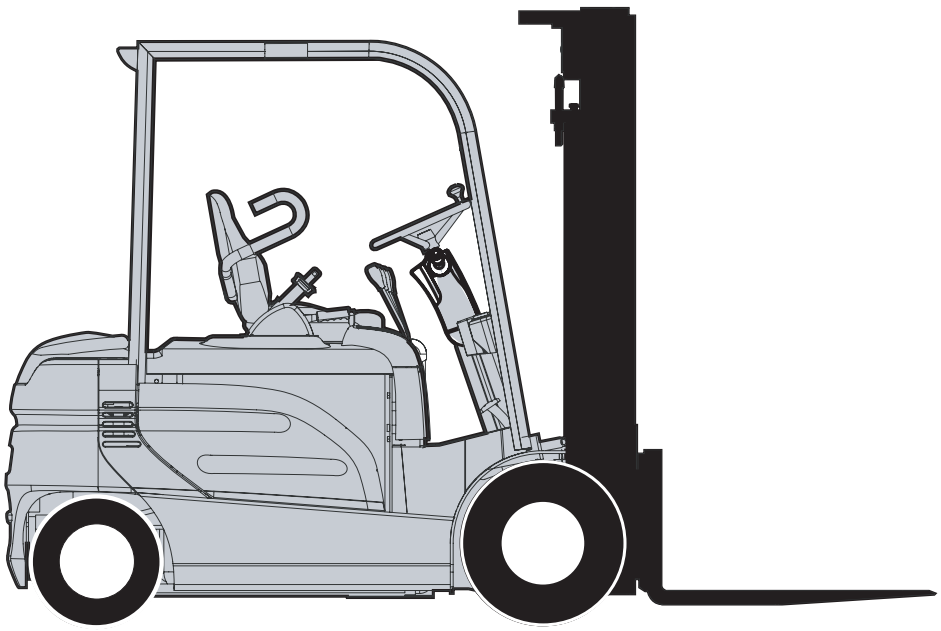
SM-765
GEX 20-30
Service Manual



Rated Capacity: 2000 - 3000kg

October 2007

CLARK®
THE FORKLIFT

Technical Publications
Lexington, KY 40510
www.Clarkmhc.com

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Section 2

Lifting, Jacking, and Blocking

WARNING

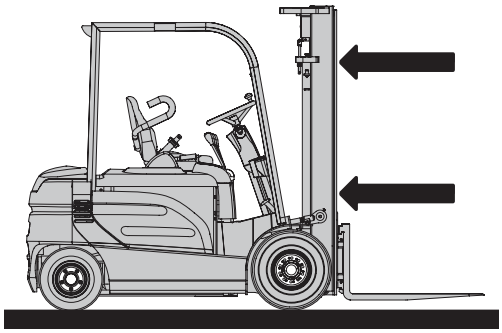
Lifting or jacking any large piece of equipment such as a fork truck presents obvious hazards. It must be done with great care and forethought. Consult the truck weight information in Group 40, Specifications, to ensure that your lifting equipment is of adequate capacity.

GROUP PS

PERIODIC SERVICE

tires, check the ground strap or chain for wear and secure attachment.

Check all of the critical components that handle or carry the load.

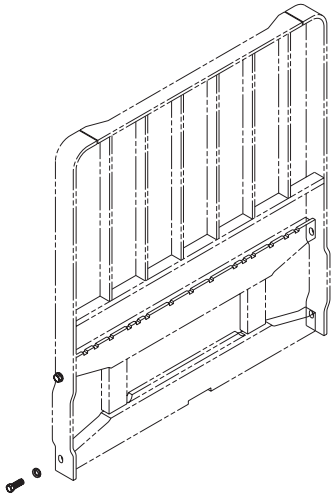


Check the overhead guard for damage. Be sure that it is properly positioned and all mounting fasteners are in place and tight.

CAUTION

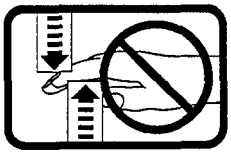
If load backrest has been removed, a bolt and washer must be in place on each end of the top fork bar to act as a fork stop.

Check the load backrest for damage. Inspect the welds on the carriage and load backrest for cracks. Be sure that the mounting fasteners are all in place and tight.



DANGER

Uprights can drop suddenly if not properly blocked. Look at the upright, but keep hands, tools, etc. out.



IMPORTANT

Uprights and lift chains require special attention and maintenance to maintain them in safe operating condition. Refer to Lift Chain Maintenance in Group 34 for additional information.

Check the upright assembly. Inspect the upright rails, carriage rollers, lift chains, lift and tilt cylinders. Look for obvious wear and damaged or missing parts. Check for any loose parts or fittings. Check for leaks, damaged or loose rollers, and rail wear (metal flaking). Carefully check the lift chains for wear, rust and corrosion, cracked or broken links, stretching, etc. Check that the lift and carriage chains are correctly adjusted to have equal tension. Check that the lift chain anchor fasteners and locking means are in place and tight.

Be sure all safety guards and chain retainers are in place and not damaged. Inspect the carriage stops and cylinder retainer bolts. Check all welded connections.

Inspect all lift line hydraulic connections for leaks. Check the lift cylinder rods for wear nicks, grooves, and scratches. Check the cylinder seals for leaks. Refer to Group 34 for details on uprights.

hydraulic fluid filter at every fluid change. Replace the sump tank breather/fill cap every 2000 operating hours.

NOTE

Always use genuine Clark Parts.

Sump Tank Breather Maintenance

Remove the sump tank fil cap/breather and inspect for excessive contamination and damage. Clean and replace as recommended by the PM schedule, or as required by operating conditions.

Access to the Drive Axle

Access the Drive axle by removing the floorplate or through the upright.

WARNING

An upright or carriage can move unexpectedly. Chain or block the carriage and rails. Failure to follow this warning can result in serious injury or death.

Refer to Group SA, Section 2 for additional information on supporting the upright.

Block the wheels. Be sure to put blocking under the carriage and upright rails.

Drive Axle Fluid

Check the drive axle fluid level with the truck on a level surface and fluid at operating temperature.

Remove the fluid level inspection plug located on the left side of the drive axle housing. Fluid level should be at the bottom of the inspection hole. If fluid level is low, add enough fluid to bring fluid level up to bottom of the inspection hole. DO NOT overfill.

Add the recommended fluid only, as required.

Inspect the fill plug for damage. Replace as needed. Install and tighten the plug.

Drive Axle Fluid Change

NOTE

Check the PM interval (operating hours), or the condition of the fluid to determine if the drive axle fluid needs to be changed.

Drain and replace the drive axle fluid every 2000 operating hours. The fluid should be drained when it is at operating temperature. Put the truck in a level position. Block the wheels to prevent truck from moving.

Inspect and clean the drive axle breather (air vent) mounted on top of drive axle.. Refer to Lubrication Chart and Group 40.

Truck Chassis Inspection and Lubrication

Lubrication and inspection of truck chassis components, including steer wheels and wheel bearings, will be easier if the rear of the truck is raised and blocked up under the frame. Refer to Group SA, Section 2, for additional information.

IMPORTANT

Do not raise truck by lifting under the counterweight.

WARNING

Be sure to put blocking under the frame to keep the truck safe.

Be sure to clean the grease fittings before lubricating. Remove excess grease from all points after lubricating.

Upright and Tilt Cylinder Lubrication

Clean the fittings and lubricate the tilt cylinder rod end bushings.

Clean the fittings and lubricate the upright trunnion bushings (one fitting on top of trunnion, each side).

Lift Chains

Lubricate the entire length of the rail lift and carriage chains with Clark Chain and Cable Lube.

Battery Cleaning

The easiest and most satisfactory method of cleaning a battery is to wash it with a low-pressure cold water spray. The battery top can also be washed with a baking soda solution and rinsed with clear water.

IMPORTANT

- **Remove battery from truck before washing.**
- **Vent caps must be free of obstruction and in good condition.**
- **Battery top should be clean and free of cracks or breaks.**
- **Battery terminals must be clean and solidly mounted.**
- **Damaged batteries should be repaired or replaced. Consult your battery vendor.**
- Check to be sure all vent caps are tight before washing the battery.
- Fill a bucket with cold water. Add a box of baking soda to the bucket. Stir the solution until dissolved. Keep this solution around the battery service area at all times.
- After washing battery, thoroughly rinse with clear cold water.

Battery Charging

Follow the instructions supplied by the battery charger vendor.

Battery Electrolyte

- Check with battery manufacturer's documentation before working on battery electrolyte.
- Always use a carboy tilter or siphon when handling battery electrolyte.
- When mixing electrolyte, always pour acid into water-NEVER pour water into acid. Pouring water into acid will cause a dangerous chemical action or splash.

Clean Battery Compartment

. Using baking soda and water solution, clean the walls and floor of the compartment. Rinse with clear water.

. Blow off the compartment walls and floor with an air hose. Allow to air-dry.

CAUTION

Wear eye protection and protective clothing when cleaning or drying with compressed air. Reduce air pressure to 207 kPa (30 psi). Debris removed with air pressure can cause injury.

Replacement Batteries

CAUTION

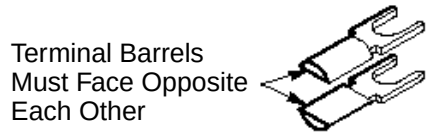
Use a battery properly sized to the dimensions of the battery compartment. Batteries too small can shift and cause damage to the truck or injury to the operator or bystanders. Only use batteries that comply with factory recommendations as to size and capacity.

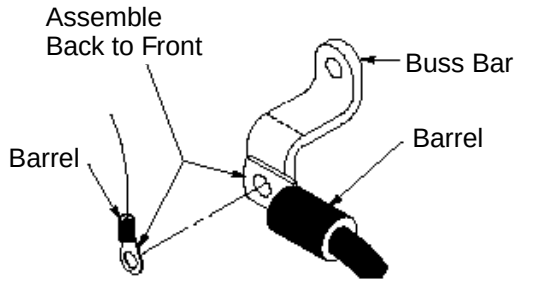
Battery Installation

If the battery is uncovered, cover the battery with a non-conductive material (i.e., plywood, heavy cardboard, etc.) prior to installation.

- Using an overhead hoist and insulated spreader bar, lift battery into battery compartment.
- Install battery retainer, if applicable.
- Remove non-conductive material from battery.
- Connect battery to truck.

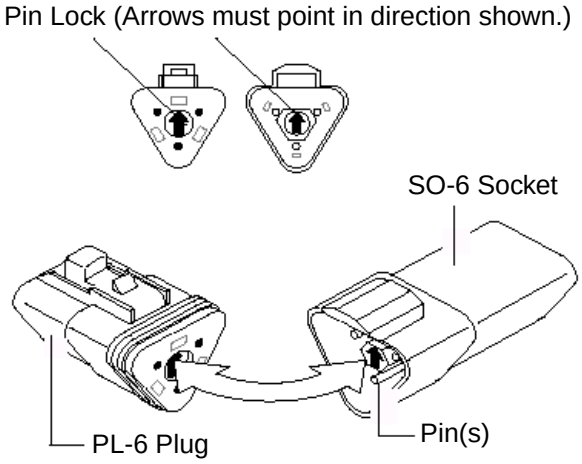
Multiple cable and wire connections must be connected as illustrated or electrical shorts and control damage may result.





Multiple Connections

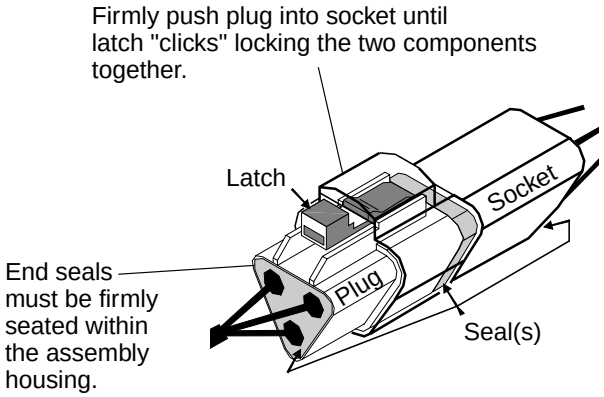
Connector Plugs and Receptacles are permanently labeled with the proper PL (Plug) and SO (Socket/ Receptacle) number for easy identification. Match the plug number with the appropriate receptacle number before making a connection. If you do not, electrical shorts and possible damage to the equipment may result. i.e., Plug #PL-6 plugs into pin socket #SO-6, etc.



