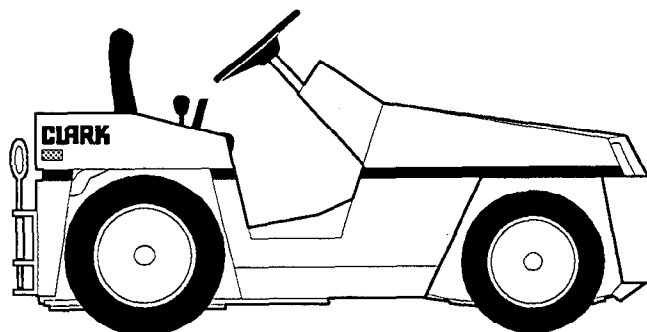


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# Service Manual

SM 607D



**DT 30E-50E-60E**

**Diesel  
Towing  
Tractors**

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# CLARK

Technical  
Publications  
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## Truck Models Covered by this Manual

This manual gasoline and diesel engine powered industrial towing tractors

### Models

DT 30E - DT 50E - DT 60E

## Arrangement and Use of this Manual

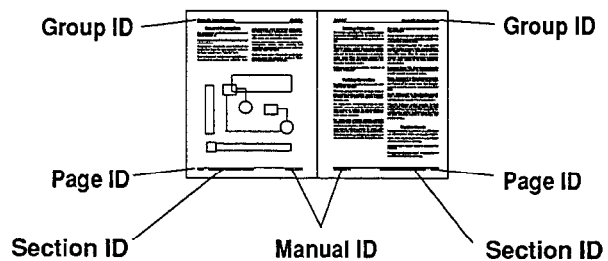
Clark arranges parts and service procedures by standardized *Groups*. In this manual, Groups are similar to “chapters.” Groups are listed in the indexes on the next page.

Each Group begins with a table of contents that shows the *Sections* contained within the Group. Lengthy Sections also begin with a table of contents.

Each Group and Section has an identifying name and number, or “ID.”

Each page also has a unique ID. The page ID consists of three numbers separated by hyphens. The three numbers represent the Group number, the Section number, and the page number. For example, “00-1-2” on the lower corner of the page indicates Group 00, Section 1, Page 2.

You can quickly locate a specific point in the manual by using the headers and footers that appear on every Section page. The following illustration points out these areas.



This manual is intended for the use of trained service personnel. Please read Group SA, “Safe Maintenance,” and the *Operator's Manual* before working on or operating the truck.

