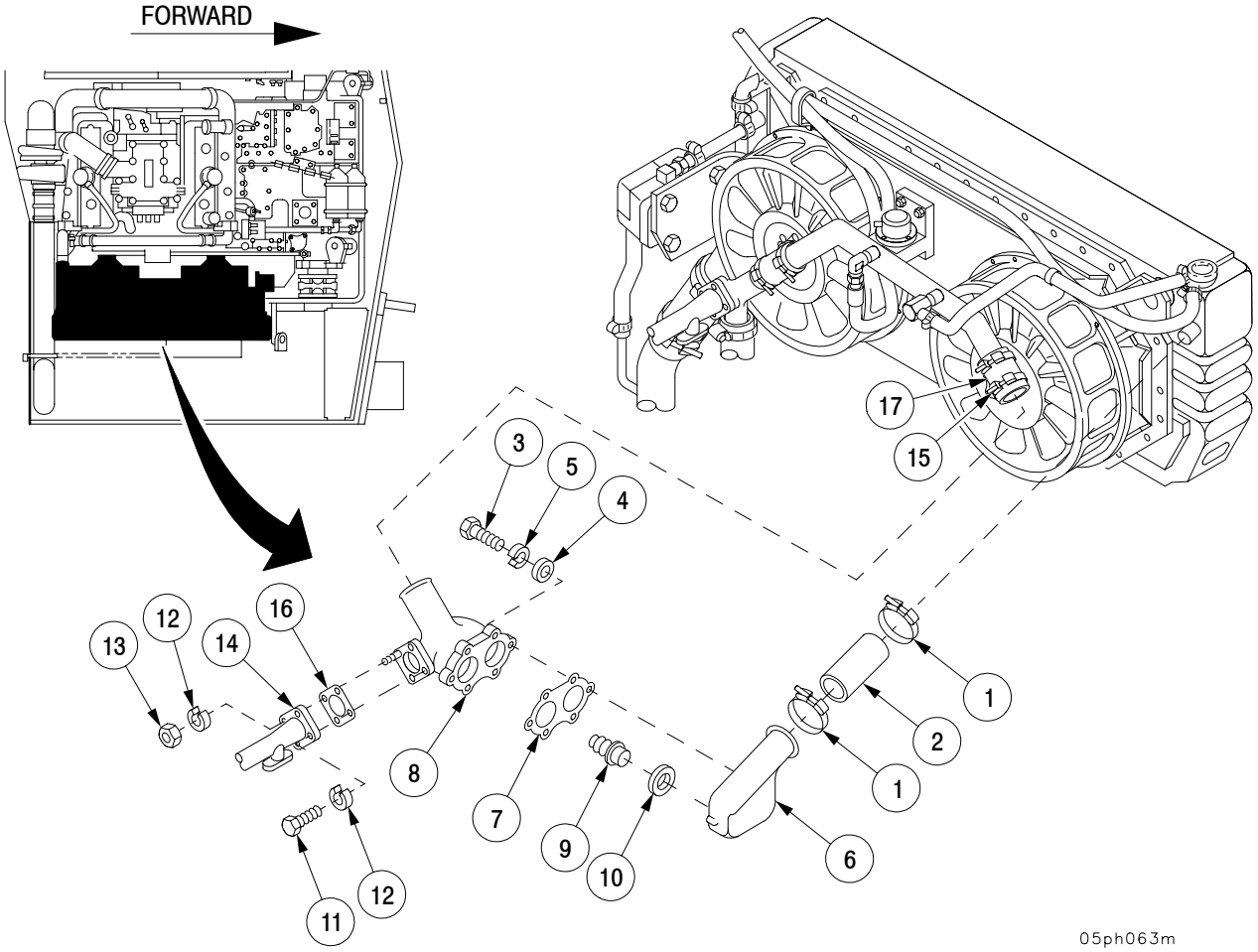
4 Remove three screws (11), four lockwashers (12), and nut (13) at engine coolant manifold (14). Discard lockwashers.

5 Loosen clamp (15) and remove thermostat housing (8) with gasket (16) from connector hose (17). Discard gasket.

Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-8 INLET THERMOSTAT AND HOUSING ASSEMBLY - CONTINUED

a. Removal - Continued

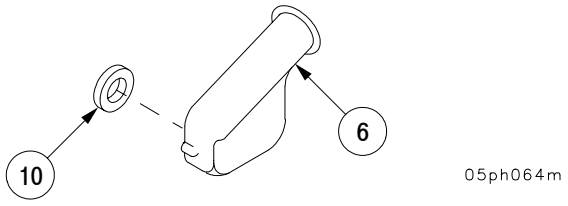


Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-8 INLET THERMOSTAT AND HOUSING ASSEMBLY - CONTINUED

b. Installation.

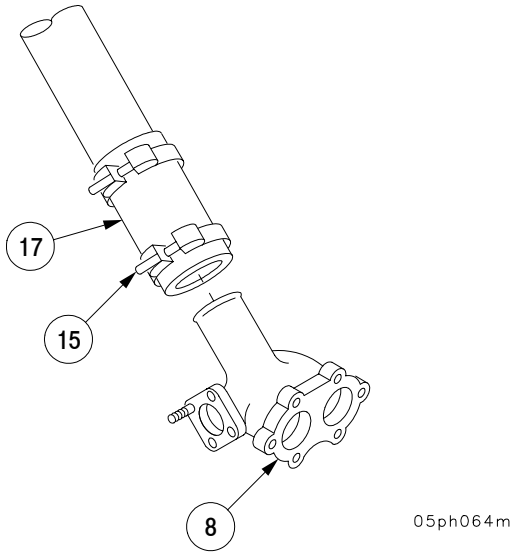
1 Install two new seals (10) in thermostat housing (6), with leather facing outward, using installer and handle.



NOTE

- Use adhesive at connections between hoses and mating tubes or castings.
- Hoses must cover unpainted areas of tubes and fittings or be positioned evenly between red bands on tubes and housings.

