

**STP 9-62B14-SM-TG**

**MOS 62B, Construction Equipment  
Repairer, Skill Levels 1/2/3/4, Soldier's  
Manual and Trainer's Guide**



**OCTOBER 2002**

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**HEADQUARTERS  
DEPARTMENT OF THE ARMY**



## SOLDIER'S MANUAL and TRAINER'S GUIDE

### MOS 62B, Construction Equipment Repairer, Skill Levels 1/2/3/4, Soldier's Manual and Trainer's Guide

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\*This supersedes STP 5-62B1-SM, 25 September 1990, and STP 5-62B24-SM-TG, 15 October 1990.

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## PREFACE

This publication is for skill level (SL) 1, 2, 3, and 4 soldiers who hold a military occupational specialty (MOS) of 62B and their trainers or leaders. It contains standardized training objectives (in the form of task summaries) that may be used to train and evaluate soldiers on critical tasks that support unit missions during wartime. Trainers and leaders should actively plan for soldiers holding MOS 62B to have access to this publication.

All tasks in this manual are applicable to active component (AC) and reserve component (RC) soldiers, which include the Army National Guard (NG) and the Army Reserve.

NOTE: The 62B MOS is a diverse MOS responsible for maintaining multiple items of construction equipment. The equipment referenced in this publication was selected based on the type of the system. As resident training reflects, personnel in the 62B MOS are trained on systems, not equipment specifics; therefore, if the piece of equipment identified for the task in this soldier's training publication (STP) is not available, use a piece of equipment and the references with a similar system.

Users of this publication are encouraged to recommend changes and submit comments for its improvement. Comments should be keyed to a specific page, paragraph, and line of text in which the change is recommended. Reasons should be provided for each comment to ensure understanding and complete evaluation. Comments should be prepared using a Department of the Army (DA) Form 2028 and forwarded directly to the Commander, United States (US) Army Maneuver Support Center, ATTN: ATZT-DT-WR-E, Building 3200, Directorate of Training Development, 320 MANSCEN Loop, Suite 210, Fort Leonard Wood, MO 65473-8929.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.



## CHAPTER 1

### Introduction

#### GENERAL

1-1. This manual identifies the individual MOS training requirements for soldiers in MOS 62B, Skill Levels (SLs) 1 through 4. It is designed to be used by commanders, trainers, and soldiers to plan, conduct, and evaluate individual training in units. This manual is the primary reference for supporting self-development, evaluating MOS proficiency, and training of 62B soldiers. Commanders employ two primary methods to evaluate soldiers' proficiency:

- *Commander's evaluation.* Commander's evaluations are local tests or assessments of soldier's performance of MOS-specific and common tasks critical to the unit mission. They may be conducted year-round.
- *Common task test (CTT).* CTTs are hands-on tests used to evaluate proficiency on common tasks. Alternate written tests are provided if equipment is not available for hands-on testing.

1-2. This manual should be used along with Soldier's Training Publications (STPs) 21-1-Soldier's Manual of Common Tasks (SMCT) and 21-24-SMCT; Army Training and Evaluation Programs (ARTEPs); and Field Manuals (FMs) 25-4, 25-5, 25-100, and 25-101 to establish effective training plans and programs that integrate individual and collective tasks.

#### TASK SUMMARIES

1-3. Task summaries contain information necessary to conduct training and evaluate soldier proficiency on tasks critical to the MOS. A separate task summary is provided for each critical task. These task summaries are, in effect, standardized training objectives which ensure that soldiers do not have to relearn a task on reassignment to a new unit. The format for the task summaries included in this manual is as follows:

- *Task Title.* The task title identifies the action to be performed.
- *Task Number.* A 10-digit number identifies each task or skill. Include this task number, along with the task title, in any correspondence relating to the task.
- *Conditions.* The task conditions identify all the equipment, tools, references, job aids, and supporting personnel that the soldier needs to perform the task in wartime. This section identifies any environmental conditions that could alter task performance, such as visibility, temperature, and wind. This section also identifies any specific cues or events (a chemical attack or identification of a threat vehicle) that triggers task performance.
- *Standards.* The task standards describe how well and to what level you must perform a task under wartime conditions. Standards are typically described in terms of accuracy, completeness, and speed.
- *Training and Evaluation.* This section may contain all or part of the following: the training information outline, the evaluation preparation subsection, and the evaluation guide. The training information outline includes detailed training information. The evaluation preparation subsection indicates the necessary modifications to the task performance in order to train and evaluate a task that cannot be trained to the wartime standard under wartime conditions. It may also include special training and evaluation preparation instructions to accommodate these modifications and any instruction that should be given

to the soldier before evaluation. The evaluation guide identifies the specific actions, known as performance measures, that the soldier must do to successfully complete the task. These actions are listed in a pass/fail format for easy evaluation. Each evaluation guide contains a feedback statement that indicates the requirements for receiving a GO on the evaluation.

- *References.* This section identifies references that provide more detailed and thorough explanations of task performance requirements than that given in the task summary description.

1-4. Additionally, some task summaries include safety statements and notes. Safety statements (danger, warning, and caution) alert users to the possibility of immediate death, personal injury, or damage to equipment. Notes provide a small, extra supportive explanation or hint relative to the performance measures.

### **SOLDIER'S RESPONSIBILITIES**

1-5. Each soldier is responsible for performing individual tasks that the first-line supervisor identifies based on the unit's mission-essential task list (METL). The soldier must perform the task to the standards listed in the soldier's manual (SM). If a soldier has a question about how to do a task or which tasks in this manual he must perform, it is the soldier's responsibility to ask the first-line supervisor for clarification. The first-line supervisor knows how to perform each task or can direct the soldier to the appropriate training materials.

### **NONCOMMISSIONED OFFICER SELF-DEVELOPMENT AND THE SOLDIER'S MANUAL**

1-6. Self-development is one of the key components of the leader development program. It is a planned, progressive, and sequential program followed by leaders to enhance and sustain their military competency. It consists of individual study, research, professional reading, practice, and self-assessment. Under the self-development concept, the noncommissioned officer (NCO), as an Army professional, has the responsibility to remain current in all phases of the MOS. The SM is the primary source for the NCO to use in maintaining MOS proficiency.

1-7. Another important resource for NCO self-development is the Army Correspondence Course Program (ACCP). (See DA Pamphlet 350-59 for information on enrolling in this program and for a list of courses, or write to: Army Institute for Professional Development, US Army Training Support Center, ATTN: ATIC-IPS, Newport News, Virginia 23628-0001.)

1-8. Unit learning centers are valuable resources for planning self-development programs. They can help access enlisted career maps, training support products, and extension training materials.

### **TRAINING SUPPORT**

1-9. This manual includes the following appendixes and information that provides additional training support information:

- *Appendix A, Department of the Army (DA) Form 5164-R (Hands-On Evaluation).* This appendix provides a copy of DA Form 5164-R. The NCO trainer can use this form to set up the leader book described in FM 25-101. The use of this form may help preclude writing the soldier tasks associated with the unit's METL and can become a part of the leader book.
- *Appendix B, Department of the Army (DA) Form 5165-R (Field Expedient Squad Book).* This appendix provides a copy of DA Form 5165-R. The NCO trainer can use this form to set up the leader book described in FM 25-101. The use of this form may help

preclude writing the soldier tasks associated with the unit's METL and can become a part of the leader book.

- *Appendix C, Conversion Factors (United States [US] and Metric Units)*. This appendix provides an English to metric measurement conversion chart.
- *Glossary*. The glossary is a single comprehensive list of acronyms, abbreviations, definitions, and letter symbols.
- *References*. This section contains two lists of references, required and related, that supports the training of all tasks in this SM. Required references are listed in the conditions statement and are required for the soldier to do the task. Related references are materials that provide more detailed information and a more thorough explanation of task performance.

## **ENLISTED PERSONNEL MANAGEMENT SYSTEM**

1-10. The Enlisted Personnel Management System (EPMS) (AR 614-200) is the Army's overall system to improve the professionalism of the enlisted force. It integrates policies relating to training, evaluation, classification, and promotion into an overall system. It provides the soldier with a means to look to the future and see a realistic, clear, and viable career progression path from private to sergeant major (SGM). However, the EPMS is useless if the soldier does not understand and use it. Part of the trainer's job is to make sure the soldier understands and uses the EPMS. As an aid, Figure 1-1 provides the trainer with a career map for the 62B soldier. Along with information contained in AR 614-200, the soldier can use the career map to develop goals early in his career and plan accordingly.

NCOES	PLDC	BNCOC	ANCOC		USASMA	
Civilian Schools	High school, GED diploma	College*				
		1 year	2 years	3 years		
		A goal: Troop assignments often preclude off-duty education.				
Other schools	Drill sergeant school Recruiting school Battle staff course 1SG course					
Encouraged assignments	Retention, recruiter Drill sergeant Instructor RC advisor CMF 63 staff assignments					
Key leadership assignments	Technician	Team leader	Squad leader/ section leader	Platoon/ section sergeant	First sergeant	CSM
Rank	Private, private first class, specialist, corporal	Sergeant	Staff sergeant	Sergeant first class	First sergeant/ master sergeant	Sergeant major/ command sergeant major
Years of service	1-4	3-8	6-14	10-18	16-22	20+

**Figure 1-1. Career Map, Career Management Field (CMF) 63**

**SKILL PROGRESSION CHART**

1-11. Similar or related education, training, and experience are grouped into CMFs. The career progression path for MOS 62B, CMF 63, construction equipment repairer, is shown in Figure 1-2.

E-9	63Z50M First sergeant
SL 5 E-8 through E-9	63Z50 Mechanical maintenance operations noncommissioned officer Mechanical maintenance management noncommissioned officer Mechanical maintenance supervisor Senior enlisted career advisor Mechanical maintenance management log noncommissioned officer Mechanical maintenance infantry noncommissioned officer Mechanical maintenance control sergeant Senior maintenance supervisor M1 Senior mechanical maintenance supervisor Bradley Fighting Vehicle Systems (BFVS) senior maintenance supervisor Senior mechanical maintenance noncommissioned officer Operations noncommissioned officer
SL 4 (E-7)	62B40 Construction equipment maintenance supervisor Construction equipment supervisor Engineer equipment maintenance noncommissioned officer
SL 3 (E-6)	62B30 Senior construction equipment repairer Construction equipment maintenance assistant Technical inspector Construction equipment maintenance sergeant Construction equipment sergeant Engineer commodity manager Engineer equipment noncommissioned officer
SL 2 (E-5)	62B20 Construction equipment repairer
SL 1 (E-1 through E-4)	62B10 Construction equipment repairer
	Trainee

Figure 1-2. Career Progression Sequence for Construction Equipment Repairer (CMF 63)





## CHAPTER 2

### Trainer's Guide

2-1. General. The MOS Training Plan (MTP) identifies the essential components of a unit training plan for individual training. Units have different training needs and requirements based on differences in environment, location, equipment, dispersion, and similar factors. Therefore, the MTP should be used as a guide for conducting unit training and not a rigid standard. The MTP consists of two parts. Each part is designed to assist the commander in preparing a unit training plan which satisfies integration, cross training, training up, and sustainment training requirements for soldiers in this MOS.

Part One of the MTP shows the relationship of an MOS skill level between duty position and critical tasks. These critical tasks are grouped by task commonality into subject areas.

Section I lists subject area numbers and titles used throughout the MTP. These subject areas are used to define the training requirements for each duty position within an MOS.

Section II identifies the total training requirement for each duty position within an MOS and provides a recommendation for cross training and train-up/merger training.

- **Duty Position Column.** This column lists the duty positions of the MOS, by skill level, which have different training requirements.
- **Subject Area Column.** This column lists, by numerical key (see Section I), the subject areas a soldier must be proficient in to perform in that duty position.
- **Cross Train Column.** This column lists the recommended duty position for which soldiers should be cross trained.
- **Train-Up/Merger Column.** This column lists the corresponding duty position for the next higher skill level or MOSC the soldier will merge into on promotion.

Part Two lists, by general subject areas, the critical tasks to be trained in an MOS and the type of training required (resident, integration, or sustainment).

- **Subject Area Column.** This column lists the subject area number and title in the same order as Section I, Part One of the MTP.
- **Task Number Column.** This column lists the task numbers for all tasks included in the subject area.
- **Title Column.** This column lists the task title for each task in the subject area.
- **Training Location Column.** This column identifies the training location where the task is first trained to soldier training publications standards. If the task is first trained to standard in the unit, the word "Unit" will be in this column. If the task is first trained to standard in the training base, it will identify, by brevity code (ANCOC, BNCOC, etc.), the resident course where the task was taught. Figure 2-1 contains a list of training locations and their corresponding brevity codes.

<b>ANCOC</b>	Advanced NCO Course
<b>AIT</b>	Advanced Individual Training
<b>UNIT</b>	Trained in the Unit
<b>BNCOC</b>	Basic NCO Course
<b>BTC</b>	Basic Technical Course

**Figure 2-1. Training Locations**

- **Sustainment Training Frequency Column.** This column indicates the recommended frequency at which the tasks should be trained to ensure soldiers maintain task proficiency. Figure 2-2 identifies the frequency codes used in this column.

<b>BA</b> - Biannually
<b>AN</b> - Annually
<b>SA</b> - Semiannually
<b>QT</b> - Quarterly
<b>MO</b> - Monthly
<b>BW</b> - Bi-weekly
<b>WK</b> - Weekly

**Figure 2-2. Sustainment Training Frequency Codes**

- **Sustainment Training Skill Level Column.** This column lists the skill levels of the MOS for which soldiers must receive sustainment training to ensure they maintain proficiency to soldier's manual standards.

2-2. Subject Area Codes.

**Skill Level 1**

- 1 Preventive
- 2 Electrical
- 3 Engines
- 4 Hydraulics
- 5 Power Trains
- 6 Brakes
- 7 Suspension Systems
- 8 Body, Cab, Hull and Accessories

**Skill Level 2**

- 1 Preventive
- 2 Electrical
- 3 Engines
- 4 Hydraulics
- 5 Power Trains
- 6 Brakes

**Skill Level 3**

- 1 Preventive
- 2 Electrical
- 3 Engines
- 4 Hydraulics
- 5 Power Trains
- 6 Brakes
- 9 Common Logistic Tasks

**Skill Level 4**

- 9 Common Logistic Tasks

2-3. Critical Tasks List.**MOS TRAINING PLAN  
62B14****CRITICAL TASKS**

<b>Subject Area</b>	<b>Task Number</b>	<b>Title</b>	<b>Training Location</b>	<b>Sust Tng Freq</b>	<b>Sust Tng SL</b>
<b>Skill Level 1</b>					
1. Preventive	091-62B-1101	Perform a Weekly Service on an Item of Construction Equipment	AIT	SA	1-2
	091-62B-1102	Perform a Monthly Service on an Item of Construction Equipment	AIT	SA	1-2
	091-62B-1103	Perform a Quarterly Service on an Item of Construction Equipment	AIT	SA	1-2
	091-62B-1104	Perform a Semiannual Service on an Item of Construction Equipment	AIT	SA	1-2
	091-62B-1105	Perform an Annual Service on an Item of Construction Equipment	AIT	SA	1-2
	091-62B-1106	Perform a Biannual Service on an Item of Construction Equipment	AIT	SA	1-2
	091-62B-1107	Perform a Usage Service on an Item of Construction Equipment	AIT	SA	1-2
	091-62B-1108	Sample an Item of Construction Equipment Enrolled in the Army Oil Analysis Program (AOAP).	AIT	AN	1-2
2. Electrical	091-62B-1201	Repair a Wiring Harness on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1202	Replace Batteries on an Item of Construction Equipment	AIT	SA	1-2
	091-62B-1203	Replace a Starter on an Item of Construction Equipment.	AIT	SA	1-2
	091-62B-1204	Replace a Switch on an Item of Construction Equipment	AIT	SA	1-2
	091-62B-1205	Replace an Alternator on an Item of Construction Equipment	AIT	SA	1-2
	091-62B-1206	Replace an Electrical Gauge on an Item of Construction Equipment	UNIT	AN	1-2
3. Engines	091-62B-1301	Replace a Fuel Tank on an Item of Construction Equipment	UNIT	BA	1-2
	091-62B-1302	Replace a Fuel Line on an Item of Construction Equipment	AIT	AN	1-2

## CRITICAL TASKS

Subject Area	Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
	091-62B-1303	Replace a Fuel Filter on an Item of Construction Equipment	AIT	SA	1-2
	091-62B-1304	Replace a Fuel Pump on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1305	Replace an Injector Pump on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1306	Replace a Hand Primer Pump on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1307	Replace Air Filters on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1308	Replace a Turbocharger on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1309	Replace an Oil Filter on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1310	Replace an Oil Line on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1311	Replace a Water Pump on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1312	Replace a Thermostat on an Item of Construction Equipment	AIT	BA	1-2
	091-62B-1313	Replace an Engine Oil Cooler on an Item of Construction Equipment	UNIT	AN	1-2
	091-62B-1314	Replace Drive Belts on an Item of Construction Equipment	AIT	BA	1-2
	091-62B-1315	Replace an Engine Cooling Fan on an Item of Construction Equipment	AIT	BA	1-2
	091-62B-1316	Replace a Radiator on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1317	Replace a Water Hose on an item of Construction Equipment	AIT	BA	1-2
4. Hydraulics	091-62B-1401	Repair a Hydraulic Accumulator on an Item of Construction Equipment	AIT	SA	1-2
	091-62B-1402	Replace a Hydraulic Line on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1403	Replace a Hydraulic Pump on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1404	Replace a Hydraulic Control Valve on an Item of Construction Equipment	AIT	AN	1-2

## CRITICAL TASKS

Subject Area	Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
	091-62B-1405	Replace a Hydraulic Relief Valve on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1406	Replace a Hydraulic Cylinder on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1407	Replace Hydraulic Filters on an Item of Construction Equipment	UNIT	BA	1-2
	091-62B-1408	Replace an Accumulator on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1409	Repair a Hydraulic Cylinder on an Item of Construction Equipment	AIT	AN	1-2
5. Power Trains	091-62B-1501	Replace a Transmission on an Item of Construction Equipment	UNIT	AN	1-2
	091-62B-1502	Replace a Driveshaft on an Item of Construction Equipment	AIT	BA	1-2
	091-62B-1503	Replace Universal Joints on an Item of Construction Equipment	AIT	BA	1-2
	091-62B-1504	Replace a Power Divider on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1505	Replace a Hydrojet on an Item of Powered Bridging Equipment	UNIT	AN	1-2
	091-62B-1506	Replace a Differential on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1507	Replace a Final Drive on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1508	Repair a Winch Brake on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1509	Repair Steering Brakes and Clutches on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1510	Repair a Clutch Assembly on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1511	Replace a Steering Gear on an Item of Construction Equipment	AIT	AN	1-2
6. Brakes	091-62B-1601	Adjust the Brake Shoes on an Item of Construction Equipment	AIT	BA	1-2
	091-62B-1602	Replace a Master Cylinder on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1603	Replace a Brake Booster on an Item of Construction Equipment	AIT	AN	1-2

## CRITICAL TASKS

Subject Area	Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
	091-62B-1604	Replace a Treadle Valve on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1605	Replace a Brake Air Compressor on an Item of Construction Equipment	AIT	BA	1-2
	091-62B-1606	Replace a Slack Adjuster on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1607	Replace a Brake Cylinder on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1608	Replace the Brake Lines on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1609	Replace the Brake Shoes on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1610	Replace the Brake Pads on an Item of Construction Equipment	AIT	BA	1-2
	091-62B-1611	Replace the Brake Drums on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1612	Replace the Brake Rotors on an Item of Construction Equipment	AIT	BA	1-2
	091-62B-1613	Replace a Moisture Separator on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1614	Replace an Air Pressure Gauge on an Item of Construction Equipment.	AIT	AN	1-2
	091-62B-1615	Repair a Brake Air Compressor on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1616	Repair a Brake Caliper on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1617	Replace an Air Brake Safety Valve on an Item of Construction Equipment.	AIT	AN	1-2
	091-62B-1618	Repair an Air Brake Safety Valve on an Item of Construction Equipment.	AIT	AN	1-2
	091-62B-1619	Replace a Brake Chamber on an Item of Construction Equipment.	AIT	AN	1-2
7. Suspension Systems	091-62B-1701	Replace a Track on an Item of Construction Equipment	AIT	AN	1-2
	091-62B-1702	Repair a Track Assembly on an Item of Construction Equipment.	AIT	AN	1-2
	091-62B-1703	Replace a Wheel and Tire on an Item of	UNIT	BA	1-2

## CRITICAL TASKS

Subject Area	Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
	091-62B-1704	Construction Equipment. Replace a Drive Sprocket on an Item of Construction Equipment.	UNIT	AN	1-2
	091-62B-1705	Replace an Idler Wheel on an Item of Construction Equipment.	UNIT	AN	1-2
	091-62B-1706	Replace Shock Absorbers on an Item of Construction Equipment	UNIT	AN	1-2
8. Body, Cab, Hull and Accessories	091-62B-1801	Replace a Cutting Edge on an Item of Construction Equipment	UNIT	BA	1-2
	091-62B-1802	Replace a Ripper Tooth on an Item of Construction Equipment.	UNIT	AN	1-2
	091-62B-1803	Replace a Winch Cable on an Item of Construction Equipment	UNIT	AN	1-2
	091-62B-1804	Replace a Winch on an Item of Construction Equipment	UNIT	AN	1-2
<b>Skill Level 2</b>					
1. Preventive	091-62B-2101	Perform a Quality Assurance/Control Inspection on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2102	Perform Battle Damage Assessment and Repair (BDAR) on an Item of Construction Equipment	UNIT	AN	2
2. Electrical	091-62B-2201	Replace a Wiring Harness on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2202	Replace an Electronic Sensor on an Item of Construction Equipment.	UNIT	AN	2
	091-62B-2203	Replace an electronic-control module on an item of construction equipment.	UNIT	AN	2
	091-62B-2204	Troubleshoot a Starting System on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2205	Troubleshoot a Charging System on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2206	Troubleshoot an Accessory Circuit on an Item of Construction Equipment	UNIT	AN	2
3. Engines	091-62B-2301	Replace an Oil Pump on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2302	Replace a Fuel Injector on an Item of	UNIT	AN	2

## CRITICAL TASKS

Subject Area	Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
		Construction Equipment.			
	091-62B-2303	Replace a Blower on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2304	Replace an Engine on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2305	Repair an Engine on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2306	Troubleshoot a Fuel System on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2307	Troubleshoot a Lubrication System on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2308	Troubleshoot a Cooling System on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2309	Troubleshoot an Air Induction System on an Item of Construction Equipment	UNIT	AN	2
4. Hydraulics	091-62B-2401	Fabricate a Hydraulic Line on an Item of Construction Equipment.	UNIT	AN	2
	091-62B-2402	Repair a Hydraulic Relief Valve on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2403	Repair a Hydraulic Pump on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2404	Repair a Hydraulic Control Valve on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2405	Troubleshoot a Primary Hydraulic System on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2406	Troubleshoot a Hydraulic Suspension System on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2407	Troubleshoot a Hydraulic Drive System on a Item of Construction Equipment	UNIT	AN	2
	091-62B-2408	Troubleshoot a Hydraulic Steering System on an Item of Construction Equipment	UNIT	AN	2
5. Power Trains	091-62B-2501	Replace a Torque Converter on an Item of Construction Equipment.	UNIT	AN	2
	091-62B-2502	Replace a Planetary Drive on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2503	Repair a Transmission on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2504	Repair a Differential on an Item of Construction	UNIT	AN	2



## CRITICAL TASKS

Subject Area	Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
		Equipment			
	091-62B-2505	Repair a Final Drive on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2506	Repair a Power Divider on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2507	Repair a Hydrojet on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2508	Repair a Steering System on an Item of Construction Equipment.	UNIT	AN	2
	091-62B-2509	Troubleshoot a Transmission on an Item of Construction Equipment.	UNIT	AN	2
	091-62B-2510	Troubleshoot a Transmission on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2511	Troubleshoot a Final Drive on an Item of Construction Equipment.	UNIT	AN	2
	091-62B-2512	Troubleshoot a Power Divider on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2513	Troubleshoot a Planetary Drive on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2514	Troubleshoot a Hydrojet on an Item of Powered Bridging Equipment	UNIT	AN	2
6. Brakes	091-62B-2601	Repair a Brake Master Cylinder on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2602	Repair a Brake Booster on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2603	Troubleshoot an Air Brake System on an Item of Construction Equipment	UNIT	AN	2
	091-62B-2604	Troubleshoot an Air-Over-Hydraulic Brake System on an Item of Construction Equipment	UNIT	AN	2
<b>Skill Level 3</b>					
1. Preventive	091-62B-3101	Perform an Initial Inspection on an Item of Construction Equipment	BNCOC	AN	3
	091-62B-3102	Perform an In-Process Inspection on an Item of Construction Equipment	BNCOC	AN	3
	091-62B-3103	Perform a Final Inspection on an Item of Construction Equipment	BNCOC	AN	3
2. Electrical	091-62B-3201	Determine the Cause of an Electrical-Component Malfunction on an Item of	BNCOC	AN	3

**CRITICAL TASKS**

<b>Subject Area</b>	<b>Task Number</b>	<b>Title</b>	<b>Training Location</b>	<b>Sust Tng Freq</b>	<b>Sust Tng SL</b>
		Construction Equipment			
3. Engines	091-62B-3301	Determine the Cause of an Engine Component Failure on an Item of Construction Equipment	BNCOC	AN	3
4. Hydraulics	091-62B-3401	Determine the Cause of a Hydraulic Component Failure on an Item of Construction Equipment	BNCOC	AN	3
5. Power Trains	091-62B-3501	Determine the Cause of a Power Train Component Malfunction on an Item of Construction Equipment	BNCOC	AN	3
6. Brakes	091-62B-3601	Determine the Cause of a Brake Component Failure on an Item of Construction Equipment	BNCOC	AN	3
9. Common Logistic Tasks	091-CLT-3001	Manage a Shop Safety Program	BNCOC	AN	3
	091-CLT-3002	Maintain a Publications Library	BNCOC	AN	3
	091-CLT-3003	Establish Maintenance Facilities	BNCOC	AN	3
	091-CLT-3004	Assist in Preparing a Standing Operating Procedure	BNCOC	AN	3
	091-CLT-3005	Manage Tool Control Procedures	BNCOC	AN	3
	091-CLT-3006	Manage Key Control Procedures	BNCOC	AN	3
	091-CLT-3007	Manage the TMDE Calibration Program	BNCOC	AN	3
	091-CLT-3008	Recon Terrain/Route	BNCOC	AN	3
	091-CLT-3009	Supervise Maintenance Operations	BNCOC	AN	3
	091-CLT-3010	Interpret Maintenance Operational Overlay	BNCOC	AN	3
	091-CLT-3011	Deploy Maintenance Support Teams	BNCOC	AN	3
	091-CLT-3012	Manage the Standard Army Maintenance System (SAMS)	BNCOC	AN	3
	091-CLT-3013	Manage the Unit Level Logistics System (ULLS)	BNCOC	AN	3
	091-CLT-3014	Manage the Unit Army Oil Analysis Program (AOAP)	BNCOC	AN	3
	091-CLT-3015	Deploy Company Maintenance Team/Recovery Support Team	BNCOC	AN	3
	091-CLT-3016	Review the Army Materiel Status System (AMSS) Reports	BNCOC	AN	3
<b>Skill Level 4</b>					

## CRITICAL TASKS

Subject Area	Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
	091-CLT-4001	Perform Senior Rater Responsibilities for a Maintenance Section	ANCOC	AN	4
	091-CLT-4002	Supervise Platoon/Section Administrative Procedures	ANCOC	AN	4
	091-CLT-4003	Manage Combat Stress	ANCOC	AN	4
	091-CLT-4004	Ensure Maintenance Operations are in Compliance With the Army Environmental Program	ANCOC	AN	4
	091-CLT-4005	Enforce Compliance With the Shop Safety Program	ANCOC	AN	4
	091-CLT-4006	Coordinate Support for the Maintenance Platoon/Section	ANCOC	AN	4
	091-CLT-4007	Select a Field Maintenance Site	ANCOC	AN	4
	091-CLT-4008	Prepare an Operational Overlay for Maintenance Operations	ANCOC	AN	4
	091-CLT-4009	Control Flow of Work Through the Maintenance Shop	ANCOC	AN	4
	091-CLT-4010	Integrate Automated Logistics Support Systems	ANCOC	AN	4
	091-CLT-4011	Plan Logistics Support for Maintenance Operations	ANCOC	AN	4
	091-CLT-4012	Monitor the Preparation and Disposition of the Army Materiel Status System (AMSS) Reports	ANCOC	AN	4
	091-CLT-4013	Analyze the Prescribed Load List (PLL) Report	ANCOC	AN	4
	091-CLT-4014	Monitor Quality Control Program	ANCOC	AN	4
	091-CLT-4015	Analyze Bench Stock Listing	ANCOC	AN	4
	091-CLT-4016	Analyze Open Work Request Reconciliation Listing	ANCOC	AN	4
	091-CLT-4017	Analyze Completed Shop Workload Summary	ANCOC	AN	4
	091-CLT-4018	Analyze Shop Deadline and Deferred Workload Listing	ANCOC	AN	4
	091-CLT-4019	Analyze Shop Workload Summary Listing	ANCOC	AN	4
	091-CLT-4020	Maintain Property Accountability	ANCOC	AN	4
	091-CLT-4021	Prepare Standing Operating Procedures for Maintenance Operations	ANCOC	AN	4
	091-CLT-4022	Supervise the Deployment of Company Maintenance Team/Recovery Support	ANCOC	AN	4

## CRITICAL TASKS

Subject Area	Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
		Team/Maintenance Support Team			
	091-CLT-4023	Conduct a Route Reconnaissance for a Maintenance Mission	ANCOC	AN	4
	091-CLT-4024	Conduct an Area Reconnaissance for a Maintenance Mission	ANCOC	AN	4
	091-CLT-4025	Manage Battlefield Maintenance Support	ANCOC	AN	4
	091-CLT-4026	Perform Support Operations NCO Duties	ANCOC	AN	4
	091-CLT-4027	Manage Maintenance Operations at a Maintenance Collection Point	ANCOC	AN	4
	091-CLT-4028	Provide Maintenance Support During Tactical Operations	ANCOC	AN	4
	091-CLT-4029	Supervise Preventive Maintenance Checks and Services (PMCS)	ANCOC	AN	4

## CHAPTER 3

### MOS/Skill Level Tasks

#### Skill Level 1

#### Subject Area 1: Preventive

### Perform a Weekly Service on an Item of Construction Equipment

#### 091-62B-1101

**Conditions:** Given an item of construction equipment that is due a weekly service; the applicable organizational and technical maintenance manuals; a lubrication order; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); a general mechanic's tool kit; petroleum, oils, and lubricants (POL); an equipment maintenance and inspection work sheet; and a pen.

**Standards:** Complete a weekly service on an item of construction equipment according to the equipment organizational maintenance manuals and the lubrication order. Complete the service without causing injury to any personnel and further damage to the equipment.

#### Performance Steps

1. Receive the previous service equipment maintenance and inspection work sheet.
  - a. Review the previous service equipment maintenance and inspection work sheet.
  - b. Initiate a new service equipment maintenance and inspection work sheet.

CAUTION: BE AWARE OF EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS. WATCH FOR POSSIBLE ELECTRICAL SHOCK, INJURY, OR DEATH BY BEING CRUSHED BY EQUIPMENT. POLS CAN BE FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY. DIESEL FUEL IS FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA.

2. Perform an inspection and service on an item of construction equipment step by step according to the organizational maintenance manual.
  - a. Locate organizational maintenance technical manuals (TMs) with updates.
  - b. Locate the latest technical bulletin (TB) that relates to the item of equipment used.
  - c. Review the operator's monthly preventive-maintenance checks and services (PMCS).
  - d. Perform an organization PMCS inspection according to the equipment's TM.
  - e. Record all faults, deficiencies, and shortcomings on the maintenance inspection work sheet.
3. Locate all deficiencies, faults, and shortcomings.
4. Perform any authorized repairs on deficiencies, faults, or shortcomings according to the maintenance allocation chart as they are found.
5. Replace any deferred parts received (not installed).
  - a. Identify the component that requires replacement.
  - b. Verify any repair parts (usable on codes).
  - c. Receive the repair parts.
  - d. Replace the repair parts.
6. Annotate all activities on an equipment maintenance and inspection work sheet.
7. Forward the equipment maintenance and inspection work sheet to the maintenance shop foreman or supervisor.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all of the equipment and tools that are needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received the previous service equipment maintenance and inspection work sheet.	—	—
2. Performed an inspection and service on an item of construction equipment step by step according to the organizational maintenance manual.	—	—
3. Located all deficiencies, faults, or shortcomings.	—	—
4. Performed any authorized repairs on deficiencies, faults, or shortcomings according to the maintenance allocation chart as they are found.	—	—
5. Replaced any deferred parts received (not installed).	—	—
6. Annotated all activities on a equipment maintenance inspection work sheet.	—	—
7. Forwarded the equipment maintenance and inspection work sheet to the maintenance shop foreman or supervisor.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 TM 5-1940-277-10  
 TM 5-1940-277-20

**Related**

AR 750-1  
 DA PAM 738-750

**Perform a Monthly Service on an Item of Construction Equipment**  
**091-62B-1102**

**Conditions:** Given an item of construction equipment that is due a monthly service; the applicable organizational maintenance manuals, the lubrication order (LO); test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); a general mechanic's tool kit; petroleum, oils, and lubricants (POL); and a pen.

**Standards:** Complete a monthly service on an item of construction equipment according to the equipment organizational maintenance manuals and the lubrication order. Complete the service without causing injury to any personnel and further damage to the equipment.

**Performance Steps**

1. Receive the previous service maintenance and inspection work sheet.
  - a. Review the previous service maintenance and inspection work sheet.
  - b. Initiate a new service maintenance and inspection work sheet.

**CAUTION: BE AWARE OF EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS. WATCH FOR POSSIBLE ELECTRICAL SHOCK, INJURY, OR DEATH BY BEING CRUSHED BY EQUIPMENT. POLS CAN BE FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY. DIESEL FUEL IS FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA.**

2. Perform an inspection and service on the item of construction equipment step by step according to the organizational maintenance manual.
  - a. Locate the latest organizational maintenance manuals relating to the item of equipment.
  - b. Locate the latest technical bulletin (TB) that relates to the item of equipment.
  - c. Review the operator's monthly preventive-maintenance checks and services (PMCS) inspection.
  - d. Perform an organization PMCS inspection according to the equipment's technical manual (TM).
  - e. Record all deficiencies, faults, and shortcomings on the maintenance inspection work sheet.
3. Locate any deficiencies, faults, or shortcomings.
4. Perform authorized repairs on deficiencies, faults, or shortcomings according to the maintenance allocation chart as they are found.
5. Replace deferred parts that are received (not installed).
  - a. Identify the components requiring replacement.
  - b. Verify repair parts (usable on codes).
  - c. Receive the repair parts.
  - d. Replace the parts.
6. Annotate all activities on a maintenance inspection work sheet.
7. Forward the maintenance and inspection work sheet to the maintenance shop foreman or supervisor.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all of the equipment and tools that are needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received the previous service maintenance and inspection work sheet.	—	—
2. Performed an inspection and service on the item of construction equipment step by step according to the organizational maintenance manual.	—	—
3. Located any deficiencies, faults, or shortcomings.	—	—
4. Performed authorized repairs on deficiencies, faults, or shortcomings according to the maintenance allocation chart as they are found.	—	—
5. Replaced deferred parts that were received (not installed).	—	—
6. Annotated all activities on a maintenance inspection work sheet.	—	—
7. Forwarded the maintenance and inspection work sheet to the maintenance shop foreman or supervisor.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 LO 5-3805-262-12  
 TM 5-3805-262-20

**Related**

AR 750-1  
 DA PAM 738-750



**Perform a Quarterly Service on an Item of Construction Equipment**  
**091-62B-1103**

**Conditions:** Given an item of construction equipment due a quarterly service; the applicable organizational maintenance manuals; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); a general mechanic's tool kit; petroleum, oils, and lubricants (POL); an equipment maintenance and inspection work sheet; and a pen.

**Standards:** Complete a quarterly service on an item of construction equipment according to the equipment organizational maintenance manuals and the lubrication order. Complete the service without causing injury to any personnel and further damage to the equipment.

**Performance Steps**

1. Receive the previous service equipment maintenance and inspection work sheet.
  - a. Initiate a new service equipment maintenance and inspection work sheet.
  - b. Review the previous service equipment maintenance and inspection work sheet.

**CAUTION: BE AWARE OF EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS. WATCH FOR POSSIBLE ELECTRICAL SHOCK, INJURY, OR DEATH BY BEING CRUSHED BY EQUIPMENT. POLS CAN BE FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY. DIESEL FUEL IS FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA.**

2. Perform an inspection and service on the item of construction equipment step by step according to the organizational maintenance manual.
  - a. Locate the latest organizational maintenance manuals relating to the item of equipment.
  - b. Locate the latest technical bulletin (TB) relating to the item of equipment.
  - c. Review the operator's monthly preventive-maintenance checks and services (PMCS) inspection.
  - d. Perform an organization PMCS inspection according to the equipment's technical manual (TM).
  - e. Record all deficiencies, faults, and shortcomings on the maintenance inspection work sheet.
3. Locate any deficiencies, faults, or shortcomings.
4. Perform authorized repairs on deficiencies, faults, or shortcomings according to the maintenance allocation chart as they are found.
  - a. Identify the components that require replacements.
  - b. Identify all additional supporting maintenance steps.
5. Replace deferred parts received (not installed).
  - a. Identify the components that require replacements.
  - b. Verify the repair parts (usable on codes).
  - c. Receive the repair parts.
  - d. Replace parts.
6. Annotate all activities on an equipment maintenance and inspection work sheet.
7. Forward the equipment maintenance and inspection work sheet to the maintenance shop foreman or supervisor.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all of the equipment and tools that are needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable technical manuals. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received the previous service equipment maintenance and inspection work sheet.	—	—
2. Performed an inspection and service on the item of construction equipment step by step according to the organizational maintenance manual.	—	—
3. Located any deficiencies, faults, or shortcomings.	—	—
4. Performed authorized repairs on deficiencies, faults, or shortcomings according to the maintenance allocation chart as they are found.	—	—
5. Replaced deferred parts received (not installed).	—	—
6. Annotated all activities on an equipment maintenance and inspection work sheet.	—	—
7. Forwarded the equipment maintenance and inspection work sheet to the maintenance shop foreman or supervisor.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 TM 5-2430-200-10  
 TM 5-2430-200-24

**Related**

AR 750-1  
 DA PAM 738-750

**Perform a Semiannual Service on an Item of Construction Equipment**  
**091-62B-1104**

**Conditions:** Given an item of construction equipment due a semiannual service; the applicable organizational maintenance manuals; the lubrication order (LO); test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); a general mechanic's tool kit; petroleum, oils, and lubricants (POL); an equipment maintenance and inspection work sheet; and a pen.

**Standards:** Complete a semiannual service on an item of construction equipment according to the equipment organizational maintenance manuals and the lubrication order. Complete the service without causing injury to any personnel and further damage to the equipment.

**Performance Steps**

1. Receive the previous service equipment maintenance and inspection work sheet.
  - a. Review the previous service equipment maintenance and inspection work sheet.
  - b. Initiate a new service equipment maintenance and inspection work sheet.

**CAUTION: BE AWARE OF EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS. WATCH FOR POSSIBLE ELECTRICAL SHOCK, INJURY, OR DEATH BY BEING CRUSHED BY EQUIPMENT. POLS CAN BE FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY. DIESEL FUEL IS FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA.**

2. Perform an inspection and service on the item of construction equipment step by step according to the organizational maintenance manual.
  - a. Locate the latest organizational maintenance manuals relating to the item of equipment.
  - b. Locate the latest technical bulletin (TB) relating to the item of equipment.
  - c. Review the operator's monthly preventive-maintenance checks and services (PMCS) inspection.
  - d. Perform an organization PMCS inspection according to the equipment technical manual (TM).
  - e. Record all deficiencies, faults, and shortcomings on the maintenance inspection work sheet.
3. Locate any deficiencies, faults, or shortcomings.
4. Perform authorized repairs on deficiencies, faults, or shortcomings according to the maintenance allocation chart as they are found.
  - a. Identify the components requiring replacements.
  - b. Identify all additional supporting maintenance steps.
5. Replace deferred parts received (not installed).
  - a. Identify the components requiring replacements.
  - b. Verify the repair parts (usable on codes).
  - c. Receive the repair parts.
  - d. Replace the parts.
6. Annotate all activities on the equipment maintenance and inspection work sheet.
7. Forward the equipment maintenance and inspection work sheet to the maintenance shop foreman or supervisor.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all of the equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received the previous service maintenance inspection work sheet.	—	—
2. Performed an inspection and service on the item of construction equipment step by step according to the organizational maintenance manual.	—	—
3. Located any deficiencies, faults, or shortcomings.	—	—
4. Performed authorized repairs on deficiencies faults or shortcomings in accordance with the maintenance allocation chart as they are found.	—	—
5. Replaced deferred parts received (not installed).	—	—
6. Annotated all activities on the maintenance inspection work sheet.	—	—
7. Forwarded the maintenance inspection work sheet to the maintenance shop foreman or supervisor.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 LO 5-2350-262-12  
 TM 5-2350-262-20-1  
 TM 5-2350-262-20-2

**Related**

AR 750-1  
 DA PAM 738-750

## Perform an Annual Service on an Item of Construction Equipment

### 091-62B-1105

**Conditions:** Given an item of construction equipment due an annual service; the applicable organizational maintenance manuals; the lubrication order (LO); test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); a general mechanic's tool kit; petroleum, oils, and lubricants (POL); an equipment maintenance and inspection work sheet; and a pen.

**Standards:** Complete an annual service on an item of construction equipment according to the equipment organizational maintenance manuals and the lubrication order. Complete the service without causing injury to any personnel and further damage to the equipment.

#### Performance Steps

1. Receive the previous service equipment maintenance and inspection work sheet.
  - a. Initiate a new service equipment maintenance and inspection work sheet.
  - b. Review the previous service equipment maintenance and inspection work sheet.

**CAUTION: BE AWARE OF EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS. WATCH FOR POSSIBLE ELECTRICAL SHOCK, INJURY, OR DEATH BY BEING CRUSHED BY EQUIPMENT. POLS CAN BE FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY. DIESEL FUEL IS FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA.**

2. Perform an inspection and service on the item of construction equipment step by step according to the organizational maintenance manual.
  - a. Locate the latest organizational maintenance manuals relating to the item of equipment.
  - b. Locate the latest technical bulletin (TB) relating to the item of equipment.
  - c. Review the operator's monthly preventive-maintenance checks and services (PMCS) inspection.
  - d. Perform an organization PMCS inspection according to the equipment technical manual (TM).
  - e. Record all deficiencies, faults, and shortcomings on the maintenance and inspection work sheet.
3. Locate any deficiencies, faults, or shortcomings.
4. Perform authorized repairs on deficiencies, faults, or shortcomings according to the maintenance allocation chart as they were found.
  - a. Identify the components requiring replacements.
  - b. Identify all additional supporting maintenance steps.
5. Replace deferred parts received (not installed).
  - a. Identify the components requiring replacements.
  - b. Verify repair parts (usable on codes).
  - c. Receive the repair parts.
  - d. Replace the parts.
6. Annotate all activities on the equipment maintenance and inspection work sheet.
7. Forward the equipment maintenance and inspection work sheet to the maintenance shop foreman or supervisor.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all of the equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable technical manuals. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received the previous service equipment maintenance and inspection work sheet.	—	—
2. Performed an inspection and service on the item of construction equipment step by step according to the organizational maintenance manual.	—	—
3. Located all deficiencies, faults, or shortcomings.	—	—
4. Performed authorized repairs on deficiencies, faults, or shortcomings according to the maintenance allocation chart as they are found.	—	—
5. Replaced deferred parts received (not installed).	—	—
6. Annotated all activities on the equipment maintenance and inspection work sheet.	—	—
7. Forwarded the equipment maintenance and inspection work sheet to the maintenance shop foreman or supervisor.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 LO 5-2410-237-12  
 TM 5-2410-237-20

**Related**

AR 750-1  
 DA PAM 738-750

## Perform a Biannual Service on an Item of Construction Equipment

**091-62B-1106**

**Conditions:** Given an item of construction equipment due a biannual service; the applicable organizational maintenance manuals; the lubrication order (LO); test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); a general mechanic's tool kit; petroleum, oils, and lubricants (POL); an equipment maintenance and inspection work sheet; and a pen.

**Standards:** Complete a biannual service on an item of construction equipment according to the equipment organizational maintenance manuals and the lubrication order. Complete the service without causing injury to any personnel and further damage to the equipment.

### Performance Steps

1. Receive the previous service equipment maintenance and inspection work sheet.
  - a. Initiate a new service equipment maintenance and inspection work sheet.
  - b. Review the previous service equipment maintenance and inspection work sheet.

**CAUTION: BE AWARE OF EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS. WATCH FOR POSSIBLE ELECTRICAL SHOCK, INJURY, OR DEATH BY BEING CRUSHED BY EQUIPMENT. POLS CAN BE FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY. DIESEL FUEL IS FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA.**

2. Perform an inspection and service on the item of construction equipment step by step according to the organizational maintenance manual.
  - a. Locate the latest organizational maintenance manual relating to the item of equipment.
  - b. Locate the latest technical bulletin (TB) relating to the item of equipment.
  - c. Review the operator's monthly preventive-maintenance checks and services (PMCS) inspection.
  - d. Perform an organization PMCS inspection according to the equipment' technical manual (TM).
  - e. Record all deficiencies, faults, and shortcomings on the maintenance and inspection work sheet.
3. Locate any deficiencies, faults, or shortcomings.
4. Perform authorized repairs on deficiencies, faults, or shortcomings according to the maintenance allocation chart as they are found.
  - a. Identify the components requiring replacements.
  - b. Identify all additional supporting maintenance steps.
5. Replace deferred parts received (not installed).
  - a. Identify the components requiring replacements.
  - b. Verify repair parts (usable on codes).
  - c. Receive the repair parts.
  - d. Replace the parts.
6. Annotate all activities on the equipment maintenance and inspection work sheet.
7. Forward the equipment maintenance and inspection work sheet to the maintenance shop foreman or supervisor.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and applicable technical manuals. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received the previous service equipment maintenance and inspection work sheet.	—	—
2. Performed an inspection and service on the item of construction equipment step by step according to the organizational maintenance manual.	—	—
3. Located all deficiencies, faults, or shortcomings.	—	—
4. Performed authorized repairs on deficiencies, faults, or shortcomings according to the maintenance allocation chart as they were found.	—	—
5. Replaced deferred parts received (not installed).	—	—
6. Annotated all activities on the equipment maintenance and inspection work sheet.	—	—
7. Forwarded the equipment maintenance and inspection work sheet to the maintenance shop foreman or supervisor.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 LO 5-2410-237-12  
 TM 5-2410-237-20

**Related**

AR 750-1  
 DA PAM 738-750



## Perform a Usage Service on an Item of Construction Equipment

**091-62B-1107**

**Conditions:** Given an item of construction equipment meeting or exceeding the miles, hours, and kilometers required to do a service; the applicable organizational maintenance manuals; the lubrication order (LO); test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); a general mechanic's tool kit; petroleum, oils, and lubricants (POL); an equipment maintenance and inspection work sheet; and a pen.

**Standards:** Complete a usage service on an item of construction equipment according to the equipment organizational maintenance manuals and lubrication order. Complete the service without causing injury to any personnel and further damage to the equipment

### Performance Steps

1. Receive the previous service equipment maintenance and inspection work sheet.
  - a. Review the previous service equipment maintenance and inspection work sheet.
  - b. Initiate a new service equipment maintenance and inspection work sheet.

**CAUTION: BE AWARE OF EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS. WATCH FOR POSSIBLE ELECTRICAL SHOCK, INJURY, OR DEATH BY BEING CRUSHED BY EQUIPMENT. POLS CAN BE FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY. DIESEL FUEL IS FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA.**

2. Perform an inspection and service on the item of construction equipment step by step according to the organizational maintenance manual.
  - a. Locate the latest organizational maintenance manuals relating to the item of equipment.
  - b. Locate the latest technical bulletin (TB) relating to the item of equipment.
  - c. Review the operator's monthly preventive-maintenance checks and services (PMCS) inspection.
  - d. Perform an organization PMCS inspection according to the equipment technical manual (TM).
  - e. Record all deficiencies, faults, and shortcomings on the maintenance inspection work sheet.
3. Locate any deficiencies, faults, or shortcomings.
4. Perform authorized repairs on deficiencies, faults, or shortcomings according to the maintenance allocation chart as they are found.
  - a. Identify the components requiring replacements.
  - b. Identify all additional supporting maintenance steps.
5. Replace deferred parts received (not installed).
  - a. Identify the components requiring replacements.
  - b. Verify repair parts (usable on codes).
  - c. Receive the repair parts.
  - d. Replace the parts.
6. Annotate all activities on an equipment maintenance and inspection work sheet.
7. Forward the equipment maintenance and inspection work sheet to the maintenance shop foreman or supervisor.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received the previous service maintenance and inspection work sheet.	—	—
2. Edited/screened/verified maintenance and inspection work sheet.	—	—
3. Initiated a new service maintenance and inspection work sheet.	—	—
4. Obtained the appropriate equipment organizational maintenance manual and lubrication order.	—	—
5. Performed an inspection and service on the item of construction equipment step by step according to the organizational maintenance manual.	—	—
6. Located any deficiencies, faults, or shortcomings.	—	—
7. Performed authorized repairs on deficiencies, faults, or shortcomings according to the maintenance allocation chart as they were found.	—	—
8. Replaced deferred parts received (not installed).	—	—
9. Annotated all activities on the maintenance and inspection work sheet.	—	—
10. Forwarded the maintenance and inspection work sheet to the maintenance shop foreman or supervisor.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 LO 5-1940-277-12  
 TM 5-1940-277-20

**Related**

AR 750-1  
 DA PAM 738-750

**Sample an Item of Construction Equipment Enrolled in the Army Oil Analysis Program (AOAP).**

**091-62B-1108**

**Conditions:** Given an item of construction equipment requiring a sample taken from the engine; hydraulic or transmission oils; a general mechanic's tool kit; an oil sampling pump; oil sampling tubing; an oil sample bottle; personal protective equipment (PPE); the applicable equipment technical manuals (TMs); an oil analysis request form work sheet; and a pen.

**Standards:** Obtain an engine, hydraulic, or transmission oil sample for submittal to the AOAP laboratory without causing injury to any personnel and damage to the environment or the equipment.

**Performance Steps**

1. Receive and review an oil analysis request.
  - a. Determine the type of sample required.
  - b. Review the analysis request for completeness.

**CAUTION: BE AWARE OF EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS. WATCH FOR POSSIBLE ELECTRICAL SHOCK, INJURY, OR DEATH BY BEING CRUSHED BY EQUIPMENT. POLS CAN BE FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY. DIESEL FUEL IS FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA.**

2. Determine the required method of sampling. Check the equipment to determine if the sampling valve is installed or if a sampling pump is required.
3. Obtain sampling equipment.
  - a. Obtain a sampling pump, if required.
  - b. Obtain sampling tubing, if required.
  - c. Obtain a sampling bottle.
  - d. Ensure that all sampling equipment is clean and free of contamination.
4. Obtain a sample using a sampling pump method.
  - a. Use a dipstick to determine the length of the sampling tubing.
  - b. Cut the tubing approximately 10 inches longer than the dipstick.
  - c. Attach the tubing and the sample bottle to the sampling pump.
  - d. Insert the tubing into the reservoir either through the dipstick tube or the fill neck ensuring not to touch the sides or bottom of the reservoir.
  - e. Hold the sampling pump horizontal while pumping the handle until the bottle is filled to 1/2 inch from the top of the bottle.
  - f. Remove the bottle and replace the cap on the sample bottle.
  - g. Remove the tubing from the reservoir, detach it from the sample pump, and discard appropriately.
5. Obtain a sample using a sampling valve method.
  - a. Locate the sampling valve.
  - b. Flush the sampling valve by opening and draining a small amount of oil into an appropriate container.
  - c. Fill the sample bottle to 1/2 inch below the top of the bottle.
  - d. Replace the cap on the sampling bottle.
6. Annotate the sample for identification.
7. Annotate the equipment bumper number, the serial number of the component, and either the miles, kilometer, or hours on the equipment.
8. Turn in the sample to the maintenance supervisor.

**Evaluation Preparation:** Provide the soldier the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed an oil analysis request.	—	—
2. Determined the required method of sampling.	—	—
3. Obtained sampling equipment.	—	—
4. Obtained a sample using a sampling pump method.	—	—
5. Obtained a sample using a sampling valve method.	—	—
6. Annotated the sample for identification.	—	—
7. Annotated the equipment bumper number, the serial number of the component, and either the miles, kilometer, or hours on the equipment.	—	—
8. Turned in the sample to the maintenance supervisor.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5991-E
- TM 5-3805-248-14&P-1
- TM 5-3805-248-14&P-2
- TM 5-3805-248-14&P-3

**Related**

- AR 750-1
- DA PAM 738-750
- TB 43-0210
- TB 43-0211

## Subject Area 2: Electrical

**Repair a Wiring Harness on an Item of Construction Equipment  
091-62B-1201**

**Conditions:** Given an item of construction equipment with a faulty wiring harness; replacement wire; an electrical terminal kit; a soldering gun; insulated tape; a general mechanic's tool kit; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet; and a pen.

**Standards:** Repair a wiring harness without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection and maintenance work sheet.

**WARNING: THE POSSIBILITY OF AN ELECTRICAL SHOCK EXISTS, DISCONNECT BATTERIES BEFORE REMOVING OR WORKING ON AN ELECTRICAL SYSTEM. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

2. Inspect the equipment and verify its condition
  - a. Check the connections.
  - b. Perform a continuity test.
3. Disconnect the battery cable
  - a. Lift up the rubber boot and use a wrench to disconnect the negative battery cable.
4. Repair any defective wires in the wiring harness.
  - a. Remove the clamps and the tie straps, as necessary, for access to the wiring harness.
  - b. Cut the outer covering of the wiring harness, if necessary, to expose the wires.
  - c. Locate the defective wire.
  - d. Use a wire cutter to remove the damaged section of the wire.
  - e. Use a wire cutter to cut a replacement wire of the same gauge and color.
  - f. Use a wire stripper to strip 1/4 inch of insulation from the ends of the wire.
  - g. Splice the ends of the new wire to the ends of the harness wire using insulated splice connectors.
  - h. Wrap the outer covering of the wiring harness with insulated tape, if necessary.
  - i. Replace the clamps and install new tie straps, as necessary, to secure the wiring harness.
5. Repair the wiring harness connector.
  - a. Use a wrench to loosen and remove the nut from the connector shell.
  - b. Pull the grommet with inserts from the connector shell.
  - c. Pull the damaged insert with wire end from the grommet and cut the wire as close to the insert as possible.
  - d. Strip the wire insulation to the depth of the new insert solder well.
  - e. Position the wire end into the solder well of the new insert and solder.
  - f. Push the insert with the wire into the grommet, align the inserts with holes into the connector shell, and push the grommet with inserts into the connector shell until it is seated.
  - g. Slide the nut over the wiring harness, install on the connector shell, and tighten with a wrench.
6. Connect the battery cable.
  - a. Use a wrench to reconnect the negative battery cable.
  - b. Put the rubber boot back in place.
7. Perform a system test.
  - a. Check the connections.
  - b. Perform a voltage check.

**Performance Steps**

c. Have the operator start the equipment.

8. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Disconnected the battery cable.	—	—
4. Repaired any defective wires in the wiring harness.	—	—
5. Repaired the wiring harness connector.	—	—
6. Connected the battery cable.	—	—
7. Performed a system test.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-3805-262-20

**Related**

AR 750-1  
DA PAM 738-750  
TM 9-8000

## Replace Batteries on an Item of Construction Equipment

**091-62B-1202**

**Conditions:** Given an item of construction equipment with unserviceable batteries; a serviceable set of batteries; a general mechanic's tool kit; a soldier's portable on-site repair and test (SPORT) set; personal protective equipment (PPE); test, measurement, and diagnostic equipment (TMDE); the applicable technical manuals (TMs); an equipment inspection and maintenance work sheet; and a pen.

**Standards:** Replace batteries without causing injury to any personnel and damage to the environment or the equipment.

### Performance Steps

1. Receive and review an equipment inspection and maintenance work sheet.

**WARNING: THE POSSIBILITY OF AN ELECTRICAL SHOCK EXISTS. DISCONNECT BATTERIES BEFORE REMOVING OR WORKING ON AN ELECTRICAL SYSTEM. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

2. Inspect the equipment and verify its condition.
  - a. Check the connections.
  - b. Check the battery fluid level.
  - c. Perform a voltage check.
3. Remove and tag the negative and positive cables
  - a. Lift up the rubber boot and use a wrench to disconnect the negative battery cable.
  - b. Lift up the rubber boot and use a wrench to disconnect the positive battery cable.
  - c. Lift up the rubber boots on the cable and use a wrench to remove the remaining cables from the battery terminals.
4. Remove the mounting bracket and unserviceable batteries.
  - a. Use a wrench to remove six locknuts and washers from the battery hold-down bracket.
  - b. Remove the bracket.
  - c. Attach the lifting equipment to the battery handles. Remove the battery and repeat the same steps to remove the second battery.

**NOTE:** A battery weighs 115 pounds.

5. Install the replacement batteries and brackets.
  - a. Attach the lifting equipment to the battery handles. Use the lifting equipment to lower the battery into the battery box. Repeat the previous step for the second battery.

**NOTE:** A battery weighs 115 pounds.

6. Connect the battery cables and remove the tags.
  - a. Attach one cable to the positive terminal of battery and one to the negative terminal of the battery. Use a wrench to secure the cable to the terminals. Slide the boots over the terminals.
  - b. Attach the positive battery cable to the positive terminal of the battery. Use a wrench to secure the cable to the terminal. Slide the boot over the terminal.
  - c. Attach the negative battery cable to the negative terminal on the battery. Use a wrench to secure the cable to the terminal. Slide the boot over the terminal.
7. Perform a system test.
  - a. Perform a voltage check.
  - b. Have the operator start the equipment.
8. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed and tagged the negative and positive cables.	—	—
4. Removed the mounting brackets and unserviceable batteries.	—	—
5. Installed the replacement batteries and brackets.	—	—
6. Connected the battery cables and removed the tags.	—	—
7. Performed a system test.	—	—
8. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2410-237-20

**Related**

AR 750-1  
DA PAM 738-750



## Replace a Starter on an Item of Construction Equipment.

**091-62B-1203**

**Conditions:** Given an item of construction equipment with an unserviceable starter; a serviceable starter; a general mechanic's tool kit; special tools; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); applicable technical manuals (TMs); an equipment inspection and maintenance work sheet; and a pen.

**Standards:** Replace a starter without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review an equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
  - a. Check the connections.
  - b. Perform the tests using TMDE.

**WARNING: THE POSSIBILITY OF AN ELECTRICAL SHOCK EXISTS. DISCONNECT BATTERIES BEFORE REMOVING OR WORKING ON AN ELECTRICAL SYSTEM. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

3. Disconnect the battery cable.
    - a. Lift up the rubber boot and use a wrench to disconnect the negative battery cable.
  4. Remove the crankcase guards.
    - a. Place a special tool in position under the crankcase guard with a transmission jack.
    - b. Use a wrench to remove 20 of the 22 bolts holding the crankcase guard.
    - c. Install the special tool into the crankcase guard and position the jack to hold the guard.
    - d. Remove the remaining bolts and the crankcase guards.
  5. Remove the starter.
    - a. Disconnect the wires from the starter and tag it for identification.
    - b. Support the starter.
- NOTE:** The starter weighs 77 pounds.
- c. Use a wrench to remove the three bolts that hold the starter to the engine.
    - d. Remove the starter.
  6. Install a serviceable starter.
    - a. Support the starter on the engine and use a wrench to install the three mounting bolts.
    - b. Reconnect all of the wires to the starter and remove the tags.
  7. Connect the battery cable.
    - a. Use a wrench to connect the negative battery cable.
    - b. Put the rubber boot back in place.
  8. Perform a system test.
    - a. Check the connections.
    - b. Perform a voltage check.
    - c. Have the operator start the equipment.
  9. Install the crankcase guards.
    - a. Raise the guards into position with the special tool and the transmission jack.
    - b. Use a wrench to install 22 bolts.
    - c. Lower and remove the special tool and the jack.
  10. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed an equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Disconnected the battery cable.	—	—
4. Removed the crankcase guards.	—	—
5. Removed the starter.	—	—
6. Installed a serviceable starter.	—	—
7. Connected the battery cable.	—	—
8. Performed a system test.	—	—
9. Installed the crankcase guards.	—	—
10. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-3805-248-14&P-2

**Related**

AR 750-1  
DA PAM 738-750  
TM 5-3805-248-14&P-1  
TM 5-3805-248-14&P-3  
TM 9-8000

**Replace a Switch on an Item of Construction Equipment**  
**091-62B-1204**

**Conditions:** Given an item of construction equipment with an unserviceable switch; a serviceable switch; a general mechanic's tool kit; special tools; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manuals (TMs); an equipment inspection and maintenance work sheet; and a pen.

