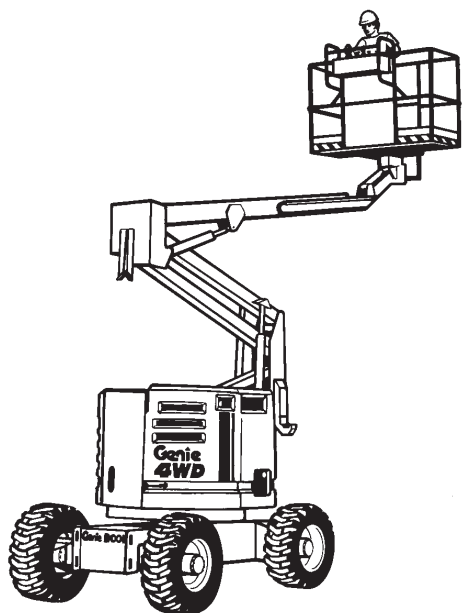


**Genie Industries**



# Genie® Z-45/22

# Service Manual



Second Edition, First Printing  
Part No. 32960

# Genie® Z-45/22

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## Important

Read, understand and obey the safety rules and operating instructions in the *Genie Z-45/22 Operator's Manual* before attempting any maintenance or repair procedure.

This service manual covers the Genie Z-45/22 2WD and 4WD models introduced in 1994.

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 a 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.

If you have any questions, call Genie Industries.

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## Genie Industries

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# Important

## Verify Correct Manual



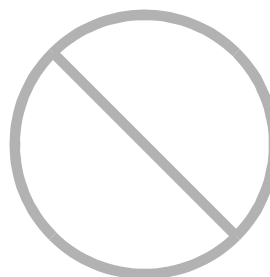
Do not read any further until you have verified that this is the correct manual for this machine. Contact Genie Industries if you have any questions.

This manual covers the Genie Z-45/22 2WD and 4WD models produced from May 1994, starting with serial number Z-45-001523.



The serial number plate is located under the engine side turntable cover. It is secured to the bulkhead near the hydraulic pump.

Use the *Genie Z-45/22 Service Manual*, First Edition, part number 29487, to service machines not covered in this second edition.



Do not use this manual with the Genie Z-45/22 DC, Bi-fuel, Tri-fuel, Diesel and Gas/LPG models. Compare turntable cover size and shape.

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# Safety Rules



## Danger

Failure to obey the instructions and safety rules in this manual, and the Genie Z-45/22 Operating Instruction Manual will result in death or serious injury.

Many of the hazards identified in the operating instruction 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 and worksite regulations
  - 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, and 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 properly ventilated and well lit.



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 environmentally safe.

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# Table of Contents

---

## Introduction

Important Information .....	<i>ii</i>
-----------------------------	-----------

---

## Section One Safety Rules

General Safety Rules .....	<i>iii</i>
----------------------------	------------

---

## Section Two Specifications

Machine Specifications .....	2 - 1
Performance Specifications .....	2 - 2
Hydraulic Specifications .....	2 - 2
Ford LSG 423 Engine Specifications .....	2 - 5
Deutz F3L Engine Specifications .....	2 - 7

---

## Section Three Scheduled Maintenance Inspections

Introduction .....	3 - 1
Table A .....	3 - 2
Table B .....	3 - 3
Table C .....	3 - 5
Table D .....	3 - 6
Maintenance Inspection Report .....	3 - 7

---

## Section Four Scheduled Maintenance Procedures

Introduction .....	4 - 1
A-1 Inspect the Manuals .....	4 - 2
A-2 Inspect the Decals and Placards .....	4 - 2
A-3 Inspect for Damage, Loose or Missing Parts .....	4 - 2
A-4 Check the Engine Oil Level .....	4 - 3
A-5 Check the Engine Coolant Level - Gasoline/LPG Models .....	4 - 3
A-6 Check for Fuel Leaks .....	4 - 3
A-7 Check the Hydraulic Oil Level .....	4 - 4
A-8 Check for Hydraulic Leaks .....	4 - 4
A-9 Check Tire Pressure .....	4 - 5

---

TABLE OF CONTENTS

---

**Section Four    Scheduled Maintenance Procedures, continued**

- A-10 Test the Platform and Ground Controls ..... 4 - 5
- A-11 Test Auxiliary Power Operation ..... 4 - 5
- A-12 Test the Tilt Level Sensor ..... 4 - 6
- A-13 Test the Limit Switches ..... 4 - 6
- A-14 Replace the Engine Oil and Filter - Gasoline/LPG Models ..... 4 - 8
- A-15 Change the Engine Air Filter ..... 4 - 10
- B-1 Check the Engine Belt(s) ..... 4 - 11
- B-2 Check the Radiator - Gasoline/LPG Models ..... 4 - 11
- B-3 Check the Oil Cooler and Cooling Fins - Deutz Diesel Models ..... 4 - 11
- B-4 Check the Exhaust System ..... 4 - 12
- B-5 Check the Battery ..... 4 - 12
- B-6 Check the Hydraulic Tank Filter Condition Indicator ..... 4 - 13
- B-7 Inspect the Electrical Wiring ..... 4 - 13
- B-8 Inspect the Tires and Wheels (including lug nut torque) ..... 4 - 14
- B-9 Confirm Proper Brake Configuration ..... 4 - 14
- B-10 Check the Oil Level in the Torque Hubs ..... 4 - 15
- B-11 Check and Adjust the Engine Idle Mixture - Gasoline/LPG Models ..... 4 - 15
- B-12 Check and Adjust the Engine RPM ..... 4 - 15
- B-13 Test the Key Switch ..... 4 - 17
- B-14 Test the Emergency Stop Buttons ..... 4 - 18
- B-15 Test the Ground Control Override ..... 4 - 18
- B-16 Test the Oscillate Lock-out ..... 4 - 18
- B-17 Test Platform Self-leveling ..... 4 - 19
- B-18 Test the Service Horn ..... 4 - 19
- B-19 Test the Foot Switch ..... 4 - 20
- B-20 Test the Engine Idle Select ..... 4 - 20
- B-21 Test Fuel Select Operation - Gasoline/LPG Models ..... 4 - 21
- B-22 Test the Turntable Rotation Stop ..... 4 - 21



---

<b>Section Four</b>	<b>Scheduled Maintenance Procedures, continued</b>	
	B-23 Test the Drive Enable System .....	4 - 21
	B-24 Test the Drive Brakes .....	4 - 22
	B-25 Test Drive Speed - Stowed Position .....	4 - 23
	B-26 Test the Alarm Package (optional equipment) .....	4 - 23
	B-27 Perform Hydraulic Oil Analysis .....	4 - 24
	B-28 Replace the Engine Oil and Filter - Deutz Diesel Models .....	4 - 24
	C-1 Check the Primary Boom Wear Pads .....	4 - 26
	C-2 Check the Turntable Rotation Bearing Bolts .....	4 - 26
	C-3 Check the Free-wheel Feature .....	4 - 27
	C-4 Grease the Worm Drive Gear .....	4 - 28
	C-5 Replace the Torque Hub Oil .....	4 - 29
	C-6 Replace the Hydraulic Tank Filter .....	4 - 29
	C-7 Replace the Drive Loop Hydraulic Filter .....	4 - 30
	C-8 Replace the Diesel Fuel Filter .....	4 - 30
	C-9 Replace the Gasoline Fuel Filter .....	4 - 31
	C-10 Replace the PCV Valve - Gasoline/LPG Models .....	4 - 32
	C-11 Clean or Replace the Distributor Cap and Rotor - Gasoline/LPG Models .....	4 - 32
	C-12 Replace the Spark Plugs - Gasoline/LPG Models .....	4 - 33
	C-13 Check and Adjust the Air/Propane Mixture - Gasoline/LPG Models .....	4 - 33
	C-14 Check and Adjust the Ignition Timing - Gasoline/LPG Models .....	4 - 34
	C-15 Check the Engine Valve Clearances - Deutz Diesel Models .....	4 - 34
	D-1 Test or Replace The Hydraulic Oil .....	4 - 35
	D-2 Change or Recondition the Engine Coolant .....	4 - 36
	D-3 Change the Fuel Lines .....	4 - 38
	D-4 Check Engine Valve Clearance - Gasoline/LPG Models .....	4 - 39
	D-5 Check Engine Cylinder Compression - Gasoline/LPG Models .....	4 - 39
	D-6 Clean PCV Hoses, Tubes, and Fittings - Gasoline/LPG Models .....	4 - 40
	D-7 Check the Fuel Injection Pumps and Injectors - Deutz Diesel Models .....	4 - 41
	D-8 Check the Toothed Belt - Deutz Diesel Models .....	4 - 41
	D-9 Replace The Timing Belt - Gasoline/LPG Models .....	4 - 41

TABLE OF CONTENTS

---

**Section Five      Troubleshooting Flow Charts**

Introduction ..... 5 - 1

1    Engine Will Not Crank Over ..... 5 - 3

2    Engine Cranks Over But Will Not Start - Gasoline/LPG Models ..... 5 - 5

3    Engine Cranks Over But Will Not Start - Deutz Diesel Models ..... 5 - 12

4    Engine Will Not Start On LPG, But Will Start On Gasoline  
- Gasoline/LPG Models ..... 5 - 15

5    Engine Will Not Start On Gasoline, But Will Start On LPG  
- Gasoline/LPG Models ..... 5 - 17

6    Engine High Idle Inoperative - Gasoline/LPG Models ..... 5 - 19

7    Engine Low Idle Inoperative - Gasoline/LPG Models ..... 5 - 22

8    Engine High Idle Inoperative - Deutz Diesel Models ..... 5 - 23

9    Engine Low Idle Inoperative - Deutz Diesel Models ..... 5 - 25

10   All Functions Inoperative, Engine Starts and Runs ..... 5 - 26

11   All Lift and Steer Functions Inoperative, Drive Functions Operational ..... 5 - 27

12   Ground Controls Inoperative, Platform Controls Operate Normally ..... 5 - 28

13   Platform Controls Inoperative, Ground Controls Operate Normally ..... 5 - 29

14   Secondary Boom Up Function Inoperative ..... 5 - 30

15   Secondary Boom Down Function Inoperative ..... 5 - 32

16   Primary Boom Up Function Inoperative ..... 5 - 34

17   Primary Boom Down Function Inoperative ..... 5 - 36

18   Primary Boom Extend Function Inoperative ..... 5 - 38

19   Primary Boom Retract Function Inoperative ..... 5 - 40

20   Turntable Rotate Function Inoperative ..... 5 - 41

21   Turntable Rotate Left Function Inoperative ..... 5 - 43

22   Turntable Rotate Right Function Inoperative ..... 5 - 44

23   All Platform Leveling Functions Inoperative ..... 5 - 45

24   Platform Level Up Function Inoperative ..... 5 - 46

25   Platform Level Down Function Inoperative ..... 5 - 47

TABLE OF CONTENTS

---

<b>Section Five</b>	<b>Troubleshooting Flow Charts, continued</b>	
26	Platform Rotate Left Function Inoperative .....	5 - 48
27	Platform Rotate Right Function Inoperative .....	5 - 49
28	Oscillate Function Inoperative .....	5 - 50
29	Steer Left Function Inoperative .....	5 - 51
30	Steer Right Function Inoperative .....	5 - 52
31	All Drive Functions Inoperative, All Other Functions Operate Normally .....	5 - 53
32	Drive Forward Or Reverse Function Inoperative .....	5 - 56
33	High Range Drive Function Inoperative .....	5 - 57
34	Low Range Drive Function Inoperative .....	5 - 60
35	Traction Function Inoperative .....	5 - 61
36	Machine Will Not Drive At Full Speed .....	5 - 62
37	Machine Drives At Full Speed With Platform Raised or Extended .....	5 - 63
38	Drive Enable System Is Malfunctioning .....	5 - 64
39	Auxiliary Functions Inoperative .....	5 - 65

---

<b>Section Six</b>	<b>Schematics</b>	
	Introduction .....	6 - 1
	Electrical Symbol Legend .....	6 - 2
	Electrical Schematic - Gasoline/LPG Models .....	6 - 3
	Ground Control Box Legend - Gasoline/LPG Models .....	6 - 5
	Relay Panel Legend - Gasoline/LPG Models .....	6 - 6
	Platform Control Box Legend - Gasoline/LPG Models .....	6 - 7
	Electrical Schematic - Diesel Models .....	6 - 8
	Ground Control Box Legend - Diesel Models .....	6 - 10
	Platform Control Box Legend - Diesel Models .....	6 - 11
	Hydraulic Symbols Legend .....	6 - 12
	2WD Hydraulic Schematic .....	6 - 13
	4WD Hydraulic Schematic .....	6 - 14

TABLE OF CONTENTS

---

**Section Seven Repair Procedures**

Introduction ..... 7 - 1

**Platform Controls**

1-1 Joystick Controllers ..... 7 - 2

1-2 Horsepower Limiter Board ..... 7 - 6

1-3 Foot Switch ..... 7 - 8

1-4 Resistors ..... 7 - 8

1-5 Toggle Switches ..... 7 - 9

**Platform Components**

2-1 Platform ..... 7 - 10

2-2 Platform Leveling Slave Cylinder ..... 7 - 10

2-3 Platform Rotator ..... 7 - 11

**Primary Boom Components**

3-1 Plastic Cable Track ..... 7 - 13

3-2 Primary Boom ..... 7 - 13

3-3 Primary Boom Lift Cylinder ..... 7 - 16

3-4 Extension Cylinder ..... 7 - 18

3-5 Platform Leveling Master Cylinder ..... 7 - 19

**Secondary Boom Components**

4-1 Secondary Boom ..... 7 - 21

4-2 Secondary Boom Lift Cylinders ..... 7 - 26

**Turntable Covers**

5-1 Turntable Covers ..... 7 - 27

**Deutz Engine F3L 1011**

6-1 RPM Adjustment ..... 7 - 28

6-2 Flex Plate ..... 7 - 28

**Ford LSG 423 Engine**

7-1 Governor Actuator ..... 7 - 29

---

<b>Section Seven</b>	<b>Repair Procedures, continued</b>	
7-2	Choke Adjustments .....	7 - 30
7-3	Timing Adjustment .....	7 - 30
7-4	Carburetor Adjustment .....	7 - 30
7-5	RPM Adjustment .....	7 - 30
7-6	Flex Plate .....	7 - 31
7-7	Water Temperature and Oil Pressure Switches .....	7 - 32
7-8	Vacuum Switch .....	7 - 33
	<b>Ground Controls</b>	
8-1	Control Relays .....	7 - 34
8-2	Toggle Switches, See 1-5, <i>Toggle Switches</i> .....	7 - 9
8-3	Wago® Components .....	7 - 35
8-4	Resistors .....	7 - 35
8-5	Power Relay .....	7 - 36
	<b>Hydraulic Pumps</b>	
9-1	Lift/Steer Pump .....	7 - 37
9-2	Drive Hydraulic Pump .....	7 - 38
	<b>Function Manifold</b>	
10-1	Function Manifold Components .....	7 - 40
10-2	Valve Adjustments .....	7 - 42
	<b>Fuel and Hydraulic Tanks</b>	
11-1	Hydraulic Tank .....	7 - 44
11-2	Fuel Tank .....	7 - 45
	<b>Turntable Rotation Components</b>	
12-1	Rotation Hydraulic Motor .....	7 - 46
12-2	Rotation Bearing and Worm Drive .....	7 - 46
	<b>2WD Steering Axle Components</b>	
13-1	Yoke and Hub .....	7 - 51
13-2	Steering Cylinders .....	7 - 52

TABLE OF CONTENTS

---

**Section Seven Repair Procedures, continued**

13-3 Tie Rod ..... 7 - 53

**4WD Steering Axle Components**

14-1 Yoke and Hub ..... 7 - 54

14-2 Steering Cylinders, See 13-2, *Steering Cylinders* ..... 7 - 52

14-3 Tie Rod, See 13-3, *Tie Rod* ..... 7 - 53

**Oscillating Axle Components**

15-1 Oscillating Axle Lock-out Cylinder ..... 7 - 56

**Steer and Oscillate Manifold**

16-1 Steer and Oscillate Manifold Components ..... 7 - 57

16-2 Valve Adjustments ..... 7 - 58

**Non-steering Axle Components**

17-1 Drive Motor ..... 7 - 59

17-2 Torque Hub ..... 7 - 59

**2WD Drive Manifold**

18-1 2WD Drive Manifold Components ..... 7 - 60

18-2 Valve Adjustments ..... 7 - 62

**4WD Drive Manifold**

19-1 4WD Drive Manifold Components ..... 7 - 64

19-2 Valve Adjustments ..... 7 - 66

# Specifications

## Machine Specifications

Stowed dimension	2WD	4WD
Length	17 ft 8 1/2 in 5.4m	17 ft 10 3/4 in 5.45m
Width		
Rough terrain	6 ft 8 1/4 in 203.8cm	6 ft 4 5/8 in 194.6cm
Industrial	5 ft 9 5/8 in 176.8cm	
Height	6 ft 6 in 1.98m	7 ft 4 in 2.23m
Weight	13860 lbs 6287kg	14410 lbs 6536kg
Ground clearance	8 in 20.3cm	11 in 27.9cm
<b>Platform dimensions</b>		
Length	6 ft 182.8cm	6 ft 182.8cm
Width	30 in 76.2cm	30 in 76.2cm
<b>Operational dimensions</b>		
Maximum platform height	45 ft 13.72m	45 ft 13.72m
Maximum horizontal reach	23 ft 7m	23 ft 7m
Maximum up-and-over clearance	21 ft 7 in 6.58m	21 ft 7 in 6.58m
Maximum turntable tailswing	1 inch 2.54cm	none
Wheelbase	6 ft 3 in 190.5cm	6 ft 3 in 190.5cm
Minimum turning circle, outside	14 ft 4 in 4.37m	14 ft 9 in 4.49m
Minimum turning circle, inside	7 ft 2.13m	6 ft 8 in 2.03m
Turntable rotation	359°	359°
Platform rotation	180°	180°

Tires and wheels	Rough terrain	Industrial
Wheel diameter	17.5 inches	14.5 inches
Wheel width	10.5 inches	7 inches
Wheel lugs - 4WD	9 @ 5/8-18	
Wheel lugs - 2WD		
Front	8 @ 5/8 -18	8 @ 5/8 -18
Rear	9 @ 5/8 -18	9 @ 5/8 -18
Lug nut torque	125 ft-lbs 169.5 Nm	125 ft-lbs 169.5 Nm
Tire size	14-17.5NHS	9-14.5 LT
Tire ply rating	8	Tread 8 Sidewall 6
Tire contact area	59 sq in 380sq cm	43.5 sq in 280sq cm
Overall tire diameter	35.8 inches 91cm	28 inches 71cm
Tire pressure		
2WD	40 psi 2.76 bar	100 psi 6.89 bar
4WD	28 psi 1.93 bar	

### Fluid capacities

Fuel tank	15 gallons	56.8 liters
Propane tank	33.5 pounds	15.2kg
Hydraulic tank	25 gallons	95 liters
Hydraulic system (including tank)	30 gallons	114 liters
Torque hubs	17 ounces	0.5 liters

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

## SPECIFICATIONS

**Performance Specifications**

<b>Drive speeds, maximum</b>	<b>2WD</b>	<b>4WD</b>
Boom lowered, high range	5.0 mph 8.0km/h	4.8 mph 7.7km/h
Boom lowered, low range	1.1 mph 1.8km/h or 5 feet in 3 sec.	0.9 mph 1.4km/h or 4 feet in 3 sec.
Boom raised, high range	0.68 mph / 1km/h or 1 foot per second	
Boom raised, low range	0.68 mph / 1km/h or 1 foot per second	
<b>Gradeability (stowed)</b>	30%	40%
<b>Boom function speeds, maximum from platform controls</b>		
Primary boom extend	29 seconds	
Primary boom retract	25 seconds	
Primary boom up	27 seconds	
Primary boom down	35 seconds	
Secondary boom up	25 seconds	
Secondary boom down	25 seconds	
Turntable rotate (359°)	73 seconds	
Platform rotate (180°)	15 seconds	
Platform level up	25 seconds	
Platform level down	15 seconds	
Multiple function stowed to full raised	60 seconds	
Multiple function full raised to stowed	60 seconds	

**Hydraulic Specifications**

<b>Hydraulic fluid</b>	Dexron II equivalent	
<b>Drive pump</b>		
Type	bi-directional variable displacement piston pump	
Displacement	0 - 25 gpm 0 - 1.6 liters/second	
Maximum drive pressure	3800 psi 262 bar	
Charge pressure		
Eskridge brake	360 psi	24.8 bar
Mico brake	290 psi	20 bar
Medium pressure filter	3 micron	
Medium pressure filter bypass pressure	50 psi 345 kPa	
<b>Drive manifold</b>		
Motor shift/brake relief pressure		
Eskridge brake	320 psi	22 bar
Mico brake	250 psi	17.2 bar
4WD front motor flow regulators	3.0 gpm 11.4 liters/minute	
4WD rear motor flow regulators	4.5 gpm 17.0 liters/minute	
2WD rear motor flow regulators	7.0 gpm 26.5 liters/minute	



SPECIFICATIONS

**Front drive motors - 4WD models**

Displacement per revolution	2.1 cu in 34.4cc
-----------------------------	---------------------

**Rear drive motor**

Displacement per revolution	High - 2.8 cu in / 45.9cc Low - 0.15 cu in / 2.5cc
-----------------------------	---

**Function pump**

Type	fixed displacement gear pump
Displacement	6.4 gpm @ 2150 rpm 0.4 liters/second
Function circuit return line filter	10 micron with 25 psi / 172kPa bypass

**Function manifold**

Function relief valve pressure	2200 psi 152 bar
Secondary down relief valve pressure	1200 psi 83 bar
Primary down relief valve pressure	1200 psi 83 bar
Primary extend relief valve pressure	1200 psi 83 bar
Steer/oscillate flow regulator	1.5 gpm 5.7 liters/minute

**Steer/oscillate manifold**

Sequencing valve pressure	1800 psi 123 bar
---------------------------	---------------------



Accumulator pre-charge pressure	1600 psi 110 bar
---------------------------------	---------------------

**Auxillary pump**

Type	fixed displacement gear pump
Displacement	0.85 gpm 3.2 liters/minute
Auxillary pump relief pressure	2030 psi 138 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.

These bolt torque specifications are for general use only. Specification may vary depending on application of bolt.

## 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 and 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>High idle</b>	2150 rpm
<b>Low idle</b>	1400 rpm
<b>Governor</b>	electronic
<b>Compression pressure</b>	psi of lowest cylinder must be at least 75% of highest cylinder
<b>Valve clearances</b>	
Intake	0.0010 - 0.0027 inches 0.025 - 0.068mm
Exhaust	0.0015 - 0.0032 inches 0.038 - 0.081mm
<b>Lubrication System</b>	
Oil pressure (operating temp. @ 2150 rpm)	40-60 psi 276-414 kPa
Oil capacity (including filter)	5 quarts 4.71 liters
<b>Oil viscosity requirements</b>	
Below 60°F / 15.5°C	5W - 30
-10 to 90°F / -23 to 32°C	10W - 30
above -10°F / -23°C	10W - 40 or 10W - 50
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 (normal temp)	0.5V DC
Brush length, new	0.50 inches 12.7mm
Brush length, wear limit	0.25 inches 6.35mm
Brush spring tension	40 ounces
Bolt torque through brush	55 - 75 inch-pounds 98 - 134gm-cm
Brush mounting bolt torque	15 - 20 foot-pounds 2.1 - 2.7kg-m
Maximum commutator run out	0.005 inches 0.127mm
<b>Battery</b>	
Type	12V, Group 24
Ampere hour	75A
Cold Cranking Ampere	875A
Reserve capacity @ 25A rate	125 minutes
<b>Fuel Pump</b>	
Static pressure	5.0 - 7.0 psi
Minimum volume flow	1 pint / 473cc in 25 seconds

## FORD ENGINE LSG-423 SPECIFICATIONS

**Ignition System**

Ignition spark advance 10° BTDC

Ignition coil primary resistance 1.13 - 1.25W (75°F)

Ignition coil secondary resistance 7700 - 9300W (75°F)

Spark plug type Motorcraft AWSF-52

Spark plug gap 0.042 - 0.046 inches  
1.07 - 1.18mm**Coolant capacity** 11.5 quarts  
10.9 liters**Alternator output** 35A, 14.5V**Fan belt deflection**  $\frac{3}{8}$  to  $\frac{1}{2}$  inch  
9 to 12 mm**Bolt torque specifications**

Item / Size	Torque (ft-lbs)	Torque (Nm)
Auxiliary shaft gear bolt / M-10	28-40	38-54
Auxiliary shaft thrust plate bolt / M-6	6-9	8-12
Belt tensioner (timing) pivot bolt / M-10	28-40	38-54
Belt tensioner (timing) adjusting bolt / M-8	14-21	19-28
Camshaft gear bolt / M-12	50-71	68-96
Camshaft thrust plate bolt / M-6	6-9	8-12
Carburetor to spacer stud / M-8	7.5-15	10-20
Carburetor spacer to manifold bolt / M-8	10-14	14-19
Crankshaft damper bolt / M-14	103-133	140-180

Cylinder head bolt / M-12

torque in sequence:

first step 50-60 68-81

second step 80-90 108-122

Distributor clamp bolt / M-10 14-21 19-28

Distributor vacuum tube to manifold adaptor 5-8 7-11

Exhaust manifold to cylinder head bolt or nut / M-10

torque in sequence:

first step 14-19 19-26

second step 20-30 27-41

Flywheel to crankshaft bolt / M-10 56-64 76-87

Fuel pump to cylinder block / M-8 14-21 19-28

Intake manifold to cylinder head bolt or nut / M-8 14-21 19-28

Oil pressure sending unit to block 8-18 11-24

Oil pan drain plug to pan / M-14 15-25 20-34

Oil pan to block / M-6 10-13.5 14-18

Oil filter insert to block 20-35 27-47

Rocker arm cover to cylinder head / M-6 5-8 7-11

Spark plug to cylinder head / M-14 5-10 7-14

Temperature sending unit to block / M-14 8-18 11-24

Water jacket drain plug to block 23-28 31-38

Water pump to block bolt 14-21 19-28

Auxiliary shaft cover bolt / M-6 6-9 8-12

Water outlet connection bolt / M-8 14-21 19-28

Cylinder front cover bolt / M-6 6-9 8-12

Inner timing belt cover stud / M-8 14-21 19-28

Outer timing belt cover bolt / M-6 6-9 8-12

## DEUTZ ENGINE F3L 1011 SPECIFICATIONS

**Deutz Engine F3L 1011**

<b>Displacement</b>	125.02 cu in 2.049 liters
<b>Number of cylinders</b>	3
<b>Bore and stroke</b>	3.58 x 4.13 inches 91 x 105 mm
<b>Horsepower</b>	36 @ 2300 rpm
<b>Firing order</b>	1 - 2 - 3
<b>Compression ratio</b>	18.5:1
<b>Compression pressure</b>	362 to 435 psi 25 to 30 bar
Pressure (psi) of lowest cylinder must be at least 85% of highest cylinder	
<b>Low idle</b>	1300 rpm
<b>High idle</b>	2300 rpm
<b>Governor</b>	centrifugal mechanical
<b>Valve clearance, cold</b>	
Intake	0.012 in 0.3 mm
Exhaust	0.020 in 0.5 mm
<b>Lubrication system</b>	
Oil pressure	26 to 87 psi 1.8 to 6.0 bar
Oil capacity (including filter)	8.5 quarts 8 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

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 19 mm	
Brush length, minimum	0.5 in 12.7 mm	
<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 12 mm	
<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



# 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*.

**⚠ WARNING** 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.
- ☑ Machines that have been out of service for a period longer than 3 months must complete the quarterly inspection.

## 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 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					
A-6	Check for Fuel Leaks					
A-7	Check the Hydraulic Oil Level					
A-8	Check for Hydraulic Leaks					
A-9	Check Tire Pressure					
A-10	Test the Platform and Ground Controls					
A-11	Test Auxiliary Power Operation					
A-12	Test the Tilt Level Sensor					
A-13	Test the Limit Switches					
<b>Every 100 hours, perform the following two engine maintenance procedures.</b>						
A-14	Replace the Engine Oil and Filter - Gasoline/LPG Models					
A-15	Change the Engine Air Filter					











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 Electrical Wiring					
B-8	Inspect the Tires and Wheels including lug nut torque					
B-9	Confirm Proper Brake Configuration					
B-10	Check the Oil Level in the Torque Hubs					
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					









































## MAINTENANCE TABLES

**Table B, continued**

		Tools are required	New parts required	Warm engine required	Cold engine required	Dealer service suggested
B-16	Test the Oscillate Lock-out oscillating axle equipped models					
B-17	Test Platform Self-leveling					
B-18	Test the Service Horn					
B-19	Test the Foot Switch					
B-20	Test the Engine Idle Select					
B-21	Test Fuel Select Operation - Gasoline/LPG Models					
B-22	Test the Turntable Rotation Stop					
B-23	Test the Drive Enable System					
B-24	Test the Drive Brakes					
B-25	Test Drive Speed - Stowed Position					
B-26	Test the Alarm Package (optional equipment) travel alarm, descent alarm, flashing beacon					
B-27	Perform Hydraulic Oil Analysis See D-1, <i>Test or Replace the Hydraulic Oil</i>					
<b>Every 500 hours, perform the following engine maintenance procedure.</b>						
B-28	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 Feature					
C-4	Grease the Worm Drive Gear including turntable rotation bearing					
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					
C-9	Replace the Gasoline Fuel Filter					
C-10	Replace the PCV Valve - Gasoline/LPG Models					
C-11	Clear 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/Propane 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 includes cleaning the suction strainers					
D-2	Change or Recondition the Engine Coolant including all coolant hoses and clamps					
D-3	Change the Fuel Lines					
D-4	Check Engine Valve Clearance - Gasoline/LPG Models					
D-5	Check Engine Cylinder Compression - Gasoline/LPG Models					
D-6	Clean PCV Hoses and Fittings - Gasoline/LPG Models					
D-7	Check the Fuel Injection Pumps and Injectors - Diesel Models					
D-8	Check the Toothed Belt - Diesel Models					
D-9	Replace the Timing Belt - Ford					

# 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.

**Daily Inspection: A**

**Frequent Inspection: A+B**

**Annual Inspection: A+B+C**

**2 Year Inspection: A+B+C+D**

- 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", remove the machine from use, repair and re-inspect it. After repair, place a check in the "R" box.

**Legend**

Y = yes, acceptable  
 N = no, unacceptable  
 R = repaired

**Comments**

\_\_\_\_\_

**Checklist A** Y N R

Refer to Table A

A-1 Manuals			
A-2 Decals and placards			
A-3 Damage, loose or missing parts			
A-4 Engine oil			
A-5 Engine coolant			
A-6 Fuel leaks			
A-7 Hydraulic oil			
A-8 Hydraulic leaks			
A-9 Tire pressure			
A-10 Platform and ground controls			
A-11 Auxiliary power			
A-12 Tilt alarm			
A-13 Limit switches			
<b>Perform every 100 hours:</b>			
A-14 Change engine oil and filter - Gas/LPG			
A-15 Change engine air filter			

**Checklist B** Y N R

Refer to Table B

B-1 Engine belt(s)			
B-2 Engine radiator			
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 Drive torque hubs			
B-11 Idle mixture-gasoline			
B-12 Engine RPM			
B-13 Key switch			
B-14 Emergency Stop button			
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 Turntable rotation stop			
B-23 Drive enable system			
B-24 Drive brakes			
B-25 Drive speed			
B-26 Alarm package			
B-27 Oil analysis			

**Perform every 500 hours:**

B-28 Replace engine oil and filter - Deutz			
--	--	--	--

**Checklist C** Y N R

Refer to Table C

C-1 Wear pads			
C-2 Turntable bolts			
C-3 Free-wheel configuration			
C-4 Worm drive gear			
C-5 Drive torque hubs			
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			
C-13 Propane adjustments			
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, hoses and clamps			
D-3 Fuel lines and clamps			
D-4 Engine valve clearance -gasoline			
D-5 Cylinder compression			
D-6 PCV hoses and fittings-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, frequently (every 3 months), annually and every 2 years as specified on the maintenance report.

**⚠ WARNING** Failure to properly complete each inspection when required may result in death, serious injury or substantial machine 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
  - 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 warnings and step-by-step instructions.

### 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 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.

# Table A Procedures

## A-1

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

**NOTICE** Contact your 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 ground 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 Z45/22 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 damage or illegibility. Replace any illegible decal immediately.

**NOTICE** Contact your 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 gear boxes
  - boom components and wear pads
  - dents or damage to machine
  - tires and wheels
  - engine and related components
  - limit switches, alarms, horns and beacon
  - nuts, bolts and other fasteners
  - platform entry mid-rail or gate
  - cracks in welds or structural components
  - compartment covers and latches



TABLE A PROCEDURES

## A-4 Check the Engine Oil Level

Maintaining proper engine oil level is essential to good engine performance and service life. Operating the machine at 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.

⦿ **Result:** The oil level should be in the "safe" zone.

<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.

<b>Deutz Engine F3L 1011</b>	8.5 quarts
<b>Oil capacity (including filter)</b>	8 liters

### Deutz Engine F3L 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 engine coolant at the proper level is essential to engine life. Improper coolant level will affect the engines cooling capability and damage engine components. Daily checks will allow the inspector to identify dramatic changes in coolant level that might indicate cooling system problems.

- 1 Check the fluid level in the coolant recovery tank. Add water 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 propane 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 propane 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

**⚠ 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.

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

Maintaining 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 machine is in the fully stowed position, then visually inspect the sight gauge located on the side of the hydraulic oil reservoir.
- ⊙ 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	25 gallons 95 liters
Hydraulic system (including tank)	30 gallons 114 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 and turntable surface
  - engine compartment—fittings, hoses, auxiliary power unit, main pump and turntable surface
  - all hydraulic cylinders
  - all hydraulic manifolds
  - primary and secondary 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.

**AWARNING** 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	2WD Models	4WD Models
Industrial tire	9-14.5LT 100 psi / 6.89 bar	
Rough terrain tire	14-17.5NHS 40 psi / 2.76 bar	14-17.5NHS 28 psi / 1.93 bar

## A-10

### Test the Platform and Ground Controls

Testing 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 activate and operate smoothly.

- 2 Push in the Emergency Stop button to the *off* position.
- ⦿ Result: No function should operate, the engine should stop.

**NOTICE** Diesel models: All functions should stop immediately. The engine will shut off after 2 or 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 activate and 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 can override the platform controls, including the Emergency Stop button.

## A-11

### Test Auxiliary Power Operation

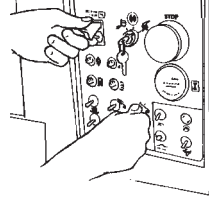
Detection of auxiliary power system malfunctions is essential for safe machine operation. An unsafe working condition exists if the auxiliary powered functions do not operate in the event of a main power loss. Auxiliary power is designed for short term emergency use only, and excessive use will result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

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

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

TABLE A PROCEDURES

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



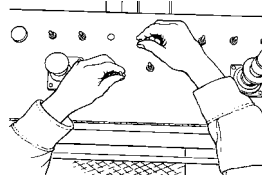
- primary boom up/down
- extend and retract
- secondary boom up/down
- turntable rotate right/left

- ⊙ 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, press down the foot switch.

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



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

## A-12 Test the Tilt Level Sensor

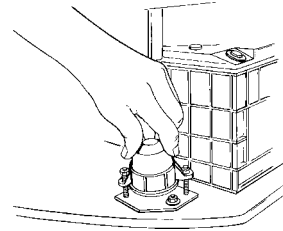
The tilt sensor sounds an alarm in the platform when the incline of the chassis exceeds 4.5°.

**NOTICE** Select a level test area.

- 1 Start the engine from the ground controls.

- 2 Open the engine side cover and press down on one side of the tilt sensor.

- ⊙ Result: After a 1.5 second delay, the alarm in the platform should sound.



## A-13 Test the Limit Switches

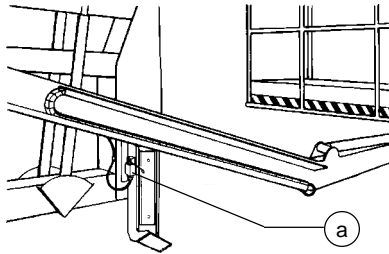
Detecting limit switch malfunctions is essential to safe machine operation. The drive enable limit switch activates a signal light to inform the operator that the platform is past the non-steer wheels, and stops drive movement unless the drive enable override switch is used. The drive limit switch is used to restrict drive speed when the boom is raised and signal the oscillate cylinder to extend the lock-out wedges (oscillating axle equipped machines). Also, on oscillating axle equipped machines, there are two limit switches to stop the boom from being raised unless the lock out wedges are extended. Improperly functioning limit switches will allow the boom to raise and/or drive into an unsafe position.

### Drive Limit Switch

- 1 With the engine off and the machine in the stowed position, visually inspect the drive limit switch for the following:
- broken or missing rollers or arms
  - missing fasteners
  - loose wiring

TABLE A PROCEDURES

- 2 Start the engine from the ground controls.
- 3 Raise the primary boom above the drive limit switch and turn the machine off.
- 4 Manually activate the drive limit switch.



a drive limit switch

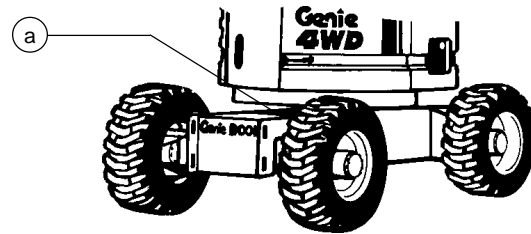
- ⊙ Result: The drive limit switch arm should move freely and spring return to center. A distinct click should be felt and heard.
- 5 Restart the engine and lower the boom into the fully stowed position.
  - 6 Move the key switch to platform control, and then start the engine from the platform controls.
  - 7 Slowly move the drive control handle off center.
- ⊙ Result: The machine should move at normal drive speeds.
- 8 Raise the primary boom above the drive limit switch.
  - 9 Slowly move the drive control handle off center.
- ⊙ Result: The machine should move at a reduced drive speed.

**Drive speed, maximum, raised**

All models	1 foot/ 0.3 meters per second
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**Drive Enable Limit Switch**

- 1 With the engine off and the machine in the stowed position, visually inspect the drive enable limit switch for the following:
  - broken or missing rollers or arms
  - missing fasteners
  - loose wiring
- 2 Manually activate the drive enable limit switch.



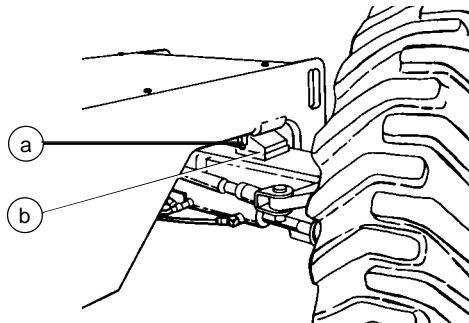
a drive enable limit switch

- ⊙ Result: The drive enable limit switch roller should move freely and spring return to center. A distinct click should be felt and heard.
- 3 Start the engine from the platform controls and then rotate the turntable to the left until the platform is positioned over the left non-steer wheel.
- ⊙ Result: The *platform over steer wheels* indicator light should be on. Drive movement should stop until the drive enable override switch is activated.
- 4 Rotate the turntable to the right until the platform is positioned over the right non-steer wheel.
- ⊙ Result: The *platform over steer wheels* indicator light should be on. Drive movement should stop until the drive enable override switch is activated.

TABLE A PROCEDURES

**Oscillating Axle Limit Switches**

- 1 With the engine off and the machine in the stowed position, visually inspect the oscillate lock-out switch for the following:



Oscillating axle limit switch

- a limit switch  
b oscillate lock out wedge

- broken or missing rollers or arms
  - missing fasteners
  - loose wiring
- 2 Start the engine from the ground controls and raise the primary boom above the drive speed limit switch.
- ⦿ Result: The oscillation cylinder should extend the lock-out wedges. The boom should stop moving until the wedges are fully extended.

**A-14****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.

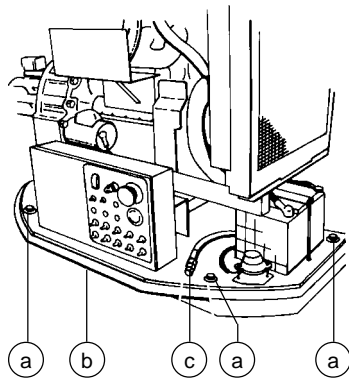
**NOTICE** Perform this procedure after warming the engine to normal operating temperature.

**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 pivot plate retaining bolts
- b engine pivot plate
- 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 3 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 three 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-15****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.

- 1 Remove the end cap from the air cleaner canister.
- 2 Remove the mounting fastener from the air filter, then remove the filter.
- 3 Clean the inside of the canister and the gasket with a dry cloth.
- 4 Insert the new filter and replace the mounting fastener.
- 5 Replace the end cap on the canister.

**Air filters - Genie part numbers**

Ford LSG-423 Engine	27916
Deutz F3L 1011	29553

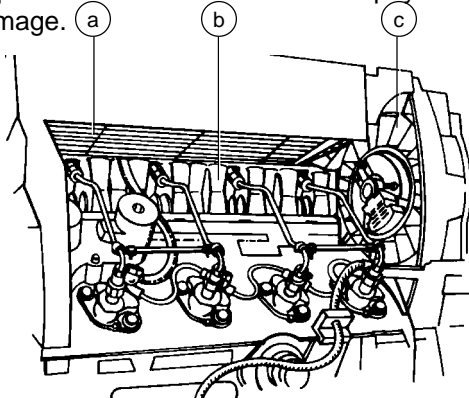




TABLE B PROCEDURES

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

## B-5 Check the Battery

**NOTICE** The factory ships each machine with a sealed battery; checking the water level is not necessary. If the battery is replaced with another type, the battery acid level and specific gravity should be checked at this time.

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 extremely hazardous conditions.

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

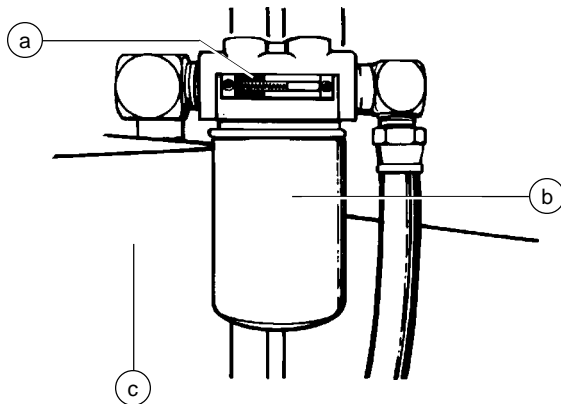
- 1 Put on protective clothing and eye wear if batteries are to be opened.
- 2 Be sure that the battery cable connections are free of corrosion.
- 3 Be sure that the battery hold down and cable connections are tight.

TABLE B PROCEDURES

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

Maintaining the hydraulic reservoir 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 Switch the engine speed control to high idle (rabbit symbol).
- 3 Inspect the filter condition indicator.



- a filter condition indicator  
b filter  
c hydraulic reservoir

- ⊙ **Result:** The filter should be operating in the *green* area. If the display shows *red*, this indicates that the hydraulic filter is being bypassed and the filter should be replaced.

## 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.

**⚠WARNING** Electrocution hazard. Contact with hot or live circuits may result in 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 relay panel
  - engine wiring harness
  - inside of the ground control box
  - turntable manifold wiring
- 2 Start the engine from the ground controls, and then raise the secondary boom until the upper pivot is above the turntable covers.
- 3 Inspect the upper pivot area for burnt, chafed and pinched cables.
- 4 Fully 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
  - primary boom to platform cable harness
  - inside of the platform control box

TABLE B PROCEDURES

### B-8 Inspect the Tires and Wheels

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.

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

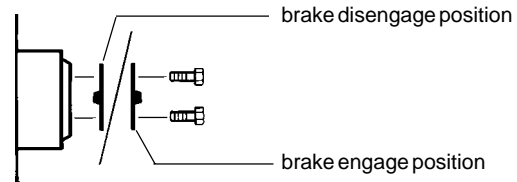
- 1 Check all tire treads and sidewalls for cuts, cracks, punctures and unusual wear.
- 2 Check each wheel for damage, bends and cracked welds.
- 3 Check every lug nut for proper torque.
- 4 Check the pressure in each air-filled tire.

Tires and wheels	Rough terrain	Industrial
Tire size	14-17.5NHS	9-14.5 LT
Tire ply rating	8	Tread 8 Sidewall 6
Tire pressure		
2WD	40 psi 2.76 bar	100 psi 6.89 bar
4WD	28 psi 1.93 bar	
Lug nut torque	125 ft-lbs 169.5 Nm	125 ft-lbs 169.5 Nm
Wheel diameter	17.5 inches	14.5 inches
Wheel width	10.5 inches	7 inches
Wheel lugs - 4WD	9 @ 5/8-18	
Wheel lugs - 2WD		
Front	8 @ 5/8 -18	8 @ 5/8 -18
Rear	9 @ 5/8 -18	9 @ 5/8 -18

### B-9 Confirm 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 the torque hub disconnect caps to be sure they are in the engaged position.



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

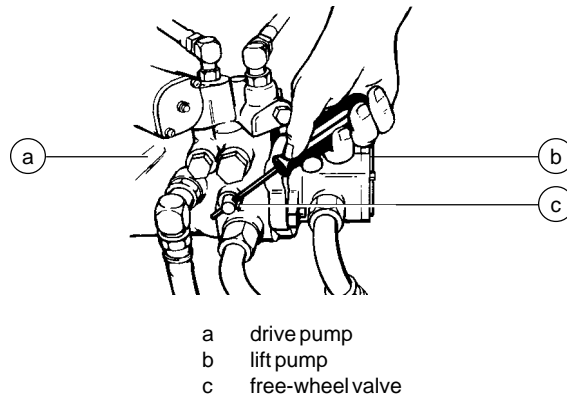
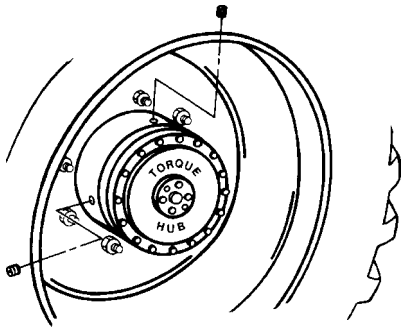


TABLE B PROCEDURES

## B-10 Check the Oil Level in the Torque Hubs

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

- 1 Drive the machine to rotate the hub until the side 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.
- 4 Apply pipe thread sealant to the plug, and then install it in the torque hub.
- 5 Repeat this procedure for each torque hub.

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### Drive torque hub oil

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Capacity	17 fluid ounces 0.51 liters
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Type: SAE 90 multipurpose hypoid gear oil - API service classification GL5

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## 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 Litre 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

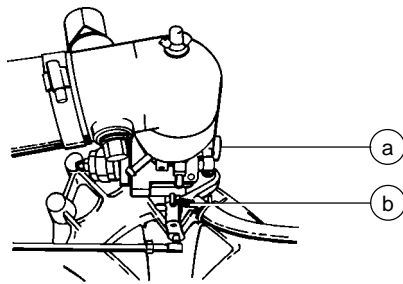
**NOTICE** Perform this procedure in gasoline mode with the engine at normal operating temperature.

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

TABLE B PROCEDURES

- 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

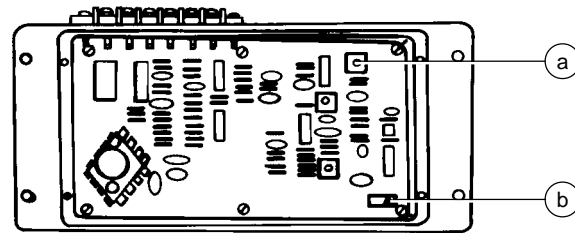
- 4 Turn the engine off and reconnect the blue/black wire to the governor actuator.
- 5 Start the engine from the ground controls.
- ⊙ Result: Electronic governor low idle should be 1400 rpm.
- 6 Move the engine idle control switch to high idle (rabbit symbol) from the ground controls.
- ⊙ Result: High idle should be 2150 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 bulkhead, 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.

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	1400 rpm
High idle	2150 rpm

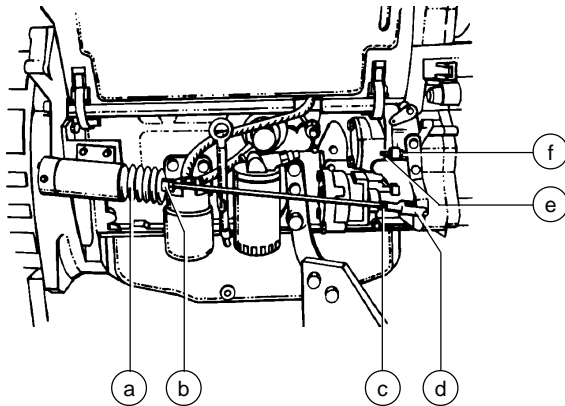
**Deutz Diesel models**

- 1 Connect an rpm gauge to the engine, and then start the engine from the ground controls.
- ⊙ Result: Low idle should be 1300 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 2300 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	1300 rpm
High idle	2300 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 Operate each machine function from the **ground controls**.
- ⊙ Result: The machine functions should **not** operate.
- 4 Turn the key switch to ground control.
- 5 Operate each 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 can 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 be off and no machine functions should operate.

**NOTICE** Diesel models: All functions should stop immediately. The engine will shut off after 2 or 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 be 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 can not 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.

## B-16 Test the Oscillate Lock-out

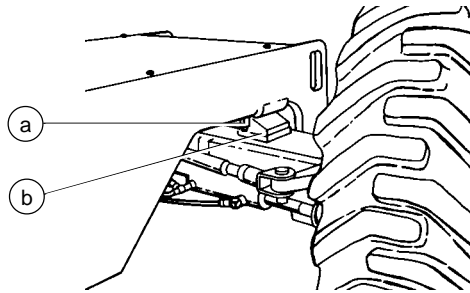
**NOTICE** Perform this test on oscillating axle equipped machines only.

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



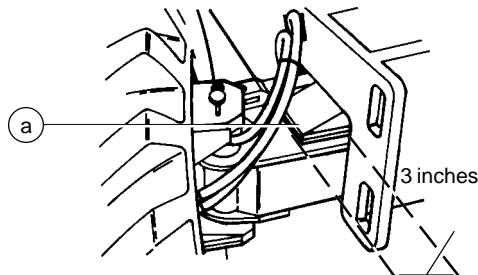
TABLE B PROCEDURES

- 1 From the ground controls, raise the primary boom above the drive speed limit switch.



Oscillating axle limit switch  
 a limit switch  
 b oscillating lock out wedge

- ⊙ Result: The oscillate cylinder should extend the lock-out wedges 3 inches (7.6cm) past the chassis frame. The boom should stop moving until the wedges are fully extended.



a oscillate lock out wedge

- 2 Lower the primary boom onto its resting pad.

- ⊙ Result: The oscillate lock-out wedges should fully retract.

### NOTICE

When the primary and secondary booms are fully lowered into the stowed position and the engine is turned off, the oscillate lock-out wedges may partially extend. This should not be mistaken for the full lock-out position.

## B-17

### Test Platform Self-leveling

Precise 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 a hydraulic cylinder (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 fully lower the boom into the stowed position.
  - 2 Adjust the platform to a level position using the manual 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.
  - 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* mode 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, operate 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 Speed 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 is 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 speed 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 speed 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 speed control switch to high idle (rabbit symbol).
  - ⦿ Result: The engine should change to high idle.
- 6 Move the engine speed control switch to low idle (turtle symbol).
  - ⦿ Result: The engine should change to low idle.
- 7 Move the engine speed 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	1400 rpm
High idle	2150 rpm

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### Deutz Diesel models

Low idle	1300 rpm
High idle	2300 rpm

TABLE B PROCEDURES

**B-21****Test Fuel Select Operation - Gasoline/LPG Models**

The ability to select and switch between gasoline and LP 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 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 propane gas fuel levels, and warming the engine to normal operating temperature.

- 1 Move the fuel select switch to gasoline and then move the engine speed 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 propane gas.
- 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 Turntable Rotation Stop**

The turntable is capable of rotating the boom 359 degrees and is stopped midpoint between the steering wheels by the rotation stop. Detecting a rotation stop malfunction is essential to safe operation and good machine performance. If the turntable rotates past the rotation stop, component damage may result.

- 1 Start the engine from the platform controls.
- 2 Rotate the turntable to the left as far as it will go.
- ⊙ Result: Movement should stop when the boom reaches mid-point between the steer tires.
- 3 Rotate the turntable to the right full circle as far as it will go.
- ⊙ Result: Movement should stop when the boom reaches mid-point between the steer tires.

**B-23****Test the Drive Enable System**

Proper drive enable system operation is essential to safe machine operation. When the platform is over the non-steering wheels, drive movement is stopped and the indicator light turns *on* and the drive enable switch must be used to reactivate the drive function. This 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 boom to be moved into an unsafe position.

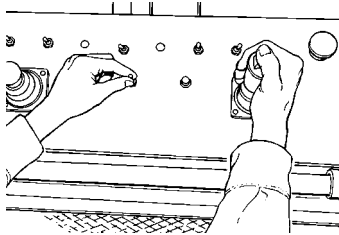
- 1 Start the engine from the platform controls.
- 2 Rotate the turntable to the right until the platform is positioned over the right non-steer wheel.
- ⊙ Result: *Platform over non-steer wheel* indicator light should turn on.

TABLE B PROCEDURES

- 3 Slowly move 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: Drive function should not operate.
- 4 Hold drive enable toggle switch to either side and slowly move the drive control handle off center.



- ⊙ Result: Drive function should operate.
- 5 Rotate the turntable to the left until platform is positioned over the left non-steer tire.
- ⊙ Result: *Platform over steer wheel* indicator light should come on.
- 6 Repeat steps 3 and 4.

## B-24

### Test the Drive Brakes

Proper brake action is essential to safe machine operation. The 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.

**NOTICE** Be sure that the machine is not in free-wheel or partial free-wheel configuration. Refer to B-8 in this section, *Confirm 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 drive mode (machine on flat ground).
- 3 Fully lower the boom into the stowed position.
- 4 Choose a point on the machine; i.e., contact patch of a rear 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.

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

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#### Specifications: high range, paved surface

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Stopping distance,	5.5 to 6 feet
	1.67 to 1.82 m

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TABLE B PROCEDURES

## B-25

### Test 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 20 feet (6m) apart.
- 2 Start the engine from the platform controls, and then select high drive mode (machine on flat ground).
- 3 Move the engine speed control switch to high idle (rabbit & foot switch), and then fully lower the boom into the stowed position.
- 4 Choose a point on the machine; i.e., contact patch of a rear 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.

---

**Specifications: stowed position, high range**

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**Distance: 20 feet / 6 meters**

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4WD	2.85 seconds (±0.25 seconds)
2WD	2.75 seconds (±0.25 seconds)

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## B-26

### Test the Alarm Package (optional equipment)

The alarm package includes:

- travel alarm
- descent alarm
- flashing beacon

Alarms and beacons are installed to alert operators and ground personnel of machine proximity and motion. The alarm package components are installed on the right side, on top of the turntable cover.