## Contents of this Manual

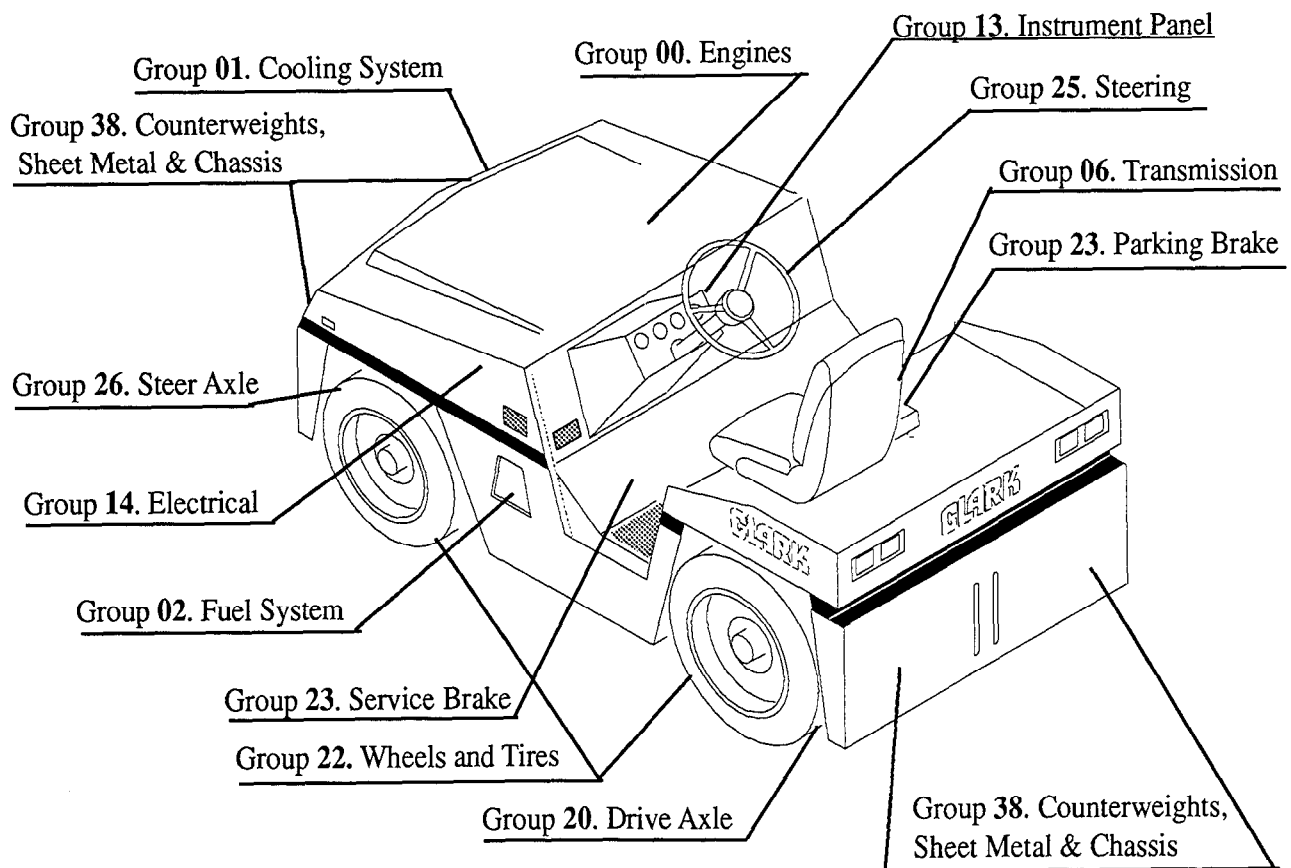
### Group Index

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| Group PS. Periodic Service  | Group 21. U-Joint                              |
| Group 00. Engines           | Group 22. Wheels and Tires                     |
| Group 01. Cooling System    | Group 23. Brake System                         |
| Group 02. Fuel System       | Group 25. Steering Column and Gear             |
| Group 03. Air Induction     | Group 26. Steer Axle                           |
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## Alphabetical Index

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**GROUP SA**

**SAFE MAINTENANCE**

Safety ..... Section 1

Lifting, Jacking and Blocking the Truck ..... Section 2

Towing..... Section 3

## Section 1. Safety

### Safety Signs and Messages

Safety signs and messages in this manual and on the tow tractor provide instructions and identify specific areas where potential hazards exist and special precautions should be taken. Be sure you know and understand the meaning of these instructions, signs, and messages. Damage to the truck, death, or serious injury to you or other persons may result if these messages are not followed.

#### NOTE

**This message is used when special information, instructions or identification is required relating to procedures, equipment, tools, pressures, capacities, and other special data.**

#### IMPORTANT

**This message is used when special precautions should be taken to ensure a correct action or to avoid damage to, or malfunction of, the truck or a component.**

#### CAUTION

**This message is used as a reminder of safety hazards that can result in personal injury if proper precautions are not taken.**

#### WARNING

**This message is used when a hazard exists that can result in injury or death if proper precautions are not taken.**

#### DANGER

**This message is used when an extreme hazard exists that can result in injury or death or serious injury if proper precautions are not taken.**

The above terms have been adopted by Clark Material Handling Company. The same terms may be used in different context in service literature supplied directly or indirectly by vendors of truck components.

### Safe Maintenance Practices

The following instructions have been prepared from current industry and government safety standards applicable to industrial truck operation and maintenance. These recommended procedures specify conditions, methods, and accepted practices that aid in the safe maintenance of industrial trucks. They are listed here for the reference and safety of all workers during maintenance operations. Carefully read and understand these instructions and the specific maintenance procedures before attempting to do any repair work.

When in doubt of any maintenance procedure, please contact your local Clark dealer.

1. Powered industrial trucks can become hazardous if maintenance is neglected. Therefore, suitable maintenance facilities, trained personnel, and procedures must be provided.
2. Maintenance and inspection of all powered industrial trucks shall be done in conformance with the manufacturer's recommendations.
3. A planned maintenance, lubrication, and inspection program shall be followed.
4. Only trained and authorized personnel shall be permitted to maintain, repair, adjust, and inspect industrial trucks. Work shall be performed in accordance with the manufacturer's specifications.
5. Properly ventilate work area, vent exhaust fumes, and keep shop clean and floor dry.
6. Avoid fire hazards and have fire protection equipment present in the work area. Do not use an open flame to check for level or leakage of fuel, electrolyte, or coolant. Do not use open pans of fuel or flammable cleaning fluids for cleaning parts.
7. Before starting work on truck:
  - a. Raise drive wheels off of floor or disconnect power source and use blocks or other positive truck positioning devices.
  - b. Disconnect battery before working on the electrical system.
8. Before working on engine fuel system of gasoline, LPG or diesel-powered trucks, be sure the fuel shut-off valve is closed.