**Standards:** Replace a switch without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
  - a. Check the connections.
  - b. Perform the tests using TMDE.

**WARNING: TURN THE BATTERY DISCONNECT SWITCH TO OFF OR DISCONNECT THE BATTERY GROUND CABLE BEFORE WORKING INSIDE THE DASH ASSEMBLY. FAILURE TO FOLLOW THIS PRECAUTION COULD RESULT IN PERSONAL INJURY.**

3. Disconnect the battery cable or turn the battery disconnect switch to OFF.
  - a. Lift up the rubber boot and use a wrench to disconnect the negative battery cable.
4. Remove the unserviceable switch.
  - a. Use a wrench to remove four cap screws, washers, lock washers, and the cover from the top of the dash assembly.
  - b. Remove the nut and the retaining ring from the front of the engine start switch.
  - c. Remove the switch through the back of the dash panel.
  - d. Tag the wires and disconnect them from the start switch with a flat blade screwdriver.
5. Install a serviceable switch.
  - a. Connect the wires to the back of the start switch with a flat blade screwdriver and remove the tags.
  - b. Insert the switch through the back of the dash panel and install a retaining ring and nut on the front of the switch.
  - c. Use a wrench to install a cover on the top of the dash with four cap screws, washers, and lock washers.
6. Connect the battery cable or turn the battery disconnect switch to ON.
  - a. Use a wrench to reconnect the negative battery cable.
  - b. Put the rubber boot back in place.
7. Perform a system test.
  - a. Ensure that the switch activates the function.
8. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Disconnected the battery cable or turned the battery disconnect switch to OFF.	—	—
4. Removed the unserviceable switch.	—	—
5. Installed a serviceable switch.	—	—
6. Connected the battery cable or turned the battery disconnect switch to ON.	—	—
7. Performed a system test.	—	—
8. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 TM 5-2410-237-20

**Related**

AR 750-1  
 DA PAM 738-750  
 TM 9-8000

## Replace an Alternator on an Item of Construction Equipment

### 091-62B-1205

**Conditions:** Given an item of construction equipment with an unserviceable alternator; a serviceable alternator; a general mechanic's tool kit; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manuals (TMs); an equipment inspection and maintenance work sheet; and a pen.

**Standards:** Replace an alternator without causing injury to any personnel and damage to the equipment.

#### Performance Steps

1. Receive and review an equipment inspection and maintenance work sheet.

**WARNING: THE POSSIBILITY OF AN ELECTRICAL SHOCK EXISTS. DISCONNECT BATTERIES BEFORE REMOVING OR WORKING ON AN ELECTRICAL SYSTEM. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

2. Inspect the equipment and verify its condition.
  - a. Check the connections.
  - b. Perform a voltage test.
3. Disconnect the battery cable.
  - a. Lift up the rubber boot and use a wrench to disconnect the negative battery cable.
4. Remove the air compressor drive belt.
  - a. Use a wrench to loosen two cap screws that secure the air compressor to the mounting bracket.
  - b. Move the air compressor closer to the engine and remove the drive belt from the air compressor pulley and the fan pulley.
5. Remove the alternator drive belt.
  - a. Use a wrench to loosen the cap screw at the alternator adjusting strap.
  - b. Use a wrench to loosen two lock nuts at the alternator mounting bracket.
  - c. Push the top of the alternator as far as possible toward the engine.
  - d. Remove the drive belts from the pulleys by guiding them over the engine fan blades and removing them from the loader.
6. Remove the alternator.
  - a. Slide the battery terminal boot on the alternator out of the way.
  - b. Use a wrench to loosen and remove the nut and lock washer from the alternator battery terminal.
  - c. Disconnect and tag the wire terminal from the alternator battery terminal.
  - d. Use a wrench at the alternator adjusting strap to loosen and remove the cap screw, lock washer, and washer.
  - e. Use a wrench at the alternator mounting bracket to remove two cap screws and a washer.
  - f. Lift the alternator from the mounting bracket.
7. Install the serviceable alternator.
  - a. Position the alternator on the mounting bracket and install two cap screws, washers, and locknuts. Do not tighten the locknuts.
  - b. Align the slot in the adjusting strap with the threaded hole at the top of the alternator and install the cap screw, the lock washer, and the washer. Do not tighten the cap screw.
  - c. Use a straightedge to check the alignment of the alternator pulley with the fan and crankshaft pulleys.
  - d. Slide the alternator mounting bracket on the timing gear cover, as necessary, to align the pulleys.
  - e. Install the alternator drive belt on the pulleys.

**Performance Steps**

- f. Pry the top of the alternator away from the engine to increase the tension on the drive belt.
  - g. Use a wrench to tighten the cap screw at the alternator adjusting strap.
  - h. Measure the drive belt tension and adjust it, as necessary.
  - i. Use a wrench to tighten the mounting bracket locknuts.
  - j. Reconnect the alternator battery terminal and use a wrench to tighten the terminal nut.
  - k. Slide the battery terminal boot onto the terminal.
8. Install the air compressor drive belt.
    - a. Position the drive belt around the fan pulley and the air compressor pulley.
    - b. Move the air compressor away from the engine until the proper drive belt tension is obtained.
    - c. Align the air compressor pulley with the fan pulley and use a wrench to tighten two cap screws.
  9. Connect the battery cable.
    - a. Use a wrench to connect the negative battery cable.
    - b. Put the rubber boot back in place.
  10. Perform a system test.
    - a. Check the connections.
    - b. Perform a voltage check.
    - c. Have the operator start the equipment.
  11. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition	—	—
3. Disconnected the battery cable.	—	—
4. Removed the air compressor drive belt.	—	—
5. Removed the alternator drive belt.	—	—
6. Removed the alternator.	—	—
7. Installed the replacement alternator.	—	—
8. Installed the air compressor drive belt.	—	—
9. Connected the battery cable.	—	—
10. Performed system test.	—	—
11. Annotated the equipment inspection and maintenance worksheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-3805-262-20

**Related**

AR 750-1  
DA PAM 738-750  
TM 9-8000

## Replace an Electrical Gauge on an Item of Construction Equipment

091-62B-1206

**Conditions:** Given an item of construction equipment with an unserviceable electrical gauge; a serviceable electrical gauge; a general mechanic's tool kit; special tools; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace an electrical gauge without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review an equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
  - a. Check the connections.
  - b. Perform the tests using TMDE.

**WARNING: THE POSSIBILITY OF AN ELECTRICAL SHOCK EXISTS. DISCONNECT BATTERIES BEFORE REMOVING OR WORKING ON AN ELECTRICAL SYSTEM. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

3. Disconnect the battery cable.
  - a. Lift up the rubber boot and use a wrench to disconnect the negative battery cable.
4. Remove the gauge and panel assembly.
  - a. Remove four screws and washers from the gauge and panel assembly.
  - b. Pull the gauge and panel assembly away from the bracket.
5. Remove the faulty electrical gauge from the panel assembly.
  - a. Tag and remove two electrical leads from the faulty gauge.
  - b. Remove two nuts, washers, and the mounting bracket from the panel assembly.
  - c. Slide the faulty gauge from the panel.
6. Install the serviceable electrical gauge.
  - a. Slide the serviceable gauge into the panel assembly.
  - b. Install the gauge mounting bracket, two washers, and the nuts.
  - c. Connect the electrical leads to the gauge and remove the tags.
7. Install the gauge and panel assembly.
  - a. Guide the gauge and panel assembly into the bracket.
  - b. Install four mounting screws and washers into the bracket.
8. Connect the battery cable.
  - a. Use a wrench to reconnect the negative battery cable.
  - b. Put the rubber boot back in place.
9. Perform a system test.
  - a. Turn the power switch on and ensure that the gauge works.
10. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.



<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed an equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Disconnected the battery cable.	—	—
4. Removed the gauge and panel assembly.	—	—
5. Removed the faulty electrical gauge from the panel assembly.	—	—
6. Installed the serviceable electrical gauge.	—	—
7. Installed the gauge and panel assembly.	—	—
8. Connected the battery cable.	—	—
9. Performed a system test.	—	—
10. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 TM 5-2350-262-20-1

**Related**

AR 750-1  
 DA PAM 738-750  
 TM 9-8000

Subject Area 3: Engines

**Replace a Fuel Tank on an Item of Construction Equipment**  
**091-62B-1301**

**Conditions:** Given an item of construction equipment with an unserviceable and drained fuel tank; all accessories removed for access to the fuel tank; a serviceable fuel tank; shop equipment (general-purpose repair); lifting equipment (500 pounds); personal protective equipment (PPE); test, measurement, and diagnostic equipment (TMDE); the applicable technical manuals (TMs); a maintenance request; and a pen.

**Standards:** Replace the fuel tank without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection and maintenance work sheet.

2. Inspect the equipment and verify its condition.

**WARNING: DIESEL FUEL IS FLAMMABLE. KEEP OPEN FLAMES AND SPARKS OUT OF THE AREA WHILE WORKING ON A FUEL SYSTEM. WIPE UP SPILLS IMMEDIATELY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

3. Remove the fuel lines.

- a. Use a wrench to disconnect the fuel supply line from the fitting.
- b. Use two wrenches to disconnect the drain line from the valve.
- c. Use a wrench to remove the cap screw and washer from the clip and remove the drain line.
- d. Use two wrenches to disconnect the nut from the joint assembly.
- e. Use a wrench to disconnect the fuel return line from the elbow.

4. Remove the unserviceable fuel tank.

- a. Use a wrench to remove two cap screws and spacers from underneath each fender.
- b. Use the lifting equipment to remove the fuel tank.
- c. Remove the plunger and strainer from the tank.

5. Install the serviceable fuel tank.

- a. Install the strainer and plunger in the fuel tank.
- b. Use the lifting equipment to install the fuel tank.
- c. Use a wrench to install two cap screws and spacers underneath each fender.

6. Install the fuel lines.

- a. Connect the fuel return line to the elbow and tighten it with a wrench.
- b. Replace the nut on the joint assembly and tighten the nut with two wrenches.
- c. Position the drain line on the equipment and install the clip.
- d. Use a wrench to secure the clip with a washer and cap screw.
- e. Use two wrenches to reconnect the drain line to the valve.
- f. Use a wrench to reconnect the fuel supply line to the fitting.

7. Perform a system test.

- a. Fill the fuel tank.
- b. Check for leaks.
- c. Start the equipment.
- d. Check for leaks and proper operation of the equipment.

8. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is

not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed an equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the fuel lines.	—	—
4. Removed the unserviceable fuel tank.	—	—
5. Installed the serviceable fuel tank.	—	—
6. Installed the fuel lines.	—	—
7. Performed a system test.	—	—
8. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
 DA FORM 5990-E  
 TM 5-2410-237-34

**Related**  
 AR 750-1  
 TM 9-8000

## Replace a Fuel Line on an Item of Construction Equipment

091-62B-1302

**Conditions:** Given an item of construction equipment with a drained fuel tank; all accessories removed for access to the fuel line; an unserviceable fuel line; a serviceable fuel line; a general mechanic's tool kit; fuel system caps and plugs; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the fuel line without causing injury to any personnel and damage to equipment.

### Performance Steps

1. Receive and review an equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.

**WARNING: FUEL IS A COMBUSTIBLE MATERIAL. DO NOT SMOKE OR ALLOW SPARKS OR OPEN FLAMES INTO AREAS WHERE FUEL IS PRESENT. FAILURE TO COMPLY MAY RESULT IN SEVERE INJURY OR DEATH.**

**CAUTION: DRAIN FUEL FROM THE FUEL LINES INTO AN APPROPRIATE CONTAINER. SPILLED FUEL MAY DAMAGE ELECTRICAL COMPONENTS. PLUG ALL PORTS AND HOSE ENDS TO AVOID CONTAMINATING THE FUEL SYSTEM. FAILURE TO COMPLY MAY RESULT IN DAMAGE TO EQUIPMENT.**

3. Remove the unserviceable fuel line.
  - a. Use two wrenches to disconnect the fuel return line from the check valve on the engine.
  - b. Install the cap over the check valve opening.
  - c. Align the arrows on the quick disconnect and disconnect the line at the quick disconnect.
  - d. Disconnect the connector from the bottom of the simplified test equipment/internal combustion engine (STE/ICE)-R interface resistor box.
  - e. Tag the transmission and air line hoses for proper routing during installation.
  - f. Remove five screws, lock washers, and three clamp halves securing the fuel return line under the STE/ICE-R interface resistor box.
  - g. Remove the screw and the clamp securing the fuel return line to the wall.
  - h. Use two wrenches to disconnect the fuel return line from the elbow.
    - i. Install the cap over the opening of the elbow.
    - j. Remove the unserviceable fuel return line.
4. Install the serviceable fuel line.
  - a. Remove the cap from the elbow.
  - b. Use two wrenches to connect the fuel return line to the elbow.
  - c. Secure the fuel return line to the wall with a screw and clamp.
  - d. Route the fuel return line through the top slot of the three clamp halves.
  - e. Secure the fuel return line with three clamp halves, five lock washers, and screws.
  - f. Connect the connector to the STE/ICE-R interface resistor box.
  - g. Use two wrenches to connect the fuel return line to the check valve on the engine.
  - h. Remove the cap from over the check valve opening.
    - i. Align the arrows on the quick disconnect and connect the line at the quick disconnect.
5. Perform a system check.
  - a. Refill the fuel tank.
  - b. Have the operator start the engine.
  - c. Check the system for leaks.
6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed an equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable fuel line.	—	—
4. Installed the serviceable fuel line.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
 DA FORM 5988-E  
 TM 5-2350-262-20-1

**Related**  
 AR 750-1  
 TM 9-8000

## Replace a Fuel Filter on an Item of Construction Equipment

091-62B-1303

**Conditions:** Given an item of construction equipment with an unserviceable fuel filter; a serviceable fuel filter; a general mechanic's tool kit; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the fuel filter without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review an equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition. Clean the filter head, fuel filters, and engine area adjacent to the filters using a clean cloth moistened with cleaning solvent P-D-680.

**WARNING: DRY CLEANING SOLVENT (P-D-680) USED TO CLEAN PARTS IS TOXIC AND FLAMMABLE. WEAR PROTECTIVE GOGGLES AND GLOVES AND USE ONLY IN A WELL-VENTILATED AREA. AVOID CONTACT WITH SKIN, EYES, AND CLOTHING AND DO NOT BREATHE THE VAPORS. DO NOT USE NEAR OPEN FLAMES OR EXCESSIVE HEAT AND DO NOT SMOKE WHEN USING IT. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY. IF YOU BECOME DIZZY WHILE USING CLEANING SOLVENT, GET FRESH AIR AND MEDICAL ATTENTION IMMEDIATELY. IF CONTACT WITH SKIN OR CLOTHES IS MADE, FLUSH WITH LARGE AMOUNTS OF WATER. IF CONTACT WITH EYES IS MADE, WASH EYES WITH WATER AND GET MEDICAL AID IMMEDIATELY. DIESEL FUEL IS HIGHLY COMBUSTIBLE. DO NOT SMOKE OR ALLOW OPEN FLAMES OR SPARKS INTO THE AREA. DEATH OR SEVERE INJURY MAY RESULT IF PERSONNEL FAIL TO OBSERVE THIS PRECAUTION. IF YOU ARE BURNED, OBTAIN MEDICAL AID IMMEDIATELY.**

3. Remove the unserviceable fuel filter.
  - a. Place a quart container under the filter drain plug.
  - b. Remove the drain plug and the drain fuel.
  - c. Use a filter wrench and turn the filter counterclockwise to loosen.
  - d. Unscrew and remove the filter.
4. Install the serviceable fuel filter.
  - a. Apply a thin film of oil to the gasket of a new fuel filter.
  - b. Screw the filter clockwise into the base of the filter head until the gasket contacts the head.
  - c. Hand tighten 1/2 turn.
  - d. Loosen the filter and retighten it by hand 1/2 to 3/4 turn after the gasket contacts the filter head.
  - e. Open the bleed valve on top of the filter head and place the key switch in the ON position.
  - f. Close the bleed valve when clear. Bubble free fuel will appear.
  - g. Close the bleed valve on top of the filter head and place the key switch in the OFF position.
  - h. Use a clean rag to wipe up any diesel fuel spillage.
5. Perform a system check.
  - a. Have an operator start the engine.
  - b. Check the system for leaks.
6. Annotate the equipment Inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable fuel filter.	—	—
4. Installed the serviceable fuel filter.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
 DA FORM 5988-E  
 TM 5-3805-262-20

**Related**  
 AR 750-1  
 TM 9-8000

## Replace a Fuel Pump on an Item of Construction Equipment

091-62B-1304

**Conditions:** Given an item of construction equipment; an unserviceable fuel pump with all of the accessories removed for access to the fuel pump; a serviceable fuel pump; shop equipment (general-purpose repair); lifting equipment (100 pounds); special tools; test, measurement, and diagnostic equipment; personal protective equipment (PPE); the applicable technical manuals (TMs); an equipment maintenance request; and a pen.

**Standards:** Replace the fuel pump without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review an equipment maintenance request.

2. Inspect the equipment and verify its condition.

**WARNING: DIESEL FUEL IS FLAMMABLE. KEEP OPEN FLAMES AND SPARKS OUT OF THE AREA WHILE WORKING ON A FUEL SYSTEM. WIPE UP SPILLS IMMEDIATELY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

3. Remove the unserviceable fuel pump.

- a. Use two wrenches to remove the nut, the cap screw, washers, and the rod from the lever on the fuel pump.
- b. Use a wrench to disconnect the fuel return line from the fuel manifold.
- c. Use a wrench to remove six nuts and washers from the pump drive gear cover.
- d. Remove the drive gear cover.
- e. Use a wrench to loosen the cap screw on the drive gear.
- f. Attach a gear puller at the threaded holes of the drive gear.
- g. Use a wrench on the gear puller to loosen the fuel injection pump drive gear from the taper on the fuel injection pump camshaft.
- h. Use a wrench to loosen the gear puller and remove it from the drive gear.
- i. Remove the cap screw and washer from the drive gear.
- j. Fasten the lifting equipment to the fuel injection pump housing and governor.
- k. Use a wrench to remove three nuts securing the fuel pump to the engine housing.
- l. Separate the fuel pump from the engine housing.
- m. Use the lifting equipment to move the pump away from the engine.

4. Install the serviceable fuel pump.

- a. Set the engine to the top center compression for the number 1 piston.
- b. Use a wrench to remove four cap screws from the timing hole cover and remove the cover and gasket.
- c. Use a wrench to rotate the injection pump camshaft until the timing pin goes into the notch in the camshaft.
- d. Install new preformed packing on the injection pump housing.
- e. Fasten the lifting equipment to the fuel injection pump housing and governor.
- f. Use the lifting equipment to mount the fuel pump housing onto the engine timing-gear housing.
- g. Install three nuts on the fuel pump mounting studs and tighten with a wrench.
- h. Install the cap screw and washer into the timing gear.
- i. Install the adapter on the injection pump drive gear.
- j. Use two torque wrenches and hold the adapter by applying a torque of 50 foot-pounds in a clockwise direction.
- k. While holding the adapter, tighten the cap screw with a torque wrench to 200 foot-pounds.
- l. Remove the timing pin from the injection pump housing.
- m. Check the timing of the engine and reset it, if necessary.



**Performance Steps**

- n. Install a new gasket on the timing hole cover and install the cover using four cap screws and a wrench.
  - o. Place a new gasket and pump drive gear cover in position on the engine front housing cover.
  - p. Use a wrench to install six washers and nuts on drive gear cover.
  - q. Use a wrench to install the fuel return line to the fuel manifold.
  - r. Use two wrenches to install the washers, the cap screws, and the rod and nut to the lever on the fuel pump.
5. Perform a system check.
- a. Return the equipment to operating condition.
  - b. Remove the air inlet elbow and piping from the air inlet of the turbocharger.
  - c. Start the engine.
  - d. If the engine runs properly, stop the engine.
  - e. Reinstall the air inlet elbow and piping from the air inlet of the turbocharger.
  - f. Start and test operate the equipment through all of the speeds.
6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable fuel pump.	—	—
4. Installed the serviceable fuel pump.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
 DA FORM 5990-E  
 TM 5-2410-237-34

**Related**  
 AR 750-1  
 DA PAM 738-750  
 TM 9-8000

## Replace an Injector Pump on an Item of Construction Equipment

091-62B-1305

**Conditions:** Given an item of construction equipment with an unserviceable fuel injection pump and all accessories removed for access to the fuel injection pump, a serviceable fuel injection pump, general-purpose shop equipment, special tools, personal protective equipment (PPE), the applicable technical manual, an equipment maintenance request, and a pen.

**Standards:** Replace the fuel injection pump without causing damage to the equipment or injury to personnel.

### Performance Steps

1. Receive and review an equipment maintenance request.

2. Inspect the equipment and verify its condition.

**DANGER: DIESEL FUEL IS FLAMMABLE. KEEP OPEN FLAME AND SPARKS OUT OF THE AREA WHILE WORKING ON FUEL SYSTEMS. WIPE UP SPILLS IMMEDIATELY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

3. Remove the unserviceable fuel injection pump.

- a. Use a wrench to remove the four caps crews from the timing hole cover.
- b. Remove the timing hole cover and gasket.
- c. Move the governor lever to the FUEL OFF position.
- d. Install the timing pin in the timing pinhole.
- e. Move the governor lever (with the timing pin in position) to the HIGH IDLE position.
- f. Wire the governor lever in the HIGH position.
- g. Use the injector pump wrench to remove the bushing from the injector pump.
- h. Install the extractor on the bonnet of the injector pump and remove the pump.
- i. Remove the spacer from the fuel injector pump housing.

4. Install a serviceable fuel injector pump.

- a. Install a spacer in the fuel injection pump housing.
- b. Verify that the timing pin is installed and that the fuel rack is in the center position (governor lever in HIGH position).
- c. Install the extractor on the bonnet of the fuel injection pump.
- d. Lightly oil the preformed packing and install the packing and the bushing over the extractor.
- e. Align the fuel injection pump with the lifter assembly and the pump housing and install it.
- f. Push down on the extractor and tighten the bushing by hand until the bushing is even with the pump housing.
- g. Remove the extractor.
- h. Use the injector pump wrench and the torque wrench to tighten the bushing to 120 foot-pounds.
- i. Remove the timing pin and the injector pump wrench.
- j. Install the new gasket on the timing hole cover and install the cover using the four caps crews and a wrench.

5. Perform a system check.

- a. Return the equipment to operating condition.
- b. Start the engine.
- c. Check for proper fuel system operation.

6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Setup: Ensure that the site is set up with the equipment, the tools, and the appropriate technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and the appropriate technical publications.

Ensure that expendable materials and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable fuel injection pump.	—	—
4. Installed a serviceable fuel injection pump.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5990-E  
TM 5-2410-237-34

**Related**

AR 750-1  
DA PAM 738-750  
TM 9-8000

**Replace a Hand Primer Pump on an Item of Construction Equipment  
091-62B-1306**

**Conditions:** Given an item of construction equipment with an unserviceable hand primer pump, a serviceable hand primer pump, a general mechanic's tool kit, personal protective equipment (PPE), the applicable technical manual, an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the hand primer pump without causing damage to equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.  
**DANGER: DIESEL FUEL IS FLAMMABLE. KEEP OPEN FLAME AND SPARKS OUT OF THE AREA WHILE WORKING ON FUEL SYSTEMS. WIPE UP SPILLS IMMEDIATELY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**
3. Remove the unserviceable hand primer pump.
  - a. Turn the fuel supply valve at the bottom of the fuel tank to the OFF position.
  - b. Use a wrench to remove the cap screws and the washers from the hand primer pump mounting on the primary fuel filter base.
  - c. Remove the hand primer pump and the gasket.
4. Install a serviceable hand primer pump.
  - a. Position the hand primer pump and the gasket on the mounting of the primary fuel filter base.
  - b. Use a wrench to secure the pump to the mounting base with the cap screws and the washers.
  - c. Turn the valve on the fuel supply to the ON position.
  - d. Unscrew the knob on the hand primer pump and pump it several times to prime the fuel system.
  - e. Screw the knob in after priming is complete.
5. Perform a system check.
  - a. Have the operator start the engine.
  - b. Check for proper fuel system operation.
6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Setup: Ensure that the site is set up with the equipment, the tools, and the appropriate technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and the appropriate technical publications. Ensure that expendable materials and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable hand primer pump.	—	—
4. Installed a serviceable hand primer pump.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2410-237-20

**Related**

AR 750-1  
DA PAM 738-750  
TM 9-8000

**Replace Air Filters on an Item of Construction Equipment  
091-62B-1307**

**Conditions:** Given an item of construction equipment with unserviceable air filters, serviceable air filters, a general mechanic's tool kit, personal protective equipment (PPE), the applicable technical manual, an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the air filters without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.  
**DANGER: PARTS MAY BE HEAVY. OBTAIN ASSISTANCE IF NECESSARY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH AND DAMAGE TO THE PARTS.**
3. Remove the unserviceable air filters.
  - a. Remove the wing nut and cover the assembly on the precleaner bowl.
  - b. Remove the precleaner bowl.
  - c. Empty, wash, and dry the precleaner bowl.
  - d. Install the precleaner bowl.
  - e. Replace the wing nut, cover the assembly on the precleaner bowl, and hand tighten the wing nut.
  - f. Loosen the cover wing nut and remove the cover assembly with the wing nut attached on the element housing assembly.
  - g. Loosen and remove the primary element wing nut assembly.
  - h. Remove the primary element.
  - i. Loosen and remove the secondary wing nut assembly.
  - j. Remove the secondary element.
  - k. Pull the evacuator valve off the air cleaner body.
  - l. Wipe down the inside of the assembly with a cloth dampened with water and detergent, then dry it.
  - m. Wash, dry, and reinstall the evacuator valve.
4. Install serviceable air filters.
  - a. Install the secondary element and secure it with the wing nut assembly.
  - b. Install the primary element and secure it with the wing nut assembly.
  - c. Install the cover assembly and tighten the cover wing nut securely.
5. Perform a system check.
  - a. Reset the air restriction indicator if the red band is viewable.
  - b. Have the operator start the equipment.
  - c. Ensure that the red band in the air restriction indicator is not viewable.
6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Setup: Ensure that the site is set up with the equipment, the tools, and the appropriate technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and the appropriate technical publications. Ensure that expendable materials and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
3. Removed the unserviceable air filters.	—	—
4. Installed serviceable air filters.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 TM 5-3805-262-20

**Related**

AR 750-1  
 DA PAM 738-750  
 TM 9-8000

**Replace a Turbocharger on an Item of Construction Equipment**  
**091-62B-1308**

**Conditions:** Given an item of construction equipment with an unserviceable turbocharger and all accessories removed to gain access to the turbocharger, a serviceable turbocharger, a general mechanic's tool kit, personal protective equipment (PPE), the applicable technical manual, an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the turbocharger without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.

2. Inspect the equipment and verify its condition.

**DANGER: PARTS MAY BE HEAVY. OBTAIN ASSISTANCE IF NECESSARY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH AND DAMAGE TO THE PARTS. PETROLEUM, OILS, AND LUBRICANTS (POL) CAN BE FLAMMABLE AND ARE SLIPPERY. KEEP OPEN FLAME AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY.**

3. Remove the unserviceable turbocharger.

- a. Use a wrench to remove the four cap screws from the pipe assembly.
- b. Remove the pipe assembly and the turbocharger elbow.
- c. Remove the two seals from each end of the elbow and discard the seals.
- d. Use a wrench to remove the four nuts and the four cap screws from the turbocharger and the adapter.
- e. Use a wrench to remove the cap screw and the retainer from the elbow and the turbocharger.
- f. Lift the turbocharger carefully off of the adapter and remove the elbow from the output side of the turbocharger.
- g. Remove the gasket from the adapter and discard the gasket.

4. Install a serviceable turbocharger.

- a. Install two seals on each end of the elbow and insert one end of the elbow in the engine intake pipe.
- b. Use a wrench to install the gasket and the adapter on the exhaust manifold with four cap screws and nuts.
- c. Position the gasket on the adapter.
- d. Position the turbocharger on the adapter and insert the elbow in the output side of the turbocharger.
- e. Apply an antiseize compound to the four cap screws that secure the turbocharger to the adapter.
- f. Align the bolt holes in the turbocharger, the gasket, and the adapter and use a wrench to install the four cap screws and nuts.
- g. Install two seals on each end of the turbocharger elbow and insert one end of the elbow in the pipe assembly.
- h. Position the pipe assembly with the elbow to the turbocharger.
- i. Insert the elbow in the turbocharger and use a wrench to install the pipe assembly on the engine intake pipe with four cap screws.

5. Perform a system check.

- a. Reinstall all accessories to return equipment to service.
- b. Have the operator start the engine.
- c. Check for proper air induction system operation.

6. Annotate the equipment inspection and maintenance work sheet.



**Evaluation Preparation:** Setup: Ensure that the site is set up with the equipment, the tools, and the appropriate technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and the appropriate technical publications. Ensure that expendable materials and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE is on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition	—	—
3. Removed the unserviceable turbocharger	—	—
4. Installed a serviceable turbocharger	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2410-237-20

**Related**

AR 750-1  
DA PAM 738-750  
TM 9-8000

**Replace an Oil Filter on an Item of Construction Equipment**  
**091-62B-1309**

**Conditions:** Given an item of construction equipment with an unserviceable oil filter, a serviceable oil filter, a general mechanic's tool kit, personal protective equipment (PPE), the applicable technical manual, an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the oil filter without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.

2. Inspect the equipment and verify its condition.

**WARNING: A HOT ENGINE AND ENGINE COMPONENTS CAN CAUSE SEVERE BURNS. DO NOT WORK ON THE ENGINE OR ENGINE COMPONENTS UNLESS THE ENGINE IS COOL. SPILLED HYDRAULIC OIL IS VERY SLIPPERY. USE CAUTION WHEN ENTERING OR WORKING IN THE BOWL AREA. WIPE UP ANY SPILLED OIL IMMEDIATELY.**

3. Remove the unserviceable oil filter.

- a. Use a wrench to disconnect the hose from the filter head to gain access to the drain plug on the filter shell.
- b. Place a 1-gallon container in position to drain the oil in.
- c. Use a wrench to remove the plug from the shell and drain the oil.
- d. Use a wrench to install the plug on the shell and connect the hose to the filter head.
- e. Use a wrench to loosen the shell retaining screw and remove the shell, the element, and the gasket from the filter head.
- f. Discard the element and the gasket.

4. Install a serviceable oil filter.

- a. Remove the cap from the elbow.
- b. Install the gasket, the element, and the shell on the filter head with the shell retaining screw.
- c. Use a torque wrench to tighten the retaining screw to 25 to 35 foot-pounds.

5. Perform a system check.

- a. Have the operator start the engine.
- b. Check the system for leaks.
- c. Have the operator stop the engine.
- d. Have the operator check the oil level.

6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Setup: Ensure that the site is set up with the equipment, the tools, and the appropriate technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and the appropriate technical publications. Ensure that expendable materials and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable oil filter.	—	—
4. Installed the serviceable oil filter.	—	—
5. Performed a system check.	—	—

**Performance Measures**

**GO**    **NO GO**

6. Annotated the equipment inspection and maintenance work sheet.

\_\_\_\_\_

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

TM 5-2350-262-20-2

**Related**

AR 750-1

DA PAM 738-750

TM 9-8000

**Replace an Oil Line on an Item of Construction Equipment  
091-62B-1310**

**Conditions:** Given an item of construction equipment with an unserviceable oil line and all accessories removed for access to the oil line, a serviceable oil line, a general mechanic's tool kit, oil line caps and plugs, personal protective equipment (PPE), the applicable technical manual, an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the oil line without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.

2. Inspect the equipment and verify its condition.

**DANGER: PETROLEUM, OILS, AND LUBRICANTS (POL) CAN BE FLAMMABLE AND ARE SLIPPERY. KEEP OPEN FLAME AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

3. Remove the unserviceable oil line.

- a. Remove the seat assembly from the tractor.
- b. Use two wrenches to loosen the cap screw, lock washer, nut, and clamp set.
- c. Use a wrench to remove the four cap screws holding the cooler line tube assembly to the torque converter relief valve.
- d. Use a wrench to remove the two cap screws, four washers, and two flange halves holding the hose assembly to the tube assembly.
- e. Use a wrench to remove the two cap screws and the two lock washers that hold the cooler line tube assembly to the cooler oil outlet.
- f. Separate the connections and lift out the oil cooler line tube assembly.
- g. Remove the clamps and the seals from the tube assembly and discard the seals.

4. Install a serviceable fuel line.

- a. Place a new seal and the tube assembly in position on the oil cooler outlet. Secure them with two cap screws and two lock washers. Tighten the cap screws with a wrench.
- b. Place the seal, the hose assembly, and the two flange halves in position with the tube assembly. Secure them with the four cap screws and the four washers. Tighten the cap screws with a wrench.
- c. Place the seal and the tube assembly in position with the torque converter relief valve. Secure them with four cap screws. Tighten the cap screws with a wrench.
- d. Tighten the cap screws and the nuts using two wrenches.

5. Perform a system check. Have the operator start the equipment and check it for leaks.

6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Setup: Ensure that the site is set up with the equipment, the tools, and the appropriate technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and the appropriate technical publications. Ensure that expendable materials and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
3. Removed the unserviceable oil line.	—	—
4. Installed a serviceable oil line.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2410-237-20

**Related**

AR 750-1  
DA PAM 738-750  
TM 9-8000

## Replace a Water Pump on an Item of Construction Equipment

091-62B-1311

**Conditions:** Given an item of construction equipment with an unserviceable water pump and all accessories removed for access to the water pump, a serviceable water pump, general-purpose repair shop equipment, special tools, personal protective equipment (PPE), the applicable technical manual, an equipment maintenance request, and a pen.

**Standards:** Replace the water pump without causing damage to the equipment or injury to personnel.

### Performance Steps

1. Receive and review the equipment maintenance request.

2. Inspect the equipment and verify its condition.

DANGER: PETROLEUM, OILS, AND LUBRICANTS (POL) CAN BE FLAMMABLE AND ARE SLIPPERY. KEEP OPEN FLAME AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY. COOLANT IS A MIXTURE OF ANTIFREEZE AND WATER, BOTH ARE SLIPPERY. WIPE UP SPILLS IMMEDIATELY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.

3. Remove the water pump.

- a. Drain the coolant from the cooling system.
- b. Remove the bolt with a washer and the clamp. Allow the ground wire to hang down, out of the way.
- c. Remove the four bolts with washers and the bracket.
- d. Loosen the pivot bolt, and remove the water pump V-belt.
- e. Loosen the hose clamp, and disconnect the radiator hose. Be sure to catch any remaining coolant in an appropriate manner.
- f. Loosen the hose clamp.
- g. Remove the six bolts with washers, and remove the water pump with the two O-ring seals. Upon reassembly, ensure that the mounting surfaces are clean.

4. Replace the water pump.

- a. Replace the water pump with the new O-ring seals. Replace the six bolts with washers, ensuring that the mounting surfaces are clean.
- b. Tighten the hose clamp.
- c. Connect the radiator hose, and tighten the hose clamp.
- d. Replace the water pump V-belt, and tighten the pivot bolt.
- e. Replace the bracket, and replace the four bolts with washers.
- f. Attach the ground wire, and replace the bolt and washer and the clamp.
- g. Replace the coolant in the cooling system.

5. Perform a system check.

- a. Replace the required accessories.
- b. Have the operator start the equipment and check it for leaks

6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Setup: Ensure that the site is set up with the equipment, the tools, and the appropriate technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and the appropriate technical publications. Ensure that expendable materials and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the water pump.	—	—
4. Replaced the water pump.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
DA FORM 5990-E  
TM 5-2430-200-24

**Related**  
AR 750-1  
DA PAM 738-750  
TM 9-8000

## Replace a Thermostat on an Item of Construction Equipment

091-62B-1312

**Conditions:** Given an item of construction or powered bridging equipment with an unserviceable thermostat, a serviceable thermostat, a general mechanic's tool kit, personal protective equipment (PPE), the applicable technical manual, an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the thermostat without causing damage to the equipment or injury to personnel.

### Performance Steps

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition  
**DANGER: PERFORMANCE OF THIS TASK CAN RESULT IN EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, OR ACIDS; ELECTRICAL SHOCKS; OR INJURY OR DEATH BY BEING CRUSHED BY EQUIPMENT.**
3. Remove the unserviceable thermostat.
  - a. Drain the freshwater cooling system on the MK1. Drain the primary and secondary cooling systems on the MK2
  - b. Use a screwdriver to loosen the three hose clamps on the thermostat housing.
  - c. Use a socket to remove the bolt and washer attaching the thermostat mounting bracket to the engine on the MK2.
  - d. Remove the thermostat housing from the engine by separating it from the three hose connections at the clamps.
  - e. Use a wrench to remove the four bolts and washers from the thermostat inlet housing. On the MK2, remove the thermostat mounting bracket from the inlet housing.
  - f. Remove the thermostat inlet housing, the gasket, the thermostat element, and the O-ring from the outlet housing.
  - g. Pull the O-ring, thermostat element, and gasket from the inlet housing and discard them.
4. Install a serviceable thermostat.
  - a. Clean the mating surfaces of the outlet and the inlet thermostat housings and apply silicone sealant.
  - b. Install the gasket on the inlet thermostat housing and the O-ring on outlet housing. Install a new thermostat element. Make sure the element is firmly seated in the inlet thermostat housing.
  - c. Align the bolt holes in the inlet and the outlet thermostat housings. On the MK2, align the holes of the mounting bracket with the holes in the thermostat housings. Install the washers and bolts. Tighten the bolts using a wrench.
  - d. Install the thermostat housing assembly. Connect the three hoses and hose clamps. Tighten the hose clamps using a screwdriver.
  - e. Secure the thermostat mounting bracket to the engine with a washer and a bolt. Tighten the bolt using a socket.
  - f. Refill the freshwater cooling system on the MK1. Refill the primary and secondary pooling systems on the MK2
5. Perform a system check. Check the system for leaks after refilling the cooling system with freshwater.
6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Setup: Ensure that the site is set up with the equipment, the tools, and the appropriate technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and the appropriate technical publications. Ensure that expendable materials and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.



**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition	—	—
3. Removed the unserviceable thermostat.	—	—
4. Installed a serviceable thermostat.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 TM 5-1940-277-20

**Related**

AR 750-1  
 DA PAM 738-750

## Replace an Engine Oil Cooler on an Item of Construction Equipment

091-62B-1313

**Conditions:** Given an item of construction equipment with an unserviceable oil cooler and the coolant drained from the engine, a serviceable oil cooler, a general mechanic's tool kit, personal protective equipment (PPE), the applicable technical manual, an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the oil cooler without causing damage to the equipment or injury to personnel.

### Performance Steps

1. Receive and review the equipment inspection and maintenance work sheet.

2. Inspect the equipment and verify its condition.

DANGER: PETROLEUM, OILS, AND LUBRICANTS (POL) CAN BE FLAMMABLE AND ARE SLIPPERY. COOLANT CONTAINS WATER AND ANTIFREEZE AND IS SLIPPERY. KEEP OPEN FLAME AND SPARKS OUT OF THE AREA WHILE WORKING ON THE SYSTEM. WIPE UP SPILLS IMMEDIATELY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.

3. Remove the unserviceable oil cooler.

- a. Use a wrench to remove the drain plug, and drain the oil from the oil filter base into the drain pan.
- b. Use a wrench to remove the two oil filter base hoses.
- c. Use a wrench to remove the four bolts that hold the oil filter base to the oil cooler and the six bolts that hold the oil filter base to the cylinder block.
- d. Use a wrench to disconnect the turbocharger oil line from the top of the oil filter base.
- e. Remove the oil filter base.
- f. Drain the oil from the oil cooler into the drain pan.
- g. Use a wrench to remove the four bolts that hold the engine oil cooler to the cylinder block.
- h. Use a wrench to remove the two bolts that hold the water inlet pipe to the water pump.
- i. Use a wrench to remove the two bolts to disconnect the water inlet hose.
- j. Remove the engine oil cooler from the engine.
- k. Remove the water outlet pipe and the water inlet pipe from the engine oil cooler.
- l. Remove the coupling from the water inlet pipe.
- m. Remove the O-ring seal from the water outlet pipe and the O-ring seals from the coupling.

4. Install a serviceable oil cooler.

- a. Put clean engine oil on the O-ring seal, and install the seal on the water outlet pipe.
- b. Install the pipe into the engine oil cooler.
- c. Put clean engine oil on the O-ring seals for the coupling.
- d. Put the O-ring seals on the coupling, and install the coupling into the water inlet pipe.
- e. Install the pipe into the engine oil cooler.
- f. Place the oil cooler in position on the engine.
- g. Use a wrench to install the four bolts that hold the oil cooler to the cylinder block.
- h. Use a wrench to install the two bolts that hold the oil cooler to the water pump.
- i. Connect the water inlet hose to the water inlet pipe, and use a wrench to install the two bolts.
- j. Place the oil filter base in position on the oil cooler and the cylinder block.
- k. Use a wrench to install the six bolts that hold the oil filter base to the cylinder block.
- l. Use a wrench to install the four bolts that hold the oil filter base to the oil cooler.
- m. Use a wrench to connect the turbocharger oil line to the top of the oil filter base.
- n. Use a wrench to install the two oil filter base hoses.
- o. Use a wrench to install the oil filter drain plug.

5. Perform a system check.

- a. Replace the coolant.

**Performance Steps**

- b. Check the engine oil and fill it to the proper level (if needed).
- c. Have the operator start the equipment.
- d. Check the system for leaks.

6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Setup: Ensure that the site is set up with the equipment, the tools, and the appropriate technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and the appropriate technical publications. Ensure that expendable materials and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable oil cooler.	—	—
4. Installed a serviceable oil cooler.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 TM 5-3805-248-14&P-2

**Related**

AR 750-1  
 DA PAM 738-750

**Replace Drive Belts on an Item of Construction Equipment  
091-62B-1314**

**Conditions:** Given an item of construction equipment with unserviceable drive belts, serviceable drive belts, a general mechanic's tool kit, personal protective equipment (PPE), the applicable technical manual, an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the drive belts without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.

**DANGER:** PERFORMANCE OF THIS TASK CAN RESULT IN EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, OR ACIDS; ELECTRICAL SHOCKS; OR INJURY OR DEATH BY BEING CRUSHED BY EQUIPMENT.

3. Remove the unserviceable drive belts.
  - a. Loosen the cap screw at the alternator adjusting strap.
  - b. Loosen the two locknuts at the alternator mounting bracket.
  - c. Push the top of the alternator toward the engine as far as possible.
  - d. Remove the drive belts from the pulleys, guide them over the engine fan blades, and remove them from the loader.

4. Install serviceable drive belts.

**NOTE:** Replace the drive belts with a matched set to prevent early belt failure.

- a. Guide the drive belts over the engine fan blades, and position them on the pulleys.
- b. Apply a pry bar to the front housing area of the alternator.

**WARNING:** APPLYING A PRY BAR TO THE REAR HOUSING AREA OF THE ALTERNATOR OR THE FAN AREA WILL DAMAGE THE ALTERNATOR.

- c. Pry the top of the alternator away from the engine to increase tension on the drive belts.
- d. Tighten the cap screw at the alternator adjusting strap.
- e. Measure the tension of the drive belts. Tension must be 90 pounds for used belts or 110 pounds for new belts.

**NOTE:** If a drive belt tension gauge is not available, check for 1/2-inch deflection midway between the alternator and the crankshaft pulleys.

- f. Loosen the cap screw, and repeat steps (c) through (e) above until the belt tension is correct .
- g. Tighten the cap screw and locknuts to 60 to70 foot-pounds in sequence.

5. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Setup: Ensure that the site is set up with the equipment, the tools, and the appropriate technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and the appropriate technical publications. Ensure that expendable materials and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable drive belts.	—	—
4. Installed serviceable drive belts.	—	—

**Performance Measures**

**GO**    **NO GO**

5. Annotated the equipment inspection and maintenance work sheet.

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**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-3805-262-20

**Related**

AR 750-1  
DA PAM 738-750  
TM 9-8000

**Replace an Engine Cooling Fan on an Item of Construction Equipment  
091-62B-1315**

**Conditions:** Given an item of construction equipment with an unserviceable cooling fan, a serviceable fan, general mechanics tool kit, personal protective equipment (PPE), the applicable technical manual, an equipment maintenance and inspection worksheet, and a pen.

**Standards:** Replace the cooling fan without damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment maintenance and inspection work sheet.
2. Inspect and verify the condition of the equipment.

**CAUTION:** PARTS MAY BE HEAVY; OBTAIN ASSISTANCE IF NECESSARY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH TO PERSONNEL AND DAMAGE TO PARTS.

3. Remove the unserviceable fan.
  - a. Remove the bolt and the locking nut with two washers from the rod end of the radiator. Allow the radiator lift cylinder to rest against the top of the engine.
  - b. Retract the radiator lift cylinder by using the cab and radiator tilt pump.
  - c. Lower the radiator assembly onto the radiator mounts by using the hoist.
  - d. Remove the two bolts from the right corner of the fan guard.
  - e. Remove the two bolts and washers from the left front corner of the fan guard.
  - f. Raise the radiator assembly slowly with the hoist and allow the fan guard, the fan, and the fan motor to rest on the engine. Raise the radiator support rod in order to support the radiator in the raised position.
  - g. Remove the eight bolts with the washers and fan. (Note the orientation of the fan for correct installation during reassembly).

4. Install the serviceable fan.
  - a. Replace the fan and secure it with the eight bolts and washers.

**NOTE:** The orientation of the fan must be the same as it was when it was removed.

- b. Lower the radiator support rod that supports the radiator. Slowly lower the radiator assembly, the fan, and the fan guard with the hoist to the level of the mounting brackets.
- c. Replace the two bolts and washers on the left front corner of the fan guard.
- d. Replace the two bolts on the right corner of the fan guard.
- e. Extend the radiator lift cylinder using the cab and the radiator tilt pump.
- f. Replace the bolt and locking nut with two washers at the rod end of the radiator.

5. Annotate the equipment maintenance and inspection work sheet.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure any required repair parts and personal protection equipment is on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance and inspection worksheet.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Removed the unserviceable fan.	—	—
4. Installed the serviceable fan.	—	—

**Performance Measures**

**GO**    **NO GO**

5. Annotated the equipment maintenance and inspection worksheet.

\_\_\_\_\_

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

TM 5-2430-200-24

**Related**

AR 750-1

DA PAM 738-750

**Replace a Radiator on an Item of Construction Equipment**  
**091-62B-1316**

**Conditions:** Given an item of construction equipment with an unserviceable radiator, a serviceable radiator, general mechanics tool kit, personal protective equipment (PPE), the applicable technical manual, an equipment maintenance and inspection work sheet, and a pen.

**Standards:** Replace the radiator without damage to equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment maintenance and inspection work sheet.

2. Inspect and verify the condition of the equipment.

**CAUTION: PARTS MAY BE HEAVY; OBTAIN ASSISTANCE IF NECESSARY. FAILURE TO FOLLOW THESE INSTRUCTION COULD RESULT IN INJURY OR DEATH TO PERSONNEL AND DAMAGE TO PARTS.**

**CAUTION: COOLANT IS A MIXTURE OF WATER AND ANTIFREEZE AND IS SLIPPERY. WIPE UP ANY SPILLS IMMEDIATELY.**

3. Remove the unserviceable radiator.

- a. Place a drain pan under the radiator.
- b. Use two wrenches to disconnect the two transmission cooler lines from the radiator.
- c. Cap the transmission cooler lines and place them in the drain pan.
- d. Use a wrench to remove the two transmission cooler line elbows from the radiator.
- e. Use a screwdriver to loosen the two clamps on the upper and lower radiator hoses.
- f. Slide the clamps away from the radiator and disconnect the upper and lower radiator hoses.
- g. Remove the drain hose from the radiator drain valve by pulling it off.
- h. Place a wooden block under the radiator.
- i. Use a wrench to remove the eight cap screws, nuts, lock washers, and washers that are securing the radiator.
- j. Remove the radiator by working one side of it past the stop and taillight mounting bracket that is welded to the guard.

4. Install the serviceable radiator.

- a. Lift the radiator carefully into the guard.
- b. Position the wooden block beneath the radiator in order to align the radiator mounting holes with the brackets and mounting holes.
- c. Use a wrench to secure the radiator by using eight cap screws washers, lock washers, and nuts.
- d. Remove the wooden block.
- e. Install the drain hose by pushing it onto the radiator drain valve.
- f. Use a wrench to install the two transmission cooler line elbows into the radiator.
- g. Remove the plugs from the transmission lines and use two wrenches to connect the transmission cooler lines to the radiator.
- h. Connect the upper and lower radiator hoses to the radiator and use a screwdriver to secure the two clamps around the hoses at the radiator.

5. Perform a system test.

- a. Have all of the accessories installed on the equipment.
- b. Replace the coolant in the radiator.
- c. Have the operator start the equipment.
- d. Check the system for leaks.

6. Annotate the equipment maintenance and inspection work sheet.



**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

<b>Performance Measures</b>	<u><b>GO</b></u>	<u><b>NO GO</b></u>
1. Received and reviewed the equipment maintenance and inspection worksheet.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Removed the unserviceable radiator.	—	—
4. Installed the serviceable radiator.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance and inspection worksheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
 DA FORM 5988-E  
 TM 5-3805-262-20

**Related**  
 AR 750-1  
 DA PAM 738-750

**Replace a Water Hose on an item of Construction Equipment**  
**091-62B-1317**

**Conditions:** Given an item of construction equipment with an unserviceable water line, a serviceable water line, general mechanics tool kit, personal protective equipment (PPE), the applicable technical manual, an equipment maintenance and inspection work sheet, and a pen.

**Standards:** Replace the water line without damage to equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment inspection maintenance work sheet.
2. Inspect and verify the condition of the equipment.  
CAUTION: COOLANT IS A MIXTURE OF WATER AND ANTIFREEZE AND IS SLIPPERY. WIPE UP ANY SPILLS IMMEDIATELY.
3. Remove the unserviceable water hose.
  - a. Use a screwdriver to loosen the clamp around the water line on the elbow at the radiator.
  - b. Use a screwdriver to loosen the clamp around the water line on the transmission oil cooler.
  - c. Slide the clamps off of the radiator elbow and the transmission cooler mounting tube.
  - d. Remove the water line from the radiator and the transmission cooler.
4. Install the serviceable water hose.
  - a. Slide the clamps over both ends of the water line.
  - b. Slide one end of the water line over the transmission mounting tube
  - c. Slide the other end of the water line over the radiator elbow.
  - d. Position the clamps over the mounting elbow and tube.
  - e. Use a screwdriver to tighten the clamps.
5. Perform a system check.
  - a. Replace the coolant.
  - b. Have the operator start the engine.
  - c. Check the system for leaks.
6. Annotate the equipment maintenance and inspection work sheet.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment maintenance and inspection worksheet.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Removed the unserviceable water line.	—	—
4. Installed the serviceable water line.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance and inspection worksheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2350-262-20-2

**Related**

AR 750-1  
DA PAM 738-750

Subject Area 4: Hydraulics

**Repair a Hydraulic Accumulator on an Item of Construction Equipment  
091-62B-1401**

**Conditions:** Given an item of construction equipment with a faulty hydraulic accumulator; charging equipment; test, measurement, and diagnostic equipment (TMDE); a general mechanic's tool kit; personal protective equipment (PPE); the applicable technical manual TMs; an equipment maintenance and inspection worksheet; and a pen.

**Standards:** Repair the hydraulic accumulator without damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment maintenance and inspection worksheet.

2. Inspect and verify the condition of the equipment.

**WARNING: HIGH PRESSURE IS PRESENT IN THE M9 HYDRAULIC SYSTEM. DO NOT DISCONNECT ANY HYDRAULIC SYSTEM COMPONENT UNLESS THE HYDRAULIC SYSTEM PRESSURE HAS BEEN RELIEVED. WAIT AT LEAST 4 MINUTES BEFORE DISCONNECTING ANY HOSE OR FITTING.**

**CAUTION: SPILLED HYDRAULIC OIL IS VERY SLIPPERY. USE CAUTION WHEN ENTERING OR WORKING IN THE BOWL AREA. WIPE UP ANY SPILLED OIL IMMEDIATELY.**

**WARNING: HIGH-PRESSURE NITROGEN GAS IS USED IN THIS EQUIPMENT. KEEP YOUR HANDS AND FACE AWAY FROM THE GAS VALVE. DO NOT BREATHE NITROGEN GAS.**

**CAUTION: CAP OR PLUG ALL OF THE PORTS AND ENDS OF THE HOSES AND TUBES IN ORDER TO PREVENT CONTAMINATION OF HYDRAULIC OIL. FAILURE TO COMPLY MAY RESULT IN DAMAGE TO EQUIPMENT.**

**CAUTION: DO NOT BEND THE TUBES. REMOVE THE TUBES FROM THE VEHICLE IN ORDER TO AVOID BENDING THEM. FAILURE TO COMPLY MAY RESULT IN DAMAGE TO EQUIPMENT.**

3. Charge the accumulator.

- a. Use a wrench to remove the two screws and lock washers from the valve guard on the charge and gauge assembly.
- b. Remove the valve guard.
- c. Use a wrench to remove the gas cap from the gas valve.
- d. Connect the adapter valve from the charging equipment to the gas valve.
- e. Install the adapter and transducer from the TMDE to the bleed valve on the charging equipment.
- f. Connect the W4 cable to the transducer and the TMDE.
- g. Open the nitrogen valve on the charging equipment and adjust the regulator valve to 2000 psi.
- h. Bleed the air and moisture from the charging hose by opening the shutoff valve on the charging equipment and loosen the adapter valve assembly in order to allow nitrogen to escape for 10 seconds.
- i. Tighten the adapter valve assembly.
- j. Ensure the TMDE reads 2000 psi and then close the shut off valve.
- k. Loosen the nut to open the gas valve and slightly open the shutoff valve.
- l. Check the ambient temperature and refer to the TM for the proper charge.
- m. Tighten the nut in order to close the gas valve.
- n. Close the tank valve of the charging equipment and relieve tension on the regulator valve of the charging equipment.
- o. Open the bleed valve in order to bleed the charging hose.

**Performance Steps**

- p. Disconnect the adapter valve from the gas valve and use a wrench to install a gas cap on the charge and gauge assembly.
  - q. Install a valve guard on the charge and gauge assembly and use a wrench to install two screws and lock washers.
  - r. Disconnect the W4 cable from the transducer and the TMDE.
  - s. Remove the transducer and adapter from the bleed valve.
4. Perform a system check.
    - a. Have the operator start equipment.
    - b. Check the system for proper operation.
  5. Annotate the equipment maintenance and inspection worksheet.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, TMDE, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance and inspection worksheet.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Charged the accumulator.	—	—
4. Performed a system check.	—	—
5. Annotated the equipment maintenance and inspection worksheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 TM 5-2350-262-20-2

**Related**

AR 750-1  
 DA PAM 738-750  
 FM 5-499

## Replace a Hydraulic Line on an Item of Construction Equipment

091-62B-1402

**Conditions:** Given an item of construction equipment with an unserviceable hydraulic line and all accessories removed for access to the hydraulic line and hydraulic pressure relieved from the system, a serviceable hydraulic line, a general mechanics tool kit, hydraulic system caps and plugs, personal protective equipment (PPE), the applicable technical manual, an equipment maintenance and inspection work sheet, and a pen.

**Standards:** Replace the hydraulic line without damage to the equipment or injury to soldiers.

### Performance Steps

1. Receive and review the equipment inspection maintenance work sheet.
2. Inspect and verify the condition of the equipment.

**WARNING: HIGH PRESSURE IS PRESENT IN THE M9 HYDRAULIC SYSTEM. DO NOT DISCONNECT ANY HYDRAULIC SYSTEM COMPONENT UNLESS THE HYDRAULIC SYSTEM PRESSURE HAS BEEN RELIEVED. WAIT AT LEAST 4 MINUTES BEFORE DISCONNECTING ANY HOSE OR FITTING.**

**CAUTION: SPILLED HYDRAULIC OIL IS VERY SLIPPERY. USE CAUTION WHEN ENTERING OR WORKING IN THE BOWL AREA. WIPE UP ANY SPILLED OIL IMMEDIATELY.**

**CAUTION: CAP OR PLUG ALL OF THE PORTS AND ENDS OF THE HOSES AND TUBES IN ORDER TO PREVENT CONTAMINATION OF HYDRAULIC OIL. FAILURE TO COMPLY MAY RESULT IN DAMAGE TO EQUIPMENT.**

**CAUTION: DO NOT BEND THE TUBES. REMOVE THE TUBES FROM THE VEHICLE IN ORDER TO AVOID BENDING THEM. FAILURE TO COMPLY MAY RESULT IN DAMAGE TO EQUIPMENT.**

3. Remove the unserviceable hydraulic line.
  - a. Remove the dipstick, hydraulic cap and filter from the filler neck.
  - b. Install the hydraulic tank plug and hydraulic tank cap on the filler neck.
  - c. Use two wrenches to disconnect the hydraulic hose from the elbow on the rotary actuator.
  - d. Place the cap on the opening of the elbow.
  - e. Trace the hydraulic line to the opposite end and use two wrenches to disconnect it from the fitting.
  - f. Place the cap over the end of the fitting.
  - g. Note the location and remove the tie down straps that are securing the hydraulic line.
  - h. Remove the unserviceable hydraulic line.
4. Install the serviceable hydraulic line.
  - a. Install plugs at both ends of the hydraulic line.
  - b. Route the hydraulic line in the proper location.
  - c. Remove the plug from the hydraulic line and the cap from the fitting.
  - d. Use two wrenches to connect the hydraulic line to the fitting.
  - e. Remove the plug from the hydraulic line and the cap from the elbow on the rotary actuator.
  - f. Use two wrenches to connect the hydraulic line to the elbow.
  - g. Install tie down straps in the proper location.
  - h. Remove the hydraulic tank plug and the hydraulic tank cap from the hydraulic tank filler neck.
  - i. Install the filler cap and the dipstick on the filler neck.
5. Perform a system check.
  - a. Refill the hydraulic tank.
  - b. Have the operator start the equipment.
  - c. Check the system for proper operation.

**Performance Steps**

6. Annotate the equipment maintenance and inspection work sheet.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance and inspection worksheet.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Removed the unserviceable hydraulic line.	—	—
4. Installed the serviceable hydraulic line.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance and inspection worksheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 TM 5-2350-262-20-2

**Related**

AR 750-1  
 DA PAM 738-750  
 FM 5-499

**Replace a Hydraulic Pump on an Item of Construction Equipment**  
**091-62B-1403**

**Conditions:** Given an item of construction equipment with an unserviceable hydraulic pump and all accessories removed for access to the hydraulic pump, with hydraulic pressure relieved from the system; a serviceable hydraulic pump; general mechanics tool kit; hydraulic system caps and plugs; personal protective equipment (PPE), the applicable technical manual, an equipment maintenance and inspection work sheet, and a pen.

**Standards:** Replace the hydraulic pump without damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment maintenance and inspection work sheet.
2. Inspect and verify the condition of the equipment.
3. Remove the unserviceable hydraulic pump.

**DANGER: HYDRAULICS OIL IS UNDER HIGH PRESSURE (2450 PSI). NEVER DISCONNECT ANY HYDRAULIC LINE OR FITTING WITHOUT FIRST DROPPING THE PRESSURE TO ZERO. A HIGH PRESSURE OIL STREAM CAN PIERCE THE BODY AND CAUSE SEVERE INJURY TO SOLDIERS.**

- a. Tag the hoses and use a wrench to disconnect the two hydraulic hoses on the front hydraulic pump.
  - b. Install caps or plugs on the end of the hydraulic hoses.
  - c. Loosen the nut and turn the screw on the back of the pump in order to loosen the belt.
  - d. Remove the belt.
  - e. Use a wrench to remove the pump mounting bolt, washer, and nut.
  - f. Remove the front hydraulic pump.
  - g. Install caps or plugs on the hydraulic fittings on the pump.
  - h. Use a wrench to remove eight screws, two adapters, and two packings from the sides of the pump.
  - i. Discard the packings.
  - j. Use a wrench to remove the nut, lock washer, and key from the pulley.
  - k. Remove the pulley and discard the lock washer.
4. Install the serviceable hydraulic pump.
    - a. Install the two new packings and two adapters, and use a wrench to install eight screws on the sides of the hydraulic pump.
    - b. Install the key, pulley, new lock washer, and nut on the pump and tighten them with a wrench.
    - c. Place the front hydraulic pump in position and install the mounting bolt, washer, and nut.
    - d. Remove the caps or plugs from the hydraulic fittings on the pump.
    - e. Reinstall the drive belt.
    - f. Adjust the front hydraulic pump belt and tighten the mounting bolt with a wrench.
    - g. Remove the caps or plugs from the two hydraulic hoses.
    - h. Connect the two hydraulic hoses to the pump and tighten them with a wrench.
  5. Perform a system check.
    - a. Refill the hydraulic tank.
    - b. Have the operator start the equipment.
    - c. Check the system for proper operation.
  6. Annotate the equipment maintenance and inspection work sheet.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the



expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment maintenance and inspection worksheet.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Removed the unserviceable hydraulic pump.	—	—
4. Installed the serviceable hydraulic pump.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance and inspection worksheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2420-224-20-2

**Related**

AR 750-1  
DA PAM 738-750  
FM 5-499

**Replace a Hydraulic Control Valve on an Item of Construction Equipment**  
**091-62B-1404**

**Conditions:** Given an item of construction equipment with a faulty hydraulic control valve and all of the accessories removed for access to the control valve with the hydraulic system pressure relieved, and the reverse alarm pressure switch and neutral start switch removed; a serviceable hydraulic control valve; a general mechanics tool kit; personal protective equipment (PPE); the applicable technical manual; an equipment maintenance and inspection work sheet; and a pen.