Example of Pin Lock Plug and Socket

There is a moisture-resistant seal at each wireend of the connector and between the plug and socket.

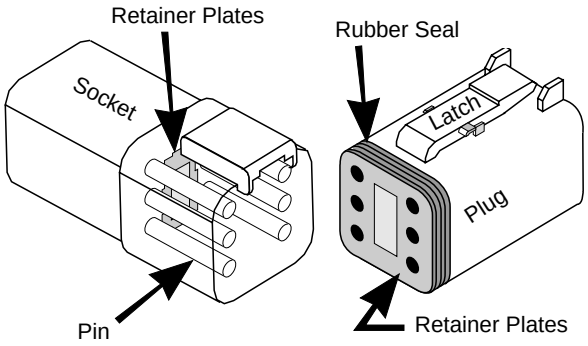
Check seals for damage that would make them unfit for furtherservice (cuts, etc.). Make certain the end seals are seated flush with the end of the connector housing. Make certain the plug and socket latchtightly to each other.



Seals and Latch

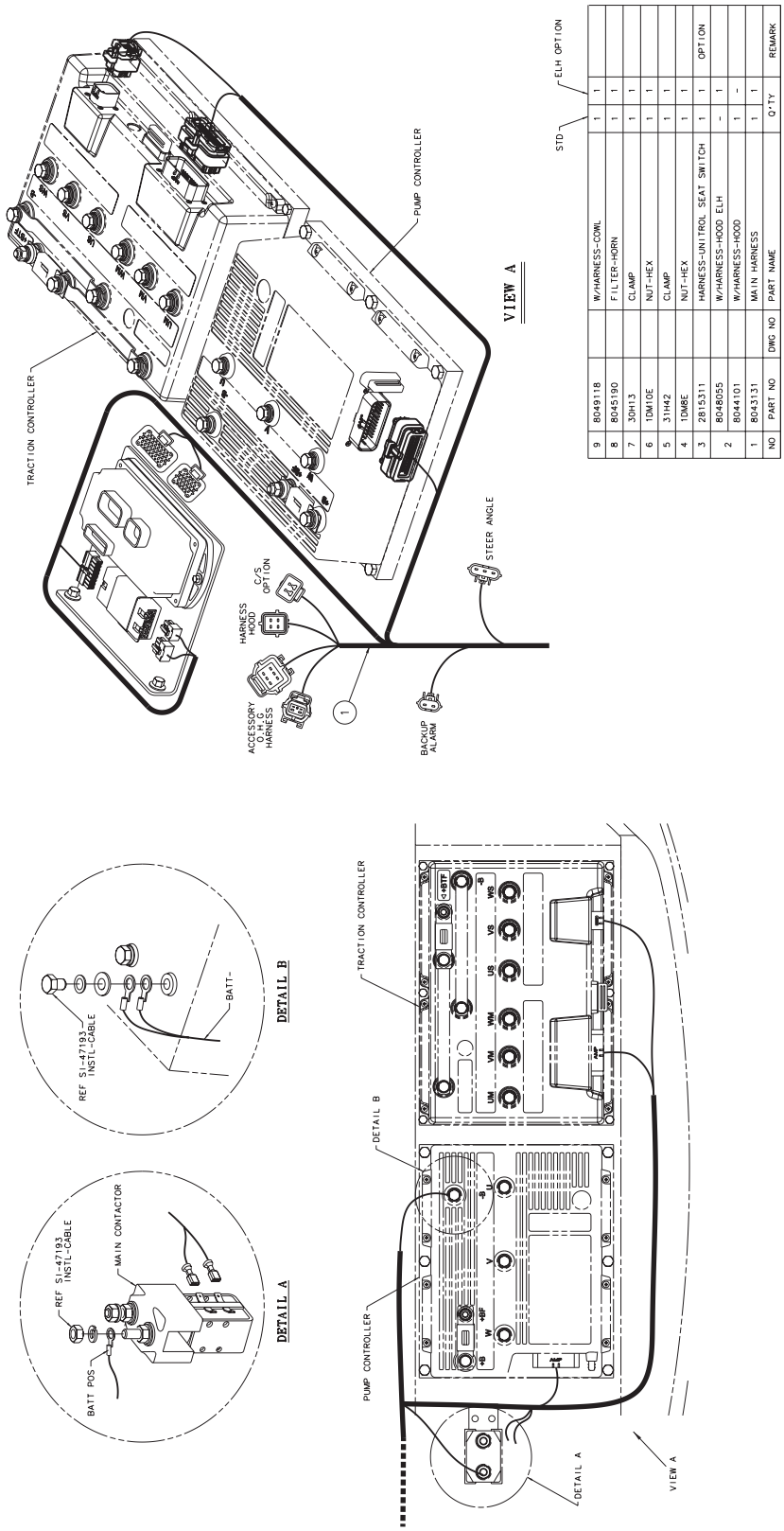
Retainer plates snap into place to secure the pins and their sockets.

Check the plates and seal for damage and secure mounting.

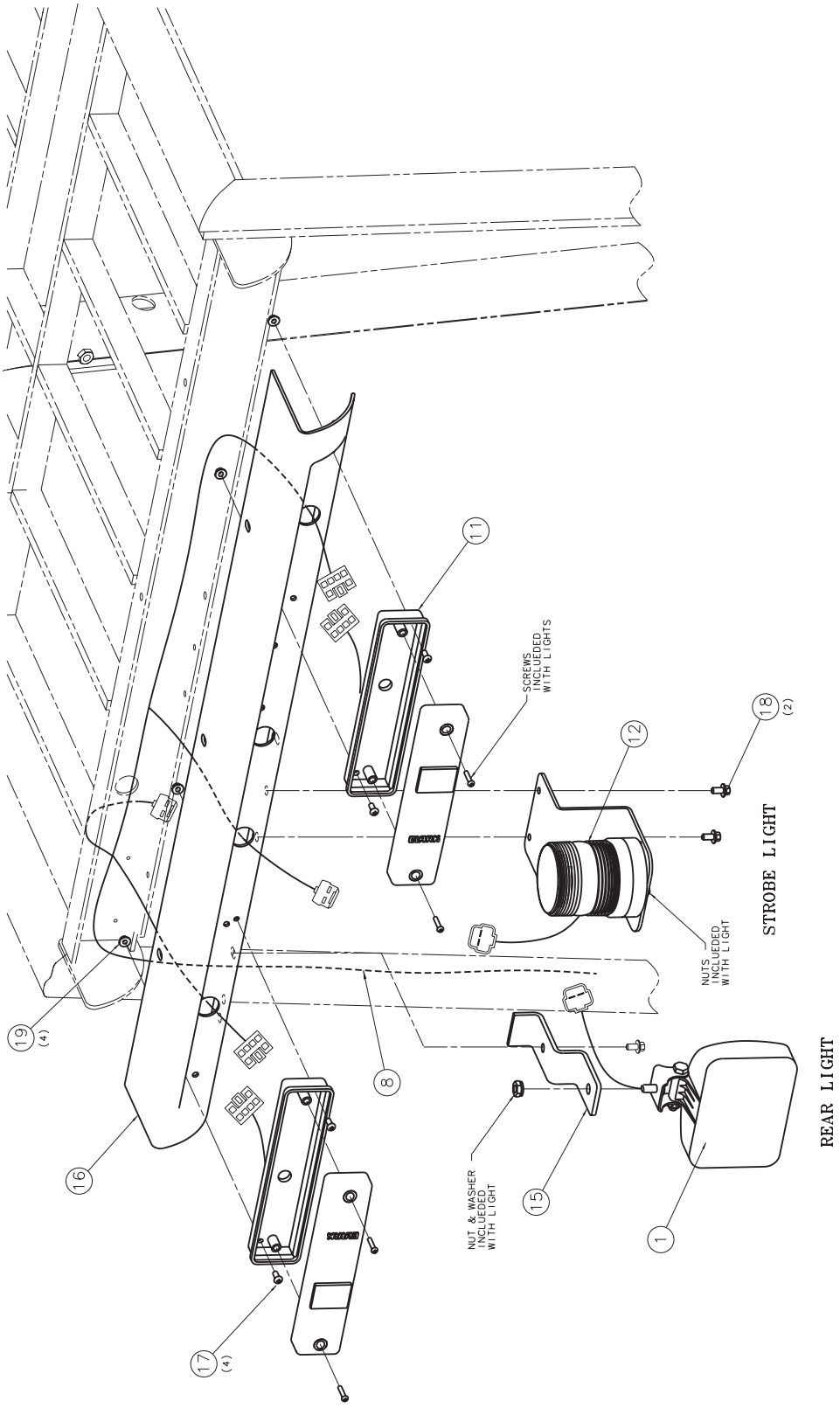


Retainer Plates

Main Harness



NO	PART NO	DWG NO	PART NAME	Q'TY		REMARK
				STD	ELH OPTION	
9	8049118		W/HARNESS-CONL	1	1	
8	8045190		FILTER-HORN	1	1	
7	30H13		CLAMP	1	1	
6	10M10E		NUT-HEX	1	1	
5	31H42		CLAMP	1	1	
4	10M8E		NUT-HEX	1	1	
3	28153311		HARNESS-UNITROL SEAT SWITCH	1	1	OPTION
2	8048055		W/HARNESS-HOOD ELH	–	1	
	8044101		W/HARNESS-HOOD	1	–	
1	8043131		MAIN HARNESS	1	1	



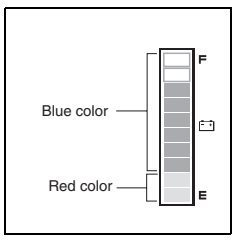
Seat Belt: At start up this symbol displays along with an audio alarm for 4 seconds. This display reminds you to fasten your seat belt.

Parking Brake: The symbol is displayed and "-255" status code appears on the numeric display when parking brake is applied. Release parking brake to operate truck.

Service Status: The following 5 codes are usually operator fault codes, and can be corrected by as explained in "Section 5, Operating Procedures." If you see any other codes displayed, the truck needs to be serviced.

- -01 Seat Switch Open
- -061, -065 ,-140, -203, -207 Overheat of motor and controller (Restart after cooling down)
- -66 Low Battery (truck will go into lift lockout when the dash display shows less than 15%)
- -77 Maintenance Hours (preset hour meter reading indicating that it is time to have the truck serviced. Truck will reduce the top speed if desired)
- -79 Incorrect Start Up Sequence (SRO)
- -217, -245 Wrong set battery
- -255 Parking Brake Switch Open

Battery discharge indicator



It displays the battery discharge condition of forklift truck.
The one bar indicates 10% charging condition.
If the battery is charged more than 20% (8 bars or more), blue LED is displayed, but it is less than 20% (2 bars or less), red LED is displayed. If it is less than 10% (1 bar), it will flicker and buzzer sound.

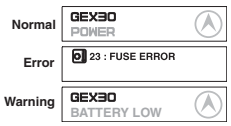
Slow-speed indicator (Turtle shaped)

The traveling speed of truck is limited to set speed.
The upper mark is slow speed operating icon, and the figure shows the limited max. speed. (In upper example, the limited max. speed is 2km/h)

Hourmeter & Speed

- It displays the accumulated operating hour and traveling speed of truck.
- When the traveling speed is less than 0.5km/h, it displays the accumulated operating hour.
- When the traveling speed is more than 0.5km/h, it displays the traveling speed.

Message display



The model name, POWER selection, travel direction, warning and error message are displayed.

- In normal operating condition: Model name/POWER/Travel direction
- When several messages are simultaneously displayed, it will be displayed in the order of Error, Warning and Normal condition.

- If many error conditions are simultaneously occurred, the priority 2 Errors will be displayed. (The priority means Error number)

Travel direction icon

- It displays the traveling direction or angle of steering wheel..
- The direction icon rotates in 10 degrees. (Total 36 icon)

Error icon

When error occurs this icon is displayed to distinguish the condition easily. When the error message is displayed, this icon is simultaneously displayed.

Section 3

Pump Motor Overhaul

Inspection Procedure

Before performing these service procedures:

- Park truck safely.
- Fully lower the upright.
- Apply the park brake
- Turn the key switch OFF.
- Disconnect battery from truck receptacle.
- Discharge capacitors by connecting a 200 ohm 10 watt resistor between the positive and negative input post of the controller for 10 seconds.

