*TM 5-3805-261-10

TECHNICAL MANUAL

OPERATOR'S MANUAL

FOR

GRADER, ROAD, MOTORIZED, DIESEL ENGINE DRIVEN (DED), HEAVY, COMMERCIAL CONSTRUCTION EQUIPMENT (CCE)

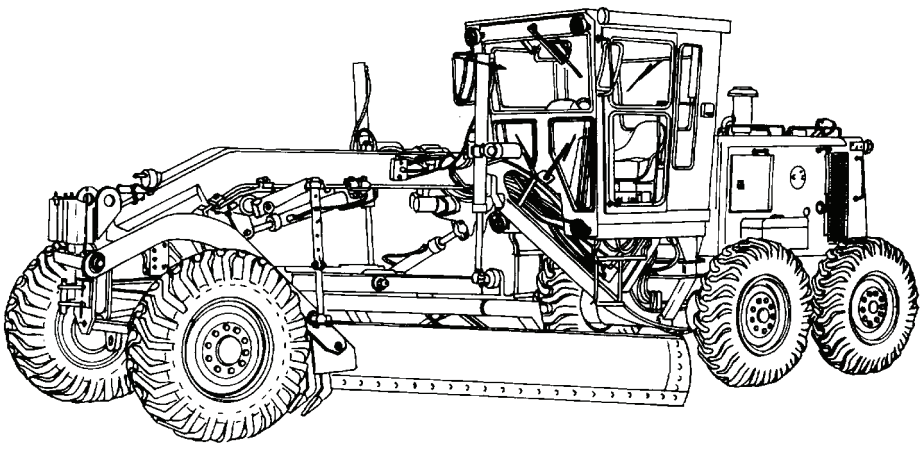
(NSN 3805-01-150-4795) CATERPILLAR MODEL 130G (EIC: EHF)

TYPE I, NONSECTIONALIZED

(NSN 3805-01-126-7894) CATERPILLAR MODEL 130GNS (EIC: EHN)
(NSN 3805-01-252-0128) CATERPILLAR MODEL 130GNSCE (EIC: EJJ)

TYPE II, SECTIONALIZED

(NSN 3805-01-126-7895) CATERPILLAR MODEL 130GS (EIC: EHP)
(NSN 3805-01-251-8252) CATERPILLAR MODEL 130GSCE (EIC: EJH)



SUPERSEDURE NOTICE - This manual supersedes TM 5-3805-261-10, dated March 1989, including all changes.

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

HEADQUARTERS, DEPARTMENT OF THE ARMY

APRIL 2006

WARNING SUMMARY

This warning summary contains general safety warnings and hazardous materials warnings that must be understood and applied during operation and maintenance of this equipment. Failure to observe these precautions could result in serious injury or death to personnel. Also included are explanations of safety and hazardous materials icons used within the technical manual.

BIOLOGICAL - abstract symbol bug shows that a material may contain bacteria or viruses that present a danger to life or health.

CHEMICAL - drops of liquid on hand shows that the material will cause burns or irritation to human skin or tissue.

EAR PROTECTION - headphones over ears show that noise level will harm ears.

ELECTRICAL - electrical wire to arm with electricity symbol running through human body shows that shock hazard is present.

EYE PROTECTION - person with goggles shows that the material will injure the eyes.

FIRE - flame shows that a material may ignite and cause burns.

FLYING PARTICLES - arrows bouncing off face with face shield shows that particles flying through the air will harm face.

HEAVY PARTS - heavy object on human figure shows that heavy parts present a danger to life or limb.

HOT AREA - hand over object radiating heat shows that part is hot and can burn.

HYDRAULIC FLUID PRESSURE - hydraulic fluid spraying human figure shows that fluid escaping under great pressure can cause injury or death to personnel.

RADIOACTIVE - identifies a material that emits radioactive energy and can injure human tissue or organs.

VAPOR - human figure in a cloud shows that material vapors present a danger to life or health.

FOR INFORMATION ON FIRST AID, REFER TO FM 4-25.11.

WARNING

CARBON MONOXIDE (EXHAUST GASES) CAN KILL!

- Carbon monoxide is a colorless, odorless, deadly poison which, when breathed, deprives the body of oxygen and causes suffocation. Exposure to air containing carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, apparent drowsiness, and coma. Permanent brain damage or death to personnel can result from severe exposure.
- Carbon monoxide occurs in exhaust fumes of internal combustion engines. Carbon monoxide can become dangerously concentrated under conditions of inadequate ventilation. The following precautions must be observed to ensure safety of personnel when engine of grader is operated.

1. DO NOT operate engine in enclosed areas without adequate ventilation.
2. DO NOT idle engine without adequate ventilation.
3. DO NOT drive machine with inspection plates or cover plates removed (130G, 130GNS, and 130GNSCE).
4. BE ALERT for exhaust poisoning symptoms. They are:
   - Headache
   - Dizziness
   - Sleepiness
   - Loss of muscular control
5. If you see another person with exhaust poisoning symptoms:
   - Remove person from area.
   - Expose to fresh air.
   - Keep person warm.
   - DO NOT permit physical exercise.
   - Administer cardiopulmonary resuscitation (CPR), if necessary.
   - Notify a medic.
6. BE AWARE. The field protective mask for nuclear-biological-chemical (NBC) protection will not protect you from carbon monoxide poisoning.

The Best Defense Against Carbon Monoxide Poisoning Is Good Ventilation!


WARNING

BATTERIES

- To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. DO NOT smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating or electric shock, damage to equipment, and injury to personnel.
- Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may result in injury or death to personnel.

a. Eyes. Flush with cold water for no less than 15 minutes and seek medical attention immediately.

b. Skin. Flush with large amounts of cold water until all acid is removed. Seek medical attention as required.

c. Internal. If corrosion or electrolyte is ingested, drink large amounts of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Seek medical attention immediately.

d. Clothing/Equipment. Wash area with large amounts of cold water. Neutralize acid with baking soda or household ammonia.

WARNING

COMPRESSED AIR

Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in injury or death to personnel. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.


WARNING

ETHER STARTING AID SYSTEM


Ether fuel is extremely flammable and toxic. DO NOT smoke and make sure you are in a well-ventilated area away from heat, open flames or sparks. Wear eye protection. Avoid contact with skin and eyes and avoid breathing ether fumes. If fluid enters or fumes irritate the eyes, wash immediately with large quantities of clean water for 15 minutes. Seek medical attention immediately if ether is inhaled or causes eye irritation. Failure to follow this warning may cause injury or death to personnel.

WARNING

FIRE EXTINGUISHER

Discharging large quantities of dry chemical fire extinguisher inside an enclosed cab may result in temporary breathing difficulty during and immediately after the discharge event. Discharge fire extinguisher from outside the cab. Ventilate cab thoroughly prior to reentry.

WARNING

FUEL HANDLING

- DO NOT smoke or permit any open flame in area of grader while you are servicing fuel system. Be sure hose nozzle is grounded against filler tube during refueling to prevent static electricity. Failure to follow this warning may result in injury to personnel or equipment damage.
- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing injury or death to personnel, or damage to vehicle.
- Operating personnel must wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing.

WARNING

HAZARDOUS WASTE DISPOSAL

When servicing this machine, performing maintenance or disposing of materials such as engine coolant, transmission fluid, lubricants, battery acids, or batteries, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance. If further information is needed, please contact The Army Environmental Hotline at 1-800-872-3845.

WARNING

HEARING PROTECTION

Your hearing can be PERMANENTLY DAMAGED if you are exposed to constant high noise levels of 85 dB or greater. Hearing protection is required when operating machine or when working on machine while it is operating. Failure to wear hearing protection may result in hearing loss.

WARNING

HYDRAULIC SYSTEM PRESSURE

DO NOT disconnect or remove any hydraulic system line or fitting unless engine is shut down and hydraulic system pressure has been relieved. Tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing injury or death to personnel.

WARNING

MACHINE OPERATION

- Use caution and maintain three-point contact at all times when mounting or dismounting machine. DO NOT use steering wheel as a handhold. Failure to follow this warning may result in injury or death to personnel.
- BE ALERT for personnel in the area while operating machine. Always check to ensure area is clear of personnel and obstructions before moving. Failure to follow this warning may result in injury or death to personnel.
- Use of seat belt while operating machine is mandatory. Fasten belt BEFORE operating machine. Trying to fasten belt during operation creates a hazardous condition. Failure to follow this warning may result in injury or death to personnel.
- DO NOT allow riders on machine. Failure to follow this warning may result in injury or death to personnel.
- NEVER leave operator compartment without applying parking brake. Failure to follow this warning may result in injury or death to personnel.
- DO NOT use parking/emergency brake to stop a moving machine under usual conditions. Only if service brakes fail, apply parking/emergency brake. Failure to follow this warning may result in injury to personnel or damage to equipment.
- NEVER use starting fluid or spray to aid in starting the engine, other than the on-board ether cold start system. Failure to follow this warning may cause injury or death to personnel or damage to equipment.
- Always use a ground guide when driving machine up or down ramps in preparation for highway or marine transport. Failure to use a ground guide may cause injury or death to personnel or damage to equipment.

WARNING

NBC EXPOSURE

- If NBC exposure is suspected, personnel wearing protective equipment must handle all air cleaner media. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures.
- Refer to FM 3-3, *Chemical and Biological Contamination Avoidance,* FM 3-5, *NBC Decontamination,* FM 3-3-1, *Nuclear Contamination Avoidance.*
- NBC contaminated filters must be handled using adequate precautions and must be disposed of by trained personnel.

To order this NBC decal use:

National Stock Number (NSN) - 7690-01-114-3702
Part Number (PN) - 12296626
Commercial and Government Entity Code (CAGEC) - 19207

WARNING

PRESSURIZED COOLING SYSTEM

- DO NOT service cooling system unless engine has cooled. This is a pressurized cooling system and escaping steam or hot coolant will cause serious burns.
- DO NOT remove cooling system radiator cap when engine is hot. Allow engine to cool down. Loosen cap to first stop and let any pressure out of cooling system, then remove cap. Failure to follow this warning may cause serious burns.
- Wear effective eye, glove, and skin protection when handling coolants. Failure to follow this warning may cause injury to personnel.

WARNING

SECTIONALIZATION

- Use extreme caution when operating with remote control. Be ready at all times to release steering control button and pull emergency brake control if a dangerous situation should occur. Failure to follow these warnings may result in injury to personnel or damage to equipment.
- Wear eye protection when disconnecting hydraulic lines. Failure to follow this warning may cause injury to personnel.
- Stop unit immediately if the LOW AIR indicator light illuminates. Determine the source of the problem and correct before continuing operation. The LOW AIR light will come on momentarily after starting engine.
- Never shift to any gear higher than “1st GEAR.”
- Wear hearing protection while operating the rear section of the grader. Failure to follow this warning may cause injury to personnel.

WARNING

SLAVE STARTING

- When slave starting grader, use NATO slave cable that DOES NOT have loose or missing insulation.
- DO NOT proceed if suitable cable is not available.
- DO NOT use civilian-type jumper cables.
- DO NOT allow disabled and booster machines to come in contact with each other at any time during slave starting. Failure to follow these warnings may cause injury or death to personnel.

WARNING

SOLVENT CLEANING COMPOUND

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to follow this warning may cause injury or death to personnel.

WARNING

TIRES

- Operating machine with underinflated or defective tire may lead to tire failure and loss of traction or control. Failure to follow this warning may cause damage to equipment or injury to personnel.
- If tire pressure is 0 psi (0 kPa) DO NOT inflate. Notify Unit Maintenance. Failure to follow this warning may cause injury or death to personnel.
- Use a self-inflating chuck and stand at a distance behind tire when inflating tire. Failure to follow this warning may cause injury or death to personnel.

WARNING

TOWING GRADER

- Ensure tow line is strong enough and is in good condition.
- Attach tow line only to towing connection points provided on frame.
- DO NOT tow faster than 8 km/h (5 mph).
- DO NOT have tension on tow line when inspecting it. DO NOT jerk tow line; it may break.
- Use a tow bar if machine is to be moved more than a few feet. If a tow bar is not available, attach a machine of equal size to rear of towed machine to provide braking when going downhill.
- DO NOT allow riders on a machine that is being towed.
- Always block wheels before removing axle shafts or disconnecting parking/emergency brake.
- If axle shafts are removed or parking/emergency brake is disconnected, block wheels when parking.

WARNING

WORK SAFETY

- Lifting cables, chains, hooks, and slings used for lifting machine must be in good condition and of suitable capacity. Failure to follow this warning may cause injury or death to personnel and damage to equipment.
- Improper use of lifting equipment and improper attachment of cables to machine may cause injury to personnel and damage to equipment. Observe all standard rules of safety.
- Hitch and steering movement can reduce clearances suddenly and cause injury. Always stop engine BEFORE working in area of hitch link.
- Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury or death to personnel.
- Wear suitable eye protection and keep face and eyes away from exhausting air tank drain valves. Failure to do so may cause injury to personnel.

LIST OF EFFECTIVE PAGES/WORK PACKAGES

Date of issue for original manual is:

Original 28 April 2006

TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS 32 AND TOTAL NUMBER OF WORK PACKAGES IS 22 CONSISTING OF THE FOLLOWING:

Page/WP No.	***Change No.**
Cover/(Back Blank)	0
a to h	0
A/(B Blank)	0
i to iv	0
WP 0001 00 to 0022 00	0
Index-1 to Index-4	0

* Zero in this column indicates an original page or work package.

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TM 5-3805-261-10

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 28 April 2006

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REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028 (*Recommended Changes to Equipment Technical Publications*), through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is https://aeps.ria.army.mil/. The DA Form 2028 is located under the Public Applications section in the AEPS Public Home Page. Fill out the form and click on SUBMIT. Using this form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or e-mail your letter or DA Form 2028 direct to: AMSTA-LC-LMIT/TECH PUBS, TACOM-RI, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The e-mail address is: TACOM-TECH-PUBS@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

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HOW TO USE THIS MANUAL

NOTE

If at any time you are unsure how to use this manual or you cannot locate the information you need, notify your supervisor.

INTRODUCTION

1. This revised manual is designed to help you operate all models of Caterpillar 130G Series Graders and to perform operator troubleshooting and maintenance on the equipment.
2. This manual is written in work package format:
    a. Chapters divide the manual into major categories of information (e.g., *Introductory Information with Theory of Operation, Operating Instructions, Operator Troubleshooting, Operator Maintenance Instructions,* and *Supporting Information*).
    b. Each Chapter is divided into work packages, which are identified by a 6-digit number (e.g., 0001 00, 0002 00, etc.) located on the upper right-hand corner of each page. The work package page number (e.g., 0001 00-1, 0001 00-2, etc.) is located centered at the bottom of each page.
    c. If a Change Package is issued to this manual, added work packages will use the 5^{th} and 6^{th} digits of their number to indicate new material. For instance, work packages inserted between WP 0001 00 and WP 0002 00 will be numbered WP 0001 01, WP 0001 02, etc.
3. Read through this manual to become familiar with its organization and contents before attempting to operate or maintain the equipment.

CONTENTS OF THIS MANUAL

1. A *Warning Summary* is located at the beginning of this manual. Become familiar with these warnings before operating or performing operator troubleshooting or maintenance on the machine.
2. A *Table of Contents*, located in the front of the manual, lists all chapters and work packages in the publication.
    a. The *Table of Contents* also provides *Reporting Errors and Recommending Improvements* information and DA Form 2028 addresses for the submittal of corrections to this manual.
    b. If you cannot find what you are looking for in the Table of Contents, refer to the alphabetical *Index* at the back of the manual.
3. Chapter 1, *General Information, Equipment Description,* and *Theory of Operation*, provides general information on the manual and the equipment.
4. Chapter 2, *Operation Instructions*, explains and illustrates all operator controls and indicators and contains a *Decal and Data Plate Guide*. It also describes how to perform all operating procedures for the grader: *Operation Under Usual Conditions, Advanced Operation and Operator Tips,* and *Operation Under Unusual Conditions*.
5. Chapter 3 covers all *Operator Troubleshooting*. WP 0010 00 contains a *Troubleshooting Symptom Index*. If the grader malfunctions, this index should always be consulted to locate the appropriate troubleshooting procedure.
6. Chapter 4 covers *Operator Maintenance*. Major areas covered are *Preventive Maintenance Checks and Services (PMCS)* and operator level maintenance tasks.
7. Chapter 5 includes *Supporting Information: References, Components of End Item (COEI) and Basic Issue Items (BII) Lists,* and *Expendable and Durable Items List*.

FEATURES OF THIS MANUAL

1. WARNINGs, CAUTIONs, NOTEs, subject headings, and other important information are highlighted in **BOLD** print as a visual aid.

WARNING

A WARNING indicates a hazard that may result in injury or death to personnel.

CAUTION

A CAUTION is a reminder of safety practices or directs attention to usage practices that may result in damage to equipment.

NOTE

A NOTE is a statement containing information that will make the procedures easier to perform.

2. Statements and words of particular interest may be printed in CAPITAL LETTERS to create emphasis.
3. Within a procedural step, reference may be made to another work package in this manual or to another manual. These references indicate where you should look for more complete information.
   a. If you are told: “Service air cleaner (WP 0014 00),” go to WP 0014 00 in this manual for instructions on this service.
   b. If you are told: “For complete information on servicing batteries, refer to TM 9-6140-200-14,” go to the *References* work package (WP 0020 00) for complete information.
4. Illustrations are placed after, and as close to, the procedural steps to which they apply. Callouts placed on the art are text or numbers.
5. Numbers located at lower right corner of art (e.g., 397-001; 397-002, etc.) are art control numbers and are used for tracking purposes only.
6. Dashed leader lines used in the lubrication illustrations (WP 0012 00) and in the PMCS table (WP 0013 00) indicate that called out lubrication points are located on both sides of the machine.
7. Technical instructions include metric units as well as standard units. For your reference, a *Metric Conversion Chart* is located on the inside back cover of the manual.

CHAPTER 1
GENERAL INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

GENERAL INFORMATION 0001 00

SCOPE

1. **Type of Manual.** This manual is for use in operating and performing operator maintenance on the 130G Series Grader.
2. **Equipment Name and Model Number.** Grader, Road, Motorized, Diesel Engine Driven (DED), Heavy, Commercial Construction Equipment (CCE) Models 130G, 130GNS, 130GNSCE, 130GS, and 130GSCE.
3. **Purpose of Equipment.** The 130G Series Grader is used for rough and finished grading, low and high bank sloping, flat and V-ditching, scarifying bituminous road mixes, and snow removal. Mission support role includes construction and maintenance of roads, airfields, hardstands, drainage, site preparation for pipeline, and river crossing.

MAINTENANCE FORMS, RECORDS, AND REPORTS

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

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRS)

If your grader needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF Form 368, *Product Quality Deficiency Report*. Mail it to us at: Commander, U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-AC-NML, Rock Island, Illinois 61299-7630. We'll send you a reply.

CORROSION PREVENTION AND CONTROL (CPC)

1. Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.
2. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem. If a corrosion problem is identified, it can be reported using SF Form 368*, Product Quality Deficiency Report*. Use of key words such as "corrosion," "rust," "deterioration," or "cracking" will ensure that the information is identified as a CPC problem. The form should be submitted to the address specified in *DA PAM 738-750*.

THREAT OF NUCLEAR, BIOLOGICAL, AND CHEMICAL (NBC) CONTAMINATION

1. The 130G Series Grader incorporates a CARC painted exterior. Materials used in the machine are metal, rubber, plastic, fabric, and glass.
2. In the event of NBC contamination, decontaminants for these surfaces and materials are listed in FM 3-5, *NBC Decontamination*. For decontamination procedures, refer to FM 3-7, *NBC Field Handbook*.

ELECTROMAGNETIC PULSE (EMP) EXPOSURE

Components listed and designated as EMP susceptible may be damaged by EMP exposure. If the machine is exposed to an EMP incident, verify proper operation and repair as necessary.

OZONE DEPLETING SUBSTANCES

Listing to be provided by requiring activity.

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

For destruction of Army materiel to prevent enemy use, refer to TM 750-244-3.

PREPARATION FOR SHIPMENT

For preparation for shipment procedures, refer to WP 0017 00.

LIST OF ABBREVIATIONS/ACRONYMS

NOTE

Refer to ASME Y14.38-1999 for standard abbreviations.

ABBREVIATION/ACRONYMS	DEFINITION
BII	Basic Issue Items
CID	Cubic Inch Displacement
cm	Centimeter
COEI	Components of End Item
CPC	Corrosion Prevention and Control
EIRs	Equipment Improvement Recommendations
EMP	Electromagnetic Pulse
EMS	Electronic Monitoring System
GCWR	Gross Combination Weight Rating
GVWR	Gross Vehicle Weight Rating
ISO	International Organization for Standardization
kg	Kilogram
km	Kilometer
kPa	Kilopascal
kph	Kilometers per Hour
kW	Kilowatt
L	Liter
lb-ft	Pound Foot
mph	Miles per Hour
m	Meter
mm	Millimeter
NATO	North Atlantic Treaty Organization
NBC	Nuclear, Biological, and Chemical
Nm	Newton Meter
PMCS	Preventive Maintenance Checks and Services
ROPS	Rollover Protective Structure
TOE/MTOE	Table of Organization and Equipment/Modified Table of Organization and Equipment

END OF WORK PACKAGE

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

1. **Characteristics.**

   a. The 130G Series Grader provides the Army with the capability of rough and finished grading, low and high bank sloping, flat and V-ditching, scarifying bituminous road mixes, and snow removal. Mission support role includes construction and maintenance of roads, airfields, hardstands, drainage, site preparation for pipeline and river crossing.

   b. The 130G Series Grader has excellent maneuverability; fast, precise blade control without drift; superior visibility, convenience, and safety; with true sit-down operation.

NOTE

Throughout this manual, some titles, callouts, and descriptions are followed by a model name in parentheses. This indicates that the statement only applies to that specific model. If a model name is not shown, the statement applies to all 130G Series Grader models.

   c. There are five models of the 130G Series Grader. See *Model Difference Chart* in this work package. The main difference between these models is that two can be sectionalized (130GS and 130GSCE) and three cannot be sectionalized (130G, 130GNS, and 130GNSCE). Sectionalization is the process of separating the machine in two halves for the purpose of air transport. Refer to WP 0018 00 and WP 0019 00.

2. **Capabilities and Features.**

NOTE

Refer to *Equipment Data* at the end of this work package for machine dimensions, weights, fluid capacities, and other miscellaneous equipment data.

   a. The 130G Series Grader can be transported by trailers, rail, aircraft or marine vessels.

   b. The following is a list of capabilities and features:

      (1) Caterpillar® 3304 turbocharged diesel engine with four in-line cylinders

      (2) Sectionalization for air transport (models 130GS and 130GSCE)

      (3) Ether starting aid

      (4) Single lever, full powershift transmission with six forward and six reverse speeds

      (5) Rollover Protection Structure (ROPS) or enclosed operator compartment with ROPS

      (6) V-type, front mounted scarifier

      (7) Supplemental steering

      (8) Differential lock control to reduce wheel slippage when high traction is required

      (9) Articulated frame and front wheel lean steering

      (10) Electronic Monitoring System (EMS)

      (11) Inching capability

      (12) 12-foot blade with manual and hydraulic side shift

      (13) NATO slave receptacle

MODEL DIFFERENCES CHART

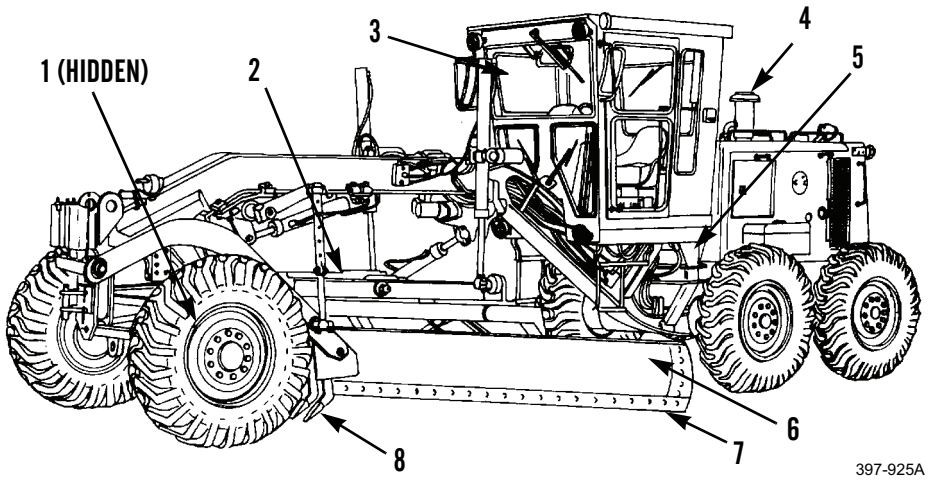
NOTE

The following chart lists only the operational and visual differences between the five 130G models. Internal component differences are not shown in this chart.

Table 1. Model Differences.

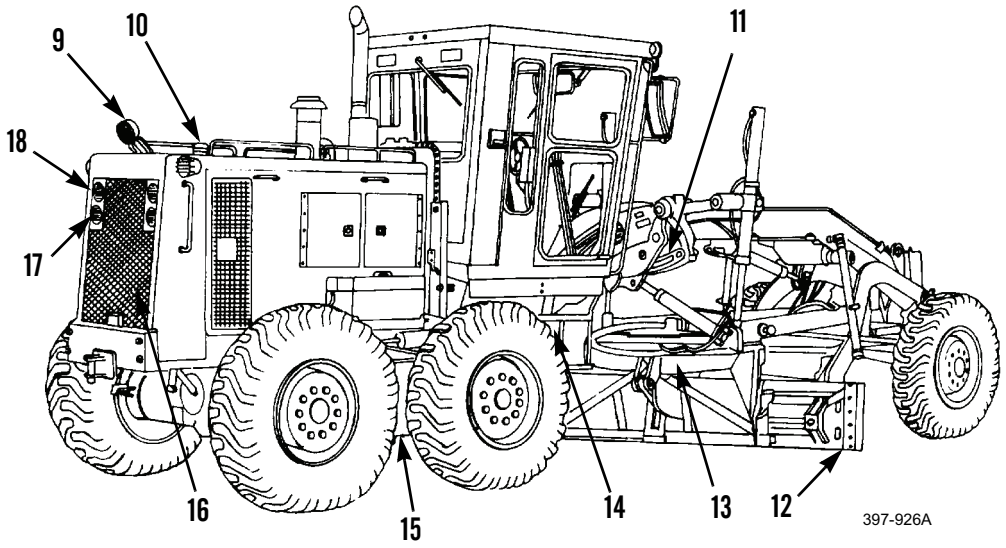
		MODELS			
	CCE	TYPE I		TYPE II	
	130G	130GNS	130GNSCE	130GS	130GSCE
Sectionalized				X	X
Nonsectionalized	X	X	X		
Enclosed Cab	X				
Remote Control Attachment				X	X
Blade Float Function	X				
Scarifier Shanks Stowage Rack	X	X	X		
Upper and Lower Windshields	X				
Wipers	X				
Defroster Fans	X				
Dome Light	X				
Exterior Mirrors	X				
Heater	X				
Cab Doors and Latches	X				
Sound Suppression Panels	X				
Cab Storage Compartment	X				

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS



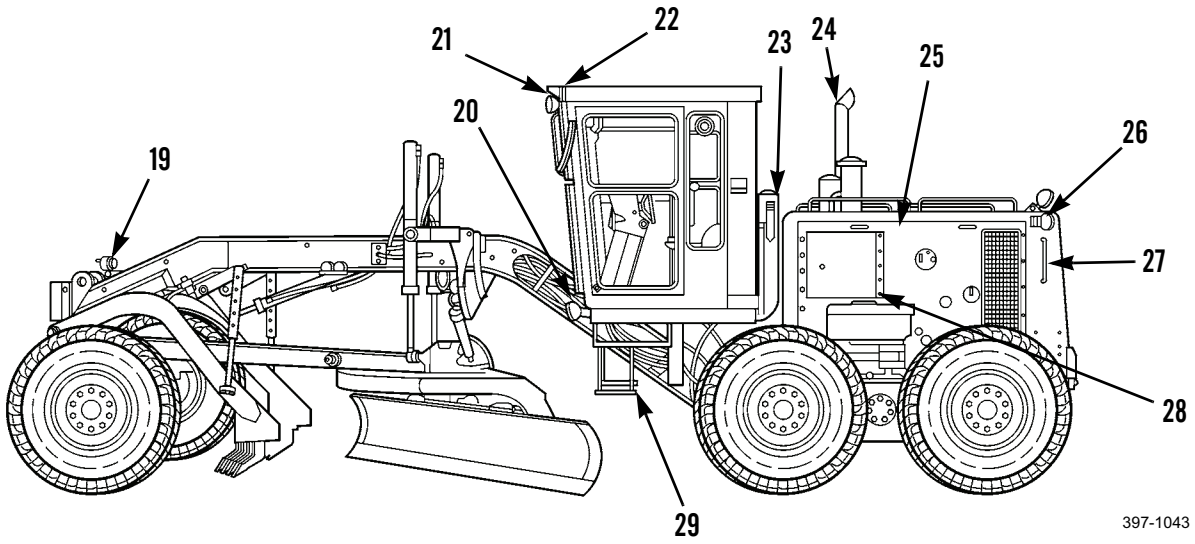
KEY	COMPONENT	DESCRIPTION
1	Wheel Lean Lock Pin	When installed, locks wheel lean cross bar to the front axle.
2	Tool Box	Contains items listed on the Basic Issue Item List (BII).
3	Operator Compartment (Model 130G CCE shown)	Location of operator controls. Entry doors on both sides. Allows operator to be in the sitting or standing position while operating the machine.
4	Air Cleaner	Removes debris from air entering the engine.
5	Anti-Pivot Pin	Prevents the articulation joint from moving. Used during transportation.
6	Blade	Hydraulically controlled with replaceable cutting edges.
7	Cutting Edge	Replaceable edges of the blade.
8	Scarifier	Has eleven removable shanks used for breaking up material.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - CONTINUED



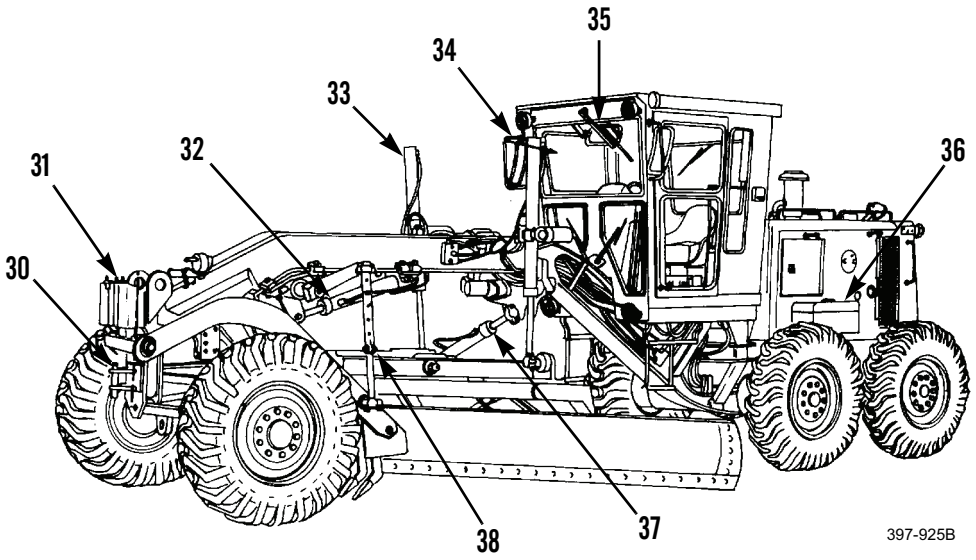
KEY	COMPONENT	DESCRIPTION
9	Rear Work Light	Provides light toward rear of machine.
10	Fuel Tank Fill Cap	Provides a means to fill fuel tank. Contains dipstick for fuel level check.
11	Centershift	Allows center point of blade to be shifted outward to either side. Provides more blade reach.
12	End Bit	Replaceable outer edges of blade.
13	Blade Circle	Mounting system for blade that provides 90 degrees of horizontal blade rotation in both directions.
14	Fuse Box	Provides access to fuses.
15	Tandem Housing	Houses drive gears for tandem wheels.
16	Radiator	Stores and cools engine coolant.
17	Service Stop/Taillights	Turns on with service light switch and service brake pedal.
18	Parking/Turn Signals	Serve as parking lights and flash to indicate direction machine is turning.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - CONTINUED



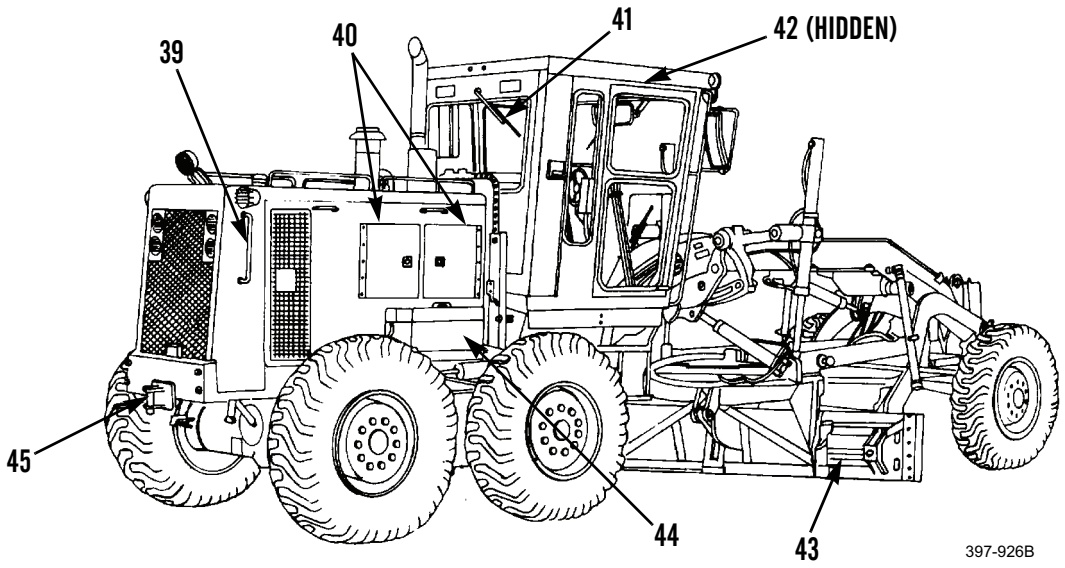
KEY	COMPONENT	DESCRIPTION
19	Blackout Driving Light	Used when operating in blackout mode.
20	Front Work Lights	Provide light in blade area.
21	Headlights	Provide light forward of machine.
22	Cab Turn Signals	Flash to indicate direction machine is turning.
23	Hydraulic Tank Fill Cap	Provides a means to fill hydraulic tank.
24	Exhaust Stack	Directs exhaust fumes to rear of machine.
25	Fuel Tank	Storage tank for diesel fuel.
26	Blackout Stop and Taillights	Used when operating in blackout mode.
27	Grab Handle	Provides a hand hold.
28	Engine Compartment Access Door	Provides access to left side engine compartment.
29	Steps	Provides foot holds for entry to operator compartment.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - CONTINUED



KEY	COMPONENT	DESCRIPTION
30	Front Towing Pin	Attachment point for towing.
31	Scarifier Shank Rack	Storage location for scarifier shanks.
32	Scarifier Hydraulic Cylinder	Raises and lowers the scarifier.
33	Blade Height Hydraulic Cylinder	Raises and lowers each side of blade independently.
34	Side View Mirror	Provides view toward rear and side of machine.
35	Front Wipers (130G Only)	Wipe windshield.
36	Battery Box	Houses battery.
37	Blade Swing Hydraulic Cylinder	Provides side-to-side blade adjustment.
38	Scarifier Link Rod	Link rod with adjustable height setting.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - CONTINUED



KEY	COMPONENT	DESCRIPTION
39	Grab Handle	Provides a hand hold.
40	Engine Compartment Access Door	Provides access to right side of engine compartment.
41	Rear Wiper (130G Only)	Wipes rear window.
42	Fuse Box (if Equipped)	Provides access to fuses.
43	Blade Slide Hydraulic Cylinder	Extends and retracts blade horizontally.
44	Battery Box	Houses battery.
45	Rear Towing Pin	Attachment point for towing.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - CONTINUED

397-1041

KEY	COMPONENT	DESCRIPTION
46	Air Dryer (if Equipped)	Removes moisture from air system.
47	Control Box (GS and GSCE Models)	Controls rear section of machine after sectionalization.
48	Tool Box (if Equipped)	Storage location for tools.

EQUIPMENT DATA

Length:	
Overall	27.4 ft (8.35 m)
Power Section (Sectionalized)	10.5 ft (3.20 m)
Forward Section (Sectionalized)	19.6 ft (5.97 m)
Width:	
Overall	12.0 ft (3.66 m)
Wheel to Wheel (Outside)	7.95 ft (2.42 m)
Wheelbase	19.4 ft (5.91 m)
Height:	
Top of Rollover Protective Structure (ROPS)	10.1 ft (3.1 m)
Top of Exhaust Stack	10.5 ft (3.2 m)
Weight:	
Model 130G CCE	31,500 lb (14,288 kg)
Models 130GNS and 130GNSCE	31,540 lb (14,306 kg)
Models 130GS and 130GSCE	31,870 lb (14,456 kg)
Maximum Travel Speed	24.5 mph (40.8 kph)
Turning Width, Curb-to-Curb	48 ft (14.6 m)
Engine:	
Manufacturer	Caterpillar Inc.
Model	3304
Horsepower	135 hp (100.7 kW)
Engine RPM (low idle)	960-980 RPM
Engine RPM (high idle)	2,250±50 RPM
Cylinders	4
Displacement	425 CID (6.9 L)
Fuel System	Direct injection
Cooling System, Thermostat Completely Open	175°F (79.4°C)
Transmission:	
Manufacturer	Caterpillar Inc.
Type	6 speeds forward, 6 reverse
Range Selection	Single lever, direct power shift
Front Axles:	
Type	Arched bar/solid steel
Ground Clearance	24 in. (610 mm)
Wheel Lean Angle	18 degrees left or right
Rear Axles:	
Type	Full floating/forged steel
Tandem Axle Spacing	5 ft (1.5 m)
Service Brakes:	
Type	4-wheel oil disc, air actuated, dual circuit air system, non-adjustable
Parking Brakes:	
Type	Multiple oil disc, located in transmission case, spring engaged, air disengaged

EQUIPMENT DATA - CONTINUED

Tires:	
Type	Tubeless
Size	13.00-24 (10PR) Traction type
Inflation	35 psi (241 kPa)
Steering:	
Type	Hydraulic, adjustable steering console
Turning Radius	24 ft (7.3 m)
Supplemental power steering	Electric
Capacities:	
Fuel Tank	75 gal. (284 L)
Radiator	10 gal. (38 L)
Engine Crankcase	5 gal. (19 L)
Hydraulic System	18 gal. (68.1 L)
Transmission and Differential	21 gal. (79 L)
Tandem housing (each)	17 gal. (64 L)
Electrical System:	
Batteries:	
Quantity	2
Voltage (each)	12 volt
System Voltage	24 volt
Blade Range:	
Circle centershift:	
Right	20.5 in. (521 mm)
Left	25.5 in. (648 mm)
Blade Sideshift:	
Manual:	
Right	15 in. (381 mm)
Left	None
Hydraulic:	
Right	26.5 in. (673 mm)
Left	20.5 in. (521 mm)
Blade Lift (maximum)	17.25 in. (438 mm)
Blade Shoulder Reach (maximum):	
Frame straight	6.125 ft (1.9 m)
Crab position	9.21 ft (2.8 m)
Maximum Depth of Cut	17.75 in. (451 mm)
Hydraulic Blade Tip	
Forward	40 degrees
Rearward	5 degrees

END OF WORK PACKAGE

THEORY OF OPERATION 0003 00

INTRODUCTION

1. The grader consists of the following functional systems: engine; power train; air and brake systems; electrical system; steering and hydraulic systems.
2. This work package explains how the systems and components of the machine work together. A functional description is provided for each major component and system.
3. The 130G Series Grader is an all-purpose, medium sized, wheeled vehicle used for spreading and evening various types of granular material (dirt, stone, sand, etc.). Power is by a Caterpillar in-line, four-cylinder, direct injected, diesel engine. Hydraulically operated implements allow blade positioning for forward or backward grading, ditch or embankment grading, and snow removal. A scarifier allows loosening of compacted material prior to grading. Front leaning wheel and frame articulation provide maximum maneuverability. Only the 130G model has a sound suppressing Rollover Protective Structure (ROPS) cab with insulation, heater, and windows, which allows for all-weather operation.

ENGINE

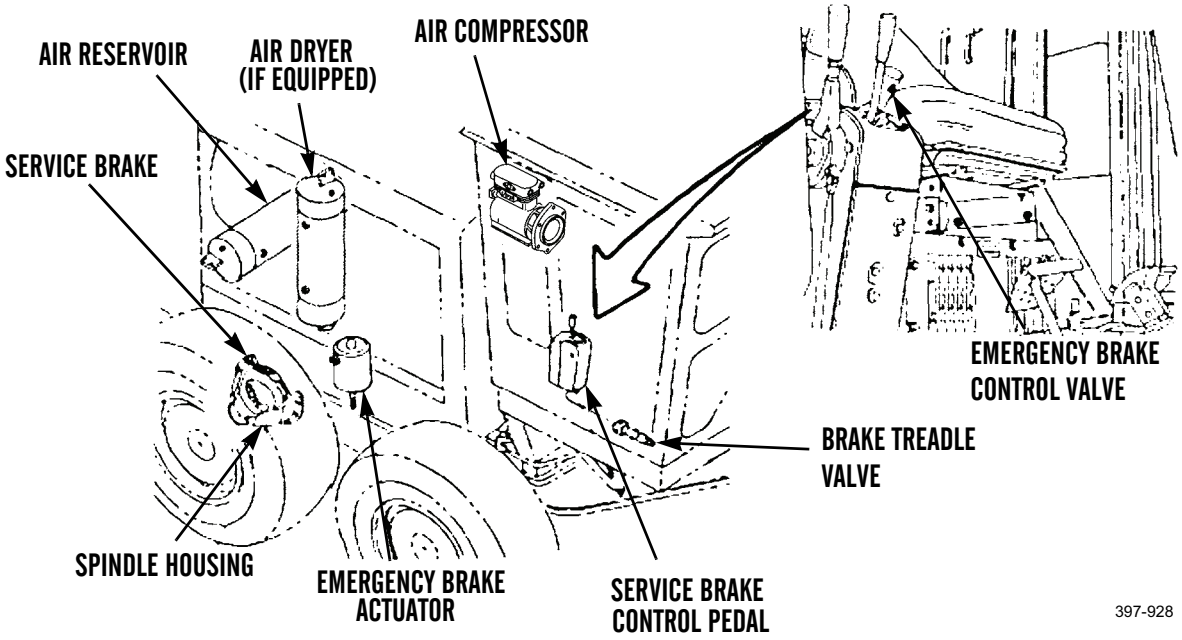
1. **General.** The grader is equipped with a Caterpillar 3304 turbocharged diesel engine with four in-line cylinders, generating 135 horsepower @ 2,200 RPM.
2. **Fuel System.** Diesel fuel is drawn from the tank by a fuel transfer pump, filtered by a primary fuel filter, routed to the fuel injection pump and secondary filter, and then injected through the fuel injector nozzles into the engine cylinders. Air is drawn in through dry-type, replaceable filter elements. A dust ejector removes incoming dust from the air and routes it out through the exhaust system.
3. **Cooling System.** Provides coolant to the engine. Coolant is circulated through the engine by a gear-driven water pump. A hydraulic oil cooler is located in front of the radiator. Engine and transmission oil coolers are mounted on the left side of the engine.
4. **Lubrication System.** The engine lubrication system consists of a gear-driven oil pump, oil filter, oil cooler, and oil pan. The engine is lubricated by cooled and pressurized oil that is circulated through the engine block and head.
5. **Exhaust System.** The exhaust system removes exhaust gases from the engine through the exhaust manifold and turbocharger. The gases flow into exhaust pipes and a muffler to the atmosphere above the cab.

POWER TRAIN

1. **Transmission.** Six speeds are provided in both forward and reverse. A transmission modulator pedal disengages the transmission from the drive wheels. The pedal also provides limited movement for close-quarter maneuvering.
2. **Final Drive Assembly.** Axle shafts turn the planetary gears of the final drive. Final drive sprockets turn the rear wheel spindles through drive chains inside the tandem axle housing.
3. **Rear Axle Differential and Lock Differential.** A four-wheeled tandem rear axle arrangement houses axle shafts driven by a lock-unlock equipped differential. The axle shafts turn the final drive sprocket chains through planetary reduction gears. The sprocket chains then drive the sprocket spindles and wheels.

AIR AND BRAKE SYSTEMS

1. **General.** A gear-driven, two-cylinder air compressor mounted at the left forward side of the engine provides air pressure for the service brakes. A dual section air reservoir is connected by air lines and mounted under the rear of the machine. A governor controls the pressure.



2. **Service Brakes.** A foot pedal operated air valve in the cab directs air pressure through air lines for engaging multiple oil disc brake assemblies for each wheel, within the tandem and spindle housings.

3. **Parking/Emergency Brakes.** Multiple oil disc-type located in the transmission case. Manually actuated by forward movement of red lever on transmission control console. Lever engages parking brake and activates transmission neutral lock to prevent machine movement. Brake is spring engaged and air disengaged. Can be used for emergency stopping if air supply fails.

4. **Emergency Braking.** Dual air system provides separate circuit at each tandem for safety. Malfunction of one circuit leaves remaining circuit with at least half of original braking capacity.

ELECTRICAL SYSTEM

1. The electrical system consists of two 12-volt batteries connected in series with negative grounding, providing 24 volts to operate the electrical systems and components.

2. The system contains all the necessary switches, circuit breakers, fuses, relays, harnesses, and connectors to operate the machine, including a NATO slave receptacle.

3. The major systems comprising the electrical system are:

   a. Starting system

   b. Charging systems

   c. Monitoring system panel

   d. Service, work, and blackout lights

HYDRAULIC SYSTEM

1. **General.** The hydraulic variable-displacement pump assembly is mounted under the cab and is shaft driven by the engine. The variable-displacement rear section draws oil from the hydraulic tank and provides oil flow for steering, articulation, wheel lean, and earth moving components. The constant-displacement front section circulates oil to the reservoir (tank) through the cooler, the filter, and the strainer.

2. **Steering System.**

   a. **Steering Cylinders:** There are two steering cylinders mounted at the front axle that turn the front wheels. The cylinders are powered by the hydraulic system and controlled by the steering wheel pump and steering wheel.

   b. **Wheel Lean Cylinder:** The wheel lean cylinder is mounted on the right side of the front axle. It is powered by hydraulic system and controlled by a lever in the operator compartment. The function of the wheel lean cylinder is to set the front wheels at an angle. This counteracts blade pressure exerted sideways against the front wheels when grading or moving heavy material. The wheel lean cylinder also sets front wheel angle to prevent the front of the machine from slipping sideways and downward when the machine is moving across a slope.

3. **Earth Moving Equipment.** The scarifier height, blade height, rotation, tilt, side-shift, center-shift, and angle are all hydraulic powered and controlled by levers in the operator compartment.

END OF WORK PACKAGE

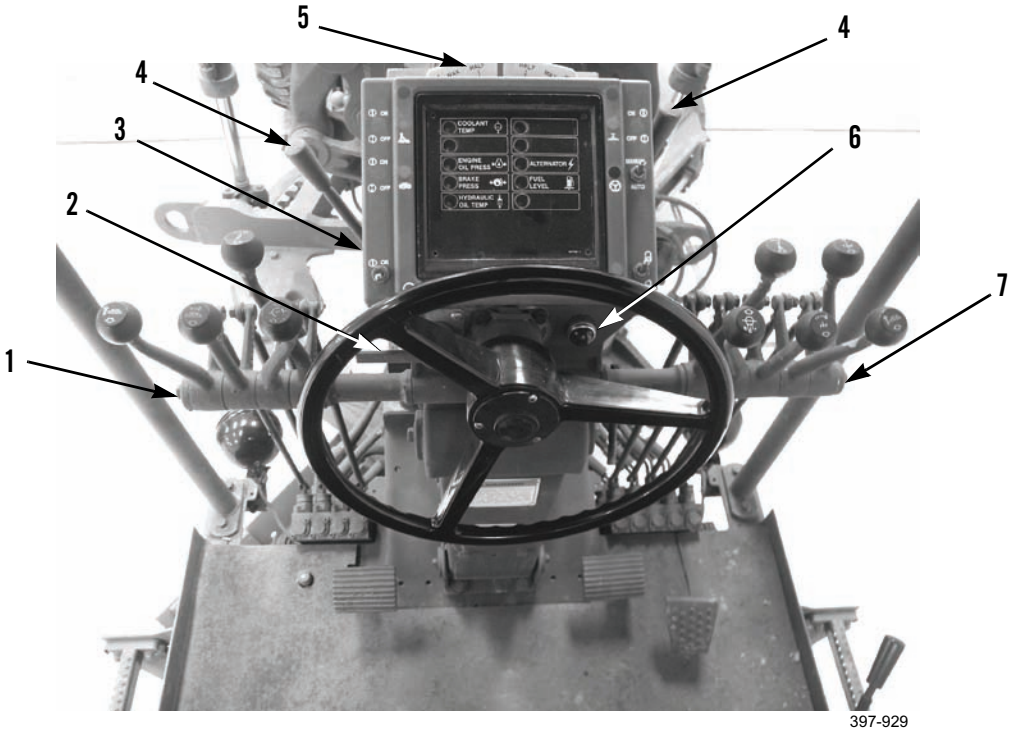
CHAPTER 2
OPERATION INSTRUCTIONS

DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS 0004 00

GENERAL

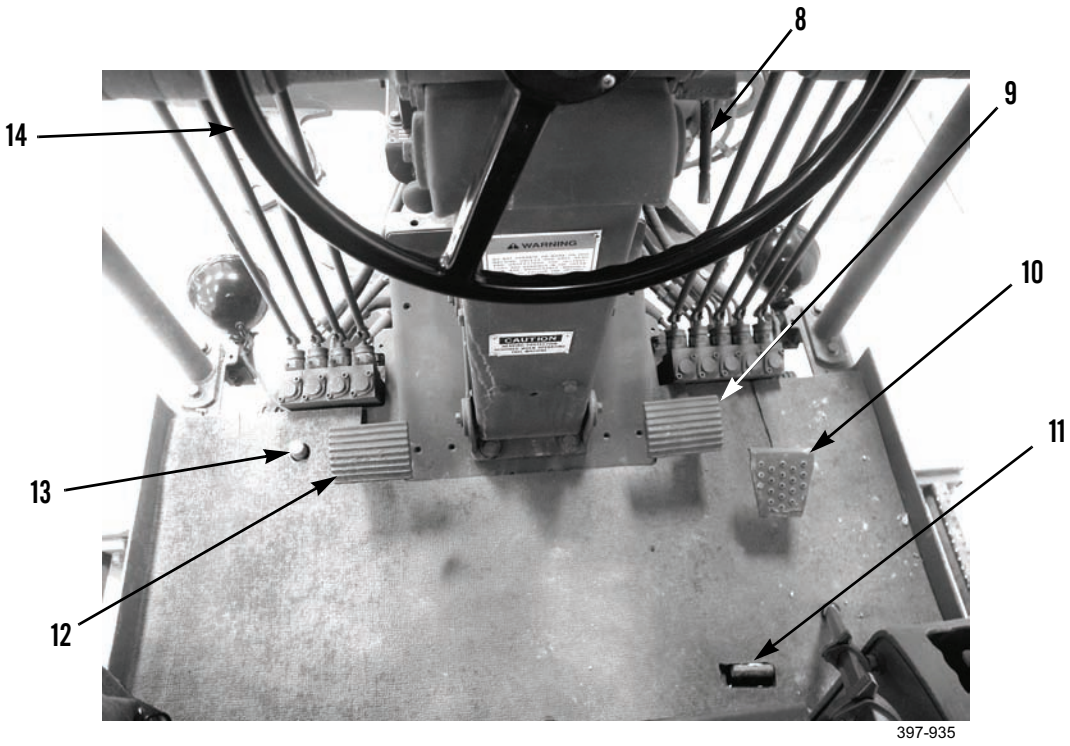
Do not attempt to operate the grader until becoming familiar with the location and use of all controls and indicators. This work package describes all operator controls and indicators.

OPERATOR CONTROLS AND INDICATORS



KEY	CONTROL OR INDICATOR	FUNCTION
1	Left Side Earth Moving Controls	Set of controls for earth moving equipment.
2	Turn Signal/Hazard Lever	Raise lever for right turn signal. Lower lever for left turn signal. Place lever in center position to turn off. Pull lever to turn on hazard flashers.
3	Electronic Monitoring System (EMS) Panel	Contains malfunction warning indicators for systems on the machine.
4	Steering Console Adjustment Lever	Pull lever to release steering console to allow adjustment.
5	Articulation Indicator	Indicates articulation angle.
6	EMS Fault Light	Flashes when an EMS fault is present.
7	Right Side Earth Moving Controls	Set of controls for earth moving equipment.

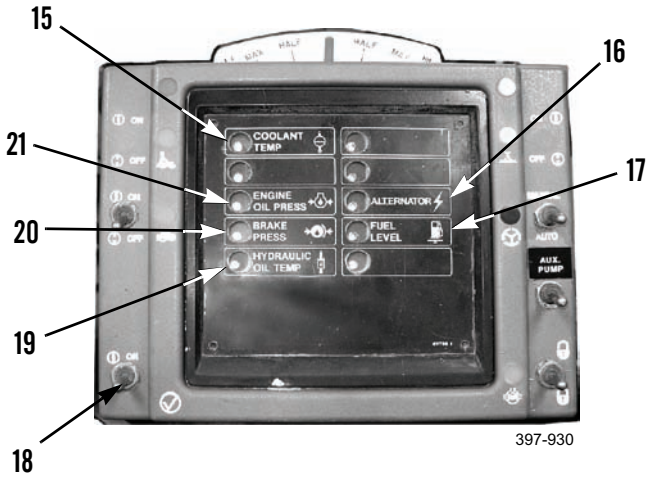
OPERATOR CONTROLS AND INDICATORS - CONTINUED



397-935

KEY	CONTROL OR INDICATOR	FUNCTION
8	Steering Wheel Tilt Lock	Rotate counter-clockwise to loosen for adjustment. Rotate clockwise to tighten.
9	Service Brake Pedal	Press pedal to slow or stop machine.
10	Accelerator Pedal	Press pedal to increase engine speed. Pull top of pedal to shut down engine.
11	Decelerator Pedal	Push down to decrease engine speed below governor setting.
12	Transmission Modulator Pedal	Disengages power to wheels. Used to move slowly around obstacles.
13	Headlight Dimmer Switch	Depress dimmer switch to change headlight beams from low to high beam. Press switch again to return headlights beams to low beam.
14	Steering Wheel	Controls machine direction of travel. Turn steering wheel clockwise to turn right. Turn steering wheel counterclockwise to turn left.

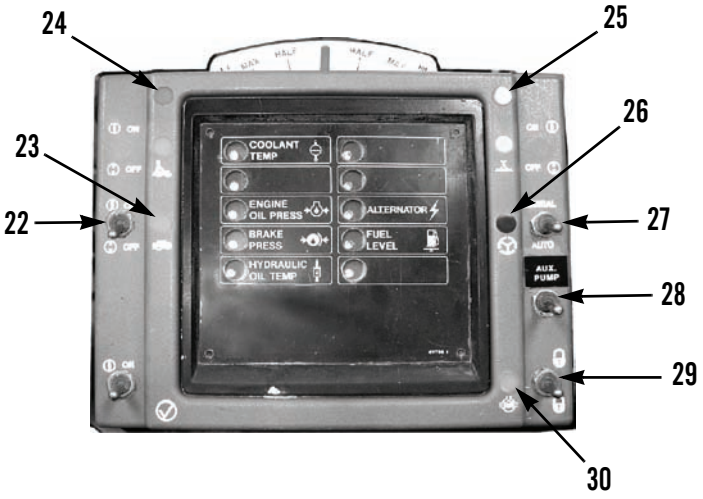
ELECTRONIC MONITORING SYSTEM (EMS) PANEL



KEY	CONTROL OR INDICATOR	FUNCTION
15	Coolant Temperature Fault Indicator	Flashes on and off when engine coolant temperature is above 225ºF (107ºC).
16	Alternator Fault Indicator	Flashes on and off indicating malfunction in charging circuit.
17	Low Fuel Level Indicator	Flashes on and off indicating low fuel level.
18	EMS Panel Test Switch	With battery disconnect switch on, hold test switch on and panel indicators should flash and EMS fault light should blink. If any panel indicators or the fault light does not work, notify Unit Maintenance.
19	Hydraulic Oil Temperature Fault Indicator	Flashes on and off indicating hydraulic oil temperature is above 190ºF (88ºC).
20	Brake Air Pressure Fault Indicator	Flashes on and off when air pressure in either circuit is below 65 psi (448 kPa). The EMS fault light and fault alarm are also activated.
21	Engine Oil Pressure Fault Indicator	Flashes on and off to indicate oil pressure is low. The EMS fault light and fault alarm are also activated.

DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS - CONTINUED 0004 00

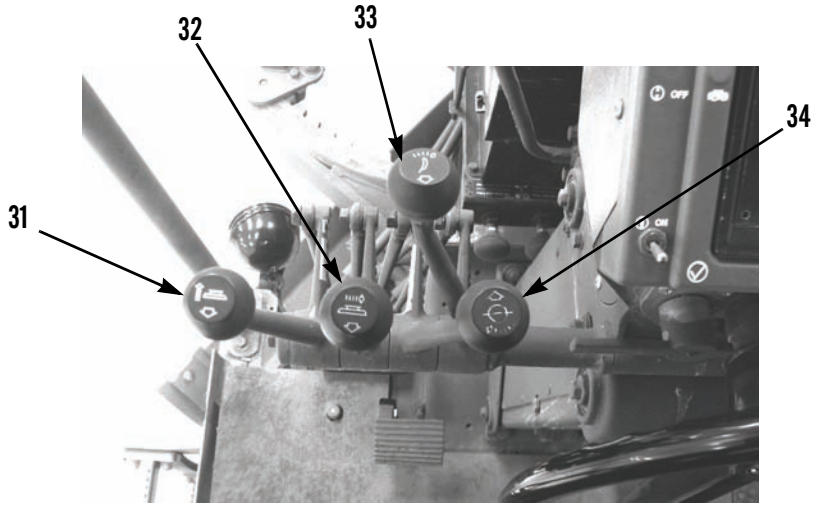
ELECTRONIC MONITORING SYSTEM (EMS) PANEL - CONTINUED



397-930

KEY	CONTROL OR INDICATOR	FUNCTION
22	Blade Float Switch (if Equipped)	With the switch in the ON position, the indicator is on and the blade will move up and down following the contour of the ground.
23	Blade Float Indicator (if Equipped)	With the switch in the ON position, the indicator is on.
24	Left Turn Signal Indicator	With the left turn signal on, indicator will flash.
25	Right Turn Signal Indicator	With the right turn signal on, indicator will flash.
26	Supplemental Steering Indicator	Indicator light is on when system is working.
27	Supplemental Steering Switch	Supplemental steering provides steering control if engine stalls. Switch must be in AUTO position while operating machine.
28	Auxiliary Hydraulic Pump Switch (if Equipped)	Used during sectionalization to allow hydraulic system control.
29	Differential Lock Switch	Locks and unlocks the differential.
30	Differential Lock Indicator	The indicator light is on when the differential is unlocked.

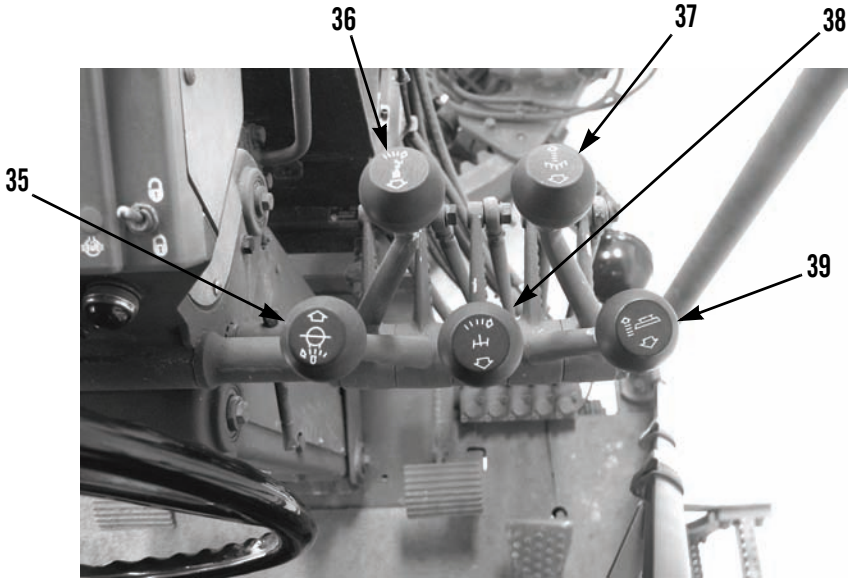
EARTH MOVING CONTROLS



397-934

KEY	CONTROL OR INDICATOR	FUNCTION
31	Left Side Blade Control	Left side blade height control has three positions: Raise: Pull lever back to raise left side of blade. Hold: Center position holds blade in set position. Lower: Move lever forward to lower left side of blade.
32	Blade Sideshift Control	Blade sideshift control has three positions: Right: Pull lever back and blade moves to right. Hold: Center position holds blade in set position. Left: Move lever forward and blade moves to left.
33	Blade Tip Control	Blade tip control has three positions: Back: Pull lever back and top edge of blade tips toward rear of machine. Hold: Center position holds blade in set position. Forward: Move lever forward and top edge of blade tilts toward front of machine.
34	Blade Circle Drive Control	Blade circle drive control has three positions: Clockwise: Pull lever back and circle rotates clockwise. Hold: Center position holds circle in set position. Counterclockwise: Move lever forward and circle rotates counterclockwise.