9. Operation of the truck to check performance must be conducted in an authorized, safe, clear area.
10. Before starting to drive truck:
  - a. Be in operating position.
  - b. Be sure parking brake is engaged.
  - c. Put direction control in neutral.
  - d. Start engine.
  - e. Check functioning of direction and speed controls, steering, brakes and warning devices.
11. Before leaving truck
  - a. Stop truck.
  - b. Put directional control in neutral.
  - c. Apply the parking brake.
  - d. Stop the engine by turning off the ignition circuit.
  - e. Put blocks at the wheels if truck is on an incline.
12. Brakes, steering mechanisms, control mechanisms, warning devices, lights, governors, guards, safety devices, and frame members must be carefully and regularly inspected and maintained in a safe operating condition.
13. Special trucks or devices designed and approved for hazardous area operation must receive special attention to ensure that maintenance preserves the original, approved, safe-operating features.
14. Fuel systems must be checked for leaks and condition of parts. Extra special consideration must be given in the case of a leak in the fuel system. Action must be taken to prevent the use of the truck until the leak has been corrected.
15. The truck manufacturer's capacity, operation, and maintenance instruction plates, tags, or decals must be maintained in legible condition.
16. Batteries, motors, controllers, limit switches, protective devices, electrical conductors, and connections must be inspected and maintained in conformance with good practice. Special attention must be paid to the condition of electrical insulation.
17. To avoid injury to personnel or damage to the equipment, consult the manufacturer's procedures in replacing contacts on any battery connection.
18. Industrial trucks must be kept in a clean condition to minimize fire hazards and help in the detection of loose or defective parts.
19. Modifications and additions that affect capacity and safe truck operation must not be done without the manufacturer's prior written approval. Capacity, operation and maintenance instruction plates, tags, or decals must be changed accordingly. This is an OSHA requirement.
20. Care must be taken to assure that all replacement parts, including tires, are interchangeable with the original parts and of a quality at least equal to that provided in the original equipment. Parts, including tires, are to be installed per the manufacturer's procedures. Always use genuine CLARK or CLARK-approved parts.
21. Use special care when removing heavy components from the truck, such as counterweight, seat deck, etc. Be sure that towing equipment is of the correct capacity and in good condition. The frame must always be safely blocked for major component removal.

### NOTE

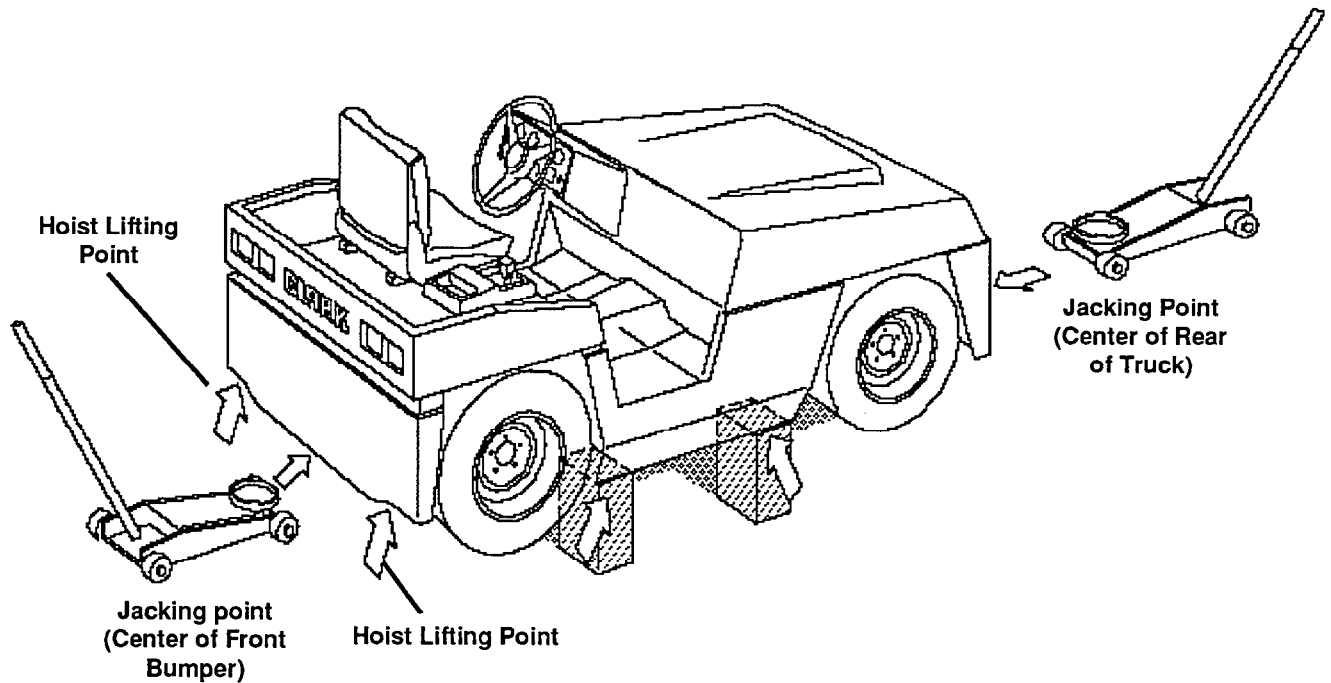
**You should also be familiar with additional operating and maintenance safety instructions contained in the following publications:**

