

TM 9-2320-283-13&P

TECHNICAL MANUAL
OPERATOR AND FIELD MAINTENANCE MANUAL
INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
FOR
ANTI-LOCK BRAKE SYSTEM (ABS)
M915A1
NSN 2320-01-125-2640 (EIC B4B)

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

GENERAL PURPOSE NOTICE: This TM is intended for the U.S. Army Reserve program.

HEADQUARTERS, DEPARTMENT OF THE ARMY
7 AUGUST 2012

WARNING SUMMARY

This warning summary contains specific safety warnings and hazardous material warnings found in the body of the technical manual that must be understood and applied during installation, operation, and maintenance of this equipment. Failure to observe these warnings may result in serious injury or death to personnel.

FIRST AID DATA

Refer to FM 4-25.11 for information on first aid.

WARNING

EXHAUST GASES CAN KILL

Carbon monoxide is a colorless, odorless, deadly poison which, when breathed, deprives the body of oxygen and causes suffocation. Exposure to air containing carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, apparent drowsiness, and coma. Permanent brain damage or death to personnel may result from severe exposure. Carbon monoxide occurs in exhaust fumes of internal combustion engines.

Carbon monoxide may become dangerously concentrated under conditions of inadequate ventilation. The following precautions must be observed to ensure safety of personnel.

1. DO NOT operate vehicle in an enclosed area without proper ventilation.
2. BE ALERT for exhaust poisoning symptoms:
 - a. Headache
 - b. Dizziness
 - c. Sleepiness
 - d. Loss of muscular control
3. If you see another person with exhaust poisoning symptoms:
 - a. Remove person from area.
 - b. Expose person to fresh air.
 - c. Keep person warm.
 - d. DO NOT permit physical exercise.
 - e. Administer cardiopulmonary resuscitation (CPR), if necessary.
 - f. Notify a medic.
4. BE AWARE. The field protective mask for nuclear-biological-chemical (NBC) protection WILL NOT protect you from carbon monoxide poisoning.

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS GOOD VENTILATION!

WARNING SUMMARY-CONTINUED

Operator and passenger must wear seatbelts during operation. Ensure seatbelts are adjusted for proper fit. Failure to comply may result in injury or death to personnel. Seek medical attention in the event of an injury.

Operators must know how to use the controls and indicators before starting and driving the tractor, and must be able to use the features of the tractor in the safest and most efficient way to accomplish their mission.

Failure to comply may result in injury or death to personnel. Seek medical attention in the event of an injury.

On wet pavement, gravel, and snow covered roads, the ABS may increase braking distances due to the system responding to prevent wheel lockup. On very slippery surfaces such as sheet ice, braking distance may further increase. Reduce vehicle speeds on all slippery surfaces, anticipate slowing or stopping ahead of time, and avoid full-braking emergency stops. Failure to comply may result in damage to equipment or possible injury or death to personnel. Seek medical attention in the event of an injury.

Stopping distances may increase on wet pavement, gravel, and snow covered roads due to the ABS responding to prevent wheel lockup. On very slippery surfaces such as sheet ice, braking distance may further increase. Reduce vehicle speeds on all slippery surfaces, anticipate slowing or stopping ahead of time, and avoid panic stops. Failure to comply may result in damage to equipment and possible injury or death to personnel. Seek medical attention in the event of an injury.

Pumping the service brake with ABS may lengthen the stopping distance which may lengthen the stopping distance which could lead to a collision. Keep foot firmly planted on brake pedal when stopping, rather than manually pumping the brakes. Failure to comply may result in damage to equipment and possible injury or death to personnel. Seek medical attention in the event of an injury.

Do not use engine retarder on slippery road surfaces. Using engine retarder on wet, icy, or snow-covered roads may result in loss of vehicle control. Failure to comply may result in damage to equipment or possible injury or death to personnel. Seek medical attention in the event of an injury.

Never down-shift to a gear range lower than the tractor road speed on slippery pavement; the force of a sudden increase in engine rpm through the transmission may cause the drive wheels to lose traction and result in a loss of control of tractor and jackknifing of trailer. Failure to comply may result in damage to equipment or possible injury or death to personnel. Seek medical attention in the event of an injury.

Ensure wheel chocks are placed in front of tires opposite the end of tractor to be raised and parking brake is released. If tractor is not free to roll toward jack during jacking operations, tractor may topple jack. Failure to comply may result in injury or death to personnel. Seek medical attention in the event of an injury.

Ensure jack is rated at 20-ton and jack stands are rated at 10-ton to support weight of truck. Do not get under tractor unless it is properly supported by jack stands. Failure to comply may result in injury or death to personnel. Seek medical attention in the event of an injury.

Two personnel are required to remove brake drum from hub. Brake drum weighs 85 lbs (39 kg). Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

Two personnel are required to remove service deck assembly from tractor frame due to its size. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

Metal shavings are sharp and may fly out during reaming operations. Wear eye protection when enlarging hole with reamer. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

Retaining springs may fly out with extreme force during removal of brake shoes. Wear eye protection when removing brake shoes. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

Ensure all residual air pressure is released from air reservoirs prior to disconnecting any air hose or tube assembly. Failure to comply may result in damage to equipment or possible injury to personnel. Seek medical attention in the event of an injury.

There are no adverse effects on human health associated with the use of MIL-PRF-680 when used as intended; however when used indoors, ventilation shall be sufficient to prevent the accumulation of vapors above allowable exposure limits. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

WARNING SUMMARY-CONTINUED

When applying and removing MIL-PRF-680 Type II or IV degreasing solvent, personnel shall wear chemical-resistant gloves and a face shield or goggles to prevent skin and eye contact with solvent and oil, grease, and other contaminants removed with solvent. In case of skin contact, remove any contaminated clothing before reuse. In the event of eye contact, flush eyes with large amounts of water for at least 15 minutes or until irritation subsides. Do not have food or drink in the vicinity. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

Ensure all nuts on all air tube fittings are properly tightened during installation. Failure to comply may result in damage to equipment or possible injury to personnel. Seek medical attention in the event of an injury. Improper cleaning methods and use of unauthorized cleaning solvents may result in damage to equipment or possible injury to personnel. Seek medical attention in the event of an injury.

Compressed air source shall not exceed 30 psi (207 kPa). When cleaning with compressed air, eye shields must be worn. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

Spring brake chambers contain a loaded compression spring and must be handled with extreme care. Be careful not to drop the spring brake chamber, and always work from the side of the unit and not from the front or back. During removal and installation, do not use an impact wrench on the release tool or strike any part of the unit for any reason. Do not attempt to dismantle the spring brake chamber, and replace the entire unit if any structural damage is evident. Failure to comply may result in damage to equipment or possible injury or death to personnel. Seek medical attention in the event of an injury.

Ensure harness leads are routed to the correct wheel as labeled with white bands denoting LF, RF, LR, and RR. Failure to comply may result in damage to equipment or possible injury or death to personnel. Seek medical attention in the event of an injury.

MIL-PRF-680 solvent is combustible; DO NOT use or store near heat, sparks, flame, or other ignition sources. Use mechanical ventilation whenever product is used in a confined space, heated above temperatures, or agitated. Keep container sealed when not in use.

Contact with MIL-PRF-680 may cause skin irritation. Use chemical gloves. In case of skin contact, remove any contaminated clothing and wash skin thoroughly with soap and water. Wash contaminated clothing before reuse. Eye contact may cause irritation, tearing, or blurring of vision. Use face shield or goggles when eye contact may occur. In case of eye contact, flush eyes with large amounts of water for at least 15 minutes or until irritation subsides. Inhalation may cause irritation to upper respiratory passages. DO NOT have food or drink in the vicinity. Failure to comply may result in death or injury to personnel. Seek medical attention in the event of an injury.

Leaking or spilled oil may cause a slip and fall hazard. Clean any leaking or spilled oil immediately, using suitable fluid absorbent materials. Dispose of contaminated cloths, rags, or cleaning materials in accordance with local procedures and plans. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

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WASHINGTON, D.C., 7 AUGUST 2012

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HOW TO USE THIS MANUAL

ABOUT YOUR TECHNICAL MANUAL

Equipment operators shall familiarize themselves with the format and use of this Technical Manual (TM) prior to operating equipment or performing routine maintenance. Learning how to use this TM will enable personnel to quickly locate information, gain proper knowledge of the equipment, and shorten the time necessary to complete the required procedure. Features of this TM are:

Work Package Format – This TM is organized in Work Package (WP) format. Each WP is an individual, stand-alone unit of information identified by a four-digit sequence number. WPs are positioned within the TM in sequential order (i.e., 0001, 0002, 0003, etc.) and each WP is page numbered consecutively after the sequence number at the bottom of each page (i.e., 0001-1, 00001-2, 0001-3, etc.).

Text Design – A table of contents is located in the front matter section of the TM. WP titles and sequence numbers are listed in the table of contents in sequential order. WPs are organized into chapters based on subject and chapters are listed in the table of contents. Chapter title pages are positioned sequentially within the TM and each chapter title page contains an index of the WPs in that chapter only. In addition to the table of contents and chapter title pages, a separate subject index is located in the rear matter section of the TM. The subject index is organized in alphabetical order with WP sequence and page numbers provided. Each WP contains identification information which includes the following:

Maintenance level(s) – This identifies what maintenance level(s) can perform the task.

WP title – This identifies the name and title of the procedure, and where applicable, the title of the subtasks within the WP.

Effectivity notice – This is only listed when a WP does not apply to all configurations or modes of the equipment, in which case only the model(s) that apply are listed.

Initial setup – Initial setup requirements may be listed after WP identification information above. The initial setup contains a list of all tools, materials/parts, authorized personnel, reference information, and equipment conditions that must be performed first. Special environment conditions and any other specific information required to perform the complete task may also be included.

Use of Text and Illustrations – WP text may be presented as general information written in paragraphs, a single task having numbered steps, or two or more subtasks each containing separate information; e.g., removal, inspection, installation. Where steps are used, they must be followed in the order which they are numbered. When illustrations are used, they are located after the text to which they apply on facing two-page modules, and are identified in the text by figure and item numbers. Each illustration has a figure number and title beneath it, and may contain item numbers with arrows pointing to each part called out in the corresponding text. Illustrations callouts are numbered sequentially, starting at the 11 o'clock position and continuing clockwise around each illustration. Tables and figures are numbered sequentially within each WP. Abbreviations and acronyms are spelled out within the text the first time they appear in the manual only. A list of all abbreviations and acronyms used in this TM is provided in General Information, WP 0001.

ABOUT YOUR TECHNICAL MANUAL

The format of this TM is designed to make accessing information quick and easy. The following example describes how to use the format for finding information within this TM. The example is intended as a guide and should be reviewed and put to memory before attempting to use this manual. If you have any questions after reviewing the following example, don't hesitate to ask your supervisor.

HOW TO USE THIS MANUAL—CONTINUED

PROBLEM: You observe one of the rear wheels is locking when the service brake is applied during a hard stop.

SOLUTION: You must find information on brake lockup, troubleshoot as necessary, and correct the problem.

Refer to the table of contents to determine what chapter and WP number (s) contain information on troubleshooting. If there is not an obvious WP title in the table of contents for troubleshooting a brake lockup condition, you may locate the information more quickly by using the subject index. After reviewing the table of contents and/or subject index, you determine that Chapter 3, WP 0009, contains the Troubleshooting Symptom Index, and WP 0010 contains Troubleshooting Procedures.

Go to WP 0009 first, and look through the malfunction/symptom titles. In reviewing the titles, you discover the heading Troubleshooting Procedures, with several symptoms and a corresponding WP number for each.

Go to WP 0010, review the WP Introduction, and then locate the desired SYMPTOM by page number as noted from WP 0009. Look at each SYMPTOM for the one that best describes the problem you have with the equipment. In this case, there is a specific symptom titled “Warning light does not illuminate with ignition on.” There are two possible causes listed under MALFUNCTION for the symptom “Warning light does not illuminate with ignition on,” the first tells you to look for blown fuses, and the second tells you to check for a faulty warning light. Under the first CORRECTIVE ACTION you are instructed to check for blown fuses, refer to WP 0030. Under the second CORRECTIVE ACTION you are instructed to check for faulty warning light, and refer to WP 0033.

In this example, Field Maintenance will go to WP 0030 or WP 0033 and perform the necessary procedures to correct the problem. If parts are needed go to WP 0038 to read the RPSTL Introduction and “How to Locate Repair Parts” before looking for the replacement parts needed in WP 0039 through WP 0058. After completing this task, refer to the table of contents or the subject index and find the WP for operation of the ABS brake system. In this example, WP 0005 provides operating instructions for the ABS brake system. Test and verify the ABS brake system is operational.

CHAPTER 1

GENERAL INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

OPERATOR AND FIELD MAINTENANCE GENERAL INFORMATION

SCOPE

This technical manual contains Operator and Field Maintenance procedures, installation instructions for the Anti-lock Brake System (ABS) Modification Kit, and parts information for the M915A1 truck intended for the U.S. Army Reserve program. Operating instructions include safety requirements, equipment description, use of controls, and operation under usual and unusual conditions. Maintenance instructions include Operator and Field Maintenance troubleshooting procedures, Preventive Maintenance Checks and Services (PMCS), and maintenance procedures as allocated by the Maintenance Allocation Chart (MAC). In addition, a Repair Parts and Special Tools List (RPSTL) contains parts information for all ABS kit components and M915A1 brake system-related components.

Type of Manual

Technical manual covering Operator and Field Maintenance instructions, kit installation instructions, and a Repair Parts and Special Tools List (RPSTL)

Equipment Name and Model Number

Anti-lock Brake System (ABS) for Truck, Tractor, Line Haul, 6X4, M915A1, 2320-01-125-2640. The ABS modification consists of three kits: Kit # 000-008-19-25, Kit # 001AFB, and Kit # 002HDW.

Purpose of Equipment

The ABS modification is intended to improve operational control and safety of the M915A1 vehicle by preventing its wheels from locking while braking.

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of Army forms and procedures used for equipment maintenance will be those prescribed by (as applicable) Department of Defense Pamphlet DA PAM 750-8, The Army Maintenance Management System (TAMMS) Users Manual.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your ABS Modification Kit needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you do not like about your equipment. Let us know why you do not like the design or performance.

All non-Aviation/Missile EIRs and PQDRs must be submitted through the Product Data Reporting and Evaluation Program (PDREP) Web site. The PDREP site is:
<https://www.pdrep.csd.disa.mil/>.

If you do not have Internet access, you may submit your information using an SF 368 (Product Quality Deficiency Report). You can send your SF 368 using email, regular mail, or fax using the addresses/fax numbers specified in DA PAM 750-8, The Army Maintenance Management System (TAMMS) Users Manual. We will send you a reply.

CORROSION PREVENTION AND CONTROL (CPC)

Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problem with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

Corrosion specifically occurs with metals. It is an electrochemical process that causes the degradation of metals. It is commonly caused by exposure to moisture, acids, bases, or salts. An example is the rusting of iron. Corrosion damage in metals can be seen, depending on the metal, as tarnishing, pitting, fogging, surface residue, and/or cracking.

Plastics, composites, and rubber can also degrade. Degradation is caused by thermal (heat), oxidation (oxygen), solvation (solvents), or photolytic (light, typically UV) processes. The most common exposures are excessive heat or light. Damage from these processes will appear as cracking, softening, swelling, and/or breaking.

SF 368, PQDR, should be submitted to the address specified in DA PAM 750-8, TAMMS Users Manual.

OZONE DEPLETING SUBSTANCES (ODS)

There are no Class 1 ODS used or associated with the installation and operation of the ABS for the M915A1 truck.

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Procedures for destruction of Army materiel to prevent enemy use can be found in TM 750-244-3, Procedures for Destruction of Equipment to Prevent Enemy Use.

PREPARATION FOR STORAGE OR SHIPMENT

For preparation for shipment and limited storage, refer to WP 0013. Additional information can be found in TM 746-10, General Packaging Instructions for Field Units.

LIST OF ABBREVIATIONS/ACRONYMS

Abbreviations and acronyms appearing in this TM are defined in the paragraph from where they first appear, after which only the abbreviation or acronym is used. The following is a quick-reference list of all abbreviations and acronyms and their corresponding word or compound term used in this TM.

AAL - Additional Authorization List	HAP - Hazardous Air Pollutant
ABS - Anti-lock Brake System	IAW - In Accordance With
AEPS - Army Electronic Product Support	MIR - Modified Individual Regulation
AR - Army Regulation	ODS - Ozone Depleting Substances
ATC - Automatic Traction Control	PMV - Pressure Modulator Valve
BII - Basic Issue Item	PQDR - Product Quality Deficiency Report
CAGE - Commercial and Government Entity Code	RPM - Revolutions Per Minute
cm - Centimeter	SF - Standard Form
COEI - Component of End Item	SVC - Service
CPC - Corrosion Prevention and Control	TAMMS - The Army Maintenance Management System
DA - Department of the Army	TM - Technical Manual
DA-PAM - Department of Army Pamphlet	UV - Ultraviolet
DIA - Diameter	WCA - Warranty Claim Action
DOD - Department of Defense	WP - Work Package
ECU - Electronic Control Unit	

END OF WORK PACKAGE

**OPERATOR AND FIELD MAINTENANCE
EQUIPMENT DESCRIPTION AND DATA**

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

The ABS installed on the M915A1 tractor is provided to keep wheels from locking up during braking. ABS also enables the operator to maintain steering control under heavy braking by preventing the tractor from skidding sideways. In addition, the increased stability during braking resulting from ABS reduces the chances of a crash and/or severity of impact in a crash.

ABS significantly improves safety and control for operators when braking in most on-road conditions and other types of terrain. On high-traction surfaces such as concrete and asphalt, braking distances are minimized with the ABS. However, in other types of terrain or conditions such as on gravel or in deep snow, ABS may increase braking distances as a result of preventing wheel lock-up during braking. On very slippery surfaces such as sheet ice, ABS may lose its effectiveness to prevent a skid because it becomes possible to lock multiple wheels at once.

The ABS consists of four wheel speed sensors, four modulators, and an Electronic Control Unit (ECU) installed on the existing brake circuit. The system performs a self-check automatically and warning indicator light alerts operator to any malfunction should it occur. A test blink code switch allows the maintainer to troubleshoot ABS without the use of hand-held or PC-based diagnostic tools. A diagnostic connector is also provided to enable the use of remote diagnostic tools for troubleshooting.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

This work package covers major components of the ABS.

WHEEL SENSOR – There are four identical wheel sensors each located on axle spindle and brake spider housings of front axle and rear-rear axle. The wheel sensor remains stationary and is initially adjusted so that it contacts the tone ring on wheel hub. The wheel sensor is an electrical component in the shape of a cylinder with a power cable connected to ABS ECU via speed sensor harness.

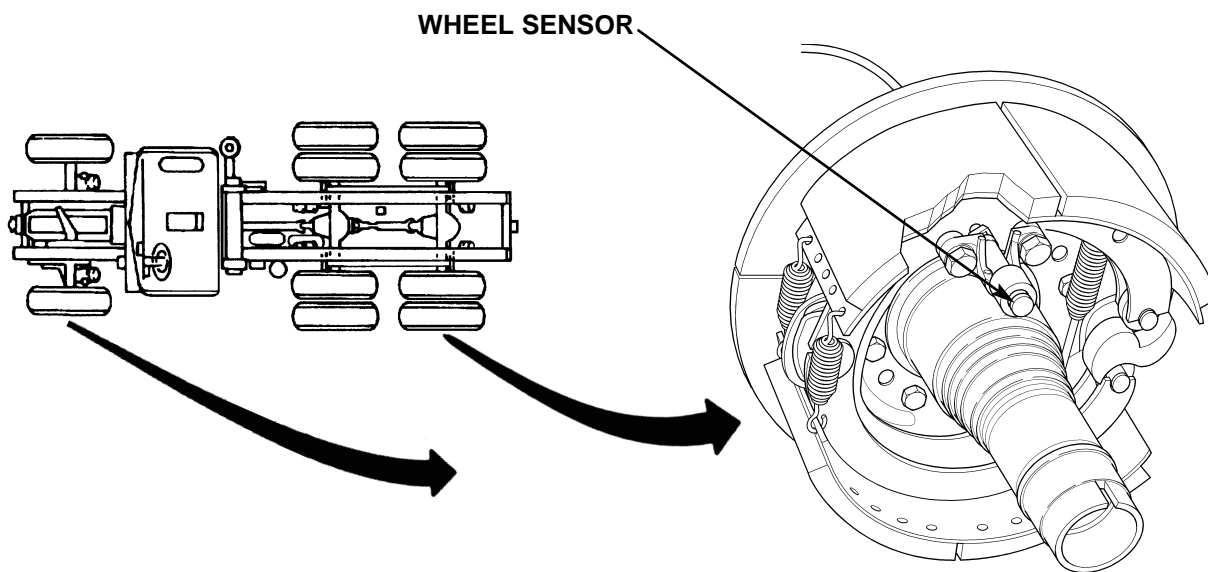


Figure 1 Wheel Sensor.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED

TONE RING – There are four tone rings each located on inner bearing and seal end of hub at the front and rear-rear axles. The tone ring rotates with hub and wheel assembly and passes in front of wheel sensor. The tone ring is a round steel disc with equally spaced open slots near its outer circumference.

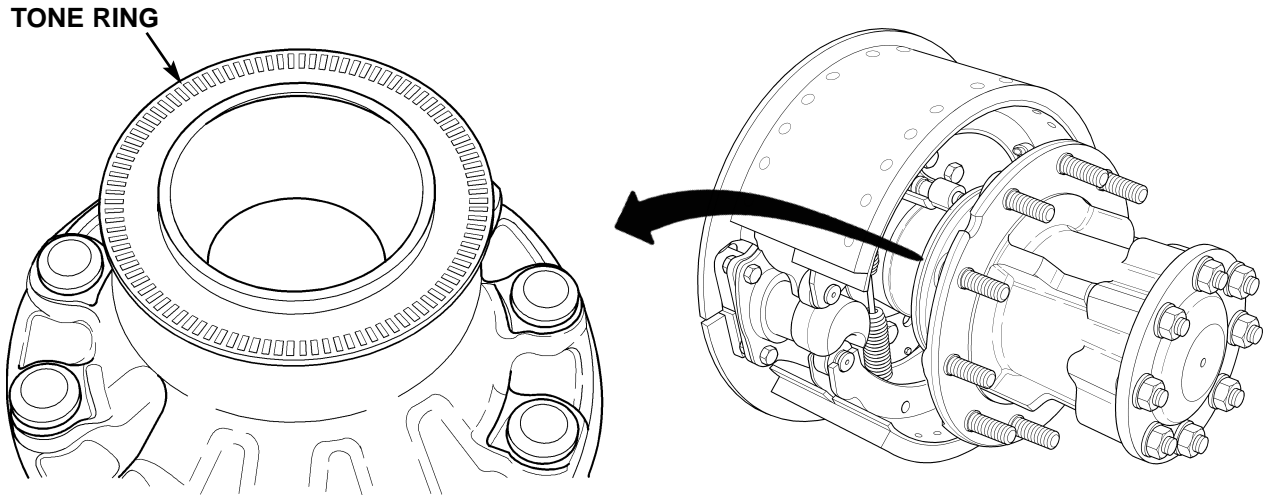


Figure 2. Tone Ring.

MODULATOR – There are four identical modulators each located inside frame rails near front and rear-rear axles. The modulator is controlled by the ABS ECU and rapidly applies and releases air pressure to control braking force at the wheel. The modulator is an electrically operated valve connected to ECU via modulator harness, and has inlet and outlet ports connecting it from the air supply to the brake chamber.

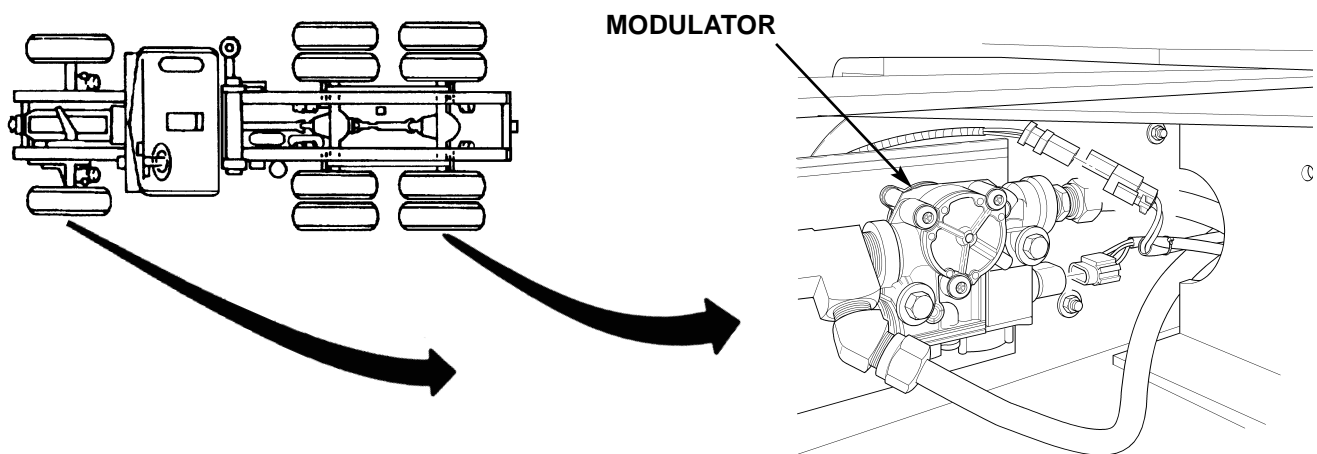


Figure 3. Modulator.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED

SPEED SENSOR HARNESS – The speed sensor harness is located adjacent to the modulator harness on cab firewall, and connects four wheel sensors to ABS ECU. The speed sensor harness is connected to ECU harness right bulkhead connector, on cab firewall, and is routed along the left-hand frame rail where it splits to each of four wheel sensor cables at the front and rear-rear axles.

MODULATOR HARNESS – The modulator harness is located adjacent to speed sensor harness on cab firewall, and connects four modulators to ABS ECU. The modulator harness is connected to ECU harness left bulkhead connector, on cab firewall, and is routed along the left-hand frame rail where it splits to each of four modulators on the left and right-hand frame rails.

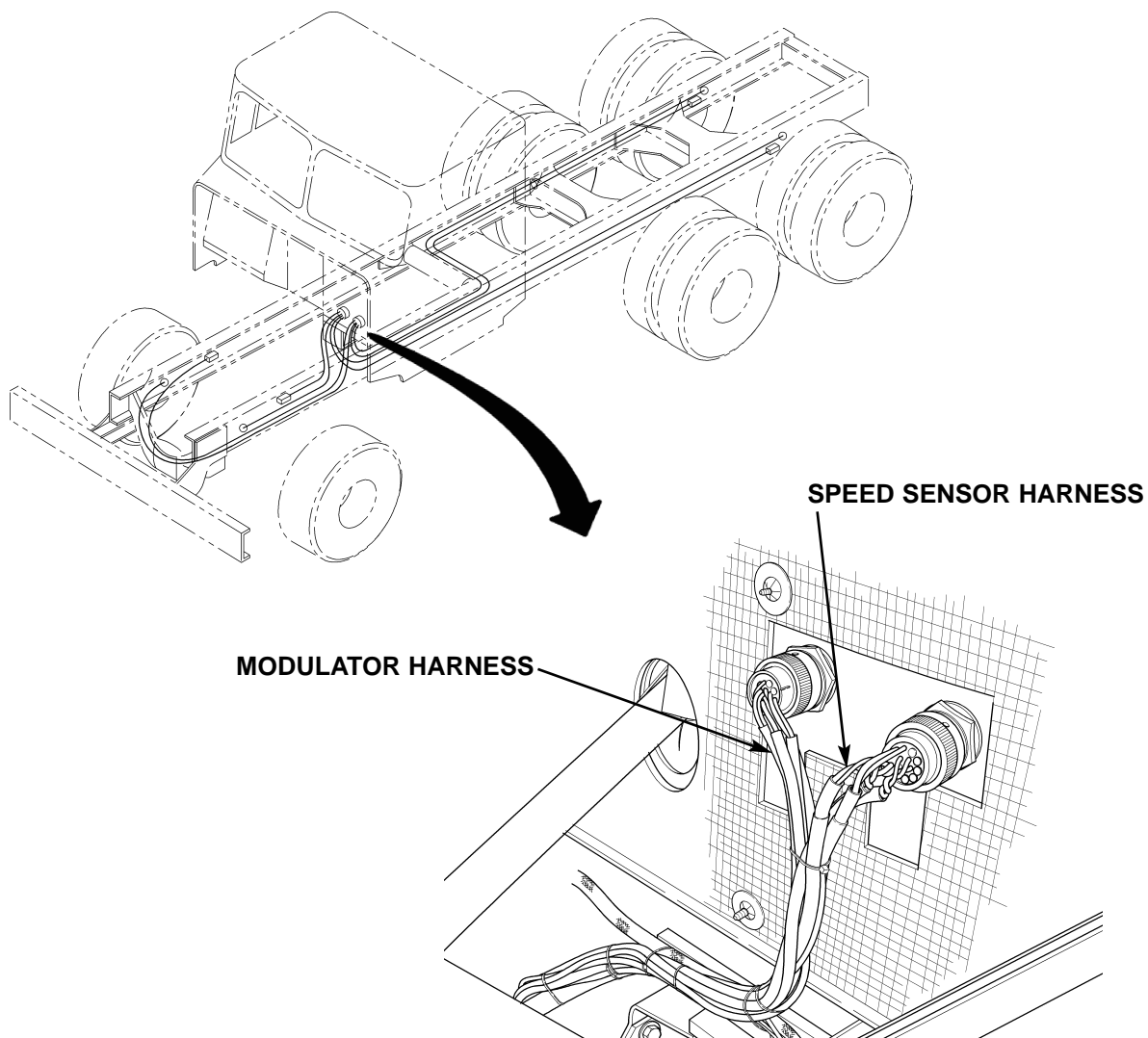


Figure 4. Speed Sensor and Modulator Harnesses.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED

ABS ECU HARNESS – This harness is located inside the cab below instrument panel, and connects ECU to tractor electrical power source, speed sensor and modulator harnesses. This harness has two bulkhead connectors installed in the cab firewall, two in-line fuses located at power source and circuit breaker, and provides proper electrical grounds for ABS ECU.

ELECTRONIC CONTROL UNIT (ECU) – There is a single ECU located inside the cab below instrument panel left of steering column. The ABS ECU is connected to speed sensor and modulator harness via ABS ECU and diagnostic connector harness. The ECU controls all functions of the ABS and has built-in diagnostics.

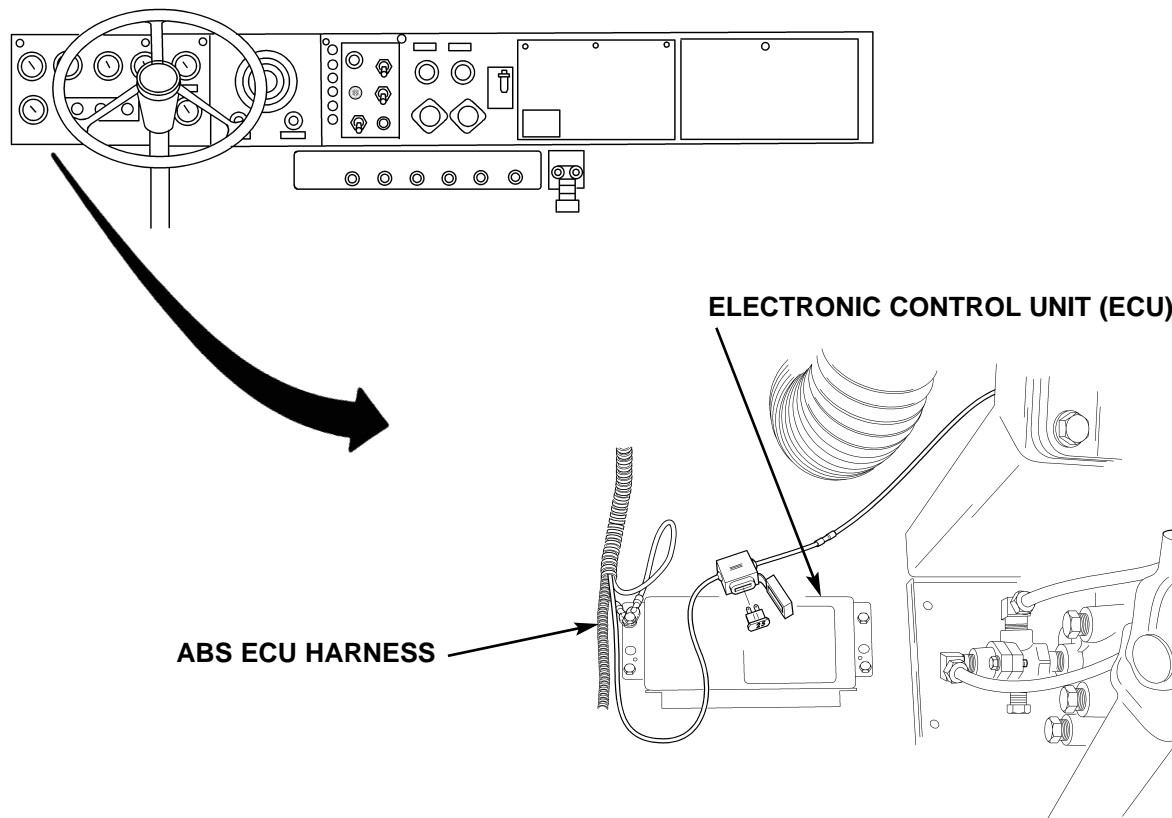


Figure 5. Electronic Control Unit (ECU) and Diagnostic Connector.

ABS WARNING LIGHT – The ABS warning light is located on center control panel below the vehicle LIGHTS switch. It illuminates amber when ignition is switched on and then goes out, indicating ABS is operational. It may also illuminate when there is a malfunction in ABS. The same warning light is also used to indicate troubleshooting blink codes, initiated by ABS test switch, from ABS ECU.

ABS TEST SWITCH – The ABS test switch is located on center control panel adjacent to BLACKOUT switch. It is a momentary switch used to access troubleshooting blink codes. When test switch is pressed, ABS warning light will illuminate. Pauses between pressing the test switch change the diagnostic mode at which time the ECU will respond with output information blinks (diagnostic messages) via ABS warning light.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED

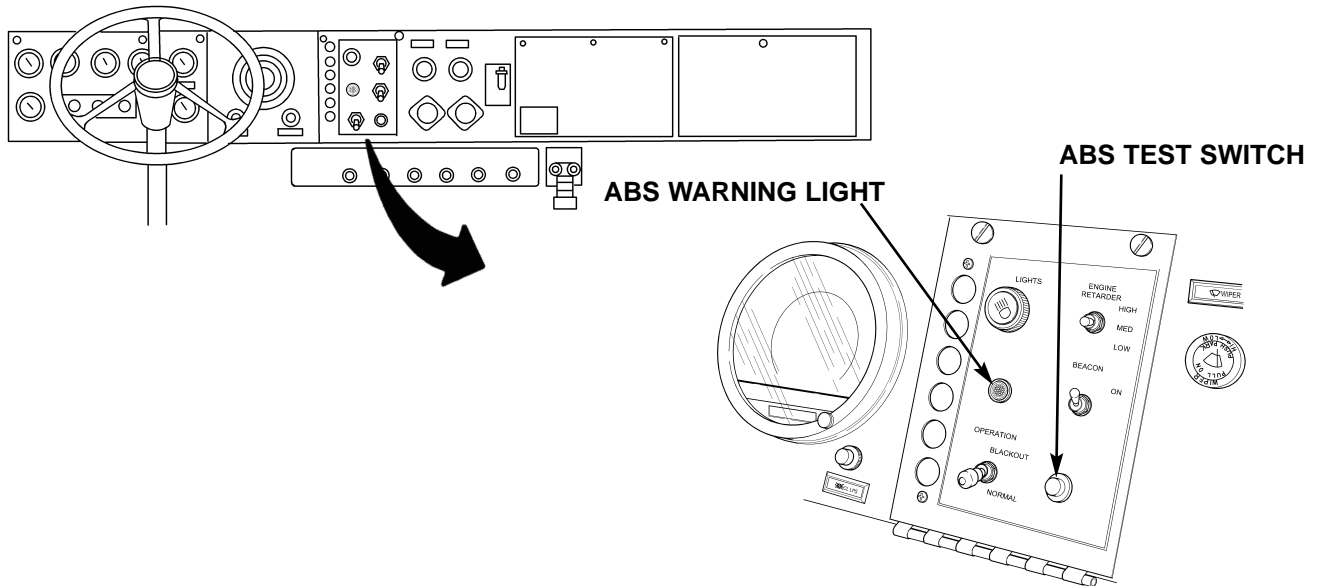


Figure 6. ABS Warning Light and Test Switch.

QUICK-RELEASE VALVE – There is a quick release valve located on the tractor protection valve inside the right-hand frame rail. The quick-release valve is a spring operated check valve that is air pressure activated within the brake system.

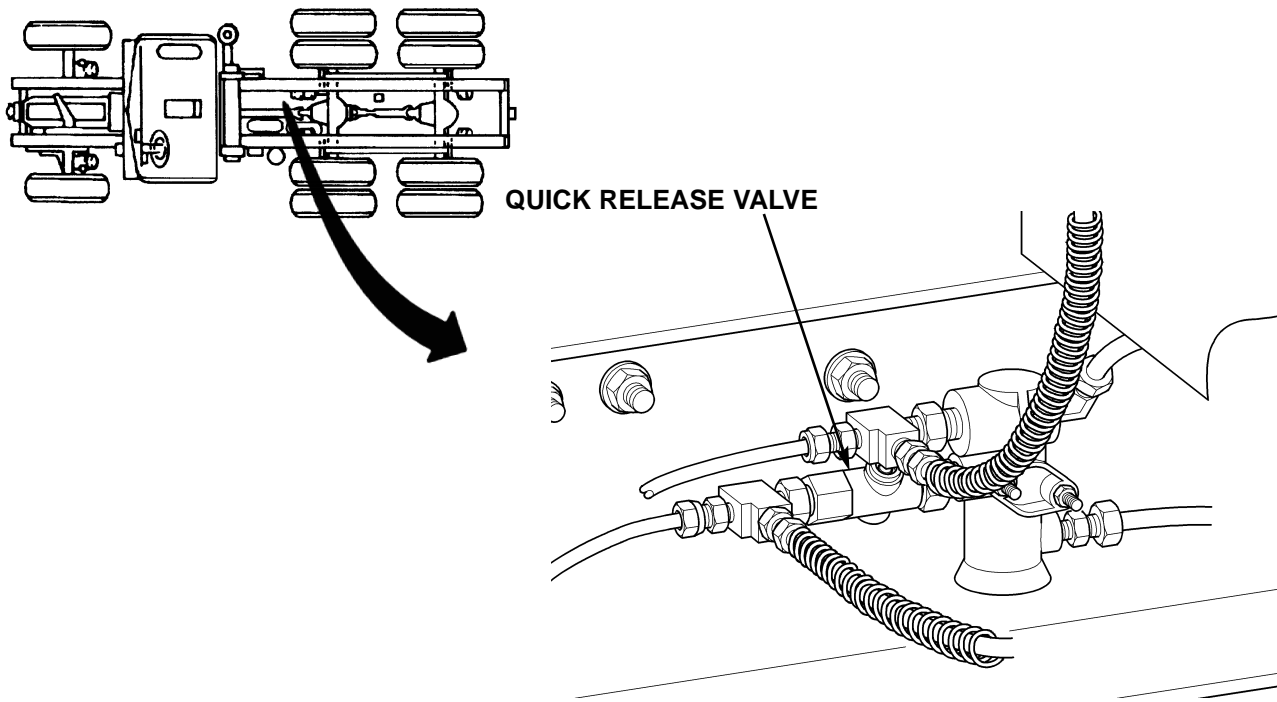


Figure 7. Quick-Release Valve.

EQUIPMENT DATA

Equipment data for the M915A1 equipped with ABS is listed below.

Table 1. Brake System.

Brake System:

Actuation Air over mechanical (S-Cam)

Pressure Range 65–150 psi (448.2–1,034.2 kPa)

Air Brake Chambers

Service Front axle (2)

Fail-Safe (spring brakes) Forward-rear (2); Rear-rear (2)

ABS (Anti-lock Brake System)

Type 4-channel

Location Front axle and rear-rear axle

END OF WORK PACKAGE

OPERATOR AND FIELD MAINTENANCE

THEORY OF OPERATION

INTRODUCTION

This work package is intended to provide the operator and maintainer with a basic understanding of design and function of the M915A1 equipped with ABS. This information describes how the system works to enable the operator and maintainer to better utilize the equipment.

FUNCTION OF ANTI-LOCK BRAKE SYSTEM (ABS)

The ABS is a brake system which prevents the wheels from locking while braking. The ABS works with the vehicle's regular brake system by automatically pulsing the brakes as if the operator were manually pumping the brake pedal to prevent wheel lockup.

When operator applies the service brake pedal, the ABS applies and releases braking pressure at the wheels up to 20 times a second. The process is repeated continuously, and is the cause of the characteristic pulsing feel through brake pedal.

ABS is controlled by the ECU which monitors rotation speed of each wheel by way of a speed sensor. There are a total of four speed sensors on the M915A1 truck; two on the front axle and two on the rear-rear axle. When the service brake is applied, the ECU senses the speed of each wheel. If one or more wheels begin to rotate considerably slower than the others (a condition that will bring on a lockup), the ECU will activate the modulator(s) controlling the braking force at the slower rotating wheel(s) to decrease pressure on the braking circuit and reduce the braking force. The slower rotating wheel or wheels begin to turn faster and the braking force is reapplied. This process is repeated continuously while brakes are applied. The ABS installed on the M915A1 tractor does not include Automatic Traction Control (ATC).

STEERING AXLE CONTROL

The front or steering axle contains a speed sensor and modulator on both wheels. When the service brakes are applied, the ECU blends the braking force between the two steering axle brakes to help reduce steering wheel pull on slippery road surfaces. This brake application control is called Modified Individual Regulation (MIR).

DUAL DRIVE AXLE CONTROL

The brakes on the forward-rear and rear-rear axles are controlled as a unit; one modulator controls both right-side rear wheels and the other modulator controls both left-side rear wheels. The rear speed sensors are installed on the rear-rear axle wheel ends only. When the service brakes are applied, the brakes on both forward-rear and rear-rear axles receive equal braking pressure during a stop.

BLINK CODES

Blink codes enable the maintainer to troubleshoot ABS problems without using a hand-held or PC-based diagnostic tool. The ABS amber warning light, located in the cab on the center control panel, is designed to display sequences of blinks communicated by the ABS ECU. The blink codes are activated by the test switch, also located on the center control panel.

END OF WORK PACKAGE

CHAPTER 2

OPERATOR INSTRUCTIONS

OPERATOR AND FIELD MAINTENANCE

DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS

This work package contains a description and illustration for each ABS control and indicator on the M915A1 equipped with ABS. It is important to learn the name, location, and function of all controls and indicators before attempting to operate or perform maintenance on the tractor. Operators will know the location and understand proper use of all controls and indicators before operating the tractor.

Table 1. Center Control Panel.

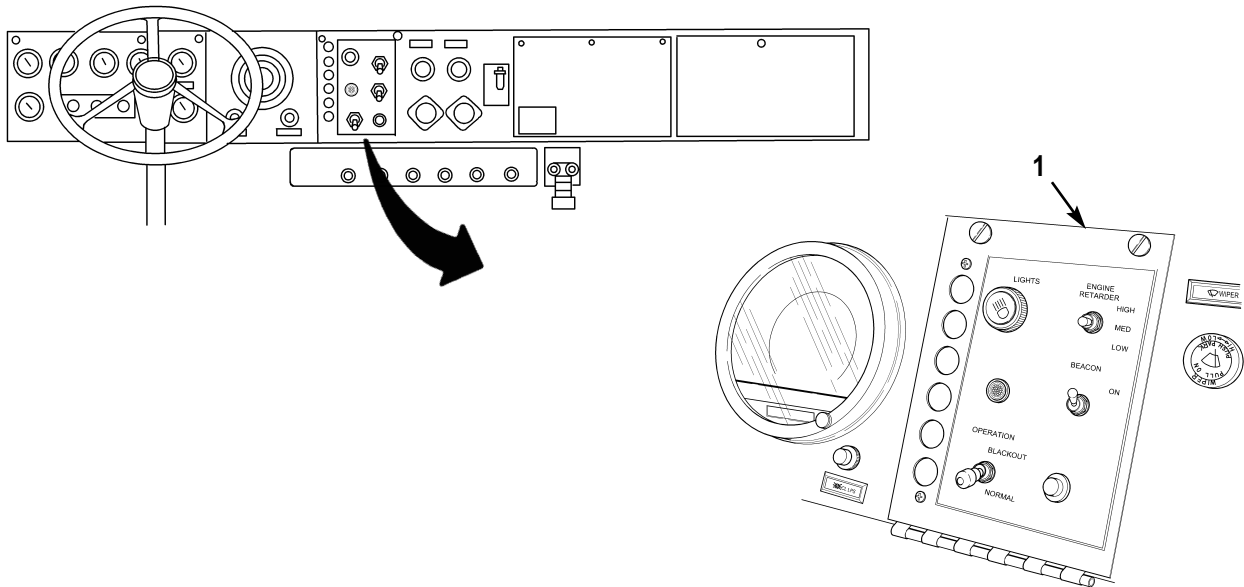
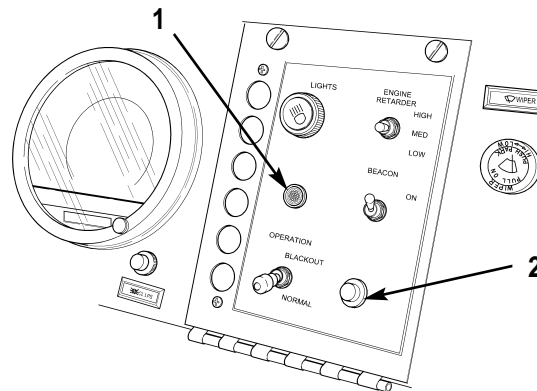
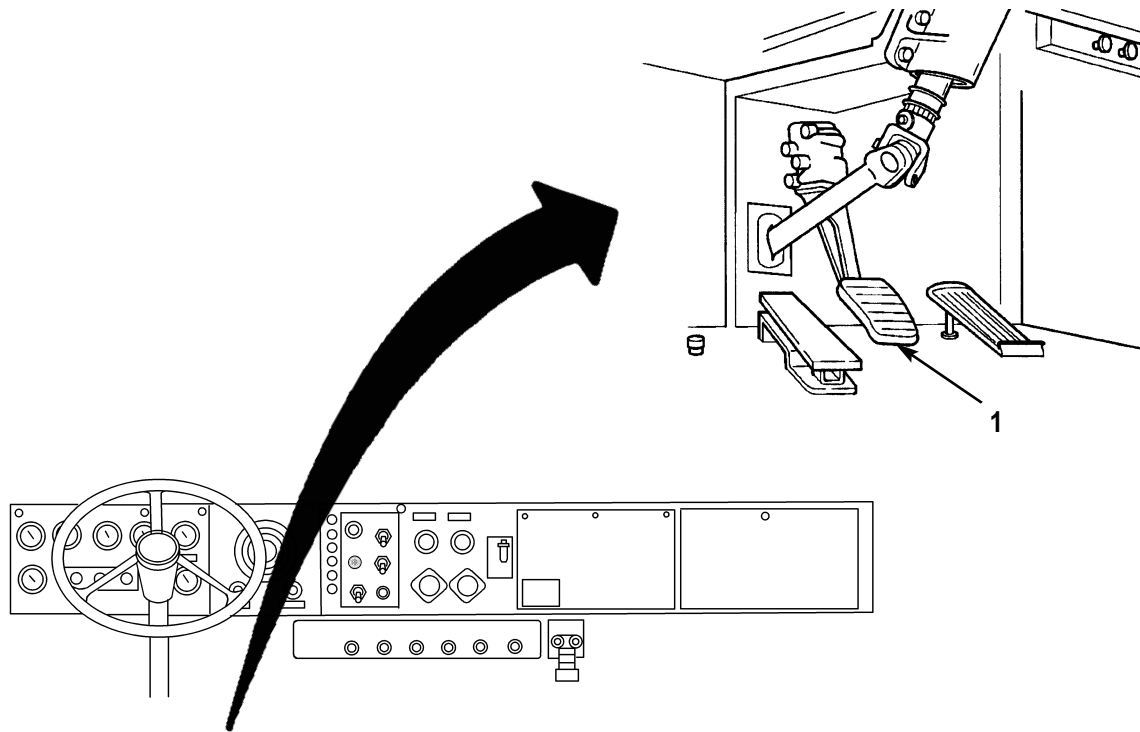


Figure 1. Center Control Panel.

Key	Control/Indicator	Function
1	Center Control Panel	The center control panel is modified to contain the ABS warning light and test switch. If necessary, center control panel can be hinged open to access ABS electrical harness wiring by turning two screws, located at the top of the panel, 90 degrees in either direction.

Table 2. ABS Warning Light and Test Switch.*Figure 2. ABS Warning Light and Test Switch.*

Key	Control/Indicator	Function
1	ABS Warning Light	During normal operation of the tractor, the ABS warning light will illuminate and go out when ignition is switched on, and may illuminate and go out when the service brake is applied. Should an actual malfunction occur during operation, this light will remain illuminated. The same warning light is also used to indicate troubleshooting blink codes, initiated by the ABS test switch, from the ABS ECU.
2	ABS Test Switch	The ABS test switch is only used to access troubleshooting blink codes built into the ABS ECU diagnostics. When the test switch is depressed the ABS warning light will illuminate. By depressing the test switch for a specific duration and then releasing it, ABS diagnostics is activated (turned on) and several diagnostic modes can then be accessed. Timed pauses between depressing the test switch will change modes, and the number of times the switch is depressed corresponds to a specific trouble code mode. Once the mode is selected, the ECU will begin responding with a sequence of blink codes via the ABS warning light. The total number of blinks is called a message, and the number of blinks flashed through ABS warning light corresponds to a specific trouble code used for troubleshooting the ABS.

Table 3. Service Brake Pedal.*Figure 3. Service Brake Pedal.*

Key	Control/Indicator	Function
1	Service Brake Pedal	To apply the service brake pedal on ABS equipped tractors, place right foot on pedal and push down firmly in proportion to the amount of braking force required to slow, stop, or hold tractor from moving when stopped. The primary difference in applying the service brake with ABS is to keep foot firmly planted on brake pedal when stopping, rather than manually pumping the brakes to prevent wheel lockup and subsequent skidding. If tractor is coupled to trailer, the trailer's service brakes will also be applied when the tractor's service brake pedal is applied.

END OF WORK PACKAGE

**OPERATOR AND FIELD MAINTENANCE
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**References**

TM 9-2320-283-10
AR 70-1
DA FORM 2404/5988-E
WP 0006
WP 0009
WP 0013
WP 0014

GENERAL

This work package provides instructions for operating the M915A1 tractor equipped with ABS under usual conditions.

PREPARATION FOR USE**WARNING**

Operator and passenger must wear seatbelts during operation. Ensure seatbelts are adjusted for proper fit. Failure to comply may result in injury or death to personnel. Seek medical attention in the event of an injury.

This vehicle has been designed to operate safely and sufficiently within the limits specified in TM 9-2320-283-10 and in this TM. Operation beyond these limits is prohibited IAW AR 70-1 without written approval from TACOM Life Cycle Management Command, ATTN: AMSTA-LM-LMPP, Warren, MI 48397-5000.

Operators must know how to use the controls and indicators before starting and driving tractor, and must be able to use the features of the tractor in the safest and most efficient way to accomplish their mission.

Prior to operating the M915A1 tractor, operators must perform the following:

1. Ensure Field Maintenance has performed the required maintenance interval service to the tractor; refer to DA Form 2404/5988-E, Equipment Inspection and Maintenance Worksheet.
2. Perform all operator/crew Before Operation PMCS as listed in WP 0013 and WP 0014.
3. Review operating instructions prior to performing mission. Refer to operating procedures listed in this work package and in WP 0006, Operation Under Unusual Conditions.
4. If used, ensure chocks are removed from tractor and trailer wheels prior to operation.
5. If trailer is connected to fifth wheel, ensure fifth wheel primary and secondary locks are engaged. Refer to TM 9-2320-283-10. If trailer is connected to towing pintle, ensure pintle latch is closed and secured with cotter pin. Refer to TM 9-2320-283-10.

END OF TASK

OPERATING PROCEDURES

Starting Engine

NOTE

Whenever ignition switch is turned on, the ABS ECU automatically runs through a self test and the ABS amber warning light illuminates for three seconds and then goes off. If a fault is found, the ABS warning light will stay on; refer to WP 0009, troubleshooting.

1. Turn on ignition switch. Refer to TM 9-2320-283-10. Observe ABS warning light (figure 1, item 1) on center control panel (figure 1, item 2) illuminate for three seconds and then go off. At same time, listen for all four modulators to cycle twice; a clicking sound should be heard.

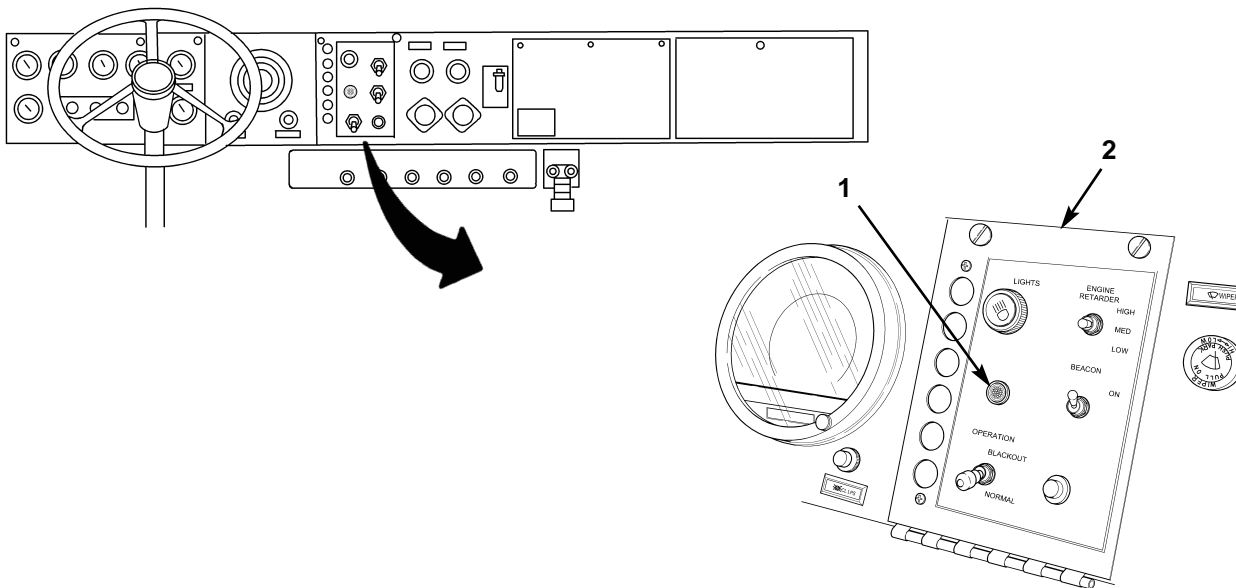


Figure 1. Observing ABS Warning Light.

NOTE

The normal operating range is 105–140 psi (724–965 kPa). The low air pressure warning lamp and buzzer will go off at approximately 64 to 76 psi (441 to 524 kPa).

2. Start engine. Refer to TM 9-2320-283-10. Allow engine to run until air pressure builds up in reservoirs and low air pressure warning lamp and buzzer go off.

END OF TASK

PREPARATION FOR MOVEMENT

1. Perform all preliminary checks for placing tractor in motion IAW TM 9-2320-283-10.
2. Apply service brake pedal (figure 2, item 1) and release parking brake control (figure 2, item 2).

PREPARATION FOR MOVEMENT – CONTINUED

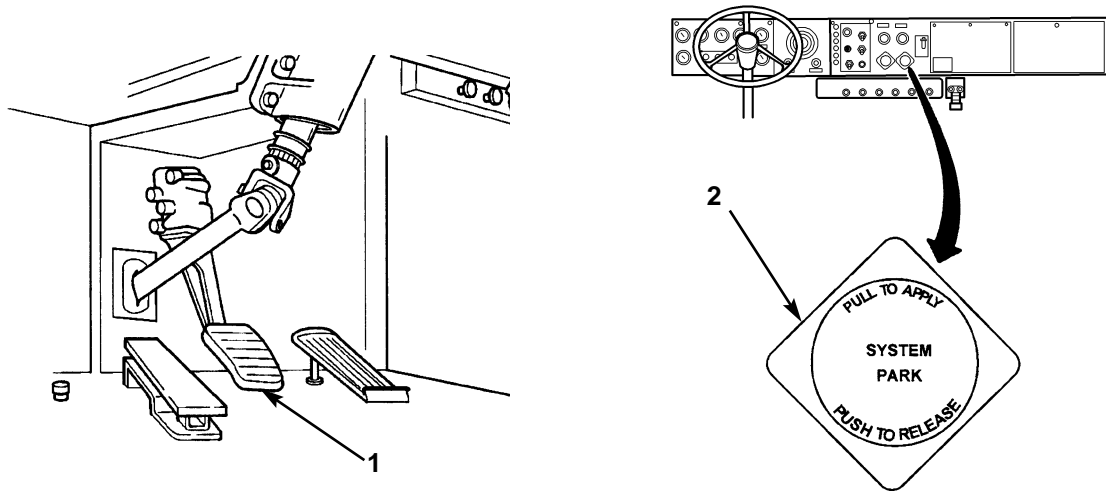


Figure 2. Service Brake Pedal and Parking Brake Control.

3. Place transmission control lever (figure 3, item 1) in desired gear range. Refer to TM 9-2320-283-10, Use of Transmission Gear Ranges.
4. Follow basic driving guidelines IAW TM 9-2320-283-10.

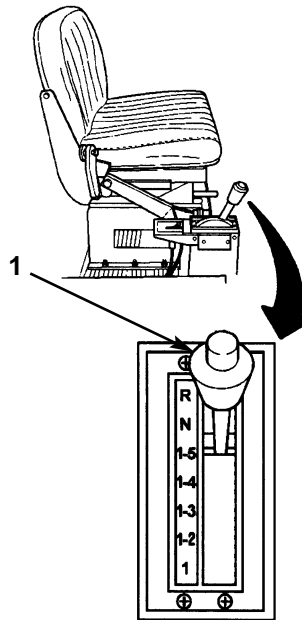


Figure 3. Placing Tractor in Motion.

END OF TASK

SLOWING AND STOPPING TRACTOR

NOTE

There are four ways to slow the tractor: release accelerator, apply engine retarder, manually downshift transmission, or apply service brake. The service brake may be applied on its own or in conjunction with the engine retarder and/or transmission downshifting.

The recommended technique for stopping an ABS equipped tractor in a typical full-braking emergency is to press the brake pedal down as firmly as possible and, where appropriate, to steer around obstructions.

The primary difference in applying the service brake with ABS is to keep foot firmly planted on the brake pedal when stopping, rather than manually pumping the brakes, to prevent wheel lockup and subsequent skidding.

1. Release accelerator (figure 4, item 1) and allow reduction in engine RPM and automatic downshifting of transmission to help slow tractor.
2. Depress engine retarder control pedal (figure 4, item 3) where conditions permit. Refer to TM 9-2320-283-10.

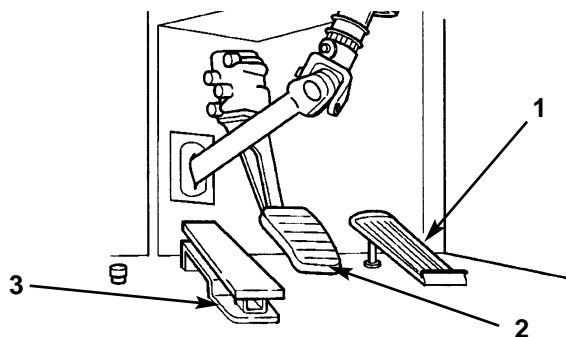


Figure 4. Accelerator and Brake Retarder.

3. Manually downshift transmission by placing transmission control lever (figure 5, item 1) in a lower gear range where conditions permit. Refer to TM 9-2320-283-10.

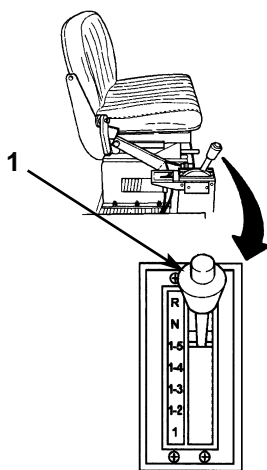


Figure 5. Manually Downshifting Transmission.

SLOWING AND STOPPING TRACTOR – CONTINUED**WARNING**

Stopping distance may increase on wet pavement, gravel, and snow covered roads due to the ABS responding to prevent wheel lockup. On very slippery surfaces such as sheet ice, braking distance may further increase. Reduce vehicle speeds on all slippery surfaces, anticipate slowing or stopping ahead of time, and avoid full-braking emergency stops. Failure to comply may result in damage to equipment and possible injury or death to personnel. Seek medical attention in the event of an injury.

4. Release accelerator pedal (figure 4, item 1) and press service brake pedal (figure 4, item 2) to slow tractor. Continue to firmly depress and hold service brake pedal (figure 4, item 2) to bring tractor to a complete stop.
5. If parking tractor, continue to depress and hold service brake pedal (figure 4, item 2), place transmission control lever (figure 5, item 1) in Neutral (N) position, and apply parking brake control (figure 6, item 1).

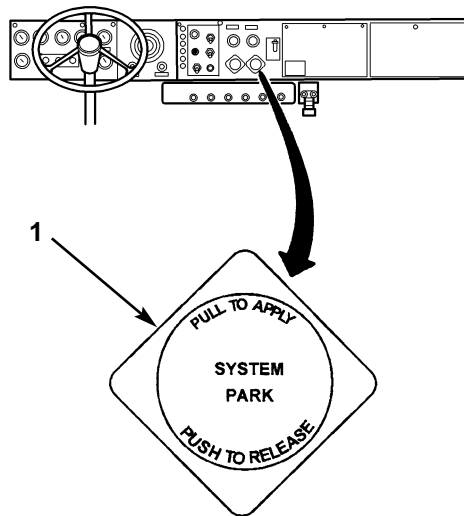


Figure 6. Parking Brake Control.

END OF TASK
END OF WORK PACKAGE

OPERATOR AND FIELD MAINTENANCE OPERATION UNDER UNUSUAL CONDITIONS

INITIAL SETUP:

References

TM 9-2320-283-10
AR 70-1

GENERAL

This work package provides instructions for operating the M915A1 tractor equipped with ABS under unusual conditions.

UNUSUAL ENVIRONMENT/WEATHER

Braking on Slippery Surfaces

WARNING

Operator and passenger must wear seatbelts during operation. Ensure seatbelts are adjusted for proper fit. Failure to comply may result in injury or death to personnel. Seek medical attention in the event of an injury.

Stopping distances may increase on wet pavement, gravel, and snow covered roads due to the ABS responding to prevent wheel lockup. On very slippery surfaces such as sheet ice, braking distance may further increase. Reduce vehicle speeds on all slippery surfaces, anticipate slowing or stopping ahead of time, and avoid panic stops. Failure to comply may result in damage to equipment and possible injury or death to personnel. Seek medical attention in the event of an injury.

Pumping the service brake with ABS may lengthen the stopping distance which could lead to a collision. Keep foot firmly planted on brake pedal when stopping, rather than manually pumping the brakes. Failure to comply may result in damage to equipment and possible injury or death to personnel. Seek medical attention in the event of an injury.

NOTE

The vehicle has been designed to operate safely and sufficiently within the limits specified in TM 9-2320-283-10 and in this TM. Operation beyond these limits is prohibited IAW AR 70-1 without written approval from TACOM Life Cycle Management Command, ATTN: AMSTA-LC-LMPP, Warren, MI 48397-5000.

Operators must know how to use the controls and indicators before starting and driving the tractor, and must be able to use the features of the tractor in the safest and most efficient way to accomplish their mission.

The primary difference in applying the service brake with ABS is to keep foot firmly planted on brake pedal when stopping, rather than manually pumping the brakes to prevent wheel lockup and subsequent skidding.

UNUSUAL ENVIRONMENT/WEATHER – CONTINUED**NOTE**

The recommended technique for stopping an ABS equipped tractor in a typical panic stop is to press the brake pedal down as firmly as possible and, where appropriate, to steer around obstructions.

1. If pulling a trailer, ensure trailer air brakes are connected to tractor and are operating properly. Refer to TM 9-2320-283-10.
2. Drive at slower speeds and maintain at least double the normal distance from vehicles ahead.
3. Avoid sudden braking which may increase the possibility of skidding or jackknifing tractor.
4. After driving through standing water or slush, drive slowly and test service brakes by maintaining moderate pressure on service brake pedal (figure 1, item 2).

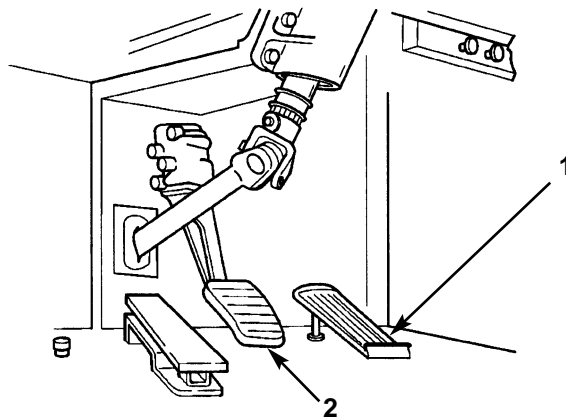


Figure 1. Testing Wet Service Brakes.

CAUTION

Never move inter-axle differential control to LOCK position while tractor is moving or any wheel is spinning. Failure to comply may result in damage to equipment.

5. If operating on a difficult stretch of road, stop and inspect surface of road before driving on it. Select transmission gear range that is suited to road conditions, and engage inter-axle differential lock. Refer to TM 9-2320-283-10.

WARNING

Do not use engine retarder on slippery road surfaces. Using engine retarder on wet, icy, or snow-covered roads may result in loss of vehicle control. Failure to comply may result in damage to equipment or possible injury or death to personnel. Seek medical attention in the event of an injury.

Never down-shift to a gear range lower than the tractor road speed on slippery pavement; the force of a sudden increase in engine rpm through the transmission may cause the drive wheels to lose traction and result in a loss of control of tractor and jackknifing of trailer. Failure to comply may result in damage to equipment or possible injury or death to personnel. Seek medical attention in the event of an injury.

UNUSUAL ENVIRONMENT/WEATHER – CONTINUED

6. To slow tractor, ease up on accelerator (figure 1, item 1), leave transmission in gear range already selected, and slowly apply service brake pedal (figure 1, item 2).
7. To stop tractor, release accelerator pedal (figure 1, item 1) and press service brake pedal (figure 1, item 2) to slow tractor. Continue to firmly depress and hold service brake pedal (figure 1, item 2) to bring tractor to a complete stop.

WARNING

On icy, slushy, wet, or muddy surfaces, avoid parking on an incline or uneven grade. Tractor may begin to slide after parked and damage to equipment and possible injury or death to personnel may result.

NOTE

Refer to TM 9-2320-283-10 for parking on icy, slushy, wet, or muddy surfaces in freezing temperatures.

8. If parking tractor, continue to depress and hold service brake pedal (figure 1, item 2), place transmission control lever (figure 2, item 1) in Neutral (N) position, and apply parking brake control (figure 2, item 2).

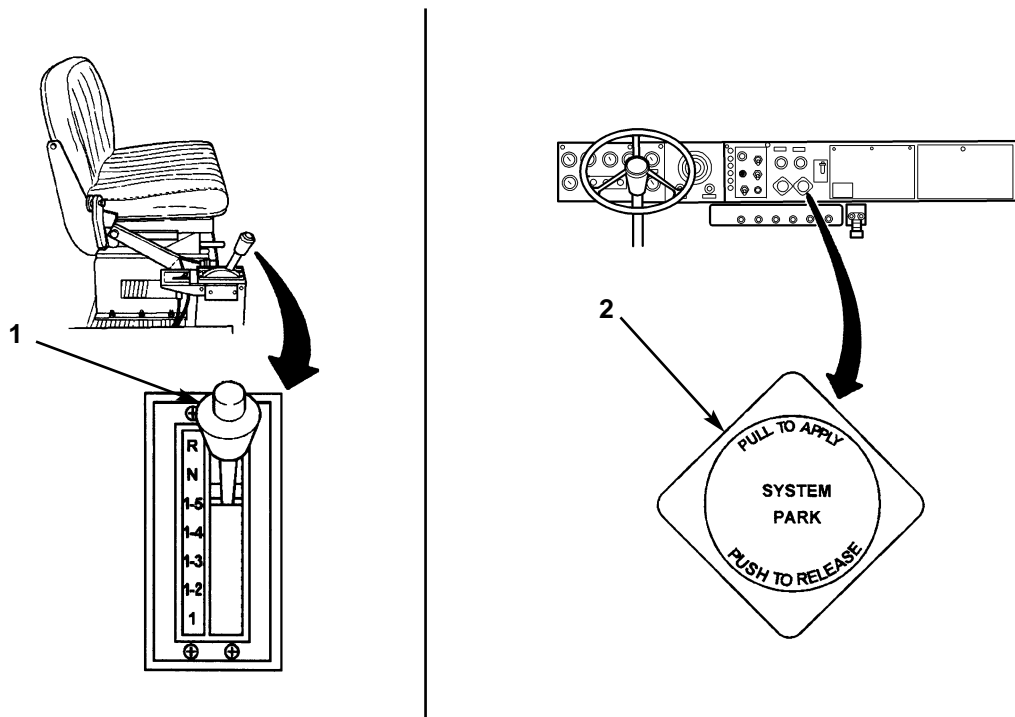


Figure 2. Slowing, Stopping, and Parking on Slippery Surfaces.

END OF TASK
END OF WORK PACKAGE

**OPERATOR AND FIELD MAINTENANCE
EMERGENCY**

INITIAL SETUP:**References**WP 0006

GENERAL

This work package provides instructions for operating the M915A1 ABS equipped tractor with an inoperable ABS to complete mission.

OPERATING WITH INOPERABLE ABS

If ABS warning light goes on and stays on when tractor is being operated, a minor or major malfunction of the ABS may have occurred and rendered the system inoperable. Operator must heed to ABS warning light and treat the warning as if tractor no longer has ABS capability. This means the following driving habits and braking techniques shall be followed:

WARNING

If ABS becomes inoperable and operator is unfamiliar with braking techniques used on trucks without ABS, especially if operating on slippery road surfaces, it may be prudent to carefully pull off the road and radio for assistance. Failure to comply may result in damage to equipment or possible injury or death to personnel. Seek medical attention in the event of an injury.

NOTE

When service brake pedal is applied, ABS works with the regular braking system by automatically pumping brakes for the operator. In vehicles not equipped with ABS, operator must be mindful to manually pump the brakes to prevent wheel lockup.

1. Maintain at least double the normal distance from vehicle ahead until mission is completed or until ABS can be checked and restored.

OPERATING WITH INOPERABLE ABS - CONTINUED

2. Apply service brake pedal (figure 1, item 1) evenly to slow tractor, and gradually pump service brake pedal (figure 1, item 1) as necessary to avoid locking wheels and skidding during a stop.
3. On wet or slippery surfaces, lightly apply service brake pedal (figure 1, item 1) once or twice prior to stopping to help avoid skidding. Refer to WP 0006.
4. Avoid sudden braking on wet or slippery road surfaces; this can cause tractor to skid and trailer to jackknife. Refer to WP 0006.

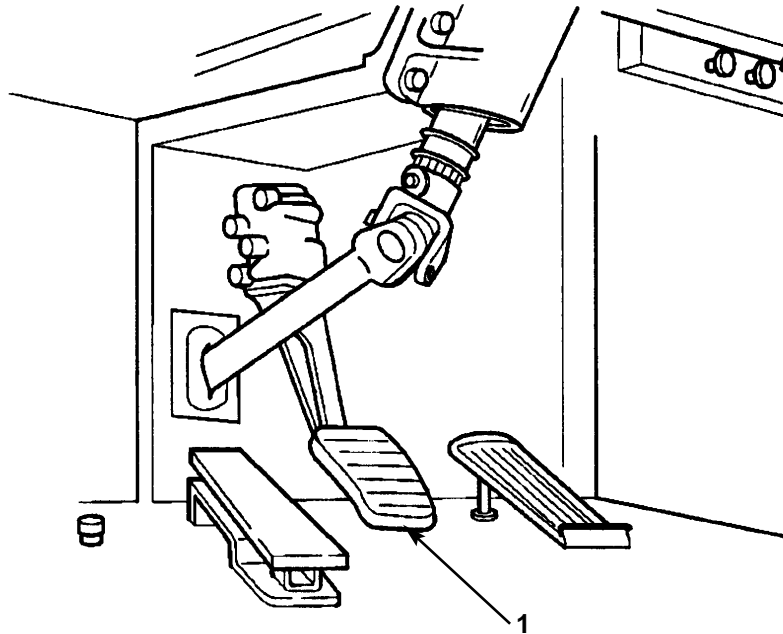


Figure 1. Applying Service Brake Pedal.

END OF TASK
END OF WORK PACKAGE

**OPERATOR AND FIELD MAINTENANCE
STOWAGE AND DECAL/DATA PLATE GUIDE**

Locations and descriptions of data plates and decals found on the M915A1 tractor are listed in TM 9-2320-283-10. There are no additional decals or data plates associated with the operation of M915A1 ABS equipped tractors. The ABS ECU is identified below.

ABS ECU decal – This identification decal is located on the front of the ABS ECU. It contains a part number and various bar codes.

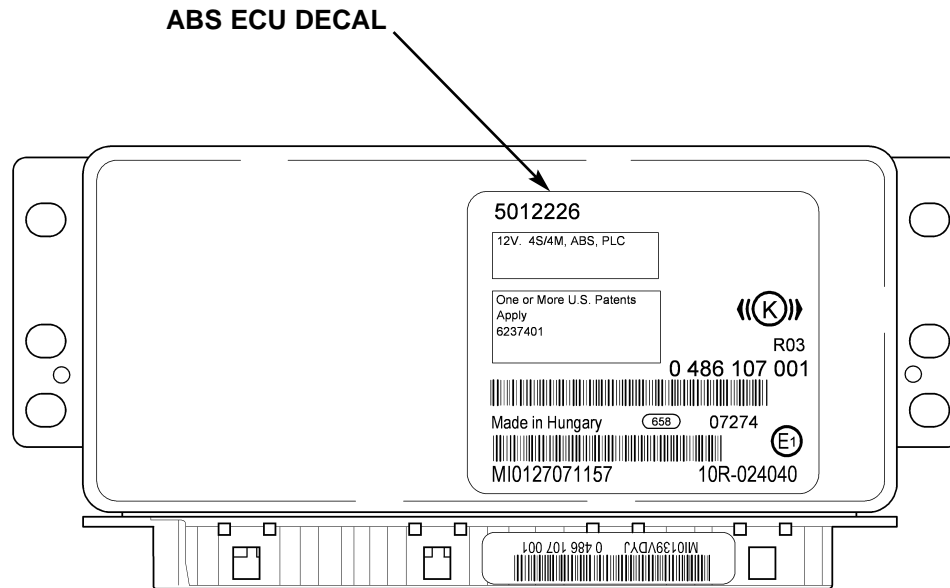


Figure 1. ABS ECU Decal.

**END OF TASK
END OF WORK PACKAGE**

CHAPTER 3

TROUBLESHOOTING PROCEDURES

**OPERATOR MAINTENANCE
TROUBLESHOOTING INDEX**

TROUBLESHOOTING INDEX**Malfunction/Symptom****Troubleshooting Procedures****INDICATORS AND CONTROLS**

Warning light does not illuminate with ignition onWP 0010-2
Warning light does not go out with ignition onWP 0010-2
Warning light illuminated during vehicle operationWP 0010-2

BRAKE SYSTEM

Parking brakes will not releaseWP 0010-2
Trailer brakes will not applyWP 0010-2
Brakes grab or pull to one side when appliedWP 0010-3
Modulators cannot be heard to cycle when ignition is switched onWP 0010-3
One or more wheels lock (skid) when service brake is appliedWP 0010-3

PNEUMATIC SYSTEM

Air pressure will not build up to operating pressureWP 0010-3
Air pressure gauge indicates more than 120 psi (8.3 bar)WP 0010-3
Air is heard leaking from vehicle continuouslyWP 0010-4

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**References**

DA-Form 2404
DA-Form 5504
DA-Form 5988-E
TM 9-2320-283-10

INTRODUCTION

This work package contains operator level troubleshooting procedures for correcting unsatisfactory operation and basic equipment malfunctions for the M915A1 equipped ABS. Operator troubleshooting will not include use of the ABS diagnostic modes or use of a hand-held diagnostic tool.

Each troubleshooting procedure lists a fault symptom describing a specific problem. Under each symptom is a list of possible malfunctions in the order of probability that may be the cause of the problem. Finally, each malfunction is provided a corrective action followed by work package or TM reference, or instruction to notify Field Maintenance to correct the problem.

Prior to performing any troubleshooting procedure, the following recommendations should be observed:

NOTE

This TM cannot list all possible malfunctions that may occur. If the symptom for a particular problem or malfunction is not listed in this work package, notify your supervisor.

Isolate the component where the malfunction occurs by finding the symptom that most accurately describes the problem.

Perform troubleshooting procedures in the order in which steps are listed.

Consider the possibility that the problem could be simple in origin and may require only minor adjustment: use common sense.

If a problem cannot be corrected after performing all corrective actions listed for a given symptom, notify your supervisor.

If the corrective action is not authorized at the operator level, operators should provide a brief written description of the problem using Equipment inspection and Maintenance Worksheet, DA-Form 2404 or DA-Form 5988-E, and Maintenance Request Form, DA-Form 5504.

TROUBLESHOOTING**INDICATORS AND CONTROLS****SYMPTOM**

Warning light does not illuminate with ignition on.

MALFUNCTION

No power to ABS ECU due to blown ECU harness fuses or faulty warning light.

CORRECTIVE ACTION

1. Notify Field Maintenance to check 30-amp and 5-amp fuses on ABS ECU harness.
2. Notify Field Maintenance to check ABS warning light.

SYMPTOM

Warning light does not go out with ignition on.

MALFUNCTION

ABS ECU processing a system fault.

CORRECTIVE ACTION

1. Operate engine until low air pressure warning light and buzzer go off.
2. Notify Field Maintenance to troubleshoot ABS.

SYMPTOM

Warning light illuminated during vehicle operation.

MALFUNCTION

ABS ECU processing a system fault.

CORRECTIVE ACTION

Notify Field Maintenance to troubleshoot ABS.

BRAKE SYSTEM**SYMPTOM**

Parking brakes will not release.

MALFUNCTION

Air pressure is below 100 psi (7 bar) or an air leak can be heard.

CORRECTIVE ACTION

1. Operate engine until low air pressure warning light and buzzer go off.
2. Notify Field Maintenance to troubleshoot air leak in brake system.

SYMPTOM

Trailer brakes will not apply.

MALFUNCTION

Trailer brake hoses not connected to tractor, trailer couplers leaking, or trailer brakes are caged.

CORRECTIVE ACTION

1. Connect trailer air brake hoses to tractor. Refer to TM 9-2320-283-10.
2. Adjust trailer brake hose connections at couplers. If necessary, notify Field Maintenance to correct leaking trailer brake hose couplers.
3. Uncage trailer brakes. Refer to TM 9-2320-283-10.

TROUBLESHOOTING—CONTINUED**BRAKE SYSTEM—CONTINUED****SYMPTOM**

Brakes grab or pull to one side when applied.

MALFUNCTION

Brake shoes out of adjustment or brake chamber leaking or brake shoes contaminated with oil due to leaking axle seal.

CORRECTIVE ACTION

1. Adjust slack adjusters. Refer to TM 9-2320-283-10.
2. Notify Field Maintenance to check brake chamber.
3. Notify Field Maintenance to check brake shoes for oil contamination and replace hub seal if necessary.

SYMPTOM

Modulators cannot be heard to cycle when ignition is switched on.

MALFUNCTION

No power to ABS ECU due to blown ECU harness fuses or faulty warning light.

CORRECTIVE ACTION

1. Notify Field Maintenance to check 30-amp and 5-amp fuses on ABS ECU harness.
2. Notify Field Maintenance to check ABS warning light.

SYMPTOM

One or more wheels lock (skid) when service brake is applied.

MALFUNCTION

Brake shoes out of adjustment or wheel sensor (s) contaminated or out of adjustment.

CORRECTIVE ACTION

1. Adjust slack adjusters. Refer to TM 9-2320-283-10.
2. Notify Field Maintenance to check wheel sensors and troubleshoot ABS as necessary.

PNEUMATIC SYSTEM**SYMPTOM**

Air pressure will not build up to operating pressure.

MALFUNCTION

Leaking or damaged air tube(s), hose(s), or valve(s).

CORRECTIVE ACTION

Notify Field Maintenance to repair or replace leaking or damaged air tubes, hoses, or valves.

SYMPTOM

Air pressure gauge indicates more than 120 psi (8.3 bar).

MALFUNCTION

Damaged pressure release governor or un-loader valve.

CORRECTIVE ACTION

Notify Field Maintenance to check operation of valves.

TROUBLESHOOTING—CONTINUED**PNEUMATIC SYSTEM—CONTINUED****SYMPTOM**

Air is heard leaking from vehicle continuously.

MALFUNCTION

Quick-release valve damaged or stuck open.

CORRECTIVE ACTION

Notify Field Maintenance to check quick-release valve at tractor protection valve.

END OF WORK PACKAGE

**FIELD MAINTENANCE
TROUBLESHOOTING INDEX
AND DIAGNOSTIC TROUBLE CODE INDEX**

TROUBLESHOOTING INDEX**Malfunction/Symptom****Troubleshooting Procedures****INDICATORS AND CONTROLS**

Warning light does not illuminate with ignition onWP 0012-13

Warning light does not go out with ignition onWP 0012-13

Warning light illuminated during vehicle operationWP 0012-13

BRAKE SYSTEM

Parking brakes will not releaseWP 0012-13

Trailer brakes will not applyWP 0012-13

Brakes grab or pull to one side when appliedWP 0012-14

Modulators cannot be heard to cycle when ignition is switched onWP 0012-14

One or more wheels lock (skid) when service brake is appliedWP 0012-14

PNEUMATIC SYSTEM

Air pressure will not build up to operating pressureWP 0012-14

Air pressure gauge indicates more than 120 psi (8.3 bar)WP 0012-15

Air is heard leaking from vehicle continuouslyWP 0012-15

DIAGNOSTIC TROUBLE CODES INDEX

<u>1st Blink Code No.</u>	<u>Description</u>	<u>Work Package/Page No.</u>
1	No Faults	
2	Table 1. Wheel Speed Sensors	WP 0012-5
3	Table 1. Wheel Speed Sensors	WP 0012-5
4	Table 1. Wheel Speed Sensors	WP 0012-5
5	Table 1. Wheel Speed Sensors	WP 0012-5
6	Table 3. Power Supply	WP 0012-8
7	Table 2. Pressure Modulator Valves	WP 0012-7
8	Table 2. Pressure Modulator Valves	WP 0012-7
9	Table 2. Pressure Modulator Valves	WP 0012-7
10	Table 2. Pressure Modulator Valves	WP 0012-7
11	Table 4. J1939 Serial Communications	WP 0012-10
12	Table 5. ECU	WP 0012-10
13	Table 6. Miscellaneous	WP 0012-11

END OF WORK PACKAGE**0011-1/2 blank**

FIELD MAINTENANCE TROUBLESHOOTING PROCEDURES

INITIAL SETUP:

References

DA-Form 2404
DA-Form 5504
DA-Form 5988-E
TM 9-2320-283-10
TM 9-2320-283-20
WP 0004
WP 0005
WP 0011
WP 0019

References—continued

WP 0020
WP 0021
WP 0022
WP 0023
WP 0028
WP 0029
WP 0030
WP 0032
WP 0034

INTRODUCTION

This work package contains Field Maintenance level troubleshooting procedures for correcting unsatisfactory operation and basic equipment malfunctions for the M915A1 equipped with Antilock Braking System (ABS). Field troubleshooting includes use of the ABS diagnostic modes.

Each troubleshooting procedure lists a fault symptom describing a specific problem. Under each symptom is a list of possible malfunctions in the order of probability that may be the cause of the problem. Finally, a corrective action is provided for each malfunction followed by work package or TM reference or instruction to notify your supervisor.

Prior to performing any troubleshooting procedure, the following recommendations should be observed:

NOTE

This TM cannot list all possible malfunctions that may occur. If the symptom for a particular problem or malfunction is not listed in this work package, notify your supervisor.

1. Isolate the component where the malfunction occurs by finding the symptom that most accurately describes the problem.
2. Perform troubleshooting procedures in the order in which steps are listed.
3. Consider the possibility that the problem could be simple in origin and may require only minor adjustment, use common sense.
4. If a problem cannot be corrected after performing all corrective actions listed for a given symptom, notify your supervisor.
5. If the corrective action is not authorized at the Field Maintenance level, maintainers should provide a brief written description of the problem using an Equipment Inspection and Maintenance Worksheet, DA-Form 2404 or DA-Form 5988-E, and Maintenance Request Form, DA-Form 5504.

HOW TO USE ABS DIAGNOSTICS

The M915A1 ABS Electronic Control Unit (ECU) contains self-testing diagnostic circuitry that continuously monitors the operation of the ABS. The ABS diagnostics can be accessed in two ways: the blink code switch or by plugging in a hand-held or PC based diagnostic tool into the ECU diagnostic connector. When a fault in the ABS is detected by the ECU, the ECU will automatically control the following:

Illuminate the ABS warning light. Refer to WP 0004.

Partially or fully disable the ABS depending on the malfunction.

Record the trouble code information in the ECU's memory.

HOW TO USE ABS DIAGNOSTICS—CONTINUED

NOTE

Use of hand-held or PC-based diagnostic tools is not covered in this TM.

Communicate the trouble code information through the ABS diagnostic connector to a separate hand-held or PC-based diagnostic tool. Refer to WP 0004.

In order to retrieve the trouble code information recorded in the ECU's memory for troubleshooting purposes, the maintainer must activate blink codes and select diagnostic modes using the ABS test switch and warning light in the tractor cab. When activated, trouble code messages from the ECU are flashed in the form of blinks. The maintainer must count and record the number of blinks in each sequence and refer to the Troubleshooting Tests Index to locate troubleshooting procedures.

The following procedure shall be followed to familiarize the use of blink codes and diagnostic modes for troubleshooting the ABS.

1. ACTIVATING BLINK CODES

- a. Turn on vehicle ignition and wait at least two seconds before pressing the ABS test switch.

NOTE

The ECU will not enter the blink code mode if the vehicle is in motion. Once in the blink code mode, if any wheel speed sensor detects motion the ECU will exit the blink code mode.

If the ABS test switch is depressed for more than five seconds the ECU will register a malfunctioning switch.

Each message includes a sequence of one or more groups of blinks that must be counted and recorded by the maintainer.

Once the ECU enters the blink code mode it will automatically remain in the active diagnostic mode and cannot be cleared via the test switch until all blink code messages have been displayed.

- b. Press and hold the ABS test switch for at least 1 second but no more than 5 seconds. This will activate (turn on) the blink codes. Once activated, wait 3.5 seconds to receive blink code messages.

2. READING BLINK CODE MESSAGES

- a. A sequence of one or more groups of blinks is called a message. Reading a message is based on counting the timing between blinks and adding up the number of digits in each sequence as follows:
 - 1) A digit is equal to a blink every half second. Consecutive digits are counted up until a pause in timing occurs. The total number of consecutive digits is recorded as a number which corresponds to a diagnostic trouble code. For example, four blinks a half second apart equal four digits and a blink code number of 4.
 - 2) A 1.5 second pause ends a digit count and begins the next digit count.
 - 3) A 2.5 second pause ends a message and begins the next digit count.
 - 4) The ABS warning lamp will illuminate for 5 seconds indicating the end of a message.

HOW TO USE ABS DIAGNOSTICS—CONTINUED

- b. To interpret a message, the first blink code number corresponds to a specific component and its location. The second blink code number corresponds to a symptom description and a correction action. The following example is designed to guide the maintainer through a typical blink code message.

- 1) Activate ECU blink codes. Refer to Activating Blink Codes above.
- 2) Count and record the numbers in the message. Refer to Reading Blink Code Messages above. For this example, the numbers are:

3, 2 and 12, 4

- 3) Go to the Diagnostic Trouble Codes Index. Refer to WP 0011. The first blink code numbers in the message are 3 and 12. Look down the 1st Blink Code Number column for number 3 and note the table number, work package, and page number.

NOTE

There are six Troubleshooting Diagnostic Trouble Code tables:
Wheel Speed Sensors, Pressure Modulator Valves, Power Supply,
J1939 Serial Communications, ECU, and Miscellaneous.

- 4) Go to the work package and page determined from the Diagnostic Trouble Codes Index, and refer to Table 1, Troubleshooting Diagnostic Trouble Codes: Wheel Speed Sensors. Look down the 1st Blink Code column for number 3. In this example, the location is the Right Steering Axle Wheel Sensor.
- 5) The second blink code numbers in the message are 2 and 4. Refer to table 1, and Look down the 2nd Blink Code column for number 2, and note the Diagnostic Trouble Code Description. In this example, the description is Output Low at Drive-off. Refer to the corrective action information for Output Low at Drive-off and perform the procedures given to correct the problem.
- 6) Repeat steps 3 through 5 above for numbers 12 and 4 in the second group of the message.
- 7) Clear the message Active Diagnostic Trouble Code Retrieval as described in Changing Diagnostic Modes below.

CHANGING DIAGNOSTIC MODES

The ECU has several diagnostic modes that can be selected by the maintainer. Each of these modes contain stored information or functions within the ECU. To select and retrieve this information or other ECU functions, the test switch is depressed a specific number of times; the system diagnostic modes are listed and described below.

No. of Times to Press Test Switch

System Diagnostic Mode Entered

1	Active Diagnostic Trouble Code Retrieval
2	Inactive Diagnostic Trouble Code Retrieval
3	Clear Active Diagnostic Trouble Codes
4	System Configuration Check Mode
5	Dynamometer Test Mode
7	Reconfigure ECU Mode

CHANGING DIAGNOSTIC MODES—CONTINUED

Active Diagnostic Trouble Code Mode—This mode is used for retrieving diagnostic trouble codes. When in this mode, the ECU transmits blink codes for diagnostic trouble codes. For a complete explanation, refer to How to Use ABS Diagnostics in this work package.

With the exception of wheel speed sensor trouble codes, active diagnostic trouble modes are cleared as problems are corrected during troubleshooting by simply turning the vehicle ignition switch off and on. Wheel speed sensor trouble codes will clear when power is turned off and on and the ECU detects valid wheel speed from all speed sensors.

Inactive Diagnostic Trouble Code Mode—This mode is used for retrieving past trouble codes and comments (such as configuration changes made to the ECU) stored in the ECU's memory. Whenever an active trouble code is cleared the ECU automatically stores the code in its memory bank as an inactive trouble code commonly referred to as event history. In this mode, inactive diagnostic blink codes are retrieved and reviewed by the maintainer to aid in troubleshooting the ABS.

Clear Active Diagnostic Trouble Codes—This mode is used to clear active diagnostic trouble codes. When cleared, active diagnostic trouble codes are permanently stored as event history in the ECU's memory.

System Configuration Check Mode—This mode is used to display system configuration information which tells the maintainer the type of ABS system the ECU has been programmed to operate. This configuration information is conveyed using the following blink code patterns:

1st No.	System Power
1	12 Volts
2	24 Volts
2nd No.	Wheel Speed Sensors
4	4 Sensors
6	6 Sensors
3rd No.	Pressure Modulator Valves
4	4 Modulators
5	5 Modulators
6	6 Modulators
4th No.	ABS Configuration
1	4S/4M or 6S/6M
2	6S/4M
3	6S/5M
5th No.	Tractor Control Configuration
2	No ATC
3	ATC Engine Control Only
4	ATC Brake Control Only
5	Full ATC (Engine and Brake Control)
6th No.	Retarder Configuration
1	No retarder
2	J1939 Retarder
3	Retarder Relay
4	J1939 Retarder, Retarder Relay

Table 1. Wheel Speed Sensors—Continued.

CHANGING DIAGNOSTIC MODES—CONTINUED

Dynamometer Test Mode—This mode is used to disable the Automatic Traction Control (ATC); the ABS for the M915A1 does not include ATC.

Reconfigure ECU Mode—This mode is used when replacing the ECU to verify the new unit has the correct default settings. The correct ECU for the M915A1 ABS is programmed and configured by part number. To access this mode, the test switch is pressed and held in prior to switching the vehicle ignition to ON position. Once power is on, the test switch is released and then pressed seven times to enter the Reconfiguration ECU Mode.

DIAGNOSTIC TROUBLE CODE TABLES**Table 1. Wheel Speed Sensors.**

1st Blink Code	Location	Corrective Action
2	Left steering axle wheel sensor	
3	Right steering axle wheel sensor	
4	Left drive axle wheel sensor	
5	Right drive axle wheel sensor	
2nd Blink Code	Fault	Corrective Action
1	Excessive air gap	a. Adjust sensor to contact tone ring. Refer to WP 0022. b. Rotate wheel and verify a minimum of 0.25 VAC sensor output at 0.5 Revolutions Per Second (RPS). c. Verify condition of sensor head. d. Verify mounting of tone ring and condition of slots. Refer to WP 0021. e. Verify proper bearing end play. Refer to WP 0019. f. Verify condition and tension of clamp sleeve. Refer to WP 0019. g. Verify sensor clamping and cable routing. Refer to WP 0022.
2	Output low at drive-off	a. Adjust sensor to contact tone ring. Refer to WP 0022. b. Rotate wheel and verify a minimum of 0.25 VAC sensor output at 0.5 RPS. c. Verify condition of sensor head. d. Verify mounting of tone ring and condition of slots. Refer to WP 0021. e. Verify proper bearing end play. Refer to WP 0019. f. Verify condition and tension of clamp sleeve. Refer to WP 0019. g. Verify sensor clamping and cable routing. Refer to WP 0022.

DIAGNOSTIC TROUBLE CODE TABLES—CONTINUED

2nd Blink Code	Fault	Corrective Action
3	Open or shorted	<ul style="list-style-type: none"> a. Verify 1,500–2,500 ohms across sensor leads. b. Verify no continuity between sensor leads and ground or voltage. c. Verify no continuity between sensor leads and other sensors. d. Check for corroded/damaged wiring or connectors between the ECU and the wheel speed sensor. Refer to WP 0035.
4	Loss of sensor signal	<ul style="list-style-type: none"> a. Adjust sensor to contact tone ring. Refer to WP 0022. b. Rotate wheel and verify a minimum of 0.25 VAC sensor output at 0.5 RPS. c. Verify condition of sensor head. d. Verify mounting of tone ring and condition of slots in tone ring. Refer to WP 0021. e. Verify proper bearing end play. Refer to WP 0019. f. Verify condition and tension of clamp sleeve. Refer to WP 0019. g. Verify sensor clamping and cable routing. Refer to WP 0022. h. Check for corroded/damaged wiring or connectors between ECU and wheel speed sensor. Refer to WP 0035.
5	Wheel end	<ul style="list-style-type: none"> a. Verify mounting of tone ring and condition of slots. Refer to WP 0021. b. Verify proper bearing end play. Refer to WP 0022. c. Verify no continuity between sensor leads and other sensors. d. Check for corroded/damaged wiring or connectors between the ECU and the wheel speed sensor. Refer to WP 0035. e. Check mechanical function of brake. Refer to TM 9-2320-283-20. f. Check for kinked or restricted air tubes and holes. Refer to WP 0023.

DIAGNOSTIC TROUBLE CODE TABLES—CONTINUED

Table 1. Wheel Speed Sensors—Continued.

2nd Blink Code	Fault	Corrective Action
6	Erratic sensor signal	a. Adjust sensor to contact tone ring. Refer to WP 0022. b. Rotate wheel and verify a minimum of 0.25 VAC sensor output at 0.5 RPS. c. Verify condition of sensor head. d. Verify mounting of tone ring and condition of slots. Refer to WP 0021. e. Verify proper bearing end play. Refer to WP 0019. f. Verify condition and tension of clamp sleeve. Refer to WP 0019. g. Verify sensor clamping and cable routing. Refer to WP 0022. h. Check for corroded/damaged wiring or connectors between ECU and wheel speed sensor. Refer to WP 0034.
7	Tire size calibration	a. Verify correct tire size as desired. b. Verify proper tire inflation. c. Verify correct number of tone ring slots.
8	Configuration	a. ECU is configured for four sensors but has detected the presence of additional sensors. b. Verify sensor wiring and ECU configuration.

Table 2. Pressure Modulator Valves (PMV).

1st Blink Code	Location	Corrective Action
7	Left steering axle PMV	
8	Right steering axle PMV	
9	Left drive axle PMV	
10	Right drive axle PMV	
2nd Blink Code	Fault	Corrective Action
1	Release solenoid shorted to ground	a. Verify no continuity between PMV leads and ground. b. Verify 4.9 to 5.5 ohms from REL to CMN and HLD to CMN and 9.8 to 11 ohms from REL to HLD. c. Check for corroded/damaged wiring or connectors between ECU and PMV.
2	Release solenoid shorted to voltage	a. Verify no continuity between PMV leads and voltage. b. Verify 4.9 to 5.5 ohms from REL to CMN and HLD to CMN and 9.8 to 11 ohms from REL to HLD. c. Check for corroded/damaged wiring or connectors between ECU and PMV.
3	Release solenoid open circuit	a. Verify 4.9 to 5.5 ohms from REL to CMN and HLD to CMN and 9.8 to 11 ohms from REL to HLD. b. Check for corroded/damaged wiring or connectors between ECU and PMV.

DIAGNOSTIC TROUBLE CODE TABLES—CONTINUED

Table 2. Pressure Modulator Valves (PMV)—Continued.