**NOTICE** The alarm and beacons will operate with the engine running or not.

- 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. Now 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, then from the platform controls, pull out the Emergency Stop button to the *on* position.
  - ⊙ Result: The flashing beacon should be on and flashing.

## TABLE B PROCEDURES

- 4 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. Slowly move the drive control handle off center, hold for a moment and then release it. Slowly 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-27****Perform Hydraulic Oil Analysis**

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

**B-28****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.

**NOTICE**

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

**CAUTION**

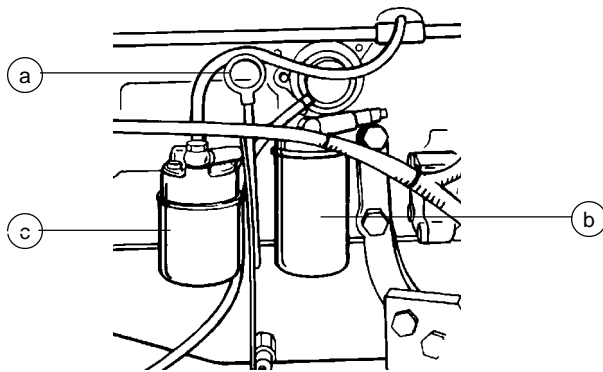
Beware of hot engine parts and oil. Contact with hot engine oil and/or engine parts may cause severe burns.

- 1 Remove the oil filler cap located on the valve cover.
- 2 Pull the end of the drain hose out from under the engine.
- 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.

TABLE B PROCEDURES

- 4 Install the plug into the drain hose.
- 5 Use an oil wrench and remove the oil filter.

- 10 Check the oil filter and oil pan for leaks.
- 11 Check the engine oil level dipstick. Add oil if needed.



- a engine oil level dipstick
- b oil filter
- c fuel filter

- 6 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.
- 7 Use a permanent ink marker to write the date and number of hours from the hour meter on the oil filter.
- 8 Fill the engine with new oil per specifications and replace the oil filler cap.
- 9 Start the engine from the ground controls. Allow the engine to run for 30 seconds then turn the engine off.

<b>Deutz Engine F3L 1011</b>	8.5 quarts
<b>Oil capacity (including filter)</b>	8 liters

**Deutz Engine F3L 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 surfaces to provide a low friction, replaceable wear pad between moving parts. Improperly shimmed wear pads or continued use of worn out wear pads may result in component damage and unsafe operating conditions.

- 1 Start the engine from the ground controls and raise the end of the primary boom to a comfortable working height (chest high).
- 2 Extend the extension boom 10 inches (25 cm).
- 3 Measure each wear pad. Replace the pad if it is less than 0.41 inches (1 cm) thick. If the pad is more than 0.41 inches (1 cm) thick, shim as necessary to obtain zero clearance and zero drag.
- 4 Extend and retract through the entire range of motion to check for tight spots that could cause binding or scraping.

#### NOTICE

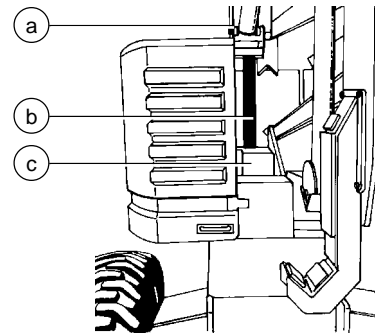
Always maintain squareness between the primary boom outer and inner tubes.

## 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 and place a 4x4x31 inch (78 cm) block between the chassis counterweight and the upper mid-pivot. Carefully lower the secondary boom onto the block.

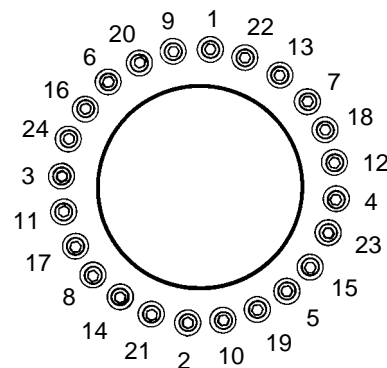


- a upper mid-pivot
- b 4x4x31 inch block
- c counterweight

#### WARNING

Crushing hazard. Keep hands away from the block and all moving parts when lowering the secondary boom.

- 2 Raise the primary boom until the end of the boom is approximately 7 feet (2 m) off the ground.
- 3 Be sure that each turntable bolt is torqued in sequence to 190 foot-pounds (258 Newton meters).



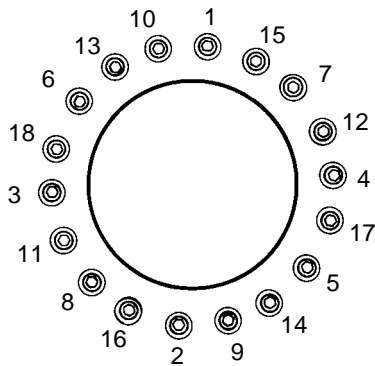
Bolt torque sequence

- 4 Remove the support block and then lower the primary and secondary booms to the stowed position.
- 5 Use a forklift to support the chassis counterweight, directly below the turntable bearing.



TABLE C PROCEDURES

- 6 Loosen the counterweight positioning bolt, then remove the 2 mounting bolts.
- 7 Carefully lower and remove the counterweight.
- 8 Be sure that each bearing mounting bolt is torqued in sequence to 190 foot-pounds (258 Newton meters).



Bolt torque sequence

- 9 Reinstall the counterweight.

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

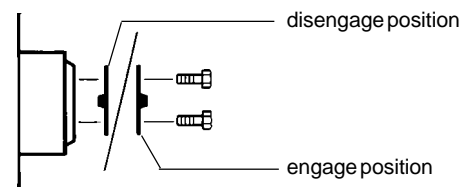
Proper use of the free-wheel configuration is essential to safe machine operation. The free-wheel configuration is used primarily for towing. A machine configured to free-wheel without operator knowledge may result in death or serious injury and property damage.

**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 (5000 lbs / 2268 kg) under the chassis between the rear drive wheels.
- 3 Lift the wheels off the ground and then place jack stands under the chassis for support.

- 4 Disengage the torque hubs by turning over the torque hub disconnect caps on each non-steering wheel hub.

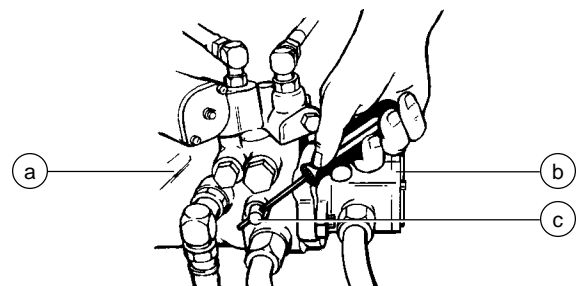


- 5 Manually rotate each non-steering wheel.
- ⊙ Result: Each non-steering wheel should rotate with minimum effort.
- 6 Re-engage the torque hubs by turning over the hub disconnect caps. Carefully remove the jack stands, lower the machine and remove the jack.

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

#### Steer wheels: 4WD models

- 7 Chock the drive 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 chassis for support.
- 10 Open the free wheel valve, located on the drive pump, by turning it counterclockwise two turns.



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

TABLE C PROCEDURES

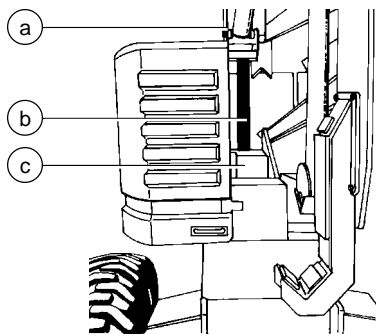
- 11 Manually rotate each steer wheel.
- ⦿ Result: Each steer wheel should rotate with minimal effort.
- 12 Close the free wheel valve (clockwise). Carefully remove the jack stands, lower the machine and remove the jack.

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

### C-4 Grease the Turntable Rotation Bearing and Worm Drive Gear

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

- 1 Raise the secondary boom and place a 4x4x31 (78 cm) block between the chassis counterweight and the upper mid-pivot. Carefully lower the secondary boom onto the block.



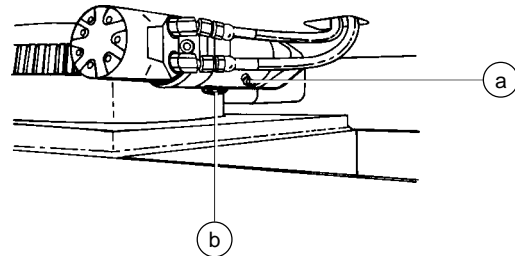
a upper mid-pivot  
b 4x4x31 inch block  
c counterweight

**WARNING** Crushing hazard. Keep hands away from the block and all moving parts when lowering the secondary boom.

- 2 Raise the primary boom until the end of the boom is approximately 7 feet (2 m) off the ground. Then shut off the engine.
- 3 Locate the grease fitting on the inside of the bearing in the middle of the turntable.
- 4 Pump grease into the rotation bearing until you see it coming out of the bearing seal gap. Repeat this step with the platform in the following locations.
  - platform over the drive wheels
  - platform over the left side
  - platform over the drive wheels
  - platform over the right side

**WARNING** Crushing hazard. Turn the key switch to the *off* position and remove the key while pumping grease.

- 5 Locate the grease fitting on the worm drive housing.



a grease fitting  
b grease overflow

- 6 Pump grease into the gear until you see it coming out of the side of the gear housing.

**Specification**

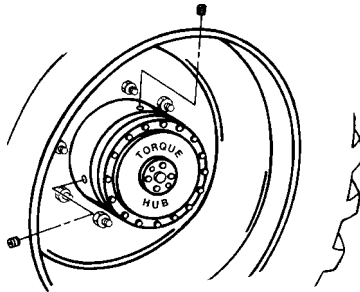
Multipurpose grease

TABLE C PROCEDURES

### 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.

- 1 Select the 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.
- 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. Apply pipe thread sealant to the plugs, and then install the plugs.
- 5 Repeat steps 1 through 4 for all the other drive torque hubs.

---

#### Specifications

<b>Capacity</b>	17 fluid ounces 0.5 liters
<b>Type</b>	SAE 90 multipurpose hypoid gear oil. API classification GL5

### 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 frequently.

**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.

## TABLE C PROCEDURES

## 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 frequently.

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

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

- 1 Rotate the filter housing counterclockwise and remove the housing.
- 2 Remove the filter element from the housing.
- 3 Inspect the housing seal and replace it if necessary.
- 4 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.
- 5 Start the engine from the ground controls.
- 6 Inspect the filter assembly to ensure that there are no leaks.

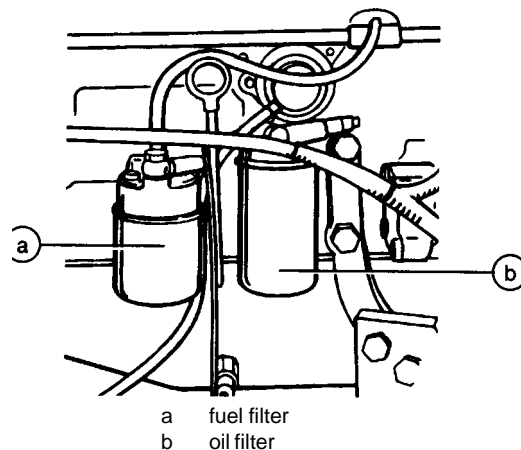
## C-8 Replace the Diesel Fuel Filter - Deutz Diesel Models

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.



- 3 Apply a thin layer of oil or diesel fuel to the new fuel filter gasket.

TABLE C PROCEDURES

- 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**

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 frequently.

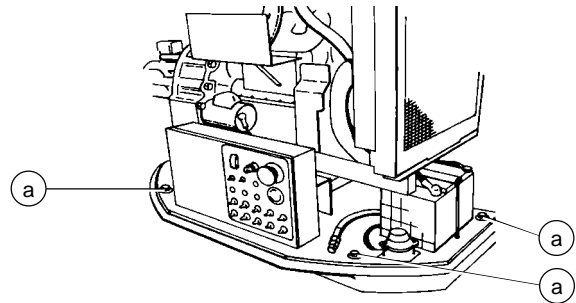
**⚠ DANGER**

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 Remove the 3 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 bolts

- 2 Loosen the filter bracket mounting bolt. Disconnect the fuel hoses from the filter, then slide the filter out of the bracket.
- 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 reconnect the fuel hoses to the filter.
- 4 Clean up any fuel that may have spilled during the installation procedure.
- 5 Swing the engine pivot plate back to its original position and replace the three retaining bolts.
- 6 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.

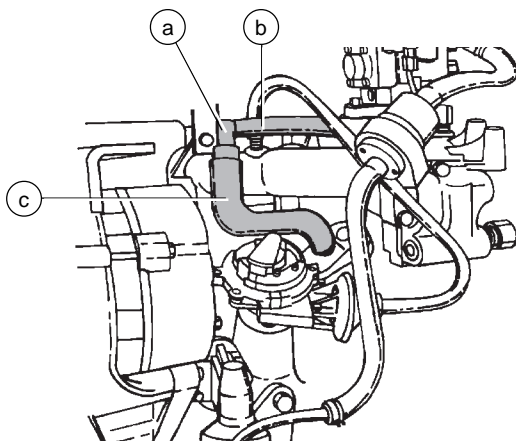
## TABLE C PROCEDURES

### 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 3 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the PCV valve.
- 2 Remove the hoses from the valve, then remove the valve.
- 3 Install the new valve.
- 4 Swing engine pivot plate back to its original position and replace the three retaining bolts.

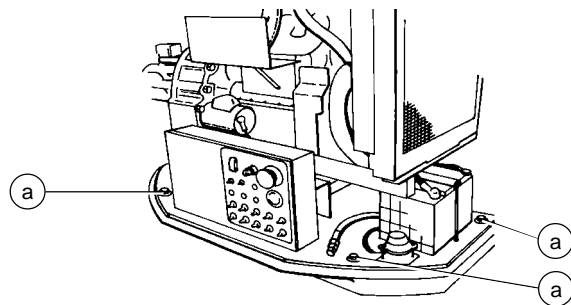


- a PCV valve
- b hose, PCV valve to carburetor
- c hose, PCV valve to crankcase

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

Distributor caps and rotors 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 frequently.

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



a pivot bolt plates

- 1 Remove the 3 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the distributor.
- 2 Label and remove 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.

TABLE C PROCEDURES

- 7 Install the rotor and cap, then re-attach the coil and spark plug wires.
- 8 Swing engine pivot plate back to its original position and replace the three retaining pins.

### 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 turned 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 plugs, then reconnect the plug wires. Be sure that each spark plug wire is attached to the correct spark plug.

**Specifications**

<b>Spark Plugs</b> (Motorcraft)	AWSF-42
<b>Gap</b>	0.032 - 0.036 inches 0.81 - 0.91mm
<b>Torque specs</b>	5 - 10 foot-pounds 6.8 - 13.6 Nm

### C-13 Check and Adjust the Air/Propane Mixture

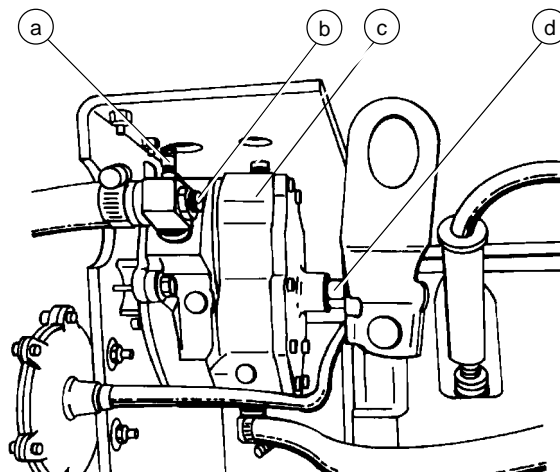
Maintaining the proper air-to-fuel mixture during propane operation is essential to good engine performance.

**⚠ 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 propane idle mixture.

**NOTICE** The engine should be warmed to normal operating temperature before performing this procedure.

- 1 Move the fuel select switch to propane fuel and start the engine from the ground controls.
- 2 Loosen the high idle mixture adjustment lock nut.



- a low idle mixture adjustment screw
- b high idle mixture adjustment screw
- c propane regulator
- d pressure adjustment

TABLE C PROCEDURES

- 3 Load the system by pressing the primary boom extension retract switch, and then move the engine speed control switch to high idle (rabbit symbol).
- 4 Adjust the high idle adjustment nut 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.

- 5 Hold the adjustment screw and tighten the lock nut.
- 6 Move the engine speed 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.

**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 Litre 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 0261 1642). Genie part number 29789.



## Table D Procedures

### D-1

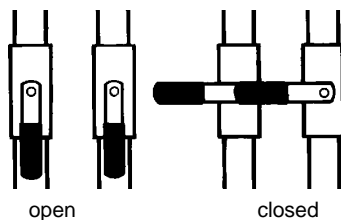
#### Test or Replace the Hydraulic Oil

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-27) thereafter should be completed.**

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

- 1 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.

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

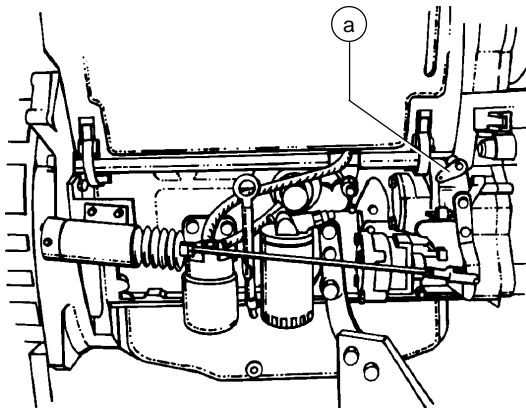
Remove the high tension lead from the center of the ignition coil.

**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).

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

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**Hydraulic system**

Hydraulic tank capacity 25 gallons  
95 liters

Hydraulic system capacity (including tank) 30 gallons  
114 liters

Hydraulic fluid Dexron II equivalent

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**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.

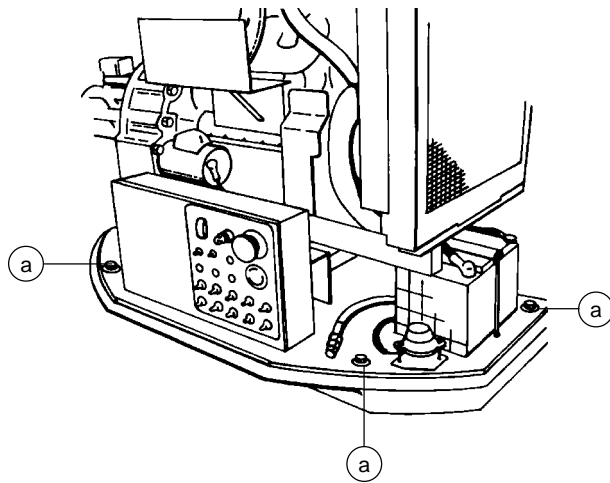
**CAUTION** Beware of hot engine parts and coolant. Contact with hot engine parts and/or coolant will cause severe burns.

**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

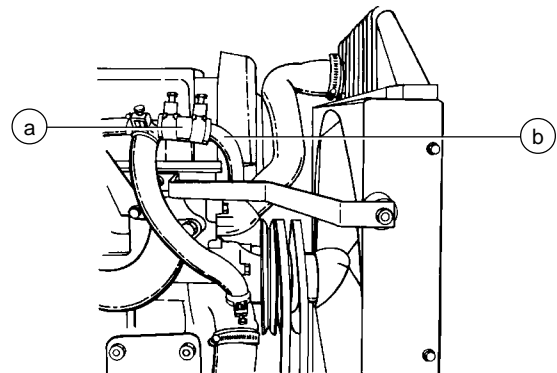
- 4 Remove the 3 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the radiator petcock.



a pivot plate retaining bolts

- 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.



a hose A  
b hard line B

- 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.

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

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## TABLE D PROCEDURES

### D-3 Change the Fuel Lines

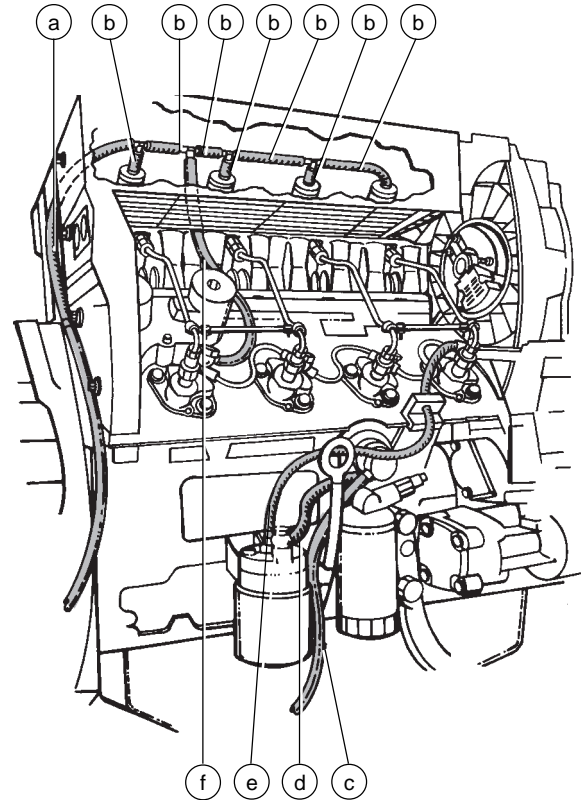
Maintaining the fuel lines in good condition is essential to safe operation and good engine performance. Failure to detect a worn, cracked or leaking fuel line may cause an unsafe operating condition.

**⚠ 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:

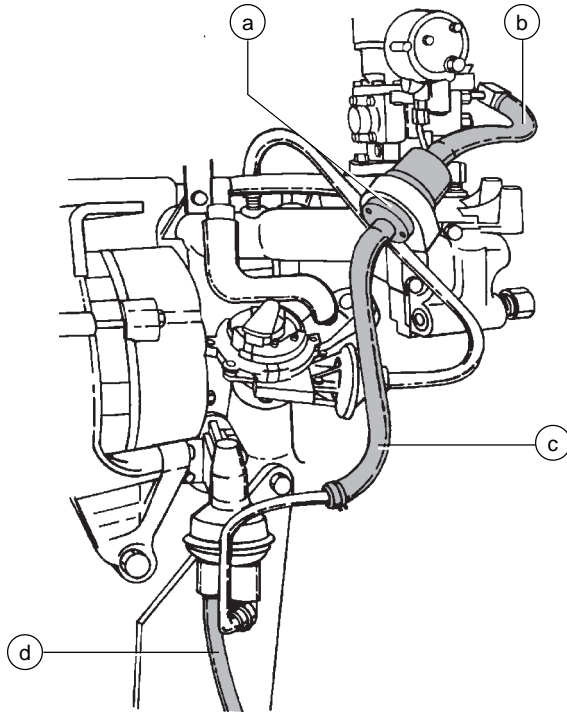
**⚠ DANGER** Fuel may be expelled under pressure. Wrap a cloth around fuel hoses to absorb leaking fuel before disconnecting them.



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.

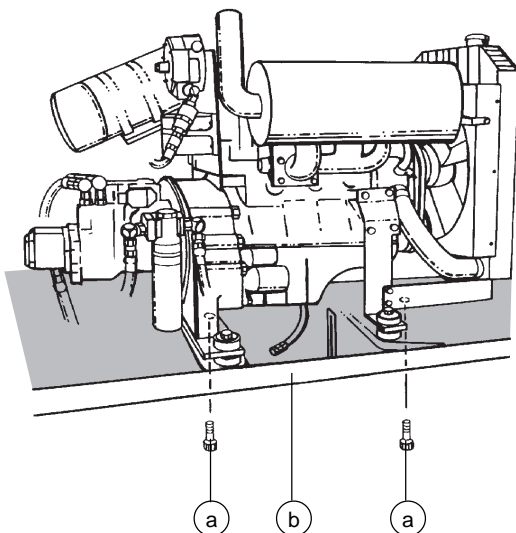
TABLE D PROCEDURES

## 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.

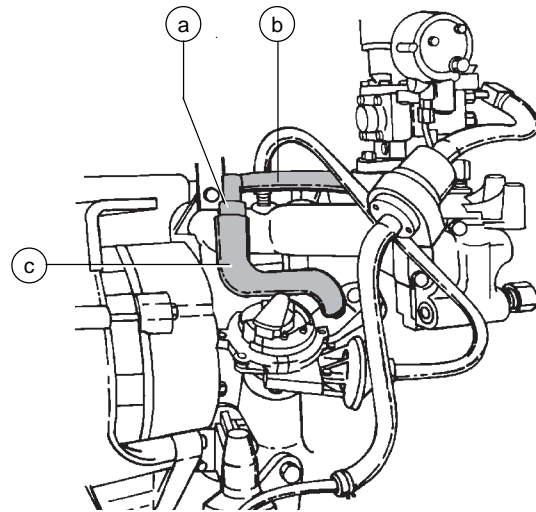
**NOTICE** Perform this procedure with the engine off.

- 1 Remove the 3 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 Fuel Injection Pumps  
and Injectors****- Deutz Diesel Models**

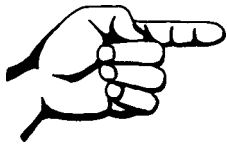
Complete information to perform this procedure is available in the *Deutz FL 1011 Workshop Manual* (Deutz number: 0291 1942). Genie part number 29789.

**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 pin
  - 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-45/22 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** Electrocutation 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

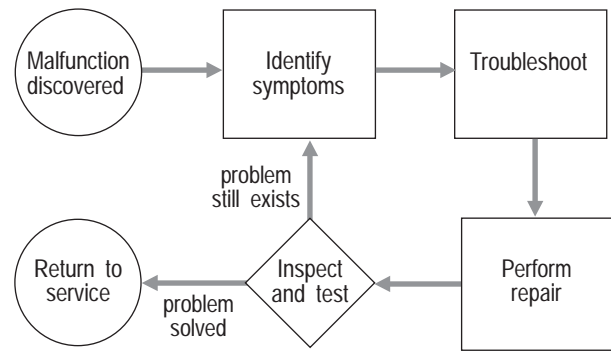
## About This Section

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) are not tripped.

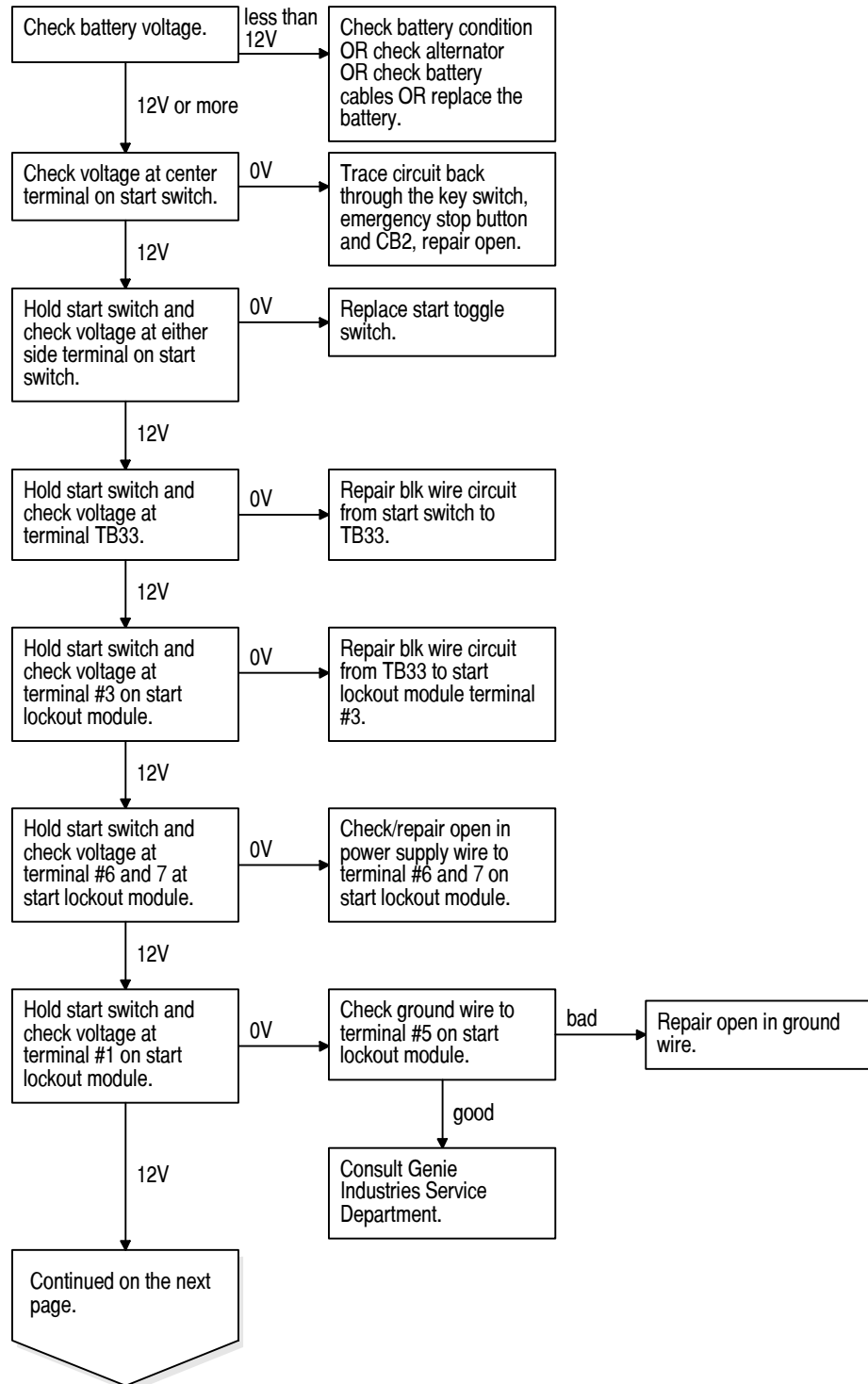
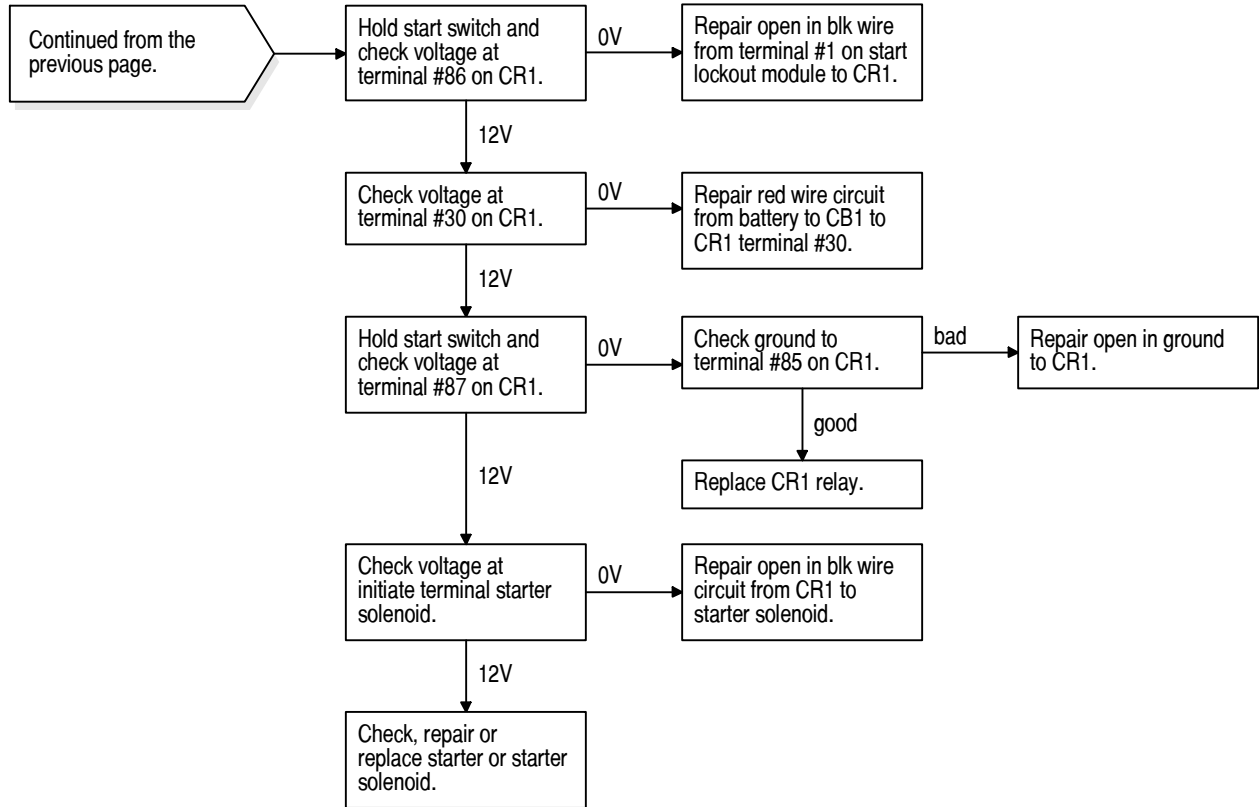


CHART 1



# Chart 2

## 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.

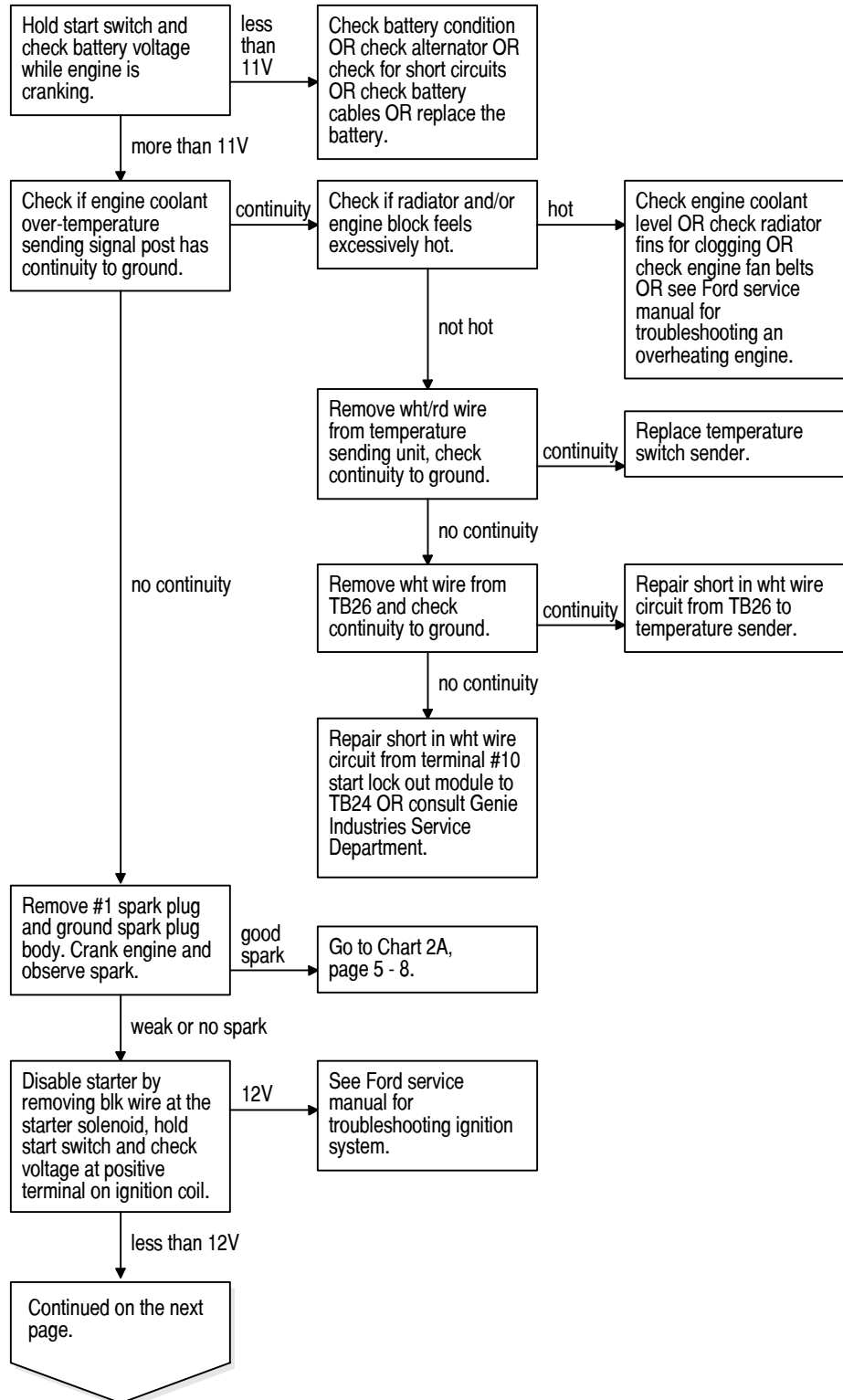


CHART 2

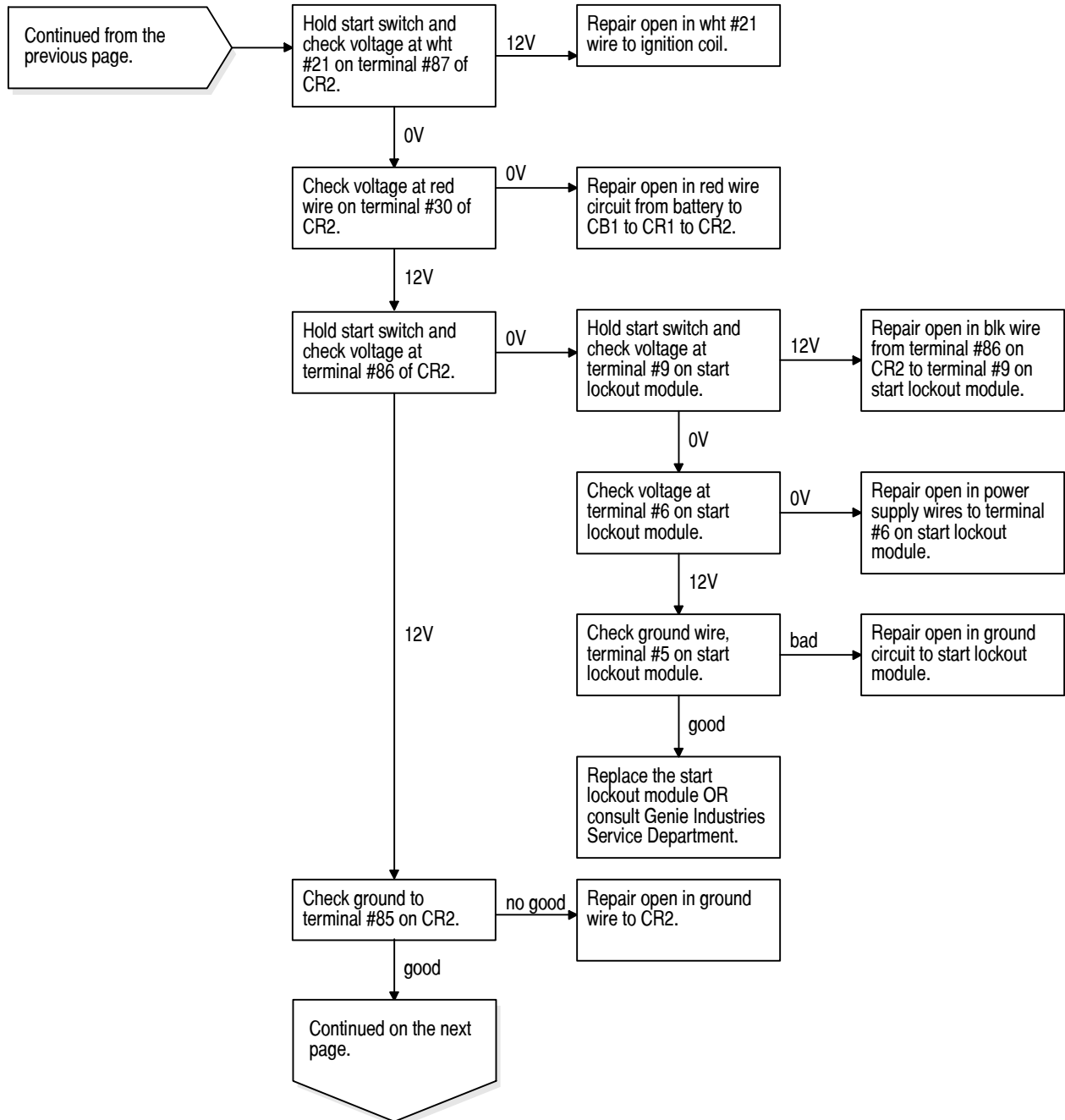
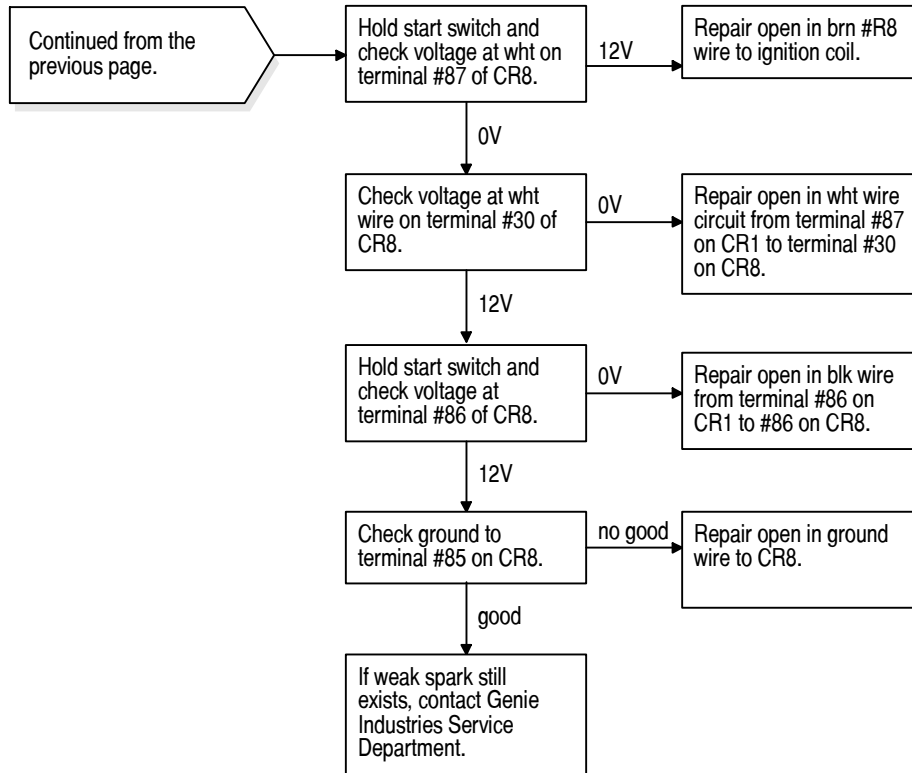


CHART 2



# Chart 2A

**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.

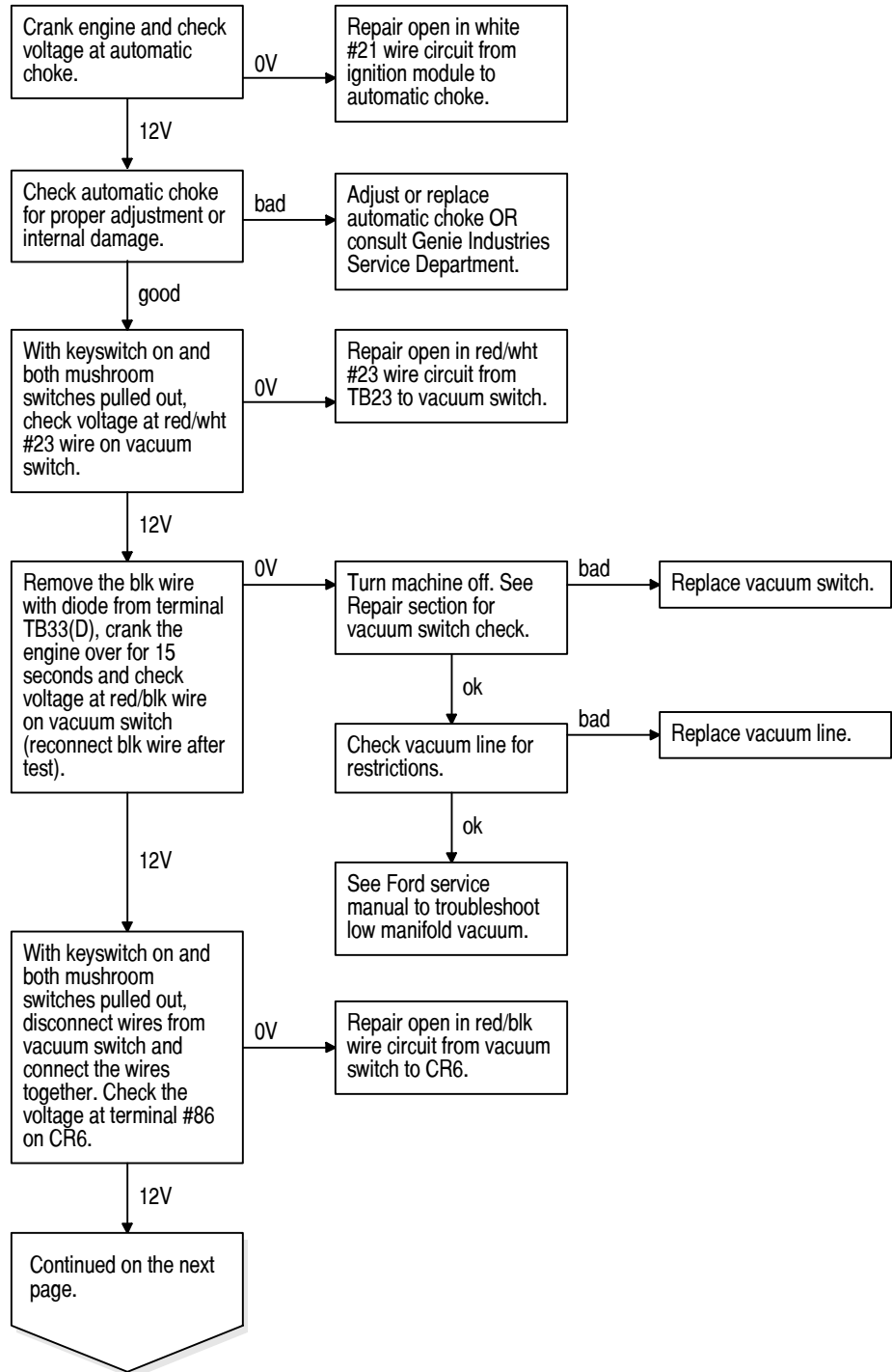




CHART 2A

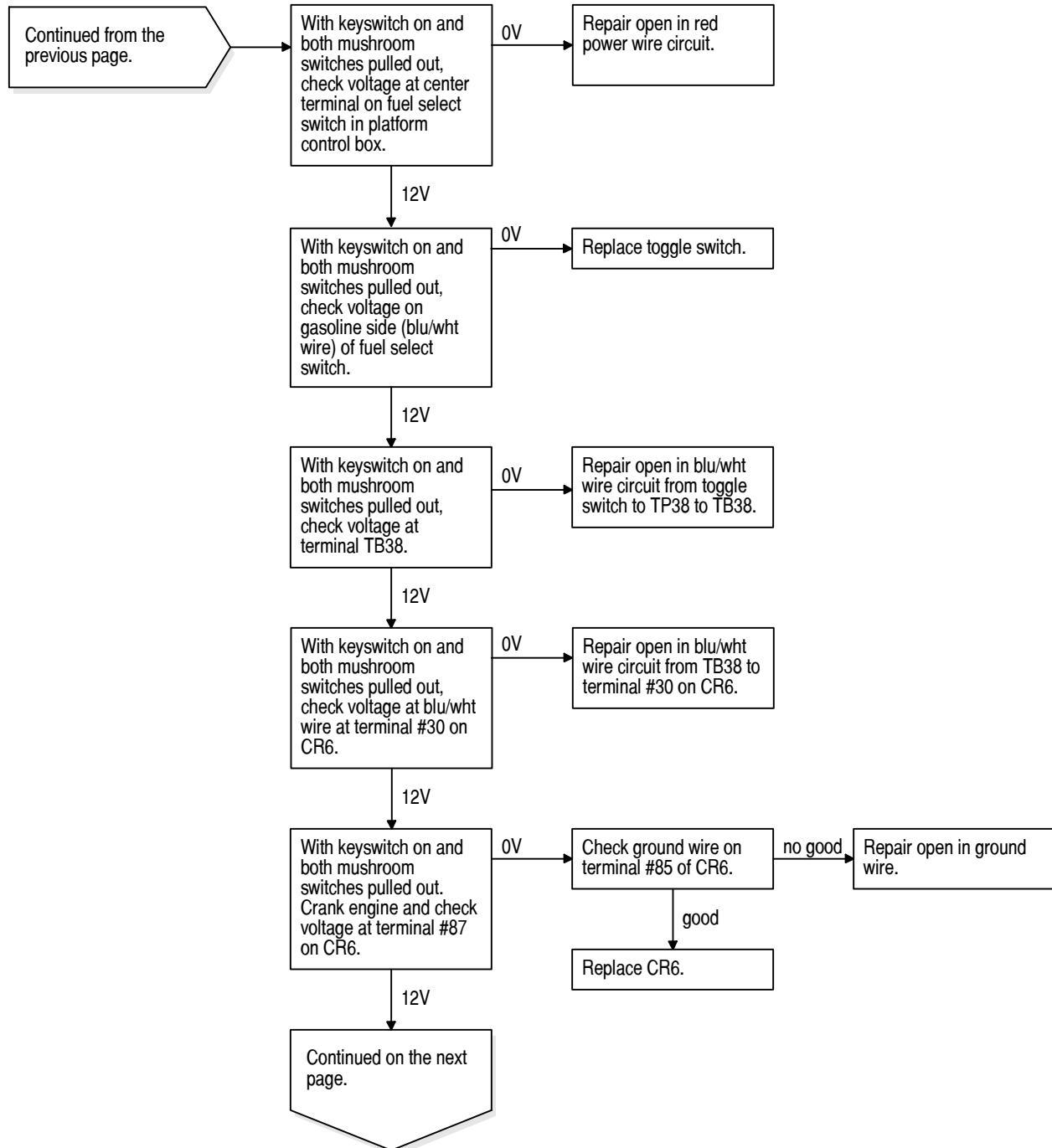
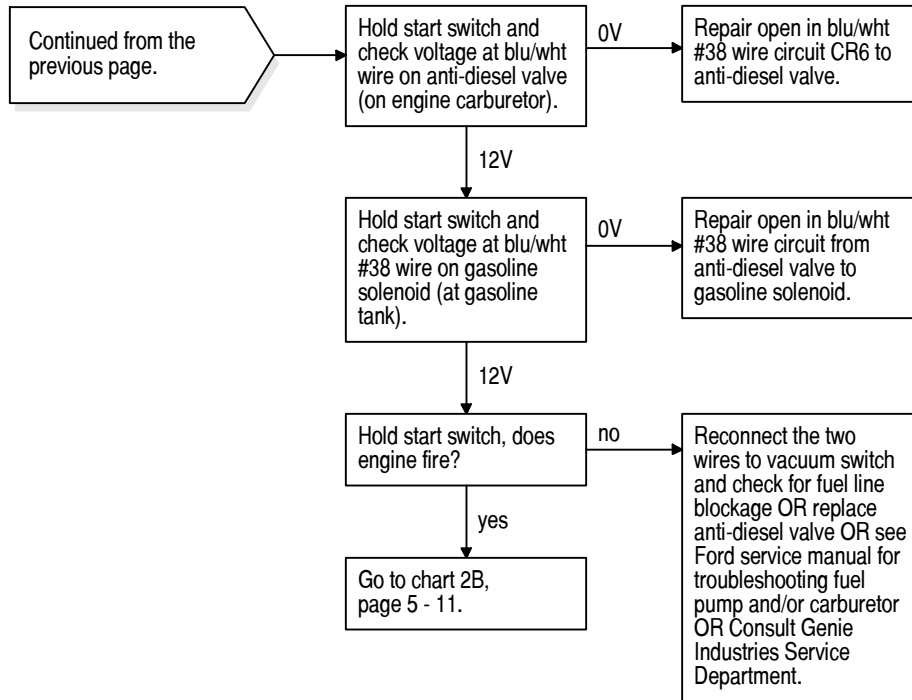
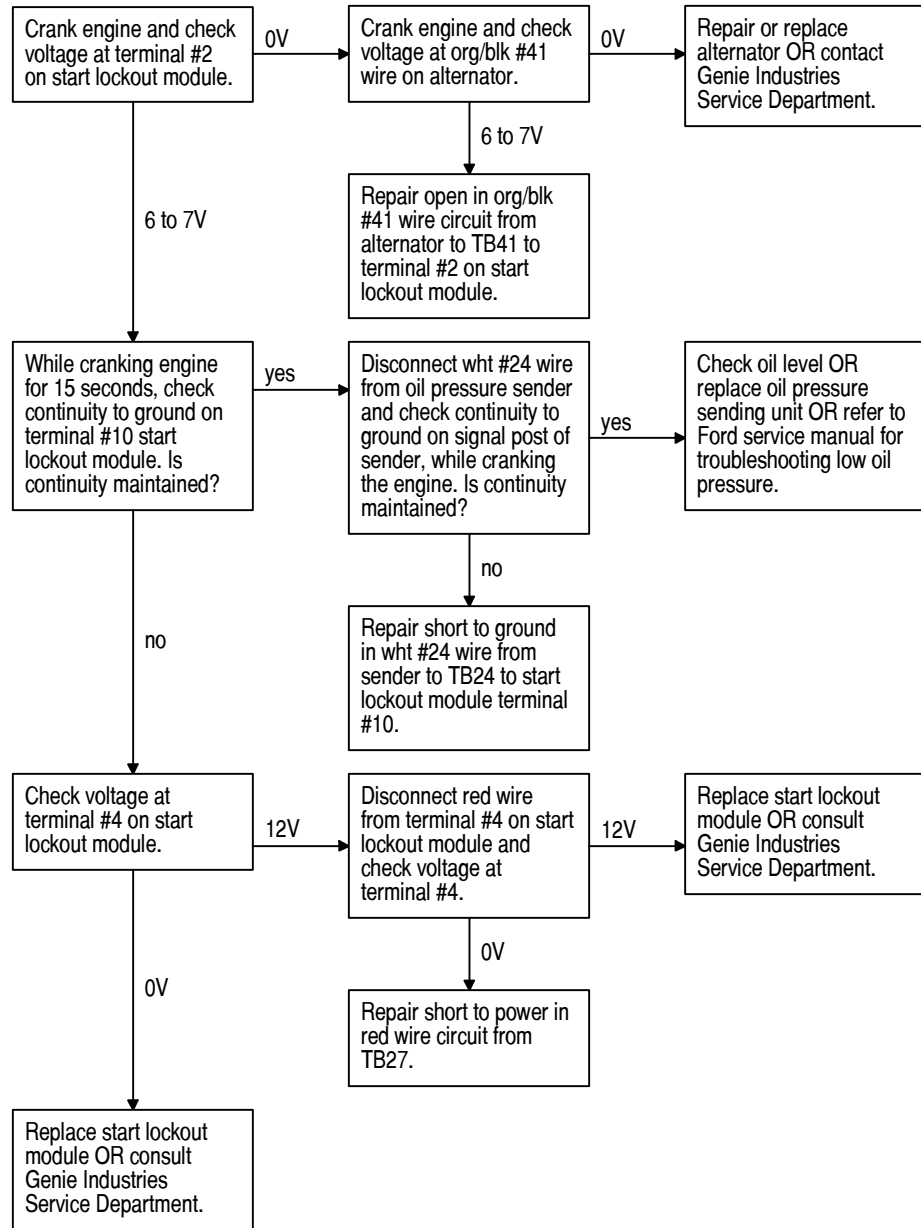


