For use in service manual
form SB2035E01

SB2034E02
Apr. 1999

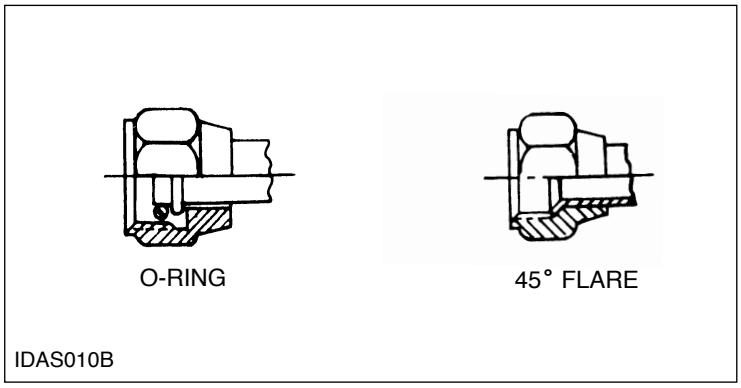
SERVICE MANUAL CONTENTS

NOTICE

This form lists the contents of the complets Service Manual for this product. The items listed with form numbers are available and included in the manual. If form numbers listed with mark (*) are, they are not available for the initial release of the manual. When items are updated, or supplements added, they will be announced in preview and should be ordered as they become available.

TITLE	FORM NUMBER
Service Manual Contents	SB2034E02
Safety	SB2003E00
Torque Specifications	SB2004E00
DRIVE & CONTROL SYSTEM	
MicroController Control System	SB2023E01
POWER TRAIN	
Power Train	SB2025E01
VEHICLE SYSTEMS	
Vehicle Systems	SB2026E02
Vehicle Systems D & A	SB2028E02
Hydraulic System Schematic	SB2027E02
Electric System Schematic	SB2022E00
OPERATION & MAINTENANCE	
Operation & Maintenance Manual	SB2068E05

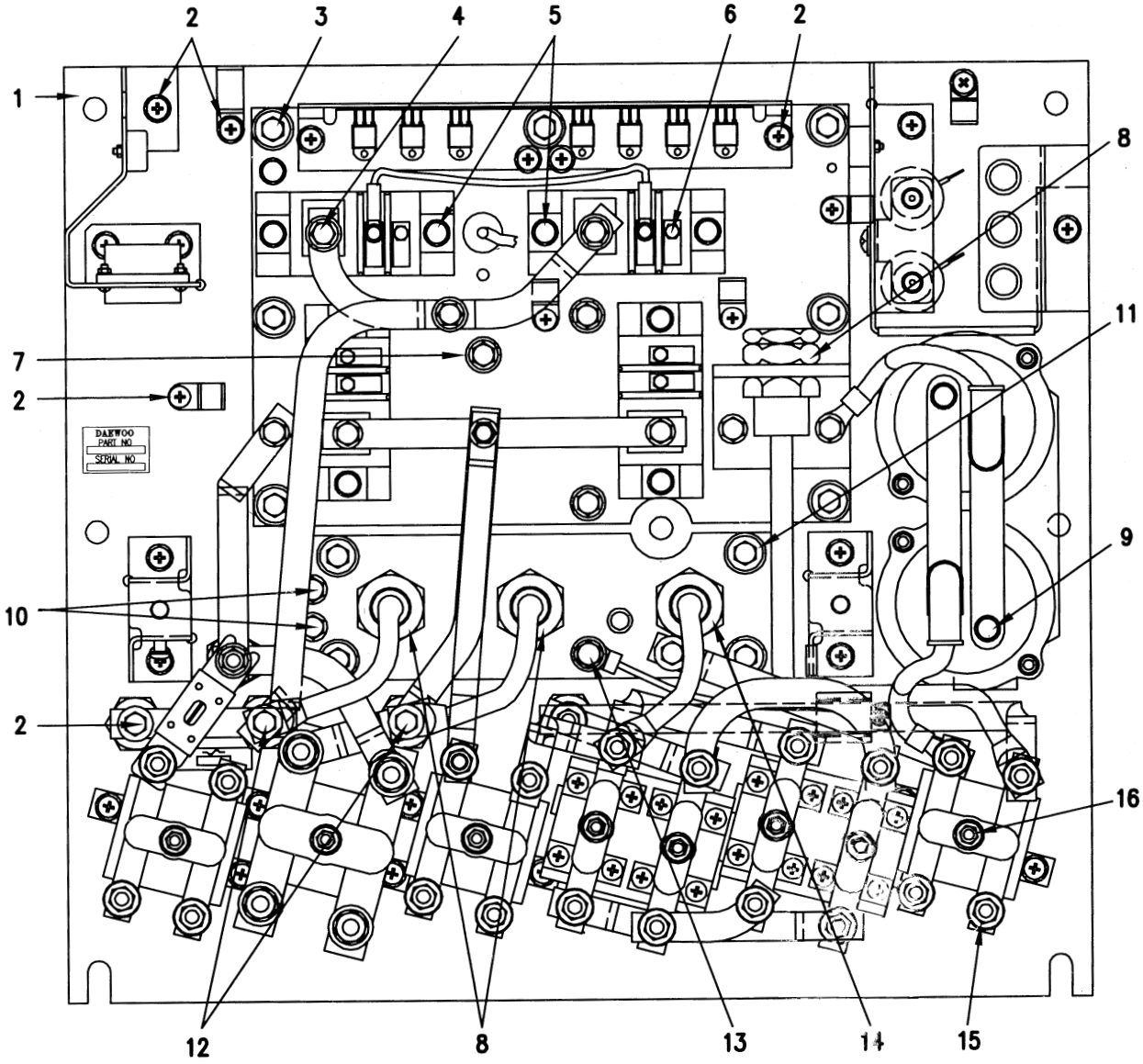
AIR CONDITIONING AND TAPERED PIPE THREAD FITTINGS



AIR CONDITIONING FITTINGS						
O-RING FITTING END			45° FLARE FITTING END			
THREAD SIZE inch	STANDARD TORQUE		STEEL TUBES STANDARD TORQUE		ALUMINUM TUBES STANDARD TORQUE	
	N • m	(lb • ft)	N • m	(lb • ft)	N • m	(lb • ft)
5/8-18	18 ± 4	13 ± 3	30 ± 3	22 ± 2	23 ± 3	17 ± 2
3/4-16	37 ± 4	27 ± 3	52 ± 5	38 ± 4	33 ± 4	24 ± 3
7/8-14	40 ± 4	30 ± 3	60 ± 7	44 ± 5	38 ± 4	28 ± 3
1 1/16-14	45 ± 5	33 ± 4	75 ± 8	55 ± 6	50 ± 5	37 ± 4

TAPERED PIPE THREAD FITTINGS				
PIPE THREAD SIZE inch	STANDARD TORQUE			
	THREADS WITH 1E2200E SEALANT		THREADS WITHOUT SEALANT	
	N • m	(lb • ft)	N • m	(lb • ft)
1/16-27	15	11	20	15
1/8-27	20	15	25	18
1/4-18	25	18	35	26
3/8-18	35	26	45	33
1/2-14	45	33	60	45
3/4-14	60	45	75	55
1-11 1/2	75	55	90	65
1 1/4-11 1/2	95	70	110	80
1 1/2-11 1/2	110	80	130	95
2-11 1/2	130	95	160	120

Control Panel (Layout)



NOTE: Apply a small amount of 9P7951 Thermal Joint Compound on the surface of the transistor, diode or thermal switch that contacts the heatsink.

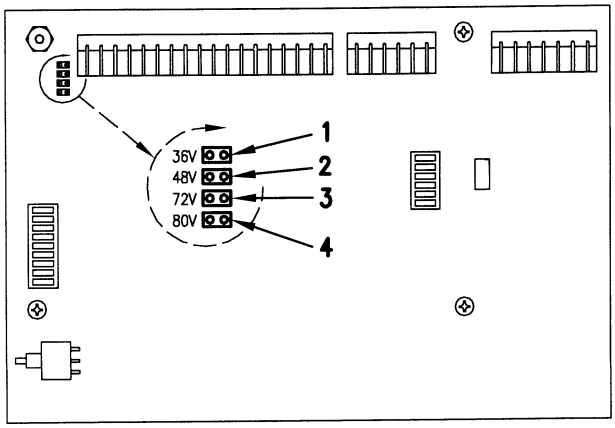
(1) Control panel plate. Apply a small amount of 9P7951 Thermal Joint Compound on control panel plate and mating surface prior to assembly.
(2) Apply 9S3263 Thread Lock on the threads of all screws that are used to fasten components on the control panel.
(3) Apply 9S3263 Thread Lock to the bolts used to tighten the positive heatsink to the control panel to a torque of .....10 to 14 N•m (90 to 125 lb•in)
(4) Use a backup wrench to hold nuts and tighten bolts the fasten bus bars to the power transistors to a torque of .....4 to 6 N•m (35 to 55 lb•in)
(5) Tighten screws that fasten power transistors to the positive heatsink to a torque of .....4 to 6 N•m (35 to 55 lb•in)

(10) SW11 - SW16 (option switches)
SW11 - Lift limit switch option
SW12 - Reduced battery range
SW13 - Reduced steer speed
SW14 - EE option switch
SW15 - 80% bypass and stall timer option
SW16 - Not applicable
(11) DIAG/RUN/SET
(12) P1 Potentiometer - Current limit adjustment
(13) P3 Potentiometer - Regenerative braking adjustment
(14) P4 Potentiometer - Field shunt adjustment
(15) P5 Potentiometer - BDI adjustment
(16) P6 Potentiometer - Stall overcurrent adjustment

The Logic Unit (logics) has one printed circuit board contained in a vertical sheet metal box on the control panel. Most of the circuitry on the board conditions voltage signals into and out of the microprocessor. Software in the microprocessor controls logic outputs for: power components in the hydraulic pump system and drive system, contactor coils and the CVMS display. Access to the board is provided by four lock screws, which allow the cover to be removed.

With the cover removed, access is provided to the diagnostics switch, battery jumpers (J1, J2, J3 and J4) auxiliary hydraulic speed control switches and adjustment potentiometers, P1 for current limit, P3 for regenerative braking, P4 for field shunt pickup, P5 for the Battery Discharge Indicator (BDI) and P6 for overcurrent Protection.

Battery Selection Jumpers

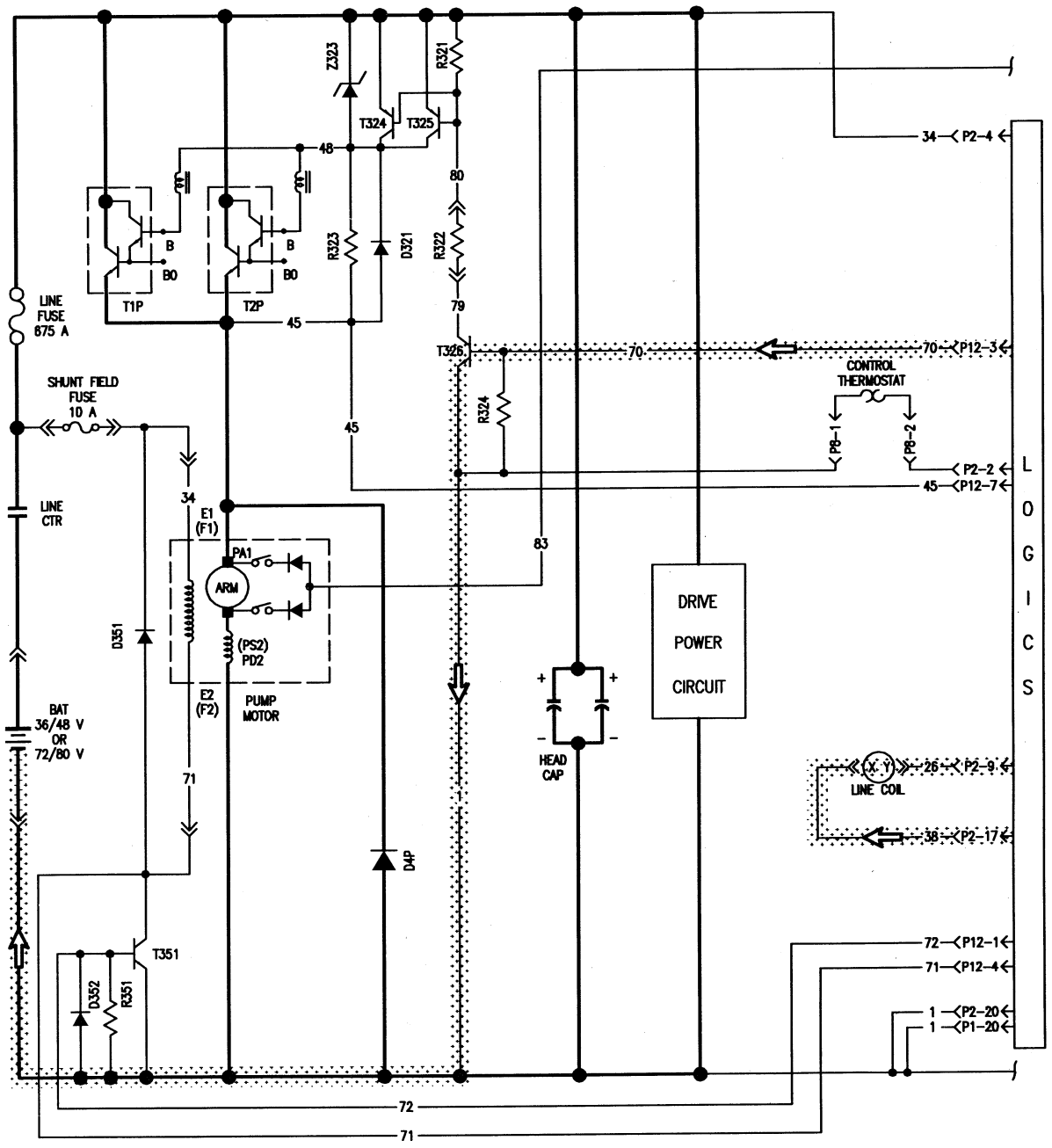


Location of Battery Selection Jumpers
(1) J1. (2) J2. (3) J3. (4) J4.

A jumper is used to match the logics to the operating battery voltage. Remove the logic cover to access the jumper. The jumper should be installed as indicated:
J1 = 36V J2 = 48V J3 = 72V J4 = 80V
If the jumper is placed on the incorrect voltage, no damage will be done to the logics, but incorrect Battery Discharge Indicator will be displayed, and either the hydraulics will not operate properly, or the battery may be damaged due to deep discharge.

Power Steering Idle

Transistor T1P and T2P Pulsing



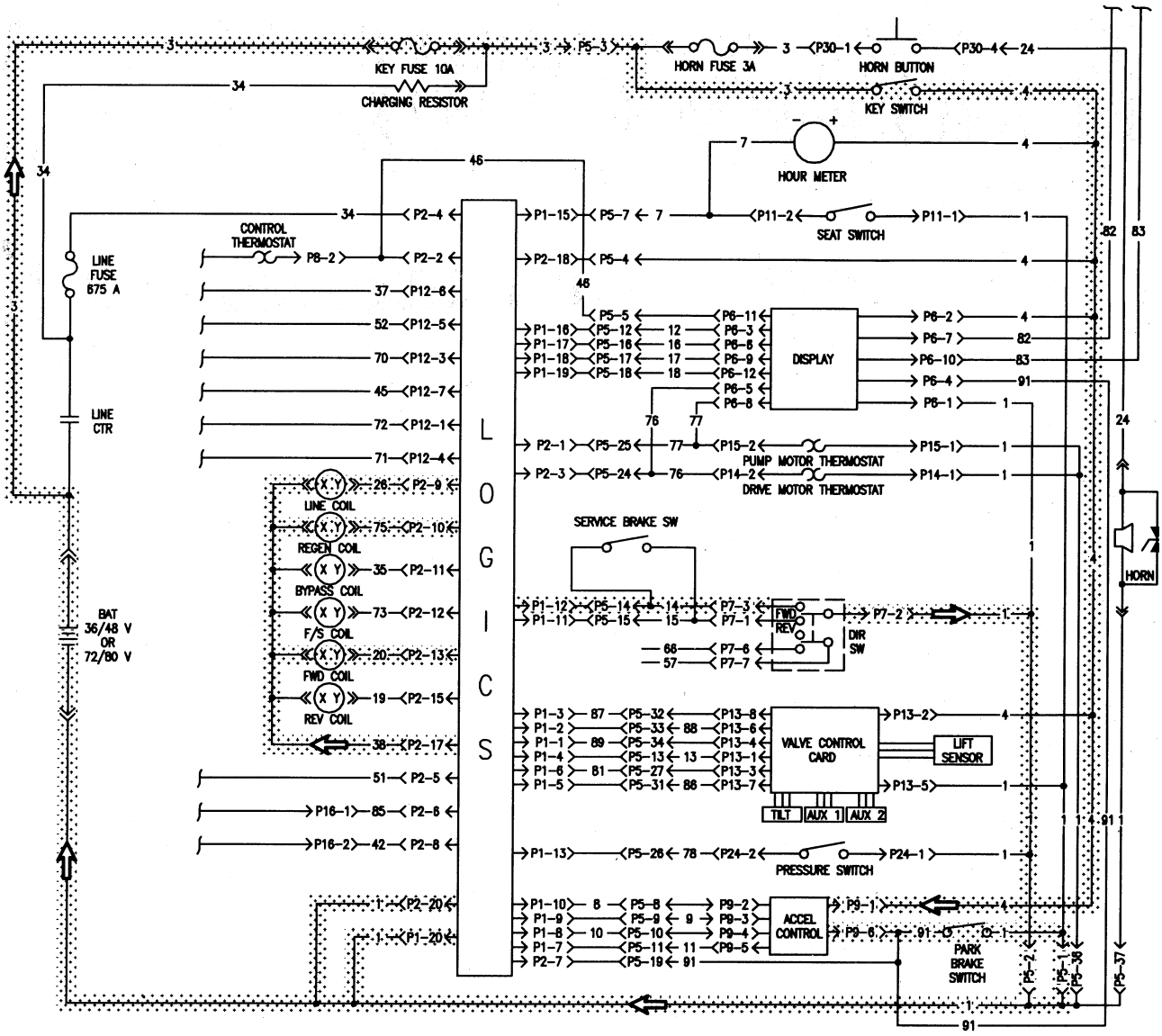
T326 Base Input Signal

After the line contactor is closed the logics generates a positive pulsing signal (approximately 1.5 volts) on P12-3, to the base of transistor T326. This is a rapidly changing signal that can only be viewed on an oscilloscope. Because T326 is a NPN type transistor, the positive signal into the base causes current flow through the base/emitter junction.

When current flows through the base/emitter junction the transistor turns ON and main current will flow through the collector/emitter junction. If the base signal from the logics is ON at T326, T326 will be ON. When the base signal is OFF, T326 will be OFF.

