

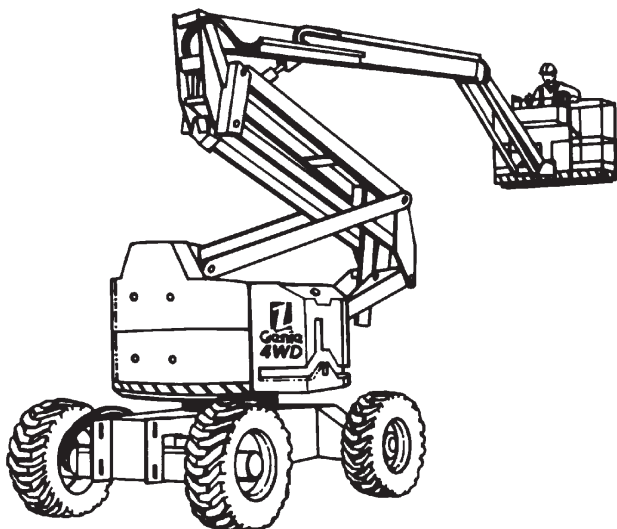
**Genie Industries**



# Genie Z-60/34

## Service Manual

(before serial number 1090)



First Edition (Rev A1)  
Part No. 30105  
May 2007



# Genie® Z-60/34

## Important

Read, understand and obey the safety rules and operating instructions in the *Genie Z-60/34 Operator's Manual* before attempting any maintenance or repair procedure.

This service manual covers the Genie Z-60/34 2WD and 4WD models introduced in 1993.

This manual provides detailed scheduled maintenance information for the machine owner and user. It also provides troubleshooting and repair procedures for qualified service professionals.

Basic mechanical, hydraulic and electrical skills are required to perform most procedures. However, several procedures require specialized skills, tools, lifting equipment and a suitable workshop. In these instances, we strongly recommend that maintenance and repair be performed at an authorized Genie dealer service center.

Genie Industries has endeavored to deliver the highest degree of accuracy possible. However, continuous improvement of our products is a Genie policy. Therefore product specifications are subject to change without notice.

Readers are encouraged to notify Genie of errors and send in suggestions for improvement. All communications will be carefully considered for future printings of this and other manuals. Please write to the technical publications team in care of Genie Industries, PO Box 69, Redmond WA 98073-0069 USA.

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# Safety Rules



## Danger

Failure to obey the instructions and safety rules in this manual and the *Genie Z-60/34 Operator's Manual* will cause death or serious injury.

Many of the hazards identified in the operator's manual are also safety hazards when maintenance and repair procedures are performed.

## Do Not Perform Maintenance Unless:

- You are trained and qualified to perform maintenance on this machine.
- You read, understand and obey:
  - manufacturer's instructions and safety rules
  - employer's safety rules
  - applicable governmental regulations
- You have the appropriate tools, lifting equipment and a suitable workshop.

## SAFETY RULES

**Personal Safety**

Any person working on or around a machine must be aware of all known safety hazards. Personal safety and the continued safe operation of the machine should be your number one priority.



Read each procedure thoroughly. This manual and the decals on the machine, use signal words to identify the following:

**▲ DANGER** Indicates the presence of a hazard that **will** cause death or serious injury.

**▲ WARNING** Indicates the presence of a hazard that **may** cause death or serious injury.

**▲ CAUTION** Indicates the presence of a hazard that **will** or **may** cause serious injury or damage to the machine.

**NOTICE** Indicates special operation or maintenance information.



Be sure to wear protective eye wear and other protective clothing if the situation warrants it.



Be aware of potential crushing hazards such as moving parts, free swinging or unsecured components when lifting or placing loads. Always wear approved steel-toed shoes.

**Workplace Safety**

Be sure to keep sparks, flames and lighted tobacco away from flammable and combustible materials like battery gases and engine fuels. Always have an approved fire extinguisher within easy reach.



Be sure that all tools and working areas are properly maintained and ready for use. Keep work surfaces clean and free of debris that could get into machine components and cause damage.



Be sure that your workshop or work area is well ventilated and safely and adequately illuminated.



Be sure any forklift, overhead crane or other lifting or supporting device is fully capable of supporting and stabilizing the weight to be lifted. Use only chains or straps that are in good condition and of ample capacity.



Be sure that fasteners intended for one time use (i.e., cotter pins and self-locking nuts) are not reused. These components may fail if they are used a second time.



Be sure to properly dispose of old oil or other fluids. Use an approved container. Please be mindful of the environment.



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# Specifications

## Machine Specifications

Stowed dimensions	2WD/Ind	2WD/RT 4WD/RT
	Length	26 ft 7.92m
Width	7 ft 2.13m	7 ft 6 in 2.29m
Height	8 ft 1 in 2.46m	8 ft 4 in 2.54m
Weight	21900 lbs 9934kg	22055 lbs 10004kg
Ground clearance	9 in 22.86cm	12 in 30.5cm
Operational dimensions		
Maximum platform height	60 ft 18.3m	60 ft 18.3m
Maximum horizontal reach	34 ft 10.36m	34 ft 10.36m
Maximum turntable tailswing	0	0
Wheelbase	7 ft 11 in 2.41m	7 ft 9 in 2.36m
Minimum turning circle, outside	26 ft 6 in 8.1m	39 ft 11.9m
Minimum turning circle, inside	7 ft 6 in 2.3m	22 ft 6.7m
Turntable rotation	continuous	continuous
Platform rotation	180°	180°
Platform dimensions	6 ft (Standard)	8 ft* (Optional)
Length	6 ft 1.83m	8 ft 2.44m
Width	30 in 76.2cm	36 in 91.4cm
Maximum capacity	500 lbs 227kg	500 lbs 227kg

\* 8 ft platform not available for 2WD/Ind machines.

Tires and wheels	Industrial (Ind)	Rough Terrain (RT)
Tire size	32x12-15NHS 300-15NHS	15-19.5NHS
Tire ply rating	20	12
Load range	L	F
Tire contact area	73 sq in 470 sq cm	68 sq in 439 sq cm
Overall tire diameter	32.9 in 83.6cm	40 in 102cm
Tire pressure	110 psi 7.58 bar	60 psi 4.14 bar
Wheel diameter	15.2 in 38.6cm	19.5 in 49.5cm
Wheel width	9.75 in 24.8cm	12.25 in 31cm
Wheel lugs	9 @ 5/8-18	9 @ 5/8-18
Lug nut torque	125 ft-lbs 169.5 Nm	125 ft-lbs 169.5 Nm
Fluid capacities		
Fuel tank	76 liters	20 gallons
LPG tank	15.2 kg	33.5 pounds
Hydraulic tank	170 liters	45 gallons
Hydraulic system (including tank)	201 liters	53 gallons
Drive torque hub	1.2 liters	40 fl oz
Turntable rotation torque hub	0.24 liters	8 fl oz

**Continuous improvement of our products is a Genie policy. Product specifications are subject to change without notice.**

## PERFORMANCE SPECIFICATIONS

**Performance Specifications**

Drive speeds, maximum	2WD	4WD
Boom stowed, high range Gasoline/LPG models	3.5 mph 5.6km/h 40 ft/7.8 sec 12.2m/7.8 sec	4.5 mph 7.2km/h 40 ft/6.1 sec 12.2m/6.1 sec
Boom stowed, high range Deutz diesel models	3.0 mph 4.8km/h 40 ft/9.1 sec 12.2m/9.1 sec	3.9 mph 6.3km/h 40 ft/7 sec 12.2m/7 sec
Boom stowed, low range Gasoline/LPG models	1.1 mph 1.8km/h 40 ft/25 sec 12.2m/25 sec	1.2 mph 1.9km/h 40 ft/23 sec 12.2m/23 sec
Boom stowed, low range Deutz diesel models	1.1 mph 1.8km/h 40 ft/25 sec 12.2m/25 sec	1.2 mph 1.9km/h 40 ft/23 sec 12.2m/23 sec
Boom raised or extended All models	0.68 mph 1.1km/h 40 ft/40 sec 12.2m/40 sec	0.68 mph 1.1km/h 40 ft/40 sec 12.2m/40 sec

Gradeability (boom stowed)	2WD	4WD
Industrial	30%	NA
Rough terrain	20%	35%

Boom function speeds, maximum from platform controls	
Jib boom up	15 to 25 seconds
Jib boom down	8 to 18 seconds
Primary boom up	40 to 50 seconds
Primary boom down	35 to 45 seconds
Primary boom extend	30 to 40 seconds
Primary boom retract	20 to 30 seconds
Secondary boom up	40 to 50 seconds
Secondary boom down	30 to 40 seconds
Tumtable rotate - 360°	140 to 200 seconds
Platform rotate - 180°	10 to 20 seconds
Platform level up	15 to 25 seconds
Platform level down	8 to 18 seconds

HYDRAULIC SPECIFICATIONS



**Hydraulic Specifications**

<b>Hydraulic fluid</b>	Dexron II equivalent	
<b>Drive pump</b>		
Type: bi-directional variable displacement piston pump		
<b>Displacement</b>	0 to 31.5 gallons per minute 0 to 119 liters per minute	
<b>Maximum drive pressure</b>	3500 psi 241.3 bar	
<b>Charge pressure</b>	360 psi 24.8 bar	
<b>Medium pressure filter</b>	3 micron	
<b>Medium pressure filter bypass pressure</b>	50 psi 3.4 bar	
<b>Drive manifold</b>		
<b>Motor shift/brake relief pressure</b>	290 psi 20 bar	
<b>4WD front motor flow regulators</b>	4.5 gallons per minute 17 liters per minute	
<b>4WD rear motor flow regulators</b>	7.0 gallons per minute 26.5 liters per minute	
<b>2WD rear motor flow regulators</b>	8.0 gallons per minute 30.3 liters per minute	
<b>Front drive motors</b>	<b>4WD models</b>	
<b>Displacement per revolution</b>	2.14 cu in 35.1cc	
<b>Rear drive motors</b>		
<b>Displacement per revolution</b>		
low range	2.8 cu in	45.9cc
high range	0.16 cu in	2.6cc

<b>Function pump</b>		
Type: pressure balanced gear		
<b>Displacement - static</b>	0.98 cu in 16cc	
<b>Displacement - 2600 rpm</b>	10.2 gallons per minute 0 to 38.6 liters per minute	
<b>Hydraulic tank circuit return line filter</b>	10 micron with 25 psi (1.7 bar) bypass	
<b>Function manifold</b>		
<b>Function relief valve pressure</b>	2500 psi 176 bar	
<b>Primary boom down relief valve pressure</b>	1200 psi 83 bar	
<b>Primary boom extend</b>	1000 psi 69 bar	
<b>Secondary boom down relief valve pressure</b>	1200 psi 83 bar	
<b>Steer/oscillate flow regulator</b>	3.5 gallons per minute 13.3 liters per minute	
<b>Auxiliary pump</b>		
Type: fixed displacement gear pump		
<b>Displacement - static</b>	0.152 cu in 2.5cc	
<b>Displacement - 2600 rpm</b>	1.4 gallons per minute 5.3 liters per minute	
<b>Auxiliary pump relief pressure</b>	2500 psi 176 bar	

BOLT TORQUE SPECIFICATIONS

**Bolt Torque Specifications**

Size	Threads	SAE Grade 5 Bolts 			SAE Grade 8 Bolts 		
		Torque - Dry inch-pounds	Torque - Dry foot-pounds	Torque - Dry Newton meters	Torque - Dry inch-pounds	Torque - Dry foot-pounds	Torque - Dry Newton meters
No. 10	24	43		5	60		7
	32	49		6	68		8
1/4 inch	20	96		11	144		16
	28	120		14	168		19
5/16 inch	18		17	23		25	34
	24		19	28		25	34
3/8 inch	16		30	41		45	61
	24		35	48		50	68
7/16 inch	14		50	68		70	95
	20		55	75		80	109
1/2 inch	13		75	102		110	149
	20		90	122		120	163
9/16 inch	12		110	149		150	204
	18		120	163		170	231
5/8 inch	11		150	204		220	298
	18		170	231		240	326
3/4 inch	10		260	353		380	515
	16		300	407		420	570
7/8 inch	9		430	583		600	814
	14		470	637		660	895
1 inch	8		640	868		900	1221
	12		700	949		1000	1356

Torque specification for lubricated bolts is 25% less than dry torque specification for bolt size.

## FORD ENGINE LSG-423 SPECIFICATIONS

**Ford Engine LSG-423**

<b>Displacement</b>	140 cu in 2.3 liters
<b>Number of cylinders</b>	4
<b>Bore &amp; stroke</b>	3.780 x 3.126 inches 96 x 79.4mm
<b>Horsepower</b>	63 @ 4000 rpm
<b>Firing order</b>	1 - 3 - 4 - 2
<b>Low idle</b>	1600 rpm
<b>High idle</b>	2600 rpm
<b>Governor</b>	electronic
<b>Compression ratio</b>	9.5:1
<b>Compression pressure (approx.)</b>	150 to 175 psi 10 to 12 bar
Pressure (psi) of lowest cylinder must be at least 75% of highest cylinder	
<b>Valve clearances</b>	0.040 to 0.050 inches 1.0 to 1.3mm
<b>Lubrication system</b>	
Oil pressure (operating temp. @ 2600 rpm)	40 to 60 psi 2.75 to 4.1 bar
Oil capacity (including filter)	5 quarts 4.7 liters
<b>Oil viscosity requirements</b>	
Temperature below 60°F / 15.5°C	5W-30
-10°F to 90°F / -23°C to 32°C	10W-30
Temperature above -10°F / -23°C	10W-40 to 10W-50
Temperature above 25°F / -4°C	20W-40 or 20W-50
Use oils meeting API classification SF (labeled SF/CC or SF/CD) as they offer improved wear protection.	

<b>Starter motor</b>	
Normal engine cranking speed	110 rpm
Current draw, normal load	150A
Current draw, maximum load	460A
Current draw, no load	70A
Maximum circuit voltage drop while starting (normal temperature)	0.5V DC
Brush length, new	0.50 in 12.7mm
Brush length wear limit	0.25 in 6.35mm
Brush spring tension	40 ounces 11 Newtons
Bolt torque through brush	55 to 75 inch-pounds 6 to 8.5Nm
Brush mounting bolt torque	15 to 20 foot-pounds 20 to 27Nm
Maximum commutator run-out	0.005 inches 0.127mm
<b>Battery</b>	
Type	12V, Group 31
Quantity	1
Cold cranking ampere	1000A
Reserve capacity @ 25A rate	200 minutes
<b>Fuel pump</b>	
Static pressure	5 to 7 psi 0.34 to 0.48 bar
Minimum volume flow (in 25 seconds)	1 pint 473cc

## FORD ENGINE LSG-423 SPECIFICATIONS

<b>Ignition System</b>		
Ignition spark advance	10° BTDC	
Ignition coil primary resistance	1.13 to 1.25Ω @ 75°F / 24°C	
Ignition coil secondary resistance	7700 to 9300Ω @ 75°F / 24°C	
Spark plug type	Motorcraft AWSF-52	
Spark plug gap	0.042 to 0.046 inches 1.07 to 1.18mm	
<b>Engine coolant</b>		
Capacity	11.5 quarts 10.9 liters	
<b>Alternator</b>		
Output	35A, 14.5V	
Fan belt deflection	<sup>3</sup> / <sub>8</sub> to <sup>1</sup> / <sub>2</sub> inch 9 to 12mm	
<b>Bolt torque specifications</b>		
Bolt description (size)	torque ft-lbs	torque Nm
Auxiliary shaft gear bolt (M-10)	28 to 40	38 to 54
Auxiliary shaft thrust plate bolt (M-6)	6 to 9	8 to 12
Timing belt tensioner pivot bolt (M-10)	28 to 40	38 to 54
Timing belt tensioner adjusting bolt (M-8)	14 to 21	19 to 28
Camshaft gear bolt (M-12)	50 to 71	68 to 96
Camshaft thrust plate bolt (M-6)	6 to 9	8 to 12
Carburetor to spacer stud (M-8)	7.5 to 15	10 to 20
Carburetor spacer to manifold bolt (M-8)	10 to 14	14 to 19
Crankshaft damper bolt (M-14)	103 to 133	140 to 180
Cylinder head bolt (M-12): torque in sequence		
first step	50 to 60	68 to 81
second step	80 to 90	108 to 122

	torque ft-lbs	torque Nm
Distributor clamp bolt (M-10)	14 to 21	19 to 28
Distributor vacuum tube to manifold adaptor	5 to 8	7 to 11
Exhaust manifold to cylinder head bolt or nut (M-10): torque in sequence		
first step	14 to 19	19 to 26
second step	20 to 30	27 to 41
Flywheel to crankshaft bolt (M-10)	56 to 64	76 to 87
Fuel pump to cylinder block (M-8)	14 to 21	19 to 28
Intake manifold to cylinder head bolt or nut (M-8)	14 to 21	19 to 28
Oil pressure sending unit to block	8 to 18	11 to 24
Oil pan drain plug to pan (M-14)	15 to 25	20 to 34
Oil pan to block (M-6)	10 to 13.5	14 to 18
Oil filter insert to block	20 to 35	27 to 47
Rocker arm cover to cylinder head (M-6)	5 to 8	7 to 11
Spark plug to cylinder head (M-14)	5 to 10	7 to 14
Temperature sending unit to block (M-14)	8 to 18	11 to 24
Water jacket drain plug to block	23 to 28	31 to 38
Water pump to block bolt (M-8)	14 to 21	19 to 28
Auxiliary shaft cover bolt (M-6)	6 to 9	8 to 12
Water outlet connection bolt (M-8)	14 to 21	19 to 28
Cylinder front cover bolt (M-6)	6 to 9	8 to 12
Inner timing belt cover stud (M-8)	14 to 21	19 to 28
Outer timing belt cover bolt (M-6)	6 to 9	8 to 12

## Deutz Engine F4L 1011

<b>Displacement</b>	166.7 cu in 2.732 liters
<b>Number of cylinders</b>	4
<b>Bore and stroke</b>	3.58 x 4.13 inches 91 x 105mm
<b>Horsepower</b>	56 @ 3000 rpm
<b>Firing order</b>	1 - 3 - 4 - 2
<b>Compression ratio</b>	18.5:1
<b>Compression pressure</b>	362 to 435 psi 25 to 30 bar
<b>Low idle</b>	1200 rpm
<b>High idle</b>	2200 rpm
<b>Governor</b>	centrifugal mechanical
<b>Valve clearance, cold</b>	
Intake	0.012 in 0.3mm
Exhaust	0.020 in 0.5mm
<b>Lubrication system</b>	
Oil pressure	26 to 87 psi 1.8 to 6.0 bar
Oil capacity (including filter)	11 quarts 10.5 liters
<b>Oil viscosity requirements</b>	
Temperature below 60°F / 15.5°C (synthetic)	5W-30
-10°F to 90°F / -23°C to 32°C	10W-40
Temperature above -4°F / -34°C	15W-40
Engine oil should have properties of API classification CC/SE, CD/SE, CC/SF or CD/SF grades.	
<b>Injection system</b>	
Injection pump make	OMAP

## DEUTZ ENGINE F4L 1011 SPECIFICATIONS

Injection pump pressure	4351 psi 300 bar	
Injector opening pressure	3626 psi 250 bar	
Fuel requirement	diesel number 2-D	
<b>Alternator output</b>	55A, 14V	
<b>Starter motor</b>		
Current draw, no load	90A	
Brush length, new	0.7480 in 19mm	
Brush length, minimum	0.5 in 12.7mm	
<b>Battery</b>		
Type	12V, Group 31	
Quantity	1	
Cold cranking ampere	1000A	
Reserve capacity @ 25A rate	200 minutes	
<b>Fan belt deflection</b>	<sup>3</sup> / <sub>8</sub> to <sup>1</sup> / <sub>2</sub> inch 9 to 12mm	
<b>Bolt tightening specifications</b>		
Bolt description (size, grade)	torque ft-lbs	torque Nm
Camshaft/thrust bearing bolt (M-8 x 35, 8.8)	15 to 18	20 to 24
Rocker arm bolts (M-8 x 45, 8.8)	15 to 18	20 to 24
Rocker arm set screw nut	15 to 18	20 to 24
Cylinder head cover	6 to 7	8 to 10
Blower rotor nut (M-17 Valeo or M-18 Bosch)	33 to 41	45 to 55
Blower carrier bolts (M-8 x 50 Torx, 8.8)	15 to 18	20 to 24
V-belt pulley bolts (M-10 x 16, 8.8)	28 to 34	38 to 46

## DEUTZ ENGINE F4L 1011 SPECIFICATIONS

Bolt tightening specifications, continued Bolt description (size, grade)	torque		torque	
	ft-lbs	Nm	ft-lbs	Nm
Idle pulley/V-belt pulley bolt (M-10 x 25, 8.8)	27 to 32	36 to 44		
Idle pulley for toothed belt (M-10 x 50, 8.8)	30 to 36	41 to 49		
Oil pump bolts (M-8 x 35 Torx)	15 to 18	20 to 24		
Oil filter bracket bolts (M-8 x 20 Torx, 8.8)	7 to 8	9 to 11		
Oil intake housing bolts (M-8 x 75 Torx)	15 to 18	20 to 24		
Fuel pump bolts	15 to 18	20 to 24		
Injection pump bolts	15 to 18	20 to 24		
Injector cap nut	30 to 37	40 to 50		
Injector fastening bolt	15 to 18	20 to 24		
Injection line	10 to 12	13.5 to 16.5		
Air intake manifold bolts (M-8 x 30, 8.8)	15 to 18	20 to 24		
Air intake manifold, 3-hole flange bolts (M-8 x 35 Torx, 8.8)	15 to 18	20 to 24		
Exhaust manifold bolts (M-10 x 30 Torx, 10.9)	27 to 32	36 to 44		
Starter fastening bolts (M-10 x 28, 8.8)	28 to 34	38 to 46		
Starter carrier bolts (M-12 x 28, 8.8)	50 to 60	68 to 82		
Oil pan bolts (M-8 x 16 Torx, 8.8)	15 to 18	20 to 24		
Oil drain bolts	37 to 44	50 to 60		
Oil thermostat housing screw plug (M-38 x 1.5)	37 to 44	50 to 60		
Oil thermostat housing bolts (M-6 x 35 Torx, 8.8)	5.5 to 7	7.5 to 9		
Oil thermostat housing bolts (M-6 x 80 Torx, 8.8)	5.5 to 7	7.5 to 9		
Oil thermostat housing bolts (M-6 x 105 Torx, 8.8)	14 to 16	19 to 22		
Valve plunger housing bolts (M-8 x 30 Torx, 8.8)	14 to 16	19 to 22		
Alternator nuts (M-5)	3	4		
Fuel bracket bolts (M-8 x 20, 8.8)	15	20		
Adapter housing bolts (M-12 x 35, 10.9 or M-12 x 75, 10.9)	70 to 77	95 to 105		
			first step tightening torque	second step tightening angles
			ft-lbs Nm	1st 2nd
Main bearing bolts	37	50		60° 45°
Big end bolts	22	30		60° 60°
Flywheel bolts	22	30		60° 30°
Cylinder head studs	step 1 step 2 step 3	22 30 59 80 118 160		120° NA
Camshaft/central bolt	22	30		150° NA
Crankshaft/central bolt	96	130		210° NA



# Scheduled Maintenance Inspections



## Observe and Obey:

- Maintenance inspections shall be completed by a person trained and qualified on the maintenance of this machine.
- Scheduled maintenance inspections shall be completed daily, quarterly, annually and every 2 years as specified on the *Maintenance Inspection Report*.



Failure to properly complete each inspection when required may cause death, serious injury or substantial damage.

- Immediately tag and remove from service a damaged or malfunctioning machine.
- Repair any machine damage or malfunction before operating machine.
- Keep records on all inspections for three years.

## About This Section

### The Schedule

There are four types of maintenance inspections that must be performed according to a schedule—daily, quarterly, annual, two year. To account for repeated procedures, the *Maintenance Tables* and the *Maintenance Inspection Report* have been divided into four subsections—A, B, C, D. Use the following chart to determine which group(s) of procedures are required to perform a scheduled inspection.

Inspection	Table or Checklist
Daily	A
Quarterly	A + B
Annual	A + B + C
Two year	A + B + C + D

### Maintenance Tables

The maintenance tables contained in this section provide summary information on the specific physical requirements for each inspection.

Complete step-by-step instructions for each scheduled maintenance procedure are provided in section 4, *Scheduled Maintenance Procedures*.









### Maintenance Inspection Report

The maintenance inspection report contains checklists for each type of scheduled inspection.

Make copies of the *Maintenance Inspection Report* to use for each inspection. Store completed forms for three years.

# Maintenance Tables




















**Table A**

		Tools are required	New parts required	Warm engine required	Cold engine required	Dealer service suggested
A-1	Inspect the Operator's and Safety Manuals					
A-2	Inspect the Decals and Placards					
A-3	Inspect for Damage, Loose or Missing Parts					
A-4	Check the Engine Oil Level					
A-5	Check the Engine Coolant Level - Gasoline/LPG Models					
A-6	Check for Fuel Leaks					
A-7	Check the Hydraulic Oil Level					
A-8	Check for Hydraulic Leaks					
A-9	Check the Tire Pressure					
A-10	Test the Platform and Ground Controls					
A-11	Test the Auxiliary Power Operation					
A-12	Test the Tilt Sensor					
A-13	Test the Limit Switches					
A-14	Check the Air Filter Condition Indicator - Deutz Diesel Models					
<b>Every 100 hours, perform the following two engine maintenance procedures.</b>						
A-15	Replace the Engine Oil and Filter - Gasoline/LPG Models					
A-16	Replace the Engine Air Filter					

REV B








MAINTENANCE TABLES

**Table B**

		Tools are required	New parts required	Warm engine required	Cold engine required	Dealer service suggested
B-1	Check the Engine Belt(s)					
B-2	Check the Radiator - Gasoline/LPG Models					
B-3	Check the Oil Cooler and Cooling Fins - Deutz Diesel Models					
B-4	Check the Exhaust System					
B-5	Check the Battery					
B-6	Check the Hydraulic Tank Filter Condition Indicator					
B-7	Inspect the Electrical Wiring					
B-8	Inspect the Tires and Wheels (including lug nut torque)					
B-9	Confirm the Proper Brake Configuration					
B-10	Check the Torque Hub Oil Level and Fastener Torque					
B-11	Check and Adjust the Engine Idle Mixture - Gasoline/LPG Models					
B-12	Check and Adjust the Engine RPM					
B-13	Test the Key Switch					
B-14	Test the Emergency Stop Buttons					
B-15	Test the Ground Control Override					
B-16	Test the Oscillate Lock-out (oscillating axle equipped models)					
B-17	Test the Platform Self-leveling					










































MAINTENANCE TABLES

**Table B,** continued

		Tools are required	New parts required	Warm engine required	Cold engine required	Dealer service suggested
B-18	Test the Service Horn					
B-19	Test the Foot Switch					
B-20	Test the Engine Idle Select					
B-21	Test the Fuel Select Operation - Gasoline/LPG Models					
B-22	Test the Drive Enable System					
B-23	Test the Drive Brakes					
B-24	Test the Drive Speed - Stowed Position					
B-25	Test the Alarm Package - Optional Equipment					
B-26	Perform Hydraulic Oil Anaysis <i>See D-1 Test or Replace the Hydraulic Oil</i>					
<b>Every 500 hours, perform the following engine maintenance procedure.</b>						
B-27	Replace the Engine Oil and Filter - Deutz Diesel Models					
























MAINTENANCE TABLES

**Table C**

		Tools are required	New parts required	Warm engine required	Cold engine required	Dealer service suggested
C-1	Check the Primary Boom Wear Pads					
C-2	Check the Turntable Rotation Bearing Bolts					
C-3	Check the Free-wheel Configuration					
C-4	Grease the Turntable Rotation Bearing and Rotate Gear					
C-5	Replace the Torque Hub Oil					
C-6	Replace the Hydraulic Tank Filter					
C-7	Replace the Drive Loop Hydraulic Filter					
C-8	Replace the Diesel Fuel Filter - Deutz Diesel Models					
C-9	Replace the Gasoline Fuel Filter - Gasoline/LPG Models					
C-10	Replace the PCV Valve - Gasoline/LPG Models					
C-11	Clean or Replace the Distributor Cap and Rotor - Gasoline/LPG Models					
C-12	Replace the Spark Plugs - Gasoline/LPG Models					
C-13	Check and Adjust the Air/LPG Mixture - Gasoline/LPG Models					
C-14	Check and Adjust the Ignition Timing - Gasoline/LPG Models					
C-15	Check the Engine Valve Clearances - Deutz Diesel Models					

MAINTENANCE TABLES

**Table D**

		Tools are required	New parts required	Warm engine required	Cold engine required	Dealer service suggested
D-1	Test or Replace the Hydraulic Oil					
D-2	Change or Recondition the Engine Coolant - Gasoline/LPG Models					
D-3	Change the Fuel Lines					
D-4	Check the Engine Valve Clearance - Gasoline/LPG Models					
D-5	Check the Engine Cylinder Compression - Gasoline/LPG Models					
D-6	Clean the PCV Hoses and Fittings - Gasoline/LPG Models					
D-7	Check the Engine Injection Pumps and Injectors - Deutz Diesel Models					
D-8	Check the Toothed Belt - Deutz Diesel Models					
D-9	Replace the Timing Belt - Gasoline/LPG Models					

# Maintenance Inspection Report

**Model** \_\_\_\_\_

**Serial number** \_\_\_\_\_

**Date** \_\_\_\_\_

**Hour meter** \_\_\_\_\_

**Machine owner** \_\_\_\_\_

**Inspected by (print)** \_\_\_\_\_

**Inspector signature** \_\_\_\_\_

**Inspector title** \_\_\_\_\_

**Inspector company** \_\_\_\_\_

**Instructions**

- Make copies of this page to use for each inspection.
- Select the appropriate checklist(s) for the type of inspection to be performed.

<input type="checkbox"/>	<b>Daily Inspection: A</b>
<input type="checkbox"/>	<b>Quarterly Inspection: A+B</b>
<input type="checkbox"/>	<b>Annual Inspection: A+B+C</b>
<input type="checkbox"/>	<b>2 Year Inspection: A+B+C+D</b>

- Place a check in the appropriate box after each inspection procedure is completed.
- Use the maintenance tables in this section and the step-by-step procedures in section 4 to learn how to perform these inspections.
- If any inspection receives an "N", tag and remove the machine from service, repair and re-inspect it. After repair, place a check in the "R" box.

**Legend**

- Y = yes, acceptable
- N = no, remove from service
- R = repaired

**Comments**

**Checklist A** Y N R

Refer to Table A

A-1 Operator's and Safety manuals			
A-2 Decals and placards			
A-3 Damage, loose or missing parts			
A-4 Engine oil level			
A-5 Engine coolant-gasoline			
A-6 Fuel leaks			
A-7 Hydraulic oil level			
A-8 Hydraulic leaks			
A-9 Tire pressure			
A-10 Platform and ground controls			
A-11 Auxiliary power			
A-12 Tilt sensor			
A-13 Limit switches			
A-14 Air filter indicator-Deutz			
<b>Perform every 100 hours:</b>			
A-15 Replace engine oil and filter-gasoline			
A-16 Replace air filter			

**Checklist B** Y N R

Refer to Table B

B-1 Engine belt(s)			
B-2 Engine radiator-gasoline			
B-3 Oil cooler and fins-Deutz			
B-4 Exhaust system			
B-5 Battery			
B-6 Hydraulic tank filter			
B-7 Electrical wiring			
B-8 Tires and wheels			
B-9 Brake configuration			
B-10 Torque hub oil level			
B-11 Idle mixture-gasoline			
B-12 Engine RPM			
B-13 Key Switch			
B-14 Emergency Stop			
B-15 Ground control override			
B-16 Oscillate lock-out			
B-17 Platform leveling			
B-18 Service horn			

B-19 Foot switch			
B-20 Engine idle select			
B-21 Fuel select-gasoline			
B-22 Drive enable system			
B-23 Drive brakes			
B-24 Drive speed-stowed			
B-25 Alarm package			
B-26 Hydraulic oil analysis			
<b>Perform every 500 hours:</b>			
B-27 Replace engine oil and filter-Deutz			

**Checklist C** Y N R

Refer to Table C

C-1 Boom wear pads			
C-2 Turntable bearing bolts			
C-3 Free-wheel configuration			
C-4 Grease rotation bearing			
C-5 Torque hub oil			
C-6 Hydraulic tank filter			
C-7 Drive loop hydraulic filter			
C-8 Fuel filter-diesel			
C-9 Fuel filter-gasoline			
C-10 PCV valve-gasoline			
C-11 Distributor cap-gasoline			
C-12 Spark plugs-gasoline			
C-13 Air/LPG mixture			
C-14 Ignition timing-gasoline			
C-15 Valves-Deutz			

**Checklist D** Y N R

Refer to Table D

D-1 Hydraulic oil			
D-2 Engine coolant-gasoline			
D-3 Change fuel lines			
D-4 Valves-gasoline			
D-5 Compression-gasoline			
D-6 PCV hoses-gasoline			
D-7 Fuel injection-Deutz			
D-8 Toothed belt-Deutz			
D-9 Timing belt-Ford			

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# Scheduled Maintenance Procedures



## Observe and Obey:

- ☑ Maintenance inspections shall be completed by a person trained and qualified on the maintenance of this machine.
- ☑ Scheduled maintenance inspections shall be completed daily, quarterly, annually and every 2 years as specified on the *Maintenance Inspection Report*.



Failure to perform each procedure as presented and scheduled may cause death, serious injury or substantial damage.

- ☑ Immediately tag and remove from service a damaged or malfunctioning machine.
- ☑ Repair any machine damage or malfunction before operating machine.
- ☑ Keep records on all inspections for three years.
- ☑ Unless otherwise specified, perform each repair procedure with the machine in the following configuration:
  - machine parked on a flat level surface
  - boom in stowed position
  - turntable rotated with the boom between the non-steering wheels
  - turntable secured with the turntable rotation lock
  - key switch in the OFF position with the key removed
  - wheels chocked

## About This Section

This section contains detailed procedures for each scheduled maintenance inspection.

Each procedure includes a description, safety information and step-by-step instructions.

### Symbols Legend



Indicates the presence of a hazard that **will** cause death or serious injury.



Indicates the presence of a hazard that **may** cause death or serious injury.



Indicates the presence of a hazard that **will** or **may** cause serious injury or damage to the machine.



Indicates special operation or maintenance information.

- ⊙ Indicates that a specific result is expected after performing a step.

# Table A Procedures

## A-1

### Inspect the Operator's and Safety Manuals

Maintaining the operator's and safety manuals in good condition is essential to safe machine operation. Manuals are included with each machine and should be stored in the box provided in the platform. An illegible or missing manual will not provide safety and operational information necessary for a safe operating condition.

- 1 Check to make sure that the operator's and safety manuals are present and complete in the storage box in the platform.
- 2 Examine the pages of each manual to be sure that they are legible and in good condition.
- 3 Always return the manuals to the storage box after use.

#### **NOTICE**

Contact your authorized Genie distributor or Genie Industries if replacement manuals are needed.

## A-2

### Inspect the Decals and Placards

Maintaining all of the safety and instructional decals and placards in good condition is mandatory for safe machine operation. Decals alert operators and personnel to the many possible hazards associated with using this machine. They also provide users with operation and maintenance information. An illegible decal will fail to alert personnel of a procedure or hazard and could result in unsafe operating conditions.

- 1 Refer to the *Decals* section in the *Genie Z-60/34 Operator's Manual* and use the decal list and illustrations to determine that all decals and placards are in place.

- 2 Inspect all decals for legibility and damage. Replace any damaged or illegible decal immediately.

#### **NOTICE**

Contact your authorized Genie distributor or Genie Industries if replacement decals are needed.

## A-3

### Inspect for Damage, Loose or Missing Parts

Daily machine condition inspections are essential to safe machine operation and good machine performance. Failure to locate and repair damage, and discover loose or missing parts may result in an unsafe operating condition.

- 1 Inspect the entire machine for damage and improperly installed or missing parts including:
  - electrical components, wiring and electrical cables
  - hydraulic hoses, fittings, cylinders and manifolds
  - fuel and hydraulic tanks
  - drive and turntable rotation motors and torque hubs
  - boom components and wear pads
  - dents or damage to machine
  - tires and wheels
  - engine and related components
  - limit switches, alarms, horn and beacon
  - nuts, bolts and other fasteners
  - platform entry mid-rail gate
  - cracks in welds or structural components
  - compartment covers are in place and latched

TABLE A PROCEDURES

## A-4 Check the Engine Oil Level

Maintaining the proper engine oil level is essential to good engine performance and service life. Operating the machine with an improper oil level can damage engine components.

**NOTICE** Check the oil level with the engine off.

- 1 Check the oil level dipstick. Add oil as needed.

<b>Ford Engine LSG 423 Oil capacity (including filter)</b>	5 quarts 4.7 liters
--	------------------------

### Ford Engine LSG 423 Oil viscosity requirements

below 60F / 15.5C	5W-30
-10 to 90F / -23 to 32C	10W-30
above -10F / -23C	10W-40 or 10W-50
above 25F / -4C	20W-40 or 20W-50

Use oils meeting API classification SF (labeled SF/CC or SF/CD) as they offer improved wear protection.

<b>Deutz Engine F4L 1011 Oil capacity (including filter)</b>	11 quarts 10.5 liters
--	--------------------------

### Deutz Engine F4L 1011 Oil viscosity requirements

below 60°F / 15.5°C (synthetic)	5W-30
-10°F to 90°F / -23°C to 32°C	10W-40
above -4°F / -34°C	15W-40

Engine oil should have properties of API classification CC/SE, CD/SE, CC/SF or CD/SF grades.

## A-5 Check the Engine Coolant Level - Gasoline/LPG Models

Maintaining the engine coolant at the proper level is essential to engine service life. Improper coolant level will affect the engine's cooling capability and damage engine components. Daily checks will allow the inspector to identify changes in coolant level that might indicate cooling system problems.

- 1 Check the fluid level in the coolant recovery tank. Add fluid as needed.

⊙ Result: The fluid level should be in the NORMAL range.

## A-6 Check for Fuel Leaks

Failure to detect and correct fuel leaks will result in an unsafe condition. An explosion or fuel fire may cause death or serious injury.

**⚠ DANGER** Engine fuels are combustible. Inspect the machine in an open, well-ventilated area away from heaters, sparks, flames and lighted tobacco. Always have an approved fire extinguisher within easy reach.

- 1 Open the shutoff valve on the liquid petroleum gas (LPG) tank by turning it counterclockwise.

TABLE A PROCEDURES

- 2 Perform a visual inspection around the following areas. (An LPG detector may be necessary to locate LPG leaks.)

**Gasoline/LPG models:**

- LPG tank, hoses and fittings, solenoid shutoff valve, LPG regulator and carburetor
- gasoline tank, shutoff valve, solenoid shutoff valve, hoses and fittings, fuel pump and carburetor

**Deutz Diesel models:**

- fuel tank, shutoff valve, hoses and fittings, fuel pump, fuel filter, fuel injection pumps and fuel injectors



If a fuel leak is discovered, keep any additional personnel from entering the area and do not operate the machine. Repair the leak immediately.

**A-7****Check the Hydraulic Oil Level**

Maintaining the hydraulic oil at the proper level is essential to machine operation. Improper hydraulic oil levels can damage hydraulic components. Daily checks allow the inspector to identify changes in oil level that might indicate the presence of hydraulic system problems.

- 1 Be sure that the boom is in the stowed position, then visually inspect the sight gauge located on the side of the hydraulic oil tank.
- ⊙ Result: The hydraulic oil level should be within the top 2 inches (5cm) of the sight gauge.

**Hydraulic Oil Specifications**

Hydraulic oil type	Dexron II equivalent
Tank capacity	45 gallons 170 liters
Hydraulic system (including tank)	53 gallons 201 liters

**A-8****Check for Hydraulic Leaks**

Detecting hydraulic fluid leaks is essential to operational safety and good machine performance. Undiscovered leaks can develop into hazardous situations, impair machine functions and damage machine components.

- 1 Inspect for hydraulic oil puddles, dripping or residue on or around the following areas:
  - hydraulic tank—filter, fittings, hoses, auxiliary power unit and turntable surface
  - engine compartment—fittings, hoses, main pump, filter and turntable surface
  - all cylinders
  - all hydraulic manifolds
  - primary, secondary, and jib booms
  - the underside of the chassis
  - ground area under the machine

TABLE A PROCEDURES

### A-9 Check the Tire Pressure

**NOTICE** This procedure does not need to be performed on machines equipped with the foam-filled tire option.

**WARNING** The industrial tire uses a split rim. Any service or repair should be done by a qualified service center.

**WARNING** An over-inflated tire can explode and may cause death or serious injury.

To safeguard maximum stability, achieve optimum machine handling and minimize tire wear, it is essential to maintain proper pressure in all air-filled tires.

- 1 Check each tire with an air pressure gauge and add air as needed.

Tire Specifications	Industrial	Rough terrain
Tire size	32x12-15NHS 300-15NHS	15-19.5NHS
Pressure	110 psi 7.58 bar	60 psi 4.14 bar

### A-10 Test the Platform and Ground Controls

Testing the machine functions and the Emergency Stop buttons for malfunctions is essential for safe machine operation. An unsafe working condition exists if any function fails to operate properly or either Emergency Stop button fails to stop all the machine functions and shut off the engine. Each function should activate, operate smoothly and be free of hesitation, jerking and unusual noise.

- 1 Start the engine from the ground controls, and then operate each machine function through a full cycle.
  - ⊙ Result: All machine functions should operate smoothly.
- 2 Push in the Emergency Stop button to the off position.
  - ⊙ Result: No function should operate, the engine should stop.

**NOTICE** Deutz Diesel models: All functions should stop immediately. The engine will shut off after 2 to 3 seconds.

- 3 Start the engine from the platform controls, and then operate each machine function through a full cycle.
  - ⊙ Result: All machine functions should operate smoothly.
- 4 Push in the Emergency Stop button to the off position.
  - ⊙ Result: No function should operate, the engine should stop.

**NOTICE** As a safety feature, selecting and operating the ground controls will override the platform controls, including the Emergency Stop button.

TABLE A PROCEDURES

## A-11 Test the Auxiliary Power Operation

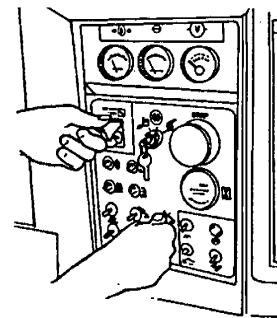
Detection of auxiliary power system malfunctions is essential for safe machine operation. An unsafe working condition exists if the auxiliary powered functions do not operate in the event of a main power loss. When operating the machine on engine power, selecting auxiliary power will stop the engine immediately. Auxiliary power is designed for short term emergency use only, and excessive use will result in battery drain and component damage.

**NOTICE** Oscillating axle equipped machines only: From the stowed position, auxiliary power can not raise the primary boom above the lift interlock limit switch. Auxiliary power can raise the primary boom if it is already raised above the lift interlock limit switch.

- 1 Turn the key switch to ground control and pull out the Emergency Stop button to the ON position.

- 2 Simultaneously hold the auxiliary power switch ON while activating the following functions through a partial cycle:

- jib boom up/down
- primary boom up/down
- extend and retract
- secondary boom up/down
- turntable rotate right/left



- ⓐ Result: Each function should operate smoothly.

- 3 Turn the key switch to platform control.

- 4 At the platform controls, pull out the Emergency Stop button to the ON position, then press down the foot switch.

- 5 Simultaneously hold the auxiliary power switch ON while activating the following functions through a partial cycle:

- jib boom up/down
- primary boom up/down
- extend and retract
- secondary boom up/down
- turntable rotate right/left
- steer right/left

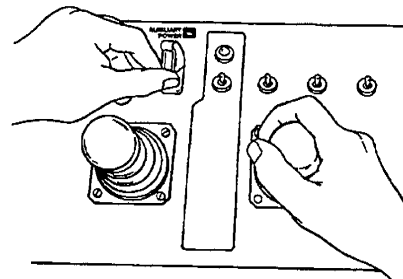


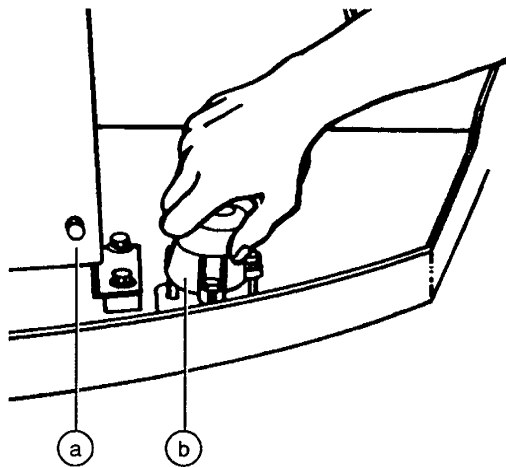
TABLE A PROCEDURES

### A-12 Test the Tilt Sensor

The tilt sensor sounds an alarm in the platform when the incline of the drive chassis exceeds 3 degrees.

**NOTICE** Select a level test area. The tilt alarm should not be sounding prior to test.

- 1 Start the engine from the platform controls.
  - 2 Open the tank side cover and press down on one side of the tilt sensor.
- ⊙ Result: After a 1 second delay, the alarm in the platform should sound.



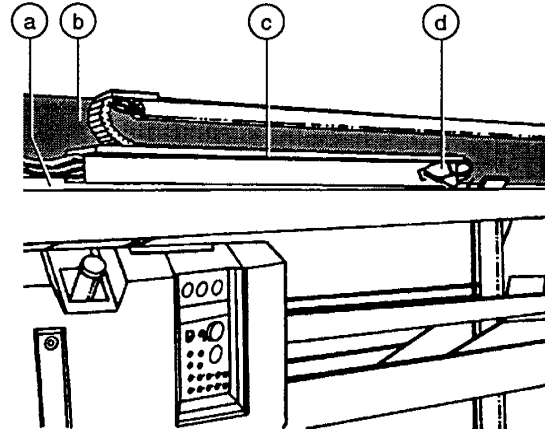
a ground control box  
b tilt sensor

### A-13 Test the Limit Switches

#### Drive Limit Switches

The drive limit switches are used to restrict drive speed when the primary boom is raised or extended, and to signal the oscillate cylinder to extend the lock-out wedges (oscillating axle equipped machines). An improperly functioning drive limit switch will allow the machine to operate in an unsafe position.

- 1 With the engine off and the boom in the stowed position, visually inspect the drive limit switch located on the primary boom for the following:
  - broken or missing actuator arm
  - missing fasteners
  - loose wiring



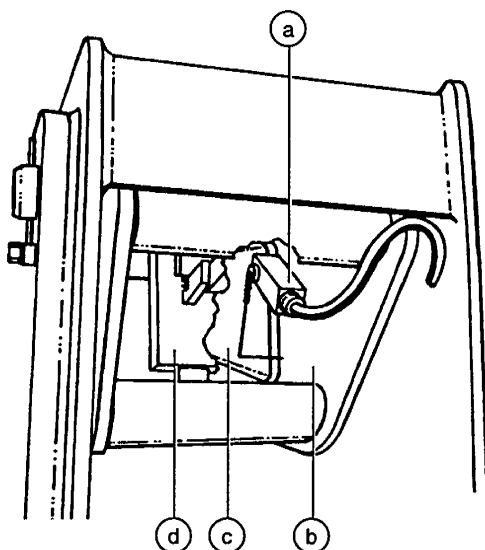
a lift interlock switch  
(hidden from view)  
b primary boom  
c cable track  
d drive limit switch

- 2 Start the engine from the ground controls. Then raise the secondary boom until the upper mid-pivot is above the turntable covers. Turn the engine off.

TABLE A PROCEDURES

3 Visually inspect the drive limit switch located in the pivot end of the primary boom. Inspect for the following:

- broken or missing actuator arm
- missing fasteners
- loose wiring



- a drive limit switch
- b primary boom
- c extension boom tube
- d extension cylinder

4 Lower the boom to the stowed position.

5 Start the engine from the platform controls. Then slowly move the drive control handle off center.

⊙ Result: The machine should move at normal drive speeds.

6 Raise the primary boom above the drive limit switch.

7 Slowly move the drive control handle off center.

⊙ Result: The machine should move at a reduced drive speed.

8 Lower the boom to the stowed position, then extend the primary boom 1 foot (30cm).

9 Slowly move the drive control handle off center.

⊙ Result: The machine should move at a reduced drive speed.

---

**Drive Speed, maximum, raised or extended**

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All models	1 foot per second 0.3 meter per second
------------	---

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**Drive Enable Limit Switch**

The drive enable limit switch is located in the electrical rotary coupler. The switch activates a signal light to inform the operator in the platform that the primary boom is past either of the non-steering wheels and stops drive movement unless the drive enable override switch is used. An improperly functioning drive enable limit switch will allow the machine to operate in an unsafe position.

1 Start the engine from the platform controls. Then rotate the turntable to the left until the primary boom is past the left non-steering wheel.

⊙ Result: The drive enable indicator light should be on. Drive function should not operate until the drive enable override switch is activated.

2 Rotate the turntable to the right until the primary boom is past the right non-steering wheel.

⊙ Result: The drive enable indicator light should be on. Drive function should not operate until the drive enable override switch is activated.

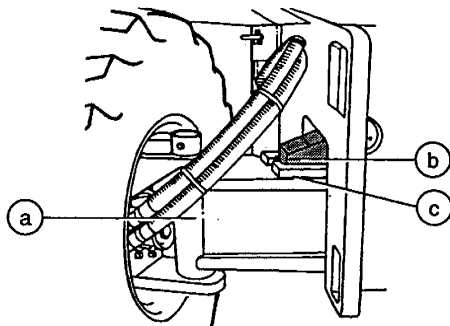


TABLE A PROCEDURES

**Rotation Oscillate Lock-out Limit Switch (oscillating axle equipped machines)**

The rotation oscillate lock-out switch is located in the electrical rotary coupler. The switch signals the oscillate cylinder to extend the lock-out wedges when the primary boom is rotated past either of the non-steering wheels. An improperly functioning rotation oscillate lock-out switch will allow the machine to operate in an unsafe position.

- 1 Start the engine from the platform controls. Then rotate the turntable to the left until the primary boom is past the left non-steering wheel.



a oscillating axle  
 b oscillating lock-out wedge  
 c lock-out wedge stop

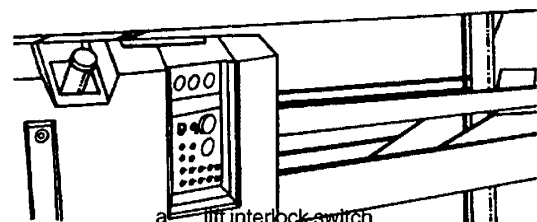
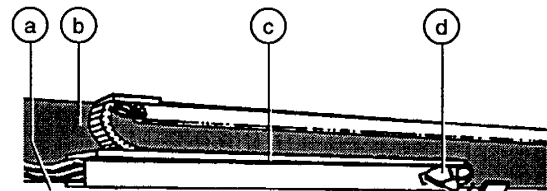
- ⊙ Result: The oscillate cylinder should fully extend the lock-out wedges against the wedge stops.
- 2 Rotate the turntable to the right until the primary boom is past the right non-steering wheel.
- ⊙ Result: The oscillate cylinder should fully extend the lock-out wedges against the wedge stops.

**Lift Interlock Limit Switch**

On oscillating axle equipped machines, the lift interlock switch stops the primary boom from being raised if the oscillate lock-out wedges are not fully extended. An improperly functioning lift interlock switch will allow the machine to operate in an unsafe position.

- 1 With the engine off and the boom in the stowed position, visually inspect the lift interlock limit switch for the following:

- broken or missing actuator arm
- missing fasteners
- loose wiring



a lift interlock switch (hidden from view)  
 b primary boom  
 c cable track  
 d drive limit switch

- 2 Using auxiliary power, raise the primary boom past the lift interlock limit switch.

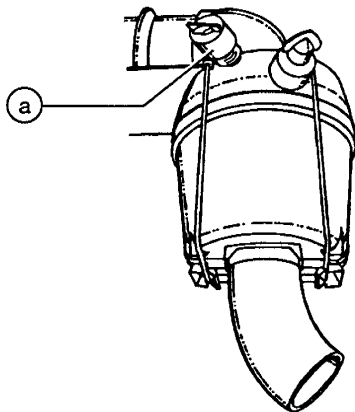
- ⊙ Result: When the primary boom passes the lift interlock limit switch, the primary boom should stop and not be able to continue to raise because the auxiliary power will not extend the oscillating lock-out wedges.

TABLE A PROCEDURES

## A-14 Check the Air Filter Condition Indicator - Deutz Diesel Models

Maintaining the engine air filter in good condition is essential to good engine performance and service life. The filter condition indicator will show when there is not enough air flowing through the filter.

- 1 Visually inspect the condition indicator located on the side of the air filter canister.
- ⊙ Result: If the clear window of the indicator is showing the red plunger, the air filter is dirty or clogged and should be replaced. See A-16, *Replace the Engine Air Filter*.



a air filter condition indicator

## A-15 Replace the Engine Oil and Filter - Gasoline/LPG Models

**NOTICE** Ford engine specifications require that this procedure be performed every 100 hours. Perform this procedure more often if dusty conditions exist or the machine is subjected to extended low idle operation.

Periodic replacement of the engine oil and filter is essential to good engine performance. Operating the machine with an improper oil level or neglecting periodic oil and filter changes can damage engine components. A daily check of elapsed machine hours against the hours noted on the oil filter will allow the inspector to anticipate and perform oil and filter changes at the 100 hour interval.

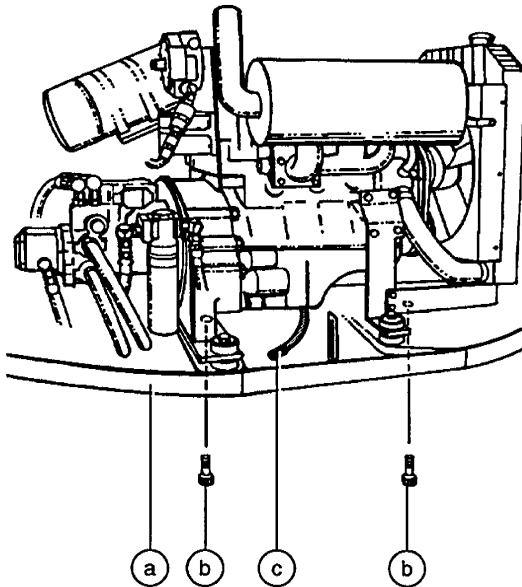
**NOTICE** Perform this procedure after warming the engine to normal operating temperature.

**CAUTION** Beware of hot engine parts and oil. Contact with hot engine oil and/or engine parts may cause severe burns.

- 1 Remove the oil filler cap located on the valve cover.

TABLE A PROCEDURES

- 2 Pull the end of the oil drain hose out from under the engine.



- a engine pivot plate
- b pivot plate retaining bolts
- c oil drain hose

- 3 Remove the plug from the end of the drain hose and allow all of the oil from the engine to drain into a suitable container.
- 4 Install the plug into the drain hose.
- 5 Remove the 2 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the oil filter.
- 6 Use an oil filter wrench and remove the filter.

- 7 Apply a thin layer of oil to the new oil filter gasket (filter part no. 28656). Then install the filter and tighten it securely by hand.
- 8 Use a permanent ink marker to write the date and number of hours from the hour meter on the oil filter.
- 9 Fill the engine with new oil per specifications and install the filler cap.
- 10 Start the engine from the ground controls. Allow the engine to run for 30 seconds, then turn the engine off.
- 11 Check the oil filter and the oil drain hose for leaks.
- 12 Swing the engine pivot plate back to its original position and replace the two retaining bolts.
- 13 Check the engine oil level dipstick. Add oil if needed.

<b>Ford Engine LSG-423</b>	5 quarts
<b>Oil capacity (including filter)</b>	4.7 liters

**Ford Engine LSG-423 Oil viscosity requirements**

below 60F / 15.5C	5W-30
-10 to 90F / -23 to 32C	10W-30
above -10F / -23C	10W-40 or 10W-50
above 25F / -4C	20W-40 or 20W-50

Use oils meeting API classification SF (labeled SF/CC or SF/CD) as they offer improved wear protection.

## TABLE A PROCEDURES

**A-16****Replace the Engine Air Filter**

**NOTICE** Engine specifications require that this procedure be performed every 100 hours. Perform this procedure more often if dusty conditions exist.

Maintaining the engine air filter in good condition is essential to good engine performance and service life. Failure to perform this procedure can lead to poor engine performance and component damage.

**NOTICE** Perform this procedure with the engine off.

**Gasoline/LPG Models**

- 1 Remove the end cap from the air cleaner canister.
- 2 Remove the mounting fastener from the air filter, then remove the filter.
- 3 Insert the new filter (part no. 27916) and replace the mounting fastener.
- 4 Replace the end cap on the canister.

**Deutz Diesel Models**

- 1 Remove the end cap from the air cleaner canister, then remove the air filter.
- 2 Insert the new filter (part no. 29553) and replace the end cap on the canister.

**NOTICE** Reset the filter condition indicator by pressing the tab located on the end of the indicator.

# Table B Procedures

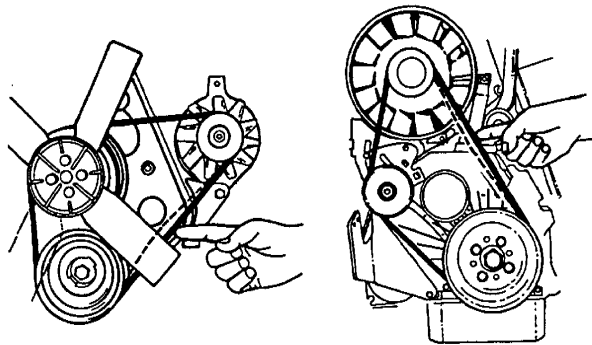
## B-1 Check the Engine Belt(s)

Maintaining the engine belt(s) is essential to good engine performance and service life. The machine will not operate properly with a loose or defective belt and continued use may cause component damage.

**WARNING** Do not inspect while the engine is running. Remove the key to secure from operation.

**CAUTION** Beware of hot engine components. Contact with hot engine components may cause severe burns.

- 1 **Deutz Diesel models:** Remove front engine cover to access belt.
- 2 **All models:** Inspect the engine belt(s) for:
  - cracking
  - glazing
  - separation
  - breaks
- 3 Check the engine belt(s) for proper tension.



Ford engine

Deutz Diesel engine

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**Belt deflection - all models**  $\frac{3}{8}$  inch to  $\frac{1}{2}$  inch  
9mm to 12mm

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## B-2 Check the Radiator- Gasoline/LPG Models

Maintaining the radiator in good condition is essential for good engine performance. Operating a machine with a damaged or leaking radiator may result in engine damage. Also, restricting air flow through the radiator (i.e., dirt or debris) will affect the performance of the cooling system. A frequent check allows the inspector to identify changes in the condition of the radiator that might indicate cooling system problems.

**WARNING** Do not inspect while the engine is running. Remove the key to secure from operation.

**CAUTION** Beware of hot engine components. Contact with hot engine components may cause severe burns.

- 1 Inspect the radiator for leaks and physical damage.
- 2 Clean the radiator fins of debris and foreign materials.

## B-3 Check the Oil Cooler and Cooling Fins - Deutz Diesel Models

Maintaining the oil cooler in good condition is essential for good engine performance. Operating a machine with a damaged oil cooler may result in engine damage. Also, restricting air flow through the oil cooler will affect the performance of the cooling system.

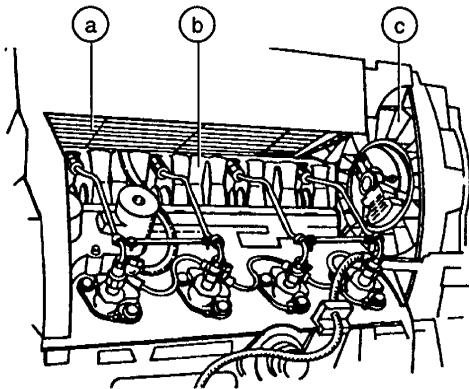
**WARNING** Do not inspect while the engine is running. Remove the key to secure from operation.

TABLE B PROCEDURES

**CAUTION** Beware of hot engine components. Contact with hot engine components may cause severe burns.

**Oil Cooler**

- 1 Remove the cover from the side of the engine, then remove the oil cooler top cover.
- 2 Inspect the oil cooler for leaks and physical damage.



- a oil cooler
- b cylinder head cooling fins
- c blower fins

- 3 Clean the oil cooler of debris and foreign material.

**Cooling and Blower Fins**

- 4 Inspect the blower fins for physical damage.
- 5 Clean the blower fins of debris and foreign material.
- 6 Inspect the head cooling passages and fins for physical damage or foreign material, using a flashlight.
- 7 Clean the cylinder head cooling passages of debris and foreign material.

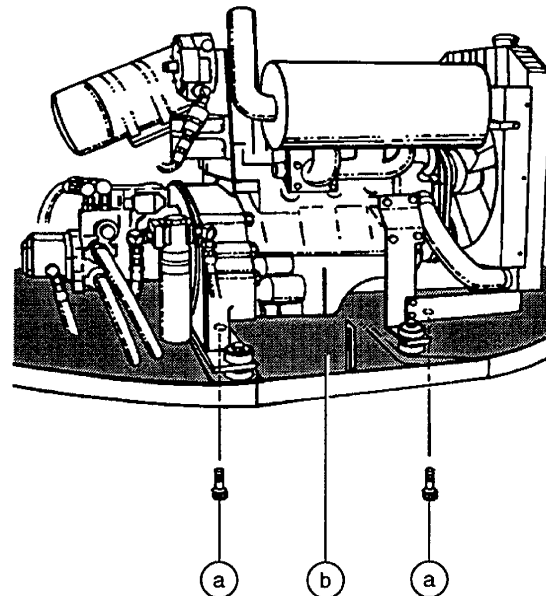
**B-4**  
**Check the Exhaust System**

Maintaining the exhaust system is essential to good engine performance and service life. Running the engine with a damaged or leaking exhaust system can cause component damage and unsafe operating conditions.

**WARNING** Do not inspect while the engine is running. Remove the key to secure from operation.

**CAUTION** Beware of hot engine components. Contact with hot engine components may cause severe burns.

- 1 **Deutz Diesel models:** Remove the 2 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the exhaust system.



- a pivot plate retaining bolts
- b engine pivot plate

TABLE B PROCEDURES

- 2 Be sure that all nuts and bolts are tight.
- 3 Inspect all welds for cracks.
- 4 Inspect for exhaust leaks; i.e., carbon buildup around seams and joints.

## B-5 Check the Battery

Proper battery condition is essential to good engine performance and operational safety. Improper fluid levels or damaged cables and connections can result in engine component damage and hazardous conditions.



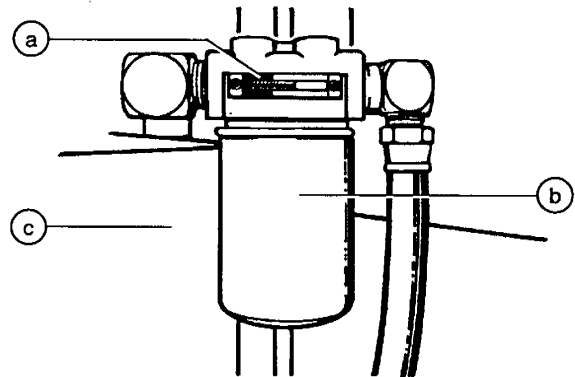
Batteries contain acid. Avoid spilling or contacting battery acid. Neutralize battery acid spills with baking soda and water.

- 1 Put on protective clothing and eye wear.
- 2 Be sure that the battery cable connections are free of corrosion.
- 3 Be sure that the battery hold downs and cable connections are tight.
- 4 Remove the battery vent caps and check the specific gravity with a hydrometer.
- 5 Check the battery acid level. If needed, replenish with water to the bottom of the battery fill tube. Do not overfill.
- 6 Install the vent caps.

## B-6 Check the Hydraulic Tank Filter Condition Indicator

Maintaining the hydraulic tank filter in good condition is essential to good system performance and safe machine operation. The filter condition indicator will show when the hydraulic flow is bypassing a clogged filter. If the filter is not frequently checked and replaced, impurities will remain in the hydraulic system and cause component damage.

- 1 Start the engine from the platform controls.
- 2 Move the engine speed control switch to high idle (rabbit symbol).
- 3 Inspect the filter condition indicator.



- a filter condition indicator
- b filter
- c hydraulic tank

- ⊙ Result: The filter should be operating with the plunger in the green area. If the display shows the plunger in the red area, this indicates that the hydraulic filter is being bypassed and the filter should be replaced. See C-6, *Replace the Hydraulic Tank Filter*.

