



## Model AC Series Maintenance Manual



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## For your Safety

### Special Notices and Safety Indicators

The below notices are used throughout this manual for your reference and protection. Attention required.

#### NOTICE

Special notice - read and thoroughly understand.



#### CAUTION

Proceed with caution. Failure to heed caution may cause injury to person or damage product.



#### WARNING

Proceed with caution. Failure to heed warning will cause injury to person or damage product.



#### DANGER

Proceed with extreme caution. Failure to heed notice will cause injury or death to person and/or damage product.

#### NOTICE

### Lock Out/Tag Out

In the interest of operator safety and in compliance with OSHA regulations, guidelines have been developed for performing service and maintenance on the truck. Before performing service and maintenance on the truck, review the following sections in this manual for additional procedures to be followed.

#### IMPORTANT

When doing maintenance or repair on the Bendi AC truck, unless the truck must be on for testing, remove the key from the Keyswitch. In addition, because it's possible to have a duplicate key, remove the main power fuse and install a commercially available Lock Out/Tag Out device on the battery connectors. Also, install a lockout warning reminder on the steering wheel warning that the truck is not available for use.



#### CAUTION

#### Battery Safety Rules:

- Wear protective clothing, rubber apron, boots gloves, and full-face shield when performing any maintenance on batteries. DO NOT allow electrolyte to come in contact with eyes, skin, clothing or floor.
- If electrolyte contacts eyes, flush immediately with clean water. OBTAIN MEDICAL ATTENTION IMMEDIATELY!! Should electrolyte be spilled on skin, rinse promptly with clean water and soap. A baking soda solution (one pound to one gallon of water) will neutralize acid spilled on clothing, floor or other surfaces. Apply solution until bubbling stops and rinse with clean water.
- Keep battery vent plugs firmly in place at all times, except when adding water or taking hydrometer readings.
- DO NOT bring any type of flame or spark near the battery.
- DO NOT place any electrically conductive tool on the battery that could cause a spark. Gas formed while the battery is charging is highly explosive. This gas remains in the cells long after charging is complete.
- Keep the battery clean. Foreign matter in the electrolyte will result in poor battery performance.
- Follow the battery manufacturer's instructions concerning maintenance and repair.

## INTRODUCTION, SAFETY, PREVENTATIVE MAINTENANCE

To be performed each 1000 hrs of truck operation in addition to the required pre-shift daily inspection.

Continued onto the next page for clarity.  
Fluid specifications found on page 1-17.

Operators 1000 Hour Inspection	Status	Landoll / Bendi AC
<b>SAFETY &amp; OPERATIONAL CHECKS</b> <b>Have a qualified technician correct all problems.</b>	OK - Yes, No	Maintenance Note if Applicable
Mast, carriage, or attachment friction surfaces - Clean, inspect for wear or damage, and lubricate.		
Lift chains - Clean and lubricate.		
Extend mast - Check for excessive wear.		
Attachment control - Operational.		
Accelerator - Functioning smoothly.		
Controls (turn power on); Investigate unusual noises immediately.		
Instrument monitors - Functioning.		
Parking and service brakes - Functioning smoothly, check pads for excessive wear.		
Hydraulic fluid level - Check and fill.		
Exterior of hydraulic tank and oil tank breather - Clean.		
Hydraulic oil and power steering pump - Clean dust from motors.		
Battery - Thoroughly clean.		
Battery box and connectors - Neutralize and clean.		
Battery - Check electrolyte level.		
Battery - Check structure and electrical conditions.		
Traction motors - Clean dust.		
Seat belt, buckle, and retractors - Functioning smoothly.		
Tires - Check for debris, torque lug nuts to 225 ft. lbs. (305Nm).		
Wheel bearings - Clean and fill with grease.		
Leaks - Hydraulic oil, battery, brake fluid, complete transmission.		
Hydraulic hoses and connections - Check for wear.		
Switches (interlock, direction, parking/seat, key, pressure, and temperature) - Check.		
Wire connections and sending units - Check.		
Grease fittings - Service.		
Forks, top clip retaining pin and heel - Condition.		
Mast rollers - No greater than 1/16".		
Mast chains - Lube with SAE 40W oil or Bowman Heavy Load Red grease - Check for wear and stretch.		
Steering operation - Functioning smoothly; Lube knob.		
Brake fluid - Check level.		
Hydraulic oil filter - Change element and check for proper level - Check pressures.		
Battery - Check resistance between truck body and negative/positive terminal.		
Battery rollers - Remove, clean, and repack (optional).		
Contact points and Micro Switches - Check operation.		
Control panel - Clean surface.		