2nd Blink Code	Fault	Corrective Action
4	Hold solenoid shorted to ground	a. Verify no continuity between PMV leads and ground. b. Verify 4.9 to 5.5 ohms from REL to CMN and HLD to CMN and 9.8 to 11 ohms from REL to HLD. c. Check for corroded/damaged wiring or connectors between ECU and PMV.
5	Hold solenoid shorted to voltage	a. Verify no continuity between PMV leads and voltage. b. Verify 4.9 to 5.5 ohms from REL to CMN and HLD to CMN and 9.8 to 11 ohms from REL to HLD. c. Check for corroded/damaged wiring or connectors between ECU and PMV.
6	Hold solenoid open circuit	a. Verify 4.9 to 5.5 ohms from REL to CMN and HLD to CMN and 9.8 to 11 ohms from REL to HLD. b. Check for corroded/damaged wiring or connectors between ECU and PMV.
7	CMN open circuit	a. Verify 4.9 to 5.5 ohms from REL to CMN and HLD to CMN and 9.8 to 11 ohms from REL to HLD. b. Check for corroded/damaged wiring or connectors between ECU and PMV.
8	Configuration error	a. A mismatch exists between the ECU configuration and the modulator installation and wiring. b. Verify PMV wiring and installation. c. Verify ECU configuration.

Table 3. Power Supply.

1st Blink Code	Location	Corrective Action
6	Power supply (circuit 40 purple wire)	
2nd Blink Code	Fault	Corrective Action
1	Battery voltage too low	a. Measure battery voltage under load. b. Check vehicle battery and associated components. c. Check for damaged wiring. d. Check for damaged or corroded connectors and connections.

DIAGNOSTIC TROUBLE CODE TABLES—CONTINUED

Table 3. Power Supply—Continued.

2nd Blink Code	Fault	Corrective Action
2	Battery voltage too high	<ul style="list-style-type: none"> a. Measure battery voltage under load. b. Ensure battery voltage is correct for model of ECU. c. Check vehicle battery and associated components. d. Check for damaged or corroded connectors and connections. e. Check for damaged or corroded connectors and connections.
3	Battery voltage too low during ABS	<ul style="list-style-type: none"> a. Measure battery voltage under load. b. Ensure battery voltage is correct for model of ECU. c. Check vehicle battery and associated components. d. Check for damaged wiring. e. Check for damaged or corroded connectors and connections.
4	Battery voltage open circuit	<ul style="list-style-type: none"> a. Measure battery voltage under load. b. Check condition of fuse. c. Check vehicle battery and associated components. d. Check for damaged wiring. e. Check for damaged or corroded connectors and connections.
5	Ignition voltage too low	<ul style="list-style-type: none"> a. Measure ignition voltage under load. b. Check vehicle battery and associated components. c. Check for damaged wiring. d. Check for damaged or corroded connectors and connections. e. Check condition of fuse.
6	Ignition voltage too high	<ul style="list-style-type: none"> a. Measure ignition voltage. b. Ensure battery voltage is correct for model of ECU. c. Check vehicle battery and associated components. d. Check for damaged wiring. e. Check for damaged or corroded connectors and connections.
7	Ignition voltage too low during ABS	<ul style="list-style-type: none"> a. Measure ignition voltage under load. b. Check vehicle battery and associated components. c. Check for damaged wiring. d. Check for damaged or corroded connectors and connections.
8	Input voltage has excessive noise (temporary)	<ul style="list-style-type: none"> a. Check alternator output for excessive noise. b. Check for other devices causing excessive noise.
9	Input voltage has excessive noise	<ul style="list-style-type: none"> a. Check alternator output for excessive noise. b. Check for other devices causing excessive noise.

DIAGNOSTIC TROUBLE CODE TABLES—CONTINUED

Table 4. J1939 Serial Communications.

1st Blink Code	Location	Corrective Action
11	J1939	
2nd Blink Code	Fault	Corrective Action
1	J1939 Serial link	a. Loss of communications between ECU controller and other devices connected to J1939 link. b. Check for damaged or reversed J1939 wiring. c. Check for corroded or damaged connectors. d. Verify ECU configuration. e. Check for other devices inhibiting J1939 communications.
2	J1939 Retarder	a. Loss of communications between ECU controller and other devices connected to J1939 link. b. Check for damaged or reversed J1939 wiring. c. Check for corroded or damaged connectors. d. Verify presence of retarder on J1939 link. e. Check for other devices inhibiting J1939 communications.
3	J1939 Engine communications	a. Loss of communications between ECU controller and other devices connected to J1939 link. b. Check for damaged or reversed J1939 wiring. c. Check for corroded or damaged connectors. d. Verify presence of engine ECU on J1939 link. e. Verify ECU configuration. f. Check for other devices inhibiting J1939 communications.

Table 5. ECU.

1st Blink Code	Location	Corrective Action
13	ECU	
2nd Blink Code	Fault	Corrective Action
2	ECU (10)	All: a. Check for damaged or corroded connectors. b. Check for damaged wiring. c. Clear trouble codes; if diagnostic trouble codes return replace ECU.
3	ECU (11)	
4	ECU (12)	
5	ECU (13)	
6	ECU (14)	
7	ECU (15)	

DIAGNOSTIC TROUBLE CODE TABLES—CONTINUED

Table 5. ECU—Continued.

2nd Blink Code	Fault	Corrective Action
8	ECU (16)	
9	ECU (17)	
10	ECU (18)	
11	ECU (1A)	
12	ECU (1B)	
13	ECU (80)	

Table 6. Miscellaneous.

1st Blink Code	Location	Corrective Action
12	Miscellaneous	
2nd Blink Code	Fault	Corrective Action
1	Stop lamp switch not detected	<ul style="list-style-type: none"> a. ECU has not detected the presence of stop lamp switch since ignition power was applied (note: stop lamp switch input may be applied to the ECU controller using either hardwire input of J1939). b. Check for brake switch input into ECU (see system wiring schematic). With service brake released, check for presence of stop lamp bulb. With service brake applied, verify system voltage is now present at stop lamp switch input to ECU. c. Check for damaged wiring between ECU, stop lamp switch, and bulb. d. Check for corroded or damaged connectors. e. Check for damaged or reversed J1939 wiring. f. Check for corroded or damaged connectors on J1939 link. g. Verify presence of engine ECU on J1939 link. h. Verify ECU configuration.
2	Stop lamp switch defective	<ul style="list-style-type: none"> a. Apply and release service brake. Check for brake switch input into ECU (see system wiring schematic). b. With service brake released, check for presence of stop lamp bulb. c. With service brake applied, verify system voltage is now present at stop lamp switch input to ECU. d. Check for damaged wiring between ECU, stop lamp switch, and bulb. e. Check for corroded or damaged connectors. f. Check for reversed J1939 wiring. g. Check for corroded or damaged connectors on J1939 link. h. Verify presence of engine ECU on J1939 link. i. Verify ECU configuration.

DIAGNOSTIC TROUBLE CODE TABLES—CONTINUED

Table 6. Miscellaneous—Continued.

2nd Blink Code	Fault	Corrective Action
3	Dynamometer test mode	ECU has been placed in the Dynamometer Test Mode by either the diagnostic blink code switch or a hand-held or PC-based diagnostic tool.
4	Retarder relay open circuit or shorted to ground	<ul style="list-style-type: none"> a. Verify vehicle contains a retarder relay. b. Verify ECU configuration. c. Check wiring between ECU and retarder relay. d. Verify no continuity between retarder; disable output of ECU controller and ground. e. Verify condition and wiring of retarder relay.
5	Retarder relay circuit shorted to ground	<ul style="list-style-type: none"> a. Check wiring between ECU and retarder relay. b. Verify no continuity between retarder; disable output of ECU controller and ground. c. Verify condition and wiring of relay.
6	ABS warning light circuit fault	<ul style="list-style-type: none"> a. Check operation of ABS test switch. b. Verify ABS Warning Light ground input.
7	PMV common shorted to ground	<ul style="list-style-type: none"> a. Verify no continuity between CMN of all PMVs. b. Check for corroded/damaged wiring or connectors between ECU and CMN of all PMVs.
8	PMV common shorted to voltage	<ul style="list-style-type: none"> a. Verify no continuity between CMN of all PMVs. b. Check for corroded/damaged wiring or connectors between ECU and CMN of all PMVs.
9	Incorrect tire size	<ul style="list-style-type: none"> a. Verify correct tire size on tractor. b. Verify proper tire inflation. c. Verify correct number of tone ring teeth. d. Verify ECU has proper tire size settings.
10	Wheel speed sensors reversed on axle	<ul style="list-style-type: none"> a. Sensors are reversed (left to right) on one of axles. b. Verify proper installation, connection, and wiring of sensors.

DIAGNOSTIC TROUBLE CODE TABLES—CONTINUED**INDICATORS AND CONTROLS****SYMPTOM**

Warning light does not illuminate with ignition on.

MALFUNCTION

No power to ABS ECU due to blown ECU harness fuses or faulty warning light.

CORRECTIVE ACTION

1. Check 30-amp and 5-amp fuses on ABS ECU harness. Refer to WP 0030.
2. Check ABS warning light. Refer to WP 0032.

SYMPTOM

Warning light does not go out with ignition on.

MALFUNCTION

ABS ECU processing a system fault.

CORRECTIVE ACTION

1. Operate engine until low air pressure warning light and buzzer go off. Refer to WP 0005.
2. Refer to ABS Diagnostic Codes.

SYMPTOM

Warning light illuminated during vehicle operation.

MALFUNCTION

ABS ECU processing a system fault.

CORRECTIVE ACTION

Refer to ABS Diagnostic Codes in this work package.

BRAKE SYSTEM**SYMPTOM**

Parking brakes will not release.

MALFUNCTION

Air pressure is below 100 psi (7 bar) or an air leak can be heard.

CORRECTIVE ACTION

1. Operate engine until low air pressure warning light and buzzer go off. Refer to WP 0005.
2. Troubleshoot air leak in brake system. Refer to WP 0023.

SYMPTOM

Trailer brakes will not apply.

MALFUNCTION

Trailer brake hoses not connected to tractor, trailer couplers leaking, or trailer brakes are caged.

CORRECTIVE ACTION

1. Connect trailer air brake hoses to tractor. Refer to TM 9-2320-283-10.
2. Adjust trailer brake hose connections at couplers. Refer to TM P-2320-283-20.
3. Uncage trailer brakes. Refer to TM 9-2320-283-10.

DIAGNOSTIC TROUBLE CODE TABLES—CONTINUED**BRAKE SYSTEM—CONTINUED****SYMPTOM**

Brakes grab or pull to one side when applied.

MALFUNCTION

Brake shoes out of adjustment or brake chamber leaking or brake shoes contaminated with oil due to leaking axle seal.

CORRECTIVE ACTION

1. Adjust slack adjusters. Refer to TM 9-2320-283-10.
2. Check brake chamber. Refer to WP 0029 and TM 9-2320-283-20.
3. Check brake shoes for oil contamination and replace hub seal if necessary. Refer to WP 0019 or WP 0020.

SYMPTOM

Modulators cannot be heard to cycle when ignition is switched on.

MALFUNCTION

No power to ABS ECU due to blown ECU harness fuses or faulty warning light.

CORRECTIVE ACTION

1. Check 30-amp and 5-amp fuses on ABS ECU harness. Refer to WP 0030.
2. Check ABS warning light. Refer to WP 0032.

SYMPTOM

One or more wheels lock (skid) when service brake is applied.

MALFUNCTION

Brake shoes out of adjustment or wheel sensor(s) contaminated or out of adjustment.

CORRECTIVE ACTION

1. Adjust slack adjusters. Refer to TM 9-2320-283-10.
2. Check tone rings and wheel sensors for contamination or incorrect air gap. Refer to WP 0021 and WP 0022.

PNEUMATIC SYSTEM**SYMPTOM**

Air pressure will not build up to operating pressure.

MALFUNCTION

Leaking or damaged air tube(s), hose(s), or valve(s).

CORRECTIVE ACTION

Repair leaks or replace leaking or damaged air tubes, hoses, or valves. Refer to WP 0023.

DIAGNOSTIC TROUBLE CODE TABLES—CONTINUED**PNEUMATIC SYSTEM—CONTINUED****SYMPTOM**

Air pressure gauge indicates more than 120 psi (8.3 bar).

MALFUNCTION

Damaged pressure release governor or unloader valve.

CORRECTIVE ACTION

Check operation of valves. Refer to TM 9-2320-283-20.

SYMPTOM

Air is heard leaking from vehicle continuously.

MALFUNCTION

Quick-release valve damaged or stuck open.

CORRECTIVE ACTION

Check quick-release valve at tractor protection valve. Refer to WP 0028.

END OF WORK PACKAGE

CHAPTER 4

PMCS MAINTENANCE INSTRUCTIONS

OPERATOR MAINTENANCE
PMCS INTRODUCTION

GENERAL

PMCS is required to keep the equipment in good operating condition. Operator level PMCS is performed before and after operation to ensure the equipment is fully operational and ready at all times. Failure to perform PMCS as required may result in major damage or a failure which could compromise the mission or cause injury to personnel. Operators will perform PMCS as follows:

Ensure PMCS is performed each time the M915A1 equipped with ABS is operated.

When the equipment is operated for the first time or has not been operated for a three month period, notify Field Maintenance to perform PMCS inspection.

When the equipment has been operated for one month or 83 hours of operation (whichever comes first) notify Field Maintenance to perform PMCS inspection.

Observe all warnings, cautions, and notes when performing PMCS.

Always perform PMCS in the same order as written. With practice, this will enable operators to become familiar with the equipment and enable them to quickly spot anything wrong with the equipment.

Before operating of the M915A1 equipped with ABS, perform all "Before" PMCS steps.

During operation of the M915A1 equipped with ABS, perform all "During" PMCS steps.

After operating the M915A1 equipped with ABS, perform all "After" PMCS steps.

At any PMCS interval, if the item to be checked or serviced is found to be not ready or available, that problem must be corrected by troubleshooting and, if necessary, notify Field Maintenance to perform the task.

Ensure operator PMCS for the M915A1 equipped with ABS is performed each time the equipment is operated.

Whenever the equipment is found to be not ready or available and the problem cannot be resolved at the operator level, describe what is wrong with the equipment using DA Form 2404 or DA Form 5988-E. This will document the problem and help unit maintenance locate and correct it. For information on how to use this form, see DA PAM 750-8.

PURPOSE OF PMCS TABLE

The purpose of the PMCS table is to provide a systematic method of inspection and servicing of the equipment. In this way, small defects can be detected early and corrected before they become a major problem causing the equipment to fail. The PMCS table is arranged with the individual PMCS procedures listed in sequence under assigned intervals. The most logical time (before, during, and after operation) to perform each procedure determines the interval to which it is assigned. Make a habit of performing the checks in the same order each time; anything wrong will be seen quickly. Refer to WP 0012 for Operator PMCS.

PURPOSE OF PMCS TABLE-CONTINUED

The following is a list and description of the column headings in the PMCS table.

Item Number - This column shows the sequence in which the checks and services are to be performed and is used to identify the equipment area on the Equipment Inspection and Maintenance Worksheet, DA Form 2404 or DA Form 5988-E.

Interval - This column indicates when each check is to be performed.

Item To Be Checked or Serviced - This column identifies the item and location to be checked by part, component, or assembly name.

Procedure - This column explains what type of service, specific damage, or defect is to be checked.

Equipment Not Ready/Available If - This column lists conditions that make the equipment unavailable for use as a result of damage, missing parts, or improper functioning that would present a safety hazard. Do not accept or operate equipment with a condition noted in this column.

CORROSION PREVENTION AND CONTROL (CPC)

CPC of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported to ensure that the problem can be corrected and improvements can be made to prevent the problem in future items. 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. If a corrosion problem is identified, it can be reported using SF 368 Product Quality Deficiency Report (PQDR). Use key words, such as corrosion, rust, deterioration, or cracking to ensure that the information is identified as a CPC problem. The PQDR must be submitted to the address specified in DA Pam 750-8, The Army Maintenance Management System (TAMMS) Users Manual.

SPECIAL INSTRUCTIONS

Preventative maintenance is not limited to performing the checks and services listed in the PMCS table in this TM. Refer to TM 9-2330-283-10 for Operator PMCS or M915A1 tractor. When performing PMCS check all components as follows:

WARNING

There are no adverse effects on human health associated with the use of MIL-PRF-680 when used as intended; however when used indoors, ventilation shall be sufficient to prevent the accumulation of vapors above allowable exposure limits. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

When applying and removing MIL-PRF-680 Type II or IV degreasing solvent, personnel shall wear chemical-resistant gloves and a face shield or goggles to prevent skin and eye contact with solvent and oil, grease, and other contaminants removed with solvent. In case of skin contact, remove any contaminated clothing before reuse. In the event of eye contact, flush eyes with large amounts of water for at least 15 minutes or until irritation subsides. Do not have food or drink in the vicinity. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

SPECIAL INSTRUCTIONS-CONTINUED**WARNING**

Compressed air source shall not exceed 30 psi (207 kPa). When cleaning with compressed air, eye shields must be worn. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

CAUTION

To prevent contamination, do not clean internal surfaces of an hose, valve, or fitting with cleaning solvent compound. Failure to comply may result in damage to equipment.

NOTE

MIL-PRF-680 Type II and IV degreasing solvents shall be used as degreasers and cleaners for painted and unpainted metal parts. These two approved types of solvents are hydrocarbon-based, low-odor, and recyclable. In addition Type II and IV have a high flash point and are not defined as a flammable material. Type IV solvent contains citrus odor and has a stronger solvency than Type II solvent. Used MIL-PRF-680 solvent should not be mixed with other waste materials, especially those containing halogenated solvents, and disposal shall be in accordance with local, state, and Federal regulations.

Keep it clean - Dirt, grease, oil, and debris get in the way and may cover up a serious problem. Clean work area as needed. Use MIL-PRF-680 Type II or IV degreasing solvent to clean oil and grease from all exterior metal surfaces of equipment. Use a soap and water solution to clean dirt and debris from all exterior and interior surfaces and rinse thoroughly with clean water.

Bolts, nuts, and screws - Check them all for obvious looseness, missing, bent or broken condition. Look for corrosion around bolt heads. If mounting hardware is loose, damaged, or corroded, notify Field Maintenance.

Wiring harness, wires, and connectors - Look for cracked or broken wiring. If damaged wiring or loose connections are found, notify Field Maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
PMCS INCLUDING LUBRICATION INSTRUCTIONS**

INITIAL SETUP:**References**

TM 9-2320-283-10

GENERAL

This PMCS uses the one-look format beginning in the driver's side of cab and continuing from outside the cab in a counterclockwise direction around the tractor. Refer to table 1 for Operator PMCS of the ABS.

While performing PMCS, ensure components and assemblies are correctly installed. Incorrect installation may cause equipment damage or failure.

When checking / servicing an item, ensure that all attaching mounting hardware is properly secured. Loose, cracked, broken, or missing hardware may affect equipment performance or cause premature failure.

While performing PMCS, check under vehicle, axles, geared hubs, and inside engine compartment for noticeable air leaks.

LUBRICATION

There is no lubrication required for the ABS with the exception of packing the front wheel bearings with grease during installation of the front hubs. For lubrication instructions for the M915A1 tractor, refer to TM 9-2320-283-10.

Table 1. Operator Preventive Maintenance Checks and Services for ABS.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/AVAILABLE IF:
1	Before	M915A1 Tractor	Perform all “before” operation PMCS on tractor IAW TM 9-2320-283-20.	ABS warning does not illuminate or stays illuminated. a. Modulators cannot be heard to cycle. b. Modulators cannot be heard to dump air.
2		ABS Warning Light	Turn on ignition and observe ABS warning light illuminate and then go out.	
3		Modulators	a. When ignition is turned on, listen for all four modulators to cycle twice; a clicking sound should be heard. b. With ignition off, depress and hold service brake pedal down, turn ignition on, and listen for all four modulators to dump air.	
4	During	M915A1 Tractor	Perform all “during” operation PMCS on tractor IAW TM 9-2320-283-20.	ABS warning light stays illuminated during operation.
5	After	ABS Warning Light	Drive tractor and observe that ABS warning light does not stay illuminated during operation.	
6		M915A1 Tractor	Perform all “after” operation PMCS on tractor IAW TM 9-2320-283-20.	a. Any air leaks are heard. b. Air pressure drops rapidly.
7		Air Pressure Gauges	a. Park tractor, stop engine, depress service brake pedal and listen for air leaks. b. Depress and hold service brake pedal down for 10 seconds and observe air pressure gauge for any rapid drop in pressure.	

END OF TASK**END OF WORK PACKAGE**

**FIELD MAINTENANCE
PMCS INTRODUCTION**

GENERAL INFORMATION

To maintain vehicles covered by this TM, inspect them on a regular basis to ensure that minor faults are discovered and corrected before they result in serious injury to personnel or damage or failure to equipment. All intervals are based on normal operation. Hard time intervals may be shortened if your lubricants are contaminated or if you are operating the equipment under adverse conditions, including longer-than-usual operating hours. Hard time intervals may be extended during periods of low activity, though adequate preservation precautions must still be observed. This work package contains instructions of items to be checked or serviced by identifying inspections, adjustments, lubrication, and corrections to be performed on vehicle components to avoid costly repairs or major breakdowns.

The preventive maintenance for which you are responsible is located in WP 0016. The checks and services listed include those in TM 9-2320-283-20 and those pertaining to the ABS. When performing maintenance on a system, consult the PMCS table after completing a procedure, perform the final inspection, and functional tests necessary to return the vehicle to a serviceable state. All problems detected during PMCS must be resolved before the vehicle can return to service.

INTERVALS

Field maintenance, assisted by operator/crew, will perform checks and services contained in the PMCS table. Refer to WP 0016 at the following intervals:

1. **Monthly (M)**: Every month.
2. **Quarterly (Q)**: Every 3 months or 5,000 km (3,107 mi), whichever occurs first.
3. **Semi-Annually (S)**: Every 6 months or 10,000 km (6,214 mi), whichever occurs first.
4. **Annually (A)**: Every 12 months or 20,000 km (12,427 mi), whichever occurs first.
5. **Biennially (B)**: Every 24 months or 40,000 km (24,854 mi), whichever occurs first.

REPORTING REPAIRS

All vehicle shortcomings will be reported on DA Form 2404 Equipment Inspection and Maintenance Worksheet or DA Form 5988-E (automated) (DA PAM 750-8) immediately after the PMCS is performed and before performing corrective actions. All vehicle deficiencies will be reported in the equipment record.

CORROSION PREVENTION AND CONTROL (CPC)

CPC of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported to ensure that the problem can be corrected and improvements can be made to prevent the problem in future items. 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. If a corrosion problem is identified, it can be reported using SF 368 Product Quality Deficiency Report (PQDR). Use key words, such as corrosion, rust, deterioration, or cracking to ensure that the information is identified as a CPC problem. The PQDR must be submitted to the address specified in DA Pam 750-8, The Army Maintenance Management System (TAMMS) Users Manual.

FLUID LEAKAGE

It is necessary to know how fluid leakage affects the status of the M915A1 tractor. Following are types/classes of leakage you need to know to be able to determine the status of the vehicle. Learn these leakage definitions and remember—when in doubt, notify your supervisor.

NOTE

Equipment operation is allowed with minor leakages (Class I or II). Consideration must be given to fluid capacity in the item/system being checked/inspected. When in doubt, notify your supervisor.

When operating with Class I or II leaks, continue to check fluid levels as required in the PMCS. Class III leaks should be reported immediately to your supervisor. The following information will provide a definition of the leak classes:

1. Class I. Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
2. Class II. Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.
3. Class III. Leakage of fluid great enough to form drops that fall from item being checked/inspected.

GENERAL MAINTENANCE PROCEDURES

The following information will assist with general maintenance type procedures:

WARNING

There are no adverse effects on human health associated with the use of MIL-PRF-680 when used as intended; however when used indoors, ventilation shall be sufficient to prevent the accumulation of vapors above allowable exposure limits. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

When applying and removing MIL-PRF-680 Type II or IV degreasing solvent, personnel shall wear chemical-resistant gloves and a face shield or goggles to prevent skin and eye contact with solvent and oil, grease, and other contaminants removed with solvent. In case of skin contact, remove any contaminated clothing before reuse. In the event of eye contact, flush eyes with large amounts of water for at least 15 minutes or until irritation subsides. Do not have food or drink in the vicinity. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

NOTE

Degreasing solvents shall be used as degreasers and cleaners for painted and unpainted metal parts. These two approved types of solvent are hydrocarbon-based, low odor, and recyclable. In addition Type II or IV have a high flash point and are not defined as a flammable material. Type IV solvent contains a citrus odor and has a stronger solvency than Type II solvent. Used MIL-PRF-680 solvent should not be mixed with other waste materials, especially those containing halogenated solvents, and disposal shall be in accordance with local, state, and Federal regulations.

GENERAL MAINTENANCE PROCEDURES – CONTINUED

1. **Cleanliness.** Dirt, grease, oil, and debris only get in the way and may cover up a serious problem. Use MIL-PRF-680, Type II or IV, degreasing solvent on all painted or unpainted metal surfaces and soapy water on rubber.
2. **Bolts, Nuts, and Screws.** Check bolts, nuts, and screws for obvious looseness, and missing, bent, or broken conditions. Look for chipped paint, bare metal, or rust around bolt heads. If any part seems loose, tighten it. If any part is broken or missing, replace it.
3. **Welds.** Look for loose or chipped paint, rust, or gaps where parts are welded together. If a bad weld is found, notify your supervisor.
4. **Electric Wires and Connectors.** Look for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors and ensure wires are in good shape. If a bad wire or connector is found, notify your supervisor.
5. **Hydraulic Lines and Fittings.** Look for wear, damage, and leaks; ensure clamps and fittings are tight. Wet spots show leaks. Stain around a fitting or connector can mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, repair or replace it.
6. **Damage.** Damage is defined as any condition that affects safety or would make the M915A1 tractor unserviceable for mission requirements.

EXPLANATION OF COLUMNS

The following information defines the column titles within the PMCS table:

1. **ITEM NO.** Numbers in this column shall be used as a source of item numbers for the TM Number Column on DA Form 2404 (Equipment Inspection and Maintenance Worksheet), in recording results of PMCS.
2. **INTERVAL COLUMN.** The interval column identifies when to do a certain check or service.
3. **ITEM TO BE CHECKED OR SERVICED.** This column identifies the item to be checked or serviced.
4. **PROCEDURE.** The procedure column of the PMCS table identifies how to perform the required checks and services.
5. **EQUIPMENT NOT READY/AVAILABLE IF.** This column identifies what faults will keep the vehicle from being capable of performing its primary mission. If the faults listed in this column are discovered while performing PMSC procedures, do not operate the vehicle until all faults are corrected. Follow standard operating procedures for maintaining the vehicle or reporting equipment failure.

END OF WORK PACKAGE

FIELD MAINTENANCE
PMCS INCLUDING LUBRICATION INSTRUCTIONS

INITIAL SETUP:**Tools and Special Tools**

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)

References

TM 9-2320-283-20

GENERAL

This PMCS uses the one look format beginning in the driver's side of cab and continuing from outside the cab in a counterclockwise direction around the tractor. Refer to table 1 for Field PMCS of the ABS.

While performing PMCS, ensure components and assemblies are correctly installed. Incorrect installation may cause equipment damage or failure.

When checking/servicing an item, ensure that all attaching / mounting hardware is properly secured. Loose, cracked, broken, or missing hardware may affect equipment performance or cause premature failure.

While performing PMCS, check under vehicle, axles, geared hubs, and inside engine compartment for signs of oil or coolant leaks.

LUBRICATION

There is no lubrication required for the ABS with the exception of packing the front wheel bearings with grease during installation of the front hubs. For lubrication instructions for the M915A1 tractor, refer to TM 9-2320-283-20.

Table 1. Field Preventative Maintenance Checks and Services.

ITEM NO.	INTERVAL	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
1	Before	M915A1 Tractor	Perform all “before” operation PMCS on tractor IAW TM 9-2320-283-20.	ABS warning does not illuminate or stays illuminated. a. Modulators cannot be heard to cycle. b. Modulators cannot be heard to dump air.
2		ABS Warning Light	Turn on ignition and observe ABS warning light illuminate and then go out.	
3		Modulators	a. When ignition is turned on, listen for all four modulators to cycle twice; a clicking sound should be heard. b. With ignition off, depress and hold service brake pedal down, turn ignition on, and listen for all four modulators to dump air.	
4		Air Lines and Fittings	Check for damage and audible air leaks.	
5	During	Wiring Harness and Wiring Connectors	Check for cut, frayed, or damaged wiring and loose or damaged connectors.	Any cut, frayed, damaged, or loose wiring or connectors are found. ABS warning light stays illuminated during operation.
6		M915A1 Tractor	Perform all “during” operation PMCS on tractor IAW TM 9-2320-283-20.	
7		ABS Warning Light	Drive tractor and observe that ABS warning light does not stay illuminated during operation.	
8	After	M915A1 Tractor	Perform all “after” operation PMCS on tractor IAW TM 9-2320-283-20.	a. Any air leaks are heard. b. Air pressure drops rapidly.
9		Air Pressure Gauges	a. Park tractor, stop engine, depress service brake pedal and listen for air leaks. b. Depress and hold service brake pedal down for 10 seconds and observe air pressure gauge for any rapid drop in pressure.	

END OF TASK**END OF WORK PACKAGE**

CHAPTER 5

MAINTENANCE INSTRUCTIONS

**FIELD MAINTENANCE
SERVICE UPON RECEIPT**

INITIAL SETUP:**References**

DA PAM 750-8
DD Form 314
DD Form 361
DD Form 1397
TM 9-2320-283-10
TM 9-2320-283-20
TM 9-2355-103-20
WP 0016
WP 0018
WP 0037

SERVICE UPON RECEIPT OF MATERIEL

Upon receipt of a new, used, or reconditioned vehicle, refer to TM 9-2320-283-10 and perform the following steps to determine if the vehicle has been properly prepared for service.

NOTE

The operator will assist when performing service-upon-receipt inspections.

Refer to TM 9-2355-103-20 and other work packages in this TM when servicing, inspecting, and lubricating equipment.

Inspect equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 361, Transportation Discrepancy Report.

Check the equipment against the packing slip to ensure the shipment is complete. Report discrepancies in accordance with applicable service instructions on DA PAM 750-8, The Army Maintenance Management System (TAMMS) User Manual.

Inspect all assemblies, subassemblies, and accessories to ensure they are in proper working order.

Secure, clean, lubricate, or adjust equipment as indicated in the Preventive Maintenance Checks and Services (PMCS). Refer to WP 0016 and WP 0037.

Check all Basic Issue Items (BII) to ensure every item is present, in good condition, and properly mounted or stowed.

Read Processing and Deprocessing Record of Shipping, Storage, and Issue of Vehicles and Spare Engines tag (DD Form 1397), and follow all precautions listed. This tag should be attached to steering wheel, shift column, or battery switch.

Perform annually or 6,000 mi (9,656 km) PMCS listed in WP 0016.

Lubricate the vehicle according to the instructions found in WP 0016 and in TM 9-2320-283-20.

Schedule semiannual service on DD Form 314 (Preventive Maintenance Schedule and Record Card).

INSTALLATION INSTRUCTIONS

For installation of the ABS Kit for the M915A1 tractor, refer to WP 0018.

ABS KIT MATRIX

The ABS installation consists of three separate kits: KIT # 000-008-19-25, KIT # 001AFB, and KIT # 002HDW. Prior to installation, refer to the ABS Kit Matrix Table and identify and inventory all parts contained in each kit. Refer to WP 0018 for ABS Kit Installation Instructions.

Table 1. ABS KIT # 000-008-19-25 Matrix.

DESCRIPTION	PART NUMBER	NSN	CAGE CODE	QTY
Front Wheel Seal	CHR/35066	5330-01-149-9677	80201	2
Rear Wheel Seal	CHR/47697	5330-01-117-1014	80201	2
Quick Release Valve	BW/800333	2530-01-531-2330	06853	1
Front Hub Cap	CHR/1711	2530-01-424-0396	80201	2
Drop Elbow	BW/233420		06853	
Split Loom	PHM/5-023			Bulk
Momentary Switch	CHS/9095	5930-00-221-8992	13445	1
Front Harness	000-019-19-25		06YZ5	1
Rear Harness	000-019-19-26		06YZ5	1
ECU Pigtail	000-109-19-27		06YZ5	1
Complete Harness	JG-55287-D		06YZ5	1
Diagnostic Cable	BW/800790		06853	1
Harness	BW/801995		06853	1
Wheel Sensor	BW/801543		06853	4
Module	BW/801481		06853	4
ABS Assembly	BW/801877		06853	1
Rear Wheel Hub	GUN/HR936K	2530-01-496-5641	73972	2
Exciter Ring	GUN/W1438		73972	2
Rear Stud	GUN/W1322L		73972	10
Rear Stud	GUN/W1322R		73972	10
Rear Brake Sensor	CM/103620H	2590-01-478-9451	4N501	2
Front Hub	GUN/HF801K	2530-01-159-3022	73972	2
Front Exciter Ring	000-008-01-01		06YZ5	2
Front Stud	GUN/W1090L		73972	10
Front Stud	GUN/W1090L		73972	10
Front Drum	GUN/W3710X		73972	2
Brake Chamber	HDX/GC3030	2533-01-083-2502	06721	2
Warning Light	L1 AMBER		06YZ5	1
1/2 Adapter Fitting	W1468X6X2			1

ABS KIT MATRIX – CONTINUED

Table 2. ABS KIT # 001AFB Matrix.

DESCRIPTION	PART NUMBER	NSN	CAGE CODE	QTY
Tubing, 5/8" Green <ul style="list-style-type: none"> • Relay Valve to Left Modulator (45") • Relay Valve to Right Modulator (29-1/2") • Right-Rear Modulator to Right-Rear Bulkhead Fitting (12") • Left-Rear Modulator to Left-Rear Bulkhead Fitting (48") • Right-Rear Modulator to Right-Front-Front Bulkhead Fitting • Left-Rear Modulator to Left-Front Bulkhead Fitting • Rear Air Tank to Foot Valve (168") 	PH/PFT-10BGRN100		53248	29'
Tubing, 1/2" Green <ul style="list-style-type: none"> • Foot Valve to Stop Light Switch (12") 	PH/PFT-8BGRN100		53248	1'
Tubing, 1/2" Blue <ul style="list-style-type: none"> • Stop Light Switch to Tractor Protection Valve (112") 	PH/PFT-8BBLU100		53248	10'
Tubing, 1/2" Red <ul style="list-style-type: none"> • QR1 with Check Valve to Mountable Tee Fitting (80") • Mountable Tee to Right-Rear Brake Chamber (26") • Mountable Tee to Left-Rear Brake Chamber (29") 	PH/1220-8BRED100		53248	7'
Rubber Air Hose <ul style="list-style-type: none"> • Right-Rear Bulkhead Fitting to Right-Rear Chamber (29") • Left-Rear Bulkhead Fitting to Left-Rear Chamber (29") • Right-Front Bulkhead Fitting to Right Forward-Rear Axle Chamber (29") 	ABS1		06YZ5	3'

ABS KIT MATRIX – CONTINUED

Table 2. ABS KIT # 001AFB Matrix – Continued.

DESCRIPTION	PART NUMBER	NSN	CAGE CODE	QTY
Right Blackout Light Mount	001-020-19-29		06YZ5	1
Left Blackout Light Mount	001-020-19-30		06YZ5	1
Right Tail Light Mount	001-020-19-31		06YZ5	1
Left Tail Light Mount	001-020-19-32		06YZ5	1
Right Modulator Mount	001-020-19-33		06YZ5	1
Left Modulator Mount	001-020-19-34		06YZ5	1
Bulkhead Bracket for Front Crossmember	001-020-19-35		06YZ5	1
Bulkhead Bracket for Right-Front and Left-Rear Frame Rail	001-020-19-36		06YZ5	2
Bulkhead Bracket for Left-Front and Right-Rear Frame Rail	001-020-19-37		06YZ5	2
Bulkhead Bracket for Forward-Rear Axle Housing	001-020-19-38		06YZ5	1

Table 3. ABS KIT # 002HDW Matrix.

DESCRIPTION	PART NUMBER	NSN	CAGE CODE	QTY
Cotter Pin	41-1222	5315-00-043-1782	6H404	2
1/2X8 PIPE	54X8		6H404	1
1/2PX#8 Flare 45 Degree RT	54X8X8			3
3/8P Bulkhead Fitting	HDX/11307		6H404	2
5/8TX1/2P Straight	W1468X10		06721	3
3/4P X 5/8T Straight Fitting	W14681012		6H404	1
1/4 pipe x 1/2 Tube Straight Fitting	W1468x8x4		6H404	1
3/8PX 1/2T Straight Fitting	W1468X8		6H404	6
1/2TX1/2P Straight	W1468X8X8		6H404	1
1/4PX Z 3/8T 90 Degree Fitting	W1469X6		6H404	1
3/8P X 1/2T 90 Degree Fitting	W1469X6X6		6H404	1
5/8TX1/2P 45 Degree	W1480X10		6H404	3
3/8P X 1/2T 45 Degree Fitting	W1480X6X6		6H404	1
3/8P X 1/2T 45 Degree Fitting	W1480X8		6H404	2
1/2TX1/2P 45 Degree	W1480X8X8		6H404	1
1/2" Bulkhead Fitting	PH/207ACBH-8		53248	4
1/2 Loom Clamp	W26723		6H404	1
3/4 Loom Clamp	W26725		6H404	1

ABS KIT MATRIX – CONTINUED**Table 3. ABS KIT # 002HDW Matrix – Continued.**

DESCRIPTION	PART NUMBER	NSN	CAGE CODE	QTY
3/8 Pipe Plug	W3152X6		6H404	1
1/2P To 3/8P Reducer	W3220X8X6		6H404	2
5/8 - 11 Flange Locknut	W323102		6H404	16
3/4P 45 Degree Fitting	W3350X12		6H404	2
3/8P 45 Degree Fitting	W3350X6		6H404	2
1/2P 45 Degree Fitting	W3350X8		6H404	1
1/4 - 20 Locknut	W343804		6H404	1
5/8 - 18 Locknut	W34-4910	5310-00-198-6691	6H404	1
5/16 X 18 Locknut	W348705		6H404	1
1/4 Flat Washer	W373804		6H404	1
5/16 Flat Washer	W373805		6H404	1
3/4P Straight Tee	W3750X12		6H404	1
1/2P Straight Tee	W3750X8		6H404	1
1/4 - 20 X 1 Bolt	W380408		6H404	1
1/4 - 20 X 3 1/2 Bolt	W380428		6H404	1
Hub Cap Bolts, 5/16-18 X 3/4	W380506		6H404	12
5/16 - 18 X 3 Bolt	W380524		6H404	1
Cotter Pin 146/150	W411008	5315-00-187-9549	6H404	2
3/8P X #8 Flare Straight Fitting	W48X8		6H404	1
Twist Ties	W26681		6H404	A/R
Twist Ties	W26764		6H404	A/R
Connector	WBSN-331		6H404	2
Connector	WB-539-10		6H404	2
1/2 Adapter Fitting	W1468X6X2		6H404	1
Connector	3155X2		6H404	1

END OF WORK PACKAGE

FIELD MAINTENANCE ABS KIT INSTALLATION

INITIAL SETUP:

Tools and Special Tools

General mechanic tool set (WP 0063, Table 2, Item 8)
 Shop tools (WP 0063, Table 2, Item 9)
 11/16 in. reamer (WP 0063, Table 2, Item 10)
 Seal installer (WP 0063, Table 2, Items 3 through 7)
 4-1/8 in. socket (WP 0063, Table 2, Item 1)
 2-1/4 in. socket (WP 0063, Table 2, Item 2)
 5/16 in. Drill bit (WP 0063, Table 2, Item 11)

Materials/Parts

Grease (WP 0066, Item 8)
 Electrical tape (WP 0066, Item 9)
 Sealing compound (WP 0066, Item 5)
 Sealing compound (WP 0066, Item 6)
 KIT # 000-008-19-25 (WP 0014, Table 1)
 KIT # 001AFB (WP 0014, Table 2)
 KIT # 002HDW (WP 0014, Table 3)
 16 locknuts (WP 0056, Item 4)

References

TM 9-2320-283-10
 TM 9-2320-283-20

Equipment Condition

Vehicle parked on hard level surface.
 Parking brake set (TM 9-2320-283-10).
 Battery power disconnected (TM 9-2320-283-20-2).
 Mud flaps removed (TM 9-2320-283-10).
 Blackout tail lamps and brackets removed
 (TM 9-2320-283-20).
 Stop/tail lamp and brackets removed
 (TM 9-2320-283-20).
 Trailer receptacle removed (TM 9-2320-283-20).
 Hood raised and secured (TM 9-2320-283-10).

Personnel Required

Assistant

CAUTION

Ensure all tools required to install ABS kit are acquisitioned and used during installation. Failure to use proper tools may result in damage to equipment.

NOTE

Where applicable, ABS kit items called out within text and illustrations are identified by their part number adjacent to the corresponding callout number in the illustration. All existing components/parts to be reused during installation of the ABS kit shall be cleaned and inspected prior to installation IAW TM 9-2320-283-20.

GENERAL

The ABS installation consists of three separate kits: KIT # 000-008-19-25, KIT # 001AFB, and KIT # 002HDW. Prior to installation, refer to WP 0014 ABS Kit Matrix and identify and inventory all parts contained in each kit.

REMOVING WHEELS

WARNING

Ensure wheel chocks are placed in front of tires opposite the end of tractor to be raised and parking brake is released. If tractor is not free to roll toward jack during jacking operations, tractor may topple jack. Failure to comply may result in injury or death to personnel. Seek medical attention in the event of an injury.

REMOVING WHEELS – CONTINUED

WARNING

Ensure jack is rated at 20-ton and jack stands are rated at 10-ton to support weight of truck. Do not get under tractor unless it is properly supported by jack stands. Failure to comply may result in injury or death to personnel. Seek medical attention in the event of an injury.

1. Place wheel chock in front of both tires (figure 1, item 2) on front axle (figure 1, item 1).

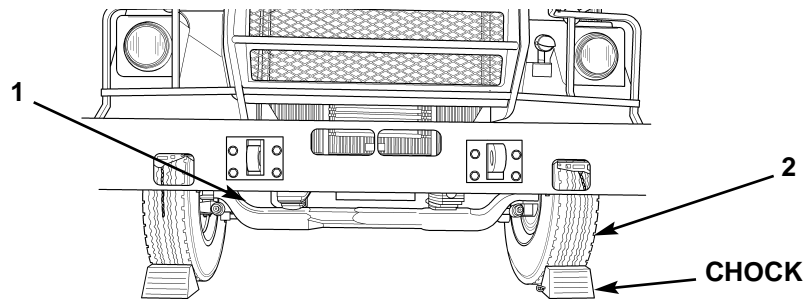


Figure 1. Chocking Front Wheels.

2. Release parking brake and drain air reservoirs. Refer to TM 9-2320-283-10.
3. Position suitable floor jack under center of axle housing on rear-rear axle (figure 2, item 1), and raise rear-rear axle (figure 2, item 1) until tires (figure 2, item 2) are approximately 1 in. (25.4 mm) off ground.
4. Position jack stand under axle housing at each side of rear-rear axle (figure 2, item 1) and lower rear-rear axle (figure 2, item 1) making sure tires are still off ground when axle is fully supported on jack stands. Remove floor jack from under truck.

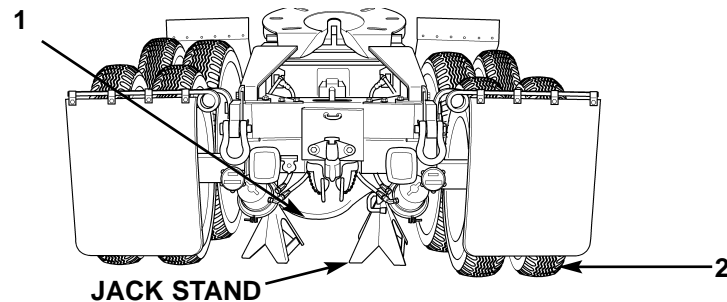


Figure 2. Jacking Rear-Rear Axle.

5. Place wheel chock in front of both tires (figure 3, item 2) on forward-rear axle (figure 3, item 1) at both sides of tractor.

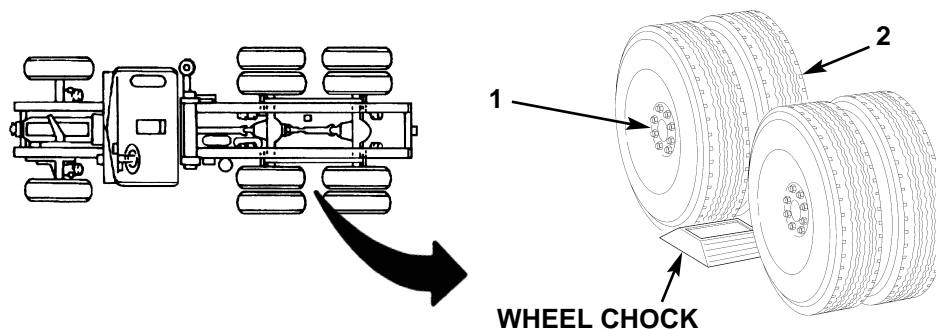


Figure 3. Chocking Wheels on Forward-Rear Axle.

REMOVING WHEELS – CONTINUED

6. Position suitable floor jack under center of front axle beam (figure 4, item 3), and raise front axle beam (figure 4, item 3) until tires (figure 4, item 1) are approximately 1 in. (25.4 mm) off ground.
7. Position jack stand under first leaf spring (figure 4, item 2) at each side of front axle beam (figure 4, item 3), and lower front axle beam (figure 4, item 3) making sure tires are still off ground when fully supported on jack stands. Remove floor jack from under truck.

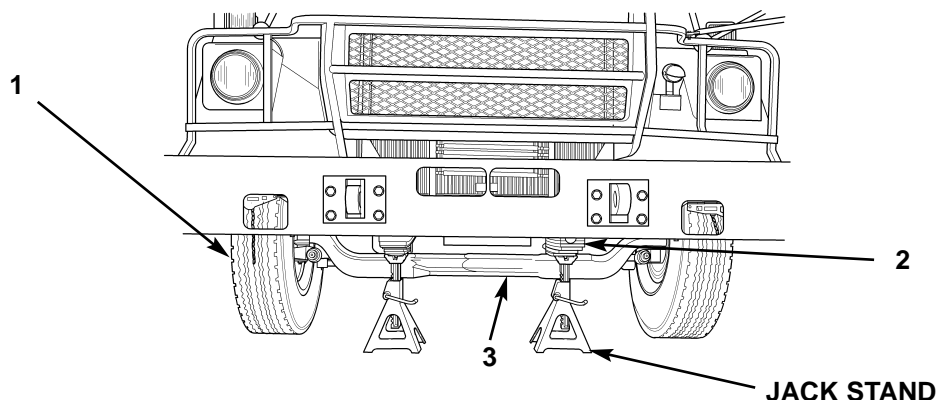


Figure 4. Jacking Front Axle.

CAUTION

Lug nuts and wheel studs are stamped (L) for left-hand treads and (R) for right-hand threads. Prior to removal, identify lug nuts and wheel studs, and ensure lug nuts are turned in the correct direction or damage to equipment will result.

NOTE

Mark location of wheel and tire assemblies for installation.

7. Using suitable impact wrench and socket, remove 10 lug nuts (figure 5, item 1) and outer wheel and tire assembly (figure 5, item 3) from dual wheel cap nuts (figure 5, item 2) on rear-rear axle (figure 5, item 4).
8. Using suitable impact wrench and socket, remove 10 dual wheel cap nuts (figure 5, item 7) and inner wheel and tire assembly (figure 5, item 5) from wheel studs (figure 5, item 6) and rear-rear axle hub (figure 5, item 8).
9. Repeat steps 7 and 8 to remove opposite outer and inner wheel and tire assemblies from rear-rear axle.

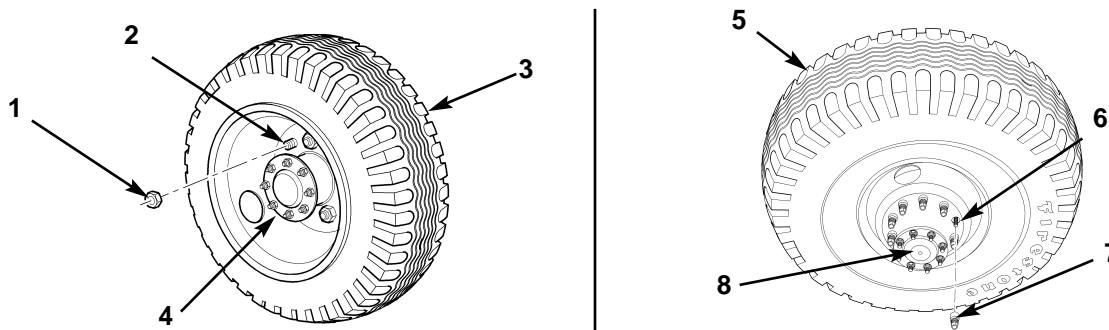


Figure 5. Removing Wheels from Rear-Rear Axle Hubs.

REMOVING WHEELS – CONTINUED

10. Using suitable impact wrench and socket, remove 10 lug nuts (figure 6, item 1) and wheel and tire assembly (figure 6, item 3) from wheel studs (figure 6, item 2) and front axle hub (figure 6, item 4).
11. Repeat step 10 to remove opposite wheel and tire assembly from front axle hub (figure 6, item 4).

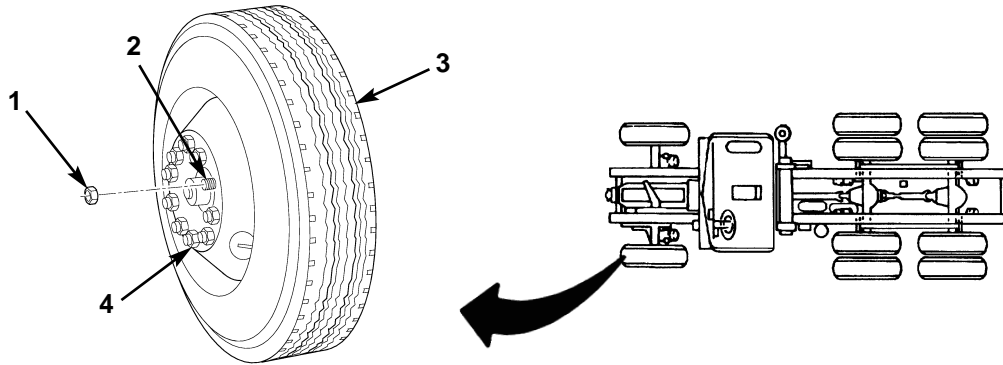


Figure 6. Removing Wheels from Front Axle Hubs.

END OF TASK**REAR-REAR AXLE COMPONENTS INSTALLATION**

1. Depress and rotate screw (figure 7, item 5) on slack adjuster (figure 7, item 6) until brake drum (figure 7, item 2) can be rotated freely at both ends of rear-rear axle (figure 7, item 1).

WARNING

Two personnel are required to remove brake drum from hub. Brake drum weighs 85 lbs (39 kg). Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

NOTE

In order to remove brake drum, it may be necessary to strike the drum with a hammer to free it from hub flange.

2. Carefully slide brake drum (figure 7, item 2) off wheel studs (figure 7, item 3) and remove from hub (figure 7, item 4) at both ends of rear-rear axle (figure 7, item 1).

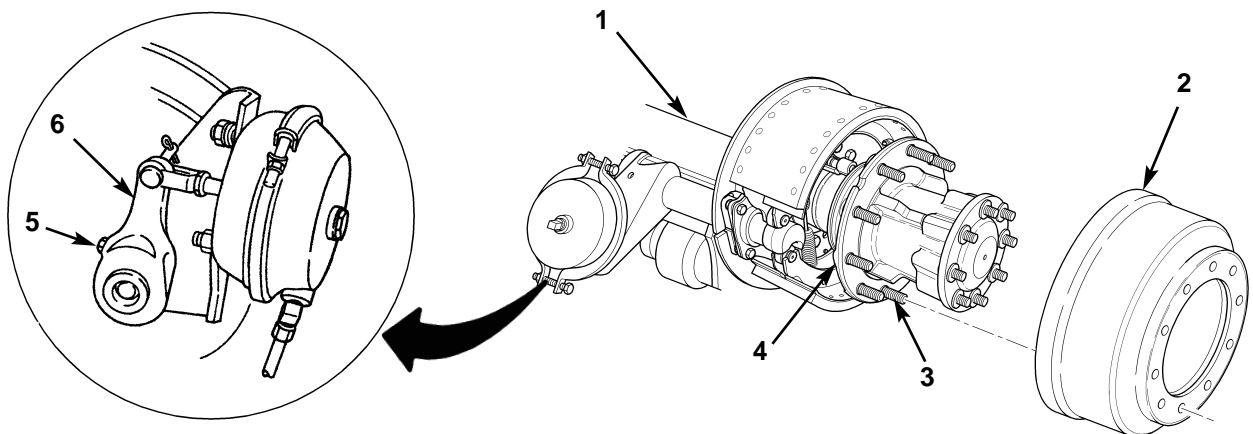


Figure 7. Removing Rear Brake Drums.

REAR-REAR AXLE COMPONENTS INSTALLATION – CONTINUED**WARNING**

Leaking or spilled oil may cause a slip and fall hazard. Clean any leaking or spilled oil immediately, using suitable fluid absorbent materials. Dispose of contaminated cloths, rags, or cleaning materials in accordance with local procedures and plans. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

NOTE

In order to remove the axle shaft, it may be necessary to strike the axle shaft flange with a hammer to free it from the hub.

3. Position clean, dry drain pan under rear-rear axle hub (figure 8, item 1), and remove eight locknuts (figure 8, item 4), washers (figure 8, item 3), and axle shaft (figure 8, item 2) from hub (figure 8, item 1). Discard locknuts (figure 8, item 4).

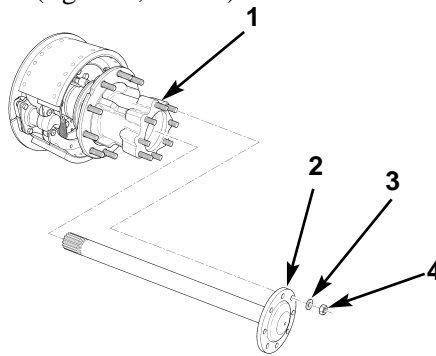


Figure 8. Removing Axle Shaft.

5. Bend tabs on lockwasher (figure 9, item 4) away from outer nut (figure 9, item 5). Using 4-1/8 in. (105 mm) socket, remove outer nut (figure 9, item 5), lockwasher (figure 9, item 4), and inner nut (figure 9, item 6) from axle housing spindle (figure 9, item 8). If tabs are broken, replace lockwasher (figure 9, item 4).
6. Remove outer bearing cone (figure 9, item 7) and rear wheel hub (figure 9, item 3) from axle housing spindle (figure 9, item 8).

NOTE

Bearing cups will not be removed from rear wheel hub and are discarded with hub.

7. Using suitable drift and hammer, remove seal (figure 9, item 1) and inner bearing cone (figure 9, item 2) from rear wheel hub (figure 9, item 3). Discard seal (figure 9, item 1) and rear wheel hub (figure 9, item 3).
8. Repeat steps 3 through 7 to remove opposite axle shaft and hub assembly from rear-rear axle.

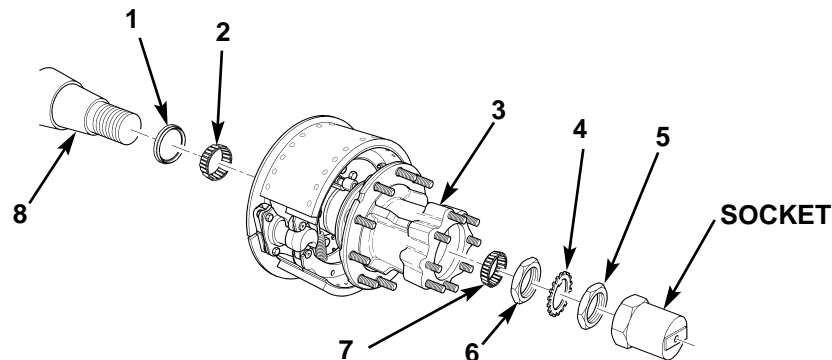


Figure 9. Removing Hub and Wheel Bearings.

REAR-REAR AXLE COMPONENTS INSTALLATION – CONTINUED

9. Remove two locknuts, (figure 10, item 4), washers (figure 10, item 3), and screws (figure 10, item 5) from top two holes in axle housing and brake spider (figure 10, item 1). Retain washers (figure 10, item 3) and discard locknuts (figure 10, item 4) and screws (figure 10, item 5).

WARNING

Metal shavings are sharp and may fly out during reaming operations. Wear eye protection when enlarging hole with reamer. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Protect spindle shaft when enlarging hole in brake spider and axle housing. Ensure all metal shavings are cleaned from spindle and brake spider. Failure to comply may result in damage to equipment.

10. Using 11/16 in. (17.5 mm) reamer, enlarge existing hole (figure 10, item 2) between top two holes in axle housing and brake spider (figure 10, item 1).

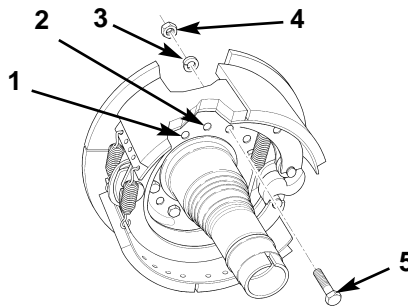


Figure 10. Enlarging Hole in Brake Spider.

11. Install new clamp sleeve (figure 11, item 2) and new sensor (figure 11, item 1) on new sensor mounting bracket (figure 11, item 3). Slide sensor (figure 11, item 1) approximately half way in clamp sleeve (figure 11, item 2).

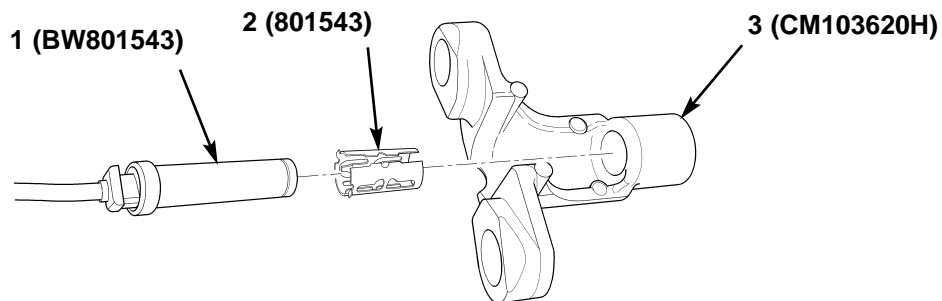


Figure 11. Installing Wheel Sensor on Sensor Bracket.

REAR-REAR AXLE COMPONENTS INSTALLATION – CONTINUED

12. Route wheel sensor power cable (figure 12, item 7) through enlarged hole (figure 12, item 3), and install sensor mounting bracket (figure 12, item 4) on axle housing and brake spider (figure 12, item 6) with two new bolts (figure 12, item 5), washers (figure 12, item 2) retained in step 9, and new locknuts (figure 12, item 1).

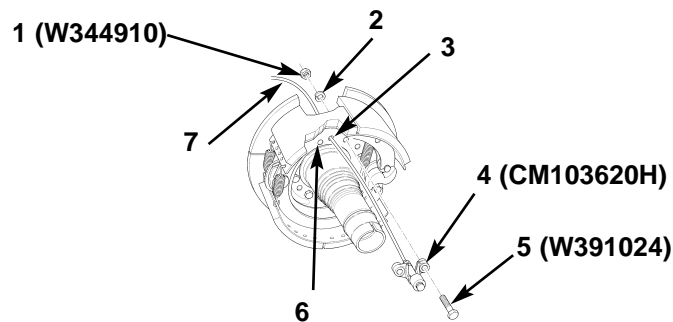


Figure 12. Installing Wheel Sensor on Brake Spider.

13. Measure and cut new bulk split loom (figure 13, item 2) to length of wheel sensor power cable (figure 13, item 3), and install split loom (figure 13, item 2) on power cable (figure 3, item 3).

CAUTION

To protect wheel sensor power cable, ensure split loom is positioned through enlarged hole in brake spider during installation. Failure to comply may result in damage to equipment.

14. Slide end of split loom (figure 13, item 2) into enlarged hole (figure 13, item 5), and secure split loom (figure 13, item 2) to camshaft bracket (figure 13, item 6) with two new tie straps (figure 13, item 1).
15. Repeat steps 9 through 14 to install new wheel sensor assembly (figure 13, item 4) at opposite end of rear-rear axle.

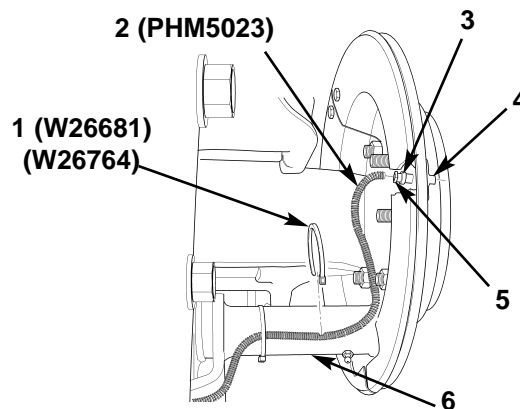


Figure 13. Installing Split Loom on Wheel Sensor Power Cable.

REAR-REAR AXLE COMPONENTS INSTALLATION – CONTINUED**NOTE**

Ensure new inner and outer bearing cups are installed on new rear wheel hub.

Ensure the same right-hand or left-hand threaded wheel studs are installed on the same hub. Ensure each wheel stud is driven in until shoulder is fully seated against hub flange.

16. Position new rear hub (figure 14, item 3) facing down on rear brake drum (figure 14, item 4) with wheel stud holes aligned.
17. Install 10 new right-hand threaded studs (figure 14, item 1) on rear hub (figure 14, item 3).
18. Repeat steps 16 and 17 to install new left-hand threaded studs on opposite new rear hub.

CAUTION

Use caution not to bend or distort tone ring during installation. Tone ring must turn true with hub after installation. Ensure tone ring is fully seated on hub. Failure to comply may result in damage to equipment.

19. Using block of wood and hammer, drive rear tone ring (figure 14, item 2) on rear hub (figure 14, item 3) until seated.

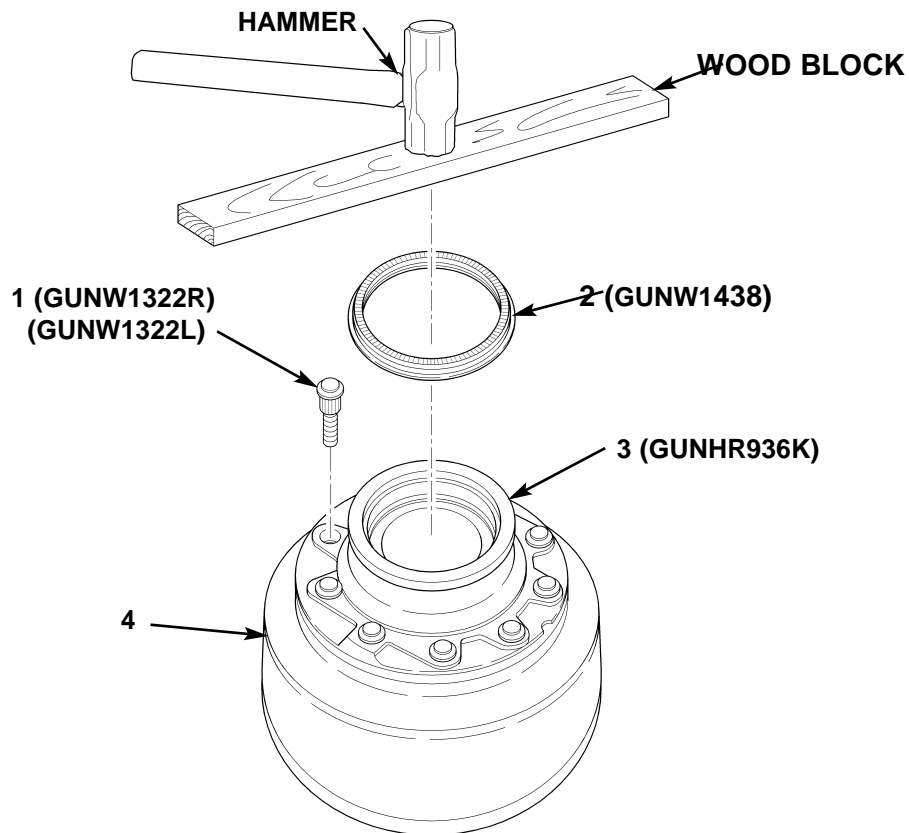


Figure 14. Installing Wheel Studs and Rear Tone Ring.

REAR-REAR AXLE COMPONENTS INSTALLATION – CONTINUED**NOTE**

Do not get grease on rear seal shoulder bore of wheel hub when installing inner bearing cone.

20. Apply grease to inner bearing cone (figure 15, item 2), and set inner bearing cone (figure 15, item 2) on inner cup in rear hub (figure 15, item 3).
21. Apply sealant to outside edge of new seal (figure 15, item 1), and position seal (figure 15, item 1) on rear wheel hub (figure 15, item 3) with tapered side of seal facing up.
22. Using seal installer, drive seal (figure 15, item 1) into shoulder bore of rear hub (figure 15, item 3) until fully seated.

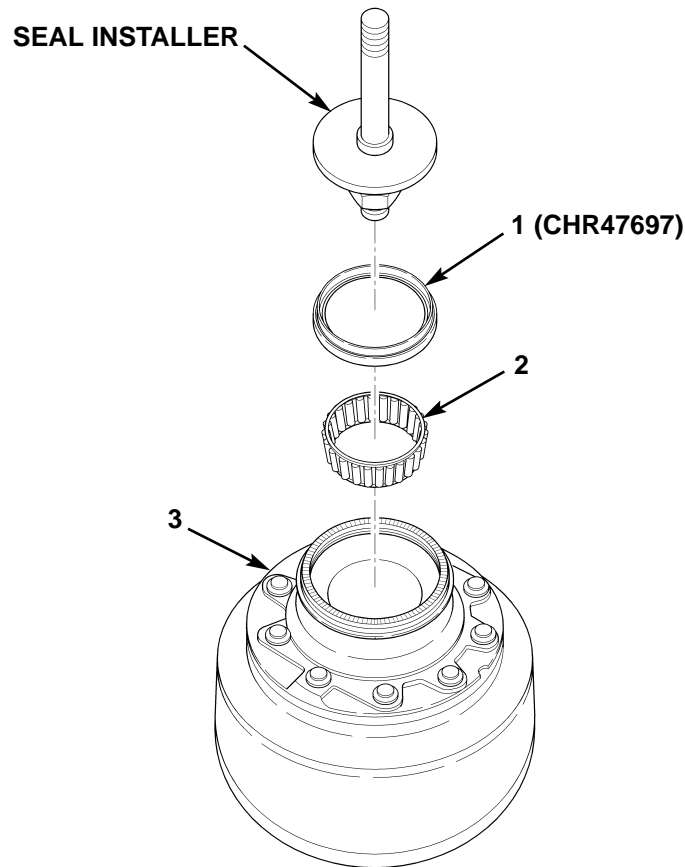


Figure 15. Installing Inner Bearing Cone and Seal.

REAR-REAR AXLE COMPONENTS INSTALLATION – CONTINUED**CAUTION**

Be careful not to slide hub seal over threads at end of axle housing spindle when installing hub. Ensure hub is centered when positioning on spindle. Failure to comply may result in damage to equipment.

23. Fill cavity in rear hub (figure 16, item 1) with grease, and carefully position hub (figure 16, item 1) on axle housing spindle (figure 16, item 6).
24. Apply grease to outer bearing cone (figure 16, item 2), and position bearing cone (figure 16, item 2) against outer cup in rear hub (figure 16, item 1).
25. Install inner nut (figure 16, item 3) on axle housing spindle (figure 16, item 6) with machined surface facing out. Using 4-1/8 in. (105 mm) socket, tighten inner nut (figure 16, item 3) to 50 lb-ft (68 N•m) while rotating hub (figure 16, item 1) back and forth. Then back off inner nut (figure 16, item 2) 1/4 to 1/3 turn. Rotate hub; hub should rotate freely.
26. Install lockwasher (figure 16, item 4) on axle housing spindle (figure 16, item 6).
27. Install outer nut (figure 16, item 5) on axle housing spindle (figure 16, item 6) with machined surface facing out. Using 4-1/8 in. (105 mm) socket, tighten outer nut (figure 16, item 5) to 250–275 lb-ft (339–373 N•m). Rotate hub; hub should rotate freely.
28. Bend one tab on lockwasher (figure 16, item 4) against each flat on outer nut (figure 16, item 5).
29. Repeat steps 19 through 28 for installation of opposite rear hub on rear-rear axle.

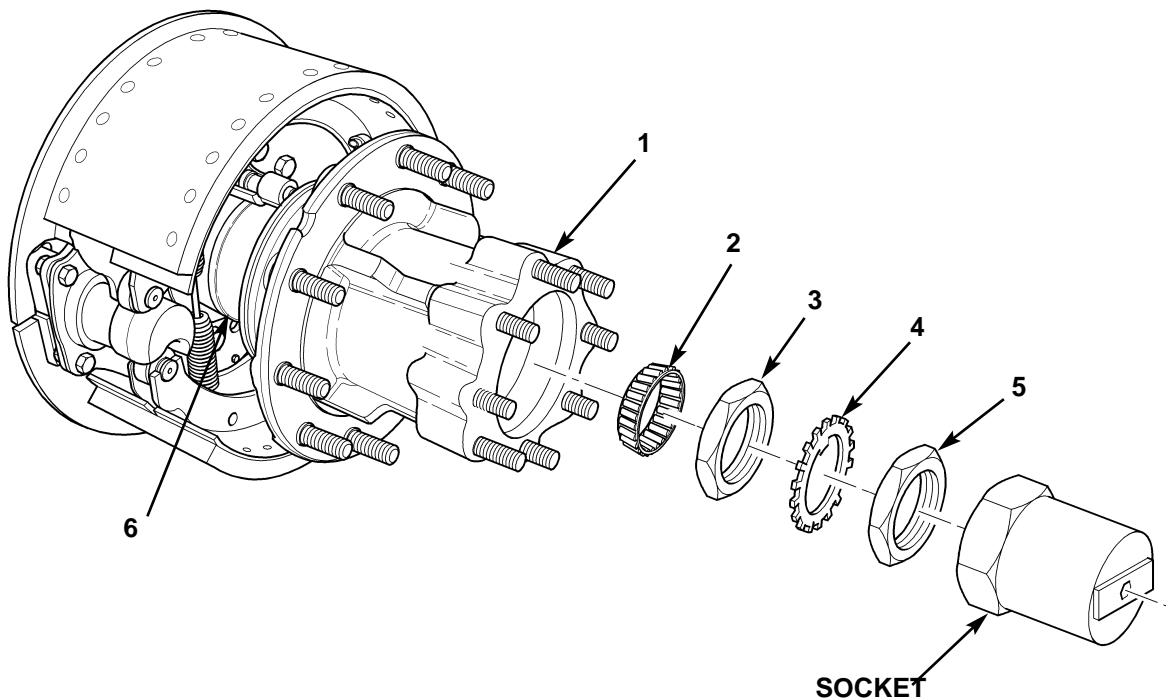


Figure 16. Installing Rear Wheel Hub.

REAR-REAR AXLE COMPONENTS INSTALLATION – CONTINUED

30. Remove old adhesive from axle shaft flange (figure 17, item 1), clean surface, and apply new adhesive to axle shaft flange (figure 17, item 1).
31. Install axle shaft (figure 17, item 4) on rear hub (figure 17, item 5) with eight washers (figure 17, item 2), and new locknuts (figure 17, item 3).
32. Position suitable tanker bar to prevent rear hub (figure 17, item 5) from turning clockwise, and tighten eight locknuts (figure 17, item 3) to 90–120 lb-ft (122–163 N•m).

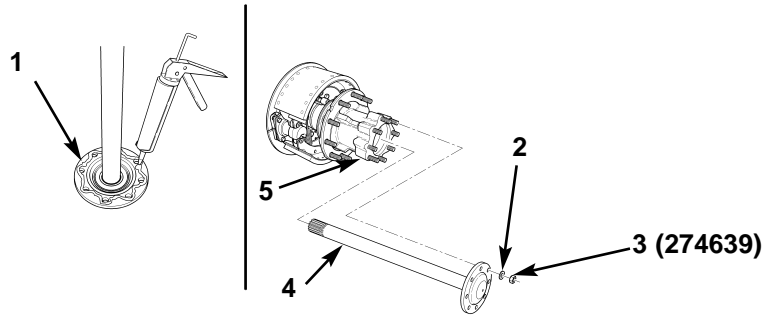


Figure 17. Installing Axle Shaft.

CAUTION

To protect wheel sensor power cable, ensure split loom is positioned through enlarged hole in brake spider after positioning wheel sensor. Failure to comply may result in damage to equipment.

33. Push wheel sensor (figure 18, item 1) in until it contacts tone ring (figure 18, item 2).

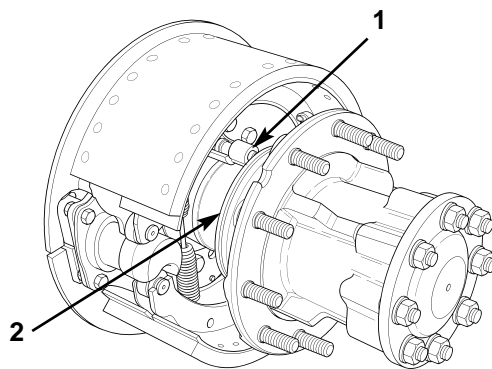


Figure 18. Positioning Wheel Sensor.

REAR-REAR AXLE COMPONENTS INSTALLATION – CONTINUED**WARNING**

Two personnel are required to install drum on hub. Brake drum weighs 85 lbs (39 kg). Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

34. Carefully slide rear brake drum (figure 19, item 3) over wheel studs (figure 19, item 1) on rear hub (figure 19, item 2).
35. Repeat steps 30 through 34 for installation of opposite axle shaft and rear brake drum.

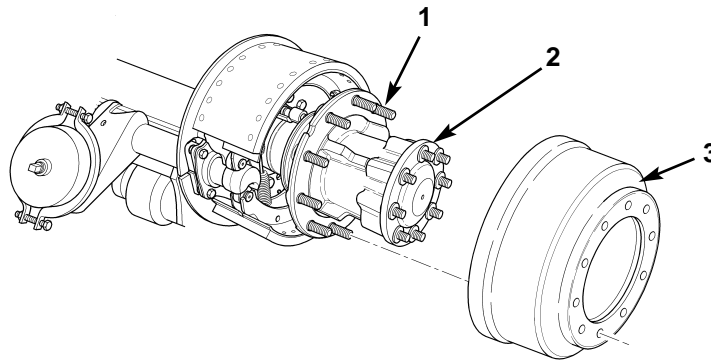


Figure 19. Installing Rear Brake Drums.

END OF TASK**FRONT AXLE COMPONENTS INSTALLATION**

1. Depress and rotate screw (figure 20, item 1) on slack adjuster (figure 20, item 5) until brake drum (figure 20, item 3) can be rotated freely at both ends of front axle.

WARNING

Two personnel are required to remove drum from hub. Brake drum weighs 85 lbs (39 kg). Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

NOTE

In order to remove brake drum, it may be necessary to strike the drum with a hammer to free it from hub flange.

2. Carefully slide brake drum (figure 20, item 3) off wheel studs (figure 20, item 2) and remove from hub (figure 20, item 4) at both ends of front axle. Discard both front brake drums (figure 20, item 3).

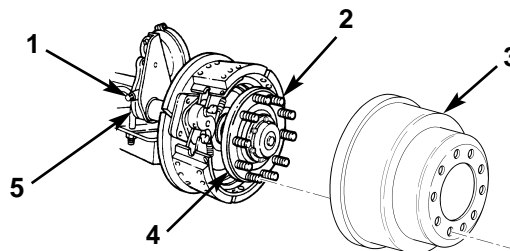


Figure 20. Removing Front Brake Drum.

FRONT AXLE COMPONENTS INSTALLATION – CONTINUED

WARNING

Retaining springs may fly out with extreme force during removal of brake shoes. Wear eye protection when removing brake shoes.

Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

3. Using suitable pry bar, lift upper and lower brake shoes (figure 21, items 1 and 7) at camshaft (figure 21, item 2) one at a time, and remove two shoulder pins (figure 21, item 5) and rollers (figure 21, item 4) from between camshaft (figure 21, item 2) and brake shoes (figure 21, items 1 and 7).
4. Disconnect shoe release spring (figure 21, item 3) from pin (figure 21, item 6) on lower brake shoe (figure 21, item 7), and remove upper and lower brake shoes (figure 21, items 1 and 7) and two shoe retaining springs (figure 21, item 8) together as an assembly, as shown in figure 21.
5. Repeat steps 3 and 4 for removal of opposite front brake shoes (figure 21, items 1 and 7).

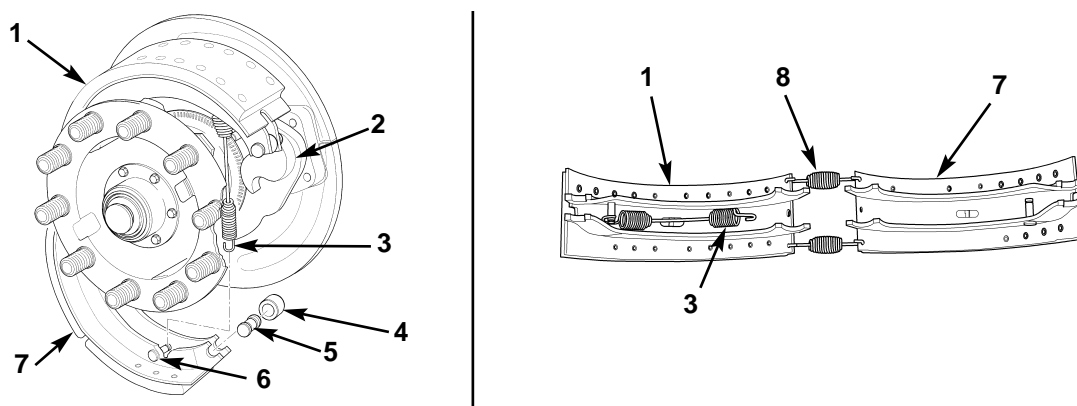


Figure 21. Removing Front Brake Shoes.

6. Position clean, dry drain pan under front hub (figure 22, item 2), and remove six bolts (figure 22, item 10), lockwashers (figure 22, item 9), cap (figure 22, item 8), and gasket (figure 22, item 7) from front hub (figure 22, item 2). Discard gasket (figure 22, item 7), lockwashers (figure 22, item 9), bolts (figure 22, item 10), and cap (figure 22, item 8).
7. Remove cotter pin (figure 22, item 6), slotted nut (figure 22, item 5), and key washer (figure 22, item 4) from spindle (figure 22, item 1). Discard cotter pin (figure 22, item 6).
8. Remove outer bearing cone (figure 22, item 3), and front hub (figure 22, item 2) from spindle (figure 22, item 1).

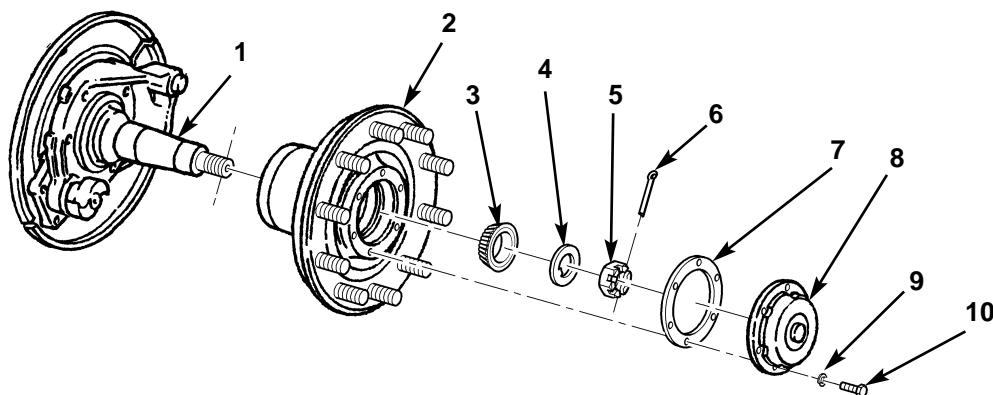


Figure 22. Removing Front Hub.

FRONT AXLE COMPONENTS INSTALLATION – CONTINUED**NOTE**

Bearing cups will not be removed from front hub and are discarded with hub.

9. Using suitable drift and hammer, remove seal (figure 23, item 3) and inner bearing cone (figure 23, item 2) from front hub (figure 23, item 1). Discard seal (figure 23, item 3) and front hub (figure 23, item 1).
10. Repeat steps 6 through 9 for removal of opposite hub assembly from front axle.

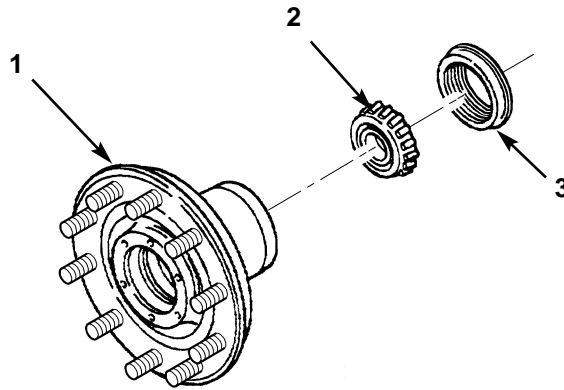


Figure 23. Removing Bearing Seal and Inner Bearing Cone.

NOTE

Ensure new inner and outer bearing cups are installed on new front wheel hub.

Ensure the same right-hand or left-hand threaded wheel studs are installed on the same hub. Ensure each wheel stud is driven in until shoulder is fully seated against hub flange.

11. Position new front hub (figure 24, item 1) facing down on new front brake drum (figure 24, item 4) with wheel stud holes aligned.
12. Install 10 new right-hand threaded studs (figure 24, item 3) on front hub (figure 24, item 1).

CAUTION

Use caution not to bend or distort tone ring during installation. Tone ring must turn true with hub after installation. Ensure tone ring is fully seated on hub. Failure to comply may result in damage to equipment.

13. Using block of wood and hammer, drive new front tone ring (figure 24, item 2) on front hub (figure 24, item 1) until seated.
14. Repeat steps 11 through 13 for installation of new left-hand threaded studs and new tone ring on opposite new front hub (figure 24, item 1).

FRONT AXLE COMPONENTS INSTALLATION – CONTINUED

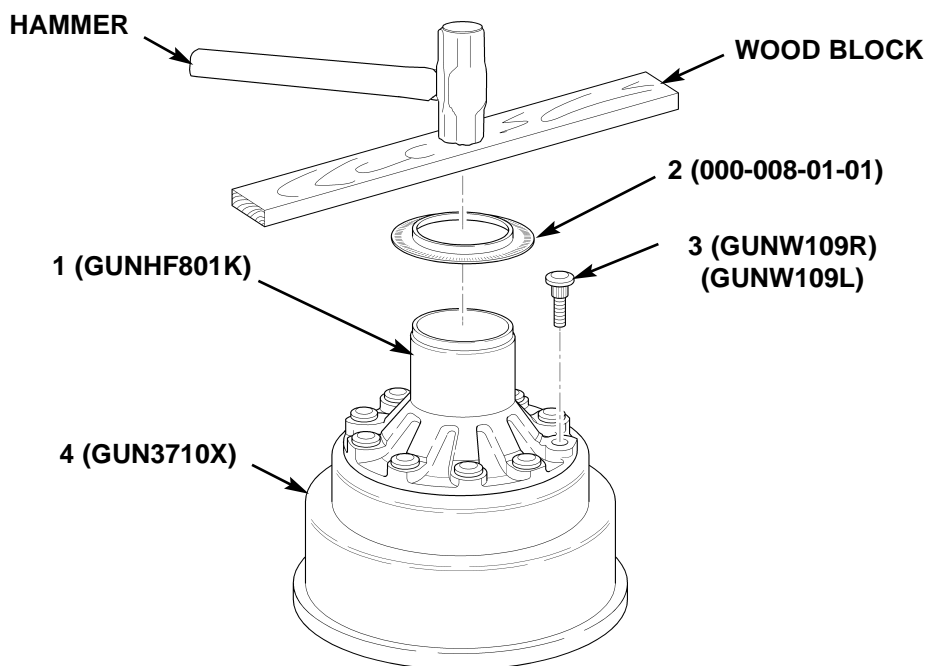


Figure 24. Installing Wheel Studs and Front Tone Ring.

15. Remove locknut, (figure 25, item 5), washer (figure 25, item 4), and screw (figure 25, item 3) from front top hole (figure 25, item 1) in spindle and brake spider (figure 25, item 2). Discard locknut (figure 25, item 5), washer (figure 25, item 4), and screw (figure 25, item 3).

WARNING

Metal shavings are sharp and may fly out during reaming operations. Wear eye protection when enlarging hole with reamer. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Protect spindle shaft when enlarging hole in brake spider and spindle. Ensure all metal shavings are cleaned from spindle and brake spider. Failure to comply may result in damage to equipment.

16. Using 11/16 in. (17.5 mm) reamer, enlarge front top hole (figure 25, item 1) in spindle and brake spider (figure 25, item 2).

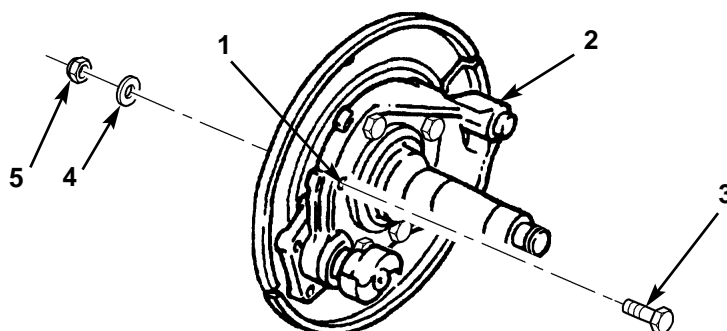


Figure 25. Enlarging Hole in Brake Spider.

FRONT AXLE COMPONENTS INSTALLATION – CONTINUED

17. Install new clamp sleeve (figure 26, item 2) and new wheel sensor (figure 26, item 1) on front top hole of spindle and brake spider (figure 26, item 4). Slide wheel sensor (figure 26, item 1) approximately half way in clamp sleeve (figure 26, item 2).

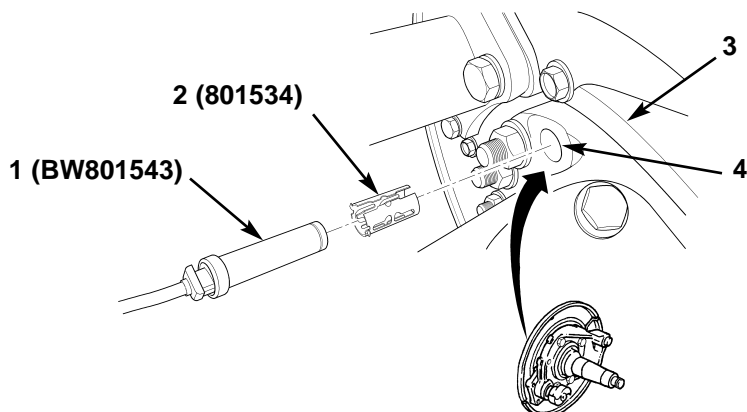


Figure 26. Installing Clamp Sleeve and Wheel Sensor.

18. Measure and cut new bulk split loom (figure 27, item 5) to length of wheel sensor power cable (figure 27, item 2), and install split loom (figure 27, item 5) on power cable (figure 27, item 2).

CAUTION

To protect wheel sensor power cable, ensure split loom is positioned through enlarged hole in brake spider during installation. Failure to comply may result in damage to equipment.

19. Tape end of split loom (figure 27, item 5) to power cable at wheel sensor (figure 27, item 1) with electrical tape, and secure split loom (figure 27, item 5) to camshaft bracket (figure 27, item 4) with two new tie straps (figure 27, item 3).
20. Repeat steps 15 through 19 for installation of new wheel sensor (figure 27, item 1) at opposite end of front axle.

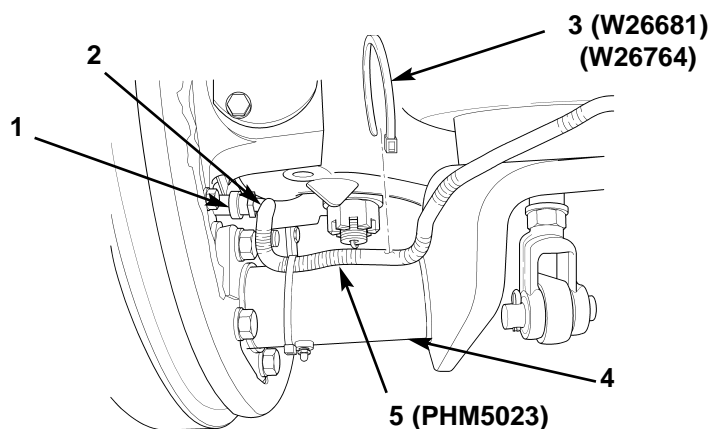


Figure 27. Installing Split Loom on Wheel Sensor Power Cable.

FRONT AXLE COMPONENTS INSTALLATION – CONTINUED**NOTE**

Do not get grease on rear seal shoulder bore of wheel hub when installing inner bearing cone.

21. Apply grease to inner bearing cone (figure 28, item 2), and set inner bearing cone (figure 28, item 2) on inner cup of front hub (figure 28, item 3).
22. Apply sealant to outside edge of new seal (figure 28, item 1), and position seal (figure 28, item 1) on front hub (figure 28, item 3) with tapered side of seal facing up.
23. Using seal installer, drive seal (figure 28, item 1) into shoulder bore of front hub (figure 28, item 3) until fully seated.

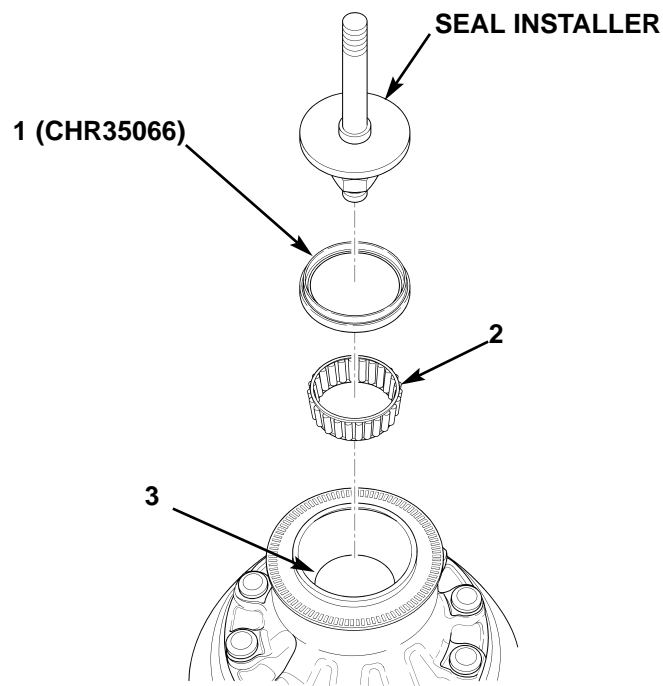


Figure 28. Installing Inner Bearing Cone and Seal.

FRONT AXLE COMPONENTS INSTALLATION – CONTINUED

CAUTION

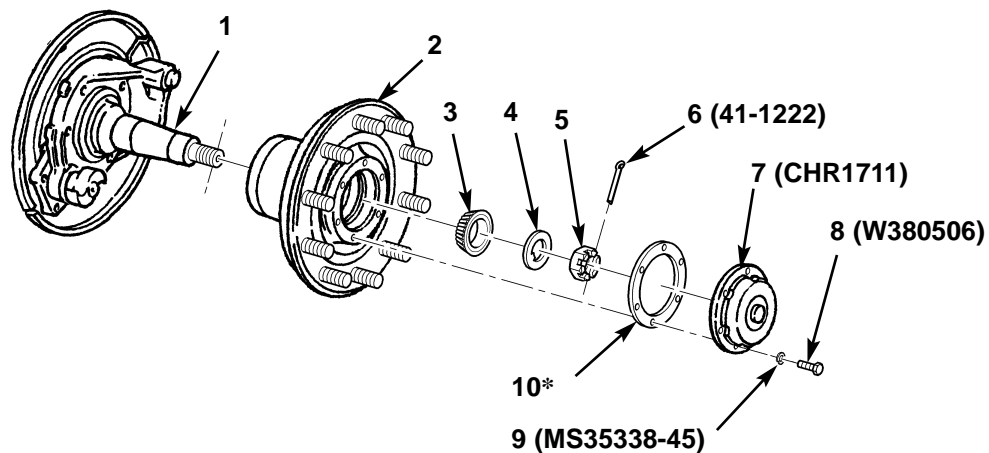
Be careful not to slide hub seal over threads at end of spindle when installing hub. Ensure hub is centered when positioning on spindle. Failure to comply may result in damage to equipment.

24. Fill cavity of front hub (figure 29, item 2) with grease, and carefully position hub (figure 29, item 2) on spindle (figure 29, item 1).
25. Apply grease to outer bearing cone (figure 29, item 3), and position bearing cone (figure 29, item 3) on spindle (figure 29, item 1) up against outer cup of front hub (figure 29, item 2).
26. Install key washer (figure 29, item 4) and slotted nut (figure 29, item 5) on spindle (figure 29, item 1), and using 2-1/4 in. (57 mm) socket, tighten slotted nut (figure 29, item 5) to 50 lb-ft (68 N•m). Then back off slotted nut (figure 29, item 5) 1/4 to 1/3 turn until hole in spindle and slotted nut line up. Rotate hub; hub should rotate freely.
27. Insert new cotter pin (figure 29, item 6) through slotted nut (figure 29, item 5) and hole in spindle (figure 29, item 1). Bend ends of cotter pin (figure 29, item 6) over slotted nut (figure 29, item 5) and into hole at center of spindle.

NOTE

Since front bearings and hub are packed with grease during installation, front hub shall not be filled with grease.

28. Install new gasket (figure 29, item 10) and new cap (figure 29, item 7) on front hub (figure 29, item 2) with six new lockwashers (figure 29, item 9) and new bolts (figure 29, item 8).
29. Repeat steps 21 through 28 for installation of opposite hub on front axle.



*ITEM 10 SUPPLIED WITH ITEM 7

Figure 29. Installing Front Wheel Hub.

FRONT AXLE COMPONENTS INSTALLATION – CONTINUED

30. Push wheel sensor (figure 30, item 7) in until it contacts tone ring (figure 30, item 6).

WARNING

Retaining springs may fly out with extreme force during installation of brake shoes. Wear eye protection when installing brake shoes. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

31. Position upper and lower brake shoes (figure 30, items 1 and 3) on brake spider (figure 30, item 9) with two shoe retaining springs (figure 30, item 2) connected.

CAUTION

Ensure hook ends of brake shoe release spring are positioned in outer groove of pin on brake shoes to provide clearance for tone ring. Failure to comply may result in damage to equipment.

32. Secure upper and lower brake shoes (figure 30, items 1 and 3) at camshaft (figure 30, item 8) by connecting hook ends of shoe release spring (figure 30, item 5) to pin (figure 30, item 4) on upper and lower brake shoes (figure 30, items 1 and 3).
33. Using suitable pry bar, lift upper brake shoe (figure 30, item 1) at camshaft (figure 30, item 8), and position roller (figure 30, item 10) and shoulder pin (figure 30, item 11) between upper brake shoe (figure 30, item 1) and camshaft (figure 30, item 8).
34. Repeat step 33 to install roller (figure 30, item 10) and shoulder pin (figure 30, item 11) on lower brake shoe (figure 30, item 3).

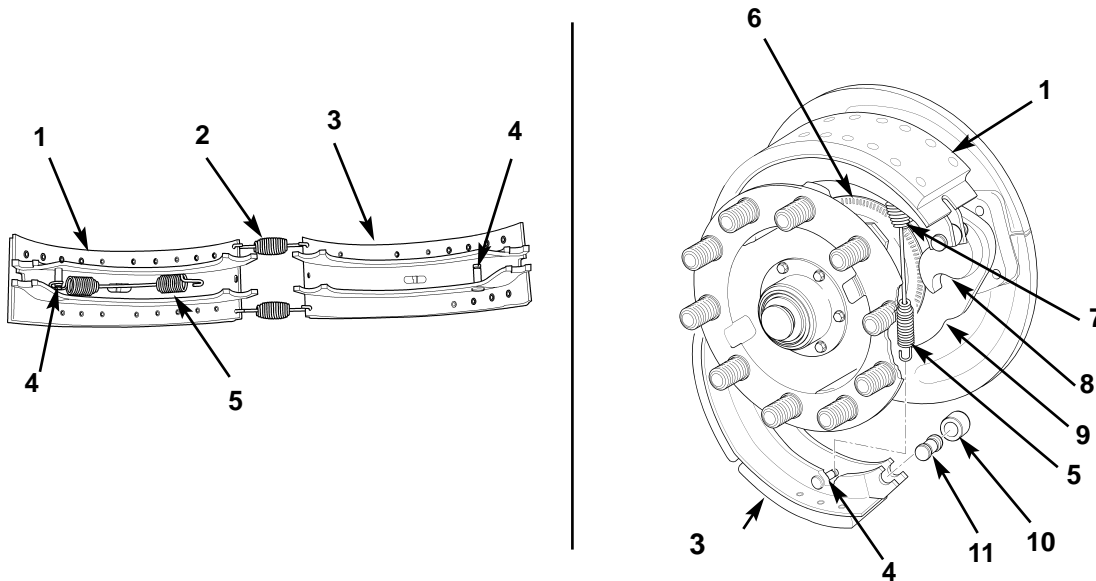


Figure 30. Positioning Wheel Sensor and Installing Brake Shoes.

FRONT AXLE COMPONENTS INSTALLATION – CONTINUED**WARNING**

Two personnel are required to install drum on hub. Brake drum weighs 85 lbs (39 kg). Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

35. Carefully slide new front brake drum (figure 31, item 2) over wheel studs (figure 31, item 1) on front hub (figure 31, item 3).
36. Repeat steps 30 through 35 for installation of opposite brake shoes and new front brake drum on front axle.

