

# **534B OPERATION & LUBRICATION MANUAL**

### **IMPORTANT**

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GRADALL

Read and understand this manual and the Gradall Material Handler Safety Manual before starting, operating or performing maintenance procedures on this machine.

### **KEEP THESE MANUALS IN CAB.**

#### AVERTISSEMENT!

Si vous ne lisez pas l'anglais, demandez a votre surveillant de vous para las instrucciones donner les instructions de seguridad! de securite!

#### **ATENCION!**

Si no lee ingles, preguntele a su supervisor

#### VORSICHT!

Wen Sie kein Englisch lesen, bitten Sie ihren Vorgesetzten um die Sicherheitsvorschriften!

**Covers Units Starting Serial No. 8744110** And Also Covers Unit No. 8744079

### **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 and use of the recommended operating procedures can help you avoid accidents. Because some procedures may be new to even the experienced operator we recommend that this manual be read, understood and followed by all who operate the unit.

Danger, Warning and Caution notes in this manual and the FIEI Rough Terrain Forklift Safety Manual will help you avoid injury and damage to the equipment. These notes are not intended to cover all eventualities; it would be impossible to anticipate and evaluate all possible applications and methods of operation for this equipment.

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

Do not modify this machine without written permission from The Gradall Company.

#### NOTICE

The Gradall Company retains all proprietary rights to the information contained in this manual.

The Company also 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

The manual provides important information familiarize you with safe operating procedures and operator maintenance requirements for the Gradall/ 534-B Material Handler.

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

#### **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. He/she\* must not be using medication which could impair his abilities nor be under the influence of alcohol or any other drug during the work shift.

The operator should also 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, understand and comply with instructions contained in the following material furnished with the material handler:

This Operator's Manual FIEI Rough Terrain Forklift Safety Manual Gradall Material Handler Safety Manual All instruction decals and plates Any optional equipment instructions furnished

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

Regardless of previous experience operating similar equipment, the operator must be given sufficient opportunity to practice with the 534-B Material Handler in a safe, open area (not hazardous to people or property) to develop the skills and "feel" required for safe, efficient operation.

\*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 location of componente 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 publication are furnished with the material handler to provide information concerning safety, replacement parte, maintenance procedures, theory of operation and vendor components. Replacement manuals, decals and instructions plates can be ordered from your Gradall Material Handler Distributor.

#### **Serial Number Location**

Specify Model and Serial Numbers when ordering parts and when discussing specific applications and procedures with your distributor. The model/serial number plate located on the cate wall to the right of the Operator's seat pedestal.



#### Nomenclature

The illustrations on page 3 include nomenclature applied to major components of the material handler. The term "handler" will be used throughout the balance of this manual in place of the words "material handler".

#### NOMENCLATURE





### SAFETY HIGHLIGHTS

Read and understand this manual, the Gradall Material Handler Safety Manual and all instructional decals and plates before starting, operating or performing maintenance procedures on this equipment.

Most safety notes included in this manual involve characteristics of the Model 534-B Material Handler. Refer to the FIEI Rough Terrain Forklift Safety Manual and the Gradall Material Handler Safety Manual for safety precautions relating to general material handling procedures and practices. 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 proper operator must be given sufficient opportunity to practice with the 534-B Material Handler in a safe open area (not hazardous to people or property) to develop the skills and "feel" required for safe, efficient operation.

Watch for these symbols; they are used to call your attention to safety notices.



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

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

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

#### **Decals Inside Cab**



WARNING! LEVEL GRADALL HANDLER BEFORE LIFTING ANY LOAD ABOVE 4 FEET Located on Dashboard Part No.9103-3014





# WARNING:

SHUT OFF ENGINE AND SET BRAKES BEFORE LEAVING GRADALL HANDLER UNATTENDED

> Located on Firewall Part No. 9100-3029



# WARNING:

ON GRADES AND UNEVEN GROUND PLACE FORKS IN CARRY POSITION (APPROX. 12" ABOVE GROUND) BEFORE MOVING GRADALL HANDLER

9100-3050

Located on Firewall Part No. 9100-3050

# WARNING:

**OPERATOR PROTECTION** (such as hard hats,

SAFETY GLASSES AND/OR EAR MUFFS) SHOULD BE WORN WHEN JOB CONDITIONS WARRANT

9100-3036

Located on Firewall Part No. 9100-3036

#### Decals Inside Cab (cont.)

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Located on Firewall Part No. 9103-3279



Located on Front Face of Dashboard Part NO. 9104-3207



WITHOUT FIRST READING THE OPERATOR'S MANUAL. IF A MANUAL IS NOT AVAILABLE, REFER TO AN AUTHORIZED GRADALL DEALER.