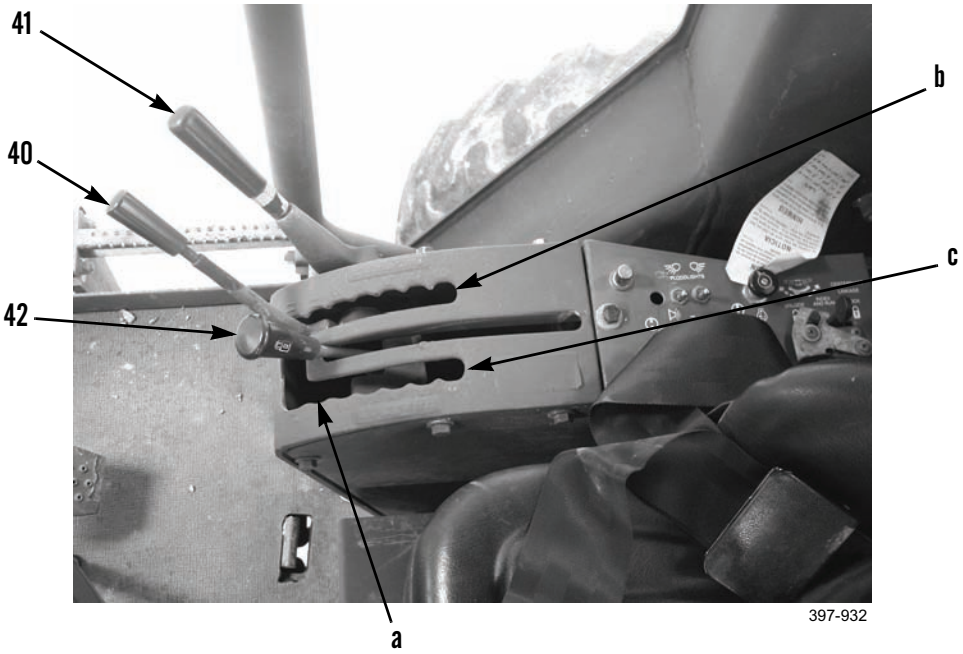
EARTH MOVING CONTROLS - CONTINUED



KEY	CONTROL OR INDICATOR	FUNCTION
35	Blade Centershift Control	Blade centershift control has three positions: Right: Pull lever back and the drawbar, blade and circle move right. Hold: Center position holds the drawbar, blade and circle in set position. Left: Move lever forward and the drawbar, blade and circle move left.
36	Articulation Control	Articulation control has three positions: Right: Pull lever backward and rear of machine articulates to right. Hold: Center position holds machine at current articulation angle. Left: Move lever forward and rear of machine articulates to left.
37	Scarifier Control	Scarifier control has three positions: Raise: Pull lever back to raise scarifier. Hold: Center position holds scarifier in set position. Lower: Move lever forward to lower scarifier to ground.
38	Wheel Lean Control	Wheel lean control has three positions: Right: Pull lever back and front wheels lean right. Hold: Center position holds wheel lean in set position. Left: Move lever forward and front wheels lean left.

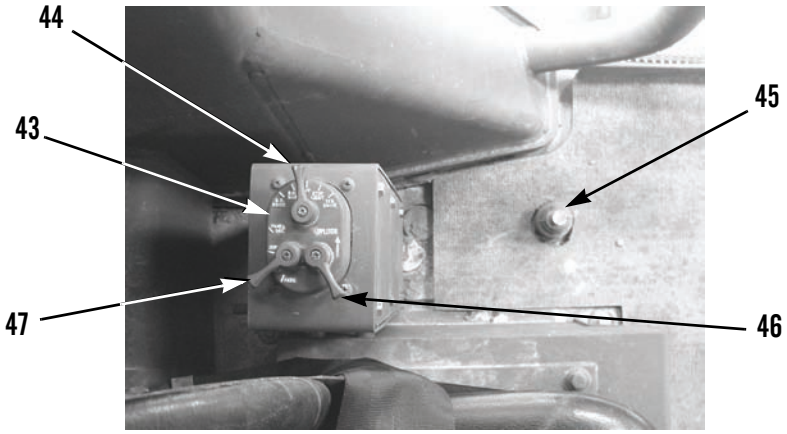
39	Right Side Blade Control	Right side blade height control has three positions: Raise: Pull lever back to raise right side of blade. Hold: Center position holds blade in set position. Lower: Move lever forward to lower right side of blade.

TRANSMISSION CONTROLS



KEY	CONTROL OR INDICATOR	FUNCTION
40	Transmission Shift Lever	Allows operator to select transmission operation.
	(a) N (Neutral)	Position lever in N (Neutral) when starting engine and when parking machine.
	(b) Reverse Speeds (1, 2, 3, 4, 5, 6)	Select desired reverse speed by placing lever in position 1 through 6 in the REVERSE (right) side of the shift control box.
	(c) Forward Speeds (1, 2, 3, 4, 5, 6)	Select desired forward speed by placing lever in position 1 through 6 in the FORWARD (left) side of the shift control box.
41	Governor Control	Lever to set engine speed. Move forward to increase engine speed. Move rearward to decrease engine speed. Do not use as a cruise control.
42	Parking/Emergency Brake Lever	Move lever forward to set the parking/emergency brake and lock the transmission shift lever in Neutral. Move lever rearward to release parking/emergency brake and release the gear selection lever.

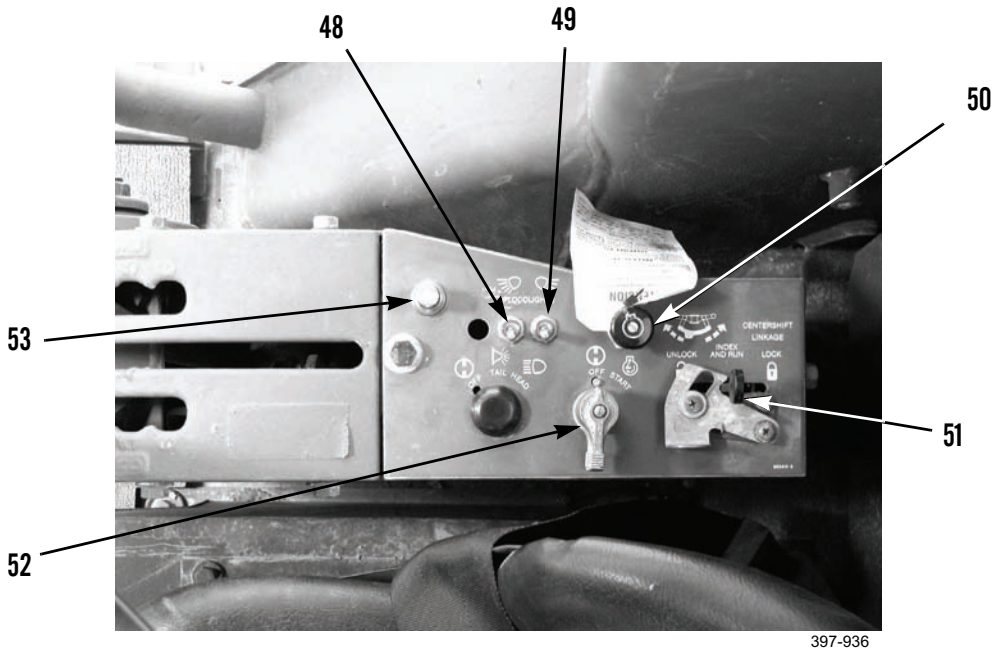
MILITARY LIGHT SWITCH AND UNLOADING VALVE



397-933

KEY	CONTROL OR INDICATOR	FUNCTION
43	Military Light Switch	Controls operation of service, blackout, parking, and instrument panel lights. When operating in blackout mode, work lights, service, and directional lights are disabled. Backup alarm and horn are also disabled in blackout mode.
44	Mode Switch	Used to select desired mode of lighting. Release unlock (46) switch to change modes.
45	Hydraulic Unloading Valve	Press to relieve hydraulic system pressure. Reduces load on engine starter.
46	Unlock Switch	Lift up to unlock mode switch. Returns to locked position when released.
47	Panel Brightness Switch	Used to adjust brightness of instrument panel lights.

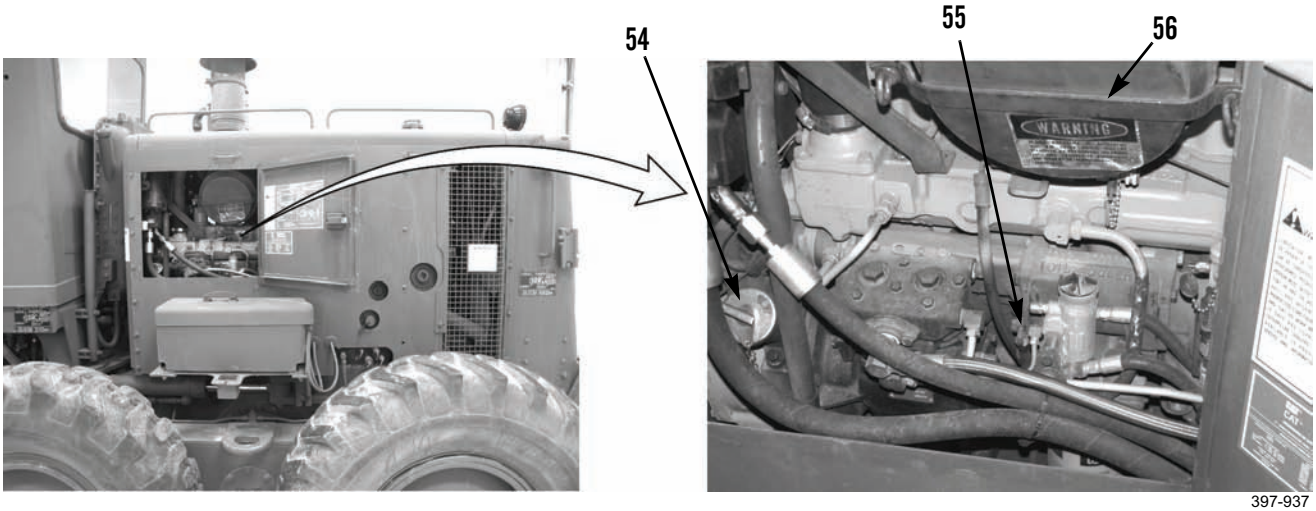
OPERATOR CONTROL PANEL



397-936

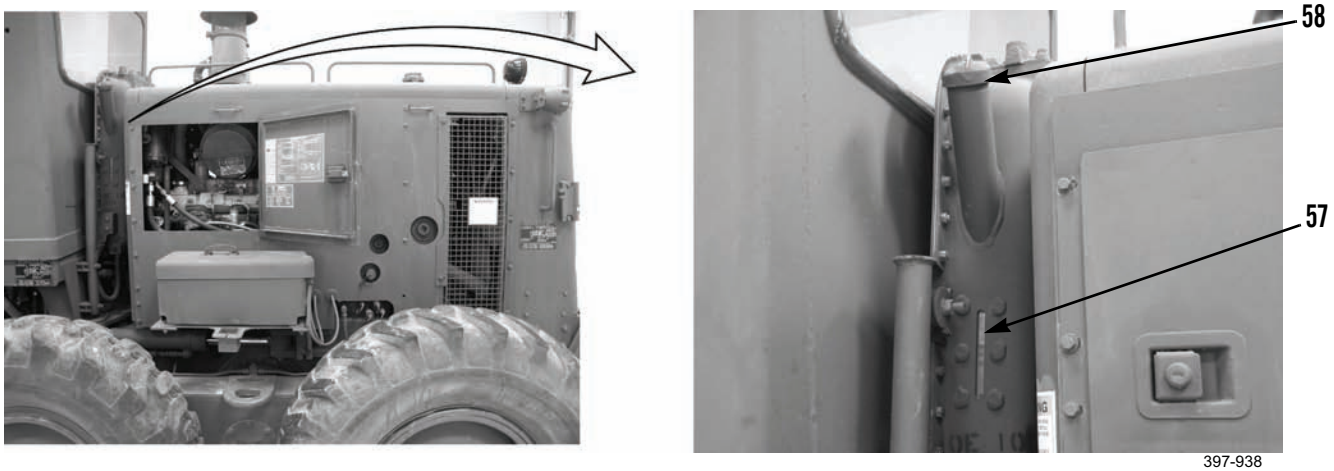
KEY	CONTROL OR INDICATOR	FUNCTION
48	Front Floodlight Switch	Controls floodlights located on front of operator compartment.
49	Rear Floodlight Switch	Controls floodlight located on rear of machine.
50	Ether starting aid switch	Controls ether starting aid. Ether is injected into intake at a calibrated amount for each button press.
51	Centershift Lock Switch	Locks centershift to hold at set position and unlocks centershift to allow adjustment.
52	Engine Start Switch	Push switch in and turn right to crank engine.
53	Control Panel Light	Illuminates operator control panel.

ENGINE COMPARTMENT



397-937

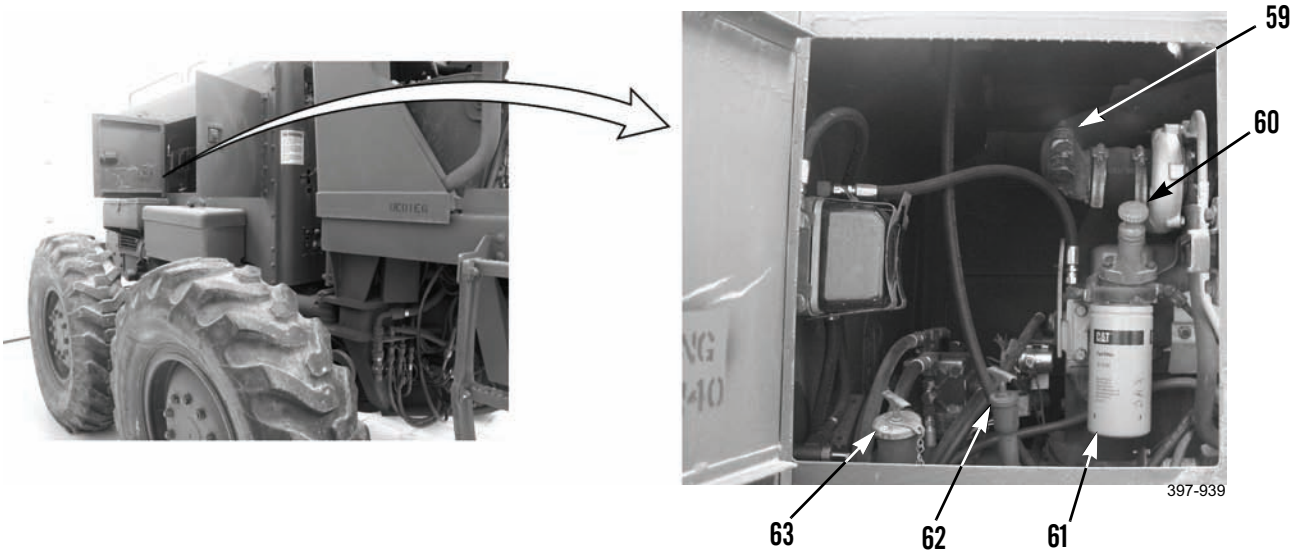
KEY	CONTROL OR INDICATOR	FUNCTION
54	Engine Oil Fill Cap	Remove cap to add engine oil to the engine crankcase.
55	Engine Oil Dipstick	Indicates level of oil in engine crankcase. Level should be between ADD and FULL ENGINE STOPPED lines on dipstick.
56	Air Cleaner Housing	Housing for primary and secondary air filters.



397-938

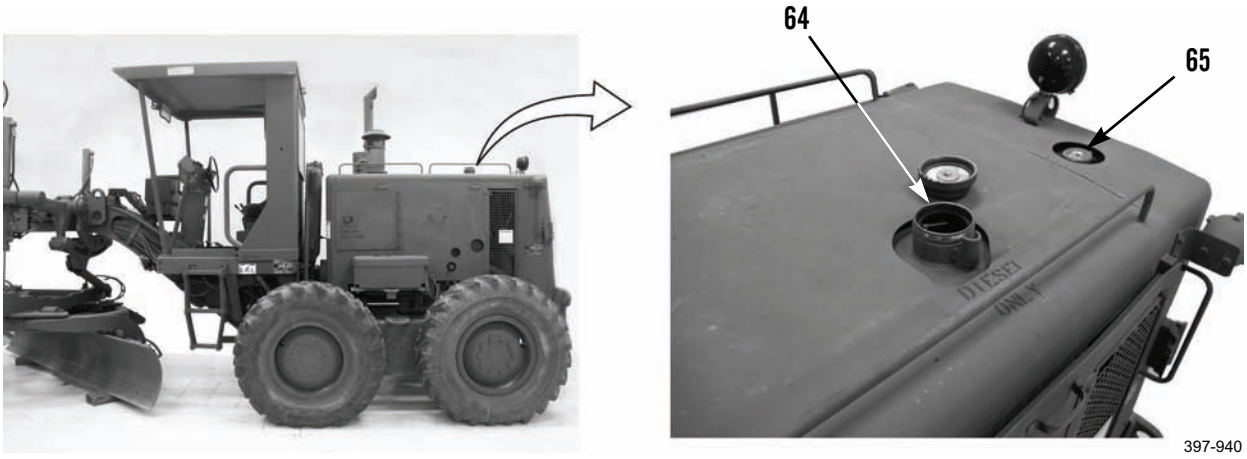
KEY	CONTROL OR INDICATOR	FUNCTION
57	Hydraulic Reservoir Sight Gauge	Provides a visual indication of oil level. Operating range is above bottom line on gauge.
58	Hydraulic Reservoir Fill Cap	Remove cap to add hydraulic oil to the hydraulic tank.

ENGINE COMPARTMENT - CONTINUED

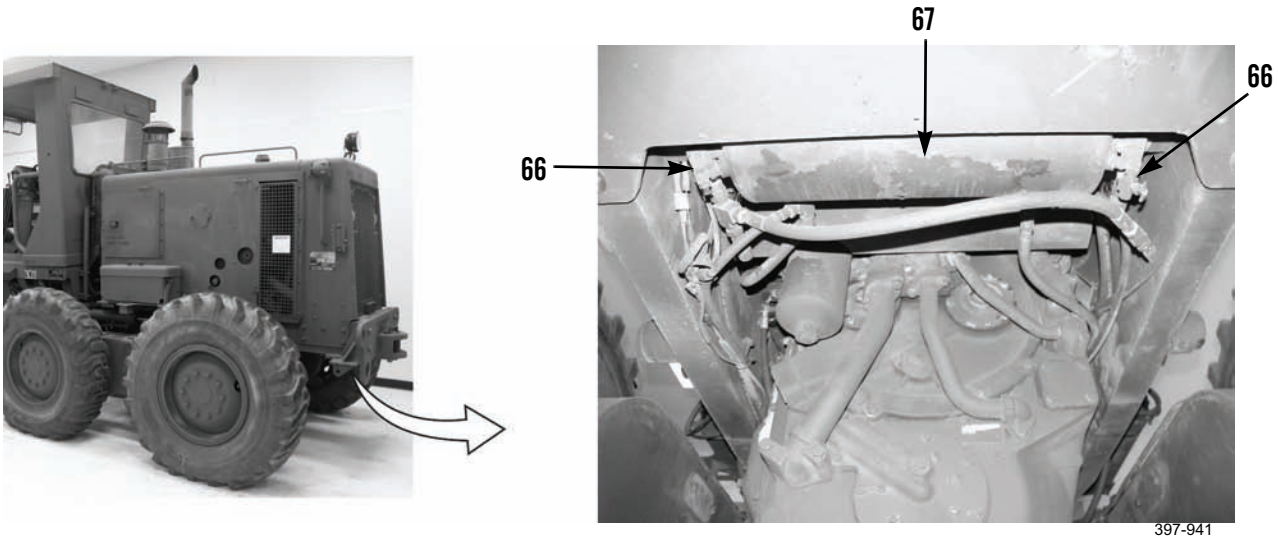


KEY	CONTROL OR INDICATOR	FUNCTION
59	Engine Air Filter Service Indicator	Indicates air cleaner air flow is adequate if indicator is yellow or green. If indicator is red, service air cleaner. Press button on bottom to reset after servicing.
60	Fuel System Priming Pump	Helps remove air trapped in the fuel system. Primarily used after fuel filter replacement.
61	Fuel Filter	Removes debris from fuel system before entering engine.
62	Transmission Oil Dipstick	Indicates level of oil in transmission. Level should be between ADD and FULL ENGINE IDLING lines on dipstick.
63	Transmission Oil Fill Cap	Remove cap to add transmission oil to the transmission.

ENGINE COMPARTMENT - CONTINUED

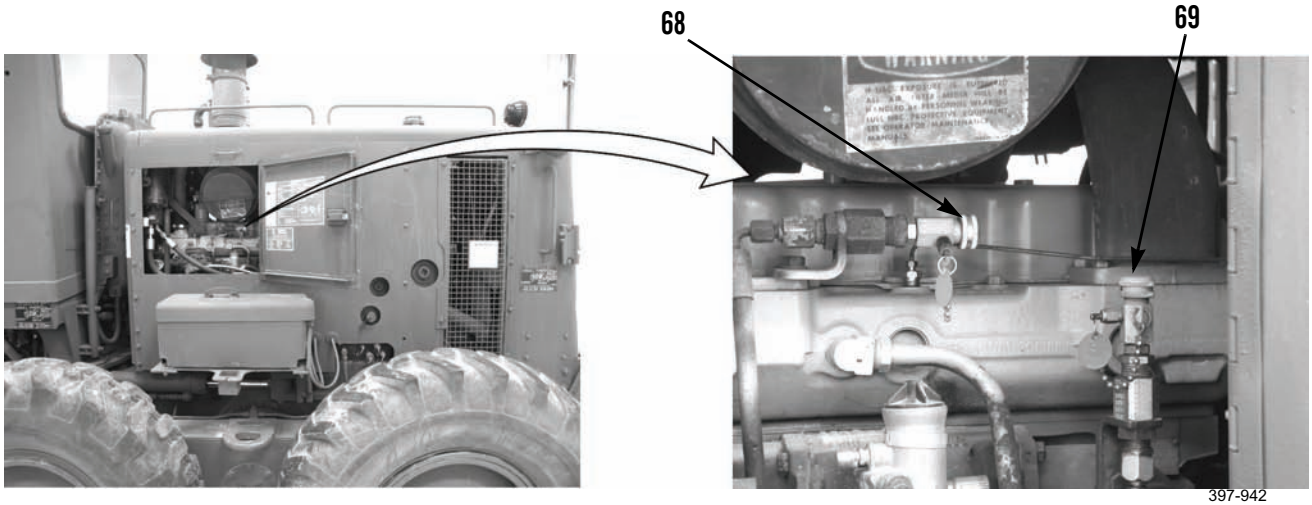


KEY	CONTROL OR INDICATOR	FUNCTION
64	Fuel Tank Dipstick	Indicates level of fuel in tank. Markings on dipstick are 10%, 50%, and FULL.
65	Radiator Cap	Remove cap to add engine coolant to the radiator.



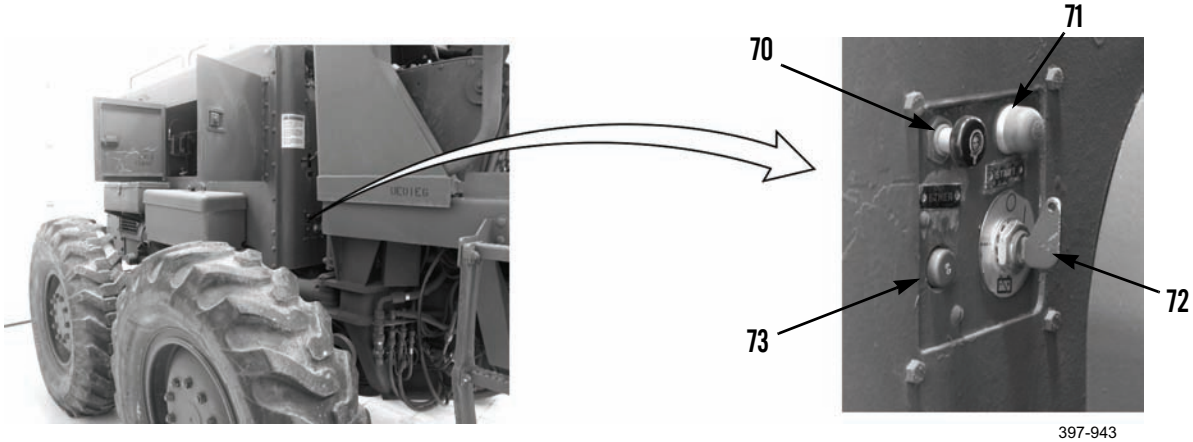
KEY	CONTROL OR INDICATOR	FUNCTION
66	Air Tank Drains	Used to remove moisture and sediment from air tanks. Two drain valves, one at each end.
67	Air Tank	Dual chamber air tank. Provides air reserve for two separate air brake circuits.

OIL SAMPLING VALVES



KEY	CONTROL OR INDICATOR	FUNCTION
68	Engine Oil Sampling Valve	Used to collect sample of engine oil.
69	Transmission Oil Sampling Valve	Used to collect sample of transmission oil.

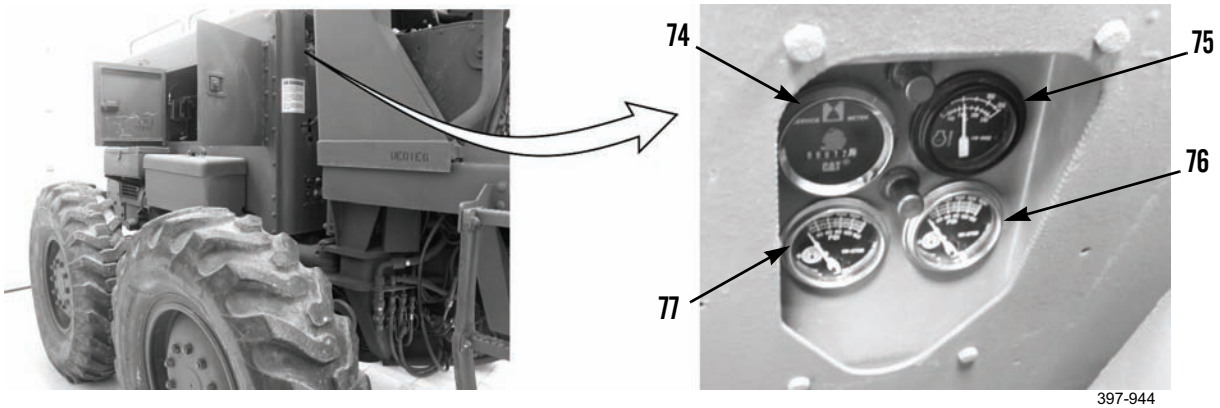
ENGINE COMPARTMENT EXTERIOR CONTROLS



397-943

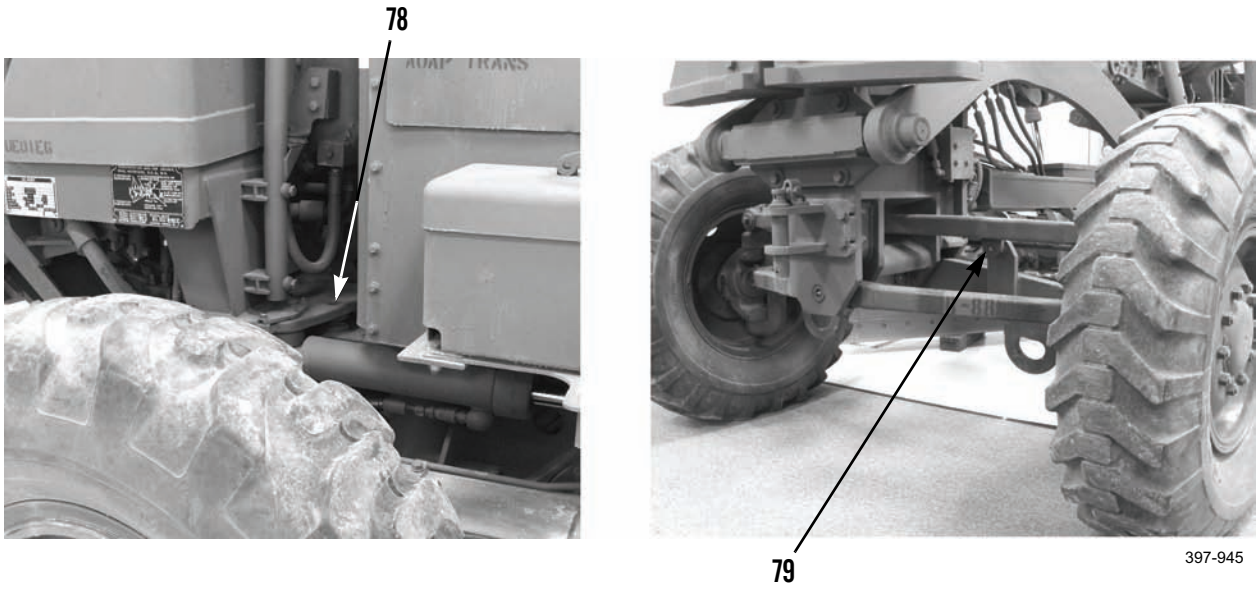
KEY	CONTROL OR INDICATOR	FUNCTION
70	Ether Starting Aid Switch (130GS and 130GSCE)	Controls ether starting aid. Ether is injected into intake at a calibrated amount for each button press.
71	Engine Start Switch (130GS and 130GSCE)	Press to crank engine.
72	Battery Disconnect Switch (130GS and 130GSCE)	To activate electrical system, insert key and turn switch right (ON). Turn switch left (OFF) and remove key to turn off electrical system.
73	Main Circuit Breaker (130GS and 130GSCE)	Provides overload protection for the electrical system. Press to reset.

ENGINE COMPARTMENT GAUGES



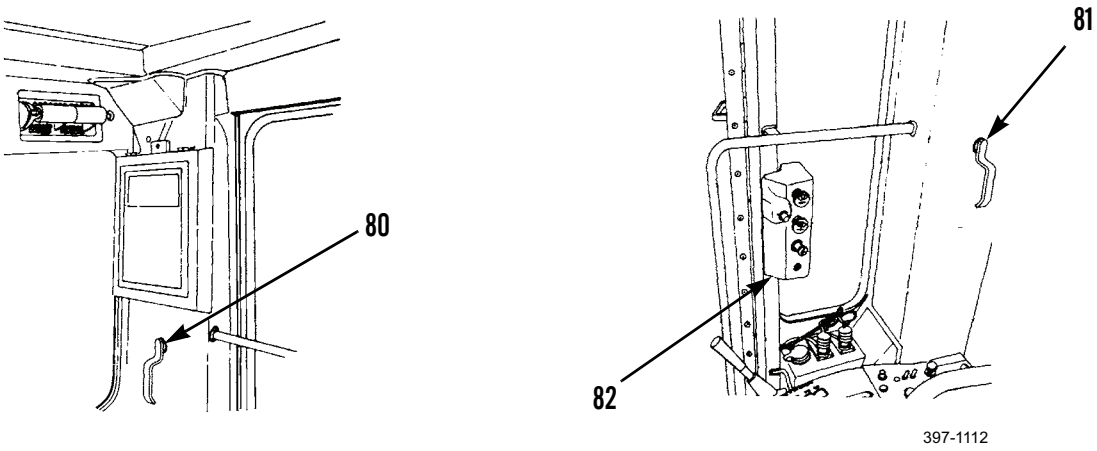
KEY	CONTROL OR INDICATOR	FUNCTION
74	Hour Meter	Records total engine operating hours. Used to determine service intervals.
75	Engine Coolant Temperature	Indicates engine coolant temperature. Normal operating temperature is between 160° and 227ºF (71° and 108ºC). At 225ºF, alarm will sound.
76	Air Pressure Gauge	Indicates air pressure in air system. Normal operating pressure is in the green range.
77	Air Pressure Gauge	Indicates air pressure in air system. Normal operating pressure is in the green range.

LOCKING PIN LOCATION



KEY	CONTROL OR INDICATOR	FUNCTION
78	Pivot Locking Pin	Prevents pivoting of machine during transport. Remove before operating machine.
79	Wheel Lean Locking Pin	Prevents front wheels from leaning during transport. Remove before operating machine.

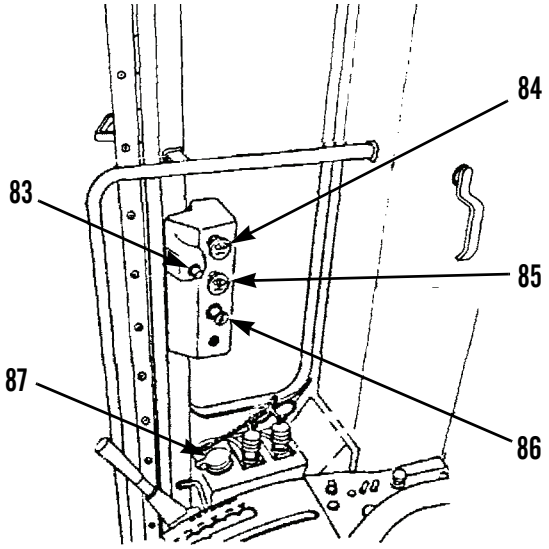
130G CCE



KEY	CONTROL OR INDICATOR	FUNCTION
80	Door Safety Latch, Left Side	Left side catch holds door in open position.
81	Door Safety Latch, Right Side	Right side catch holds door in open position.
82	Wiper Control Panel (Front Wipers)	Location of controls for front wipers (upper and lower) and washers. Wiper fuse is located behind control panel.

DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS - CONTINUED 0004 00

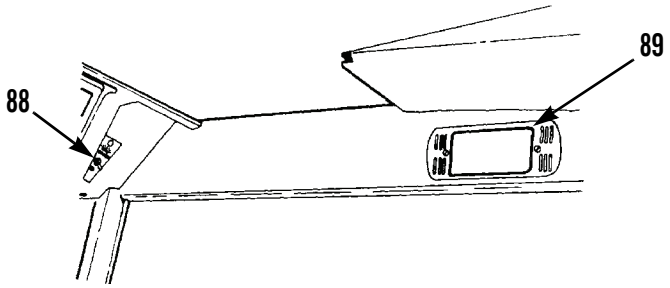
130G CCE - CONTINUED



397-1113

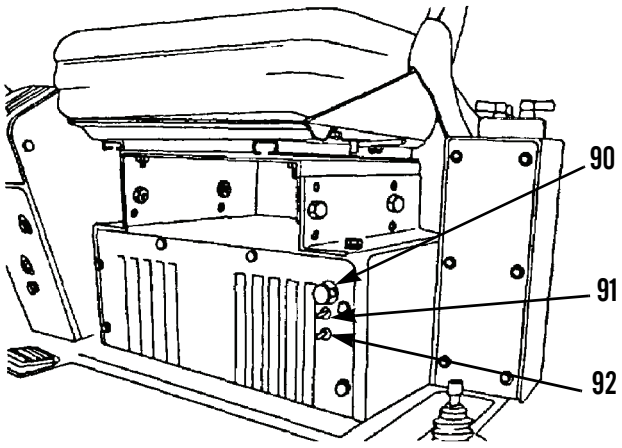
KEY	CONTROL OR INDICATOR	FUNCTION
83	Panel Light	Illuminates the wiper control panel.
84	Upper Windshield Wiper/ Washer Control	Two-speed control. Turn clockwise.
85	Lower Windshield Wiper/ Washer Control	Controls lower front wipers and washers.
86	Lighter	Push in and lighter will pop out when hot.
87	Washer Reservoir and Fill	Container for window washer solvent.

130G CCE - CONTINUED



397-1114

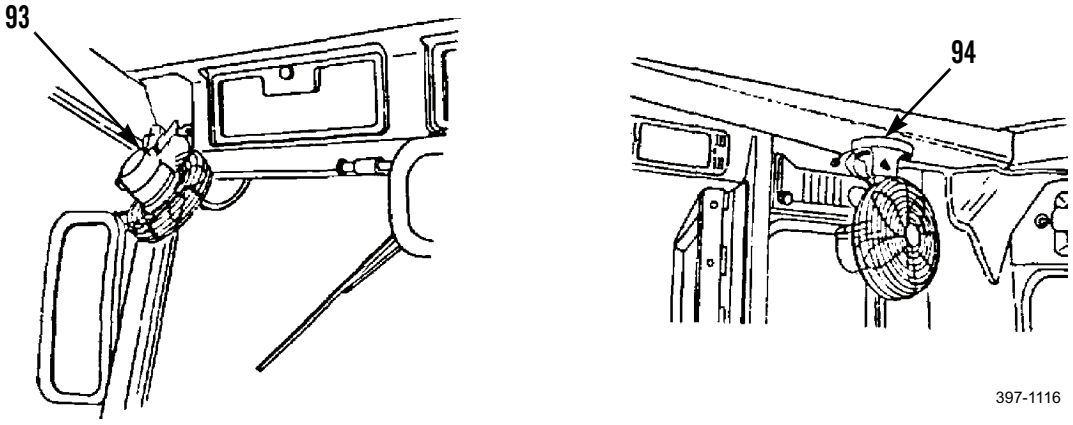
KEY	CONTROL OR INDICATOR	FUNCTION
88	Dome Light Switch	Controls the dome light. Switch has bright, off, and dim positions.
89	Dome Light	Illuminates the operator compartment.



397-1115

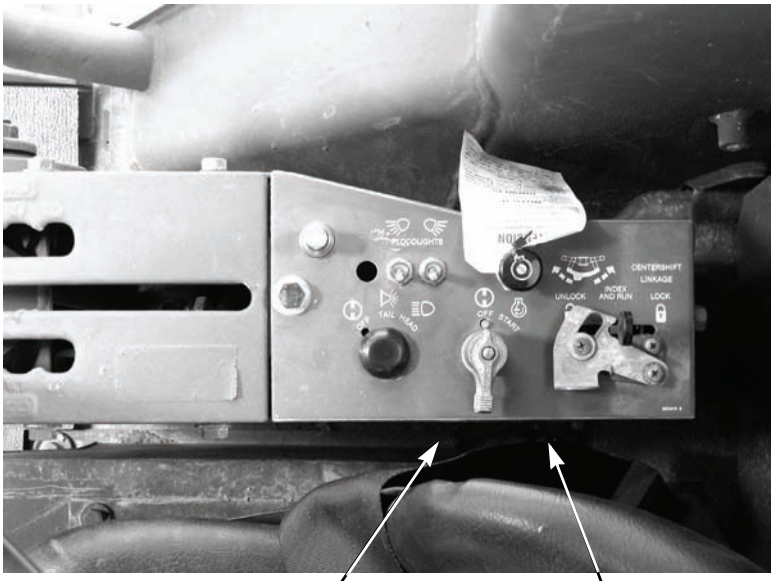
KEY	CONTROL OR INDICATOR	FUNCTION
90	Temperature Control	Pull out knob to increase temperature. Push in to reduce temperature.
91	Fan Switches	The two toggle switches control high and low speed for the two blower motors.
92	Heater	Provides heated air in the operator compartment.

130G CCE - CONTINUED



KEY	CONTROL OR INDICATOR	FUNCTION
93	Front Defroster Fan	Aids in cleaning frost from windshield.
94	Rear Defroster Fan	Aids in cleaning frost from rear window.

130G CCE - CONTINUED



397-936

KEY	CONTROL OR INDICATOR	FUNCTION
95	Main Circuit Breaker	Provides overload protection for the electrical system. Press to reset.
96	Battery Disconnect Switch	To activate electrical system, insert key and turn switch right (ON). Turn switch left (OFF) and remove key to turn off electrical system.

END OF WORK PACKAGE

OPERATION UNDER USUAL CONDITIONS 0005 00

GENERAL

This machine has been designed to operate safely and efficiently within the limits specified in this TM. Operation beyond these limits is prohibited in accordance with AR 70-1 without written approval from: Commander, U.S. Army Tank-Automotive and Armaments Command, ATTN: AMSTA-DSA-CS, Warren, MI 48397-5000.

WARNING

Hearing protection is required when operating machine. Failure to wear hearing protection may cause hearing loss.

1. This work package contains instructions for safely operating this machine under usual conditions.
2. Read and become familiar with information in this work package and in WP 0006 00 BEFORE operating machine.
3. Operation under unusual conditions is described in WP 0007 00.

MOUNTING AND DISMOUNTING MACHINE

WARNING

- Use caution and maintain three-point contact all times when mounting and dismounting machine, to avoid injury.
- DO NOT use steering wheel as a handhold.
- Failure to follow these warnings may cause injury.

1. Mount and dismount machine only at locations with steps and/or grabhandles. Do NOT use steering wheel as a handhold.
2. Ensure steps and/or grabhandles are clean and secure before using them.
3. Face machine when mounting and dismounting.
4. Maintain minimum three-point contact at all times, i.e., two feet and one hand or two hands and one foot.
5. Never mount or dismount a moving machine.
6. Never jump from machine.
7. DO NOT mount or dismount machine while carrying tools or supplies.

INITIAL ADJUSTMENTS AND DAILY CHECKS

NOTE

Refer to WP 0004 00 for the location and operation of controls.

1. Perform *Before* operation Preventive Maintenance Checks and Services (PMCS) BEFORE starting engine (WP 0012 00 and WP 0013 00).

INITIAL ADJUSTMENTS AND DAILY CHECKS - CONTINUED

CAUTION

The wheel lean locking pin and pivot locking pin must be removed before operating machine. Failure to following this caution may result in damage to machine.

2. Remove wheel lean locking pin from front of machine.
3. Remove pivot locking pin from center of machine.
4. Turn on battery disconnect switch.
5. Occupy and adjust seat.
6. Adjust rearview and exterior mirrors (if equipped) as required.

WARNING

DO NOT operate machine unless seat belt has been fastened. Failure to follow this warning may cause injury or death to personnel.

7. Fasten seat belt.

START ENGINE

WARNING

- DO NOT operate engine in enclosed areas due to the dangers of carbon monoxide poisoning from exhaust fumes. Always start and operate engine in a well-ventilated area and, if in an enclosed area, vent exhaust to the outside. Failure to follow this warning may cause injury or death to personnel.
- Be ALERT for personnel in the area while operating machine. Always check to ensure area is clear of personnel before starting engine. Failure to follow this warning may cause injury or death to personnel.
- Hearing protection is required when operating machine. Failure to wear hearing protection may cause hearing loss.

NOTE

Refer to WP 0004 00 for the location and operation of controls.

1. **Starting Engine Above 32ºF (0ºC).**
   a. Ensure blade is lowered to the ground.
   b. Ensure transmission is in N (Neutral).
   c. Ensure parking brake is applied (parking brake control lever pushed forward).
   d. Ensure all hydraulic control levers are in center HOLD position.
   e. Ensure all accessories are off.
   f. Ensure all personnel are clear of machine.
   g. Insert battery disconnect switch key and turn to ON position.
   h. If temperature is below 60°F (16°C), press hydraulic unloading valve. Release after engine has started.
   i. Partially depress accelerator pedal and hold during cranking.

START ENGINE - CONTINUED

CAUTION

DO NOT crank starter motor for more than 30 seconds at a time. After 30 seconds, allow starter motor to cool for at least 2 minutes before attempting to start engine again. Excessive heating of starter motor may result in damage or premature starter failure.

j. Push in and turn start switch to START position. When engine starts, release start switch.

CAUTION

Turbocharger damage can result if engine RPM is not kept low until oil pressure indicator on EMS panel has stopped flashing.

k. Release accelerator pedal after engine has started.

l. If engine oil pressure indicator does not stop flashing within 10 seconds after engine starts, stop engine by pulling backwards on accelerator pedal and perform troubleshooting.

m. After engine has started, proceed to *Machine Warmup*.

2. **Starting Engine Below 32ºF (0ºC) Using Ether Starting Aid.**

a. Ensure blade is lowered to ground.

b. Ensure transmission is in N (Neutral).

c. Ensure parking brake is applied (parking brake control lever pushed forward).

d. Ensure all hydraulic control levers are in center HOLD position.

e. Ensure all accessories are off.

f. Ensure all personnel are clear of machine.

g. Insert battery disconnect switch key and turn to right (ON) position.

h. Press hydraulic unloading valve. Hold for 1 to 2 minutes after engine has started.

i. Partially depress accelerator pedal and hold during cranking.

CAUTION

- DO NOT crank starter motor for more than 30 seconds at a time. After 30 seconds, allow starter motor to cool for at least 2 minutes before attempting to start engine again. Excessive heating of starter motor may result in damage or premature starter failure.
- After 7 starting attempts (30 seconds of cranking followed by a 2-minute wait), wait for 30 minutes before next starting attempt, at which time attempt only 4 30-second cranking cycles, then wait 30 minutes before next attempt.

j. Push in and turn start switch to START position.

START ENGINE - CONTINUED

CAUTION

Use ether-starting aid sparingly and for cold starting purposes ONLY. Excessive ether without cranking can cause piston and ring damage.

NOTE

Inject ether only while cranking engine or after initial start-up, until engine is running smoothly.

k. Push ether starting aid switch down for 2-3 seconds, then release for 2-3 seconds. Operate switch at 2-3 second intervals as engine is cranked. Continue to use switch at 2-3 second intervals until engine starts and is running smoothly.

l. Release start switch when engine starts.

CAUTION

Turbocharger damage can result if engine RPM is not kept low until oil pressure indicator on EMS panel has stopped flashing.

m. Release accelerator pedal after engine has started.

n. If engine oil pressure indicator does not stop flashing within 10 seconds after engine starts, stop engine by pulling backwards on accelerator pedal and perform troubleshooting.

o. After engine has started, proceed to *Machine Warmup*.

MACHINE WARMUP

1. Operate engine at low idle for 5 minutes to warm up engine. During warmup, monitor EMS panel indicators for any signs of abnormal temperatures or pressures. Shut down engine at the first sign of a problem.
2. Continue to warm up machine as follows:
   a. If temperature is greater than 32ºF (0ºC), warm up machine for a total of approximately 15 minutes.
   b. If temperature is less than 32ºF (0ºC), warm up machine for a total of approximately 30 minutes.
   c. If temperature is less than 0ºF (-18ºC) or if hydraulic functions are sluggish, additional time may be needed.
3. Cycle steering and machine controls to assist in hydraulic system warmup. Ensure that all are functioning properly.

OPERATE MACHINE

WARNING

- Be ALERT for personnel in the area while operating machine. Always check to ensure area is clear of personnel and obstructions before starting engine, moving machine, or moving implements. Failure to follow this warning may cause injury or death to personnel or damage to equipment.
- DO NOT allow riders on machine. Failure to follow this warning may cause injury or death to personnel.

NOTE

Refer to WP 0004 00 for a description of transmission controls.

1. **Transmission Ranges.**
   a. N (Neutral) is normal transmission position when machine is not in use. Use N to start engine, when idling engine, and for parking. Always lock transmission in Neutral by applying the parking brake when machine is left unattended, parked, or stopped.
   b. To select a specific reverse gear range, move transmission shift lever to the right (Reverse) and pull back to desired gear, normally second or third. Backup alarm will sound when in a reverse gear.
   c. To select a specific forward gear range, move transmission shift lever to the left (Forward) and pull back to desired gear, normally second or third.

WARNING

- Make sure all personnel are clear of machine and work area.
- Make sure your seat belt is fastened.
- DO NOT coast down hills. Keep transmission engaged.
- DO NOT push down on the transmission modulator pedal while going downhill. Failure to follow these warnings may result in injury to personnel or damage to equipment.

   d. Downshift one position at a time when reducing engine and ground speeds. Downshift when going downhill (to the same gear used to climb the grade) or when operating on side slopes where high speed may compromise safety.

2. **Moving the Grader.**
   a. Move governor control lever to low idle position.
   b. Raise all implements.
   c. Apply transmission modulator pedal.
   d. Apply service brake pedal and hold.
   e. Release parking/emergency brake.
   f. Move transmission control lever to appropriate position.
   g. Release service brake pedal.
   h. Release the transmission modulator pedal and the machine will start to move.
   i. Set the governor control lever to obtain the desired speed.
   j. Operate under a light load for the first 5 minutes.
   k. Push accelerator pedal down and machine will move faster than speed set by governor control lever. Release accelerator pedal and machine will resume governed speed.
   l. Push decelerator pedal down and machine will slow down below speed set by governor control lever. Release decelerator pedal and machine will resume governed speed.
   m. Upshift one position at a time as engine and ground speeds increase.
   n. Downshift one position at a time while at the same time reducing machine speed with service brake applications.

OPERATE MACHINE - CONTINUED

3. **Stopping the Grader.**
   a. Move the governor control lever forward to reduce engine speed.
   b. Apply the service brake pedal and transmission modulator pedal to stop the machine.
   c. Move the transmission control lever to neutral.
   d. Apply the parking/emergency brake.
4. **Parking the Grader.**

WARNING

- NEVER leave operator compartment without applying parking brake.
- DO NOT use parking/emergency brake to stop a moving machine under usual conditions.
- Only if service brakes fail, apply parking/emergency brake. Failure to follow these warnings may result in injury to personnel or damage to equipment.

CAUTION

Prolonged idling may cause wet stacking or sludge buildup in the engine.

1. Apply parking/emergency brake to secure machine against movement when parked.
2. Lower the blade and scarifier to the ground. Apply slight downward pressure.

OPERATE DIFFERENTIAL LOCK

CAUTION

- Excessive wheel spin and uncontrolled wheel spin can cause accelerated wear of power train components and tires.
- Improper use of differential lock may damage components of differential lock and power train.

NOTE

The differential lock switch should be in the locked position most of the time. The differential lock switch should only be in the unlocked position when making sharp turns or large articulation changes, especially on hard, dry surfaces and when roading the machine at higher speeds on hard surfaces.

1. Turn differential lock switch to ON position.
2. Keep differential lock switch in the ON position while making small steering or articulation adjustments. This will prevent wheel slippage when traction is poor. Power will be equally distributed to each wheel and all wheels will turn at the same speed.
3. Anticipate using differential lock before wheel slippage occurs. DO NOT engage differential lock while one wheel is slipping. Decrease engine RPM until wheel stops spinning, and then engage differential lock.

OPERATE STEERING

1. Operator controls machine direction using steering wheel.
2. Avoid oversteering. Become familiar with steering characteristics of machine before attempting maneuvers in limited space.

OPERATE STEERING - CONTINUED

3. In the event of steering system failure, perform the following:
   a. Stop machine in a safe location.
   b. Apply parking/emergency brake.
   c. Shut down engine and troubleshoot malfunction.
   d. DO NOT operate machine until problem has been corrected.
4. For wheel lean and articulation descriptions, see *Traveling and Earth Moving Operations* in WP 0006 00.

ENGINE SHUTDOWN

CAUTION

- Stopping engine immediately after it has been operating under a load can result in overheating and accelerated wear of engine components.
- The following shutdown procedures allow engine to cool. This will prevent excessive temperatures in turbocharger center housing. Failure to shut down engine properly may cause premature engine failure.

1. Run engine at low idle for 5 minutes.
2. Turn off machine lights and accessories.
3. Pull accelerator pedal toward operator seat to shut down engine. Do not try to shut down engine with battery disconnect switch.

AFTER OPERATION

1. Perform *After* operation PMCS (WP 0013 00).
2. Turn battery disconnect switch to left (OFF) position.
3. Remove key from battery disconnect switch.
4. Close and lock doors and windows (if equipped).

END OF WORK PACKAGE

SCOPE

NOTE

- The information in this work package is provided as a supplement to the basic operating procedures described in WP 0005 00. A thorough reading and understanding of both this work package and WP 0005 00 is essential to safe and efficient machine operation.
- If machine is equipped with laser level system, refer to TM 5-6675-348-12&P.

This work package is designed to provide general information as well as advanced operating instructions to maximize machine efficiency and potential.

MACHINE SERVICES

1. To ensure safe and efficient operation, the operator is responsible for performing Preventive Maintenance Checks and Services (PMCS) at the job site. This will ensure the machine is ready to perform its mission and will reduce downtime due to machine failures.
2. To facilitate performance of PMCS, ensure machine is clean. Wash machine to remove dust and dirt that could interfere with inspections and preventive maintenance.
3. After operation, determine requirements of next mission, so that machine adjustments can be made in advance, if required.

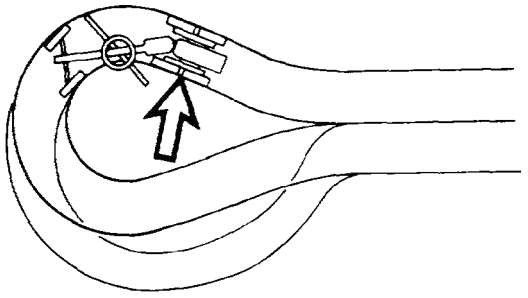
TRAVELING AND EARTH MOVING OPERATIONS

Turning Around Using Articulation

CAUTION

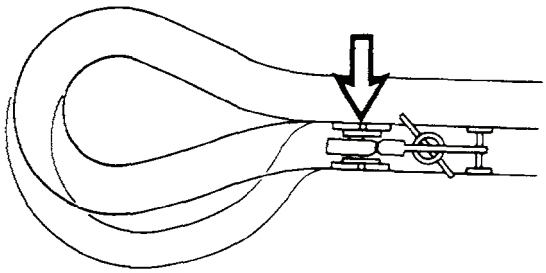
To prevent possible damage to the drive train, make sure the differential is unlocked before turning or maneuvering the machine through tight corners.

1. Turn left and articulate the frame left.



397-946

2. Turn right and articulate the frame right.



397-947

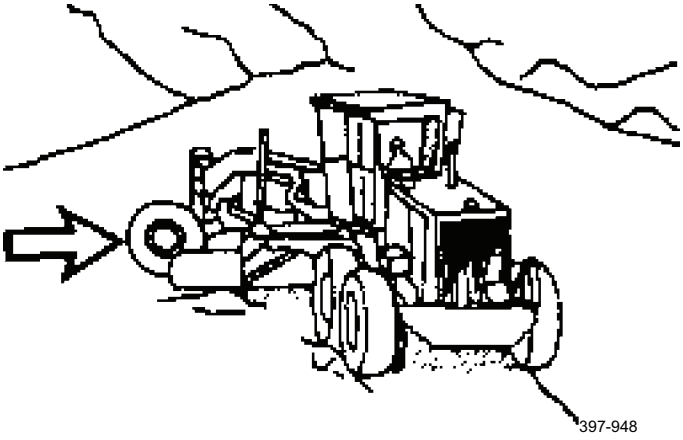
TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Turning Around in Tight Areas

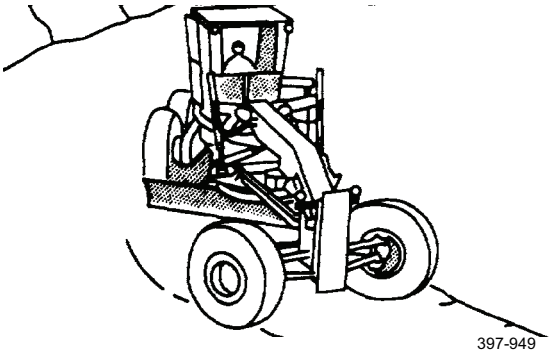
CAUTION

Watch clearance between blade and front tires while articulating machine.

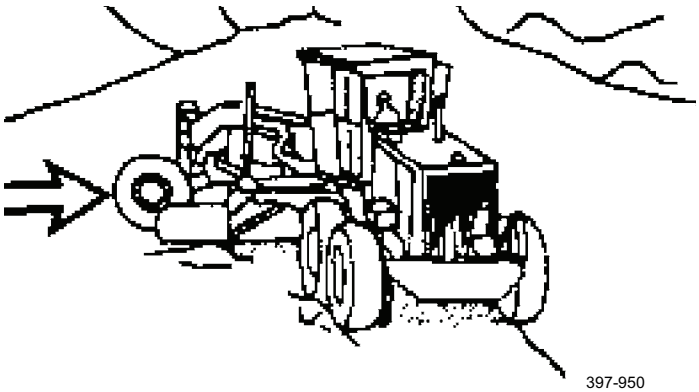
1. Lean the wheels slightly in the direction of the turn (right for right turn, left for left turn), then turn the wheels.



2. Travel as far forward as possible.



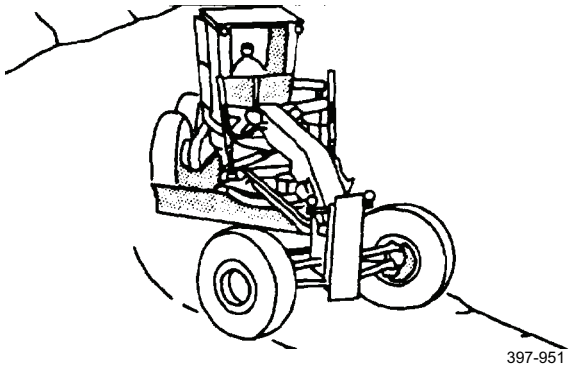
3. Turn the front wheels in the opposite direction. Back the machine as far as possible to line it up with the new direction of travel.



TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Turning Around in Tight Areas - Continued

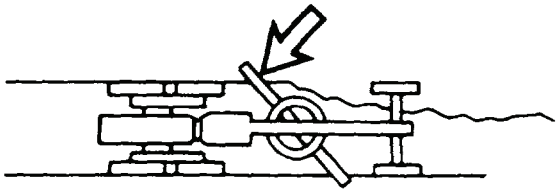
4. Turn the wheels to the new travel direction. Straighten the wheels after the turn is completed.



397-951

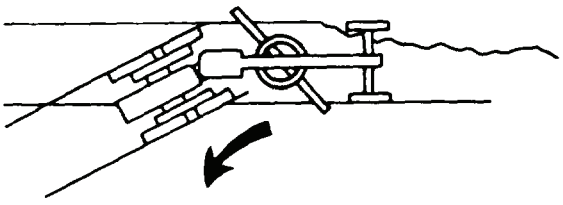
Backing Out of a Drop-off or Ditch

1. Stop the machine. Raise the blade and implements.



397-952

2. Articulate right while moving back slowly.

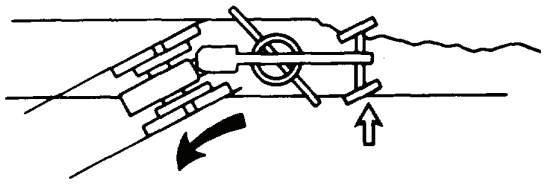


397-953

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

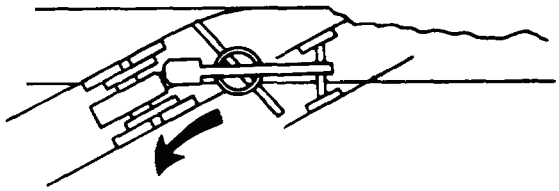
Backing Out of a Drop-off or Ditch - Continued

3. Turn left while moving back slowly.



397-954

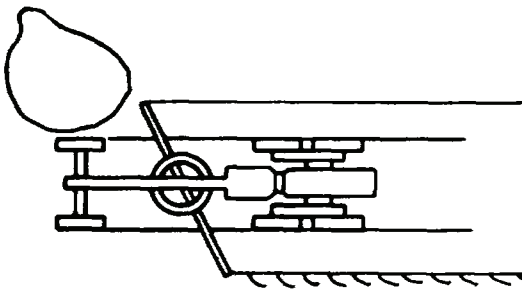
4. Continue to back out until the machine is completely out of the drop-off or ditch.



397-955

Grading Around an Object

1. Press the transmission modulator pedal to move the machine slowly (inch) around an object.



397-956

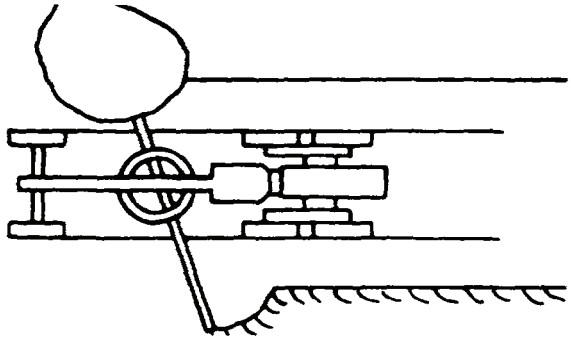
TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Grading Around an Object - Continued

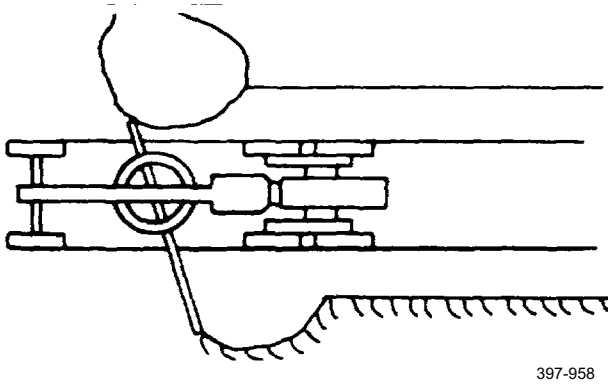
NOTE

Grade as close to the object as possible to minimize hand cleanup.

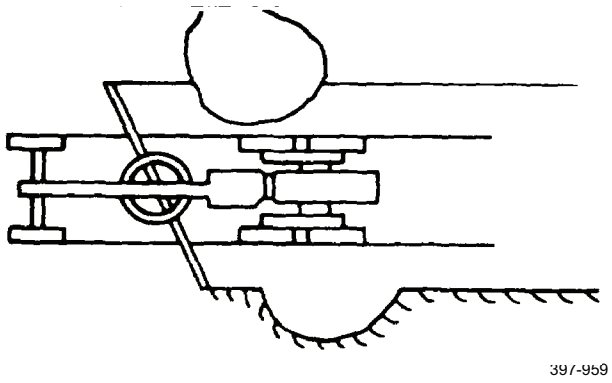
2. Grade close to object.



3. While traveling in a straight line, sideshift blade to grade around object.



4. When passing object, begin to move blade back to the center position.
5. Once past object, blade should be back in original position.



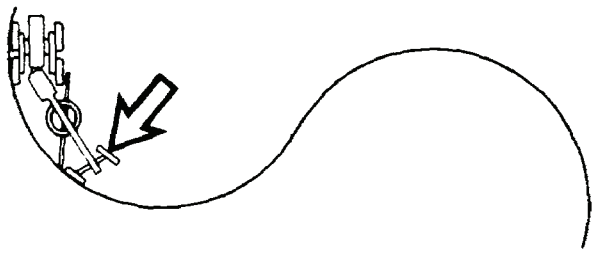
TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Grading on an "S" Curve

CAUTION

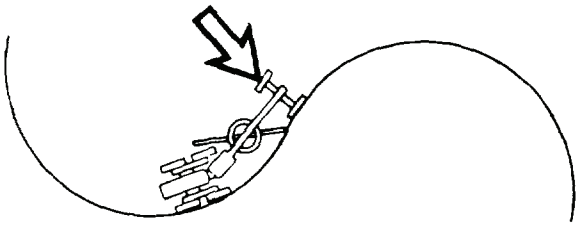
Do not allow the blade to contact the tires when articulating the machine. Failure to follow this caution may result in damage to the machine.

1. Articulate left, turn left and sideshift right.



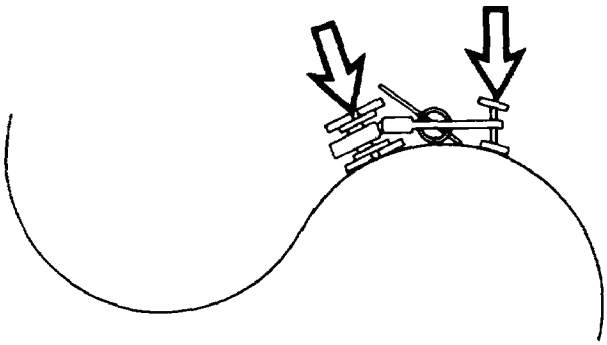
397-960

2. Turn straight and move sideshift as necessary.



397-961

3. Articulate right, turn right and sideshift left.

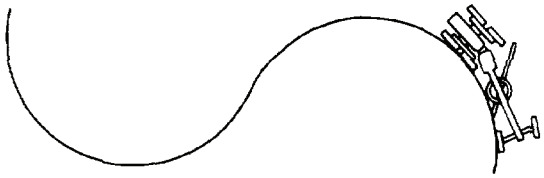


397-962

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Grading on an "S" Curve - Continued

4. Continue to grade.



397-963

Right-Hand Leveling

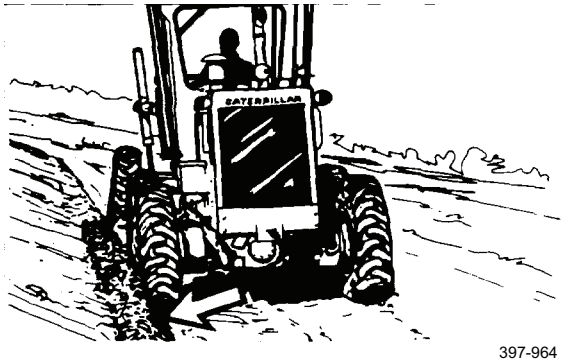
NOTE

During right-hand leveling, left lift cylinder will be vertical and right lift cylinder will be slightly angled.