CHART 2A



# Chart 2B

## Engine Runs While Cranking Then Dies



# 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.

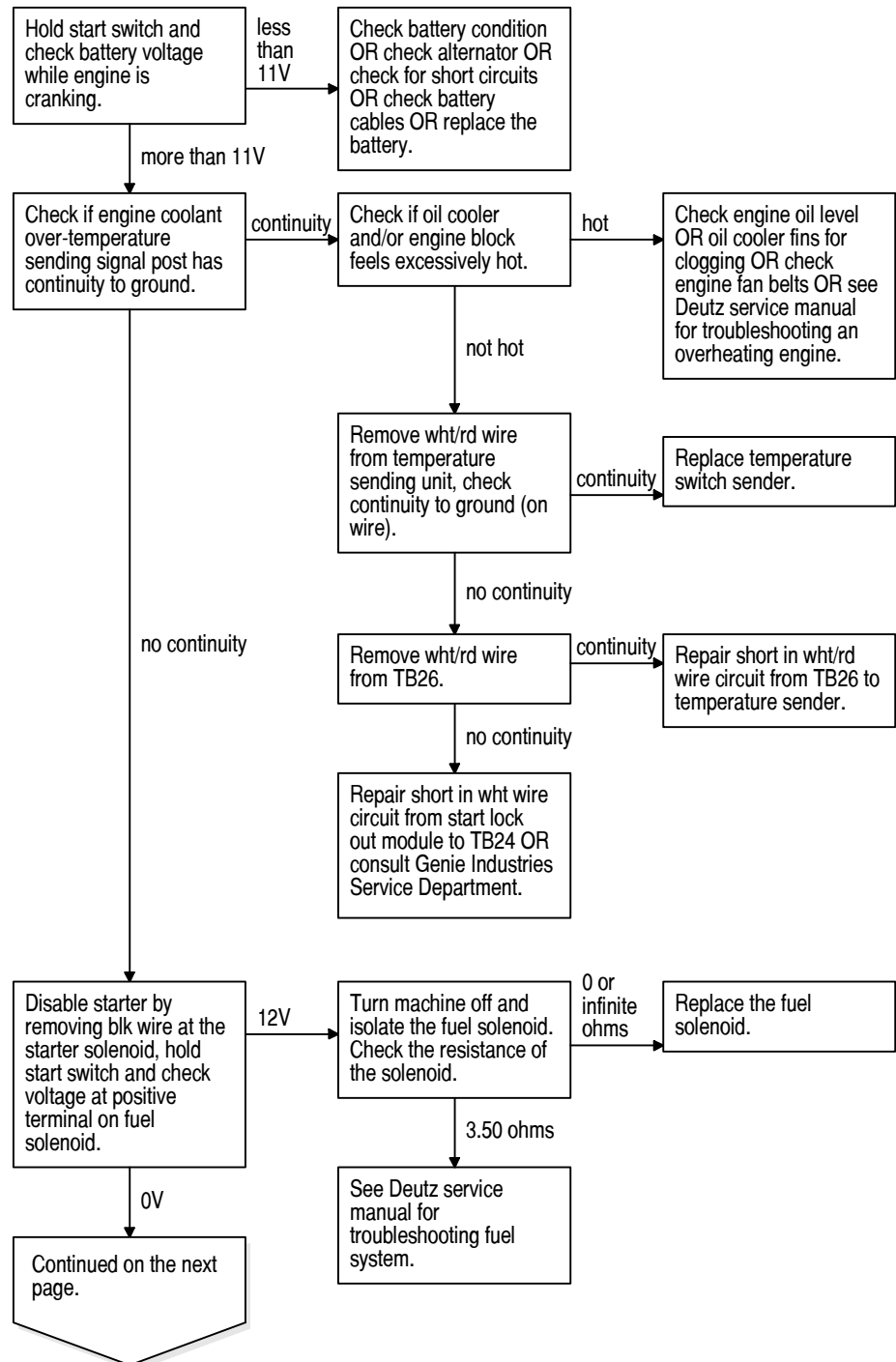


CHART 3

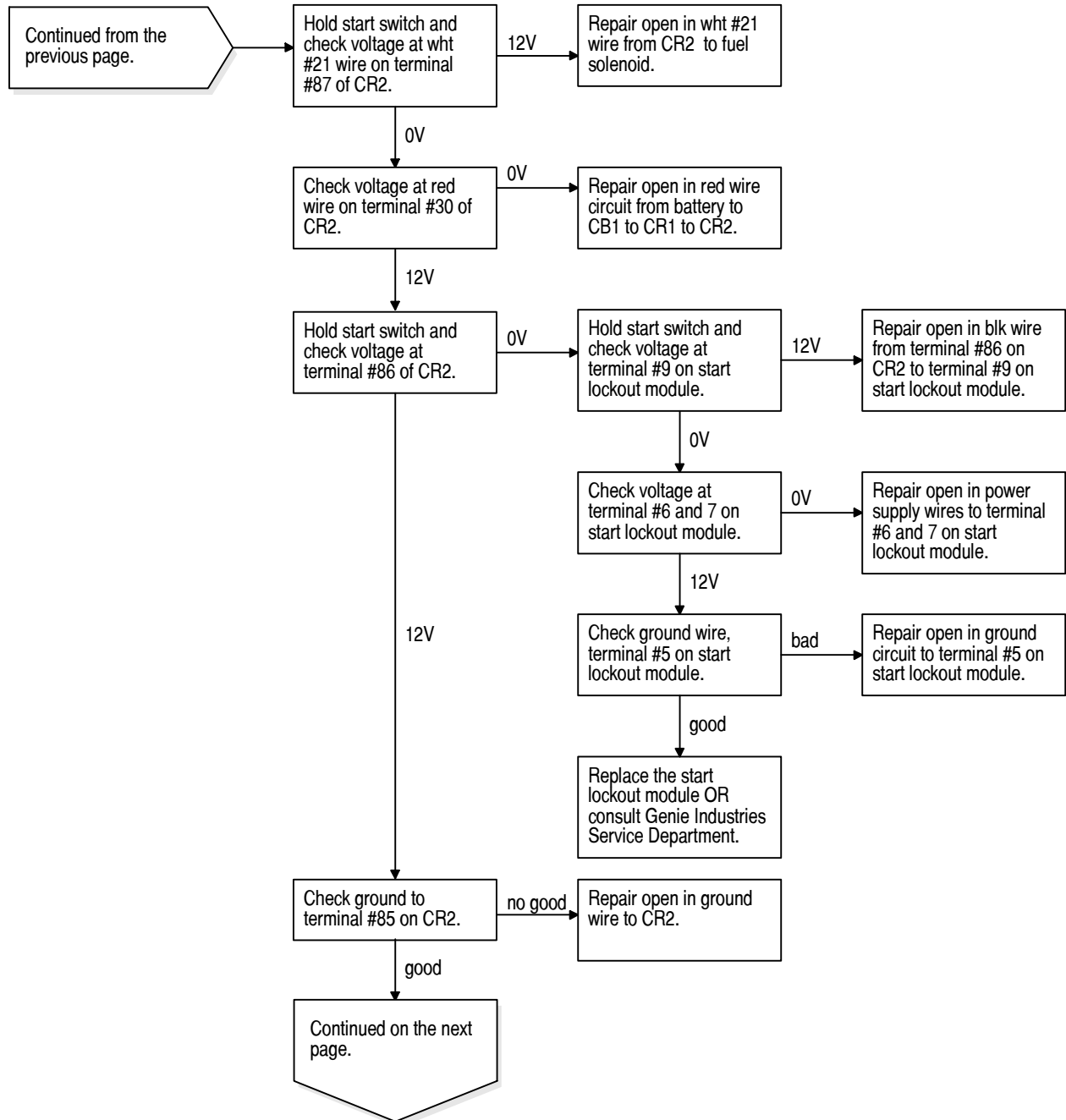
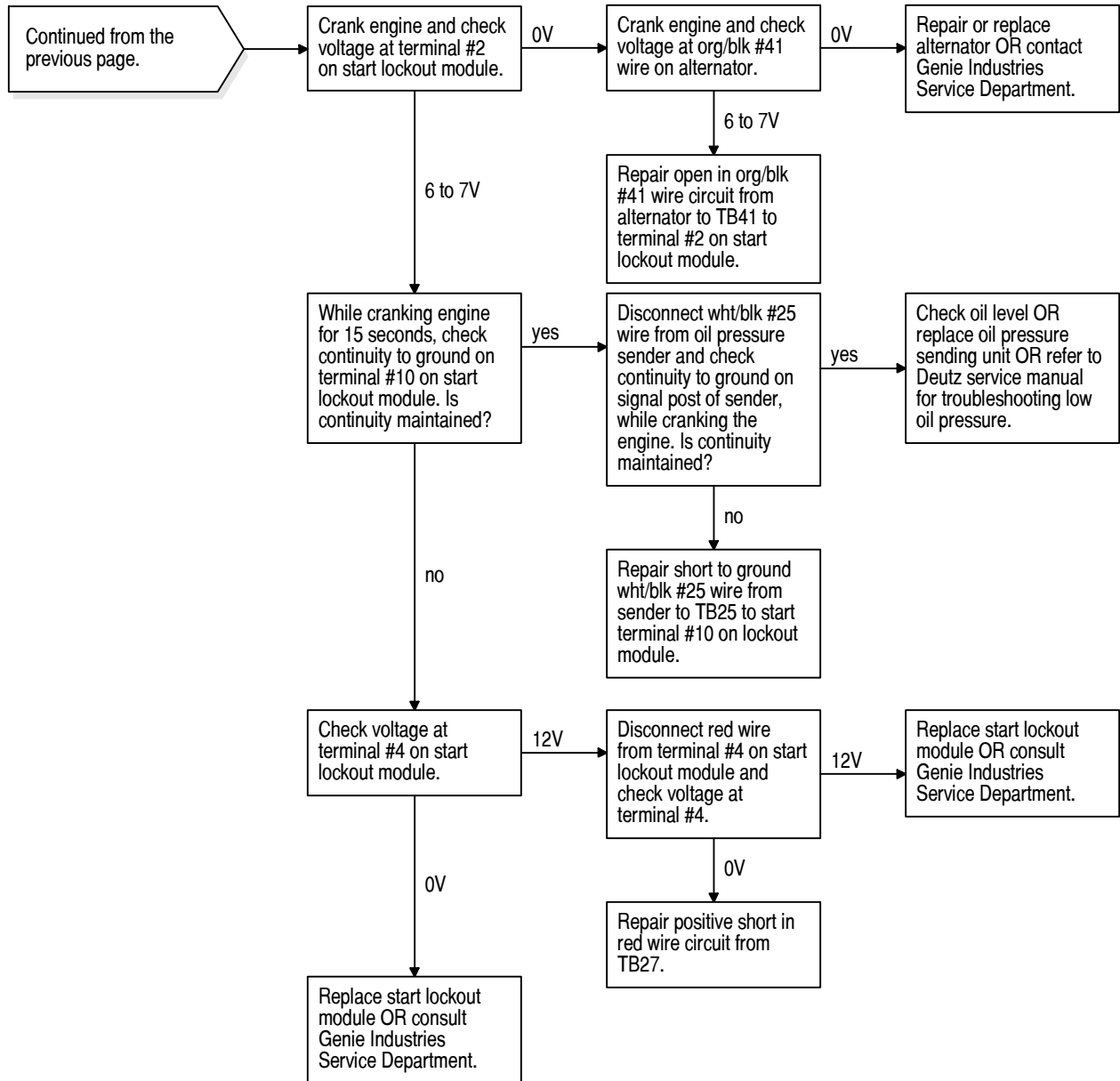


CHART 3



# 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.

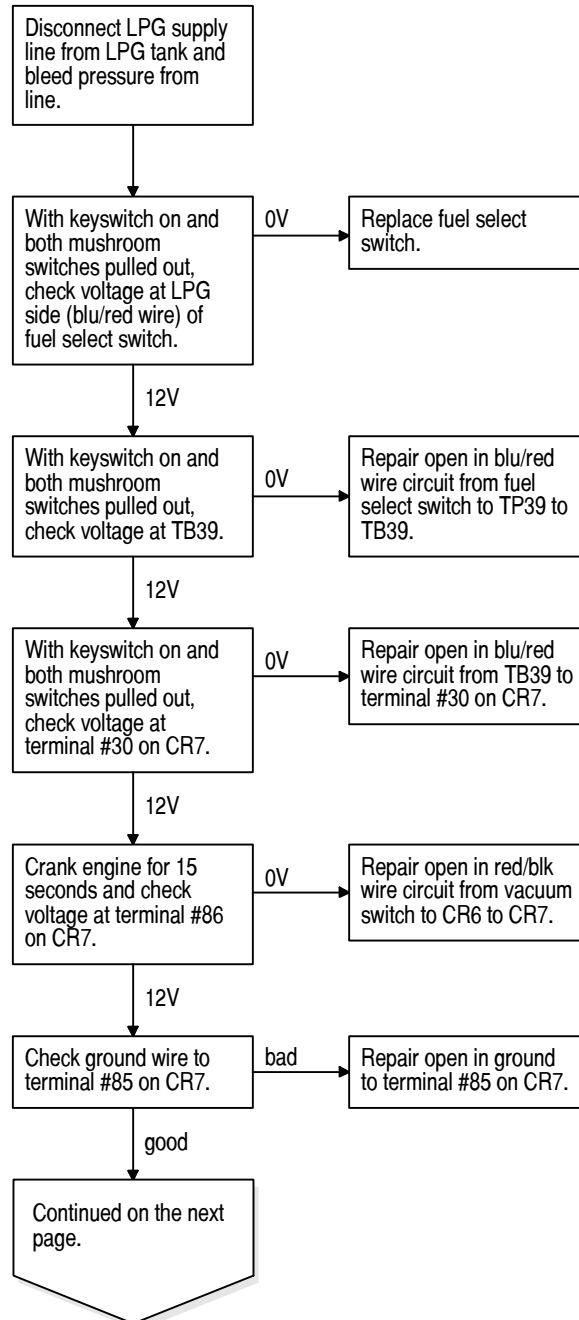
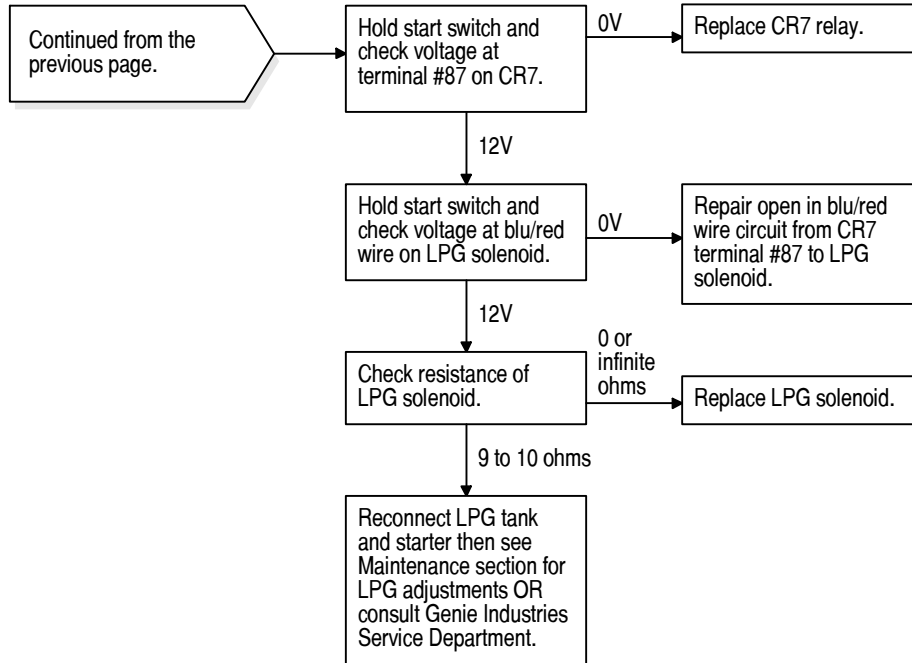


CHART 4





# 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.

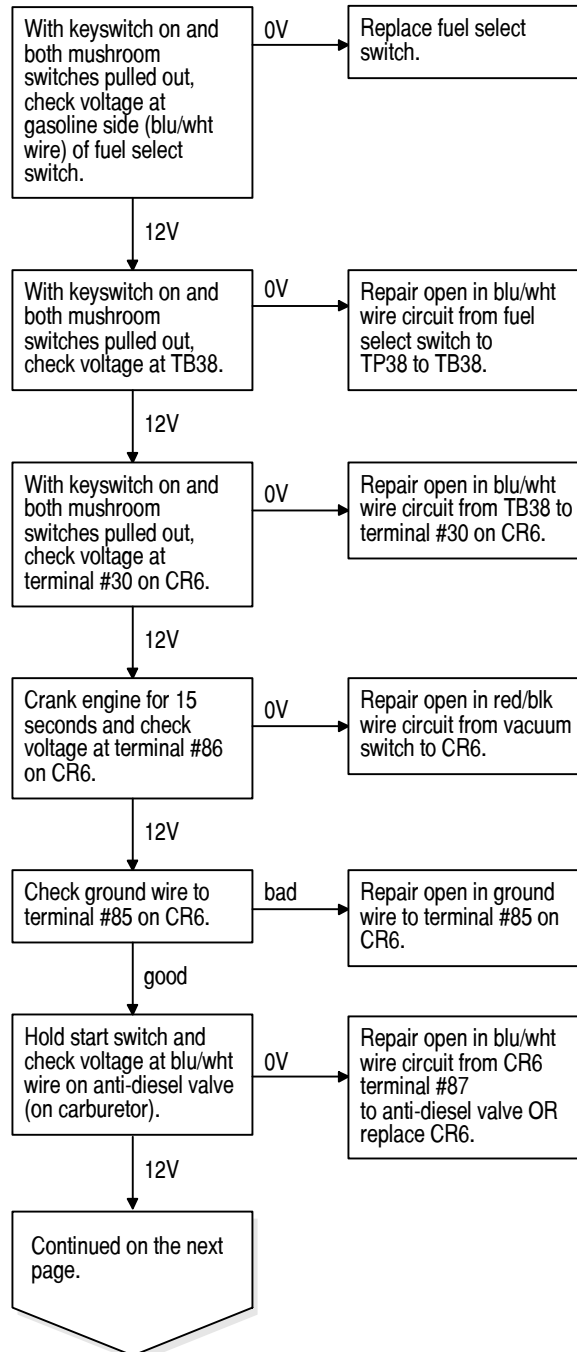
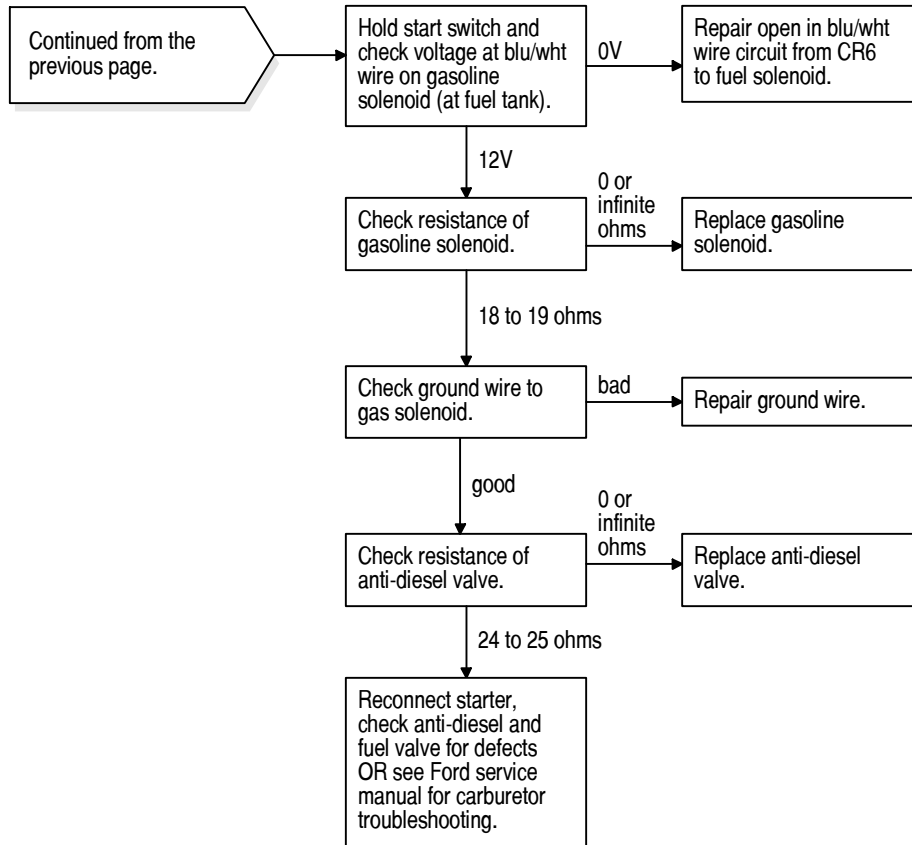


CHART 5



# 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.

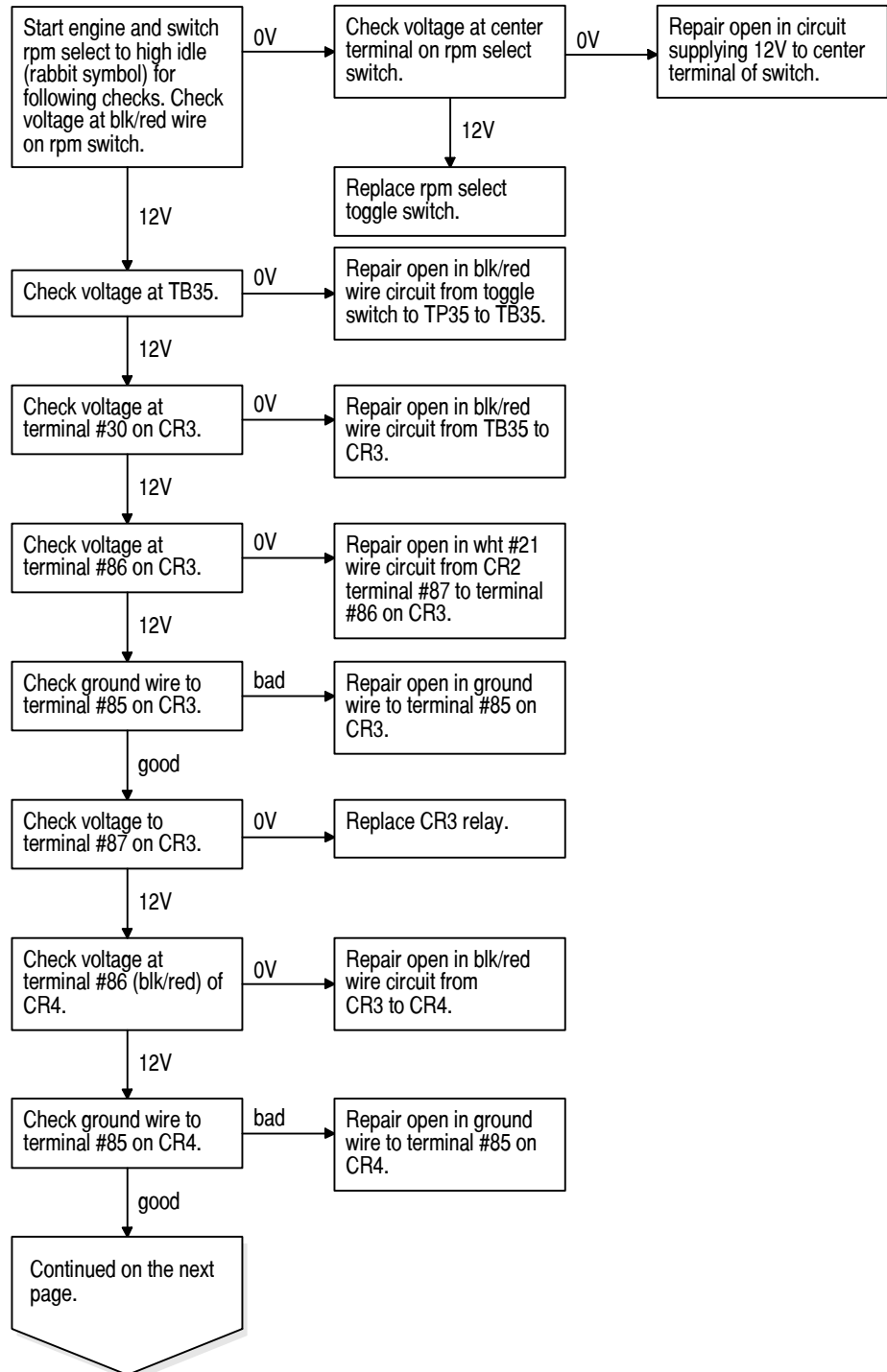


CHART 6

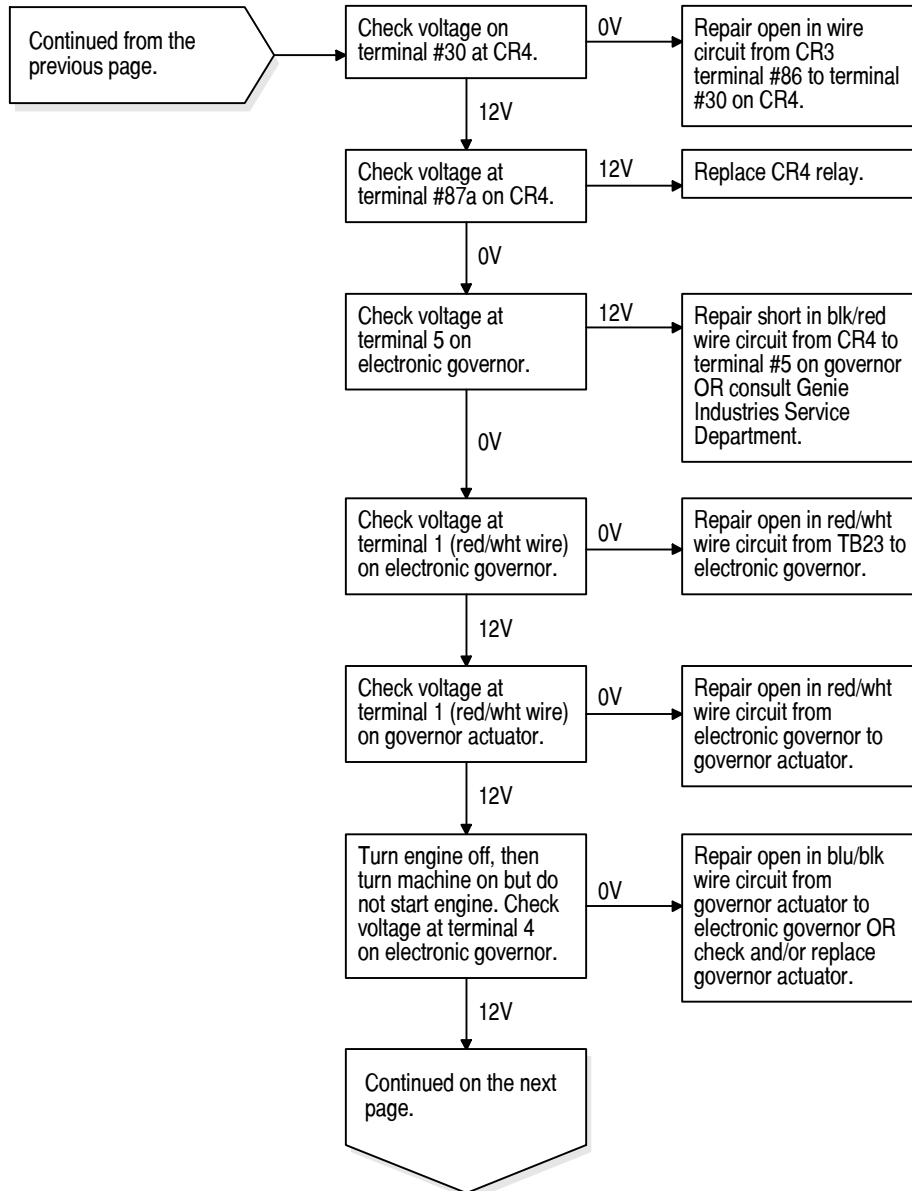
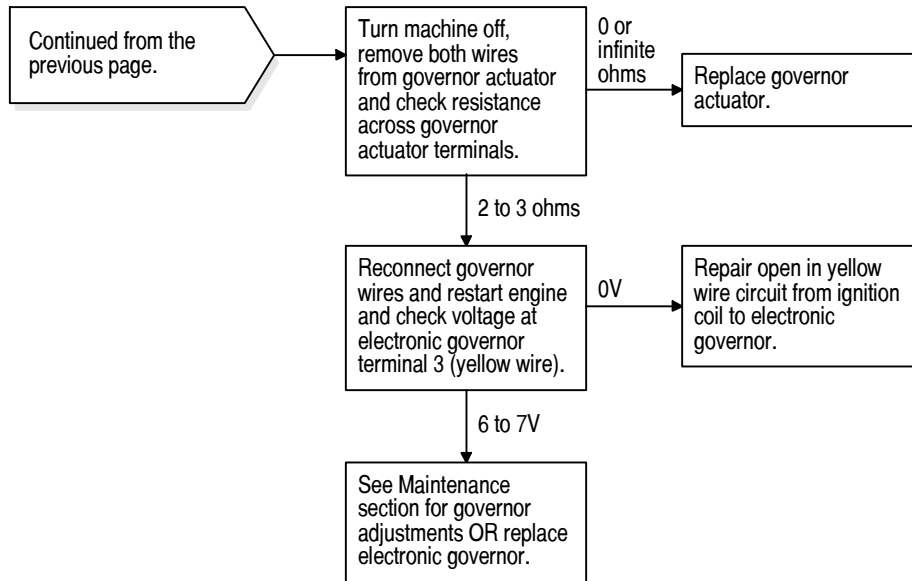


CHART 6



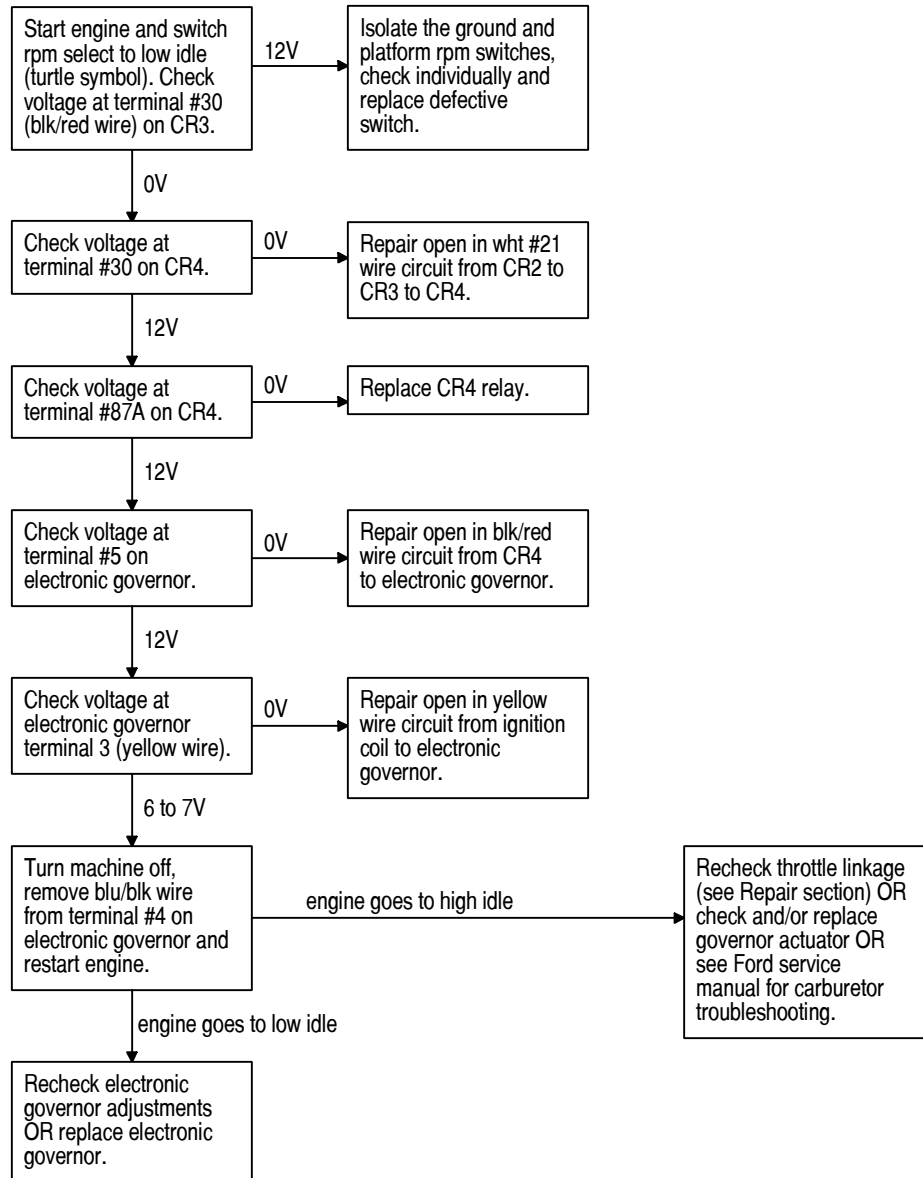
# Chart 7

## 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 2-speed solenoid grounding wires are free of corrosion and have full continuity to ground.

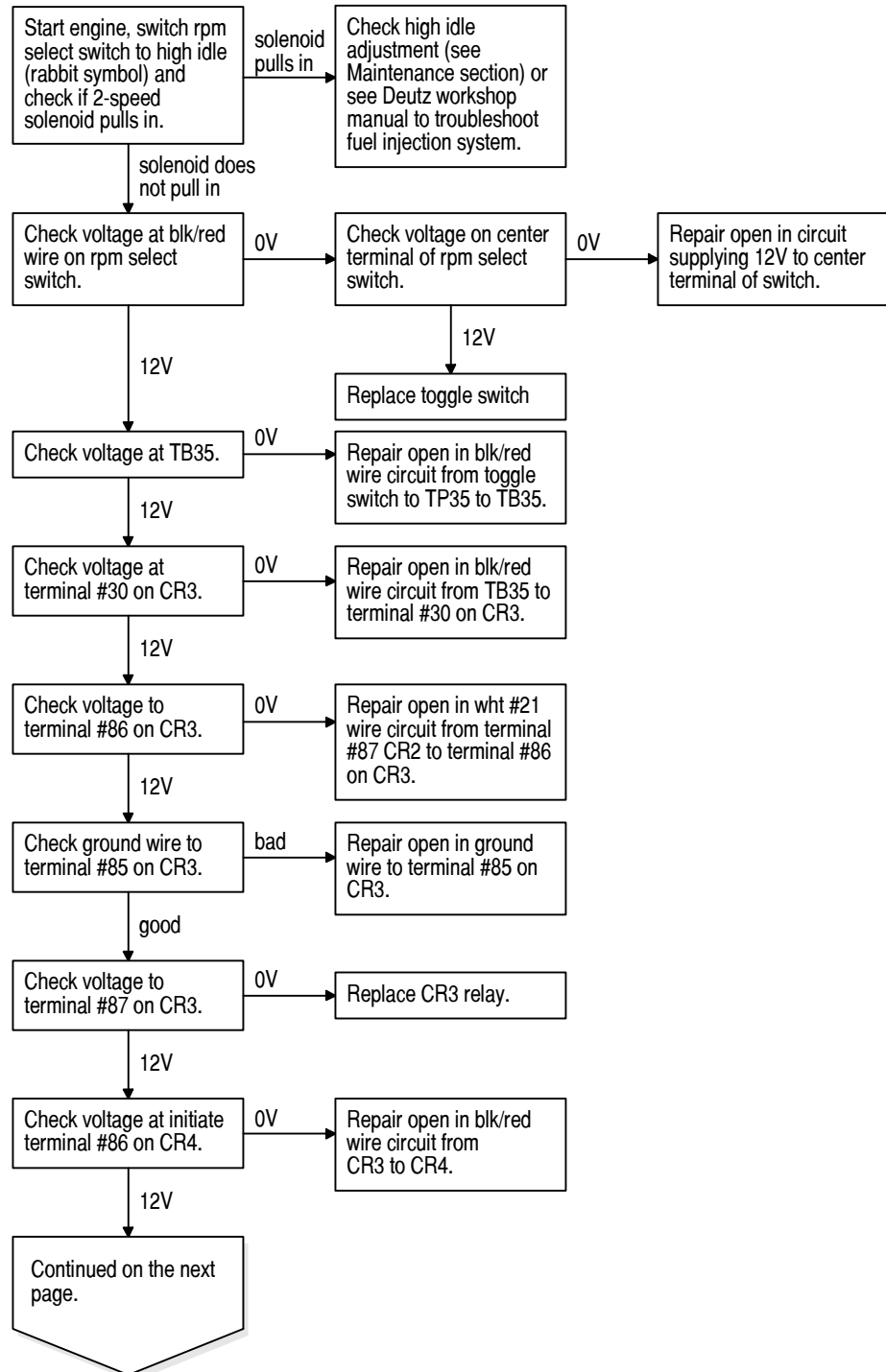
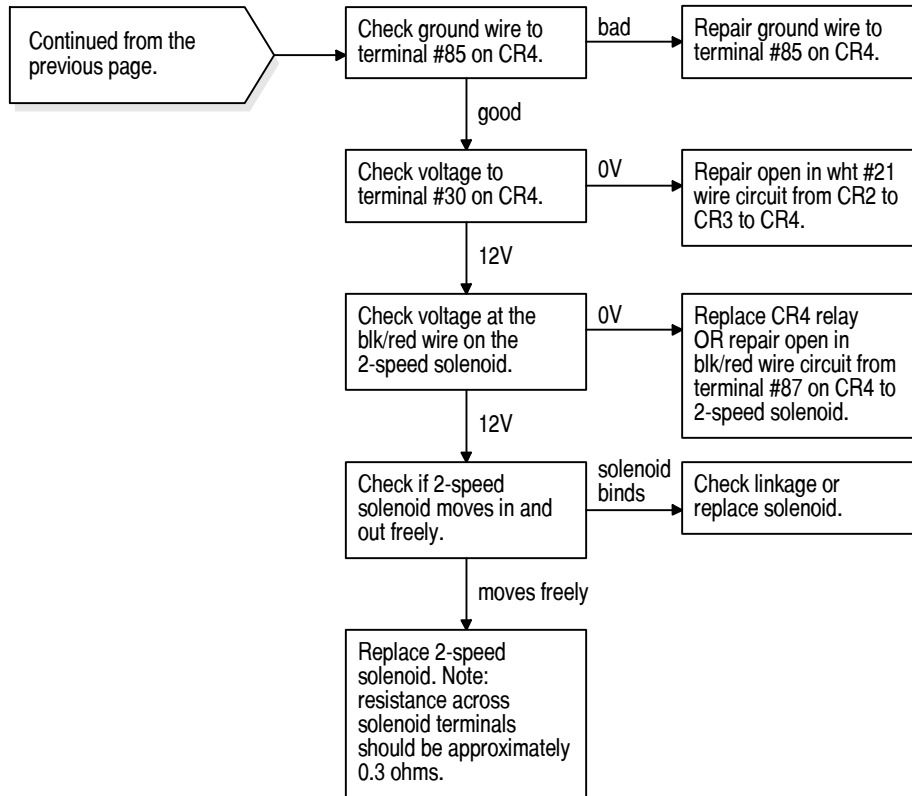


CHART 8

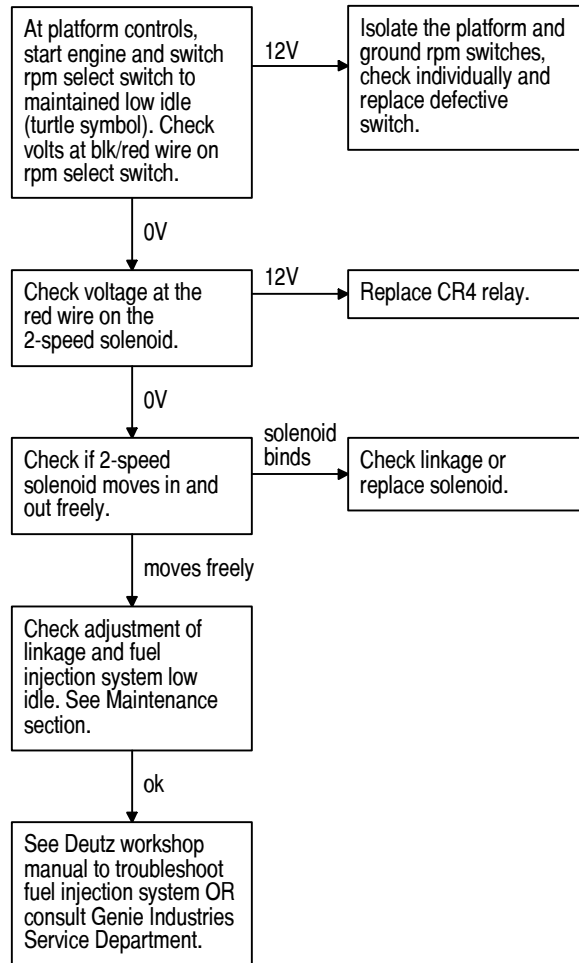




# Chart 9

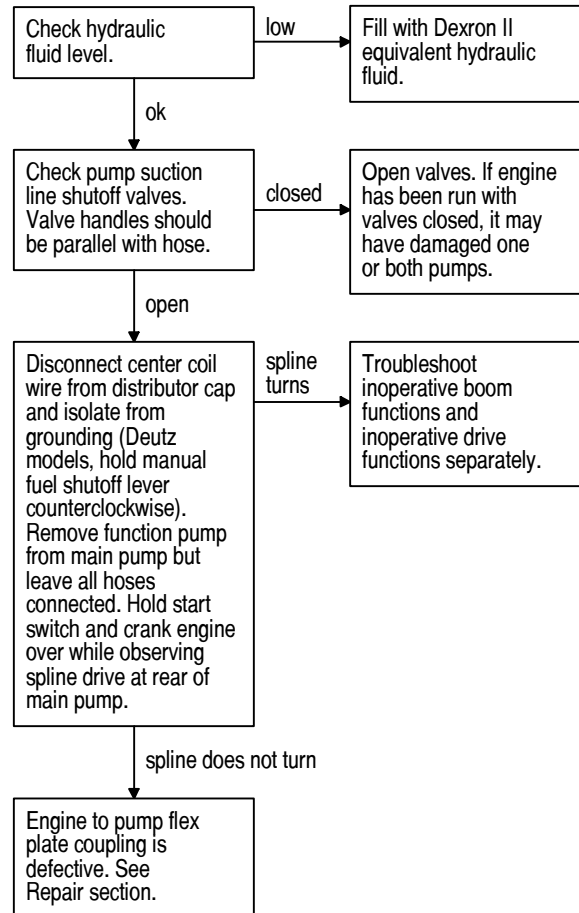
## Engine Low Idle Inoperative - Deutz Diesel Models

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

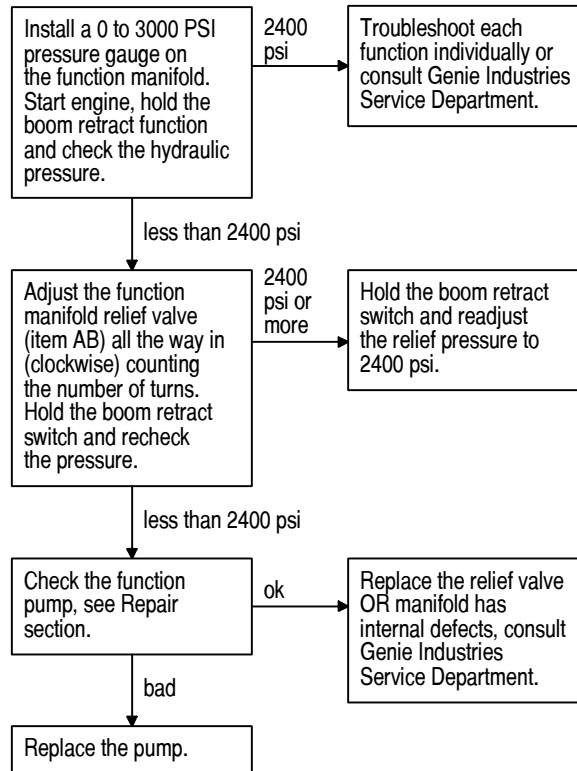


# Chart 11

## 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.

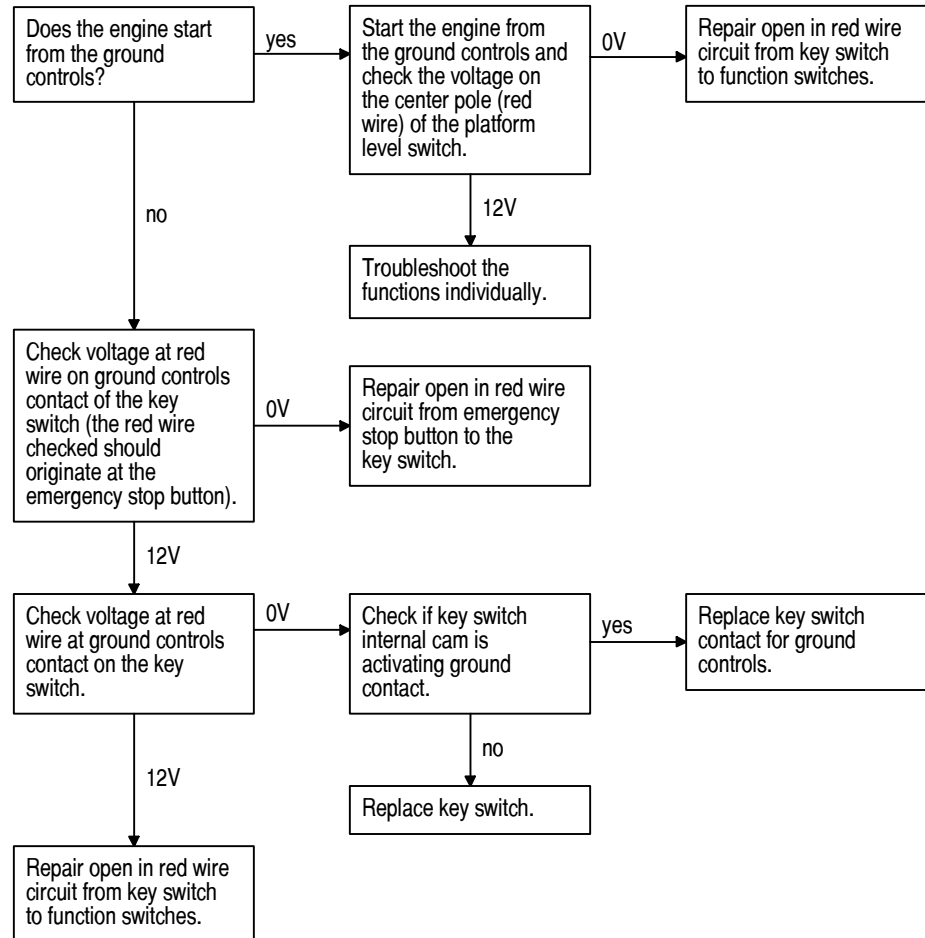
Be sure all grounding wires for the hydraulic manifold valves are free of corrosion and have full continuity to ground.



# Chart 12

## Ground Controls Inoperative, Platform Controls Operate Normally

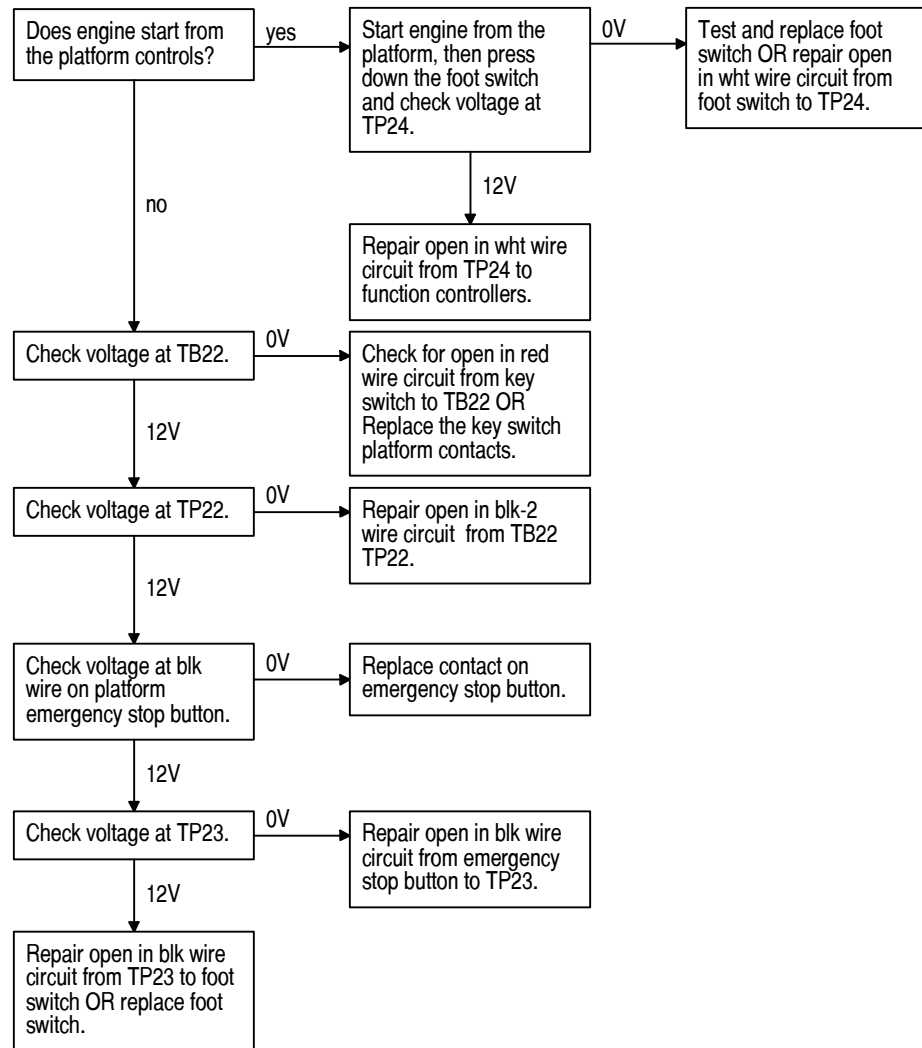
Be sure all other functions operate normally, including platform controls.



# Chart 13

## Platform Controls Inoperative, Ground Controls Operate Normally

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



# Chart 14

## Secondary Boom Up Function Inoperative

Be sure all other functions operate normally.