9103-3103

Located on Manual Holder Part No. 9103-3103

PUSH TO RELEASE

PULL TO SET

#### PARK BRAKE INSTRUCTIONS

OPRK BORNET

#### PARKING BRAKE LIGHT IDENTIFICATION

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Located on Manual Holder Part No. 9106-3031



Located on Boom Lever Knob Part No. 9100-3044

#### Decals Inside Cab (cont.)



FOR MINIMUM CLEARANCES OF HIGH VOLTAGE LINES IN EXCESS OF 50,000 VOLTS, SEE YOUR LOCAL STATE ANDFEDERAL REGULATIONS DO NOT DEFACE OR REMOVED THIS SIGN FROM THIS MACHINE

> Located on Mudguard Part No. 8360-1011



Located on Dashboard Part No. 9106-3034 Optional Lift Capacity Charts are located on Firewall.

#### **Decals Outside Cab**



AND SMOKING MATERIALS WHEN REFUELING.

9100-3052

Located on Fuel Tank Part No.9100-3052



Located on Radiator Part No 9103-3011



Located on Hydraulic Reservoir & Left of Cab Door Part No. 9104-3211

> Located on Radiator Part No. 9100-3032



Located on Fuel Tank Part No. 7702-3308



CHECK TO ASSURE QUICK SWITCH PIN IS FULLY ENGAGED AND LOCKED AFTER ATTACHMENT CHANGE

> Located on Boom Head Part No. 9103-3023



Located Left of Cab Door Part No. 7702-3003

### TIRE PRESSURE 55 PSI

Located on Wheel Rims Part No. 9105-9104 REAR: 55 psi FRONT: 65 psi

# HYDRAULIC OIL

Located on Hydraulic Reservoir Part No. 7702-3006



Located on Boom Part No. 9100-3031 Decals Outside Cab (cont.)



Located on Boom Part No. 9104-3217



Located on Exhaust Guard Part No. 7734-3018 Located on Boom Part No. 9104-3216



Located on Radiator Part No. 9104-3210

### 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 desired to give instructions to the operator other than provided by the established signal system all handler motions shall first be stopped.



### **OPERATOR'S CAB**

The standard cab is open on three sides and includes an overhead guard to provide protection from falling objects.



A fully enclosed cab with Plexiglass windows and a lokable door is available as an option. The cab door can be secured in the fully opened or closed position. 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 lever is located beneath front edge of seat belt at all times.

An optional windshield wiper is available for use with enclosed cabs. An ON/OFF control switch is located on the wiper motor.

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 variable speed heater fan is available for use with units equipped with a heater. An ON/OFF/SPEED CONTROL knob is located on the dashboard. Hot water to the heater can be controlled by a valve at the engine.



\*Items preceded by an asterisk and may not be furnished on your handler.

### WARNING

A brief description of controls and Instruments is provided here as a convenience for the operator. These descriptions DO NOT provide complete operating instructions. Read and understand this manual and the FIEI Rough Terrain Forklift Safety Manual before operating the handler.

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#### NOTE: These descriptions are provided in alphabetical sequence in accordance with the nomenclature shown on the facing page.

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.

Ammeter: The ammeter indicates the charge/discharge rate of the battery charging system. With the engine running, a discharge reading or a continuing high charge rate indicates a problem in the system.

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

**Boom Extend/Retract Lever:** This lever controls boom extension and retraction. Speed is proportional to lever actuation. Move lever to right to extend boom or to left to retract boom.

**Boom Raise/Lower Lever:** This lever controls raising and lowering the boom. Speed is proportional to lever actuation. Pull lever to rear to raise boom or push lever forward to lower boom.

**Brake/Inching Pedal:** The brake/inching pedal provides service brake control and inching control. To activate the brakes, push the pedal down. To release the brakes, remove foot from pedal. When full brakes are applied, the rear hydraulic drive is disconnected. When partial brake/inching pedal movement is used, the front wheel drive is disconnected from the transmission. The inching feature of the rear wheel drive system provides for smooth machine operation at low speeds and high engine rpm.

**Park Brake Control Knob:** The park brake control knob is located to the left of the operator and is used to apply and release the parking brake. To apply the parking brake, pull the knob up. To release the parking brake, push the knob down.

