Bendi B3/30 AC

Maintenance Manual

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To be performed after 1st 50 hours of truck operation
in addition to the required pre-shift daily inspection

Forklift 1st 50 Hour Inspection	Status	Landoll / Bendi AC
SAFETY & OPERATIONAL CHECKS **Have a qualified technician correct all problems.**	**OK - Yes, No**	**Maintenance Note if Applicable**
Mast chains-Inspect, clean and lubricate.		
Power Steering System-Inspect and Fill.		
Drive wheels, Re-Torque lug nuts (225 Ft.-lbs.).		
Gear Box-Drain, flush and refill.		

Date Inspector:	Truck No.	Model No.	Location	Serial No.	Shift	Hr Meter	Battery Fluid	Hydraulic Oil

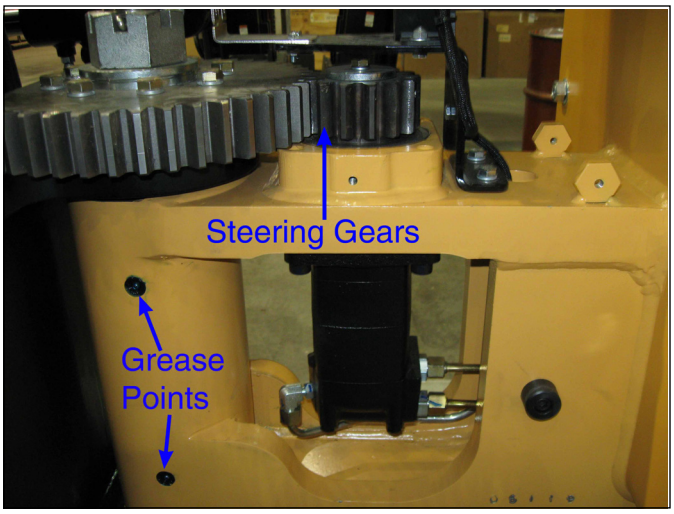


Figure 1-3 Rotation Bearing Grease Points

Torque Specifications

Component	Torque
Wheel	225 ft. lbs. (305 Nm.)
Fluid draining and filling plug	16 ft. lbs. (22 Nm.)
Hydraulic braking unit and brake cable	37 ft. lbs. (50 Nm.)
Drive motor with vehicle frame	130 ft. lbs. (176 Nm.)
Hydrostatic Steering Control Unit	
Plug and o-ring assy #8 SAE fitting	Refer to Torque Chart - Page 1-19
Steer control unit assy bolt (M8 X1.0)	18-23 ft. lbs. (24-31 Nm.)
Mounting bolts	23-25 ft. lbs. (31-34 Nm.)
Mast and Side Shift Mechanism	
Chain guard capscrews	48-52 ft. lbs. (65-71 Nm.)
Main lift cyl. plunger retainer	95-125 ft. lbs. (129-169 Nm.)
Free lift cyl. plunger retainer	275-300 ft. lbs. (373-407 Nm.)
Carriage roller capscrews	70-80 ft. lbs. (95-108 Nm.)
Chain and hose sheave screws	26-30 ft. lb. (35-41 Nm.)
Lift chain adjusting nuts	50-70 ft. lbs. (68-90 Nm.)
Backrest screws	145 ft. lbs. (197 Nm.)
Side shift mounting hooks	115-125 ft. lbs. (156-170 Nm.)

Fluid Capacities

Item	Capacity -Quarts (Liters)
Hydraulic Tank	11.6 gallons (44 liters)
Brake Fluid	0.21 quarts (0.20 liters)
Gear Box	16 oz.

Chapter 2

Tires, Brakes and Drivetrain

Floor Plate

NOTE

While not absolutely necessary for many of the repairs described in this section, sometimes the removal of the floor plate can decrease the required downtime needed for maintenance work. The floor plate removal and reassembly takes only a few minutes, and for this reason, it is described early in this chapter.

When instructions are given for repairs in this chapter, it will automatically be assumed that the floor plate has been removed.

Floor Plate Removal and Assembly

This panel provides access to the accelerator assembly which is mounted to the underside of the floor plate. The master cylinder and service brake pedal and linkage are mounted within the frame well, easily accessible when the floor plate has been removed.

1. Thoroughly clean the floor area using a vacuum.
2. Lift up the rubber floor mat, carefully separating it from the accelerator and brake pedal. (See Figure 2-1)
3. Remove the 5/16”-18 floor plate fasteners.
4. Remove the left floor plate from the truck frame.
5. Carefully lift up the right floor plate a few inches. The accelerator pedal assembly will still be attached to the floor plate by the accelerator wiring harness. Unhook the accelerator harness and lift away the floor plate.
6. Assemble in reverse procedure.

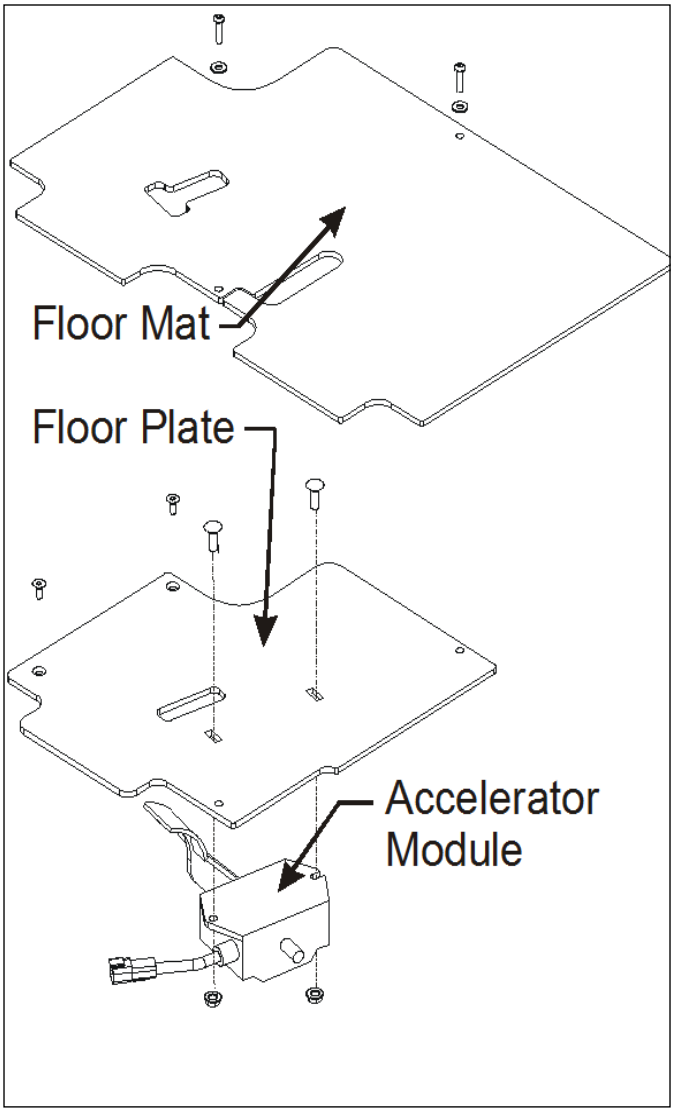


Figure 2-1 Floor Plate Assembly

Parking Brake Assembly

The parking brake assembly is used for holding the forklift in place while unattended; it is activated by pulling the park brake lever.

Adjusting Parking Brake Cable

1. First, review “Before You Begin,” page 1-2.
2. Set the key switch to OFF, remove the key from the key switch and disconnect the battery.
3. Make sure all the other wheels are securely blocked so that the truck cannot move.
4. Remove the floor plates.
5. Loosen adjustment bolt jam nut.
6. Remove emergency brake yoke pin.
7. Turn emergency brake yoke to adjust desired brake cable tension.
8. Replace yoke pin nut and tighten.