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

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

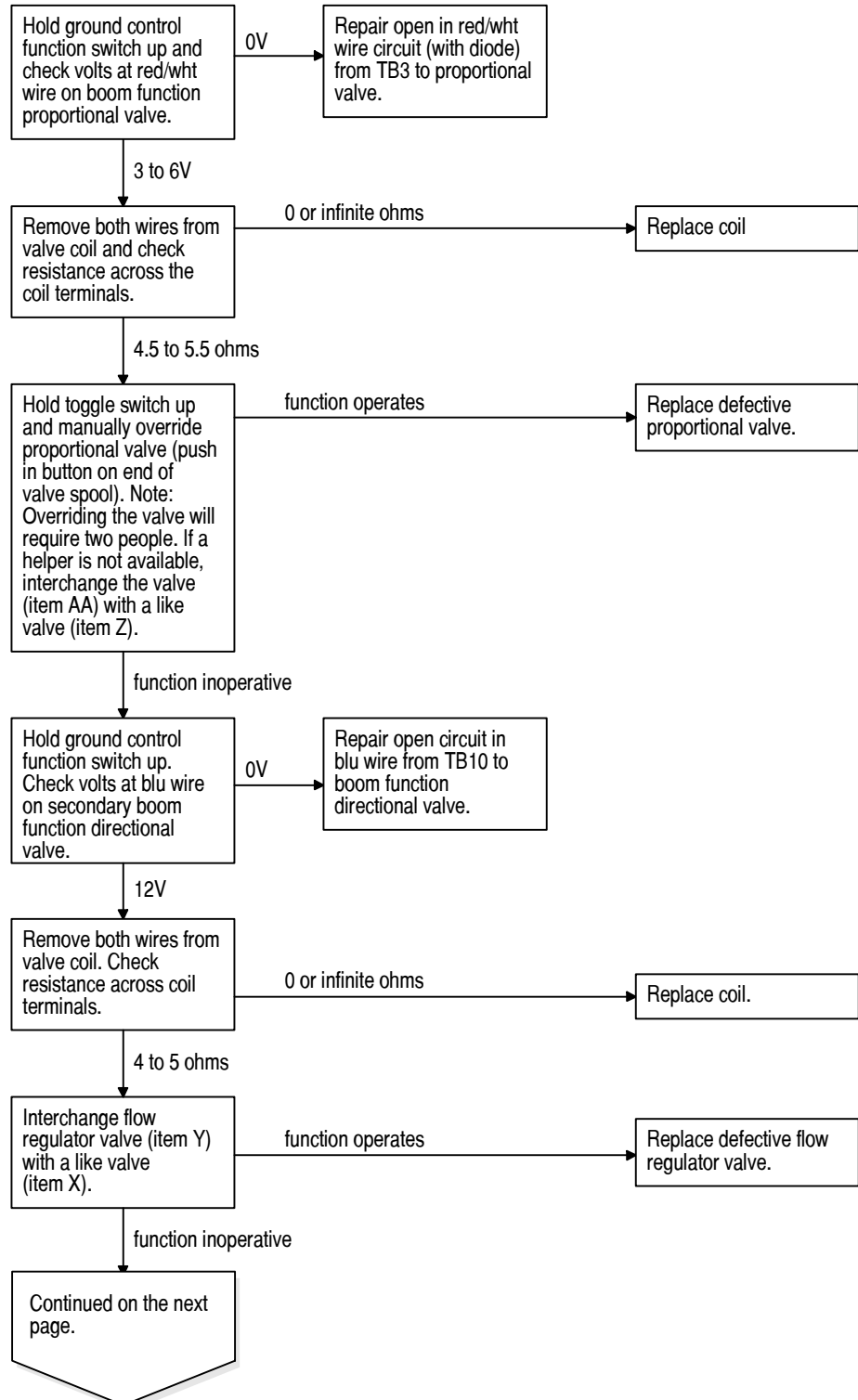
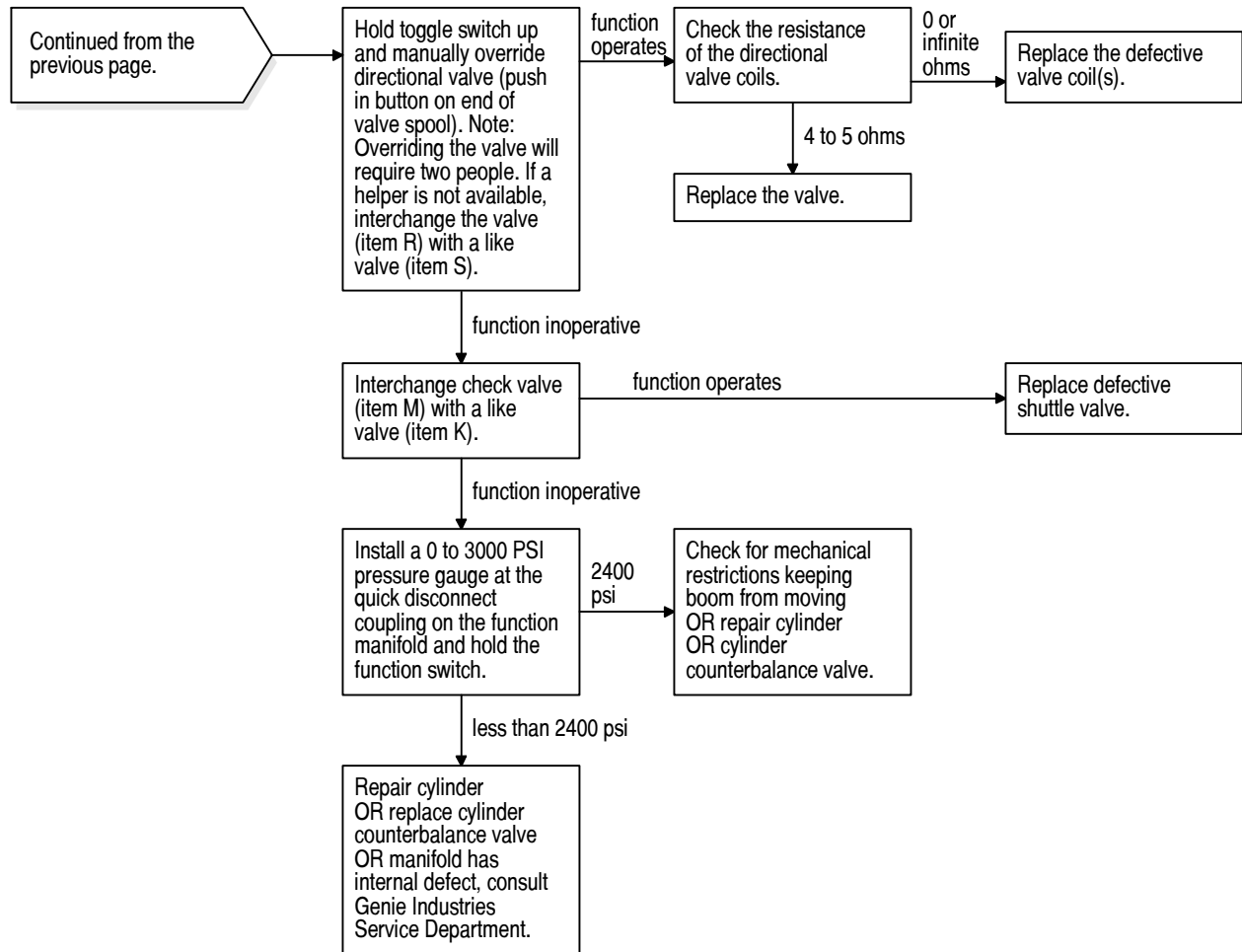


CHART 14



# Chart 15

## Secondary Boom Down Function Inoperative

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

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

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

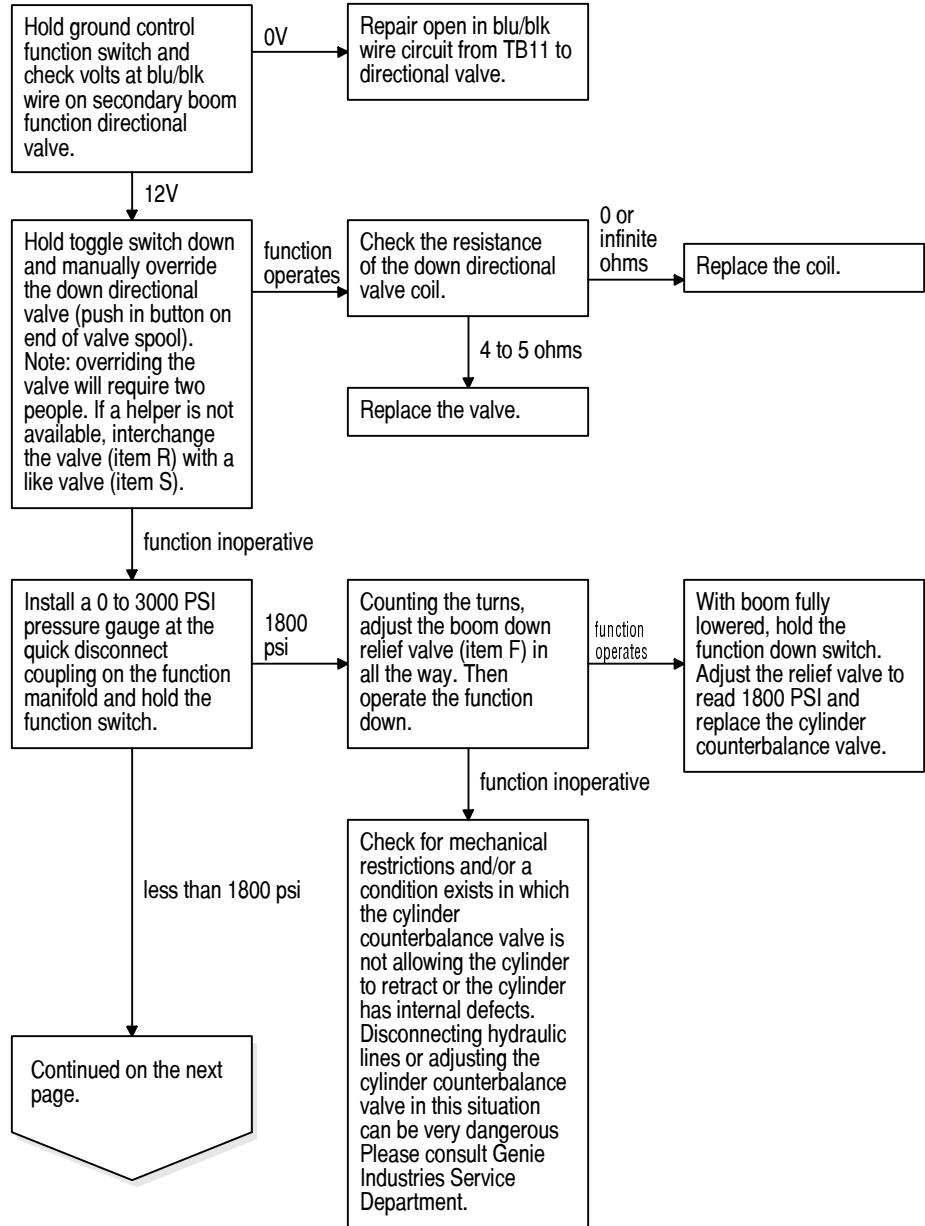
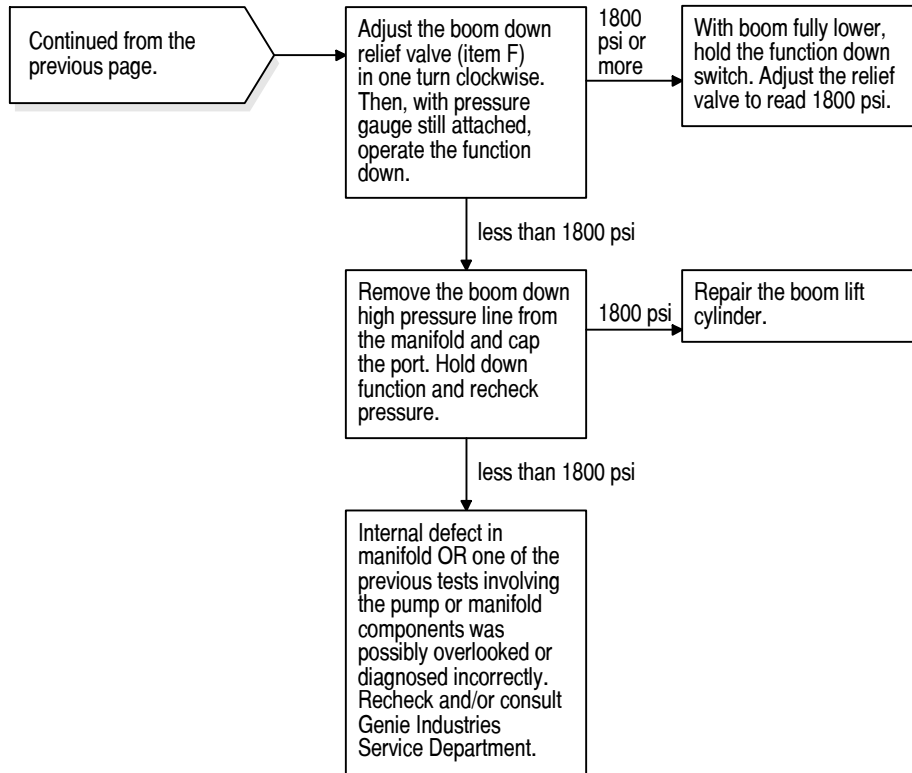




CHART 15



# Chart 16

## Primary Boom Up Function Inoperative

Be sure all other functions operate normally.

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

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

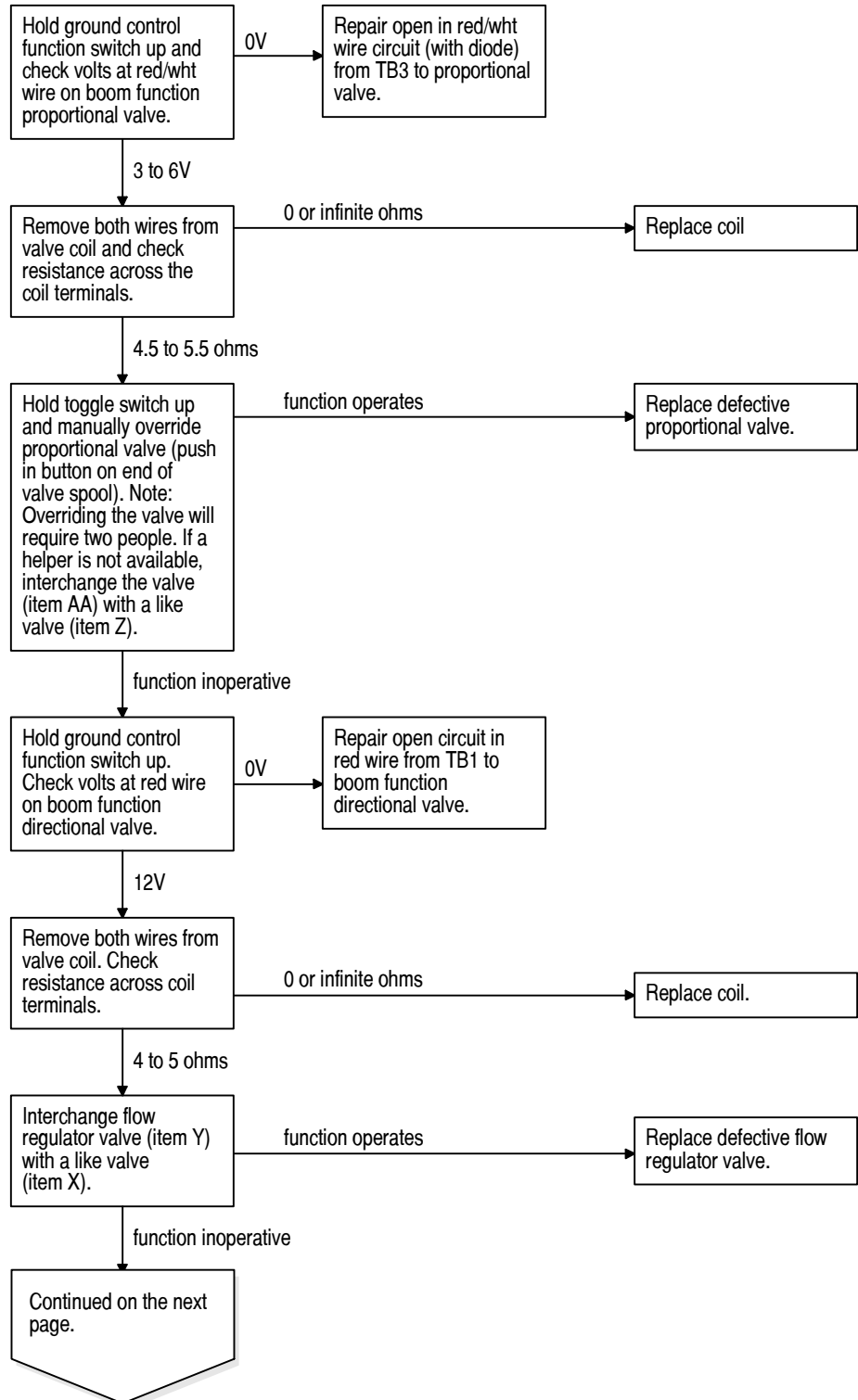
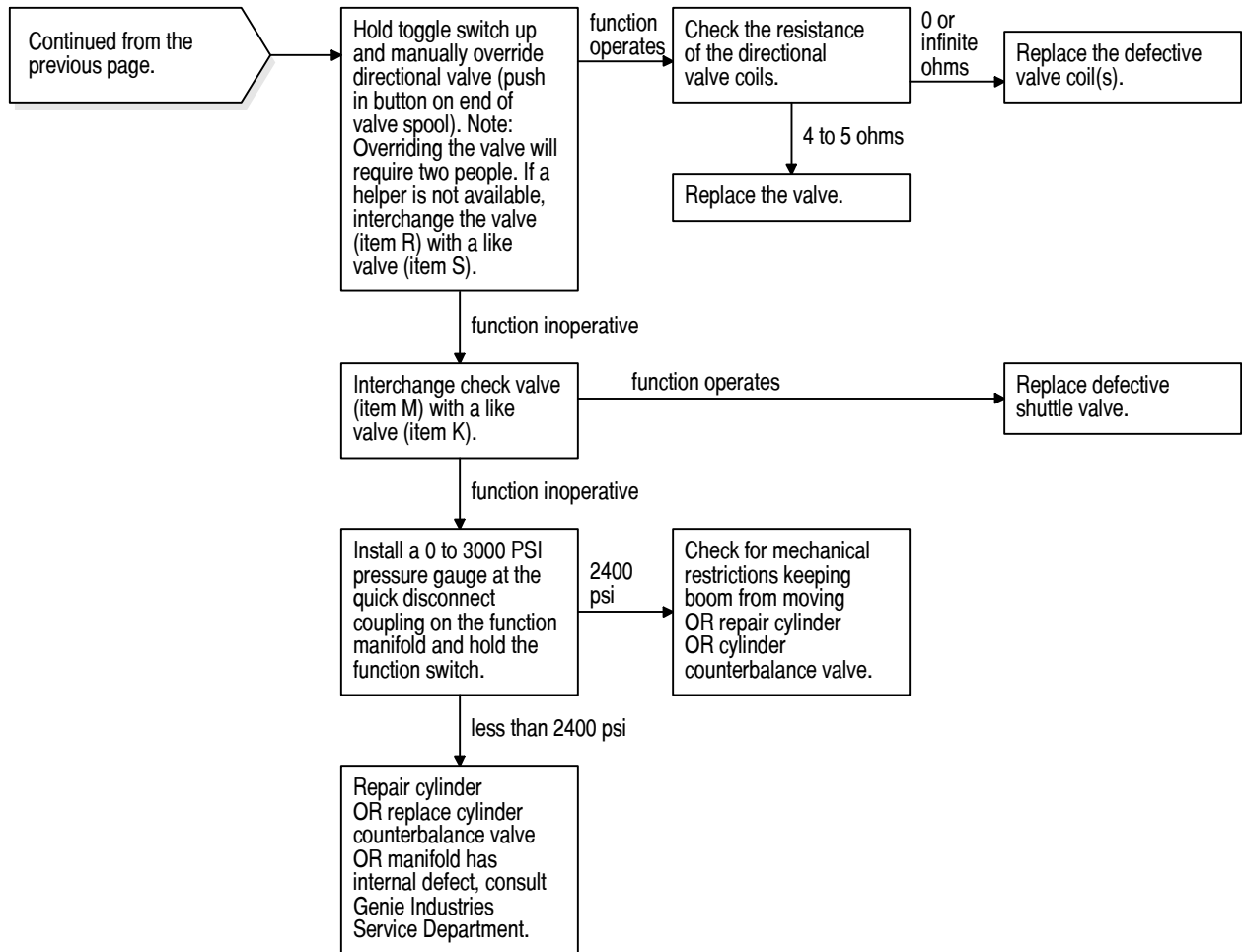


CHART 16



# Chart 17

## Primary Boom Down Function Inoperative

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

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

If boom down function operates

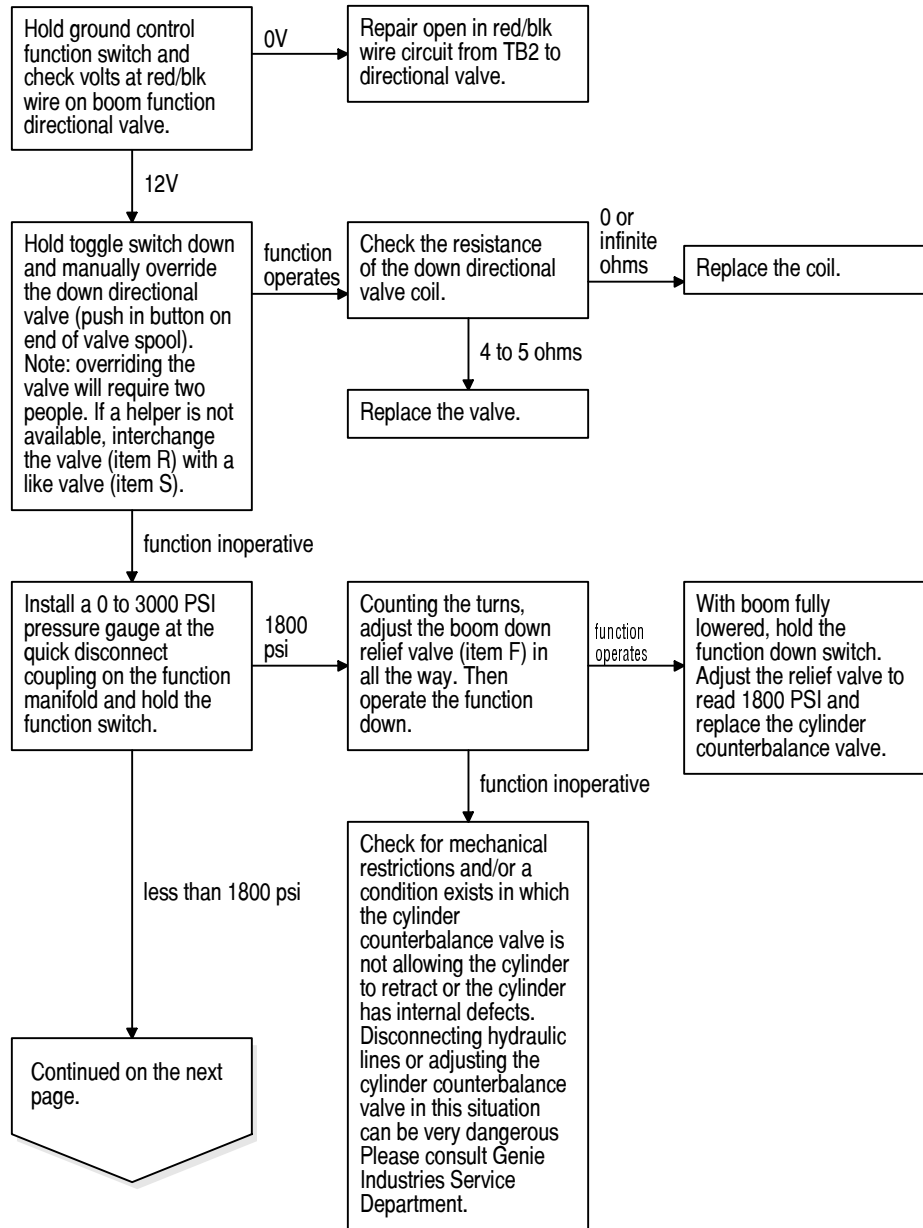
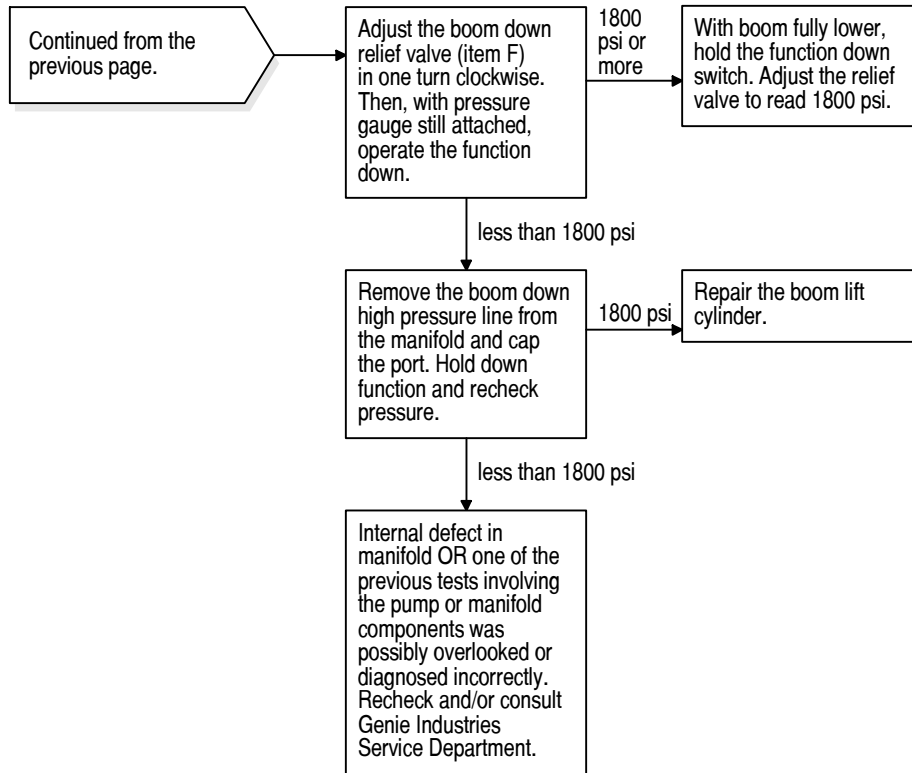


CHART 17



# Chart 18

## Primary 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.

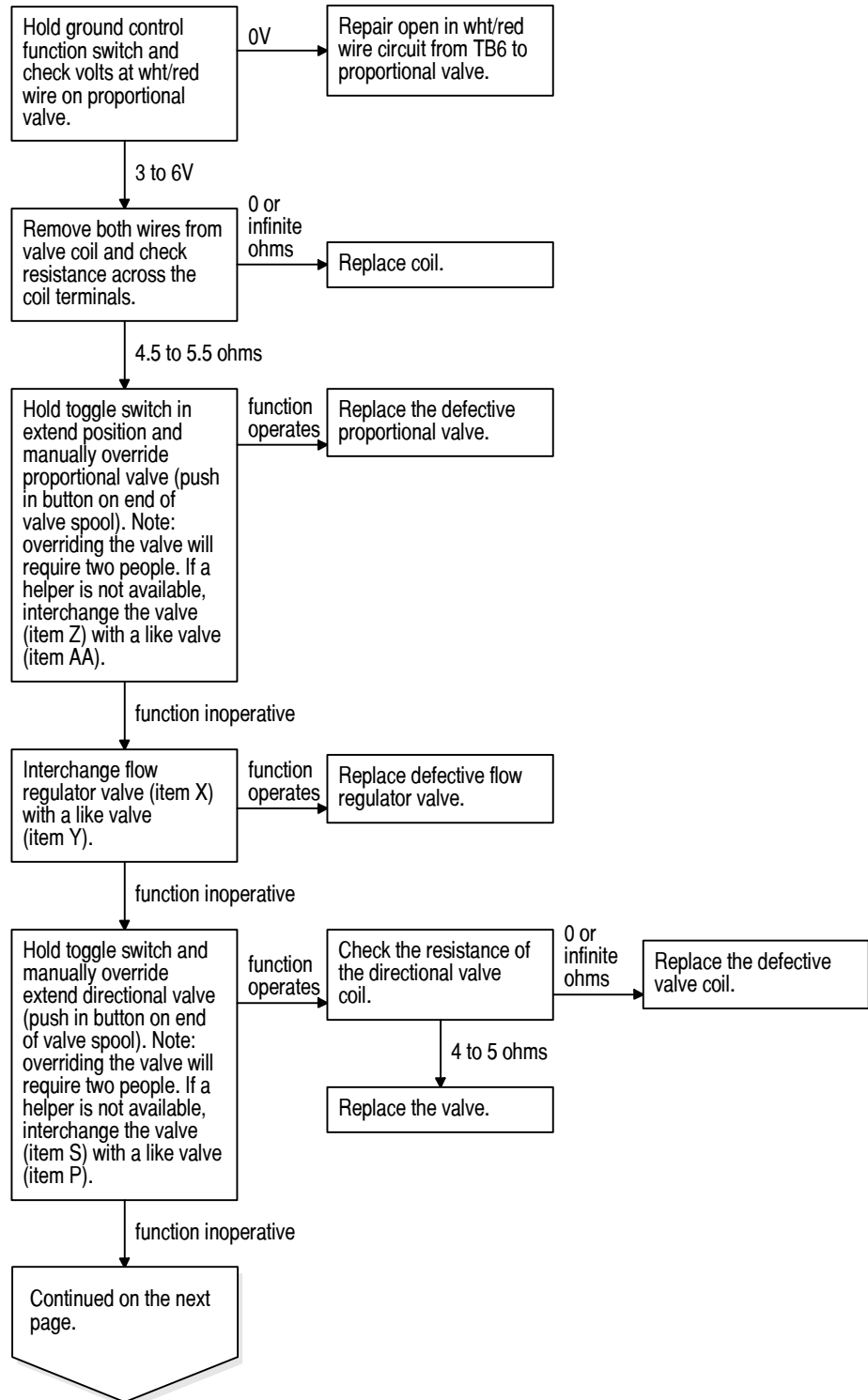
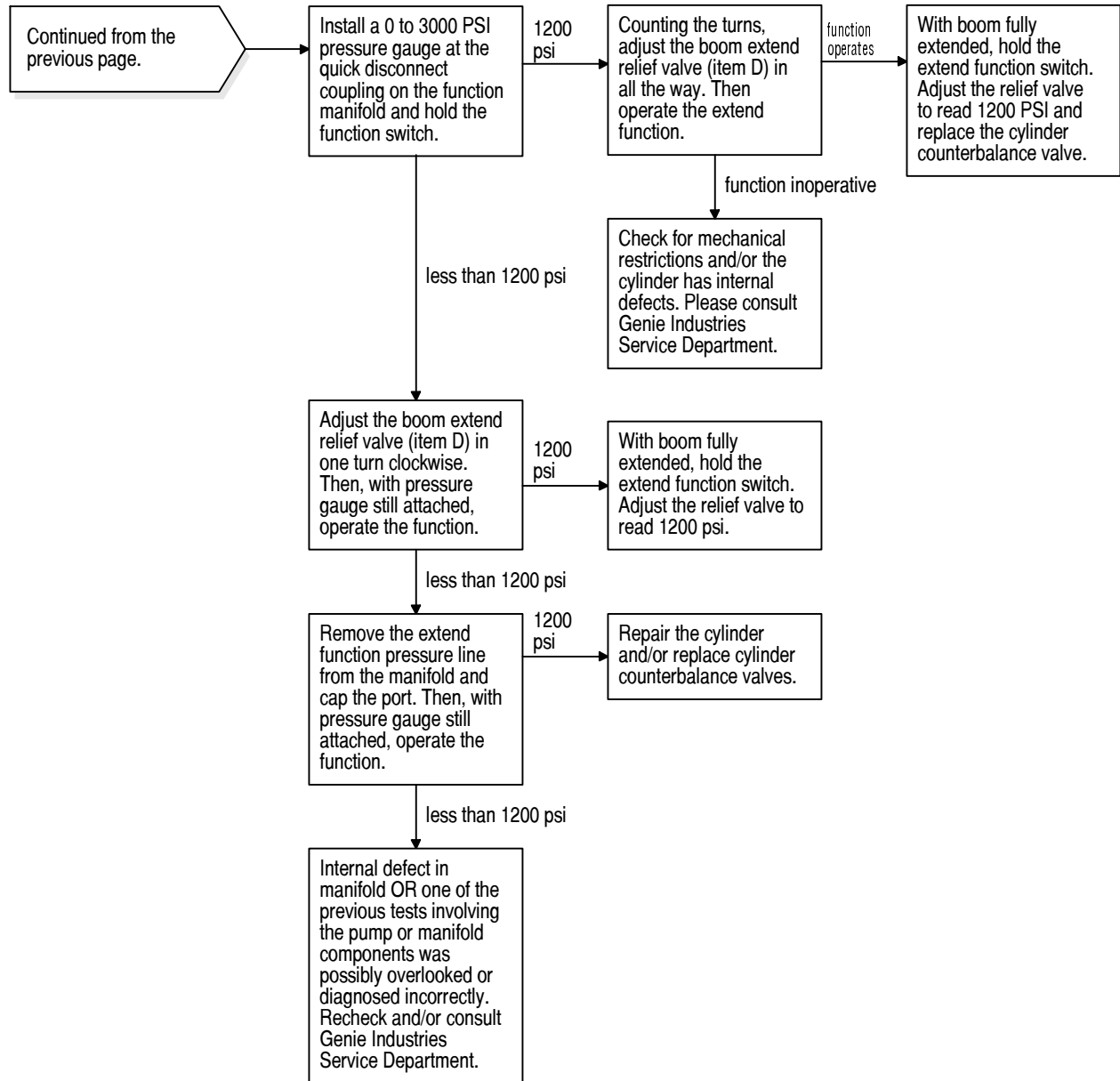


CHART 18



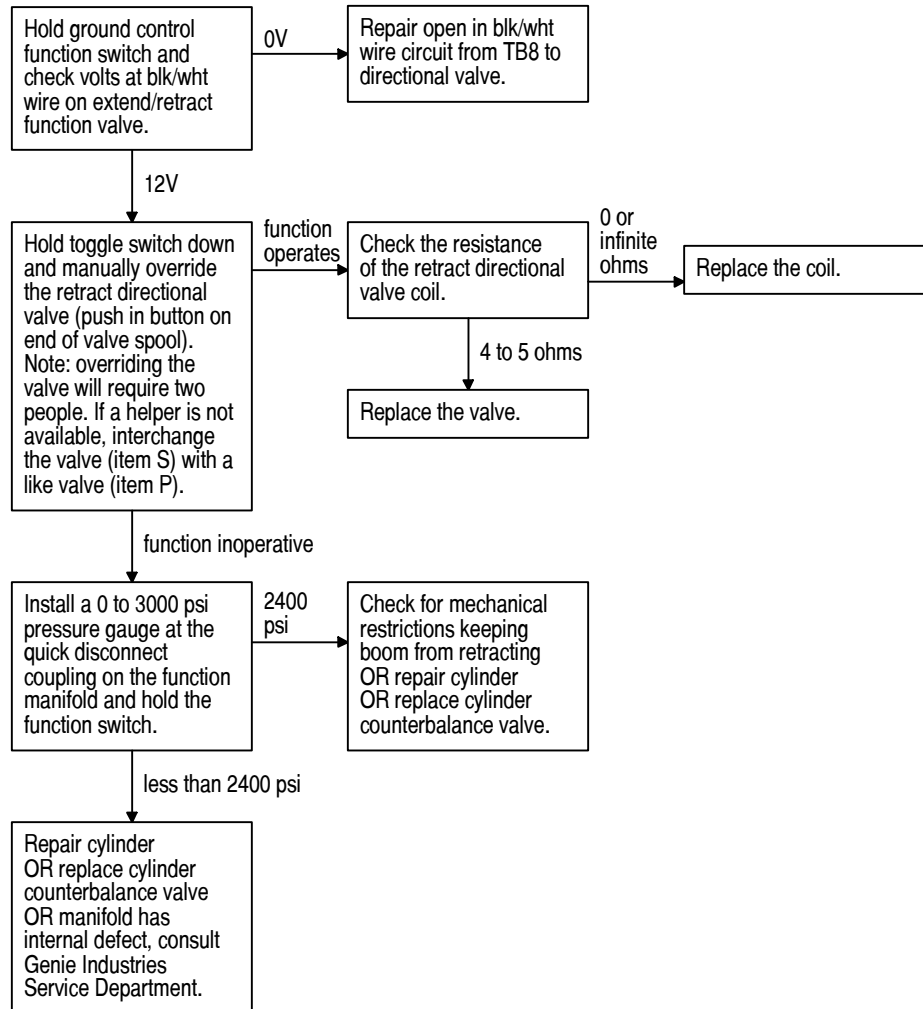
# Chart 19

## Primary Boom Retract Function Inoperative

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

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

If primary 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.

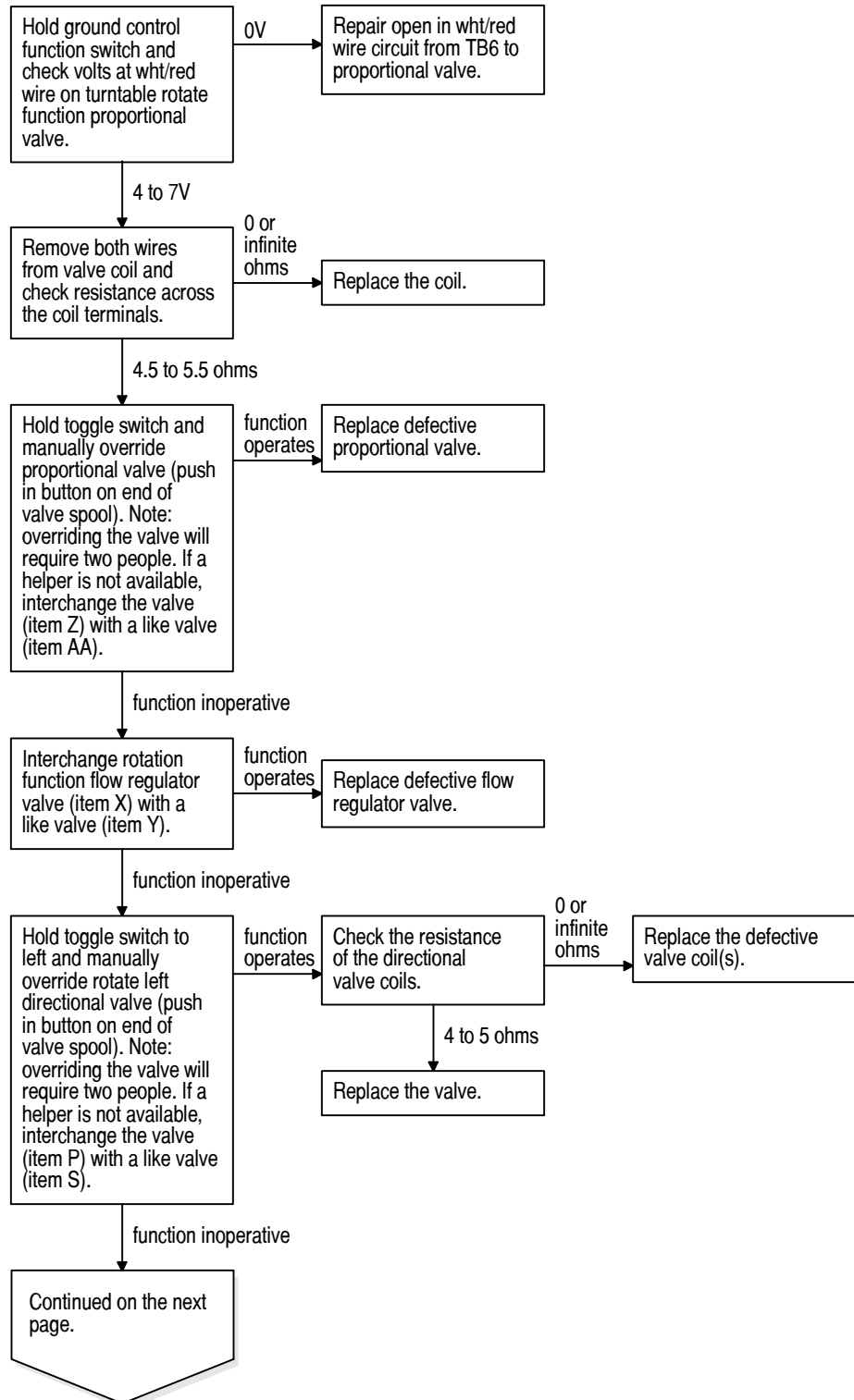
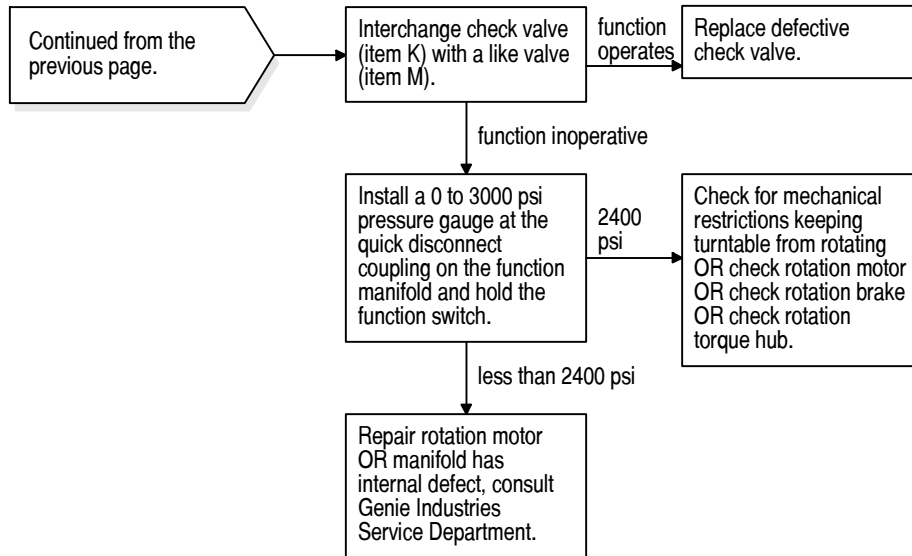