<b>Condition</b>	<b>Cause</b>	<b>Suggested Repair</b>
<p><b>Spongy or soft service brake pedal.</b></p>	<p>Possible air in brake lines.</p> <p>Faulty master cylinder.</p> <p>Faulty brake caliper.</p>	<ul style="list-style-type: none"> <li>• Bleed air from brake lines - indicated by bubbles in fluid during fluid bleed, or when checking the master fluid reservoir.</li> <li>• Check brake system for loose fittings, cross threaded fittings and brake calipers for leaks.</li> <li>• Also check master cylinder reservoir fluid level - low level can allow air into lines.</li> <li>• Examine the brake lines, wheel calipers and master cylinder for leaks - repair immediately, then bleed the brakes.</li> <li>• Also check master cylinder piston for worn seals. Reference "Master Cylinder" on page 2-12.</li> <li>• Remove the master cylinder filler cap and "slowly" press the brake pedal. A pulse of fluid should be seen in the cylinder reservoir. If not, replace the cylinder.</li> <li>• Check brake caliper for leaks - rebuild or replace.</li> </ul>
<p><b>Parking brake does not hold the truck.</b></p>	<p>Brake cable system malfunction or out of adjustment.</p>	<ul style="list-style-type: none"> <li>• Check parking brake linkage for loose nuts, broken or stressed linkage, mis-adjustment - repair and readjust. See page 2-8.</li> </ul>
<p><b>Steering drifts/wanders or is erratic.</b></p>	<p>Improperly sized tires.</p> <p>Low fluid or leaks in power steering system.</p> <p>Worn or out-of-adjustment steer assembly.</p> <p>Insufficient hydraulic pressure.</p> <p>Steering potentiometer misaligned.</p> <p>Worn, loose wheel bearings.</p> <p>Air in the hydraulic system.</p>	<ul style="list-style-type: none"> <li>• Check Identification plate for proper fit and replace if not proper size</li> <li>• Check hydraulic fluid level -replenish as necessary.</li> <li>• Check all related components for seal or fitting leaks - repair or replace.</li> <li>• Check motion control valve cartridges for foreign material (these are replaceable cartridges and will wear out over time).</li> <li>• Failed or weak orbital centering spring will cause the steering to drift - replace accordingly.</li> <li>• Check if steer pinion gear is seated properly on steer motor.</li> <li>• Make sure the shaft woodruff key, between steer pinion gear and steer motor is installed correctly.</li> <li>• Bad steer motor - repair or replace.</li> <li>• Check hydraulic pressure of steering relief valve (2,600 psi).</li> <li>• Check steering motor for internal or seal leaks, sticking or mis-adjustment - repair or replace.</li> <li>• Perform dash calibration.</li> <li>• Check wheel bearings - replace as needed.</li> <li>• Check the inlet connections to determine where air is being drawn into the system.</li> <li>• Internal leaks? Tighten loose connections.</li> <li>• Bleed hydraulic system.</li> </ul>

3. Install the new caliper assembly in reverse order making sure the brake pads are properly installed.
4. Bleed the brakes.
5. It is recommended when replacing a brake caliper assembly, you should purge the entire brake system of used, possibly contaminated fluid.

8. Install the O-ring seal to the pistons and slide the pistons into the housing bore. Make sure the O-ring seals do not twist as the piston is inserted.
9. Bottom out the piston into the bore, install new brake pads. Reinstall caliper assembly onto caliper bracket.
10. Bleed the brakes.
11. Repeat steps 19 through 20 of the section "Changing Brake Pads" on page 2-5.

## Repairing Brake Caliper Pistons

### IMPORTANT

If the brake caliper piston freezes up or shows signs of leakage, it must be repaired or replaced.

Whenever servicing or replacing a caliper assembly or internal parts, you must service both sides of the truck to prevent premature wear and uneven braking action.

1. Repeat steps 1 through 8 of the section "Changing Brake Pads" on page 2-5.
2. Remove the brake caliper assembly from the truck.
3. Restrain the piston in the caliper to stop the piston, then lightly apply compressed air to the inlet port.

### IMPORTANT

Do NOT apply too much air pressure to the bore, or the piston will eject and cause damage to the piston or the technician. Stand back from the piston while air is being applied.

4. Once the piston releases, remove the O-ring seals and discard. Be careful not to scratch metal surfaces. Do not use metal tools when removing the seal.
5. Remove both bleeder screws.
6. Inspect the piston and the caliper housing bore for corrosion, worn plating, scoring, nicks, etc. Crocus cloth may be used to polish out light corrosion only. If extensive corrosion exists, the entire brake caliper assembly must be replaced.
7. Thoroughly wipe out the bore area and clean all parts, lubricate the pistons, caliper and O-ring seals with fresh, DOT #3 brake fluid.

## Disc Brake Rotors

### IMPORTANT

- Whenever servicing and/or replacing a rotor assembly, you must service both sides of the truck to prevent premature wear and uneven braking action.
- Repeat steps 1 through 6 of preceding section "Changing Brake Pads", beginning on page 2-5.
- Check the rotors for scoring, cracks, deep grooves, raised lip on the outer edge, signs of overheating, rotor run-out or other damage. Rotor run-out should be measured while the rotor is installed.
- Rotor thickness measurements may be checked with the rotor installed or removed from the truck. Use a dial gauge to check run-out. Use a calibrated micrometer, calibrated in ten-thousandths of an inch, to check thickness. See Figure 2-4.