**Standards:** Replace the hydraulic control valve without damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment maintenance and inspection work sheet.

2. Inspect and verify the condition of the equipment.

**DANGER: HYDRAULICS OIL IS UNDER HIGH PRESSURE (2450 PSI). NEVER DISCONNECT ANY HYDRAULIC LINE OR FITTING WITHOUT FIRST DROPPING THE PRESSURE TO ZERO. A HIGH PRESSURE OIL STREAM CAN PIERCE THE BODY AND CAUSE SEVERE INJURY TO SOLDIERS.**

3. Remove the unserviceable hydraulic control valve.

- a. Use two wrenches to disconnect the hose from the elbow on the hydraulic shift control valve.
- b. Drain the oil into a suitable container and cap the hose end.
- c. Use a wrench to remove the elbow and bushing from the valve.
- d. Use two wrenches to disconnect the six hoses from the three elbows and adapters.
- e. Drain the oil into a suitable container and cap the hose ends.
- f. Remove the cotter pin, the straight pin, and the clevis from the bell crank, and discard the cotter pin.
- g. Use a wrench to remove two screws, lock washers, and washers from the valve, and discard locknuts bracket.
- h. Use a wrench to remove the two locknuts, washers, screws, and the valve from the bracket, and discard the locknuts.
- i. Use a wrench to remove the locknut, the lever, and the key from the valve shaft, and discard the locknuts.

4. Install the serviceable hydraulic control valve.

- a. Apply the sealing compound to the threads of the adapters, elbows, and tees, and use a wrench to install them on the valve.
- b. Use a wrench to install the key and the lever on the valve shaft with the screw and the locknut.
- c. Use a wrench to install the valve on the bracket with four washers, two lock washers, four screws, and two locknuts.
- d. Connect the clevis to the bell crank with a straight pin and a cotter pin.
- e. Remove the cap and use two wrenches to connect the VALVE HL hose to the elbow at port HL.
- f. Remove the cap and use two wrenches to connect the VALVE N hose to the elbow at port N.
- g. Remove the cap and use two wrenches to connect the VALVE 2 hose to the elbow at port 2.
- h. Remove the cap and use two wrenches to connect the VALVE R hose to the adapter at port R.
- i. Remove the cap and use two wrenches to connect the XMSN CONT VALVE-S hose to the adapter at port S.
- j. Remove the cap and use two wrenches to connect the valve 1 hose to the adapter at port 1.
- k. Use a wrench to install the bushing on the valve, and the elbow on the bushing.
- l. Remove the cap and use two wrenches to connect the XMSN CONT VALVE-D hose to the elbow.

5. Perform a system check.

- a. Return the equipment to operating condition.
- b. Check the system for proper operation.

**Performance Steps**

6. Annotate the equipment maintenance and inspection work sheet.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

<b>Performance Measures</b>	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance and inspection worksheet.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Removed the unserviceable hydraulic control valve.	—	—
4. Installed the serviceable hydraulic control valve.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance and inspection worksheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2350-262-20-2

**Related**

AR 750-1  
DA PAM 738-750  
FM 5-499

**Replace a Hydraulic Relief Valve on an Item of Construction Equipment  
091-62B-1405**

**Conditions:** Given an item of construction equipment with an unserviceable hydraulic relief valve and all of the accessories removed for access to the hydraulic relief valve, with hydraulic pressure relieved from system, a serviceable hydraulic relief valve, a general mechanics tool kit, personal protective equipment (PPE), the applicable technical manual, an equipment maintenance and inspection work sheet, and a pen.

**Standards:** Replace the hydraulic relief valve without damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment maintenance and inspection work sheet.
2. Inspect and verify the condition of the equipment.
3. Remove the unserviceable hydraulic relief valve.  
**DANGER: HYDRAULICS OIL IS UNDER HIGH PRESSURE (2450 PSI). NEVER DISCONNECT ANY HYDRAULIC LINE OR FITTING WITHOUT FIRST DROPPING PRESSURE TO ZERO. A HIGH PRESSURE OIL STREAM CAN PIERCE THE BODY AND CAUSE SEVERE INJURY TO PERSONNEL.**
  - a. Use two wrenches to disconnect the two nuts on the front loader hydraulic relief valve.
  - b. Remove the unserviceable hydraulic relief valve.
  - c. Use a wrench to remove the two elbows.
4. Install the serviceable hydraulic relief valve.
  - a. Use a wrench to install the two elbows.
  - b. Position the arrow on the valve toward the driver's side of the vehicle.
  - c. Install the hydraulic relief valve and use two wrenches to tighten it.
5. Perform a system check.
  - a. Service the hydraulic tank.
  - b. Have the operator start the equipment.
  - c. Check the system for proper operation.
6. Annotate the equipment maintenance and inspection work sheet.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment maintenance and inspection worksheet.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Removed the unserviceable hydraulic relief valve.	—	—
4. Installed the serviceable hydraulic relief valve.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance and inspection worksheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2420-224-20-2

**Related**

AR 750-1  
DA PAM 738-750  
FM 5-499

## Replace a Hydraulic Cylinder on an Item of Construction Equipment

091-62B-1406

**Conditions:** Given an item of construction equipment with an unserviceable hydraulic cylinder and all of the accessories removed for access to the cylinder, a serviceable hydraulic cylinder, a general mechanic's tool kit, a common number 1 and 2 tool kit, lifting equipment with a strap, hydraulic system caps and plugs, personal protective equipment (PPE), the applicable technical manual, an equipment maintenance and inspection work sheet, and a pen.

**Standards:** Replace the hydraulic cylinder without damage to the equipment or injury to soldiers.

### Performance Steps

1. Receive and review the equipment maintenance and inspection work sheet.
2. Inspect and verify the condition of the equipment.
3. Remove the unserviceable hydraulic cylinder.

**DANGER:** THE HYDRAULIC SYSTEM PRESSURE IS OVER 2000 POUNDS PER SQUARE INCH (PSI), AND THE HYDRAULIC RESERVOIR IS PRESSURIZED WITH COMPRESSED AIR. BEFORE LOOSENING OR DISCONNECTING ANY HYDRAULIC HOSES, LINES OR FITTINGS, LOOSEN THE HYDRAULIC RESERVOIR FILL CAP, AND OPERATE ALL OF THE HYDRAULIC CONTROL LEVERS IN ORDER TO RELIEVE THE HYDRAULIC SYSTEM PRESSURE. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY OR DEATH. IF YOU ARE INJURED, OBTAIN MEDICAL ASSISTANCE IMMEDIATELY.

**DANGER:** THE DRY CLEANING SOLVENT, P-D-680, THAT IS USED TO CLEAN THE PARTS IS TOXIC AND FLAMMABLE. WEAR PROTECTIVE GOGGLES AND GLOVES, AND USE IT ONLY IN A WELL-VENTILATED AREA. AVOID CONTACT WITH YOUR SKIN, EYES AND CLOTHES, AND DO NOT BREATHE THE VAPORS. DO NOT USE THE SOLVENT NEAR AN OPEN FLAME OR EXCESSIVE HEAT. DO NOT SMOKE WHEN USING THE SOLVENT. FAILURE TO FOLLOW THESE PRECAUTIONS COULD CAUSE SERIOUS INJURY. IF YOU BECOME DIZZY WHILE USING THE CLEANING SOLVENT, GET FRESH AIR AND MEDICAL ATTENTION IMMEDIATELY. IF YOUR SKIN OR CLOTHES MAKES CONTACT WITH THE SOLVENT, FLUSH WITH LARGE AMOUNTS OF WATER. IF THE SOLVENT MAKES CONTACT WITH YOUR EYES, WASH YOUR EYES WITH WATER AND GET MEDICAL AID IMMEDIATELY.

**DANGER:** WHEN YOU ARE USING A HOIST TO REMOVE OR INSTALL PARTS, MAKE SURE THAT THE HOIST IS SECURELY FASTENED TO THE PART AND THAT ALL SLACK IS TAKEN UP. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY IF THE PART FALLS ON YOU. IF YOU ARE INJURED BY FALLING EQUIPMENT, OBTAIN MEDICAL AID IMMEDIATELY.

- a. Use a clean cloth moistened with cleaning solvent in order to remove dirt and grease from the hose connections on the lift cylinder assembly. Dry by using clean cloths.
- b. Attach a hoist equipped with straps in order to the lift cylinder assembly and take up the slack.
- c. Use a wrench in order to remove the lubrication fittings.
- d. Use a wrench in order to loosen and remove the locknut and cap screw.
- e. Using a hammer and a 1 7/8-inch diameter rod, drive the pin out of the loader lift frame assembly and the cylinder rod eye.
- f. Have the operator start the engine and operate it at idle speed.
- g. Have the operator place the LIFT ARM control lever in the LOWER position in order to retract the cylinder rod, and then turn off the engine.
- h. Operate LIFT ARM control lever in both directions to relieve system pressure in hydraulic circuits.
- i. Use a wrench to loosen the two fittings, and disconnect the hoses from the elbows that are installed in the lift cylinder assembly ports, and move the hoses out of way.
- j. Cap and plug all openings.

**Performance Steps**

- k. At the bottom of the lift cylinder assembly, use a wrench to loosen and remove the lock nut and cap screw.
- l. Pull the lift cylinder assembly carefully from the shaft and place it on the workbench.

4. Install the serviceable hydraulic cylinder.

- a. Attach a hoist equipped with straps to the lift cylinder assembly, carefully raise the lift cylinder assembly, and install its bottom end on the shaft.
- b. Align the hole in the lift cylinder assembly tube eye with the hole in the pivot shaft.
- c. Apply blue thread compound to the threads of the cap screw and the lock nut.
- d. Install the cap screw and the locknut, and use a wrench to tighten them to 1000 to 1200 foot-pounds.
- e. Remove the caps and plugs and connect the two hoses to the elbows that are installed in the lift cylinder assembly ports. Use two wrenches to tighten the fittings securely.

**WARNING: DO NOT USE YOUR FINGER TO CHECK THE ALIGNMENT IN THE FOLLOWING STEP. YOU COULD LOSE A FINGER IF YOU DO SO. IF YOU ARE INJURED, OBTAIN MEDICAL AID IMMEDIATELY.**

- f. Have the operator start the engine and operate it at idle speed. Place the LIFT ARM control lever in the RAISE position until the rod end eye of the cylinder is aligned with the hole in the loader lift frame assembly.
- g. Start the reassembly by inserting the pin in the cylinder rod eye and the lift frame assembly. Be sure that the hole in the pin is aligned with the hole in the rod end.
- h. Using a hammer and a 1-7/8 inch diameter rod, drive the pin into the rod eye and the lift frame assembly.
- i. Apply blue thread compound to the threads of the cap screw and the lock nut.
- j. Install the cap screw and locknut, and use a wrench to tighten them to 1000 to 1200 foot-pounds.
- k. Remove the hoist straps from the lift cylinder assembly.
- l. Use a wrench to install the lubrication fittings.
- m. Assist in reinstalling all of the accessories that have been removed.
- n. Lubricate the lubrication fittings.

5. Perform a system test.

- a. Tighten the hydraulic reservoir fill cap, and close and lock the access door.
- b. Have the operator start the engine and operate it at idle speed.
- c. With the engine operating at idle speed, have the operator extend and retract the lift cylinder assemblies by placing the LIFT ARM control lever in the RAISE and LOWER positions four times in order to remove air from the hydraulic system.
- d. Have the operator lower the bucket to the ground and turn off the engine.
- e. Check for hydraulic oil leakage at the hose connections to the lift cylinder assemblies, and tighten the fittings as necessary.
- f. Check the hydraulic reservoir oil level and add oil as necessary.

6. Annotate the equipment maintenance and inspection work sheet.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance and inspection worksheet.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Removed the unserviceable hydraulic cylinder.	—	—

**Performance Measures**

- 4. Installed the serviceable hydraulic cylinder.
- 5. Performed a system test.
- 6. Annotated the equipment maintenance and inspection worksheet.

**GO**    **NO GO**

—    —  
—    —  
—    —

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-3805-262-20

**Related**

AR 750-1  
DA PAM 738-750  
FM 5-499



## Replace Hydraulic Filters on an Item of Construction Equipment

### 091-62B-1407

**Conditions:** Given an item of construction equipment with unserviceable hydraulic filters and the hydraulic pressure relieved from the system, serviceable hydraulic filters and accessories, a general mechanics tool kit, hydraulic system caps and plugs, personal protective equipment (PPE), the applicable technical manual, an equipment maintenance and inspection work sheet, and a pen.

**Standards:** Replace the hydraulic filters without damage to the equipment or injury to soldiers.

#### Performance Steps

1. Receive and review the equipment maintenance and inspection work sheet.

2. Inspect and verify the condition of the equipment.

**DANGER: HYDRAULICS OIL IS UNDER HIGH PRESSURE (2450 PSI) IS USED WHEN OPERATING THIS EQUIPMENT. NEVER DISCONNECT ANY HYDRAULIC LINE OR FITTING WITHOUT FIRST DROPPING THE PRESSURE TO ZERO. A HIGH PRESSURE OIL STREAM CAN PIERCE THE BODY AND CAUSE SEVERE INJURY TO SOLDIERS.**

**CAUTION: FUEL AND OIL ARE SLIPPERY AND CAN CAUSE FALLS. TO AVOID INJURY, WIPE UP SPILLED FUEL OR OIL WITH RAGS.**

3. Remove the unserviceable hydraulic filters.

- a. Assist the operator in draining the front hydraulic tank into a suitable container.
- b. Remove and discard the air filter that is installed on top of the hydraulic tank.
- c. Use a wrench to remove the hydraulic filter head and packing from the top of the hydraulic tank.
- d. Remove the valve, retaining ring and fluid filter, and plug the opening.
- e. Use a wrench to disconnect the hydraulic hose from the side of the hydraulic tank, and install the cap or plug in the hose.
- f. Use a wrench in order to remove the elbow and coupling.
- g. Use a wrench to remove the four bolts, the support, the gasket, and the filter. Discard the gasket and plug the opening.

4. Install the serviceable hydraulic filters.

- a. Remove the plug and install the new filter, new gasket, support, and four bolts into the side of the hydraulic tank, and use a wrench to tighten.
- b. Use a wrench to install the coupling and elbow.
- c. Remove the cap or plug from the hydraulic hose, connect it, and use a wrench to tighten.
- d. Remove the plug and install new fluid filter and the retaining ring in the top of the hydraulic tank.
- e. Install the valve, new packing and head, and use a wrench to tighten.
- f. Install a new air filter in the top of the tank.

5. Perform a system check.

- a. Refill the hydraulic tank.
- b. Have the operator start the equipment.
- c. Check the system for leaks and proper operation.

6. Annotate the equipment maintenance and inspection work sheet.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance and inspection worksheet.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Removed the unserviceable hydraulic filters.	—	—
4. Installed the serviceable hydraulic filters.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance and inspection worksheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2420-224-20-2

**Related**

AR 750-1  
DA PAM 738-750  
FM 5-499

## Replace an Accumulator on an Item of Construction Equipment

**091-62B-1408**

**Conditions:** Given an item of construction equipment with an unserviceable hydraulic accumulator, all accessories removed for access to the accumulator, a serviceable hydraulic accumulator, a general mechanics tool kit, personal protective equipment (PPE), the applicable technical manual, an equipment maintenance and inspection work sheet, and a pen.

**Standards:** Replace the hydraulic accumulator without damage to the equipment or injury to soldiers.

### Performance Steps

1. Receive and review the equipment maintenance and inspection work sheet.

2. Inspect and verify the condition of the equipment.

**WARNING: HIGH PRESSURE IS PRESENT IN THE M9 HYDRAULIC SYSTEM. DO NOT DISCONNECT ANY HYDRAULIC SYSTEM COMPONENT UNLESS THE HYDRAULIC SYSTEM PRESSURE HAS BEEN RELIEVED. WAIT AT LEAST 4 MINUTES BEFORE DISCONNECTING ANY HOSE OR FITTING.**

**CAUTION: SPILLED HYDRAULIC OIL IS VERY SLIPPERY. USE CAUTION WHEN ENTERING OR WORKING IN THE BOWL AREA. WIPE UP ANY SPILLED OIL IMMEDIATELY.**

**WARNING: HIGH-PRESSURE NITROGEN GAS IS USED IN THIS EQUIPMENT. KEEP YOUR HANDS AND FACE AWAY FROM THE GAS VALVE. DO NOT BREATHE NITROGEN GAS.**

3. Remove the unserviceable hydraulic accumulator.

- a. Use a wrench to disconnect the hose from the elbow at the main hydraulic accumulator, drain the oil into a suitable container and cap the end of the hose.
- b. Use a wrench to remove the two self-locking screws and washers from the main hydraulic accumulator and bracket, and discard the self-locking screws.
- c. Use a wrench to remove the elbow packing, and the plug and packing from the accumulator. Discard the packings.
- d. Use a wrench to remove the two locknuts, washers, U-bolt, and accumulator from the support, and discard the locknuts.

4. Install the serviceable accumulator.

- a. Install the U-bolt on the main hydraulic accumulator and support with two lock washers and locknuts and tighten them with a wrench.
- b. Install a main hydraulic accumulator on the bracket with two washers and self-locking screws and tighten them with a wrench.
- c. Use a wrench to install the accumulator packing, the plug, packing and the elbow on the accumulator.
- d. Use a wrench to connect the accumulator hose to the elbow.

5. Perform a system check.

- a. Assist in returning the equipment to operational condition.
- b. Check the system for proper operation.

6. Annotate the equipment maintenance and inspection work sheet

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE is on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance and inspection worksheet.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Removed the unserviceable hydraulic accumulator.	—	—
4. Installed the serviceable accumulator.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance and inspection worksheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2350-262-20-2

**Related**

AR 750-1  
DA PAM 738-750  
FM 5-499

## Repair a Hydraulic Cylinder on an Item of Construction Equipment

### 091-62B-1409

**Conditions:** Given an item of construction equipment with a faulty hydraulic cylinder removed from the equipment, all accessories needed to repair the cylinder, shop equipment-general purpose repair, a general mechanics tool kit, a hydraulic systems test and repair unit (HSTRU), personal protective equipment (PPE), the applicable technical manual, an equipment maintenance request, and a pen.

**Standards:** Repair the hydraulic cylinder without damage to the equipment or injury to soldiers.

#### Performance Steps

1. Receive and review the equipment maintenance request.

2. Inspect and verify the condition of the equipment.

**WARNING: FUEL AND OIL ARE SLIPPERY. WIPE UP SPILLS WITH A RAG IMMEDIATELY IN ORDER TO PREVENT SLIPPAGE.**

3. Disassemble the faulty hydraulic cylinder.

- a. Remove the self-tapping screw from the end of the backhoe boom cylinder tube.
- b. Use a spanner wrench to remove the retainer from the end of the backhoe boom cylinder tube.
- c. Remove the piston rod from the tube.
- d. Use a wrench in order to remove the screw and washer from the piston rod.
- e. Remove the piston from the piston rod.
- f. Remove and discard the two wear rings, retainer, and packing from the piston.
- g. Remove the retainer from the piston rod.
- h. Remove and discard the packing and the backup ring from the retainer.
- i. Remove and discard the seals, wiper and bushing from the retainer.

4. Inspect the faulty hydraulic cylinder.

- a. Inspect the piston, piston rod, and tube for scratches or scoring.
- b. Inspect the threads on the piston rod, piston screw, tube, and retainer for wear or damage.

5. Assemble the hydraulic cylinder.

- a. Apply the coat of lubricating oil to the packings and seals before the assembly.
- b. Install the new bushing, new wiper and new seals in the retainer.
- c. Install the new backup ring and the new packing on the retainer.
- d. Install the retainer on the piston rod.
- e. Install the new packing, new retainer, and two new wear rings on the piston.
- f. Install the piston on the piston rod.

**WARNING: ADHESIVE CAN CAUSE IMMEDIATE BONDING ON CONTACT WITH EYES, SKIN, OR CLOTHING, AND ALSO GIVES OFF HARMFUL VAPORS. WEAR PROTECTIVE GOGGLES USE THE ADHESIVE IN A WELL-VENTILATED AREA. IF ANY ADHESIVE GETS IN YOUR EYES, TRY TO KEEP THEM OPEN, FLUSH THEM WITH WATER FOR 15 MINUTES, AND GET IMMEDIATE MEDICAL ATTENTION.**

- g. Apply a coat of sealing compound to the threads of the screw and install the screw and washer on the piston rod. Use a wrench to tighten the screw to 475-525 foot-pounds.
- h. Install the piston rod into the tube.
- i. Use a spanner wrench to thread the retainer into the tube and tighten it to 100-200 foot-pounds.
- j. Install a self-tapping screw in end of the tube.

6. Perform a system check.

- a. Return the equipment to operating condition.
- b. Start the equipment.
- c. Check the system for leaks and proper operation.

**Performance Steps**

7. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

<b>Performance Measures</b>	<u><b>GO</b></u>	<u><b>NO GO</b></u>
1. Received and reviewed the equipment maintenance request	—	—
2. Inspected and verified the condition of the equipment	—	—
3. Disassembled the faulty hydraulic cylinder.	—	—
4. Inspected the faulty hydraulic cylinder.	—	—
5. Assembled the hydraulic cylinder.	—	—
6. Performed a system check.	—	—
7. Annotated the equipment maintenance request	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5990-E  
TM 5-2420-224-34

**Related**

AR 750-1  
DA PAM 738-750  
FM 5-499

## Subject Area 5: Power Trains

**Replace a Transmission on an Item of Construction Equipment**  
**091-62B-1501**

**Conditions:** Given an item of construction equipment with an unserviceable transmission (the engine is removed from the equipment), a serviceable transmission, a tool kit (general mechanics), a number (No.) 1 tool kit (common organizational maintenance), 2-ton capacity chain hoists with slings, a transmission jack, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** You will replace the transmission, without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment maintenance request.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable transmission.
  - a. Tag all hoses and electrical leads before disconnecting.
  - b. Remove the transport/service link.
  - c. Remove the hood support.
  - d. Cut, remove, and discard the tie strap that secures the fuel shutoff cable and the accelerator cable to the wiring harness.
  - e. Remove the transmission oil filter, lines, and cooler hoses.
  - f. Disconnect all electrical leads.
  - g. Disconnect the hose from the clutch cutout cylinder.
  - h. Disconnect the control linkage from the transmission control valve spool.
  - i. Remove the cap screws that secure the wiring harness bracket to the transmission and the hydraulic pump to the transmission charging pump.
  - j. Disconnect the parking brake lever from the parking brake chamber.
  - k. Disconnect the center driveshaft from the transmission.
  - l. Remove the rear driveshaft.
  - m. Remove the cap screw that secures the hydraulic system manifold bracket to the transmission front cover and the transmission control cable bracket to the transmission.
  - n. Connect the transmission jack to the bottom of the transmission.
  - o. Connect the chain hoist to the transmission rear.

**WARNING: WHEN USING A CHAIN HOIST TO REMOVE OR INSTALL PARTS, BE SURE THE CHAIN HOIST IS SECURELY FASTENED TO THE PART AND THAT ALL SLACK IN THE CHAIN IS TAKEN UP. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY DUE TO THE PART FALLING ON YOU. IF YOU ARE INJURED BY FALLING EQUIPMENT OR PARTS, OBTAIN MEDICAL AID IMMEDIATELY.**

- p. Remove the transmission-mounting brackets.
- q. Raise the transmission, install a second chain hoist on the transmission front, and disconnect the transmission jack.

**CAUTION: CHECK THAT ALL HOSES, LINES, AND ELECTRICAL CONNECTIONS ARE DISCONNECTED AS THE TRANSMISSION IS LIFTED FROM THE LOADER. IF NECESSARY, LOWER THE TRANSMISSION ONTO THE TRANSMISSION JACK AND DISCONNECT THE REMAINING HOSES, LINES, OR ELECTRICAL CONNECTIONS.**

- r. Lift and remove the transmission from the loader.
  - s. Drain the transmission oil into a suitable container.
4. Install the serviceable transmission.

### Performance Steps

**WARNING:** WHEN USING A CHAIN HOIST TO REMOVE OR INSTALL PARTS, BE SURE THE CHAIN HOIST IS SECURELY FASTENED TO THE PART AND THAT ALL SLACK IN THE CHAIN IS TAKEN UP. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY DUE TO A PART FALLING ON YOU. IF YOU ARE INJURED BY FALLING EQUIPMENT, OBTAIN MEDICAL AID IMMEDIATELY.

**CAUTION:** CHECK THAT ALL HOSES, LINES, AND ELECTRICAL LEADS ARE CLEAR AS THE TRANSMISSION IS LOWERED INTO THE LOADER. IF NECESSARY, REPOSITION HOSES, LINES, OR ELECTRICAL LEADS BEFORE INSTALLING THE TRANSMISSION.

- a. Put the transmission left-side bracket in position on the chassis and install and tighten the cap screw and washer, and the new locknut and washer.
  - b. Connect the chain hoists to the transmission (front and rear). Raise the transmission from the ground and put it in position over the loader's rear chassis. Slowly lower the transmission into the loader. Then connect the transmission jack to the bottom of the transmission and remove the front chain hoist.
  - c. Raise the hydraulic pump by using a pry bar. Move the transmission toward the front of the loader. Engage the hydraulic pump driveshaft with the transmission charging pump drive. Start the hydraulic pump mounting cap screws into the transmission.
  - d. Align the transmission-mounting holes with the associated holes in the bracket by raising or lowering the transmission as necessary.
  - e. Install four lock washers and cap screws. Install the 2-inch cap screw in the top front mounting hole. Tighten the cap screws to 135-165 foot-pounds.
  - f. Put the transmission's right-side bracket on the frame. Install and tighten the cap screw and washer and the new locknut and washer.
  - g. Align the transmission-mounting holes with the associated holes in the bracket. Install four washers and cap screws. Install the 2-inch cap screw in the top front mounting hole. Tighten the cap screws and nuts to 135-165 foot-pounds.
  - h. Disconnect the chain hoist and the transmission jack from the transmission.
  - i. Install the rear driveshaft, and connect the center drive shaft to the transmission.
  - j. Connect the parking brake lever to the parking brake chamber and adjust the linkage if necessary.
  - k. Position the hydraulic system manifold bracket on the transmission's front cover; install and tighten the cap screw to secure.
  - l. Position the transmission control cable bracket on the transmission; install and tighten the cap screws to secure.
  - m. Position the wiring harness bracket at the transmission charging pump and install.
  - n. Tighten the cap screws that secure the hydraulic pump to the transmission charging pump to 135-165 foot-pounds.
  - o. Connect the transmission control linkage to the transmission control valve spool.
  - p. Connect the hose to the transmission control valve clutch cutout cylinder.
  - q. Connect all electrical leads.
  - r. Connect the transmission oil cooler hoses, and install the oil filter and lines to the transmission.
  - s. Install a new tie strap to secure the fuel shutoff cable and the accelerator cable to the wiring harness.
  - t. Install the hood support and the transport service link.
  - u. Install the engine, fill the transmission with oil, and adjust the transmission control linkage.
5. Perform a system check.
    - a. Start the engine.
    - b. Check the system for leaks and proper operation.
  6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and have appropriate technical publications available.



Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected the equipment and verified the condition.	—	—
3. Removed the unserviceable transmission.	—	—
4. Installed the serviceable transmission.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5990-E
- TM 5-3805-262-10
- TM 5-3805-262-20
- TM 5-3805-262-34

**Related**

- AR 750-1
- DA PAM 738-750

## Replace a Driveshaft on an Item of Construction Equipment

### 091-62B-1502

**Conditions:** Given an item of construction equipment with an unserviceable drive shaft, a serviceable driveshaft, a tool kit (general mechanics), a number (No.) 1 tool kit (common organizational maintenance), personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** You will replace the driveshaft, without causing damage to the equipment or injury to personnel.

#### Performance Steps

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify the condition.

**DANGER: BE SURE THAT THE TRANSPORT/SERVICE LINK IS ENGAGED BEFORE PERFORMING THE FOLLOWING STEPS. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY OR DEATH DUE TO THE CHASSIS PIVOTING AND CRUSHING YOU WHEN YOU ARE WORKING IN THE AREA BETWEEN THE FRONT AND THE REAR CHASSIS.**

3. Remove the unserviceable driveshaft.
  - a. Loosen the cap on the rear driveshaft.
  - b. Use a wrench to remove the eight cap screws and lock washers.
  - c. Push the halves of the rear driveshaft together, and remove the rear driveshaft from the vehicle.

4. Install the serviceable driveshaft.

**WARNING: DRY CLEANING SOLVENT P-D-680 USED TO CLEAN PARTS IS TOXIC AND FLAMMABLE. WEAR PROTECTIVE GOGGLES AND GLOVES, AND USE ONLY IN A WELL-VENTILATED AREA. AVOID CONTACT WITH SKIN, EYES, AND CLOTHING, AND DO NOT BREATHE THE VAPORS. DO NOT USE NEAR AN OPEN FLAME OR EXCESSIVE HEAT, AND DO NOT SMOKE WHEN USING IT. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY. IF YOU BECOME DIZZY WHILE USING THE CLEANING SOLVENT, GET FRESH AIR AND MEDICAL ATTENTION IMMEDIATELY. IF CONTACT WITH SKIN OR CLOTHES IS MADE, FLUSH WITH LARGE AMOUNTS OF WATER. IF CONTACT WITH EYES IS MADE, WASH EYES WITH WATER AND GET MEDICAL AID IMMEDIATELY.**

- a. Use a clean cloth moistened with cleaning solvent P-D-680 to clean the rear driveshaft universal joints mounting surfaces and the mating surfaces of the transmission and the rear-axle yokes.
- b. Loosen the cap on rear driveshaft and push the halves of the driveshaft together.
- c. Position the rear driveshaft so that the sliding yoke is near the front of the vehicle. Position the universal joint on the transmission yoke, and install the four lock washers and cap screws finger tight.
- d. Pull the halves of the rear driveshaft apart, and position the universal joint on the rear-axle yoke and install the four lock washers and cap screws.
- e. Tighten the eight cap screws to 63-83 foot-pounds.

5. Perform a system check.

**DANGER: DISENGAGE THE TRANSPORT/SERVICE LINK BEFORE DRIVING THE VEHICLE. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY OR DEATH DUE TO THE LOSS OF STEERING CONTROL.**

- a. Service the driveshaft.
- b. Check the system for proper operation.

6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable driveshaft.	—	—
4. Installed the serviceable driveshaft.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
 DA FORM 5988-E  
 TM 5-3805-262-20

**Related**  
 AR 750-1  
 DA PAM 738-750

## Replace Universal Joints on an Item of Construction Equipment

091-62B-1503

**Conditions:** Given an item of construction equipment with unserviceable universal joints (the driveshaft is removed from the equipment), serviceable universal joints, a tool kit (general mechanics), a number (No. 1) tool kit (common organizational maintenance), personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Replace the universal joints, without causing damage to the equipment or injury to personnel.

### Performance Steps

1. Receive and review the equipment maintenance request.
2. Inspect the equipment and verify the condition.
3. Remove the unserviceable universal joints.
  - a. Use a wrench to remove the eight cap screws and lock washers from the rear driveshaft.
  - b. Remove the two universal joints with lubrication fittings from the splined yoke and the slip yoke. Tap the universal joints lightly using rubber mallet to loosen, if necessary.
  - c. Use a wrench to remove the two lubrication fittings from the universal joints.

4. Install the serviceable universal joints.

**WARNING:** DRY CLEANING SOLVENT P-D-680 USED TO CLEAN PARTS IS TOXIC AND FLAMMABLE. WEAR PROTECTIVE GOGGLES AND GLOVES, AND USE ONLY IN A WELL-VENTILATED AREA. AVOID CONTACT WITH SKIN, EYES, AND CLOTHING, AND DO NOT BREATHE THE VAPORS. DO NOT USE NEAR AN OPEN FLAME OR EXCESSIVE HEAT, AND DO NOT SMOKE WHEN USING IT. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY. IF YOU BECOME DIZZY WHILE USING THE CLEANING SOLVENT, GET FRESH AIR AND MEDICAL ATTENTION IMMEDIATELY. IF CONTACT WITH SKIN OR CLOTHES IS MADE, FLUSH WITH LARGE AMOUNTS OF WATER. IF CONTACT WITH EYES IS MADE, WASH EYES WITH WATER AND GET MEDICAL AID IMMEDIATELY.

- a. Clean the parts using cleaning solvent P-D-680. Dry the parts using clean cloths.
- b. Inspect parts for cracks, distortion, or damage.

**NOTE:** Replace an item if the inspection indicates a need for replacement.

- c. Position the two universal joints on the splined yoke and the slip yoke.
- d. Install the eight lock washers and cap screws. Do not tighten.
- e. Seat the universal joints by tapping lightly with rubber mallet.
- f. Use a wrench to tighten the cap screws to 45 foot-pounds.
- g. Use a wrench to install the two lubrication fittings in the two universal joints.

**DANGER:** BE SURE THAT THE TRANSPORT/SERVICE LINK IS ENGAGED BEFORE PERFORMING THE FOLLOWING STEPS. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY OR DEATH DUE TO THE CHASSIS PIVOTING AND CRUSHING YOU WHEN YOU ARE WORKING IN THE AREA BETWEEN THE FRONT AND THE REAR CHASSIS.

- h. Install and lubricate the rear driveshaft.

5. Perform a system check.

**DANGER:** DISENGAGE THE TRANSPORT/SERVICE LINK BEFORE DRIVING THE VEHICLE. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY OR DEATH DUE TO THE LOSS OF STEERING CONTROL.

- a. Start the engine.
- b. Check the system for proper operation.

6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of

construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected the equipment and verified the condition.	—	—
3. Removed the unserviceable universal joints.	—	—
4. Installed the serviceable universal joints.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5990-E  
 TM 5-3805-262-20  
 TM 5-3805-262-34

**Related**

AR 750-1  
 DA PAM 738-750

## Replace a Power Divider on an Item of Construction Equipment

091-62B-1504

**Conditions:** Given an item of construction equipment with an unserviceable power divider (all accessories are removed to gain access to the power divider and all lines and accessories are removed from the power divider), a serviceable power divider, shop equipment (general-purpose), 400-pound lifting equipment, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Replace the power divider, without causing damage to the equipment or injury to personnel.

### Performance Steps

1. Receive and review the equipment maintenance request.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable power divider.
  - a. Fasten two 5/8-inch 11NC eyebolts to the holes on the top of the torque divider housing.
  - b. Fasten the lifting equipment to the eyebolts (the torque divider weighs 325 pounds).
  - c. Place an oil pan beneath the torque divider housing.
  - d. Use a wrench to remove the 12 nuts and washers.
  - e. Install two 3/8-inch 16NC forcing screws in the torque divider housing.
  - f. Turn the forcing screws in slowly until enough pressure is applied to separate the torque divider housing from the flywheel housing.

**NOTE:** Do not remove the torque divider at this point.

- g. Back the torque divider housing away from the flywheel housing just enough to slide a piece of wire around the planetary carrier, and connect each end of the wire to the forcing screws. This will assure that the planetary carrier assembly does not fall when the torque divider is removed.
  - h. Back the torque divider housing slowly away from the flywheel housing, and lift the assembly from the tractor (the torque divider weighs 325 pounds).

4. Install the serviceable power divider.
  - a. Wrap a wire around the torque (power) divider and the planetary gear assembly to prevent the gear assembly from sliding off the shaft during installation.
  - b. Install two 5/8-inch 11NC eyebolts into the cover of the torque divider. Place a new gasket on the flywheel housing.
  - c. Attach the lifting equipment to the torque divider, and carefully lift the torque divider into position (the torque divider weighs 325 pounds). Remove the wire from around the torque divider assembly.
  - d. Slide the torque divider housing onto the studs on the flywheel housing.

**NOTE:** Carefully maneuver the torque divider onto the housing so that the planetary gear engages with the flywheel.

- e. Use a wrench to install the 12 washers and nuts that secure the torque divider housing to the flywheel housing. Torque the nuts to 75 foot-pounds.
  - f. Remove the lifting equipment and the two 5/8-inch 11NC eyebolts from the top of the torque divider housing.

5. Perform a system check.
  - a. Reinstall all lines and accessories to return the equipment to service.
  - b. Service the torque divider housing and the transmission with oil.
  - c. Run the engine, and test-drive in all speeds.
6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of

construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable power divider.	—	—
4. Installed the serviceable power divider.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5990-E  
 TM 5-2410-237-20  
 TM 5-2410-237-34

**Related**

AR 750-1  
 DA PAM 738-750

## **Replace a Hydrojet on an Item of Powered Bridging Equipment** **091-62B-1505**

**Conditions:** Given an item of power bridging equipment with an unserviceable hydrojet (the equipment is out of the water on a grounded cradle with the hatches open to gain access to the hydrojet, the driveshaft and the steering assembly are removed), a serviceable hydrojet, shop equipment (general-purpose), lifting equipment, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Replace the hydrojet, without causing damage to the equipment or injury to personnel.

### **Performance Steps**

1. Receive and review the equipment maintenance request.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable hydrojet.
  - a. Loosen the clamp on the oil pipe hose, disconnect the hose, drain the oil into a container, and remove the hose from the hydrojet.
  - b. Remove the four nuts, washers, and bolts; the cap; and the two spacers from the driveshaft guard.

**WARNING: EXERCISE CARE WHEN REMOVING THE INTAKE GRILLE. IT WEIGHS 30 POUNDS AND THE RETAINER MAY SEPARATE FROM THE GRILLE WHEN THE MOUNTING BOLTS ARE REMOVED. INJURY TO PERSONNEL WILL RESULT.**

**NOTE:** Before the next step, check the bolt installation diagram for the four unmarked bolts. These are the bolts removed in the next step.

- c. Remove the four nuts, washers, and socket bolts from the intake grille, and remove the grille.
- d. Remove the two cap screws and washers that secure the aft end of the hydrojet intake case.
- e. Remove the 12 bolts and lock washers that secure the hydrojet intake case to the hull.
- f. Attach the sling of the lifting equipment to the hydrojet intake case, and remove the assembly from the equipment. Discard the intake gasket.

4. Install the serviceable hydrojet.

**NOTE:** If the assembly has a rear reaction case attached, it must be removed. Remove the eight cap screws, nuts, and washers, and then remove the case. The case may be attached to the steering assembly. Refer to the steering assembly removal procedure if necessary.

- a. Coat one side of the intake gasket with rubber-base adhesive, and stick it in position on the hull interior.
- b. Attach the sling of the lifting equipment to the hydrojet intake case, and lower it into position in the hull.
- c. Position the driveshaft guard bottom section across the forward edge of the intake case, and install the two washers and two cap screws.
- d. Install the 12 mounting bolts, washers, and nuts into the hydrojet intake case mounting holes.

**NOTE:** Before proceeding to the next step, make sure the intake grille and the retainer are assembled properly and that the mounting bolts are handy.

- e. Position the intake grille into the hull opening, with the scoop portion of the retainer toward the bow of the boat.
- f. Secure with four socket head bolts, washers, and nuts.
- g. Install the four nuts, washers, and bolts; the cap; and the two spacers on the driveshaft guard.
- h. Place clamps into position on the oil pipe hose, install the hose, and tighten the clamps.
- i. Fill the oil reservoir with oil.

5. Perform a system check.

- a. Reinstall all accessories to return the equipment to service.
- b. Inspect the system for the proper connections and the proper operation.



**Performance Steps**

- 6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<u><b>GO</b></u>	<u><b>NO GO</b></u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable hydrojet.	—	—
4. Installed the serviceable hydrojet.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
 DA FORM 5990-E  
 TM 5-1940-277-34

**Related**  
 AR 750-1  
 DA PAM 738-750

## Replace a Differential on an Item of Construction Equipment 091-62B-1506

**Conditions:** Given an item of construction equipment with an unserviceable differential, a serviceable differential, shop equipment (general-purpose), lifting and jack equipment, caps and plugs, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Replace the differential, without causing damage to the equipment or injury to personnel.

### Performance Steps

1. Receive and review the equipment maintenance request.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable differential.

**WARNING:** DISCONNECT THE BATTERY AND DISCHARGE ANY CAPACITORS BEFORE STARTING TO WORK ON THE MACHINE. HANG A "DO NOT OPERATE" TAG IN THE OPERATOR'S COMPARTMENT.

**WARNING:** RELIEVE ALL THE PRESSURE IN THE AIR, OIL, OR WATER SYSTEMS BEFORE ANY LINES, FITTINGS, OR RELATED ITEMS ARE DISCONNECTED OR REMOVED. ALWAYS MAKE SURE THAT ANY RAISED COMPONENTS ARE BLOCKED CORRECTLY, AND BE ALERT FOR POSSIBLE PRESSURE WHEN DISCONNECTING ANY DEVICE FROM A SYSTEM THAT UTILIZES PRESSURE.

- a. Turn the tractor so it is at a right angle to the scraper, and remove the supplemental steering pump. Drain the hydraulic oil out of the transmission and the differential case into a suitable container.
  - b. Disconnect all lines that are connected to the implement and the steering pump. Put caps on all lines and hoses to keep out dirt.
  - c. Remove the bolts from the inlet pipe. Cap all lines to keep out dirt.
  - d. Remove the nuts and remove the oil manifold. Disconnect the lines and the headlamp wire. Put caps on the lines to keep out dirt.
  - e. Remove the cover bolts from the linkage housing and remove the cover.
  - f. Remove the bolts from the housing. Loosen the nut and remove the linkage from the shaft. Push the linkage housing to one side.
  - g. Disconnect the differential lock airline. Put a cap on the airline to keep out dirt.
  - h. Remove the three bolts and remove the driveshaft cover.
  - i. Install a bolt into one of the threaded holes in the driveshaft. Remove the driveshaft.
  - j. Fasten a hoist and ratchet puller to the transmission for support. Remove the nuts, but do not remove the four bolts that hold the differential to the transmission.
  - k. Move the axles out far enough to free the differential housing.
  - l. Remove the transfer gears, the transmission, and the differential as a unit (the unit weighs 4,500 pounds).
4. Install the serviceable differential.
    - a. Remove the access cover from the top of the differential case. Loosen the locknut and turn the thrust stop on the inside of the differential case to give enough clearance for installation of the differential. Put the transfer gears, the transmission, and the differential in position, and install the washers and nuts that hold the transmission and the differential to the frame.
    - b. Turn the thrust stop to give a clearance of 0.002 inch plus an additional turn of 0.001 inch between the thrust stop and the bearing cap. Tighten the locknut. Install the access cover on top of the differential case.
    - c. Push the axles back into the differential housing, and install the driveshaft.
    - d. Install the driveshaft access cover and the bolts that hold it.

**Performance Steps**

- e. Remove the protection cap from the differential lock airline. Install differential lock airline.
  - f. Install the shift linkage and the shift linkage housing.
  - g. Connect the headlamp wire. Remove the protection caps from the lines. Connect the lines to their respective positions. Install the oil manifold and the nuts that hold it to the transmission.
  - h. Install the inlet pipe and bolts, and then remove the protective caps from all lines and hoses. Install the supplemental steering pump. Connect all lines and hoses to the pump.
5. Perform a system check.
    - a. Fill the transmission and the differential case with hydraulic oil to the correct level.
    - b. Run the engine and test-drive in all speeds.
  6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable differential.	—	—
4. Installed the serviceable differential.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5990-E
- TM 5-3805-248-14&P-1
- TM 5-3805-248-14&P-2

**Related**

- AR 750-1
- DA PAM 738-750

## Replace a Final Drive on an Item of Construction Equipment

091-62B-1507

**Conditions:** Given an item of construction equipment with an unserviceable final drive (all accessories are removed for access to the final drive, and the final drive is disconnected and drained of oil), a serviceable final drive, shop equipment (general-purpose), tool kit (general mechanics), a hoist and sling, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Replace the final drive, without causing damage to the equipment or injury to personnel.

### Performance Steps

1. Receive and review the equipment maintenance request.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable final drive.

- a. Connect the sling to the studs of the final drive with four nuts.
- b. Move the sling locking bar over the final drive flange.

**WARNING: THE LIFTING DEVICE MUST HAVE A WEIGHT CAPACITY GREATER THAN 550 POUNDS. THE HUB MUST BE USED AS A COUNTERWEIGHT WHEN REMOVING OR INSTALLING THE FINAL DRIVE. TWO PERSONS SHOULD HANDLE THE SLING. STAND CLEAR OF THE FLANGE, BECAUSE IT MAY SLIP AND CAUSE SERIOUS INJURY TO PERSONNEL.**

- c. Connect the drive sprocket and the hub to the sling with the chain. Ensure there is no slack in the chain.
- d. Connect the lifting device to the sling and raise it to take up the slack.
- e. **LEFT SIDE ONLY:** Disconnect the electrical lead from the adapter. Remove the adapter and 26 self-locking screws and washers from the adjusting flange. Discard the self-locking screws. Leave the last three screws in the adjusting flange.
- f. **RIGHT SIDE ONLY:** Remove 27 self-locking screws and washers from the adjusting flange. Discard the self-locking screws. Leave the last three screws in the adjusting flange.

**WARNING: STAND CLEAR OF THE FLANGE, BECAUSE IT MAY SLIP AND CAUSE SERIOUS INJURY TO PERSONNEL.**

- g. Support the adjusting flange with wooden blocks.

**CAUTION: THE BLOCKS SHOULD NOT REST ON THE BILGE PUMP SCREEN. FAILURE TO COMPLY MAY RESULT IN DAMAGE TO THE EQUIPMENT.**

- h. Remove three self-locking screws and washers from the adjusting flange. Discard the self-locking screws.
- i. Move the sling from side to side to break the final drive from the hull.

**WARNING: THE HUB MUST BE USED AS A COUNTERWEIGHT WHEN REMOVING OR INSTALLING THE FINAL DRIVE. TWO PERSONS SHOULD HANDLE THE SLING. FAILURE TO COMPLY MAY RESULT IN SERIOUS INJURY TO PERSONNEL.**

- j. Lift the final drive clear of the vehicle. Remove the sprocket and the hub from the sling. Remove four nuts and then remove the sling. Remove the shaft, the nut, and the retaining ring from final drive if it is damaged.
- k. Remove the packing from the hull and discard.

4. Install the serviceable final drive.

- a. Ensure that the final drive is lined up straight for installation, and coat the packing with silicon compound and install on the final drive.

**WARNING: THE HUB MUST BE USED AS A COUNTERWEIGHT WHEN REMOVING OR INSTALLING THE FINAL DRIVE. TWO PERSONS SHOULD HANDLE THE SLING. FAILURE TO COMPLY MAY RESULT IN SERIOUS INJURY TO PERSONNEL.**

- b. Connect the sling to the studs of the final drive with four nuts.
- c. Move the sling locking bar over the final drive flange.

**Performance Steps**

- d. Connect the drive sprocket and the hub to the sling with a chain. Ensure there is no slack in the chain.
  - e. Connect the lifting device to the sling, and lift the final drive into position.
  - f. Install the nut, the retaining ring, and the shaft on the final drive (if removed).
  - g. LEFT SIDE ONLY: Install the final drive on the hull and the adjusting flange with 29 washers and self-locking screws. Tighten the self-locking screws to 160-180 foot-pounds.
  - h. Install the adapter on the adjusting flange, and connect the electrical lead to the adapter.
  - i. RIGHT SIDE ONLY: Install the final drive on the hull and the adjusting flange with 30 washers and self-locking screws. Tighten the self-locking screws to 160-180 foot-pounds.
  - j. Remove the drive sprocket and the hub from the sling.
  - k. Remove the four nuts and the sling from the final drive.
5. Perform a systems check.
    - a. Reinstall and reconnect all accessories that were removed from the equipment.
    - b. Service the final drive.
    - c. Test operate the equipment to ensure proper operation.
  6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable final drive.	—	—
4. Installed the serviceable final drive.	—	—
5. Performed a systems check.	—	—
6. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5990-E
- TM 5-2350-262-10
- TM 5-2350-262-20-1
- TM 5-2350-262-20-2
- TM 5-2350-262-34

**Related**

- AR 750-1
- DA PAM 738-750

**Repair a Winch Brake on an Item of Construction Equipment**  
**091-62B-1508**

**Conditions:** Given an item of construction equipment with a faulty winch brake, a tool kit (general mechanics), personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** You will repair the winch brake, without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Repair the faulty winch brake.

**CAUTION: DO NOT ADJUST THE LINKAGE WITH THE ENGINE RUNNING, BECAUSE IT WILL RESULT IN DAMAGE TO THE LINKAGE.**

- a. Use a flat-blade screwdriver to remove the four cap screws that secure the guide to the cover. Remove the guide.
  - b. Use a wrench to remove the cap screw and the nut from the control cable.
  - c. Loosen the rod end until the distance between the rod end and the end of the threads on the cable is 0.5 inch.
  - d. Use a wrench to tighten the nut against the rod end to a torque of  $30 \pm 5$  inch-pounds.
  - e. Put the rod end in position on the bell crank. Use a wrench to install the cap screw and the nut.
  - f. Put the control lever in the BRAKE ON position.
  - g. Remove the lock washer and the cap screw on the cable by using a wrench. Remove the rod end from the control lever.
  - h. Loosen the rod end until the dimensions are the same when the control lever is in the BRAKE ON position.
  - i. Use a wrench to tighten the nut against the rod end to a torque of  $30 \pm 5$  inch-pounds.
  - j. Install the rod end on the control lever. Use a wrench to install the lock washer and the cap screw.
  - k. Move the control lever to all positions. Ensure that the threads on the cables do not come in contact with the rubber seals. If the threads come in contact with the rubber seals, adjust the cables again.
  - l. Install the guide onto the cover. Use a flat-blade screwdriver to install the four cap screws.
  - m. Use a wrench to remove the four cap screws and lock washers from the cover. Remove the cover.
  - n. Use a wrench to remove the cap screw and nut that secure the cable to the winch control valve.
  - o. Adjust the cable so that the distance between the rod end and the end of the threads on the cable is 0.5 inch.
  - p. Install the rod end in position on the lever and secure with a cap screw and a nut. Use a wrench to tighten the nut against the rod end to a torque of  $30 \pm 5$  inch-pounds.
  - q. Install the cover over the winch control valve. Use a wrench to install the four cap screws and lock washers to secure the cover.
4. Perform a system test.
    - a. Place the equipment in service.
    - b. Check the winch for the proper operation.
  5. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of

construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Repaired the faulty winch brake.	—	—
4. Performed a system test.	—	—
5. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2410-237-20

**Related**

AR 750-1  
DA PAM 738-750

**Repair Steering Brakes and Clutches on an Item of Construction Equipment**  
**091-62B-1509**

**Conditions:** Given an item of construction equipment with faulty steering brakes and clutches (all accessories have been removed for access to the steering brakes and clutches), a tool kit (general mechanics), a number (No.) 1 tool kit (common), personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** You will repair the steering brakes and clutches, without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Repair the faulty steering brakes and clutches.

NOTE: Steps 3a through 3k are for the right-side linkage. Repeat the procedure for the left-side linkage.

- a. Use a wrench to remove the three cap screws and washers from the cover.
- b. Remove the cover with the gasket from the top of the final drive case to gain access to the rake band-adjusting nut. Discard the gasket.
- c. Use a wrench to turn the brake band adjusting nut clockwise until the band is tight, and then loosen 1 1/2 turns (9 clicks) counterclockwise.
- d. Remove the rod by removing the cotter pins and the holding pin. Discard the cotter pins.
- e. Use two wrenches to loosen the nut at both ends of the rod, and turn the rod until the distance between the centerline of the pins is  $19.25 \pm 0.02$  inches.
- f. Use a wrench and a torque wrench to tighten the nut to a torque of  $75 \pm 10$  foot-pounds.
- g. Install the rod and secure it with the pin and new cotter pins.
- h. Use two wrenches to loosen the nut on the rod and turn the rod until the distance between the centerlines of the pins is 12.88 inches.
- i. Use a wrench and a torque wrench to tighten the nut to a torque of  $75 \pm 10$  foot-pounds.
- j. Use two wrenches to loosen the nut on the rod, and turn the rod end to adjust the length of the rod so that the distance between the front of the right brake pedal and the seat kick plate is  $18.53 \pm 0.12$  inches.
- k. Use a wrench and a torque wrench to tighten the nut to a torque of  $75 \pm 10$  foot-pounds.
- l. Install the gasket and the cover, and use a wrench to install the three washers and cap screws.
- m. Repeat steps 3a through 3k for the left side.
- n. Use a socket to remove the four cap screws, lock washers, and washers and the cover from the top of the dash.
- o. Use a wrench to loosen the locking nuts on the steering clutch rods.
- p. Use pliers to remove the cotter pins and the pin that connect the rod ends to the levers. Discard the cotter pins.
- q. Push the levers all the way toward the front of the machine against the bumpers.
- r. Turn the rod ends so that the distance between the centerline of the handles and the face of the dash is  $0.50 \pm 0.12$  inches.
- s. Install the pins and the new cotter pins that connect the rod ends to the levers, and tighten the locking nuts on the rods to a torque of  $75 \pm 10$  pound-feet.
- t. Use two wrenches to loosen the locking nuts on the lower linkage, and turn the rods so that the distance between the centerline of the pins is  $18.50 \pm 0.02$  inches.
- u. Tighten the locking nuts to a torque of  $9 \pm 3$  foot-pounds.
- v. Use two wrenches to loosen the locking nuts on the floor linkage, and then remove the cotter pins and the pin that connect the rod ends to the levers. Discard the cotter pins.
- w. Pull the rods, one at a time, toward the front of the machine until a resistance is felt.
- x. Make an adjustment to the rod ends, one at a time, so that the pins can be installed through the rod ends into the levers.



**Performance Steps**

- y. Turn rod ends, one at a time, 1/2 turn so the length of rods is made shorter.
  - z. Put the rod ends into position on the levers, and install the pin and the new cotter pins and tighten the nuts to a torque of 9 ±3 foot-pounds.
  - aa. Place the cover in position, and use a socket to install the four washers, lock washers, and screws.
4. Perform a system test.
    - a. Reinstall all accessories removed from the equipment.
    - b. Place the equipment in service.
    - c. Check the equipment for proper operation.
  5. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Repaired the faulty steering brakes and clutches.	—	—
4. Performed a system test.	—	—
5. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2410-237-20

**Related**

AR 750-1  
DA PAM 738-750

**Repair a Clutch Assembly on an Item of Construction Equipment  
091-62B-1510**

**Conditions:** Given an item of construction equipment with a faulty clutch assembly (all accessories have been removed for access to the clutch assembly), a tool kit (general mechanics), personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Repair the clutch assembly, without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.

2. Inspect the equipment and verify its condition.

**DANGER: PERFORMANCE OF THIS TASK CAN RESULT IN EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, OR ACIDS; ELECTRICAL SHOCKS; OR INJURY OR DEATH BY BEING CRUSHED BY EQUIPMENT.**

3. Repair the clutch assembly.

a. Remove the spring from the clutch slave cylinder and the clutch lever.

b. Loosen the locknut.

c. Move the clutch lever down until it stops.

d. Insert a measuring device between the top surface of the clutch lever and the bottom surface of the spring bracket. Raise the clutch lever (the movement of the clutch lever must not exceed 1/8 inch).

e. Turn the adjusting pin to adjust the clearance. Tighten the locknut when the proper clearance is obtained.

f. Attach the spring to the clutch slave cylinder and the clutch lever.

4. Perform a system check.

a. Have the operator start the equipment.

b. Check the system for proper operation.

5. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u><b>GO</b></u>	<u><b>NO GO</b></u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	___	___
2. Inspected the equipment and verified its condition.	___	___
3. Repaired the clutch assembly.	___	___
4. Performed a system check.	___	___
5. Annotated the equipment inspection and maintenance work sheet.	___	___

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2420-224-20-2

**Related**

AR 750-1  
DA PAM 738-750

**Replace a Steering Gear on an Item of Construction Equipment**  
**091-62B-1511**

**Conditions:** Given an item of construction equipment with an unserviceable steering gear (all the accessories have been removed for access to the steering gear), shop equipment (general-purpose repair), tool kit (general mechanics), a hoist, caps and plugs, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** You will replace the steering gear, without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment maintenance request.
2. Inspect the equipment and verify its condition.

**DANGER: PERFORMANCE OF THIS TASK CAN RESULT IN EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, OR ACIDS; ELECTRICAL SHOCKS; OR INJURY OR DEATH BY BEING CRUSHED BY EQUIPMENT.**

**DANGER: PARTS MAY BE HEAVY. OBTAIN ASSISTANCE IF NECESSARY. FAILURE TO DO COULD RESULT IN INJURY OR DEATH OR DAMAGE TO PARTS.**

3. Remove the unserviceable steering gear.
  - a. Drain the power-steering reservoir into a suitable container.
  - b. Remove the cotter pin and the castellated nut from the power-steering gear. Discard the cotter pin.
  - c. Use a puller to disconnect the pitman arm from the power-steering gear assembly.
  - d. Disconnect the tube from the top of the power-steering gear assembly. Tag and cap the tube.
  - e. Remove the hollow bolt and the two seals, and disconnect the tube from the side of the steering gear assembly. Discard the seals. Tag and cap the tube.
  - f. Use a suitable hoist to support the weight of the power-steering gear assembly.
  - g. Remove the four screws and washers and the power-steering gear assembly.
4. Install the serviceable steering gear.
  - a. Use a suitable hoist to install the power-steering gear assembly and the four screws and washers. Tighten the two smaller screws to 144 foot-pounds and the two larger screws to 173 foot-pounds.
  - b. Install the hollow bolt and the two new seals, and connect the tube to the side power-steering gear assembly.
  - c. Connect the tube to the top of the steering gear.
  - d. Connect the pitman arm onto the power-steering gear assembly, and install the castellated nut and a new cotter pin.
  - e. Fill the power-steering reservoir.
5. Perform a system check.
  - a. Return the equipment to service.
  - b. Check the system for leaks and proper operation.
6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable steering gear.	—	—
4. Installed the serviceable steering gear.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5990-E
- TM 5-2420-224-20-1
- TM 5-2420-224-20-2
- TM 5-2420-224-34

**Related**

- AR 750-1
- DA PAM 738-750

Subject Area 6: Brakes

**Adjust the Brake Shoes on an Item of Construction Equipment  
091-62B-1601**

**Conditions:** Given an item of construction equipment with faulty brakes, a tool kit (general mechanics), personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Adjust the brake shoes without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Adjust the brake shoes.
  - a. Measure the movement of the slack adjuster at the pin when the brakes are applied. If the movement is 2.5 inches or more, adjust the brakes.
  - b. Loosen the lock bolt to adjust. Turn the adjusting shaft in the same direction it turns when the brakes are applied. Adjust as needed to limit movement to 1.62 inches.
  - c. Tighten the lock bolt.
4. Perform a system check.
  - a. Have the operator start the equipment.
  - b. Check the equipment for proper operation.
5. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Adjusted the brake shoes.	—	—
4. Performed a system check.	—	—
5. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-3805-248-14&P-3

**Related**

AR 750-1  
DA PAM 738-750

**Replace a Master Cylinder on an Item of Construction Equipment  
091-62B-1602**

**Conditions:** Given an item of construction equipment with an unserviceable master cylinder (the accessories are removed for access to the master cylinder), a serviceable master cylinder, a tool kit (general mechanics), a number (No.) 1 tool kit (common), personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the master cylinder without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable master cylinder.

**WARNING: FUEL AND OIL ARE SLIPPERY AND CAN CAUSE FALLS. TO AVOID INJURY, WIPE UP SPILLED FUEL OR OIL WITH RAGS.**

- a. Set the parking brake.
- b. Tag and disconnect the brake fluid reservoir hose and the clutch hydraulic reservoir hose. Drain each hose into a suitable container.
- c. Disconnect the two brake line fittings using a wrench.
- d. Remove the three screws and spring-tension washers and the brake master cylinder. Discard the spring-tension washers.
- e. Remove the two bleeder valves.

4. Install the serviceable master cylinder.
  - a. Install the two bleeder valves.
  - b. Install the brake master cylinder and the three screws and new spring-tension washers.
  - c. Connect the two brake line fittings using a wrench.
  - d. Remove the tags and connect the brake fluid reservoir hose and the clutch hydraulic reservoir hose.
5. Perform a system check.
  - a. Service the hydraulic reservoir and the brake fluid reservoir.
  - b. Bleed the brake system.
  - c. Adjust the brake pedal.
  - d. Return the equipment to service.
  - e. Check the system for leaks and proper operation.
6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u><b>GO</b></u>	<u><b>NO GO</b></u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable master cylinder.	—	—
4. Installed the serviceable master cylinder.	—	—

**Performance Measures**

**GO**    **NO GO**

5. Performed a system check.

—      —

6. Annotated the equipment inspection and maintenance work sheet.

—      —

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

TM 5-2420-224-20-2

**Related**

AR 750-1

DA PAM 738-750



**Replace a Brake Booster on an Item of Construction Equipment**  
**091-62B-1603**

**Conditions:** Given an item of construction equipment with an unserviceable brake booster (all accessories removed for access to the brake booster), a serviceable brake booster, a tool kit (general mechanics), a number (No.) 1 tool kit (common), personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the brake booster without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable master cylinder.