Drive Circuit

Control Circuit

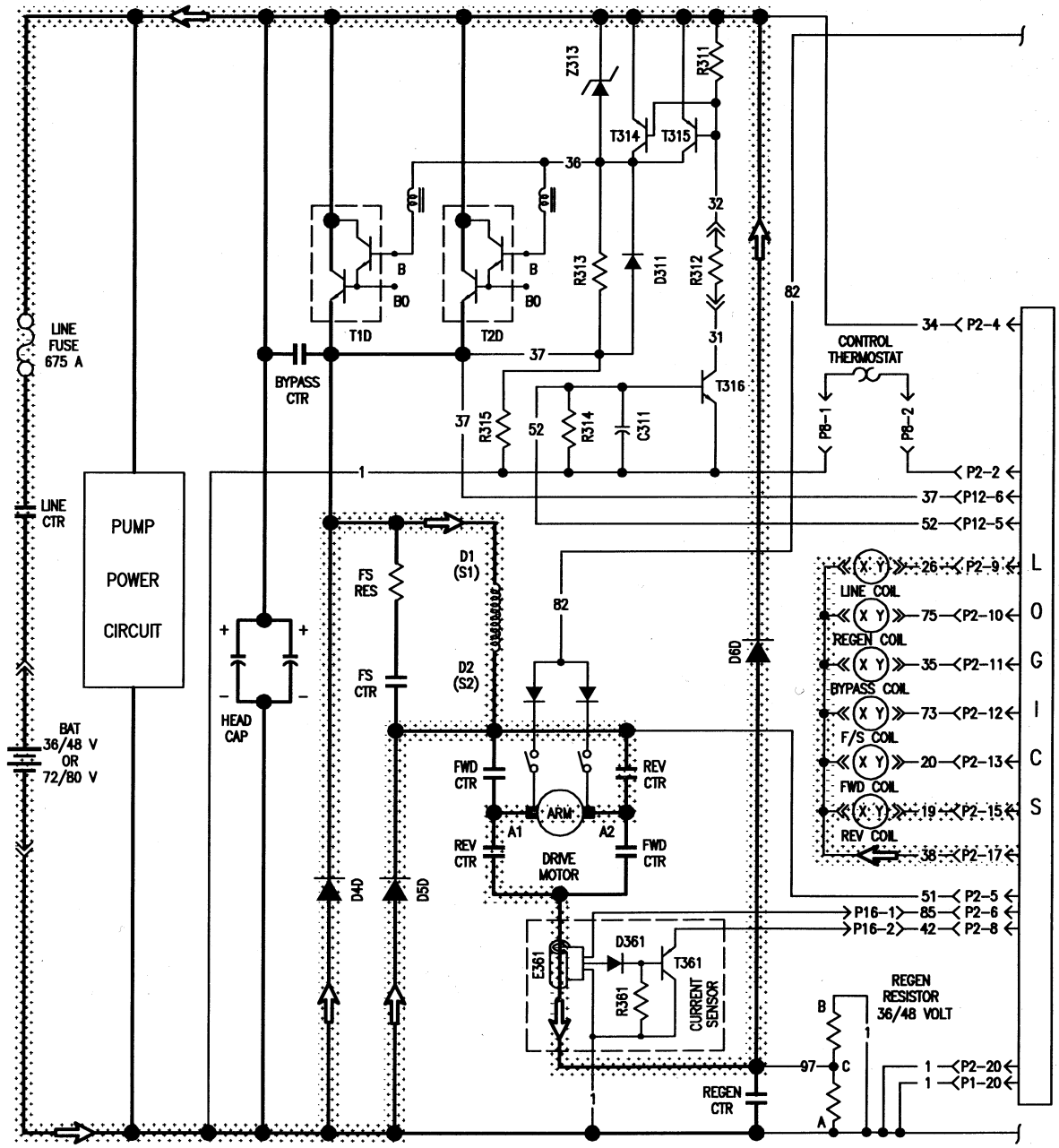


Drive Control Circuit

NOTE: The circuit diagrams have shaded lines for illustration of current flow in each circuit.

With the actuation circuit complete the logics supplies a HIGH voltage (15 volts) to the direction switch at P1-11 and P1-12. A HIGH voltage is also supplied to the accelerator control at P1-10, P1-9, P1-8 and P1-7. Battery voltage is supplied to the accelerator at P9-1. Releasing the park brake closes the park brake switch and provides a path to battery negative. Selecting a direction will change the voltage from HIGH to LOW on P1-12 for forward or P1-11 for reverse. Depressing the accelerator pedal will cause the accelerator voltage pattern on P1-7, P1-8, P1-9 and P1-10 to change from all HIGH to one of the fifteen speed patterns explained under Accelerator Control.

The logics detects the voltage pattern change at P1-7, P1-8, P1-9 and P1-10, activates the correct direction contactor, regen contactor and starts pulsing the drive power transistors. With the forward direction selected current flows from the logic P2-17 through forward direction and regen contactor coils to logic P2-13 and P2-10 back to battery negative. The forward and regen contactor tips close.

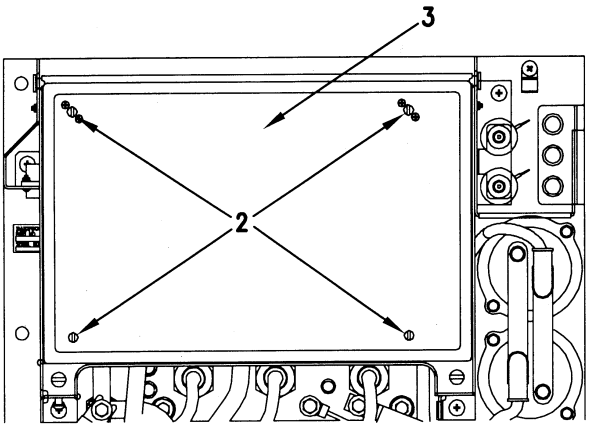


Regenerative Circuit (Power Transistors OFF)

When current peaks at it's preset value, the logics will turn OFF the power transistors. Combined flyback current and generated current will now flow from the drive motor field and armature, through the current sensor, D6D, line fuse, line contactor tips, battery, flyback diode D4D back to the drive motor field and plugging diode D5D back to the drive motor armature.

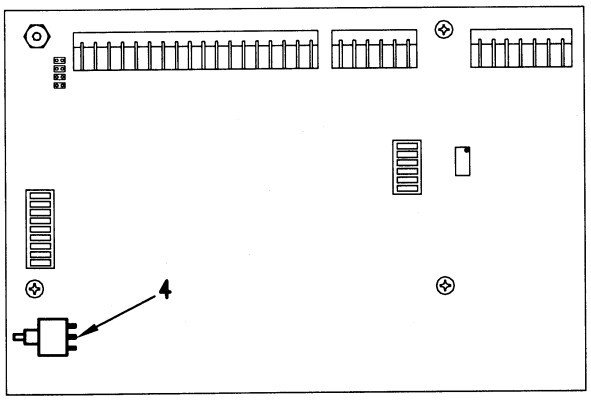
This is the charging cycle for the battery. When the combined flyback and generated current decreases, the logics will turn ON the power transistors and the cycle starts again.

As electrical braking slows the truck, the armature generates less and less current. The logics makes up for the decreasing generated current by increasing the pulse rate of the power transistors.



Removing Cover from Logic Unit (Logics)
(2) Screws. (3) Cover.

5. Loosen four screws (2) to remove logic cover (3).



DIAG/RUN/SET Switch Location
(4) Switch.

6. Move switch (4) to “Diagnostic” position. This places the controller in diagnostics when the battery is connected and key is turned to ON. If any of the tests that follow fail (except the line fuse test where the Display =“d”) continue through the tests that remain. Move switch (4) to “Run” and then back to “Diagnostic” position. This will bypass the failed test and allow the next test to be performed.

7. Connect the battery and turn key to ON.

Display = “blank” See Troubleshooting Problems 1 or 2.

Display = “d” Line fuse not disconnected or head capacitor not discharged below 5 volts, return to Step 2.

Display = “F” Logics has a failure. Replace logics.

Display = “F&E” Stored default values not set, try reprogramming default settings. See Activating Default Settings.

NOTE: This test does not check all the logic circuits, so the logics may pass this test and still have a failure.

Display = “1” Ready for Test 1.

Test 1 : Seat Switch

Press and release seat to close and open seat switch.

Display = “1” Seat switch circuit defect, move hand around on seat and press again. If still “1”, see Troubleshooting Problem 7.

Display = “2” Seat switch circuit OK.

Test 2 : Direction Switch

Move direction switch from neutral to reverse, to forward.

Display = “2” Direction switch circuit defect. See Problem 8.

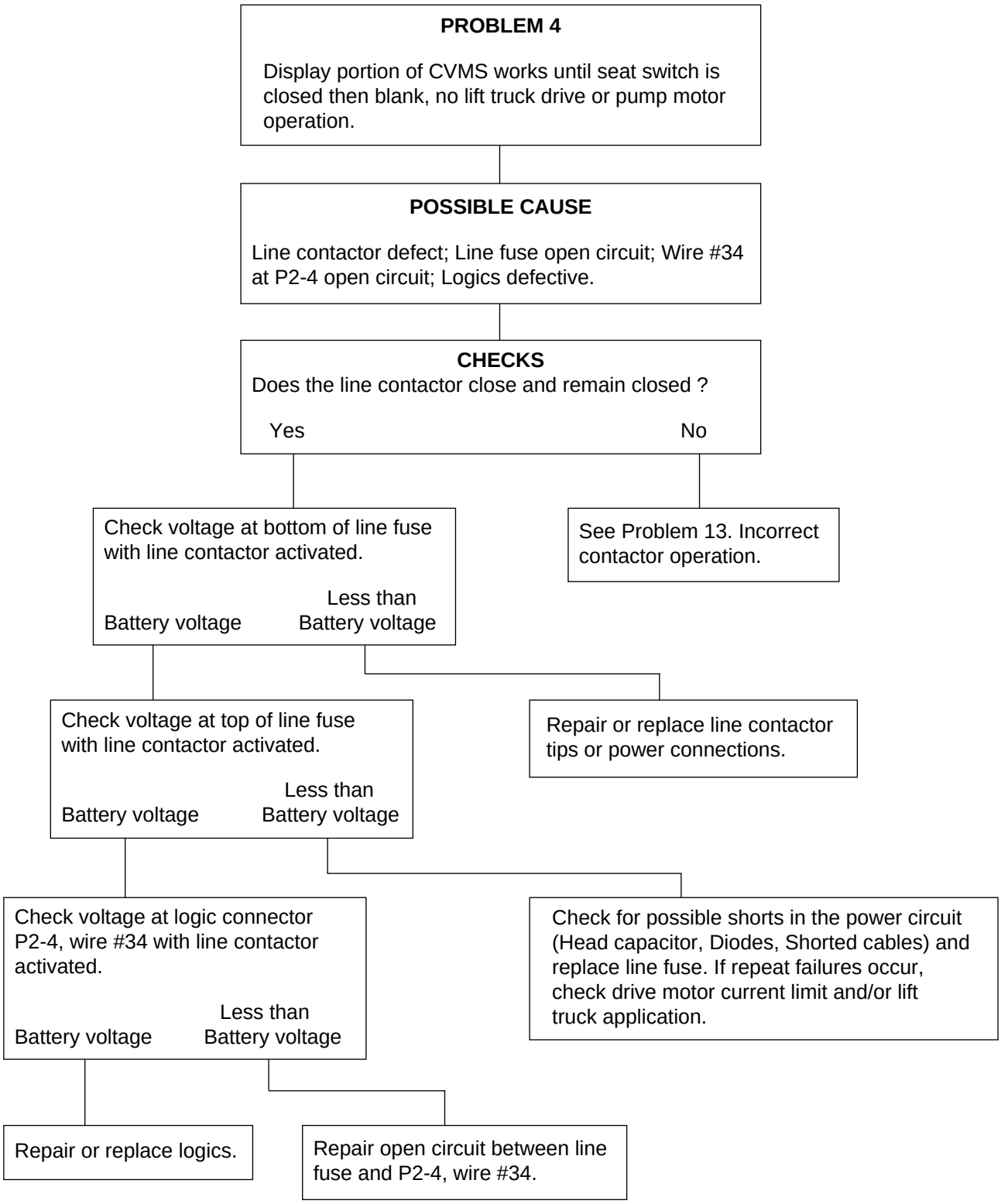
Display = “3” Direction switch circuit OK.

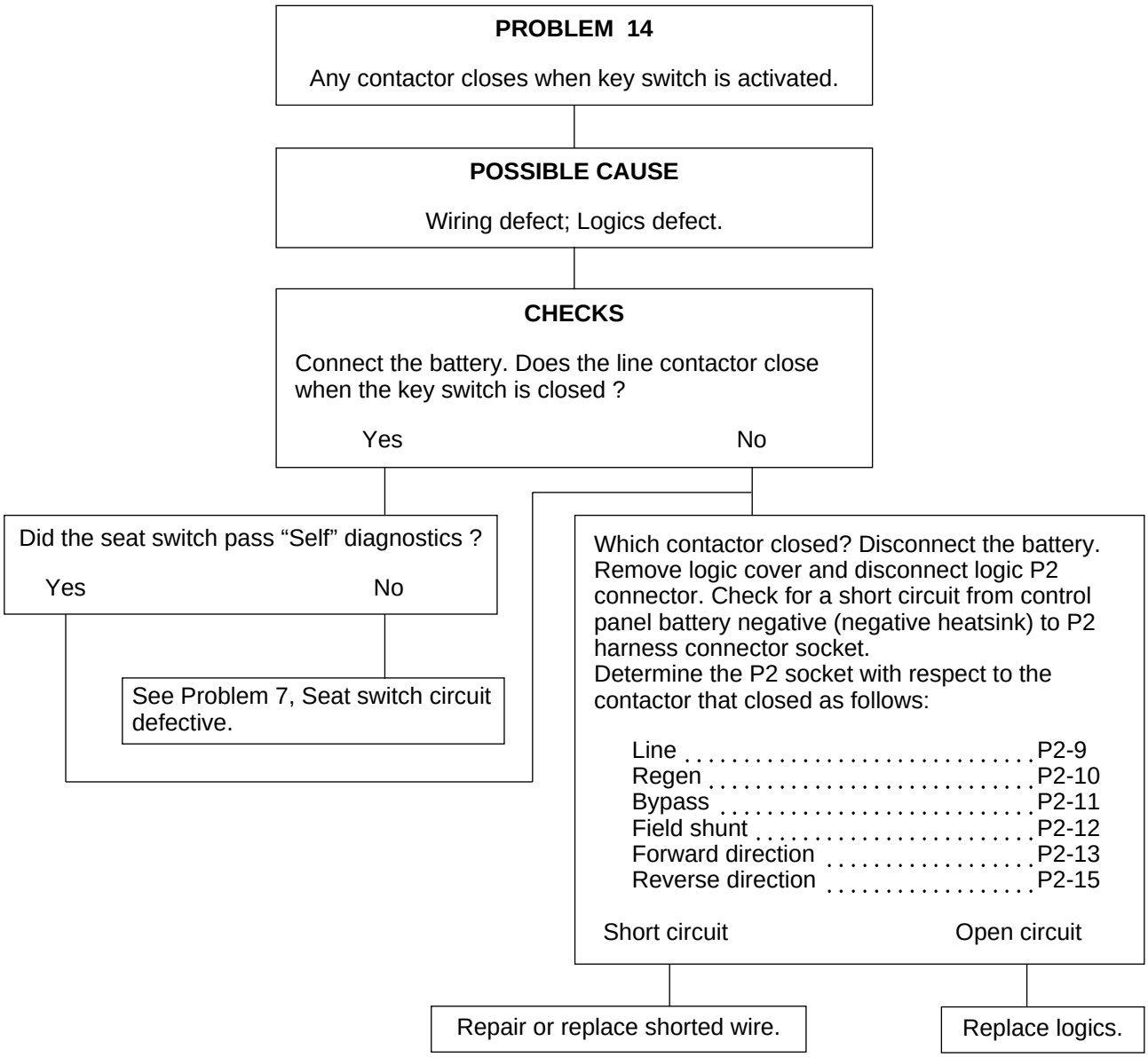
Test 3 : Lift Sensor or Switch Circuit

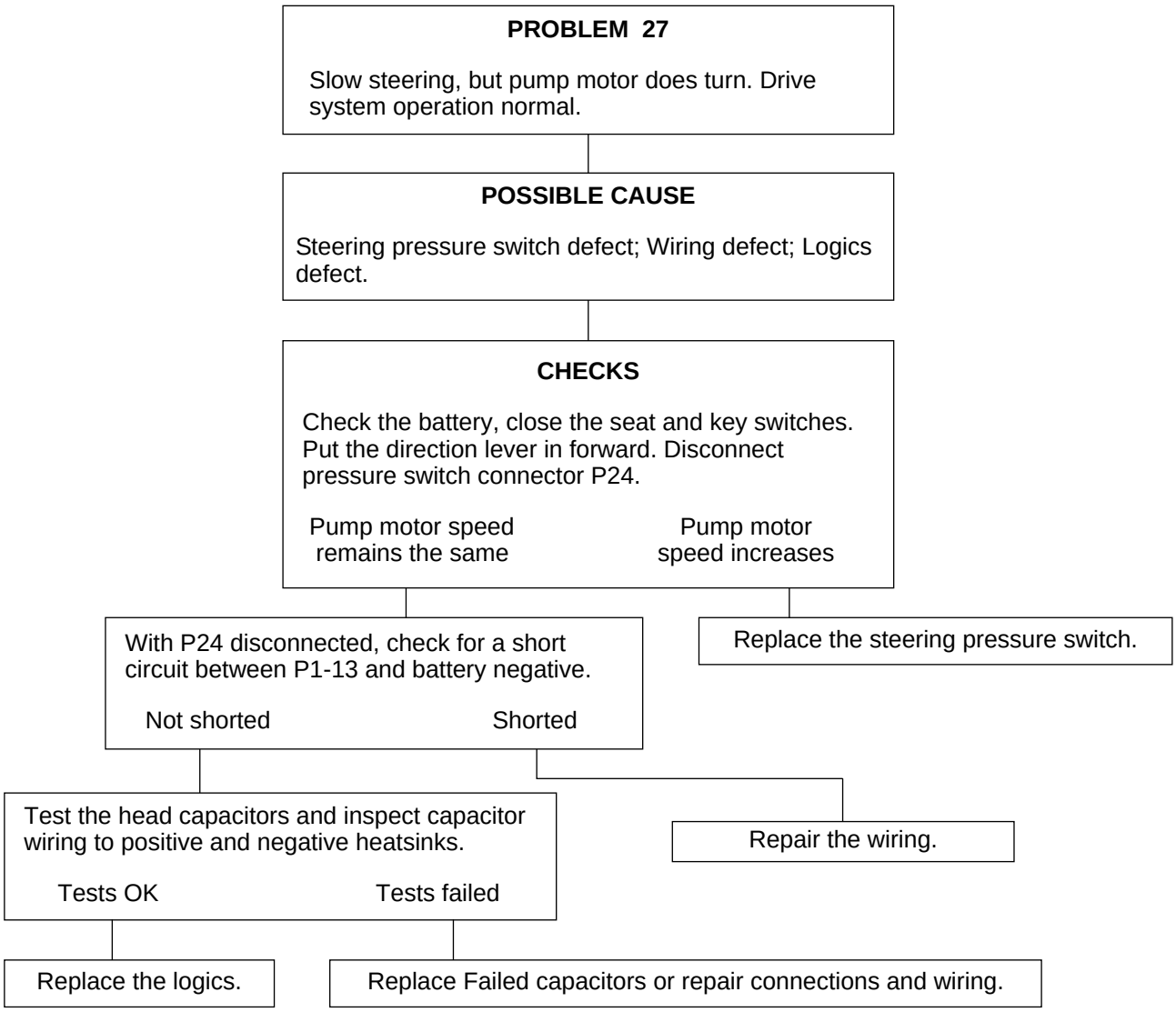
Pull lift lever to maximum, then release.