Motor Cleanliness

Electric motors should be kept clean at all times to prevent shorting, minimize wear, and optimize cooling.

- Wipe off all dust, dirt, oil, water, etc., from outer surface of motor.
- Remove any debris from cooling fan air vents and around motor frame to prevent overheating.
- Air-clean (blow off) motors using clean, dry (moisture-free) compressed air at 207 kPa (30 psi) maximum air pressure.

The presence of any oil on or near the motor could indicate either bad bearings or leaking hydraulic system. Determine cause and repair problem before extensive motor damage occurs.

Pump Motor Removal and Installation

1. Tilt the steering column fully forward and remove the floor plate.
2. Disconnect battery and remove all electrical cables from the motor. Tag cable terminals to aid in reinstallation. Position cables out of the way of motor removal.
3. Have drain pan in place to catch axle oil. Remove the hydraulic pump from the motor (see group 29 for instructions).

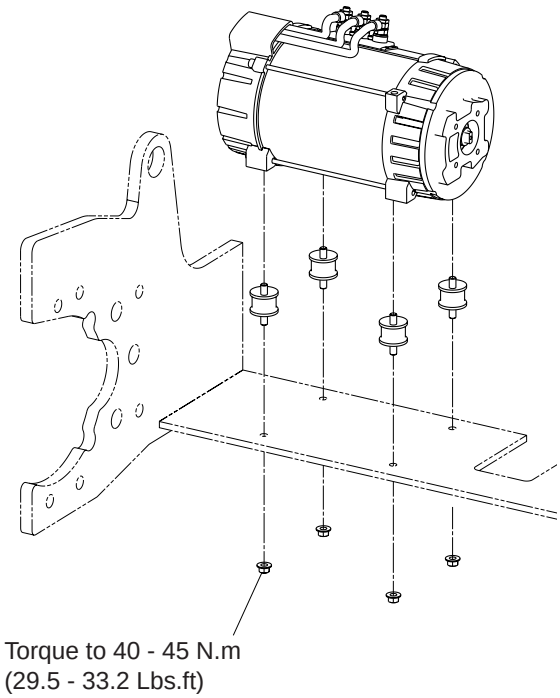
IMPORTANT

The pump motor assembly weighs over 110 pounds. A suitable lifting device may be needed to help hold and then raise the motor from the truck.

4. Remove the 4 nuts securing the pump motor mounting plate to the frame bottom.
5. Lift the motor assembly and place it on a bench for service.
6. Reinstall in reverse order.

NOTE

When removing or installing cables to motor, hold the terminal's lower nut with a wrench while turning the upper fastening nut with another wrench.



Section 1

Description

The CLARK GEX uses a Dual AC controller to control both drive motors and a single AC controller to control the single motor/pump combination which supplies flow to all hydraulic functions and steering.

Traction Control and Motors

The dual AC traction control consists of two motor controls mounted to a single heat-sink plate and enclosed by a single cover. The right portion of the control is reference to as the "slave" control and operates the left drive motor. The left portion of the control is referred to as the "master" control and operates the right drive motor. The control receives inputs from the speed control (accelerator) pedal, steer tire position sensor (steer pot), direction switches, foot brake switch, motor encoders, motor thermistors and other miscellaneous switches. The control is able to proportional reduce the speed of the inside tire when the truck is in a turn, based on the steer angle input from the steer sensor. Once the steer angle exceeds a certain value, the inside wheel will start to reverse. The speed of the vehicle is controlled by the accelerator control pedal. For a given pedal position the control will maintain a set speed, as determined by control parameter settings. These settings are adjustable to meet your customer's needs. One feature that is new to the GEX is "release braking". This feature will apply a regenerative braking force every time the driver lifts up off the accelerator pedal. The final travel speed will be determined by the new pedal position. The control receives motor speed feedback from the motor encoders which allow for precise speed regulation. Every motor also has a built-in thermistor which constantly monitors the winding temperature and reports this information to the control. Should it sense that the motor is approaching the temperature limit, the control will cutback motor current until the temperature decreases. Since it is cutting back current and not voltage, the top end speed will not be effected, unless on a grade. Each control also has built-in thermal protection that will reduce output current should the control approach the thermal limit.

Lift/Steer Control and Motor

A single motor/pump combination is used for both hydraulic functions and steering. The motor is controlled by a dedicated controller. The lift lever is equipped with a linear potentiometer that measures the distance the lever is stroked and provides this input to the control. The control uses this information to increase motor speed in proportion to the distance stroked, providing only the desired flow rate. Tilt and aux switches mounted on the hydraulic valve provide unique inputs to the control. The speed of each function can be programmed independently so that only the required flow rate is produced, minimizing power losses. When the key is in the "ON" position and a direction is selected, the control will operate the motor at a fixed rpm (roughly 500~600 rpm). This provides adequate flow for the steering function. If the control receives an input from the lift potentiometer, tilt or aux switches, then it will ramp up the motor speed to match the desired speed. Once the request is removed the motor speed will return to the fixed level. As with the traction control and motors, the lift/steer control and motor have thermistors for thermal protection and the motor has a built-in encoder for speed feedback.

Section 2

Control Programming

Programming & Adjustments Using ZAPI Handset

Adjustments via Handset

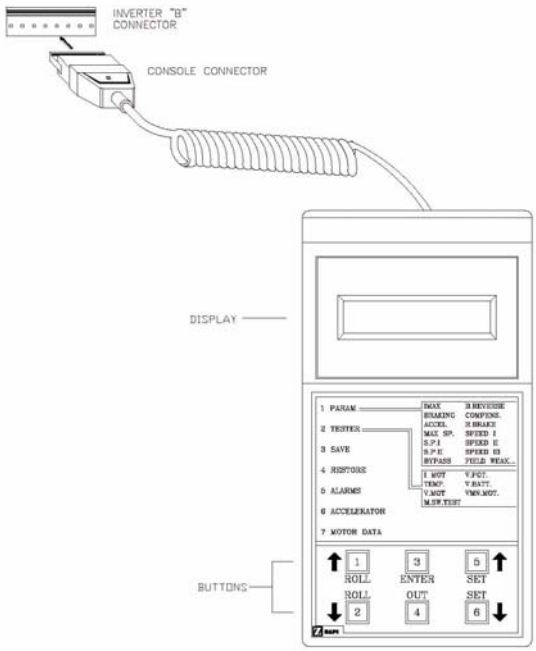
Adjustments of parameters and changes to the controller's configuration are made using the digital Handset. The Handset is connected to the "B: connector of the controller.

Start with the battery disconnected at the battery receptacle, key switch in the OFF position.

Disconnect the dash display harness from the Master Control and connect the handset cord into this "B" connector.

Plug in the battery and turn the key switch ON.

Description of Handset & Connections



Digital Handsets used to communicate with the AC Controllers must be fitted with EPROM CK ULTRA, minimum "Release Number 3.07, CLARK part number **8033636**.

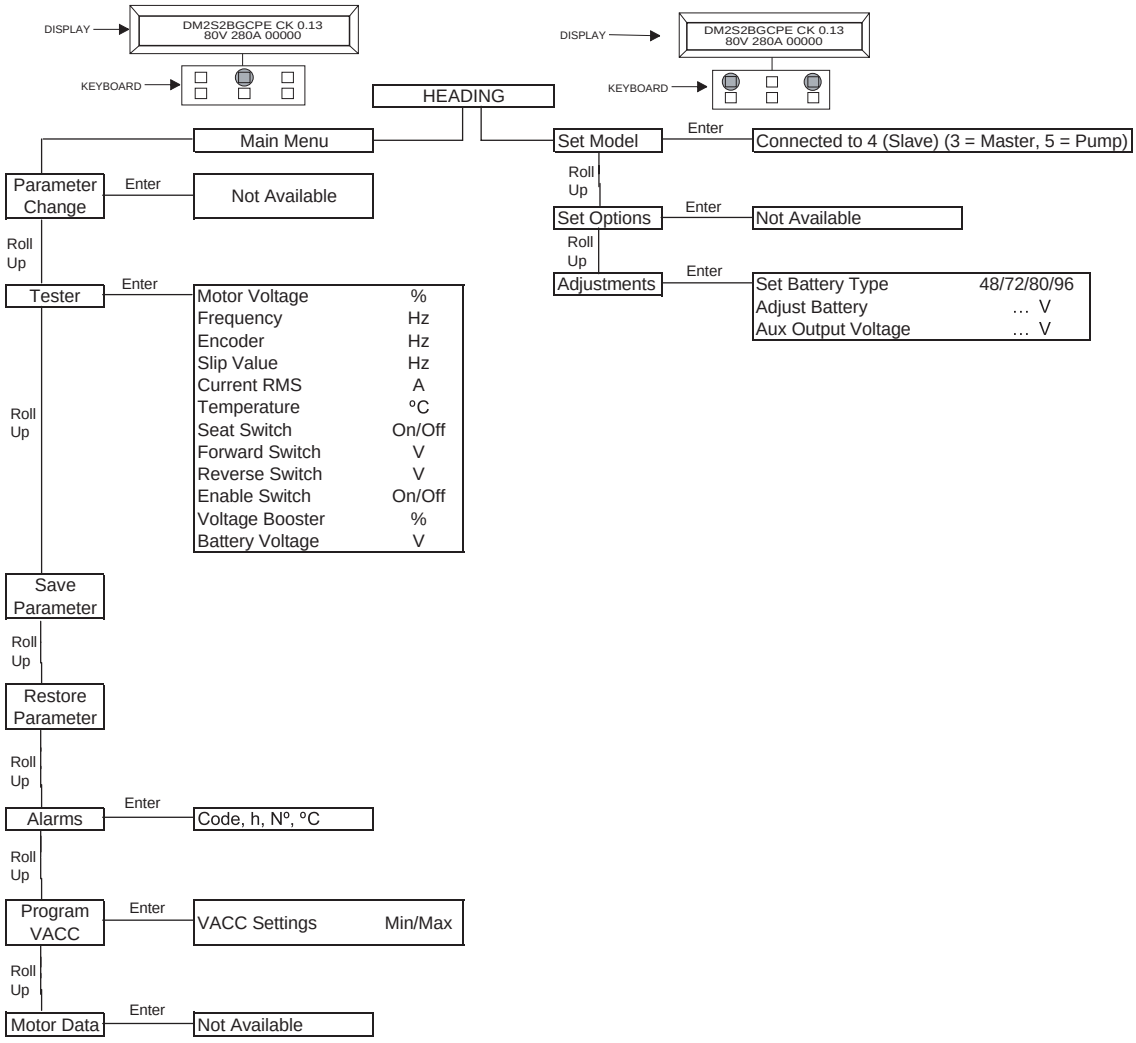
The Handset “Release Number” will be displayed on the Handset display momentarily when the key switch is first turned ON.

Slave Control - "Dualac2 Power (80V)"

Submenu "Adjustments"

1. SET BATTERY TYPE: Selects nominal battery voltage
2. ADJUST BATTERY: Fine adjustment of the battery voltage measured by the controller.