**WARNING: DO NOT DISCONNECT ANY AIR SYSTEM LINES OR FITTINGS UNLESS THE VEHICLE'S ENGINE IS SHUT OFF AND THE AIR SYSTEM PRESSURE IS RELIEVED. FAILURE TO DO SO COULD RESULT IN INJURY TO PERSONNEL.**

- a. Relieve the air pressure from the system.
  - b. Remove the three fluid passage bolts and the six seal rings from the top of the brake booster. Tag and disconnect the line and the two tubes. Discard the seal rings.
  - c. Remove the fluid passage bolt and the three seal rings from the side of brake booster. Discard the seal rings.
  - d. Tag and disconnect the two lines and set the two valves aside.
  - e. Remove the nut, the lock washer, and the eccentric bolt from the side of the brake booster. Discard the lock washer.
  - f. Roll the rubber cover carefully away from the brake booster and remove the rubber cover and the clevis rod.
  - g. Remove the three nuts and lock washers and the brake booster. Discard the lock washers.
4. Install the serviceable brake booster.
    - a. Install the brake booster and the three new lock washers and nuts.
    - b. Install the clevis rod and the rubber cover and carefully roll the rubber cover over the brake booster.
    - c. Install the eccentric bolt and the new lock washer and nut.
    - d. Position the two valves and connect the two lines. Remove the tags.
    - e. Install the three new seal rings and the fluid passage bolt.
    - f. Connect the line and the two tubes. Remove the tag. Install the six new seal rings and the three fluid passage bolts.
  5. Perform a system check.
    - a. Reinstall all the accessories that were removed.
    - b. Bleed the brake system.
    - c. Adjust the brake pedal.
    - d. Return the equipment to service.
    - e. Check the system for leaks and proper operation.
  6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable master cylinder.	—	—
4. Installed the serviceable brake booster.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2420-224-20-2

**Related**

AR 750-1  
DA PAM 738-750

## Replace a Treadle Valve on an Item of Construction Equipment 091-62B-1604

**Conditions:** Given an item of construction equipment with an unserviceable brake treadle valve, a serviceable brake treadle valve, a tool kit (general mechanics), a number (No.) 1 tool kit (common), personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the brake treadle valve without causing damage to the equipment or injury to personnel.

### Performance Steps

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable treadle valve.

NOTE: All the air lines, adapters, tees, and fittings are disconnected and removed from the treadle valve being removed and the cab floor mat is pulled back just enough to gain access to the treadle valve mounting hardware.

- a. While the assistant in the cab holds the cap screws using a socket wrench, remove the three nuts and lock washers from beneath the cab deck.
- b. Remove the three cap screws and the treadle valve from the bottom of the loader cab.

4. Install the serviceable treadle valve.
  - a. Position the treadle valve on the cab deck. Install the three cap screws. Tell the assistant to install and tighten the three lock washers and nuts.
  - b. Connect the air lines and the fittings to the treadle valve.
  - c. Install a double check valve and a stoplight switch, if necessary.
  - d. Close the air reservoir drain valve.
  - e. Reposition the cab floor mat.

5. Perform a system check
  - a. Perform a leakage test.
    - (1) Start the engine and operate at idle speed. Continue to operate the engine until the air pressure gauge indication on the left instrument cluster no longer increases.
    - (2) Apply the parking brake. Turn off the engine. Be sure the treadle valve is fully released.
    - (3) Apply a soap solution on and around the bottom bore of the valve body. Watch for bubbles.
    - (4) Tell the assistant to press the treadle completely while you apply the soap solution on and around the bottom bore of the valve body. Watch for bubbles.

NOTE: If bubbles are seen, this indicates air leakage. If there is any air leakage, replace the treadle valve.

- b. Perform an operating test.

**WARNING: OPEN THE AIR RESERVOIR DRAIN VALVE TO RELIEVE ALL THE AIR SYSTEM PRESSURE BEFORE DISCONNECTING THE AIR SYSTEM COMPONENTS OR LINES. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY.**

- (1) Open the air reservoir drain valve to relieve the air system pressure. Remove one plug from the valve's upper chamber and install a 1/2- to 1/8-inch national pipe thread (NPT) reducer.
- (2) Connect the 0 to 150 pounds per square inch (psi) pressure gauge to the reducer. The pressure gauge hose must be long enough that the pressure gauge can be read in the cab.
- (3) Close the air reservoir drain valve. Start the engine and operate it at idle speed. Continue to operate the engine until the air pressure gauge indication on the left instrument cluster no longer increases.

**Performance Steps**

- (4) Press the treadle valve slowly while watching the pressure gauge. The pressure gauge will indicate increasing air pressure as the treadle valve is depressed.
- (5) Operate the engine at 1000 revolutions per minute (rpm) until the air pressure gauge indication on the left instrument cluster no longer increases.
- (6) Press the treadle valve down completely. The pressure gauge connected to the valve port will indicate the approximate pressure in the air reservoir. The correct pressure is approximately 110 psi when the treadle valve is fully depressed.
- (7) Release the treadle valve. The pressure gauge connected to valve port will indicate zero psi. Turn off the engine.

**WARNING: RELIEVE ALL THE AIR SYSTEM PRESSURE BEFORE DISCONNECTING THE AIR SYSTEM COMPONENTS OR LINES. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY.**

- (8) Open the air reservoir drain valve to relieve the air system pressure.
- (9) Disconnect the air pressure gauge from the valve port. Remove the reducer and install the plug in the valve body.
- (10) Close the air reservoir drain valve and close and lock the front access door.

6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable treadle valve.	—	—
4. Installed the serviceable treadle valve.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
 DA FORM 5988-E  
 TM 5-3805-262-20

**Related**  
 AR 750-1  
 DA PAM 738-750

## Replace a Brake Air Compressor on an Item of Construction Equipment

091-62B-1605

**Conditions:** Given an item of construction equipment with an unserviceable brake air compressor (all accessories have been removed for access to the brake air compressor), a serviceable brake air compressor, a tool kit (general mechanics), a number (No.) 1 tool kit (common), personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the brake air compressor without causing damage to the equipment or injury to personnel.

### Performance Steps

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable brake air compressor.

**WARNING: RELIEVE ALL AIR PRESSURE BEFORE PERFORMING MAINTENANCE ON THE AIR SYSTEM. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY. IF YOU ARE INJURED, OBTAIN MEDICAL AID IMMEDIATELY.**

- a. Disconnect the alcohol evaporator lines and the fittings to the air compressor.
  - b. Open the drain valve in the bottom of the air reservoir to relieve the air pressure.
  - c. Disconnect the oil supply hose (at the front of the air compressor) and install a plug in it to prevent the entry of foreign matter.
  - d. Disconnect the air hose from the fitting at the top of the air reservoir and at the governor.
  - e. Disconnect the oil drain hose from the fitting at the engine and at the bottom of the air compressor.
  - f. Remove the two cap screws, lock washers, and washers that secure the air compressor to the mounting bracket.
  - g. Remove the drive belt from the air compressor pulley.
  - h. Loosen the two clamps. Pull the water hoses from the elbow and the adapter to disconnect them from the air compressor. Remove the clamps.
  - i. Move the air compressor away from the engine, and loosen the clamp that secures the air hose to the air compressor.
  - j. Pull the air inlet hose from the elbow, remove the clamp, and disconnect the air hose from the elbow.
  - k. Remove the air compressor from the engine compartment.
4. Install the serviceable brake air compressor.
    - a. Put the air compressor against the chassis, and connect the outlet hose to the elbow.
    - b. Position the clamp on the air hose. Connect the air hose to the elbow, and then position the clamp and tighten it.
    - c. Position the clamps on the water hoses. Connect the water hoses to the elbow and the adapter, respectively. Position the clamps on the hose ends and tighten them.
    - d. Position the drive belt around the engine fan pulley and the air compressor pulley.
    - e. Position the air compressor on the mounting bracket and secure it with the two washers, lock washers, and cap screws.
    - f. Apply the thread sealant to the threads of the oil drain hose. Connect the oil drain hose to the bottom of the air compressor and tighten it. Connect the oil drain hose to the fitting at the engine and tighten it.
    - g. Connect and tighten the air hose to the governor and to the tee located at the top of the air reservoir.
    - h. Connect the oil supply hose to the air compressor and tighten it.
    - i. Connect the alcohol evaporator lines and the fittings to the air compressor.

**Performance Steps**

- j. Check and ensure that the drain valve located on the bottom of the air reservoir is closed.
- 5. Perform a system check.
  - a. Have the operator start and operate the engine at idle speed until the air pressure gauge located on the left instrument cluster indicates in the green area of gauge. Then turn off the engine.
  - b. Check the system for leaks and proper operation, and adjust the tension of the air compressor drive belt as needed.
- 6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable brake air compressor.	—	—
4. Installed the serviceable brake air compressor.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
 DA FORM 5988-E  
 TM 5-3805-262-20

**Related**  
 AR 750-1  
 DA PAM 738-750

**Replace a Slack Adjuster on an Item of Construction Equipment**

**091-62B-1606**

**Conditions:** Given an item of construction equipment with an unserviceable slack adjuster (all accessories have been removed for access to the slack adjuster), a serviceable slack adjuster, a tool kit (general mechanics), special tools, personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the slack adjuster without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.

2. Inspect the equipment and verify its condition.

**WARNING: DO NOT WORK ON ANY MACHINE THAT IS SUPPORTED ONLY BY LIFT JACKS OR A HOIST. ALWAYS USE BLOCKS OR JACK STANDS TO SUPPORT THE MACHINE BEFORE PERFORMING ANY DISASSEMBLY.**

3. Remove the unserviceable slack adjuster.

- a. Remove the seal, the retainer, and the bearing cone from the axle housing.
- b. Put blocks between the brake shoes and the axle housing to give clearance for the removal of the camshafts.
- c. Remove the pin that fastens the rod of the rotochamber to the slack adjuster.
- d. Remove the ring from the groove in the camshaft.
- e. Pull the camshaft out of the axle housing. Remove the slack adjuster, the ring, and the washer from the camshaft.

4. Install the serviceable slack adjuster.

- a. Install a washer on the camshaft. Put the camshaft in position and install the washer, the ring, and the slack adjuster on the camshaft.
- b. Push the end of the camshaft into the axle housing. Put the ring in the groove in the camshaft.
- c. Install the pin that fastens the rod of the rotochamber to the slack adjuster.
- d. Install the seal retainer and bearing cone on the axle housing.
- e. Use a seal installer to install the Duo-Cone seal. Remove the spacer.

5. Perform a system check.

- a. Reinstall all the accessories that were removed from the equipment.
- b. Adjust the brakes.
- c. Have the operator start the equipment.
- d. Check the equipment for proper operation.

6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable slack adjuster.	—	—

**Performance Measures**

- 4. Installed the serviceable slack adjuster.
- 5. Performed a system check.
- 6. Annotated the equipment inspection and maintenance work sheet.

GO      NO GO

\_\_\_\_      \_\_\_\_  
\_\_\_\_      \_\_\_\_  
\_\_\_\_      \_\_\_\_

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-3805-248-14&P-2

**Related**

AR 750-1  
DA PAM 738-750



**Replace a Brake Cylinder on an Item of Construction Equipment  
091-62B-1607**

**Conditions:** Given an item of construction equipment with an unserviceable brake cylinder (all accessories have been removed for access to the brake cylinder), a serviceable brake cylinder, a tool kit (general mechanics), a number (No.) 1 tool kit (common), personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the brake cylinder without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable brake cylinder.
  - a. Disconnect the brake line using a wrench.
  - b. Remove the fitted screw; the standard screw; the two nuts, washers, and lock washers; and the brake caliper. Discard the fitted screw, the washers, and the lock washers.
4. Install the serviceable brake cylinder.

**CAUTION:** WHEN INSTALLING A FITTED SCREW IN THE BRAKE CALIPER, MAKE SURE IT IS NEW. TO PREVENT DAMAGE TO EQUIPMENT, NEVER USE A FITTED SCREW TWICE.

- a. Install the brake caliper, the new fitted screw, the standard screw, the two new lock washers, washers, and nuts. Tighten the screws to 185 foot-pounds.
  - b. Connect the brake line using a wrench.
5. Perform a system check.
  - a. Reinstall all the accessories that were removed.
  - b. Fill the clutch hydraulic reservoir and the brake fluid reservoir.
  - c. Bleed the brake system.
  - d. Return the equipment to service.
  - e. Check the system for leaks and proper operation.
6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE is on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable brake cylinder.	—	—
4. Installed the serviceable brake cylinder.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

TM 5-2420-224-20-2

**Related**

AR 750-1

DA PAM 738-750

**Replace the Brake Lines on an Item of Construction Equipment  
091-62B-1608**

**Conditions:** Given an item of construction equipment with unserviceable brake lines (all accessories have been removed for access to the brake lines), serviceable brake lines, a tool kit (general mechanics), a number (No.) 1 tool kit (common), personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the brake lines without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable brake lines.

**WARNING: RELIEVE ALL AIR PRESSURE BEFORE PERFORMING MAINTENANCE ON THE AIR SYSTEM. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY. IF YOU ARE INJURED, OBTAIN MEDICAL AID IMMEDIATELY.**

- a. Open the drain valve in the bottom of the air reservoir to relieve the air pressure.
- b. Tag the location and disconnect the two brake line hoses that lead from tees on the brake treadle to the front- and rear-brake actuators.
- c. Disconnect the brake line hoses from the front- and rear-brake actuator adapters.
- d. Cut, remove, and discard the tie straps on the hoses, and remove the hoses from the equipment.

4. Install the serviceable brake lines.
  - a. Route the brake lines into position on the equipment.
  - b. Note the location, and connect the brake lines to the tees on the brake treadle valve.
  - c. Connect the brake lines to the front and rear brake actuator adapters.
  - d. Install the tie straps on the brake hoses.
  - e. Close the drain valve in the bottom of the air reservoir.
5. Perform a system check.
  - a. Have the operator start and then operate the engine at idle speed until the air pressure gauge located on the left instrument cluster indicates in the green area of the gauge. Then turn off the engine.
  - b. Check the system for leaks and proper operation.

6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	___	___
2. Inspected the equipment and verified its condition.	___	___
3. Removed the unserviceable brake lines.	___	___
4. Installed the serviceable brake lines.	___	___
5. Performed a system check.	___	___

**Performance Measures**

**GO**    **NO GO**

6. Annotated the equipment inspection and maintenance work sheet.

\_\_\_\_\_

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
DA FORM 5988-E  
TM 5-3805-262-20

**Related**  
AR 750-1  
DA PAM 738-750

**Replace the Brake Shoes on an Item of Construction Equipment  
091-62B-1609**

**Conditions:** Given an item of construction equipment with unserviceable brake shoes (all accessories have been removed for access to the brake shoes), a tool kit (general mechanics), a number (No.) 1 tool kit (common), special tools, personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the brake shoes without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable brake shoes.

**WARNING: DO NOT WORK ON ANY MACHINE THAT IS SUPPORTED ONLY BY LIFT JACKS OR A HOIST. ALWAYS USE BLOCKS OR JACK STANDS TO SUPPORT THE MACHINE BEFORE PERFORMING ANY DISASSEMBLY.**

- a. Remove the bearing cone and the Duo-Cone seal from the axle housing.
  - b. Remove the guards.
  - c. Remove the brake springs.
  - d. Remove the lock wire and the bolts that hold the pins.
  - e. Remove the spring, the retainer, and the felt washer that hold the pins.
  - f. Remove the pins and the brake shoes (each shoe weighs 45 pound).
4. Install the serviceable brake shoes.
    - a. Put the brake shoes in position and install the pins that hold them.
    - b. Install the felt washer, the retainer, and the spring on the pins.
    - c. Install the two bolts and the lock wire that hold the pins.
    - d. Install the brake spring and guards.
    - e. Install the Duo-Cone seal using the special tool. Install the bearing cone on the axle housing.
  5. Perform a system check.
    - a. Return the equipment to service.
    - b. Have the operator start the equipment.
    - c. Check the equipment for proper operation
  6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable brake shoes.	—	—
4. Installed the serviceable brake shoes.	—	—
5. Performed the system check.	—	—

**Performance Measures**

**GO**    **NO GO**

6. Annotated the equipment inspection and maintenance work sheet.

\_\_\_\_\_

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

TM 5-3805-248-14&P-2

**Related**

AR 750-1

DA PAM 738-750

**Replace the Brake Pads on an Item of Construction Equipment  
091-62B-1610**

**Conditions:** Given an item of construction equipment with unserviceable brake pads and all of the accessories removed for quick access, serviceable brake pads, general mechanic's tool kit, a number 1 common tool kit, special tools, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection maintenance worksheet, and a pen.

**Standards:** Replace the brake pads without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment Inspection maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable brake pads.
  - a. Remove the dust cover.
  - b. Disconnect the brake pad indicator wire.
  - c. Remove the two pins and spring.
  - d. Remove two brake linings and two protective plates using a puller.
4. Install the serviceable brake pads.
  - a. Collapse the pistons using an installation tool.

**CAUTION:** Ensure that the openings on the protective plates are in the same position on both sides of the brake linings to prevent damage to the caliper piston seals.

  - b. Install two protective plates and two new brake linings.
  - c. Install the two pins and spring.
  - d. Connect the brake pad indicator wire.
  - e. Install the dust cover.
5. Perform a system check.
  - a. Reinstall all accessories removed.
  - b. Assist the operator in filling the clutch hydraulic reservoir and the brake fluid reservoir.
  - c. Return the equipment to service.
  - d. Check the system for proper operation.
6. Annotate the equipment inspection maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with the equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed an equipment inspection maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable brake pads.	—	—
4. Installed the serviceable brake pads.	—	—
5. Performed s system check.	—	—
6. Annotated the equipment inspection maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2420-224-20-2

**Related**

AR 750-1  
DA PAM 738-750



**Replace the Brake Drums on an Item of Construction Equipment  
091-62B-1611**

**Conditions:** Given an item of construction equipment with unserviceable brake drums and all of the accessories removed for access, a general mechanic's tool kit, a number 1 common tool kit, a hoist, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection maintenance work sheet, and a pen.

**Standards:** Replace the brake drums without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable brake drums.

**WARNING: DO NOT WORK ON ANY MACHINE THAT IS SUPPORTED ONLY BY LIFT JACKS OR SUPPORTED ONLY BY A HOIST. ALWAYS USE BLOCKS OR JACK STANDS TO SUPPORT THE MACHINE BEFORE PERFORMING ANY DISASSEMBLIES.**

- a. Remove the nuts and washers.
- b. Remove the brake drums with a hoist.

**NOTE:** A hoist weighs 126 pounds.

4. Install the serviceable brake drums.
  - a. Put the brake drum in position using a hoist.
  - b. Install the nuts and washers that hold the brake drum. Tighten the nuts to a torque of 95 ± 5 foot-pounds.
5. Perform a system check.
  - a. Return the equipment to service.
  - b. Have the operator start the equipment.
  - c. Check the equipment for proper operation.
6. Annotate the equipment inspection maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable brake drums.	—	—
4. Installed the serviceable brake drums.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

TM 5-3805-248-14&P-2

**Related**

AR 750-1

DA PAM 738-750

**Replace the Brake Rotors on an Item of Construction Equipment  
091-62B-1612**

**Conditions:** Given an item of construction equipment with unserviceable brake rotors and all of the accessories removed for access, the serviceable brake rotors, a general mechanic's tool kit, a number 1 common tool kit, special tools, personal protective equipment (PPE), the applicable technical manuals (FMs), an equipment inspection maintenance worksheet, and a pen.

**Standards:** Replace the brake rotors without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection maintenance work sheet.
2. Inspect the equipment and verify its condition.

**WARNING: AIR BRAKE SYSTEMS ARE UNDER HIGH PRESSURE. RELIEVE THE AIR PRESSURE BY DRAINING ALL OF THE TANKS BEFORE WORKING ON THE SYSTEM. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

**CAUTION: ENSURE THAT THE JACKS AND THE JACK STANDS ARE INSPECTED FOR SERVICEABILITY. ENSURE THAT THE JACKS AND THE JACK STANDS ARE PLACED PROPERLY ON A SOLID AND LEVEL SURFACE.**

3. Remove the unserviceable brake rotors.
  - a. Remove the brake pads.
  - b. Remove two screws and install the installation tools.
  - c. Remove eight screws.
  - d. Remove the installation tools and the disc while supporting the disc.
  - e. Remove and discard the spacer and the seal.
4. Install the serviceable brake rotors.
  - a. Install the new seal and the new spacer together using the installing tool and the mandrel.
  - b. Install the disc and the installation tools.
  - c. Install the hub and eight screws.
  - d. Remove the installation tools and install the remaining two screws. Tighten with 10 screws to 240 foot-pounds.
  - e. Install the brake pads.
5. Perform a system check.
  - a. Reinstall all of the accessories that were removed.
  - b. Check the hub oil level and service, if necessary.
  - c. Return the equipment to service.
  - d. Check the system for proper operation.
6. Annotate the equipment inspection maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
3. Removed the unserviceable brake rotors.	—	—
4. Installed the serviceable brake rotors.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2420-224-20-2

**Related**

AR 750-1  
DA PAM 738-750

## Replace a Moisture Separator on an Item of Construction Equipment

**091-62B-1613**

**Conditions:** Given an item of construction equipment with an unserviceable moisture separator and all of the accessories removed for access, a general mechanic's tool kit, a number 1 common tool kit, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection maintenance work sheet, and a pen.

**Standards:** Replace the moisture separator without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review an equipment inspection maintenance work sheet.

2. Inspect the equipment and verify its condition.

**CAUTION: BE AWARE OF EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS. WATCH FOR POSSIBLE ELECTRICAL SHOCK, INJURY, OR DEATH BY BEING CRUSHED BY EQUIPMENT. PETROLEUM, OILS, AND LUBRICANTS (POL) CAN BE FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY. DIESEL FUEL IS FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA.**

3. Remove the unserviceable moisture separator.

- a. Have the operator put the machine on level ground. Lower all of the equipment to the ground and put blocks in front of and in back of the wheels so the machine cannot move. Shut off the engine.
- b. Remove all of the air pressure from the air reservoirs and air system. Ensure that the lines to and from the air dryer are at atmospheric pressure.
- c. Disconnect the unloader line from the end cover of the air dryer. Disconnect the wire at the air dryer.
- d. Loosen the bolts on the top of the air dryer and turn the clamps 90 degrees.
- e. Push in on the end cover assembly, put a screwdriver in the notch, and remove the snap ring. Remove the end cover assembly.
- f. Using a 3/4-inch socket wrench, remove the oil filter and the desiccant cartridge and desiccant sealing plate as an assembly.
- g. Remove the nut and the desiccant sealing plate. Remove the O-ring seals. Remove the clip and ball check valve located under the clip.

4. Install the serviceable moisture separator.

- a. Clean the desiccant plate in a solvent. Ensure that the purge valve orifice and the check valve seat are open and clean.
- b. Put some of the lubricant from the repair kit on the new O-ring seals and place them in their respective grooves.
- c. Install a new ball check valve. Install the clip.
- d. Remove the seat and spring and then remove the plate and desiccant material from the cartridge shell.
- e. Remove the bolt, washer, and oil filter and then remove the plate from the cartridge shell.
- f. Clean the bolt and washer and the inside and outside of the cartridge shell.
- g. Put a new plate in the bottom of the cartridge shell with the felt side (cloth side) up.
- h. Put the washer and a new oil filter on the bolt. Ensure that the side of the oil filter that has the gasket on it is next to the bottom of the cartridge shell.
- i. Put a whole package of the new desiccant material in the cartridge shell. **DO NOT** let the bolt come out or the desiccant material will come out.

**Performance Steps**

- j. Install a new plate with the cloth side towards the desiccant. Ensure that the shoulder on the bolt is above the plate. Use a soft hammer to hit the side of the cartridge shell to make the desiccant go down (settle).
  - k. Put the spring, the seat, and the rebuilt desiccant sealing plate over the bolt.
  - l. Put the nut on the bolt and tighten it several turns. To make the desiccant go into place (settle into place), hit the side of the cartridge shell several times with a soft hammer.
  - m. Put some of the lubricant from the repair kit on the seals. Tighten the nut until the desiccant sealing plate is in place.
  - n. Inspect the inside of the air dryer body to see that it is clean and put some of the lubricant from the repair kit on the O-ring seal on the purge plate assembly.
  - o. Install the oil filter, the desiccant cartridge, and the purge plate assembly in the air dryer body as an assembly. Tighten the bolt to a torque of 32 foot-pounds.
  - p. Remove the O-ring seal, the screw, the washer, the diaphragm and the cover from the top of the air dryer. Remove the purge valve assembly.
  - q. Put a large screwdriver in the slot to hold the purge valve piston and keep it from turning and loosening the bolt.
  - r. Remove the bolt, the purge valve, the purge valve piston and spring, and the O-ring seals from cap nut.
  - s. Remove the O-ring from the purge valve piston and put some of the lubricant from the repair kit on the new purge valve and the new seal.
  - t. Put the new seals on the cap nut and a new seal on the purge valve piston.
  - u. Assemble the purge valve piston, the new spring, and the new purge valve in the cap nut. Install the lock washer and bolt. Tighten the bolt to a torque of 50 inch-pounds.
  - v. Put some of the lubricant from the repair kit on the threads of the cap nut. Install the purge valve assembly and tighten it to a torque of 180 to 250 inch-pounds.
  - w. Install the cover, a new diaphragm, and the washer and screw.
  - x. Reconnect the unloader line and wire.
5. Perform a system check.
- a. Return the equipment to service.
  - b. Have the operator start the equipment.
  - c. Check the equipment for proper operation.
6. Annotate an equipment inspection maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable moisture separator.	—	—
4. Installed the serviceable moisture separator.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

TM 5-3805-248-14&P-3

**Related**

AR 750-1

DA PAM 738-750

## Replace an Air Pressure Gauge on an Item of Construction Equipment.

### 091-62B-1614

**Conditions:** Given an item of construction equipment with an unserviceable air pressure gauge and all of the accessories removed for access, a serviceable air pressure gauge, a general mechanic's tool kit, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection maintenance work sheet, and a pen.

**Standards:** Replace the air pressure gauge without causing injury to any personnel and damage to the equipment.

#### Performance Steps

1. Receive and review an equipment inspection maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable air pressure gauge.

**WARNING:** REMOVE OR DISCONNECT THE BATTERIES AND TURN THE VEHICLE MASTER DISCONNECT SWITCH OFF BEFORE PERFORMING MAINTENANCE IN THE IMMEDIATE BATTERY AREA OR BEFORE WORKING ON AN ELECTRICAL SYSTEM. DISCONNECTIONS WILL PREVENT ELECTRICAL SHOCK TO PERSONNEL OR EQUIPMENT. DO NOT DISCONNECT ANY AIR SYSTEM LINES OR FITTINGS UNLESS THE VEHICLE ENGINE IS SHUT OFF AND THE AIR SYSTEM PRESSURE IS RELIEVED. THIS COULD RESULT IN INJURY TO PERSONNEL.

**NOTE:** Tag the lines and the connectors before disconnecting. This will assist you when connecting.

- a. Disconnect two air hoses from the indicator assembly.
  - b. Remove two nuts, two brackets, and the indicator from the dashboard.
  - c. Disconnect two connectors from the rear of the indicator assembly.
  - d. Remove seven lamp holders, five nuts, five washers, two screws, two lock washers, two nuts, and the housing. Discard the lock washers.
  - e. Remove the lamp and the filter from each of the seven lamp holders.
  - f. Remove the air pressure gauge from the indicator assembly.
4. Install the serviceable air pressure gauge.
    - a. Install the air pressure gauge in the indicator assembly.
    - b. Install a lamp and a filter in each of the seven lamp holders.
    - c. Install the housing, the two nuts, the two new lock washers, the two screws, the five washers, the five nuts, and the seven lamp holders.
    - d. Connect the two connectors and install the indicator in the dashboard.
    - e. Install the two brackets and the two nuts and connect the two air hoses.
  5. Perform a system check.
    - a. Reinstall all of the accessories that were removed.
    - b. Return the equipment to service.
    - c. Check the system for proper operation.
  6. Annotate an equipment inspection maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.



**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable air pressure gauge.	—	—
4. Installed the serviceable air pressure gage.	—	—
5. Performed a system check.	—	—
6. Annotated an equipment inspection maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 TM 5-2420-224-20-2

**Related**

AR 750-1  
 DA PAM 738-750

**Repair a Brake Air Compressor on an Item of Construction Equipment**  
**091-62B-1615**

**Conditions:** Given an item of construction equipment with a faulty brake air compressor and all of the accessories removed for access, a general mechanic's tool kit, a number 1 common tool kit, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance worksheet, and a pen.

**Standards:** Repair the brake air compressor without causing injury to any personnel or damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Repair a faulty brake air compressor.

**WARNING: RELIEVE ALL AIR PRESSURE BEFORE PERFORMING MAINTENANCE ON AN AIR SYSTEM. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY. IF YOU ARE INJURED, OBTAIN MEDICAL AID IMMEDIATELY.**

- a. Open the drain valve in the bottom of an air reservoir to relieve the air pressure.
  - b. At the top of the air reservoir, remove the safety valve from the T fitting and install a 1/4-inch national pipe thread (NPT) straight T fitting with fine threads. Install the safety valve in the straight T fitting.
  - c. Install 0 to 150 pounds per square inch (psi) air pressure gauge in the straight T fitting and close the drain valve in the bottom of the air reservoir.
  - d. Start the engine and operate at idle speed.
  - e. Watch the pressure gauge. The pressure indication will increase until the air compression stops. When the pressure indication stops increasing, record the pressure indication. The pressure indication should be 105 to 115 psi.
  - f. Continue to operate the engine at idle speed. Apply the brakes several times while observing the pressure gauge indication. The pressure indication will decrease until the compression starts. When the pressure indication just starts to increase, record it. The pressure must be 90 to 95 psi.
  - g. At the governor assembly, loosen the lock nut. Turn the adjusting screw clockwise to decrease the pressure setting or counterclockwise to increase the pressure setting.
  - h. Tighten the lock nut while holding the adjusting screw using a screwdriver to prevent the adjusting screw from moving and changing the adjustment.
  - i. Turn off the engine and open the drain valve at the bottom of the air reservoir to relieve the air pressure then close the drain valve and repeat steps d through h above until the pressure settings are correct.
  - j. Turn off the engine and open the drain valve to relieve the air pressure. Disconnect the 0 to 150-psi pressure gauge from the straight T fitting. Remove the safety valve from the straight T fitting and then remove the straight T fitting.
  - k. Reinstall the safety valve in the T fitting at the bottom of the air reservoir and close the drain valve.
4. Perform a system test.
    - a. Have the operator start and operate the engine at idle speed until the air pressure gauge, located on the left instrument cluster, shows in the green area of the gauge then turn off the engine.
    - b. Check the system for leaks and proper operation.
    - c. Have the operator place the key switch in the ON position, but do not start the engine. Apply the brakes several times to decrease the air pressure and until the low air pressure warning buzzer sounds. Place the key switch in the OFF position.

**Performance Steps**

- d. Check the system for leaks and proper operation.
- 5. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Repaired a faulty brake air compressor.	—	—
4. Performed a system test.	—	—
5. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-3805-262-20

**Related**

AR 750-1  
DA PAM 738-750

## Repair a Brake Caliper on an Item of Construction Equipment

091-62B-1616

**Conditions:** Given an item of construction equipment with a faulty brake caliper removed from the equipment, all of the accessories needed to repair the brake caliper, shop equipment (general-purpose repair), a general mechanic's tool kit, special tools, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Repair the brake caliper without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review an equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Disassemble the faulty brake caliper.

**WARNING: ADHESIVE CAUSES IMMEDIATE BONDING ON CONTACT WITH EYES, SKIN, OR CLOTHING. IT ALSO GIVES OFF HARMFUL VAPORS. WEAR PROTECTIVE GOGGLES AND USE IN WELL-VENTILATED AREAS. IF ADHESIVE GETS IN YOUR EYES, TRY TO KEEP THEM OPEN. FLUSH THEM WITH WATER FOR 15 MINUTES AND GET IMMEDIATE MEDICAL ATTENTION.**

- a. Remove and discard two caps on the brake caliper.
- b. Install the brake caliper on the holder.

**WARNING: PLACE A SMALL BLOCK OF WOOD BETWEEN THE PISTONS DURING REMOVAL TO PREVENT INJURY TO PERSONNEL.**

- c. Using a regulated air supply of 5 pounds per square inch (psi) applied into the brake line connecting point, remove the piston.
- d. Install the installation tools over the open side of the brake caliper.
- e. Remove the piston using a regulated air supply of 5 psi applied into the brake line connecting point.
- f. Remove the bleeder valve if it is damaged.
- g. Remove four screws, then remove and discard four packings.

4. Assemble the brake caliper.
  - a. Apply a coat of silicone from the kit to two new packings and bores and then install the two packings. Install the new packings in the ends of the caliper.
  - b. Install four screws and tighten 55 to 61 foot-pounds.
  - c. Install a new bleeder valve if it was removed.
  - d. Install a brake caliper on the holder using the installation tools. Install the piston in the brake caliper up to the groove on the piston. Repeat these instructions for the other piston.
  - e. Apply a coat of silicone from the kit to the two new caps and in the groove on the pistons and then install the caps in the brake caliper.

5. Perform a system check.
  - a. Return the equipment to service.
  - b. Check the system for leaks and proper operation.

6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Disassembled the faulty brake caliper.	—	—
4. Assembled the brake caliper.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5988-E
- TM 5-2420-224-20-1
- TM 5-2420-224-20-2
- TM 5-2420-224-34

**Related**

- AR 750-1
- DA PAM 738-750

**Replace an Air Brake Safety Valve on an Item of Construction Equipment.**

**091-62B-1617**

**Conditions:** Given an item of construction equipment with an unserviceable air brake safety valve, a serviceable air brake safety valve, a general mechanic's tool kit, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the air brake safety valve without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable air brake safety valve.

**WARNING: RELIEVE ALL OF THE AIR PRESSURE BEFORE PERFORMING MAINTENANCE ON AN AIR SYSTEM. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY. IF YOU ARE INJURED, OBTAIN MEDICAL AID IMMEDIATELY.**

- a. Open the drain valve located at the bottom of the air reservoir to relieve the air system pressure.
- b. Remove the safety valve from the top of the air reservoir using two wrenches.
4. Install the serviceable air brake safety valve.
  - a. Install the safety valve on the top of the air reservoir using two wrenches.
  - b. Close the drain valve on the bottom of the air reservoir.
5. Perform a system check.
  - a. Have the operator start and operate the engine at idle speed until the air pressure gauge, located on the left instrument cluster, shows in the green area of the gauge. Turn off the engine.
  - b. Check the system for leaks and for proper operation.
6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in the task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable air brake safety valve.	—	—
4. Installed the serviceable air brake safety valve.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

TM 5-3805-262-20

**Related**

AR 750-1

DA PAM 738-750

## Repair an Air Brake Safety Valve on an Item of Construction Equipment.

091-62B-1618

**Conditions:** Given an item of construction equipment with a faulty air brake safety valve and with the safety valve removed, a general mechanic's tool kit, a number 1 common tool kit, the accessories needed to repair the safety valve, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Repair the air brake safety valve without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review the equipment maintenance request.
2. Inspect the equipment and verify its condition.
3. Repair the faulty air brake safety valve.

**WARNING:** RELIEVE ALL OF THE AIR PRESSURE BEFORE PERFORMING MAINTENANCE ON AN AIR SYSTEM. FAILURE TO DO THIS COULD RESULT IN SERIOUS INJURY. IF YOU ARE INJURED, OBTAIN MEDICAL AID IMMEDIATELY.

- a. Put the pressure protection valve body in a vise and use paint or other suitable marker to make match marks on the cap and body to aid reassembly.
- b. Hold the cap to prevent it from turning and loosening a nut.

**NOTE:** To aid reassembly, note and record the number of turns required to remove the cap when performing the following step.

- c. Remove the cap and record the number of turns, and then remove the nut.
- d. Remove the spring from the piston. Remove the piston assembly from the body and remove and discard the O-ring from the piston. Remove the valve body from the vise.
- e. Place the drive pin punch with the flat point in the vise. The end of the punch must be small enough to fit inside the small end of the piston.
- f. Position the piston over the drive pin punch with the wide end down. Push down on the guide to compress the spring.
- g. Pull the valve from the valve stem. Remove the guide from the spring. Remove the spring from the piston.
- h. Push the valve stem against the plug to remove the plug from the piston.
- i. Remove the valve stem from the piston and remove and discard the O-ring from the plug.
- j. Clean all metal parts using a cleaning solvent (P-D-680). Dry them using clean cloths.

**WARNING:** DRY CLEANING SOLVENT (P-D-680) IS TOXIC AND FLAMMABLE. WHEN USING IT TO CLEAN PARTS, WEAR PROTECTIVE GOGGLES AND GLOVES AND ONLY USE IT IN A WELL-VENTILATED AREA. AVOID CONTACT WITH SKIN, EYES, AND CLOTHING AND DO NOT BREATHE THE VAPORS. DO NOT USE NEAR OPEN FLAMES OR EXCESSIVE HEAT AND DO NOT SMOKE WHEN USING IT. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY. IF YOU BECOME DIZZY WHILE USING CLEANING SOLVENT, GET FRESH AIR AND MEDICAL ATTENTION IMMEDIATELY. IF CONTACT WITH YOUR SKIN OR CLOTHES IS MADE, FLUSH WITH LARGE AMOUNTS OF WATER. IF CONTACT WITH YOUR EYES IS MADE, WASH THEM WITH WATER AND GET MEDICAL AID IMMEDIATELY.

- k. Clean all nonmetallic parts by wiping them with a clean, dry cloth.

**NOTE:** Replace an item if an inspection indicates a need for replacement.

- l. Inspect the valve body and piston for cracks, breaks, chipping, and other damage. Replace the pressure protection valve if the valve body or piston requires replacement.
- m. Inspect the springs for cracks, rust, or corrosion. Inspect the valve, the guide, the plug, and the valve stem for deformation, cracks, breaks, chipping, or other damage.
- n. Lubricate the piston, the body bore, the new O-rings, and the valve using a silicone lubricant.
- o. Install the valve stem in the piston and install the new O-ring on the plug.



**Performance Steps**

- p. Install the plug in the piston. Push the plug into the piston until the plug is fully seated in the piston.
  - q. Place the drive pin punch with the flat point in the vise. The end of the punch must be small enough to fit inside the small end of the piston.
  - r. Put the piston over the drive pin punch that is mounted in the vise. Install the spring on the piston. Install the guide on the spring.
  - s. Push down on the guide to compress the spring until the valve stem tip protrudes beyond the spring. Install the valve on the valve stem. Ensure that the valve is fully seated on the valve stem.
  - t. Release the guide and remove the assembled piston from the drive pin punch. Install the new O-ring on the piston.
  - u. Remove the drive pin punch from the vise and install the body in the vise.
  - v. Install the piston assembly in body. Install the spring in piston. Install the nut on the body and turn the nut clockwise until it is positioned at the bottom of the body threads.
  - w. Install the cap on the body and turn it the same number of turns as recorded during disassembly. Ensure that the match marks are aligned and then adjust the pressure protection valve.
4. Perform a system test.
    - a. Return the equipment to service.
    - b. Test the system for leaks and proper operation.
  5. Annotate the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Repaired the faulty air brake safety valve.	—	—
4. Performed a system test.	—	—
5. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5990-E
- TM 5-3805-262-20
- TM 5-3805-262-34

**Related**

- AR 750-1
- DA PAM 738-750

## Replace a Brake Chamber on an Item of Construction Equipment.

091-62B-1619

**Conditions:** Given an item of construction equipment with an unserviceable brake chamber, a serviceable brake chamber, a general mechanic's tool kit, a number 1 common tool kit, system caps and plugs, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the brake chamber without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review an equipment Inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition. When performing an inspection, plug and cap the hoses and fittings if they have been disconnected or removed to prevent dirt or other contaminants from entering the air system.

**NOTE:** The preliminary procedure is for the loader to be turned completely right with the wheels blocked and the parking brake released.

- a. Remove and discard the cotter pin from the parking brake control lever at the parking brake chamber.
- b. Remove the clevis pin and two washers. Remove and discard the cotter pin. Remove the clevis pin and two links.
- c. Apply the parking brake to release the air pressure from the parking brake chamber.

**WARNING:** OPEN THE AIR RESERVOIR DRAIN VALVE TO RELIEVE THE AIR SYSTEM PRESSURE BEFORE DISCONNECTING THE AIR SYSTEM COMPONENTS OR LINES. FAILURE TO DO THIS COULD RESULT IN SERIOUS INJURY. IF YOU ARE INJURED, OBTAIN MEDICAL AID IMMEDIATELY.

- d. Loosen and disconnect the hose fitting from the elbow on the brake chamber.
- e. Remove the elbow from the brake chamber.
- f. Remove two locknuts and washers.
- g. Remove the brake chamber from the loader.

3. Remove the unserviceable brake chamber.

- a. Clean all of the metal parts using a cleaning solvent (P-D-680). Dry them using clean cloths.

**WARNING:** DRY CLEANING SOLVENT (P-D-680) IS TOXIC AND FLAMMABLE. WHEN USING IT TO CLEAN PARTS, WEAR PROTECTIVE GOGGLES AND GLOVES AND ONLY USE IT IN A WELL-VENTILATED AREA. AVOID CONTACT WITH SKIN, EYES, AND CLOTHING AND DO NOT BREATHE THE VAPORS. DO NOT USE NEAR OPEN FLAMES OR EXCESSIVE HEAT AND DO NOT SMOKE WHEN USING IT. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY. IF YOU BECOME DIZZY WHILE USING CLEANING SOLVENT, GET FRESH AIR AND MEDICAL ATTENTION IMMEDIATELY. IF CONTACT WITH YOUR SKIN OR CLOTHES IS MADE, FLUSH WITH LARGE AMOUNTS OF WATER. IF CONTACT WITH YOUR EYES IS MADE, WASH THEM WITH WATER AND GET MEDICAL AID IMMEDIATELY.

- b. Clean all nonmetallic parts by wiping them with a clean, dry cloth.

**NOT:** Replace an item if an inspection indicates a need for replacement.

- c. Inspect the hose for deterioration, cracks, chafing, or other damage. Check the hose fittings for stripped or crossed threads and deformation.
- d. Inspect the links for cracks, breaks, and deformed holes and slots.
- e. Inspect the clevis pins for cracks, breaks, and bent condition.
- f. Inspect all other parts for cracks, distortion, or crossed or stripped threads.
- g. Position the brake chamber in the loader and install two washers and lock nuts. Tighten the lock nuts securely.
- h. Install the elbow in the brake chamber, remove the cap or plug, and connect and tighten the hose fitting to the elbow.

**Performance Steps**

- i. Install two links on the yoke using a clevis pin and a new cotter pin.
- j. Close the air reservoir drain valve.

4. Install the serviceable brake chamber.

5. Perform a system check.

- a. Have the operator start and operate the engine at idle speed until the air pressure gauge, located on the left instrument cluster, shows in the green area of the gauge. Turn the engine off.
- b. Have the operator push in the knob of the parking brake valve to release the parking brake.
- c. Lift the brake lever until the lever stops moving if the parking brake is mounted on the transmission.

NOTE: In the following step, the clevis pin must be at the bottom of the slots in the links when it is attached.

- d. Position the links and attach to the brake lever using the clevis pin and a new cotter pin.
- e. Adjust the parking brake linkage, if necessary.
- f. Check the system for leaks and proper operation.

6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment Inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable brake chamber.	—	—
4. Installed the serviceable brake chamber.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-3805-262-20

**Related**

AR 750-1  
DA PAM 738-750

Subject Area 7: Suspension Systems

**Replace a Track on an Item of Construction Equipment**

**091-62B-1701**

**Conditions:** Given an item of construction equipment with an unserviceable track, a serviceable track, a general mechanic's tool kit, a number 1 common tool kit, lifting equipment, special tools, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the track without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable track.

**WARNING: UNLESS OTHERWISE SPECIFIED, PERFORM MAINTENANCE WITH THE MACHINE PARKED ON LEVEL GROUND, THE BLADE RESTING ON THE GROUND, THE TRANSMISSION CONTROL LEVER IN NEUTRAL, THE PARKING BRAKE ENGAGED, THE ENGINE STOPPED, AND THE ELECTRICAL-DISCONNECT SWITCH IN THE OFF POSITION. CHIPS OR OTHER DEBRIS CAN FLY OFF OBJECTS WHEN STRUCK. BEFORE STRIKING AN OBJECT, ENSURE THAT NO ONE CAN BE INJURED BY FLYING DEBRIS.**

- a. Raise the machine so the midrollers are off the ground at a height of approximately 8 inches. The midrollers should be clear of the belt guide blocks. Support the machine on suitable stands.
  - b. Release the drive belt tension. Leave the undercarriage charging hose connected between the recoil cylinder port and the tank port on the remote tool manifold.
  - c. Use a floor jack to raise the rear swing arm and the idler.
  - d. Rretract the recoil cylinder fully. Use a lifting sling around the tension assembly, and fasten a ratchet puller to the drive wheel. Use the ratchet puller to retract the recoil cylinder. When the recoil cylinder is fully retracted, remove the lifting sling and the ratchet puller.
  - e. Remove 11 of the 12 bolts with washers from the drive wheel. Leave one of the bolts near the top of the drive wheel to keep the wheel in place.
  - f. Use a forklift or other suitable lifting device to support the outer drive wheel. Remove the remaining bolt with washer and the outer drive wheel. The weight of the outer drive wheel is approximately 166 pounds.
  - g. Remove 11 of the 12 bolts with washers from the front idler. Leave one of the bolts near the top of the idler to keep the idler in place.
  - h. Use a forklift or other suitable lifting device to remove the drive belt (track). The weight of the drive belt is approximately 1036 pounds.
  - i. Use a forklift or other suitable lifting device to support the front idler. Remove the remaining bolt with washer, and remove the front idler. The front idler weighs approximately 161 pounds. Upon installation, apply thread compound to the threads of 12 bolts, and tighten the bolts to a torque of  $391 \pm 52$  foot-pounds.
4. Install the serviceable track.
    - a. Reverse the removal steps to install the belt. Upon installation, apply thread compound to the threads of 12 new bolts, and tighten the bolts to a torque of  $391 \pm 52$  foot-pounds. Do not reuse the old bolts.
    - b. When installing the belt, be sure to point the V of the grousers, on the topside of the belt, towards the front of the machine. Ensure that the pivot arm does not pivot over the center during this procedure. Reset the belt tension after the belt has been installed.

**Performance Steps**

5. Perform a system check.
  - a. Have the operator start and operate the equipment.
  - b. Check the system for proper operation.
6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed equipment Inspection and maintenance worksheet.	—	—
2. Inspected equipment and verified condition.	—	—
3. Removed unserviceable track.	—	—
4. Installed serviceable track.	—	—
5. Performed system check.	—	—
6. Annotated equipment inspection and maintenance worksheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
 DA FORM 5988-E  
 TM 5-2430-200-24

**Related**  
 AR 750-1  
 DA PAM 738-750

## Repair a Track Assembly on an Item of Construction Equipment.

### 091-62B-1702

**Conditions:** Given an item of construction equipment with a faulty track assembly, all accessories needed to repair the track, a general mechanic's tool kit, a number 1 common tool kit, special tools, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance worksheet, and a pen.

**Standards:** Repair the track assembly without causing injury to any personnel and damage to the equipment.

#### Performance Steps

1. Receive and review an equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.

**WARNING: DO NOT WORK UNDER THE VEHICLE UNLESS THE HULL IS BLOCKED AND THE APRON LOCK PINS ARE INSTALLED. FAILURE TO COMPLY MAY RESULT IN SERIOUS INJURY TO PERSONNEL.**

3. Repair the track assembly.

- a. Have the operator drive the vehicle onto level ground and position the damaged track shoe, to be replaced, midway between the drive sprocket and the ground. Place the transmission in neutral.
- b. Have the operator place the vehicle in the UNSPRUNG mode and lower the front of the vehicle until the dozer blade is no longer touching the ground. Raise the front road wheel as high as possible. If the dozer blade is no longer touching the ground, adjust the track tension.
- c. Have the operator stop the vehicle engine. Do not set the parking brake. Relieve the hydraulic pressure. Allow the vehicle to settle for five minutes, and then relieve the hydraulic pressure again to release any residual pressure.

**NOTE:** Disconnect the track at the rear of the vehicle about midway between the number 4 road wheel and the sprocket.

- d. Block the track or the road wheels on the side of the damaged track shoe.
- e. Remove the locknut and washer from the outer end of the track pin of the damaged shoe.

**WARNING: WEAR GOGGLES WHEN USING A HAMMER WITH A DRIFT PIN OR A TRACK PIN. FAILURE TO COMPLY MAY RESULT IN SERIOUS INJURY TO PERSONNEL.**

- f. Drive the track pin out of the ends of the track using a drift pin and a hammer. Remove the drift pin from the ends of the track. Separate the ends of the track using a hammer and a crowbar.
- g. Remove the locknut and washer from the outer end of the track pin on the track shoe to be removed.
- h. Drive the track pin out of the track and the track shoe using a drift pin and a hammer. Remove the drift pin and the damaged track shoe from the track. Remove the locknut and washer from the ends of two track pins. Remove the locknut, the washer, and the track pad from the track shoe.
- i. Install the replacement track pad and track shoe with a washer and locknut. Tighten the locknut to 240 to 270 foot-pounds.
- j. Coat the threads of two track pins and the face of four locknuts with grease.
- k. Install the washer and locknut on two track pins and tighten the locknuts to the end of the threads. Install the locknut on the track pin.
- l. Position the replacement track shoe on the end of the track and align it with the drift pin.
- m. Install the track and the track shoe by driving out the drift pin with a track pin and by using a hammer and a 15-inch adjustable wrench. Remove the locknut from the track pin.
- n. Loosen the locknut with three turns. Drive the track pin into the track shoe using the drift pin and the hammer until the washer is flush against the track shoe. Install the washer and locknut on the hull side of the track pin.

**Performance Steps**

- o. Have the operator start the vehicle engine and tie the ends of the track together with a rope. Pull the ends of the track together as close as possible.
- p. Position the two rack connecting fixtures on the ends of the track. Ensure that the fixtures do not bind the rope holding the ends of the track.
- q. Tighten the track connecting fixtures until the ends of the track mesh. Drive the drift pin through the holes in the ends of the track. Install the lock nut on the track pin.

**CAUTION: THE BUSHINGS ARE NOT PROPERLY ALIGNED IF THE PIN BINDS. REMOVE THE PIN AND TIGHTEN OR LOOSEN THE TRACK CONNECTING FIXTURES, AS NECESSARY, UNTIL THE BUSHINGS ARE ALIGNED. FAILURE TO COMPLY MAY RESULT IN DAMAGE TO THE EQUIPMENT.**

- r. Install the track pin on the tracks by driving out the drift pin with a track pin and by using the hammer and the 15-inch adjustable wrench. Remove the locknut from the track pin.
- s. Loosen the locknut with three turns. Drive the track pin into the track shoe until the washer is flush against the track shoe.
- t. Remove the two track connecting fixtures and the rope from the tracks.
- u. Install the washer and locknut on the hull side of the track pin. Have the operator stop the vehicle engine. Tighten four locknuts (120 to 160 foot-pounds).

- 4. Perform a system check.
  - a. Return the equipment to an operational condition.
  - b. Check the system for proper operation.
- 5. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Repaired the track assembly.	—	—
4. Performed a system check.	—	—
5. Annotated an equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 TM 5-2350-262-20-2

**Related**

AR 750-1  
 DA PAM 738-750

## Replace a Wheel and Tire on an Item of Construction Equipment.

091-62B-1703

**Conditions:** Assigned as a construction equipment repairer given an item of construction equipment with an unserviceable wheel and tire, a serviceable wheel and tire, a Number 1 common tool kit, a general mechanic's tool kit, lifting and jack equipment, special tools, personal protective equipment (PPE), the applicable technical manuals (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the wheel and tire without causing injury to any personnel or damage to the equipment.

### Performance Steps

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.

**WARNING:** DISCONNECT THE BATTERY AND DISCHARGE ANY CAPACITORS BEFORE STARTING WORK ON THE MACHINE. HANG A "DO NOT OPERATE" TAG IN THE OPERATOR'S COMPARTMENT. ALWAYS ENSURE THAT ALL RAISED COMPONENTS ARE BLOCKED CORRECTLY.

3. Remove the unserviceable wheel and tire.
  - a. Remove the final drive.
  - b. Release the brake as follows:
    - (1) Disconnect the air lines to the rotochamber.
    - (2) Connect shop air to the air inlet at the top of the rotochamber.
    - (3) Keep the air supply constant.
    - (4) Connect shop air to the inlet for the parking brake at the lower side of the rotochamber.
    - (5) Keep the air supply constant.
    - (6) Turn the air supply to the top of the rotochamber off and the brake will release.
    - (7) Disconnect the air supply and connect air lines to rotochamber after installation.
  - c. Use special tools and a hydraulic pump to lift the side of the tractor at the edge of the differential case until the tire is clear of the floor.
  - d. Put stands under the edge of the differential case and the frame at the front of the tractor and lower the tractor onto the stands.
  - e. Put a block under the outer edge of the wheel being removed and then remove lockwire, bolts, retainer, and shims that hold the hub.
  - f. Remove the ring gear and hub using a lifting bracket (weight is 200 pounds) and then remove the bearing cone.
  - g. Fasten the wheel to a suitable lifting and moving device with a bracket and chain and remove the wheel (weight is 2200 pounds).
4. Install the serviceable wheel and tire.
  - a. Fasten the wheel to a suitable lifting and moving device with a bracket and chain and put the wheel in position using this device.
  - b. Install the bearing cone.
    - (1) Install the ring gear and hub with a lifting bracket tool.
    - (2) Install the retainer without shims.
    - (3) Use three bolts installed equal distance apart.
  - c. While the wheel is turned, tighten each bolt to a torque of 25 pounds per foot one time only.
  - d. While the wheel is turned, tighten each bolt to a torque of 50 pounds per foot one time only.
  - e. Use a depth micrometer to measure through the holes with threads in the retainer and find the average depth to the end of the axle housing.
  - f. Use an outside micrometer to measure the thickness of the retainer at the holes with threads and find the average thickness.
  - g. Find the difference between the two average measurements.



**Performance Steps**

NOTE: This difference is the measured gap.

- h. Remove the retainer and install enough shims so that their thickness is .012 inches more than the measured gap.
  - i. Reinstall the retainer. While the wheel is turned, tighten the bolts to a torque of 100 ± 10 pounds per foot.
  - j. Install lockwire, remove the stands, and make brake adjustments.
5. Perform a system check.
    - a. Return the equipment to service.
    - b. Check the equipment for proper operation.
  6. Annotate completed work on the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable wheel and tire.	—	—
4. Installed the serviceable wheel and tire.	—	—
5. Performed a system check.	—	—
6. Annotated completed work on the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 TM 5-3805-248-14&P-2

**Related**

AR 750-1  
 DA PAM 738-750

## Replace a Drive Sprocket on an Item of Construction Equipment.

091-62B-1704

**Conditions:** Assigned as a construction equipment repairer given an item of construction equipment with an unserviceable drive sprocket, all accessories removed for access to the drive sprocket, a general mechanic's tool kit, a number 1 common tool kit, personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the drive sprocket without causing injury to any personnel or damage to the equipment.

### Performance Steps

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.

**WARNING: BLOCK THE ROAD WHEELS BEFORE WORKING IN OR ON THE VEHICLE WHEN THE TRACK IS DISCONNECTED. FAILURE TO COMPLY MAY RESULT IN DAMAGE TO THE EQUIPMENT OR INJURY TO PERSONNEL.**

3. Remove the unserviceable drive sprocket.
  - a. Remove the thirteen self-locking screws from the outer sprocket and remove the outer sprocket from the hub by tapping it with a hammer and wood block on the back side until loose. Retain five cap screws to use as jacking screws and discard the rest.
  - b. Remove the twenty locknuts from the studs and discard them and then install the five jacking screws on hub.
  - c. Tighten the five jacking screws alternately until the hub loosens from the final drive, and then remove the jacking screws from hub and discard them.
  - d. Place the hub and inner sprocket on a solid surface with the inner sprocket facing up, remove the thirteen self-locking screws from the inner sprocket and remove the sprocket from the hub by tapping it with a hammer and wood block on the under side until loose. Discard the self-locking screws.

4. Install a serviceable drive sprocket.

**CAUTION: ENSURE THAT THE MATING SURFACES OF THE HUB, SPROCKET, AND FINAL DRIVE ARE FREE OF PAINT, DIRT, AND FOREIGN MATTER BEFORE ASSEMBLY. FAILURE TO COMPLY MAY RESULT IN DAMAGE TO THE EQUIPMENT.**

- a. Place the hub on a solid surface with the inner side facing up.
  - b. Coat the threads of thirteen self-locking screws with lubricating oil, and use them to install the inner sprocket. Tighten to 240-270 pounds per foot.
  - c. Coat the outer edge of the final drive with an antiseize compound, and install the hub and the inner sprocket on the final drive.
  - d. Coat the final drive studs with lubricating oil, and install ten locknuts on final drive studs. Tighten to 240-270 pounds per foot.
  - e. Install an additional ten locknuts on the final drive studs and tighten to 50-70 pounds per foot.
  - f. Coat the threads of thirteen self-locking screws with lubricating oil, and use them to install the outer sprocket on the hub. Tighten to 240-270 pounds per foot.
5. Perform a system check.
    - a. Return the equipment to operational condition.
    - b. Check the system for proper operation.
  6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure

that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable drive sprocket.	—	—
4. Installed a serviceable drive sprocket.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2350-262-20-2

**Related**

AR 750-1  
DA PAM 738-750

**Replace an Idler Wheel on an Item of Construction Equipment.**

**091-62B-1705**

**Conditions:** Assigned as a construction equipment repairer given an item of construction equipment with an unserviceable idler wheel, a serviceable idler wheel, a general mechanic's tool kit, a Number 1 common tool kit, lifting equipment, personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the idler wheel without causing injury to any personnel or damage to the equipment.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable idler wheel.

**WARNING:** UNLESS OTHERWISE SPECIFIED, MAINTENANCE SHOULD BE PERFORMED WITH THE MACHINE PARKED ON LEVEL GROUND, THE BLADE RESTING ON THE GROUND, THE TRANSMISSION CONTROL LEVER IN "NEUTRAL," THE PARKING BRAKE ENGAGED, THE ENGINE STOPPED, AND THE ELECTRICAL DISCONNECT SWITCH IN THE "OFF" POSITION. CHIPS OR OTHER DEBRIS CAN FLY OFF OBJECTS WHEN STRUCK. BEFORE STRIKING ANY OBJECT, ENSURE THAT NO ONE CAN BE INJURED BY FLYING DEBRIS.

- a. Release the belt tension.
- b. Remove eleven of the twelve bolts with washers from the outer front idler. Leave one of the bolts near the top of the idler to keep the idler in place. Support the swing arm with a jack or other suitable device.
- c. Use a forklift or other suitable lifting device to support the outer front idler. Remove the remaining bolt and washer, and remove the outer front idler. The weight of the front idler is approximately 161 pounds.
4. Install the serviceable idler wheel.
  - a. Reverse installation steps to install the outer front idler.
  - b. Apply thread compound to the threads of twelve bolts upon installation, and tighten the bolts to a torque of 391 ± 52 pounds per foot.
  - c. Reset the belt tension.
5. Perform a system check.
  - a. Have the operator start and operate the equipment.
  - b. Check the system for proper operation.
6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable idler wheel.	—	—
4. Installed the serviceable idler wheel.	—	—

**Performance Measures**

5. Performed a system check.

GO      NO GO

\_\_\_\_\_      \_\_\_\_\_

6. Annotated the equipment inspection and maintenance work sheet.

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**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2430-200-24

**Related**

AR 750-1  
DA PAM 738-750

**Replace Shock Absorbers on an Item of Construction Equipment  
091-62B-1706**

**Conditions:** Assigned as a construction equipment repairer given an item of construction equipment with unserviceable shock absorbers, serviceable shock absorbers, a general mechanic's tool kit, a Number 1 common tool kit, personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the shock absorbers without causing injury to any personnel or damage to the equipment.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.

**CAUTION: PARTS MAY BE HEAVY, OBTAIN ASSISTANCE IF NECESSARY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH TO PERSONNEL OR DAMAGE TO THE PARTS.**

3. Remove the unserviceable shock absorbers.
  - a. Remove the nut, lock washer, screw, and two spacers, discarding the lock washer.
  - b. Remove the lock nut, washer, screw, and rear shock absorber, discarding the lock nut.
  - c. Remove the two spacer sleeves and the two bumpers.
  - d. Repeat the procedure for the other shock absorber.
4. Install the serviceable shock absorbers.
  - a. Install the two bumpers and the two spacer sleeves.
  - b. Install the rear shock absorber, screw, washer, and new lock nut, tightening the screw to 177 foot-pounds.
  - c. Install the two spacers, screw, new lock washer, and nut.
  - d. Repeat the procedure for the other shock absorber.
5. Perform a system check.
  - a. Return the equipment to service.
  - b. Check the system for proper operation.
6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable shock absorbers.	—	—
4. Installed the serviceable shock absorbers.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2420-224-20-2

**Related**

AR 750-1  
DA PAM 738-750

Subject Area 8: Body, Cab, Hull and Accessories

**Replace a Cutting Edge on an Item of Construction Equipment  
091-62B-1801**

**Conditions:** Assigned as a construction equipment repairer given an item of construction equipment with an unserviceable cutting edge, a serviceable cutting edge, a general mechanic's tool kit, a number 2 common tool kit, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the cutting edge without causing injury to personnel or damage to the equipment.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable cutting edge.
  - a. Have the operator raise the blade approximately 12 inches, block it securely, and shut off the engine.
  - b. Remove nuts, cap screws, and end bits as needed.
  - c. Remove nuts, cap screws, and cutting edges as needed.