TABLE B PROCEDURES

## B-7 Inspect the Electrical Wiring

Maintaining electrical wiring in good condition is essential to safe operation and good machine performance. Failure to find and replace burnt, chafed, corroded or pinched wires could result in unsafe operating conditions and may cause component damage.



Electrocution hazard. Contact with hot or live circuits may cause death or serious injury. Remove all rings, watches and other jewelry.

- 1 Inspect the following areas for burnt, chafed, corroded and loose wires:
  - engine compartment electrical panel
  - engine wiring harness
  - inside of the ground control box
  - turntable manifold wiring
- 2 Start the engine from the ground controls, then raise the secondary boom until the upper mid-pivot is above the turntable covers.
- 3 Inspect the turntable center area for burnt, chafed and pinched cables.
- 4 Lower the boom into the stowed position and turn the engine off.
- 5 Inspect the following areas for burnt, chafed, corroded, pinched and loose wires:
  - cable track on the primary and secondary booms
  - jib boom to platform cable harness
  - inside of the platform control box

## B-8 Inspect the Tires and Wheels (including lug nut torque)

Maintaining the tires and wheels in good condition is essential to safe operation and good performance. Tire and/or wheel failure could result in a machine tip-over. Component damage may also result if problems are not discovered and repaired in a timely fashion.



The industrial tire uses a split rim. Any service or repair should be done by a qualified service center.



An over-inflated tire can explode and may cause death or serious injury.

- 1 Check all tire treads and sidewalls for cuts, cracks, punctures and unusual wear.
- 2 Check each wheel for damage, bends and cracked welds.
- 3 Check each lug nut for proper torque.
- 4 Check the pressure in each air-filled tire.

Tires and wheels	Industrial	Rough terrain
Tire size	32x12-15 NHS 300-15NHS	15-19.5NHS
Tire ply rating	20	12
Overall tire diameter	32.9 in 83.6cm	40 in 102cm
Tire pressure	110 psi 7.58 bar	60 psi 4.14 bar
Wheel diameter	15.2 in 38.6cm	19.5 in 49.5cm
Wheel width	9.75 in 24.8cm	12.25 in 31cm
Wheel lugs	9 @ 5/8-18	9 @ 5/8-18
Lug nut torque	125 ft-lbs 169.5 Nm	125 ft-lbs 169.5 Nm



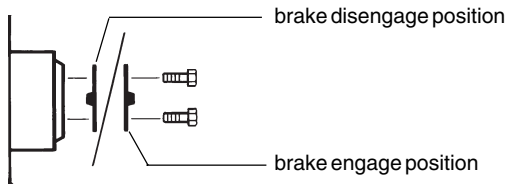
REV B

TABLE B PROCEDURES

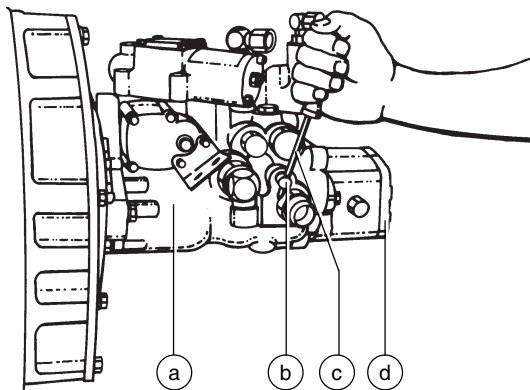
### B-9 Confirm the Proper Brake Configuration

Proper brake configuration is essential to safe operation and good machine performance. Hydrostatic brakes and hydraulically-released, spring-applied individual wheel brakes can appear to operate normally when they are actually not fully operational.

- 1 Check each torque hub disconnect cap to be sure it is in the engaged position.



- 2 On 4WD models, be sure the free-wheel valve on the drive pump is closed (clockwise).



- a drive pump
- b free-wheel valve
- c screwdriver
- d lift pump

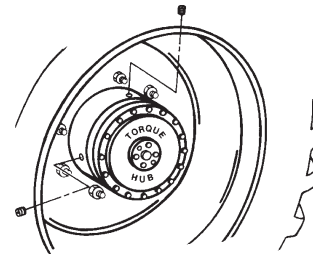
**NOTICE** On 2WD models, the free-wheel valve should always remain closed.

### B-10 Check the Torque Hub Oil Level and Fastener Torque

Failure to maintain proper torque hub oil levels may cause the machine to perform poorly and continued use may cause component damage.

#### Drive Torque Hubs

- 1 Drive the machine to rotate the hub until the plugs are located one on top and the other at 90 degrees.



- 2 Remove the plug located at 90 degrees and check the oil level.
  - ⦿ Result: The oil level should be even with the bottom of the plug hole.
- 3 If necessary, remove the top plug and add oil until the oil level is even with the bottom of the side plug hole, then re-install the plugs into the hub.
- 4 Check the torque hub fasteners. Torque the fasteners to 160 ft-lbs / 217 Nm.
- 5 Repeat this procedure for each torque hub.

#### Drive Torque Hub Oil

Capacity	40 fluid ounces 1.2 liters
----------	-------------------------------

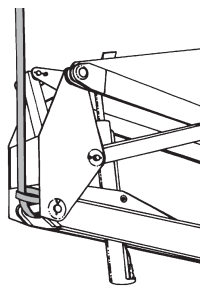
Type: SAE 90 multipurpose hypoid gear oil - API service classification GL5

TABLE B PROCEDURES

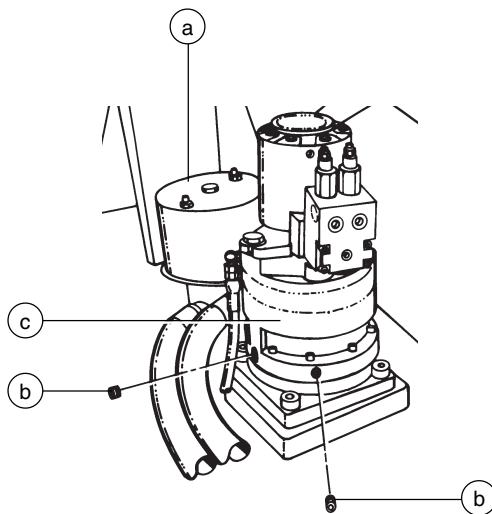
REV B

**Turntable Rotate Torque Hub**

- 1 Raise the secondary boom until the platform end of the lower secondary boom arm is 8 feet (2.4m) off the ground.
- 2 Attach the lifting strap from an overhead crane to the platform end of the lower secondary boom arm for support. Do not lift.



- 3 Remove the plug located on the side of the hub and check the oil level.
- ⦿ Result: The oil level should be even with the bottom of the plug hole.



- a electrical rotary coupler
- b plug
- c torque hub

- 4 If necessary, add oil until the oil level is even with the bottom of the side plug hole, then re-install the plug into the hub.

- 5 Check the turntable rotate torque hub fasteners. Torque the fasteners to 160 ft-lbs / 217 Nm.

**Turntable Rotate Torque Hub Oil**

Capacity	8 fluid ounces 0.24 liters
----------	-------------------------------

TypeSAE 90 multipurpose hypoid gear oil - API service classification GL5

**B-11  
Check and Adjust the Engine Idle Mixture - Gasoline/LPG Models**

Complete information to perform this procedure is available in the *Ford LSG-423 2.3 Liter Industrial Engine Service Manual* (Ford number: 194-216). Genie part number 29586.

**B-12  
Check and Adjust the Engine RPM**

Maintaining the engine rpm at the proper setting for both low and high idle is essential to good engine performance and service life. The machine will not operate properly if the rpm is incorrect and continued use may cause component damage.

**Gasoline/LPG Models**

**NOTICE**

Perform this procedure in gasoline mode with the engine at normal operating temperature.

- 1 Disconnect the blue/black wire from the governor actuator.

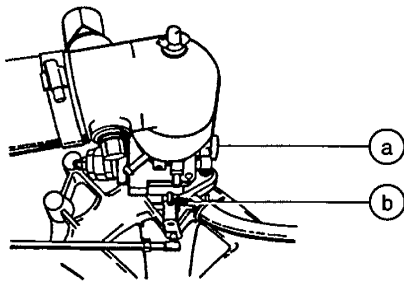
TABLE B PROCEDURES

2 Connect an rpm gauge to the engine, then start the engine from the ground controls.

⊙ Result: Carburetor low idle should be 900 rpm.

**Skip to step 4 if the low idle rpm is correct.**

3 Turn the idle adjustment screw on the carburetor clockwise to increase rpm or counterclockwise to decrease rpm.



Gasoline/LPG low idle adjustment  
a carburetor  
b adjustment screw

4 Turn the engine off and reconnect the blue/black wire to the governor actuator.

5 Start the engine from the ground controls.

⊙ Result: Electronic governor low idle should be 1600 rpm.

6 Move the engine idle control switch to high idle (rabbit symbol) from the ground controls.

⊙ Result: High idle should be 2600 rpm.

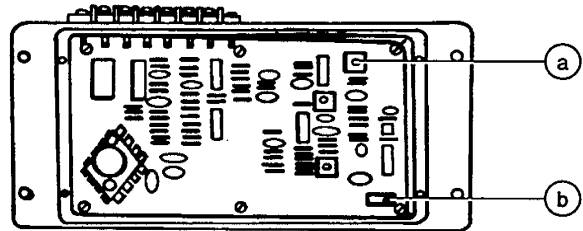
7 Turn the engine off.

**If low and high idle rpm's are correct, disregard adjustment steps 8 and 9.**

8 Remove the mounting fasteners from the electronic governor located on the engine side bulk head, then remove the back panel from the governor.

9 Restart the engine, turn the low or high speed set screw clockwise to increase the rpm or counterclockwise to decrease the rpm.

**NOTICE** Do not adjust any trimpot other than specified in this procedure.



Gasoline/LPG idle adjustment  
a low idle adjustment  
b high idle adjustment

10 Re-assemble the governor and recheck low and high idle.

**Gasoline/LPG models**

Low idle - carburetor	900 rpm
Low idle - electronic governor	1600 rpm
High idle	2600 rpm

**Deutz Diesel models**

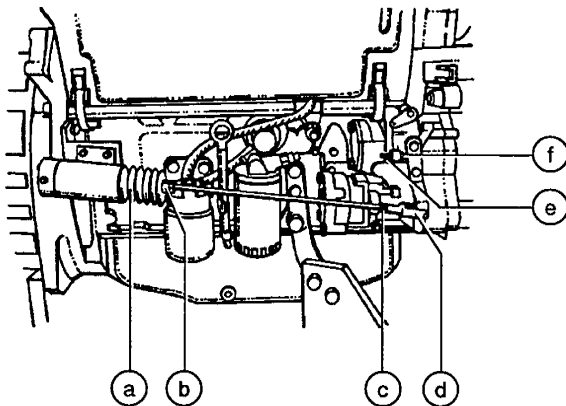
1 Connect an rpm gauge to the engine, and then start the engine from the ground controls.

⊙ Result: Low idle should be 1200 rpm.

**Skip to step 3 if the low idle rpm is correct.**

TABLE B PROCEDURES

- 2 Loosen the lock nut, then turn the adjustment screw clockwise to increase the rpm or counterclockwise to decrease the rpm. Tighten the lock nut and recheck the rpm.



- a solenoid boot
- b high idle adjustment nut
- c lock nut
- d yoke
- e low idle adjustment screw
- f lock nut

- 3 Move the engine idle control switch to high idle (rabbit symbol) from the ground controls.

⊙ Result: High idle should be 2200 rpm.

**If high idle rpm is correct, disregard adjustment step 4.**

- 4 Loosen the yoke lock nut, then turn the adjustment nut and solenoid boot counterclockwise to increase the rpm or clockwise to decrease the rpm. Tighten the yoke lock nut and recheck the rpm.

**Deutz Diesel models**

Low idle	1200 rpm
High idle	2200 rpm

### B-13 Test the Key Switch

Proper key switch action and response is essential to safe machine operation. The machine can be operated from the ground or platform controls and the activation of one or the other is accomplished with the key switch. Failure of the key switch to activate the appropriate control panel could cause a hazardous operating situation.

- 1 Pull out the Emergency Stop button to the ON position at both the ground and platform controls.
- 2 Turn the key switch to ground control, start the engine and then turn the key switch to **platform control**.
- 3 Check the machine function from the **ground controls**.
- ⊙ Result: The machine functions should **not** operate.
- 4 Turn the key switch to ground control.
- 5 Check the machine function from the **platform controls**.
- ⊙ Result: The machine functions should **not** operate.
- 6 Turn the key switch to the OFF position.
- ⊙ Result: The engine should stop and no functions should operate.

**NOTICE** Deutz Diesel models: All functions should stop immediately. The engine will shut off after 2 to 3 seconds.

TABLE B PROCEDURES

## B-14 Test the Emergency Stop Buttons

Properly functioning Emergency Stop buttons are essential for safe machine operation. An improperly operating Emergency Stop button will fail to shut off power and stop all machine functions resulting in a hazardous situation for ground and platform personnel.

**NOTICE** As a safety feature, selecting and operating the ground controls will override the platform controls, including the Emergency Stop button.

- 1 Start the engine from the ground controls.
  - 2 Push down the Emergency Stop button to the OFF position.
- ⊙ Result: The engine should shut off and no machine functions should operate.

**NOTICE** Deutz Diesel models: All functions should stop immediately. The engine will shut off after 2 to 3 seconds.

- 3 Start the engine from the platform controls.
  - 4 Push down the Emergency Stop button to the OFF position.
- ⊙ Result: The engine should shut off and no machine functions should operate.

**NOTICE** The ground Emergency Stop button will stop all machine operation, even if the key switch is switched to platform control.

## B-15 Test the Ground Control Override

A properly functioning ground control override is essential to safe machine operation. The ground control override function is intended to allow ground personnel to operate the machine from the ground controls whether or not the Emergency Stop button on the platform controls is in the ON or OFF position. This function is particularly useful if the operator at the platform controls cannot return the boom to the stowed position.

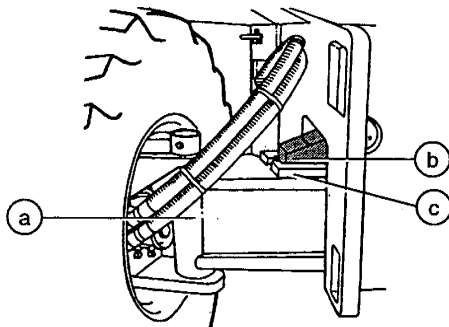
- 1 Push in the platform Emergency Stop button to the OFF position.
  - 2 Start the engine from the ground controls.
  - 3 Operate each boom function through a partial cycle.
- ⊙ Result: All boom functions should operate.

## TABLE B PROCEDURES

### B-16 Test the Oscillate Lock-out (oscillating axle-equipped models)

Proper axle oscillation lock-out when the primary boom is raised, extended or the turntable rotated is essential to safe machine operation. If the lock-out wedges do not extend when the primary boom is raised, extended or the turntable rotated, the stability of the machine is compromised and it may tip over.

- 1 From the ground controls, raise the primary boom above the drive speed limit switch.
- ⊙ Result: The oscillate cylinder should fully extend the lock-out wedges against the wedge stops.



- a oscillating axle
- b oscillating lock-out wedge
- c lock out wedge stop

- 2 Lower the boom to the stowed position.
- ⊙ Result: The oscillate lock-out wedges should retract.

### B-17 Test the Platform Self-leveling

Automatic platform self-leveling throughout the full cycle of boom raising and lowering is essential for safe machine operation. The platform is maintained at level by the platform leveling slave cylinder which is controlled by the master cylinder located at the base of the primary boom. A platform self-leveling failure creates an unsafe working condition for platform and ground personnel.

- 1 Start the engine from the ground controls, then lower the boom into the stowed position.
  - 2 Adjust the platform to a level position using the platform leveling switch.
  - 3 Raise and lower the primary boom through a full cycle.
- ⊙ Result: The platform should remain level at all times to within  $\pm 5$  degrees.

### B-18 Test the Service Horn

A functional service horn is essential to safe machine operation. The service horn is activated at the platform controls and sounds at the ground as a warning to ground personnel. An improperly functioning horn will prevent the operator from alerting ground personnel of hazards or unsafe conditions.

- 1 Turn the key switch to platform control and pull out the Emergency Stop button to the ON position at both the ground and platform controls.
  - 2 Push down the service horn button at the platform controls.
- ⊙ Result: The service horn should sound.

TABLE B PROCEDURES

### B-19 Test the Foot Switch

A properly functioning foot switch is essential to safe machine operation. Machine functions should activate and operate smoothly as long as the foot switch is pressed down, and promptly stop when the foot switch is released. The foot switch will also shift the engine into high idle if the idle select is switched to the rabbit and foot switch symbol. An improperly functioning foot switch can cause an unsafe working condition and endanger platform and ground personnel.

**NOTICE** The engine should not start if the foot switch is pressed down.

- 1 Start the engine from the platform controls.
- 2 Without pressing down the foot switch, check the machine functions.
  - ⊙ Result: The machine functions should **not** operate.
- 3 Press down the foot switch and operate the machine functions.
  - ⊙ Result: The machine functions should operate.

### B-20 Test the Engine Idle Select

A properly operating engine idle select switch is essential to good engine performance and safe machine operation. There are three settings.

Low idle (turtle symbol) allows the operator to control individual boom functions only. Drive functions do not operate at low idle.

High idle (rabbit symbol) allows the operator to control multiple boom and/or drive functions simultaneously. This setting maintains a consistent high idle and usually selected only when the generator option is being used.

Foot switch activated high idle (rabbit and foot switch symbols) should be used for normal machine operation. This selection activates high idle only when the foot switch is pressed down.

- 1 Pull out the Emergency Stop button to the ON position at both the ground and platform controls.
- 2 Start the engine from the ground controls. Then move the engine idle control switch to high idle (rabbit symbol) and hold in the ON position.
  - ⊙ Result: The engine should change to high idle.
- 3 Release the engine idle control switch.
  - ⊙ Result: The engine should return to low idle.
- 4 Turn the key switch to platform controls.
- 5 At the platform controls, move the engine idle control switch to high idle (rabbit symbol).
  - ⊙ Result: The engine should change to high idle.
- 6 Move the engine idle control switch to low idle (turtle symbol).
  - ⊙ Result: The engine should change to low idle.
- 7 Move the engine idle control switch to foot switch activated high idle (rabbit and foot switch symbol).
  - ⊙ Result: The engine should **not** change to high idle.
- 8 Press down the foot switch.
  - ⊙ Result: The engine should change to high idle.

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**Gasoline/LPG models**

Low idle	1600 rpm
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High idle	2600 rpm
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**Deutz Diesel models**

Low idle	1200 rpm
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High idle	2200 rpm
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## TABLE B PROCEDURES

## B-21 Test the Fuel Select Operation - Gasoline/LPG Models

The ability to select and switch between gasoline and LPG fuels as needed is essential to safe machine operation. A fuel selection can be made when the engine is running or not. Switching malfunctions and/or the failure of the engine to start and run properly in both fuel modes and through all idle speeds can indicate fuel system problems that could develop into a hazardous situation.

**NOTICE** Perform this test after checking the gasoline and LPG fuel levels, and warming the engine to normal operating temperature.

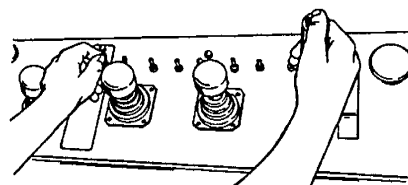
- 1 Move the fuel select switch to gasoline and then move the engine idle control switch to foot switch activated high idle (rabbit and foot switch symbol).
- 2 Start the engine from the platform controls and allow it to run at low idle.
- 3 Press down the foot switch to allow the engine to run at high idle.
- ⊙ Result: The engine should start promptly and operate smoothly in low and high idle.
- 4 Release the foot switch and stop the engine.
- 5 Move the fuel select switch to LPG.
- 6 Restart the engine and allow it to run at low idle.
- 7 Press down the foot switch to allow the engine to run at high idle.
- ⊙ Result: The engine should start promptly and operate smoothly in low and high idle.

**NOTICE** The engine may hesitate momentarily and then continue to run on the selected fuel if the fuel source is switched while the engine is running.

## B-22 Test the Drive Enable System

Proper drive enable system operation is essential to safe machine operation. When the primary boom is past the non-steering wheels, drive movement is stopped and the indicator light turns on. The drive enable switch must be used to reactivate drive function and should inform the operator that the machine will move in the opposite direction that the drive and steer controls are moved. An improperly functioning drive enable system may allow the machine to be moved into an unsafe position.

- 1 Start the engine from the platform controls.
- 2 Rotate the turntable to the right until the primary boom is past the right non-steering wheel.
- ⊙ Result: The drive enable indicator light should turn on.
- 3 Slowly move the drive control handle off center.
- ⊙ Result: The drive function should **not** operate.
- 4 Hold the drive enable toggle switch to either side and slowly move the drive control handle off center.



**CAUTION** Always use the color-coded direction arrows on the platform control panel and the drive chassis to identify which direction the machine will travel.

- ⊙ Result: The drive function should operate.
- 5 Rotate the turntable to the left until the primary boom is past the left non-steering wheel.
- ⊙ Result: The drive enable indicator light should come on.
- 6 Repeat steps 3 and 4.



TABLE B PROCEDURES

### B-23 Test the Drive Brakes

Proper brake action is essential to safe machine operation. The drive brake function should operate smoothly, free of hesitation, jerking and unusual noise. Hydrostatic brakes and hydraulically-released individual wheel brakes can appear to operate normally when not fully operational.

**WARNING** Be sure that the machine is not in free-wheel or partial free-wheel configuration. Refer to B-9 in this section, *Confirm the Proper Brake Configuration*.

**NOTICE** Select a test area that is firm, level and free of obstructions.

- 1 Mark a test line on the ground for reference.
- 2 Start the engine from the platform controls, and then select high range drive (2 wheel symbol).
- 3 Move the engine idle control switch to foot switch activated high idle (rabbit and foot switch), then lower the boom into the stowed position.
- 4 Choose a point on the machine; i.e., contact patch of a tire, as a visual reference for use when crossing the test line.
- 5 Bring the machine to top drive speed before reaching the test line. Release the drive joystick when your reference point on the machine crosses the test line.
- 6 Measure the distance between the test line and your machine reference point.

Braking: high range, paved surface	2WD	4WD
Stopping distance	4.5 to 5 ft 1.37 to 1.52m	6 to 6.5 ft 1.82 to 1.98m

**NOTICE** The brakes must be able to hold the machine on any slope it is able to climb.

### B-24 Test the Drive Speed - Stowed Position

Proper drive function movement is essential to safe machine operation. The drive function should respond quickly and smoothly to operator control. Drive performance should also be free of hesitation, jerking and unusual noise over the entire proportionally controlled speed range.

**NOTICE** Select a test area that is firm, level and free of obstructions.

- 1 Create start and finish lines by marking two lines on the ground 40 feet (12.2m) apart.
- 2 Start the engine from the platform controls, then select high range drive (2 wheel symbol).
- 3 Move the engine idle control switch to foot switch activated high idle (rabbit and foot switch), then lower the boom into the stowed position.
- 4 Choose a point on the machine; i.e., contact patch of a tire, as a visual reference for use when crossing the start and finish lines.
- 5 Bring the machine to top drive speed before reaching the start line. Begin timing when your reference point on the machine crosses the start line.
- 6 Continue at full speed and note the time when the machine reference point passes over the finish line.

Drive speed: stowed position, high range	2WD	4WD
Gasoline/LPG models	40 ft/7.8 sec 12.2m/7.8 sec	40 ft/6.1 sec 12.2m/6.1 sec
Deutz Diesel models	40 ft/9.1 sec 12.2m/9.1 sec	40 ft/7 sec 12.2m/7 sec

## TABLE B PROCEDURES

## B-25 Test the Alarm Package - Optional Equipment

The alarm package includes:

- travel alarm
- descent alarm
- flashing beacon

Alarms and a beacon are installed to alert operators and ground personnel of machine proximity and motion. The alarm package is installed on top of the turntable counterweight.

**NOTICE** The alarms and beacon will operate with the engine running or not running.

- 1 At the ground controls pull out the Emergency Stop button to the ON position and turn the key switch to ground control.
  - ⊙ Result: The flashing beacon should be on and flashing.
- 2 Move the primary boom switch to the DOWN position, hold for a moment and then release it. Move the secondary boom switch to the DOWN position, hold for a moment and then release it.
  - ⊙ Result: The descent alarm should sound when each switch is held down.
- 3 Turn the key switch to platform control.
- 4 At the platform controls pull out the Emergency Stop button to the ON position.
  - ⊙ Result: The flashing beacon should be on and flashing.
- 5 Press down the foot switch. Move the primary boom control handle to the DOWN position, hold for a moment and then release it. Move the secondary boom control handle to the DOWN position, hold for a moment and then release it.
  - ⊙ Result: The descent alarm should sound when each control handle is held down.
- 6 Press down the foot switch. Move the drive control handle off center, hold for a moment and then release it. Move the drive control handle off center in the opposite direction, hold for a moment and then release it.
  - ⊙ Result: The travel alarm should sound when the drive control handle is moved off center in either direction.

## B-26 Perform Hydraulic Oil Analysis

See D-1, *Test or Replace the Hydraulic Oil.*

## B-27 Replace the Engine Oil and Filter - Deutz Diesel Models

**NOTICE** Engine specifications require that this procedure be performed every 500 hours. Perform this procedure more often if dusty conditions exist.

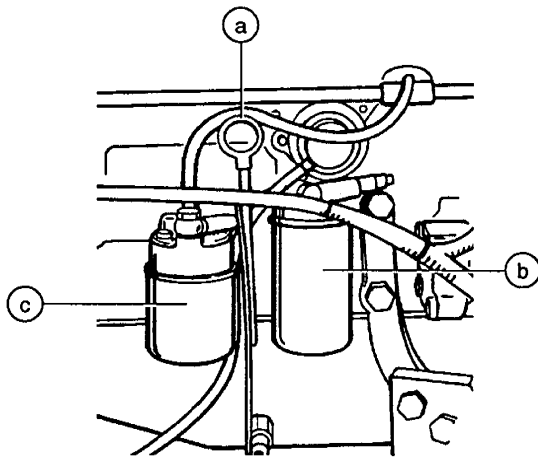
Periodic replacement of the engine oil and filter is essential to good engine performance. Operating the machine with an improper oil level or neglecting periodic oil and filter changes can damage engine components. A frequent check of elapsed machine hours against the hours noted on the oil filter will allow the inspector to anticipate and perform oil and filter changes at the 500 hour interval.

TABLE B PROCEDURES

**NOTICE** Perform this procedure after warming the engine to normal operating temperature.

**CAUTION** Beware of hot engine parts and oil. Contact with hot engine oil and/or engine parts may cause severe burns.

- 1 Remove the oil filler cap located on the valve cover.
- 2 Remove the plug from the oil pan and allow all of the oil from the engine to drain into a suitable container.
- 3 Install the plug into the oil pan.
- 4 Use an oil wrench and remove the oil filter.
- 5 Apply a thin layer of oil to the new filter gasket (filter part no. 29561). Then install the filter and tighten it securely by hand.
- 6 Use a permanent ink marker to write the date and number of hours from the hour meter on the oil filter.
- 7 Fill the engine with new oil per specifications and replace the oil filler cap.
- 8 Start the engine from the ground controls. Allow the engine to run for 30 seconds then turn the engine off.
- 9 Check the oil filter and oil pan for leaks.
- 10 Check the engine oil level dipstick. Add oil if needed.



a engine oil level dipstick  
 b oil filter  
 c fuel filter

<b>Deutz Engine F4L 1011</b>	11 quarts
<b>Oil capacity (including filter)</b>	10.5 liters

**Deutz Engine F4L 1011 Oil viscosity requirements**

Temperature below 60°F / 15.5°C (synthetic)	5W-30
-10°F to 90°F / -23°C to 32°C	10W-40
Temperature above -4°F / -34°C	15W-40

Engine oil should have properties of API classification CC/SE, CD/SE, CC/SF or CD/SF grades.

# Table C Procedures

## C-1 Check the Primary Boom Wear Pads

Maintaining the primary boom wear pads in good condition is essential to safe machine operation. Wear pads are placed on boom tube surfaces to provide a low friction, replaceable wear pad between moving parts. Improperly shimmed wear pads or continued use of extremely worn wear pads may result in component damage and unsafe operating conditions.

- 1 Start the engine from the ground controls, then extend the primary boom 1 foot (30cm).
- 2 Measure each wear pad. Replace the wear pad if it is less than  $\frac{7}{16}$  inch (1.1cm) thick. If the wear pad is more than  $\frac{7}{16}$  inch (1.1cm) thick, shim as necessary to obtain zero clearance and zero drag
- 3 Extend and retract the primary boom through the entire range of motion to check for tight spots that could cause binding or scraping.

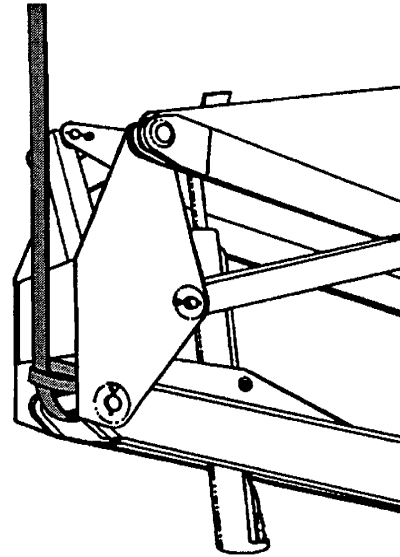
**NOTICE** Always maintain squareness between the primary boom inner and outer tubes.

## C-2 Check the Turntable Rotation Bearing Bolts

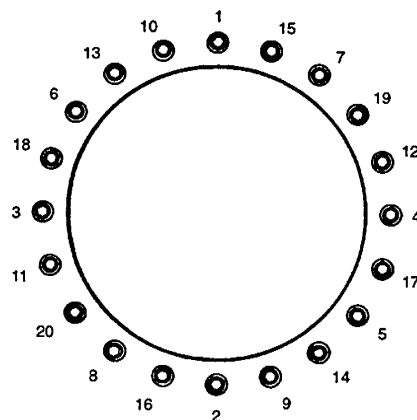
Maintaining proper torque on the turntable bearing bolts is essential to safe machine operation. Improper bolt torque could result in an unsafe operating condition and component damage.

- 1 Raise the secondary boom until the platform end of the lower secondary boom arm is 8 feet (2.4m) off the ground.

- 2 Attach the lifting strap from an overhead crane to the platform end of the lower secondary boom arm for support. Do not lift.



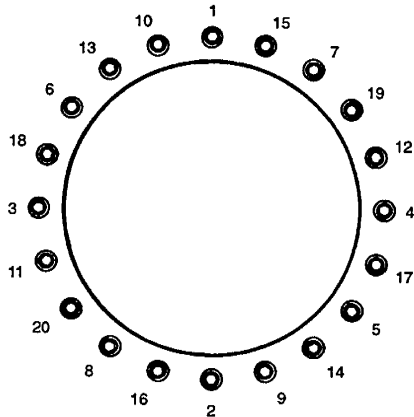
- 3 Check to ensure that each turntable bearing bolt is torqued in specified order to 210 foot-pounds (285 Newton meters).



- 4 Remove the strap from the lower secondary boom arm. Then lower the boom to the stowed position.

TABLE C PROCEDURES

- 5 Check to ensure that each bearing mounting bolt under the drive chassis is torqued in specified order to 210 foot-pounds (285 Newton meters).



### C-3 Check the Free-wheel Configuration

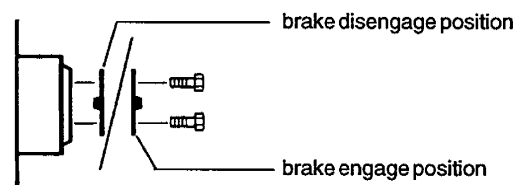
Proper use of the free-wheel configuration is essential to safe machine operation. The free-wheel configuration is used primarily for towing. A machine configured to free-wheel without operator knowledge may cause death or serious injury and property damage.

**WARNING** Collision hazard. Select a work site that is firm and level.

#### Non-steering wheels: All models

- 1 Chock the steer wheels to prevent the machine from rolling.

- 2 Center a lifting jack of ample capacity (15000 lbs/6804kg) under the drive chassis between the non-steering wheels.
- 3 Lift the wheels off the ground and then place jack stands under the drive chassis for support.
- 4 Disengage the torque hubs by turning over the torque hub disconnect caps on each non-steering wheel hub.



- 5 Manually rotate each non-steering wheel.
- ⊙ Result: Each non-steering wheel should rotate with minimum effort.
- 6 Re-engage the torque hubs by turning over the hub disconnect caps. Carefully remove the jack stands, lower the machine and remove the jack.

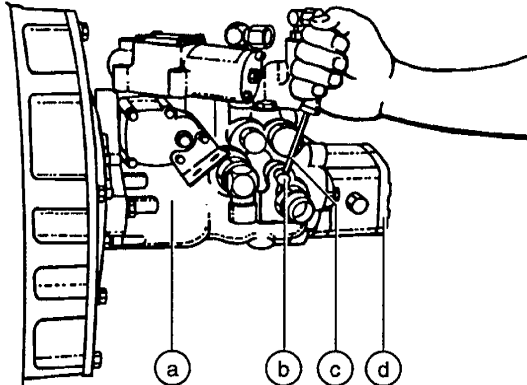
**WARNING** Collision hazard. Failure to re-engage the torque hubs may cause death or serious injury and property damage.

#### Steer wheels: 4WD models

- 7 Chock the non-steering wheels to prevent the machine from rolling.
- 8 Position the lifting jack under the steering axle and center it between the steering wheels.
- 9 Lift the wheels off the ground and then place jack stands under the drive chassis for support.

TABLE C PROCEDURES

10 Open the free-wheel valve, located on the drive pump, by turning it counterclockwise two turns.



- a drive pump
- b free-wheel valve
- c screwdriver
- d lift pump

11 Manually rotate each steer wheel.

⊙ Result: Each steer wheel should rotate with minimal effort.

12 Close the free-wheel valve (clockwise). Carefully remove the jack stands, lower the machine and remove the jack.

**WARNING** Collision hazard. Failure to close the free-wheel valve may cause death or serious injury and property damage.

**NOTICE** On 2WD models, the free-wheel valve should always remain closed.

### C-4 Grease the Turntable Rotation Bearing and Rotate Gear

Yearly application of lubrication to the turntable bearing and rotate gear is essential to good machine performance and service life. Continued use of an improperly greased bearing and gear will result in component damage.

- 1 Locate the grease fitting on the platform end of the engine side bulkhead.
- 2 Pump grease into the turntable rotation bearing. Rotate the turntable in increments of 4 to 5 inches (10 to 13cm) at a time and repeat this step until the entire bearing has been greased.
- 3 Apply grease to each tooth of the drive gear, located under the turntable.

Oil type	Multipurpose grease
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### C-5 Replace the Torque Hub Oil

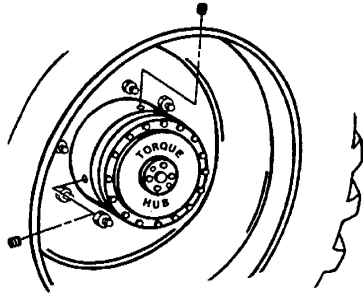
Replacing the torque hub oil is essential for good machine performance and service life. Failure to replace the torque hub oil at yearly intervals may cause the machine to perform poorly and continued use may cause component damage.

#### Drive Torque Hubs:

- 1 Select the drive torque hub to be serviced. Then drive the machine until one of the two plugs is at the lowest point.
- 2 Remove both plugs and drain the oil.

TABLE C PROCEDURES

- 3 Drive the machine until one plug is at the top and the other is at 90 degrees.



- 4 Fill the hub with oil from the top hole until the oil level is even with the bottom of the side hole. Then re-install the plugs.
- 5 Repeat steps 1 through 4 for all the other drive torque hubs.

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**Oil capacity per hub** 40 fluid ounces  
1.2 liters

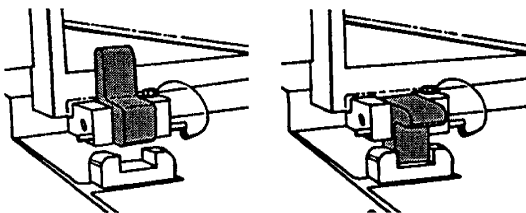
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Type: SAE 90 multipurpose hypoid gear oil - API service classification GL5

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**Turntable Rotate Torque Hub**

- 1 Secure the turntable from rotating with the turntable rotation lock.

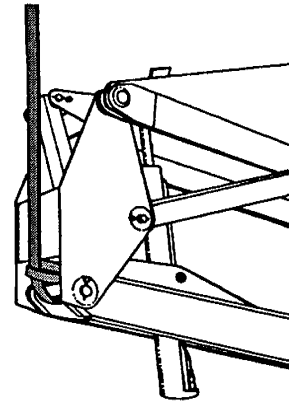


unlocked

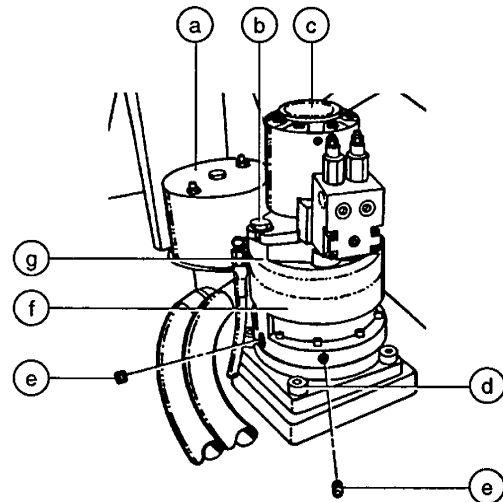
locked

- 2 Raise the secondary boom until the platform end of the lower secondary boom arm is 8 feet (2.4m) off the ground.

- 3 Attach the lifting strap from an overhead crane to the platform end of the lower secondary boom arm for support. Do not lift.



- 4 Remove the motor/brake mounting bolts, and then remove the motor and brake from the torque hub and set them to the side.



- a electrical rotary coupler
- b motor/brake mounting bolt
- c motor
- d torque hub mounting bolt
- e plug
- f torque hub
- g brake

## TABLE C PROCEDURES

- 5 Remove the torque hub mounting bolts, and then remove the torque hub from the machine.
- 6 Remove the plug from the side of the torque hub. Then drain the oil from the hub.
- 7 Install the torque hub. Torque the hub mounting bolts to 180 foot-pounds (244 Newton meters).
- 8 Install the brake and motor onto the torque hub.
- 9 Fill the hub with oil from the side hole until the oil level is even with the bottom of the hole. Then install the plug.

---

<b>Capacity</b>	8 fluid ounces 0.24 liters
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Type: SAE 90 multipurpose hypoid gear oil - API service classification GL5

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## C-6 Replace the Hydraulic Tank Filter

Replacement of the hydraulic tank filter is essential for good machine performance and service life. A dirty or clogged filter may cause the machine to perform poorly and continued use may cause component damage. Extremely dirty conditions may require that the filter be replaced more often.

**CAUTION** Beware of hot oil. Contact with hot oil may cause severe burns.

**NOTICE** Perform this procedure with the engine off.

- 1 Remove the filter with an oil filter wrench.
- 2 Apply a thin layer of oil to the new oil filter gasket.
- 3 Install the new filter (part no. 20293) and tighten it securely by hand. Clean up any oil that may have spilled during the installation procedure.

- 4 Start the engine from the ground controls.
- 5 Inspect the filter and related components to be sure that there are no leaks.

## C-7 Replace the Drive Loop Hydraulic Filter

Replacing the drive loop hydraulic filter is essential to good machine performance and service life. A dirty or clogged filter may cause the machine to perform poorly and continued use may cause component damage. Extremely dirty conditions may require that the filter be replaced more often.

**CAUTION** Beware of hot oil. Contact with hot oil may cause severe burns.

**NOTICE** Perform this procedure with the engine off.

- 1 Open the engine side turntable cover and locate the drive loop hydraulic filter mounted on the engine near the main pump.
- 2 Rotate the filter housing counterclockwise and remove the housing.
- 3 Remove the filter element from the housing.
- 4 Inspect the housing seal and replace it if necessary.
- 5 Install the new filter (part no. 20880) and hand tighten the housing onto the filter head. Clean up any oil that may have spilled during the installation procedure.
- 6 Start the engine from the ground controls.
- 7 Inspect the filter assembly to be sure that there are no leaks.



TABLE C PROCEDURES

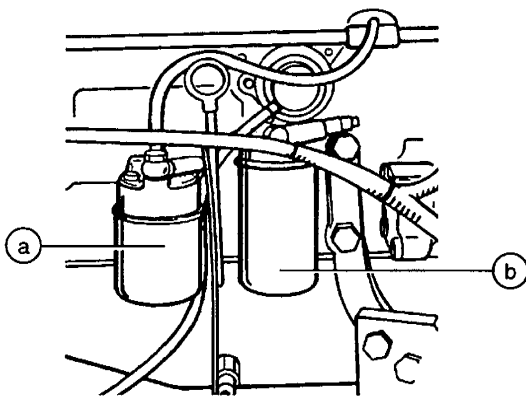
### C-8 Replace the Diesel Fuel Filter - Deutz Diesel Models

Replacing the diesel fuel filter is essential to good engine performance and service life. A dirty or clogged filter may cause the engine to perform poorly and continued use may cause component damage. Extremely dirty conditions may require that the filter be replaced more often.

**▲ DANGER** Engine fuels are combustible. Replace the fuel filter in an open, well-ventilated area away from heaters, sparks, flames and lighted tobacco. Always have an approved fire extinguisher within easy reach.

**NOTICE** Perform this procedure with the engine off.

- 1 Turn the manual fuel shutoff valve, located at the fuel tank, to the CLOSED position.
- 2 Remove the fuel filter with a filter wrench.



a fuel filter  
b oil filter

- 3 Apply a thin layer of oil or diesel fuel to the new fuel filter gasket.
- 4 Install the new filter (part no. 29560) and tighten it securely by hand. Clean up any diesel fuel that might have spilled during the procedure.
- 5 Turn the manual fuel shutoff valve, located at the fuel tank, to the OPEN position.
- 6 Start the engine from the ground controls, then inspect the fuel filter for leaks.

**▲ DANGER** If a fuel leak is discovered, keep any additional personnel from entering the area and do not operate the machine. Repair the leak immediately.

### C-9 Replace the Gasoline Fuel Filter - Gasoline/LPG Models

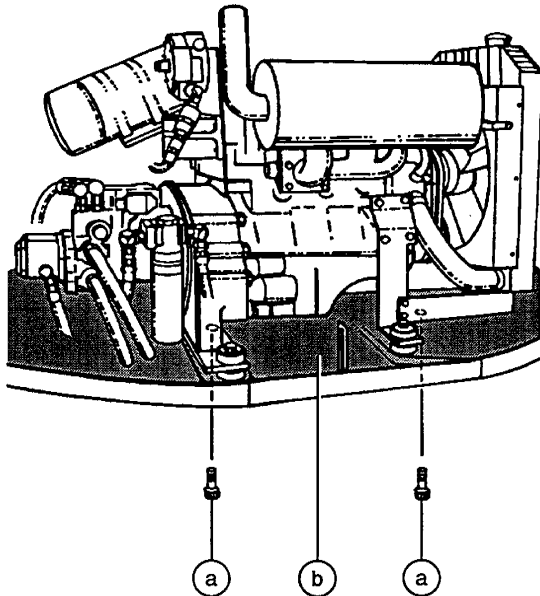
Replacing the gasoline fuel filter is essential to good engine performance and service life. A dirty or clogged filter may cause the engine to perform poorly and continued use may cause component damage. Extremely dirty conditions may require that the filter be replaced more often.

**▲ DANGER** Engine fuels are combustible. Replace the fuel filter in an open, well-ventilated area away from heaters, sparks, flames and lighted tobacco. Always have an approved fire extinguisher within easy reach.

**NOTICE** Perform this procedure with the engine off.

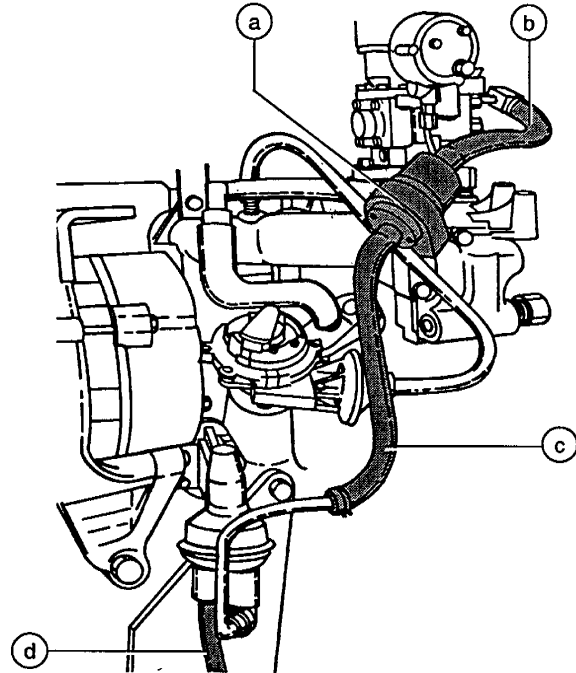
TABLE C PROCEDURES

- 1 Remove the 2 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the fuel filter, located near the carburetor.



a pivot plate retaining bolts  
b engine pivot plate

- 2 Loosen the filter bracket mounting bolt. Disconnect the fuel hoses from the filter, then slide the filter out of the bracket.



Gasoline/LPG models

- a fuel filter  
b hose from the fuel filter to the carburetor  
c hose from the fuel pump to the fuel filter  
d hose from the fuel shutoff valve to the fuel pump

- 3 Install the new fuel filter in the bracket with the flow direction arrow on the filter, pointing toward the carburetor. Tighten the bracket mounting bolt, then connect the fuel hoses to the filter.
- 4 Clean up any fuel that may have spilled during the installation procedure.
- 5 Start the machine from the ground controls, then inspect the fuel filter and hoses for leaks.

**⚠ DANGER** If a fuel leak is discovered, keep any additional personnel from entering the area and do not operate the machine. Repair the leak immediately.

- 6 Swing the engine pivot plate back to its original position and replace the two retaining bolts.

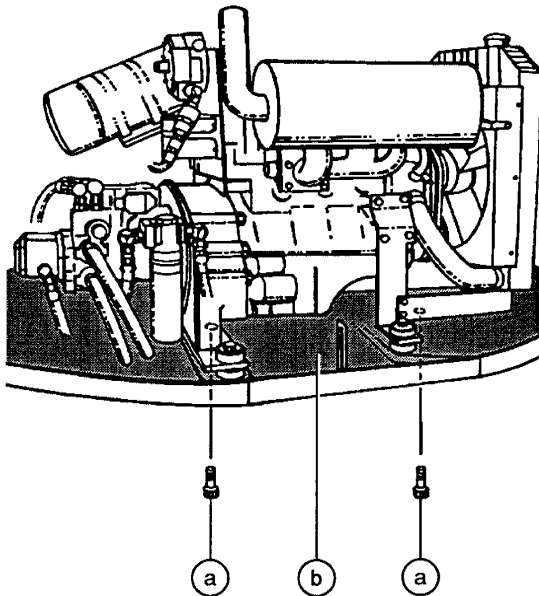
TABLE C PROCEDURES

### C-10 Replace the PCV Valve - Gasoline/ LPG Models

Yearly replacement of the PCV valve is essential to good engine performance. A malfunctioning valve can impair crankcase ventilation and may cause engine damage.

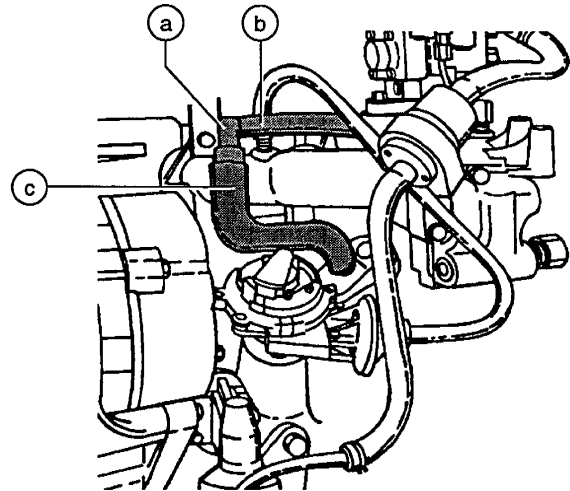
**NOTICE** Perform this procedure with the engine off.

- 1 Remove the 2 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the PCV valve.



a pivot plate retaining bolts  
b engine pivot plate

- 2 Remove the hoses from the PCV valve, then remove the valve.



Shown with distributor cap removed  
a PCV valve  
b hose, PCV valve to carburetor  
c hose, PCV valve to crankcase

- 3 Install the new PCV valve. Connect the hoses.
- 4 Swing the engine pivot plate back to its original position and replace the two retaining bolts.

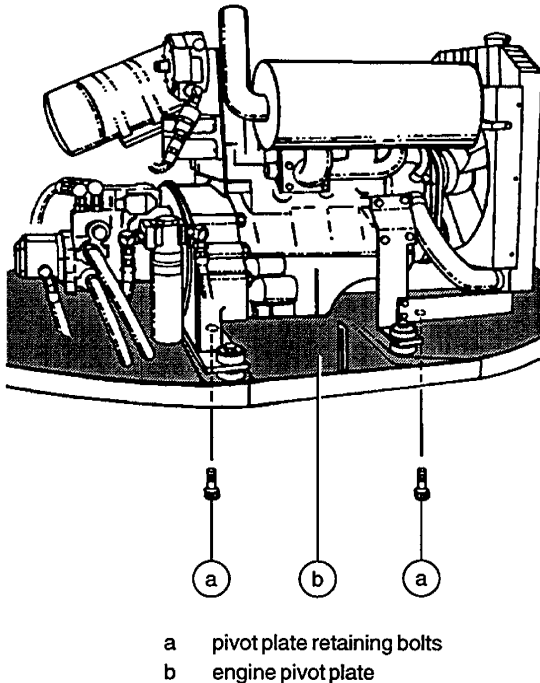
### C-11 Clean or Replace the Distributor Cap and Rotor - Gasoline/LPG Models

A distributor cap and rotor that are clean and free of damage, wear and corrosion are essential to good engine performance and service life. A dirty or worn cap and rotor may cause the engine to perform poorly and continued use may cause component damage. Extremely dirty conditions may require that the cap and rotor be replaced more often.

**NOTICE** Perform this procedure with the engine off.

## TABLE C PROCEDURES

- 1 Remove the 2 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the distributor.



- 2 Label and disconnect the coil and spark plug wires from the distributor cap.
- 3 Remove the cap and rotor from the distributor.
- 4 Clean the cap and rotor using electrical contact cleaner or a damp cloth.
- 5 Completely dry the cap and rotor.

**NOTICE** Moisture in the distributor cap will cause the engine to run poorly.

- 6 Inspect the cap and rotor for corrosion, cracks and abrasion. Replace the cap and rotor if they are damaged.
- 7 Install the rotor and cap, then connect the coil and spark plug wires.
- 8 Swing the engine pivot plate back to its original position and replace the two retaining bolts.

## C-12 Replace the Spark Plugs - Gasoline/LPG Models

Periodic replacement of the spark plugs is essential to good engine performance and service life. Worn, loose or corroded spark plugs will cause the engine to perform poorly and may result in component damage.

**NOTICE** Perform this procedure with the engine off.

- 1 Label, then disconnect the plug wires from the spark plugs by grasping the molded boot. Do not pull on the plug wire.
- 2 Blow out any debris around spark plugs.
- 3 Remove all the spark plugs from the engine.
- 4 Adjust the gap on each new spark plug.
- 5 Install the new spark plugs, then connect the wires. Be sure that each spark plug wire is attached to the correct spark plug.

### Spark plug specifications

Spark plug type	Motorcraft AWSF-42
Spark plug gap	0.042 to 0.046 inches 1.07 to 1.18mm
Spark plug torque	5 to 10 foot-pounds 7 to 14Nm

TABLE C PROCEDURES

### C-13 Check and Adjust the Air/LPG Mixture - Gasoline/LPG Models

Maintaining the proper air-to-fuel mixture during LPG operation is essential to good engine performance.

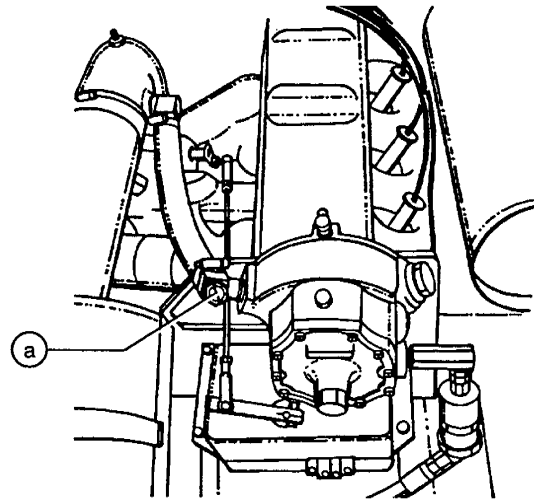
**⚠ DANGER** Engine fuels are combustible. Perform this procedure in an open, well-ventilated area away from heaters, sparks, flames and lighted tobacco. Always have an approved fire extinguisher within easy reach.

**NOTICE** The engine rpm needs to be preset for gasoline fuel operation before adjusting the LPG idle mixture.

**NOTICE** The engine should be warmed to normal operating temperature before performing this procedure. Refer to B-12, *Check and Adjust the Engine RPM*.

- 1 Move the fuel select switch to LPG fuel and start the engine from the ground controls.

- 2 Loosen the high idle mixture adjustment lock nut.



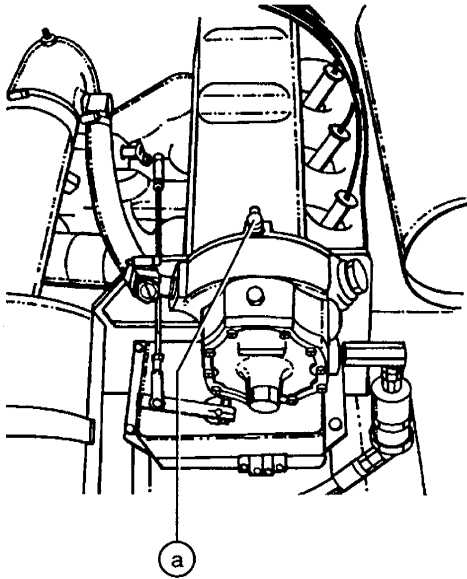
a high idle mixture  
adjustment screw

- 3 Load the system by pressing the primary boom retract switch, then move the engine idle control switch to high idle (rabbit symbol).
- 4 Adjust the high idle adjustment screw to obtain an air-to-fuel mixture ratio of 13.0:1 to 13.2:1, using an exhaust gas analyzer.

**NOTICE** If an exhaust gas analyzer is not available, adjust to obtain peak or optimum rpm.

## TABLE C PROCEDURES

- 5 Hold the adjustment screw and tighten the lock nut.
- 6 Move the engine idle control switch to low idle (turtle symbol) and adjust the low idle screw to obtain an air-to-fuel mixture ratio of 13.0:1 to 13.2:1.



a low idle mixture adjustment screw

### C-14 Check and Adjust the Ignition Timing - Gasoline/LPG Models

Complete information to perform this procedure is available in the *Ford LSG-423 2.3 Liter Industrial Engine Service Manual* (Ford number: 194-216). Genie part number 29586.

### C-15 Check the Engine Valve Clearances - Deutz Diesel Models

Complete information to perform this procedure is available in the *Deutz FL 1011 Workshop Manual* (Deutz Number 02611642). Genie part number 29789.

# Table D Procedures

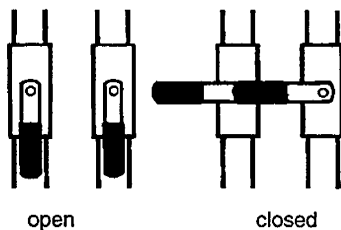
## D-1 Test or Replace the Hydraulic Oil

Replacement or testing of the hydraulic oil is essential for good machine performance and service life. Dirty oil and suction strainers may cause the machine to perform poorly and continued use may cause component damage. Extremely dirty conditions may require oil changes to be performed more often.

**NOTICE** The machine uses Dexron II equivalent hydraulic oil. Before replacing the hydraulic oil, the oil may be tested by an oil distributor for specific levels of contamination to verify that changing the oil is necessary. **If the hydraulic oil is not replaced at the two year inspection, quarterly testing (B-26) thereafter should be completed.**

**NOTICE** Perform this procedure with the boom in the stowed position.

- 1 Remove the mounting fasteners from the ground control box. Then move the control box to the side to access the suction line strainers.
- 2 Close the two hydraulic shutoff valves located at the hydraulic tank.



**CAUTION** Component damage hazard. The engine must not be started with the hydraulic tank shutoff valves in the CLOSED position or component damage will occur. If the tank valves are closed, remove the key from the key switch and tag the machine to inform personnel of the condition.

- 3 Remove the drain plug from the hydraulic tank.
- 4 Completely drain the tank into a container. See capacity specifications listed below.
- 5 Disconnect and cap the two suction hoses that are attached to the hydraulic tank shutoff valves.
- 6 Remove the strainer assemblies from the tank.
- 7 Carefully clean any foreign material from the strainers.
- 8 Apply pipe thread sealant to the strainer mounting threads, and then install them.
- 9 Apply pipe thread sealant to the drain plug, and then install it in the tank.
- 10 Install the two suction hoses.
- 11 Fill the tank with hydraulic oil until the level is within the top 2 inches (5cm) of the sight gauge. Do not overfill.
- 12 Clean up any oil that may have spilled and open the hydraulic tank valves.
- 13 Install the ground control box.
- 14 Prime the pump by doing the following:

Connect a 0 to 600 psi (0 to 41 bar) pressure gauge to the test port on the drive pump.

**Gasoline/LPG models:**

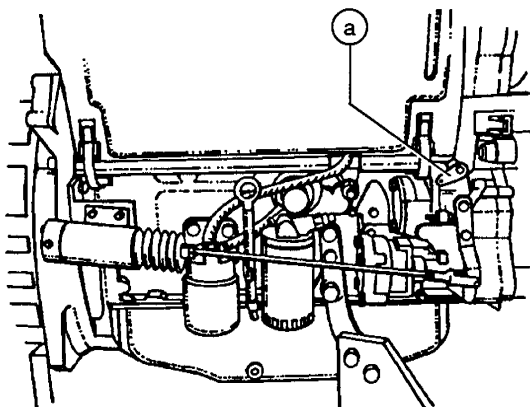
Remove the high tension lead from the center of the ignition coil.

**WARNING** Electrocutation hazard. Contact with electrically charged circuits may cause death or serious injury. Remove all rings, watches and other jewelry.

TABLE D PROCEDURES

**Deutz Diesel models:**

Hold the manual fuel shutoff valve counterclockwise to the CLOSED position.



a manual fuel shutoff valve

**All models:**

Crank the engine with the starter motor for 15 seconds, wait 15 seconds, then crank the engine an additional 15 seconds or until the pressure reaches 320 psi (22 bar).

15 Connect the wiring and start the engine from the ground controls. Check the hydraulic tank for leaks.

**Hydraulic system**

Hydraulic tank capacity 45 gallons  
170 liters

Hydraulic system capacity (including tank) 53 gallons  
201 liters

Hydraulic fluid Dexron II equivalent

**D-2**

**Change or Recondition the Engine Coolant - Gasoline/LPG Models**

Replacing or reconditioning the engine coolant is essential to good engine performance and service life. Old or dirty coolant may cause the engine to perform poorly and continued use may cause engine damage. Extremely dirty conditions may require coolant to be changed more frequently.

**CAUTION** Beware of hot engine parts and coolant. Contact with hot engine parts and/or coolant will cause severe burns.

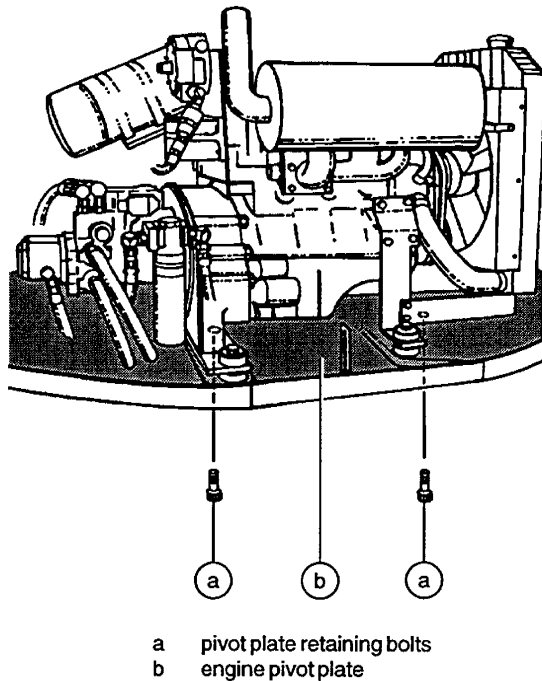
**NOTICE** Perform this procedure with the engine off and cooled.

- 1 Put on protective clothing and eye wear.
- 2 Disconnect the coolant return hose at the radiator and drain the coolant return tank.
- 3 Remove the radiator cap from the radiator.



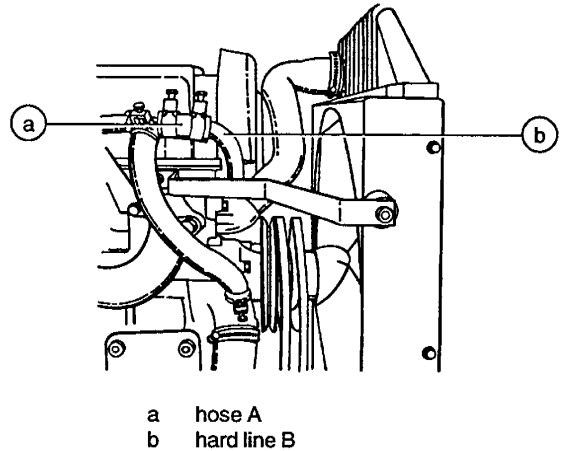
TABLE D PROCEDURES

- 4 Remove the 2 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the radiator petcock.



- 5 Open the petcock on the radiator and allow all the coolant to drain into a container.
- 6 After all the coolant has drained, close the petcock. Connect the coolant return hose to the radiator.
- 7 Open the petcock on the engine block and allow the coolant to drain into a container. After the fluid is drained, close the petcock.
- 8 Replace all coolant hoses and clamps.
- 9 Pour the proper coolant mixture (anti-freeze and water) for your climate into the radiator until it is full.

- 10 Disconnect hose A from hard line B and hold until coolant starts to pour out of the open hose. Then immediately reconnect the hose.



- 11 Fill the radiator and then fill the coolant recovery tank to the NORMAL range.
- 12 Clean up any coolant spilled during this procedure.
- 13 Start the engine from the ground controls, run it for 30 seconds, and then turn it off.
- 14 Inspect for leaks and then check the fluid level in the coolant recovery tank. Add water if needed.
- 15 Start the engine from the ground controls and run it until reaching normal operating temperature.
- 16 Allow engine to cool and check the fluid level in the coolant recovery tank. Add water if needed.

<b>Ford Engine LSG-423</b>	11.5 quarts
<b>Coolant capacity</b>	10.9 liters

## TABLE D PROCEDURES

### D-3 Change the Fuel Lines

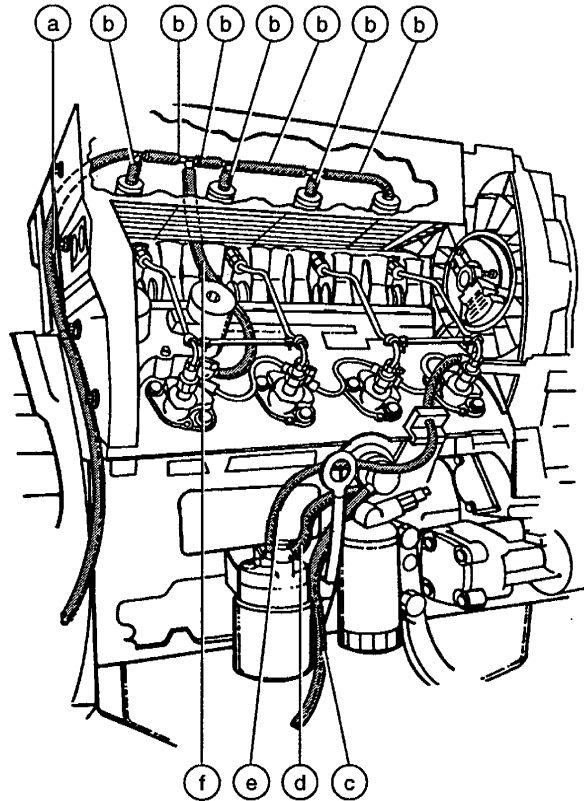
Maintaining the fuel lines in good condition is essential to safe operation and good engine performance. Failure to detect a worn, cracked or leaking fuel line may cause an unsafe operating condition.