IMPORTANT

The adjustment should be set that so when the park brake lever is screwed all the way out (completely counterclockwise) and the lever is pulled to its full vertical position, the parking brake holds the wheel as stated in the section “Checking Parking Brake Adjustment”, on page 2-9.

9. Tighten adjustment bolt jam nut.
10. Reassemble in reverse order.

IMPORTANT

The parking brake cable assembly and bracket will be loose when hardware is removed. Remove the parking brake assembly carefully so that the actuator pins, yoke, and parking brake springs do not fall out.

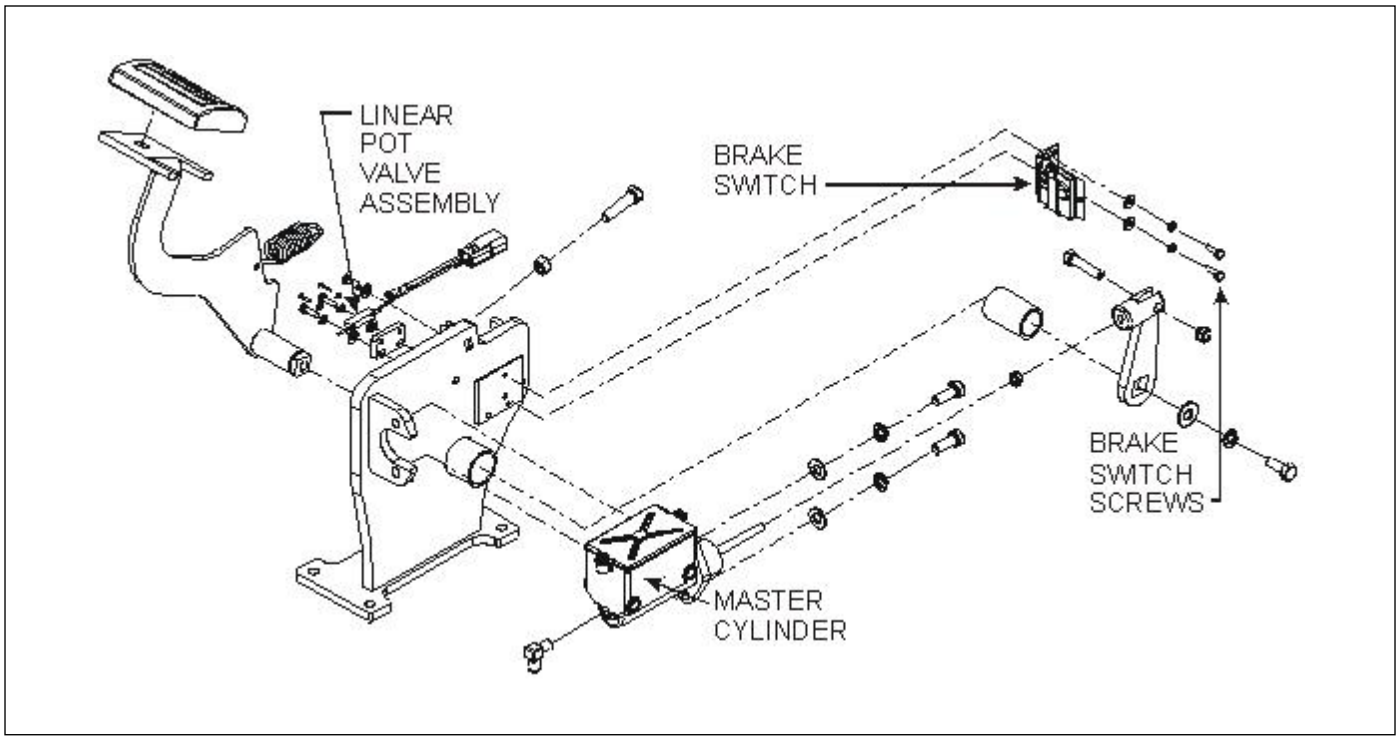


Figure 2-5 Brake Pot and Switch

Brake Pedal Assembly

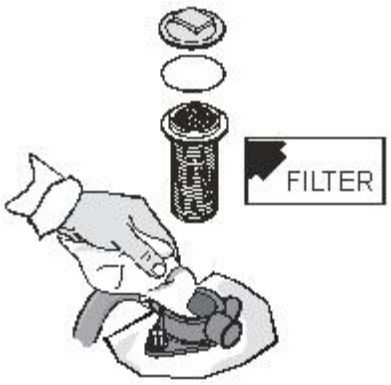
NOTE

The two piece floor plate gets removed to provide access to the brake pedal and accelerator pedal which is mounted to the underside of the floor plate. The master cylinder and service brake pedal and linkage are mounted within the frame well.

Brake Pedal

The service brake pedal has about 1" maximum free-play before any pressure is applied to the brakes, (or before the pedal moves the master cylinder plunger).

The pedal also has a maximum range of travel of up to only 0.500” (12.7 mm) before it contacts the positive stop hex screw, and includes a brake light switch that energizes the brake STOP lights, where applicable, and has a switch for disengaging traction drive. The brake light/accelerator switch is factory set to trip just as the brake pedal begins its downward stroke.



Checking and Adjusting Hydraulic Pressure

⚠ WARNING

HIGH PRESSURE FLUIDS CAN BE DANGEROUS! Before continuing with this section, read about the warnings of pressurized hydraulic oil under "Hydraulic System" Warning page 1-5.

NOTE

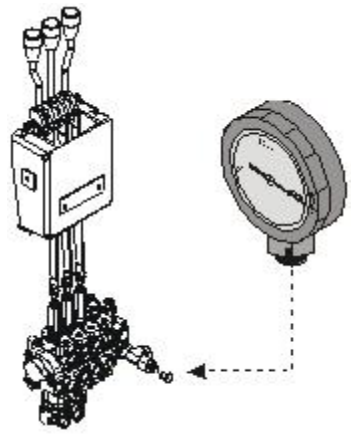
For ease of checking hydraulic pressure, Landoll offers a Pressure Check Kit (P.N. 0018152) which includes a 5000 p.s.i. (344.7 bar) gauge, hose and a quick-coupler assembly. If you are using your own system, have shop rags, oil absorbent and a small container ready to collect any oil spills.

1. For this test, make sure that the hydraulic tank has plenty of oil.
2. Set the key to OFF, remove the key from the key switch and disconnect the battery.
3. Remove the control valve cover, located to the right of the driver's seat.
4. Operate the function joystick briefly to relieve any system pressure.
5. Connect the pressure check kit quick-coupler (female end) to the coupler (male end) on the control valve.
   - If you are not using the pressure check kit, remove the quick-coupler and install an appropriate fitting to accept your pressure gauge arrangement
   - Have rags handy to collect any oil leakage.
   - Install your 5000 psi (344.7 bar) gauge arrangement to the tee fitting.
   - All parts connected to the gauge port must be capable of handling up to 5000 p.s.i. (344.7 bar).
   - To adjust pressure, the truck (pump) must be running to create hydraulic pressure. Always pay careful attention when servicing while the truck is running. To check or set the pressure, you must pull the tilt lever to dead head the cylinder to build pressure, then set the relief valve.
6. Loosen the relief valve jam nut.
7. Start the truck.
8. Adjust the valve stem by turning clockwise to increase pressure, counterclockwise to decrease pressure. This procedure adjusts the pressure relief valve setting.
9. Release the joystick immediately once the pressure is set at 2600 psi. (179 bar)

IMPORTANT

Do not hold a hydraulic joystick (bottomed out) for excessive periods of time. Extreme pressure is applied to the system which can, over periods of time, generate heat and damage oil and internal components.

10. If the pressure is low and cannot be adjusted to the proper value, check the pump and make sure there are no leaks in the hydraulic system. If the pressure is too high and cannot be adjusted to the proper pressure, replace the relief valve.
11. Tighten the relief valve lock nut.
12. Set the key to OFF, remove the key from the key switch, and disconnect the battery.
13. Operate the function joysticks momentarily to relieve system pressure.
14. Remove the pressure gauge quick-coupler or remove your gauge arrangement.
15. Start the truck.
16. Left and lower the mast a few times to check the hydraulic system for leaks.
17. Set the key to OFF and disconnect the battery.
18. Reassemble all covers and panels that were previously removed.



