



## OWNER/OPERATOR MANUAL

# **GRADALL<sup>®</sup>** **522/524** **534D-6/534D-6T**

**9133-4037**

December, 2000

522/524 Starting  
Serial No. 0277001

534D-6/534D-6T Starting  
Serial No. 0588001

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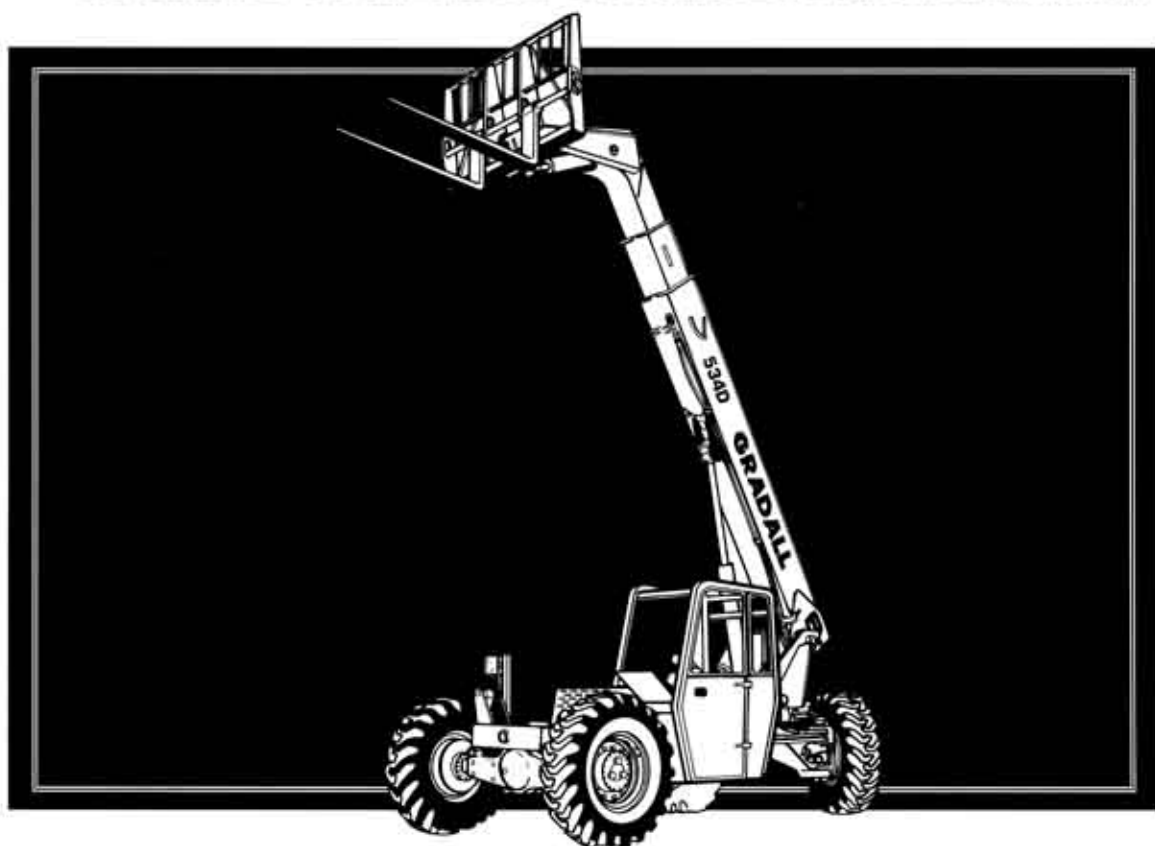




# GRADALL®

## MATERIAL HANDLERS

### 522/524/534D-6/534D-6T MATERIAL HANDLERS OWNER/OPERATOR MANUAL COVERING OPERATION & PERIODIC MAINTENANCE



#### IMPORTANT!

Read and understand this Manual, the GRADALL Material Handler Safety Manual and the EMI Rough Terrain Forklift Safety Manual and view the GRADALL/EMI Operator Orientation Video before starting, operating or performing maintenance procedures on this machine.

#### KEEP ALL OPERATOR AND SAFETY MANUALS IN CAB

- AVERTISSEMENT!** Si vous ne lisez pas l'Anglais, demandez a votre surveillant de vous donner les instructions de securite!
- ATENCION!** Si no lee Ingles, preguntele a su supervisor para las intricciones de seguridad!
- VORSICHT!** Wen Sie kein Enlisch lesen, bitten Sie ihren Vorgesetzten um die Sicherheitsvorschriften!



## IMPORTANT SAFETY NOTICE

Safe operation depends on reliable equipment and proper operating procedures. Performing the checks and services described in this Manual will help to keep your GRADALL Material Handler in reliable condition. Following recommended operating procedures can help you avoid accidents. Because some procedures may be new to even the experienced operator, we require that this Manual be read, understood and complied with by all who operate this machine.

Strict attention to and compliance with instructions provided in this Manual, the EMI Rough-Terrain Forklift Safety Manual, the GRADALL Material Handler Safety Manual, the GRADALL/EMI Operator Orientation Video, as well as instructional decals and plates affixed to the machine will help prevent injuries to personnel and damage to the equipment. The information provided herein is not intended to cover all situations; it is impossible to anticipate and evaluate all possible applications and methods of operation for this equipment.

This Manual covers recommended operating procedures and basic maintenance checks and services for the 522, 524, 534D-6 & 534D-6T Material Handlers. Detailed maintenance information is available in the appropriate Service Manual.

Any procedure not specifically recommended by GRADALL must be thoroughly evaluated from the standpoint of safety before it is placed in practice. If you are not sure, contact your GRADALL Material Handler Distributor before operating.

Use only GRADALL-authorized parts. The use of counterfeit parts may cause premature failure which could lead to injuries and/or machine damage.

**Do not modify this machine without written permission from GRADALL. Use only genuine GRADALL replacement parts.**

## OTHER NOTICES

GRADALL retains all proprietary rights to the information contained in this Manual.

GRADALL reserves the right to change specifications without notice.

GRADALL is a registered trademark for Hydraulic Excavators, Hydraulic Material Handlers and Attachments manufactured by The Gradall Company.





## INTRODUCTION

### General

This Manual provides important information to regarding safe operating maintenance requirements for the GRADALL 522, 524, 534D-6 & 534D-6T Material Handlers.

If you have any questions regarding the material handler, contact your GRADALL Material Handler Distributor.

**NOTE!** "Material handler" and "handler" are used interchangeably throughout this Manual.

### Operator Qualifications

Operators of the material handler must be in good physical and mental condition, have normal reflexes and reaction time, good vision and depth perception and normal hearing. S/he\* must not be using medication which could impair abilities nor be under the influence of alcohol or any other intoxicant during the work shift.

The operator should possess a valid, applicable driver's license and must have completed a course of training in the safe operation of this type of material handling equipment.

In addition, the operator must read/view, understand and comply with instructions contained in the following material furnished with the material handler:

- This Owner/Operator Manual
- EMI Rough-Terrain Forklift Safety Manual
- GRADALL Material Handler Safety Manual
- All instructional decals and plates
- Any optional equipment instructions furnished
- GRADALL/EMI Operator Orientation Video

The operator must also read, understand and comply with all applicable Employer, Industry and Governmental rules, standards and regulations.

\* Though no offense or discrimination is intended, only the masculine pronouns will be used throughout the remainder of this Manual.

### Orientation

When used to describe the location of components in the material handler, the directions "front", "rear", "right" and "left" relate to the orientation of a person sitting in the operator's seat.

### Related Manuals & Decals

Separate publications are furnished with the material handler to provide information concerning safety, replacement parts, maintenance procedures, theory of operation and vendor components. Replacement manuals, decals and instruction plates can be ordered from your GRADALL Material Handler Distributor.

### Models Covered

This Manual covers the 522, 524, 534D-6 & 534D-6T Material Handlers. These units are equipped with a two-section or three-section boom and with four-wheel drive. Optional equipment available for use with these units is described in appropriate sections of the Manual. Be certain to refer to proper information for your unit and the operational equipment furnished on your machine.

### Serial Number Location

Specify Model Number and Serial Number when ordering parts and when discussing specific applications and procedures with your Distributor. The model/serial number plate is located inside the operator's cab, front left side plate.



### Nomenclature

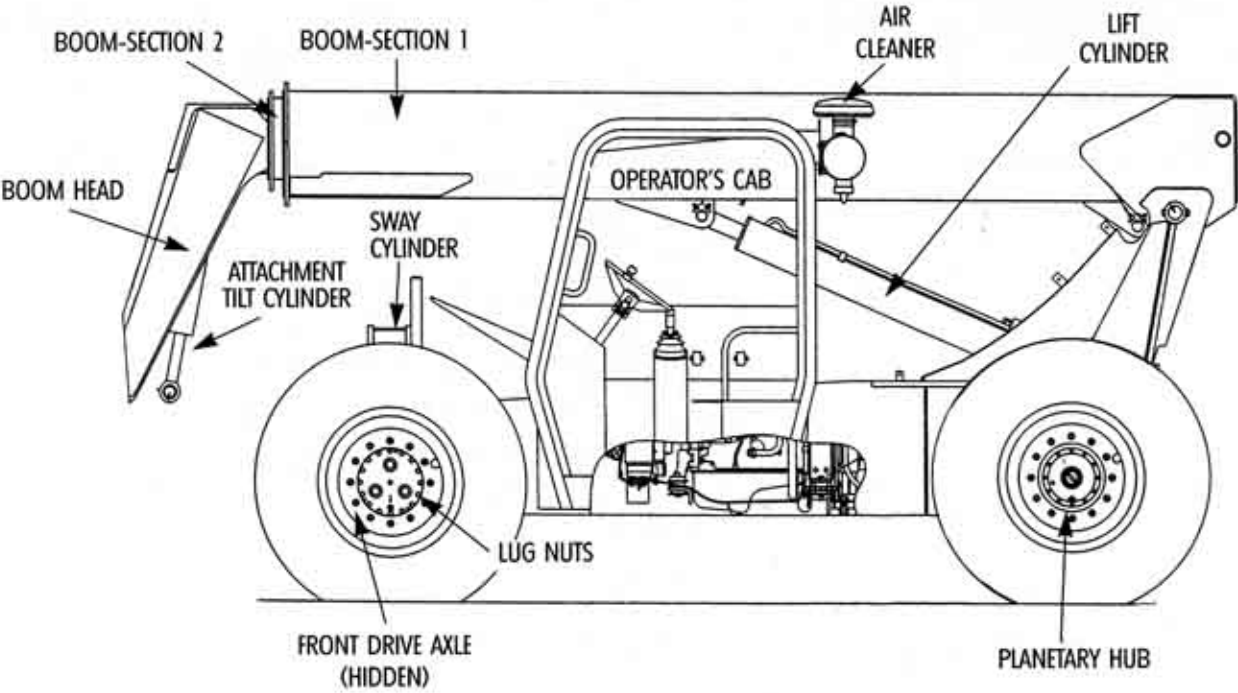
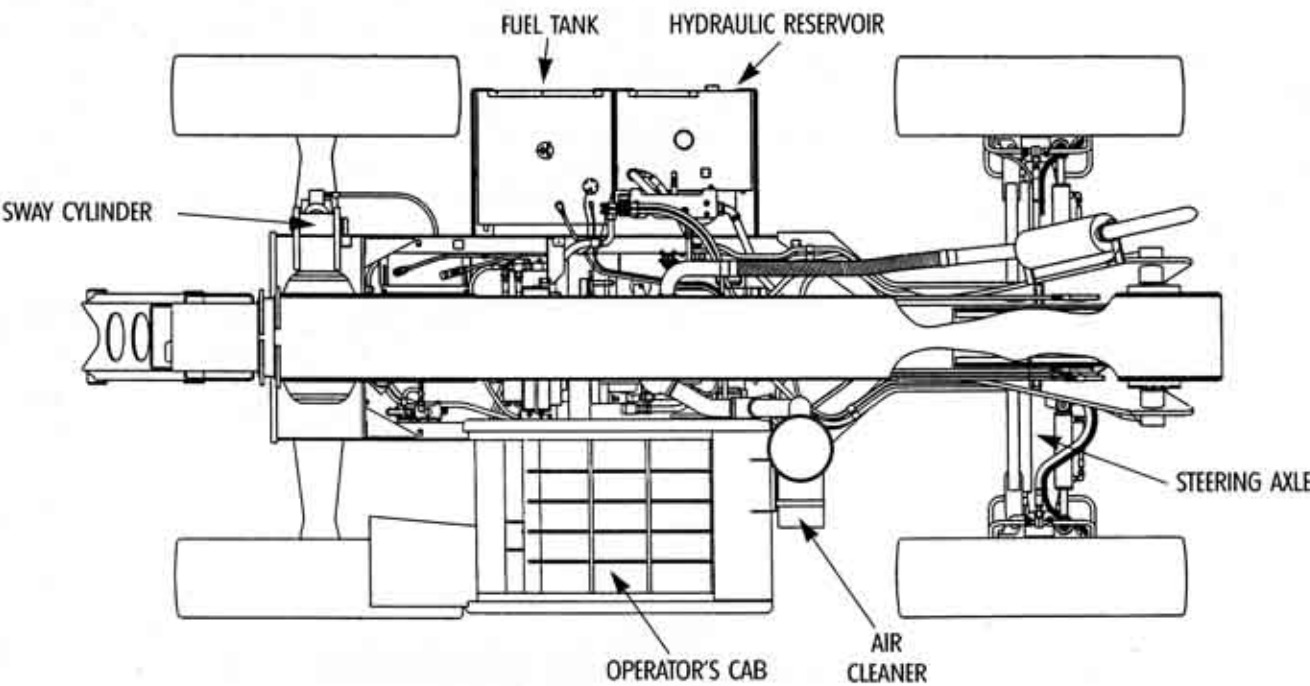
The illustrations on page 3 include nomenclature applied to major components of the material handler.

### Revisions

1. Page 36, *Recommended Lubricants & Capacities*. Front axle capacity changed from 33 pints (15.6 L) to 40 pints (19 L).
2. Page 35, *Lubrication & Routine Maintenance*. Added LoPro tire specs.



NOMENCLATURE



**NOTE!** 522 and 524 Material Handlers may be equipped with either a 2-section boom or a 3-section boom.





## SAFETY HIGHLIGHTS

Read and understand all manuals and instructional material listed on cover, inside front cover and page 2 of this Manual before starting, operating or performing maintenance procedures on this equipment.

Operators of this equipment must have successfully completed a training program in the safe operation of this type of material handling equipment.

Regardless of previous experience operating similar equipment, the operator must be given sufficient opportunity to practice with the handler in a safe, open area (not hazardous to people or property) to gain

operating skills and the proper "feel" for controls and operating clearances required for safe, efficient operation.

The GRADALL Material Handler is equipped with a right-side rear-view mirror. This mirror is intended as an operator's aid and does not replace the requirement for line-of-sight. Certain jobsite and machine conditions may require use of a signal person to help the operator when picking, placing or transporting a load. Never operate the handler until you know pick-up point, line of travel and landing point are clear. Always be aware that objects in mirrors are closer than they appear.

### WATCH FOR THESE SYMBOLS; THEY CALL YOUR ATTENTION TO SAFETY NOTICES



**DANGER**

This symbol indicates an extreme hazard which would result in high probability of death or serious injury if proper precautions are not taken.



**WARNING**

This symbol indicates a hazard which could result in death or serious injury if proper precautions are not taken.



**CAUTION**

This symbol indicates a hazard which could result in injury or damage to equipment or property if proper precautions are not taken.