**⚠ DANGER** Engine fuels are combustible. Replace the fuel lines in an open, well-ventilated area away from heaters, sparks, flames and lighted tobacco. Always have an approved fire extinguisher within easy reach.

**NOTICE** Perform this procedure with the engine off.

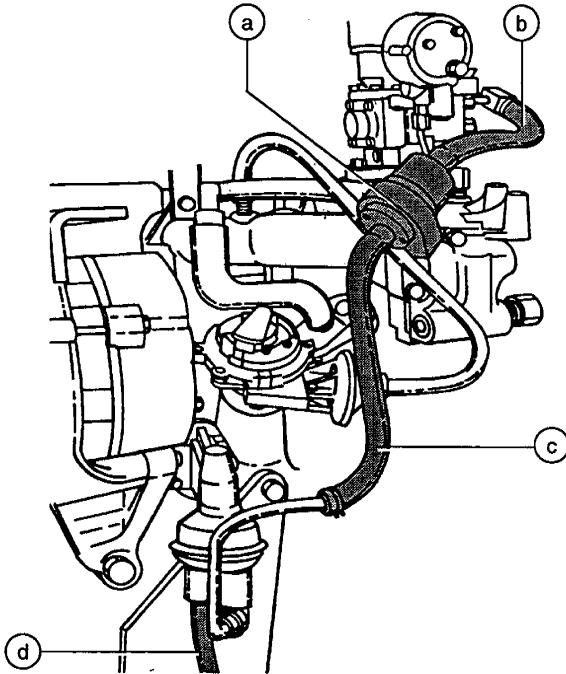
- 1 Close the manual fuel shutoff valve, located next to the fuel tank.
- 2 Remove and replace the fuel line hoses and clamps according to the following illustrations:

**⚠ DANGER** Fuel may be expelled under pressure. Wrap a cloth around fuel hoses to absorb leaking fuel before disconnecting them.



- Deutz Diesel models
- a hose from the injector to the fuel tank
  - b hoses connecting injectors
  - c hose from the fuel shutoff valve to the fuel pump
  - d hose from the fuel pump to the fuel filter
  - e hose from the fuel filter to the injection pump
  - f hose from the injection pump to the injectors

TABLE D PROCEDURES



- Gasoline/LPG models
- a fuel filter
  - b hose from the fuel filter to the carburetor
  - c hose from the fuel pump to the fuel filter
  - d hose from the fuel shutoff valve to the fuel pump

- 3 Clean up any fuel that may have spilled during this procedure.
- 4 Start the engine from the ground controls, then inspect the fuel filter and hoses for leaks.

**▲ DANGER**

If a fuel leak is discovered, keep any additional personnel from entering the area and do not operate the machine. Repair the leak immediately.

**D-4  
Check the Engine Valve Clearance - Gasoline/LPG Models**

Complete information to perform this procedure is available in the *Ford LSG-423 2.3 Liter Industrial Engine Service Manual* (Ford number: 194-216). Genie part number 29586.

**D-5  
Check the Engine Cylinder Compression - Gasoline/LPG Models**

Complete information to perform this procedure is available in the *Ford LSG-423 2.3 Liter Industrial Engine Service Manual* (Ford number: 194-216). Genie part number 29586.

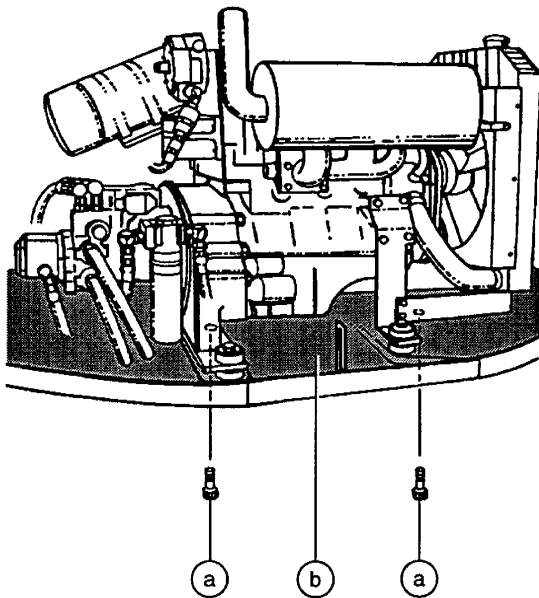
## TABLE D PROCEDURES

## D-6 Clean the PCV Hoses and Fittings - Gasoline/LPG Models

Maintaining PCV hoses is essential to good engine performance. Improperly functioning PCV hoses will fail to ventilate the crankcase and continued use of neglected hoses could result in component damage.

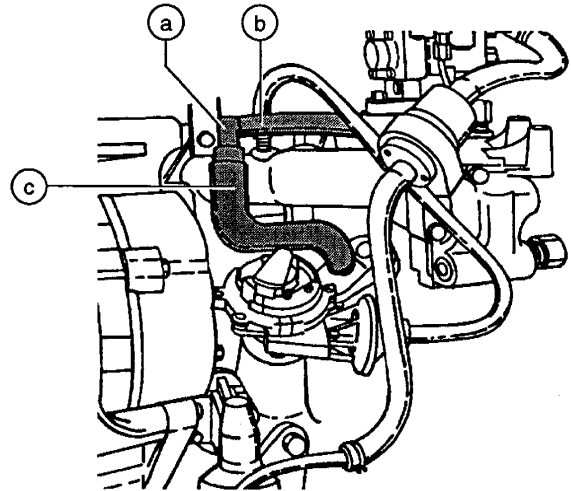
**NOTICE** Perform this procedure with the engine off.

- 1 Remove the 2 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the PCV hoses.



a pivot plate retaining bolts  
b engine pivot plate

- 2 Disconnect the hoses from the PCV valve, then disconnect the hoses from the engine.



Shown with distributor cap removed

a PCV valve  
b hose, PCV valve to carburetor  
c hose, PCV valve to crankcase

- 3 Clean the hoses with a mild cleaning solvent.
- 4 Dry both hoses and inspect them for cracks and damage. Replace the hoses if they are damaged.

## TABLE D PROCEDURES

**D-7****Check the Engine Injection  
Pumps and Injectors -  
Deutz Diesel Models**

Complete information to perform this procedure is available in the *Deutz FL 1011 Workshop Manual* (Deutz number: 0291 1942). Genie part number 29789.

**D-8****Check the Toothed Belt -  
Deutz Diesel Models**

Complete information to perform this procedure is available in the *Deutz FL 1011 Operation Manual* (Deutz number: 0297 4706 EN). Genie part number 29790.

**D-9****Replace the Timing Belt -  
Gasoline/LPG Models**

Complete information to perform this procedure is available in the *Ford LSG-423 2.3 Liter Industrial Engine Service Manual* (Ford number: 194-216). Genie part number 29586.

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# Troubleshooting Flow Charts



## Observe and Obey:

- ☑ Troubleshooting and repair procedures shall be completed by a person trained and qualified on the repair of this machine.
- ☑ Immediately tag and remove from service a damaged or malfunctioning machine.
- ☑ Repair any machine damage or malfunction before operating the machine.
- ☑ Unless otherwise specified, perform each repair procedure with the machine in the following configuration:
  - machine parked on a flat level surface
  - boom in stowed position
  - turntable rotated with the boom between the non-steering wheels
  - turntable secured with the turntable rotation lock
  - key switch in the OFF position with the key removed
  - wheels chocked

## Before Troubleshooting:

- ☑ Read, understand and obey the safety rules and operating instructions printed in the *Genie Z-60/34 Operator's Manual*.
- ☑ Be sure that all necessary tools and test equipment are available and ready for use.
- ☑ Read each appropriate flow chart thoroughly. Attempting shortcuts may produce hazardous conditions.
- ☑ Be aware of the following hazards and follow generally accepted safe workshop practices.

**⚠ DANGER** Crushing hazard. When testing or replacing any hydraulic component, always support the structure and secure it from movement.

**⚠ DANGER** Electrocution hazard. Contact with electrically charged circuits may result in death or serious injury. Remove all rings, watches and other jewelry.

**⚠ WARNING** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

**NOTICE** Perform all troubleshooting on a firm level surface.

**NOTICE** Two persons will be required to safely perform some troubleshooting procedures.

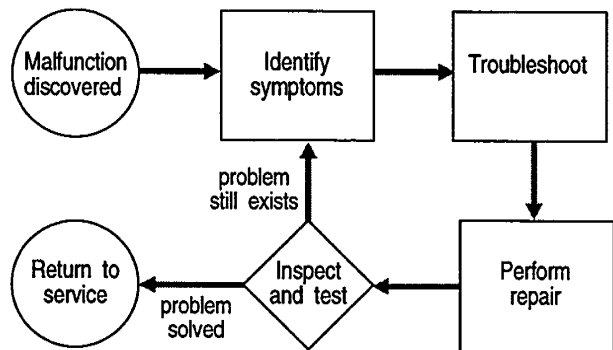
## TROUBLESHOOTING FLOW CHARTS

**About This Section**

When a malfunction is discovered, the flow charts in this section will help a service professional pinpoint the cause of the problem. To use this section, basic hand tools and certain pieces of test equipment are required—voltmeter, ohmmeter, pressure gauges.

The location of terminals mentioned in this section can be found on the appropriate electrical or hydraulic schematics provided in Section 6, *Schematics*.

Since various degrees of a particular function loss may occur, selecting the appropriate flow chart may be troublesome. When a function will not operate with the same speed or power as a machine in good working condition, refer to the flow chart which most closely describes the problem.

**General Repair Process**



# Chart 1

## Engine Will Not Crank Over

Be sure the key switch is in the appropriate position.

Be sure the emergency stop buttons are pulled up into the on position.

Be sure the circuit breaker(s) is not tripped.

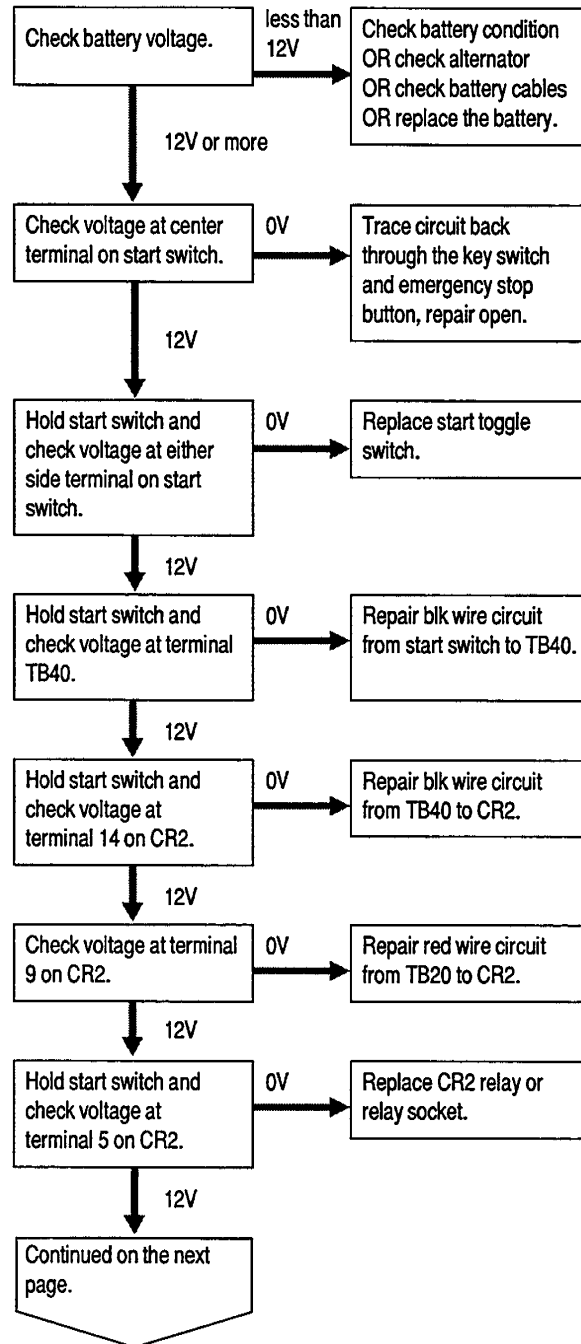
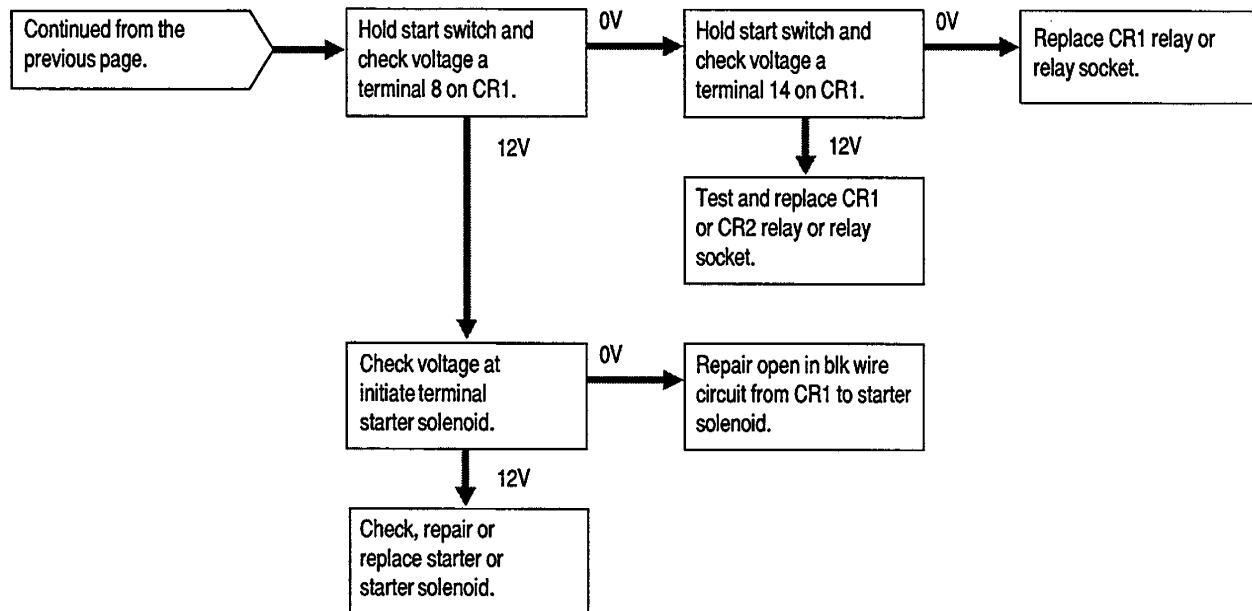


CHART 1



# Chart 2A

## Engine Cranks Over But Will Not Start - Gasoline/LPG Models

Be sure to check the engine oil level and fill as needed.

Be sure to check fuel levels and engine coolant level.

Be sure the gasoline shut-off valve is in the on position.

Be sure that automatic choke is not sticking closed.

Perform following tests in gasoline mode only.

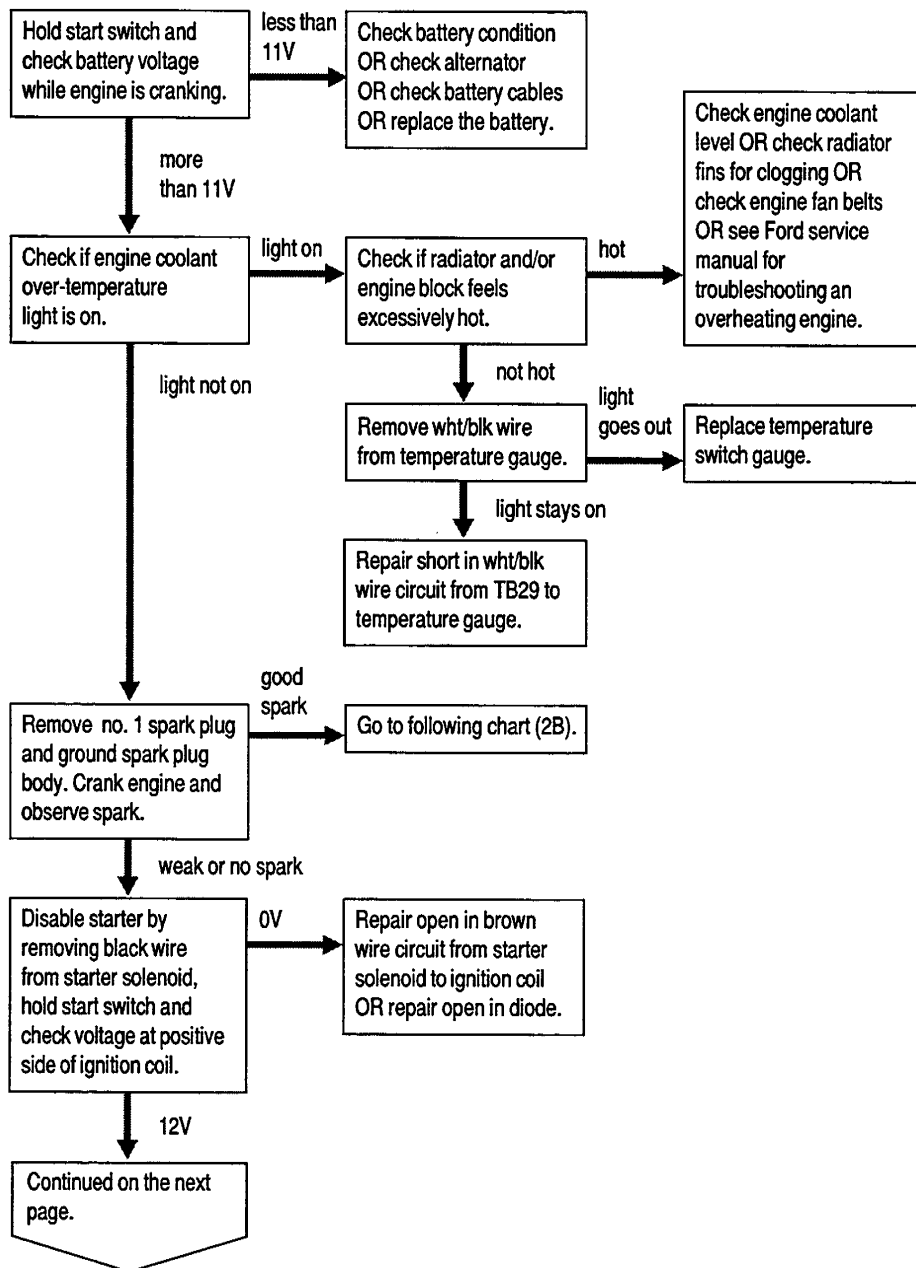
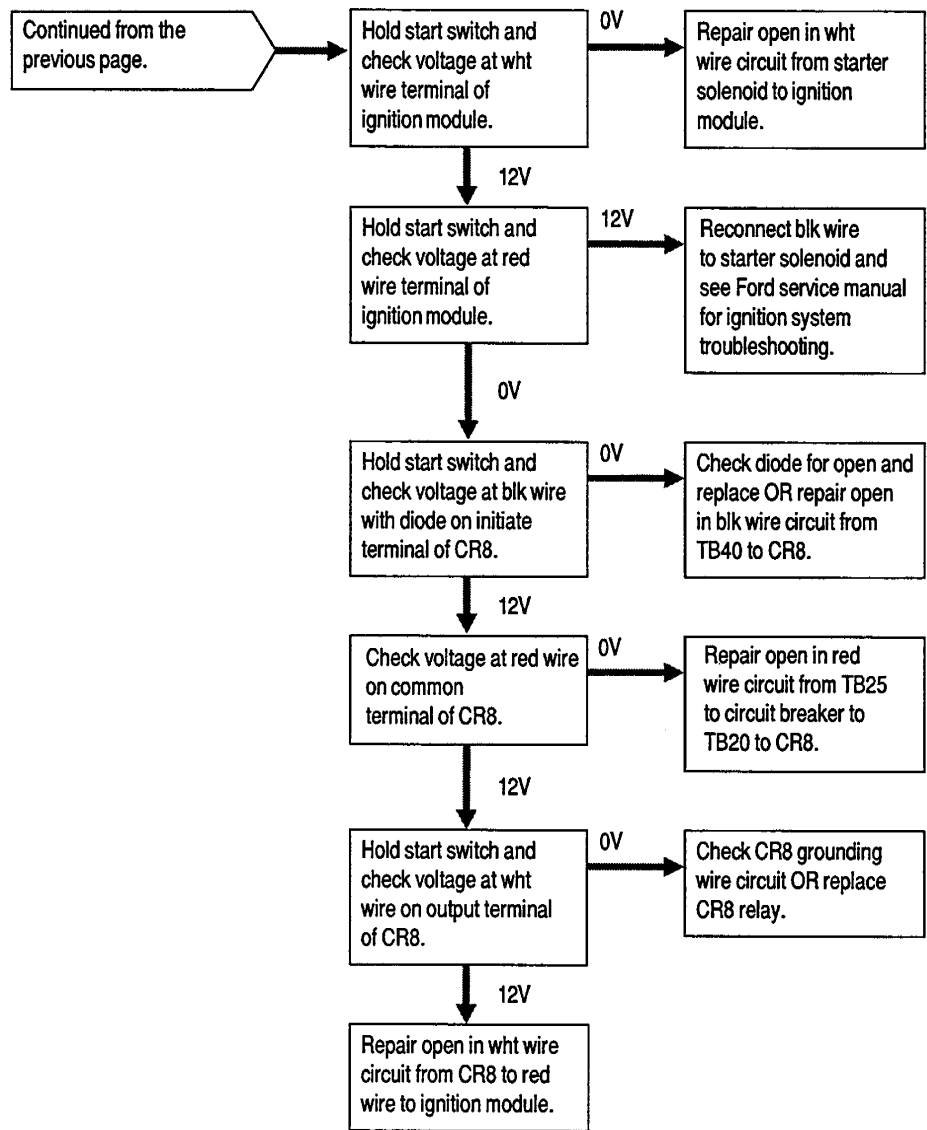


CHART 2A



# Chart 2B

## Engine Cranks Over But Will Not Start - Gasoline/LPG Models

## or Engine Runs While Cranking Then Dies

Continuation of "good spark" fault path.

Perform these tests in gasoline mode only.

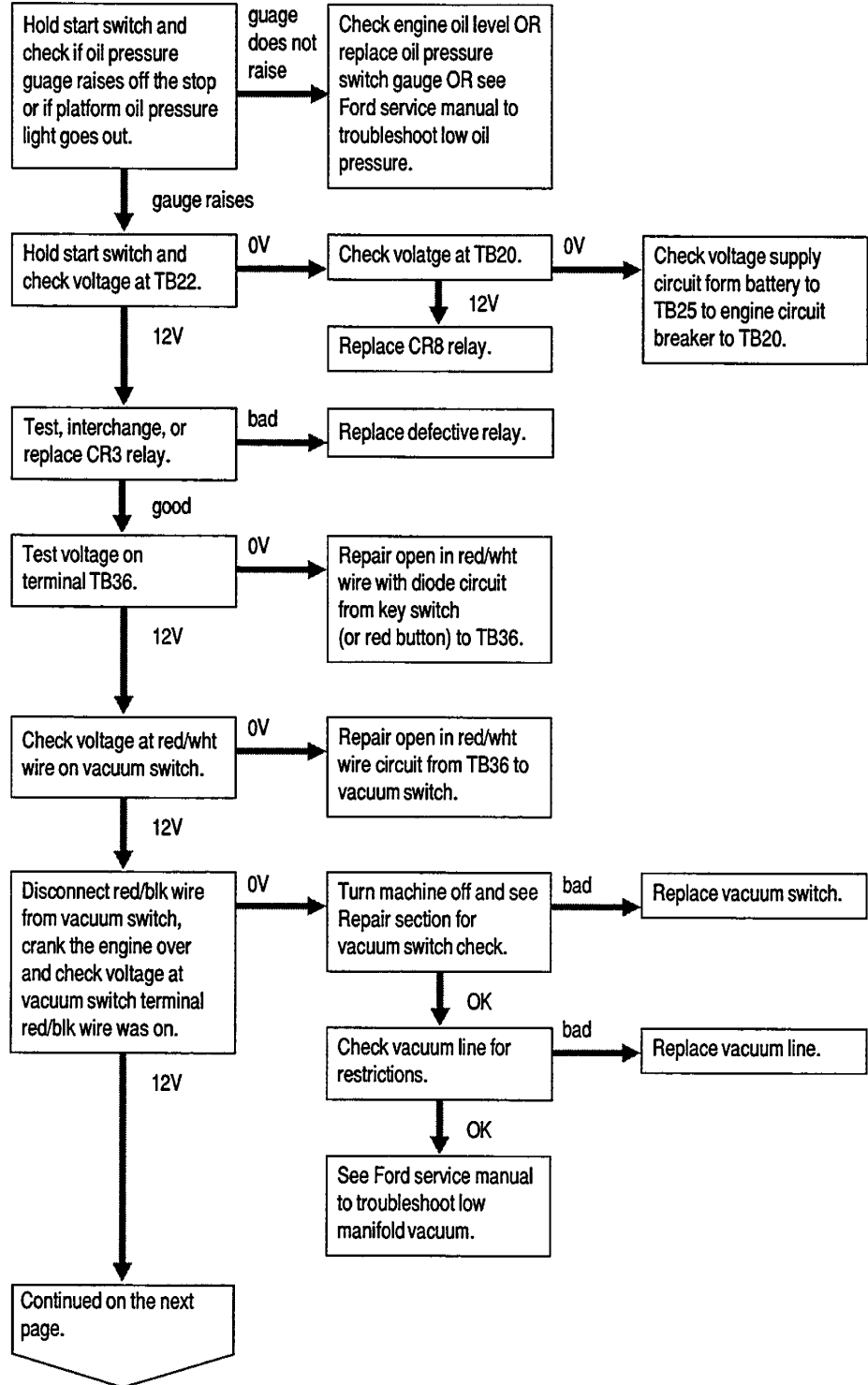


CHART 2B

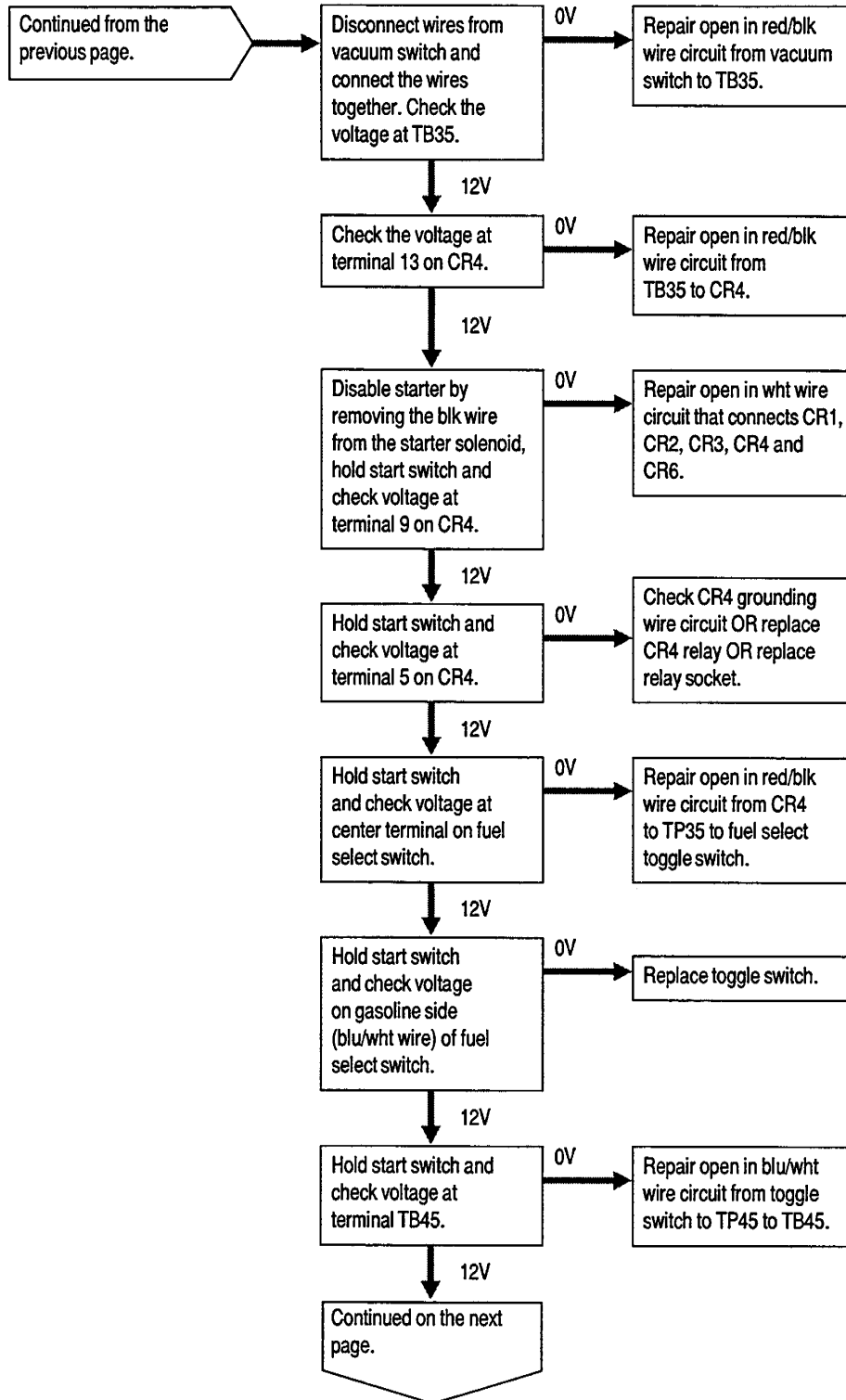
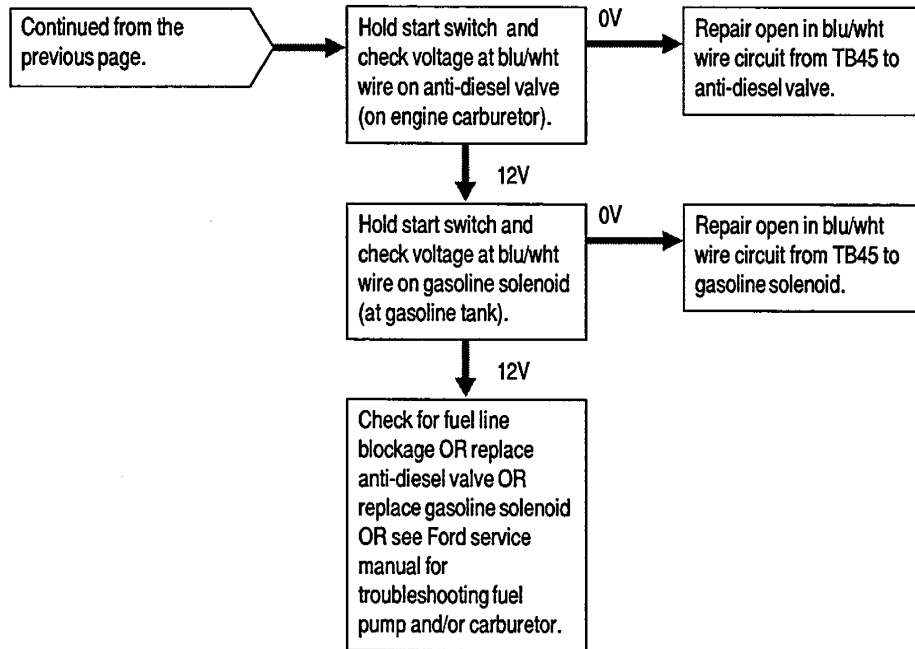


CHART 2B



# Chart 3

## Engine Cranks Over But Will Not Start - Deutz Diesel Models

Be sure to check the engine oil level and fill as needed.

Be sure to check fuel level.

Be sure the diesel shut-off valve is in the on position.

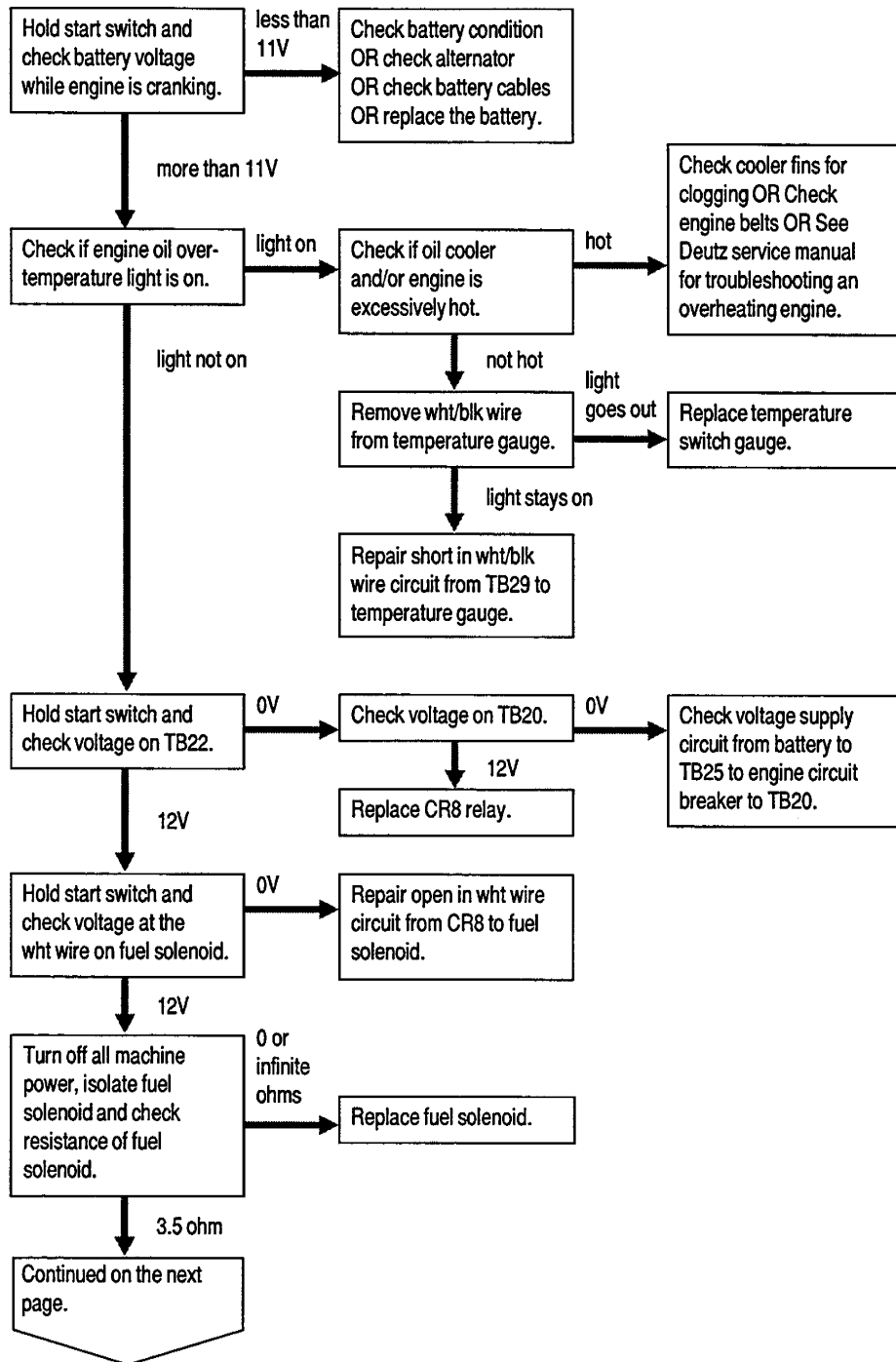
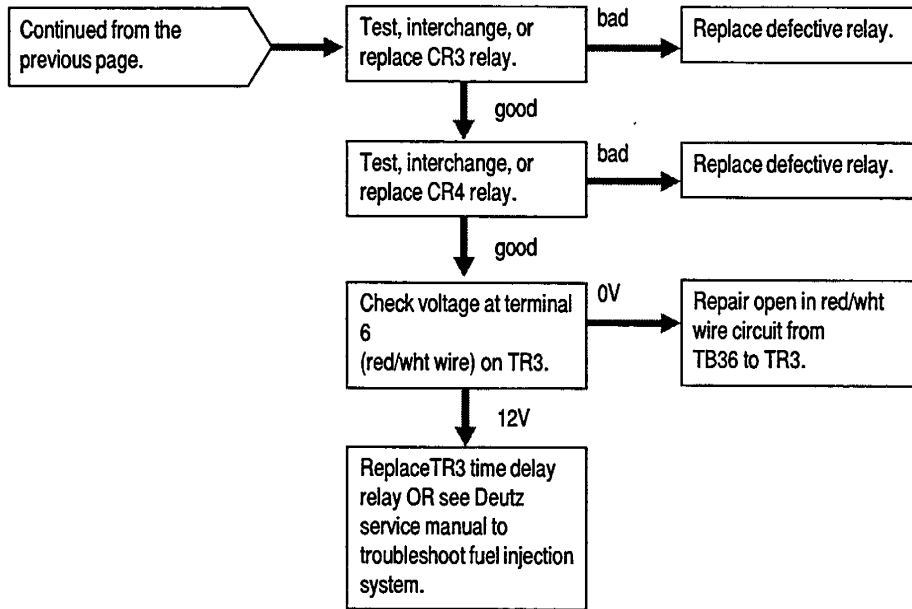




CHART 3

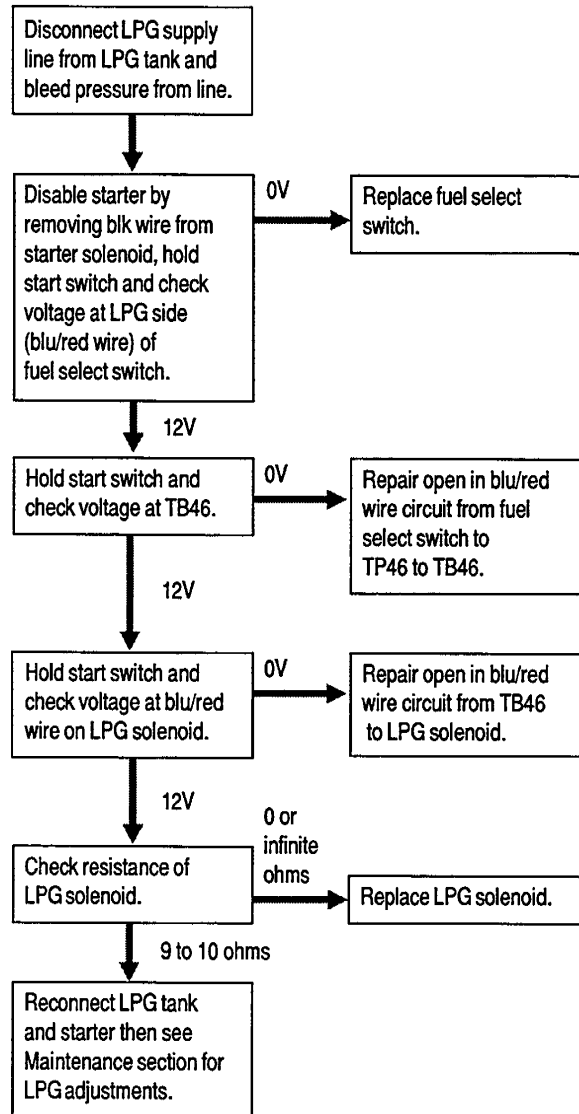


# Chart 4

## Engine Will Not Start On LPG, But Will Start On Gasoline - Gasoline/LPG Models

Be sure fuel select switch is switched to LPG.

Be sure to check LPG fuel level.



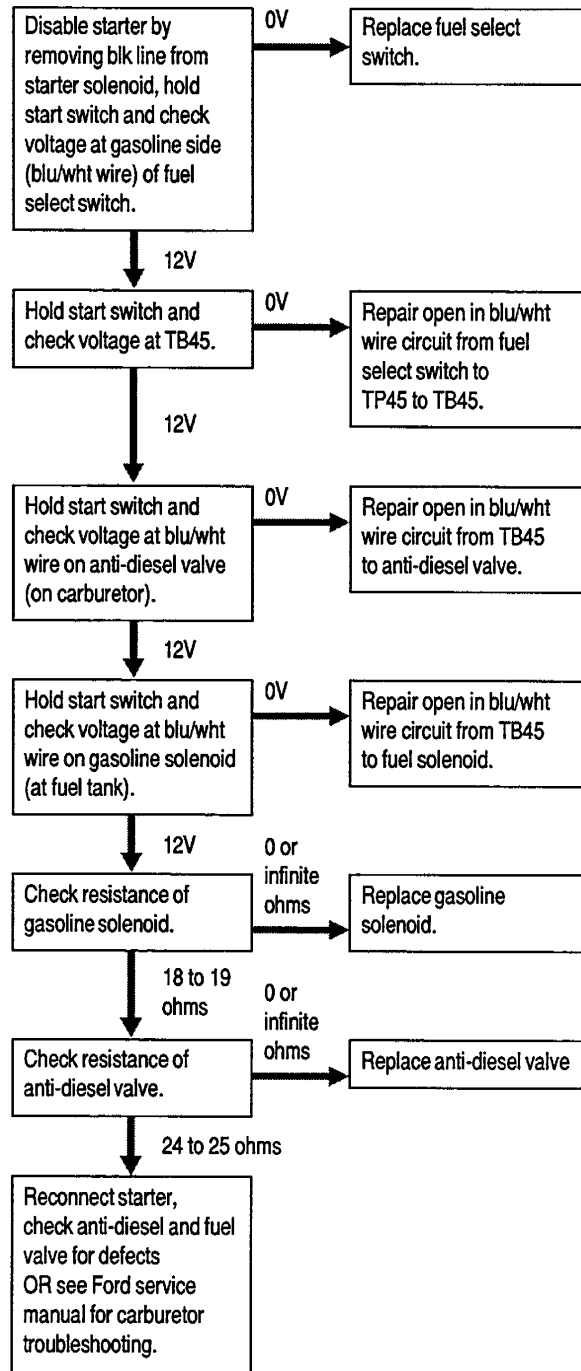
# Chart 5

## Engine Will Not Start On Gasoline, But Will Start On LPG - Gasoline/LPG Models

Be sure fuel select switch is switched to gasoline.

Be sure to check gasoline fuel level.

Be sure that engine choke is operating properly.



# Chart 6

## Engine High Idle Inoperative - Gasoline/LPG Models

If high idle operates on LPG but not on gasoline, see Ford service manual for carburetor troubleshooting.

If high idle operates on gasoline but not on LPG, see Repair section for LPG regulator adjustments.

Be sure throttle linkage from governor to carburetor is not binding, see Repair section.

Be sure high idle can be achieved by grasping the governor actuator arm and momentarily pulling to throttle the carburetor.

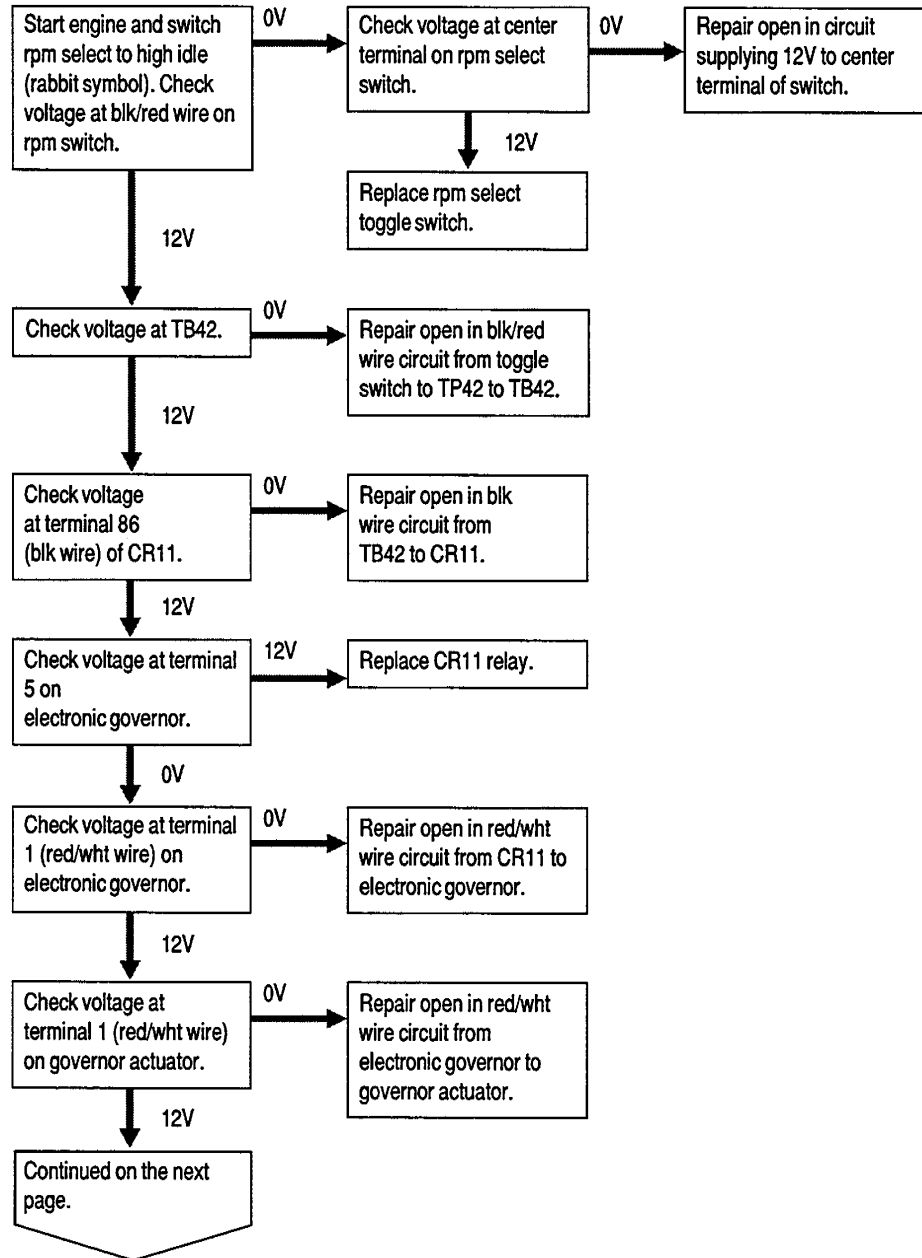
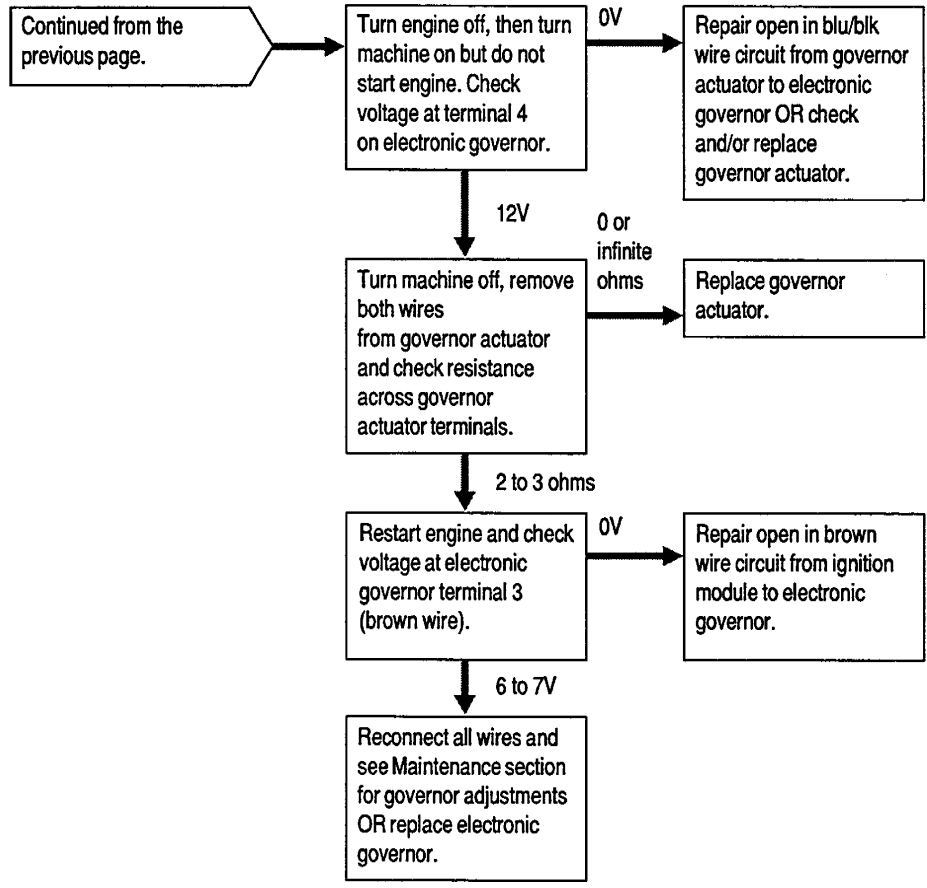


CHART 6



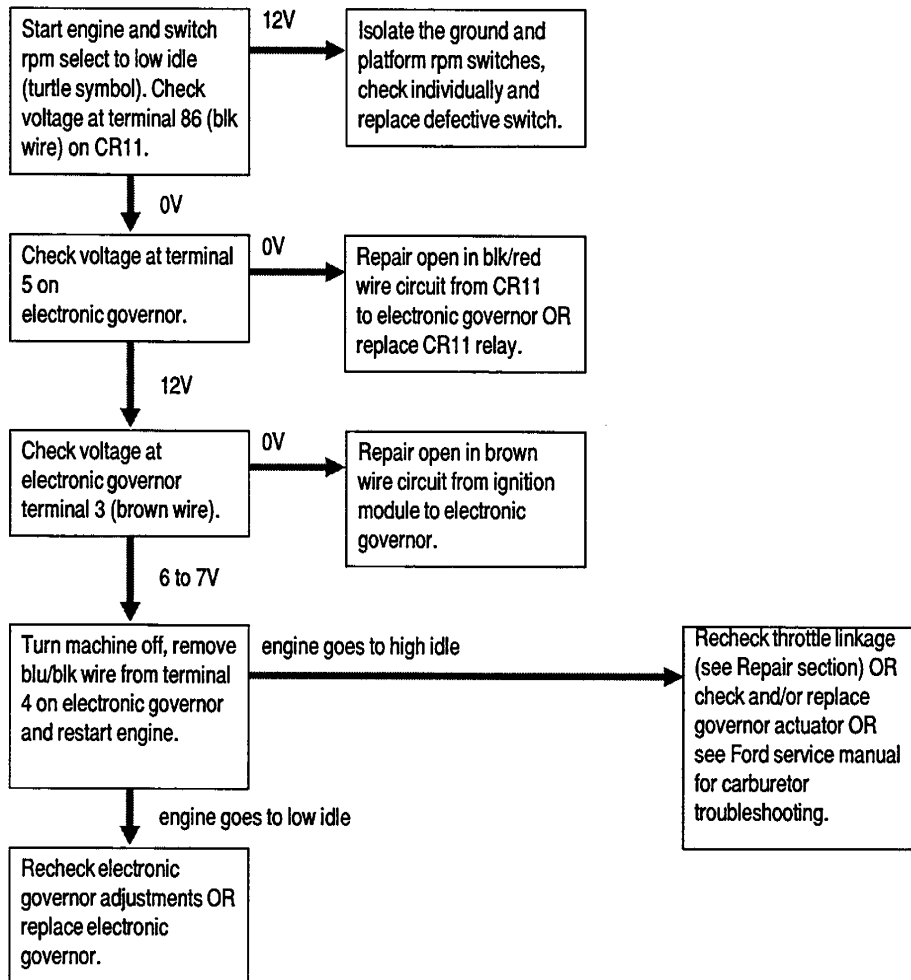
# Chart 7

## Engine Low Idle Inoperative - Gasoline/LPG Models

If low idle operates on LPG but not on gasoline, see Ford service manual for carburetor troubleshooting.

If low idle operates on gasoline but not on LPG, see Repair section for LPG regulator adjustments.

Be sure throttle linkage from governor to carburetor is not binding, see Repair section.

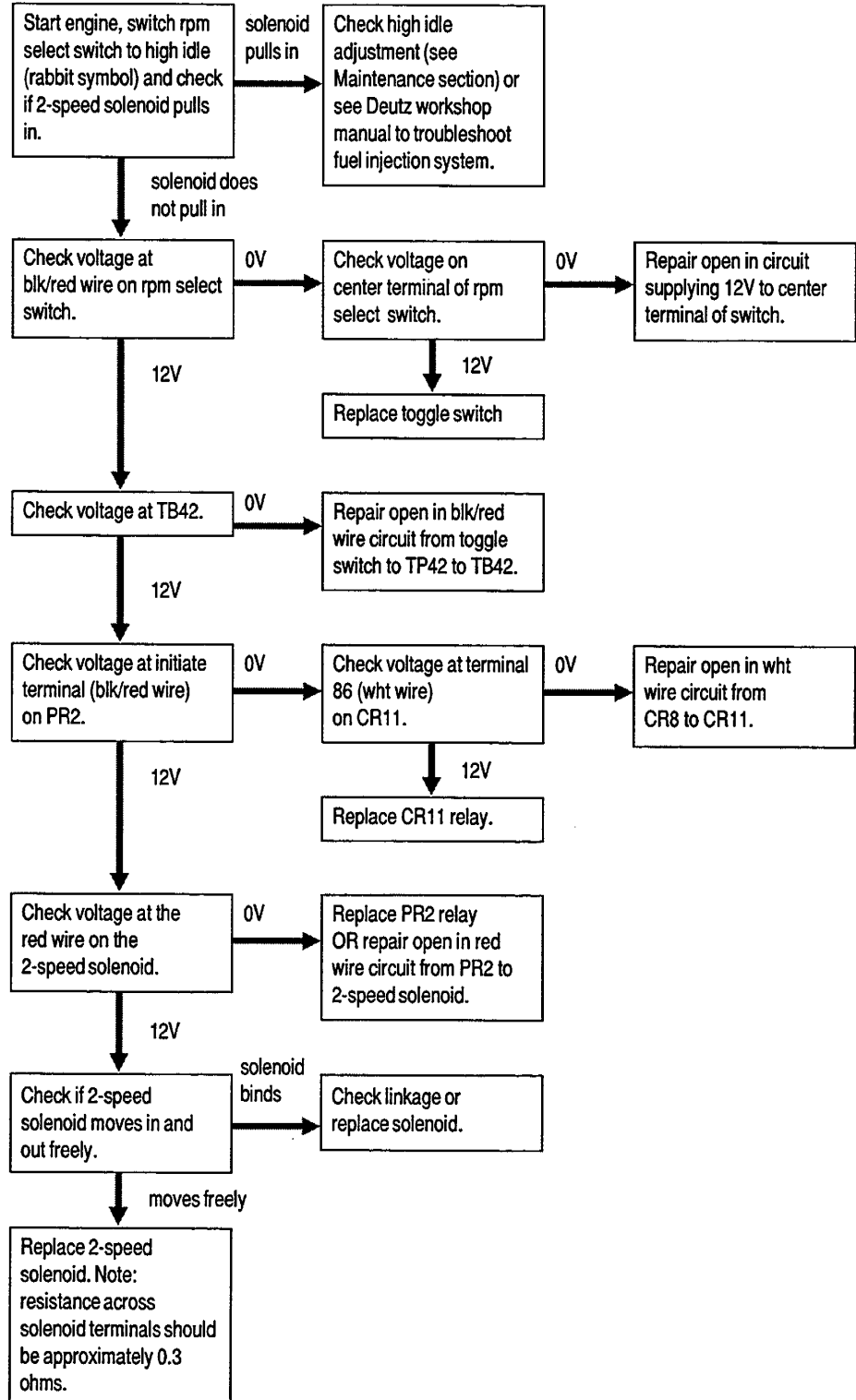


# Chart 8

## Engine High Idle Inoperative - Deutz Diesel Models

Be sure mechanical linkage is not binding or defective.

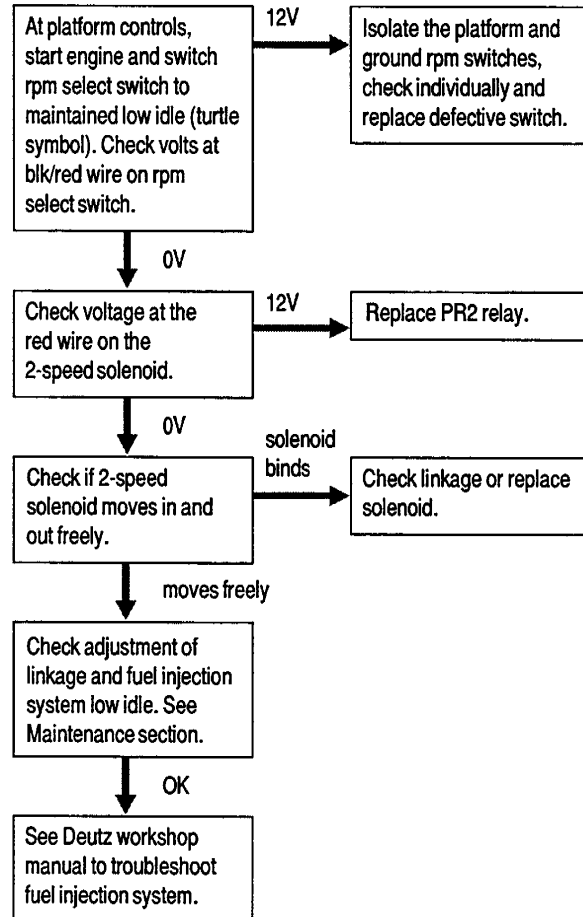
Be sure PR2 relay and 2-speed solenoid grounding wires are free of corrosion and have full continuity to ground.



# Chart 9

## Engine Low Idle Inoperative - Deutz Diesel Models

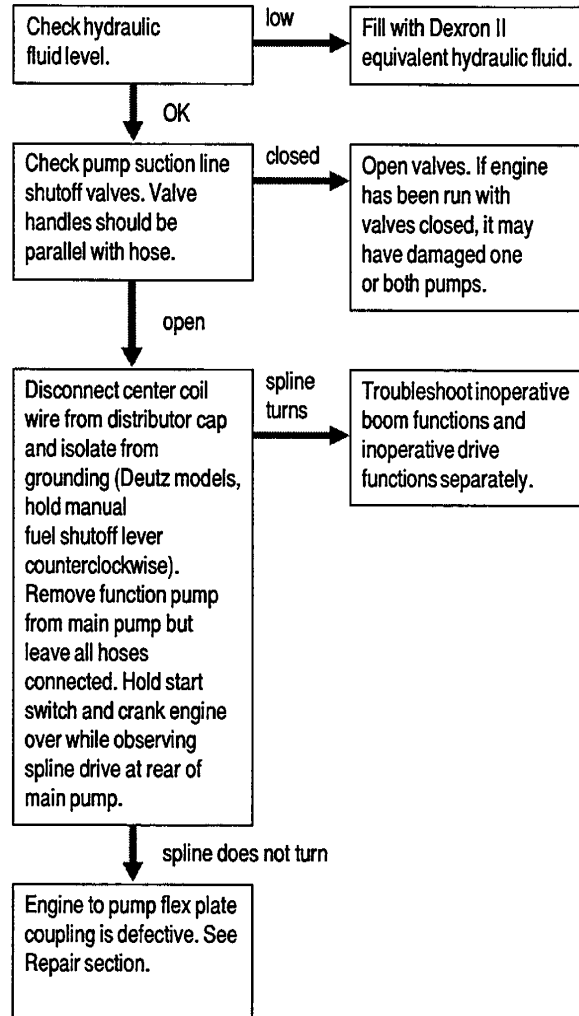
Check if mechanical linkage from 2-speed solenoid to fuel injection system is binding or defective.





# Chart 10

## All Functions Inoperative, Engine Starts and Runs

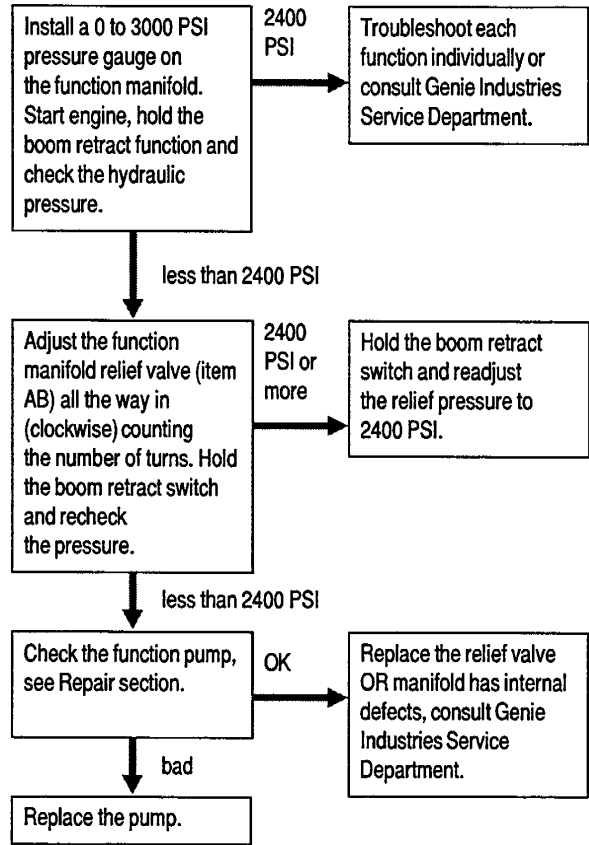


# Chart 11

## All Lift and Steer Functions Inoperative, Drive Functions Operational

Be sure the hydraulic suction line shutoff valve for the lift/steer pump is in the open position.

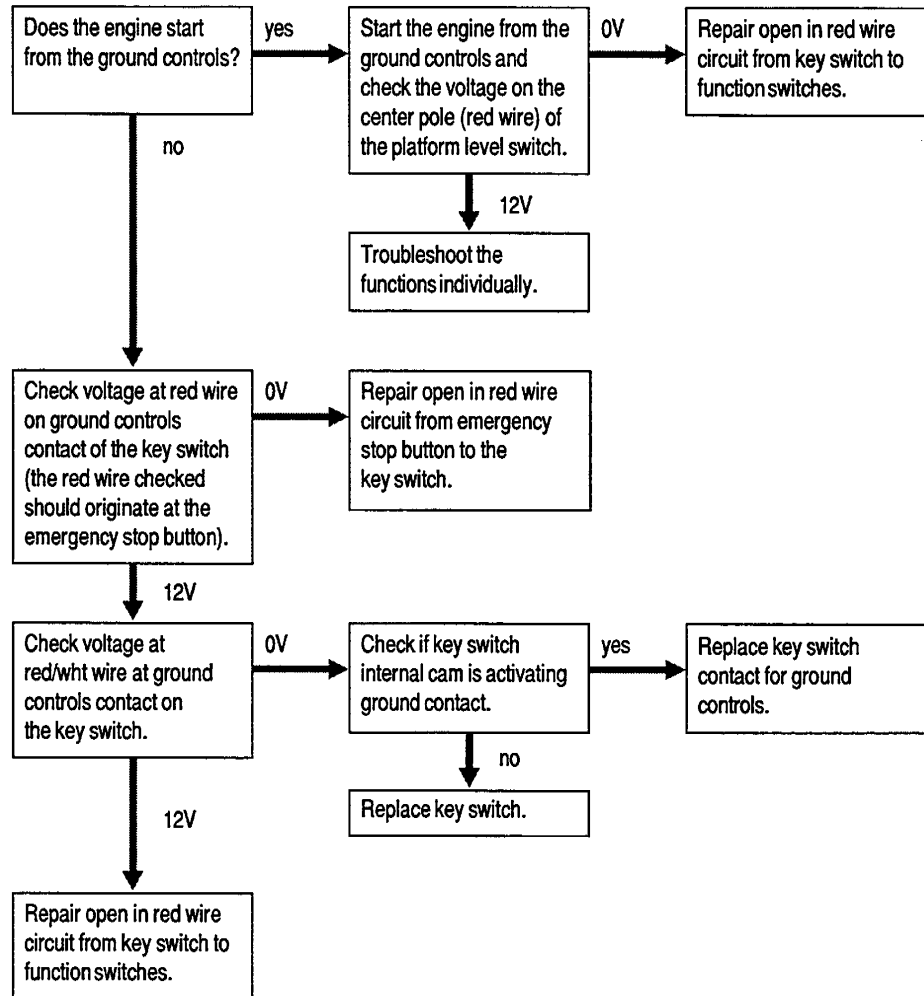
Be sure all grounding wires for the hydraulic manifold valves are free of corrosion and have full continuity to ground.