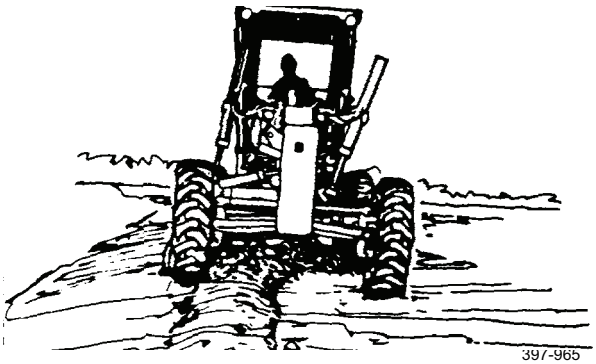
1. Use the centershift cylinder to position the circle approximately 8 in. (200 mm) to the left. Move the centershift lock pin lever to the INDEX and RUN position.

2. Set the blade to cast material outside of the left rear wheels.

3. Set the blade horizontal at the desired depth of the cut.



397-964

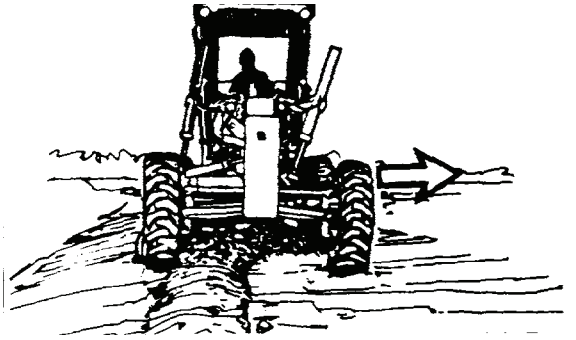


397-965

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

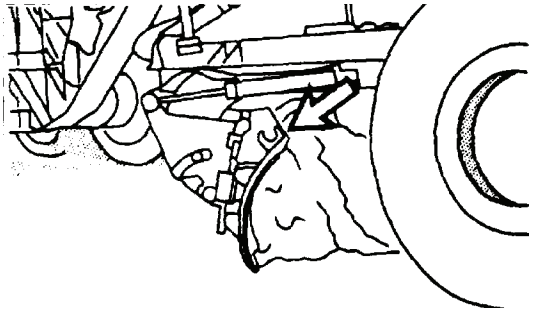
Right-Hand Leveling - Continued

4. Lean the wheels to the left to overcome the side draft.



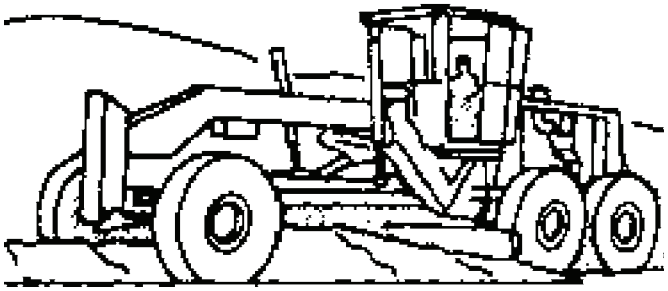
397-966

5. Tip the blade to the best position for the material being worked. Start with the top of the blade slightly ahead of the cutting edge.



397-967

6. Under good conditions, work the material from side to side.



397-968

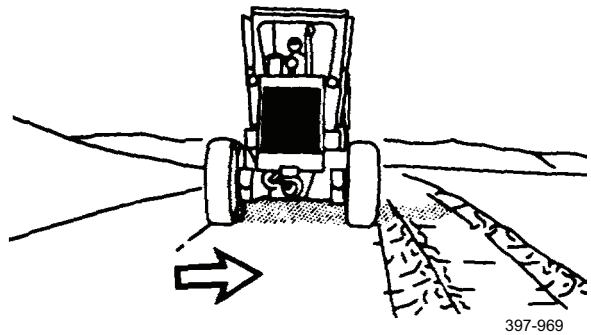
TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Right-Hand Leveling - Continued

NOTE

- Normally, the machine is used with the frame straight for flat blading. Articulate it to counteract side draft from heavy blade loads. Turn the front of the tandems toward the heel of the blade.
- If the wheels start to spin, turn the front of the tandems away from the heel of the blade. This will reduce the width of the cut and reduce the load on the machine.
- In normal leveling work, deliver the material to the outside of the rear wheels. This will maintain a smooth surface for the rear wheels.

7. Spread the loose material over the surface until it is smooth.

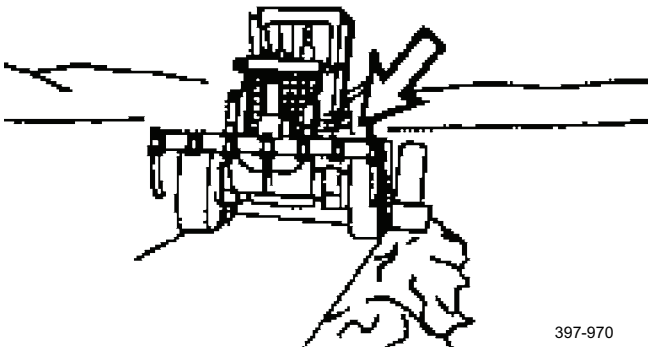

397-969

Left-Hand Leveling

NOTE

During left-hand leveling, right lift cylinder will be vertical and left lift cylinder will be slightly angled.

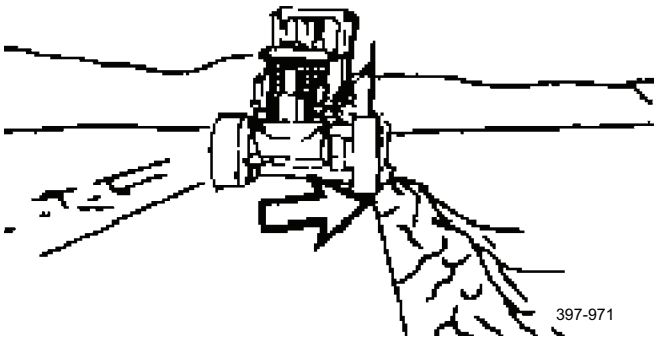
1. Use the centershift cylinder to position the circle approximately 8 in. (200 mm) to the right. Move the centershift lock pin lever to the INDEX and RUN position.


397-970

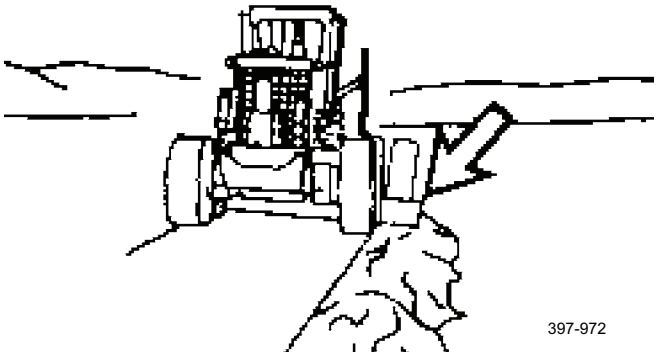
TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Left-Hand Leveling - Continued

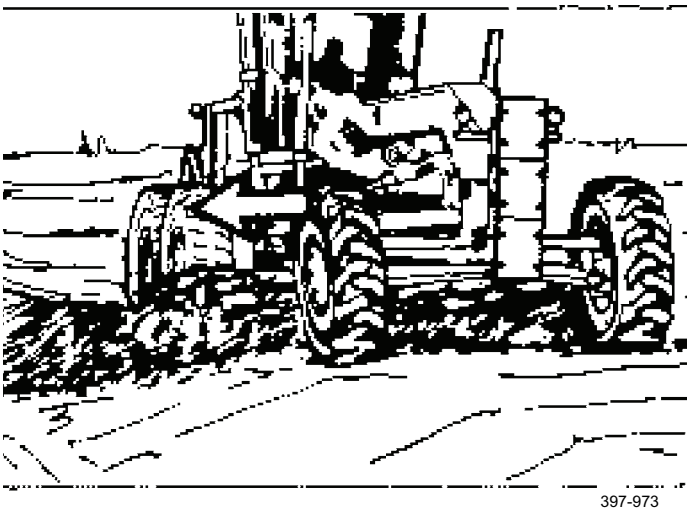
2. Set the blade to cast material outside of the right rear wheels.



3. Set the blade horizontal at the desired depth of the cut.



4. Lean the wheels to the right to overcome the side draft.



TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Left-Hand Leveling - Continued

5. Tip the blade to the best position for the material being worked. Start with the top of the blade slightly ahead of the cutting edge.
6. Under good conditions, work the material from side-to-side.

NOTE

- Normally, the machine is used with the frame straight for flat blading. Articulate it to counteract side draft from heavy blade loads. Turn the front of the tandems toward the heel of the blade.
- If the wheels start to spin, turn the front of the tandems away from the heel of the blade. This will reduce the width of the cut and reduce the load on the machine.
- In normal leveling work, deliver the material to the outside of the rear wheels. This will maintain a smooth surface for the rear wheels.

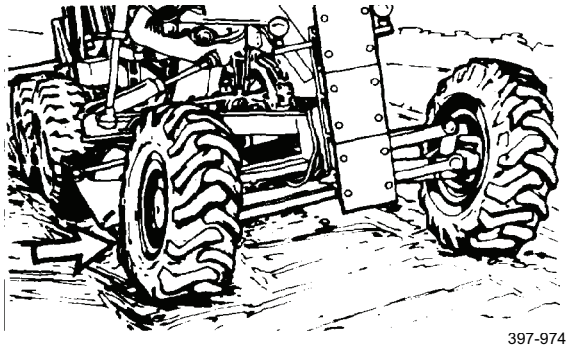
7. Spread the loose material over the surface until it is smooth.

Right-Hand "V" Ditching

CAUTION

- Make sure the blade is lowered to the ground before retracting the centershift lock pin. Failure to follow this caution may result in damage to machine.
- Make sure frame is in straight alignment. If the machine is articulated, the tire sidewalls may be forced against the back slope, causing tire sidewall damage and also forcing dirt between the tire and rim, causing air loss and flat tires.

1. Set the centershift lock pin in the center position. Move the centershift lock pin lever to the INDEX and RUN position.
2. Set the blade with the right end in line with the outer edge of the right front tire. Tilt the blade so the top of the blade is slightly ahead of the cutting edge.

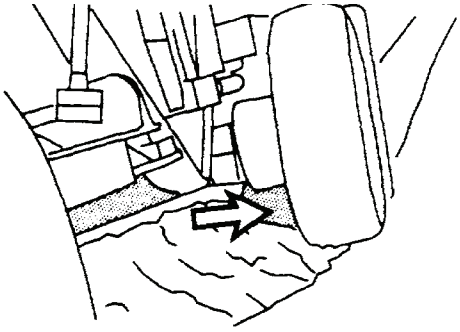


397-974

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Right-Hand “V” Ditching - Continued

3. Raise the left lift cylinder to the high position. Angle the blade to deliver the material inside the left rear wheels.

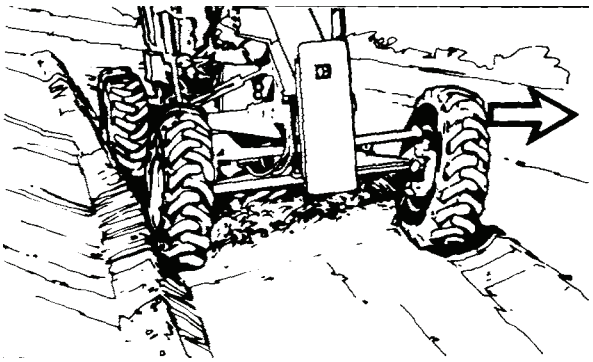


397-975

4. Lower the right lift cylinder to set the blade tip for desired depth of cut.

397-976

5. Lean the wheels to the left. Make a shallow (2 to 4 in. [50 to 102 mm]) marking pass.

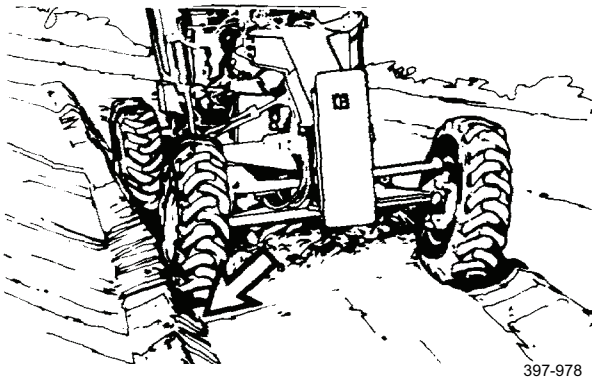


397-977

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Right-Hand "V" Ditching - Continued

6. Keep the right front tire in the bottom of the ditch. Continue ditching to the desired depth.

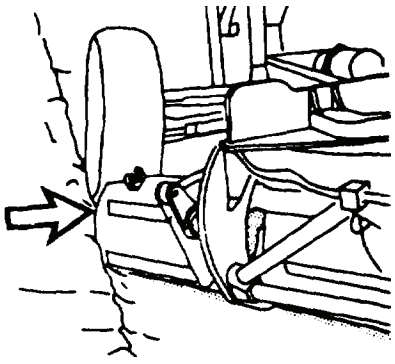

397-978

Left-Hand "V" Ditching

CAUTION

- Make sure the blade is lowered to the ground before retracting the centershift lock pin. Failure to follow this caution may result in damage to machine.
- Make sure frame is in straight alignment. If the machine is articulated, the tire sidewalls may be forced against the back slope, causing tire sidewall damage and also forcing dirt between the tire and rim, causing air loss and flat tires.

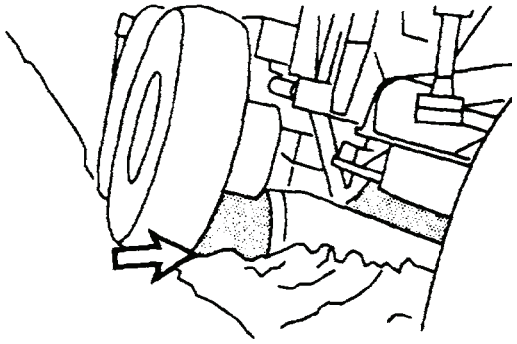
1. Set the centershift lock pin in the center position. Move the centershift lock pin lever to the INDEX and RUN position.
2. Set the blade with the left end in line with the outer edge of the left front tire. Tilt the blade so the top of the blade is slightly ahead of the cutting edge.


397-979

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

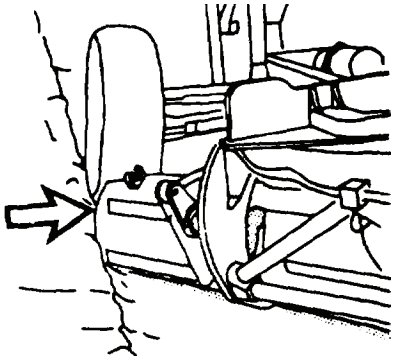
Left-Hand "V" Ditching - Continued

3. Raise the right lift cylinder to high position Angle the blade to deliver the material inside the right rear wheels.



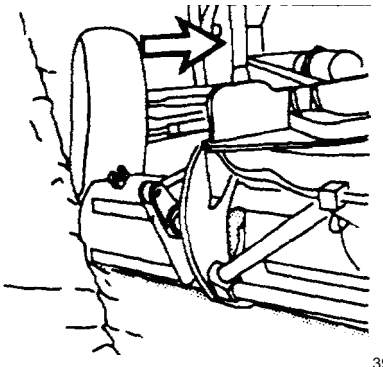
397-980

4. Lower the left lift cylinder to set the blade tip for the desired depth of cut.



397-979

5. Lean the wheels to the right. Make a shallow (2 to 4 in. [50 to 102 mm]), marking pass.

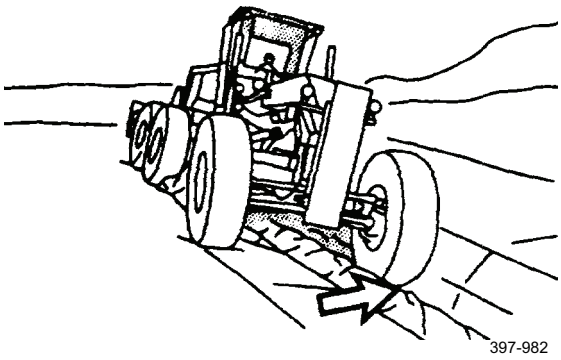


397-981

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Left-Hand "V" Ditching - Continued

6. Keep the left front tire in the bottom of the ditch. Continue ditching to the desired depth.

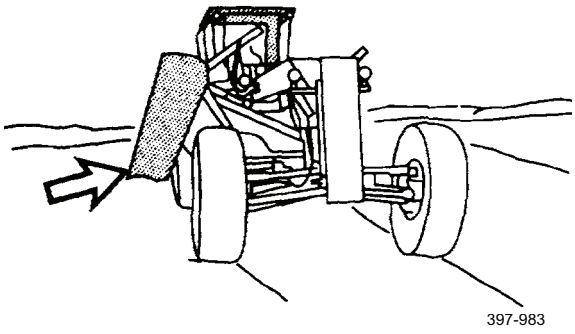


Ditch Back Sloping

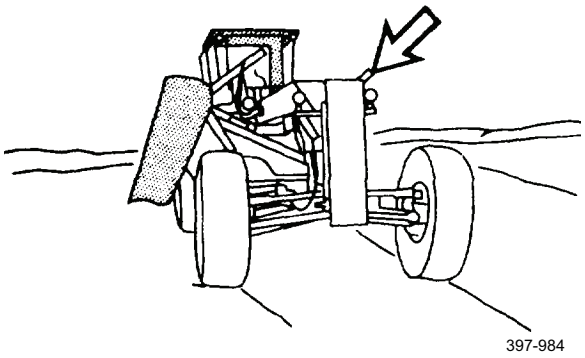
CAUTION

Make sure the blade is lowered to the ground before retracting the centershift lock pin. Failure to follow this caution may result in damage to machine.

1. Tilt the blade forward.
2. Shift the centershift pin to the top position by using both blade lift controls. Move the centershift lock pin lever to INDEX and RUN position.
3. Extend the centershift cylinder as needed.
4. Rotate the circle to the left.



5. Lower the left lift cylinder while the circle is turning.



TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

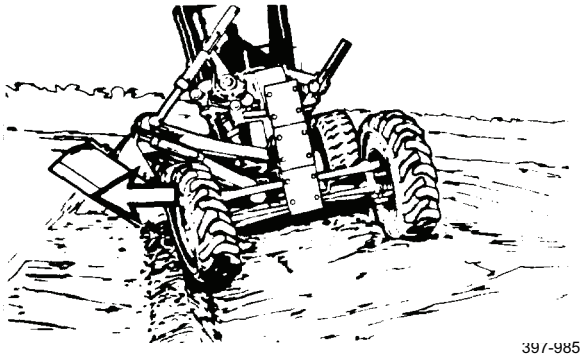
Ditch Back Sloping - Continued

6. Set the heel of the blade in front of the right rear tire.
7. Lower the right lift cylinder to set the degree of slope.

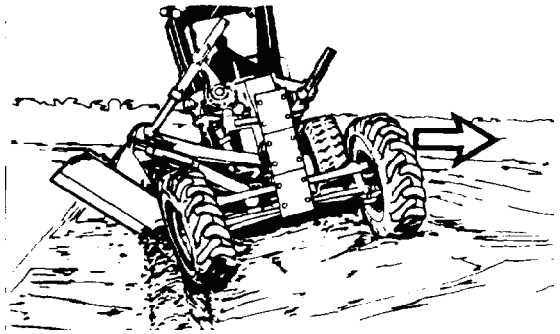
NOTE

The wheels should normally be near the vertical position.

8. Lean the wheels toward the slope for a heavier cut.


397-985

9. Lean the wheels away from the slope for lighter cut.

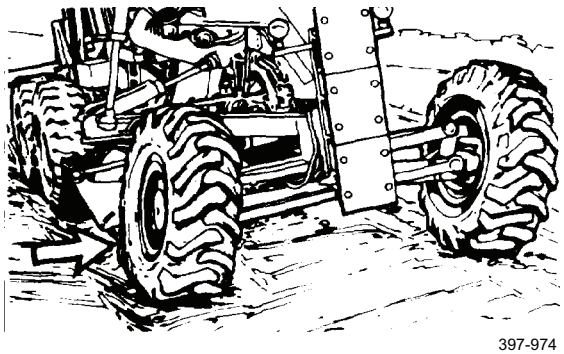

397-986

Right-Hand Ditch Cleanup

CAUTION

Make sure the blade is lowered to the ground before retracting the centershift lock pin. Failure to follow this caution may result in damage to machine.

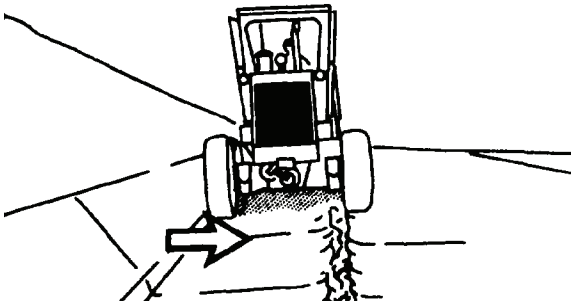
1. Set the centershift lock pin in the right-center position. Move the centershift lock pin lever to the INDEX and RUN position.
2. Set the right end of the blade behind the right front tire.
3. Lower the right lift cylinder to set the blade to the depth of the ditch.


397-974

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Right-Hand Ditch Cleanup - Continued

4. Set the left lift cylinder to deliver the material onto the slope between the tandems, without cutting.



397-987

5. Lean the front wheels slightly to the left.

397-988

6. Another pass is required to move the material up the slope and onto the shoulder. Spread the material and finish the final grade.

397-989

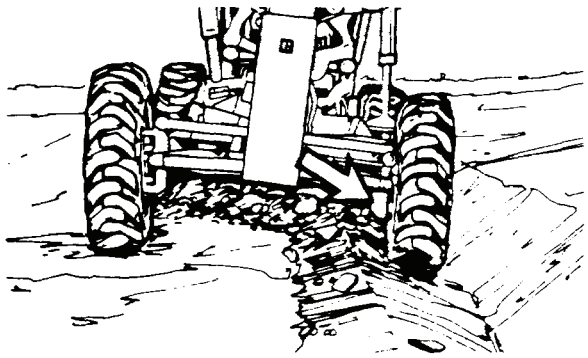
TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Left-Hand Ditch Cleanup

CAUTION

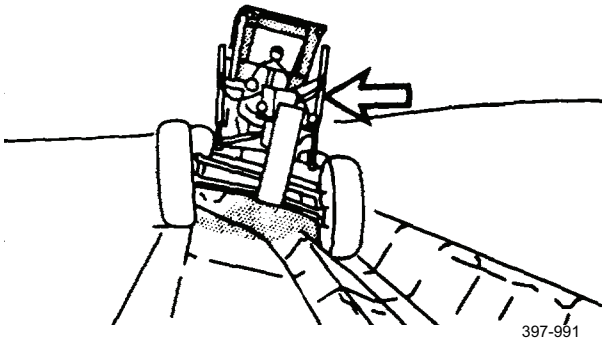
Make sure the blade is lowered to the ground before retracting the centershift lock pin. Failure to follow this caution may result in damage to machine.

1. Set the centershift lock pin in the left-center position. Move the centershift lock pin lever to the INDEX and RUN position.
2. Set the left end of the blade behind the left front tire.



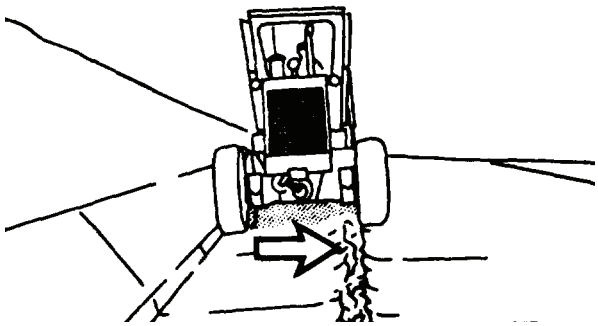
397-990

3. Lower the left lift cylinder to set the blade to the depth of the ditch.



397-991

4. Set the right lift cylinder to deliver the material onto the slope between the tandems, without cutting.

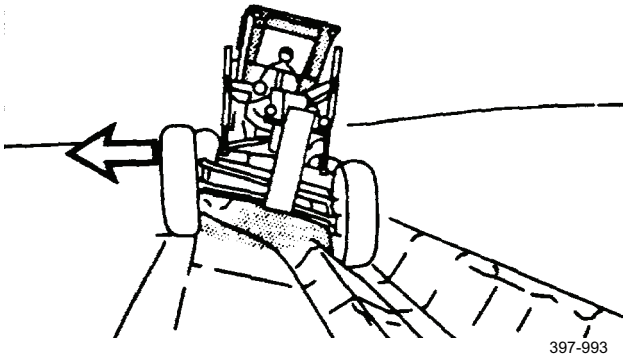


397-992

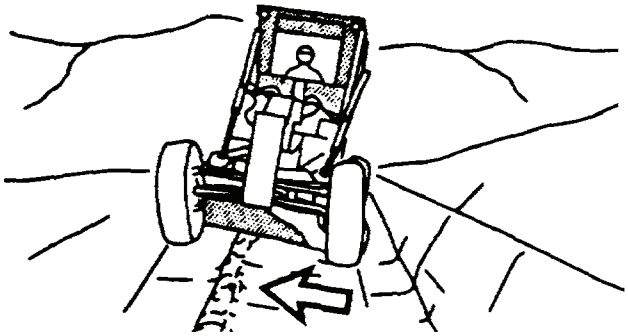
TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Left-Hand Ditch Cleanup - Continued

5. Lean the front wheels slightly to the right.


397-993

6. Another pass is required to move the material up the slope and onto the shoulder. Spread the material and finish the final grade.

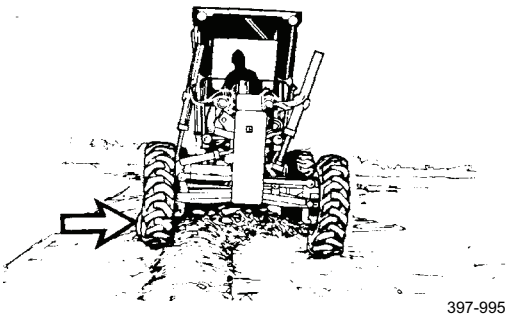

397-994

Right-Hand Shoulder Cleanup

CAUTION

Make sure the blade is lowered to the ground before retracting the centershift lock pin. Failure to follow this caution may result in damage to machine.

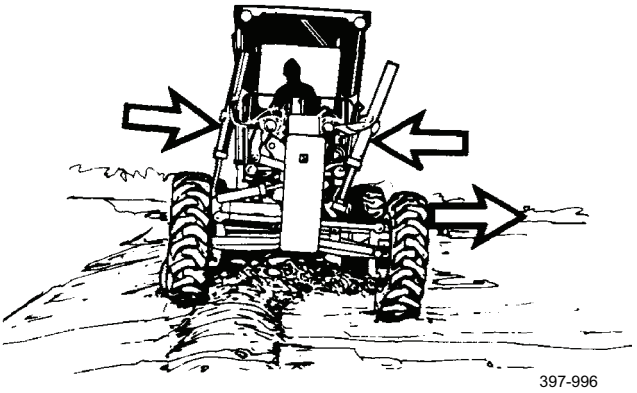
1. Set the centershift lock pin in the center position. Move the centershift lock pin lever to the INDEX and RUN position.
2. Set the blade so the right end is in line with the outer edge of the right tire. The material must be delivered between the wheels.


397-995

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Right-Hand Shoulder Cleanup - Continued

3. Lower the lift cylinders so the blade is horizontal and at the desired depth of the cut.
4. Lean the front wheels slightly to the left.


397-996

Left-Hand Shoulder Cleanup

CAUTION

Make sure the blade is lowered to the ground before retracting the centershift lock pin. Failure to follow this caution may result in damage to machine.

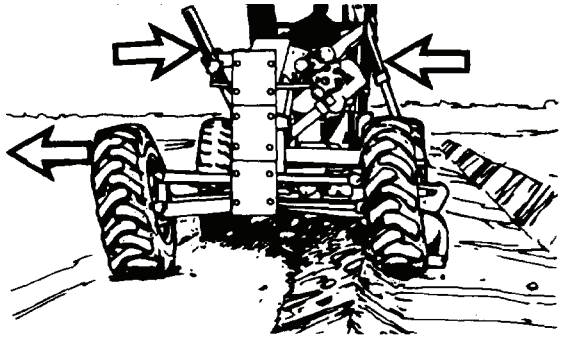
1. Set the centershift lock pin in the center position. Move the centershift lock pin lever to the INDEX and RUN position.
2. Set the blade so the left end is in line with the outside edge of the left front tire. The material must be delivered between the wheels.


397-997

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Left-Hand Shoulder Cleanup - Continued

3. Lower the lift cylinders until the blade is horizontal and at the desired depth of the cut.
4. Lean the front wheels slightly to the right.



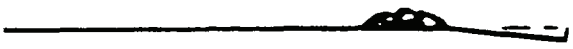
397-998

Road Building - "V" Ditch Method

NOTE

The steps in this procedure are for one side of the road. Repeat these steps for the opposite side.

1. Begin with a light cut followed by a heavy cut.



397-999

397-1000

2. Perform another heavy cut and then clean the shoulder.

397-1001

397-1002

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Road Building - “V” Ditch Method

3. Level to center and perform another heavy cut.

397-1003

397-1004

4. Clean shoulder and spread to center.

397-1005

397-1006

5. Slope and bank back side of ditch then clean the bottom.

397-1007

397-1008

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Road Building - "V" Ditch Method - Continued

6. Ditching pass to clean and shape inside slope.

397-1009

7. Finishing shoulder pass.

397-1010

8. Level and finish.

397-1011

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

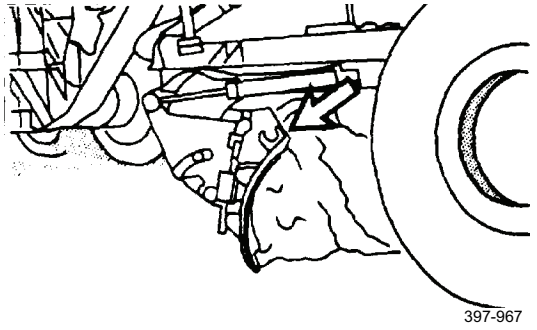
Flat Bottom Ditching

1. If no “V” ditch exists, build a “V” ditch to the desired depth of the flat bottom ditch.

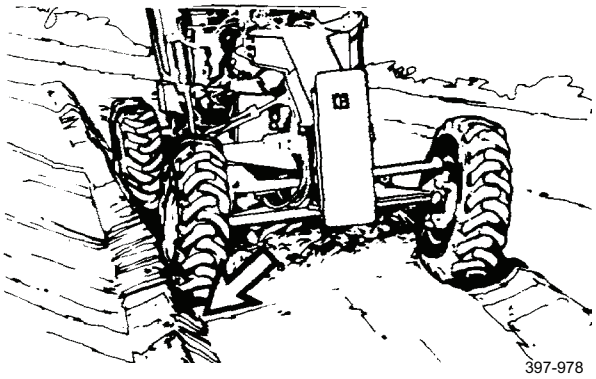
NOTE

The shoulder slope should be flatter than normal, ending at the finished shoulder line.

2. Tip the blade forward.


397-967

3. Move the centershift lock pin to the right-center position. Move the centershift lock pin lever to the INDEX and RUN position.
4. Have the right front tire in the bottom of the “V” ditch.


397-978

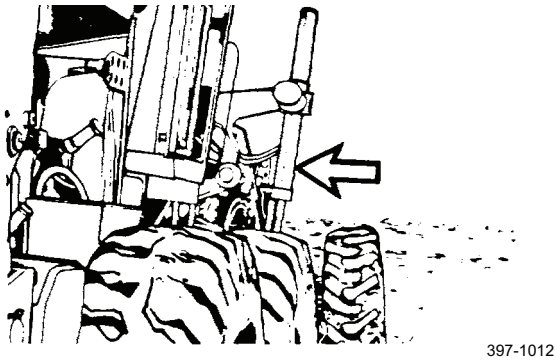
5. Set the blade so the toe is inside the right front tire at the desired width of the flat bottom ditch.


397-976

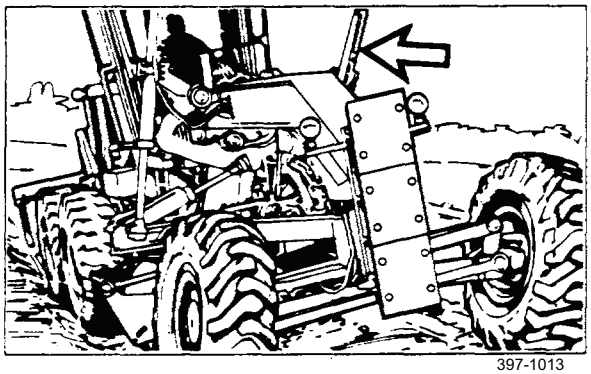
TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Flat Bottom Ditching - Continued

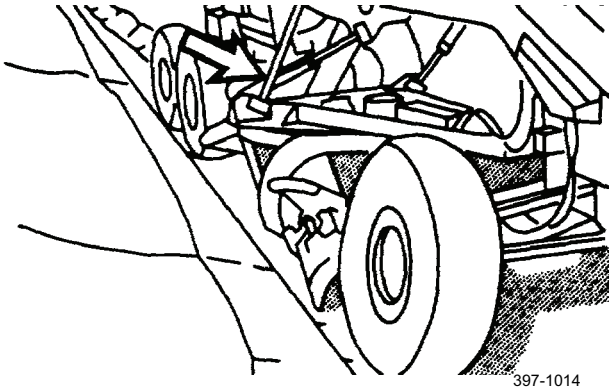
6. Lower the right lift cylinder to set the depth of the cut.



7. Raise the left lift cylinder to set the desired shoulder slope.
8. Lean the front wheels to the left. Cut the second "V" ditch to the same depth or slightly above the first one.



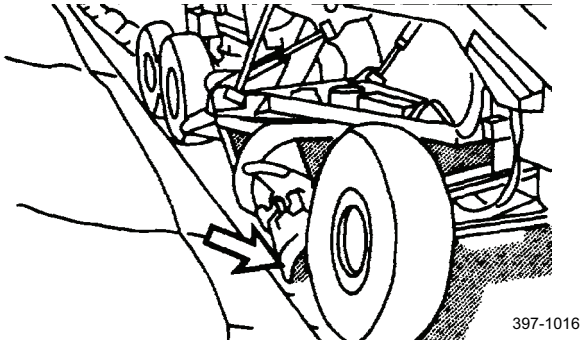
9. Cut a flat bottom. Set the right lift cylinder to the required depth.



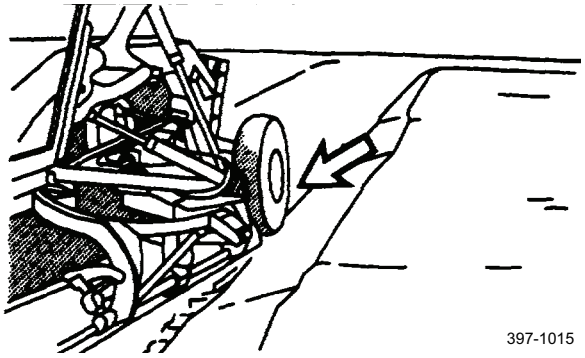
TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Flat Bottom Ditching - Continued

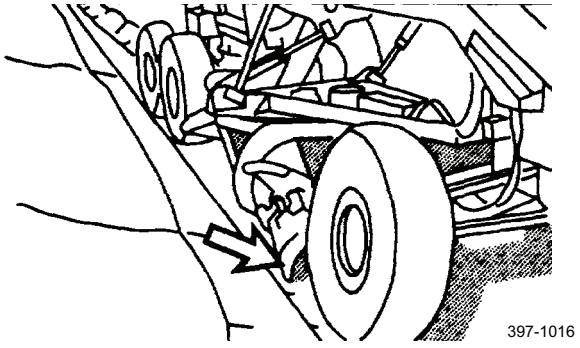
10. Set the left lift cylinder as required.



11. Move the centershift lock pin to the far-right position. Move the centershift lock pin lever to the INDEX and RUN position.
12. Start the right front tire in the bottom of the first “V” ditch.
13. Set the right end of the blade at the bottom of the backslope.



14. Lower the right lift cylinder so the point of the blade is on the established grade of ditch.



15. Lower the left lift cylinder to the desired depth of cut. Lean the front wheels to the left.
16. Set the blade at a sharp angle and move the material up the slope of the ditch.
17. Spread the windrow and finish the final grade.

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Road Building - Flat Bottom Ditch Method

NOTE

Steps in this procedure are for one side. Repeat these steps on the opposite side.

1. Flatten the inside slope.

397-1017

2. Left hand trench cut to bottom width and depth.

397-1018

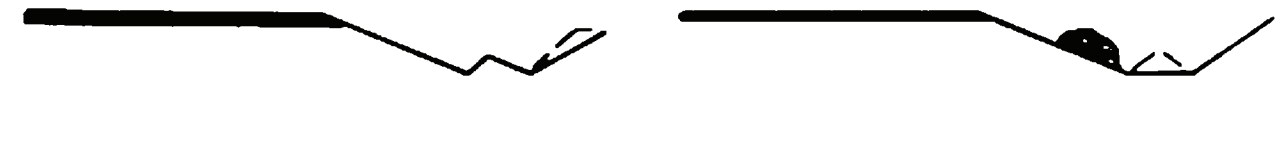
3. Clean the shoulder and spread to center.

397-1019

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

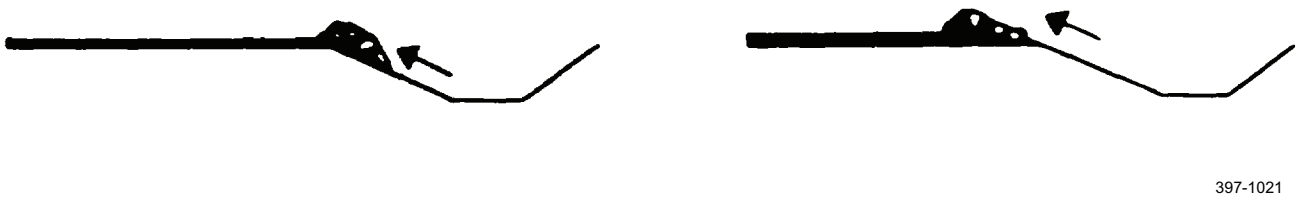
Road Building - Flat Bottom Ditch Method - Continued

4. Finish the bank slope and flatten bottom ditch out.



397-1020

5. Clean the ditch and clean the inside slope.



397-1021

6. Finish shoulder pass then level and finish.

397-1022

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

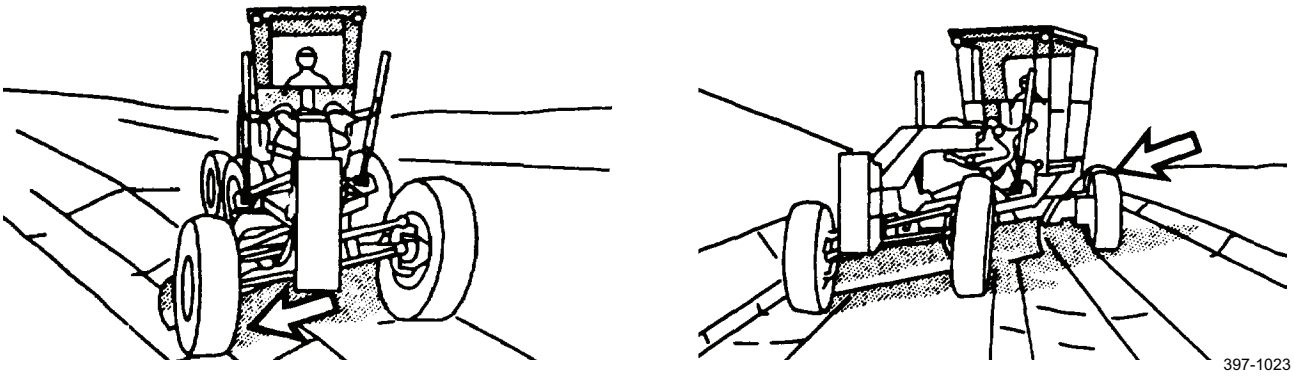
Grading in a Wet Ditch

1. Articulate the machine so the front wheels and the blade are in the ditch. Steer with the front wheels.

NOTE

This method may be used to avoid obstructions whenever cleaning old ditches, which may have tree overhangs, rock ledges, etc.

2. Keep the rear wheels on the shoulder to prevent wheel slippage in wet or soft material in the ditch.



Grading on a 3-to-1 Slope

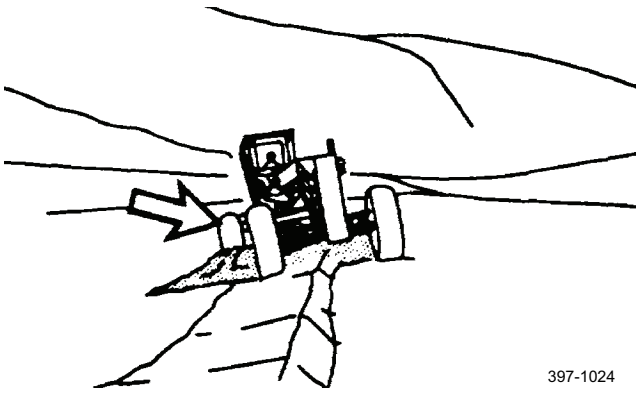
WARNING

- Only an experienced operator should operate the machine on a steep side slope.
- Never fully articulate the machine uphill on steep slopes. Failure to follow these warnings may cause injury or damage to machine.

NOTE

- When working on steep slopes, operate the machine in first gear, at a reduced engine speed.
- When working on slopes, use the accelerator to control the speed of the machine.
- When operating on extreme slopes, use crab steering to keep the back of the grader on the downhill side of cut.

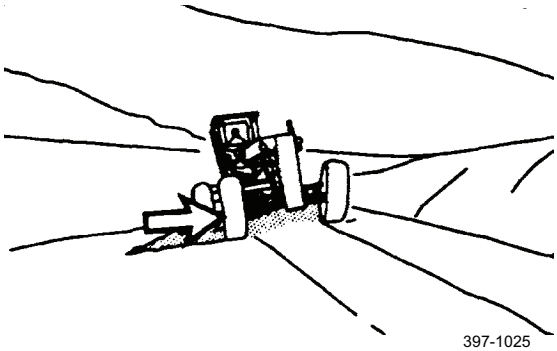
1. Articulate the frame to place the frame in an offset position for maximum stability.



TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Grading on a 3-to-1 Slope - Continued

2. Use crab steering when the front of the machine tends to slip due to heavy side load on the blade.

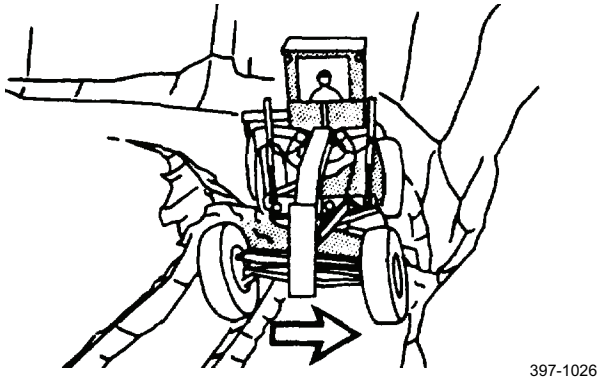


High Bank Cuts - Right Side

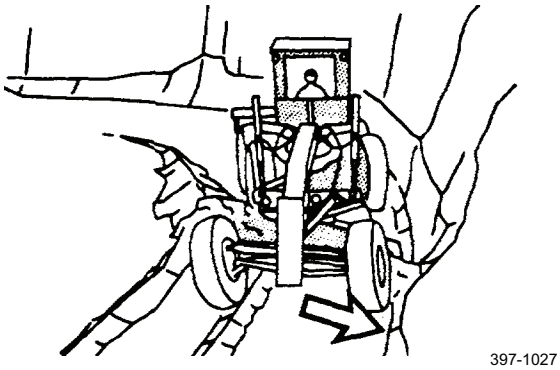
CAUTION

Make sure the blade is lowered to the ground before retracting the centershift lock pin. Failure to follow this caution may result in damage to machine.

1. The roadbed at the base of the cut must be uniform.



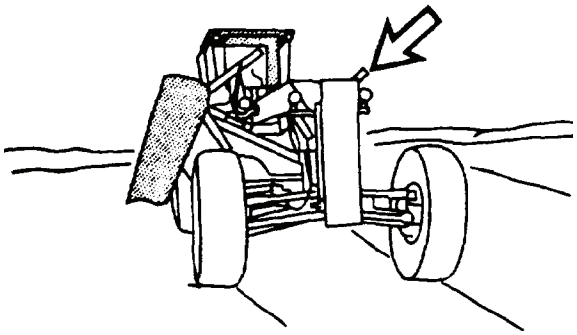
2. If the material is hard, slope the roadbed slightly in to the bank to keep the machine from sliding away from the bank.
3. Tip the blade 3/4 to full position forward.



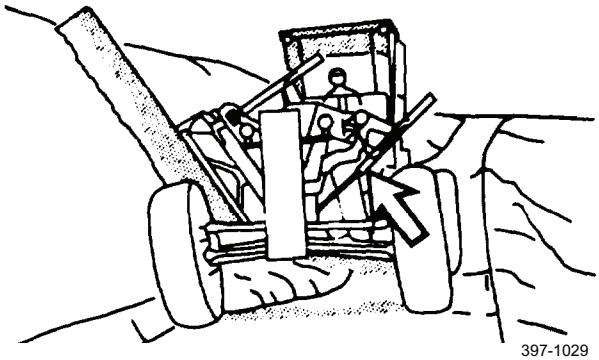
TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

High Bank Cuts - Right Side - Continued

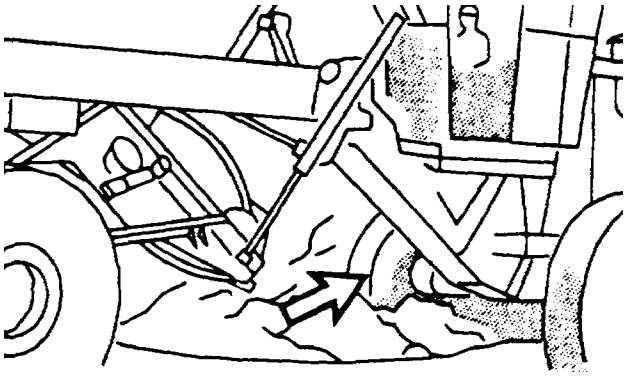
4. Move the centershift lock pin to the far left position. Move the centershift lock pin lever to the INDEX and RUN position.
5. Sideshift the blade to the right.
6. Rotate the circle counterclockwise. Lower the left lift cylinder while the circle is turning.


397-1028

7. Lower the left lift cylinder to set heel of the blade at the bottom of the slope and in line with the outer edge of the rear tire.


397-1029

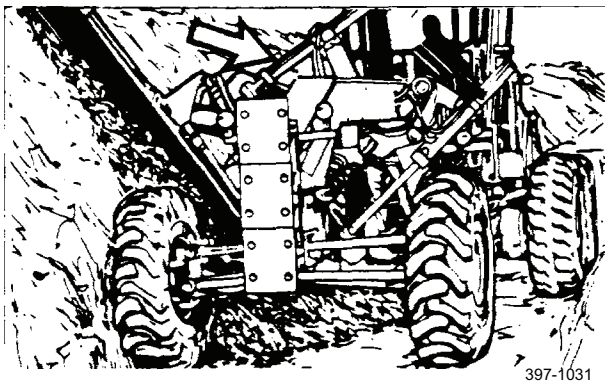
8. The right rear tires should be in the “V” at the base of the slope.


397-1030

TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

High Bank Cuts - Right Side - Continued

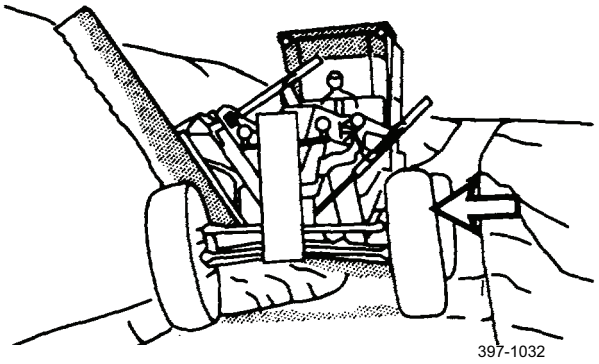
9. Lower the right lift cylinder to set the desired degree of bank slope.
10. Move into the cut gradually.



NOTE

The wheels normally should be near the vertical position.

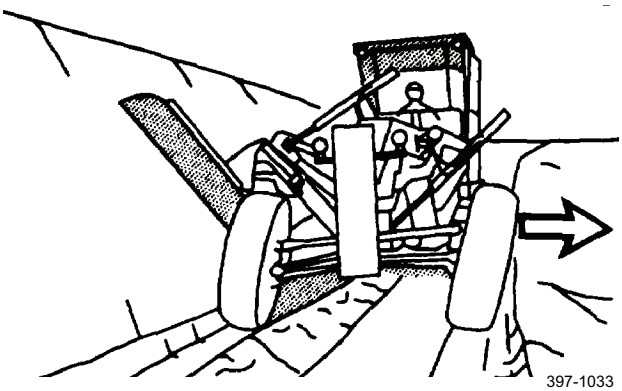
11. Lean the wheels toward the slope for a heavier cut.



NOTE

The procedure shown is for the right side. Position the blade opposite to that shown for the left side. Keep the material from the slope moved to the outside of the rear wheels.

12. Lean the wheels away from the slope for a lighter cut.



TRAVELING AND EARTH MOVING OPERATIONS - CONTINUED

Extreme Side Reach

CAUTION

Make sure the blade is lowered to the ground before retracting the centershift lock pin. Failure to follow this caution may result in damage to machine.

NOTE

The following steps are for extreme side reach to the right. For extreme left side reach, position the centershift lock pin and blade to the far left.

1. Move the centershift lock pin to the far right position. Move the centershift lever lock pin lever to the INDEX and RUN position.
2. Sideshift the blade to the far right position.
3. Lower the blade to the desired depth and set it at an angle to deliver the material to the side.

Front Mounted Scarifier Operation

CAUTION

- When using the scarifier, the frame must be straight.
- When carrying the scarifier in the fully raised position, do not allow the scarifier beam to contact the drawbar.
- Raise the scarifier when turning. Failure to follow these cautions may cause damage to machine.

1. Enter the material gradually, while traveling in a straight line.
2. Use all the shanks in light material, fewer shanks in heavier material.
3. Keep the scarifier as deep as conditions permit. Match travel speed to the load.
4. Break up paving by digging under the surface and lifting the scarifier.
5. All the teeth can remain in the front scarifier when level grading with the blade.

CAUTION

Do not reverse the scarifier teeth. They may impact frame.

6. Remove all the front scarifier teeth and set the link rods at the shortest distance when reverse blading or ditching.
7. Clean the scarifier when dirt begins to accumulate.

END OF WORK PACKAGE

OPERATION UNDER UNUSUAL CONDITIONS 0007 00

GENERAL

WARNING

This machine has been designed to operate safely and efficiently within the limits specified in this TM. Operation beyond these limits is prohibited in accordance with AR 70-1 without written approval from: Commander, U.S. Army Tank-Automotive and Armaments Command, ATTN: AMSTA-DSA-CS, Warren, MI 48397-5000.

This section contains instructions for safely operating the 130G under unusual conditions. In addition to normal preventive maintenance, special care must be taken to keep the machine operational in extreme temperatures and other environmental conditions.

SLAVE STARTING

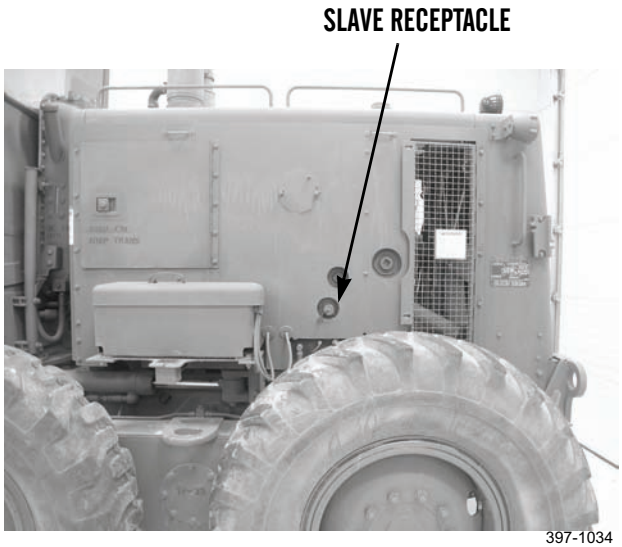
WARNING

- When slave starting, use NATO slave cable that does NOT have loose or missing insulation.
- DO NOT proceed if suitable cable is not available.
- DO NOT use civilian-type jumper cables.
- DO NOT allow disabled and booster machines to come in contact with each other at any time during slave starting. Failure to follow these warnings may cause injury or death to personnel.

NOTE

Ensure that both disabled machine and booster machine are equipped with serviceable NATO slave receptacles.

1. Remove slave receptacle cover on disabled machine and booster machine.
2. Connect slave cable to booster machine slave receptacle.
3. Connect other end of slave cable to slave receptacle of disabled machine, located on left side of engine compartment.
4. Turn ON the battery disconnect switch of the disabled machine.
5. Start booster machine and run at a speed just above idle.
6. Wait approximately five minutes, then start disabled machine. If engine fails to start, notify Unit Maintenance.
7. After starting disabled machine, return booster machine to idle.
8. Remove the slave cable from disabled machine, then from booster machine.



397-1034

OPERATE IN EXTREME COLD

1. **General.**

   Extreme cold causes many problems:

   a. Lubricants thicken or congeal.

   b. Batteries may freeze or lose their electrical efficiency.

   c. Electrical insulation may crack and cause short circuits.

   d. Fuel may not readily atomize for combustion.

   e. Various materials will become hard, brittle, and easily damaged.

   f. The cooling system requires adequate protection from extreme cold.

   g. Fuels, lubricants, and antifreeze compounds require special storage, handling, and use.

   Refer to FM 9-207 for additional information.

2. **Cooling System.**

   a. Inspect for leaks and general condition.

   b. Make sure clamps are tight.

   c. Check fluid level in radiator.

   d. Notify Unit Maintenance if system needs service.

3. **Fuel Tank.**

   a. Do not allow fuel tank to remain partially empty for a long period of time in extremely cold weather.

   b. Fill after each work period to help avoid water condensation in the fuel tank.

   c. Remove all ice and snow from around the fuel filler opening before refueling.

4. **Electrical System.**

   a. Inspect battery cables, wiring harness, and wiring.

   b. Check for breaks or cracks caused by cold weather. Report any problems found to Unit Maintenance.

   c. Save the batteries. Use lights and other electrical equipment as little as possible.

5. **Lubrication.**

   Lubricate according to *Preventive Maintenance Checks and Services (PMCS) Introduction* with the temperature range that applies to the lowest expected temperature.

6. **Engine Operation.**

   a. Before starting, make sure fuel and oil in the engine, transmission, and tandems are thin enough to flow.

   b. If oil drips from the dipstick, it is thin enough for engine to be started.

   c. Use *Starting Engine Below 32ºF (0ºC) Using Ether Starting Aid* procedure in WP 0005 00 and allow engine time to reach operating temperature. Be alert that tires may be frozen to ground.

   d. Hold hydraulic unloading valve down to reduce load on engine starter.

   e. Keep hydraulic unloading valve down one to two minutes after the engine starts.

   f. With the engine running at low idle, release the hydraulic unloading valve slowly to allow the pump to be loaded gradually with the cold, thickened oil.

   g. Run the engine at reduced speed only long enough to circulate the oil through the engine. Then increase engine speed and warm up the engine. Low idling speeds during extremely cold temperatures can result in incomplete combustion and form heavy deposits on the valves.

   h. Cover radiator if necessary to bring engine up to operating temperature.

OPERATE IN EXTREME COLD - CONTINUED

7. **Machine Operation.**
   a. Test brakes and vehicle controls carefully.
   b. Move all implement controls slowly to warm the hydraulic oil. Cycle each control several times. Normal warm-up period in extreme cold is 30 minutes.
   c. Operate under a light load for the first five minutes of operation.
   d. Start driving very slowly for about 100 yds (91.4 m). If a problem is noted, notify Unit Maintenance as required.
8. **Parking Machine.**
   a. If machine will be parked for a short period, park in a sheltered area out of wind. If shelter is not available, park machine so that radiator does not face into the wind.
   b. If machine will be parked for a long shutdown period, try to park on high ground and use planks or brush to make a raised and relatively dry surface. Keep tires out of snow, water, ice, and mud, if possible.
   c. Clean snow, ice, and mud from machine as soon as possible after shutdown.
   d. If machine will be parked for a long period of time, have Unit Maintenance prepare machine for storage.
   e. Ensure tires are properly inflated.

OPERATE IN EXTREME HEAT

1. **General.** During very hot weather, altering operating procedures may be necessary to prevent machine from overheating. Avoid continuous high engine RPM.
   a. You must be alert for the possibility of overheating.
   b. Keep a close eye on EMS engine coolant and hydraulic oil temperature indicators.
   c. If coolant or hydraulic temperature indicators come on, you may operate at three-fourths workload until indicators go out.
   d. It is important to maintain engine RPM to help cooling.
   e. If indicators stay on after more than 10 minutes of reduced workload, stop the machine and notify Unit Maintenance.
2. **Cooling System.**


WARNING


- DO NOT service cooling system unless engine has been allowed to cool down. This is a pressurized cooling system and escaping steam or hot coolant will cause serious burns.
- DO NOT remove cooling system radiator cap when engine is hot. Allow engine to cool down. Failure to follow this warning may cause serious burns.
- Wear effective eye, glove, and skin protection when handling coolants. Failure to follow this warning may cause injury.

   a. Check coolant level at frequent intervals and keep radiator cap tight.
   b. Be sure the radiator is free of bugs, dust, and other foreign matter.
   c. Check fan belt tension frequently. Report any damaged or loose belts to Unit Maintenance.

OPERATE IN EXTREME HEAT - CONTINUED

3. **Lubrication.**

   Lubricate according to *WP 0012 00, Preventive Maintenance Checks and Services (PMCS) Introduction,* with the temperature range that applies to the highest expected temperature.

4. **Air Cleaner.**

   a. Check and clean air precleaner at closer than normal intervals.

   b. Check air cleaner indicator frequently. Notify Unit Maintenance if the red indicator locks in the visible position.

5. **Parking Machine.**

   a. Park machine under cover, if possible. Cover windshield (if equipped) to protect against sand blasting.

   b. Ensure all tires are inflated to proper pressure.

   c. Check frequently for rust. Clean and lubricate machine to help prevent deterioration.

OPERATE IN MUD OR SOFT SURFACES

1. Before entering mud or other soft surfaces, check conditions and engage differential lock. Select appropriate transmission gear range. Enter soft area at a medium speed for gear range selected.
2. Maintain steady pressure on accelerator pedal to keep machine rolling until solid ground is reached. Do not accelerate to point where wheels spin, if possible.
3. If machine gets stuck, try to pull out slowly in a low gear. Boards, brush, or similar materials may be placed under tires to provide traction.
4. Notify Unit Maintenance to clean and inspect for proper lubrication.

OPERATE IN SANDY OR DUSTY CONDITIONS

1. Maintain steady, even movement with transmission in lower gears. Use differential lock as required. Try to keep machine rolling without straining engine and powertrain. If machine gets stuck, notify Unit Maintenance.
2. Whenever operating in sandy or dusty areas, you should:

   a. Service engine air cleaner more frequently.

   b. Make sure each tire has a valve cap.

   c. If machine overheats, stop and perform troubleshooting procedures.

   d. Make sure engine oil filler tube and transmission fluid filler tube are cleaned before dipsticks are removed to check fluid levels. Clean accumulations of sand and dirt from around fluid filler locations before checking or adding fluids.

   e. Clean spouts of fuel containers and areas around filler caps on fuel tanks before adding fuel. Under extremely sandy or dusty conditions, filter fuel when filling tanks.

   f. Cover windshield (if equipped) to protect against sand blasting.

   g. Notify Unit Maintenance to clean, inspect, and lubricate more frequently.

   h. When operating the machine on soft sand at slow speeds, the tire inflation pressure may be decreased for improved traction. Refer to FM 21-305.

   i. Check hydraulic cylinders, top of circle, centershift linkage, and articulation cylinders frequently. Do not allow dust, dirt, or sand to collect in these areas.

OPERATION IN SALTWATER AREAS

1. Keep the machine as clean as possible. Wash down with fresh water after use.
2. Inspect wiring connections closely for corrosion.
3. Keep lubrication points clean and well lubricated.

OPERATION AT HIGH ALTITUDES

NOTE

Engine operates at less than peak performance at high altitudes.

1. Coolant level and engine indicators must be watched closely.
2. Add coolant if necessary.

OPERATE IN SNOW AND ICE

1. Fuel tank should be kept full. Keep snow and ice away from fuel filler.
2. Clean snow away from outside indicators.
3. **Driving.**
   a. Engage differential lock and accelerate slowly to avoid spinning tires.
   b. Drive at slower speeds.
   c. Give signals sooner.
   d. Apply brakes sooner to give early warning of intention to stop. This will also help to avoid skidding.
   e. Maintain double the normal distance from the machine ahead.
   f. Keep windshields, mirrors, and lights clean and free of snow and ice.
   g. If approaching a difficult stretch of road, stop and inspect road carefully before driving on it.
   h. Select transmission gear range that best suits road condition. Use differential lock as required.
4. **Stopping.**
   a. Ease up on accelerator, leaving machine in gear.
   b. Apply service brakes lightly and evenly. DO NOT pump service brake pedal.
   c. Always avoid sudden braking.
5. **Parking.** If parking on icy, slushy, wet, or muddy surfaces, place boards, brush, or other materials that will provide traction underneath tires. This will guard against tires freezing to the ground or becoming pocketed in ice, and will provide some traction when machine is started and moving again.

FORDING

1. The 130G Series Grader can be forded in water depths up to 30 inches (76 cm). Observe the following precautions when fording any body of water:

2. **Before Fording.**

   a. Check the depth of the water at its deepest point.

   b. Make sure the bottom is even enough for fording.

   c. Do not ford even the narrowest stream more than 30 inches (76 cm) deep.

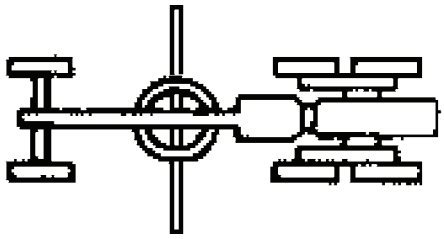
   d. Make sure your engine is operating at full efficiency.

   e. Raise blade and scarifier to maximum height.

   f. Set blade angle perpendicular to machine.

   g. Set transmission lever in low.

   h. Set governor control high to minimize the danger of stalling.



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3. **During Fording.**

   a. Enter water slowly to minimize waves and backwash.

   b. Speed should not exceed 3-4 mph (5-6 km/h).

   c. If stalling occurs, notify Unit Maintenance.

4. **After Fording.**

   a. Lubricate the machine completely as soon as possible after fording.