GEX Handset
Slave Control Configuration



See Group 19, Section 4 for GEX Factory Control Settings

Section 3

CONTROL TROUBLESHOOTING

FAULT CODES FOR GEX

This is the list of codes that the CLARK dash display may show

Fault Code	Fault Name	Control
1	"NO SEAT SWITCH"	MASTER
2	"CHOPPER RUNNING"	MASTER
8	"WATCHDOG"	MASTER
9	"INPUT MISMATCH"	MASTER
10	"WAITING DISPLAY"	MASTER
13	"EEPROM KO"	MASTER
17	"LOGIC FAILURE #3	MASTER
18	"LOGIC FAILURE #2	MASTER
19	"LOGIC FAILURE #1	MASTER
30	"VMN LOW"	MASTER
31	"VMN HIGH"	MASTER
33	"IDLE TIME"	MASTER
37	"CONTACTOR CLOSED"	MASTER
38	"CONTACTOR OPEN"	MASTER
53	"STBY I HIGH"	MASTER
60	"CAPACITOR CHARGE"	MASTER
61	" HIGH TEMPERATURE"	MASTER
65	"MOTOR TC START"	MASTER
66	"BATTERY LOW"	MASTER
71	"MOTOR SHUTDOWN"	MASTER
72	"MOTOR LOCKED"	MASTER
74	"DRIVER SHORTED"	MASTER
75	"CONTACTOR DRIVER"	MASTER
76	"COIL SHORTED"	MASTER
77	"MAINTENANCE HOURS"	MASTER
78	"VACC NOT OK"	MASTER
79	"INCORRECT START (SRO)"	MASTER
80	"FORWARD + REVERSE"	MASTER
81	"TH MOTOR SENSOR KO"	MASTER
82	"ENCODER ERROR"	MASTER
84	"STEER SENSOR KO"	MASTER
86	"PEDAL WIRE KO"	SLAVE
87	"WATCHDOG"	SLAVE
88	"WATCHDOG"	SLAVE
96	"LOGIC FAILURE #3	SLAVE
97	"LOGIC FAILURE #2	SLAVE
98	"LOGIC FAILURE #1	SLAVE
99	"TH MOTOR SENSOR KO"	SLAVE
109	"VMN LOW"	SLAVE
110	"VMN HIGH"	SLAVE
132	"STBY I HIGH"	SLAVE
139	"CAPACITOR CHARGE"	SLAVE

Fault Code	Fault Name	Control
140	" HIGH TEMPERATURE"	SLAVE
148	"ENCODER ERROR"	SLAVE
150	"WATCHDOG"	PUMP
151	"CHOPPER RUNNING"	PUMP
155	"EEPROM KO"	PUMP
159	"LOGIC FAILURE #3	PUMP
160	"LOGIC FAILURE #2	PUMP
161	"LOGIC FAILURE #1	PUMP
171	"MOTOR SHUTDOWN"	PUMP
172	"VMN LOW"	PUMP
173	"VMN HIGH"	PUMP
174	"TH MOTOR SENSOR KO"	PUMP
182	"MOTOR LOCKED"	PUMP
195	"STBY I HIGH"	PUMP
196	"THERMIC SENSOR KO"	PUMP
201	"ENCODER ERROR"	PUMP
202	"CAP CHARGE"	PUMP
203	" HIGH TEMPERATURE"	PUMP
204	"VACC NOT OK"	PUMP
205	"INCORRECT START"	PUMP
206	"PEDAL WIRE KO"	PUMP
207	"MOTOR TC START"	PUMP
208	"BATTERY LOW "	PUMP
211	"COIL SHORTED"	PUMP
212	"COIL INTERUPTED"	PUMP
217	"WRONG SET BATTERY"	PUMP
218	"SAFETY"	PUMP
222	"NO CAN MSG"	PUMP
225	"AUX OUTPUT KO"	PUMP
232	"MASTER KO"	SLAVE
233	"NO CAN MSG 3"	SLAVE
235	"THERMIC SENSOR KO"	SLAVE
236	"INPUT MISMATCH"	SLAVE
243	"NO CAN MSG 5"	MASTER
245	"WRONG SET BATTERY"	MASTER
246	"SLAVE KO"	MASTER
247	"NO CAN MSG 4"	MASTER
248	"CHECKUP NEEDED"	MASTER
249	"THERMIC SENSOR KO"	MASTER
253	"AUX OUTPUT KO"	MASTER
255	"HANDBRAKE"	MASTER
Blank	"DASH DISPLAY"	MASTER

Fault Code	Fault Name	Fault Description	Control	Troubleshooting	Action Required
150	"WATCH-DOG"	Watchdog circuit has been triggered	PUMP	• It is a self-diagnosing test within the logic between Master and Slave micro controllers. This fault could also be caused by a CAN-BUS malfunction, which blinds Master -Slave communication. So , before replacing the controller , check the CAN-BUS	
151	“CHOPPER RUNNING”	FET is running	PUMP	• XXXX	
155	"EEPROM KO"	**Warning: Eeprom fault controller will use default parameters**	PUMP	• Fault in the area of memory in which the adjustment parameters are stored; this fault does not inhibit truck operation, but the controller will use default parameters. • If defect persists when key is switched OFF and ON again, replace the logic board. If the fault disappears, remember that the parameters stored previously have been cancelled and replaced by the default values.	
160	"LOGIC FAILURE #2	Failure in U,V,W voltage feedback circuit	PUMP	• Fault in the hardware section of the controller that manages the phase 's voltage feedback.	Replace controller
161	"LOGIC FAILURE #1	An over voltage or under voltage condition has been detected	PUMP	• This fault signals that the under voltage / over voltage protection interrupt has been triggered. Two possible reasons: • A real under voltage / over voltage situation happened. • Verify battery setting. • Fault in the hardware section of the controller that manages the over voltage protection. Replace logic Card. • Possible plugging in or unplugging of battery or charger with the key switch on.	Replace controller
171	"MOTOR SHUT-DOWN"	**Warning: Pump motor temp. are very high (over MOTOR SHUT-DOWN param.)**	PUMP	• This fault occurs when the pump motor temperature switches are open (digital sensor), or if the analog sensor temperature overtakes the cut off level. • The cut off level is adjusted with the MOTOR SHUTDOWN parameter (145°C) in the ADJUSTMENT submenu. • If this fault occurs, maximum current is reduced to 130 amps needed for steering. • If the shutdown occurs when the motor is cold check the wiring. If wiring is ok replace logic board.	

DECELER. DELAY	LEVEL = 0	LEVEL = 0	LEVEL = 0	LEVEL = 0
ACCELER. DELAY TILT	LEVEL = 0	LEVEL = 0	LEVEL = 0	LEVEL = 0
DECELER. DELAY TILT	LEVEL = 0	LEVEL = 0	LEVEL = 0	LEVEL = 0
ACCELER. DELAY AUX1	LEVEL = 0	LEVEL = 0	LEVEL = 0	LEVEL = 0
DECELER. DELAY AUX1	LEVEL = 0	LEVEL = 0	LEVEL = 0	LEVEL = 0
ACCELER. DELAY AUX2	LEVEL = 0	LEVEL = 0	LEVEL = 0	LEVEL = 0
DECELER. DELAY AUX2	LEVEL = 0	LEVEL = 0	LEVEL = 0	LEVEL = 0
MAX SPEED UP	**60 Hz**	**75 Hz**	**100 Hz**	**100 Hz**
MIN SPEED UP	16.50 Hz	16.50 Hz	16.50 Hz	16.50 Hz
CUTBACK SPEED	100%	100%	100%	100%
1ST SPEED FINE*	40 Hz	40 Hz	40 Hz	40 Hz
2ND SPEED FINE*	25 Hz (S/Shift)	25 Hz (S/Shift)	25 Hz (S/Shift)	25 Hz (S/Shift)
3RD SPEED FINE*	50 Hz	50 Hz	50 Hz	50 Hz
4TH SPEED FINE*	50 Hz	50 Hz	50 Hz	50 Hz
HYD SPEED FINE	21 Hz	21 Hz	21 Hz	21 Hz
IDLE SPEED	12 Hz	12 Hz	12 Hz	12 Hz
IDLE TIME	LEVEL = 5	LEVEL = 5	LEVEL = 5	LEVEL = 5
MAXIMUM CURRENT	LEVEL = 9	LEVEL = 9	LEVEL = 9	LEVEL = 9
AUXILIARY TIME	2	2	2	2

SET OPTION				
HOUR COUNTER	RUNNING	RUNNING	RUNNING	RUNNING
SET TEMPERATURE	ANALOG	ANALOG	ANALOG	ANALOG
THERM PROTECTION	OFF	OFF	OFF	OFF
HOUR METER TRUCK	ON	ON	ON	ON
PRESSURE FUNCT.	OFF	OFF	OFF	OFF
DIGITAL LEFT	OFF	OFF	OFF	OFF

SET MODEL				
CONNECTED TO	5 (PUMP)	5 (PUMP)	5 (PUMP)	5 (PUMP)

ADJUSTMENTS				
SET BATTERY TYPE	**80V**	**80V**	**80V**	**80V**
ADJUST BATTERY				
THROTTLE 0 ZONE	5%	5%	5%	5%
THROTTLE X POINT	63%	63%	63%	63%
THROTTLE Y POINT	36%	36%	36%	36%
ADJUSTMENT #04	130 °C	130 °C	130 °C	130 °C
MOTOR SHUTDOWN	145 °C	145 °C	145 °C	145 °C
IMAX PROTECTION	100%	100%	100%	100%
ADJUSTMENT #03	55 °C	55 °C	55 °C	55 °C

*** See AUX Hydraulic Settings in Section 3**

** Not used software version CK 1.12 + higher

All motors must be stopped before saving parameters. parameter may not be stored to EEPROM if motor is running.

Section 1

Specification and description of drive axle

Specifications

General specification

Reduction ratio	:	26
Speed	:	Forward/Reverse 1
Oil capacity	:	1.0 liter
Gear type	:	Plant gear
Drive axle oil	:	Torque fluid 56(SAE 80W)
Weight	:	60kg (excl. oil)

Brake specification

Service brake type : Wet brake

Required flow of service brake: 3.9cc

Service brake setting stroke: 0.9mm

Brake oil : Hydraulic fluid

Parking brake lever ratio : 1:8.27

Fitting specification

Brake port : M10X1.0P

Oil drain plug : PT 1/4, PT 3/8

Air bleeder : PT 1/8

Air bleeder (Brake): M12X1.25P

Oil port : PT1/2

Nipple : M6X0.75P(grease)

Stud bolt (Wheel bolt): M14X1.5P

Loctite specification

Bolt	:	Loctite 277
Fitting	:	Loctite 572

Torque specification

Boss bearing and plate housing socket bolt, tightening torque : (330 kgf.cm) 12T

Brake piston and plate housing socket bolt, tightening torque : (130 kgf.cm) 8T

Brake stopper fixing socket bolt, tightening torque: (130 kgf.cm)

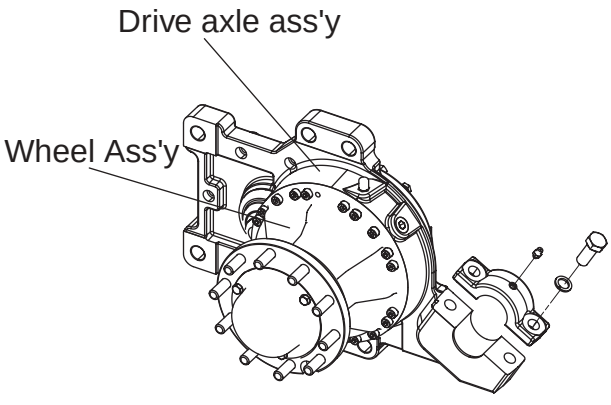
Wheel bearing free load adjusting nut, tightening torque : (2000 kgf.cm)

Final housing socket bolt, tightening torque : (330 kgf.cm) 12T

Wheel cap fixing socket bolt, tightening torque : (330 kgf.cm) 12T

Master hinge mounting bolt: M16X2.0X40

DESCRIPTION



Section 5

Disassembly and Reassembly of axle end

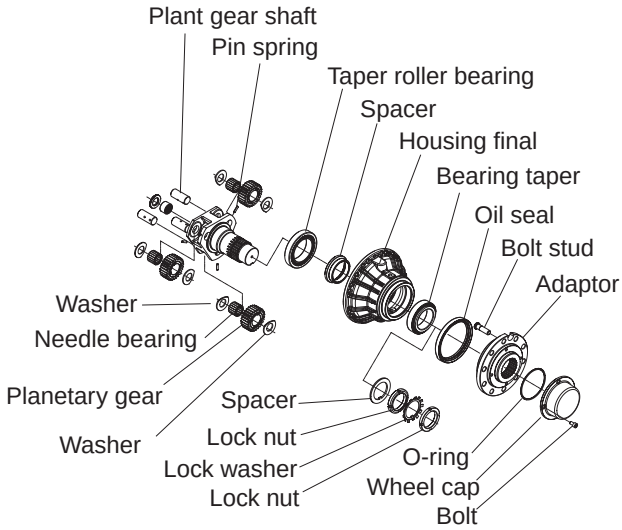
NOTE

Arrange all the parts under the order of disassembly.
Pay attention to the parts and removal order when disassemble.
Record with irremovable pen if necessary and distinguish the parts.

Removal of axle end from the drive axle

Remove hexagon socket bolts from the plate housing by using appropriate tool to disassemble the wheel assembly and drive axle.