### SAFETY PRECAUTIONS



**WARNING**

Operator must be seated with seat belt fastened, forward reverse lever in "Neutral" position, parking brake applied and all hydraulic controls in "Neutral" before starting engine.

- Make sure all **DANGER, WARNING, CAUTION** and **INSTRUCTIONAL DECALS** are in place and can be read. Clean or replace decals as required.
- Ensure handler is on a firm, level surface before lifting or placing load. Have surface leveled if necessary. **Unit can tip over if load is raised with handler on a soft or uneven surface.**
- Always look in the direction of travel. **Reduce speed and be especially careful when traveling in reverse and/or turning. Be aware of tail swing due to rear-pivot steering.**
- If load or conditions obstruct view, **use a signal person** when lifting, carrying or placing a load.
- Loose clothing can get caught in moving machinery and can also cause accidental actuation of controls. **Dress properly for the job.**
- **Be alert to any unusual response to controls.** If unusual response is noticed, position handler in a safe area, lower forks to ground, apply parking brake, stop

engine and remove key from ignition switch. Tag steering wheel to forbid operation and **notify maintenance personnel.**

- Keep hands, gloves, shoes, control knobs and pedals clean. **Slippery controls can cause accidents.** Keep a firm grip on the steering wheel when traveling.
- **Load capacities are based on load center being within 24 inches from front vertical face of forks.**
- **Never service the handler with the engine running.**
- **Release trapped pressure** before disconnecting, opening or removing any hydraulic component.
- Keep all windows and mirror(s) clean. Adjust mirror(s) as required for maximum visibility, before and during operation.
- **Never permit diesel engine to run out of fuel.** Doing so can cause severe damage.
- **Whenever leaving the cab, perform standard shut-down procedure:**

#### STANDARD SHUT-DOWN PROCEDURE

Position the handler in a safe location, apply parking brake, lower forks to ground, move all controls to "Neutral", allow engine to run at low idle for 3 to 5 minutes. Stop engine and remove ignition key. Chock wheels.

Located inside cab, front left side plate  
P/N 9137-3002





## DECALS INSIDE CAB

### **WARNING**

FOR SAFE OPERATION OF MACHINE AND TO MINIMIZE RISK OF SERIOUS INJURY, READ AND OBSERVE THE FOLLOWING:

1. ONLY TRAINED AND AUTHORIZED PERSONNEL MAY OPERATE THIS MACHINE.
2. BEFORE OPERATING, READ AND UNDERSTAND ALL CAPACITY CHARTS, OPERATOR MANUALS AND SAFETY MANUALS. IF MANUALS ARE NOT AVAILABLE, CONSULT AN AUTHORIZED GRADALL DEALER. UNDERSTAND ALL CONTROLS IN CAB AND CHECK FOR PROPER OPERATION. CLEAR LOOSE OBJECTS OFF MACHINE AND SOUND HORN BEFORE STARTING ENGINE.
3. OPERATOR MUST BE SEATED WITH SEAT BELT FASTENED. ASSURE FORWARD/REVERSE LEVER IS IN NEUTRAL, PARK BRAKE APPLIED AND ALL HYDRAULIC CONTROLS ARE IN NEUTRAL BEFORE IGNITION SWITCH IS TURNED ON.
4. DO NOT OPERATE MACHINE WITHOUT PROPER CAPACITY CHART IN PLACE.
5. BEFORE MOVING, BE SURE OF A CLEAR PATH AND SOUND HORN. WATCH FOR PEDESTRIANS AND OBSTRUCTIONS. CHECK OVERHEAD AND SIDE CLEARANCES. ALWAYS LOOK IN DIRECTION OF TRAVEL.
6. START TURN AND BRAKE SMOOTHLY. REDUCE TRAVEL SPEEDS FOR TURNS, SLIPPERY OR UNEVEN SURFACES. AVOID RUNNING OVER LOOSE OBJECTS OR HOLES IN THE ROADWAY SURFACE.
7. WHEN TRAVELING WITH LOAD, FULLY RETRACT BOOM AND PLACE FORKS IN CARRY POSITION (APPROX 12" ABOVE GROUND). TILT CARRIAGE BACK SLIGHTLY TO CRADLE LOAD. USE EXTREME CAUTION WHEN TURNING.
8. ON INCLINES, TRAVEL WITH LOAD UP-GRADE.
9. DO NOT USE BOOM AS WALKWAY.
10. USE TWO HANDS WHEN CLIMBING ON MACHINE.
11. USE ONLY A GRADALL MANUFACTURED PERSONNEL WORK PLATFORM FOR LIFTING PERSONNEL. NO RIDERS ON MACHINE, FORKS, LOAD, OR OTHER LIFTING ATTACHMENTS AT ANY TIME. DO NOT USE PERSONNEL WORK PLATFORM WITHOUT THE PROPER GRADALL MATERIAL HANDLER/PERSONNEL WORK PLATFORM CAPACITY CHART DISPLAYED IN THE CAB. DO NOT DRIVE MACHINE WITH PERSONNEL IN PLATFORM.
12. KEEP OTHERS AWAY FROM MACHINE WHILE OPERATING. DO NOT STAND UNDER BOOM OR LOAD.
13. USE EXTREME CARE WHEN HANDLING LONG, HIGH, OR WIDE LOADS. DO NOT HANDLE UNSTABLE OR LOOSELY STACKED LOADS.
14. FORKS TO BE CENTERED UNDER LOAD AND SPACED APART AS FAR AS POSSIBLE.
15. BEFORE ADJUSTING OR SERVICING, PLACE FORWARD/REVERSE LEVER IN NEUTRAL, REST BOOM ON GROUND OR SUPPORT, SET PARKING BRAKE, SHUT OFF ENGINE AND CHOCK WHEELS.
16. BEFORE LEAVING MACHINE UNATTENDED, PLACE FORWARD/REVERSE LEVER IN NEUTRAL, LOWER BOOM, SET PARKING BRAKE AND SHUT OFF ENGINE. CHOCK WHEELS IF MACHINE MUST PARK ON AN INCLINE.
17. LEVEL MACHINE BEFORE LIFTING ANY LOAD ABOVE 4 FEET (IF EQUIPPED WITH FRAME LEVELING).
18. OPERATOR PROTECTION (SUCH AS HARD HATS, SAFETY GLASSES, AND/OR HEARING PROTECTION) SHOULD BE WORN WHEN JOB CONDITIONS WARRANT. ALWAYS USE SEAT BELT.
19. IMPROPER USE OF MACHINE COULD RESULT IN MACHINE TIPPING OVER. IF MACHINE STARTS TO TIP OVER, DO NOT LEAVE OPERATORS SEAT. LEAN AWAY FROM TIP & BRACE YOURSELF.
20. KEEP MIRROR(S) CLEAN AND PROPERLY ADJUSTED. OBJECTS IN MIRROR ARE CLOSER THAN THEY APPEAR.

3055-3029 REV. 4

Located on right side of cab wall  
P/N 9055-3028

### **TRACTION LOCK SWITCH**

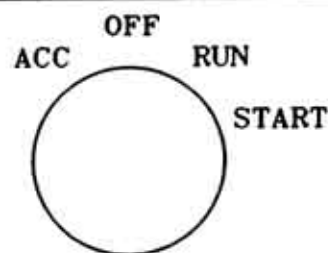
SWITCH LOCATED ON FLOOR. SWITCH HYDRAULICALLY LOCKS FRONT AND REAR WHEELS TOGETHER FOR INCREASED TRACTION.



DO NOT ENGAGE WHEN WHEELS ARE IN MOTION OR ON IMPROVED SURFACES. MACHINE MUST BE IN 4 WHEEL DRIVE.

9108-3314

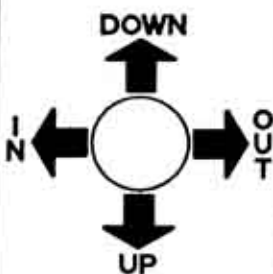
Located on dashboard  
P/N 9108-3314



**MACHINE MUST BE IN NEUTRAL AND PARK BRAKE ON TO START**

Located on dashboard  
P/N 9114-3120

### **BOOM JOYSTICK OPERATION**




9130-3047

Located on joystick pedestal  
P/N 9130-3047



## DECALS INSIDE CAB



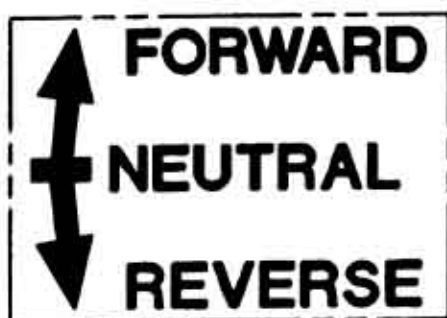
### ! WARNING

**DO NOT GO NEAR LEAKS**

- High pressure oil easily punctures skin causing serious injury, gangrene or death
- If injured, seek emergency medical help. Immediate surgery is required to remove oil.
- Do not use finger or skin to check for leaks.
- Lower load or relieve hydraulic pressure before loosening fittings.

106148

Located on valve access cover in cab  
P/N 9108-3492



Located on forward/reverse lever  
P/N 9116-3028



Located on left side, front cab plate  
P/N 9116-4097 (enclosed cab)  
P/N 9116-4093 (open cab)



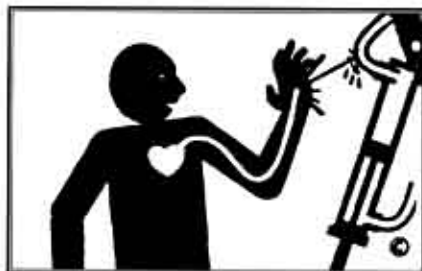
Located on dashboard  
P/N 9114-3182



Located on right cab wall  
P/N 9114-3292



Located on left side, front cab plate  
P/N 9116-4094

**DECALS OUTSIDE CAB****WARNING****DO NOT GO NEAR LEAKS**

- High pressure oil easily punctures skin causing serious injury, gangrene or death
- If injured, seek emergency medical help. Immediate surgery is required to remove oil.
- Do not use finger or skin to check for leaks.
- Lower load or relieve hydraulic pressure before loosening fittings.

106148

Located on hydraulic reservoir  
P/N 9108-3492

ALL HANDLER  
INSTRUCTIONS  
524D

**SERVICE INTERVALS**

| DAILY<br>10 HRS                              | WEEKLY<br>50 HRS | MONTHLY<br>150 HRS | 3 MO.<br>500 HRS | 6 MO.<br>1000 HRS | ANNUAL<br>1500 HRS | TYPE OR<br>EQUIVALENT               |
|--|------------------|--------------------|------------------|-------------------|--------------------|-------------------------------------|
| CHECK OIL                                    | CHANGE           | CHANGE             | CHANGE           | CHANGE            | CHANGE             | SAE 15W-40-CD ***<br>DIESEL FUEL #2 |
| CHECK TIRE PRESSURE                          | CHECK            | CHECK              | CHECK            | CHECK             | CHECK              | MOBIL 424                           |
| CHECK RADIATOR                               | CHECK            | CHECK              | CHECK            | CHECK             | CHECK              | MOBIL 424                           |
| CHECK WATER PUMP                             | CHECK            | CHECK              | CHECK            | CHECK             | CHECK              | MOBIL 424                           |
| CHECK CYLINDER FITTINGS EACH END             | CHECK            | CHECK              | CHECK            | CHECK             | CHECK              | ETHYLENE GLYCOL<br>ANTI-FREEZE      |
| CHECK REAR AXLE (12) FITTINGS                | CHECK            | CHECK              | CHECK            | CHECK             | CHECK              | ETHYLENE GLYCOL<br>ANTI-FREEZE      |
| CHECK FRONT AXLE PIVOT (2) FITTINGS          | CHECK            | CHECK              | CHECK            | CHECK             | CHECK              | ETHYLENE GLYCOL<br>ANTI-FREEZE      |
| CHECK ALL BEARING PADS                       | CHECK            | CHECK              | CHECK            | CHECK             | CHECK              | ETHYLENE GLYCOL<br>ANTI-FREEZE      |
| CHECK FRONT BOTTOM BEARING PADS              | CHECK            | CHECK              | CHECK            | CHECK             | CHECK              | ETHYLENE GLYCOL<br>ANTI-FREEZE      |
| CHECK BOOM PIVOT (2) FITTINGS                | CHECK            | CHECK              | CHECK            | CHECK             | CHECK              | ETHYLENE GLYCOL<br>ANTI-FREEZE      |
| CHECK HEAD PIN (2) FITTINGS                  | CHECK            | CHECK              | CHECK            | CHECK             | CHECK              | ETHYLENE GLYCOL<br>ANTI-FREEZE      |
| CHECK QUICK SWITCH (1) FITTING               | CHECK            | CHECK              | CHECK            | CHECK             | CHECK              | ETHYLENE GLYCOL<br>ANTI-FREEZE      |
| CHECK RETRACT & EXTEND CABLE                 | CHECK            | CHECK              | CHECK            | CHECK             | CHECK              | ETHYLENE GLYCOL<br>ANTI-FREEZE      |
| CHECK SEE OPERATOR & MAINTENANCE MANUAL      | CHECK            | CHECK              | CHECK            | CHECK             | CHECK              | ETHYLENE GLYCOL<br>ANTI-FREEZE      |
| CHECK 35 BOOM RETRACT & EXTEND CABLE SHEAVES | CHECK            | CHECK              | CHECK            | CHECK             | CHECK              | ETHYLENE GLYCOL<br>ANTI-FREEZE      |

Located on mudguard  
P/N 9114-3294

**GRADALL®**  
HYDRAULIC SYSTEM

FILL WITH TRACTOR HYDRAULIC FLUID

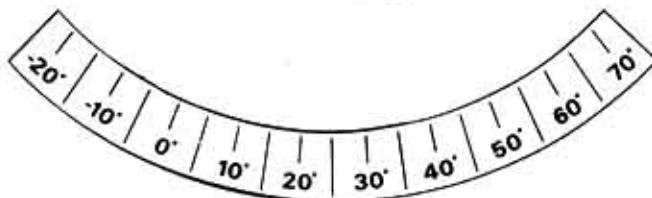
**Mobilfluid® 424**

or equivalent.

For Mobil Product Information, Call 1-800-662-4525.

9114-3294

Located on hydraulic reservoir  
P/N 9114-3288



Located on left side of boom  
P/N 9100-3031

**WARNING**

READ AND UNDERSTAND THE FOLLOWING PRIOR TO LIFTING PERSONNEL.  
WHEN LIFTING PERSONNEL USE ONLY A GRADALL MANUFACTURED PERSONNEL WORK PLATFORM.  
DO NOT DRIVE MACHINE WITH PERSONNEL IN PLATFORM.  
WHEN PERSONNEL ARE IN PLATFORM REMAIN SEATED IN CAB WITH PERSONNEL  
IN DIRECT LINE OF SIGHT.  
OPERATE CONTROLS LIGHTLY AND CAUTIOUSLY WHEN LIFTING PERSONNEL.  
READ AND UNDERSTAND PERSONNEL WORK PLATFORM USER'S MANUAL BEFORE LIFTING PERSONNEL.  
DO NOT USE PERSONNEL WORK PLATFORM WITHOUT THE PROPER GRADALL MATERIAL.  
HANDLER PERSONNEL WORK PLATFORM CAPACITY CHART DISPLAYED IN CAB.  
FAILURE TO COMPLY COULD RESULT IN SERIOUS INJURY OR DEATH.

9055-3027 REV A

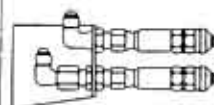
Located on mud guard  
P/N 9055-3027

**CAUTION**

COOLING SYSTEM  
IS PRESSURIZED.  
REMOVE CAP SLOWLY.  
HOT FLUID CAN  
CAUSE BURNS.