TOWING AND SPECIAL TECHNIQUES

WARNING

- Ensure tow line is strong enough and is in good condition.
- Attach the tow line only to the towing connection points provided on the frame.
- DO NOT tow faster than 8 km/h (5 mph).
- DO NOT have tension on the tow line when inspecting it. DO NOT jerk the tow line; it may break.
- Use a tow bar if the machine is to be moved more than a few feet. If a tow bar is not available, attach a machine of equal size to the rear of the towed machine to provide braking when going downhill.
- DO NOT allow riders on a machine that is being towed.
- Always block the wheels before removing the axle shafts or disconnecting the parking/emergency brake.
- If the axle shafts are removed or the parking/emergency brake is disconnected, block the wheels when parking.
- Failure to follow these warnings may result in injury or death to personnel.

TOWING AND SPECIAL TECHNIQUES - CONTINUED

Disconnecting the Parking/Emergency Brake

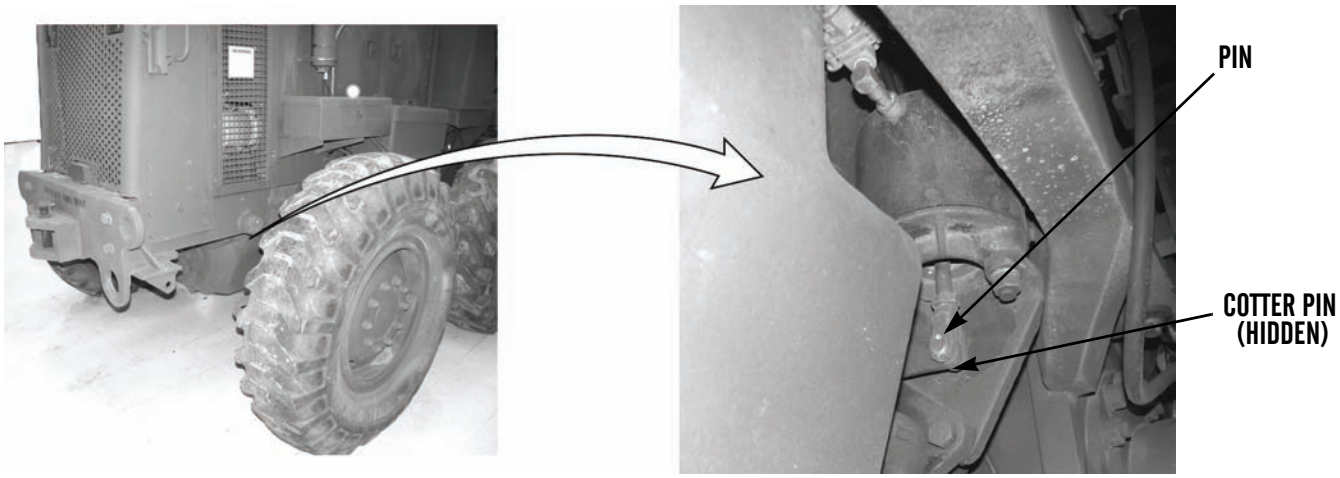
NOTE

- Because engine is not running during towing, the following machine systems will not function properly.
- Service brakes will not function.
- Parking brake will not release.
- Transmission lubrication will be insufficient.

1. Block wheels of disabled machine.
2. Place parking/emergency brake in the OFF position.

WARNING

When working on the rotochamber with the parking/emergency brake lever in the OFF position, a sudden loss of air pressure will let the rod move rapidly. Failure to follow this warning may result in injury to personnel.



397-1035

3. Remove the cotter pin and pin from the rod end of the rotochamber.
4. If machine is equipped with supplemental steering, use the following steering method:

CAUTION

- Using the supplemental steering excessively will cause the motor and solenoid to overheat.
- Hold the manual switch in the ON position only long enough to make steering corrections. DO NOT exceed two minute duration.
- Activate the supplemental steering only when making steering corrections.

a. Move and hold manual switch to MANUAL.

b. Make the steering correction, then release the switch. It will return to AUTO.

5. When the towing operation is complete, connect the parking/emergency brake.

TOWING AND SPECIAL TECHNIQUES - CONTINUED

Connecting the Parking/Emergency Brake

WARNING

Before operating the machine, connect the rotochamber for the parking/emergency brake. Failure to follow this warning may result in injury to personnel.

1. Block wheels of disabled machine.
2. Place parking/emergency brake in the OFF position.
3. Push lever UP and adjust the rod end until the lever has a small amount of free movement.
4. Install the pin in rod end of rotochamber.
5. Obtain a new cotter pin from Unit Maintenance and install on pin.

OPERATE PORTABLE FIRE EXTINGUISHER

1. Remove fire extinguisher from storage.
2. Hold fire extinguisher upright. Stand back 8 ft (2.4 m) from base of fire, point nozzle toward fire, and pull safety pin.
3. Squeeze lever, discharging chemical at base of fire. Use a side-to-side motion to spread chemical.
4. After using fire extinguisher, order new fire extinguisher.

END OF WORK PACKAGE

DECAL AND DATA PLATE GUIDE 0008 00

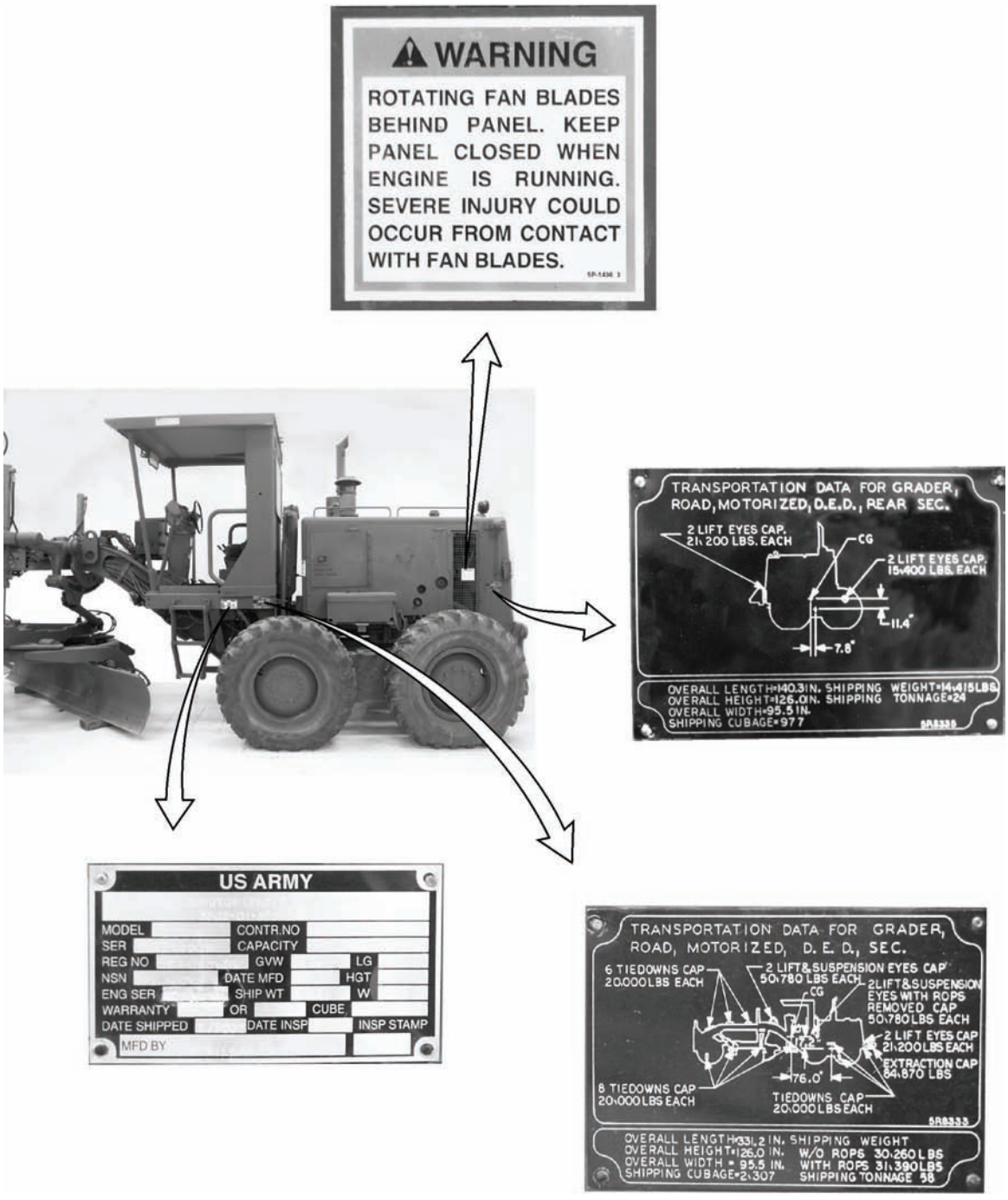
SCOPE

NOTE

Data plates shown are for the 130GS and 130GSCE models. Data plates on other models are similar.

This work package includes illustrations showing the location of all decals and data plates on the machine.

DECALS AND DATA PLATES



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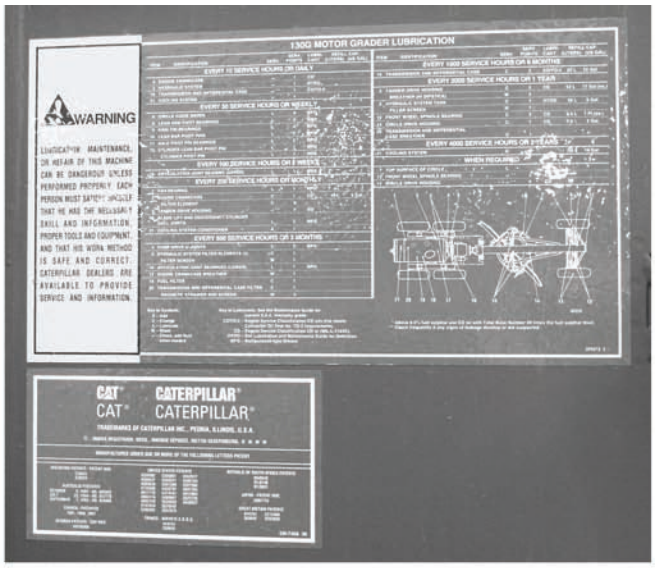
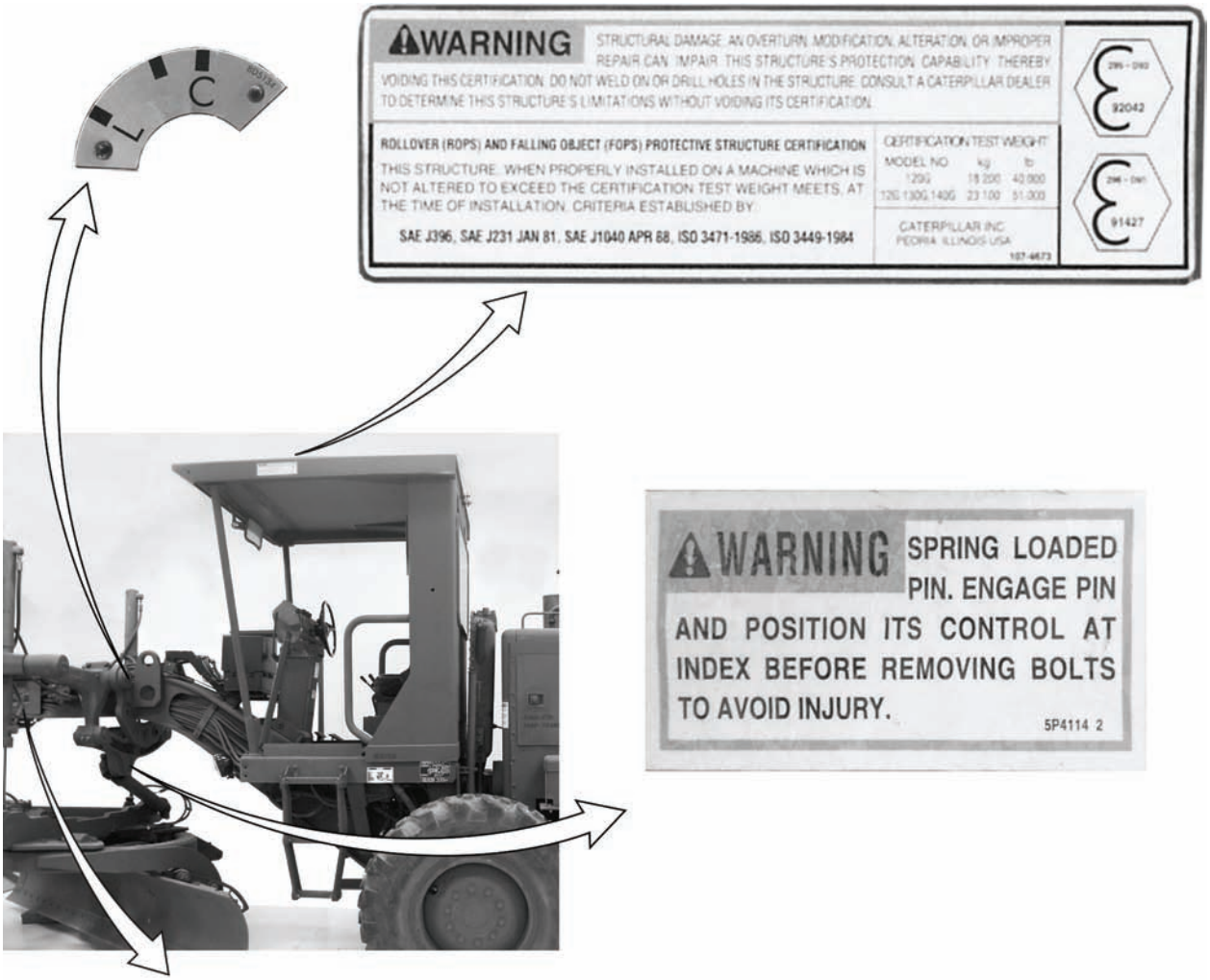
DECAL AND DATA PLATE GUIDE - CONTINUED 0008 00

DECALS AND DATA PLATES - CONTINUED



DECAL AND DATA PLATE GUIDE - CONTINUED 0008 00

DECALS AND DATA PLATES - CONTINUED



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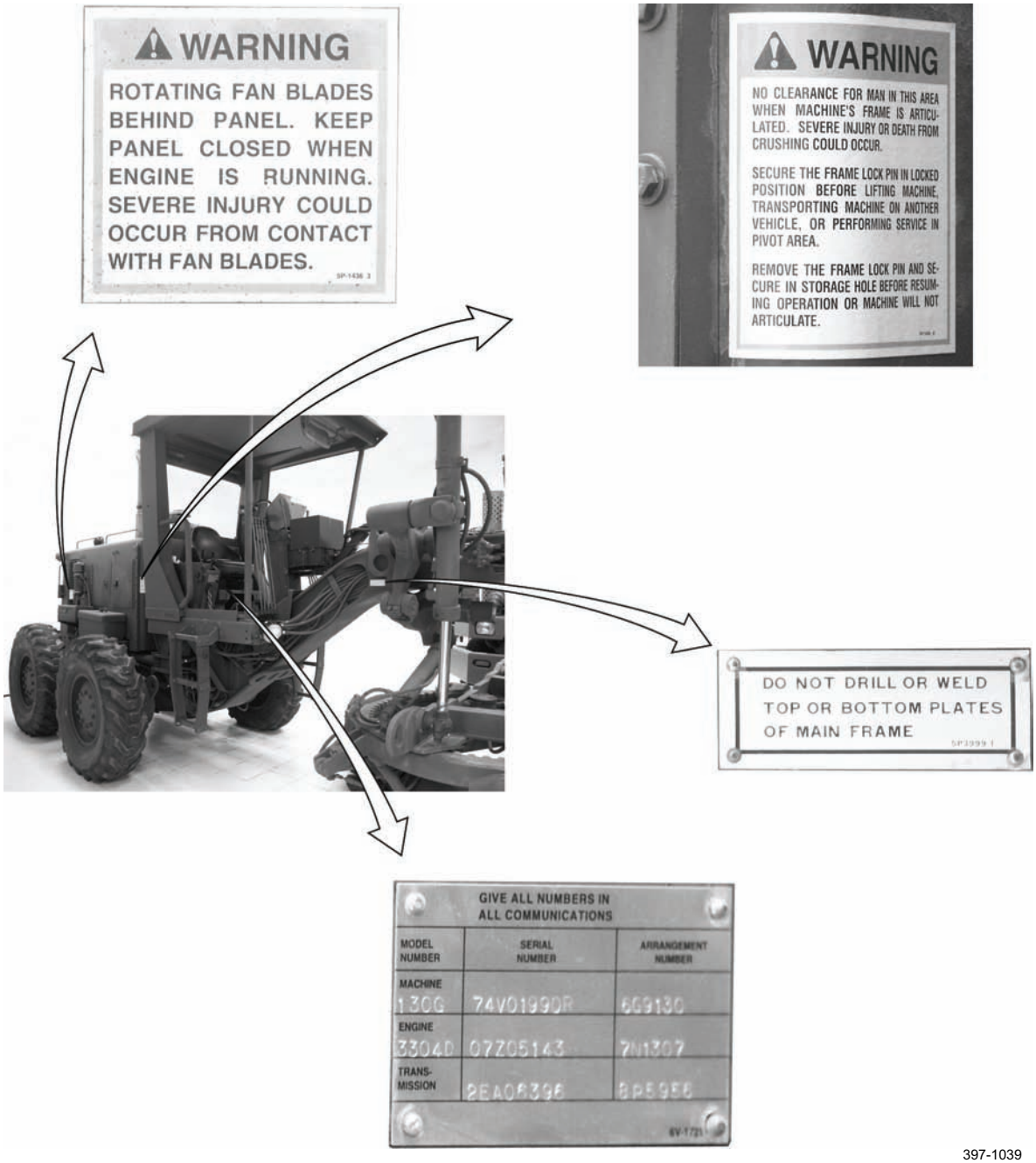
(TYPE II MODELS ONLY)

DECAL AND DATA PLATE GUIDE - CONTINUED 0008 00

DECALS AND DATA PLATES - CONTINUED



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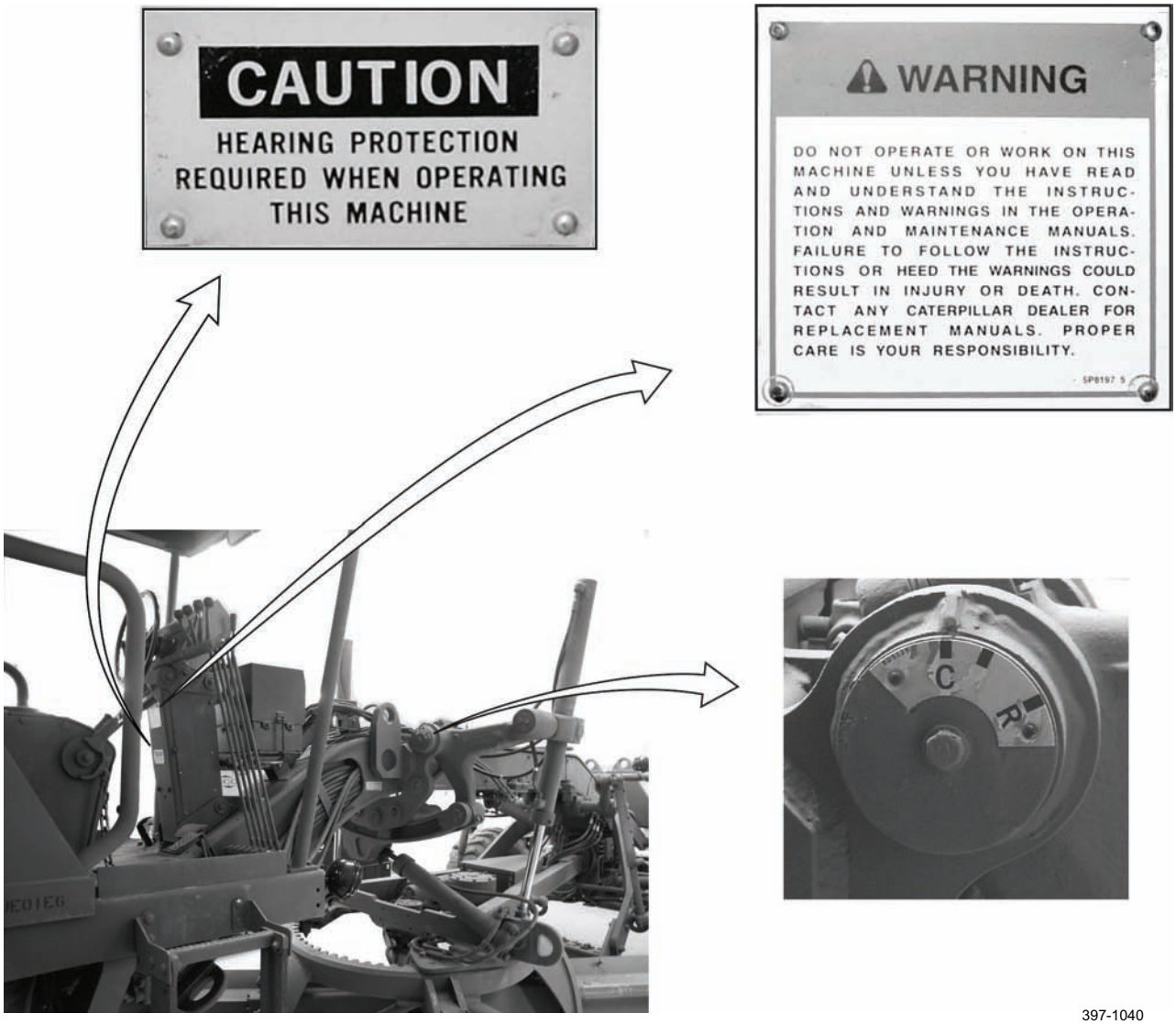
DECALS AND DATA PLATES - CONTINUED



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END OF WORK PACKAGE

CHAPTER 3
OPERATOR TROUBLESHOOTING

TROUBLESHOOTING INTRODUCTION 0009 00

INTRODUCTION

1. Troubleshooting procedures are grouped by system, containing information you need to locate malfunctions. A troubleshooting symptom index in WP 0010 00 is provided to aid in locating a malfunction or symptom and direct you to the appropriate troubleshooting table in WP 0011 00.
2. The troubleshooting table contains a listing of malfunctions, test, and inspection procedures, and corrective actions. The corrective action column further directs you to the required corrective maintenance procedure within this manual by work package number. However, if the required maintenance procedure is beyond Operator level capabilities, the direction is to notify Unit Maintenance.

PRELIMINARY TROUBLESHOOTING PROCEDURES

NOTE

Fluid leaks are classified as either Class I, Class II, or Class III.

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

Before starting any specific troubleshooting procedures, perform the following:

1. Visually check all hoses and tubes for leaks.
2. Check for mechanical jamming or binding caused by rocks or other foreign matter.
3. Check fluid levels in subject area and fill as required (WP 0013 00).

ELECTRICAL TROUBLESHOOTING

1. Analyze the symptoms and conditions to determine the most likely cause for the problem, then troubleshoot that circuit first. The more information you have concerning the problem, the easier it will be to troubleshoot.
2. Isolate to the subsystem level (in cases where more than one subsystem is involved); next isolate the problem to a single circuit within the subsystem; then, isolate the problem to the faulty component using the troubleshooting symptom index (WP 0010 00).
3. Frayed, broken, loose, or corroded wiring is a common source of problems in any electrical circuit. Always make a visual inspection before starting detailed troubleshooting. Inspect contacts to ground carefully because components with case grounds are especially troublesome.

END OF WORK PACKAGE

TROUBLESHOOTING SYMPTOM INDEX 0010 00

Malfunction/Symptom **Troubleshooting Procedure Page**

Air System and Brakes

Parking/Emergency Brake Will Not Engage 0011 00-4
Parking/Emergency Brake Will Not Release 0011 00-4
Service Brakes Do Not Operate Correctly 0011 00-5

Electrical System

Backup Alarm Will Not Sound When Machine Is Placed in Reverse 0011 00-5
Blackout Drive Light Will Not Operate When B.O. Drive Function Is Selected 0011 00-5
Rear Service Blackout Light(s) Will Not Operate When B.O. Drive Function Is Selected 0011 00-5
Front Work Lights Inoperative 0011 00-6
Directional Turn Signal or Hazard Flasher Control Is Not Working 0011 00-6
Horn Will Not Sound When Button Is Pressed 0011 00-6
Headlight(s)/Parking Light(s) Do Not Operate When SER. DRIVE or PARK Functions Are Selected 0011 00-7
High Beams Do Not Come On 0011 00-7
Stoplights Do Not Operate When Brake Pedal Is Pressed 0011 00-7
Taillights Do Not Come On. 0011 00-7
Windshield Wiper Not Working (If equipped) 0011 00-7
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Heater Fan Not Working (If equipped) 0011 00-8

EMS Fault Indicators

EMS Coolant Temp Indicator Flashes During Operation. 0011 00-1
EMS Engine Oil Press (psi) Indicator Flashes During Operation. 0011 00-2
EMS Brake Press (psi) Indicator Flashes During Operation. 0011 00-2
EMS Hydraulic Oil Temp Indicator Flashes During Operation 0011 00-2
EMS Alternator Indicator Flashes During Operation 0011 00-3
EMS Fuel Level Indicator Flashes During Operation. 0011 00-3

Engine

Engine:
- Cranks but Fails to Start:
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- Does Not Develop Full Power. 0011 00-9
- Does Not Idle Properly 0011 00-9
- Fails to Crank When Start Switch Is Turned to Start 0011 00-10
- Starts but Dies 0011 00-10
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Excessive Exhaust Smoke (At Normal Operating Temperature) 0011 00-10

TROUBLESHOOTING SYMPTOM INDEX - CONTINUED **0010 00**

Hydraulic System

Blade Control Levers Bind 0011 00-10
Blade Drifts After Control Lever Is Released or Centered 0011 00-11
Travel Time of Blade Lift Cylinders Is Excessively Slow 0011 00-11
Scarifier Control Lever Binds 0011 00-11
Travel Time of Scarifier Is Excessively Slow 0011 00-11

Steering

Machine:
- Steering Excessively Slow or Intermittent to Respond 0011 00-12
- Turns Correctly Under Normal Driving Conditions, but Turns Slowly While Grading 0011 00-12
- Turns Slowly in Both Directions 0011 00-12
- Turns Slowly in One Direction 0011 00-12
- Drifts (Either Direction), Wanders, or Pulls to One Side on Level Pavement, Even When Steering Wheel Is in Straight Position. 0011 00-12

Steering Is Erratic 0011 00-12
Turning Steering Wheel Is Difficult 0011 00-12

Transmission

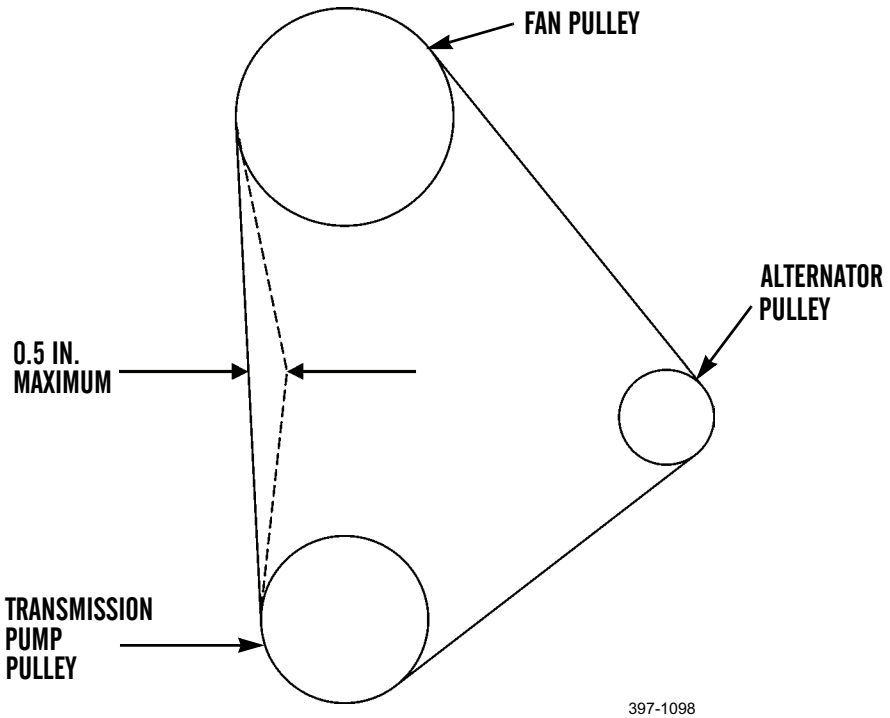
Machine Moves, as in Gear, When Shift Lever Is in Neutral (N) Position. 0011 00-13
Slow or Erratic Transmission Engagement 0011 00-13
Transmission:
- Does Not Operate in Any Gear 0011 00-13
- Cannot Be Shifted Out of Neutral 0011 00-13
- Does Not Shift from One Gear to Another 0011 00-13
- Engages, but Machine Does Not Move; Engine Stops Running 0011 00-13

END OF WORK PACKAGE

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
EMS FAULT INDICATORS		
1. EMS Coolant Temp Indicator Flashes During Operation.	 **WARNING**  • DO NOT service cooling system unless engine has been allowed to cool down. This is a pressurized cooling system and escaping steam or hot coolant will cause serious burns. • DO NOT remove cooling system radiator cap when engine is hot. Allow engine to cool down. Failure to follow this warning may cause serious burns. • Wear effective eye, glove, and skin protection when handling coolants. Failure to follow this warning may cause injury to personnel.	
	1. Check for flashing coolant temperature indicator during operation.	Reduce load and continue to monitor temperature. If indicator is still flashing, go to test step 2.
	2. Allow engine to idle at 960 RPM for 5-10 minutes to cool down.	If problem still exists shut down engine and, go to test step 3.
	3. Check radiator for debris.	Remove debris. If there is excessive debris, notify Unit Maintenance. If no debris is present, go to test step 4.
	4. Check system for leaks.	If leaks are found, notify Unit Maintenance. If no leaks are found, go to test step 5.
	5. Check coolant level.	If low, add coolant (WP 0013 00). If coolant level is okay, go to test step 6.
	6. Check water pump and fan drive belts for looseness and/or damage.	If water pump and fan drive belts are loose and/or damaged, notify Unit Maintenance. If belts are okay, go to test step 7.
	7. Check engine oil level.	If engine oil is low, fill to correct level (WP 0013 00). If problem still exists, go to test step 8.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	EMS FAULT INDICATORS - CONTINUED	
1. EMS Coolant Temp Indicator Flashes During Operation - Continued.	8. Check transmission oil level.	If transmission oil level is low, fill to correct level (WP 0013 00). If level is okay and problem still exists, notify Unit Maintenance.
2. EMS Engine Oil Press (psi) Indicator Flashes During Operation.	**CAUTION** When engine oil pressure indicator flashes, immediate shut-down of machine is required to prevent damage to machine.	
	Check engine oil level (WP 0013 00)	If engine oil is low, fill to correct level. If problem still exists, notify Unit Maintenance.
3. EMS Brake Press (psi) Indicator Flashes During Operation.	**WARNING** When brake air pressure low indicator comes on, bring machine to a safe stop. Failure to follow this warning may result in injury.	
	1. Ensure that air tank drain valve(s) are closed.	Close drain valve(s) if required. If problem still exists, go to test step 2.
	2. Check for air leaks at air tank, hoses, fittings, lines, and air dryer (if equipped).	If any leaks are present or if problem still exists, notify Unit Maintenance.
4. EMS Hydraulic Oil Temp Indicator Flashes During Operation.	1. Check for flashing hydraulic oil temp indicator during operation.	Reduce load and continue to monitor temperature. If indicator is still flashing, go to test step 2.
	2. Allow engine to idle at 960 RPM for 5-10 minutes to cool down.	If problem still exists, shut down engine and go to test step 3.
	3. Check radiator for debris.	Remove debris. If there is excessive debris, notify Unit Maintenance. If no debris is present, go to test step 4.
	4. Check system for leaks.	If leaks are found, notify Unit Maintenance. If no leaks are found, go to test step 5.
	5. Check hydraulic oil level (WP 0013 00).	If low, add hydraulic oil (WP 0013 00). If hydraulic oil level is okay, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	EMS FAULT INDICATORS - CONTINUED	
5. EMS Alternator Indicator Flashes During Operation.	1. Check the battery cable connections for corrosion.	If corrosion is present, notify Unit Maintenance. If no corrosion is present, go to test step 2.
	2. Check the battery cable connections for secure connections.	If connections are loose, notify Unit Maintenance. If connections are not loose, go to test step 3.
	3. Check alternator drive belts for damage and/or 1/2 in. deflection at mid-point of belt on longest segment.	If alternator drive belt has 1/2 in. or more of deflection and/or is damaged, notify Unit Maintenance. If belt is okay, go to test step 4.
	4. Inspect wiring harnesses and ground connections.	If a wiring harness fault is found, notify Unit Maintenance. If problem still exists, notify Unit Maintenance.
6. EMS Fuel Level Indicator Flashes During Operation.	Check fuel level in fuel tank.	Add fuel as necessary (WP 0013 00). If indicator still flashes, notify Unit Maintenance.



MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	AIR SYSTEM AND BRAKES	
1. Parking/Emergency Brake Will Not Engage.	**WARNING** Park machine on level ground, stop engine, and lower blade to prevent injury to operator and/or severe damage to machine.	
	1. Check for debris/obstruction at brake actuator.	Clean debris/obstruction from brake actuator. If problem still exists, go to test step 2.
	NOTE Raise blade and scarifier before moving machine.	
	2. Slowly try to move machine forward to test if brake is engaged.	If problem still exists, go to test step 3.
	3. Perform parking brake test (WP 0013 00).	If problem still exists, notify Unit Maintenance.
2. Parking/Emergency Brake Will Not Release.	1. Observe air pressure gages. Air pressure must be above 60 psi (414 kPa) in order to release parking brake.	If air pressure is not above 60 psi (414 kPa), check and close air tank drain valve(s) if required. If problem still exists, go to test step 2.
	2. Check for air leaks at air tank, hoses, fittings, lines, and air dryer (if equipped).	If any leaks are present, notify Unit Maintenance. If no leaks are found, go to test step 3.
	NOTE Raise blade and scarifier before moving machine.	
	3. Slowly try to move machine forward to test if brake is released.	If problem still exists, notify Unit Maintenance.
	4. Perform parking brake test (WP 0013 00).	If problem still exists, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
AIR SYSTEM AND BRAKES - CONTINUED		
3. Service Brakes Do Not Operate Correctly.	**WARNING** Park machine on level ground, stop engine, and lower blade to prevent injury to operator and/or severe damage to machine.	
	1. Check for mud or dirt under brake pedal.	Clean mud or dirt from under brake pedal. If problem still exists, go to test step 2.
	2. Check for air leaks at air tank, hoses, fittings, lines, and air dryer (if equipped).	Tighten air hoses, if required. If problem still exists, go to test step 3.
	3. Check for air leaks or damage to brake system components.	If problem still exists, notify Unit Maintenance.
ELECTRICAL SYSTEM		
1. Backup Alarm Will Not Sound When Machine Is Placed in Reverse.	1. Ensure STOP LIGHT or SER DRIVE function has been selected on military light switch.	Select STOP LIGHT or SER DRIVE. If problem still exists, go to test step 2.
	2. Check fuse at fuse panel (WP 0015 00).	If fuse is blown, request a replacement fuse from Unit Maintenance. If fuse is okay, and problem still exists, notify Unit Maintenance.
2. Blackout Drive Light Will Not Operate When B.O. Drive Function Is Selected.	1. Check blackout drive light for separated connection or damage.	Reconnect connector, if required. If connector is okay, go to step 2.
	2. Remove cover and check bulb for discolored or broken element.	If bulb is unserviceable, request replacement from Unit Maintenance.
3. Rear Service Blackout Light(s) Will Not Operate When B.O. Drive Function Is Selected.	1. Check rear service blackout lights for separated connections or damage.	Reconnect connectors, if required. If connectors are okay, go to next step.
	2. Remove cover and check bulb for discoloration or broken element.	If bulb is unserviceable, request replacement from Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ELECTRICAL SYSTEM - CONTINUED	
4. Front Work Lights Inoperative.	1. Ensure STOP LIGHT or SER DRIVE function has been selected on military light switch.	Select STOP LIGHT or SER DRIVE. If problem still exists, go to test step 2.
	2. Check for blown fuse at fuse panel (WP 0015 00).	If fuse is blown, request a replacement fuse from Unit Maintenance. If fuse is okay, go to test step 3.
	3. Check light for separated connection or damage.	Reconnect connector, if required. If connector is okay, notify Unit Maintenance.
5. Directional Turn Signal or Hazard Flasher Control Is Not Working.	1. Ensure STOP LIGHT or SER DRIVE function has been selected on military light switch.	Select STOP LIGHT or SER DRIVE. If problem still exists, go to test step 2.
	2. Check for blown fuse at fuse panel (WP 0015 00).	If fuse is blown, request a replacement fuse from Unit Maintenance. If fuse is okay, go to test step 3.
	3. Check lights for separated connections or damage.	Reconnect connectors, if required. If any damage to lights is found, notify Unit Maintenance. If connectors and lights are okay, notify Unit Maintenance.
6. Horn Will Not Sound When Button Is Pressed.	1. Ensure STOP LIGHT or SER. DRIVE function has been selected on military light switch.	Select STOP LIGHT or SER DRIVE. If problem still exists, go to test step 2.
	2. Check for blown fuse at fuse panel (WP 0015 00).	If fuse is blown, request a replacement fuse from Unit Maintenance. If fuse is okay and problem still exists, go to test step 3.
	3. Check horn for separated connections or damage.	Reconnect connectors, if required. If connectors are okay, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ELECTRICAL SYSTEM - CONTINUED	
7. Headlight(s)/Parking Light(s) Do Not Operate When SER DRIVE or PARK Functions Are Selected.	1. Ensure SER DRIVE or PARK function has been selected on military light switch.	Select SER DRIVE or PARK. If problem still exists, go to test step 2.
	2. Check lights for disconnected connections or damage.	Reconnect connectors, if required. If any damage to lights is found, notify Unit Maintenance. If connectors and lights are okay, notify Unit Maintenance.
8. High Beams Do Not Come On.	1. Ensure SER DRIVE or PARK function has been selected on military light switch.	Select SER DRIVE or PARK. If problem still exists, go to test step 2.
	WARNING Park machine on level ground, stop engine, and lower blade to prevent injury to operator and/or severe damage to machine.	
	2. Check for mud and dirt around high beam switch.	Clean mud or dirt from high beam switch. If problem still exists, notify Unit Maintenance.
9. Stoplights Do Not Operate When Brake Pedal Is Pressed.	1. Ensure STOP LIGHT or SER DRIVE function has been selected on military light switch.	Select STOP LIGHT or SER DRIVE. If problem still exists, go to test step 2.
	2. Check lights for disconnected connections or damage.	Reconnect connectors, if required. If any damage to lights is found, notify Unit Maintenance.
10. Taillights Do Not Come On.	1. Ensure SER DRIVE function has been selected on military light switch.	Select SER DRIVE. If problem still exists, go to test step 2.
	2. Check lights for disconnected connections or damage.	Reconnect connectors, if required. If problem still exists, notify Unit Maintenance.
11. Windshield Wiper Not Working (if Equipped).	Check fuses at fuse panel (WP 0015 00).	If fuse is blown, request a replacement from Unit Maintenance. If fuse is okay, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ELECTRICAL SYSTEM - CONTINUED	
12. Defroster Fan Not Working (if Equipped).	1. Check for blown fuses at fuse panel (WP 0015 00).	If fuse is blown, request a replacement fuse from Unit Maintenance. If fuse is okay, and problem still exists, go to test step 2.
	2. Check fan for disconnected electrical connections.	Reconnect electrical connectors if required. If problem still exists, notify Unit Maintenance.
13. Heater Fan Not Working (if Equipped).	Check for blown fuse at fuse panel (WP 0015 00).	If fuse is blown, request a replacement from Unit Maintenance. If fuse is okay, notify Unit Maintenance.
	ENGINE	
1. Engine Cranks but Fails to Start (Operating Temperature Above 32°F [0°C]).	 **WARNING** • DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel. • Operating personnel must wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing.	
	Check fuel level using fuel tank dipstick.	If indication is empty, add fuel (WP 0013 00). If fuel level is okay, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ENGINE - CONTINUED	
2. Engine Cranks but Fails to Start (Operating Temperature Below 32°F [0°C]).	 **WARNING** • DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to machine and injury or death to personnel. • Operating personnel must wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing.	
	1. Check fuel level using fuel tank dipstick.	If indication is empty, add fuel (WP 0013 00). If fuel level is okay, go to test step 2.
	NOTE For every 30 seconds of engine cranking, allow 2 minutes for starter motor to cool down.	
	2. While cranking engine, press ether starting aid switch. Wait approximately 2 seconds between injections.	If engine still will not start, notify Unit Maintenance.
3. Engine Does Not Develop Full Power.	Check air filter service indicator.	If indicator is red, service air filter (WP 0014 00) and retest. If problem still exists, notify Unit Maintenance.
4. Engine Does Not Idle Properly.	Check air filter service indicator.	If indicator is red, service air filter (WP 0014 00) and retest. If problem still exists, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ENGINE - CONTINUED	
	NOTE Ensure accelerator pedal is not in off position.	
5. Engine Fails to Crank When Start Switch Is Turned to Start.	1. Check position of battery disconnect switch.	Place battery disconnect switch in ON. If problem still exists, go to test step 2.
	2. Check position of transmission shift lever.	Place transmission shift lever in N (Neutral). If problem still exists, go to test step 3.
	NOTE A thirty 30-minute cool-down time may be required before circuit breaker can be reset.	
	3. Check that main circuit breakers are not tripped (WP 0004 00).	Reset circuit breaker. If problem still exists, go to test step 4.
	4. Check for dirty, loose, or damaged battery cables.	Clean dirty cables. Tighten loose connections. If cable is damaged, notify Unit Maintenance.
6. Engine Starts but Dies.	Check for water in fuel system.	Notify Unit Maintenance.
7. Engine Starts but Misfires or Runs Rough After Warmup Period.	Check for water in fuel system.	Notify Unit Maintenance.
8. Excessive Engine Oil Consumption.	Check for loose oil lines and oil leaks.	If oil lines are loose or leaks are found, notify Unit Maintenance.
9. Excessive Exhaust Smoke (at Normal Operating Temperature).	1. Check air filter service indicator.	If indicator is red, service air filter (WP 0014 00) and retest. If problem still exists, go to test step 2.
	2. Check engine oil level.	If oil level is above FULL, notify Unit Maintenance.
	HYDRAULIC SYSTEM	
	NOTE If equipped with blade float and blade float is on, blade lift controls will not operate.	
1. Blade Control Levers Bind.	1. Check for bent or damaged lever.	If lever is bent or damaged, notify Unit Maintenance. If lever is okay, go to test step 2.
	2. Check control linkage for damage or debris that would restrict freedom of movement, and/or automatic return to hold position.	Clean any debris from linkage. If any damage is found, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	HYDRAULIC SYSTEM - CONTINUED	
2. Blade Drifts After Control Lever Is Released or Centered.	1. Check blade hydraulic lift cylinders for damage.	If any damage is found, notify Unit Maintenance. If no damage is found and problem still exists, go to test step 2.
	2. Check control linkage for damage or debris that would restrict freedom of movement and/or automatic return to hold position.	Clean any debris. If any damage is found, notify Unit Maintenance.
3. Travel Time of Blade Lift Cylinders Is Excessively Slow.	1. Check blade hydraulic lift cylinders for any buildup of debris.	Clean any debris from cylinder(s). If problem still exists, go to test step 2.
	2. Check hydraulic oil level.	If hydraulic oil level is low, fill to correct level (WP 0013 00). If problem still exists, go to test step 3.
	3. Check control linkage for damage or debris that would restrict freedom of movement and/or automatic return to hold position.	Clean any debris from linkage. If any damage is found, notify Unit Maintenance.
4. Scarifier Control Lever Binds.	1. Check for bent or damaged lever.	If lever is bent or damaged, notify Unit Maintenance. If lever is okay, go to test step 2.
	2. Check control linkage for damage or debris that would restrict freedom of movement and/or automatic return to hold position.	Clean any debris from linkage. If any damage is found, notify Unit Maintenance.
5. Travel Time of Scarifier Is Excessively Slow.	1. Check scarifier area for any buildup of debris.	Clean any debris from scarifier area. If problem still exists, go to test step 2.
	2. Check hydraulic oil level.	If hydraulic oil level is low, fill to correct level (WP 0013 00). If problem still exists, go to test step 3.
	3. Check control linkage for damage or debris that would restrict freedom of movement and/or automatic return to hold position.	Clean any debris from linkage. If any damage is found, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	STEERING	
1. Machine Steering Excessively Slow or Intermittent to Respond.	**WARNING** Hitch and steering movement can reduce clearances suddenly and cause injury to personnel. Stop engine before servicing.	
	Check hydraulic oil level.	If oil level is low, fill to correct level (WP 0013 00). If oil level is okay, notify Unit Maintenance.
2. Machine Turns Correctly During Normal Driving Conditions, but Turns Slowly While Grading.	1. Check steering system for oil leaks.	If any oil leaks are found, notify Unit Maintenance. If no leaks are found, go to test step 2.
	2. Check hydraulic oil level.	If hydraulic oil level is low, fill to correct level (WP 0013 00). If problem still exists, notify Unit Maintenance.
3. Machine Turns Slowly in Both Directions.	Check hydraulic oil level.	If oil level is low, fill to correct level (WP 0013 00). If oil level is okay, notify Unit Maintenance.
4. Machine Turns Slowly in One Direction.	1. Check oil leaks at steering cylinders.	If any oil leaks are found, notify Unit Maintenance. If no leaks are found, go to test step 2.
	2. Check hydraulic oil level.	If hydraulic oil level is low, fill to correct level (WP 0013 00). If problem still exists, notify Unit Maintenance.
5. Machine Drifts (Either Direction), Wanders, or Pulls to One Side on Level Pavement, Even When Steering Wheel Is in Straight Position.	1. Check tires for proper pressure.	Inflate tires to proper pressure (WP 0013 00). If problem still exists, go to test step 2.
	2. Possible linkage or hydraulic component malfunction.	Notify Unit Maintenance.
6. Steering Is Erratic.	Check hydraulic oil level.	If oil level is low, fill to correct level (WP 0013 00). If oil level is okay and problem still exists, notify Unit Maintenance.
7. Turning Steering Wheel Is Difficult.	1. Oil is too cold.	Operate machine until normal operating temperature is reached. If problem still exists, go to test step 2.
	2. Check hydraulic oil level.	If oil level is low, fill to correct level (WP 0013 00). If oil level is okay, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	TRANSMISSION	
1. Machine Moves, as in Gear, When Shift Lever Is in Neutral (N) Position.	Shut down engine and move shift lever through all forward gears and all reverse gears.	Start engine. If problem still exists, notify Unit Maintenance.
2. Slow or Erratic Transmission Engagement.	**NOTE** Before checking oil level, ensure that machine is parked on level ground, parking brake applied, transmission in N (Neutral), oil warm, engine at low idle, and blade lowered with slight downward pressure applied.	
	Check transmission oil level.	If transmission oil is low, fill to correct level (WP 0013 00). If problem still exists, notify Unit Maintenance.
3. Transmission Does Not Operate in Any Gear.	**NOTE** Before checking oil level, ensure that machine is parked on level ground, parking brake applied, transmission in N (Neutral), oil warm, engine at low idle, and blade lowered with slight downward pressure applied.	
	Check transmission oil level (WP 0013 00).	If transmission oil is low, fill to correct level (WP 0013 00). If problem still exists, notify Unit Maintenance.
4. Transmission Cannot Be Shifted Out of Neutral.	Check position of parking/ emergency brake lever.	Disengage parking/emergency brake lever if required. If problem still exists, notify Unit Maintenance.
5. Transmission Does Not Shift from One Gear to Another.	1. Check transmission oil level (WP 0013 00).	If transmission oil is low, fill to correct level (WP 0013 00). If problem still exists, go to test step 2.
	2. Control linkage out of adjustment.	Notify Unit Maintenance.
6. Transmission Engages, but Machine Does Not Move; Engine Stops Running.	Possible internal failure.	Notify Unit Maintenance.

END OF WORK PACKAGE

CHAPTER 4
OPERATOR MAINTENANCE INSTRUCTIONS

PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) INTRODUCTION 0012 00

GENERAL

To ensure that the machine is ready for operation at all times, it must be inspected on a regular basis so that defects may be found and corrected before they result in serious damage, equipment failure, or injury to personnel. WP 0013 00 contains systematic instructions on inspections, lubrications, adjustments, and corrections to be performed by the operator to keep your equipment in good operating condition and ready for its primary mission.

EXPLANATION OF TABLE ENTRIES

1. **Item Number (Item No.) Column**. Numbers in this column are for reference. When completing DA Form 2404 or DA Form 5988-E *(Equipment Inspection and Maintenance Worksheet)*, include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must perform checks and services for the interval listed.

2. **Interval Column.** This column tells you when you must perform the procedure in the procedure column.

   a. *Before* procedures must be done immediately before you operate the machine.

   b. *During* procedures must be done while you are operating the machine.

   c. *After* procedures must be done immediately after you have operated the machine.

   d. *Weekly* procedures must be done once each week.

   e. *Monthly* procedures must be done once each month.

3. **Man-Hours Column.** This column indicates man-hours required to complete prescribed lubrication service.

4. **Location, Item to Check/Service Column.** This column provides the location and item to be checked or serviced.

NOTE

The WARNINGs and CAUTIONs appearing in your PMCS table must always be observed. WARNINGs and CAUTIONs appear before applicable procedures. You must observe these WARNINGs to prevent serious injury to yourself and others, and CAUTIONs to prevent your equipment from being damaged.

5. **Procedure Column.** This column gives the procedure you must perform to know if the equipment is ready or available for its intended mission or for operation. You must perform the procedure at the time stated in the interval column.

6. **Not Fully Mission Capable If: Column.** Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If you perform check/service procedures that show faults listed in this column, the equipment is not mission-capable. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

GENERAL PMCS PROCEDURES

1. Always perform PMCS in the same order. With experience, you should be able to identify problems easily. If the machine does not perform as required, refer to the appropriate troubleshooting index (WP 0010 00). If anything looks wrong and you can't fix it, write it on your DA Form 2404 or DA Form 5988-E. If you find something seriously wrong, IMMEDIATELY report it to your supervisor.

2. Before performing preventive maintenance, read all the checks required for the applicable interval and prepare everything needed to make all the checks. For example, you'll always need a rag (Item 15, WP 0022 00) or two.

GENERAL PMCS PROCEDURES - CONTINUED

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may cause injury or death to personnel.

a. **Keep It Clean.** Dirt, grease, oil, and debris get in the way and may cover up a serious problem. Clean as you work and as needed. Use solvent cleaning compound (Item 2, WP 0022 00) on all metal surfaces. Use detergent (Item 4, WP 0022 00) and water when you clean rubber, plastic, and painted surfaces.

WARNING

When servicing this machine, performing maintenance, or disposing of materials such as engine coolant, hydraulic fluid, lubricants, battery acids or batteries, and CARC paint, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance. If further information is needed, please contact The Army Environmental Hotline at 1-800-872-3845. Failure to follow this warning may result in injury to personnel.

b. **Hazardous Waste Disposal.** Ensure all spills are cleaned up and disposed of in accordance with local policy and ordinances.

c. **Rust and Corrosion.** Check metal parts for rust and corrosion. If any bare metal or corrosion exists, clean and apply a light coat of lubricating oil (Item 12, WP 0022 00). Report it to your supervisor.

d. **Bolts, Nuts, and Screws.** Check bolts, nuts, and screws for obvious looseness and missing, bent, or broken condition. You can't try them all with a tool, but look for chipped paint, bare metal, or rust around bolt heads. If you find one you think is loose, tighten it.

e. **Welds.** Look for loose or chipped paint, rust, or gaps where parts are welded together. If you find a bad weld, report it to your supervisor.

f. **Electric Wires and Connectors.** Look for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors and ensure that the wires are in good condition.

g. **Hoses and Fluid Lines.** Look for wear, damage, and signs of leaks. Ensure that clamps and fittings are tight. Wet spots indicate leaks, but a stain around a fitting or connector can also mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, report it to your supervisor.

h. **Fluid Leakage.** It is necessary for you to know how fluid leakage affects the status of your machine. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your machine. Learn and be familiar with them, and remember - when in doubt, notify your supervisor.

CAUTION

Operation is allowable with Class I and Class II leakage. WHEN IN DOUBT, NOTIFY YOUR SUPERVISOR. When operating with Class I or Class II leaks, check fluid levels more frequently. Class III leaks must be reported immediately to your supervisor. Failure to do this will result in damage to machine and/or components.

GENERAL PMCS PROCEDURES - CONTINUED

NOTE

Notify Unit Maintenance of any leaks the operator cannot fix.

Leakage Definitions for PMCS

Class I	Leakage indicated by wetness or discoloration, but not great enough to form drops.
Class II	Leakage great enough to form drops, but not enough to cause drops to drip from the item being checked/inspected.
Class III	Leakage great enough to form drops that fall from the item being checked/inspected.

GENERAL LUBRICATION PROCEDURES

NOTE

- Lubrication instructions contained in this PMCS are mandatory.
- Overall views of lubrications points are located at the end of this work package.
- Refer to FM 9-207 for lubrication in arctic operation.

1. Included in this PMCS are lubrication services to be performed by the operator.
2. Lubrication intervals are based on normal operation. Lubricate more during constant use and less during inactive periods. Use correct grade of lubricant for seasonal temperature expected (Refer to *KEY* on page 0012 00-4).
3. For equipment under manufacturer's warranty, hardtime intervals shall be followed. Shorten intervals if lubricants are known to be contaminated or if operation is under adverse conditions (e.g., longer than usual operating hours, extended idling periods, extreme dust, etc.).
4. Keep all lubricants in an environmental storage container and store in a clean, dry place away from extreme heat. Keep container covers clean and do not allow dust, dirt, or other foreign material to mix with lubricants. Keep lubrication equipment clean and ready for use. Clean top of container before opening.

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may cause injury or death to personnel.

5. Clean area around lubrication points with solvent cleaning compound (Item 2, WP 0022 00) or equivalent before lubricating equipment. Keep all external parts of equipment not requiring lubrication free of lubricants. After lubrication, wipe off excess lubricant to prevent accumulation of foreign matter.
6. Maintain a record of lubrication performed and report any problems noted during lubrication. Refer to DA PAM 738-750 for forms and procedures to record and report any findings.

GENERAL LUBRICATION PROCEDURES - CONTINUED

NOTE

Only lubricants authorized for use by the operator are listed in this KEY.

- KEY -

LUBRICANT/ COMPONENT	REFILL CAPACITY	EXPECTED TEMPERATURES*		
		+6°F to +122°F (-14°C to +50°C)	-4°F to +50°F (-20°C to +10°C)	-25°F to +32°F (-4°C to 0°C)
OE/HDO Lubricating Oil, ICE, Tactical				
OEA Lubricating Oil, ICE, Arctic				
Engine Crankcase	5 Gal. (19 L)	See Chart A		
Transmission, Transfer and Differential Housing	21 Gal. (79 L)	See Chart B		
Tandem Drive Housing (Each)	17 Gal. (64 L)	See Chart B		
Hydraulic System	18 Gal. (68.1 L)	See Chart C		
GO Lubricating Oil, Gear, Multipurpose				
Circle Drive Housing	2 Gal. (7 L)	All Temperatures		
GAA Grease, Automotive and Artillery				
Hitch Steering Linkage		All Temperatures		
Earth Moving Equipment		All Temperatures		
ANTIFREEZE Ethylene Glycol, Inhibited, Heavy Duty				
Engine Radiator	10 Gal. (38 L) System Capacity	All Temperatures		
FUEL JP8				
Fuel Tank	75 Gal. (284 L)	All Temperatures		
*** For arctic operation, refer to FM 9-207.**				

GENERAL LUBRICATION PROCEDURES - CONTINUED

Table 2. CHART A—ENGINE

Lubricant	EXPECTED TEMPERATURES																			
	°F	-70	-60	-50	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+120
	°C	-57	-51	-46	-40	-34	-29	-23	-18	-12	-7	-1	+4	+10	+16	+21	+27	+32	+38	+49
OE/HDO	Lubricating Oil, ICE, Tactical																			
OEA	Lubricating Oil, ICE, Arctic																			
OE/HDO 10W/30																				
OE/HDO 15W/40																				
OEA																				

Table 3. CHART B—TRANSMISSION, DIFFERENTIAL, AND TANDEM DRIVE HOUSING

Lubricant	EXPECTED TEMPERATURES																			
	°F	-70	-60	-50	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+120
	°C	-57	-51	-46	-40	-34	-29	-23	-18	-12	-7	-1	+4	+10	+16	+21	+27	+32	+38	+49
OE/HDO	Lubricating Oil, ICE, Tactical																			
OEA	Lubricating Oil, ICE, Arctic																			
OE/HDO 30																				
OE/HDO 10*																				
OEA *																				

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

Table 4. CHART C—HYDRAULIC RESERVOIR

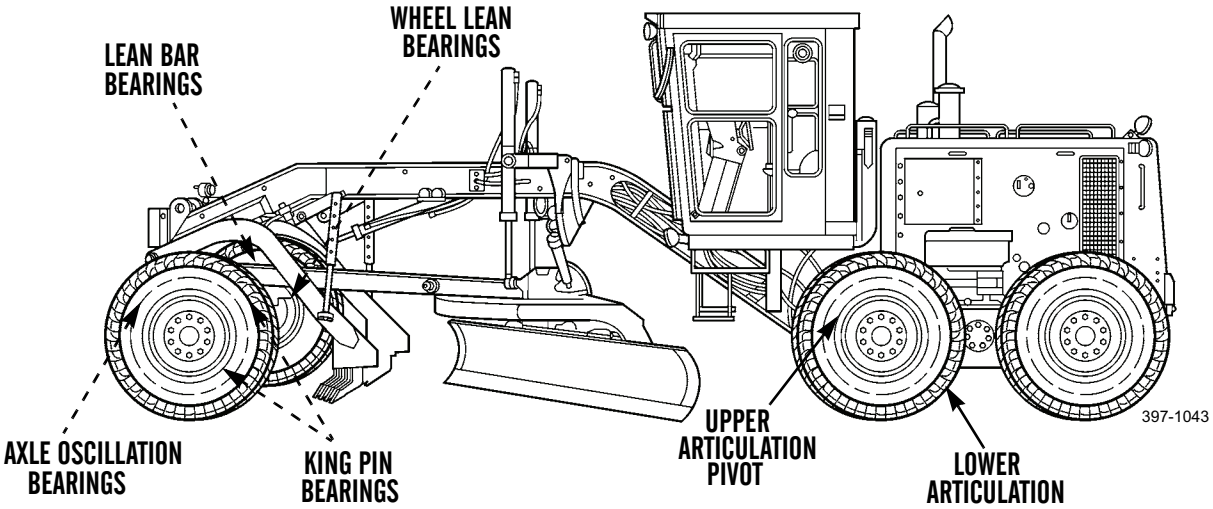
Lubricant	EXPECTED TEMPERATURES																			
	°F	-70	-60	-50	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+120
	°C	-57	-51	-46	-40	-34	-29	-23	-18	-12	-7	-1	+4	+10	+16	+21	+27	+32	+38	+49
OE/HDO	Lubricating Oil, ICE, Tactical																			
OEA	Lubricating Oil, ICE, Arctic																			
OE/HDO 30																				
OE/HDO 10																				
OEA *																				

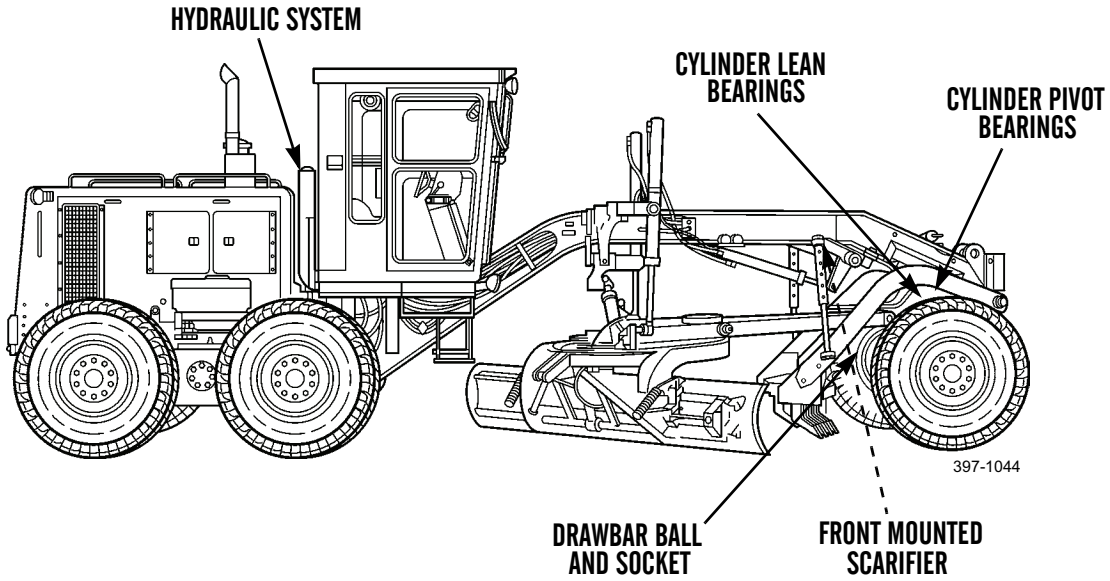
*If OEA lubricant is required to meet the low expected-temperature range, OEA lubricant is to be used in lieu of OE/HDO 10 lubricant for all expected temperatures where OE/HDO 10 is specified.

GENERAL LUBRICATION PROCEDURES - CONTINUED

NOTE

- The following lube points are serviced daily and weekly.
- Dashed lines indicate identical items on both sides.

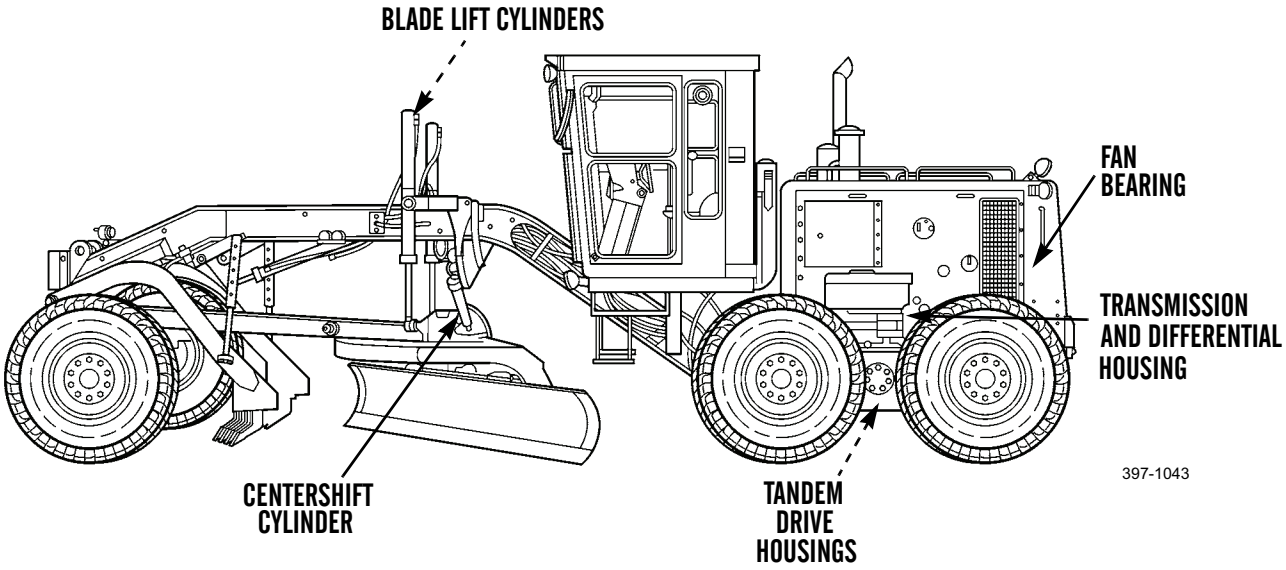




GENERAL LUBRICATION PROCEDURES - CONTINUED

NOTE

The following lube points are serviced monthly.