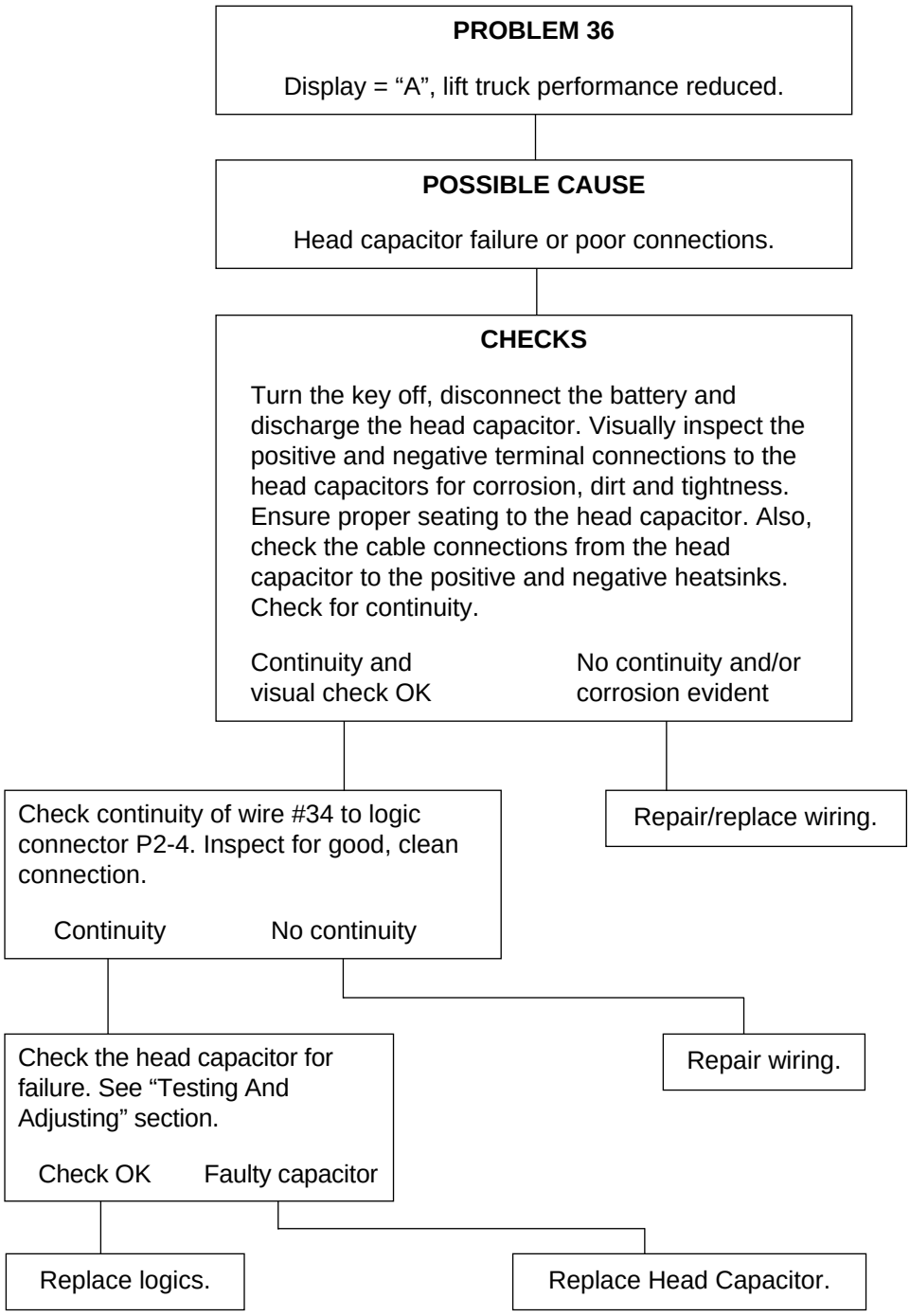
Display = “3” Lift sensor or switch circuit defect or out of adjustment. See Problem 9.

Display = “0” (Flashing) Lift circuit OK. Display now shows the speed that the lift lever is set to. As lever is pulled back, 0 through 7 will be shown. This indicates at what position the lift lever changes the pump motor speed. The flashing mode must be overridden by switching the DIAG/RUN/SET switch to the “Run” and then back to “Diagnostic” position.

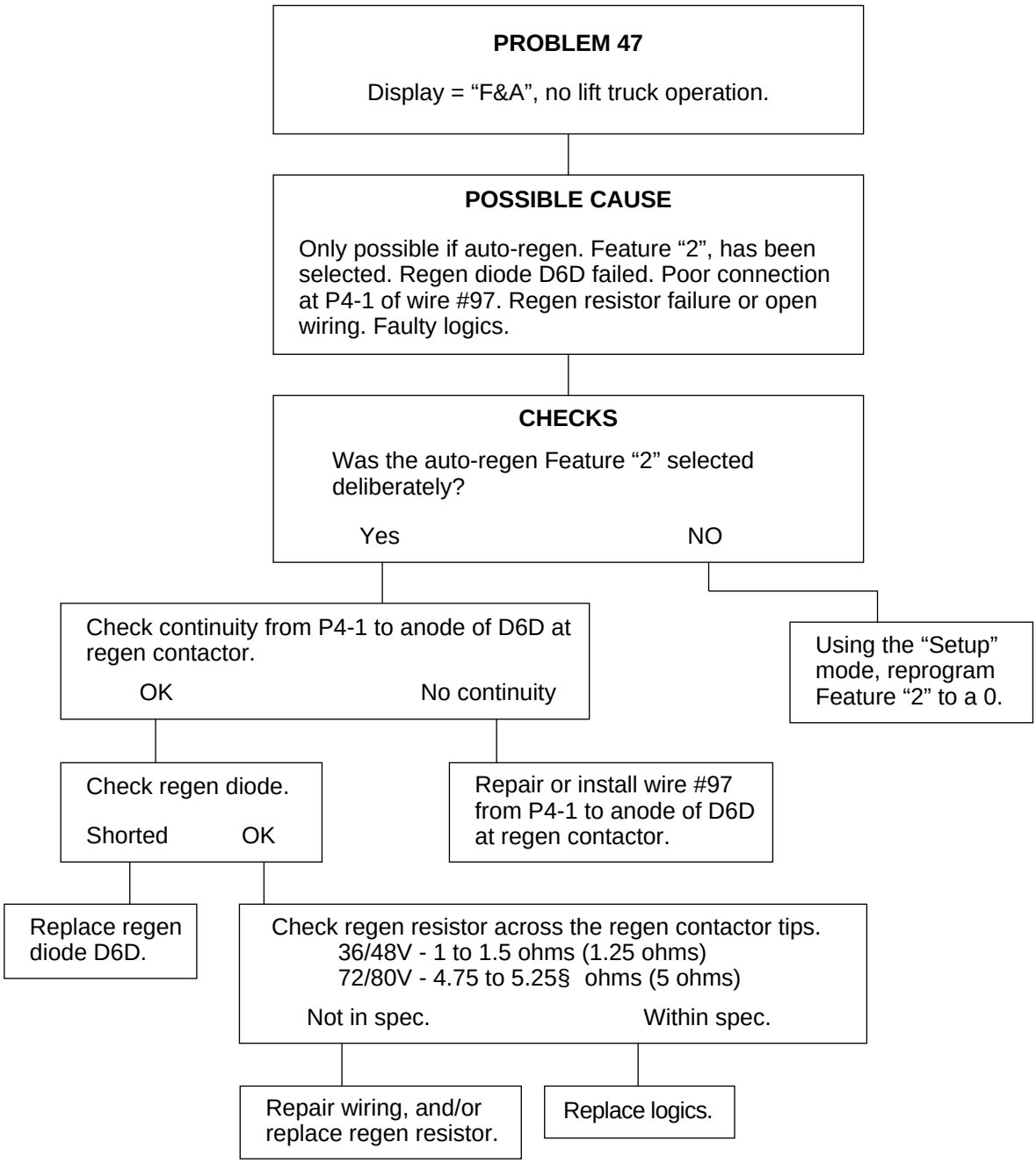

PROBLEM 4
Display portion of CVMS works until seat switch is closed then blank, no lift truck drive or pump motor operation.
POSSIBLE CAUSE
Line contactor defect; Line fuse open circuit; Wire #34 at P2-4 open circuit; Logics defective.
CHECKS
Does the line contactor close and remain closed ?
Yes
No
Check voltage at bottom of line fuse with line contactor activated.
Battery voltage
Less than Battery voltage
See Problem 13. Incorrect contactor operation.
Check voltage at top of line fuse with line contactor activated.
Battery voltage
Less than Battery voltage
Repair or replace line contactor tips or power connections.
Check voltage at logic connector P2-4, wire #34 with line contactor activated.
Battery voltage
Less than Battery voltage
Check for possible shorts in the power circuit (Head capacitor, Diodes, Shorted cables) and replace line fuse. If repeat failures occur, check drive motor current limit and/or lift truck application.
Repair or replace logics.
Repair open circuit between line fuse and P2-4, wire #34.


PROBLEM 14
Any contactor closes when key switch is activated.
POSSIBLE CAUSE
Wiring defect; Logics defect.
CHECKS
Connect the battery. Does the line contactor close when the key switch is closed ?
Yes
No
Did the seat switch pass “Self” diagnostics ?
Yes
No
See Problem 7, Seat switch circuit defective.
Which contactor closed? Disconnect the battery. Remove logic cover and disconnect logic P2 connector. Check for a short circuit from control panel battery negative (negative heatsink) to P2 harness connector socket.
Determine the P2 socket with respect to the contactor that closed as follows:
Line P2-9
Regen P2-10
Bypass P2-11
Field shunt P2-12
Forward direction P2-13
Reverse direction P2-15
Short circuit
Open circuit
Repair or replace shorted wire.
Replace logics.


PROBLEM 27
Slow steering, but pump motor does turn. Drive system operation normal.
POSSIBLE CAUSE
Steering pressure switch defect; Wiring defect; Logics defect.
CHECKS
Check the battery, close the seat and key switches. Put the direction lever in forward. Disconnect pressure switch connector P24.
Pump motor speed remains the same
Pump motor speed increases
Replace the steering pressure switch.
With P24 disconnected, check for a short circuit between P1-13 and battery negative.
Not shorted
Shorted
Repair the wiring.
Test the head capacitors and inspect capacitor wiring to positive and negative heatsinks.
Tests OK
Tests failed
Replace the logics.
Replace Failed capacitors or repair connections and wiring.



NOTE: Somewhere it should state that all wire “#1” should be checked throughout the panel, especially the ones going into the logic connector at P2-20. Also check all battery connections throughout panel, cables, busbars, etc.



Discussion : “F&A” error code and sensing are only used if Feature “2”, auto-regen, is enabled. The logics monitors the voltage on the D6D anode through P4-1 to ensure that the regen contactor is working correctly. The “F&A” code ensures that the sense wire #97 has been installed, and is connected correctly. The regen resistor ensures that any frame voltage does not effect the sensing of voltage on P4-1.

Conductor and Switch Continuity

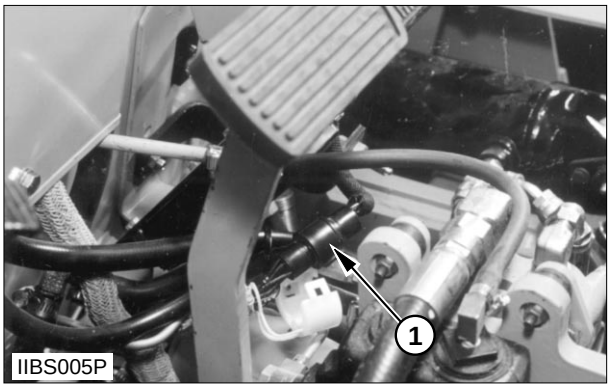
1. Set the multimeter to the 200Ω range.

2. Use the multimeter to perform the continuity test. If continuity exists, the measurement will be less than 1 ohm. If the measurement is more than this, continuity does not exist and the problem will have to be repaired.

Accelerator Control

⚠ WARNING

Battery voltage and high amperage are present. Injury to personnel is possible. Disconnect the battery and discharge the head capacitor (HEAD CAP) before any contact is made with the control panel.



P9 Connector Location
(1) P9 connector

Refer to “Self-Diagnostics” Accelerator Control in Troubleshooting section. Remember that the park brake switch disables the Accelerator Control.

Capacitor (Head)

⚠ WARNING

Battery voltage and high amperage are present. Injury to personnel is possible. Disconnect the battery and discharge the head capacitor (HEAD CAP) before any contact is made with the control panel.

NOTICE

Damage can be caused to the head capacitor. Do not remove bolts from capacitors to perform tests. Remove capacitor connecting cables at heatsink connections.

Head capacitor refers to both the head capacitors hooked together as installed in the control panel. If the capacitors hooked together fail the Head Capacitor Test, then replace both capacitors.

1. Disconnect the battery and discharge the head capacitor.

2. Visually inspect the capacitor for bulges at the terminals.

3. Verify the plastic top is not melted around the terminals and that the blow plug is not leaking.

⚠ WARNING

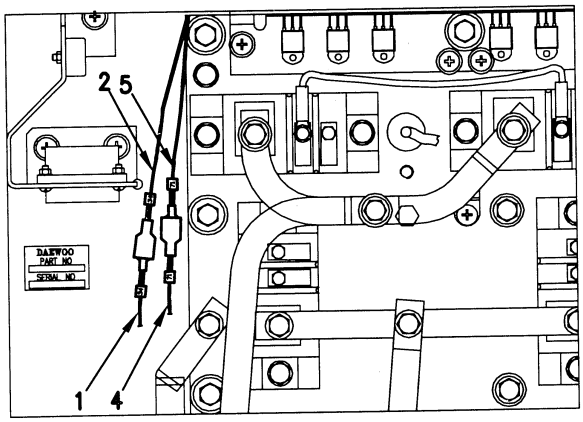
Head Capacitor “blow plug” will rupture with reverse polarity. Vapors and contents of Head Capacitors are toxic, flammable and corrosive. Personal injury can be caused from breathing the fumes or if its contents make contact with the skin. Be sure to always connect the positive wire, from the positive heatsink, to the positive terminal of the Head Capacitor.

13. Transistor T326 (emitter/base) test.
Set the multimeter to the 2KΩ range. Connect the positive lead to the negative heatsink (10). Connect the negative lead to P12-3, wire #70. The measurement must be 225 to 275 ohms.

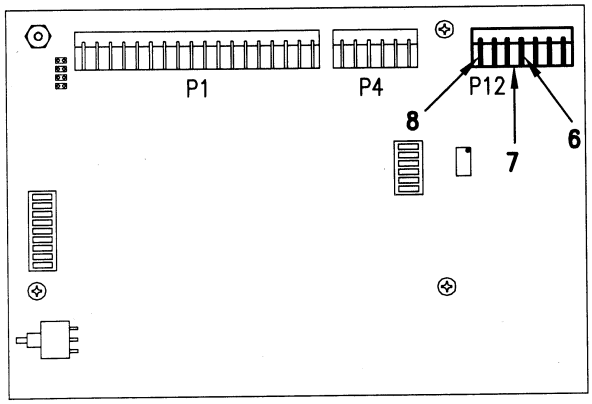
14. Resistor R324 test.
Set the multimeter to the 2KΩ range. Connect the positive lead to P12-3, wire #70. Connect the negative lead to the negative heatsink (10). The measurement must be 225 to 275 ohms.

15. Connect all disconnected wires.

Hydraulic Pump Shunt Field Tests



Component Locations
(1) Wire #34, shunt field side. (2) Wire #34, driver board side. (4) Wire #71, shunt field side. (5) Wire #71, driver board side.



Component Locations
(6) P12-4 wire #71. (7) Connector P12. (8) P12-1 wire #72.

1. Disconnect wire #71 (5) from the pump motor shunt field wire #71 (4).

2. Disconnect P12 connector (7) from the logic board.

3. Transistor T351 (collector/emitter) test.
Set the multimeter to the diode test position. Connect the positive lead to the negative heatsink. Connect the negative lead to connector P12-4 wire #71 (6).
The measurement must be .3 to .9 volts.

Reverse the test leads (positive lead to wire #71, negative to wire #72).
The measurement must be OL.

4. Transistor T351 (collector/base) test.
Set the multimeter to the diode test position. Connect the positive lead to connector P12-1, wire #72 (8). Connect the negative lead to wire #71 (5). The measurement must be .3 to .9 volts.

Reverse the test leads (positive lead to wire #71, negative lead to wire #72).
The measurement must be OL.

5. Transistor T351 (emitter/base) and diode D352 test.
Set the multimeter to the 2KΩ range. Connect the positive lead to P12-1, wire #72 (8). Connect the negative lead to negative heatsink. The measurement must be 325 to 375 ohms.

7. Disconnect wire #34 (2) from the pump motor shunt field wire #34 (1).

8. Diode D351 test.
Set the multimeter to the diode test position. Connect the positive lead to wire #71 (5). Connect the negative lead to wire #34 (2). The measurement must be .3 to .9 volts.

Reverse the test leads (positive to wire #34, negative to wire #71). The measurement must be OL.

9. Connect all disconnected wires and connectors.

Valve Control Card Adjustment

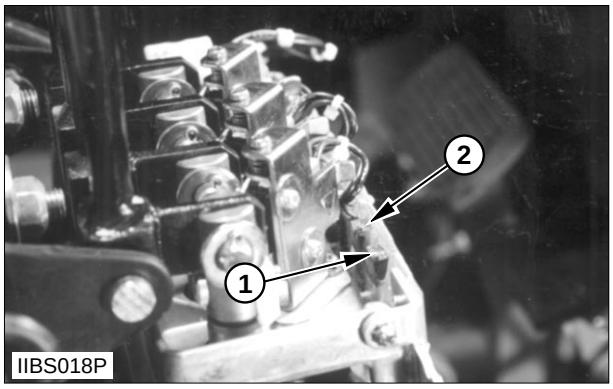
⚠ WARNING

The lift truck can move suddenly. Injury to personnel or damage to the lift truck is possible. Safely lift the drive wheels off the floor. Put blocks of wood under the frame so both drive wheels are free to turn. Keep away from drive wheels that turn.

1. Verify the lift sensor clearance is adjusted correctly.

2. Disconnect all tilt and auxiliary switch connectors.

3. Place the lift truck in “Self” Diagnostics so that the display is flashing the lift speed by bypassing Tests 1, 2 and 3 with the DIAG/RUN/SET switch. (see Built-In Diagnostic Operation in Troubleshooting section for correct procedure).



Valve Control Card Adjustment
(1) P1 Potentiometer. (2) P2 Potentiometer.