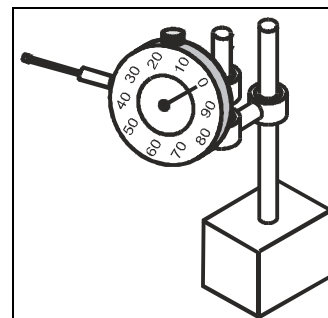
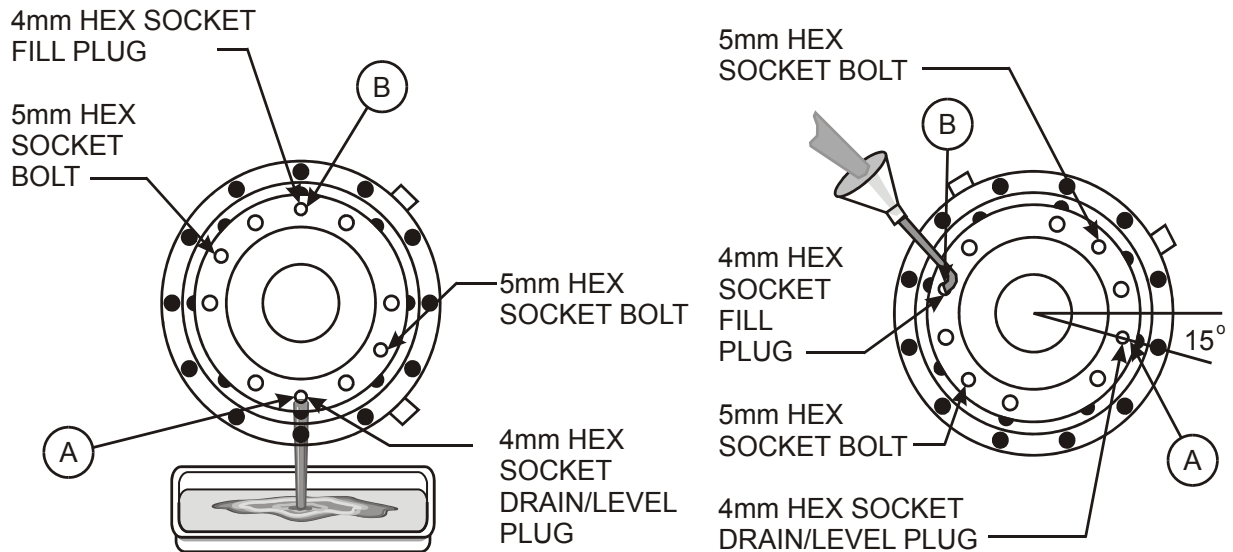


Figure 2-4 Rotor Micrometer

18. Turn the gear box a few times to eliminate any air pockets and recheck fluid level. The oil level should be checked again after a short driving period. If necessary, re-fill the oil.



DRAINING THE PLANETARY GEARBOX

FILLING THE PLANETARY BOX

Figure 2-10: Draining Gearbox

## Accelerator Pedal Assembly

### NOTE

The accelerator assembly consists of the linear potentiometer, harness, and accelerator pedal.

### Adjusting Accelerator Pedal

1. First, review “Before You Begin,” page 1-1.
2. Set the Keyswitch to OFF and remove the key from the Keyswitch.
3. Block wheels and perform the Lock Out/Tag Out procedure.
4. Remove the floor plates.
5. Note: It is recommended to hold the right hand floor plate in a vice while doing this procedure.
6. Loosen the allen head fastener on the pedal arm so that it can rotate freely. Rotate the pedal until the pedal touches the rear of the slot. Tighten the fastener.
7. Install floor plate assembly back on the forklift.
8. Install left hand floor plate.
9. Refer to Landoll Setup Procedure, located in “Calibration of Steering and Throttle Pot” on page 5-1 to re-calibrate the throttle pot module.

## Replacing Accelerator Module

1. First, review “Before You Begin,” page 1-1.
2. Set the Keyswitch to OFF and remove the key from the Keyswitch.
3. Apply the parking brake, perform a Lock Out/Tag Out procedure, disconnect the battery and block all wheels.
4. Remove the floor plates. See “Floor Plate Removal”, on this page.
5. Remove the two round head screws (5/16-18 x 1) and hardware securing the accelerator to the floor panel. See Figure 2-9.
6. Disassemble the accelerator from the floor plate and install the replacement accelerator in its place. See Figure 2-9.
7. Loosen the allen headed fastener on the pedal arm and orient the pedal 90 degrees up. Insert the flat part of the arm through the slot, rotate and mate the accelerator mounting surface to the underside of the floor plate. Align with the 5/16" bolts and tighten to secure the accelerator.
8. Adjust the pedal, See Adjusting Accelerator Pedal, above.
9. Re-calibrate the software beginning on page 5-1.

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### NOTE

*During this time close inspection should be given looking for leaks between the sections. If there have been sectional leaks, simply unbolt the three bolts that hold the sections together, replace the leaking o-ring and tighten up the bolts holding the sections together. See "Hydraulic Control Valve" in F-523 Bendi AC parts book.*

17. Remove the spool and end mechanism from the bore.
18. Remove the seal, wiper and seal plate from the tang/clevis end of the spool. A dental pick can be used to remove the wiper and o-ring. Use caution to avoid nicking the bore.
19. Remove the end mechanism from the cap end of the spool.
20. Remove all foreign material from the spool and seal counter bores.
21. Lubricate the seal groove bores on the cap and tang/clevis ends of the housing.
22. Re-assemble the cap end of the spool with the new seals per the applicable end mechanism repair instruction and carefully reinsert the spool.
23. Install the new seal and wiper on the tang/clevis end of the spool using the seal plate to push them in prior to completing the seal plate cap screw installation and torque.
24. Assemble the switch pot brackets to the other end of the valve.
25. Apply grease (NLSI #2 Texaco #880) to actuator end prior to assembly of the spool actuator.
26. Reassemble valve to truck.
27. Attach and tighten all hoses.
28. Operate valve functions and check for leaks.

## Spool Section Rebuild

### NOTE

*The inlet assembly will include an o-ring, and the spool sections will include an o-ring, load check poppet and load check spring.*

1. For proper reassembly alignment, lay valve components on a clean, hard, flat surface.
2. Thread tie rod nuts onto the short threaded end of each of the individual tie rods with the nuts threaded up the entire length of the threads.
3. Insert tie rods through tie rod holes of inlet housing, lay inlet on end with tie rods pointing up and install o-ring into groove. Special care must be taken to ensure o-ring has been completely installed in groove.

4. Place first spool section over inlet section with o-ring groove facing upward and install o-ring into groove.
5. Install load check poppet into load check cavity, nose first.
6. Once load check poppet has been properly installed, place load check spring in hollow cavity inside check poppet.