Disassembly of carrier and hub bearing



Section 2

Pneumatic Wheels and Tires

CAUTION

SAFE PARKING. Before working on truck :

1. **Park truck on a hard, level, and solid surface, such as a concrete floor with no gaps or breaks.**
2. **Put upright in vertical position and fully lower the forks or attachment.**
3. **Put all controls in neutral. Turn key switch OFF and remove key.**
4. **Apply the parking brake and block the wheels.**

Pneumatic Tire Maintenance Precaution

The following instructions supplement the OSHA requirements. In the event of any conflict or inconsistency between these instructions and the OSHA requirements, the OSHA requirements shall be controlling.

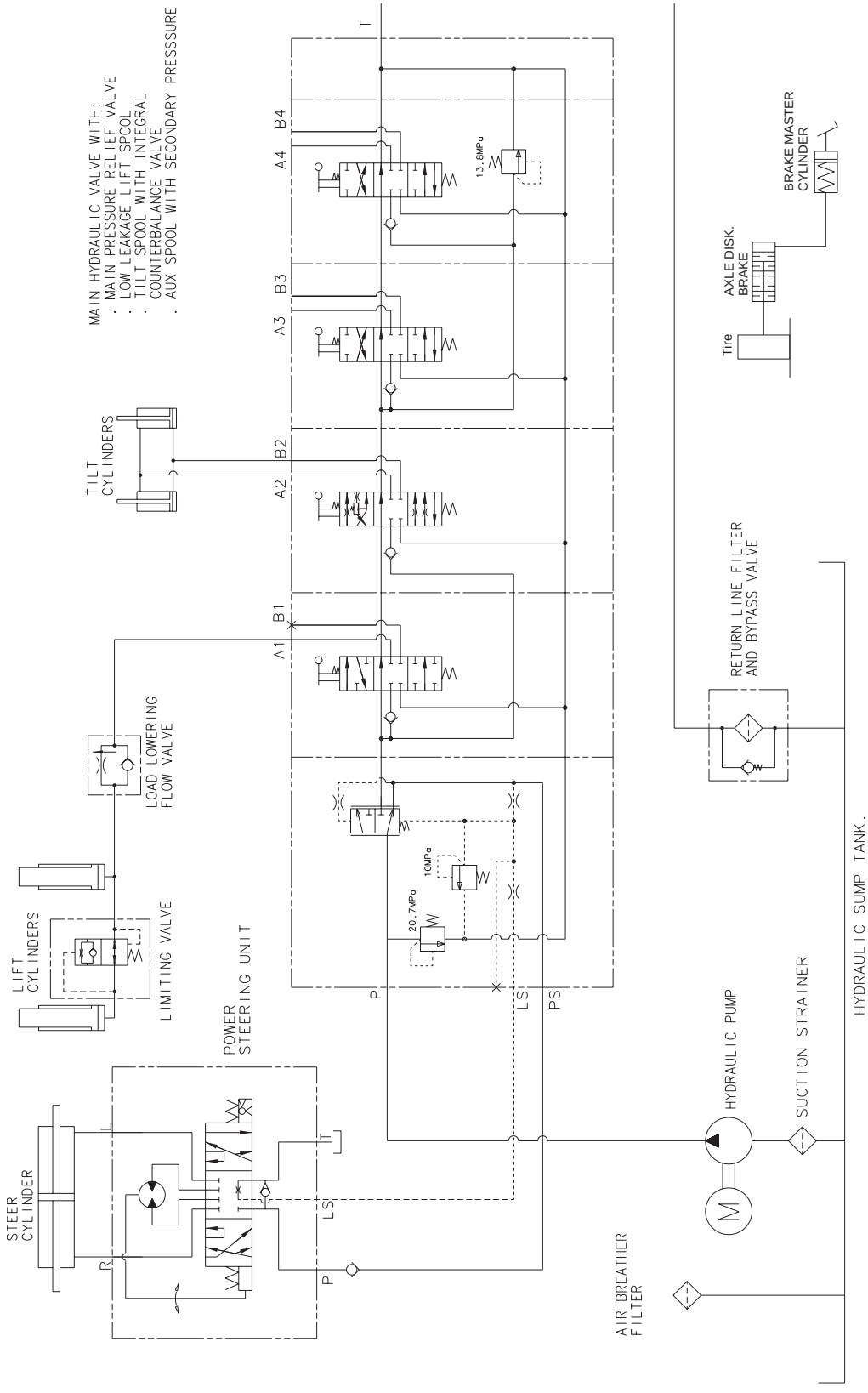
WARNING

Before you do tire or rim maintenance, read the OSHA rules regarding owner responsiblilty. Read and understand all maintenance and repair procedures on tires and rims. Do not work on tires or rims unless you have been trained in the correct procedures. Serious injury or death can result if the safety messages are ignored.

1. Do not let anyone mount or demount tires without proper training.
2. Never sit on or stand in front of a tire and rim assembly that is being filled with air. Use a clip-on chuck and make sure the hose is long enough to permit the person filling the tire with air to stand to the side of the tire, not in front or in back of the tire assembly.
3. Never operate a vehicle on only one tire of a dual assembly. The carrying capacity of the single tire and rim is dangerously exceeded, and operating a vehicle in this manner can result in damage to the rim and truck tip-over and driver injury.
4. Do not fill a tire with air that has been run flat without first inspecting the tire, rim, and wheel assembly. Double check the lock ring for damage. Make sure that it is secure in the gutter before filling the tire with air.
5. Always remove all air from a single tire and from both tires of a dual assembly prior to removing any rim components, or any wheel components, such as nuts and rim clamps. Always remove the valve core to remove air from tire. Be sure all air is removed.
6. Check rim components periodically for fatigue cracks. Replace all cracked, badly worn, damaged, and severely rusted components.
7. Do not, under any circumstances, attempt to rework, weld, heat, or braze any rim components that are cracked, broken, or damaged. Replace with new parts or parts that are not damaged, which are of the same size, type, and make.
8. Never attempt to weld on an inflated tire/rim assembly.
9. Clean rims and repaint to stop detrimental effects of corrosion. Be very careful to clean all dirt and rust from the lock ring gutter. This is important to secure the lock ring in its proper position.
   A Filter on the air filling equipment to remove the moisture from the air line prevents a lot of corrosion. The filter should be checked periodically to make sure it is working properly.
10. Make sure correct parts are being assembled. Ask your distributor or the manufacturer if you have any doubts.
11. Do not be careless or take chances. If you are not sure about the proper mating of rim and wheel parts, consult a wheel and rim expert. This may be the tire man who is servicing your fleet, the rim and wheel distributor in your area, or the CLARK dealer.
12. Mixing parts of one manufacturer's rims with those of another is potentially dangerous. Always ask manufacturer for approval.

GROUP 23

BRAKE SYSTEM



GROUP 25

STEERING COLUMN AND GEAR

Section 4

Stering System Relief Pressure Check and Adjustment

CAUTION

SAFE PARKING. Before working on truck:

1. **Park truck on a hard, level, and solid surface, such as a concrete floor with no gaps or breaks.**
2. **Put upright in vertical position and fully lower the forks or attachment.**
3. **Put all controls in neutral. Turn key switch OFF and remove key.**
4. **Apply the parking brake and block the wheels.**

Description and Operation

Steering system relief pressure settings above the specified values can cause failure of the hydraulic lines, damage to seals in the steering gear, and ball joint breakage on the steer axle.

The steering system's pressure relief valve is part of the main hydraulic pump assembly. Steering system relief pressure is adjustable and should be checked if indicated by troubleshooting. Use the gauge port on the pump to check steering relief pressure.

Steering system relief pressure setting should be 10000 kPa (1450 psi).

NOTE

If relief pressure is not correct, the problem may be caused by dirt in the valve or worn parts, including steering control valve and main hydraulic pump. Generally, if the relief pressure measured when the steering system is in bypass is not correct, the priority demand valve should be replaced.

WARNING

Do not use your hands to check for hydraulic leakage. Use a piece of cardboard or paper to search for leaks. Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure.
If any fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury or gangrene may result.

Steering System Relief Pressure Setting Check and Adjustment

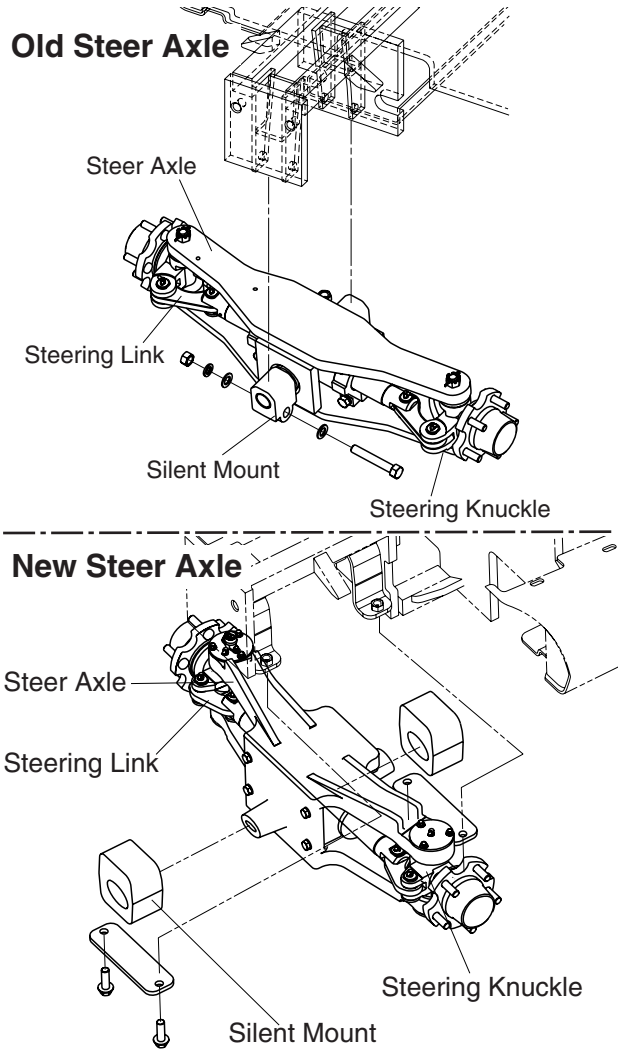
This procedure requires installation of a pressure gauge at the gauge port on the main hydraulic pump. The pressure is measured while the steering handwheel is turned fully in one direction to put the steering system in bypass.

Steering system relief pressure setting may be checked using a Mico Quadrigage (Clark Part No. 1800106) or with a conventional pressure gauge, 0-20,700 kPa (0-3000 psi).

1. Tilt the steering column fully forward and raise the seat deck.

GROUP 26

STEERING AXLE



Steer Axle Mounting

Steer Axle Replacement

Replacement is the reverse of removal. Refer to Figure A for replacement.

CAUTION

Make sure truck is correctly raised and safely blocked using hardwood blocks under the frame. Be sure the blocking will permit installation of the axle without disturbing the blocking.

1. If silent blocks have been removed from axle, install new silent block assemblies. Use a rubber or plastic mallet to seat the silent mounts onto the axle trunnions.
2. Make sure that the silent blocks are positioned correctly front and rear on the steer axle trunnions at the start of installation. Align the silent blocks square with the axle.
3. Use a fork lift truck or mobile floor jack to temporarily support and raise the axle into place under the truck. If another lift truck is used to handle axle, center the forks with about 305 mm (12 in) spread between them. Place steer axle assembly in secure position on fork tips.

   If hydraulic jack is used, be sure axle is securely supported on jack pad.

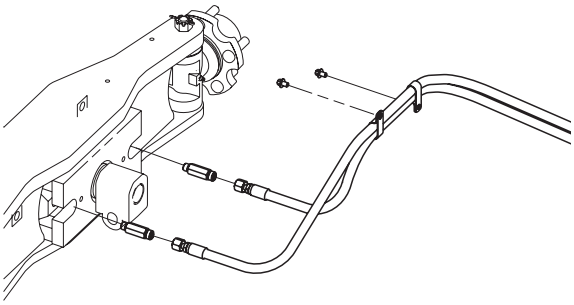
WARNING

Heavy components can fall and cause severe injury. Keep your body clear at all times.