2 Install thermostat housing (8) on connector hose (17) and tighten clamp (15).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-8 INLET THERMOSTAT AND HOUSING ASSEMBLY - CONTINUED

b. Installation - Continued

3 Install thermostat housing (8) and new gasket (16) in engine coolant manifold (14) with screw (11), two new lockwashers (12), and nut (13).

4 Install rear protective cover (para 8-50).

5 Install two thermostats (9).

6 Install thermostat housing (6) and new gasket (7) at thermostat housing (8) with six screws (3), six new lockwashers (5), and six flat washers (4).

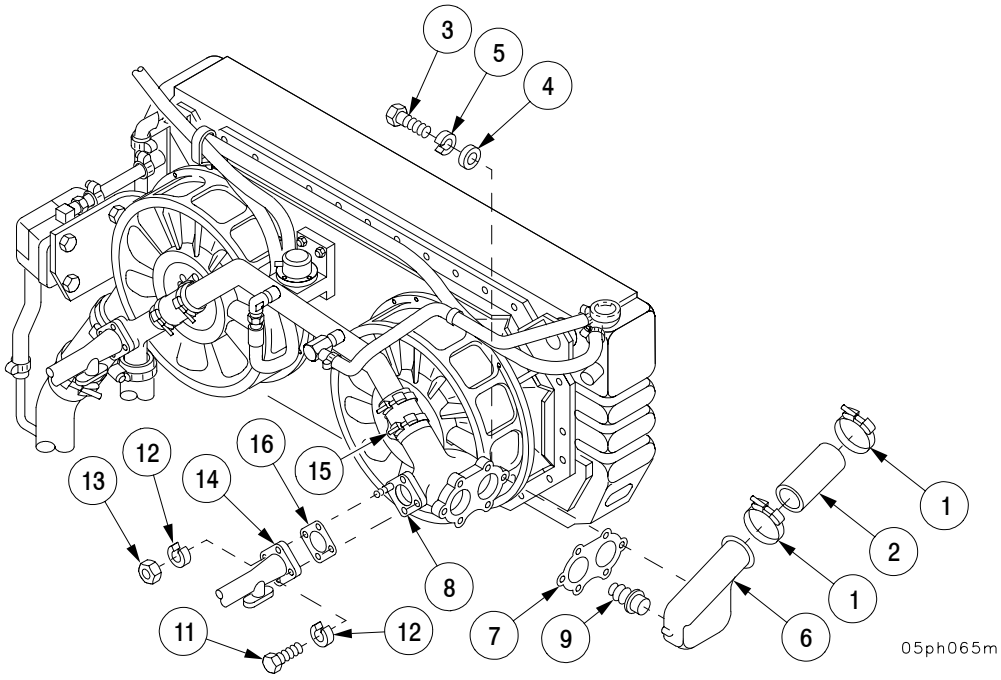
7 Install housing-to-radiator hose (2) and tighten two clamps (1).

8 Fill cooling system (TM 9-2350-314-10).

9 Operate engine (TM 9-2350-314-10) a minimum of 5 minutes at 165°F (74°C) minimum coolant temperature.

10 Shut down engine (TM 9-2350-314-10) and check for leaks and level.

11 Torque clamp (15) and two clamps (1) to 40-60 lb-in. (4.5-6.8 N·m).



NOTE

FOLLOW-ON MAINTENANCE:
Install fan access door (para 16-26)

Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-9 BYPASS THERMOSTAT AND HOUSING ASSEMBLY.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Installer handle (item 26, Appx F)
Torque wrench (item 85, Appx F)
Seal installer (item 31, Appx F)

Materials/Parts
Gasket (item 56, Appx E)
Gasket (item 57, Appx E)
Encased plain seal (item 58, Appx E)
Adhesive (item 4, Appx C)
Lockwashers (5) (item 20, Appx E)

Equipment Conditions
Coolant system drained
(TM 9-2350-314-10)
Powerpack removed (para 4-1)
Front protective cover removed
(para 8-50)

References
TM 9-2350-314-10

WARNING

Never crawl under equipment when performing maintenance unless equipment is securely blocked.

a. Removal.

1 Loosen clamp (1) at connector hose (2).

2 Remove screw (3), two lockwashers (4), nut (5), and gasket (6) at engine coolant manifold (7). Discard gasket and lockwashers.