# Chart 12

## Ground Controls Inoperative, Platform Controls Operate Normally

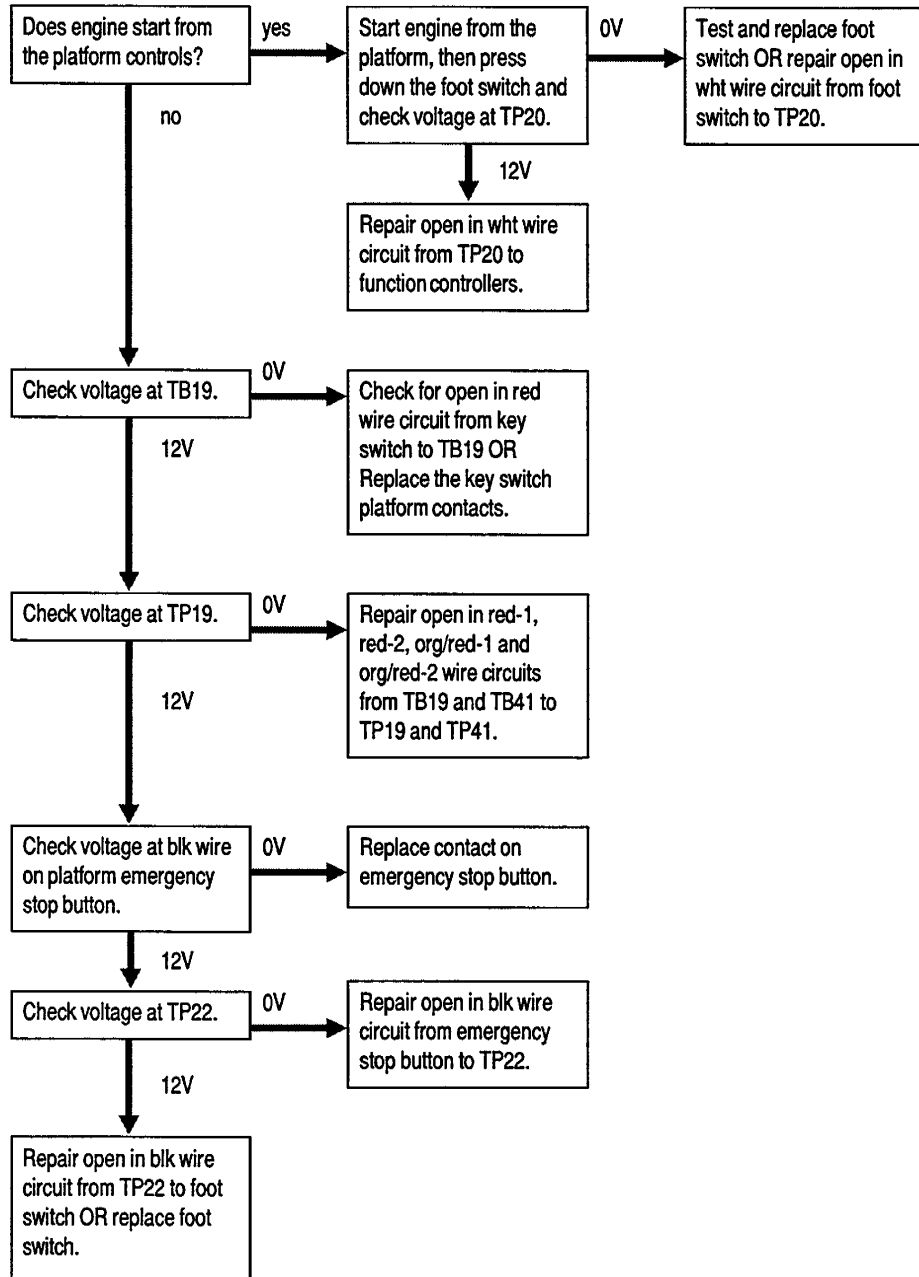
Be sure all other functions operate normally, including platform controls.



# Chart 13

## Platform Controls Inoperative, Ground Controls Operate Normally

Be sure all cables are in good condition with no kinks or abrasions.



# Chart 14

## Primary Boom Up Function Inoperative

Be sure all other functions operate normally.

If primary boom up function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If primary boom up function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

Note: Oscillating axle equipped models, from the stowed position the auxiliary power can not raise the primary boom above the lift interlock limit switch. Auxiliary power can raise the boom if it is already raised above the lift interlock limit switch.

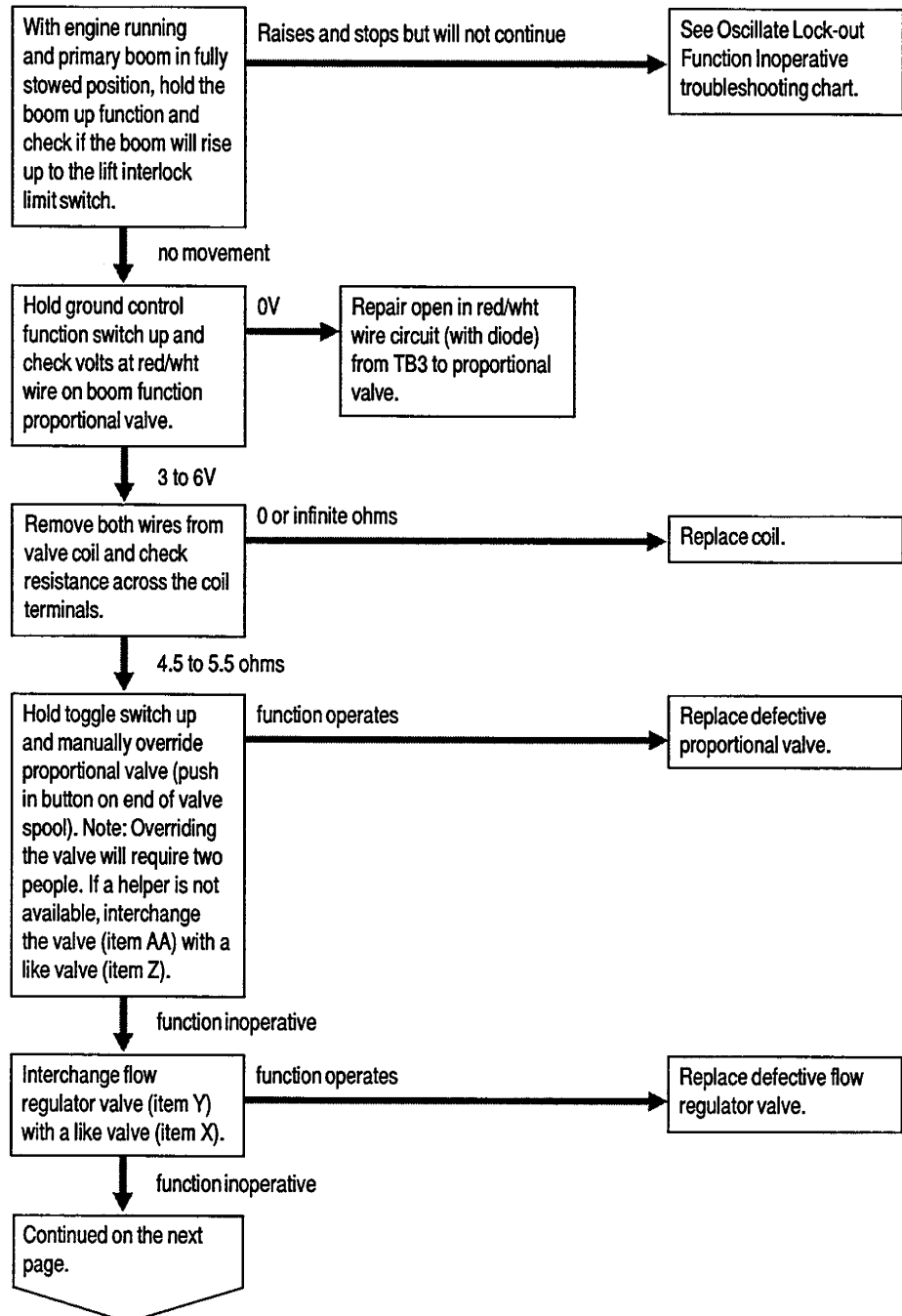
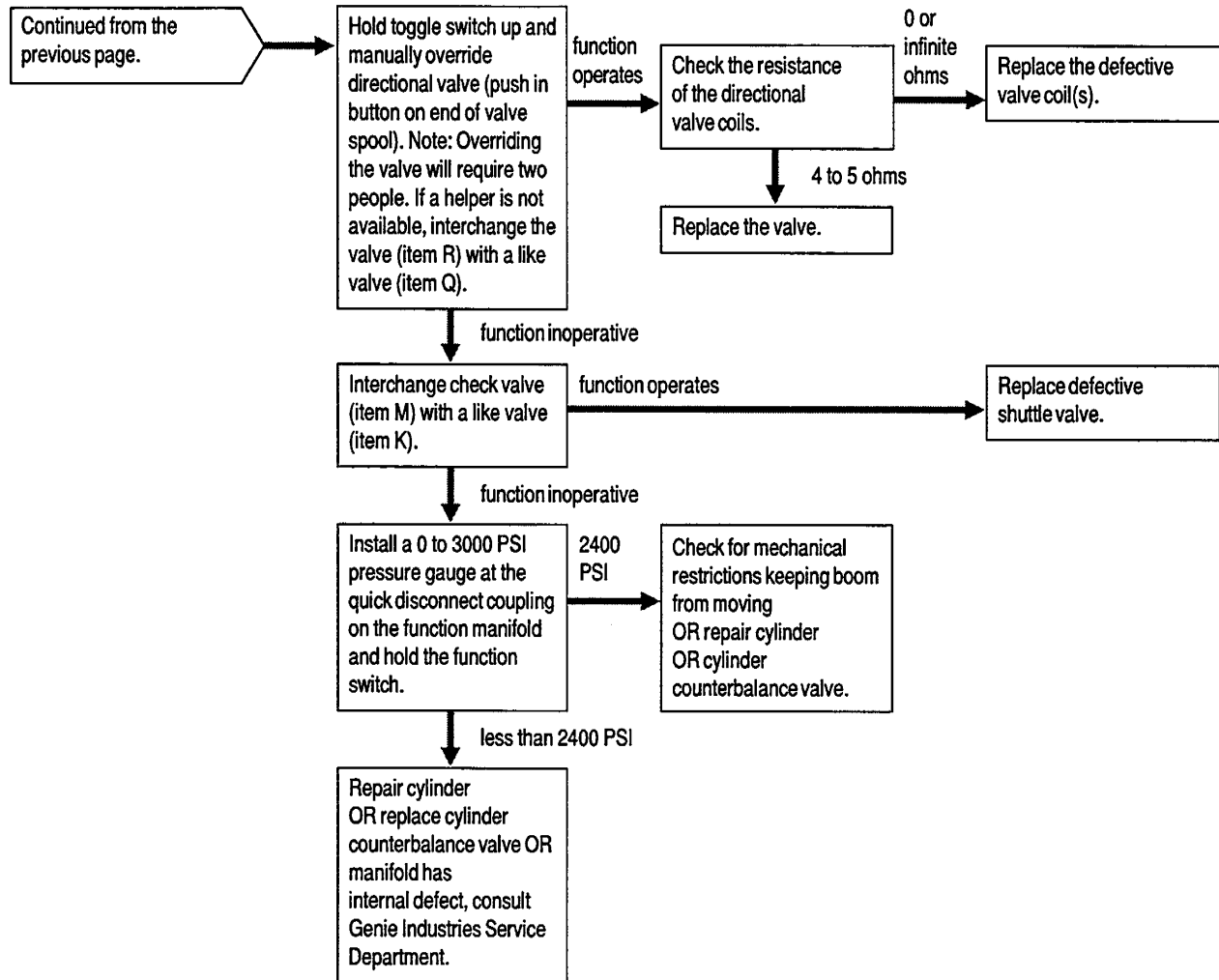


CHART 14



# Chart 15

## Primary Boom Down Function Inoperative

Be sure all other functions operate normally including boom up function.

If primary boom down function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If primary boom down function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

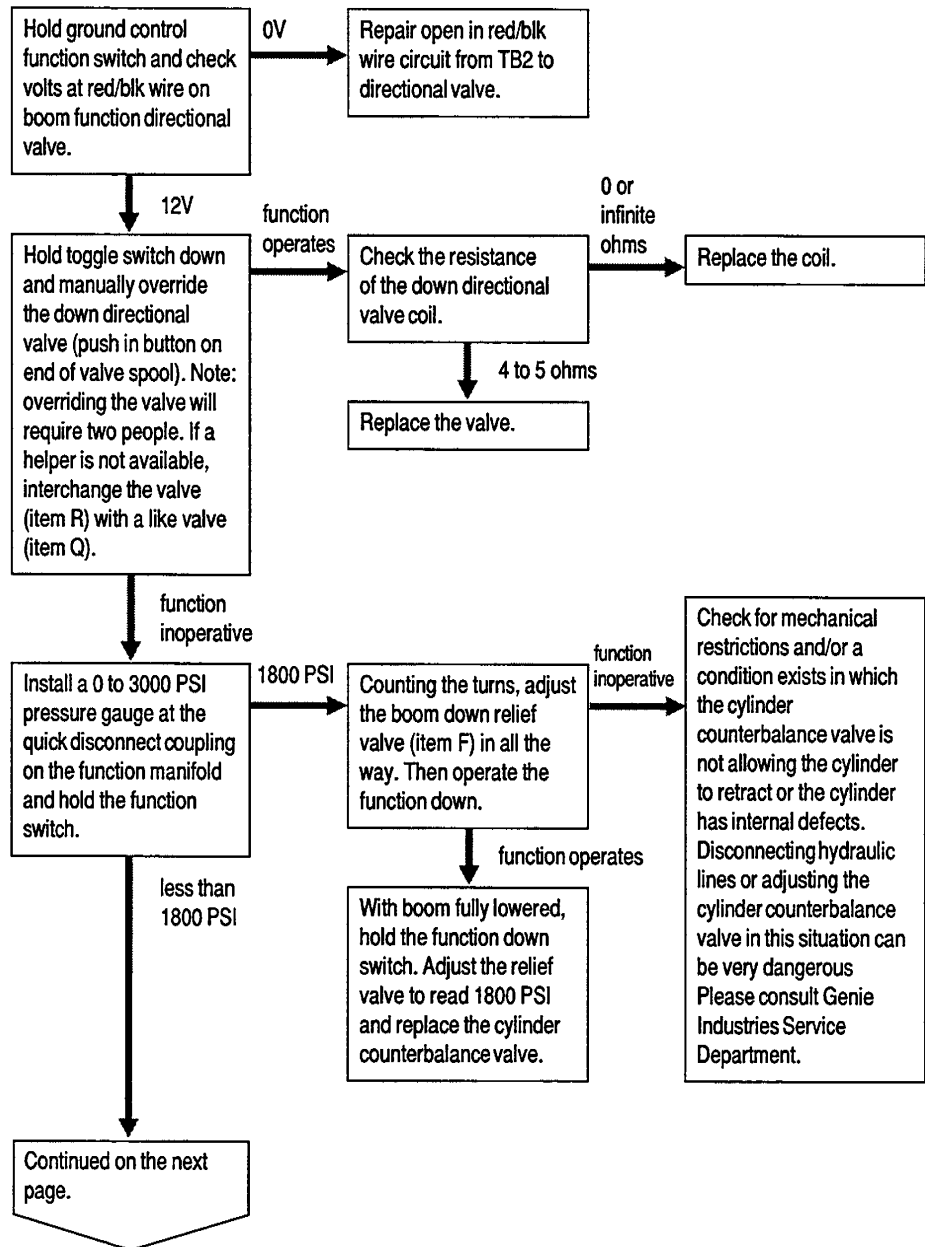
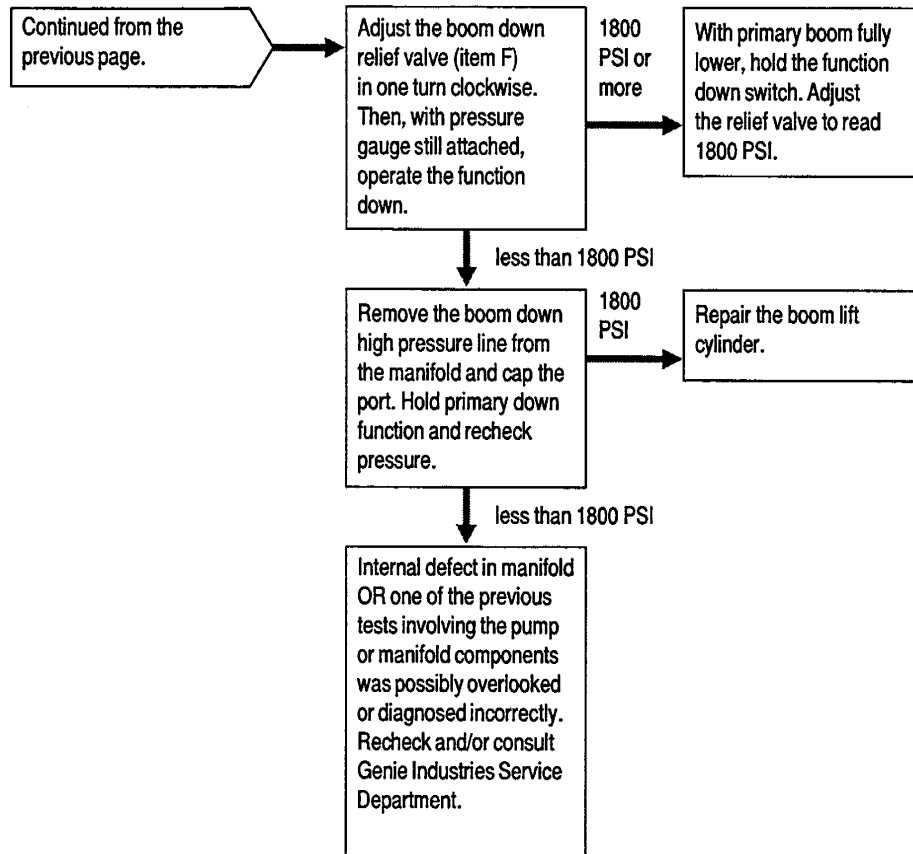


CHART 15





# Chart 16

## Secondary Boom Up Function Inoperative

Be sure all other functions operate normally.

If secondary boom up function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If secondary boom up function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

Note: Oscillating axle equipped models, from the stowed position the auxiliary power can not raise the primary boom above the lift interlock limit switch. Auxiliary power can raise the primary boom if it is already raised above the lift interlock limit switch.

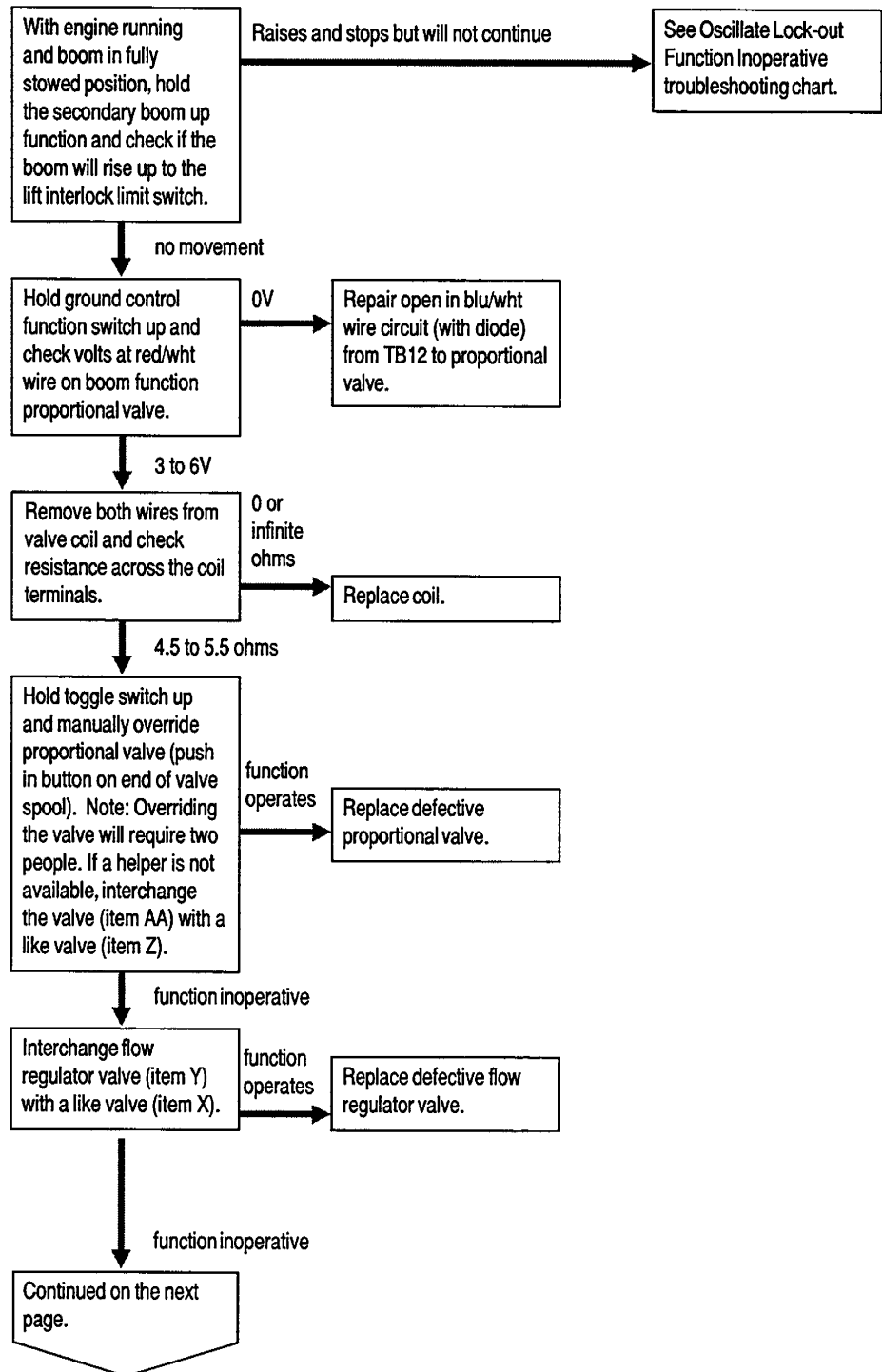
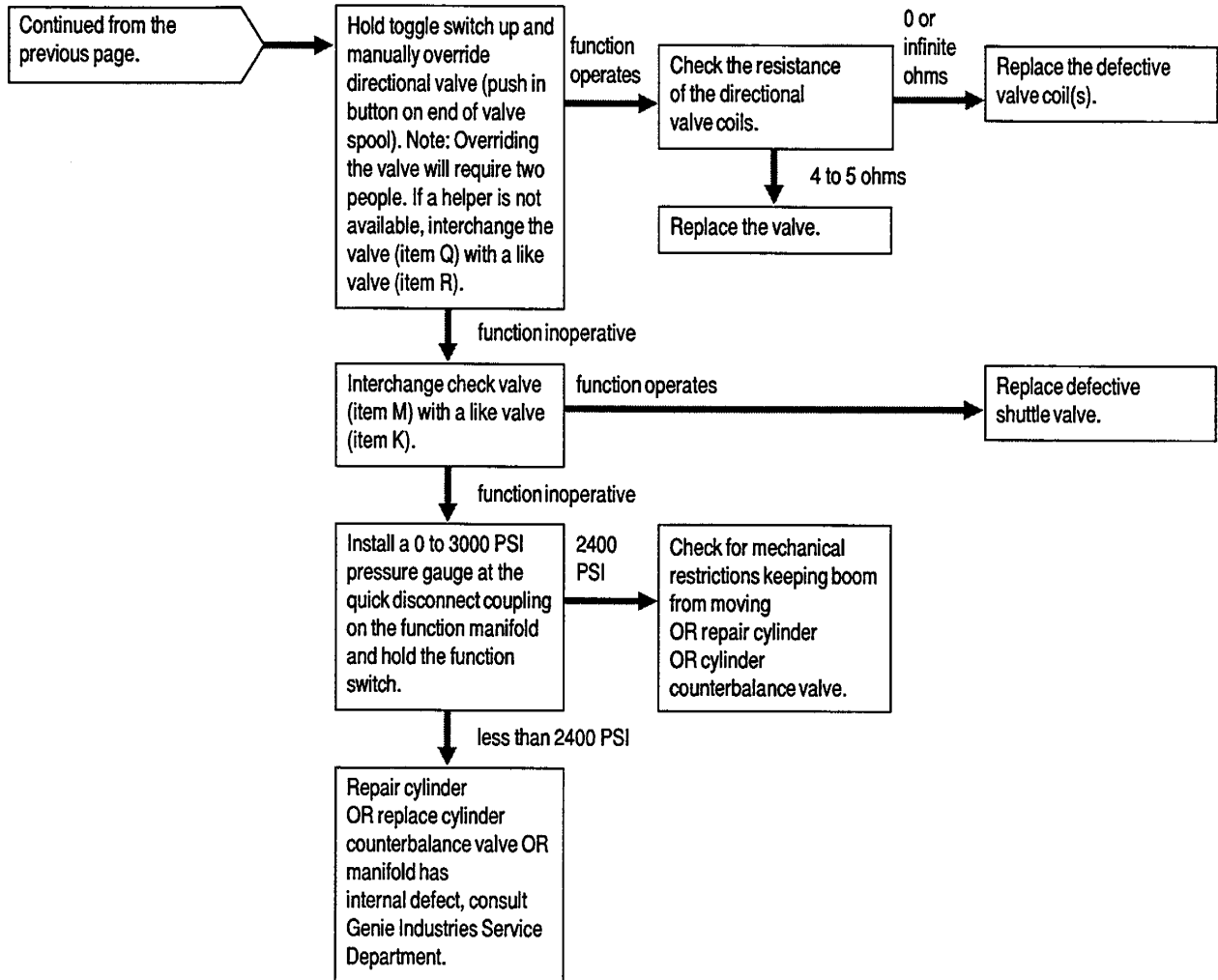


CHART 16



# Chart 17

## Secondary Boom Down Function Inoperative

Be sure all other functions operate normally including boom up function.

If secondary boom down function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If secondary boom down function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

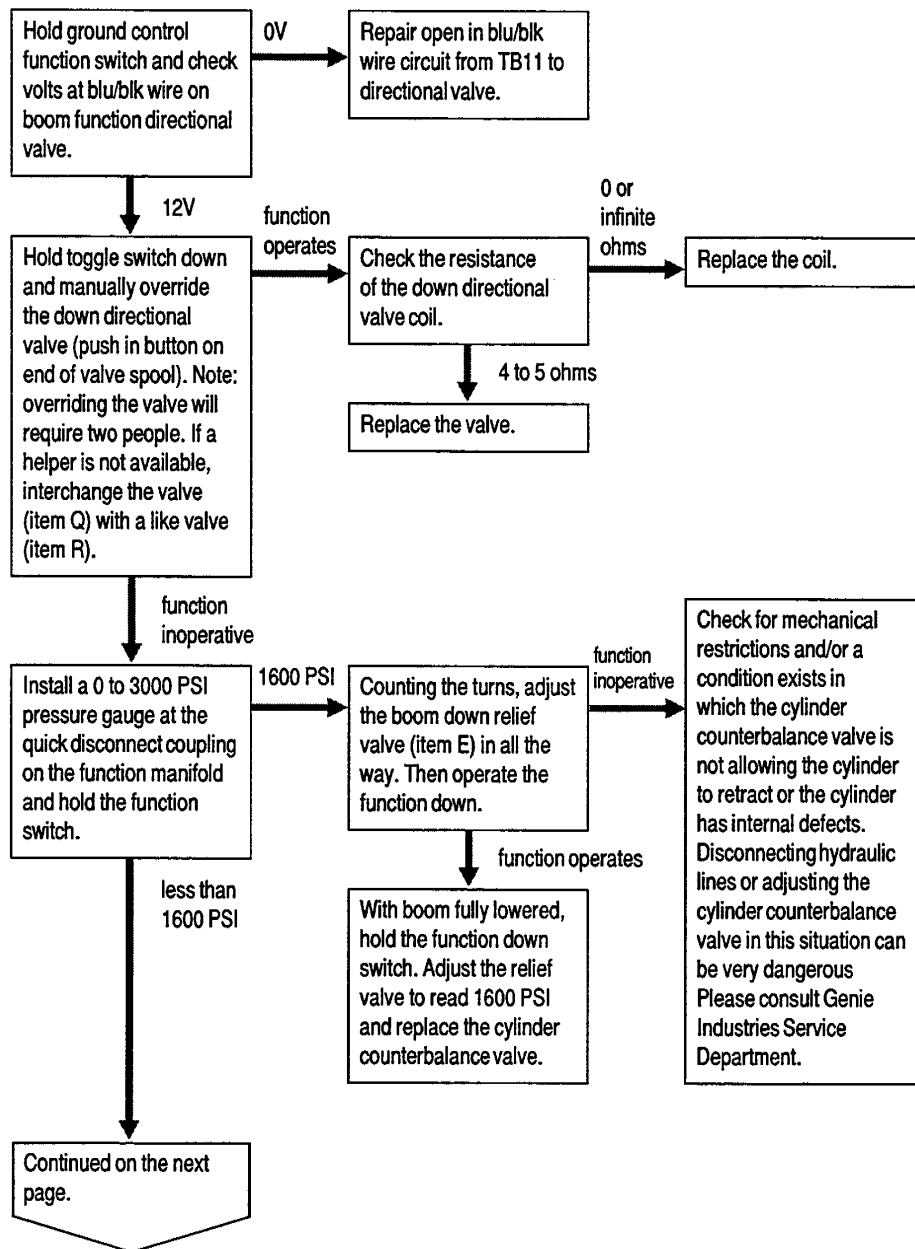
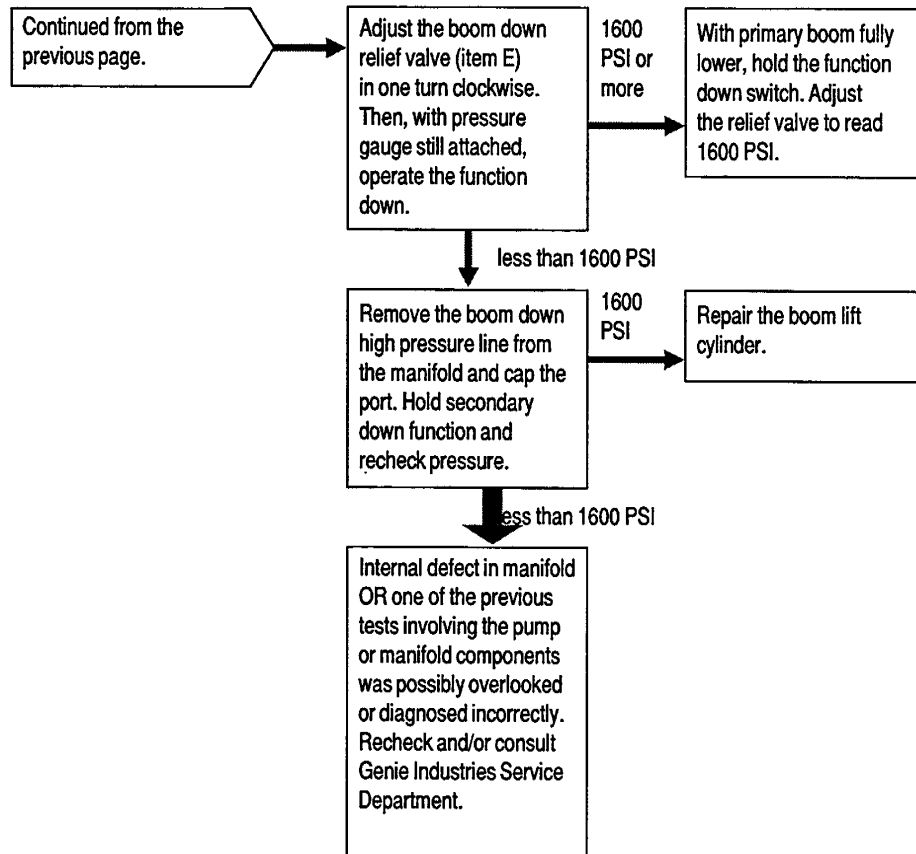


CHART 17



# Chart 18

## Boom Extend Function Inoperative

Be sure all other functions operate normally.

If boom extend function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If boom extend function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

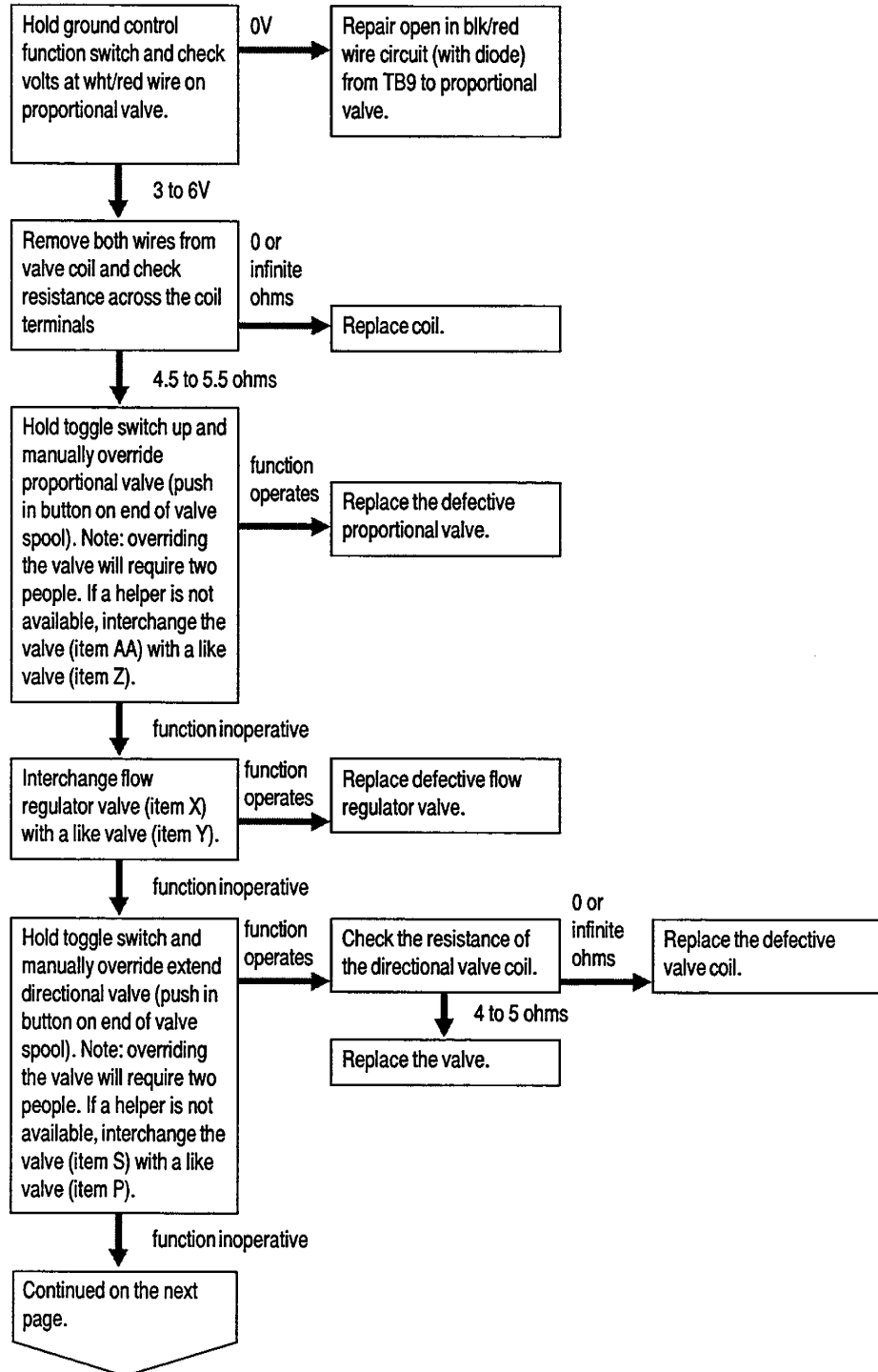
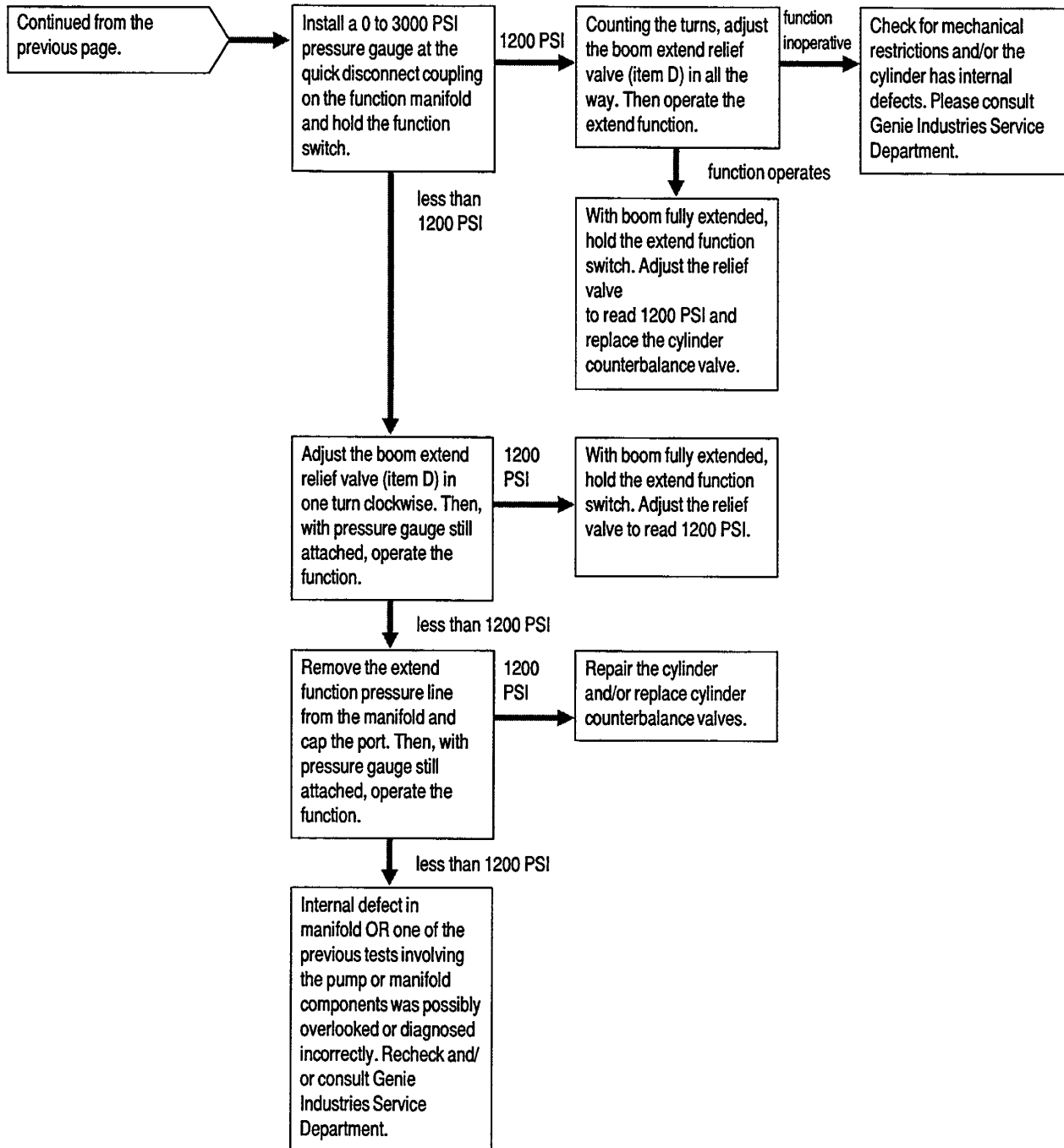


CHART 18



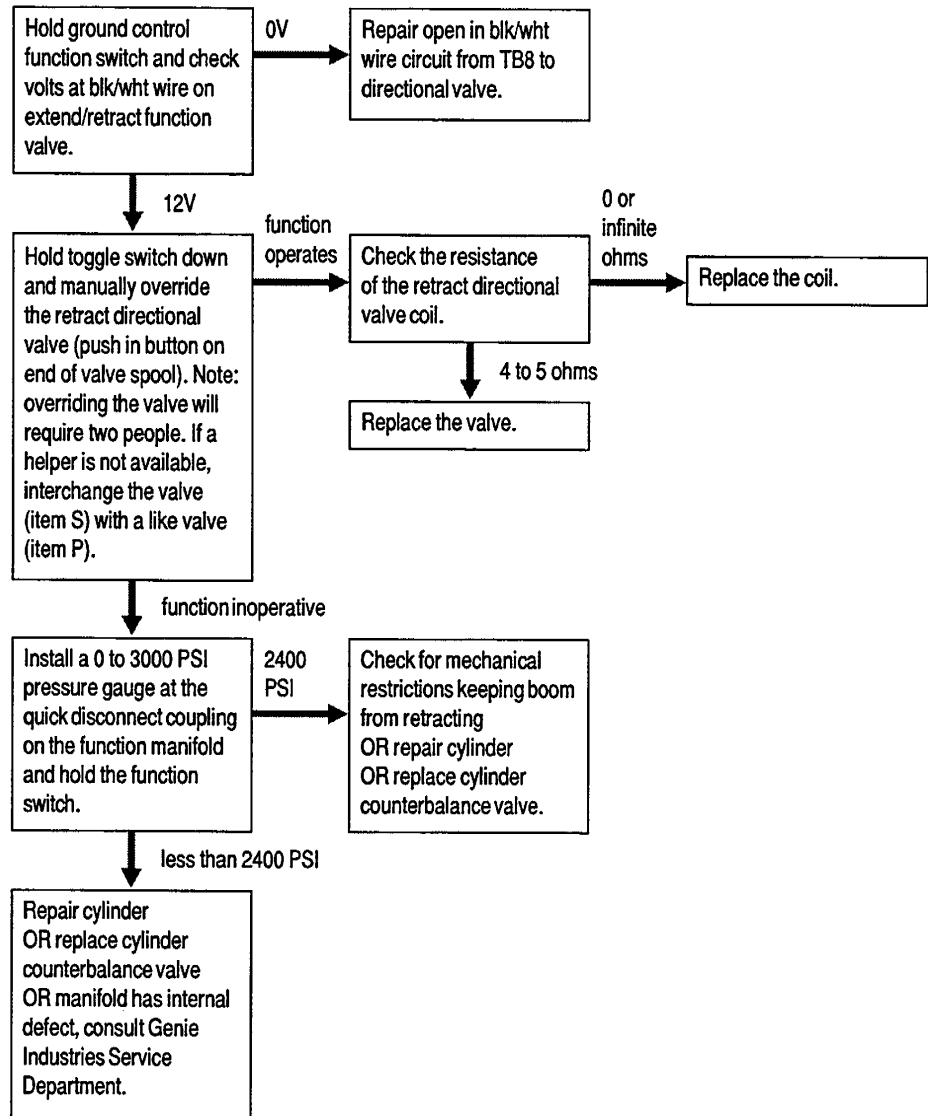
# Chart 19

## Boom Retract Function Inoperative

Be sure all other functions operate normally including boom extend function.

If boom retract function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If boom retract function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.



# Chart 20

## Turntable Rotate Function Inoperative

Be sure all other functions operate normally.

If turntable rotate function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If turntable rotate function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

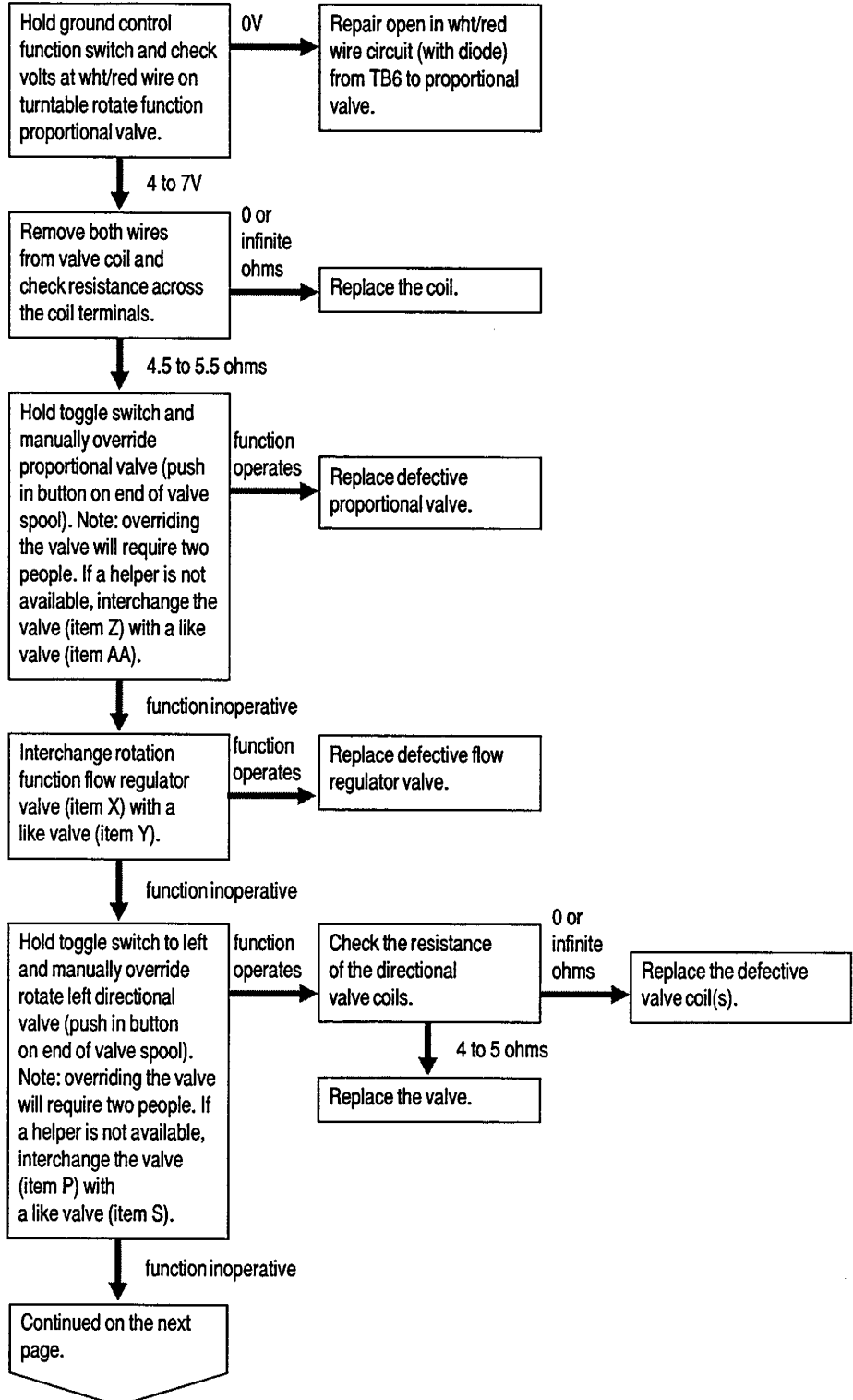
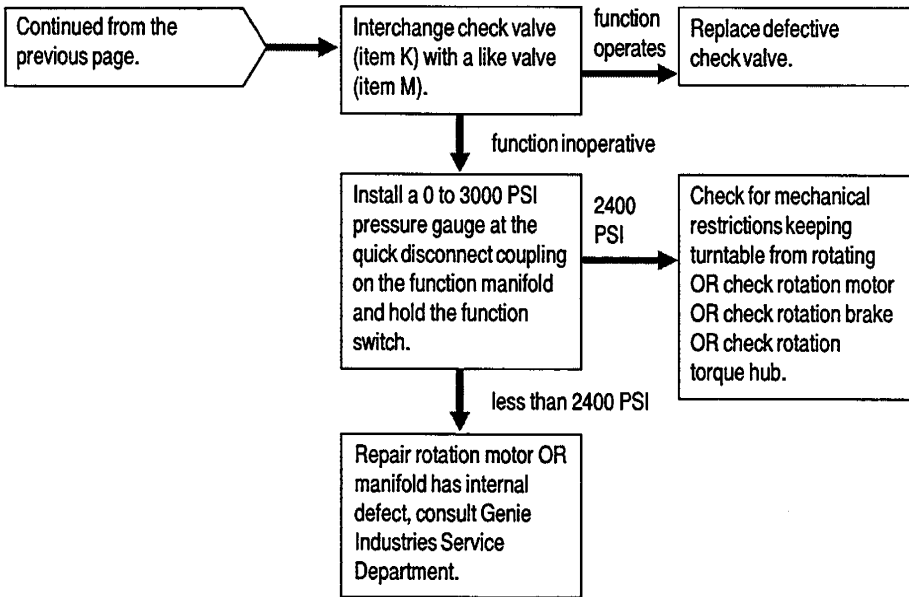




CHART 20



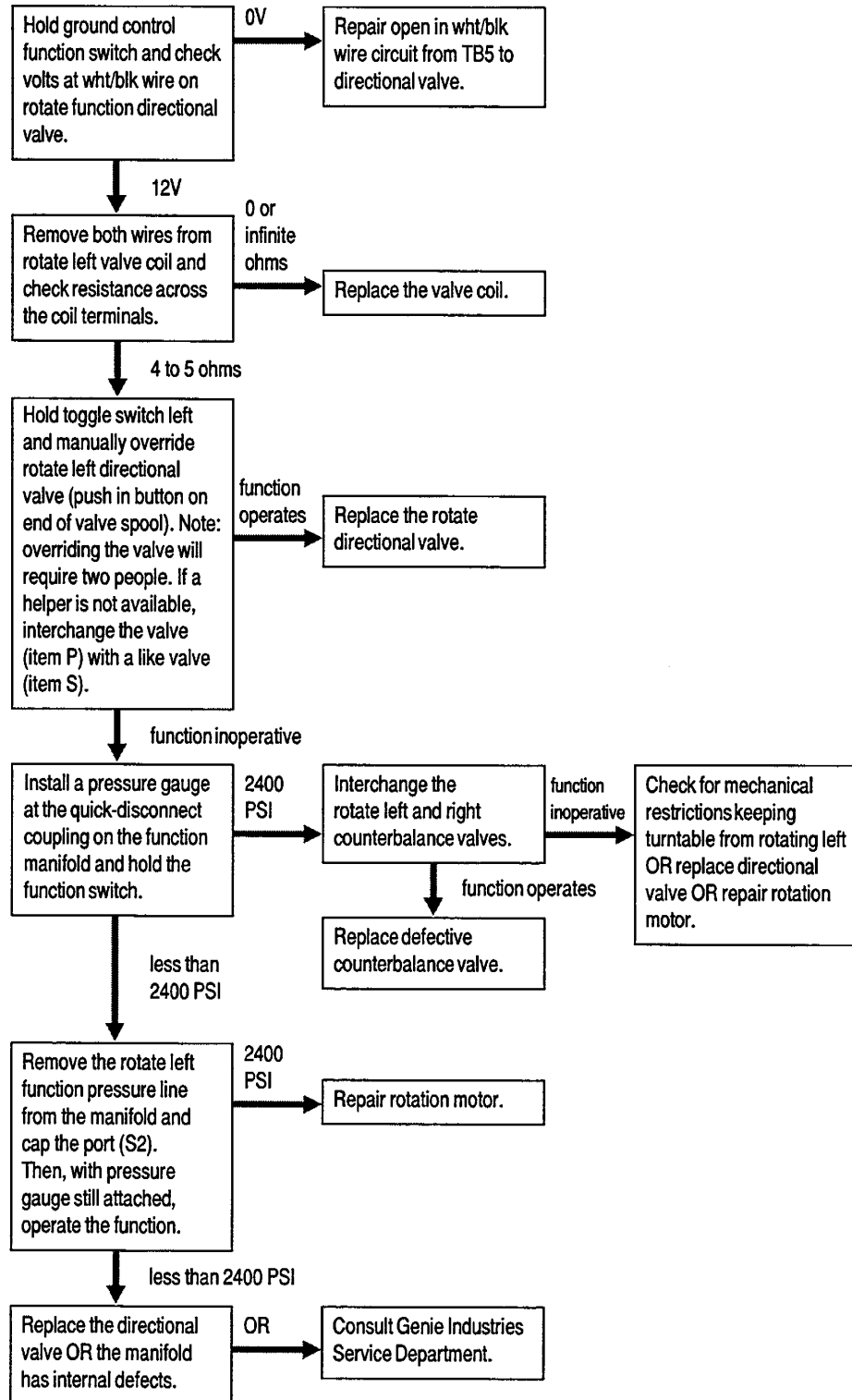
# Chart 21

## Turntable Rotate Left Function Inoperative

Be sure all other functions operate normally including turntable rotate right function.

If turntable rotate left function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If turntable rotate left function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.



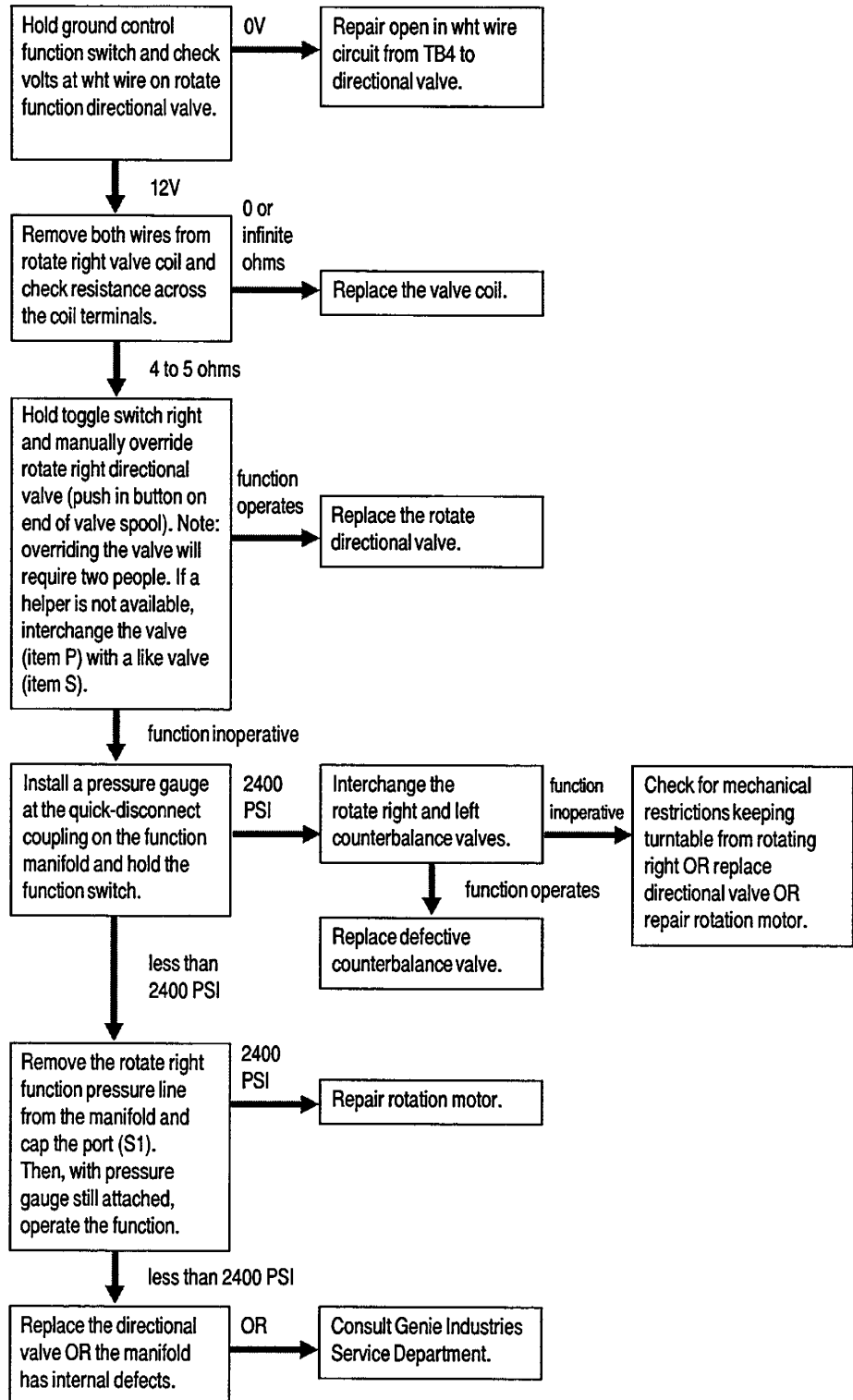
# Chart 22

## Turntable Rotate Right Function Inoperative

Be sure all other functions operate normally including turntable rotate right function.

If turntable rotate right function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If turntable rotate right function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.



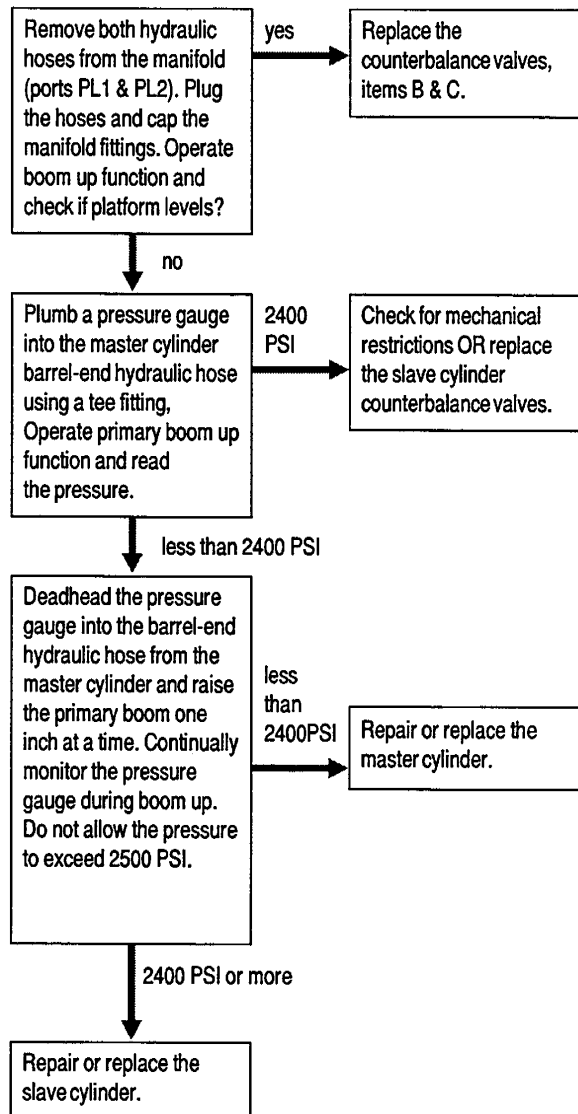
# Chart 23

## All Platform Leveling Functions Inoperative

Be sure all other functions operate normally.

Be sure both automatic and manual platform leveling do not operate.

If automatic leveling operates but manual leveling does not, troubleshoot *Platform Leveling Up Function Inoperative*.



# Chart 24

## Platform Level Up Function Inoperative

Be sure all other functions operate normally.

If platform level up function operates normally from the ground controls but not from the platform controls, troubleshoot the platform control toggle switch. See Repair section.

If platform level up function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

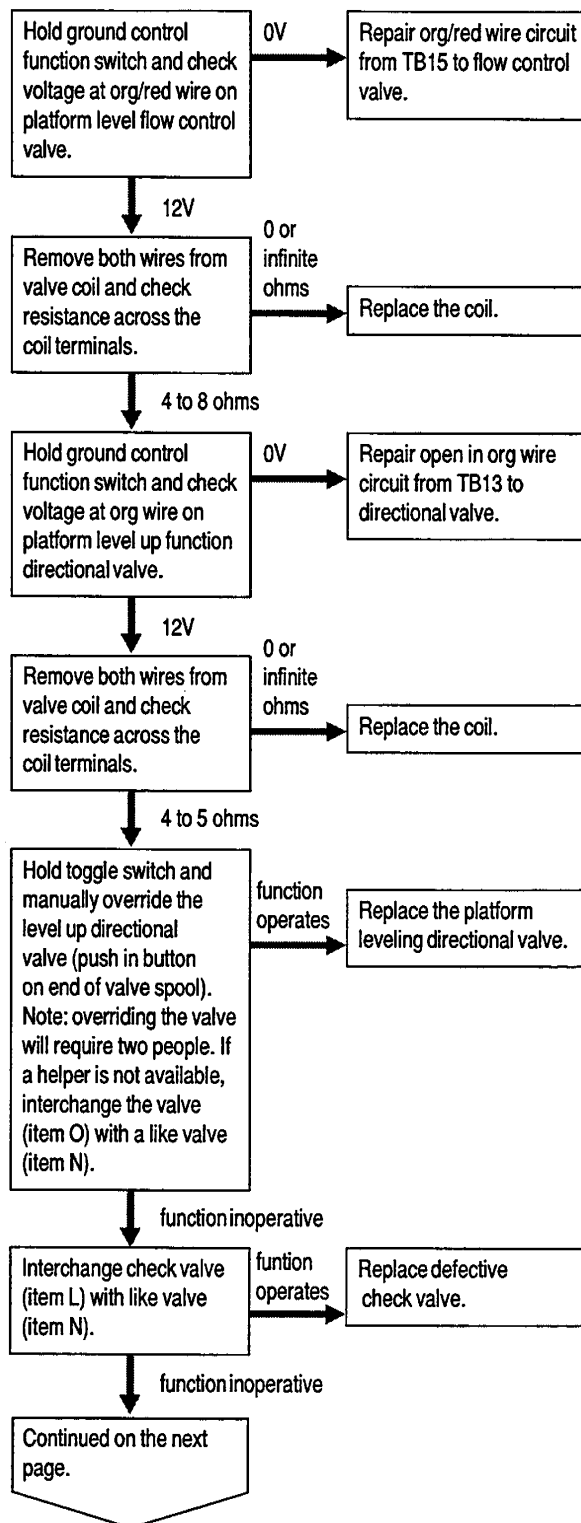
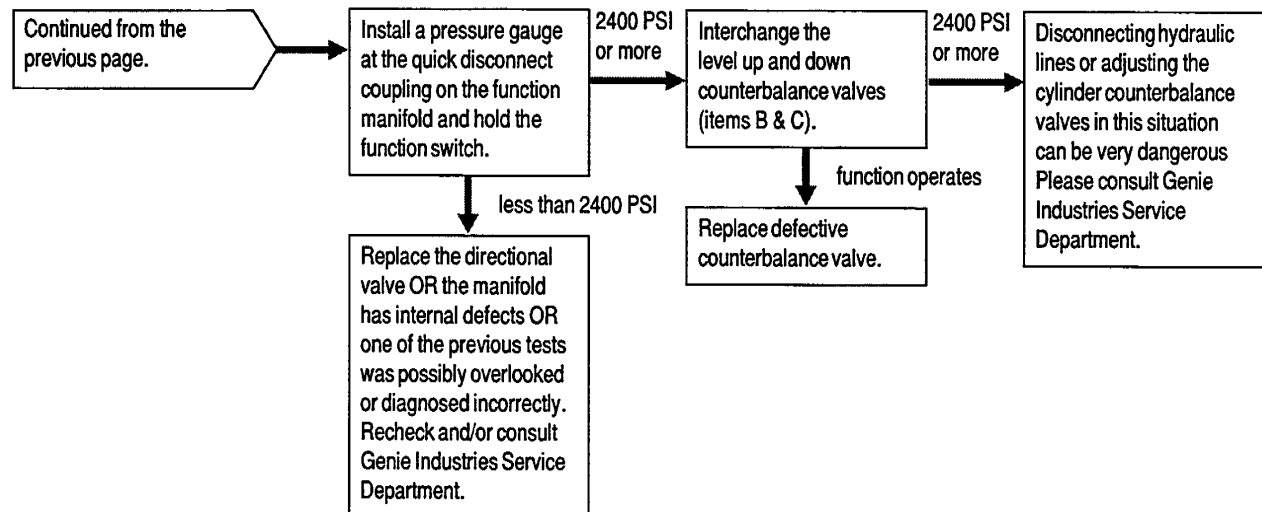


CHART 24



# Chart 25

## Platform Level Down Function Inoperative

Be sure all other functions operate normally.

If platform level down function operates normally from the ground controls but not from the platform controls, troubleshoot the platform control toggle switch. See Repair section.