END OF WORK PACKAGE

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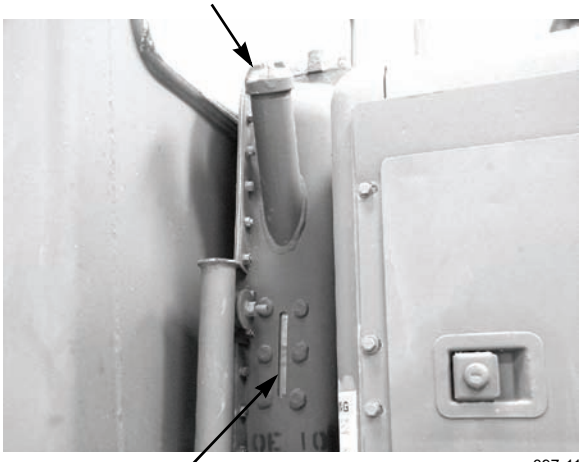
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
				NOTE • Review all WARNINGs, CAUTIONs, and NOTEs before performing PMCS and operating the machine. • Perform all PMCS checks if: a. You are the assigned operator but have not operated the machine since the last weekly checks. b. You are operating the machine for the first time. • Unless otherwise indicated, perform PMCS with machine parked on level ground, parking brake applied, transmission in N (Neutral), blade lowered to the ground, wheels blocked, and engine shut down. • If leakage is detected during performance of PMCS, further investigation is required to determine location and cause of leak. • Walk around machine and look for any obvious leaks or damage. • During walk around, also visually check tires for low inflation, damage, and debris.	
			LEFT SIDE AND REAR		
1	**Before**		**Overall View**	Check left front side of machine for evidence of leakage or damage.	Class III leaks or damage that would impair operation are evident.
2	**Before**		**Lights**	Check left front work light, headlights, front turn signal lights, and blackout light for missing or damaged components.	Missing or damaged components if necessary for mission.
3	**Before**		**Below Operator Compartment**	Check hoses, cables, and connections below left side of operator compartment for damage or leaks.	Class III leaks or damage that would impair operation.

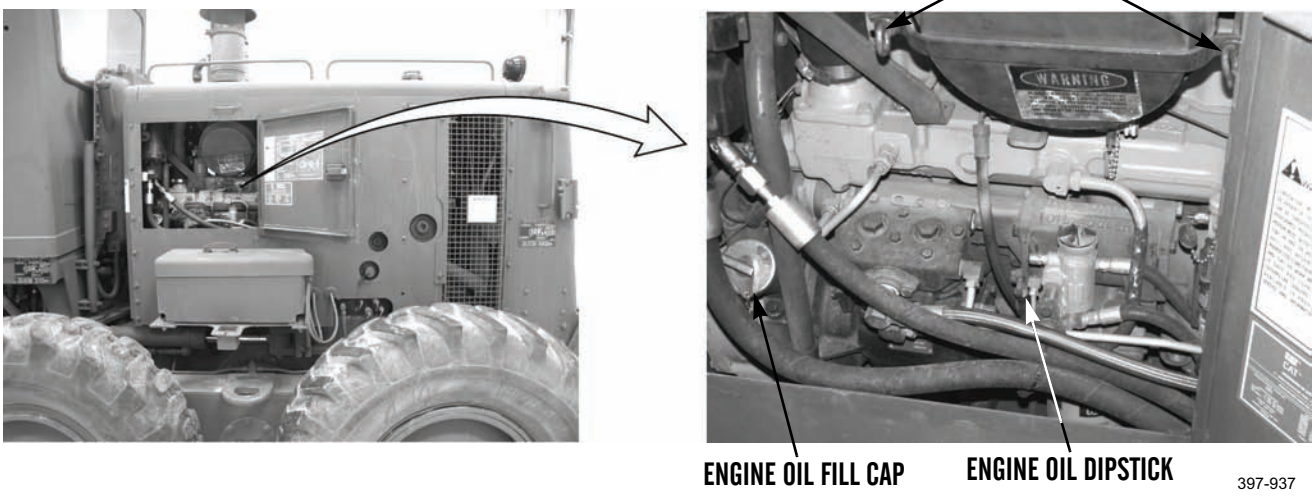
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
4	Before	0.1 Hours	Hydraulic Reservoir Oil Level Check	a. Visually check hydraulic tank, hoses, and fittings for damage or leaks. b. Check hydraulic oil level in sight gauge. Maintain oil level between the ADD and FULL marks. c. If oil is required, (1) Clean area around fill cap and tube. Remove cap and add oil (Item 11 or 14, WP 0022 00) as necessary. (2) Install fill cap securely.	Class III leaks are evident.



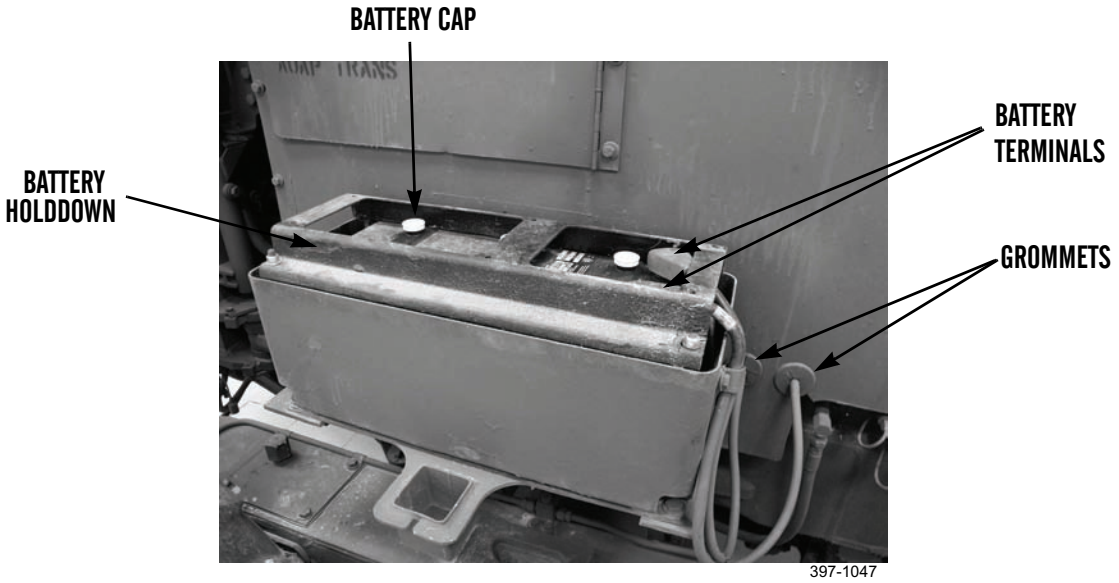
397-1119

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
5	Before		Air Pre-cleaner	 **WARNING**  • If NBC exposure is suspected, personnel wearing protective equipment should handle all air cleaner media. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures. • NBC contaminated filters must be handled using adequate precautions and must be disposed of by trained personnel. Check and clean precleaner screen.	
6	Before		Left Engine Compartment	a. Release retainer and open left side engine compartment access door.	
				b. Check left engine compartment for evidence of fluid leakage such as oil, coolant, and fuel.	Class III fuel or oil leaks are evident. Any coolant leak is evident.
				c. Check left rear engine compartment for damaged or missing drive belts and damaged or leaking coolant hoses.	

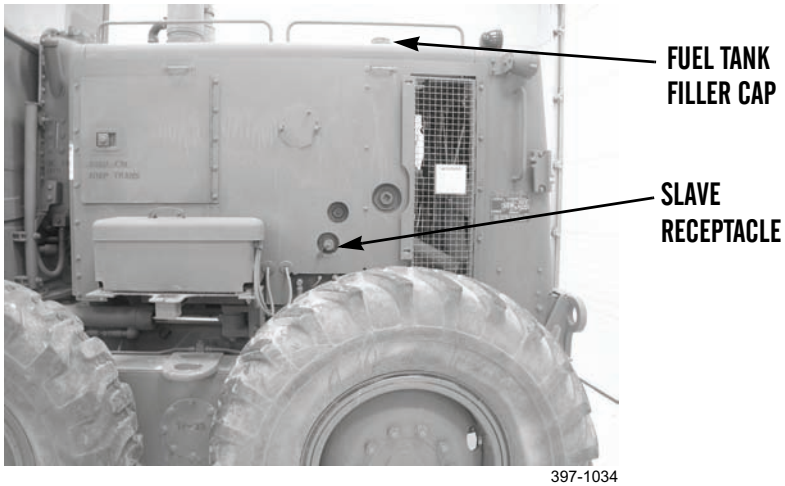
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
7	Before	0.1 Hours	Engine Oil Level Check	a. Clean area around engine dipstick and fill cap. b. Remove dipstick, clean, and reinstall. Remove dipstick and check level of oil on dipstick. Level should be in area indicated on the ENGINE STOPPED AND OIL COLD side of the dipstick. Maintain the level in the SAFE RANGE on the dipstick. c. Add oil (Item 10, 11, 12, or 14, WP 0022 00) as required through filler opening. Reinstall fill cap.	
8	Before		Primary and Secondary Air Filters	a. Loosen both eyebolts and remove air filter cover. b. Make sure primary and secondary air filters are present. c. Install cover and tighten eyebolts. d. Close left side engine compartment access door.	Missing or damaged air filter components.



ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
9	Before		Left Battery Compartment	Remove compartment access lid and check the following items:	
				a. Check left side battery, battery filler caps (if battery is equipped with filler caps), and battery hold-down for damaged or missing parts.	Battery, filler caps, or hold-down missing or damaged.
				b. Check for loose battery cables.	Cables are loose, missing, or damaged.
				c. Check for damaged or missing battery cable grommets.	
10	Before		NATO Receptacle	Ensure the NATO slave receptacle cover is installed.	

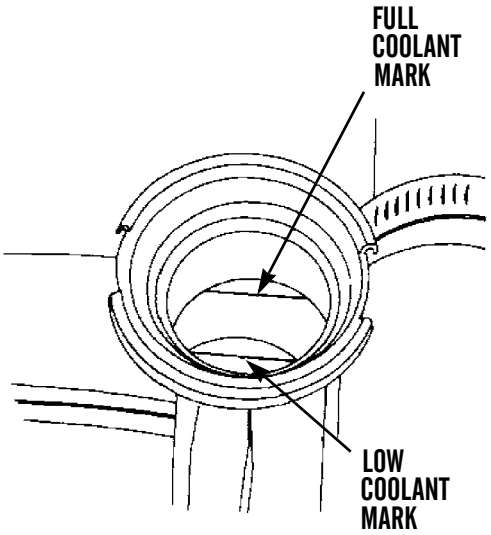


ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
11	Before		Fuel Tank Filler Cap	**WARNING** • DO NOT smoke or permit any open flame in area of machine while you are servicing fuel system. Be sure hose nozzle is grounded against filler tube during refueling to prevent static electricity. Failure to follow this warning may cause injury to personnel or equipment damage. • Operating personnel must wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing.	
				Ensure fuel level dipstick, screen and filler cap are present and secure.	Missing fuel tank filler cap.



397-1034

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
12	Before		Radiator	**WARNING** • DO NOT service cooling system unless engine has been allowed to cool down. This is a pressurized cooling system and escaping steam or hot coolant will cause serious burns. • DO NOT remove cooling system radiator cap when engine is hot. Allow engine to cool down. Loosen cap to first stop and let any pressure out of cooling system, then remove cap. Failure to follow this warning may cause serious burns. • Wear effective eye, glove, and skin protection when handling coolants. Failure to do so may cause injury to personnel. a. Open cap and remove cooling system pressure cap. b. Maintain coolant level between upper and lower marks on the inside of the filler neck. If necessary, add a 50/50 mixture of antifreeze (Item 1, WP 0022 00) and water.	

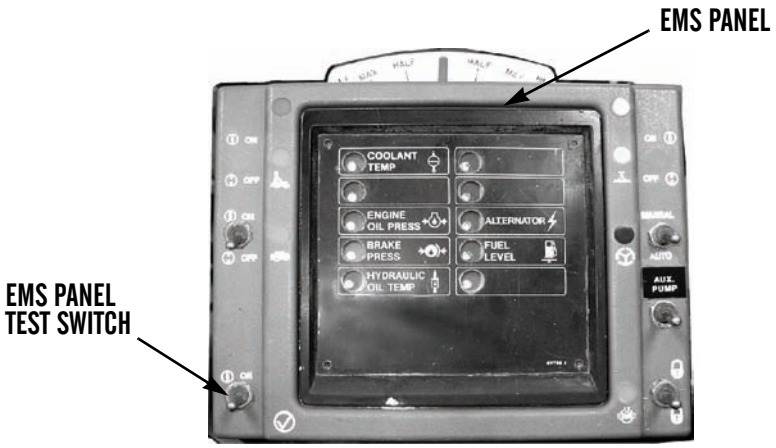


397-1126

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
13	Before		Below Engine Compartment	a. Check air tanks, lines, and valves for damaged or missing parts.	Damage that would impair operation is evident.
				b. Check both air tank valves to ensure they are closed.	
14	Before		Rear of Machine	a. Check for damage to rear blackout light, taillights, turn signal lights, or rear work light.	Damage that would impair operation is evident.
				b. Check radiator grille, backup alarm, and towing pin for debris and damage.	Damage that would impair operation is evident.
				c. Check under engine compartment for evidence of fluid leakages such as oil, coolant, fuel, and hydraulic fluid.	Class III fuel, oil, or hydraulic leaks are evident. Any coolant leak is evident.
				d. Check machine for obvious damage that would impair operation.	Damage that would impair operation is evident.
				e. Check rear support brackets mounted on rear bumper for damaged or missing components (if Equipped).	Missing or damaged if required for mission.
			RIGHT SIDE AND FRONT		
15	Before		Right Battery Compartment	Remove right side battery compartment access lid and check the following items:	
				a. Check right side battery, battery filler caps (if battery is equipped with filler caps), and battery holddown for damaged or missing parts.	Battery, filler caps, or holddown missing or damaged.
				b. Check for loose battery cables.	Cables are loose, missing, or damaged.
				c. Check for damaged or missing battery cable grommets.	

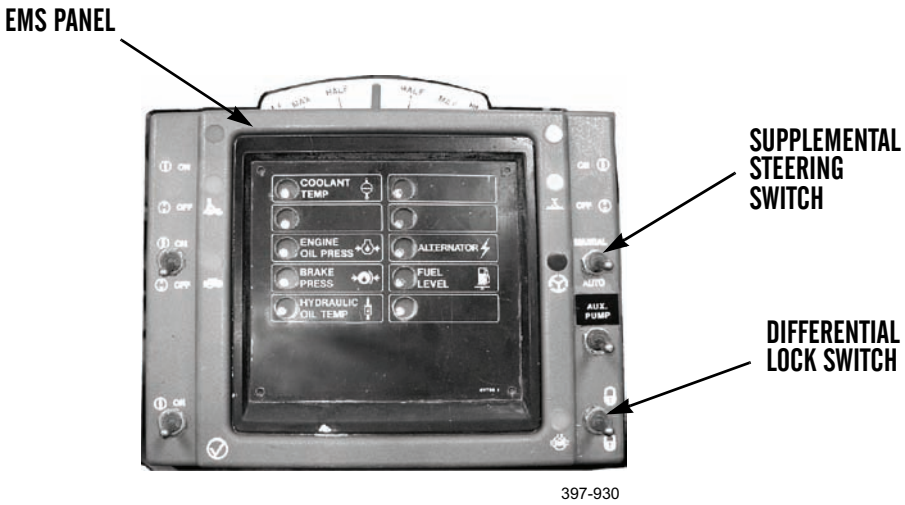
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
16	Before		Right Engine Compartment	a. Check right rear engine compartment for damaged or missing drive belts and damaged or leaking coolant hoses.	Missing or damaged components.
				b. Release retainer and open both right side engine compartment access doors.	Class III fuel or oil leaks are evident. Any coolant leak is evident.
				c. Check engine compartment for evidence of fluid leakage such as oil, coolant, and fuel.	
17	Before		Below Operator Compartment	a. Check hoses and connections below right side of operator compartment for damage or leaks.	Class III leaks or damage that would impair operation.
				b. Check cables for fraying or damage.	
				c. Check fuse box for missing fuses, damage, or corrosion.	Missing or damaged components if required for mission.
18	Before		Lights	Check right front work light, headlights, blackout drive light, and front turn signal lights for missing or damaged components.	Missing or damaged components if necessary for mission.
19	Before		Front of Machine	Check front towing pin for missing or damaged components.	Damaged or missing components if required for mission.
			CAB INTERIOR		
20	Before		Operator Seat and Seat Belt	Check seat and seat belt for damage and proper operation. Ensure seat adjustments can be made and seat locks in place.	Seat belt is damaged. Date on belt is more than three years old. Seat will not adjust/lock in place.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
21	Before		EMS Panel - Test Switch On and Engine Off	a. Turn the battery disconnect switch on and leave the engine off. b. Move the EMS Panel test switch to ON and check the following: (1) All indicators should be on. (2) Master fault light should be on. (3) Fault alarm should be off.	 Any indicators are off. Master fault light is off. Fault alarm is on.



ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
22	Before		EMS Panel - Test Switch Off and Engine Off	a. Move the EMS Panel test switch to OFF and check for the following:	
				(1) Coolant temperature indicator should be off.	Coolant temperature indicator is on.
				(2) Engine oil pressure indicator should be on.	Engine oil pressure indicator is off.
				(3) Brake air pressure indicator should be on.	Brake air pressure indicator is off.
				(4) Hydraulic oil temperature indicator should be off.	Hydraulic oil temperature indicator is on.
				(5) Alternator indicator should be on.	Alternator indicator is off.
				(6) Steering indicator should be on.	Steering indicator is off.
				(7) Master fault light should be off.	Master fault light is on.
				(8) Fault alarm should be off.	Fault alarm is on.
23	Before		EMS Panel - Test Switch Off and Engine On	a. Start the engine using the *Start Engine* procedure in WP 0005 00.	
				b. With the engine running, check for the following:	
				(1) All indicators should be off.	An indicator is on.
				(2) Master fault light should be off.	Master fault light is on.
				(3) Fault alarm should be off.	Fault alarm is on.
24	Before		EMS Panel - Test Switch On and Engine On	With the engine running and the EMS panel test switch on, check for the following:	
				(1) All indicators should be on.	An indicator is off.
				(2) Master fault light should be on.	Master fault light is off.
				(3) Fault alarm should be on.	Fault alarm is off.
25	Before		EMS Panel - Blade Float (if equipped)	**WARNING** Blade must be lowered before turning on the blade float switch. Failure to follow this warning may result in injury.	
				With engine running, move the Blade Float switch to ON. Blade float indicator should be on.	Blade float indicator is off.

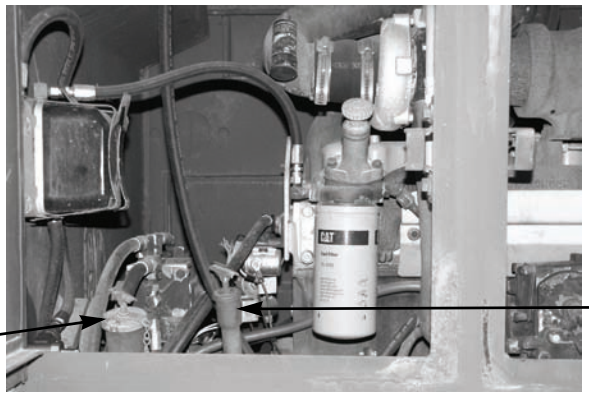
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
26	Before		EMS Panel - Supplemental Steering	**CAUTION** Do not hold the supplemental steering switch in the manual position for more than two seconds. Move the switch to manual position. Indictor light should go on and machine steers normally.	Supplemental steering indicator is off or steering is poor.
27	Before		EMS Panel - Differential Lock	Move the switch to unlock position. Indictor light should go off.	Differential lock indicator is on.



397-930

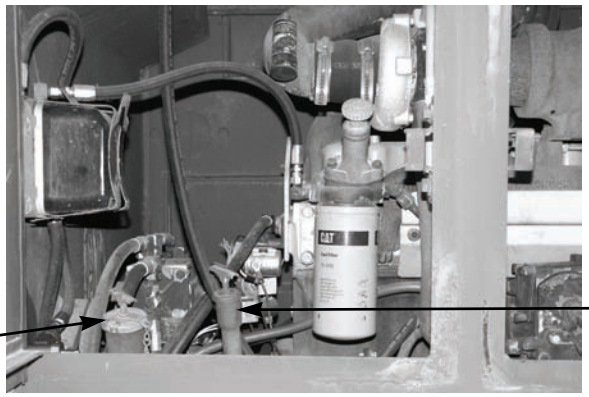
28	Before		Hydraulic Controls	Perform a functional check of all hydraulic systems: blade lift, centershift, blade slide, circle drive, blade tilt, wheel lean, and scarifier.	Class III oil leak is evident. Any hydraulic system or function does not operate properly.
29	Before		Steering Wheel and Column	Check steering wheel and column for damage and proper operation.	Damage that would impair operation is evident.
30	Before		Rearview Mirror and Side View Mirrors	Check and adjust rearview mirror. With assistance, check and adjust side view mirrors (if Equipped).	

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
31	Before		Lights	Check operation of lights (service and blackout lights, brake lights, turn signals, and work lights).	Any lights do not function, if required for mission.
32	Before		Wipers and Washers (if Equipped)	Operate all wipers and washer to verify correct operation.	Wipers and washers not operating if required for mission.
33	Before		Gauges	Check air pressure, oil temperature, and hour meter gauges for indication in normal range.	Gauge indication not in normal range.
34	Before		Fire Extinguisher	a. Visually check for missing or damaged fire extinguisher. Ensure it is securely stowed in mounting bracket.	Fire extinguisher is missing or damaged.
				b. Check gauge for reading in green area on gauge.	Pressure gauge needle is in red area.
				c. Check for damaged or missing seal.	Seal is broken or missing.
				d. Inspect fire extinguisher inspection tag.	Inspection date is not current and/or tag is missing.
35	Before		Backup Alarm and Horn	a. Verify that backup alarm functions when transmission is placed in R (Reverse).	Backup alarm does not function.
				b. Check operation of horn.	



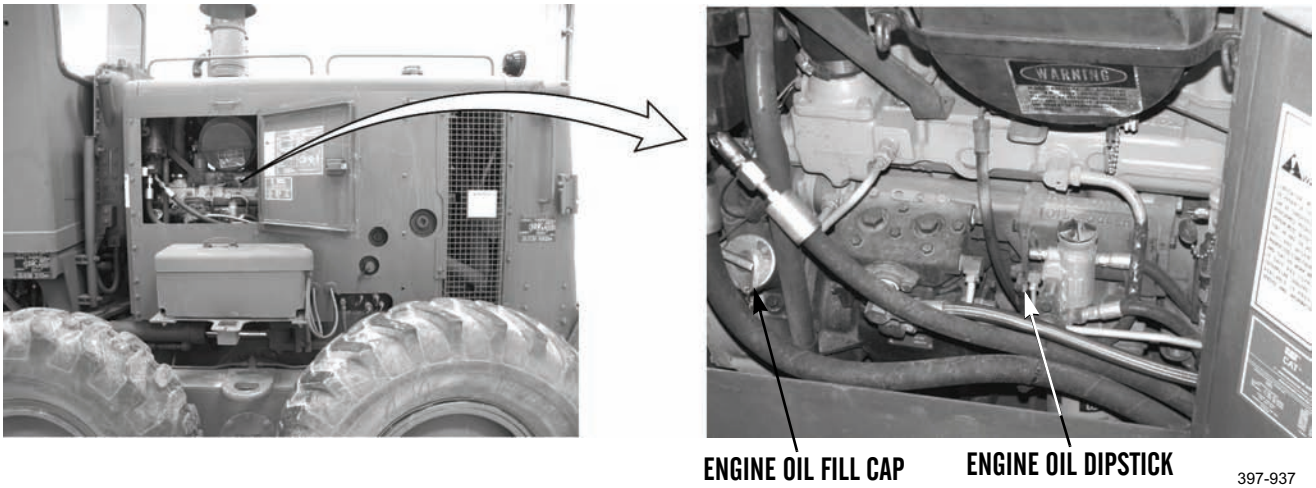
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
36	Before		Transmission/Differential Oil Level	a. While the engine is at low idle, check the transmission oil level. Maintain level in the OPERATING RANGE on the dipstick. b. If oil level is low, add oil (Item 10, 11, 12, or 14, WP 0022 00) through filler opening. Reinstall fill cap. DO NOT overfill.	
37	During		Pedals	Check accelerator pedal, decelerator pedal, service brake pedal, and transmission modulator pedal for binding and obstructions.	Pedal binds or does not operate properly.
38	During		Brakes	Check service brakes for pulling, grabbing, or reduced braking capacity.	Brakes pull, grab, or do not operate properly.
39	During		Steering	Check for smooth, controlled steering without pulling or drifting.	Steering is erratic.
40	During		Drive Train	Monitor grader operation for unusual noise or vibrations from engine, transmission, drive shafts, axles, and wheels. Notify Unit Maintenance if unusual noises are present.	
41	During		Blade and Scarifier	Monitor blade and scarifier operations for unusual noise or vibrations.	
42	During		Overall Leakage	Watch for evidence of fluid leakage.	Class III fuel, oil, or hydraulic fluid leaks are evident. Any coolant leak is evident.
43	During		Instrument Panel	a. With machine fully warmed up, monitor EMS panel indicators and readings on gauges.	Gauges indicate an abnormal reading.
				b. If an EMS panel indicator is flashing, troubleshoot system (WP 00010 00).	Engine oil pressure or air brake pressure EMS panel indicator is flashing.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
			ENGINE IDLING		
44	After		**Overall View**	**NOTE** Ensure machine is clean in order to facilitate performance of PMCS inspections.	
				a. Check under machine for evidence of fluid leakages such as oil, coolant, fuel, or hydraulic fluid.	Class III fuel, oil, or hydraulic fluid leaks are evident. Any coolant leak is evident.
				b. Check machine for obvious damage that would impair operation.	Damage that would impair operation is evident.
45	After		**Heater Controls (If equipped)**	Check heater for damage and verify correct operation.	Damaged or does not operate if required for mission.
46	After		**Transmission/Differential Oil Level**	a. While the engine is at low idle, check the transmission oil level. Maintain level in the OPERATING RANGE on the dipstick.	
				b. If oil level is low, add oil (Item 10, 11, 12, or 14, WP 0022 00) through filler opening. Reinstall fill cap. DO NOT overfill.	

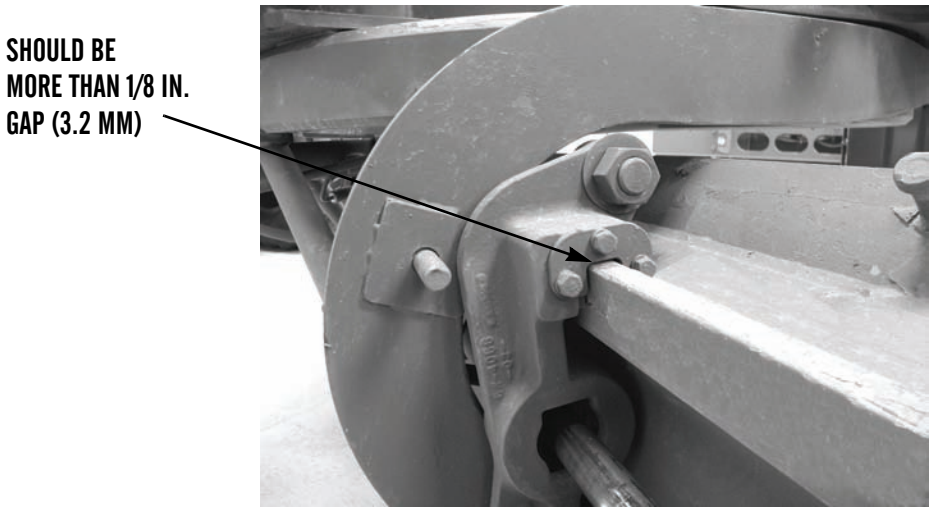


397-1050

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
47	After	0.1 Hours	Engine Oil Level Check	**NOTE** To ensure an accurate reading, machine must be parked on level ground. Allow machine to idle for 10 minutes. a. Clean area around engine dipstick and fill cap. b. With engine at low idle, remove dipstick, clean, and reinstall. Remove dipstick and check level of oil on ENGINE IDLING side of dipstick. Level should be between ADD and FULL. c. Add oil (Item 10, 11, 12, 13, or 14, WP 0022 00) as required through filler opening. Reinstall fill cap. d. Close engine compartment access doors. e. Shut down engine (WP 0005 00).	

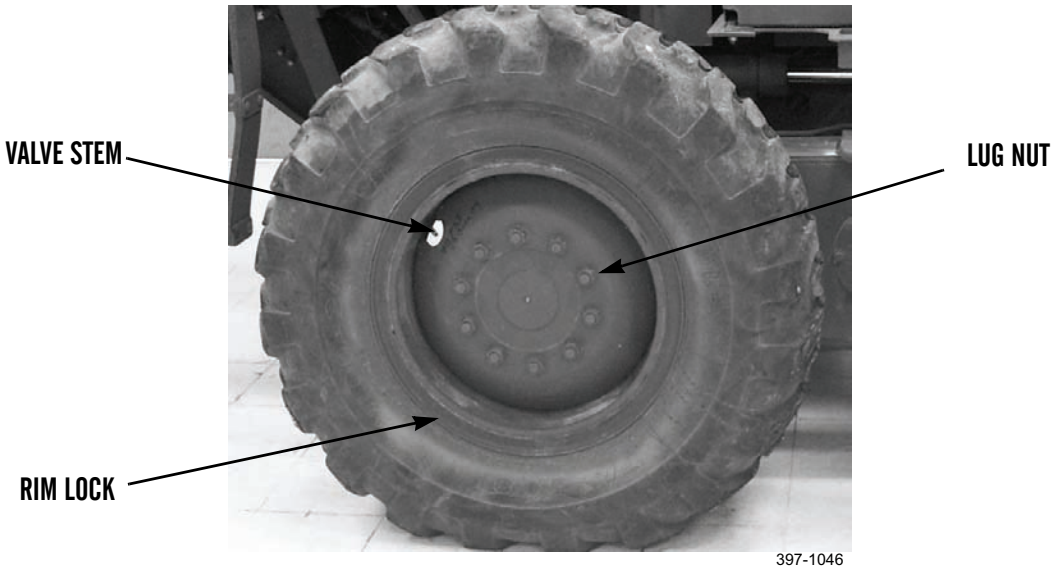


ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
				WARNING	
			LEFT SIDE AND REAR	Improperly inflated tires can cause excessive heat buildup resulting in blowouts. Failure to follow this warning may cause injury to personnel or damage to equipment.	
48	**After**		**Left Front Wheel and Tire**	a. Visually check left front tire for cuts or bulges in tread or sidewall area. Check for uneven wear or underinflation. Look for foreign material embedded in tread or sidewall area. Remove foreign material if found.	Tire has cuts or bulges in tread or sidewall area or other damage that would impair operation.
				b. Check for loose or missing lug nuts or valve stem caps.	Missing two or more lug nuts or has damaged valve stem.
49	**After**		**Steering**	a. Check steering linkage for cracks, distortion, or damage.	Cracks or distortion in steering linkage that would impair operation.
				b. Check left front steering cylinder and hoses for damage or leaks.	Class III leaks or damage that would impair operation.
50	**After**		**Drawbar**	a. Check drawbar and drawbar pivot point for damage.	Class III leaks or damage that would impair operation.
				b. Check all hoses and fittings for leaks.	
51	**After**		**Scarifier**	Check scarifier frame, link rod, and teeth for excessive wear, damage, or missing components.	Damage that would impair operation, or missing six scarifier teeth if required for mission.
52	**After**		**Hydraulic Cylinders**	a. Check scarifier hydraulic cylinder and hoses for damage or leaks.	Class III leaks or damage that would impair operation.
				b. Check left lift cylinder and hoses for damage or leaks.	Class III leaks or damage that would impair operation.
				c. Check centershift cylinder and hoses for damage or leaks.	Class III leaks or damage that would impair operation.
53	**After**		**Circle Drive**	a. Check all circle drive components for damage or debris. Remove debris.	Damage to circle drive that would impair operation.
				b. Check circle drive for damage or leaks.	Class III leaks or damage that would impair operation.

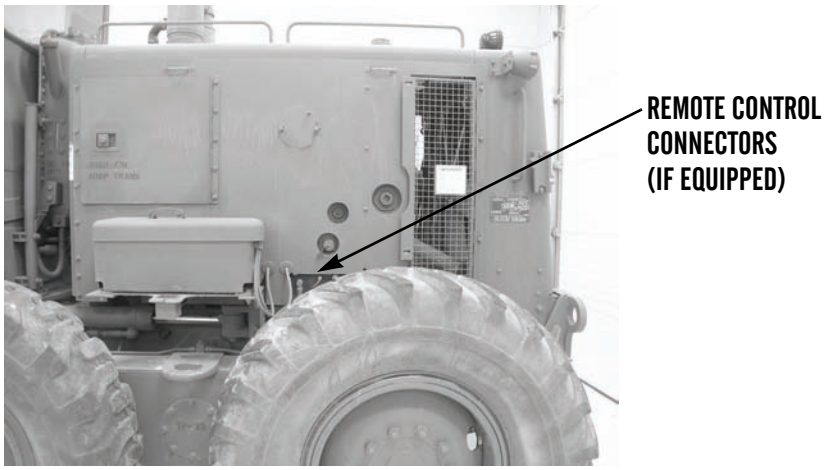
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
54	After		**Blade Slide Bushings**	Check the blade slide bushings on both ends for excessive wear. The gap between the blade bracket and blade should be greater than 1/8 in.	Blade slide bushing has excessive wear.
				 397-1049	
55	After		**Blade and Cutting Edges**	a. Check the blade for damage or distortion.	Damage or distortion.
				b. Check the cutting edges for damage or loose bolts.	Damage or loose bolts.
				c. Check the cutting edges for excessive wear.	Cutting edge is worn to within 3/4 in. (19 mm) of blade.
				d. Check sideshift cylinder for debris, damage, or leaks. Remove debris.	Class III leaks or damage that would impair operation.
56	After		**Blade Work Lights**	Ensure the blade work lights are present and securely mounted.	
57	After		**Left Door (if Equipped)**	Check left door for damage or missing components.	Missing or damaged components if necessary for mission.
58	After		**Left Mirror and Step (if Equipped)**	Check the left side mirror and step for damage or missing components.	Missing or damaged components if necessary for mission.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
59	After		Rollover Protection Structure (ROPS)	Check ROPS for damage and loose or missing mounting bolts.	Loose or missing ROPS bolts or damaged to structure.
60	After		Left Side Hitch Area	**WARNING** Hitch and steering movement can reduce clearances suddenly and cause injury to personnel. Always stop engine BEFORE working in area of hitch link.	
				a. Check castings and stops for damage.	Damage that would impair operation is evident.
				b. Visually check for any obstructions between moving components of hitch. Remove obstructions and check for damage.	Damage that would impair operation is evident.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
61	After		Left Rear Wheels and Tires	**WARNING** Improperly inflated tires can cause excessive heat buildup resulting in blowouts. Failure to follow this warning may cause injury to personnel or damage to equipment.	
				a. Visually check left front tire for cuts or bulges in tread or sidewall area. Check for uneven wear or underinflation. Look for foreign material embedded in tread or sidewall area. Remove foreign material if found.	Tire has cuts or bulges in tread or sidewall area or other damage that would impair operation.
				b. Check for loose or missing lug nuts or valve stem caps.	Missing two or more lug nuts or has damaged valve stem.

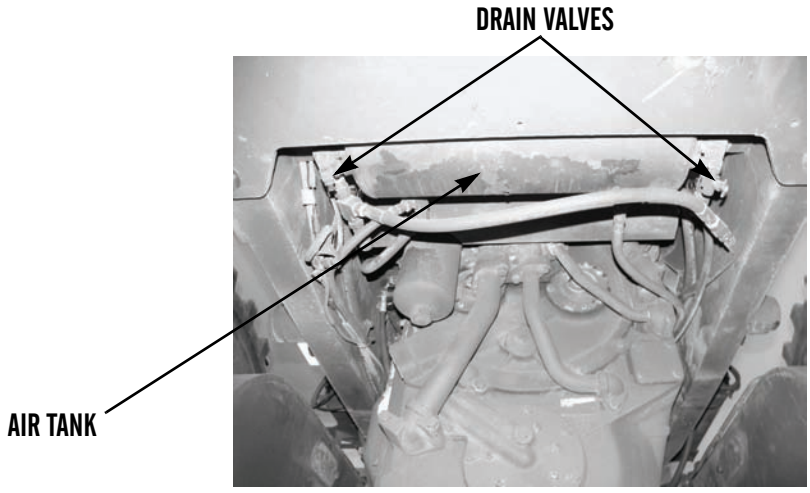


397-1046

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
62	After		**Remote Control Connectors (if Equipped)**	Check for leaks and for missing caps on connectors. Install caps if necessary.	Class III leaks are evident.
				 397-1034	
63	After		**Left Tandem Housing**	Check for damage and leaks from tandem housing.	Class III oil leak or damage is evident.
64	After		**Left Side Engine Compartment**	a. Open left side engine compartment access doors.	
				b. Check engine compartment for evidence of fluid leakage such as oil, coolant, and fuel.	Class III oil leaks are evident. Any coolant leak is evident.
				c. Check engine compartment for any of the following conditions. Notify Unit Maintenance as needed: (1) Loose or damaged coolant hoses (2) Damaged electrical harnesses (3) Damaged cooling fan or clogged radiator	Damage that would impair operation is evident.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
64 (Con't)				d. Locate battery cables that are routed into engine compartment from battery compartment. Check for the following:	
				(1) Loose, broken, split, or frayed battery cables	Cables are loose or damaged.
				(2) Damaged or missing battery cable grommets	
65	After		Engine Air Precleaner and Primary Element	 **WARNING** 	
				• If NBC exposure is suspected, personnel wearing protective equipment should handle all air cleaner media. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures.	
				• NBC contaminated filters must be handled using adequate precautions and must be disposed of by trained personnel.	
				a. Clean engine air precleaner if debris is visible in precleaner (WP 0014 00).	
				b. Inspect primary element and clean if necessary (WP 0015 00).	
66	After		Fuel Tank Filler Tube and Fuel Tank	 **WARNING**	
				• DO NOT smoke or permit any open flame in area of machine while you are servicing fuel system. Be sure hose nozzle is grounded against filler tube during refueling to prevent static electricity. Failure to follow this warning may cause injury to personnel or equipment damage.	
				• Operating personnel must wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing.	
				a. Check for damage or fuel leaks from fuel tank drain valve.	Class III fuel leaks are evident.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
66 (Con't)				**NOTE** • Place portable fire extinguisher within reach prior to refueling. • DO NOT overfill fuel tank. If fuel starts foaming from fuel tank, stop IMMEDIATELY to avoid fuel spillage.	
				b. Check fuel tank filler tube and cap for damage or leaks.	Class III fuel leaks or damage are noted.
				c. Remove fuel tank filler cap. Inspect cap gasket for damage.	Fuel cap gasket is missing or damaged.
				d. Add fuel (Item 5, 6 or 7, WP 0022 00) to tank. DO NOT overfill. Reinstall fuel cap and secure.	
67	After		Radiator	 **WARNING**  • DO NOT service cooling system unless engine has been allowed to cool down. This is a pressurized cooling system and escaping steam or hot coolant will cause serious burns. • DO NOT remove cooling system radiator cap when engine is hot. Allow engine to cool down. Loosen cap to first stop and let any pressure out of cooling system, then remove cap. Failure to follow this warning may cause serious burns. • Wear effective eye, glove, and skin protection when handling coolants. Failure to do so may cause injury to personnel. **NOTE** If there is an accumulation of debris at hydraulic oil cooler and radiator, engine grille must be removed to allow a thorough cleaning. Notify Unit Maintenance.	

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
67 (Con't)				a. Check radiator for debris. b. Remove debris. If debris cannot be removed, notify Unit Maintenance. c. Visually check radiator for signs of leakage or damage.	Damage that would impair operation is evident.
				 397-1052	
68	**After**		**Air System Tank**	a. Check air tank, lines, and valves under rear of engine compartment for leaks and damaged or missing parts.	Any air leak or damage that would impair operation is evident.
				WARNING Wear suitable eye protection and keep face and eyes away from exhausting air tank drain valves. Failure to do so may cause injury to personnel.	
				b. Open both drain valves on each end of air tank. Drain all moisture and sediment. Check for oil in draining air. If oil is noted, notify Unit Maintenance. Close drain valves when all air and moisture has vented.	

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
			RIGHT SIDE AND FRONT		
69	**After**		**Right Rear Wheels and Tires**	a. Visually check tire for cuts or bulges in tread or sidewall area. Check for uneven wear or underinflation. Look for foreign material embedded in tread or sidewall area. Remove foreign material if found.	Tire has cuts or bulges in tread or sidewall area or other damage that would impair operation.
				b. Check for loose or missing lug nuts, and valve stem with cap.	Damaged valve stem or missing two or more lug nuts.
70	**After**		**Right Tandem Housing**	Check for damage and leaks from right side tandem housing.	Class III oil leak or damage is evident.
71	**After**		**Air Dryer (if Equipped)**	Check air dryer for damage or signs of leakage.	Damage that would impair operation is evident.

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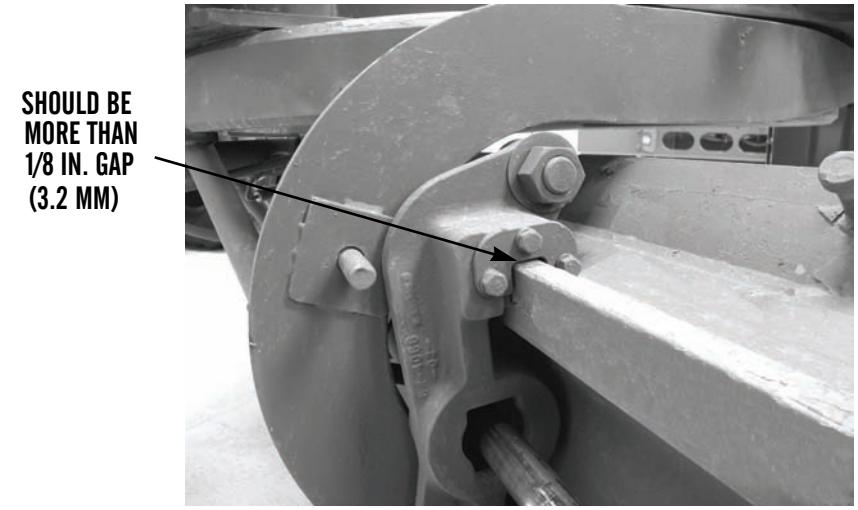
72	**After**		**Drain Fuel Water Separator (if Equipped)**	**NOTE** Notify Unit Maintenance if fuel does not turn clear. Open fuel water separator valve behind right side engine access door. Drain fuel into approved container to remove water and foreign particles.	

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
73	After		Air Filter Service Indicator	a. Check for air cleaner indicator in red range. b. Ensure air filter service indicator shows green or yellow and is not damaged. Service air cleaner if red band is showing (WP 0014 00).	Red band is showing.
				 397-1050	
74	After		Muffler	Check muffler for damage or missing components.	Damage that would impair operation.
75	After		Right Side Hitch Area	**WARNING** Hitch and steering movement can reduce clearances suddenly and cause injury to personnel. Always stop engine BEFORE working in area of hitch link.	
				a. Check castings and stops for damage.	Damage that would impair operation is evident.
				b. Visually check for any obstructions between moving components of hitch. Remove obstructions and check for damage.	Damage that would impair operation is evident.
76	After		Rollover Protective Structure (ROPS)	Check ROPS for damage and loose or missing mounting bolts.	One loose or missing ROPS bolt or damaged to structure.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
77	After		Right Door (If equipped)	Check right door for damage or missing components.	Missing or damaged components if necessary for mission.
78	After		Right Mirror and Step (If equipped)	Check the right side mirror and step for damage or missing components.	Missing or damaged components if necessary for mission.
79	After		Blade Work Lights	Ensure the blade work lights are present and securely mounted.	
80	After		Blade Slide Bushings	Check the blade slide bushings on both ends for excessive wear. The gap between the blade bracket and blade should be 1/8 in. or larger.	Blade slide bushing has excessive wear.

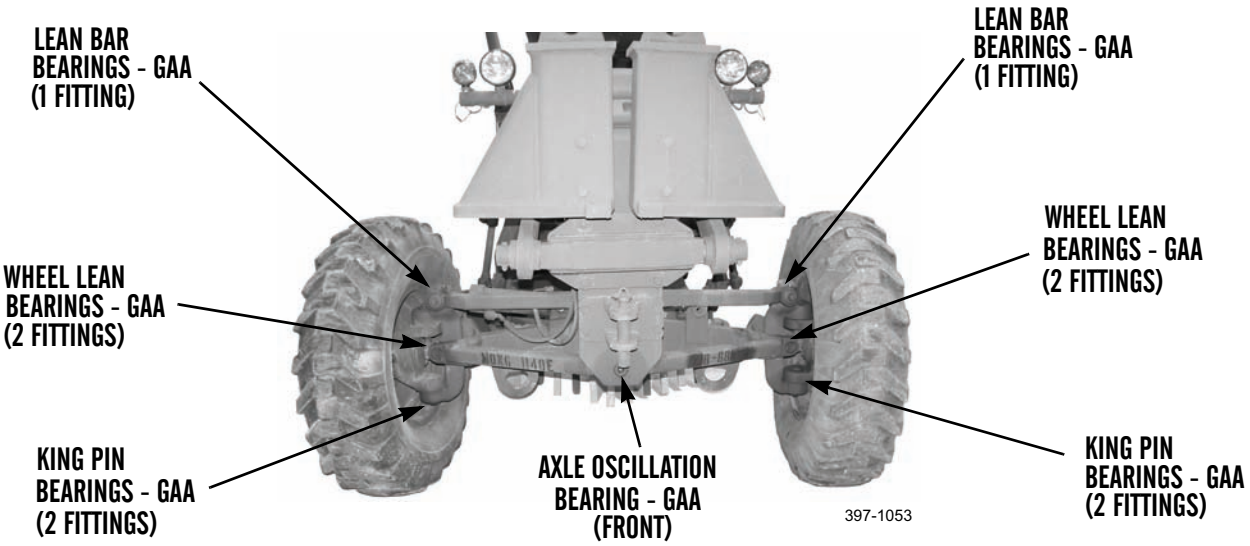


397-1049

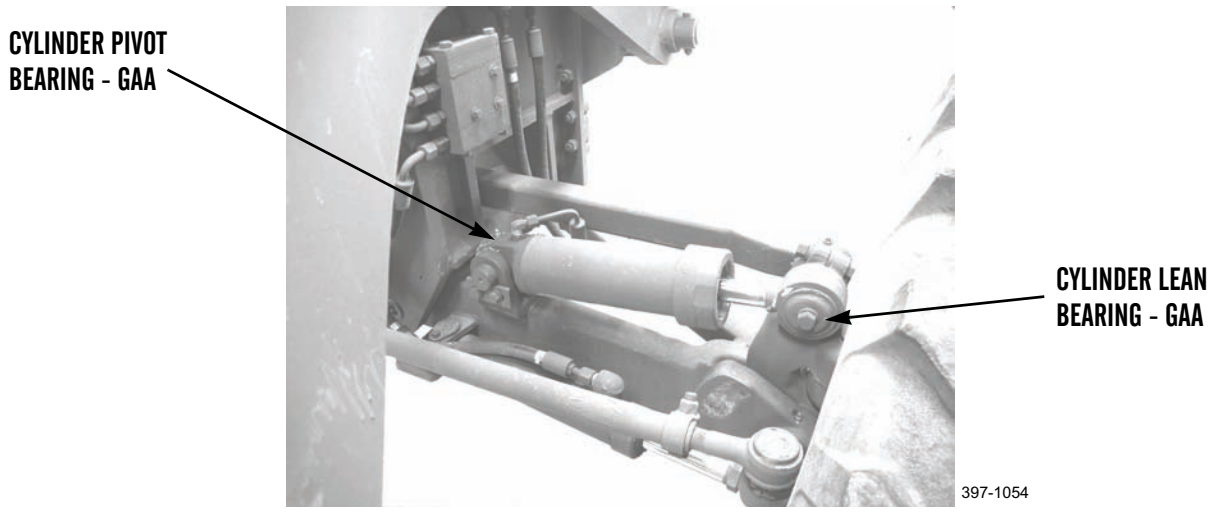
81	After		Blade and Cutting Edges	a. Check the blade for damage or distortion.	Damage or distortion.
				b. Check the cutting edges for damage and loose or missing bolts.	Damage or loose bolts.
				c. Check the cutting edges for excessive wear.	Cutting edge is worn to within 3/4 in. (19 mm) of blade.
				d. Check sideshift cylinder for debris, damage, or leaks. Remove debris.	Class III leaks or damage that would impair operation.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
82	After		Cutting Edge and End Bits	**NOTE** • If blade cutting edge or end bits are worn or damaged, notify Unit Maintenance. • Obtain appropriate measuring device from Unit Maintenance to measure cutting edge wear.	
				a. Inspect cutting edge for excessive wear, cracks, breaks, and loose or missing mounting hardware.	Cutting edge is worn to within 3/4 in. of blade or is damaged, or two or more mounting bolts are missing.
				b. Inspect both end bits of the blade for cracks, breaks, loose or missing mounting hardware, and excessive wear.	End bit is worn down to blade or damaged, or loose mounting hardware is evident.
83	After		Hydraulic Cylinders	a. Check right lift cylinder and hoses for damage or leaks.	Class III leaks or damage that would impair operation.
				b. Check centershift cylinder and hoses for damage or leaks.	Class III leaks or damage that would impair operation.
				c. Check sideshift cylinder and hoses for damage or leaks.	Class III leaks or damage that would impair operation.
84	After		Circle Drive	a. Check all circle drive components for damage or debris. Remove debris.	Damage to circle drive that would impair operation.
				b. Check circle drive for damage or leaks.	Class III leaks or damage that would impair operation.
85	After		Scarifier	Check scarifier frame, link rod, and teeth for excessive wear, damage, or missing components.	Damage that would impair operation or missing six scarifier teeth, if required for mission.
86	After		Drawbar	a. Check drawbar and drawbar pivot point for damage.	Class III leaks or damage that would impair operation.
				b. Check all hoses and fittings for leaks.	
87	After		Steering	a. Check steering linkage for cracks, distortion, or damage.	Cracks or distortion to steering linkage that would impair operation.
				b. Check right front steering cylinder and hoses for damage or leaks.	Class III leaks or damage that would impair operation.

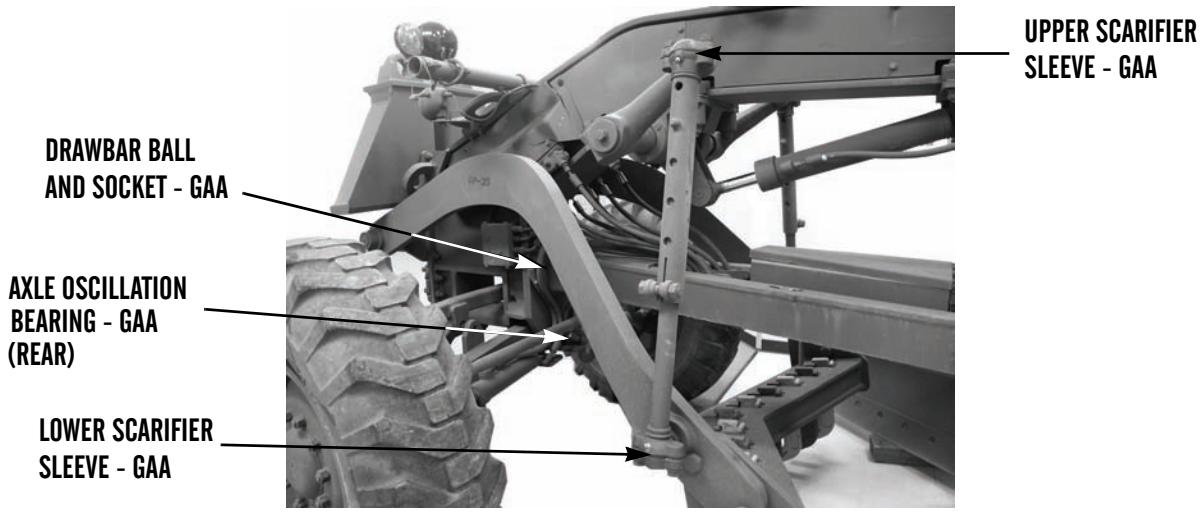
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
88	**After**		**Right Front Wheel and Tire**	a. Visually check right front tire for cuts or bulges in tread or sidewall area. Check for uneven wear or underinflation. Look for foreign material embedded in tread or sidewall area. Remove foreign material if found.	Tire has cuts or bulges in tread or sidewall area or other damage that would impair operation.
				b. Check for loose or missing lug nuts, and valve stem with cap.	Damaged valve stem or missing two or more lug nuts.
89	**Weekly**	**0.2 Hours**	**Front End Grease Points**	a. Apply GAA grease (Item 8, WP 0022 00) to two lean bar bearing grease fittings.	
				b. Apply GAA grease (Item 8, WP 0022 00) to four wheel lean bearing grease fittings.	
				c. Apply GAA grease (Item 8, WP 0022 00) to four king pin bearing grease fittings.	
				d. Apply GAA grease (Item 8, WP 0022 00) to axle oscillation bearing grease fittings.	



ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
90	Weekly	0.2 Hours	Wheel Lean Cylinder	a. Apply GAA grease (Item 8, WP 0022 00) to cylinder pivot bearing grease fitting. b. Apply GAA grease (Item 8, WP 0022 00) to cylinder lean bearing grease fitting.	

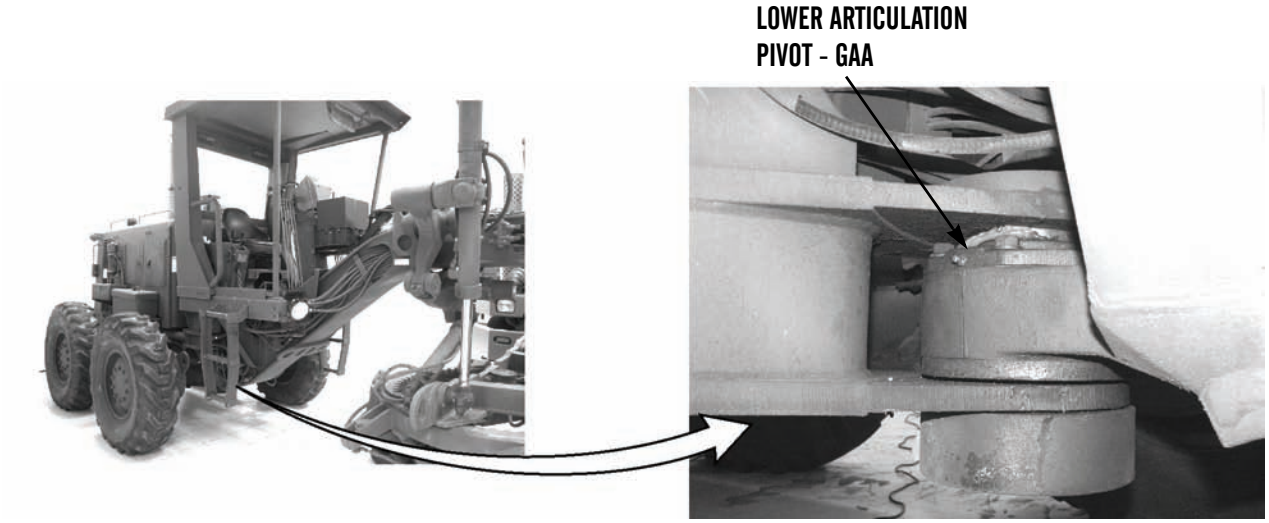


ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
91	Weekly	0.2 Hours	Scarifier and Drawbar	a. Apply GAA grease (Item 8, WP 0022 00) to right upper and lower scarifier sleeve grease fittings. b. Apply GAA grease (Item 8, WP 0022 00) to left upper and lower scarifier sleeve grease fittings. c. Apply GAA grease (Item 8, WP 0022 00) to drawbar ball and socket grease fitting. d. Apply GAA grease (Item 8, WP 0022 00) to axle oscillation bearing grease fitting.	

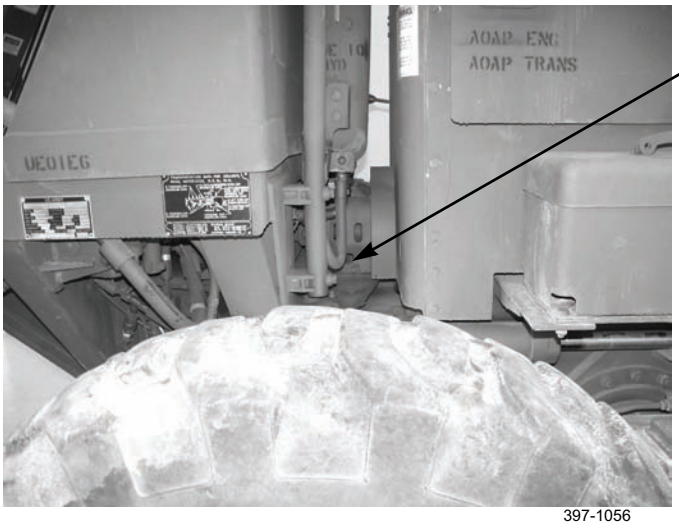


397-1055

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
92	Weekly	0.2 Hours	Articulation Pivot	a. Apply GAA grease (Item 8, WP 0022 00) to upper articulation pivot grease fitting. b. Apply GAA grease (Item 8, WP 0022 00) to lower articulation pivot grease fitting.	



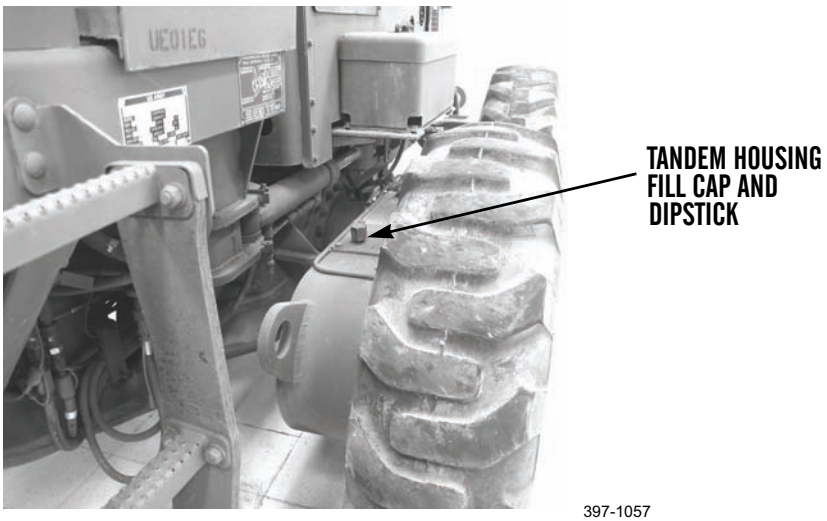
397-1121



397-1056

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
93	Weekly		Left Battery Compart-ment	  **WARNING** 	
				• To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. DO NOT smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating, damage to equipment, and injury to personnel. • Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes, or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may cause death or serious injury to personnel. • DO NOT use compressed air to clean batteries. Use a clean, dry rag.	
				CAUTION To reduce battery damage, check battery compartment for corrosion (greenish/white powder) and DO NOT jerk or pull on battery cables during visual inspection.	
				a. Remove cover to battery compart-ment.	
				b. Check holddown for looseness or damage.	Holddown is loose or dam-aged.
				c. Inspect battery for a cracked case and evidence of leaking.	Battery case is cracked or leaks are evident.
				NOTE If machine is equipped with original equipment maintenance-free batteries, batteries will have no filler caps.	
				d. Check for damaged or missing battery filler caps.	Damaged or missing filler caps are noted.
				e. Check for missing, broken, split, or frayed battery cables.	Damage is noted.
				f. Check for damaged battery posts.	Damage is noted.
				g. Install battery compartment cover.	

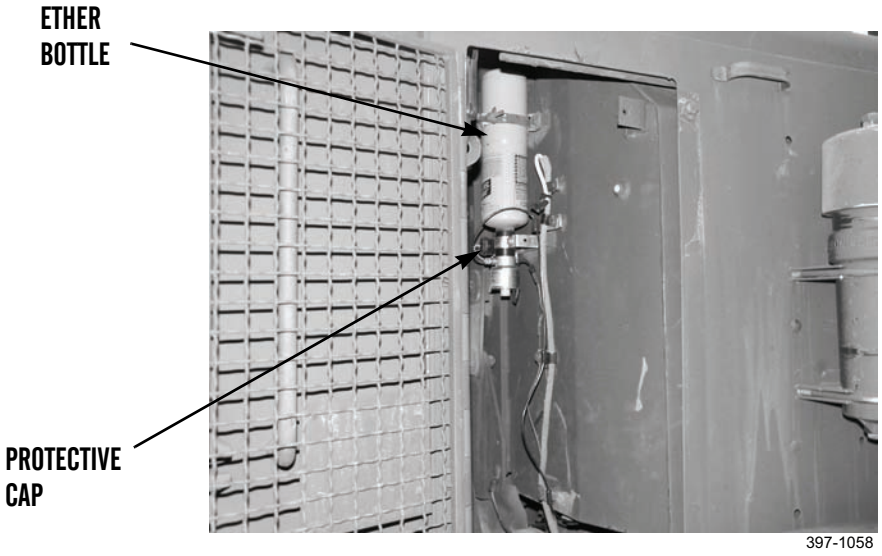
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
93 (Con't)				h. Check for rust, corrosion, and cleanness. i. Check battery cable grommets for dry rot and loose or missing condition. If condition exists, contact Unit Maintenance for new grommets and install.	
94	**Weekly**		**Left Tandem Oil Level**	Check left tandem housing oil level on both sides. Dipstick is under fill cap. Maintain the level between the ADD and FULL marks on the dipstick.	



397-1057

95	**Weekly**		**Ether Cold Start System**	**WARNING** Ether fuel is extremely flammable and toxic. DO NOT smoke and make sure you are in a well-ventilated area away from heat, open flames, or sparks. Wear eye protection. Avoid contact with skin and eyes and avoid breathing ether fumes. If fluid enters or fumes irritate the eyes, wash immediately with large quantities of clean water for 15 minutes. Seek medical attention immediately if ether is inhaled or causes eye irritation. Failure to follow this warning may cause injury or death to personnel.	