CHART 20



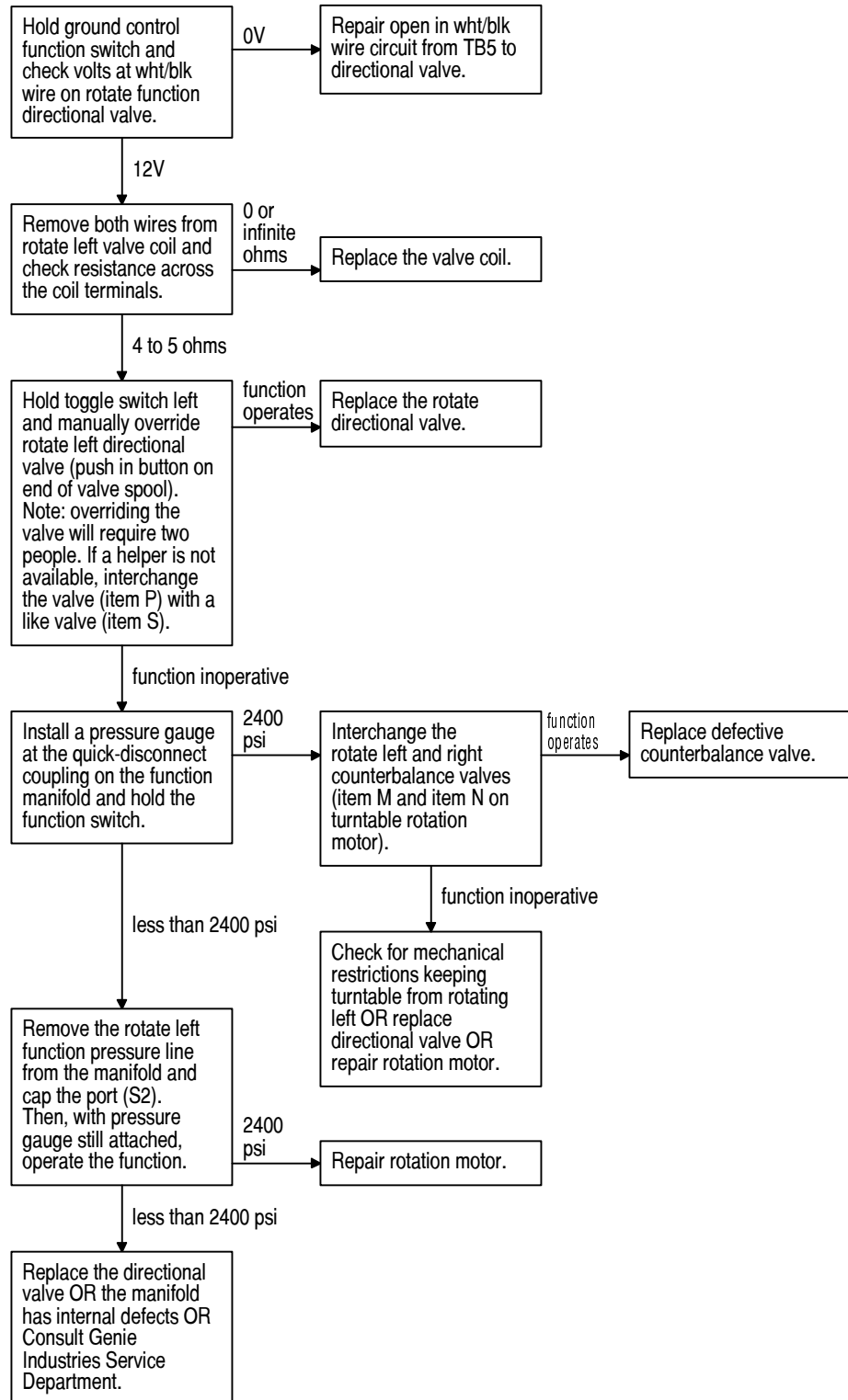
# Chart 21

## 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.



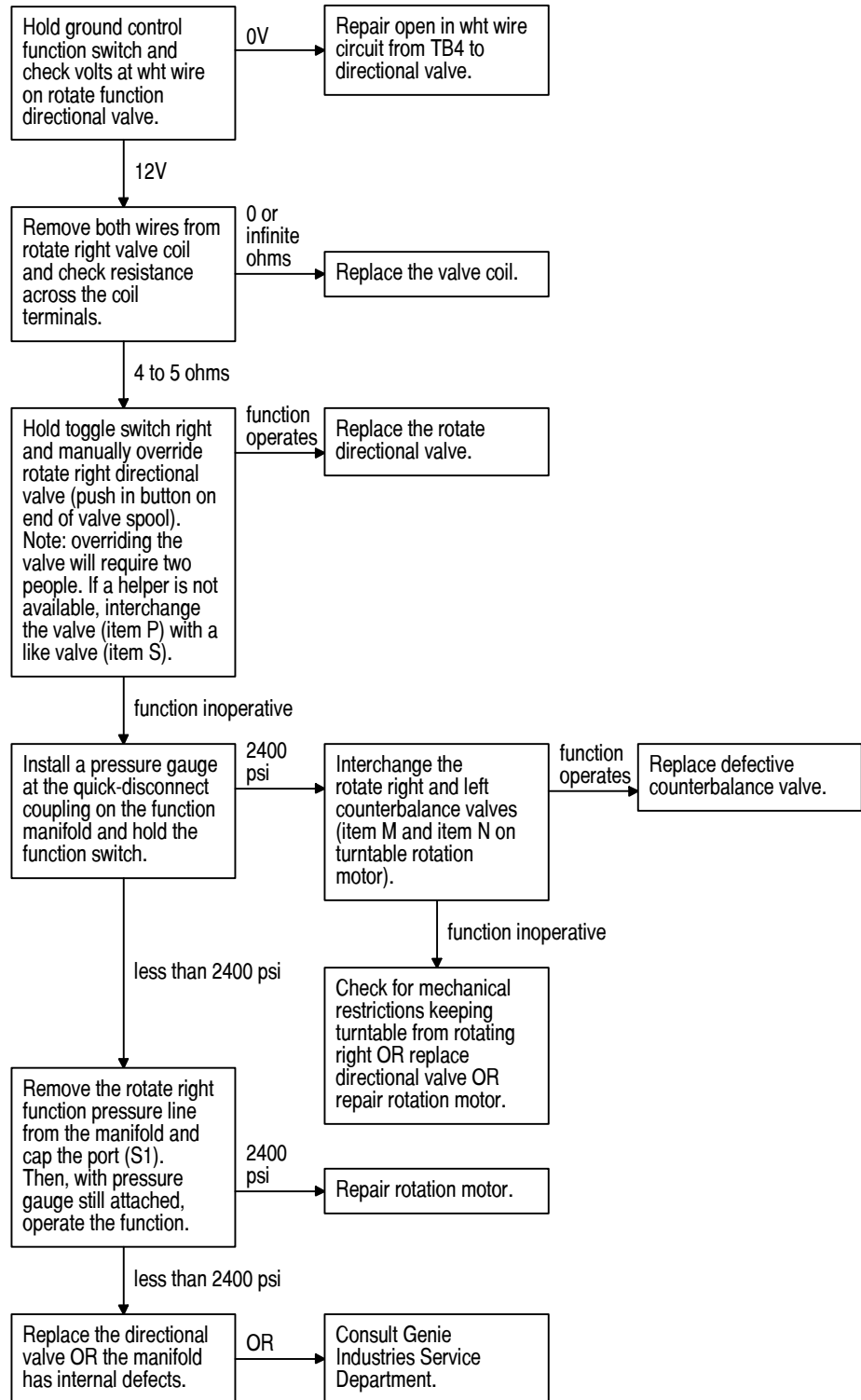
# Chart 22

## 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.



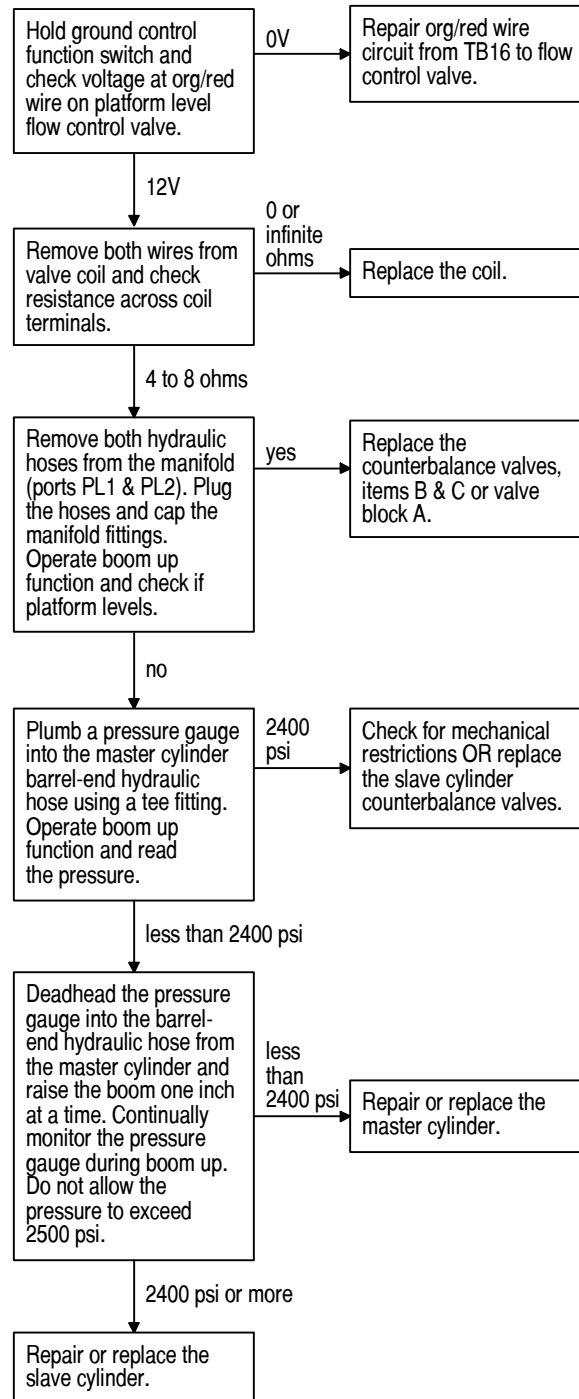
# Chart 23

## 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*.



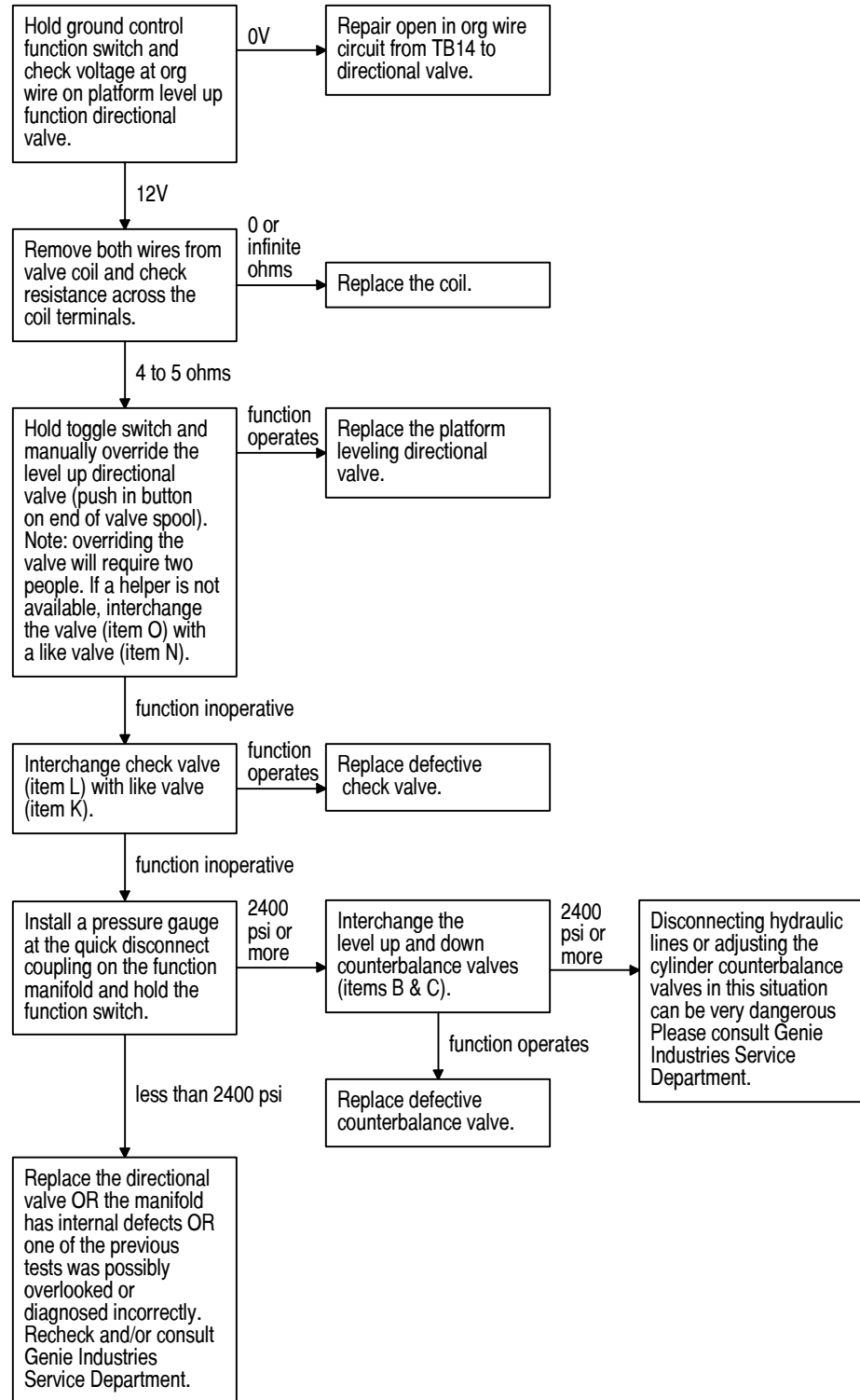
# Chart 24

## 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.



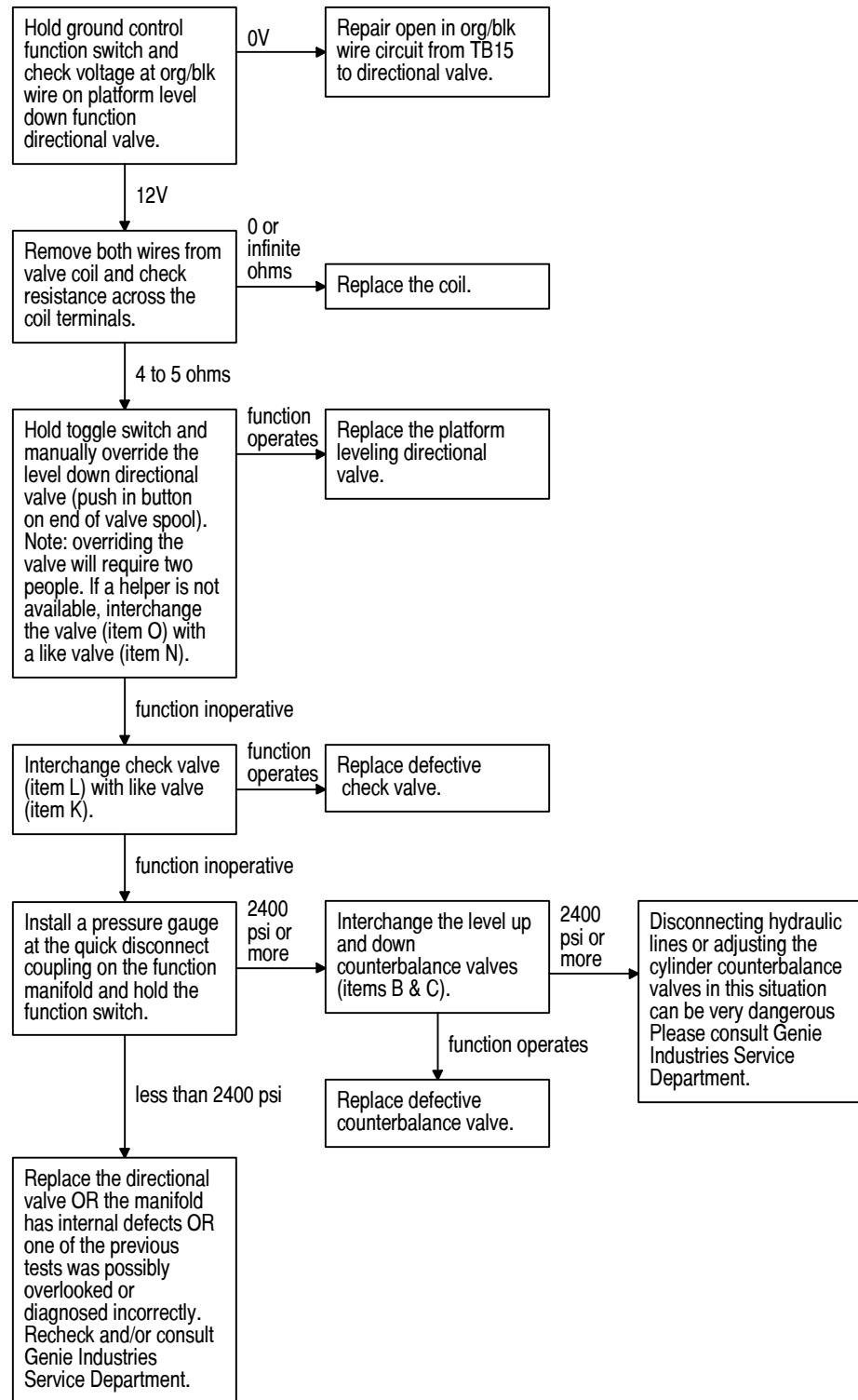
# Chart 25

## 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.



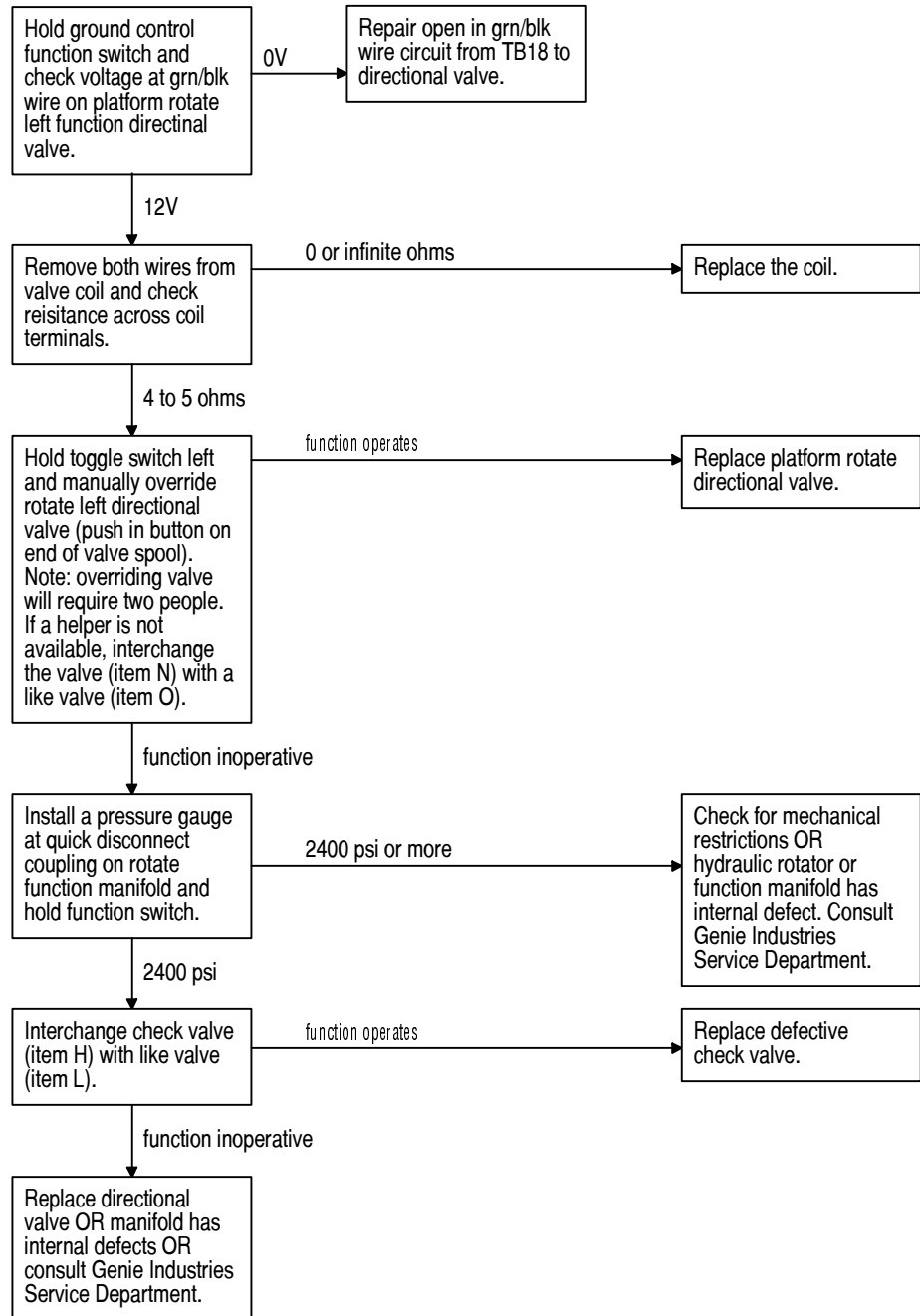
# Chart 26

## 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 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.





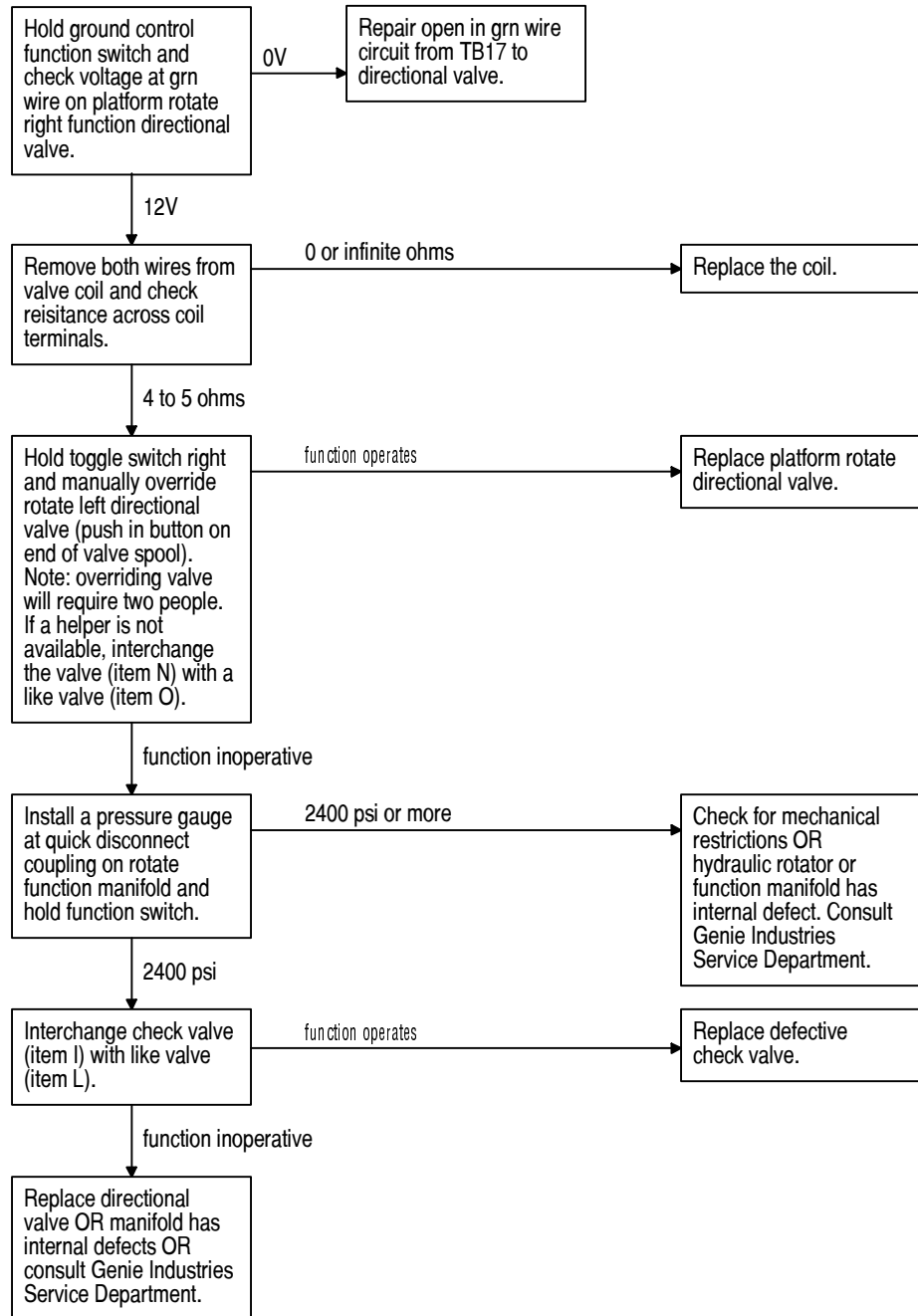
# Chart 27

## Platform Rotate Right Function Inoperative

Be sure all other functions operate normally.

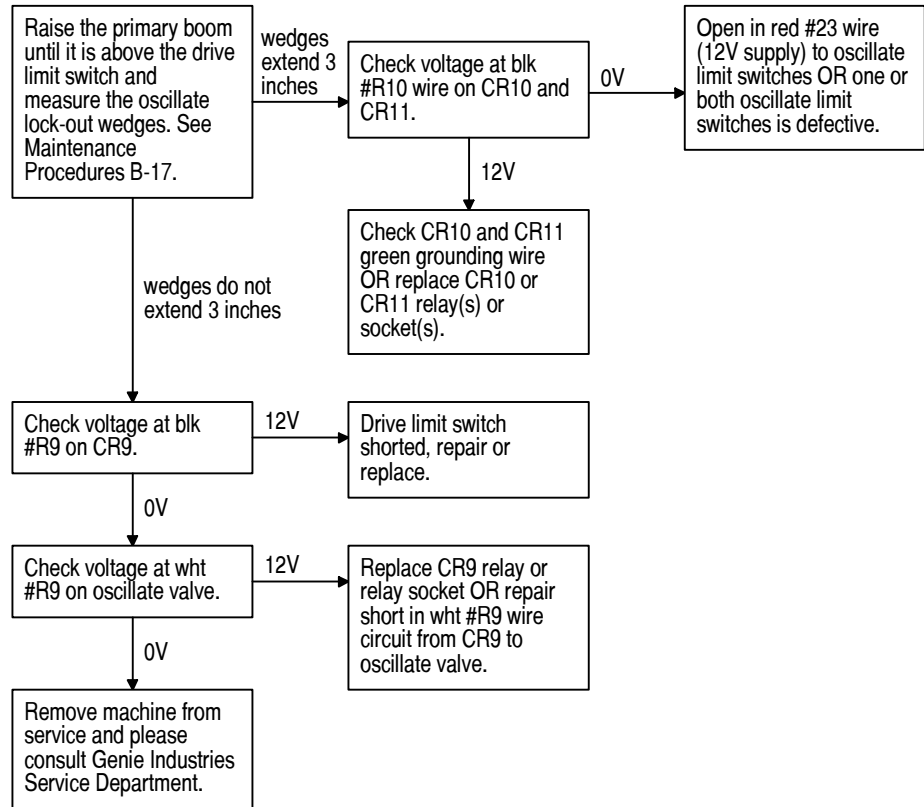
If platform rotate right function operates normally from the ground controls but not from platform controls, troubleshoot the platform control toggle switch. See Repair section.

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 28

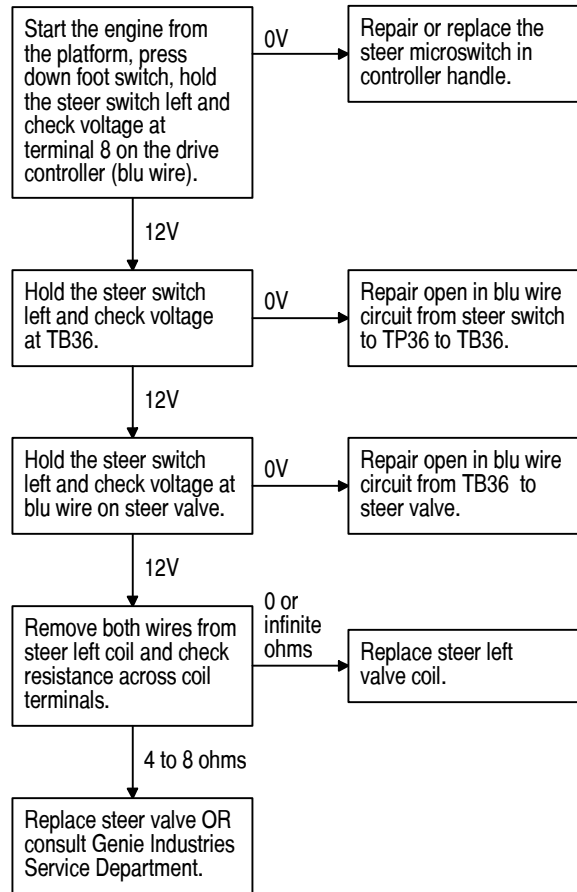
## Oscillate Lock-out Function Inoperative



# Chart 29

## Steer Left Function Inoperative

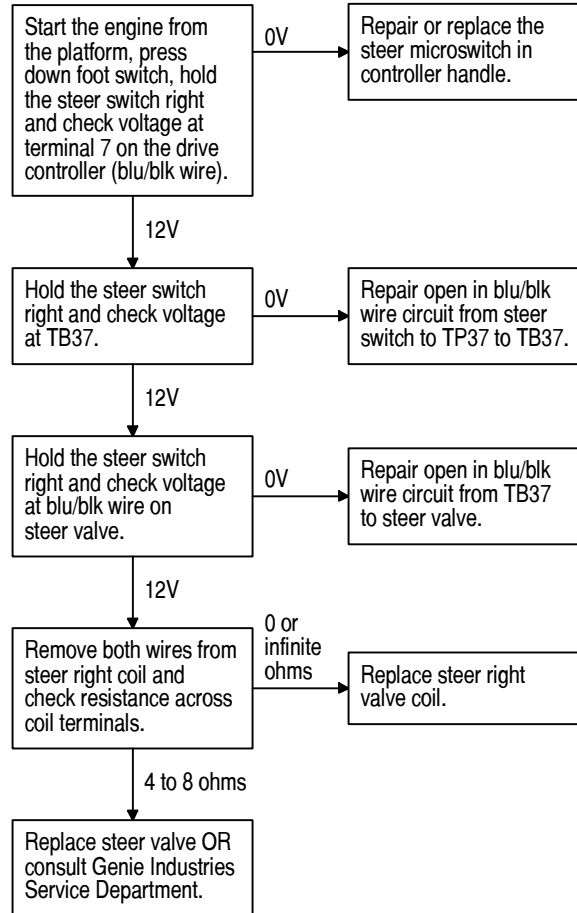
Be sure all other functions operate normally.



# Chart 30

## Steer Right Function Inoperative

Be sure all other functions operate normally.



# Chart 31

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

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

Be sure machine not in the free wheel configuration.

Be sure the drive speed select switch is set to machine on level surface position (maximum drive speed).

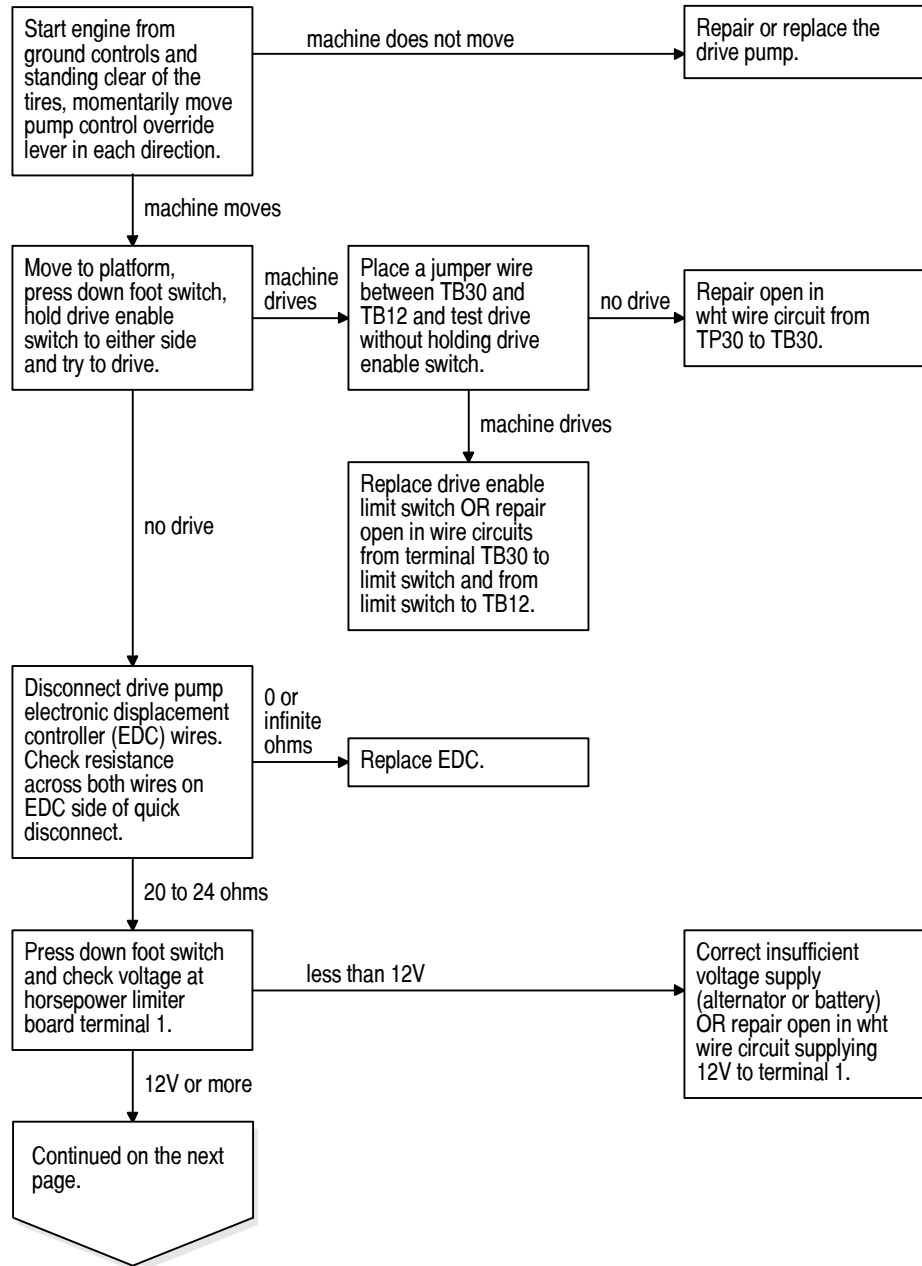


CHART 31

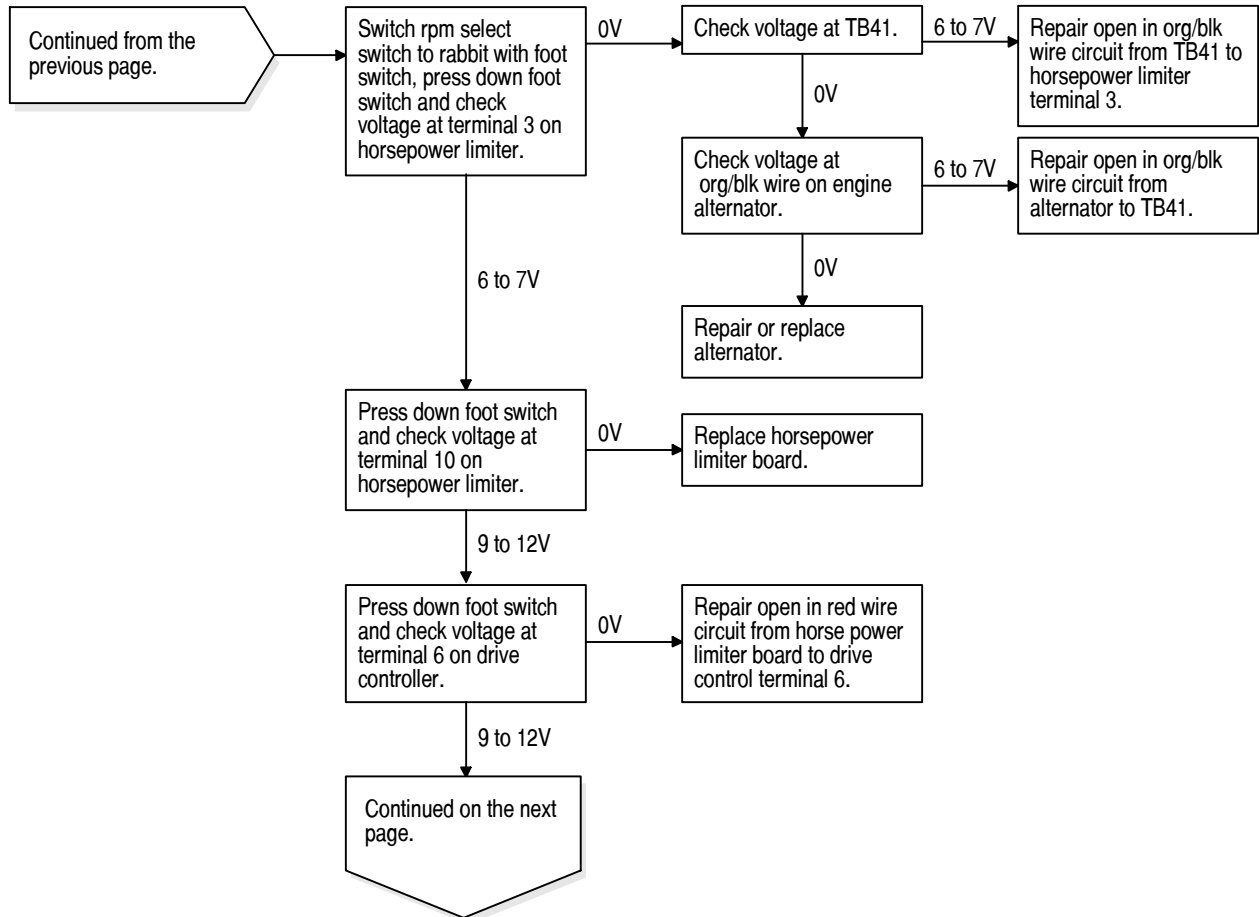
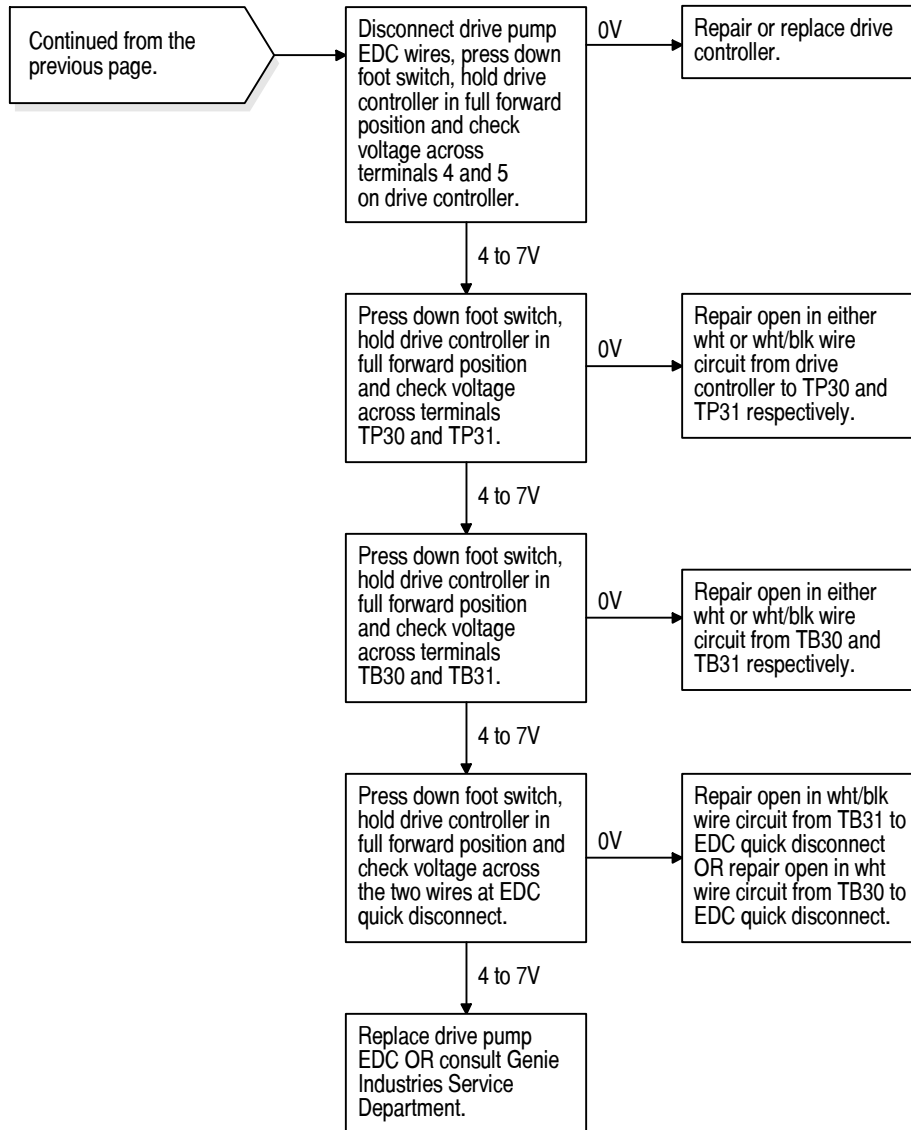


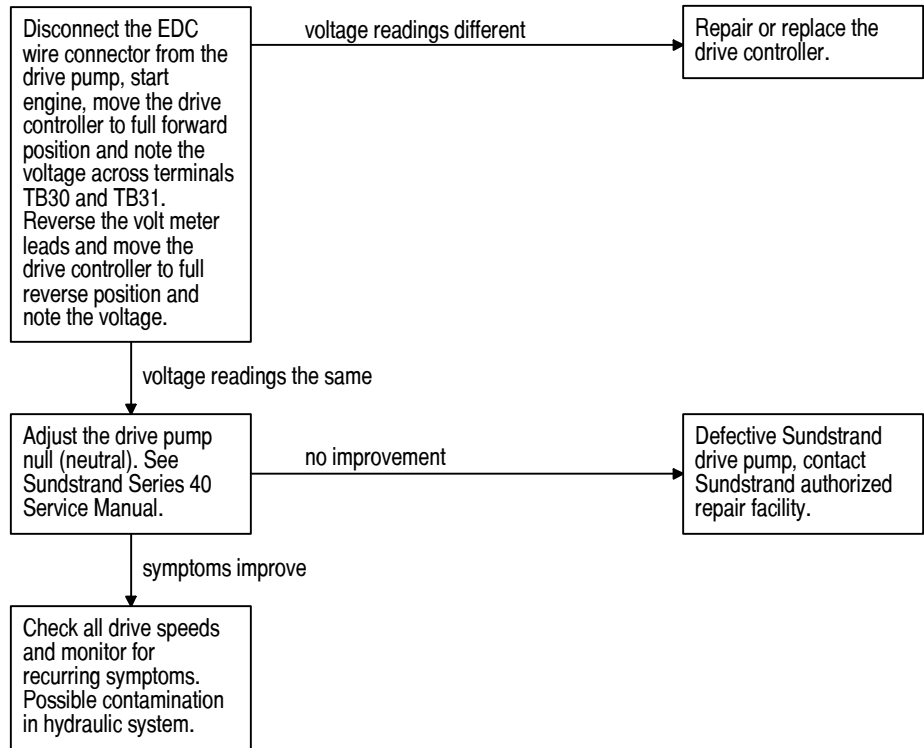
CHART 31



# Chart 32

## Drive Forward Or Reverse Function Inoperative

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





# Chart 33

## 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.

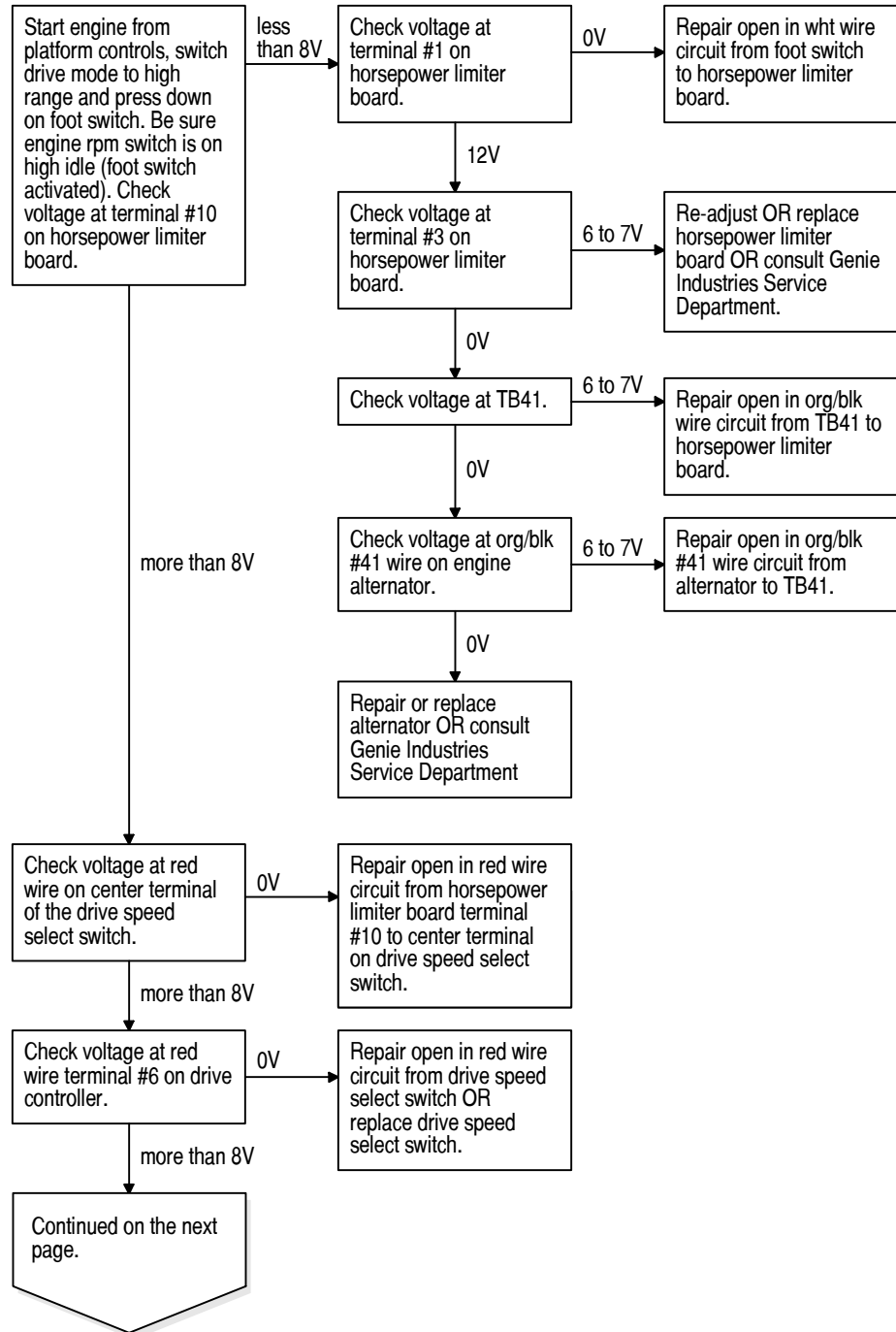


CHART 33

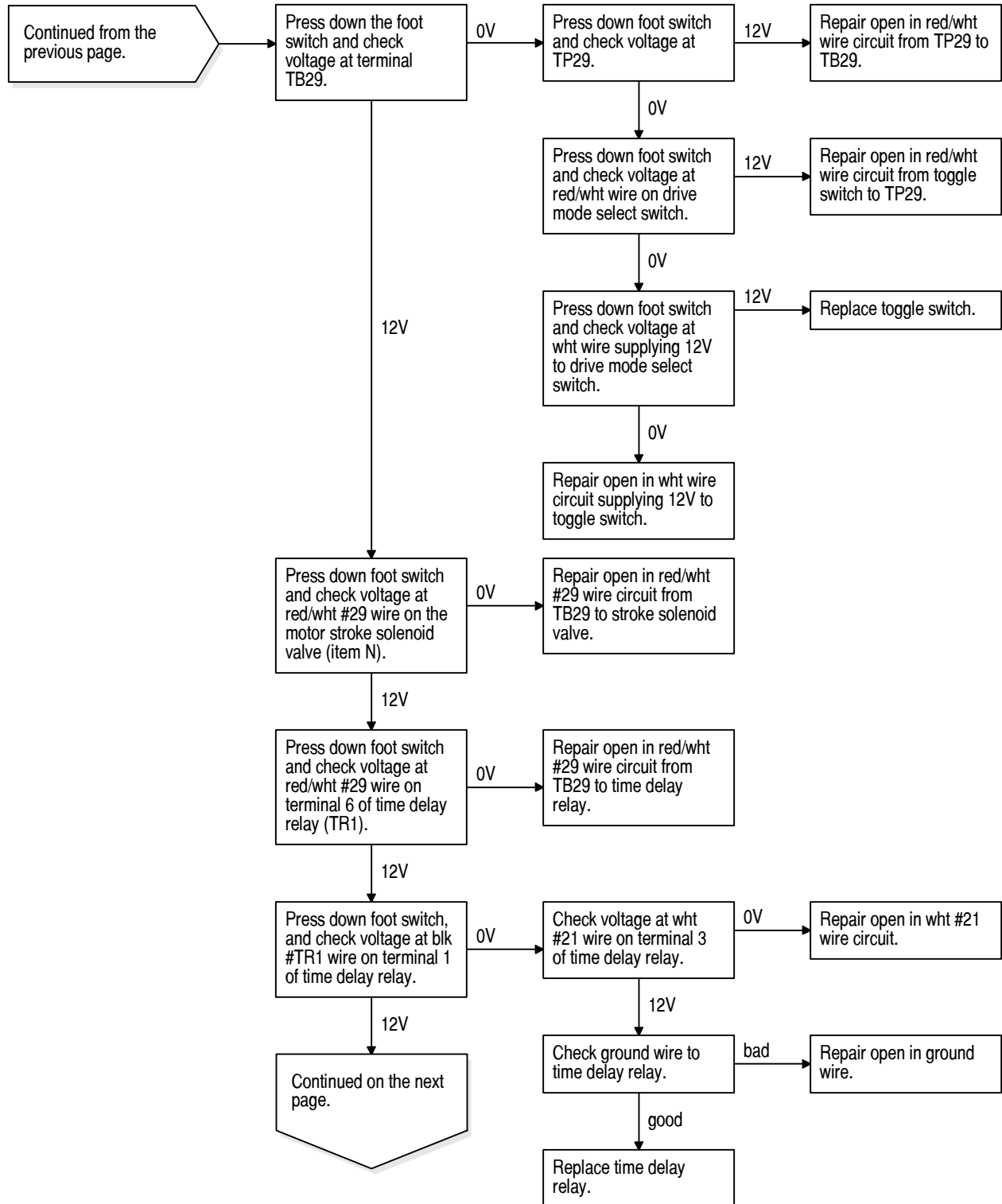
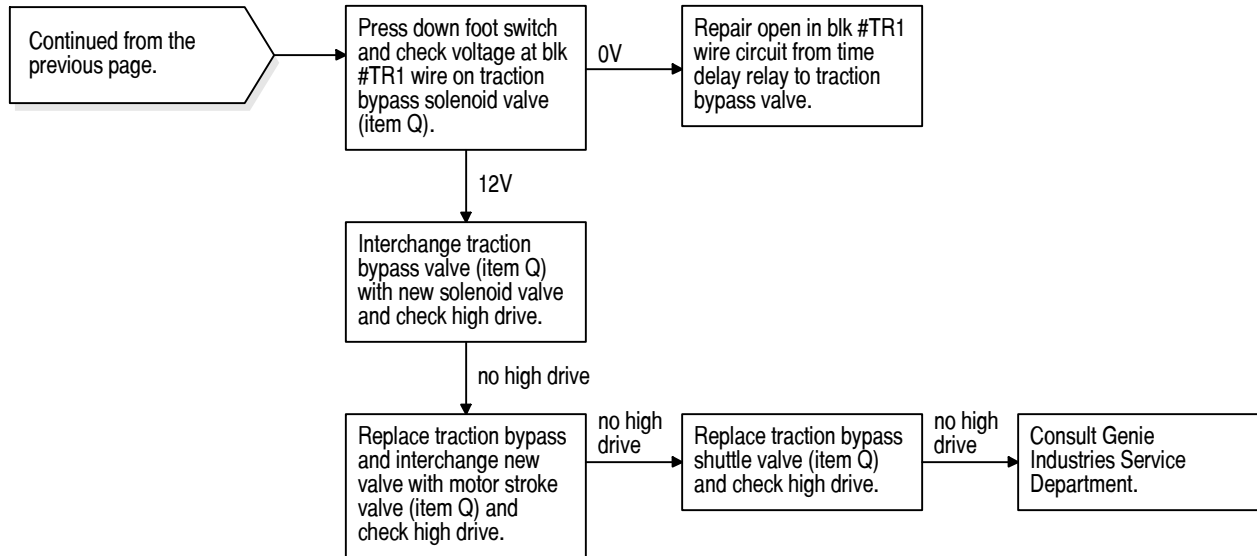


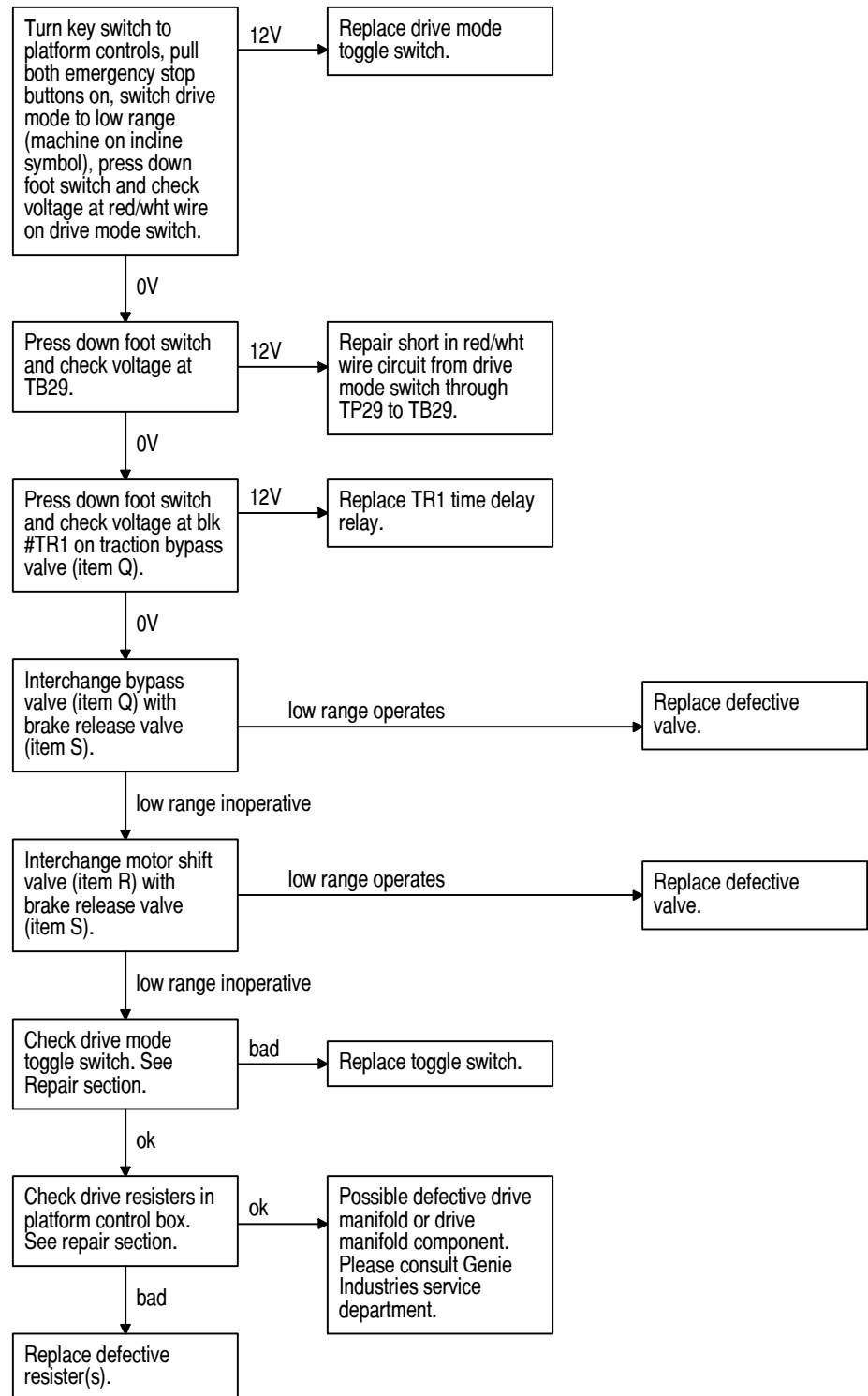
CHART 33



# Chart 34

## Low Range Drive Function Inoperative

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



# Chart 35

## **Traction Function Inoperative**

Be sure all other functions operate normally.

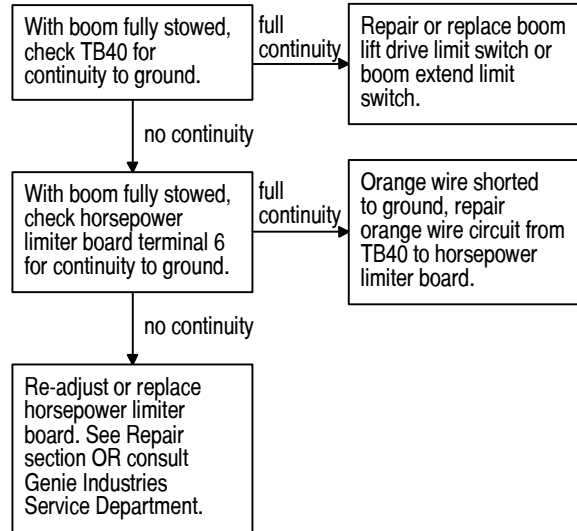
Any type of traction problem, consult Genie Industries Service Department.

# Chart 36

## Machine Will Not Drive At Full Speed

Be sure all other functions operate normally.

Be sure the free-wheel valve is closed on the drive pump.



# Chart 37

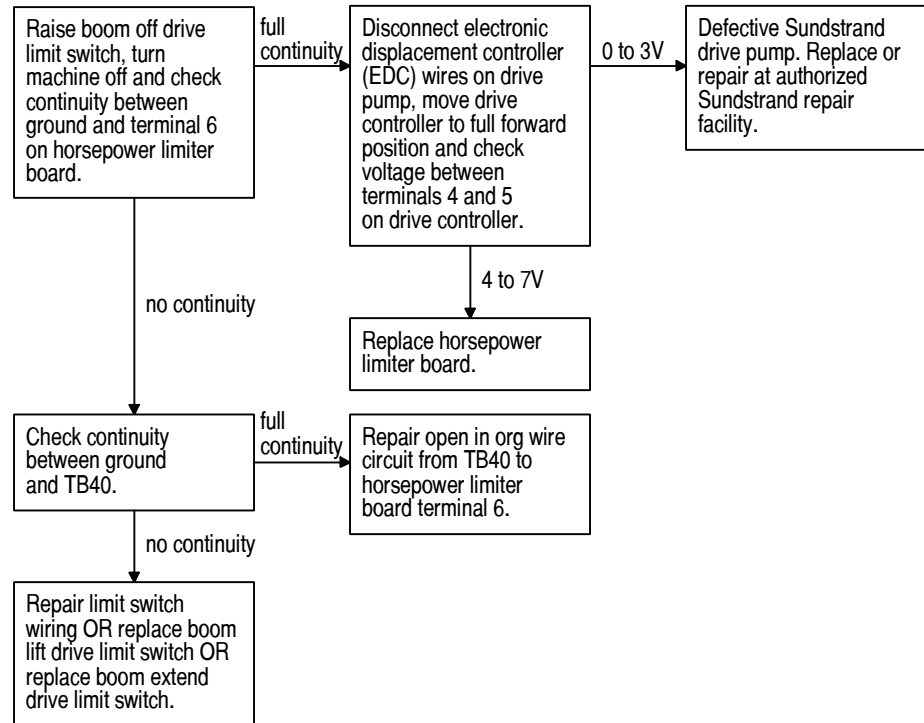
## Machine Drives At Full Speed With Platform Raised or Extended

Remove machine from service immediately.

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

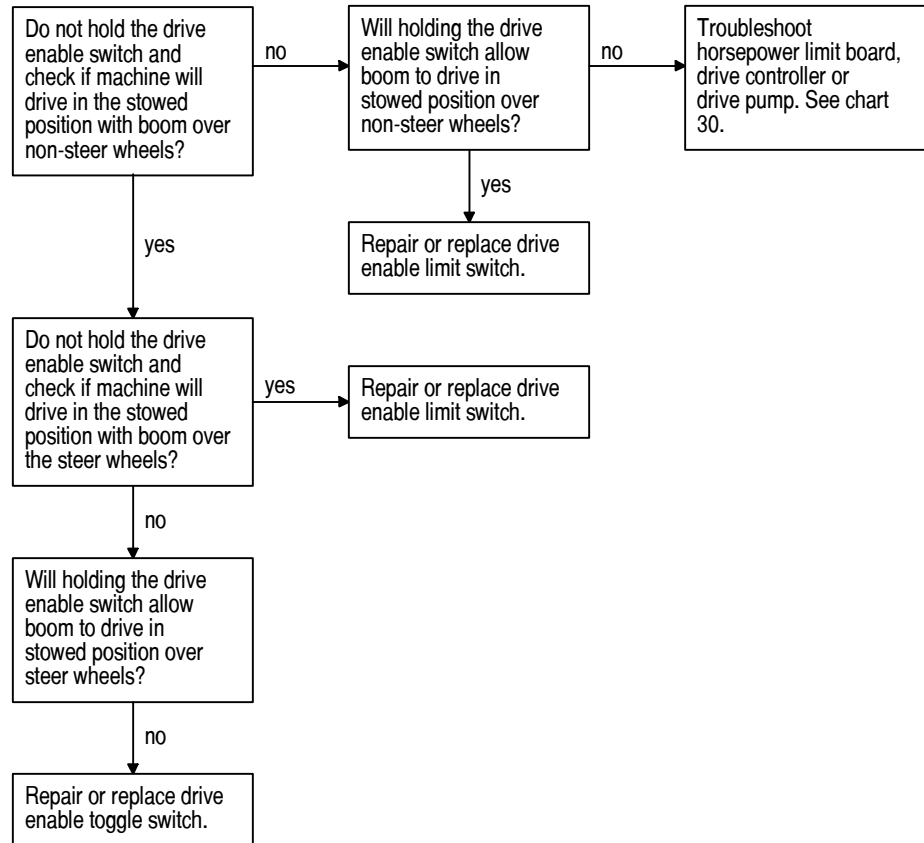
Be sure wiring to limit switches is intact and show no sign of tampering.

Be sure orange wire (cable1) is properly attached to horsepower limiter.



# Chart 38

## Drive Enable System is Malfunctioning





# Chart 39

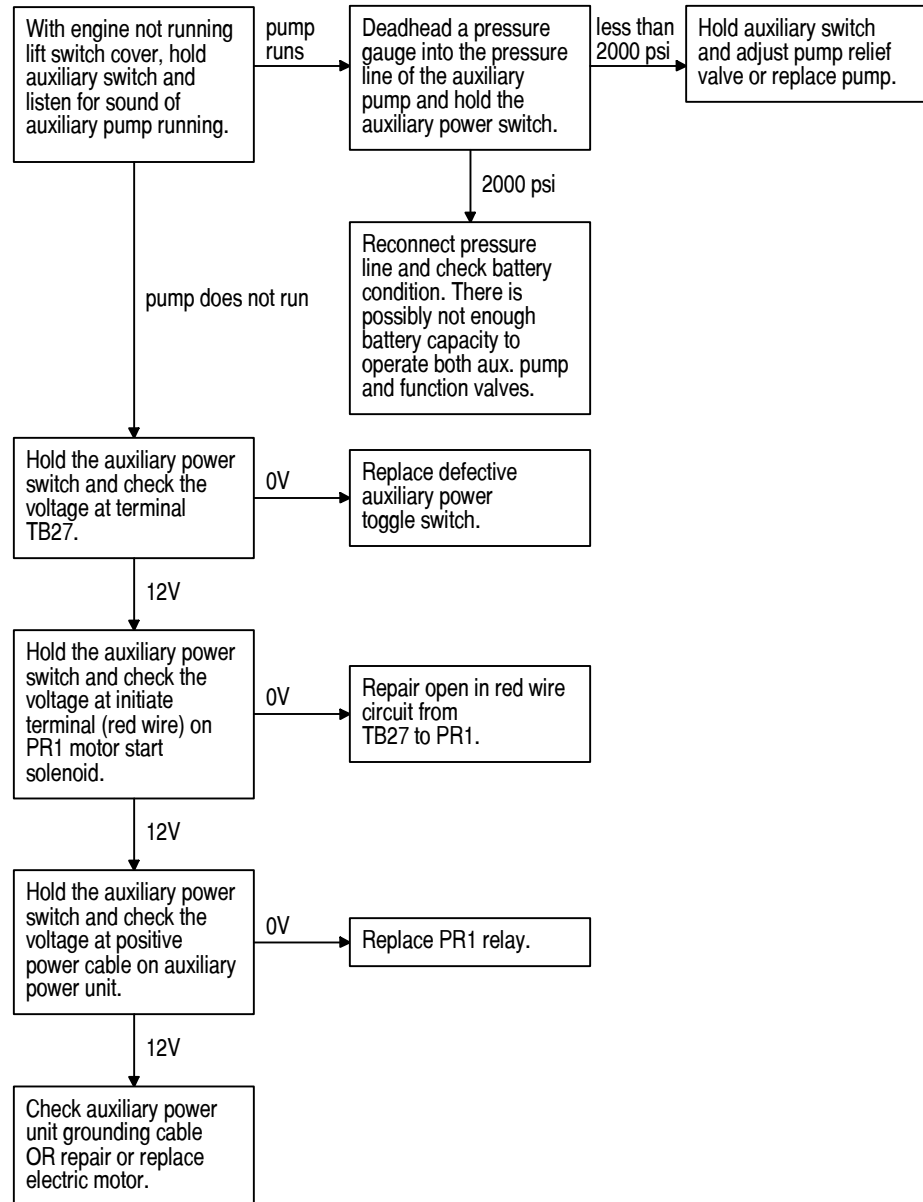
## Auxiliary Functions Inoperative

Be sure all other functions operate normally.

Be sure key switch is in the appropriate position and the Emergency Stop buttons are pulled up to the on position.

Be sure engine is not running when using auxiliary power.