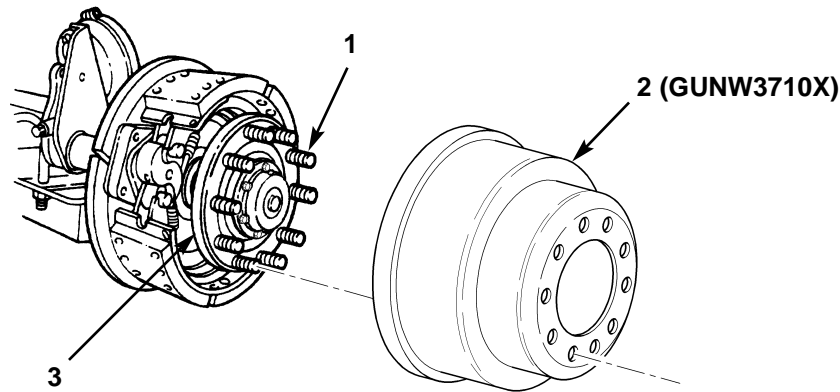


Figure 31. Installing Front Brake Drums.

END OF TASK**REMOVAL OF ITEMS FOR ACCESS OR REUSE****NOTE**

The following items are removed for access during installation of ABS components or are removed to be used in new locations or discarded. Retain all removed parts except those listed to be discarded.

1. Remove nut (figure 32, item 2), screw (figure 32, item 3), and strap (figure 32, item 13) from clamp (figure 32, item 1) on air hose tender (figure 32, item 5).
2. Disconnect emergency air pressure coupling (figure 32, item 12) and service air pressure coupling (figure 32, item 4) from storage brackets (figure 32, item 11) on air hose tender (figure 32, item 5), and set air hoses on spare tire carrier.

WARNING

Two personnel are required to remove service deck assembly from tractor frame due to its size. Failure to comply may result in injury to personnel. Seek medical attention in the event of injury.

3. Remove four bolts (figure 32, item 7) and washers (figure 32, item 6) from service deck assembly (figure 32, item 10) and four tabs (figure 32, item 8), and remove service deck assembly (figure 32, item 10) from tractor frame (figure 32, item 9).

REMOVAL OF ITEMS FOR ACCESS OR REUSE – CONTINUED

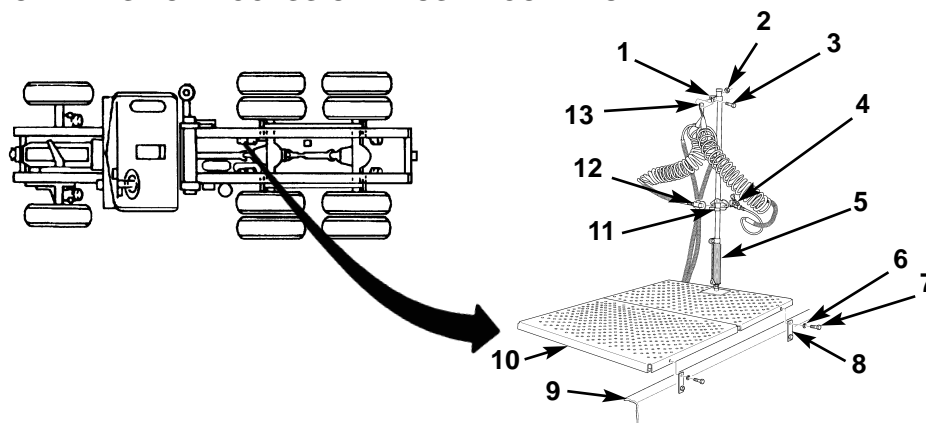


Figure 32. Disconnecting Air Hoses and Removing Service Deck.

NOTE

Two mountable tees are removed and reused for Service (SVC) brakes on forward-rear and rear-rear axles.

4. Disconnect tube (figure 33, item 5) from mountable tee (figure 33, item 4), and remove air hose assembly (figure 33, item 8) from elbow (figure 33, item 6) on quick-release valve (figure 33, item 7) and mountable tee (figure 33, item 4).
5. Remove pipe plug (figure 33, item 9) from mountable tee (figure 33, item 4), and remove screw (figure 33, item 1), lockwasher (figure 33, item 2), and mountable tee (figure 33, item 4) from right frame rail (figure 33, item 3) adjacent to forward-rear axle. Discard lockwasher (figure 33, item 2).

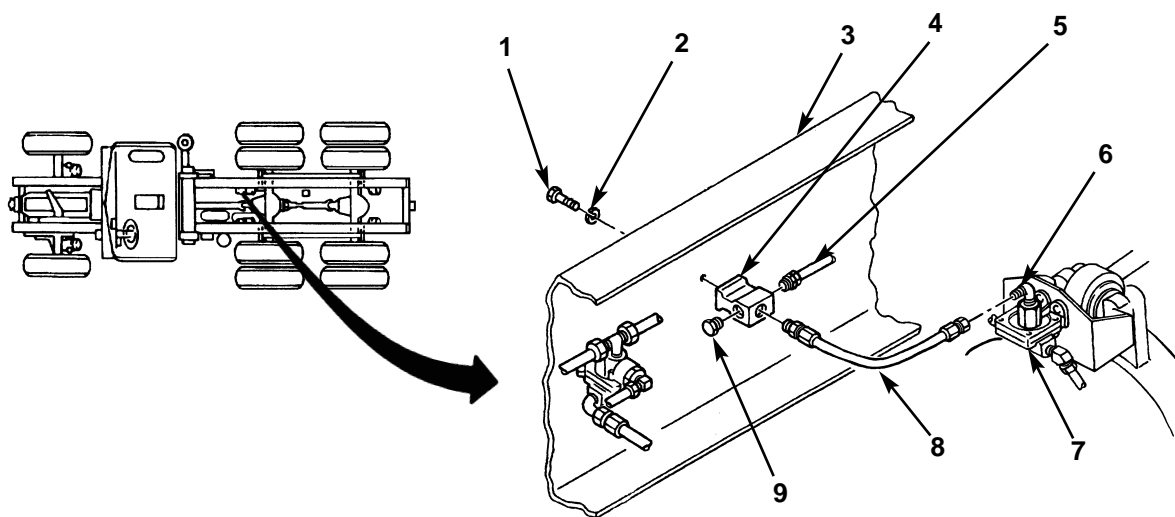


Figure 33. Removing Mountable Tee at Forward-Rear Axle.

REMOVAL OF ITEMS FOR ACCESS OR REUSE – CONTINUED

6. Disconnect tube (figure 34, item 9) from mountable tee (figure 34, item 4), and remove air hose assembly (figure 34, item 6) from elbow (figure 34, item 7) on quick-release valve (figure 34, item 8) and mountable tee (figure 34, item 4).
7. Remove pipe plug (figure 34, item 5) from mountable tee (figure 34, item 4), and remove screw (figure 34, item 1), lockwasher (figure 33, item 2), and mountable tee (figure 34, item 4) from right frame rail (figure 34, item 3) adjacent to rear-rear axle. Discard lockwasher (figure 34, item 2).

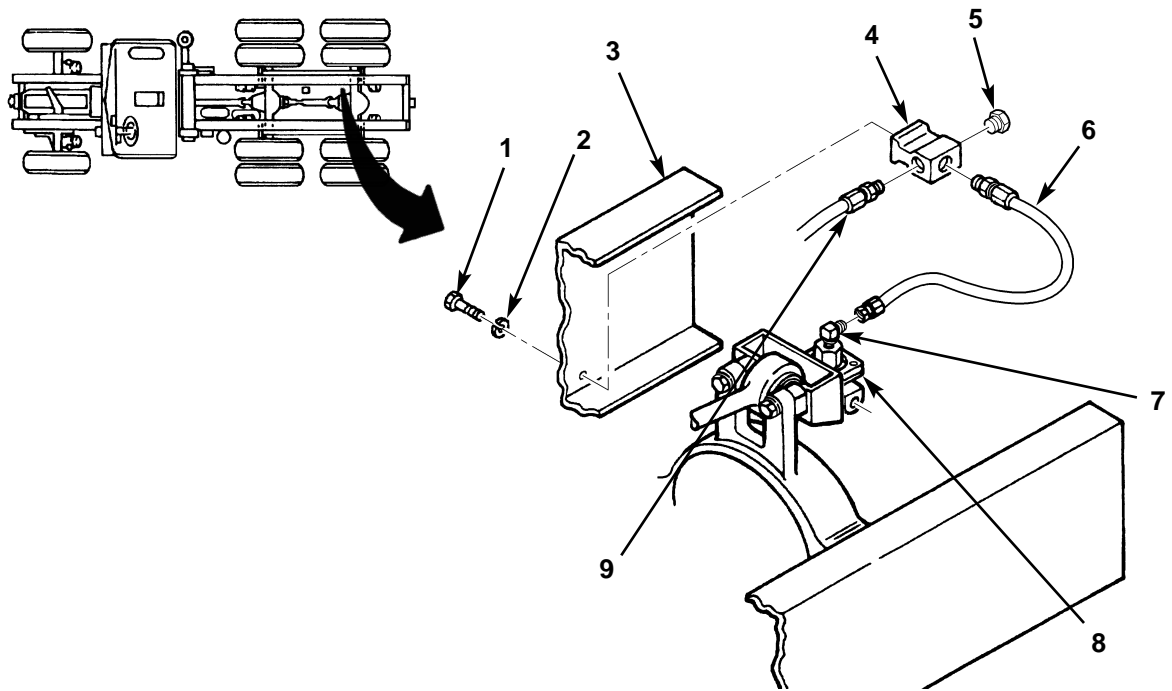


Figure 34. Removing Mountable Tee at Rear-Rear Axle.

8. Disconnect tubes (figure 35, items 6 and 10) from adapter (figure 35, item 9) and elbow (figure 35, item 7), and remove adapter (figure 35, item 9), elbow (figure 35, item 7), and elbow (figure 35, item 2) from quick-release valve (figure 35, item 8).
9. Remove two locknuts (figure 35, item 4), washers, (figure 35, item 3), screws (figure 35, item 1), and quick-release valve (figure 35, item 8) from bracket (figure 35, item 5) on forward-rear axle. Discard all removed items in this step.
10. Disconnect tubes (figure 35, items 13 and 17) from two adapters (figure 35, item 14), and remove adapters (figure 35, item 14) and elbow (figure 35, item 15) from quick-release valve (figure 35, item 18).
11. Remove two locknuts (figure 35, item 11), washers, (figure 35, item 12), screws (figure 35, item 16), and quick-release valve (figure 35, item 18) from bracket (figure 35, item 19) on rear-rear axle. Discard all removed items in this step.

REMOVAL OF ITEMS FOR ACCESS OR REUSE – CONTINUED

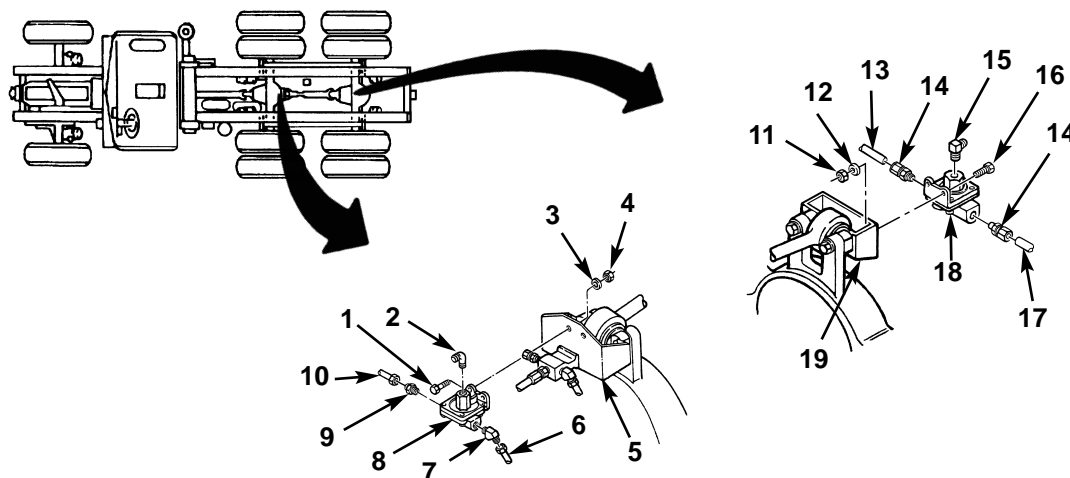


Figure 35. Removing Quick-Release Valves.

NOTE

Bolts removed from rear alignment clips are reused to mount rear modulators. A total of four bolts are removed and reused at right and left locations.

12. Remove two nuts (figure 36, item 2) and bolts (figure 36, item 6) from bottom mounting holes of rear alignment clip (figure 36, item 1) and frame rail (figure 36, item 7) at both sides of truck. Discard nuts (figure 36, item 2).

NOTE

Bolts removed from leaf spring shackles are reused to mount bulkhead brackets. A total of six bolts are removed and reused in three locations.

13. Remove two nuts (figure 36, item 3) and bolts (figure 36, item 5) from mounting holes at right-front, right-rear, and left-rear leaf spring shackles (figure 36, item 4) and frame rails (figure 36, item 7). Discard nuts (figure 36, item 3).

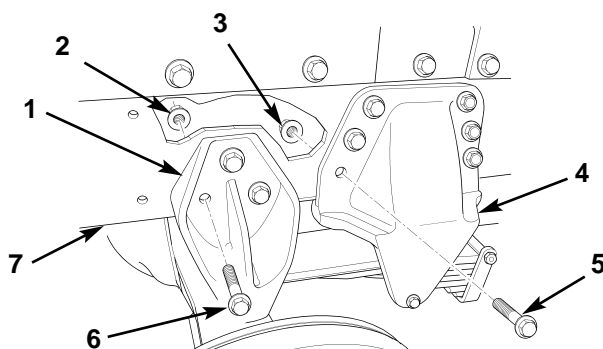


Figure 36. Removing Mounting Hardware from Suspension.

REMOVAL OF ITEMS FOR ACCESS OR REUSE – CONTINUED**NOTE**

One bolt and washer, adapter, tee, and two elbows removed from front axle ratio valve will be reused for installation of front bulkhead union and air block bracket.

14. Disconnect tubes (figure 37, items 3, 4, and 6) from elbow (figure 37, item 2), adapter (figure 37, item 5), and elbow (figure 37, item 7), and remove adapter (figure 37, item 5), elbow (figure 37, item 7), tee (figure 37, item 8), and elbow (figure 37, item 2) from ratio valve (figure 37, item 9).
15. Remove two locknuts (figure 37, item 12), washers (figure 37, item 11), bolts (figure 37, item 1), and ratio valve (figure 37, item 9) from crossmember (figure 37, item 10). Discard locknuts (figure 37, item 12) and ratio valve (figure 37, item 9).

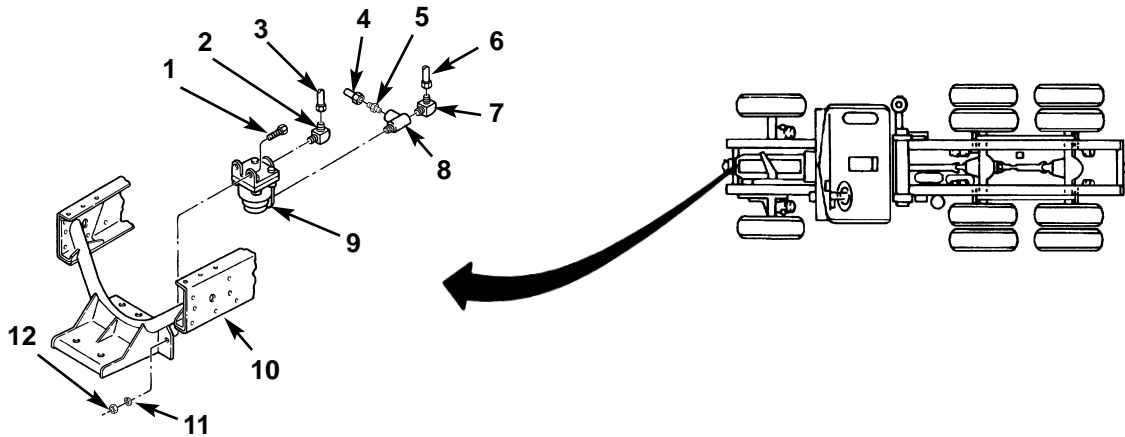


Figure 37. Removing Front Axle Ratio Valve.

END OF TASK**INSTALLATION OF REAR MODULATORS****NOTE**

Installation of modulators on the rear of frame is the same; left frame rail is shown.

Mark modulators and modulator mounts Left-Rear and Right-Rear for identification during ABS installation.

Prior to installation, ensure pipe joint compound is applied to male pipe threads of fittings having National Pipe Threads (NPT) only.

1. Install new adapter (figure 38, item 6) on inlet of new modulator (figure 38, item 7), and install new tee (figure 38, item 11) on outlet of modulator (figure 38, item 7). Position tee (figure 38, item 11) as shown.

INSTALLATION OF REAR MODULATORS – CONTINUED

2. Install new adapter (figure 38, item 12) and new elbow (figure 38, item 10) on tee (figure 38, item 11). Position elbow (figure 38, item 10) as shown.
3. Install modulator (figure 38, item 7) on new driver-side modulator mount (figure 38, item 5) with two new washers (figure 38, item 8), new bolts (figure 38, item 9), new washers (figure 38, item 4), and new locknuts (figure 38, item 3).

NOTE

Modulator mounts are mounted on frame rails with bolts removed from suspension components. Bolt heads shall be installed against modulator brackets.

Prior to installing rear modulator brackets on frame rails, bend existing loop clamp in toward frame rail for clearance.

4. Install driver-side modulator mount (figure 38, item 5) on left frame rail (figure 38, item 1) with two bolts (figure 38, item 13) and new locknuts (figure 38, item 2).
5. Perform steps 1 through 4 for installation of opposite new modulator (figure 38, item 7) on right frame rail.

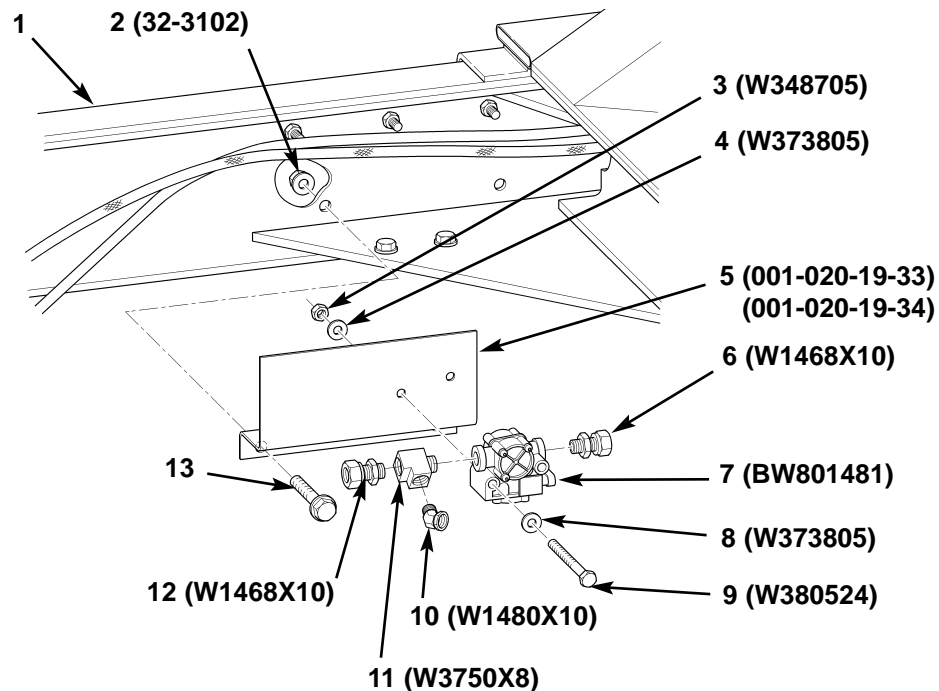


Figure 38. Installing Rear Modulators.

END OF TASK

INSTALLATION OF FRONT MODULATORS

NOTE

Installation of modulators on front of frame is the same; left frame rail shown.

Mark modulators Left-Front and Right-Front for identification during ABS installation.

Prior to installation, ensure pipe joint compound is applied to male pipe threads of fittings having National Pipe Threads (NPT) only.

It may be necessary to remove tape to access air tubes routed at left frame rail.

1. Working from inside left frame rail (figure 39, item 4) at front of truck, measure and cut tube (figure 39, item 3) 4-1/2 in. (114 mm) from elbow (figure 39, item 1), and remove 4-1/2 in. (114 mm) tube (figure 39, item 2) from elbow (figure 39, item 1). Retain both pieces of tubing for installation.

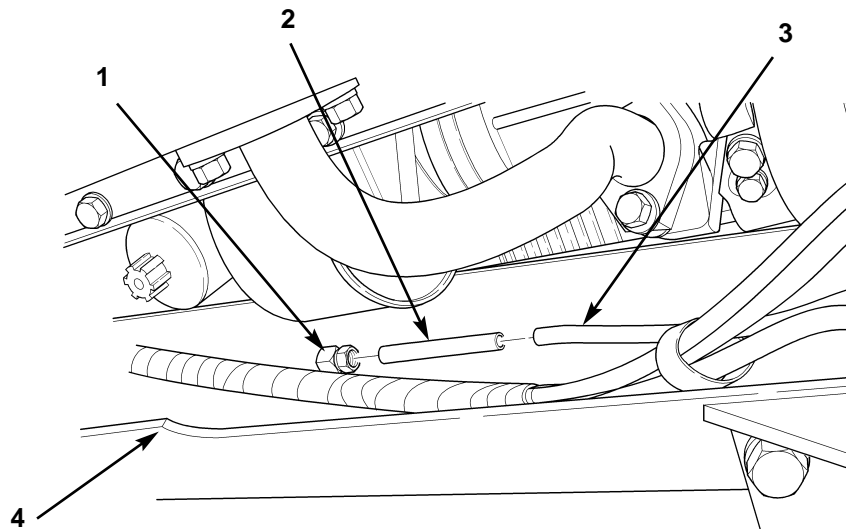


Figure 39. Cutting Existing Front Brake Tube for Reuse.

2. Install new adapter (figure 40, item 5) on outlet of new modulator (figure 40, item 6), and install 4-1/2 in. (114 mm) tube (figure 40, item 4) on adapter (figure 40, item 5).
3. Hold modulator (figure 40, item 6) up to outside left frame rail (figure 40, item 3) at front of truck so that end of 4-1/2 in. (114 mm) tube (figure 40, item 4) contacts brake hose (figure 40, item 2). With modulator (figure 40, item 6) and tube (figure 40, item 4) level with frame rail (figure 40, item 3), mark location of modulator mounting holes on frame rail (figure 40, item 3).
4. Using punch and 5/16 in. (8 mm) drill bit, locate and drill two holes (figure 40, item 1) in left frame rail (figure 40, item 3) as marked in step 3.

INSTALLATION OF FRONT MODULATORS – CONTINUED

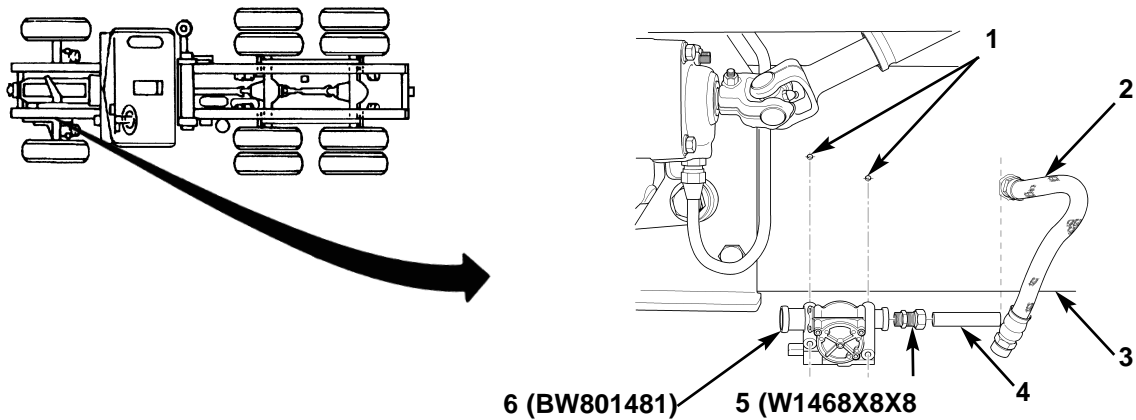


Figure 40. Drilling Mounting Holes for Front Modulator.

5. Install new elbow (figure 41, item 5) on inlet of modulator (figure 40, item 6) as shown in figure 41.
6. Connect 4-1/2 in. (114 mm) piece of tube (figure 41, item 9) removed in step 1, to elbow (figure 41, item 1), and install remaining length of tube (figure 41, item 4) on elbow (figure 41, item 5).
7. Install modulator (figure 41, item 6) on inside of left frame rail (figure 41, item 10), at holes drilled in step 4, with two new washers (figure 41, item 7), new bolts (figure 41, item 8), new washers (figure 41, item 2), and new locknuts (figure 41, item 3).
8. Repeat steps 1 through 7 for installation of opposite front modulator (figure 41, item 6).

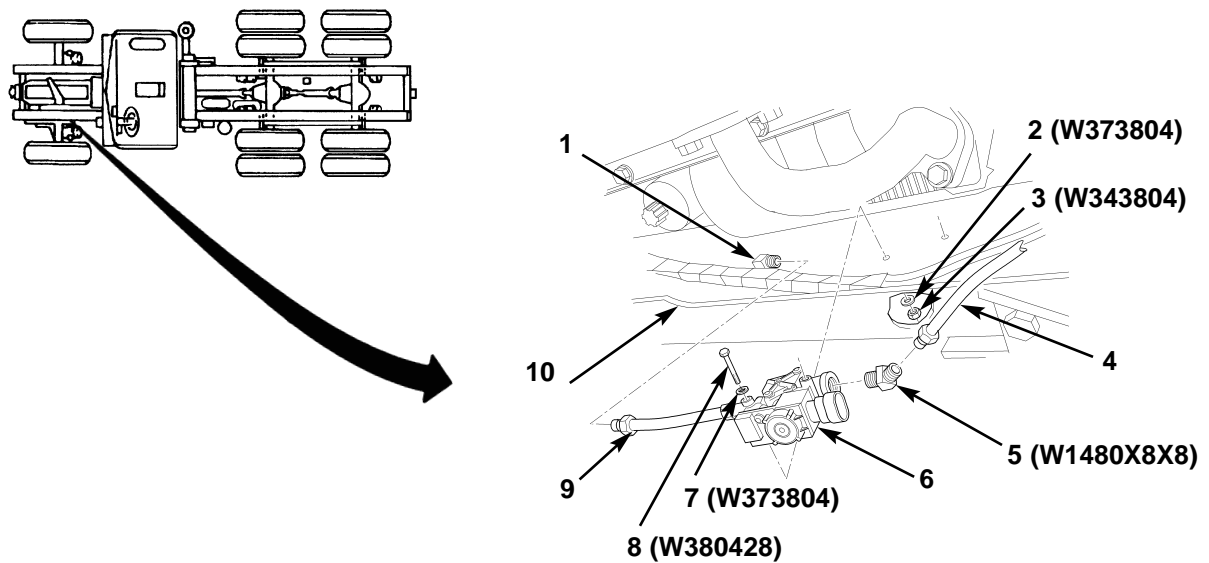


Figure 41. Installing Front Modulators.

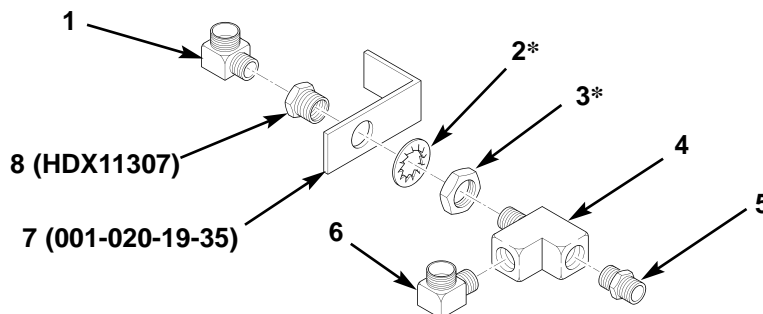
INSTALLATION OF FRONT MODULATORS – CONTINUED

9. Install new bulkhead fitting (figure 42, item 8) on new bulkhead fitting mount (figure 42, item 7) with new lockwasher (figure 42, item 2) and new nut (figure 42, item 3).

NOTE

One bolt and washer, adapter, tee, and two elbows removed from front axle ratio valve will be reused for installation of front bulkhead fitting and mount.

10. Install elbow (figure 42, item 1) and tee (figure 42, item 4) on bulkhead fitting (figure 42, item 8).
Install elbow (figure 42, item 6) and adapter (figure 42, item 5) on tee (figure 42, item 4).



* ITEM 2 SUPPLIED WITH ITEM 8

* ITEM 3 SUPPLIED WITH ITEM 8

Figure 42. Assembling Front Bulkhead.

11. Install bulkhead fitting mount (figure 43, item 10) on front crossmember (figure 43, item 11) with bolt (figure 43, item 9), washer (figure 43, item 2), and new locknut (figure 43, item 1).
12. Connect air tubes (figure 43, items 4, 5, and 6) to elbows (figure 43, items 3 and 7) and adapter (figure 43, item 8).

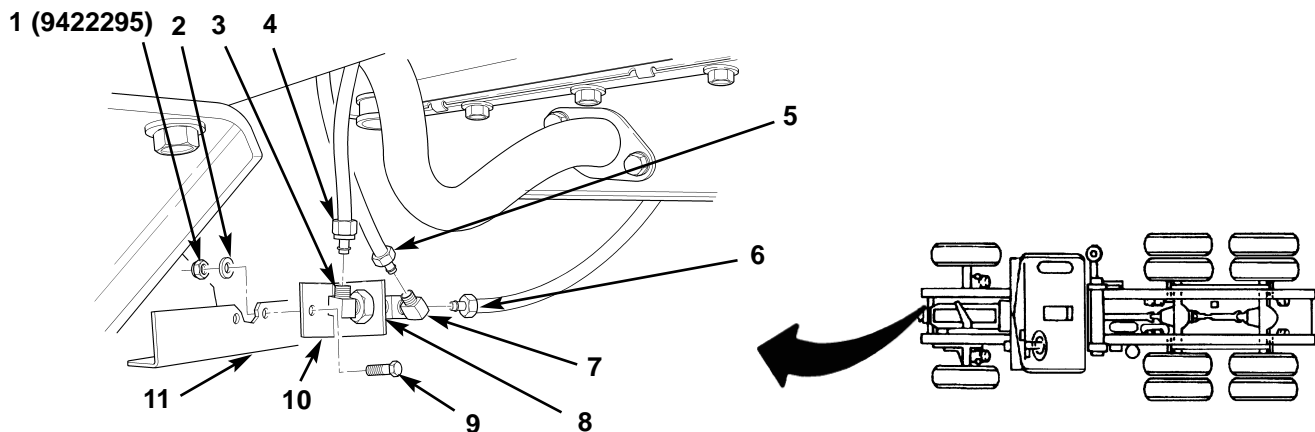


Figure 43. Installing Bulkhead Bracket and Connecting Tubes.

END OF TASK

INSTALLATION OF ABS AIR LINES

NOTE

Plastic air line tubing is connected to fittings with a brass ferrule supplied with new fittings or replacement ferrule.

When installing air line tubing, length of tubing shall be trimmed so there is a small amount of looseness when both ends are connected to fittings and tubing is not so short it has to be pulled tight.

Prior to installation, ensure pipe joint compound is applied to male pipe threads of fittings having National Pipe Threads (NPT) only.

1. Remove tube (figure 44, item 4) from right adapter (figure 44, item 3) on relay valve (figure 44, item 2), and remove tube (figure 44, item 5) and left adapter (figure 44, item 1) from relay valve (figure 44, item 2). Discard tubes (figure 44, items 4 and 5).

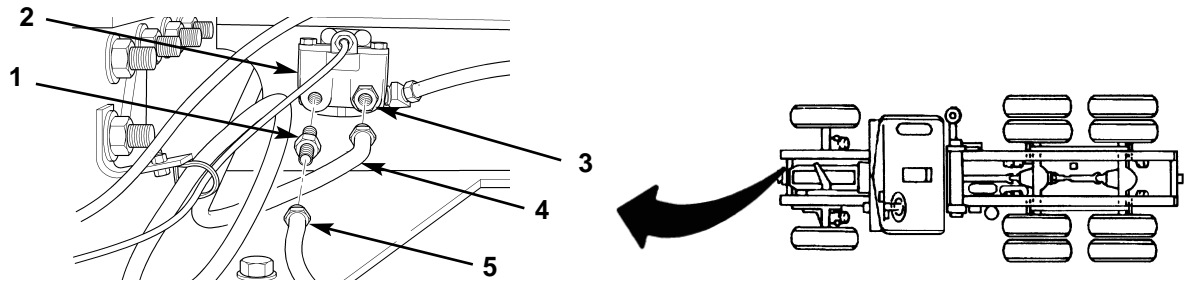


Figure 44. Disconnecting Tubing from Relay Valve.

2. Install new elbow (figure 45, item 4) on relay valve (figure 45, item 1) pointing approximately at 5 o'clock position.
3. Cut new 5/8 in. (16 mm) green tube (figure 45, item 3) to 29 1/2 in. (75 cm) in length, connect tube (figure 45, item 3) to adapter (figure 45, item 2), and connect opposite end of tube (figure 45, item 3) to adapter (figure 45, item 5) on right-rear modulator (figure 45, item 6).

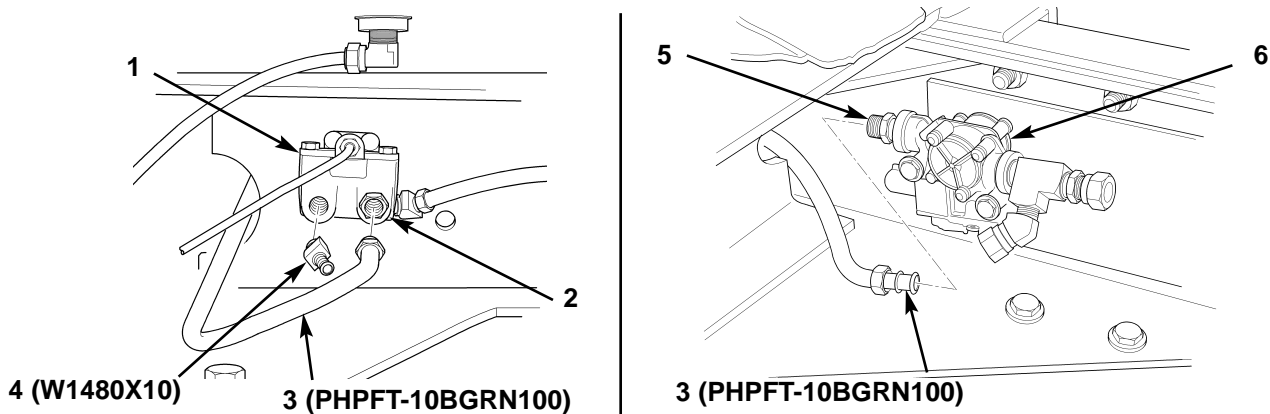


Figure 45. Connecting Tube to Relay Valve and Right-Rear Modulator.

INSTALLATION OF ABS AIR LINES – CONTINUED

4. Cut new 5/8 in. (16 mm) green tube (figure 46, item 2), to 45 in. (114 cm) in length, connect tube (figure 46, item 2) to elbow (figure 46, item 1), and route opposite end of tube (figure 46, item 2) through crossmember opening at left frame rail to left-rear modulator (figure 45, item 3).
5. Connect tube (figure 46, item 2) to adapter (figure 46, item 4) on left-rear modulator (figure 46, item 3).

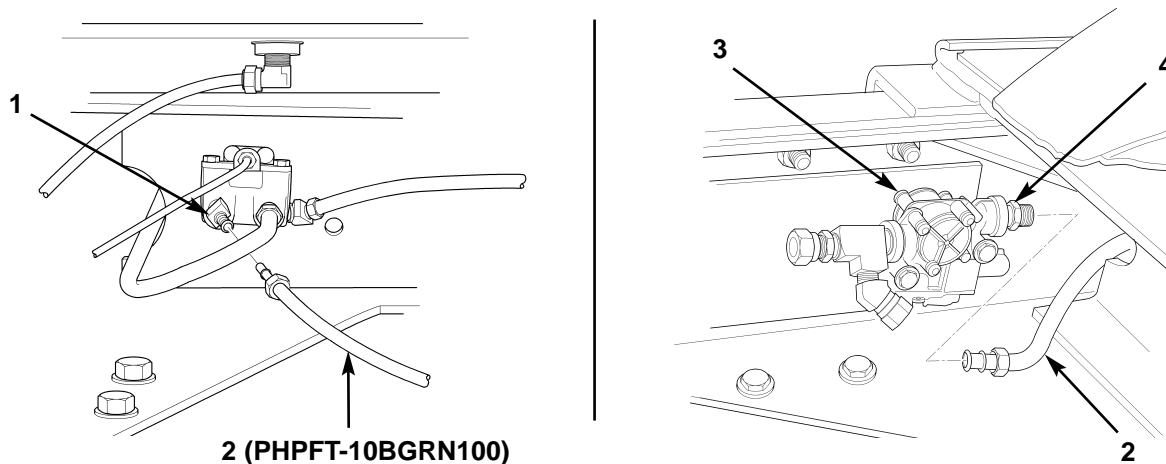
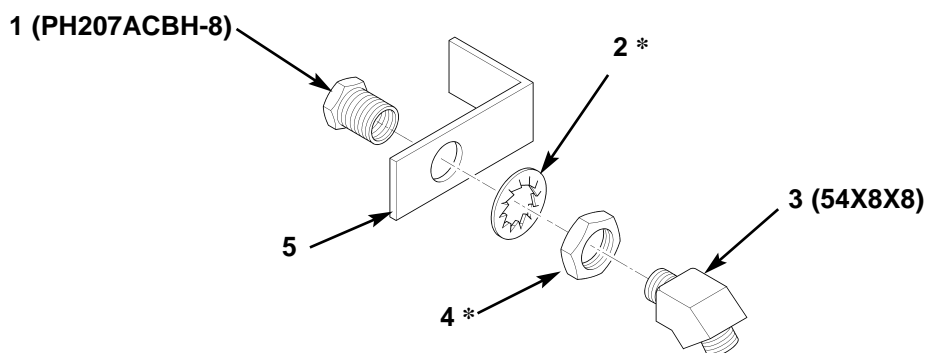


Figure 46. Connecting Tube to Relay Valve and Left-Rear Modulator.

NOTE

Mark new bulkhead fitting mounts RF, RR, LF, and LR for right and left and front and rear identification during ABS installation.

6. Install new bulkhead fitting (figure 47, item 1) on new right-rear bulkhead fitting mount (figure 47, item 5) with new lockwasher (figure 47, item 2) and new nut (figure 46, item 4) supplied with the new bulkhead fitting (figure 47, item 1).
7. Install new elbow (figure 47, item 3) on bulkhead fitting (figure 47, item 1) as shown in figure 47.



* ITEM 2 SUPPLIED WITH ITEM 1

* ITEM 4 SUPPLIED WITH ITEM 1

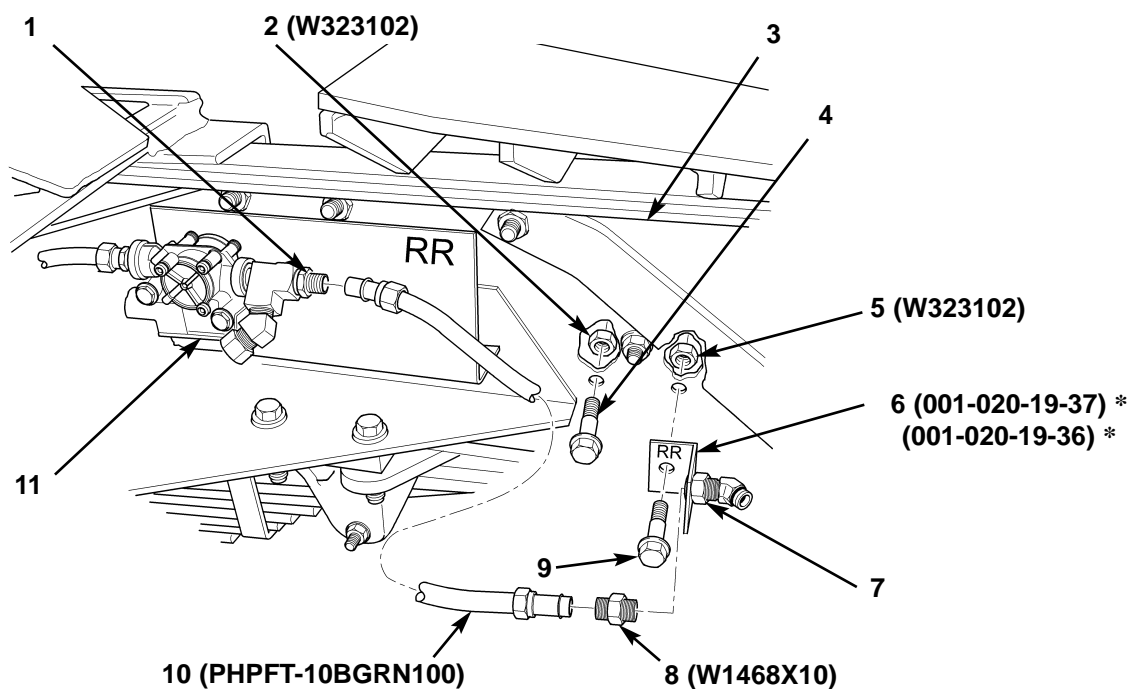
Figure 47. Assembling Right-Rear Bulkhead.

INSTALLATION OF ABS AIR LINES – CONTINUED

NOTE

Bolts removed from leaf spring shackles are reused to mount bulkhead fitting mounts. A total of six bolts are reused in three locations.

8. Install right-rear bulkhead fitting mount (figure 48, item 6) on right frame rail (figure 48, item 3) and rear alignment clip (figure 48, item 3) with bolt (figure 48, item 9) and new locknut (figure 48, item 5).
9. Install bolt (figure 48, item 4) and new locknut (figure 48, item 2) on right frame rail (figure 48, item 3) and rear alignment clip (figure 48, item 3).
10. Install new adapter (figure 48, item 8) on bulkhead fitting (figure 48, item 7), and cut and install 12 in. (30 cm) piece of 5/8 in. (16 mm) green tubing (figure 48, item 10) on adapters (figure 48, items 1 and 8) between right-rear bulkhead (figure 48, item 7) and modulator (figure 48, item 11).
11. Perform steps 6 through 10 for installation of new left-rear bulkhead fitting mount on left frame rail.



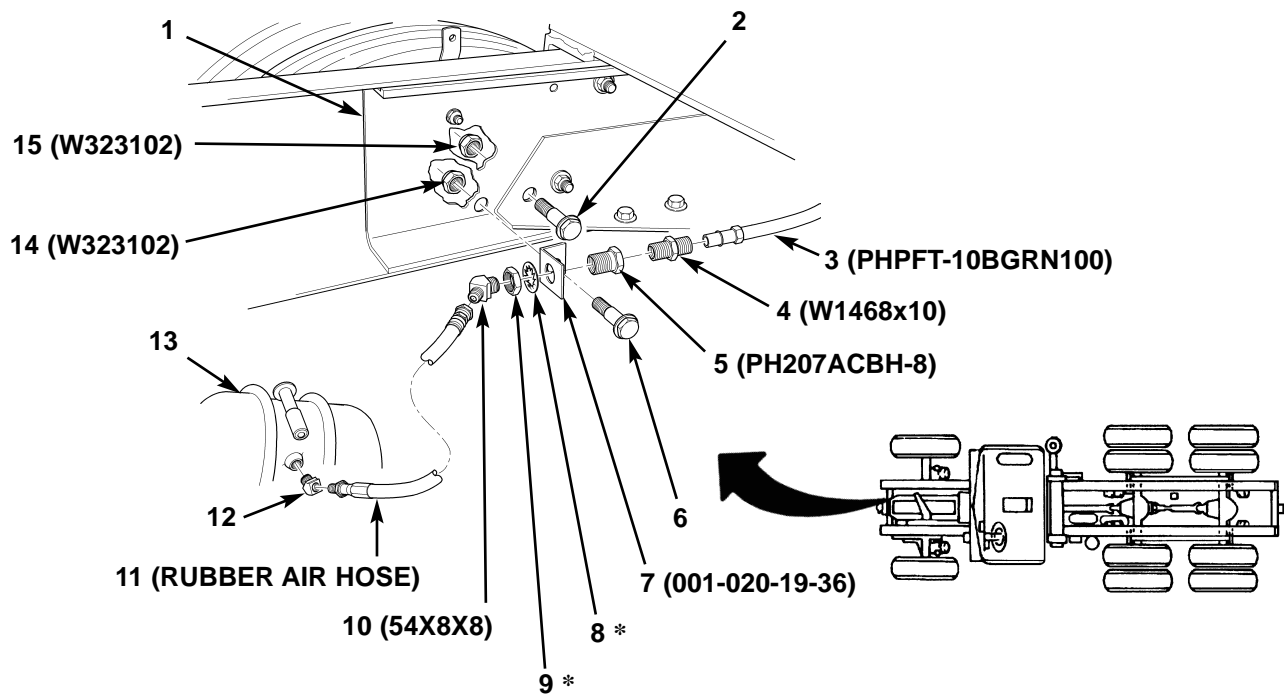
* P/N 001-020-19-37 IS USED FOR RIGHT-REAR MOUNT

* P/N 001-020-19-36 IS USED FOR LEFT-REAR MOUNT

Figure 48. Installing Right-Rear Bulkhead.

INSTALLATION OF ABS AIR LINES – CONTINUED

12. Install new right-front bulkhead fitting mount (figure 49, item 7) on right frame rail and forward leaf spring shackle (figure 49, item 1) with bolt (figure 49, item 6) and new locknut (figure 49, item 14).
13. Install bolt (figure 49, item 2) and new locknut (figure 49, item 15) on right frame rail and forward leaf spring shackle (figure 49, item 1).
14. Install new bulkhead fitting (figure 49, item 5) on right-front bulkhead fitting mount (figure 49, item 7) with new lockwasher (figure 49, item 8) and new nut (figure 49, item 9).
15. Install new adapter (figure 49, item 4) and new elbow (figure 49, item 10) on bulkhead fitting (figure 49, item 5).
16. Remove and discard existing tube and fitting from spring brake chamber (figure 49, item 13), and install new elbow (figure 49, item 12) and new hose assembly (figure 49, item 11) on spring brake chamber (figure 49, item 13) as shown.
17. Connect opposite end of hose assembly (figure 49, item 11) to elbow (figure 49, item 10) on right-front bulkhead (figure 49, item 5).
18. Cut and route new 48 in. (122 cm) piece of 5/8 in. (16 mm) green tubing (figure 49, item 3) between right-front bulkhead and right-rear modulator, and connect tube (figure 49, item 3) to adapter (figure 49, item 4).



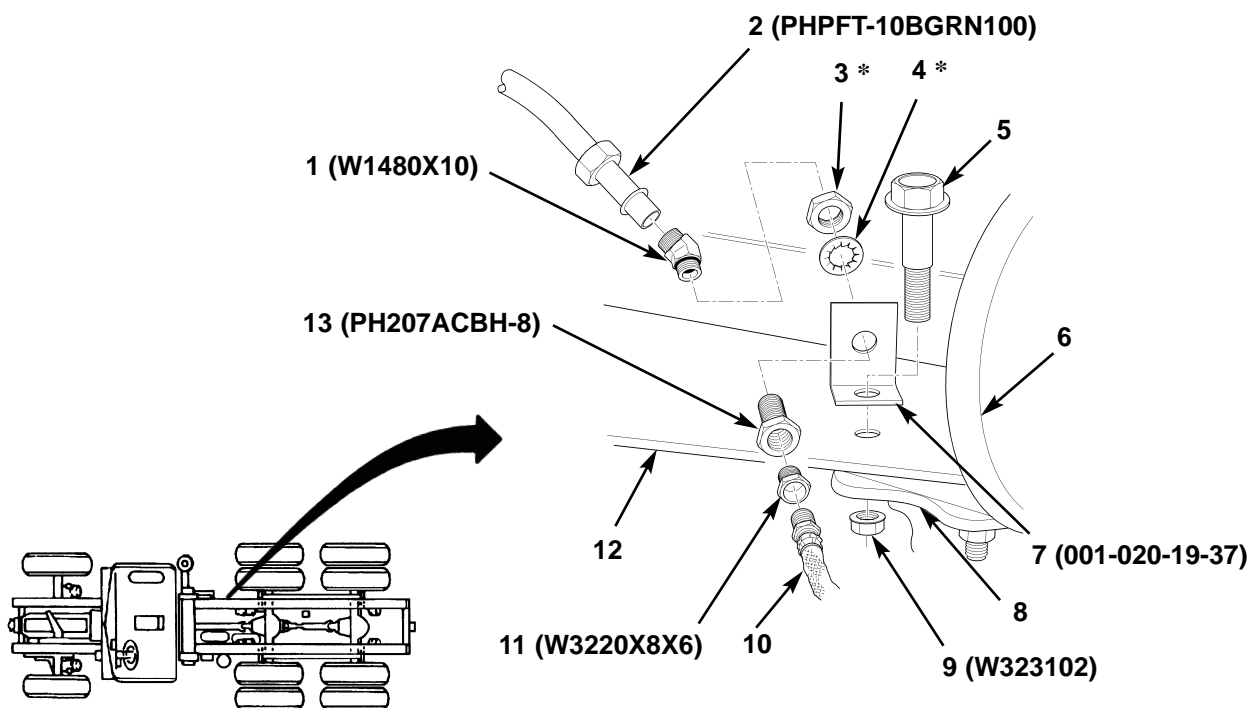
* ITEM 8 SUPPLIED WITH ITEM 5

* ITEM 9 SUPPLIED WITH ITEM 5

Figure 49. Installing Left-Forward Bulkhead.

INSTALLATION OF ABS AIR LINES – CONTINUED

19. Remove bolt (figure 50, item 5) and locknut (figure 50, item 9) from crossmember (figure 50, item 12) and front left spacer (figure 50, item 8) located adjacent to primary reservoir (figure 50, item 6). Discard locknut (figure 50, item 9).
20. Install new left-front bulkhead fitting mount (figure 50, item 7) on crossmember (figure 50, item 12) with bolt (figure 50, item 5) and new locknut (figure 50, item 9).
21. Install new bulkhead fitting (figure 50, item 13) on bulkhead fitting mount (figure 50, item 7) with lockwasher (figure 50, item 4) and new nut (figure 50, item 3).
22. Install new elbow (figure 50, item 1) and new reducer bushing (figure 50, item 11) on bulkhead fitting (figure 50, item 13).
23. Install hose assembly (figure 50, item 10) on reducer bushing (figure 50, item 11).
24. Cut and route new 24 in. (61 cm) piece of 5/8 in. (16 mm) green tubing (figure 50, item 2) between left-front bulkhead and left-rear modulator, and connect tube (figure 50, item 2) to elbow (figure 50, item 1).



* ITEM 3 SUPPLIED WITH ITEM 13

* ITEM 4 SUPPLIED WITH ITEM 13

Figure 50. Installing Left-Forward Bulkhead.

INSTALLATION OF ABS AIR LINES – CONTINUED

25. Route end of tube (figure 51, item 3) through opening in crossmember (figure 51, item 4), and connect tube (figure 51, item 3) to elbow (figure 51, item 2) on right-rear modulator (figure 51, item 1).

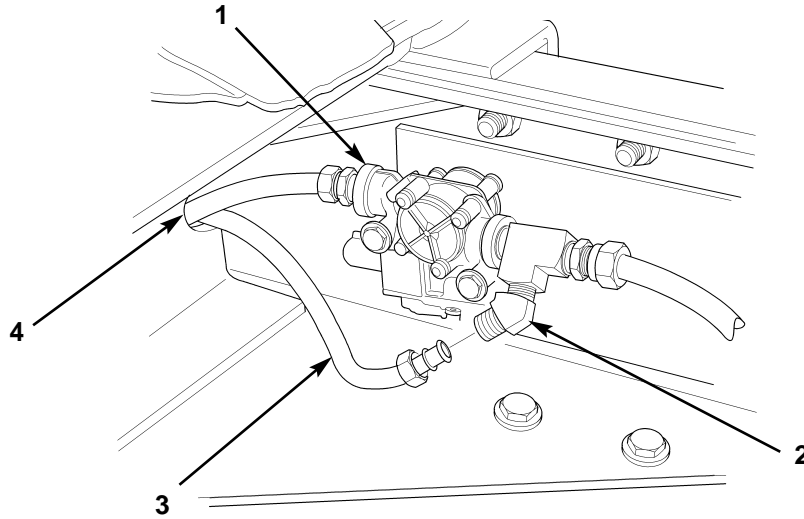


Figure 51. Connecting Tube to Right-Rear Modulator.

26. Route end of tube (figure 52, item 3) through opening in crossmember (figure 52, item 2), and connect tube (figure 52, item 3) to elbow (figure 52, item 4) on left-rear modulator (figure 52, item 1).

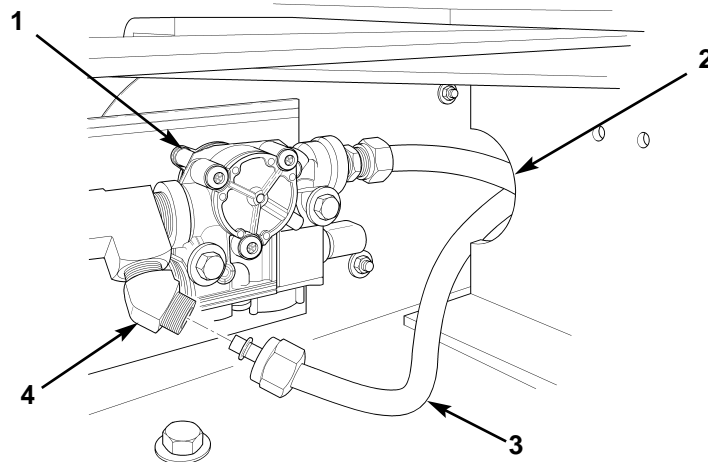


Figure 52. Connecting Tube to Left-Rear Modulator.

INSTALLATION OF ABS AIR LINES – CONTINUED**NOTE**

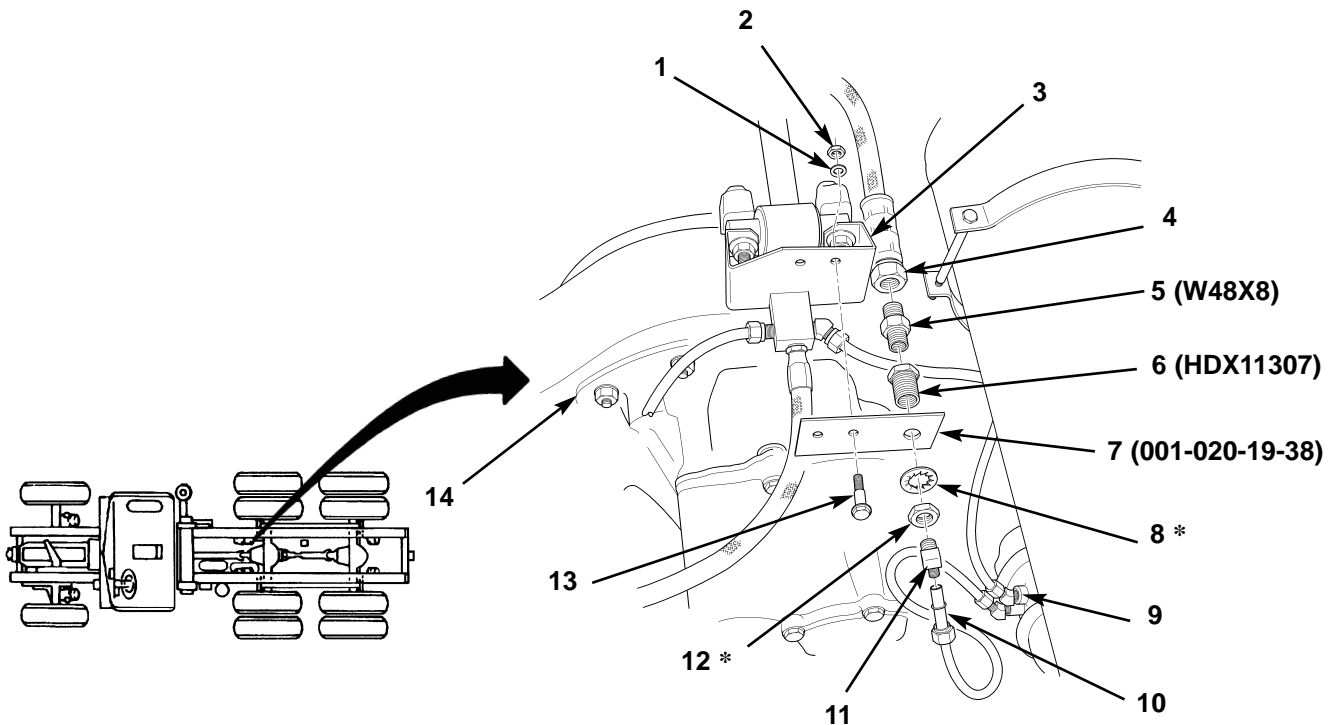
Screws and washers removed with quick-release valve at forward-rear axle are used to install bulkhead fitting mount on forward-rear axle.

27. Install new bulkhead fitting mount (figure 53, item 7) on bracket (figure 53, item 3) at top of forward-rear axle (figure 53, item 14) with two screws (figure 53, item 13), washers (figure 53, item 1), and new locknuts (figure 53, item 2).
28. Install new bulkhead fitting (figure 53, item 6) on bulkhead fitting mount (figure 53, item 7) with new lockwasher (figure 53, item 8) and new nut (figure 53, item 12).

NOTE

Elbow, installed in step 29 below, is reused from previously removed forward-rear axle quick-release valve.

29. Install elbow (figure 53, item 11) and new adapter (figure 53, item 5) on bulkhead fitting (figure 53, item 6), and connect tube (figure 53, item 10) from left spring brake chamber (figure 53, item 9) to elbow (figure 53, item 11) and hose assembly (figure 53, item 4) from left-front bulkhead to adapter (figure 53, item 5).



* ITEM 8 SUPPLIED WITH ITEM 6

* ITEM 12 SUPPLIED WITH ITEM 6

Figure 53. Installing Forward-Rear Axle Bulkhead.

INSTALLATION OF ABS AIR LINES – CONTINUED

30. Disconnect tubes (figure 54, items 3 and 4) from adapter (figure 54, item 1) and elbow (figure 54, item 2), located at front end of primary reservoir (figure 54, item 5).

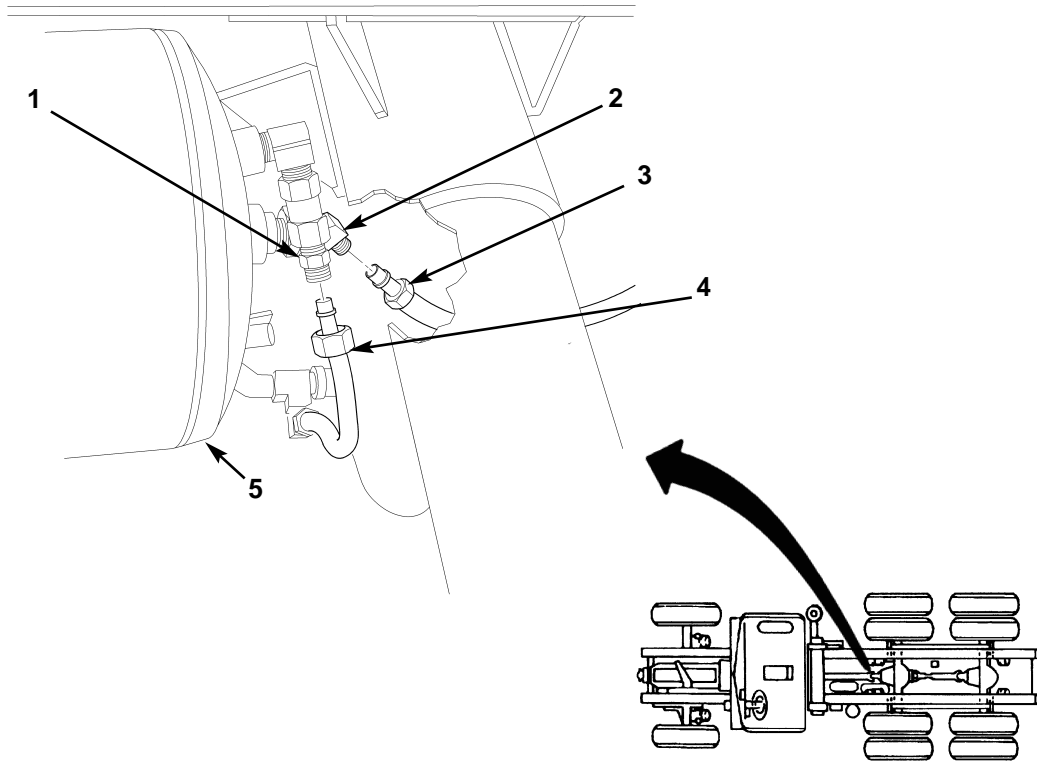


Figure 54. Disconnecting Tubes from Primary Reservoir.

31. Remove two nuts (figure 55, item 8) and screws (figure 55, item 4) from primary reservoir upper and lower clamps (figure 55, items 5 and 7).
32. Remove two nuts (figure 55, item 6) and upper clamps (figure 55, item 5) from right frame rail (figure 55, item 9) and primary reservoir (figure 55, item 10).

NOTE

The 3/8 in. (9.5 mm) tube connected between primary reservoir and the brake treadle valve is replaced with 5/8 in. (16 mm) tube.

33. Slide primary reservoir (figure 55, item 10) back from crossmember, and disconnect tube (figure 55, item 1) from elbow (figure 55, item 3) and tube (figure 55, item 2) from adapter (figure 55, item 11). Cut off and discard end of 3/8 in. (9.5 mm) tube (figure 55, item 1).

INSTALLATION OF ABS AIR LINES – CONTINUED

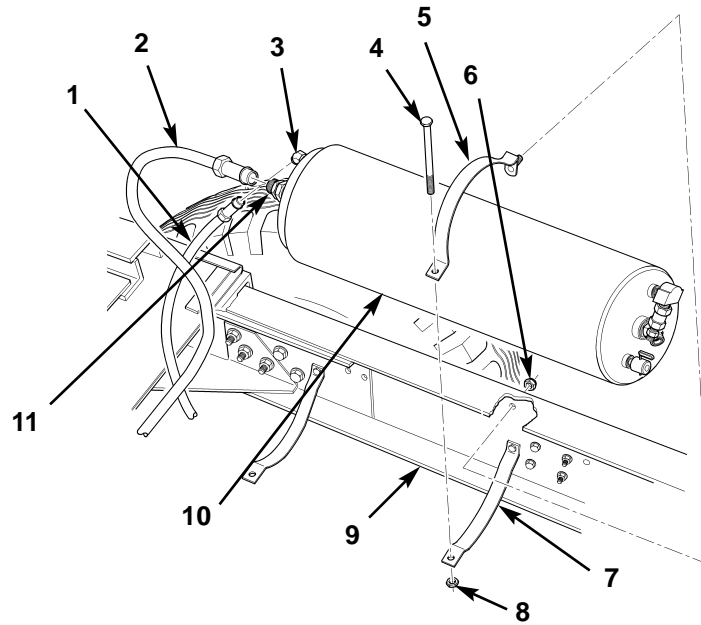


Figure 55. Removing Primary Reservoir.

34. Remove elbow (figure 56, item 1), adapter (figure 56, item 4), and reducer bushing (figure 56, item 3) from primary reservoir (figure 56, item 2).

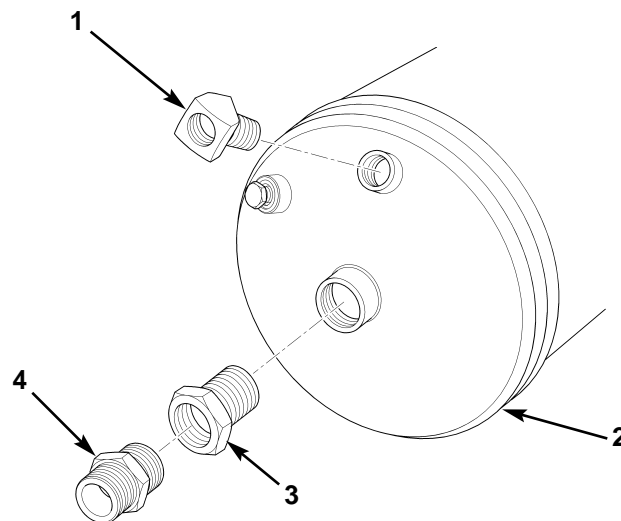


Figure 56. Removing Fittings from Primary Reservoir.

INSTALLATION OF ABS AIR LINES – CONTINUED**NOTE**

Reducer bushing and adapter removed in step 34 are reused in steps 35 and 36.

35. Install new tee (figure 57, item 7) on primary reservoir (figure 57, item 2), and install reducer bushing (figure 57, item 6) and new elbow (figure 57, item 4) on tee (figure 57, item 7) as shown in figure 57.
36. Install adapter (figure 57, item 5) on reducer bushing (figure 57, item 6), and install straight fitting (figure 57, item 3) on elbow (figure 57, item 4).
37. Install plug (figure 57, item 1) on primary reservoir (figure 57, item 2).

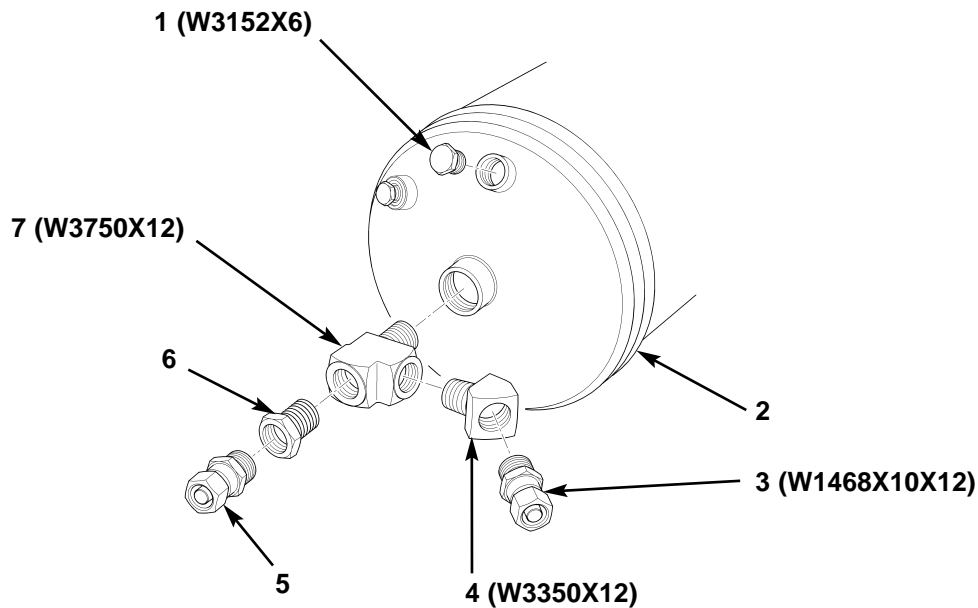


Figure 57. Installing Fittings on Primary Reservoir.

NOTE

The 3/8 in. (9.5 mm) green tubing between the brake treadle valve and the primary reservoir is replaced with 5/8 in. (16 mm) green tubing.

38. Disconnect tubes (figure 58, items 5, 11, 14, 17, and 18) from adapter (figure 58, item 16) and elbows (figure 58, items 1, 2, 4, 12, and 15). Cut off and discard tube (figure 58, item 11).
39. Rotate double check valve (figure 58, item 3) 1/4 turn counterclockwise, and remove elbow (figure 58, item 12) and reducer bushing (figure 58, item 10) from brake treadle valve (figure 58, item 6).

INSTALLATION OF ABS AIR LINES – CONTINUED

40. Remove hex-head plug (figure 58, item 13) from double check valve (figure 58, item 3), and install socket-head plug (figure 58, item 7) on double check valve (figure 58, item 3) in its place.
41. Install new elbow (figure 58, item 8) on brake treadle valve (figure 58, item 6), rotate double check valve (figure 58, item 3) 1/4 turn clockwise, and connect tubes (figure 58, items 5, 14, 17, and 18) to elbows (figure 58, items 2, 4, and 15) and adapter (figure 58, item 16).
42. Cut and route new 168 in. (427 cm) 5/8 in. (16 mm) green tubing (figure 58, item 9) under truck cab up to location at brake treadle valve (figure 58, item 6), and connect end of tube (figure 58, item 9) to elbow (figure 58, item 8) on brake treadle valve (figure 58, item 6).

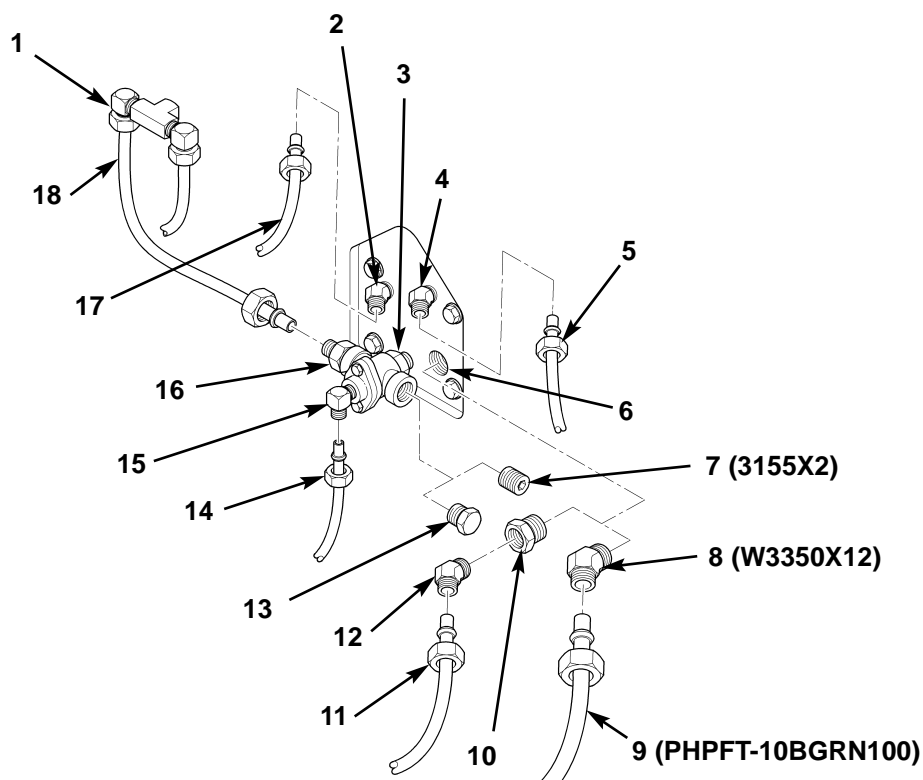


Figure 58. Installing 5/8 Tube on Brake Treadle Valve.

INSTALLATION OF ABS AIR LINES – CONTINUED

43. Route 5/8 in. (16 mm) green tube (figure 59, item 1) from brake treadle valve along left frame rail (figure 59, item 10), and connect end of tube (figure 59, item 1) to elbow (figure 59, item 11) on primary reservoir (figure 59, item 4). Secure tube (figure 59, item 1) with tie straps.
44. Connect tube (figure 59, item 2) to adapter (figure 59, item 3) on primary reservoir (figure 59, item 4).

NOTE

Mounting primary reservoir after routing ABS wiring harness along left frame rail makes installation of wiring harness easier.

45. Position primary reservoir (figure 59, item 4) on lower clamps (figure 59, item 8), and install upper clamps (figure 59, item 6) on left frame rail (figure 59, item 10) with two nuts (figure 59, item 7).
46. Secure primary reservoir (figure 59, item 4) to left frame rail (figure 59, item 10) and two upper and lower clamps (figure 59, items 6 and 8) with two screws (figure 59, item 5) and nuts (figure 59, item 9).

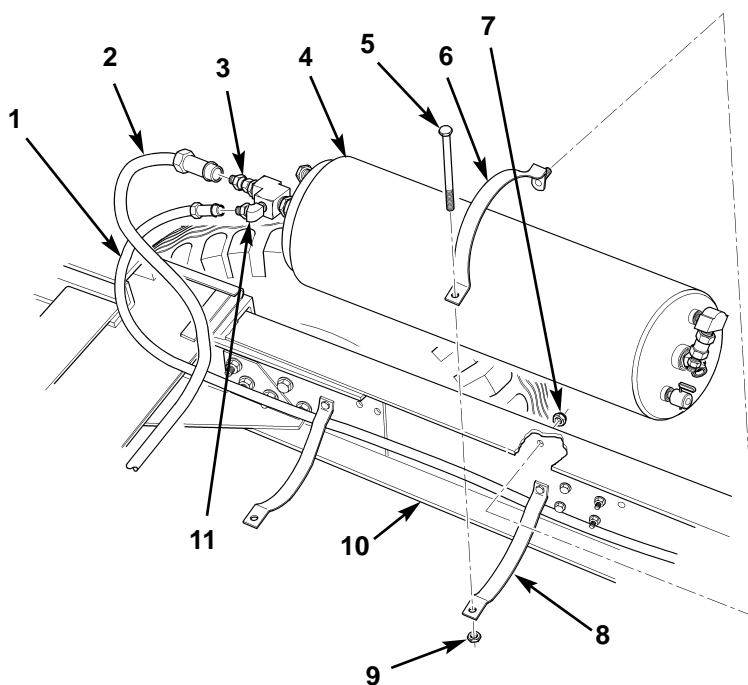


Figure 59. Installing Primary Reservoir.

INSTALLATION OF ABS AIR LINES - CONTINUED

47. Connect tubes (figure 60, items 3 and 4) to adapter (figure 60, item 1) and elbow (figure 60, item 2) located at front end of primary reservoir (figure 60, item 5).

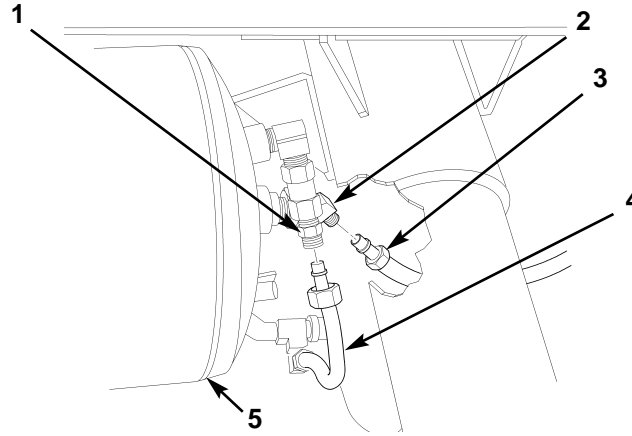


Figure 60. Connecting Tubes to Primary Reservoir.

NOTE

The 3/8 in. (9.5 mm) green tubing between the double check valve and the tee on the double check valve stop/light switch is replaced with 1/2 in. (13 mm) green tubing.

48. Remove tube (figure 61, item 8) from elbows (figure 61, items 1 and 6), elbow (figure 61, item 6) from double check valve (figure 61, item 5), and elbow (figure 61, item 1) from tee (figure 61, item 3) at double check valve/stoplight switch (figure 61, item 4). Discard tube (figure 61, item 8).
49. Install new adapter (figure 61, item 7) on double check valve (figure 61, item 5), and install new adapter (figure 61, item 2) on tee (figure 61, item 3) at double check valve/stoplight switch (figure 61, item 4).
50. Cut and install new piece of 1/2 in. (13 mm) green tubing (figure 61, item 8) on adapters (figure 61, items 2 and 7).

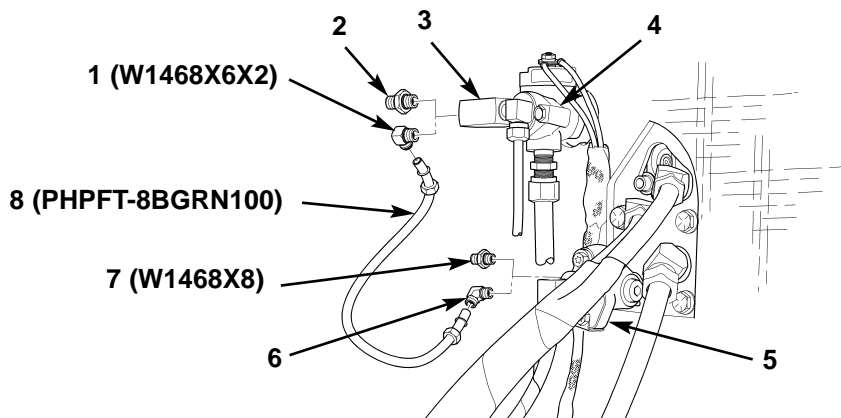


Figure 61. Replacing Tube Between Double Check and Quick Release Valves.

INSTALLATION OF ABS AIR LINES – CONTINUED

NOTE

The 3/8 in. (9.5 mm) blue tubing between the double check valve stop/light switch tractor protection valve is replaced with 1/2 in. (13 mm) blue tubing.

51. Cut and remove piece of tube (figure 62, item 4) from adapter (figure 62, item 5), and remove adapter (figure 62, item 5) from double check valve/stoplight switch (figure 62, item 1). Discard tube (figure 62, item 4).
52. Install new adapter (figure 62, item 2) on double check valve/stoplight switch (figure 62, item 1).
53. Cut and route 112 in. (284.5 cm) new piece of 1/2 in. (13 mm) blue tubing (figure 62, item 3) under truck cab and along left frame rail to tractor protection valve (figure 63, item 6), and connect end of tube (figure 62, item 3) to adapter (figure 62, item 2) on double check valve/stoplight switch (figure 62, item 1).

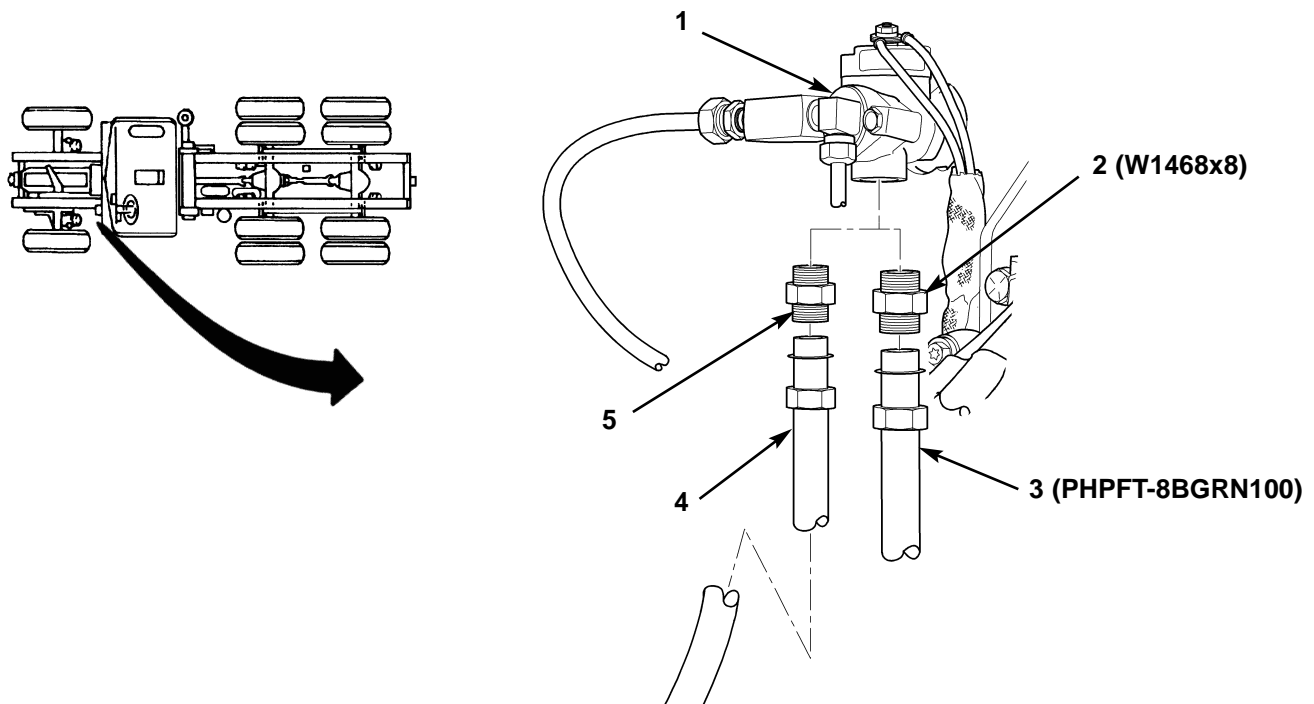


Figure 62. Replacing Tube Between Double Check and Protection Valves.

54. Cut and remove piece of tube (figure 63, item 2) from elbow (figure 63, item 3), and remove elbow (figure 63, item 3) from tractor protection valve (figure 63, item 6). Discard tube (figure 63, item 2).
55. Install new adapter (figure 63, item 5) on tractor protection valve (figure 62, item 6).
56. Route 1/2 in. (13 mm) blue tube (figure 63, item 4) along left frame rail (figure 63, item 13), and connect end of blue tube (figure 63, item 4) to adapter (figure 63, item 5) on tractor protection valve (figure 63, item 6). Secure tube (figure 63, item 4) with tie straps.
57. Disconnect trailer brake tube (figure 63, item 9) from adapter (figure 63, item 10), and remove adapter (figure 63, item 10) from tee (figure 63, item 11).

INSTALLATION OF ABS AIR LINES – CONTINUED

58. Disconnect tube (figure 63, item 1) from adapter (figure 63, item 12), and remove tee (figure 63, item 11) from reducer bushing (figure 63, item 8) and reducer bushing (figure 63, item 8) from tractor protection valve (figure 63, item 6).
59. Install new quick-release valve (figure 63, item 7) on tractor protection valve (figure 63, item 6), and install reducer bushing (figure 63, item 8) and tee (figure 63, item 11) on quick-release valve (figure 63, item 7) as shown.
60. Connect tube (figure 63, item 1) to adapter (figure 63, item 12) at quick-release valve (figure 63, item 7).
61. Install adapter (figure 63, item 10) on tee (figure 63, item 11), and connect trailer brake tube (figure 63, item 9) to adapter (figure 63, item 10).

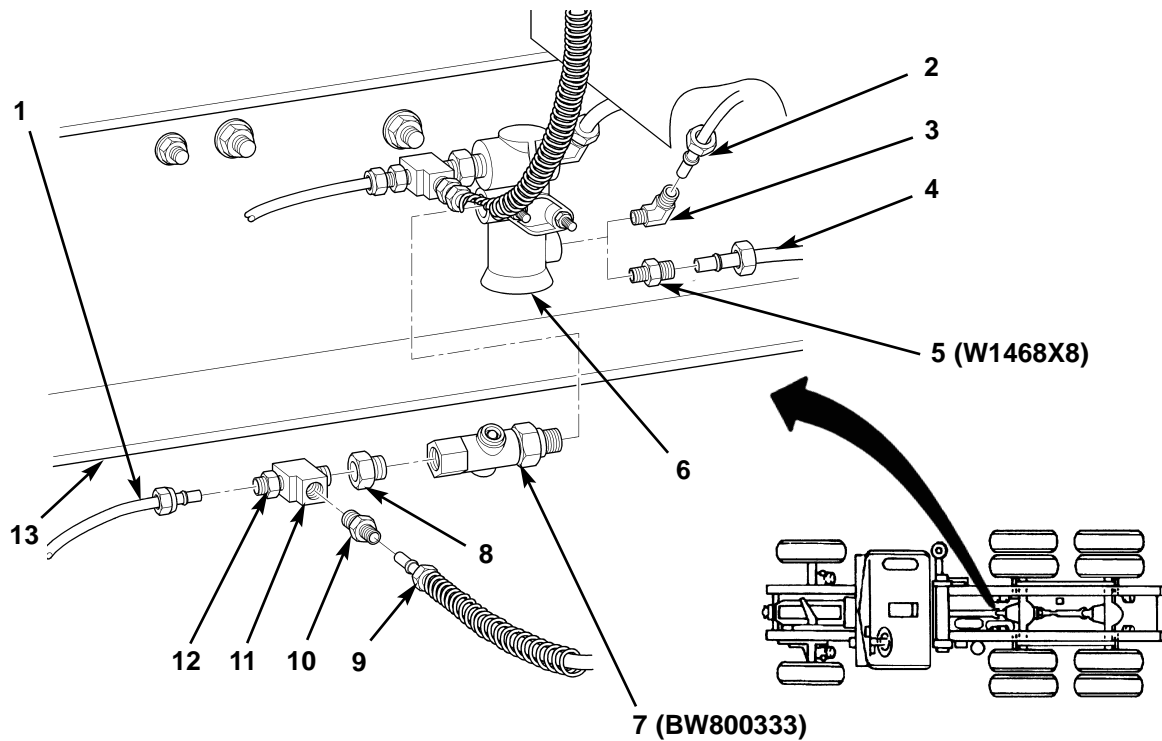


Figure 63. Installing Quick-Release Valve on Protection Valve.

INSTALLATION OF ABS AIR LINES – CONTINUED**WARNING**

Spring brake chambers contain a loaded compression spring and must be handled with extreme care. Be careful not to drop the spring brake chamber, and always work from the side of the unit and not from the front or back. During removal and installation, do not use an impact wrench on the release tool or strike any part of the unit for any reason. Do not attempt to dismantle the spring brake chamber, and replace the entire unit if any structural damage is evident. Failure to comply may result in damage to equipment or possible injury or death to personnel. Seek medical attention in the event of an injury.

NOTE

Elbow removed in step 62 will be reused in step 67.

62. Disconnect tube (figure 64, item 3) from elbow (figure 64, item 2) on brake chamber (figure 64, item 1) at rear-rear axle (figure 64, item 13), and remove elbow (figure 64, item 2) from brake chamber (figure 64, item 1).

NOTE

If pin cannot be easily removed from clevis on brake chamber, rotate screw on slack adjuster until pin can be removed.

63. Remove cotter pin (figure 64, item 7) and pin (figure 64, item 6) from clevis (figure 64, item 4) and slack adjuster (figure 64, item 5), and remove two locknuts (figure 64, item 8), washers (figure 64, item 9), and brake chamber (figure 64, item 1) from camshaft bracket (figure 64, item 10). Discard locknuts (figure 64, item 8), washers (figure 64, item 9), and cotter pin (figure 64, item 7).

NOTE

Clevis removed in step 64 will be reused in step 66.

64. Loosen jamnut (figure 64, item 11), and remove clevis (figure 64, item 4) from pushrod (figure 64, item 12) of brake chamber (figure 64, item 1). Discard brake chamber (figure 64, item 1).

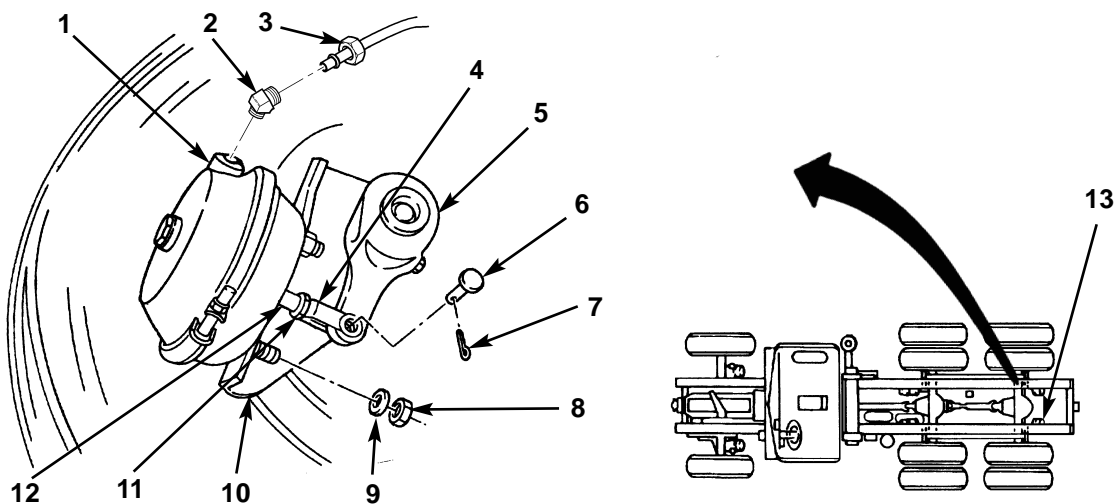
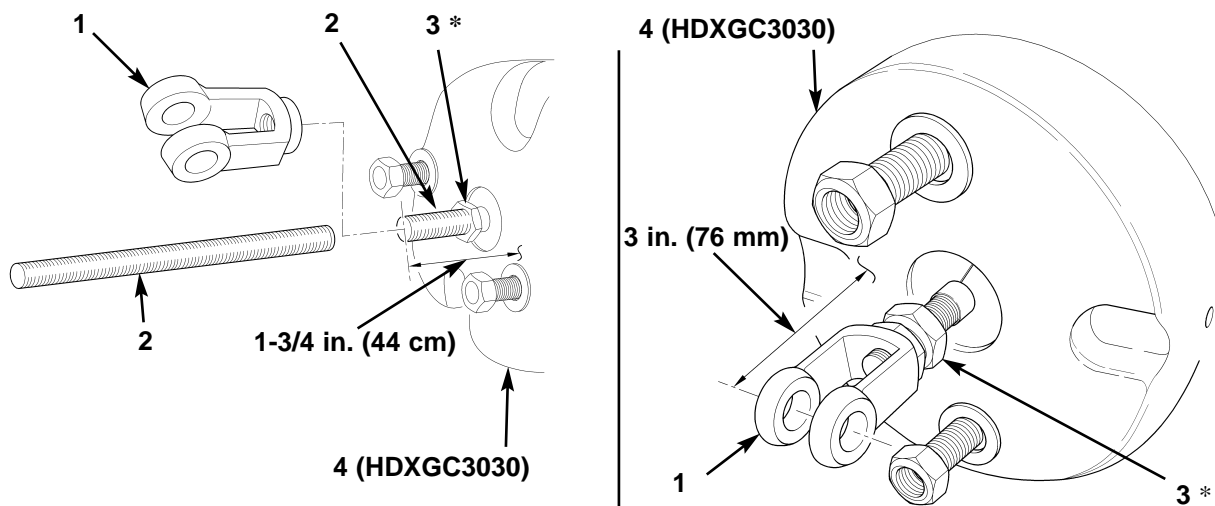


Figure 64. Removing Brake Chambers from Rear-Rear Axle.

INSTALLATION OF ABS AIR LINES - CONTINUED

65. Thread new jamnut (figure 65, item 3) on pushrod (figure 65, item 2), and cut off pushrod (figure 65, item 2) 1-3/4 in. (44 mm) from face of new spring brake chamber (figure 65, item 4). Discard remaining piece of pushrod (figure 65, item 2).
66. Install clevis (figure 65, item 1) on pushrod (figure 65, item 2) of spring brake chamber (figure 65, item 4) until center of holes in clevis (figure 65, item 1) are 3 in. (76 mm) from face of spring brake chamber (figure 65, item 4). Finger tighten jamnut (figure 65, item 3).



* ITEM 3 SUPPLIED WITH ITEM 4

Figure 65. Shortening Pushrod and Installing Clevis.

67. Install elbow (figure 66, item 5) on parking brake port (figure 66, item 1), and install new elbow (figure 66, item 4) on service brake port (figure 66, item 3) of spring brake chamber (figure 66, item 2).

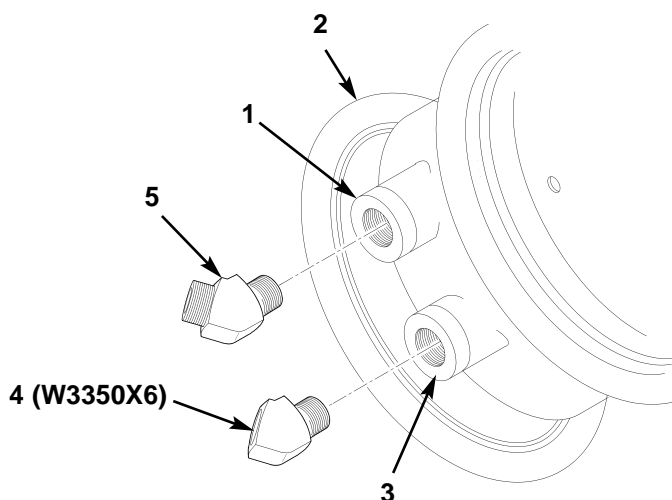
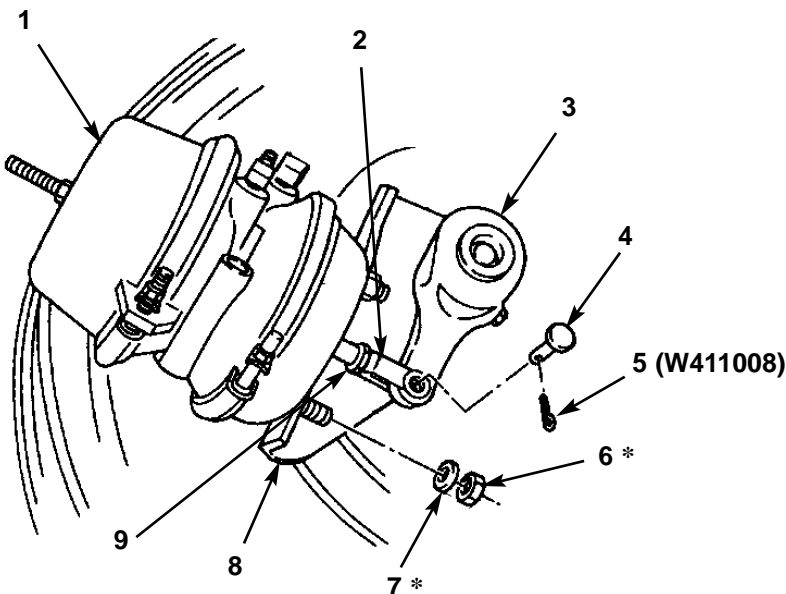


Figure 66. Installing Elbows on Spring Brake Chamber.

INSTALLATION OF ABS AIR LINES – CONTINUED**NOTE**

Ensure spring brake chamber is installed so mounting studs are at top of elongated holes in camshaft bracket prior to tightening locknuts.

68. Install spring brake chamber (figure 67, item 1) on camshaft bracket (figure 67, item 8) with two washers (figure 67, item 7) and new locknuts (figure 67, item 6) supplied with spring brake chamber (figure 67, item 1).
69. Connect clevis (figure 67, item 2) to slack adjuster (figure 67, item 3) with pin (figure 67, item 4) and new cotter pin (figure 67, item 5). Tighten jamnut (figure 67, item 9). Un-cage spring brake chamber (figure 67, item 1). Refer to TM 9-2320-283-10.
70. Repeat steps 62 through 69 for installation of opposite spring brake chamber (figure 67, item 1).



* ITEM 6 SUPPLIED WITH ITEM 1

* ITEM 7 SUPPLIED WITH ITEM 1

Figure 67. Installing Spring Brake Chambers.

71. Remove plug (figure 68, item 1) from quick-release valve (figure 68, item 4) on right frame rail (figure 68, item 5), and install new adapter (figure 68, item 3) on quick-release valve (figure 68, item 4).
72. Cut and route new piece of 1/2 in. (13 mm) red tubing (figure 68, item 2) 80 in. (203 cm) in length on right frame rail (figure 68, item 5), and connect end of tube (figure 68, item 2) to adapter (figure 68, item 3) on quick-release valve (figure 68, item 4).

INSTALLATION OF ABS AIR LINES – CONTINUED

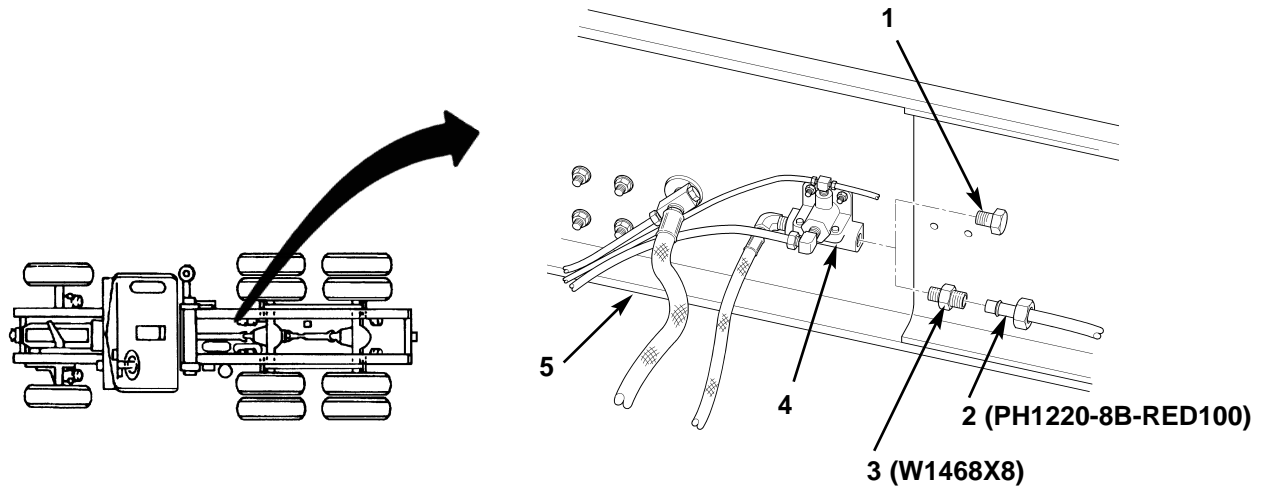


Figure 68. Installing Tube on Quick-Release Valve.

NOTE

The mountable tee, screw, and plug previously removed from right frame rail adjacent to quick-release valve is reused in step 73.