3 Loosen upper clamp (8) and remove housing (9).

4 Loosen lower clamp (10) and remove coolant hose (11).

5 Remove three screws (12), three flat washers (13), and three lockwashers (14). Discard lockwashers.

Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

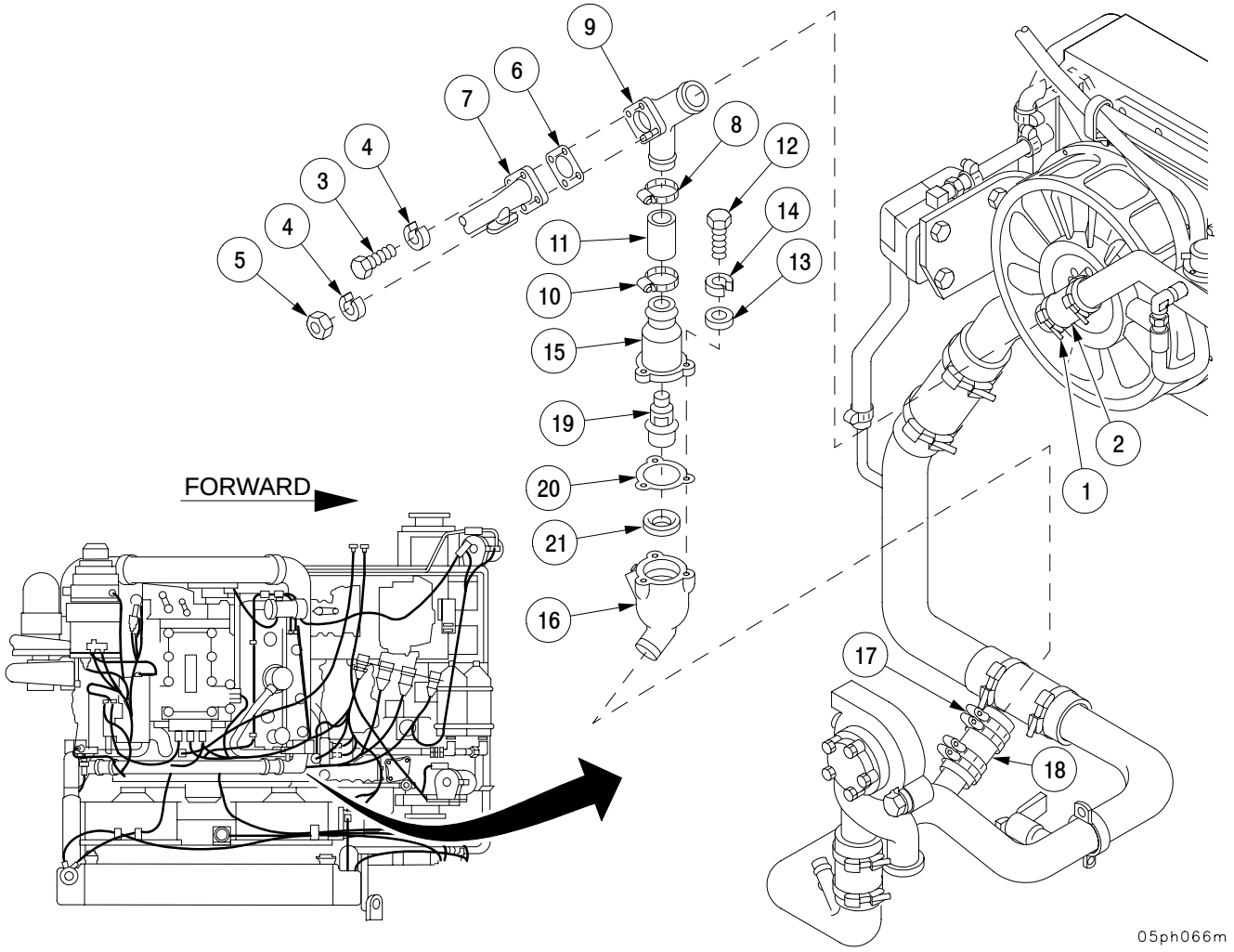
7-9 BYPASS THERMOSTAT AND HOUSING ASSEMBLY - CONTINUED

a. Removal - Continued

6 Separate upper thermostat housing (15) from lower thermostat housing (16).

7 Loosen two clamps (17) and remove lower thermostat housing (16) from connector hose (18).

8 Remove thermostat (19), gasket (20), and seal (21). Discard gasket and seal.



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-9 BYPASS THERMOSTAT AND HOUSING ASSEMBLY - CONTINUED

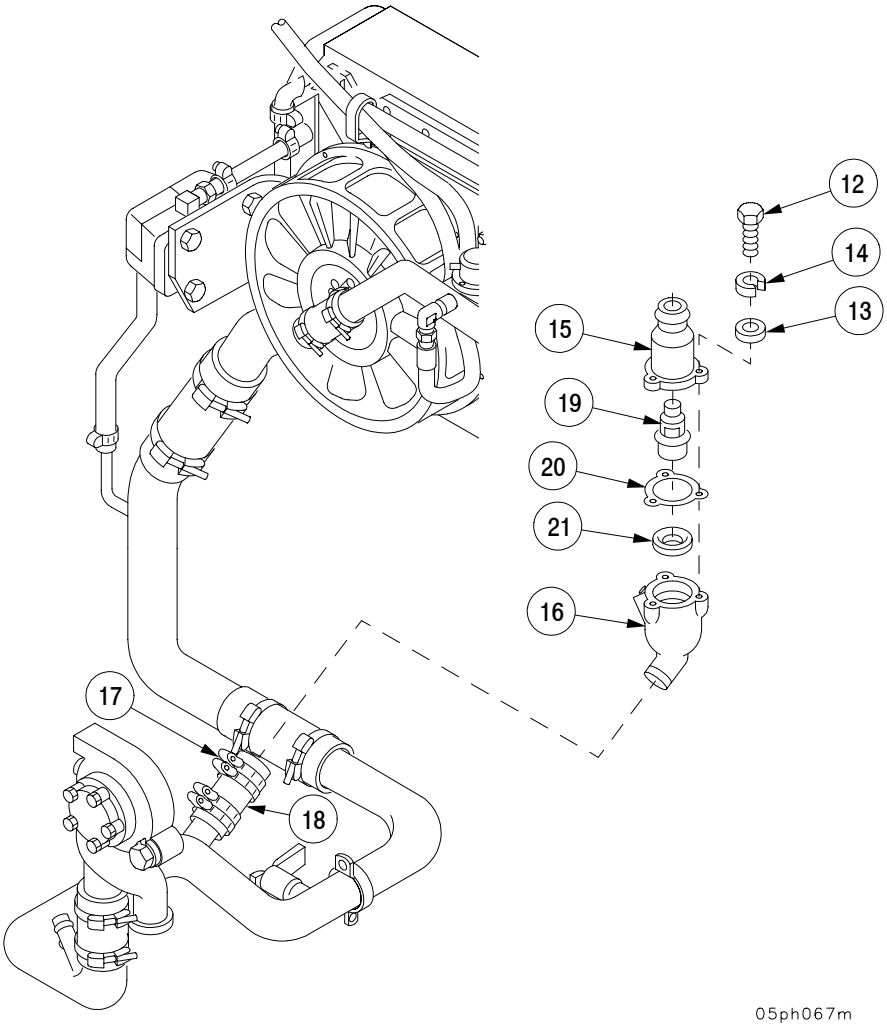
b. Installation.