If platform level down function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

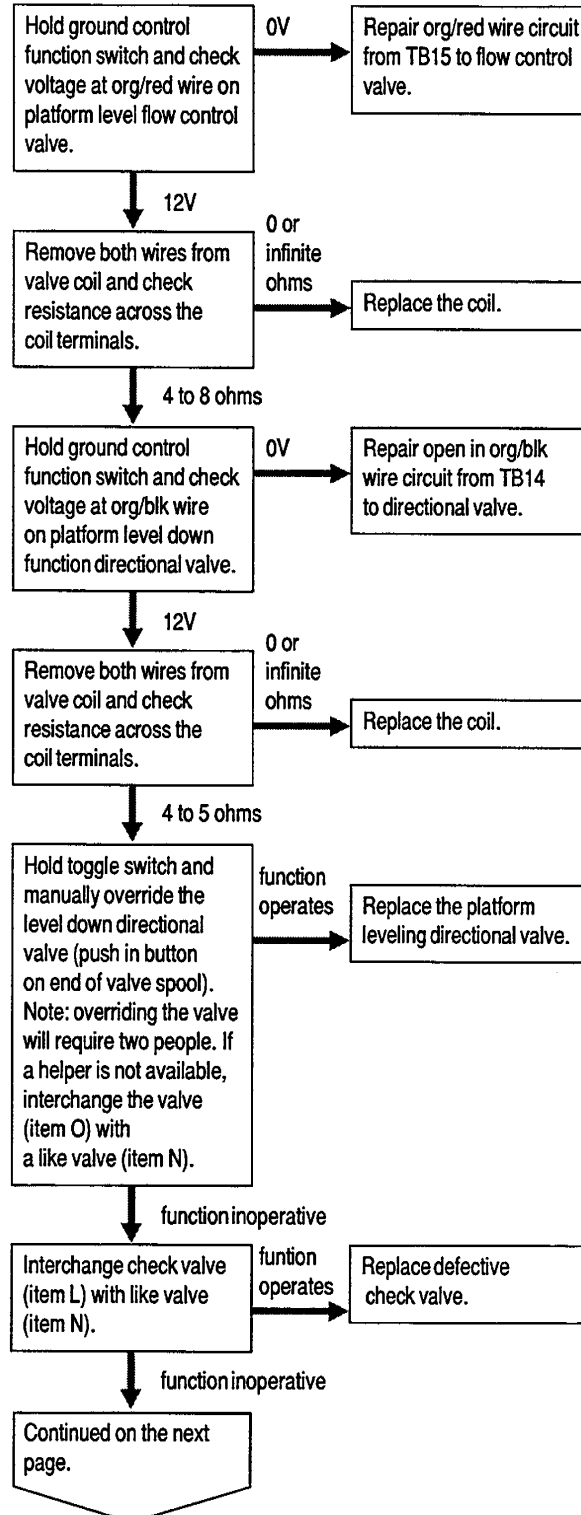
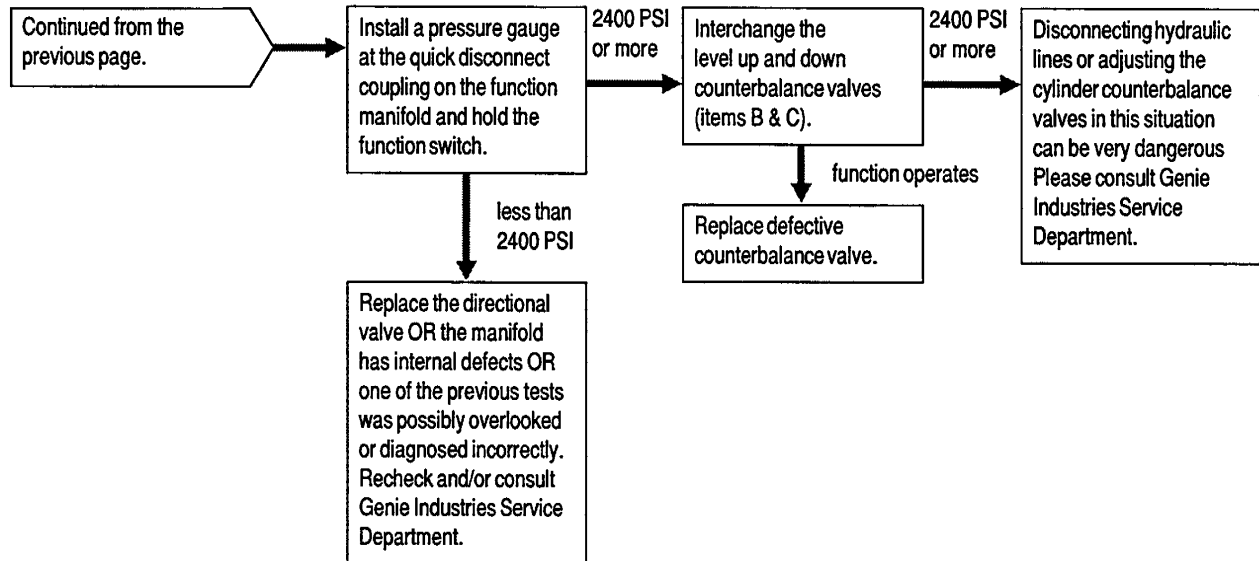


CHART 25





# Chart 26

## Jib Boom Up Function Inoperative

Be sure all other functions operate normally.

If jib boom up function operates normally from the ground controls but not from the platform controls, troubleshoot the platform control toggle switch. See Repair section.

If jib boom up function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

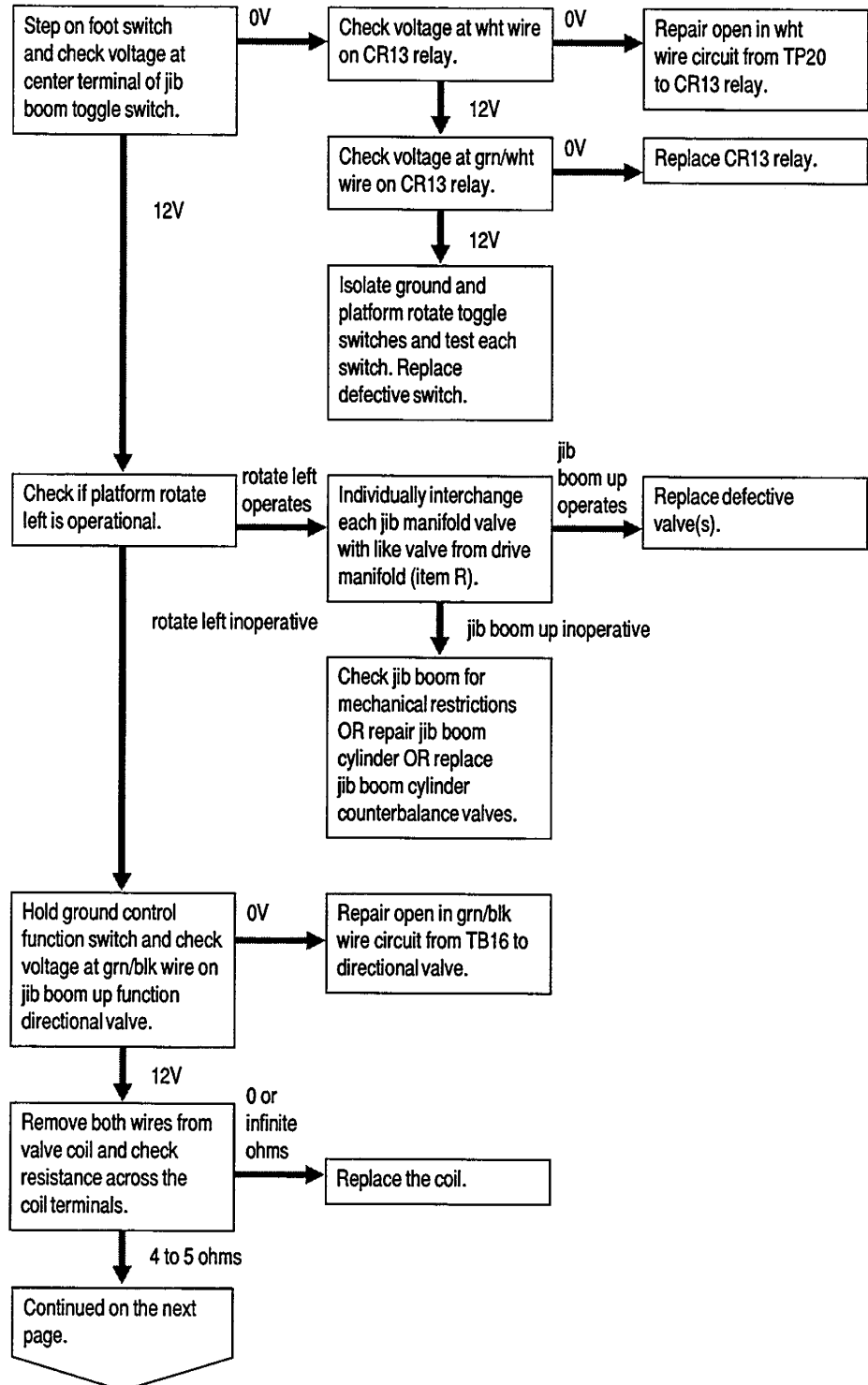
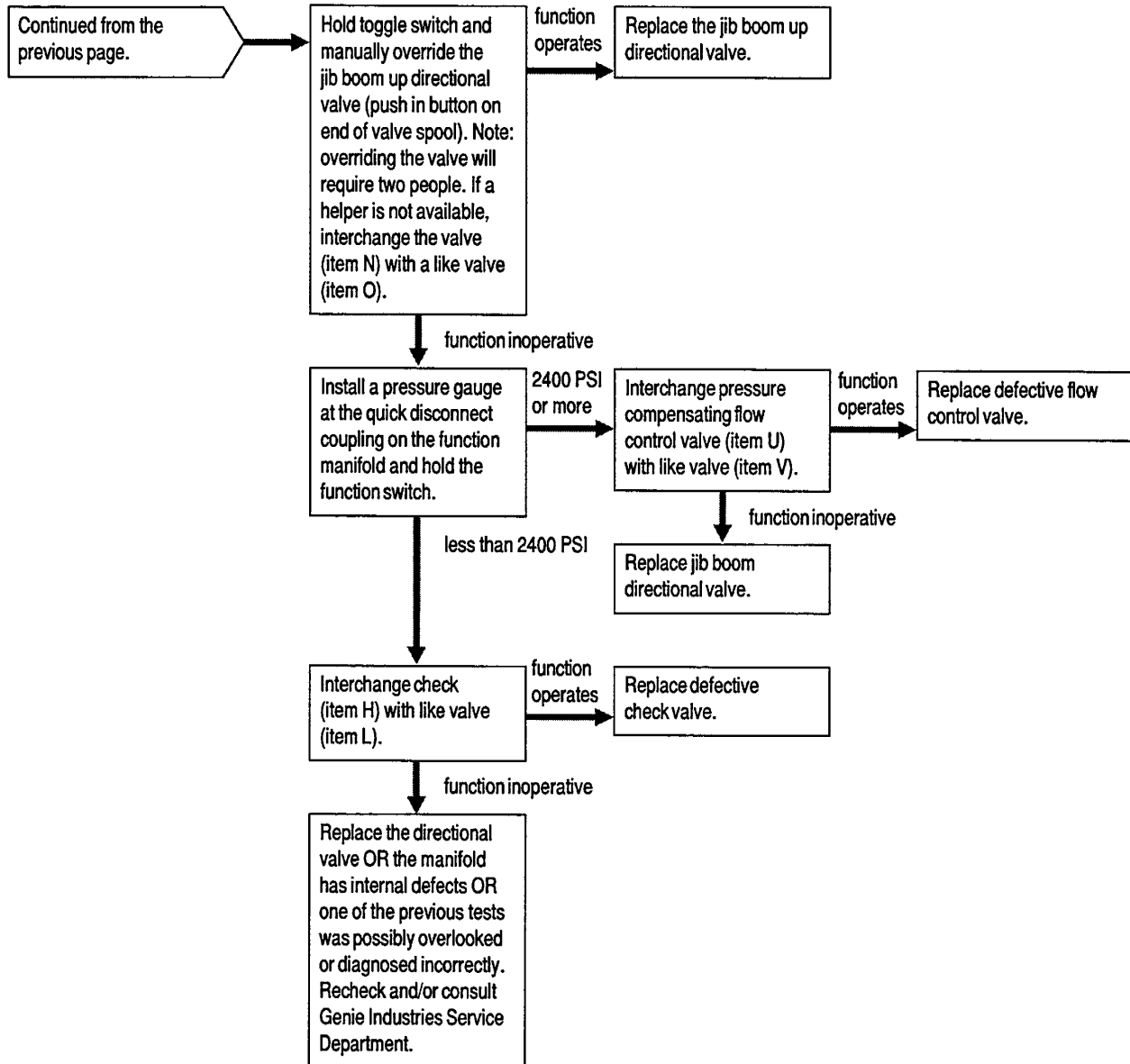


CHART 26



# Chart 27

## Jib Boom Down Function Inoperative

Be sure all other functions operate normally.

If jib boom down function operates normally from the ground controls but not from the platform controls, troubleshoot the platform control toggle switch. See Repair section.

If jib boom down function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

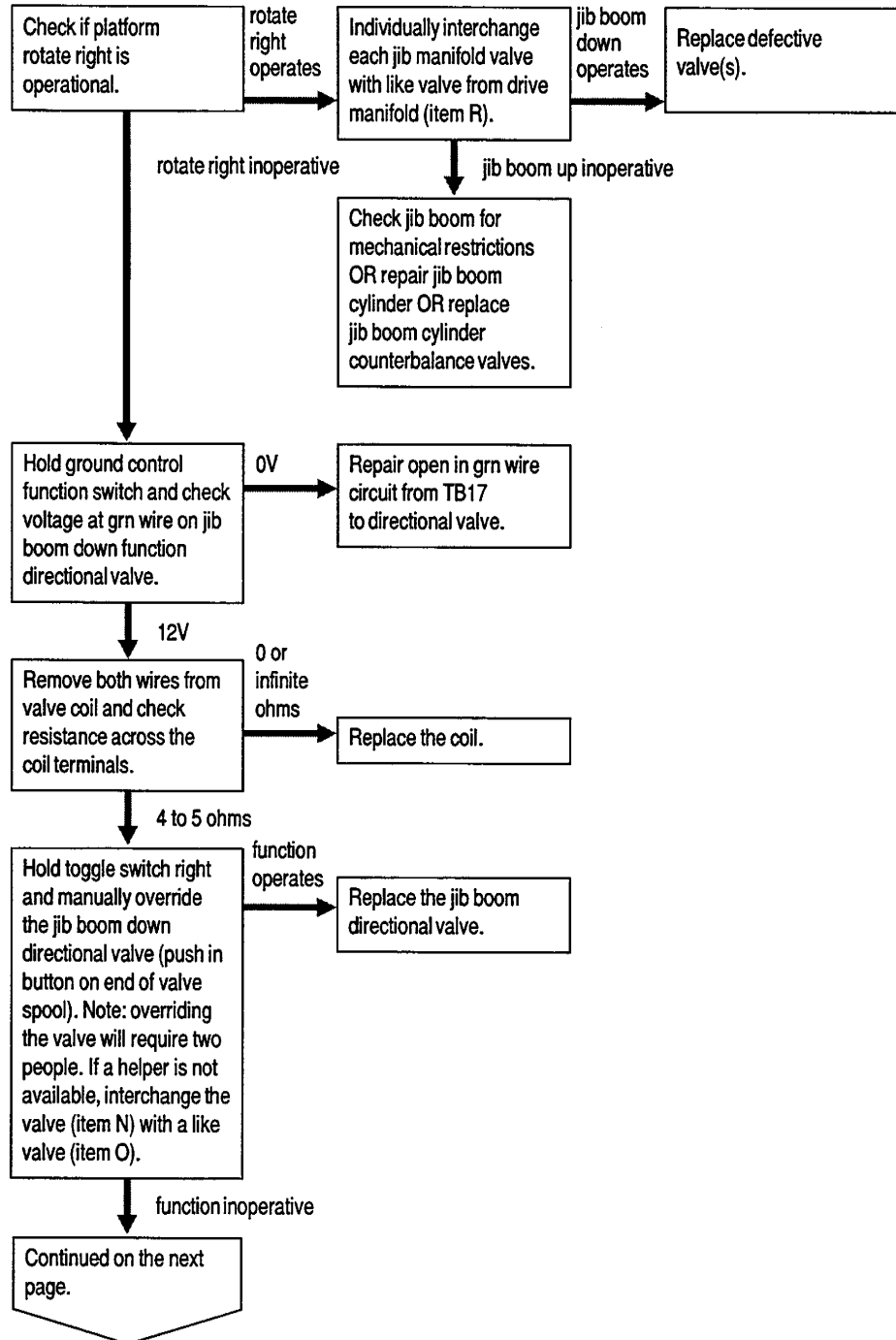
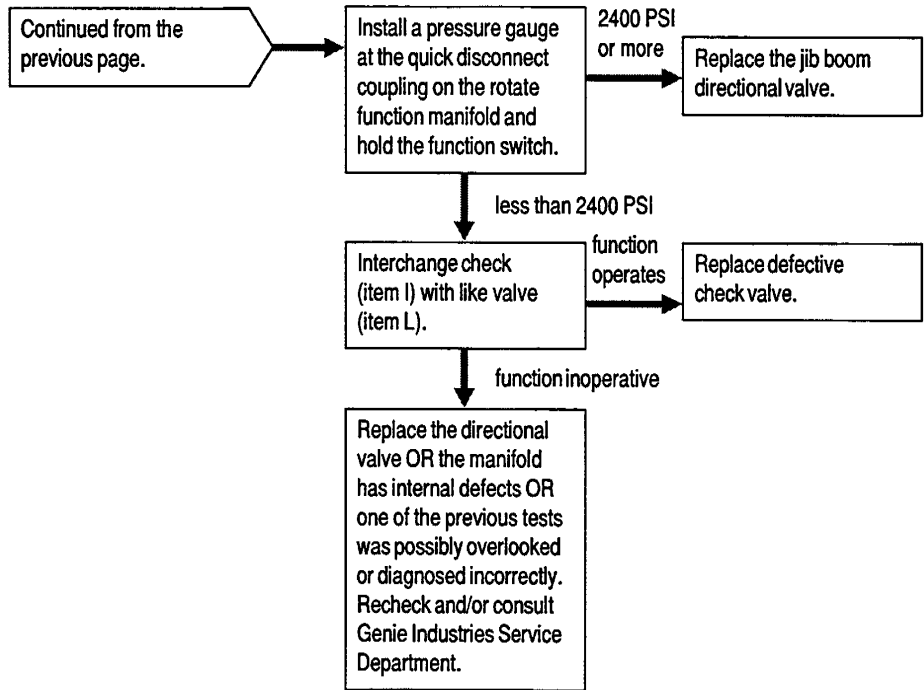


CHART 27



# Chart 28

## Platform Rotate Left Function Inoperative

Be sure all other functions operate normally.

If platform rotate left function operates normally from the ground controls but not from the platform controls, troubleshoot the platform control toggle switch. See Repair section.

If platform rotate left function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

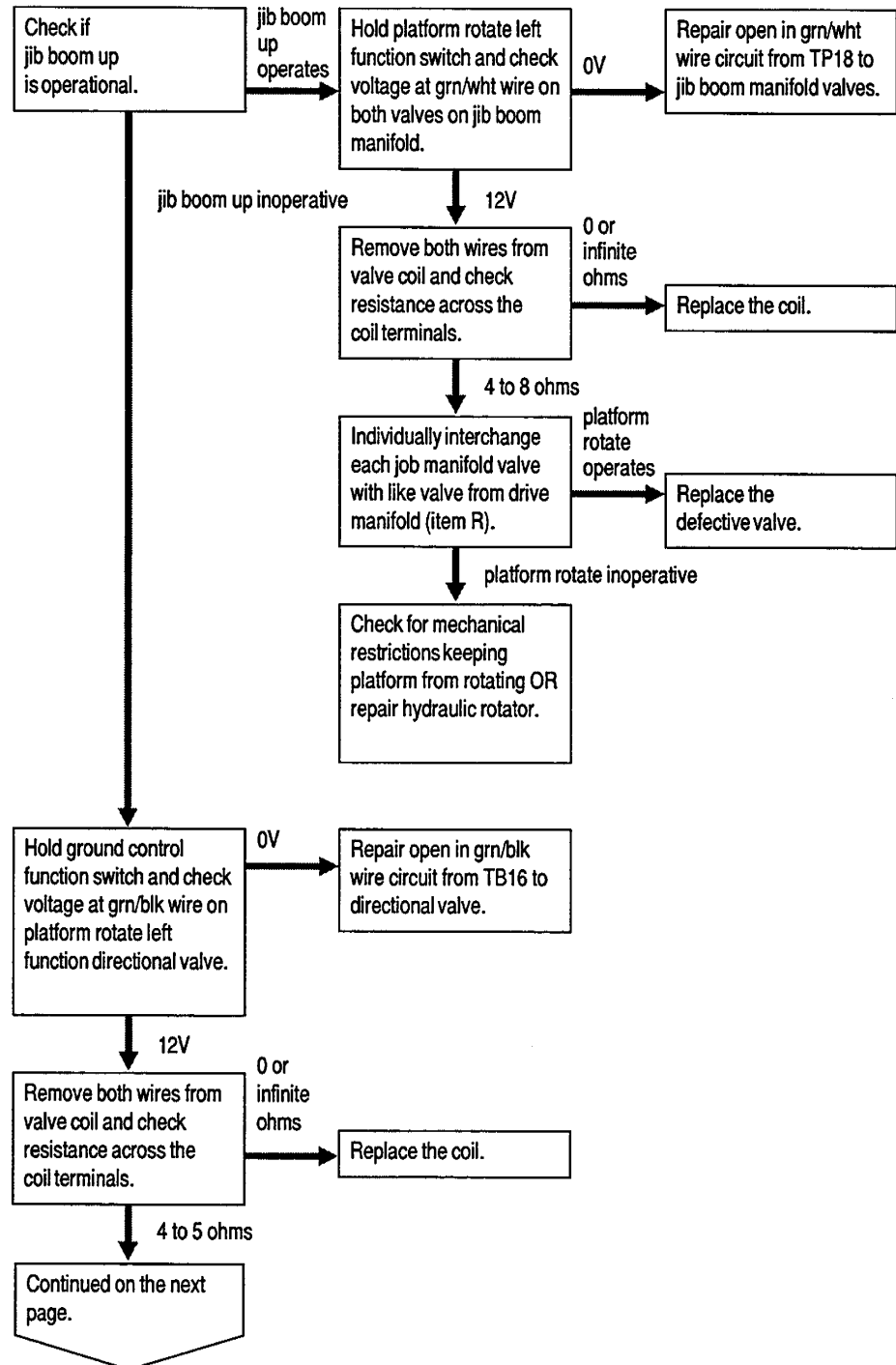
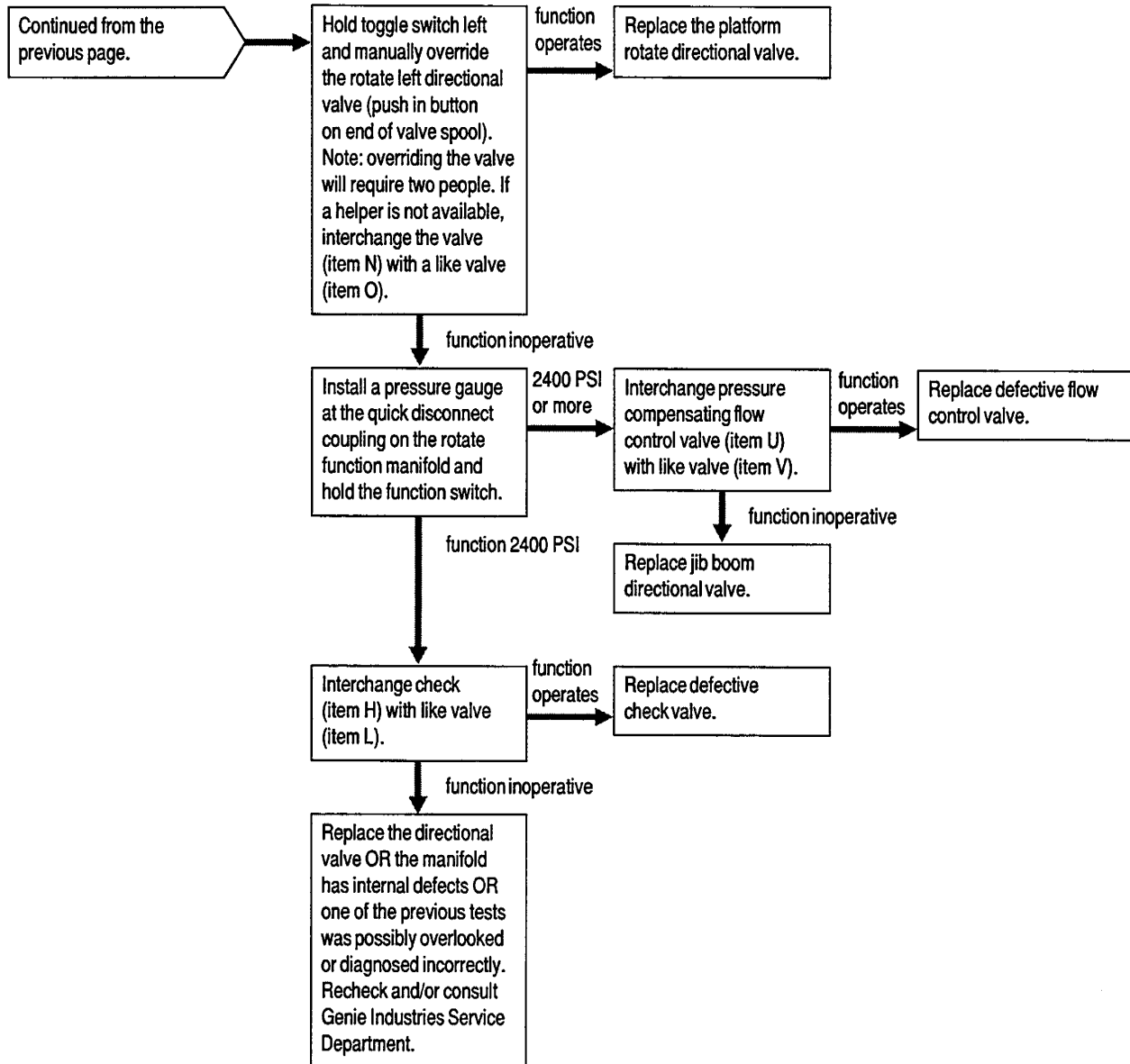


CHART 28



# Chart 29

## Platform Rotate Right Function Inoperative

Be sure all other functions operate normally.

If platform rotate right function operates normally from the ground controls but not from the platform controls, troubleshoot the platform control toggle switch. See Repair section.

If platform rotate right function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

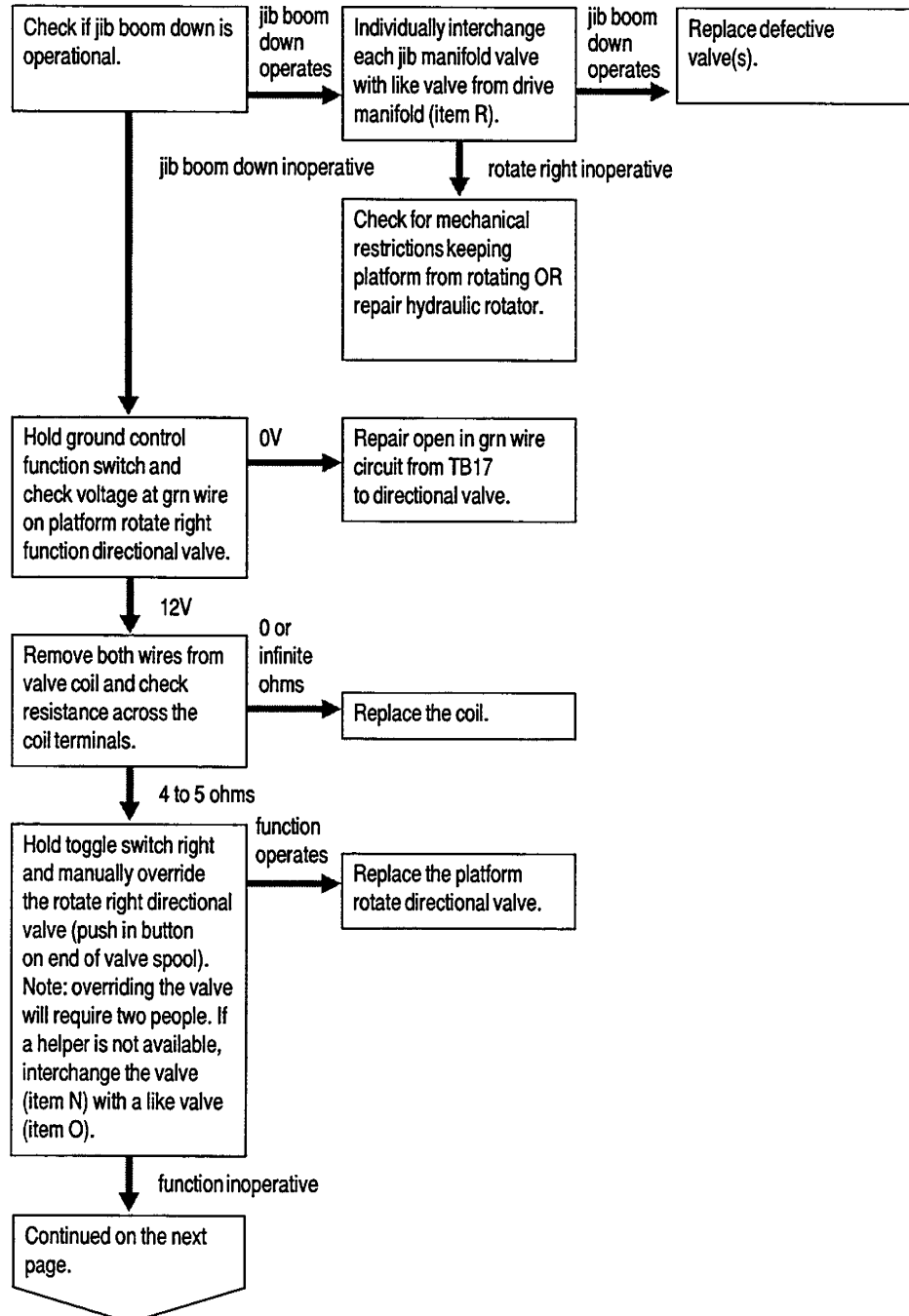
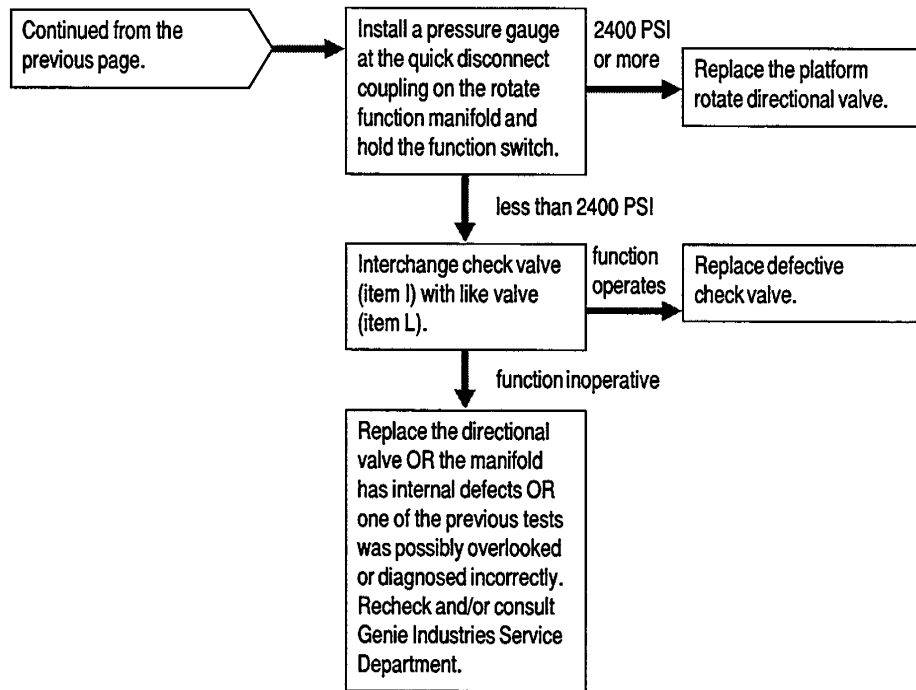


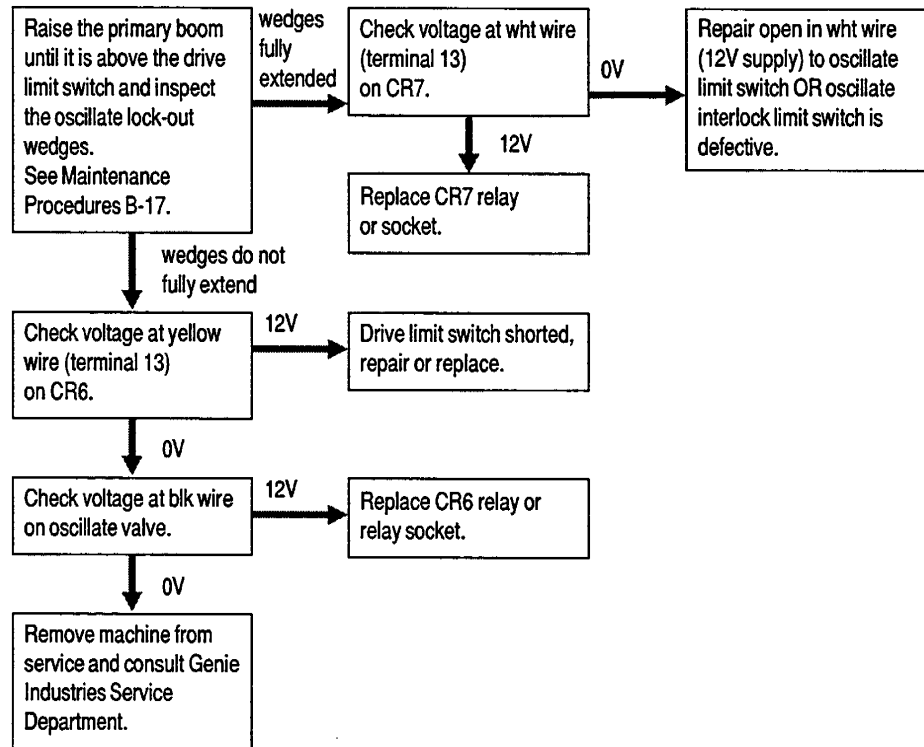
CHART 29





# Chart 30

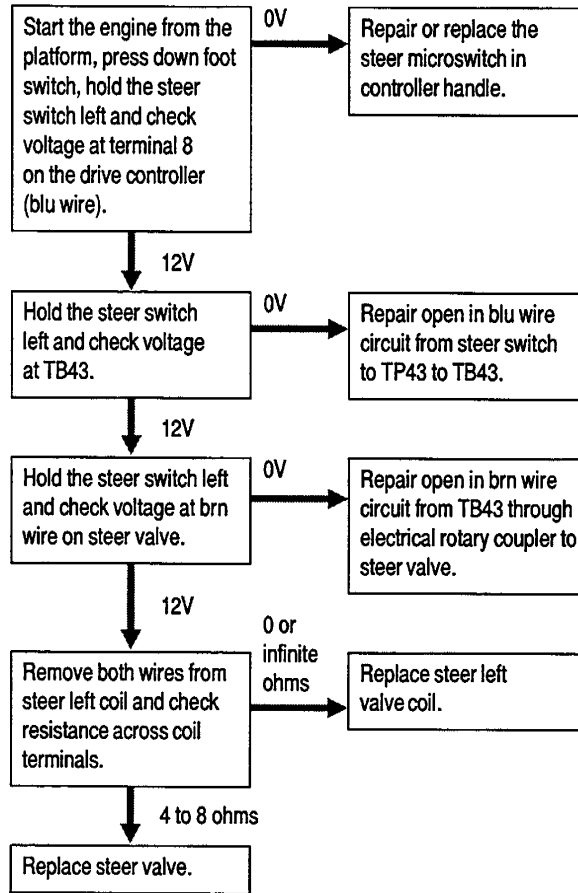
## Oscillate Lock-out Function Inoperative



# Chart 31

## Steer Left Function Inoperative

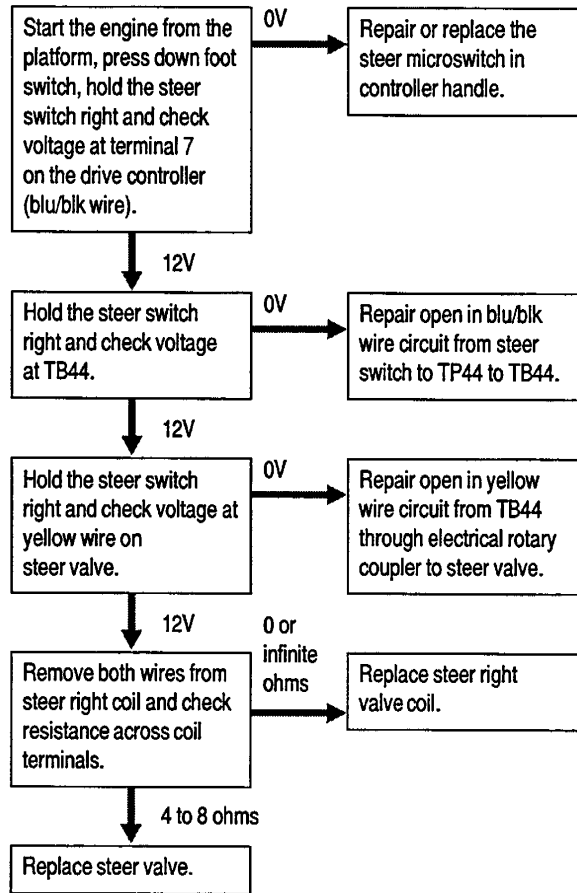
Be sure all other functions operate normally.



# Chart 32

## Steer Right Function Inoperative

Be sure all other functions operate normally.



# Chart 33

## All Drive Functions Inoperative, All Other Functions Operate Normally

Be sure the hydraulic suction line valve is in the open position.

Be sure machine is not in the free wheel configuration.

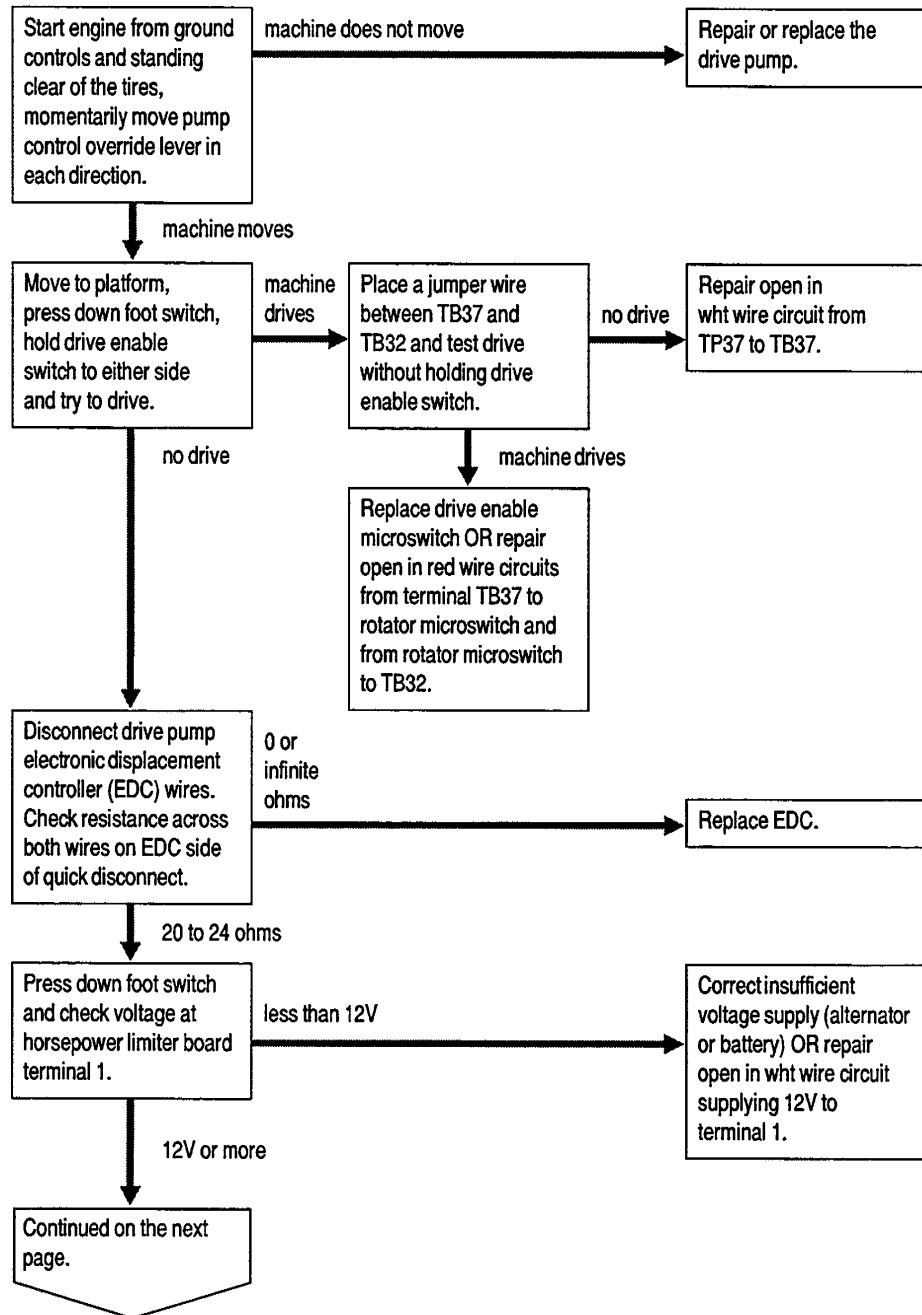


CHART 33

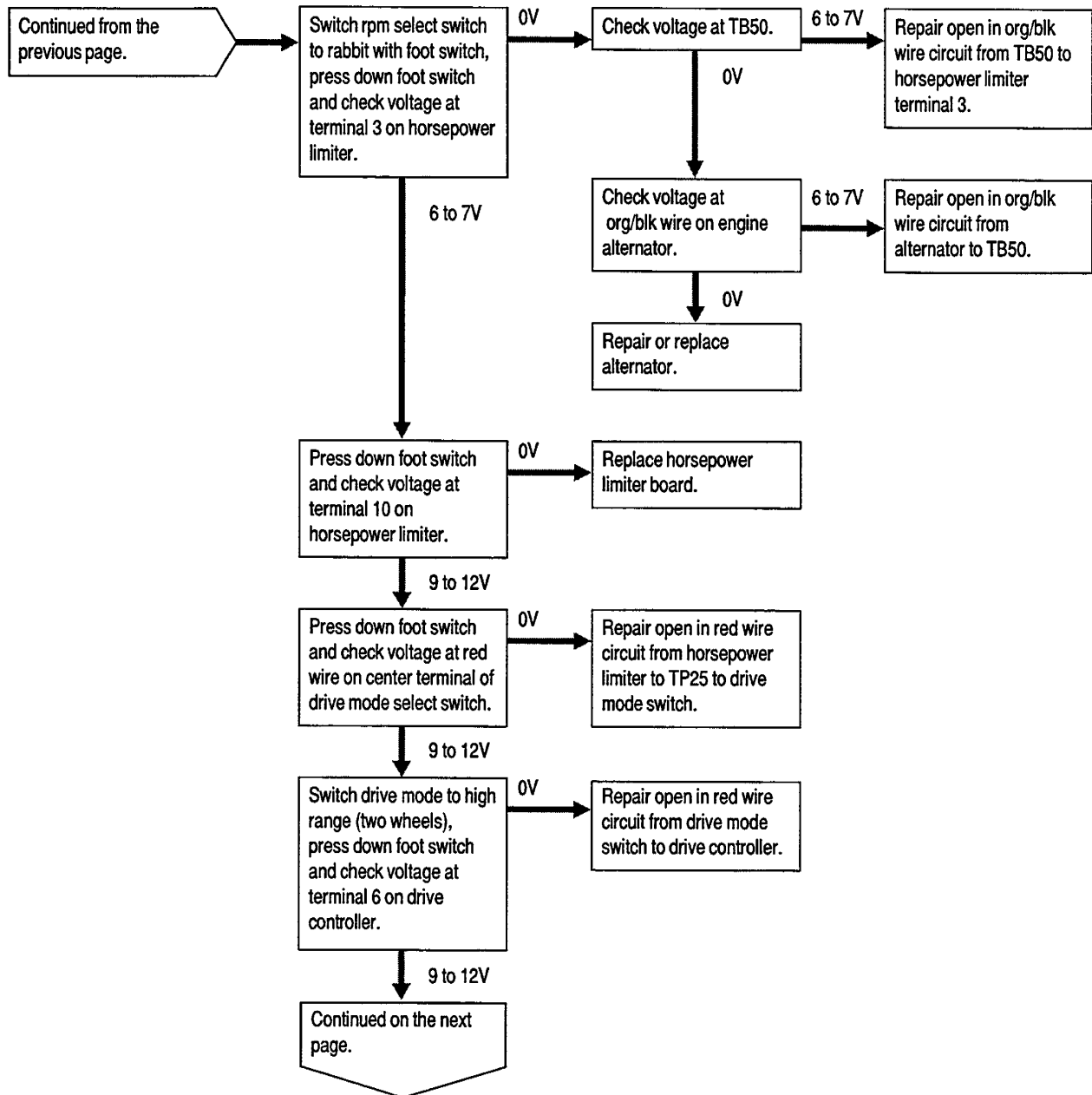
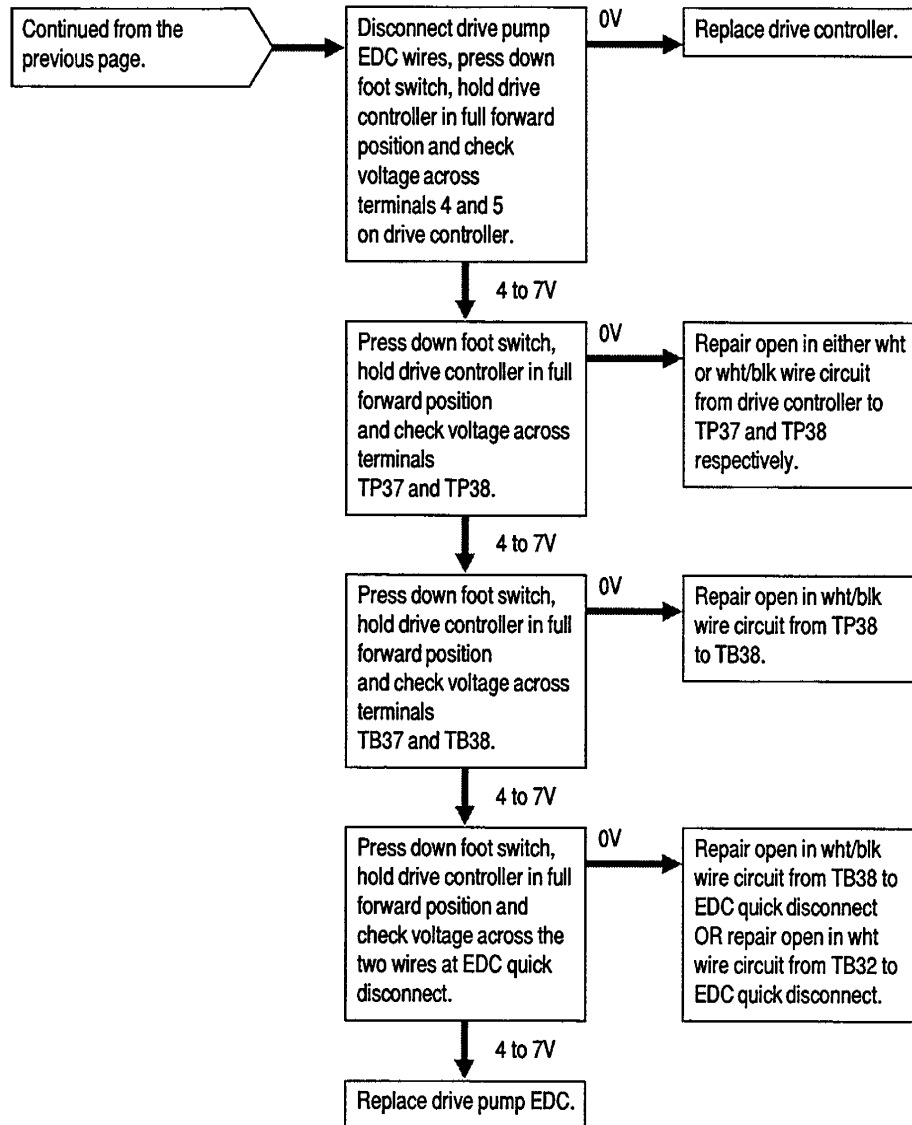


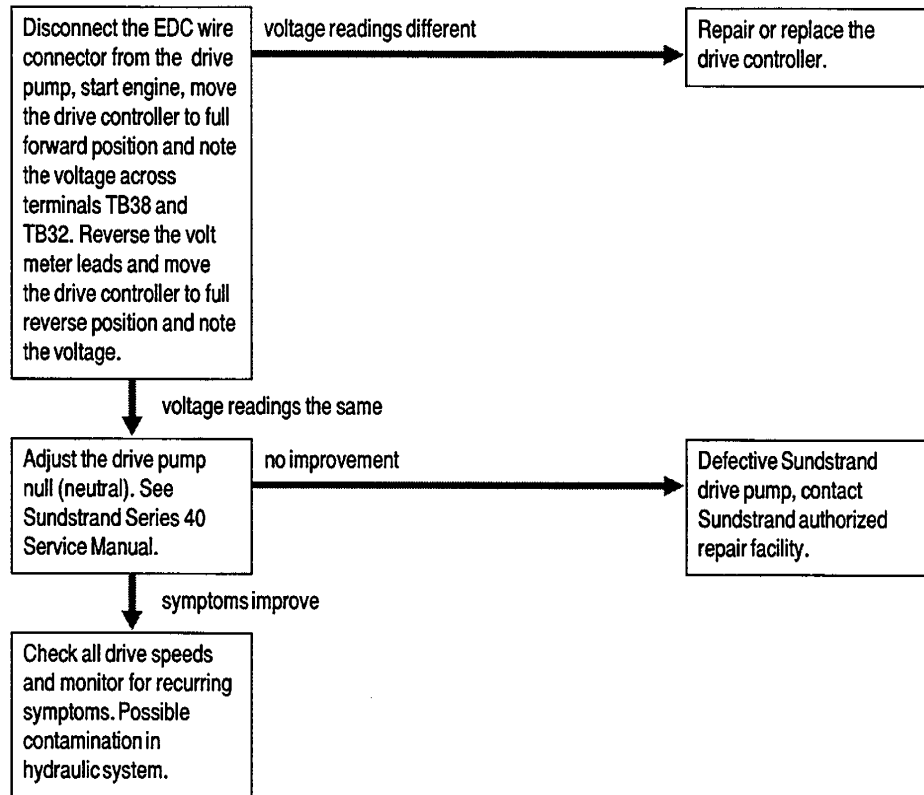
CHART 33



# Chart 34

## Drive Forward Or Reverse Function Inoperative

Be sure all other functions operate normally including drive in opposite direction of malfunction.



# Chart 35

## High Range Drive Function Inoperative

Be sure all other functions operate normally including drive low range (four wheel symbol).

Be sure all drive manifold solenoid valve grounding wires are free of corrosion and have full continuity to ground.

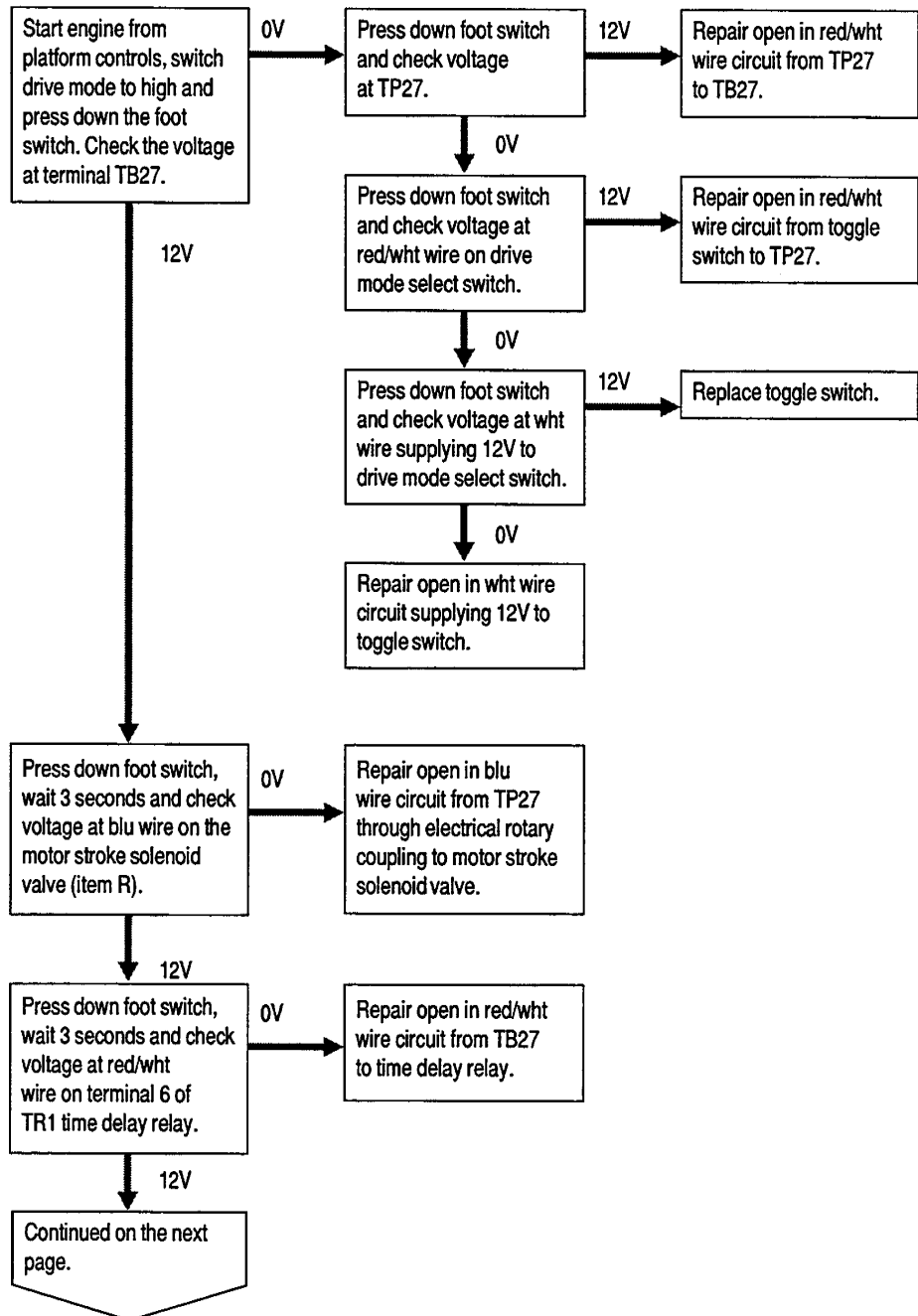
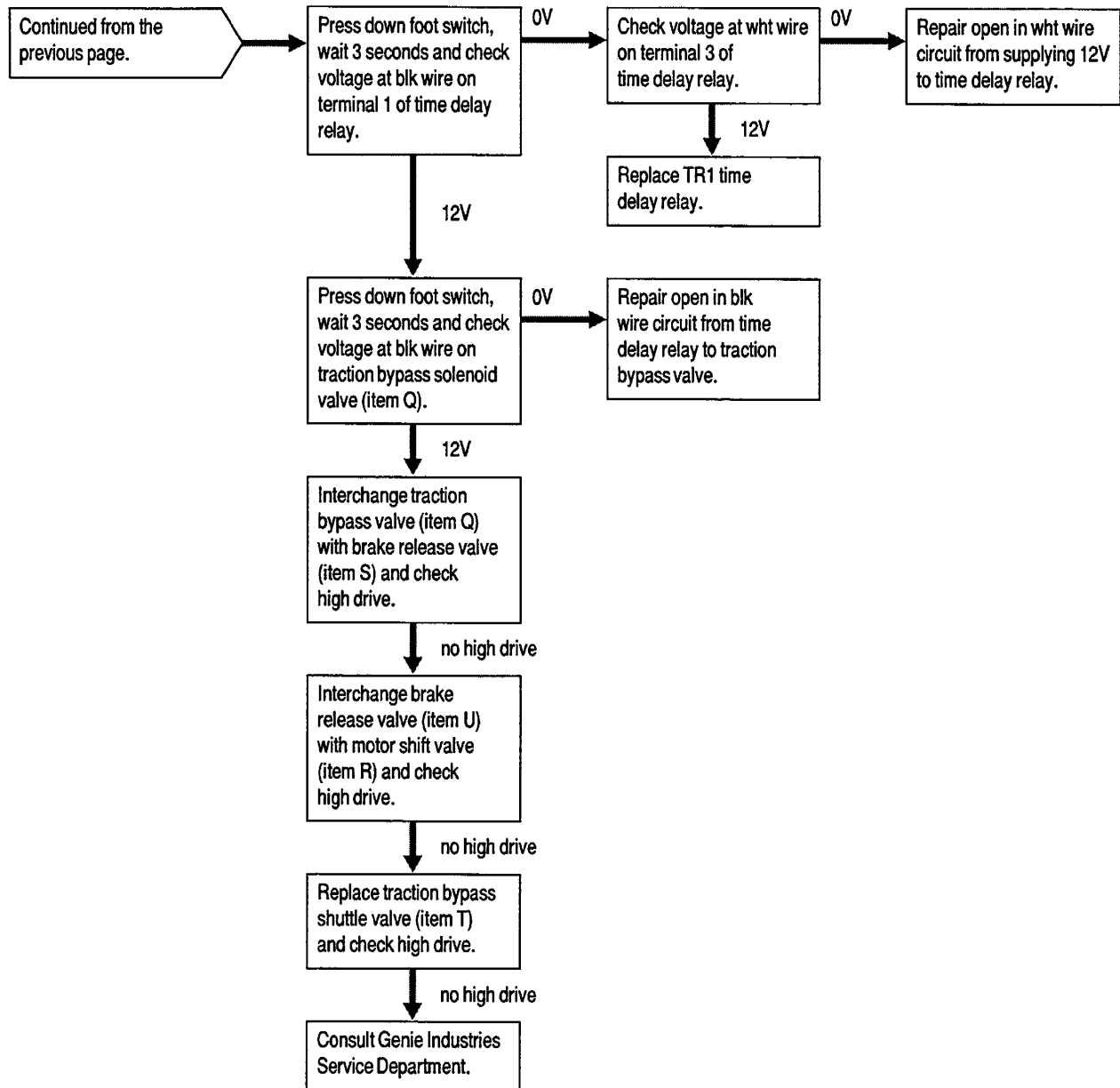




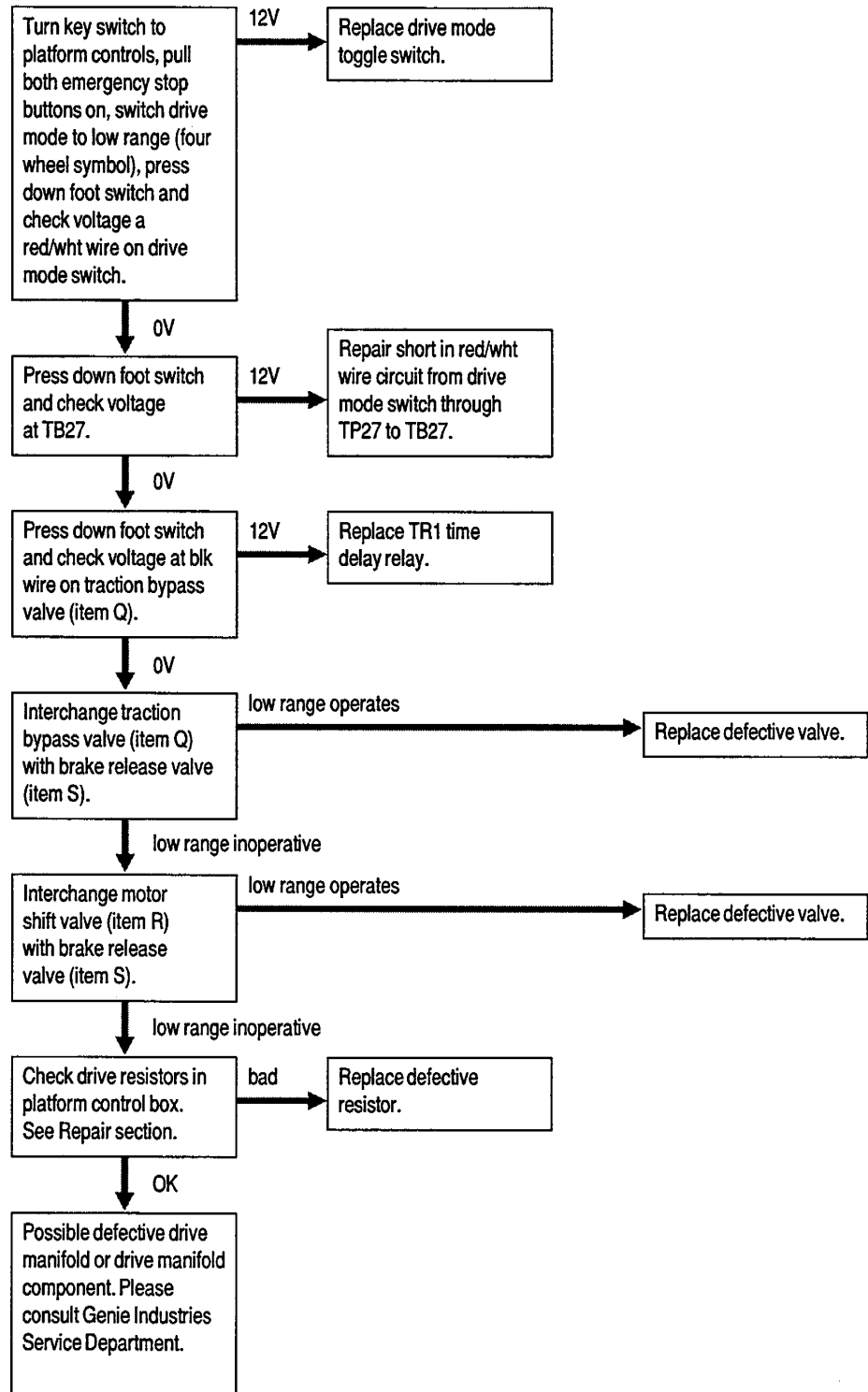
CHART 35



# Chart 36

## Low Range Drive Function Inoperative

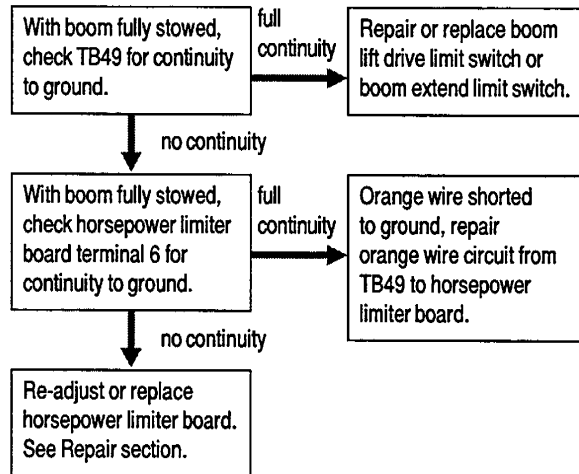
Be sure all other functions operate normally including drive high range (two wheel symbol).



# Chart 37

## Machine Will Not Drive At Full Speed

Be sure all other functions operate normally.



# Chart 38

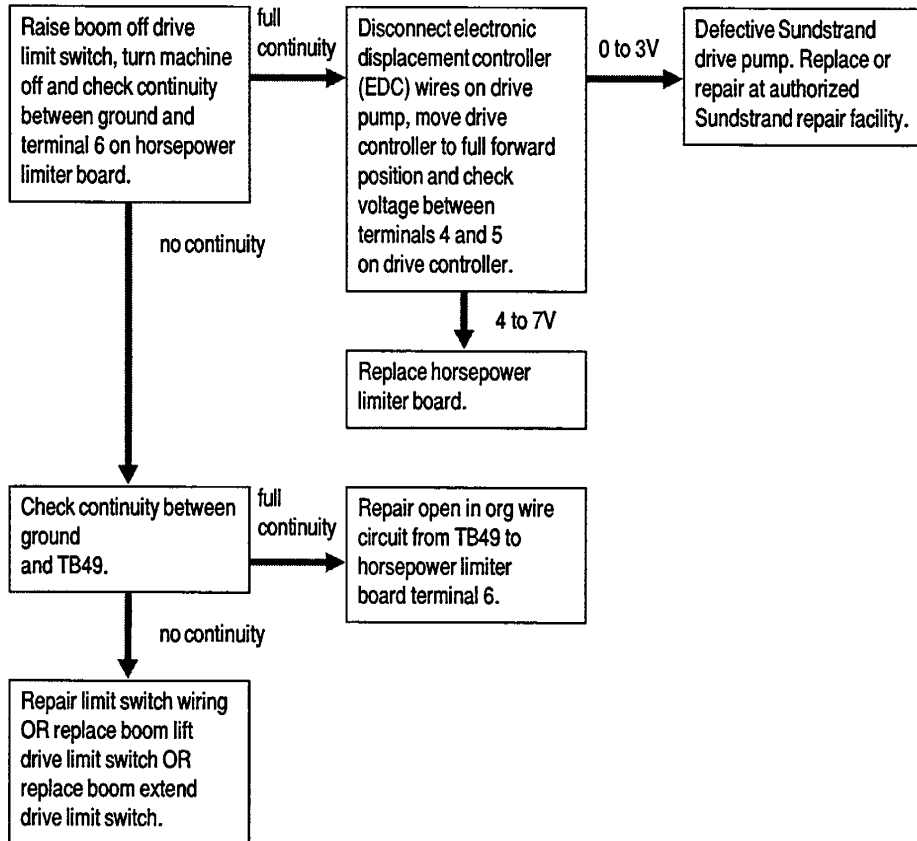
## Machine Drives At Full Speed With Platform Raised or Extended

Remove machine from service immediately.