8060-3026

Located on engine cover  
P/N 8060-3026

**TEST PORTS**

IMPLEMENT  
PRESSURE  
CHARGE  
PRESSURE

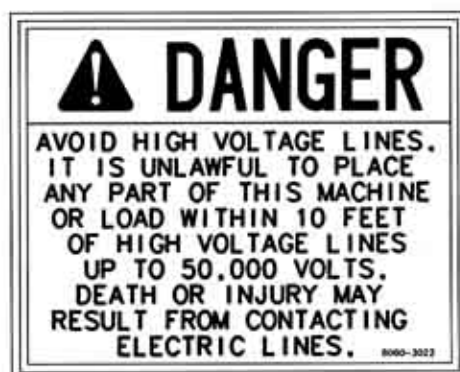
9114-3162

Located on hydraulic filter bracket  
P/N 9114-3162

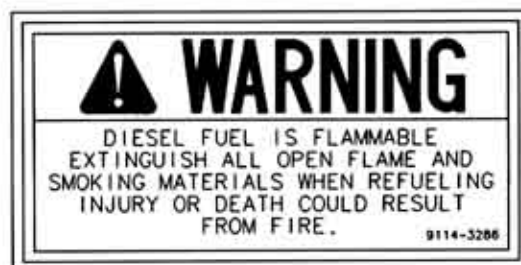




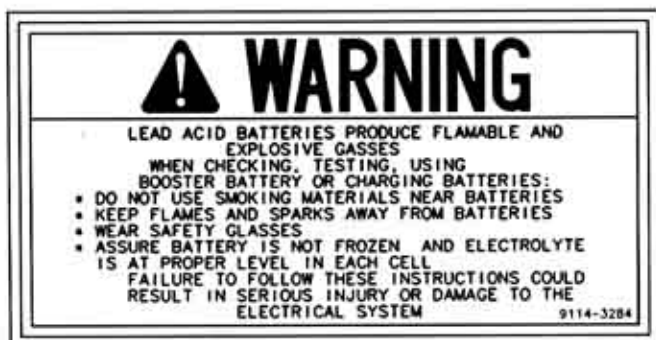
## DECALS OUTSIDE CAB



Located on mud guard  
P/N 8060-3022



Located on fuel tank  
P/N 9114-3286



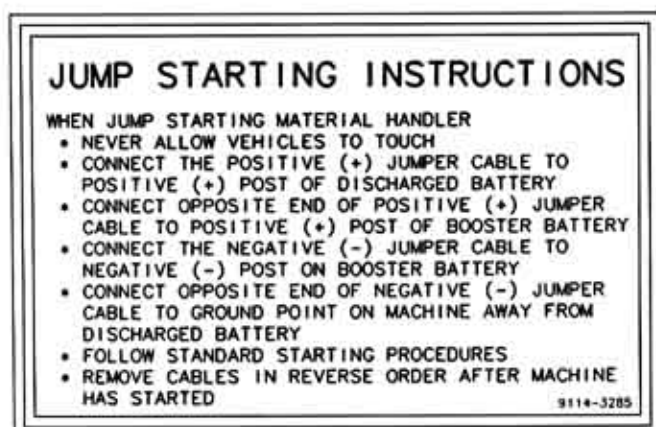
Located beside battery  
P/N 9114-3284



Located on both sides and top of boom  
P/N 8060-3019

# HYDRAULIC OIL

Located on hydraulic reservoir  
Part No. 9108-3509



Located beside battery  
P/N 9114-3285



Located on right and left rear frame  
and hydraulic reservoir  
P/N 9114-3282



## DECALS OUTSIDE CAB

### **WARNING**

READ AND UNDERSTAND THE FOLLOWING PRIOR TO LIFTING PERSONNEL.  
WHEN LIFTING PERSONNEL USE ONLY A GRADALL MANUFACTURED  
PERSONNEL WORK PLATFORM.  
ALL PERSONNEL IN PLATFORM MUST WEAR A FULL BODY HARNESS WITH  
LANYARD ATTACHED TO A DESIGNATED ANCHORAGE POINT.  
READ AND UNDERSTAND PERSONNEL WORK PLATFORM USER'S MANUAL  
BEFORE OCCUPYING PERSONNEL WORK PLATFORM.  
FAILURE TO COMPLY COULD RESULT IN SERIOUS INJURY OR DEATH.

9055-3026 REV. A

Located on boom head and optional personnel work platform  
P/N 9055-3026

### **WARNING**

STAY CLEAR OF MOVING PARTS  
WHILE ENGINE IS RUNNING.  
MOVING PARTS CAN CAUSE  
SERIOUS INJURY.

9114-3281

Located on sheet metal cover of  
hydraulic reservoir and fuel tank  
P/N 9114-3281

### **WARNING**

EXHAUST SYSTEMS CAN BE HOT.  
KEEP AWAY FROM EXHAUST SYSTEM WHEN HOT.  
HOT EXHAUST COMPONENTS CAN CAUSE  
SEVERE BURNS.

9114-3280

Located on engine compartment  
P/N 9114-3280

### **HYDRAULIC OIL LEVEL**

———— FULL

———— ADD

CHECK OIL LEVEL WITH  
HANDLER LEVEL AND ALL  
CYLINDERS RETRACTED.  
1 GALLON BETWEEN  
ADD AND FULL MARKS

9116-3130

Located on hydraulic reservoir  
P/N 9116-3130

### **WARNING**

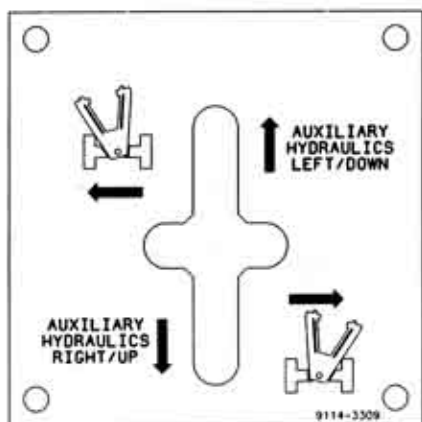
NO RIDERS PERMITTED ON HANDLER.  
OPERATOR ONLY IN MACHINE  
WHILE RUNNING.  
RIDERS COULD FALL OFF MACHINE  
CAUSING SERIOUS INJURY OR DEATH.

9114-3283

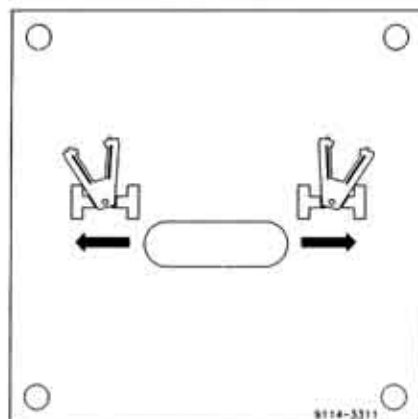
Located on left cab wall  
P/N 9114-3283



## OPTIONAL EQUIPMENT DECALS



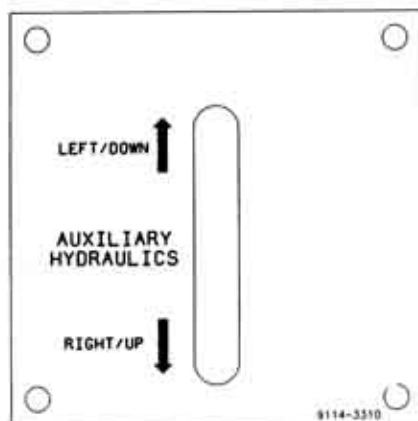
Located on dashboard  
P/N 9114-3309



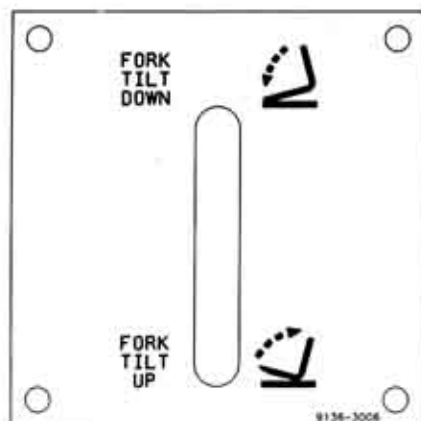
Located on dashboard  
P/N 9114-3311

|   |                      |
|---|----------------------|
| <b>GRADALL</b>  |                      |
| 405 MILL AVE. S.W. NEW PHILADELPHIA, OHIO   |                      |
| MADE IN U.S.A.  |                      |
| ATTACHMENT  | <input type="text"/> |
| SERIAL NUMBER   | <input type="text"/> |
| WEIGHT  | <input type="text"/> |
| CAPACITY  | <input type="text"/> |
| HYD. PRESSURE   | <input type="text"/> |
| DO NOT USE PERSONNEL WORK PLATFORM WITHOUT THE PROPER GRADALL MATERIAL HANDLER/PERSONNEL WORK PLATFORM CAPACITY CHART DISPLAYED IN CAB. |                      |
| 9055-3033   |                      |

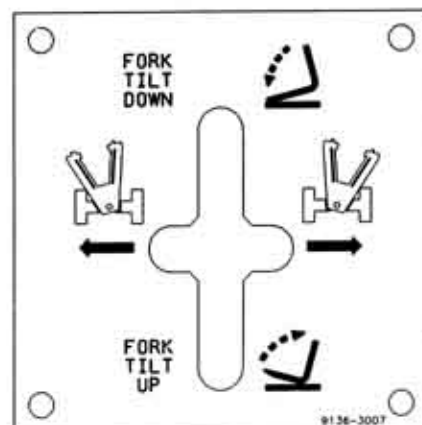
Located on personnel work platform  
P/N 9055-3033



Located on dashboard  
P/N 9114-3310



Located on dashboard  
P/N 9136-3006

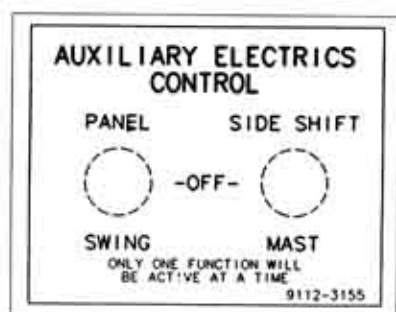


Located on dashboard  
P/N 9136-3007





## OPTIONAL EQUIPMENT DECALS



Located on dashboard  
P/N 9112-3155

- FOR COLD STARTING
1. TURN IGNITION SWITCH TO ON POSITION
  2. HOLD COLD START SWITCH ON FOR 20 SECONDS
  3. TURN KEY TO START WHILE KEEPING SWITCH ON. IF ENGINE FAILS TO START IN 15 SECONDS RETURN KEY TO ON AND RELEASE SWITCH. WAIT 20 SECONDS AND REPEAT STEPS 2 & 3.

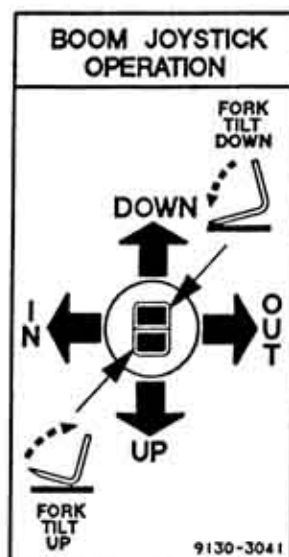
Located on dashboard  
P/N 9114-3164



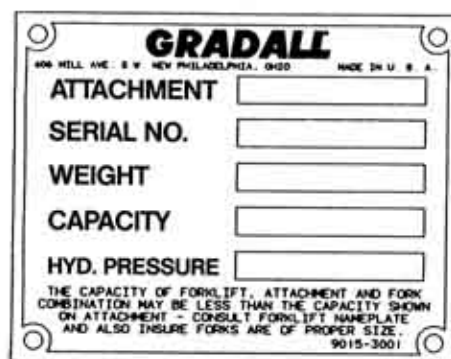
Located on personnel work platform  
P/N 9055-3031



Located on lever knob  
P/N 9108-3317



Located on joystick pedestal  
P/N 9130-3041



Located on attachment  
P/N 9015-3001



Located on personnel work platform  
P/N 9055-3032



Located on lever knob  
P/N 9108-3318



## OPERATOR'S CAB

The standard cab permits vision from all sides and includes an overhead guard to provide protection from falling objects.

### WARNING

Never operate the handler unless the overhead guard is in place and in good condition.

A fully-enclosed cab with windows and a lockable door is available as an option. The top half of the cab door can be secured in the fully-opened or closed position. The bottom half of the cab door can be secured in the closed position only. Be sure the door is fully secured when operating the handler.

The operator's seat is equipped with a seat belt and includes fore and aft adjustment to compensate for variations in operator size. The adjustment release/lock is located beneath front edge of seat. **Wear seat belt when operating machine.**

An optional windshield wiper/washer is available for use with enclosed cabs. A control switch is located on the instrument panel.

A variable-speed defroster fan is available for use with enclosed cabs. An "On/Off" control switch and speed control are located on the base of the fan.

A heater fan is available for use with units equipped with a heater. An "On/Off" switch is located on the dashboard. Hot water to the heater can be controlled by a valve at the engine.

**The operator's cab is a certified S.A.E. "FOPS/ROPS" structure. Do not make any modification to this structure. If damaged, the cab cannot be repaired. It must be replaced.**

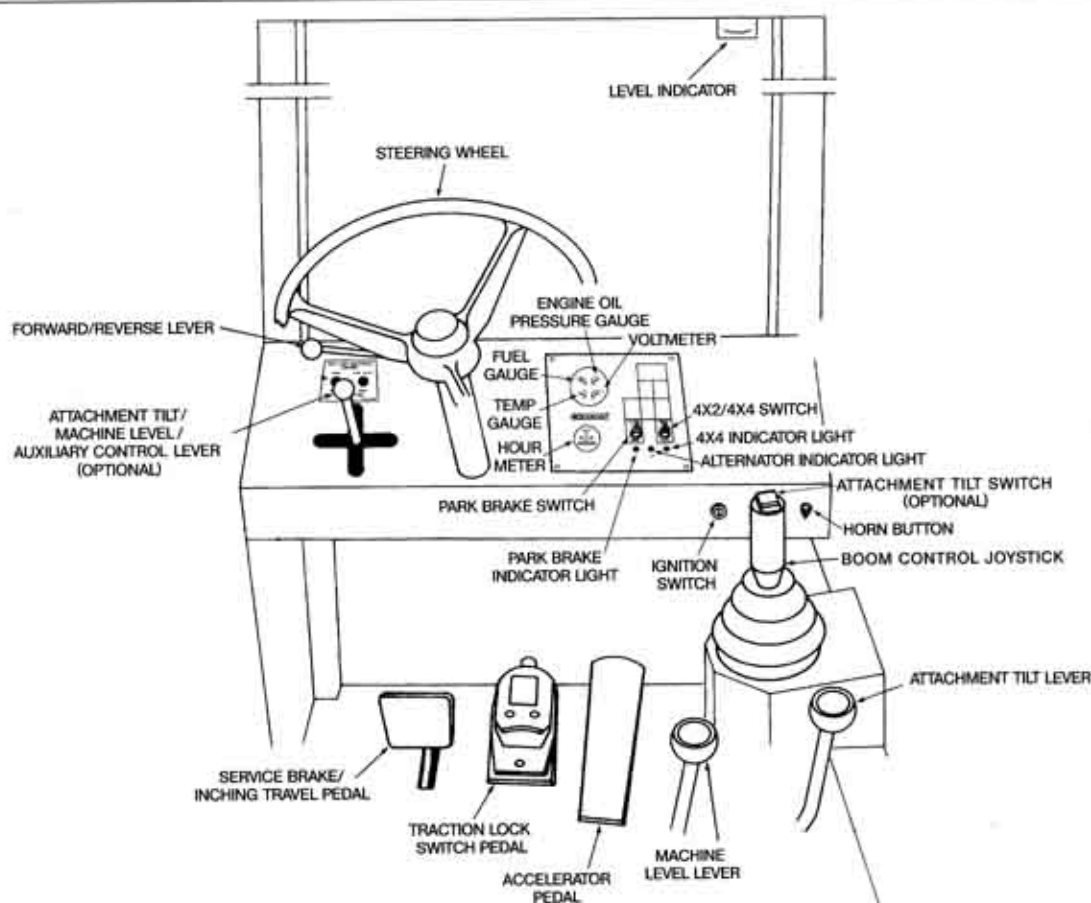
### WARNING

Any modification which adds weight to this machine must be approved by GRADALL to assure compliance with FOPS/ROPS certification for this cab/machine configuration.