Steering Wheel Removal

1. Pry the plastic cover from the steering wheel using your finger tips. If you cannot grab the cover, you can start it by carefully using a medium sized flat blade screw driver and gently prying upwards. **DO NOT** force it or the cover may crack.
2. Loosen the steering wheel nut.
3. Remove the steering wheel.

NOTE

If the steering wheel is difficult to remove, use a commercial puller. With this tool, it should remove easily.

4. Install the steering wheel by placing it over the shaft, aligning the wheel and shaft splines and pushing downward evenly until the nut can be installed.
5. Tighten the nut.

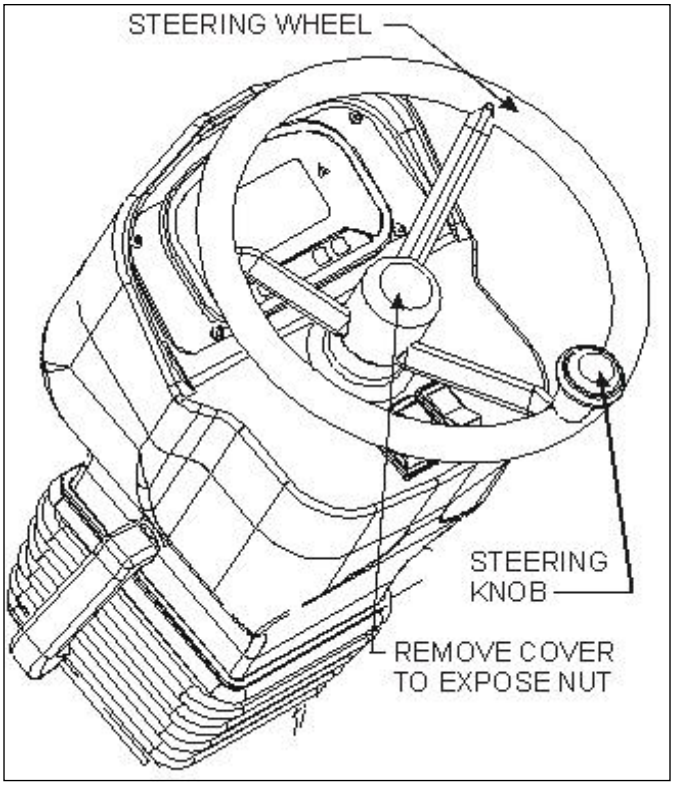


Figure 4-4 Steering Wheel and Knob

Steering Column (Console) Removal

NOTE

This is a two man operation, due to weight of steering column (approximately 30 pounds/14 kgs.). If an overhead crane is available, the crane could be strapped to the steering wheel for support.

1. Remove floor plates. (See “Floor Plate Removal,” page 2-1)
2. Remove the lower dash cover weldment.
3. Disconnect the plugs that connect the dash harness to the main harness and any optional lighting harnesses.
4. Relieve hydraulic pressure in the system by turning the steering wheel a few times to the left and right.
5. Also pry (up) the bellows (rubber boot) free of the bellows retainer plate. This exposes the mounting plate for the steering column and the orbital control unit.

IMPORTANT

Four screws secure the assembly to the orbital steering mount bracket for stability. Once removed the unit is supported by the hydraulic hoses only.

6. Remove the four bolts and hardware securing the orbital control unit to the steering column.
7. Remove the four bolts and hardware securing the steering column console to the bellows retainer plate. (See Figure 4-5)
8. With help, lift the steering column upwards to disengage the shaft from the orbital unit, then remove the steer column from the truck.
9. When installing the new steer column, you must turn the steering shaft until it aligns with the orbital unit and drops into place.
10. Continue by reversing the preceding steps making sure to tighten and torque all mounting screws (See General Torque, Hydraulic Fitting Torque, and Bendi AC Special Torque Tables in on page 1-18)

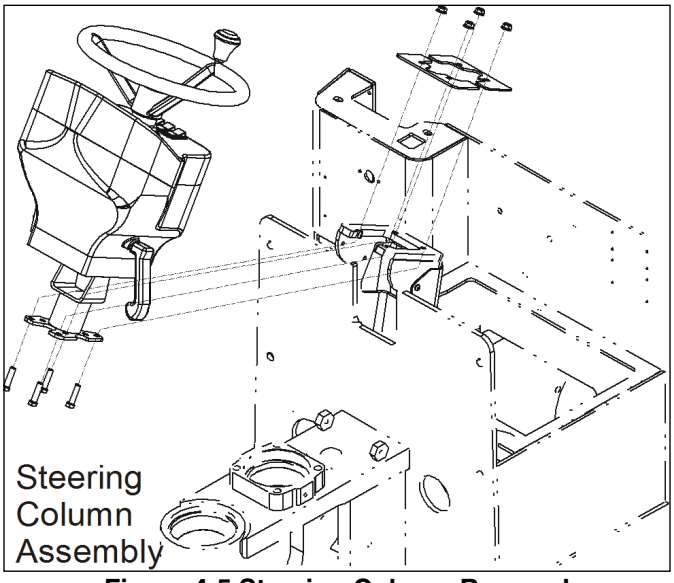


Figure 4-5 Steering Column Removal

Chapter 5

Bendi B3/30 AC Calibration and Programming

Controller Theory of Operation

The Bendi AC truck uses Curtis controllers that convert DC battery power to 3-phase AC power by precisely controlling the induction drive for high bandwidth, efficiency and low ripple torque generation.The Dual Drive feature of Curtis controllers allows two controllers to work together in vehicles with dual fixed axle drive motors, a steered wheel or axle, and an analog steer-angle sensor. The two controllers should be the same size and model. Different models of controllers cannot be mixed. The pair of controllers control motor speed on the inner and outer wheels during turns, as well as vehicle speed and acceleration while turning. Current is automatically balanced between the two traction motors when driving straight, and a limited operating strategy (LOS) allows limp-home in case of a steer angle sensor or single motor or controller failure.

Below is shown the Dash Display for reference:

Button **#1 "Enter Key"** - Used to Enter the Calibration Mode and to make selections after they are located.

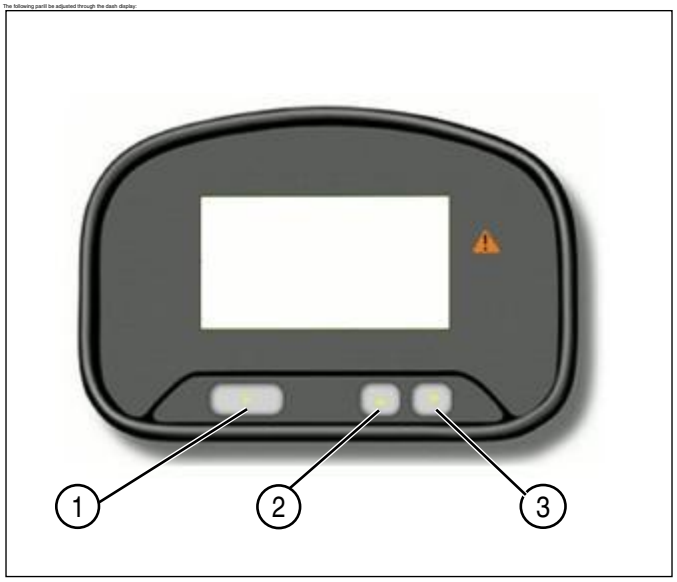
Display directions:

Hold the enter button down until the change is accepted.

Button **#2 "Up Key"** - Moves "Up" through the selections.

Button **#3 "Down Key"** -Move "Down" through the selections.