**Carriage Tilt Lever:** This lever controls tilt of the fork carriage. Speed is proportional to lever actuation. Push lever forward to tilt down or pull lever to rear to tilt up.

**Engine Coolant Temperature Gage:** This gage displays engine coolant temperature. Normal operating temperature is 180-200°F. (82-93°C.)

**Engine Oil Pressure Gage:** This gage displays engine oil pressure. Normal operating pressure is 35-50 psi (241-345 kPa).

**Forward/Reverse Lever:** This lever engages forward or reverse travel. Push lever fully forward for forward travel; pull lever fully to rear for reverse travel or Read and understand this manual and the move lever to centered position for neutral.

Fuel Gage: This gage displays level of fuel in fuel tank.

Heater Fan Switch (optional): This rotary switch controls heater fan. Rotate clockwise to start fan. Continued clockwise rotation controls fan speed.

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 ON position (turned clockwise) voltage is available for all electrical functions. Turn key counterclockwise to stop engine and remove voltage from all electrical functions.

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

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

**Machine Level lever:** This lever controls the vertical relationship of the handler frame to the front axle. Move the lever to the right to tilt frame to right or move lever to left to tilt frame to left.

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

**Seat Lock Release Lewer:** This lever unlocks and locks seat position adjustment. Lift lever to unlock and release lever to lock adjustment.

**Start Button:** The start button controls operation of the engine starter motor. With ignition switch in ON position, depress start button to actuate starter motor. Release button to disengage starter motor.

**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.

**Transmission Speed Selector Lever:** This lever permits selection of three speed ranges for forward and reverse travel.

**Transmission Temperature Gage:** This gage displays temperature of transmission fluid. Normal operating temperature is 180-200°F. (82-93°C.).

### 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.

Before removing filler caps or fill plugs, wipe all dirt and grease away from the ports. If dirt is allowed to enter these ports, it can shorten the life of o-rings, seals, packings and bearings.

When adding fluids or changing filter elements, refer to the lubrication section of this manual to determine the proper type to be used.

If spark arrestors are required, be sure they are in place and in good working order.

#### Complete all required maintenance before operating unit.



Service the unit in accordance with the lubrication and maintenance schedule.



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



**Inspect unit for obvious damage, vandalism and needed 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 show signs of abrasion.

### **ENGINE OPERATION**

**NOTE:** If engine is being started at beginning of work shift be sure to perform all "CHECKS AND SERVICES BEFORE STARTING ENGINE" (page 6).

#### **Starting Engine**

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- 1. Check to be sure that all controls are in neutral and that all electrical components (lights, heater, defroster, etc.) are turned off. Set parking brake.
- 2. Insert ignition key and turn clockwise to ON position.
- 3. Depress accelerator pedal approximately 1/4 to 1/3 of travel from top.

### CAUTION

Depressing start button while engine flywheel is rotating can cause serious damage to engine and/or starting motor.

NOTE: If temperature requires the use of a starting aid, and if your handler is equipped with a factoryinstalled ether starting aid, depress cold weather

#### **Cold Weather Starting Aids**

Diesel engine ignition is accomplished by heat generated when fuel/air mixture is compressed within the cylinders. Because this heat may be insufficient to start a cold engine in cold weather, the use of starting aids has become common practice.

Because of the wide variety of starting aids available it would be impractical to attempt to provide, button one time only before starting engine. If you use a different starting aid, be sure to follow manufacturer's instructions carefully. Excessive ether may damage engine.

- 4. Depress start button to engage starting motor. Release button immediately when engine starts. If engine fails to start within 20 seconds, release button and allow starting motor to cool for a few minutes before trying again.
- 5. After engine starts, observe oil pressure gage. If gage remains on zero for more than ten seconds, stop engine and determine cause. Correct cause of malfunctioning before restarting engine. Normal engine oil pressure should be in range of 35 - 50 psi (241 - 345 kPa).
- 6. Warm up engine at approximately 1/2 throttle until engine coolant temperature reaches operating range of 180 200°F. (82 93°C.).

specific instructions for their use in this manual. Carefully follow instructions furnished with your starting aid.

If you use a starting aid employing ether or a similar substance pay particular attention to manutacturer's warnings.

#### **Normal Engine Operation**

### Observe gages frequently to be sure all engine systems are tunctioning properly.

The ammeter shows the charge/ discharge rate of the battery charging system. With the engine running, a discharge reading (-) or a continuing high charge reading (+) indicates a problem in the battery charging system.