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

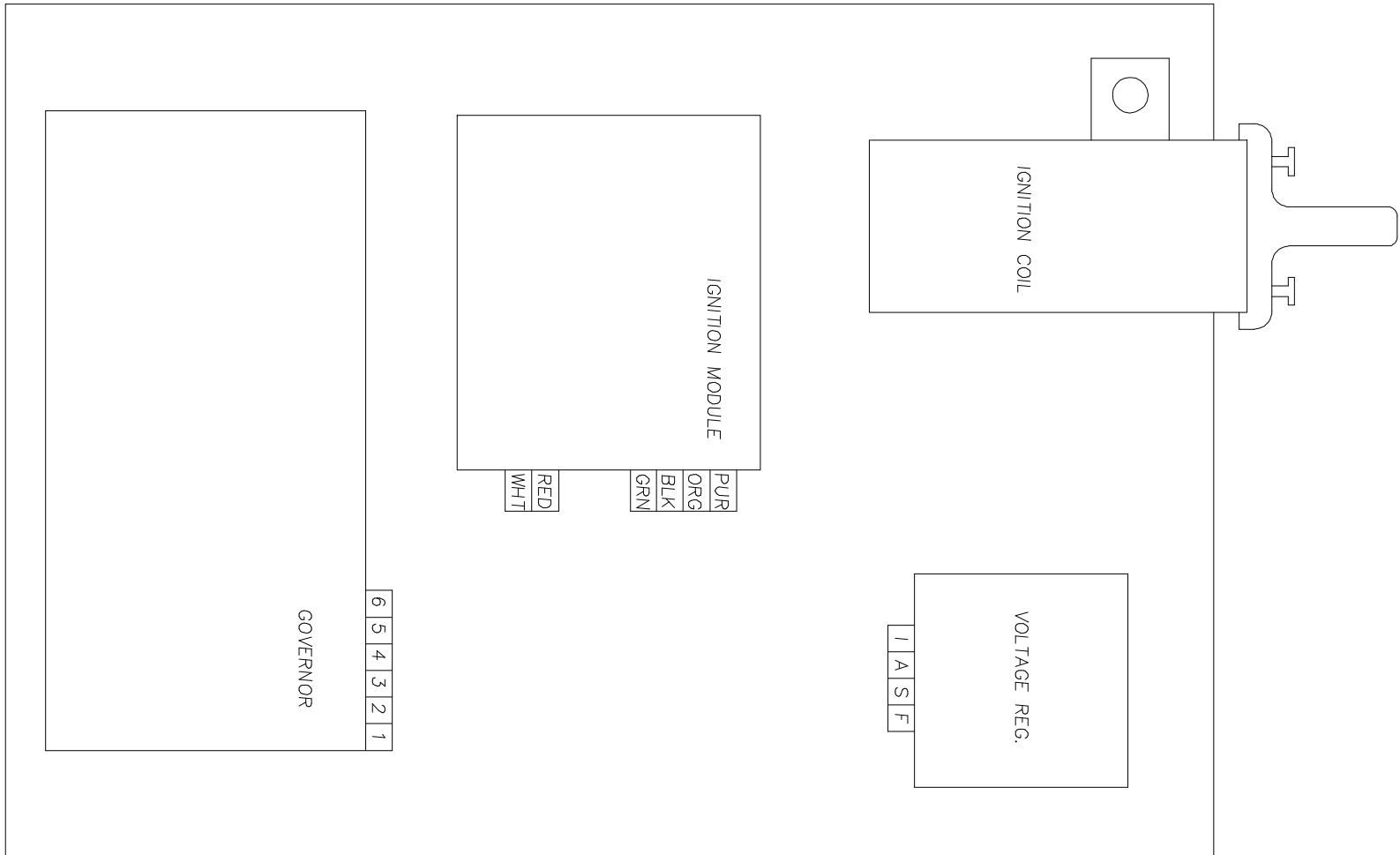


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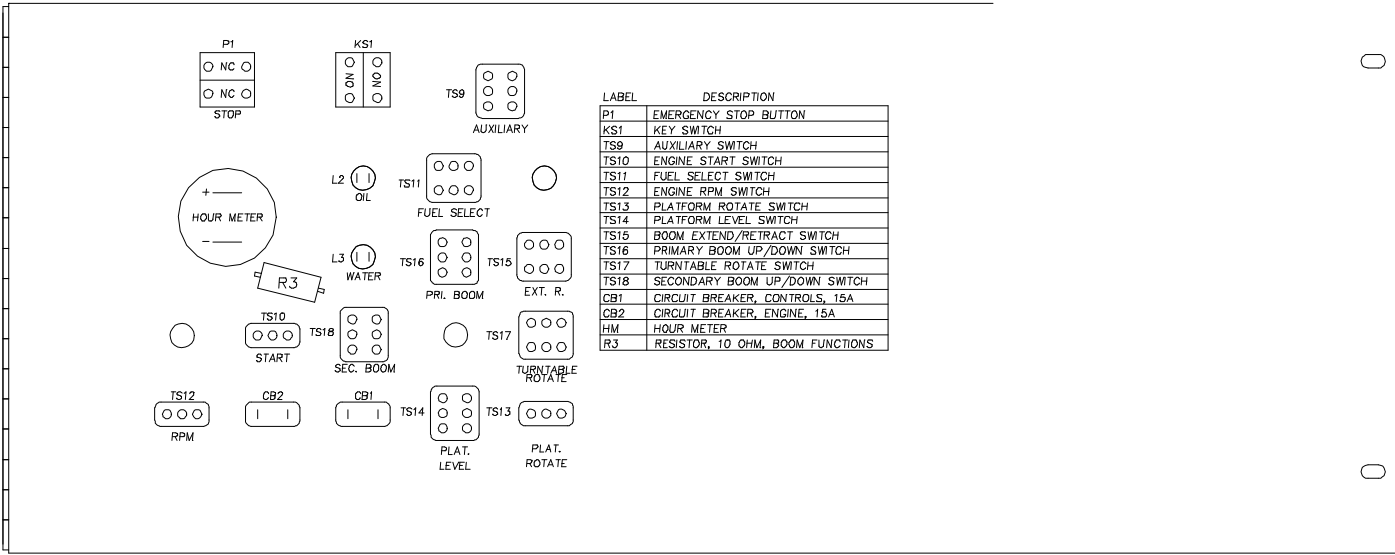




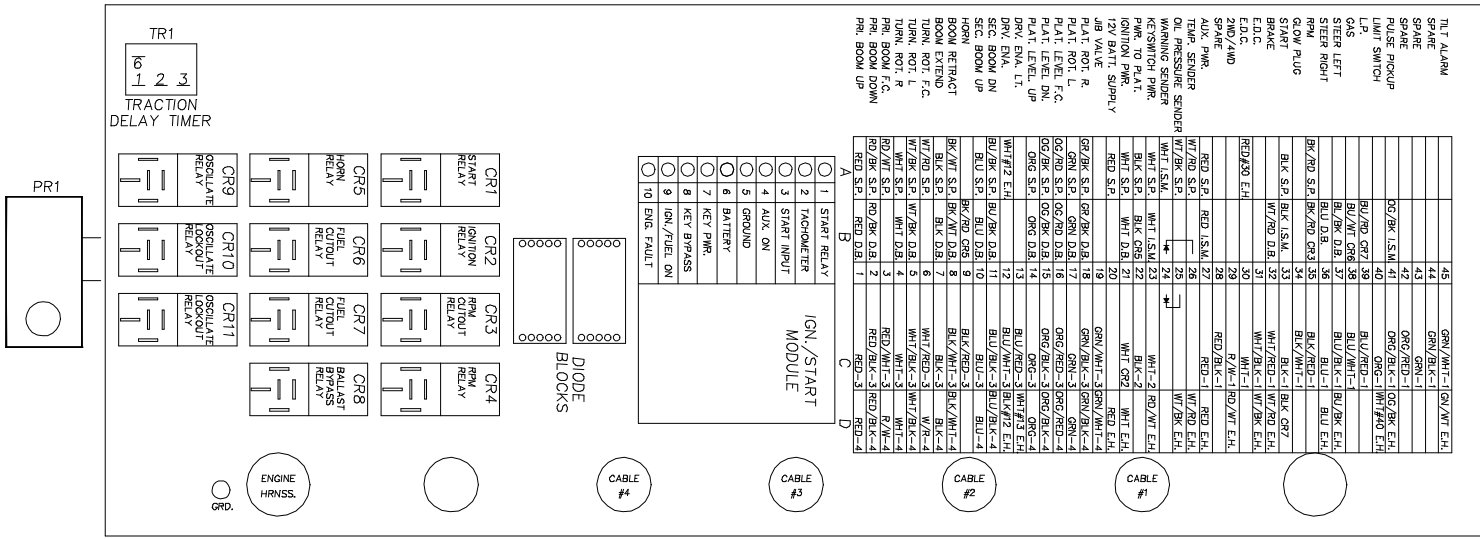
Z45/22 HP 2WD & 4WD FORD  
RELAY PANEL LEGEND  
SERIAL #Z45-001523 TO Z45-002134



Z45/22 HP 2WD & 4WD FORD  
GROUND CONTROL BOX LEGEND  
SERIAL #Z45-001523 TO Z45-002134

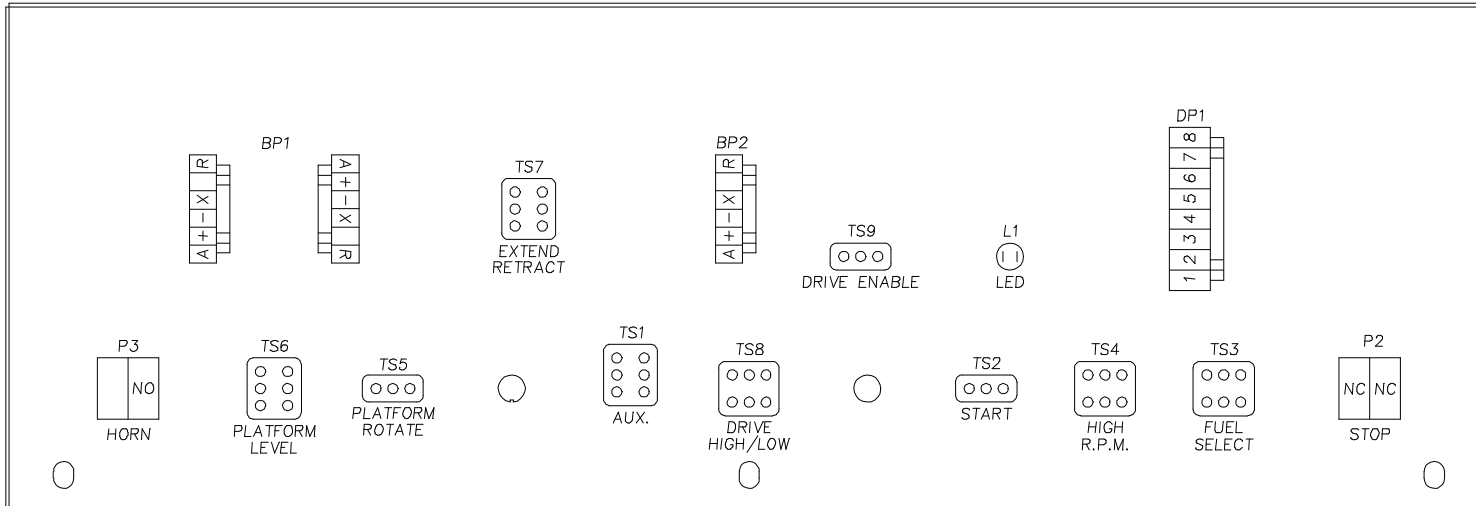
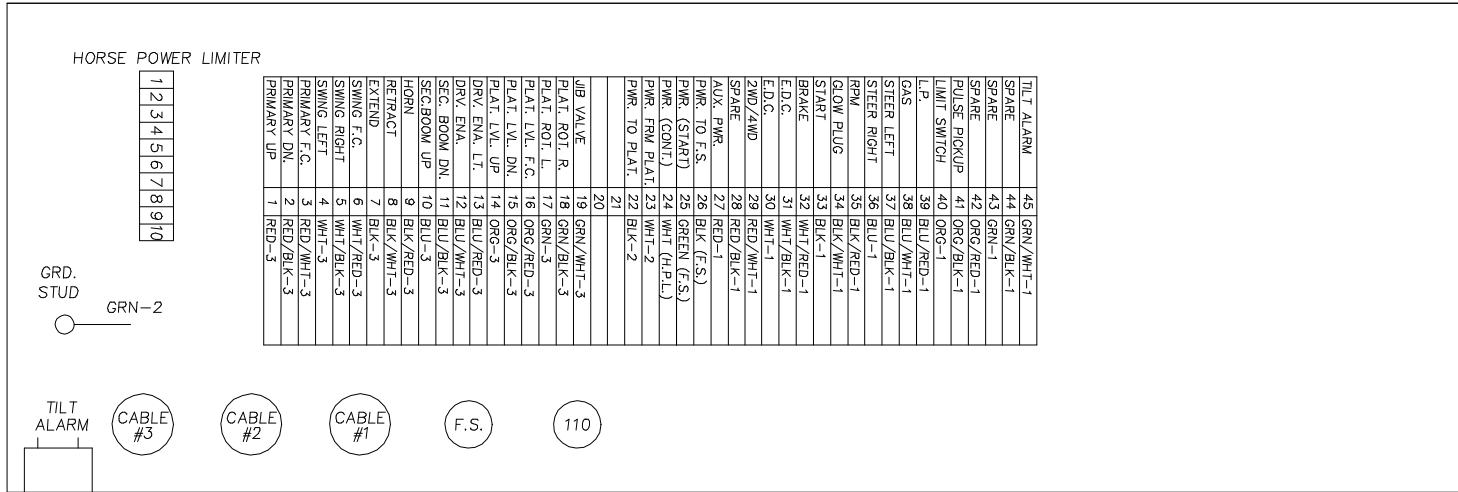


LABEL	DESCRIPTION
P1	EMERGENCY STOP BUTTON
KS1	KEY SWITCH
TS9	AUXILIARY SWITCH
TS10	ENGINE START SWITCH
TS11	FUEL SELECT SWITCH
TS12	ENGINE RPM SWITCH
TS13	PLATFORM ROTATE SWITCH
TS14	PLATFORM LEVEL SWITCH
TS15	BOOM EXTEND/RETRACT SWITCH
TS16	PRIMARY BOOM UP/DOWN SWITCH
TS17	TURNABLE ROTATE SWITCH
TS18	SECONDARY BOOM UP/DOWN SWITCH
CB1	CIRCUIT BREAKER, CONTROLS, 15A
CB2	CIRCUIT BREAKER, ENGINE, 15A
HM	HOUR METER
R3	RESISTOR, 10 OHM, BOOM FUNCTIONS



45	GNV/WHI-1	IGN/WHI E.H.
44	GNV/BLK-1	IGN/WHI E.H.
43	GNV-1	GNV-1
42	ORG/RED-1	ORG/RED E.H.
41	OG/RED-1	OG/RED E.H.
40	BLU/ORG-1	WHI/WHI E.H.
39	BLU/RED-1	BLU/RED E.H.
38	BLU/CR7-1	BLU/WHI-1
37	BLU/WHI-1	BLU/WHI-1
36	BLU/WHI-1	BLU/WHI-1
35	BLU/WHI-1	BLU/WHI-1
34	BLU/WHI-1	BLU/WHI-1
33	BLK-1	BLK/CR7
32	WHI/RED-1	WHI/RED E.H.
31	WHI/RED-1	WHI/RED E.H.
30	WHI-1	WHI/WHI E.H.
29	RED/BLK-1	RED/BLK E.H.
28	RED-1	RED E.H.
27	RED/LSM	RED/LSM E.H.
26	WHI/WHI-1	WHI/WHI E.H.
25	WHI/WHI-1	WHI/WHI E.H.
24	WHI/WHI-1	WHI/WHI E.H.
23	WHI/WHI-1	WHI/WHI E.H.
22	WHI/WHI-1	WHI/WHI E.H.
21	WHI/WHI-1	WHI/WHI E.H.
20	WHI/WHI-1	WHI/WHI E.H.
19	GNV/WHI-1	GNV/WHI E.H.
18	GNV/BLK-1	GNV/BLK E.H.
17	OG/RED-1	OG/RED E.H.
16	OG/RED-1	OG/RED E.H.
15	OG/RED-1	OG/RED E.H.
14	OG/RED-1	OG/RED E.H.
13	OG/RED-1	OG/RED E.H.
12	OG/RED-1	OG/RED E.H.
11	OG/RED-1	OG/RED E.H.
10	OG/RED-1	OG/RED E.H.
9	OG/RED-1	OG/RED E.H.
8	OG/RED-1	OG/RED E.H.
7	OG/RED-1	OG/RED E.H.
6	OG/RED-1	OG/RED E.H.
5	OG/RED-1	OG/RED E.H.
4	OG/RED-1	OG/RED E.H.
3	OG/RED-1	OG/RED E.H.
2	OG/RED-1	OG/RED E.H.
1	OG/RED-1	OG/RED E.H.

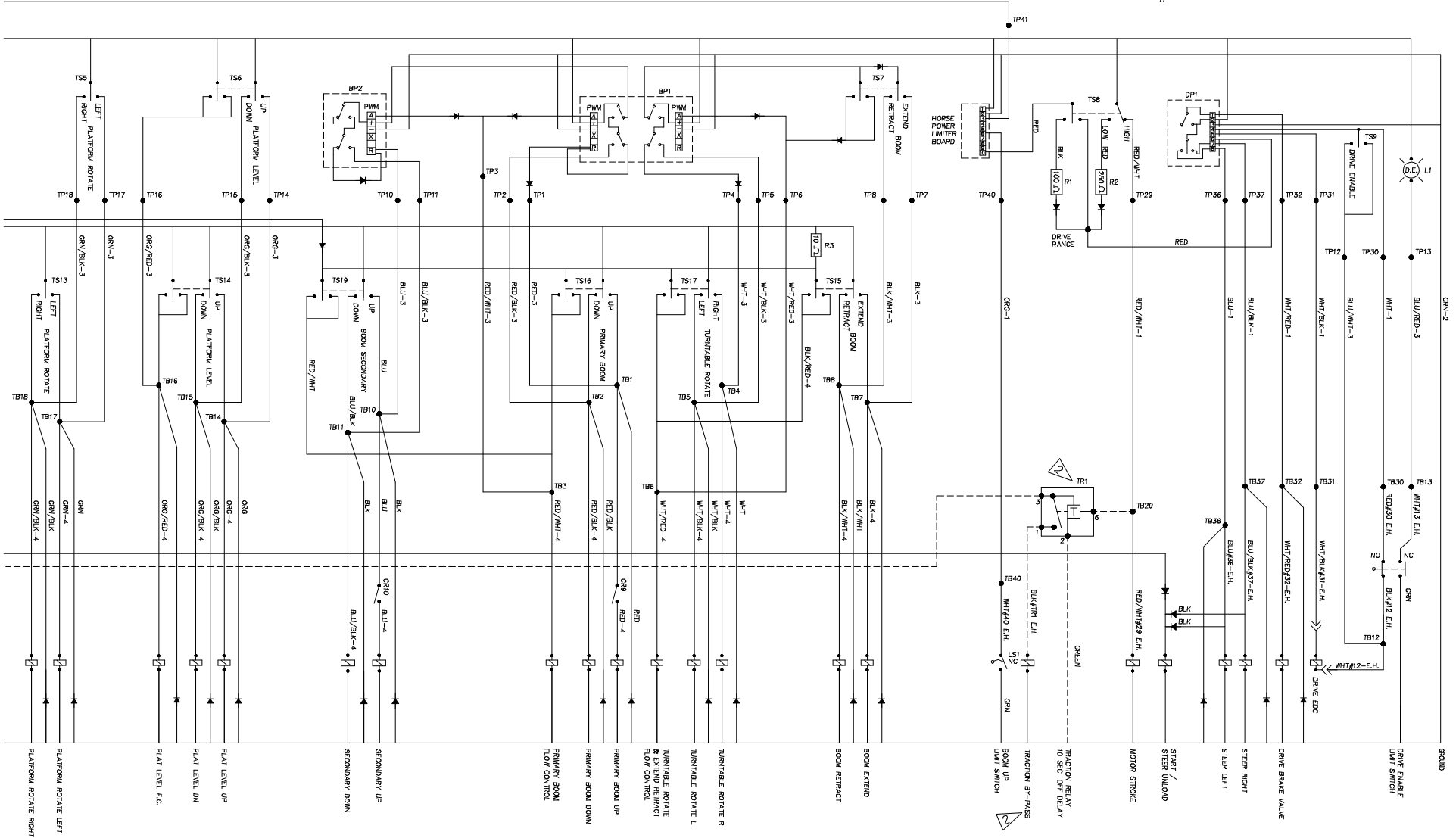
Z45/22 HP 2WD & 4WD FORD  
 PLATFORM CONTROL BOX LEGEND  
 SERIAL #Z45-001523 TO Z45-002134







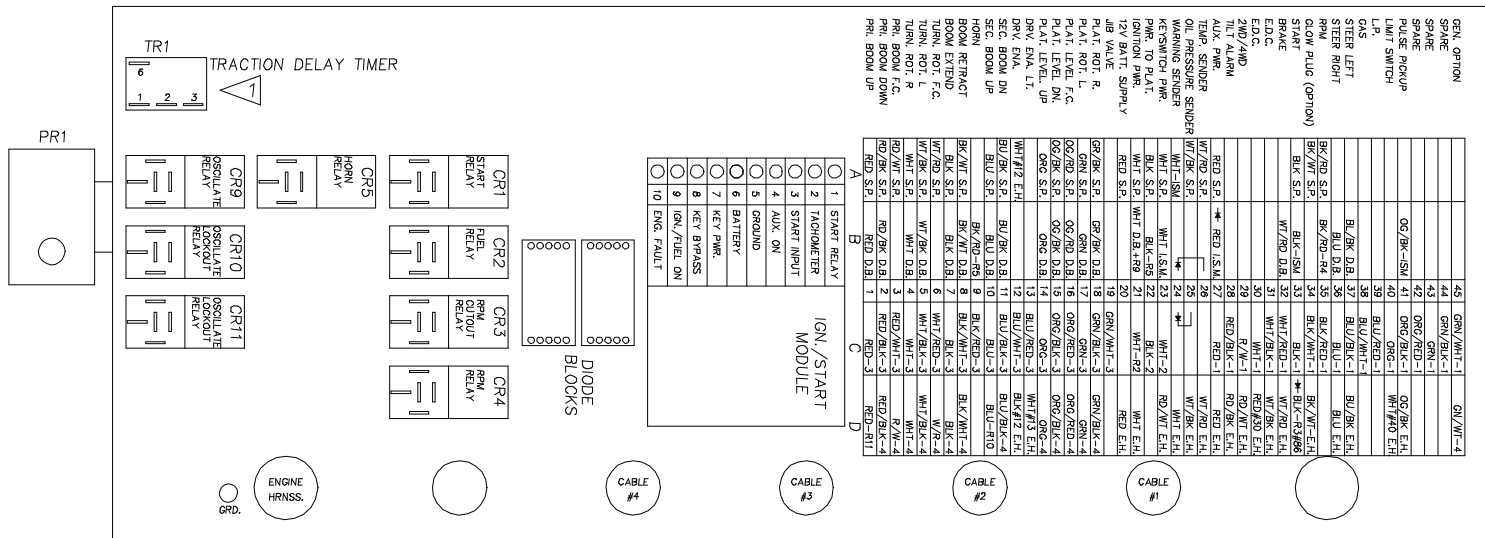
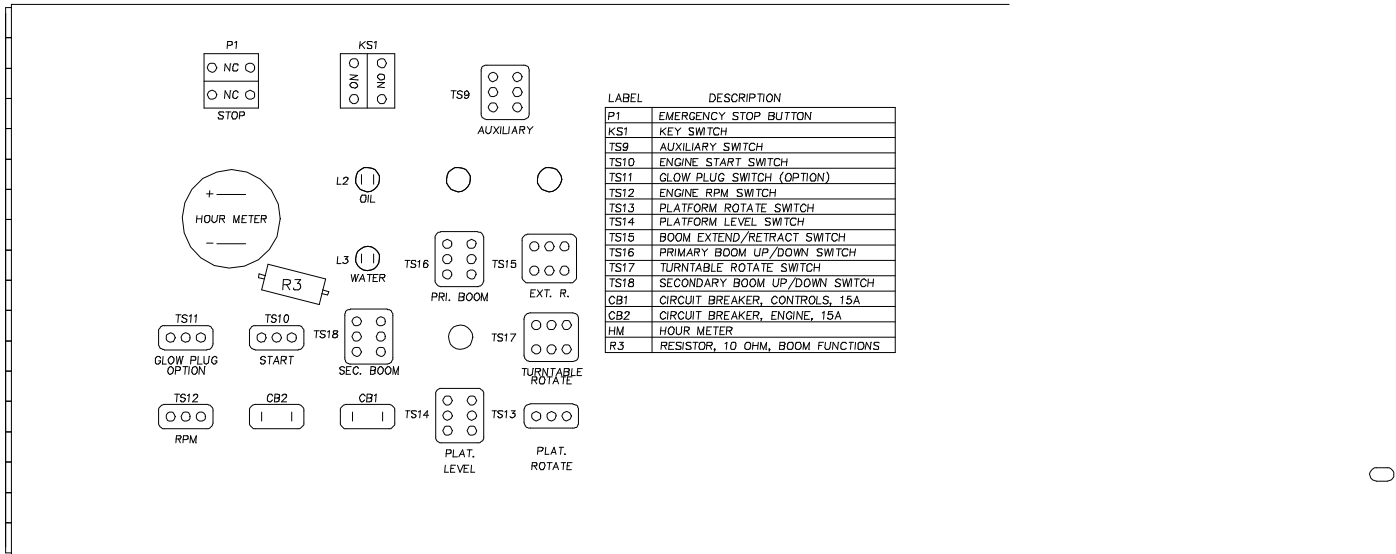
Z45/22 2WD & 4WD DEUTZ DIESEL  
ELECTRICAL SCHEMATIC (cont'd)  
SERIAL #Z45-001524 TO 5050



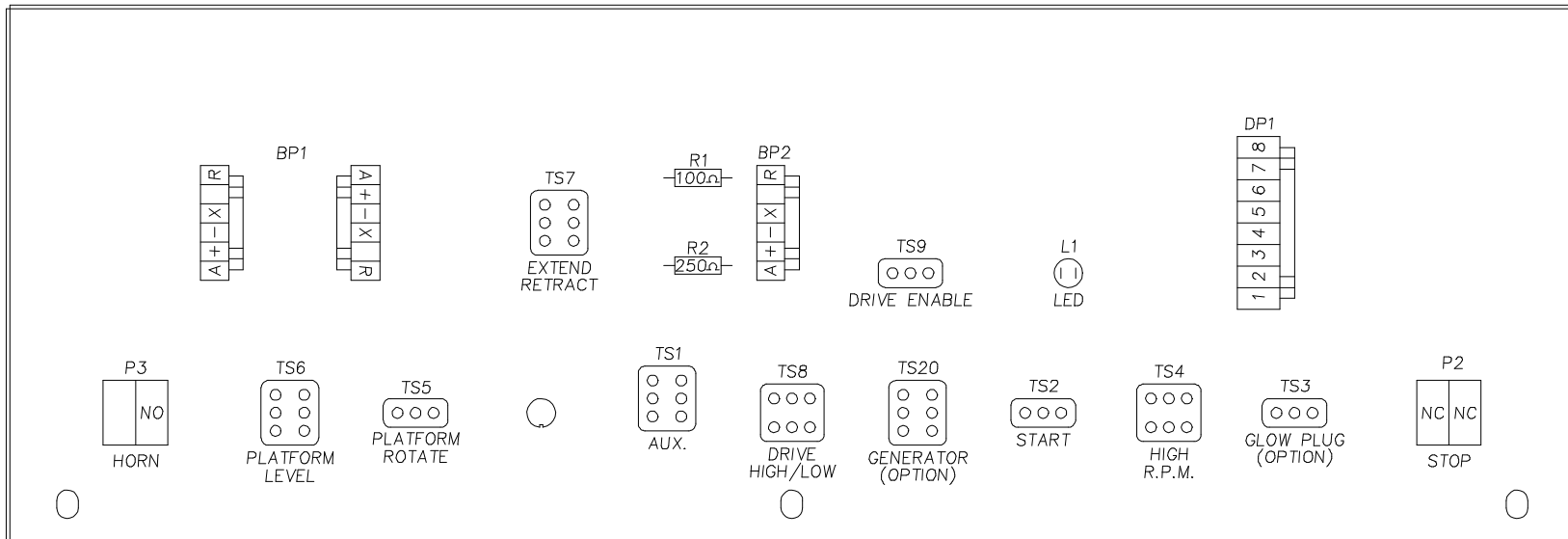
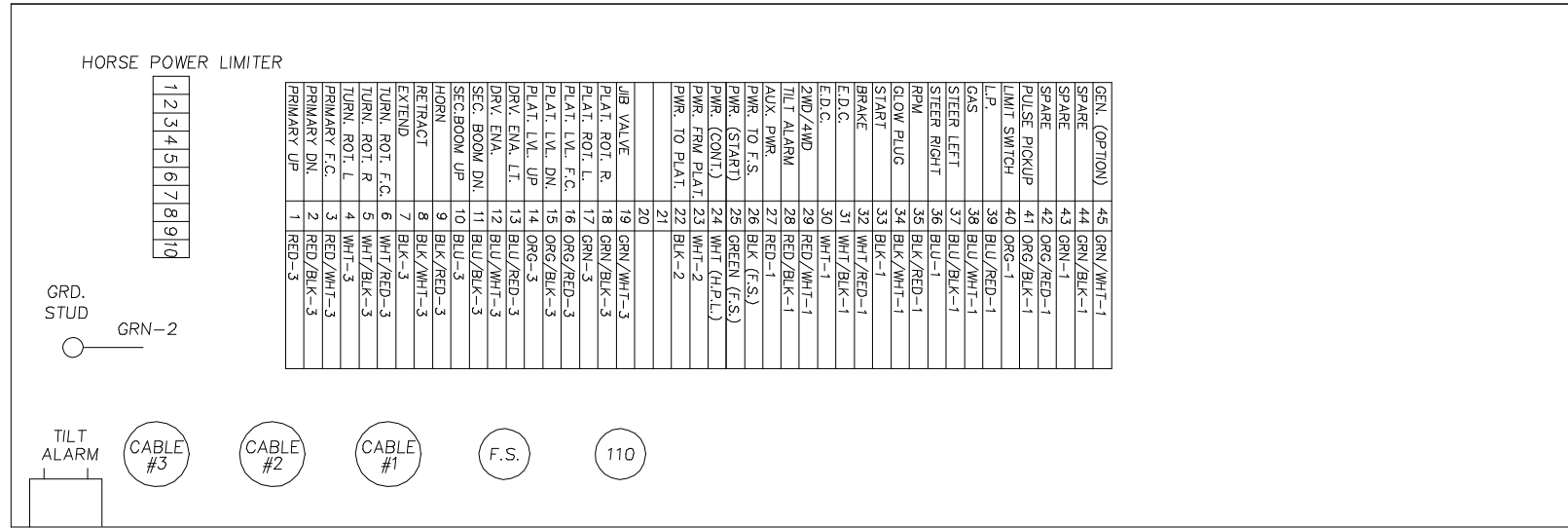
Z45/22 2WD & 4WD DEUTZ DIESEL  
GROUND CONTROL BOX LEGEND  
SERIAL #Z45-001524 TO 5050

NOTE:

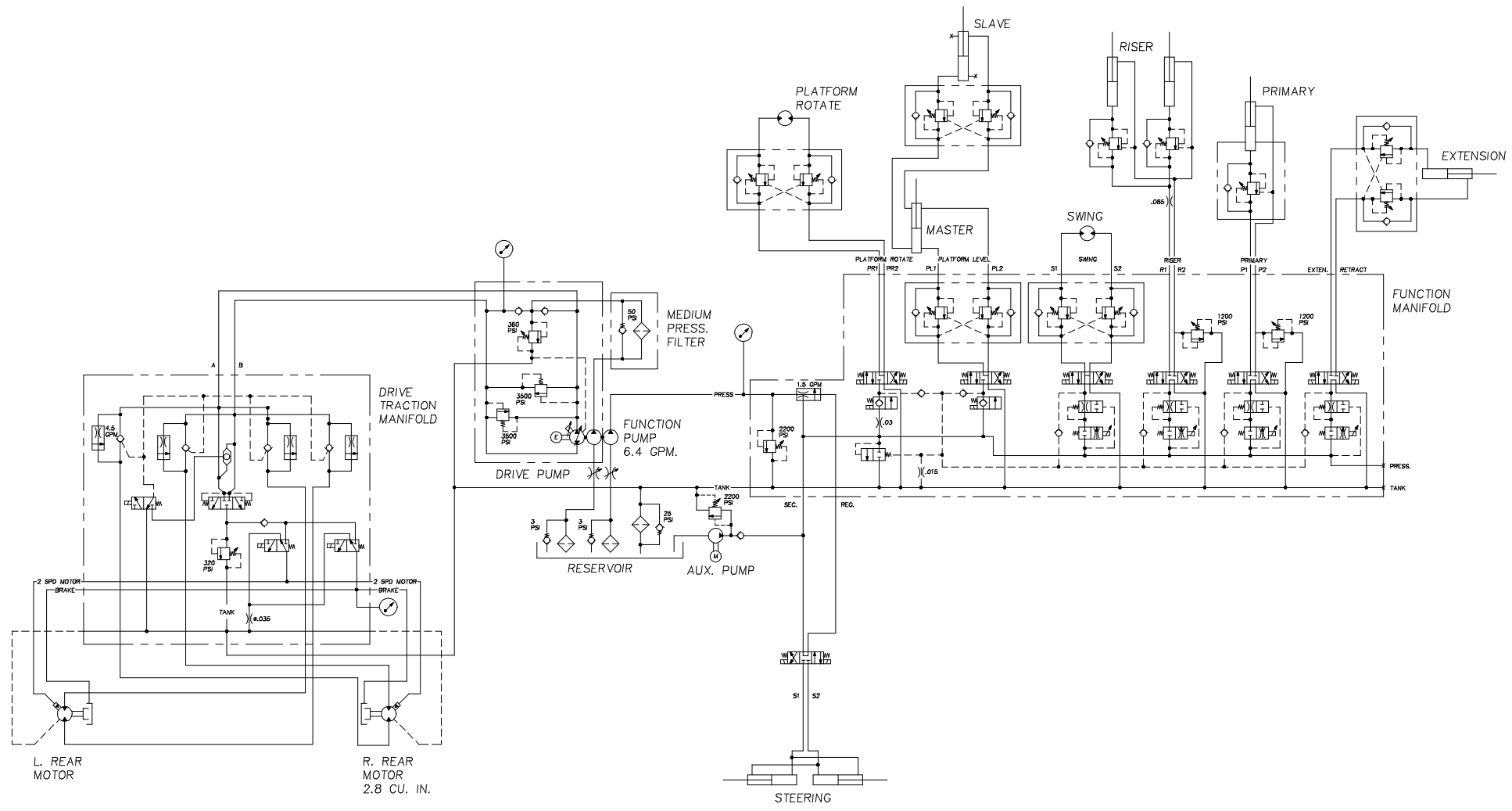
▷ TRI, TRACTION  
DELAY RELAY, WAS  
ELIMINATED @ SERIAL  
#Z45-002538 AND  
ABOVE.



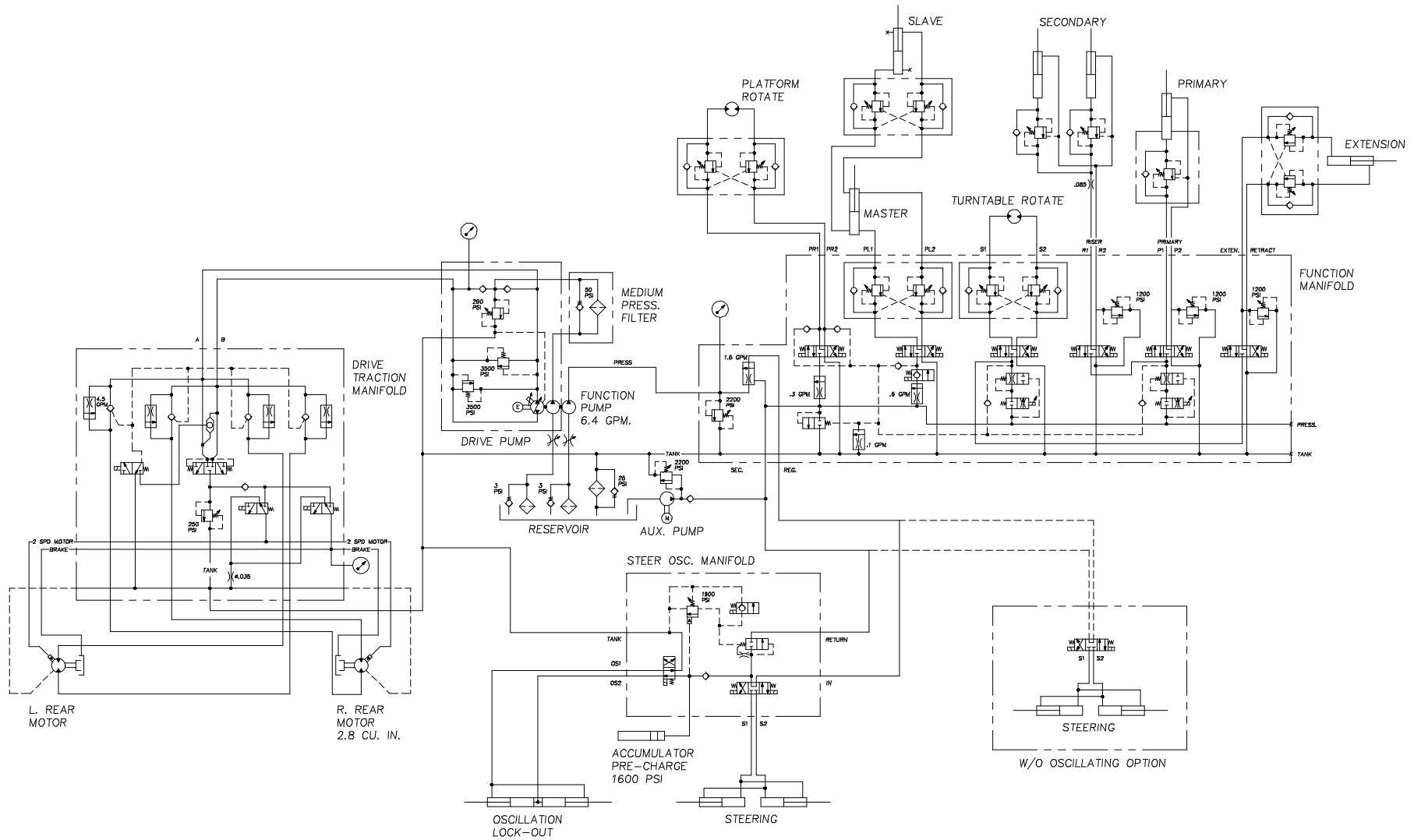
Z45/22 2WD & 4WD DEUTZ DIESEL  
 PLATFORM CONTROL BOX LEGEND  
 SERIAL #Z45-001524 TO 5050



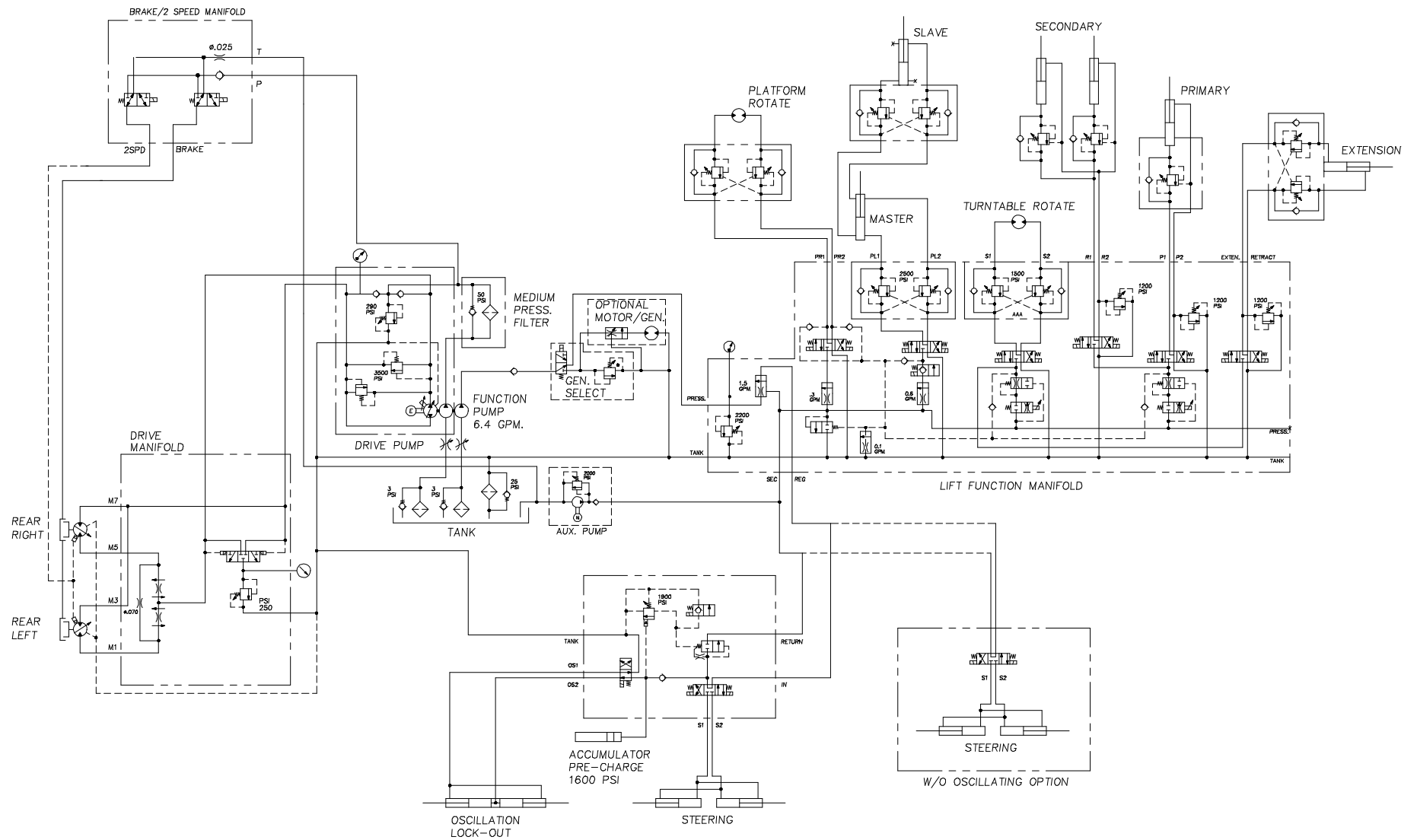
Z45/22 HP 2WD  
 HYDRAULIC SCHEMATIC  
 SERIAL #Z45-000170 TO Z45-000987



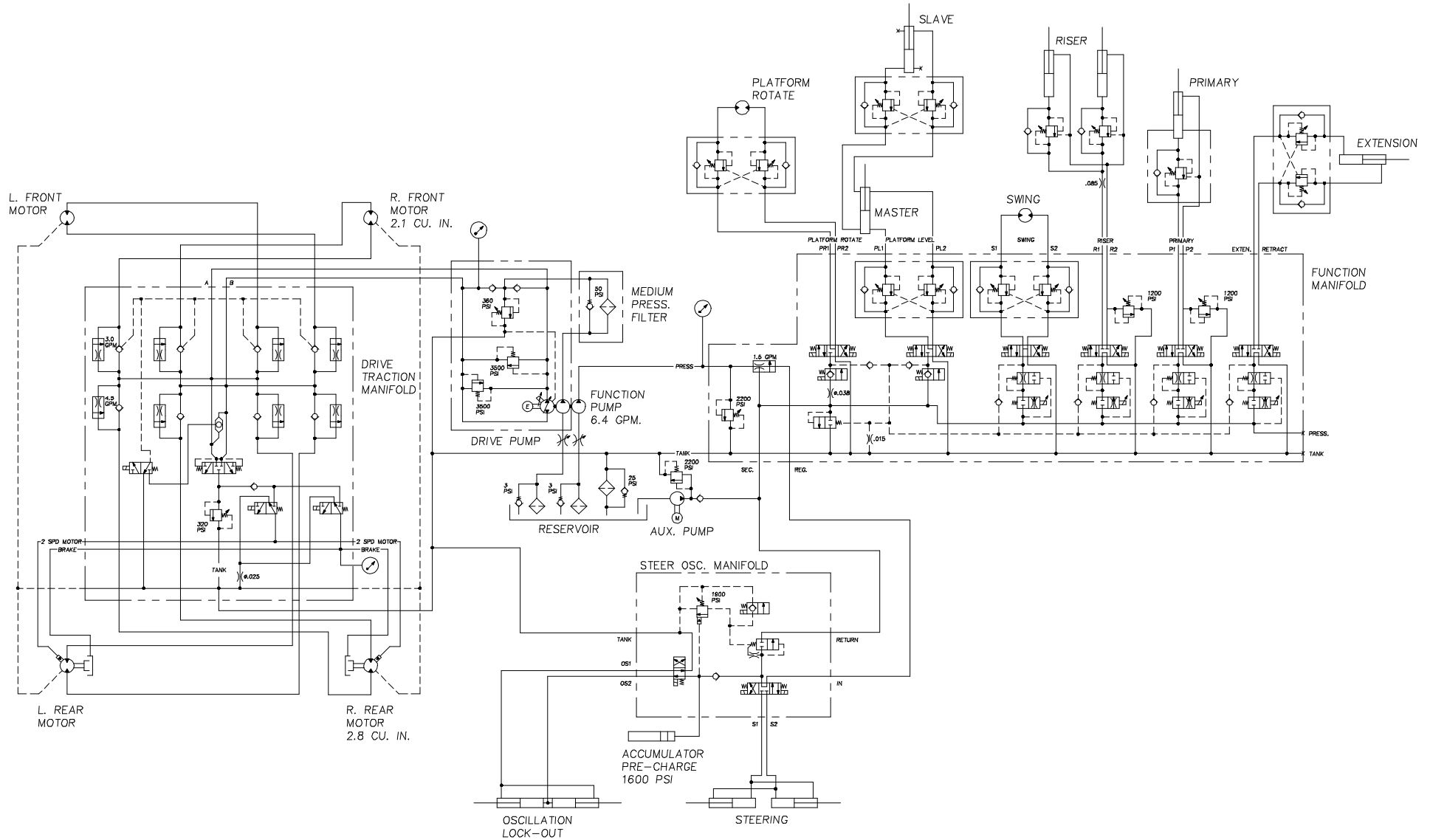
Z45/22 HP 2WD  
 HYDRAULIC SCHEMATIC  
 SERIAL #Z45-000989 TO Z45-002536



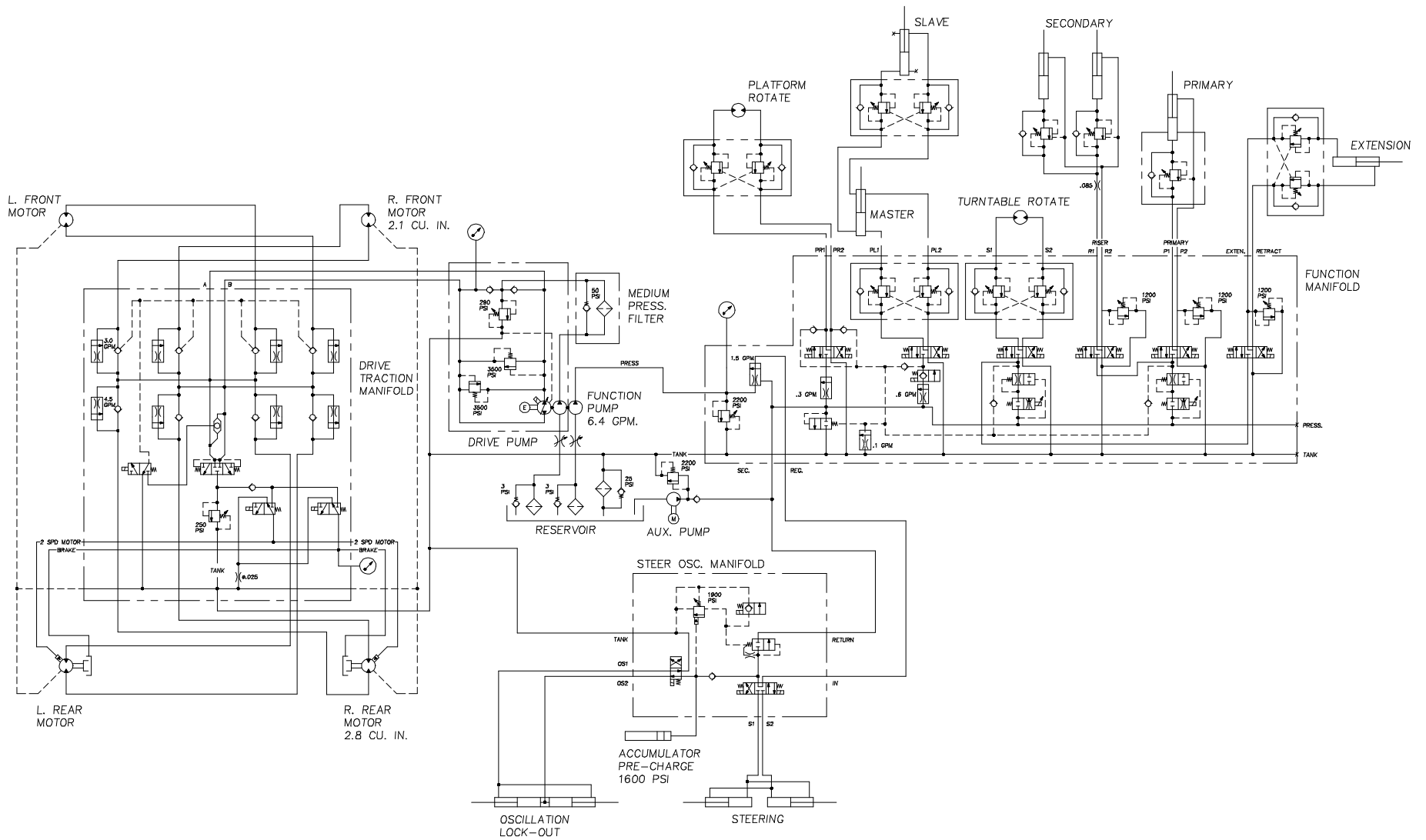
Z45/22 HP 2WD  
 HYDRAULIC SCHEMATIC  
 SERIAL #Z45-002541 & ABOVE



Z45/22 HP 4WD  
 HYDRAULIC SCHEMATIC  
 SERIAL #Z45-000001 TO Z45-000981

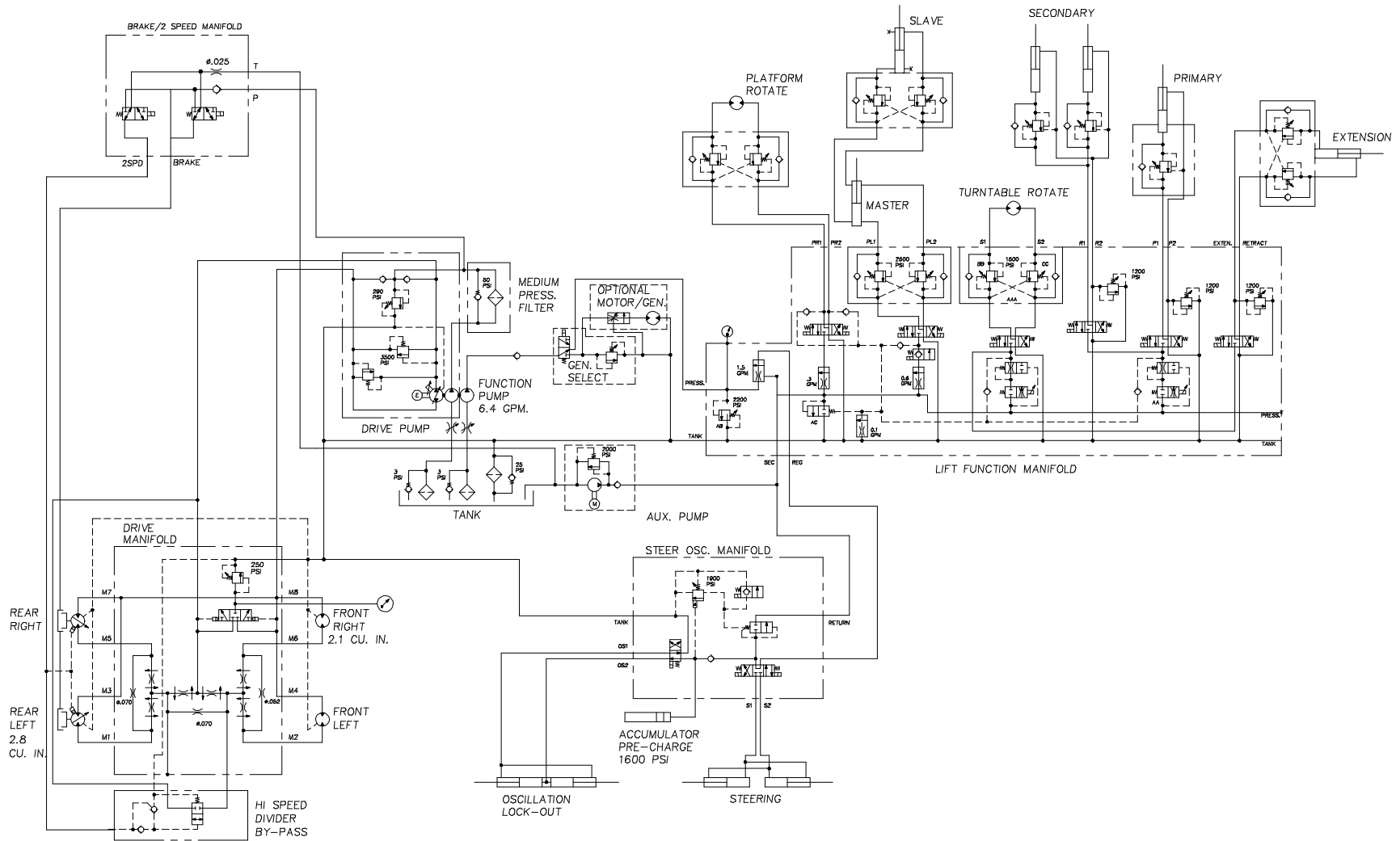


Z45/22 HP 4WD  
 HYDRAULIC SCHEMATIC  
 SERIAL #Z45-000990 TO Z45-002535





Z45/22 HP GP & DIESEL 4WD  
 HYDRAULIC SCHEMATIC  
 SERIAL #Z45-002539 AND ABOVE



# 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

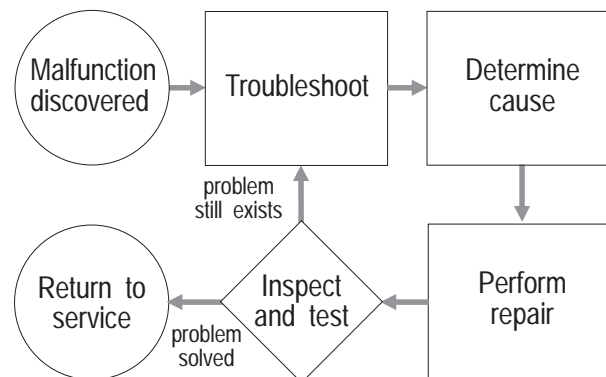
- ☑ Read, understand and obey the safety rules and operating instructions in the *Genie Z-45/22 Operator's Manual*.
- ☑ Be sure that all necessary tools and parts are available and ready for use.
- ☑ Read each procedure completely and adhere to the instructions.. Attempting shortcuts may produce hazardous conditions.
- ☑ Unless otherwise specified, perform each procedure with the machine in the following configuration:
  - machine parked on a flat, level surface
  - boom in the stowed position
  - turntable rotated with the boom between the non-steering wheels
  - 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 Procedure



## 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 injury or damage to the machine.

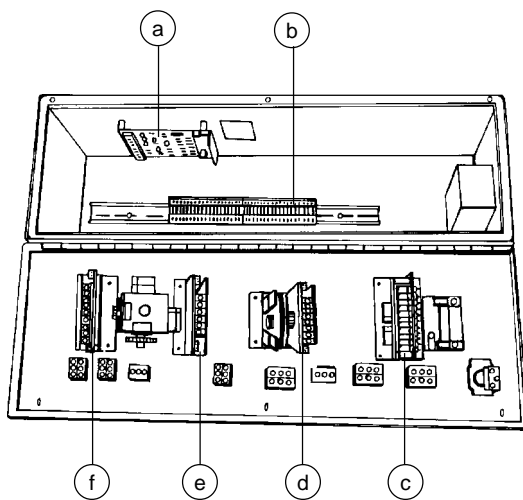
**NOTICE** Indicates special operation or maintenance information.

- ⦿ 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 secondary boom proportional controller
  - e primary boom proportional controller
  - f turntable rotate proportional controller

## Primary Boom Up/Down Controller Adjustments

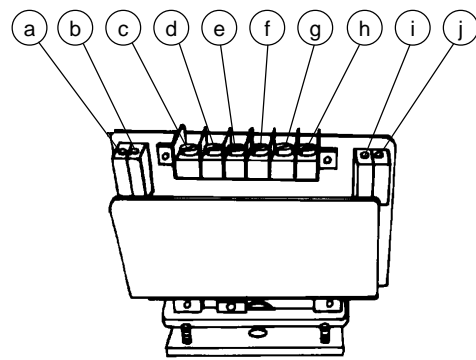
### NOTICE

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 15.4V DC output.

### AWARNING

Electrocution 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 red Emergency Stop button to the on position. Do not start the engine.
- 3 Open the platform control box lid and locate the boom up/down controller.



- a dual (lo) 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 ramp rate: Turn the trimpot adjustment screw clockwise 15 turns or until you hear a click, then turn the screw counterclockwise 5 turns.
- 5 Connect the red lead(+) from a volt meter to the "A" terminal on the controller PC 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.