The following parameters can be adjusted through the dash display:



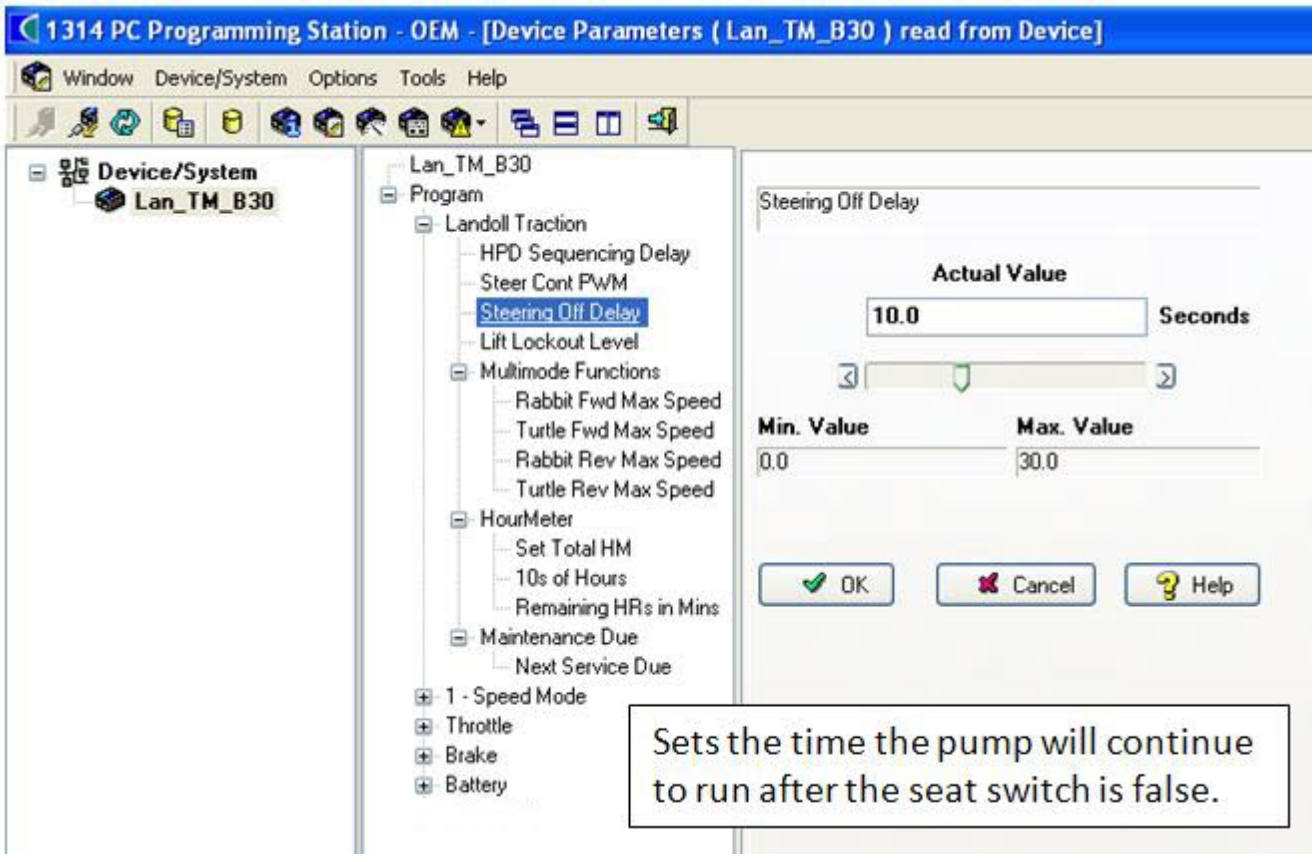
The following parameters can be adjusted through the dash display:

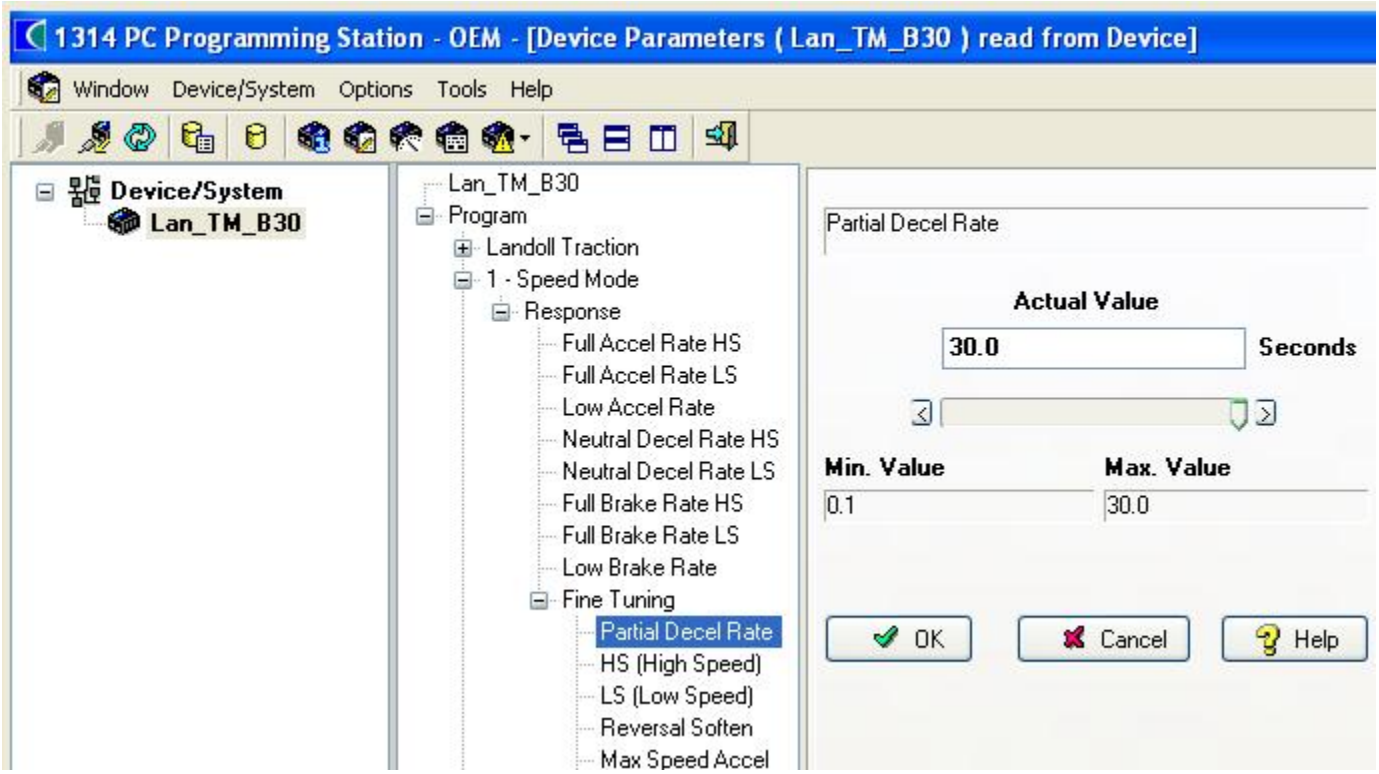
- **Maintenance Monitor - Used to set the hour meter value at which the operator will be alerted that service is required, NXT SVC DUE. When the truck meets or exceeds the value entered in this section, "SERVICE DUE" will be shown on the display. If this feature is not desired, set the value to the factory default of 99900 hrs. Use the Up/Down arrows to manipulate the values by the hundreds.**
- **Steer Potentiometer(POT) Setup - Used to calibrate the steering position potentiometer.**
- **Accelerator Potentiometer(POT) Setup - Used to calibrate the accelerator potentiometer.**
- **Lift Potentiometer(POT) Setup - Used to calibrate the lift potentiometer.**
- **Brake Potentiometer(POT) Setup - Used to calibrate the brake potentiometer.**
- **Lift Lockout Setup - This parameter allows for adjustment of the battery capacity percentage where lift lockout is initiated.**

IMPORTANT

When replacing the steering, brake, acceleration or lift potentiometer maintenance has been performed, re-calibration of the Bendi AC is required.