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
95 (Con't)				a. Remove two bolts and open right rear engine access cover. b. Check for loose connections and damage to lines, fittings, and ether cylinder. Ensure cylinder is securely mounted. Be alert for odor of leaking ether. c. Check and install protective cap on fitting when ether cylinder is not installed. d. Close right rear engine access cover. Install two bolts.	Damage or evidence of leaks is noted, or ether cylinder is missing, if required for mission.
96	**Weekly**		**Exhaust System**	Check exhaust system pipes, clamps, and muffler for looseness, leakage, and damage.	Damage or leaks are noted.

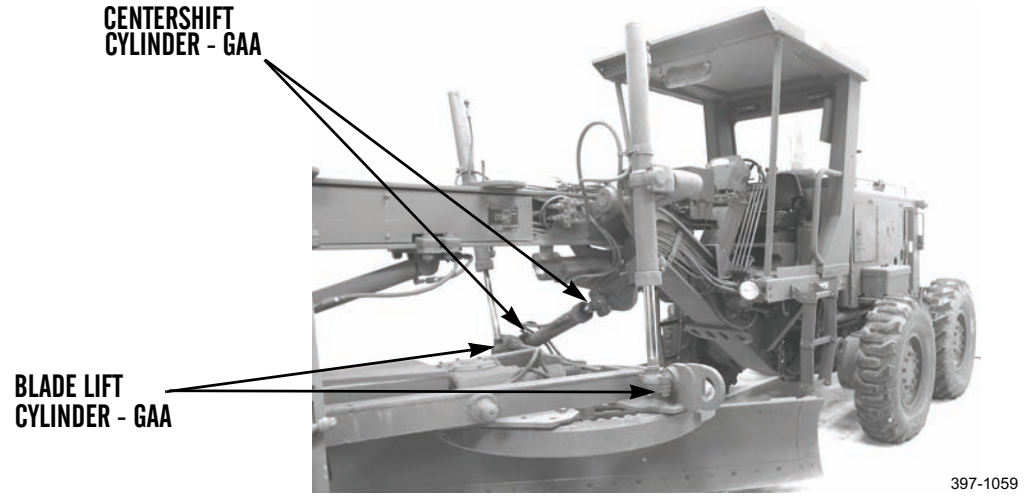


ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
97	Weekly		Right Battery Compartment	  **WARNING**  • To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. DO NOT smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating, damage to equipment, and injury to personnel. • Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes, or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may cause death or serious injury to personnel. • DO NOT use compressed air to clean batteries. Use a clean, dry rag. **CAUTION** To reduce battery damage, check battery compartment for corrosion (greenish/white powder) and DO NOT jerk or pull on battery cables during visual inspection.	
				a. Remove cover to battery compartment.	
				b. Check holddown for looseness or damage.	Holddown is loose or damaged.
				c. Inspect battery for a cracked case and evidence of leaking.	Battery case is cracked or leaks are evident.
				NOTE If machine is equipped with original equipment maintenance-free batteries, batteries will have no filler caps.	
				d. Check for damaged or missing battery filler caps.	Damaged or missing filler caps are noted.
				e. Check for missing, broken, split, or frayed battery cables.	Damage is noted.
				f. Check for damaged battery posts.	Damage is noted.
				g. Install battery compartment cover.	

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
97 (Con't)				h. Check for rust, corrosion, and cleanliness. i. Check battery cable grommets for dry rot, looseness or if missing. If condition exists, contact Unit Maintenance for new grommets and install.	
98	**Weekly**		**Right Tandem Oil Level**	Check right tandem housing oil level on both sides. Dipstick is under fill cap. Maintain the level between the ADD and FULL marks on the dipstick.	
99	**Weekly**		**ROPS**	a. Check ROPS for loose, damaged, or missing mounting hardware. Notify Unit Maintenance to retorque/ replace mounting hardware. b. Check ROPS for any signs of cracking in base metal or welded areas.	Loose, damaged, or missing mounting hardware is noted. Any signs of damage or cracked welds are noted.
100	**Weekly**		**Air System Pressure Check**	Perform the following test of air system: a. Start engine and allow air pressure to reach 110±10 psi (758±69 kPa). b. Apply and hold service brake pedal. Shut down engine. c. Reading on air pressure gauge should not drop more then 5 psi (34 kPa) after the engine is stopped for 10 minutes.	Drop of air pressure is greater than 5 psi (35 kPa) in 10 minutes.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
101	Weekly		Wheels and Tires	a. Check for loose or missing lug nuts or valve stem caps. Notify Unit Maintenance if lug nuts are loose.	Missing two or more lug nuts or has damaged valve stem.
				WARNING • Operating machine with underinflated or defective tire may lead to tire failure and loss of traction or control. Damage to equipment or injury to personnel may result. • If tire pressure is 0 psi (0 kPa), DO NOT inflate. Notify Unit Maintenance. Failure to follow this warning may cause injury or death to personnel.	
				b. Park machine so that valve stem is at 9 o'clock or 3 o'clock.	
				c. Clean area around valve stem, then remove valve stem cap.	
				d. Check gauge air pressure in each tire with tire pressure gauge. Tire inflation should be 35 psi (241 kPa).	
				WARNING Use a self-inflating chuck and stand at tread side of tire at maximum distance allowed by inflation hose. Failure to do so could result in injury or death to personnel.	
				e. Adjust air pressure in tire as required to 35 psi (241 kPa). Use the pneumatic tire inflation hose assembly.	
				f. Install valve stem cap.	

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
102	Monthly	0.2 Hours	Blade Lift and Centershift Cylinders	a. Apply GAA grease (Item 8, WP 0022 00) to blade lift cylinder grease fittings. b. Apply GAA grease (Item 8, WP 0022 00) to centershift cylinder grease fittings.	

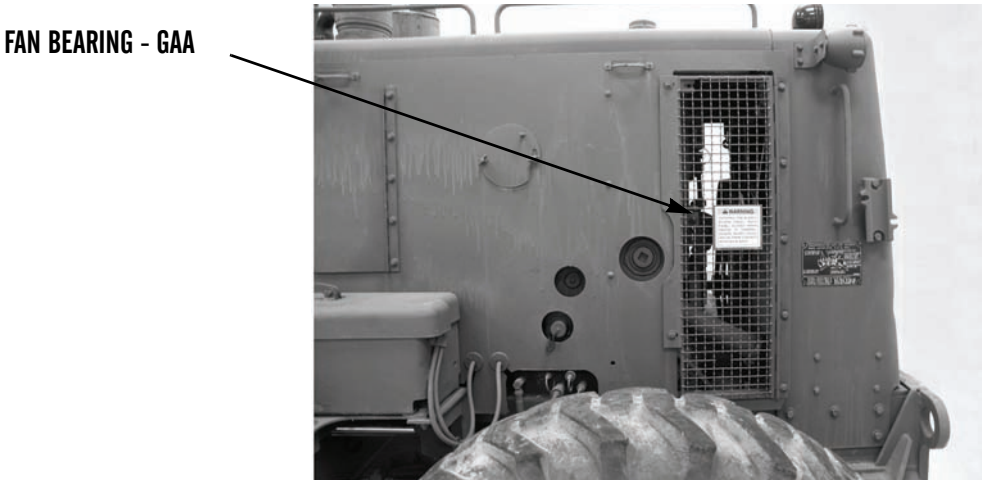


397-1059

NOTE

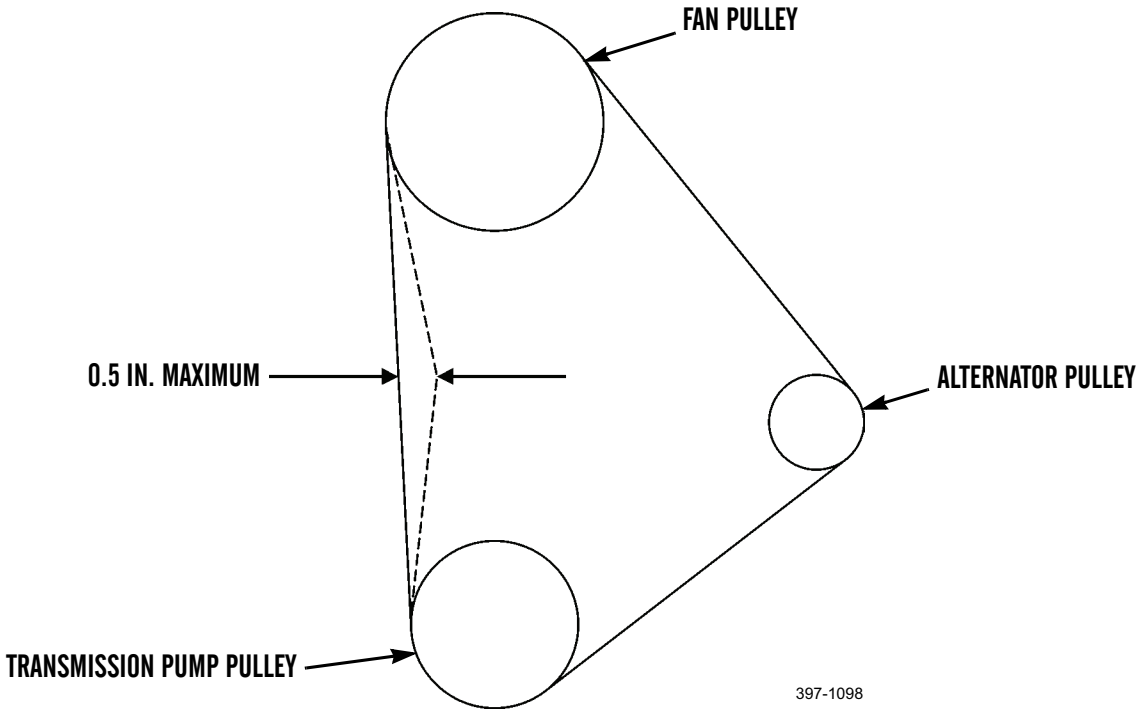
If any remote lubrication lines are damaged, notify Unit Maintenance. These lines must be filled with grease.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
103	Monthly	0.2 Hours	Radiator Fan Bearing	Apply GAA grease (Item 8, WP 0022 00) to fan bearing grease fittings.	



397-1060

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
104	Monthly		Drive Belts	a. Remove two bolts and open left rear engine compartment access door.	
				b. Check belts for 1/2 in. deflection at mid-point of longest segment of belt.	Drive belt has more than 1/2 in. deflection.
				c. Check for missing, frayed, or cracked drive belts.	Drive belt is missing or damaged.
				d. Check for loose or damaged drive pulleys.	Pulley is loose or damaged.
				e. Close left rear engine compartment access door and install two bolts.	

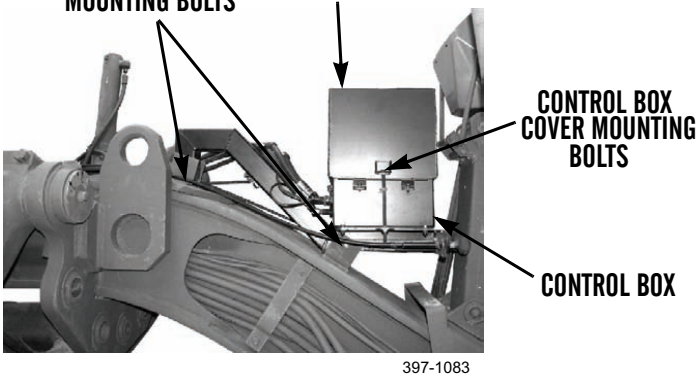


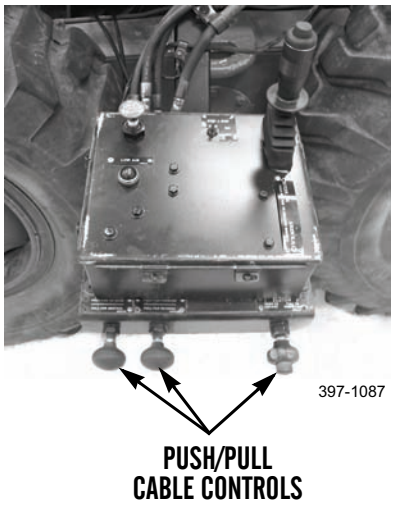
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
105	Monthly		All Systems - Machine Exercise	**CAUTION** DO NOT perform this PMCS exercise when temperature is below 0°F (-18°C). **NOTE** DO NOT exercise machine if it has been operated within the past month. a. Perform *Before* operation PMCS. b. Start and warm up engine (WP 0005 00). c. While machine is warming up, perform a walkaround inspection, checking for evidence of leaks.	Class III oil or hydraulic leaks are evident. Any fuel or coolant leaks are evident.
				NOTE If temperature is below 32°F (0°C), operate controls prior to moving machine. d. When machine has warmed up, begin to operate ALL controls slowly: (1) Transmission in all ranges including reverse (2) Differential lock engaged and disengaged (3) Parking and service brakes applied and released (4) Steering from full left to full right (5) All hydraulic controls (blade, scarifier, articulation and wheel lean circuits) (6) Centershift guide pin g. Operate controls for another five minutes. h. Move machine and operate all controls through full motion to bring all systems to operating temperature.	

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
105 (Con't)				i. Move machine and continue to operate all controls through full motion for 30 minutes AFTER machine systems have reached operating temperature. j. Stop machine and allow to idle for five minutes. k. Shut down engine. l. Perform *After* operation PMCS.	
106	Monthly		Service Brake Test	**WARNING** Be ALERT for personnel in the area while operating machine. Always check to ensure area is clear of personnel and obstructions before starting engine, moving machine, or lowering or raising blade. Failure to follow this warning may cause injury or death to personnel or damage to equipment. Perform the following service brake test: a. Ensure area around machine is clear of all personnel and obstacles. b. Test brakes on hard, packed dirt. c. Fasten seat belt before testing brakes. d. Start and warm up engine (WP 0005 00). e. Ensure air system is at operating pressure of 110±10 psi (758±69 kPa). f. Raise blade and scarifier. g. Operate machine in 3rd gear at full throttle. h. Apply service brake. If engine stalls, service brakes are satisfactory.	Wheels do not skid. Notify Unit Maintenance.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
107	Monthly		Parking Brake Test	**WARNING** Be ALERT for personnel in the area while operating machine. Always check to ensure area is clear of personnel and obstructions before starting engine, moving machine, or lowering or raising blade. Failure to follow this warning may cause injury or death to personnel or damage to equipment.	
				a. Ensure area around machine is clear of all personnel and obstacles.	
				b. Test brakes on hard, packed dirt.	
				c. Fasten seat belt before testing brakes.	
				d. Start and warm up engine (WP 0005 00).	
				e. Ensure air system is at operating pressure of 110±10 psi (758±69 kPa).	
				f. Raise blade and scarifier.	
				g. Operate machine in 2nd gear at full throttle.	
				h. Press transmission modulator pedal, shift transmission to neutral, and apply parking brake.	Wheels do not skid. Notify Unit Maintenance.
108	Monthly		Sectionalization Equipment (if Equipped)	Check sectionalization components with the following steps:	Binding or damaged components if required for mission.
				a. Remove two mounting bolts from control box.	
				b. With assistance, position control box in mounting bracket next to left battery box.	
				c. Check all cables and hoses for damage and debris. Remove debris. Notify Unit Maintenance if damaged.	
				d. Make sure electrical connector and all hose ends have caps installed.	

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
108 (Con't)				e. Remove two bolts from control box cover and remove cover. f. Check controls for damage and debris. Remove debris. Notify Unit Maintenance if damaged. g. Lubricate push/pull cables with dry lubricant (Item 9, WP 0022 00). h. Extend and retract all push/pull cable controls. Check for binding and damage. Notify Unit Maintenance if damaged or if cables do not move freely. i. Install control box cover and tighten two cover mounting bolts. j. Install control box on frame of machine. Install two mounting bolts.	





END OF WORK PACKAGE

ENGINE AIR PRECLEANER AND AIR CLEANER ASSEMBLY SERVICING 0014 00

THIS WORK PACKAGE COVERS

Engine Air Precleaner Inspection

Engine Air Cleaner Assembly Servicing

INITIAL SETUP

Materials/Parts

Detergent (Item 4, WP 0022 00)

Rag, wiping (Item 15, WP 0022 00)

Equipment Condition

Engine off

WARNING

- If nuclear, biological, and chemical (NBC) exposure is suspected, personnel wearing protective equipment should handle all air cleaner media. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures.
- NBC contaminated filters must be handled using adequate precautions and must be disposed of by trained personnel.
- Failure to follow these warnings may result in injury or death to personnel.

CAUTION

Service engine air precleaner and air cleaner assembly with engine stopped. Engine damage could result if service is preformed with engine running.

ENGINE AIR PRECLEANER INSPECTION

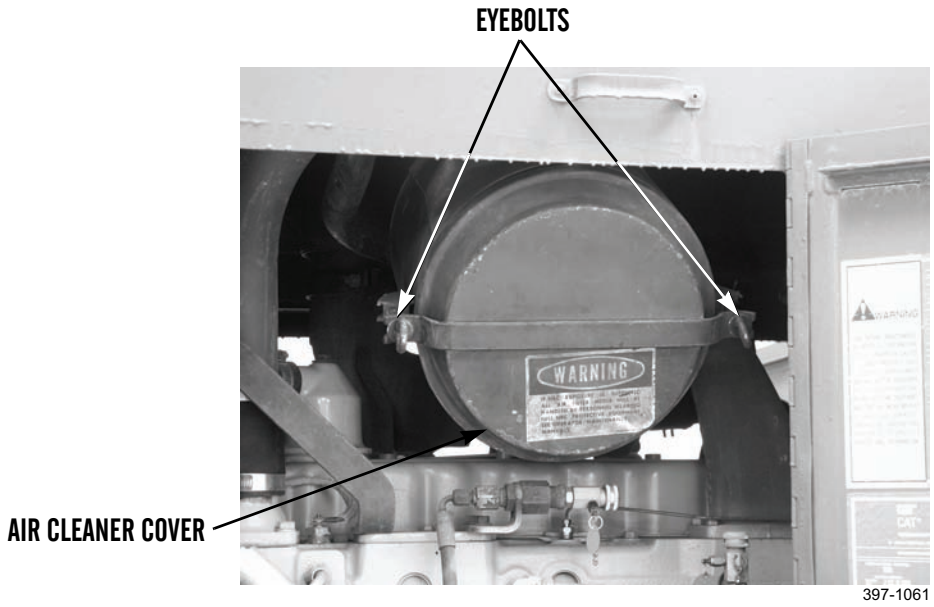
NOTE

DO NOT clean precleaner with air pressure.

Check precleaner for debris and damage. If precleaner shows signs of damage or is full of debris, notify Unit Maintenance.

ENGINE AIR CLEANER ASSEMBLY SERVICING

1. Loosen two eyebolts and remove cover.
2. Inspect cover seal for damage. If damaged, notify Unit Maintenance to obtain replacement cover and/or seal.



3. Remove primary element from air cleaner housing.

NOTE

Notify Unit Maintenance to replace secondary element at every third primary element replacement.

4. Inspect secondary element. Notify Unit Maintenance if damaged or if primary element is being replaced for the third time.
5. Wipe inside of air cleaner housing clean with a rag.

CAUTION

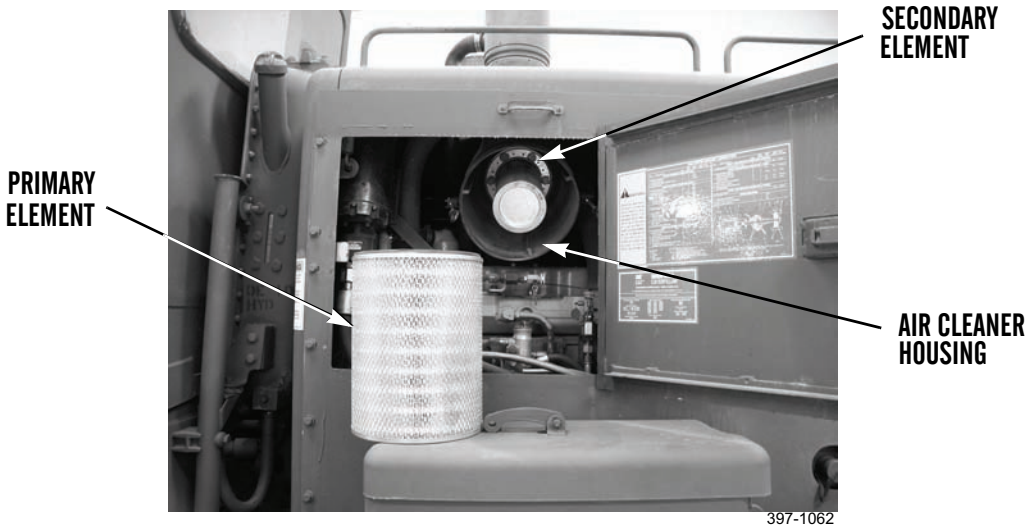
DO NOT use a damaged primary element. Engine damage can result.

6. Inspect primary element. If pleats or seals are damaged, discard primary element.

ENGINE AIR CLEANER ASSEMBLY SERVICING - CONTINUED

NOTE

A primary element may be cleaned a maximum of six times. Also replace primary element if it has been in service for one year.



7. If primary element is OK, clean as follows:

   Compressed air used for cleaning purposes should never exceed 30 psi (207 kPa). Pressurized water used for cleaning purposes should not exceed 40 psi (276 kPa). Wear protective clothing (goggles/shield, gloves, etc.) and use caution to avoid injury to personnel.

NOTE

DO NOT clean primary element by tapping or bumping element.

   a. Use compressed air or pressurized water. Clean inside and outside pleats by directing stream along pleats.
   b. A solution of detergent and water may be used as required. Fully rinse pleats.
   c. Allow primary element to air dry completely.

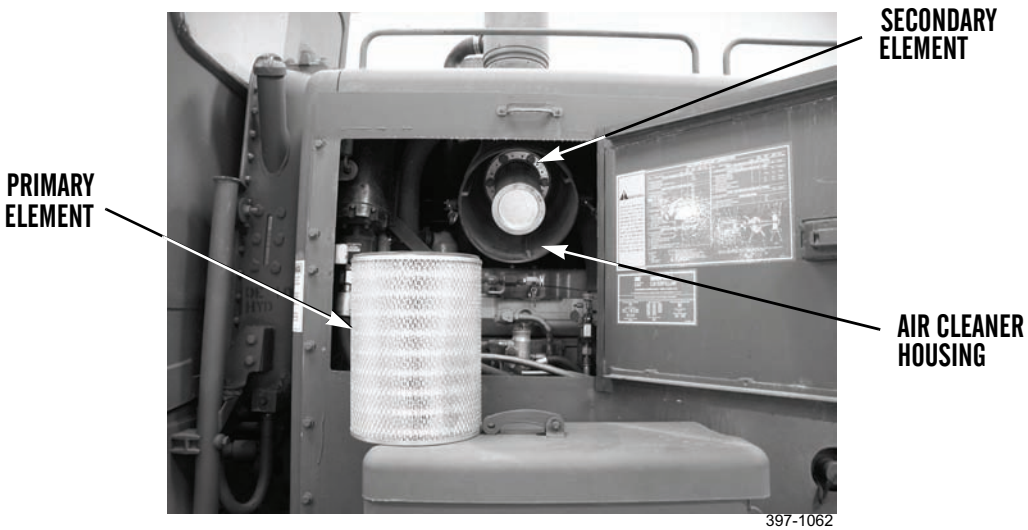
8. Inspect primary element again. If pleats or seals are damaged, discard primary element and obtain a replacement.

ENGINE AIR CLEANER ASSEMBLY SERVICING - CONTINUED

NOTE

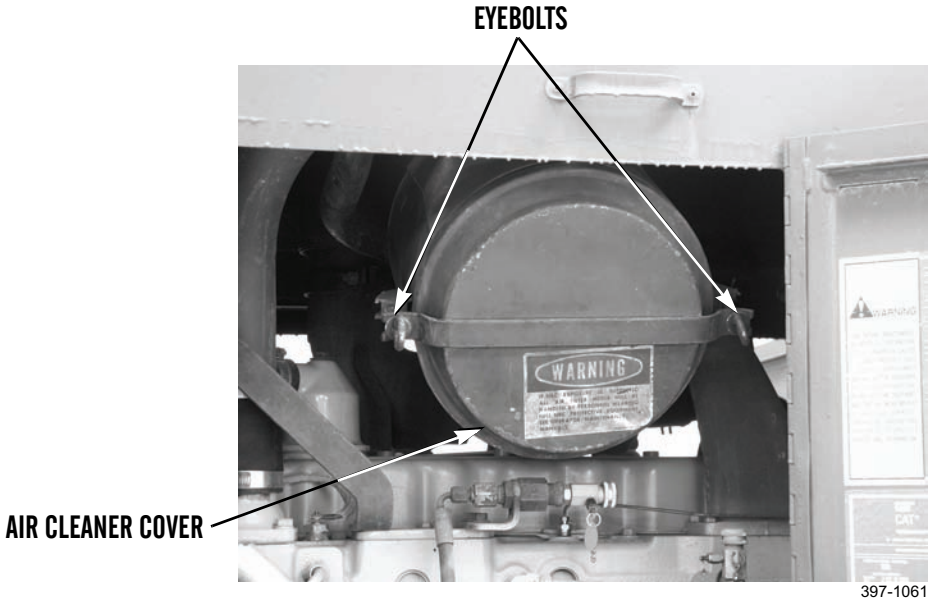
Primary element must be completely dry before installation.

9. Install primary element inside air cleaner housing.



397-1062

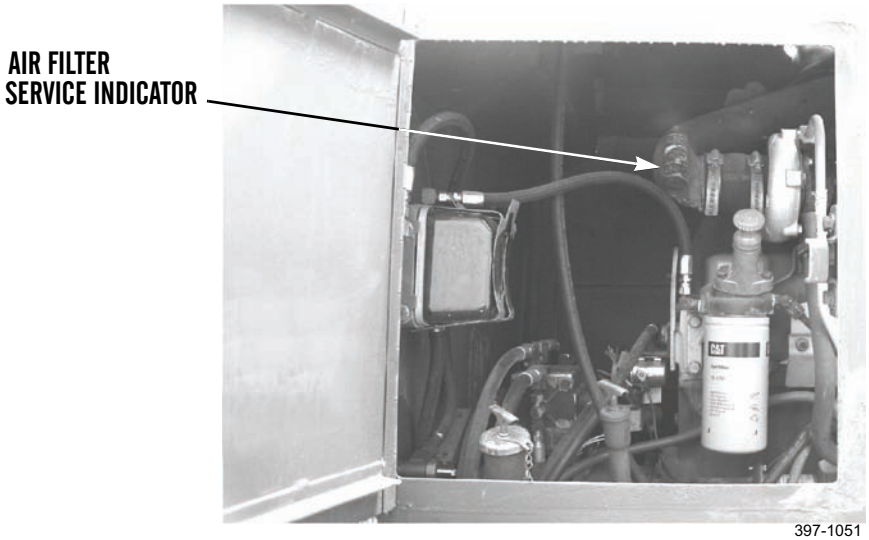
10. Clean cover and install. Tighten two eyebolts to secure cover.



397-1061

ENGINE AIR CLEANER ASSEMBLY SERVICING - CONTINUED

11. Reset air filter service indicator by pushing in on bottom of indicator.



397-1051

12. Start engine.
13. If air filter service indicator shows green or yellow, service is complete.
14. If indicator shows red or if engine exhaust smoke is black, notify Unit Maintenance.

END OF WORK PACKAGE

FUSE REPLACEMENT 0015 00

THIS WORK PACKAGE COVERS

Removal, Installation

INITIAL SETUP

Materials/Parts

Fuse

Equipment Conditions

Machine parked on level ground

Equipment Conditions - Continued

Machine parked on level ground

Parking/emergency brake applied (WP 0004 00)

Implements lowered to ground (WP 0004 00)

Battery disconnect switch in OFF position (WP 0004 00)

WARNING

Ensure battery disconnect switch is in the OFF position before working in fuse panel. Failure to follow this warning may result in injury.

REMOVAL

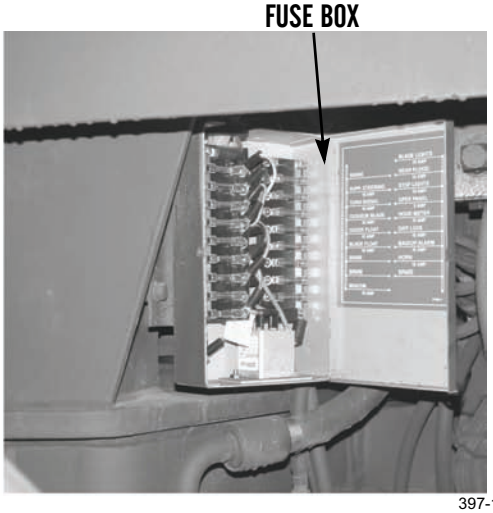
1. Open fuse panel cover.

NOTE

Visually check all fuses. Replace fuse if it has any of the following:

a. Discolored glass tube
b. Broken filament
c. Broken or cracked glass tube

2. Remove fuse from fuse box.
3. Contact Unit Maintenance for replacement fuse.



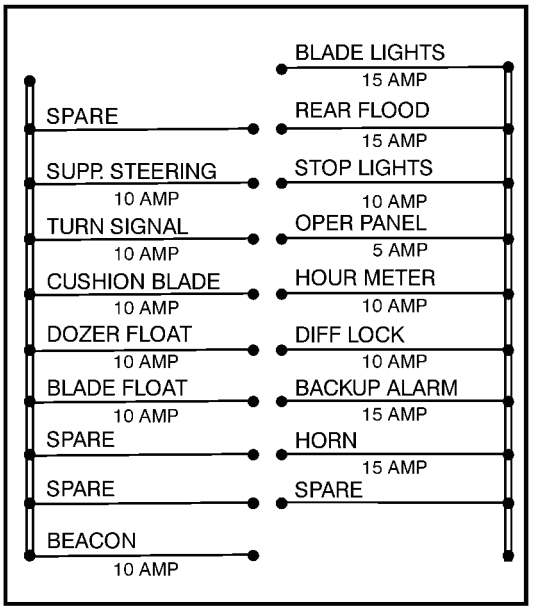
397-1063

INSTALLATION

CAUTION

Always verify amperage rating of new fuse is correct. Using a fuse with the wrong amperage could result in damage to electrical system.

1. Install new fuse in fuse box.
2. Close fuse panel cover.
3. Turn on the battery disconnect switch (WP 0004 00).
4. Operate electrical system related to new fuse to verify correct operation.
5. If fuse fails again, notify Unit Maintenance.

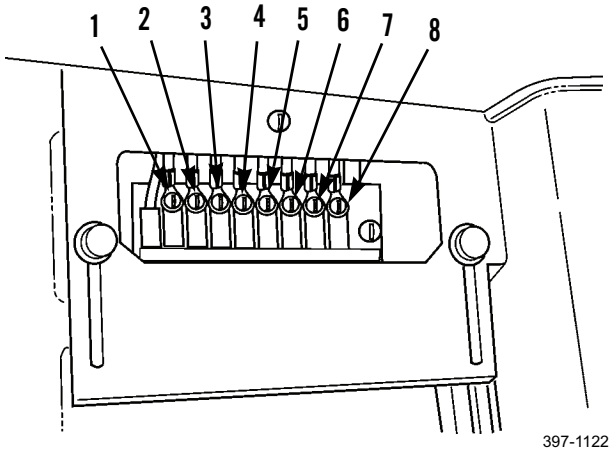


FUSE CHART 397-1123

INSTALLATION - CONTINUED

Fuse Chart - 130G CCE Model

FUSE	AMPERAGE	COMPONENT
1	4 (slow blow)	Front Wiper
2	15	Heater/Air Conditioner
3	10	Beacon
4	10	Fan (Rear)
5	5	Dome Light
6	4 (slow blow)	Rear Wiper
7	15	Lighter
8		Spare



END OF WORK PACKAGE

TIRE MAINTENANCE 0016 00

THIS WORK PACKAGE COVERS

Tire Pressure Adjustment

INITIAL SETUP

Tools and Special Tools

Gauge, tire pressure (Item 8, WP 0021 00)

Hose assembly, pneumatic: tire inflation (Item 10, WP 0021 00)

Equipment Conditions

Machine parked on level ground

Parking/emergency brake applied (WP 0004 00)

Implements lowered to ground (WP 0004 00)

Battery disconnect switch in ON position (WP 0004 00)

Engine at high idle (WP 0004 00)

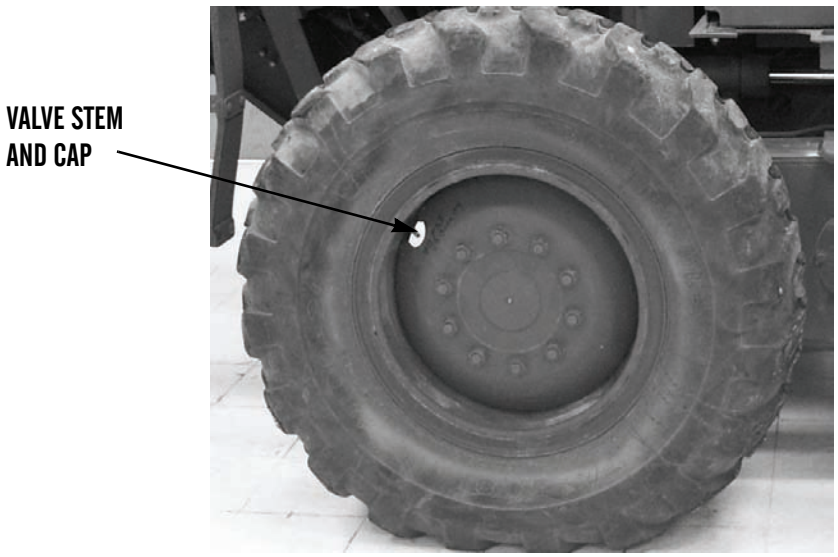
WARNING

- Operating machine with underinflated or defective tire may lead to tire failure and loss of control. Failure to follow this warning may cause injury to personnel or damage to equipment.
- If tire pressure is 0 psi (0 kPa) DO NOT inflate. Notify Unit Maintenance. Failure to follow this warning may cause injury or death to personnel.
- Use a self-inflating chuck and stand at tread side of tire at maximum distance allowed by inflation hose. Failure to follow this warning may cause injury or death to personnel.

NOTE

- A tire inflated in enclosed shop area with temperature of 65-70°F (18-21°C), will be underinflated if machine is moved to freezing temperatures.
- Inspect tire for damage or foreign material in tread. Notify Unit Maintenance if tire is damaged.

TIRE PRESSURE ADJUSTMENT



397-1046

1. Remove valve stem cap.
2. Check tire pressure with tire pressure gauge. Correct pressure is 35 psi (241 kpa) for all tires on the 130G.
3. Attach air chuck to the valve stem.
4. Stand at tread side of tire at maximum distance allowed by the inflation hose.
5. Open valve slowly to increase air pressure in tire.
6. Check tire pressure periodically to ensure tire is not overinflated.
7. If necessary to reduce air pressure, disconnect air chuck and press valve stem core to vent air from tire.
8. Disconnect air chuck from valve stem.
9. Install valve stem cap.

END OF WORK PACKAGE

PREPARATION FOR TRANSPORT INTRODUCTION 0017 00

GENERAL

1. Check the regulations covering transportation of cylinders containing compressed gas.
2. Check the travel route for overpass clearances. Be sure that there will be adequate clearance for the Rollover Protective Structure (ROPS). Observe laws for width, weight, and hauling permits.
3. For detailed information on machine transporting, refer to TM 55-3805-261-14.
4. For information on rigging machine for transport, refer to FM 10-450-3 and FM 10-450-4.
5. For sectionalization for air transport, refer to WP 0018 00 and WP 0019 00.

END OF WORK PACKAGE

SECTIONALIZATION FOR AIR TRANSPORT INTRODUCTION 0018 00

INTRODUCTION

There are two models of the 130G Type II (130GS and 130GSCE) that can be sectionalized and transported by helicopter. These machines are equipped with all special tools and equipment needed for sectionalization. A remote control box is stored on the frame just forward of the operator's console to control the rear section after sectionalization.

1. This work package has general information for the sectionalization procedure.
2. Due to size and weight restrictions, the grader must be sectionalized (separated) to accomplish air transport by helicopter. Once separated, each half is rigged separately and lifted by helicopter.
3. Work package WP 0019 00 describes how to prepare the grader for air transport by helicopter, how to drive the rear section of the grader, and how to return the machine to operational configuration after air transport.
4. The amount of fuel left in machine's fuel tank must comply with guidance from Military Traffic Management Command (MTMC).
5. Assistance from two Unit Maintenance mechanics is required to prepare the machine for air transport.

WARNING

If operating machine without Rollover Protective Structure (ROPS), drive with extreme caution, at low idle, and in 1st gear ONLY. Machine has no rollover protection without ROPS. Failure to follow this warning may cause injury or death to personnel or damage to equipment.

6. As part of this procedure, the ROPS is removed from the grader. Operation of the machine after assembly at the work site may be required without the ROPS, until the ROPS is transported to the work site and reinstalled.

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure any lifting device used is in good condition and of suitable lifting capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in injury or death to personnel.

7. Many components that must be removed and installed during this procedure are very heavy. Use assistance, caution, and follow safe work practices when handling them.

WARNING

Articulation movement can reduce clearances suddenly and cause injury to personnel. Always stop engine BEFORE working in area of hitch link.

8. Throughout procedure, be aware of potential hazards when working around hitch. Do NOT work in area of hitch link unless engine is shut down.

TOOLS AND EQUIPMENT

1. Tools and equipment required for sectionalization are stored in a tool box located on the front of the machine.
2. BII tools (WP 0021 00) must also be used.
3. The following table contains wrench sizes that are needed to complete the sectionalization procedure.

Location	Bolt/Nut Size	Wrench Size
Pump drive shaft guard bolts	3/8-16 1/2-13	9/16 3/4
Pump drive shaft bolts	3/8-16 3/8-24	9/16 9/16
Upper articulation pin outer bolts	1/2-13	3/4
Lower articulation pin bottom cap bolts	5/8-11	15/16
Lower articulation pin outer bolts	1/2-13	3/4
Lower articulation pin retainer bolts	1/2-13	3/4
Articulation pin pusher bolts	1/2-13	3/4
Articulation cylinder pin cap bolts	3/8-24	9/16
Front frame cable clamp bolts	3/8-16	9/16
Remote control box storage attaching bolts	5/16-18	1/2
Solid tandem link cap bolts	3/8-16	9/16
Push-pull cable nuts		3/8 1/2 15/16 1
Bolt-on eyes	3/4-10	-

END OF WORK PACKAGE

SECTIONALIZATION FOR AIR TRANSPORT 0019 00

THIS WORK PACKAGE COVERS

Disassembly, Driving the Rear Frame, Assembly

INITIAL SETUP

Tools and Special Tools

Components of End Item and Basic Issue Items (WP 0021 00)

Materials/Parts

Rag, wiping (Item 15, WP 0022 00)

Tag, marker (Item 16, WP 0022 00)

Pin, cotter (1)

References

WP 0005 00

WP 0006 00

Personnel

Two

Equipment Conditions

Machine parked on level ground (WP 0002 00)

Parking/emergency brake applied (WP 0002 00)

Implements lowered to ground (WP 0002 00)

Engine off (WP 0002 00)

Battery disconnect switch in OFF position (WP 0004 00)

DISASSEMBLY

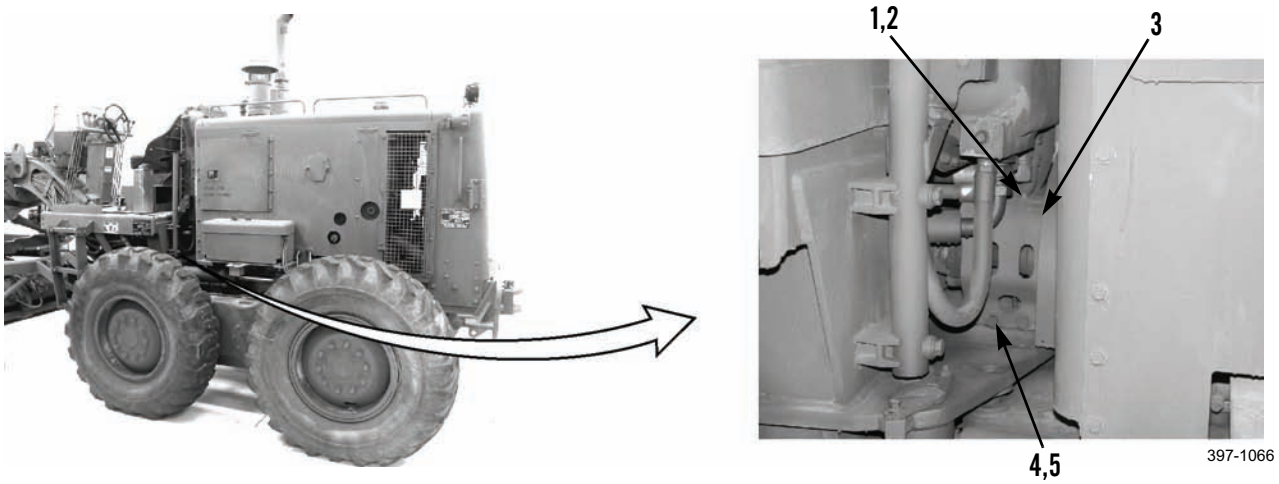
NOTE

- Assistance from two Unit Maintenance personnel is required for these procedures.
- Disassembly must be performed on a firm, level surface.
- Whenever possible, return hardware, clamps, and bolts to the holes from which they were removed. Be sure to tighten them enough so that they will not loosen from vibration.

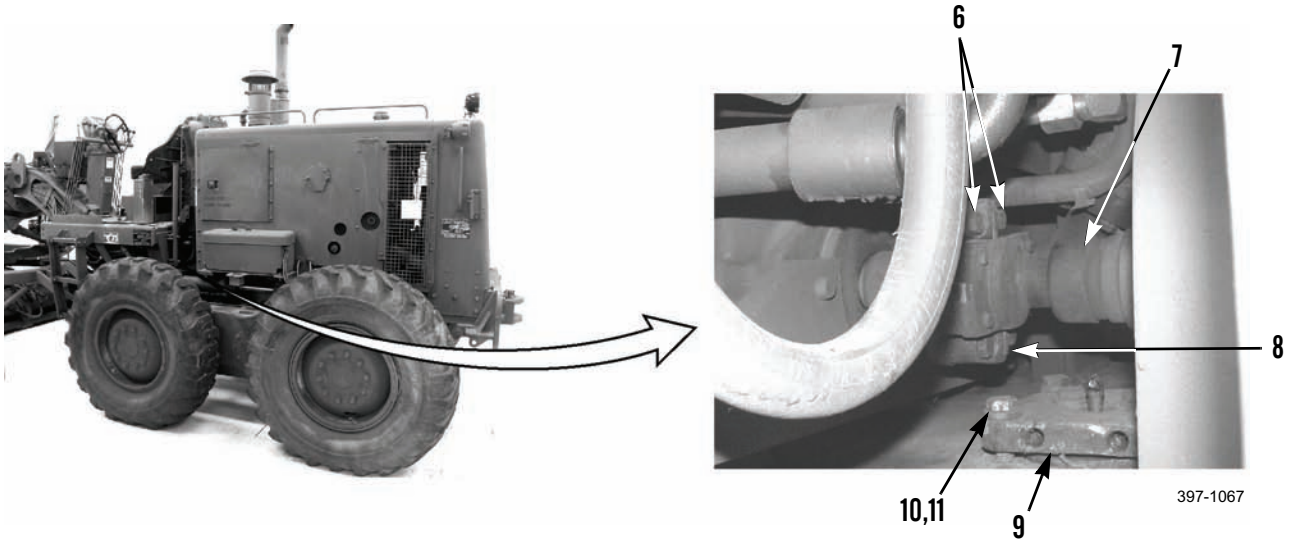
1. Notify Unit Maintenance to remove the Rollover Protective Structure (ROPS) from the machine.
2. Notify Unit Maintenance to move two supports from front of machine to rear support brackets on rear of machine.
3. Install six ROPS bolts and bushings on bottom of supports.
4. Start engine and center blade and side shift cylinders (WP 0005 00).
5. Position blade at a 90-degree angle to the frame and lower the blade to the ground. Apply slight downward pressure to reduce front weight on the articulation joint.
6. Shut down engine (WP 0005 00).

DISASSEMBLY - CONTINUED

7. Remove three bolts (1) and washers (2) from top of hydraulic pump driveshaft guards (3).
8. Remove four bolts (4), washers (5), and two hydraulic pump driveshaft guards (3).

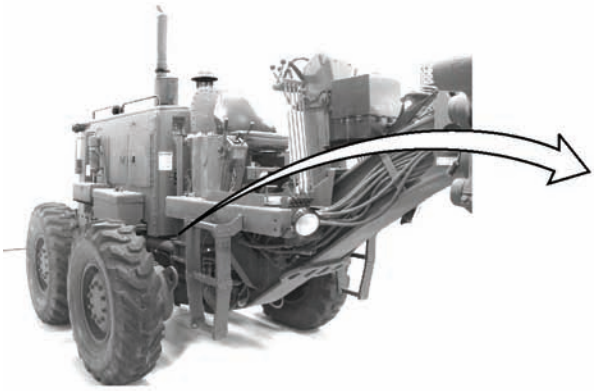


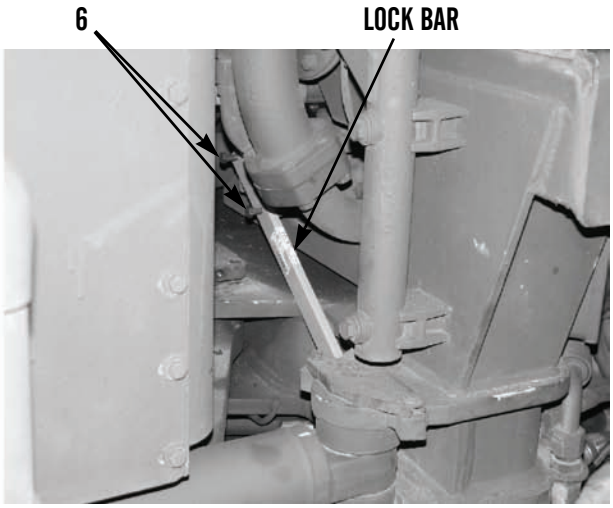
9. Remove eight bolts (6) from hydraulic pump driveshaft U-joints (8) (four bolts on each end).
10. Remove hydraulic pump driveshaft (7) and U-joints (8) as an assembly.
11. Remove four outer bolts (10) and washers (11) from top of upper pivot pin (9).



DISASSEMBLY - CONTINUED

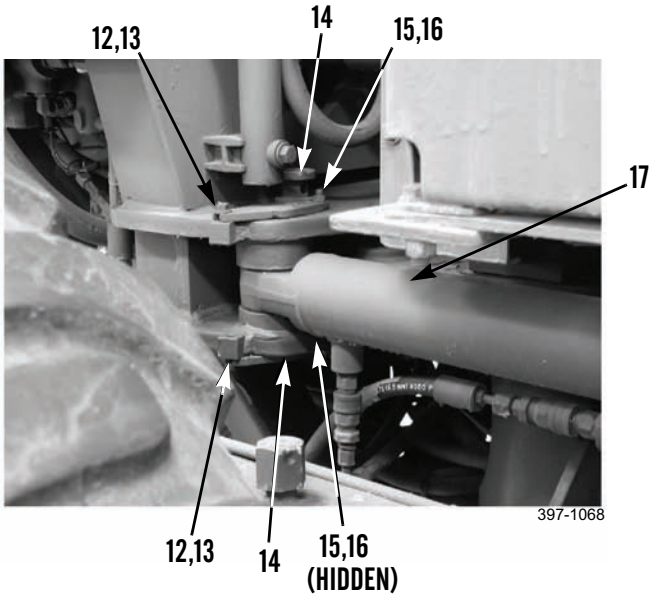
12. Install the pump driveshaft lock bar on pump yoke using two driveshaft bolts (6). Be sure that free end of lock bar is pointing toward right hand side of machine. Lock bar will prevent pump rotation.





397-1100

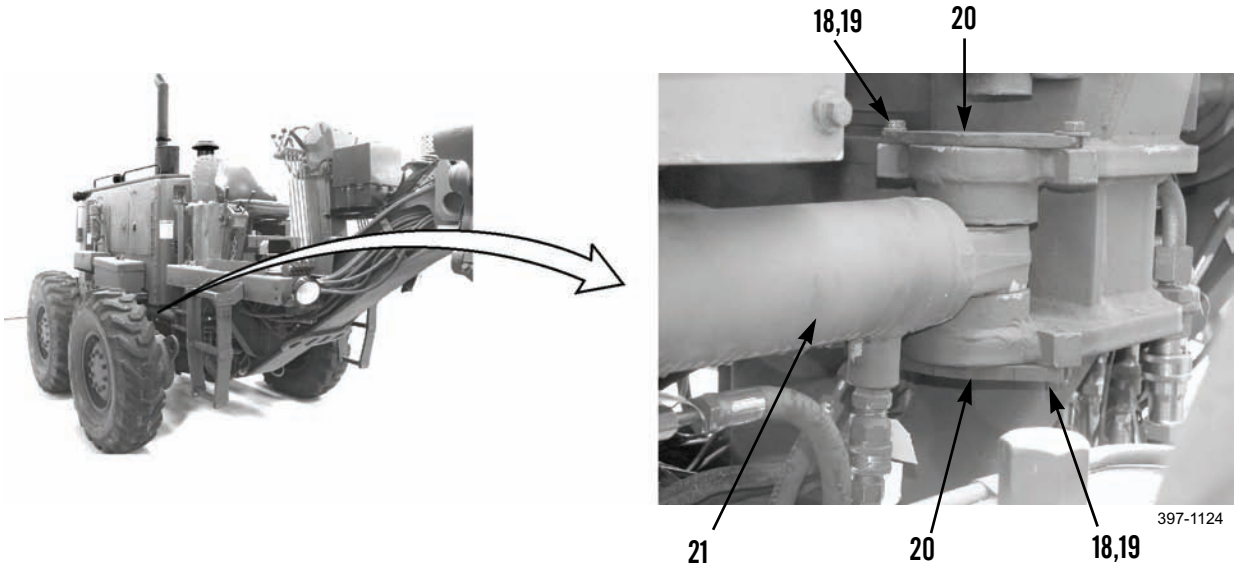
13. Remove two bolts (12), washers (13), nuts (15), washers (16), and retainer caps (14) from left articulation cylinder (17).



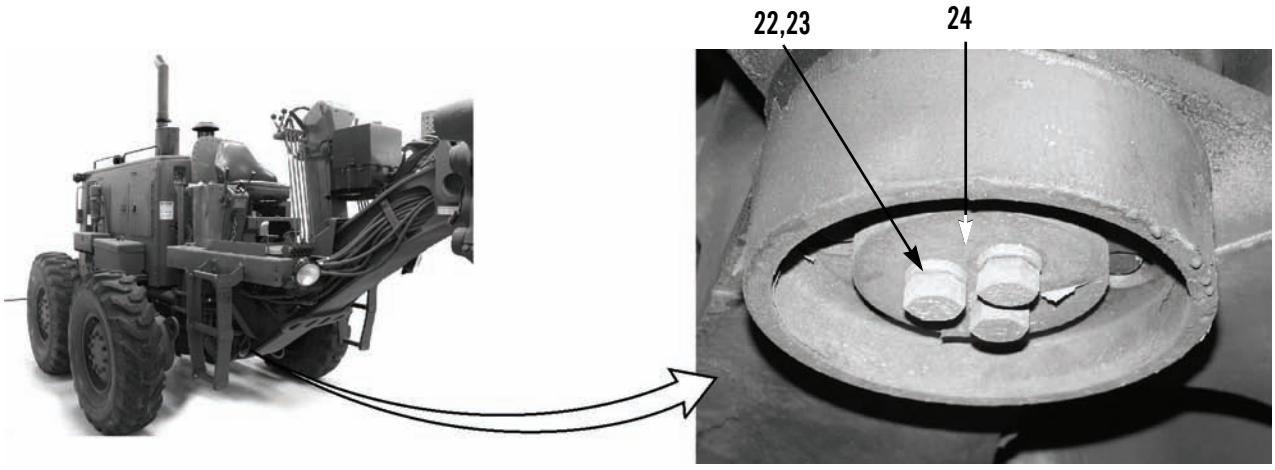
397-1068

DISASSEMBLY - CONTINUED

14. Remove four bolts (18), washers (19), and two retainer caps (20) from right articulation cylinder (21).

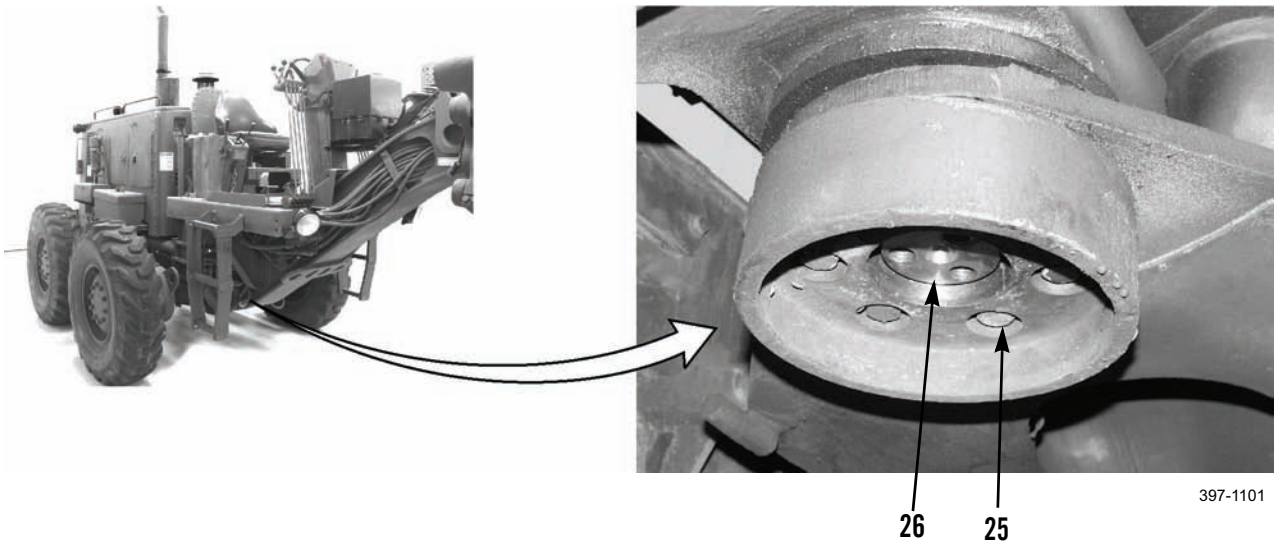


15. Remove three bolts (22), washers (23), and cap (24) from the bottom of the lower pivot pin.



DISASSEMBLY - CONTINUED

16. Loosen six retainer bolts (25) on the bottom of lower pivot pin (26) about 1/2 in.



DISASSEMBLY - CONTINUED

- DO NOT disconnect or remove any hydraulic system hose or fitting unless engine is shut down and hydraulic system pressure has been relieved. Tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing injury to personnel.
- At operating temperature, hydraulic oil is hot. Allow hydraulic oil to cool before disconnecting any hydraulic hoses. Failure to follow this warning may cause injury to personnel.

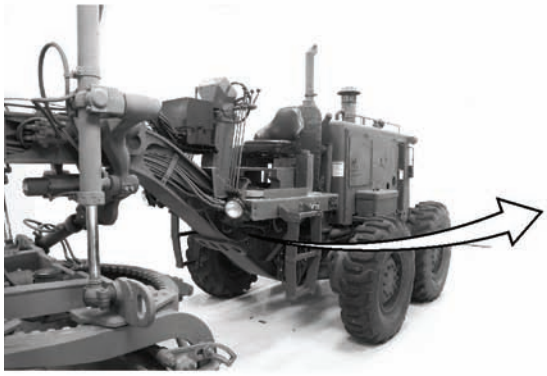
CAUTION

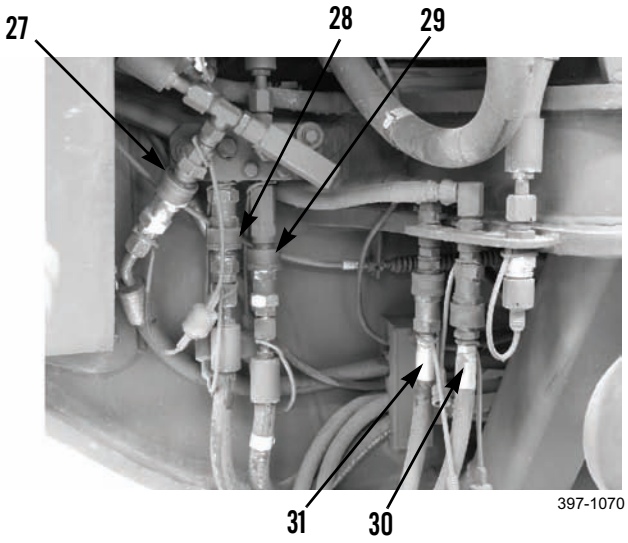
Keep hydraulic and air hose connectors clean. Do not allow dirt or other contamination to enter fittings.

NOTE

Tag hose assemblies before disconnecting to aid in installation.

17. Disconnect three hydraulic hoses (27, 28, and 29) and two air hoses (30 and 31) on left side of machine.



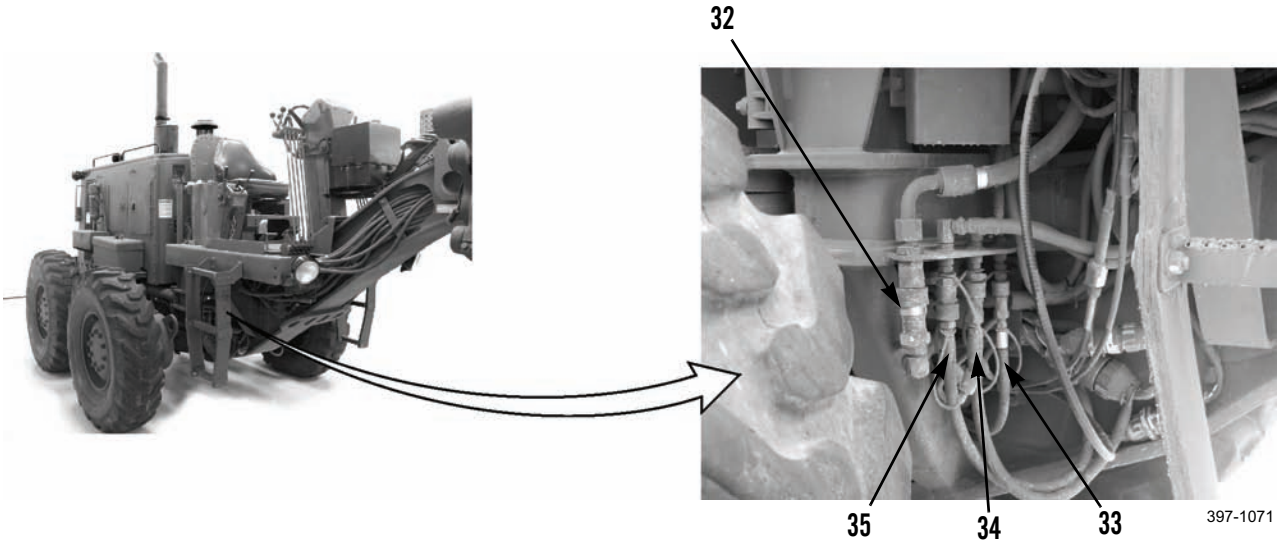


397-1070

18. Remove dirt from dust covers and install on connectors.

DISASSEMBLY - CONTINUED

19. Disconnect hydraulic hose (32) and three air hoses (33, 34, and 35) on right side of machine.

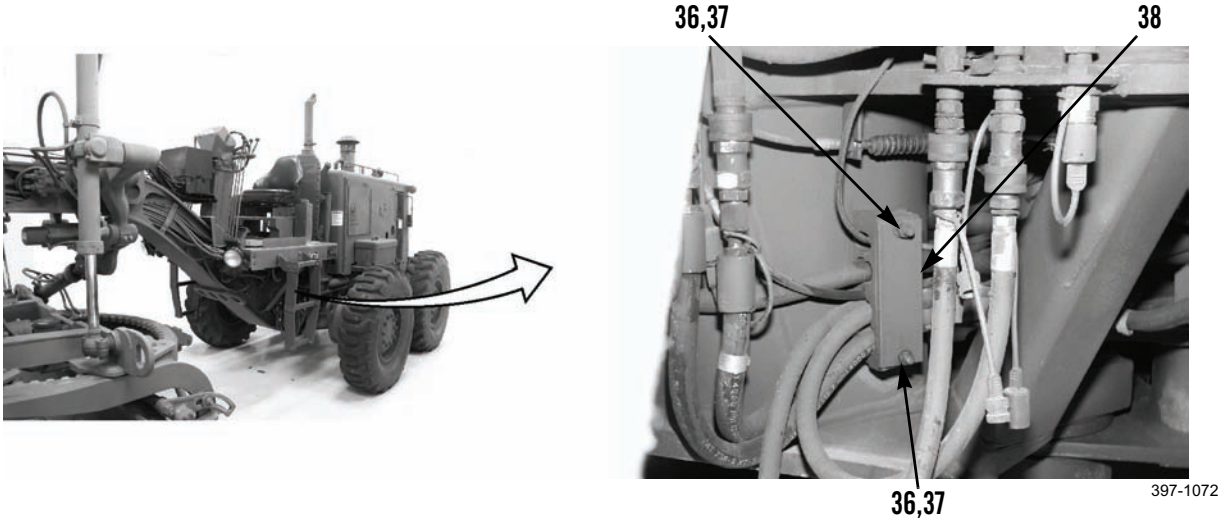


20. Remove dirt from dust covers and install on connectors.

NOTE

The following step is for the left side. Repeat step for the right side.