4. Turn potentiometer P1 (1) fully counterclockwise until a clicking sound is heard, (roughly 20 turns).

5. Turn potentiometer P2 (2) fully counterclockwise until a clicking sound is heard, (roughly 20 turns).

6. Turn potentiometer P2 (2) 15 full turns clockwise.

7. Display should be flashing a “0”, if not adjust P2 counterclockwise until a flashing “0” is obtained.

8. Position the lift lever just prior to the hydraulic valve opening. Adjust P1 (1) clockwise until a flashing “1” is obtained on the display.

9. Pull the lift lever all the way back. A flashing “7” must be displayed.

10. If a flashing “7” is not displayed, adjust P2 (2) clockwise until it is.

11. Release the lift lever and adjust P1 counterclockwise until a “0” is displayed.

12. Repeat steps 9 and 10 until “0” to “7” speeds are correct.

13. Put the lift truck back in the run mode so the actual hydraulics can be tested.

14. Connect the battery, close the seat switch and turn the key to ON.

15. Pull the lift lever back until the pump motor turns on. The forks must not move. Adjust P1 so the motor starts just before the valve opens.

If the valve opens before the motor turns on, adjust P1 (1) clockwise.

If the motor turns on too far in advance of the valve opening, adjust P1 (1) counterclockwise.

7. To increase the value, cycle the direction lever to neutral and then back to forward. The display will increment one number. Repeat this cycle until the desired value for this feature is shown.

8. To program this value into memory, move the DIAG/RUN/SET switch to “Run”. If the key switch is turned off prior to moving the DIAG/RUN/SET to “Run”, the value will not be programmed. The display will blank to indicate that the value has been programmed. If other features need to be programmed, move the DIAG/RUN/SET switch to the “Setup” position, and the next feature will flash on the display. Cycle the DIAG/RUN/SET switch as in step 5 above until the desired feature number is flashed. A flashing “d” indicates the end of the feature list. The key switch must be cycled to return to the beginning of the feature list.

After programming a feature or features, the lift truck should be tested to verify that the operation is correct.

Pump Contactor
Operation - Feature “0”

This feature allows for the field shunt contactor to be used as a pump contactor. The main benefit of this feature is that it eliminates the heat generated by the pump transistors during hydraulic speeds 6 and 7.
If the panel overheats on a regular basis, this can solve thermal cutbacks. Hydraulic speeds will increase slightly, but travel speeds will be reduced by approximately 10% due to elimination of field shunt operation.
Panel busbars and cabling have to be reconfigured to enable this option to work. Part numbers 6R8524, 6R8523 and 914018, must be installed into the panel as follows:

1. Remove field shunt resistor and busbar from field shunt contactor to forward direction contactor. Disconnect S2 cable from panel.

2. Install 6R8524 busbar from bottom right hand side of bypass contactor to bottom left hand side of field shunt contactor.

3. Install 6R8523 busbar from top right side of field shunt contactor to pump flyback diode standoff.

4. Install 914018 busbar from top left side of forward contactor to 914044 insulator.

5. Install S2 cable to insulator.

6. Dial logic potentiometer P4 fully clockwise.

For further details, and diagrams, contact your Daewoo dealer.

Steering Pulsing
Frequency - Feature “1”

The factory setting for the steering pulsing, at both idle and boost up, is 7800 Hz. In some applications this can cause excessive panel heating. By setting this feature to a lower frequency range, which is the same frequency as the lifting speeds, panel heating can be reduced. The sound level of the steering will change, and may become more objectionable dependent on operator preference and ambient noise levels.

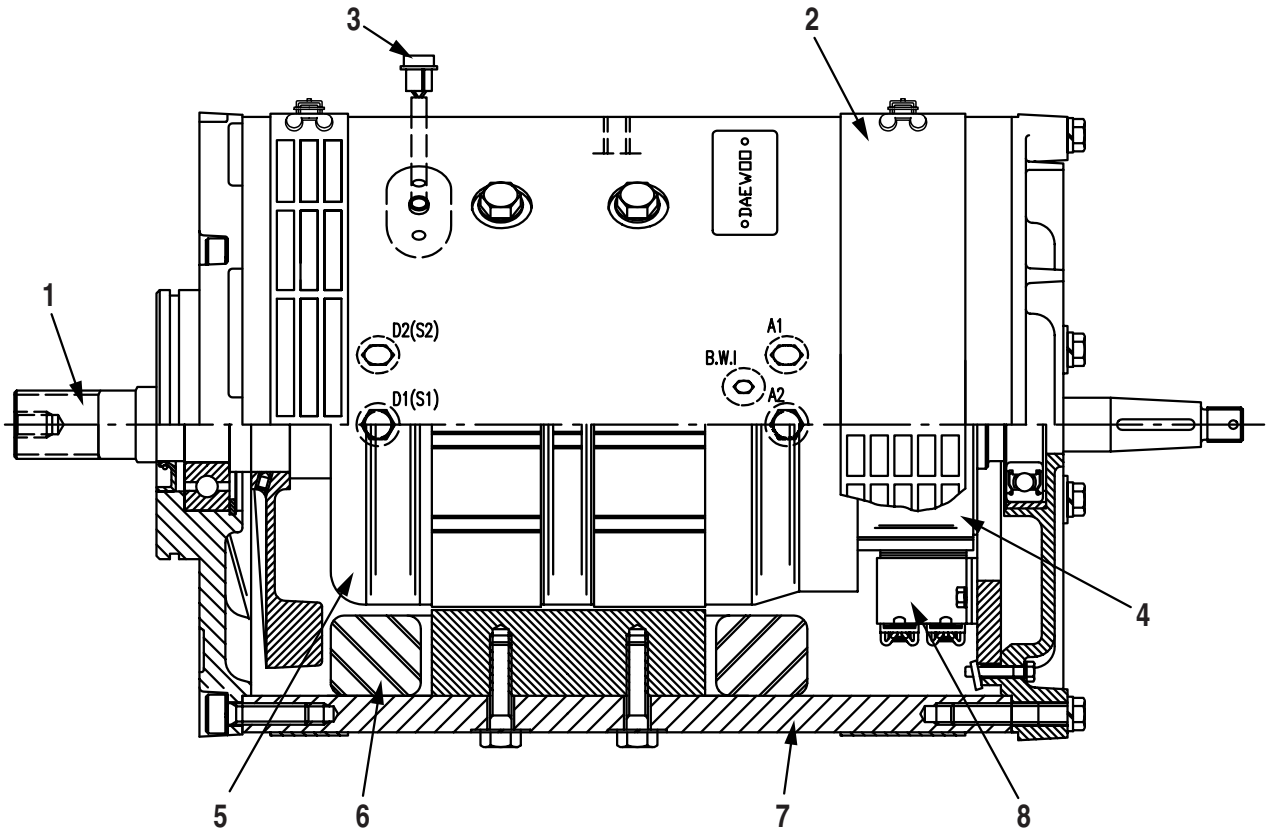
0 - Normal frequencies
1 - 700 Hz boost up, 7800 Hz idle
2 - When this feature is set to a 2 the pulse width of the hydraulic transistors is reduced, and subsequently battery amp draw is reduced.
The pulse width to the hydraulic transistors has been reduced, and both idle and boost up speeds will be slower and slightly quieter.

Assisted Braking
(Auto Regen) - Feature “2”

If selected, as long as the accelerator is released and a direction chosen, this feature will automatically activate regenerative braking during the use of the service brake. The service brake switch will connect circuits 14 and 15 together, sending a code to the logics indicating that the brake pedal has been depressed. As long as the brake pedal is depressed, regen braking will continue until the truck stops. If this feature is not selected, depressing the service brake switch will place the truck in neutral.
If this feature is selected, it is necessary for a wire to connect the regen diode (D6D) anode (at the regen contactor) to logic connector pin P4-1. In addition logic board switch SW11, must be positioned to OFF (left).
If either of these is not done additional error codes will be displayed.

“F&A” - Implies that the voltage at P4-1 is high when it should be low. This can occur if the wire falls off, is poorly connected, or hasn’t been installed.
“F&b” - Implies that the voltage at P4-1 is low when it should be high. This can occur if the regen contactor welds shut, or if SW11 is positioned incorrectly to ON (right).

Drive Motor



Drive Motor
(1) Shaft. (2) Cover. (3) Thermal switch (thermostat). (4) Commutator. (5) Armature assembly. (6) Field coils. (7) Frame. (8) Brush holder.

The drive system is operated by a direct current (DC) motor. Electric storage batteries are the source of power for the DC motor.

The drive motor is a series wound motor and uses a high temperature insulation. A series wound motor is a commutator motor. The field and armature circuits are a series, which provides a single path for the current. Armature (5) is mounted with single row ball bearings at each end. The ball bearings are permanently lubricated with a high temperature lubricant.

The electrical connections to the motor are made at corrosion resistant terminals on motor frame (7). On the outside of the motor frame is cover (2) that can be removed for easy access to the brushes and the commutator. Field coils (6) are fastened to the inside of the motor frame.

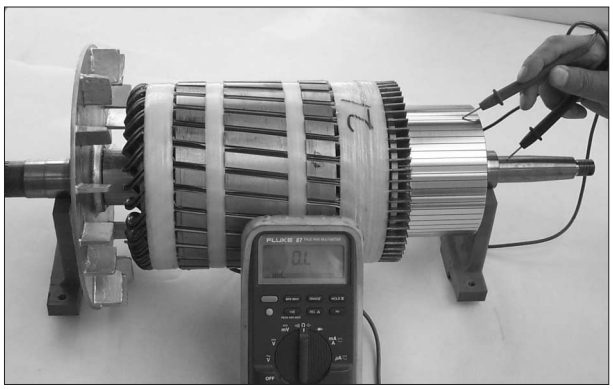
The four motor brushes are held in four brush holders (8). A spring holds each of the brushes against commutator (4) as the brushes wear.

The Optional Superior (S) function equipped lift truck's drive motor is protected from overheating by a thermal switch (thermostat) (3). The thermal switch opens at 150 $\pm$ 6°C (302 $\pm$ 11°F). It closes at 130 $\pm$ 7°C (266 $\pm$ 13°F). When the normally closed thermal switch is open, the amount of current through the motor is limited to allow the motor to cool. The motor has a fan for cooling.

The drive motor is activated when the parking brake is released, the key and seat switch are closed, a direction is selected and the accelerator pedal is depressed.

The drive motor powers the power transfer group through shaft (1).

Ground Test



Ground Test.

A digital multimeter can also be used to test for grounds. Put the Function/Range Switch on the 2M resistance (Ω) scale. When the test probes are put on the commutator and the shaft, the meter must give an indication of over load (OL). This means that the resistance is more than 2 megohms.

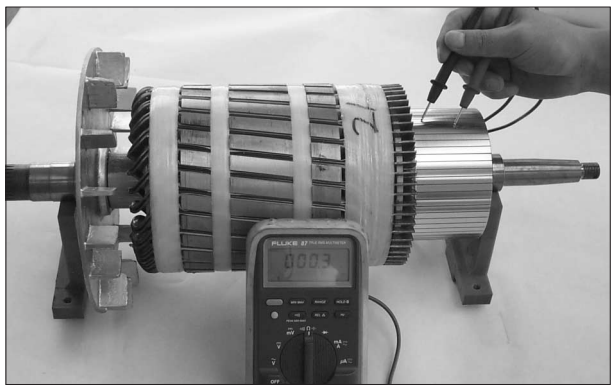
NOTICE

Never use air pressure that is more than 205 kPa (30 psi). Make sure the air line has a water filter.

If there is an indication of a ground in the above test, remove any dirt or debris form the armature with compressed (pressure) air.

Do the test for grounds again. If there is still an indication of a ground, make a replacement of the armature.

Open Circuit Test



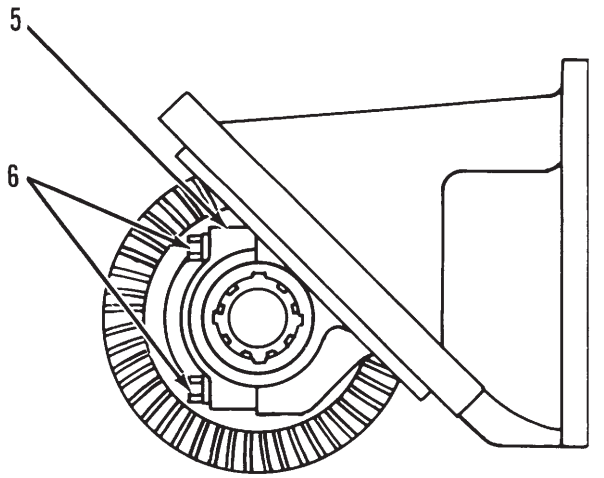
Open Circuit Test

1. Put the digital multimeter Function / Range Switch on the 200 ohm resistance (Ω) scale.

2. Put one test lead on one commutator bar. Put the other test lead on an adjacent (next to) bar and there must be less than one ohm resistance.

This test can also be done with an instrument, such as a Kelvin Double Bridge, that can make a measurement of very low resistance. Do the test the same as above and make a comparison of the resistance measurements.

Two burned areas on opposite sides of the commutator are indications of an open armature winding. These burned areas can cause very rapid brush wear.



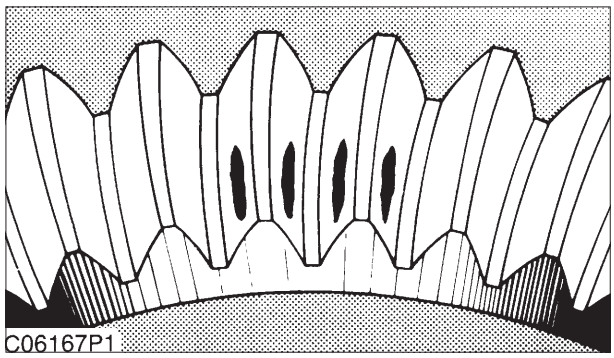
Install Carrier Assembly
(5) Bearing cap (6) Bolts

3. Put the carrier assembly in position in the housing assembly. Install bearing caps (5) and four bolts (6).
Tighten bolts (6) to a torque of 220 ± 25 N•m (160 ± 18 lb•ft).

4. Install lockwashers (7) and locknuts (8). Use tooling (A) to check gear clearance (backlash) between bevel gear (2) and pinion (9). Adjust locknuts (8) until the clearance is 0.15 to 0.20 mm (0.006 to 0.008 in.).
Adjust the clearance by turning one locknut (8) in and the other locknut out an equal amount.

5. Check the rolling torque again as shown in Pinion Bearing Adjustment, Step 6. Tighten locknuts (8) equally to preload the differential case bearings. Proper bearing preload will increase the rolling torque at the pinion (recorded in Pinion Bearing Adjustment, Step 6) by 0.63 to 0.88 N•m (5.6 to 7.8 lb•in).

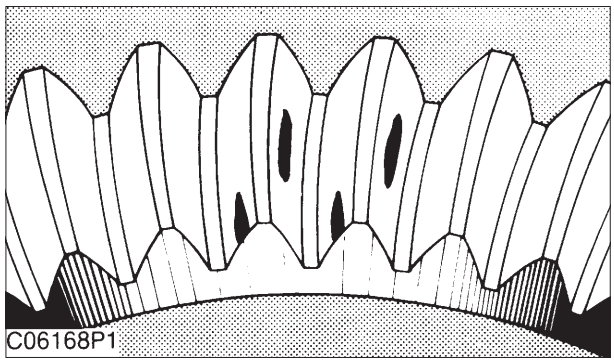
6. Measure backlash again. After backlash and preload are correct, bend a tab on each lockwasher (7) into a slot in locknuts (8) to hold them in position.



Correct Tooth Contact Setting

7. Check the tooth contact pattern as follows. Check the tooth contact setting between the bevel gear and pinion after the gear clearance (backlash) and bearing preload adjustments have been made as follows.

a. Put a small amount of Prussian blue, red lead or paint on the bevel gear teeth. Turn the pinion in both directions and check the marks made on the bevel gear teeth.



Short Toe Contact Setting

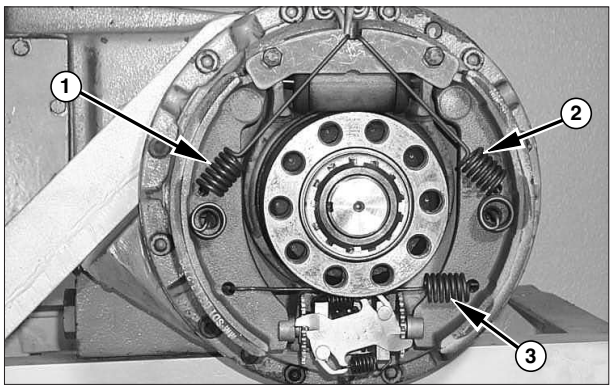
b. With no load, correct tooth contact setting will be as shown. The area of contact starts near the toe of the gear and goes 30 to 50% up the length of the tooth.
With this setting, when a load is put on the gear, the load will be over the correct area of the teeth.

Disassembly & Assembly

Brakes, Brake Adjuster And Wheel Cylinder

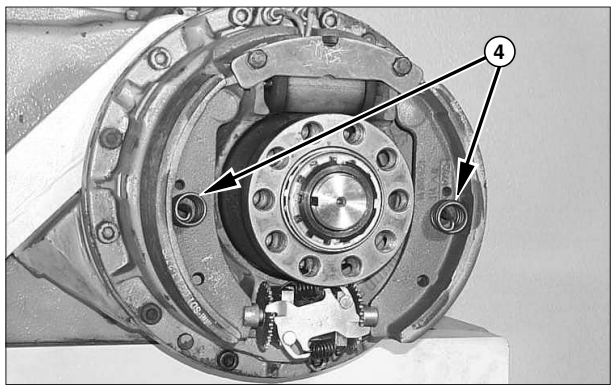
Remove Brakes, Brake Adjuster And Wheel Cylinder

Tools Needed	A
Jack Stand	1

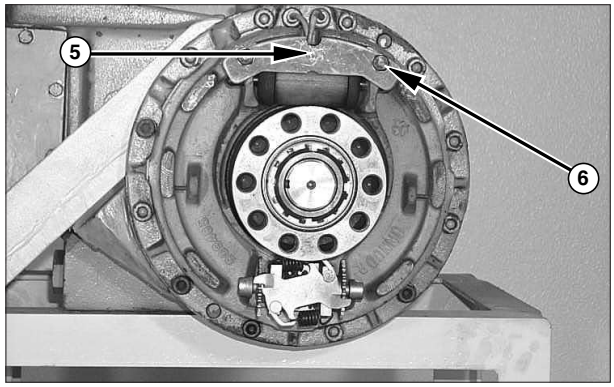


1. Put the lift truck in position on tooling (A), and remove the drive wheels. On B20/25/30S models, remove the brake drum also.

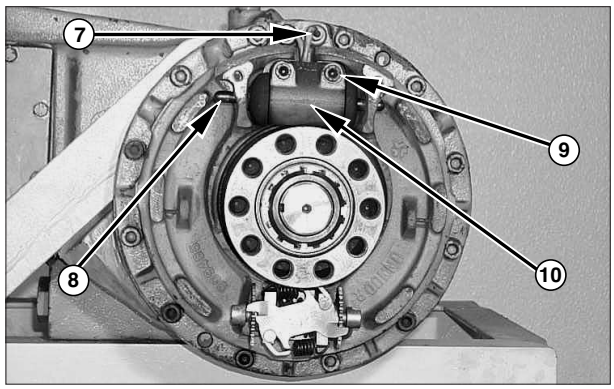
2. Remove brake return springs (1), (2) and (3) with a suitable brake shoe spring tool.