1 Install new seal (21) in lower thermostat housing (16), using installer and handle.

2 Install lower thermostat housing (16) in connector hose (18) and tighten two clamps (17).

3 Install new gasket (20) and thermostat (19).

4 Connect upper thermostat housing (15) to lower thermostat housing (16) with three screws (12), three new lockwashers (14), and three flat washers (13).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-9 BYPASS THERMOSTAT AND HOUSING ASSEMBLY - CONTINUED

b. Installation - Continued

NOTE

- Use adhesive at connectors between hoses and mating tubes or castings.
- Hoses must cover unpainted areas of tubes and fittings or be positioned evenly between red bands on tubes and housings.

5 Install coolant hose (11) and tighten lower clamp (10).

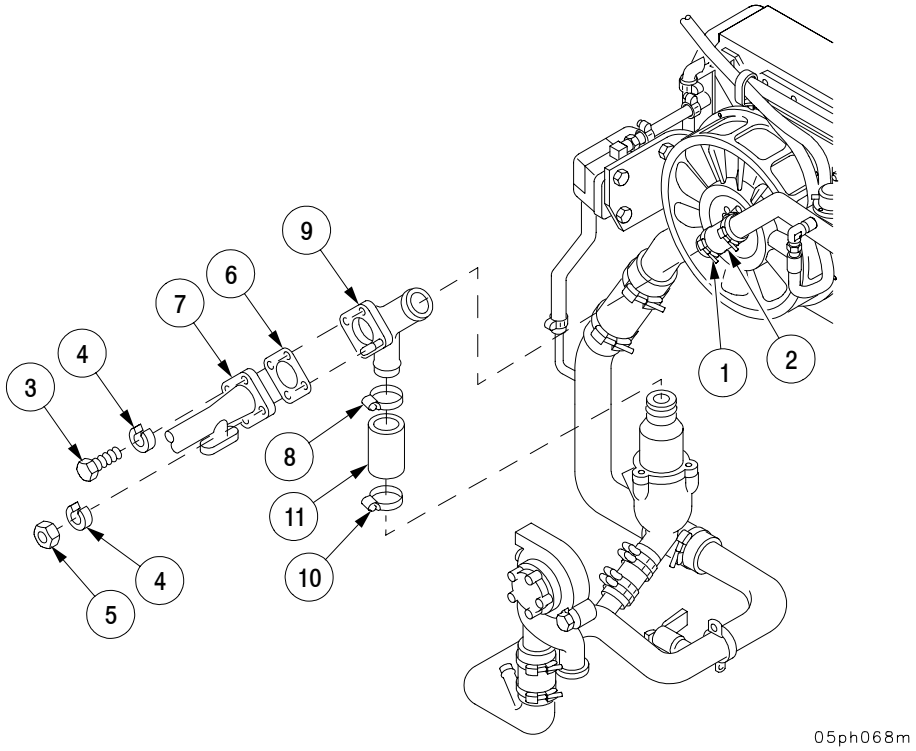
6 Install housing (9) on coolant hose (11) and tighten upper clamp (8).

7 Install housing (9) and new gasket (6) on engine coolant manifold (7) with screw (3), two new lockwashers (4), and nut (5).

8 Install front protective cover (para 8-50).

9 Install connector hose (2) on housing (9) and tighten clamp (1).

10 Fill cooling system (TM 9-2350-314-10).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

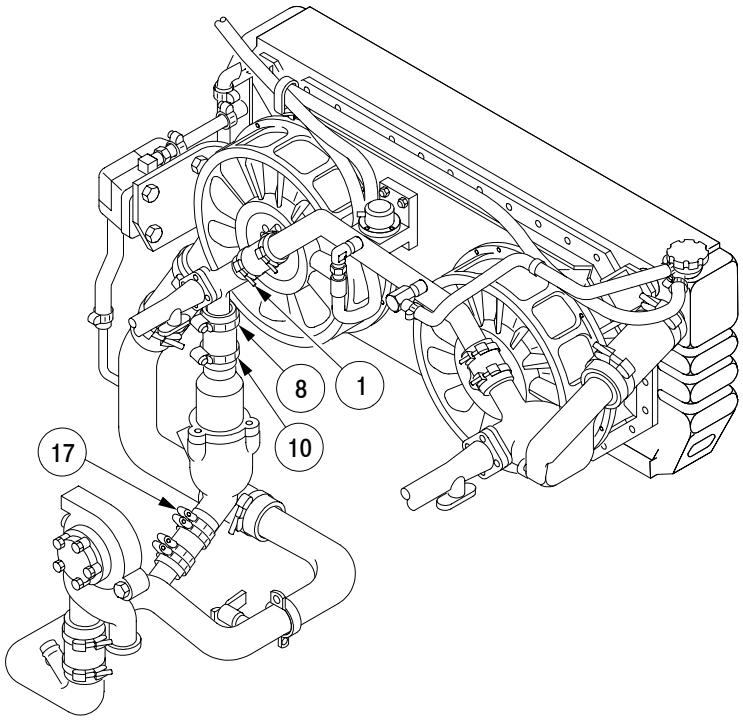
7-9 BYPASS THERMOSTAT AND HOUSING ASSEMBLY - CONTINUED

b. Installation - Continued

11 Operate engine (TM 9-2350-314-10) a minimum of 5 minutes at 165°F (74°C) minimum coolant temperature.

12 Shut down engine (TM 9-2350-314-10) and check for leaks and level.

13 Torque clamps (1, 8, 10, and 17) to 40-60 lb-in. (4.5-6.8 N·m).



05ph069m

NOTE

FOLLOW-ON MAINTENANCE:
Install powerpack (para 4-1)

Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-10 LOW LEVEL COOLANT DETECTOR AND BRACKET.

This task covers: a. Removal b. Disassembly c. Assembly d. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)
Torque wrench (item 85, Appx F)
Wire brush (item 7, Appx F)

Materials/Parts
Lockwashers (4) (item 44, Appx E)
Lockwashers (2) (item 9, Appx E)
Adhesive (item 4, Appx C)
Sealing compound (item 50, Appx C)
Dry-cleaning solvent (item 59, Appx C)

Equipment Conditions
Vehicle MASTER switch OFF
(TM 9-2350-314-10)
Battery ground leads disconnected
(para 8-33)
Transmission access doors opened
(TM 9-2350-314-10)

References
TM 9-2350-314-10

Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-10 LOW LEVEL COOLANT DETECTOR AND BRACKET - CONTINUED

a. Removal.