## Hydraulic Lift Pot

### NOTE

*The hydraulic lift pot is replaced as a complete unit with the wiring harness.*

## Replacing Lift Pot

1. First, review Before You Begin on page 1-1.
2. Set the Keyswitch to OFF and remove the key from the Keyswitch.
3. Apply the parking brake, perform a Lock Out/Tag Out procedure, disconnect the battery and block the wheels.
4. Relieve pressure in the system by turning the steering wheel two times to the left, then two times to the right and move the controls in both directions.
5. Remove the floor plate to allow removal of the valve cover.
6. Disconnect the lift pot from the main truck harness at the Deutsch connector.
7. Remove the lift pot bracket from the end of valve.
8. Remove the two screws holding the lift pot from the bracket.
9. Install new pot and reassemble the pot to the bracket.
10. Reassemble pot mount bracket to valve.
11. Reinstall valve on truck.
12. Attach and tighten hydraulic hoses.
13. Start truck, operate hydraulic system, and check for leaks.
14. Calibrate lift pot input to controller. Refer to page 5-1 for calibration instructions. This adjustment is actually completed through the controller electronically.
15. Reinstall brake assembly.
16. Install floor plates and valve cover.

## Battery Removal



### CAUTION

Don't allow metallic objects to be on top or near the battery. A short could cause an electrical arc and personal injury may result. When moving the battery, keep the top of the battery covered with an insulator, such as a piece of plywood or tarp.

### Rollout Battery Removal - optional

1. Remove the safety retainer bar, deactivating the safety switch.
2. Position battery roll out stand next to the truck and align the stand with the path of the battery.
3. Roll the battery onto the stand.

### Battery Installation

1. Change and charge batteries in accordance with ANSI/NFPA 505.
2. Check to be sure the key is off.
3. Open the right hand door.
4. If using a rollout stand, position the battery stand next to the truck. Align stand with battery compartment. Battery roller stand should be at the same height as the truck.
5. Push battery into the truck's battery compartment or lower if using a hoist.
6. Install the rollout battery arm bar, or the truck will not operate. See Figure 4-4.
7. Connect the battery.

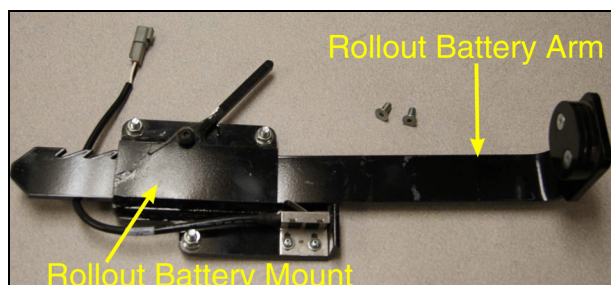


Figure 4-4 Rollout Battery Arm Bar

## Electrical Static Discharge

### IMPORTANT

- Normal precautions concerning the handling of electronic components are applicable in order to minimize the risk of damage to these devices by Electrical Static Discharge. Avoid contact with the pins of these devices and insure that when they are removed from a printed circuit board (PCB), the pins are strapped together with conductive tape. Immediately place the PCB in static-free bubble wrap or an ESD bag.
- smocks over normal clothing must be worn to discharge high voltage potentials caused by friction during normal wear.
- Use a grounding wrist band to protect microprocessors and all electronic components from static electricity and always touch a metal surface (other than the truck) before touching a PCB. These precautions are especially necessary with respect to microprocessor devices, found on the hydraulic control PCB's of this truck.

### ESD Strap

Shown to the right is the ESD(Electrical Static Discharge) Strap which will be installed just behind the front steering assembly. See Figure 4-5. This device will drain all static electricity build up that may occur on the Bendi AC forklift.



Figure 4-5 ESD Strap Location

# 1314 Installation Procedure

Follow the installation instructions below:

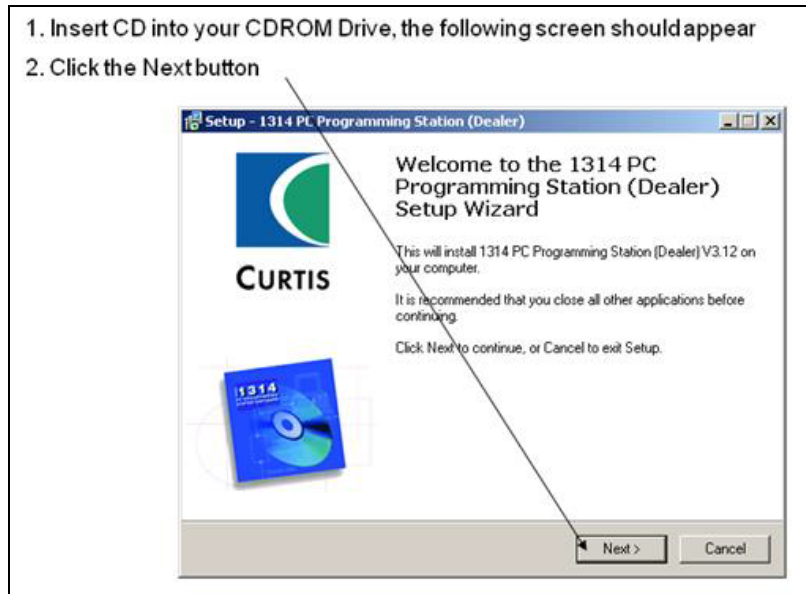


Figure 5-6: Start - Steps 1 & 2



Figure 5-7: Steps 3 & 4

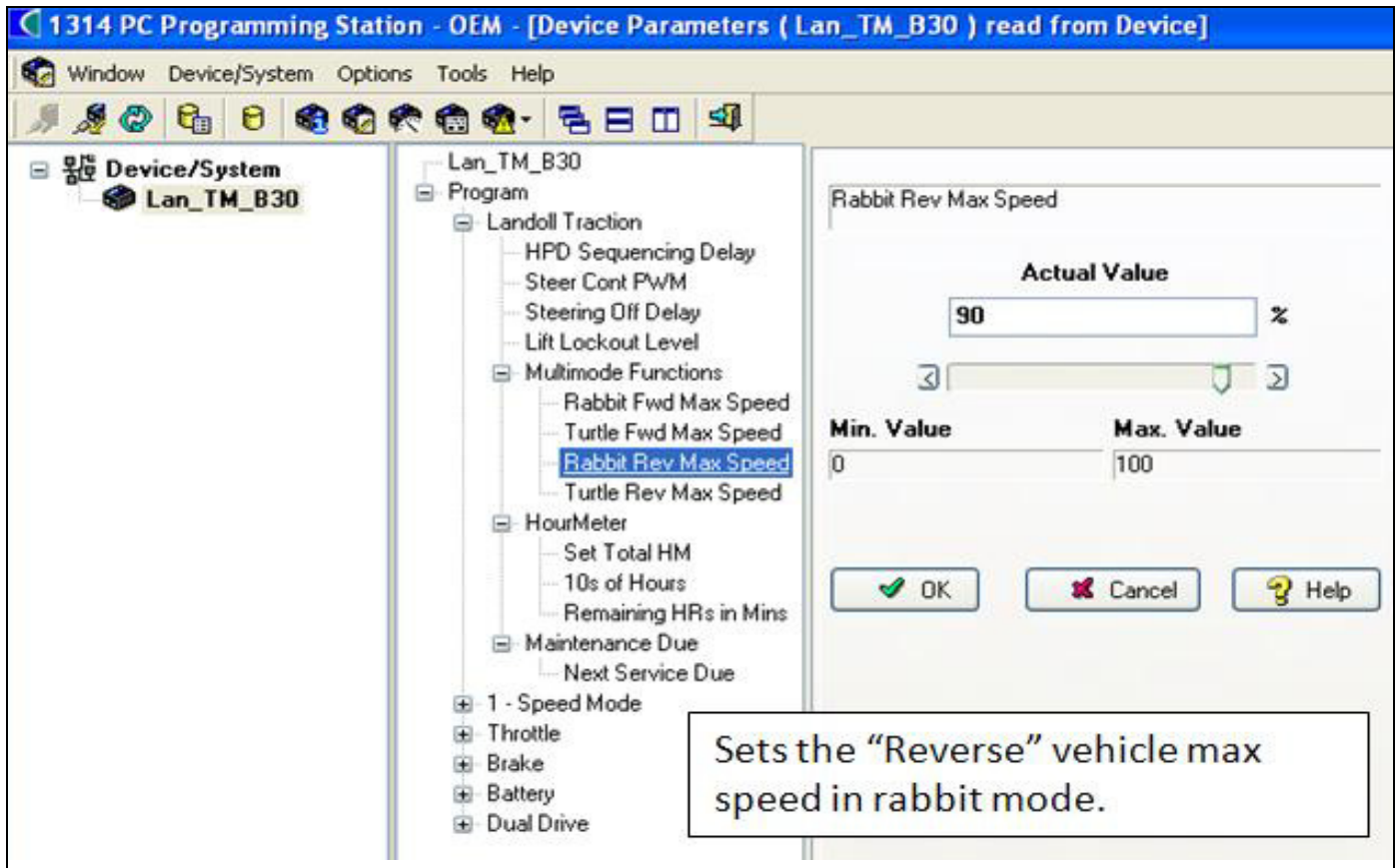


Figure 5-26: Rabbit Rev Max Speed

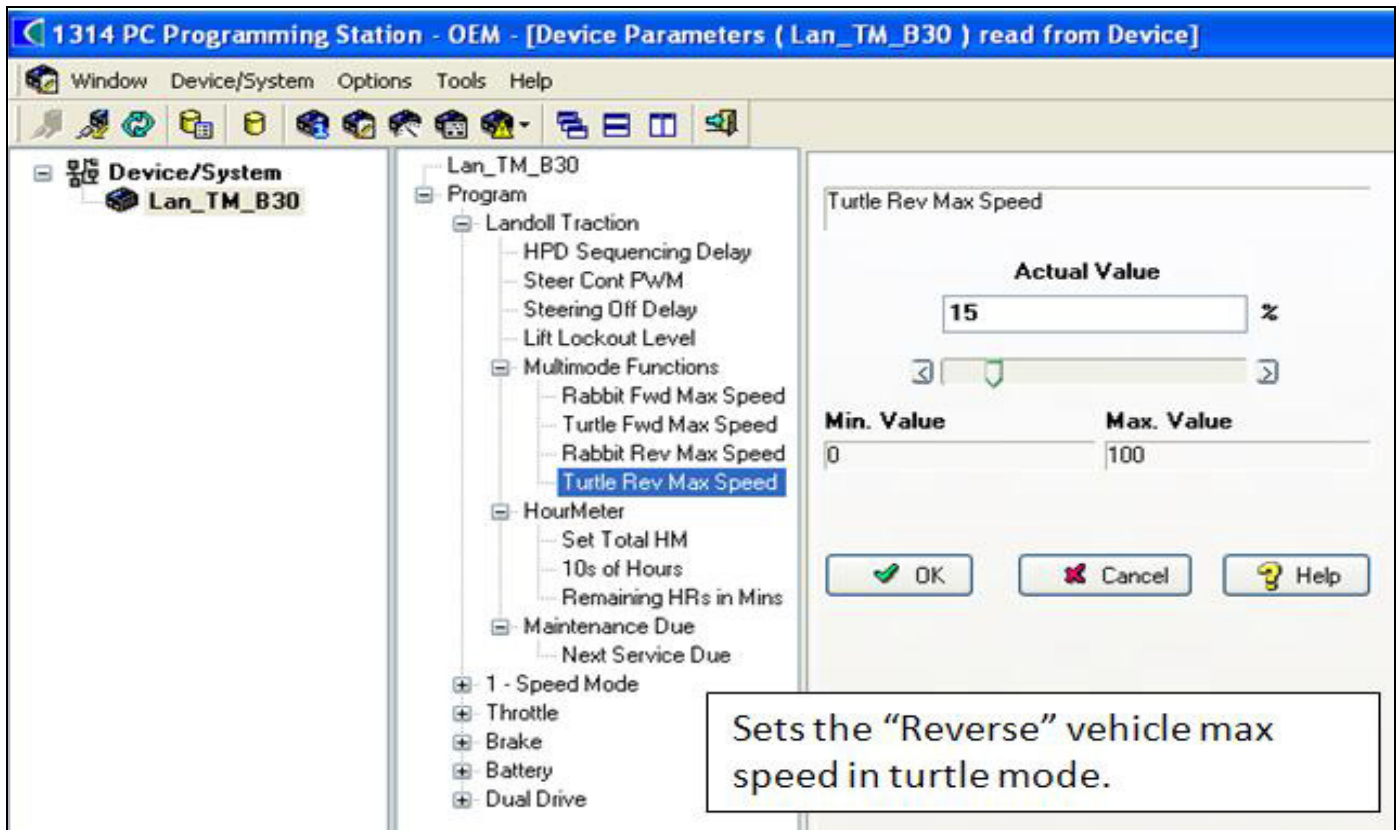


Figure 5-27: Turtle Rev Max Speed