3. Remove brake retainer springs (4). Remove the brake shoes.

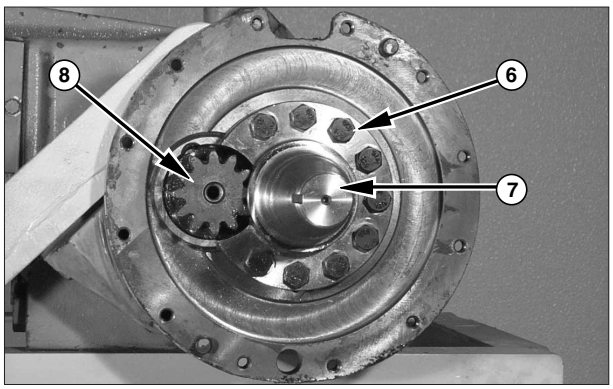


4. Remove bolts (6) to remove wheel cylinder cover (5).



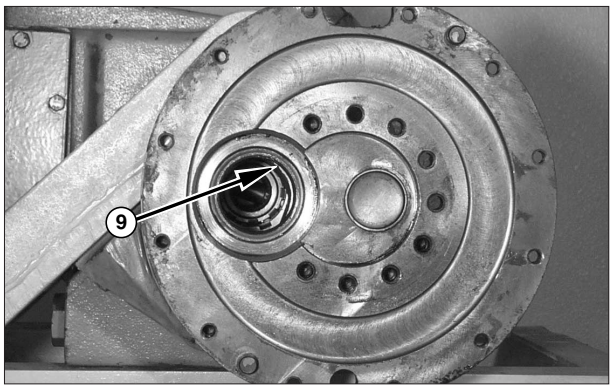
5. Disconnect brake lines (7). Remove plungers (8) from the wheel cylinder.

6. Remove bolts (9) to remove wheel cylinder (10).

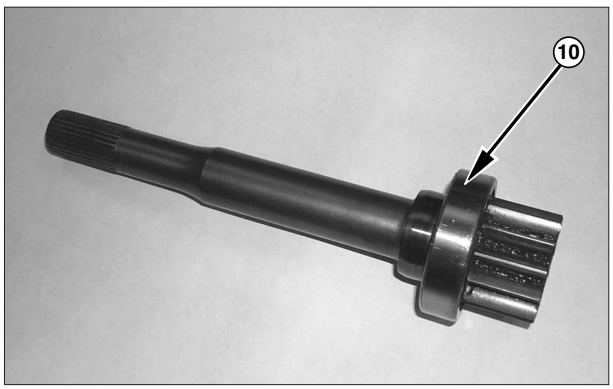


5. Remove bolts (6), and remove spindle (7).

6. Remove shaft assembly (8).



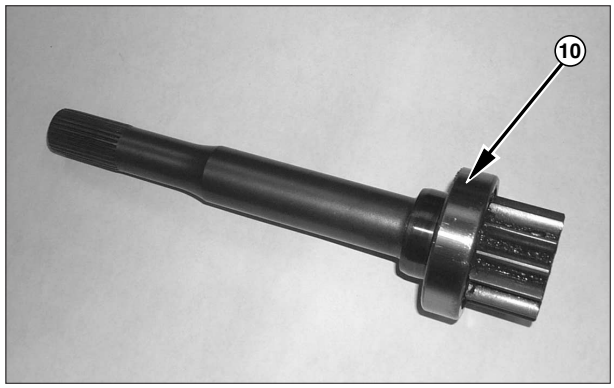
7. Remove lip seal (9) from the housing.



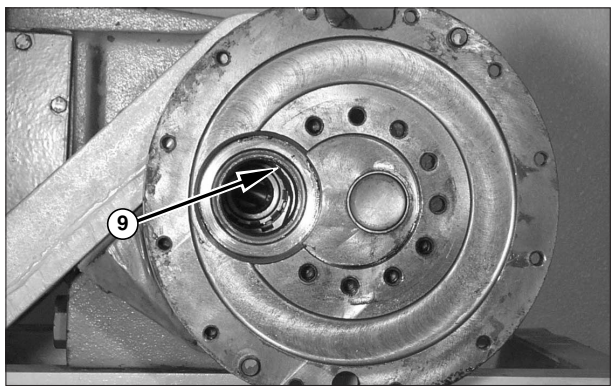
8. Remove the retainer and bearing (10) from the shaft.

Install Final Drives And Hubs

Tools Needed	A	B
Spanner Wrench	1	
Driver set		1



1. Install bearing (10) with a press. Heat the retainer to 317 to 427°C (700 to 801°F) and install it against bearing (10) with a press.



2. Install lip seal (9) in the housing with tool group (B) and a suitable press. Install the seal with the lip toward the inside.

The return hydraulic oil from the cylinders flows through hydraulic control valve (6), line (14), into filter (10) and hydraulic tank (13). Relief valve poppet (9) will release extra pressure to the hydraulic tank when the pressure in the lift circuits goes higher than relief valve pressure shown in the Control Valve section of SPECIFICATIONS. Relief valve poppet (11) does the same thing for the sideshift or tilt circuit when pressure goes higher than the auxiliary relief valve pressure shown in the Control Valve section of SPECIFICATIONS.

The speed at which the lift cylinder(s) are lowered is controlled by flow regulator (7).

Excess flow protector (2) and (4) will act as a flow control valve if an line between them and flow control valve (7) is broken when the mast is raised or lowered. This prevents a sudden fall of the mast or carriage if an oil line is broken.

The tilt forward, tilt back and sideshifter speed are controlled by flow control valves in hydraulic control valve (6). There is an anti-cavitation valve inside the tilt spool to prevent cavitation (development of air pockets) in tilt cylinders (8).

For a complete hydraulic schematic, see the foldout in the back of this module.

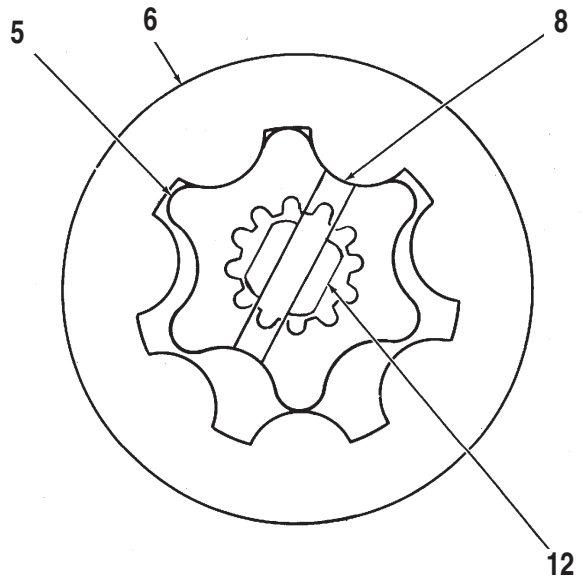
Oil Flow

The oil from the priority valve flows through inlet (4). When the steering wheel is stationary (NEUTRAL), the oil is stopped by spool (1). The oil can not flow through the steering gear to the steering cylinder until the steering wheel is turned.

The steering wheel is connected to spool (1) by a shaft assembly and splines. When the steering wheel is turned, spool (1) turns a small amount until springs (7) are compressed. Then, sleeve (2) starts to turn. As long as the steering wheel is turned, the spool and sleeve both turn as a unit, but they turn a few degrees apart.

When the spool and sleeve are a few degrees apart, oil passages are opened between them. This lets the pump oil from inlet (4) flow through passages in body (11) to the metering section.

When the steering wheel is turned, pin (8) turns with the sleeve and causes drive (12) to turn also. The drive causes a rotation of gear (5) inside gear (6). This rotation of the gear sends a controlled (metered) flow of pilot oil back through body (11). This oil flows to port (9) or (10) and then to the steering cylinder. Port (9) or (10), that is not used for pressure oil to the steering cylinder, is used for return oil from the other end of the steering cylinder.



IDCS114S

Pump Gears In Metering Section
(5) Internal pump gear. (6) External pump gear. (8) Pin. (12) Drive.

If the steering wheel rotation is stopped, springs (7) will move sleeve (2) back in alignment with spool (1) (NEUTRAL position). This will close passages between the metering section and control section and the steering gear will be in the NEUTRAL position.

When the engine is off, the steering gear can be manually operated. The control section will work as a pump. The oil that is returned from the steering cylinder is not returned to the tank. The suction of the control section will open an internal check valve and let return oil from the steering cylinder go to the inlet side of the control section. During power operation, supply pressure keeps the check valve closed.

Lift and Tilt Cylinders

Problem: Leakage around the cylinder rod.

Probable Cause:

1. Cylinder head (bearing) seals are worn.

2. Cylinder rod is worn, scratched or bent.

Problem: There is leakage of oil inside the cylinder or loss of lift or tilt power.

Probable Cause:

1. The piston seals are worn and let oil go through.

2. Cylinder has damage.

Problem: The tilt cylinder rods show wear.

Probable Cause:

1. The cylinders are not in correct alignment.

2. Oil is dirty.

Problem: Foreign material behind the wiper rings causing scratches on the cylinder rod.

Probable Cause:

1. The wiper rings shoe wear and do not remove dirt and foreign material.

Steering System

Problem: Too much force needed to turn steering wheel.

Probable Cause:

1. Priority valve (if equipped) releases pressure oil at a low setting.

2. Pump oil pressure is low, worn pump.

3. Steering gear covers are too tight.

4. Steering column not aligned with steering gear.

5. Priority valve spool is held in one position.

6. Steering gear without lubrication.

7. Low fluid level in the hydraulic supply tank.

Problem: Steering wheel does not return to center position correctly.

Probable Cause:

1. Steering gear covers are too tight.

2. Steering column is not in correct alignment.

3. Valve spool in the steering gear has a restriction.

4. Priority valve check valve permits lift and tilt hydraulic oil to affect steering hydraulic circuit.

Problem: Oil leakage at the pump.

Probable Cause:

1. Loose hose connections.

2. Bad shaft seal.

Problem: Low oil pressure.

Probable Cause:

1. Low oil level.

2. Priority valve (if equipped) relief valve spring weak.

3. Relief valve (priority valve) will not move from the open position.

4. Oil leakage inside or outside of the system.

5. Bad pump.

Problem: Pump makes noise and the steering cylinder rod does not move smoothly.

Probable Cause:

1. Air in the steering hydraulic circuit.

2. The pump has too much wear.

3. Loose connection of the oil line on the inlet side of the pump.

4. The viscosity of the oil is wrong.

5. The oil level in the hydraulic tank is low.

Mast and Carriage

Mast Adjustment

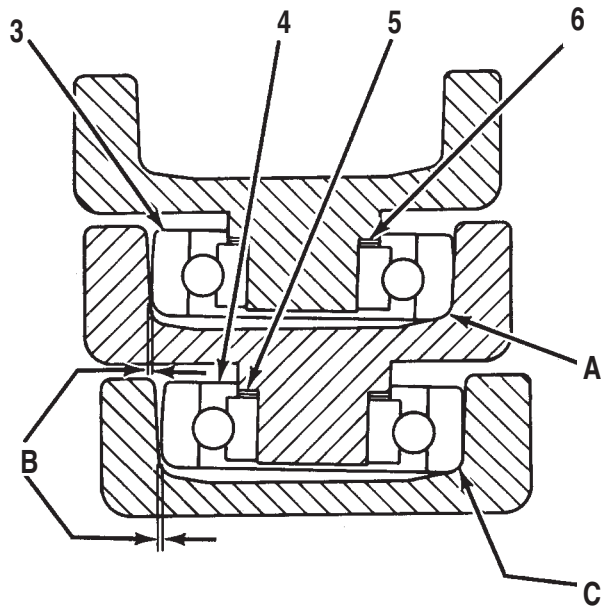
NOTE: The Standard, Full Free Lift and Full Free Triple Lift mast load bearings are all adjusted the same way. The mast shown in the following illustrations is the Full Free Triple Lift mast.

To make the mast clearance adjustments, mast must be removed from the lift truck.

Carriage, chain and lift cylinder must be removed from the mast for easy adjustments.

Use the procedure that follows to adjust the load bearings.

A. Lower Bearing Adjustment of Intermediate Mast



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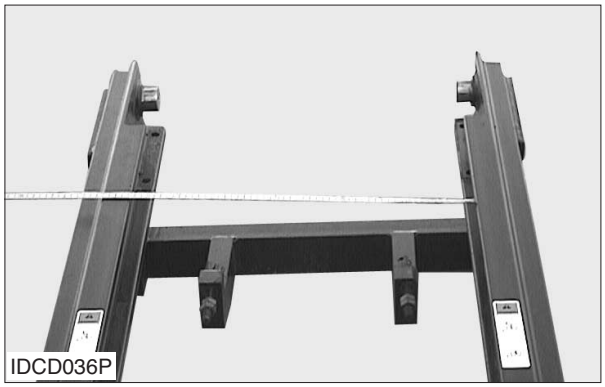
Mast Adjustment Lower Bearings
(A) Zero clearance. (B) Minimum clearance. (C) Zero clearance.
(3) Bearing. (4) Bearing. (5) Shims. (6) Shims.

1. Select lower bearings (3) and (4) from the chart to obtain minimum clearance (B) between bearing and channel leg for full channel length. Use same bearing on left and right side.

Mast And Carriage Bearings		
Part No.	Bearing Size	Bearing O.D.*
D581814	Under Size	108.6 mm (4.276 in)
D581815	Standard	109.6 mm (4.135 in)
D581816	Over Size	110.7 mm (4.358 in)

***** Permissible tolerance ±0.08mm (.003in)



2. Find narrowest point by ruler on the stationary mast in the area where the bearings make contact at 475 mm (18.7 in) channel lap.

⚠ WARNING

Tilt cylinder pivot eyes can loosen if the torque on the pivot eye clamping bolt is not tight enough. This will let the tilt cylinder rod turn in the tilt cylinder eye. The cylinder rod may then twist our of the pivot eye and the tilt cylinder will be out of alignment or may let the mast fall and cause personal injury or damage. When the rod lengths are made even, the tilt angle differences or the mast alignment will no longer be a problem.

3. Tighten bolt (2) and the nut to a torque of 95 ± 15 N•m (70 ± 10 lb•ft).
4. With mast at full back tilt, install shims (4) as required to permit no gap between spacer (5) and head (6). Shim so mast does not twist at full tilt back.

Drift Test

Drift is movement of the mast or carriage that is the result of hydraulic leakage in the cylinders or control valve. Before testing the drift:

⚠ WARNING

Personal injury can be caused by sudden movement of the mast or carriage. Use wood blocks and clamps to hold the mast in this position. Keep hands and feet clear of any parts that can move.

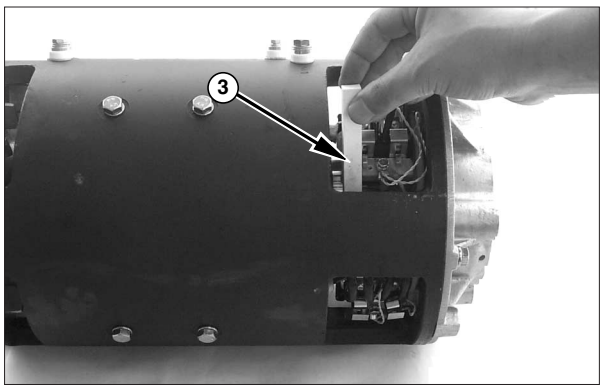
1. Check the chain adjustment and tilt cylinder alignment and make necessary adjustments.
2. Lift the mast approximately 762 mm (30 in). Use wood blocks and clamps to hold the mast in this position.
3. Check the mast hinge bolts to make sure they are tight.
4. Remove the blocks and clamps and lower the mast.

Drift Test For Lift System

1. Put a rated capacity load on the forks of the lift truck. Operate the lift truck through a complete lift and tilt cycle until the oil is at normal temperature of operation, 45 to 55°C.
2. Put the mast in a vertical position.
   Raise a rated capacity load to a sufficient height to test the lift cylinders.
3. Measure any drift of the carriage for a ten minute period. Drift for all models shall not exceed 100.0 mm (4.00 in).

⚠ WARNING

Wear eye protection when seating, polishing or cleaning the motor with air pressure. During the seating and polishing procedure, keep fingers away from components in rotation. For prevention of injury to finger, do not use a commutator cleaner or seater stone that is shorter than 63.5 mm (2.50 in).



Brush Seating
(3) Brush seater stone.

9. Put ZLX0036 Brush seater Stone (3) on the commutator and operate the motor at a slow speed.

NOTICE

Do not let stone (3) stay in contact with the commutator bar too long a time. This causes more wear than is necessary to the brushes and the commutator.

10. Move stone (3) across the commutator at the back edge of the brushes for a short time. This will take the shiny finish off the commutator and seat the new brushes.

11. Turn the key switch to the OFF position and disconnect the batteries. Check the contact surface of each brush. At least 85% of the brush contact surface of each brush most show wear. If necessary, do Steps 9 through 12 again until the correct wear can be seen on the brush contact surface.

NOTICE

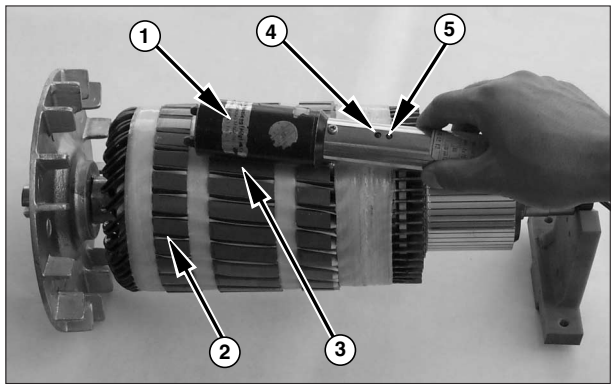
Never use air pressure that is more than 205 kPa (30 psi). Make sure the line is equipped with a water filter.

12. After the brushes have correct seat contact surface, operate the motor at slow speed. Use compressed (pressure) air to remove all dust and abrasive grit.

Armature Tests

Tools Needed	
Digital Multimeter Or Equivalent	1
Growler Tester	1

Short Circuit Test



Short Circuit Test
(1) Growler. (2) Armature. (3) Hacksaw blade. (4) Green light. (5) Red light.