73. Install elbow (figure 69, item 7) and plug (figure 69, item 3) on mountable tee (figure 69, item 2), and install mountable tee (figure 69, item 2) on top hole in right frame rail (figure 69, item 6) with new lockwasher (figure 69, item 4) and screw (figure 69, item 5).
74. Connect 1/2 in. (13 mm) red tube (figure 69, item 8) from quick-release valve (figure, 68 item 4) to elbow (figure 69, item 7), and install hose assembly (figure 69, item 1) on mountable tee (figure 69, item 2).

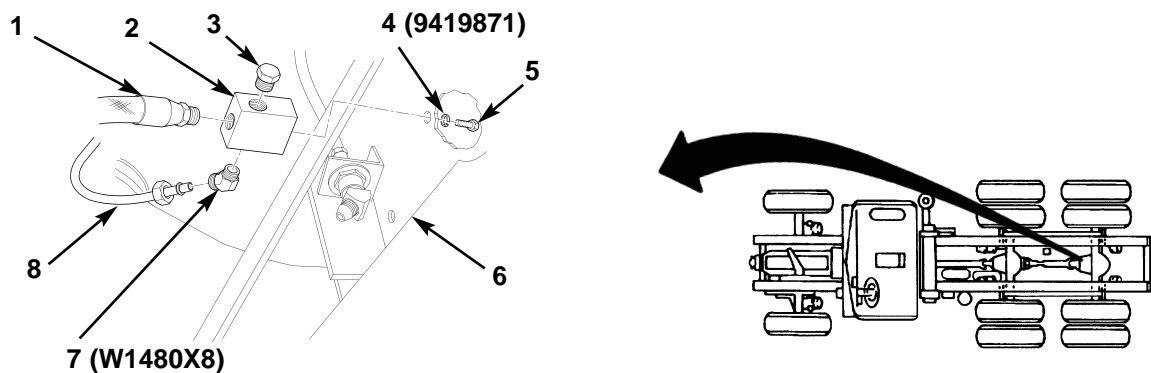


Figure 69. Installing Mountable Tee on Right Frame Rail.

INSTALLATION OF ABS AIR LINES – CONTINUED**NOTE**

The mountable tee and bolt previously removed from bracket at top of forward-rear axle is reused in step 75.

75. Install new elbow (figure 70, item 6) and two new adapters (figure 70, items 4 and 7) on mountable tee (figure 70, item 8), and install mountable tee (figure 70, item 8) on top hole of rear-rear axle bracket (figure 70, item 3) with new lockwasher (figure 70, item 2) and bolt (figure 70, item 1).
76. Connect hose assembly (figure 70, item 5) to elbow (figure 70, item 6) on mountable tee (figure 70, item 8).

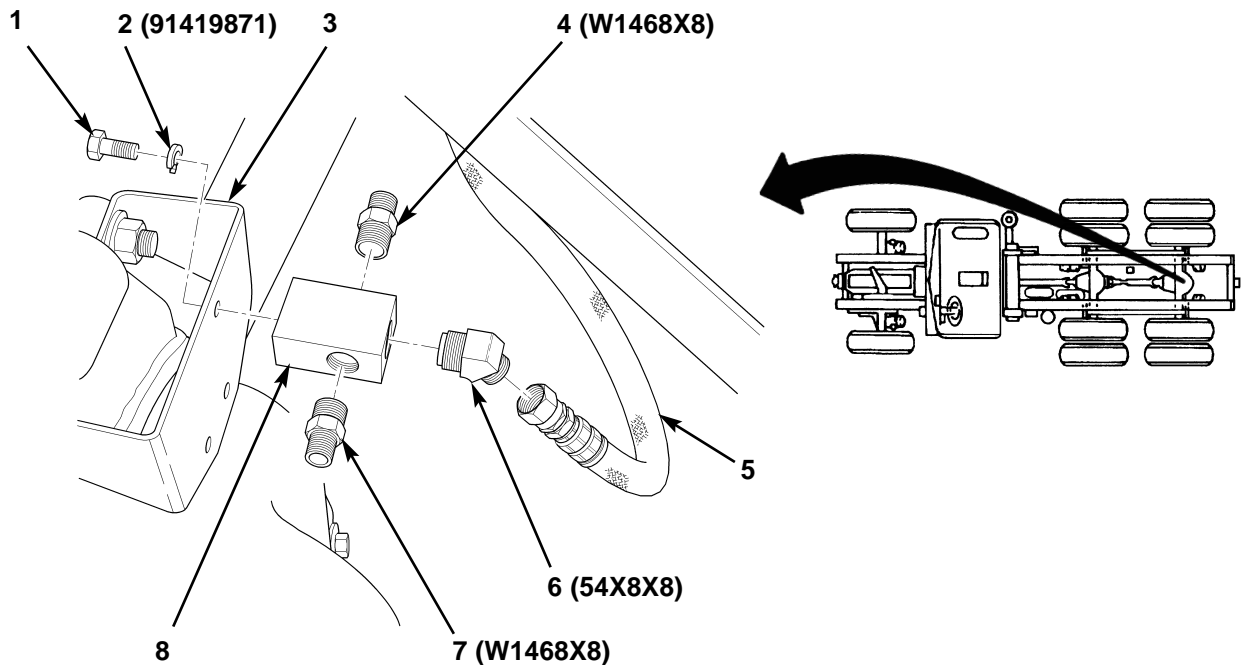


Figure 70. Installing Mountable Tee on Rear-Rear Axle Bracket.

77. Measure and cut 9 in. (74 cm) new piece of 1/2 in. (13 mm) red bulk tubing (figure 71, item 4), and install tube (figure 71, item 4) on mountable tee adapter (figure 71, item 3) and elbow (figure 71, item 5) on parking brake port of spring brake chamber (figure 71, item 7) at left side of vehicle.
78. Install new hose assembly (figure 71, item 8) on elbow (figure 71, item 6) at service brake port of spring brake chamber (figure 71, item 7) and flared elbow (figure 71, item 1) at bulkhead (figure 71, item 2).

NOTE

New 1/2 in. (13 mm) red tubing to be installed in step 79 will be cut to 26 in. (66 cm) in length.

79. Repeat steps 77 and 78 for installation of opposite tube (figure 71, item 4) and hose assembly (figure 71, item 8) at right side of vehicle.

INSTALLATION OF ABS AIR LINES – CONTINUED

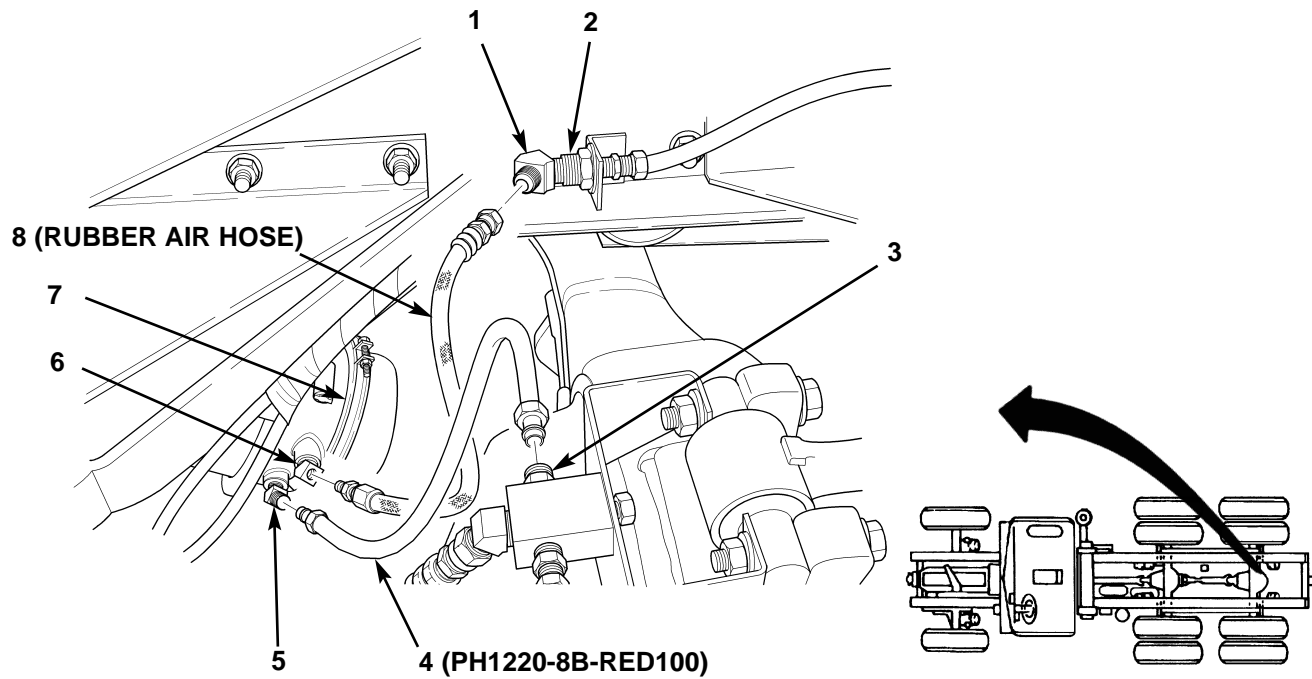


Figure 71. Installing Tube and Hose Assembly on Service Brake Chambers.

END OF TASK

INSTALLATION OF BRACKETS FOR REAR EXTERIOR LIGHTING

NOTE

As an equipment condition, the right and left blackout tail lamps, stop/tail lamps, and trailer receptacle have been removed to provide clearance for installation of new spring brake chambers on rear-rear axle. New mounting brackets are installed after installation of spring brake chambers. Installation of right and left-hand brackets is the same. Left-hand brackets are shown.

One star washer shall be installed on center hole between new stop/tail lamp mounting bracket and truck frame to ensure a good electrical ground.

1. Install new tail light mount (figure 72, item 5) on rear frame section and bracket (figure 72, item 8) with new star washer (figure 72, item 7), three bolts (figure 72, item 6), and new locknuts (figure 72, item 9).
2. Install new blackout light mount (figure 72, item 2) on rear shackle mounting bracket (figure 72, item 1) with new lockwasher (figure 72, item 3) and screw (figure 72, item 4).
3. Repeat steps 1 and 2 of installation of right-hand mounting brackets (figure 72, items 2 and 5).

NOTE

It may be necessary to loosen wiring harness clamps and pull trailer receptacle back to reach new mounting brackets.

Reuse grommets from discarded mounting brackets. Ensure new lockwashers are used for installation of receptacle and lamps.

4. Install trailer light receptacle. Refer to TM 9-2320-283-20.
5. Install stop/tail lamps. Refer to TM 9-2320-283-20.
6. Install blackout tail lamps. Refer to TM 9-2320-283-20.

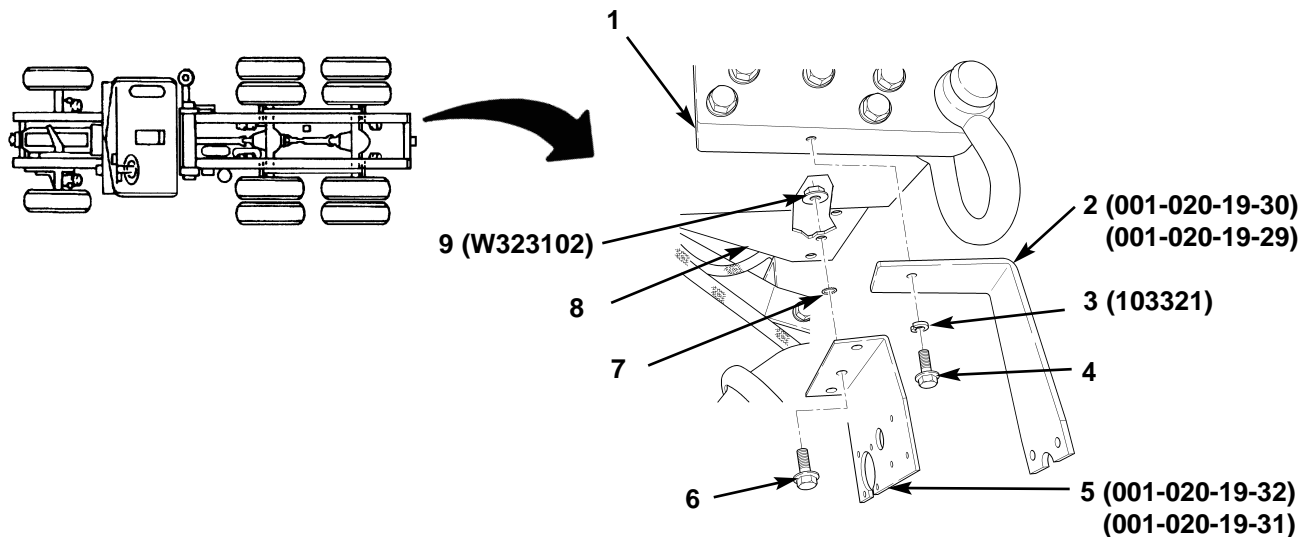


Figure 72. Installing Rear Exterior Lighting Brackets.

END OF TASK

INSTALLATION OF ABS ELECTRONIC CONTROL UNIT (ECU)

1. Working inside cab left of steering column, position T1 template (supplied in ABS kit) over two studs (figure 73, item 1), and mark location of four holes (figure 73, item 3) and two holes (figure 73, item 4) on cab firewall (figure 73, item 2). Remove T1 template.
2. Drill four 3/16 in. (5 mm) holes (figure 73, item 3) and two 1-1/2 in. (38 mm) holes (figure 73, item 4) through cab firewall (figure 73, item 2).

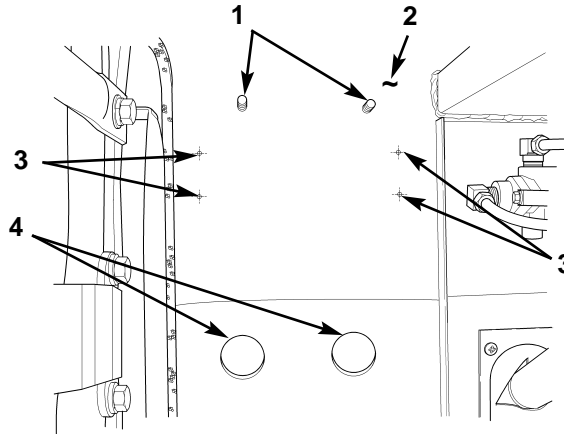


Figure 73. Drilling Holes for ABS ECU and Bulkhead Connectors.

3. Working outside cab, cut and remove exterior insulation (figure 74, item 1) from around holes (figure 74, items 2 and 4) drilled in firewall (figure 74, item 5).

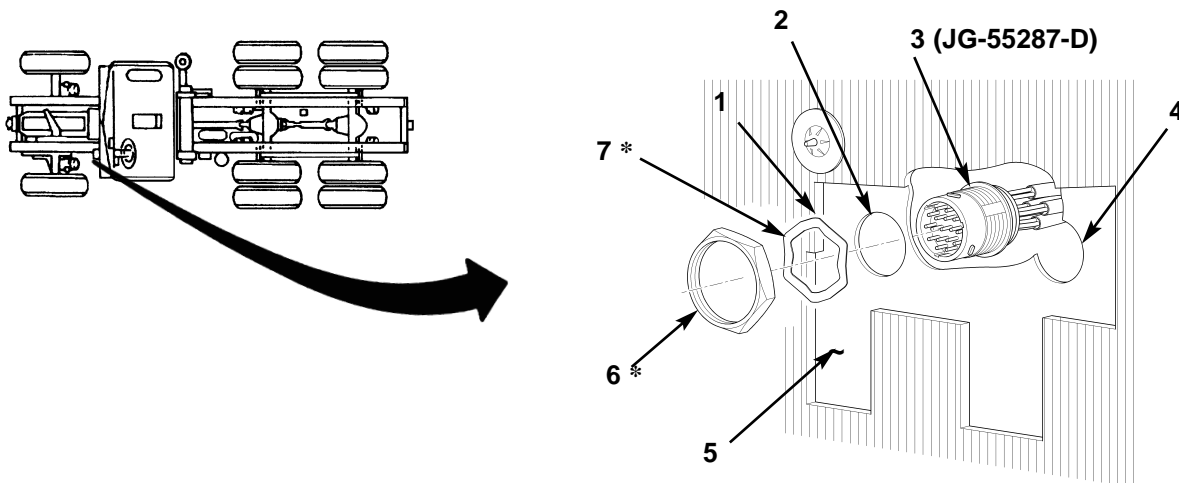
CAUTION

Plastic bulkhead nuts shall be finger tightened on bulkhead connectors. Over tightening plastic nut will strip threads and damage bulkhead.

NOTE

Assistant will help with installation of harness bulkhead connectors.

4. Install new ABS ECU harness bulkhead connector (figure 74, item 3) on hole (figure 74, item 2) closest to steering column with washer (figure 74, item 7) and nut (figure 74, item 6) supplied with new connector (figure 74, item 3).
5. Repeat step 7 for installation of opposite bulkhead connector on hole (figure 74, item 4).



* ITEM 6 SUPPLIED WITH ITEM 3

* ITEM 7 SUPPLIED WITH ITEM 3

Figure 74. Installing Electrical Bulkhead Connectors.

INSTALLATION OF ABS ELECTRONIC CONTROL UNIT (ECU) – CONTINUED**NOTE**

Leave top left mounting hole in ECU open for connection of ground wires in step 11.

6. Install new ABS ECU (figure 75, item 6) on firewall (figure 75, item 11) with three new screws (figure 75, item 5).
7. Connect three black ground wires (figure 75, items 2, 3, and 4) to ECU (figure 75, item 6) and firewall (figure 75, item 11) with new screw (figure 75, item 1).
8. Connect harness connectors (figure 75, items 8 and 9) to ECU receptacles (figure 75, items 7 and 10).

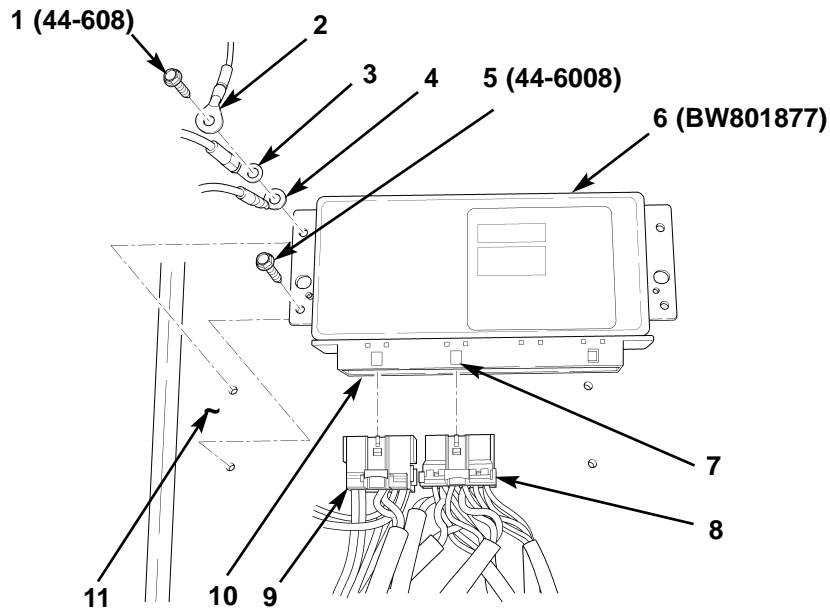


Figure 75. Installing ABS ECU.

INSTALLATION OF ABS ELECTRONIC CONTROL UNIT (ECU) – CONTINUED**CAUTION**

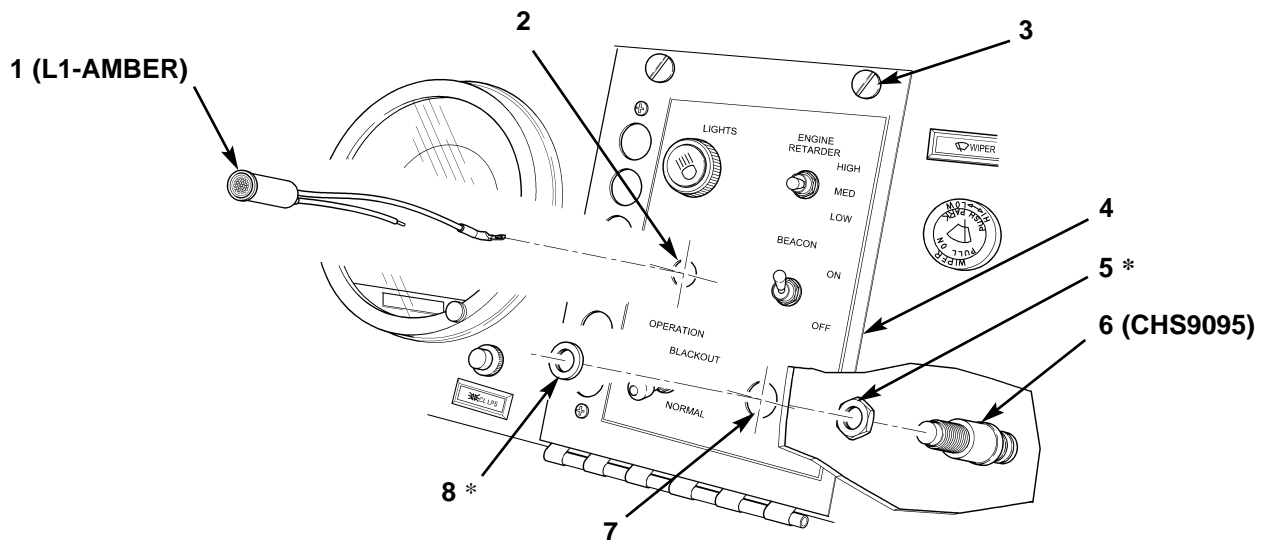
Ensure wiring behind control panel is not in the way prior to drilling new holes. Failure to comply may result in damage to equipment.

9. Turn two turnlock fasteners (figure 76, item 3) 90 degrees, open center control panel (figure 76, item 4), and move any wiring away from location of holes to be drilled.
10. Locate and drill 9/16 in. (14 mm) hole (figure 76, item 2) in center control panel (figure 76, item 4) left of BEACON switch.
11. Locate and drill 1/2 in. (13 mm) hole (figure 76, item 7) in lower right corner of center control panel (figure 76, item 4).
12. Install new amber warning light (figure 76, item 1) in hole (figure 76, item 2) on center control panel (figure 76, item 4) by pushing housing through hole until collar is against front surface of center control panel (figure 76, item 4).

NOTE

The ABS test switch is installed by threading nut on switch housing first. Then position switch through mounting hole, install collar until tight, and turn nut on switch housing until tight against back of panel.

13. Install new test switch (figure 76, item 6) in hole (figure 76, item 7) on center control panel (figure 76, item 4) with new nut (figure 76, item 5) and new collar (figure 76, item 8).



* ITEM 5 SUPPLIED WITH ITEM 6

* ITEM 8 SUPPLIED WITH ITEM 6

Figure 76. Installing ABS Warning Light and Test Switch.

INSTALLATION OF ABS ELECTRONIC CONTROL UNIT (ECU) – CONTINUED

14. Route 76 in. (193 cm) blue wire (figure 77, item 10) from ABS ECU harness to test switch (figure 77, item 16), and connect blue wire (figure 77, item 10) and black wire (figure 77, item 2) to terminal (figure 77, item 17) with star washer (figure 77, item 7) and screw (figure 77, item 6).
15. Connect new 8 in. (203 mm) black wire (figure 77, item 11) to test switch terminal (figure 77, item 15) with star washer (figure 77, item 9) and screw (figure 77, item 8).
16. Remove nut (figure 77, item 12) and star washer (figure 77, item 13) from heater control box mounting stud (figure 77, item 14), and connect opposite end of 8 in. (203 mm) black wire (figure 77, item 11) to stud (figure 77, item 14) with star washer (figure 77, item 13) and nut (figure 77, item 12).

NOTE

Wire connectors shall be crimped and heat shrunk during installation.

17. Connect remaining black wire (figure 77, item 3) from warning light (figure 77, item 1) to new 36 in. (91 cm) blue wire (figure 77, item 5) with new wire connector (figure 77, item 4).

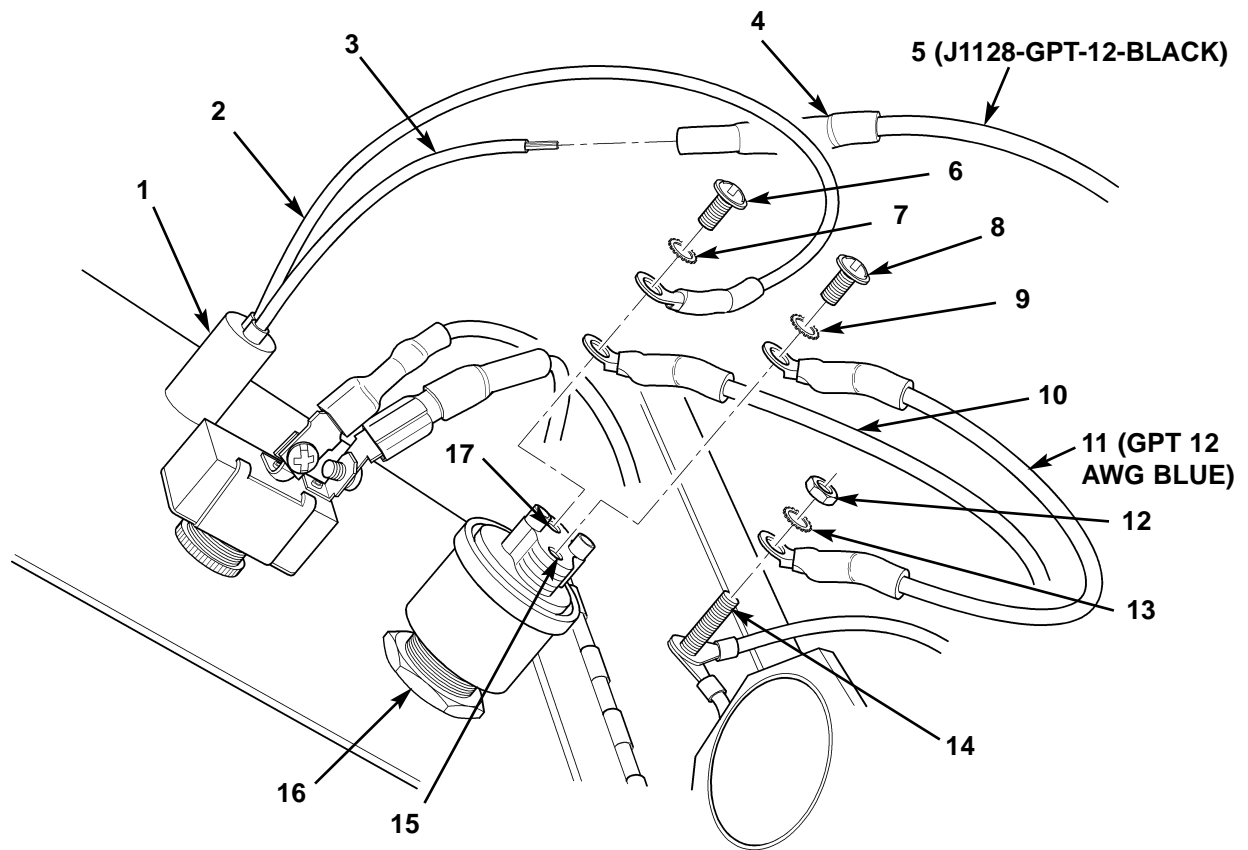


Figure 77. Connecting ABS Warning Light and Test Switch.

18. Turn three turnlock fasteners 90 degrees, and hinge open circuit breaker cover (figure 78, item 8).
19. Open glove compartment door (figure 78, item 7), and remove two screws (figure 78, item 5) and star washers (figure 78, item 4) from dash panel (figure 78, item 6) and circuit breaker panel (figure 78, item 3).
20. Remove screw (figure 78, item 1) and star washer (figure 78, item 2) from dash panel (figure 78, item 6) and circuit breaker panel (figure 78, item 3), and lift circuit breaker panel (figure 78, item 3) out to access wiring.

INSTALLATION OF ABS ELECTRONIC CONTROL UNIT (ECU) – CONTINUED

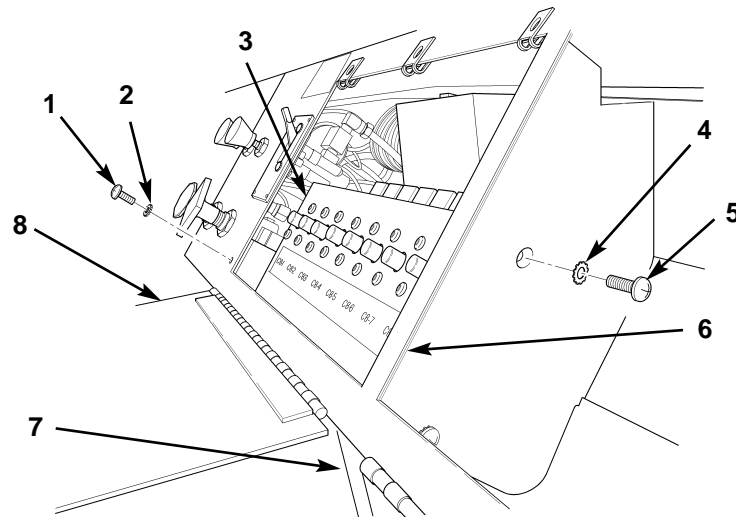


Figure 78. Removing Circuit Breaker Panel.

21. Route 36 in. (91 cm) blue wire (figure 79, item 6) from ABS warning light to circuit breaker panel (figure 79, item 2).

NOTE

Circuit 38 terminal stud has two green wires connected to it.

22. Remove nut (figure 79, item 5) from CB#3, circuit 38, terminal stud (figure 79, item 7), and connect 36 in. (91 cm) blue wire (figure 79, item 6) to terminal stud (figure 79, item 7) with nut (figure 79, item 5).
23. Route 102 in. (91 cm) 5-amp fused orange wire (figure 79, item 4) from ECU harness to circuit breaker panel (figure 79, item 2).

NOTE

Circuit 12C terminal stud has a bus bar and one red wire connected to it.

24. Remove nut (figure 79, item 3) from CB#3, circuit 12C, terminal stud (figure 79, item 1), and connect orange wire (figure 79, item 4) to terminal stud (figure 79, item 1) with nut (figure 79, item 3).

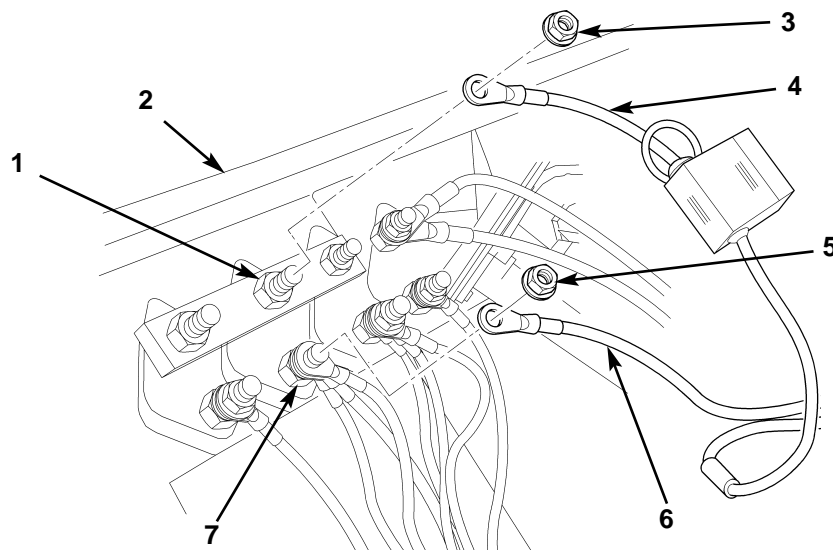


Figure 79. Connecting ABS ECU Harness to CB#3.

INSTALLATION OF ABS ELECTRONIC CONTROL UNIT (ECU) – CONTINUED

NOTE

The purple wire from circuit 40 to cigar lighter (not in use) is used to power ABS. The purple wire is located in dash panel wiring harness behind instrument panel near steering column.

25. Working under dash panel (figure 80, item 3), locate circuit 40 purple wire (figure 80, item 2), and connect 36 in. (91 cm) 30-amp fused red wire (figure 80, item 4) to purple wire (figure 80, item 2) with wire connector (figure 80, item 1).
26. Secure all ABS ECU harness wires with tie straps where necessary.

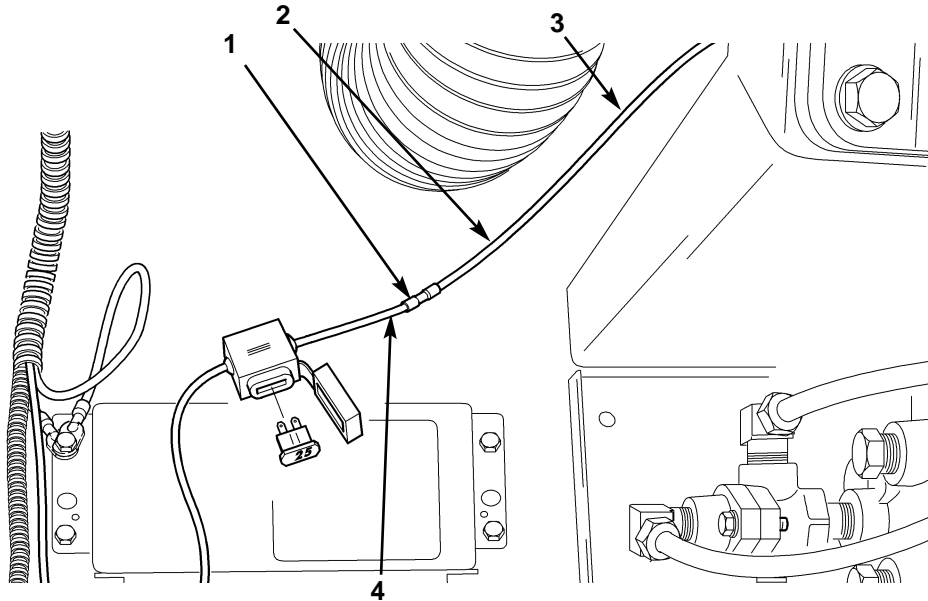


Figure 80. Connecting ABS ECU Harness to Battery Power.

27. Close center control panel (figure 81, item 2) and turn two turnlock fasteners (figure 81, item 1) 90 degrees.

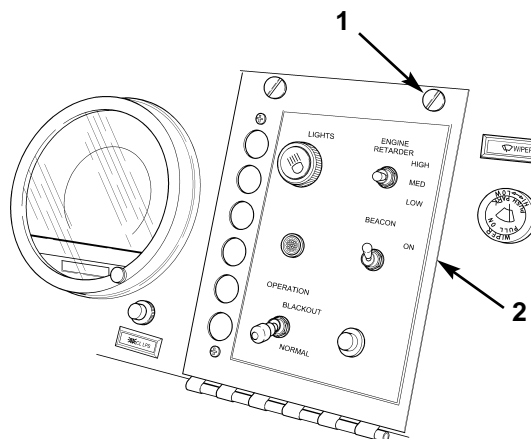


Figure 81. Securing Center Control Panel.

INSTALLATION OF ABS ELECTRONIC CONTROL UNIT (ECU) – CONTINUED

28. Position circuit breaker panel (figure 82, item 4) in place on dash panel (figure 82, item 9) and install star washer (figure 82, item 3) and screw (figure 82, item 2) on dash panel (figure 82, item 9) and circuit breaker panel (figure 82, item 4).
29. From glove compartment (figure 82, item 8), install two star washers (figure 82, item 6) and screws (figure 82, item 7) on dash panel (figure 82, item 9) and circuit breaker panel (figure 82, item 4). Close and secure glove compartment door (figure 82, item 10).
30. Close circuit breaker cover (figure 82, item 1) and turn three turnlock fasteners (figure 82, item 5) 90 degrees.

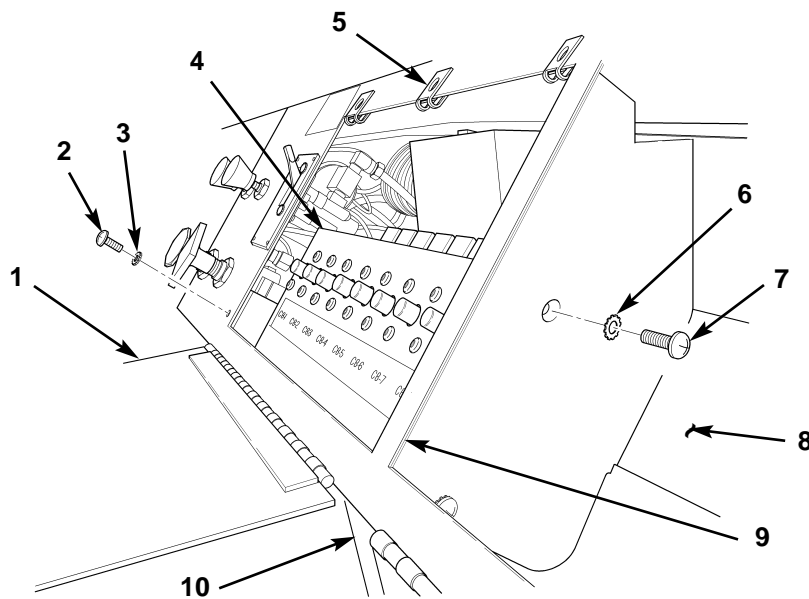


Figure 82. Securing Center Control Panel.

INSTALLATION OF ABS ELECTRONIC CONTROL UNIT (ECU) – CONTINUED**NOTE**

There are two ABS harnesses: the speed sensor harness and modulator harness. Each harness contains four leads, and each lead is labeled with a white band denoting its location: LF, RF, LR, or RR.

Ensure ends of all harness leads are identified prior to installation.

31. Lay out new speed sensor harness (figure 83, item 5) and new modulator harness (figure 83, item 8) together on shop floor and tie together with five new tie straps (figure 83, item 6) for approximately 3 ft (91 cm) from connectors (figure 83, items 1 and 4).
32. Connect speed sensor harness connector (figure 83, item 4) and modulator harness connector (figure 83, item 1) to bulkhead connectors (figure 83, items 2 and 3), and route harness leads down to left frame rail (figure 83, item 7).

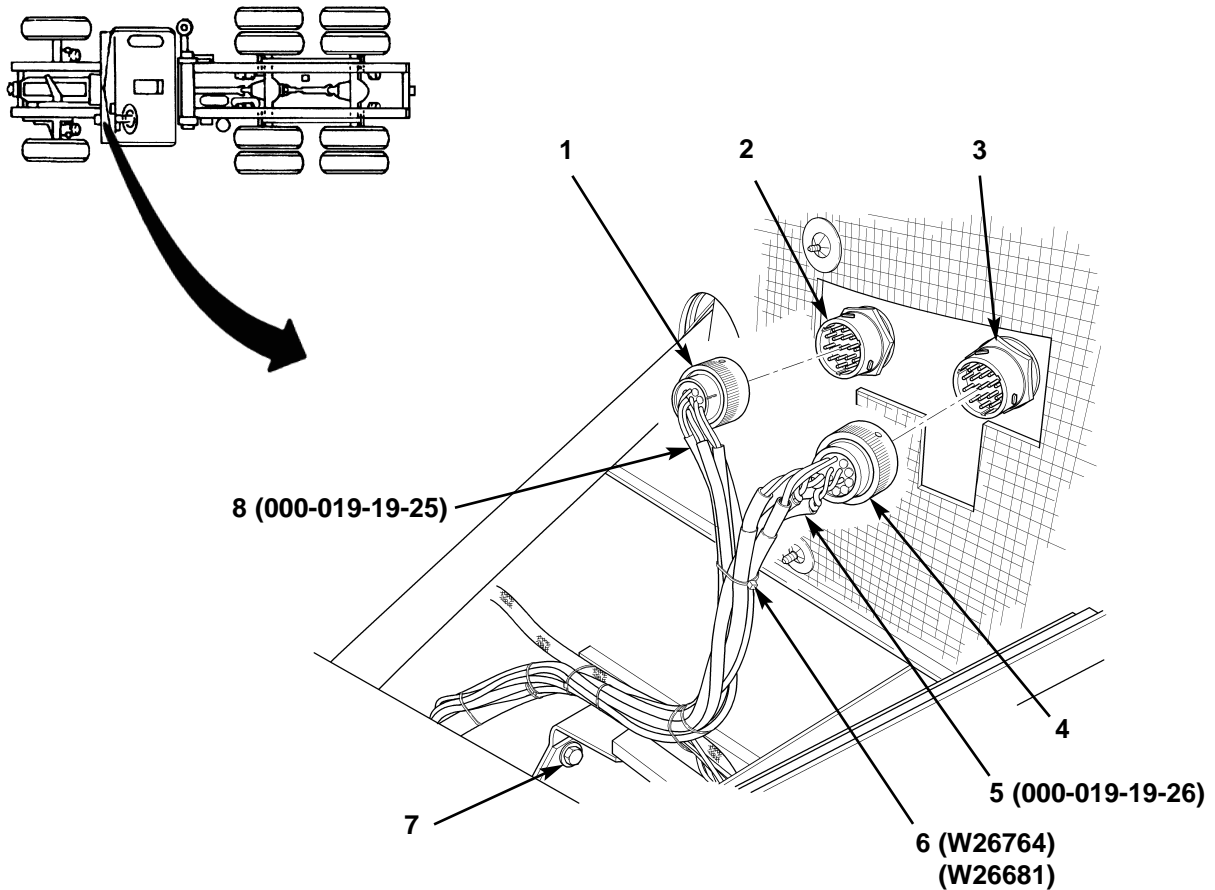


Figure 83. Connecting Harnesses to Bulkhead Connectors.

INSTALLATION OF ABS ELECTRONIC CONTROL UNIT (ECU) – CONTINUED**CAUTION**

Ensure harness leads are routed to correct wheel as labeled with white bands denoting LF, RF, LR, or RR. Failure to comply may result in damage to equipment and possible injury or death to personnel.

33. Route ends of speed sensor harness (figure 84, item 1) and modulator harness (figure 84, item 2) to left-front, right-front, left-rear, and right-rear locations as depicted in figure 84 below.

NOTE

When securing harnesses, it is necessary to loop back excess length of wiring and secure it with tie straps. Do not cut and splice harness wiring together to shorten it.

34. Secure sensor harness (figure 84, item 1) and modulator harness (figure 84, item 2) with tie straps during installation along chassis frame.

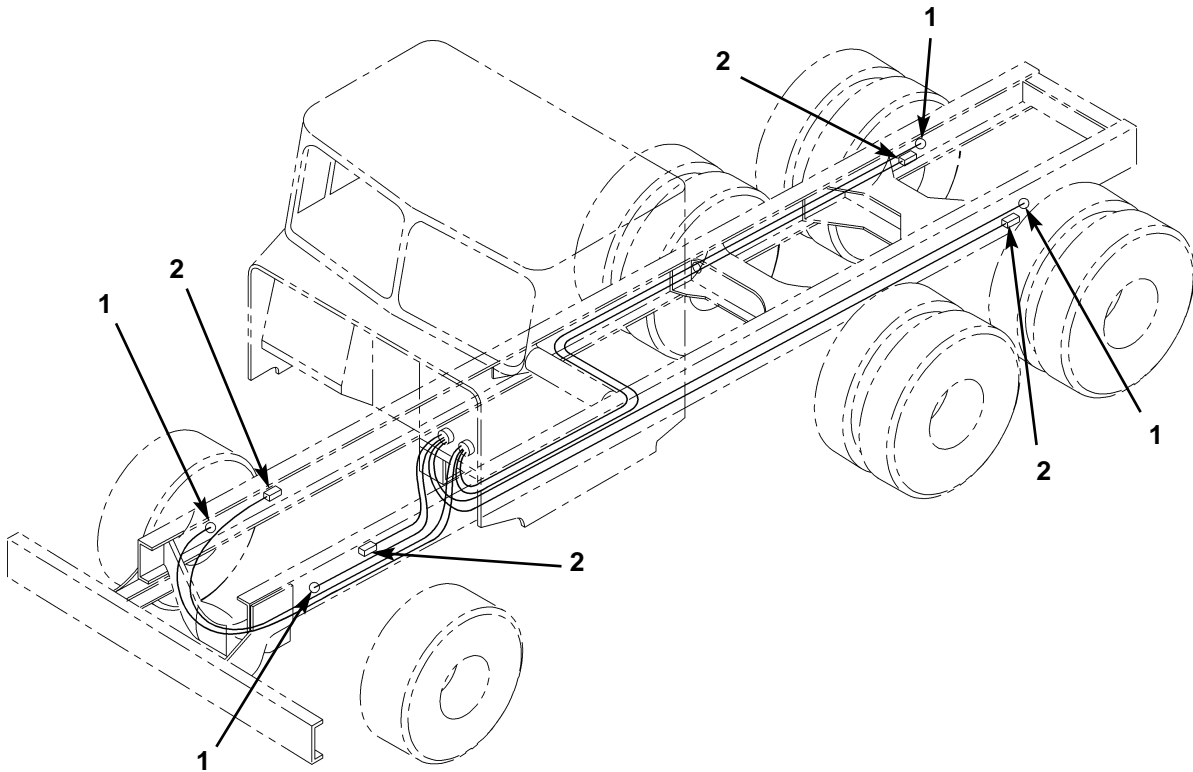


Figure 84. Routing Speed Sensor and Modulator Harnesses.

INSTALLATION OF ABS ELECTRONIC CONTROL UNIT (ECU) – CONTINUED**NOTE**

Each wheel sensor harness lead comes with two wire connectors for connecting harness leads to sensor cable. Wire connectors shall be crimped and heat shrunk during installation.

35. Connect harness brown wire (figure 85, item 5) to sensor cable white wire (figure 85, item 4) and harness black wire (figure 85, item 1) to sensor cable black wire (figure 85, item 3) using two new wire connectors (figure 85, item 2). Wrap wire connectors (figure 85, item 2) with electrical tape.
36. Repeat step 35 to connect remaining three wheel sensor harness leads to sensor cables.

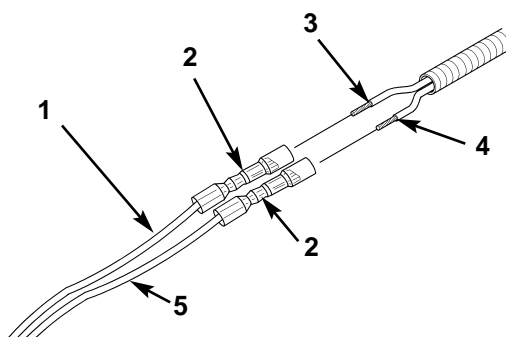


Figure 85. Connecting Harness Leads to Wheel Sensor Cable Leads.

NOTE

Connecting harness leads to wheel sensor cables and modulators is performed the same way. Left-rear modulator and wheel sensor cable is shown.

37. Route wheel sensor cable (figure 86, item 2) up to frame rail (figure 86, item 3) and behind left-rear modulator mounting bracket (figure 86, item 1).

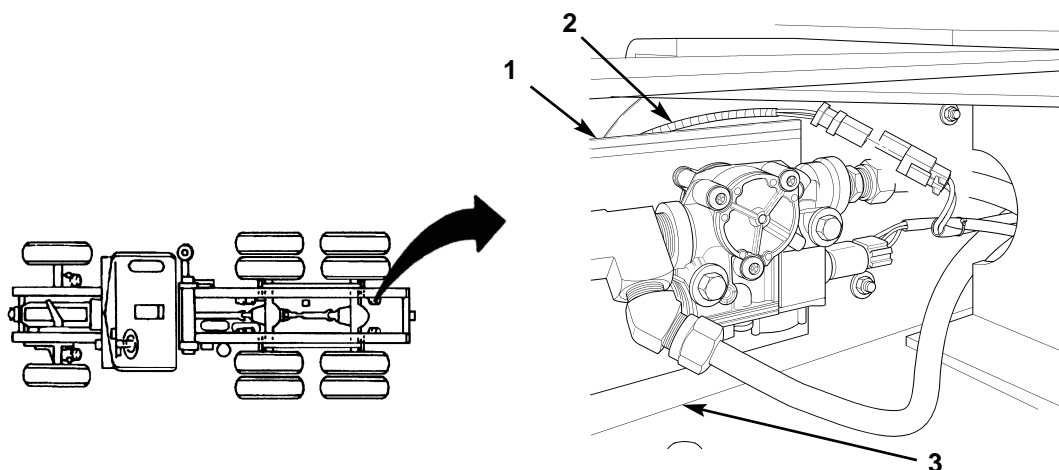


Figure 86. Routing Wheel Sensor Cable.

INSTALLATION OF ABS ELECTRONIC CONTROL UNIT (ECU) – CONTINUED

38. Connect plug (figure 87, item 2) from wheel sensor cable (figure 87, item 1) to harness receptacle connector (figure 87, item 3) on wheel sensor harness (figure 87, item 4).
39. Connect plug (figure 87, item 6) from modulator harness (figure 87, item 5) to modulator receptacle (figure 87, item 7).
40. Secure loose wheel sensor cable (figure 87, item 1) to brake hose or tube assembly with tie straps.
41. Repeat steps 37 through 40 to connect and secure remaining three wheel sensor cables and modulators.

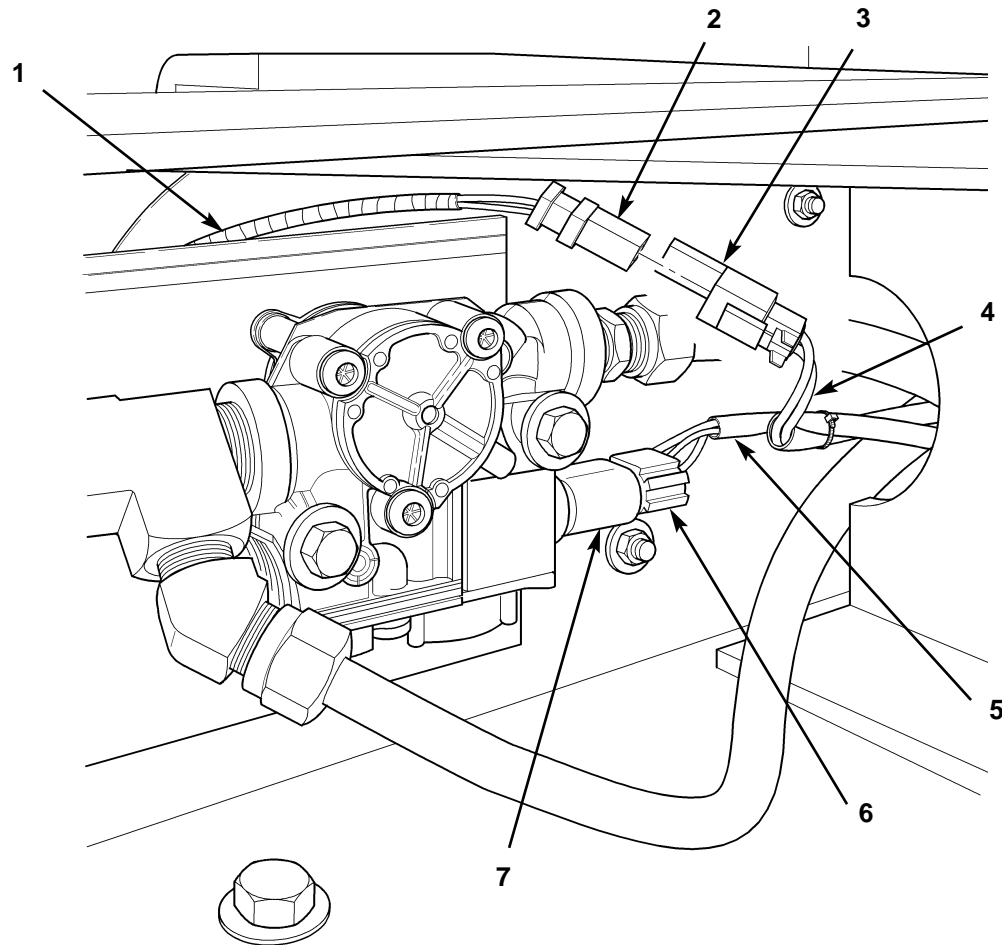


Figure 87. Connecting Harness Leads to Wheel Sensor Cable and Modulator.

END OF TASK

ABS SELF TEST

1. Connect battery power (TM 9-2320-283-20).

NOTE

Normal operating range is 105–140 psi (724–965 kPa). The low air pressure warning lamp and buzzer goes off at approximately 64–76 psi (441–524 kPa).

2. Start engine. Refer to TM 9-2320-283-10. Allow engine to run until air pressure builds up in reservoirs and low air pressure warning lamp and buzzer go off.

NOTE

Assistant will help listen for air leaks by walking around vehicle when service brake pedal is depressed.

3. Stop engine. Refer to TM 9-2320-283-10. Depress service brake pedal, and listen for air leaks. Hold pedal down for a minimum of 10 seconds and observe front and rear air pressure gauges for any noticeable drop in air pressure. If air pressure drops, refer to troubleshooting, WP 0009.

NOTE

Whenever ignition switch is turned on, the ABS ECU automatically run through a self test and ABS amber warning light illuminates for three seconds and goes off. If fault is found, ABS warning light will stay on.

4. Turn on ignition switch. Refer to TM 9-2320-283-10. Observe ABS warning light (figure 88, item 1) on center control panel (figure 88, item 2) illuminate for three seconds and then go off. At same time, listen for all four modulators to cycle twice; a clicking sound should be heard. Turn ignition switch off.

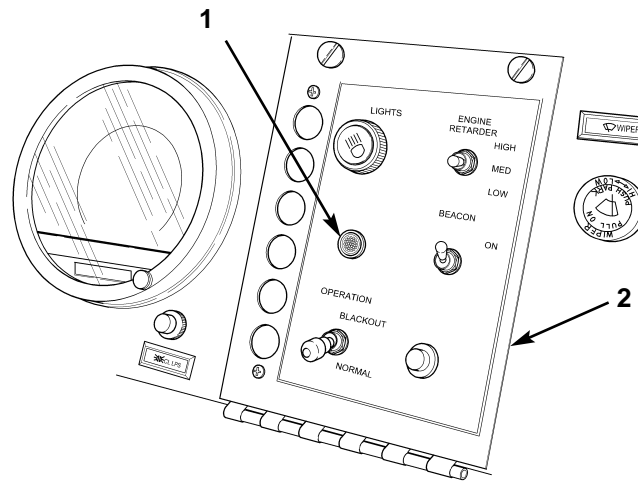


Figure 88. ABS Warning Light Operation.

NOTE

Each modulator makes a popping sound when it releases air.

5. Depress and hold service brake pedal down, turn ignition switch on, and listen for all four modulators to dump air. If no popping sound can be heard, refer to troubleshooting, WP 0009.

ABS SELF TEST – CONTINUED

6. Install inner and outer wheel and tire assemblies on rear-rear axle hubs. Refer to TM 9-2320-283-10.
7. Install wheel and tire assemblies on front axle hubs. Refer to TM 9-2320-283-10.
8. Install mud flaps. Refer to TM 9-2320-283-10.
9. Adjust slack adjusters on all six wheels. Refer to TM 9-2320-283-20.
10. Jack front of truck, remove jack stands, lower front of truck, and remove jack. Refer to TM 9-2320-283-10.
11. Jack rear of truck, remove jack stands, lower rear of truck, and remove jack. Refer to TM 9-2320-283-10.

WARNING

Two personnel are required to install service deck assembly from tractor frame due to its size. Failure to comply may result in injury to personnel. Seek medical attention in the event of injury.

12. Position service deck assembly (figure 89, item 11) on tractor frame (figure 89, item 10) and install four washers (figure 89, item 7) and bolts (figure 89, item 8) on four tabs (figure 89, item 9) and service deck assembly (figure 89, item 11).
13. Loop strap (figure 89, item 15) around emergency air pressure hose (figure 89, item 14) and service air pressure hose (figure 89, item 5). Install strap (figure 89, item 15) on air hose tender (figure 89, item 4) with clamp (figure 89, item 1), screw (figure 89, item 3), and nut (figure 89, item 2).
14. Connect emergency air pressure coupling (figure 89, item 13) and service air pressure coupling (figure 89, item 6) to storage brackets (figure 89, item 12) on air hose tender (figure 89, item 4).

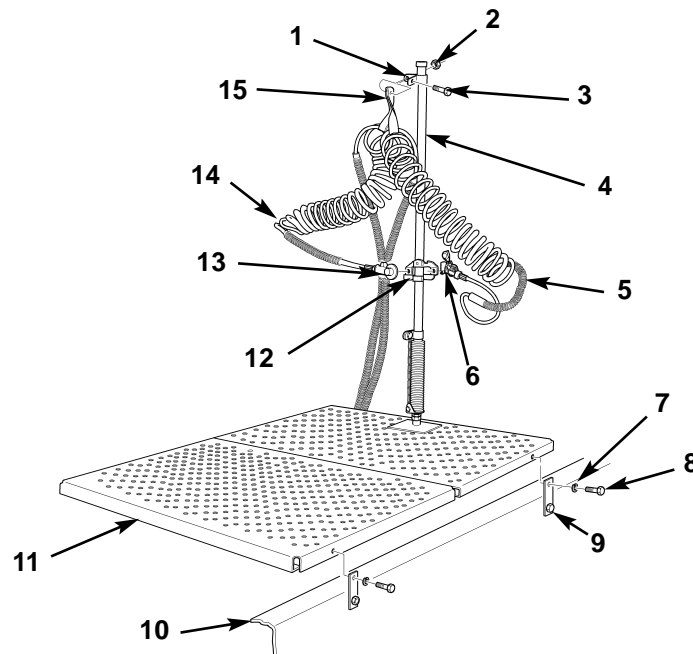


Figure 89. Installing Service Deck and Connecting Air Hoses.

ABS SELF TEST – CONTINUED

15. Lower and secure hood. Refer to TM 9-2320-283-10.
16. Start engine and drive vehicle. Refer to TM 9-2320-283-10. Test brakes at slow speeds in parking lot prior to operating on public road. If ABS warning light (figure 90, item 1) goes on and remains on, refer to troubleshooting, WP 0009.
17. Operate tractor on paved road at 40 mph (64 kph) and make a panic stop by applying service brake pedal until tractor comes to a complete stop. Observe if any wheel locks or if ABS warning light (figure 90, item 1) goes on and remains on. If any wheel locks or ABS warning light (figure 90, item 1) stays on, refer to troubleshooting, WP 0009.
18. Operate tractor on paved road at 60 mph (97 kph) and make a panic stop by applying service brake pedal until tractor comes to a complete stop. Observe if any wheel locks or if ABS warning light (figure 90, item 1) goes on and remains on. If any wheel locks or ABS warning light (figure 90, item 1) stays on, refer to troubleshooting, WP 0009.
19. After completing road test, park tractor and stop engine. Refer to TM 9-2320-283-10. Depress service brake pedal and listen for air leaks. Hold pedal down for minimum of 10 seconds, and observe front and rear air pressure gauges for any noticeable drop in air pressure. If air pressure drops, refer to troubleshooting, WP 0009.
20. Wait 5 minutes and check front and rear air pressure gauges for any noticeable drop in air pressure. If air pressure drops below normal operating range of 105 to 140 psi (724 to 965 kPa), refer to troubleshooting, WP 0009.

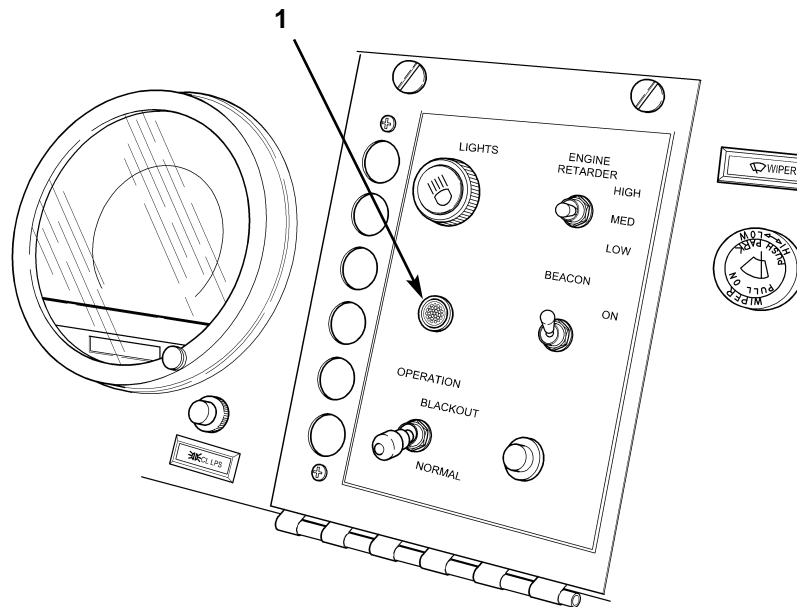


Figure 90. ABS Warning Light.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE FRONT AXLE HUB REPLACEMENT

INITIAL SETUP:**Tools and Special Tools**

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)
 Seal installer (WP 0061, Table 2, Items 3, 4, and 5)
 2-1/4 in. socket (WP 0063, Item 2)

Materials/Parts

Grease (WP 0066, Item 2)
 Gasket (WP 0055, Item 3)
 Six lockwashers (WP 0055, Item 5)
 Cotter pin (WP 0055, Item 2)
 Seal (WP 0055, Item 7)

References

TM 9-2320-283-20
 WP 0021

Equipment Condition

Front brake drum removed (TM 9-2320-283-20).

REMOVAL**WARNING**

Retaining springs may fly out with extreme force during removal of brake shoes. Wear eye protection when removing brake shoes. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

NOTE

Front hubs are removed the same way. This task covers removal of right-hand front axle hub.

1. Using suitable pry bar, lift upper and lower brake shoes (figure 1, items 1 and 7) at camshaft (figure 1, item 2) one at a time, and remove two shoulder pins (figure 1, item 5) and rollers (figure 1, item 4) from between camshaft (figure 1, item 2) and brake shoes (figure 1, items 1 and 7).
2. Disconnect shoe release spring (figure 1, item 3) from pin (figure 1, item 6) on lower brake shoe (figure 1, item 7), and remove upper and lower brake shoes (figure 1, items 1 and 7) and two shoe retaining springs (figure 1, item 8) together as an assembly, as shown in figure 1.

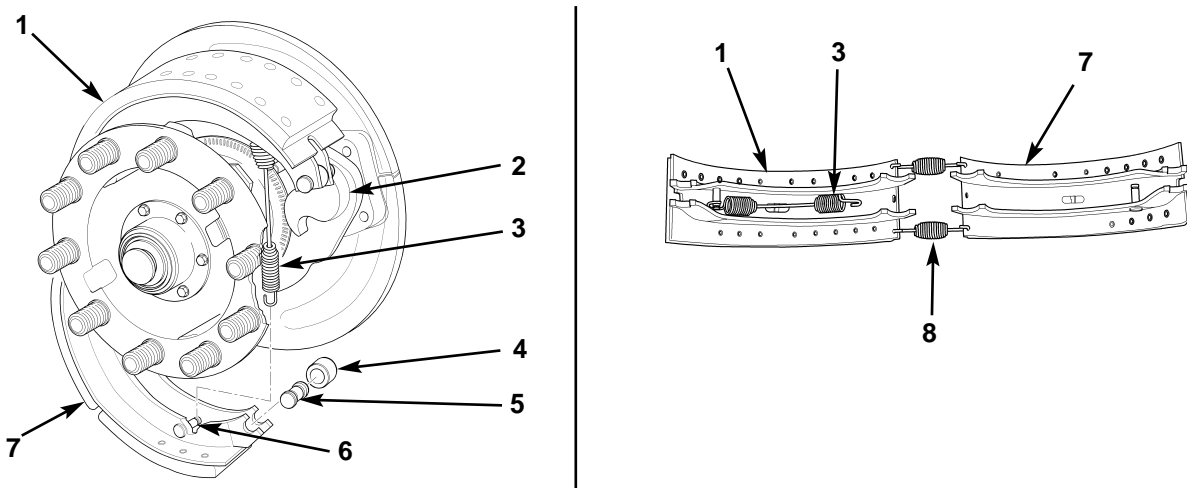


Figure 1. Removing Front Brake Shoes.

REMOVAL - CONTINUED

3. Position clean, dry drain pan under front hub (figure 2, item 2) and remove six bolts (figure 2, item 10), lockwashers (figure 2, item 9), cap (figure 2, item 8), and gasket (figure 2, item 7) from front hub (figure 2, item 2). Discard gasket (figure 2, item 7) and lockwashers (figure 2, item 9).
4. Remove cotter pin (figure 2, item 6), slotted nut (figure 2, item 5), and key washer (figure 2, item 4) from spindle (figure 2, item 1). Discard cotter pin (figure 2, item 6).
5. Remove outer bearing cone (figure 2, item 3) and front hub (figure 2, item 2) from spindle (figure 2, item 1).

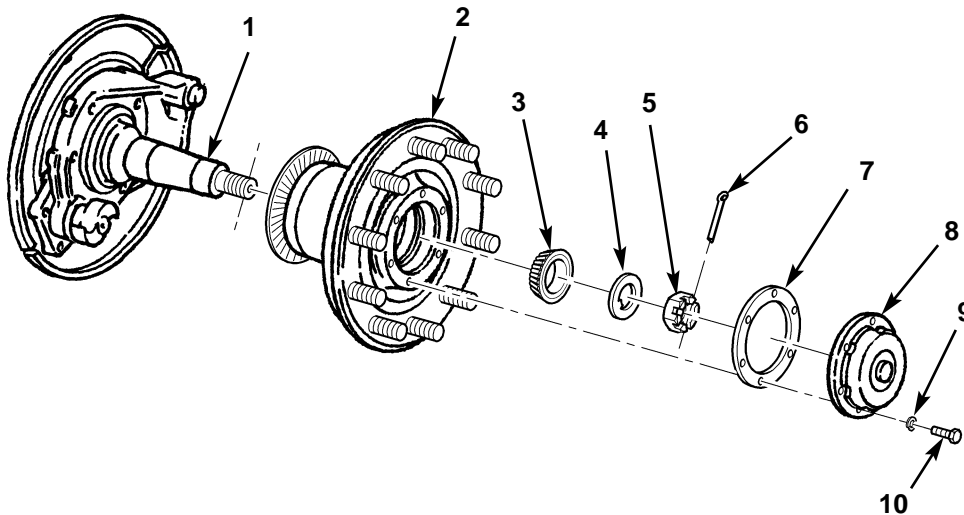


Figure 2. Removing Front Hub.

6. Using suitable drift and hammer, remove seal (figure 3, item 3) and inner bearing cone (figure 3, item 2) from front hub (figure 3, item 1). Discard seal (figure 3, item 3).

CAUTION

Ensure tone ring is removed from hub prior to removal of wheel studs or inner and outer bearing cones from hub. Failure to comply may result in damage to tone ring.

NOTE

Perform steps 7 through 9 to replace wheel studs. Perform steps 7 and 10 to replace inner and outer bearing cups.

Only remove and replace damaged wheel studs from hub. Do not reuse removed wheel studs.

7. Remove front tone ring (figure 3, item 4) from front hub (figure 3, item 1). Refer to WP 0021.
8. Using suitable press or hammer, drive wheel stud (figure 3, item 5) from front hub (figure 3, item 1).
9. Repeat step 8 to remove remaining wheel studs (figure 3, item 5) as necessary.
10. Remove inner and outer bearing cups. Refer to TM 9-2320-283-20.

REMOVAL – CONTINUED

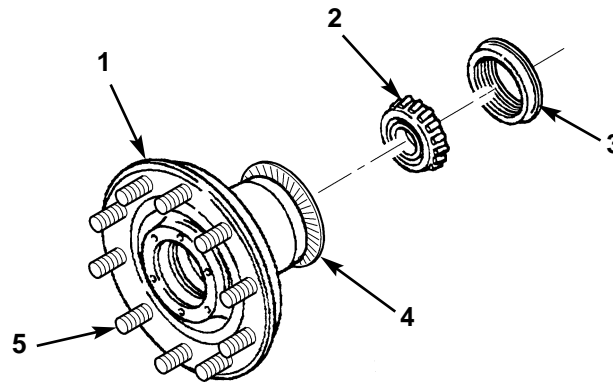


Figure 3. Removing Bearing Seal and Inner Bearing Cone.

END OF TASK

INSTALLATION

NOTE

If removed, perform steps 1 and 2 to install inner and outer bearing cups. If removed, perform step 3 to install new wheel studs. Perform step 4 for installation of tone ring.

1. Install inner and outer bearing cups. Refer to TM 9-2320-283-20.

NOTE

Ensure the same right-hand or left-hand threaded wheel studs are installed on the same hub. Ensure each wheel stud is driven in until shoulder is fully seated against hub flange.

2. Position front hub (figure 4, item 1) facing down on front brake drum (figure 4, item 4) with wheel stud holes aligned.
3. Install new wheel studs (figure 4, item 3) on front hub (figure 4, item 1) as required.
4. Install front tone ring (figure 4, item 2) on front hub (figure 3, item 1). Refer to WP 0021.

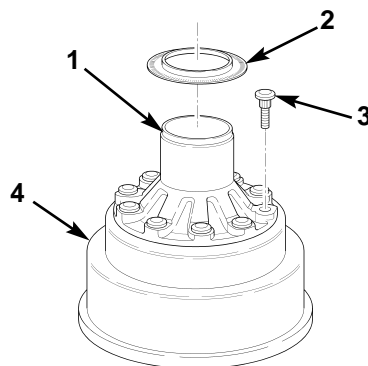


Figure 4. Installing Bearing Cones, Wheel Studs, and Front Tone Ring.

INSTALLATION – CONTINUED**NOTE**

Do not get grease on rear seal shoulder bore of wheel hub when installing inner bearing cone.

5. Apply grease to inner bearing cone (figure 5, item 2) and set inner bearing cone (figure 5, item 2) on inner cup of front hub (figure 5, item 3).
6. Apply sealant to outside edge of new seal (figure 5, item 1) and position seal (figure 5, item 1) on front hub (figure 5, item 3) with tapered side of seal facing up.
7. Using seal installer, drive seal (figure 5, item 1) into shoulder bore of front hub (figure 5, item 3) until fully seated.

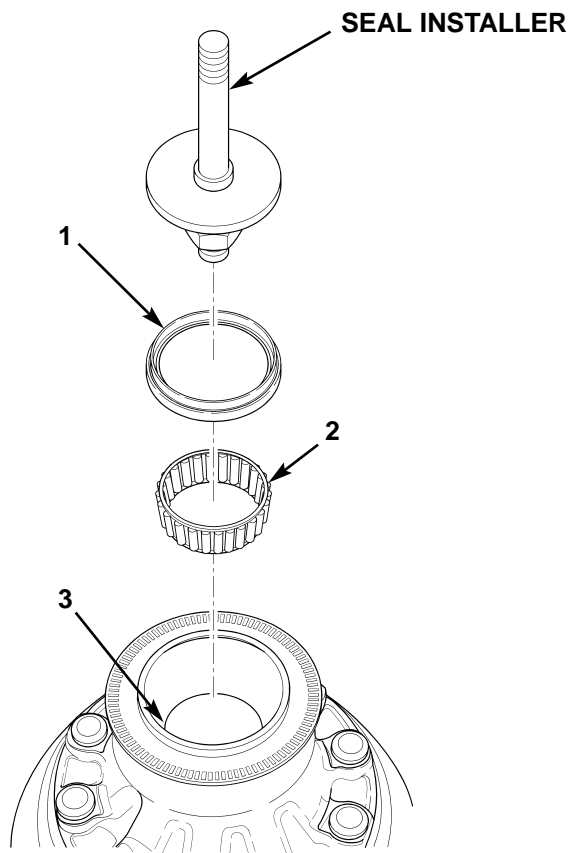


Figure 5. Installing Inner Bearing Cone and Seal.

CAUTION

Be careful not to slide hub seal over threads at end of spindle when installing hub. Ensure hub is centered when positioning on spindle. Failure to comply may result in damage to equipment.

INSTALLATION – CONTINUED

8. Fill cavity of front hub (figure 6, item 2) with grease and carefully position hub (figure 6, item 2) on spindle (figure 6, item 1).
9. Apply grease to outer bearing cone (figure 6, item 3) and position bearing cone (figure 6, item 3) on spindle (figure 6, item 1) against outer cup of front hub (figure 6, item 2).
10. Install key washer (figure 6, item 4) and slotted nut (figure 6, item 5) on spindle (figure 6, item 1) and using 2-1/4 in. (57 mm) socket, tighten slotted nut (figure 6, item 5) to 50 lb-ft (68 N•m). Back off slotted nut (figure 6, item 5) 1/4 to 1/3 turn until hole in spindle and slot in nut line up. Rotate hub; hub should rotate freely.
11. Insert new cotter pin (figure 6, item 6) through slotted nut (figure 6, item 5) and hole in spindle (figure 6, item 1). Bend ends of cotter pin (figure 6, item 6) over slotted nut (figure 6, item 5) and into hole in center of spindle.

NOTE

Front bearings and hub are packed with grease during installation.
Front hub shall not be filled with oil.

12. Install new gasket (figure 6, item 10) and cap (figure 6, item 7) on front hub (figure 6, item 2) with six new lockwashers (figure 6, item 9) and bolts (figure 6, item 8).

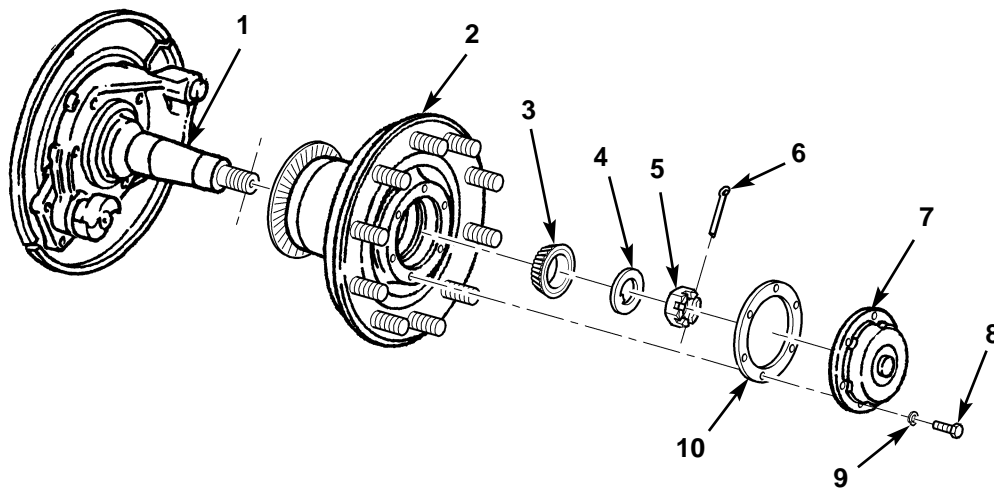


Figure 6. Installing Front Wheel Hub.

INSTALLATION – CONTINUED

13. Push in wheel sensor (figure 7, item 7) until it contacts tone ring (figure 7, item 6).

WARNING

Retaining springs may fly out with extreme force during removal of brake shoes. Wear eye protection when removing brake shoes. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

14. Position upper and lower brake shoes (figure 7, Items 1 and 3) on brake spider (figure 7, item 9) with two shoe retaining springs (figure 7, item 2) connected.

CAUTION

Ensure hook ends of brake shoe release spring are positioned in outer groove of pin on brake shoes to provide clearance for tone ring. Failure to comply may result in damage to equipment.

15. Secure upper and lower brake shoes (figure 7, Items 1 and 3) at camshaft (figure 7, item 8) by connecting hook ends of shoe release spring (figure 7, item 5) to pin (figure 7, item 4) on upper and lower brake shoes (figure 7, Items 1 and 3).
16. Using suitable pry bar, lift upper brake shoe (figure 7, item 1) at camshaft (figure 7, item 8), and position roller (figure 7, item 10) and shoulder pin (figure 7, item 11) between upper brake shoe (figure 7, item 1) and camshaft (figure 7, item 8).
17. Repeat step 16 to install roller (figure 7, item 10) and shoulder pin (figure 7, item 11) on lower brake shoe (figure 7, item 3).
18. Install front brake drum. Refer to TM 9-2320-283-20.

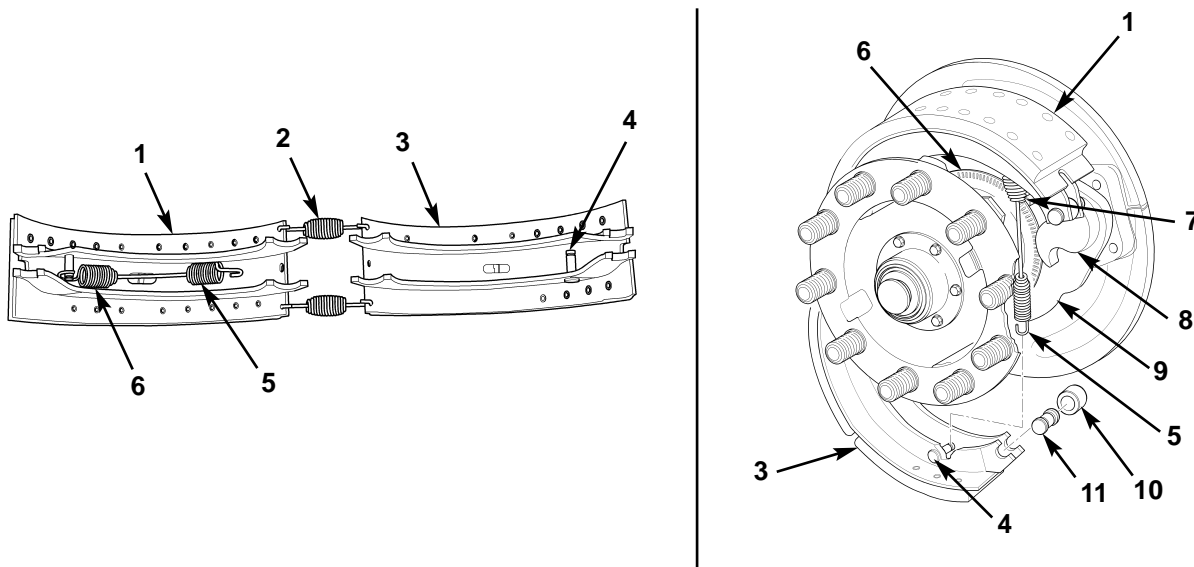


Figure 7. Positioning Wheel Sensor and Installing Brake Shoes.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
REAR-REAR AXLE HUB REPLACEMENT

INITIAL SETUP:**Tools and Special Tools**

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)
4-1/8 in. socket (WP 0063, Table 2, Item 1)
Seal installer (WP 0063, Table 2, Items 3, 6, and 7)

References

TM 9-2320-283-20
WP 0021

Equipment Condition

Rear-rear axle brake drum removed
(TM 9-2320-283-20).

Materials/Parts

Adhesive (WP 0066, Item 1)
Grease (WP 0066, Item 2)
Eight locknuts (WP 0055, Item 4)
Seal (WP 0055, Item 5)

REMOVAL**WARNING**

Leaking or spilled oil may cause a slip and fall hazard. Clean any leaking or spilled oil immediately, using suitable fluid absorbent materials. Dispose of contaminated cloths, rags, or cleaning materials in accordance with local procedures and plans. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

NOTE

Rear hubs are removed the same way. This task covers removal of right-hand rear-rear axle hub.

In order to remove axle shaft, it may be necessary to strike axle shaft flange with a hammer to free it from the hub.

1. Position clean, dry drain pan under rear-rear hub (figure 1, item 1) and remove eight locknuts (figure 1, item 4), washers (figure 1, item 3), and axle shaft (figure 1, item 2) from rear hub (figure 1, item 1). Discard locknuts (figure 1, item 4).

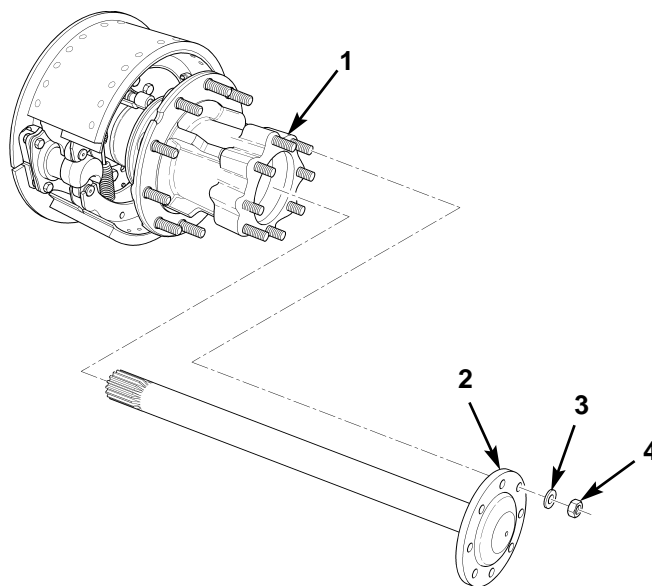


Figure 1. Removing Axle Shaft.

REMOVAL – CONTINUED

2. Bend tabs on lockwasher (figure 2, item 4) away from outer nut (figure 2, item 5). Using 4-1/8 in. (105 mm) socket, remove outer nut (figure 2, item 5), lockwasher (figure 2, item 4), and inner nut (figure 2, item 6) from axle housing spindle (figure 2, item 10). If tabs are broken, replace lockwasher (figure 2, item 4).
3. Remove outer bearing cone (figure 2, item 7) and rear hub (figure 2, item 3) from axle housing spindle (figure 2, item 10).
4. Using suitable drift and hammer, remove seal (figure 2, item 1) and inner bearing cone (figure 2, item 2) from rear hub (figure 2, item 3). Discard seal (figure 2, item 1).

CAUTION

Ensure tone ring is removed from hub prior to removal of wheel studs or inner and outer bearing cones from hub. Failure to comply may result in damage to tone ring

NOTE

Perform steps 5 through 7 to replace wheel studs. Perform steps 5 and 8 to replace inner and outer bearing cups.

Only remove and replace damaged wheel studs from hub. Do not reuse removed wheel studs.

5. Remove rear tone ring (figure 2, item 9) from rear hub (figure 2, item 3). Refer to WP 0021.
6. Using suitable press or hammer, drive wheel stud (figure 2, item 8) from rear hub (figure 2, item 3).
7. Repeat step 6 to remove remaining wheel studs (figure 3, item 8) as necessary.
8. Remove inner and outer bearing cups. Refer to TM 9-2320-283-20.

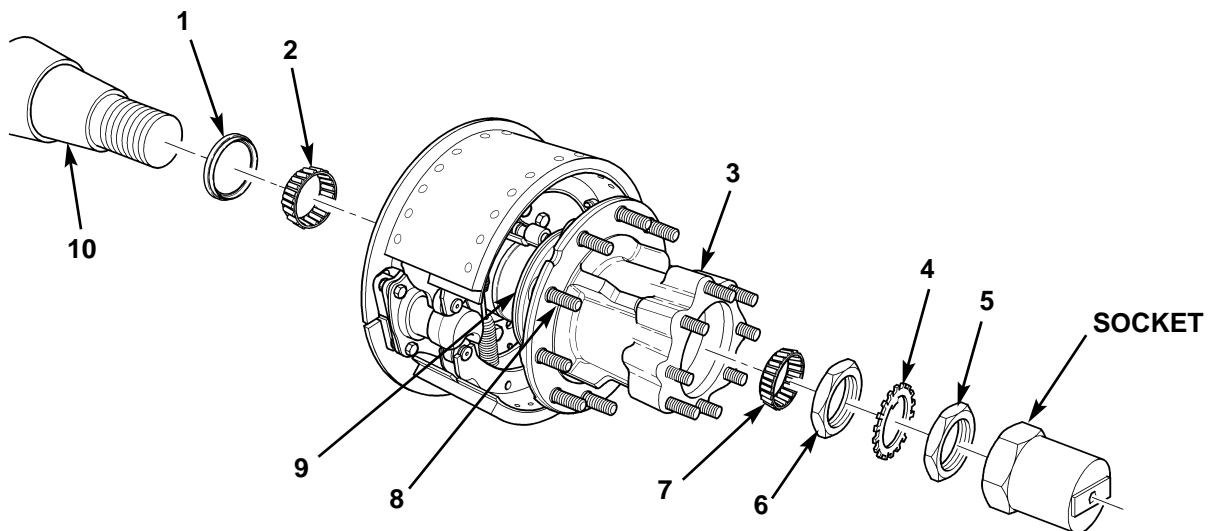


Figure 2. Removing Hub and Wheel Bearings.

END OF TASK

INSTALLATION**NOTE**

If removed, perform steps 1 and 2 to install inner and outer bearing cups. If removed, perform step 3 to install new wheel studs. Perform step 4 for installation of tone ring.

1. Install inner and outer bearing cups. Refer to TM 9-2320-283-20.

NOTE

Ensure the same right-hand or left-hand threaded wheel studs are installed on same hub. Ensure each wheel stud is driven in until shoulder is fully seated against hub flange.

2. Position rear hub (figure 3, item 3) facing down on rear brake drum (figure 3, item 4) with wheel stud holes aligned.
3. Install new wheel studs (figure 3, item 1) on rear hub (figure 3, item 3) as required.
4. Install rear tone ring (figure 3, item 2) on rear hub (figure 3, item 3). Refer to WP 0021.

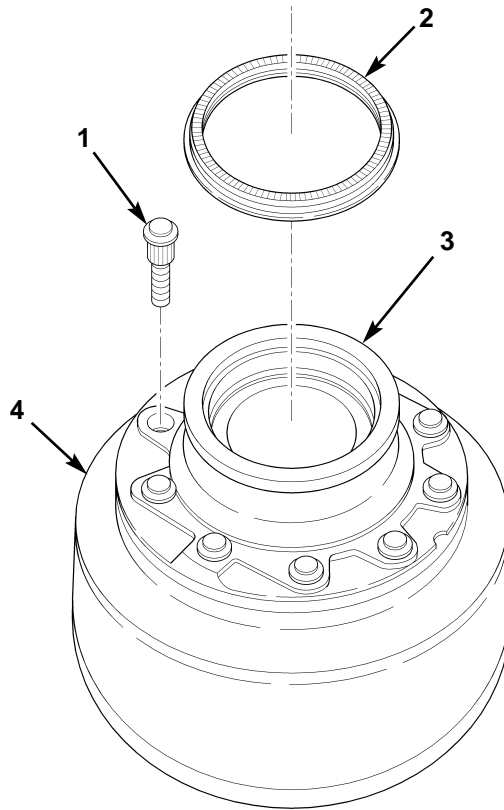


Figure 3. Installing Bearing Cones, Wheel Studs, and Rear Tone Ring.

INSTALLATION – CONTINUED**NOTE**

Do not get grease on rear seal shoulder bore of wheel hub when installing inner bearing cone.

5. Apply grease to inner bearing cone (figure 4, item 2) and set inner bearing cone (figure 4, item 2) on inner cup in rear hub (figure 4, item 3).
6. Apply sealant to outside edge of new seal (figure 4, item 1) and position seal (figure 4, item 1) on rear hub (figure 4, item 3) with tapered side of seal facing up.
7. Using seal installer, drive seal (figure 4, item 1) into shoulder bore of rear hub (figure 4, item 3) until fully seated.

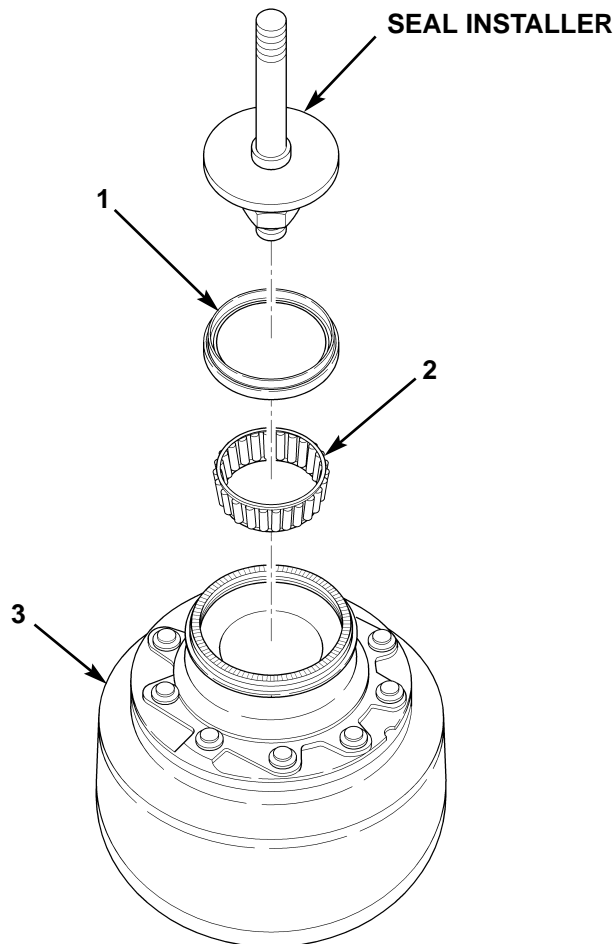


Figure 4. Installing Inner Bearing Cone and Seal.

INSTALLATION – CONTINUED**CAUTION**

Be careful not to slide hub seal over threads at end of axle housing when installing hub. Ensure hub is centered when positioning on axle housing. Failure to comply may result in damage to equipment.

8. Fill cavity in rear hub (figure 5, item 1) with grease and carefully position hub (figure 5, item 1) on axle housing spindle (figure 5, item 6).
9. Apply grease to outer bearing cone (figure 5, item 2) and position bearing cone (figure 5, item 2) against outer cup in rear hub (figure 5, item 1).
10. Install inner nut (figure 5, item 3) on axle housing spindle (figure 5, item 6) with machined surface facing out. Using 4-1/8 in. (105 mm) socket, tighten inner nut (figure 5, item 3) to 50 lb-ft (68 N•m) while rotating hub (figure 5, item 1) back and forth. Back off inner nut (figure 5, item 3) 1/4 to 1/3 turn. Rotate hub; hub should rotate freely.
11. Install lockwasher (figure 5, item 4) on axle housing spindle (figure 5, item 6).
12. Install outer nut (figure 5, item 5) on axle housing spindle (figure 5, item 6) with machined surface facing out. Using 4-1/8 in. (105 mm) socket, tighten outer nut (figure 5, item 5) to 250–275 lb-ft (339–373 N•m). Rotate hub; hub should rotate freely.
13. Alternately bend one tab on lockwasher (figure 5, item 4) against each flat on outer nut (figure 5, item 5).

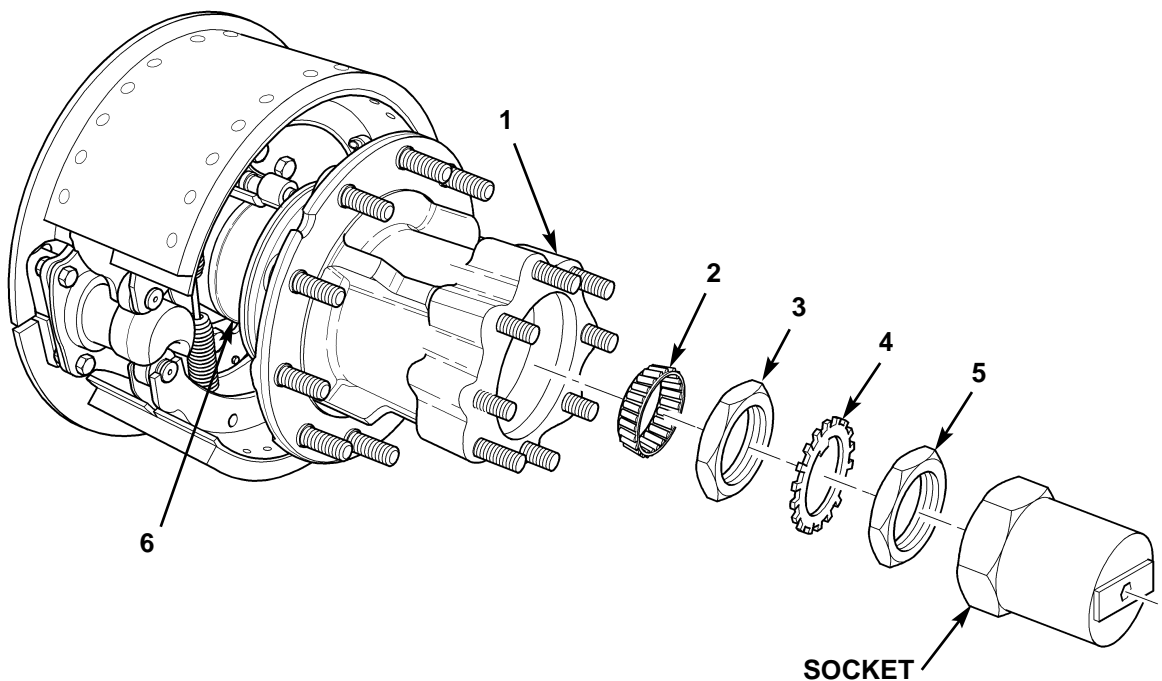


Figure 5. Installing Rear-Rear Wheel Hub.

INSTALLATION - CONTINUED

14. Remove old adhesive from axle shaft flange (figure 6, item 1) and apply adhesive to axle shaft flange (figure 6, item 1).
15. Install axle shaft (figure 6, item 5) on rear hub (figure 6, item 2) with eight washers (figure 6, item 3) and new locknuts (figure 6, item 4).
16. Position suitable tanker bar to prevent rear hub (figure 6, item 2) from turning clockwise. Tighten eight locknuts (figure 6, item 4) to 90–120 lb-ft (122–163 N•m).

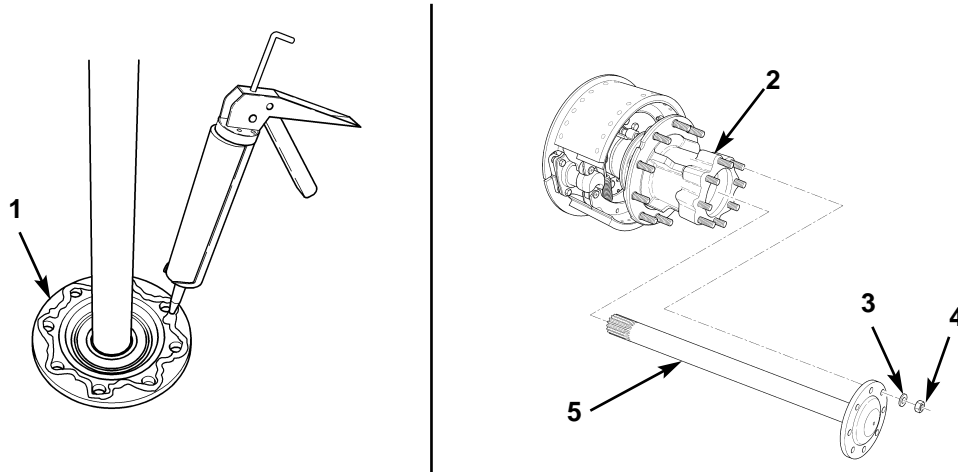


Figure 6. Installing Axle Shaft.

CAUTION

To protect wheel sensor power cable, ensure split loom is positioned through enlarged hole in brake spider after positioning wheel sensor. Failure to comply may result in damage to equipment.

17. Push in wheel sensor (figure 7, item 1) until it contacts tone ring (figure 7, item 2).

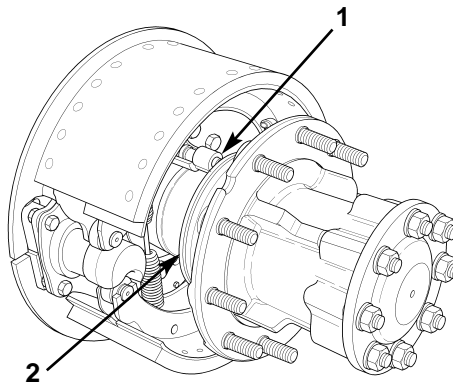


Figure 7. Positioning Wheel Sensor.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
tone ring replacement

INITIAL SETUP:**Tools and Special Tools**

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)

Equipment ConditionFront or rear-rear axle hub removed
(WP 0019, WP 0020).**References**TM 9-2320-283-20

REMOVAL**NOTE**

Tone rings on front and rear-rear axle hubs are removed and installed the same way. This procedure covers replacement of front tone ring.

1. Position front hub (figure 1, item 2) on flat surface with tone ring (figure 1, item 1) facing up.

CAUTION

Be careful not to bend or distort tone ring when removing. Failure to comply will result in damage to equipment.

2. Using flat and narrow piece of wood, approximately 12 in. (30.5 cm) in length, and hammer, carefully remove tone ring (figure 1, item 1) from front hub (figure 1, item 2).

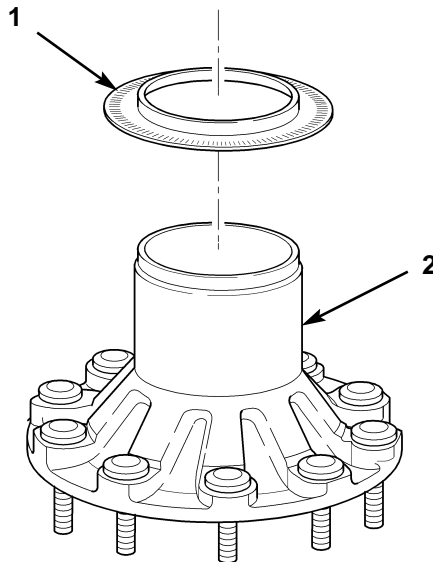


Figure 1. Removing Front Tone Ring.

END OF TASK

INSTALLATION

1. Position front hub (figure 2, item 3) on flat surface with inner bearing end (figure 2, item 2) facing up.

CAUTION

Be careful not to bend or distort tone ring when installing. Do not strike tone ring with hammer; use a flat block of wood to prevent damage. Tone ring must turn true with hub after installation. Ensure tone ring is fully seated on hub. Failure to comply may result in damage to equipment.

2. Using flat block of wood and hammer, position front tone ring (figure 2, item 1) on front hub (figure 2, item 3) and block of wood centered across tone ring (figure 2, item 1).
3. Carefully drive tone ring (figure 2, item 1) on front hub (figure 2, item 3) until fully seated.
4. Install front or rear-axle hub. Refer to WP 0019 and WP 0020.