**Be alert for unusual noises or vibration.** When an unusual condition is noticed, stop machine in a safe position and shut off engine. Determine cause and correct problem before continuing. **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 (it furnished).

#### **Stopping the Engine**

**Operate engine at idle speed for a few minutes before turning it off.** This allows engine coolant and lubricating oil to carry excessive heat away from critical engine areas.

**Do not "gun" engine before shut down;** this practice causes raw fuel to remove oil film from

cylinder walls and dilute lubricant in crankcase.

To stop the engine, **allow engine to run at idle for a few minutes, this is to allow the turbo components to cool.** Turn key counter clockwise to stop position. Be sure to remove key from ignition switch before leaving cab.

### WARM UP & OPERATIONAL CHECKS

(To be performed at beginning of each work shift)

#### Complete all required maintenance before operating unit

The safety efficiency and service life of your unit 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. **Check items during warm-up period.** 

- \*1. Heater defroster and windshield wiper
- \*2. Operating lights and rotating beacon
- 3. Low brake pressure light should go out with engine running above idle
- 4. Ammeter should show low charging rate after charging system has replaced starting drain

### When engine warms to operating range, check the following items:

5. Service brake, parking brake and parking brake lock.

- 6. Forward and reverse travel in all gears
- 7. "Inching" travel should be smooth through full pedal travel
- 8. Horn and back-up alarm
- 9 All boom and attachment functions full stroke in both directions
- 10. Hydraulic Filter Condition Indicator observe torque converter temperature gage after starting normal operation. When needle has been in operating range for an hour or so, stop handler in a safe area and set parking brake. With engine running at full RPM check hydraulic filter condition indicator. When yellow flag fills indicator window filter is clogged and hydraulic oil is bypassing filter. Filter must be changed before reaching bypass condition (change before yellow flag reaches midpoint of window).

### CAUTION

Continued operation with hydraulic fluid by-passing the filter (yellow flag showing) can cause severe damage to hydraulic system components.

### **BRAKE SYSTEM**

#### General

The brake system furnished on the handler includes a service brake, inching brake and parking brake.

Because service braking and "inching" (slow travel) functions overlap, some features of inching will be discussed here. Refer to Drive Train Section for additional information on inching travel.

#### **Inching Travel**

Overlap between service braking and inching occurs because the same foot pedal controls both functions, and 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 while, inching involves a controlled driving force applied to the rear wheels.

The service brake/inching pedal has three separate filnclicities connects from transmission.

- 2. It controls hydraulic flow to rear axle drive motors (hydraulic flow regulates speed).
- 3. It applies service brake.



As illustrated, the three functions occur in sequence as service brake/inching pedal is depressed from top to bottom of stroke.

### WARNING

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

#### **Service Brakes**

The service brake is applied to the front wheels of the handler.

Oil for the brakes comes from the pilot circuit pump, thru an accumulator charging valve and the accumulator. When the service/inching brake pedal is depressed far enough to actuate the brake valve, the hydraulic oil flows to the wet disc brakes in both front wheel hubs. The pressure compresses the brake discs.



#### **Parking Brakes**

The parking brakes are also applied at the wet disc brakes in the front axles.

TO APPLY THE PARKING BRAKE, pull up on the parking brake knob located to the left of the operator's seat. This opens the parking brake circuit to dump, allowing a spring in the wet disc brake assembly to compress the discs, applying the brakes.

TO RELEASE THE PARKING BRAKE, push down on the parking brake knob.

When the handler is not being used, with the engine shut off, the parking brakes must be applied.

### STEERING SYSTEM

Ninety degree rear wheel power steering is provided to reduce operator fatigue and to permit high maneuverability in close quarters. It is important that the operator practice maneuvering the handler in a safe, open area until he becomes thoroughly familiar with steering response and clearance required for tailswing and load when turning.



Be alert for any increase in effort needed to steer. It any difference is noted, notify maintenance personnel immediately for correction. It 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 tails, stop as soon as possible. Do not drive unit until problem has been corrected.

#### FRONT OUTRIGGERS (2) (OPTIONAL)

Front outriggers are provided in order to raise the front tires off of the ground level while working, thus improving the overall stability of the handler.

Two outrigger control levers are located to the right hand side of the operator's seat. Pushing forward on the lever lowers the outriggers, and pulling back on the lever raises them.



#### General

The drive train provides two and four wheel drive and includes the engine, torque converter **transmission**, drive shaft and front and rear driving axles.

Inching travel is directly related to drive train functions and will be discussed in this section.