NOTE

Tag all electrical connections and electrical leads prior to removal to aid in installation.

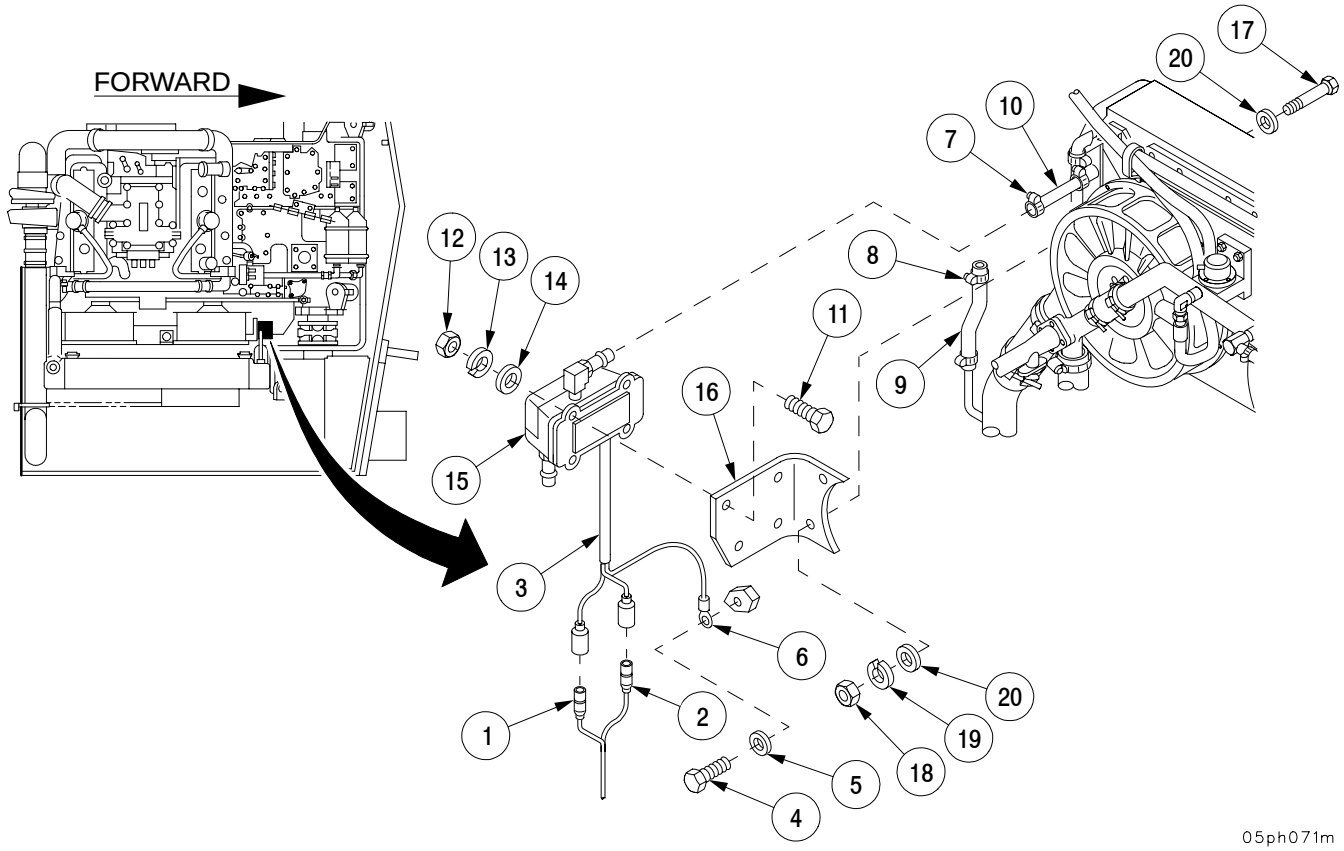
1 Disconnect wiring harness W104 leads 352A (1) and 352B (2) from low level coolant detector wiring harness (3).

2 Remove screw (4) and flat washer (5) and disconnect ground lead (6) from VMS bracket.

3 Loosen two clamps (7 and 8) and disconnect two hoses (9 and 10). Remove clamps (7 and 8).

4 Remove four screws (11), four nuts (12), four lockwashers (13), four flat washers (14), and low level coolant detector (15) from bracket (16). Discard lockwashers.

5 Remove two screws (17), two nuts (18), two lockwashers (19), four flat washers (20), and bracket (16). Discard lockwashers.



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-10 LOW LEVEL COOLANT DETECTOR AND BRACKET - CONTINUED

b. Disassembly.