ANSI/ASME B56.9 - 1992 Operator Controlled Industrial Tow Tractors (Safety Code For Powered Industrial Trucks). Published by: American Society of Mechanical Engineers, United Engineering Center, 345 E. 47th Street, New York, NY 10017.

NFPA 505-1982: Fire Safety Standard for Powered Industrial Trucks: Type Designations, Areas of Use, Maintenance and Operation. Available from: National Fire Protection Assoc., Inc., Batterymarch Park, Quincy, MA 02269.

General Industrial Standards, OSHA 2206: OSHA Safety and Health Standards (29 CFR 1910), Subpart N-Materials Handling and Storage, Section 1910.178 Powered Industrial Trucks. For sale by: Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

## Section 2. Lifting, Jacking and Blocking



### **⚠ DANGER!!!**

Working on or under an improperly blocked truck can result in serious injury or death. Always insure that wheels are chocked and that blocking is secure and stable before working on truck. Never work on a truck that is held up only by a hoist or jack.

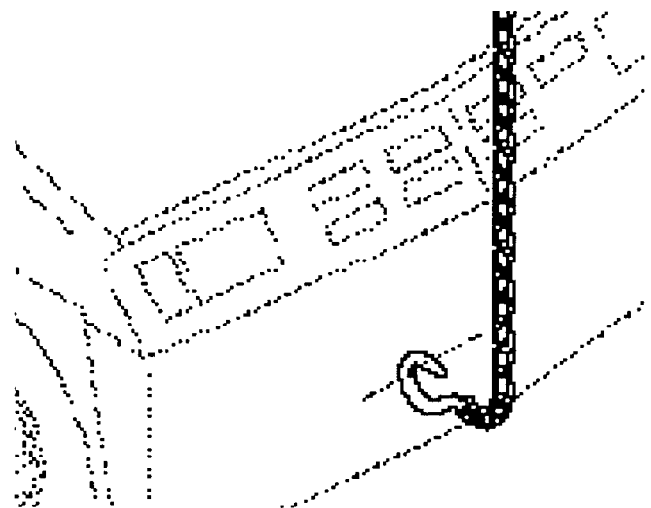
### GENERAL

Refer to specification section for the service weight and axle loadings of your truck. Be sure your lifting or jacking equipment is of sufficient capacity. Have blocks ready for placement before lifting or jacking the truck. The best and safest blocking method is to set the entire truck on blocks.

#### Raising Front End Of Truck

The preferred method of raising the front end of the truck is with a hoist. A lifting hook fits securely into the front plate and frame member assembly. Protect the truck finish with cloth or cardboard under the chain.

If a jack is used to lift in this position, be sure it is securely seated under front plate.





## Section 3.

### Towing

If your truck is disabled but can be moved freely on its own wheels without further damage, use the following procedures to tow the truck safely to a repair area.

#### **WARNING**

It is important for your safety and to the care of your tow tractor to use the proper equipment and carefully follow these recommendations for safe towing.

Do not tow a tow tractor if there is a problem with the brakes or tires, or if the steering cannot be operated.

Do not tow the disabled truck up or down ramps or steep inclines.

Do not attempt to tow the disabled truck if traction or weather conditions are poor.

Push or tow for short distances only. Towing at higher speeds or longer distances can destroy the transmission. If the engine is not running, the transmission receives no forced lubrication to any of its bearings. The best method to move a tow tractor is to raise the rear tires off the ground and tow backwards or load it entirely onto another vehicle.

1. Be sure to apply the parking brake or block the drive wheels on the disabled truck while working around it.
2. Use a truck for towing that is of equal or larger capacity than the disabled truck.
3. Use an approved, solid metal tow bar with towing coupler.

#### **NOTE**

Approved towing equipment is available from your Clark dealer.