Be sure boom lift drive limit switch or boom extend drive limit switch is not being held down or up.

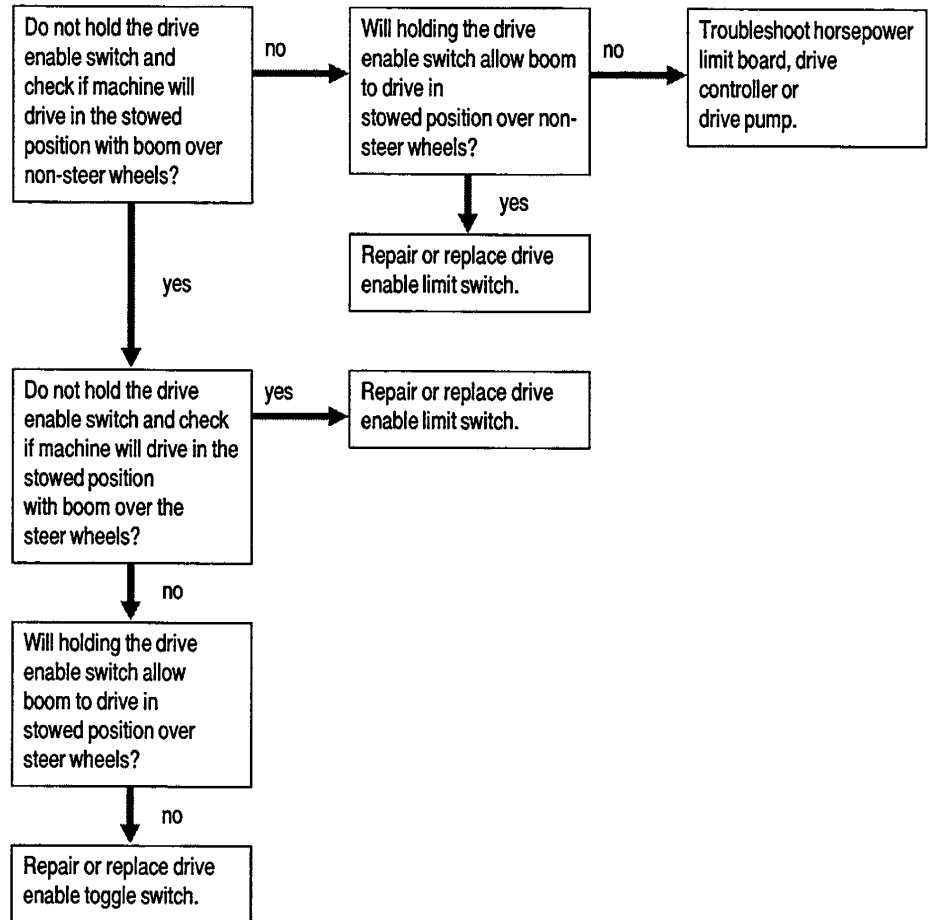
Be sure wiring to limit switches is intact and shows no sign of tampering.

Be sure orange wire (cable 1) is properly attached to horsepower limiter.



# Chart 39

## Drive Enable System Is Malfunctioning



# Chart 40

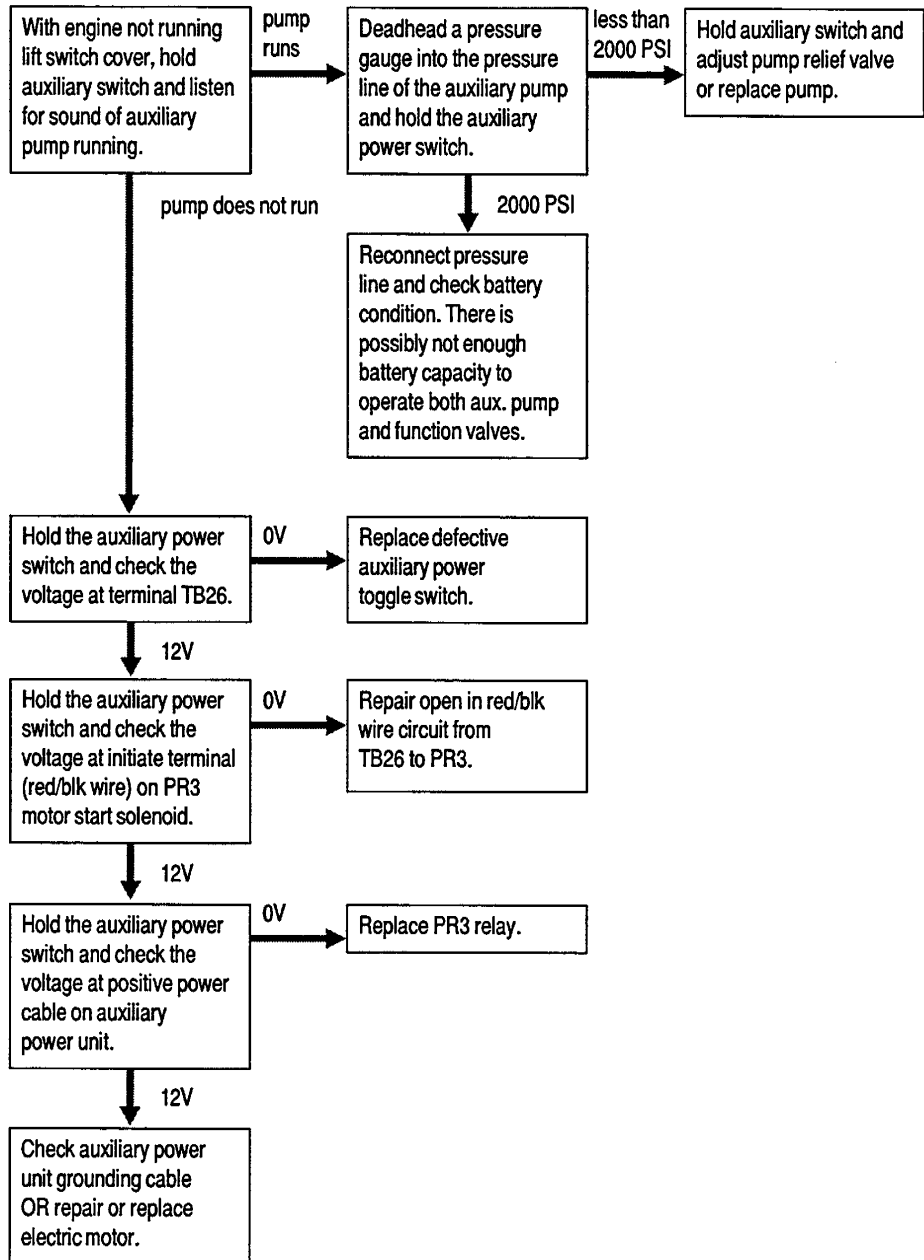
## Auxiliary Functions Inoperative

Be sure all other functions operate normally.

Be sure key switch is in the appropriate position and the emergency stop buttons are pulled up into the on position.

Be sure engine is not running when using auxiliary power.

Note: Operating auxiliary power with the engine running should immediately kill the engine.



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# Schematics



## Observe and Obey:

- ☑ Troubleshooting and repair procedures shall be completed by a person trained and qualified on the repair of this machine.
- ☑ Immediately tag and remove from service a damaged or malfunctioning machine.
- ☑ Repair any machine damage or malfunction before operating the machine.

## Before Troubleshooting:

- ☑ Read, understand and obey the safety rules and operating instructions in the *Genie Z-60/34 Operator's Manual*.
- ☑ Be sure that all necessary tools and test equipment are available and ready for use.

## About This Section

There are two groups of schematics in this section. An illustration legend precedes each group of drawings.

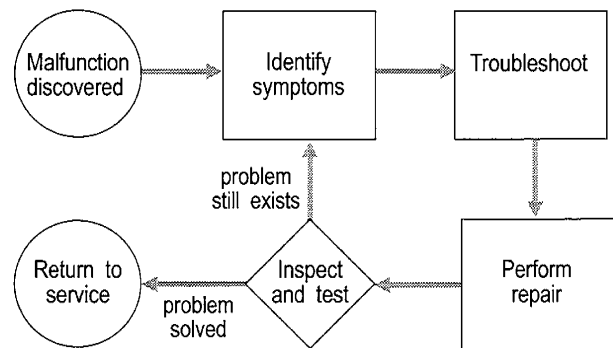
### Electrical Schematics

**⚠ WARNING** Electrocutation hazard. Contact with hot or live circuits may result in death or serious injury. Remove all rings, watches and other jewelry.

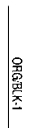
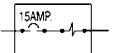
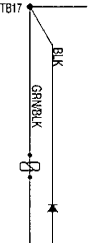

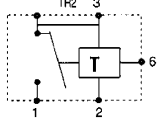



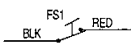
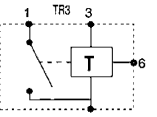



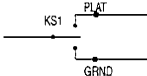
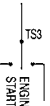




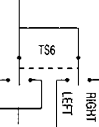



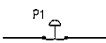
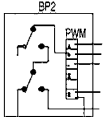

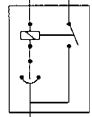


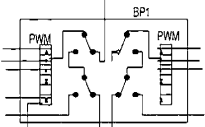






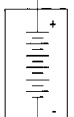
### Hydraulic Schematics

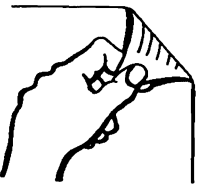
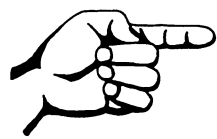
**⚠ WARNING** Bodily injury hazard. Spraying hydraulic oil can perforate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

### General Repair Process

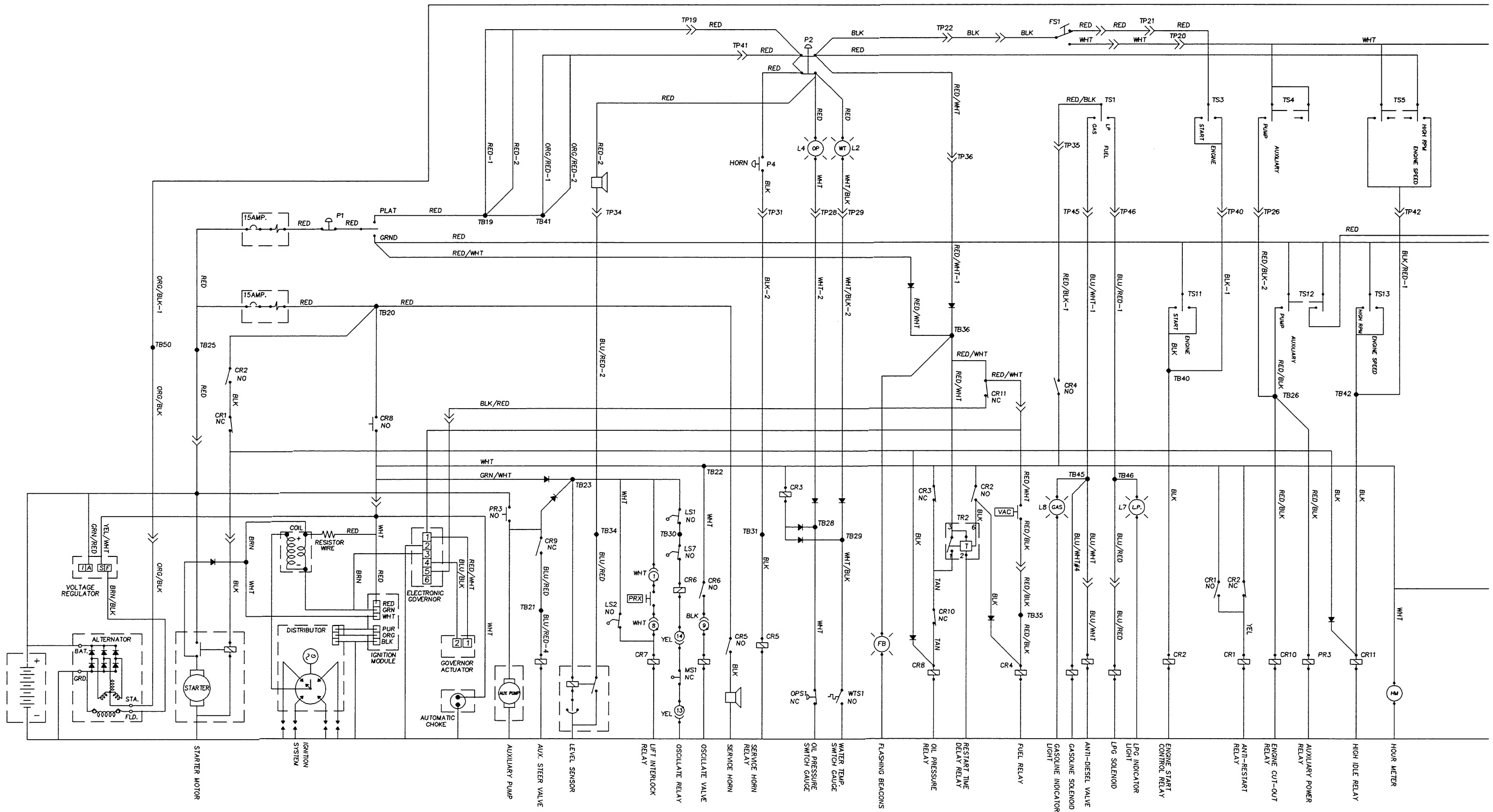


# Electrical Symbols Legend

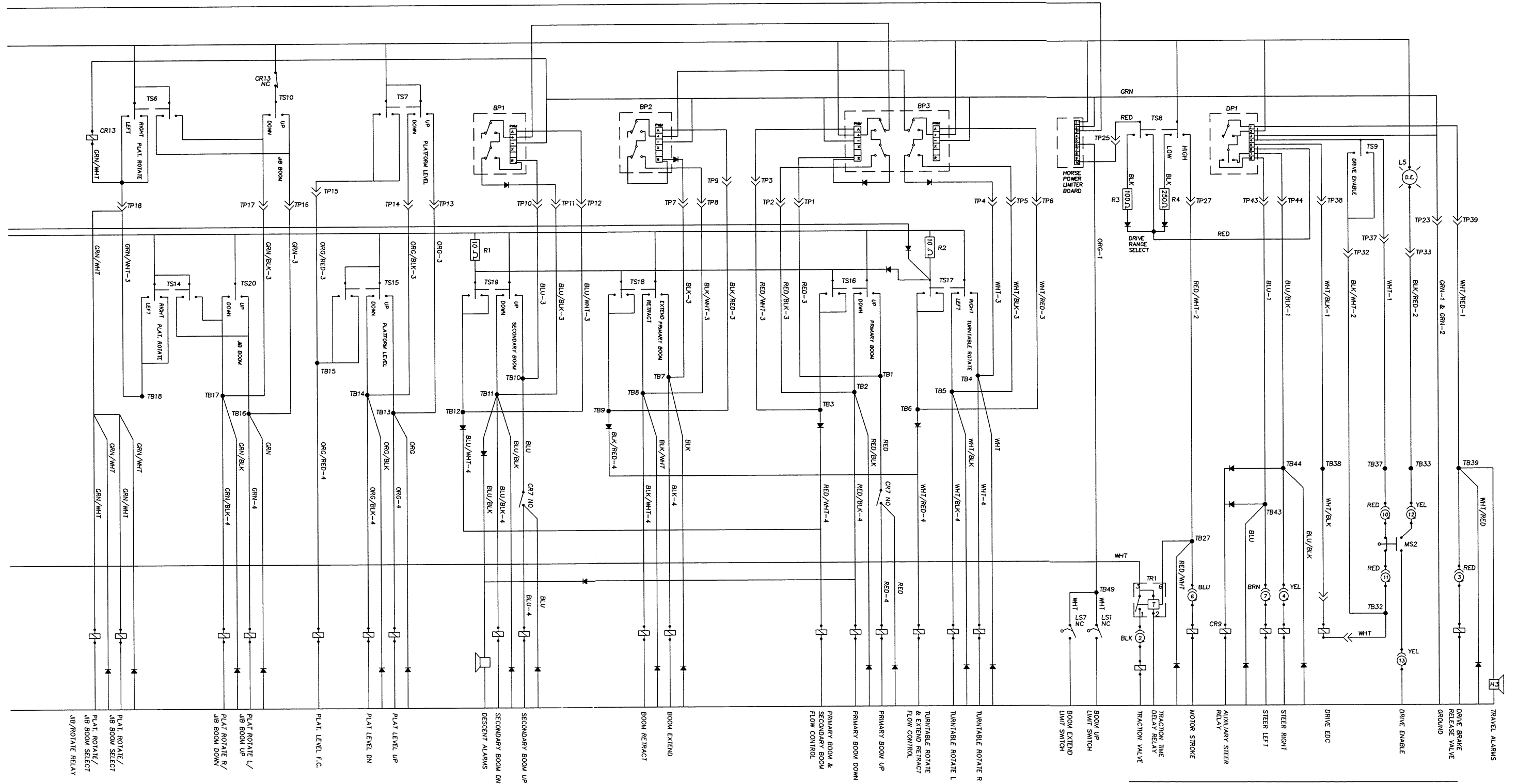
 <p>Wire color with cable number</p>	 <p>Circuit breaker</p>	 <p>Ground suppression circuit</p>	 <p>Water temperature switch normally open</p>	 <p>Time delay relay positive switching</p>
 <p>Terminal</p>	 <p>Solenoid or relay coil</p>	 <p>Limit switch</p>	 <p>Foot switch</p>	 <p>Time delay relay negative switching</p>
 <p>Quick disconnect terminal</p>	 <p>Horn</p>	 <p>Limit switch normally open held closed</p>	 <p>Key switch</p>	 <p>Toggle switch SPDI</p>
 <p>T-circuits connect at terminal</p>	 <p>Light</p>	 <p>Limit switch normally open held open</p>	 <p>Horn button normally open</p>	 <p>Toggle switch DPDT</p>
 <p>T-circuits connect</p>	 <p>Resistor</p>	 <p>Limit switch normally closed held open</p>	 <p>Emergency Stop button normally closed</p>	 <p>Single axis proportional controller</p>
 <p>Connection no terminal</p>	 <p>Tilt sensor</p>	 <p>Vacuum switch normally open</p>	 <p>Relay contact normally open</p>	 <p>Dual axis proportional controller</p>
 <p>Circuits crossing no connection</p>	 <p>Spark plug</p>	 <p>Oil pressure switch normally closed</p>	 <p>Relay panel contactor</p>	
 <p>Diode</p>	 <p>Glow plug</p>			
 <p>Battery</p>				



# Electrical Schematic - Gasoline/LPG Models

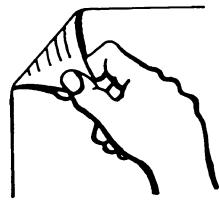


# Electrical Schematic - Gasoline/LPG Models

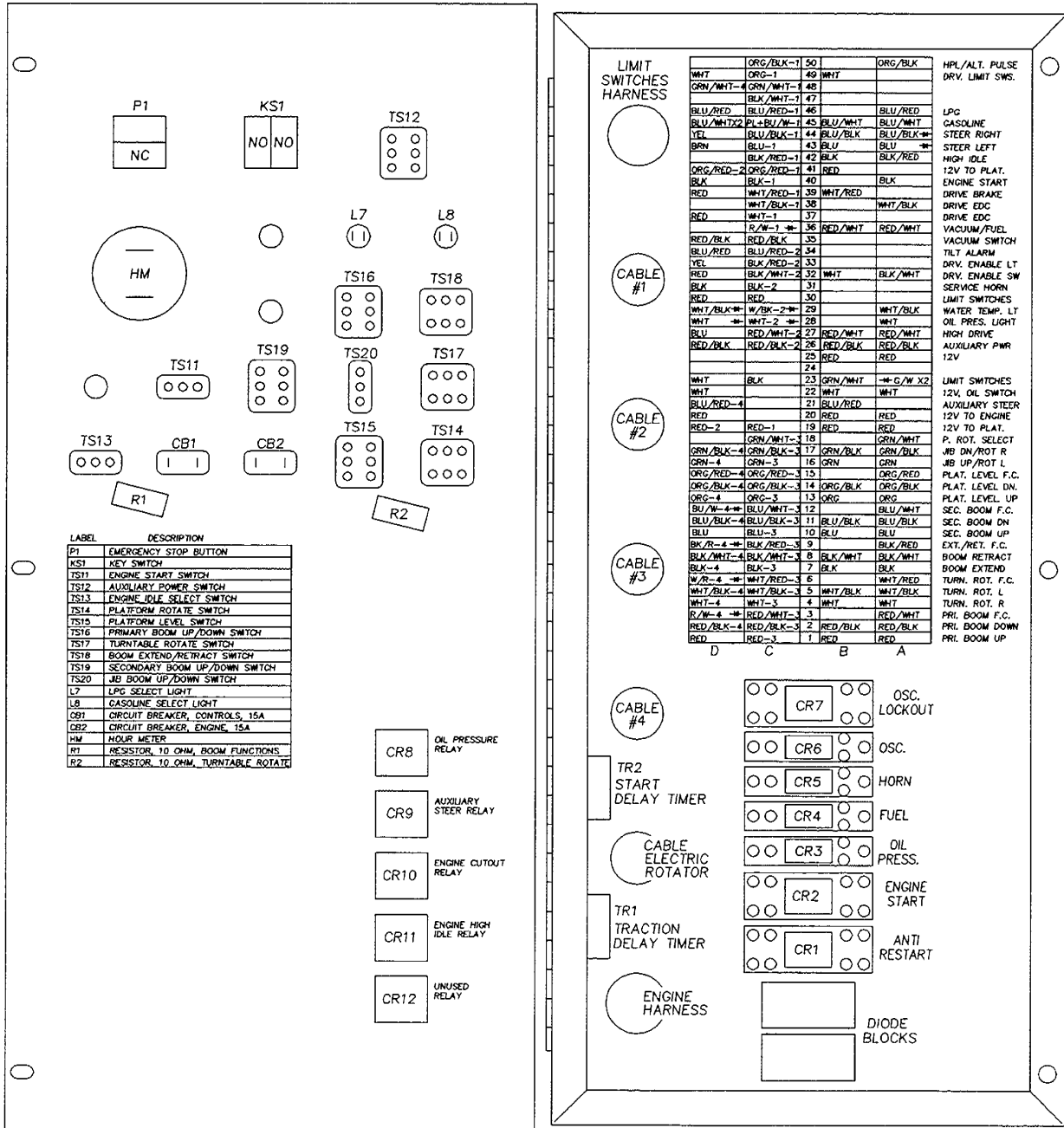


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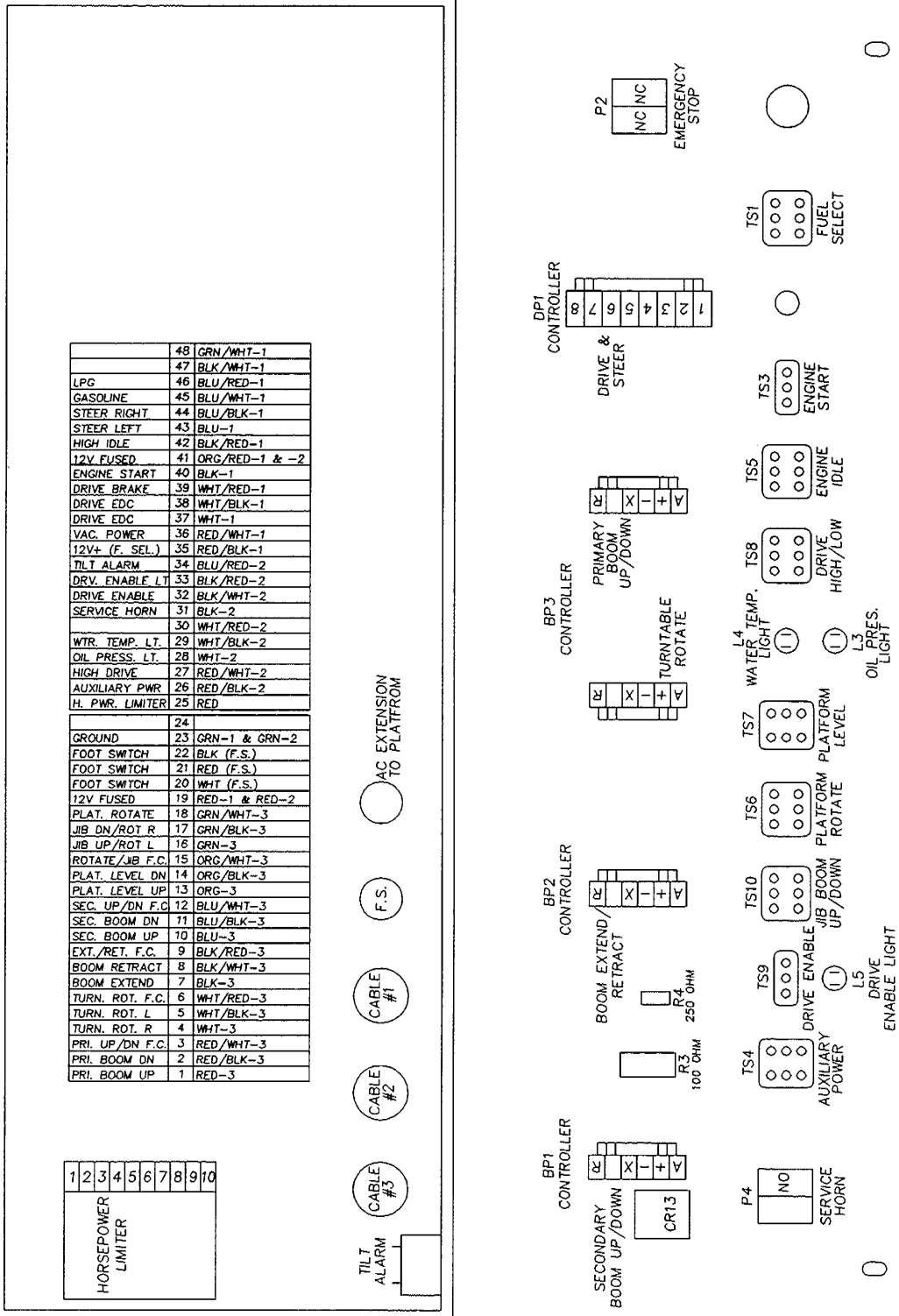
**Electrical Schematic -  
Gasoline/LPG Models**



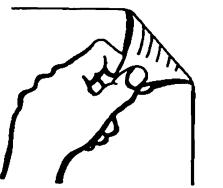
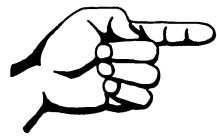
## Ground Control Box Legend - Gasoline/LPG Models



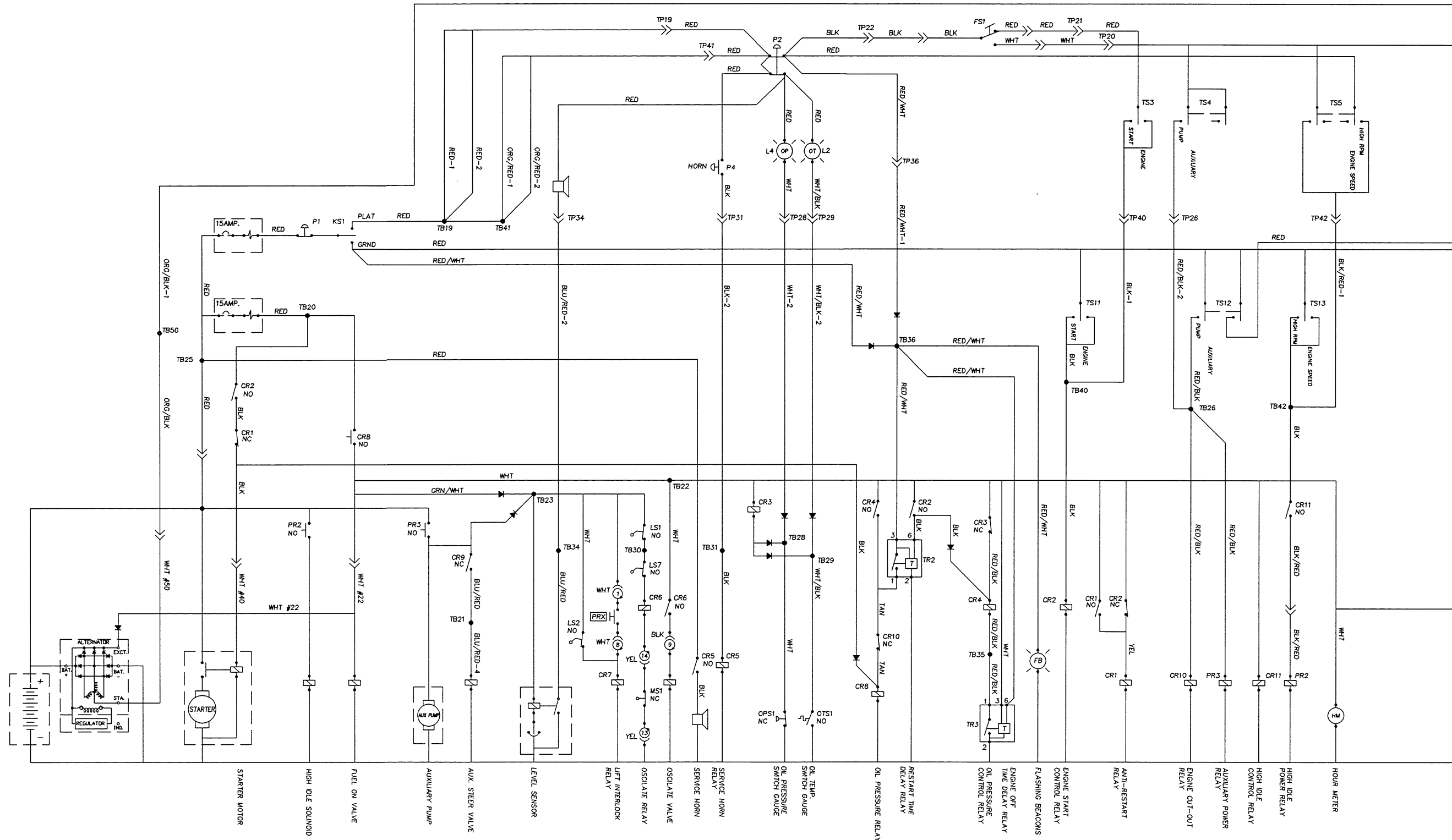
# Platform Control Box Legend - Gasoline/LPG Models



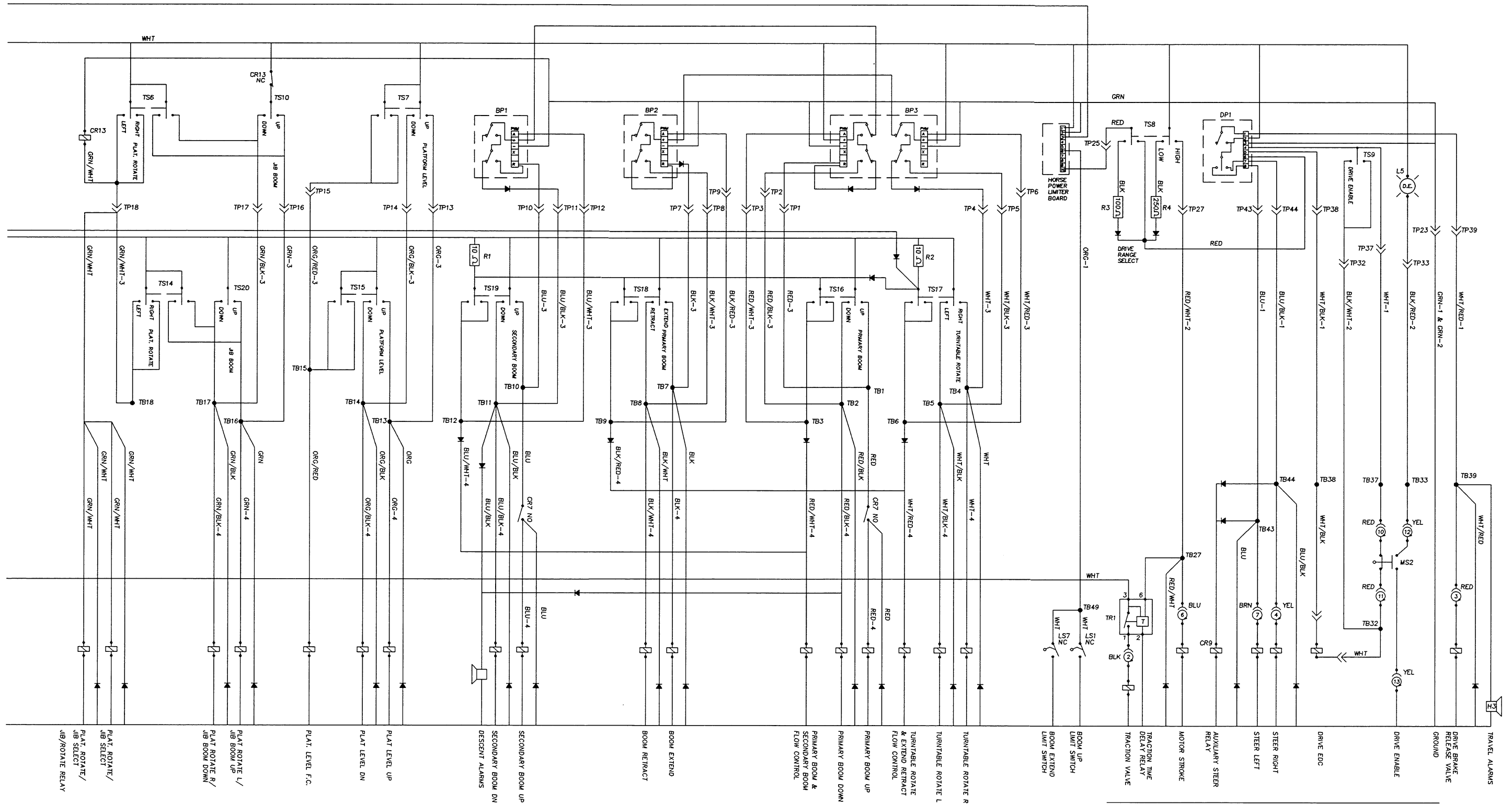




# Electrical Schematic - Deutz Diesel Models

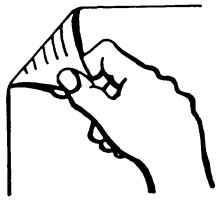


# Electrical Schematic - Deutz Diesel Models

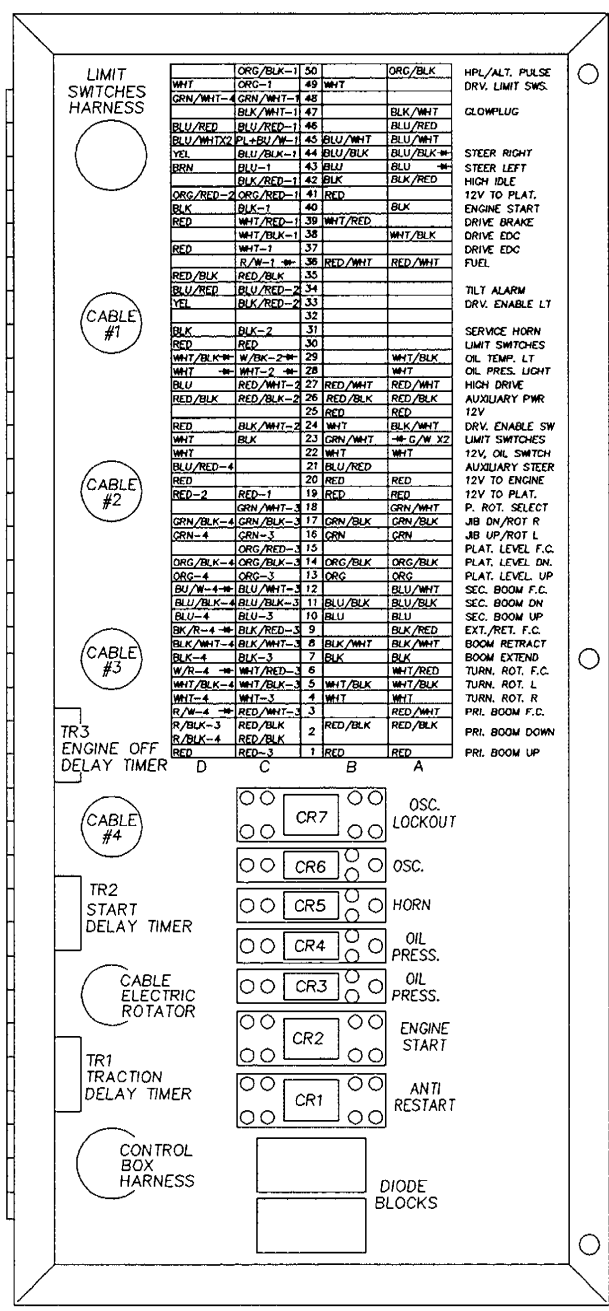
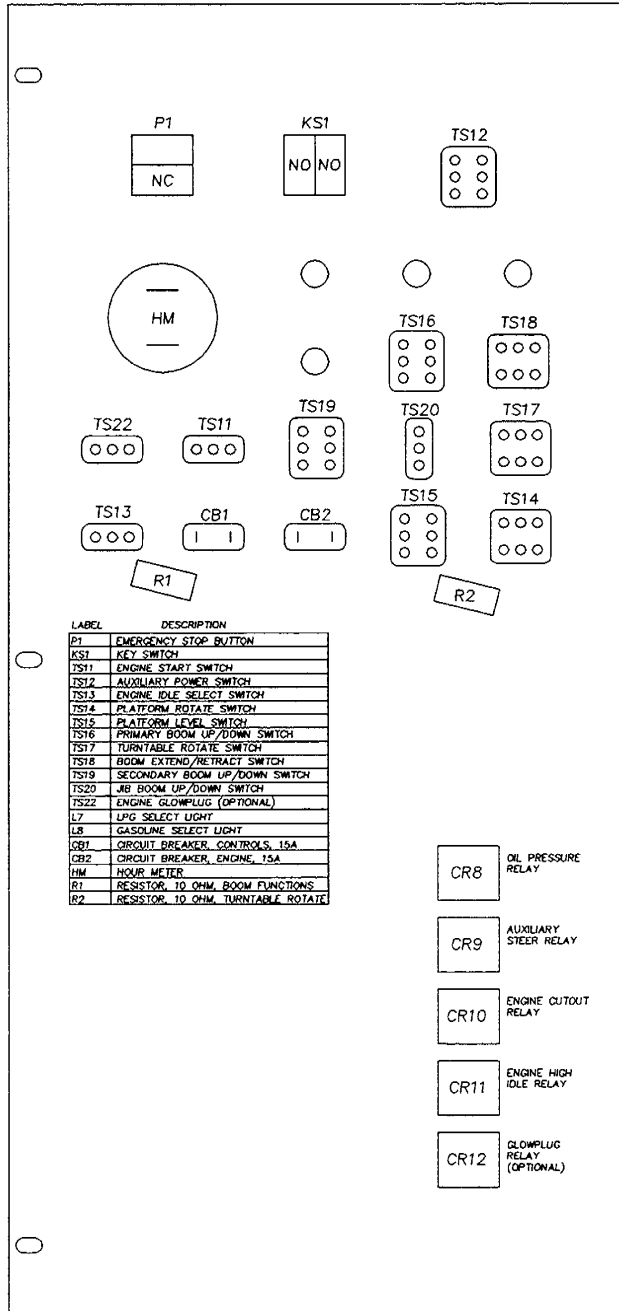


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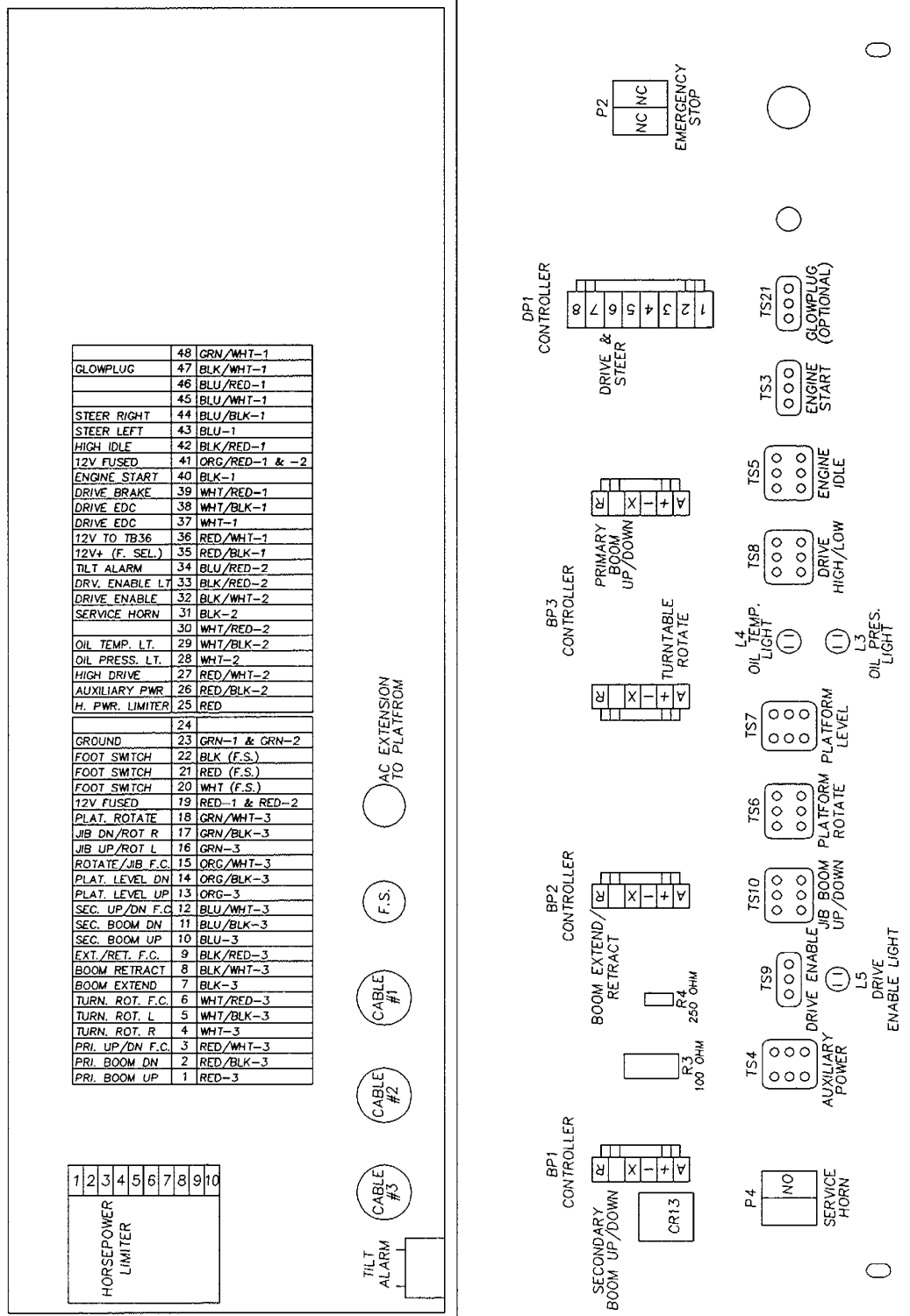
**Electrical Schematic -  
Deutz Diesel Models**



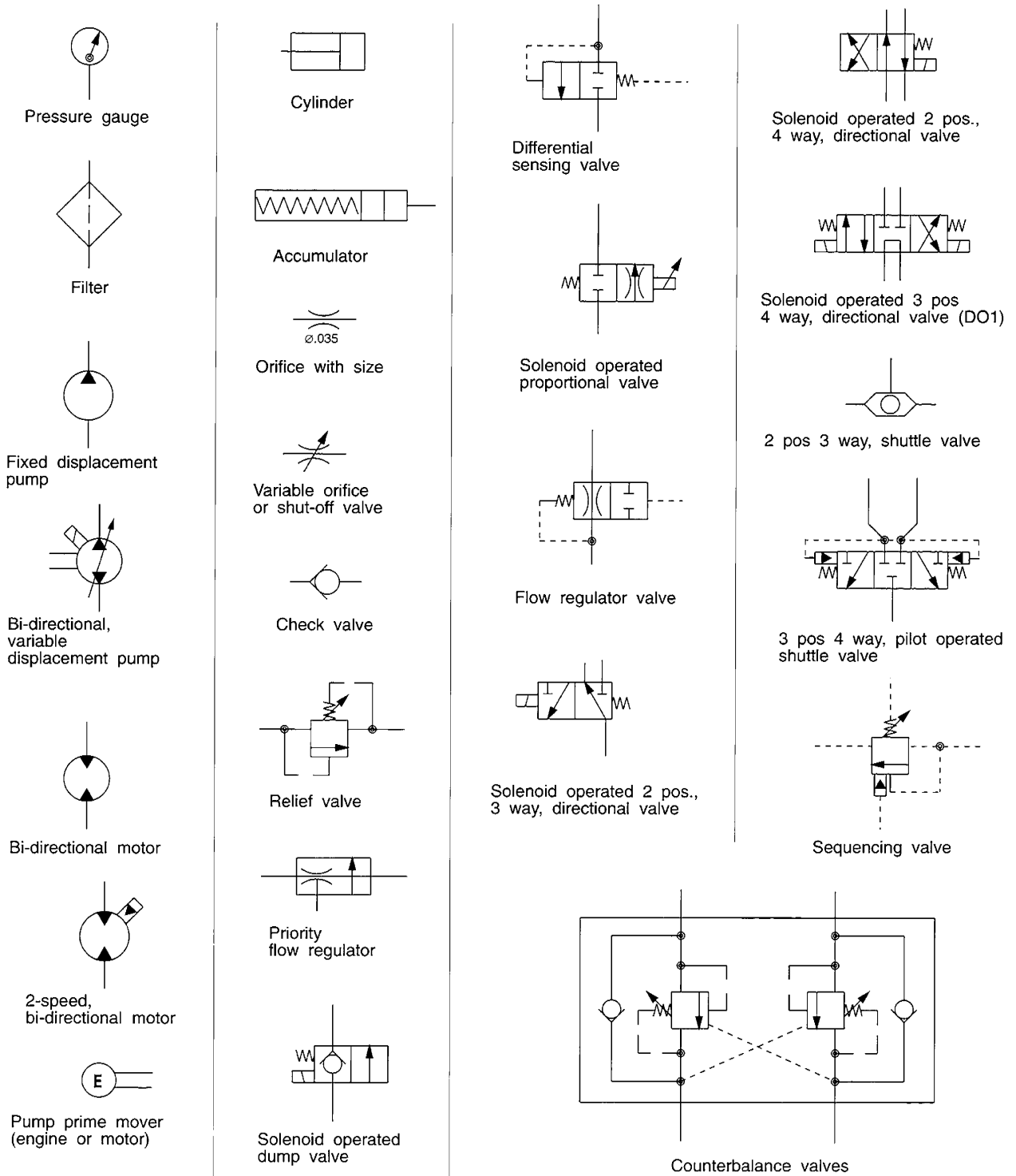
# Ground Control Box Legend - Deutz Diesel Models



# Platform Control Box Legend - Deutz Diesel Models



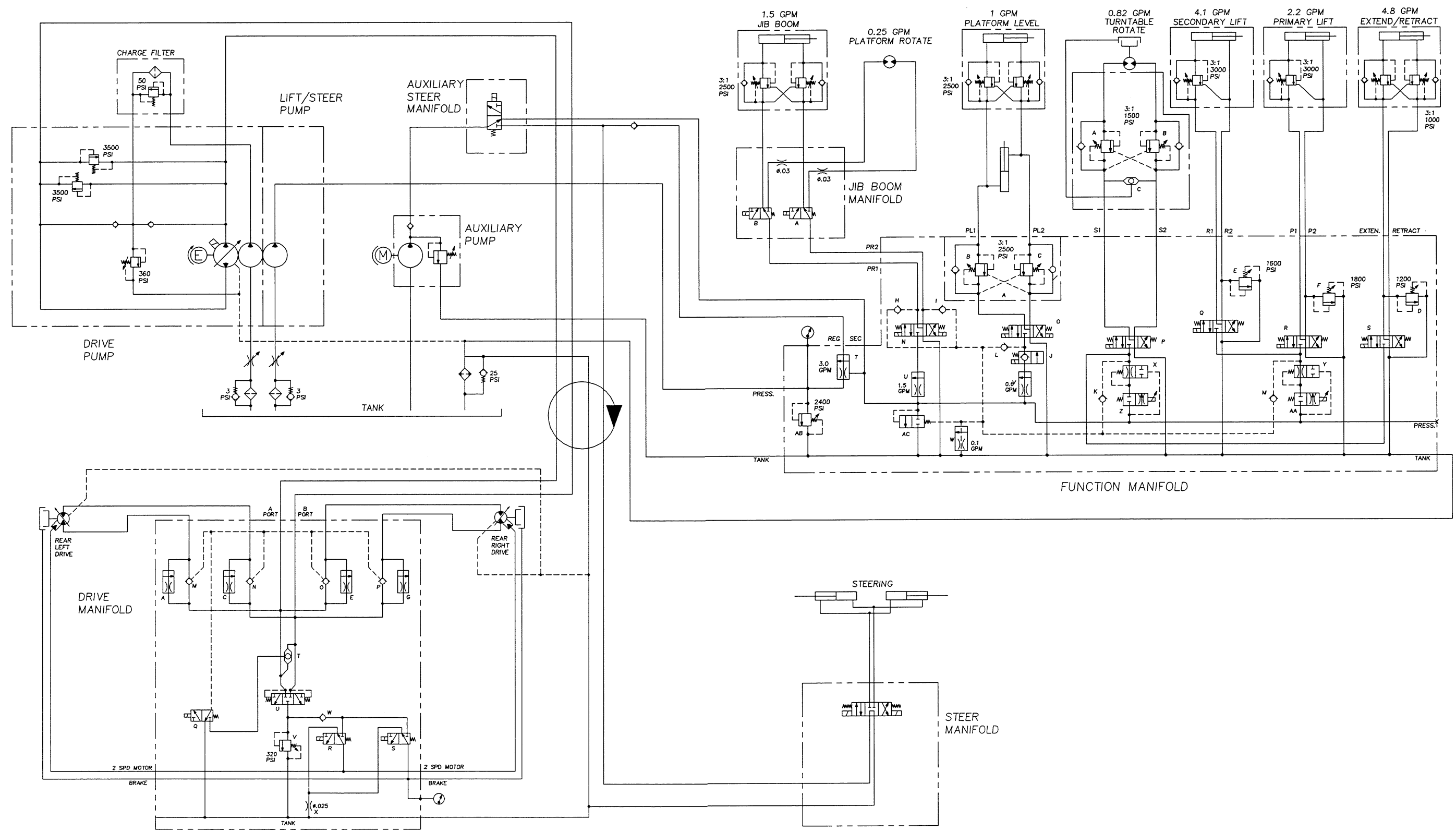
# Hydraulic Symbols Legend





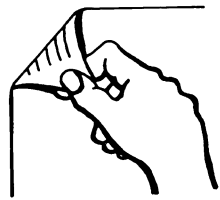


### 2WD Hydraulic Schematic

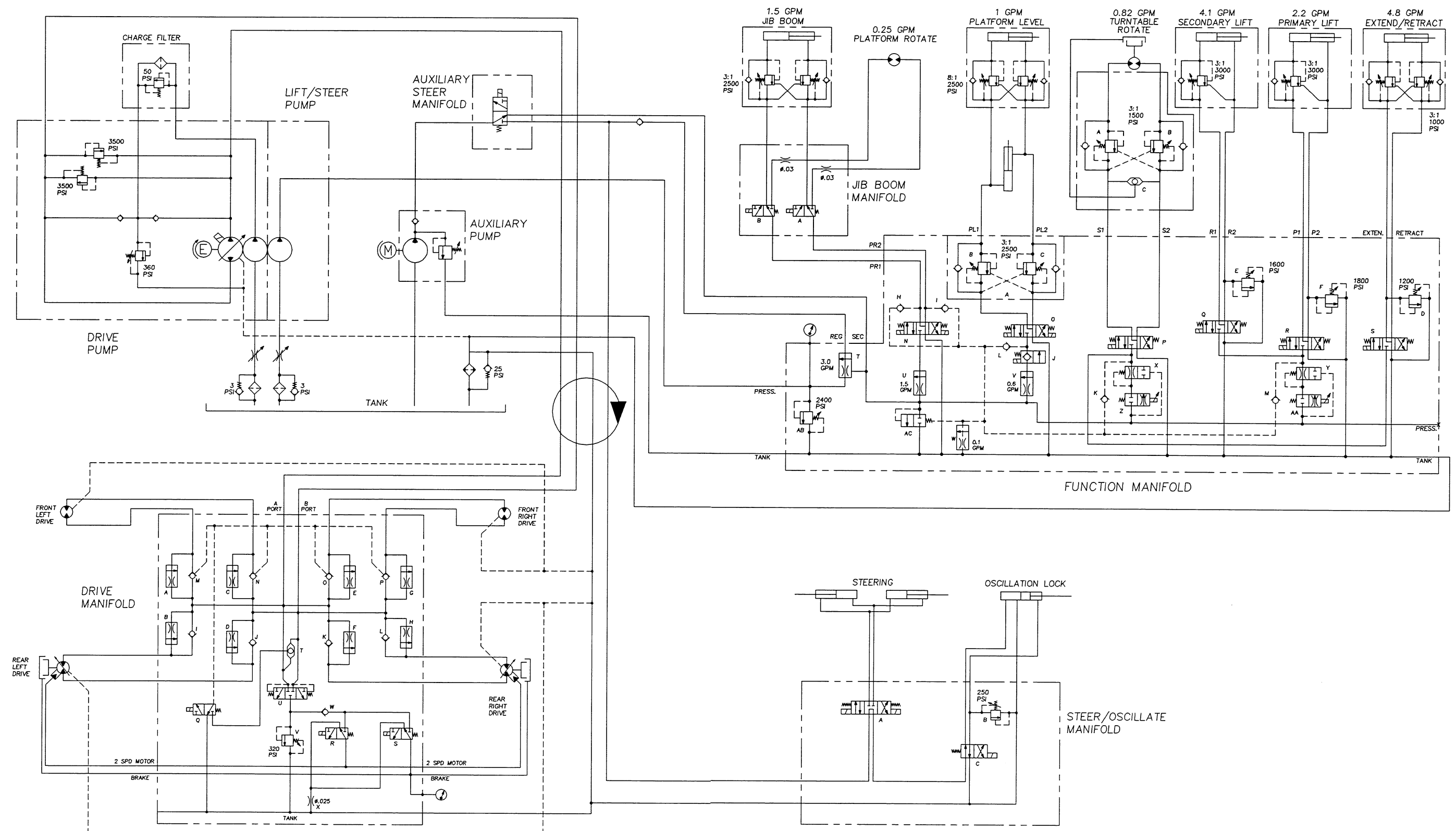


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**2WD Hydraulic Schematic**

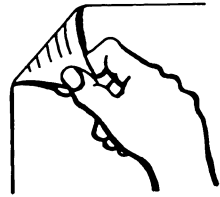


### 4WD Hydraulic Schematic



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### 4WD Hydraulic Schematic



# Repair Procedures



## Observe and Obey:

- ☑ Repair procedures shall be completed by a person trained and qualified on the repair of this machine.
- ☑ Immediately tag and remove from service a damaged or malfunctioning machine.
- ☑ Repair any machine damage or malfunction before operating the machine.

## Before Repairs Start:

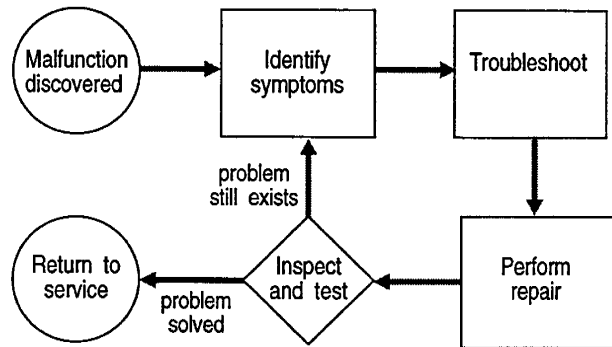
- ☑ Read, understand and obey the safety rules and operating instructions in the *Genie Z-60/34 Operator's Manual*.
- ☑ Be sure that all necessary tools and parts are available and ready for use.
- ☑ Read each procedure completely and adhere to the instructions. Attempting shortcuts may produce hazardous conditions.
- ☑ Unless otherwise specified, perform each repair procedure with the machine in the following configuration:
  - machine parked on a flat level surface
  - boom in stowed position
  - turntable rotated with the boom between the non-steering wheels
  - turntable secured with the turntable rotation lock
  - key switch in the OFF position with the key removed
  - wheels chocked

## About This Section

Most of the procedures in this section should only be performed by a trained service professional in a suitably equipped workshop. Select the appropriate repair procedure after troubleshooting the problem.

Perform disassembly procedures to the point where repairs can be completed. Then to re-assemble, perform the disassembly steps in reverse order.

### General Repair Process



### Symbols Legend

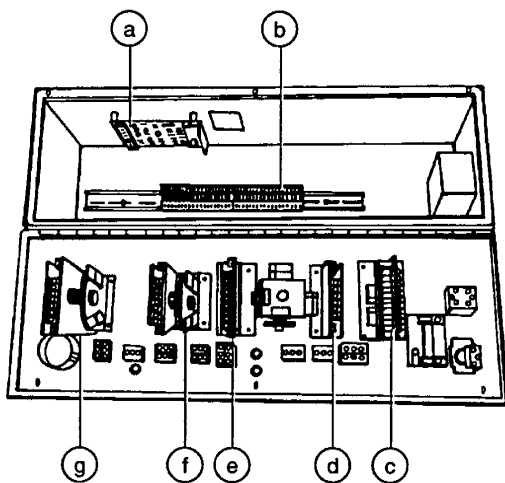
- ⚠ DANGER** Indicates the presence of a hazard that **will** cause death or serious injury.
- ⚠ WARNING** Indicates the presence of a hazard that **may** cause death or serious injury.
- ⚠ CAUTION** Indicates the presence of a hazard that **will** or **may** cause serious personal injury or damage to the machine.
- NOTICE** Indicates special operation or maintenance information.
- ⦿ Indicates that a specific result is expected after performing a series of steps.

# Platform Controls

## 1-1

### Joystick Controllers

Maintaining joystick controllers at the proper settings is essential to safe machine operation. Every joystick controller should operate smoothly and provide proportional speed control over its entire range of motion.



Platform control box

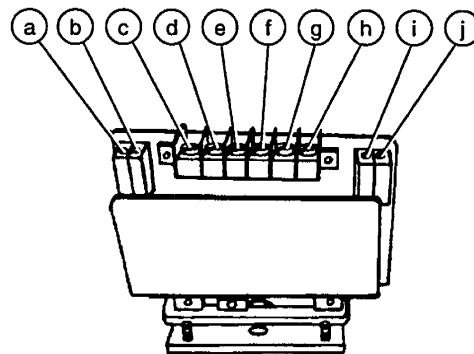
- a horsepower limiter board
- b quick disconnect terminal strip
- c drive proportional controller
- d primary boom proportional controller
- e turntable rotate proportional controller
- f extend/retract proportional controller
- g secondary boom proportional controller

### Primary Boom Up/Down Controller Adjustments

**NOTICE** Do not adjust the joystick controllers unless the static battery voltage is above 12V DC and the alternator is operating properly with 12.5 to 14.5V DC output.

**WARNING** Electrocutation hazard. Contact with electrically charged circuits may result in death or serious injury. Remove all rings, watches and other jewelry.

- 1 Check the battery condition with a volt meter. The reading should be 12V DC or more to accurately adjust the controller.
- 2 Turn the key switch to platform control and pull out the Emergency Stop button to the ON position at both the ground and platform controls. Do not start the engine.
- 3 Open the platform control box lid and locate the primary boom up/down controller.



- a dual (lo) range adjustable trimpot
- b ramp rate adjustable trimpot
- c terminal "R", activates max-out range
- d terminal unused
- e terminal "X", auxiliary
- f terminal "-", ground
- g terminal "+", battery, positive
- h terminal "A", proportional output
- i threshold adjustable trimpot
- j max-out adjustable trimpot

- 4 Set the preliminary ramp rate: Turn the trimpot adjustment screw clockwise 15 turns or until you hear a repeated click.
- 5 Connect the red(+) lead from a volt meter to the "A" terminal on the controller printed circuit board. Connect the black(-) lead to ground.
- 6 Set the threshold: Press down the foot switch, then slowly move the control handle off center until the moment a voltage reading appears. Adjust the voltage to 4.40V DC. Turn the threshold trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.

## PLATFORM CONTROLS

- 7 Set the max-out: Press down the foot switch, then move the control handle all the way to the UP position. Adjust the voltage to 6.50V DC. Turn the max-out trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.
- 8 Set the dual (lo) range: Press down the foot switch, then move the control handle all the way to the DOWN position. Adjust the voltage to 6.00V DC. Turn the dual range trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.
- 9 Start the engine and move the engine idle control switch to foot switch activated high idle (rabbit and foot switch symbol). Lower the boom to the stowed position.

**NOTICE** Engine should be at normal operating temperature.

- 10 Start a timer and record how long it takes for the primary boom to fully raise. Adjust the max-out trimpot to achieve a 40 to 50 second cycle time.
- 11 Start a timer and record how long it takes for the primary boom to fully lower. Adjust the dual range trimpot to achieve an 35 to 45 second cycle time.

**NOTICE** If the function cycle time is not achievable, check the relief valve pressure. See 11-3, *Valve Adjustments - Function Manifold*.

- 12 Turn the engine off and re-connect the volt meter.
- 13 Pull out the Emergency Stop button to the ON position.
- 14 Press down the foot switch and then move the control handle all the way to the UP position. Record the maximum voltage reading.
- 15 Start the engine.

- 16 Start a timer and simultaneously move the control handle all the way to the UP position. Note how long it takes to reach the maximum voltage recorded in step 14. This is the ramp speed.
- 17 Set the ramp rate: turn the trimpot to obtain a 2 to 3 second ramp speed. Turn the trimpot clockwise to increase the time or counterclockwise to decrease the time.

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**Primary boom up/down specifications**


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Threshold	4.40V DC
Primary boom up - Max-out Cycle time	6.50V DC 40 to 50 seconds
Primary boom down - Dual (lo) range Cycle time	6.00V DC 35 to 45 seconds
Ramp rate	2 to 3 seconds

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### Primary Boom Extend/Retract Controller Adjustments

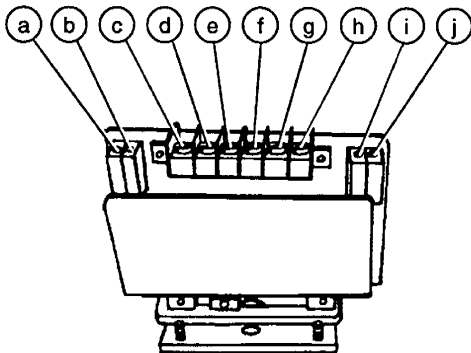
**NOTICE** Do not adjust the joystick controllers unless the static battery voltage is above 12V DC and the alternator is operating properly with 12.5 to 14.5V DC output.

**WARNING** Electrocutation hazard. Contact with electrically charged circuits may result in death or serious injury. Remove all rings, watches and other jewelry.

- 1 Check the battery condition with a volt meter. The reading should be 12V DC or more to accurately adjust the controller.
- 2 Turn the key switch to platform control and pull out the Emergency Stop button to the ON position at both the ground and platform controls. Do not start the engine.

## PLATFORM CONTROLS

- 3 Open the platform control box lid and locate the primary boom extend/retract controller. Refer to the platform control box illustration, page 7-2.