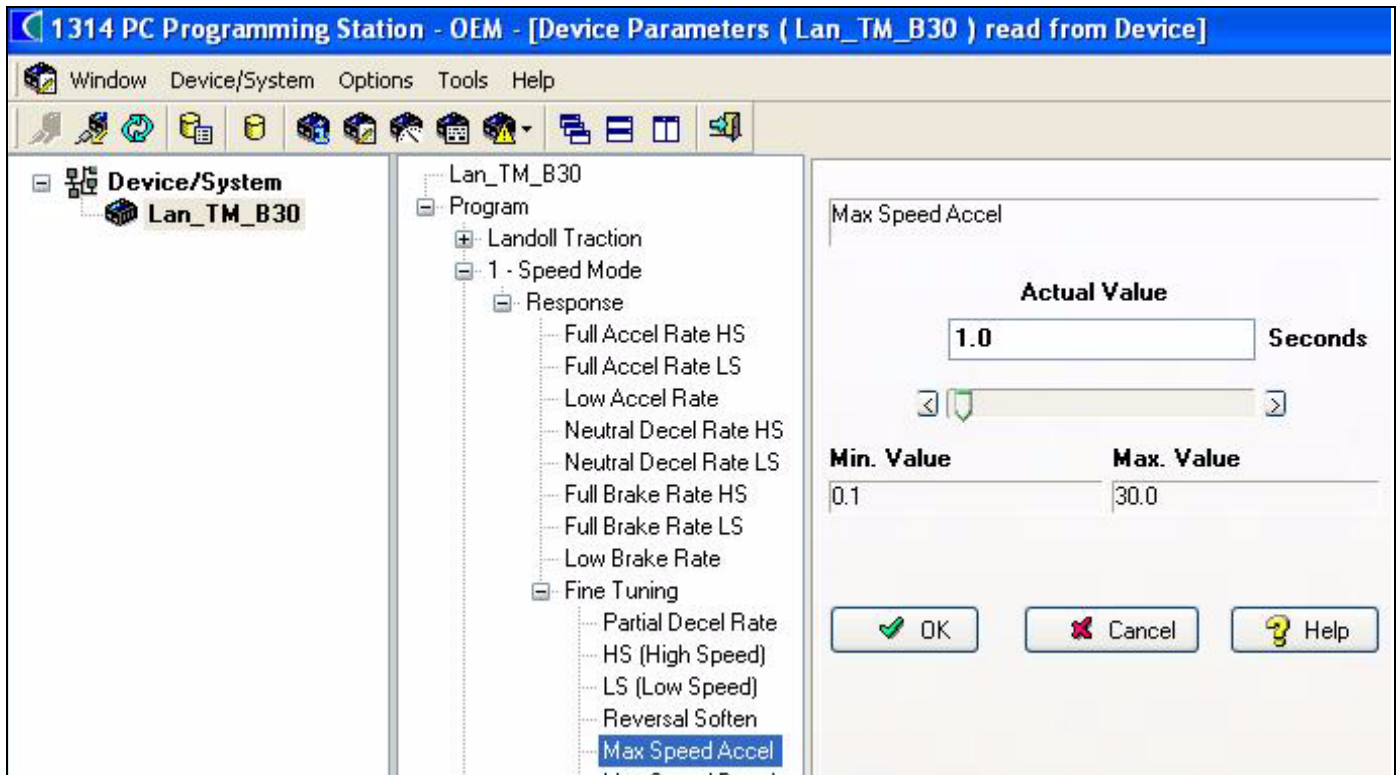


Figure 5-45: Max Speed Accel

See Figure 5-45. **Max Speed Accel:** This parameter controls the rate at which the maximum speed setpoint is allowed to change when the value of Max Speed is raised.