5. An operator must be on the disabled truck.

#### **CAUTION**

The power steering will not operate on the disabled truck when the engine is not running. The steering handwheel will be difficult to turn.

6. Tow the truck slowly. Careful towing is necessary to prevent injury to personnel or damage to the disabled truck. The truck should be towed at a speed of less than 8 kph (5 mph, or a moderate walking speed) with a driver in place and steering the disabled truck
7. Park the disabled truck in authorized area only. Leave the directional control in park, turn the ignition switch to OFF, and engage the parking brake. Remove the ignition key and, when necessary, block the wheels to prevent the truck from rolling.

#### **WARNING**

Always engage the parking brake when parking a tow tractor. The truck can roll and cause injury or death to personnel near it.

## Parking

Never park on a grade.

Before leaving your tractor:

Always come to a complete stop...

AND

Be sure shifter is in park or neutral...

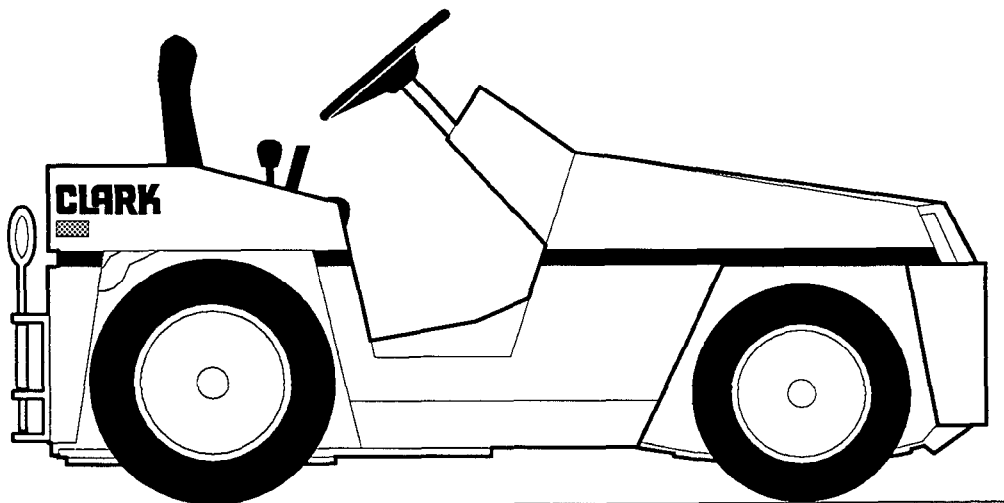
AND

Set parking brake...

AND

Turn key to "OFF" position.

### Tow Tractor PARKING



## PERIODIC SERVICE

Maintenance Schedules ..... Section 1

The Planned Maintenance Program ..... Section 2

The PM Inspection Form ..... Section 3

## Section 1. Maintenance Schedules

### “Periodic Service” and “Planned Maintenance”

The term “periodic service” includes all maintenance tasks that should be performed on a regularly scheduled basis.

The term “Planned Maintenance” indicates a formalized program of basic inspections, adjustments, and lubrications that the Clark service organization provides customers at a prescribed interval, usually 50-250 hours. The recommended basic “Planned Maintenance” procedure is given in Section 2 of this Group.

The current Section, “Maintenance Schedules,” specifies all maintenance tasks—including Planned Maintenance tasks—that should be performed periodically, and suggests intervals at which they should be performed.

### Determining Maintenance Intervals

Time intervals on the charts on the next four pages and elsewhere in this manual relate to truck operating hours as recorded on the hourmeter, and are based on experience Clark has found to be convenient and suitable under **normal** operation. Standard operating condition classifications are:

**Normal Operation:** Eight-hour material handling, mostly in buildings or in clean, open air on clean, paved surfaces.

**Severe Operation:** Prolonged operating hours or constant usage.

**Extreme Operation:**

- In sandy or dusty locations, such as cement plants, lumber mills, and coal dust or stone crushing sites.
- High-temperature locations, such as steel mills and foundries.
- Sudden temperature changes, such as constant trips from buildings into the open air, or in refrigeration plants.

If the tow tractor is used in *severe* or *extreme* operating conditions, the maintenance intervals should be shortened accordingly.

### IMPORTANT

**MAINTENANCE INTERVALS.** If the tow tractor is used in severe or extreme operating conditions, the maintenance intervals should be shortened accordingly.

Since the operating environments of tow tractors vary widely, the above descriptions are highly generalized and should be applied as actual conditions dictate.

# Group PS, Periodic Service



## Recommended Periodic Service Schedule

This chart lists maintenance tasks that should be done periodically, the suggested time intervals, and the service manual Group in which the task is covered. Apply as

appropriate for diesel, gas, and LPG trucks. Refer to Operator's Manual for Daily Checks.