4. Install the serviceable cutting edge.

**CAUTION:** IF THE OPPOSITE EDGE OF THE CUTTING EDGE SECTION IS NOT WORN, ROTATE THIS SECTION. IF BOTH EDGES OF THE CUTTING EDGE SECTIONS ARE WORN, REPLACE WORN SECTION(S) TO PREVENT WEAR ON THE BLADE SUPPORT.

- a. Clean the mounting surface of blade, cutting edges, and end bits thoroughly.
- b. Install cutting edges with cap screws and nuts.
- c. Torque nuts to 350+50 foot-pounds.
- d. Install the two end bits with cap screws and nuts.
- e. Torque nuts to 350+50 foot-pounds.

**WARNING:** WEAR SAFETY GLASSES WHENEVER STRIKING METAL OBJECTS WITH A HAMMER.

- f. Seat all cap screw heads firmly in countersink with a heavy hammer.
- g. Tighten cap screws again to the proper torque requirements.

5. Perform a system check.
  - a. Have the operator raise the blade and remove the blocking.
  - b. Place the equipment in service.
  - c. Check the equipment for proper operation.
6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable cutting edge.	—	—



**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
4. Installed the serviceable cutting edge.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2410-237-20

**Related**

AR 750-1  
DA PAM 738-750

**Replace a Ripper Tooth on an Item of Construction Equipment.**

**091-62B-1802**

**Conditions:** Assigned as a construction equipment repairer given an item of construction equipment with an unserviceable ripper tooth, a serviceable ripper tooth, a general mechanic's tool kit, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the ripper tooth without causing injury to any personnel or damage to the equipment.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.

**CAUTION: PARTS MAY BE HEAVY, OBTAIN ASSISTANCE IF NECESSARY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH TO PERSONNEL OR DAMAGE TO PARTS.**

3. Remove the unserviceable ripper tooth.
  - a. Have the operator raise the ripper until its teeth tips are approximately 6 inches off the ground.
  - b. Place blocks under the ripper beam.
  - c. Face the rear of tractor and using a drift pin and hammer, drive the pin from the right side of tooth.
  - d. Remove the tooth and retainer from the shank.
4. Install the serviceable ripper tooth.
  - a. Install the retainer in recess on the right hand side of the ripper shank.
  - b. Slide the tooth over the end of the ripper shank and retainer and insert a pin in the tooth and shank, grooved end first.
  - c. From the left hand side of the tooth using a hammer, drive a pin through the retainer flush on both sides of the tooth.
  - d. Repeat Steps 4a through 4c for the other two teeth as necessary.
  - e. Have the operator start the engine, raise the ripper, remove the blocks, and then lower the ripper and turn off the engine.
5. Perform a system check.
  - a. Place the equipment in service.
  - b. Check the ripper for proper operation.
6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable ripper tooth.	—	—
4. Installed the serviceable ripper tooth.	—	—
5. Performed a system check.	—	—

**Performance Measures**

**GO**    **NO GO**

6. Annotated the equipment inspection and maintenance work sheet.

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**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

TM 5-2410-237-20

**Related**

AR 750-1

DA PAM 738-750

## Replace a Winch Cable on an Item of Construction Equipment

091-62B-1803

**Conditions:** Given an item of construction equipment with an unserviceable winch cable, a serviceable winch cable, a number 2 common tool kit, a general mechanic's tool kit, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the winch cable without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review an equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable winch cable.

**WARNING:** ALWAYS WEAR LEATHER GLOVES WHEN HANDLING THE WIRE ROPE ASSEMBLY. NEVER ALLOW THE WIRE ROPE TO RUN THROUGH YOUR HANDS. FAILURE TO COMPLY MAY RESULT IN SEVERE INJURY TO PERSONNEL.

- a. Have the operator start the vehicle engine and relieve the tension on the wire rope.
- b. Disconnect the hook from the bracket at the rear of the vehicle.
- c. Have the operator place the control lever in the HIGH position and move and hold the shift lever to the OUT position. Pull the wire rope assembly from the winch drum.
- d. Have the operator release the shift lever and shut off the vehicle's engine.
- e. Remove two screws, the retainer, and the wire rope assembly from the winch drum.
- f. Remove the cotter pin and the nut and pin from the shackle. Remove the hook and shackle from the wire rope.

4. Install the serviceable winch cable.

- a. Install the shackle and hook on the wire rope assembly with the pin, nut, and cotter pin.
- b. Have the operator clean and lubricate the wire rope before installation.
- c. Have the operator start the vehicle's engine and rotate the winch drum. Have the assistant observe when the wire rope retainer area is in the 7 o'clock position then have the operator stop the vehicle's engine.
- d. Install the retainer loosely with two screws.
- e. Slide the wire rope under the retainer and tighten the screws.
- f. Have the operator start the vehicle's engine and pay in the wire rope. Ensure that the wire rope is in the groove on the side of the drum.

**NOTE:** The wire rope must have adequate tension and level winding while paying in so all of the wire rope will fit on the winch drum.

- g. Attach the hook to the bracket on the rear of the vehicle after paying in the wire rope.
- h. Have the operator stop the vehicle's engine.

5. Perform a system check.

- a. Return the equipment to service.
- b. Check the winch cable for proper operation.

6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable winch cable.	—	—
4. Installed the serviceable winch cable.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5988-E
- TM 5-2350-262-10
- TM 5-2350-262-20-2

**Related**

- AR 750-1
- DA PAM 738-750

## Replace a Winch on an Item of Construction Equipment

091-62B-1804

**Conditions:** Assigned as a construction equipment repairer given an item of construction equipment with an unserviceable winch, a serviceable winch, a general mechanic's tool kit, a number 2 common tool kit, 2-ton lifting equipment, lifting brackets, personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the winch without causing injury to any personnel or damage to the equipment.

### Performance Steps

1. Receive and review the equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable winch.
  - a. Remove the winch control valve.
  - b. Remove the winch magnetic strainer assembly and wire the magnetic strainer up and out of the way.

**NOTE:** Use a tap to chase and clean the threaded holes of the bosses to which lifting brackets are attached.

- c. Install a suitable lifting bracket capable of lifting two tons in threaded boss on each side of winch.
- d. Use a 12-point wrench to remove the two cap screws and the two lock washers.
- e. Use a wrench to remove seven cap screws, seven lock washers, and the cover from the top of the winch.
- f. Remove and discard the gasket and preformed packing from the cover.
- g. Use a slugging wrench to remove the two nuts and the two washers from the two inner studs that secure the winch to the rear of the tractor.
- h. Attach the lifting equipment to both lifting brackets and to the bar for added support.
- i. Use a socket with a torque multiplier to remove the six self-locking nuts and six washers from the six studs.

**CAUTION:** REMOVE THE WINCH SLOWLY AND CAREFULLY TO PREVENT DAMAGE TO THE MOUNTING STUDS, TRANSMISSION, AND DRIVE SHAFT. THREE PERSONS ARE REQUIRED TO REMOVE THE WINCH. ADJUST THE LIFTING EQUIPMENT AS NECESSARY TO REMOVE THE LOAD FROM THE STUDS.

- j. Use the lifting equipment to move the winch straight back until the drive shaft is completely out of the tractor body.
- k. Set the winch on adequate blocking to prevent tipping.

**CAUTION:** A COVER AND GASKET MUST BE INSTALLED TO PREVENT DIRT AND OTHER DAMAGING CONTAMINANTS FROM ENTERING THE FINAL DRIVE CASE.

**NOTE:** A round cover is stored on the side of the fuel tank; the gasket and cap screws are stored in the toolbox.

- l. Install a round cover and gasket over the hole for the winch drive shaft. Secure the cover to the tractor with nine cap screws and nine lock washers using a wrench.
- m. Remove and discard the two preformed packings from the two studs on the back of the tractor.
- n. Remove the ring, pin, and coupling from the transmission end of the winch drive shaft. Remove the retaining ring from winch coupling. Remove the pin and the drive shaft from the winch coupling. Remove and discard the seal from the coupling flange. Remove and discard the seal from the drive shaft.

4. Install the serviceable winch.
  - a. Remove all traces of paint, rust, and so forth, from the winch and tractor mounting surfaces that make contact.

**Performance Steps**

- b. Clean the ring groove in the winch coupling, seal the grooves in the coupling flange and the drive shaft.
- c. Lubricate lightly and install a new seal on the drive shaft and the coupling flange.
- d. Install a ring onto the end of the winch coupling temporarily. Rotate the coupling with the hole straight up. Keep the bottom of the ring to hold the pin in position.
- e. Insert the drive shaft into the winch coupling, align the holes, and install the pin. Retain the pin with the ring by sliding it into the groove in the winch coupling.
- f. Clean the ring groove in the coupling. Lightly lubricate and temporarily install the ring on the groove end of the coupling. Do not install it in the groove at this time.
- g. Install the coupling on the drive shaft, align the holes, and install the pin. Retain the pin with the ring by sliding it into the groove in the coupling.
- h. Install a suitable lifting bracket in the threaded boss on each side of the winch.
- i. Use a wrench to remove the nine cap screws, the nine lock washers, the gasket, and the round cover that covers the drive shaft hole in the back of the tractor.
- j. Clean the base of the two top inner studs. Lightly lubricate and install two new preformed packings on the studs.
- k. Attach the lifting equipment to the lifting brackets on the winch and to the bar.

**CAUTION: INSTALL THE WINCH SLOWLY AND CAREFULLY TO PREVENT DAMAGE TO THE MOUNTING STUDS, TRANSMISSION, AND DRIVE SHAFT. TWO PERSONS ARE REQUIRED TO INSTALL THE WINCH. ADJUST THE WINCH AS NEEDED WITH THE LIFTING EQUIPMENT UNTIL THE PROPER ALIGNMENT IS ACHIEVED.**

**WARNING: USE CAUTION WHEN LINING UP THE SHAFT TO AVOID BODILY INJURY. THE WEIGHT OF THE WINCH ASSEMBLY IS 1.5 TONS. ENSURE THAT THE WINCH IS STEADY WHEN ALIGNING THE DRIVE SHAFT TO THE HOLE IN THE BACK OF THE TRACTOR TO AVOID PERSONAL INJURY.**

- l. Align the winch drive shaft with the hole in the back of the tractor. Use one person to rotate the winch drive shaft to ensure that the splines of the transmission coupling and the transmission output shaft align properly. Slowly move the winch toward the tractor until the coupling on the drive shaft is seated in the transmission and winch housing and on the mounting studs.

**NOTE:** When aligned properly, the winch case will be flush with the back of the tractor.

- m. Use a socket with a torque multiplier to install washers and self-locking nuts onto the studs.
- n. Use a special tool torque wrench adapter to install two washers and two nuts onto the two top inner studs.
- o. Torque the nuts to 1200+120 foot-pounds.
- p. Install the new preformed packing, a new gasket, and a cover on the winch. Use a twelve-point wrench to install two cap screws and two washers.
- q. Remove the lifting equipment and brackets from the winch.
- r. Install the magnetic strainer and the winch control valve.

- 5. Perform a system check.
  - a. Place the equipment in service.
  - b. Check the winch for proper operation.
- 6. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet.	—	—

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable winch.	—	—
4. Installed the serviceable winch.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
DA FORM 5988-E  
TM 5-2410-237-20

**Related**  
AR 750-1  
DA PAM 738-750



Skill Level 2

Subject Area 1: Preventive

**Perform a Quality Assurance/Control Inspection on an Item of Construction Equipment  
091-62B-2101**

**Conditions:** Given an item of construction equipment in the process of being repaired at the organizational or support level maintenance by military or contract maintenance; the applicable organizational and or support level equipment technical manuals (TMs); test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); an equipment inspection and maintenance work sheet or an equipment maintenance request and work envelope (if applicable); and a pen.

**Standards:** Perform a quality control inspection on an item of construction equipment ensuring that all repairs are accomplished as prescribed by the procedures in the equipment technical manual. Complete the inspection without causing injury to any personnel and damage to the equipment. Initiate additional actions required as a result of the inspection.

**Performance Steps**

1. Receive the equipment inspection and maintenance work sheet or the equipment maintenance request and work envelope (if applicable).
  - a. Review the equipment inspection and maintenance work sheet or the equipment maintenance request and work envelope (if applicable).
  - b. Review the work request.
2. Obtain the appropriate equipment organizational and support TMs, technical bulletins (TBs), and the equipment maintenance inspection work sheet.
  - a. Locate the technical manuals with updates.
  - b. Locate the latest technical bulletins relating to the item of equipment.
3. Verify that the repairs are being completed according to the equipment technical manual.
  - a. Determine the deficiencies, faults, or shortcomings that are being repaired
  - b. Direct additional repairs or work to the responsible shop if the repair is unsatisfactory or the faults are still uncorrected.
  - c. Annotate the equipment inspection and maintenance work sheet and/or the maintenance request.
4. Forward the equipment inspection and maintenance work sheet or the equipment maintenance request and work envelope to the maintenance control supervisor or shop supply clerk.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received the equipment inspection and maintenance work sheet or the equipment maintenance request and work envelope (if applicable).	—	—
2. Obtained the appropriate equipment organizational and support technical manuals, technical publications, and equipment maintenance inspection work sheet.	—	—

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
3. Verified that the repairs were being completed according to the equipment technical manual.	—	—
4. Forwarded the equipment inspection and maintenance work sheet or the equipment maintenance request and work envelope to the maintenance control supervisor or shop supply clerk.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5988-E
- DA FORM 5990-E
- TM 5-2350-262-20-1
- TM 5-2350-262-20-2
- TM 5-2350-262-20-3
- TM 5-2350-262-24P
- TM 5-2350-262-34

**Related**

- AR 750-1
- DA PAM 738-750

**Perform Battle Damage Assessment and Repair (BDAR) on an Item of Construction Equipment  
091-62B-2102**

**Conditions:** Given an item of construction equipment that requires expedient repairs in a combat situation; the applicable BDAR technical manual (TM) and kit; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); an equipment inspection and maintenance work sheet or an equipment maintenance request for supporting a work order; and a pen.

**Standards:** Perform BDAR on an item of construction equipment. Complete the BDAR without causing injury to any personnel and damage to the equipment. Initiate additional actions required as a result of the inspection.

**Performance Steps**

1. Receive the mission to perform a BDAR.
  - a. Obtain and verify the location of the equipment.
  - b. Obtain an initial report of damage or required repairs.
  - c. Obtain a BDAR Kit and manual.
2. Establish security requirements.
  - a. Obtain a situation report regarding enemy and friendly forces.
  - b. Assemble and brief the security team.
3. Deploy with the security team to the site.
  - a. Don appropriate mission-oriented protection posture (MOPP) level based on the nuclear, biological, and chemical (NBC) reports.
  - b. Navigate to the site and locate the equipment.
  - c. Deploy the security elements.
4. Perform an equipment inspection.
  - a. Check the equipment for NBC contamination.
  - b. Inspect the vehicle for booby traps.
  - c. Locate the damage or required repairs.
5. Determine the extent of the repairs.
  - a. Determine if self-evacuation/recovery is possible.
  - b. Determine if recovery assets are required.
  - c. Determine if repairs warrant destruction of the equipment in place.
6. Perform expedient repairs to allow for self-evacuation/recovery.
  - a. Use BDAR procedures to rapidly repair damages.
  - b. Use substitute parts, if required.
  - c. Use field expedient materials to make repairs, as required.
  - d. Use field expedient lubricants, fuels, or fluids, if required.
  - e. Annotate the repairs on an equipment inspection maintenance work sheet according to DA Pam 738-750.
7. Notify the change of command for destruction procedures, if required.
  - a. Contact the command element.
  - b. Prepare equipment for destruction as directed and according to the BDAR manual.
8. Request recovery support, if required.
  - a. Contact the support element.
  - b. Verify coordinates.
9. Return equipment to the maintenance collection point and forward the equipment inspection and maintenance work sheet to the maintenance shop supervisor or shop foreman.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<u><b>GO</b></u>	<u><b>NO GO</b></u>
1. Received the mission to perform BDAR.	—	—
2. Established security requirements.	—	—
3. Deployed with the security team to the site.	—	—
4. Performed an equipment inspection.	—	—
5. Determined the extent of the repairs.	—	—
6. Performed expedient repairs to allow self-evacuation/recovery.	—	—
7. Notified the change of command for destruction procedures, if required.	—	—
8. Requested recovery support, if required.	—	—
9. Returned equipment to the maintenance collection point and forwarded the equipment inspection and maintenance work sheet to the maintenance shop supervisor or shop foreman.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

**Related**

AR 750-1  
 DA FORM 5990-E  
 DA PAM 738-750  
 TM 5-2350-262-10  
 TM 5-2350-262-20-1  
 TM 5-2350-262-20-2  
 TM 5-2350-262-20-3

## Subject Area 2: Electrical

**Replace a Wiring Harness on an Item of Construction Equipment****091-62B-2201**

**Conditions:** Given an item of construction equipment with an unserviceable wiring harness; a serviceable wiring harness; a general mechanic's tool kit; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet; and a pen.

**Standards:** Replace the wiring harness without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment Inspection and maintenance work sheet.

2. Inspect the equipment and verify its condition.

**WARNING: THE POSSIBILITY OF AN ELECTRICAL SHOCK EXISTS. DISCONNECT BATTERIES BEFORE REMOVING OR WORKING ON AN ELECTRICAL SYSTEM. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

3. Disconnect the battery cable.

a. Lift up the rubber boot and use a wrench to disconnect the negative battery cable.

4. Remove the unserviceable wiring harness.

a. Remove the three screws, the washers, and the sleeve nuts from the instrument panel.

b. Pull the instrument panel assembly away from the brackets to expose the rear of the panel.

c. Tag all of the ventilation fan wiring harness electrical leads.

d. Remove the screw and the electrical leads from the fan switch.

e. Remove the nut and lock washer from the ground lead on the fan motor and remove the lead.

f. Remove the nut, the lock washer, the washer, and the nut and ground lead from the driver's compartment wall.

g. Disconnect the electrical connector from the ventilation fan wire receptacle and remove the ventilation fan wiring harness.

5. Install the serviceable wiring harness.

a. Connect the ventilation fan wiring harness electrical connector to the ventilation fan wire receptacle.

b. Install the ground lead to the driver's compartment wall with a nut, a washer, and a new lock washer and screw.

c. Install the other end of the ground lead to the fan motor with a new lock washer and nut.

d. Install the leads of the other end of the ventilation fan wiring harness to the fan switch with a screw.

e. Replace the instrument panel on the brackets and secure it with three washers, sleeve nuts, and screws.

6. Connect the battery cable.

a. Use a wrench to reconnect the negative battery cable.

b. Put the rubber boot back in place.

7. Perform a system test.

a. Perform a voltage check.

b. Have the operator start the equipment.

8. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<u><b>GO</b></u>	<u><b>NO GO</b></u>
1. Received and reviewed an equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Disconnected the battery cable.	—	—
4. Removed the unserviceable wiring harness.	—	—
5. Installed the serviceable wiring harness.	—	—
6. Connected the battery cable.	—	—
7. Performed a system test.	—	—
8. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2350-262-20-1

**Related**

AR 750-1  
DA PAM 738-750

**Replace an Electronic Sensor on an Item of Construction Equipment.**

**091-62B-2202**

**Conditions:** Given an item of construction equipment with an unserviceable electronic sensor; a serviceable electronic sensor; a general mechanic's tool kit; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manuals (TMs); an equipment inspection and maintenance work sheet; and a pen.

**Standards:** Replace the electronic sensor without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.

**WARNING: THE POSSIBILITY OF AN ELECTRICAL SHOCK EXISTS. DISCONNECT BATTERIES BEFORE REMOVING OR WORKING ON AN ELECTRICAL SYSTEM. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

- a. Check the connections.
- b. Perform tests using TMDE.
3. Disconnect the negative battery cable.
  - a. Lift up the rubber boot and use a wrench to disconnect the negative battery cable.
4. Remove the unserviceable electronic sensor.
  - a. Disconnect the sensor wiring connector.
  - b. Remove the unserviceable sensor from the bore.
5. Install the serviceable electronic sensor.
  - a. Coat the serviceable sensor O-ring with high-temperature grease and install the sensor into the bore.
  - b. Tighten the sensor securely or to the specified torque.
  - c. Install the sensor wire connector.
6. Connect the negative battery cable.
  - a. Use a wrench to reconnect the negative battery cable.
  - b. Put the rubber boot back in place.
7. Perform a system test.
  - a. Perform a voltage check.
  - b. Have the operator start the equipment.
  - c. Check the equipment for proper operation.
8. Annotate the equipment inspections and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Disconnected the negative battery cable.	—	—

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
4. Removed the unserviceable electronic sensor.	—	—
5. Installed the serviceable electronic sensor.	—	—
6. Connected the negative battery cable.	—	—
7. Performed a system test.	—	—
8. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-3805-280-24-2

**Related**

AR 750-1  
DA PAM 738-750



**Replace an electronic-control module on an item of construction equipment.**

**091-62B-2203**

**Conditions:** Given an item of construction equipment with an unserviceable electronic-control module; a serviceable electronic-control module; a general mechanic's tool kit; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manuals (TMs); an equipment inspection and maintenance work sheet; and a pen.

**Standards:** Replace the electronic-control module without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection and maintenance work sheet.
2. Inspect the equipment and verify its condition.  
**WARNING: THE POSSIBILITY OF AN ELECTRICAL SHOCK EXISTS. DISCONNECT BATTERIES BEFORE REMOVING OR WORKING ON AN ELECTRICAL SYSTEM. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**
  - a. Check the connections.
  - b. Perform tests using TMDE.
3. Disconnect the negative battery cable.
  - a. Lift up the rubber boot and use a wrench to disconnect the negative battery cable.
4. Remove the unserviceable electronic-control module.
  - a. Move the seat forward and remove the access cover.
  - b. Disconnect the cable connectors.
  - c. Remove the cap screws and the engine and pump controller.
5. Install the serviceable electronic-control module.
  - a. Place the engine and pump controller in position and install the cap screws.
  - b. Connect the cable connectors.
  - c. Replace the access cover and place the seat back into position.
6. Connect the negative battery cable.
  - a. Use a wrench to reconnect the negative battery cable.
  - b. Put the rubber boot back in place.
7. Perform a system test.
  - a. Do an engine speed learning procedure.
  - b. Have the operator start the equipment.
  - c. Check the equipment for proper operation.
8. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection and maintenance work sheet.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Disconnected the negative battery cable.	—	—

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
4. Removed the unserviceable electronic-control module.	—	—
5. Installed the serviceable electronic-control module.	—	—
6. Connected the negative battery cable.	—	—
7. Performed a system test.	—	—
8. Annotated the equipment inspection and maintenance work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-3805-280-24-2

**Related**

AR 750-1  
DA PAM 738-750

## Troubleshoot a Starting System on an Item of Construction Equipment

**091-62B-2204**

**Conditions:** Given an item of construction equipment with an unserviceable starting system; a general mechanic's tool kit; special tools; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manuals (TMs); an equipment inspection and maintenance work sheet; and a pen.

**Standards:** Locate the faults, deficiencies, or shortcomings by troubleshooting the starting system without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review an equipment inspection and maintenance work sheet or an equipment maintenance request.

2. Inspect the equipment and verify its condition.

**WARNING: THE POSSIBILITY EXISTS FOR AN ELECTRICAL SHOCK. DISCONNECT THE BATTERIES BEFORE REMOVING OR WORKING ON AN ELECTRICAL SYSTEM. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

3. Perform troubleshooting procedures on the starting system.

a. Connect an external 24-volt direct current (DC) supply to the slave receptacle.

(1) Apply the parking brake and place the transmission control lever in the neutral (N) position.

Place the ignition key switch in the start position.

(2) If the starter cranks, check the battery-specific gravity. Charge or replace the batteries, as necessary.

(3) If the starter does not crank, place the ignition key switch in the off position and disconnect the external supply from the slave receptacle. Go to the next step.

b. Check the voltage between the starter ground terminal and the starter solenoid battery (BAT) terminal. The voltage reading should indicate 24 volts.

(1) If the voltage reading is 24 volts, go to the next step.

(2) If the voltage reading is zero, check for a loose connection or circuit at the cables between the batteries and the starter. Clean and tighten the connections or replace the cable, as necessary.

c. Check the voltage between the starter solenoid S-terminal and the starter ground terminal. Tell the assistant to place the ignition key switch in the start position. The voltage reading should indicate 24 volts.

(1) If the voltage reading is 24 volts, replace the defective starter.

(2) If the voltage reading is zero, go to the next step.

d. Place the ignition key switch in the on position. Place the vehicle light switch in the SER DRIVE position. The service driving lights and the taillights should be on.

(1) If at least one light is on, go to step g below.

(2) If all of the lights are off, go to step e below.

e. At the relay bracket, check the voltage between each terminal of the 30-ampere circuit breaker (the one on the top) and the chassis frame. The voltage reading should indicate 24 volts for both terminals.

(1) If the voltage reading is 24 volts for both terminals, check the wiring connection between the 30-ampere circuit breaker and the ignition wire key switch connector BAT terminal. Repair or replace the wiring or the connector, as necessary.

(2) If the wiring and the connector are okay, remove the right instrument panel and replace the ignition key switch.

(3) If the voltage reading is 24 volts at one terminal and zero at the remaining terminal, replace the 30-ampere circuit breaker. If the voltage reading is zero for both terminals, go to step f.

**Performance Steps**

- f. Check the voltage between the large left terminal of the starter relay and the chassis frame. The voltage reading should indicate 24 volts.
  - (1) If the voltage reading is 24 volts, check the wires between the starter relay terminal and the 30-ampere circuit breakers. Replace the wires as necessary.
  - (2) If the voltage reading is zero, check the cable between the starter solenoid BAT terminal and the starter relay terminal. Replace the cable as necessary.
- g. At the transmission control valve, check the voltage between each terminal of the N start switch and the chassis frame. Tell the assistant to place the ignition key switch in the start position. The voltage reading should indicate 24 volts for both terminals.
  - (1) If the voltage reading is 24 volts for both terminals, go to step h.
  - (2) If the voltage reading is zero for both terminals, check the wiring connection between the N start switch and the ignition key switch connector START terminal. Repair or replace the wiring or the connector, as necessary. If the wiring and the connector are okay, remove the right instrument panel and replace the ignition key switch.
- h. At the relay bracket, check the voltage between the small center terminals of the starter relay. Tell assistant to place ignition key switch in start position. Voltage reading should indicate 24 volts.
  - (1) If the voltage reading is zero, go to step i.
  - (2) If the voltage reading is 24 volts, go to step j.
- i. Disconnect the negative lead from the starter relay terminal and connect it to the chassis frame. Tell the assistant to place the ignition key switch in the start position. The voltage reading should indicate 24 volts.
  - (1) If the voltage reading is 24 volts, check the ground wire connection between the starter relay terminal and the mounting lug. Tighten the connections or replace the wire, as necessary.
  - (2) If the voltage reading is zero, check the wiring connection between the N start switch and the starter relay terminal. Repair or replace the wiring as necessary.
- j. Check the voltage between the large right terminal of the starter relay and the chassis frame. Tell the assistant to place the ignition key switch in the start position. The voltage reading should indicate 24 volts.
  - (1) If the voltage reading is 24 volts, check the cable between the starter terminal and the starter solenoid S-terminal. Tighten the relay connections and replace the cable, as necessary.
  - (2) If the voltage reading is zero, replace the starter relay.

4. Annotate the equipment inspection and maintenance work sheet.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed an equipment inspection and maintenance work sheet or an equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Performed troubleshooting procedures on the starting system.	—	—
4. Annotated the equipment inspection and maintenance work sheet or an equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
DA FORM 5990-E  
TM 5-3805-262-20  
TM 5-3805-262-34

**Related**

AR 750-1  
DA PAM 738-750

**Troubleshoot a Charging System on an Item of Construction Equipment**  
**091-62B-2205**

**Conditions:** Given an item of construction equipment with an unserviceable charging system; a general mechanic's tool kit; special tools; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet or an equipment maintenance request; and a pen.

**Standards:** Locate the faults, deficiencies, or shortcomings by troubleshooting a starting system without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection and maintenance work sheet or an equipment maintenance request.

2. Inspect the equipment and verify its condition.

**WARNING: THE POSSIBILITY EXISTS FOR AN ELECTRICAL SHOCK. DISCONNECT THE BATTERIES BEFORE REMOVING OR WORKING ON AN ELECTRICAL SYSTEM. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

3. Perform troubleshooting procedures on the charging system.

a. Check for loose, broken, or missing alternator belts.

(1) Adjust the loose belts.

(2) Replace the broken or missing belts.

b. Test the alternator circuit voltage.

(1) Place the battery disconnect switch to the OFF position.

(2) Disconnect the wiring leads from the alternator positive terminal.

(3) Check the voltage of the orange leads that have been disconnected from the alternator positive terminal and check the negative lead to the chassis ground.

(4) Place the battery disconnect switch to the ON position.

(a) If the battery voltage is indicated, place the battery disconnect switch to the OFF position and check the continuity between the alternator and the ground. Repair or replace the alternator ground cable.

(b) If the wiring to the chassis ground is okay, replace the alternator.

(c) If a battery voltage is not indicated, repair or replace the alternator-to-ammeter wiring.

4. Annotate the equipment inspection and maintenance work sheet or the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection and maintenance work sheet or a maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Performed troubleshooting procedures on the charging system.	—	—
4. Annotated the equipment inspection and maintenance work sheet or the maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
DA FORM 5990-E  
TM 5-2410-237-20  
TM 5-2410-237-34

**Related**

AR 750-1  
DA PAM 738-750

## Troubleshoot an Accessory Circuit on an Item of Construction Equipment

091-62B-2206

**Conditions:** Given an item of construction equipment with an unserviceable accessory circuit; a general mechanic's tool kit; special tools; test, measurement, and diagnostic equipment (TMDE), personal protective equipment (PPE); the applicable technical manuals (TMs), an equipment inspection and maintenance worksheet or an equipment maintenance request; and a pen.

**Standards:** Locate the faults, deficiencies, or shortcomings by troubleshooting the accessory circuit without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review an equipment inspection and maintenance work sheet or an equipment maintenance request.
2. Inspect the equipment and verify its condition.

**WARNING:** THE POSSIBILITY EXISTS FOR AN ELECTRICAL SHOCK. DISCONNECT THE BATTERIES BEFORE REMOVING OR WORKING ON AN ELECTRICAL SYSTEM. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.

3. Perform troubleshooting procedures on the accessory circuit.

**NOTE:** The following steps are for the fault of voltmeter light or instrument cluster gauge lights. Do not operate!

- a. Place the ignition key switch in the ON position. Place the vehicle light switch in the SER DRIVE and PANEL DIM positions. Place the dimmer compartment light control at the right instrument panel in a full clockwise position. The voltmeter light and the instrument cluster gauge lights should be on.
  - (1) If the voltmeter light is off and at least one instrument cluster gauge light is on, replace the voltmeter lamp. If the new voltmeter lamp does not operate, replace the voltmeter light socket assembly.
  - (2) If the voltmeter light is on and all the instrument cluster gauge lights are off, check the gray wire connection from the wiring harness to the instrument cluster connector (pin 8). Repair or replace the wiring or the connector, as necessary.
  - (3) If the wiring and the connector are okay, remove the instrument cluster and replace the circuit board. If the voltmeter light is on and at least one instrument cluster gauge light is on, replace the instrument cluster gauge lamp.
  - (4) If the new gauge lamp does not operate, remove the instrument cluster and replace the circuit board. If the voltmeter light and all instrument cluster gauge lights are off, go to step b.
- b. Place the cab dome light switch in the ON position.
  - (1) If the cab dome light is on, go to step c.
  - (2) If the cab dome light is off, go to step d.
- c. Reach behind the right instrument panel and check the voltage between each terminal of the 15-ohm resistor and the cab sheet metal. The voltage should indicate at least 5 volts for both terminals.
  - (1) If the voltage indicates at least 5 volts for both terminals, check the gray wire connection from the 15-ohm resistor to the instrument cluster connector (pin 8). Repair or replace the wiring or connector, as necessary.
  - (2) If the voltage reading indicates zero for both terminals, check the gray wire connection from the 15-ohm resistor to the dimmer compartment light control. Repair or replace the wiring or the terminal, as necessary.
  - (3) If the voltage reading indicates at least 5 volts at one terminal and zero at the remaining terminal, remove the right instrument panel and replace the 15-ohm resistor.
- d. Place the vehicle light switch in the PANEL BRT position. The cab dome light should be on.
  - (1) If the cab dome light is not on, go to step e.



**Performance Steps**

- (2) If the cab dome light is on, remove the right instrument panel and replace the vehicle light switch.
- e. Reach beneath the right instrument panel and check the voltage between each terminal of the dimmer compartment light control and the cab sheet metal. The voltage reading should indicate 24 volts for both terminals.
  - (1) If the voltage reading indicates 24 volts for both terminals, check the wiring connection from the dimmer compartment light control to the 15-ohm resistor and the cab dome light. Repair or replace the wiring or terminals, as necessary.
  - (2) If the voltage reading indicates zero for both terminals, check the wiring connection between the dimmer compartment light control and the vehicle light switch connector (pin B). Repair or replace the wiring or connector, as necessary. If the wiring and the connector are okay, remove the right instrument panel and replace the vehicle light switch.
  - (3) If the voltage reading indicates 24 volts at one terminal and zero at the remaining terminal, remove the right instrument panel and replace the dimmer compartment light control.
- 4. Annotate the equipment inspection and maintenance work sheet or the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the condition. Ensure that the site is set up with the equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection and maintenance work sheet or an equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Performed troubleshooting procedures on the accessory circuit.	—	—
4. Annotated equipment inspection and maintenance work sheet or an equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 DA FORM 5990-E  
 TM 5-3805-262-20

**Related**

AR 750-1  
 DA PAM 738-750

## Subject Area 3: Engines

**Replace an Oil Pump on an Item of Construction Equipment****091-62B-2301**

**Conditions:** Given an item of construction equipment with an unserviceable oil pump and all accessories removed for access to the oil pump, a serviceable oil pump, shop equipment (general-purpose repair), personal protective equipment (PPE), the applicable technical manuals, an equipment inspection and maintenance work sheet, and a pen.

**Standards:** Replace the oil pump without damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet.
  2. Inspect and verify the condition of the equipment.
  3. Remove the unserviceable oil pump.
    - a. Use a wrench to remove the two cap screws. Loosen and remove the elbow and gasket from the pump body. Discard the gasket.
    - b. Bend the lock away from the cap screw on the strainer assembly support. Use a wrench to remove the cap screw and the lock.
    - c. Bend the locks away from the two cap screws. Use a wrench to remove the two cap screws and the strainer assembly. Remove and discard the gasket.
- WARNING: THE OIL PUMP IDLER GEAR IS FREE TO FALL WHEN THE OIL PUMP IS REMOVED.**
- d. Have the assistant hold onto the pump and the idler gear. Use a wrench to remove the two cap screws and the two washers. Remove the pump.
  4. Install the serviceable oil pump.
    - a. Install the oil pump assembly in position on the engine. Have the assistant hold the pump and the idler gear. Use a wrench to install the two cap screws and the two locks that secure the pump.
    - b. Install the two cap screws and washers. Use a wrench to tighten the cap screws.
    - c. Place the strainer assembly with the new gasket in position. Install the lock and the two cap screws. Use a wrench to tighten the cap screws. Bend the lock down.
    - d. Install the lock and the cap screw on the strainer assembly support. Use a wrench to tighten the cap screw. Bend the lock down.
    - e. Install the new gasket and elbow onto the pump body. Install the two cap screws and tighten with a wrench.
  5. Perform a system check.
    - a. Install the accessories that were removed from the equipment.
    - b. Return the equipment to service.
    - c. Start the equipment and check for leaks and proper operation.
  6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

- |   | <u>GO</u> | <u>NO GO</u> |
|---|-----------|--------------|
| 1. Received and reviewed the equipment inspection and maintenance work sheet. | —         | —            |

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
2. Inspected and verified the condition of the equipment.	—	—
3. Removed the unserviceable oil pump.	—	—
4. Installed the serviceable oil pump.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment inspection and maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
 DA FORM 5988-E  
 TM 5-2410-237-34

**Related**  
 AR 750-1  
 DA PAM 738-750

**Replace a Fuel Injector on an Item of Construction Equipment.  
091-62B-2302**

**Conditions:** Given an item of construction equipment with an unserviceable fuel injector and all accessories removed to gain access to the fuel injector, a serviceable fuel injector, a number 1 common tool kit, personal protective equipment (PPE), the applicable technical manual (TM), an equipment maintenance and inspection work sheet, and a pen.

**Standards:** Replace the fuel injector without damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment maintenance and inspection work sheet.
2. Inspect and verify the condition of the equipment.
3. Remove the unserviceable fuel injector.
  - a. Use a twelve-point wrench to remove the cap screw and clamp from the fuel injection nozzle.
  - b. Use a slide hammer puller to remove the fuel injection nozzle.

**CAUTION: HOLD THE SLIDE HAMMER PULLER SO THAT THE CENTERLINE OF THE TOOL IS IN ALIGNMENT WITH THE CENTERLINE OF THE FUEL INJECTION NOZZLE. THIS WILL PREVENT DISTORTION OF THE NOZZLE, WHICH CAN CAUSE IT TO BEND OR BREAK OFF DURING REMOVAL.**

4. Install the serviceable fuel injector.
  - a. Install a new seal on the fuel injection nozzle.
  - b. Place the carbon dam seal into the groove on the narrow end of the nozzle.
  - c. Insert the fuel injection nozzle in position in the cylinder head.
  - d. Install the clamp and bolt in order to hold each nozzle in position.
5. Perform a system check.
  - a. Install all of the accessories that were removed in order to return the equipment to service.
  - b. Have the operator start the engine.
  - c. Check the system for proper operation.
6. Annotate the equipment maintenance and inspection work sheet.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment maintenance and inspection work sheet.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Removed the unserviceable fuel injector.	—	—
4. Installed the serviceable fuel injector.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance and inspection work sheet.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2410-237-20

**Related**

AR 750-1  
DA PAM 738-750

**Replace a Blower on an Item of Construction Equipment**  
**091-62B-2303**

**Conditions:** Given an item of construction equipment with an unserviceable blower and all accessories removed to gain access to the blower, a serviceable blower, shop equipment (general-purpose repair), a general mechanic's tool kit, personal protective equipment (PPE), the applicable technical manual, an equipment maintenance request, and a pen.

**Standards:** Replace the blower without damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment maintenance request.
2. Inspect and verify the condition of the equipment.
3. Remove the unserviceable blower.

**WARNING: ALWAYS BLOCK THE UNIT SECURELY IN ORDER TO PREVENT MOVEMENT WHILE YOU ARE PERFORMING MAINTENANCE OR REPAIRS.**

- a. Remove the six bolts, special washers, and reinforcement plates that secure the blower to the engine end plate and the flywheel housing. Note the location of the two shorter bolts. Then remove the front end plate, cover, and gasket from the blower.
- b. Remove the four blower-to-block bolts and special washers, and lift the blower away from the engine.

4. Install the serviceable blower.

- a. Affix a new blower-to-block gasket on the side of the cylinder block. Apply Scotch Grip Rubber Adhesive No. 4300, or the equivalent, to the block side of the gasket.
- b. Position the blower front end plate and gasket on the end of the blower. Install six bolts with two special washers on the center bolts, and the reinforcement plates on the two top and two bottom bolts. Install a new engine end plate to the blower gasket over the threaded ends of the bolts. Apply Scotch Grip Rubber Adhesive No. 4300 or the equivalent to the engine end plate side of the gasket.

**NOTE: THE CURRENT FRONT AND REAR END PLATE GASKETS ARE IDENTICAL AND MAY BE USED IN EITHER POSITION. FORMERLY, THESE GASKETS WERE NOT INTERCHANGEABLE DUE TO A DIFFERENCE IN THICKNESS.**

- c. Place the blower on the cylinder block. Locate the flanges and while holding the blower in place, thread the six bolts finger tight in the rear engine end plate and flywheel housing. Then install the blower-to-block mounting bolts and washers and tighten them to 10-15 foot-pounds of torque.
- d. Tighten the center blower-to-end plate bolts first and then the top and bottom bolts to 20-25 foot-pounds of torque. Then tighten the blower-to-block bolts to 55-60 foot-pounds of torque.
- e. Check the backlash between the upper rotor gear and the camshaft or the balance shaft gear. The backlash should be .003 inches to .007 inches.

5. Perform a system check.

- a. Install the accessories that were removed from the equipment.
- b. Start the equipment and check the system for proper operation.

6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Removed the unserviceable blower.	—	—
4. Installed the serviceable blower.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
DA FORM 5990-E  
TM 5-3895-347-14&P

**Related**  
AR 750-1  
DA PAM 738-750

## Replace an Engine on an Item of Construction Equipment

091-62B-2304

**Conditions:** Given an item of construction equipment with an unserviceable engine, all accessories removed for access to the engine, with the engine oil and transmission oil drained, a serviceable engine, shop equipment (general-purpose repair), lifting equipment 3000 pounds capacity, engine stand 3000 lbs capacity, personal protective equipment (PPE), the applicable technical manual (TM), an equipment maintenance request, and a pen.

**Standards:** Replace the engine without damage to the equipment or injury to soldiers.

### Performance Steps

1. Receive and review the equipment maintenance request.
2. Inspect and verify the condition of the equipment.
3. Remove the unserviceable engine.

NOTE: Tag the wires and cables for installation.

- a. Tilt the operator's seat forward and disconnect the simplified test equipment/internal combustion engine (STE/ICE) wire from the battery disconnect switch by using a wrench.
- b. Remove the battery cover and use a wrench to disconnect the two cables from the positive post of the battery and one cable from the negative post of the battery.
- c. Use a Phillips screwdriver to remove the two screws that hold the wires to the shunt, and remove the wires. Use a wrench to remove one clip and three plastic ties that hold the STE/ICE wiring harness to the tractor. Pull the STE/ICE wiring harness through the frame and drape it over the engine.
- d. Use a wrench to remove the nut that holds the ground wire to the starter. Use a wrench to remove the nut that holds the power cable to the positive post of the starter.
- e. Remove two cotter pins and pins to remove right and left steering rods. Discard the cotter pins.
- f. Use a wrench to remove the nut that holds the wire harness to the alternator terminal. Slide the rubber boot from the start relay terminal. Use a wrench to remove the nut and washer that holds the wire to the relay.

NOTE: If more than one hydraulic line is to be removed, identify the lines in order to assure proper installation. Use a suitable container to catch any hydraulic oil that may drain from the system.

**WARNING:** WIPE THE AREA CLEAN AROUND ALL HYDRAULIC CONNECTIONS THAT ARE TO BE OPENED DURING THE REMOVAL AND DISASSEMBLY. CAP THE OIL LINES AND PLUG THE HOLES AFTER REMOVING THE LINES. CONTAMINATION OF THE HYDRAULIC SYSTEM COULD RESULT IN PREMATURE FAILURE.

- g. Use a wrench to remove the four cap screws, four washers, and two flange halves that hold the hose assembly to the oil cooler tube assembly. Remove and discard the seal.
- h. Disconnect the vent line from the torque divider by using a wrench to remove the two cap screws, two flat washers, and the gasket. Discard the gasket.
- i. Disconnect the oil supply line for the transmission by using a wrench to remove the two cap screws, the flat washer, and the seal. Discard the seal.
- j. Disconnect the two lines from the sequence relief valve by using a wrench to remove the eight cap screws, washers, and four split flanges.
- k. Use a wrench to remove the two clamps that attach two lines to the torque divider. Use a wrench to remove the line from the sequence relief valve.
- l. Use a wrench to remove the clip that holds the power cable to the governor control linkage bracket. Cut the plastic ties, and pull the wire harness from the engine, and lay the harness over the transmission.
- m. Use a wrench to remove the cap screw and flat washer on the clamp of the battery cable. Disconnect the clamp that holds the battery cable to the flywheel housing. Move the battery cable out of the way of the engine.



**Performance Steps**

- n. Use two wrenches to disconnect the clamp that holds the transmission oil supply line to the fender. Move the line and bracket out of the way.
- o. Use a wrench to remove the two cap screws and lock washers that support the magnetic screen assembly. Discard the preformed packing. Lower the magnetic screen assembly out of the way of the engine.
- p. Use two wrenches to disconnect the fuel supply line from the primary fuel filter. Use a wrench to remove the fuel return line from the fuel injection pump.
- q. Use a wrench to remove the four cap screws and four washers from the rear engine mounting brackets at the frame.

**WARNING: DO NOT REMOVE THE CAP SCREWS ON EITHER SIDE OF THE ENGINE.**

- r. Use two wrenches to remove the two cap screws, two nuts, and two flat washers from the engine front support.

**CAUTION: ALWAYS USE A SPREADER BAR WHILE LIFTING THE ENGINE ASSEMBLY. THIS WILL KEEP THE LIFTING FORCE VERTICAL AT ALL TIMES AND AVOID DAMAGE TO THE LIFTING BRACKETS.**

**CAUTION: THE ENGINE ASSEMBLY MUST BE LIFTED SO THAT THE CRANKSHAFT CENTERLINE IS HORIZONTAL. THIS WILL PREVENT BINDING ON THE REAR ENGINE MOUNT LOCATING PINS.**

- s. Attach the lifting equipment to the engine lifting brackets and lift the engine from the machine. The weight of the engine and the torque divider is 3000 pounds. Lower the engine to a suitable repair stand.

**WARNING: BE SURE THAT THE ENGINE IS CLEAR BEFORE YOU REMOVE THE SHIMS, TO AVOID PINCHING FINGERS OR HANDS.**

- t. Remove the shims from the locating pins and the rear mounting surface on the main frame.

**4. Install the serviceable engine.**

**CAUTION: REMOVE THE CAMPS FROM THE LINES, AND REMOVE THE PLUGS FROM THE HOLES AS THE INSTALLATIONS ARE MADE. WIPE CLEAN ALL OF THE LINE ENDS, LINE FITTING, AND MOUNTING SURFACES. APPLY A LIGHT FILM OF CLEAN HYDRAULIC OIL TO ALL OF THE SEALS AS YOU INSTALL THEM. CONTAMINATION OF THE HYDRAULIC SYSTEM COULD RESULT IN PREMATURE FAILURE.**

- a. Place the replacement engine in an engine stand that is suitable for transferring the accessories from the damaged engine.
- b. Remove the transmission oil line from the damaged engine. Remove the torque divider from the damaged engine. Install the torque divider on the replacement engine. Install the transmission oil line on the replacement engine.
- c. Remove all of the clamps or ties that attach the STE/ICE harness to the engine, and remove the harness from the starter, alternator, and tachometer. Tag all of the cables as to their location, and remove the STE/ICE harness from the engine.
- d. Install the STE/ICE wiring harness and the ties that secure the harness to the replacement engine, and connect the wires to the starter, alternator, and tachometer on the replacement engine.
- e. Position the shims in place on the rear mount surface of the main frame. Be sure that the locating pins are in position on the main frame.
- f. Attach the lifting equipment to the three lifting brackets on the replacement engine. Install the engine in the machine while keeping the crankshaft centerline horizontal. Make sure that the rear engine mounts fit onto the locating pins in the frame.
- g. Install the two cap screws, washers, and nuts in the front engine mounting bracket. Tighten the cap screws to 325+25 foot-pounds.
- h. Install the four cap screws and four washers in the rear engine mounting brackets. Tighten the cap screws to 325+25 foot-pounds.
- i. Connect the fuel return line to the fuel injection pump. Use two wrenches to connect the fuel supply line to the primary fuel filter.
- j. Lift the magnetic screen assembly into position and install the new preformed packing. Use a wrench to install the two cap screws and lock washers.

**Performance Steps**

- k. Put the transmission oil supply line and the bracket into position. Use two wrenches to connect the clamp that holds the line to the fender.
  - l. Position the battery cable over the flywheel housing and use a wrench to attach the clamp that holds the battery cable to the flywheel housing.
  - m. Put the power cable through the governor control linkage bracket, and attach the clip that holds the cable to the bracket.
  - n. Install the line on the sequence relief valve by using a wrench. Install the two clamps that attach the two lines to the torque divider.
  - o. Connect the two lines to the sequence relief valve by using a wrench to install eight cap screws, washers, and four split flanges.
  - p. Connect the transmission oil supply line by using a wrench to install two cap screws, washers, and the new seal. Connect the vent line by using a wrench to install the two cap screws, two flat washers, and the new gasket.
  - q. Install the new seal on the oil cooler tube. Connect the hose assembly to the oil cooler tube assembly by using four cap screws, four washers, and two flange halves.
  - r. Connect the wire to the start relay terminal by using a washer and nut. Slide the rubber boot over the terminal. Connect the wire harness to the alternator terminal by using nut.
  - s. Connect right and left steering rods to control valve using pins and cotter pins.
  - t. Use a wrench to install the nut that holds the power cable to the positive post of the starter. Use a wrench to install the nut that holds the ground wire to the starter.
  - u. Pull the STE/ICE wiring harness through the frame. Install one clip, using a wrench, and three plastic ties to hold the STE/ICE wiring harness to the tractor. Place two wires into position on the shunt and attach them with two Phillips screws.
  - v. Use a wrench to connect two wires to the positive post of the battery and one wire to the negative post of the battery. Install the battery cover. Use a wrench to connect the STE/ICE wire to the battery disconnect switch.
5. Perform a system check.
    - a. Reinstall all of the accessories that were removed from the equipment.
    - b. Return the equipment to service.
    - c. Check the system for leaks and proper operation.
  6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment; tools; test, measurement, and diagnostic equipment (TMDE); and publications available. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that expendable material/supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Removed the unserviceable engine.	—	—
4. Installed the serviceable engine.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5990-E

TM 5-2410-237-34

**Related**

AR 750-1

DA PAM 738-750

## Repair an Engine on an Item of Construction Equipment

091-62B-2305

**Conditions:** Given an item of construction equipment with a faulty engine and all accessories removed for access to the engine fault, the engine oil drained, all accessories needed to repair the engine fault, shop equipment (general-purpose repair), a basic field-maintenance machine shop, personal protective equipment (PPE), the applicable technical manual (TM), an equipment maintenance request, and a pen.

**Standards:** Repair the engine without damage to the equipment or injury to soldiers.

### Performance Steps

1. Receive and review the equipment maintenance request.
2. Inspect and verify the condition of the equipment.
3. Repair the faulty engine.
  - a. Disassemble the engine in order to obtain access to the pistons.
    - (1) Remove the air induction components.
    - (2) Remove the fuel system components.
    - (3) Remove the accessories.
    - (4) Remove the heads.
    - (5) Remove the oil pan.
    - (6) Remove the main bearings and crankshaft.
  - b. Remove the damaged pistons. Use a wire brush to clean all of the carbon from around the inner surface of the cylinder liners. Turn the crankshaft until two pistons are at bottom center.

**NOTE:** Keep each connecting rod cap together with its respective connecting rod and piston. The connecting rod and cap are machined as a set and must be kept that way.

- c. Use a wrench to remove the two nuts, connecting rod cap, and bearing half from connecting rod.

**CAUTION:** PLACE TAPE OVER THE THREADS OF THE CONNECTING ROD CAP SCREWS. THIS WILL PREVENT DAMAGE TO THE CRANKSHAFT WHEN THE RODS ARE REMOVED. BE CAREFUL NOT TO DAMAGE THE CRANKSHAFT OR THE CYLINDER WALL LINERS WHILE REMOVING THE CONNECTING RODS. DAMAGE TO THESE COMPONENTS COULD RESULT IN PREMATURE ENGINE FAILURE.

- d. Slide the piston and connecting rod assembly up through the cylinder block and remove it from engine. Remove the bearing half.
      - e. Mark each connecting rod and piston assembly with identification as to its proper location in the engine. Repeat steps 3.d. and 3.e. for the remaining pistons.
      - f. Install the serviceable pistons.
        - (1) Turn the crankshaft until the bearing journals for the piston and connecting rod assembly that are being installed are at bottom center.
        - (2) Put clean engine oil on the crankshaft journals and inside the cylinder liners, the piston rings, and the connecting rod bearings.
        - (3) Rotate the piston rings so that the ring openings are approximately 90° apart from each other.
        - (4) Place the ring compressor in position on the cylinder liner.

**CAUTION:** NEVER INSTALL THE RING COMPRESSOR WITHOUT THE USE OF THE CYLINDER LINER AS A GUIDE. DAMAGE TO THE PISTON RINGS COULD RESULT.

- (5) Put the bearing half and the connecting rod and piston assembly into the same cylinder it was removed from by carefully sliding it through the ring compressor, and at the same time guiding the connecting rod onto the assembly.

**NOTE:** Make sure the "V" mark on the piston is in alignment with the "V" mark on the cylinder block.

**Performance Steps**

- (6) Put clean engine oil on the bearings, the bolt threads, and the surfaces of the nuts that make contact with the connecting rod caps. Put the connecting rod bearing halves and caps in position on the connecting rods. Make sure that the tabs on the back of bearings are in the tab grooves of the connecting rod and cap. Use a 13/16-inch wrench to install the nuts onto the cap screws, and tighten it to a torque of 30±3 foot-pounds. Put a mark on each nut and the end of each cap screw. Tighten the nuts 90° more.

**CAUTION:** WHEN THE CONNECTING ROD CAPS ARE INSTALLED, MAKE SURE THAT THE NUMBER ON THE SIDE OF THE CAP IS NEXT TO THE SAME NUMBER ON THE SIDE OF THE CORRESPONDING CONNECTING ROD.

- g. Repeat steps 3.f.(1) through 3.f.(6) for the installation of the other pistons.
  - h. Reassemble the engine.
4. Perform a system check.
    - a. Reinstall all of the accessories that were removed from the engine.
    - b. Return the equipment to service.
    - c. Run the engine and check for proper operation.
  5. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Repaired the faulty engine.	—	—
4. Performed a system check.	—	—
5. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5990-E  
TM 5-2410-237-34

**Related**

AR 750-1  
DA PAM 738-750

**Troubleshoot a Fuel System on an Item of Construction Equipment**  
**091-62B-2306**

**Conditions:** Given an item of construction equipment with a fuel system fault, a general mechanics tool kit, a No.1 common tool kit, test measurement and diagnostic equipment (TMDE), personal protective equipment (PPE), the applicable technical manual, an equipment inspection maintenance worksheet or an equipment maintenance request, and a pen.

**Standards:** Locate the fault, deficiency, or shortcoming by troubleshooting the fuel system without damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment inspection maintenance worksheet or the equipment maintenance request.
2. Inspect and verify the condition of the equipment.

**DANGER: DIESEL FUEL IS FLAMMABLE. KEEP OPEN FLAMES AND SPARKS OUT OF THE AREA WHILE WORKING ON THE FUEL SYSTEM. WIPE UP SPILLS IMMEDIATELY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

3. Perform troubleshooting procedures on the fuel system for low fuel pressure.
  - a. Check the engine fuel pressure while cranking it. At 200 revolutions per minute (rpm), the pressure should read approximately 40 to 50 pounds per square inch (psi).
  - b. If the fuel pressure is zero, remove the fuel transfer pump and check to see if the cam timing gear is turning.
  - c. If the fuel pressure is low, check the fuel filters, fuel lines, fuel transfer pump, and valves for restrictions.
  - d. If the fuel system has been repaired, verify that the orificed check valve is mounted correctly on the fuel return line, and is working. Ensure that the correct orifice has been installed.
  - e. Check for air in the fuel by installing a 2P-8278 fuel flow tube on the return line. If access to the rear of the engine is restricted, install the sight glass on the return line, at the tank.
  - f. Check the fuel transfer pump fittings and joints for air leaks. Check the unit injectors and sleeves for combustion gas leaks.
  - g. Remove each unit injector and use a magnifying glass to inspect the base of the sleeve. The unit injector may also show evidence of leaking combustion gas.
4. Annotate the equipment inspection maintenance worksheet or the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment, TMDE, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment inspection maintenance worksheet or the equipment maintenance request.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Performed troubleshooting procedures on the fuel system for low fuel pressure.	—	—
4. Annotated the equipment inspection maintenance worksheet or the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

DA FORM 5990-E

TM 5-2430-200-24

**Related**

AR 750-1

DA PAM 738-750

## Troubleshoot a Lubrication System on an Item of Construction Equipment

091-62B-2307

**Conditions:** Given an item of construction equipment with a lubrication system fault; a general mechanic's tool kit; a number 1 common tool kit; test measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manual (TM); an equipment inspection work sheet or an equipment maintenance request; and a pen.

**Standards:** Locate the fault, deficiency, or shortcoming by troubleshooting the lubrication system without damage to the equipment or injury to soldiers.

### Performance Steps

1. Receive and review the equipment inspection and maintenance work sheet or the equipment maintenance request.

2. Inspect and verify the condition of the equipment.

CAUTION: EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS IS POSSIBLE WHILE PERFORMING THIS TASK.

WARNING: INJURY OR DEATH DUE TO ELECTRICAL SHOCKS AND UNSTABLE EQUIPMENT IS POSSIBLE. DIESEL FUEL AND PETROLEUM, OILS, AND LUBRICANTS (POL) ARE FLAMMABLE. KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA.

CAUTION: DIESEL FUEL AND POL ARE SLIPPERY. WIPE UP ANY SPILLS.

3. Perform troubleshooting procedure on the lubrication system for low or no oil pressure.

a. Check for low engine oil level. If the engine oil level is low, add oil.

b. Remove the nut and lock washer, and disconnect wire 31P from the oil pressure sender. Check for resistance between the terminal and the casing of the oil pressure sender. If resistance is not present, replace the oil pressure sender.

c. With wire 31P disconnected from the oil pressure sender, check for +24 volts, direct current (vdc) between wire 31P and the ground at the oil pressure sender. If +24 vdc is present, notify direct support maintenance. If +24 vdc is not present go on step 3-d.

d. With wire 31P disconnected from the oil pressure sender, check for +24 vdc between wire 31P and the ground at connector D. If +24 vdc is present, repair wire 31P between connector D and the oil pressure sender.

e. If +24 vdc is not present, loosen the two captive screws and pull the bracket out enough to gain access to the area behind the bracket. Remove the two clamps and the pipe assembly.

f. With wire 31P disconnected from the oil pressure sender, check for +24 vdc between wire 31P and the ground at the indicator (gage). If +24 vdc is not present, reconnect wire 31P at the oil pressure sender and replace the oil pressure gage. If +24 vdc is present, reconnect wire 31P at the oil pressure sender and repair wire 31P between the indicator (gage) and connector D.

4. Annotate the equipment inspection and maintenance work sheet or the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, TMDE, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

### Performance Measures

1. Received and reviewed the equipment inspection and maintenance work sheet or the equipment maintenance request.

GO    NO GO

—        —



**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
2. Inspected and verified the condition of the equipment.	—	—
3. Performed troubleshooting procedure on the lubrication system for low or no oil.	—	—
4. Annotated the equipment inspection and maintenance work sheet or the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 DA FORM 5990-E  
 TM 5-2420-224-20-1

**Related**

AR 750-1  
 DA PAM 738-750

**Troubleshoot a Cooling System on an Item of Construction Equipment  
091-62B-2308**

**Conditions:** Given an item of construction equipment with a faulty cooling system, a general mechanic's tool kit, a number 1 common tool kit, personal protective equipment (PPE), the applicable technical manual (TM), an equipment maintenance and inspection work sheet or an equipment maintenance request, and a pen.

**Standards:** Locate the fault, deficiency, or shortcoming by troubleshooting the cooling system without damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment maintenance and inspection work sheet or the equipment maintenance request.
2. Inspect and verify the condition of the equipment.
3. Perform troubleshooting procedures on the cooling system.

**WARNING: TAKE CARE WHEN REMOVING THE RADIATOR CAP. STEAM OR HOT COOLANT UNDER PRESSURE MAY CAUSE INJURY TO SOLDIERS.**

- a. Check the engine water temperature gauge for any indication that the engine is overheating. If the engine is overheating proceed to step 3.b.
- b. Check the coolant level.

**CAUTION: DAMAGE CAN RESULT WHEN COOLANT IS ADDED WHILE THE ENGINE IS HOT.**

- c. Inspect for loose, missing, and worn V-belts. Check the V-belt tension.
- d. Check the fan operation.
- e. Inspect the radiator, water pump, transmission oil cooler, engine oil cooler, drain cocks, hoses, and hose connections for leaks.
- f. Test the radiator for leaks.
- g. Inspect the fan for cracked or missing blades.
- h. Check the radiator for airflow obstructions.
- i. Check the operation of the pressure cap and inspect the cap-sealing surface.
- j. Test the pressure cap.
- k. Test the water temperature regulator for proper operation.
- l. Test the cooling system.