Intentionally left blank for sevice technician notes.

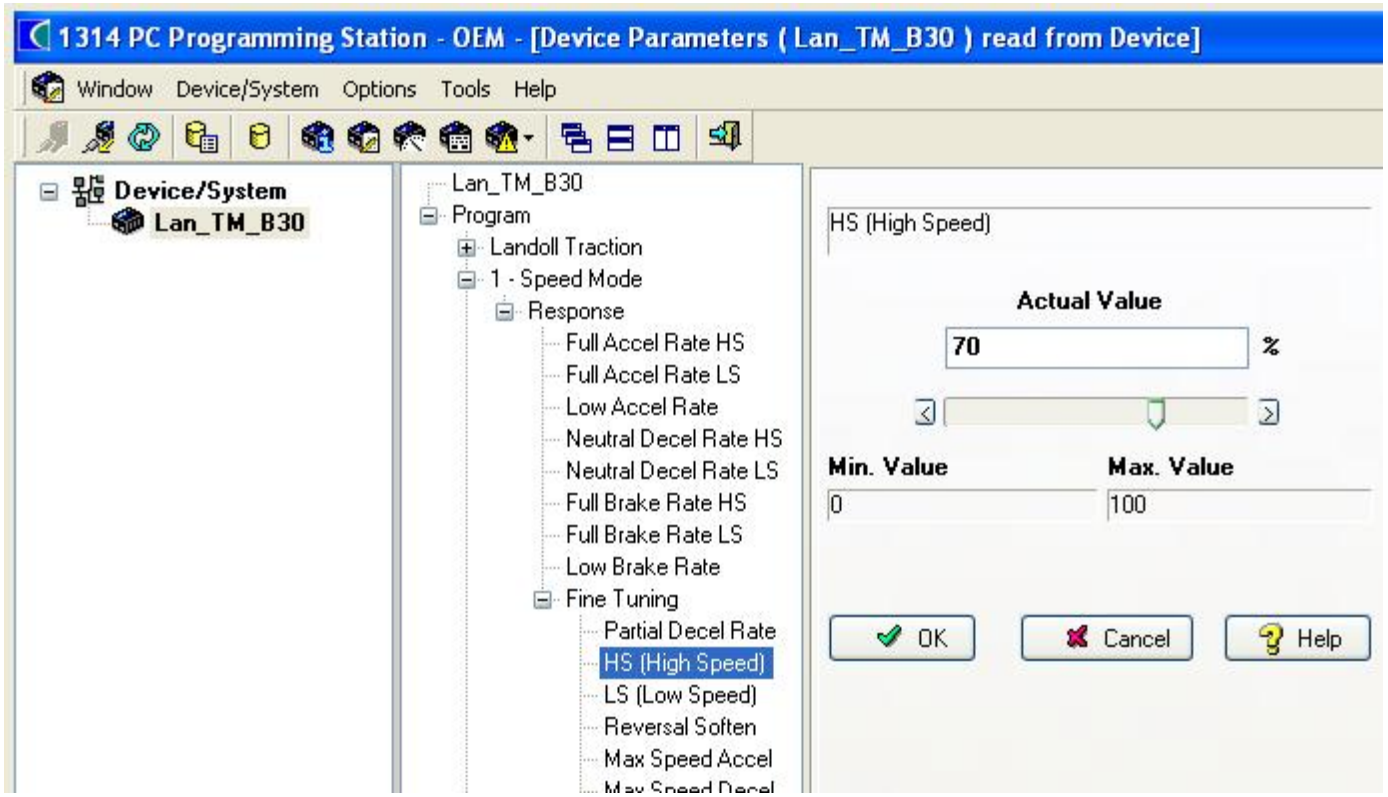


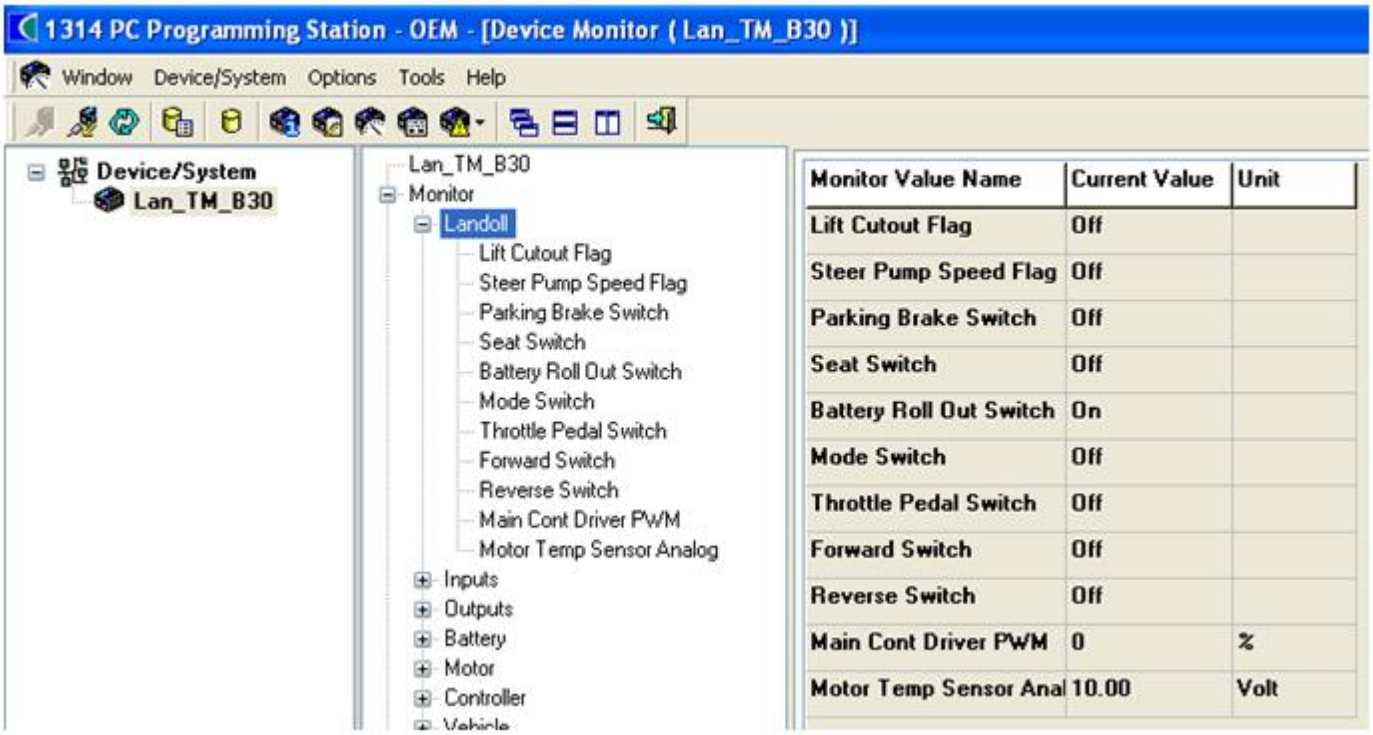


Low Accel Rate: **Above** - Sets the rate at which the speed command increases when a small amount of throttle is applied. Typically adjusts low speed control.

Neutral Decel Rate HS: Below - Sets the rate that slows down the vehicle when the throttle is released to neutral at high vehicle speeds.

Neutral Decel Rate LS: **Above** - Sets the rate that slows down the vehicle when the throttle is released to neutral at slow vehicle speeds.





"Landoll" Parameter Details:

"LIft Cutout Flag" "on" when in Lift Lock Out.

"Steer PumpSpeed Flag" "on" when in forward or reverse AND driver is on the seat.

"Seat Swith" "on" when operator is on seat.

"Battery Roll Out Switch" - Optional Feature - check to see if jumper is in place on battery roll out connector.