TASKS	1st 50 Hours	Every 50-250 Hours	Every 450-500 Hours (or 3 months)	Every 900-1000 Hours (or 6 months)	Every 2000 Hours (or 1 year)
<i>Group PS - Periodic Maintenance</i>					
Perform Planned Maintenance inspections, lubrications and adjustments		•			
<i>Group 00 - Engine</i>					
Exhaust smoke from gas engine-inspect (blue-oil; black-fuel)					
Idle/governed rpm - check/adjust		•			
Mounts / brackets - inspect/tighten		•			
Oil change - drain/refill *	•	•			
Oil filler cap & seal - clean/check		•			
Oil filter - replace	•	• (Diesel)	• (Gas/LPG)		
Oil level / condition - check	•	•			
Stall rpm - check		•			
Tune up - determine by stall check and/or functional test		•			
Valve Tappet Adjustment - Diesel engine		•			
<i>Group 01 - Cooling System</i>					
Coolant level / condition / check/sample		•			
Coolant protection level - hydrometer test				•	
Coolant change - drain & flush		•			•
Coolant hoses - inspect/replace		•			•
Fan blades - inspect loose/damaged		•			
Fan belt(s) - check tension/wear	•	•			
Radiator cap - inspect/test		•			
Thermostat - test/replace					•
Water pump - check leaks/wear		•			
<i>Group 02 - Fuel System</i>					
Carburetor - idle/air - check/adjust		•			
CO level - check/adjust					•
Diesel injectors/lines - clean/inspect				•	
Filler cap/screen - clean/inspect		•			
Fuel filter, diesel - replace				•	
Fuel filter, gas - replace					•
LPG lock-off valve filter inspect/replace					•
LPG tank mounting/guard - inspect		•			
LPG tank shut-off valve - inspect/test		•			
LPG vaporizer/regulator/hoses inspect		•			
Throttle linkage - check/adjust		•			

\* Oil change interval may be determined by laboratory analysis

TASKS	1st 50 Hours	Every 50-250 Hours	Every 450-500 Hours (or 3 months)	Every 900-1000 Hours (or 6 months)	Every 2000 Hours (or 1 year)
<b>Group 03 - Air Intake &amp; Exhaust</b>					
Air filter element - replace				• (Diesel)	• (Gas/LPG)
Air hose/clamps - inspect		•			
Exhaust pipe/muffler - inspect		•			
<b>Group 06 - Transmission</b>					
Air Vent - inspect, clean or replace			•		
Axle mounting bolts - inspect/tighten				•	
Charging pump - stall test		•			
Clutch pack operation - stall test		•			
Fluid change - drain/fill					•
Fluid filter - replace	•				
Fluid level/condition - check/sample	•				
Oil cooler lines - inspect		•			
Transmission strainer - clean					•
<b>Group 12 - Ignition and Starting System</b>					
Diesel cold starting plug - test					•
Distributor cap/rotor - inspect		•			
Ignition timing - check/adjust			•		
Ignition wiring - inspect		•			
Neutral start - check		•			
Spark plugs - regap/replace			•		
Starter motor - inspect/test					•
Starter solenoid - inspect/test					•
<b>Group 13 - Gauges, Indicators</b>					
Hourmeter - check		•			
Lamp check - at start-up		•			
Wiring Harness - inspect				•	
<b>Group 14 - Electrical: Alternator, Regulator, Battery</b>					
Alternator - inspect/test					•
Alternator drive belts - inspect/adjust	•	•			
Alternator output - test					•
Battery electrolyte level - check/add		•			
Battery condition - cranking voltage test		•			
Battery terminals/cables - clean/tighten		•			
<b>Group 22 - Wheels and Tires</b>					
Wheel mounting lugs - tighten	•	•			
Tire pressure/condition - check	•	•			

TASKS	1st 50 Hours	Every 50-250 Hours	Every 450-500 Hours (or 3 months)	Every 900-1000 Hours (or 6 months)	Every 2000 Hours (or 1 year)
<i>Group 23 - Brakes</i>					
Operation - check		•			
Service brake - check wear					•
Brake lines - check	•	•			
Parking brake - check/adjust	•	•			
<i>Group 26 - Steer Axle and Lines</i>					
Operation - check		•			
Power steering relief pressure - check					•
Steer axle mounting - check		•			
Steer wheel bearings - check		•			
Steer wheels bearings - lubricate/adjust					•
Steering cylinder seals - check leakage		•			

## Section 2. The Planned Maintenance Program

This Section defines a set of basic service procedures, known as the “Planned Maintenance Program,” and describes a systematic approach for performing them.