1 Remove two screws (21) and cover (22) from low level coolant detector (15).

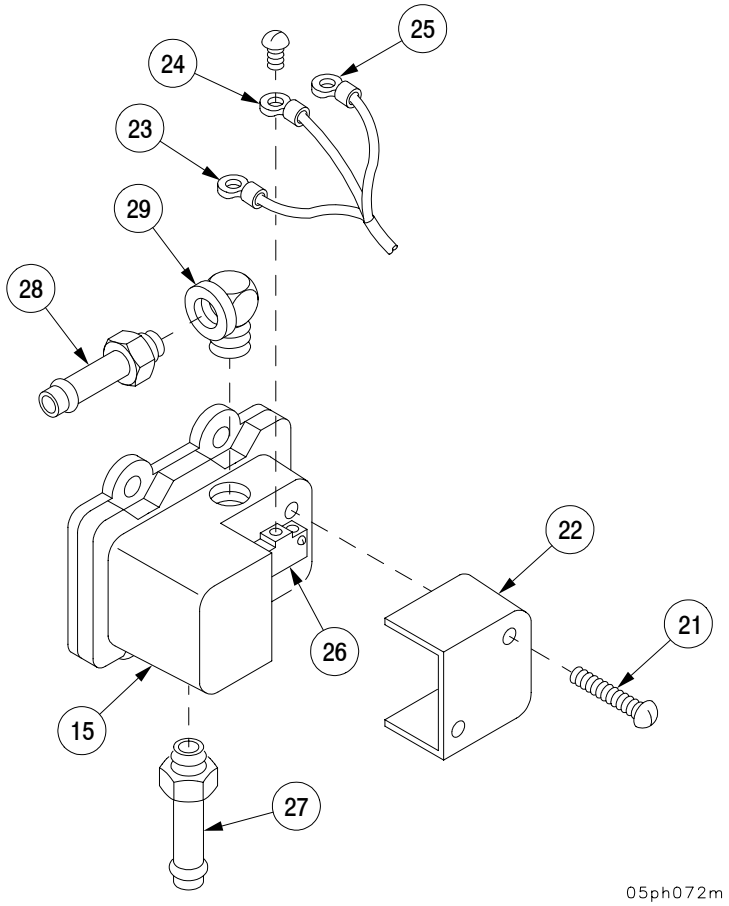
NOTE

Tag all electrical connections and electrical leads prior to removal to aid in installation.

2 Remove three leads (23, 24, and 25) from terminal block (26).

3 Remove adapter (27) from low level coolant detector (15) and adapter (28) from elbow (29).

4 Remove elbow (29) from low level coolant detector (15).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-10 LOW LEVEL COOLANT DETECTOR AND BRACKET - CONTINUED

c. Assembly.

WARNING

Dry-cleaning solvent (P-D-680) is toxic and flamable. To avoid injury, wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using solvent. Failure to do so could cause SERIOUS INJURY. If you become dizzy while using dry-cleaning solvent, get fresh air immediately, and if necessary, get medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash them with water immediately and obtain medical aid (FM 21-11).

1 Clean threads of two adapters (27 and 28), elbow (29), and low level coolant detector (15) with dry-cleaning solvent and wire brush.

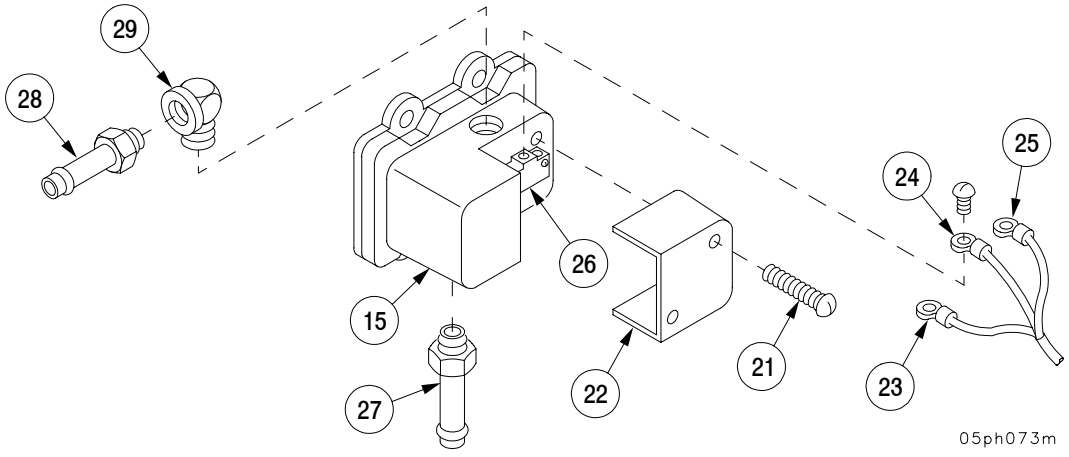
2 Apply sealing compound to threads of two adapters (27 and 28) and elbow (29).

3 Install elbow (29) in low level coolant detector (15).

4 Install adapter (27) in low level coolant detector (15) and adapter (28) in elbow (29).

5 Install three leads (23, 24, and 25) on terminal block (26)

6 Install cover (22) on low level coolant detector (15) with two screws (21).



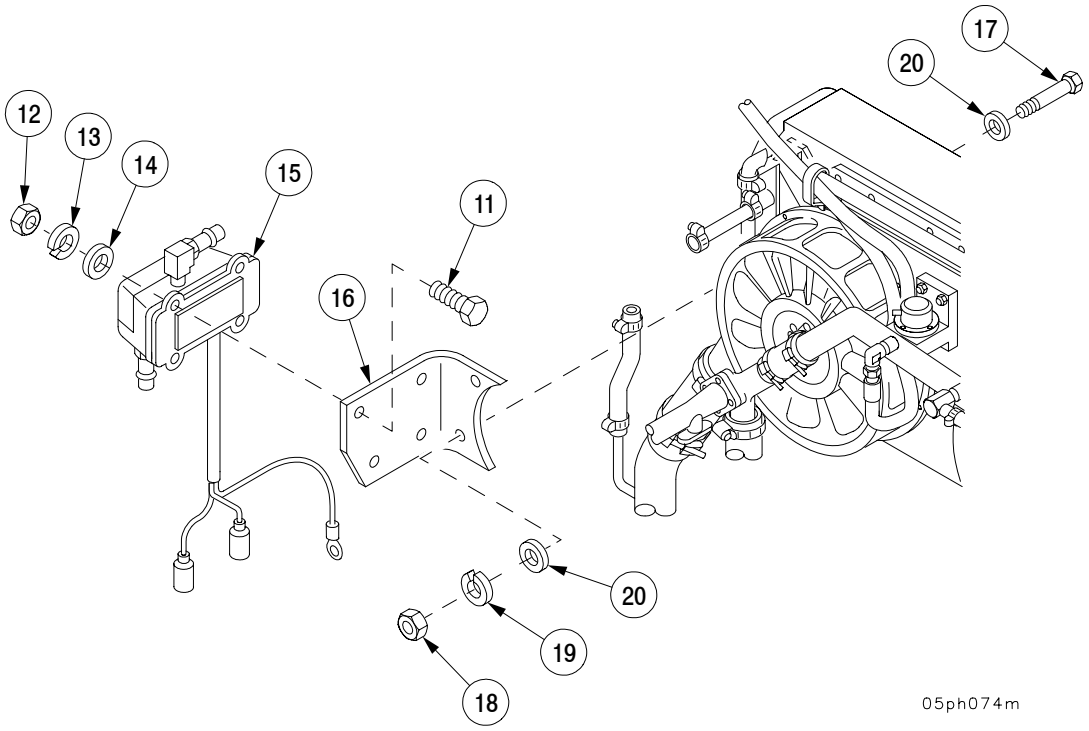
Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-10 LOW LEVEL COOLANT DETECTOR AND BRACKET - CONTINUED

d. Installation.