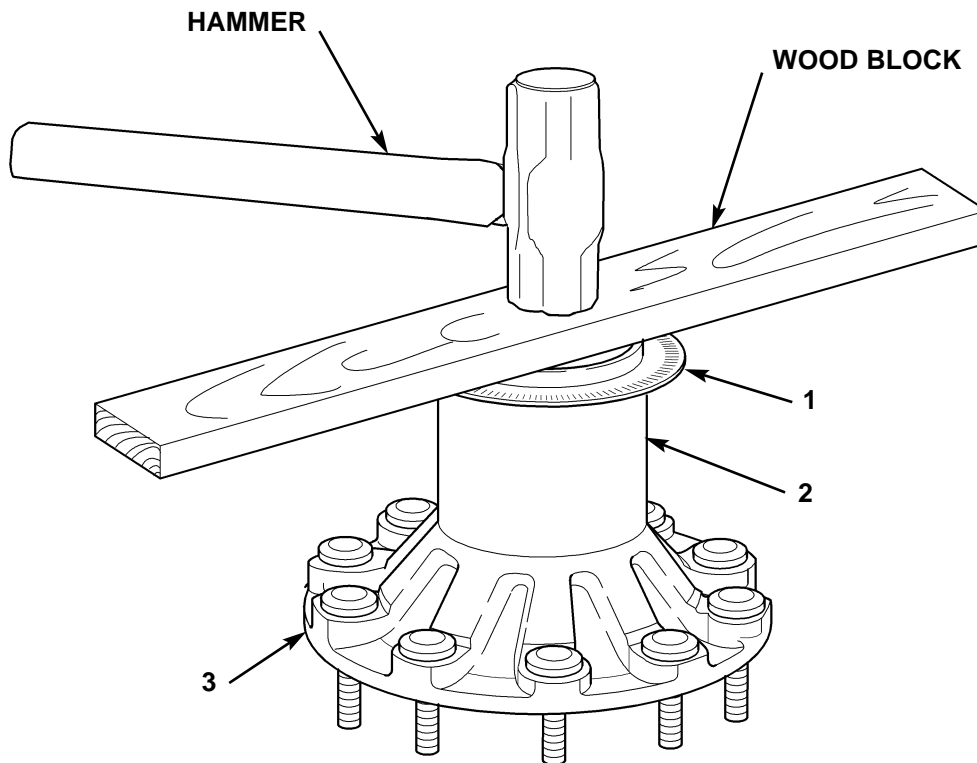


Figure 2. Installing Front Tone Ring.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
WHEEL SENSOR REPLACEMENT

INITIAL SETUP:**Tools and Special Tools**

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)

References

TM 9-2320-283-20

Materials/Parts

Two locknuts (WP 0043, Item 7)
Tie straps (WP 0066, Item 10)
Tape, electrical (WP 0066, Item 9)
Two connectors (WP 0066, Item 11)

Equipment Condition

Front or rear-rear axle brake drum removed
(TM 9-2320-283-20).

NOTE

Wheel sensors on front and rear-rear axles are removed differently.

REMOVAL, SENSOR, FRONT AXLE

1. Disconnect wheel sensor cable (figure 1, item 1) from front wheel sensor harness (figure 1, item 3) located inside frame rail adjacent to front modulator (figure 1, item 2).

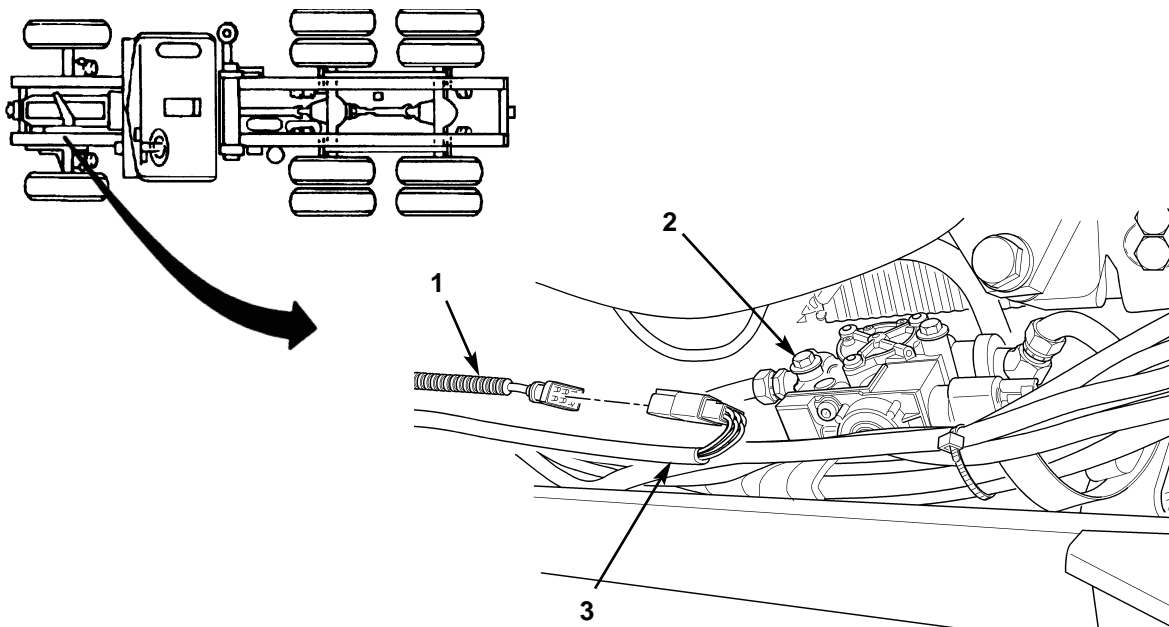


Figure 1. Disconnecting Wheel Sensor Cable at Front Modulator.

REMOVAL, SENSOR, FRONT AXLE – CONTINUED**NOTE**

Note location, size, and quantity of tie straps prior to removal for installation.

2. Remove all tie straps from wheel sensor cable (figure 2, item 2). Discard tie straps.

CAUTION

When removing wheel sensor from clamp sleeve, do not pull from cable or damage to sensor may result.

3. While holding end of wheel sensor (figure 2, item 3), remove wheel sensor (figure 2, item 3) from clamp sleeve (figure 2, item 4). If replacing wheel sensor (figure 2, item 3), remove split loom (figure 2, item 1) from wheel sensor cable (figure 2, item 2).
4. Remove clamp sleeve (figure 2, item 4) from hole (figure 2, item 5) in front spindle and brake spider (figure 2, item 6).

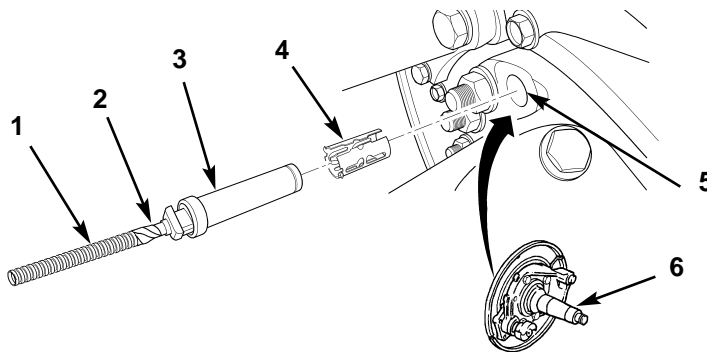


Figure 2. Removing Wheel Sensor from Front Axle.

END OF TASK**REMOVAL, SENSOR, REAR-REAR AXLE****NOTE**

Note location, size, and quantity of tie straps prior to removal for installation.

1. Disconnect wheel sensor cable (figure 3, item 3) from rear wheel sensor harness (figure 3, item 4) located inside frame rail adjacent to rear modulator (figure 3, item 1). Remove tie straps from wheel sensor cable (figure 3, item 2) and remove tape and split loom (figure 3, item 3) from wheel sensor cable (figure 3, item 3). Discard tie straps and tape.

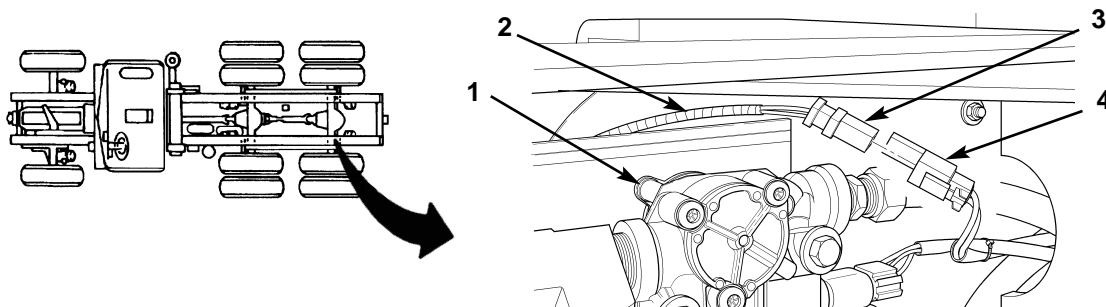


Figure 3. Disconnecting Wheel Sensor Cable at Rear Modulator.

REMOVAL, SENSOR, REAR-REAR AXLE – CONTINUED

2. Remove connector (figure 4, item 4) by cutting two wires (figure 4, item 2) on wheel sensor cable (figure 4, item 3) just in front of wire connectors (figure 4, item 1). Cut and discard both wire connectors (figure 4, item 1) from wires on connector (figure 4, item 4).

CAUTION

Do not move wheel sensor in mounting bracket by prying between tone ring and head of wheel sensor. Damage to wheel sensor or tone ring may result.

3. Remove two locknuts (figure 4, item 5), washers (figure 4, item 6), and bolts (figure 4, item 8) from mounting bracket (figure 4, item 7) and axle housing and brake spider (figure 4, item 11).
4. Carefully remove mounting bracket (figure 4, item 7) and wheel sensor cable (figure 4, item 3) from hole in axle housing and brake spider (figure 4, item 11).

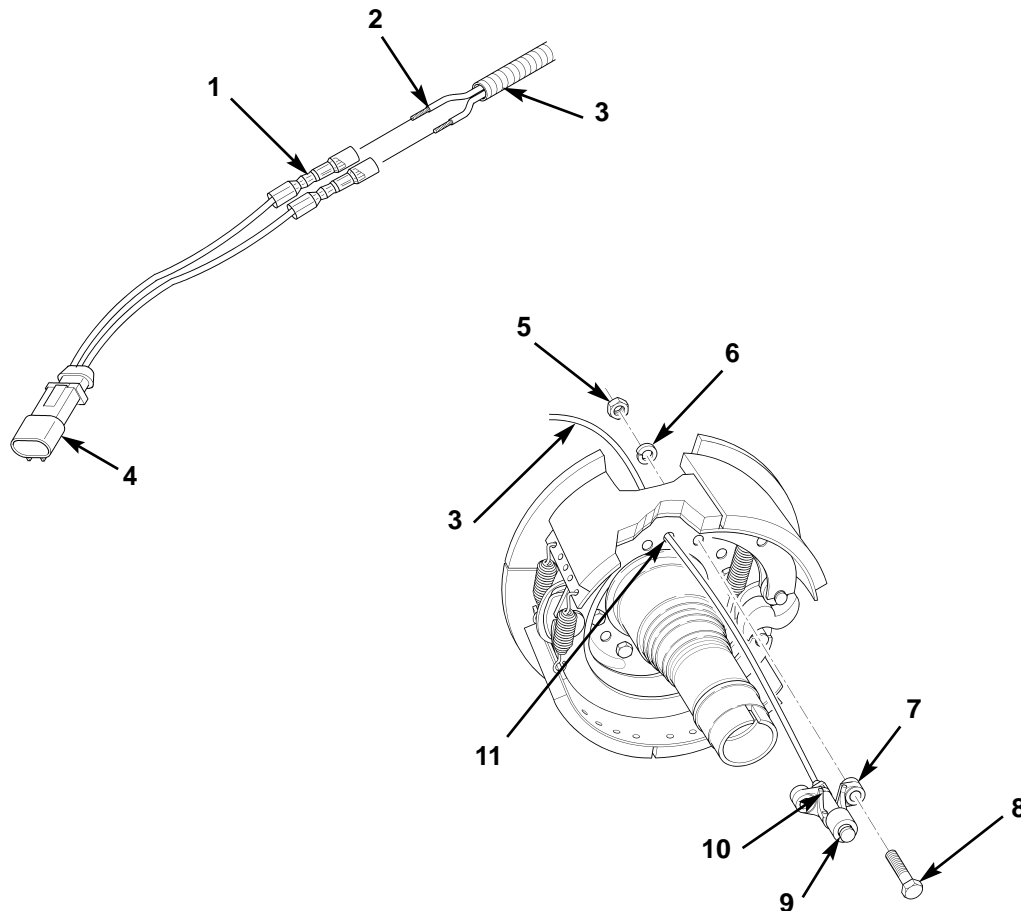


Figure 4. Removing Wheel Sensor and Mounting Bracket from Rear-Rear Axle.

REMOVAL, SENSOR, REAR-REAR AXLE – CONTINUED**CAUTION**

When removing wheel sensor from clamp sleeve, do not pull from cable or damage to sensor may result.

5. While holding end of wheel sensor (figure 5, item 1), pull and remove wheel sensor (figure 5, item 1) from clamp sleeve (figure 5, item 2).
6. Remove clamp sleeve (figure 5, item 2) from mounting bracket (figure 5, item 3).

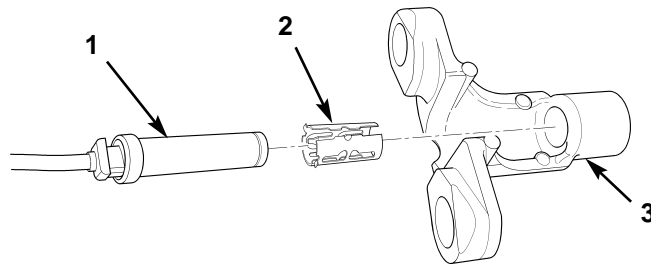


Figure 5. Wheel Sensor, Clamp Sleeve, and Mounting Bracket.

END OF TASK**NOTE**

Wheel sensors on front and rear-rear axles are installed differently.

INSTALLATION, SENSOR, REAR-REAR AXLE

1. Install clamp sleeve (figure 5, item 2) and wheel sensor (figure 5, item 1) on mounting bracket (figure 5, item 3). Slide wheel sensor (figure 5, item 1) approximately halfway in clamp sleeve (figure 5, item 2).
2. Route wheel sensor power cable (figure 6, item 1) through hole (figure 6, item 7) and install mounting bracket (figure 6, item 5) on axle housing and brake spider (figure 6, item 4) with two bolts (figure 6, item 6), washers (figure 6, item 3), and new locknuts (figure 6, item 2).
3. Using screwdriver, push wheel sensor (figure 6, item 9) in until it contacts tone ring (figure 6, item 8).

INSTALLATION, SENSOR, REAR-REAR AXLE – CONTINUED

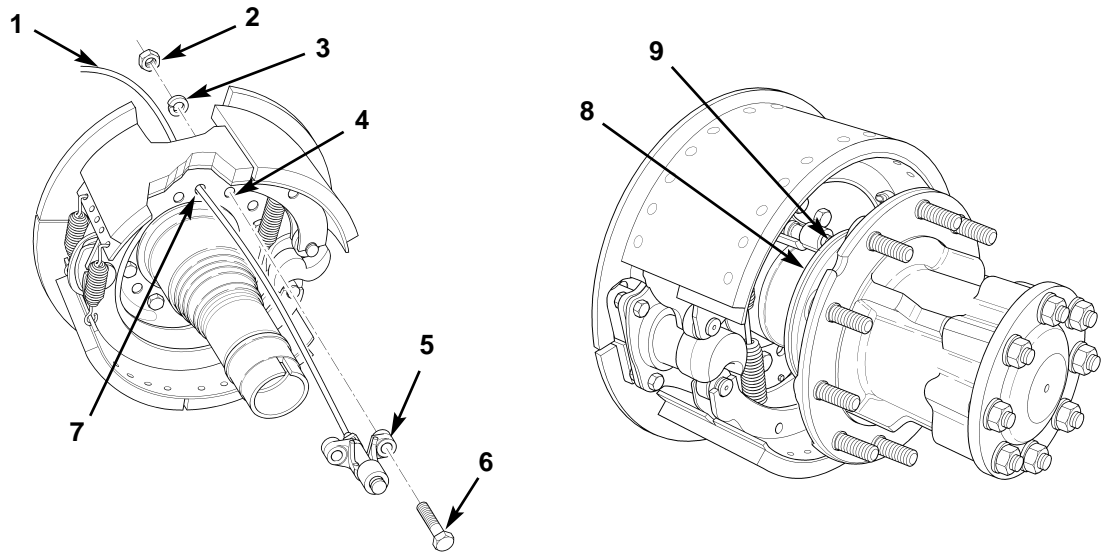


Figure 6. Installing Wheel Sensor and Mounting Bracket on Rear-Rear Axle.

CAUTION

To protect wheel sensor power cable, ensure split loom is positioned through enlarged hole in brake spider during installation. Failure to comply may result in damage to equipment.

4. Install split loom (figure 7, item 2) on cable (figure 7, item 3), slide end of split loom (figure 7, item 2) into hole (figure 7, item 4), and secure split loom (figure 7, item 2) to camshaft bracket (figure 7, item 5) with two tie straps (figure 7, item 1).

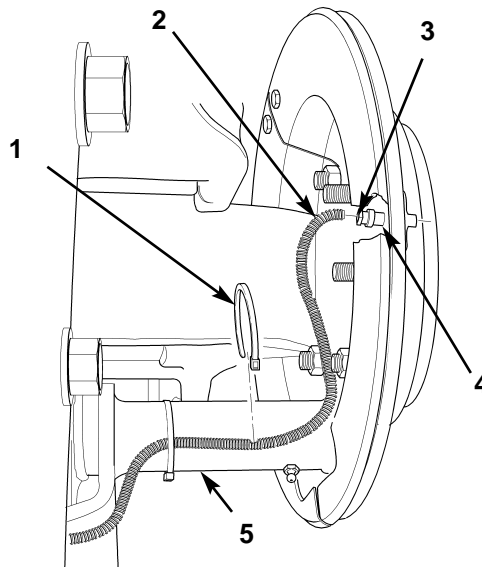


Figure 7. Installing Split Loom on Wheel Sensor Cable.

INSTALLATION, SENSOR, REAR-REAR AXLE – CONTINUED

5. Connect harness brown wire (figure 8, item 5) to sensor cable white wire (figure 8, item 4) and harness black wire (figure 8, item 1) to sensor cable black wire (figure 8, item 3) using two new wire connectors (figure 8, item 2). Crimp and tape wire connectors (figure 8, item 2) with electrical tape.
6. Route end of wheel sensor cable (figure 8, item 8) under frame rail (figure 8, item 10) and up behind rear modulator mounting bracket (figure 8, item 6).
7. Connect wheel sensor cable (figure 8, item 8) to rear wheel sensor harness (figure 8, item 9) located inside frame rail adjacent to rear modulator (figure 8, item 7).
8. Secure wheel sensor cable (figure 8, item 8) with additional tie straps as noted during removal.

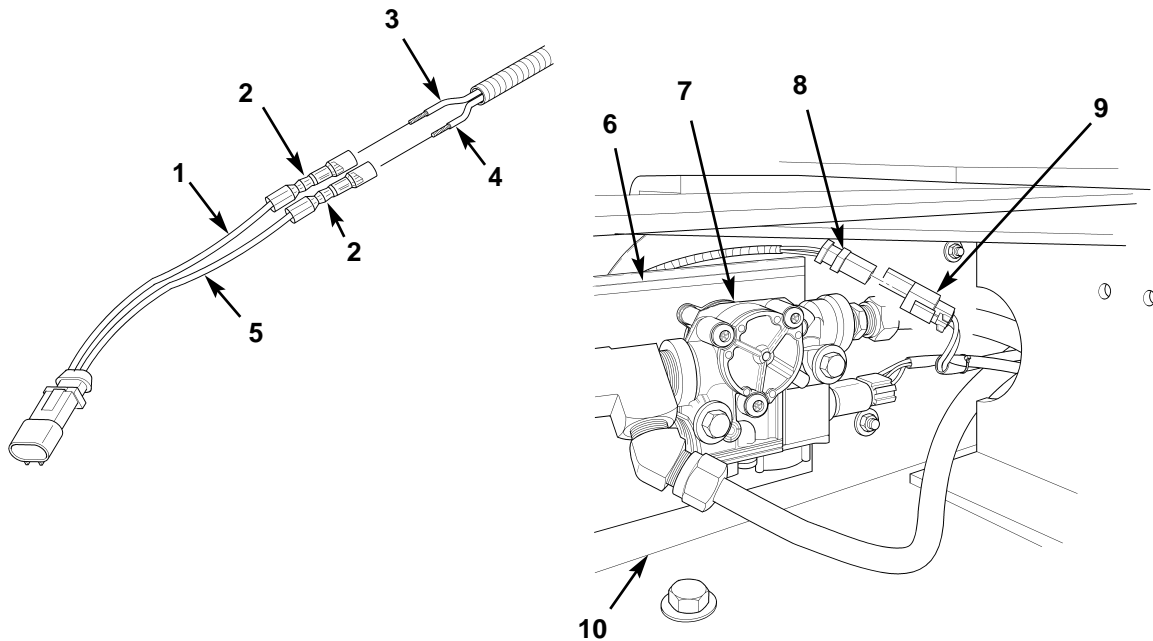


Figure 8. Connecting Wheel Sensor at Rear-Rear Axle.

END OF TASK**INSTALLATION, SENSOR, FRONT AXLE**

1. Install clamp sleeve (figure 9, item 2) on hole (figure 9, item 3) in front spindle and brake spider (figure 9, item 4).
2. Install wheel sensor (figure 9, item 1) on clamp sleeve (figure 9, item 2) and push wheel sensor (figure 9, item 1) in until it contacts tone ring.
3. Install split loom (figure 9, item 7) on cable (figure 9, item 5). Tape end of split loom (figure 9, item 7) to cable (figure 7, item 5) with electrical tape.
4. Secure split loom (figure 9, item 7) to camshaft bracket (figure 9, item 8) with two new tie straps (figure 9, item 6).

INSTALLATION, SENSOR, FRONT AXLE – CONTINUED

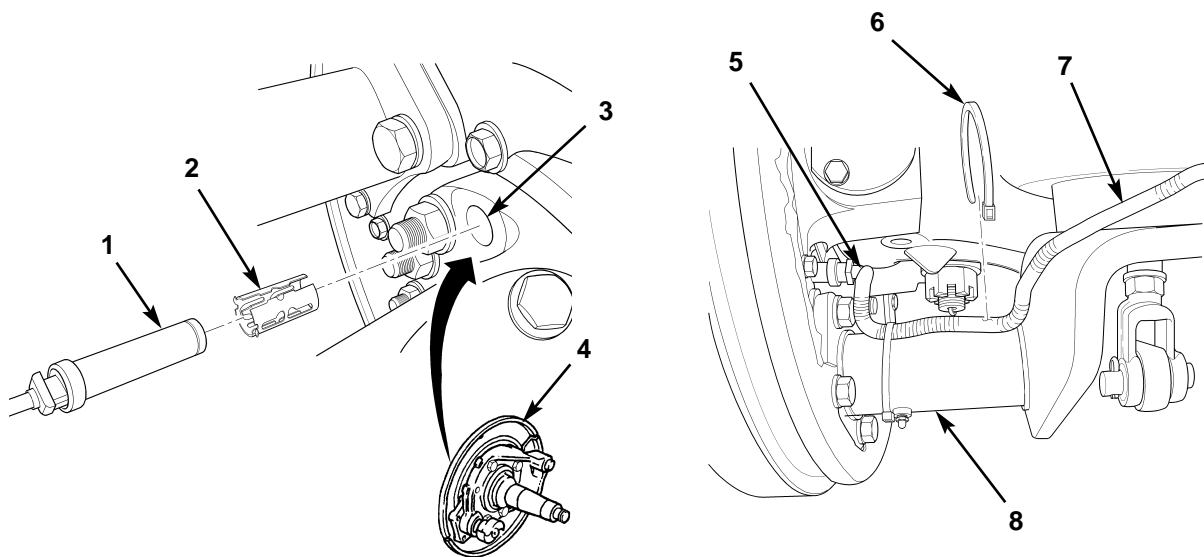


Figure 9. Installing Wheel Sensor on Front Axle.

5. Route end of wheel sensor cable (figure 10, item 1) to front modulator (figure 10, item 2) as noted during removal.
6. Connect wheel sensor cable (figure 10, item 1) to front wheel sensor harness (figure 10, item 3) located inside frame rail adjacent to front modulator (figure 10, item 2).
7. Secure wheel sensor cable (figure 10, item 1) with additional tie straps as noted during removal.
8. Install front or rear-rear axle brake drum (TM 9-2320-283-20).

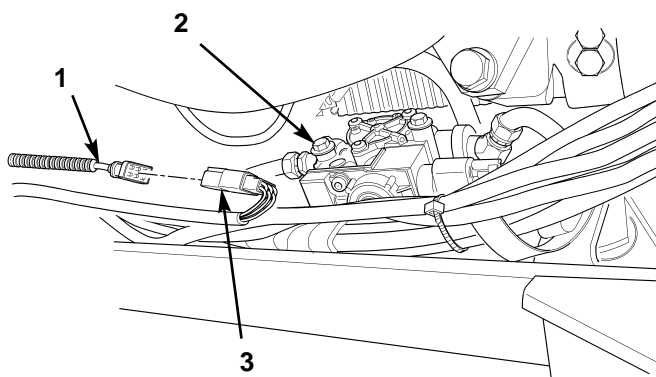


Figure 10. Connecting Wheel Sensor Cable to Front Axle.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
AIR HOSE AND AIR TUBE REPLACEMENT

INITIAL SETUP:**Tools**

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)

References

TM 9-2320-283-10

Materials/Parts

Bulk tubing, 5/8 green (WP 0058, Item 1)

Bulk tubing, 1/2 green (WP 0058, Item 2)

Bulk tubing, 1/2 red (WP 0058, Item 4)

Bulk tubing, 1/2 blue (WP 0058, Item 3)

Pipe joint compound (WP 0066, Item 6)

Tie Strap (WP 0066, Item 10)

Equipment Condition

Air reservoirs drained (TM 9-2320-283-10).

WARNING

Ensure all residual air pressure is released from air reservoirs prior to disconnecting any air hose or tube assembly. Failure to comply may result in damage to equipment or possible injury to personnel. Seek medical attention in the event of an injury.

NOTE

This task covers removal of a rubber air hose and nylon air tube at one location. All air hoses and air tubing are replaced the same way.

REMOVAL, AIR HOSE**NOTE**

Always disconnect swivel nut end of air hose assembly first.

1. Loosen swivel nut (figure 1, item 3), and disconnect hose assembly (figure 1, item 1) from flare fitting (figure 1, item 4).
2. Loosen opposite end of hose assembly (figure 1, item 1), and remove hose assembly (figure 1, item 1) from NPT fitting (figure 1, item 2).

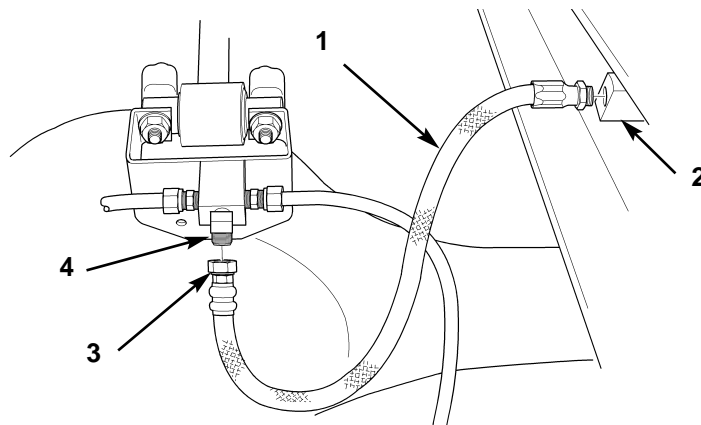


Figure 1. Removing Hose Assembly.

END OF TASK

REMOVAL, AIR TUBE**NOTE**

Note location, size, and quantity of tie straps prior to removal for installation.

1. If present, remove and discard all tie straps from tube to be removed.

NOTE

If present, it may be necessary to remove any clamps securing tube to vehicle, and in some cases, to cut off one end of tube and remove brass nut, enabling end of tube to pass through hole in vehicle frame.

2. Loosen and slide nut (figure 2, item 2) back on tube (figure 2, item 3), and pull tube (figure 2, item 3) out of fitting (figure 2, item 1).
3. Repeat step 2 for opposite end of tube (figure 2, item 3), and remove tube (figure 2, item 3) from any holddown clamps that may be present.

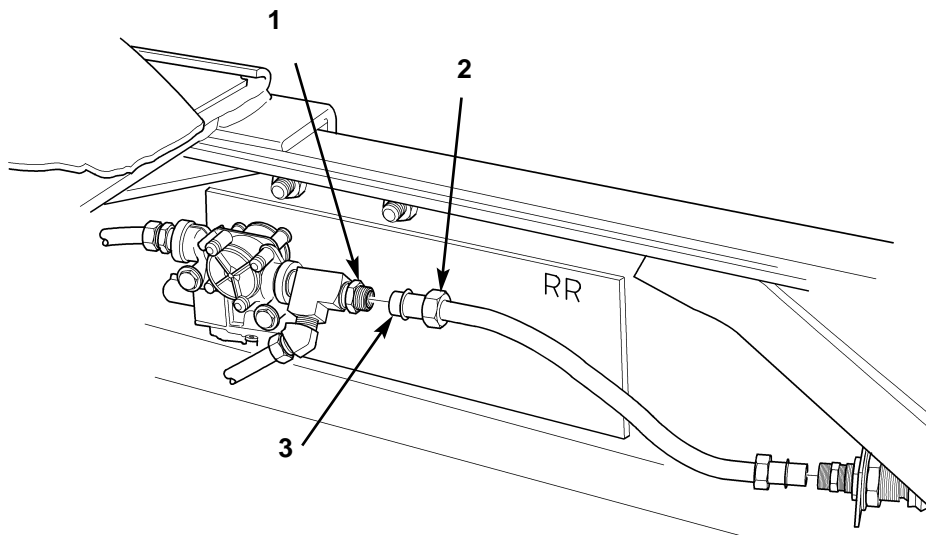


Figure 2. Removing Tube Assembly.

END OF TASK**INSTALLATION, AIR TUBE****NOTE**

Perform steps 1 through 3 if end of tube has been cut off during removal or new tubing will be installed.

When installing new tubing, length of tubing shall be trimmed so there is a small amount of looseness when both ends are connected to fittings and tubing is not so short it has to be pulled tight. Ensure ends of tube are cut reasonably square.

INSTALLATION, AIR TUBE – CONTINUED

1. Measure and cut bulk tubing to desired length, and route new tube (figure 3, item 1) as noted during removal.
2. Slide nut (figure 3, item 2) on tube (figure 3, item 1) with threads (figure 3, item 5) facing end of tube (figure 3, item 3), and install ferrule (figure 3, item 3) on outside diameter (O.D.) of tube (figure 3, item 1).

NOTE

If sleeve insert is not contained in fitting, perform step 3 to install sleeve insert on inside diameter (I.D.) of tube.

3. Install sleeve insert (figure 3, item 4) on I.D. of tube (figure 3, item 1).

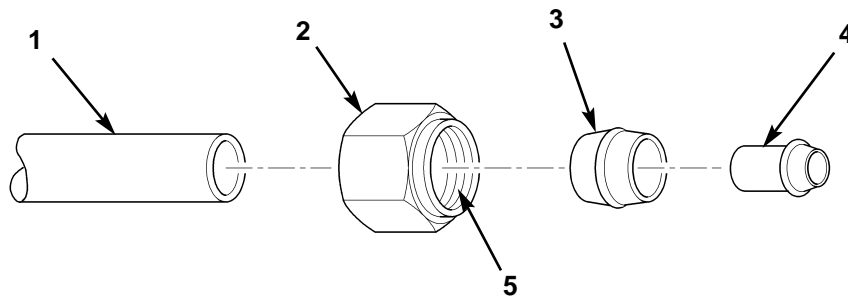


Figure 3. Installing Nut, Ferrule, and Sleeve Insert.

WARNING

All nylon air line tubing must be connected to fittings with a brass ferrule and sleeve insert or end of tube will leak or blow off once under pressure. Failure to comply may result in damage to equipment or possible injury to personnel. Seek medical attention in the event of an injury.

4. Push end of tube (figure 4, item 1) in fitting (figure 4, item 3) until it bottoms and thread nut (figure 4, item 2) on fitting (figure 4, item 3). Tighten nut (figure 4, item 2) in accordance with (IAW) table 1.

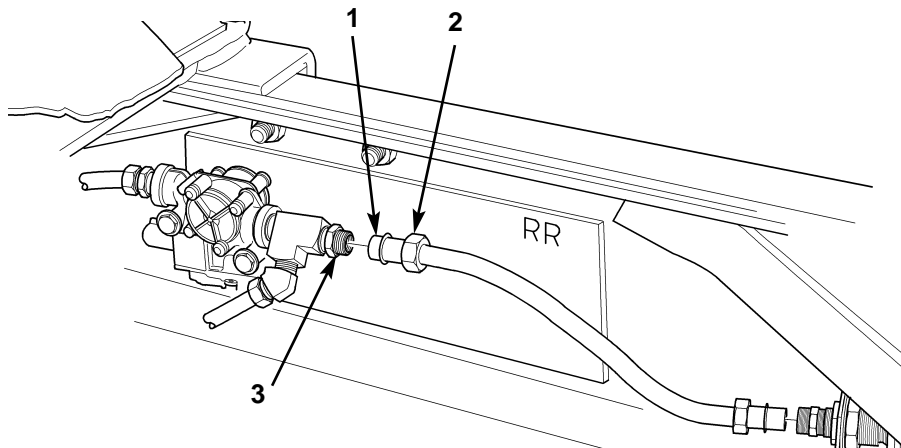


Figure 4. Installing Tube Assembly.

INSTALLATION, AIR TUBE – CONTINUED

5. Tighten nut (figure 5, item 1) and measure gap A, in accordance with (IAW) table 1 below, to ensure proper compression of ferrule on tube (figure 5, item 2).
6. Repeat steps 4 and 5 for opposite end of tube (figure 5, item 2).
7. If necessary, install new tie straps on tube (figure 5, item 2) as noted during removal.

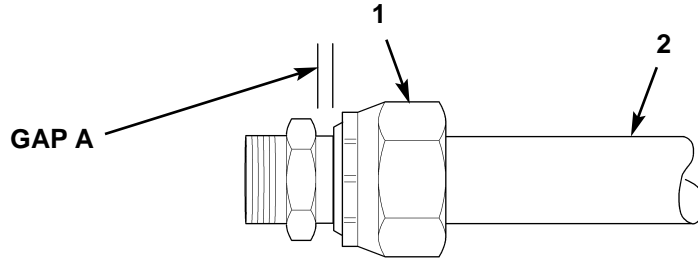


Figure 5. Tightening Fitting Nut.

Table1. Tube Fitting Nut Torque Specifications.

TUBE O.D.	TIGHTEN NUT TO:	GAP "A"
1/4	77–103 lb-in. (8.7–11.6 N•m)	0.085–0.105
3/8	10–15 lb-ft (13.5–20.3 N•m)	0.125–0.145
1/2	22–30 lb-ft (29.8–40.6 N•m)	0.100–0.120
5/8	23–32 lb-ft (31.2–43.3 N•m)	0.115–0.135
3/4	34–45 lb-ft (46.1–61.0 N•m)	0.180–0.200

END OF TASK

INSTALLATION, AIR HOSE**NOTE**

Always connect NPT end of air hose assembly first.

Prior to installation, ensure pipe joint compound is applied to male pipe threads of fittings having National Pipe Threads (NPT) only.

1. Install NPT end on hose assembly (figure 6, item 1) on NPT fitting (figure 6, item 2) until tight.
2. Connect opposite end of hose assembly (figure 6, item 1) to flared fitting (figure 6, item 4) and tighten swivel nut (figure 6, item 3).

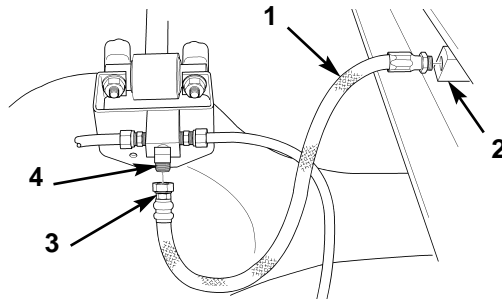


Figure 6. Installing Hose Assembly.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
MOUNTABLE TEE REPLACEMENT

INITIAL SETUP:**Tools**

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)

References

TM 9-2320-283-20

Materials/Parts

Pipe joint compound (WP 0066, Item 6)

Two lockwashers (WP 0049, Item 6)

Equipment Condition

Air reservoirs drained (TM 9-2320-283-10).

NOTE

This task covers removal and installation of mountable tees located on rear-rear axle and right frame rail.

REMOVAL

1. Disconnect hose assembly (figure 1, item 7) and two tubes (figure 1, items 5 and 9) from elbow (figure 1, item 6) and two adapters (figure 1, items 4 and 8) on mountable tee (figure 1, item 3).
2. Remove elbow (figure 1, item 6) and two adapters (figure 1, items 4 and 8) from mountable tee (figure 1, item 3) and remove bolt (figure 1, item 1), lockwasher (figure 1, item 2), and mountable tee (figure 1, item 3) from top hole of rear-rear axle bracket (figure 1, item 10). Discard lockwasher (figure 1, item 2).

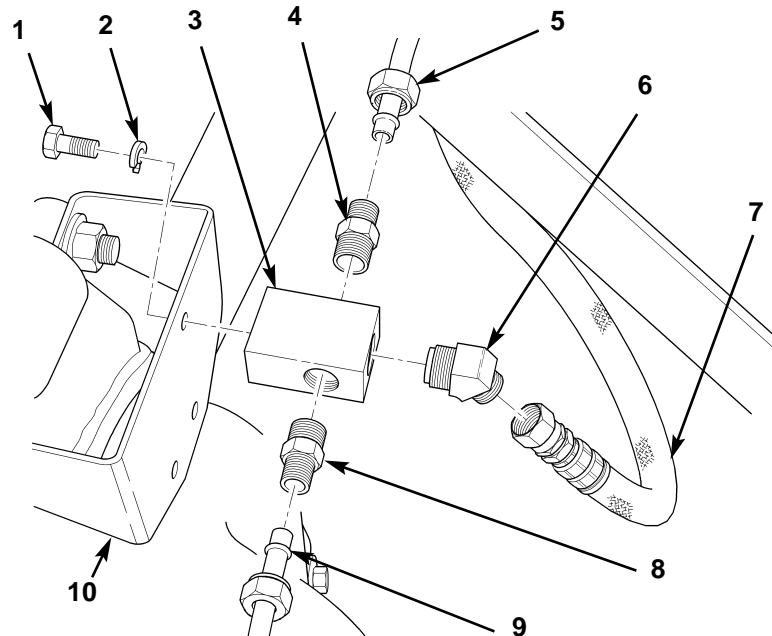


Figure 1. Removing Mountable Tee from Rear-Rear Axle Bracket.

REMOVAL – CONTINUED

3. Disconnect 1/2 in. (13 mm) red tube (figure 2, item 8) from elbow (figure 2, item 7), and remove hose assembly (figure 2, item 1) from mountable tee (figure 2, item 2).
4. Remove elbow (figure 2, item 7) and plug (figure 2, item 3) from mountable tee (figure 2, item 2), and remove screw (figure 2, item 5), lockwasher (figure 2, item 4), and mountable tee (figure 2, item 2) from top hole of right frame rail (figure 2, item 6). Discard lockwasher (figure 2, item 4).

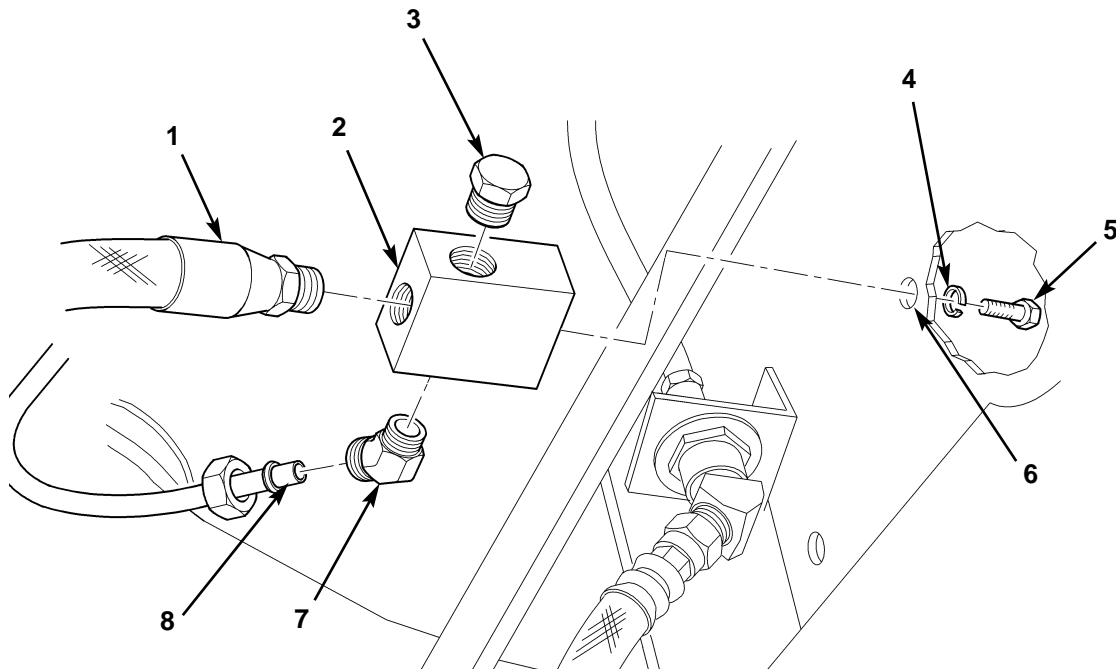


Figure 2. Mountable Tee on Right Frame Rail.

END OF TASK**INSTALLATION****NOTE**

Apply pipe joint compound to NPT male pipe threads only.

4. Apply pipe joint compound to male pipe threads, and install elbow (figure 2, item 7) and plug (figure 2, item 3) on mountable tee (figure 2, item 2).
5. Install mountable tee (figure 2, item 2) on top hole of right frame rail (figure 2, item 6) with new lockwasher (figure 2, item 4) and screw (figure 2, item 5).
6. Connect 1/2 in. (13 mm) red tube (figure 2, item 8) to elbow (figure 2, item 7).
7. Apply pipe joint compound to male pipe threads, and install hose assembly (figure 2, item 1) on mountable tee (figure 2, item 2).

INSTALLATION OF ABS AIR LINES - CONTINUED

8. Apply pipe joint compound to male pipe threads, and install elbow (figure 3, item 6) and two adapters (figure 3, items 4 and 8) on mountable tee (figure 3, item 3).
9. Install mountable tee (figure 3, item 3) on top hole of rear-rear axle bracket (figure 3, item 10) with new lockwasher (figure 3, item 2) and bolt (figure 3, item 1).
10. Connect hose assembly (figure 3, item 7) to elbow (figure 3, item 6) on mountable tee (figure 3, item 3).
11. Connect two tubes (figure 3, items 9 and 5) to two adapters (figure 3, items 4 and 8) on mountable tee (figure 3, item 3).

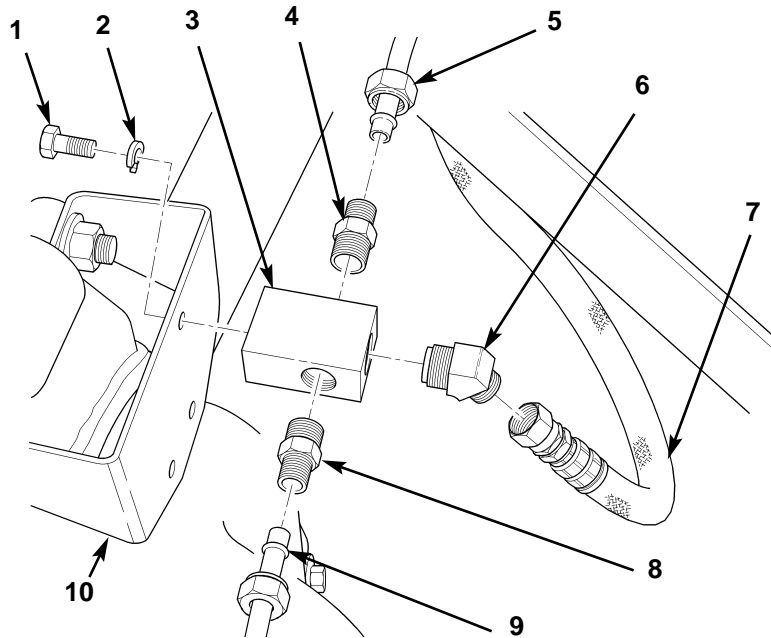


Figure 3. Installing Mountable Tee on Rear-Rear Axle Bracket.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE

FRONT AND REAR AIR BLOCKS REPLACEMENT

INITIAL SETUP:

Tools

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)

Materials/Parts

Pipe joint compound (WP 0066, Item 6)

Locknut (WP 0047, Item 3)

Locknut (WP 0049, Item 4)

Lockwasher (WP 0047, Item 1)

Lockwasher (WP 0048, Item 3)

Lockwasher (WP 0049, Item 1)

Two locknuts (WP 0048, Item 1)

Two locknuts (WP 0048, Item 5)

Two lockwashers (WP 0048, Item 7)

References

TM 9-2320-283-10

TM 9-2320-283-20

Equipment Condition

Air reservoirs drained (TM 9-2320-283-10).

NOTE

This task covers removal and installation of all air blocks for the ABS.

REMOVAL, FRONT CROSSMEMBER AIR BLOCK

1. Disconnect three air tubes (figure 1, items 4, 5, and 6) from two elbows (figure 1, items 3 and 7) and adapter (figure 1, item 8).
2. Remove locknut (figure 1, item 1), washer (figure 1, item 2), bolt (figure 1, item 9), and bulkhead fitting mount (figure 1, item 10) from front crossmember (figure 1, item 11). Discard locknut (figure 1, item 1)

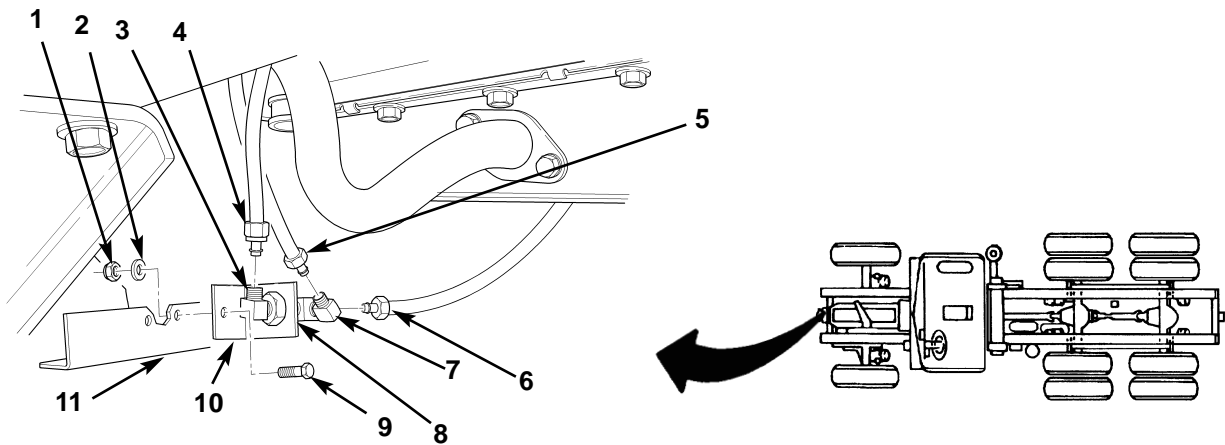


Figure 1. Removing Front Crossmember Air Block.

REMOVAL, FRONT CROSSMEMBER AIR BLOCK - CONTINUED

3. Remove adapter (figure 2, item 5) and elbow (figure 2, item 6) from tee (figure 2, item 4). Remove tee (figure 2, item 4) and elbow (figure 2, item 1) from bulkhead fitting (figure 2, item 8).
4. Remove nut (figure 2, item 3), lockwasher (figure 2, item 2), and bulkhead fitting (figure 2, item 8) from bulkhead fitting mount (figure 2, item 7). Discard lockwasher (figure 2, item 2).

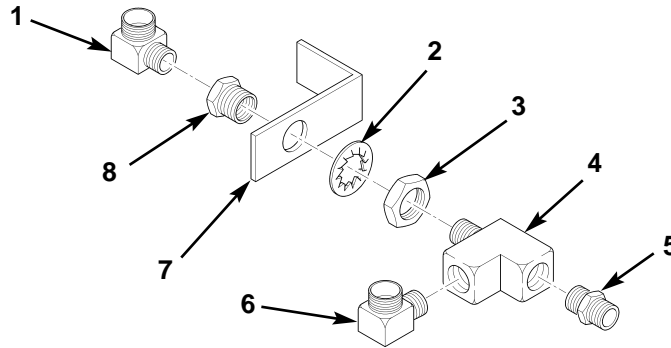


Figure 2. Disassembling Front Crossmember Air Block.

END OF TASK**REMOVAL, RIGHT-REAR AND LEFT-REAR AIR BLOCK****NOTE**

Right-rear and left-rear air blocks are removed the same way. Right-rear air block is shown.

1. Disconnect tube (figure 3, item 8) and air hose assembly (figure 3, item 5) from adapter (figure 3, item 7) and elbow (figure 3, item 4). Remove adapter (figure 3, item 7) from bulkhead fitting (figure 3, item 6).
2. Remove locknut (figure 3, item 2), bolt (figure 3, item 9), and right-rear bulkhead fitting mount (figure 3, item 3) from right frame rail and rear leaf spring shackle (figure 3, item 1). Discard locknut (figure 3, item 2).
3. Remove elbow (figure 4, item 3) from bulkhead fitting (figure 4, item 1).
4. Remove nut (figure 4, item 4), lockwasher (figure 4, item 2), and bulkhead fitting (figure 4, item 1) from right-rear bulkhead fitting mount (figure 4, item 5). Discard lockwasher (figure 4, item 2).
5. Repeat steps 1 through 4 for removal of left-rear air block.

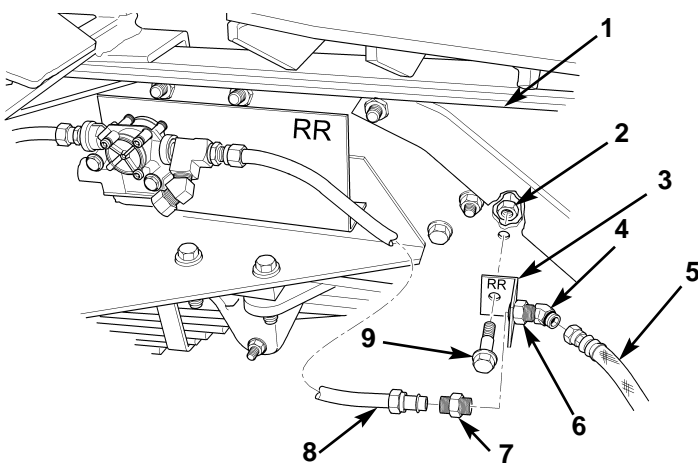


Figure 3. Removing Right-Rear Air Block.

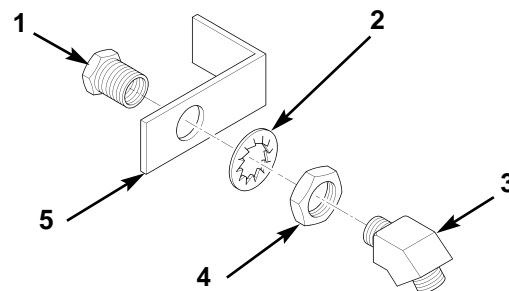


Figure 4. Disassembling Right-Rear Air Block.

END OF TASK

REMOVAL, RIGHT-FRONT AIR BLOCK

1. Disconnect tube (figure 5, item 2) and hose assembly (figure 5, item 10) from adapter (figure 5, item 3) and elbow (figure 5, item 9) on right-front bulkhead fitting mount (figure 5, item 6).
2. Remove adapter (figure 5, item 3) and elbow (figure 5, item 9) from bulkhead fitting (figure 5, item 4).
3. Remove nut (figure 5, item 8), lockwasher (figure 5, item 7), and bulkhead fitting (figure 5, item 4) from right-front bulkhead fitting mount (figure 5, item 6). Discard lockwasher (figure 5, item 7).
4. Remove locknut (figure 5, item 11), bolt (figure 5, item 5), and right-front bulkhead fitting mount (figure 5, item 6) from right frame rail and forward leaf spring shackle (figure 5, item 1). Discard locknut (figure 5, item 11).

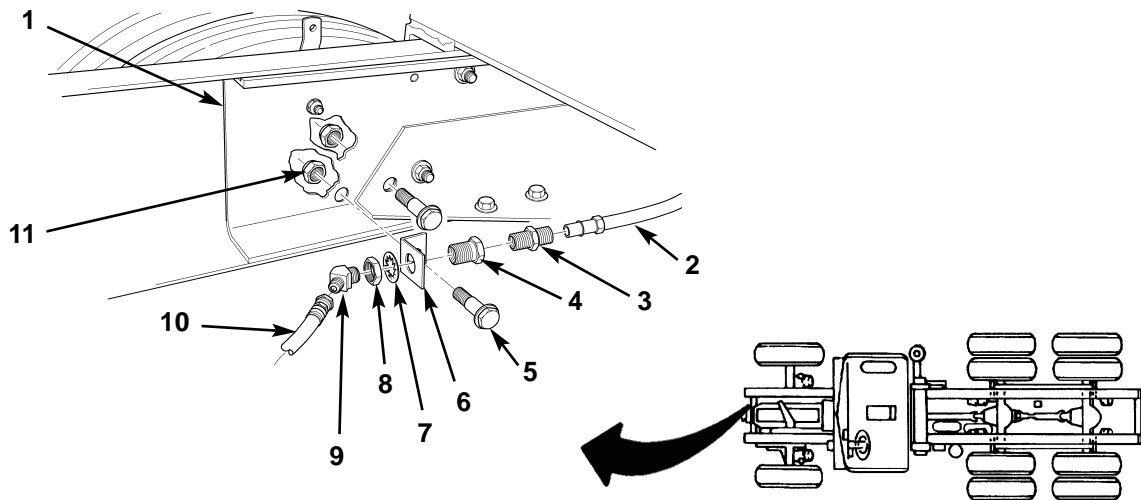


Figure 5. Removing Right-Front Air Block.

END OF TASK

REMOVAL, FORWARD-REAR AXLE AIR BLOCK

1. Disconnect tube (figure 6, item 10) and hose assembly (figure 6, item 4) from elbow (figure 6, item 11) and adapter (figure 6, item 5) on spring brake chamber (figure 6, item 9) and forward-rear bulkhead fitting mount (figure 6, item 7).
2. Remove elbow (figure 6, item 11) and adapter (figure 6, item 5) from bulkhead fitting (figure 6, item 6).
3. Remove nut (figure 6, item 12), lockwasher (figure 6, item 8), and bulkhead fitting (figure 6, item 6) from forward-rear bulkhead fitting mount (figure 6, item 7). Discard lockwasher (figure 6, item 8).
4. Remove two locknuts (figure 6, item 2), washers (figure 6, item 1), screws (figure 6, item 13), and forward-rear bulkhead fitting mount (figure 6, item 7) from bracket (figure 6, item 3) at top of forward-rear axle (figure 6, item 14). Discard locknuts (figure 6, item 2).

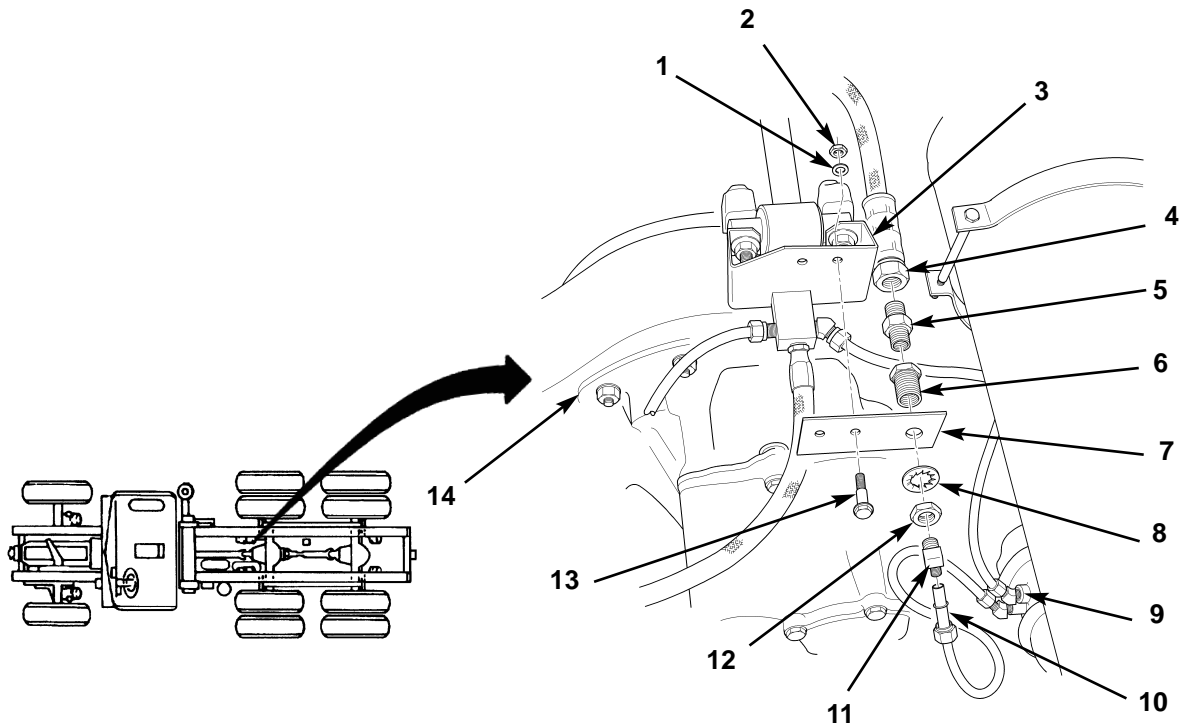


Figure 6. Removing Forward-Rear Axle Air Block.

END OF TASK

REMOVAL, LEFT-FRONT AIR BLOCK – CONTINUED

1. Disconnect tube (figure 7, item 2) from elbow (figure 7, item 1), and remove hose assembly (figure 7, item 10) from reducer bushing (figure 7, item 11) on left-front bulkhead fitting mount (figure 7, item 7).
2. Remove elbow (figure 7, item 1) and reducer bushing (figure 7, item 11) from bulkhead fitting (figure 7, item 13).
3. Remove nut (figure 7, item 3), lockwasher (figure 7, item 4), and bulkhead fitting (figure 7, item 13) from left-front bulkhead fitting mount (figure 7, item 7). Discard lockwasher (figure 7, item 4).
4. Remove locknut (figure 7, item 9), bolt (figure 7, item 5), and left-front bulkhead fitting mount (figure 7, item 7) from spacer (figure 7, item 8) and crossmember (figure 7, item 12). Discard locknut (figure 7, item 9).

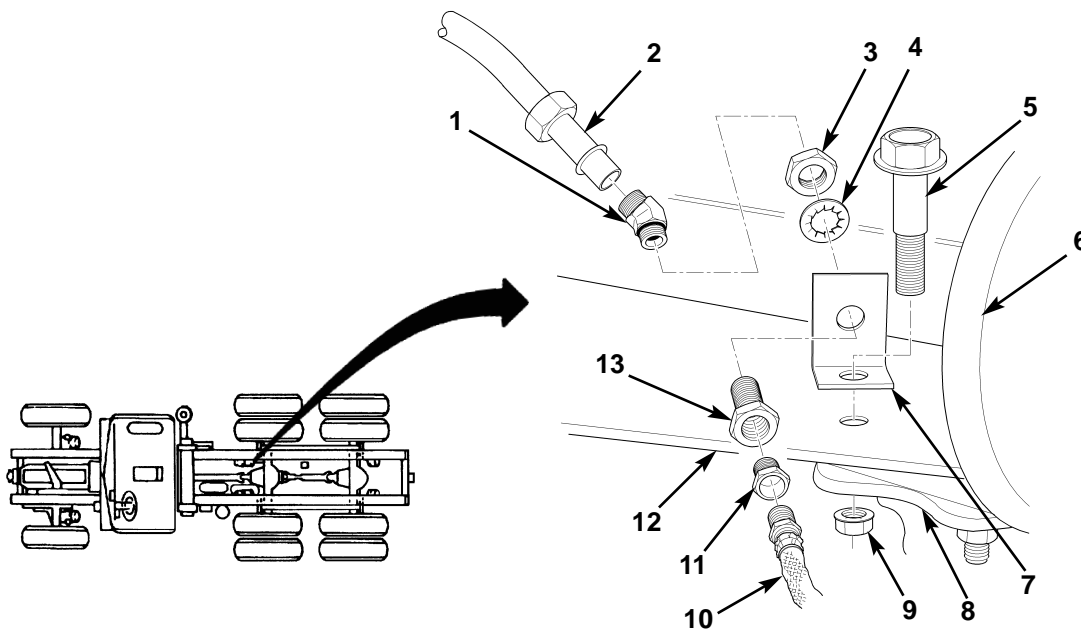


Figure 7. Left-Front Air Block.

END OF TASK**INSTALLATION, LEFT-FRONT AIR BLOCK**

1. Install left-front bulkhead fitting mount (figure 7, item 7) on crossmember (figure 7, item 12) and spacer (figure 7, item 8) with bolt (figure 7, item 5) and new locknut (figure 7, item 9).
2. Install bulkhead fitting (figure 7, item 13) on left-front bulkhead fitting mount (figure 7, item 7) with new lockwasher (figure 7, item 4) and nut (figure 7, item 3).
3. Install elbow (figure 7, item 1) and reducer bushing (figure 7, item 11) on bulkhead fitting (figure 7, item 13).
4. Install hose assembly (figure 7, item 10) on reducer bushing (figure 7, item 11), and connect tube (figure 7, item 2) to elbow (figure 7, item 1).

END OF TASK

INSTALLATION, FORWARD-REAR AXLE AIR BLOCK

1. Install forward-rear bulkhead fitting mount (figure 8, item 7) on bracket (figure 8, item 3) at top of forward-rear axle (figure 8, item 14) with two screws (figure 8, item 13), washers (figure 8, item 1), and new locknuts (figure 8, item 2).
2. Install bulkhead fitting (figure 8, item 6) on forward-rear axle bulkhead fitting mount (figure 8, item 7) with new lockwasher (figure 8, item 8) and nut (figure 8, item 12).
3. Install elbow (figure 8, item 11) and adapter (figure 8, item 5) on bulkhead fitting (figure 8, item 6).
4. Connect tube (figure 8, item 10) from left spring brake chamber (figure 8, item 9) to elbow (figure 8, item 11), and connect hose assembly (figure 8, item 4) from left-front bulkhead to adapter (figure 8, item 5).

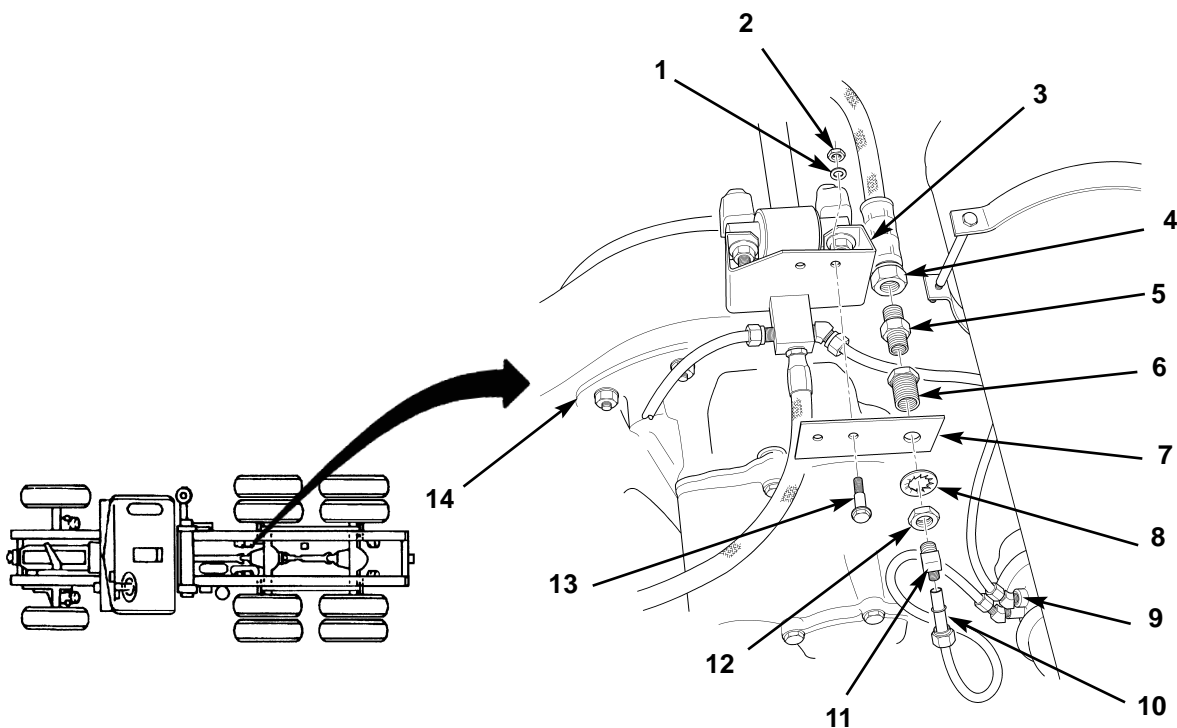


Figure 8. Installing Forward-Rear Axle Air Block.

END OF TASK

INSTALLATION, RIGHT-FRONT AIR BLOCK

1. Install right-front bulkhead fitting mount (figure 9, item 6) on right frame rail and forward leaf spring shackle (figure 9, item 1) with bolt (figure 9, item 5) and new locknut (figure 9, item 11).
2. Install bulkhead fitting (figure 9, item 4) on right-front bulkhead fitting mount (figure 9, item 6) with new lockwasher (figure 9, item 7) and nut (figure 9, item 8).
3. Install adapter (figure 9, item 3) and elbow (figure 9, item 9) on bulkhead fitting (figure 9, item 4).
4. Connect hose assembly (figure 9, item 10) from right spring brake chamber to elbow (figure 9, item 9), and connect tube (figure 9, item 2) to adapter (figure 9, item 3) on right-front bulkhead fitting mount (figure 9, item 6).

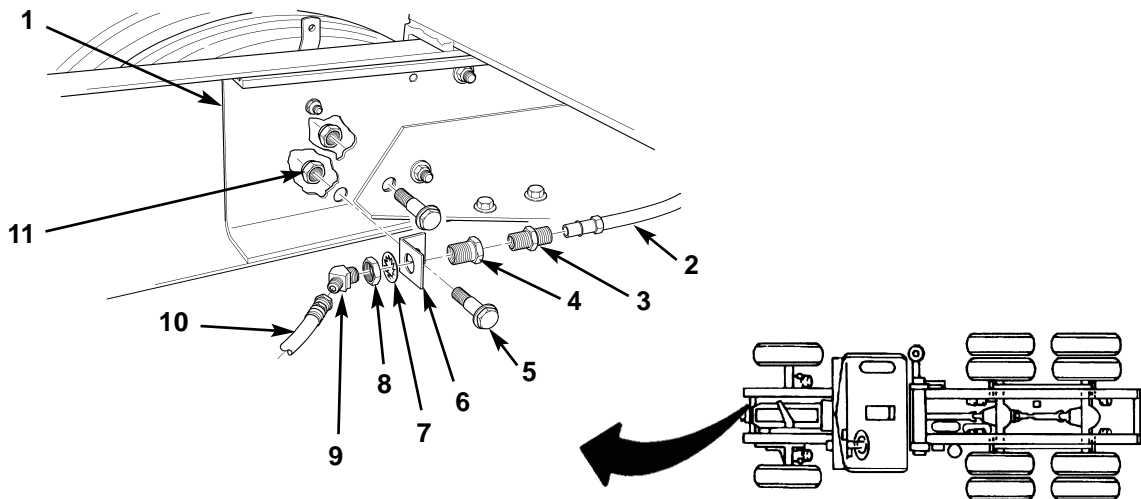


Figure 9. Installing Right-Front Air Block.

END OF TASK

INSTALLATION, RIGHT-REAR AND LEFT-REAR AIR BLOCKS

1. Install bulkhead fitting (figure 10, item 1) on right-rear bulkhead fitting mount (figure 10, item 5) with new lockwasher (figure 10, item 2) and nut (figure 10, item 4).
2. Install elbow (figure 10, item 3) on bulkhead fitting (figure 10, item 1).

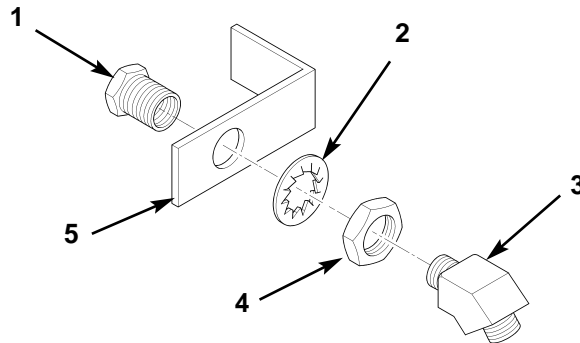


Figure 10. Assembling Right-Rear Air Block.

NOTE

Right-rear and left-rear air blocks are installed the same way.
Right-rear air block is shown.

3. Install right-rear bulkhead fitting mount (figure 11, item 3) on right frame rail and rear leaf spring shackle (figure 11, item 1) with bolt (figure 11, item 9) and new locknut (figure 11, item 2).
4. Install adapter (figure 11, item 7) on bulkhead fitting (figure 11, item 6), and connect tube (figure 11, item 8) to adapter (figure 11, item 7).
5. Connect hose assembly (figure 11, item 5) from right spring brake chamber to elbow (figure 11, item 4).
6. Repeat steps 1 through 5 for installation of left-rear air block.

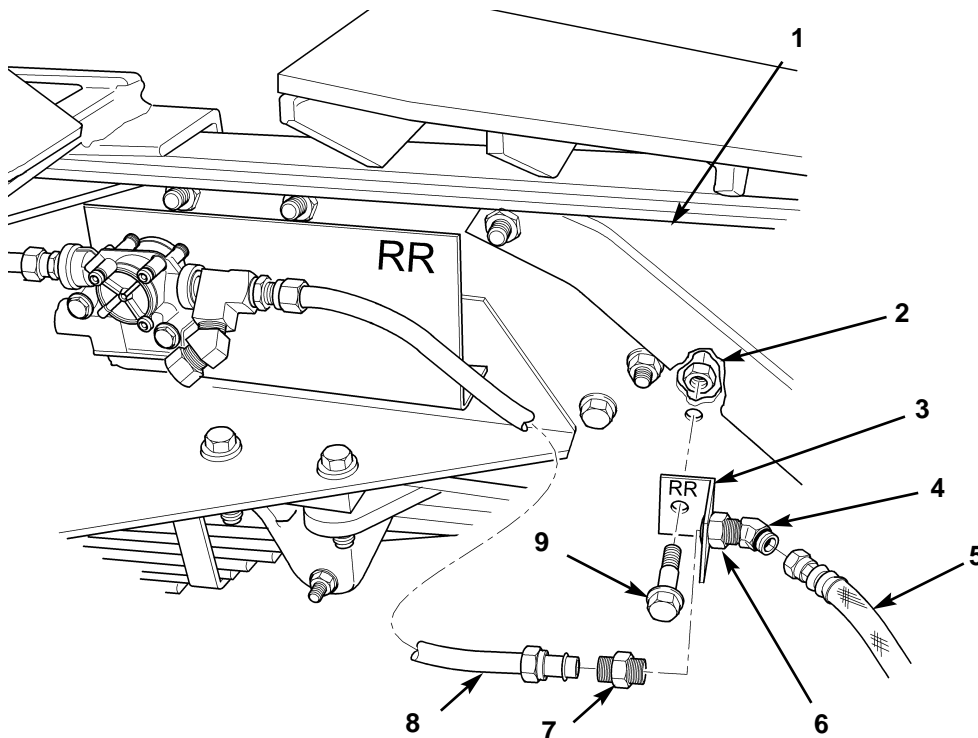


Figure 11. Installing Right-Rear Air Block.

END OF TASK

INSTALLATION, FRONT CROSSMEMBER AIR BLOCK

1. Install bulkhead fitting (figure 12, item 8) on front crossmember bulkhead fitting mount (figure 12, item 7) with new lockwasher (figure 12, item 2) and nut (figure 12, item 3).
2. Install elbow (figure 12, item 1) and tee (figure 12, item 4) on bulkhead fitting (figure 12, item 8). Install elbow (figure 12, item 6) and adapter (figure 12, item 5) on tee (figure 12, item 4).
3. Install bulkhead fitting mount (figure 13, item 10) on front crossmember (figure 13, item 11) with bolt (figure 13, item 9), washer (figure 13, item 2), and new locknut (figure 13, item 1).
4. Connect three air tubes (figure 13, items 4, 5, and 6) to two elbows (figure 13, items 3 and 7) and adapter (figure 13, item 8).

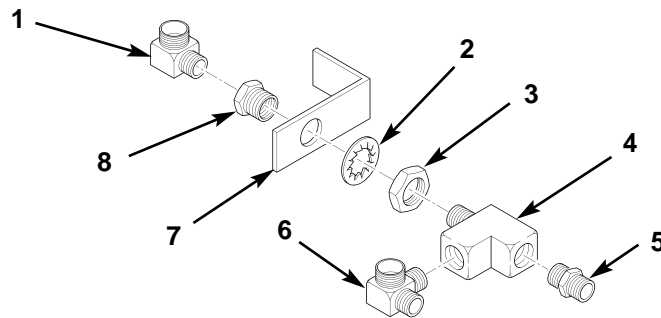


Figure 12. Assembling Front Crossmember Air Block.

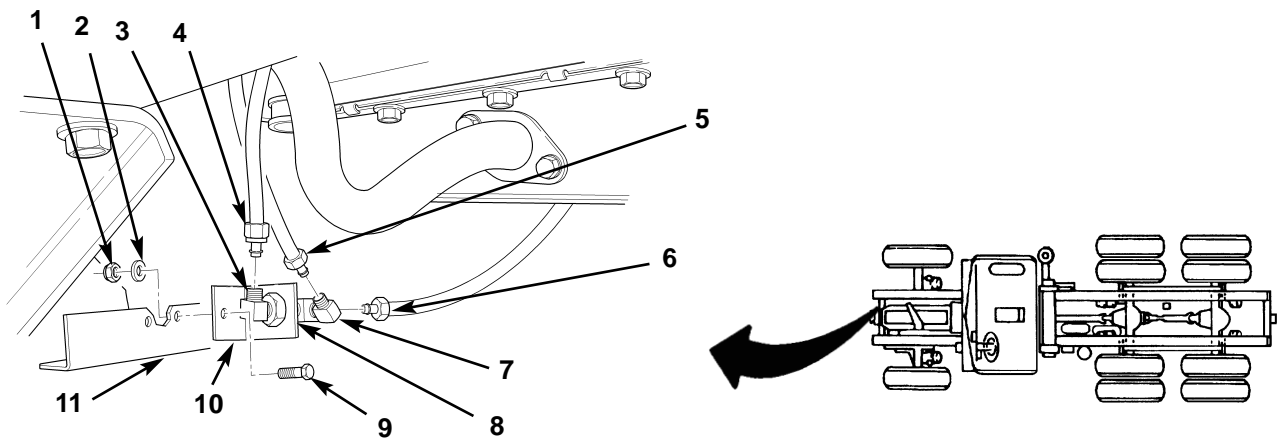


Figure 13. Installing Front Crossmember Air Block.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
FRONT AND REAR MODULATORS REPLACEMENT

INITIAL SETUP:**Tools**

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)

Materials/Parts

Two locknuts (WP 0044, Item 2)

Two locknuts (WP 0044, Item 7)

Two locknuts (WP 0044, Item 8)

References

WP 0021

TM 9-2320-283-20

TM 9-2320-283-10

Equipment Condition

Air reservoirs drained (TM 9-2320-283-10).

Battery power disconnected (TM 9-2320-283-20).

NOTE

This task covers removal and installation of front and rear modulators. Left side is shown.

REMOVAL, FRONT MODULATOR

1. Disconnect wheel sensor cable (figure 1, item 1) from wheel sensor harness connector (figure 1, item 4) and disconnect modulator harness connector (figure 1, item 3) from front modulator (figure 1, item 2).

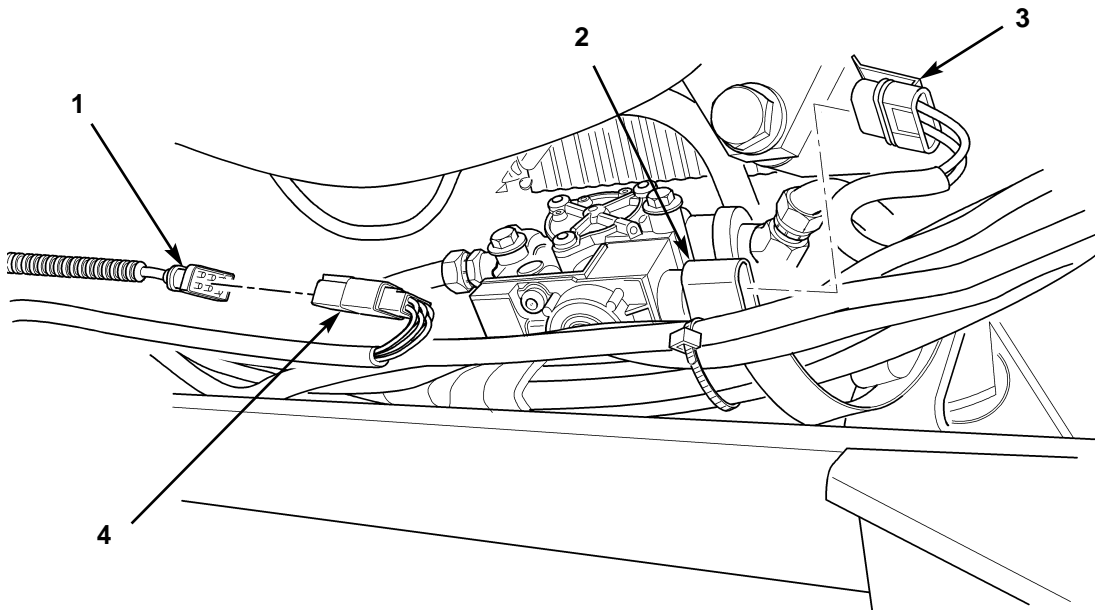


Figure 1. Disconnecting Front Wheel Sensor and Modulator.

REMOVAL, FRONT MODULATOR – CONTINUED

2. Loosen nut (figure 2, item 12) on elbow (figure 2, item 1), and disconnect tube (figure 2, item 11) from elbow (figure 2, item 1) on frame rail (figure 2, item 2).
3. Remove two locknuts (figure 2, item 4), washers (figure 2, item 3), bolts (figure 2, item 14), washers (figure 2, item 13), and front modulator (figure 2, item 8) from frame rail (figure 2, item 2). Discard locknuts (figure 2, item 4).

NOTE

Perform step 4 if front modulator will be replaced.

4. Remove tube (figure 2, item 11) from adapter (figure 2, item 10), and remove adapter (figure 2, item 10) from front modulator outlet (figure 2, item 9). Remove elbow (figure 2, item 6) from front modulator inlet (figure 2, item 7).

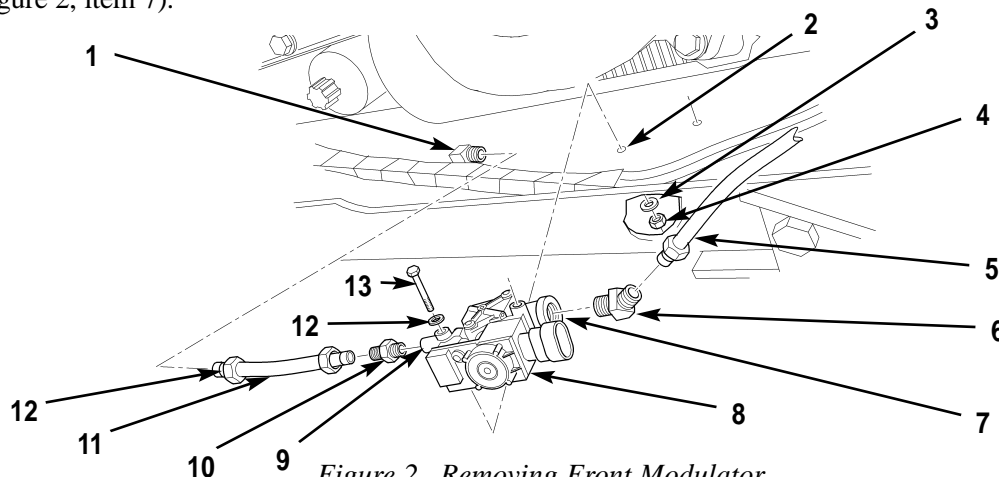


Figure 2. Removing Front Modulator.

END OF TASK**REMOVAL, REAR MODULATOR**

1. Disconnect wheel sensor cable (figure 3, item 3) from wheel sensor harness connector (figure 3, item 4) and disconnect modulator harness connector (figure 3, item 6) from rear modulator (figure 3, item 1).

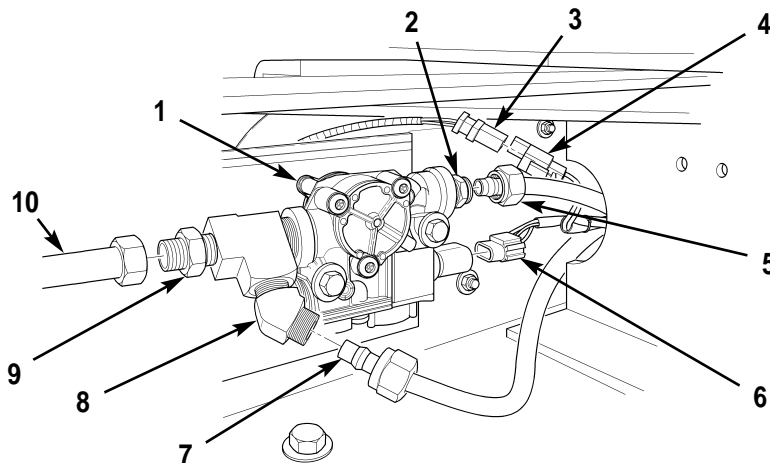


Figure 3. Disconnecting Rear Wheel Sensor and Modulator.

2. Disconnect two tubes (figure 3, Items 5 and 7) from adapter (figure 3, item 2) and elbow (figure 3, item 8) on rear modulator (figure 3, item 1).
3. Disconnect tube (figure 3, item 10) from adapter (figure 3, item 9) on rear modulator (figure 3, item 1).

REMOVAL, REAR MODULATOR – CONTINUED

4. Remove two locknuts (figure 4, item 1), bolts (figure 4, item 15), and rear modulator bracket (figure 4, item 5) from frame rail (figure 4, item 2). Discard locknuts (figure 4, item 1).

NOTE

Perform steps 4 through 6 if replacing rear modulator.

5. Remove two locknuts (figure 4, item 3), washers (figure 4, item 4), bolts (figure 4, item 9), washers (figure 4, item 10), and rear modulator (figure 4, item 8) from rear modulator bracket (figure 4, item 5). Discard locknuts (figure 4, item 3).
6. Remove elbow (figure 4, item 12) and adapter (figure 4, item 14) from tee (figure 4, item 13).
7. Remove tee (figure 4, item 13) from rear modulator outlet (figure 4, item 11), and remove adapter (figure 4, item 7) from rear modulator inlet (figure 4, item 6).

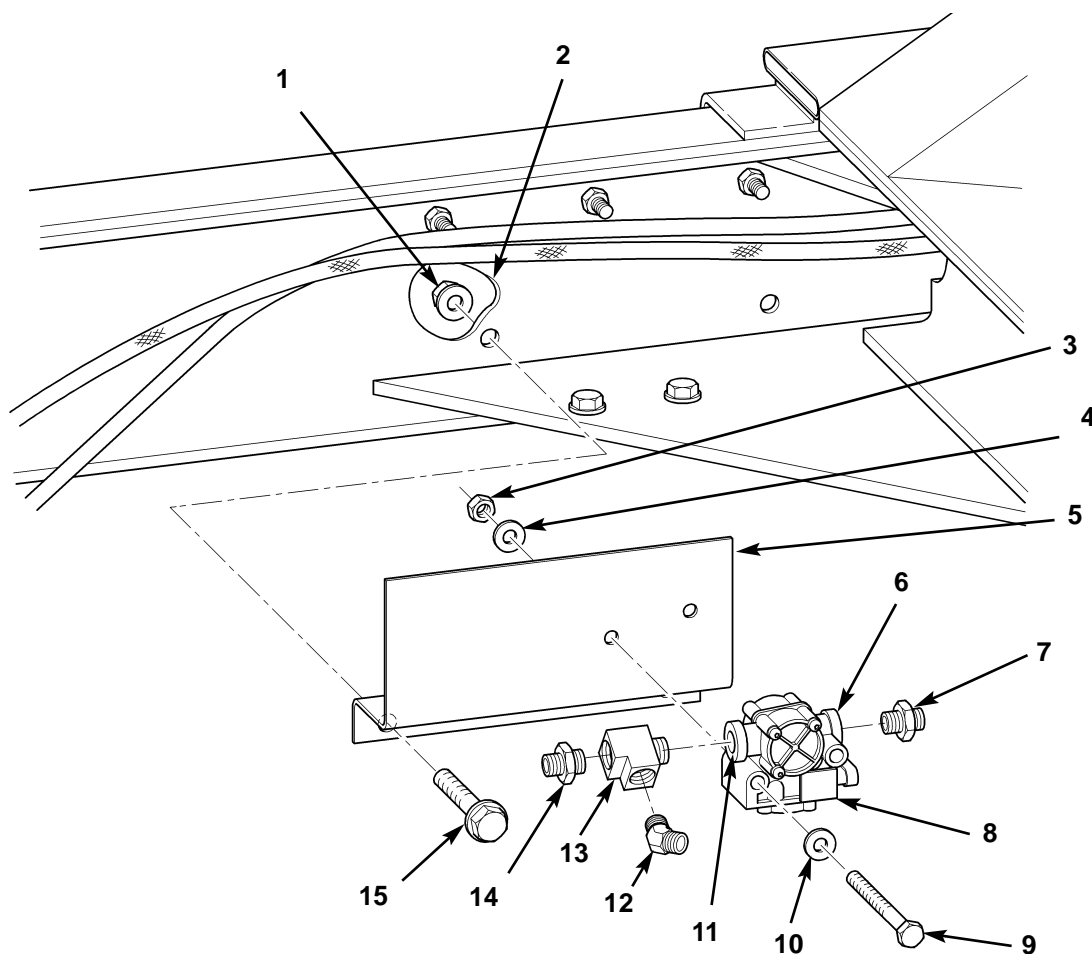


Figure 4. Removing Rear Modulator.

END OF TASK

INSTALLATION, REAR MODULATOR**WARNING**

Ensure all nuts on air tube fittings are properly tightened during installation. Refer to WP 0021. Failure to comply may result in damage to equipment or possible injury to personnel. Seek medical attention in the event of an injury.

NOTE

Perform steps 1 and 2 if fittings have been removed from rear modulator.

Prior to installation, ensure pipe joint compound is applied to male pipe threads of fittings having National Pipe Threads (NPT) only.

1. Install adapter (figure 5, item 7) on rear modulator inlet (figure 4, item 6), and install tee (figure 5, item 13) on rear modulator outlet (figure 4, item 11).
2. Install adapter (figure 5, item 14) and elbow (figure 5, item 12) on tee (figure 5, item 13).
3. Install rear modulator (figure 5, item 8) on rear modulator bracket (figure 5, item 5) with two washers (figure 5, item 10), bolts (figure 5, item 9), washers (figure 5, item 4), and new locknuts (figure 5, item 3).
4. Install rear modulator bracket (figure 5, item 5) on frame rail (figure 5, item 2) with two bolts (figure 5, item 9) and new locknuts (figure 5, item 1).

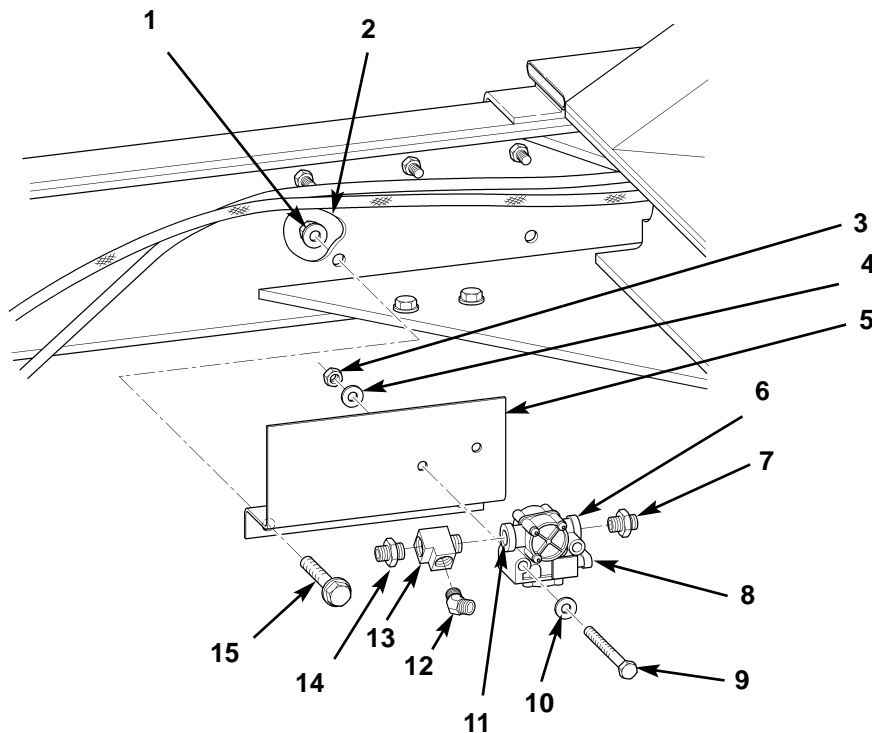


Figure 5. Installing Rear Modulator.

5. Connect tube (figure 6, item 10) to adapter (figure 6, item 9) on rear modulator (figure 6, item 1).
6. Connect two tubes (figure 6, Items 4 and 7) to elbow (figure 6, item 8) and adapter (figure 6, item 1) on rear modulator (figure 6, item 9).

INSTALLATION, REAR MODULATOR – CONTINUED

7. Connect modulator harness connector (figure 6, item 6) to rear modulator (figure 6, item 1), and connect wheel sensor cable (figure 6, item 3) to wheel sensor harness connector (figure 6, item 4).

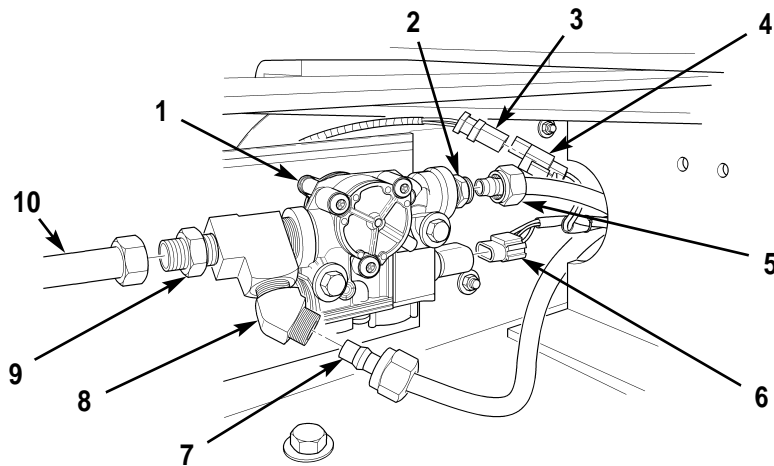


Figure 6. Connecting Rear Wheel Sensor and Modulator.

END OF TASK**INSTALLATION, FRONT MODULATOR****NOTE**

Perform step 1 if fittings have been removed from front modulator.

1. Install elbow (figure 7, item 6) on front modulator inlet (figure 7, item 7), and install adapter (figure 7, item 10) on front modulator outlet (figure 7, item 9). Connect tube (figure 7, item 11) to adapter (figure 7, item 10).
2. Position front modulator (figure 7, item 8), connect tube (figure 7, item 11) to elbow (figure 7, item 1), and install front modulator (figure 7, item 8) on frame rail (figure 7, item 2) with two washers (figure 7, item 12), bolts (figure 7, item 13), washers (figure 7, item 3), and new locknuts (figure 7, item 4).
3. Connect tube (figure 7, item 5) to elbow (figure 7, item 6) on front modulator (figure 7, item 8).

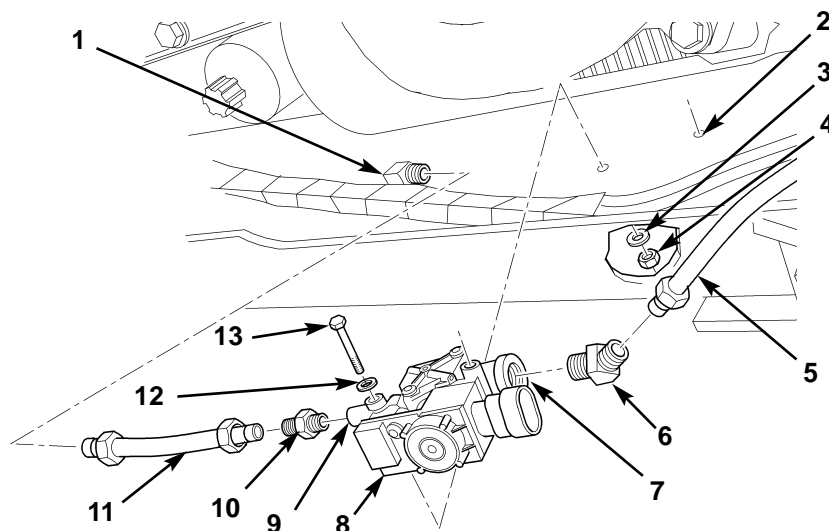


Figure 7. Installing Front Modulator.

INSTALLATION, FRONT MODULATOR – CONTINUED

4. Connect modulator harness connector (figure 8, item 3) to front modulator (figure 8, item 2), and connect wheel sensor cable (figure 8, item 1) to wheel sensor harness connector (figure 8, item 4).
5. Connect battery power. Refer to TM 9-2320-283-20.
6. Perform ABS Self Test. Refer to WP 0018.

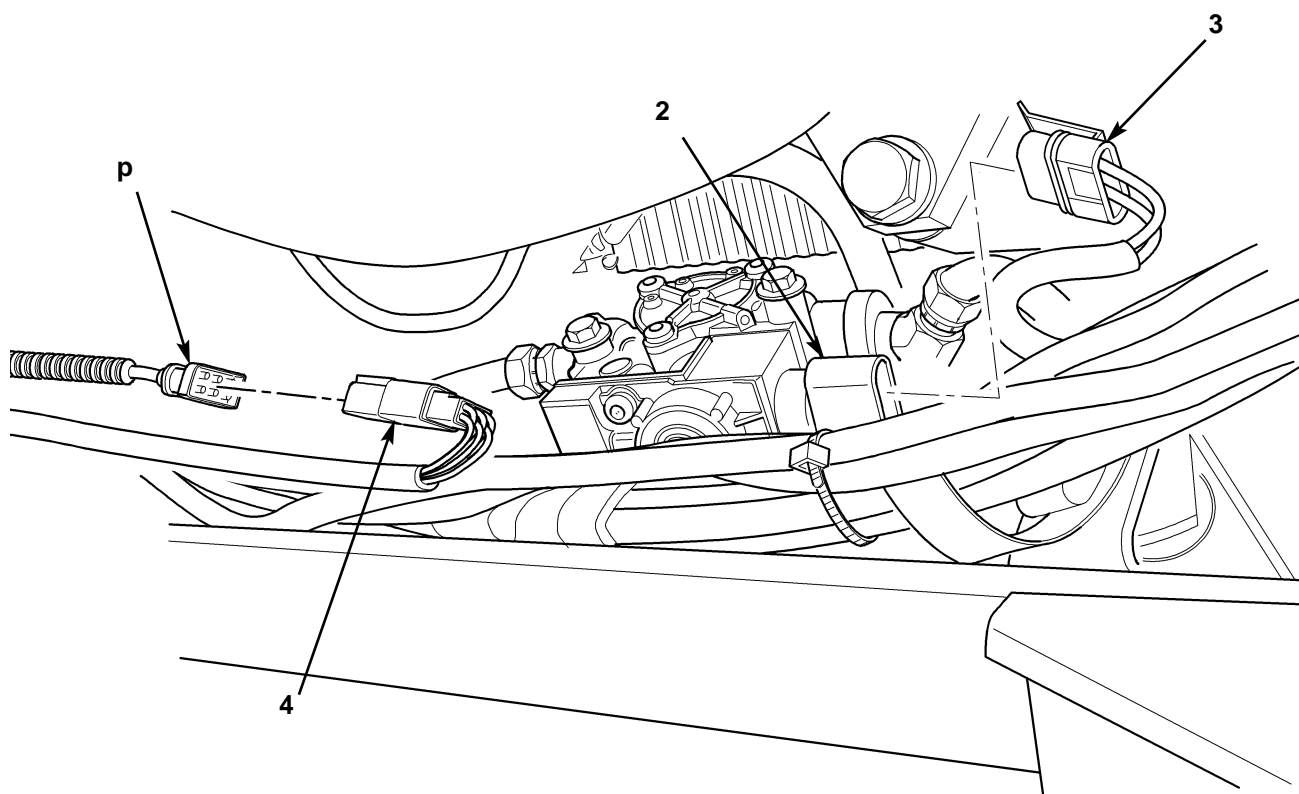


Figure 8. Connecting Front Wheel Sensor and Modulator.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
PRIMARY RESERVOIR REPLACEMENT

INITIAL SETUP:**Tools and Special Tools**

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)

Materials/Parts

Pipe joint compound (WP 0066, Item 6)

References

WP 0021

TM 9-2320-283-20

TM 9-2320-283-10

Equipment Condition

Air reservoirs drained (TM 9-2320-283-10).