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 5.02V 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 4.33V 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 speed control switch to foot switch activated high idle (rabbit and foot switch symbol). Raise the primary boom 1 inch (2.5 cm) above the drive limit switch.

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

- 10 Start a timer and record how long it takes for the primary boom to reach the *full up* position. Adjust the max-out trimpot to achieve a 25 to 29 second cycle time.
- 11 Start a timer and record how long it takes for the primary boom to lower into the *full down* position. Adjust the dual range trimpot to achieve a 33 to 37 second cycle time.

**Primary boom up/down specifications**

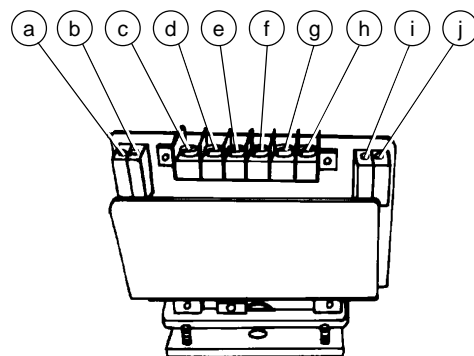
Threshold	2.50V DC
Primary boom up - Max-out Cycle time	5.02V DC 25 to 29 seconds
Primary boom down - Dual range Cycle time	4.33V DC 33 to 37 seconds

**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 15.4V 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 keyswitch 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.



- a dual (lo) 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

## PLATFORM CONTROLS

- 4 Set the ramp rate: Turn the trimpot adjustment screw clockwise 15 turns or until you hear a click, then turn the screw counterclockwise 5 turns.
- 5 Connect the red lead(+) from a volt meter to the "A" terminal on the controller PC 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 *up* position. Adjust the voltage to 5.01V DC. Turn the max-out trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.
- 8 Set the dual range: Press down the foot switch, then move the control handle all the way to the *down* position. Adjust the voltage to 4.05V DC. Turn the dual range trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.

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

- 9 Start the engine and move the engine speed control switch to foot switch activated high idle (rabbit and foot switch symbol). Raise the primary boom 1 inch (2.5cm) above the drive limit switch.
- 10 Start a timer and record how long it takes for the secondary boom to reach the *full up* position. Adjust the max-out trimpot to achieve a 23 to 27 second cycle time.
- 11 Start a timer and record how long it takes for the secondary boom to lower into the *full down* position. Adjust the dual range trimpot to achieve a 23 to 27 second cycle time.

---

**Secondary boom up/down specifications**


---

Threshold	2.50V DC
Secondary boom up - Max-out Cycle time	5.01V DC 23 to 27 seconds
Secondary boom down - Dual Range Cycle time	4.05V DC 23 to 27 seconds

---

## Turntable Rotation Controller Adjustments

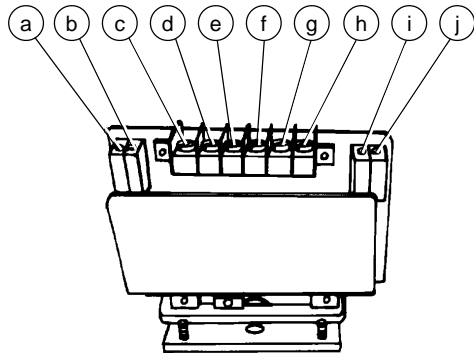
**NOTICE** Do not adjust the joystick controllers unless the static battery voltage is above 12V DC and the alternator is operating properly with 12.5 to 15.4V DC output.

**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.

PLATFORM CONTROLS

- Open the platform control box lid and locate the turntable rotate controller.



- a dual (lo) 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

- Set the ramp rate: Turn the trimpot adjustment screw clockwise 15 turns or until you hear a click, then turn the screw counterclockwise 5 turns.
- Connect the red lead(+) from a volt meter to the "A" terminal on the controller PC board. Connect the black lead(-) to ground.
- 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 3.35V DC. Turn the threshold trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.
- Set the max-out: Press down the foot switch then move the control handle all the way to the *full right* or *full left* position. Adjust the voltage to 6.26V DC. Turn the max-out trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.

- 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.

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

- Start the engine and move the engine speed control switch to foot switch activated high idle (rabbit and foot switch symbol). Rotate the turntable to the *full right* position.
- Start a timer and record how long it takes the turntable to rotate to the *full left* position. Adjust the max-out trimpot to achieve a 71 to 75 second cycle time.

**Turntable rotation specifications**

Threshold	3.35V DC
Turntable rotation - Max-out	6.26V DC
Cycle time	71 to 75 seconds

## PLATFORM CONTROLS

## 1-2 Horsepower Limiter Board

The horsepower limiter board is responsible for governing drive pump output. It reads 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 keep the engine from stalling. Three adjustments are required for optimum performance.

### How to Adjust the Horsepower Limiter Board

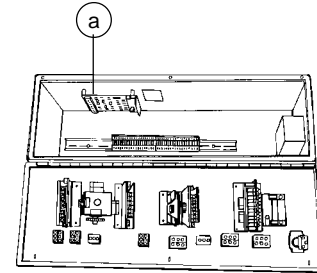
**NOTICE** The engine rpm must be correct before performing this procedure. See Maintenance Procedure B-12, *Check and Adjust the Engine RPM*.

**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.

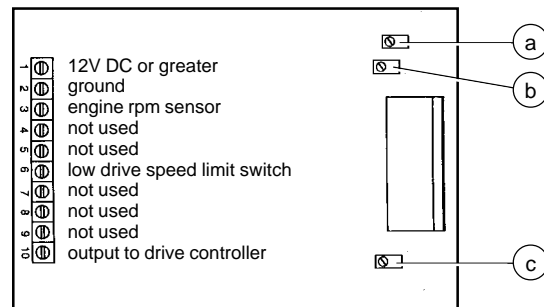
- 1 Remove the fasteners from the platform control box lid.
- 2 Open the control box lid and locate the horsepower limiter board.

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



a horsepower limiter board

- 3 Connect the black lead(-) from a DC volt meter to the number 2 terminal, and the red lead(+) to the number 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 elevated 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 speed 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**

---

Voltage setting - 2WD model	8.0V DC
Voltage setting - 4WD model	9.0V DC

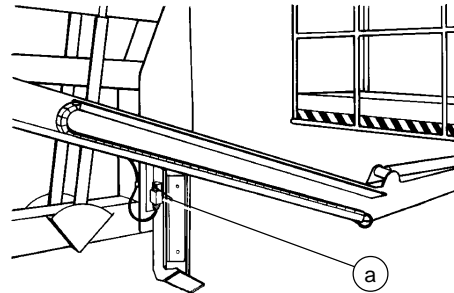
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- 7 Move the engine speed control switch to low idle (turtle symbol).
- 8 Press down the foot switch and then adjust the "C" potentiometer to obtain a 0.01V DC to 0.03V DC voltage reading.
- 9 Move the engine speed control switch to foot switch activated high idle (rabbit and foot switch symbol).
- 10 Press down the foot switch and re-adjust the "A" potentiometer to the previous voltage setting.
- 11 Be sure that the boom is in the fully stowed position, then drive the boom and observe how the engine rpm reacts to drive control handle movement. If the machine 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 and engine droop.

- 12 Disconnect the volt meter.

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



a drive limit switch

- 14 Drive the boom for 20 feet (6.1 m) and record the elapsed time. Do this again in the opposite direction.
- 15 Adjust the "B" potentiometer to obtain the correct elevated drive speed of 1 foot per second (30.5 cm per second).
- 16 Close the platform control box lid and re-install the fasteners.

---

**Drive speed specifications**

---

Stowed position, high range, distance: 20 ft / 6 m	
2WD	2.85 seconds (±0.25 seconds)
4WD	2.75 seconds (±0.25 seconds)

---

Boom raised, high range, distance: 20 ft / 6 m	
2WD and 4WD	1 foot per second 30.5 cm per second

---



## PLATFORM CONTROLS

### 1-3 Foot Switch

#### How to Test the Foot Switch

- 1 Turn the keyswitch to the *off* position and disconnect 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 connector combination listed below and check for continuity.

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

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

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

Test	Desired result
red to black	no continuity (infinite $\Omega$ )
red to white	no continuity
black to white	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.

#### How to Test the Resistors

- 1 Turn the keyswitch 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

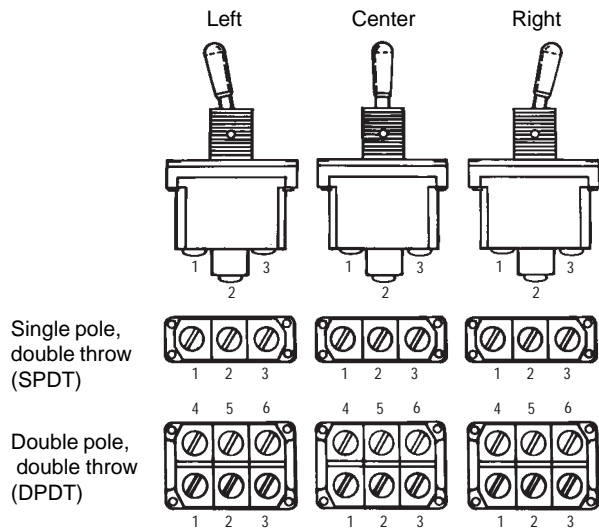
## 1-5 Toggle Switches

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

### How to Test a Toggle Switch

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

- 1 Turn the keyswitch to the *off* position 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.



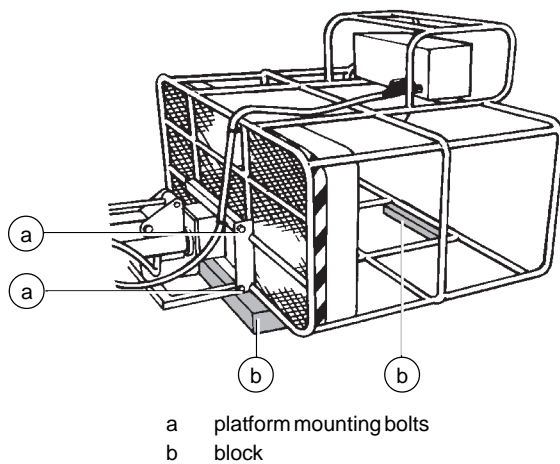
Test	Desired result
<b>Left Position</b>	
terminal 1 to 2, 3, 4, 5, & 6	no continuity (infinite $\Omega$ )
terminal 2 to 3	continuity (zero $\Omega$ )
terminal 2 to 4, 5 & 6	no continuity
terminal 3 to 4, 5 & 6	no continuity
terminal 4 to 5 & 6	no continuity
terminal 5 to 6	continuity
<b>Center position</b>	There are no terminal combinations that will produce continuity (infinite $\Omega$ )
<b>Right Position</b>	
terminal 1 to 2	continuity
terminal 1 to 3, 4, 5 & 6	no continuity
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 under the platform and disconnect the foot switch wiring plug.
- 2 Remove the platform control box mounting bolts, then lift it out and set it aside.
- 3 Tilt the platform with the ground controls manual platform leveling switch until the platform lays horizontal.



- 4 Place blocks under the platform railing for support. Then carefully rest the platform on the blocks.
- 5 Remove the platform mounting bolts and remove the platform.

## 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 primary 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, bleed the slave cylinder to be sure there is no air in the closed loop.

- 1 Tilt the platform with the ground controls platform leveling switch until the platform is horizontal.
- 2 Place blocks under the platform railing for support. Then carefully rest the platform on the blocks.
- 3 Disconnect the hydraulic hoses from the slave cylinder and connect them together with a straight line 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.

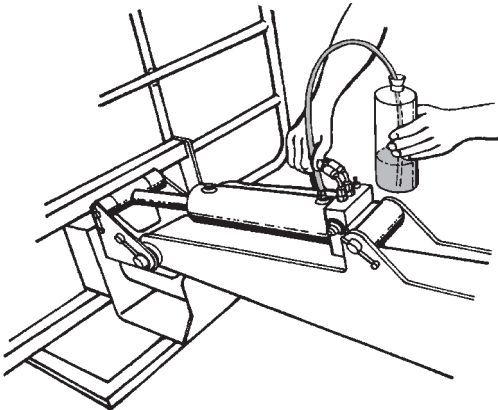
- 4 Remove the rod ends from both the barrel and rod end pins.
- 5 Use a soft metal drift and drive the pins out.

## PLATFORM COMPONENTS

## How to Bleed the Slave Cylinder

**CAUTION** Do not start the engine. Use auxiliary power for all machine functions in this procedure.

- 1 Raise the primary boom 6 inches (15cm) above the primary boom rest.
- 2 Move the manual platform level switch to the right until the slave cylinder is fully extended. Continue to hold the platform level switch for 10 seconds.
- 3 Connect a clear hose to the bleed valve on the cylinder barrel. Place the other end of the hose in a container to collect any discharge.



- 4 Open the bleed valve, but do not remove it.
- 5 Hold the platform level switch to the right for 5 seconds, then release it.
- 6 Close the bleed valve, then remove the hoses.
- 7 Hold the platform level switch to the left until the slave cylinder is fully retracted.
- 8 Connect the clear hose to the bleed valve on the slave cylinder block.
- 9 Open the bleed valve and allow the slave cylinder to extend using gravity, until the cylinder is fully extended. Close the bleed valve.

## 2-3 Platform Rotator

The platform rotator is a hydraulically activated helical gear assembly used to rotate the platform 180 degrees. It is equipped with external counterbalance valves to hold platform in place and to provide pressure relief.

### How to Remove the Platform Rotator

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

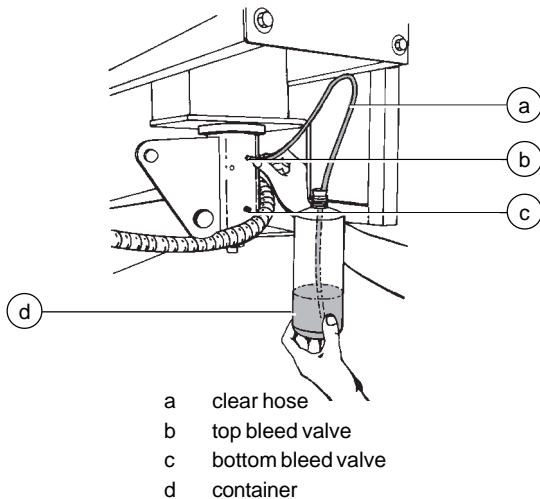
**CAUTION** Bodily injury hazard. Spraying hydraulic oil can perforate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

- 3 Remove the 6 mounting bolts from the platform pivot weldment.
- 4 Remove the top nut from the threaded rod. Then pull the rod out the bottom of the platform rotator and remove the platform pivot weldment.
- 5 Support the platform rotator, but do not apply any lifting pressure.
- 6 Remove the pin retainer from the slave cylinder rod-end pivot pin and the rotator pivot pin.
- 7 Use a soft metal drift to drive the pins out, then remove the platform rotator.

## PLATFORM COMPONENTS

**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.



- 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 3 times.

**CAUTION** Crushing hazard. Keep hands clear of the platform pivot weldment 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 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 the valve.

- 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 hands clear of the platform pivot weldment during rotation.

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

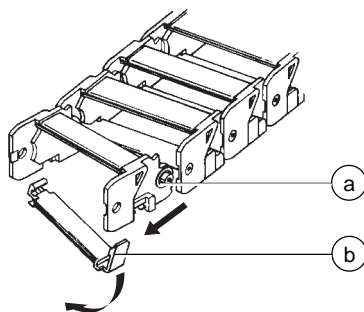
# Primary Boom Components

## 3-1 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

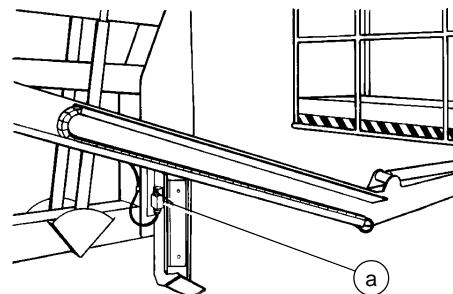
- 1 Use a slotted screwdriver to pry down on the lower clip.
- 2 Repeat step 1 for each link.
- 3 To remove a single link, open the lower clip and then use a screw driver to pry the link to the side.

## 3-2 Primary Boom

### How to Shim the Primary Boom Wear Pads

**NOTICE** Measure each wear pad. Replace the pad if it is less than 0.41 inches (1cm) thick. If the pad is more than 0.41 inches (1cm) thick, perform the following procedure.

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



a drive limit switch

- 2 Extend the primary boom 10 inches (25.4 cm).
- 3 Remove the wear pad mounting fasteners.
- 4 Install the new shims under the wear pad to obtain zero clearance and zero drag.
- 5 Using a round punch, align the holes in the shim to the wear pad and install the mounting fasteners.
- 6 Extend and retract through the entire range of motion to check for tight spots that could cause binding.

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

## PRIMARY BOOM COMPONENTS

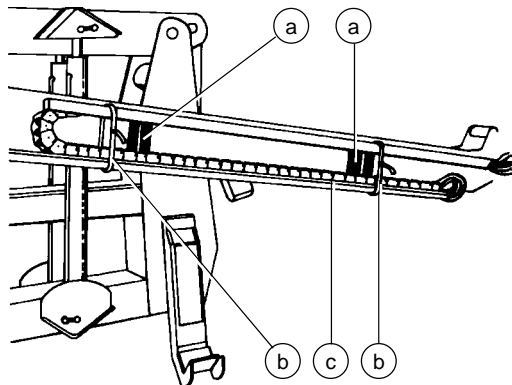
## How to Remove the Primary Boom

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

- 1 Remove the platform. See 2-1, *How to Remove the Platform*.
- 2 Disconnect and plug the hydraulic hoses at the slave cylinder and the platform rotator counterbalance 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.

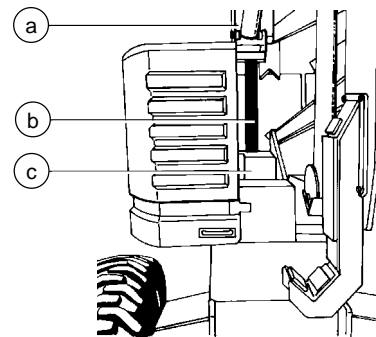
- 3 Remove the fasteners that secure the upper cable track tray to the primary boom.
- 4 Loosen the fasteners that secure the lower cable track tray. Tie the upper and lower cable tracks together with wire ties. Remove the cable track assembly from the primary boom.



- a wood block
- b tie-wrap
- c plastic cable track

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

- 5 Raise the secondary boom and place a 4x4x31 inch (78 cm) block between the chassis counterweight and upper mid-pivot. Carefully lower the secondary boom onto the block.



- a upper mid-pivot
- b 4x4x31 inch block
- c counterweight

**WARNING** Crushing hazard. Keep hands away from the block and all moving parts when lowering the secondary boom.

- 6 Raise the end of the primary boom 8 feet (2.5 m) off the ground, then extend the primary boom 5 inches (12.5 cm).
- 7 Attach an overhead crane to the primary boom. Do not lift the primary boom.

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

## PRIMARY BOOM COMPONENTS

- 8 Disconnect and plug the extension cylinder and the platform leveling master cylinder hydraulic hoses. Cap the extension 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.

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

**NOTICE** Leave the master cylinder attached to the primary boom.

- 10 Remove the retaining fastener from the primary boom pivot pin. Do not remove the pin.
- 11 Remove the hose clamp bolt on the primary boom, next to the upper mid-pivot.
- 12 Support the lift cylinder with a lifting device.
- 13 Remove the pin retainer from the lift cylinder rod-end pivot pin. Use a soft metal drift to remove the pin.

**CAUTION** The lift cylinder will fall unless it is supported.

- 14 Remove the hose and cable clamps from the underside of the primary boom.
- 15 Use a slide hammer to remove the primary boom pivot pin, then carefully lift the primary boom off 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 tube must be replaced. The extension cylinder can be removed without completely disassembling the primary boom. See 3-4, *How to Remove the Extension Cylinder*.

- 1 Remove the primary boom. See above, *How to Remove the Primary Boom*.
- 2 Remove the pin retainer from the slave cylinder rod-end pivot pin. Use a soft metal drift to remove the pin.
- 3 Remove the pin retainer from the slave cylinder barrel-end pivot pin. Use a soft metal drift to remove the pin, then remove slave cylinder from the primary boom.
- 4 Support the platform rotator with a lifting device.
- 5 Remove the pin retainer from the platform rotator pivot pin. Use a soft metal drift to remove the pin, then remove the platform rotator from primary boom.
- 6 Support the master cylinder with a lifting device.
- 7 Remove the retaining fastener bolt from the master cylinder pivot pin. Use a soft metal drift to remove the pin, then remove the master cylinder from the primary boom.
- 8 Remove the fasteners from the extension cylinder pivot pin. Use a soft metal drift to remove the pin.
- 9 Support and slide the extension boom out of the primary boom weldment.

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



## PRIMARY BOOM COMPONENTS

- 10 Remove the extension boom end cap.
- 11 Remove the fasteners from the extension cylinder rod-end weldment, then support and slide the extension cylinder out of the extension boom.

**NOTICE** The bolts that secure the cylinder rod-end weldment are installed with Loctite® removable thread sealant. It may be necessary to heat the bolts and the surrounding area to remove them. Do not reuse the bolts.

- 12 Remove and label the wear pads from the primary boom weldment and the extension tube.

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

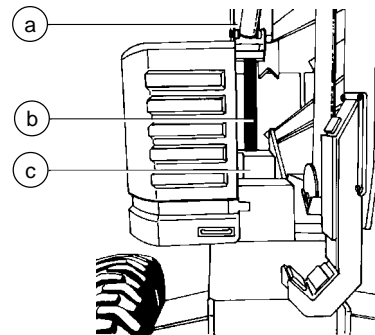
### 3-3 Primary Boom Lift Cylinder

The lift cylinder raises and lowers the primary boom.

#### 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 result in death or serious injury and significant component damage. Dealer service is strongly recommended.

- 1 Raise the secondary boom and place a 4x4x31 inch (78cm) block between the chassis counterweight and the upper mid-pivot. Carefully lower the secondary boom onto the block.



- a upper mid-pivot
- b 4x4x31 inch block
- c counterweight

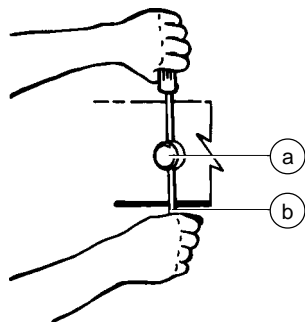
**WARNING** Crushing hazard. Keep hands away from the block and all moving parts when lowering the secondary boom.

## PRIMARY BOOM COMPONENTS

- 2 Raise the primary boom until the end of the boom is 8 feet (2.5 m) off the ground.
- 3 Support the primary boom with an overhead crane. Do not lift the primary boom.
- 4 Disconnect and plug the primary 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.

- 5 Remove the pin retainer from the pivot pin at the barrel-end of the primary lift cylinder.
- 6 Use an overhead crane to lift the primary boom 1 inch (2.5 cm). This will relieve pressure on the barrel-end pivot pin.
- 7 Support the primary lift cylinder with straps or ropes to restrict it from swinging freely.
- 8 Place a rod through the barrel-end pivot pin and twist to remove the pin.



a pivot pin  
b 10 to 12 inch rod

**CAUTION** Crushing hazard. When the barrel-end pivot pin is removed, the primary lift cylinder will swing down if it is not properly supported.

- 9 Carefully loosen the straps and allow the primary lift cylinder to slowly swing down. Now attach the rod of the primary lift cylinder to an overhead crane or similar lifting device.
- 10 Remove the pin retainer from the remaining pivot pin, then use a soft metal drift to remove the pin.

**WARNING** Crushing hazard. The primary lift cylinder will fall if it is not properly supported.

## PRIMARY BOOM COMPONENTS

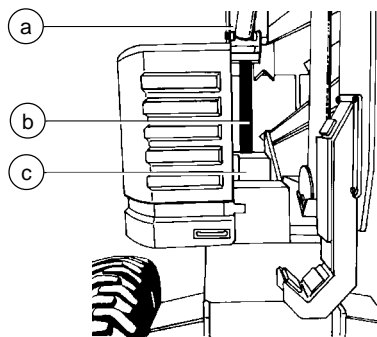
### 3-4 Extension Cylinder

The extension cylinder extends and retracts the primary boom steel 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 loss.

#### How to Remove the Extension Cylinder

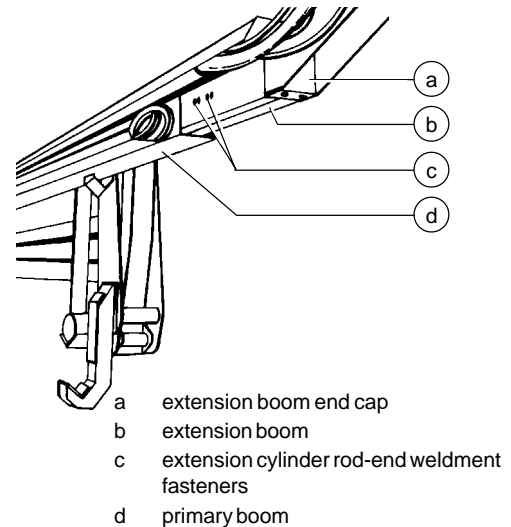
**⚠ WARNING** This procedure requires specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may result in death or serious injury and significant component damage. Dealer service is strongly recommended.

- 1 Raise the secondary boom and place a 4x4x31 inch (78 cm) block between the chassis counterweight and the upper mid-pivot. Carefully lower the secondary boom onto the block.



- a upper mid-pivot
- b 4x4x31 inch block
- c counterweight

**⚠ WARNING** Crushing hazard. Keep hands away from the block and all moving parts when lowering the secondary boom.



- 2 Raise the primary boom until the extension boom end cap is 5 feet (1.5 m) off the ground.
- 3 Extend the extension tube to the primary boom tube 17 inches (43 cm). Then secure to prevent any additional movement
- 4 Remove the extension boom end cap.
- 5 Remove the fasteners from the cylinder rod-end weldment.

**NOTICE** The bolts that secure the cylinder rod-end weldment are installed with Loctite® removable thread sealant. It may be necessary to heat the bolts and the surrounding area to remove them. Do not reuse the bolts.

- 6 If the function is operational, extend the extension cylinder until the rod-end weldment clears the end of the extension tube.

## PRIMARY BOOM COMPONENTS

- 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 fasteners from the extension cylinder pivot pin, then use a soft metal drift to remove the pin.
- 9 Carefully pull out and properly support the extension cylinder from the platform end of the primary boom.

**CAUTION** Crushing hazard. The cylinder will fall if it is not properly supported when it is pulled out of the extension tube.

**NOTICE** To make installation the extension cylinder easier, be sure that the cylinder rod is extended 3 to 4 feet (1 m).

### 3-5 Platform Leveling Master Cylinder

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

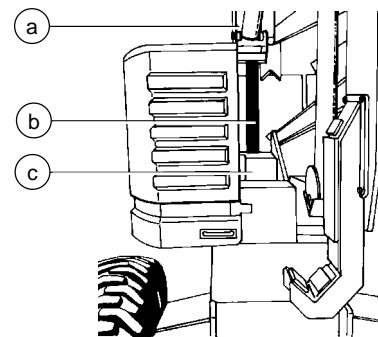
#### How to Remove the Platform

### Leveling Master Cylinder

**WARNING** This procedure requires specific repair skills, lifting equipment 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** Before cylinder removal is considered, bleed the cylinder to be sure that there is no air in the closed loop. See 2-2, *How to Bleed the Slave Cylinder*.

- 1 Remove the end cover from the turntable.
- 2 Raise the secondary boom and place a 4x4x31 inch (78 cm) block between the chassis counterweight and the upper mid-pivot. Carefully lower the secondary boom onto the block.



- a upper mid-pivot
- b 4x4x31 inch block
- c counterweight

**WARNING** Crushing hazard. Keep hands away from the block and all moving parts when lowering the secondary boom.

- 3 Extend the primary boom 6 inches (15 cm), then raise the primary boom until it is level.

## PRIMARY BOOM COMPONENTS

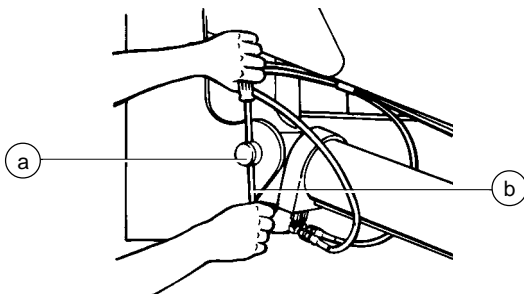
- 4 Disconnect and plug the extension cylinder hydraulic hoses. Cap the ports on the extension cylinder.

**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 Fully lower the primary boom and support it with an overhead crane.
- 6 Disconnect and plug the primary lift cylinder hydraulic hoses. Cap the ports on the primary 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.

- 7 Support the barrel-end of the primary lift cylinder with a strap.
- 8 Remove the pin retainer from the primary lift cylinder barrel-end pivot pin.
- 9 Place a rod through the barrel-end pivot pin and twist to remove the pin.



a pivot pin  
b 10 to 12 inch (30cm) rod

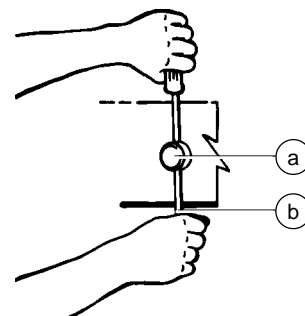
- 10 Carefully lower and rest the barrel-end of the primary lift cylinder on the turntable counterweight.

- 11 Disconnect and plug the platform leveling master cylinder hydraulic hoses. Cap the fittings on 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.

- 12 Remove the retaining fastener from the platform leveling master cylinder rod-end pivot pin, then use a slide hammer to remove the pin.
- 13 Attach a strap to the rod-end of the platform leveling master cylinder.
- 14 Remove the pin retainer from the platform leveling master cylinder barrel-end pivot pin. Then support the cylinder with the strap.
- 15 Place a rod through the barrel-end pivot pin and twist to remove the pin.

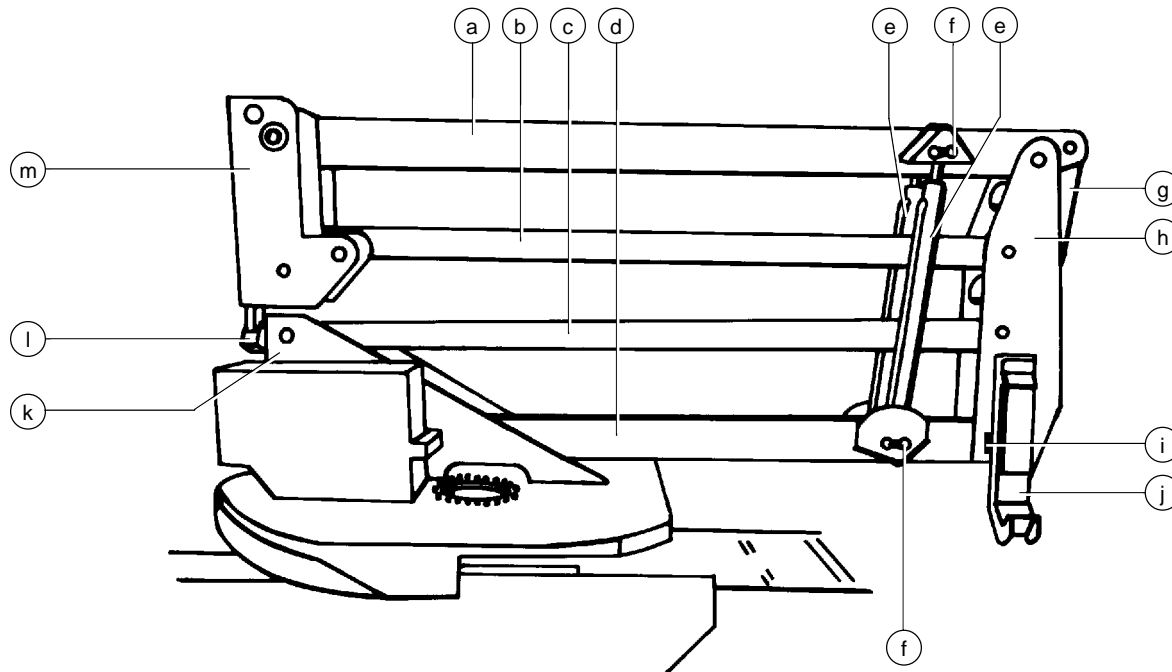
**CAUTION** Crushing hazard. The cylinder will fall if it is not supported when the pivot pin is removed.



a pivot pin  
b 10 to 12 inch (30cm) rod

- 16 Carefully lower the platform leveling master cylinder down and out of the upper mid-pivot.

# Secondary Boom Components



## 4-1 Secondary Boom

### How to Disassemble the Secondary Boom

**WARNING** The procedures in this section require specific repair skills, lifting equipment 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 required.

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

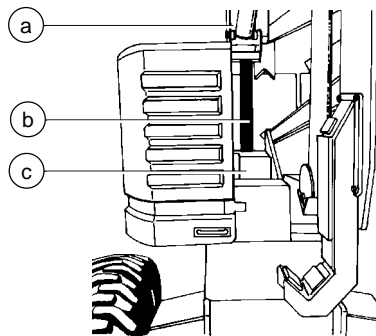
#### Secondary Boom

- a upper secondary boom (number 1 arm)
- b upper tension link (number 2 arm)
- c lower tension link (number 3 arm)
- d lower secondary boom (number 4 arm)
- e secondary lift cylinder
- f pin retainer
- g compression link
- h lower mid-pivot
- i drive limit switch
- j primary boom rest
- k turntable pivot
- l upper mid-pivot rest
- m upper mid-pivot

## SECONDARY BOOM COMPONENTS

- 1 Remove the platform. See 2-1, *How to Remove the Platform*.
- 2 Remove the primary boom. See 3-2, *How to Remove the Primary Boom*.

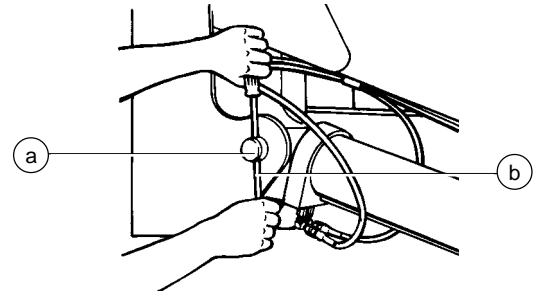
**AWARNING** Crushing hazard. Do not remove the 4x4x31 inch (78 cm) support block installed during primary boom removal.



- a upper mid-pivot
- b 4x4x31 inch block
- c counterweight

- 3 Use an overhead crane to attach a lifting strap to the rod-end of the primary lift cylinder. Then raise the primary lift cylinder with the crane, to a vertical position.
- 4 Remove the pin retainer from the pivot pin at the barrel-end of the primary lift cylinder.
- 5 Place a rod through the barrel-end pivot pin and twist to remove the pin. Remove the primary lift cylinder from the machine.

**AWARNING** Crushing hazard. The primary lift cylinder will fall if it is not properly supported when the barrel-end pivot pin is removed.



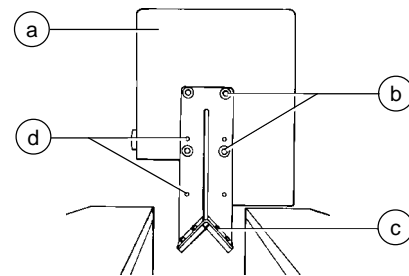
- a pivot pin
- b 10 to 12 inch (30 cm) rod

- 6 Remove the turntable end cover.
- 7 Be sure that the upper mid-pivot rest is in the industrial tire position.

Machines equipped with:

**Rough terrain tires.** Move the upper mid-pivot rest up into the industrial tire position on the mid-pivot.

**Industrial tires.** No modification is necessary.



- a upper mid-pivot
- b mounting position holes for rough-terrain tire models
- c upper mid-pivot rest
- d mounting position holes for industrial tire models

- 8 Attach the lifting strap from an overhead crane to the number 1 arm at the end nearest the upper mid-pivot and lift to support.
- 9 Remove the pin retainers from the two secondary lift cylinder rod-end pivot pins.
- 10 Place a rod through each rod-end pivot pin and twist to remove the pins.

## SECONDARY BOOM COMPONENTS

- 11 Lift the number 1 arm until the secondary lift cylinders can swing forward to rest on the lower mid-pivot.
- 12 Remove the block between the counterweight and the upper mid-pivot.
- 13 Lower the arms enough to relieve the pressure on the compression link upper pivot pin.

---

**Specification: to remove pressure on the compression link**


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Industrial tires	The upper mid-pivot rest should be approximately 1 inch (2.5 cm) above the rest block.
Rough terrain tires	The upper mid-pivot rest should be approximately 4 inches (10 cm) above the rest block.

---

- 14 Remove the pin retaining fastener from the compression link to number 1 arm pivot pin. Use a soft metal drift to remove the pin.
  - 15 Lower the arms to full rest and re-position the lifting strap to the center of the number 1 arm.
  - 16 Remove the pin retaining fastener from the lower mid-pivot to number 1 arm pivot pin. Use a soft metal drift to remove the pin.
  - 17 Remove the pin retaining fastener from the upper mid-pivot to number 1 arm pivot pin. Use a slide hammer to remove the pin.
- ⚠ WARNING** Crushing hazard. If the overhead crane is not properly attached, the number 1 arm may become unbalanced and fall when it is disconnected from the upper mid-pivot.
- 18 Carefully remove the number 1 arm from the machine.
  - 19 Number each electrical cable and its entry location at the platform control box.
  - 20 Open the platform control box and label each wire termination from the cables. Disconnect all control cable wiring from the platform control box.
  - 21 Pull all of the electrical cables out of the plastic cable track. Do not pull out the hydraulic hoses.
  - 22 Disconnect and plug the platform rotator 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.
- 23 Remove the upper and lower cable trays from the number 2 arm. Also remove the upper cable tray from the number 3 arm.
  - 24 Pull all of the cables and hoses down through the upper mid-pivot.
- ⚠ CAUTION** Component damage hazard. Cables and hoses can be irreparably damaged if they are kinked or pinched.
- 25 Attach a lifting strap from an overhead crane to the upper mid-pivot. Then place a hydraulic jack between arm numbers 2 and 3 at the end nearest the upper mid-pivot end of the arms.
  - 26 Adjust the hydraulic jack and overhead crane to relieve the pressure on the pivot pin connecting the number 2 arm to the upper mid-pivot.
  - 27 Remove the pin retaining fastener from the upper mid-pivot to number 2 arm pivot pin. Use a slide hammer to remove the pin.
- ⚠ WARNING** Crushing hazard. The upper mid-pivot will fall if it is not properly supported when the pivot pin is removed.



## SECONDARY BOOM COMPONENTS

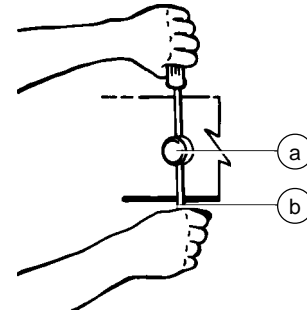
- 28 Carefully lift and remove the upper mid-pivot from the machine.
- 29 Position the lifting strap from an overhead crane at the center of the number 2 arm.
- 30 Remove the pin retaining fastener from the lower mid-pivot to number 2 arm pivot pin. Use a soft metal drift to remove the pin.

**AWARNING** Crushing hazard. If the overhead crane is not properly attached, the number 2 arm may become unbalanced and fall when it is disconnected from the mid-pivot.

- 31 Carefully remove the number 2 arm from the machine.
- 32 Remove the two cable clamps from the inside of the lower mid-pivot.
- 33 Disconnect and remove the drive speed limit switch from the primary boom rest.
- 34 Disconnect and plug the hydraulic hoses at the secondary lift cylinders.

**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.

- 35 Remove the pin retainers from each secondary lift cylinder barrel-end pivot pin.
- 36 Place a rod through each barrel-end pivot pin and twist to remove the pin. Remove each secondary lift cylinder from the machine.



a pivot pin  
b 10 to 12 inch (30 cm) rod

**AWARNING** Crushing hazard. The secondary lift cylinders will fall when the barrel-end pivot pins are removed if they are not properly supported.

- 37 Remove the lower cable tray from the number 3 arm.
- 38 Pull all of the cables and hoses through the lower mid-pivot and out of the turntable pivot.

**CAUTION** Component damage hazard. Cables and hoses can be irreparably damaged if they are kinked or pinched.

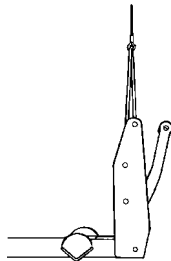
- 39 Attach the strap from an overhead crane to the top tube of the lower mid-pivot. Then place a hydraulic jack between arm numbers 3 and 4 at the end nearest the lower mid-pivot.
- 40 Remove the pin retaining fastener from the lower mid-pivot to number 3 arm pivot pin. Use a soft metal drift to remove the pin.
- 41 Carefully lower the lower mid-pivot and compression link away from the machine to a resting position.
- 42 Position the lifting strap from an overhead crane at the center of the number 3 arm.

## SECONDARY BOOM COMPONENTS

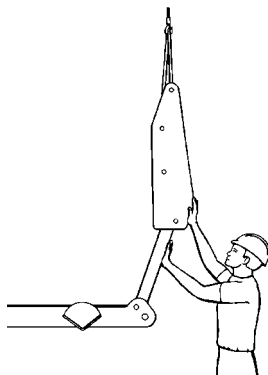
- 43 Remove the pin retaining fastener from the turntable pivot to number 3 arm pivot pin. Use a slide hammer to remove the pin.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the number 3 arm may become unbalanced and fall when it is disconnected from the turntable pivot.

- 44 Carefully remove the number 3 arm from the machine.
- 45 Position the strap from an overhead crane around the top tube of the lower mid-pivot and then carefully lift the lower mid-pivot until it is vertical.



- 46 Remove the pin retaining fastener from the lower mid-pivot to number 4 arm pivot pin. Use a soft metal drift to remove the pin.
- 47 Support the compression link by hand, then carefully lift the lower mid-pivot up and over the compression link and off of the machine.



- 48 Lower the compression link to a resting position. Then attach the lifting strap from an overhead crane to the compression link and raise it to a vertical position.

- 49 Remove the pin retaining fastener from the compression link to number 4 arm pivot pin. Use a soft metal drift to remove the pin.
- 50 Remove the compression link.
- 51 Position the lifting strap from an overhead crane at the center of the number 4 arm.
- 52 Remove the pin retaining fastener from the turntable pivot to number 4 arm pivot pin. Use a slide hammer to remove the pin.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the number 4 arm may become unbalanced and fall when it is disconnected from the turntable pivot.

- 53 Carefully remove the number 4 arm.

## SECONDARY BOOM COMPONENTS

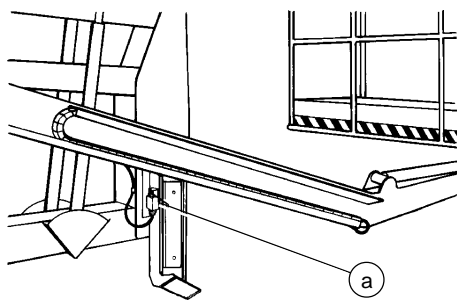
## 4-2 Secondary Boom Lift Cylinders

There are two boom lift cylinders incorporated in the structure of the secondary boom assembly. These cylinders operate in parallel and require hydraulic pressure to extend and retract. Each secondary boom lift cylinder is equipped with a counterbalance valves to prevent movement in the event of a hydraulic line failure. A 1200 psi (83 bar) relief valve for the down function is located on the boom function manifold.

### How to Remove the Secondary Lift Cylinders

**⚠ WARNING** This procedure requires specific repair skills, lifting equipment 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.

- 1 Lower the secondary boom to full rest, then raise the primary boom just above the drive limit switch.



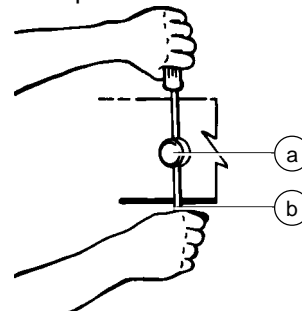
a drive limit switch

- 2 Disconnect and plug the hydraulic hose and steel lines for each secondary 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.

- 3 Remove the pin retainers from each secondary lift cylinder rod-end pivot pin.
- 4 Place a rod through the rod-end pivot pin and twist to remove the pin.



a pivot pin  
b 10 to 12 inch (30cm) rod

- 5 Loosen, but do not remove, the counterbalance valve to fully retract the cylinder.

### NOTICE

The counterbalance valve is pre-set from the factory. Do not adjust this valve.

- 6 Remove the pin retainer from the pivot pins at the barrel-ends of each secondary lift cylinder.
- 7 Place a rod through each barrel-end pivot pin and twist to remove the pins. Remove the secondary lift cylinders from the machine.

### ⚠ WARNING

Crushing hazard. The secondary lift cylinders will fall when the barrel-end pivot pins are removed if they are not properly supported.

### NOTICE

Prior to removing the secondary lift cylinder, mark the location of the hydraulic fitting with a special internal orifice. Be sure to install the fitting into the same location during re-assembly.

# Turntable Covers

## 5-1

### 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.

**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 fasteners from the cover hinge pins.
- 5 Raise the cover slightly to relieve the pressure on the cover hinge pins.
- 6 Remove the cover hinge pins.
- 7 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** Some adjustment may be necessary when a new cover is installed.

# Deutz Engine F3L 1011

## 6-1 RPM Adjustment

Refer to Maintenance Procedures, B-12,  
*Check and Adjust the Engine RPM.*

## 6-2 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

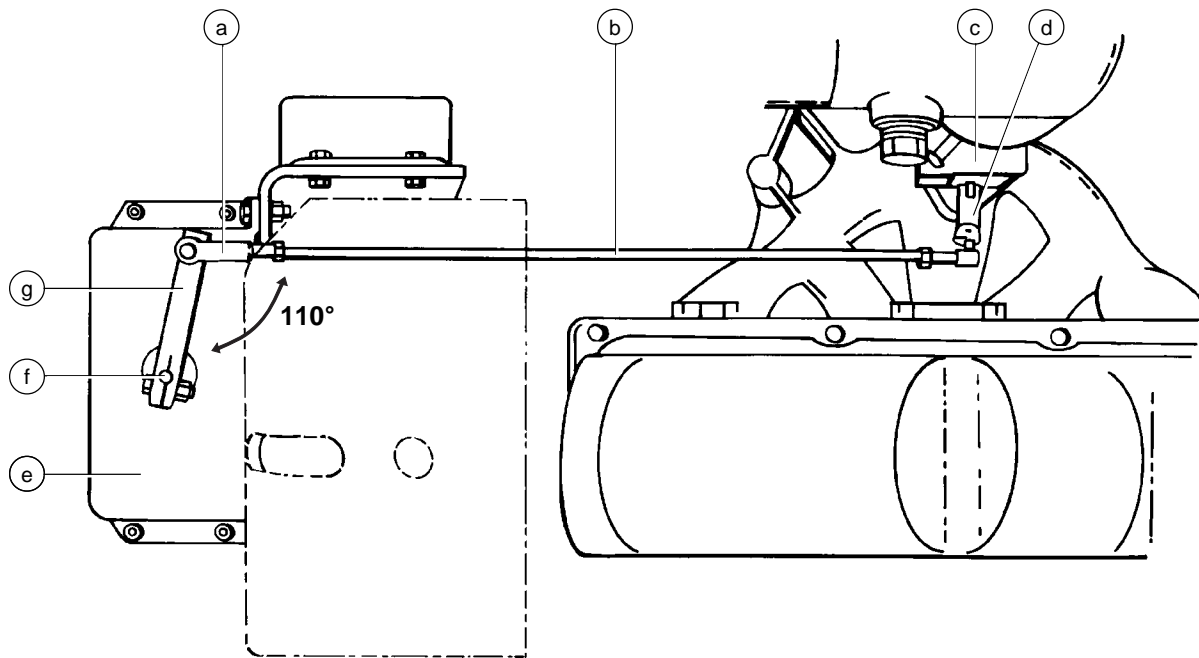
- 1 Install the flex plate onto the flywheel with the flat side of the spline against the flywheel. Torque the flex plate mounting bolts to 34 ft-lbs (46 Nm).
- 2 Install the coupler onto the pump shaft with the set screw toward the pump. Leave a  $\frac{3}{16}$  inch (4.7 mm) gap between the coupler and pump end plate.

- 3 Apply Loctite® removable thread sealant to the coupler set screw. Torque the set screw to 45 ft-lbs (61 Nm).

**CAUTION** Component damage hazard. Do not force the drive pump during installation or the flex plate teeth may become damaged.

- 4 Assemble the engine and torque the pump mounting plate to 34 ft-lbs (46 Nm).

# Ford LSG 423 Engine



## 7-1 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 110 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 110 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.

#### Governor Actuator and Linkage

- a clevis yoke
- b linkage rod
- c carburetor
- d throttle plate shaft
- e governor actuator
- f actuator shaft
- g actuator arm

## FORD LSG 423 ENGINE

- 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** If the throttle linkage is improperly adjusted and allowed to reach full throttle, the engine will over-rev and cause component damage.

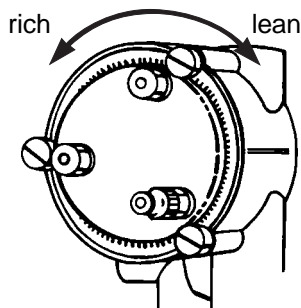
## 7-2 Choke Adjustments

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

This choke functions in both gasoline and propane 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 propane fueled operation.



## 7-3 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.

## 7-4 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.

## 7-5 RPM Adjustment

See the scheduled maintenance procedure B-13, *Check and Adjust the Engine RPM*.

## FORD LSG 423 ENGINE

## 7-6 Flex Plate

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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 and remove the hose between the carburetor venturi and the air cleaner.
- 2 Disconnect and remove the muffler support bracket.
- 3 Disconnect the linkage from the governor, then remove the governor linkage from the carburetor. Do not alter the length of the linkage.
- 4 Disconnect the wiring plug at the electronic displacement controller (EDC), located on the drive pump.
- 5 Remove the mounting fasteners from the regulator mounting bracket, then pull the bracket up past the bell housing. Secure the bracket before continuing.
- 6 Support the drive pump with an appropriate lifting device. Then remove all of the pump mounting plate to engine bell housing bolts.
- 7 Carefully pull the pump away from the engine and secure it from moving.
- 8 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 1/32 inch (0.031 mm) gap between the coupler and pump end plate.
- 3 Apply removable Loctite® thread sealant to the coupler set screw. Torque the set screw to 45 ft-lbs (61 Nm).

**CAUTION** Component damage hazard. Do not force the drive pump during re-installation or the flex plate teeth may become damaged.



## FORD LSG 423 ENGINE

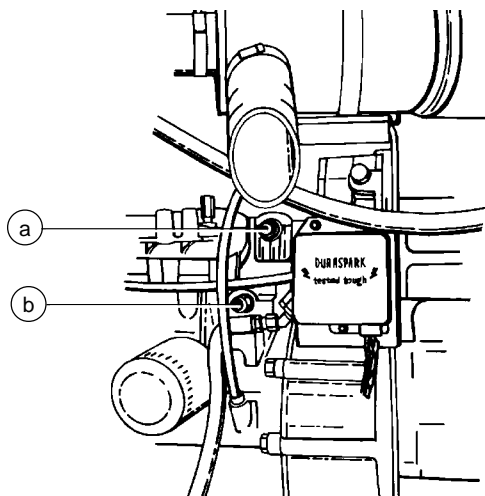
## 7-7 Water Temperature and Oil Pressure Switches

The water temperature switch is a normally open switch that closes at approximately 230° F (112° C). When this switch closes, the engine is shut off to prevent damage and will not restart until the temperature drops below the switch point. An over-temperature indicator light at the ground and platform controls should turn on when the switch closes.

**CAUTION** Component damage hazard. Do not crank the engine with the over-temperature on.

The oil pressure switch is a normally closed switch that opens at approximately 3 to 5 psi (0.21 to 0.34 bar). If the oil pressure drops below the switch point, the switch closes and shuts off the engine. A low oil pressure indicator light at the ground controls should turn on when the switch closes.

**CAUTION** Component damage hazard. Do not start or continue to run the engine with the low oil pressure light on.



a oil pressure switch  
b water temperature switch

## How to Remove the Water Temperature and Oil Pressure Switches

Perform this procedure with the engine off.

- 1 Remove the 3 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access both switches.
- 2 Disconnect the wiring from the desired switch.
- 3 Remove the switch from the engine block, and then install the new switch. Do not over tighten.

**CAUTION** Burn hazard. Contact with hot engine fluids or components may cause severe burns

**NOTICE** Always use pipe thread sealant when installing a switch.

### Water temperature switch specifications

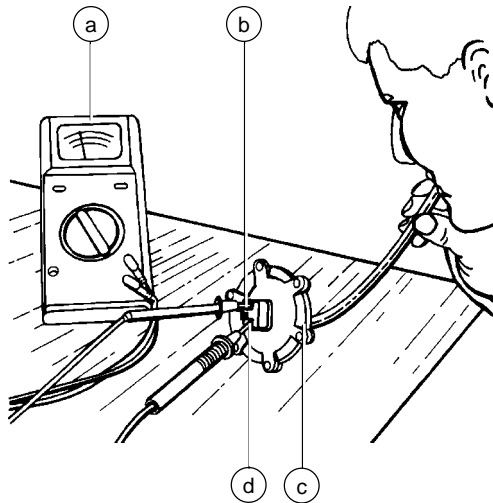
Torque	8-18 ft-lbs 11-24 Nm
Hex size	13/16 inch
Temperature switch point (C)	230° F (112° C)

### Oil pressure switch

Torque	8-18 ft-lbs 11-24 Nm
Hex size	1-1/16 inch
Oil pressure switch point	3-5 psi 0.21-0.34 bar

## 7-8 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 vacuum switch terminals to ground.

# Ground Controls

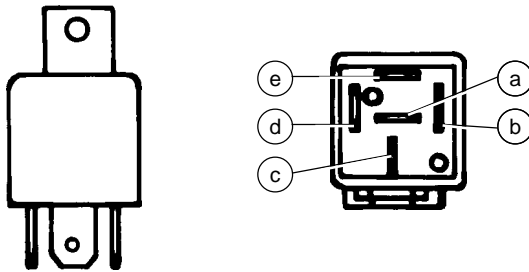
## 8-1 Control Relays

Relays used for single function switching are single pole double throw (SPDT) relays.

### How to Test a Single Pole Double Throw Relay

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

- 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 to 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 87a to 87 & 30	no continuity (infinite Ω)
terminal 87 to 30	continuity (zero Ω)

## GROUND CONTROLS

## 8-2 Toggle Switches

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See 1-4, *Toggle Switches*.

## 8-3 Wago® Components

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### How to Remove a Wago® Component

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

**NOTICE** A small standard screw driver is provided and should be used when removing a Wago® component. This screwdriver is located in the instruction 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.