### NOTE!

Relevant S.A.E. Recommended Practices:  
S.A.E. J1040 for ROPS  
S.A.E. J231 for FOPS

## CONTROL AND INSTRUMENT IDENTIFICATION







## WARNING

A brief description of controls and instruments is provided here as a convenience for the operator. These descriptions DO NOT provide complete operation instructions. Read and understand this Manual, the EMI Rough Terrain Forklift Safety Manual and the GRADALL Material Handler Safety Manual and view the GRADALL/EMI Operator Orientation Video.

**Accelerator Pedal:** The accelerator pedal is connected to the engine-speed control by a cable to provide accurate engine speed control. Depress pedal to increase speed and release pedal to decrease speed.

**Alternator Indicator Light:** Glows (red) to indicate alternator is not charging.

**Attachment Tilt Lever:** This lever controls tilt of the fork carriage. Speed is proportional to lever actuation and engine RPM. Push lever forward to tilt down; pull lever back to tilt up.

**Attachment Tilt Switch (optional):** Depress front of switch to tilt down; depress rear of switch to tilt up.

**Auxiliary Control Lever (optional):** This lever is used to control optional hydraulic attachments. Follow decal instructions for lever/handler movements.

**Auxiliary Light Switch (optional):** This switch turns auxiliary lights on and off.

**Boom Control Joystick:** This joystick controls boom elevation and extension. Pull joystick back to raise boom; push joystick forward to lower boom. Move joystick to right to extend boom; move to left to retract boom. Speed of boom movement is proportional to joystick actuation and engine RPM.

**Engine Coolant Temperature Gauge:** This gauge displays engine coolant temperature.

**Engine Oil Pressure Gauge:** This gauge displays engine oil pressure.

**Forward/Reverse Lever:** This lever engages forward or reverse travel. Push lever fully forward for forward travel; pull lever fully backward for reverse travel. Move lever to centered position for "Neutral".

**Fuel Gauge:** This gauge displays level of fuel in fuel tank.

**Heater Fan Switch (optional):** This switch turns heater fan on and off.

**Horn Button:** Depress button to sound horn.

**Hourmeter:** This meter indicates total time of engine operation in hours and tenths of hours.

**Ignition Switch:** This switch is actuated by a key. In "ACC" or "RUN" position, voltage is available for all electrical functions. Full clockwise rotation to "START" engages starter motor. Counter-clockwise rotation to "OFF" stops engine and removes voltage from all electrical functions.

**Level Indicator:** This bubble level indicator enables the operator to determine the left to right level condition of the handler.

**Lights Switch (optional):** This switch controls optional lighting which may be provided with the handler.

**Machine Level Lever:** This lever controls the relationship of the handler frame to the front axle. Push the lever forward to tilt frame to left; pull lever back to tilt frame to right.

**Parking Brake Switch:** This switch controls the application and release of the parking brake.

**Parking Brake Indicator Light:** Glows (red) to indicate brake is applied.

**Rotating Beacon Switch (optional):** This switch controls operation of rotating beacon.

**Seat Lock Release Lever:** This lever unlocks and locks seat position adjustment.

**Service Brake/Inching Travel Pedal:** This pedal operates the service brakes on the front axle. It also permits slow travel speed while engine speed is kept high for other handler functions. The further the pedal is depressed, the slower the travel speed. Full depression of pedal causes full service brake application.

**Starting Aid Switch:** This switch engages and disengages the cold-weather starting aid, if your handler is so-equipped.

**Steering Wheel:** The steering wheel controls the angle of rear axle wheels. Turning the steering wheel to the right causes a right turn by angling rear wheels to left. A left turn is caused by angling rear wheels to right.

**Traction-Lock Pedal:** This pedal operates traction-lock valve which functions to restore traction when a wheel spins in four-wheel drive.

**Voltmeter:** This gauge indicates alternator output and battery condition.

**4x2/4x4 Switch:** This switch engages and disengages rear-wheel drive motors. Rear drive motors are engaged for four-wheel drive.

**4x4 Indicator Light:** Glows (amber) to indicate four-wheel drive is engaged. When park brake is applied, this light will not glow.





## CHECKS AND SERVICES BEFORE STARTING ENGINE

To be performed at beginning of each work shift.

### WARNING

Use extreme caution when checking items beyond your normal reach. Use an approved safety ladder.

- If spark arrestors are required, be sure they are in place and in good working order.
- Check to be certain that windows and mirror(s) are clean and undamaged. Also make certain that mirror(s) are properly adjusted for operator's view.
- Before removing filler caps or fill plugs, wipe all dirt and grease away from the ports. If dirt enters these ports, it can severely reduce component life.
- When adding fluids, refer to lubrication section of Manual to determine proper type.

Complete all required maintenance before operating unit.

### WARNING

Before operating handler, complete all required maintenance. Replace or repair all damaged, worn or missing components before starting or operating handler. Failure to properly maintain handler may cause serious injury or death.



Service the unit in accordance with the ***"Lubrication and Routine Maintenance"*** schedule, pages 34 and 35.



Inspect all structural members, including attachment, for signs of damage.



Inspect unit for obvious damage, vandalism and necessary maintenance. Check for signs of fuel, lubricant, coolant and hydraulic leaks. Open all access doors and look for loose fittings, clamps, components and attaching hardware. Replace hydraulic lines that are cracked, brittle, cut or which show signs of leakage or abrasion.



## WARM UP & OPERATIONAL CHECKS

### To be performed at beginning of each work shift.

The safety, efficiency and service life of your handler will be increased by performing the operational checks listed below. Items preceded by an asterisk (\*) are optional and may not be furnished on your machine.

#### Before entering the operator's cab, check:

1. Air Filter Restriction Indicator. If needle is in red area, filter is clogged and element must be changed.

#### During warm-up period, check:

- \*2. Heater, defroster and windshield wiper.
- \*3. Operating lights and rotating beacon.
- 4. Voltmeter - should show 13.5 to 14 volts.

#### When engine warms to operating range, check:

5. Service brake and parking brake.
6. Forward and reverse travel.
7. Steering (stop to stop in both directions) with engine at low idle.
8. "Inching" travel - should be smooth through full pedal travel.

9. Horn and back-up alarm.
10. All boom and attachment functions - operate fully and correctly.
11. Hydraulic Filter Condition Indicator - observe engine coolant temperature gauge after starting normal operation. When needle has been in operating range for an hour or so, stop handler in a safe area, apply parking brake, lower forks fully, shift forward/reverse lever to "Neutral" position and chock wheels. With engine running at full throttle, have an assistant check the Hydraulic Filter Condition Indicator. When needle is in red area, filter is clogged and hydraulic oil is bypassing filter. Filter element must be changed before reaching bypass condition (change before needle reaches red area).

### CAUTION

Continued operation with hydraulic fluid bypassing the filter can cause severe damage to hydraulic system components.

### Complete all required maintenance before operating unit.

## ENGINE OPERATION

### WARNING

Operator must be seated with seat belt fastened, forward/reverse lever in "Neutral" position, parking brake applied and all hydraulic controls in "Neutral" before starting engine.

### Starting the Engine

1. Make sure all controls are in "Neutral" and all electrical components (lights, heater, defroster, etc.) are turned off. Set parking brake.

### CAUTION

Turning ignition switch to "START" position while engine flywheel is rotating can cause serious damage to engine and/or starting motor.

**NOTE!** Engine will not start unless forward/reverse lever is in "Neutral" and parking brake switch is applied.

2. Depress accelerator pedal approximately 1/4 to 1/3 of travel from top.
3. Turn ignition switch to "START" to engage starting motor. Release key immediately when engine starts. If engine fails to start within 20 seconds, release key and allow starting motor to cool for a few minutes before trying again.
4. After engine starts, observe oil pressure gauge. If gauge remains on zero for more than ten seconds, stop engine and determine cause. Correct malfunction before restarting engine. Minimum pressure at operating temperature:  
Low idle: ..... 10 PSI (69kPa)  
Full throttle under load: ..... 30 PSI (207kPa)
5. Warm up engine at approximately 1/2 throttle until engine coolant temperature reaches operating range.





## Cold-Weather Starting Aids

Diesel engine ignition is accomplished by heat generated when fuel/air mixture is compressed within the cylinders. In cold weather situations, a supplemental starting aid may be required. Gradall-approved starting aids employ ether. If your handler is equipped with an ether starting aid, proceed as follows:

### FOR COLD STARTING

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3. TURN KEY TO START WHILE KEEPING SWITCH ON. IF ENGINE FAILS TO START IN 15 SECONDS RETURN KEY TO ON AND RELEASE SWITCH. WAIT 20 SECONDS AND REPEAT STEPS 2 & 3.

## ⚠ CAUTION

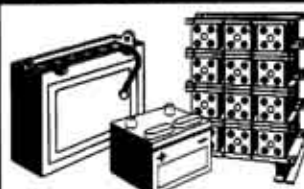
If you use a starting aid employing ether or a similar substance, pay particular attention to manufacturer's warnings. Excessive ether can cause severe engine damage.

## Battery-Boosted Starting

If you ever have to battery-boost start (jump-start) your handler, proceed as follows:

- Never allow vehicles to touch
- Connect the positive (+) jumper cable to positive (+) post of discharged battery
- Connect opposite end of positive (+) jumper cable to positive (+) post of booster battery
- Connect the negative (-) jumper cable to negative (-) post on booster battery
- Connect opposite end of negative (-) jumper cable to ground point on machine away from discharged battery
- Follow standard starting procedures
- Remove cables in reverse order after machine has started

### BATTERIES AND RELATED PARTS CONTAIN LEAD



### WASH HANDS AFTER HANDLING!

WARNING: Battery posts, terminal and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm.

### CALIFORNIA PROPOSITION 65 BATTERY WARNING

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm.

### WASH HANDS AFTER HANDLING !

## Normal Engine Operation

**Observe gauges frequently to be sure all engine systems are functioning properly.**

The voltmeter shows the "charge/discharge" state of the battery charging system. With the engine running, meter should indicate 13.5 to 14 volts. With engine stopped, meter indicates battery charge (12 volts). The alternator indicator light glows (red) to indicate alternator is not charging.

**Be alert for unusual noises or vibration.** When an unusual condition is noticed, park machine in safe position and perform standard shut-down procedure. **See Page 4.** Report condition to your supervisor or maintenance personnel.

**Avoid prolonged idling.** Idling causes engine temperature to drop and this permits formation of heavy carbon deposits and dilution of lubricating oil by incompletely-burned fuel. If the engine is not being used, turn it off.

## ⚠ CAUTION

Always keep engine covers closed while engine is running.

## Stopping the Engine

- **To stop engine, perform standard shut-down procedure.**
- **Operate engine at low idle for 3 to 5 minutes before turning it off.** This allows engine coolant and lubricating oil to carry excessive heat away from critical engine areas, including turbocharger.

- **Do not "gun" engine before shut down:** This practice causes incompletely-burned fuel to remove oil film from cylinder walls and dilute lubricant in crankcase.



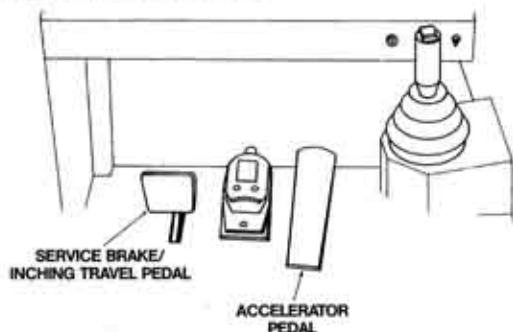


## BRAKE SYSTEM

### General

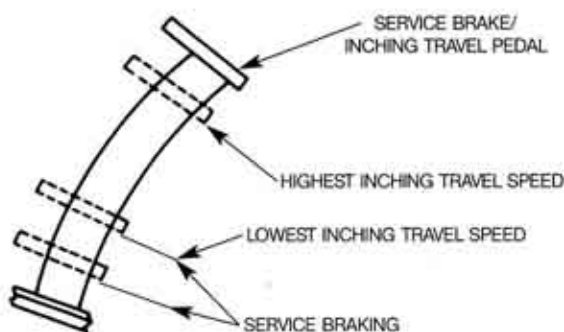
The brake system includes a service brake and a parking brake. Service and parking brakes are applied through a pair of wet disc brake packs located within axle housing.

Because service braking and "inching" (slow travel) functions overlap, some features of inching will be discussed here. **See "Drive Train" section, page 20** for additional information on inching travel.



### Inching Travel

Overlap between braking and inching occurs because the same pedal controls both functions; also because both functions control travel speed. However, the methods of controlling travel speed are quite different. Service braking involves a controlled stopping force applied to the front wheels. Inching involves a controlled driving force applied to the driving wheels.



Most of the inching travel pedal stroke controls the speed of inching travel. As the pedal nears the bottom of its stroke, service brakes are engaged.

### ⚠ WARNING

Practice inching/braking in a safe, open area until you are thoroughly familiar with handler response.

### Service Brakes

The power-assisted service brakes are applied only to wheels of the front axle. Hydraulic pressure for power-assist feature is provided by a brake circuit.

### ⚠ WARNING

If power-assist feature should fail for any reason, it would require greater effort to apply service brake. **It is extremely important that you never stop the engine while traveling.**

If power assist fails, stop as soon as possible. Do not drive the handler until problem has been corrected.

Depressing service brake/inching travel pedal to braking portion of pedal travel causes controlled hydraulic pressure to be applied to service brakes. The greater the pedal travel, the greater the braking force.

If power-assist fails, it will require much greater force on pedal to apply brake and stopping distance will be greater.

### ⚠ WARNING

Always move parking brake switch to "On" position before leaving cab.

Never stop engine while traveling. Parking brake will be fully-applied and unit may stop abruptly. A sudden stop could cause load loss.

### Parking Brakes

The parking brakes are spring-applied and hydraulically-released.

Hydraulic power to release parking brakes is provided by the hydraulic system and is controlled by the parking brake switch located on the dashboard.

With the engine running and the parking brake switch "Off", parking brakes are disengaged. Moving the switch to "On" releases hydraulic pressure to apply the parking brakes. With switch in "On" position, four-wheel drive is disabled.

### NOTE!

In the event of engine or hydraulic failure, parking brakes can be released for towing. **See "To Release Parking Brake", page 38.**



## PARKING THE HANDLER

### Precautions

- Avoid parking on slopes or near an excavation.
- Park on level ground and chock wheels.
- Avoid parking on roads or highways. If it cannot be avoided, be sure to display warning flags during day and flares or flashing lights at night.
- Position boom-head or attachment on ground; never leave machine with boom in air.
- If parking on a slope cannot be avoided, position the handler at a right angle across the slope, straighten rear wheels and chock all wheels.