4. Install axle assembly into frame by slowly raising it up while guiding silent block bushings into frame sockets.
5. Install silent block mounting bolts through frame socket holes and silent block, front and rear.
   Reset the two mounting plates under the silent blocks of the axle.
6. Install silent mount fasteners and tighten to 240-265 N·m (180-196 ft-lb).
7. Remove temporary axle support from under truck.
8. Connect the hydraulic lines to steering cylinder. Tighten fittings to 12-14 N·m (106-123 in-lb; 8.8-10.3 ft-lb).

IMPORTANT

Make sure all fittings and openings on the hydraulic lines are clean.

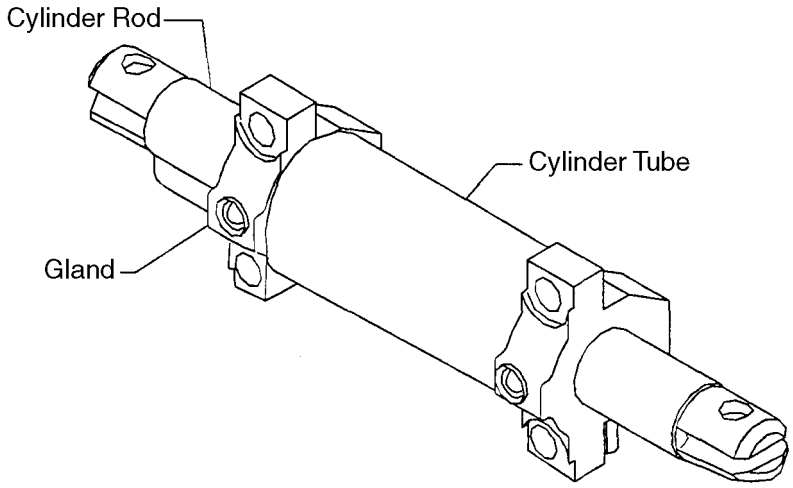


Section 6

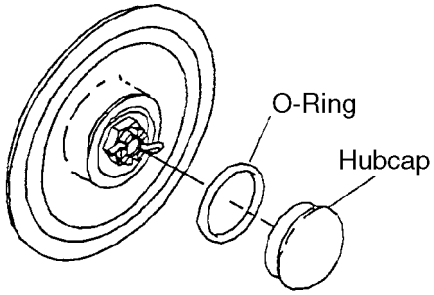
Steer Cylinder Overhaul

IMPORTANT

Before removing any component for overhaul, make sure the correct repair parts, seals, and gasket sets are available.



16. Refit O-ring on hubcap and install hubcap by tapping into place with a rubber or plastic-faced hammer.



Wheel Bearing Adjustment

The steer wheel bearings are retained and adjusted by the wheel nut.

NOTE

You should clean and repack the wheel bearings before performing a wheel bearing adjustment. See "Wheel Bearing Lubrication" in this Section for the complete procedure.

CAUTION

SAFE PARKING. REFER TO PAGE 3.

1. Make sure the truck is parked on a level, hard surface, the upright is fully lowered, the drive wheels are chocked, and the steer wheels are jacked and blocked securely. Refer to "Lifting, Jacking, and Blocking" for safe procedures.
2. Remove hubcap.
3. Remove and discard cotter pin.
4. Loosen wheel nut.
5. After wheel nut is loosened, hit the top of wheel to loosen the bearings. This moves the bearings free of their seated, running position.
6. Rotate hub or wheel counter clockwise and torque wheel nut to 27-31 N·m (20-23 ft-lb).
7. Back wheel nut up until it is loose.
8. While turning the hub or wheel counter clockwise, torque the wheel nut to 2.3-2.8 N·m (1.7-2 ft-lb).
9. Back up wheel nut to nearest castellation slot and install new cotter pin.
10. Recheck for correct bearing adjustment by rotating the wheel by hand. Wheel should rotate freely or with only slight "drag". Readjust bearings by adjusting wheel nut as necessary to avoid binding in bearings.
11. Bend cotter pin tabs over.
12. Pack the area around wheel nut with grease.
13. Refit O-ring on hubcap if removed or replaced and install hubcap by tapping into place with a rubber or plastic-faced hammer.

Steer Axle Disassembly

IMPORTANT

Before removing any component for overhaul, make sure the correct repair parts, seals, and gasket sets are available.

CAUTION

SAFE PARKING. REFER TO PAGE 3.

NOTE

Cleanliness is of extreme importance in the repair and overhaul of this assembly.

- Before starting disassembly, thoroughly clean the axle assembly of all accumulations of dirt, oil, corrosion, and other substances to prevent contamination of the parts during disassembly and overhaul.
- Work in a clean area.
- Keep all parts in order as disassembly progresses. Take care to properly identify each part and its order of removal. If necessary, keep notes and put markings on parts using a non-destructive marker such as a grease pencil or felt-tipped pen.
- If necessary, see Section 3, "Steer Axle Removal and Replacement," for the procedures to remove the steer axle from the truck.
- See Section 5, "Steer Cylinder Removal and Replacement," for the procedures to remove the steering cylinder and steering links from the steer axle.
- See Section 6, "Steering Cylinder Overhaul," to disassemble the steer cylinder.

Hydraulic Fluid and Filter Change

CAUTION

SAFE PARKING. Before working on truck:

1. **Park truck on a hard, level, and solid surface, such as a concrete floor with no gaps or breaks.**
2. **Put upright in vertical position and fully lower the forks or attachment.**
3. **Put all controls in neutral. Turn key switch OFF and remove key.**
4. **Apply the parking brake and block the wheels.**

There is drain plug in the hydraulic sump tank. When the sump tank must be drained of all fluid, the procedure is to remove the drain plug and allow the fluid to drain into a suitable drain pan. Unless the sump tank is to be removed for other repair or maintenance, the hydraulic fluid can also be changed by one of the following methods:

Pressure gauge to the diagnostic check port fitting.

NOTE: Use quick-disconnect adapter fitting.

You will need a drain pan of 24 L (6.3 gal) minimum capacity. Be sure the outlet end of the drain line is directed into the drain pan and held from moving when pressurized.

Turn key switch ON.

Move tilt control lever to the back tilt position to start the lift pump. Hold tilt lever in this position until sump tank is emptied. A steady stream of used oil should flow from the drain line.

Continue operation until the sump tank is emptied. This point will be reached when the pump starts to cavitate. When cavitation occurs the pump speed will increase and the speed sound will whine. Release the tilt lever immediately when pump cavitation occurs.

IMPORTANT

Be careful when sump is nearly emptied and oil flow becomes erratic as the pump approaches cavitation Do not operate pump after cavitation occurs.

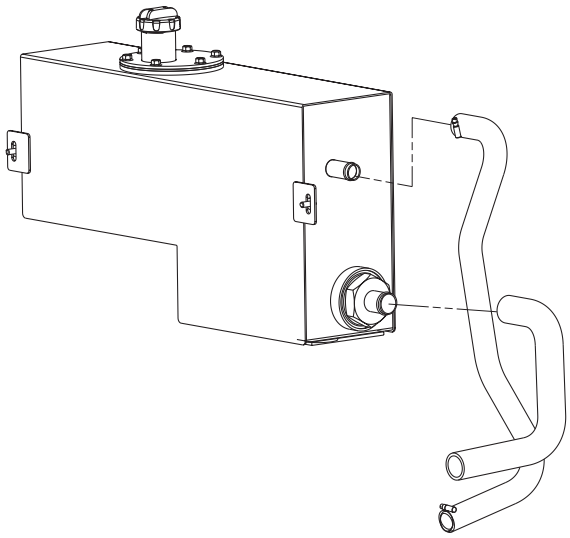
Turn the key switch OFF.

Disconnect drain line from truck.

NOTICE

If old oil is excessively dirty or hydraulic system is contaminated, it is recommended that the sump tank be completely drained by removing the pump suction line from the sump outlet and flushed withy clean oil.

Remove, clean and replace the strainer.



Remove and discard old oil filter. Install new filter. Follow the installation instructions printed on the filter body.

GROUP 30

HYDRAULIC CONTROL VALVE/LIFT CIRCUIT

IMPORTANT

Other hydraulic-related components and circuits are described and illustrated in Group 25, "Steering Column and Gear", Group 26 "Steer Axle", Group 29, "Hydraulic Sump, Filters and Pump", Group 32, "Tilt Cylinders", and Group 34, "Uprights". Refer to these other groups for hydraulic components not covered in this group.

Flowrate per RPM

GEX 20/25

RPM	Hz	Flowrate		Lift Speed	Tilt in velocity		Remark
		lpm	gpm	mm/ sec	mm/ sec	deg/ sec	
500	15	9.7	2.6	82	23.39	3.76	
600	18	11.8	3.1	100	28.45	4.57	
700	21	14.0	3.7	118	33.76	5.43	
800	25	16.1	4.3	137	38.82	6.24	
900	28	18.2	4.8	155	43.89	7.05	
1000	31	20.4	5.4	173	49.19	7.91	
1100	35	22.5	5.9	191	54.26	8.72	
1200	38	24.7	6.5	209	59.56	9.57	
1300	41	26.8	7.1	227	64.63	10.39	
1400	45	28.9	7.6	245	69.69	11.20	
1500	48	31.1	8.2	263	75.00	12.05	
1600	51	33.2	8.8	282	80.06	12.87	
1700	55	35.3	9.3	300	85.12	13.68	
1800	58	37.5	9.9	318	90.43	14.53	
1900	61	39.6	10.5	336			
2000	65	41.8	11.0	354			
2100	68	43.9	11.6	372			
2200	71	46.0	12.2	390			
2300	75	48.2	12.7	408			
2400	78	50.3	13.3	427			
2500	81	52.4	13.9	445			
2600	85	54.6	14.4	463			
2700	88	56.7	15.0	481			
2800	91	58.9	15.5	499			
2900	95	61.0	16.1	517			
3000	98	63.1	16.7	535			
3100	101	65.3	17.2	553			
3200	105	67.4	17.8	572			
3300	108	69.5	18.4	590			
3400	111	71.7	18.9	608			
3500	115	73.8	19.5	626			

* The above are only theoretical value.

- Displacement of pump : 22.5 cc/rev
- Volumetric efficiency of pump : 0.95

GEX 30

RPM	Hz	Flowrate		Lift Speed	Tilt in velocity		Remark
		lpm	gpm	mm/ sec	mm/ sec	deg/ sec	
500	15	8.0	2.1	68	19.29	3.10	
600	18	9.8	2.6	83	23.63	3.80	
700	21	11.6	3.1	99	27.97	4.50	
800	25	13.4	3.6	114	32.31	5.19	
900	28	15.2	4.0	129	36.65	5.89	
1000	31	17.1	4.5	145	41.24	6.63	
1100	35	18.9	5.0	160	45.58	7.32	
1200	38	20.7	5.5	175	49.92	8.02	
1300	41	22.5	5.9	191	54.26	8.72	
1400	45	24.3	6.4	206	58.60	9.42	
1500	48	26.1	6.9	221	62.94	10.12	
1600	51	27.9	7.4	236	67.28	10.81	
1700	55	29.7	7.8	252	71.62	11.51	
1800	58	31.5	8.3	267	75.96	12.21	
1900	61	33.3	8.8	282	80.30	12.91	
2000	65	35.1	9.3	298	84.64	13.60	
2100	68	36.9	9.8	313	88.98	14.30	
2200	71	38.7	10.2	328			
2300	75	40.5	10.7	344			
2400	78	42.3	11.2	359			
2500	81	44.1	11.7	374			
2600	85	45.9	12.1	389			
2700	88	47.7	12.6	405			
2800	91	49.5	13.1	420			
2900	95	47.7	13.6	435			
3000	98	53.2	14.0	451			
3100	101	55.0	14.5	466			
3200	105	56.8	15.0	481			
3300	108	58.6	15.5	497			
3400	111	60.4	15.9	512			
3500	115	62.2	16.4	527			

* The above are only theoretical value.

- Displacement of pump : 19 cc/rev
- Volumetric efficiency of pump : 0.95

Section 2

Tilt Cylinder Checks and Adjustments

CAUTION

SAFE PARKING. Before working on truck:

1. **Park truck on a hard, level, and solid surface, such as a concrete floor with no gaps or breaks.**
2. **Put upright in vertical position and fully lower the forks or attachment.**
3. **Put all controls in neutral. Turn key switch OFF and remove key.**
4. **Apply the parking brake and block the wheels.**

Tilt Cylinder Drift Check

To check tilt cylinder drift, a rated capacity load is placed on the forks, lifted up and held to determine if the tilt cylinder rods moves (drifts) in a specified length of time.

