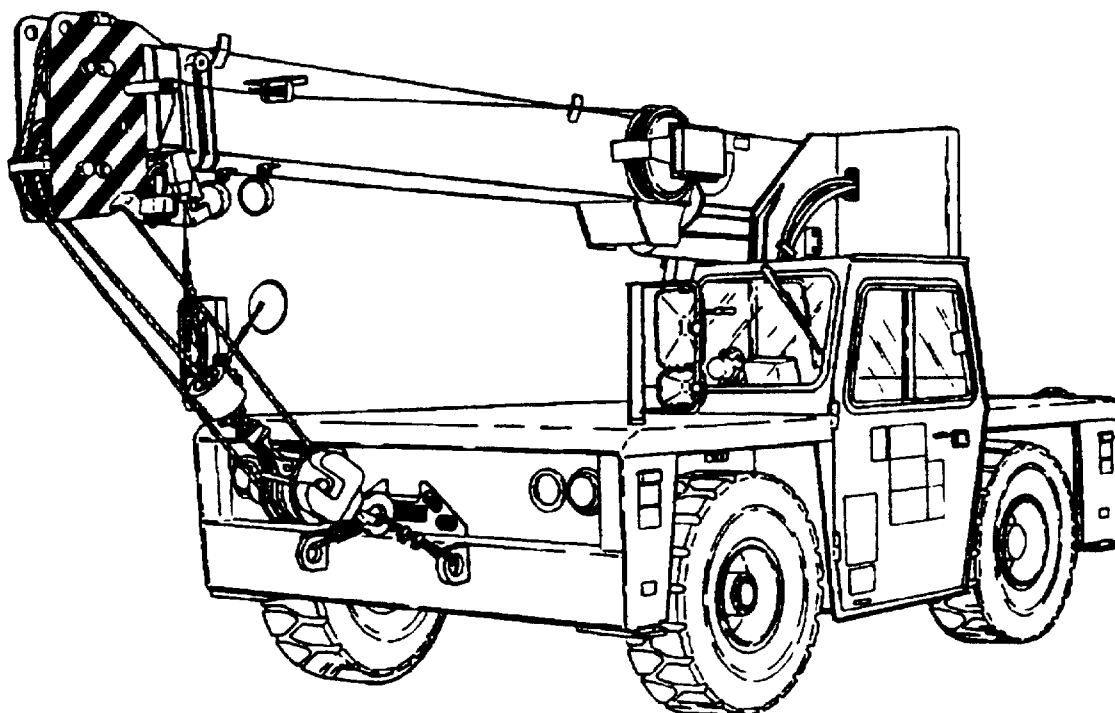

TECHNICAL MANUAL

Unit, Direct Support
and
General Support Maintenance Manual
for
WAREHOUSE CRANE
10,000 LB. CAPACITY, M469
WHEELED, DIESEL POWERED
NSN 3950-01-412-5345
(Grove Model AP 308T)



Approved for public release: Distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY
June 1997

Technical Manual

No. 10-3950-672-24-2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 15 June 1997

**Unit, Direct Support and
General Support Maintenance Manual
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(Grove Model AP 308T)**

REPORTING OF ERRORS

You can improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Tank-automotive and Armaments Command, ATTN: AMSTA-IM-OPIT, Warren MI 48397-5000. A reply will be furnished to you. You may also provide DA Form 2028-2 information to TACOM via datafax or email. TACOM's datafax number for AMSTA-IM-OPIT is: (810) 574-6323 and email address is: tacomtech-pubs@cc.tacom.army.mil

This manual is an authentication of the manufacturer's commercial literature and does not conform with the format and content specified in AR 25-30, Military Publications. This technical manual does, however, contain valuable information that is essential to the operation and maintenance of the equipment.

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HOW TO USE THIS MANUAL

This manual is designed to help you operate and maintain the equipment. All task descriptions will take you step-by-step through the procedure. Don't take shortcuts. Before you begin any task, you should read through the complete procedure, make sure you know what needs to be done, then go back and follow the steps as written.

Pay particular attention to WARNINGS and CAUTIONS, as they contain information that will prevent injury to personnel or damage to equipment.

Use the alphabetical index at the back of the manual to find a topic not listed in the table of contents.

CHAPTER 4

ENGINE MAINTENANCE

INTRODUCTION

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Generic Symbols

The following group of symbols have been used in this manual to help communicate the intent of the instructions. When one of the symbols appears, it conveys the meaning defined below.



WARNING - Serious personal injury or extensive property damage can result if the warning instructions are not followed.