### Parking procedure

1. Using service brake, stop the handler in an appropriate parking area.
2. Move parking brake switch to "On".
3. Shift forward/reverse lever to "Neutral".
4. Position boom-head or attachment on ground.
5. Allow engine to cool at idle speed for 3 to 5 minutes, stop engine and remove ignition key.
6. Chock wheels as an extra precaution against rolling.
7. Fill fuel tank to minimize condensation.
8. Lock cab and install protective covers, if so-equipped.
9. Disconnect batteries if unit is in an area where tampering is a risk.

## STEERING SYSTEM

- Rear-wheel power steering is provided to reduce operator fatigue and to permit high maneuverability in close quarters.
- It is imperative that the operator practice maneuvering the handler in a safe, open area to become thoroughly familiar with steering response and clearance required for tail swing and load when turning.

### WARNING

Be alert for any increase in effort needed to steer. If any difference is noted, notify maintenance personnel immediately. If power assist feature should fail for any reason, IT WOULD BECOME VERY DIFFICULT TO STEER. For this reason it is extremely important that you NEVER TURN ENGINE OFF WHILE TRAVELING.

In the event power steering fails, stop as soon as possible. Do not drive handler until problem has been corrected.





## DRIVE TRAIN

### General

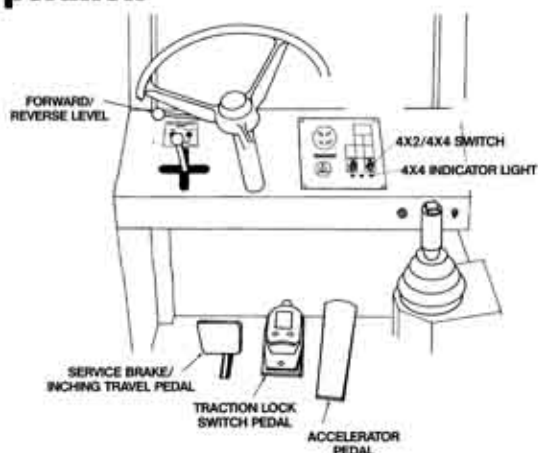
Material Handlers covered by this Manual are equipped with hydrostatic drive. From the operator's standpoint, operation is similar to driving a vehicle equipped with an automatic transmission.

Major components of the system include a front drive axle with a differential and planetaries. The differential receives torque from a variable-displacement piston pump and a motor.

This combination of components eliminates the need for a conventional mechanical transmission and also provides inching travel.

These handlers also have piston motors to provide torque to rear-wheel drive hubs, as well as an electrically-controlled valve which functions to restore tractive effort if conditions cause a wheel to spin.

### Operation



**Normal Travel:** Direction of travel is selected by moving forward/reverse lever forward for forward travel, backward for reverse travel. Move lever to center position for "Neutral".

### WARNING

Bring handler to a complete stop before shifting forward/reverse lever when carrying a load. A sudden change in direction of travel can reduce stability and/or cause load to shift or fall.

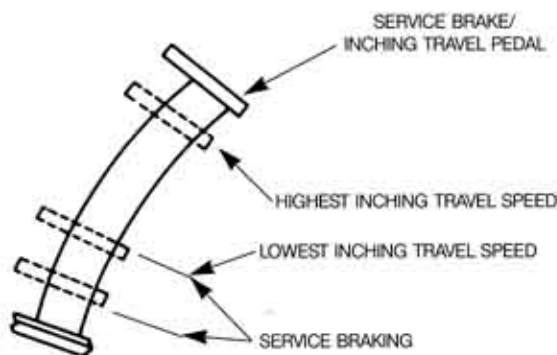
If hydrostatic drive system senses increased travel load, the system will compensate automatically by reducing travel speed to match load and engine RPM.

**Inching Travel:** Inching travel is provided to permit slow travel speed while maintaining high engine speed for other handler functions.

The service brake/inching travel pedal controls inching travel. The upper portion of pedal travel actuates a valve which

controls travel pump output. The greater the pedal travel, the less the pump flow; the less the pump flow, the slower the travel.

The lower portion of pedal travel actuates the service brake. The greater the pedal travel, the stronger the brake application. Travel flow is reduced when brakes begin to apply.



### WARNING

Practice inching/braking in a safe, open area until you are thoroughly familiar with response of machine to pedal travel.

**Four-Wheel Drive:** When required by travel conditions, rear-wheel (four-wheel) drive can be engaged by moving toggle switch to "4x4" position. Return unit to two-wheel drive by moving toggle switch to "4x2" position.

Four-wheel drive can be engaged and disengaged while traveling.

When parking brake is applied, four-wheel drive is disabled.

**Traction Lock Switch:** This switch (pedal) controls the traction lock valve which functions to restore tractive effort when a wheel tends to spin in four-wheel drive.

When switch pedal is depressed and held, traction lock valve functions to cause delivery of full drive pressure to wheels of other axle, regardless of low pressure at spinning wheel.

**DO NOT** engage traction lock function on improved surfaces. Unit must be in four-wheel drive to engage traction lock function.

**DO NOT** engage traction lock function while wheels are turning. Return engine to idle, engage traction lock and increase RPM. Disengage after traction resumes while in motion.

### CAUTION

**Never disengage rear hubs!**





## BOOM

- The boom is raised and lowered by a hydraulic cylinder anchored to chassis frame and boom-section 1.
- Two-section booms are extended by a cylinder within the boom, anchored at rear of boom-section 1 and near front of boom-section 2. Three-section booms are extended by a cylinder within the boom, anchored at rear of boom-section 1 and boom-section 2. A pair of cable and sheave arrangements govern equal extension of boom-section 2 and boom-section 3.
- Raise boom by pulling boom-control joystick back; lower boom by pushing joystick forward.
- Extend boom by moving joystick to right; retract boom by moving joystick to left.
- The Attachment-Tilt Cylinder, located within the boom-head, tilts the fork carriage (or other attachment) back and forth as required.
- Push tilt lever forward to tilt carriage forward; pull lever back to tilt carriage backward. All cylinders related to boom/carriage movement (attachment-tilt, boom up/down, and boom in/out) are protected by counterbalance valves which prevent cylinders from retracting in the event of a broken hydraulic hose or tube.
- 522 and 524 handlers may be equipped with either a 2-section or 3-section boom. 534D-6 and 534D-6 Turbo handlers all have a 3-section boom. Always check the appropriate capacity chart for your specific machine.
- Boom functions can be operated simultaneously by moving joystick to a position between two single functions. Speed of boom movement is proportional to speed of joystick actuation and engine RPM.

### Checking & Adjusting Boom Cable

For more detailed information, including boom cable checks and adjustments, see the appropriate **Service Manual**.



## LEVELING THE HANDLER

### DANGER

Raising the boom (loaded or unloaded) when handler is leaning to one side can cause machine to tip over with little or no warning and cause serious injury or death.

"Leveling" means positioning the handler so that it is level from side to side (left to right).

A level indicator is located in upper right corner of front window frame to permit operator to determine whether handler frame is level. *See diagram, page 13.*

**NOTE!** There are four very important things to remember about handler leveling:

1. Never engage a load or lift a load more than four feet above ground unless handler is level.
2. A handler with the boom raised and/or an attachment installed is a partially-loaded handler.
3. Once the handler frame is level and the handler has raised a load more than four feet above ground, it must not be moved from this position if such movement could change the level condition. Do not use sway to level handler with load more than four feet above ground.
4. The combination of side tilt and load can cause the handler to tip over.

#### Two ways to level the handler:

1. The surface which will support the handler can be leveled. This method must be chosen if it will be necessary to move the handler from its position after the load has been raised over four feet from ground AND such movement could change the level condition.

**Remember:** The supporting surface must be large enough, smooth enough and firm enough to keep the handler level when it is moved from its position.

2. The handler may be leveled by means of the frame-leveling system. This method may be chosen when it will not be necessary to move the handler from its position after the load has been raised above four feet from ground - OR - when such movement will not change the level condition of the handler.

Always determine best position for handler to raise load from its present location and also to position load at its destination. **THEN**, determine which method of leveling will be required at each location.

**FINALLY**, consider terrain between present location of load and its destination. Never attempt to transport a load across terrain which could cause handler to tip over.

#### Leveling Handler Frame:

The handler is designed to permit tilting main frame 8° to left or right to compensate for uneven ground conditions.

The rear axle pivots at the midpoint of the main frame to help ensure that all wheels will remain in contact with the ground.

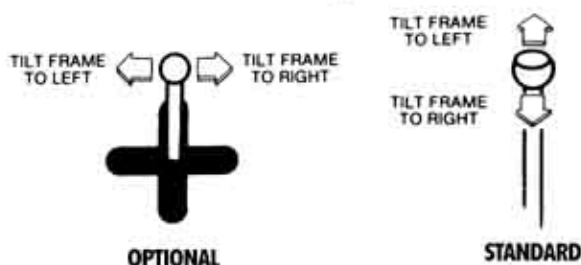
A hydraulic cylinder provides a rigid connection between front axle and main frame to help ensure a solid work platform and to tilt main frame to left or right.

Optional rear-axle stabilization is available for Material Handlers covered by this manual. This system includes a hydraulic cylinder attached between the frame and the rear axle, as well as flow-restricting valving. This system controls rear-axle oscillation whenever the boom is raised over 40° from level. **However, the system never locks up and is not designed to increase lateral stability.**

#### Leveling Procedure:

1. Position machine in best location to lift or place load and apply parking brake.
2. Observe level indicator to determine whether machine must be leveled. Note position of indicator for later realignment.

#### Frame-Leveling Controls



3. If necessary to level handler, position boom in carry position and level machine with the lever.
4. Lift or place load as appropriate.
5. Retract and lower boom to carry position.
6. Realign frame to position noted in step 2.

### WARNING

If handler cannot be leveled using leveling system, do not attempt to raise or place load. Have surface leveled.





## OPERATING PROCEDURES & TECHNIQUES

**NOTE!** Much of the material in this section may be new to even the experienced operator.

### Hydraulic Controls

All boom and attachment movements are governed by hydraulic controls. Rapid, jerky operation of hydraulic controls will cause rapid, jerky movement of the load. Such movements can cause the load to shift or fall or may cause the machine to tip over.

#### Feathering

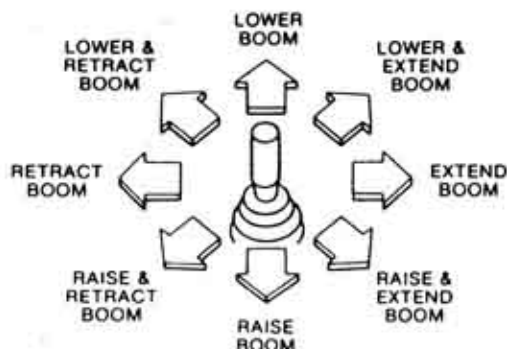
Feathering is a control operation technique used for smooth operation. To feather controls, move control lever very slowly until function begins to move, then gradually move lever further until function is moving at desired speed. Gradually move lever toward "Neutral" as load approaches destination. Continue to reduce load speed to bring load to a smooth stop. Feathering effect can be increased by reducing engine speed at beginning and near end of load movement.

### WARNING

Do not permit lift cylinders to hit the end of their stroke. The jolt could topple loads, causing a hazard to personnel and equipment nearby.

#### Boom Control Joystick

The boom control joystick can be positioned to activate individual boom movements or combinations of boom movements as illustrated:



With boom raised above horizontal, forks can be inserted under a load by moving boom control joystick forward and to the right until forks move forward horizontally.

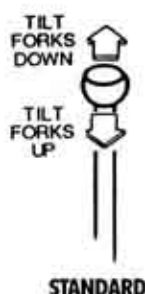
With boom raised above horizontal, forks can be removed from a load by moving boom control joystick back and to the left until forks move rearward horizontally.

With boom lowered below horizontal, forks can be inserted under a load by moving boom control joystick back and to the right until forks move forward horizontally.

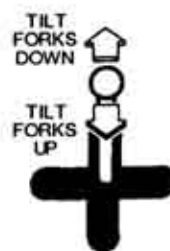
With boom lowered below horizontal, forks can be removed from a load by moving boom control joystick forward and to the left until forks move rearward horizontally.

The closer the boom to horizontal, the less boom raise/lower movement required for inserting and removing forks.

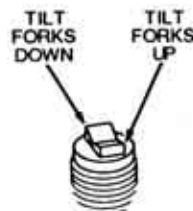
#### Carriage Tilt Controls



STANDARD



OPTIONAL



OPTIONAL

### WARNING

Always move boom to carry position (horizontal or below) before leveling frame. Attempting to level machine with boom raised may cause it to tip over.

#### Rated Capacity Chart

The rated capacity chart, located on dashboard, indicates maximum load capacities for handlers equipped with GRADALL-furnished carriage/fork combination. These capacities apply to standard carriage/fork combinations except as stated on the capacity chart.

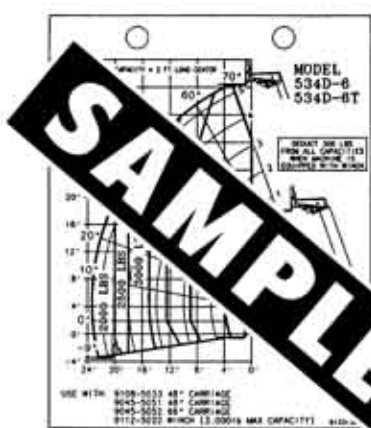
### WARNING

All loads shown on rated capacity chart are based on machine being on firm, level ground; the forks being positioned evenly on carriage; the load being centered on forks; proper size tires being properly inflated; and the handler being in good operating condition.





## Rated Capacity Charts



### Samples Only - USE CHARTS IN CAB

#### Elevation:

Numbers at left side of sample chart represent elevation to top of horizontal fork as measured from level ground (in feet). Elevation relates to dimension "A" shown on serial number plate, inside cab, front left side plate.

#### Boom Extension

Numbers across bottom of sample chart and numbers parallel to boom represent boom reach as measured from front of front tires to extended position.

Number decals on boom relate directly to boom extension. The largest number which can be read from operator's seat indicates total boom extension and must be matched with boom angle to determine load capacity.

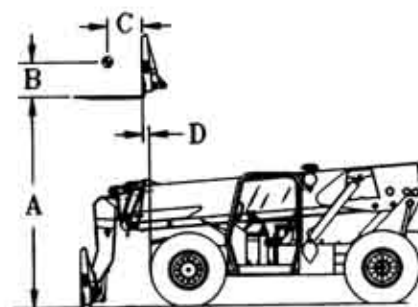
Boom extension relates to dimension "D" shown on serial number plate.

#### Boom Angle

Numbers shown at ends of angled lines represent angle of boom to horizontal as measured from horizontal. Maximum angles are  $-4^{\circ}$  below horizontal with boom fully lowered to  $71^{\circ}$  above horizontal with boom fully raised.

A boom angle indicator is located on left side of boom-section 1 to show boom angle. **Be sure machine is level from front to rear or indicator will provide incorrect reading.**

#### Load Center



Loads shown on rated capacity chart are based on the load center being two feet above and two feet forward of surfaces of horizontal forks as indicated by dimensions "B" and "C" on serial number plate.

The load center of a load is the center of gravity of the load. For regularly-shaped loads of the same material, such as a pallet of blocks, the center of gravity can be located by measuring the load to find its center. For irregular loads, or loads of dissimilar materials, keep the heaviest part of the load as close to the heel of the forks as possible.

In all cases, the load center must be centered between the forks.