REMOVAL

1. Remove nut (figure 1, item 2), screw (figure 1, item 3), and strap (figure 1, item 15) from clamp (figure 1, item 1) on air hose tender (figure 1, item 4)
2. Disconnect emergency air pressure coupling (figure 1, item 13) and service air pressure coupling (figure 1, item 6) from storage brackets (figure 1, item 12) on air hose tender (figure 1, item 4). Set air hoses (figure 1, items 5 and 14) on spare tire carrier.

WARNING

Two personnel are required to remove service deck assembly from tractor frame due to its size. Failure to comply may result in injury to personnel. Seek medical attention in the event of injury.

3. Remove four bolts (figure 1, item 8) and lockwashers (figure 1, item 7) from service deck assembly (figure 1, item 11) and four tabs (figure 1, item 9). Remove service deck assembly (figure 1, item 11) from tractor frame (figure 1, item 10).

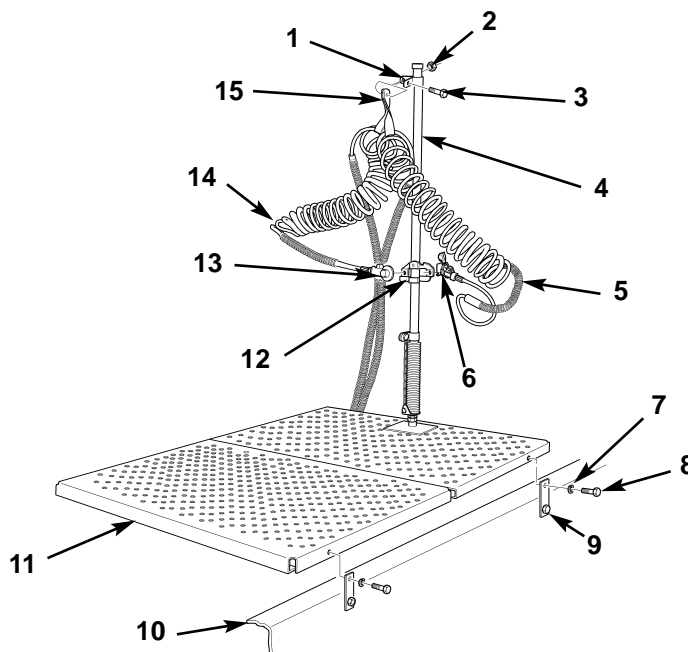


Figure 1. Disconnecting Air Hoses and Removing Service Deck.

REMOVAL – CONTINUED

4. Disconnect tubes (figure 2, items 3 and 4) from adapter (figure 2, item 1) and elbow (figure 2, item 2), located at front end of primary reservoir (figure 2, item 5).

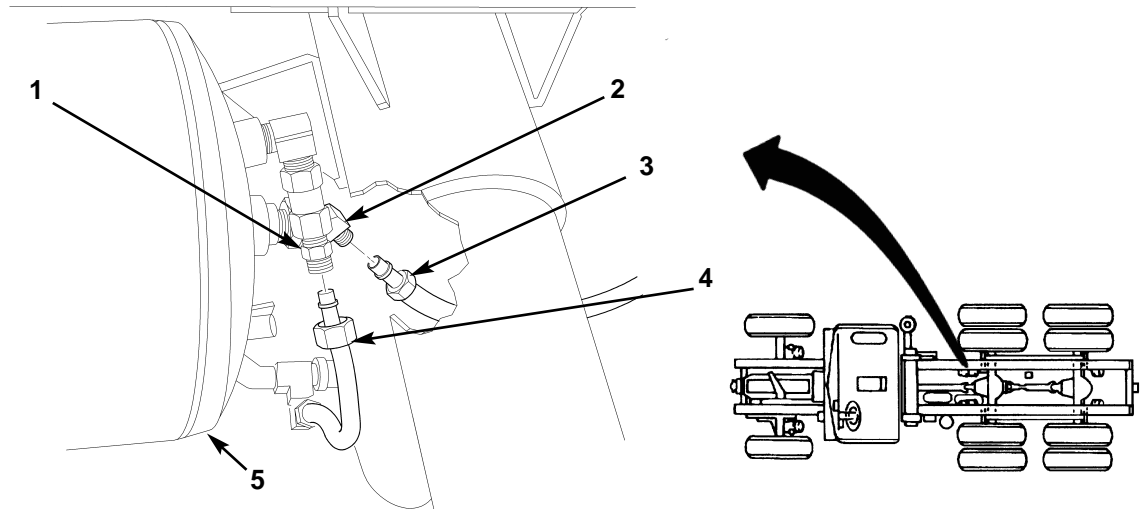


Figure 2. Disconnecting Tubes from Primary Reservoir.

5. Remove two nuts (figure 3, item 9) and screws (figure 3, item 5) from primary reservoir upper and lower clamps (figure 3, items 6 and 8).
6. Remove two nuts (figure 3, item 7) and upper clamps (figure 3, item 6) from right frame rail (figure 3, item 10) and primary reservoir (figure 3, item 4).
7. Slide primary reservoir (figure 3, item 4) back from crossmember, disconnect tube (figure 3, item 1) from elbow (figure 3, item 11) and tube (figure 3, item 2) from adapter (figure 3, item 3).
8. Remove fittings from front of primary reservoir (figure 3, item 4). Refer to TM 9-2320-283-20.

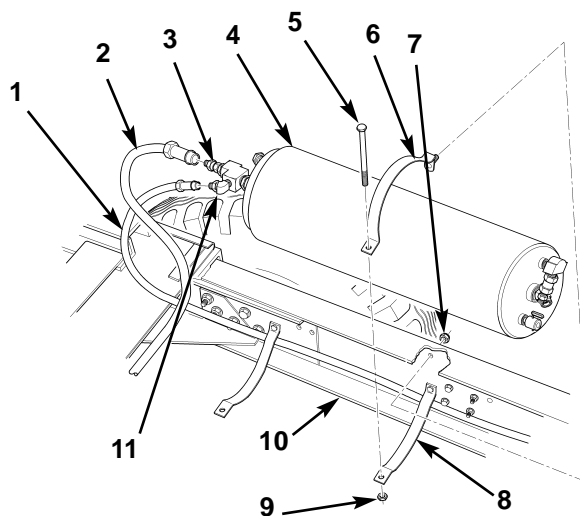


Figure 3. Removing Primary Reservoir.

REMOVAL – CONTINUED

9. Remove plug (figure 4, item 1) from rear of primary reservoir (figure 4, item 2).
10. Remove adapter (figure 4, item 5) from reducer bushing (figure 4, item 6), and remove adapter (figure 4, item 3) from elbow (figure 4, item 4).
11. Remove reducer bushing (figure 4, item 6) and elbow (figure 4, item 4) from tee (figure 4, item 7), and remove tee (figure 4, item 7) from rear of primary reservoir (figure 4, item 2).

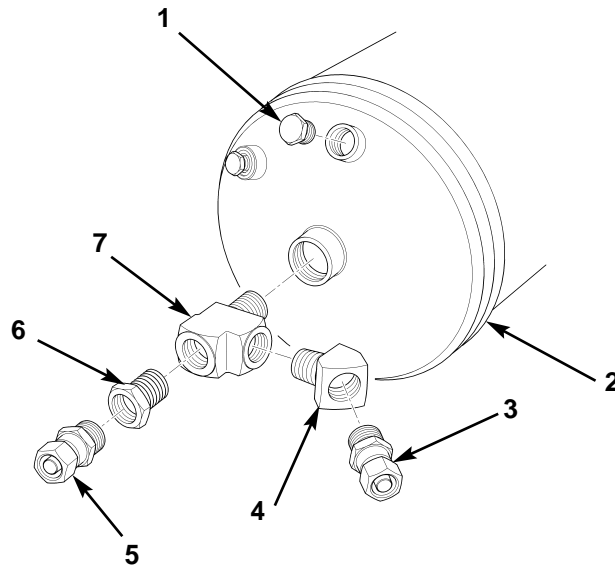


Figure 4. Removing Fittings from Rear of Primary Reservoir.

END OF TASK**INSTALLATION****WARNING**

Ensure all nuts on air tube fittings are properly tightened during installation. Refer to WP 0021. Failure to comply may result in damage to equipment or possible injury to personnel. Seek medical attention in the event of an injury.

NOTE

Prior to installation, ensure pipe joint compound is applied to male pipe threads of NPT fittings only.

1. Install tee (figure 4, item 7) on rear of primary reservoir (figure 4, item 2), and install reducer bushing (figure 4, item 6) and elbow (figure 4, item 4) on tee (figure 4, item 7).
2. Install adapter (figure 4, item 5) on reducer bushing (figure 4, item 6), and install adapter (figure 4, item 3) on elbow (figure 4, item 4).
3. Install plug (figure 4, item 1) on rear of primary reservoir (figure 4, item 2).

INSTALLATION – CONTINUED

4. Install fittings on front of primary reservoir (figure 5, item 4). Refer to TM 9-2320-283-20.
5. Connect tubes (figure 5, items 1 and 2) to elbow (figure 5, item 11) and adapter (figure 5, item 3) on rear of primary reservoir (figure 5, item 4).
6. Position primary reservoir (figure 5, item 4) on lower clamps (figure 5, item 8), and install upper clamps (figure 5, item 6) on left frame rail (figure 5, item 10) with two nuts (figure 5, item 7).
7. Secure primary reservoir (figure 5, item 4) by installing two screws (figure 5, item 5) and nuts (figure 5, item 9) on upper and lower clamps (figure 5, items 6 and 8).

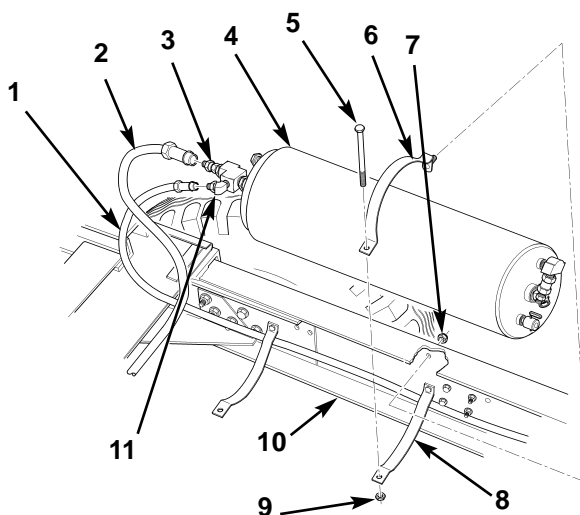


Figure 5. Installing Primary Reservoir.

8. Connect tubes (figure 6, items 3 and 4) to adapter (figure 6, item 1) and elbow (figure 6, item 2) located at front end of primary reservoir (figure 6, item 5).

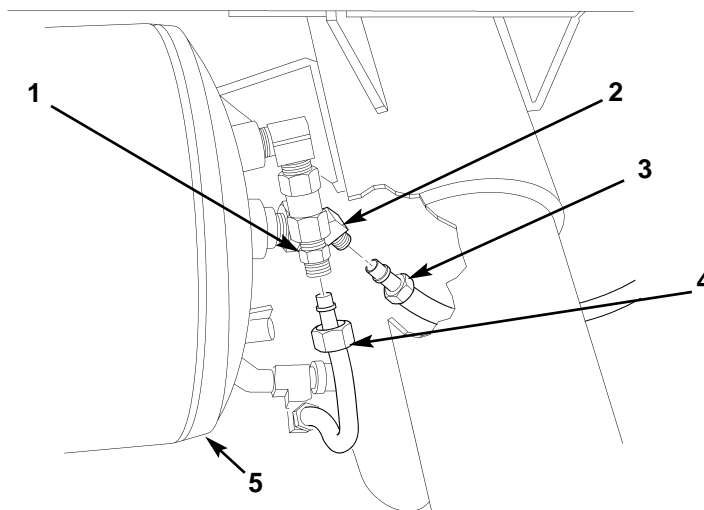


Figure 6. Connecting Tubes to Primary Reservoir.

INSTALLATION – CONTINUED**WARNING**

Two personnel are required to remove service deck assembly from tractor frame due to its size. Failure to comply may result in injury to personnel. Seek medical attention in the event of injury.

9. Position service deck assembly (figure 7, item 11) on tractor frame (figure 7, item 10), and install four lockwashers (figure 7, item 7) and bolts (figure 7, item 8) on four tabs (figure 7, item 9) and service deck assembly (figure 7, item 11).
10. Loop strap (figure 7, item 15) around emergency air pressure hose (figure 7, item 14) and service air pressure hose (figure 7, item 5). Install strap (figure 7, item 15) on air hose tender (figure 7, item 4) with clamp (figure 7, item 1), screw (figure 7, item 3), and nut (figure 7, item 2).
11. Connect emergency air pressure coupling (figure 7, item 13) and service air pressure coupling (figure 7, item 6) to storage brackets (figure 7, item 12) on air hose tender (figure 7, item 4).

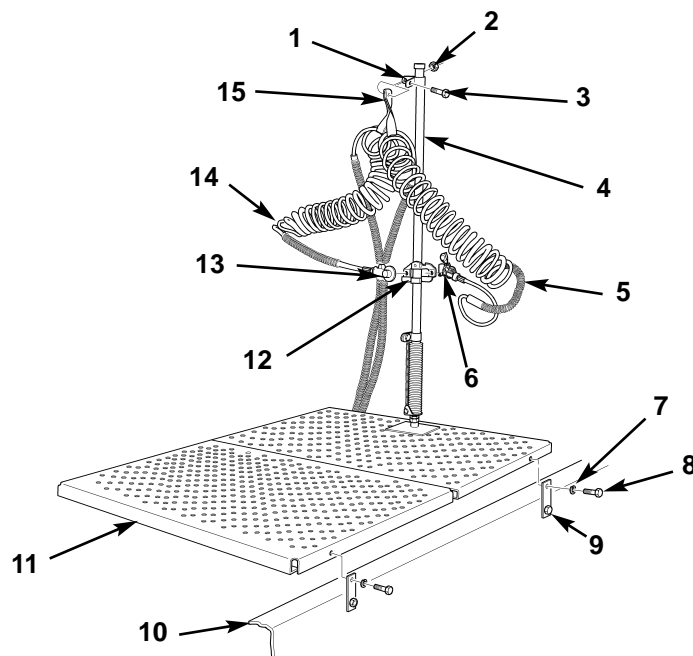


Figure 7. Installing Service Deck and Connecting Air Hoses.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
QUICK-RELEASE VALVE REPLACEMENT

INITIAL SETUP:**Tools and Special Tools**

Tool kit, general mechanic's (WP 0063, Table 1, Item 8)

References

WP 0021

Materials/Parts

Pipe joint compound (WP 0066, Item 6)

Equipment Condition

Air reservoirs drained (TM 9-2320-283-10).

REMOVAL

1. Remove nut (figure 1, item 2), screw (figure 1, item 3), and strap (figure 1, item 15) from clamp (figure 1, item 1) on air hose tender (figure 1, item 4).
2. Disconnect emergency air pressure coupling (figure 1, item 13) and service air pressure coupling (figure 1, item 6) from storage brackets (figure 1, item 12) on air hose tender (figure 1, item 4) and set air hoses (figure 1, items 5 and 14) on spare tire carrier.

WARNING

Two personnel are required to remove service deck assembly from tractor frame due to its size. Failure to comply may result in injury to personnel. Seek medical attention in the event of injury.

3. Remove four bolts (figure 1, item 8) and lockwashers (figure 1, item 7) from service deck assembly (figure 1, item 11) and four tabs (figure 1, item 9). Remove service deck assembly (figure 1, item 11) from tractor frame (figure 1, item 10).

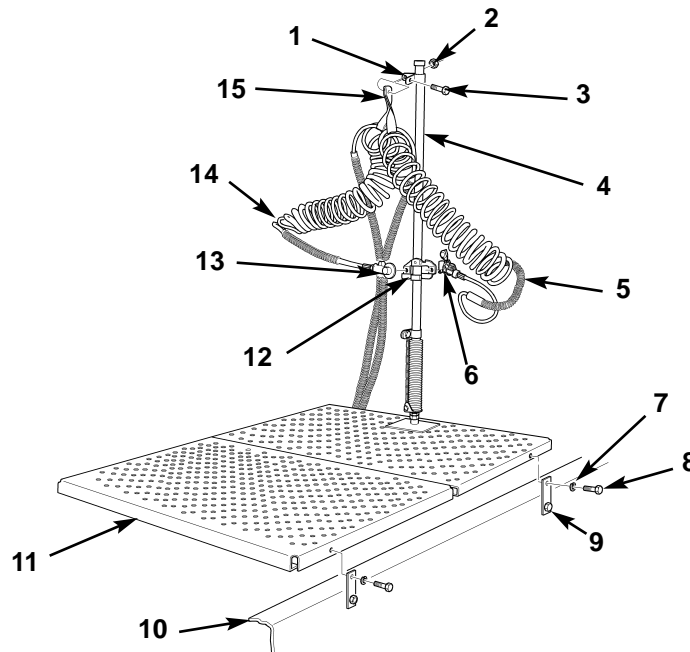


Figure 1. Disconnecting Air Hoses and Removing Service Deck.

REMOVAL – CONTINUED

4. Disconnect trailer brake tube (figure 2, item 6) from adapter (figure 2, item 7) and remove adapter (figure 2, item 7) from tee (figure 2, item 8).
5. Disconnect tube (figure 2, item 1) from adapter (figure 2, item 2) on tee (figure 2, item 8).
6. Remove tee (figure 2, item 8) and reducer bushing (figure 2, item 5) from quick-release valve (figure 2, item 4) and remove quick-release valve (figure 2, item 4) from tractor protection valve (figure 2, item 3).

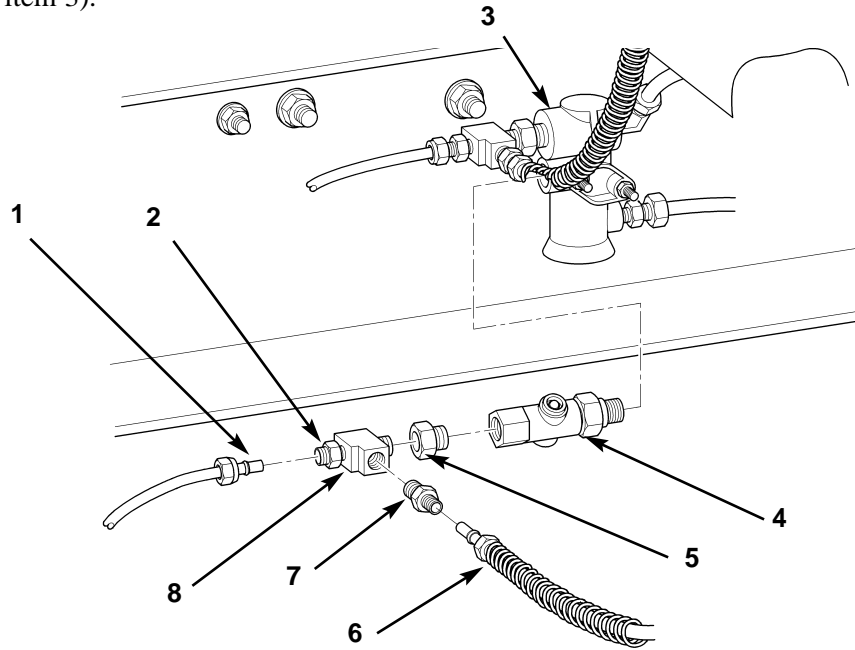


Figure 2. Quick-Release Valve.

END OF TASK**INSTALLATION****WARNING**

Ensure all nuts on air tube fittings are properly tightened during installation. Refer to WP 0021. Failure to comply may result in damage to equipment or possible injury to personnel. Seek medical attention in the event of an injury.

NOTE

Prior to installation, ensure pipe joint compound is applied to male pipe threads of NPT fittings only.

1. Install quick-release valve (figure 2, item 4) on tractor protection valve (figure 2, item 3) and install reducer bushing (figure 2, item 5) and tee (figure 2, item 8) on quick-release valve (figure 2, item 4).
2. Connect tube (figure 2, item 1) to adapter (figure 2, item 2) on tee (figure 2, item 8).
3. Install adapter (figure 2, item 7) on tee (figure 2, item 8) and connect trailer brake tube (figure 2, item 6) to adapter (figure 2, item 7).

INSTALLATION – CONTINUED**WARNING**

Two personnel are required to install service deck assembly from tractor frame due to its size. Failure to comply may result in injury to personnel. Seek medical attention in the event of injury.

4. Position service deck assembly (figure 3, item 11) on tractor frame (figure 3, item 10) and install four lockwashers (figure 3, item 7) and bolts (figure 3, item 8) on four tabs (figure 3, item 9) and service deck assembly (figure 3, item 11).
5. Loop strap (figure 3, item 15) around emergency air pressure hose (figure 3, item 14) and service air pressure hose (figure 3, item 5). Install strap (figure 3, item 15) on air hose tender (figure 3, item 4) with clamp (figure 3, item 1), screw (figure 3, item 3), and nut (figure 3, item 2).
6. Connect emergency air pressure coupling (figure 3, item 13) and service air pressure coupling (figure 3, item 6) to storage brackets (figure 3, item 12) on air hose tender (figure 3, item 4).

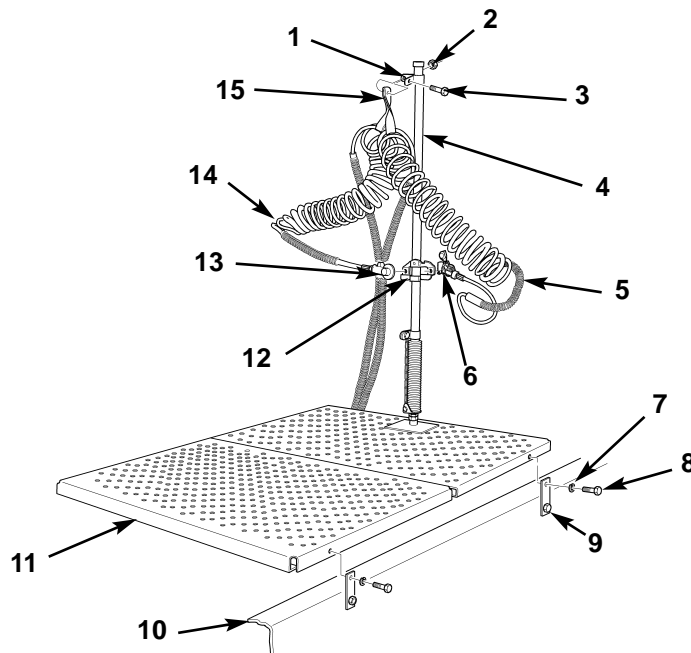


Figure 3. Installing Service Deck and Connecting Air Hoses.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE

SPRING BRAKE CHAMBER REPLACEMENT

INITIAL SETUP:

Tools and Special Tools

Tool kit, general mechanic's (WP 0063, Table 1 Item 8)

Materials/Parts

Pipe joint compound (WP 0066, Item 6)

Two locknuts (WP 0046, Item 2)

Cotter pin (WP 0046, Item 3)

References

TM 9-2320-283-20

TM 9-2320-283-10

WP 0021

Equipment Condition

Air reservoirs drained (TM 9-2320-283-10).

Cage brake chambers on rear-rear axle
(TM 9-2320-283-10).

REMOVAL

NOTE

Removal of spring brake chambers on right and left-hand sides of rear-rear axle is the same. This task covers right-hand side.

1. Disconnect hose assembly (figure 1, item 8) from flared elbow (figure 1, item 1) on rear air block (figure 1, item 2) and remove hose assembly (figure 1, item 8) from elbow (figure 1, item 6) at service brake port of spring brake chamber (figure 1, item 7).
2. Remove tube (figure 1, item 4) from mountable tee adapter (figure 1, item 3) and elbow (figure 1, item 5) on parking brake port of spring brake chamber (figure 1, item 7).

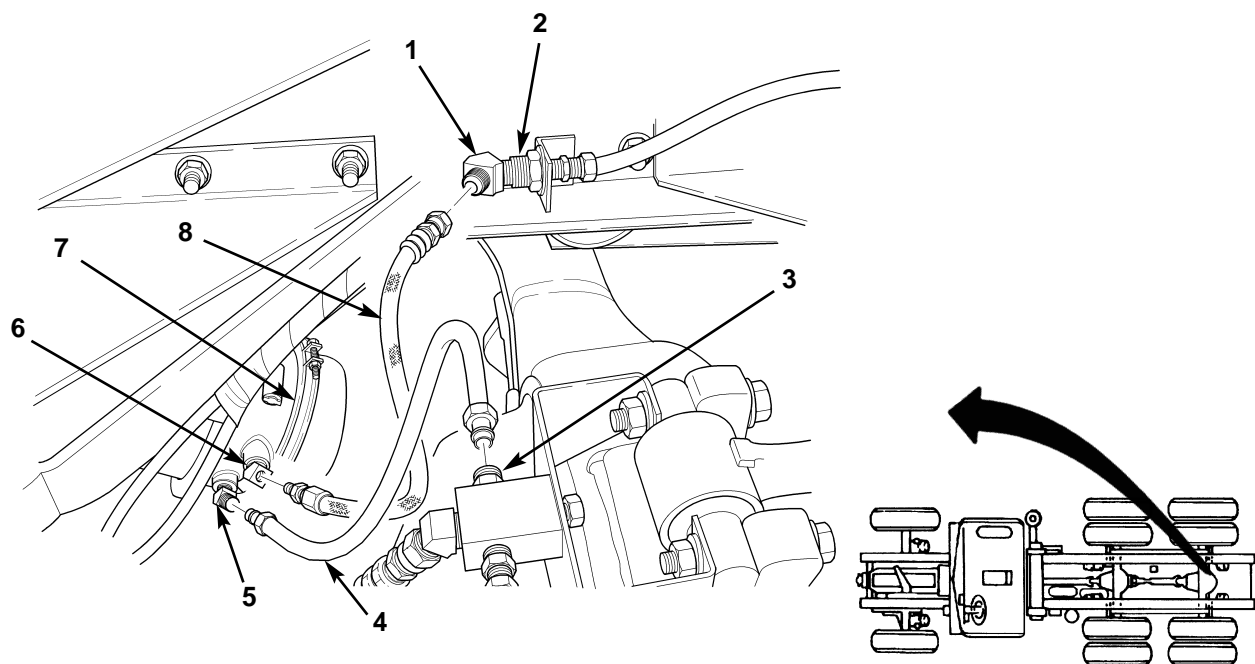


Figure 1. Removing Tube and Hose Assembly from Service Brake Chamber.

REMOVAL – CONTINUED**WARNING**

Spring brake chamber contains a loaded compression spring and must be handled with extreme care. Be careful not to drop the spring break chamber and always work from the side of the unit and not from the front or back. During removal and installation, do not use an impact wrench on the release tool or strike any part of the unit for any reason. Do not attempt to dismantle the spring brake chamber. Replace the entire unit if any structural damage is evident. Failure to comply may result in damage to equipment or possible injury or death to personnel. Seek medical attention in the event of an injury.

3. Remove cotter pin (figure 2, item 5) from pin (figure 2, item 4) and remove pin (figure 2, item 4) from clevis (figure 2, item 2) and slack adjuster (figure 2, item 3).
4. Remove two locknuts (figure 2, item 6), washers (figure 2, item 7), and spring brake chamber (figure 2, item 1) from camshaft bracket (figure 2, item 8). Discard locknuts (figure 2, item 6).

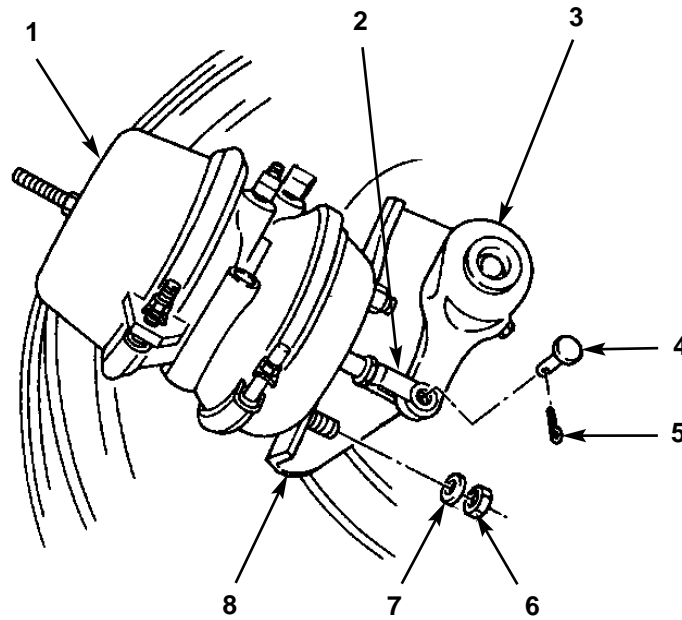


Figure 2. Removing Spring Brake Chamber.

NOTE

Perform steps 5 and 6 if replacing spring brake chamber.

5. Remove clevis (figure 3, item 1) and jamnut (figure 3, item 2) from pushrod (figure 3, item 3) on spring brake chamber (figure 3, item 4).

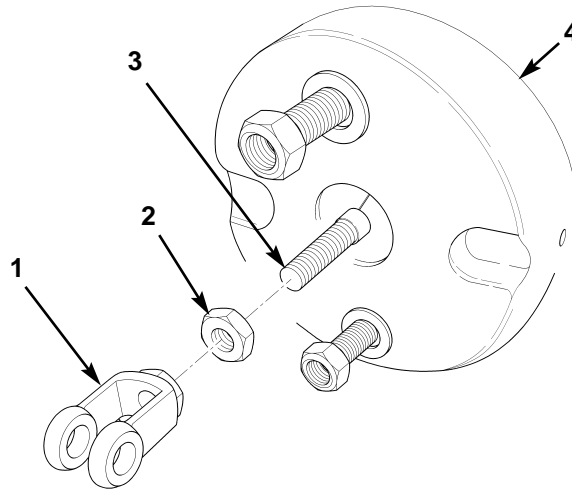


Figure 3. Removing Clevis and Jamnut.

6. Remove elbow (figure 4, item 5) from parking brake port (figure 4, item 1) and remove elbow (figure 4, item 4) from service brake port (figure 4, item 3) of spring brake chamber (figure 4, item 2).

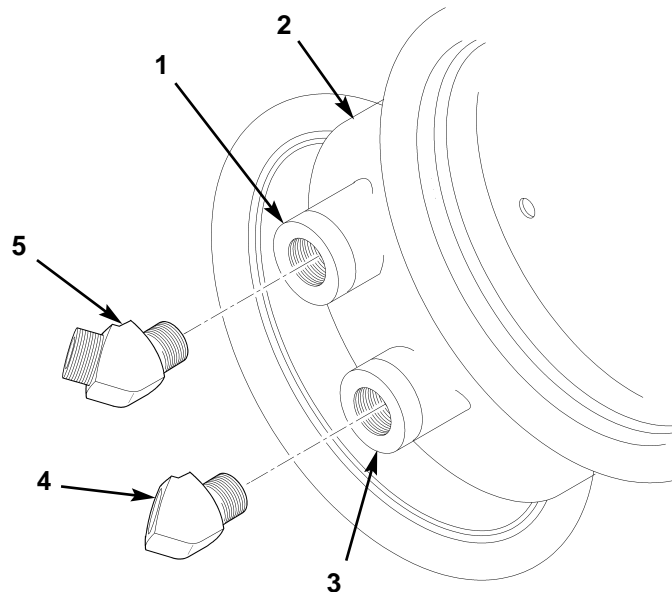


Figure 4. Removing Elbows.

END OF TASK

INSTALLATION**WARNING**

Spring brake chamber contains a loaded compression spring and must be handled with extreme care. Be careful not to drop the spring break chamber and always work from the side of the unit and not from the front or back. During removal and installation, do not use an impact wrench on the release tool or strike any part of the unit for any reason. Do not attempt to dismantle the spring brake chamber. Replace the entire unit if any structural damage is evident. Failure to comply may result in damage to equipment or possible injury or death to personnel. Seek medical attention in the event of an injury.

NOTE

Installation of spring brake chambers on right and left-hand sides of rear-rear axle is the same. This task covers the right-hand side.

Prior to installation, ensure pipe joint compound is applied to male pipe threads of NPT fittings only.

Perform steps 1 and 2 if elbows and clevis have been removed.

1. Install elbow (figure 5, item 5) on parking brake port (figure 5, item 1) and install elbow (figure 5, item 4) on service brake port (figure 5, item 3) of spring brake chamber (figure 5, item 2).

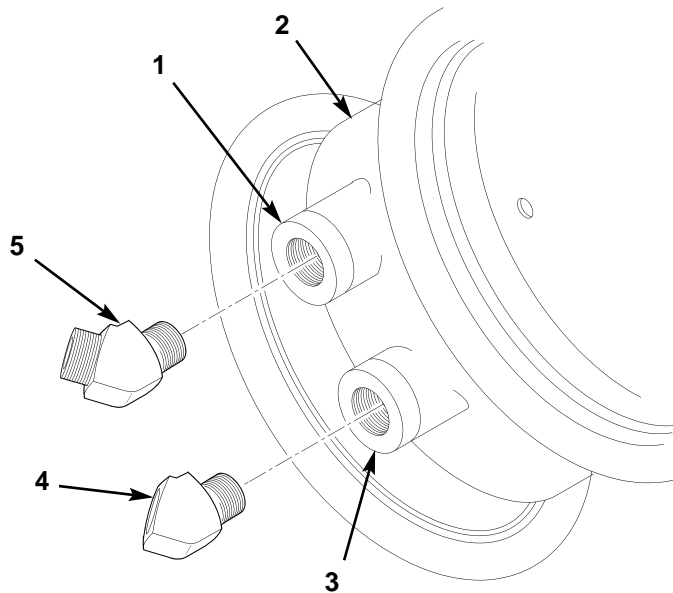


Figure 5. Installing Elbows.

INSTALLATION – CONTINUED

2. Install jamnut (figure 6, item 3) and clevis (figure 6, item 4) on pushrod (figure 6, item 2) of spring brake chamber (figure 6, item 1) until center of holes in clevis (figure 6, item 4) are 3 in. (76 mm) from face of spring brake chamber (figure 6, item 1). Finger tighten jamnut (figure 6, item 3).

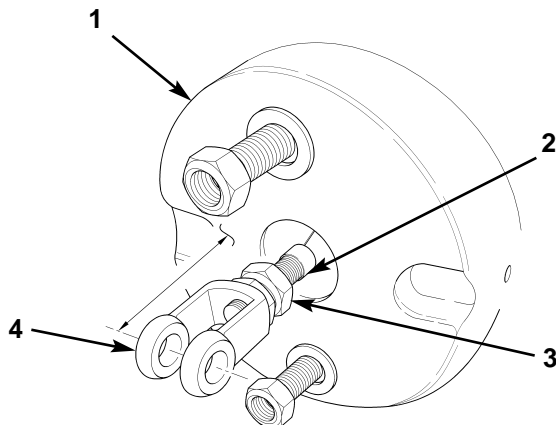


Figure 6. Installing Clevis.

NOTE

Ensure spring brake chamber is installed so mounting studs are at top of elongated holes in camshaft bracket prior to tightening locknuts.

3. Install spring brake chamber (figure 7, item 1) on camshaft bracket (figure 7, item 8) with two washers (figure 7, item 7) and new locknuts (figure 7, item 6).
4. Connect clevis (figure 7, item 2) to slack adjuster (figure 7, item 3) with pin (figure 7, item 4) and new cotter pin (figure 7, item 5). Tighten jamnut (figure 7, item 9).
5. Un-cage spring brake chamber (figure 7, item 1). Refer to TM 9-2320-283-10.

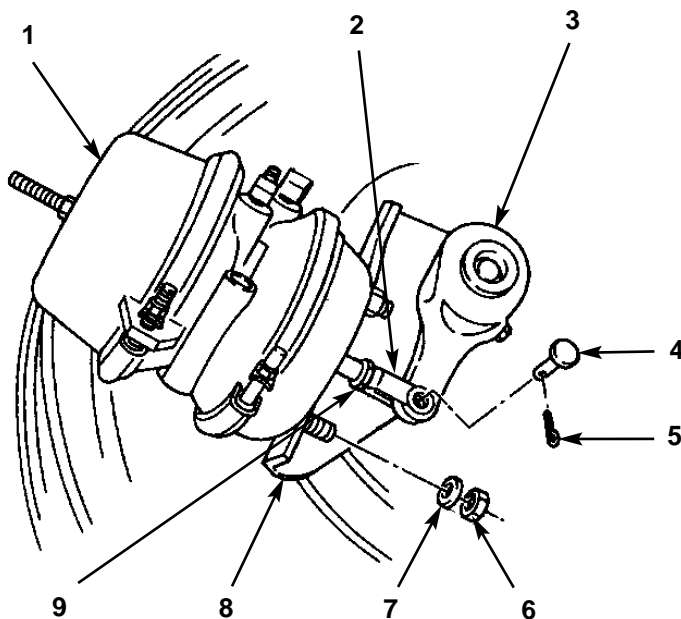


Figure 7. Installing Spring Brake Chamber.

INSTALLATION – CONTINUED**WARNING**

Ensure all nuts on all air tube fittings are properly tightened during installation. Refer to WP 0021. Failure to comply may result in damage to equipment or possible injury to personnel. Seek medical attention in the event of an injury.

6. Install tube (figure 8, item 4) on mountable tee adapter (figure 8, item 3) and elbow (figure 8, item 5) on parking brake port of spring brake chamber (figure 8, item 7).
7. Install hose assembly (figure 8, item 8) on elbow (figure 8, item 6) at service brake port of spring brake chamber (figure 8, item 7) and flared elbow (figure 8, item 1) on bulkhead (figure 8, item 2).

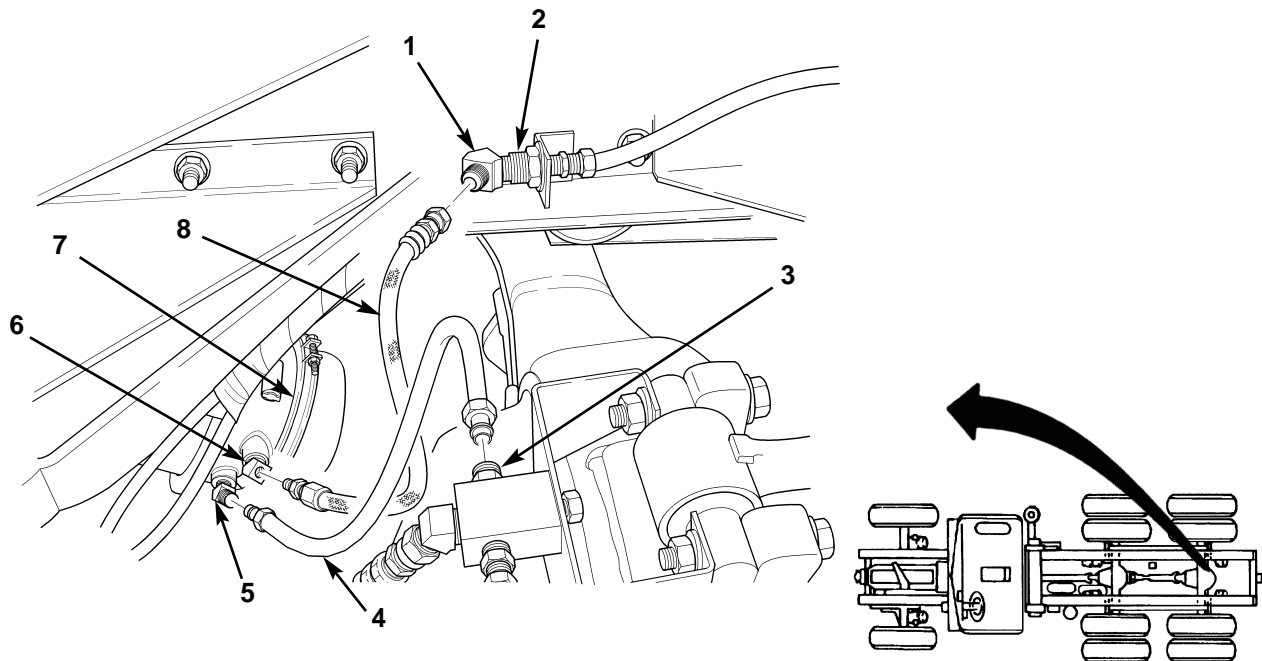


Figure 8. Installing Tube and Hose Assembly on Service Brake Chamber.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ABS FUSES REPLACEMENT

INITIAL SETUP:**Tools and Special Tools**

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)

Equipment Condition

Battery power disconnected (TM 9-2320-283-20).

ReferencesTM 9-2320-283-20

NOTE

This task covers removal and installation of the ABS ECU harness fuses.

REMOVAL**NOTE**

The ABS ECU harness 30-amp fused red wire is connected to circuit 40 purple wire and is located under the instrument panel to the left of steering column above ECU.

1. Locate ABS ECU 30-amp fused red wire (figure 1, item 5) and follow it to black fuse connector (figure 1, item 1) near circuit 40 purple wire (figure 1, item 2).
2. Pull cover (figure 1, item 3) off fuse connector (figure 1, item 1) and remove fuse (figure 1, item 4) from fuse connector (figure 1, item 1).
3. Examine fuse (figure 1, item 4). Discard fuse (figure 1, item 4) if center wire is burned away.

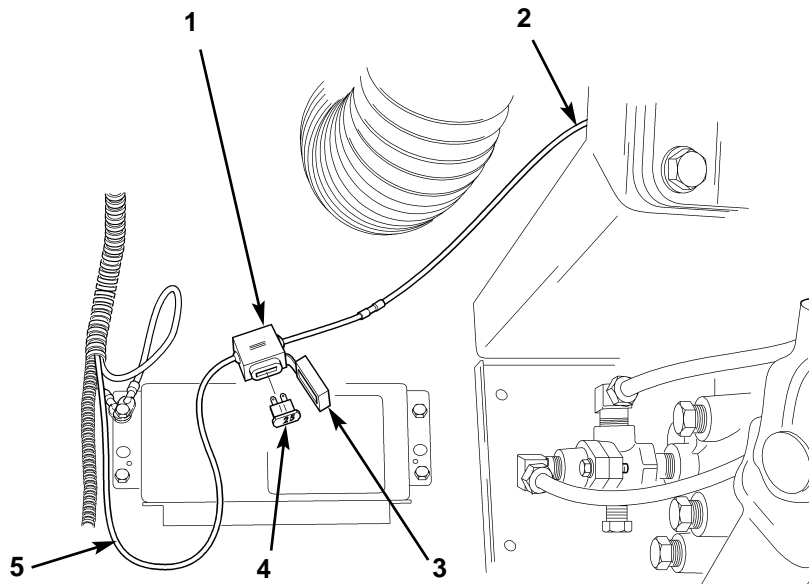


Figure 1. Removing and Checking ABS ECU 30-amp Fuse.

REMOVAL – CONTINUED

NOTE

The ABS ECU harness 5-amp fused orange wire is connected to circuit 12C terminal stud on CB#3, located behind the circuit breaker panel.

4. Turn three turnlock fasteners (figure 2, item 5) 90 degrees and hinge open circuit breaker cover (figure 2, item 1).
5. Open glove compartment door (figure 2, item 10) to glove compartment (figure 2, item 8) and remove two screws (figure 2, item 7) and star washers (figure 2, item 6) from dash panel (figure 2, item 9) and circuit breaker panel (figure 2, item 4).
6. Remove screw (figure 2, item 2) and star washer (figure 2, item 3) from dash panel (figure 2, item 9) and circuit breaker panel (figure 2, item 4) and lift circuit breaker panel (figure 2, item 4) out to access wiring.

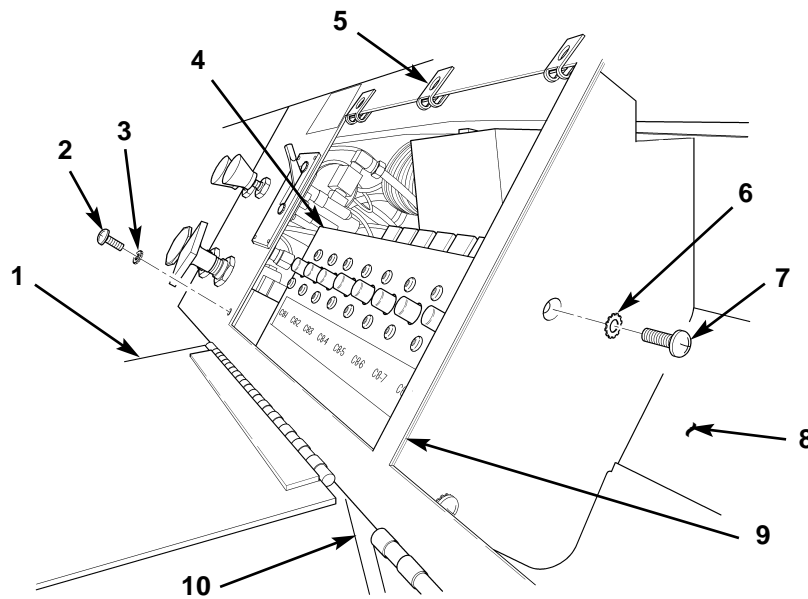


Figure 2. Circuit Breaker Panel.

7. Locate ABS ECU 5-amp fused orange wire (figure 3, item 4) and follow it to black fuse connector (figure 3, item 5) near CB#3 (figure 3, item 1).
8. Pull cover (figure 3, item 2) off fuse connector (figure 3, item 5) and remove fuse (figure 3, item 3) from fuse connector (figure 3, item 5).
9. Examine fuse (figure 3, item 3). Discard fuse (figure 3, item 3) if center wire is burned away.

REMOVAL – CONTINUED

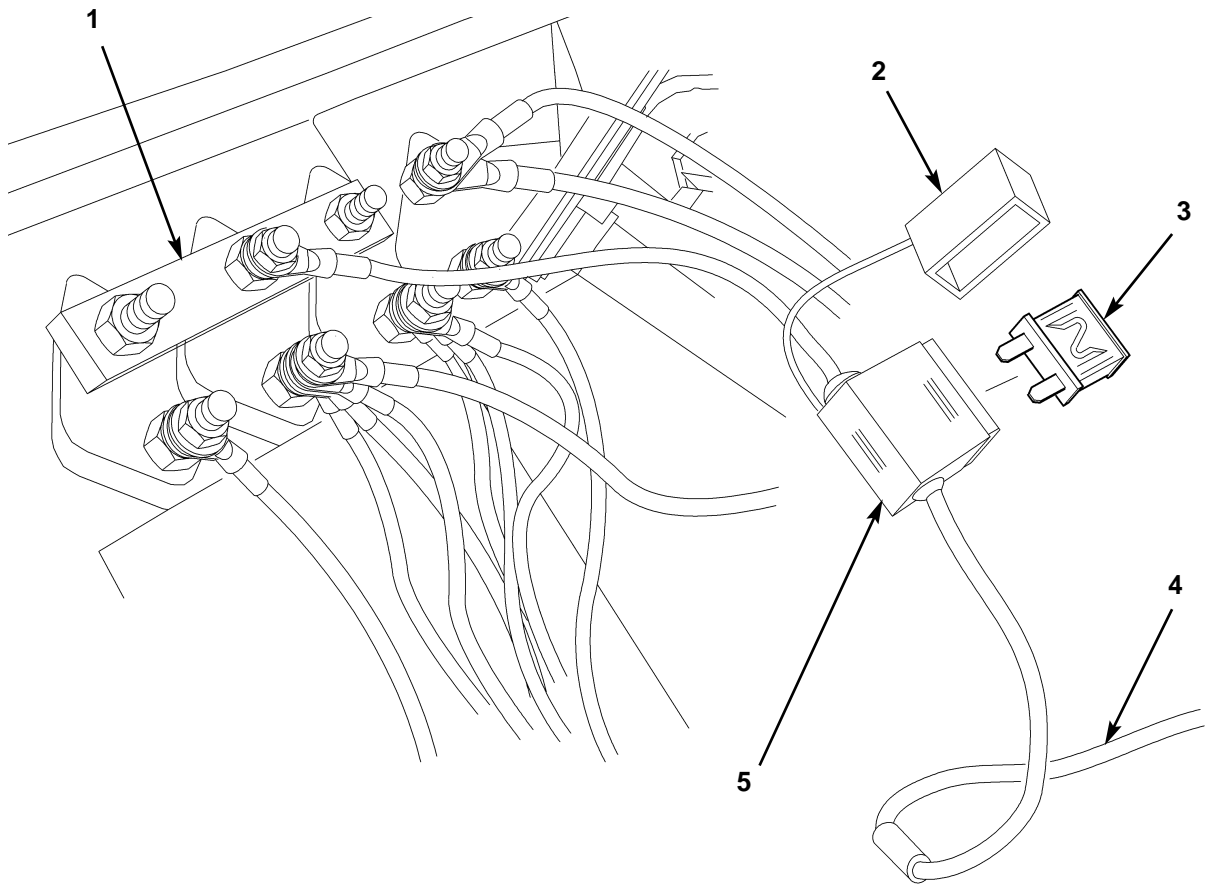


Figure 3. Checking ABS ECU 5-amp Fuse.

END OF TASK

INSTALLATION

CAUTION

Never replace original fuse with a higher amp fuse or use jumper wire in place of fuse to complete circuit. Failure to comply may result in damage to equipment.

1. Install fuse (figure 3, item 3) on fuse connector (figure 3, item 5) and push cover (figure 3, item 2) on fuse connector (figure 3, item 5).
2. Position circuit breaker panel (figure 2, item 4) in place on dash panel (figure 2, item 9) and install star washer (figure 2, item 3) and screw (figure 2, item 2) on dash panel (figure 2, item 9) and circuit breaker panel (figure 2, item 4).
3. From glove compartment (figure 2, item 8), install two star washers (figure 2, item 6) and screws (figure 2, item 7) on dash panel (figure 2, item 9) and circuit breaker panel (figure 2, item 4). Close and secure glove compartment door (figure 2, item 10).
4. Close circuit breaker cover (figure 2, item 1) and turn three turnlock fasteners (figure 2, item 5) 90 degrees.

INSTALLATION – CONTINUED

5. Install fuse (figure 4, item 3) on fuse connector (figure 4, item 1) and push cover (figure 4, item 2) on fuse connector (figure 4, item 1).
6. Connect battery power. Refer to TM 9-2320-283-20.

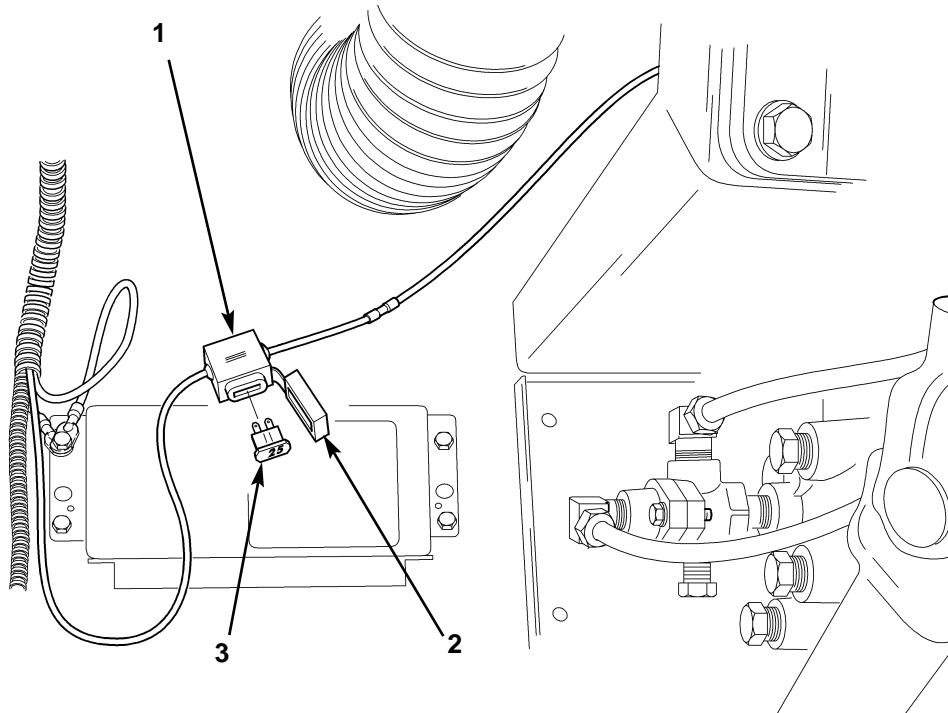


Figure 4. Installing ABS ECU 30-amp Fuse.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ABS ECU REPLACEMENT

INITIAL SETUP:**Tools and Special Tools**

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)

Equipment Condition

Battery power disconnected (TM 9-2320-283-20).

ReferencesTM 9-2320-283-20

REMOVAL**NOTE**

The ABS ECU is located below instrument panel left of steering column.

1. Disconnect ABS ECU harness connectors (figure 1, items 9 and 10) from ABS ECU receptacles (figure 1, items 8 and 11).
2. Remove screw (figure 1, item 1) and three black ground wires (figure 1, items 2, 3, and 4) from ABS ECU (figure 1, item 5) and firewall (figure 1, item 7).
3. Remove remaining three screws (figure 1, item 6) and ABS ECU (figure 1, item 5) from firewall (figure 1, item 7).

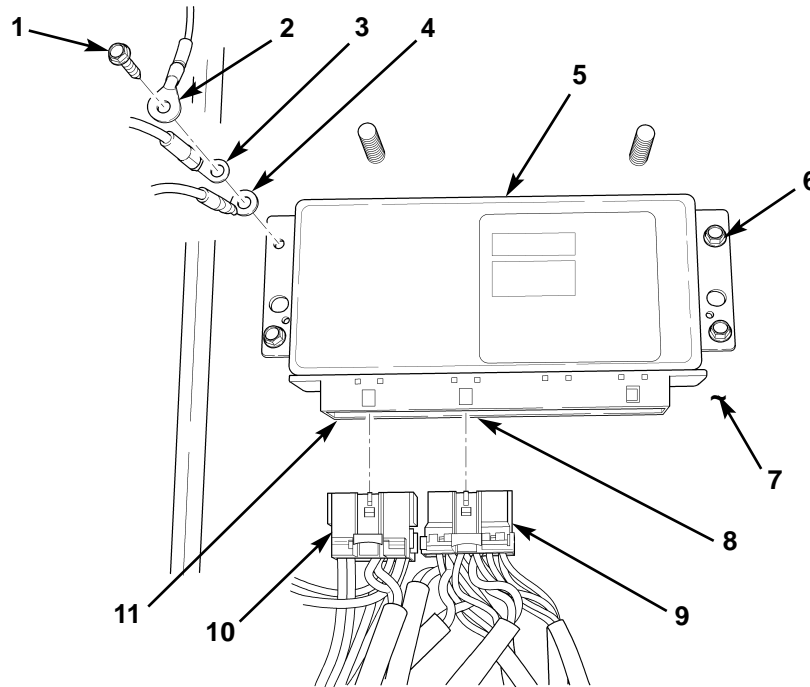


Figure 1. Removing ABS ECU.

END OF TASK

INSTALLATION**NOTE**

Leave top left mounting hole in ECU open for connection of ground wires in step 2.

1. Install ABS ECU (figure 2, item 5) on firewall (figure 2, item 7) with three screws (figure 2, item 6).
2. Connect three black ground wires (figure 2, items 2, 3, and 4) to ABS ECU (figure 2, item 5) and firewall (figure 2, item 7) with screw (figure 2, item 1).
3. Connect ABS ECU harness connectors (figure 2, items 9 and 10) to ABS ECU receptacles (figure 2, item 8 and 11).
4. Connect battery power. Refer to TM 9-2320-283-20.

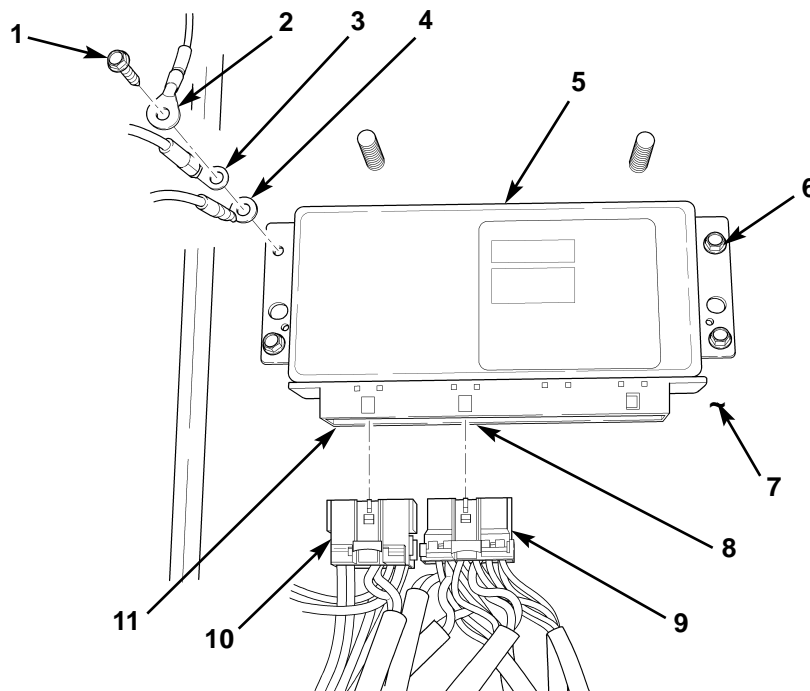


Figure 2. Installing ABS ECU.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ABS WARNING LIGHT AND TEST SWITCH REPLACEMENT

INITIAL SETUP:**Tools and Special Tools**

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)

Materials/Parts

Wire connector (WP 0066, Item 11)

References

TM 9-2320-283-20

Equipment Condition

Battery power disconnected (TM 9-2320-283-20).

REMOVAL

1. Turn two turnlock fasteners (figure 1, item 1) 90 degrees and open center control panel (figure 1, item 2).

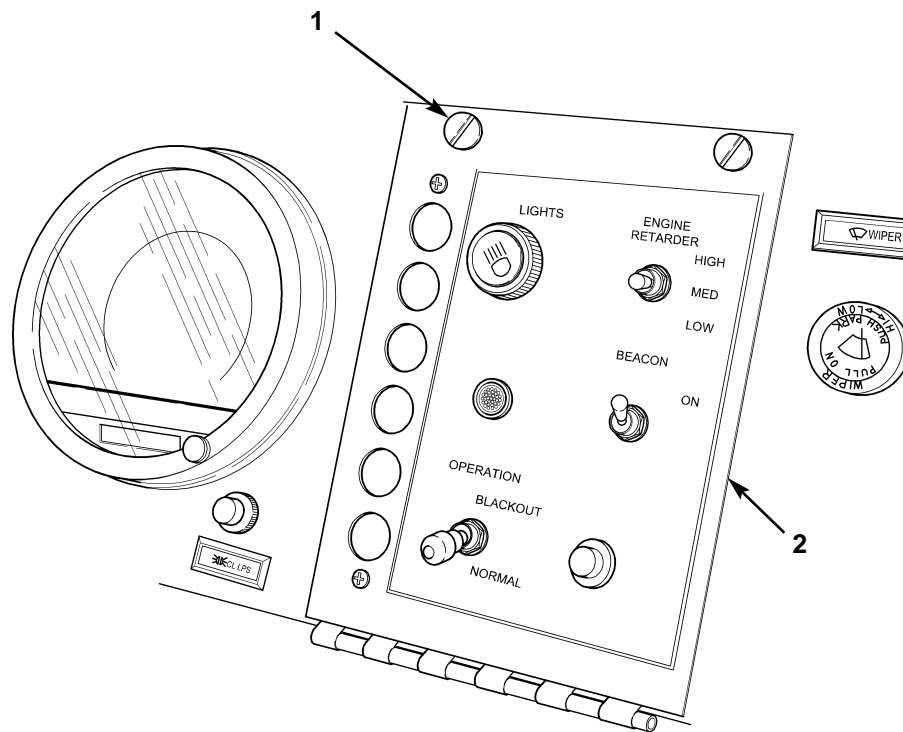


Figure 1. Opening Center Control Panel.

REMOVAL – CONTINUED**NOTE**

Perform steps 2 and 3 to disconnect ABS warning light. Perform steps 3 and 4 to disconnect ABS test switch.

Tag and note location of wires prior to removal for installation.

2. Cut black wire (figure 2, item 4) from ABS warning light (figure 2, item 1) at wire connector (figure 2, item 5) and cut wire connector (figure 2, item 5) from blue wire (figure 2, item 6). Discard wire connector (figure 2, item 5).
3. Remove screw (figure 2, item 7), star washer (figure 2, item 8), black wire (figure 2, item 3), and blue wire (figure 2, item 2) from terminal (figure 2, item 13) on ABS test switch (figure 2, item 14).
4. Remove screw (figure 2, item 9), star washer (figure 2, item 10), and black ground wire (figure 2, item 11) from terminal (figure 2, item 12) on ABS test switch (figure 2, item 14).

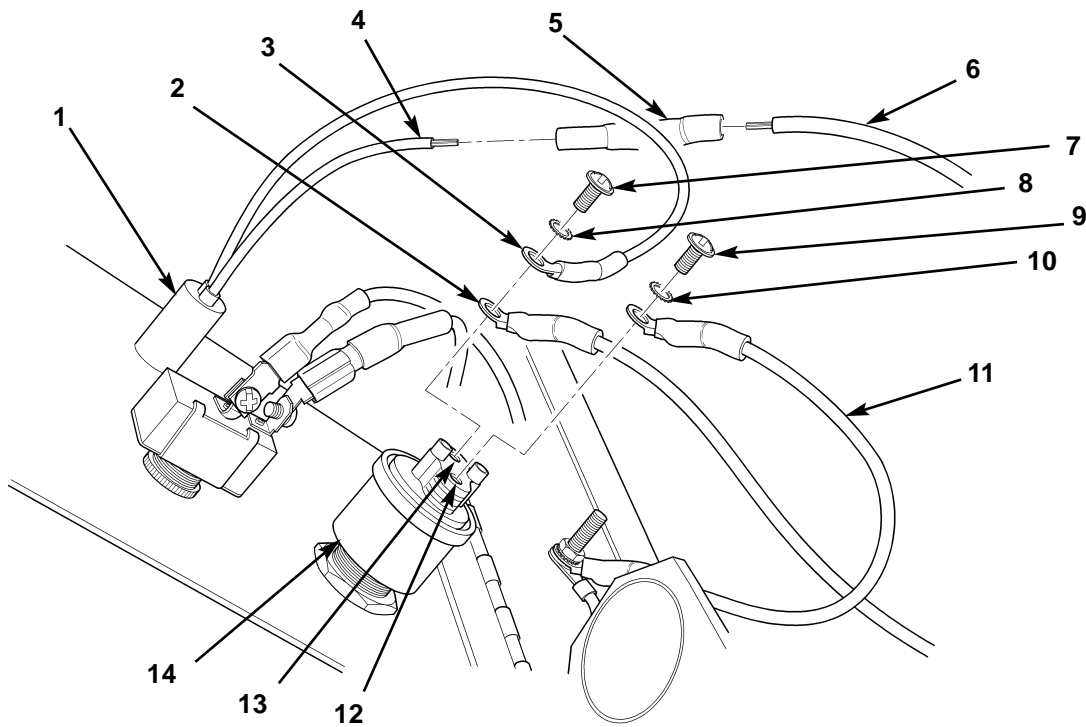


Figure 2. Disconnecting Wires.

NOTE

Perform step 5 to remove ABS warning light. Perform step 6 to remove ABS test switch.

5. From behind center control panel (figure 3, item 3), push housing of ABS warning light (figure 3, item 1) out of hole (figure 3, item 2) in center control panel (figure 3, item 3).
6. Loosen nut (figure 3, item 4) and remove collar (figure 3, item 7) and ABS test switch (figure 3, item 5) from hole (figure 3, item 6) in center control panel (figure 3, item 3).

REMOVAL – CONTINUED

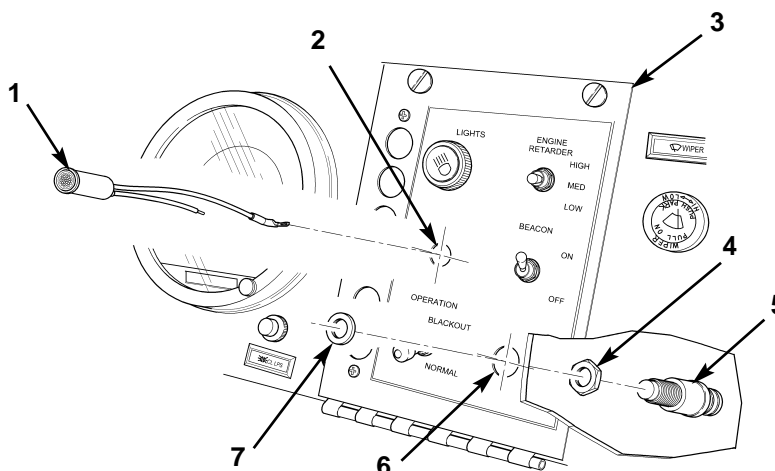


Figure 3. Removing ABS Warning Light and Test Switch.

END OF TASK

INSTALLATION

NOTE

The ABS test switch is installed by threading nut on switch housing first. Position switch through mounting hole, install collar until tight, and turn nut on switch housing until tight against back of panel.

1. Install ABS test switch (figure 3, item 5) on hole (figure 3, item 6) in center control panel (figure 3, item 3) with nut (figure 3, item 4) and collar (figure 3, item 7).
2. Install ABS warning light (figure 3, item 1) on hole (figure 3, item 2) in center control panel (figure 3, item 3) by pushing housing of ABS warning light (figure 3, item 1) through hole (figure 3, item 2) until collar is against front surface of center control panel (figure 3, item 3).

NOTE

Perform steps 3 and 4 to connect ABS test switch. Perform steps 4 and 5 to connect ABS warning light.

3. Connect black ground wire (figure 2, item 11) to terminal (figure 2, item 12) on ABS test switch (figure 2, item 14) with star washer (figure 2, item 10) and screw (figure 2, item 9).
4. Connect blue wire (figure 2, item 2) and black wire (figure 2, item 3) to terminal (figure 2, item 13) on ABS test switch (figure 2, item 14) with star washer (figure 2, item 8) and screw (figure 2, item 7).

NOTE

Wire connectors shall be crimped and heat shrunk during installation.

5. Connect black wire (figure 2, item 4) from ABS warning light (figure 2, item 1) to blue wire (figure 2, item 6) with new wire connector (figure 2, item 5).

INSTALLATION – CONTINUED

6. Close center control panel (figure 4, item 2) and turn two turnlock fasteners (figure 4, item 1) 90 degrees.
7. Connect battery power. Refer to TM 9-2320-283-20.

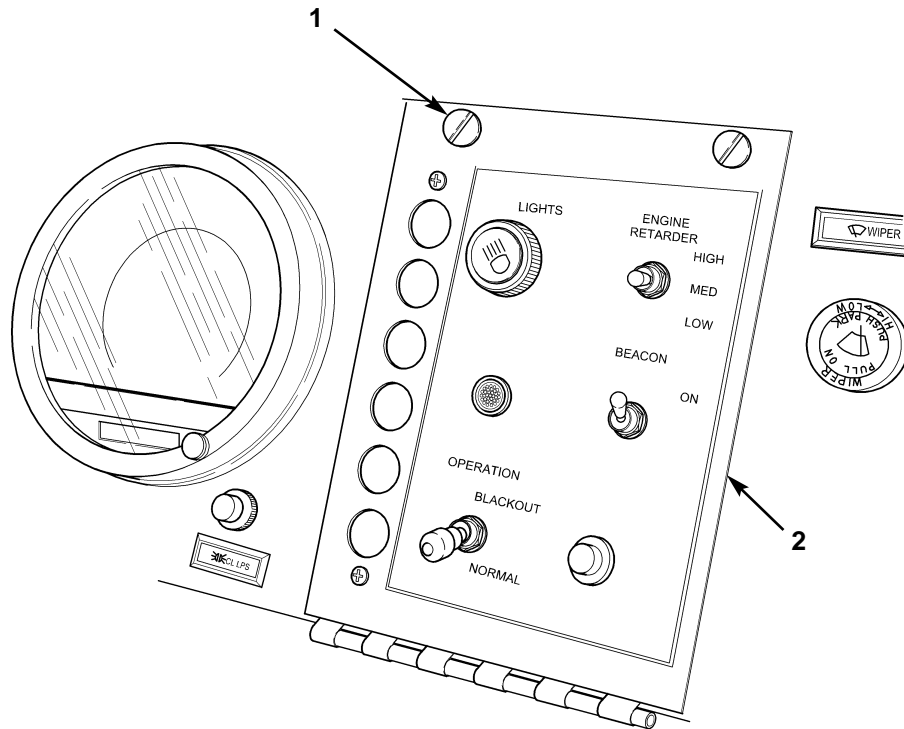


Figure 4. Closing Center Control Panel.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
ABS ECU AND DIAGNOSTIC CONNECTOR HARNESS REPLACEMENT

INITIAL SETUP:**Tools and Special Tools**

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)

Materials/Parts

Tie straps (WP 0067, Item 10)

Two wire connectors (WP 0066, Item 11)

Four locknuts (WP 0041, Item 5)

References

TM 9-2320-283-10

TM 9-2320-283-20

Equipment Condition

Battery power disconnected (TM 9-2320-283-20).

Hood raised and secured (TM 9-2320-283-10).

REMOVAL**NOTE**

The ABS ECU harness 30-amp fused red wire is connected to circuit 40 purple wire and is located under the instrument panel to the left of steering column above ECU.

1. Locate ABS ECU 30-amp fused red wire (figure 1, item 4) and follow it to black fuse connector (figure 1, item 1) near circuit 40 purple wire (figure 1, item 3).
2. Cut and discard wire connector (figure 1, item 2) from 30-amp fused red wire (figure 1, item 4) and circuit 40 purple wire (figure 1, item 3).

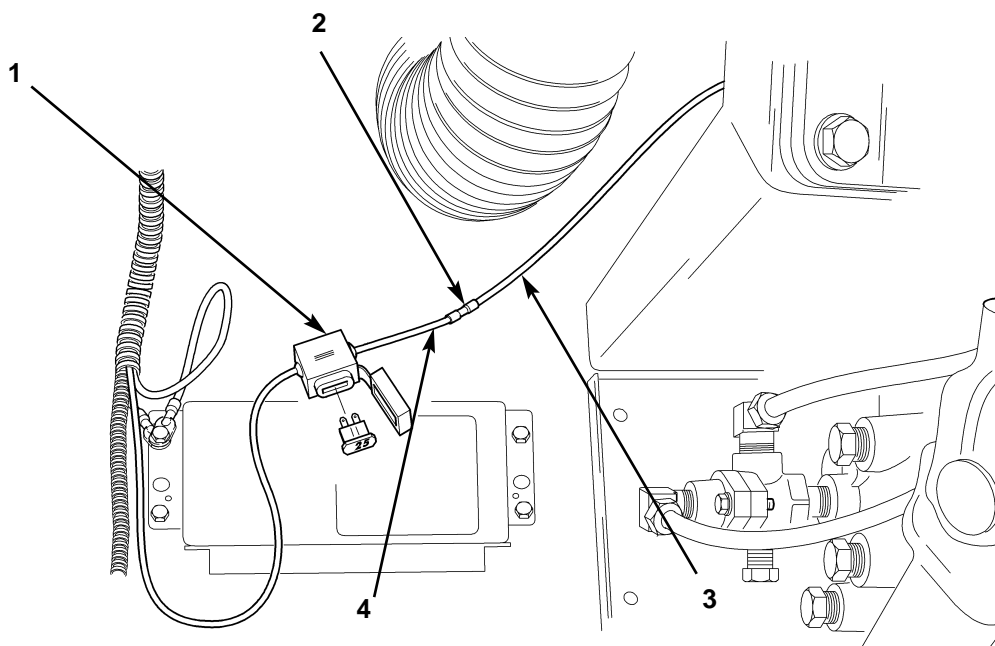


Figure 1. Disconnecting ABS ECU Harness from Battery Power.

REMOVAL – CONTINUED

3. Disconnect two ABS ECU harness connectors (figure 2, items 5 and 6) from two ABS ECU receptacles (figure 2, items 4 and 7).
4. Remove screw (figure 2, item 1) and three black ground wires (figure 2, items 2, 9, and 10) from ABS ECU (figure 2, item 3) and firewall (figure 2, item 8).

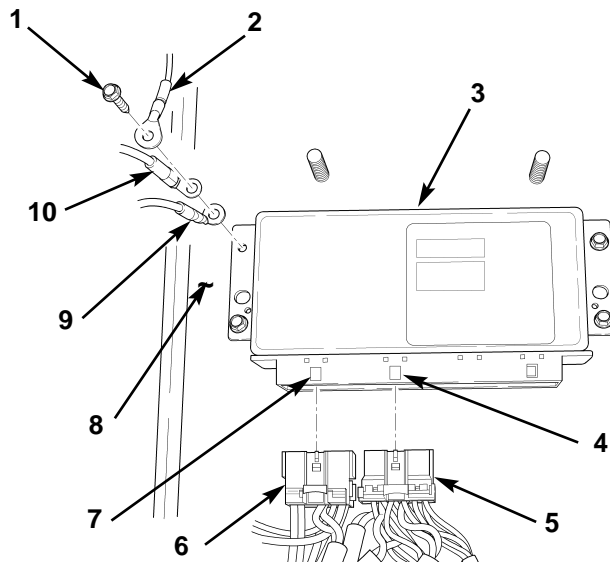


Figure 2. Disconnecting Harness from ECU.

REMOVAL – CONTINUED

5. Disconnect speed sensor harness connector (figure 3, item 4) and modulator harness connector (figure 3, item 1) from two bulkhead connectors (figure 3, items 2 and 3).

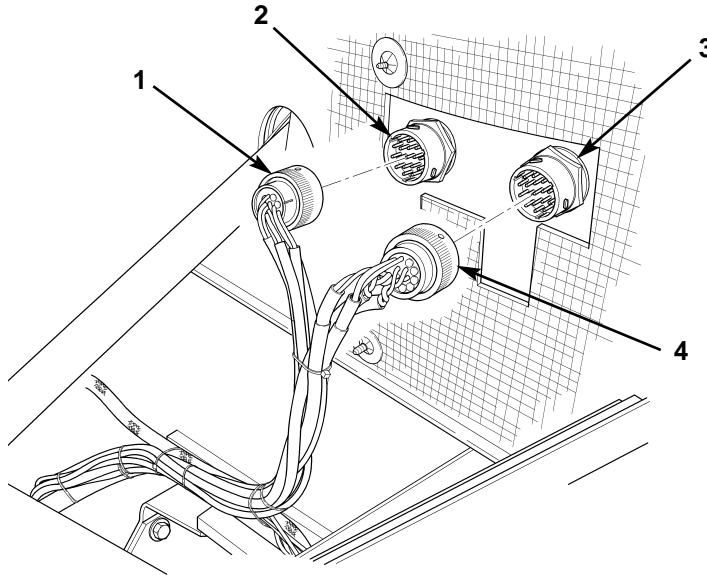


Figure 3. Disconnecting Speed Sensor and Modulator Harness Connectors.

6. Working outside cab, remove nut (figure 4, item 1) and washer (figure 4, item 2) from modulator harness bulkhead connector (figure 4, item 3), and push connector (figure 4, item 3) through firewall hole (figure 4, item 4).
7. Repeat step 7 to remove speed sensor harness bulkhead connector (figure 3, item 3).

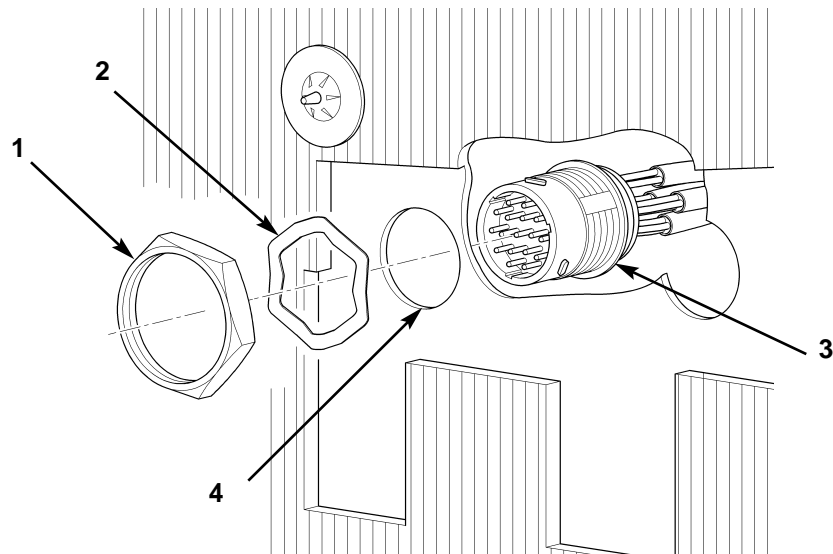


Figure 4. Removing Bulkhead Connectors from Firewall.

REMOVAL – CONTINUED

8. Turn two turnlock fasteners (figure 5, item 1) 90 degrees, and open center control panel (figure 5, item 2).

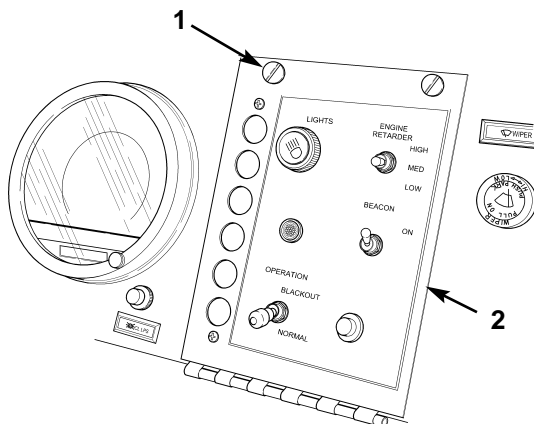


Figure 5. Opening Center Control Panel.

9. Cut black wire (figure 6, item 4) from ABS warning light (figure 6, item 1) at wire connector (figure 6, item 5), and cut wire connector (figure 6, item 5) from blue wire (figure 6, item 6). Discard wire connector (figure 6, item 5).
10. Remove screw (figure 6, item 7), star washer (figure 6, item 8), black wire (figure 6, item 3), and blue wire (figure 6, item 2) from terminal (figure 6, item 16) on ABS test switch (figure 6, item 17).
11. Remove screw (figure 6, item 9), star washer (figure 6, item 10), and black ground wire (figure 6, item 13) from terminal (figure 6, item 15) on ABS test switch (figure 6, item 17).
12. Remove nut (figure 6, item 11), star washer (figure 6, item 12), and black ground wire (figure 6, item 13) from heater control box mounting stud (figure 6, item 14).

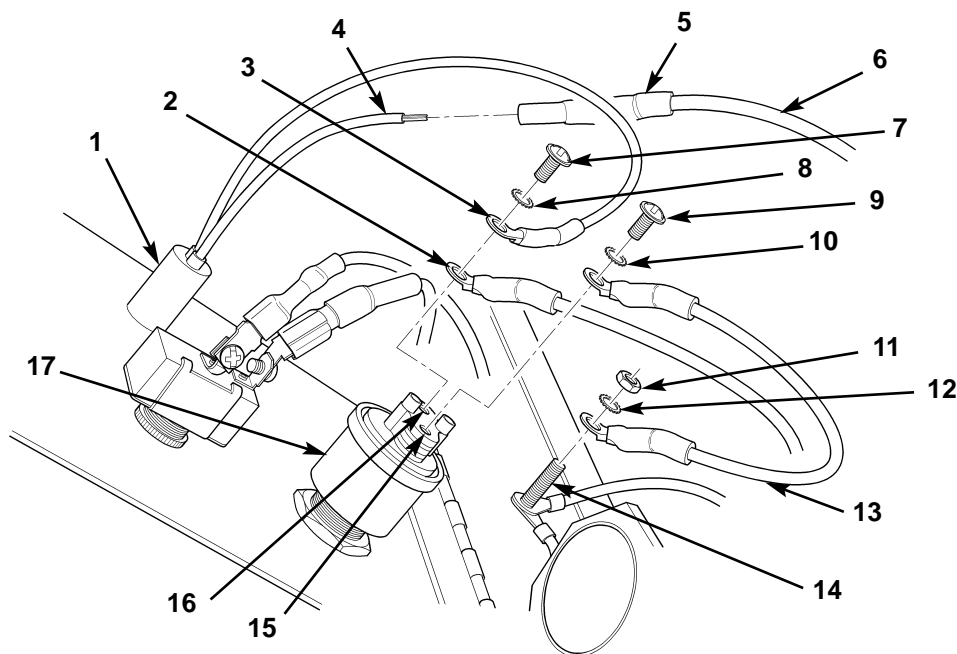


Figure 6. Disconnecting Harness Leads from ABS Warning Light and Test Switch.

REMOVAL – CONTINUED

13. Turn three turnlock fasteners (figure 7, item 5) 90 degrees, and hinge open circuit breaker cover (figure 7, item 1).
14. Open glove compartment door (figure 7, item 10) to compartment (figure 7, item 8), and remove two screws (figure 7, item 7) and star washers (figure 7, item 6) from dash panel (figure 7, item 9) and circuit breaker panel (figure 7, item 4).
15. Remove screw (figure 7, item 2) and star washer (figure 7, item 3) from dash panel (figure 7, item 9) and circuit breaker panel (figure 7, item 4), and lift circuit breaker panel (figure 7, item 4) out to access wiring.

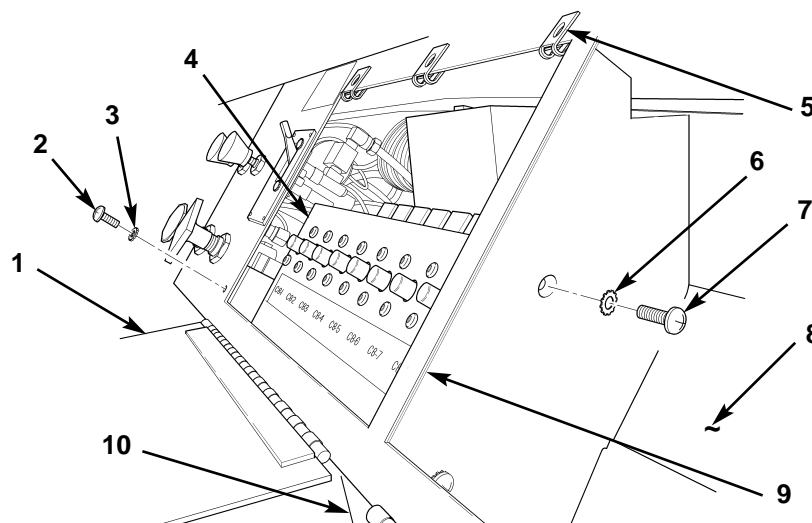


Figure 7. Removing Circuit Breaker Panel.

16. Remove nut (figure 8, item 2) and orange wire (figure 8, item 3) from CB#3, circuit 12C, terminal stud (figure 8, item 1).
17. Remove nut (figure 8, item 4) and blue wire (figure 8, item 5) from CB#3, circuit 38, terminal stud (figure 8, item 6).
18. Cut and discard tie straps from ABS ECU harness where necessary, carefully pull ABS ECU harness leads from behind dash panel, and remove complete ABS ECU and diagnostic harness from cab.

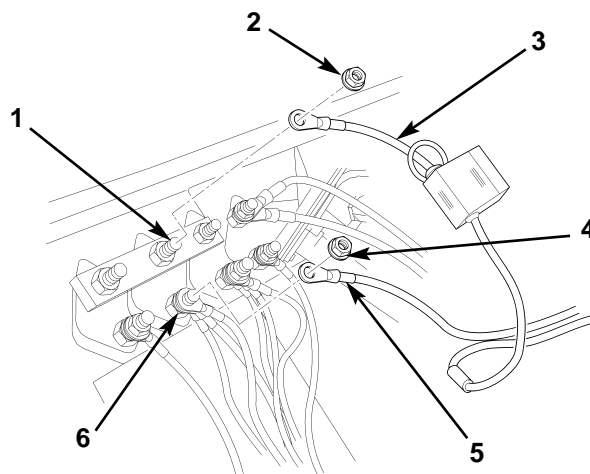


Figure 8. Disconnecting Harness Leads from Circuit Breaker.

END OF TASK

INSTALLATION

1. Position ABS ECU and diagnostic harness in cab.

NOTE

Circuit 38 terminal stud has two green wires connected to it.

2. Route 36 in. (91 cm) blue wire (figure 9, item 6) from ABS warning light to circuit breaker panel (figure 9, item 2), and connect blue wire (figure 9, item 6) to CB#3, circuit 38, terminal stud (figure 9, item 7) with nut (figure 9, item 5).

NOTE

Circuit 12C terminal stud has a buss bar and one red wire connected to it.

3. Route 102 in. (91 cm) 5 Amp-fused orange wire (figure 9, item 4) from ABS ECU harness to circuit breaker panel (figure 9, item 2), and connect orange wire (figure 9, item 4) to CB#3, circuit 12C, terminal stud (figure 9, item 1) with nut (figure 9, item 3).

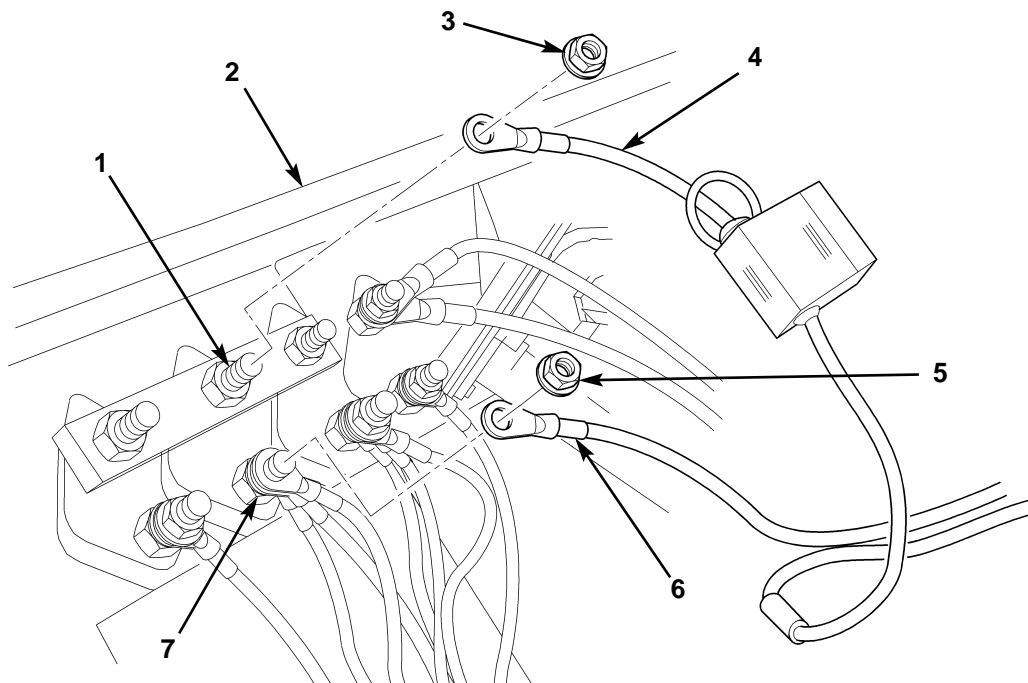


Figure 9. Connecting ABS ECU Harness to CB#3.

4. Position circuit breaker panel (figure 10, item 4) in place on dash panel (figure 10, item 9), and install star washer (figure 10, item 3) and screw (figure 10, item 2) on dash panel (figure 10, item 9) and circuit breaker panel (figure 10, item 4).
5. From glove compartment (figure 10, item 8), install two star washers (figure 10, item 6) and screws (figure 10, item 7) on dash panel (figure 10, item 9) and circuit breaker panel (figure 10, item 4). Close and secure glove compartment door (figure 10, item 10).
6. Close circuit breaker cover (figure 10, item 1) and turn three turnlock fasteners (figure 10, item 5) 90 degrees.

INSTALLATION – CONTINUED

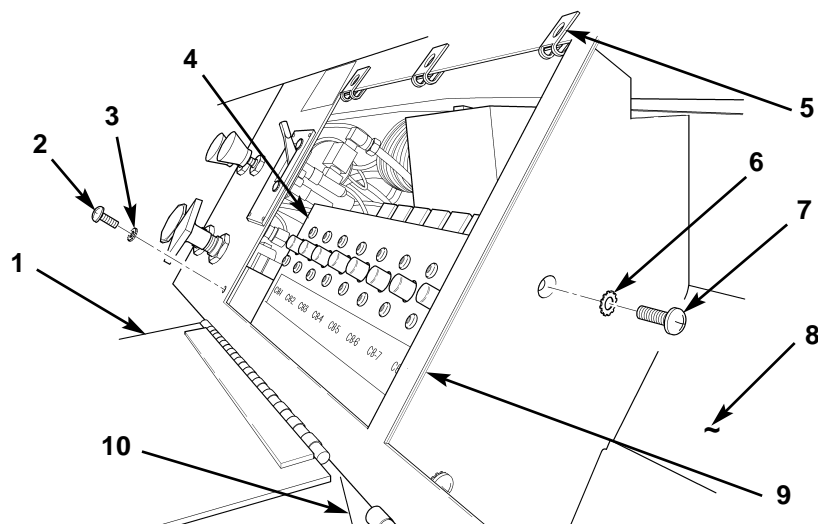


Figure 10. Installing Circuit Breaker Panel.

NOTE

Wire connectors shall be crimped and heat shrunk during installation.

7. Connect ABS warning light (figure 11, item 1) black wire (figure 11, item 4) to 36 in. (91 cm) blue wire (figure 11, item 6) from CB#3 with new wire connector (figure 11, item 5).
8. Route 76 in. (193 cm) blue wire (figure 11, item 2) from ABS ECU harness to test switch (figure 11, item 17), and connect blue wire (figure 11, item 2) and ABS warning light black wire (figure 11, item 3) to test switch terminal (figure 11, item 16) with star washer (figure 11, item 8) and screw (figure 11, item 7).
9. Connect 8 in. (203 mm) black wire (figure 11, item 13) to ABS test switch terminal (figure 11, item 15) with star washer (figure 11, item 10) and screw (figure 11, item 9).
10. Connect opposite end of 8 in. (203 mm) black wire (figure 11, item 13) to heater control box mounting stud (figure 11, item 14) with star washer (figure 11, item 12) and nut (figure 11, item 11).

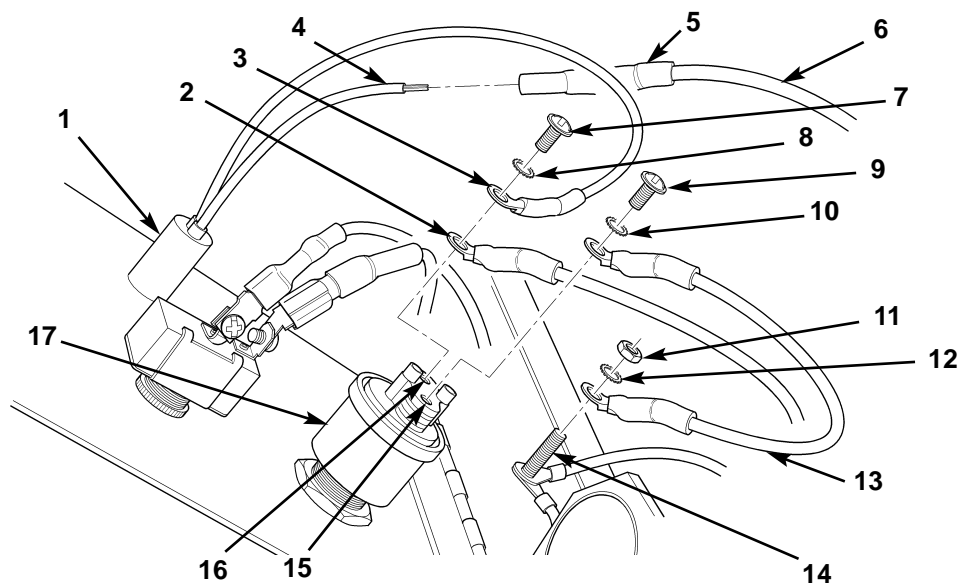


Figure 11. Connecting ABS Warning Light and Test Switch.

INSTALLATION – CONTINUED

11. Close center control panel (figure 12, item 2), and turn two turnlock fasteners (figure 12, item 1) 90 degrees.

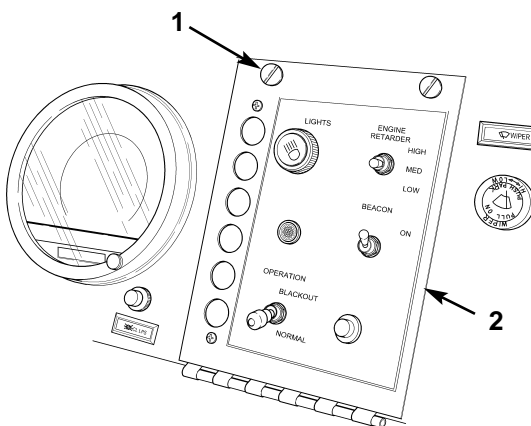


Figure 12. Closing Center Control Panel.

CAUTION

Plastic bulkhead nuts shall be finger tightened on bulkhead connectors. Over tightening plastic nut strips threads and damages bulkhead.

NOTE

Assistant will help with installation of harness bulkhead connectors.

12. Install modulator harness bulkhead connector (figure 13, item 4) on hole (figure 13, item 5) closest to steering column with washer (figure 13, item 2) and nut (figure 13, item 1).
13. Repeat step 12 for installation of speed sensor harness bulkhead connector on hole (figure 13, item 3).

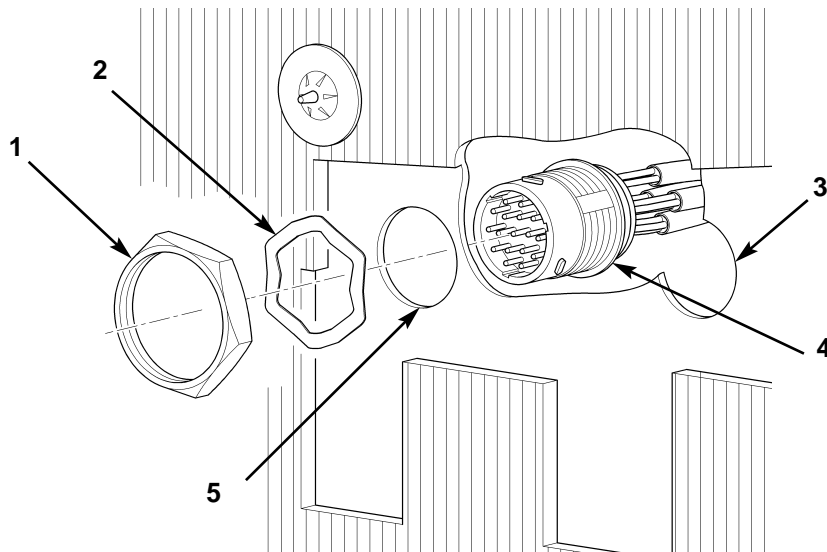


Figure 13. Installing ABS ECU Harness Bulkhead Connectors.

INSTALLATION – CONTINUED

14. Connect speed sensor harness connector (figure 14, item 4) and modulator harness connector (figure 14, item 1) to ABS ECU harness bulkhead connectors (figure 14, items 2 and 3).

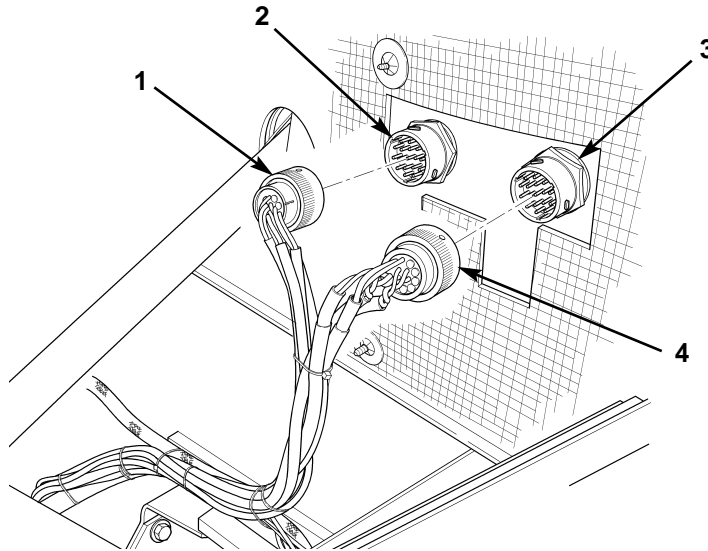


Figure 14. Connecting Harnesses to Bulkhead Connectors.

15. Connect three black ground wires (figure 15, items 2, 9, and 10) to ECU (figure 15, item 3) and firewall (figure 15, item 8) with screw (figure 15, item 1).
16. Connect ABS ECU harness connectors (figure 15, items 5 and 6) to ECU receptacles (figure 15, items 4 and 7).

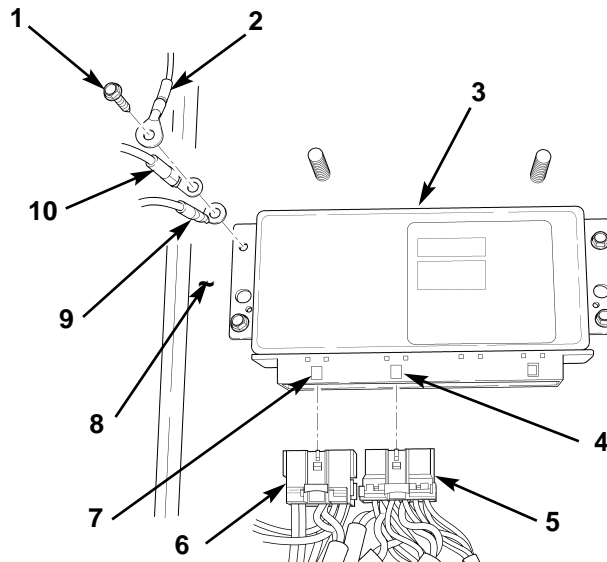


Figure 15. Connect ABS ECU Harness to ECU.