#### **Two & Four Wheel Drive**

The drive train is designed to provide two wheel drive (front axle driving) or four wheel drive (both) front and rear axles driving.

Under certain conditions, changing from four wheel drive to two wheel drive may cause a difference in the way the machine responds to steering, braking and drive controls. Always be aware of which travel mode you are using.

### There are two ways to disengage rear wheel drive:

- 1. Shift to third gear (rear axle drive is engaged only in first and second gears)
- 2. Disengage rear planetary hubs (refer to Rear Drive Axle heading in this section)

NOTE: Rear drive axle can also be disengaged in response to overload in associated electrical circuitry causing automatic reset type circuit breaker to trip (open). Breaker will close again in approximately ten seconds.

#### **Torque Converter**

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There are no operator controls for the torque converter. It functions automatically to permit starting from a standstill in any transmission speed range.

An oil temperature gage is provided to indicate operating temperature of torque converter/transmission. Normal operating temperature is 180-200°F. (82- 93°C.). If overheating occurs, attempt to lower temperature by traveling in a lower gear. If necessary, stop and allow torque converter to cool with engine running and gear selector in neutral. Be sure radiator fins are clean.

### CAUTION

Continued operation of overheated torque converter/transmission can cause serious damage to these components.

#### Transmission

The transmission provides three speed ranges for both forward and reverse travel.

Gear	lst	2nd	3rd	3rd*
mph	2.8	6.0	15.9	17.9
kmph	4.5	9.6	25.6	28.8

\*With rear planetary hubs disengaged

There are three operator controls for the transmission:

- 1. Gear Selector Lever (for 1st, 2nd and 3rd gears)
- 2. Direction Selector lever (for forward, neutral and reverse)
- 3. Service Brake Inching Pedal (refer to Inching Travel heading in this section)

#### To Operate Transmission:

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- 1. Release parking brake and hold handler in position using service brake.
- 2. Move gear selector to appropriate speed range (1st. 2nd or 3rd gear). The gear selector may be shifted while traveling. When traveling downhill, use the same gear needed to travel up the hill.



Never shift gear selector or direction selector to cause a sudden change of travel speed or direction. Such a change could cause load to shift or machine to tip over. Reversing direction while traveling can also damage transmission.

- 3. Move direction selector to forward or reverse position.
- 4. Release service brake and depress accelerator to attain appropriate speed.
- 5. Stop handler by releasing accelerator and applying service brake.
- 6. Move direction selector to neutral position.
- 7. Apply parking brake.

#### **Front Driving Axle**

The front driving axle includes a differential and planetary drive hubs and is powered by a drive shaft from the transmission. The service brake/inching pedal is the only operator control for the front axle (refer to Inching Travel heading).

#### **Rear Driving Axle**

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The rear driving axle includes planetary hubs which are powered by hydraulic motors mounted on the inner face of the hubs. HYdraulic flow to drive motors is provided only in first and second gear speed ranges. Drive motors are free-floating in third gear.

### CAUTION

Continuous driving for two miles or more in third gear, with rear driving hubs engaged, can damage hydraulic drive motors.

#### To Disengage Rear Driving Hubs:

- 1. Apply parking brake and remove key from ignition switch.
- 2. Remove thumb screws or hex head cap screws from keeper pin plate.
- 3. Remove and rotate plate (cup out-engaged-cup in-disengaged).
- 4. Secure plate using thumb screws or hex head cap screws.
- 5. Repeat procedure for other hub.
- To Engage Rear Driving Hubs: Repeat procedure.

NOTE: If machine is moved with keeper pin plate removed, input shaft pin will pop out. Hydraulic flow to rear axle drive motors is controlled electrically. An automatic reset type breaker is included to prevent damage from overload. If circuit breaker trips (opens) rear axle drive will be inoperative for approximately ten seconds until breaker resets. Notify maintenance personnel if circuit breaker trips repeatedly.

To determine whether circuit breaker has tripped, attempt to move machine using inching travel. If machine does not respond to inching travel pedal, circuit breaker is open.

#### **Inching Travel**

Inching travel is provided to permit very slow travel while maintaining high engine speed for other functions. Because inching travel depends on hydraulic flow to rear axle drive motors, inching travel functions only in first and second gears. There is no hydraulic flow to drive motors in third gear.

Inching travel is controlled by the service brake/inching travel pedal. This pedal has three separate functions:

- 1. It disconnects front drive axle from transmission.
- 2. It controls hydraulic flow to rear axle drive motors (hydraulic flow equals speed).
- 3. It applies service brake.