#### Load Limits

Some capacities shown on the rated capacity chart are based on machine stability and some are based on hydraulic lift capacity. The "common sense" or "feel" an experienced operator might apply in regard to "tipping loads" **DOES NOT APPLY** to hydraulic load limits. Exceeding load limits can cause damage, or, in some cases, cause the machine to tip over.



## ATTACHMENTS

### Approved Attachments

Although the carriage/fork combination is most frequently used, several other GRADALL-approved attachments are available for use with your material handler. Contact your GRADALL Material Handler Distributor for information on approved attachments designed to solve special material handling problems.

The serial number plate lists attachments approved for use with your handler. However, there may be additional approved attachments available. Contact your GRADALL Material Handler Distributor for further information.

### Non-Approved Attachments

#### DANGER

Attachments which have not been approved for use with your handler may cause machine damage or an accident resulting in injury or death.

#### DANGER

Do not use non-approved attachments for the following reasons:

- GRADALL cannot establish range and capacity limitations for "will fit", homemade, altered or other non-approved attachments.
- An overextended or overloaded handler can tip over with little or no warning and cause serious injury or death to the operator and/or those working near the handler.
- GRADALL cannot assure the ability of a non-approved attachment to perform its intended function safely.
- Non-approved attachments may cause structural or other damage to the handler. Such damage could cause dangerous operating conditions resulting in serious injury or death.

### Carriage/Fork Capacities

The standard carriage/fork capacity chart (located on the dashboard) indicates maximum reach and load capacities for handlers equipped with an approved carriage/fork combination. **These limitations apply to standard, GRADALL-approved carriage/fork combinations, except as stated on the capacity chart.**

Non-standard carriage/fork combinations (greater or lesser capacity) may be furnished by GRADALL at customers' request or may be available for installation because they were furnished for a different application.

If a carriage/fork combination of lesser capacity is used, **the overall machine capacity is reduced** to carriage/fork capacity as indicated on carriage/fork serial number plate.

If a carriage/fork combination of greater capacity is used, the overall machine capacity may be reduced because of additional attachment weight and/or other considerations. **Contact your local GRADALL Distributor to determine capacity limitations.**

### Other Attachment Capacities

A serial number/capacity plate is attached to all GRADALL-furnished attachments. **Do not assume that any GRADALL attachment may be used on any GRADALL Material Handler.**

First, check the listing of approved attachments on handler serial number plate. If the attachment in question is not included in the list, contact your local GRADALL Distributor to check whether or not the attachment is approved.

Next, **if the attachment is approved for use** with your handler, compare maximum capacity from attachment serial number plate to maximum capacity for that **attachment** as indicated on material handler serial number plate. **The smallest of these values is correct for your handler.**

#### DANGER

Never use an attachment without the appropriate, GRADALL-supplied capacity chart for that particular attachment installed in the handler.





## Attachment Installation



1. Retract Quick Switch™ (attachment tilt lever forward) to provide clearance. Check to be sure lock pin is secured in raised position with retainer pin.



2. Align boom head pivot with recess in attachment. Raise boom slightly to engage boom head pivot in recess.



3. Engage Quick Switch (attachment tilt lever backward).

### **WARNING**

This installation procedure is designed for one-man operation. If a helper is involved, shut off the engine before proceeding to steps 4 and 5.



4. Remove retainer pin and lower lock pin fully.



5. Secure lock pin in locked position using retainer pin.

### **DANGER**

Always be certain that carriage or attachment is properly positioned on boom head and is secured by lock pin and retainer pin. Failure to ensure proper installation could permit carriage/attachment/load to disengage and cause serious injury or death.

## Attachment Operation

Operation of the handler equipped with carriage/fork combination is covered in the **GRADALL Material Handler Safety Manual**, the **EMI Rough-Terrain Forklift Safety Manual** and this **Manual**.

Operation of the handler when equipped with other approved attachments is covered in this section or in separate instructions furnished with the attachment. Any separate instructions must be kept in Manual Holder in cab with this **Owner/Operator Manual**.

When an attachment is installed on the handler, take extra care when engaging, securing, manipulating, transporting and positioning the load.

Operate a handler equipped with an attachment as a partially-loaded handler. Pay special attention to capacity and range limits for the handler/attachment combination.

Practice operation of handler and attachment in a safe, open area, not hazardous to yourself, other persons, equipment or property. Become thoroughly familiar with response of handler and attachment to controls before operating in a work situation.

Always consider terrain between present location of load and delivery point. Never attempt to transport a load across terrain which could cause handler to tip over.





## Fork Positioner

### ⚠ WARNING

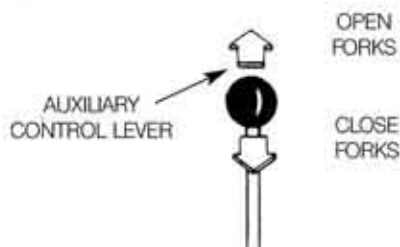
#### PRECAUTIONS

- Always adjust fork position before engaging load.
- As with all other attachments, handler must be level before handling a load more than four feet above ground level. **See "Leveling The Handler", page 22.**

#### Capacity:

Maximum load capacity for fork positioner carriage is the same as standard carriage without fork positioner. **Refer to Attachment Capacity Chart.** Capacity varies with boom extension and elevation positions.

#### Controls:



The auxiliary control lever is used to adjust fork position. Pull lever back to close forks; push lever forward to open forks.

#### Installation Procedure:

1. Remove standard carriage/fork combination or other attachment from boom head. **See "Attachment Installation", page 26.**
2. Install carriage/fork combination with positioner.
3. Connect auxiliary hydraulic hoses to positioner cylinders.

### ⚠ WARNING

Observe all precautions and load capacity limits (listed previously) when handling loads with carriage/fork positioner.

4. Always adjust fork position before engaging load. Moving forks after engaging load could cause load to fall from forks.

## Light Material Bucket

### ⚠ WARNING

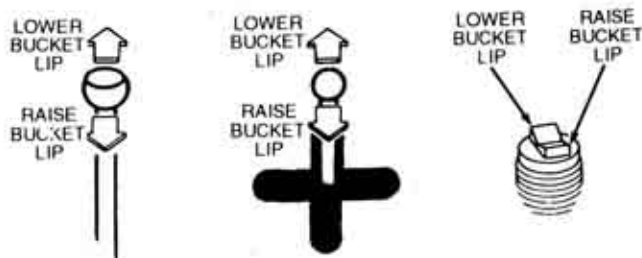
#### PRECAUTIONS

- Handler must be level when handling a load more than four feet above ground. **See page 22.**
- Retract boom fully before loading bucket. Loading bucket with boom extended could damage structural members or extension chains.
- Avoid shock loads; drive into stockpile smoothly to load bucket.
- Do not use bucket as a lever to pry heavy material. Excessive prying forces could damage the bucket.
- Do not use bucket for "back dragging". This can cause severe damage to Quick Switch fittings.

#### Capacity:

Maximum capacity of light material bucket is shown on the attachment serial number plate and may be used in areas where it does not exceed capacities shown on standard carriage/fork capacity chart. Capacity must be reduced for areas where maximum bucket capacity would exceed standard carriage/fork capacity chart.

#### Attachment Tilt Controls:



Because the carriage tilt cylinder is used to tilt the bucket, the carriage tilt lever is used to control the bucket. Pull lever back to raise bucket lip; push lever forward to lower bucket lip.

#### Installation Procedure:

1. Remove carriage/fork combination or other attachment from boom head. **See page 26.**
2. Install light material bucket on boom head.
3. Retract boom fully and tilt bucket up or down as required to position bottom of bucket parallel with ground.



4. Raise or lower boom to appropriate height for loading material from stockpile.

## ⚠ WARNING

Observe all precautions and load capacity limits (listed previously) when handling loads with light material bucket.

5. Align handler with face of stockpile and drive slowly and smoothly into pile to load bucket. Do not corner-load bucket.
6. Tilt bucket up far enough to retain load and back away from pile.
7. Lower bucket to carry position (approximately one foot above ground) and travel carefully to unloading point. Turn bucket down to dump load.

## Mast (6' with 48" or 66" carriage)

## ⚠ WARNING

### PRECAUTIONS

- Read additional capacity information under "Capacity" heading.
- Because the mast increases lift height, it is especially important to level the handler before lifting a load more than four feet above ground. **See page 22.**

### Capacity:

Maximum lift capacity (indicated on attachment serial number plate) applies only to certain areas within boom extension/elevation pattern of handler/mast combination. A separate capacity chart must be used for handlers equipped with mast. Study this chart carefully before attempting to handle a load with mast attachment.

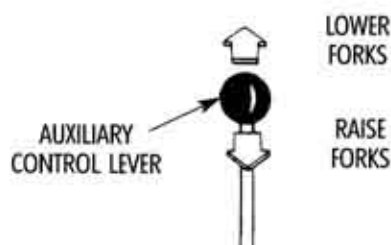
## ⚠ WARNING

Do not handle a load with Mast attachment until you have studied "Mast Capacity Chart" carefully. If your handler does not have a "Mast Capacity Chart", ask your supervisor to get one.

### Attachment Tilt Controls:

The carriage tilt cylinder is used to tilt the mast and the carriage tilt lever controls mast tilt.

The auxiliary control lever is used to raise and lower the forks in the mast. Pull lever back to raise forks; push lever forward to lower forks.



### Installation Procedure:

1. Remove carriage/fork combination or other attachment from boom head. **See page 26.**
2. Install mast on boom head.
3. Connect auxiliary hydraulic hoses to mast cylinder.
4. Always level handler before raising the boom or the forks, with or without a load.
5. To travel with a load, lower forks fully in mast and lower boom to position load approximately one foot above ground.
6. Use mast as required to increase vertical reach of handler.
7. Use a signal man to assist in positioning the load if necessary.





## Swing Forks

### ⚠ WARNING

#### PRECAUTIONS

- Read additional capacity information under "Capacity" heading.
- Always level forks (horizontally) before swinging load to side. Swinging unlevelled forks may result in load slipping from forks.
- Because the swing forks can swing the load to the side, it is especially important that the handler be level when handling a load more than four feet above ground level.

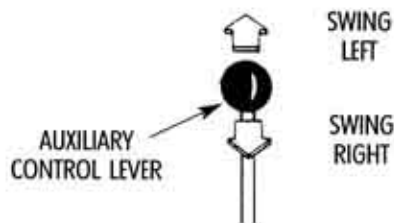
#### Capacity:

Maximum lift capacity for swing forks is shown on the attachment capacity chart. However, maximum lift capacity applies only to certain areas within boom extension/elevation pattern of handler/swing forks combination. A separate capacity chart must be used for handlers equipped with swing forks. Study this chart carefully before attempting to handle a load with swing forks attachment.

### ⚠ WARNING

Do not handle a load with Swing Forks attachment until you have studied "Swing Forks Capacity Chart" carefully. If your handler does not have a "Swing Forks Capacity Chart", ask your supervisor to get one.

#### Attachment Tilt Controls:



The carriage tilt cylinder is used to tilt the swing forks up and down and the carriage tilt lever controls fork tilt.

The auxiliary control lever is used to swing the forks to the left and right. Pull lever back to swing forks right; push lever forward to swing forks left.

#### Installation Procedure:

1. Remove carriage/fork combination or other attachment from boom head. **See page 26.**
2. Install swing forks attachment on boom head.
3. Connect auxiliary hydraulic hoses to swing forks attachment.

### ⚠ WARNING

Observe all precautions and load capacity limits listed previously when handling loads with swing forks attachment.

4. Always position forks straight ahead before engaging load.
5. To travel with load, keep forks in straight ahead position and lower load to approximately one foot above ground.
6. Inspect supporting surface at delivery point and have it leveled if necessary.
7. Use a signal man to assist in positioning the load if necessary.

## Slope Pile Carriage

### ⚠ WARNING

#### PRECAUTIONS

- Level handler before tilting carriage to engage load.
- Always level handler before lifting a load more than four feet above ground.

#### Capacity:

Maximum lift capacity for the slope pile carriage is shown on the attachment serial number plate. However, maximum lift capacity applies only to certain areas within boom extension/elevation pattern of handler/slope pile carriage combination. A separate capacity chart must be used for handlers equipped with slope pile carriage. Study this chart carefully before attempting to handle a load with slope pile carriage.

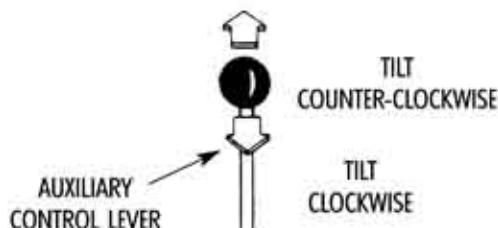




## ⚠ WARNING

Do not handle a load with Slope Pile Carriage attachment until you have studied "Slope Pile Carriage Capacity Chart" carefully. If your handler does not have a "Slope Pile Carriage Capacity Chart", ask your supervisor to get one.

### Attachment Tilt Controls:



The carriage tilt lever controls carriage tilt.

The auxiliary control lever is used to tilt slope pile carriage. Push lever forward to tilt carriage counter-clockwise; pull lever back to tilt clockwise.

### Installation Procedure:

1. Remove carriage/fork combination or other attachment from boom head. **See page 26.**
2. Install slope pile carriage on boom head.
3. Connect auxiliary hydraulic hoses to slope pile carriage attachment.
4. Approach load with forks centered on load and stop handler.
5. Level handler before tilting carriage to engage load.
6. Tilt carriage to left or right to align forks with load and engage load.
7. Raise load slightly and then level carriage.
8. Travel with load lowered to travel position (load approximately one foot above ground).

## Boom Head-Mounted Winch

## ⚠ WARNING

### PRECAUTIONS

- Maximum winch load capacity is reduced from normal carriage/fork load rating.
- Always level the handler before lifting a load.
- Travel with load and boom lowered to travel position (load approximately one foot above the ground).
- Always lower load to rest before leaving handler.

### Capacity:

The boom head-mounted winch maximum load capacity is shown on the standard carriage capacity chart. However, maximum capacity may be used only in areas where it does not exceed capacities shown on standard carriage/fork capacity chart (located on dashboard). Also note that maximum winch capacity is less than carriage/fork maximum capacity. Capacity rating is based on load being lifted and suspended vertically from the boom and with no load on forks.

## ⚠ WARNING

Do not handle a load with Boom Head-Mounted Winch attachment until you have studied "Boom Head-Mounted Winch Capacity Chart" carefully. If your handler does not have a "Boom Head-Mounted Winch Capacity Chart", ask your supervisor to get one.

## ⚠ WARNING

A side load or a swinging load can cause the handler to tip over and/or damage the boom.

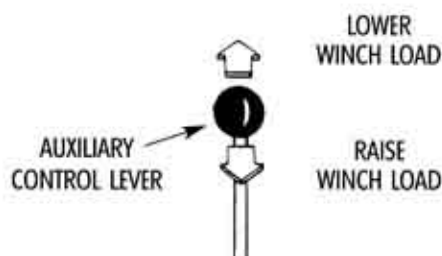
### Observe the following Special Precautions:



### SPECIAL PRECAUTIONS



- Never drag the load; lift vertically.
- Use tag line to guide and steady a suspended load. Tag lines must be long enough to keep helpers clear of load and handler.
- Beware of wind. Wind can cause a suspended load to swing and cause dangerous side loads - even with tag lines.
- Start, travel, turn and stop slowly to prevent load from swinging.
- Weight of all rigging (slings, etc.) must be included as part of load.
- Do not attempt to use handler frame-leveling to compensate for load swing.

**Attachment Tilt Controls:**

The auxiliary control lever is used to control the boom head-mounted winch. Pull the lever back to raise winch load; push the lever forward to lower winch load.