- a dual (lo) range adjustable trimpot
- b ramp rate adjustable trimpot
- c terminal "R", activates max-out range
- d terminal unused
- e terminal "X", auxiliary
- f terminal "-", ground
- g terminal "+", battery, positive
- h terminal "A", proportional output
- i threshold adjustable trimpot
- j max-out adjustable trimpot

- 4 Set the preliminary ramp rate: Turn the trimpot adjustment screw clockwise 15 turns or until you hear a repeated click.
- 5 Connect the red(+) lead from a volt meter to the "A" terminal on the controller printed circuit board. Connect the black(-) lead to ground.
- 6 Set the threshold: Press down the foot switch, then slowly move the control handle off center until the moment a voltage reading appears. Adjust the voltage to 2.50V DC. Turn the threshold trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.
- 7 Set the max-out: Press down the foot switch, then move the control handle all the way to the EXTEND position. Adjust the voltage to 8.80V DC. Turn the max-out trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.
- 8 Set the dual (lo) range: Press down the foot switch then move the control handle all the way to the RETRACT position. Adjust the voltage to 8.80V DC. Turn the dual range trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.
- 9 Start the engine and move the engine idle control switch to foot switch activated high idle (rabbit and foot switch symbol). Raise the jib boom until it is level. Fully retract the primary boom.
- NOTICE** Engine should be at normal operating temperature.
- 10 Start a timer and record how long it takes for the primary boom to fully extend. Adjust the max-out trimpot to achieve a 30 to 40 second cycle time.
- NOTICE** If the function cycle time is not achievable, check the relief valve pressure. See 11-3, *Valve Adjustments - Function Manifold*.
- 11 Start a timer and record how long it takes for the primary boom to fully retract. Adjust the dual range trimpot to achieve a 20 to 30 second cycle time.
- 12 Turn the engine off and re-connect the volt meter.
- 13 Pull out the Emergency Stop button to the ON position.
- 14 Press down the foot switch and then move the control handle all the way to the EXTEND position. Record the maximum voltage reading.
- 15 Start the engine.
- 16 Start a timer and simultaneously move the control handle all the way to the EXTEND position. Note how long it takes to reach the maximum voltage recorded in step 14. This is the ramp speed.



PLATFORM CONTROLS

17 Set the ramp rate: turn the trimpot to obtain a 2 second ramp speed. Turn the trimpot clockwise to increase the time or counterclockwise to decrease the time.

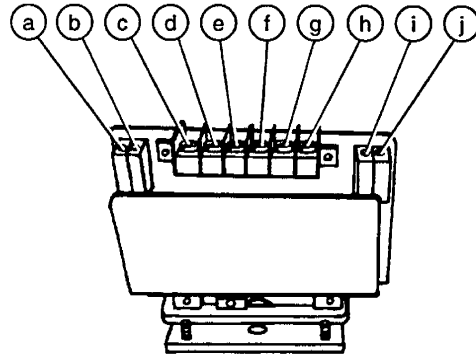
Primary boom extend/retract specifications	
Threshold	2.50V DC
Primary boom extend - Max-out Cycle time	8.80V DC 30 to 40 seconds
Primary boom retract - Dual (lo) range Cycle time	8.80V DC 20 to 30 seconds
Ramp rate	2 seconds

### Secondary Boom Up/Down Controller Adjustments

**NOTICE** Do not adjust the joystick controllers unless the static battery voltage is above 12V DC and the alternator is operating properly with 12.5 to 14.5V DC output.

**WARNING** Electrocutation hazard. Contact with electrically charged circuits may result in death or serious injury. Remove all rings, watches and other jewelry.

- 1 Check the battery condition with a volt meter. The reading should be 12V DC or more to accurately adjust the controller.
- 2 Turn the key switch to platform control and pull the Emergency Stop button to the ON position at both the ground and platform controls. Do not start the engine.
- 3 Open the platform control box lid and locate the secondary boom up/down controller. Refer to the platform control box illustration, page 7-2.



- a dual (lo) range adjustable trimpot
- b ramp rate adjustable trimpot
- c terminal "R", activates max-out range
- d terminal unused
- e terminal "X", auxiliary
- f terminal "-", ground
- g terminal "+", battery, positive
- h terminal "A", proportional output
- i threshold adjustable trimpot
- j max-out adjustable trimpot

- 4 Set the preliminary ramp rate: Turn the trimpot adjustment screw clockwise 15 turns or until you hear a repeated click.
- 5 Connect the red(+) lead from a volt meter to the "A" terminal on the controller printed circuit board. Connect the black(-) lead to ground.
- 6 Set the threshold: Press down the foot switch, then slowly move the control handle off center until the moment a voltage reading appears. Adjust the voltage to 4.30V DC. Turn the threshold trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.
- 7 Set the max-out: Press down the foot switch, then move the control handle all the way to the UP position. Adjust the voltage to 8.50V DC. Turn the max-out trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.

## PLATFORM CONTROLS

- 8 Set the dual (lo) range: Press down the foot switch, then move the control handle all the way to the down position. Adjust the voltage to 8.50V DC. Turn the dual range trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.
- 9 Start the engine and move the engine idle control switch to foot switch activated high idle (rabbit and foot switch symbol). Lower the boom to the stowed position.

**NOTICE** Engine should be at normal operating temperature.

- 10 Start a timer and record how long it takes for the secondary boom to fully raise. Adjust the max-out trimpot to achieve a 40 to 50 second cycle time.
- 11 Start a timer and record how long it takes for the secondary boom to fully lower. Adjust the dual range trimpot to achieve a 30 to 40 second cycle time.

**NOTICE** If the function cycle time is not achievable, check the relief valve pressure. See 11-3, *Valve Adjustments - Function Manifold*.

- 12 Turn the engine off and re-connect the volt meter.
- 13 Pull out the Emergency Stop button to the on position.
- 14 Press down the foot switch and then move the control handle all the way to the up position. Record the maximum voltage reading.
- 15 Start the engine.
- 16 Start a timer and simultaneously move the control handle all the way to the up position. Note how long it takes to reach the maximum voltage recorded in step 14. This is the ramp rate.

- 17 Set the ramp rate: Turn the trimpot to obtain a 2 to 3 second ramp speed. Turn the trimpot clockwise to increase the time or counterclockwise to decrease the time.

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### Secondary boom up/down specifications

---

Threshold	4.30V DC
Secondary boom up - Max-out Cycle time	8.50V DC 40 to 50 seconds
Secondary boom down - Dual (lo) range Cycle time	8.50V DC 30 to 40 seconds
Ramp rate	2 to 3 seconds

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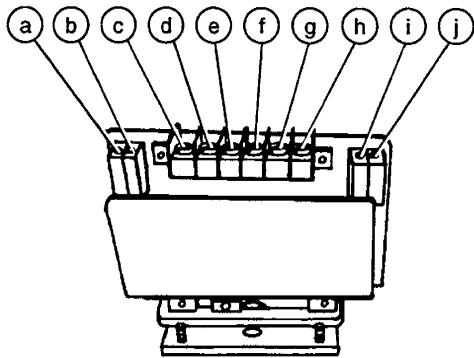
## Turntable Rotation Controller Adjustments

**NOTICE** Do not adjust the joystick controllers unless the static battery voltage is above 12V DC and the alternator is operating properly with 12.5 to 14.5V DC output.

**WARNING** Electrocutation hazard. Contact with electrically charged circuits may result in death or serious injury. Remove all rings, watches and other jewelry.

- 1 Check the battery condition with a volt meter. The reading should be 12V DC or more to accurately adjust the controller.
- 2 Turn the key switch to platform control and pull out the Emergency Stop button to the on position at both the ground and platform controls. Do not start the engine.
- 3 Open the platform control box lid and locate the turntable rotation controller. Refer to the platform control box illustration, page 7-2.

PLATFORM CONTROLS



- a dual (lo) range adjustable trimpot
- b ramp rate adjustable trimpot
- c terminal "R", activates max-out range
- d terminal unused
- e terminal "X", auxiliary
- f terminal "-", ground
- g terminal "+", battery, positive
- h terminal "A", proportional output
- i threshold adjustable trimpot
- j max-out adjustable trimpot

- 4 Set the preliminary ramp rate: Turn the trimpot adjustment screw clockwise 15 turns or until you hear a repeated click.
- 5 Connect the red(+) lead from a volt meter to the "A" terminal on the controller printed circuit board. Connect the black(-) lead to ground.
- 6 Set the threshold: Press down the foot switch then slowly move the control handle off center until the moment a voltage reading appears. Adjust the voltage to 3.00V DC. Turn the threshold trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.
- 7 Set the max-out: Press down the foot switch then move the control handle all the way to the left or right. Adjust the voltage to 5.80V DC. Turn the max-out trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.

- 8 Set the dual (lo) range: Turn the trimpot adjustment screw clockwise 15 turns or until you hear a click. This is the only dual range adjustment for this controller.
- 9 Start the engine and move the engine idle control switch to foot switch activated high idle (rabbit and foot switch symbol).

**NOTICE** Engine should be at normal operating temperature.

- 10 Start a timer and record how long it takes the turntable to rotate through a complete circle. Adjust the max-out trimpot to achieve an 140 to 200 second cycle time.
- 11 Turn the engine off and re-connect the volt meter.
- 12 Pull out the Emergency Stop button to the ON position.
- 13 Press down the foot switch and then move the control handle all the way to the left or right. Record the maximum voltage reading.
- 14 Start the engine.
- 15 Start a timer and simultaneously move the control handle all the way to the left or right. Note how long it takes to reach the maximum voltage recorded in step 13. This is the ramp rate.
- 16 Set the ramp rate: turn the trimpot to obtain a 3 second ramp speed. Turn the trimpot clockwise to increase the time or counterclockwise to decrease the time.

Turntable rotation specifications	
Threshold	3.00V DC
Turntable rotation - Max-out	5.80V DC
Cycle time	140 to 200 seconds
Ramp rate	3 seconds

## PLATFORM CONTROLS

## 1-2 Horsepower Limiter Board

The horsepower limiter board is responsible for governing drive pump output. It senses engine rpm from the alternator. The horsepower limiter board senses drops in rpm normally due to increased drive resistance (rough terrain or incline) and decreases voltage to the drive controller which in turn decreases voltage to the drive pump thereby reducing pump output to maintain optimum engine rpm and horsepower. Three adjustments are required for optimum performance.

### How to Adjust the Horsepower Limiter Board

#### NOTICE

The engine rpm must be correct before performing this procedure. See Maintenance Procedure B-12, *Check and Adjust the Engine RPM*.

#### NOTICE

Do not adjust the horsepower limiter board unless the static battery voltage is above 12V DC and the alternator is operating properly with 12.5 to 14.5V DC output.

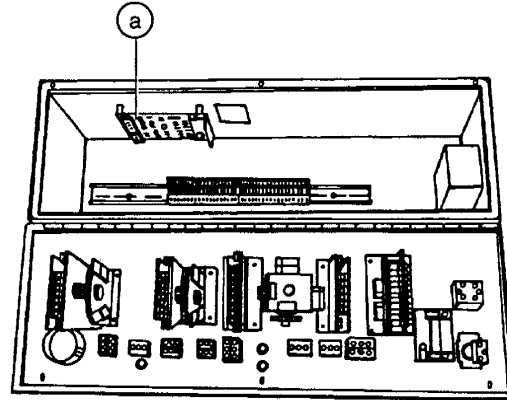
#### NOTICE

**Gasoline/LPG models:** Perform this procedure in gasoline mode.

- 1 Remove the fasteners from the platform control box lid.
- 2 Open the control box lid and locate the horsepower limiter board.

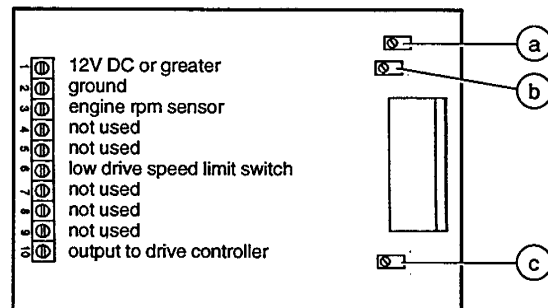
#### WARNING

Electrocution hazard. Contact with electrically charged circuits may result in death or serious injury. Remove all rings, watches and other jewelry.



Platform control box  
a horsepower limiter board

- 3 Connect the black(-) lead from a DC volt meter to the no. 2 terminal, and the red(+) lead to the no. 10 terminal.



Horsepower limiter board

- a "A" potentiometer-maximum voltage output to the controller in the stowed position
  - b "B" potentiometer-maximum voltage output to the drive controller in the boom raised position
  - c "C" potentiometer-reaction rate or how fast the voltage output reacts to the change in engine rpm
- 4 Start the engine from the platform controls.
  - 5 Move the engine idle control switch to foot switch activated high idle (rabbit and foot switch symbol).

PLATFORM CONTROLS

- 6 Press down the foot switch and adjust the "A" potentiometer counterclockwise to increase voltage or clockwise to decrease voltage.

**"A" potentiometer specifications - all models**

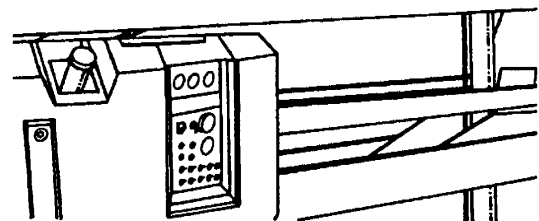
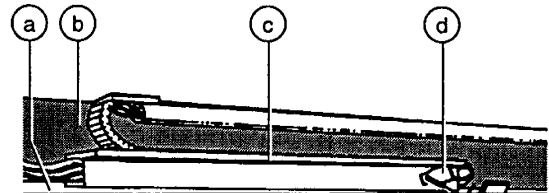
Voltage setting	9.00V DC
-----------------	----------

- 7 Move the engine idle control switch to low idle (turtle symbol).
- 8 Press down the foot switch and then adjust the "C" potentiometer to obtain a 0.01V DC to 0.03V DC voltage reading.
- 9 Move the engine idle control switch to foot switch activated high idle (rabbit and foot switch symbol). Move the drive select switch to high range (two-wheel symbol).
- 10 Press down the foot switch and re-adjust the "A" potentiometer to the previous voltage setting in step 6.
- 11 Be sure that the boom is in the stowed position, then drive the machine and observe how the engine rpm reacts to drive control handle movement. If the engine surges or hunts, adjust the "C" potentiometer counterclockwise until surging is minimized.

**NOTICE** Under an extreme load, an excessive counterclockwise adjustment to the "C" potentiometer will cause the engine to stall. The "C" potentiometer adjustment is a compromise between engine stability (surging) and engine rpm droop.

- 12 Disconnect the volt meter.

- 13 Raise the primary boom above the drive limit switch.



- a lift interlock switch (hidden from view)
- b primary boom
- c cable track
- d drive limit switch

- 14 Drive the machine for 40 feet (12m) and record the elapsed time. Repeat this step in the opposite drive direction.
- 15 Adjust the "B" potentiometer to obtain the correct raised drive speed of 1 foot per second (30.5cm per second).
- 16 Close the platform control box lid and install the fasteners.

**Drive speed specifications**

Stowed position, high range	distance: 40 ft / 12m	
	<b>2WD</b>	<b>4WD</b>
Gasoline/LPG Models	40 ft/7.8 sec	40 ft/6.1 sec
	12.2m/7.8 sec	12.2m/6.1 sec
Deutz Diesel Models	40 ft/9.1 sec	40 ft/7 sec
	12.2m/9.1 sec	12.2m/7 sec
Primary boom raised or extended, high range	distance: 40 ft / 12m	
All models	1 foot per second	
	30.5cm per second	

## PLATFORM CONTROLS

### 1-3 Foot Switch

#### How to Test the Foot Switch

- 1 Turn the key switch to the OFF position and separate the wiring quick disconnect plug from the platform toe board.
- 2 Do not press down the foot switch. Connect the leads from an ohmmeter or continuity tester to each wire combination listed below and check for continuity.

Test	Desired result
red to black (or TP21 to TP22)	continuity (zero $\Omega$ )
red to white (or TP21 to TP20)	no continuity (infinite $\Omega$ )
black to white (or TP22 to TP20)	no continuity

**NOTICE** Do not use the color of the connector as a guide for these tests. Use the actual wire color to identify which connector to use for testing.

- 3 Press down the foot switch. Connect the leads from an ohmmeter or continuity tester to each wire combination listed below and check for continuity.

Test	Desired result
red to black (or TP21 to TP22)	no continuity (infinite $\Omega$ )
red to white (or TP21 to TP20)	no continuity
black to white (or TP22 to TP20)	continuity (zero $\Omega$ )

### 1-4 Resistors

Two resistors are used to maintain proper control of drive speeds. Both resistors are located in the platform control box.

**NOTICE** Refer to the schematic legends for resistor locations and values.

#### How to Test the Resistors

- 1 Turn the key switch to the OFF position and set the drive mode select switch to high range (two-wheel symbol).
- 2 Connect the leads from an ohmmeter to each end of the resistor being tested.
- 3 Compare the ohmmeter reading with the resistance rating printed on the resistor.

PLATFORM CONTROLS

## 1-5 Toggle Switches

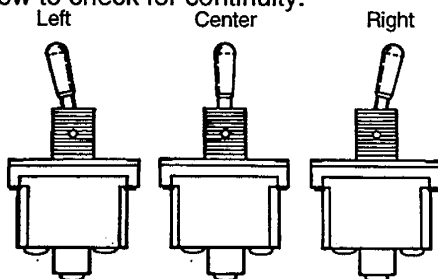
Toggle switches used for single function switching are single pole double throw (SPDT) switches. Dual function switching requires a double pole double throw (DPDT) switch.

### How to Test a Toggle Switch

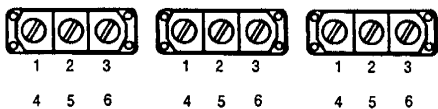
**NOTICE** Continuity is the equivalent of 0 to 3 ohms. A simple continuity tester may not accurately test the switch.

This procedure covers fundamental switch testing and does not specifically apply to all varieties of toggle switches.

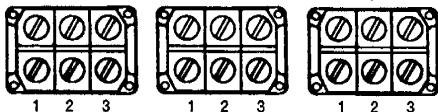
- 1 Turn the key switch to the OFF position. Tag and disconnect all wiring from the toggle switch to be tested.
- 2 Connect the leads of an ohmmeter to the switch terminals in the following combinations listed below to check for continuity.



Single pole double throw (SPDT)



Double pole double throw (DPDT)



Test	Desired result
<b>Left position</b>	
terminal 1 to 2, 3, 4, 5 & 6	no continuity (infinite $\Omega$ )
terminal 2 to 3	continuity (zero $\Omega$ )
terminal 2 to 4, 5 & 6	no continuity
terminal 3 to 4, 5 & 6	no continuity
terminal 4 to 5 & 6	no continuity
terminal 5 to 6	continuity
<b>Center position</b>	
	There are no terminal combinations that will produce continuity (infinite $\Omega$ )
<b>Right position</b>	
terminal 1 to 2	continuity (infinite $\Omega$ )
terminal 1 to 3, 4, 5 & 6	no continuity (zero $\Omega$ )
terminal 2 to 3, 4, 5 & 6	no continuity
terminal 3 to 4, 5 & 6	no continuity
terminal 4 to 5	continuity
terminal 4 to 6	no continuity
terminal 5 to 6	no continuity

# Platform Components

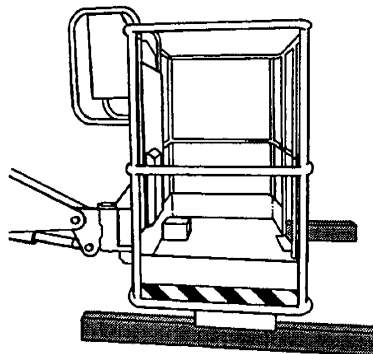
## 2-1

### Platform

#### How to Remove the Platform

- 1 Remove the cable harness from the cable clamps located on the platform and separate the foot switch wiring quick disconnect plug from the platform toe board.
- 2 Remove the sliding cover from the platform control box.
- 3 Remove the platform control box mounting bolts, then lower the control box and set it aside.
- 4 Remove the platform mounting bolts and lift the platform off of the mounting weldment.

- 2 Raise the jib boom slightly and place blocks under the platform mounting weldment. Then lower the jib boom until the platform is resting on the blocks.



## 2-2

### Platform Leveling Slave Cylinder

The slave cylinder and the rotator pivot are the two primary supports for the platform. The slave cylinder keeps the platform level through the entire range of boom motion. It operates in a closed-circuit hydraulic loop with the master cylinder. The slave cylinder is equipped with counterbalance valves to prevent movement in the event of a hydraulic line failure.

#### How to Remove the Slave Cylinder

#### NOTICE

Before cylinder removal is considered to correct a malfunction, bleed the slave cylinder to be sure there is no air in the closed loop hydraulic circuit.

- 1 Adjust the platform to a level position.

- 3 Support the slave cylinder with a lifting device.
- 4 Remove the pin retainer from both the barrel-end and rod-end pivot pins.
- 5 Use a soft metal drift to remove the barrel-end pin.
- 6 Disconnect the hydraulic hoses from the slave cylinder and connect them together with a connector.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

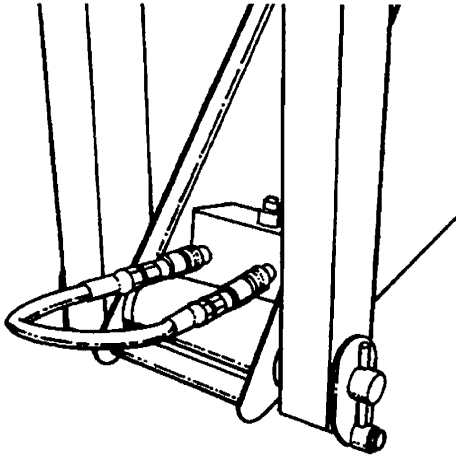
- 7 Use a soft metal drift to remove the rod-end pin. Then remove the cylinder from the machine.



## PLATFORM COMPONENTS

## How to Bleed the Slave Cylinder

- 1 Connect a hydraulic hose between the two test ports on the block of the cylinder barrel end.



- 2 Start the engine from the ground controls and raise the jib boom to a level position.
- 3 Move the platform level switch up and down through two platform leveling cycles to remove any air that might be in the system.
- 4 Remove the hydraulic hose from the test ports. Move the platform level switch up and down through a platform leveling cycle and inspect the test ports for leaks.

## 2-3

### Platform Rotator

The platform rotator is a hydraulically activated helical gear assembly used to rotate the platform 90 degrees left or 90 degrees right from the center position.

## How to Remove the Platform Rotator

**CAUTION** Component damage hazard. Mark the platform mounting weldment and the rotator flange before removing the platform mounting weldment. The platform mounting weldment must be replaced in the exact same position on the rotator flange as it was before removal. If a new rotator is installed or the rotator is disassembled, proper alignment can be achieved by rotating the rotator all the way to the left and then installing the platform mounting weldment all the way in the left position.

- 1 Remove the platform. See 2-1, *How to Remove the Platform*.
- 2 Disconnect and plug the hydraulic hoses from the platform rotator.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 3 Support the platform mounting weldment, but do not apply any lifting pressure.
- 4 Remove the six mounting bolts from the platform mounting weldment, then remove the center bolt and slide the platform mounting weldment off of the platform rotator.
- 5 Support the platform rotator. Do not apply any lifting pressure.
- 6 Support the platform leveling slave cylinder.
- 7 Remove the pin retainer from the slave cylinder barrel-end pivot pin.

## PLATFORM COMPONENTS

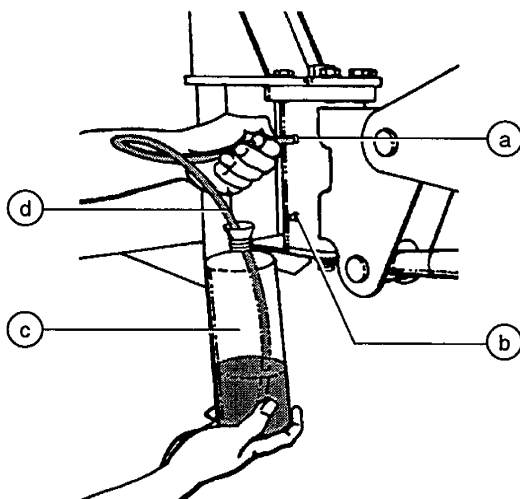
- 8 Use a soft metal drift to remove the barrel-end pin.
- 9 Disconnect and plug the hydraulic hoses from the slave cylinder. Pull the hoses up through the platform rotator.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 10 Remove the pin retainer from the slave cylinder rod-end pivot pin and the rotator pivot pin.
- 11 Use a soft metal drift to drive both pins out, then remove the platform rotator from the machine.

## How to Bleed the Platform Rotator

- 1 Connect a clear hose to the top bleed valve. Place the other end of the hose in a container to collect any discharge.



- a top bleed valve
- b bottom bleed valve
- c container
- d clear hose

- 2 Open the top bleed valve, but do not remove it.
- 3 Start the engine from the ground controls.
- 4 Hold the platform rotate switch to the right for approximately 5 seconds, then release it. Repeat this three times.

**CAUTION** Crushing hazard. Keep clear of the platform during rotation.

- 5 Hold the platform rotate switch to the left for approximately 5 seconds, then release it.
- 6 Fully rotate the platform to the left and continue holding the platform rotate switch until air stops coming out of the bleed valve. Immediately release the platform rotate switch and close the top bleed valve.
- 7 Rotate the platform to the right until it is centered.
- 8 Connect the clear hose to the bottom bleed valve and open it.
- 9 Rotate the platform to the right and continue holding the platform rotate switch until air stops coming out of the bleed valve.

**CAUTION** Crushing hazard. Keep clear of the platform during rotation.

- 10 Close the bottom bleed valve and remove the hose.
- 11 Turn off the engine and clean up any hydraulic oil that may have spilled.
- 12 Start the engine from the ground controls. Rotate the platform full right, then full left and inspect the bleed valves for leaks.

# Jib Boom Components

## 3-1

### Jib Boom

#### How to Remove the Jib Boom

**NOTICE** Perform this procedure with the boom in the stowed position.

- 1 Remove the platform. See 2-1, *How to Remove the Platform*.
- 2 Remove the platform mounting weldment, the platform leveling slave cylinder and the platform rotator. See 2-3, *How to Remove the Platform Rotator*.
- 3 Support the platform pivot weldment with a lifting device.
- 4 Remove the pin retainer from the platform pivot weldment to jib boom pivot pin. Use a soft metal drift to remove the pin, then remove the platform pivot weldment from the jib boom.
- 5 Disconnect and plug the jib boom lift cylinder hydraulic hoses.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 6 Remove the pin retainer from the jib boom lift cylinder barrel-end pivot pin. Use a soft metal drift to remove the pin.

- 7 Tag, disconnect and plug all the hydraulic hoses from the jib boom manifold. Then tag and remove the wiring from the manifold.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 8 Pull the hydraulic hoses up through the jib boom lift cylinder mounting bracket.
- 9 Remove the cable tray from the side of the jib boom.
- 10 Support the jib boom with an overhead crane.
- 11 Remove the pin retainer from the jib boom pivot pin. Use a soft metal drift to remove the pin, then remove the jib boom from the primary boom.

**WARNING** Crushing hazard. The jib boom will fall when the pin is removed if it is not properly supported.

- 12 Remove the pin retainers from the jib boom lift cylinder rod-end pivot pin. Do not remove the pin.
- 13 Remove both of the jib boom leveling links from the primary boom.
- 14 Support the jib boom lift cylinder with an overhead crane.
- 15 Use a soft metal drift to remove the jib boom lift cylinder rod-end pivot pin, then remove the jib boom lift cylinder from the primary boom.

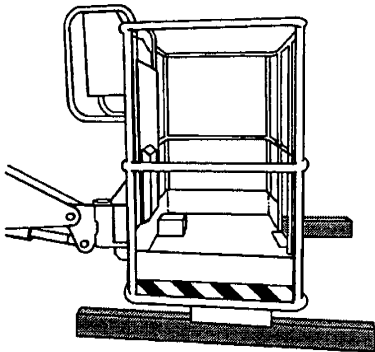
**WARNING** Crushing hazard. The jib boom lift cylinder will fall when the pin is removed if it is not properly supported.

## JIB BOOM COMPONENTS

**3-2****Jib Boom Lift Cylinder****How to Remove the Jib Boom Lift Cylinder**

**NOTICE** Perform this procedure with the boom in the stowed position.

- 1 Raise the jib boom slightly and place blocks under the platform mounting weldment. Then lower the jib boom until the platform is resting on the blocks.



- 2 Remove the pin retainers from the jib boom lift cylinder rod-end pivot pin. Do not remove the pin.

- 3 Remove the pin retainers from the platform leveling slave cylinder barrel-end pivot pin. Do not remove the pin.
- 4 Remove both of the jib boom leveling links from the machine.
- 5 Disconnect and plug the jib boom lift cylinder hydraulic hoses.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 6 Support the jib boom lift cylinder with an overhead crane.
- 7 Remove the pin retainer from the jib boom lift cylinder barrel-end pivot pin. Use a soft metal drift to remove the barrel-end pin.
- 8 Use a soft metal drift to remove the jib boom lift cylinder rod-end pin. Remove the cylinder from the machine.

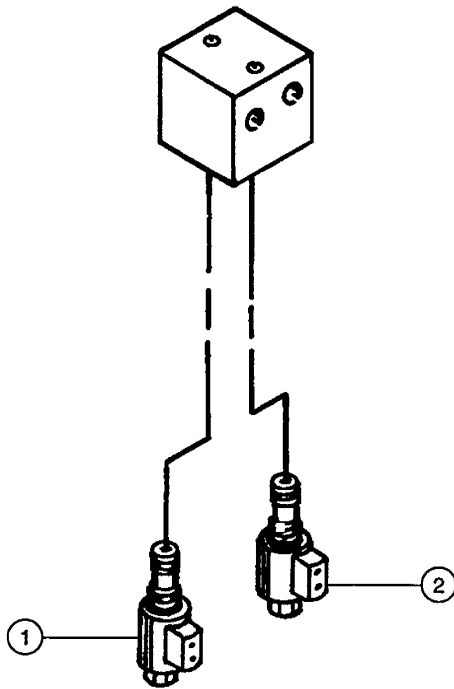
**WARNING** Crushing hazard. The jib boom lift cylinder will fall when it is removed if it is not properly supported.

JIB BOOM COMPONENTS

**3-3**

**Jib Boom / Platform Rotate Manifold Components**

- 1 2 position 3 way valve ..... A ..... Platform rotate select ..... 8-10 ft-lbs / 11-14 Nm
- 2 2 position 3 way valve ..... B ..... Platform rotate select ..... 8-10 ft-lbs / 11-14 Nm



**Plug Torque Specifications**

Description	Hex Size	Torque
SAE No. 2	1/8	50 in-lbs / 6 Nm
SAE No. 4	3/16	13 ft-lbs / 18 Nm
SAE No. 6	1/4	18 ft-lbs / 24 Nm
SAE No. 8	5/16	50 ft-lbs / 68 Nm
SAE No. 10	9/16	55 ft-lbs / 75 Nm
SAE No. 12	5/8	75 ft-lbs / 102 Nm

**How to Check the Resistance of a Valve Coil**

- 1 Turn the key switch to the OFF position and disconnect the wires from the valve coil to be tested.
- 2 Connect the leads from an ohmmeter to the valve coil terminals.

**Valve coil specification**

2 position 3 way valve	6.3Ω
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# Primary Boom Components

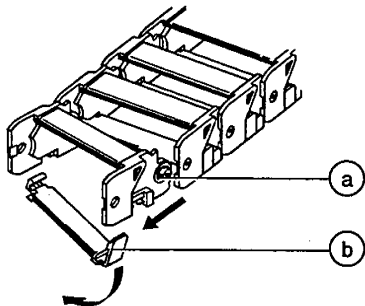
## 4-1

### Plastic Cable Track

The primary boom cable track guides cables and hoses running up the boom. It can be repaired link by link without removing the cables and hoses that run through it. Removing the entire primary boom cable track is only necessary when performing major repairs that involve removing the primary boom.

#### How to Repair the Plastic Cable Track

**CAUTION** Component damage hazard. The primary boom cable track can be damaged if it is twisted.



a link separation point  
b lower clip

- 1 Use a screwdriver to pry down on the lower clip.
- 2 Repeat step 1 for each link.
- 3 To remove a single link, open the lower clip and then use a screw driver to pry the link to the side.

## 4-2

### Primary Boom

#### How to Shim the Primary Boom

**NOTICE** Measure each wear pad. Replace the pad if it is less than  $\frac{7}{16}$  inch (11 mm) thick. If the pad is more than  $\frac{7}{16}$  inch (11mm) thick, perform the following procedure.

- 1 Extend the primary boom 10 inches (25cm).
- 2 Remove the wear pad mounting fasteners.
- 3 Install the new shims under the wear pad to obtain zero clearance and zero drag.
- 4 Use a round punch to align the shim to the wear pad. Install the mounting fasteners.
- 5 Extend and retract the primary boom through an entire cycle. Check for tight spots that could cause scraping or binding.

**NOTICE** Always maintain squareness between the primary boom outer and inner tubes.

#### How to Remove the Primary Boom

**WARNING** This procedure requires specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may cause death or serious injury and significant component damage. Dealer service is strongly recommended.

**NOTICE** Perform this procedure with the boom in the stowed position.

- 1 Remove the platform. See 2-1, *How to Remove the Platform*.
- 2 Remove the jib boom. See 3-1, *How to Remove the Jib Boom*.
- 3 Remove the cable clamp from the upper mid-pivot.

## PRIMARY BOOM COMPONENTS

- 4 Support the cable track with an overhead crane.
- 5 Remove the drive speed limit switch from the cable track side panel. Do not remove the wiring from the switch.
- 6 Remove the side panel from the cable track to access the cable track mounting bolts.
- 7 Remove the cable track mounting fasteners, then remove the cable track from the primary boom.

**CAUTION** Component damage hazard. The primary boom cable track can be damaged if it is twisted.

- 8 Remove the retaining bolt from the master cylinder rod-end pivot pin. Use a slide hammer to remove the pin.
- 9 Disconnect and plug the extension cylinder hydraulic hoses. Cap the fittings on the cylinder.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 10 Attach an overhead crane to the center point of the primary boom. Lift the primary boom enough to access the primary boom lift cylinder rod-end pivot pin.
- 11 Attach a similar lifting device to the lift cylinder.
- 12 Remove the pin retainer from the primary boom lift cylinder rod-end pin. Use a soft metal drift to remove the pin.

**CAUTION** Crushing hazard. The primary boom lift cylinder will fall unless it is properly supported.

- 13 Lower the rod end of the lift cylinder onto support blocks.

- 14 Remove the drive speed limit switch mounted on the inside of the pivot end of the primary boom.
- 15 Remove the pin retainer from the primary boom pivot pin.
- 16 Remove the primary boom pivot pin with a soft metal drift, then carefully remove the primary boom from the machine.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the primary boom may become unbalanced and fall when it is removed from the machine.

## How to Disassemble the Primary Boom

**NOTICE** Complete disassembly of the primary boom is only necessary if the outer or inner primary boom tubes must be replaced. The extension cylinder can be removed without completely disassembling the primary boom. See 4-4, *How to Remove the Extension Cylinder*.

- 1 Remove the primary boom. See 4-2, *How to Remove the Primary Boom*.
- 2 Remove the cotter pin from the extension cylinder pivot pin. Use a soft metal drift to remove the pin.
- 3 Remove and label the wear pads from the platform end of the primary boom.

**NOTICE** Pay careful attention to the location and amount of shims used with each wear pad.

- 4 Support and slide the extension boom out of the platform end of the primary boom.

**CAUTION** Crushing hazard. The extension boom will fall when it is removed from the primary boom if is not properly supported.

## PRIMARY BOOM COMPONENTS

- 5 Remove the extension boom end cap.
- 6 Remove the snap rings from the extension cylinder rod-end pins. Use a soft metal drift to remove the pins.
- 7 Support and slide the extension cylinder out of the platform end of the extension boom.
- 8 Remove and label the wear pads from the extension boom.

**NOTICE** Pay careful attention to the location and amount of shims used with each wear pad.

## 4-3

## Primary Boom Lift Cylinder

## How to Remove the Primary Boom Lift Cylinder

**WARNING** This procedure requires specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may cause death or serious injury and significant component damage. Dealer service is strongly recommended.

- 1 Fully raise the jib boom.
- 2 Raise the primary boom enough to access the primary boom lift cylinder rod-end pivot pin.
- 3 Attach an overhead crane to the primary boom for support. Do not lift it.
- 4 Place a block of wood across the lower leveling links to support the cylinder when the rod-end pin is removed. Support the cylinder with a lifting device.
- 5 Remove the pin retainer from the primary boom lift cylinder rod-end pin. Then use a soft metal drift to remove the pin.
- 6 Lower the rod end of the cylinder onto the blocks that were placed on the leveling links. Then lower the primary boom onto the boom rest.
- 7 Raise the secondary boom enough to access the primary boom lift cylinder barrel-end pivot pin.
- 8 Remove and plug the hydraulic hoses from the primary boom lift cylinder.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 9 Place a block of wood across the lower leveling links to support the cylinder when the barrel-end pin is removed. Support the cylinder with a lifting device.
- 10 Remove the pin retainer from the primary boom lift cylinder barrel-end pin. Then use a soft metal drift to remove the pin.
- 11 Lower the barrel end of the cylinder onto the blocks that were placed on the leveling links. Then lower the secondary boom onto the boom rest.
- 12 Carefully pull the lift cylinder toward the platform end of the secondary boom.
- 13 Remove the cylinder from the side of the machine with a forklift.



## PRIMARY BOOM COMPONENTS

## 4-4

**Extension Cylinder**

The extension cylinder extends and retracts the primary boom extension tube. It can only be removed from the platform end of the primary boom. The extension cylinder is equipped with counterbalance valves to prevent movement in the event of a hydraulic line failure.

**How to Remove the Extension Cylinder****WARNING**

This procedure requires specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may cause death or serious injury and significant component damage. Dealer service is strongly recommended.

**NOTICE**

Perform this procedure with the boom in the stowed position.

- 1 Remove the platform. See 2-1, *How to Remove the Platform*.
- 2 Remove the jib boom. See 3-1, *How to Remove the Jib Boom*.
- 3 Extend the primary boom until the extension cylinder rod-end mounting pins are accessible.

- 4 Remove the extension boom end cap.
- 5 Remove the snap rings from the extension cylinder rod-end pins. Use a soft metal drift to remove the pins.
- 6 If the function is operational, extend the extension cylinder until the rod-end clears the end of the extension tube.
- 7 Disconnect and plug the extension cylinder hydraulic hoses. Cap the fittings on the cylinder.

**CAUTION**

Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 8 Remove the cotter pin from the extension cylinder barrel-end pivot pin. Use a soft metal drift to remove the pin.
- 9 Support and slide the extension cylinder out of the extension boom.

**CAUTION**

Crushing hazard. The extension cylinder will fall when it is removed from the extension boom if it is not properly supported.

## PRIMARY BOOM COMPONENTS

## 4-5 Platform Leveling Master Cylinder

The master cylinder acts as a pump for the slave cylinder. It is part of the closed circuit hydraulic loop that keeps the platform level through the entire range of boom motion. The master cylinder is located inside the upper mid-pivot at the base of the primary boom.

### WARNING

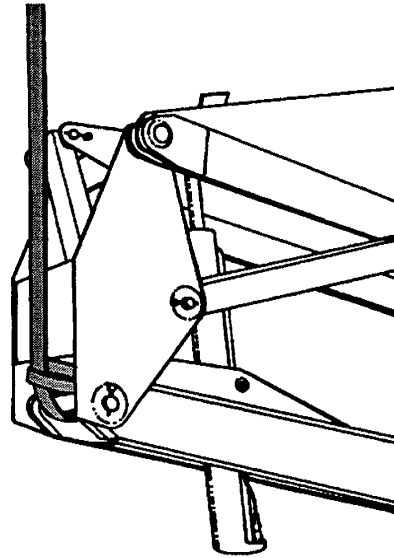
This procedure requires specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may cause death or serious injury and significant component damage. Dealer service is strongly recommended.

Perform this procedure with the boom in the stowed position.

### NOTICE

- 1 Remove the pin retainer from the master cylinder rod-end pivot pin. Use a soft metal drift to remove the pin.
- 2 Raise the secondary boom until the upper mid-pivot is above the turntable covers.

- 3 Attach the lifting strap from an overhead crane to the platform end of the lower secondary boom arm for support. Do not lift.



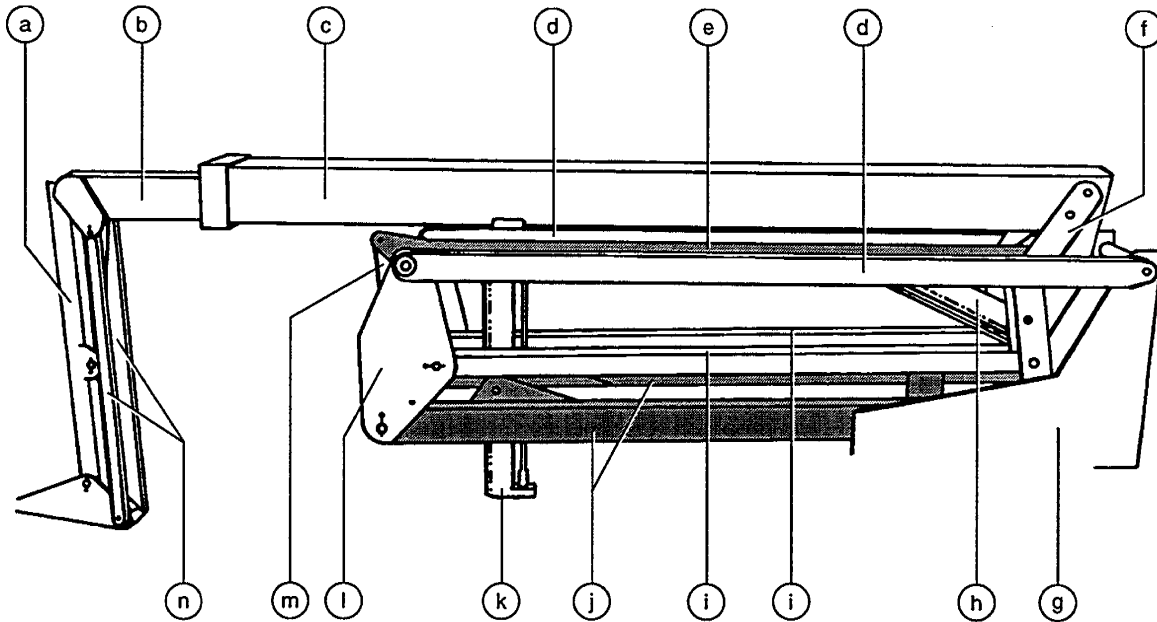
- 4 Disconnect and plug the hydraulic hoses from the master cylinder.

### CAUTION

Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 5 Remove the pin retainer from the master cylinder barrel-end pivot pin. Use a soft metal drift to remove the pin.

# Secondary Boom Components



## 5-1

### Secondary Boom

#### How to Disassemble the Secondary Boom



This procedure requires specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may cause death or serious injury and significant component damage. Dealer service is strongly recommended.

Follow the disassembly steps to the point required to complete the repair. Then re-assemble the secondary boom by following the disassembly steps in the reverse order.

- 1 Remove the platform. See 2-1, *How to Remove the Platform.*

#### Secondary Boom

- a jib boom
- b extension tube
- c primary boom
- d upper leveling link
- e upper secondary boom
- f upper mid-pivot
- g turntable pivot
- h primary boom lift cylinder
- i lower leveling link
- j lower secondary boom
- k secondary boom lift cylinder
- l lower mid-pivot
- m connecting link
- n jib boom leveling link

## SECONDARY BOOM COMPONENTS

- 2 Remove the primary boom. See 4-2, *How to Remove the Primary Boom*.
- 3 Remove all four retaining bolts from the two upper leveling link pivot pins. Do not remove the pins.
- 4 Position the lifting strap from an overhead crane at the center of the engine side upper leveling link, then remove it from the machine. Repeat this step for the tank side upper leveling link.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the leveling link may become unbalanced and fall when it is removed.

- 5 Remove the pin retainer from the lower mid-pivot to the connecting link pivot pin. Use a soft metal drift to remove the pin.
- 6 Attach a strap from the upper mid-pivot to the upper leveling link pivot pin mounting tube, to secure the upper mid-pivot from moving.
- 7 Position the lifting strap from an overhead crane at the center of the upper secondary boom.
- 8 Remove the lift interlock switch from the upper secondary boom.
- 9 Remove the mounting fasteners from the secondary boom lift cylinder rod end mounting bracket.
- 10 Remove the pin retainer from both upper mid-pivot to upper secondary boom pivot pins. Use a soft metal drift to remove the pins.
- 11 Use a soft metal drift to remove the lower mid-pivot to upper secondary boom pivot pin, then remove the upper secondary boom from the machine.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the upper secondary boom may become unbalanced and fall when it is removed.

- 12 Remove both turntable covers. See 6-1, *How to Remove the Turntable Cover*.
- 13 Remove the mounting fasteners from both of the turntable bulkheads, then remove both turntable bulkheads.
- 14 Remove the hydraulic tank. See 12-1, *How to Remove the Hydraulic Tank*.
- 15 Attach an overhead crane to the primary boom lift cylinder, then lift the cylinder to a vertical position.
- 16 Remove the pin retainer from the primary boom lift cylinder barrel-end pivot pin. Use a soft metal drift to remove the pin, then remove the cylinder from the machine.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the primary boom lift cylinder may become unbalanced and fall when it is removed.

- 17 Disconnect and plug the secondary boom lift cylinder hydraulic hoses.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 18 Attach an overhead crane to the secondary boom lift cylinder.
- 19 Remove the retaining bolts from the secondary boom lift cylinder pivot pins. Use a slide hammer to remove the pins, then remove the cylinder from the machine.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the secondary boom lift cylinder may become unbalanced and fall when it is removed.

- 20 Attach a strap from the lower mid-pivot to the lower secondary boom, to secure the lower mid-pivot from moving.

## SECONDARY BOOM COMPONENTS

21 Number each electrical cable and its entry location at the platform control box.

22 Open the platform control box and label each wire termination from the cables. Disconnect all control cable wiring from the platform control box.

23 Pull all of the electrical cables out of the cable track. Do not pull out the hydraulic hoses.

24 Disconnect and plug the platform rotator and slave cylinder hydraulic hoses at the union, located near the upper mid-pivot. Remove the cable track assembly from the machine.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

25 Remove the cable tray from both of the lower leveling links.

26 Attach an overhead crane to the upper mid-pivot, then remove the securing strap from the upper mid-pivot.

27 Disconnect and plug the master cylinder hydraulic hoses.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

28 Pull all of the cables and hoses down through the upper mid-pivot.

29 Place blocks under each of the lower leveling links for support.

30 Remove the pin retainer from both of the upper mid-pivot to lower leveling link pivot pins. Use a soft metal drift to remove the pins, then remove the upper mid-pivot from the machine.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the upper mid-pivot may become unbalanced and fall when it is removed.

31 Position the lifting strap from an overhead crane at the center of the engine side lower leveling link.

32 Remove the pin retainer from the lower mid-pivot to engine side lower leveling link pivot pin. Use a soft metal drift to remove the pin, then remove the engine side lower leveling link from the machine.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the leveling link may become unbalanced and fall when it is removed.

33 Position the lifting strap from an overhead crane at the center of the tank side lower leveling link.

34 Remove the pin retaining fastener from the lower mid-pivot to tank side lower leveling link pivot pin. Use a soft metal drift to remove the pin, then remove the tank side lower leveling link from the machine.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the leveling link may become unbalanced and fall when it is removed.

35 Attach an overhead crane to the connecting link.

## SECONDARY BOOM COMPONENTS

36 Remove the pin retainer from the lower mid-pivot to connecting link pivot pin. Use a soft metal drift to remove the pin, then remove the connecting link from the machine.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the connecting link may become unbalanced and fall when it is removed.

37 Pull all of the cables and hoses down through the lower mid-pivot.

38 Attach an overhead crane to the lower mid-pivot, then remove the securing strap.

39 Remove the pin retainer from the lower mid-pivot to lower secondary boom pivot pin. Use a soft metal drift to remove the pin, then remove the lower mid-pivot from the machine.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the lower mid-pivot may become unbalanced and fall when it is removed.

40 Remove the cable trays from the lower secondary boom.

41 Position the lifting strap from an overhead crane at the center of the lower secondary boom.

42 Remove the pin retainer from the lower secondary boom to turntable pivot pin. Use a soft metal drift to remove the pin, then remove the lower secondary boom from the machine.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the lower secondary boom may become unbalanced and fall when it is removed.

**NOTICE** When assembling the secondary boom, be sure the hydraulic hoses and electrical cables are routed correctly with no kinking or binding. Replace the cable ties if removed during disassembly.

## 5-2

## Secondary Boom Lift Cylinder

The secondary boom lift cylinder raises and lowers the secondary boom. The secondary boom lift cylinder is equipped with counterbalance valves to prevent movement in the event of a hydraulic line failure.

## How to Remove the Secondary Boom Lift Cylinder

**WARNING** This procedure requires specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may cause death or serious injury and significant component damage.

- 1 Support the secondary boom lift cylinder with an overhead crane or similar lifting device.
- 2 Disconnect and plug the secondary boom lift cylinder hydraulic hoses.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 3 Remove the mounting fasteners from the secondary boom lift cylinder rod end mounting bracket.

## SECONDARY BOOM COMPONENTS

- 4 Remove the retaining bolts from the secondary boom lift cylinder pivot pins. Use a slide hammer to remove the pins, then remove the cylinder from the machine.

**CAUTION** Crushing hazard. The secondary boom lift cylinder will fall when it is removed from the machine if is not properly supported.

**NOTICE** Pay careful attention to the amount of shims used on each of the secondary boom lift cylinder pivot pins.

---

# Turntable Covers

## 6-1

### Turntable Covers

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#### How to Remove a Turntable Cover

- 1 Raise the turntable cover. Support the open cover with an overhead crane or forklift. Do not lift it.

**CAUTION** Crushing hazard. Due to its heavy weight, do not attempt to support the cover by hand.

- 2 Remove the upper and lower retaining clips from the gas strut.
- 3 Gently pry the strut pivot sockets off of the ball studs and remove the strut.
- 4 Remove the cover hinge mounting bolts. Do not allow the hinge back-up plate to fall.
- 5 Carefully lift and remove the cover from the machine.

**WARNING** If a turntable cover must be replaced, be sure that all appropriate safety and instructional decals are applied to the new cover.

**NOTICE** Alignment adjustments may be necessary when a new cover is installed.



# Deutz Engine F4L 1011

## 7-1

### RPM Adjustment

---

Refer to Maintenance Procedures, B-12, *Check and Adjust the Engine RPM.*

- 3 Apply Loctite® removable thread sealant to the coupler set screw. Torque the set screw to 37 ft-lbs (50 Nm).

**CAUTION** Component damage hazard. Do not force the drive pump during installation or the flex plate teeth may become damaged.

## 7-2

### Flex Plate

---

The flex plate acts as a coupler between the engine and the pump. It is bolted to the engine flywheel and has a splined center to drive the pump.

#### How to Remove the Flex Plate

- 1 Disconnect the wiring plug at the electronic displacement controller (EDC), located on the drive pump.
- 2 Support the drive pump with an appropriate lifting device. Then remove all of the pump mounting plate to engine bell housing bolts.
- 3 Carefully pull the pump away from the engine and secure it from moving.
- 4 Remove the flex plate mounting fasteners, then remove the flex plate from the engine.

#### How to Install the Flex Plate

- 1 Install the flex plate onto the flywheel with the flat side of the spline against the flywheel. Torque the flex plate mounting bolts to 34 ft-lbs (46 Nm).
- 2 Install the coupler onto the pump shaft with the set screw towards the pump. Leave a 1/2 inch (12.7mm) gap between the coupler and the pump end plate.

## 7-3

### Oil Temperature and Oil Pressure Gauges

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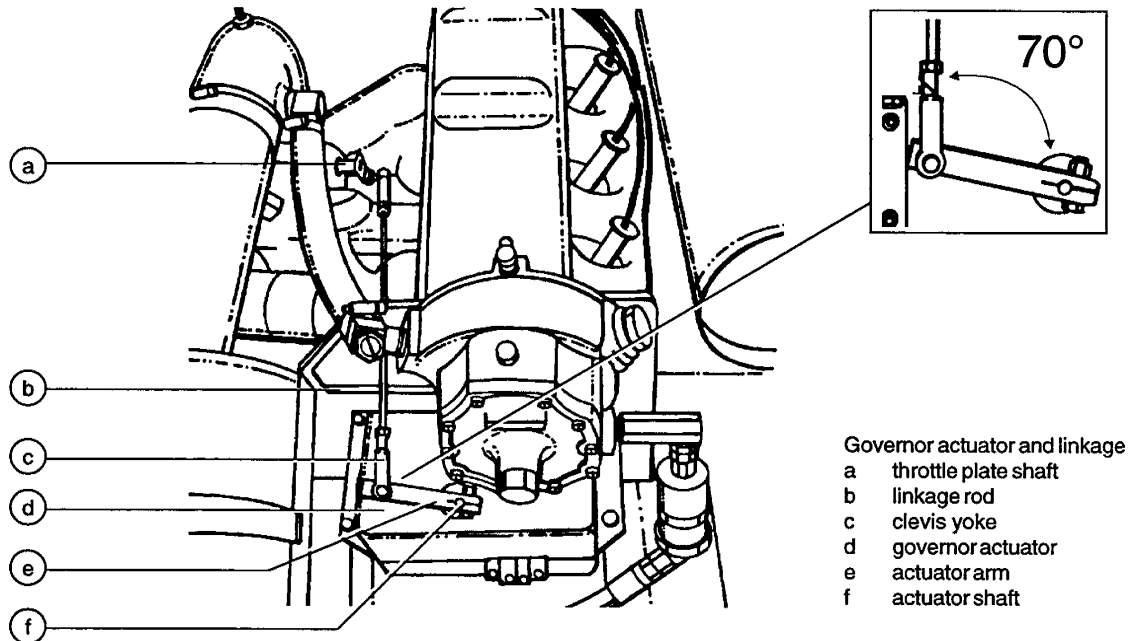
The oil temperature gauge is a mechanical gauge, with adjustable limit contacts that are factory set. The contacts will close at 220° F (104° C). When the contacts close the engine will shut off to prevent damage and will not start until the temperature drops below the contact point. An over-temperature indicator light at the platform controls should turn on when the contacts close.

**CAUTION** Component damage hazard. Do not crank the engine with the over-temperature light on.

The oil pressure gauge is a mechanical gauge, with adjustable limit contacts that are factory set. The contacts will close at 19 psi (1.3 bar). When the contacts close the engine will shut off to prevent damage. A low oil pressure indicator light at the platform controls should turn on when the contacts close.

**CAUTION** Component damage hazard. Do not continue to run the engine with the low oil pressure light on.

# Ford LSG-423 Engine



## 8-1

### Governor Actuator

#### How to Set Up the Governor Actuator and Linkage

**NOTICE** Adjustment of the governor actuator is only necessary when the governor actuator or the linkage has been replaced.

- 1 Connect the linkage rod to the throttle plate shaft, then tighten the lock nut.
- 2 Fasten the lock nut and clevis yoke to the linkage rod. Do not tighten the lock nut against the clevis yoke.
- 3 Loosen the fastener on the actuator arm. Rotate the actuator arm until it is at a 70 degree angle to the linkage rod.
- 4 Position the linkage rod so that the throttle is in the idle position. Then adjust the clevis yoke on the linkage rod to obtain the proper length. Install the yoke onto the actuator arm and tighten the lock nut.

- 5 With the throttle in the idle position and the actuator arm at a 70 degree angle to the linkage, rotate the actuator shaft slightly counterclockwise to pre-load the spring. Tighten the fastener on the actuator arm without releasing the shaft.
- 6 Manually pull the actuator arm through a full cycle to be sure that the linkage moves freely. Be sure that the linkage activates the throttle shaft to approximately half throttle.

**NOTICE** The linkage must be free of friction and obstruction. Do not let it rub against the engine, brackets or hoses.

**CAUTION** Component damage hazard. If the throttle linkage is improperly adjusted and allowed to reach full throttle, the engine will over-rev and cause component damage.

## FORD LSG-423 ENGINE

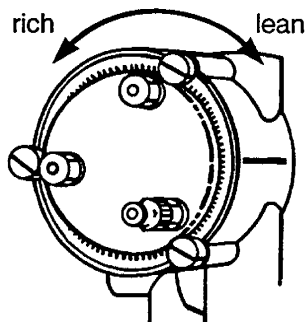
**8-2****Choke Adjustments**

This engine is equipped with an electrically heated automatic choke. The choke has a poppet valve to enhance cold starting ability on LPG fuel.

**NOTICE** Choke adjustments are affected by climate. Richer adjustment will be necessary in colder climates, leaner adjustment in warmer climates.

**Automatic Choke With Poppet Valve**

The choke functions in both gasoline and LPG mode. The choke butterfly may be adjusted to a fully closed (rich) position for colder climates and the poppet valve will provide a flow path during LPG fueled operation.

**8-3****Timing Adjustment**

Complete information to perform this procedure is available in the *Ford LSG-423 2.3 Liter Industrial Engine Service Manual* (Ford number: 194-216). Genie part number 29586.

**8-4****Carburetor Adjustment**

Complete information to perform this procedure is available in the *Ford LSG-423 2.3 Liter Industrial Engine Service Manual* (Ford number: 194-216). Genie part number 29586.

**8-5****RPM Adjustment**

Refer to Maintenance Procedures, B-12, *Check and Adjust the Engine RPM.*

## FORD LSG-423 ENGINE

**8-6****Flex Plate**

---

The flex plate acts as a coupler between the engine and the pump. It is bolted to the engine flywheel and has a splined center to drive the pump.

**Flex Plate Removal**

- 1 Disconnect the wiring plug at the electronic displacement controller (EDC), located on the drive pump.
- 2 Support the drive pump with an appropriate lifting device. Then remove all of the pump mounting plate to engine bell housing bolts.
- 3 Carefully pull the pump away from the engine and secure it from moving.
- 4 Remove the flex plate mounting fasteners, then remove the flex plate from the engine.

**How to Install the Flex Plate**

- 1 Install the flex plate onto the flywheel with the raised side of the spline against the flywheel. Torque the flex plate mounting bolts to 34 ft-lbs (46 Nm).
- 2 Install the coupler onto the pump shaft with the set screw towards the pump. Leave a  $\frac{3}{16}$  inch (4.7mm) gap between the coupler and the pump end plate.
- 3 Apply Loctite® removable thread sealant to the coupler set screw. Torque the set screw to 37 ft-lbs (50 Nm).

**CAUTION** Component damage hazard. Do not force the drive pump during installation or the flex plate teeth may become damaged.

**8-7****Water Temperature and Oil Pressure Gauges**

---

The water temperature gauge is a mechanical gauge, with adjustable limit contacts that are factory set. The contacts will close at 220° F (104° C). When the contacts close the engine will shut off to prevent damage and will not start until the temperature drops below the contact point. An over-temperature indicator light at the platform controls should turn on when the contacts close.

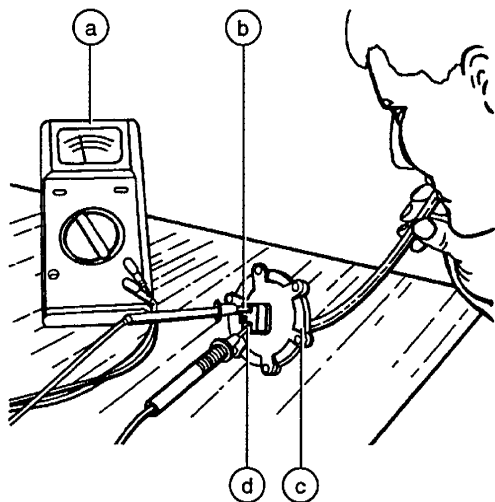
**CAUTION** Component damage hazard. Do not crank the engine with the over-temperature light on.

The oil pressure gauge is a mechanical gauge, with adjustable limit contacts that are factory set. The contacts will close at 19 psi (1.3 bar). When the contacts close the engine will shut off to prevent damage. A low oil pressure indicator light at the platform controls should turn on when the contacts close.

**CAUTION** Component damage hazard. Do not continue to run the engine with the low oil pressure light on.

## FORD LSG-423 ENGINE

## 8-8

**Vacuum Switch****How to Test the Vacuum Switch**

- a ohmmeter
- b common terminal (SOL.)
- c vacuum switch
- d normally open terminal (ING.)

1 Connect the leads from an ohmmeter or continuity tester to the common and normally open terminals.

⊙ Result: There should be no continuity (infinite  $\Omega$ ).

2 Apply mild suction to the vacuum port.

⊙ Result: The switch should close and show full continuity (zero  $\Omega$ ).

**CAUTION** Component damage hazard.  
Do not short the vacuum switch terminals to ground.

# Ground Controls

## 9-1

### Control Relays

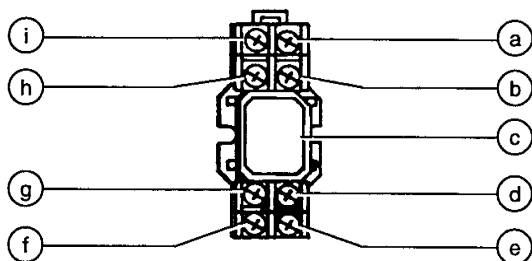
Relays used for single function switching are single pole double throw (SPDT) relays. (There are two types of single pole double throw relays used for ground controls.) Dual function switching requires a double pole double throw (DPDT) relay.

### How to Test a Double Pole Double Throw Relay

**WARNING** Electrocutation hazard. Contact with electrically charged circuits may cause death or serious injury. Remove all rings, watches and other jewelry.

This procedure covers fundamental relay testing and does not specifically apply to all varieties of relays.

- 1 Turn the key switch to the OFF position and remove the key.
- 2 Label and then disconnect all the wiring from the relay to be tested.
- 3 Connect the leads from an ohmmeter to each terminal combination and check for continuity. Terminals 13 and 14 represent the coil and should not be tested in any other combination.



- a terminal no. 5
- b terminal no. 1
- c relay
- d terminal no. 13
- e terminal no. 9
- f terminal no. 12
- g terminal no. 14
- h terminal no. 4
- i terminal no. 8

Test	Desired result
terminal 13 to 14	160 to 170Ω
terminal 8 to 5, 4, 1, 12 & 9	no continuity (infinite Ω)
terminal 5 to 4, 1, 12 & 9	no continuity
terminal 4 to 1 & 9	no continuity
terminal 1 to 12	no continuity
terminal 4 to 12	continuity (zero Ω)
terminal 1 to 9	continuity

- 4 Connect 12V DC to terminal 14 and a ground wire to terminal 13, then test the following terminal combinations.

Test	Desired result
terminal 8 to 1, 5, 9 & 4	no continuity (infinite Ω)
terminal 5 to 1, 4 & 12	no continuity
terminal 4 to 1, 9 & 12	no continuity
terminal 1 to 9 & 12	no continuity
terminal 8 to 12	continuity (zero Ω)
terminal 5 to 9	continuity (zero Ω)

GROUND CONTROLS

### How to Test a Single Pole Double Throw Relay

This procedure covers fundamental relay testing and does not specifically apply to all varieties of relays.

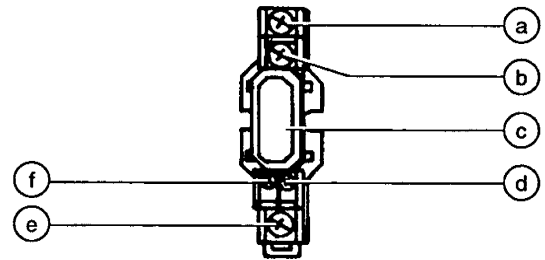
#### Socket Connection Relay

- 1 Turn the key switch to the OFF position and remove the key.
- 2 Label and then disconnect all the wiring from the relay to be tested.
- 3 Connect the leads from an ohmmeter or continuity tester to each terminal combination and check for continuity. Terminals 13 and 14 represent the coil and should not be tested in any other combination.

- 4 Connect 12V DC to terminal 14 and a ground wire to terminal 13, then test the following terminal combinations.