INSTALLATION – CONTINUED

17. Working under dash panel (figure 16, item 2), locate circuit 40 purple wire (figure 16, item 3), and connect 36 in. (91 cm) 30-amp fused red wire (figure 16, item 4) to purple wire (figure 16, item 3) with new wire connector (figure 16, item 1).
18. Secure all ABS ECU harness wires with new tie straps where necessary.
19. Lower and secure hood. Refer to TM 9-2320-283-10.
20. Connect battery power. Refer to TM 9-2320-283-20.

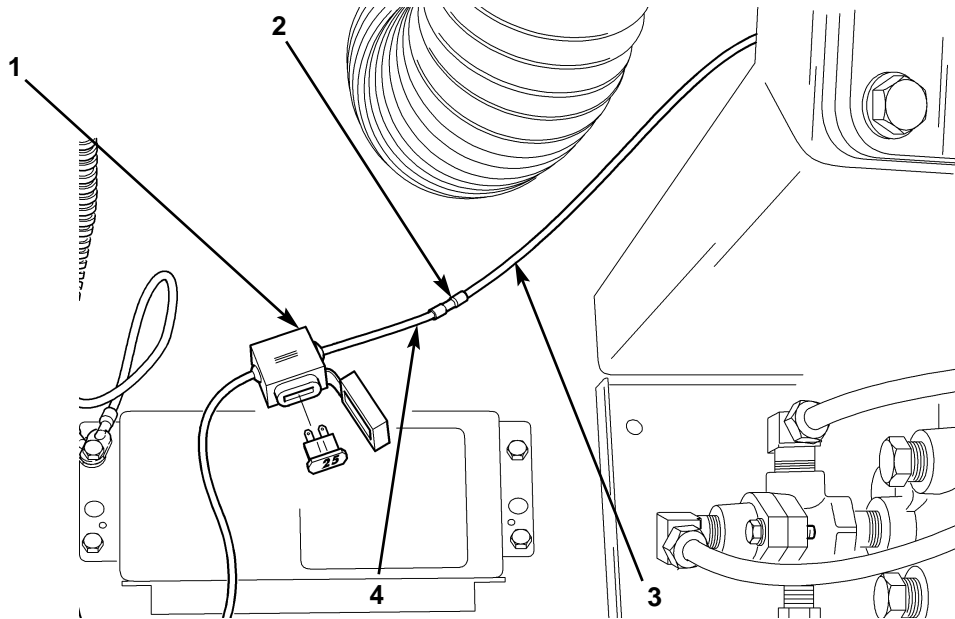


Figure 16. Connecting ABS ECU Harness to Battery Power.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
SPEED SENSOR AND MODULATOR HARNESSES REPLACEMENT

INITIAL SETUP:**Tools and Special Tools**

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)

Materials/Parts

Electrical tape (WP 0066, Item 9)

Tie straps (WP 0066, Item 10)

References

TM 9-2320-283-20

Equipment Condition

Battery power disconnected (TM 9-2320-283-20).

Hood raised and secured (TM 9-2320-283-10).

REMOVAL**NOTE**

There are two ABS harnesses: the speed sensor harness and modulator harness. Each harness contains four leads and each lead is labeled with a white band denoting its location: LF, RF, LR, or RR. Ensure ends of all harness leads are identified prior to removal.

Disconnecting harness leads from wheel sensor cables and modulators is performed the same way. The left front and left rear wheel sensor cables and modulators are shown.

1. Disconnect left front wheel sensor cable plug (figure 1, item 1) from left front wheel sensor harness connector (figure 1, item 2).
2. Disconnect left front modulator harness plug (figure 1, item 3) from left front modulator receptacle (figure 1, item 4).

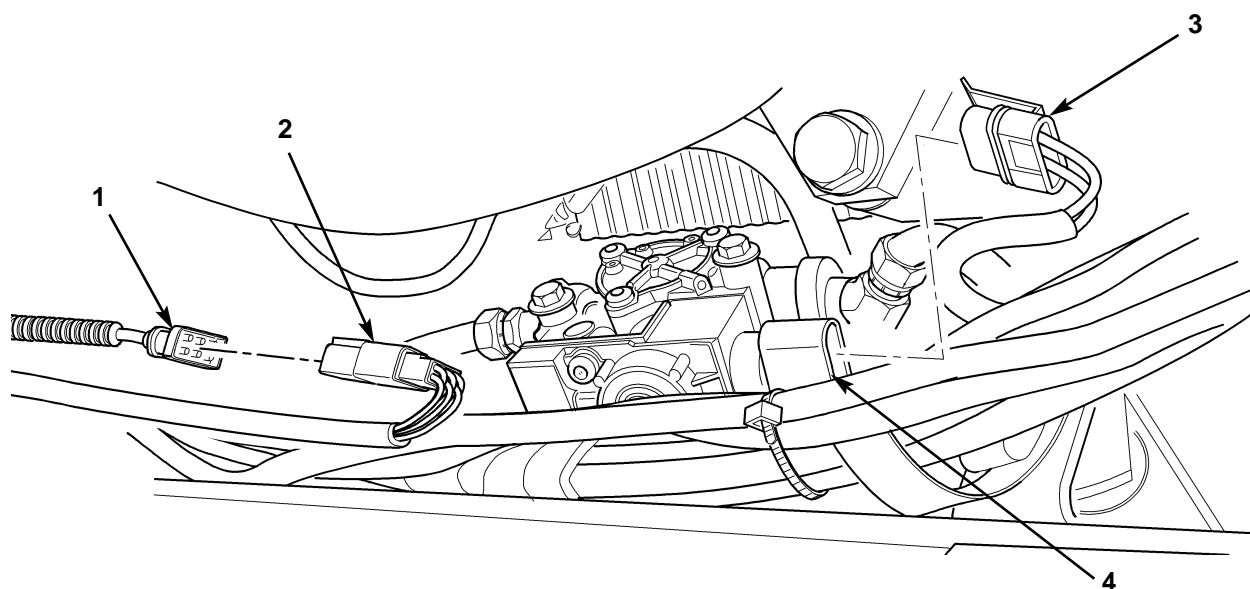


Figure 1. Disconnecting Front Wheel Sensor and Modulator Harnesses.

REMOVAL – CONTINUED

3. Disconnect left rear wheel sensor cable plug (figure 2, item 1) from left rear wheel sensor harness connector (figure 2, item 2).
4. Disconnect left rear modulator harness plug (figure 2, item 3) from left rear modulator receptacle (figure 2, item 4).
5. Perform steps 1 through 4 to disconnect right front and right rear wheel sensor cables and modulators.

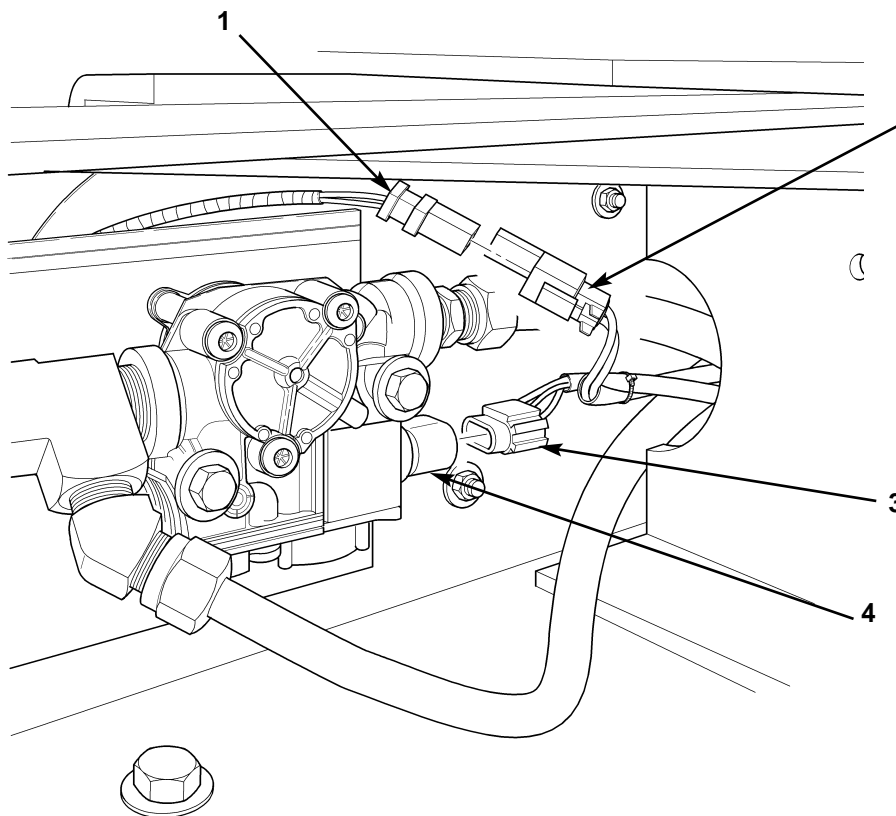


Figure 2. Disconnecting Rear Wheel Sensor and Modulator Harnesses.

CAUTION

Exercise caution not to cut harnesses when cutting tie straps during removal of wheel sensor and modulator harnesses. Failure to comply may result in damage to equipment.

NOTE

Note location of wheel sensor and modulator harness routing during removal of tie straps.

6. Cut and remove tie straps at each modulator (figure 3, items 2) while pulling wheel sensor harness leads (figure 3, items 1) and modulator harness leads (figure 3, items 2) through frame until all harness leads hang from bulkhead connectors (figure 3, items 4 and 5) at left-hand frame rail (figure 3, item 3). Discard tie straps.

REMOVAL – CONTINUED

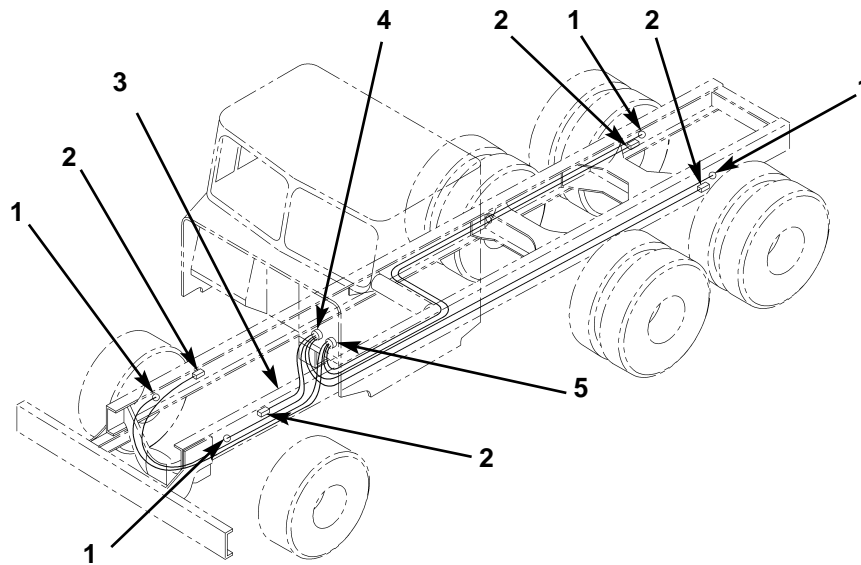


Figure 3. Removing Wheel Sensor and Modulator Harnesses.

7. Disconnect speed sensor harness connector (figure 4, item 4) and modulator harness connector (figure 4, item 1) from bulkhead connectors (figure 4, items 2 and 3). Remove all speed sensor and modulator harness leads (figure 4, items 5 and 8) from left frame rail (figure 4, item 7).
8. Lay out speed sensor harness lead (figure 4, item 5) and modulator harness lead (figure 4, item 8) on shop floor and remove remaining tie straps (figure 4, item 6) to separate. Discard tie straps (figure 4, item 6).

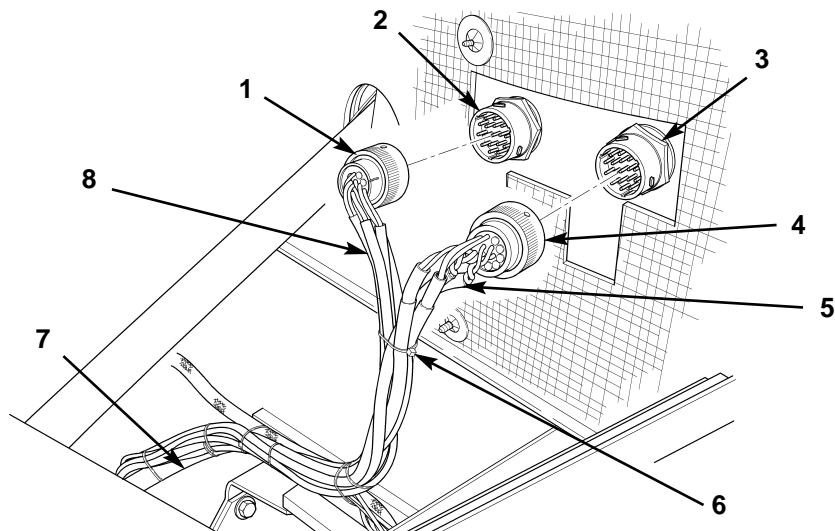


Figure 4. Disconnecting and Separating Wheel Sensor and Modulator Harnesses.

END OF TASK

INSTALLATION**NOTE**

There are two ABS harnesses: the speed sensor harness and modulator harness. Each harness contains four leads and each lead is labeled with a white band denoting its location: LF, RF, LR, or RR.

Ensure ends of all harness leads are identified prior to installation.

1. Lay out speed sensor harness (figure 5, item 5) and modulator harness (figure 5, item 8) on shop floor. Tie together with five new tie straps (figure 5, item 6) approximately 3 ft (91 cm) from connectors (figure 5, items 1 and 4).
2. Connect speed sensor harness connector (figure 5, item 4) and modulator harness connector (figure 5, item 1) to bulkhead connectors (figure 5, items 2 and 3), and route harness leads down to left frame rail (figure 5, item 7).

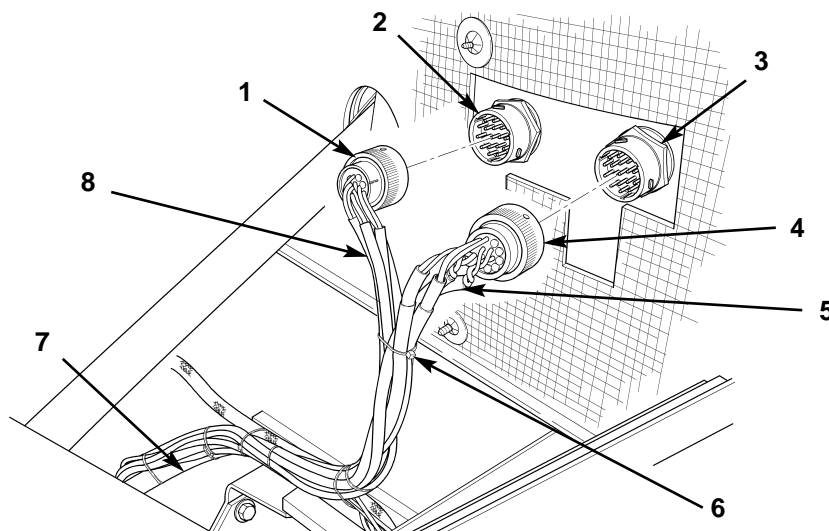


Figure 5. Connecting Harnesses to Bulkhead Connectors.

WARNING

Ensure harness leads are routed to the correct wheel as labeled with white bands denoting LF, RF, LR, or RR. Failure to comply may result in damage to equipment and possible death to personnel. Seek medical attention in the event of injury.

3. Route ends of speed sensor harness (figure 6, item 1) and modulator harness (figure 6, item 2) to left front, right front, left rear, and right rear locations as depicted in figure 6.

NOTE

When securing harnesses it is necessary to loop back excess length of wiring and secure it with tie straps. Do not cut and splice harness wiring together to shorten.

4. Secure sensor harness (figure 6, item 1) and modulator harness (figure 6, item 2) with new tie straps during installation along chassis frame.

INSTALLATION – CONTINUED

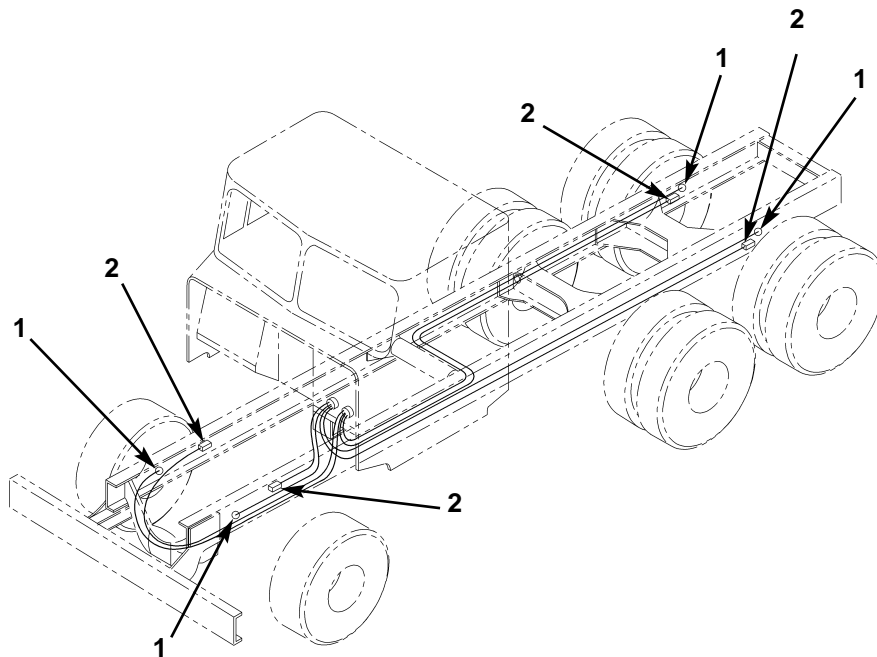


Figure 6. Connecting Rear Wheel Sensor and Modulator Harnesses.

NOTE

Connecting harness leads to wheel sensor cables and modulators is performed the same way. The left rear and left front modulator and wheel sensor cables are shown.

5. Route wheel sensor cable (figure 7, item 2) up to frame rail (figure 7, item 3) and behind left rear modulator mounting bracket (figure 7, item 1).

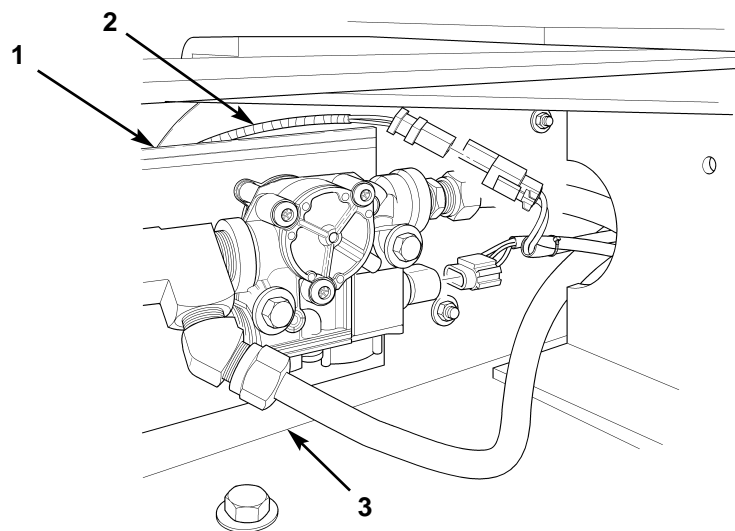


Figure 7. Routing Wheel Sensor Cable

INSTALLATION – CONTINUED

6. Connect left rear wheel sensor cable plug (figure 8, item 1) to left rear wheel sensor harness connector (figure 8, item 2).
7. Connect left rear modulator harness plug (figure 8, item 3) to left rear modulator receptacle (figure 8, item 4).
8. Secure loose wheel sensor cable to brake hose or tube assembly with new tie straps.

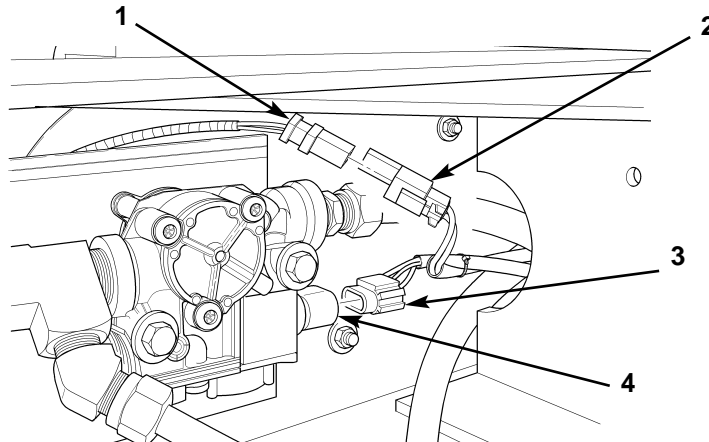


Figure 8. Connecting Rear Wheel Sensor and Modulator Harnesses.

9. Connect left front wheel sensor cable plug (figure 9, item 1) to left front wheel sensor harness connector (figure 9, item 2).
10. Connect left front modulator harness plug (figure 9, item 3) to left front modulator receptacle (figure 9, item 4).
11. Secure loose wheel sensor cable to brake hose or tube assembly with tie straps.
12. Repeat steps 5 through 11 to connect right rear and right front wheel sensor cables and modulators.
13. Connect battery power. Refer to TM 9-2320-283-20.

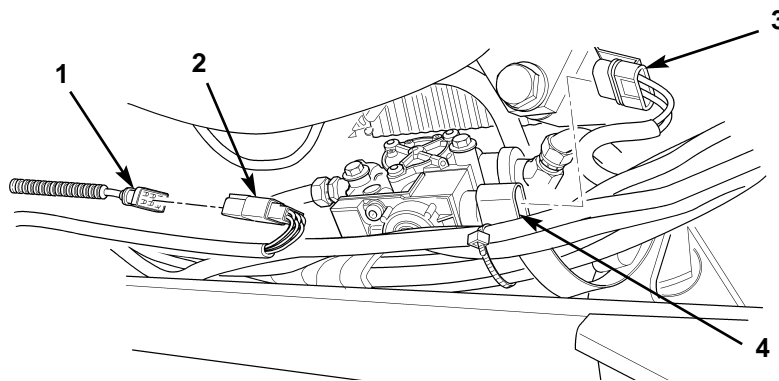


Figure 9. Connecting Front Wheel Sensor and Modulator Harnesses.

END OF TASK

END OF WORK PACKAGE

FIELD MAINTENANCE
BLACKOUT AND TAIL LIGHT MOUNTING BRACKETS REPLACEMENT

INITIAL SETUP:**Tools and Special Tools**

Tool kit, general mechanic's (WP 0063, Table 2, Item 8)

Materials/Parts

Two lockwashers (WP 0057, Item 8)

References

TM 9-2320-283-20

Equipment Condition

Battery power disconnected (TM 9-2320-283-20).

Blackout tail lamps and brackets removed (TM 9-2320-283-20).

Stop/tail lamp and brackets removed (TM 9-2320-283-20).

Trailer receptacle removed (TM 9-2320-283-20).

REMOVAL**NOTE**

Removal of right and left brackets is the same. Left brackets are shown.

1. Remove screw (figure 1, item 5), lockwasher (figure 1, item 4), and left mounting bracket (figure 1, item 3) from rear shackle mounting bracket (figure 1, item 2). Discard lockwasher (figure 1, item 4).
2. Remove three nuts (figure 1, item 1), screws (figure 1, item 6), left mounting bracket (figure 1, item 7), and star washer (figure 1, item 8) from rear frame section (figure 1, item 9) and bracket (figure 1, item 7).
3. Repeat steps 1 and 2 for removal of right mounting brackets (figure 1, items 3 and 7).

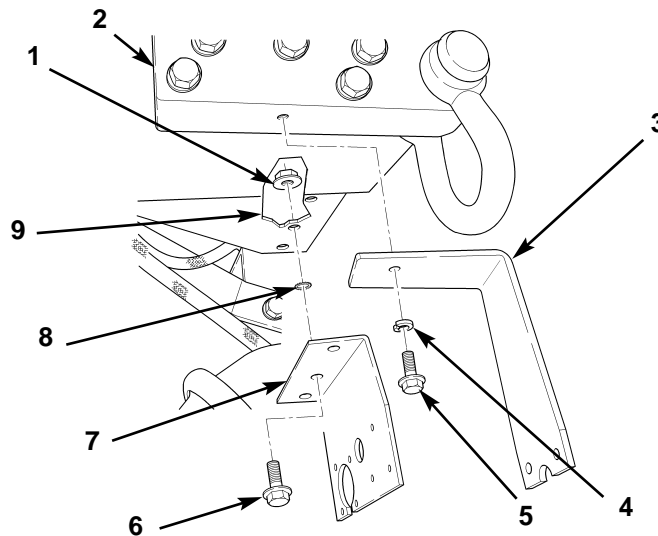


Figure 1. Removing Rear Exterior Lighting Brackets.

END OF TASK

INSTALLATION**NOTE**

Installation of right and left brackets is the same. Left brackets are shown.

One star washer shall be installed on center hole between new stop/tail lamp mounting bracket and truck frame to ensure a good electrical ground.

1. Install star washer (figure 2, item 8) and left mounting bracket (figure 2, item 7) on rear frame section (figure 2, item 9) and bracket (figure 2, item 7) with three screws (figure 2, item 6) and nuts (figure 2, item 1).
2. Install left mounting bracket (figure 2, item 3) on rear shackle mounting bracket (figure 2, item 2) with new lockwasher (figure 2, item 4) and screw (figure 2, item 5).
3. Repeat steps 1 and 2 for installation of right mounting brackets (figure 2, items 3 and 7).

NOTE

Reuse grommets from removal. Ensure new lockwashers are used for installation of receptacle and lamps.

4. Install trailer light receptacle. Refer to TM 9-2320-283-20.
5. Install stop/tail lamps. Refer to TM 9-2320-283-20.
6. Install blackout tail lamps. Refer to TM 9-2320-283-20.
7. Connect battery power. Refer to TM 9-2320-283-20.

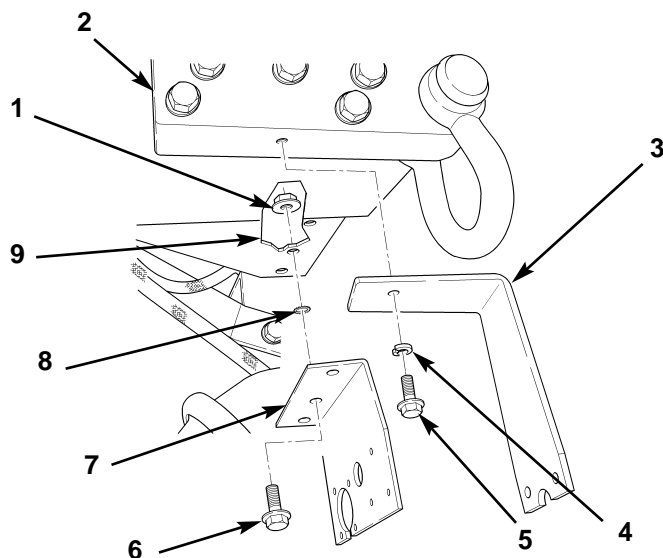


Figure 2. Installing Rear Exterior Lighting Brackets.

END OF TASK

END OF WORK PACKAGE

OPERATOR MAINTENANCE
GENERAL MAINTENANCE

INITIAL SETUP:**Materials/Parts**

Grease (WP 0066, Item 8)
Cleaning cloth (WP 0066, Item 2)
Corrosion preventative compound
(WP 0066, Item 4)
Solvent cleaning compound (WP 0066, Item 7)
Detergent (WP 0066, Item 1)

References

AR 750-1
DA PAM 750-8
DD Form 250
FM 38-700
MIL-STD-1366
TC 38-C
TM 55-2200-001-12
TM 38-400
TM 746-10

GENERAL

General maintenance instructions for cleaning, painting, placing in service, and preparation for storage or shipment are provided in this work package. Publications that provide additional information on general shop practice techniques and preservation are listed in WP 0061, References.

CLEANING

1. General Instructions. Cleaning procedures will be the same for the majority of parts and components on the vehicle. General cleaning procedures are detailed in steps 2 through 6.
2. The Importance of Cleaning. Great care and effort are required in all cleaning operations. The presence of dirt and foreign material is a constant threat to satisfactory equipment operation and maintenance. The following instruction will apply to all cleaning operations:

WARNING

Improper cleaning methods and use of unauthorized cleaning solvents may result in damage to equipment or possible injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Keep all related parts and components together. Do not mix parts.
Failure to comply may result in damage to parts.

- a. Clean all parts before performing PMCS, lubrication, and maintenance procedures.
- b. Hands must be kept free of any accumulation of grease which can transfer to components and thereby collect dust and grit.

CLEANING-CONTINUED**WARNING**

There are no adverse effects on human health associated with the use of MIL-PRF-680 when used as intended; however when used indoors, ventilation shall be sufficient to prevent the accumulation of vapors above allowable exposure limits. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

When applying and removing MIL-PRF-680 Type II or IV degreasing solvent, personnel shall wear chemical-resistant gloves and a face shield or goggles to prevent skin and eye contact with solvent and oil, grease, and other contaminants removed with solvent. In case of skin contact, remove any contaminated clothing before reuse. In the event of eye contact, flush eyes with large amounts of water for at least 15 minutes or until irritation subsides. Do not have food or drink in the vicinity. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

CAUTION

Before opening reservoir, ensure area around reservoir filler cap is clean. Do not allow dirt, dust, or water to enter reservoir. Failure to do this may cause damage to internal components.

3. Oil and Grease Covered Surfaces. Using MIL-PRF-680, Type II or IV, degreasing solvent clean oil and grease from exterior surfaces of bridge prior to cleaning dirt, mud, and debris with soap and water.

CAUTION

Do not allow cleaning solvent to come in contact with seals or flexible hoses. Failure to comply will result in damage to parts.

4. Oil Seals and Flexible Hoses.
5. External Surfaces. Clean all accessible external surfaces of vehicle with soap and water and rinse thoroughly. Use power wash pump when cleaning to save time and effort.

NOTE

All parts subject to rusting must be lightly oiled after cleaning and prior to storage.

6. Remove all evidence of corrosion from rusted surfaces.

END OF TASK**PAINTING**

The M915A1 tractor will require touch-up of painted surfaces periodically. The M915A1 is painted with Chemical Agent Resistant Coating (CARC) paint; notify Field Maintenance if components require touch-up of painted surfaces.

END OF TASK

LOADING AND MOVEMENT OF EQUIPMENT**WARNING**

Do not lift a load greater than the rated load capacity of the lifting device. All non-essential personnel must stand clear during lifting operations. Failure to comply may result in damage to equipment or possible injury or death to personnel. Seek medical attention in the event of an injury.

1. Slings Provisions. Slings provisions enable lifting of vehicle for both normal lift and external lift by helicopter. To lift vehicle, connect lifting sling to four lifting lug brackets, located at front and rear of vehicle.
2. Center of Gravity. Lift points are located to balance load in relation to center of gravity.
3. Loading and Movement. For transportability guidance, handling, and movement of the M915A1 tractor, refer to TM 38-400, Storage and Materials Handling, and TM 55-2200-001-12, Transportability Guidance for Application of Blocking, Bracing, and Tiedown Materials. The M915A1 tractor can be transported as set forth in MIL-STD-1366.

END OF TASK**PREPARATION FOR SHIPMENT AND LIMITED STORAGE**

1. Cleaning. Protection for M915A1 tractor and accompanying equipment must be sufficient to protect the material against deterioration and physical damage.

WARNING

There are no adverse effects on human health associated with the use of MIL-PRF-680 when used as intended; however when used indoors, ventilation shall be sufficient to prevent the accumulation of vapors above allowable exposure limits. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

When applying and removing MIL-PRF-680 Type II or IV degreasing solvent, personnel shall wear chemical-resistant gloves and a face shield or goggles to prevent skin and eye contact with solvent and oil, grease, and other contaminants removed with solvent. In case of skin contact, remove any contaminated clothing before reuse. In the event of eye contact, flush eyes with large amounts of water for at least 15 minutes or until irritation subsides. Do not have food or drink in the vicinity. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

PREPARATION FOR SHIPMENT AND LIMITED STORAGE—CONTINUED**NOTE**

MIL-PRF-680 Type II and IV degreasing solvents shall be used as degreasers and cleaners for painted and unpainted metal parts. These two approved types of solvents are hydrocarbon-based, low-odor, and recyclable. In addition Type II and IV have a high flash point and are not defined as a flammable material. Type IV solvent contains citrus odor and has a stronger solvency than Type II solvent. Used MIL-PRF-680 solvent should not be mixed with other waste materials, especially those containing halogenated solvents, and disposal shall be in accordance with local, state, and Federal regulations.

Prior to application of corrosion preventive compound, surfaces must be cleaned to ensure removal of corrosion, soil, grease, or vehicle acid and alkali residues.

- a. Remove dirt, grease, oil, and other foreign matter from all painted and unpainted metal surfaces of vehicle by scrubbing with cloths soaked in MIL-PRF-680 Type II and IV degreasing solvents. Refer WP 0066, Items 2 and 7. Use warm water for cleaning rubber parts.

WARNING

Compressed air source shall not exceed 30 psi (207 kPa). When cleaning with compressed air, eye shields must be worn. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury

- b. Clean exterior surfaces of vehicle by power washing with water, to ensure removal of all dirt and foreign matter. After cleaning, allow parts to air dry, use compressed air, or wipe with clean, dry cloths. Refer to WP 0066, Item 2.
2. Preservation. All critical unpainted metal surfaces must be protected during shipment. Coat all unpainted, exposed, or machined metal surfaces on the exterior of the vehicle with approved corrosion-preventive compound only. Refer to WP 0066, Item 4. Equipment protected must be closely watched for signs of corrosion. For additional information of preservation, refer to FM 38-700 and TC 38-3.
3. Packing. Pack all Basic Issue Items (BII) and Additional Authorization List (AAL) items to prevent physical damage. Refer to WP 0064 and WP 0065. For additional information on packing, refer to FM 38-701 and TC 38-3.
4. Shipment of Army Documents. Prepare all Army shipping documents accompanying M915A1 tractor in accordance with DA Pam 750-8
5. Limited Storage Instructions. Commanders are responsible for ensuring that all vehicles issued or assigned to their command are maintained in a serviceable condition and properly cared for, and that personnel under their command comply with technical instructions. Lack of time, trained personnel, or proper tools may result in a unit being incapable of performing maintenance for which it is responsible. In such cases, unit commanders may, with the approval of major commanders, place a vehicle that is beyond the maintenance capability of the unit in administrative storage. For detailed information, refer to AR 750-1.

PREPARATION FOR SHIPMENT AND LIMITED STORAGE—CONTINUED

6. Storage of Remanufactured M915A1.
 - a. If a remanufactured M915A1 is placed in storage at either contractor or Government facilities, before being put in service, the warranty period shall not start until each such system is withdrawn from that storage, or until nine months from the date shown on the Material Inspection and Receiving Report (DD Form 250); whichever occurs first.
 - b. If a remanufactured M915A1 is placed in contractor storage, the contractor shall maintain and exercise such stored system in accordance with the contractor's approved technical manual. Upon removal from storage, and before delivering the M915A1 tractor to the Government, the contractor shall exercise and perform all PMCS tasks in accordance with the contractor's approved technical manual.
 - c. If a remanufactured M915A1 is placed in Government storage, the Government will exercise stored system in accordance with the contractor's approved technical manual. The Government shall notify the contractor before placing each such system in storage and again at the time it is withdrawn. If there are any contractor-caused retrofits that must be applied to the M915A1 tractor, the storage time does not start until those retrofits are completed.
7. Transport of M915A1 by Aircraft. The M915A1 tractor is transportable by aircraft. For shipping information, refer to TM 746-10, General Packaging instructions for Field Units.
 - a. Loadmaster will determine the required amount of side clearance in cargo bay and the quantity and location of restraints.
 - b. Apply forward, aft, and lateral restraint once M915A1 tractor is loaded. Follow standard tiedown pattern. Loadmaster will determine tiedown points and tiedown forces to be applied.
 - c. Offloading is the reverse of loading.

END OF TASK**END OF WORK PACKAGE**

FIELD MAINTENANCE
GENERAL MAINTENANCE INSTRUCTIONS

INITIAL SETUP:**Materials/Parts**

Solvent cleaning compound (WP 0066, Item 7)

References

ATTP 3-34.39

TM 9-214

TM 9-6140-200-13

WARNING

Improper cleaning methods and use of unauthorized cleaning solvents may result in damage to equipment or possible injury to personnel. Seek medical attention in the event of an injury.

Compressed air source must not exceed 30 psi (207 kPa). Wear eye shields and gloves when cleaning with compressed air. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

There are no adverse effects on human health associated with the use of MIL-PRF-680 when used as intended; however when used indoors, ventilation shall be sufficient to prevent the accumulation of vapors above allowable exposure limits. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

When applying and removing MIL-PRF-680 Type II or IV degreasing solvent, personnel shall wear chemical-resistant gloves and a face shield or goggles to prevent skin and eye contact with solvent and oil, grease, and other contaminants removed with solvent. In case of skin contact, remove any contaminated clothing before reuse. In the event of eye contact, flush eyes with large amounts of water for at least 15 minutes or until irritation subsides. Do not have food or drink in the vicinity. Failure to comply may result in injury to personnel. Seek medical attention in the event of an injury.

NOTE

Degreasing solvents shall be used as degreasers and cleaners for painted and unpainted metal parts. These two approved types of solvent are hydrocarbon-based, low odor, and recyclable. In addition Type II or IV have a high flash point and are not defined as a flammable material. Type IV solvent contains a citrus odor and has a stronger solvency than Type II solvent. Used MIL-PRF-680 solvent should not be mixed with other waste materials, especially those containing halogenated solvents, and disposal shall be in accordance with local, state, and Federal regulations.

GENERAL CLEANING PROCEDURES

Cleaning procedures are the same for most parts and components that make up the vehicle subassemblies. Great care and effort are required in all cleaning operations. Dirt and foreign material can jeopardize satisfactory vehicle operation and maintenance.

The following guidelines apply to all cleaning operations:

1. Clean all parts before inspection, after repair, and before assembly.
2. Keep hands free of large amounts grease, which can collect dust and grit.
3. After cleaning, wrap or cover all parts with plastic or paper to protect them from dust and/or dirt.

NOTE

All electrical equipment and other parts that can be damaged by steam cleaning or moisture must be removed and all openings must be covered before cleaning. Dry parts with compressed air.

4. Dry and cover all cleaned parts and inspect or repair as necessary. All parts subject to rusting must be oiled and wrapped in paper or plastic to avoid dirt and/or dust settling on them. Keep all subassembly parts together and avoid mixing parts.
5. Clean inner and outer surfaces of castings and all areas likely to collect grease and oil with MIL-PRF-680, Type II or IV, degreasing solvent. Use a stiff brush to remove sludge and gum deposits. Use compressed air to blow out all tapped screw holes and to dry castings after cleaning.
6. Particular attention must be given to all oil passages in castings and machined parts. Oil passages must be kept clean and free of obstructions. Clean passages with wire probes to break up any sludge or gum deposits. Wash passages by flushing with cleaning solvents. Dry passages with compressed air.
7. Clean electrical cables and flexible hoses with soap and water. Allow to air dry.
8. Clean machined-tooled parts with MIL-PRF-680, Type II or IV, degreasing solvent and dry with compressed air.
9. Clean machined surfaces with MIL-PRF-680, Type II or IV, degreasing solvent and dry with lint-free cloth.
10. Use compressed air to blow out all tapped screw holes where gasket material comes in contact with mating surfaces. This will clear holes of any deteriorating gasket material.
11. Clean battery terminals and cables with a wire brush. For general cleaning instructions, maintenance, and servicing of battery cables and clamps, refer to TM 9-6140-200-13.

END OF TASK**PAINTING**

The M915A1 is painted with Chemical Agent Resistant (CARC) paint. For touch-up of painted surfaces refer to ATTP 3-34.39, Color, Marking, and Camouflage Painting of Military Vehicles, Construction Equipment, and Material Handling Equipment.

END OF TASK

GENERAL INSPECTION PROCEDURES

Procedures for inspections are the same for many parts and components that make up vehicle subassemblies. Dimensional standards for parts have been fixed at extremely close tolerances, so use specification tables located throughout this manual. Use specified inspection equipment for inspections where cracks and other damage cannot be seen. Exercise extreme care in all phases of inspection and adhere to the following guidelines:

1. When inspecting castings perform the following inspections:
 - a. Inspect all ferrous and non-ferrous castings for cracks using a magnifying glass and a strong light.
 - b. Check areas around studs, pipe plugs, threaded inserts, and sharp corners for cracks. Replace all cracked castings.
 - c. Inspect machined surfaces for nicks, burrs, or raised metals. Mark damaged areas for repair or replacement.
 - d. Inspect all pipe plugs, pipe plug openings, screws, and screw openings for damaged or stripped threads.
 - e. Using straight edge or surface plate, check all gasket mating surfaces, flanges on housings, and supports for warpage. Visually inspect mating flanges for discolorations. This may indicate persistent oil leakage.
 - f. Check all castings for conformance to applicable repair standards.
2. Refer to TM 9-214 for inspection of bearings. Check all bearings for conformance to applicable repair standards.
3. Replace studs, bolts, and screws if threads are damaged, bent, loose, or stretched.
4. Using magnifying glass and strong light, inspect all gears for cracks. No cracks are allowed. Inspect gear teeth for wear, sharp fins, burrs, and galled or pitted surfaces. Check keyway slots for wear and/or damage.
5. Check all bushings and bushing-type bearings for secure fit, evidence of overheating, wear, burrs, nicks, and out-of-round condition. Check for dirt in lubrication holes or grooves. Holes and grooves must be clean and free from damage.
6. All seals must be replaced with new seals.
7. Inspect core hole expansion plugs for leakage. Replace plugs when leakage is present.
8. Inspect machined-tooled parts for cracks, breaks, elongated holes, wear, and chips.
9. Inspect machined surfaces for cracks, evidence of wear, burrs, nicks, pitted surfaces, and scratches.
10. Inspect mated surfaces for remains of old gaskets or seals, evidence of leakage, pitting, and secure fit.
11. Inspect surfaces for rust, pitting, holes, and severe damage.
12. Inspect oil bathed internal parts for cracks, nicks, burrs, evidence of overheating, and wear.
13. Inspect air actuated internal parts for cracks, nicks, burrs, evidence of overheating, and wear.
14. Inspect externally exposed parts for breaks, cracks, rust damage, and wear.
15. Inspect springs for broken, collapsed, and twisted coils.
16. Inspect batteries for damage, cracks, leaks, corrosion, and broken or loose terminals.
17. Inspect battery cables for damage and corrosion. For general cleaning instructions, maintenance, and servicing of battery cables and clamps, refer to TM 9-6140-200-13.

END OF TASK**END OF WORK PACKAGE**

CHAPTER 6

PARTS INFORMATION

**FIELD MAINTENANCE
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
INTRODUCTION**

INITIAL SETUP: Not Applicable

INTRODUCTION

SCOPE

This RPSTL lists and authorizes spares and repair parts; special tools; special test, measurement, and diagnostic equipment (TMDE); and other special support equipment required for performance of Field maintenance of the ABS for M915A1 truck. It authorizes the requisitioning, issue, and disposition of spares, repair parts, and special tools as indicated by the Source, Maintenance, and Recoverability (SMR) codes.

GENERAL

In addition to the Introduction work package, this RPSTL is divided into the following work packages.

1. Repair parts List Work Packages. Work packages containing lists of spares and repair parts authorized by this RPSTL for use in the performance of maintenance. These work packages also include parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending alphanumeric sequence, with the parts in each group listed in ascending figure and item number sequence. Sending units, brackets, filters, and bolts are listed with the component they mount on. Bulk materials are listed by item name in FIG BULK at the end of the work packages. Repair parts kits are listed separately in their own functional group and work package. Repair parts for repairable special tools are also listed in a separate work package. Items listed are shown on the associated illustrations.
2. Special tools List work Packages. Work packages containing lists of special tools, special TMDE, and special support equipment authorized by this RPSTL (as indicated by Basis of Issue (BOI) information in the DESCRIPTION AND USABLE ON CODE (UOC) column). Tools that are components of common tool sets and/or Class VII are not listed.
3. Cross-Reference Indexes Work Packages. There are two cross-reference indexes in the RPSTL: the National Stock Number (NSN) Index work package and the Part Number (PN) Index work package. The National Stock Number Index work package refers you to the figure and item number. The Part Number Index work package refers you to the figure and item number.

EXPLANATION OF COLUMNS IN THE REPAIR PARTS LIST AND SPECIAL TOOLS LIST WORK PACKAGES

ITEM NO. (Column (1)). Indicates the number used to identify items called out in the illustration.

SMR CODE (Column (2)). The SMR code containing supply/requisitioning information, maintenance level authorization criteria, and disposition instruction, as shown in the following breakout. This entry may be subdivided into 4 subentries, one for each service.

EXPLANATION OF COLUMNS IN THE REPAIR PARTS LIST AND SPECIAL TOOLS LIST WORK PACKAGES—CONTINUED

TABLE 1. SMR Code Explanation.

<u>Source Code XX</u>	<u>Maintenance Code XX</u>	<u>Recoverability Code X</u>
1st two positions: How to get an item.	3rd position: who can install, replace, or use the item.	4th position: Who can do complete repair* on the item.
		5th position: Who determines disposition action on unserviceable items.

* Complete Repair: Maintenance capacity, capability, and authority to perform all corrective maintenance tasks of the "Repair" function in a use/user environment in order to restore serviceability to a failed item.

Source Code. The source code tells you how you get an item needed for maintenance, repair, or overhaul of an end item/equipment. Explanations of source codes follow:

<u>Source Code</u>	<u>Application/Explanation</u>
PA PB PC PD PE PF PG PH PR PZ	<p>NOTE</p> <p>Items coded PC are subject to deterioration.</p> <p>Stock items; use the applicable NSN to requisition/request items with these source codes. They are authorized to the level indicated by the code entered in the third position of the SMR code.</p>
KD KF KB	<p>Items with these codes are not to be requested/requisitioned individually. They are part of a kit which is authorized to the maintenance level indicated in the third position of the SMR code. The complete kit must be requisitioned and applied.</p>
MF—Made at Field/ASB level MH—Made at Below Depot/Sustainment level ML—Made at SRA/TASMG MD—Made at depot MG—Navy only	<p>Items with these codes are not to be requested/requisitioned individually. They must be made from bulk material which is identified by the part number in the DESCRIPTION AND USABLE ON CODE (UOC) column and listed in the bulk material group work package of the RPSTL. If the item is authorized to you by the third position code of the SME code, but the source code indicates it is made at higher level, order the Item from the higher level of maintenance.</p>

EXPLANATION OF COLUMNS IN THE REPAIR PARTS LIST AND SPECIAL TOOLS LIST WORK PACKAGES—CONTINUED

<u>Source Code</u>	<u>Application/Explanation</u>
AF—Assembled by Field AH—Assembled by Below depot/sustainment level AL—Assembled by SRA AD—Assembled by depot AG—Navy only	Items with these codes are not to be requested/requisitioned individually. The parts that make up the assembled item must be requisitioned or fabricated and assembled at the level of maintenance indicated by the source code. If the third position of the SMR code authorizes you to replace the item, but the source code indicates the item is assembled at a higher level, order the item from the higher level of maintenance.
XA	Do not requisition an “XA” coded item. Order the next Higher assembly (Refer to NOTE below).
XB	If an item is not available from salvage, order it using the CAGEC and part number.
XC	Installation drawings, diagrams, instruction sheets, field service drawings: identified by manufacturer’s part number.
XD	Item is not stocked. Order an XD-coded item through local purchase or normal supply channels using the CAGEC and part number given, if no NSN is available.

NOTE

Cannibalization or controlled exchange, when authorized, may be used as a source of supply for items with the above source codes except for those items source coded “XA” or those aircraft support items restricted by requirements of AR 750-1.

Maintenance Code. Maintenance codes tell you the level(s) of maintenance authorized to use and repair support items. The maintenance codes are entered in the third and fourth positions of the SMR code as follows:

Third Position. The maintenance code entered in the third position tells you the lowest maintenance level authorized to remove, replace, and use an item. The maintenance code entered in the third position will indicate authorization to the following levels of maintenance:

<u>Maintenance Code</u>	<u>Application/Explanation</u>
F—	Field maintenance can remove, replace, and use the item.
H—	Below Depot/Sustainment maintenance can remove, replace, and use the item.
L—	Specialized repair activity can remove, replace, and use the item.
G—	Afloat and ashore intermediate maintenance can remove, replace, and use the item (Navy only).
K—	Contractor facility can remove, replace, and use the item.
Z—	Item is not authorized to be removed, replace, or used at any maintenance level
D—	Depot can remove, replace, and use the item.

EXPLANATION OF COLUMNS IN THE REPAIR PARTS LIST AND SPECIAL TOOLS LIST WORK PACKAGES—CONTINUED

*NOTE—Army may use C in the third position. However, for joint service publications, Army will use O.

Fourth Position. The maintenance code entered in the fourth position tells you whether or not the item is to be repaired, and identifies the lowest maintenance level with the capability to do complete repair (perform all authorized repair functions).

NOTE

Some limited repair may be done on the item at a lower level of maintenance, if authorized by the Maintenance Allocation Chart (MAC) and SMR codes.

Maintenance

Code

Application/Explanation

F—	Field is the lowest level that can do complete repair of the item.
H—	Below Depot/Sustainment is the lowest level that can do complete repair of the item.
L—	Specialized repair activity (enter specialized repair activity or TASMG designator) is the lowest level that can do complete repair of the item.
D—	Depot is the lowest level that can do complete repair of the item.
G—	Both afloat and ashore intermediate levels are capable of complete repair of item. (Navy Only)
K—	Complete repair is done at contractor facility.
Z—	Non-repairable. No repair is authorized.
B—	No repair is authorized. No parts or special tools are authorized for maintenance of “B” coded item. However, the item may be reconditioned by adjusting, lubricating, etc., at the user level.

Recoverability Code. Recoverability codes are assigned to items to indicate the disposition action on unserviceable items. The recoverability code is shown in the fifth position of the SMR code as follows:

Recoverability

Code

Application/Explanation

Z —	Non-reparable item. When unserviceable, condemn and dispose of the item at the level of maintenance shown in the third position of the SMR code.
F—	Reparable item. When uneconomically repairable, condemn and dispose of the item at the field level.
H—	Reparable item. When uneconomically repairable, condemn and dispose of the item at the below depot sustainment level.
D—	Reparable item. When beyond lower level repair capability, return to depot. Condemnation and disposal of item are not authorized below depot level.
L—	Reparable item. Condemnation and disposal not authorized below Specialized Repair Activity (SRA).
A—	Item requires special handling or condemnation procedures because of specific reasons (such as precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals/directives for specific instructions.
G—	Filed level repairable item. Condemn and dispose at either afloat or ashore intermediate levels. (Navy only)
K—	Reparable item. Condemnation and disposal to be performed at contractor facility

EXPLANATION OF COLUMNS IN THE REPAIR PARTS LIST AND SPECIAL TOOLS LIST WORK PACKAGES—CONTINUED

NSN (Column (3)). The NSN for the item is listed in this column.

CAGEC (Column (4)). The Commercial and Government Entity Code (CAGEC) is a five-digit code which is used to identify the manufacturer, distributor, or Government agency/activity that supplies the item.

PART NUMBER (Column (5)). Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

NOTE

When you use an NSN to requisition an item, the item you receive may have a different part number from the number listed.

DESCRIPTION AND USABLE ON CODE (UOC) (Column (6)). This column includes the following information:

1. The federal item name, and when required, a minimum description to identify the item.
2. Part numbers of bulk materials are referenced in this column in the line entry to be manufactured or fabricated.
3. Hardness Critical item (HCI). A support item that provides the equipment with special protection from electromagnetic pulse (EMP) damage during a nuclear attack.
4. The statement END OF FIGURE appears just below the last item description in column (6) for a given figure in both the Repair Parts list and Special Tools list work packages.
5. QTY (Column (7)). The QTY (quantity per figure) column indicates the quantity of the item used in the breakout shown on the illustration/figure, which is prepared for a functional group, sub-functional group, or an assembly. A “V” appearing in this column instead of quantity indicates that the quantity is variable and quantity may change from application to application.

EXPLANATION OF CROSS-REFERENCE INDEXES WORK PACKAGES FORMAT AND COLUMNS

1. National Stock Number (NSN) Index Work Package. NSNs in this index are listed in National Item Identification Number (NIIN) sequence.

STOCK NUMBER Column. This column lists the NSN in NIIN sequence. The NIIN consists of the last nine digits of the NSN. When using this column to locate an item, ignore the first four digits of the NSN. However, the complete NSN should be used when ordering items by stock number.

For example, if the NSN is 5385-01-574-1476, the NIIN is 01-574-1476.

FIG. Column. This column lists the number of the figure where the item is identified/located. The figures are in numerical order in the repair parts list and special tools list work packages.

ITEM Column. The item number identifies the item associated with the figure listed in the adjacent FIG. column. This item is also identified by the NSN listed on the same line.

2. Part Number (P/N) Index Work Package. Part numbers in this index are listed in ascending alphanumeric sequence (vertical arrangement of letter and number combinations which places the first letter or digit of each group in order A through Z, followed by the numbers 0 through 9 and each following letter or digit in like order).

PART NUMBER Column. Indicates the part number assigned to the item.

FIG. Column. This column lists the number of the figure where the item is identified/located in the repair parts list and special tools list work packages.

ITEM Column. The item number is the number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

EXPLANATION OF COLUMNS IN THE REPAIR PARTS LIST AND SPECIAL TOOLS LIST WORK PACKAGES—CONTINUED

Fabrication Instructions. Bulk materials required to manufacture items are listed in the bulk material functional group of this RPSTL. Part numbers for bulk material are also referenced in the Description Column of the line item entry for the item to be manufactured/fabricated. Detailed fabrication instructions for items source coded to be manufactured or fabricated are found in (enter applicable TM number).

Index Numbers. Items which have the word BULK in the figure column will have an index number shown in the item number column. This index number is a cross-reference between the NSN / Part Number (P/N) Index work packages and the bulk material list in the repair parts list work package.

HOW TO LOCATE REPAIR PARTS**1. When NSNs or Part Numbers Are Not Known.**

First. Using the table of contents, determine the assembly group to which the item belongs. This is necessary since figures are prepared for assembly groups and subassembly groups, and lists are divided into the same groups.

Second. Find the figure covering the functional group or the subfunctional group to which the item belongs.

Third. Identify the item on the figure and note the number(s).

Fourth. Look in the repair parts list work package for the figure and item numbers. The NSNs and part numbers are on the same line as the associated item numbers.

2. When NSN is known.

First. If you have the NSN, look in the STOCK NUMBER column of the NSN index work package. The NSN is arranged in NIIN sequence. Note the figure and item number next to the NSN.

Second. Turn to the figure and locate the item number. Verify that the item is the one you are looking for.

3. When Part Number Is Known.

First. If you have the part number and not the NSN, look in the PART NUMBER column of the part number index work package. Identify the figure and item number.

Second. Look up the item on the figure in the applicable repair parts list work package.

ABBREVIATIONS

No uncommon abbreviations are used in this RPSTL.

END OF WORK PACKAGE

FIELD MAINTENANCE
WARNING LIGHT AND TEST SWITCH

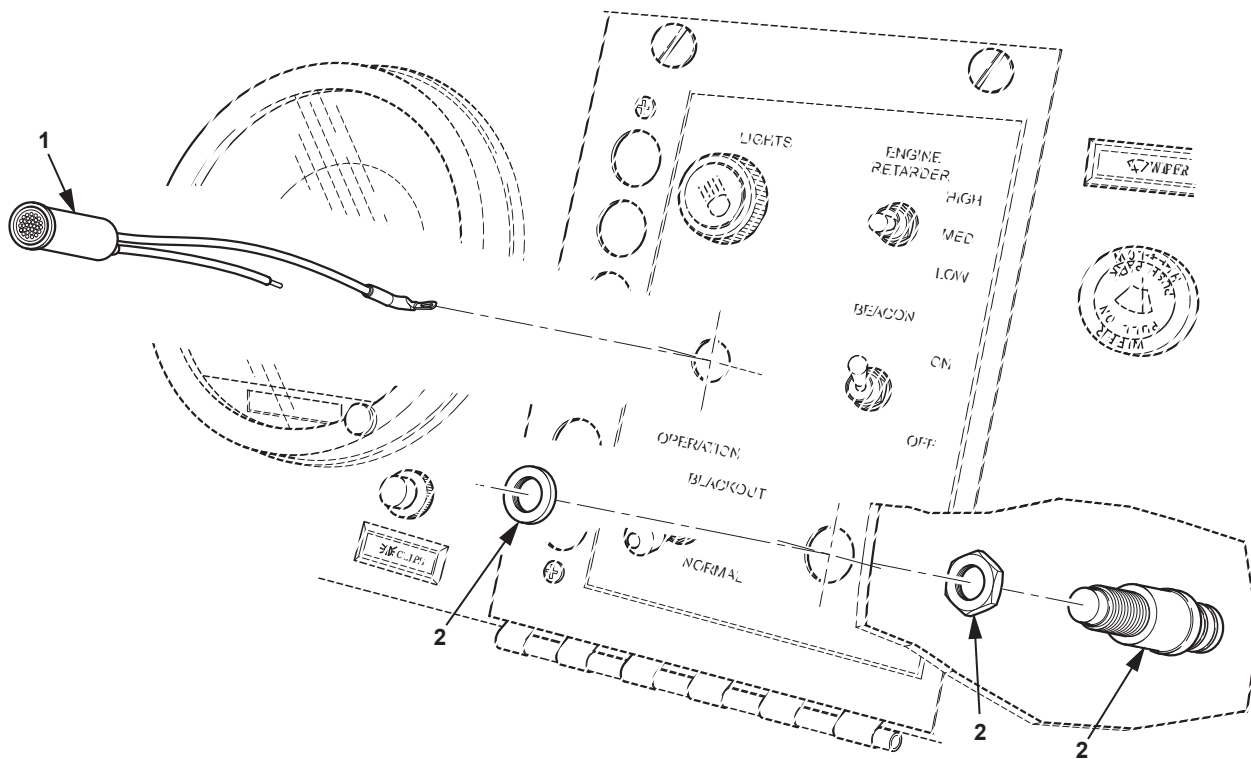
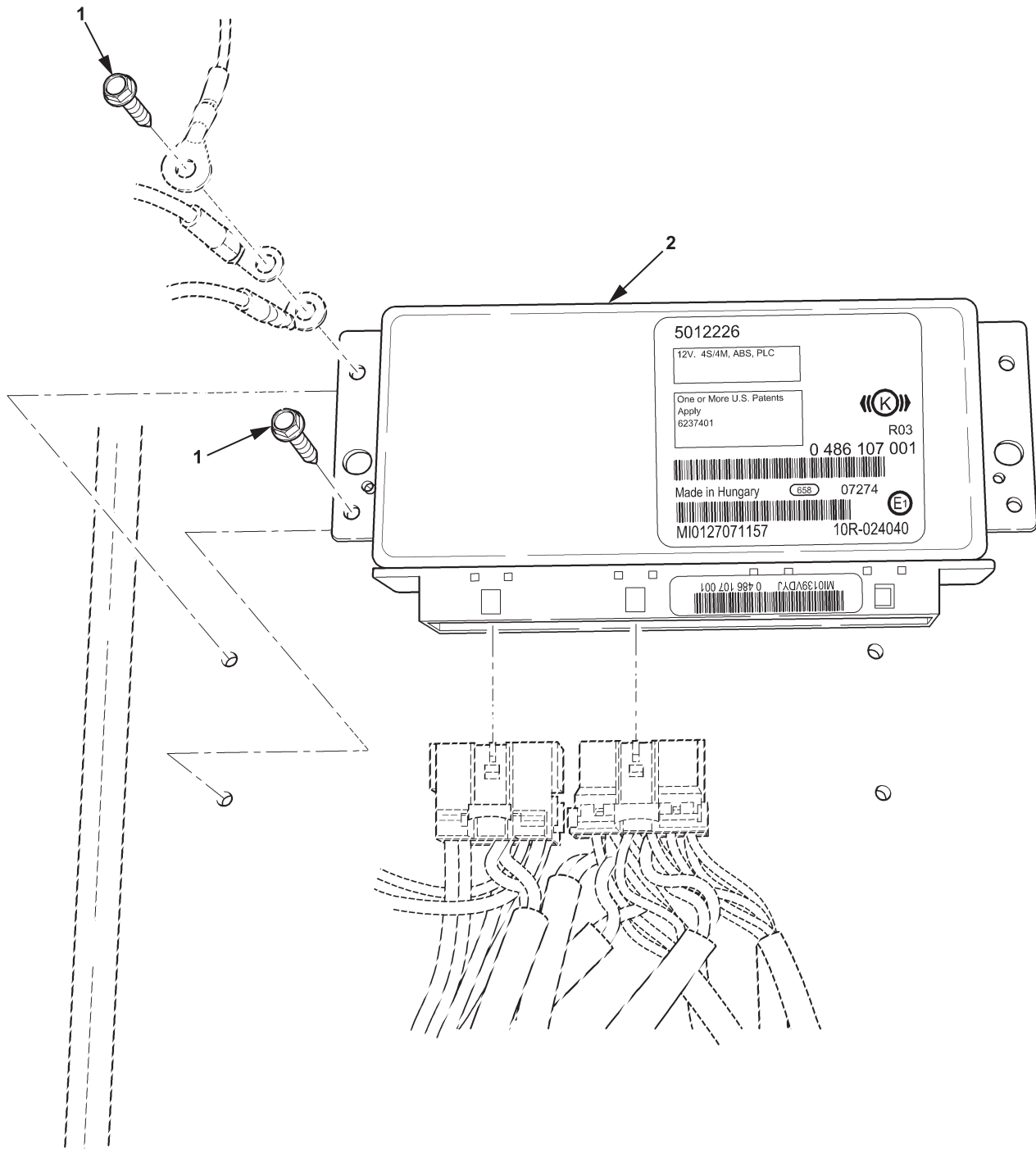


Figure 1. Warning Light and Test Switch.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 0607 INSTRUMENT OR ENGINE CONTROL PANEL FIG. 1 WARNING LIGHT AND TEST SWITCH WARNING LIGHT AND TEST SWITCH	
1	PAFZZ	---	06YZ5	L1 AMBER	LIGHT,WARNING	1
2	PAFZZ	5930-00-221-8992	13445	9095	SWITCH,PUSH	1
					END OF FIGURE	

FIELD MAINTENANCE

ECU

*Figure 2. ECU.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 0610 SENDING UNITS AND WARNING SWITCHES FIG. 2 ECU ECU	
1	PAFZZ	---	6H404	44-6008	SCREW,PAN HEAD 10X1.00	4
2	PAFZZ	---	06853	BW/801877	ABS ASSEMBLY,ECU	1

END OF FIGURE

FIELD MAINTENANCE

ECU HARNESS

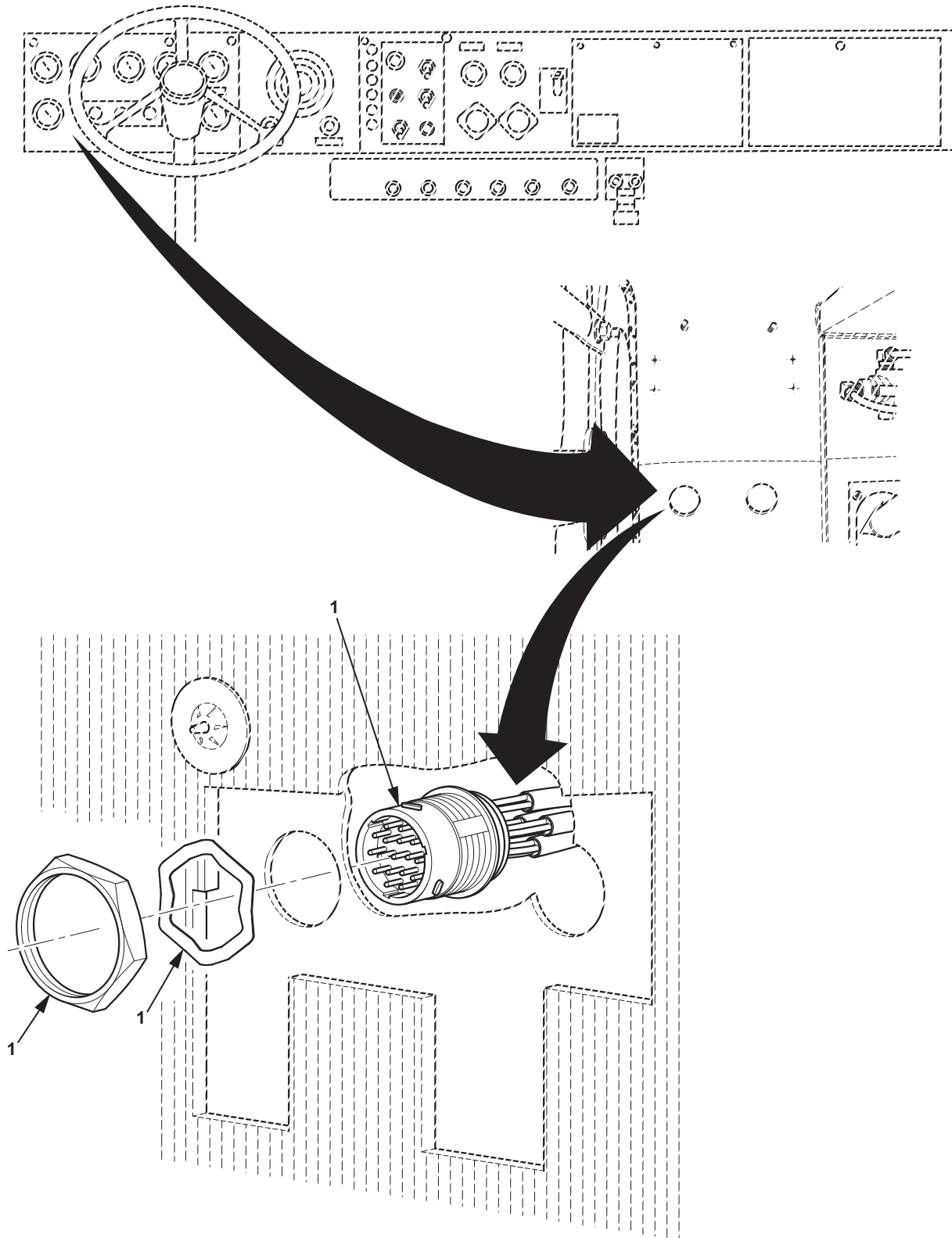


Figure 3. ECU Harness (Sheet 1 of 3).

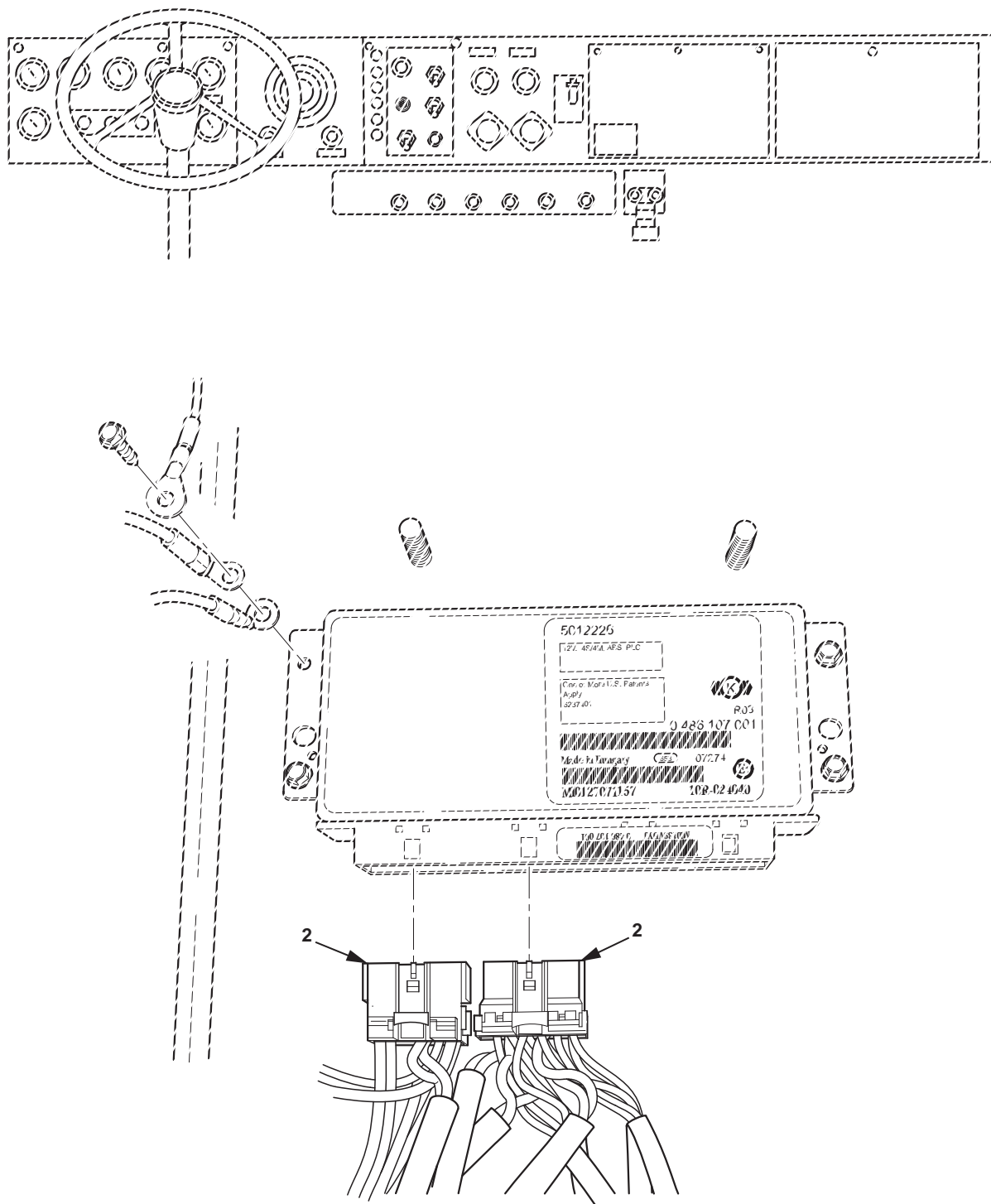


Figure 3. ECU Harness (Sheet 2 of 3).

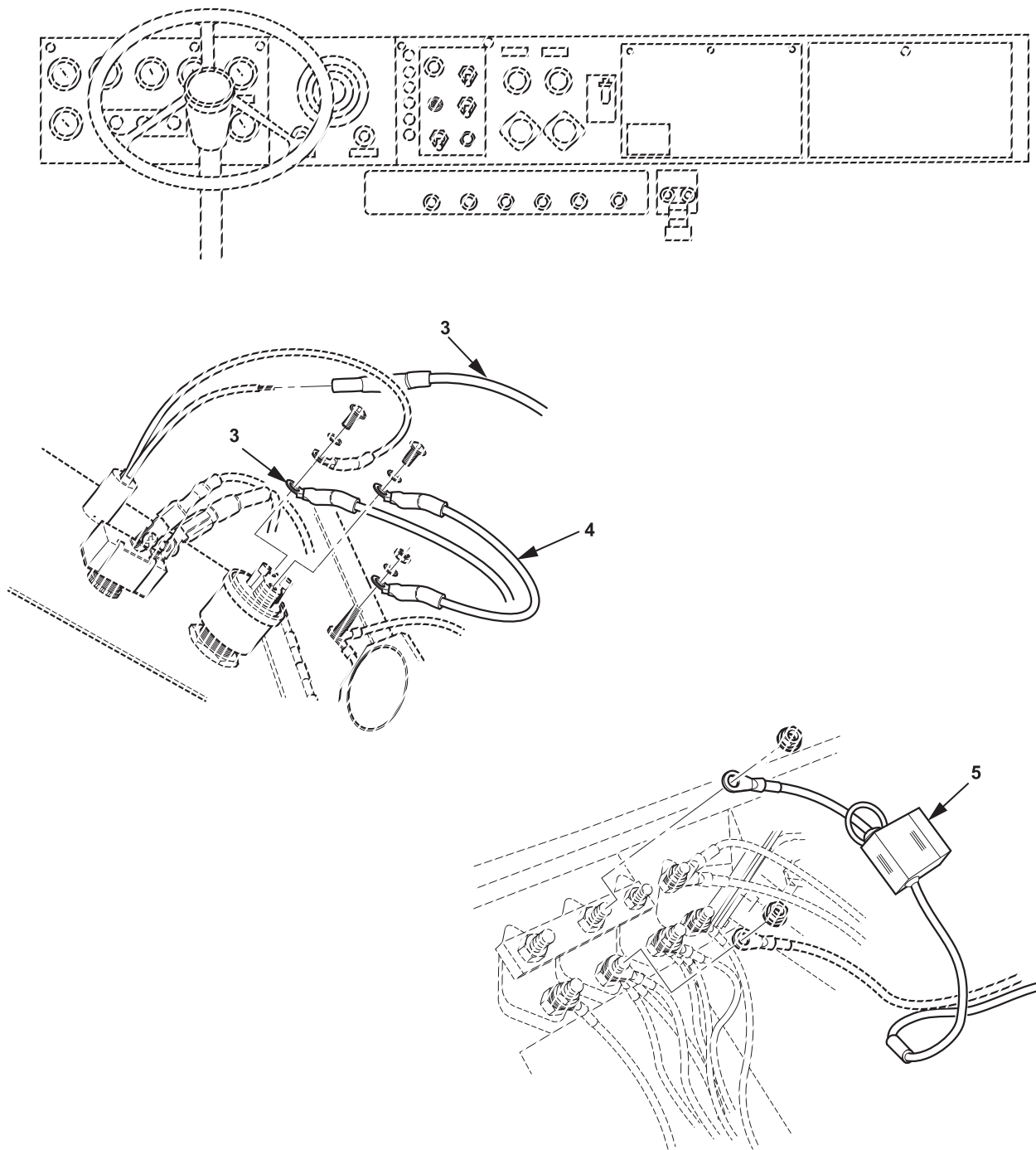


Figure 3. ECU Harness (Sheet 3 of 3).

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 0613 HULL OR CHASSIS WIRING HARNESS FIG. 3 ECU HARNESS ECU HARNESS	
1	PAFZZ	---	06YZ5	JG-55287-D 1	HARNESS,ECU	1
2	PAFZZ	5930-00-221-8992	13445	9095	SWITCH,PUSH HARNESS	1
3	PAFZZ	6145-00-845-5957	81343	J1128-GPT- 12-BLACK	WIRE,ELECTRICAL	2
4	PAFZZ	6145-00-845-5959	81343	GPT 12AWG BLUE	WIRE,ELECTRICAL	1
5	PAFZZ	---	6H404	28-21	FUSE HOLDER 12 GA. LEADS 30A MA	1
					END OF FIGURE	

FIELD MAINTENANCE
SPEED SENSOR AND MODULATOR HARNESSES

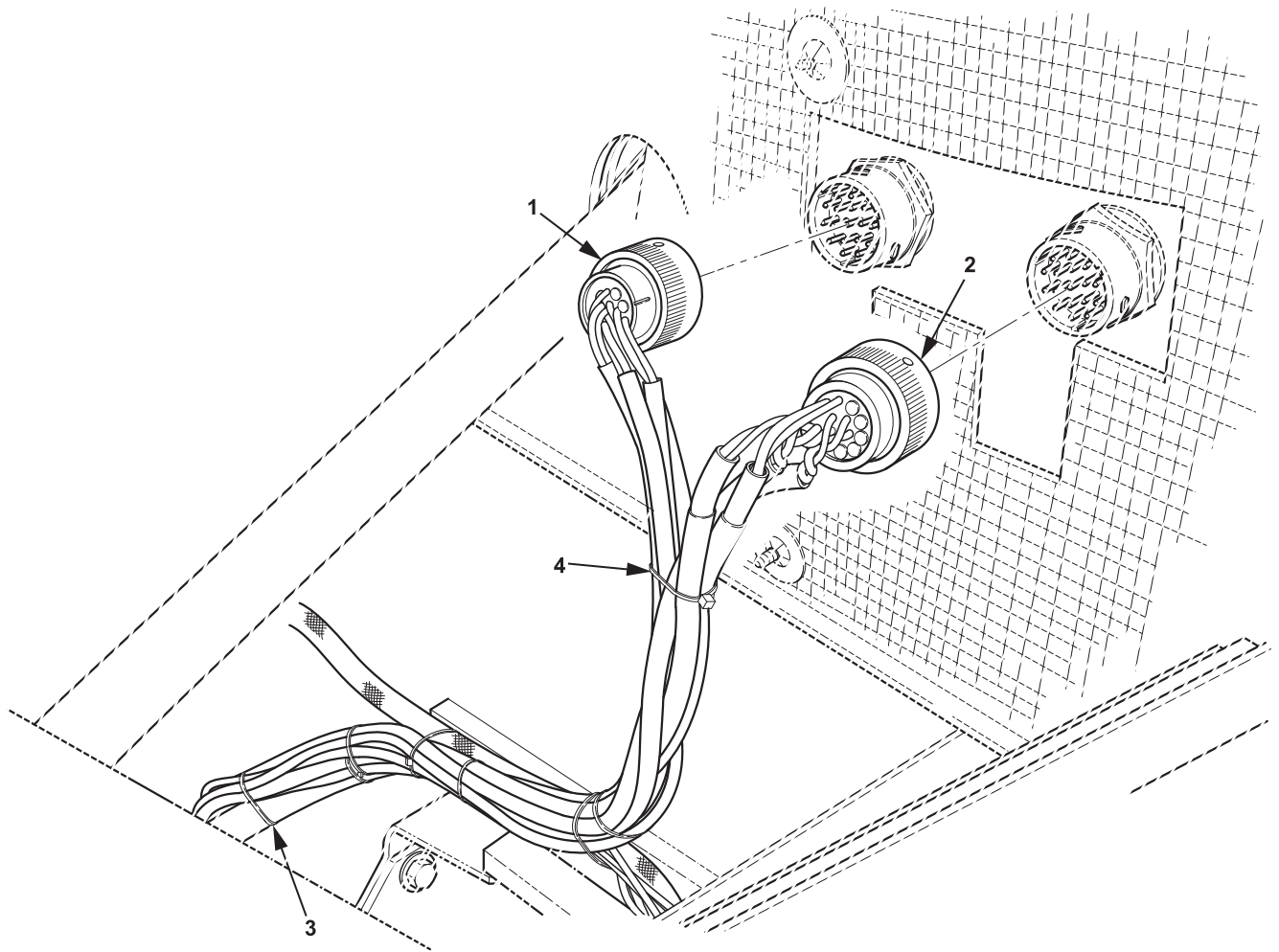
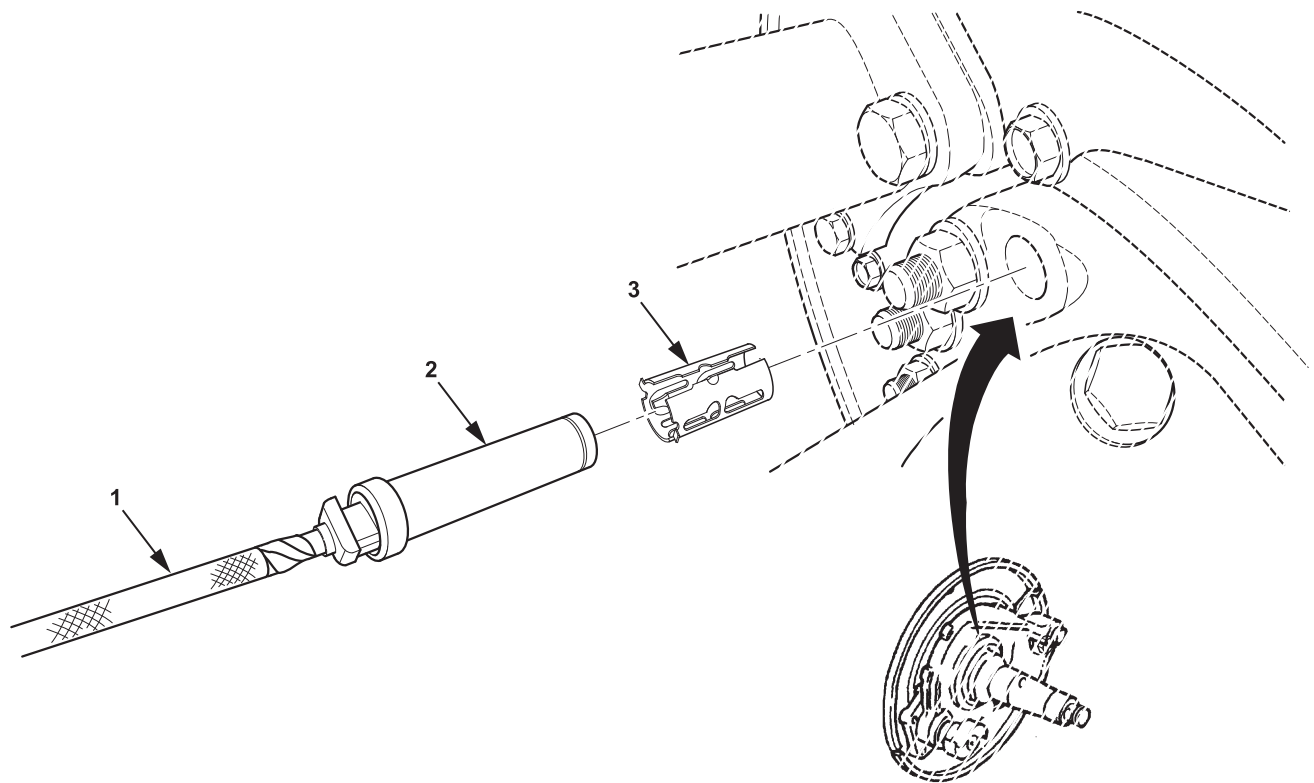


Figure 4. Speed Sensor and Modulator Harnesses.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 0613 HULL OR CHASSIS WIRING HARNESS FIG. 4 SPEED SENSOR AND MODULATOR HARNESSES SPEED SENSOR AND MODULATOR HARNESSES	
1	PAFZZ	---	06YZ5	JG-55287-D3	HARNESS,MODULATOR	1
2	PAFZZ	---	06YZ5	JG-55287-D2	HARNESS,SPEED SENSO	1
3	PAFZZ	---	6H404	W26681	STRAP,TIEDOWN,ELECT	75
4	PAFZZ	---	6H404	W26764	STRAP,TIEDOWN,ELECT	75

END OF FIGURE

FIELD MAINTENANCE
FRONT AND REAR WHEEL SENSORS



FRONT

Figure 5. Front and Rear Wheel Sensors (Sheet 1 of 2).

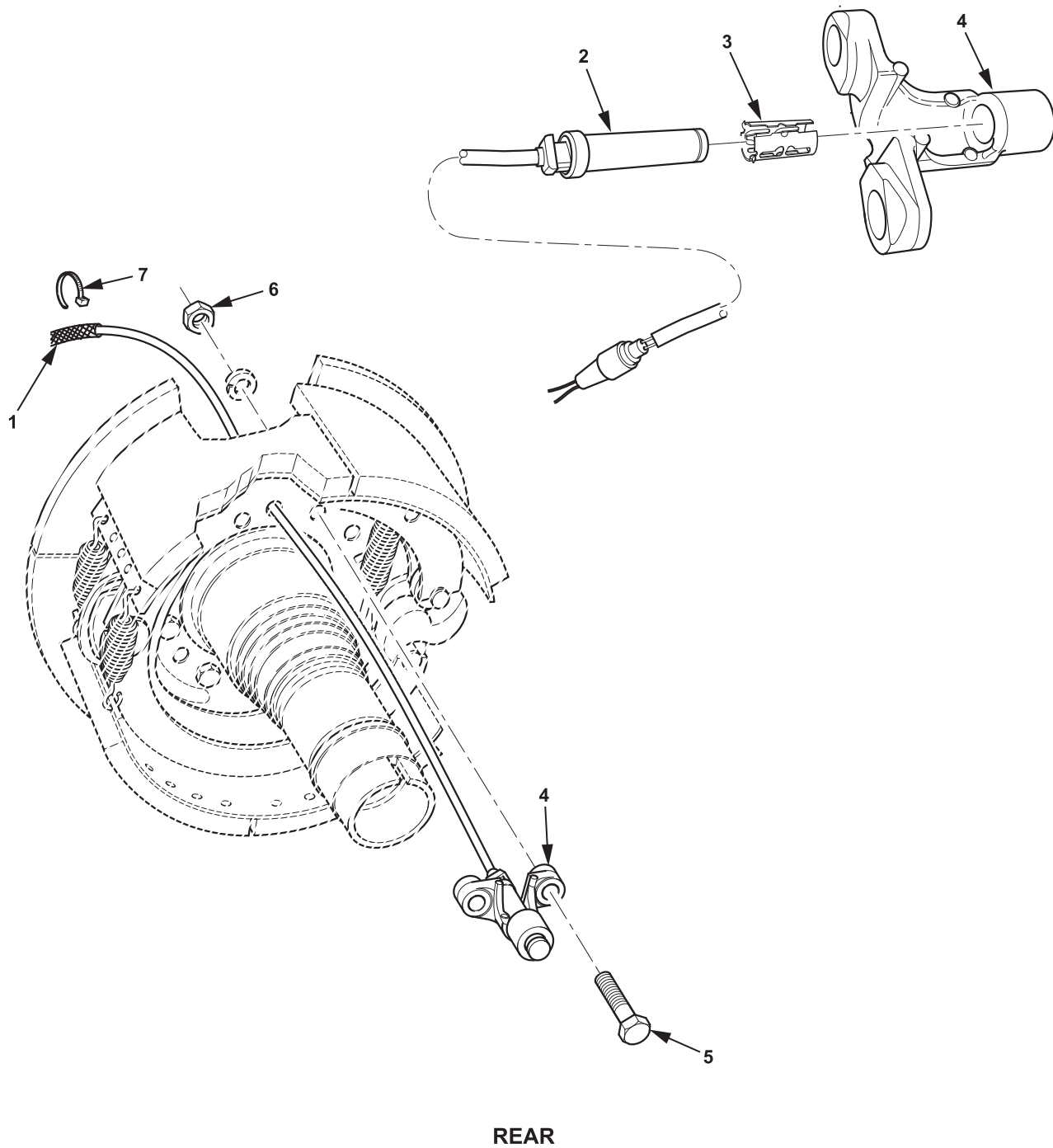


Figure 5. Front and Rear Wheel Sensors (Sheet 2 of 2).