"Mode Switch" in Turtle mode is "off" and in Rabbit mode is "on"

"Throttle Pedal Switch" - safety switch on accelerator that disables/enables throttle command.

"Forward Switch" is "on" when in Forward.

"Reverse Switch" is "on" when in Reverse.

"Main Cont Driver PWM" - 100% setting to pull in contactor and 80% to hold contactor.

"Motor Temp Sensor Analog" - Linear Thermocouple reading.

CODE	PROGRAMMER LCD DISPLAY	T	P	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
22	**Controller Overtemp Cutback** *Reduced drive and brake torque.*	X	X	1. See Monitor menu » Controller: Temperature. 2. Controller is performance-limited at this temperature. 3. Controller is operating in an extreme setting. 4. Excessive load on vehicle. 5. Improper mounting of controller	*Set:* Heat sink temperature exceeded 85°C. *Clear:* Bring heat sink temperature below 85°C.
23	**Undervoltage Cutback** *Reduced drive torque.*	X	X	1. Normal operation. Fault shows that the batteries need recharging. Controller is performance limited at this voltage. 2. Battery parameters are misadjusted. 3. Non-controller system drain on battery. 4. Battery resistance too high. 5. Battery disconnected while driving. 6. See Monitor menu » Battery: Capacitor Voltage. 7. Blown B+ fuse or main contactor did not close.	*Set:* Capacitor bank voltage dropped below the Undervoltage limit (see page 55) with the FET bridge enabled. *Clear:* Bring capacitor voltage above the undervoltage limit.
24	**Overvoltage Cutback** *Reduced brake torque.*	X	X	1. Normal operation. Fault shows that regen braking currents elevated the battery voltage during regen braking. Controller is performance limited at this voltage. 2. Battery parameters are misadjusted. 3. Battery resistance too high for given regen current. 4. Battery disconnected while regen braking. 5. See Monitor menu » Battery: Capacitor Voltage.	*Set:* Capacitor bank voltage exceeded the Overvoltage limit (see page 55) with the FET bridge enabled. Clear: Bring capacitor voltage below the Overvoltage limit.
25	**+5V Supply Failure** *None, unless a fault action is programmed in VCL.*	X	X	1. External load impedance on the +5V supply (pin 26) is too low. 2. See Monitor menu » outputs: 5 Volts and Ext Supply Current.	*Set:* +5V supply (pin 26) outside the +5V±10% range. *Clear:* Bring voltage within range.
28	**Motor Temp Hot Cutback** *Reduced drive torque.*	X	X	1. Motor temperature is at or above the programmed Temperature Hot setting, and the requested current is being cut back. 2. Motor Temp Control Menu parameters are mis-tuned. 3. See Monitor menu » Motor: Temperature and » Inputs: Analog2. 4. If the application doesn't use a motor thermistor, Temp Compensation and Temp Cutback should be programmed Off.	*Set*: Motor temperature is at or above the Temperature Hot parameter setting. *Clear:* Bring the motor temperature within range.
29	**Motor Temp Sensor Fault** *MaxSpeed reduced (LOS, Limited Operating Strategy), and motor temperature cutback disabled.*	X	X	1. Motor thermistor is not connected properly. 2. If the application doesn't use a motor and motor thermistor, Motor Temp Sensor Enable should be programmed Off. 3. See Monitor menu » Motor: Temperature and » Inputs: Analog2.	*Set:* Motor thermistor input (pin 8) is at the voltage rail (0 or 10V). *Clear:* Bring the motor thermistor input voltage within range.
31	**Coil1 Driver Open/Short** *ShutdownDriver1.*	X	X	1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring.	*Set:* Main contactor driver (pin 6) is either open or shorted. This fault can be set only when Main Enable = Off. *Clear:* Correct open or short, and cycle driver.

Measuring Chain Stretch

If the chains stretch beyond the recommended amount, they should be replaced in pairs. Chain stretch can be measured with a chain wear scale. (See Figure 6-4) The scale indicates whether the distance between two chain links is within tolerance. The shaded area in the illustration, compares a stretched chain, to a new chain. Measure the chains according to the instructions printed on the chain wear scale, without load on the carriage.

- To check the free lift chains, raise the carriage 1 ft. (30 cm) off the ground to put tension on the chains.
- To check the main lift chains, raise the mast until the inner upright starts to extend putting tension on the chains.

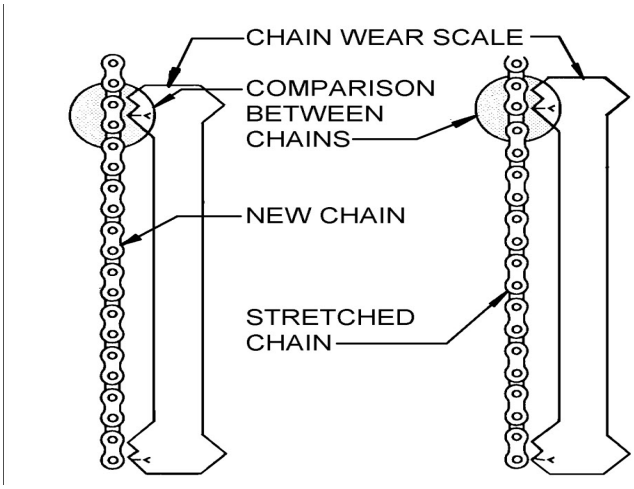


Figure 6-4 Measuring Chain Stretch

Check Primary Lift Chain

1. Park the truck on a flat, level surface, with the parking brake fully engaged.
2. Set the mast in the center of the truck, facing straight ahead, level to the floor and empty. (unloaded)
3. Set the key switch to OFF, remove the key and place in a secure area.
4. Measure the distance from the floor to the bottom heel of each fork tine. Measurement must be 1/8" (3.175 mm) minimum to 1/4" (6.35 mm) maximum.

If it is not within 1/8" to 1/4" (3.175 mm to 6.35 mm), adjust the primary lift chain accordingly.

Check Lift Operation

1. Check the lift cylinders to ensure proper sequencing. If adjustment is needed, see "Chain Adjustment" on page 6-2 or supplier information in Chapter 7.
2. Check to see that an unloaded mast will completely lift to full lift height. (the relief valve opens) If it will not, check the hydraulic oil level in the reservoir; add oil if necessary.
3. Load the mast and raise it approximately to 5'. (1.524 m) quickly lower the mast until it is about 6". (1.524 mm) above the floor and stop the mast abruptly.
4. Make sure the elevating channel rollers maintain proper contact with the mast channel.
5. Look for signs of galling where the rollers contact the rail. Galling is indicated by track marks in the rails that are 1/4" to 1/2" (6.35 mm to 12.7 mm) wide running up the rail. Normal track marks are no more than 1/4" (6.35 mm) wide.
6. If galling is detected, adjust the rollers for the proper clearance over the full length of the mast rails. (See "Inspection Check List" beginning on page 1-8)

Checking and Adjusting Degree of Tilt

1. To check degree of tilt, be certain the truck is on a smooth, level surface.
2. Tilt the mast completely back. Place the tilt gauge against the rear outer mast rail on the right side of the truck.
3. If equipped with a mast that has a fork height greater than 240", available tilt is limited to 1 degree forward and 2.1 degrees back. The standard tilt is 3 degrees forward and 3.1 degrees back for masts of 239" or lower. When testing a standard truck equipped with a mast gauge, the gauge must read between 3.0 and 3.1, while the taller mast must read between 2.0 and 2.1 degrees of rear tilt.
4. To adjust the degree of tilt, tilt the mast fully backward.
5. Set the key switch to OFF and remove the key from the key switch.

⚠ CAUTION

Do not service the tilt cylinder while the key switch is ON. If a joystick, steering wheel or accelerator pedal is accidentally moved, you could be caught between the mast and the truck, causing serious injury.