CAUTION - Minor personal injury can result or a part, an assembly or the engine can be damaged if the caution instructions are not followed.



The component weighs 23 kg [50 lb] or more. To avoid personal injury, use a hoist or get assistance to lift the component.



Indicates a **REMOVAL** or **DISASSEMBLY** step.



Indicates an **INSTALLATION** or **ASSEMBLY** step.



INSPECTION is required.



CLEAN the part or assembly.



PERFORM a mechanical or time **MEASUREMENT**.



LUBRICATE the part or assembly.



Indicates that a **WRENCH** or **TOOL SIZE** will be given.



TIGHTEN to a specific torque.



PERFORM an electrical **MEASUREMENT**.



Refer to another location in this manual or another publication for additional information.

Definition of Terms

The following is a list of guidelines for each procedure in the " Repair Sections" of the Troubleshooting and Repair Manual. The procedure will be given first; followed by a definition of the step or steps involved.

Check - Examine a component or system for damage, excessive wear, accuracy, safety, or performance.

Inspect - Examine a component or dimension to make sure it meets the required specifications.

Test - Check or compare the performance of a component or system to established specifications.

Adjust - Complete the necessary steps to set or adjust the component, assemblies, or system in the required setting or position.

Visually Inspect - Look for any obvious damage or problem.

Remove - Take off a component or assembly.

Clean - Remove dirt, grease or other contamination.

Disassemble - Take the component or assembly apart.

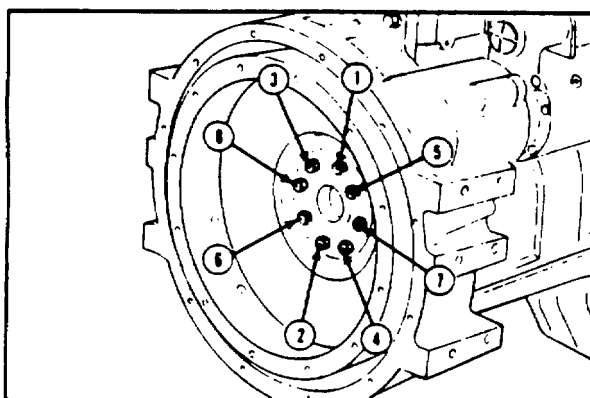
Repair - Restore a component or assembly to a serviceable condition within the established specifications.

Note: Only the easiest and simplest repairs will be made to a component or assembly. If a component or assembly must be rebuilt; it must be replaced with a new or Cummins Diesel ReCon®, Inc. replacement or be rebuilt at a Cummins authorized repair location.

Replace - Install a new, properly rebuilt, or Cummins Diesel ReCon®, Inc. component or assembly in place of one which is removed.

Install - Place a component or assembly in the correct position.

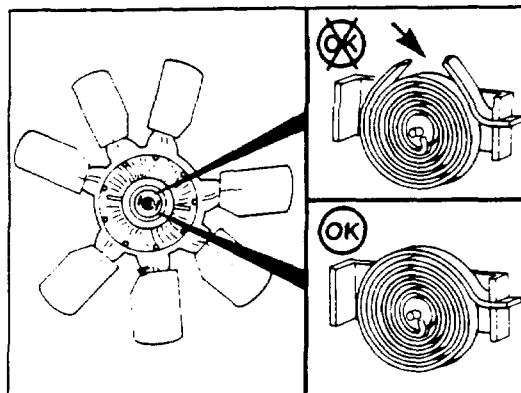
Star Pattern Torque Sequence -



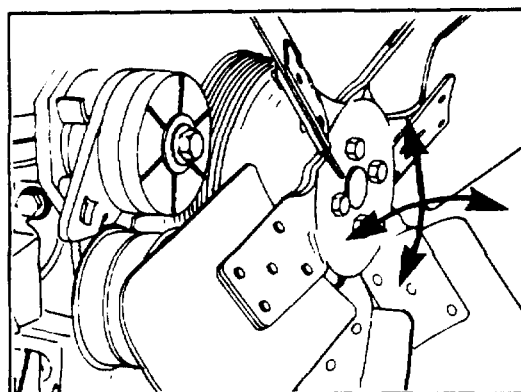
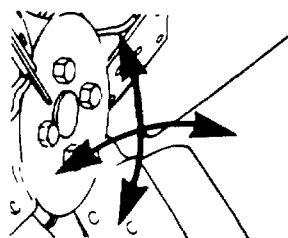
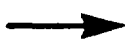
Illustrations

The illustrations used in the Diagnosis Sections of this manual are intended to give an example of a problem, show what to look for and where to look for the problem. Most of the illustrations are generic and might not look exactly like the engine or parts used in your application. Some illustrations contain symbols to indicate an action required and an acceptable or unacceptable condition.