21. Remove two nuts (36), washers (37), and clamp (38) from left side of the frame.

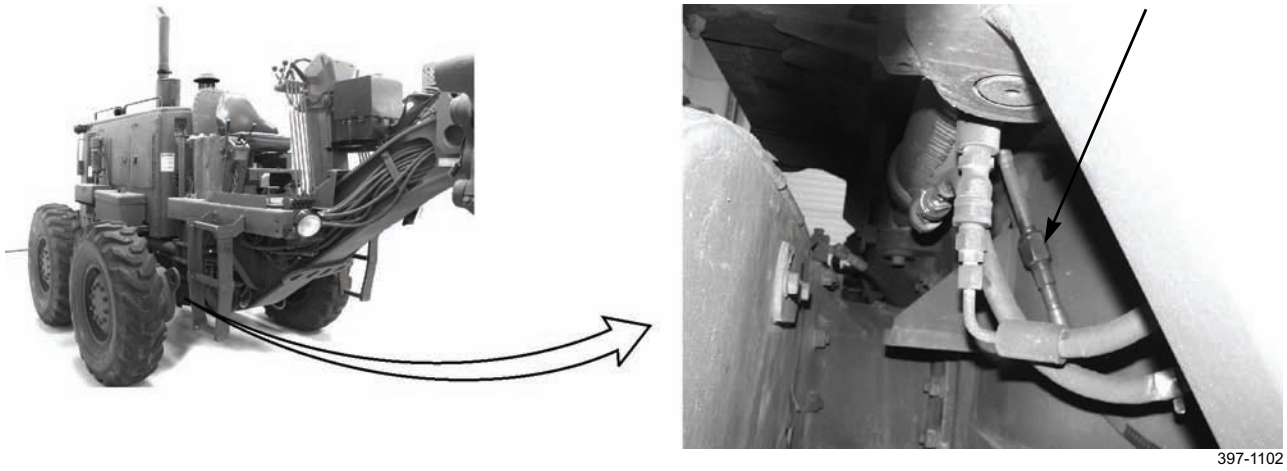


DISASSEMBLY - CONTINUED

NOTE

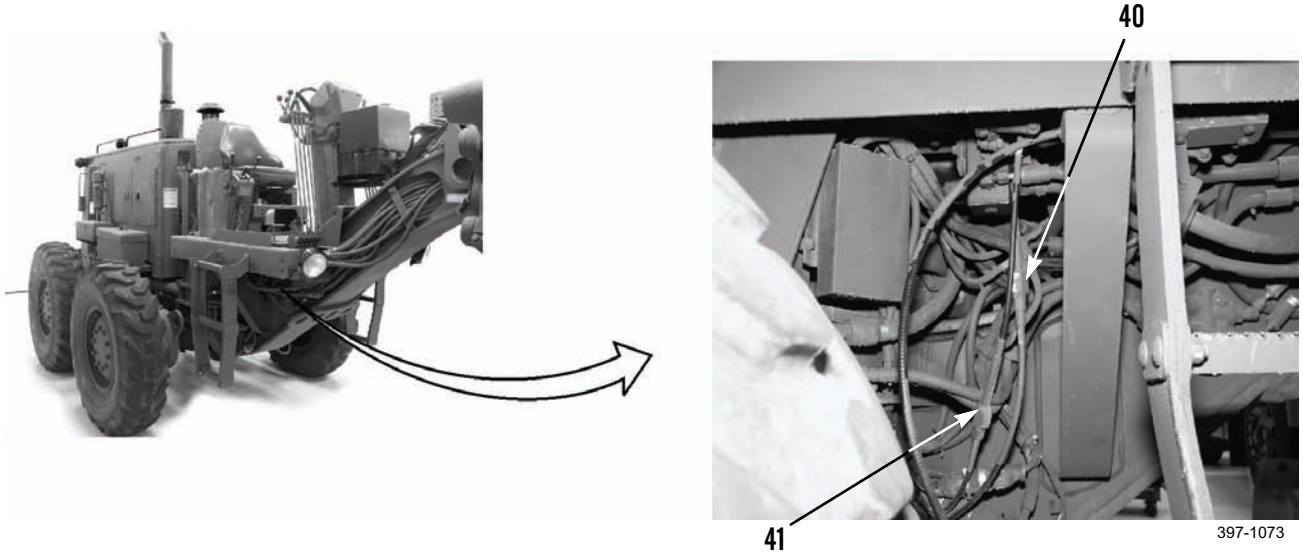
- When disconnecting cables, move the appropriate control lever in operator compartment as needed to aid in disconnection.
- Tag cables to assist in connecting to remote control box and when returning to normal configuration.

22. Disconnect throttle cable (39) on right side of machine and install dust covers.



23. Disconnect forward/reverse cable (40) on right side of machine and install dust covers. Tag both ends of cable as FORWARD/REVERSE.

24. Disconnect gear selection control cable (41) on right side of machine and install dust covers. Tag both ends of cable as GEAR SELECTION.

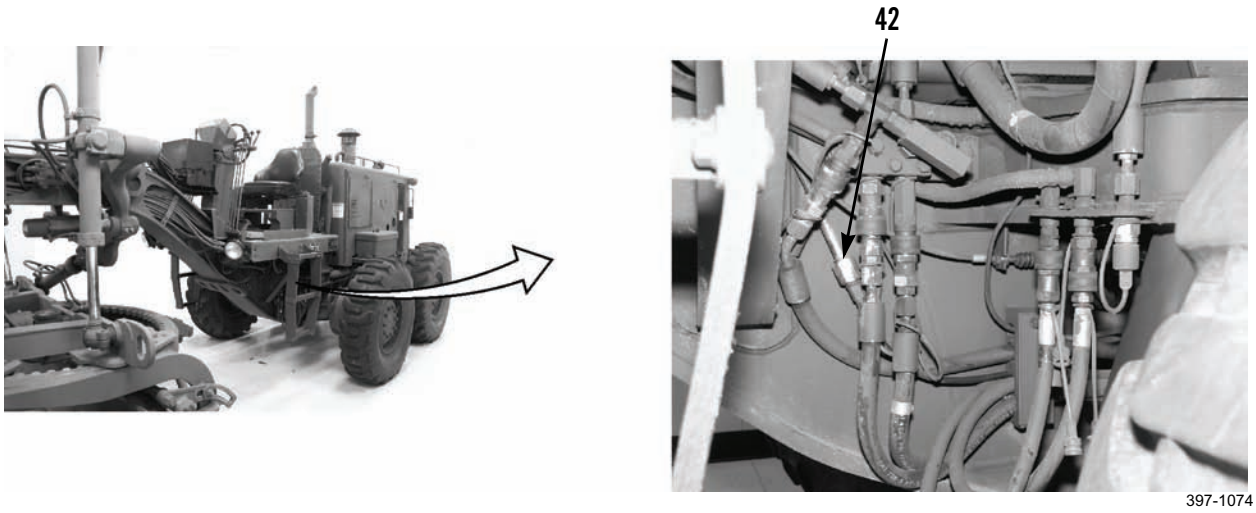


DISASSEMBLY - CONTINUED

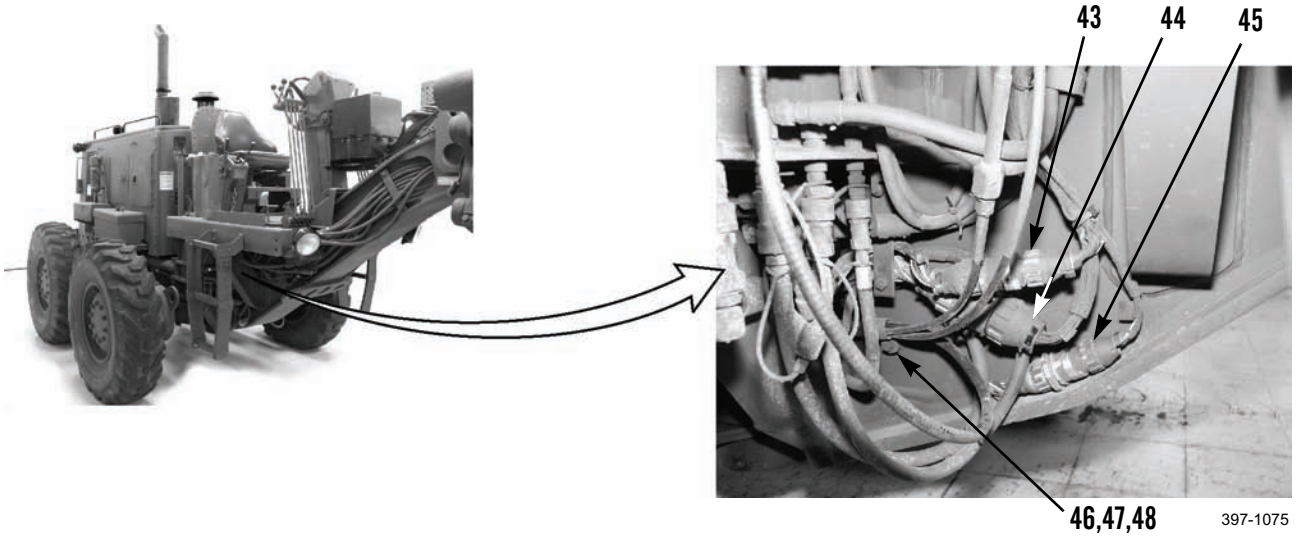
NOTE

Tag cables to assist in connecting to remote control box and when returning to normal configuration.

25. Disconnect clutch cable (42) on left side of machine and install dust cover. Tag both cable ends as CLUTCH.



26. Disconnect three wiring harness connectors (43, 44, and 45) and install dust covers on all connectors.
27. Remove bolt (46), washer (47), and clamp (48) holding control cables below operator compartment.
28. Remove control cables from clamp (48).
29. Install clamp (48), washer (47), and bolt (46) in original location.



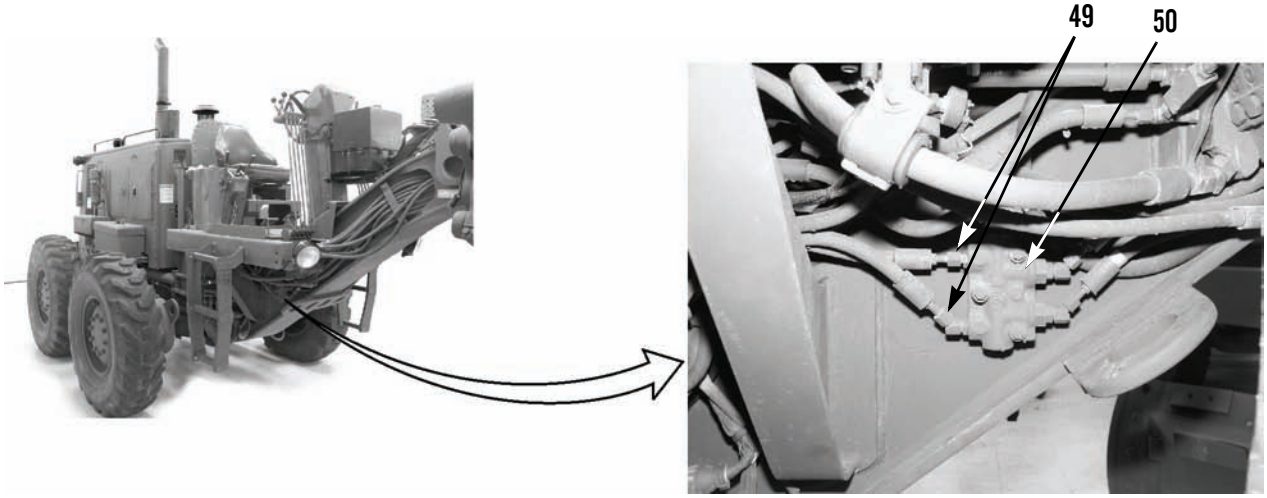
DISASSEMBLY - CONTINUED

30. Pull all hoses, cables, and wiring harness through platform supports on both sides of machine.

WARNING

Wear eye protection when disconnecting hydraulic hoses. Failure to follow this warning may cause injury to personnel.

31. Slightly loosen two hose fittings (49) at check valve (50) to relieve pressure.
32. Tighten two hose fittings (49) at check valve (50).

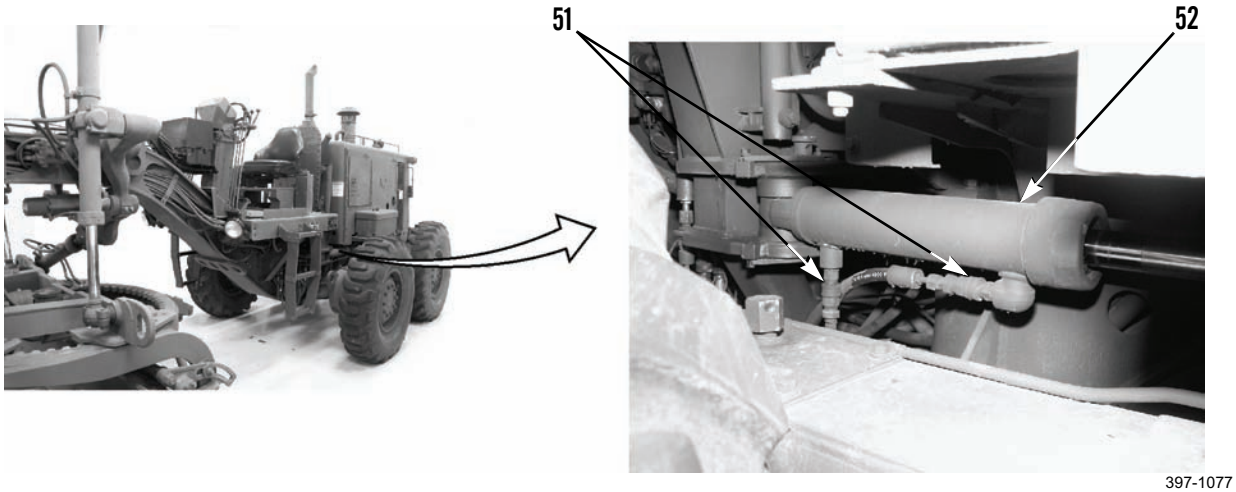


397-1076

NOTE

The following step is for the left side. Repeat step for the right side of machine.

33. Disconnect two hoses (51) from left articulation cylinder (52) and install dust covers on connectors.

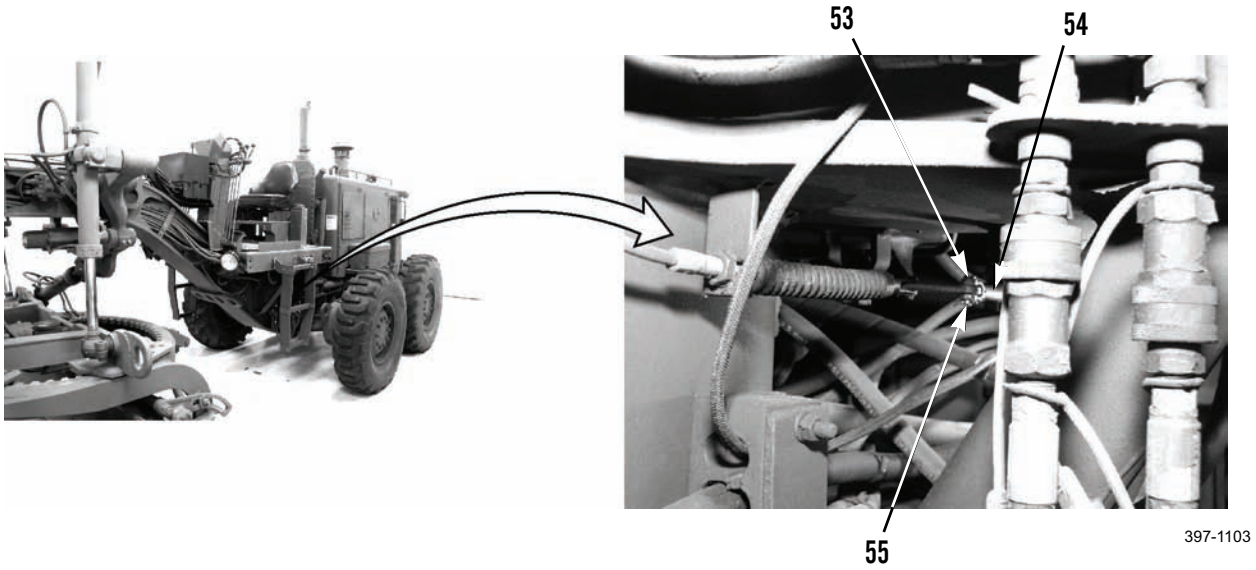


397-1077

DISASSEMBLY - CONTINUED

34. Remove two cotter pins (55) and pins (53) from both ends of articulation indicator connecting rod (54). Discard cotter pins.

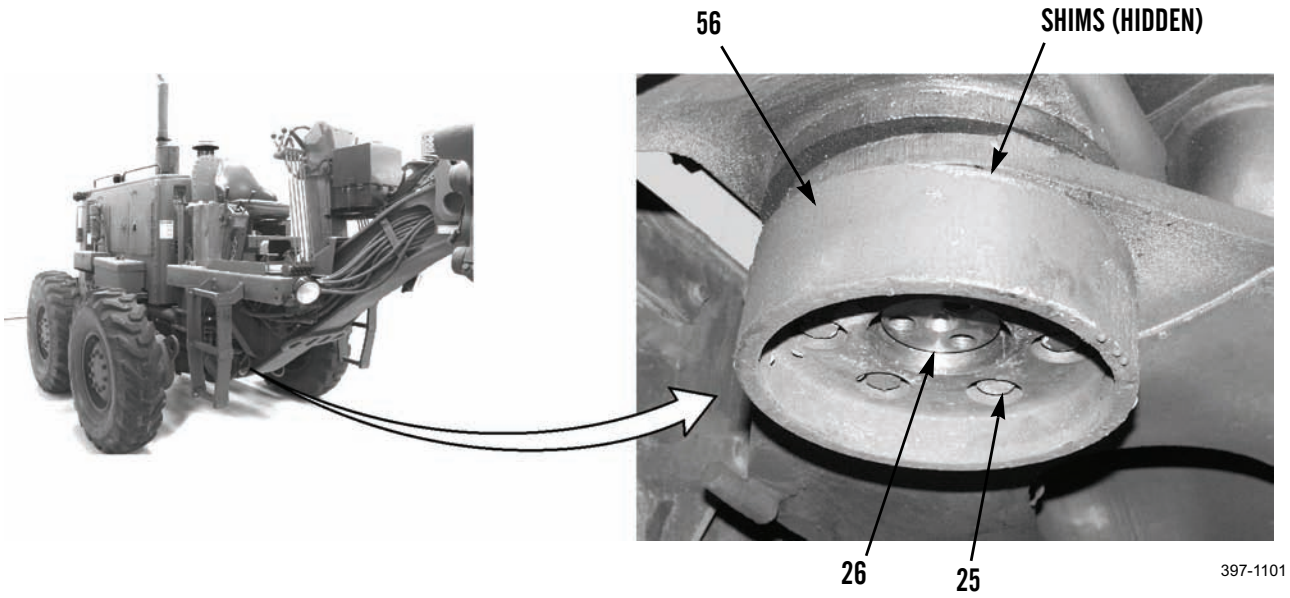
35. Place articulation indicator connecting rod (54) and pins (53) in front tool box on machine.



CAUTION

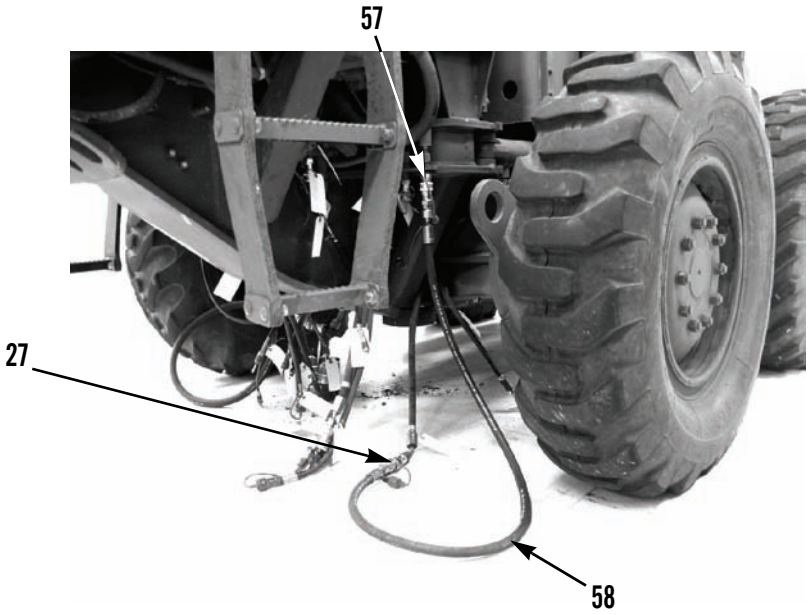
Carefully remove lower hitch retainer. Forcing retainer may cause damage to shims between lower hitch and retainer.

36. Remove six bolts (25) and retainer (56) with shims attached from bottom of lower pivot pin (26).



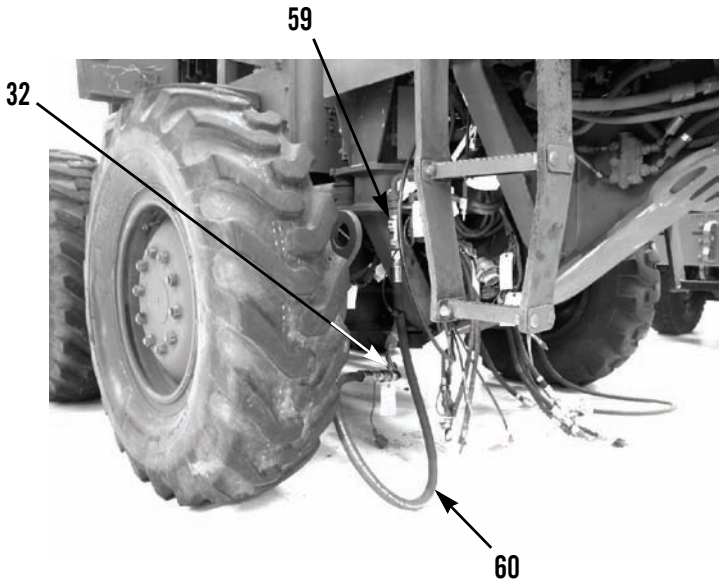
DISASSEMBLY - CONTINUED

37. Connect jumper hose (58) to auxiliary pump supply hose (27) on left side of machine.
38. Connect other end of jumper hose (58) to auxiliary pump supply connector (57).



397-1104

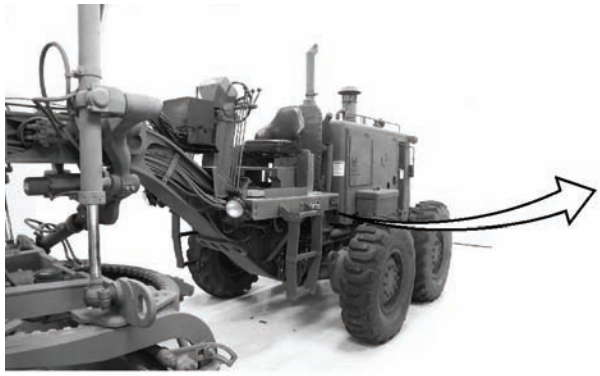
39. Connect jumper hose (60) to auxiliary pump return hose (32) on right side of machine.
40. Connect other end of jumper hose (60) to tank hose connector (59).

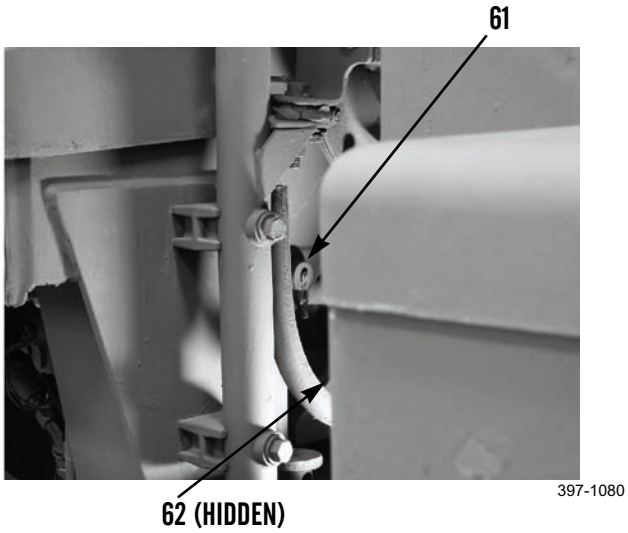


397-1105

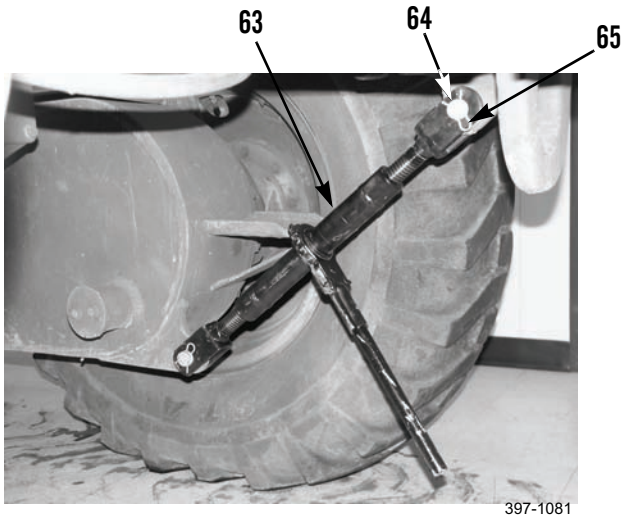
DISASSEMBLY - CONTINUED

41. Connect electrical jumper harness between engine connector (62) and platform connector (61).



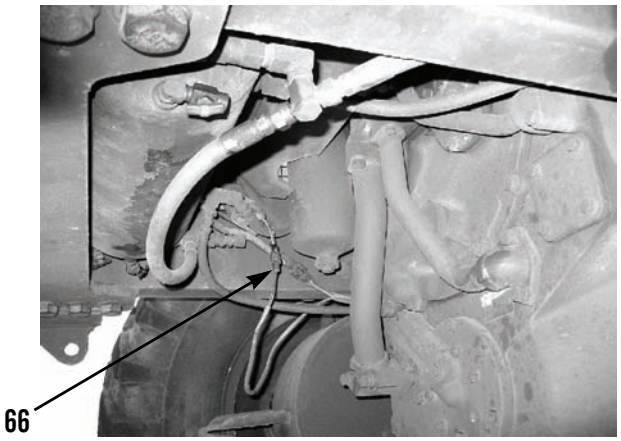


42. Position two screw jacks (63) over mounting holes on each side of rear frame and tandem housing.
43. Install two pins (64) and spring clips (65) through mounting holes of each screw jack (63).



DISASSEMBLY - CONTINUED

44. Disconnect rear electrical harness (66) and pull through frame to under operator compartment. Secure harness to machine.

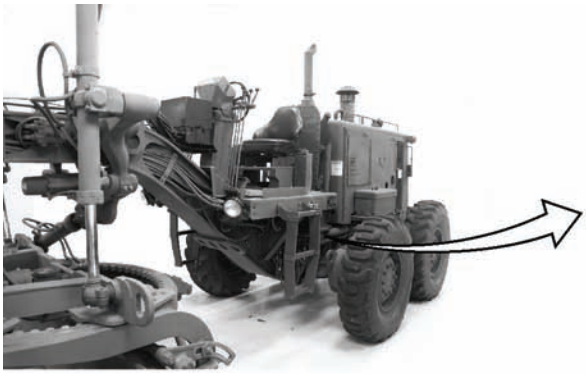


397-1110

CAUTION

Carefully remove articulation cylinder pins to avoid damage to bushings in cylinder ends.

45. Remove front articulation cylinder pin (67) from each side of the machine.



397-1082

DISASSEMBLY - CONTINUED

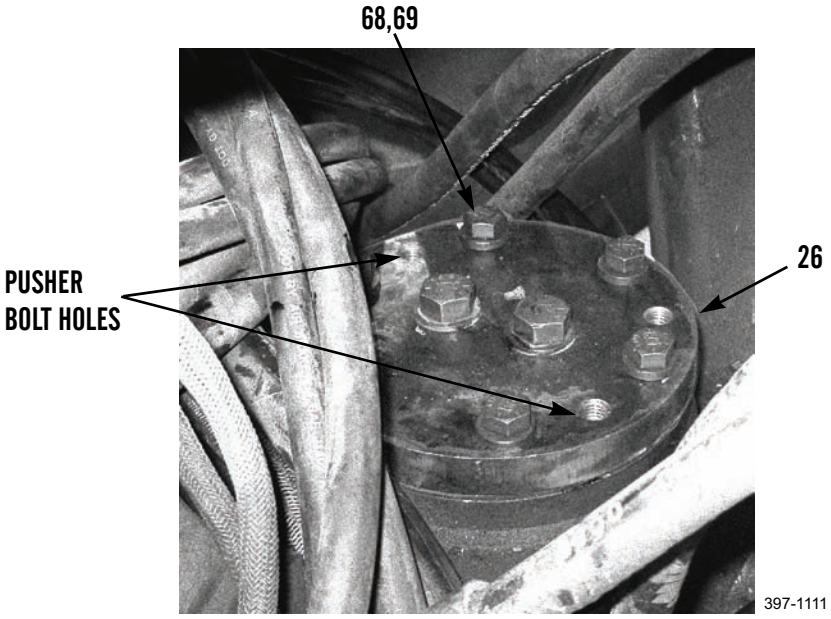
CAUTION

DO NOT turn on auxiliary pump for more than 30 seconds. Allow pump to cool for 1 minute between each use.

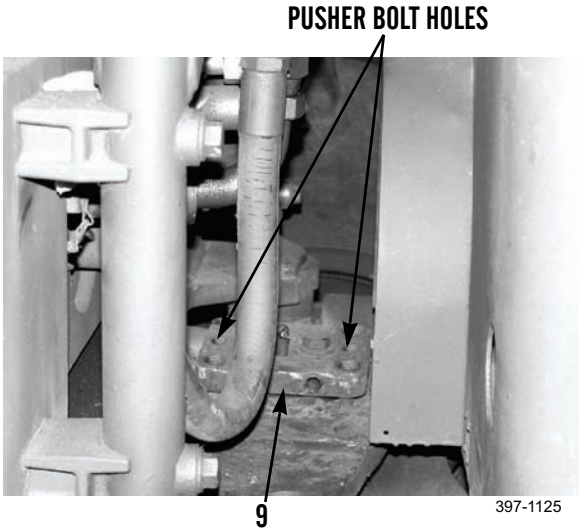
NOTE

To relieve load on hitch, turn on battery disconnect switch, turn on auxiliary pump switch, and adjust blade height as necessary. It may also be necessary to adjust screw jacks. Turn off battery disconnect switch.

46. Remove six bolts (68) and washers (69) from outer circle on top of lower pivot pin (26).
47. Install two pusher bolts in top of lower pivot pin (26).
48. Tighten two pusher bolts alternately and remove lower pivot pin (26).
49. Remove two pusher bolts.



50. Install the two pusher bolts on top of upper pivot pin (9).
51. Tighten pusher bolts alternately and remove the upper pivot pin (9).
52. Remove two pusher bolts.



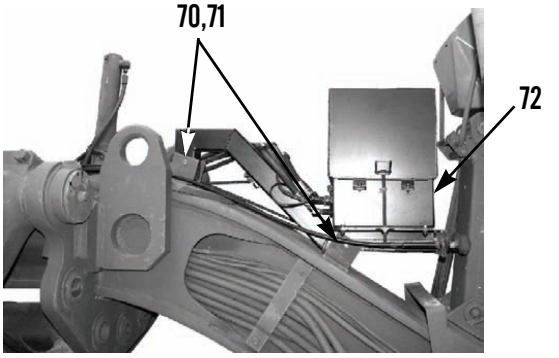
DISASSEMBLY - CONTINUED

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in injury to personnel.

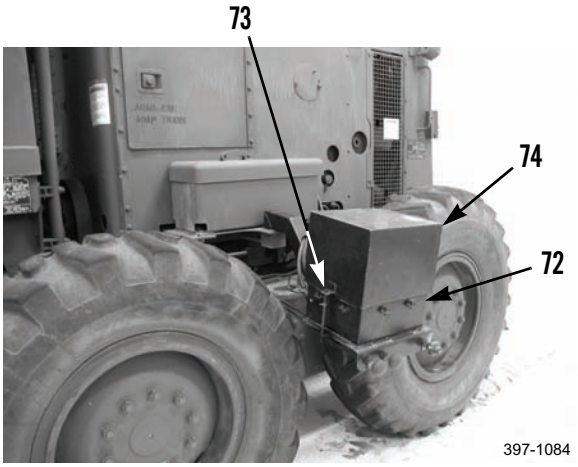
NOTE

Remote control box weighs 68 lb (31 kg).



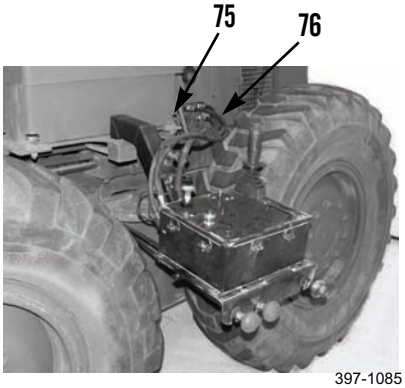
397-1083

53. Remove two nuts (70) and bolts (71) from remote control box (72).
54. With assistance, remove remote control box (72) from machine.
55. With assistance, install remote control box (72) in bracket near left-hand battery box.
56. Remove two bolts (73) and cover (74) from remote control box (72).



397-1084

57. Remove dust covers from cables and hoses.
58. Connect remote control hoses (76) and wiring harness (75) to machine.



397-1085

DISASSEMBLY - CONTINUED

NOTE

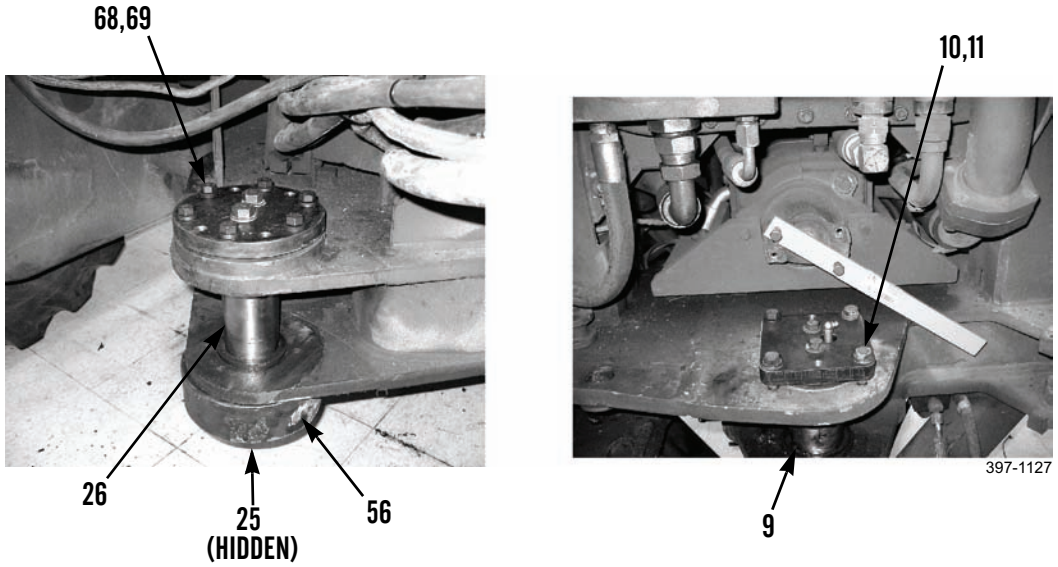
To aid in clutch cable connection, press button on remote control box clutch control to allow cable to move freely.

59. Connect remote control cables to machine cables (use tags added during removal).
60. Turn on battery disconnect switch and start engine. See *Driving the Rear Frame* in this work package.

WARNING

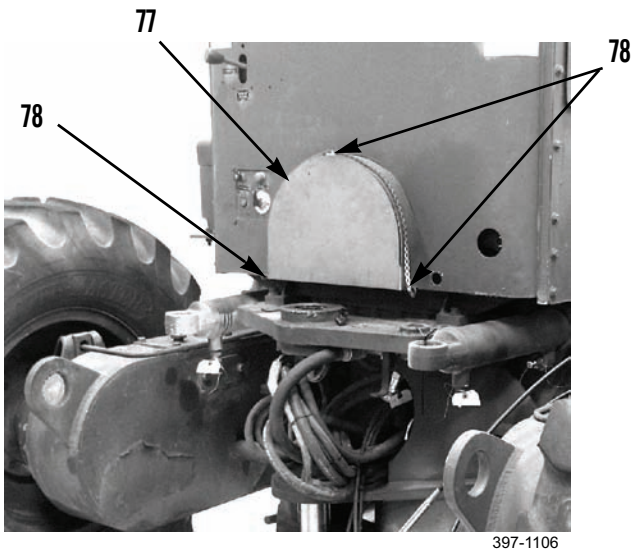
Keep all personnel away from machine when separating front and rear sections. The front section may drop a few inches if there is not enough blade down pressure.

61. Apply a slight amount of blade down pressure.
62. Drive rear frame very slowly about 3 ft. away from front section. Guide jumper hoses carefully to prevent damage. See *Driving the Rear Frame* in this work package.
63. Disconnect electrical jumper cable and two jumper hoses connecting the front and rear sections.
64. Install dust caps on hose ends.
65. Install upper pivot pin (9), bolts (10), and washers (11) in front frame. Tighten bolts enough to secure pin.
66. Install lower pivot pin (26), bolts (68), and washers (69) in rear frame. Tighten bolts enough to secure pin.
67. Install retainer (56) and bolts (25) on lower pivot pin (26).



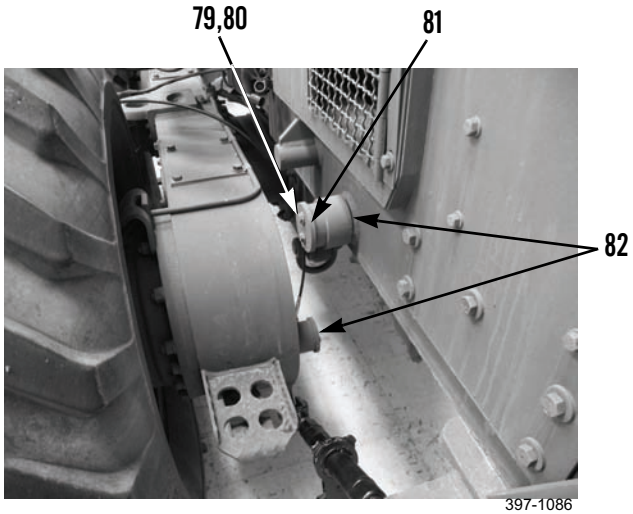
DISASSEMBLY - CONTINUED

68. Install shield (77) and three clips (78) on rear section.



397-1106

69. Secure hoses and cables to tandems and strap articulation cylinders to rear frame.
70. Secure hoses and cables to front section.
71. Secure lower pivot bushing to front frame in installed position.
72. Remove two bolts (79), washers (80), and cap (81) from each tandem link mount (82).
73. Install tandem link on each side of rear frame. Adjust screw jacks as necessary to engage tandem links.
74. Install cap (81), two washers (80), and bolts (79) on each tandem link mount (82).



397-1086

75. Remove screw jacks and store in tool box.

DISASSEMBLY - CONTINUED

NOTE

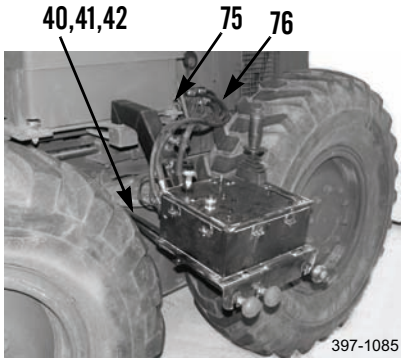
- At this point, the rear frame can be driven to air lift slinging location.
- Before slinging, proceed with the remaining disassembly steps.

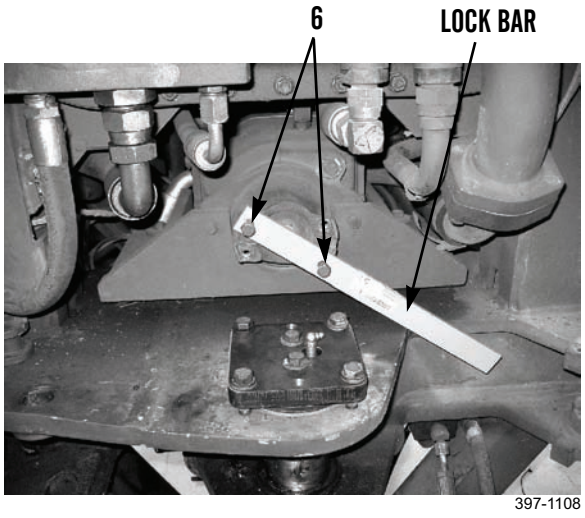
76. Disconnect remote control hoses (76) and wiring harness (75) from machine.

77. Install dust plugs on all connections.

78. Disconnect three remote control cables (40, 41, and 42) from machine cables and install dust covers.

79. Remove two bolts (6) and pump driveshaft lock bar. Store in front tool box.





80. Install cover (74) and two bolts (73) on remote control box (72).

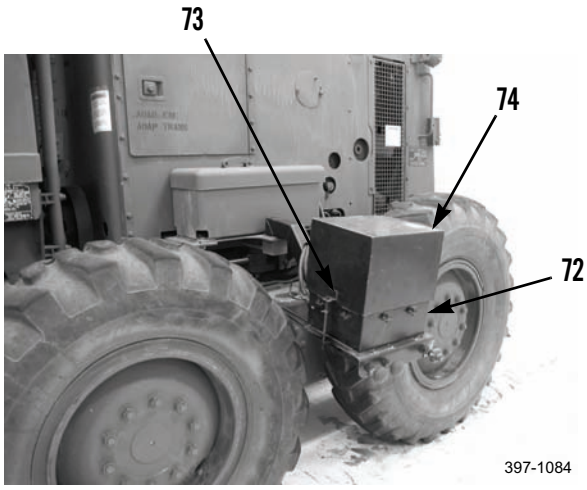
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in injury to personnel.

NOTE

Remote control box weighs 68 lb (31 kg).

81. With assistance, remove remote control box (72) from rear frame and install on the top of front frame.



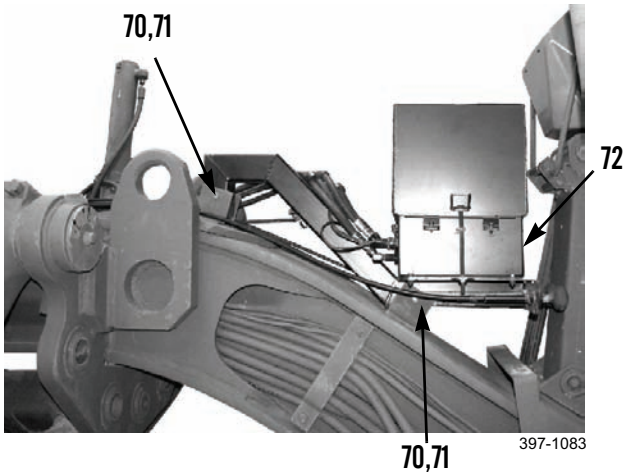
DISASSEMBLY - CONTINUED

82. Install two bolts (70) and nuts (71) on remote control box (72).

83. Install two straps (Item 20, WP 0021 00) on remote control box hoses and cables.

84. Store the articulation cylinder pins, pump driveshaft, driveshaft guard, screw jacks, tools, jumpers, and all other loose parts in the tool box on the front frame. Secure toolbox lid. Refer to the tool box inventory list and ensure that all parts are accounted for.

85. Cover the pivot pins and pivot pin bores with plastic or other material to prevent foreign matter from accumulating on the machined surfaces. Secure the covering with tape.



DRIVING THE REAR FRAME

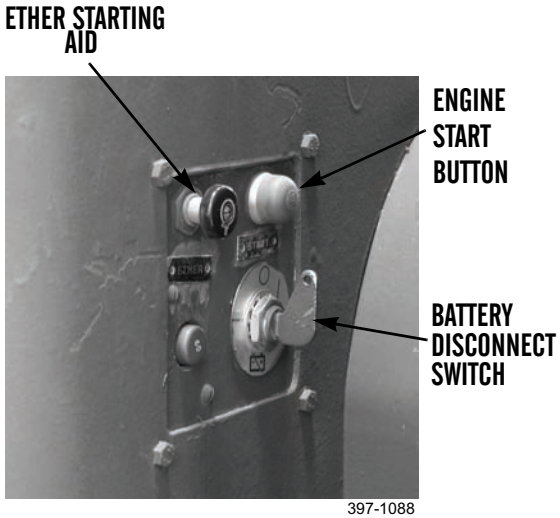
WARNING

Wear hearing protection while operating the rear section of the grader. Failure to follow this warning may result in hearing loss.

NOTE

- Remote control operation can be accomplished by one person. Use a ground guide to aid in starting and aligning the frames for reassembly.
- The backup alarm should sound when the transmission direction lever is placed in reverse (R).

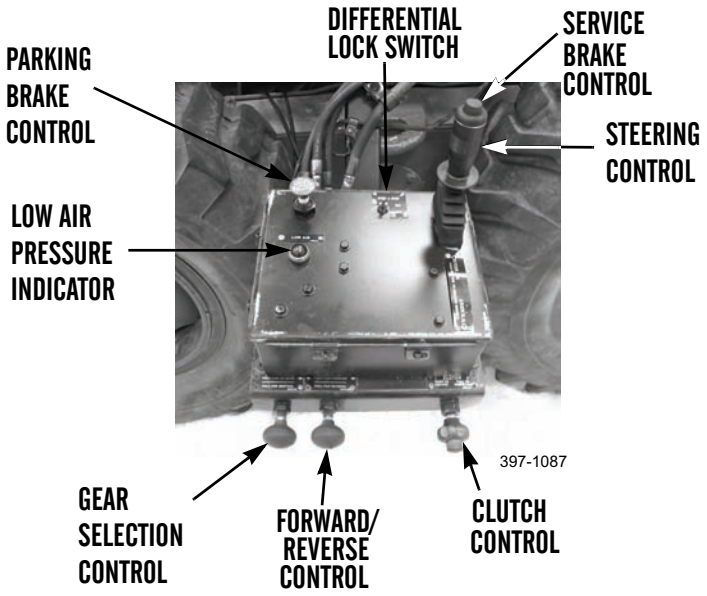
1. Turn the battery disconnect switch on.
2. Move the throttle to the low idle position.
3. Press the start button to start the engine. The ether starting aid may be required in cold weather conditions (WP 0006 00).



DRIVING THE REAR FRAME - CONTINUED

WARNING

- Stop the unit immediately if the LOW AIR indicator light illuminates. Determine the source of the problem and correct before continuing operation. The LOW AIR light will come on momentarily after starting engine.
- Never shift to any gear higher than 1st gear.
- Use extreme caution when operating with the remote control. Be ready at all times to release the steering control button and pull the emergency brake control if a dangerous situation should occur. Failure to follow these warnings may result in injury to personnel or damage to machine.



4. **Moving the machine:**

WARNING

Gear selection control has all six gears available. Only use 1st gear. Failure to follow this warning may result in injury to personnel or damage to machine.

a. Shift the transmission to 1st gear.
b. Move the transmission direction control to the desired direction.
c. Move the differential lock switch to OFF.
d. Turn off the parking/emergency brake by pushing in the control knob.
e. Release the service brakes by pressing button on steering control. Machine will move when button is pressed.

NOTE

- It is not necessary to push button on clutch control when engaging clutch.
- Button is only used when connecting clutch cable and engine is off.

f. Engage clutch gradually by rotating the clutch control to the right. Stop additional clutch engagement when the engine starts to lug.

CAUTION

DO NOT steer with differential lock switch in ON position.

g. If necessary, turn on the differential lock switch.

DRIVING THE REAR FRAME - CONTINUED

5. **Turning the machine:**

NOTE

The directions LEFT and RIGHT in this procedure relate to the direction of travel.

a. While moving the machine in a forward direction, pull the steering control toward you to turn the machine toward you (LEFT TURN). Push the steering control away from you to turn the machine away from you (RIGHT TURN).

b. While moving the machine in reverse, the steering control is reversed. Pull the steering control toward you to turn the machine toward you (RIGHT TURN). Push the steering control away from you to turn the machine away from you (LEFT TURN).

NOTE

Additional clutch engagement may be required to slide the wheels when turning, depending on ground conditions.

6. **Stopping the machine:**

a. Apply service brakes by releasing button on STEERING control.

b. Carefully disengage clutch by rotating CLUTCH control to the left.

c. Turn on the parking/emergency brake by pulling out the PARKING BRAKE control.

d. Shift transmission into Neutral by pulling GEAR SELECTION control fully out.

e. Shut down engine by raising throttle lever to NO FUEL position.

f. Turn off the battery disconnect switch.

ASSEMBLY

NOTE

- Assembly must be performed on a firm, level surface.
- All sectionalized components and tools are located in tool box on front section of machine.
- The pivot pins, bolts, and clamps are installed on the frame sections.
- Remove plastic covering on pivot pins from machine.

1. Remove two nuts (70) and bolts (71) from remote control box (72).

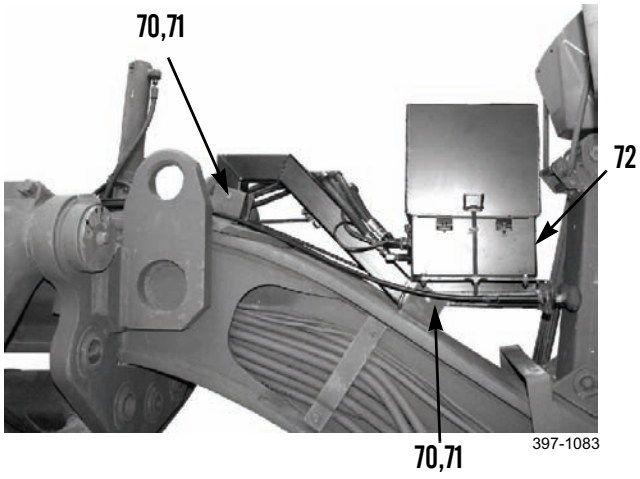
WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in injury to personnel.

NOTE

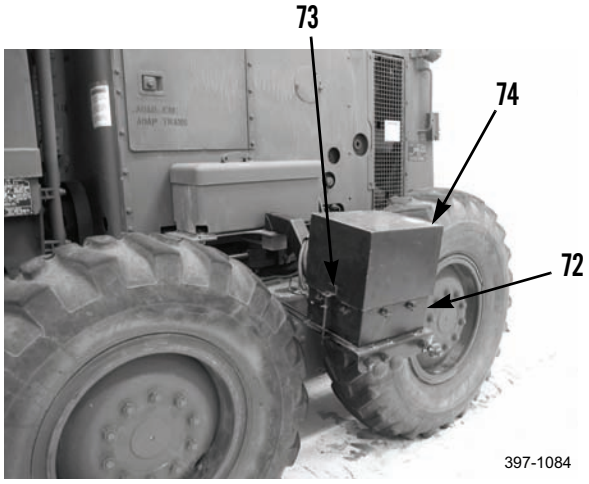
Remote control box weighs 68 lb (31 kg).

2. With assistance, remove remote control box (72) from machine.

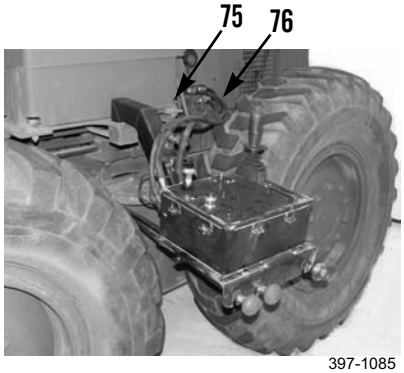


ASSEMBLY - CONTINUED

3. Install remote control box (72) in bracket near left-hand battery box.
4. Remove two bolts (73) and cover (74) from remote control box (72).



5. Remove dust covers from the cables and hoses.
6. Connect hoses (76) and wiring harness (75) to machine.



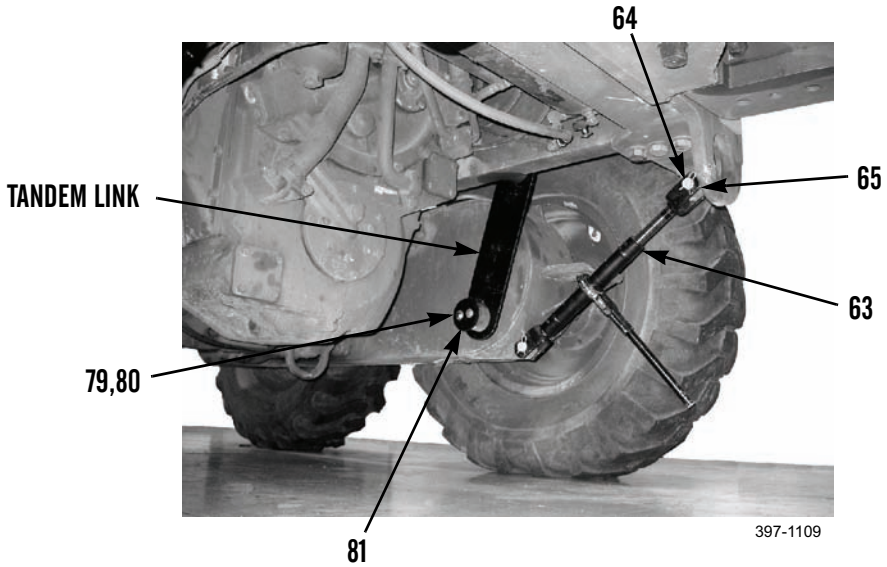
NOTE

The control levers may have to be adjusted to make the cable connections. If necessary, use the cable extractor tool (Item 9, Table 1, WP 0021 00) to extend the cables.

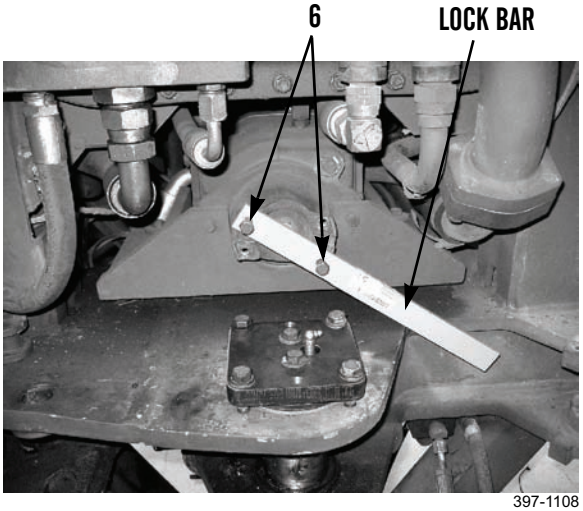
7. Connect remote control cables to corresponding machine cables (use tags added during removal).

ASSEMBLY - CONTINUED

8. Engage the parking/emergency brake, shift the transmission to Neutral and disengage the clutch. See *Driving the Rear Frame* in this work package.
9. Start the engine and move the rear frame to within 3 ft. (1 m) of the front frame, aligning the articulation joint as close as possible. See *Driving the Rear Frame* in this work package.
10. Disengage the clutch, set the parking/emergency brake, shut down the engine, and shift the transmission to Neutral.
11. Position two screw jacks (63) over mounting holes on each side of rear frame and tandem housing.
12. Install two pins (64) and spring clips (65) through mounting holes of each screw jack (63).
13. Adjust screw jacks (63) as needed to remove load from tandem links.
14. Remove two bolts (79), washers (80), and cap (81) from each tandem link.
15. Remove two tandem links from frame and store links in the tool box.
16. Reinstall two bolts (79), washers (80), and cap (81) in each tandem link mount.

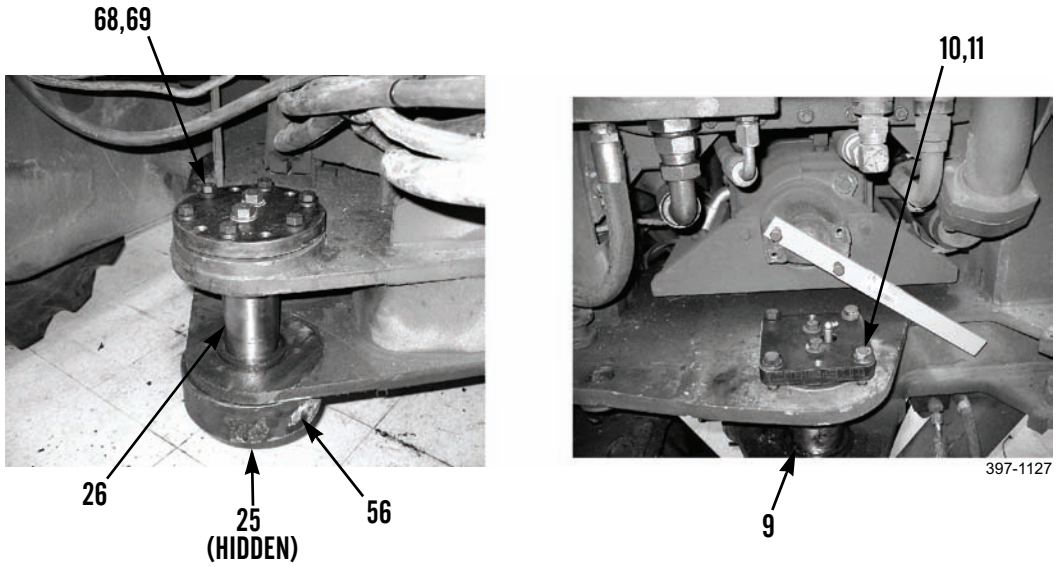


17. Remove straps (Item 20, Table 1, WP 0021 00) securing articulation cylinders, cables, and hoses.
18. Remove straps (Item 19, Table 1, WP 0021 00) securing lower pivot pin bushing.
19. Pull the articulation cylinders away from the frame.
20. Install lock bar and two bolts (6) on pump shaft yoke on front section.

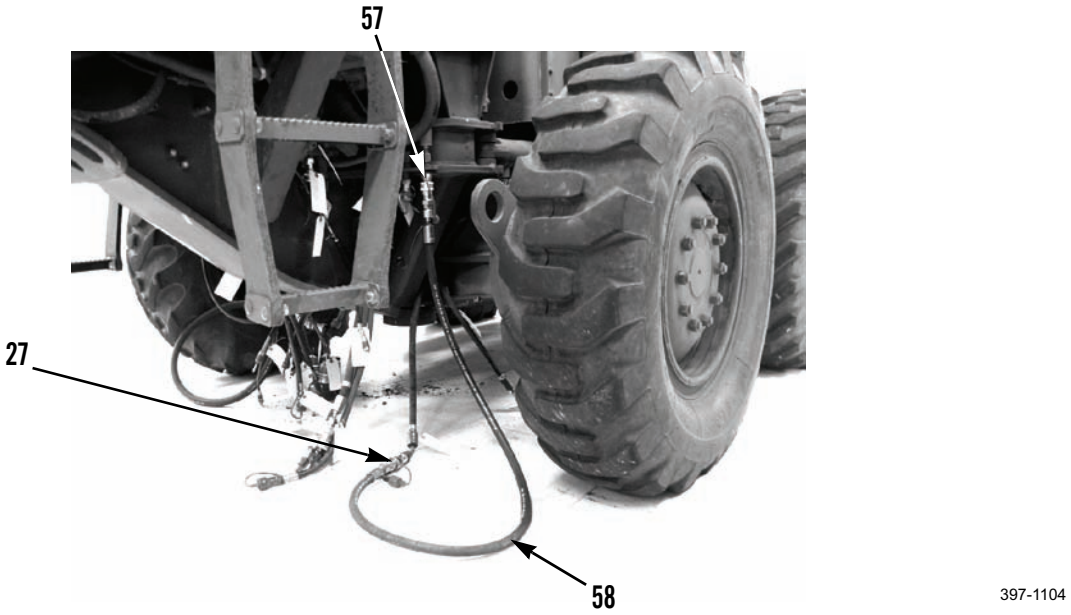


ASSEMBLY - CONTINUED

21. Remove four bolts (10), washers (11), and upper pivot pin (9) from front section.
22. Remove six bolts (25), retainer (56), bolts (68), washers (69), and lower pivot pin (26) from the rear section.

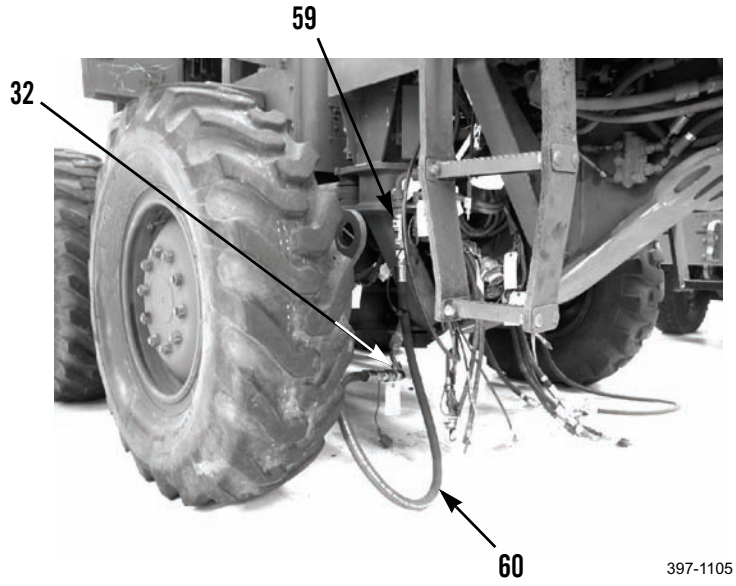


23. Connect jumper hose (58) to auxiliary pump supply hose (27) on left side of machine.
24. Connect other end of jumper hose (58) to auxiliary pump supply connector (57).

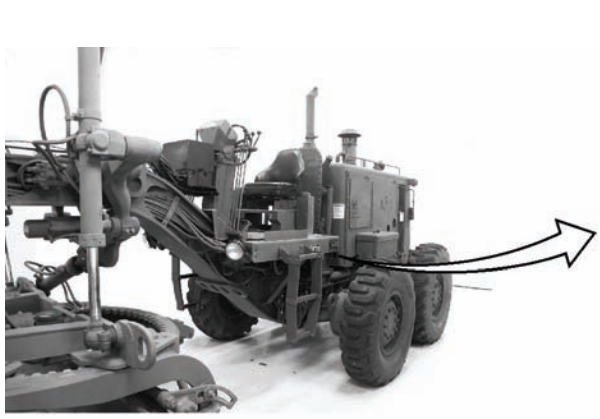


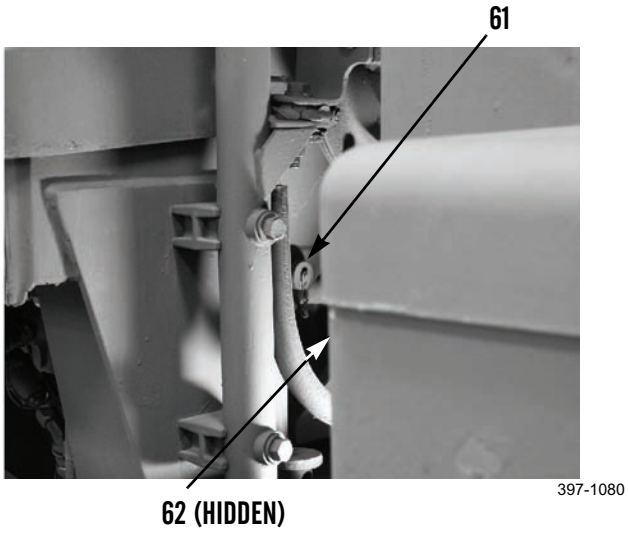
ASSEMBLY - CONTINUED

25. Connect jumper hose (60) to auxiliary pump return hose (32) on right side of machine.
26. Connect other end of jumper hose (60) to tank hose connector (59).



27. Connect electrical jumper harness between engine connector (62) and platform connector (61).





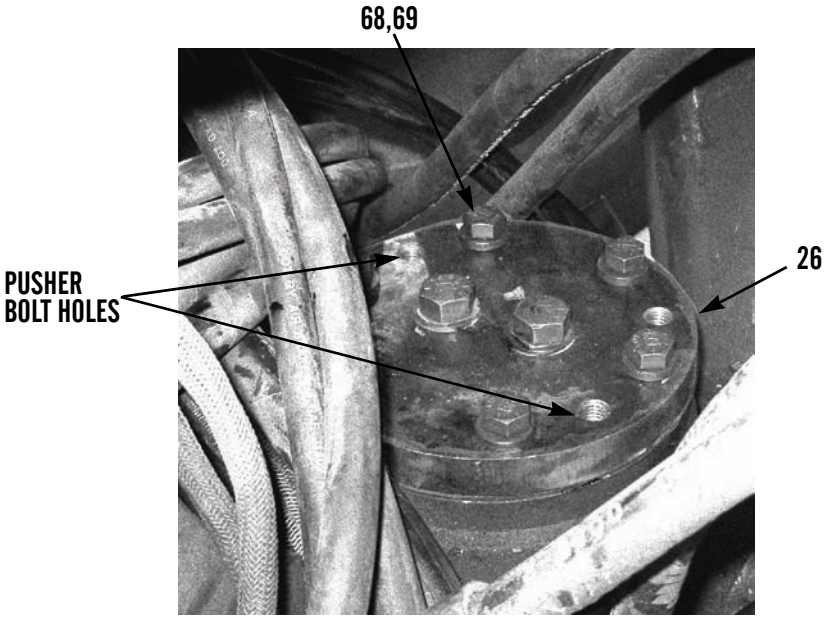
ASSEMBLY - CONTINUED

Keep all personnel away from machine while rear section is moving and while adjusting blade. Failure to follow this warning may cause injury or death to personnel.