Test	Desired result
terminal 1 to 5 & 9	no continuity (infinite $\Omega$ )
terminal 5 to 9	continuity (zero $\Omega$ )

Test	Desired result
terminal 13 to 14	190 to 200 $\Omega$
terminal 5 to 1 & 9	no continuity (infinite $\Omega$ )
terminal 1 to 9	continuity (zero $\Omega$ )

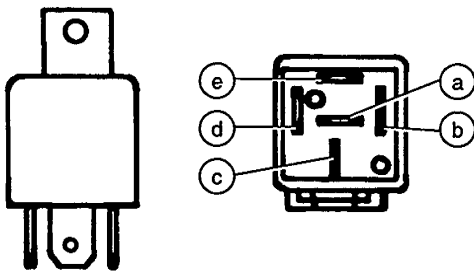


- a terminal no. 5
- b terminal no. 1
- c relay
- d terminal no. 13
- e terminal no. 9
- f terminal no. 14

GROUND CONTROLS

**Direct Connection Relay**

- 1 Label and then disconnect all the wiring from the relay to be tested.
- 2 Connect the leads from an ohmmeter or continuity tester to each terminal combination and check for continuity. Terminals 85 and 86 represent the coil and should not be tested in any other combination.



- a terminal no. 87a
- b terminal no. 85
- c terminal no. 30
- d terminal no. 86
- e terminal no. 87

Test	Desired result
terminal 85 to 86	85 to 95Ω
terminal 87 to 87a & 30	no continuity (infinite Ω)
terminal 87a to 30	continuity (zero Ω)

- 3 Connect 12V DC to terminal 85 and a ground wire to terminal 86, then test the following terminal combinations.

Test	Desired result
terminal 87 to 87a & 30	no continuity (infinite Ω)
terminal 87 to 30	continuity (zero Ω)

9-2

**Power Relay**

**WARNING** Electrocutation hazard. Contact with electrically charged circuits may cause death or serious injury. Remove all rings, watches and other jewelry.

**How to Test the Power Relay**

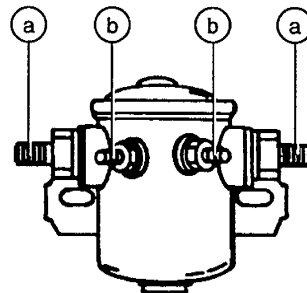
**WARNING** Electrocutation hazard. Disconnect the ground cable from the battery before performing this procedure.

- 1 Connect the leads from an ohmmeter to each terminal combination and check for continuity.

Test	Desired result
2 small posts	13 to 17Ω
2 large posts	no continuity (infinite Ω)
Any small post to any large post	no continuity (infinite Ω)

- 2 Connect 12V DC to one of the small posts and a ground wire to the other small post, then test the following terminal combination.

Test	Desired result
2 large posts	continuity (zero Ω)



- a high amp power contact terminal (large post)
- b solenoid activate coil terminal (small post)



## GROUND CONTROLS

**9-3****Toggle Switches**

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See 1-5, *Toggle Switches*.

**9-4****Wago® Components**

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**How to Remove a Wago® Component****WARNING**

Electrocution hazard. Contact with electrically charged circuits may cause death or serious injury. Remove all rings, watches and other jewelry.

**NOTICE**

A small screwdriver is provided and should be used when removing a Wago® component. This screwdriver is located in the operator's manual storage box in the platform.

- 1 Label and then disconnect the wiring from the component to be removed.
- 2 Locate the removal tab on the bottom or top side of the component.
- 3 Use the provided screwdriver to gently pry up on the tab of the component and remove it.

**9-5****Resistors**

---

**How to Test the Resistors**

Two resistors are used to maintain proper control of boom function speeds. The 10 ohm resistors reduce voltage to all the boom function switches.

**NOTICE**

Perform this procedure with the key switch off and the key removed.

- 1 Disconnect either end of one of the wires connected to the resistor to be tested.
- 2 Connect the leads from an ohmmeter to each end or wiring of the resistor being tested.
- 3 Compare the ohmmeter reading with the resistance rating printed on the resistor.

# Hydraulic Pumps

## 10-1

### Lift/Steer Pump

#### How to Test the Lift/Steer Pump

- 1 Disconnect and plug the high pressure hydraulic hose from the lift/steer pump.

#### **CAUTION**

Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 2 Connect a 0 to 5000 psi (0 to 350 bar) pressure gauge to the high pressure port.
- 3 **Gasoline/LPG models:** Remove the high tension lead from the center of the ignition coil.

#### **WARNING**

Electrocution hazard. Contact with electrically charged circuits may cause death or serious injury. Remove all rings, watches and other jewelry.

- 4 Turn the key switch to ground control and pull out the Emergency Stop button to the ON position.

- 5 **Deutz Diesel models:** Hold the manual fuel shutoff valve counterclockwise to the CLOSED position.

**All models:** Observe the pressure gauge while cranking the engine. Immediately stop cranking if the pressure reaches or exceeds 3000 psi (206 bar).

#### **CAUTION**

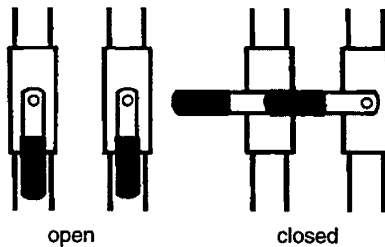
Component damage hazard. Hydraulic pressure in excess of 3000 psi (206 bar) will cause damage to the machine.

- ⊙ Result: If the pressure gauge reads 3000 psi (206 bar), immediately stop cranking the engine. The pump is good.
  - ⊙ Result: If the pressure fails to reach 3000 psi (206 bar), the pump is bad and will need to be serviced or replaced.
- 6 **Gasoline/LPG models:** Reconnect the high tension lead to the ignition coil.

## HYDRAULIC PUMPS

## How to Remove the Lift/Steer Pump

- 1 Close the two hydraulic tank valves located at the hydraulic tank.



- CAUTION** Component damage hazard. The engine must not be started with the hydraulic tank shutoff valves in the CLOSED position or component damage will occur. If the tank valves are closed, remove the key from the key switch and tag the machine to inform personnel of the condition.

- 2 Disconnect and plug the lift/steer pump hydraulic hoses. Cap the fittings.

- CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 3 Remove the pump mounting bolts. Carefully remove the pump.

- CAUTION** Component damage hazard. Be sure to open the two hydraulic tank valves and prime the pump after installing the pump.

## 10-2

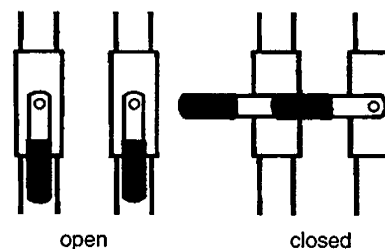
### Drive Hydraulic Pump

The drive hydraulic pump is a bi-directional variable displacement piston pump. The pump output is controlled by the electronic displacement controller (EDC), located on the pump. The only adjustment that can be made to the pump is the neutral or null adjustment. Any internal service to the pump should only be performed at an authorized Sundstrand-Sauer service center.

### How to Remove the Drive Hydraulic Pump

- CAUTION** Component damage hazard. The work area and surfaces where this procedure will be performed must be clean and free of debris that could get into the hydraulic system and cause severe component damage. Dealer service is recommended.

- 1 Disconnect the electrical connection at the electronic displacement controller (EDC) located on the drive pump.
- 2 Close the two hydraulic tank valves located at the hydraulic tank.



- CAUTION** Component damage hazard. The engine must not be started with the hydraulic tank shutoff valves in the CLOSED position or component damage will occur. If the tank valves are closed, remove the key from the key switch and tag the machine to inform personnel of the condition.

---

## HYDRAULIC PUMPS

- 3 Disconnect the hydraulic hoses from the pumps and cap them.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 4 Support the pump and remove the two drive pump mounting bolts. Carefully remove the pump.

**CAUTION** Component damage hazard. Be sure to open the two hydraulic tank valves and prime the pump after installing the pump.

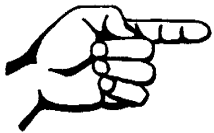
### How to Prime the Pump

- 1 Connect a 0 to 600 psi (0 to 41 bar) pressure gauge to the test port on the drive pump.
- 2 **Gasoline/LPG models:** Remove the high tension lead from the center of the ignition coil.

**WARNING** Electrocutation hazard. Contact with electrically charged circuits may cause death or serious injury. Remove all rings, watches and other jewelry.

**Deutz Diesel models:** Hold the manual fuel shutoff valve counterclockwise to the CLOSED position.

- 3 Crank the engine with the starter motor for 15 seconds, wait 15 seconds, then crank the engine an additional 15 seconds or until the pressure reaches 320 psi (22 bar).



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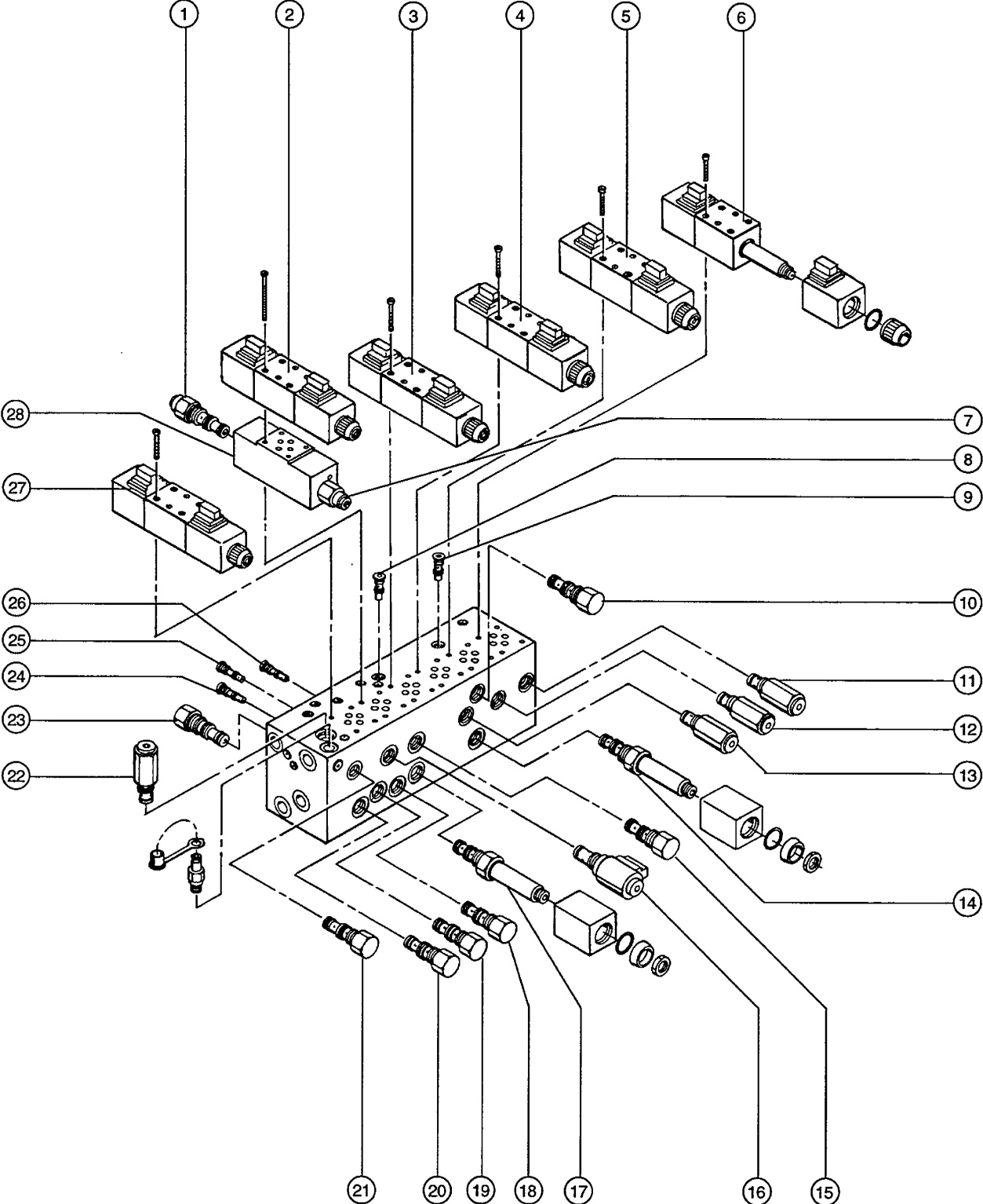
# Function Manifolds

## 11-1

### Function Manifold Components

Index No.	Description	Schematic Item	Function	Torque
1	Counterbalance valve .....	B .....	Platform level up .....	35-40 ft-lbs / 47-54 Nm
2	3 position 4 way D01 valve .....	O .....	Platform level .....	30-35 in-lbs / 3-4 Nm
3	3 position 4 way D01 valve .....	P .....	Turntable rotate .....	30-35 in-lbs / 3-4 Nm
4	3 position 4 way D01 valve .....	Q .....	Secondary boom up/down .....	30-35 in-lbs / 3-4 Nm
5	3 position 4 way D01 valve .....	R .....	Primary boom up/down .....	30-35 in-lbs / 3-4 Nm
6	3 position 4 way D01 valve .....	S .....	Primary boom extend/retract .....	30-35 in-lbs / 3-4 Nm
7	Counterbalance valve .....	C .....	Platform level down .....	35-40 ft-lbs / 47-54 Nm
8	Check valve .....	K .....	Turntable rotate - differential sensing .....	11-13 ft-lbs / 15-18 Nm
9	Check valve .....	M .....	Primary and secondary boom - differential sensing .....	11-13 ft-lbs / 15-18 Nm
10	Flow regulator valve .....	Y .....	Primary boom/secondary boom .....	10-12 ft-lbs / 14-16 Nm
11	Relief valve, 1200 psi (83 bar) .....	D .....	Primary boom extend .....	25-30 ft-lbs / 34-41 Nm
12	Relief valve, 1800 psi (124 bar) .....	F .....	Primary boom down .....	25-30 ft-lbs / 34-41 Nm
13	Relief valve, 1600 psi (110 bar) .....	E .....	Secondary boom down .....	25-30 ft-lbs / 34-41 Nm
14	Proportional solenoid valve .....	AA .....	Primary boom/secondary boom .....	10-12 ft-lbs / 14-16 Nm
15	Flow regulator valve .....	X .....	Turntable rotate/ Primary boom extend/retract .....	10-12 ft-lbs / 14-16 Nm
16	Normally closed poppet valve .....	J .....	Platform level .....	25-30 ft-lbs / 34-41 Nm
17	Proportional solenoid valve .....	Z .....	Turntable rotate/ Primary boom extend/retract .....	10-12 ft-lbs / 14-16 Nm
18	Flow regulator valve .....	V .....	Platform level .....	10-12 ft-lbs / 14-16 Nm
19	Differential sensing valve .....	AC .....	All functions .....	10-12 ft-lbs / 14-16 Nm
20	Flow regulator valve .....	U .....	Platform rotate/jib boom .....	10-12 ft-lbs / 14-16 Nm
21	Flow regulator valve .....	W .....	Differential sensing circuit .....	10-12 ft-lbs / 14-16 Nm
22	Relief valve, 2400 psi (165 bar) .....	AB .....	System relief .....	35-40 ft-lbs / 47-54 Nm
23	Priority flow regulator valve .....	T .....	Steering .....	10-12 ft-lbs / 14-16 Nm
24	Check valve .....	I .....	Jib boom down and platform rotate right - differential sensing .....	11-13 ft-lbs / 15-18 Nm
25	Check valve .....	H .....	Jib boom up and platform rotate left - differential sensing .....	11-13 ft-lbs / 15-18 Nm
26	Check valve .....	L .....	Platform level - differential sensing ..	11-13 ft-lbs / 15-18 Nm
27	3 position 4 way D01 valve .....	N .....	Jib boom/platform rotate .....	30-35 in-lbs / 3-4 Nm
28	Sandwich valve manifold .....	A .....	Platform level counterbalance valves	

FUNCTION MANIFOLDS

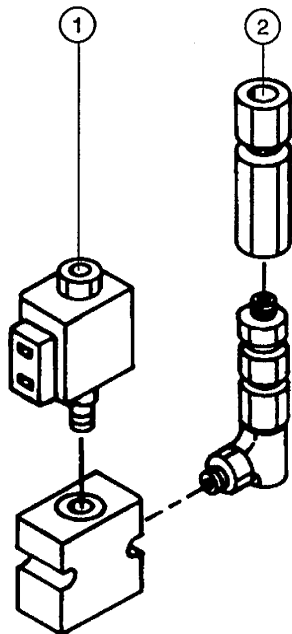


FUNCTION MANIFOLDS

# 11-2

## Auxiliary Power Manifold Components

Index No.	Description	Function	Torque
1	2 position 3 way solenoid valve .....	Auxiliary steer .....	8-10 ft-lbs / 11-14 Nm
2	Check valve .....	Auxiliary steer .....	35-40 ft-lbs / 47-54 Nm



### Plug Torque Specifications

Description	Hex Size	Torque
SAE No. 2	1/8	50 in-lbs / 6 Nm
SAE No. 4	3/16	13 ft-lbs / 18 Nm
SAE No. 6	1/4	18 ft-lbs / 24 Nm
SAE No. 8	5/16	50 ft-lbs / 68 Nm
SAE No. 10	9/16	55 ft-lbs / 75 Nm
SAE No. 12	5/8	75 ft-lbs / 102 Nm



FUNCTION MANIFOLDS

**11-3  
Valve Adjustments -  
Function Manifold**

**How to Adjust the Main  
Relief Valve**

- NOTICE** Perform this procedure with the boom in the stowed position.
- 1 Connect a 0 to 3000 psi (0 to 206 bar) pressure gauge to the test port on the function manifold.
  - 2 Start the engine from the ground controls.
  - 3 Hold the retract switch with the primary boom fully retracted, and observe the pressure reading on the pressure gauge.
  - 4 Turn the engine off. Hold the relief valve and remove the cap (item 22, function manifold).
  - 5 Adjust the internal hex socket. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Then install the relief valve cap.

**WARNING** Tip-over hazard. Do not adjust the relief valves higher than recommended.

- 6 Restart the engine. Hold the retract switch with the primary boom fully retracted, and recheck the valve pressure.

**Main relief valve specifications**

Pressure	2400 psi 165 bar
----------	---------------------

**How to Adjust the Primary Boom  
Down Relief Valve**

**NOTICE** Perform this procedure with the boom in the stowed position.

- 1 Connect a 0 to 3000 psi (0 to 206 bar) pressure gauge to the test port on the function manifold.
- 2 Start the engine from the ground controls.
- 3 Hold the primary boom down switch with the primary boom fully lowered, and observe the pressure reading on the pressure gauge.
- 4 Turn the engine off. Hold the relief valve and remove the cap (item 12, function manifold).
- 5 Adjust the internal hex socket. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Then install the relief valve cap.

**WARNING** Tip-over hazard. Do not adjust the relief valves higher than recommended.

- 6 Restart the engine. Hold the primary boom down switch with the primary boom fully lowered and recheck the valve pressure.

**Primary boom down relief valve specifications**

Pressure	1800 psi 124 bar
----------	---------------------

FUNCTION MANIFOLDS

### How to Adjust the Primary Boom Extend Relief Valve

**NOTICE** Perform this procedure with the boom in the stowed position.

- 1 Connect a 0 to 3000 psi (0 to 206 bar) pressure gauge to the test port on the function manifold.
- 2 Start the engine from the ground controls.
- 3 Hold the extend switch with the primary boom fully extended, and observe the pressure reading on the pressure gauge.
- 4 Turn the engine off. Hold the relief valve and remove the cap (item 11, function manifold).
- 5 Adjust the internal hex socket. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Then install the relief valve cap.

**WARNING** Tip-over hazard. Do not adjust the relief valves higher than recommended.

- 6 Restart the engine. Hold the extend switch with the primary boom fully extended, and recheck the valve pressure.

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**Primary boom extend relief valve specifications**

Pressure	1200 psi 83 bar
----------	--------------------

### How to Adjust the Secondary Boom Down Relief Valve

**NOTICE** Perform this procedure with the boom in the stowed position.

- 1 Connect a 0 to 3000 psi (0 to 206 bar) pressure gauge to the test port on the function manifold.
- 2 Start the engine from the ground controls.
- 3 Hold the secondary boom down switch with the secondary boom fully lowered, and observe the pressure reading on the pressure gauge.
- 4 Turn the engine off. Hold the relief valve and remove the cap (item 13, function manifold).
- 5 Adjust the internal hex socket. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Then install the relief valve cap.

**WARNING** Tip-over hazard. Do not adjust the relief valves higher than recommended.

- 6 Restart the engine. Hold the secondary boom down switch with the secondary boom fully lowered, and recheck the valve pressure.

---

**Secondary boom down relief valve specifications**

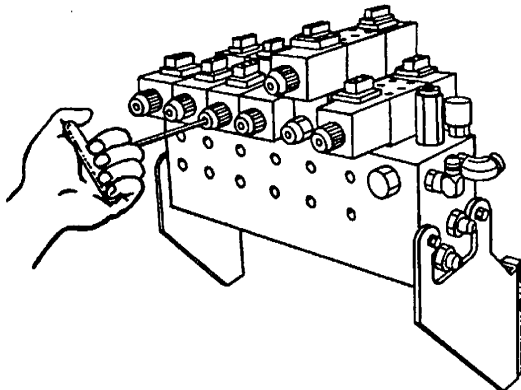
Pressure	1600 psi 110 bar
----------	---------------------

## FUNCTION MANIFOLDS

## How to Override a Valve

A hydraulic valve may need to be manually overridden to troubleshoot a malfunction. The proportional boom functions (primary boom, secondary boom, extend/retract and turntable rotate) use a variable position proportional valve and a three position directional valve. Example: one position for boom up, one position for neutral and one position for boom down. The platform rotate, jib boom and platform level functions use only three position valves. The three position valves and the proportional valves can be manually overridden. To identify the manifold valves see 11-1, *Function Manifolds*, in this section.

- 1 Push the button on the end of the valve in  $\frac{1}{4}$  inch (6mm).



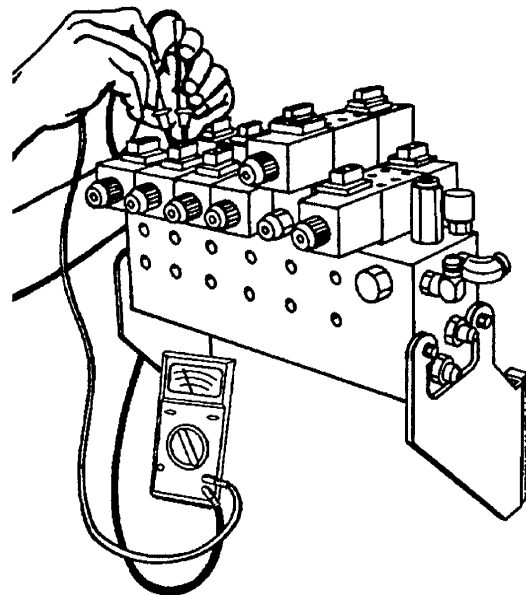
- 2 Move the ground control function switch for the function being overridden to operate function.



Collision hazard. Impact with moving boom components may cause death or serious injury. Use extreme caution when overriding a machine function. Identify the direction of machine movement before overriding a valve.

## How to Check the Resistance of a Valve Coil

- 1 Turn the key switch to the OFF position and disconnect the wires from the valve coil to be tested.
- 2 Connect the leads from an ohmmeter to the valve coil terminals.



### Valve coil specifications

Proportional solenoid valve	5Ω
3 position 4 way directional valve	4.5Ω
Normally closed poppet valve	7Ω

# Fuel and Hydraulic Tanks

## 12-1

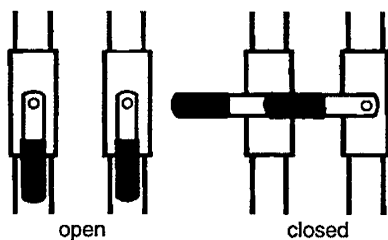
### Hydraulic Tank

The primary functions of the hydraulic tank are to cool, clean and deaerate the hydraulic fluid during operation. The hydraulic tank has a 45 gallon (170 liters) capacity and an oil level gauge with a temperature indicator. It utilizes internal suction strainers for the pump supply suction lines and has an external return line filter with condition indicator.

### How to Remove the Hydraulic Tank

**CAUTION** Component damage hazard. The work area and surfaces where this procedure will be performed must be clean and free of debris that could get into the hydraulic system.

- 1 Remove the fuel tank. See 12-2, *How to Remove the Fuel Tank*.
- 2 Remove the mounting fasteners from the ground control box. Move the control box to the side to access the hydraulic hoses.
- 3 Close the two hydraulic tank valves located at the hydraulic tank.



**CAUTION** Component damage hazard. The engine must not be started with the hydraulic tank shutoff valve in the CLOSED position or component damage will occur. If the tank valves are closed, remove the key from the key switch and tag the machine to inform personnel of the condition.

- 4 Completely drain the oil from the tank by removing the drain plug located in the bottom of the tank.

**CAUTION** Burn hazard. Contact with hot oil may cause severe burns.

- 5 Disconnect the hydraulic hoses from the hydraulic tank.
- 6 Remove the mounting fasteners from the bottom of the tank straps.
- 7 Use an appropriate lifting device to remove the tank from the machine.

**NOTICE** Always use pipe thread sealant when installing the drain plug.

**NOTICE** Use only Dexron II equivalent hydraulic fluid.

**CAUTION** Component damage hazard. Be sure to open the two hydraulic tank valves and prime the pump after installing the hydraulic tank.

### How to Prime the Pump

- 1 Connect a 0 to 600 psi (0 to 41 bar) pressure gauge to the test port on the drive pump.
- 2 **Gasoline/LPG models:** Remove the high tension lead from the center of the ignition coil.

**WARNING** Electrocutation hazard. Contact with electrically charged circuits may cause death or serious injury. Remove all rings, watches and other jewelry.

**Deutz Diesel models:** Hold the manual fuel shutoff valve counterclockwise to the CLOSED position.

- 3 Crank the engine with the starter motor for 15 seconds, wait 15 seconds, then crank the engine an additional 15 seconds or until the pressure reaches 320 psi (22 bar).

## FUEL AND HYDRAULIC TANKS

## 12-2

## Fuel Tank

---

**How to Remove the Fuel Tank**

**⚠ DANGER** Explosion hazard. Engine fuels are combustible. Remove the fuel tank in an open, well-ventilated area away from heaters, sparks, flames and lighted tobacco. Always have an approved fire extinguisher within easy reach.

**⚠ DANGER** Explosion hazard. When transferring fuel, connect a grounding wire between the machine and pump or container.

- 1 Turn the manual fuel shutoff valve to the **CLOSED** position.
- 2 **Gasoline/LPG models:** Disconnect, drain and plug the fuel hose. Disconnect the wiring from the fuel shut-off solenoid.  
**Deutz Diesel models:** Disconnect, drain and plug the supply and return fuel lines. Cap the fuel return fitting on the fuel tank.
- 3 Remove the mounting fasteners from the bottom of the tank straps.
- 4 Use an appropriate lifting device to remove the tank from the machine.

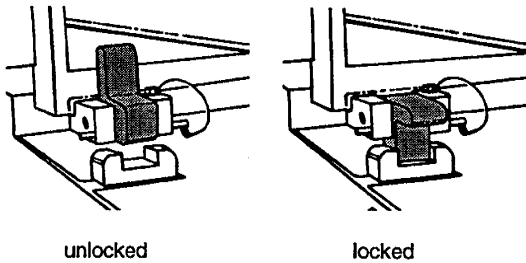
**NOTICE** Clean the fuel tank and inspect for rust and corrosion before installing.

# Turntable Rotation Components

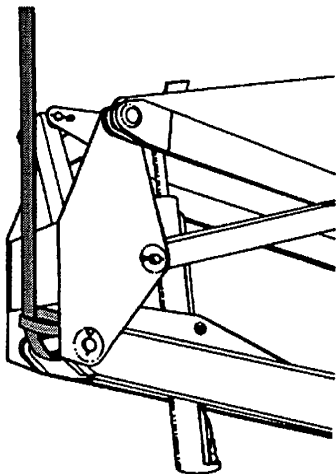
## 13-1 Rotation Hydraulic Motor

### How to Remove the Rotation Hydraulic Motor

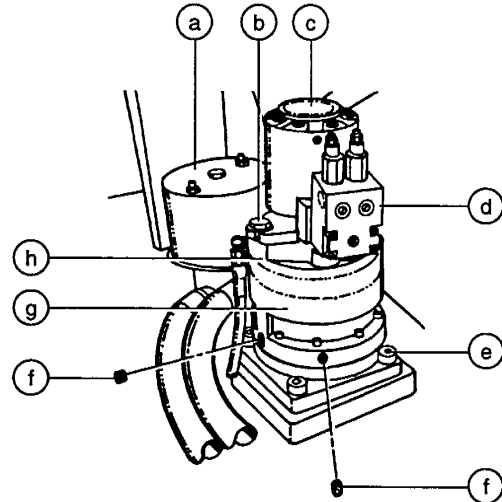
- 1 Secure the turntable from rotating with the turntable rotation lock.



- 2 Raise the secondary boom until the platform end of the lower secondary boom arm is 8 feet (2.4m) off the ground.
- 3 Attach the lifting strap from an overhead crane to the platform end of the lower secondary boom arm for support. Do not lift it.



- 4 Disconnect and plug the hydraulic hoses from the turntable rotation manifold. Cap the fittings.



- a electrical rotary coupler
- b motor and brake mounting bolt
- c motor
- d turntable rotation manifold
- e torque hub mounting bolt
- f plug
- g torque hub
- h brake

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 5 Remove the motor mounting bolts, then remove the motor from the brake.

### How to Remove the Turntable Rotation Brake or Torque Hub

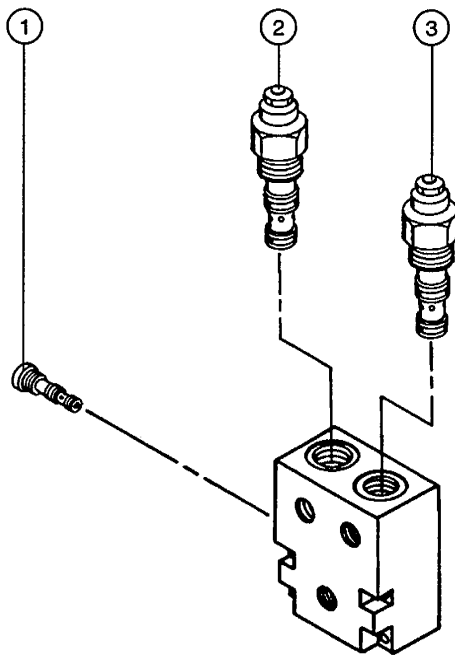
Refer to Maintenance Procedures, C-5, *How to Replace the Torque Hub Oil.*

TURNTABLE ROTATION COMPONENTS

13-2

**Turntable Rotation Manifold Components**

Index No.	Description	Schematic Item	Function	Torque
1	Shuttle valve 2 position 3 way .....	C .....	Turntable rotation brake release .....	10-13 ft-lbs / 14-18 Nm
2	Counterbalance valve .....	A .....	Turntable rotate - right .....	35-40 ft-lbs / 47-54 Nm
3	Counterbalance valve .....	B .....	Turntable rotate - left .....	35-40 ft-lbs / 47-54 Nm



**Plug Torque Specifications**

Description	Hex Size	Torque
SAE No. 2	1/8	50 in-lbs / 6 Nm
SAE No. 4	3/16	13 ft-lbs / 18 Nm
SAE No. 6	1/4	18 ft-lbs / 24 Nm
SAE No. 8	5/16	50 ft-lbs / 68 Nm
SAE No. 10	9/16	55 ft-lbs / 75 Nm
SAE No. 12	5/8	75 ft-lbs / 102 Nm

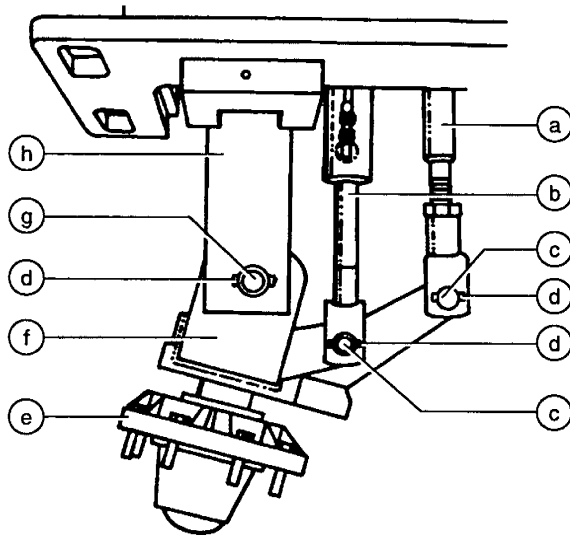
# 2WD Steering Axle Components

## 14-1

### Yoke and Hub

#### How to Remove the Yoke and Hub

- 1 Remove the retaining bolt, then the pivot pin from both the steering cylinder and the tie rod.

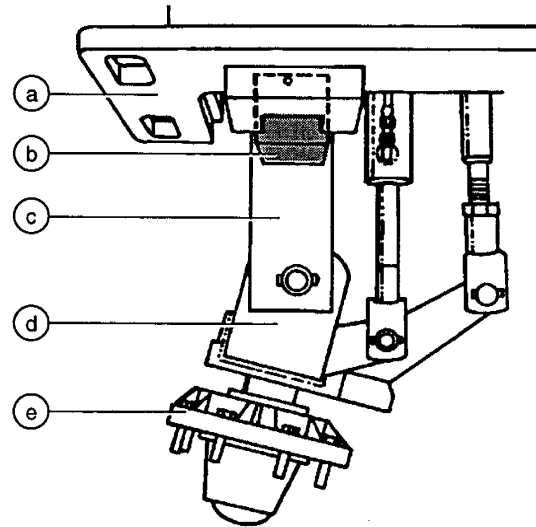


- a tie rod
- b steering cylinder
- c pivot pin
- d retaining bolt
- e hub
- f yoke
- g king pin
- h axle

- 2 Loosen the wheel lug nuts. Do not remove them.
- 3 Block the non-steering wheels, and then center a lifting jack under the steering axle.
- 4 Raise the machine 6 inches (15cm) and place blocks under the chassis for support.
- 5 Remove the lug nuts, then the tire and wheel assembly.
- 6 Remove the retaining bolt from the king pin.

#### 7 Oscillating axle equipped models:

Place a block between the oscillate cylinder lock-out wedge and the chassis on the same side as the yoke/hub being serviced.



- a chassis
- b block
- c oscillating axle
- d yoke
- e hub

- 8 Attach a strap from a lifting device to the yoke/hub assembly for support.
- 9 Use a soft metal drift to drive the king pin down and out.

**WARNING** Crushing hazard. The yoke/hub assembly will fall when the king pin is removed if it is not properly supported.

#### Torque specifications

Lug nut	125 ft-lbs 169.5 Nm
---------	------------------------



## 2WD STEERING AXLE COMPONENTS

## How to Remove the Hub and Bearings

- 1 Loosen the wheel lug nuts. Do not remove them.
- 2 Block the non-steering wheels and place a lifting jack under the steering axle.
- 3 Raise the machine and place blocks under the chassis for support.
- 4 Remove the lug nuts. Then remove the tire and wheel assembly.
- 5 Remove the dust cap, cotter pin and slotted nut.
- 6 Pull the hub off the spindle. The washer and outer bearing should fall loose from the hub.
- 7 Place the hub on a flat surface and gently pry the bearing seal out of the hub. Remove the rear bearing.

## How to Install the Hub and Bearings

**NOTICE** When replacing a wheel bearing, both the inner and outer bearings including the pressed-in races must be replaced.

- 1 Be sure that both bearings are packed with grease.
- 2 Place the large inner bearing into the rear of the hub.
- 3 Press the bearing seal evenly into the hub until it is flush.
- 4 Slide the hub onto the yoke spindle.

**CAUTION** Component damage. Do not apply excessive force or damage to the lip of the seal may occur.

- 5 Place the outer bearing into the hub.

- 6 Install the washer and slotted nut.
- 7 Tighten the slotted nut to 35 foot-pounds (47Nm).
- 8 Loosen the slotted nut, then re-tighten to 8 foot-pounds (11Nm).
- 9 Install a new cotter pin. Bend the cotter pin to lock it in.
- 10 Install the dust cap, then the tire and wheel assembly. Torque the wheel lug nuts to 125 foot-pounds (169.5Nm).

## 14-2

### Steering Cylinders

#### How to Remove a Steering Cylinder

There are two identical steering cylinders that work in parallel. They are part of the same hydraulic circuit, but move in opposite directions. The tie rod maintains equal movement of the tires. Bushings are used at both ends of each steering cylinder clevis.

- 1 Disconnect and plug the hydraulic hoses from the steering cylinder. Cap the fittings.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 2 Remove the retaining bolt. Then remove the pivot pin from each end of the steering cylinder.
- 3 Remove the steering cylinder.

## 2WD STEERING AXLE COMPONENTS

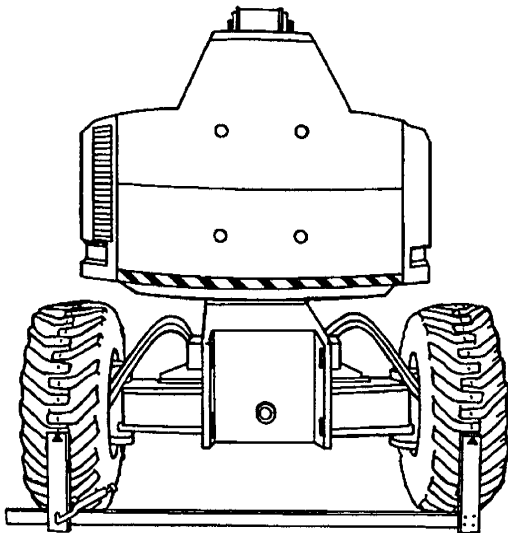
**14-3****Tie Rod****How to Remove the Tie Rod**

- 1 Remove the retaining bolt, then remove the pivot pin from each end of the tie rod.
- 2 Remove the tie rod.

**How to Perform the Toe-in Adjustment**

**NOTICE** Perform this procedure on a firm level surface. Block the non-steering tires and be sure that the machine is in the stowed position.

- 1 Straighten the steer wheels.
- 2 Measure the steer tires, front to front and back to back, using a measuring fixture .



- 3 Center a lifting jack under the steering axle, then raise the machine.
- 4 Loosen the jam nut on the adjustable end of the tie rod.
- 5 Remove the retaining bolt, then remove the pivot pin from the adjustable end of the tie rod.
- 6 Slide the tie rod off the yoke and adjust it by turning the end.

**NOTICE** One turn on the adjustable end equals approximately  $\frac{1}{8}$  inch (3.2mm) change in the front and rear measurements.

- 7 Slide the tie rod onto the yoke. Install the pivot pin, then install the retaining bolt.
- 8 Tighten the jam nut against the tie rod.
- 9 Lower the machine and recheck the front and back measurements (step 2). If further adjustment is needed, repeat steps 3 through 8.

<b>Toe-in specification</b>	$0 \pm \frac{1}{8}$ inch (6.35mm)
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# 4WD Steering Axle Components

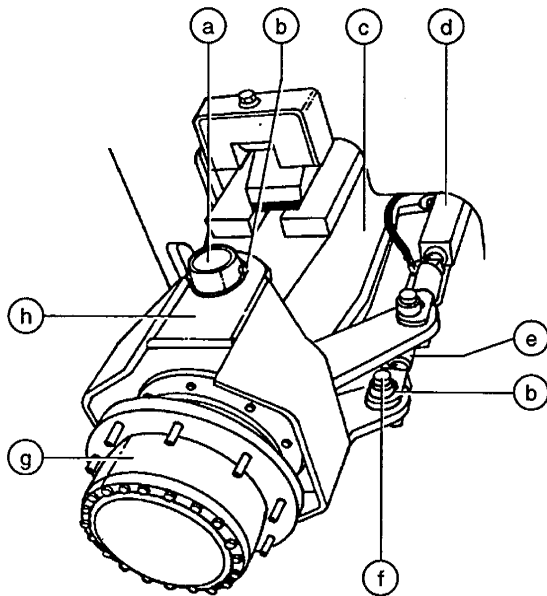
## 15-1

### Yoke and Hub

#### How to Remove the Yoke and Hub

The yoke installation utilizes bushings and a thrust washer that may require periodic replacement. The yoke must be removed before the torque hub can be removed. The wheel motor on 4WD models is an integral part of the torque hub.

- 1 Remove the retaining bolt, then remove the pivot pin from both the steering cylinder and the tie rod.

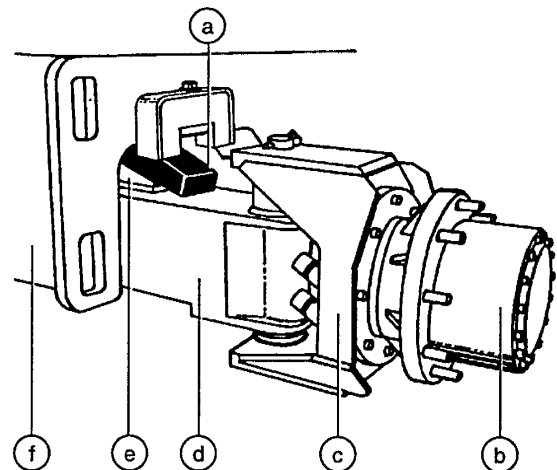


- a king pin
- b retaining bolt
- c oscillating axle
- d tie rod
- e steering cylinder
- f pivot pin
- g torque hub
- h yoke

- 2 Disconnect and plug the hydraulic hoses from the wheel motor. Cap the wheel motor hydraulic fittings.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 3 Loosen the wheel lug nuts. Do not remove them.
- 4 Block the non-steering wheels, and then center a lifting jack under the steering axle.
- 5 Raise the machine 6 inches (15cm) and place blocks under the chassis for support.
- 6 Remove the lug nuts, then remove the tire and wheel assembly.
- 7 Remove the retaining bolt from the king pin.
- 8 Place a block between the oscillate cylinder lock-out wedge and the chassis on the same side as the yoke/torque hub being serviced.



- a block
- b torque hub
- c yoke
- d oscillating axle
- e lock-out wedge
- f chassis

4WD STEERING AXLE COMPONENTS

- 9 Attach a strap from a lifting device to the yoke/torque hub assembly for support.
- 10 Use a soft metal drift to drive the king pin down and out.

**WARNING** Crushing hazard. The yoke/torque hub assembly will fall when the king pin is removed if it is not properly supported.

- 11 Place the yoke/torque hub assembly on a flat surface with the torque hub down. Remove the bolts that secure the yoke to the torque hub.

**Torque specifications**

Lug nut	125 ft-lbs 169.5 Nm
Torque hub mounting bolts	120 ft-lbs 163 Nm

**15-2**

**Steering Cylinders**

**How to Remove a Steering Cylinder**

This procedure is the same as the 2WD procedure. See repair procedure 14-2, *How to Remove a Steering Cylinder*.

**15-3**

**Tie Rod**

**How to Remove the Tie Rod**

This procedure is the same as the 2WD procedure. See Repair Procedures 14-3, *How to Remove the Tie Rod*.

**How to Perform the Toe-in Adjustment**

This procedure is the same as the 2WD procedure. See Repair Procedures 14-3, *How to Perform the Toe-in Adjustment*.

# Oscillating Axle Components

## 16-1

### Oscillating Axle Lock-out Cylinder

The oscillating axle lock-out cylinder extends the lock-out wedges between the chassis and the oscillating axle when the boom is raised, extended or the turntable is rotated. The cylinder slides from side to side in a track on the oscillating axle and uses an externally mounted proximity switch to detect when the lock-out wedges are fully extended.

### How to Remove the Oscillating Axle Lock-out Cylinder

**WARNING** This procedure requires specific repair skills and a suitable workshop. Attempting this procedure without these skills and tools may result in death or serious injury and significant component damage. Dealer service is strongly recommended.

**NOTICE** Perform this procedure on a firm level surface with the boom in the stowed position.

- 1 Disconnect and plug the oscillating axle lock-out cylinder hydraulic hoses. Cap the cylinder fittings.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

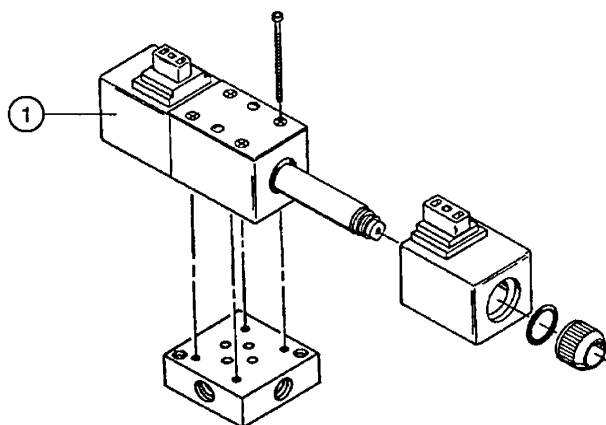
- 2 Remove the proximity switch mounting bracket from the oscillating axle lock-out cylinder.
- 3 Remove the mounting fastener from the wedge block on the rod end of the oscillating axle lock-out cylinder, then slide the wedge block to the right as far as possible.
- 4 Slide the oscillating axle lock-out cylinder to the left, then remove the cylinder.

# Steer and Oscillate Manifolds

## 17-1

### Steer Manifold Components - Non-oscillating Axle

Index No.	Description	Function	Torque
1	3 position 4 way D01 valve .....	Steering .....	30-35 in-lbs / 3-4 Nm



### Plug Torque Specifications

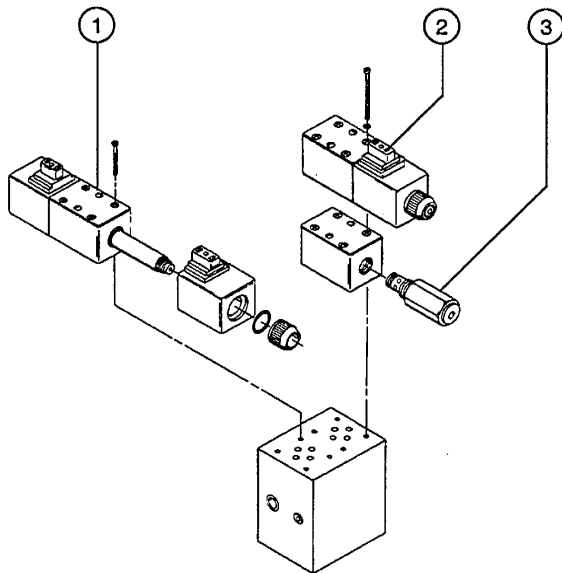
Description	Hex Size	Torque
SAE No. 2	1/8	50 in-lbs / 6 Nm
SAE No. 4	3/16	13 ft-lbs / 18 Nm
SAE No. 6	1/4	18 ft-lbs / 24 Nm
SAE No. 8	5/16	50 ft-lbs / 68 Nm
SAE No. 10	9/16	55 ft-lbs / 75 Nm
SAE No. 12	5/8	75 ft-lbs / 102 Nm

STEER AND OSCILLATE MANIFOLDS

17-2

Steer and Oscillate Manifold Components - Oscillating Axle

Index No.	Description	Schematic Item	Function	Torque
1	3 position 4 way D01 valve	A	Steering	30-35 in-lbs / 3-4 Nm
2	2 position 4 way valve	C	Oscillate lock-out	30-35 in-lbs / 3-4 Nm
3	Relief valve, 250 psi (17 bar)	B	Oscillate relief	35-40 ft-lbs / 47-54 Nm



Plug Torque Specifications

Description	Hex Size	Torque
SAE No. 2	1/8	50 in-lbs / 6 Nm
SAE No. 4	3/16	13 ft-lbs / 18 Nm
SAE No. 6	1/4	18 ft-lbs / 24 Nm
SAE No. 8	5/16	50 ft-lbs / 68 Nm
SAE No. 10	9/16	55 ft-lbs / 75 Nm
SAE No. 12	5/8	75 ft-lbs / 102 Nm

# Non-steering Axle Components

## 18-1

### Drive Motor

**CAUTION** Component damage hazard. Repairs to the drive motor should only be performed by an authorized Sundstrand-Sauer dealer.

### How to Remove a Drive Motor

A drive motor can only be removed from the inside of the chassis.

**CAUTION** Component damage hazard. The work area and surfaces where this procedure will be performed must be clean and free of debris that could get into the hydraulic system and cause severe component damage. Dealer service is recommended.

- 1 Disconnect the hydraulic hoses from the drive motor and plug them.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 2 Remove the drive motor mounting bolts.
- 3 Guide the drive motor shaft out of the brake and then remove the drive motor.

## 18-2

### Torque Hub

### How to Remove a Drive Torque Hub

The drive motor must be removed in order to access the torque hub mounting bolts.

- 1 Remove the drive motor. See 18-1, *How to Remove a Drive Motor*.
- 2 Disconnect the hydraulic hose from the brake and plug it. Then remove the hydraulic fitting and the bleed valve.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

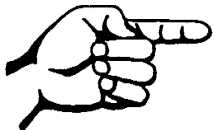
- 3 Loosen the wheel lug nuts. Do not remove them.
- 4 Center a lifting jack under the non-steering axle. Raise the machine and place blocks under the chassis for support.
- 5 Remove the wheel lug nuts, then the tire and wheel assembly.
- 6 Place a second lifting jack under the torque hub for support.
- 7 Remove the bolts that attach the torque hub to the chassis, then remove the torque hub.

**CAUTION** Crushing hazard. The torque hub will fall if it is not properly supported when the mounting bolts are removed.

#### Torque specifications

Lug nut	125 ft-lbs 169.5 Nm
Drive torque hub mounting bolts	120 ft-lbs 163 Nm





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# 2WD Drive Manifold

## 19-1

### 2WD Drive Manifold Components

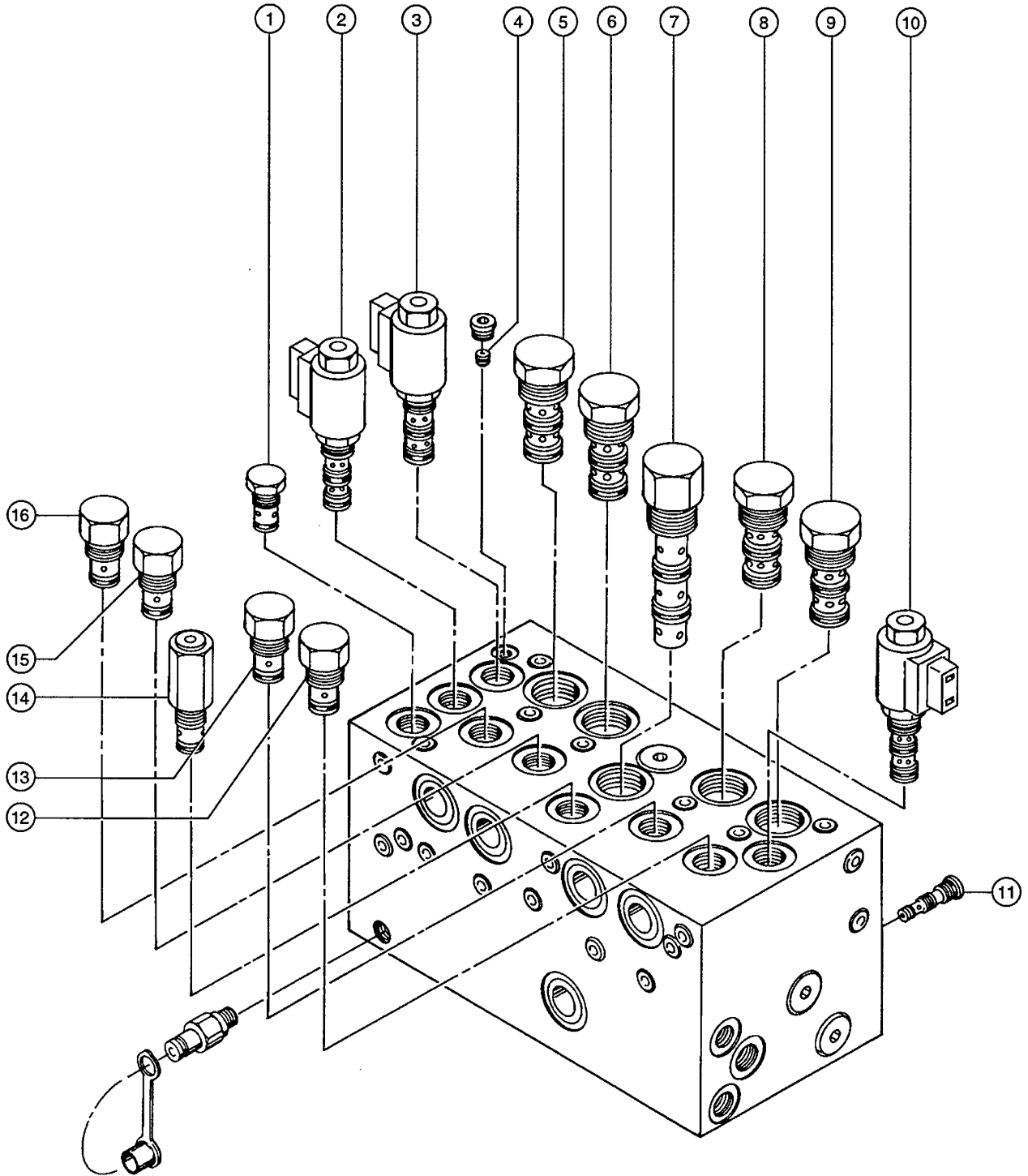
Index No.	Description	Schematic Item	Function	Torque
1	Check valve .....	W .....	Brake check .....	25-30 ft-lbs / 34-41 Nm
2	2 position 3 way valve .....	S .....	Brake release .....	8-10 ft-lbs / 11-14 Nm
3	2 position 3 way valve .....	R .....	Two-speed wheel motors (energized in high range to destroke the rear motor swash plates) .....	8-10 ft-lbs / 11-14 Nm
4	Orifice 0.025 in (0.635 mm) .....	X .....	Motor shift/brake release circuit .	
5	Pilot to open check valve .....	O .....	Right check in forward .....	85-90 ft-lbs / 115-122Nm
6	Pilot to open check valve .....	P .....	Right check in reverse .....	85-90 ft-lbs / 115-122 Nm
7	Shuttle valve 3 position 3 way .....	U .....	Low pressure flow path for brake release and two-speed motor shift .....	15-18 ft-lbs / 20-24 Nm
8	Pilot to open check valve .....	N .....	Left check in reverse .....	85-90 ft-lbs / 115-122 Nm
9	Pilot to open check valve .....	M .....	Left check in forward .....	85-90 ft-lbs / 115-122 Nm
10	2 position 3 way valve .....	Q .....	Energized in high range to pilot open check valves 5, 6, 8 & 9 to bypass flow regulators and allow full flow to front wheel motors .....	8-10 ft-lbs / 11-14 Nm
11	Shuttle valve 2 position 3 way .....	T .....	High pressure flow path for flow regulator bypass .....	10-13 ft-lbs / 14-18 Nm
12	Flow regulator valve .....	A .....	Left flow control in forward .....	10-12 ft-lbs / 14-16 Nm
13	Flow regulator valve .....	C .....	Left flow control in reverse .....	10-12 ft-lbs / 14-16 Nm
14	Relief valve, 320 psi (22 bar) .....	V .....	Charge pressure .....	10-12 ft-lbs / 14-16 Nm
15	Flow regulator valve .....	G .....	Right flow control in reverse .....	10-12 ft-lbs / 14-16 Nm
16	Flow regulator valve .....	E .....	Right flow control in forward .....	10-12 ft-lbs / 14-16 Nm

### Plug Torque Specifications

Description	Hex Size	Torque
SAE No. 2	1/8	50 in-lbs / 6 Nm
SAE No. 4	3/16	13 ft-lbs / 18 Nm
SAE No. 6	1/4	18 ft-lbs / 24 Nm

Description	Hex Size	Torque
SAE No. 8	5/16	50 ft-lbs / 68 Nm
SAE No. 10	9/16	55 ft-lbs / 75 Nm
SAE No. 12	5/8	75 ft-lbs / 102 Nm

2WD DRIVE MANIFOLD



## 2WD DRIVE MANIFOLD

**19-2****Valve Adjustments****How to Adjust the Charge Pressure Relief Valve**

- 1 Connect a 0 to 600 psi (0 to 41 bar) pressure gauge to the test port located on the drive manifold.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 2 Start the engine from the platform controls.
- 3 Drive the machine slowly in either direction and observe the pressure reading on the pressure gauge.
- 4 Turn the engine off. Hold the relief valve and remove the cap (index 14).
- 5 Adjust the internal hex socket. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Then install the valve cap.
- 6 Restart the engine. Drive the machine in either direction and recheck the valve pressure.
- 7 Turn the engine off, then remove the pressure gauge.

**Relief valve specifications**

Pressure	320 psi
22 bar	

**How to Check the Resistance of a Valve Coil**

- 1 Turn the key switch to the OFF position and disconnect the wires from the valve coil to be tested.
- 2 Connect the leads from an ohmmeter to the valve coil terminals.

**Valve coil specification**

2 position 3 way valve	6.3Ω
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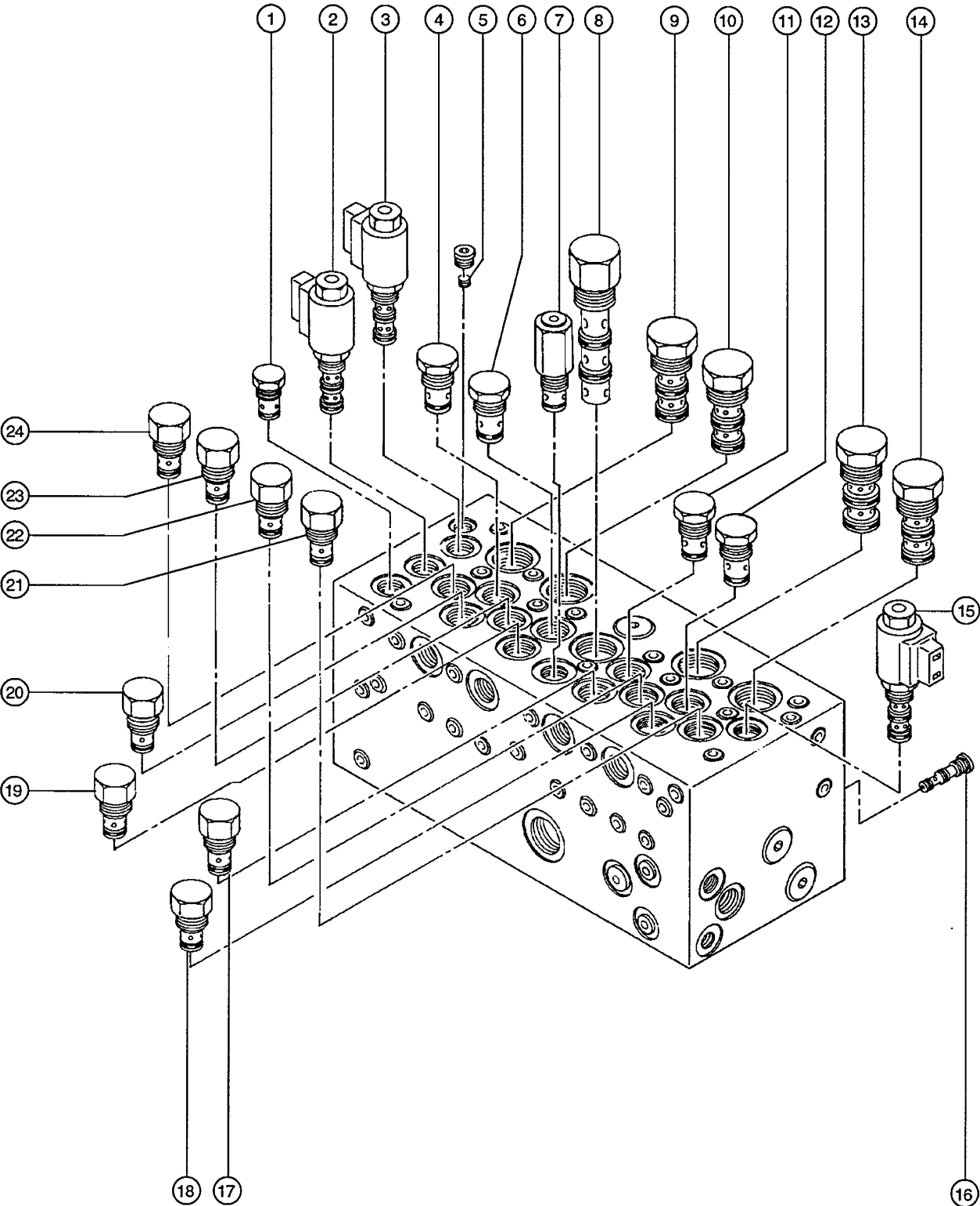
# 4WD Drive Manifold

## 20-1

### 4WD Drive Manifold Components

Index No.	Description	Schematic Item	Function	Torque
1	Check valve .....	W .....	Brake check .....	25-30 ft-lbs / 34-41 Nm
2	2 position 3 way valve .....	S .....	Brake release .....	8-10 ft-lbs / 11-14 Nm
3	2 position 3 way valve .....	R .....	Two-speed wheel motors (energized in high range to destroke the rear motor swash plates) .....	8-10 ft-lbs / 11-14 Nm
4	Check valve .....	K .....	RR check in forward .....	35-40 ft-lbs / 47-54 Nm
5	Orifice 0.025 in (0.635mm) .....	X .....	Motor shift/brake release circuit .	
6	Check valve .....	L .....	RR check in reverse .....	35-40 ft-lbs / 47-54 Nm
7	Relief valve, 320 psi (22 bar) .....	V .....	Charge pressure .....	10-12 ft-lbs / 14-16 Nm
8	Shuttle valve 3 position 3 way .....	U .....	Low pressure flow path for brake release and two-speed motor shift .....	15-18 ft-lbs / 20-24 Nm
9	Pilot to open check valve .....	O .....	RF check in forward .....	85-90 ft-lbs / 115-122 Nm
10	Pilot to open check valve .....	P .....	RF check in reverse .....	85-90 ft-lbs / 115-122 Nm
11	Check valve .....	J .....	LR check in reverse .....	35-40 ft-lbs / 47-54 Nm
12	Check valve .....	I .....	LR check in forward .....	35-40 ft-lbs / 47-54 Nm
13	Pilot to open check valve .....	N .....	LF check in reverse .....	85-90 ft-lbs / 115-122 Nm
14	Pilot to open check valve .....	M .....	LF check in forward .....	85-90 ft-lbs / 115-122 Nm
15	2 position 3 way valve .....	Q .....	Energized in high range to pilot open check valves 9, 10, 13 & 14 to bypass flow regulators and allow full flow to front wheel motors .....	8-10 ft-lbs / 11-14 Nm
16	Shuttle valve 2 position 3 way .....	T .....	High pressure flow path for flow regulator bypass .....	10-13 ft-lbs / 14-18 Nm
17	Flow regulator valve .....	D .....	LR flow control in reverse .....	10-12 ft-lbs / 14-16 Nm
18	Flow regulator valve .....	B .....	LR flow control in forward .....	10-12 ft-lbs / 14-16 Nm
19	Flow regulator valve .....	H .....	RR flow control in reverse .....	10-12 ft-lbs / 14-16 Nm
20	Flow regulator valve .....	F .....	RR flow control in forward .....	10-12 ft-lbs / 14-16 Nm
21	Flow regulator valve .....	A .....	LF flow control in forward .....	10-12 ft-lbs / 14-16 Nm
22	Flow regulator valve .....	C .....	LF flow control in reverse .....	10-12 ft-lbs / 14-16 Nm
23	Flow regulator valve .....	G .....	RF flow control in reverse .....	10-12 ft-lbs / 14-16 Nm
24	Flow regulator valve .....	E .....	RF flow control in forward .....	10-12 ft-lbs / 14-16 Nm

4WD DRIVE MANIFOLD



## 4WD DRIVE MANIFOLD

**Plug Torque Specifications**

Description	Hex Size	Torque
SAE No. 2	1/8	50 in-lbs / 6 Nm
SAE No. 4	3/16	13 ft-lbs / 18 Nm
SAE No. 6	1/4	18 ft-lbs / 24 Nm
SAE No. 8	5/16	50 ft-lbs / 68 Nm
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- 2 Start the engine from the platform controls.
- 3 Drive the machine slowly in either direction and observe the pressure reading on the pressure gauge.
- 4 Turn the engine off. Hold the relief valve and remove the cap (index 7).
- 5 Adjust the internal hex socket. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Then install the valve cap.

- 6 Restart the engine. Drive the machine in either direction and recheck the valve pressure.
- 7 Turn the engine off, then remove the pressure gauge.

**Relief valve specifications**

Pressure	320 psi
22 bar	

**How to Check the Resistance of a Valve Coil**

- 1 Turn the key switch to the OFF position and disconnect the wires from the valve coil to be tested.
- 2 Connect the leads from an ohmmeter to the valve coil terminals.

**Valve coil specification**

2 position 3 way valve	6.3Ω
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