See Figure 5-46. **Max Speed Decel:** This parameter controls the rate at which the maximum speed set point is allowed to change when the value of Max Speed is lowered.

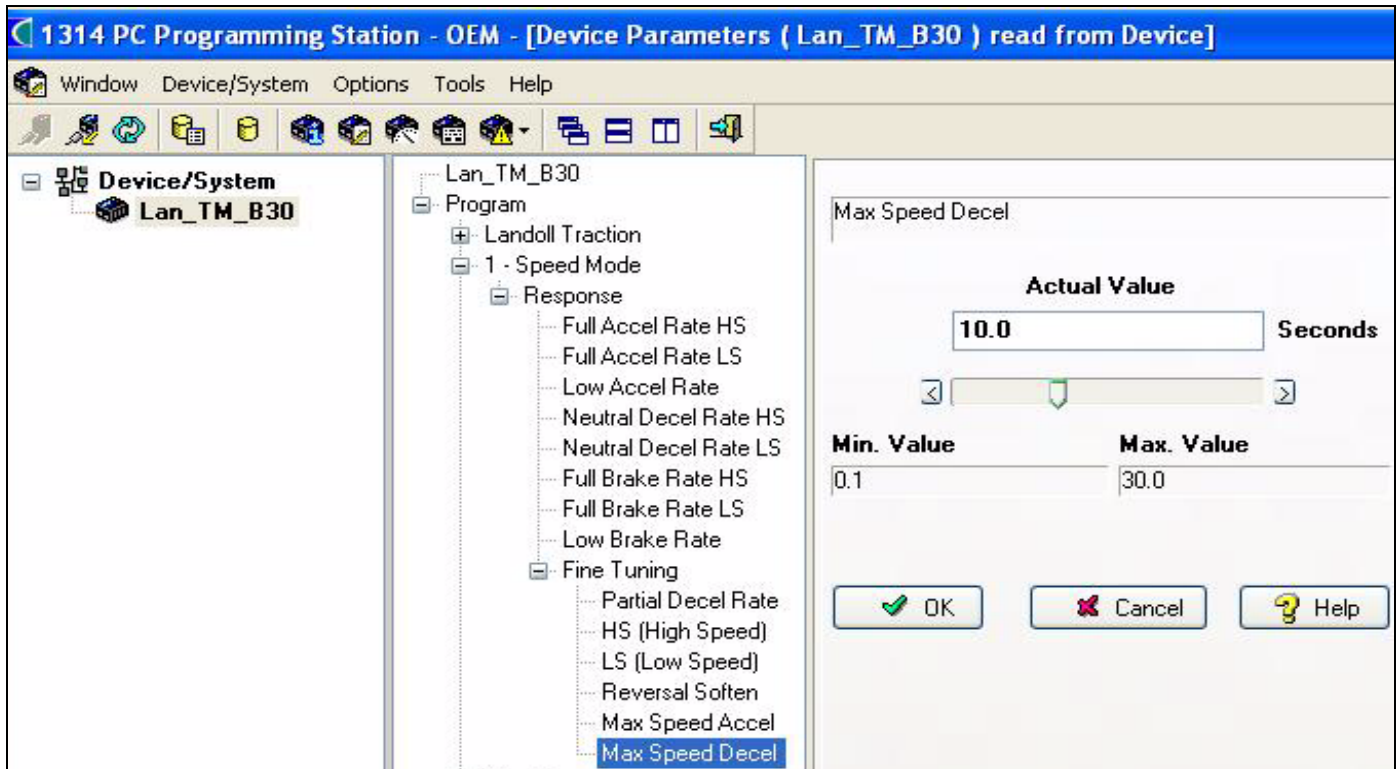


Figure 5-46: Max Speed Decel

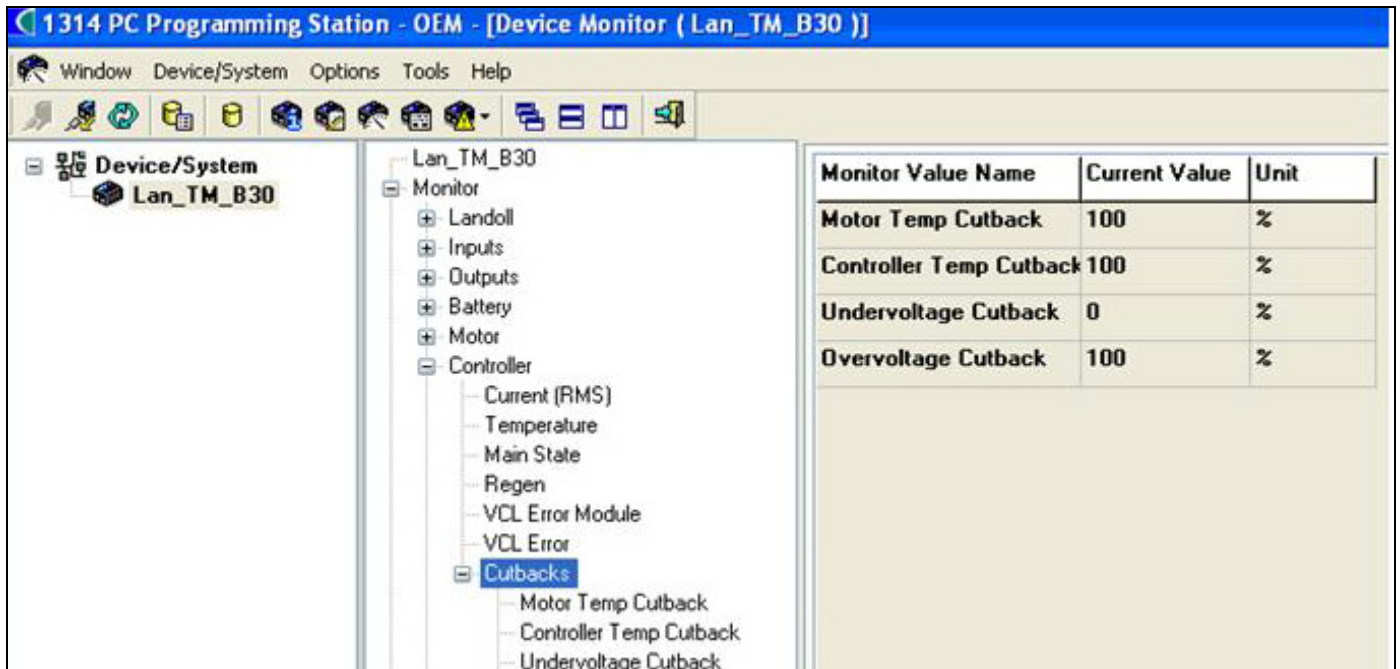


Figure 5-66 Cutback Parameters



Figure 5-67: Vehicle Parameters

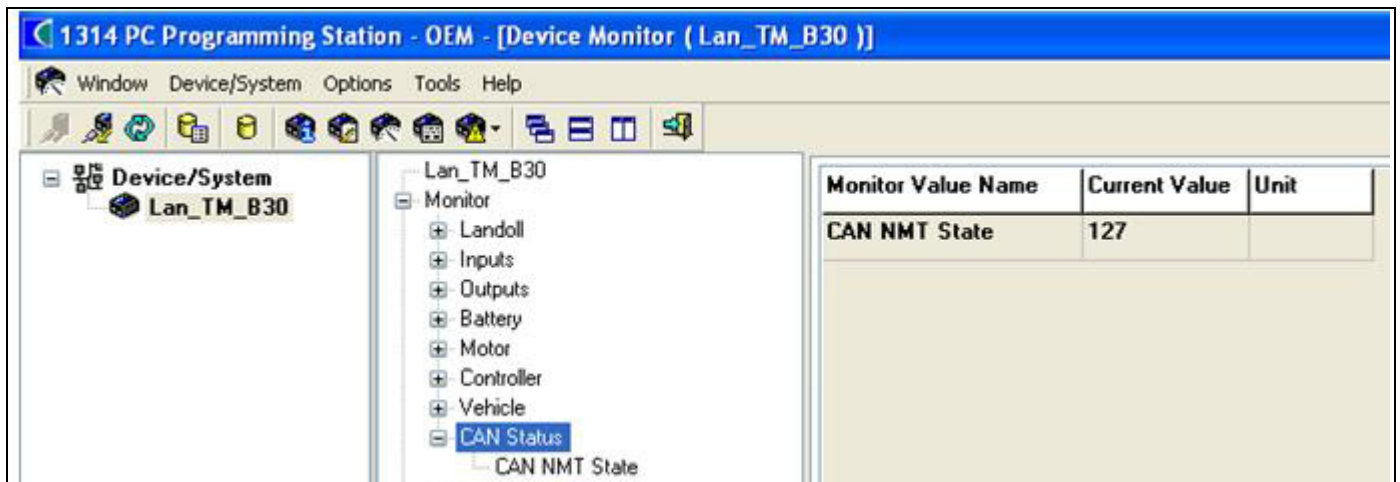


Figure 5-68: CAN Status Parameters

<b>C O D E</b>	<b>PROGRAMMER LCD DISPLAY</b>	<b>T</b>	<b>P</b>	<b>POSSIBLE CAUSE</b>	<b>SET/CLEAR CONDITIONS</b>
71	<b>OS General</b> <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>ShutdownInterlock;</i> <i>ShutdownDriver1;ShutdownD river2;</i> <i>ShutdownDriver3;ShutdownD river4; ShutdownPD;</i> <i>FullBrake:Shutdown Pump;</i> <i>TrimDisable;</i> <i>SevereDual;Shutdown Steer;</i> <i>LOSDual</i>	X	X	1. Internal Controller fault.	<i>Set:</i> Internal controller fault detected. <i>Clear:</i> Cycle KSI.
72	<b>PDO Timeout</b> <i>Shutdown Interlock;</i> <i>CAN NMT State set to Pre-operational</i>	X	X	Time between CAN OPDO messages received exceeded the PDO Timeout Period.	<i>Set:</i> Time between CAN PDO messages received exceeded the PDO Timeout Period. <i>Clear:</i> Cycle KSI or receive CAN NMT message
73	<b>Stall Detected</b> <i>ShutdownMotor;</i> <i>SevereDual;</i> <i>ShutdownEMBrake;</i> <i>Control Mode changed to LOS (Limited Operating Strategy)</i>	X	X	1. Stalled motor. 2. Motor encoder failure. 3. Bad crimps or faulty wiring. 4. Problems with power supply for the motor encoder. 5. See Monitor menu>>Motor: Motor RPM.	<i>Set:</i> No motor encoder movement detected. <i>Clear:</i> Either cycle KSI, or detect valid motor encoder signals while operating in LOS mode and return Throttle Command=) and Motor RPM=0.
74	<b>Fault On other Traction Controller</b> <i>For information on this fault, plug the programmer into the other controller.</i>	X	X	1. A fault is active on the other traction controller.	<i>Set:</i> In a Dual Drive traction system, any fault in the other traction controller will cause this fault to be set. <i>Clear:</i> Clear all the active faults in the other traction controller.

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