CAUTION

DO NOT turn on auxiliary pump for more than 30 seconds. Allow pump to cool for 1 minute between each use.

28. Turn on battery disconnect switch and start engine. Drive the rear section very slowly toward the front frame. DO NOT STEER. Position the front frame relative to the rear frame with the blade control levers. Hold the appropriate blade lever in the desired position and use the auxiliary pump switch to align the top pivot pin.
29. Shift the transmission to Neutral and shut down the engine.
30. If required, adjust screw jack lengths and use the blade control levers with auxiliary pump switch to align the bottom pin hole.
31. Apply grease to pivot pins and pivot pin bores and carefully install the lower pivot pin (26).
32. Install six washers (69) and bolts (68) on top of lower pivot pin (26). Gradually tighten bolts in a diagonal pattern. Tighten bolts to 75 lb-ft (100 Nm).

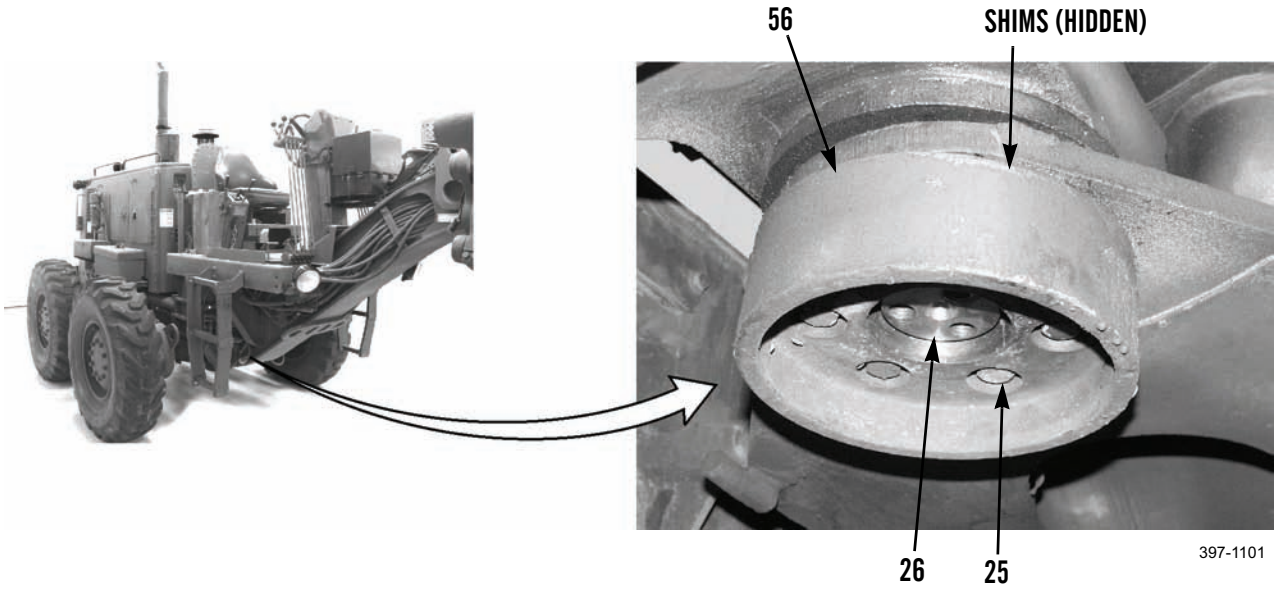


ASSEMBLY - CONTINUED

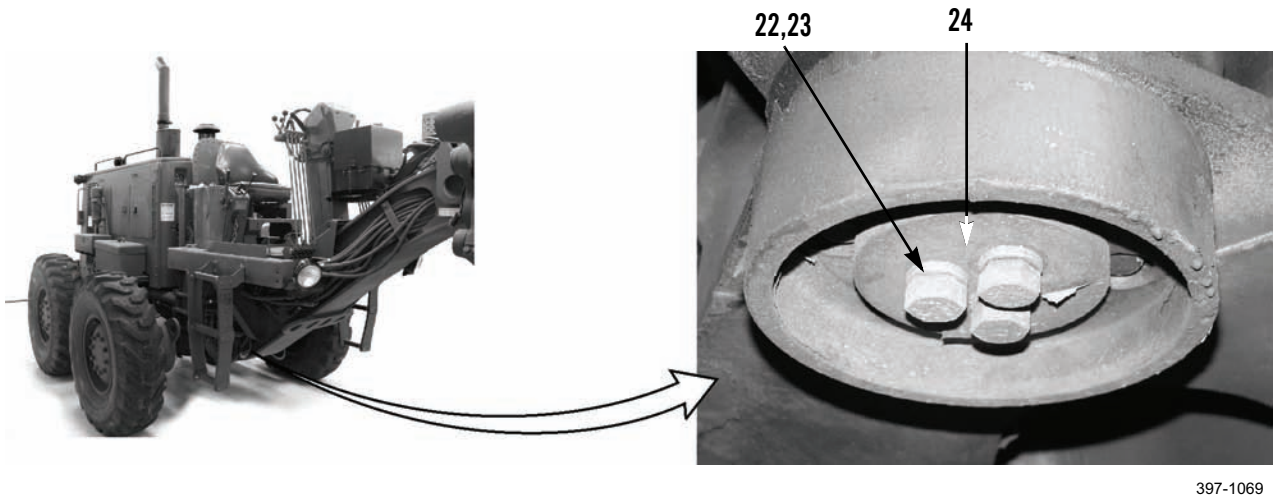
NOTE

During retainer installation, position two bolts through holes to hold and align the shims.

33. Install shims, retainer (56), and six bolts (25) on bottom of lower pivot pin (26). Gradually tighten bolts in a diagonal pattern.



34. Install cap (24), three washers (23), and bolts (22) on bottom of lower pivot pin (26). Tighten bolts to 100 lb-ft (135 Nm).



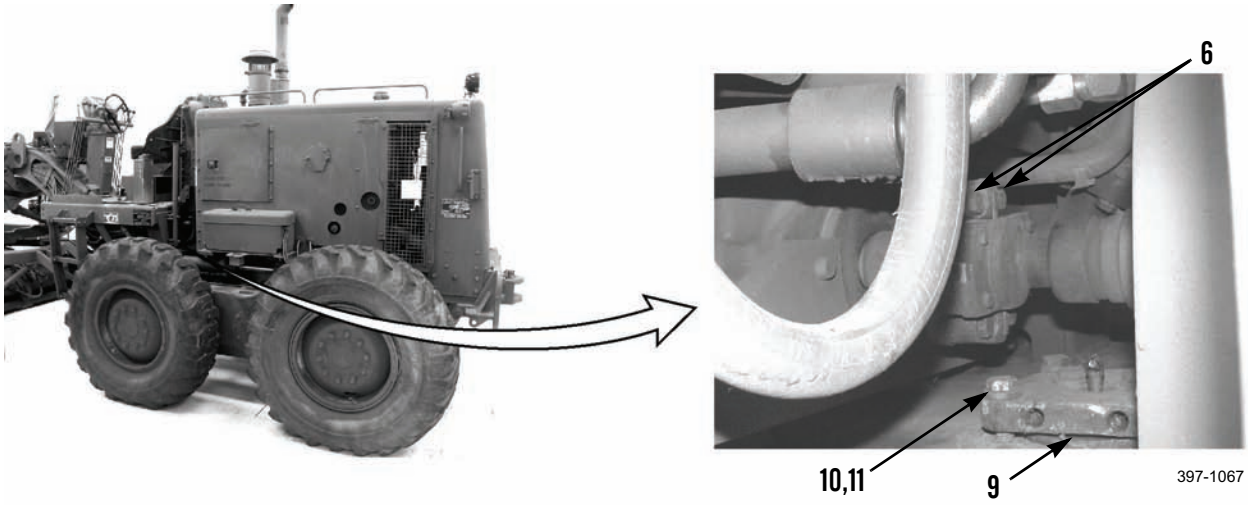
35. If required, adjust the screw jacks for top pivot pin hole alignment.

ASSEMBLY - CONTINUED

NOTE

The holes in the sides of the pivot pin cap must face the sides of the machine for mounting the pump driveshaft guard, and the grease fitting must face the right side.

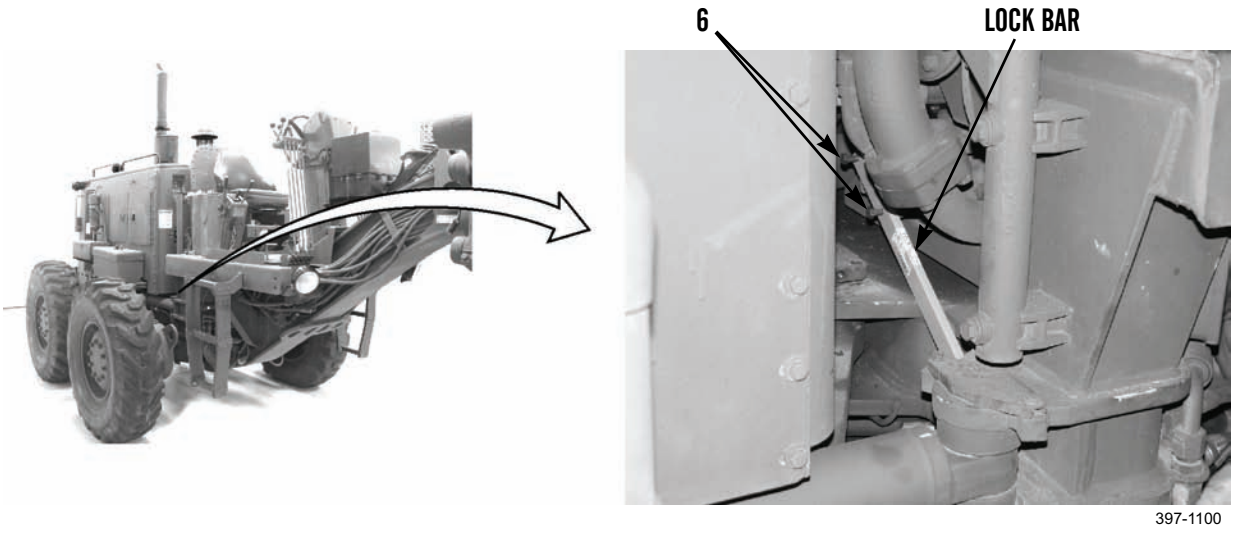
36. Install upper pivot pin (9), four washers (11), and bolts (10). Gradually tighten bolts in a diagonal pattern. Tighten bolts to 75 lb-ft (100 Nm).



37. Turn off the battery disconnect switch.

38. Remove the engine drive yoke guard from the fire wall and store in the tool box.

39. Remove two bolts (6) and pump driveshaft lock bar from the yoke. Store lock bar in front tool box.



ASSEMBLY - CONTINUED

WARNING

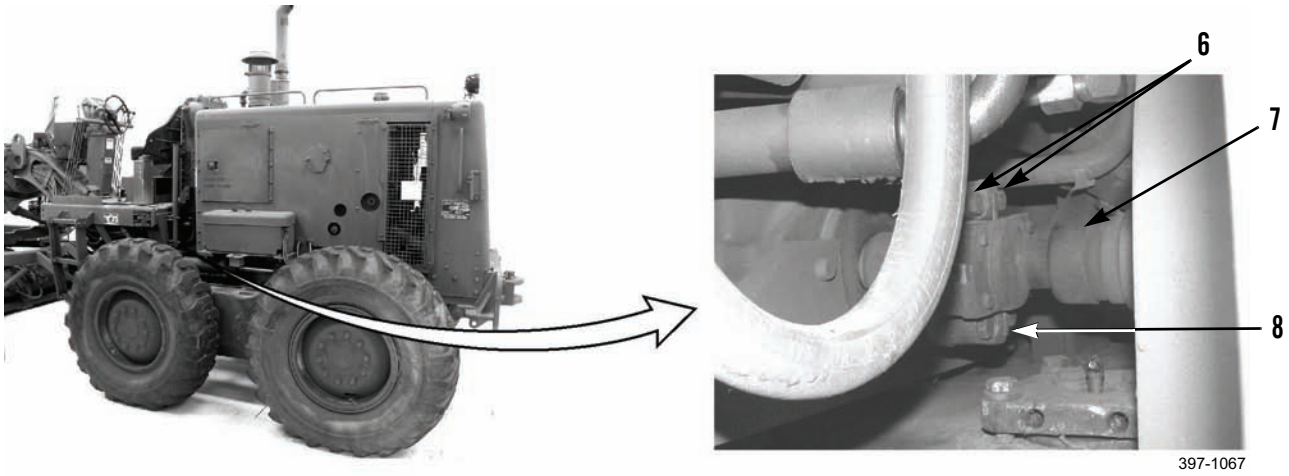
Wear eye protection when connecting pressurized hoses. Failure to follow this warning may cause injury to personnel.

40. Disconnect two hydraulic jumper hoses and electrical jumper harness. Install protective caps and store hoses and electrical harness in tool box.

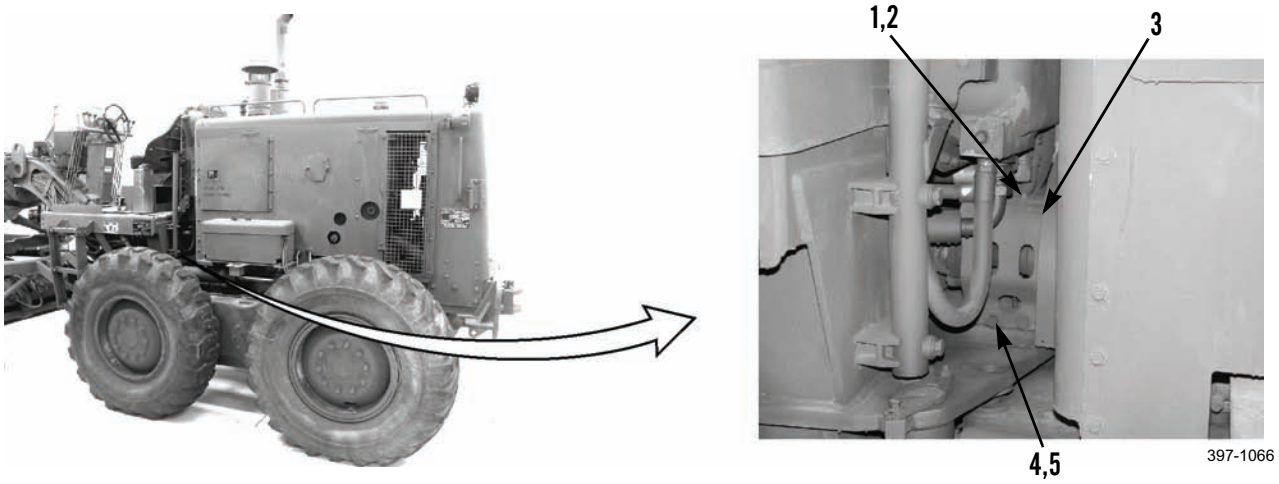
CAUTION

Two different thread types are used on driveshaft bolts. Coarse thread bolts are used on engine side of driveshaft. Fine thread bolts are used on pump side of driveshaft.

41. Install the pump driveshaft (7) and U-joint (8) assembly.
42. Install four bolts (6) on both ends of driveshaft (7). Tighten bolts to 40 lb-ft (55 Nm).

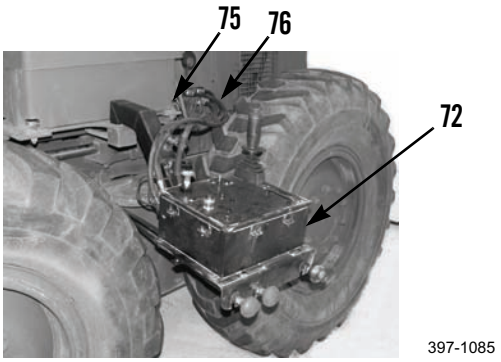


43. Install two pump driveshaft guards (3), four washers (5), bolts (4), three washers (2), and bolts (1).



ASSEMBLY - CONTINUED

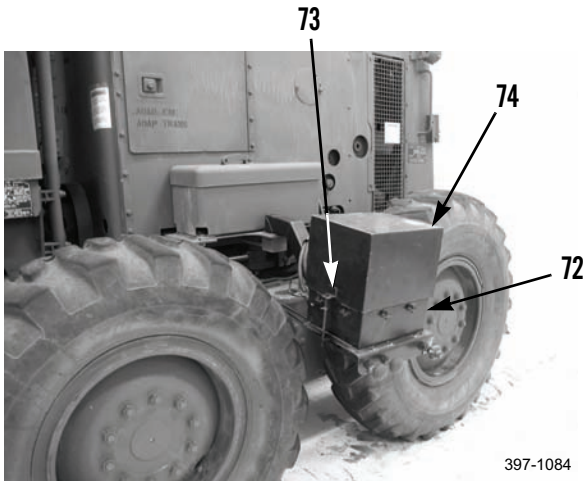
44. Disconnect remote control hoses (76), electrical connector (75), and cables of the remote control box (72). Install dust plugs on all connections.



45. Install cover (74) and two bolts (73) on remote control box (72).

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in injury to personnel.



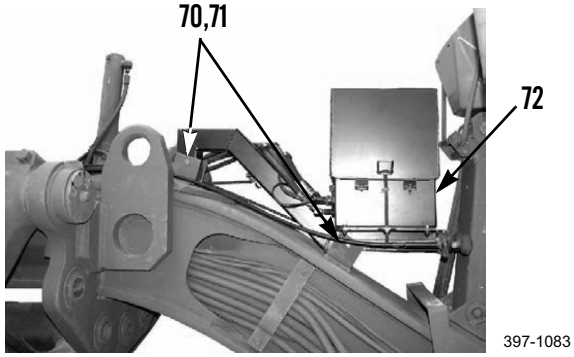
NOTE

Remote control box weighs 68 lb (31 kg).

46. With assistance, remove remote control box (72) from the rear frame and install it on the top of the front frame.

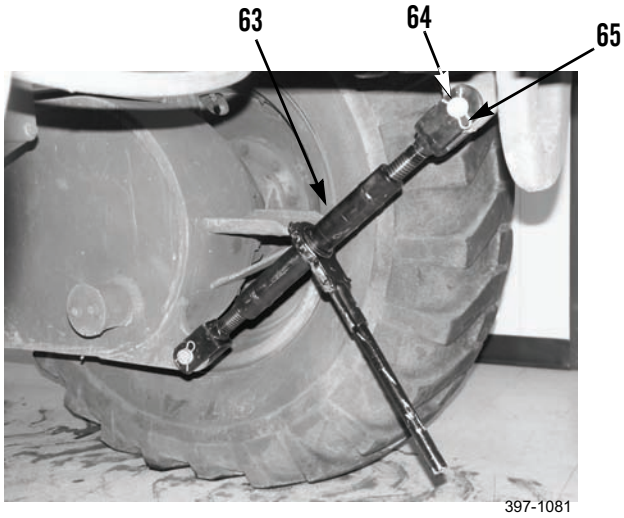
47. Install two bolts (71) and nuts (70) on remote control box.

48. Install two straps (Item 20, Table 1, WP 0021 00) on remote control box hoses and cables.

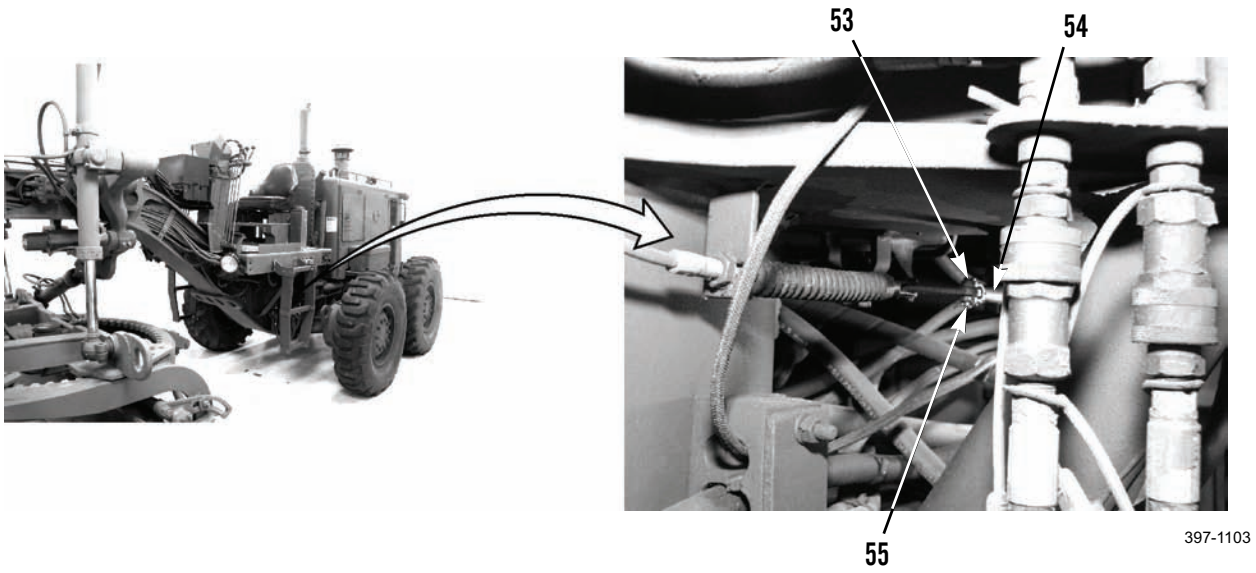


ASSEMBLY - CONTINUED

49. Remove two spring clips (65), pins (64), and screw jack (63) from each side of rear frame and store in the tool box.



50. Install articulation indicator connecting rod (54), two pins (53), and new cotter pins (55) on both ends of articulation indicator connecting rod (54).



ASSEMBLY - CONTINUED

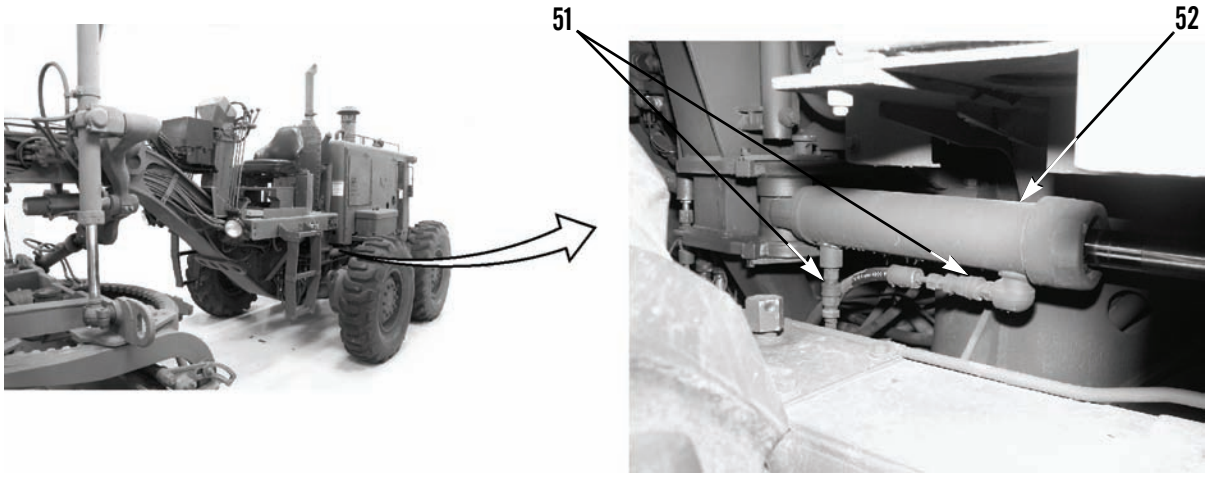
WARNING

Wear eye protection when connecting pressurized hoses. Failure to follow this warning may cause injury to personnel.

NOTE

- If trouble is experienced when attempting to connect articulation cylinder hoses, relieve pressure in the hoses. To relieve pressure, slightly loosen the fittings on the rear of the check valve. Tighten the fittings and connect the hoses.
- Control levers may need to be adjusted to make the cable connections. If necessary, use cable extractor tool (Item 9, Table 1, WP 0021 00) to extend the cables.

51. Connect articulation cylinder hoses (51) to articulation cylinder (52) on both sides of machine.



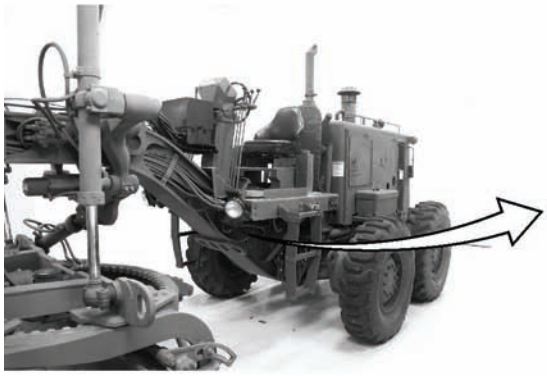
397-1077

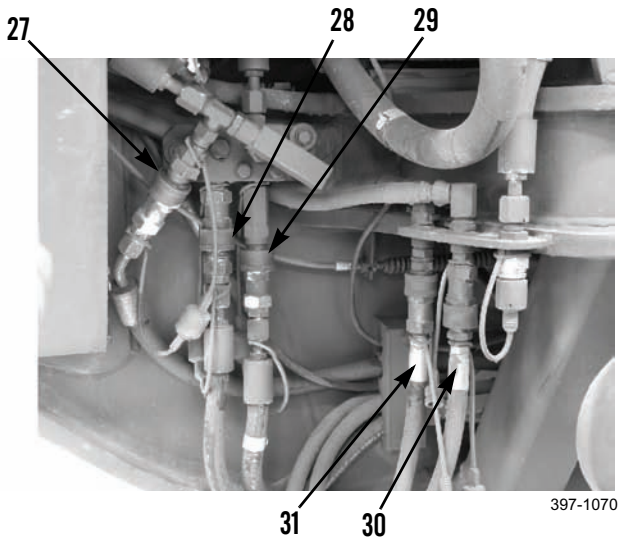
ASSEMBLY - CONTINUED

NOTE

Remove caps to make connections. Connect caps together when not in use.

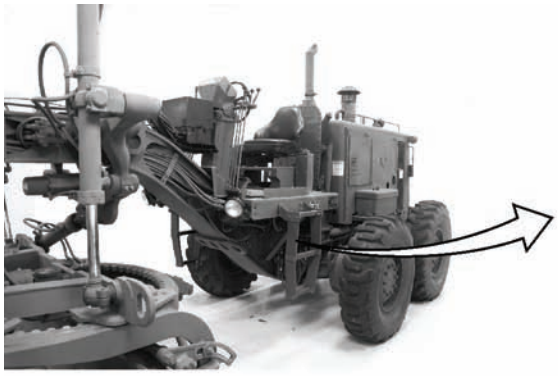
52. Feed hoses between platform support and frame.
53. Connect air hoses (30 and 31) and hydraulic hoses (27, 28, and 29) on the left side of machine.

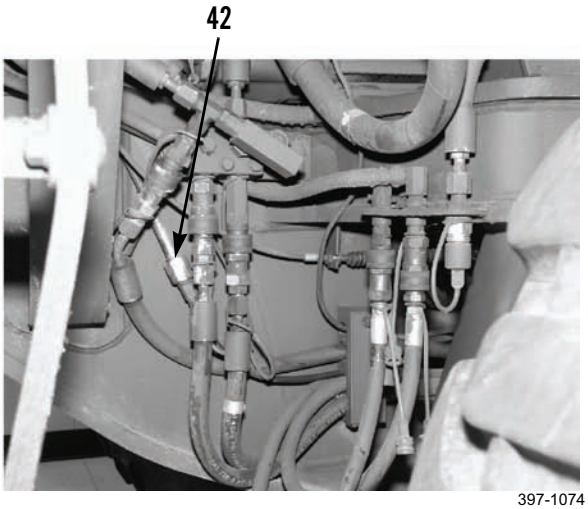




397-1070

54. Connect clutch cable (42) on left side of machine.





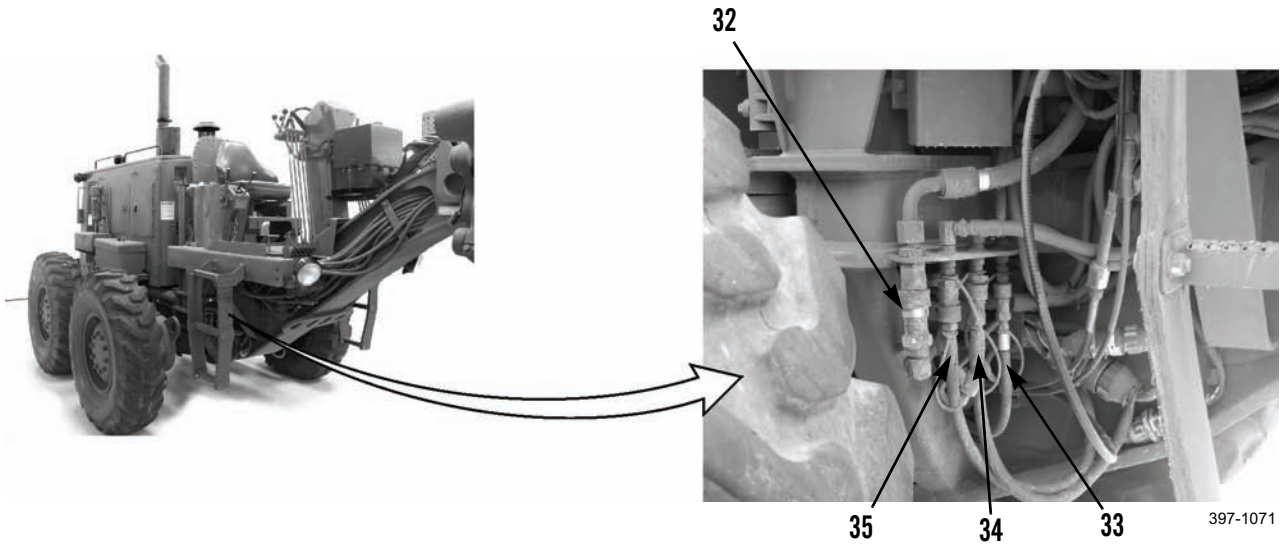
397-1074

ASSEMBLY - CONTINUED

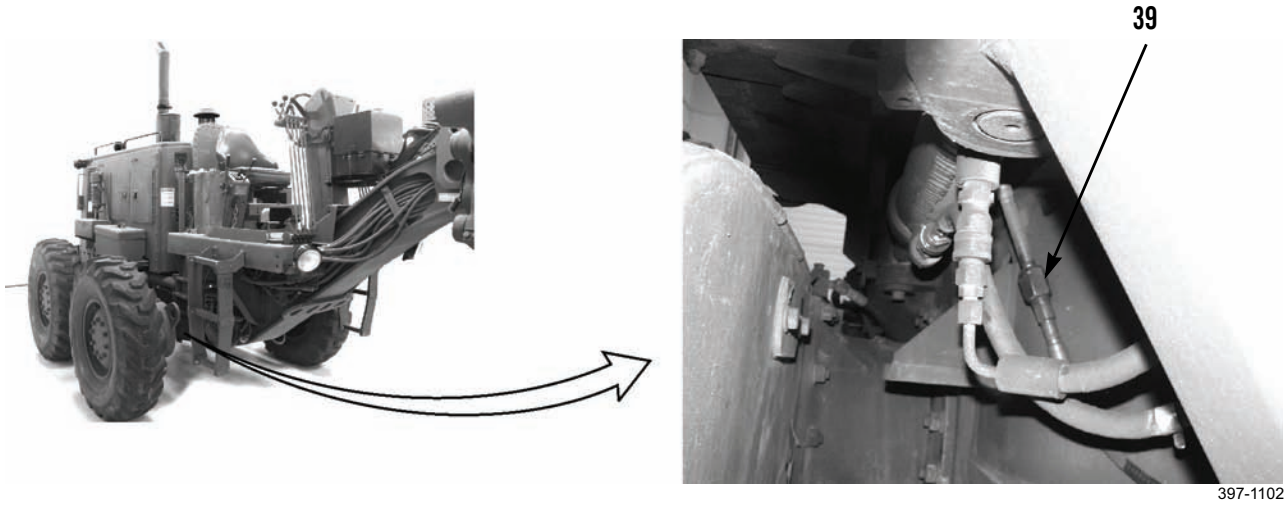
NOTE

Remove caps to make connections. Connect caps together when not in use.

55. Feed hoses between platform support and frame.
56. Connect air hoses (33, 35, and 39) and hydraulic hose (32) on right side of machine.

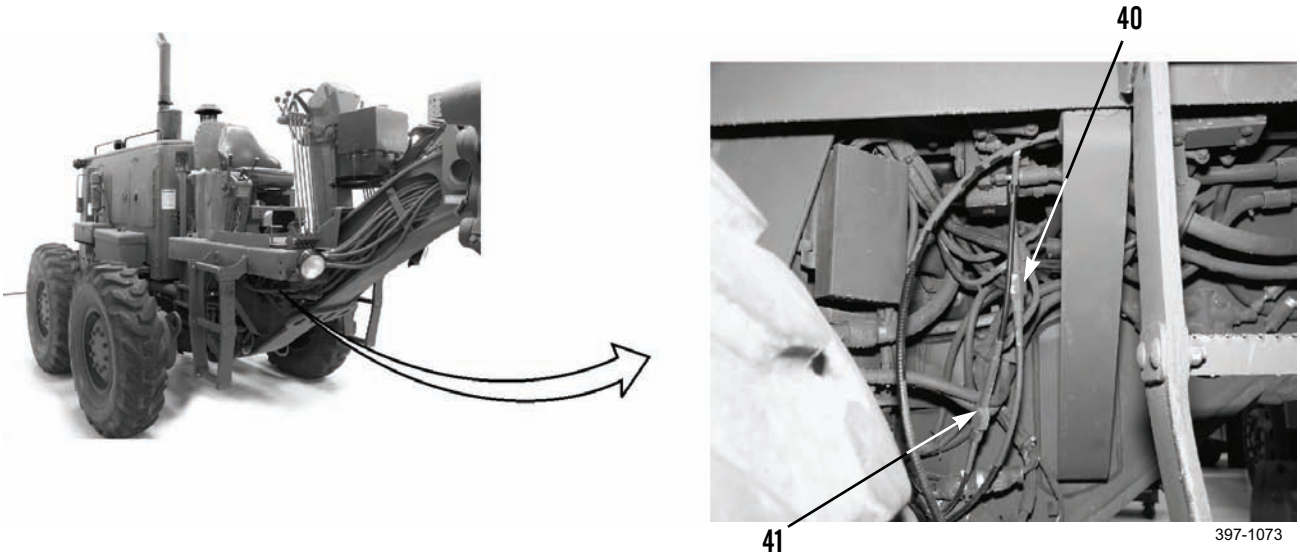


57. Connect throttle cable (39) behind right tandem housing.

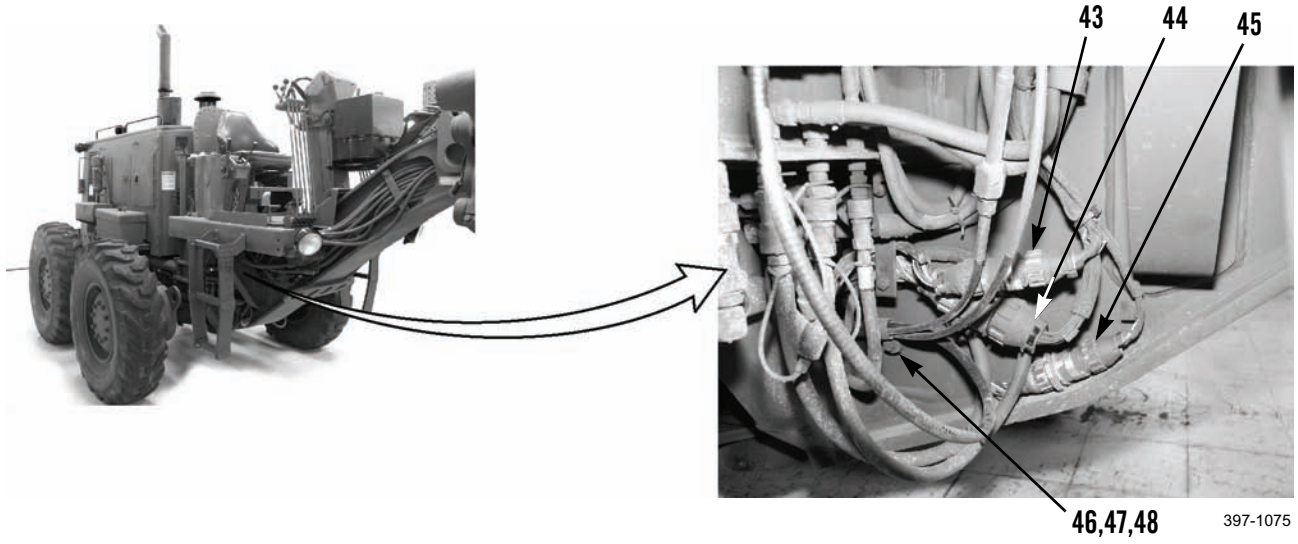


ASSEMBLY - CONTINUED

58. Connect two transmission cables (40 and 41) on right side of machine.

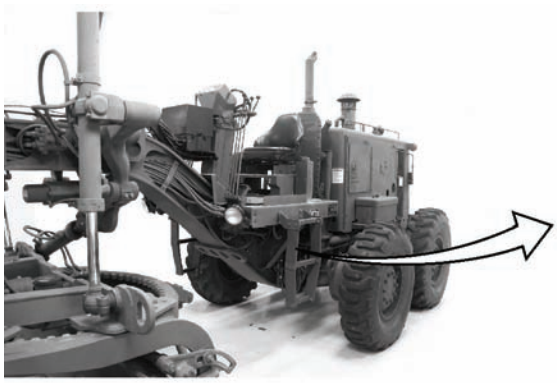


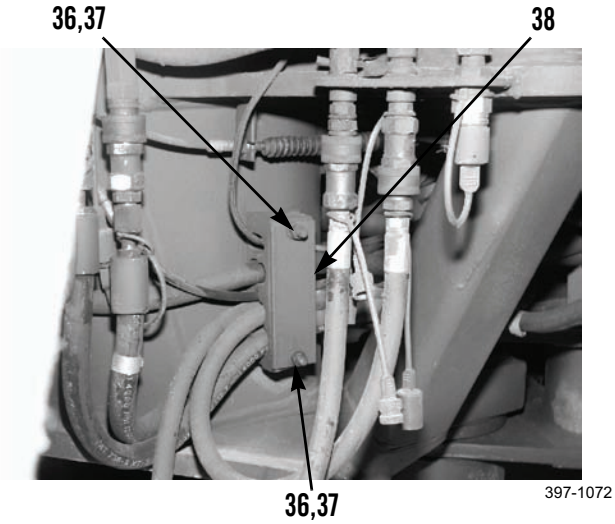
59. Remove bolt (46), washer (47), and clamp (48) from right side of machine.
60. Install clamp (48), washer (47), and bolt (46) on control cables below operator compartment.
61. Connect electrical harness connectors (43, 44, and 45) on right side of machine.



ASSEMBLY - CONTINUED

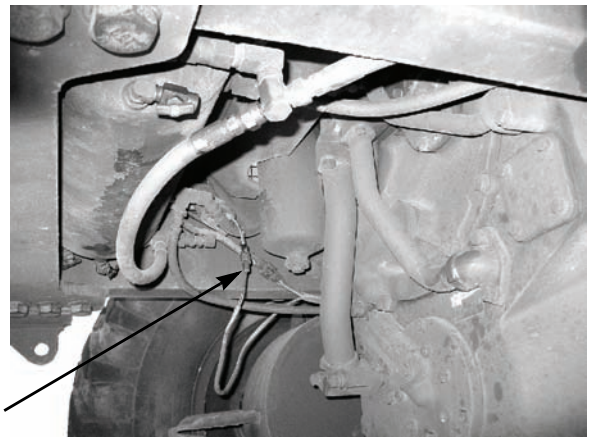
62. Install clamp (38), washers (37), and nuts (36) on each side of machine.





397-1072

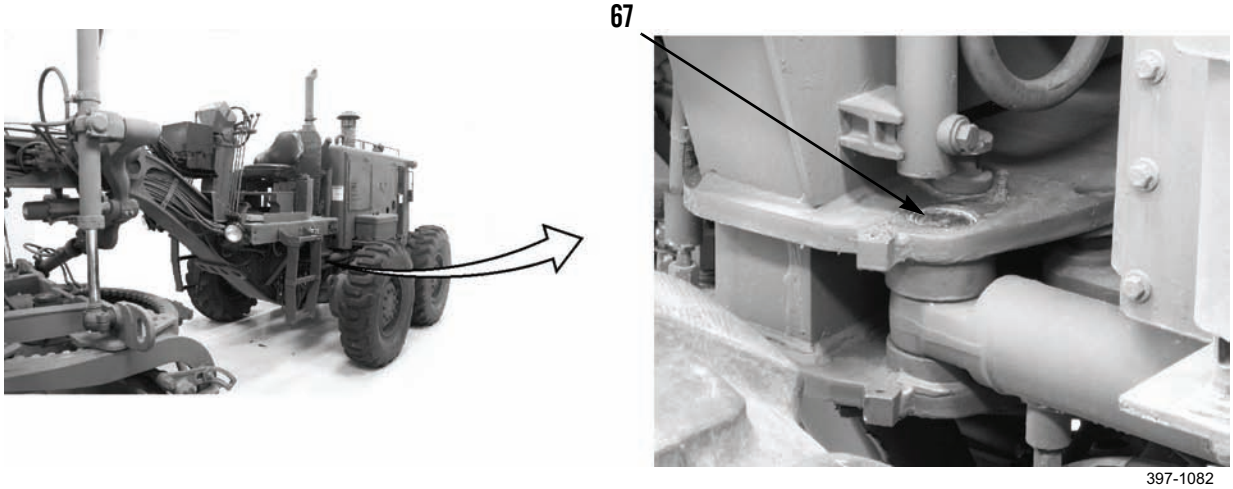
63. Route rear electrical harness (66) through to rear of machine and connect to rear harness connector.



397-1110

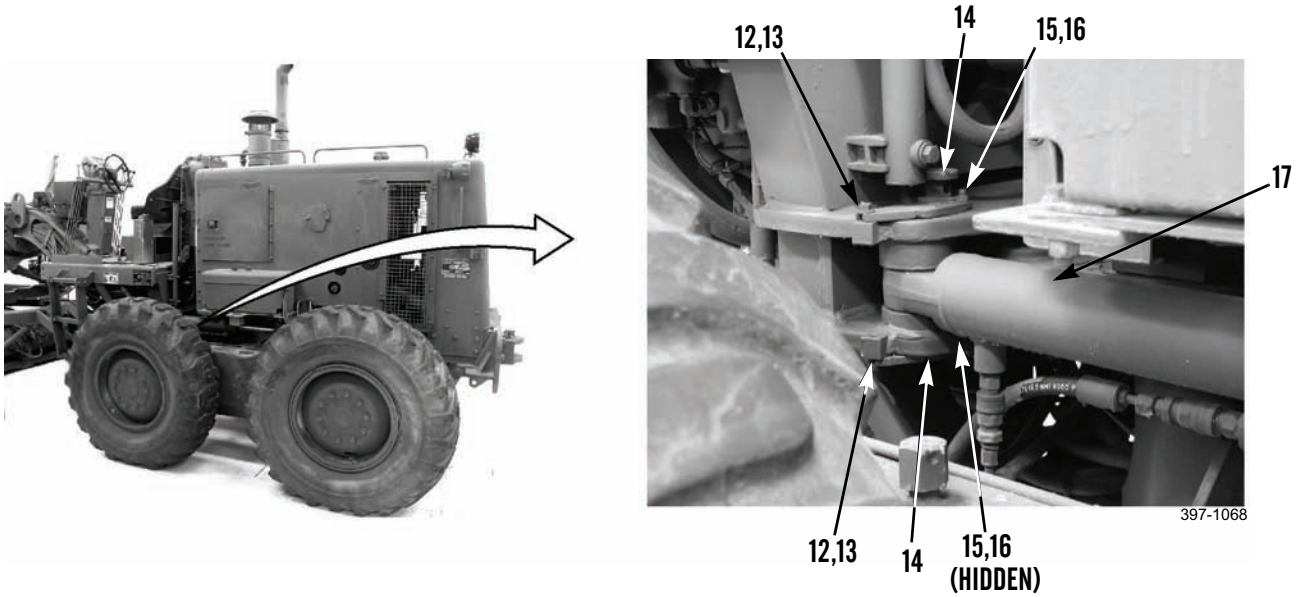
ASSEMBLY - CONTINUED

64. Turn on battery disconnect switch and start the engine (WP 0005 00). Align articulation cylinder eyes with holes in frame and install cylinder pin (67) on each side of the machine.



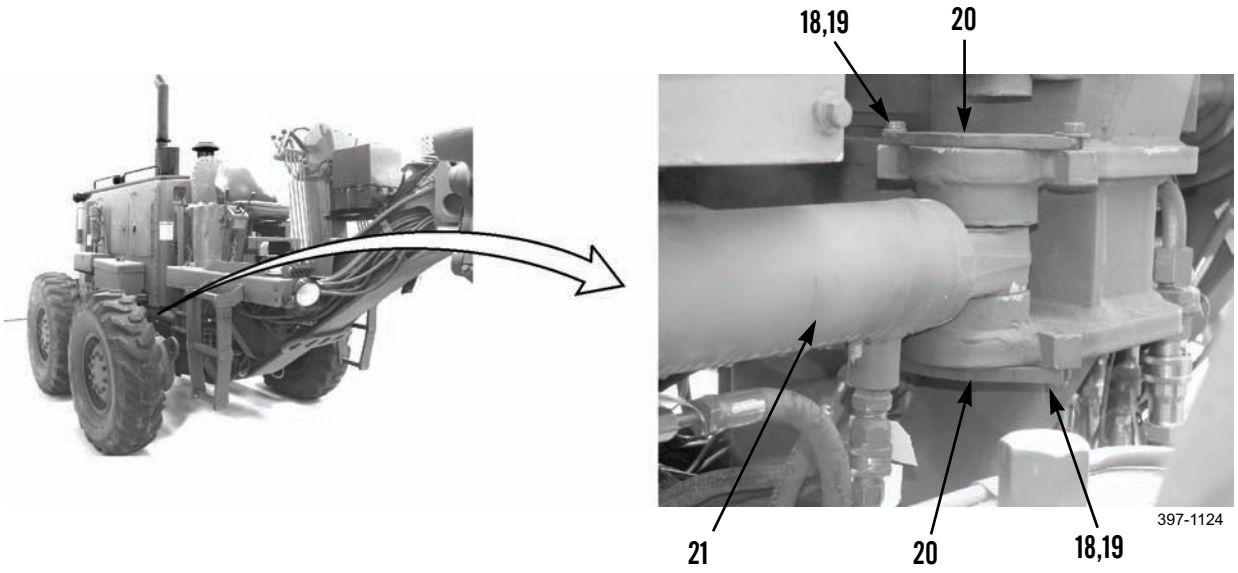
65. Shut down the engine (WP 0005 00).

66. Install two caps (14), washers (16), nuts (15), washers (13), and bolts (12) on left articulation cylinder (17).



ASSEMBLY - CONTINUED

67. Install two retainer caps (20), four washers (19), and bolts (18) on right articulation cylinders (21).



68. Store all tools, jumpers, and all other equipment in the tool box on the front of the machine and secure the lid.

WARNING

The ROPS must be installed before operating the grader. Failure to follow this warning may result in injury to personnel.

69. Notify Unit Maintenance to install the ROPS and return supports to front of machine.
70. After approximately one hour of operation, check the pivot pin bolts; tighten if necessary.

END OF WORK PACKAGE

CHAPTER 5
SUPPORTING INFORMATION

REFERENCES 0020 00

SCOPE

This work package lists all publication indexes, forms, field manuals, technical manuals, and other publications referenced in this manual and which apply to operation and operator maintenance of the 130G Series Grader.

PUBLICATION INDEXES

The following indexes should be consulted frequently for latest changes or revisions and for new publications relating to material covered in this technical manual.

Consolidated Army Publications and Forms Index. . . . . DA PAM 25-30

Functional Users Manual for The Army Maintenance Management System (TAMMS). . . . . DA PAM 738-750

FORMS

NOTE

Refer to DA PAM 738-750, *Functional Users Manual for The Army Maintenance Management System (TAMMS),* for instructions on the use of maintenance forms.

Accident Identification Card . . . . . DD Form 518

Equipment Inspection and Maintenance Worksheet . . . . . DA Form 2404, DA Form 5988-E

Maintenance Request . . . . . DA Form 2407

Motor Vehicle Accident Report. . . . . SF Form 91

Product Quality Deficiency Report . . . . . SF Form 368

Recommended Changes to Publications and Blank Forms. . . . . DA Form 2028

Uncorrected Fault Record . . . . . DA Form 2408-14

FIELD MANUALS

Army Motor Transport Unit and Operations. . . . . FM 55-30

Basic Cold Weather Manual . . . . . FM 31-70

Chemical and Biological Contamination Avoidance . . . . . FM 3-3

Desert Operations . . . . . FM 90-3

First Aid. . . . . FM 4-25.11

Manual for the Wheeled Vehicle Driver . . . . . FM 21-305

Multiservice Helicopter Sling Load: Basic Operations and Equipment . . . . . FM 10-450-3

Multiservice Helicopter Sling Load: Single-Point Load Rigging Procedures . . . . . FM 10-450-4

NBC (Nuclear, Biological, and Chemical) Defense . . . . . FM 21-40

NBC Decontamination . . . . . FM 3-5

NBC Field Handbook . . . . . FM 3-7

Northern Operations . . . . . FM 31-71

Nuclear Contamination Avoidance . . . . . FM 3-3-1

Operations and Maintenance of Ordnance Materiel in Cold Weather . . . . . FM 9-207

Recovery and Battlefield Damage Assessment and Repair . . . . . FM 9-43-2

Rigging Techniques, Procedures, and Applications . . . . . FM 5-125

REFERENCES - CONTINUED **0020 00**

TECHNICAL MANUALS

Operator's, Unit, Direct Support, and General Support Maintenance Manual for Lead-Acid Storage Batteries . . . . . TM 9-6140-200-14

Operator's, Unit Maintenance Manual for Laser Leveling Equipment. . . . . TM 5-6675-348-12&P

Procedures for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command) . . . . . TM 750-244-3

Transportability Guidance for the 130G Series Grader. . . . . TM 55-3805-261-14

OTHER PUBLICATIONS

Abbreviations and Acronyms . . . . . ASME Y14.38-1999

Army Medical Department Expendable/Durable Items . . . . . CTA 8-100

Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items) . . . . . CTA 50-970

END OF WORK PACKAGE

COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS 0021 00

SCOPE

This work package lists COEI and BII for the 130G Series Grader, to help you inventory items required for safe and efficient operation.

GENERAL

The COEI and BII information is divided into the following tabular lists:

1. **Table 1, Components of End Item List.** This listing is for informational purposes only and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

2. **Table 2, Basic Issue Items List.** These are the minimum essential items required to place the grader in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the grader during operation and whenever it is transferred between property accounts. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of end item. Illustrations are furnished to assist you in identifying the items.

EXPLANATION OF COLUMNS

Below is an explanation of columns found in the tabular listings:

1. **Column (1) - Illustration Number (Illus Number).** This column indicates the number of the illustration that shows the item.

2. **Column (2) - National Stock Number.** Indicates the National Stock Number (NSN) assigned to the item and used for requisitioning purposes.

3. **Column (3) - Description, CAGEC, and Part Number.** Indicates the Federal item name (in all capital letters) and, if required, a minimum description in parentheses to identify and locate the item. The entry for each item ends with the Commercial and Government Entity Code (CAGEC) in parentheses followed by the part number.

4. **Column (4) - Usable on Code.** Indicates a code if the item needed is not the same for all models of equipment. Usable on Codes for the 130G Grader are:

Usable On Code	Used On
AGP	130G CCE
AF9	130GNSCE (Type I)
AGN	130GNS (Type I)
AF10	130GSCE (Type II)
AGM	130GS (Type II)

5. **Column (5) - Unit of Measure (U/M).** Indicates how the item is issued for the NSN shown in Column (2).

6. **Column (6) - Quantity Required (Qty Rqd).** Indicates the quantity of the item required.

Table 1. Components of End Item List .

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQD
1	5306-00-260-4508	BOLT, MACHINE (11083) 0S1594	AF10, AGM	EA	8
2	5995-01-169-7620	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: Jumper (11083) 5R7028	AF10, AGM	EA	1
3	5340-01-186-3757	CAP, PROTECTIVE, DUST AND MOISTURE SEAL (15819) 625-2-701-89	AF10, AGM	EA	3
4		CAP (Wiring Harness) (11083) 5R6220	AF10, AGM	EA	1
5		CAP (Wiring Harness) (11083) 6V1824		EA	2
6		CAP (Wiring Harness) (11083) 6V1830	AF10, AGM	EA	2
7		CAP (Wiring Harness) (11083) 6V1827	AF10, AGM	EA	1
8		CAP (Wiring Harness) (11083) 5P8922	AF10, AGM	EA	1
9	2520-01-201-4146	EXTRACTOR ASSEMBLY, CABLE (11083) 5R7047	AF10, AGM	EA	1
10		GUARD ASSEMBLY (11083) 5R7072	AF10, AGM	EA	1
11	4720-01-169-2659	HOSE ASSEMBLY, NONMETALLIC: Jumper (Return) (11083) 5R6910	AF10, AGM	EA	1
12	4720-01-169-9603	HOSE ASSEMBLY, NONMETALLIC: Jumper (Supply) (11083) 5R6909	AF10, AGM	EA	1
13	2590-01-168-0025	JACK, LEVELING-SUPPORT (11083) 3G2468	AF10, AGM	EA	2
14	5340-01-293-1047	PLATE, MENDING: Lock Bar, Hydraulic Pump Drive Shaft (11083) 5R7075	AF10, AGM	EA	1
15	5935-01-170-7691	PLUG, END SEAL, ELECTRICAL CONNECTOR: Governor and Transmission	AF10, AGM	EA	3
16		PLUG: Wiring Harness (11083) 5R6221	AF10, AGM	EA	1

Table 1. Components of End Item List - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQD
17	5365-01-169-8377	RETAINER (11083) 5R6662	AF10, AGM	EA	4
18	5305-01-340-2633	SCREW: Pusher Bolt: 1/2 in. - 13 x 3 (11083) 0L1329	AF10, AGM	EA	2
19		STRAP: 12 Inch (11083) 2624771	AF10, AGM	EA	9
20		STRAP, RACHET:10 Feet (11083) 248-7650	AF10, AGM	EA	1
21		TANDEM LINK (11083) 5R6663	AF10, AGM	EA	2
22	5310-00-117-4788	WASHER, FLAT (11083) 5M2894	AF10, AGM	EA	8

Table 2. Basic Issue Items List.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQD
1	4930-00-288-1511	ADAPTER, GREASE GUN COUPLING: Flexible, 14 Inches Long (19207) 6300333		EA	1
2	5140-00-315-2775	BAG, TOOL: 9.5 x 18 Inches (81337) 5-7-1		EA	1
3	7510-00-889-3494	BINDER, LOOSE-LEAF: U.S. Army Equipment Log Book (19207) 11677003		EA	1
4	7520-00-559-9618	CASE, MAINTENANCE AND OPERATIONAL MANUALS (83421) 7520-00-559-9618		EA	1
5	4210-00-775-0127	EXTINGUISHER, FIRE: Dry Chemical, 5-Pound Capacity (19207) 7015266		EA	1
6	6545-00-922-1200	FIRST AID KIT (19207) 11677011		EA	1
7	6230-00-264-8261	FLASHLIGHT: 2-Cell w/o Batteries (84609) N47-1B		EA	1
8	4910-00-204-3170	GAUGE, TIRE PRESSURE (27783) 7188BH		EA	1
9	5120-00-061-8546	HAMMER, HAND: 32 Ounces, Ball-Peen (81348) GGG-H-86		EA	1
10		HOSE ASSEMBLY PNEUMATIC: Tire Inflation (11083) 225-4310		EA	1
11	4930-00-223-3391	LUBRICATING GUN, HAND: 14-Ounce Cartridge (19207) 5644803		EA	1
12	4930-00-266-9182	OILER, HAND: 8 Ounce Capacity (96906) MS15164-1		EA	1
13	5120-00-223-7397	PLIERS, SLIP JOINT: 8 Inches Long (56161) 10510983		EA	1
14	9905-00-148-9546	WARNING DEVICE KIT (19207) 11669000		EA	1
15	5120-00-449-8083	WRENCH, ADJUSTABLE: 10 Inches Long (11083) 1B7536		EA	1

END OF WORK PACKAGE

EXPENDABLE AND DURABLE ITEMS LIST 0022 00

SCOPE

This work package lists expendable and durable items you will need to operate and maintain the 130G Series Grader. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, *Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items)*, or CTA 8-100, *Army Medical Department Expendable/Durable Items*.

EXPLANATION OF COLUMNS

1. **Column (1) - Item Number.** This number is referenced in the appropriate work package Initial Setup list and in the narrative instructions to identify the item; e.g., Use antifreeze (Item 1, WP 0022 00).
2. **Column (2) - Level.** This column identifies the lowest level of maintenance that requires the listed item.

   C - Operator/Crew
3. **Column (3) - National Stock Number.** This is the National Stock Number assigned to the item, which you can use to requisition it.
4. **Column (4) - Description, CAGEC, and Part Number.** This provides the other information you need to identify the item.
5. **Column (5) - Unit of Measure (U/M).** This column shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

.

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
1	C		ANTIFREEZE: Permanent Ethylene Glycol, Inhibited, Heavy-Duty	
		6850-01-441-3218	(58536) A-A-52624 1 Gallon Can	CN
		6850-00-181-7933	(81349) MILA46153 5 Gallon Container	CN
		6850-01-441-3223	(58536) A-A-52624 55 Gallon Drum	DR
2	C		CLEANING COMPOUND: Solvent, Type III (81349) MIL-PRF-680	
		6850-01-474-2318	1 Gallon Can	CN
		6850-01-474-2320	5 Gallon Can	CN
		6850-01-474-2321	55 Gallon Drum	DR
3	C		CLEANING COMPOUND: Windshield (0FTT5) 0854-000	
		6850-00-926-2275	16 Ounce Bottle	BT
4	C		DETERGENT: General Purpose, Liquid (83421) 7930-00-282-9699	
		7930-00-282-9699	1 Gallon Can	CN
5	C		DIESEL FUEL: DF-1 Grade, Arctic (81346) ASTM D 975	
		9140-00-286-5286	Bulk	GL
		9140-00-286-5287	5 Gallon Can	CN
		9140-00-286-5288	55 Gallon Drum	DR
6	C		DIESEL FUEL: DF-2 Grade (81346) ASTM D 975	
		9140-00-286-5294	Bulk	GL
		9140-00-286-5295	5 Gallon Can	CN
		9140-00-286-5296	55 Gallon Drum	DR
7	C	9130-01-031-5816	FUEL, TURBINE: Aviation (81349) MILT83133 GR JP8	GL

EXPENDABLE AND DURABLE ITEMS LIST - CONTINUED **0022 00**

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
8	C		GREASE: Automotive and Artillery GAA	
		9150-01-197-7688	(81349) M-10924-A 1-1/4 Ounce Tube	TU
		9150-01-197-7693	(81349) M-10924-B 14 Ounce Cartridge	CA
		9150-01-197-7690	(81349) M-10924-C 1-3/4 Pound Can	CN
		9150-01-197-7692	(81349) M-10924-E 35 Pound Can	CN
9	C	9150-00-543-7220	Lubricating Oil: Molybdenum Disulfied, Silicone (81349) DOD-L-25681	LB
10	C		OIL: Lubricating, Arctic, OEA	
		9150-00-402-4478	(81349) MIL-L-46167 1 Quart Can	CN
		9150-00-402-2372	(81349) MIL-PRF-46167 5 Gallon Can	CN
		9150-00-491-7197	(81349) MIL-PRF-46167 55 Gallon Drum	DR
11	C		OIL: Lubricating, OE/HDO 10 (81349) MIL-PRF-2104	
		9150-00-189-6727	1 Quart Can	CN
		9150-00-186-6668	5 Gallon Can	CN
		9150-00-191-2772	55 Gallon Drum	DR
12	C	9150-00-247-0481	OIL: Lubricating, OE/HDO 10W/30 (81349) MIL-L-2104	QT
13	C		OIL: Lubricating, OE/HDO 15W/40 (81349) MIL-PRF-2104	
		9150-01-152-4117	1 Quart Can	CN
		9150-01-152-4118	5 Gallon Can	CN
		9150-01-152-4119	55 Gallon Drum	DR
14	C		OIL: Lubricating, OE/HDO 30 (81349) MIL-PRF-2104	
		9150-00-186-6681	1 Quart Can	CN
		9150-00-188-9858	5 Gallon Can	CN

EXPENDABLE AND DURABLE ITEMS LIST - CONTINUED **0022 00**

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
15	C		RAG: Wiping (64067) 7920-00-205-1711	
		7920-00-205-1711	50 Pound Bale	BL
16	C		TAG, MARKER (64067) 9905-00-537-8954	
		9905-00-537-8954	Bundle of 50	BD
17	C		TAPE: Duct, 2 Inches Wide (39482) 1791K70	
		5640-00-103-2254	60 Yard Roll	RL

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By Order of the Secretary of the Army:

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

Official:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0604101

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PUBLICATION/FORM NUMBER	DATE	TITLE
TM 5-3805-261-10	28 April 2006	Operator's Manual for Tractor, Full Tracked Low Speed: DED, Medium Drawbar Pull, D7F

ITEM	PAGE	PARA-	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON
	0017 00-2					Part number supplied for item 2 is incorrect.

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

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PUBLICATION NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

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THE METRIC SYSTEM AND EQUIVALENTS

Linear Measure

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

Weights

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

Liquid Measure

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

Square Measure

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches
1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet
1 Sq Kilometer = 1,000,000 Sq Meters = 0.0386 Sq Miles

Cubic Measure

1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

Temperature

5/9 (°F - 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 C° +32 = F°

APPROXIMATE CONVERSION FACTORS

To Change	To	Multiply By
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Sq Inches	Sq Centimeters	6.451
Sq Feet	Sq Meters	0.093
Sq Yards	Sq Meters	0.836
Sq Miles	Sq Kilometers	2.590
Acres	Sq Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Sq Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

To Change	To	Multiply By
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Sq Centimeters	Sq Inches	0.155
Sq Meters	Sq Feet	10.764
Sq Meters	Sq Yards	1.196
Sq Kilometers	Sq Miles	0.386
Sq Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Sq Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621

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