As illustrated, the three functions occur in sequence as pedal is depressed from top to bottom of stroke.

#### To Engage Inching Travel:

- 1. Depress service brake/inching travel pedal approximately 1-1/2 inches to disengage front driving axle from transmission. At this point rear drive motors are receiving full flow and travel speed will not have changed.
- 2. Continue to depress pedal to reduce speed-the more pedal travel, the less speed.
- 3. To stop, depress pedal fully.

#### OR

To resume normal travel release service brake/ inching travel pedal. Depress accelerator pedal to attain appropriate speed.

### WARNING

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

### **MOVING HANDLER (Emergency Only)**

If handler must be moved, when the engine is not workable, extreme care should be used because:

- 1. With the engine not operating there will be NO steering.
- 2. With the wheel hubs adjusted to permit movement, ther will be NO brakes.

If the handler is to be moved, do the following:

- 1. Place blocks on wheels to prevent movement.
- 2. On both rear axles, reverse the hub disengagement caps.\*\*
- 3. Loosen front hub cover bolts equally until cover moves 3/16" to 1/4". This released the wet disc brakes. \*\*\*

We recommend that the unit be pushed, not towed and that the unit be attached firmly to the pushing vehicle because the handler brakes are released.



\*\*In Disengaged



\*\*Out Engaged



\*\* Back off 4 bolts

### MATERIAL HANDLING

#### Leveling

1

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

### WARNING

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

A level indicators located on upper portion of front window frame to permit operator to determine that machine is or is not level.

The rear axle pivots at the midpoint of the main frame to help assure that wheels will remain in contact with ground. A hydraulic cylinder provides a rigid connection between front axle and main frame to help assure a solid work platform and permit tilting main frame to left or right.

NOTE: The frame leveling function is provided only to level the machine before lifting or placing a load. Do not attempt to use leveling feature to turn on or travel across a slope.

#### **To Level Handler:**

- 1. Position machine in best location to lift or place load and apply brake.
- 2. Observe level indicator to determine whether machine must be leveled. Note position of indicator for later realignment.
- 3. If necessary, position boom in carry position and move carriage tilt machine level lever to left or right to level machine. Move lever to left to lower left side of frame or move lever to right to lower right side of frame.
- 4. Lift or place load as appropriate.

1

- 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.

#### Boom

The three section hydraulically operated boom provides maximum reach of 36 feet above horizontal at 70ø elevation and 21 feet forward of forward edge of front tires at 0ø elevation (measured to heel of standard forks mounted on standard carriage). Boom travel extends from 4ø below horizontal to 70ø above horizontal. Raise boom by pulling boom lever to rear and lower boom bv pushing boom lever forward. Boom extension and retraction is accomplished by a hydraulic crowd cylinder anchored at rear of boom section no. 1 and at front of boom section no. 2 and also by a cable and push beam arrangement within the boom sections. Extension or retraction of attachment boom section no. 2 is always equaled by a corresponding movement of boom section no. 3

A hydraulic cylinder is located within the boom head to tilt the fork carriage or other attachment back and forth as required.

The tilt cylinder is controlled by carriage tilt/ machine level lever. Push lever forward to tilt attachment down or pull lever to rear to tilt attachment up.

Extend boom by moving boom lever to right and retract boom by moving boom lever to left. A compensating cylinder is pinned to main frame and to base of boom section no. 1. As boom is raised, oil is transferred from rod end of compensating cylinder to rod end of attachment tilt cylinder. Lowering boom causes transfer of oil from barrel end of compensating cylinder to barrel end of attachment tilt cylinder. This transfer of oil causes extension and retraction of tilt cylinder to maintain angle of attachment as boom is raised and lowered.

All cylinders related to boom (attachment tilt, raise/ lower and extend/retract) are protected by pilot operated check valves which prevent load from falling in event of a broken hydraulic hose or tube.

#### Attachments

Although the carriage/fork combination is most frequently used, a number of other attachments available for use with the handler. 180ø and 100ø swing forks are available. A material bucket can be provided for light duty work. A truss boom is available to extend maximum reach and height and can be fitted with a winch when required. Consult your Gradall Material Handler Dealer for information on attachments designed to solve special material handling problems.

#### **Attachments Capacities**

The Rated Capacity Chart located on left side of dashboard indicates maximum capacities for handlers equipped with standard carriage/fork combination. These capacities apply only to standard carriage, fork combination and cannot be used for other attachments. A serial number plate Is attached to all attachments and indicates maximum capacity for that attachment. However, the capacity shown on this plate may be incorrect in relation to your machine.