**Installation Procedure:**

1. Install winch on boom head and connect hydraulic hoses at winch motor.
2. Position winch hook directly above balance point of load and secure using appropriate rigging.
3. Attach tag lines to load and transport load to delivery site.
4. While helpers guide load with tag lines, position load at delivery point.

**Truss Boom & Truss Boom with Winch****⚠ WARNING****PRECAUTIONS**

- Because the truss boom extends the reach of the handler, maximum load capacity is reduced.
- Because of extended reach, it is especially important to level the handler before lifting a load.
- Travel with load and boom lowered to travel position (load approximately one foot above ground).
- Always lower load to rest before leaving handler.

**Capacity:**

Maximum lift capacity for the truss boom (with or without winch) is shown on attachment serial number plate. However, maximum lift capacity applies only to certain areas within boom extension/elevation pattern of handler/truss boom combination. A separate capacity chart must be used for handlers equipped with truss boom. Study this chart carefully before attempting to handle a load with truss boom.

**⚠ WARNING**

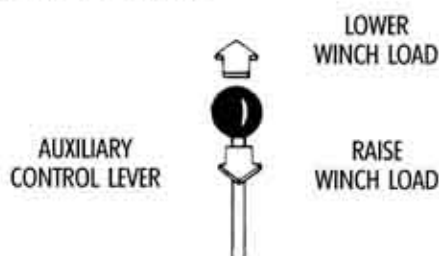
Do not handle a load with Truss Boom & Truss Boom with Winch attachment until you have studied "Truss Boom & Truss Boom with Winch Capacity Chart" carefully. If your handler does not have a "Truss Boom & Truss Boom with Winch Capacity Chart", ask your supervisor to get one.

**⚠ WARNING**

A side load or a swinging load can cause the handler to tip over and/or damage the boom.

**Observe the following Special Precautions:****SPECIAL PRECAUTIONS**

- Never drag the load; lift vertically.
- Use tag line to guide and steady a suspended load. Tag lines must be long enough to keep helpers clear of load and handler.
- Beware of wind. Wind can cause a suspended load to swing and cause dangerous side loads – even with tag lines.
- Start, travel, turn and stop slowly to prevent load from swinging.
- Weight of all rigging (slings, etc.) must be included as part of load.
- Do not attempt to use handler frame-leveling to compensate for load swing.

**Attachment Tilt Controls:**

The carriage tilt cylinder is used to tilt the truss boom up and down from the handler boom head. The carriage tilt lever controls truss boom tilt.

The auxiliary control lever is used when the truss boom is furnished with a winch. Pull the lever back to raise winch load; push the lever forward to lower winch load.



**Installation Procedure:**

1. Remove carriage/fork combination or other attachment from boom head. **See page 26.**
2. Install truss boom on boom head.
3. If truss boom winch is furnished, connect auxiliary hydraulic hoses to winch.
4. Approach truss or truss bundle with boom above and parallel to load.
5. Position truss boom approximately parallel with main boom.
6. Position truss boom/winch hook as close as possible to balance point of load and secure load to boom using short slings or other rigging. Be sure rigging will not allow load to slip in any direction.
7. Open clamps at heel of truss boom far enough to clear load and tilt truss boom up until truss/bundle contacts heel of truss boom.
8. Close clamps to hold load lightly and secure clamps.
9. Transport load to delivery site and attach tag lines if load will be freely suspended.

**Swing Mast****⚠ WARNING****PRECAUTIONS**

- Always level forks (horizontally) before swinging load to side. Swinging unleveled forks may result in load slipping from forks.
- The swing mast attachment has a smaller load capacity than the standard carriage/fork attachment. Study the swing mast capacity chart carefully before handling a load with swing mast.
- Read additional capacity information under "Capacity" heading.
- Because the swing mast increases lift height and can swing load to side, it is especially important to level handler before lifting a load more than four feet above ground level.

**Capacity:**

Maximum lift capacity is shown on attachment serial number plate. However, maximum lift capacity applies only to certain areas within boom extension/elevation pattern of handler/swing mast combination. A separate capacity chart must be used for handlers equipped with mast. Study this chart carefully before attempting to handle a load with swing mast attachment.

**⚠ WARNING**

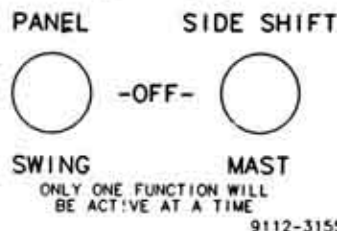
Do not attempt to handle a load with Swing Mast attachment until you have studied "Swing Mast Capacity Chart" carefully. If your handler does not have a "Swing Mast Capacity Chart", ask your supervisor to get one.

**NOTE!**

When swing mast is equipped with an optional Panel Handler attachment, additional restrictions in operation and capacity will apply. Refer to Swing Mast Capacity Chart or contact your GRADALL Material Handler Distributor for complete instructions and restrictions on use.

**Controls:**

The carriage tilt cylinder is used to tilt the mast and the carriage. Tilt lever controls mast tilt.

**AUXILIARY ELECTRICS CONTROL**

- Flip right switch up to "SIDE SHIFT" to activate side shift function. Move auxiliary hydraulic lever in appropriate direction as shown.
- Flip left switch down to "SWING" to activate swing function. Move auxiliary lever in appropriate direction as shown.
- Flip left switch up to "PANEL" to activate panel function. Move auxiliary hydraulic lever in appropriate direction as shown.
- Flip right switch down to "MAST" to activate mast function. Move auxiliary lever in appropriate direction as shown.





## WARNING

Observe all precautions and load capacity limits when handling load with swing mast.

### Installation Procedure:

1. Remove carriage/fork combination or other attachment from boom head. **See page 26.**
2. Install swing mast on boom head and connect auxiliary hydraulic hoses to swing mast diversion valve hoses. Also connect electrical cable at boom head.

3. Always lower carriage fully in mast and position forks straight ahead before engaging load.
4. To travel with a load, keep forks straight ahead and lower load to approximately one foot above ground.
5. Inspect supporting surface at delivery point and have it leveled if necessary.
6. Level handler before raising load.
7. If necessary, perform a "dry-run" (unloaded) of delivery to determine best position for handler.
8. Use a signal man to assist in positioning the load if necessary.

## Personnel Work Platform

**The material handler operator and personnel in the platform must read and understand the separate personnel work platform manual (part number 9055-4001) prior to using the platform.**

### Capacity

The Gradall personnel work platform is designed to carry a maximum of three occupants. The load includes personnel, materials, tools, etc. The maximum capacity of your work platform is based on specific model material handler/work platform combination. To determine maximum load capacity for given operating ranges, consult the proper load capacity chart (furnished with platform) for the material handler and work platform in use. **If your handler is not equipped with the proper personnel work platform capacity chart, get one before using the attachment.**

### Installation Procedure:

1. Remove carriage/fork combination or other attachment from boom head. **Refer to *Personnel Work Platform Manual* for installation procedures.**

### Operation:

- Gradall Personnel Work Platforms are approved for use **only** on Gradall Material Handlers equipped with the proper platform capacity chart.
- When lifting personnel, **use only a Gradall manufactured personnel work platform.** No other platform is approved for use on Gradall Material Handlers.

## WARNING

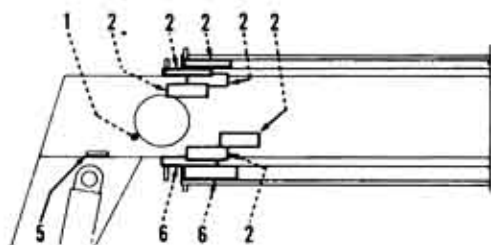
Do not use the Personnel Work Platform until you study and understand the "Capacity Chart." If your handler does not have the correct "Personnel Work Platform Capacity Chart," ask your supervisor to get one before using the attachment.

## WARNING

Do not use a boom mounted winch while the platform is mounted to the boom.

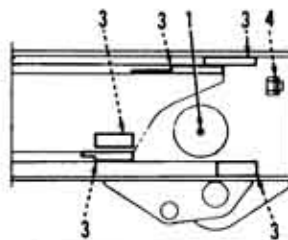


## LUBRICATION & ROUTINE MAINTENANCE



**Lubricant Symbols**  
 CG - GREASE (extreme pressure)  
 DF - DIESEL FUEL  
 EO - ENGINE FUEL  
 GO - MULTI-PURPOSE LUBE  
 HF - HYDRAULIC FLUID  
 MG - MOLY LUBE (extreme pressure)  
 MY - MOLY LUBE (cable threads)  
 SL - SPECIAL LUBE (differential)

See page 35

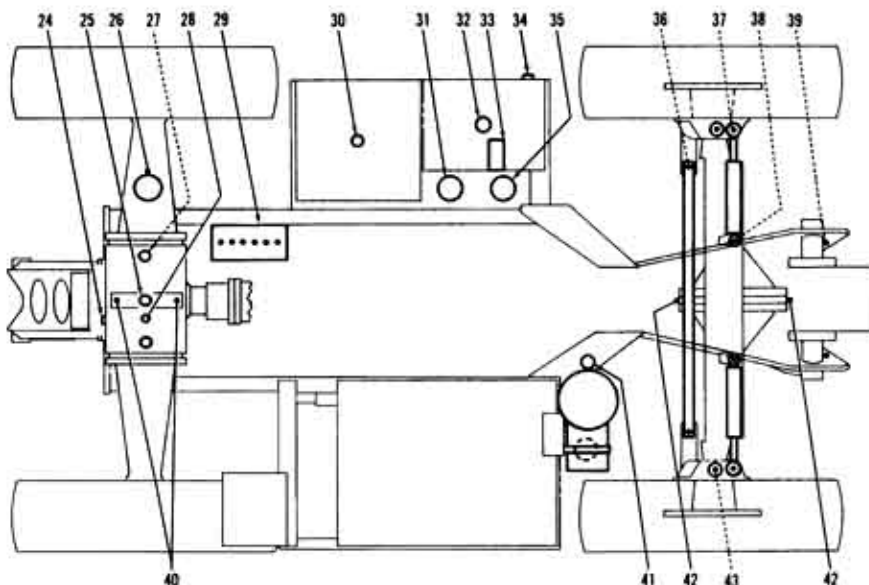
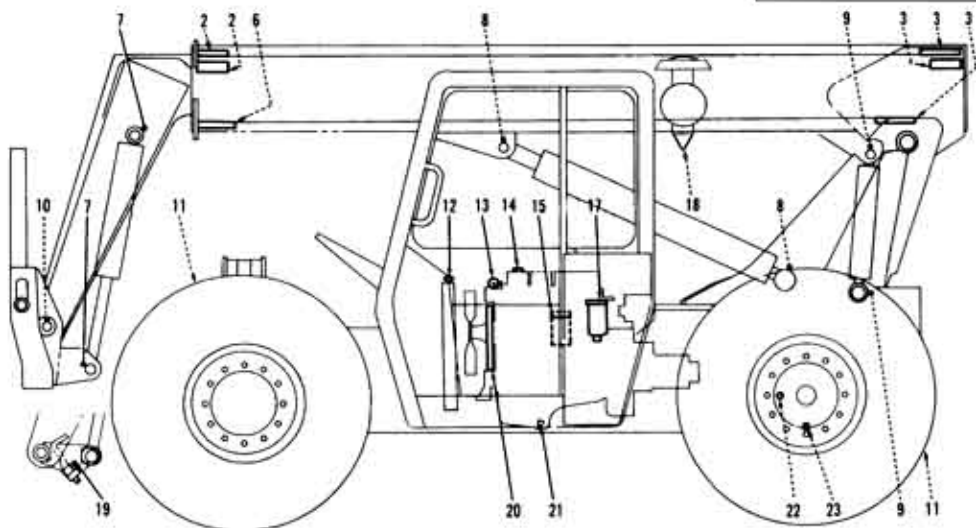


### SYMBOLS

- = Lube Fitting
- = Other Service
- .....→ = Service Both Sides

### IMPORTANT NOTICE

Be certain to check extend cable adjustment every 5 weeks or 250 hours and adjust as required. Cable damage can occur if cable is not adjusted properly.



**NOTE!** 522 and 524 Material Handlers may be equipped with either a 2-section boom or a 3-section boom.

**FAILURE TO USE GRADALL HYDRAULIC FILTER ELEMENTS COULD VOID WARRANTY**

**DETAILED SERVICE INSTRUCTIONS ARE CONTAINED IN THE GRADALL SERVICE MANUAL FOR YOUR PARTICULAR MATERIAL HANDLER**



**LUBRICATION & ROUTINE MAINTENANCE (continued)**

**Lube Symbol    No. of Points**

**Daily or Shift (10 hour Maximum)  
Lubrication & Maintenance**  
(Service at whichever interval occurs first)

|   |    |   |
|---|----|---|
| 13. Engine Crankcase Dipstick (level handler and check level - refill as required - item 14 is filler cap)  | EO | 1 |
| 30. Fuel Filler Cap (fill at end of work shift to minimize condensation)  | DF | 1 |
| 31. Hydraulic Return Filter Condition Indicator (check indicator with oil at normal operating temperature and engine running at full throttle - replace filter element before by-pass indication is reached or at least annually) | -  | 1 |
| 34. Hydraulic Level Sight Gauges (level handler, retract all other cylinders and check sight gauges - refill as required)   | HF | 1 |
| 35. Hydraulic Suction Filter (replace filter element when return filter element is replaced)  | -  | 1 |
| 41. Air Cleaner Element Condition Indicator (check for clogged condition (red band showing) and clean or replace element as required)   | -  | 1 |

**Weekly (or 50 Hour) Lubrication & Maintenance**  
(Service at whichever interval occurs first)  
(include all previous periodic services)

|   |    |   |
|---|----|---|
| 1. Extend/Retract Cable Sheaves   | CG | 3 |
| 6. Boom Bottom, Front Slide Bearings (extend boom fully and lube all wear paths - retract and extend boom fully three times and wipe excess lube from bearings) |    |   |
| 2 section boom:   | MG | 2 |
| 3 section boom:   | MG | 4 |
| 7. Carriage Tilt Cylinder Pivots  | CG | 2 |
| 8. Boom Hoist Cylinder Pivots   | CG | 2 |
| 9. Compensating Cylinder Pivots   | CG | 2 |
| 10. Boom Head/Carriage Pivot  | CG | 2 |
| 11. Tires (check for damage and proper inflation)   | -  | 4 |
| Standard for 522 and 524: 1300 x 24, 8 ply - 45 psi   |    |   |
| Standard for 534D-6 and 534D-6T 1300 x 24, 12 ply - 65 psi  |    |   |
| Optional: 13.00 x 24 Radial - 70 psi  |    |   |
| 522D/524D LoPro: 11R22.5 Radials (common wheel).  |    |   |
| 12. Radiator Fill Cap (check level and refill as required)  | -  | 1 |
| 17. Fuel Filter/Water Separator (with Drain) (replace element)  | -  | 1 |
| 19. Quick Switch Latch  | CG | 1 |
| 26. Leveling Cylinder Pivots  | CG | 2 |
| 29. Battery (check terminals)   | -  | 1 |
| 36. Tie Rod Ends  | CG | 2 |
| 37. Steering Cylinder Rod Pivots  | CG | 2 |
| 38. Steering Cylinder Barrel Pivots   | CG | 2 |
| 39. Boom Pivots   | CG | 2 |
| 40. Front Axle Pivots   | CG | 2 |
| 42. Rear Axle Pivot   | CG | 2 |
| 43. King Pins   | CG | 4 |

**At End of First 50 Hours Only**

|   |    |   |
|---|----|---|
| 23. Planetary Drain Plugs (drain while draining differential) | SL | 2 |
| 25. Differential Drain Plug (drain and refill)                | SL | 1 |