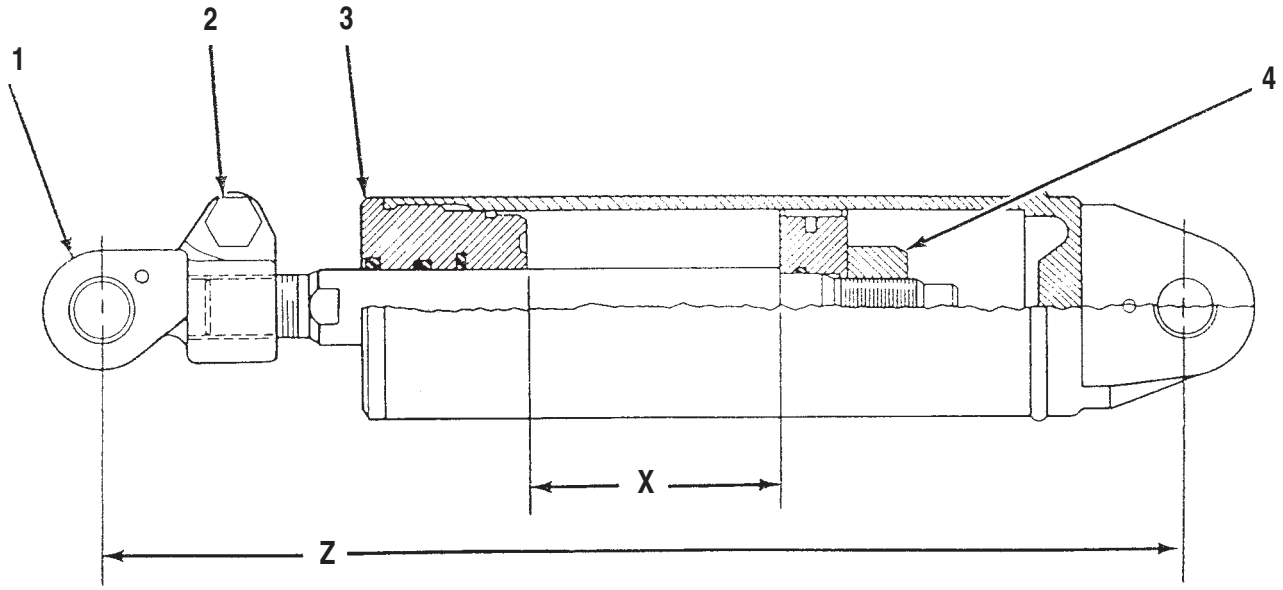
1. Turn the growler(1) on.

2. Slowly turn the growler on the armature (2) while a hacksaw blade (3) is held over the windings.

3. If the windings are shorted, the green light (4) will be on. The red light (5) will be on if the windings do not have a short.

The odor of burned insulation from the pump motor while it is in operation is an indication of a short in the armature.

Tilt Cylinders



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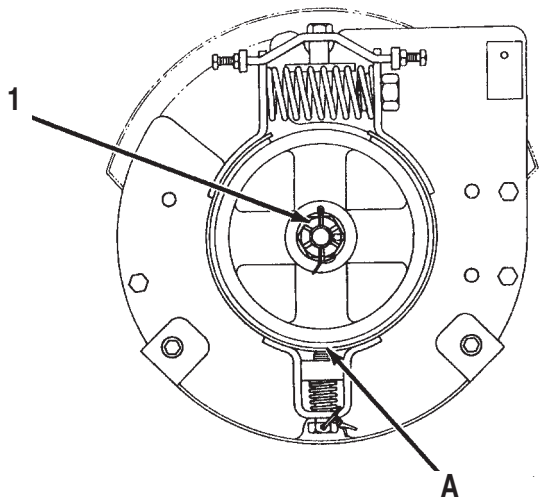
TILT CYLINDER CHART					
Model	**Tilt Gp Part No.**	**Forward Tilt Angle***	**Backward Tilt Angle***	**Cyl.Stroke(X) mm(in)**	**Cyl. Closed (z) mm(in)**
	A215207	3	3	43.5(1.71)	525.0 (20.67)
B20S-2	A215230	6	3	65.0 (2.56)	525.0 (20.67)
B25S-2	A215206	3	5	58.0 (2.28)	510.3 (20.08)
B30S-2	A215202	6	5	79.5 (3.13)	510.3 (20.08)
	A215209	10	5	107.0 (4.21)	510.3 (20.08)
	A215205	3	8	81.0 (3.19)	487.8 (19.21)
BC20S-2	A215201	6	8	102.0 (4.02)	487.8 (19.21)
BC25S-2	A215204	3	10	96.0 (3.78)	473.0 (18.62)
BC30S-2	A215200	6	10	117.0 (4.61)	473.0 (18.62)
	A215208	10	10	145.0 (5.71)	473.0 (18.62)

* Permissible tolerance of $^1/_2$°

(1) Adjust pivot eye to dimension (Z) with cylinder closed.
(2) Torque for bolt.....95 ± 15 N•m (70 ± 10 lb•ft)
(3) Torque for head .....270 ± 30 N•m (200 ± 22 lb•ft)
(4) Torque for piston nut.....270 ± 30 N•m (200 ± 22 lb•ft)

Parking Brake



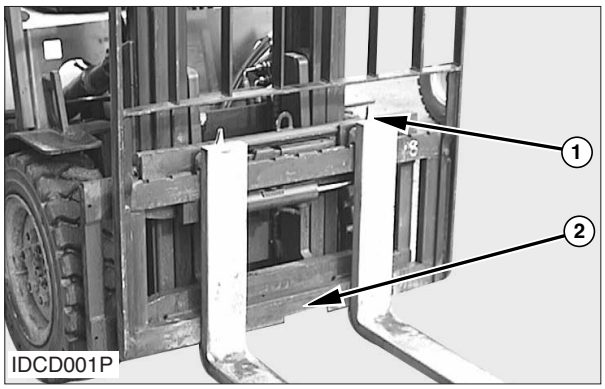
IDCS187S

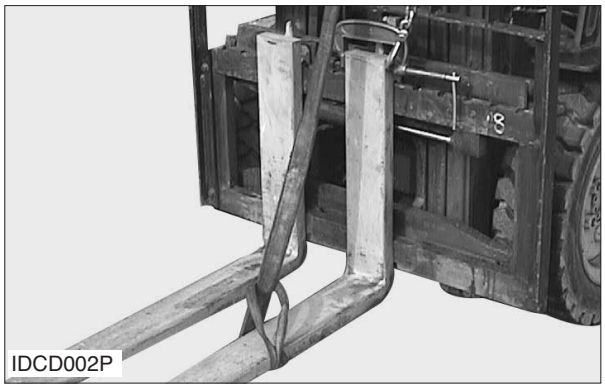
(1) Torque for brake drum retaining nut 50 ± 20 N•m(37 ± 15 ft•lb)

(2) Clearance for brake drum and brake strap assembly at location marked (A) 0.25 - 0.50 mm (.010 - .020 in)
See Parking Brake and Parking Brake Control Gp in Testing and Adjusting for brake and cable adjustment procedure.

Forks

Remove & Install Forks





1. Lift fork pin(1).

2. Use a suitable C-clamp, strap and hoist to support the fork as shown.

3. Slide the fork to slot(2) in the middle of the carriage.

4. Remove the fork. The weight of the fork is **50 kg (110 lb)**.

5. Repeat steps 1 through 4 for the remaining fork.

6. Install the forks in the reverse order of removal.

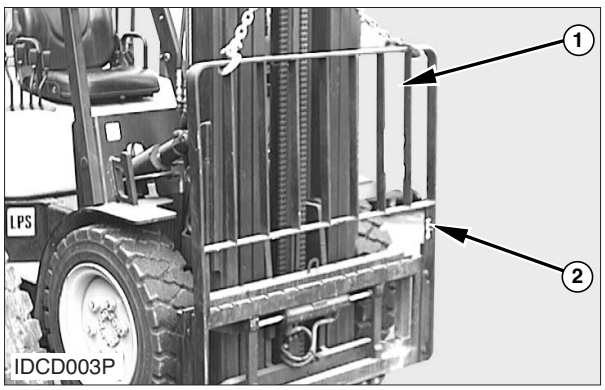
7. Put the forks in position. Lower both fork pins(1) to lock the forks in position.

Backrest

Remove & Install Backrest

Start By:

a. Remove forks.



1. Fasten a hoist to the backrest. Remove bolts(2) that fasten the backrest to the carriage.

2. Remove backrest (1). Backrest(1) weighs 40kg (90lb).

3. Install backrest(1) in the reverse order of removal.

End By:

a. Install forks.

Carriage

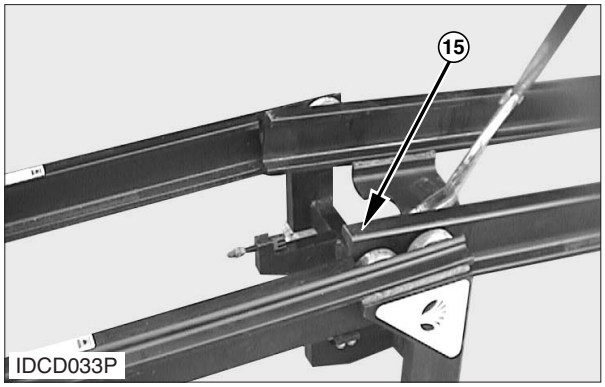
Remove & Install Carriage

Tools Needed	A
Retaining Ring Pliers	1

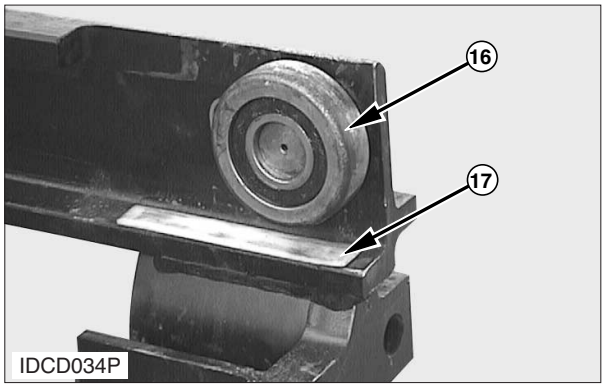
Start By:

a. Remove forks.

b. Remove backrest.

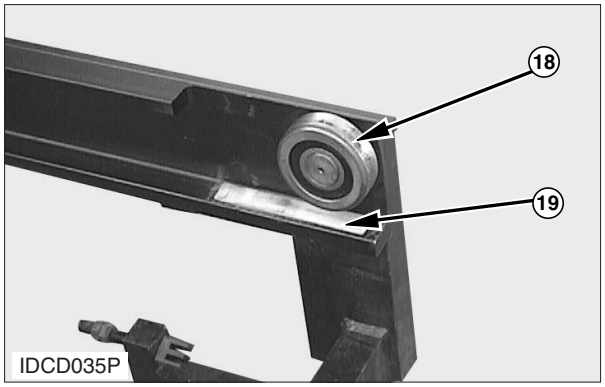


13. Fasten nylon straps and a hoist to the intermediate mast channel(15). Remove mast channel(15). The intermediate mast channel weighs **168kg (370 lb)**.



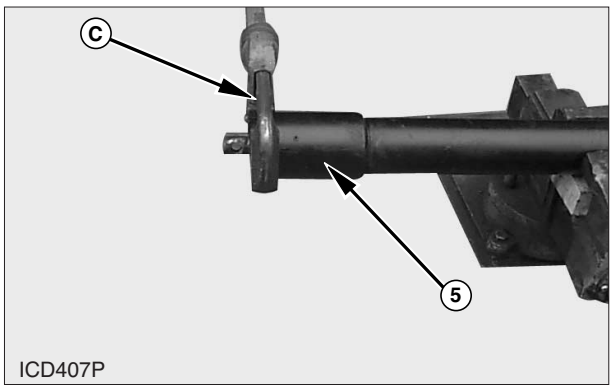
14. Remove rollers(16) and the shims from the intermediate mast channel.

15. Remove nylon pads(17) and the shims.

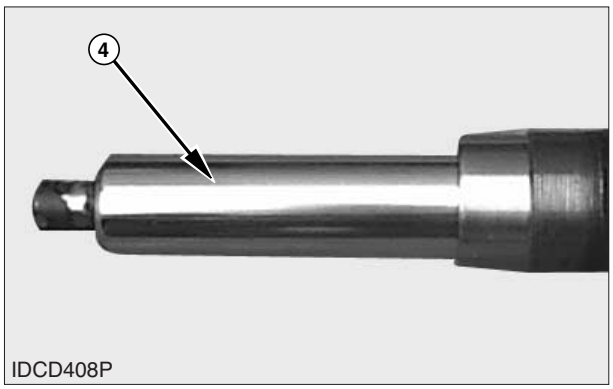


16. Remove rollers(18) and the shims from the stationary mast channel.

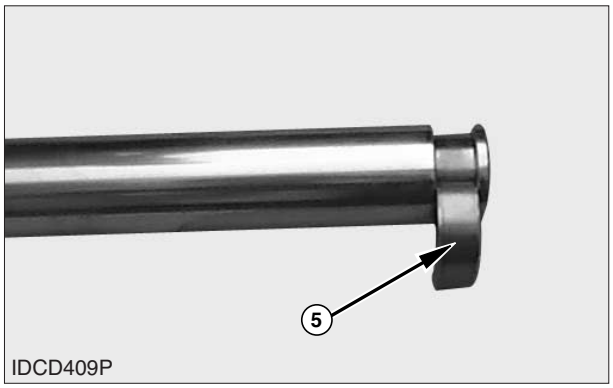
17. Remove nylon pads(19) and the shims.



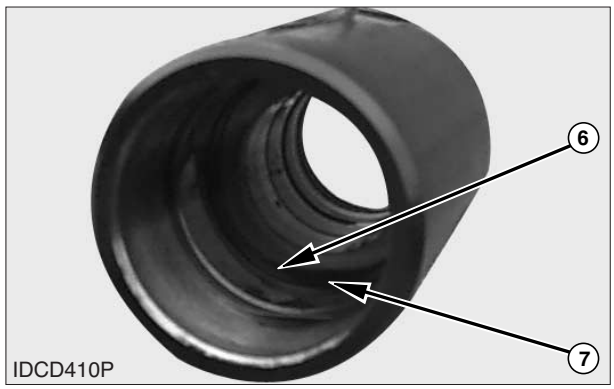
3. Remove bearing (3) with wrench (C).



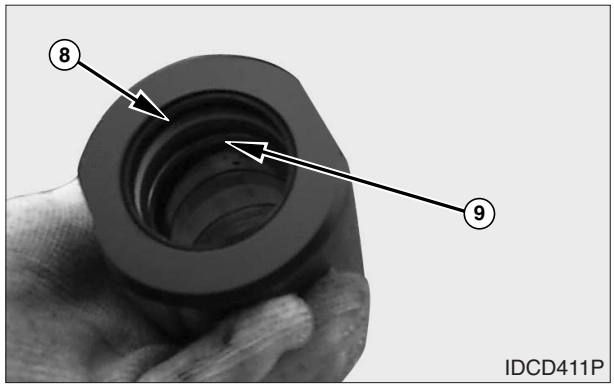
4. Remove rod (4) from the cylinder body.



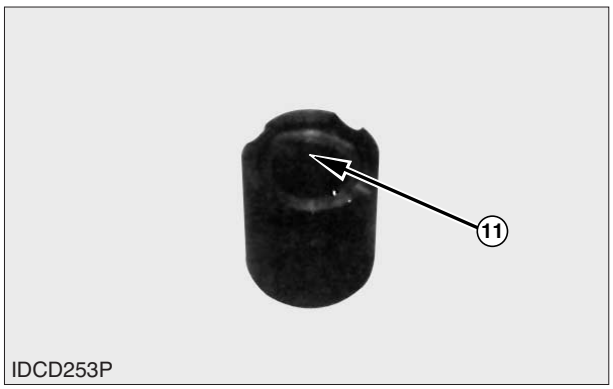
5. Remove split rings (5) from the cylinder rod.



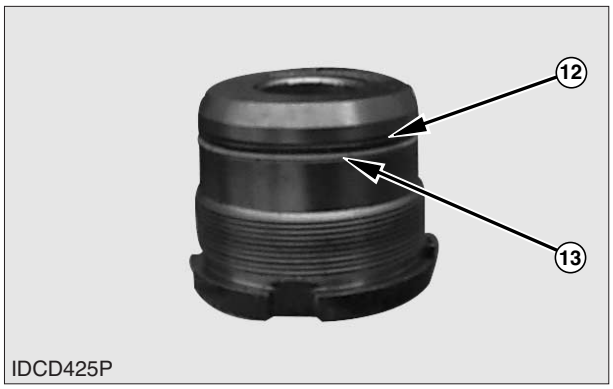
6. Remove O-ring seal (6) and back-up ring (7) from the bearing.



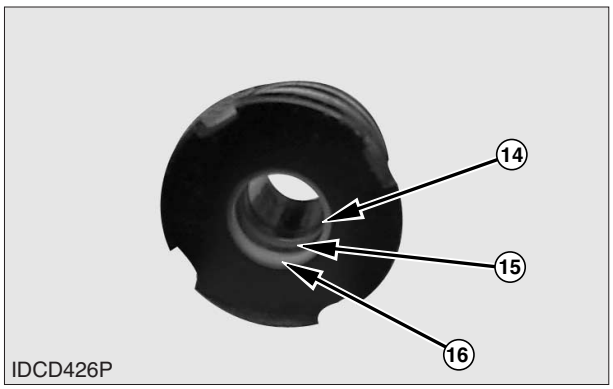
7. Remove wiper seal (8) and seal (9) from the bearing.



9. Remove seal (11) from the spacer.

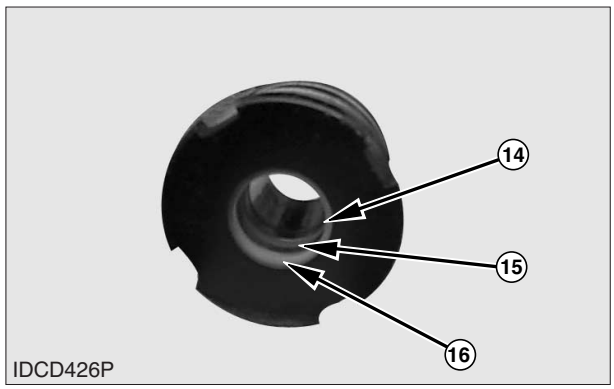


10. Remove O-ring seal (12) and back-up ring (13) from the head.



11. Remove seals (14), (15), and (16) from the head.

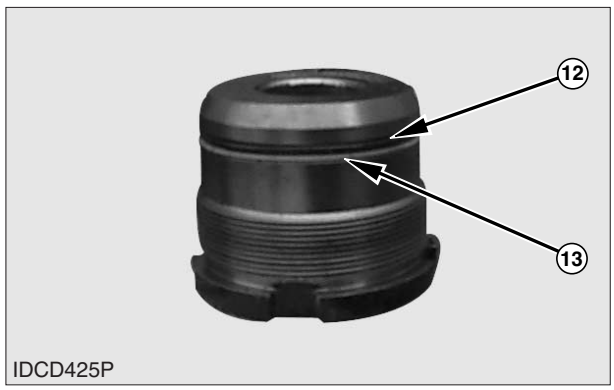
NOTE: Use the following steps to assemble the tilt cylinder.



12. Install seal (14) in the head. Position the lip of the seal toward the inside of the head.

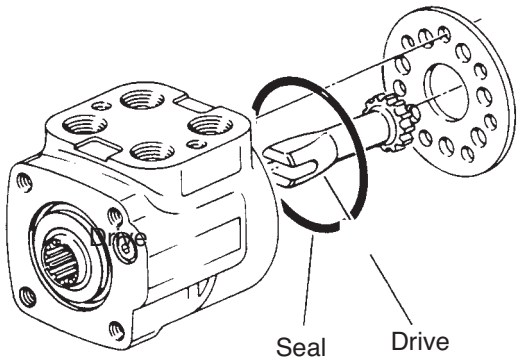
13. Install seal (15).