Refer to Attachment Capacity Plate located below Serial Number Plate on right cab wall for correct maximum capacity for all attachments furnished with your machine. If attachment in question is not listed on this plate contact factory for maximum capacity.

Refer to Operating Procedures and Techniques section for instructions on proper use of information shown on capacity plates.

#### **Attachment Installation**



1. Depress button and remove lock pin from quick switch latch pin.



2. Raise handle to retract latch pin fully.



3. Position boom head attachment pin fully in recess of attachment. Tilt upward slightly to assure full engagement.



4. Depress handle fully to engage latch pin in attachment and install lock pin in latch.

### **OPERATING PROCEDURES & TECHNIQUES**

This section highlights some common procedures and discusses areas which 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 top over.

#### Feathering

Feathering is a control operation technique used for smooth load handling. To feather controls, move control lever very slowly until load begins to move, then gradually move lever further until load 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 lowering engine speed at beginning and near end of load movement.

#### **Boom Control Lever**

The boom control lever can be positioned to cause 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 lever 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 lever 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 lever 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 lever 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/Machine Level Lever



Move lever to left to the tilt forks down and move lever to rear to tilt forks up.

Move lever to left to tilt main frame to left and move lever to right to tilt frame to right.



### **Rated Capacity Chart**

#### General

The rated capacity chart, located on left side of dashboard, indicases maximum load capacities for handlers equipped with standard carriage/fork combination. These capacities apply only to the standard carriage/fork combination and cannot be used for other attachments.

### 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.

#### **Elevation:**

Numbers at left side of chart (-4' to 48') represent elevation at heel of horizontal fork as measured from level ground. Maximum elevation with boom fully raised and extended is 36 feet. Elevation relates to dimension "A" shown on serial number plate located on right cab wall.



#### **Boom Extension**

Numbers across bottom of chart (0' to 24') and numbers parallel to boom (2' to 18') represent boom

extension as measured from fully retracted position to extend position. These numbers do not reflect total boom length, only the number of feet of extension from fully retracted position.

Number decals on boom section number two (4,8, 12, 16 and 20) relate directly to boom extension. The largest number which can be read from operator's seat indicates total boom extension.

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

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

#### **Boom Angle**

Numbers at ends of angled lines (-4 to 70) represent angle of boom to horizontal as measured from horizontal plane at ground level. Maximum angles are 4 below horizontal with boom fully lowered to 70 above horizontal with boom fully raised.

A boom angle indicator is located on left side of boom section number one 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

25

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, the machine to tip over.



### PARKING

1. Position unit in a safe, level parking area.

### WARNING

Parking brake may not hold machine on a grade

- 2. Apply parking brake and chock wheels.
- 3. Retract and lower boom fully.

- 4. Turn off all electrical accessories.
- 5. Allow engine to cool at idle speed for a few minutes and then turn off. Remove ignition key.
- 6. Fill fuel tank to minimize condensation.
- 7. Disconnect battery if unit is in an area where tampering seems possible.
- 8. Lock cab (if so equipped).

### STORAGE

- 1. Clean and inspect machine thoroughly and perform all required maintenance.
- 2. Coat all cylinder rods with a good grade of grease or rust preventative.
- 3. Park machine in a dry enclosure and remove batteries.
- 4. Prepare engine in accordance with engine manufacturer's instructions.

APPLICATION	SYMBOL	WHEN USED	GRADE	SPECIFICATION	CAPACITY*			
Engine Crankcase	EO Engine Oil	All Year	15W-40-CD	MIL-L-2104D	12 quarts			
Engine Cooling System	50% water/50% Anti-Freeze	All Year	Permanent	-	24 quarts			
Transmission	ATF (Automatic Trans. Fluid)	All Year	-	ATF-FM Dexron	20 quarts			
Fuel Tank	DF (Diesel fuel)	All Year	#2		40 gallons			
Hydraulic System	HF (Hydraulic fluid)	All Year	46	ISO *	40 gailons			
Differential & Wheel Ends	GO (multipurpose lubricant)	All Year	EP-80-90	A.P.I. GL-5	10 quarts			
Rear Planetary Hubs	GO (multipurpose lubricant)	All Year	EP-80-90	A.P.I. GL-5	44 ounces			
Grease Fittings	CG (extreme pressure lube)	All Year	EP 2	H-152	-			
Boom Bearing Pads	CG (extreme pressure lube)	All Year	EP 2	H-152	-			
* HYDRAULIC FLUID SPECIFICATIONS:								
ISO Grade 46 Pour Point, °F -20 to -40 SSU @ 100°F 200-240 Flash Point, COC, °F 280 min. Approved Supplier & Type: Union 46, Conoco Grade 46.								