**At End of First 30 Days Only (250 Hours Maximum)  
Lubrication & Maintenance**

• Check torque of all items listed in **Torque Chart** (pg 36)

**5 Week (or 250 Hour) Lubrication & Maintenance**  
(Service at whichever interval occurs first)  
(include all previous periodic services)

|   |    |    |
|---|----|----|
| 2. Boom Front, Top and Side Slide Bearings (extend boom fully and lube all wear paths - retract and extend boom fully three times and wipe excess lube from bearings)   |    |    |
| 2 section boom:   | MG | 4  |
| 3 section boom:   | MG | 12 |
| 3. Boom Rear Slide Bearings (lube paths)  | MG | 12 |
| 4. Boom Extend Cables (check adjustment and adjust as required)   | -  | 2  |
| 6. Boom Front Bottom Slide Bearings (to be performed by experienced maintenance person - check for damage and excessive wear - no wear permitted past bevel - maximum clearance at top bearing is 1/8 inch, shim or replace as required; when these bearings require service, check all other slide bearings - shims are 1/16 inch thick) |    |    |
| 2 section boom:   | -  | 2  |
| 3 section boom:   | -  | 4  |
| 15. Engine Oil Filter (replace filter element)  | -  | 1  |
| 18. Vacuum Valve (rubber cone on bottom - check to be sure cone is clear and undamaged)   | -  | 1  |
| 20. Drive Belts (check condition - replace as required)   | -  | 1  |
| 21. Engine Crankcase Drain Plug (drain and refill top level)  | EO | 1  |
| 22. Rear Hub Level Plug (check level and refill as required)  | SL | 2  |
| 24. Drive Axle Level Plug (check level and refill as required)  | SL | 1  |
| • Check torque of all items listed in <b>Torque Chart</b> (pg 36)   |    |    |

**Quarterly (or 500 Hour) Lubrication & Maintenance**  
(Service at whichever interval occurs first)  
(include all previous periodic services)

|  |    |   |
|--|----|---|
| 17. Fuel Filter/Water separator (with Drain) (replace element)   | -  | 1 |
| 32. Hydraulic System (we recommend that hydraulic fluid be analyzed to determine condition - drain and refill reservoir if required) | HF | 1 |
| 33. Hydraulic Reservoir Screen (remove, clean and install when hydraulic oil is drained)   | -  | 1 |

**Semi-Annual (or 1000 Hour) Lubrication & Maintenance**  
(Service at whichever interval occurs first)  
(include all previous periodic services)

|   |    |   |
|---|----|---|
| 23. Rear Hub Drain Plug (drain and refill - item 22 is fill plug)   | SL | 2 |
| 25/27. Differential and Planetary Drain Plugs (drain, fill to level, wait 5 minutes and fill to level again - item 24 is fill/level plug) | SL | 3 |
| 28. Front Axle Breather (clean or replace)  | -  | 1 |
| 32. Hydraulic Reservoir Breather Cap (clean or replace)   | -  | 1 |

**Annual (or 1500 Hour) Lubrication & Maintenance**  
(Service at whichever interval occurs first)  
(include all previous periodic services)

|   |    |   |
|---|----|---|
| 12. Engine Cooling System (drain, flush and refill on basis of period suggested by anti-freeze manufacturer)  | -  | 1 |
| 31. Hydraulic Return Filter (replace filter element)  | -  | 1 |
| 32. Hydraulic System (unless fluid is analyzed quarterly to determine degree of contamination, reservoir must be drained and refilled on an annual basis) | HF | 1 |
| 33. Hydraulic Reservoir Screen (remove, clean and install when hydraulic oil is drained)  | -  | 1 |
| 35. Hydraulic Suction Filter (replace filter element)   | -  | 1 |

**⚠ CAUTION**

Service intervals are based on machine usage of 1500 hours annually. Use of your unit may vary significantly and you must adjust service frequency for your usage to obtain maximum service life. Frequency headings in the following schedule indicate a calendar limit and an operating hour limit. Perform service at whichever interval occurs first.

**LUBRICATION ADVICE**

- Apply a light coating of engine oil to all linkage pivot points.
- Clean lubrication fittings before lubricating.
- Intervals shown are for normal (8-hour day) usage and conditions. Adjust intervals for abnormal usage and conditions.
- Drain engine and gear cases after operating when oil is hot.
- Check lubricant levels when lubricant is cool.
- Clean filter and air cleaner housing and reusable elements using solvent or diesel fuel. Dry components thoroughly using lint free cloth.

**RECOMMENDED LUBRICANTS & CAPACITIES**

| APPLICATION              | SYMBOL                       | WHEN USED | GRADE     | SPECIFICATION | CAPACITY*  |         |
|--------------------------|------------------------------|-----------|-----------|---------------|------------|---------|
| Boom Cable Adj. Threads  | MY (moly lube)               | All Year  | -         | P/N 1440-3323 | -          | -       |
| Boom Slide Bearing Paths | MG (extreme pres. moly lube) | All Year  | NLGI #2   | **            | -          | -       |
| Engine Cooling System    | AF (anti-freeze)             | All Year  | 1/2 & 1/2 | Permanent     | 17.7 qts   | 16.6 L  |
| Engine Crankcase         | EO (engine oil)              | All Year  | 15W-40-CD | MIL-L-2104D   | 12 qts     | 11.4 L  |
| Front Axle               | SL (special lube)            | All Year  | ***       | ***           | 40 pints   | 19 L    |
| Fuel Tank                | DF (diesel fuel)             | All Year  | #2        | -             | 40 gal     | 151.6 L |
| Grease Fittings          | MG (extreme pres. moly lube) | All Year  | NLGI #2   | **            | -          | -       |
| Hydraulic System         | HF (hydraulic fluid)         | All Year  | ****      | ****          | 45 gal     | 170 L   |
| Rear Hubs                | SL (special lube)            | All Year  | ***       | ***           | 3 pints ea | 1.4 L   |

\* Capacities are approximate - check level to be sure.

\*\* *Union 75 Megaplex XD2*\*\*\* Fill to level using **Mobilfluid® 424** (GRADALL P/N 1440-4535).\*\*\*\* Fill to level using **Mobilfluid® 424** -OR- *Citgo Tractor Hydraulic Fluid* (product code 33310).**TORQUE CHART**

**Check torque using accurate torque wrench to apply maximum torque value shown.**  
**DO NOT EXCEED MAXIMUM TORQUE.** Excess maximum torque may cause fastener to fail.

| ITEM   | FREQUENCY*                          | THREAD SIZE<br>(GRADE) | TORQUE (lubricated) |         |         |         |
|--|-------------------------------------|------------------------|---------------------|---------|---------|---------|
|  |                                     |                        | ft.-lb.             |         | Nm      |         |
|  |                                     |                        | MINIMUM             | MAXIMUM | MINIMUM | MAXIMUM |
| Boom Slide Bearings (front)                  | 5 Weeks (250 hours)                 | 3/8 - 24 (5)           | 32                  | 37      | 43      | 50      |
|  | 5 Weeks (250 hours)                 | 1/2 - 20 (5)           | 68                  | 78      | 92      | 106     |
| Boom Slide Bearings (rear)                   | If front bearings have worked loose | 3/8 - 24 (5)           | 32                  | 37      | 43      | 50      |
|  |                                     | 1/2 - 20               | 68                  | 78      | 92      | 106     |
| Boom Extend Cable (at rear)<br>Adjusting Nut | 5 Weeks (250 hours)                 | 1 - 8                  | †                   | †       | †       | †       |
|  | 5 Weeks (250 hours)                 | 1 - 8                  | 100                 | 110     | 137     | 150     |
| Wheel Lug Nuts                               | 3 Months (500 hours)                | -                      | 350                 | 400     | 476     | 544     |
| Cab MTG Bolts                                |                                     | 7/8 - 9                | 450                 | 475     | 612     | 646     |

\* Check torque at whichever interval occurs first.

† Refer to appropriate *Service Manual* for procedure to check and adjust cables.





## OBTAINING HYDRAULIC OIL SAMPLE FOR ANALYSIS

1. Operate unit until hydraulic oil reaches normal operating temperature.
2. Apply parking brake, lower boom to rest and shift Forward/Reverse lever to "Neutral". Observe Hydraulic Filter Bypass Indicator with engine running at full throttle. Replace filter elements if necessary.
3. Obtain a container to receive waste oil and a CLEAN container to receive oil sample.
4. With gauge removed from hose, attach mini-check and hose to test port near right wall of engine compartment. Hose end must be positioned in waste oil container.



TAKE HYDRAULIC OIL SAMPLE FROM THIS PORT

5. Allow at least one pint of oil to flow into waste oil container to eliminate any contamination from hose.
6. Move hose to **CLEAN** container to collect sample for analysis.
7. Return hose to waste oil container and disconnect adapter from mini-check test port.
8. Cover sample container immediately with **CLEAN** cap.
9. Stop engine and check oil level in reservoir and replenish as required.
10. Contact your GRADALL Distributor for information concerning oil analysis.

**Oil sample containers are available from several sources:**

- Oil companies
- Oil suppliers
- Sampling labs

**NOTE!** **OIL CLEANLINESS IS CRITICAL**  
The filtration system is designed to maintain a minimum ISO cleanliness level of 18/15.

## MOVING HANDLER IN EMERGENCY

**The following information assumes the handler cannot be moved under its own power.**

Before moving the handler, read all of the following information to understand options available. Then select the appropriate method.

The ability to steer the handler increases the safety of moving the unit in some situations. The steering system permits manual steering if engine or power assist feature fails. Remember:

- Although manual steering is possible without power assist, **steering will be slow and will require much greater force.**
- Response to manual steering will be increased if parking brake is released and front axle drive is bypassed, permitting front wheels to roll.

### MOVING SHORT DISTANCES

If it is only necessary to move handler a short distance (less than 100 feet), it is permissible to use a vehicle of sufficient

capacity to tow the unit with no previous preparation. Drive wheels will not roll.

If the unit must be moved more than 100 feet (but less than 200 yards), it is permissible to use a vehicle of sufficient capacity to tow unit after you:

- Activate "Tow Bypass". **See page 38.**
- Release parking brake. **See page 38.**

### MOVING LONGER DISTANCES

If the handler must be moved more than 200 yards, it must be loaded on to a trailer of sufficient capacity.

### **⚠ WARNING**

Towing handler with all wheels on ground for more than 200 yards can cause serious damage to hydraulic drive components.



## ⚠ CAUTION

Do not operate hydrostatic drive system with rear hubs disengaged as the hydraulic rear-drive motors will be severely damaged.

## TO ACTIVATE TOW BYPASS

**NOTE!** Forward relief valve is located on bottom of pump case directly below reverse relief valve.

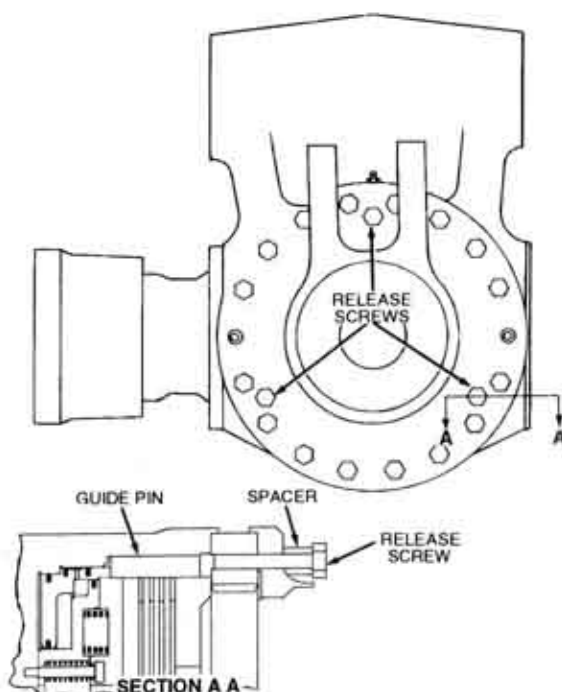


SMALL HEX  
LARGE HEX  
REVERSE RELIEF VALVE

1. Mark position of relief valve cartridge (small hex).
2. Hold large hex to prevent movement and loosen reverse relief valve cartridge (small hex) two full turns.
3. Repeat steps 1 and 2 for forward relief valve. Front axle drive is now bypassed.
4. Before returning machine to service, be certain to **return relief valve cartridges to original position and re-engage rear drive hubs.**

## TO RELEASE PARKING BRAKE

1. If possible, position unit on level ground, lower attachment to approximately one foot from ground, move forward/reverse lever to "Neutral", apply parking brake and stop engine.



2. Chock all wheels to prevent inadvertent movement.
3. Working one side at a time, remove three release screws and spacers from side of differential housing (located at 12 o'clock, 4 o'clock and 8 o'clock).
4. Put spacers aside and install release screws. Tighten each screw lightly until it just makes contact with guide pin.
5. Working carefully, tighten each release screw only 1/4 turn (90°) at a time, in sequence, until all three screws have been turned one full turn (360° [approximately 50 ft.-lb.]). Larger turns could cause components to bind and cause brake failure.
6. Repeat this procedure on other side of differential. Parking brake should be released.

## TO RESTORE PARKING BRAKE

1. Make certain engine is stopped and all wheels are chocked.
2. Loosen each release screw, only 1/4 turn at a time, in sequence, until each screw has lost contact with guide pin. Then remove release screws.
3. Install spacers and release screws and torque to 50 to 70 ft.-lb.
4. Repeat procedure on other side of differential. Parking brake should be restored to operation.





## HAND SIGNALS

**Standard Signals** - When handler work conditions require hand signals, they shall be provided or posted conspicuously for the use of both signalman and operator. No handler motions shall be made unless signals are clearly understood by both signalman and operator.

**Special Signals** - When signals for auxiliary equipment functions or conditions not covered are required, they shall be agreed upon in advance by the operator and signalman.

**Instructions** - When it is desired to give instructions to the operator other than provided by the established signal system, all handler motions shall first be stopped.



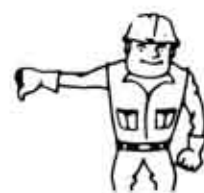
**EMERGENCY STOP** - With both arms extended laterally, hands open downward, move arms back and forth



**STOP** - With either arm extended laterally, hand open downward, move arm back and forth



**RAISE BOOM** - With either arm extended horizontally, fingers closed, point thumb upward



**LOWER BOOM** - With either arm extended horizontally, fingers closed, point thumb downward



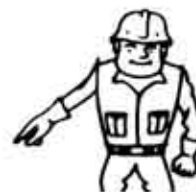
**EXTEND TELESCOPIC BOOM** - With both hands clenched, point thumbs outward



**RETRACT TELESCOPIC BOOM** - With both hands clenched, point thumbs inward



**TILT FORKS UP** - With one arm held at side, extend other arm upward at about 45°



**TILT FORKS DOWN** - With one arm held at side, extend other arm downward at about 45°



**CLOSE BUCKET** - Hold one hand closed and stationary. Rotate other hand in small vertical circle with forefinger pointing horizontally at closed hand



**OPEN BUCKET** - Hold one hand open and stationary. Rotate other hand in small vertical circle with forefinger pointing horizontally at open hand



**MOVE SLOWLY** - Place one hand motionless in front of hand giving motion signal. (Raise load slowly is shown)



**THIS FAR TO GO** - With hands raised and open inward, move hands laterally, indicating distance to go



**STOP ENGINE** - Draw thumb or forefinger across throat



**CALIFORNIA**

**Proposition 65 Warning**

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

**CALIFORNIA**

**Proposition 65 Warning**

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

**Wash hands after handling!**

***GRADALL*** Material Handlers

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