14. Install seal (16) in the cylinder head. Position the lip of seal (16) toward the outside of the cylinder head.

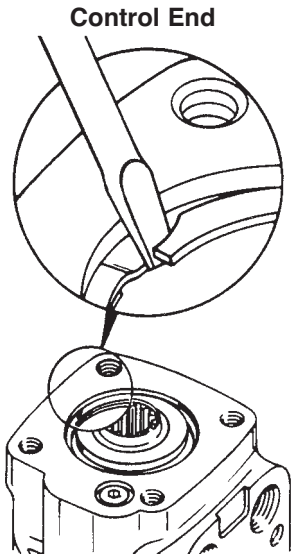


NOTE: The curved side of back up ring (13) should contact O-ring seal (12).

15. Install O-ring seal (12) and back-up ring (13). Make sure the curved side of back-up ring (13) is in contact with O-ring seal (12).



IDCD281S



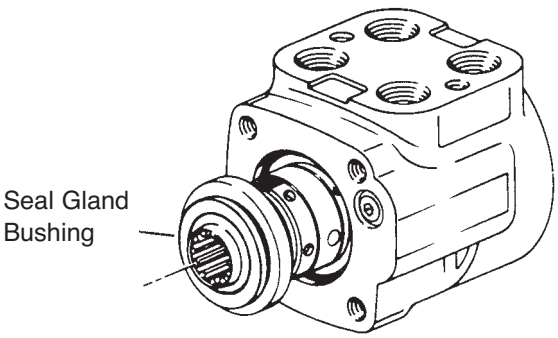
IDCD282S

8. Remove drive.

9. Remove spacer plate.

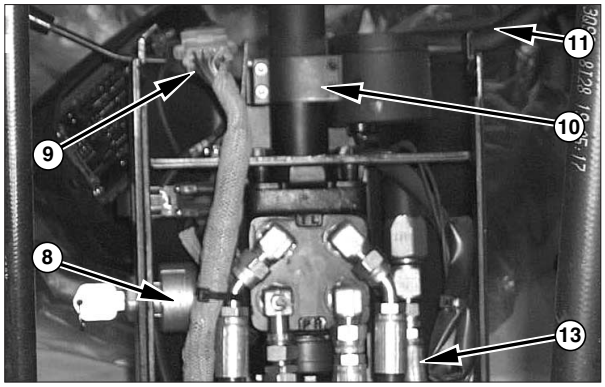
10. Remove seal from housing.

11 Remove housing from vise. Place housing on a clean soft cloth to protect surface finish. Use a thin bladed screwdriver to pry retaining ring from housing.



IDCD283S

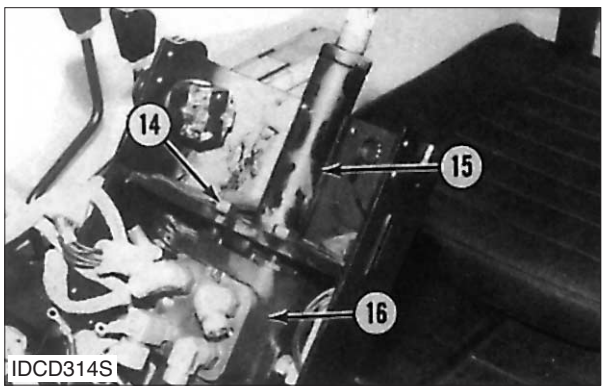
12. Rotate spool and sleeve until pin is horizontal. Push spool and sleeve assembly forward with your thumbs just far enough to free gland bushing from housing. Remove bushing.



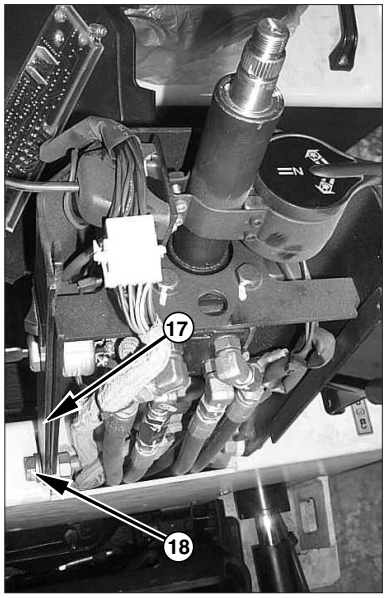
4. Disconnect the four steering gear hoses. Disconnect wires (8) from the ignition switch.

5. Disconnect all kinds of connector (9).

6. Remove bolts, clamp (10) and directional switch (11) from the steering column. Disconnect hose (13) from the steering gear.

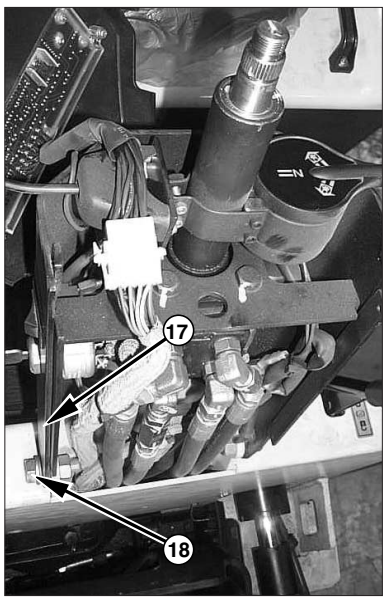


7. Remove four bolts (14), and separate steering gear (16) from steering column (15). Remove steering column (15) from the support assembly.



8. Remove the nuts, washers and bolts (18). Remove the bushings if a replacement is necessary. Remove support assembly (17) from the cowl. Remove ignition switches if necessary.

Install Steering Column

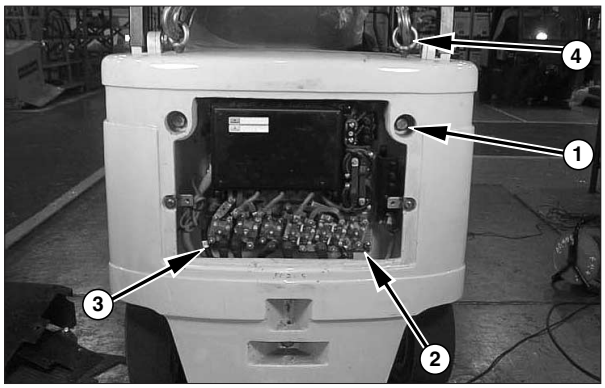


1. Install ignition switches into support assembly (17) if they were removed. Install the bushings if they were removed. Put the support assembly in position on the cowl. Install bolts (18), washers, nuts.

Counterweight

Remove And Install Counterweight

Tools Needed	A
Link Bracket	2



⚠ WARNING

Battery voltage and high amperage are present. Injury to personnel is possible. The head capacitor (HEAD CAP) must be discharged before any contact with the control panel is made. Disconnect the battery and discharge HEAD CAP.

---

1. Remove the protector cover from the counterweight. Disconnect the battery and discharge the HEAD CAP. See Discharging Head Capacitor in the MicroCommand Control System module.

2. Disconnect positive battery cable (3) and negative battery cable (2) from the control panel.

3. Install tooling (A) in the two holes at the top of the counterweight. Attach a hoist. The approximate weight of the counterweight is as follows:
BC20S .....430 kg (948 lb)
BC25S, BC30S.....570 kg (1257 lb)
B20S.....252 kg (556 lb)
B25S, B30S.....349 kg (770 lb)

4. Remove three bolts (1) and the counterweight.

NOTE: The following steps are for installation of the counterweight.

5. Put the counterweight in position on the lift truck and install three bolts (1).

6. Connect negative battery cable (2) and positive battery cable (3) to the control panel.

7. Install the protector cover on the counterweight.

Foreword

Literature Information

This manual should be stored in the operator's compartment in the literature holder or seat back literature storage area.

This manual contains safety, operation, transportation, lubrication and maintenance information.

Some photographs or illustrations in this publication show details or attachments that can be different from your lift truck. Guards and covers might have been removed for illustrative purposes.

Continuing improvement and advancement of product design might have caused changes to your lift truck which are not included in this publication. Read, study and keep this manual with the lift truck.

Whenever a question arises regarding your lift truck, or this publication, please consult your DAEWOO dealer for the latest available information.

Safety

The Safety Section lists basic safety precautions. In addition, this section identifies the text and locations of warning signs and labels used on the lift truck.
Read and understand the basic precautions listed in the Safety Section before operating or performing lubrication, maintenance and repair on this lift truck.

Operator Restraint System(If Equipped)

This manual contains safety, operation and maintenance information for the DAEWOO operator restraint system. Read, study and keep it handy.

⚠ WARNING

Your DAEWOO truck comes equipped with an operator restraint system. Should it become necessary to replace the seat for any reason, it should only be replaced with another DAEWOO operator restraint system.

Photographs or illustrations guide the operator through correct procedures of checking, operation and maintenance of the DAEWOO operator restraint system.

SAFE and EFFICIENT OPERATION of a lift truck depends to a great extent on the skill and alertness on the part of the operator. To develop this skill the operator should read and understand the Safe Driving Practices contained in this manual.

Forklift trucks seldom tipover, but in the rare event they do, the operator may be pinned to the ground by the lift truck or the overhead guard. This could result in serious injury or death.

Operator training and safety awareness is an effective way to prevent accidents, but accidents can still happen. The DAEWOO operator restraint system can minimize injuries. The DAEWOO operator restraint system keeps the operator substantially within the confines of the operator's compartment and the overhead guard.

This manual contains information necessary for Safe Operation. Before operating a lift truck make sure that the necessary instructions are available and understood.

Operation

The Operation Section is a reference for the new operator and a refresher for the experienced one. This section includes a discussion of gauges, switches, lift truck controls, attachment controls, transportation and towing information.
Photographs and illustrations guide the operator through correct procedures of checking, starting, operating and stopping the lift truck.

Operating techniques outlined in this publication are basic. Skill and techniques develop as the operator gains knowledge of the lift truck and its capabilities.

loosely stacked loads. Refer to load capacity plate on the lift truck. Use extreme caution when handling suspended, long, high or wide load.

- Do not stunt ride or indulge in horseplay.

Always look and keep a clear view of the path of travel.

- Travel in reverse if load or attachment obstructs visibility. Use extreme caution if visibility is obstructed.

- Stay in designated travel path, clear of dock edges, ditches, other dropoffs and surfaces which cannot safely support the lift truck.

- Slow down and use extra care through doorways, intersections and other location where visibility is reduced.

- Slow down and avoid pedestrians, other vehicles, obstructions, pot holes and other hazards or objects in the path of travel.

Refer to the topic “Operating Techniques” in the “Operation Section” of this manual.

Loading or Unloading Trucks/Trailers

- Do not operate lift trucks on trucks or trailers which are not designed or intended for that purpose.

- Be certain truck or trailer brakes are applied and wheel chocks in place (or be certain unit is locked to the loading dock) before entering onto trucks or trailers.

- If trailer is not coupled to a tractor, make sure the trailer landing gear is properly secured in place. On some trailers, extra supports may be needed to prevent upending or corner dipping.

- Be certain dockplates are in good condition and properly placed and secured. Do not exceed the rated capacity of dockboards or bridgeplaces.

Lift Truck Parking

When leaving the operator station, park the lift truck in authorized areas only. Do not block traffic.

Park the lift truck level, with the forks lowered and the mast tilted forward until the fork tips touch the floor.

Move the direction control lever to NEUTRAL.

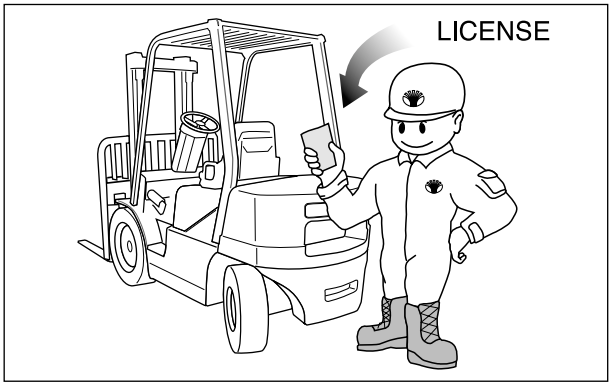
Engage the parking brake.

Turn the key switch off and remove the key.

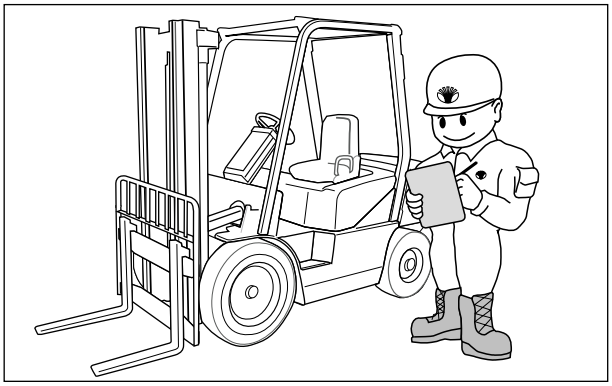
Disconnect the battery.

Block the drive wheels when parking on an incline.

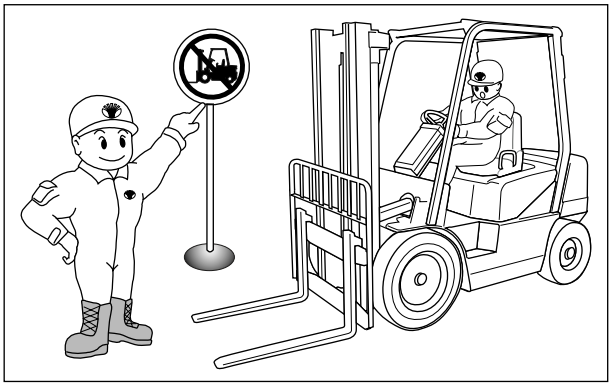
Safety Rules



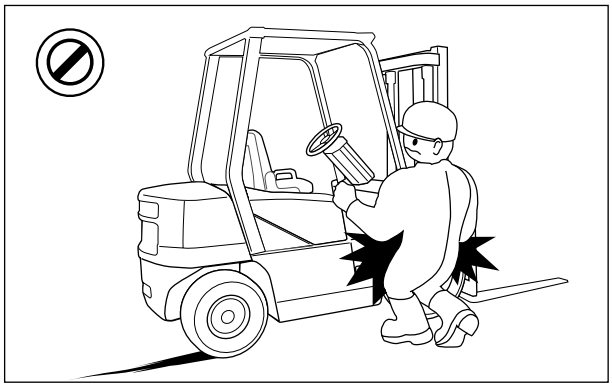
Only properly trained and authorized personnel should operate forklift trucks. Wear a hard hat and safety shoes when operating a lift truck. Do not wear loose clothing.



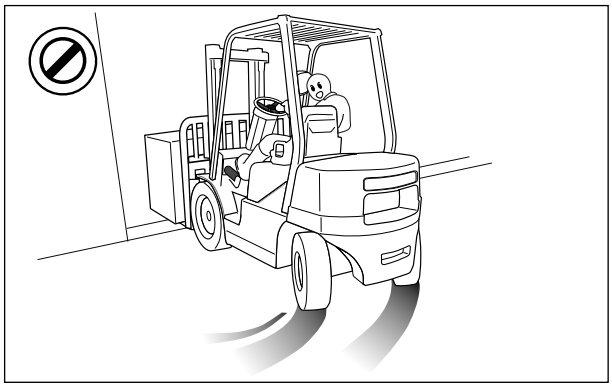
Inspect and check the condition of your forklift truck using the operator's check list before starting work. Immediately report to your supervisor any obvious defects or required repairs.



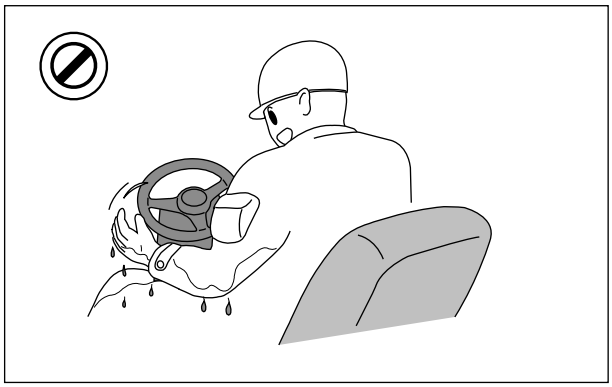
Do not operate your truck in unauthorized areas.
Know your forklift truck and think safety.
Do not compromise safety.
Follow all safety rules and read all warning signs.



Do not operate a lift truck unless you are in the operator's seat.
Keep arms, legs and head inside the confines of the operator's area. Keep hands and feet out of the mast assembly.

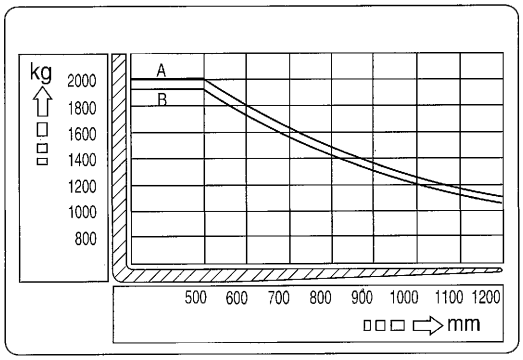
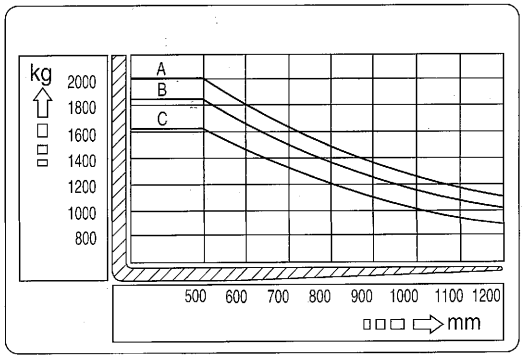
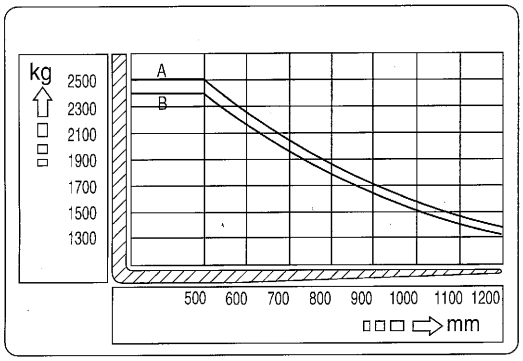
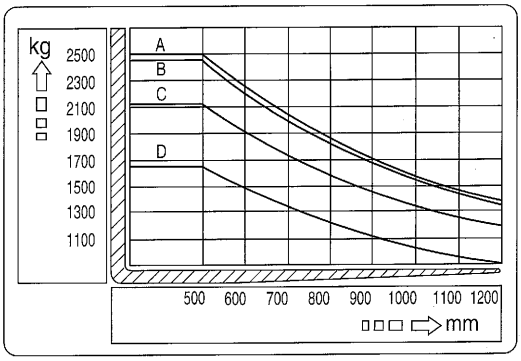
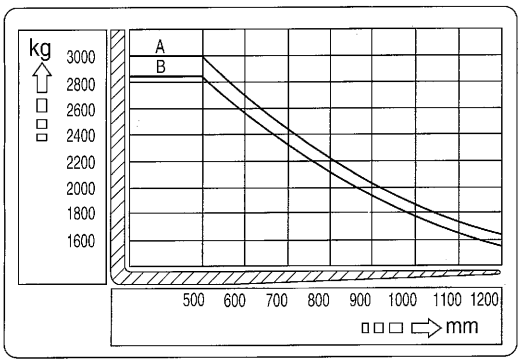
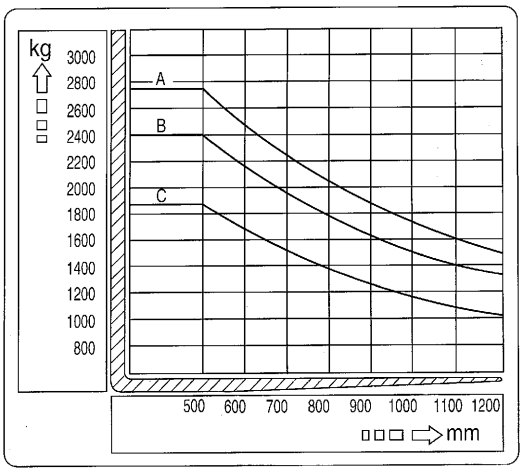


Do not start, stop, turn or change direction suddenly or at high speed. Sudden movement can cause the lift truck to tip over. Slow the speed of your truck and use the horn near corners, exits, entrances, and near people.