4. Annotate the equipment maintenance and inspection work sheet or the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment maintenance and inspection work sheet or the equipment maintenance request.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Performed troubleshooting procedures on the cooling system.	—	—
4. Annotated the equipment maintenance and inspection work sheet or the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

DA FORM 5990-E

TM 5-2410-237-20

**Related**

AR 750-1

DA PAM 738-750

**Troubleshoot an Air Induction System on an Item of Construction Equipment  
091-62B-2309**

**Conditions:** Given an item of construction equipment with an air induction system fault, a general mechanics tool kit, a No.1 common tool kit, test measurement and diagnostic equipment (TMDE), personal protective equipment (PPE), the applicable technical manual, an equipment inspection maintenance worksheet, and a pen.

**Standards:** Locate the fault, deficiency, or shortcoming by troubleshooting the air induction system without damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance worksheet.
2. Inspect and verify the condition of the equipment.
3. Perform troubleshooting procedures on the air induction system for an air restriction.
  - a. Park the machine in an open location, away from people and structures.
  - b. Block the machine in order to prevent inadvertent movement, and raise the radiator.
  - c. Remove the air intake manifold plug and install the air pressure gauge in the hole revealed by the plug's removal.
  - d. Prepare the machine so that engine speed can be measured. Refer to TM 5-2430-200-4.
  - e. Start the engine and bring the fluids up to normal operating temperature.

**WARNING: THE MACHINE MAY ACCIDENTALLY MOVE DURING THIS PROCEDURE. DO NOT ALLOW OTHER SOLDIERS IN THE AREA DURING THE TEST. PERFORM THIS TEST IN AN OPEN AREA AWAY FROM OTHER PEOPLE AND STRUCTURES.**

- f. Record the air temperature.
- g. Put the machine into EARTHMOVING mode and fully apply the service brake.
- h. Put the transmission control lever into SECOND REVERSE and fully apply the accelerator pedal.
- i. Record the engine speed and the boost pressure value, and then release the accelerator pedal.

**NOTE:** Do not stall the torque converter for more than two minutes at a time. Continuously monitor the instrument panel and stop the operation if overheating occurs in any system. If any overheating occurs, allow the systems to cool before repeating the test.

- j. The boost pressure should be  $23.62 \pm 3.48$  pounds per square inch (psi).
- k. Allow the machine to idle for five minutes in order to allow the turbocharger to cool down.
- l. Turn off the engine, remove all tools, and lower the radiator.

4. Annotate the equipment inspection maintenance worksheet.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, TMDE, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment inspection maintenance worksheet.	_____	_____
2. Inspected and verified the condition of the equipment.	_____	_____
3. Performed troubleshooting procedures on the air induction system for an air restriction.	_____	_____
4. Annotated the equipment inspection maintenance worksheet.	_____	_____

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2430-200-24

**Related**

AR 750-1  
DA PAM 738-750

Subject Area 4: Hydraulics

**Fabricate a Hydraulic Line on an Item of Construction Equipment.**

**091-62B-2401**

**Conditions:** Given an item of construction equipment with an unserviceable hydraulic line removed from the equipment, a general mechanic's tool kit, a hydraulic systems test and repair unit (HSTRU), personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance and inspection work sheet or an equipment maintenance request, and a pen.

**Standards:** Fabricate the hydraulic line capable of maintaining the required system pressure without damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment maintenance and inspection work sheet or the equipment maintenance request.
2. Inspect and verify the condition of the equipment.
3. Fabricate the hydraulic line.
  - a. Select the proper hose for fabrication.
  - b. Mark the length of the new hose.

**WARNING: GOGGLES AND WORK GLOVES MUST BE WORN WHILE OPERATING A POWER SAW ASSEMBLY IN ORDER TO AVOID A POSSIBLE SERIOUS EYE OR HAND INJURY.**

**WARNING: DO NOT TOUCH THE HOSE-CUTTING POWER SAW BLADE UNTIL IT HAS COME TO A COMPLETE STOP OR A SERIOUS INJURY COULD RESULT.**

- c. Cut the new hose to the correct length.
  - d. Select the correct size and type of couplings to be installed on the hose ends.
  - e. Install the couplings correctly on the hose ends.
  - f. Clean and pressure-test the fabricated hose.
4. Annotate the equipment maintenance and inspection work sheet or the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance and inspection work sheet or the maintenance request.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Fabricated the hydraulic line.	—	—
4. Tested the line and passed the pressure test.	—	—
5. Annotated the equipment maintenance and inspection work sheet or the maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
DA FORM 5990-E  
TM 5-2350-262-20-2  
TM 9-4940-468-13

**Related**

AR 750-1  
DA PAM 738-750

**Repair a Hydraulic Relief Valve on an Item of Construction Equipment  
091-62B-2402**

**Conditions:** Given an item of construction equipment with a faulty hydraulic relief valve removed from the equipment, all accessories needed to repair the relief valve, shop equipment (general-purpose repair), general-mechanics tool kit, personal protective equipment (PPE), the applicable technical manual, an equipment maintenance request, and a pen.

**Standards:** Repair the hydraulic relief valve without damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment maintenance request.
2. Inspect and verify the condition of the equipment.  
**WARNING: FUEL AND OIL ARE SLIPPERY AND CAN CAUSE FALLS. TO AVOID INJURY, WIPE UP SPILLED FUEL OR OIL WITH RAGS.**
3. Disassemble the faulty hydraulic relief valve.
  - a. Remove the two packings and backup ring and discard the packings.
  - b. Use two wrenches to remove the plug and packing, and discard the packing.
  - c. Remove disc(s) and shim(s) if any are present.
  - d. Remove the spring holder, the two packings, and the spring. Discard the packings.
  - e. Remove the two valve seats from the valve body.
4. Assemble the hydraulic relief valve.
  - a. Apply a coat of lubricating oil to the packings before assembly.
  - b. Install two valve seats in the valve body.
  - c. Install the spring, two new packings, and the spring holder.
  - d. Install same amount of shim(s) and disc(s) if they were removed in step 3.
  - e. Use two wrenches to install the plug and new packing.
  - f. Install the backup ring and two new packings.
5. Perform a system check.
  - a. Return the equipment to service.
  - b. Check the system for leaks and proper operation.
6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Disassembled the faulty hydraulic relief valve.	—	—
4. Assembled the hydraulic relief valve.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance request.	—	—



**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5990-E  
TM 5-2420-224-34

**Related**

AR 750-1  
DA PAM 738-750

**Repair a Hydraulic Pump on an Item of Construction Equipment**  
**091-62B-2403**

**Conditions:** Given an item of construction equipment with a faulty hydraulic pump removed from the equipment, all parts needed to repair the hydraulic pump, a general mechanics tool kit, shop equipment (general-purpose repair), hydraulic systems test and repair unit (HSTRU), personal protective equipment (PPE), the applicable technical manuals, an equipment maintenance request, and a pen.

**Standards:** Repair the hydraulic pump without damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment maintenance request.
2. Inspect and verify the condition of the equipment.
3. Repair the hydraulic pump.

**CAUTION: PARTS MAY BE HEAVY; OBTAIN ASSISTANCE IF NECESSARY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH AND DAMAGE TO PARTS.**

- a. Disassemble the pump: Remove the two nuts, two washers, two screws, and the cover from the front of the pump.
- b. Remove the retaining ring, the seal ring, two retainer springs, and the seal from the cover.
- c. Discard the seal ring and the seal.
- d. Remove the plate and the O-ring from the housing. Discard the O-ring.
- e. Remove the segment carrier from the housing.
- f. Remove the gear, the sealing segment, two segment springs, and two sealing rolls from the segment carrier. Discard the sealing segment, segment springs, and sealing rolls.
- g. Inspect the pump. If any parts of the pump that are not found in the parts kits are damaged, replace the pump.
- h. Assemble the pump.

**NOTE:** Apply a coat of lubricating oil to the O-ring and seals before assembly.

- (1) Install the new seal.
- (2) Install two retainer springs.
- (3) Install the plate in the housing
- i. Install the gear ring.
- j. Install the pin with narrow chamfer toward the outside of the housing.
- k. Install two new sealing rolls, two new segment springs, and a new sealing segment on the segment carrier.
- l. Install the gear and the segment carrier in the housing.
- m. Install a new O-ring and plate in the housing.
- n. Install the new seal, two retainer springs, new seal ring, and retaining ring in the cover.
- o. Install the cover, two screws, two washers, and two nuts.

4. Perform a system check.
  - a. Return the equipment to service.
  - b. Check the system for leaks and proper operation.
5. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Repaired the hydraulic pump.	—	—
4. Performed a system check.	—	—
5. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5990-E
- TM 5-2420-224-20-1
- TM 5-2420-224-20-2
- TM 5-2420-224-34
- TM 9-4940-468-13

**Related**

- AR 750-1
- DA PAM 738-750

## Repair a Hydraulic Control Valve on an Item of Construction Equipment

091-62B-2404

**Conditions:** an item of construction equipment with a faulty hydraulic control valve removed from the equipment; all of the parts needed in order to repair the control valve; a general mechanic's tool kit; shop equipment (general-purpose repair); test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manuals (TMs); an equipment maintenance request; and a pen.

**Standards:** Repair the hydraulic control valve without causing damage to the equipment or injury to soldiers.

### Performance Steps

1. Receive and review the equipment maintenance request.
2. Inspect and verify the condition of the equipment.
3. Repair the hydraulic control valve.
  - a. Remove the five screws and lock washers, the cover plate, and the gasket from the housing of the shift control valve. Discard the lock washers and the gasket.

**WARNING: THE PLUG HOLDS THE SPRING UNDER COMPRESSION. REMOVE THE PLUG SLOWLY. FAILURE TO COMPLY MAY RESULT IN INJURY TO SOLDIERS.**

- b. Remove the plug, spring and plunger from the housing. Remove the packing from the plug and discard the packing.
- c. Remove the switch, shims and ball bearing from the body.
- d. Remove the pin that connects the link to the spool.
- e. Remove the key from the keyway of the plate and shaft assembly. Remove the plate and shaft assembly from the housing.
- f. Remove the cotter pin, washer, pin and link from the plate and shaft assembly. Discard the cotter pin.
- g. Remove the two screws, lock washers, shim, and the body from the housing. Discard the lock washers.
- h. Remove the packing and the spool from the body and discard the packing. Remove the pin and stop from the body. Remove the packing from the stop and discard the packing.
- i. Remove the seal and the two bearings from the housing and discard the seal.
- j. Clean all of the components with dry cleaning solvent and blow-dry all components except the bearings with compressed air. Varnish and gum deposits may be removed by brushing them with a soft-bristle brush. Use a soft copper or brass wire to clean the oil passages and flush the passages with oil after cleaning them.

**DANGER: DRY CLEANING SOLVENT IS FLAMMABLE AND WILL NOT BE USED NEAR SPARKS OR OPEN FLAMES. A FIRE EXTINGUISHER WILL BE KEPT NEARBY WHEN THE SOLVENT IS USED. USE THE SOLVENT ONLY IN WELL-VENTILATED PLACES. PROLONGED EXPOSURE TO THE SOLVENT CAN CAUSE SKIN IRRITATION. FAILURE TO COMPLY MAY RESULT IN INJURY TO SOLDIERS AND DAMAGE TO EQUIPMENT.**

**WARNING: COMPRESSED AIR CAN CAUSE INJURY. DO NOT POINT COMPRESSED AIR HOSES AT ANYONE. DO NOT USE MORE THAN 30 POUNDS PER SQUARE INCH (PSI). ALWAYS WEAR GOGGLES.**

- k. Inspect the housing, body, cover plate and bearings for creaks or damage and stripped threads.
- l. Install two bearings and a seal on the housing and install packing on the stop.
- m. Install the stop on the body and secure it with a pin.

**NOTE:** Ensure that the spool has six holes on the right side and five holes on the left side when installing.

- n. Insert the spool on the bore of the body and install the packing on the body. Install the body and the shim on the housing with two lock washers and screws.

**Performance Steps**

- o. Install the link on the plate and shaft assembly with a pin, washer, and cotter pin. Install the plate and shaft assembly on the housing. Install the key in the keyway on the plate and shaft assembly.
  - p. Rotate the plate and shaft assembly in order to place the link in the spool and secure the link on the spool with a pin.
  - q. Install the plunger on the housing, ensuring that the notched part of the plate and shaft assembly sits in the slot of the plunger.
  - r. Install the packing on the plug and install the spring and the plug on the housing.
  - s. Rotate the plate and shaft assembly until the plunger rests in the third notch from the end opposite link (neutral position). Check to see that the notch in the spool is centered in the switch mounting port.
  - t. Install a ball bearing, shims, and a switch on the body.
  - u. Connect the probes of the multimeter to the leads of the switch. If the multimeter does not indicate continuity, add one or more shims until continuity is indicated.
  - v. Rotate the plate and shaft assembly so that the plunger rests in the slot next to the neutral position. If the multimeter still indicates continuity, remove one or more shims until continuity is not indicated.
  - w. Install the gasket and cover plate on the housing with five lock washers and screws.
4. Perform a system check.
    - a. Return the equipment to operating condition.
    - b. Check the system for proper operation.
  5. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<u><b>GO</b></u>	<u><b>NO GO</b></u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Repaired the hydraulic control valve.	—	—
4. Performed a system check.	—	—
5. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5990-E  
TM 5-2350-262-34

**Related**

AR 750-1  
DA PAM 738-750

**Troubleshoot a Primary Hydraulic System on an Item of Construction Equipment**  
**091-62B-2405**

**Conditions:** Given an item of construction equipment with a primary hydraulic system fault; a general mechanic's tool kit; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manual (TM), an equipment maintenance and inspection work sheet; and a pen.

**Standards:** Locate the fault, deficiency, or shortcoming by troubleshooting the primary hydraulic system without causing damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment maintenance and inspection work sheet or the maintenance request.

2. Inspect and verify the condition of the equipment.

**DANGER: HYDRAULIC FLUID IS FLAMMABLE AND SLIPPERY. KEEP OPEN FLAMES AND SPARKS OUT OF THE AREA WHILE WORKING ON THE HYDRAULIC SYSTEM. WIPE UP SPILLS IMMEDIATELY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

3. Perform troubleshooting procedures for pressure loss in the high-pressure hydraulic oil system. **DANGER: EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS, AND THE POSSIBILITY OF INJURY OR DEATH BY ELECTRICAL SHOCKS OR BEING CRUSHED BY EQUIPMENT ARE RISKS DURING THESE PROCEDURES. PETROLEUM, LUBRICANTS, AND OILS (POL) DIESEL FUEL ARE FLAMMABLE. KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA.**

**CAUTION: DIESEL FUEL AND POL ARE SLIPPERY. WIPE UP SPILLS IMMEDIATELY.**

- a. Check the dipstick to be sure that the oil level is normal.
- b. Use the engine diagnostic switch to check for active diagnostic flash codes during engine cranking.
- c. After the high-pressure hydraulic oil system is opened or worked on, there may be air remaining in the system. Crank the engine for 30 seconds at a time at least five times in order to purge the air. Allow the starter to cool off for two minutes between each cranking period.
- d. Check to see that oil is reaching the hydraulic pump inlet. Slightly loosen the oil supply line from the engine oil gallery on the left side of the engine block to see if oil leaks out.
- e. Check the engine oil pressure with a gauge installed in the oil gallery on the left side of the engine block. The oil pressure should be about 4 to 8 pounds per square inch (psi) during cranking. If no oil pressure registers, check for oil contamination or dilution by water or fuel (dilution will lower oil pressure), and measure the oil pickup performed by the engine oil pump.

4. Annotate the equipment maintenance and inspection work sheet or the maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, TMDE, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance and inspection work sheet or the maintenance request.	—	—
2. Inspected and verified the condition of the equipment.	—	—

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
3. Performed troubleshooting procedures for pressure loss in the high-pressure hydraulic oil system.	—	—
4. Annotated the equipment maintenance and inspection work sheet or the maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-2430-200-24

**Related**

AR 750-1  
DA FORM 5990-E  
DA PAM 738-750

**Troubleshoot a Hydraulic Suspension System on an Item of Construction Equipment  
091-62B-2406**

**Conditions:** Given an item of construction equipment with a hydraulic suspension system fault; a general mechanic's tool kit; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manual (TM), an equipment maintenance and inspection work sheet or an equipment maintenance request, and a pen.

**Standards:** Locate the fault, deficiency, or shortcoming by troubleshooting the hydraulic suspension system without causing damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the equipment maintenance and inspection work sheet or the equipment maintenance request.
2. Inspect and verify the condition of the equipment.
3. Troubleshoot the hydraulic suspension system of a machine (not kneeled) that is not level while operating on level ground .

**NOTE:** Raise and lower the machine at least one time, using the kneeling function, to make sure the machine is fully raised before beginning the troubleshooting procedure.

- a. Inspect all of the suspension cylinders for leaks. Repair or replace any damaged cylinders.
- b. Operate the machine in reverse on level ground, or operate the machine in self-deploy mode on level ground in order to allow the suspension to equalize if the suspension is locked in an awkward position after operating it in reverse (in earthmoving mode).
- c. Perform the following steps if the manual locking valve in closed position on one side of machine:
  - (1) Open the locking valve on the low side of the machine.
  - (2) Put the machine in self-deploy mode.
  - (3) Kneel and raise the machine again.
- d. Check and adjust the suspension charge pressures if the suspension is charged incorrectly.
- e. Perform the solenoid test procedure on the solenoid corresponding to the low side of the machine if one kneeling solenoid valve has failed.
- f. Perform the following steps if the swing arm is damaged:
  - (1) Inspect the front and rear swing arms visually on the side of the machine that is too low.
  - (2) Check to see if the front and rear idler wheels are vertical when the machine is parked on a level surface.
  - (3) Replace the swing arm if an idler wheel leans visibly in or out.

4. Annotate the equipment maintenance and inspection work sheet or the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, TMDE, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance and inspection work sheet or the equipment maintenance request.	___	___
2. Inspected and verified the condition of the equipment.	___	___



**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
3. Performed troubleshooting procedures on the hydraulic suspension system.	—	—
4. Annotated the equipment maintenance and inspection work sheet or the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

DA FORM 5990-E

TM 5-2430-200-24

**Related**

AR 750-1

DA PAM 738-750

## Troubleshoot a Hydraulic Drive System on a Item of Construction Equipment

### 091-62B-2407

**Conditions:** Given an item of construction equipment with a hydraulic drive system fault, a general mechanic's tool kit, test measurement and diagnostic equipment (TMDE), personal protective equipment (PPE), the applicable technical manual, an equipment maintenance and inspection worksheet or an equipment maintenance request, and a pen.

**Standards:** Locate the fault, deficiency or shortcoming by troubleshooting the hydraulic drive system without damage to the equipment or injury to soldiers.

#### Performance Steps

1. Receive and review the equipment maintenance and inspection worksheet or an equipment maintenance request.

2. Inspect and verify the condition of the equipment.

DANGER: EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS, AND THE POSSIBILITY OF INJURY OR DEATH BY ELECTRICAL SHOCKS OR BEING CRUSHED BY EQUIPMENT ARE RISKS DURING THESE PROCEDURES. PETROLEUM, LUBRICANTS, AND OILS (POL) DIESEL FUEL ARE FLAMMABLE. KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA.

CAUTION: DIESEL FUEL AND POL ARE SLIPPERY. WIPE UP SPILLS IMMEDIATELY.

3. Perform troubleshooting procedures on the hydraulic suspension system for the track lacking mobility in either direction.

a. Perform pilot circuit test.

- (1) Inspect for leaks at the pilot cap.
- (2) Check the pilot controller hose.
- (3) Check for stuck spools or stuck check valves.
- (4) Manually move the spools in order to check for sticking.

b. Perform a crossover relief valve test.

NOTE: If a laptop computer is available perform step 3.b.(1). If a laptop computer is not available, begin with step 3.b.(2) and use the digital pressure and temperature analyzer, and transducers or gauges.

- (1) Connect the laptop computer.
  - (a) Start the engine.
  - (b) Select "3 Front pump delivery pressure" and "4 Rear pump delivery pressure" from the Monitor Data menu.
- (2) Stop the engine.
- (3) Loosen vent plug to release the air pressure in hydraulic oil tank. Install an adapter and a male quick coupler in order to test the port on the front pump and on the rear pump. Connect the analyzer and transducers or gauges.
- (4) Install the temperature probe on the hydraulic tank-to-pump suction line.
- (5) Raise and lower the boom in order to pressurize the hydraulic oil tank.
- (6) Heat the hydraulic oil to the specified temperature.

Oil-Specification  
Temperature  $120 \pm 10^\circ$  Fahrenheit
- (7) Install pins or a round bar stock between the sprockets and the track frame in order to stall both of the propel motors.
- (8) Run the machine at specifications with the engine in:

Standard Mode-Specification--Speed Fast Idle.  
Work Mode Selector-Specification--Position Dig Mode.  
E Mode Switch-Specification--Position Off.  
HP Mode Switch-Specification--Position Off.  
Auto-Idle Switch-Specification--Position Off.

**Performance Steps**

NOTE: Actuating the power boost function increases the system relief pressure enough to check and adjust the propel motor crossover relief valves.

- (9) Slowly push the propel pedal, for propel motor being stalled, to full travel in the direction for the crossover relief valve being checked. Push the power boost button on the right control lever. Record the pressure reading.  
 Crossover Relief Valve-Specification  
 (343.2 ± 19.6 manifold barometric pressure [bar])  
 (4975 ± 285 pounds per square inch [psi])  
 Pressure 430 psi (29.4 bar) approximate change per 1/4 turn of adjusting screw
  - (10) Adjust the crossover relief valves as needed.
    - ( a ) Turn the adjusting screw in to increase the pressure setting
    - ( b ) Turn the adjusting screw out to decrease pressure.
  - (11) Repeat the procedure for the other crossover relief valves.
4. Annotate the equipment maintenance and inspection worksheet or an equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, TMDE, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance and inspection worksheet or maintenance request.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Performed troubleshooting procedures on the hydraulic suspension system for the track lacking mobility in either direction.	—	—
4. Annotated the equipment maintenance and inspection worksheet or maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5988-E
- DA FORM 5990-E
- TM 5-3805-280-24-2

**Related**

- AR 750-1
- DA PAM 738-750

## Troubleshoot a Hydraulic Steering System on an Item of Construction Equipment 091-62B-2408

**Conditions:** Given an item of construction equipment with a hydraulic steering system fault, a general mechanics tool kit, shop equipment (general-purpose repair), personal protective equipment (PPE), the applicable technical manuals, an equipment maintenance and inspection worksheet or an equipment maintenance request, and a pen.

**Standards:** Locate the fault, deficiency, or shortcoming by troubleshooting the hydraulic steering system without damage to the equipment or injury to soldiers.

### Performance Steps

1. Receive and review the equipment maintenance and inspection worksheet or the equipment maintenance request.

2. Inspect and verify the condition of the equipment.

**DANGER: HYDRAULIC FLUID IS FLAMMABLE AND SLIPPERY. KEEP OPEN FLAMES AND SPARKS OUT OF THE AREA WHILE YOU ARE WORKING ON THE HYDRAULIC SYSTEM. WIPE UP SPILLS IMMEDIATELY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.**

3. Perform troubleshooting procedures on the hydraulic steering system when the vehicle steers only to one side.

- a. Disconnect the final drives. Shift the transmission to neutral and turn the driveshaft. Observe the steer unit output coupling on the affected side.
- b. If the coupling does not turn, check the steer output coupling screw. If the screw is broken, replace the screw. If the screw is not broken, replace the steer unit.
- c. If the coupling turns, disconnect the track on the affected side. Clear the track from the drive sprocket and rotate the drive sprocket. If the sprocket will not rotate, replace the final drive. If the sprocket rotates, check the screw in the final drive sprocket. Tighten or replace the screw.

4. Annotate the equipment maintenance and inspection worksheet or the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

### Performance Measures

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance and inspection worksheet or the equipment maintenance request.	—	—
2. Inspected and verified the condition of the equipment.	—	—
3. Performed troubleshooting procedures on the hydraulic steering system for the malfunction: vehicle steers only to one side.	—	—
4. Annotated the equipment maintenance and inspection worksheet or the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
DA FORM 5990-E  
TM 5-2350-262-20-2  
TM 5-2350-262-34

**Related**

AR 750-1  
DA PAM 738-750

Subject Area 5: Power Trains

**Replace a Torque Converter on an Item of Construction Equipment.**

**091-62B-2501**

**Conditions:** Given an item of construction equipment with an unserviceable torque converter (all assemblies removed from the equipment to gain access to the torque converter), a serviceable torque converter, a general mechanic's tool kit, shop equipment (general-purpose), lifting equipment, special tools, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Replace the torque converter without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review the equipment maintenance request.

2. Inspect the equipment and verify its condition.

**WARNING: UNLESS OTHERWISE SPECIFIED, MAINTENANCE SHOULD BE PERFORMED WITH THE MACHINE PARKED ON LEVEL GROUND, THE BLADE RESTING ON THE GROUND, THE TRANSMISSION CONTROL LEVER IN NEUTRAL, THE PARKING BRAKE ENGAGED, THE ENGINE STOPPED, AND THE ELECTRICAL DISCONNECT SWITCH IN THE OFF POSITION. CHIPS OR OTHER DEBRIS CAN FLY OFF OBJECTS WHEN STRUCK. MAKE SURE NO ONE CAN BE INJURED BY FLYING DEBRIS BEFORE STRIKING ANY OBJECT.**

3. Remove the unserviceable torque converter.

- a. Remove the two bolts with washers and the implement pump.
- b. Remove the two bolts with washers and the fan pump.
- c. Remove the bolt and bracket from the top of the torque converter.
- d. Install the tooling and support the torque converter with a hoist. The weight of the torque converter is approximately 1050 pounds.
- e. Remove the 12 bolts with washers and the torque converter.

4. Install the serviceable torque converter.

- a. Install the tooling and support the torque converter with a hoist. The weight of the torque converter is approximately 1050 pounds.
- b. Place the torque converter in position and install the 12 bolts with washers.
- c. Remove the hoist and the tooling. Install the bolt and bracket on the top of the torque converter.
- d. Install the fan pump with the two bolts and washers.
- e. Install the implement pump with the two bolts and washers.

5. Perform a system check.

- a. Install all the assemblies removed from the equipment.
- b. Return the equipment to service.
- c. Check the system for proper operation.

6. Annotate the equipment maintenance request

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable torque converter.	—	—
4. Installed the serviceable torque converter.	—	—
5. Performed a system check.	—	—
6. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5990-E  
TM 5-2430-200-24

**Related**

AR 750-1  
DA PAM 738-750

## Replace a Planetary Drive on an Item of Construction Equipment

091-62B-2502

**Conditions:** Given an item of construction equipment with an unserviceable planetary drive (all accessories removed to gain access to the planetary drive), a serviceable planetary drive, a general mechanic's tool kit, a number 1 tool kit (common organizational maintenance), a number 2 tool kit (common organizational maintenance), chain hoists with straps, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Replace the planetary drive without causing damage to the equipment or injury to personnel.

### Performance Steps

1. Receive and review the equipment maintenance request.
2. Inspect the equipment and verify its condition.
3. Remove the unserviceable planetary drive.

**DANGER:** BEFORE PERFORMING THE FOLLOWING STEPS, BE SURE THAT THE TRANSPORT/SERVICE LINK IS IN THE ENGAGED POSITION AND THE CHASSIS IS SECURELY SUPPORTED BY JACK STANDS. FAILURE TO DO SO COULD CAUSE THE CHASSIS TO FALL ON YOU CAUSING SERIOUS INJURY OR DEATH.

**WARNING:** WHEN USING A CHAIN HOIST TO REMOVE OR INSTALL PARTS, BE SURE THE CHAIN HOIST IS SECURELY FASTENED TO THE PART AND THAT ALL THE SLACK IN THE CHAIN IS TAKEN UP. FAILURE TO DO SO COULD CAUSE THE PART TO FALL ON YOU CAUSING SERIOUS INJURY. IF YOU ARE INJURED BY FALLING EQUIPMENT, OBTAIN MEDICAL AID IMMEDIATELY.

- a. Put match marks on the planetary gear spider and the wheel hub using paint to aid the installation.
  - b. Remove the 30 cap screws and washers.
  - c. Separate the planetary gear spider from the wheel hub using the two pry bars. Remove the planetary gear spider.
  - d. Disconnect the brake line from the brake caliper and remove the brake caliper.
  - e. Remove the axle shaft with the sun gear, the thrust washer, and the ring gear.
  - f. Connect the chain hoist equipped with nylon straps to the wheel hub.
  - g. Remove the two socket head screws securing the lock plate to the ring gear hub and remove the lock plate.
  - h. Remove the wheel bearing nut using the wheel bearing nut tool.
  - i. Remove the ring gear hub.
  - j. Remove the wheel hub and associated parts from the front axle using the chain hoist.
4. Install the serviceable planetary drive.
    - a. Apply gear oil to the front axle wheel spindle.
    - b. Pack the area between the oil seal lips with grease.
    - c. Connect the chain hoist equipped with nylon straps to the wheel hub.
    - d. Install the wheel hub and the brake disk on the front axle wheel spindle.
    - e. Install the ring gear hub.
    - f. Install the wheel bearing nut using the wheel bearing nut tool.
    - g. Disconnect the chain hoist from the wheel hub.
    - h. Rotate the wheel hub clockwise and counterclockwise to ensure that the cones and the rollers are fully seated. Tighten the wheel bearing nut using the wheel bearing nut tool to 400 foot-pounds while rotating the wheel hub. Then loosen the nut 1/4 turn.
    - i. Wrap a piece of cord several times around the wheel hub. Connect the indicating dial scale to the free end of the cord. Pull the indicating dial scale horizontally and smoothly away from the wheel hub.



**Performance Steps**

- j. When the indicating dial scale indication remains approximately constant, note and record the indication.
  - k. If the measurement recorded above is 8 to 15 pounds, adjust the wheel bearing nut using the wheel bearing nut tool until one point of the nut is centered between two threaded holes in the ring gear hub. Check that the indicating dial scale indicates 8 to 15 pounds.
  - l. If the measurement exceeds 15 pounds, loosen the wheel bearing nut using the wheel bearing nut tool. If the measurement is less than 8 pounds, tighten the wheel bearing nut using the wheel bearing nut tool.
  - m. Repeat steps i through k above.
  - n. Install the lock plate and the two socket head screws. Tighten the socket head screws securely.
  - o. Install the ring gear and the new thrust washer.
  - p. Install the axle shaft with the sun gear, rotating the axle shaft until the splines mesh with the differential assembly gears.
  - q. Apply a bead of air drying adhesive to the wheel hub mating surface. Position the planetary gear spider on the wheel hub. Ensure that the match marks are aligned.
  - r. Install the 30 washers and cap screws. Tighten the cap screws to 90 to 120 foot-pounds.
  - s. Install the brake caliper and connect the brake line to the brake caliper.
5. Perform a system check.
- a. Return the equipment to service.
  - b. Check the system for leaks and proper operation.
6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Removed the unserviceable planetary drive.	—	—
4. Installed the serviceable planetary drive.	—	—
5. Performed a system check	—	—
6. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
 DA FORM 5990-E  
 TM 5-3805-262-34

**Related**  
 AR 750-1  
 DA PAM 738-750

## Repair a Transmission on an Item of Construction Equipment

### 091-62B-2503

**Conditions:** Given an item of construction equipment with a transmission fault (transmission drained of oil and removed from the equipment), all the accessories needed to repair the transmission fault, shop equipment (general-purpose repair), lifting equipment, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Repair the transmission without causing injury to any personnel and damage to the equipment.

#### Performance Steps

1. Receive and review the equipment maintenance request.

2. Inspect the equipment and verify its condition.

**DANGER: PERFORMANCE OF THIS TASK CAN RESULT IN EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS. THERE IS A POSSIBILITY OF ELECTRICAL SHOCK AND INJURY OR DEATH BY BEING CRUSHED BY EQUIPMENT. PETROLEUM, OILS, AND LUBRICANTS (POL), AND DIESEL FUEL CAN BE FLAMMABLE AND ARE SLIPPERY. KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY.**

3. Repair the transmission.

**DANGER: PARTS MAY BE HEAVY. OBTAIN ASSISTANCE IF NECESSARY. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH AND DAMAGE TO PARTS.**

a. Disassemble the transmission to obtain access to the clutch discs.

- (1) Remove the sleeve from the transmission case. Remove and discard seals. Remove the sleeve. Remove and discard two seals.
- (2) Remove the 14 cap screws and lock washers and the cover using a wrench.
- (3) Remove and discard the gasket. Remove the sleeve from the selector valve using snap ring pliers. Remove and discard the two seals from both ends of the sleeve.
- (4) Remove the transmission hydraulic control valves from the transmission.
- (5) Remove the six cap screws and lock washers that secure the transmission case to the input shaft bearing cage using a wrench. Remove the cap screws and lock washers, which secure the transmission case to the transfer gear case using a wrench. Remove the three nuts and lock washers that secure the transfer gear case to the transmission case using a wrench.
- (6) Install the two forged eyebolts in the transmission case bosses. Attach the lifting equipment and remove the transmission case.

**NOTE:** The transmission case weighs 140 pounds.

- (7) Remove the accessories to gain access to the bearing cage. Remove and discard the seal from the input shaft bearing cage. Remove the six cap screws that secure the input shaft bearing cage to the carrier. Install the two 3/8-16NC forged eyebolts or link brackets in the bearing-cage threaded bores. Remove the bearing cage and input shaft as a unit.

**NOTE:** The unit weighs 60 pounds.

- (8) Remove the seven long cap screws and washers that secure the clutch housings together. Mark near the two holes that have the short cap screws. Remove the two cap screws and washers using a wrench. Install the two clamps to retain the piston in the number 1 clutch housing.
- (9) Install the two 1/2-13NC forged eyebolts or link brackets in the number 1 clutch housing. Attach the lifting equipment and remove the clutch housing and piston as a unit. Turn the number 1 clutch housing over. Remove the clamps. Remove the piston using two screwdrivers. Remove and discard the two rings from the number 1 piston and clutch housing.

**NOTE:** The unit weighs 55 pounds.

**Performance Steps**

- (10) Remove the five pins and the ten springs. Remove the ring gear, the four clutch discs, and the three clutch plates. Install the two 1/2-inch eyebolts to remove the plate. Install the two 3/8-16NC forged eyebolts or link brackets in the number 1 carrier. Attach the lifting equipment and remove the carrier.

NOTE: The carrier weighs 70 pounds.

- (11) Use the lifting equipment to remove and disassemble the remaining clutch housings and the carriers.
- (12) Reassemble the transmission with the new clutch discs.

- 4. Perform a system check.
  - a. Reinstall the transmission and all the accessories removed from the equipment.
  - b. Return the equipment to service.
  - c. Check the equipment for proper operation.
- 5. Annotate the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	_____	_____
2. Inspected the equipment and verified its condition.	_____	_____
3. Repaired the transmission.	_____	_____
4. Performed a system check.	_____	_____
5. Annotated the equipment maintenance request.	_____	_____

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
 DA FORM 5990-E  
 TM 5-2410-237-34

**Related**  
 AR 750-1  
 DA PAM 738-750

## Repair a Differential on an Item of Construction Equipment

091-62B-2504

**Conditions:** Given an item of construction equipment with a faulty differential (differential removed from equipment), shop equipment (general-purpose), lifting equipment, special tools, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Repair the differential without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review the equipment maintenance request.

2. Inspect the equipment and verify its condition.

**DANGER:** PERFORMANCE OF THIS TASK CAN RESULT IN EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS. THERE IS A POSSIBILITY OF ELECTRICAL SHOCK AND INJURY OR DEATH BY BEING CRUSHED BY EQUIPMENT. PETROLEUM, OILS, AND LUBRICANTS (POL) AND DIESEL FUEL CAN BE FLAMMABLE AND ARE SLIPPERY. KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY.

3. Repair the differential.

**DANGER:** PARTS MAY BE HEAVY. OBTAIN ASSISTANCE IF NECESSARY. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH AND DAMAGE TO PARTS.

a. Disassemble the differential by disconnecting the airline at the fittings, removing the clamp, removing the airline, and removing the tube.

b. Fasten a hoist to the differential lock. Remove the four bolts and remove the differential lock.

**NOTE:** The differential weighs 85 pounds.

c. Remove the bolts and then remove the cover from the differential lock. Remove the springs. Turn the differential lock over and remove the snap ring.

d. Remove the jaw, the washers, and the spacer from the cylinder assembly. Remove the piston from the cylinder with the tooling. Remove and inspect the nonstick ring and the O-ring seals. Make the replacements if necessary.

e. Cut the wire from all the bolts. Remove the bolts, the jaw, the remaining bolt, and the lock. Remove the adjusting ring. Do the same for the rear adjusting ring. Remove the bearing cap nuts and caps. Remove the two dowels from the bearing cages.

f. Fasten a hoist to the differential and the ring gear unit and remove it from the housing. Put the differential and the ring gear on blocks with the ring gear teeth down. Remove the bearing cages and cups.

**NOTE:** The differential and the ring gear weigh 270 pounds.

g. The carrier bearing will be damaged if it is removed. If the bearing has to be removed, use the tooling.

h. Remove the differential case nuts. Fasten a hoist to and remove half of the differential, the case, and the ring gear. Remove the nuts and make a separation between the ring gear and the differential case half.

**NOTE:** This weight 135 pounds.

i. Remove the thrust plate and the side gear. Remove the differential pinion gears as an assembly. Remove the pinion gears, the washers, and the bearings from the spider. Remove the side gear from the housing. Remove the thrust plate from the housing. Remove the bearing cone from the differential case with the tooling.

j. Turn the differential housing over with the input end up. Remove the bolts and lock tabs from the retainer. Install the two 1/2"-13 NC forcing screws into the retainer and remove it from the pinion bearing. Remove and inspect the O-ring seal. Make a replacement if necessary. Remove the shims.

### Performance Steps

- k. Remove the outer bearing cup from the retainer with the tooling. Remove the seal from the retainer with the tooling. Remove the pinion assembly. Remove the bearing cup from the carrier housing. Remove the seal ring from the pinion assembly. Remove the large pinion bearing cone with the tooling. Remove the smaller pinion bearing cone with the tooling. Remove the air hose assembly.
  - l. Assemble the differential by installing the air hose assembly on the carrier housing, lowering the temperature of the pinion bearing cup, and installing the cup into the carrier housing with the tooling.
  - m. Heat the pinion bearing cone to a temperature of 275 degrees Fahrenheit and install them on the pinion. Install the seal ring on the pinion. Install the pinion assembly into the carrier housing. Lower the temperature of the bearing race for the retainer. Install the race in the retainer. Install a new O-ring seal on the retainer. Install the shims. Install the retainer and the bolts that hold it. Do not install the seal in the retainer until after the preload adjustment has been made.
  - n. Insert shims, as necessary, behind the retainer to put enough preload on the pinion bearing so the torque needed to turn the pinion is  $20 \pm 5$  pound-inches. Turn the pinion slowly while the adjustment is made using the tooling. After the adjustment is made, remove the retainer and install the seal in the retainer.
  - o. Turn the differential carrier housing over so the output end is up. Heat the bearing to a temperature of 275 degrees Fahrenheit and install it on the case. Install the thrust plate with the groove (slot) in alignment with the pin.
  - p. Install the bottom side gear on the thrust plate. Assemble the bearings, the gears, and the washers on the spider. Install the pinion gears into the differential case. Put the grooves (slots) in the thrust washers in alignment with the pins in the case.
  - q. Install the topside gear. Put grease on the thrust plate and install it in the flange half of the differential case. Put the grooves (slots) in the thrust plate in alignment. Install the ring gear on the differential case half. Install the nuts and tighten them to a torque of  $\pm 10$  foot-pounds. If the bearing cone was removed during the disassembly, heat it to a maximum temperature of 275 degrees Fahrenheit and install it on the differential case half.
  - r. Install the ring gear and the differential case half on the other differential half with a hoist. Install the nuts and tighten them to a torque of  $220 \pm 10$  foot-pounds. Install the bearing cups, the bearing cages, and the adjusting rings on the differential assembly. Fasten a hoist to the differential assembly and install it on the differential carrier housing. Install the dowel pins in the bearing cages.
  - s. Install the bearing caps so the dowel pins are in alignment with the holes in the bearing caps. Install the nuts on the studs. Tighten the nuts to a torque of  $640 \pm 80$  foot-pounds. If the replacement of the studs is necessary, tighten them to a torque of  $240 \pm 20$  foot-pounds.
  - t. Put the carrier in a position so the centerline for the axle is vertical and the ring gear is toward the top. Install the special tool and measure the gear clearance (backlash) between the ring gear and the pinion gear. Turn both the adjusting rings the same amount and in the same direction until the gear clearance (backlash) is  $.014 \pm 0.005$  inches.
  - u. Use the special tool and put the preload on the carrier bearings by rotating the upper adjusting ring to increase the indication of the dimension by  $0.007 \pm 0.002$  inches. Check the ring gear to the pinion gear clearance (backlash) and make an adjustment, if necessary.
  - v. Put the differential carrier housing in its original position. Install the locks for the adjusting rings. Install the bolts and the lock wires.
  - w. Install the jaw with the lock bolts and lockwire. Install the nonstick ring and the new O-ring seals on the piston. Install the cylinder on the piston. Install the spacer, the washers, and the jaw in the cylinder. Install the retaining ring on the jaw. Turn the differential lock assembly over and install the springs. Install the cover and the bolts.
  - x. Install the air line on the differential lock assembly. Fasten a hoist to the assembly and install it on the differential. Install the bolts that hold the differential lock assembly. Connect the air line to its fittings. Install the tube, the bracket, the two bolts, and the lock.
4. Perform a system check.

**Performance Steps**

- a. Return the equipment to service.
- b. Start the equipment and test drive it in all speeds.

5. Annotate the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with all the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Repaired the differential.	—	—
4. Performed a system check.	—	—
5. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5990-E
- TM 5-3805-248-14&P-1
- TM 5-3805-248-14&P-2

**Related**

## Repair a Final Drive on an Item of Construction Equipment

**091-62B-2505**

**Conditions:** Given an item of construction equipment with a final drive fault (all accessories removed for access to the final drive fault), a final drive drained of oil, all the parts needed to repair the final drive fault, shop equipment (general-purpose), a tool kit (general mechanics), personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Repair the final drive without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review an equipment maintenance request.

2. Inspect the equipment and verify its condition.

**DANGER: PARTS MAY BE HEAVY. OBTAIN ASSISTANCE IF NECESSARY. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH AND DAMAGE TO THE PARTS.**

3. Repair the final drive.

- a. Replace the leaking seal on the final drive by removing the screw, the washer, and the packing from the sprocket shaft. Discard the packing.
- b. Remove the plug from the screw and discard the plug.
- c. Remove the sprocket shaft and the seal from the cover and discard the seal.
- d. Remove the five screws and washers and the retainer from the cover.
- e. Inspect the shims and replace them if they are damaged with the thinnest shim toward the bearing. If the shoulder washer and the shims come out with the retainer, note their positions.
- f. Remove the packing from the retainer and discard the packing.
- g. Clean the bores of the sprocket shaft and the retainer with the dry cleaning solvent.

**WARNING: DRY CLEANING SOLVENT IS FLAMMABLE. DO NOT USE IT NEAR SPARKS OR OPEN FLAMES. KEEP A FIRE EXTINGUISHER NEARBY WHEN SOLVENT IS USED. USE ONLY IN WELL-VENTILATED PLACES. PROLONGED EXPOSURE CAN CAUSE SKIN IRRITATION. FAILURE TO COMPLY MAY RESULT IN INJURY TO PERSONNEL AND DAMAGE TO THE EQUIPMENT.**

- h. If they were removed, install the shims and the shoulder washer on the cover.
- i. Coat the threads of the screws and the packing with the lubricating oil before installation. Install the packing on the retainer. Do not remove the plastic retainer from the seal assembly.
- j. Install the retainer on the cover with the five washers and screws. Tighten the screws to 32 to 34 foot-pounds.
- k. Clean the oil from the inner surface of the seal and install the seal on the sprocket shaft with the retaining lip facing inboard.
- l. Install the sprocket shaft on the cover.
- m. Install the plug on the screw. Do not allow the plug to protrude more .015 inches.
- n. Install the packing and the washer and screw on the sprocket shaft. Tighten the screw to 270 to 295 foot-pounds.

4. Perform a system check.

- a. Reinstall all of the accessories that were removed from the equipment.
- b. Service the final drive.
- c. Test drive the equipment to ensure proper operation.

5. Annotate the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all the equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Repaired the final drive.	—	—
4. Performed a system check.	—	—
5. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5990-E
- TM 5-2350-262-10
- TM 5-2350-262-20-2
- TM 5-2350-262-34

**Related**

- AR 750-1
- DA PAM 738-750



## Repair a Power Divider on an Item of Construction Equipment

**091-62B-2506**

**Conditions:** Given an item of construction equipment with a power divider fault, the power divider removed from the equipment, all the parts needed to repair the power divider, shop equipment (general-purpose), lifting equipment, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Repair the power divider without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review the equipment maintenance request.
2. Inspect the equipment and verify its condition.

**DANGER: PERFORMANCE OF THIS TASK CAN RESULT IN EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS. THERE IS A POSSIBILITY OF ELECTRICAL SHOCKS AND INJURY OR DEATH BY BEING CRUSHED BY EQUIPMENT. PETROLEUM, OILS, AND LUBRICANTS (POL), AND DIESEL FUEL CAN BE FLAMMABLE AND ARE SLIPPERY. KEEP OPEN FLAME AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY.**

3. Repair the power divider.

**DANGER: PARTS MAY BE HEAVY. OBTAIN ASSISTANCE IF NECESSARY. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH AND DAMAGE TO THE PARTS.**

- a. Disassemble the power divider by carefully placing the torque divider on a level surface with the housing facing upward. Carefully slide the output shaft from the torque divider housing.
- b. Remove the cap screw and washer from the output shaft using a wrench. Remove the flange from the shaft. Remove the ring from the output shaft. Heat the bearings and remove them from the output shaft, if necessary. Remove the seal from the torque converter housing. Discard the seal.
- c. Remove the eight cap screws and lock washers from the torque divider housing using a wrench. Install the two 3/8-16NC eyebolts in the torque divider housing and fasten the lifting equipment to the eyebolts. Lift the housing from the torque divider.

**NOTE:** The housing weighs 89 pounds.

- d. Remove the preformed packing from the torque divider. Discard the preformed packing. Remove two cap screws and washers 180 degrees apart from each other using a wrench. Tip the assembly and drain the oil into a drain pan. Remove the remaining 32 cap screws and washers from the torque divider using a wrench.
- e. Insert the two 3/8-16NC forcing screws into the wheel. Slowly turn the screws until the impeller separates from the housing. Remove the forcing screws and install the two 3/8-16NC eyebolts in the impeller and attach the lifting equipment to the eyebolts. Lift the impeller from the assembly. Turn the impeller over. Remove the eight cap screws that hold the stator assembly in position using a twelve-point wrench.

**NOTE:** The impeller weighs 54 pounds.

- f. Apply pressure evenly on both sides of the stator using the two pry bars until the stator slides off of the impeller. Turn the impeller wheel assembly over. Remove the carrier assembly by applying equal pressure with the two pry bars on both sides of the carrier assembly.
- g. Remove the ring that holds the bearing in position using a screwdriver. Turn the carrier assembly over. Remove the bearing using a hammer and a punch. Remove the seals and the oil director from the carrier assembly, if necessary. Discard the seals.
- h. Remove the eight cap screws that hold the gear to the impeller using a twelve-point wrench. Remove the gear. Remove the carrier from the impeller. Remove the ring that holds the bearing in position in the carrier using a screwdriver. Remove the bearing from the carrier with a suitable driver group.

**Performance Steps**

- i. Remove the ring using snap ring pliers. Remove the turbine and the spacer from the housing. Turn the housing over. Remove the two pins using a hammer and a punch. Compress the ring and remove the gear using long nose pliers. Remove the ring.
- j. Install the two 3/8-16NC forcing screws in the flange assembly. Separate the flange assembly from the housing. Remove the seal from the flange assembly. Discard the seal. Remove the two bearings from the flange with a suitable driver. Do not remove the carrier from the flange unless it will be replaced.
- k. Break the carrier using a chisel and remove it if the carrier is to be removed. Remove the six cap screws from the retainer using a wrench. Remove the retainer from the housing. Remove the ring that holds the bearing in position. Remove the bearing from the housing with a suitable driver. Bend the tab flat using a chisel and a hammer. Remove the cap screw, using a wrench.
- l. Slide the shaft from the housing and remove the washers, the gear, and the bearing. If removal of the thrust washers is deemed necessary, use a drill slide and carefully drill rivet heads from the rivets. Punch the rivets from the washers using a drill punch. Remove the gasket from the torque divider housing and discard it.
- m. Reassemble the power divider by placing the thrust washers into position and inserting the rivets. Flare the ends of the rivets. Place the bearing into the gear. Place the gear with the bearing and the two washers into the planetary housing, and insert the shaft. Insert the tab and the cap screw and tighten the cap screw using a wrench. Bend one end of the tab around the cap screw and one end around the housing using a hammer and a chisel.
- n. Maintain certain tolerances for the torque divider to operate properly. Before reassembly--
  - (1) Check the clearance between the turbine and the stator. Put the stator in position on the turbine, hold the stator against one side of the turbine, and use a feeler gauge to find the clearance between the stator and the turbine.
  - (2) Check the clearance across the diameters between the stator and the turbine. The clearance must be 0.012 to 0.018 inches.
  - (3) Check the clearance at four points on the turbine.
  - (4) Check the maximum permissible clearance (0.030 inches) across the diameters.
  - (5) Check to ensure that the running clearance is one-half of the clearance across the diameters between the stator and the turbine.
  - (6) Check to ensure that the running clearance is 0.0006 to 0.009 inches. The running clearance must be this measurement.
  - (7) Check to ensure that the maximum permissible running clearance is 0.015 inches.
- o. Check the clearance between the impeller and the stator as follows:
  - (1) Make a measurement of the diameter of the stator flange at four points on the stator using an outside diameter micrometer.
  - (2) Make a record of the lowest reading.
  - (3) Make a measurement of the inside diameter of the outer edge of the flange on the impeller at four points using an inside diameter micrometer.
  - (4) Make a record of the highest reading.
- p. The clearance across diameters between the impeller and the stator is the difference between the highest reading on the impeller and the lowest reading on the stator. The clearance must be 0.009 to 0.015 inches. The maximum permissible clearance across diameters is 0.024 inches. The running clearance is one-half of the measurement made across diameters. The running clearance must be 0.0045 to 0.0075 in. The maximum permissible running clearance is 0.012 inches.
- q. Install the ring onto the bearing. Install the bearing in the housing using a suitable driver. Place the retainer on the housing and install the cap screws using a wrench. Torque the cap screws with a torque wrench to 36 foot-pounds. If the carrier was removed from the flange, heat the new carrier to a temperature of 280 degrees Fahrenheit to 330 degrees Fahrenheit for a maximum time of ten minutes. Install the carrier on the flange. Install the new seal on the carrier. Install the bearings in both ends of the flange with a suitable driver group. Install the bearing even with the outside edge of the flange on the narrow side of the flange. Install the bearing 1.00 inches inside the edge of the flange on the wide side of the flange.

NOTE: Be careful not to cause damage to the seal when the flange is installed into the housing.

**Performance Steps**

- r. Pull the ends of the seal together and install the flange in the housing. Turn the housing over. Install the spacer and the turbine in the housing. Install the ring on the end of the flange. Turn the housing over. Install the ring that holds the gear in position. Put the ring under compression using long nose pliers and place the gear in position. Release the ring so the ring is in the groove of the gear. Install the two pins in the flange.
  - s. Install the ring on the bearing. Install the bearing in the carrier with a suitable driver. Put the carrier in position in the wheel. Turn the wheel over and put the gear for the scavenge pump in position on the wheel. Install the eight cap screws using a twelve-point wrench. Torque the cap screws to 36 foot-pounds.
  - t. Lower the temperature of the bearing and install the bearing in the carrier with a suitable driver group. Install the ring that holds the bearing in the carrier. Install the new lip-type seal in the carrier with a suitable driver group. Make sure the lip of the seal is toward the bearing. Thoroughly clean all the oil passages in the carrier before continuing with the assembly.
  - u. Install the oil director in the carrier with the cutout in the director in alignment with the cored opening in the carrier. Move the metal (stake) oil director into the notch in the carrier using a flat chisel or punch. Make sure the metal that is moved (staked) into the notch is 0.045 inches below the surface. Install the new seals on the carrier. Put clean grease on the seals. Pull the ends of the seals together. Put the carrier assembly in position on the wheel
  - v. Turn the wheel over. Put the stator in position on the carrier and install the cap screws that hold the stator to the carrier using a twelve-point wrench. Tighten the cap screws evenly to a torque of 20 foot-pounds. Install the two 3/8-16NC forged eyebolts into the wheel. Fasten the lifting equipment to the eyebolts and lower the the wheel into position on the housing. Remove the eyebolts. Install the cap screws and washers that hold the wheel to the housing using a wrench. Torque them evenly to 20 foot-pounds.
  - w. Install the new preformed packing on to the carrier. Install the two 3/8-16NC forged eyebolts in the cover. Fasten the lifting equipment to the eyebolts and put the cover in position over the torque divider. Remove the eyebolts. Install the eight cap screws and washers that hold the cover to the torque divider using a wrench.
  - x. Heat the races to a temperature of 275 degrees Fahrenheit and install the bearing races on the output shaft, if the bearing races were removed. Install the new seal on the output shaft.
  - y. Install the flange on the output shaft and install the washer. Attach the cap screw that holds the flange and washer in place using a wrench. Torque the cap screw to 40 foot-pounds. Place clean grease on the seal and insert the output shaft into the torque divider.
4. Perform a system check.
    - a. Reinstall the power divider and the accessories to return the equipment to service.
    - b. Service the torque divider housing and the transmission with oil.
    - c. Run the engine and test drive it in all speeds.
  5. Annotate the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	_____	_____
2. Inspected the equipment and verified its condition.	_____	_____
3. Repaired the power divider	_____	_____
4. Performed a system check.	_____	_____

**Performance Measures**

**GO**    **NO GO**

5. Annotated the equipment maintenance request.

\_\_\_\_\_

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5990-E  
TM 5-2410-237-20  
TM 5-2410-237-34

**Related**

AR 750-1  
DA PAM 738-750

**Repair a Hydrojet on an Item of Construction Equipment**  
**091-62B-2507**

**Conditions:** Given an item of construction/power bridging equipment with a hydrojet fault (the hydrojet removed from the equipment), all the parts needed to repair the hydrojet, shop equipment (general-purpose), personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Repair the hydrojet without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review the equipment maintenance request.

**WARNING: THE MK1 AND THE MK2 ENGINES WILL NOT BE OPERATED OUT OF THE WATER FOR MORE THAN 20 MINUTES AT IDLE SPEED. ANY MAINTENANCE TASK STEP THAT REQUIRES ENGINE OPERATION MUST BE PERFORMED WITH THE BOAT IN THE WATER OR BY FOLLOWING THE PROCEDURES IN TM-5-1940-277-20 ON THE SPECIFIC PROCEDURES FOR AN MK1 OR MK2 OUT-OF-WATER ENGINE OPERATION.**

2. Inspect the equipment and verify its condition.

**DANGER: PARTS MAY BE HEAVY. OBTAIN ASSISTANCE IF NECESSARY. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH AND DAMAGE TO THE PARTS.**

3. Repair the hydrojet.

- a. Disassemble the hydrojet by removing the shaft nut and washer from the hydrojet assembly shaft. Remove the rear impeller, the key, and the rear impeller cone.
- b. Measure the clearance between the tip of the impeller blade and the front reaction case. The clearance should not be greater than .0591 inches. Replace the impeller and the case, if the clearance is too great.
- c. Remove the eight nuts and washers securing the front reaction case to the intake case. While holding all the spacers and the seal sleeves in place on the shaft, remove the front reaction case. Remove and discard the two front reaction case gaskets and the insulating ring.
- d. Remove the four seal bearing housing retaining nuts and lock washers, the retaining seal, and the bearing housing. Remove the seal housing, the two seals, and the gasket from the housing. Discard the seals and the gasket.
- e. Remove the bearing housing and the gasket. Discard the gasket. Press the bearing out of the small end of the bearing housing.
- f. Remove the four nuts and washers retaining the seal housing in the front reaction case. Remove and discard the seal housing gasket. Remove the snap ring and the two seals from the seal housing. Discard the seals.
- g. Slide the seal sleeve off the hydrojet assembly shaft. Remove and discard the O-ring. Remove the spacer, the bearing inner race, the seal sleeve, and the O-ring. Discard the O-ring.
- h. Slide the front impeller off the hydrojet assembly shaft. Pull out the key. Remove the impeller cone and the fairing.
- i. Inspect the impeller, the front reaction case, and the bearings and then replace them, as necessary.
- j. Reassemble the hydrojet by smearing the two intake cases and the mount gaskets with grease, placing the gaskets on both sides of the insulating ring, and installing the rings and the gaskets on the case.
- k. Pack the interior cavity of the reaction case with grease and slide the case assembly over the shaft, positioning the greased fitting on top. Do not use force. Install and tighten the eight washers and nuts retaining the reaction case.

**Performance Steps**

- l. Grease and slide the fairing on the hydrojet assembly shaft. Slide the impeller cone on the shaft. Place the key in the groove. Slide the front impeller on the shaft. Fit the O-ring on the seal sleeve. Slide the seal sleeve, the bearing inner race, and the spacer on the shaft. Fit the O-ring on the seal sleeve and slide the seal sleeve on the shaft.
  - m. Install the two seals and the snap ring in the seal housing. Smear the seal housing gasket with grease and mount it in the front reaction case. Install the seal housing and secure it with the washer and nut.
  - n. Pack the bearing with grease and install it in the bearing housing. Install the seal in the seal housing.
  - o. Smear the bearing housing gasket with grease and mount it in the front reaction case. Install the bearing housing in the front reaction case. Smear the seal housing gasket with grease and mount it on the front reaction case. Install and tighten the four washers and nuts retaining the seal housing.
  - p. Slide the impeller cone, base first, on the hydrojet assembly shaft. Install the key and slide the rear impeller on the shaft.
  - q. Put nonhardening thread compound on the shaft threads and install and tighten the washer and nut. Torque them to 150 foot-pounds.
4. Perform a system check.
    - a. Reinstall all of the accessories to return the equipment to service.
    - b. Inspect the system for proper connections and proper operation.
  5. Annotate the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Repaired the hydrojet.	—	—
4. Performed a system check.	—	—
5. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5990-E
- TM 5-1940-277-20
- TM 5-1940-277-34

**Related**

- AR 750-1
- DA PAM 738-750

## Repair a Steering System on an Item of Construction Equipment.

**091-62B-2508**

**Conditions:** Given an item of construction equipment with a steering system fault (all parts removed for access to the fault), all the parts needed to repair the steering system, a tool kit (general mechanics), shop equipment (general-purpose repair), special tools, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Repair the steering system without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review the equipment maintenance request.
2. Inspect the equipment and verify its condition.
3. Repair the steering system.
  - a. Remove the screws, bracket, and housing from the steering knuckle and the final drive assembly.
  - b. Remove the retaining ring and any washers from the yoke. Discard the washers, if present.

NOTE: Support the yoke to prevent dropping and causing damage to the equipment.

- c. Remove the yoke using a suitable press. Remove the bearing, the washers, and the seal using a suitable puller. Discard the seal.
- d. Remove the spacer ring from the yoke using a suitable press. Discard the spacer ring. Remove the retaining ring and the spacer from the gear.
- e. Remove the gear, the seal, and the bearing using a suitable press. Discard the seal and the bearing. Remove the bearing using an installing tool. Remove the other bearing using a suitable puller.
- f. Inspect the housings for galling, cracks, or stripped threads. Inspect the gears for cracks or missing teeth. Inspect the bearings.
- g. Install the bearing using a mandrel. Install the bearing and gear using a suitable press. Install the spacer and the retaining ring on the gear. Turn the assembly over.
- h. Install the new bearing using an installing tool and a mandrel. Discard the plastic roller retainer. Install the new seals using an installing tool and a mandrel.
- i. Determine the washer thickness for installation of the bearing.
- j. Heat the new spacer ring to 195 degrees Fahrenheit.

WARNING: THE SPACER RING WILL BE HOT ENOUGH TO BURN YOU ON CONTACT. WEAR HEAT RESISTANT GLOVES WHEN HANDLING HOT RINGS.

- k. Install the spacer ring on the yoke and install the washers.
  - l. Install the bearing, the gear, and the yoke using a suitable press and a mandrel. Install the retaining ring.
  - m. Apply a coat of the sealing compound to the mating surface of the housing and install the housing, the bracket, and the 11 screws. Tighten the screws evenly to 66-73 foot-pounds.
4. Perform a system check.
    - a. Return the equipment to service.
    - b. Check the system for proper operation.
  5. Annotate the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and provide the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Repaired the steering system.	—	—
4. Performed a system check.	—	—
5. Annotated the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**  
DA FORM 5990-E  
TM 5-2420-224-34

**Related**  
AR 750-1  
DA PAM 738-750



**Troubleshoot a Transmission on an Item of Construction Equipment.**

**091-62B-2509**

**Conditions:** Given an item of construction equipment with a transmission fault, a general mechanic's tool kit, a number 1 common tool kit, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet or an equipment maintenance request, and a pen.