Unacceptable



Acceptable



**Direction of Movement
(Action)**

The illustrations used in the Replacement Sections are intended to show replacement procedures when the engine is installed in a chassis. The illustration may differ from your application, but the procedure given will be the same.

General Safety Instructions

Important Safety Notice

Read and understand all safety precautions and warnings before performing repairs.



This symbol appears in the manual when a potential safety hazard exists that can cause personal injury or death. These hazards are not always apparent to a trained mechanic.

It is not possible for Cummins Engine Co., Inc. to anticipate every possible circumstance that can involve a potential hazard.



Warning: Cummins Engine Company, Inc. does not recommend or authorize any modifications or repairs to engines or components except for those detailed in CUMMINS SERVICE INFORMATION.

In particular, unauthorized repair to safety-related components can cause personal injury. Below is a partial listing of components classified as safety-related:

- Air Compressor
- Air Controls
- Air Shutoff Assemblies
- Balance Weights
- Cooling Fan
- Fan Hub Assembly
- Fan Mounting Bracket(s)
- Fan Mounting Capscrews
- Fan Hub Spindle
- Flywheel
- Flywheel Crankshaft Adapter
- Flywheel Mounting Capscrews
- Fuel Shutoff Assemblies
- Fuel Supply Tubes
- Lifting Brackets
- Throttle Controls
- Turbocharger Compressor Casing
- Turbocharger Oil Drain Line(s)
- Turbocharger Oil Supply Line(s)
- Turbocharger Turbine Casing
- Vibration Damper Mounting Capscrews

Read and understand all of the safety precautions and warnings before performing any repair. This list contains the general safety precautions that must be followed to provide personal safety. Special safety precautions are included in the procedures when they apply.



Be sure the work area surrounding the product is safe. Be aware of hazardous conditions that can exist.



Always wear protective glasses and protective shoes when working.



Do not wear loose-fitting or torn clothing. Remove all jewelry such as rings, watches, etc., when working.



Disconnect the battery and discharge any capacitors before beginning any repair work. Disconnect the air starter if equipped to prevent accidental engine starting. Put a "Do Not Operate" tag in the operator's compartment or on the controls.

TM 10-3950-672-24-2 General Safety Instructions Important Safety Notice



Use **ONLY** the proper engine barring techniques for manually rotating the engine. Do not attempt to rotate the engine by pulling or prying on the fan. This practice can cause serious personal injury, property damage, or damage to the fan blade(s) causing premature fan failure.



If an engine has been operating and the coolant is hot, allow the engine to cool before you slowly loosen the filler cap and relieve the pressure from the cooling system.



Do not work on anything that is supported **ONLY** by lift jacks or a hoist. Always use blocks or proper stands to support the product before performing any service work.



Relieve all pressure in the air, oil, and the cooling systems before any lines, fittings, or related items are removed or disconnected. Be alert for possible pressure when *disconnecting any device from* a system that utilizes pressure. Do not check for pressure leaks with your hand. High pressure oil or fuel can cause personal injury.



To avoid personal injury, use a hoist or get assistance when lifting components that weigh 23 kg [50 lbs] or more. Be sure all chains, hooks, slings, etc., are in good condition and are of the correct capacity. Be sure hooks are positioned correctly. Always use a spreader bar when necessary. The lifting hooks must not be side-loaded.



Corrosion inhibitor contains alkali. Do not get the substance in your eyes. Avoid prolonged or repeated contact with skin. Do not swallow internally. In case of contact, immediately wash skin with soap and water. In case of contact, immediately flood eyes with large amounts of water for a minimum of 15 minutes. **IMMEDIATELY CALL A PHYSICIAN. KEEP OUT OF REACH OF CHILDREN .**



Naptha and Methyl Ethyl Ketone (MEK) are flammable materials and must be used with caution. Follow the manufacturer's instructions to provide complete safety when using these materials. **KEEP OUT OF REACH OF CHILDREN.**



To avoid burns, be alert for hot parts on products that have just been turned **OFF**, and hot fluids in lines, tubes, and compartments.



Always use tools that are in good condition. Be sure you understand how to use them before performing any service work. Use **ONLY** genuine Cummins or Cummins Recon® replacement parts.



Always use the same fastener part number (or equivalent) when replacing fasteners. Do not use a fastener of less quality if replacements are necessary.

CHAPTER 5

MAINTENANCE PROCEDURES

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Section 1. General Engine Maintenance

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