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### Introduction to Planned Maintenance

A program of regular, routine inspections, lubrication, and other service tasks is important for the long life and trouble-free operation of the tow tractor.

The Clark service organization offers customers a formalized program—called *Planned Maintenance*, or PM—for performing these tasks.

### PM Intervals

The PM inspections, adjustments, and lubrications are typically performed on each covered truck at 50-250 hour intervals. (See Section 1, in this Group about defining service intervals.)

### The PM Form

As an aid to service technicians performing and documenting PM inspections, Clark has prepared a “Gas, LPG or Diesel Planned Maintenance Report” form. A black-and-white copy of this form is inserted in Section 3 of this Group.

We recommend that you use this form as a checklist and to make a record of your inspection and truck condition. This record can be used to inform the owner of needed repairs and help establish the optimal PM intervals.

When you have finished the PM inspections, be sure to give a copy of the report to the person responsible for tow tractor maintenance.

### The Basic PM Procedures

The chart on the next page lists the basic PM tasks. The actual PM program may be modified to meet the specific needs of the truck application.

The procedures beginning on page 4 outline a systematic approach to performing the PM tasks. These procedures consist of:

- **External visual checks** you make as you walk around the truck with it turned off.
- **Operational checks** you make while operating the truck.
- **Tests, adjustments, and lubrication** you perform with the covers removed.



### CAUTION

- **Do not make repairs or adjustments unless authorized to do so.**
- **Disconnect the battery ground cable (-) from the engine or frame before working on electrical components.**
- **Always wear safety glasses.**
- **Wear a safety (hard) hat in industrial plants and in special areas where protection is necessary or required.**
- **Remove all jewelry (watch, rings, bracelets, etc.) before working on the truck.**

### The Recommended PM Task Chart

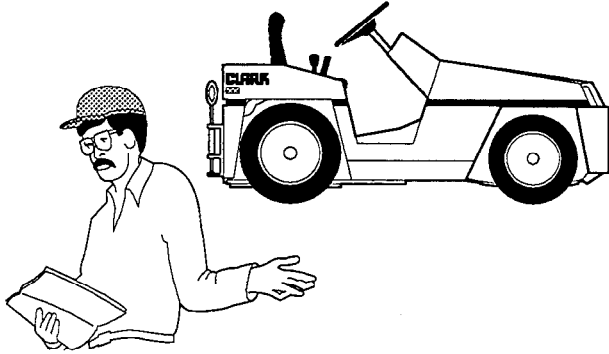
Listed by Service Manual Group

<b>Group PS - The Basic PM Procedures</b>
Visual inspection
Functional performance check - test drive
Air cleaning of truck
Lubrication, filters, and fluid levels checks
Critical fasteners torque check
<b>Group 00 - Engine</b>
Exhaust smoke (blue - oil, black - fuel)
Idle RPM - check/adjust
Max no-load governed RPM - check/adjust
Mounts / brackets - inspect/tighten
Oil filler cap & seal - clean/check
Oil level / condition - check
Stall RPM - check
<b>Group 01 - Cooling System</b>
Coolant hoses - inspect/replace
Coolant level / condition - check/sample
Coolant protection level - hydrometer test
Fan belt(s) - check tension, wear
Fan blades - inspect loose/damaged
Fan speed control - inspect
<b>Group 02 - Fuel system</b>
LPG tank mounting/guard - inspect
LPG tank shut-off valve - inspect/test
LPG vaporizer/regulator/hoses - inspect
Throttle linkage - check/adjust
Throttle return springs - check/replace
Fuel hose/clamps - inspect
<b>Group 03 - Air Induction System</b>
Air hoses/clamps - inspect
Exhaust pipe/muffler - inspect
<b>Group 06 - Transmission</b>
Charging pump - stall test
Clutch pack - stall test
Fluid level/condition - check/sample
Oil cooler / lines - inspect
<b>Group 12 - Ignition System</b>
Distributor cap/rotor - inspect
Ignition wiring - inspect
<b>Group 13 - Gauges, Indicators</b>
Hourmeter - check
Indicator lights - check
Wiring harness - inspect

<b>Group 14 - Alternator, Battery, Starter</b>
Alternator - inspect/test
Alternator drive belt - inspect/adjust
Alternator output - test
Battery condition - performance load test
Battery electrolyte level - check/add
Battery terminals/cables - clean/tighten
Neutral start - check
Starter cranking voltage - test
<b>Group 20 - Drive Axle</b>
Fluid level - check
<b>Group 22 - Wheels and Tires</b>
Tire pressure/condition - check
<b>Group 23 - Brakes</b>
Brake lines - check
Check operation
Parking brake - check/adjust
Service brake - check wear
<b>Group 26 - Steer Axle and Lines</b>
Operation - check
Steer axle mounting - check
Steer wheel bearings - check
Steering cylinder seals - check leakage
Steering control - check leakage
Steering fluid - check
Steering pump belt - check tension/wear

## Visual Inspection

First, perform a visual inspection of the tow tractor and its components. Walk around the truck and take note of any obvious damage and maintenance problems.