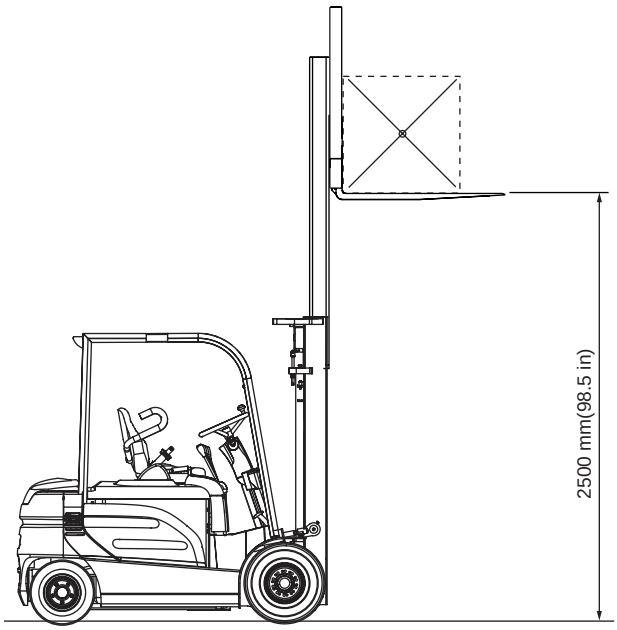
It is recommended that a test load, made up of a full-capacity load equally distributed on a 1220 x 1220 mm (48 x 48 in) pallet, be used. The material used to make up the test load must be stacked to provide load stability and must not extend beyond the pallet. It must be secured on the pallet. Refer to the truck data plate for capacity rating.

1. Adjust fork width as wide as possible to distribute the load. Refer to truck nameplate for capacity rating.

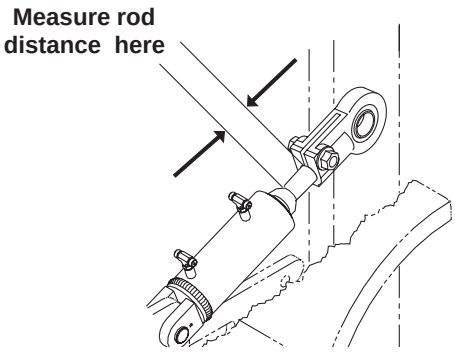
CAUTION

Test load must be stacked stably, not extend beyond the pallet, and be secured on the pallet. Clamp the load on the load backrest or fork bar to avoid sliping out from fork.

2. Drive the forks into the load pallet until the test load and pallet rest against the load backrest. Apply the parking brake and chock the wheels.
3. Raise the capacity load 2500 mm (98.5 in) off the ground and tilt the upright vertical. Shut off the truck.



4. Measure and write down the distance between the cylinder-spacer face and the rod-end yoke.



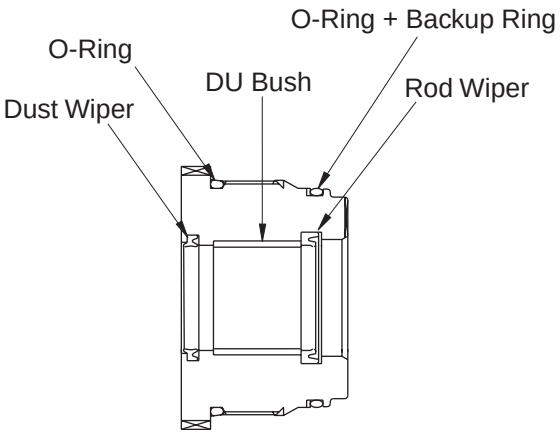
Inspection

1. Carefully clean all parts in an approved solvent and place on a clean surface.
2. Check the piston and rod for damage. Look for gouges, scratches, corrosion, or evidence of unusual wear. Minor surface damage may be repaired by use of fine abrasion cloth or stoning. Deeper damage will require replacement of piston rod assembly.
3. Be sure the threads on rod are undamaged.
4. Inspect the tilt cylinder barrel internal bore for wear, scratches or other damage. Check the outside for damage. Inspect all welds for cracks.
   Deep gouges or pitted surfaces require replacement of parts.
   Check the gland, base end, and ports for cracks or damage that could cause failure. Inspect the ports to be sure they are free of contamination and that the threads are clean and not damaged.
5. Put a light coating of hydraulic fluid on all parts. If parts are to be left disassembled for a period of time, e.g., overnight, they should be covered with a clean cloth.

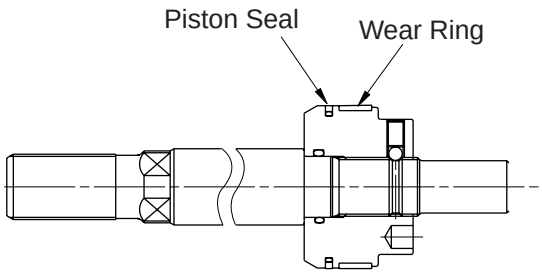
Reassembly

Be sure inside of cylinder and all parts are clean before starting reassembly. Seals may be lubricated with hydraulic oil to assist assembly into cylinder barrel.

1. Install piston dust wiper, rod seal, and O-ring on the gland. Make sure rod seal and dust wiper are installed in proper orientation as shown in the illustration.



2. Replace the piston packing and wearing.

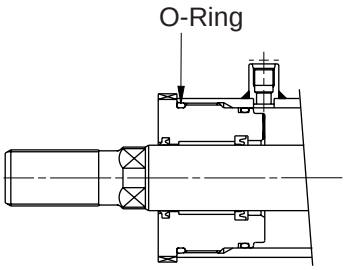


3. Install gland on piston rod. Use gentle pressure and careful movements to avoid damage to the U-cup seal and rod wiper when these parts are moved over the piston rod end.

NOTE

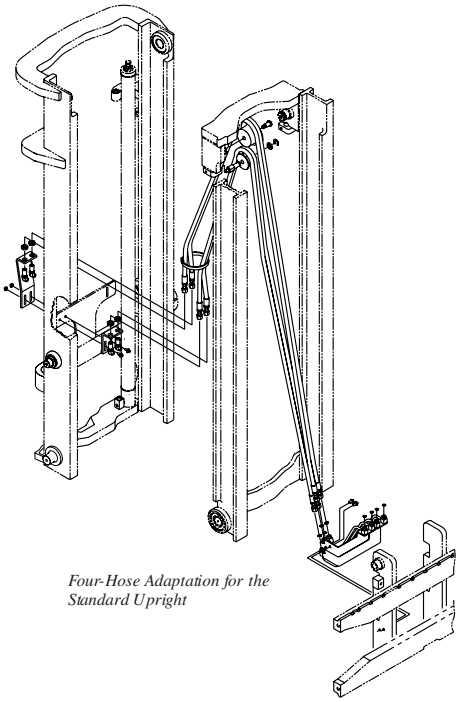
Reassemble cylinder carefully to prevent damage to seal lips and O-rings.

4. Install piston into cylinder barrel. Be careful not to damage the piston seals when installing the piston into end of cylinder.
5. Install gland into cylinder them screw the gland into the cylinder barrel with a hook wrench. When tightening, do not damage the seal. Tighten torque : 60±6 kgf·m

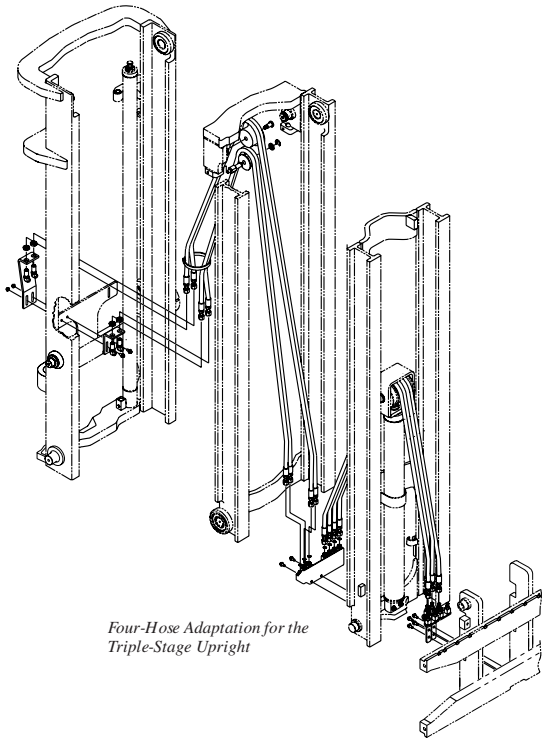


6. Check the assembly by making sure the piston slides freely in and out of the cylinder.

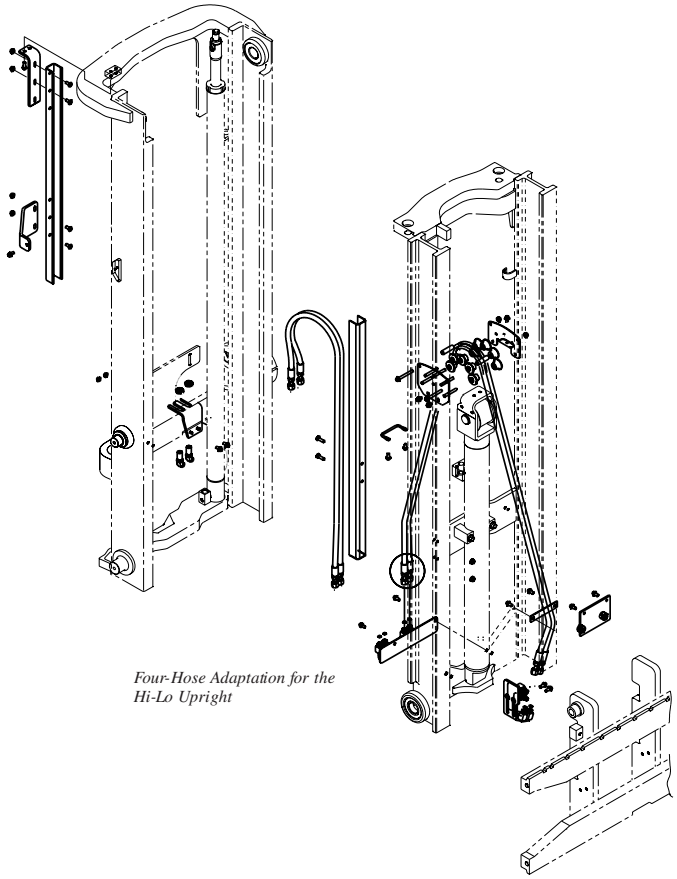
See Section 3 for replacement procedures ; see Section 2 for checks and adjustments before returning the truck to service.



Four-Hose Adaptation for the Standard Upright



Four-Hose Adaptation for the Triple-Stage Upright



Four-Hose Adaptation for the Hi-Lo Upright

IMPORTANT

Never replace a single chain in a set. Always replace the two chains in a set for consistent lift operation. Always replace anchor pins when replacing chains.

1. For example, measure a 305 mm (12 in) segment of the chain that does not roll over a sheave and count the number of links in the segment.
2. Find an area of the chain that normally runs over the sheave. This can usually be identified by wear on the plate edges that roll over the sheave.
3. If the same number of links measures over 315 mm (12.36 in) the chain must be replaced.

If using a chain check ruler, see instructions on the ruler.

Chain replacement procedures appear in Section 6.

Chain Length

IMPORTANT

Perform a chain length check and adjustment every 50-250 hours. Checks and adjustments should also be performed to adjust for chain stretch and tire wear.

Chain length must be adjusted if:

- The fork-to-ground clearance is less than 5 mm (.20 in) or more than 25 mm (1.0 in) when the upright is vertical.
- The center of the bottom carriage roller comes within 20 mm (0.80 in) of the bottom edge of the inner rail.
- The carriage safety stop hits the inner rail stop at full lift height.
- On TSUs and Hi-Lo, the difference between the bottom of the inner rail and the outer rail is greater than 10 mm (0.40 in).

See Section 6 for chain length adjustment procedures.

Chain Tension

IMPORTANT

Center any auxiliary attachments before beginning tension check

1. Raise the upright enough to put tension on the chains to be checked.
2. Push the chains forward and pull them backward; the amount of tension should be equal on both sides.

WARNING

Do not reach through the upright to push chains for tension check.