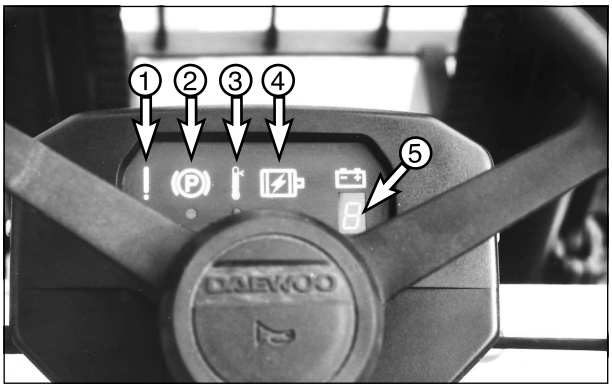


Never operate a lift truck with wet hands or shoes. Never hold any controls with grease on your hands. Your hands or feet will slide off of the controls and cause an accident.

Capacity Chart

MODEL	WIDE TREAD	
	STD, FFL	FFT
BC20S-2	 A. 2030 - 4350mm MAST B. 4960mm MAST	 A. 3900 - 4730mm MAST B. 5560mm MAST C. 6010mm MAST
BC25S-2, BC25SE-2	 A. 2030 - 4350mm MAST B. 4960mm MAST	 A. 3900 - 4290mm MAST B. 4730mm MAST C. 5560mm MAST D. 6010mm MAST
BC30S-2	 A. 2030 - 4350mm MAST B. 4960mm MAST	 A. 3900 - 4730mm MAST B. 5560mm MAST C. 6010mm MAST

Display



Motor Brushes Wear Indicator-

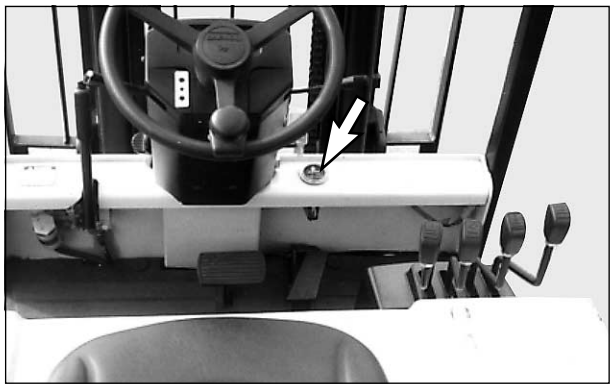
The LED below electrical motor(4) symbol will be lit when the motor brushes are worn and need to be replaced. Replace the brushes to reduce the risk of armature damage from overworn brush.

Overtemperature Indicator-
The LED below high temperature (3) symbol will be lit when the drive motor, pump motor or control panel overheats. The lift truck performance will be reduced until the device cools.

Parking Brake Indicator-
The LED below parking brake symbol (2) will be lit when the park brake is applied.

Master Warning Indicator-
The LED below exclamation mark (1) will be flashed when any failure indication is displayed on LED (5) display.

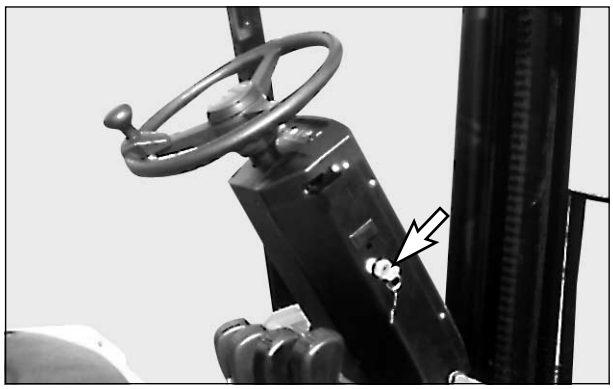
Service Hour Meter



Located on the right side of cowl.

Indicates the total number of hours the lift truck has operated. Use it to determine service intervals.

Front and Rear Floodlights Switch

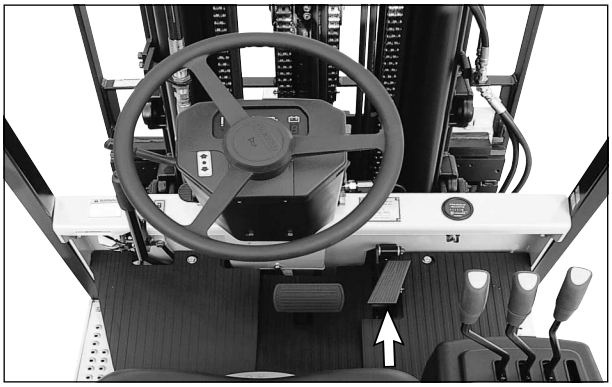


Located on the right side of the steering column, above the key switch.

OFF - Push down on the rear side of the switch to turn both front and rear floodlights off.

Front Floodlights - Push down on the front side of the switch, to the first position, to turn the front floodlights on.

Front and Rear Floodlights - Push down on the front side of the switch, to the second position, to turn both the front and rear floodlights on. The rear floodlights are optional feature.



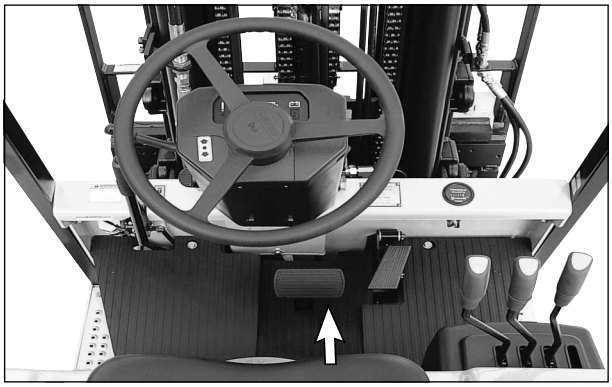
8. Push down on the accelerator pedal to reach the travel speed. Release the pedal to decrease travel speed.

9. To change the lift truck direction of travel, electrical braking(plugging) can be used to slow or stop the lift truck.

10. Electrical braking (plugging) can be used to slow or stop the lift truck or to change the lift truck direction of travel.

11. Move the directional control lever to the opposite direction of lift truck travel.

12. Hold the accelerator pedal down until the lift truck nearly comes to a complete stop. Release the accelerator pedal.



13. Push down on the service brake pedal to bring the lift truck to a complete stop and hold it.

14. To change direction, continue to push down on the accelerator pedal until the disired travel speed in the opposite direction is obtained.

15. Do not use electrical braking (plugging) to stop the lift truck where the stopping distance is too short.
Instead, release the accelerator pedal, push down on service brake pedal, and bring the lift truck to a smooth stop.

Towing Information

⚠ WARNING

Personal injury or death could result when towing a disabled lift truck incorrectly.

Block the lift truck wheels to prevent movement before releasing the brakes. The lift truck can roll free if it is not blocked.

Follow the recommendations below to properly perform the towing procedure.

The towing instructions given here are for moving a disabled lift truck only a short distance at low speed [no faster than 1.2 mph (2 km/h)] to a convenient location for repair. These instructions are for emergencies only. If long-distance moving is required, always haul the lift truck.

You must provide shielding on the towing lift truck to protect the operator if the tow line or bar should break.

Do not allow an operator to sit on the lift truck being towed unless the steering and braking can be controlled.

The operator on the towed lift truck must always steer in the direction of the tow line pull.

Inspect the tow line or bar and make sure it is in good condition and has enough strength for the towing situation involved. For a disabled lift truck stuck in mud or when towing on a grade, use a towing line or bar with a strength of at least 1.5 times the gross weight of the towing lift truck.

Keep the tow line angle to a minimum. Do not exceed a 30˚ angle from the straight-ahead position. Connect the tow line as low as possible on the lift truck being towed.

Use gradual and smooth lift truck movement. Moving the lift truck quickly could overload the tow line or bar and cause it to break.

Normally, the towing lift truck should be at least as large as the disabled lift truck. It should have enough brake capacity, weight, and power to control both lift trucks for the grade and distance involved.

A larger towing lift truck or additional lift trucks connected to the rear could be required to provide sufficient control and braking when moving a disabled lift truck downhill. This will prevent it from rolling uncontrolled.

The requirements of each towing situation will be affected by many conditions. Minimum towing lift truck capacity is required on smooth, level surfaces, while maximum capacity is needed on inclines or on poor surface conditions.

Consult your DAEWOO Lift Truck dealer for towing a disabled lift truck.

1. Release the parking brake.

NOTICE

Release the parking brake to prevent excessive wear and damage to the parking brake system.

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2. Release the service brake pedal.

3. Turn the key switch OFF.

4. Disconnect the battery.

5. Fasten the tow bar to the lift truck.

6. Remove any wheel blocks. Tow the lift truck slowly. Do not tow any faster than 2 km/h (1.2 mph).

⚠ WARNING

Be sure all necessary repairs and adjustments have been made before a lift truck that has been towed to a service area is put back into operation. Personal injury or death could result.

Lubricant Specifications

Lubricant Information

Certain abbreviations follow S.A.E. J754 nomenclature and some classifications follow S.A.E. J183 abbreviations. The MIL specifications are U.S.A. Military Specifications. The recommended oil viscosities can be found in the “Lubricant Viscosities” chart in this publication.

Chain and Linkage Oils (DEO or EO)

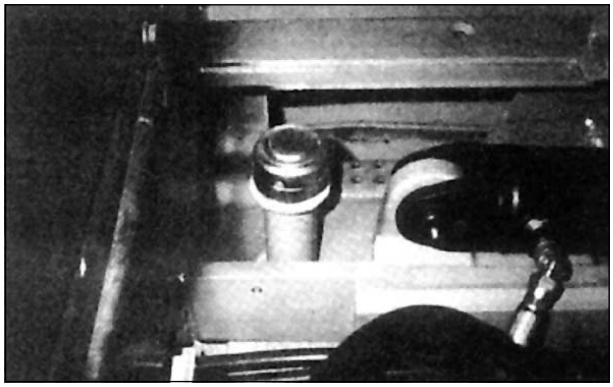
Use following engine oils are recommended for use on chains and linkages.

• European oil specification CCMC D3.

• API Specification CD, CD/SF, CE

• Military specifications MIL-L-2104D or E

Hydraulic Oils (HYDO)



The following commercial classifications can be used in the hydraulic system.

• ISO 6743/4	HM
• AFNOR NFE 48-603	HM
• DIN 51524 TEIL 2	H-LP
• HAGGLUNDS DENISON	HFO-HF2
• CINCINNATI	P68, 69, 70

Viscosity : ISO VG32

These oils should have antiwear, antifoam, antirust and antioxidation additives for heavy duty use as stated by the oil supplier. ISO viscosity grade of 32 would normally be selected.

NOTICE

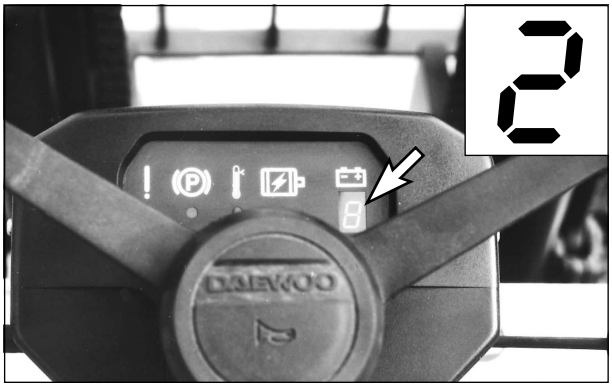
Make-up oil added to the hydraulic tanks must mix with the oil already in the systems. Use only petroleum products unless the systems are equipped for use with special products.

If the hydraulic oil becomes cloudy, water or air is entering the system. Water or air in the system will cause pump failure. Drain the fluid, retighten all hydraulic suction line clamps, purge and refill the system.Consult your DAEWOO Lift Truck dealer for purging instructions.

If an “F” is displayed, further diagnostics checks may be performed by sliding the diagnostic switch, to the “Run” position and back to the “Diagnostic” position. This switch movement bypasses the failed test and allows succeeding tests to be performed.

Seat Switch

Close the seat switch by depressing the seat and then release.



A successful test will advance the LED display from “1” to “2”. If it did not advance, move hand to a different location on the seat, press and release again. Should the display continue to read “1” a failure has been detected.

Brushes - Check, Replace

Refer to “Drive Motor” and/or “Hydraulic/Power Steering System Pump Motor” section in “Every 1000 Service Hours or 6 Months” section of “Maintenance Intervals” if brush wear is suspected.

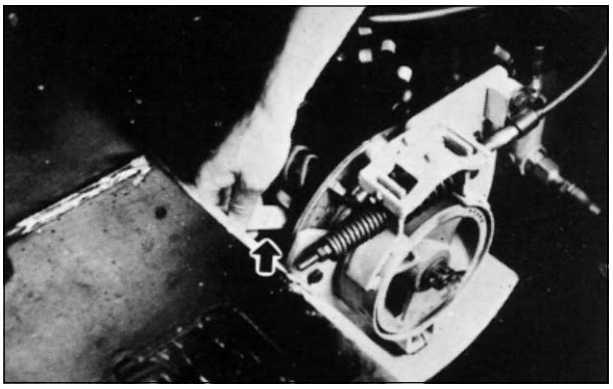
Brush Seating

1. All new drive and hydraulic motor brushes must be seated. For drive motor brush seating, lift the front of the lift truck until the drive wheels are off the floor and free to turn. Put adequate stands under the frame to support the lift truck.

NOTICE

Do NOT move the directional control lever from one direction to the other when the drive wheels are off the ground and rotating at full speed.

Damage can be caused to the control panel.

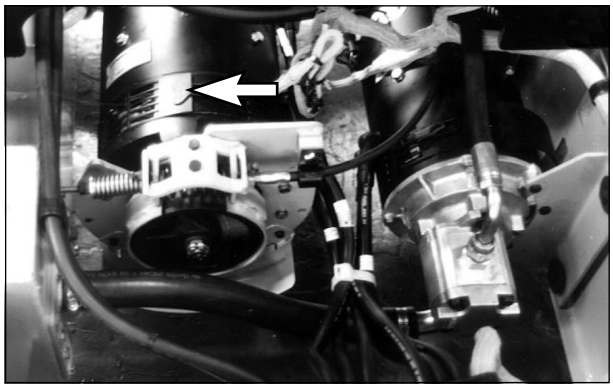


2. Use a brush seating stone for drive and hydraulic motors.

3. Put the seating stone in position on the commutator. Operate the motor slowly and move the seating stone from side to side, at the back edge of the brushes for a short time. This will take the shine off the commutator and seat the brushes.

NOTICE

Do NOT let the seating stone stay in contact with the commutator for too long. It will cause more wear than necessary to the brushes and the commutator.



4. Check the contact surface of the brushes. At least 85% of the brush contact surface must show contact with the commutator. If necessary repeat the seating procedure.

NOTE : Do NOT use a brush seating stone that is shorter than 63.5 mm (2.50 inch).

⚠ WARNING

Pressure air can cause personal injury.

When using pressure air for cleaning, wear a protective face shield, protective clothing and protective shoes.

The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

5. While operating the motor slowly, blow out all of the abrasive grit and dust with 205 kPa (30 psi) air pressure.

First 50 - 100 Service Hours or a Week

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

Drive Axle Oil - Change

⚠ WARNING

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

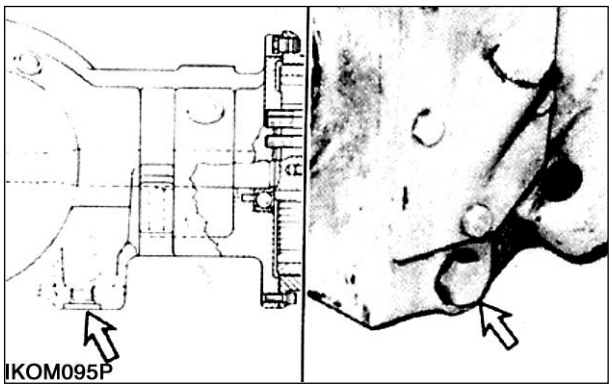
Park the lift truck level, with the parking brake engaged and directional control lever in NEUTRAL.

1. Lift the carriage high enough to access the drive axle housing level/fill plugs.

2. Turn the key switch to OFF.

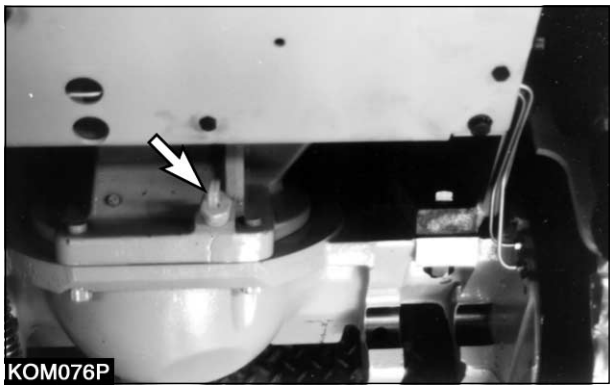
3. Raise the truck until the front tires just clear the ground.

4. Block the bottom of the mast and the frame with a block of wood to hold the carriage and the truck in the raised position.



5. Remove two drain plugs, one from the front section and one from the rear section. Allow the oil to drain.

6. Clean and install the two drain plugs.



7. Remove the dipstick/filler plug, located on top of the drive axle housing between the mast and the cowl.

8. Fill the drive axle housing with oil, see topic “Refill Capacities”.

9. Maintain the oil level between the MAX and MIN mark on the dipstick/filler plug.

10. Clean and install the dipstick/filler plug.

11. Remove the blocking. Lower the truck and the carriage.

Control Panel - Clean, Inspect

Park the lift truck level, with the forks lowered, parking brake engaged, directional control lever in NEUTRAL, and the key switch to OFF.

Disconnect the battery.

1. Remove the access cover.

⚠ WARNING

Battery voltage and high amperage are present.

The HEAD capacitor must be discharged before any contact with the control panel is made.

Personal injury could result if it has not been discharged properly.

2. Discharge the head capacitor. See “Head Capacitor” in “When Required” section of this manual.