6. Loosen the tilt cylinder adjuster bolt.
7. Continue to loosen the tilt cylinder adjuster bolt until there is no bolt pressure on the tilt cylinder clevis.
8. Place the tilt gauge against the rear outer mast rail on the right side of the truck, about 6" (152 mm) above the mast cross member.

Section 2 Installation Instructions

2.1 Truck System Requirements

To achieve maximum lifting capacity of the mast, the truck relief valve should be set to relieve at the pressure indicated in the chart below. This chart also indicates the hose fitting size to use between the truck control valve and masts valve.

Lift Tek Mast	Relief Pressure	Hose Size	Fitting* Size
30D/35D/40D	2000 psi	No. 8 min.	No. 8 min.
30D/35D/40D	2600 psi	No. 6 min.	No. 6 min.
50D/55D/60D	2600 psi	No. 8 min.	13/32 in. Orifice

* Valve inlet port is 3/4 in. SAE O-ring. See Figure 2.

WARNING: For proper truck stability or to prevent interference, tilt restriction may be required. Contact the truck manufacturer.

IMPORTANT: Lift Tek Masts are compatible with SAE 10W petroleum base oil per Mil. Spec. MIL-0-5606 or MIL-0-2104 B only. Use of synthetic or aqueous base hydraulic oil is not recommended. If fire resistant hydraulic oil must be used, contact Lift Tek.

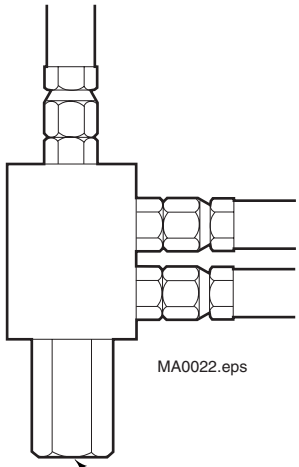


Figure 2. Valve inlet Port.

2.2 Mounting Bracket Installation

If it is necessary to install mounting brackets and crossmembers to fit your lift truck, consult with the nearest Lift Tek Service Department listed on the back cover. You must supply dimensions **A** through **F** shown in Figure 3. Failure to install the correct brackets and crossmembers can result in mast structural failure, bodily injury and loss of warranty.

WARNING: Failure to install the correct brackets and crossmembers can result in mast structural failure, bodily injury and loss of warranty.

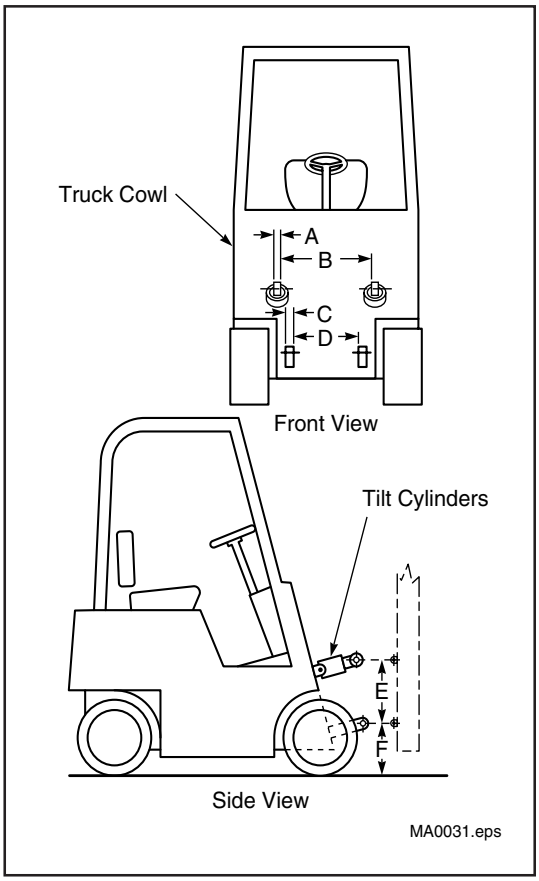


Figure 3. Determining Mounting Bracket Location.

Internal Reeving - Std-Vis
Installation 55D/60D Double Function

1. Install the carriage bracket to the tabs on the carriage side plates. Tighten the nuts to a torque of 38 ft.-lbs. (51Nm.).

2. Install the bulkhead and 90^0 fitting to the holes in the carriage bracket.

3. Install the hoses to the carriage bracket fittings. Leave the fittings loose.

4. Route the hoses up and over the rollers on the crosshead. Tighten the sheave capscrews to a torque of 38 ft.-lbs. (51Nm.).

WARNING: Chain and block the uprights and carriage to secure for step 5.

5. Raise the carriage approximately 8 ft. (240 cm). Route the hoses downward on the front side of all crossmembers, then under the tab on the front side of the cylinder support. Feed the hoses backward under the crossmember, around the casting guide upward under the back side tabs.

6. Pull the hose ends to remove slack.

7. Remove the existing capscrew from the main lift chain shafts. Install the hoses, sheaves, shaft and spacers to the main lift chain shafts. Tighten the capscrew to a torque of 58 ft.-lbs. (79Nm.). Make sure the sheaves rotate freely.

8. Attach the hoses to the brackets and fittings. Leave the fittings loose on the bracket

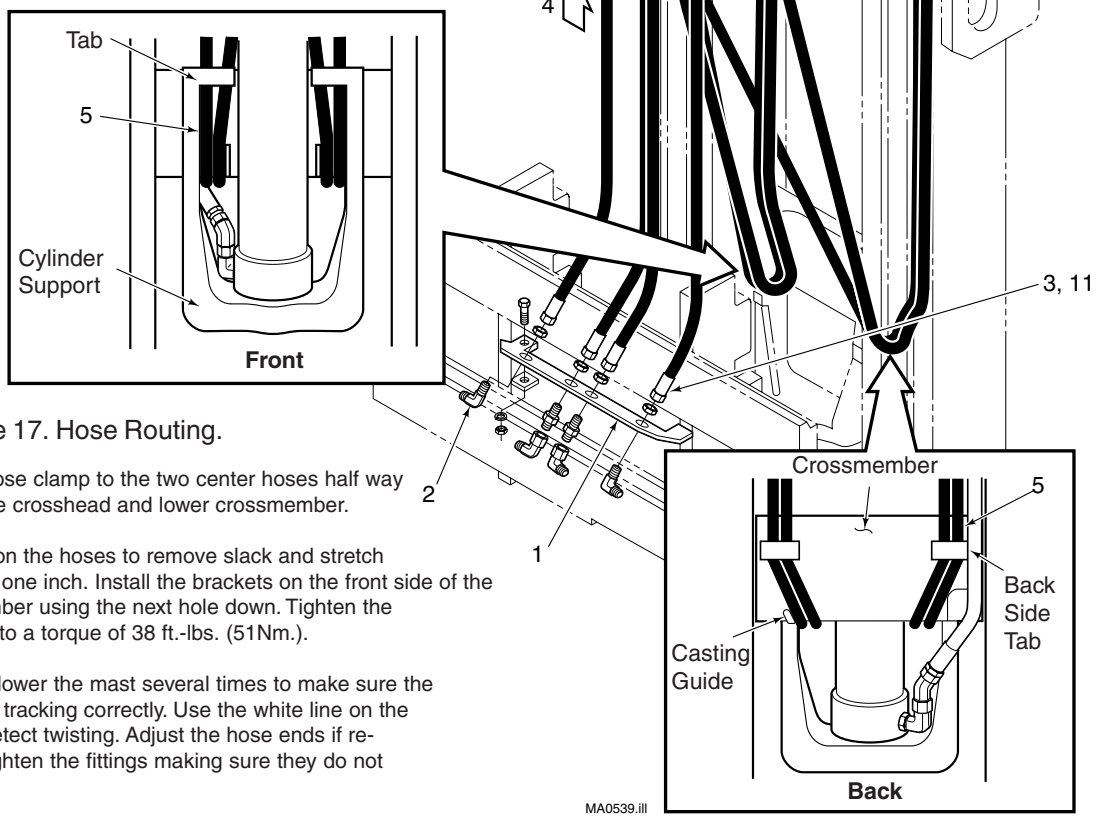


Figure 17. Hose Routing.