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 1202 SERVICE BRAKES FIG. 5 FRONT AND REAR WHEEL SENSORS FRONT AND REAR WHEEL SENSORS	
1	PAFZZ	---	13345	PHM/5-023	SPLIT,LOOM	60
2	PAFZZ	2530-01-479-1954	06853	0801543	SENSOR,ANTI-LOCK BR	4
3	PAFZZ	---	13445	801534	CLAMP,SLEEVE	4
4	PAFZZ	2590-01-478-9451	64678	CM103620H	BRACKET,VEHICULAR C MOUNTING,REAR BRAKE SENSOR	2
5	PAFZZ	---	6H404	39-1024	SCREW,CAP,HEXAGON H 5/8X3.00	4
6	PAFZZ	5310-00-269-4040	81349	M45913/1- 10CG5C	NUT,SELF-LOCKING,HE 5/8-11	4
7	PAFZZ	5975-00-944-1499	96906	MS3368-1- 9A	STRAP,TIEDOWN,ELECT	AR
					END OF FIGURE	

FIELD MAINTENANCE
FRONT AND REAR MODULATORS

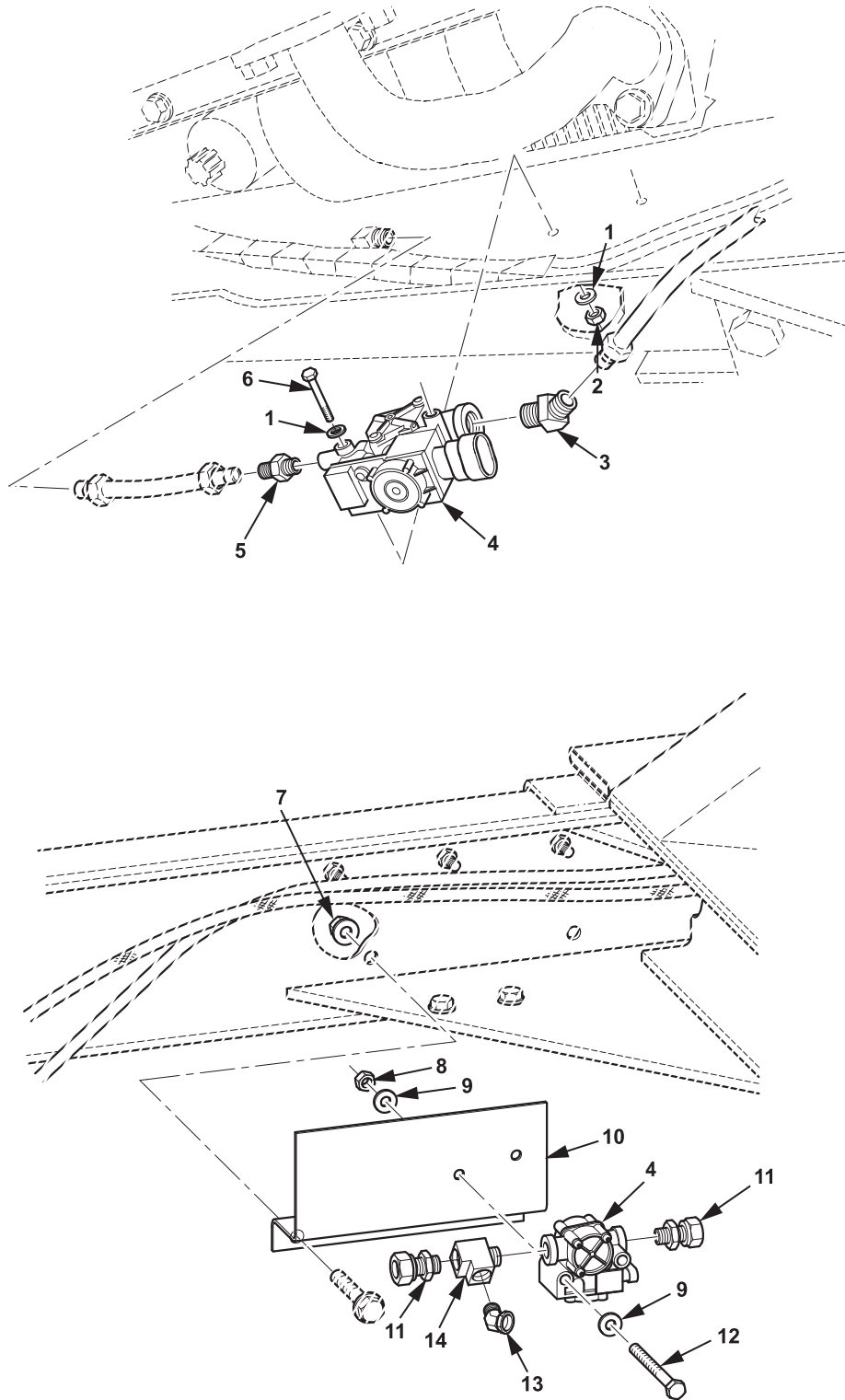


Figure 6. Front and Rear Modulators.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
GROUP 1208 AIR BRAKE SYSTEM FIG. 6 FRONT AND REAR MODULATORS FRONT AND REAR MODULATORS						
1	PAFZZ	---	6H404	37-3804	WASHER,FLAT	8
2	PAFZZ	---	6H404	34-3804	NUT,PLAIN,HEXAGON 1/4	4
3	PAFZZ	4730-01-079-3275	81343	8-8 100302 BA	ELBOW,PIPE TO TUBE	1
4	PAFZZ	4520-01-555-4997	06853	801481	AIR MOD VALVE MODULATOR	4
5	PAFZZ	4730-01-134-7759	81343	SAE J246 8 -8 100102B A	ADAPTER,STRAIGHT,PI 11/16 TUBE X 1/2 PIPE	2
6	PAFZZ	---	6H404	38-0428	SCREW,CAP,HEXAGON H 1/4X3.50	4
7	PAFZZ	---	6H404	32-3102	NUT,SELF-LOCKING 5/8-11FLANGED	4
8	PAFZZ	---	6H404	34-8705	NUT,SELF-LOCKING 5/16-18	4
9	PAFZZ	---	6H404	37-3805	WASHER,FLAT 5/16	8
10	PAFZZ	---	06YZ5	0010-020-1 9-33	MOUNT,MODULATOR,L.H	1
10	PAFZZ	---	06YZ5	0010-020-1 9-34	MOUNT,MODULATOR,R.H	1
11	PAFZZ	4730-01-196-7479	81343	SAE J246 1 0-8 100102 BA	ADAPTER,STRAIGHT,PI 7/8 TUBE X 1/2 PIPE	2
12	PAFZZ	---	6H404	38-0524	SCREW,CAP,HEXAGON H 5/16X3.00	4
13	PAFZZ	4730-01-096-0574	81343	10-8-10030 2BA	ELBOW,PIPE TO TUBE	2
14	PAFZZ	4730-01-095-2034	81343	J530 8-8-8 130424BA	TEE,PIPE	2
END OF FIGURE						

FIELD MAINTENANCE
QUICK RELEASE VALVE

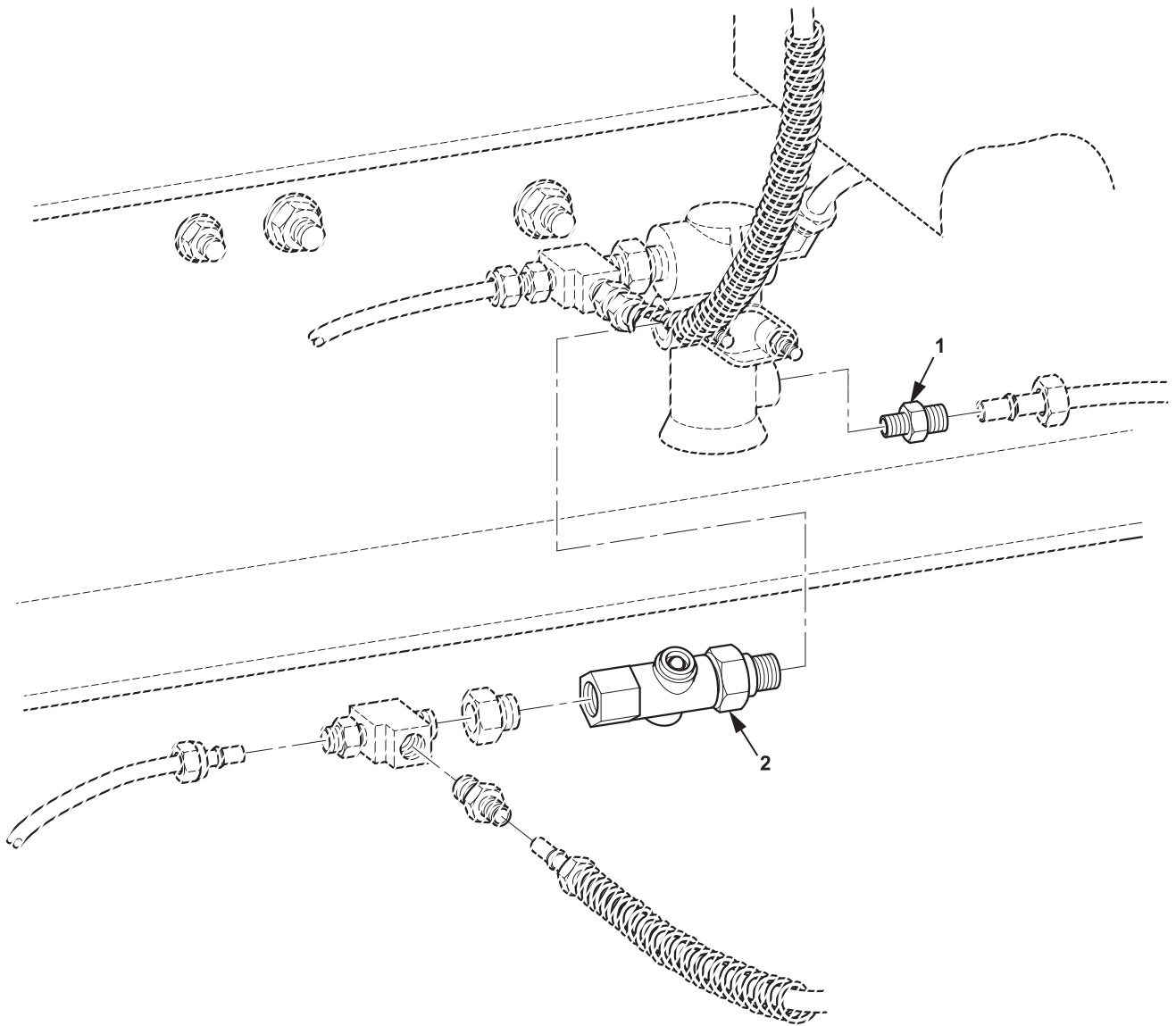


Figure 7. Quick Release Valve.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 1208 AIR BRAKE SYSTEM FIG. 7 QUICK RELEASE VALVE QUICK RELEASE VALVE	
1	PAFZZ	---	6H404	W1468X8	ADAPTER,STRAIGHT 1/2 TUBE X 3/8 PIPE	1
2	PAFZZ	2530-01-531-2330	06853	800333	VALVE,BRAKE PNEUMAT QUICK RELEASE	1

END OF FIGURE

FIELD MAINTENANCE
REAR-REAR AXLE SPRING BRAKE CHAMBER

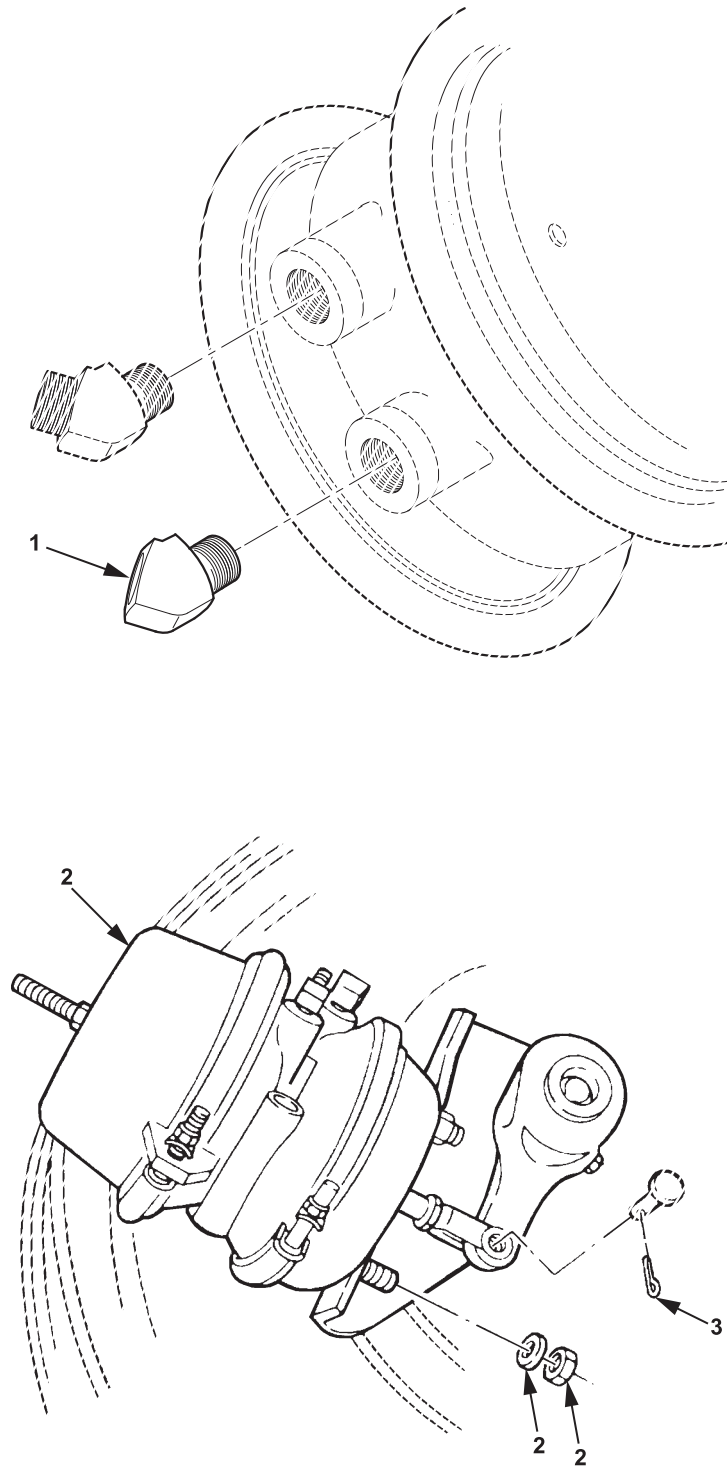


Figure 8. Rear-Rear Axle Spring Brake Chamber.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 1208 AIR BRAKE SYSTEM FIG. 8 REAR-REAR AXLE SPRING BRAKE CHAMBER REAR-REAR AXLE SPRING BRAKE CHAMBER	
1	PAFZZ	4730-00-277-8257	81343	SAE J530 6 -6 130339B	ELBOW,PIPE	4
2	PAFZZ	2530-01-083-2502	34623	ME207- 20055	BRAKE CHAMBER ASSEM	2
3	PAFZZ	5315-00-187-9549	80205	MS24665- 418	PIN,COTTER	2
					END OF FIGURE	

FIELD MAINTENANCE

FRONT AIR BLOCK

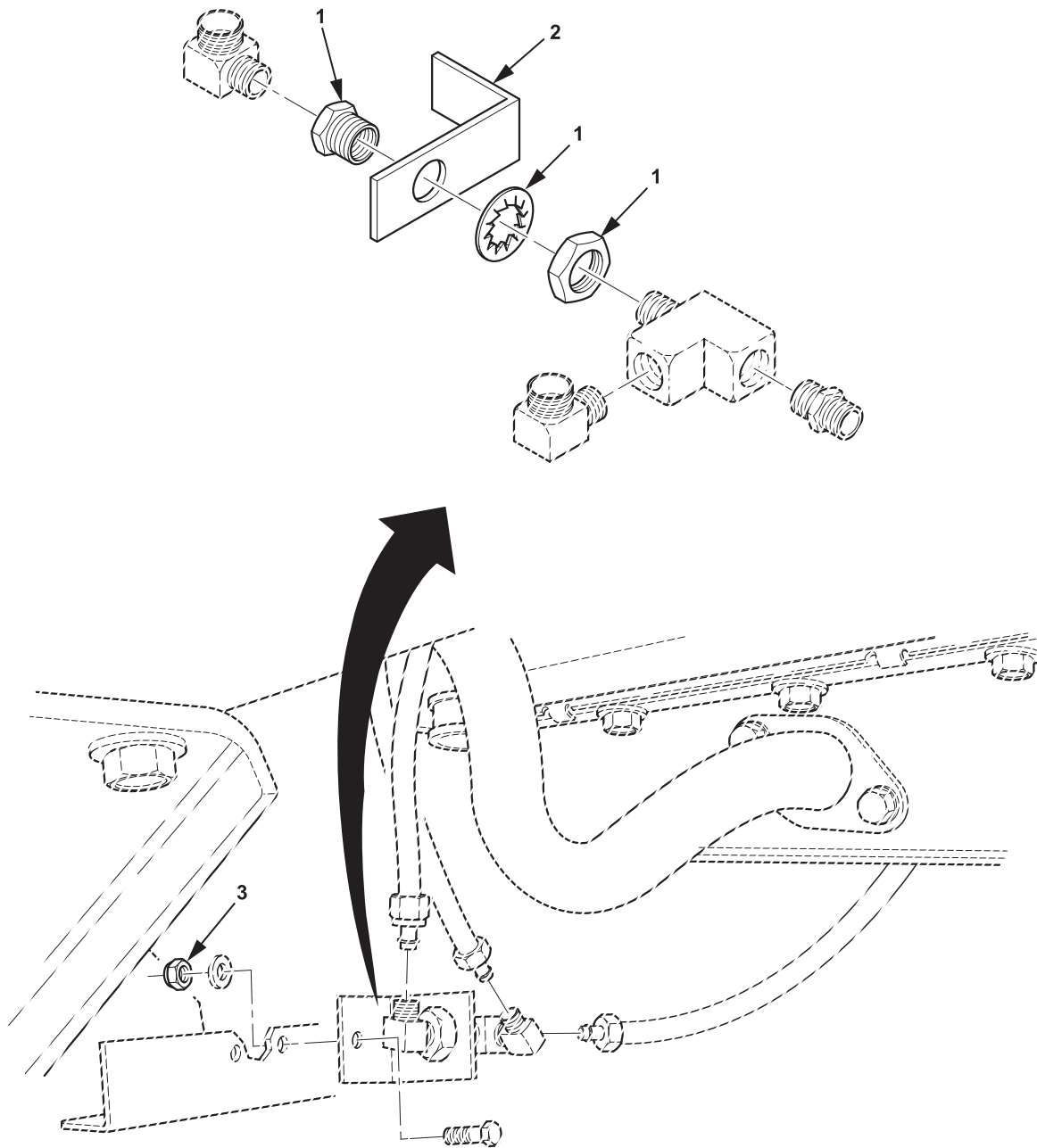


Figure 9. Front Air Block.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 1208 AIR BRAKE SYSTEM FIG. 9 FRONT AIR BLOCK FRONT AIR BLOCK	
1	PAFZZ	---	06721	HDX/11307	UNION,BULKHEAD 3/8	1
2	PAFZZ	---	06YZ5	001-020-19 -35	BRACKET,MOUNTING BULKHEAD FITTING,CROSSMEMBER	1
3	PAFZZ	5310-01-119-3668	24617	9422295	NUT,SELF-LOCKING,CO 5/16-18	1
					END OF FIGURE	

FIELD MAINTENANCE
MID-SECTION AIR BLOCKS

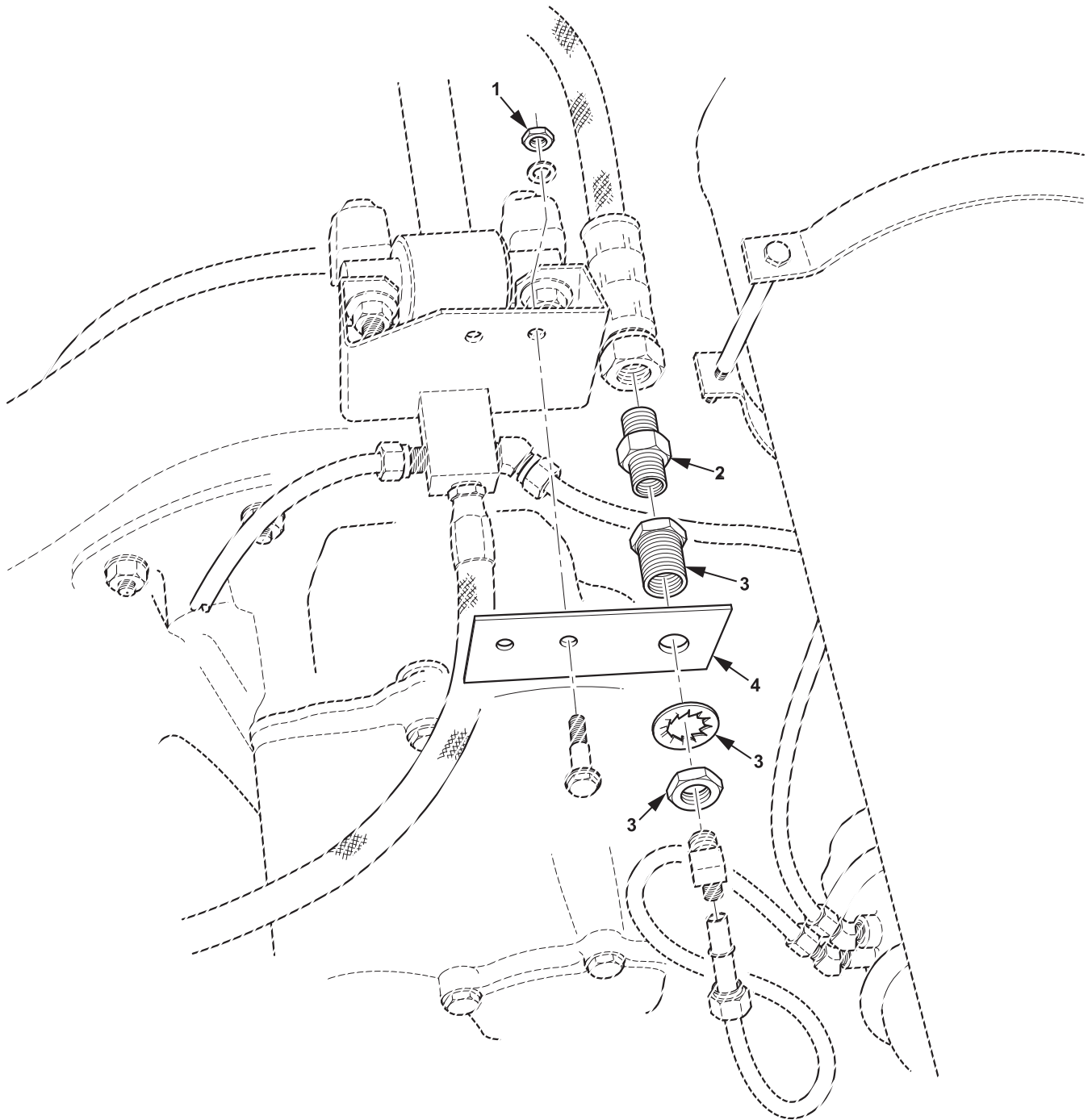


Figure 10. Mid-Section Air Blocks (Sheet 1 of 2).

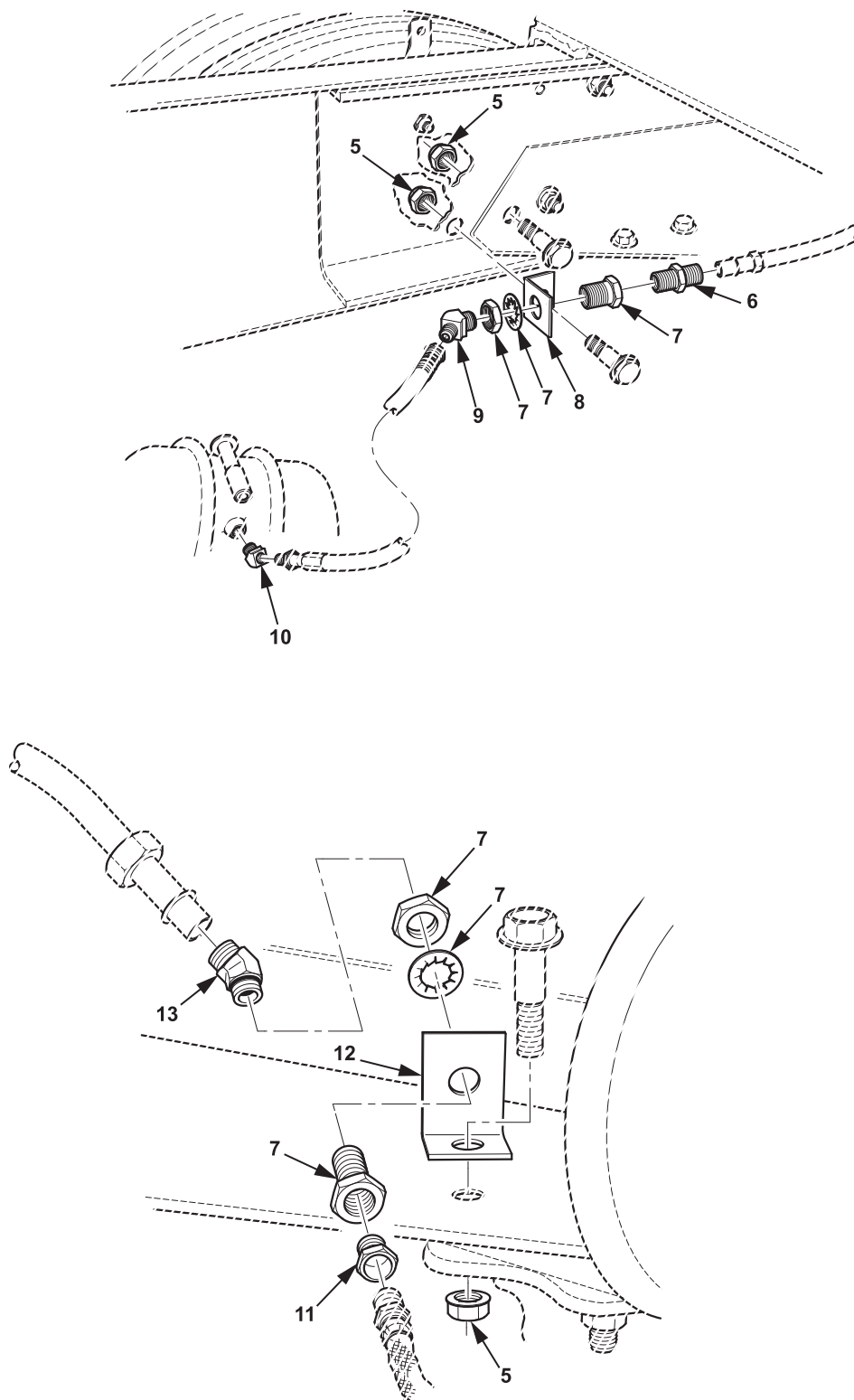


Figure 10. Mid-Section Air Blocks (Sheet 2 of 2).

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
GROUP 1208 AIR BRAKE SYSTEM FIG. 10 MID-SECTION AIR BLOCKS MID-SECTION AIR BLOCKS						
1	PAFZZ	5310-01-119-3668	24617	9422295	NUT,SELF-LOCKING,CO 5/16-18	1
2	PAFZZ	---	6H404	W48X8	ADAPTER,FLARED 3/8 PIPE	1
3	PAFZZ	---	06721	HDX/11307	UNION,BULKHEAD 3/8	1
4	PAFZZ	---	06YZ5	001-020-19-38	BRACKET,MOUNTING BULKHEAD FITTING FRONT AXLE HOUSE	1
5	PAFZZ	---	6H404	W323102	NUT,SELF-LOCKING,HE 5/8-11,FLANGED	3
6	PAFZZ	---	6H404	W1468X10	ADAPTER,STRAIGHT 5/8 TUBE X 1/2 PIPE	1
7	PAFZZ	---	6H404	PH/207ACBH-8	UNION,PIPE,1/2	2
8	PAFZZ	---	06YZ5	001-020-14-36	BRACKET,MOUNTING	1
9	PAFZZ	---	6H404	54X8X8	ELBOW,FLARED 1/2 TUBE X 1/2 PIPE	1
10	PAFZZ	---	6H404	W3350X6	ELBOW,45 DEGREE 3/8 PIPE	1
11	PAFZZ	---	6H404	W3220X8X6	BUSHING,REDUCER 1/2 PIPE X 3/8 PIPE	1
12	PAFZZ	---	06YZ5	001-020-19-37	BRACKET,MOUNTING BULKHEAD FITTING L.H.,FRONT AND R.H., REAR	1
13	PAFZZ	---	6H404	W1480X10	ELBOW,45 DEGREE 3/8 PIPE X 1/2 TUBE	1

END OF FIGURE

FIELD MAINTENANCE
REAR AIR BLOCKS

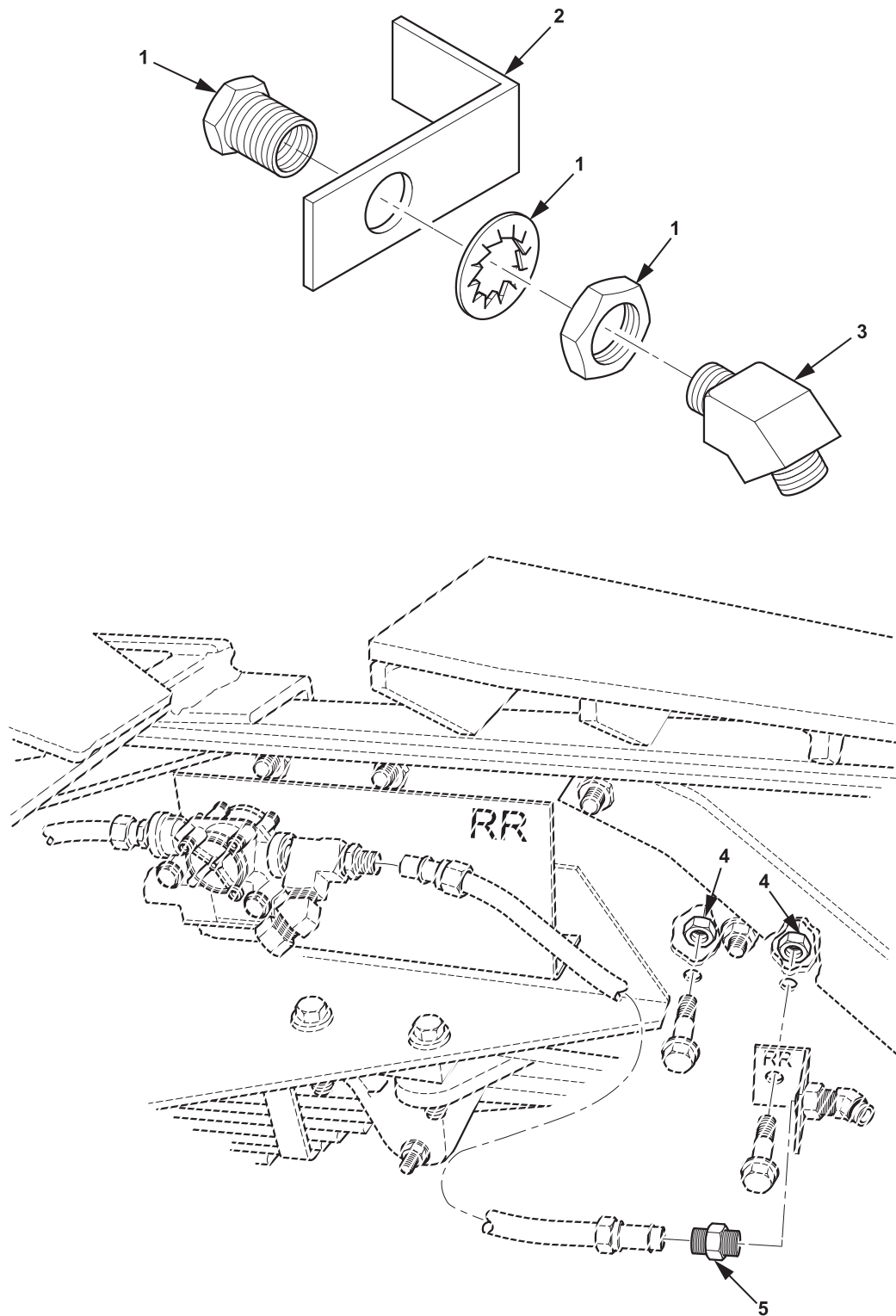


Figure 11. Rear Air Blocks (Sheet 1 of 2).

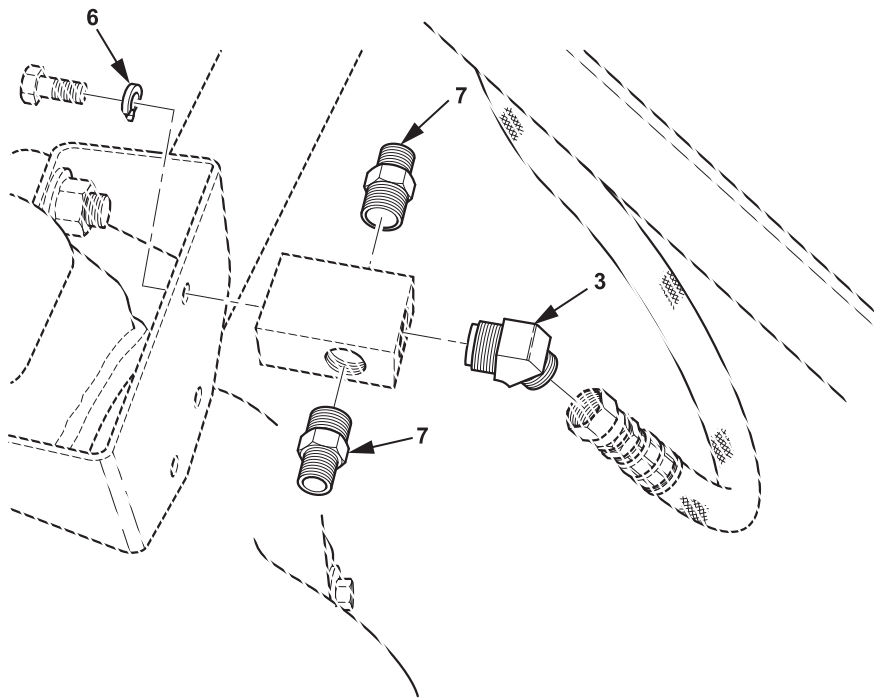
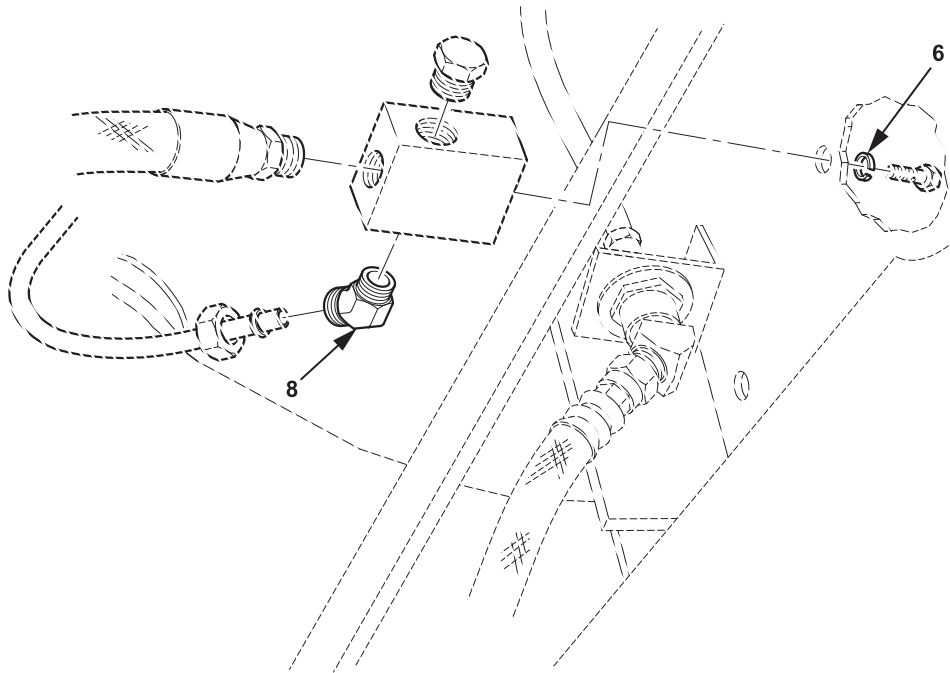


Figure 11. Rear Air Blocks (Sheet 2 of 2).

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
GROUP 1208 AIR BRAKE SYSTEM FIG. 11 REAR AIR BLOCKS REAR AIR BLOCKS						
1	PAFZZ	---	6H404	PH/207ACBH-8	UNION,PIPE,1/2	2
2	PAFZZ	---	06YZ5	001-020-19-36	BRACKET,MOUNTING BULKHEAD FITTING R.H.,FRONT AND L.H., REAR	2
2	PAFZZ	---	06YZ5	001-020-19-37	BRACKET,MOUNTING BULKHEAD FITTING L.H.,FRONT AND R.H., REAR	1
3	PAFZZ	---	6H404	54X8X8	ELBOW,FLARED 1/2,45 DEGREE RT	3
4	PAFZZ	---	6H404	W323102	NUT,SELF-LOCKING,HE 5/8-11,FLANGED	4
5	PAFZZ	---	6H404	W1468X10	ADAPTER,STRAIGHT 5/8 TUBE X 1/2 PIPE	1
6	PAFZZ	5310-01-097-9417	24617	9419871	WASHER,LOCK 3/8	2
7	PAFZZ	---	6H404	W1468X8	ADAPTER,STRAIGHT 1/2 TUBE X 3/8 PIPE	2
8	PAFZZ	---	6H404	W1480X8	ELBOW 45 DEGREE 3/8 PIPE X 1/2 TUBE	1

END OF FIGURE

FIELD MAINTENANCE
FRONT MODULATOR AIR LINES AND FITTINGS

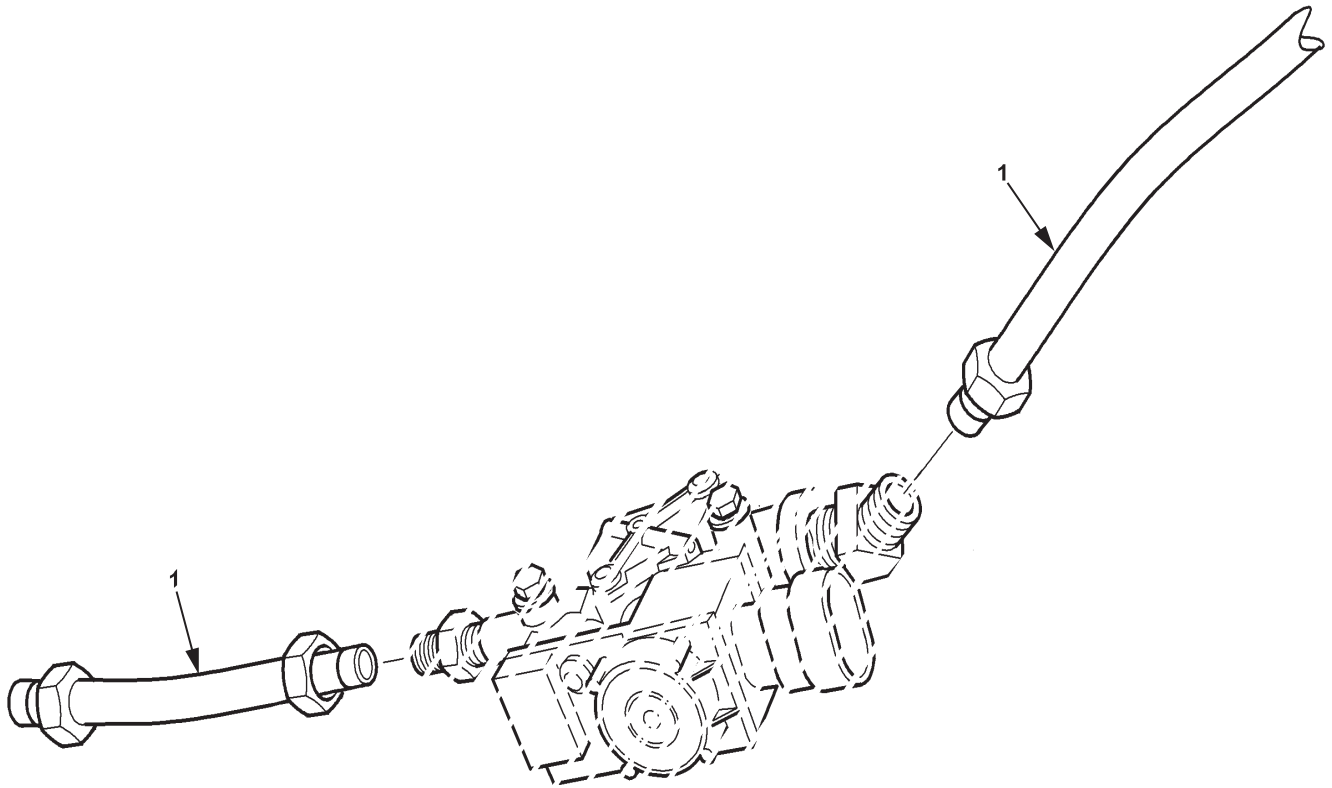


Figure 12. Front Modulator Air Lines and Fittings.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 1208 AIR BRAKE SYSTEM FIG. 12 FRONT MODULATOR AIR LINES AND FITTINGS FRONT MODULATOR AIR LINES AND FITTINGS	
1	PAFZZ	---	34623	M/357- 20075	TUBE, NONMETALLIC R.H. AND L.H., 4.5 INCHES	2
					END OF FIGURE	

FIELD MAINTENANCE
REAR MODULATOR AIR LINES AND FITTINGS

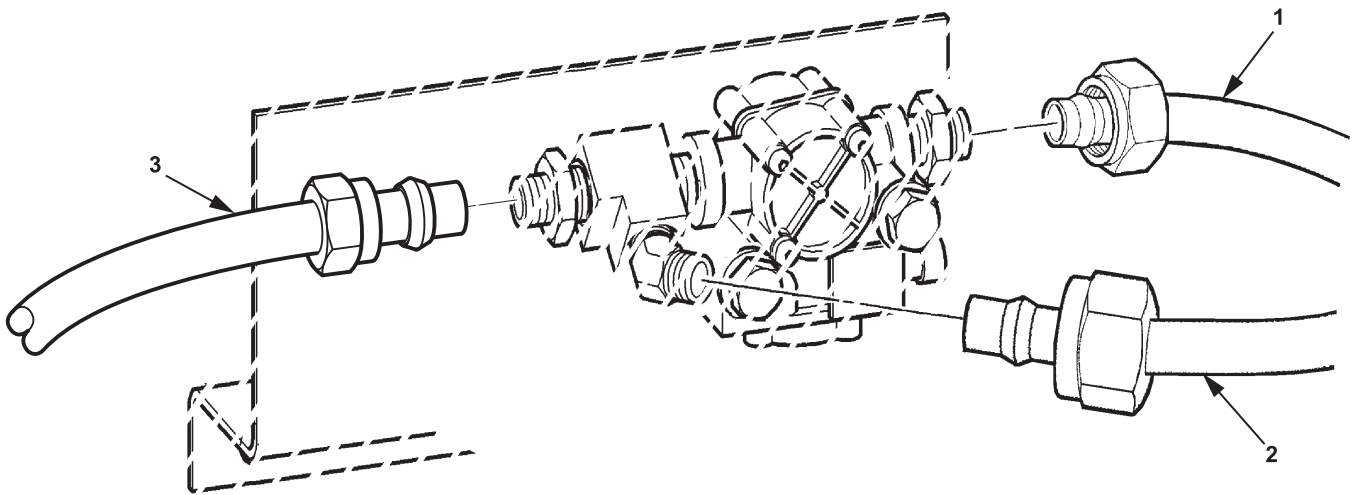


Figure 13. Rear Modulator Air Lines and Fittings.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
GROUP 1208 AIR BRAKE SYSTEM FIG. 13 REAR MODULATOR AIR LINES AND FITTINGS REAR MODULATOR AIR LINES AND FITTINGS						
1	MFFZZ	---	53248	PH/PFT-10B GRN100-45	TUBE, NONMETALLIC MAKE FROM P/N PH/PFT-10BGRN100, CAGE 53248, APPROX 45 INCHES LONG, RELAY VALVE TO LEFT MODULATOR	1
1	MFFZZ	---	53428	PH/PFT-10B GRN100-29. 5	TUBE, NONMETALLIC MAKE FROM P/N PH/PFT-10BGRN100, CAGE 53248, APPROX 29.5 INCHES LONG, RELAY VALVE TO RIGHT MODULATOR	1
2	MFFZZ	---	53248	PH/PFT-10B GRN100-48	TUBE, NONMETALLIC MAKE FROM P/N PH/PFT-10BGRN100, CAGE 53248, APPROX 48 INCHES LONG, R.H., REAR MODULATOR TO R.H., FRONT BULKHEAD FITTING	1
2	MFFZZ	---	53248	PH/PFT-10B GRN100-24	TUBE, NONMETALLIC MAKE FROM P/N PH/PFT-10BGRN100, CAGE 53248, APPROX 24 INCHES LONG, L.H., REAR MODULATOR TO L.H., FRONT BULKHEAD FITTING	1
3	MFFZZ	---	53248	PH/PFT-10B GRN100-12	TUBE, NONMETALLIC MAKE FROM P/N PH/PFT-10BGRN100, CAGE 53248, APPROX 12 INCHES LONG, REAR MODULATOR TO BULKHEAD FITTING R.H., L.H.	2

END OF FIGURE

FIELD MAINTENANCE
TREADLE VALVE AIR LINES AND FITTINGS

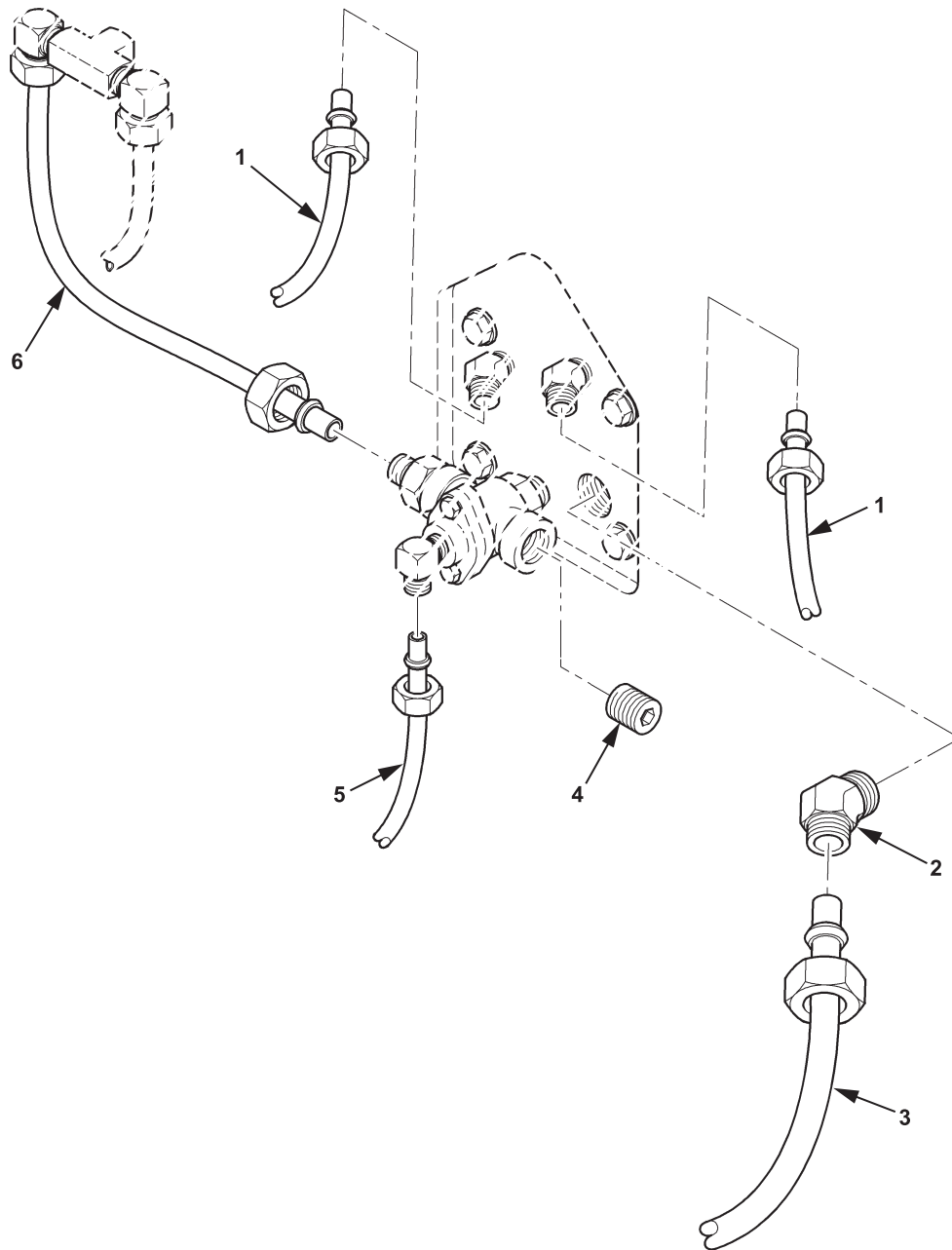


Figure 14. Treadle Valve Air Lines and Fittings.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 1208 AIR BRAKE SYSTEM FIG. 14 TREADLE VALVE AIR LINES AND FITTINGS TREADLE VALVE AIR LINES AND FITTINGS	
1	PAFZZ	---	34623	5571162	TUBE, NONMETALLIC	2
2	PAFZZ	---	6H404	W3350X12	ELBOW, 45 DEGREE, 3/8	1
3	MFFZZ	---	53248	PH/PFT-10B GRN100- 168	TUBE, NONMETALLIC MAKE FROM P/N PH/PFT-10BGRN100, CAGE 53248, APPROX 168 INCHES LONG, REAR AIR TANK TO FOOT VALVE	1
4	PAFZZ	---	6H404	3155X2	PLUG, PIPE, MALE 1/8	1
5	PAFZZ	---	34623	5571164	TUBE, NONMETALLIC	1
6	PAFZZ	---	34623	M/357- 20069	TUBE, NONMETALLIC	1
					END OF FIGURE	

FIELD MAINTENANCE
PRIMARY RESERVOIR AIR LINES AND FITTINGS

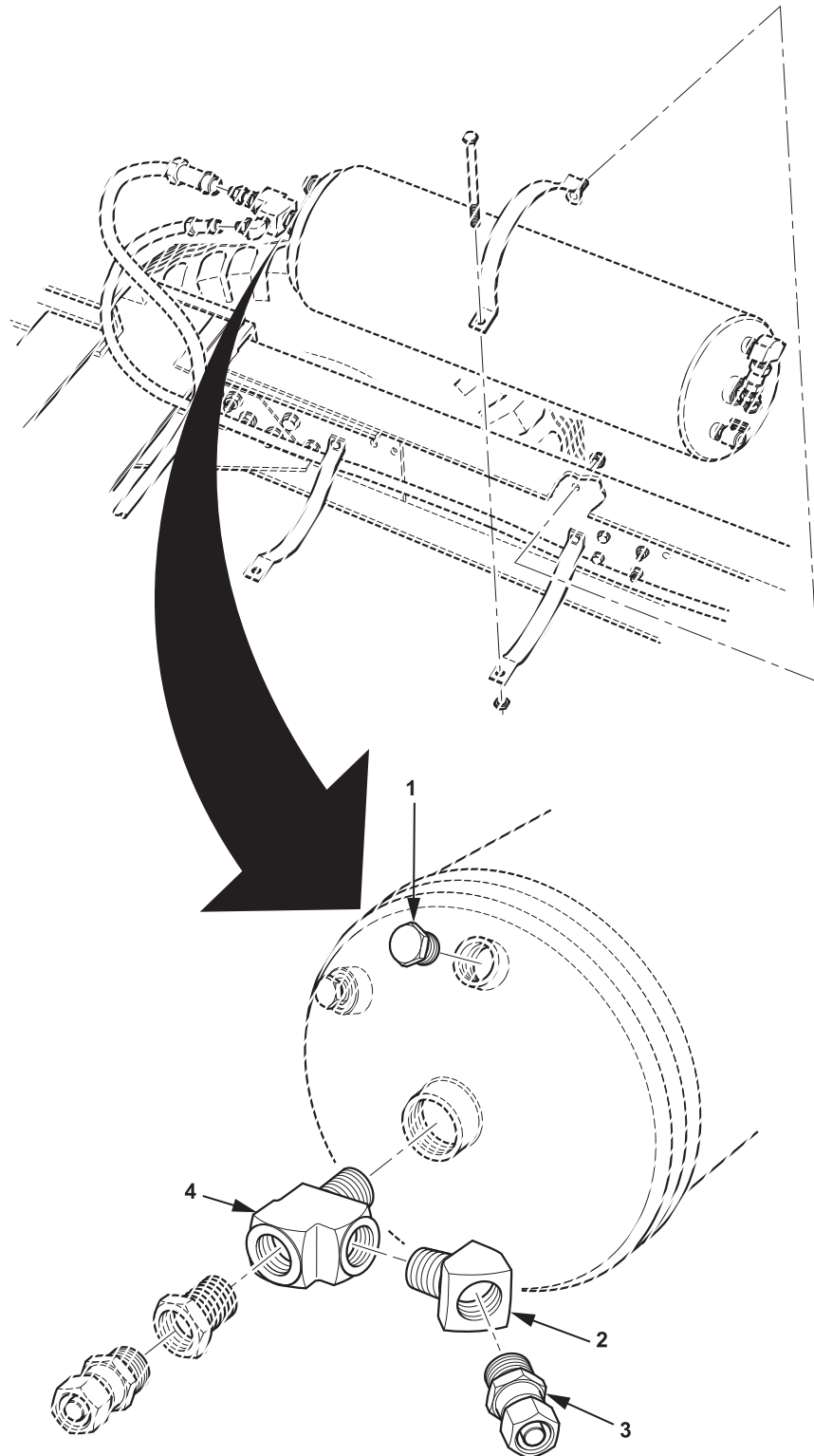


Figure 15. Primary Reservoir Air Lines and Fittings.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 1208 AIR BRAKE SYSTEM FIG. 15 PRIMARY RESERVOIR AIR LINES AND FITTINGS PRIMARY RESERVOIR AIR LINES AND FITTINGS	
1	PAFZZ	---	6H404	W3152X6	PLUG,PIPE,3/8	1
2	PAFZZ	---	6H404	W3350X12	ELBOW,45 DEGREE,3/8	1
3	PAFZZ	---	6H404	W1468X10X1 2	ADAPTER,STRAIGHT 3/4 PIPE X 5/8 TUBE	1
4	PAFZZ	---	6H404	W3750X12	TEE,STRAIGHT 3/4 PIPE	1

END OF FIGURE

FIELD MAINTENANCE
RELAY VALVE AIR LINES AND FITTINGS

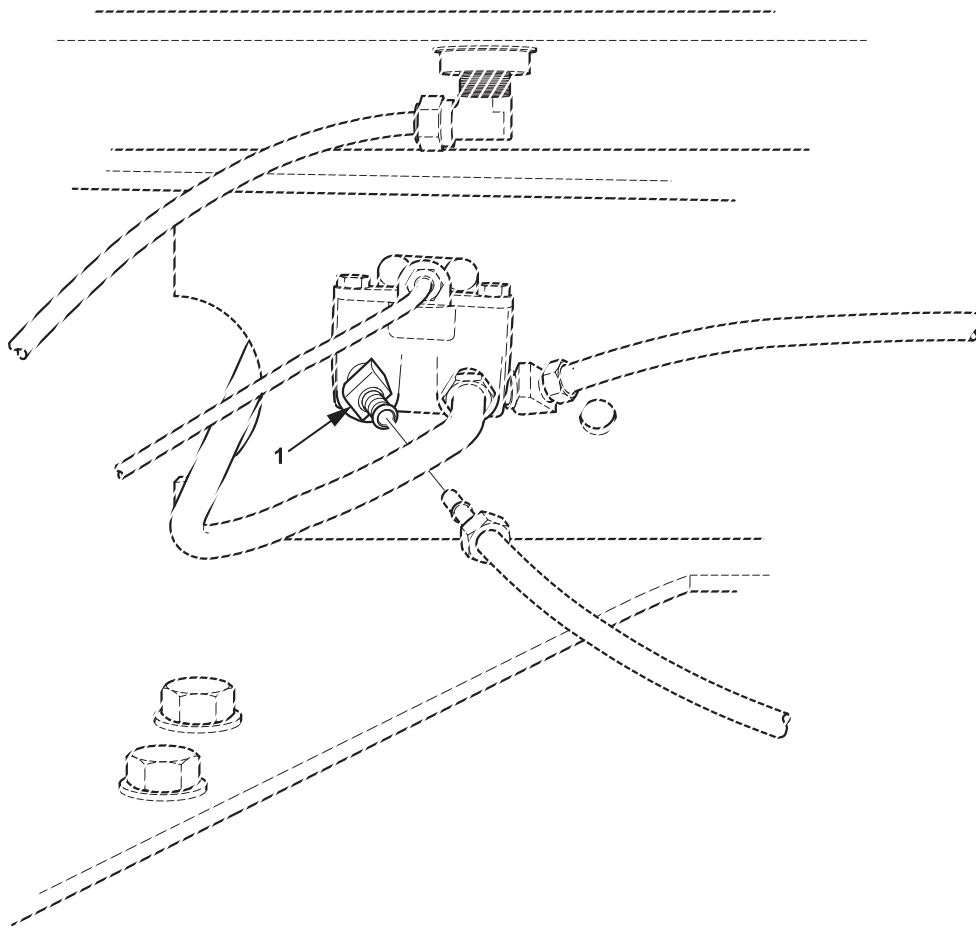


Figure 16. Relay Valve Air Lines and Fittings.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 1208 AIR BRAKE SYSTEM FIG. 16 RELAY VALVE AIR LINES AND FITTINGS RELAY VALVE AIR LINES AND FITTINGS	
1	PAFZZ	---	6H404	W1480X10	ELBOW,45 DEGREE 3/8 PIPE X 1/2 TUBE	1
					END OF FIGURE	

FIELD MAINTENANCE
FRONT HUB, TONE RING, AND DRUM

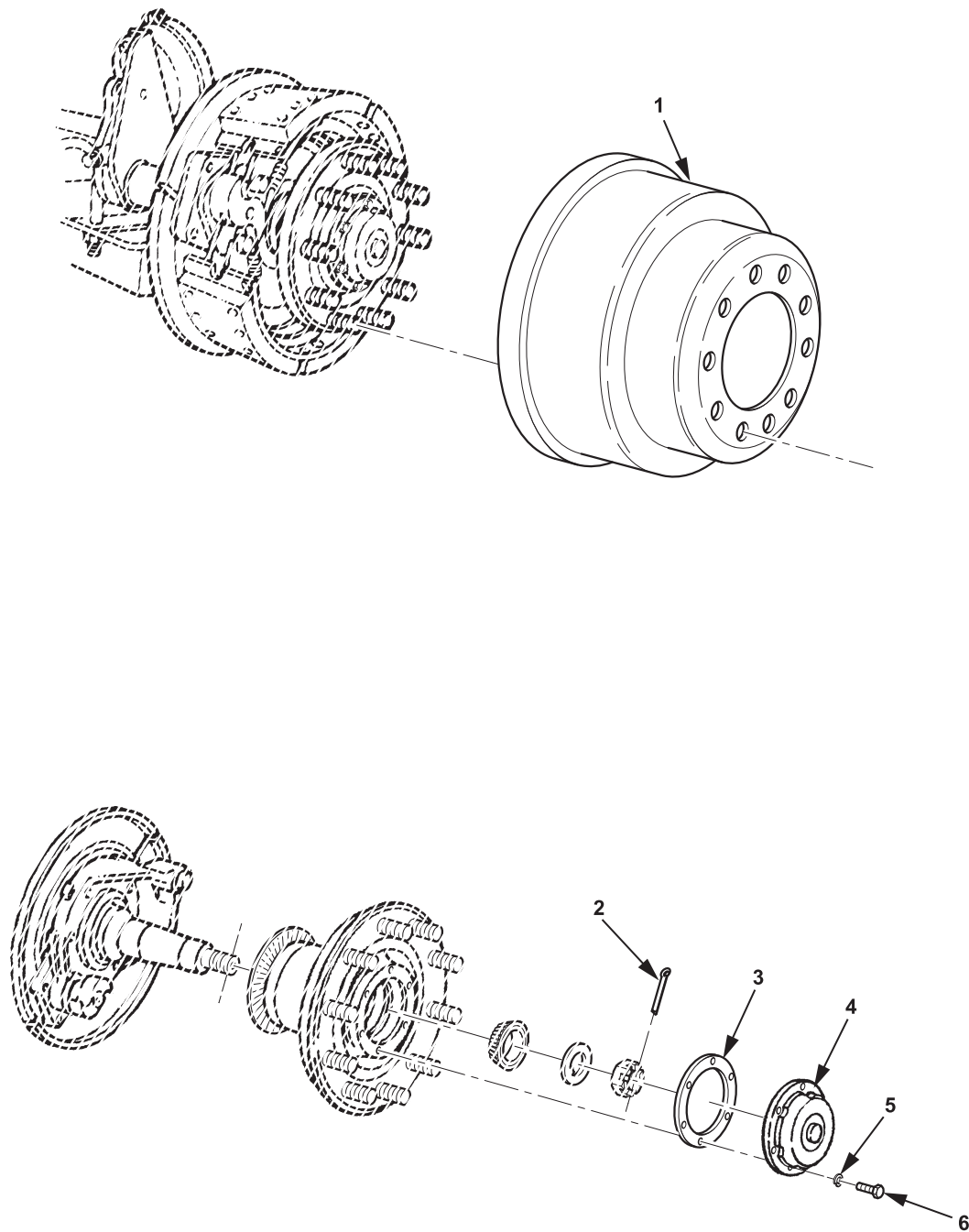


Figure 17. Front Hub, Tone Ring, and Drum (Sheet 1 of 2).

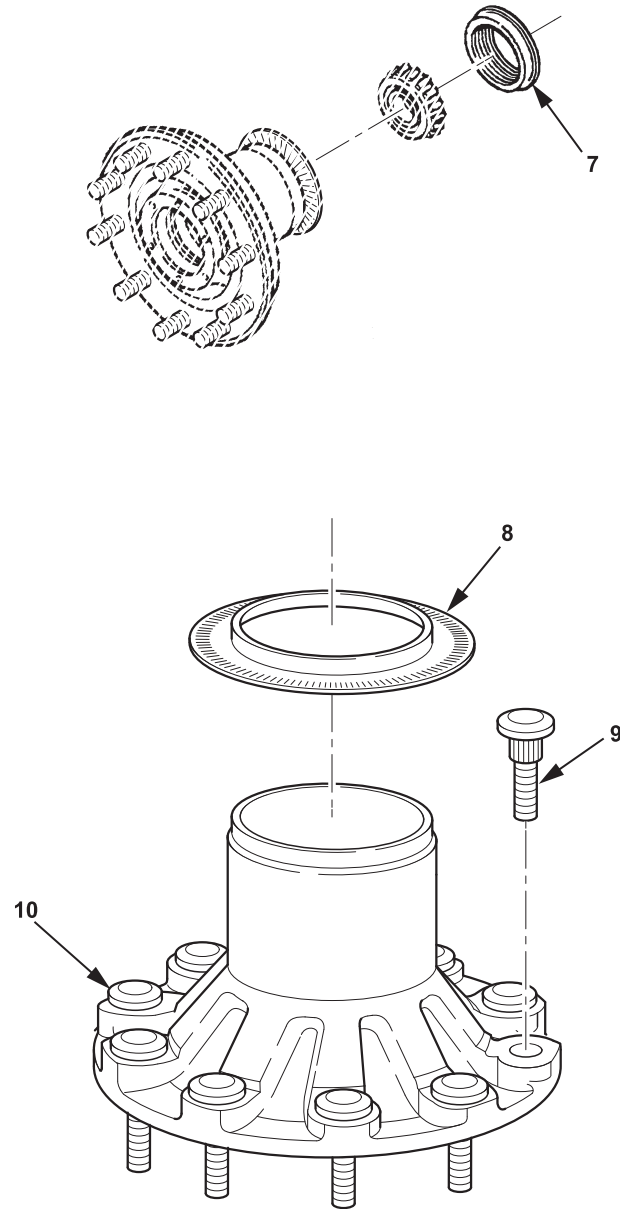


Figure 17. Front Hub, Tone Ring, and Drum (Sheet 2 of 2).

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 1311 WHEEL ASSEMBLY FIG. 17 FRONT HUB, TONE RING, AND DRUM FRONT HUB, TONE RING, AND DRUM	
1	PAFZZ	---	73972	GUN/W3710X	DRUM,FRONT	2
2	PAFZZ	5315-00-187-9549	80205	MS24665-41 8	PIN,COTTER	2
3	PAFZZ	5330-01-071-8179	45152	3310558	GASKET	2
4	PAFZZ	2530-01-424-0396	80201	1711	HUB CAP,WHEEL FRONT	2
5	PAFZZ	5310-00-407-9566	80205	MS35338-45	WASHER,LOCK 5/16	12
6	PAFZZ	---	6H404	W380506	BOLTS,HUB CAP,FRONT 5/16-18X0.75	12
7	PAFZZ	5330-01-149-9677	80201	35066	SEAL,PLAIN ENCASED FRONT	2
8	PAFZZ	---	73972	GUN/W1438	RING,EXCITER	2
9	PAFZZ	---	73972	GUN/W1090L	STUD,L.H.,FRONT	10
9	PAFZZ	---	73972	GUN/W1090R	STUD,R.H.,FRONT	10
10	PAFZZ	2530-01-159-3022	73972	HF801K	HUB AND CAP FRONT	2
END OF FIGURE						

FIELD MAINTENANCE
REAR HUB, TONE RING, AND DRUM

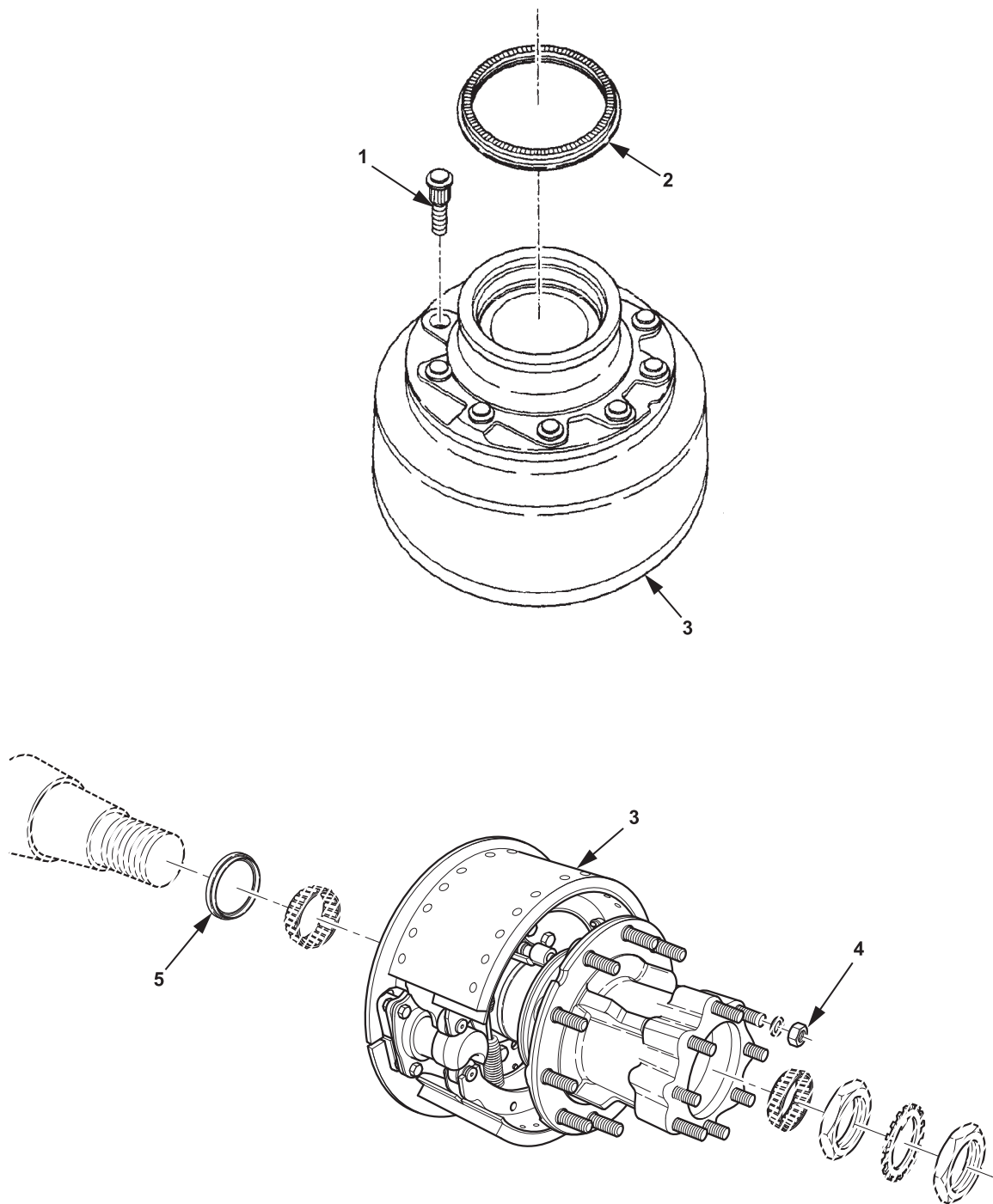


Figure 18. Rear Hub, Tone Ring, and Drum.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 1311 WHEEL ASSEMBLY FIG. 18 REAR HUB, TONE RING, AND DRUM REAR HUB, TONE RING, AND DRUM	
1	PAFZZ	---	73972	GUN/W1322L	STUD,L.H.,REAR	10
1	PAFZZ	---	73972	GUN/W1322R	STUD,R.H.,REAR	10
2	PAFZZ	---	73972	GUN/W1438	RING,EXCITER	2
3	PAFZZ	---	73972	GUN/HR936K	WHEEL HUB REAR	2
4	PAFZZ	5310-00-241-6664	9606	M45913/3-10FG8C	NUT,SELF-LOCKING,HE 5/8-18	18
5	PAFZZ	5330-01-117-1014	01212	B370003BGR	SEAL,PLAIN ENCASED REAR	2

END OF FIGURE

FIELD MAINTENANCE
TAIL LIGHT AND REAR BLACKOUT LIGHT BRACKETS

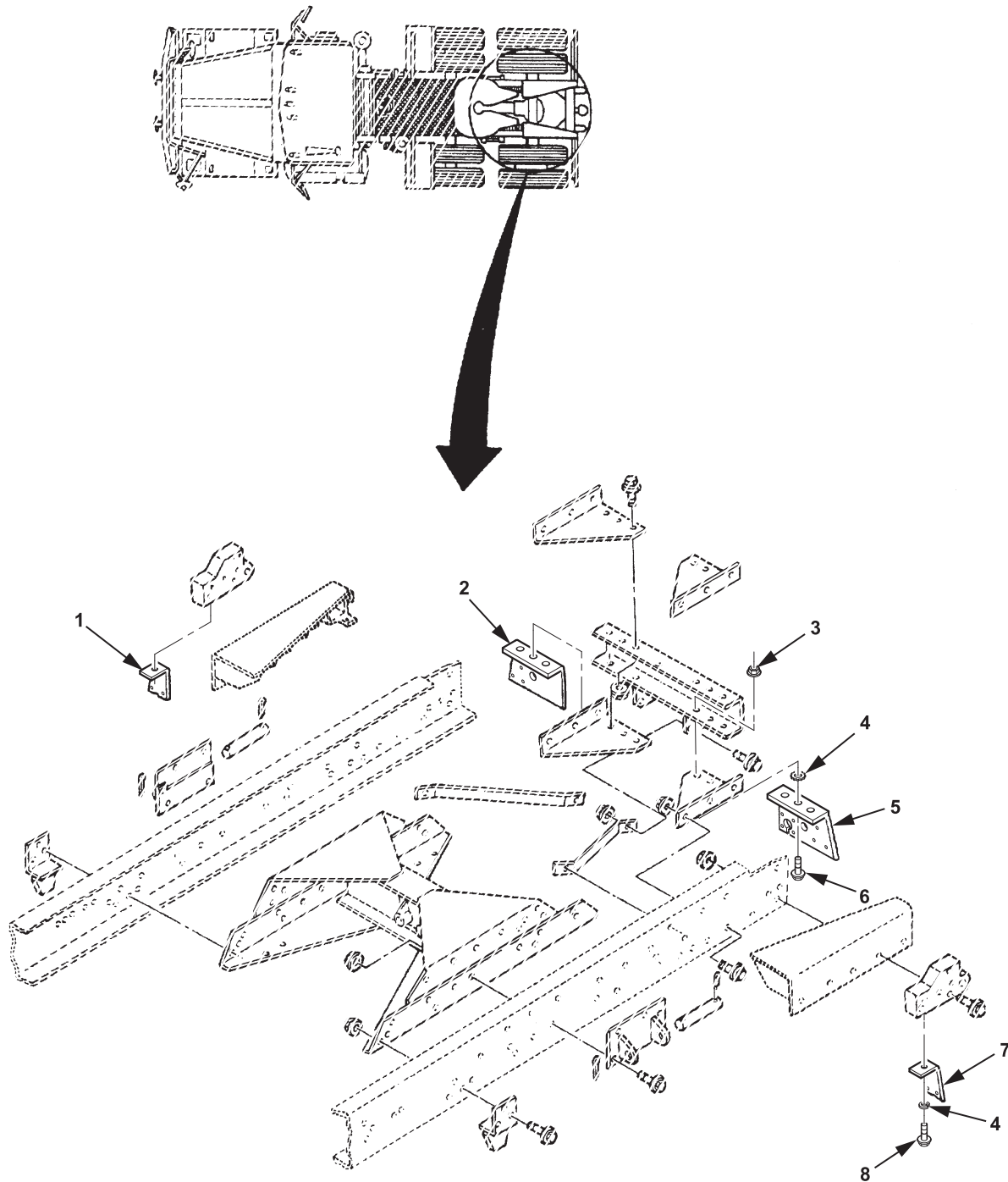


Figure 19. Tail Light and Rear Blackout Light Brackets.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 1501 FRAME ASSEMBLY FIG. 19 TAIL LIGHT AND REAR BLACKOUT LIGHT BRACKETS TAIL LIGHT AND REAR BLACKOUT LIGHT BRACKETS	
1	PAFZZ	---	06YZ5	001-020-19-30	BRACKET,MOUNTING R.H., BLACKOUT LIGHT	1
2	PAFZZ	---	06YZ5	001-020-19-32	BRACKET,MOUNTING R.H., TAIL LIGHT	1
3	PAFZZ	5310-01-085-8176	19207	12448437-5	NUT,PLAIN,EXTENDED 5/8-11	3
4	PAFZZ	5310-00-261-7340	24617	103321	WASHER,LOCK 3/8	3
5	PAFZZ	---	06YZ5	001-020-19-31	BRACKET,MOUNTING L.H., TAILLIGHT	1
6	PAFZZ	5305-01-149-1939	34623	M/25-20012	SCREW,CAP,HEXAGON H	3
7	PAFZZ	---	06YZ5	001-020-19-29	BRACKET,MOUNTING L.H., BLACKOUT MOUNT	1
8	PAFZZ	5305-01-104-4846	24617	9427321	SCREW,CAP,HEXAGON H 3/8-16X1.00	1
					END OF FIGURE	

FIELD MAINTENANCE

BULK ITEMS

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					GROUP 9501 HARDWARE SUPPLIES AND BULK MATERIEL, COMMON FIG. BULK ITEMS BULK ITEMS	
1	PAFZZ	---	53248	PH/PFT-10B GRN100	TUBE, NONMETALLIC	1
					END OF FIGURE	

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM	STOCK NUMBER	FIG.	ITEM
5315-00-187-9549	8	3	2590-01-478-9451	5	4
	17	2	2530-01-479-1954	5	2
5310-00-198-6691	5	6	2530-01-531-2330	7	2
	18	4	4520-01-555-4997	6	4
5930-00-221-8992	1	2			
	3	2			
5310-00-261-7340	19	4			
4730-00-277-8257	8	1			
5310-00-407-9566	17	5			
6145-00-845-5957	3	3			
6145-00-845-5959	3	4			
5975-00-944-1499	5	7			
5330-01-071-8179	17	3			
4730-01-079-3275	6	3			
2530-01-083-2502	8	2			
5310-01-085-8176	19	3			
4730-01-095-2034	6	14			
4730-01-096-0574	6	13			
5310-01-097-9417	11	6			
5305-01-104-4846	19	8			
5330-01-117-1014	18	5			
5310-01-119-3668	9	3			
	10	1			
4730-01-134-7759	6	5			
5305-01-149-1939	19	6			
5330-01-149-9677	17	7			
2530-01-159-3022	17	10			
4730-01-196-7479	6	11			
2530-01-424-0396	17	4			

PART NUMBER INDEX

Part Number	FIG.	ITEM	Part Number	FIG.	ITEM
001-020-14-36	10	8	38-0524	6	12
001-020-19-29	19	7	39-1024	5	5
001-020-19-30	19	1	44-6008	2	1
001-020-19-31	19	5	54X8X8	10	9
001-020-19-32	19	2		11	3
001-020-19-35	9	2	5571162	14	1
001-020-19-36	11	2	5571164	14	5
001-020-19-37	10	12	8-8 100302BA	6	3
	11	2	800333	7	2
001-020-19-38	10	4	801481	6	4
0010-020-19-33	6	10	801534	5	3
0010-020-19-34	6	10	9095	1	2
0801543	5	2		3	2
10-8-100302BA	6	13	9419871	11	6
103321	19	4	9422295	9	3
12448437-5	19	3		10	1
274639	5	6	9427321	19	8
	18	4	B370003BGR	18	5
28-211	3	5	BW/801877	2	2
3155X2	14	4	CHR/1711	17	4
32-3102	6	7	CM103620H	5	4
3310558	17	3	GPT 12AWG BLUE	3	4
34-3804	6	2	GUN/HR936K	18	3
34-8705	6	8	GUN/W1090L	17	9
35066	17	7	GUN/W1090R	17	9
37-3804	6	1	GUN/W1322L	18	1
37-3805	6	9	GUN/W1322R	18	1
38-0428	6	6	GUN/W1438	17	8
				18	2

PART NUMBER INDEX

Part Number	FIG.	ITEM	Part Number	FIG.	ITEM
GUN/W3710X	17	1	PH/PFT-10BGRN100 -45	13	1
HDX/11307	9	1	PH/PFT-10BGRN100 -48	13	2
	10	3	PHM/5-023	5	1
HF801K	17	10	SAE J246 10-8 10 0102BA	6	11
J1128-GPT-12-BLA CK	3	3	SAE J246 8-8 100 102BA	6	5
J530 8-8-8 13042 4B	6	14	SAE J530 6-6 130 339B	8	1
JG-55287-D1	3	1	W1468X10	10	6
JG-55287-D2	4	2		11	5
JG-55287-D3	4	1	W1468X10X12	15	3
L1 AMBER	1	1	W1468X8	7	1
M/25-20012	19	6		11	7
M/357-20069	14	6	W1480X10	10	13
M/357-20075	12	1		16	1
ME207-20055	8	2	W1480X8	11	8
MS24665-418	8	3	W26681	4	3
	17	2	W26764	4	4
MS3368-1-9A	5	7	W3152X6	15	1
MS35338-45	17	5	W3220X8X6	10	11
PH/207ACBH-8	10	7	W323102	10	5
	11	1		11	4
PH/PFT-10BGRN100 -12	13	3	W3350X12	14	2
PH/PFT-10BGRN100 -168	14	3		15	2
PH/PFT-10BGRN100 -24	13	2	W3350X6	10	10
PH/PFT-10BGRN100 -29.5	13	1	W3750X12	15	4
			W380506	17	6
			W48X8	10	2

CHAPTER 7

SUPPORTING INFORMATION

**OPERATOR AND FIELD MAINTENANCE
REFERENCES**

SCOPE

This work package lists all field manuals, forms, technical manuals, and miscellaneous publications referenced in the TM.

PUBLICATION INDEX

The following index should be consulted frequently for latest changes or revisions and new publications relating to material contained in this TM.

DA-PAM 750-8 The Army Maintenance Management System (TAMMS) Users Manual

FORMS

The following forms pertain to this TM: See DA-PAM 25-30 for index of blank forms. See DA-PAM 750-8, The Army Maintenance Management System (TAMMS) Users Manual, for instructions on the use of maintenance forms pertaining to this TM.

DA Form 2028	Recommended Changes to Publications and Blank Forms
DA Form 2402	Maintenance Tag
DD Form 250	Materiel Inspection and Receiving Report
DD Form 361	Transportation Discrepancy Report (TDR)
DA Form 5988-E	Equipment Inspection Maintenance Worksheet
SF 368	Product Quality Deficiency Report (Category 11)

FIELD MANUALS

FM 4-25.11	First Aid for Soldiers
FM 38-700	Packing of Materiel for Preservation
FM 38-701	Packing of Materiel for Packing

TECHNICAL MANUALS

TM 9-2320-283-10	Operator's Manual for Truck Tractor, Line Haul, 50,000 GVWR, 6X4, M915A1
TM 9-2320-283-20	Field Maintenance Manual for Truck Tractor, Line Haul, 50,000 GVWR, 6X4, M915A1

TECHNICAL MANUALS – CONTINUED

TM 9-214	Inspection, Care, and Maintenance of Antifriction Bearings
TM 9-6140-200-13	Operator's, Unit, Direct Support and General Support Maintenance Manual for Lead-Acid Storage Batteries
TM 38-400	Joint Service Manual (JSM) for Storage and Materials Handling
TM 55-2200-001-12	Transportability Guidance for Application of Blocking, Bracing, and Tie Down Materials
TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command)
TM 746-10	General Packaging Instructions for Field Units

MISCELLANEOUS PUBLICATIONS

AR 70-1	Army Acquisition Policy
ATTP 3-34.39	Camouflage, Concealment, and Decoys
TC 38-3	Guide for Basic Military Preservation and Packing

END OF WORK PACKAGE

**OPERATOR AND FIELD MAINTENANCE
MAINTENANCE ALLOCATION CHART (MAC)
INTRODUCTION**

MAINTENANCE ALLOCATION CHART (MAC) INTRODUCTION

The Army Maintenance System MAC

This introduction provides a general explanation of all maintenance and repair functions authorized at the two maintenance levels under the Two-Level Maintenance System concept.

This MAC (immediately following the introduction) designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component shall be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Field – includes two subcolumns, Crew (C) and Maintainer (F).

Sustainment – includes two subcolumns, Below Depot (H) and Depot (D)

The maintenance to be performed at field and sustainment levels is described as follows:

1. Crew maintenance. The responsibility of a using organization to perform maintenance on its assigned equipment. It normally consists of inspecting, servicing, lubricating, adjusting, and replacing parts, minor assemblies, and subassemblies. The replace function for this level of maintenance is indicated by the letter "C" in the third position of the SMR code. A "C" appearing in the fourth position of the SMR code indicates complete repair is possible at the crew maintenance level.
2. Maintainer maintenance. Maintenance accomplished on a component, accessory, assembly, subassembly, plug-in unit, or other portion either on the system or after it is removed. The replace function for this level of maintenance is indicated by the letter "F" appearing in the third position of the SMR code. An "F" appearing in the fourth position of the SMR code indicates complete repair is possible at the field maintenance level. Items are returned to the user after maintenance is performed at this level.
3. Below depot sustainment. Maintenance accomplished on a component, accessory, assembly, subassembly, plug-in unit, or other portion either on the system or after it is removed. The replace function for this level of maintenance is indicated by the letter "H" appearing in the third position of the SMR code. An "H" appearing in the fourth position of the SMR code indicates complete repair is possible at the below depot sustainment maintenance level. Items are returned to the supply system after maintenance is performed at this level.
4. Depot sustainment . Maintenance accomplished on a component, accessory, assembly, subassembly, plug-in unit, or other portion either on the system or after it is removed. The replace function for this level of maintenance is indicated by the letter "D" or "K" appearing in the third position of the SMR code. Depot sustainment maintenance can be performed by either depot personnel or contractor personnel. A "D" or "K" appearing in the fourth position of the SMR code indicates complete repair is possible at the depot sustainment maintenance level. Items are returned to the supply systems after maintenance is performed at this level.

The tools and test equipment requirements table (immediately following the MAC) lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from the MAC.

The remarks table (immediately following the tools and test equipment requirements) contains supplemental instructions and explanatory notes for a particular maintenance function.

MAINTENANCE FUNCTIONS—CONTINUED

Maintenance Functions

Maintenance functions are limited to and defined as follows:

1. **Inspect.** To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel). This includes scheduled inspection and gaugings and evaluation of cannon tubes.
2. **Test.** To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards on a scheduled basis, i.e., load testing of lift devices and hydrostatic testing of pressure hoses.
3. **Service.** Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases. This includes scheduled exercising and purging of recoil mechanisms. The following are examples of service functions:
 - a. **Unpack.** To remove from packing box for service or when required for the performance of maintenance operations.
 - b. **Repack.** To return item to packing box after service and other maintenance operations.
 - c. **Clean.** To rid the item of contamination.
 - d. **Touch up.** To spot paint scratched or blistered surfaces.
 - e. **Mark.** To restore obliterated identification.
4. **Adjust.** To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.
5. **Align.** To adjust specified variable elements of an item to bring about optimum or desired performance.
6. **Calibrate.** To determine and cause corrections to be made or to be adjusted on instruments of test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.
7. **Remove/Install.** To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.
8. **Paint (ammunition only).** To prepare and spray color coats of paints so that the ammunition can be identified and protected. The color indicating primary use is applied, preferably, to the entire exterior surface as the background color of the item. Other markings are to be repainted as original so as to retain proper ammunition identification.
9. **Replace.** To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and assigned maintenance level is shown as the third position code of the Source, Maintenance and Recoverability (SMR) code.
10. **Repair.** The application of maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

MAINTENANCE FUNCTIONS—CONTINUED**NOTE**

The following definitions are applicable to the "repair" maintenance function:

Service. Inspect, test, service, adjust, align, calibrate, and/or replace.

Fault location/troubleshooting. The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or Unit Under test (UUT).

Disassembly/assembly. The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).

Actions. Welding, grinding, riveting, straightening, fastening, machining, and/or resurfacing.

11. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.
12. Rebuild consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

Explanation of Columns in the MAC

Column (1) Group Number. Column (1) lists Functional Group Code (FGC) numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the Next Higher Assembly (NHA).

Column (2) Component/Assembly. Column (2) contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

Column (3) Maintenance Function. Column (3) lists the functions to be performed on the item listed in column (2). (For a detailed explanation of these functions refer to "Maintenance Functions" outlined above).

MAINTENANCE FUNCTIONS—CONTINUED

Column (4) Maintenance Level. Column (4) specifies each level of maintenance authorized to perform each function listed in column (3), by indicating work time required (expressed as manhours in whole hours or decimals) in the appropriate subcolumn. This work time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance levels, appropriate work time figures are to be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

Field:

C Crew maintenance
F Field maintenance

Sustainment:

L Specialized Repair Activity (SRA)
H Below depot maintenance
D Depot maintenance

NOTE

The "L" maintenance level is not included in column (4) of the MAC. Functions to this level of maintenance are identified by work time figure in the "H" column of column (4), and an associated reference code is used in the REMARKS column (6). This code is keyed to the remarks and the SRA complete repair application is explained there.

Column (5) Tools and Equipment Reference Code. Column (5) specifies, by code, those common tool sets (not individual tools), common Test, Measurement and Diagnostic Equipment (TMDE), and special tools, special TMDE and special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.

Column (6) Remarks Code. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks table entries.

Explanation of Columns in the Tools and Test Equipment Requirements

Column (1) – Tool or Test Equipment Reference Code. The tool or test equipment reference code correlates with a code used in column (5) of the MAC.

Column (2) – Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

Column (3) – Nomenclature. Name or identification of the tool or test equipment.

Column (4) – National Stock number (NSN). The NSN of the tool or test equipment.

Column (5) – Tool Number. The manufacturer's part number.

Explanation of Columns in the Remarks

Column (1)–Remarks Code. The code recorded in column (6) of the MAC.

Column (2)–Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC.

**OPERATOR AND FIELD MAINTENANCE
MAINTENANCE ALLOCATION CHART (MAC)**

Table 1. MAC for ABS.

(1) GROUP NO.	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF. CODE	(6) REMARKS
			FIELD			SUSTAINMENT			
			CREW	SERVICE	FIELD	BELOW	DEPOT		
			C	O	F	H	D		
0607	Warning Light	Inspect Replace Test	0.1		0.2 0.1			8	B

MAINTENANCE FUNCTIONS—CONTINUED

Table 1. MAC for ABS—Continued.

(1) GROUP NO.	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF. CODE	(6) REMARKS
			FIELD			SUSTAINMENT			
			CREW	SERVICE	FIELD	BELOW	DEPOT		
						DEPOT			
			C	O	F	H	D		
1208 (Contd)	Air Block, Front	Inspect Replace	0.1		0.3			8	
	Air Blocks, Mid-section	Inspect Replace	0.1		0.4			8	
	Air Blocks, Rear	Inspect Replace	0.1		0.4			8	
	Air Lines and Fittings, Front Modulators	Inspect Replace	0.1		0.5			8	
	Air Lines and Fittings, Rear Modulators	Inspect Replace	0.1		0.5			8	
	Air Lines and Fittings, Treadle Valve	Inspect Replace	0.1		0.5			8	
	Air Lines and Fittings, Primary Reservoir	Inspect Replace	0.1		0.5			8	
	Air Lines and Fittings, Relay Valve	Inspect Replace	0.1		0.5			8	
1311	Hub and Drum, Front Axle	Inspect Service Replace Repair	0.1		0.3 0.5 0.4			8 2, 3, 4, 5 8, 9	
	Hub and Drum, Rear-Rear Axle	Inspect Replace Repair	0.1		0.8 0.4			1, 3, 6, 7 8, 9	
1501	Tail Light Bracket	Inspect Replace	0.1		0.5			8	
	Blackout Light Bracket, Rear	Inspect Replace	0.1		0.3			8	
9401	ABS Kit	Installation			12.0			1 through 11	

MAINTENANCE FUNCTIONS—CONTINUED

Table 2. Tools and Test Equipment.

(1) TOOL OR TEST EQUIPMENT REF CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL/STOCK NUMBER (NSN)	(5) TOOL NUMBER
1	F	Socket, 4-1/8 inch (Rear axle nut)	5120-01-145-5793	1915
2	F	Socket, 2-1/4 inch (Front axle nut)	5120-01-089-9068	1920
3	F	Handle, Driver (Seal Installer)	4910-01-165-8193	470237
4	F	Seal Installer, ADAP (Front hub seal)	4910-01-165-8192	427
5	F	Centering Tool, ADAP (Front hub seal)	4910-01-165-8195	706
6	F	Seal Installer, ADAP (Rear hub seal)	4910-01-165-8194	446
7	F	Centering Tool, ADAP (Rear hub seal)	4910-01-168-9544	715
8	F	Tool Kit, General Mechanic's	5180-00-177-7033	SC5180-90-CL-N26 SC4910-95-CL-A74- HR
9	F	Shop Equipment, Automotive Maintenance Repair, Field Maintenance	4910-00-754-0654	
10	F	Reamer, 11/16 in (17.5 mm)	-	006431
11	F	Drill, Twist, 5/16" (7.94 mm)	5133-00-061-6271	GGG-D-751

Table 3. Remarks for ABS.

(1) REMARKS CODE	(2) REMARKS
A	Pack front wheel bearings with grease rather than full front hub with oil.
B	Inspection of brake drums will be IAW TM 9-2320-283-20.

END OF WORK PACKAGE

**OPERATOR AND FIELD MAINTENANCE
COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS**

INTRODUCTION

Scope

This work package lists COEI and BII for the M915A1 tractor equipped with ABS to help you inventory items for safe and efficient operation of the equipment.

General

The COEI and BII information is divided into the following lists:

Component of End Item (COEI). This list is for information purposes only and is not authority to requisition replacements. These items are part of the M915A1 ABS equipped truck. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Items of COEI are removed and separately packaged for transportation or shipment only when necessary. Illustrations are furnished to help you find and identify the items.

Basic Issue Items (BII). These essential items are required to place the M915A1 equipped with ABS in operation, to operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the M915A1 ABS equipped truck during operation and when it is transferred between property accounts. Listing these items is your authority to request/requisition them for replacement based on authorization of the end item by TOE/MTOE. Illustrations are furnished to help you find and identify the items.

Explanation of Columns in the COEI List and BII List

Column (1) Illus number. Gives you the number of the item illustrated.

Column (2) National Stock Number (NSN). Identifies the stock number of the item to be used for requisitioning purposes.

Column (3) Description, Part Number/(CAGEC). Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The stowage location of COEI and BII is also included in the column. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parentheses).

Column (4) Usable On Code. When applicable, this column gives you a code if the item you need is not the same for different models of equipment. These codes are identified below:

Code Used on

U2A Model M915A1 equipped with ABS

Column (5) U/I. Unit of Issue (U/I) indicates the physical measurement or count of the item as issued per the National Stock Number shown in column (2).

Column (6) Qty Rqr. Indicates the quantity required.

COMPONENT OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS—CONTINUED**Table 1. Component of End Item (COEI) List.**

(1) ILLUS NUMBERS	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC AND PART NUMBER	(4) USABLE ON CODE	(5) U/I	(6) QTY RQR
-	-	-	-	-	-

Table 2. Basic Issue Items (BII) List.

(1) ILLUS NUMBERS	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC AND PART NUMBER	(4) USABLE ON CODE	(5) U/I	(6) QTY RQR
1	5920015040722	30 AMP FUSE 1YHH8 8229245	U2A	EA	1
2	5920015040715	5 AMP FUSE 1YHH8 8229242	U2A	EA	1

**OPERATOR AND FIELD MAINTENANCE
ADDITIONAL AUTHORIZATION LIST (AAL)**

INTRODUCTION**Scope**

This work package lists additional items you are authorized for the support of the M915A1 truck equipped with the ABS.

General

This list identifies items that do not have to accompany the M915A1 with ABS and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

Explanation of Columns in the AAL

Column (1) National Stock Number (NSN). Identifies the stock number of the item to be used for requisitioning purposes.

Column (2) Description, Part Number/(CAGEC). Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parentheses).

Column (3) Usable On Code. When applicable, this column gives you a code if the item you need is not the same for different models of equipment. These codes are identified below:

Code Used on

U2A Model M915A1 equipped with ABS

Column (4) U/I. Unit of Issue (U/I) indicates the physical measurement or count of the item as issued per the National Stock Number shown in column (2).

Column (5) Qty Recm. Indicates the quantity recommended.

Table 1. Additional Authorization List.

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION PART NUMBER/(CAGEC)	(3) USABLE ON CODE	(4) U/I	(5) QTY RECM.
6230-00-163-1856	FLASHLIGHT W-F-00421 (81348)	U2A	EA	1

END OF WORK PACKAGE

**OPERATOR AND FIELD MAINTENANCE
EXPENDABLE AND DURABLE ITEMS LIST**

INTRODUCTION**Scope**

This work package lists expendable items that you will need to operate and maintain the M915A1 tractor equipped with ABS. This list is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items), CTA 50-909, Field and Garrison Furnishings and Equipment or CTA 8-100, Army Medical Department Expendable/Durable Items.

Explanation of Columns in the Expendable/Durable Items List

Column (1) Item No. This number is assigned to the entry in the list and is referenced in the narrative instructions to identify the item (e.g., Use brake fluid (WP 0098, Item 5)).

Column (2) Level. This column identifies the lowest level of maintenance that requires the listed item (C = Crew, F = Field).

Column (3) National Stock Number (NSN). This is the NSN assigned to the item which you can use to requisition it.

Column (4) Item Name, Description, Part Number/(CAGEC). This column provides the other information you need to identify the item. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parentheses).

Column (5) U/I. Unit of Issue (U/I) code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

Table 1. Expedable and Durable Items List.

(1) ITEM NO.	(2) LEVEL	(3) NATIONAL STOCK NUMBER (NSN)	(4) ITEM NAME, DESCRIPTION, PART NUMBER/(CAGEC)	(5) U/I
1	F	7930-00-282-9699	Detergent, general purpose 1-gallon 7930-00-282-9699 (83421)	BX
2	F	7920-00-044-9281	Cloth, Cleaning, 10 pound box, A-A-59323 (58536)	BX
3	F	7920-00-018-3581	Brush, cleaning, tool and parts, 7226T2 (39428)	EA
4	F	8030-00-223-3193	Corrosion preventative compound, 1 gallon MIL-PRF-16173 (81349)	GL
5	F	8030-00-252-3391	Sealing Compound, 11 ounce tube MIL-S-45180 (81349)	TU
6	F	8030-01-218-0321	Sealing Compound, Teflon, 50 milliliter tube MS-PTS-50 (02570)	TU
7	F	6850-01-472-2717	Cleaning compound, solvent, type IV, 5-gallon MIL-PRF-680 (81349)	CN
8	F	9150-01-197-7689	Grease, automotive and artillary (GAA), 6-1/2 pound M-10924-D (81349)	CN
9	F	5970-00-670-7560	Insulation tape, electrical, roll 29258 (24446)	RL
10	F	5975-00-899-4606	Strap, tiedown, electrical components, 1 hundred MIL-S-23190 (81349)	BX
11	F	1005-00-868-6923	Insert, wire connector 8735996 (19207)	EA

END OF WORK PACKAGE

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RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is OAASA.						Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE <i>Date you filled out this form.</i>
TO (Forward to proponent of publication or form) (Include ZIP Code) U.S. Army TACOM Life Cycle Management Command ATTN: AMSTA-LCL-MPP/TECH PUBS 6501 E. 11 Mile Road, Warren, MI 48397-5000						FROM (Activity and location) (Include ZIP Code) <i>Your mailing address</i>	
PART I – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS							
PUBLICATION/FORM NUMBER <i>TM Number</i>						DATE <i>Date of the TM</i>	TITLE <i>Title of the TM</i>
ITEM	PAGE	PARA-GRAPH	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON (Exact wording of recommended change must be given)	
	0007-3					<i>Figure 2, Item 9 should show a lockwasher. Currently shows a flat washer.</i>	
	0018-2					<i>Cleaning and inspection, Step 6, reference to governor support pin (14) is wrong reference. Reference should be change to (12).</i>	
<h1>SAMPLE</h1>							
TYPED NAME, GRADE OR TITLE <i>Your Name</i>					TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION <i>Your Phone Number</i>		SIGNATURE <i>Your Signature</i>

TO <i>(Forward direct to addressee listed in publication)</i> U.S. Army TACOM Life Cycle Management Command ATTN: AMSTA-LCL-MPP/TECH PUBS 6501 E. 11 Mile Road, Warren, MI 48397-5000				FROM <i>(Activity and location) (Include ZIP Code)</i> Your Address				DATE <i>Date you filled out this form</i>	
PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS									
PUBLICATION NUMBER <i>TM Number</i>				DATE <i>Date of the TM</i>			TITLE <i>Title of the TM</i>		
PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION	
<div style="font-size: 100px; font-weight: bold; opacity: 0.5;">SAMPLE</div>									
PART III – REMARKS <i>(Any general remarks, or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)</i>									
TYPED NAME, GRADE OR TITLE <i>Your Name</i>				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION <i>Your Phone Number</i>			SIGNATURE <i>Your Signature</i>		

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PART I – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS							
PUBLICATION/FORM NUMBER TM 9-2320-283-13&P						DATE 7 August 2012	TITLE Operator and Field Maintenance Manual including RPSTL for Anti-Lock Brake System (ABS) M915A1
	PAGE	PARA-GRAPH	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON	
TYPED NAME, GRADE OR TITLE					TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE

TO <i>(Forward direct to addressee listed in publication)</i> U.S. Army TACOM Life Cycle Management Command ATTN: AMSTA-LCL-MPP/TECH PUBS 6501 E. 11 Mile Road, Warren, MI 48397-5000				FROM <i>(Activity and location) (Include ZIP Code)</i>			DATE	
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TYPED NAME, GRADE OR TITLE				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION			SIGNATURE	

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is OAASA						Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
TO (Forward to proponent of publication or form) (Include ZIP Code) U.S. Army TACOM Life Cycle Management Command ATTN: AMSTA-LCL-MPP/TECH PUBS 6501 E. 11 Mile Road, Warren, MI 48397-5000						FROM (Activity and location) (Include ZIP Code)	
PART I – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS							
PUBLICATION/FORM NUMBER TM 9-2320-283-13&P						DATE 7 August 2012	TITLE Operator and Field Maintenance Manual including RPSTL for Anti-Lock Brake System (ABS) M915A1
ITEM	PAGE	PARA-GRAPH	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON	
TYPED NAME, GRADE OR TITLE					TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE

TO <i>(Forward direct to addressee listed in publication)</i> U.S. Army TACOM Life Cycle Management Command ATTN: AMSTA-LCL-MPP/TECH PUBS 6501 E. 11 Mile Road, Warren, MI 48397-5000				FROM <i>(Activity and location) (Include ZIP Code)</i>			DATE	
PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS								
PUBLICATION/FORM NUMBER TM 9-2320-283-13&P				DATE 7 August 2012		TITLE Operator and Field Maintenance Manual including RPSTL for Anti-Lock Brake System (ABS) M915A1		
PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION
PART III – REMARKS <i>(Any general remarks, recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)</i>								
TYPED NAME, GRADE OR TITLE				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE		

By Order of the Secretary of the Army:

RAYMOND T. ODIERNO
General, United States Army
Chief of Staff

Official:

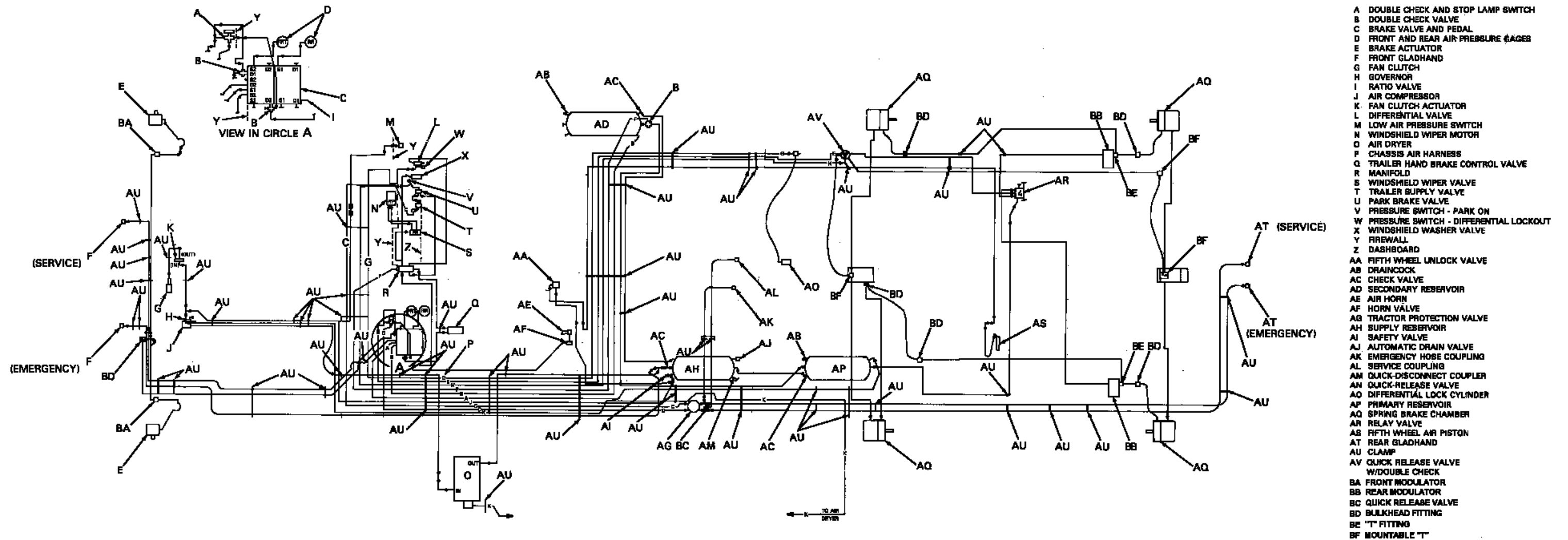
A handwritten signature in black ink, reading "Joyce E. Morrow". The signature is fluid and cursive, with the first letters of each name being capitalized and prominent.

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army

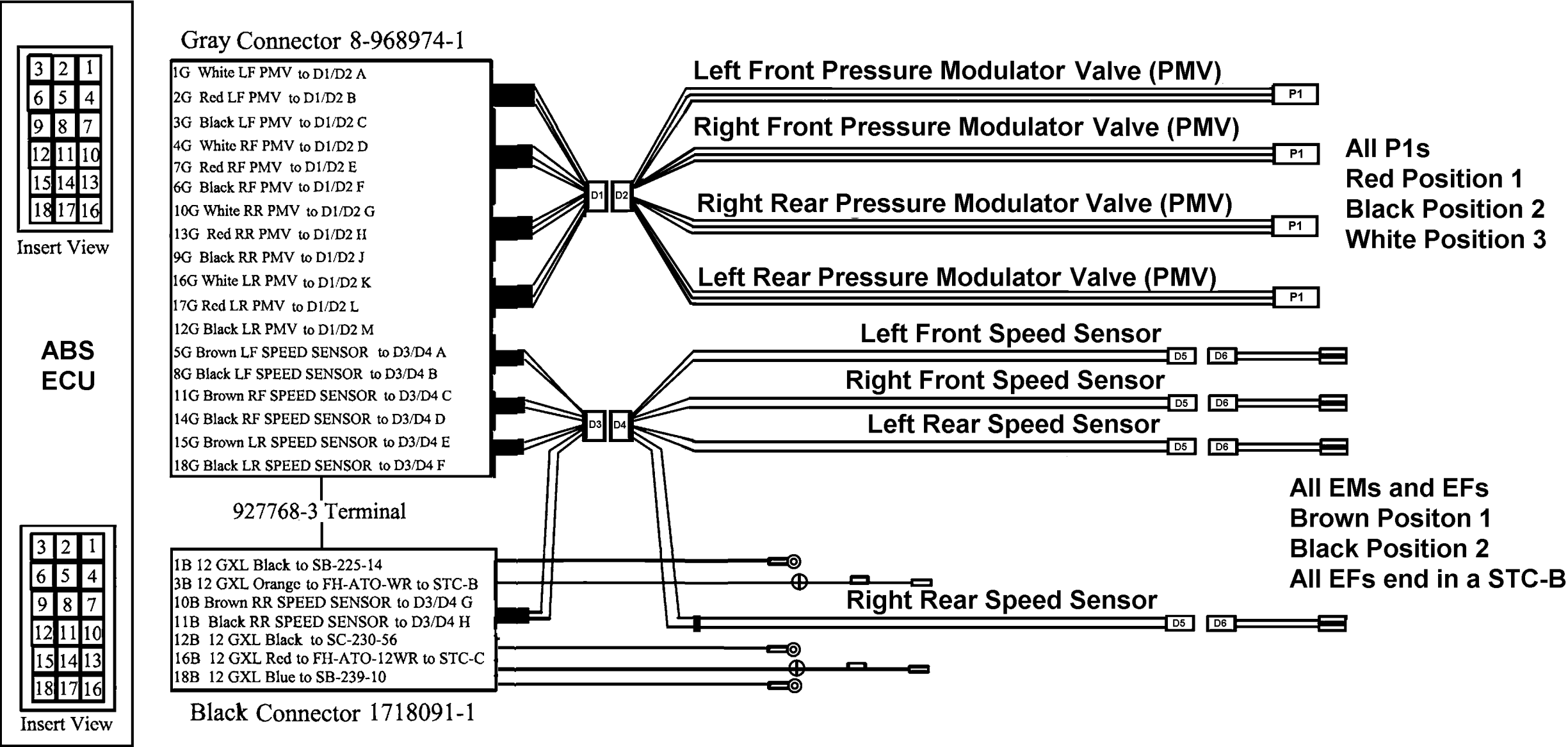
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DISTRIBUTION:

To be distributed in accordance with the initial distribution requirements for IDN 386967
requirements for TM 9-2320-283-13&P.



FO-1 M915A1 W/ABS Air and Brake System Diagram



STANDARD AND METRIC CONVERSIONS

LINEAR MEASURE

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

SQUARE MEASURE

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

CUBIC MEASURE

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

LIQUID MEASURE

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

TEMPERATURE

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

WEIGHTS

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

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Millimeters	25.4
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.4536
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds Per Square Inch	Bar	0.06895
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
Millimeters	Inches	0.03937
Centimeters	Inches	0.3937
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	2.2046
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Bar	Pounds Per Square Inch	14.503
Kilopascals	Pounds Per Square Inch	0.145
Kilometers Per Liter	Miles Per Gallon	2.354
Kilometers Per Hour	Miles Per Hour	0.621