3. If one chains moves more than the other;
   a. Lower the forks to ease tension on the chains.
   b. Adjust chain adjustment nuts for equal tension on both chains. See Section 6 for chain adjustment procedures
4. Repeat the tension test and make adjustments until the tension is equal on both chains when the carriage and upright are raised.

Carriage and Upright Weldments

The carriage and upright should be checked for fatigue cracks and bent components every 2000 hours or every year..Fatigue cracks start in areas of stress after a high number of load cycles. Stress concentrations typically exist in welded joints, in the area around a welded joint, or in the corners of parts. Dye penetrant, magnaflux, or other crack detection methods can be used to find or trace cracks. If cracks are found in any structural weldment, the component should be replaced before returning the truck to service.

- Bent components indicate excessive loading or high impacts to the weldments. Bent components are usually structurally damaged and should be replaced.
- Inspect roller contact patterns on the rail sections. Roller contact patterns should be smooth and regular.
  - In some applications, it may take up to 500 hours of operation to develop a roller contact pattern on the flange of the rail.
  - In applications where heavy loads are common, a rail lubricant may be required to allow proper wear-in on the roller.
- Check rails and carriage for wear due to undesirable contact between components. Such contact can be an indication of broken rollers, loose components, foreign objects or debris on the upright, or a broken weldment.
  - If contact or rubbing exists, the condition must be corrected immediately.
  - Rail and carriage weldments with damage should be replaced.

Upright Rollers

1. Remove the carriage as described in Section 7 of this Group.
2. Fully extend the upright making sure carriage hoses and chains are secured out of the way to prevent damage.

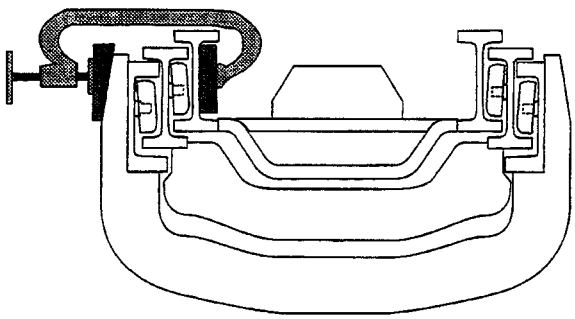
WARNING

An upright or carriage can move unexpectedly:

- **Do not walk or stand under raised forks**
- **Keep clear of load and carriage when making any check or adjustment**
- **Keep your arms and fingers away from moving parts of the upright.**
- **Do not reach through open areas of the upright.**
- **Never attempt to move or align the rails by hand. Use a prybar.**
- **Use an approved safety platform to reach the upper areas of the upright. Never use the upright as a ladder.**

Failure to follow these warnings can result in serious injury.

3. Follow the "General Roller Side Clearance Checking Procedure" given earlier in this Section.
   The clamping procedure is as illustrated below.



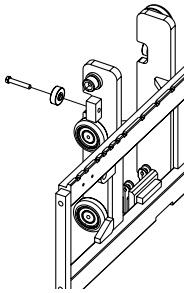
Internal Thrust Roller Adjustment

The internal thrust rollers should be adjusted to extend 0-0.75 mm (0.03 in) into the top carriage roller side clearance. Carriage roller side clearance should be within tolerances before you adjust the thrust rollers.

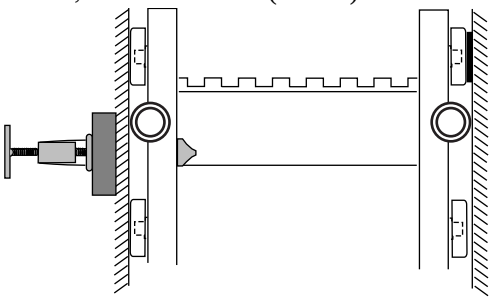
NOTE

Carriage must be replaced on upright before adjusting internal thrust rollers. See Section 8 for carriage replacement procedures.

1. Lift the carriage to the top of the inner rail.
2. Loosen the jam nut on the back of the thrust roller cap screw and then loosen the cap screw. Rotate the bearing to pivot toward the carriage and away from the rail.



3. Lower the carriage to a convenient height to do the adjustment.
4. Clamp the carriage between the top and middle carriage roller.
   - Use a shim block under the clamp on the outside of the channel rail.
   - Torque on the clamp should not exceed 25 N·m (20 ft-lb).
5. Insert a 0.5 mm (0.02 in) temporary shim between the top carriage roller and the rail web on the side opposite the clamp. If a 0.5 mm (0.02 in) shim will not fit, insert a 0.25 mm (0.01 in) shim.



IMPORTANT

Use extreme care that you do not make nicks and burrs on the interior surface area of the cap or cylinder or the piston.

Parts Inspection and Service

1. Clean all parts completely in a suitable solvent. Dry all parts with a soft clean cloth.
2. Inspect cylinder barrel and bore for cracks, pining, scoring, or other irregularities that may require replacement of the barrel.
3. Inspect the piston and rod for nicks, scratches, scoring, or other defects that may demand new parts.
4. Check all gland and piston seal grooves for nicks, burrs, and scratches that can damage seals during reinstallation.
5. Inspect and clean the check valves.
6. Inspect all seals, including the check valve O-ring.

NOTE

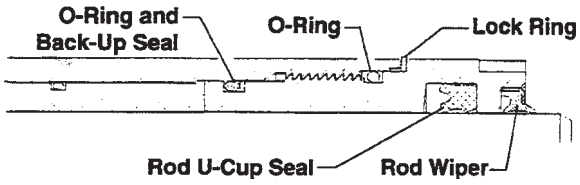
Minute imperfections inside the cylinder barrel or on the piston or rod may be improved for acceptable use by careful honing. However, removal of material that produces a notch, groove, or out-of-roundness may cause excessive leakage during operation and a shortened life.

7. Use new parts as necessary. Always use the Packing Kit listed in the parts manual. New kits include all the seals, wiper rings, wear rings and O-rings necessary for the particular cylinder.

Cylinder Reassembly

Take care when installing these parts to make sure that no parts are damaged.

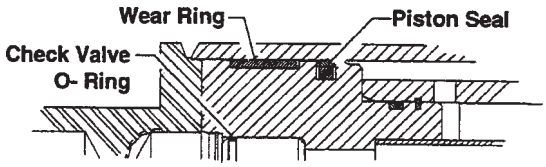
1. Coat all packing, seals and rings in clean, hydraulic oil (Clark part number 1800236 qt., 1802155 gal.) prior to reassembly. Coat the inside of the gland nut bore with hydraulic oil.
2. Replace the U-cup seal (groove toward bottom of cylinder), rod wiper, and O-ring and back-up seals on the gland.



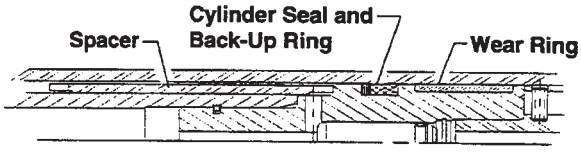
NOTE

O-rings should be carefully installed to eliminate cuts or twisting.

3. Replace the piston seals:
   a. Primary cylinder pistons require a piston seal and wear ring. Install the piston seal from the top of the rod. Use a ring compressor to compress the piston seal. This prevents damage to the seal during reassembly.



   b. Piston-type lift and secondary cylinder require a cylinder seal, a back-up ring, and a wear ring on the piston. Install the cylinder seal from the top of the rod.



4. For protection against corrosion, lubricate spacers (where used) with petroleum-based hydraulic fluid. Slide the spacer onto the rod.

Section 7

Fork and Carriage Removal and Replacement

CAUTION

SAFE PARKING. Before working on truck:

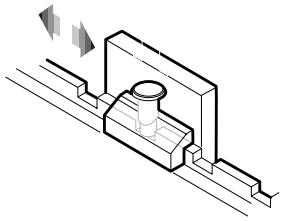
1. **Park truck on a hard, level, and solid surface, such as a concrete floor with no gaps or breaks.**
2. **Put upright in vertical position and fully lower the forks or attachment.**
3. **Put all controls in neutral. Turn key switch OFF and remove key.**
4. **Apply the parking brake and block the wheels.**

Fork Removal

NOTE

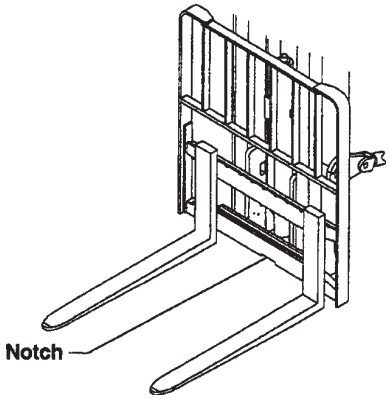
Forks do not need to be removed to remove the carriage.

1. Release the fork latches.



Latch Operation

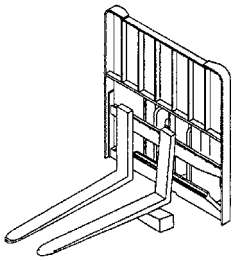
2. Move each fork to the notch on the bottom of the lower carriage cross bar.



3. Lift tip of each fork and put a 100 x 100 mm (4 x 4 in) block under the fork arm near the heel.

CAUTION

Forks weight 44-99 kg (97-220 lbs) each. Take care when lifting.



Blocking the Fork

4. Push down on tips of the forks to disengage the fork hooks from the carriage fork bar.
5. Lift fork heel and remove block.

CAUTION

Forks are not stable sitting free in upright position. Use care when working around the forks.

6. Back the truck away from the forks.

Fork Replacement

1. Carefully drive truck up close to forks.

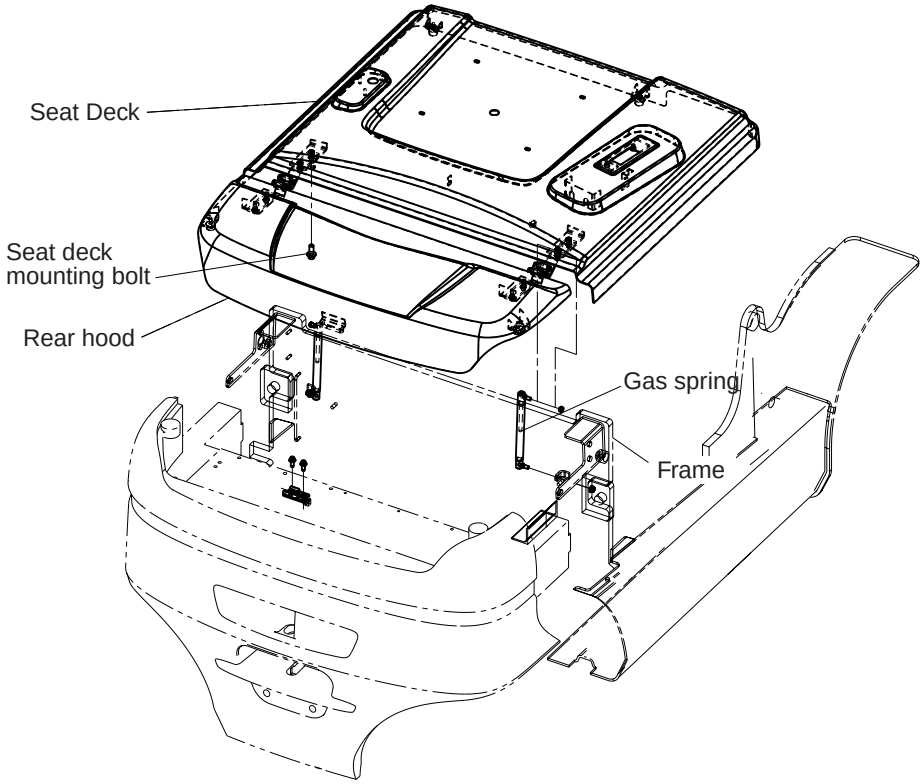
CAUTION

Forks are not stable sitting free in upright position. Use care when working around the forks.

2. Drag forks into position close to carriage and to line up with the notche on the lower carriage cross bar.
3. Lift fork heel and place block under arm near the heel.

Section 1

Counterweight Specifications and Description



4. Remove the hood mounting fasteners and remove the hood.

Reinstallation.

1. Reinstall the hood in reverse order that it was removed.

WARNING

Failure to follow this reinstallation procedure may result in operator injury. Ensure full latch engagement for battery retention.