**Standards:** Locate the faults, deficiencies, or shortcomings by troubleshooting the transmission without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection and maintenance work sheet or an equipment maintenance request.
2. Inspect the equipment and verify its condition.
3. Perform troubleshooting procedures on the transmission.

**NOTE:** Follow the steps below for the malfunction of the transmission that causes excessive noise during shifting.

- a. Check the transmission oil level and viscosity. Add or replace oil as necessary.
- b. Inspect the drive shaft and the universal joint bearings for looseness, wear, and damage.
- c. Tighten the cap screws that hold the drive shaft to the flange using a torque of 40 plus 5 foot-pounds.
- d. Tighten the nuts that hold the universal bearing caps to the drive shaft to 40 plus 5 foot-pounds.

4. Annotate the equipment inspection and maintenance work sheet or the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection and maintenance work sheet or an equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Performed troubleshooting procedures on the transmission.	—	—
4. Annotated the equipment inspection and maintenance work sheet or the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 DA FORM 5990-E  
 TM 5-2410-237-20

**Related**

AR 750-1  
 DA PAM 738-750

## Troubleshoot a Transmission on an Item of Construction Equipment

091-62B-2510

**Conditions:** Given an item of construction equipment with a differential malfunction, a general mechanic's tool kit, shop equipment (general-purpose), personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet or an equipment maintenance request, and a pen.

**Standards:** Locate the faults, deficiencies, or shortcomings by troubleshooting the differential without causing injury to any personnel and damage to the equipment.

### Performance Steps

1. Receive and review an equipment inspection and maintenance work sheet or an equipment maintenance request.
2. Inspect the equipment and verify its condition.
3. Perform troubleshooting procedures on the differential.
  - a. Check for lubricant leaking from between the differential assembly and the axle housing.
  - b. Tighten the 14 nuts securing the differential assembly to 110 to 165 foot-pounds, if the lubricant is leaking from between the differential assembly and the axle housing.
  - c. Remove the differential assembly, if tightening the nuts does not work.
  - d. Scrape the gasket residue from the front axle housing and the differential assembly mating surfaces using a putty knife.
  - e. Clean the mating surfaces using a clean cloth and cleaning solvent.

**WARNING: DRY CLEANING SOLVENT (P-D-680) USED TO CLEAN PARTS IS TOXIC AND FLAMMABLE. WEAR PROTECTIVE GOGGLES AND GLOVES AND USE IT ONLY IN A WELL-VENTILATED AREA. AVOID CONTACT WITH YOUR SKIN, EYES, AND CLOTHES AND DO NOT BREATHE VAPORS. DO NOT USE NEAR OPEN FLAMES OR EXCESSIVE HEAT AND DO NOT SMOKE WHEN USING IT. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY. IF YOU BECOME DIZZY WHILE USING CLEANING SOLVENT, GET FRESH AIR AND MEDICAL ATTENTION IMMEDIATELY. IF IT COMES IN CONTACT WITH YOUR SKIN OR CLOTHES, FLUSH WITH LARGE AMOUNTS OF WATER. IF IT COMES IN CONTACT WITH YOUR EYES, WASH THEM WITH WATER AND GET MEDICAL AID IMMEDIATELY.**

- f. Inspect the differential bore in the axle housing for cracks, nicks, and burrs at the machined surface. If cracked, replace the axle. Remove nicks and burrs using a soft stone. Apply a bead of air-drying adhesive to the differential assembly and its bore in the front axle housing. Install the differential assembly.
  - g. If the lubricant is not leaking from between the differential assembly and the axle housing, remove the differential assembly. Disassemble the differential assembly. Check the pinion oil seal for damage.
  - h. If the pinion oil seal is damaged, replace it. If the pinion oil seal is okay, check the differential assembly housing for cracks and replace, if necessary.
4. Annotate the equipment maintenance and inspection work sheet or the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet or the equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Performed troubleshooting procedures on the differential.	—	—
4. Annotated the equipment inspection and maintenance work sheet or the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5988-E
- DA FORM 5990-E
- TM 5-3805-262-20
- TM 5-3805-262-34

**Related**

- AR 750-1
- DA PAM 738-750

**Troubleshoot a Final Drive on an Item of Construction Equipment.**

**091-62B-2511**

**Conditions:** Given an item of construction equipment with a final drive fault, shop equipment (general-purpose), a general mechanic's tool kit, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet or an equipment maintenance request, and a pen.

**Standards:** Locate the faults, deficiencies, or shortcomings by troubleshooting the final drive without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection and maintenance work sheet or an equipment maintenance request.

2. Inspect the equipment and verify its condition.

CAUTION: BE AWARE OF EXPOSURE TO HAZARDOUS NOISE LEVELS, EXHAUST FUMES, AND ACIDS. WATCH FOR POSSIBLE ELECTRICAL SHOCK, INJURY, OR DEATH BY BEING CRUSHED BY EQUIPMENT. PETROLEUM, LUBRICANTS, AND OILS (POLS) CAN BE FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA. WIPE UP SPILLS IMMEDIATELY. DIESEL FUEL IS FLAMMABLE AND SLIPPERY SO KEEP OPEN FLAMES AND SPARKS AWAY FROM THE AREA.

3. Perform troubleshooting procedures on the final drive.

NOTE: Follow the steps below for malfunctioning of the final drive that causes the fluid to leak.

- a. If the leak appears to be behind the drive sprocket, check the final drive seal for damage and replace it, as necessary.
- b. If the leak appears to be between the hull and the final drive, check the final drive for loose or missing hardware. Tighten or replace it, as necessary.
- c. Remove the final drive and replace any damaged packing or thrust washer, if the condition continues.

4. Annotate the equipment inspection and maintenance work sheet or the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection and maintenance work sheet or an equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Performed troubleshooting procedures on the final drive.	—	—
4. Annotated the equipment inspection and maintenance work sheet or the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

DA FORM 5990-E

TM 5-2350-262-34

**Related**

AR 750-1

DA PAM 738-750

**Troubleshoot a Power Divider on an Item of Construction Equipment**  
**091-62B-2512**

**Conditions:** Given an item of construction equipment with a power divider fault, a general mechanic's tool kit, a number 1 common tool kit, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet or an equipment maintenance request, and a pen.

**Standards:** Locate the faults, deficiencies, or shortcomings by troubleshooting the power divider without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection and maintenance work sheet or an equipment maintenance request.
2. Inspect the equipment and verify its condition.

NOTE: Follow the steps below for the malfunction of a torque (power) divider that overheats (according to the converter oil temperature gauge).

3. Perform troubleshooting procedures on the power divider.

CAUTION: THE PARTS MAY BE HEAVY SO OBTAIN ASSISTANCE, IF NECESSARY. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN INJURY OR DEATH AND DAMAGE TO THE PARTS.

- a. Check the transmission oil level and add oil, as necessary.
- b. Check the V belts. Adjust the V belt tension or replace the V belts.
- c. Check with the operator for the proper tractor operation. Instruct the operator not to operate the tractor for long periods of time at or near stall speed.
- d. Check the oil line connections for leaks. Tighten the connections.
- e. Check for any damaged oil line(s). Replace any damaged oil line(s).
- f. Check for any obstructions at the system vents. Clean or replace the breathers.
- g. Check for a loose oil filter cover. Tighten the cover cap screws and/or replace the seal.
- h. Check the converter oil temperature gauge for proper operation using a gauge known to be good. Replace the oil temperature gauge if the test gauge does not indicate overheating.
- i. Check the oil cooler. Clean or replace the oil cooler.
- j. Check the water pump. Replace the water pump.

4. Annotate the equipment inspection and maintenance work sheet or the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and provide the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed an equipment inspection and maintenance work sheet or an equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Performed troubleshooting procedures on the power divider.	—	—
4. Annotated the equipment inspection and maintenance work sheet or the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

DA FORM 5990-E

TM 5-2410-237-20

**Related**

AR 750-1

DA PAM 738-750

**Troubleshoot a Planetary Drive on an Item of Construction Equipment  
091-62B-2513**

**Conditions:** Assigned as a construction equipment repairer given an item of construction equipment with a planetary drive fault, a general mechanic's tool kit, general-purpose shop equipment, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet or an equipment maintenance request, and a pen.

**Standards:** Locate the fault, deficiency, or shortcoming by troubleshooting the planetary drive without causing injury to any personnel or damage to the equipment.

**Performance Steps**

1. Receive and review the equipment inspection and maintenance work sheet or an equipment maintenance request.
2. Inspect the equipment and verify its condition.

NOTE: The following steps are for the malfunction of the lubricant leaking from the planetary assembly.

3. Troubleshoot the planetary drive.
  - a. Check to see if the cap screws securing the front axle planetary spider are loose. If so, tighten them to 90 to 120 foot-pounds.
  - b. Remove the planetary gear spider if tightening the cap screws does no good. Scrape the gasket residue from the planetary gear spider and wheel hub mating surfaces using a putty knife.
  - c. Clean the mating surfaces using a clean cloth and cleaning solvent P-D-680.

WARNING: DRY CLEANING SOLVENT P-D-680 USED TO CLEAN PARTS IS TOXIC AND FLAMMABLE. WEAR PROTECTIVE GOGGLES AND GLOVES AND USE ONLY IN A WELL-VENTILATED AREA. AVOID CONTACT WITH SKIN, EYES, AND CLOTHES AND DO NOT BREATHE VAPORS. DO NOT USE NEAR AN OPEN FLAME OR EXCESSIVE HEAT AND DO NOT SMOKE WHEN USING IT. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY. IF YOU BECOME DIZZY WHILE USING THE CLEANING SOLVENT, GET FRESH AIR AND MEDICAL ATTENTION IMMEDIATELY. IF CONTACT WITH SKIN OR CLOTHES IS MADE, FLUSH WITH LARGE AMOUNTS OF WATER. IF CONTACT WITH EYES IS MADE, WASH EYES WITH WATER AND GET MEDICAL AID IMMEDIATELY.

- d. Inspect the wheel hub mating surface for cracks, nicks, and burrs at the machined surface. If it is cracked, replace the wheel hub. Remove nicks and burrs using a soft stone. Apply a bead of air-drying adhesive to the planetary gear spider and wheel hub mating surfaces. Install the planetary gear spider.
4. Annotate the equipment inspection and maintenance work sheet or the equipment maintenance request.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed the equipment inspection and maintenance work sheet or the equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Troubleshot the planetary drive.	—	—



**Performance Measures**

**GO**    **NO GO**

4. Annotated the equipment inspection and maintenance work sheet or the equipment maintenance request.

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**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
DA FORM 5990-E  
TM 5-3805-262-34

**Related**

AR 750-1  
DA PAM 738-750

**Troubleshoot a Hydrojet on an Item of Powered Bridging Equipment**  
**091-62B-2514**

**Conditions:** Given an item of construction or power bridging equipment with a hydrojet fault and the equipment is out of the water on a grounded cradle, shop equipment (general purpose), personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment inspection and maintenance work sheet, an equipment maintenance request, and a pen.

**Standards:** Locate any faults, deficiencies, or shortcomings by troubleshooting the hydrojet without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection and maintenance work sheet or an equipment maintenance request.
2. Inspect the equipment and verify its condition.

NOTE: The steps below are for any malfunctions of a hydrojet that causes the boat to vibrate while it is underway.

Boat vibrates while under way

3. Perform troubleshooting procedures on the hydrojet.

WARNING: THE MK1 AND THE MK2 ENGINES WILL NOT BE OPERATED OUT OF THE WATER FOR MORE THAN 20 MINUTES AT IDLE SPEED. ANY MAINTENANCE TASK STEP THAT REQUIRES ENGINE OPERATION MUST BE PERFORMED WITH THE BOAT IN THE WATER OR BY FOLLOWING THE PROCEDURES IN TM-5-1940-277-20 ON THE SPECIFIC PROCEDURES FOR AN MK1 OR MK2 OUT-OF-WATER ENGINE OPERATION.

- a. Open the hydrojet compartment hatch covers and remove the intake case inspection covers.
- b. Reach into the hydrojet unit and feel the front impeller for evidence of deformation or damage.
- c. After this inspection, a second person using a strong light should look through the jet nozzle at the rear impeller while the first person slowly rotates the unit grasping either the shaft or the coupling. Damage will most probably occur to the front impeller.

4. Annotate the equipment inspection and maintenance work sheet or the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment maintenance and inspection work sheet or an equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Performed troubleshooting procedures on the hydrojet.	—	—
4. Annotated the equipment inspection and maintenance work sheet or the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E

DA FORM 5990-E

TM 5-1940-277-34

**Related**

AR 750-1

DA PAM 738-750

Subject Area 6: Brakes

**Repair a Brake Master Cylinder on an Item of Construction Equipment  
091-62B-2601**

**Conditions:** Given an item of construction equipment with a faulty brake master cylinder removed from the equipment, all accessories needed to repair the brake master cylinder, shop equipment (general-purpose repair), a general mechanic's tool kit, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Repair the brake master cylinder without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment maintenance request.
2. Inspect the equipment and verify its condition.
3. Disassemble the brake master cylinder.
  - a. Remove and discard the lock ring and the stop ring. Remove the piston.
  - b. Remove the wiper, the sleeve, the seal, and the disc from the piston and then discard them.
  - c. Remove the bolt and the seal ring. Discard the seal ring. Using a regulated air supply of 5 pounds per square inch (psi), remove the piston and the stop.
  - d. Remove the backup ring, the disc seal, and two seals from the piston and discard them. Remove the stop rod from the stop.
  - e. Remove two bleeder valves and two protective caps if they are damaged. Remove two elbows and two bushings.
4. Assemble the brake master cylinder.
  - a. Install two bushings and two elbows. If removed, install two new bleeder valves and two new protective caps. Install the stop rod in the stop.
  - b. Install two new seals, a new disc seal, and a new backup ring on the piston. Install the stop and the piston.
  - c. Position the piston and the stop all the way into the master cylinder housing before performing the next step. Install the new seal ring and the bolt.
  - d. Install the new seal, the new sleeve, the new wiper, and the new disc on the piston.
  - e. Install the piston. Install the new stop ring and the new lock ring.
5. Perform a system check.
  - a. Return the equipment to service.
  - b. Check the system for leaks and for proper operation.
6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment maintenance request with a work envelope.	—	—
2. Inspected the equipment and verified its condition.	—	—

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
3. Disassembled the brake master cylinder.	—	—
4. Assembled the brake master cylinder.	—	—
5. Performed a system check.	—	—
6. Annotated an equipment maintenance request with a work envelope.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5990-E
- TM 5-2420-224-20-1
- TM 5-2420-224-20-2
- TM 5-2420-224-34

**Related**

- AR 750-1
- DA PAM 738-750

**Repair a Brake Booster on an Item of Construction Equipment**  
**091-62B-2602**

**Conditions:** Given an item of construction equipment with a faulty brake booster removed from the equipment, all accessories needed to repair the brake booster, shop equipment (general-purpose repair), a general mechanic's tool kit, personal protective equipment (PPE), the applicable technical manuals (TMs), an equipment maintenance request, and a pen.

**Standards:** Repair the brake booster without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review the equipment maintenance request.
2. Inspect the equipment and verify its condition.
3. Disassemble the brake booster.
  - a. Remove the retaining ring, the thrust piece, the packing, and the spring. Discard the retaining ring, the packing, and the spring.
  - b. Remove and discard the valve. Remove the screw and washer.
  - c. Remove the flange and the retaining wire by turning the flange to the left.

**WARNING: TO PREVENT PERSONNEL INJURY, USE EXTREME CARE DURING THE REMOVAL OF THE FLANGE DUE TO THE PRESSURE OF THE SPRING IN THE CASE.**

- d. Remove the spring and the case. Separate the two housings by pulling them apart. Remove and discard five packings. Remove and discard the ring. Remove two retaining rings and two valves. Discard the valves.
4. Assemble the brake booster.
  - a. Install two new valves and two retaining rings in the flange. Install the new ring. Install five new packings. Install the inner housing into the outer housing.
  - b. Install the case and the spring. Install the flange in the case and line up the hole in the flange with the hole in the case. Install the end of the retaining wire in the hole of the flange and rotate the flange to the right until the retaining wire is completely installed.
  - c. Install the screw and the washer. Install the new valve. Install the new spring, the new packing, the thrust piece, and the new retaining ring.
5. Perform a system check.
  - a. Return the equipment to service.
  - b. Check the system for leaks and proper operation.
6. Annotate the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed equipment maintenance request.	—	—
2. Inspected equipment and verified condition	—	—
3. Disassembled brake booster.	—	—
4. Assembled brake booster.	—	—

**Performance Measures**

- 5. Performed system check.
- 6. Annotated equipment maintenance request.

<u>GO</u>	<u>NO GO</u>
—	—
—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5990-E
- TM 5-2420-224-20-1
- TM 5-2420-224-20-2
- TM 5-2420-224-34

**Related**

- AR 750-1
- DA PAM 738-750

**Troubleshoot an Air Brake System on an Item of Construction Equipment  
091-62B-2603**

**Conditions:** Given an item of construction equipment with an air brake system malfunction; a general mechanic's tool kit; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manuals (TMs); an equipment inspection and maintenance worksheet or an equipment maintenance request; and a pen.

**Standards:** Locate the faults, deficiencies, or shortcomings by troubleshooting the air brake system without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection and maintenance work sheet or an equipment maintenance request with a work envelope.
2. Inspect the equipment and verify its condition.

NOTE: If troubleshooting gives an indication that pressure air is not available at the supply passage(s) of the control valves. Loosen the connection at the supply passage and use soapy water to check for pressure air. If troubleshooting gives an indication of leakage through a control valve(s), disconnect the delivery hose at the end opposite the delivery passage. Put the end of the hose in a pan of water to check for leakage.

3. Perform troubleshooting procedures on the air brakes.

NOTE: The following steps are for the malfunction of service brakes when they do not engage correctly.

- a. Check for the air pressure at the inlet passage of the brake control valve.
- b. Inspect the brake control valve for any damage that permits little or no pressure air at the outlet passages.
- c. Inspect the components between the brake control valve and the tractor brake actuators.
- d. Inspect the scraper relay valve for any damage that permits little or no pressure air at the delivery passages to the scraper brake actuators.
- e. Inspect for any damages to the brake actuators.
- f. Check the adjustment of the rod travel of the brake actuators.
- g. Inspect the brakes for wear or damage.

4. Annotate the equipment inspection and maintenance work sheet or the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed an equipment inspection and maintenance work sheet or an equipment maintenance request.	—	—
2. Inspected the equipment and verified its condition.	—	—
3. Performed troubleshooting procedures on the air brake system.	—	—
4. Annotated the equipment Inspection and maintenance work sheet or the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.



**References**

**Required**

DA FORM 5988-E

DA FORM 5990-E

TM 5-3805-248-14&P-1

TM 5-3805-248-14&P-3

**Related**

AR 750-1

DA PAM 738-750

**Troubleshoot an Air-Over-Hydraulic Brake System on an Item of Construction Equipment  
091-62B-2604**

**Conditions:** Given an item of construction equipment with an air-over-hydraulic brake system malfunction; a general mechanic's tool kit; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manuals (TMs); an equipment inspection and maintenance work sheet or an equipment maintenance request; and a pen.

**Standards:** Locate the faults, deficiencies, or shortcomings by troubleshooting the air-over-hydraulic brake system without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive and review an equipment inspection and maintenance work sheet or an equipment maintenance request.
2. Inspect the equipment and verify its condition.

NOTE: Use the steps below for any malfunctions that cause poor brake action.

3. Performed troubleshooting procedures on the air-over-hydraulic brake system.

NOTE: If brake action is poor, bleed the air from the brake system. If service brake action is still poor after bleeding the air from the brake system go to step a below.

- a. Check the fluid level in the brake system's hydraulic reservoir.
  - (1) If the fluid level is low, add fluid.
  - (2) If the fluid level is okay, go to the next step.
- b. Check the brake hoses, the lines, and the fittings for any brake fluid leaks.
  - (1) If the connections are leaking fluid, tighten. If the brake lines are leaking fluid, replace them.
  - (2) If the brake lines and the connections are okay, go to the next step.
- c. Place blocks at each wheel to prevent the loader from moving. Engage the transport/service link. Ensure that the parking brake is applied.

WARNING: BEFORE RAISING THE VEHICLE OFF THE GROUND, BE SURE THAT THE TRANSPORT/SERVICE LINK IS ENGAGED. FAILURE TO DO THIS MAY CAUSE THE LOADER TO TURN AND SLIP OFF THE JACKS OR THE JACK STANDS CAUSING SERIOUS INJURY OR DEATH.

- d. Raise one axle and wheel off the ground. Remove the tire and wheel from the axle end. Check the brake calipers for brake fluid leakage. Repeat this for the other wheel and axle.
  - (1) If the brake caliper is leaking, replace it.
  - (2) If the brake caliper is okay, go to the next step.
- e. Check the brake pads for wear or uneven glaze and check the brake fluid for lubricant contamination.
  - (1) Replace the brake pads, if they are worn, glazed, or contaminated.
  - (2) If the brake pads are okay, check each disc for scoring or grooving.

4. Annotate the equipment inspection and maintenance work sheet or the equipment maintenance request.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received and reviewed an equipment inspection and maintenance work sheet or an equipment maintenance request.	—	—

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
2. Inspected the equipment and verified its condition.	—	—
3. Performed troubleshooting procedures on the air-over-hydraulic system.	—	—
4. Annotated the equipment inspection and maintenance work sheet or the equipment maintenance request.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
 DA FORM 5990-E  
 TM 5-3805-262-20  
 TM 5-3805-262-34

**Related**

AR 750-1  
 DA PAM 738-750

Skill Level 3

Subject Area 1: Preventive

**Perform an Initial Inspection on an Item of Construction Equipment  
091-62B-3101**

**Conditions:** Given an item of construction equipment with faults, deficiencies, or shortcomings that require support-level maintenance; the applicable organizational and support-level equipment technical manuals (TMs); test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); an equipment inspection and maintenance work sheet or an equipment maintenance request with a work envelope; and a pen.

**Standards:** Perform an initial inspection on an item of construction equipment without misdiagnosis. Complete the inspection without causing injury to any personnel and further damage to the environment or the equipment. Initiate additional actions required as a result of the inspection.

**Performance Steps**

1. Receive the equipment maintenance request work envelope.
  - a. Ensure that the work request is present.
  - b. Ensure that the equipment inspection and maintenance work sheet is present.
  - c. Verify the owning unit's information.
2. Perform an inspection on the item of construction equipment.
  - a. Verify the equipment's information.
  - b. Perform an operator monthly preventive-maintenance checks and services (PMCS) inspection according to the equipment TM.
  - c. Perform an organizational PMCS inspection according to the equipment TM.
  - d. Record all faults, deficiencies, and shortcomings on the equipment inspection maintenance work sheet.
  - e. Enter action code F on the maintenance request for the initial inspection.
3. Determine the faults, deficiencies, or shortcomings.
  - a. Perform troubleshooting procedures to locate any failed component according to the equipment TM.
  - b. Determine the cause of failure.
  - c. Determine if the failure was normal fair wear and tear.
  - d. Record the findings on the equipment inspection maintenance work sheet.
4. Determine the required work to be performed.
  - a. Identify the components requiring replacements.
  - b. Identify all additional supporting maintenance steps.
  - c. Identify additional supporting resource requirements.
  - d. Prepare an intrashop work request, if required.
  - e. Assign task sequence numbers to each required repair task on the maintenance request.
  - f. Total the man-hours.
  - g. Calculate the total man-hour cost.
  - h. Record the man-hours and cost on the maintenance request.
5. Determine the required parts needed to make repairs.
  - a. Locate the required repair parts in the applicable TM.
  - b. Verify the repair parts (usable on codes).
  - c. Determine the cost of the repair parts.
  - d. Record the repair parts, stock numbers, and cost on the maintenance request.
6. Estimate the total cost of the repairs.

**Performance Steps**

- a. Total the man-hours and the cost of the repair parts.
- b. Add the overhead and expendables cost.
- c. Annotate the total cost on the maintenance request.
  
- 7. Determine if the equipment is economically repairable.
  - a. Locate the applicable maintenance expenditure limits (MEL) technical bulletin (TB).
  - b. Determine the authorized percentage of expenditures.
  - c. Compare the total repair costs to the MEL.
  - d. Enter code N on the maintenance request for items that are uneconomically repairable.
  - e. Recommend that the owning unit initiate a request for a classification inspection or an expenditure waiver on the equipment that exceeds the maintenance expenditure limit.
  
- 8. Recommend a report of survey (RS) for damages determined not to be fair wear and tear.
  - a. Notify the chain of command.
  - b. Complete an estimated cost of damage using the estimated repair cost.
  
- 9. Complete and forward all documentation.
  - a. Enter an acceptance or rejection and signature on the maintenance request.
  - b. Issue a customer's copy of the maintenance request to the customer.
  - c. Forward the equipment maintenance request work envelope with the equipment maintenance request or the equipment inspection and maintenance work sheet to the maintenance control supervisor or shop supply clerk.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with the equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received the equipment maintenance request work envelope.	—	—
2. Performed an inspection on the item of construction equipment.	—	—
3. Determined the faults, deficiencies, or shortcomings.	—	—
4. Determined the required work to be performed.	—	—
5. Determined the required parts needed to make repairs.	—	—
6. Estimated the total cost of the repairs.	—	—
7. Determined if equipment was economically repairable.	—	—
8. Recommended an RS for damages determined not to be fair wear and tear.	—	—
9. Completed and forwarded all documentation.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

- DA FORM 5988-E
- DA FORM 5990-E
- TM 5-3805-248-14&P-1
- TM 5-3805-248-14&P-2
- TM 5-3805-248-14&P-3

**Related**

- AR 750-1
- DA PAM 738-750

**Perform an In-Process Inspection on an Item of Construction Equipment  
091-62B-3102**

**Conditions:** Given an item of construction equipment in the process of being repaired at support-level maintenance by military or contract maintenance; the applicable organizational and or support-level equipment technical manuals (TMs); test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); an equipment inspection and maintenance work sheet or an equipment maintenance request and work envelope (if applicable); and a pen.

**Standards:** Perform an in-process inspection on an item of construction equipment ensuring that all repairs are accomplished as prescribed by the procedures in the equipment technical manuals. Complete the inspection without causing injury to any personnel and damage to the equipment. Initiate additional actions required as a result of the inspection.

**Performance Steps**

1. Receive an equipment inspection and maintenance work sheet or an equipment maintenance request and work envelope, if applicable.
  - a. Review the equipment inspection and maintenance work sheet.
  - b. Review the maintenance request.
2. Obtain the appropriate equipment organizational and support TMs and technical bulletins (TBs).
  - a. Locate the TMs with updates.
  - b. Locate the latest TBs relating to the item of equipment.
3. Verify that the repairs are being completed according to the equipment TMs.
  - a. Determine the deficiencies, faults, or shortcomings of the equipment that are being repaired.
  - b. Direct any additional repairs or work to the responsible shop, if the repair is unsatisfactory or if the faults are still uncorrected.
  - c. Assign any additional task numbers, if required.
  - d. Annotate the equipment inspection maintenance work sheet and/or the maintenance request.
4. Forward the equipment inspection and maintenance work sheet or an equipment maintenance request and work envelope to the maintenance control supervisor or the shop supply clerk.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<u><b>GO</b></u>	<u><b>NO GO</b></u>
1. Received an equipment inspection and maintenance work sheet or an equipment maintenance request and work envelope, if applicable.	—	—
2. Obtained the appropriate equipment organizational and support TMs and TBs.	—	—
3. Verified that the repairs were being completed according to the equipment TMs.	—	—
4. Forwarded the equipment inspection and maintenance work sheet or an equipment maintenance request and work envelope to the maintenance control supervisor or shop supply clerk.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
DA FORM 5990-E  
TM 5-2430-200-10  
TM 5-2430-200-24

**Related**

AR 750-1  
DA PAM 738-750

**Perform a Final Inspection on an Item of Construction Equipment  
091-62B-3103**

**Conditions:** Given an item of construction equipment repaired at support-level maintenance by military or contract maintenance; the applicable organizational and support level equipment technical manuals (TMs); test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); an equipment inspection and maintenance work sheet or an equipment maintenance request and work envelope; and a pen.

**Standards:** Perform a final Inspection on an item of construction equipment ensuring that all repairs have been completed and that the equipment is fully operational. Complete the inspection without causing injury to any personnel and damage to the equipment. Initiate additional actions required as a result of the inspection.

**Performance Steps**

1. Receive an equipment inspection and maintenance work sheet or an equipment maintenance request with a work envelope.
  - a. Review the equipment inspection and maintenance work sheet.
  - b. Review the equipment maintenance request.
2. Obtain the appropriate equipment organizational and support TMs, technical bulletins (TBs), and the equipment inspection maintenance work sheet.
  - a. Locate the TMs with updates.
  - b. Locate the latest TBs relating to the item of equipment.
3. Verify that the repairs were completed according to the equipment TM.
  - a. Inspect the repair
  - b. Perform an operation test.
  - c. Direct any additional repairs or work to the responsible shop, if the repair is unsatisfactory or if the faults are still uncorrected.
  - d. Assign any additional task numbers, if required.
  - e. Annotate the equipment inspection maintenance work sheet and/or the maintenance request.
4. Forward the equipment inspection and maintenance work sheet or the equipment maintenance request with the work envelope to the maintenance control supervisor or the shop supply clerk.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and applicable TMs. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Received an equipment inspection and maintenance work sheet or an equipment maintenance request with a work envelope.	—	—
2. Obtained the appropriate equipment organizational and support TMs, TBs, and the equipment inspection and maintenance work sheet.	—	—
3. Verified that the repairs were being completed according to the equipment TM.	—	—
4. Forwarded the equipment inspection and maintenance work sheet and the equipment maintenance request with the work envelope to the maintenance control supervisor or shop supply clerk.	—	—



**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
DA FORM 5990-E  
TM 5-2350-262-20-1  
TM 5-2350-262-20-2  
TM 5-2350-262-34

**Related**

AR 750-1  
DA PAM 738-750

Subject Area 2: Electrical

**Determine the Cause of an Electrical-Component Malfunction on an Item of Construction Equipment  
091-62B-3201**

**Conditions:** Given an item of construction equipment with an electrical-component failure; all accessories removed for access; a general mechanic's tool kit; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manuals (TMs); an equipment inspection and maintenance work sheet or a maintenance request with a work envelope; and a pen.

**Standards:** Locate the root cause for the electrical-component failure without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive an equipment inspection and maintenance work sheet or an equipment maintenance request with a work envelope.
2. Use TMDE and the applicable TM to troubleshoot and determine malfunctions.
3. Locate faults, deficiencies, or shortcomings.
  - a. Locate the primary component failure.
4. Determine the cause for any faults, deficiencies, or shortcomings.
  - a. Use a fault tree analysis.
  - b. Consider all possible causes.
  - c. Eliminate all possibilities.
  - d. Determine the root cause.
5. Annotate the equipment inspection and maintenance work sheet or the equipment maintenance request with the work envelope.
6. Initiate additional actions as required.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with the equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable technical publications. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received an equipment inspection and maintenance work sheet or an equipment maintenance request with a work envelope.	—	—
2. Used TMDE and the applicable TM to troubleshoot and determine malfunctions.	—	—
3. Located faults, deficiencies, or shortcomings.	—	—
4. Determined the cause for any faults, deficiencies, or shortcomings.	—	—
5. Annotated the equipment inspection and maintenance work sheet or the equipment maintenance request with the work envelope.	—	—
6. Initiated additional actions as required.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
DA FORM 5990-E  
TM 5-2430-200-10  
TM 5-2430-200-24

**Related**

AR 750-1  
DA PAM 738-750

Subject Area 3: Engines

**Determine the Cause of an Engine Component Failure on an Item of Construction Equipment  
091-62B-3301**

**Conditions:** Assigned as a senior construction equipment repairer or technical inspector or construction equipment maintenance sergeant, given an item of construction equipment with a engine component failure and all accessories removed for access, a general mechanics tool kit, test measurement and diagnostic equipment (TMDE), personal protective equipment (PPE), the applicable technical manual, an equipment inspection maintenance worksheet or an equipment maintenance request, and a pen.

**Standards:** Locate the root cause for the engine component failure without damage to the equipment or injury to soldiers.

**Performance Steps**

1. Receive and review the maintenance inspection worksheet or the equipment maintenance request.
2. Use the TMDE and the applicable TM to troubleshoot and determine the malfunction.
3. Locate the fault, deficiency, or shortcoming.
4. Determine the cause of the fault, deficiency, or shortcoming.
  - a. Use fault-tree analysis.
  - b. Consider all possible causes.
  - c. Eliminate possibilities.
  - d. Determine the root cause.
5. Annotate the maintenance inspection worksheet or the equipment maintenance request.
6. Initiate additional actions as required.

**Evaluation Preparation:** Ensure that the site is set up with equipment, tools, TMDE, and available technical publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that the expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and personal protection equipment is on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received and reviewed the maintenance inspection worksheet or the equipment maintenance request.	—	—
2. Used the TMDE and the TM to troubleshoot and the determine malfunction.	—	—
3. Located the fault, deficiency, or shortcoming.	—	—
4. Determined the cause for fault, deficiency, or shortcoming.	—	—
5. Annotated the maintenance inspection worksheet orthe equipment maintenance request.	—	—
6. Initiated additional actions as required.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
DA FORM 5990-E  
TM 5-1940-277-10  
TM 5-1940-277-20  
TM 5-1940-277-34

**Related**

AR 750-1  
DA PAM 738-750

Subject Area 4: Hydraulics

**Determine the Cause of a Hydraulic Component Failure on an Item of Construction Equipment  
091-62B-3401**

**Conditions:** Given an item of construction equipment with a hydraulic component failure (all accessories removed for access), a tool kit (general mechanics), test measurement and diagnostic equipment (TMDE), personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet or an equipment maintenance request, and a pen.

**Standards:** You will locate the root cause for the hydraulic component failure, without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive the equipment inspection and maintenance work sheet or the equipment maintenance request.
2. Use TMDE and the appropriate TM to troubleshoot and determine the malfunction.
3. Locate the fault, the deficiency, or the shortcoming. Determine the primary component failure.
4. Determine the cause for the fault, the deficiency, or the shortcoming.
  - a. Use the fault tree analysis.
  - b. Consider all possible causes.
  - c. Eliminate possibilities.
  - d. Determine the root cause.
5. Annotate the equipment inspection and maintenance work sheet or the equipment maintenance request.
6. Initiate additional actions as required.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, the TMDE, and the publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and appropriate technical publications. Ensure that expendable material and supplies are on hand and in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received the equipment maintenance and inspection work sheet or the equipment maintenance request.	—	—
2. Used TMDE and the appropriate TM to troubleshoot and determine the malfunction.	—	—
3. Located the fault, the deficiency, or the shortcoming, and determined the primary component failure.	—	—
4. Determined the cause for the fault, the deficiency, or the shortcoming.	—	—
5. Annotated the equipment inspection and maintenance work sheet or the equipment maintenance request.	—	—
6. Initiated additional actions as required.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References****Required**

DA FORM 5988-E  
DA FORM 5990-E  
TM 5-2350-262-10  
TM 5-2350-262-20-1  
TM 5-2350-262-20-2  
TM 5-2350-262-20-3  
TM 5-2350-262-34

**Related**

Subject Area 5: Power Trains

**Determine the Cause of a Power Train Component Malfunction on an Item of Construction Equipment**  
**091-62B-3501**

**Conditions:** Given an item of construction equipment with a power train component failure (all accessories removed for access), a tool kit (general mechanics), test measurement and diagnostic equipment (TMDE), personal protective equipment (PPE), the applicable technical manual (TM), an equipment inspection and maintenance work sheet or an equipment maintenance request, and a pen.

**Standards:** Locate the root cause for the power train component failure without causing damage to the equipment or injury to personnel.

**Performance Steps**

1. Receive the equipment maintenance and inspection work sheet or the equipment maintenance request.
2. Use TMDE and the appropriate TM to troubleshoot and determine the malfunction.
3. Locate the fault, the deficiency, or the shortcoming. Locate the primary component failure.
4. Determine the cause for the fault, the deficiency, or the shortcoming.
  - a. Use fault tree analysis.
  - b. Consider all possible causes.
  - c. Eliminate possibilities.
  - d. Determine the root cause.
5. Annotate the equipment maintenance and inspection work sheet or the equipment maintenance request.
6. Initiate additional actions as required.

**Evaluation Preparation:** Ensure that the site is set up with the equipment, the tools, and the appropriate publications. If the item of construction equipment outlined here is not available, use another item of construction equipment with a similar system and provide the appropriate technical publications. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts and PPE are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received the equipment maintenance and inspection work sheet or the equipment maintenance request.	—	—
2. Used TMDE and the appropriate TM to troubleshoot and determine the malfunction.	—	—
3. Located the fault, the deficiency, or the shortcoming.	—	—
4. Determined the cause for the fault, the deficiency, or the shortcoming.	—	—
5. Annotated the equipment maintenance and inspection work sheet or the equipment maintenance request.	—	—
6. Initiated additional actions as required.	—	—



**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
TM 5-3805-248-14&P-1  
TM 5-3805-248-14&P-2  
TM 5-3805-248-14&P-3

**Related**

AR 750-1  
DA FORM 5990-E  
DA PAM 738-750

Subject Area 6: Brakes

**Determine the Cause of a Brake Component Failure on an Item of Construction Equipment  
091-62B-3601**

**Conditions:** Given an item of construction equipment with a brake component failure and all of the accessories removed for access; a general mechanic's tool kit; test, measurement, and diagnostic equipment (TMDE); personal protective equipment (PPE); the applicable technical manuals (TMs); an equipment inspection and maintenance worksheet or an equipment maintenance request; and a pen.

**Standards:** Locate the root cause for a brake system failure without causing injury to any personnel and damage to the equipment.

**Performance Steps**

1. Receive the equipment inspection and maintenance work sheet or the equipment maintenance request.
2. Use TMDE and applicable TMs to troubleshoot and determine malfunctions.
3. Locate any faults, deficiencies, or shortcomings.
  - a. Locate the primary component failure.
4. Determine the cause for any faults, deficiencies, or shortcomings.
  - a. Use a fault tree analysis.
  - b. Consider all possible causes.
  - c. Eliminate any possibilities.
  - d. Determine the root cause.
5. Annotate the equipment inspection and maintenance work sheet or the equipment maintenance request.
6. Initiate any additional actions as required.

**Evaluation Preparation:** Provide the soldier with the items listed in the conditions. Ensure that the site is set up with all equipment and tools needed. If the item of construction equipment outlined in this task is not available, use another item of construction equipment with a similar system and the applicable TMs. Ensure that expendable materials and supplies are available in sufficient quantities. Ensure that any required repair parts are on hand.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Received the equipment inspection and maintenance work sheet or the equipment maintenance request.	—	—
2. Used TMDE and applicable TMs to troubleshoot and determine malfunctions.	—	—
3. Located any faults, deficiencies, or shortcomings.	—	—
4. Determined the cause for any faults, deficiencies, or shortcomings.	—	—
5. Annotated the equipment inspection and maintenance work sheet or the equipment maintenance request.	—	—
6. Initiated any additional actions as required.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed (P). Score the soldier NO-GO if any step is failed (F). If the soldier fails any step, show him how to do it correctly.

**References**

**Required**

DA FORM 5988-E  
DA FORM 5990-E  
TM 5-2420-224-20-1  
TM 5-2420-224-20-2  
TM 5-2420-224-34

**Related**

AR 750-1

Subject Area 9: Common Logistic Tasks

**Manage a Shop Safety Program**  
**091-CLT-3001**

**Conditions:** In a field or garrison environment, given a maintenance site/facility, maintenance personnel, and applicable references.

**Standards:** Ensured personnel followed all safety procedures, that preventable accidents were avoided, and if accidents occurred that they were properly recorded and reported, IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured all safety references were on hand.	—	—
2. Established and documented goals and requirements for a successful shop safety and accident prevention program.	—	—
3. Briefed and regularly updated subordinates on shop safety program.	—	—
4. Conducted initial safety inspections.	—	—
5. Ensured initial safety concerns and violations were corrected.	—	—
6. Conducted scheduled and unscheduled safety inspections.	—	—
7. Documented safety violations, reported the violations as required, and conducted follow-up inspections to ensure violations were/remained corrected.	—	—
8. Kept necessary records of safety inspections and accident reports.	—	—
9. Ensured MSDS were prepared and maintained as required in applicable work areas.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**

AR 190-13  
AR 220-1  
AR 700-138  
AR 750-1  
DA PAM 738-750  
FM 4-30.3  
TB 43-180

**Related**

AR 385-10  
AR 385-40  
AR 385-55

**Maintain a Publications Library  
091-CLT-3002**

**Conditions:** In a field or garrison environment, given publications and storage location, local and higher headquarters publications indexes and publications procedures, SOP, and applicable forms and references.

**Standards:** Ensured required publications were on hand or ordered, publications were arranged and maintained properly, forms/records were properly maintained, and changes were posted IAW applicable references and local procedures.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Determined all publications required by the maintenance shop or section.	—	—
2. Reviewed and updated publications library SOP as needed.	—	—
3. Ensured that technical publications on hand/on order were the most current IAW DA Pam 25-30.	—	—
4. Ensured that doctrinal, training, and organizational publications on hand/on order were the most current IAW DA Pam 25-30 and local listings.	—	—
5. Ensured that administrative publications on hand/on order were the most current IAW DA Pam 25-30.	—	—
6. Ensured that local and higher headquarters publications on hand/on order were the most current IAW DA Pam 25-30 and local listings.	—	—
7. Prepared DA Form 4569 IAW DA Pam 25-33.	—	—
8. Prepared the required transmittal form IAW DA Pam 25-33.	—	—
9. Prepared DA Forms 17 and 17-1 to request local and higher headquarters publications, IAW DA Pam 25-33 and local/higher headquarters' publications requisitioning procedures.	—	—
10. Ensured that published changes were posted to applicable publications IAW DA PAM 25-40 and publication change instructions.	—	—
11. Removed obsolete/rescinded/superseded publications from library IAW DA Pam 25-40 and publication change instructions.	—	—
12. Arranged publications in proper order and in a suitable location IAW DA Pam 25-40.	—	—
13. Labeled binders used for storing library publications IAW AR 25-400-2 applicable) and DA Pam 25-40.	—	—
14. Notified personnel to return loaned publications to the library in a timely manner IAW SOP.	—	—
15. Updated US Army Publishing Agency (USAPA), local, and higher headquarters publications accounts as required IAW DA Pam 25-33 and local/higher headquarters publication account instructions.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**

AR 25-400-2

DA PAM 25-30

DA PAM 25-33

**Related**

AR 25-11

**Establish Maintenance Facilities**  
**091-CLT-3003**

**Conditions:** In a field or garrison environment, given a maintenance site, maintenance personnel, applicable equipment, maintenance shop/section SOP, and applicable references.

**Standards:** Set up a maintenance shop facility suitable for accomplishing necessary maintenance functions IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured applicable references and publications were available.	—	—
2. Identified commander's maintenance requirements for the accomplishment of the unit's mission.	—	—
3. Set up the maintenance facility IAW SOP.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**  
FM 4-30.3

**Related**

**Assist in Preparing a Standing Operating Procedure  
091-CLT-3004**

**Conditions:** In a field or garrison environment, given FM 9-43-1, higher headquarters SOP(s), and commander's guidance.

**Standards:** Prepared a draft copy of a maintenance shop/section internal or external SOP for supervisor's review, comment, and approval IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured applicable publications were available.	—	—
2. Ensured unit policies and commander's guidance were followed.	—	—
3. Ensured shop operation policies were adequately addressed.	—	—
4. Updated the shop SOP as required.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**  
FM 4-30.3

**Related**



**Manage Tool Control Procedures  
091-CLT-3005**

**Conditions:** In a field or garrison environment, given applicable supply catalog(s), applicable references, and hand receipt forms.

**Standards:** Managed tool control procedures IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured applicable references were available.	—	—
2. Established policies and procedures for the control of tools.	—	—
3. Ensured all DA Form 2062s were properly filled out and updated.	—	—
4. Ensured tools and equipment were inventoried IAW applicable references.	—	—
5. Ensured tool shortages were annotated on a shortage annex.	—	—
6. Ensured subordinates applied property accountability procedures.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**

- AR 190-13
- AR 220-1
- AR 385-10
- AR 385-40
- AR 700-138
- AR 750-1
- DA PAM 710-2-1
- FM 101-5-1
- FM 4-30.3

**Related**

- DA PAM 738-750

**Manage Key Control Procedures  
091-CLT-3006**

**Conditions:** In a field or garrison environment, given keys, key control rosters, key boxes/cabinets, and applicable publications.

**Standards:** Managed key control procedures IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured necessary publications were available.	—	—
2. Established key control policies and procedures.	—	—
3. Established key control access rosters.	—	—
4. Ensured personnel were aware of their responsibilities for the security and accountability of keys.	—	—
5. Ensured key control access rosters were properly maintained and adhered to.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**  
AR 190-13  
AR 190-51

**Related**

**Manage the TMDE Calibration Program  
091-CLT-3007**

**Conditions:** In a field or garrison environment, given TMDE, maintenance personnel, and applicable references.

**Standards:** Managed the TMDE calibration program IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured necessary publications were available.	—	—
2. Reviewed and updated TMDE computer printout list.	—	—
3. Ensured PMCS and inventory of all TMDE and auxiliary equipment are conducted, as required.	—	—
4. Ensured TMDE was turned in for calibration IAW computer printouts.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**  
AR 750-43  
TB 43-180

**Related**

**Recon Terrain/Route  
091-CLT-3008**

**Conditions:** In a field environment, given a maintenance situation/operations order (OPORD), operational overlay, grid coordinates of destination, vehicle with personnel, and applicable references.

**Standards:** Performed a route/terrain reconnaissance, and selected the most appropriate route to follow or the most appropriate location to set up a maintenance site, IAW maintenance situation/OPORD and applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured necessary equipment and publications were available.	—	—
2. Performed a map recon of the terrain and route.	—	—
3. Selected personnel for recon team.	—	—
4. Reconned route to determine best access to destination and to ensure safety of personnel and equipment.	—	—
5. Reconned terrain to determine suitability for maintenance site use, to determine best avenues of entry and exit, and to ensure safety of personnel and equipment.	—	—
6. Reported findings and conclusions to supervisors.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**  
FM 4-30.3  
FM 5-170

**Related**

**Supervise Maintenance Operations  
091-CLT-3009**

**Conditions:** In a field or garrison environment, given maintenance personnel, equipment, maintenance facility/site, SOPs, and applicable references.

**Standards:** Established and maintained an effective maintenance shop operation IAW SOPs and applicable references.

**Performance Steps**

1. Ensure unit maintenance procedures are IAW AR 750-1, DA PAM 750-35 and local major command (MACOM) policies.
  - a. Review unit standing operating procedures (SOP) for maintenance.
  - b. Inform unit personnel of changes in policy and new policy that impacts unit SOP.
2. Provide technical assistance to unit maintenance activities.
  - a. Inspect unit maintenance operations.
  - b. Identify shortcomings.
  - c. Make recommendations for corrective action.
  - d. Provide training in maintenance procedures.
3. Provide maintenance management to units.
  - a. Review reports (MCRS and ULLS-G).
  - b. Coordinate with higher level maintenance activities.
  - c. Direct cross-leveling of maintenance assets/workload.
  - d. Prioritize maintenance efforts of units.

**Performance Measures**

	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Review unit SOP as scheduled	—	—
2. Compare unit SOP against standards set in DA PAM 750-35-35.	—	—
3. Complete regular inspection of unit operations.	—	—
4. Compare unit operations against standards in AR 750-1, DA Pam 738-750 and DA PAM 750-35.	—	—
5. Inspect environmental protection practices for compliance.	—	—
6. Review safety program practices for compliance with AR 385-55.	—	—
7. Record and submit deficiencies to proper personnel for correction.	—	—
8. Record training needs.	—	—
9. Coordinate with appropriate personnel to provide needed training.	—	—
10. Review MCSR for accuracy and compliance with standards in AR 700-138, and applicable user's manual.	—	—
11. Coordinate with appropriate maintenance level to correct maintenance discrepancies.	—	—
12. Coordinate with TRADOC and AMC to ensure that emerging issues are addressed appropriately at the unit.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**

AR 385-55  
AR 700-138  
DA PAM 738-750  
DA PAM 750-1  
DA PAM 750-35

**Related**

AR 190-51  
AR 385-10  
AR 385-40  
AR 600-55  
AR 700-4  
AR 710-2  
AR 725-50  
AR 735-5  
AR 750-43  
DA PAM 25-30  
DA PAM 710-2-2  
FM 4-30.3

**Interpret Maintenance Operational Overlay  
091-CLT-3010**

**Conditions:** In a field or garrison environment, given an operational overlay, map, maintenance situation/OPORD, and applicable references.

**Standards:** Interpreted the maintenance operational overlay by identifying key features and elements of the area of operation IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured necessary references and materials were available.	—	—
2. Identified mapping symbols on the operational overlay.	—	—
3. Identified key features of the map and operational overlay.	—	—
4. Identified key elements of the area of operation on the map and operational overlay.	—	—
5. Updated the operational overlay, as necessary.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**  
FM 101-5-1  
FM 4-30.3  
FM 5-170

**Related**

**Deploy Maintenance Support Teams  
091-CLT-3011**

**Conditions:** In a field or garrison environment, given a request for maintenance support/maintenance situation, map, operational overlay, grid coordinates of destination, vehicle(s), equipment, maintenance personnel, and applicable references.

**Standards:** Deployed the maintenance support team IAW the maintenance situation/request for maintenance support and applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Reviewed the request for maintenance support/maintenance situation.	—	—
2. Determined personnel and equipment requirements necessary to perform the mission.	—	—
3. Identified available resources for the support team, including personnel with applicable MOSs, vehicle(s), tools, test equipment, publications, repair parts, time, and facilities as necessary.	—	—
4. Determined requirements for defending the team.	—	—
5. Briefed the team on the mission.	—	—
a. Reviewed operational overlay.		
b. Conducted a map recon of the route and destination.		
6. Deployed the maintenance support team.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**  
FM 4-30.3

**Related**  
FM 101-5-1  
FM 5-170



**Manage the Standard Army Maintenance System (SAMS)  
091-CLT-3012**

**Conditions:** In a field or garrison environment, given a computer system(s) with SAMS-1 software, database of equipment files, SAMS operator, and applicable references.

**Standards:** Supervised SAMS-1 functions of a direct support (DS)-level maintenance shop IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured necessary equipment and publications were available.	—	—
2. Ensured SAMS operator was adequately trained.	—	—
3. Reviewed the SAMS-1 system and the flow of information to and from system interfaces.	—	—
4. Reviewed the purpose and use of SAMS-1 categories and codes.	—	—
5. Supervised the processing of maintenance requests (DA Form 2407).	—	—
6. Interpreted SAMS-1 reports to identify maintenance trends and problems. <ul style="list-style-type: none"> <li>a. bench stock listing (AHN-023).</li> <li>b. shop section summary (AHN-006).</li> <li>c. work order detail (AHN-018).</li> <li>d. shop stock list (AHN-002).</li> <li>e. production backlog (AHN-022).</li> <li>f. equipment status listing (AHN-021).</li> </ul>	—	—
7. Requested and interpreted ad hoc reports as necessary.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**

AISM 18-L21-AHN-BUR-UM  
 AISM 18-L26-AHO-BUR-EM  
 DA PAM 738-750

**Related**

**Manage the Unit Level Logistics System (ULLS)  
091-CLT-3013**

**Conditions:** In a field or garrison environment, given a computer system(s) with Unit Level Logistics System-Ground (ULLS-G) software, database of equipment files, associated Army Materiel Status System (AMSS) software, ULLS operator, and applicable references.

**Standards:** Supervised ULLS-G functions of a unit-level maintenance shop IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured necessary equipment and references were available.	—	—
2. Ensured ULLS operator was properly trained.	—	—
3. Reviewed the ULLS system flow of information to and from system interfaces.	—	—
4. Reviewed ULLS-G maintenance forms for accuracy.	—	—
5. Analyzed ULLS-G reports and data to identify maintenance trends and problems.	—	—
a. Document register.		
b. PLL inventory report.		
c. Zero balance report.		
d. PLL excess management report.		
e. PLL inquiry.		
f. Not mission capable (NMC) report.		
6. Analyzed AMSS reports and data to identify maintenance trends and problems.	—	—
a. AMSS Authorization Report.		
b. Projected fully mission capable ( FMC) Rates Report.		
c. Equipment exception report.		
d. System status summary.		
e. Class IX failure data by administrative number.		
f. Rollup by equipment identification code ( EIC).		
g. Rollup by unit identification code (UIC).		
h. Non mission capable (NMC) Report.		

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**

AR 710-2  
DA PAM 710-2-1

**Related**

**Manage the Unit Army Oil Analysis Program (AOAP)  
091-CLT-3014**

**Conditions:** In a field or garrison environment, given Automated Oil Analysis Log Printout, unit and higher headquarters' AOAP SOPs and policies, and applicable references.

**Standards:** Managed the unit AOAP IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured necessary publications were available.	—	—
2. Reviewed the objectives and policies of the AOAP Program.	—	—
3. Identified responsibilities of key AOAP personnel.	—	—
4. Ensured sampling intervals and procedures were followed.	—	—
5. Ensured samples are processed IAW applicable references and SOPs.	—	—
6. Ensured lab results are processed IAW applicable references and SOPs, and follow-up actions were completed.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO-GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

- References**
- Required**
  - DA PAM 738-750
  - TB 43-0211

**Related**

**Deploy Company Maintenance Team/Recovery Support Team  
091-CLT-3015**

**Conditions:** In a field or garrison environment, given a request for maintenance support/maintenance situation, map, operational overlay, grid coordinates of destination, vehicle(s), equipment, maintenance personnel, and applicable references.

**Standards:** Deployed the company maintenance team/recovery support team IAW the maintenance situation/request for maintenance support and applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Reviewed the request for maintenance support/maintenance situation.	—	—
2. Determined personnel and equipment requirements necessary to perform the mission.	—	—
3. Identified available resources for the company maintenance team/recovery support team, including personnel with applicable MOSs, vehicle(s), tools, test equipment, publications, repair parts, time, and facilities, as necessary.	—	—
4. Determined requirements for defending the team.	—	—
5. Briefed the team on the mission: <ul style="list-style-type: none"> <li>a. Reviewed the operational overlay.</li> <li>b. Conducted a map recon of the route and destination.</li> </ul>	—	—
6. Deployed the maintenance support team.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**  
 FM 101-5-1  
 FM 4-30.3  
 FM 5-170

**Related**

**Review the Army Materiel Status System (AMSS) Reports  
091-CLT-3016**

**Conditions:** In a field or garrison environment, given AMSS reports produced from an ULLS-G system, and applicable references.

**Standards:** Analyzed AMSS reports and data to identify maintenance trends and problems IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured necessary ULLS equipment and references were available.	—	—
2. Analyzed AMSS reports and data to identify maintenance trends and problems.	—	—
a. AMSS authorization report.		
b. Projected FMC rates report.		
c. Equipment exception report.		
d. System status summary.		
e. Class IX failure data by administrative number.		
f. Rollup by EIC.		
g. Rollup by UIC.		
h. NMC report.		

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**References**

**Required**

AR 710-2

DA PAM 710-2-1

**Related**

Skill Level 4

Subject Area 9: Common Logistic Tasks

**Perform Senior Rater Responsibilities for a Maintenance Section**

**091-CLT-4001**

**Conditions:** In a field or garrison environment, given an NCOER with the rater's portion completed, accompanying counseling statements, and AR 623-205.

**Standards:** Performed senior rater's responsibilities IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured all materials and references were available.	—	—
2. Reviewed quarterly counseling that supported the NCOER.	—	—
3. Reviewed the administrative data and rater's portions of the NCOER for accuracy and content.	—	—
4. Prepared the senior rater's portion of the NCOER.	—	—
5. Ensured the NCOER was submitted for review and further processing.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Supervise Platoon/Section Administrative Procedures  
091-CLT-4002**

**Conditions:** In a field or garrison environment, given situation(s) requiring platoon/section administrative procedures supervision and applicable forms, records, and publications.

**Standards:** Supervised platoon/section administrative procedures IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Established files using the Modern Army Record Keeping System (MARKS). a. Prepared file folders and guides. b. Arranged file folders and guides. c. Prepared file drawer labels. d. Prepared a list of file numbers.	—	—
2. Processed a recommendation for award.	—	—
3. Processed and updated a flag on records.	—	—
4. Verified the accuracy of Suspension of Favorable Action Report.	—	—
5. Processed and updated a bar to reenlistment.	—	—
6. Processed a chapter action. a. Selected appropriate type of chapter action and identified separation guidelines. b. Initiated and follow-up the chapter action.	—	—
7. Processed a recommendation for advancement/promotion.	—	—
8. Verified accuracy of Enlisted Promotion Report (AAC-C01).	—	—
9. Assisted a subordinate NCO who had received notice of selection to be released under the Qualitative Management Program (QMP).	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Manage Combat Stress**  
**091-CLT-4003**

**Conditions:** In a field or garrison environment, given a situation requiring stress management and FM 22-51.

**Standards:** Managed combat stress IAW applicable references.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Identified sources of combat stress.	—	—
2. Identified the signs and classifications of battle fatigue.	—	—
3. Identified signs of stress in self, others, and the unit.	—	—
4. Took appropriate steps to reduce and/or prevent stress.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.



**Ensure Maintenance Operations are in Compliance With the Army Environmental Program  
091-CLT-4004**

**Conditions:** In a field or garrison environment, given a maintenance facility/site, maintenance personnel and equipment, and applicable references.

**Standards:** Ensured maintenance operations were in compliance with the Army Environmental Program and other regulatory publications.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured all publications were available.	—	—
2. Reviewed maintenance SOP to ensure environmental policies and procedures were adequately addressed concerning the following: a. Environmental strategies of compliance, restoration, prevention, and conservation. b. Federal, state, local, and host nation laws and regulations.	—	—
3. Updated/changed/amended SOP as necessary.	—	—
4. Ensured all soldiers had received training on environmental laws, regulations, policies, and procedures.	—	—
5. Ensured inspections for hazardous waste and HAZMAT were conducted as required.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Enforce Compliance With the Shop Safety Program  
091-CLT-4005**

**Conditions:** In a field or garrison environment, given a maintenance site/facility, maintenance personnel, unit safety SOP, and applicable references.

**Standards:** Enforced compliance with the shop safety program IAW applicable references and unit safety SOP.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured all safety references were on hand.	—	—
2. Ensured all safety equipment was on hand, accessible, and properly maintained.	—	—
3. Ensured all soldiers were regularly updated on the shop safety program.	—	—
4. Ensured periodic safety inspections were being conducted, and safety concerns and violations were being corrected.	—	—
5. Ensured safety violations were being documented and reported as required, and follow-ups were being conducted.	—	—
6. Inspected records of safety inspections and accident reports for accuracy and completeness.	—	—
7. Inspected to ensure Material Safety Data Sheets (MSDS) were posted and maintained in applicable work areas.	—	—
8. Performed periodic safety spot checks and inspections for safety awareness and systemic safety problems.	—	—
a. Performed on-the-spot corrections.		
b. Performed follow-ups.		

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Coordinate Support for the Maintenance Platoon/Section  
091-CLT-4006**

**Conditions:** In a field environment, given a OPORD/maintenance situation, a maintenance platoon or section with personnel and equipment, SOP, and applicable references.

**Standards:** Coordinated support for the maintenance platoon/section IAW SOP and applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Evaluated the tactical situation and OPORD requirements.	—	—
2. Determined support needed at each location.	—	—
3. Notified parent/supported units of support requirements.	—	—
4. Followed up to ensure support had been coordinated/was being provided.	—	—
a. Notified appropriate parent/supported units to resolve any problems.		
b. Addressed problems in after action review (AAR).		

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Select a Field Maintenance Site**  
**091-CLT-4007**

**Conditions:** In a field environment, given an OPORD to establish a field maintenance site, maintenance personnel, equipment, and references.

**Standards:** Selected a field maintenance site IAW the OPORD and applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Considered the following elements of a good field maintenance site during the selection process:	—	—
a. Area should be reasonably flat and have good drainage.		
b. Area should have firm soil to permit parking and movement of heavy vehicles and equipment.		
c. Area should be accessible to support units.		
d. Terrain should facilitate defense.		
e. Area should be near built-up areas that can be used for mission support.		
2. Performed a map reconnaissance to determine possible sites.	—	—
3. Performed an area reconnaissance and site recons to determine the best site.	—	—
4. Informed higher headquarters of the field maintenance site location.	—	—
5. Relocated to the new field maintenance site.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Prepare an Operational Overlay for Maintenance Operations  
091-CLT-4008**

**Conditions:** In a field or garrison environment, given a map, overlay material, maintenance situation/OPORD, and applicable references.

**Standards:** Prepared an operational overlay for maintenance operations by depicting key activities and elements within the area of operation IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured necessary references and materials were available.	—	—
2. Placed units/activities on the maintenance operations overlay using the appropriate symbols.	—	—
3. Placed key features of the area of operation on the overlay.	—	—
4. Updated the operational overlay, as necessary.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Control Flow of Work Through the Maintenance Shop  
091-CLT-4009**

**Conditions:** In a field or garrison environment, given a maintenance shop including personnel, work orders, and applicable references.