1 Install bracket (16) with two screws (17), four flat washers (20), two new lockwashers (19), and two nuts (18).

2 Install low level coolant detector (15) on bracket (16) with four screws (11), four flat washers (14), four new lockwashers (13), and four nuts (12).



Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-10 LOW LEVEL COOLANT DETECTOR AND BRACKET - CONTINUED

d. Installation - Continued

NOTE

- Use adhesive at connectors between hoses and mating tubes or castings.
- Hoses must cover unpainted areas of tubes and fittings or be positioned evenly between red bands on tubes and housings.

3 Connect two hoses (9 and 10) with two clamps (7 and 8).

4 Connect ground lead (6) to VMS bracket with screw (4) and flat washer (5).

5 Connect wiring harness leads W104 352B (2) and 352A (1) to low level coolant detector wiring harness (3).

6 Connect battery ground leads (para 8-33).

7 Check radiator coolant level (TM 9-2350-314-10).

8 Operate engine (TM 9-2350-314-10) a minimum of 5 minutes at 165°F (74°C) minimum coolant temperature.

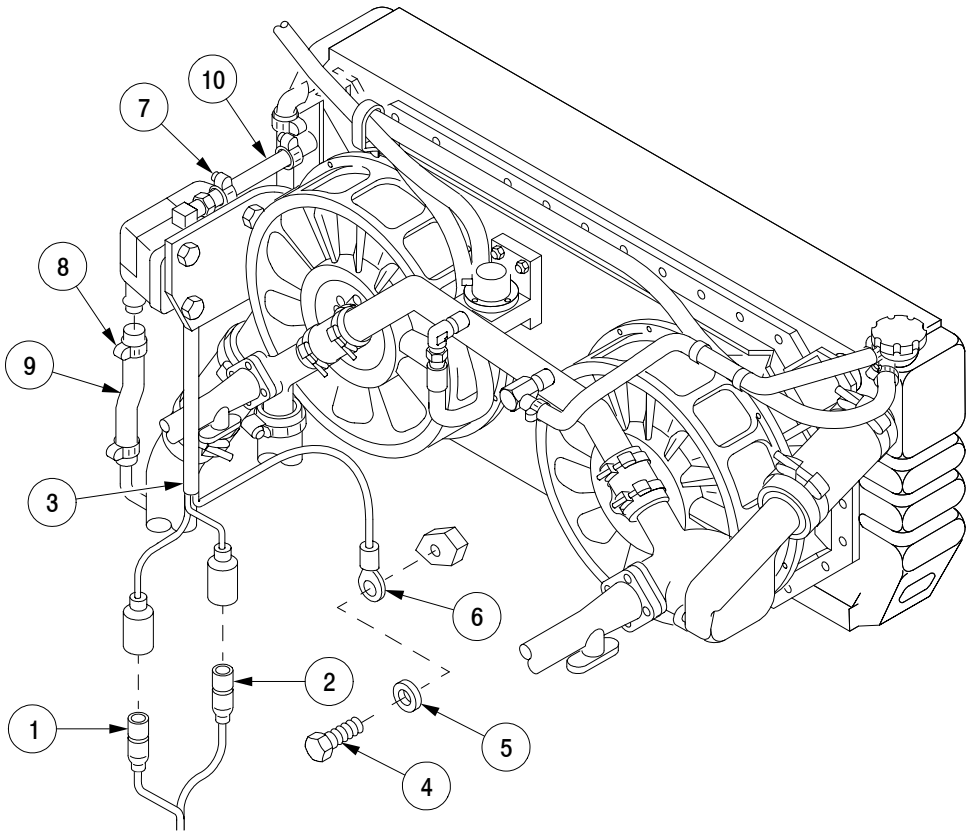
9 Shut down engine (TM 9-2350-314-10) and check for leaks.

10 Torque two clamps (7 and 8) to 15 to 25 lb-in. (1.7 to 2.8 N·m).

Section III. WATER MANIFOLD, HEADERS, THERMOSTATS, AND HOUSING - CONTINUED

7-10 LOW LEVEL COOLANT DETECTOR AND BRACKET - CONTINUED

d. Installation - Continued



NOTE

FOLLOW-ON MAINTENANCE:
Close and secure transmission access doors
(TM 9-2350-314-10)

Section IV. FAN ASSEMBLY

7-11 FAN DRIVE SHAFTS.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General mechanic's tool kit
(SC 5180-90-N26)

Equipment Conditions
Powerpack removed (para 4-1)
Radiator removed (para 7-1)

a. Removal.