9. Install the hose clamp to the two center hoses half way between the crosshead and lower crossmember.

10. Pull down on the hoses to remove slack and stretch the hoses one inch. Install the brackets on the front side of the crossmember using the next hole down. Tighten the capscrew to a torque of 38 ft.-lbs. (51Nm.).

11. Raise and lower the mast several times to make sure the hoses are tracking correctly. Use the white line on the hose to detect twisting. Adjust the hose ends if required. Tighten the fittings making sure they do not twist.

5.2-6 Free Lift Cylinder Removal- Mast on Floor

1. Remove the mast from the truck as described in Section 5.1.

2. Lay the mast down as shown.

3. Roll the carriage toward the center of the cylinder to slacken the chains and internal reeving hoses (if equipped).

4. Disconnect the hose from the cylinder 45° fitting. Cap the fitting and plug the hose.

5. Remove the chain guards from the crosshead. For reassembly, tighten the capscrews to a torque of 48-52 ft.-lbs. (65-70 Nm).

6. Remove the snap ring fastening the crosshead to the cylinder rod.

7. Pull the crosshead with chains and hoses (if equipped) off the cylinder rod.

8. Remove the cylinder strap.

9. Remove the cylinder from the mast.

10. For reassembly, reverse the above procedures.

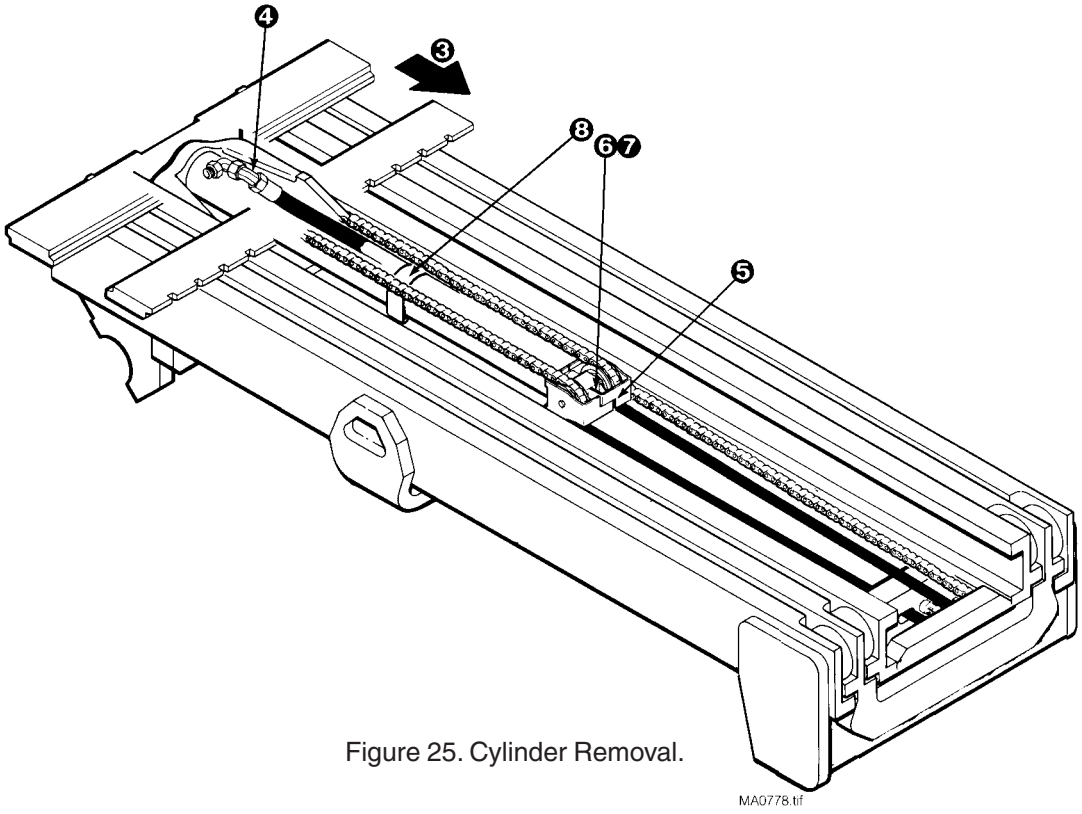


Figure 25. Cylinder Removal.

5.5-2 Upright Operation

Fully Lowered

The main Lift chains are anchored to the outer upright top crossmember then travel over the intermediate upright chain sheaves and attach to the inner upright anchors.

The free lift chains are anchored to the inner upright center crossmember then travel over the free lift cylinder chain sheaves and attach to the carriage chain anchors.

Free Lift

Actuating the truck hoist valve causes the free lift cylinder to raise which draws the carriage to the top of the inner upright.

Full Extension

When the free Lift cylinder reaches the end of its stroke the main lift cylinders begin to rise. The extension of the cylinders causes the intermediate and inner uprights to raise.

Lowering

The main lift cylinders lower at the same time. Once the main lift cylinder have nottomed out, the free lift cylinder begins to lower resulting in a smooth lowering of the carriage.

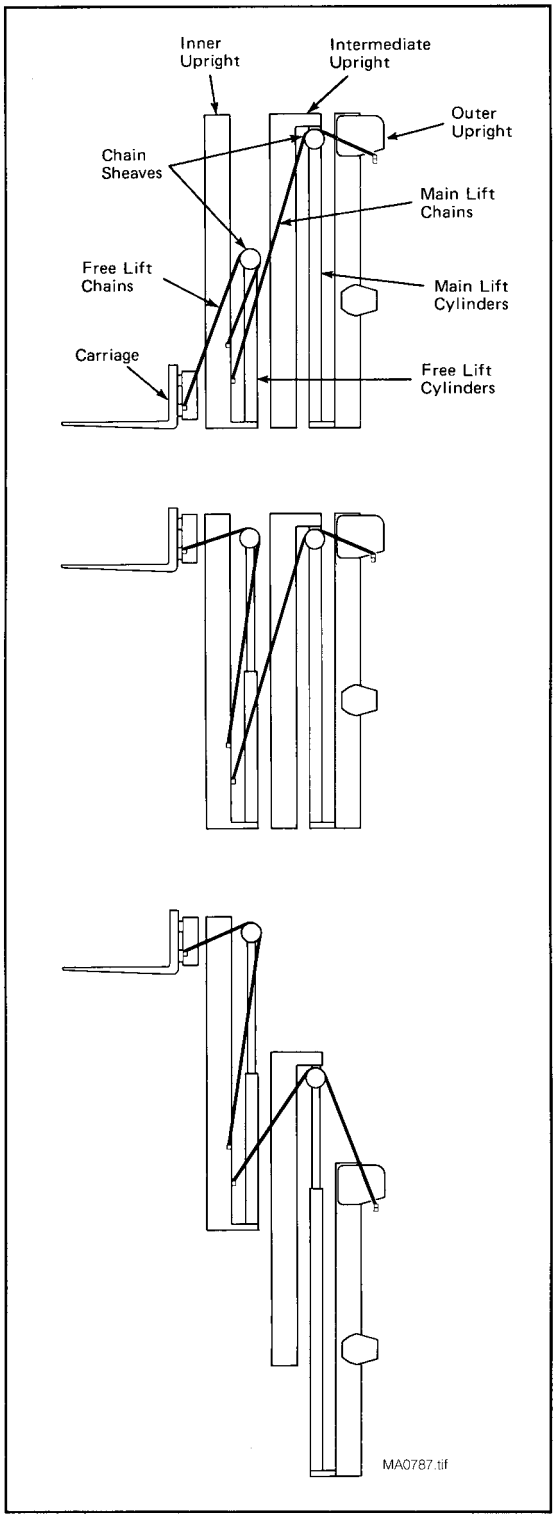


Figure 41. Upright Operation .