**Standards:** Controlled the flow of work within the maintenance shop to ensure maximum production, effective use of personnel and facilities, and orderly progression of work so that overloads were prevented or corrected, and the shop was working near capacity with a manageable backlog.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Screened maintenance requests.	—	—
2. Assigned work to the appropriate shop section.	—	—
3. Maintained work load status for the various sections.	—	—
4. Directed repair priorities and additional actions(evacuation, operational readiness float (ORF), intra-shop, deferred) as applicable.	—	—
5. Ensured shop supply section orders/maintained repair parts, as required.	—	—
6. Improved operational procedures where necessary.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Integrate Automated Logistics Support Systems  
091-CLT-4010**

**Conditions:** In a field or garrison environment, given a Unit Level Logistics System-Ground (ULLS-G) computer system with software and equipment data base in a unit-level maintenance shop, a Standard Army Maintenance System-1 (SAMS-1) computer system with software and database in a direct support (DS)-level maintenance shop, a Standard Army Maintenance System -2 (SAMS-2) computer system with software and data base in a support operations section, and applicable publications.

**Standards:** Integrated automated logistics support systems in a maintenance shop IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Identified the architecture/interface of Army automated logistics systems.	—	—
2. Supervised ULLS-G functions in a unit-level maintenance shop.	—	—
3. Supervised SAMS-1 functions in a DS-level maintenance shop.	—	—
4. Supervised SAMS-2 functions in a support operations section.	—	—
5. Interfaced with Standard Army Retail Supply System-Objective (SARSS-O) for supply functions.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Plan Logistics Support for Maintenance Operations  
091-CLT-4011**

**Conditions:** In a field or garrison environment, given an OPORD/maintenance situation, maintenance personnel and equipment, and applicable references.

**Standards:** Planned logistics support for maintenance operations IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Appraised the combat situation.	—	—
2. Determined support needed.	—	—
a. People (skills and numbers).		
b. Equipment (transportation, tools, TMDE, and communications).		
c. Supplies (components, assemblies, and repair parts).		
3. Organized resources to provide needed support.	—	—
4. Followed these planning considerations:	—	—
a. Number and type of units supported.		
b. Stock levels for repair parts.		
c. Forward displacement of maintenance support teams/maintenance collection points.		
d. Channels and procedures for recovery, collection, evacuation, and disposition of captured or abandoned materiel.		

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.



**Monitor the Preparation and Disposition of the Army Materiel Status System (AMSS) Reports  
091-CLT-4012**

**Conditions:** In a field or garrison unit-level maintenance shop, given a unit level logistics system-ground (ULLS-G) computer system with AMSS software, AMSS reports produced from a ULLS-G system, and applicable references.

**Standards:** Verified accuracy of AMSS report data, identified maintenance trends and problems, and ensured timely completion and forwarding of reports IAW applicable references and SOP.

<b>Performance Measures</b>	<u><b>GO</b></u>	<u><b>NO GO</b></u>
1. Ensured necessary ULLS equipment and references were available.	—	—
2. Checked AMSS report data for accuracy and completeness.	—	—
3. Analyzed AMSS reports and data to identify maintenance trends and problems.	—	—
4. Notified supported units, logistics assistance office/logistics assistance representative, and chain of command, (as necessary), to resolve problems and prevent future occurrences.	—	—
5. Ensured AMSS reports were completed and forwarded through appropriate channels IAW SOP.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Analyze the Prescribed Load List (PLL) Report  
091-CLT-4013**

**Conditions:** In a field or garrison unit-level maintenance shop, given PLL reports produced by ULLS-G system and applicable references.

**Standards:** Analyzed the PLL reports to ensure inventory accuracy and identified potential supply shortages/problems impacting on maintenance readiness IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured reports and references were available.	—	—
a. PLL inventory report.		
b. Zero balance report.		
c. PLL excess management report.		
d. PLL inquiries (as needed).		
e. NMC report.		
2. Performed random inventory checks and resolved discrepancies.	—	—
3. Determined expedient measures necessary to resolve not mission capable supply (NMC-S) equipment awaiting PLL items on the zero balance report.	—	—
4. Resolved discrepancies in report data within the ULLS-G system.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Monitor Quality Control Program  
091-CLT-4014**

**Conditions:** In a field or garrison maintenance shop, given a maintenance facility/site, maintenance personnel, maintenance SOP, and applicable references.

**Standards:** Monitored the quality control program to ensure quality of work IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured quality assurance/quality control (QA/QC) inspectors were adequately trained and knowledgeable in their respective maintenance areas and were on orders from the commander, if required by SOP.	—	—
2. Ensured QA/QC inspectors followed maintenance SOP guidelines and procedures and TM procedures for initial and final inspections.	—	—
3. Performed periodic checks of inspectors' work for accuracy of initial diagnosis and quality of final inspections.	—	—
4. Ensured supervisors were conducting in-process inspections of work done by mechanics/technicians.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Analyze Bench Stock Listing**  
**091-CLT-4015**

**Conditions:** In a field or garrison DS-level maintenance shop, given a SAMS-1 generated bench stock listing (AHN-023) and applicable references.

**Standards:** Analyzed bench stock listing to identify supply problems that may impact maintenance readiness IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured report and references were available.	—	—
2. Performed random bench stock inventory checks.	—	—
3. Determined expedient measures necessary to resolve NMC-S equipment awaiting bench stock items.	—	—
4. Resolved any discrepancies in report data in the SAMS-1.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Analyze Open Work Request Reconciliation Listing  
091-CLT-4016**

**Conditions:** In a field or garrison DS-level maintenance shop, given a SAMS-1 generated open work request reconciliation listing and applicable references.

**Standards:** Analyzed the open work request reconciliation listing IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured references and equipment were available.	—	—
2. Conducted face-to-face reconciliation with team chief.	—	—
3. Supervised SAMS operator on purging operations.	—	—
4. Supervised SAMS operator on mail status returned on organizational disk.	—	—
5. Improved operational procedures where necessary.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Analyze Completed Shop Workload Summary**  
**091-CLT-4017**

**Conditions:** In a field or garrison DS-level maintenance shop, given a SAMS-1 generated completed shop workload summary report and applicable references.

**Standards:** Analyzed the completed shop workload summary report IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured references and equipment were available.	—	—
2. Assigned workload to personnel, as required.	—	—
3. Tracked status of all jobs requiring parts.	—	—
4. Ensured once job was completed, parts were turned in and paperwork completed IAW local SOP.	—	—
5. Improved operational procedures, where necessary.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Analyze Shop Deadline and Deferred Workload Listing  
091-CLT-4018**

**Conditions:** In a field or garrison DS-level maintenance shop, given a SAMS-1 generated shop deadline and deferred workload listing report and applicable references.

**Standards:** Analyzed the shop deadline and deferred workload listing report IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured references and equipment were available.	—	—
2. Prioritized jobs by the status and priority code.	—	—
3. Tracked workload listing for proper status of operation and maintenance (O/M).	—	—
4. Supervised AHN-006, AHN-022, and AHN-026 reports.	—	—
5. Improved operational procedures where necessary.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Analyze Shop Workload Summary Listing**  
**091-CLT-4019**

**Conditions:** In a field or garrison DS-level maintenance shop, given a SAMS-1 generated shop workload summary listing and applicable references.

**Standards:** Analyzed the shop workload summary listing IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured references and equipment were available.	—	—
2. Assigned workload to personnel, as required.	—	—
3. Tracked status of all jobs requiring parts.	—	—
4. Ensured once job was completed, parts were turned in and paperwork completed IAW local SOP.	—	—
5. Improved operational procedures where necessary.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.



**Maintain Property Accountability**  
**091-CLT-4020**

**Conditions:** In a field or garrison environment, given property and tools, property book listing and/or hand receipts, blank forms, and applicable references.

**Standards:** Maintained property accountability IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured all references, technical bulletins (TBs), supply catalogs (SCs), and forms were available.	—	—
2. Performed initial inventory of all property, tools, and equipment. <ul style="list-style-type: none"> <li>a. Completed shortage annexes, as necessary.</li> <li>b. Reported all shortages, as necessary.</li> <li>c. Initiated report of survey or other property loss actions, as necessary.</li> <li>d. Ordered replacement items.</li> </ul>	—	—
3. Prepared sub-hand receipts for subordinate sections.	—	—
4. Had subordinates inventory all property, tools, and equipment on each respective subhand receipt and shortage annex and sign for property on hand.	—	—
5. Signed for property on property book or hand receipts, as applicable.	—	—
6. Performed periodic inventories of tools and sensitive items, as required.	—	—
7. Performed periodic partial or full inventories, as required.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Prepare Standing Operating Procedures for Maintenance Operations  
091-CLT-4021**

**Conditions:** In a field or garrison environment, given FM 9-43-1, higher headquarters SOP(s), and commander's guidance.

**Standards:** Prepared a maintenance shop internal or external SOP for the commander's review, comment, and approval IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured applicable publications were available.	—	—
2. Prepared a maintenance shop internal or external SOP.	—	—
3. Ensured unit policies and commander's guidance were followed.	—	—
4. Ensured shop operation policies were adequately addressed.	—	—
5. Updated the shop SOP as required.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Supervise the Deployment of Company Maintenance Team/Recovery Support Team/Maintenance Support Team**  
**091-CLT-4022**

**Conditions:** In a field or garrison environment, given a request for maintenance support/maintenance situation, map, operational overlay, grid coordinates of destination, vehicle(s), equipment, maintenance personnel, and applicable references.

**Standards:** Supervised the deployment of company maintenance team/recovery support team(s) IAW the maintenance situation/request for maintenance support and applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Reviewed the request for maintenance support/maintenance situation.	—	—
2. Ensured personnel and equipment to perform the mission were available.	—	—
3. Ensured resources for the company maintenance team/recovery support team/maintenance support team, including personnel with applicable MOSs, vehicle(s), tools, test equipment, publications, repair parts, time, and facilities were appropriately identified.	—	—
4. Ensured requirements for defending the team had been properly determined and arranged.	—	—
5. Ensured team leader(s) were briefed on the mission.	—	—
a. Reviewed the operational overlay.		
b. Conducted a map recon of the route and destination.		
6. Ensured the company maintenance team/recovery support team/maintenance support team was deployed.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Conduct a Route Reconnaissance for a Maintenance Mission  
091-CLT-4023**

**Conditions:** In a field environment, given a maintenance situation/OPORD, operational overlay, grid coordinates for a proposed route, map, vehicle with personnel, and applicable references.

**Standards:** Conducted a route reconnaissance for a given route identifying distances/times, problem areas along the route, possible bypasses or alternate routes, and prepared strip maps IAW the maintenance situation/OPORD and applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured necessary equipment and publications were available.	—	—
2. Determined the route to be used for the maintenance mission.	—	—
3. Performed a map recon of the route.	—	—
4. Contacted units along the route and coordinated passage.	—	—
5. Selected personnel to conduct the reconnaissance.	—	—
6. Reconned the route identifying key features to include: <ul style="list-style-type: none"> <li>a. Potential problem areas (i.e., possible enemy contact, trafficability, etc.).</li> <li>b. Possible bypasses/alternate routes.</li> </ul>	—	—
7. Recorded information on a strip map for use by the maintenance team.	—	—
8. Advised the commander/staff officer on use of the route for maintenance missions.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Conduct an Area Reconnaissance for a Maintenance Mission  
091-CLT-4024**

**Conditions:** In a field environment, given a maintenance situation/OPORD, operational overlay, grid coordinates for a proposed occupation area, map, vehicle with personnel, and applicable references.

**Standards:** Performed an area reconnaissance, selecting the most appropriate location to establish a maintenance site IAW the maintenance situation/OPORD and applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Ensured necessary equipment and publications were available.	—	—
2. Performed a map recon of the area.	—	—
3. Selected personnel to conduct the reconnaissance.	—	—
4. Reconned the area to determine suitability for maintenance operations, accessibility in and out of the site, defendability, and actions required for the safety of personnel and equipment.	—	—
5. Advised the commander/staff officer on occupying the area of operations based upon the reconnaissance.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Manage Battlefield Maintenance Support**  
**091-CLT-4025**

**Conditions:** In a field maintenance shop, given an OPORD/maintenance situation, maintenance personnel, equipment, and applicable references.

**Standards:** Managed battlefield maintenance support IAW applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Appraised the combat situation and organized and prioritized support based on type of operation: a. Offensive operation. b. Defensive operation.	—	—
2. Planned for and executed appropriate maintenance support: a. Identified requirements. b. Identified available resources. (1) Personnel and skills. (2) Publications. (3) Time. (4) Facilities. (5) TMDE and tools. (6) Parts. c. Managed resources for maximum return, with priority on the following: (1) Maintenance support forward. (2) Commander's guidance. (3) Battle damage repair. (4) Controlled exchange. (5) Cannibalization. (6) Evacuation. (7) Recovery.	—	—
3. Followed priorities for repair of battle damaged systems: a. Most essential for completion of the immediate mission. b. Least amount of time to repair. c. Repairable, but not in time to continue the immediate mission. d. Damaged beyond repair candidate for cannibalization.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Perform Support Operations NCO Duties  
091-CLT-4026**

**Conditions:** In a field or garrison environment, given a position as a support operations maintenance NCO, and applicable references.

**Standards:** Performed the duties of a support operations maintenance NCO, ensuring that the direct support (DS) maintenance mission is effectively coordinated and integrated within the battalion or support group.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Provided guidance on maintenance priorities within the unit.	—	—
2. Set objectives for maintenance shop production.	—	—
3. Monitored maintenance shop workflow and status of repair part requisitions.	—	—
4. Supervised, controlled, and directed the operation of battalion units for:	—	—
a. DS maintenance.		
b. Evacuation.		
c. Repair parts supply.		
d. Repairable exchange (RX).		
e. Technical assistance.		

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Manage Maintenance Operations at a Maintenance Collection Point  
091-CLT-4027**

**Conditions:** In a field maintenance environment, given an OPORD/maintenance situation, a maintenance collection point (MCP) site, maintenance personnel and equipment, and applicable references.

**Standards:** Managed maintenance operations at an MCP IAW the OPORD and applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Set up the MCP.	—	—
2. Managed flow of equipment for repair. <ul style="list-style-type: none"> <li>a. Focused efforts toward repairing systems for current battle or start of next battle.</li> <li>b. Fixed 4 to 6 hour jobs at unit maintenance collection point (UMCP).</li> <li>c. Evacuated other equipment to brigade MCP or farther rear location.</li> <li>d. Maximized battle damage assessment repair (BDAR), cannibalization, and controlled exchange at central MCP.</li> </ul>	—	—
3. Managed company maintenance teams/recovery support teams/maintenance support teams held at MCP.	—	—
4. Managed prescribed load list (PLL) assets for forward combat units.	—	—
5. Relocated forward (as necessary) to continue fix-forward support.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.



**Provide Maintenance Support During Tactical Operations  
091-CLT-4028**

**Conditions:** In a field environment, given an operation order (OPORD)/maintenance situation, maintenance personnel and equipment, and applicable references.

**Standards:** Provided maintenance support during tactical operations IAW the OPORD and applicable references.

<b>Performance Measures</b>	<b><u>GO</u></b>	<b><u>NO GO</u></b>
1. Provided maintenance support during offensive operations.	—	—
2. Provided maintenance support during defensive operations.	—	—
3. Provided maintenance support during retrograde operations.	—	—
4. Provided maintenance support during reconstitution operations.	—	—
5. Provided maintenance support during night operations.	—	—
6. Provided maintenance support in NBC environment.	—	—
7. Provided maintenance support during stability and support operations (SASO).	—	—
a. Peace operations.		
b. Humanitarian operations.		
c. Disaster relief operations.		
8. Provided maintenance support in the following adverse conditions.	—	—
a. Desert operations.		
b. Cold weather operations.		
c. Jungle operations.		
d. Mountain operations.		
e. Urban terrain operations.		

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**Supervise Preventive Maintenance Checks and Services (PMCS)**

**091-CLT-4029**

**Conditions:** In the field or in a motor pool environment, given proper equipment, appropriate technical manuals, supporting forms and documentation, tools and personnel.

**Standards:** Ensure maintenance status of assigned equipment is reported and personnel are trained in the proper procedures for conducting PMCS and in accordance with the appropriate references.

**Performance Steps**

1. Direct preventive maintenance checks and services.
  - a. Verify that all current and updated technical manuals and references are available or requisitioned for unit's assigned equipment.
  - b. Verify that all tools, POL, personnel and other resources are available for PMCS.
  - c. Observe operators performing PMCS at prescribed intervals.
  - d. Review maintenance forms and reporting procedures for accuracy and completeness.
2. Report maintenance status of assigned equipment.
  - a. Verify that the operator has correctly identified and corrected, or recorded faults on DA Form 5988-E or DA Form 2404.
  - b. Confirm that NMC faults are corrected before dispatch.
3. Train personnel in the proper procedures for conducting PMCS.
  - a. Enforce the Commander's training program for operators of assigned equipment.
  - b. Lead collective training.
  - c. Verify that all operators are licensed for their equipment.
  - d. Verify that squad leaders/section chiefs/team leaders train team members.

**Performance Measures**

	<u>GO</u>	<u>NO GO</u>
1. Verify that all current and updated technical manuals and references are available or requisitioned for unit's assigned equipment	—	—
2. Verify that all tools, POL, personnel and other resources are available for PMCS.	—	—
3. Enforce standing operating procedures IAW AR 750-1 and local policy.	—	—
4. Reduce training distractions.	—	—
5. Check operator's DA Form 346 to confirm that operators are licensed.	—	—
6. Observe operators performing PMCS at prescribed intervals.	—	—
7. Compare PMCS process to the PMCS table in the appropriate technical reference.	—	—
8. Review maintenance forms and reporting procedures for accuracy and completeness.	—	—
9. Correct technical and administrative deficiencies on the spot and provide feedback for the operator/crew on correct procedures.	—	—

**Evaluation Guidance:** Score the soldier GO if all steps are passed. Score the soldier NO GO if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

**APPENDIX A - DEPARTMENT OF THE ARMY (DA) FORM 5164-R (HANDS-ON EVALUATION)**

A-1. This appendix provides a copy of DA Form 5164-R. Locally reproduce DA Form 5164-R on 8 1/2-by 11-inch paper.

A-2. The use of this form is optional, but highly encouraged. This evaluation allows you to maintain and track the soldier's proficiency at the performance level.

A-3. Use the following instructions to complete DA Form 5164-R:

- Enter the title and number of the task to be evaluated at the top of the form.
- Enter in column "a" the number of each performance step from the evaluation guide.
- Enter in column "b" each performance step from the evaluation guide that corresponds to the number in column "a." Abbreviate the information, if necessary.
- Locally reproduce the partially completed DA Form 5164-R if more than one soldier will be evaluated on the specific task or the same soldier will be evaluated more than once.
- Enter the date, the evaluator's name, and the soldier's name and unit before starting the evaluation.
- Enter a check in column "c" (PASS) or column "d" (FAIL) for each performance step evaluated, as appropriate.
- Check the status block GO or NO-GO.

<b>HANDS-ON EVALUATION</b> For use of this form, see AR 350-57; the proponent agency is ODCSOPS		DATE	
TASK TITLE		TASK NUMBER	
ITEM a	PERFORMANCE STEP TITLE b	SCORE (Check One)	
		PASS c	FAIL d
		<input type="checkbox"/> P	<input type="checkbox"/> F
		<input type="checkbox"/> P	<input type="checkbox"/> F
		<input type="checkbox"/> P	<input type="checkbox"/> F
		<input type="checkbox"/> P	<input type="checkbox"/> F
		<input type="checkbox"/> P	<input type="checkbox"/> F
		<input type="checkbox"/> P	<input type="checkbox"/> F
		<input type="checkbox"/> P	<input type="checkbox"/> F
		<input type="checkbox"/> P	<input type="checkbox"/> F
		<input type="checkbox"/> P	<input type="checkbox"/> F
		<input type="checkbox"/> P	<input type="checkbox"/> F
		<input type="checkbox"/> P	<input type="checkbox"/> F
		<input type="checkbox"/> P	<input type="checkbox"/> F
		<input type="checkbox"/> P	<input type="checkbox"/> F
		<input type="checkbox"/> P	<input type="checkbox"/> F
		<input type="checkbox"/> P	<input type="checkbox"/> F
		<input type="checkbox"/> P	<input type="checkbox"/> F
EVALUATOR'S NAME		UNIT	
SOLDIER'S NAME		STATUS <input type="checkbox"/> GO <input type="checkbox"/> NO GO	

DA FORM 5164-R, SEP 85

EDITION OF DEC 82 IS OBSOLETE

USAPPC V2.00

**APPENDIX B - DEPARTMENT OF THE ARMY (DA) FORM 5165-R (FIELD EXPEDIENT SQUAD BOOK)**

B-1. This appendix provides a copy of DA Form 5165-R. Blank reproducible forms may be obtained in Army Regulation (AR) 350-41. All forms may be reproduced locally on 8 1/2- by 11-inch paper.

B-2. Trainers should use the following instructions when completing DA Form 5165-R.

- Make all entries in pencil.
- Enter the task number and a short title in the appropriate column.
- Record the date in the GO block if the soldier demonstrates task proficiency to the soldier's manual standards. Keep this form current by always recording the most recent date on which the soldier demonstrated task proficiency.
- Record the date in the NO-GO block if the soldier failed to demonstrate task proficiency to the soldier's manual standards. Soldiers who fail to perform the task should be retrained and evaluated until they can do the task. Once the soldier performs the task correctly, enter the date in the GO block and erase the previous entry from the NO-GO block.
- Read down each column (GO/NO-GO) to determine the training status of that individual. This will give the trainer a quick indication of tasks on which the soldier needs to be trained or evaluated.
- Read across the rows for each task to determine the training status of all the soldiers. The trainer can readily see on which tasks training should be focused.
- Add the names of newly assigned soldiers to one of the blank columns.
- Line through the training status column of any soldier who departs from the unit.

**NOTE TO THE TRAINING MANAGER: The training status of groups can be maintained (such as team, squad, or platoon) in key critical military occupational specialty (MOS) at any level by entering the level (such as 1st platoon, 2nd platoon, or 3rd platoon) in the column headings. Simply have the trainers report the percentage of their soldiers who have (GO blocks) and have not (NO-GO blocks) demonstrated proficiency on each task and record this information for each level.**



**APPENDIX C - CONVERSION FACTORS (UNITED STATES [US] AND METRIC UNITS)****Table C-1. Conversion Chart**

<b>US Units</b>	<b>Multiplied By</b>	<b>Equals Metric Units</b>
<b>Length</b>		
Feet	0.30480	Meters
Inches	2.54000	Centimeters
Inches	0.02540	Meters
Inches	25.40010	Millimeters
Miles (statute)	1.60930	Kilometers
Miles (nautical)	1.85320	Kilometers
Yards	0.91400	Meters
<b>Area</b>		
Square inches	6.45160	Square centimeters
Square feet	0.09290	Square meters
Square yards	0.83610	Square meters
<b>Volume</b>		
Cubic inches	16.38720	Cubic centimeters
Cubic feet	0.02830	Cubic meters
Cubic yards	0.76460	Cubic meters
Gallons	3.78540	Liters
Fluid ounces	29.57300	Milliliters
Quarts	0.94600	Liters
<b>Weight</b>		
Ounces	28.34900	Grams
Pounds	453.59000	Grams
Pounds	0.45359	Kilograms
Short tons	0.90700	Metric tons
Long tons	1.01600	Metric tons
Foot-pounds	1.3830	Newton-meters
<b>Pressure</b>		
Pounds per square inch (psi)	6.9	Kilopascals (kPa)

<b>Metric Units</b>	<b>Multiplied By</b>	<b>Equals US Units</b>
<b>Length</b>		
Centimeters	0.39370	Inches
Meters per second	2.23700	Miles per hour
Millimeters	0.03937	Inches
Kilometers	0.62137	Miles (statute)
Kilometers	0.53960	Miles (nautical)
Meters	3.28080	Feet
Meters	39.37000	Inches
Meters	1.09360	Yards
<b>Area</b>		
Square centimeters	0.15500	Square inches
Square meters	10.76400	Square feet
Square meters	1.19600	Square yards
<b>Volume</b>		
Cubic centimeters	0.06100	Cubic inches
Cubic meters	35.31440	Cubic feet
Cubic meters	1.30790	Cubic yards
Milliliters	0.03380	Fluid ounces
Liters	1.05700	Quarts
Liters	0.26420	Gallons
<b>Weight</b>		
Grams	0.03527	Ounces
Kilograms	2.20460	Pounds
Metric tons	1.10200	Short tons
Metric tons	0.98400	Long tons
Newton-meters	0.7380	Foot-pounds
<b>Pressure</b>		
KPa (Kilopascals)	.14493	Psi (pounds per square inch)



**GLOSSARY****1SG**

first sergeant

**AAR**

after-action review; after-action report

**AC**

active component; alternating current

**ACCP**

Army Correspondence Course Program

**ACE**

air combat element (NATO); analysis and control element; aviation combat element (USMC); armored combat earthmover (M9)

**ACES**

Army Continuing Education System

**activity**

A measurable, definable segment of work.

**Additional skill identifier (ASI)**

Identification of specialized skills that are closely related to, and are in addition to, those required by MOS or specialty skill identifier (SSI). Specialized skills identified by the ASI include operation and maintenance of specific weapons systems and equipment, administrative type system and subsystems, computer programming, languages, procedures, installation management, analytic methods, animal handling techniques, and similar required skills that are too restricted in scope to comprise an MOS or SSI.

**ADJ**

adjust

**ADMIN**

administrative

**ADP**

automated data processing

**ADT**

Active Duty for Training

**ADTLP**

Armywide Doctrinal and Training Literature Program

**AIS**

Automated Information System

**AIT**

advanced individual training

**AMSS**

Army Materiel Status System

**AMTP**

ARTEP Mission Training Plan

**AN**

annually

**ANCOC**

Advanced Noncommissioned Officers Course

**ANG**

Army National Guard

**Annual training**

The minimal period of annual active duty training a member performs to satisfy the annual training requirements associated with a Reserve Component assignment. It may be performed during one consecutive period or in increments of one or more days, depending upon mission requirements.

**ANSI**

American National Standards Institute

**AO**

area of operation

**AOAP**

Army Oil Analysis Program

**AOR**

area of responsibility

**appl**

applicable

**APPROX**

approximate

**AR**

Army regulation; armor; angle of repose

**ARCOM**

Army Reserve Command

**ARFOR**

Army forces

**Army National Guard**

The Army portion of the organized militia of the several States, Commonwealth of Puerto Rico and District Columbia whose units and members are federally recognized.

**ARNG**

Army National Guard

**ARTEP**

Army Training and Evaluation Program

- ASAP**  
as soon as possible; automated sheet assembly plan
- ASL**  
authorized stockage list
- ATC**  
Army training center
- ATSC**  
Army Training Support Command
- ATTN**  
attention
- AUX**  
auxiliary
- AWG**  
American wire gauge
- AWOL**  
absent without leave
- BA**  
biannually
- bar**  
manifold barometric pressure equals pounds per square inch (psi) divided by .069
- Basis of issue (BOI)**  
The basis by which an item of equipment (TADSS) will be issued to the using community.
- BAT**  
battery
- BDAR**  
battle-damage assessment and repair
- BDE**  
brigade, backward difference in elevation
- BEB**  
bridge erection boat
- BEB-SD**  
bridge-erection boat - shallow draft
- BII**  
basic-issue items
- BM**  
bimonthly; benchmark
- BMO**  
battalion maintenance officer

**BNCOC**

Basic Noncommissioned Officers Course

**BOI**

Basis of Issue

**BOM**

bill of materials

**BOS**

battlefield operating systems

**BTC**

Basic Technical Course

**BTRY**

battery

**BTU**

British thermal unit

**Bull blade**

The standard straight blade used on a crawler tractor.

**BW**

biweekly; biological warfare

**C&RS**

calibration and repair support

**CBT**

combat; common bridge transporter

**CCE**

commercial construction equipment

**CF**

Correlation Factor; cubic feet

**cfm**

cubic feet per minute

**CKT**

circuit

**CKT BKR**

circuit breaker

**Class IX**

Repair parts and components, to include kits, assemblies, and subassemblies (repairable or nonrepairable) required for maintenance support of all equipment.

**CLT**

common logistic tasks

**CMF**

career management field

**CMT**

Company Maintenance Team; common military training.

**Collective task**

See "Task."

**Collective training**

Training, either in institutions or units, that prepares cohesive teams and units to accomplish their missions on the battlefield and in operations other than war.

**combat service support**

designation given to activities which provide noncombat services to combat units such as finance and administration.

**common task**

A critical task for which all soldiers at a given skill level are accountable, regardless of their MOS. These tasks are found in the Soldier's Manual of Common Tasks (STP 21-1-SMCT and STP 21-24-SMCT).

**Comp**

Compressor, computer

**const**

construction

**CS**

combat support; Costa Rica; o-chlorobenzylidene malononitrile

**CSDP**

Command Supply Discipline Program

**CSE**

combat support equipment

**CSM**

command sergeant major

**CSS**

combat service support

**CSSCS**

Combat Service Support Control System

**CTA**

common table of allowances; consolidated training activities

**CTC**

combat training center

**CTT**

common task test; common task training

**CTX**

combined training exercise

**cu**

cubic

**cy**

Cubic yard

**DA**

Department of the Army; Denmark; direct action

**DA Form**

Department of the Army Form

**DA Pam**

Department of the Army Pamphlet

**DBP**

drawbar pull

**DC**

Dental Corps; District of Columbia; direct current

**DCSOPS**

Deputy Chief of Staff for Operations and Plans

**DD**

Department of Defense

**DD FORM**

Department of the Defense Form

**Dec**

December

**DED**

diesel engine driven

**DEF**

defensive

**Density**

The quantity of metallic silver (or dyes) per unit area in negatives and positives. Density is defined strictly as the logarithm of the optical opacity, where the opacity is the ratio of the incident to the transmitted (or reflected) light. Density varies with the use of scattered or specular light.

**Detent**

A mechanism for temporarily keeping one part (the transmission gear) in a certain position.

**DEUCE**

deployable universal combat earthmover

**DLC**

deadline code

**Drill**

A disciplined, repetitious exercise to teach and perfect a skill or procedure. Drills are linked to Mission Training Plans in that they are a method for executing a collective task or task step. There are two types: Battle Drill--A collective action executed in a standard manner throughout the Army by a platoon or smaller element without the application of a deliberate decision making process. The action is vital to success in combat or critical to preserving life. The drill is initiated on a cue, such as an enemy action or simple leader's order, and is a trained response to the given stimulus. It requires minimal leader orders to accomplish and is standard throughout like units in the Army. Crew Drill--A collective action that a crew of a weapon or piece of equipment must perform to use the weapon or equipment successfully in combat or to preserve life. This action is a trained response to a given stimulus such as a simple leader order or the status of the weapon or equipment. It requires minimal leader orders to accomplish and is standard throughout the Army.

**drvtrng**

driver training

**DS**

direct support; double story

**DSA**

division support area

**DSU**

direct support unit

**Duty Position**

an assignment within a unit requiring specialization within the individual's MOS. Example: Demolition Specialist and Squad Leader.

**E**

voltage; exposure; empty; easting; east

**e.g.**

for example

**E1**

private 1

**E2**

private 2

**E3**

private first class

**E4**

specialist

**E5**

sergeant; Table value E5

**E6**

staff sergeant

**E7**

sergeant first class

- E8**  
master sergeant; first sergeant
- E9**  
sergeant major; command sergeant major
- EA**  
each; engagement area
- ECU**  
environmental control unit
- EES**  
enlisted evaluation system
- EFF**  
efficiency
- EIC**  
equipment identification code; end item code
- EIR**  
equipment improvement recommendations
- EN**  
engineer (unit designations; graphics)
- En(L)**  
engineer (light)
- En(M)**  
engineer (mechanized)
- ENCODED**  
(a message) converted into code
- ENDEX**  
end exercise
- EOS**  
effect on system
- EP**  
emergency procedure
- EPA**  
Environmental Protection Agency
- EPMS**  
Enlisted Personnel Management System
- equip**  
equipment
- ERC**  
equipment readiness code



**ERPSL**

Essential Repair Parts Stockage List

**Error**

1. The difference between an observed value and the true value of a quantity. 2. A class of small inaccuracies due to imperfections in equipment or techniques, surrounding conditions, or human limitations; not to be confused with blunders or mistakes.

**ES**

equipment status; emplacing soldier; early start

**eval**

evaluation

**Evaluation guide**

The section of the task summary in a soldier's manual which lists the pass/fail performance measures for evaluating the soldier's performance on the task.

**evaluation preparation**

setup is an explanation of how the conditions and standards are to be modified for training purposes. Brief Soldier is an explanation of how the trainer is to brief the soldier on what must be done to accomplish the task during training.

**exam**

examination

**F**

frequency; fail; failed; Fahrenheit; full

**FC**

field circular

**Field Manual (FM)**

A DA publication that contains doctrine that prescribes how the Army and its organizations function on the battlefield in terms of missions, organizations, personnel, and equipment. The level of detail should facilitate an understanding of "what" and "how" for commanders and staffs to execute the missions and tasks. The FM may also be used to publish selected alliance doctrinal publications that are not readily integrated into other doctrinal literature.

**FIELD TRAINING EXERCISE (FTX)**

See "Exercise."

**fig**

figure

**Flow diagram**

In training development, a graphic representation of actions or events required to accomplish a task (i.e., lesson development). It is frequently accompanied by a narrative description. The flow diagram provides specific instructions and precise sequencing for accomplishing tasks and goals. In contracts, a flow diagram visually depicts the actions or events required of each participant involved in developing extension training materials. It is frequently accompanied by a narrative description and provides instructions and sequencing for extension training material developers.

**Flowchart**

A graphic representation of the sequence of a specific activity, operation, or algorithm.

**FM**  
field manual; frequency modulated/modulation

**FM RADIO**  
frequency modulated radio

**FORSCOM**  
United States Army Forces Command

**FREQ**  
frequency

**FSB**  
forward support battalion

**FSC**  
Finance Support Command; federal supply catalog

**FSCM**  
Federal supply code for managers

**FSG**  
forward support group

**FTX**  
field training exercise

**FY**  
Fiscal Year

**GED**  
general education development

**gen**  
general; generator

**GPM**  
gallons per minute

**GSA**  
general services administration

**GTA**  
graphic training aid

**HAZMAT**  
hazardous material

**HHC**  
headquarters and headquarters company

**HHD**  
headquarters and headquarters detachment

<b>HMEE</b>	high-mobility engineer escalator
<b>HP</b>	high pressure; horsepower; Hewlett Packard
<b>HQ</b>	headquarters
<b>HQDA</b>	Headquarters, Department of the Army
<b>hr.</b>	hour(s)
<b>HSTRU</b>	hydraulic systems test and repair unit
<b>IAW</b>	in accordance with
<b>IC</b>	indicator code, indicator control
<b>IDENT</b>	identify
<b>IDS</b>	intermediate direct support
<b>IDT</b>	inactive duty training
<b>IET</b>	initial entry training
<b>IL</b>	identification list
<b>ILS</b>	Integrated Logistics Support
<b>IN</b>	Infantry; inch(es)
<b>inc</b>	incorporated
<b>incl</b>	inclosure; including
<b>INDIV</b>	individual

**INDIVIDUAL SOLDIER REPORT**

Identifies those tasks in which a soldier has a training weakness as scored on the Skill Qualification Test (SQT).

**Individual training plan (ITP)**

A document prepared for each enlisted military occupational specialty, warrant officer military occupational specialty, commissioned officer specialty code, or separate functional training program that describes the overall plan to satisfy training requirements and document the long range training strategy

**insp**

inspection

**INST**

instrument

**Instr**

Instruction; instructor

**IPR**

In-Progress Review

**IRR**

Individual Ready Reserve

**ITEP**

Individual Training Evaluation Program; Integrated Test/Evaluation Program

**ITP**

Individual Training Plan

**JB**

job book

**JCSPUB**

joint chief of staff publication

**JP**

jet petroleum; Joint Publication; junction panel

**JTF**

joint task force

**JTX**

joint training exercise

**k**

kilo

**kg**

kilogram

**km**

kilometer

**kph**

kilometers per hour

**kpm**

kilometers per minute

**lb**

pound(s)

**LBE**

load-bearing equipment

**LBS-IN**

pounds per inch

**ldr**

leader

**LO**

learning objective; low; lubrication order

**loader**

a bucket loader. Earthmoving equipment used to pick up, load, or move loose earth.

**LOG**

logistics

**LOG CP**

logistics command post

**LOG PAC**

logistics package

**Logistics support analysis**

An analysis of manpower requirements, operator and maintenance quality and skills, personnel training requirements, and training materials requirements.

**LOGPAC**

logistics package; logistical package

**LOGSTAT**

logistics statistical report; logistics status; logistical status

**LP**

lesson plan; listening post; low pressure; liquid propane

**LSAR**

Logistics Support Analysis Report

**lube orders**

lubrication orders. Documents which direct the frequency and location of required lubrication on military equipment.

**LWT**

lightweight

**m**  
manual; meter(s); minute; mechanized (graphics); monthly

**MAC**  
Maintenance Allocation Chart

**MACOM**  
major Army command

**maint**  
maintenance

**man**  
manual

**MCU**  
module control unit

**MEAS**  
measure

**MECH**  
mechanized

**MEL**  
maintenance expenditure limits

**METL**  
mission-essential task list

**MHz**  
Megahertz

**MICRO**  
micrometer

**Military load classification**  
Common measure of road, bridge capacity, expressed in tons of a military type vehicle that the bridge will support safely.

**Military occupation specialty**  
A term used to identify a group of duty positions possessing such close occupational or functional relationship that an optimal degree of interchangeability among persons so classified exists at any given level of skill. Advanced--One which reflects specialized occupational qualifications above the entry military occupational specialty level required for performance in those duty positions which represent the journeyman, supervisory, or leadership levels of skill. Duty--One in which the soldier is actually performing duty. Entry--One that reflects the occupational qualifications required for performance in those duty positions which represent the lowest level of skill within an entry group. Primary--One (entry or advanced) representing the highest or most significant job skill that the individual can best perform. Secondary--Any awarded, other than that designated primary.

**Military occupational specialty (MOS)**  
A term used to identify a group of duty positions so closely related that they are interchangeable among soldiers so classified at any skill level.

**MIN**

minimum; minute(s)

**MIN/HR**

minutes per hour

**Mission**

A series of related tasks that comprise the major capabilities and/or requirements imposed on a unit by its parent organization or table(s) of organization and equipment. Examples: Defend in sector, conduct a hasty attack, and delay. Missions may be imposed to support the parent unit.

**MK1**

MARK1

**MLC**

military load classification; military load class

**mm**

millimeter(s)

**MO**

Missouri; monthly

**MOPP**

mission-oriented protection posture

**MOS**

military occupational specialty; minimum operating strip

**MOSQ**

MOS qualified

**MOU**

memorandum of understanding

**MPG**

map preparation guide

**mph**

miles per hour

**MSCR**

material condition status reportable

**MT**

maintenance; maintenance team

**MTD**

mounted

**MTOE**

modified table(s) of organization and equipment; modification table of organization and equipment

**MTP**

mission training plan; MOS training plan

**N**

neutral; north; northings; nose lift; number

**NBC**

nuclear, biological, chemical

**NCO**

noncommissioned officer

**NCOER**

noncommissioned officer evaluation report

**NCOES**

Noncommissioned Officer Education System

**NCOIC**

noncommissioned officer in charge

**NEC**

National Electrical Code

**NG**

National Guard

**NIIN**

national-item identification number

**NMC**

nonmission capable

**NMC faults**

nonmission capable faults; term used in maintenance management which indicates that equipment with such faults cannot accomplish its mission and cannot be used.

**NMCM**

nonmission-capable maintenance

**NMCS**

non-mission capable supply

**NPT**

national pipe thread

**OE**

engine oil

**OF**

optional form; Observed Fire

**OJT**

On-The-Job Training

**OPMCS**

operator preventive-maintenance checks and services



**OR**  
operational readiness

**ORF**  
operation readiness float

**Org**  
organization

**original**  
The copy submitted to the printer for reproduction.

**OSHA**  
Operational Safety and Health Act

**OSUT**  
one-station unit training

**OVE**  
on vehicle equipment

**P**  
needs practice; pass; passed; barometric pressure; mean radius of curvature

**PAM**  
pamphlet

**para**  
paragraph

**PB**  
property book; polybutylene; particle beam

**PBO**  
property book officer

**PCS**  
permanent change of station

**Performance measures**  
The actions that can be objectively observed and measured to determine if a task performer has performed the task to the prescribed standard. These measures are derived from the task performance steps during task analysis. See "Task performance specifications."

**PERS**  
personnel

**PFC**  
private first class

**PGS**  
pages

**phy**  
physical

**PKG**

packages

**PLDC**

Primary Leadership Development Course

**PLL**

prescribed load list

**PLL clerk**

prescribed load list clerk. The clerk responsible for requisitioning and maintaining the stock of repair parts in a unit.

**PLS**

preservative lubricating oil-special; palletized load system

**PLT**

platoon

**PLT SGT**

platoon sergeant

**PM**

provost marshal; program manager; preventive maintenance

**PMCS**

preventive-maintenance checks and services

**PMOS**

primary military occupational specialty

**POL**

petroleum, oils, and lubricants

**Positive**

A photographic reproduction on plate, paper, or film in which image densities are directly related to the tones of the originals.

**PPE**

protective posture equipment; personal protective equipment

**PRESS**

pressure

**prof dev**

professional development

**psf**

per square foot

**psi**

pounds per square inch

**psig**

pounds per square inch gauge

**PSR**  
personnel status report

**PT**  
physical training; point of tangency; post tensioning

**PTO**  
power takeoff

**PWR**  
power

**QDR**  
Quality Deficiency Report

**QSS**  
quick supply store

**QT**  
quarterly

**QTB**  
quarterly training briefing

**QTR**  
quarterly

**qty**  
quantity

**RA**  
Regular Army

**RC**  
rapid cure; reserve component

**RCU**  
remote control unit

**Ready Reserve**  
The Selected Reserve and Individual Ready Reserve liable for active duty as prescribed by law.

**Rectifier**  
This is a precise, autofocus, vertical photoenlarger which permits the correction for distortion in vertical aerial photography due to tip and tilt of the taking aircraft.

**References**  
FMs, SMs, TCs, TMs, GTAs, TECs, ARs, and other publications that support training and provide additional information. A complete list of references is located in the REFERENCE Section.

**reg**  
Regiment; regulation; register

**RISK ASSESSMENT**  
The process used to identify potential hazard associated with training, set values on the risk elements, compare risks against training benefits, and eliminate unnecessary risks. It is an

expression of potential loss in terms of hazard severity, accident probability, and exposure to hazard.

**ROPS**

roll-over-protection system

**rpm**

revolutions per minute

**RS**

rapid set; Religious Support; road surface (emulsified asphalt); report of survey

**S&H**

safety and handling

**S&S**

supply and services

**SA**

semiannually; situational awareness

**SAE**

Society of Automotive Engineers

**SAMS**

Standard Army Maintenance System

**SARSS**

Standard Army Retail Supply System

**SATS**

Standard Army Training System

**SCF**

standard cubic feet

**SCFM**

standard cubic feet per minute

**scraper**

Engineer equipment used to remove large quantities of earth.

**SF**

standard form

**SFC**

special forces command; sergeant first class

**SGM**

sergeant major

**SGMA**

US Army Sergeants Major Academy

**SGT**

sergeant

**shunt**

a conducting element bridged across a circuit or a portion of a circuit that establishes a current path auxiliary to the circuit.

**SKO**

sets, kits, and outfits

**SL**

skill level; side lap

**SM**

soldier's manual

**SMCT**

soldier's manual of common tasks

**SME**

subject matter expert

**SMOS**

secondary military occupational specialty

**SOLDIER'S MANUAL OF COMMON TASKS**

A document which contains the critical tasks which every soldier must be able to perform in order to fight and win on the battlefield. It provides the conditions, standards, and performance measures for each common soldier critical task.

**SOLDIER'S TRAINING PUBLICATION**

Publications that contain critical tasks and other training information used to train soldiers and serve to standardize individual training for the whole Army; provide information and guidance in conducting individual training in the unit; and aid the soldier, officer, noncommissioned officer (NCO), and commander in training critical tasks. They consist of Soldier's Manuals, Trainer's Guides, Military Qualification Standards Manuals, and Officer Foundations Standards System manuals.

**SOP**

standing operating procedure

**SPBS**

Standard Property Book System

**SPC**

specialist; standard printing color

**Special qualification identifier (SQI)**

(Warrant officers and enlisted only.) An identification of skills in addition to those of an MOS to identify special requirements of certain positions and special qualifications of personnel who are capable of filling such positions. The SQI are authorized for use with any MOS unless otherwise specified.

**SPORT**

soldier's portable on-site repair and test

**SPT**

support

**sqd**  
squad

**STE/ICE**  
simplified test equipment/internal combustion engine

**STP**  
soldier training publication

**T&E**  
test and evaluation; traversing and elevating

**T&EO**  
training and evaluation outline

**TA**  
terrain analysis; training area

**Tab**  
Table

**Table of distribution and allowance**

A table which prescribes the organizational structure, personnel, and equipment authorizations, and requirements of a military unit to perform a specific mission for which there is no appropriate table of organization and equipment.

**TASK - INDIVIDUAL TASK**

The lowest behavioral level in a job or duty that is performed for its own sake. It should support a collective task; it usually supports another individual task.

**TASK PERFORMANCE STEP**

The required unit/individual actions that must be performed to accomplish the critical task. Each step must be specific and detailed and contain only one action or unit of work. Note: A collective task step may be a supporting individual or collective task.

**TB**  
technical bulletin

**TC**  
technical coordinator; training circular; track commander; tank commander

**TDA**  
Table of Distribution and Allowance

**TG**  
trainer's guide

**TM**  
team; technical manual; trademark

**TMDE**  
test, measurement, and diagnostic equipment

**TNG**  
training

**TR**  
TRADOC Regulation

**TRAINING CIRCULAR**

TCs are publications (paper or computer-based) which provide a means to distribute unit or individual soldier training information that does not fit standard requirements for other established types of training publications. TCs are part of the Armywide Doctrinal and Training Literature Program (ADTLP).

**Training objective**

A statement that describes the desired outcome of a training activity in the unit. It consists of the following three parts: task, condition(s), standard.

**ULLS**  
Unit Level Logistics System

**UMCP**  
unit maintenance collection point

**unit**  
trained in the unit

**Unit training**  
Training (individual, collective, and joint or combined) conducted in a unit.

**US**  
United States

**USA**  
United States of America; United States Army

**USAES**  
United States Army Engineer School

**USAPPC**  
US Army Publications & Printing Command

**USASMA**  
United States Army Sergeants Major Academy

**vdc**  
volts, direct current

**VEH**  
Vehicle

**Vol**  
Volume

**WK**  
weekly

**wkly**  
weekly

STP 9-62B14-SM-TG

**yd**

yard; yard derrick crane; yard derrick

**YYMMDD**

year, month, and date



## REFERENCES

### Required Publications

Required publications are sources that users must read in order to understand or to comply with this publication.

#### Army Regulations

AR 190-13	The Army Physical Security Program (This Item is Included on EM 0001). 30 September 1993
AR 190-51	Security of Unclassified Army Property (Sensitive and Nonsensitive) (This Item is Included on EM 0001) 30 September 1993
AR 220-1	Unit Status Reporting (This Item is Included on EM 0001) 1 September 1997
AR 25-400-2	The Modern Army Recordkeeping System (MARKS) (This Item is Included on EM 0001) 1 October 2000
AR 385-10	The Army Safety Program (This item is included on EM 0001). 23 May 1988
AR 385-40	Accident Reporting and Records (This Item is Included on EM 0001) 1 November 1994
AR 385-55	Prevention of Motor Vehicle Accidents (This item is Included on EM 0001) 12 March 1987
AR 700-138	Army Logistics Readiness and Sustainability (This Item is Included on EM 0001) 16 September 1997
AR 710-2	Inventory Management Supply Policy Below the Wholesale Level (This Item is on EM 0001) 31 October 1997
AR 750-1	Army Materiel Maintenance Policy and Retail Maintenance Operations. 1 August 1994
AR 750-43	Army Test, Measurement and Diagnostic Equipment Program (This Item Is Included on EM 0001) 28 November 1997

#### Department of Army Forms

DA FORM 5988-E	Equipment Inspection Maintenance Worksheet. 1 March 1991
DA FORM 5990-E	Maintenance Request (EGA). 1 March 1991
DA FORM 5991-E	Oil Analysis Request (EGA). 1 March 1991

#### Department of Army Pamphlets

DA PAM 25-30	Consolidated Index of Army Publications and Blank Forms (ISSUED QUARTERLY)(No Printed Copies Exist)(Formerly DA Pam 310-1)(This Item is Included on EM 0001) 1 April 2001
DA PAM 25-33	User's Guide for Army Publications and Forms (This Item is Included on EM 0001) 15 September 1996
DA PAM 710-2-1	Using Unit Supply System (Manual Procedures) (Standalone Pub) (This Item is on EM 0001) 31 December 1997
DA PAM 738-750	Functional Users Manual for the Army Maintenance Management System (TAMMS). 1 August 1994
DA PAM 750-1	Leader's Unit Level Maintenance Handbook. 15 February 1994
DA PAM 750-35	Guide for Motor Pool Operations. 1 August 1994

#### Field Manuals

FM 101-5-1	Operational Terms and Graphics (MCRP 5-2A) 30 September 1997
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FM 4-30.3 Maintenance Operations and Procedures 1 September 2000  
FM 5-170 Engineer Reconnaissance. 5 May 1998

**Lubrication Orders**

LO 5-1940-277-12 Boat, Bridge, Erection, Twin Jet, Aluminum Hull, Model USCSBMK1 and USCSBMK3 (L) 1940-12) 25 June 1991  
LO 5-2350-262-12 Armored Combat Earthmover (ACE), M9 (NSN 2350-00-808-7100) (This Item is Included on EM 0035). 8 November 1993  
LO 5-2410-237-12 D7G Bulldozer with Winch D7G Bulldozer with Ripper Winterized D7G Bulldozer with Winch Winterized D7G Bulldozer with Ripper (This item is included on EM 0119) 16 January 1992  
LO 5-3805-262-12 Loader, Scoop Type, 4x4 Articulated Frame Steer, 2-1/2 Cubic Yard (MW24C) 28 February 1986

**Other Product Types**

AISM 18-L21-AHN-BUR-UM Standard Army Maintenance System Level 1 (SAMS-1) End User Manual  
AISM 18-L26-AHO-BUR-EM Standard Army Maintenance System Level 2 (SAMS-2) End User Manual

**Technical Bulletins**

TB 43-0211 AOAP Army Oil Analysis Program Guide For Leaders and Users 4 June 1998  
TB 43-180 Calibration and Repair Requirements for the Maintenance of Army Materiel (This Item is Included on EM 0022) 1 December 2000

**Technical Manuals**

TM 5-1940-277-10 Operator's Manual for Boat, Bridge Erection, Twin Set, Aluminum Hull, Model USCSBMK-1 and USCSBMK-2. December 1981  
TM 5-1940-277-20 Organizational Maintenance Manual for Boat, Bridge Erection, Twin Jct, Aluminum Hull, Models USCSBMK-1 (NSN: 1940-01-105-5728) and USCSBMK-2 (1940-01-218-2165) (Reprinted w/Basic Incl C1-4)  
TM 5-1940-277-34 Direct and General Support Maintenance Manual for Boat, Bridge Erection, Twin Jet, Aluminum Hull, Model USCSBMK-1 (NSN: 0-105-5728) and USCSBMK-2 (NSN: 1940-01-218-9165) (Reprinted w/Basic Incl C1-4)  
TM 5-1940-277-34P Direct Support and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Boat, Bridge Erection, Twin Jet Aluminum Hull, Model USCSBMK-1 (NSN 1940-01-105-5728)... 30 May 1995  
TM 5-2350-262-10 Operator's Manual for Armored Combat Earthmover (ACE), M9. 26 June 1992  
TM 5-2350-262-20-1 Unit Maintenance Manual Vol 1 of 3 for Armored Combat Earthmover (ACE), M9 (NSN 2350-00-808-7100) (This item is included on EM 0035). 3 January 1997  
TM 5-2350-262-20-2 Unit Maintenance Manual, Vol 2 of 3 for Armored Combat Earthmover (ACE), M9 (NSN 2350-00-808-7100) (This item is included on EM 0035). 3 January 1997  
TM 5-2350-262-20-3 Unit Maintenance Manual Vol 3 of 3 Hydraulic Troubleshooting Test Procedures Armored Combat Earthmover (ACE), M9 (NSN 2350-00-808-7100) (Reprinted w/Basic Incl C1-2) (This item is included on EM 0035). 16 November 1998  
TM 5-2350-262-24P Unit, Direct Support, and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts) for

	Armored Combat Earthmover (ACE), M9 (NSN 2350-00-808-7100) (This item is included on EM 0035). 27 March 2000
TM 5-2350-262-34	Intermediate and Direct and General Support Maintenance Manual for Armored Combat Earthmover (ACE), M9 (NSN: 2350-00-808-7100) 3 January 1997
TM 5-2410-237-10	Operator's Manual, Tractor, Full Tracked, Low Speed; DED, Medium Drawbar Pull, SSN M061 Tractor w/Ripper, Tractor with Winch, Tractor with Ripper and Winterized Cab, Tractor with Winch and Winterized Cab 26 January 1993
TM 5-2410-237-20	Unit Maintenance Manual for Tractor, Full Tracked, Low Speed: DED, Medium Drawbar Pull, SSN MO61, Tractor with Ripper.... 30 March 1993
TM 5-2410-237-24P	Unit, Direct Support and General Support Including Depot Maintenance Repair Parts and Special Tools List for Tractor, Full Tracked, Low Speed: DED, Medium Drawbar Pull, T9 Size, Caterpillar Model D7G Tractor with Ripper... 5 May 1993
TM 5-2410-237-34	Direct Support and General Support Maintenance Manual for Tractor, Full Tracked, Low Speed: DED, Medium Drawbar Pull, SSN M061 Tractor with Ripper... 30 March 1993
TM 5-2420-224-20-1	Unit Maintenance for Tractor, Wheeled, 4x4 DED Small Emplacement Excavator (SEE) (NSN 2420-01-160-2754) (EIC: EDL) and Tractor, Wheeled, 4x4 DED High Mobility Material Handler (HMMH) (2420-01-205-8636) (This item is included on EM 0119) 28 July 1993
TM 5-2420-224-20-2	Unit Maintenance Manual for Tractor, Wheeled, 4x4 DED Small Emplacement Excavator (SEE) (NSN 2420-01-160-2754) (EIC: EDL) and Tractor, Wheeled, 4x4 DED High Mobility Material Handler (HMMH) (2420-01-205-8636) (This item is included on EM 01 28 July 1993
TM 5-2420-224-34	Direct and General Support Maintenance Manual for Tractor, Wheeled, 4x4 DED Small Emplacement Excavator (SEE) (EIC: EDL) and Tractor, Wheeled, 4x4 DED High Mobility Material Handler (HMMH) (This item is included on EM 0119) 28 July 1993
TM 5-2430-200-10	Operator's Manual for Deployable Universal Combat Earthmover (DEUCE) 30/30 (Model DV100) (NSN 2430-01-423-2819) PIN: 7RR00003-UP 1 March 2001
TM 5-2430-200-24	Maintenance Manual for Deployable Universal Combat Earthmover (Deuce) 30/30 (Model DV100) (NSN 2430-01-423-2819) PIN: 7RR00003-UP (This item is included on EM 0110). 1 March 2001
TM 5-2430-200-24P	Parts Manual for Deployable Universal Combat Earthmover (DEUCE) 30/30 (Model DV100) (NSN: 2430-01-423-2819( PN: 7RR00003-UP (Machine) 4CW00222-UP (Engine) (This item is included on EM 0110). 1 March 2001
TM 5-3805-248-14&P-1	Scraper, Earth Moving, Motorized; Diesel Engine Driven Operations. 19 August 1985
TM 5-3805-248-14&P-2	Technical Manual for Scraper, Earth Moving, Motorized; Diesel Engine Driven (NSN 3805-01-153-1854) Maintenance (This item is included on EM 0115). 19 August 1985
TM 5-3805-248-14&P-3	Technical Manual for Scraper, Earth Moving, Motorized, Diesel Engine Driven, Maintenance. 19 August 1985
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TM 5-3805-262-20	Organizational Maintenance, Loader, Scoop Type, DED, 4x4, Articulated Frame Steer, 2 1/2 Cubic Yard, (J.I. Case Model MW24C) (NSN 3805-01-150-4814)

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TM 5-3805-280-24-2	Unit, Direct Support and General Support Maintenance Manual for Hydraulic Excavator John Deere Model 230LCR and Model 230LCRD with Rock Drill 15 February 2000
TM 5-3895-347-14&P	Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual (Including Repair Parts Information and Supplemental Operating Maintenance and Repair Parts Instructions)for Roller, Pneumatic Tired Variable Pressure 7 January 1983
TM 5-3895-349-14&P	Operator's, Organizational, Direct Support and General Support Maintenance Manual (Including Repair Parts Information and Supplemental Maintenance and Repair Parts Instructions) for Compactor, High Speed, Tamping, Self-Propelled (CCE), BOMA 25 April 1980
TM 9-4940-468-13	Operator's, Unit, and Direct Support Maintenance Manual for Tool Outfit, Hydraulic Systems Test and Repair Unit (HSTRU) (NSN 4940-01-036-5784) (EIC: 2DD) (This item is included on EM 0072) 12 June 1995

### Related Publications

Related publications are sources of additional information. They are not required in order to understand this publication.

### Army Regulations

AR 190-51	Security of Unclassified Army Property (Sensitive and Nonsensitive) (This Item is Included on EM 0001) 30 September 1993
AR 200-1	Environmental Protection and Enhancement. 21 February 1997
AR 200-2	Environmental Effects of Army Actions 12 December 1988
AR 220-1	Unit Status Reporting (This Item is Included on EM 0001) 1 September 1997
AR 25-11	Record Communications and the Privacy Communications System (This Item is Included on EM 0001) 4 September 1990
AR 350-1	Army Training 1 August 1981
AR 350-10	Management of Army Individual Training Requirements and Resources. 14 September 1990. 14 September 1990
AR 350-17	Noncommissioned Officer Development Program 31 May 1991
AR 350-41	Training in Units. 19 March 1993
AR 350-57	Self-Development Test. 17 June 1994
AR 385-10	The Army Safety Program (This item is included on EM 0001). 23 May 1988
AR 385-40	Accident Reporting and Records (This Item is Included on EM 0001) 1 November 1994
AR 385-55	Prevention of Motor Vehicle Accidents (This item is Included on EM 0001) 12 March 1987
AR 600-55	The Army Driver and Operator Standardization Program (Selection, Training, Testing, and Licensing) (This Item is Included on EM 0001) 31 December 1993

AR 700-138 Army Logistics Readiness and Sustainability (This Item is Included on EM 0001) 16 September 1997

AR 700-4 Logistics Assistance (This Item is Included on EM 0001) 30 June 1995

AR 710-2 Inventory Management Supply Policy Below the Wholesale Level (This Item is on EM 0001) 31 October 1997

AR 725-50 Requisition, Receipt, and Issue System (This Item is Included on EM 0001) 15 November 1995

AR 735-5 Policies and Procedures for Property Accountability. 10 June 2002

AR 750-1 Army Materiel Maintenance Policy and Retail Maintenance Operations. 1 August 1994

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DA FORM 5990-E Maintenance Request (EGA). 1 March 1991

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DA PAM 25-30 Consolidated Index of Army Publications and Blank Forms (ISSUED QUARTERLY)(No Printed Copies Exist)(Formerly DA Pam 310-1)(This Item is Included on EM 0001) 1 April 2001

DA PAM 710-2-2 Supply Support Activity Supply System: Manual Procedures (This Item is on EM 0001) 30 September 1998

DA PAM 738-750 Functional Users Manual for the Army Maintenance Management System (TAMMS). 1 August 1994

**Field Manuals**

FM 101-5-1 Operational Terms and Graphics (MCRP 5-2A) 30 September 1997

FM 4-30.3 Maintenance Operations and Procedures 1 September 2000

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FM 5-499 Hydraulics (This item is included on EM 0205). 1 August 1997

**Other Product Types**

TB 43-0210 Nonaeronautical Equipment Army Oil Analysis Program (AOAP) (Reprinted w/Basic Incl C1)

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TB 43-0211 AOAP Army Oil Analysis Program Guide For Leaders and Users 4 June 1998

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TM 5-2350-262-10 Operator's Manual for Armored Combat Earthmover (ACE), M9. 26 June 1992

TM 5-2350-262-20-1 Unit Maintenance Manual Vol 1 of 3 for Armored Combat Earthmover (ACE), M9 (NSN 2350-00-808-7100) (This item is included on EM 0035). 3 January 1997

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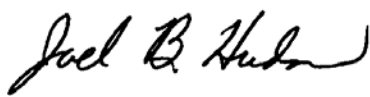
TM 5-3805-248-14&P-1	Scraper, Earth Moving, Motorized; Diesel Engine Driven Operations. 19 August 1985
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**11 OCTOBER 2002**

By Order of the Secretary of the Army:

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

Official:

A handwritten signature in black ink, reading "Joel B. Hudson", is written over a thin red horizontal line.

JOEL B. HUDSON  
*Administrative Assistant to the*  
*Secretary of the Army*  
0228304

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