### Decals, Fasteners, and Leaks

Check for loose fasteners and fittings.

Check to be sure all capacity, safety, and warning plates and decals are attached and legible.

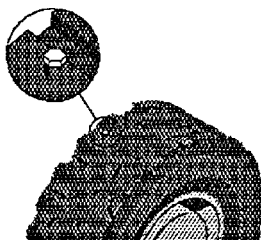
#### NOTICE

**Do not operate a tow tractor with damaged or missing decals and nameplates. Replace them immediately. They contain important information. See Group 40 for decal locations.**

Inspect the truck before and after starting engine for any signs of external leakage: fuel, engine oil or coolant, transmission fluid, etc.

### Wheels and Tires

Check the condition of the drive and steer wheels and tires. Remove objects that are embedded in the tread. Inspect the tires for excessive wear or breaks or "chunking out."



Check all wheel lug nuts or bolts to be sure none are loose or missing. Have missing bolts or lug nuts replaced and tightened to correct torque as explained in Group 22.

### ⚠ WARNING

Check tire pressure from a position facing the tread of the tire, not the side. Use a long-handled gauge to keep your body away. If tires are low, the tire may require removal and repair. Incorrect (low) tire pressure can reduce truck stability. See "Specifications" in Group 22 for proper inflation pressure.

## Functional Tests

Be sure that:

- Parking brake is applied
- Directional control is in "N" (neutral).

Test the horn, lights, and all other safety equipment. Be sure they are properly mounted and working correctly. Test all controls to ensure that they operate freely and return to neutral properly.

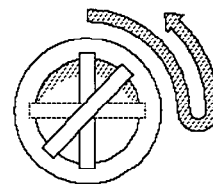
Now prepare to start the truck and test its operation.

### Starting System

A 3-position starter switch is standard equipment.

Check the neutral start function by placing the direction control lever in forward or reverse and turning key switch to "start" position. The starter must not engage until the direction control lever is moved to "neutral" position.

As you start the engine, check the instrument display. All indicator lights should come on for a lamp check. The parking brake light should remain on if the brake is set. If the lights do not operate as described, refer to Group 13 to diagnose the problem.



### Engine Shut Down Mode

If the truck's optional fault protection system detects low engine oil pressure, excessive transmission oil temperature, or excessive engine coolant temperature, the truck will go into "shutdown mode"—a buzzer will sound for 30 seconds, after which the truck will shut itself off. The truck may be restarted, but if the fault condition still exists, the engine will again shutdown in 30 seconds.

**Accelerator, Brake, Direction Control, and Parking Brake****⚠ WARNING**

Fasten your seat belt before driving the truck.

Make sure that you are on a level surface, the travel area is clear in front of the truck, the parking brake is released, and the truck is running.

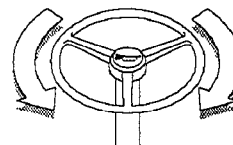
1. Push the brake pedal down fully and hold. The brakes should apply before the pedal reaches the floorplate. If the pedal continues to creep downward, report the failure immediately. **Do not operate the truck until the brakes are repaired.**
2. Move the direction control lever from neutral to forward.
3. Release the brake pedal and let the truck travel slowly forward. Then push down on the brake pedal to stop the truck. The brakes should apply smoothly and equally.
4. Be sure the travel area is clear behind the truck. Repeat steps 2 through 4 in the reverse direction.
5. Drive the truck and check that it accelerates and decelerates smoothly and stops properly.
6. Check the function of the parking brake. Park the truck on a grade and apply the parking brake. The parking brake should hold a lift truck with rated load on a 15% grade.

**⚠ WARNING**

If the service brake or, parking brake are not operating properly, take the truck out of service until it is repaired.

**Steering System**

Check the steering system by moving the steering handwheel in a full right turn and then in a full left turn. Return the steering wheels to the straight-ahead position. The steering system components should operate smoothly when the steering handwheel is turned. Hard steering, excessive play (looseness), or unusual sounds when turning or maneuvering indicates a need for inspection or servicing.

**⚠ WARNING**

If the truck has a steering system fault, take the truck out of service until it is repaired.