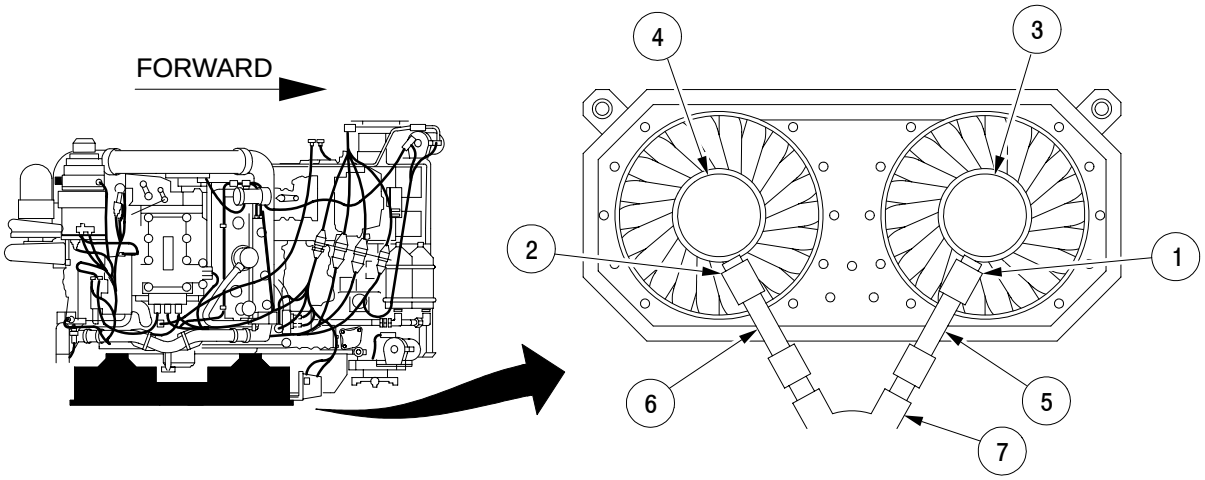
1 Push two sleeve joints (1 and 2) downward to remove from splined shafts on fan gear boxes (3 and 4).

2 Pull two fan drive shafts (5 and 6) away from fan drive assembly (7) and up through opening in shroud.

b. Installation.

1 Push two fan drive shafts (5 and 6) down through opening in shroud onto fan drive assembly (7).

2 Slide two sleeve joints (1 and 2) upward onto splined shafts of fan gear boxes (3 and 4).



NOTE

FOLLOW-ON MAINTENANCE:
Install radiator (para 7-1)
Install powerpack (para 4-1)
Check engine drive fans backlash (Table 2-1, PMCS item 7)

ALPHABETICAL INDEX

A

B

C

ALPHABETICAL INDEX - CONTINUED

D

E

ALPHABETICAL INDEX - CONTINUED

F

G

ALPHABETICAL INDEX - CONTINUED

ALPHABETICAL INDEX - CONTINUED

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N

O

P

ALPHABETICAL INDEX - CONTINUED

Q

R

S

ALPHABETICAL INDEX - CONTINUED

T

ALPHABETICAL INDEX - CONTINUED

V

W

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DENNIS J. REIMER
General, United States Army
Chief of Staff

JOEL B. HUDSON
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05381

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CONVERSION TABLE

inch	decimal	mm
1/64	0.015625	0.3969
1/32	0.031250	0.7938
3/64	0.046875	1.1906
1/16	0.062500	1.5875
5/64	0.078125	1.9844
3/32	0.093750	2.3812
7/64	0.109375	2.7781
1/8	0.125000	3.1750
9/64	0.140625	3.5719
5/32	0.156250	3.9688
11/64	0.171875	4.3656
3/16	0.187500	4.7625
13/64	0.203125	5.1594
7/32	0.218750	5.5562
15/64	0.234375	5.9531
1/4	0.250000	6.3500
17/64	0.265625	6.7469
9/32	0.281250	7.1438
19/64	0.296875	7.5406
5/16	0.312500	7.9375
21/64	0.328125	8.3344
11/32	0.343750	8.7312

inch	decimal	mm
23/64	0.359375	9.1281
3/8	0.375000	9.5250
25/64	0.390625	9.9219
13/32	0.406250	10.3188
27/64	0.421875	10.7156
7/16	0.437500	11.1125
29/64	0.453125	11.5094
15/32	0.468750	11.9062
31/64	0.484375	12.3031
1/2	0.500000	12.7000
33/64	0.515625	13.0969
17/32	0.531250	13.4938
35/64	0.546875	13.8906
9/16	0.562500	14.2875
37/64	0.578125	14.6844
19/32	0.593750	15.0812
39/64	0.609375	15.4781
5/8	0.625000	15.8750
41/64	0.640625	16.2719
21/32	0.656250	16.6688
43/64	0.671875	17.0656
11/16	0.687500	17.4625

inch	decimal	mm
45/64	0.703125	17.8594
23/32	0.718750	18.2562
47/64	0.734375	18.6531
3/4	0.750000	19.050
49/64	0.765625	19.4469
25/32	0.781250	19.8437
51/64	0.796875	20.2406
13/16	0.812500	20.6375
53/64	0.828125	21.0344
27/32	0.843750	21.4312
55/64	0.859375	21.8281
7/8	0.875000	22.2250
57/64	0.890625	22.6219
29/32	0.906250	23.0188
59/64	0.921875	23.4156
15/16	0.937500	23.8125
61/64	0.953125	24.2094
31/32	0.96750	24.6062
63/64	0.984375	25.0031
1	1.000000	25.4000

THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

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

WEIGHTS

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

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

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

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu.Feet

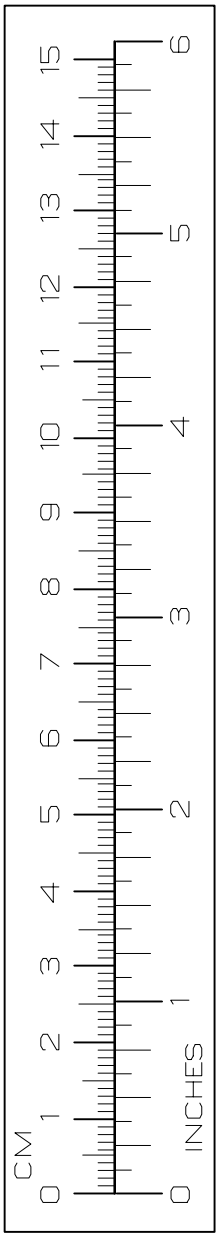
TEMPERATURE

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

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Millimeters	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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