#### **Recommended Lubricants & Capacities**

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

#### **Lubricantion Notes**

- Intervals shown are for normal (8 hour day) usage and conditions. Adjust intervals for abnormal usage and conditions.
- Apply a light coating of engine oil to all linkage pivot points.
- Clean lubrication fittings before lubricating.

- Clean air filter and cleaner housing using diesel fuel. Dry components thoroughly using a lint free cloth.
- Check lubricant levels when lubricant is cool.
- Drain engine and gear cases only after operation when lubricant is hot.

#### TIRE SPECIFICATIONS

Standard 13:00 x 24-12 ply rating front 65 psi, rear 55 psi. Tires filled with CaCl mix, front 500 lbs., rear 420 lbs. Options 17:50 x 25 - 12 ply (flotation front only)

### **LUBRICATION & MAINTENANCE DIAGRAM**





## Suggested Lubrication & Maintenance Frequencies

Component	Lube Symbol	10	50	100	250	500	1000	2000
1. Attachments (Not illustrated)	CG	•	<u> </u>				<u> </u>	
2. Quick-Switch (1)	CG		•	İ			<u>†</u>	<u> </u>
3. Tilt Carriage Pivot (1)	CG	•				1	<u> </u>	<u> </u>
4. Tilt Cylinder Pins (2)	CG	•	1			<u> </u>		<u> </u>
5. Boom Bearing Pads *(See Below)	CG		•					<u> </u>
6. Front Cable Sheave (1) (Extend Booms)	CG		•					
7. Rear Cable Sheave (2)	CG		•					<b></b>
8. Boom Extension Cable (Inspect-Tighten)	_		INS					
9. Boom Retract Cable (Inspect-Tighten)			INS					
10. Outrigger Cylinders & Pivots (8) (Options)	CG		•					
11. Accelerator & Brake Pedal Linkage (2)	CG		•					
12. Lift Cylinder Pins (4)	CG		•			<u> </u>		
13. Compensating Cylinder Pins (4)	CG		•					
15. Boom Trunion Pivot Pin (2)	CG	•						
16. Sway Cylinder Pins (2)	CG		•					
17. Front Axle Hubs (Check & Refill)	GO				•			
18. Front Axle Differential (Check & fill)	GO				•		СН	
19. Front Axle Pivot Pin (2)	CG	٠						
20. Drive Shaft Universals (2)	CG		•					
21. Batteries (Check Level)	_		INS					
22. Hydraulic Oil Level (Check & fill)	HF	٠						СН
23. Hydraulic Tank Breather Cap (Replace)	—					СН		
24. Hydraulic Oil Filter (Check)	_	٠						СН
25. Fuel Tank (Fill daily after shut-down)	DF	•						
26. Engine Oil Dipstick (Check Level & fill)	EO	٠						
27. Engine Oil & Filter (Change)	EO				СН			
28. Fuel Filter (Change)						СН		
29. Transmission Oil Level (Check & fill)	ATF		INS				СН	
30. Transmission Filter (Change)						СН		
31. Cooling System (Check & fill)	—	•						СН
32. Rear Axle Hubs (2) (Check & fill)	GO		•				СН	
33. Rear Axle Pivots (2)	CG	•						
34. King Pins (4)	CG	•						
35. Tie Rod Ends (4)	CG	•						
36. Steering Cylinder Pins (4)	CG	•						
37. Idler Arm Pivot (1)	CG	٠						
38. Hub Packing (2) (on Hyd. Motor Mtg. Studs)	CG		•					

\*#5 Boom Bearing Pads (extend boom fully and coat all wear paths on boom sections 2 and 3 with light coat of grease-retract and extend boom fully three times and wipe excess grease from bearings). Check for wear & shim or replace as required-no wear permitted past bevel-shims are 1/16" thick

CG - Chassis Grease

HF - Hydraulic Fluid

EO - Engine Oil

GO - Gear Oil

Lube
INS - Inspect & Fill
CH - Change

ATF - Transmission Fluid

### NOTES

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#### 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.



Hydraulic Equipment 406 Mill Avenue, SW, New Philadelphia, Ohio 44663 Telephone (216) 339-2211

#### 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.