## 8-4 Resistors

---

### How to Test the Resistors

Two resistors are used to maintain proper control of boom function speeds. A 10 ohm resistor reduces voltage to all the boom function switches. A 15 ohm resistor parallels the 10 ohm resistor to reduce the voltage to the turntable rotate switch.

**NOTICE** Turn the key switch to the *off* position and remove the key.

- 1 Disconnect one of the resistor wires from the resistor or the opposite end terminal.
- 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.

GROUND CONTROLS

### 8-5 Power Relay

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

#### How to Test the Power Relay

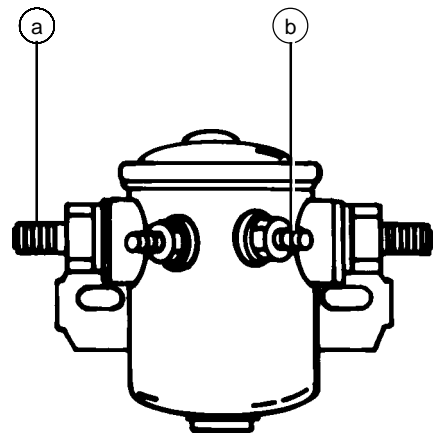
**⚠WARNING** Electrocutation hazard. Disconnect the ground cable from the battery before performing this procedure.

- 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 ground 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 terminals (large posts)
- b solenoid activate coil terminals (small posts)

# Hydraulic Pumps

## 9-1 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** Electrocutation 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).

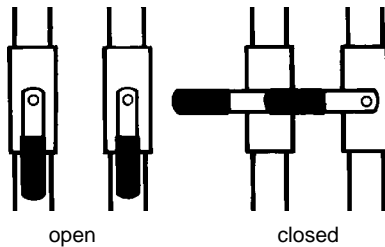
**CAUTION** Component damage hazard. Hydraulic pressure in excess of 3000 psi (206 bar) will cause damage to the machine.

- ⊙ 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.

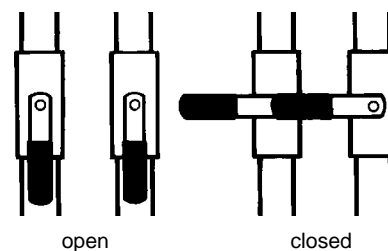
## 9-2 Drive Hydraulic Pump

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).



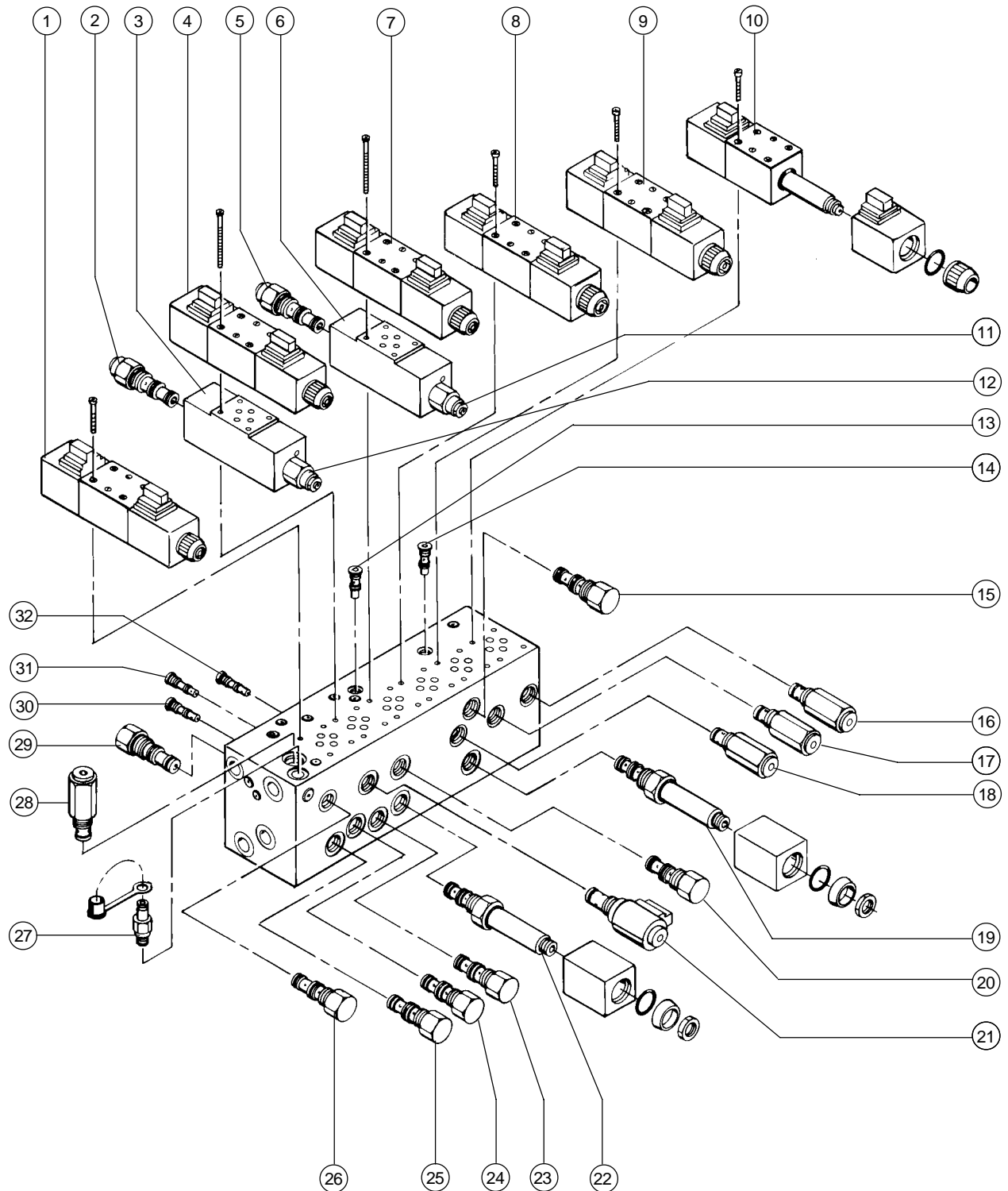
# Function Manifold

## 10-1

### Function Manifold Components

Index		Schematic		
No.	Description	Item	Function	Torque
1	3 position 4 way D01 valve .....	N .....	Platform rotate .....	30-35 in-lbs / 3-4 Nm
2	Counterbalance valve .....	B .....	Platform level up .....	35-40 ft-lbs / 47-54 Nm
3	Sandwich valve manifold .....	A .....	Platform level counterbalance valves	
4	3 position 4 way D01 valve .....	O .....	Platform level .....	30-35 in-lbs / 3-4 Nm
5	Counterbalance valve .....	BB .....	Turntable rotate right .....	35-40 ft-lbs / 47-54 Nm
6	Sandwich valve manifold .....	AAA .....	Turntable rotate counterbalance valves	
7	3 position 4 way D01 valve .....	P .....	Turntable rotate .....	30-35 in-lbs / 3-4 Nm
8	3 position 4 way D01 valve .....	Q .....	Secondary boom up/down .....	30-35 in-lbs / 3-4 Nm
9	3 position 4 way D01 valve .....	R .....	Primary boom up/down .....	30-35 in-lbs / 3-4 Nm
10	3 position 4 way D01 valve .....	S .....	Primary boom extend/retract .....	30-35 in-lbs / 3-4 Nm
11	Counterbalance valve .....	CC .....	Turntable rotate left .....	35-40 ft-lbs / 47-54 Nm
12	Counterbalance valve .....	C .....	Platform level down .....	35-40 ft-lbs / 47-54 Nm
13	Check valve .....	K .....	Turntable rotate - differential sensing .....	11-13 ft-lbs / 15-18 Nm
14	Check valve .....	M .....	Primary and secondary boom - differential sensing .....	11-13 ft-lbs / 15-18 Nm
15	Flow regulator valve .....	Y .....	Primary boom/secondary boom .....	10-12 ft-lbs / 14-16 Nm
16	Relief valve, 1200 psi (83 bar) .....	D .....	Primary boom extend .....	25-30 ft-lbs / 34-41 Nm
17	Relief valve, 1200 psi (83 bar) .....	F .....	Primary boom down .....	25-30 ft-lbs / 34-41 Nm
18	Relief valve, 1200 psi (83 bar) .....	E .....	Secondary boom down .....	25-30 ft-lbs / 34-41 Nm
19	Proportional solenoid valve .....	AA .....	Primary boom/secondary boom .....	10-12 ft-lbs / 14-16 Nm
20	Flow regulator valve .....	X .....	Turntable rotate/ Primary boom extend/retract .....	10-12 ft-lbs / 14-16 Nm
21	Normally closed poppet valve .....	J .....	Platform level .....	25-30 ft-lbs / 34-41 Nm
22	Proportional solenoid valve .....	Z .....	Turntable rotate/ Primary boom extend/retract .....	10-12 ft-lbs / 14-16 Nm
23	Flow regulator valve .....	V .....	Platform level .....	10-12 ft-lbs / 14-16 Nm
24	Differential sensing valve .....	AC .....	All functions .....	10-12 ft-lbs / 14-16 Nm
25	Flow regulator valve .....	U .....	Platform rotate/jib boom .....	10-12 ft-lbs / 14-16 Nm
26	Flow regulator valve .....	W .....	Differential sensing circuit .....	10-12 ft-lbs / 14-16 Nm
27	Diagnostic fitting .....		Testing	
28	Relief valve, 2200 psi (152 bar) .....	AB .....	System relief .....	35-40 ft-lbs / 47-54 Nm
29	Priority flow regulator valve .....	T .....	Steering .....	10-12 ft-lbs / 14-16 Nm
30	Check valve .....	I .....	Platform rotate right - differential sensing .....	11-13 ft-lbs / 15-18 Nm
31	Check valve .....	H .....	Platform rotate left - differential sensing .....	11-13 ft-lbs / 15-18 Nm
32	Check valve .....	L .....	Platform level - differential sensing ..	11-13 ft-lbs / 15-18 Nm

FUNCTION MANIFOLD



## FUNCTION 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
SAE No. 10	9/16	55 ft-lbs / 75 Nm
SAE No. 12	5/8	75 ft-lbs / 102 Nm

## 10-2 Valve Adjustments - Function Manifold

**How to Adjust the Main Relief Valve**

- 1 Connect a 0 - 3000 psi (0 to 206 bar) pressure gauge to the diagnostic nipple on the function manifold.
- 2 Start the engine from the ground controls and then completely retract the primary boom.
- 3 Hold the retract switch and observe the pressure reading on the pressure gauge.
- 4 Turn the engine off. Hold the relief valve and remove the cap (item 28).
- 5 Adjust the internal hex socket. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Then reinstall the relief valve cap.

**WARNING** Tip-over hazard. Do not adjust the relief valves higher than recommended. They are set to prevent a tip-over or damage to lift linkage.

- 6 Restart the engine. Hold the retract switch and recheck the valve pressure.

**Specifications**

Main relief valve pressure	2200 psi / 152 bar
----------------------------	--------------------

**How to Adjust the Primary or Secondary Boom Down Relief Valve**

- 1 Connect a 0 - 3000 psi (0 to 206 bar) pressure gauge to the diagnostic nipple on the function manifold.
- 2 Start the engine from the ground controls and then fully lower the boom to be adjusted.
- 3 Hold the primary or secondary boom up/down switch in the down position and observe the pressure reading on the pressure gauge.
- 4 Turn the engine off. Hold the relief valve and remove the cap (item 17 for primary boom, item 18 for secondary boom).
- 5 Adjust the internal hex socket. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Then reinstall the relief valve cap.

**WARNING** Tip-over hazard. Do not adjust the relief valves higher than recommended. They are set to prevent a tip-over or damage to lift linkage.

- 6 Restart the engine. Hold the primary or secondary boom up/down switch in the down position and recheck the valve pressure.

**Specifications**

Relief valve pressure	1200 psi / 83 bar
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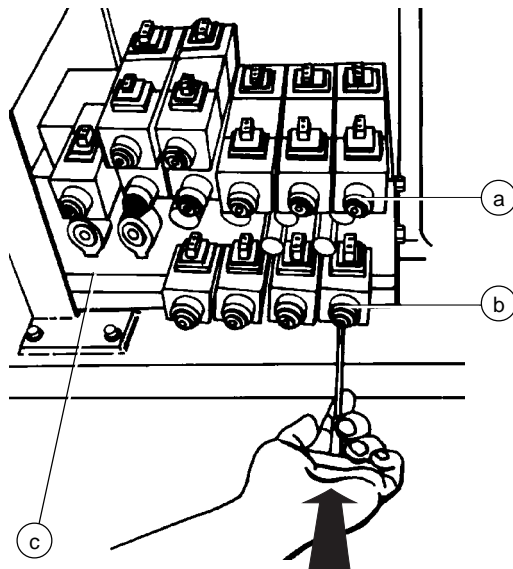
FUNCTION MANIFOLD

### How to Override a Valve

A hydraulic valve may need to be manually overridden to troubleshoot a malfunction. Each proportional boom function uses 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 and level functions use a three position valve and a two position poppet valve. The three position valves and the proportional valves can be manually overridden. To identify the manifold valves see 10-1 *Function Manifold Components* in this section.

- 1 Push the button on the end of the valve in ¼ inch (6 mm).
- 2 Move the ground control function switch for the function being overridden to operate function.

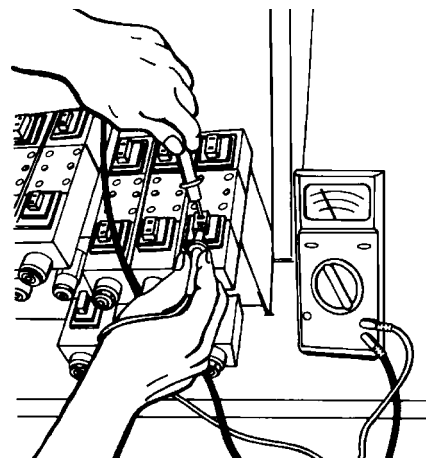
**AWARNING** Collision Hazard. Impact with moving boom components may cause death or serious injury. Use extreme caution when overriding a boom function and know the direction of intended travel.



- a directional valves
- b proportional valves
- c function manifold

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

- 1 Turn the keyswitch 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.



#### Specifications

Valve	Resistance
Proportional solenoid valve	5Ω
3 pos 4 way directional valve	4.5Ω
Normally closed poppet valve	7Ω

# Fuel and Hydraulic Tanks

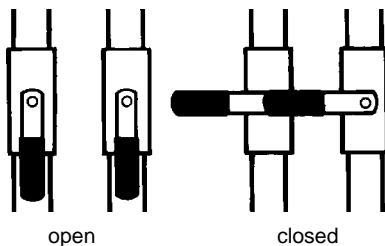
## 11-1 Hydraulic Tank

The primary functions of the hydraulic tank are to cool, clean and deaerate the hydraulic fluid during operation. This tank has a 25 gallon (94.5 liters) capacity and an oil level gauge with temperature indicator. It utilizes internal suction strainers for the pump supply suction lines and has an external return line filter.

### How to Remove the Hydraulic Tank

**CAUTION** 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.

- 1 Raise the primary boom until it is horizontal to access the anchor hook.
- 2 Close the two hydraulic tank valves located at the main pump.



- 3 Completely drain the oil from the tank by removing the drain plug located in the bottom front of tank.

**CAUTION** Burn hazard. Contact with hot oil may cause severe burns.

- 4 Disconnect the hydraulic hoses from the tank.
- 5 Remove the tank anchor hook from the back of the tank.

- 6 Remove the mounting fasteners from the bottom of the tank.
- 7 Use an appropriate lifting device to remove the tank from the machine.

**NOTICE** Always use pipe thread sealant when re-installing the drain plug.

**NOTICE** Use only Dexron II equivalent hydraulic fluid.

**CAUTION** Be sure to open the two hydraulic tank valves and prime the pump after installing the pump.

### How to Prime the Pump

- 1 **Gasoline/LPG models:** Disconnect the ignition coil wire and isolate it from ground.  
**Diesel models:** Disconnect the wiring to the injection pump fuel-on solenoid
- 2 Crank the engine with the starter motor for 15 seconds.

## FUEL AND HYDRAULIC TANKS

## 11-2 Fuel Tank

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### How to Remove the Fuel Tank

**⚠ DANGER** 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 Raise the secondary boom enough to access the back of the fuel tank.
- 2 Turn the manual fuel shutoff valve to the closed position.
- 3 **Gasoline/LPG models:** Disconnect the electrical collectors from the fuel shutoff solenoid. Disconnect, drain and plug the fuel hose.  
**Diesel models:** Disconnect, drain and plug the supply and return fuel hoses. Cap the fuel return fitting on the fuel tank.
- 4 Remove the tank anchor hook from the back of the tank.
- 5 Remove the mounting fasteners from the bottom of the tank.
- 6 Use an appropriate lifting device to remove the tank from the machine.

**NOTICE** Clean the fuel tank and inspect for rust and corrosion before it is installed.

# Turntable Rotation Components

## 12-1 Rotation Hydraulic Motor

The rotation hydraulic motor is the only serviceable component of the turntable rotation assembly. The worm gear may not be removed from the housing. In order to remove the housing, the turntable has to be removed.

### How to Remove the Turntable Rotation Motor

- 1 Remove the hydraulic hoses attached to the turntable rotation 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 turntable rotation motor mounting bolts, then remove the motor.

**NOTICE** Do not allow the turntable to rotate until the hydraulic motor is installed.

## 12-2 Rotation Bearing and Worm Drive

### How to Remove the Rotation Bearing or Worm Drive

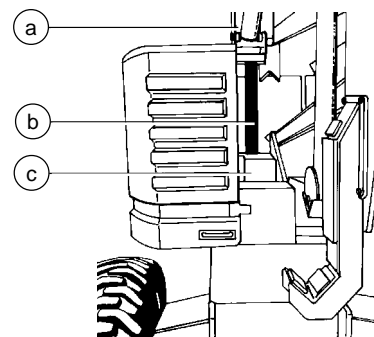
The turntable and all components above it must be removed prior to removing the rotation bearing or worm drive.

**WARNING** This procedure requires specific repair skills, lifting equipment 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 required.

**NOTICE** Be sure that the chassis is level.

- 1 Remove the platform. See 2-1, *How to Remove the Platform*.
- 2 Remove the primary boom. See 3-2, *How to Remove the Primary Boom*.

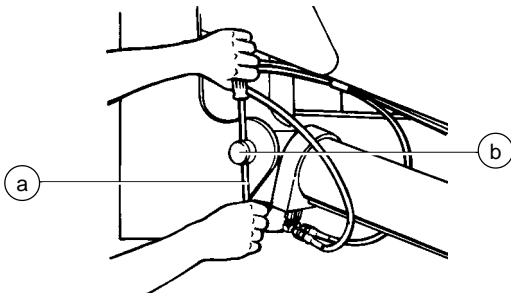
**WARNING** Crushing hazard. Do not remove the 4x4x31 inch (78 cm) support block installed during primary boom removal.



- a upper mid-pivot
- b 4x4x31 inch block
- c counterweight

TURNTABLE ROTATION COMPONENTS

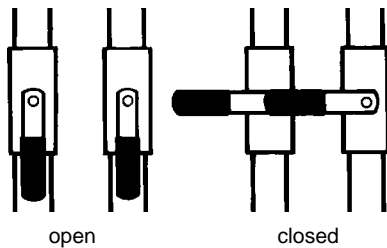
- 3 Use an overhead crane to attach a lifting strap to the rod-end of the primary lift cylinder. Then raise the primary lift cylinder with the crane, to a vertical position.
- 4 Remove the pin retainer from the pivot pin at the barrel-end of the primary lift cylinder.
- 5 Place a rod through the barrel-end pivot pin and twist to remove the pin. Remove the primary lift cylinder from the machine.



a 10 to 12 inch (30 cm) rod  
b pivot pin

**AWARNING** Crushing hazard. The primary lift cylinder will fall when the barrel-end pivot pin is removed if it is not properly supported.

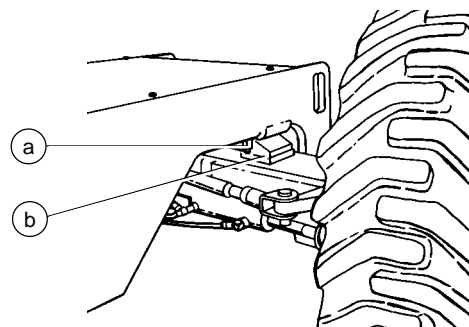
- 6 Raise the secondary boom. Remove the block from the turntable counterweight and lower the secondary boom to the stowed position.
- 7 Close the two hydraulic tank valves located at the main pump.



- 8 Disconnect the three 3/4 inch hydraulic hoses from the main pump 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.

- 9 Disconnect the same three 3/4 inch hydraulic hoses from the drive traction manifold and plug them. Pull these hoses up through the turntable and remove them from the machine.
- 10 Disconnect the "in" and "return" hydraulic hoses from the steer/oscillate manifold and plug them. Pull these hoses up through the turntable.
- 11 Disconnect the hydraulic hoses from the turntable rotation motor and plug them. Pull these hoses up through the turntable.
- 12 Label and then disconnect all the wiring from the traction manifold and the steer/oscillate manifold.
- 13 Disconnect and remove the oscillating axle limit switches from the oscillation cylinder.

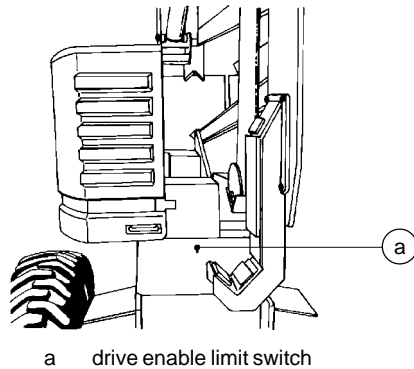


Oscillating axle limit switch  
a limit switch  
b oscillate lock-out wedge



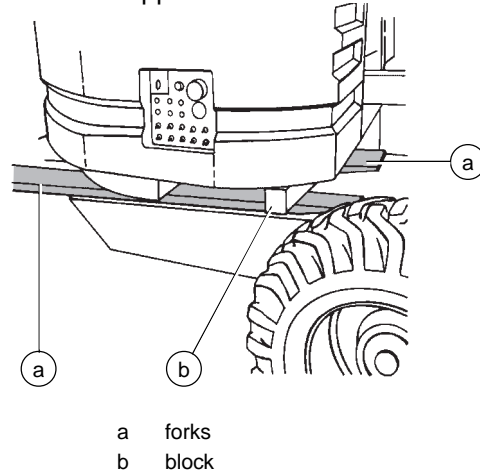
## TURNTABLE ROTATION COMPONENTS

- 14 Disconnect and remove the drive enable limit switch.



- 15 Pull the wiring harness along with the limit switches up through the turntable.
- 16 Remove the turntable end cover.
- 17 Loosen the lug nuts on both steer tires. Do not remove them.
- 18 Center a lifting jack under the steering axle. Lift the machine until the tires are just off the ground.
- 19 Support the chassis on blocks, then remove both steer tires and wheel assemblies to improve access when removing the turntable.
- 20 Prepare a forklift with a minimum rating of 18,000 pounds (8165 kg) by spreading the forks to an inside width of 3 feet (0.9 m).
- 21 Position the forklift at the counterweight end of the turntable. Center the forks underneath the turntable and above the chassis. Do not lift.

- 22 Place a 5 inch (13cm) tall block near the end of the forks for support.



- 23 Raise the forks up against the turntable. Do not lift. Be sure that the support block is still in its proper location.
- 24 Place a safety strap around the upper mid-pivot, then secure the strap to the forklift carriage.
- 25 Remove the turntable mounting bolts.
- 26 Carefully lift the turntable off the chassis. Set the turntable on blocks for support.
- 27 Place reference marks on the chassis to note the position of the worm drive housing for proper re-alignment during re-installation.
- 28 Remove the fasteners from the worm drive, then remove the worm drive.
- 29 Center the forklift forks under the chassis counterweight for support.
- 30 Loosen the counterweight positioning bolt.
- 31 Remove the fasteners from the counterweight.
- 32 Carefully lower the counterweight from the machine.
- 33 Remove the fasteners from the underside of the rotate bearing, then remove the rotate bearing.

TURNTABLE ROTATION COMPONENTS

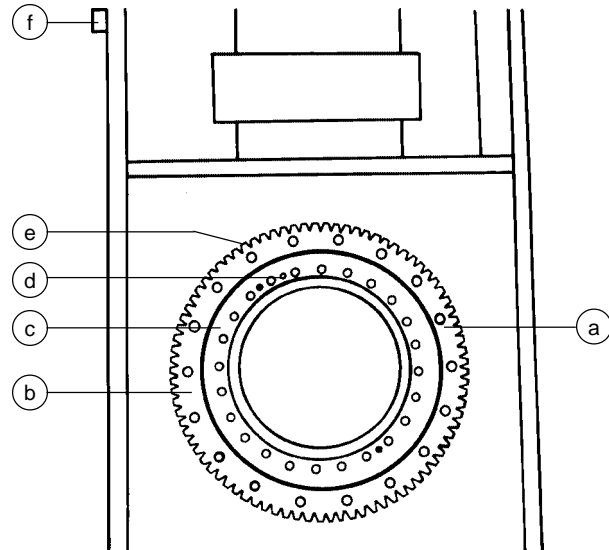
### How to Install the Rotation Bearing and Worm Drive

The rotation bearing is a structural component. It attaches the chassis to the turntable. The turntable is bolted to the inner race, with the worm gear housing sandwiched in-between. This housing has to be exactly positioned to provide the correct gear lash between the worm gear and the ring gear. The outside bearing race is bolted to the chassis from the underside.

**WARNING** This procedure requires specific repair skills, lifting equipment 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 required.

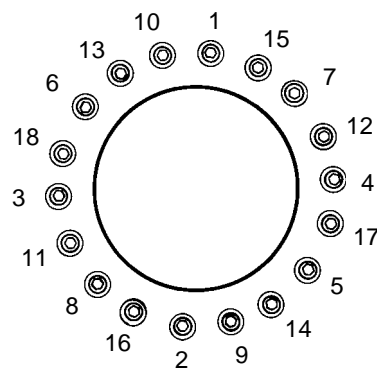
**NOTICE** If a repair requires that the turntable be removed from the chassis, installing a new rotation bearing is recommended. Consider the service life of the rotation bearing before installing a used bearing.

- 1 Position the rotation bearing on the chassis.
- 2 Locate the "red" mark on the outside bearing race. Align the mark with the rotation stop block on the chassis.



- a "O" mark
- b outer bearing
- c inner bearing
- d dowel
- e red mark
- f rotation stop block

- 3 Install the mounting fasteners from underneath the chassis. Use a torque wrench to tighten the fasteners in sequence to specifications.



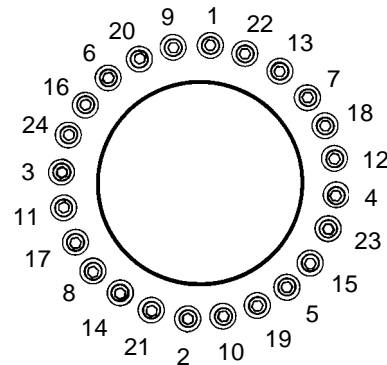
**Specifications - torque**

First rotation	95 ft-lbs 129 Nm
Second rotation	190 ft-lbs 258 Nm

## TURNABLE ROTATION COMPONENTS

- 4 Locate the "0" mark stamped in the outside bearing and the dowel on the inside bearing.
- 5 Position the inside bearing dowel 90 degrees counterclockwise from the "0" mark on the outside bearing.
- 6 Install a grease fitting on the inside bearing and apply grease until it comes out of the inner seal.
- 7 Apply grease to 10 gear teeth on each side of the "0" mark on the outside bearing.
- 8 Center the worm drive over the "0" mark on the outside bearing and install the two 5/16 inch fasteners. Hand tighten the bolts.
- 9 Push the worm drive towards the rotation bearing to be as close as possible.
- 10 Position a dial indicator to measure the worm drive in relation to the ring gear. Pull the worm drive away from the rotate bearing 0.035 inches (0.889mm)  $\pm$ 0.020 inches (0.508mm).
- 11 Tighten the two 5/16 fasteners. Observe the dial indicator to be sure that the worm drive does not move.
- 12 Locate the 1 inch hex head on the end of the worm gear housing. Turn the hex head to rotate the worm drive until it is positioned within the original reference marks on the chassis.
- 13 Position the turntable so that the flat side of the turntable is parallel with the worm drive gear.
- 14 While lowering the turntable onto the chassis, be sure that the milled area on the bottom surface of the turntable does not contact the top of the worm drive gear housing. If it is, remove the turntable and grind the worm drive gear housing until clearance is established.

- 15 Install the turntable mounting fasteners. Use a torque wrench to tighten the fasteners in sequence to specifications.




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**Specifications - torque**


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First rotation	95 ft-lbs 129 Nm
Second rotation	190 ft-lb 258 Nm

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**NOTICE**

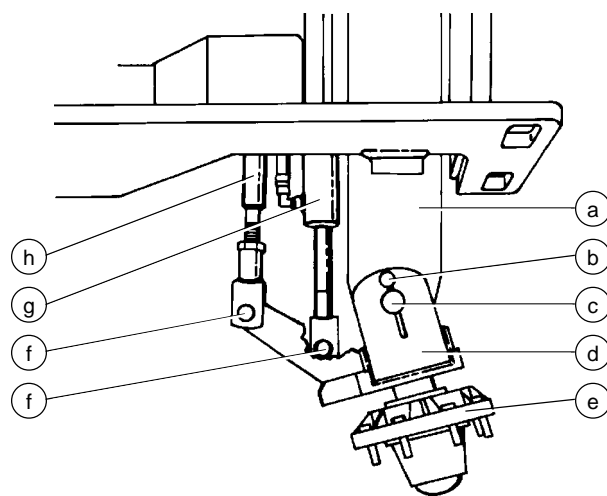
After re-assembly, the turntable should swing smoothly without jerking or grinding.

# 2WD Steering Axle Components

## 13-1 Yoke and Hub

### How to Remove the Yoke/Hub Assembly

- 1 Remove the cotter pin, and the clevis pin from both the steering cylinder and tie rod weldment.



- a axle
- b pin retainer
- c king pin
- d yoke
- e hub
- f cotter and clevis pin
- g steering cylinder
- h tie rod

- 2 Break loose the wheel lug nuts. Do not remove them.
- 3 Block the non-steering wheels and place a lifting jack under the steering axle.
- 4 Raise the machine and place blocks under the chassis.
- 5 Remove the lug nuts, then the tire and wheel assembly.
- 6 Remove the pin retainer attached to the king pin.

- 7 Place a second jack under the yoke/hub assembly.
- 8 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.

**NOTICE** Always use a new cotter pin when re-installing a clevis pin.

### How to Remove the Hub and Bearing

- 1 Loosen the wheel lug nuts. Do not remove them.
- 2 Place a lifting jack under the steering axle.
- 3 Raise the machine and place blocks under the chassis.
- 4 Remove the lug nuts, then the tire and wheel assembly.
- 5 Remove the dust cap, cotter pin and slotted nut.
- 6 Pull the hub from 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.

## 2WD STEERING AXLE COMPONENTS

## How to Install the Hub and Bearing

- 1 Be sure that the bearing is packed with grease.
- 2 Place the large inner bearing into the rear of the hub.
- 3 Press the bearing seal into the hub. Rest the seal on the hub, then press the seal evenly into the hub until it is flush.
- 4 Slide the hub onto the yoke spindle.

**CAUTION** Component damage hazard. Do not apply excessive force or damage to the lip of the seal may result.

- 5 Be sure that the outer bearing is packed with grease, and place it 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 and then re-tighten to 8 foot-pounds (11Nm).
- 9 Install a new cotter pin. Bend the 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 (169Nm).

## 13-2 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 the hydraulic hoses from the steering cylinder 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 cotter pin, then the clevis pin from each end of the steering cylinder.
- 3 Remove the steering cylinder.

**NOTICE** Always use a new cotter pin when re-installing a clevis pin.

## 2WD STEERING AXLE COMPONENTS

### 13-3 Tie Rod

#### How to Remove the Tie Rod Weldment

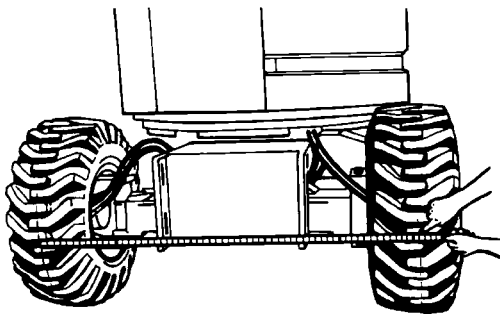
- 1 Remove the cotter pins, then the clevis pins from the ends of the tie rod.
- 2 Remove the tie rod weldment.

**NOTICE** Always use a new cotter pin when re-installing a clevis pin.

#### How to Perform the Tie Rod 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 fully stowed position.

- 1 Measure 15 inches (38 cm) up from the ground on the front and rear of each steer tire and make a reference mark at the center of the tire.
- 2 Measure the distance from the reference points on each tire: Front to front and back to back.



- 3 Center a 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 cotter pin, then remove the clevis 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 half turn on the adjustable end equals a 3/16 inch (5 mm) change in the front to rear measurement.

- 7 Slide the tie rod onto the yoke. Install the clevis pin, then a new cotter pin.
- 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.

#### Specifications

Tie rod adjustment	1/4 inch (0.635 mm) toe-in to 1/4 inch (0.635 mm) toe-out
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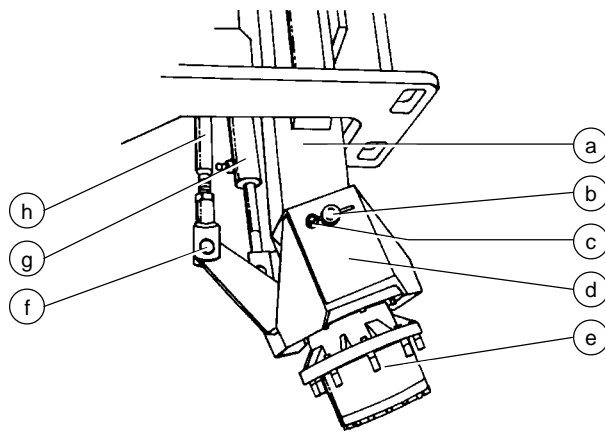
# 4WD Steering Axle Components

## 14-1 Yoke and Hub

### How to Remove the Yoke and Hub

The yoke installation utilizes bushings and a thrust washer that require periodic replacement depending upon the application. The yoke must be removed before the torque hub can be removed. The wheel motor is an integral part of the torque hub.

- 1 Remove the cotter pin, then the clevis pin from both the steering cylinder and the tie rod weldment.



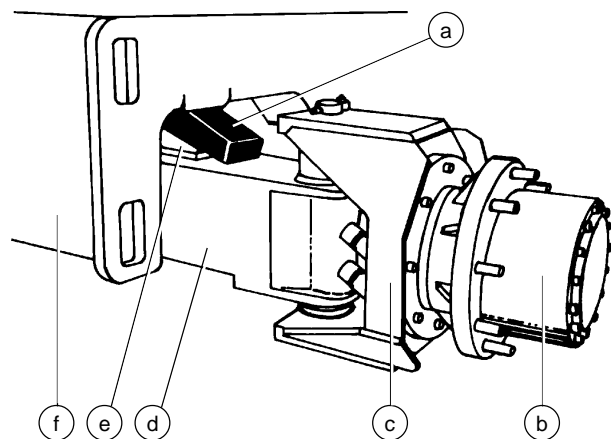
- a axle
- b pin retainer
- c king pin
- d yoke
- e torque hub
- f cotter and clevis pin
- g steering cylinder
- h tie rod

- 2 Disconnect the hydraulic hoses from the wheel motor and plug them. 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 (15 cm) and place blocks under the chassis.
- 6 Remove the lug nuts, then the tire and wheel assembly.
- 7 Remove the pin retainer 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 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 and support it.
- 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.

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**Specifications**

Lug nut torque	125 ft-lbs 169 Nm
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## 14-2 Steering Cylinders

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### How to Remove the Steering Cylinder

This procedure is the same as the 2WD procedure. See repair procedure 13-2, *How to Remove the Steering Cylinder*.

## 14-3 Tie Rod

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### How to Remove the Tie Rod Weldment

This procedure is the same as the 2WD procedure. See repair procedure 13-3, *How to Remove the Tie Rod Weldment*.

### How to Perform the Tie Rod Toe-in Adjustment

This procedure is the same as the 2WD procedure. See repair procedure 13-3, *How to Perform the Tie Rod Toe-in Adjustment*.



# Oscillating Axle Components

## 15-1

### Oscillating Axle Lock-out Cylinder

The oscillating axle lock-out cylinder extends the lock-out wedges between the chassis and the axle when the boom is raised above the drive limit switch. When the lock-out wedges are fully extended, the oscillation lock-out limit switches release and allow the primary boom to continue to raise above the drive limit switch.

### How To Remove The Oscillating Axle Lock-out Cylinder

The oscillating axle lock-out cylinder is held in place by the same pin that retains the axle. Therefore, the axle must be removed as part of this procedure.

**⚠WARNING** This procedure requires specific repair skills, lifting equipment 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.

- 1 Disconnect and plug the oscillating axle lock-out cylinder hydraulic hoses. Disconnect and plug the steer and accumulator hoses from the steer-oscillate manifold to provide clearance for pin removal.

**⚠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 oscillation lock-out limit switches from the oscillating axle lock-out cylinder.
- 3 Block the non-steering wheels, then center a jack under the oscillating axle and lift the machine 6 inches (15 cm).
- 4 Support the raised machine with blocks, then carefully lower the chassis onto the blocks. Leave the jack under the axle to support it. Do not lift.

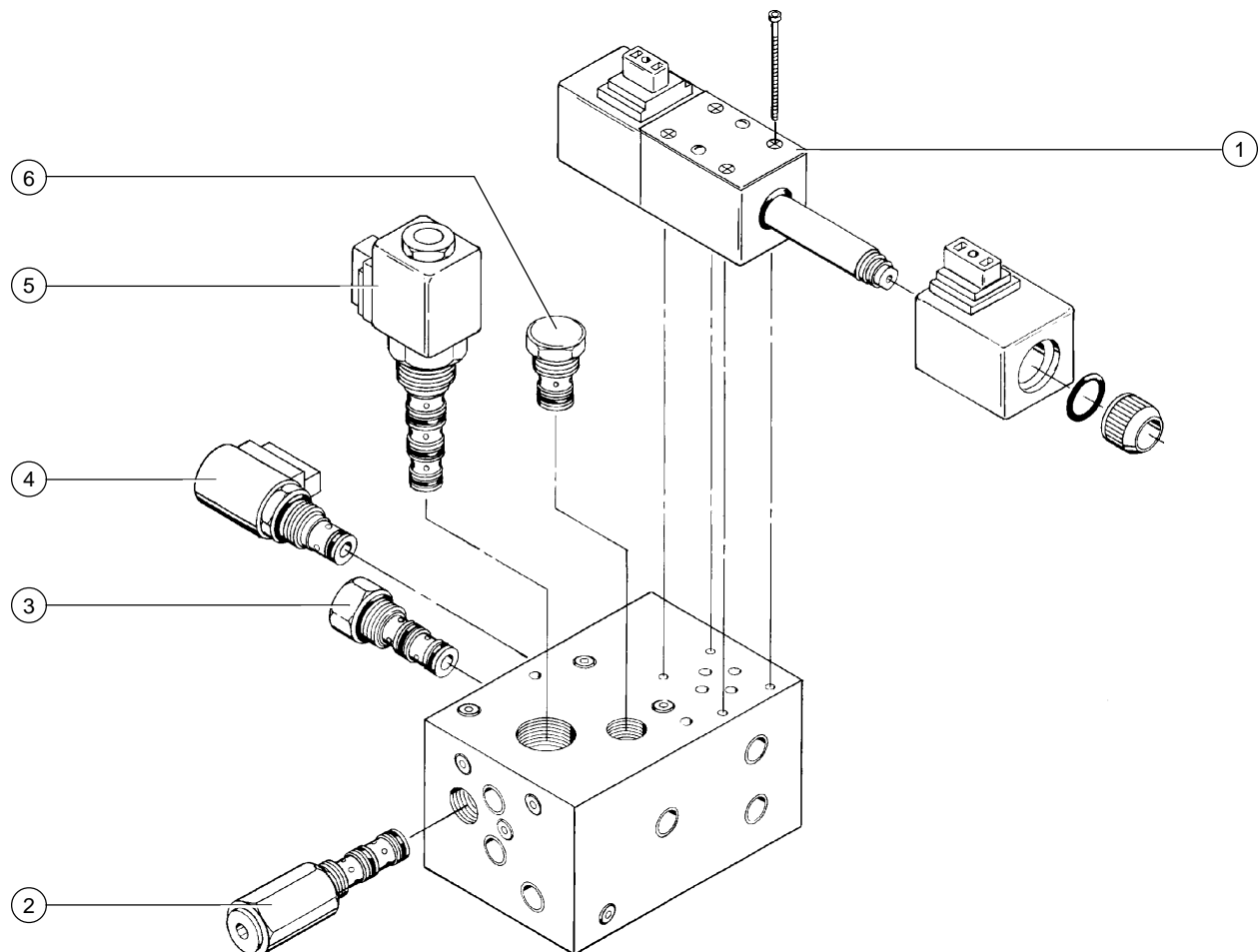
**⚠CAUTION** Crushing hazard. If the jack is not centered, the axle may tip when the pivot pin is removed.

- 5 Remove the pin retainer from the axle pivot pin. Use a soft metal drift to remove the axle pivot pin.
- 6 Remove the oscillate cylinder.

# Steer and Oscillate Manifold

## 16-1 Steer and Oscillate Manifold Components

Index No.	Description	Schematic Item	Function	Torque
1	3 position 4 way DO1 valve	F	Steering	30-35 in-lbs / 3-4 Nm
2	Pilot operated unloader valve, 1900 psi / (131 bar)	C	Sequencing	10-12 ft-lbs / 14-16 Nm
3	Sensing valve	B	Differential sensing	10-12 ft-lbs / 14-16 Nm
4	Normally closed poppet valve	A	Steering dump	25-30 ft-lbs / 34-41 Nm
5	2 position 4 way valve	D	Oscillate	10-12 ft-lbs / 14-16 Nm
6	Check valve	E	Oscillate check	35-40 ft-lbs / 47-54 Nm



## STEER AND OSCILLATE MANIFOLD

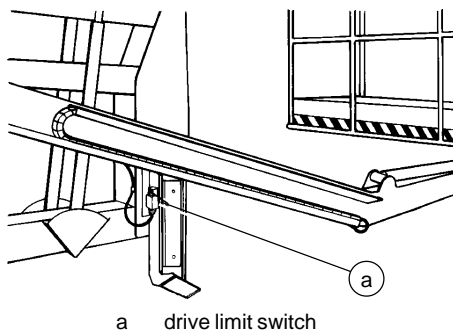
**Plug Torque Specifications**

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
SAE No. 10	9/16	55 ft-lbs / 75 Nm
SAE No. 12	5/8	75 ft-lbs / 102 Nm

**16-2  
Valve Adjustments****How to Adjust the Sequencing  
Unloader 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.

- 1 Start the engine and raise the primary boom above the drive limit switch. Do not lift the primary boom above the secondary boom.



- 2 Connect a 0 to 3000 psi (0 to 206 bar) pressure gauge to the diagnostic nipple on the function manifold.
- 3 Manually hold down the drive limit switch. When the oscillate cylinder fully retracts, the pressure will spike. Note the maximum pressure reading. Do not release the drive limit switch.
- 4 Release the drive limit switch. When the oscillate cylinder fully extends, the pressure will spike. Note the maximum pressure reading.
- 5 Hold the unloader valve and remove the cap (index 2).
- 6 Adjust the internal hex socket by turning it clockwise to increase the pressure or counterclockwise to decrease the pressure. Then reinstall the relief valve cap.
- 7 Manually hold down the drive limit switch and recheck the valve pressure.

**Specifications**

Unloader valve	1900 psi 131 bar
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# Non-steering Axle Components

## 17-1 Drive Motor

**CAUTION** Repairs to the 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. Access on older machines is even more restricted. The brake and motor must be removed together and then separated for repair.

**CAUTION** 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 Slide the drive motor shaft out of the brake and then remove.

**NOTICE** On older machines, the drive motor and brake must be removed together.

## 17-2 Torque Hub

### How to Remove a Drive Torque Hub

The drive motor and brake must be removed in order to access the torque hub mounting bolts.

- 1 Remove the drive motor and brake. See 18-1, *How to Remove a Drive Motor*.
- 2 Loosen the wheel lug nuts. Do not remove them.
- 3 Center a jack under the non-steering axle. Raise the machine and place blocks under the chassis to support it.
- 4 Remove the wheel lug nuts, then the tire and wheel assembly.
- 5 Place a second jack under the torque hub for support.
- 6 Remove the bolts that attach the brake to the hub.
- 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.

### Specifications

Lug nut torque	125 ft-lbs 169 Nm
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# 2WD Drive Manifold

## 18-1

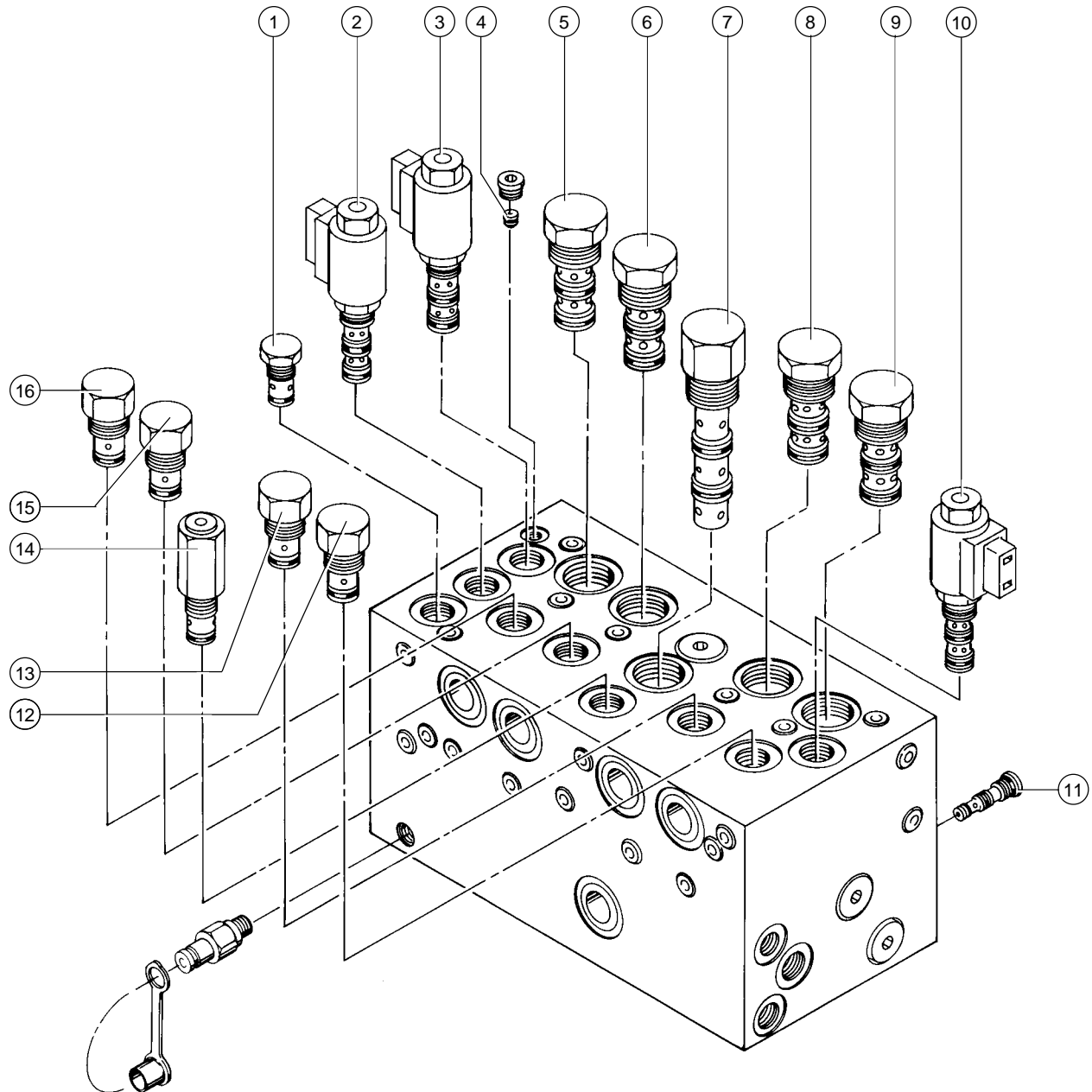
### 2WD Drive Manifold Components

Index No.	Description	Schematic Item	Function	Torque
1	Check valve .....	M .....	Brake check .....	25-30 ft-lbs / 34-41 Nm
2	2 position 3 way valve .....	O .....	Brake release .....	8-10 ft-lbs / 11-14 Nm
3	2 position 3 way valve .....	N .....	2-Speed wheel motors, (energized in high range to destroke the rear motor swash plates .....	8-10 ft-lbs / 11-14 Nm
4	Orifice 0.036 in (0.914mm) .....	P .....	Motor shift / brake release circuit	
5	Pilot to open check valve .....	E .....	Right check in forward .....	85-90 ft-lbs / 115-122 Nm
6	Pilot to open check valve .....	G .....	Right check in reverse .....	85-90 ft-lbs / 115-122 Nm
7	Shuttle valve 3 position 3 way ....	K .....	Low pressure flow path for brake release and 2-speed motor shift .....	15-18 ft-lbs / 20-24 Nm
8	Pilot to open check valve .....	D .....	Left check in reverse .....	85-90 ft-lbs / 115-122 Nm
9	Pilot to open check valve .....	B .....	Left check in forward .....	85-90 ft-lbs / 115-122 Nm
10	2 position 3 way valve .....	J .....	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 ....	I .....	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) .....	L .....	Charge pressure .....	10-12 ft-lbs / 14-16 Nm
15	Flow regulator valve .....	H .....	Right flow control in reverse .	10-12 ft-lbs / 14-16 Nm
16	Flow regulator valve .....	F .....	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
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

## 18-2 Valve Adjustments

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### How to Adjust the Charge Pressure Relief Valve

- 1 Connect a 0 to 600 psi (0 to 41 bar) pressure gauge in between one of the medium pressure hydraulic hoses and the medium pressure hydraulic oil filter.

**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 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 reinstall 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.

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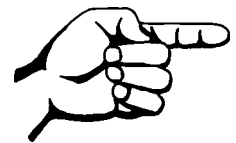
#### Specifications

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Relief valve	320 psi / 22 bar
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2WD DRIVE MANIFOLD



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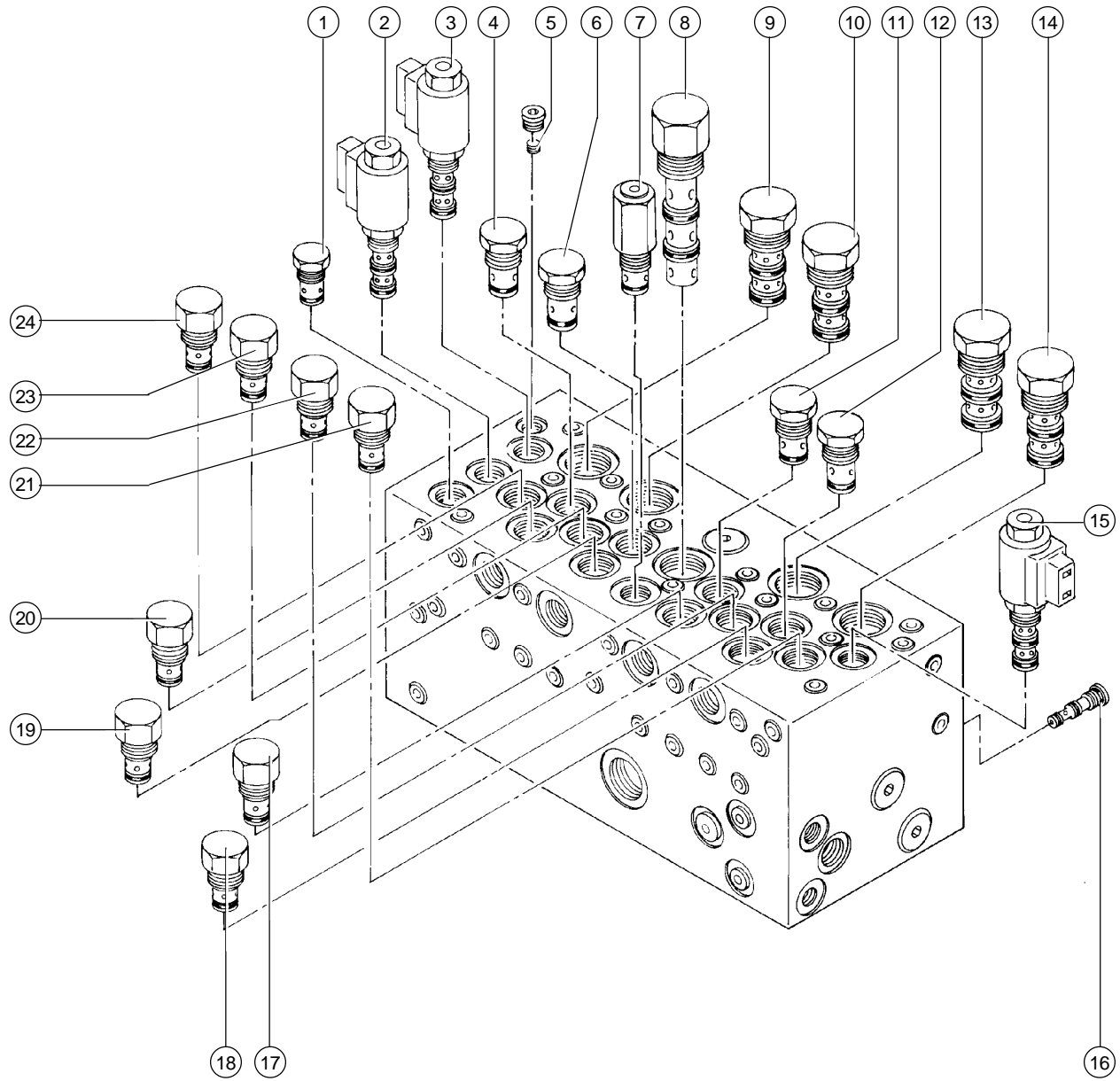
# 4WD Drive Manifold

## 19-1

### 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 .....	2-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 (0.635 mm) ...	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 2 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
SAE No. 10	9/16	55 ft-lbs / 75 Nm
SAE No. 12	5/8	75 ft-lbs / 102 Nm

## 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 in between one of the medium pressure hydraulic hoses and the medium pressure hydraulic oil filter.

#### **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 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.
- 5 Adjust the internal hex socket. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Then reinstall 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.

#### Specifications

Relief valve	320 psi / 22 bar
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