Genie
A TEREX BRAND

Service and Repair Manual

	Serial Number Range
S®-40 XC™	from S40XCH-101 to S40XCH-3290
S®-40 HF	
S®-40 TraX™	
S®-45 XC™	from S45XCH-104 to S45XCH-3291
S®-45 HF	from S45XCD-167
S®-45 TraX™	

This manual includes:
Repair procedures
Fault Codes
Electrical and
Hydraulic Schematics

For detailed maintenance procedures, refer to the appropriate Maintenance Manual for your machine.

Original Instructions
Part No. 1286829GT
Rev C
February 2023

Introduction

Important

Read, understand and obey the safety rules and operating instructions in the appropriate Operator's Manual on your machine before attempting any procedure.

This manual provides troubleshooting and repair procedures for qualified service professionals.

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

Compliance

Machine Classification

Group B/Type 3 as defined by ISO 16368

Machine Design Life

Unrestricted with proper operation, inspection and scheduled maintenance.

Technical Publications

Genie 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 all other manuals.

Contact Us:

Internet: www.genielift.com
E-mail: awp.techpub@terex.com

Find a Manual for this Model

Go to http://www.genielift.com

Use the links to locate Service Manuals, Maintenance Manuals, Service and Repair Manuals, Parts Manuals and Operator's Manuals.

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1286829GT Rev C, February 2023

First Edition, Third Printing

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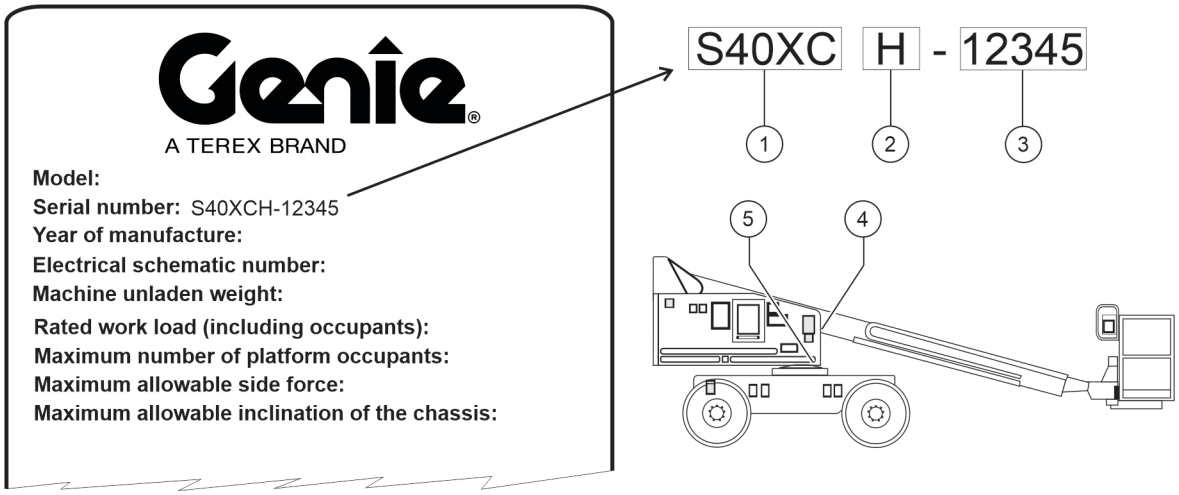
Revision History

Revision	Date	Section	Procedure / Page / Description
A	2/2019		Initial Release
A1	7/2019	Repair	Display Menu
B	10/2019		Add S-40/45 HF
		Specifications	Machine Specifications
		Repair	2-3, 7-6
		Fault Codes	Ford MSG-425
		Schematics	Limit Switch Legend
C	2/2023	All Sections	Add Deutz TD 2.2 L3, D 2.9 L4 CN4 Engines
		Repair	2-3
		Front cover	Add ending serial break

Reference Examples:	**Electronic Version** Click on any content or procedure in the Table of Contents to view the update.
Section – Repair Procedure, 4-2	
Section – Fault Codes, All charts	
Section – Schematics, Legends and schematics	

Introduction

Serial Number Legend



1 Model
2 Facility code
3 Sequence number
4 Serial label (located under cover)
5 Serial number (stamped on chassis)

Safety Rules



Danger

Failure to obey the instructions and safety rules in this manual and the appropriate Operator's Manual on your machine will result in death or serious injury.

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

Do not modify or alter a MEWP without prior written permission from the manufacturer.

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 top priority.



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



Safety alert symbol—used to alert personnel to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠DANGER Indicates a imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION Indicates a potentially hazardous situation which, if not avoided, may cause minor or moderate injury.

NOTICE Indicates a potentially hazardous situation which, if not avoided, may result in property damage.



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



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

Workplace Safety

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 top priority.



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 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.



Be sure that your workshop or work area is properly ventilated and well lit.

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Specifications

Machine Specifications

Tires and wheels	
Tire size, rough terrain (foam filled)	315/55D20 12 ply 20 in x 11 in wheel 50.8 cm x 27.9 cm wheel
Tire weight, rough terrain (minimum)	290 lbs 312 kg
Tire size, high flotation	33/16LL 500 10 ply 19.5 in x 14 in wheel 49.5 cm x 35.6 cm wheel
Tire pressure	38 psi / 2.6 bar
Tire weight, high flotation (minimum)	145 lbs 66 kg
Wheel lugs	9 @ 5/8 - 18
Lug nut torque, dry	240 ft-lbs 325 Nm
Lug nut torque, lubricated	180 ft-lbs 244 Nm

Track Components, TraX option	
Track material	Rubber
Weight (each)	480 lbs 218 kg

Fluid capacities	
LPG tank	33.5 pounds 15.2 kg
Fuel tank (standard)	20 gallons 75.7 liters
Fuel tank (optional)	30 gallons 113.6 liters
Hydraulic tank	45 gallons 170 liters
Hydraulic system (including tank)	55 gallons 208 liters
Drive hubs	20 fl oz 592 cc
Turntable rotation drive hub	8 fl oz 237 cc

Drive hub oil type: SAE 90 multipurpose hypoid gear oil API service classification GL5

For operational specifications, refer to the Operator's Manual.

Specifications

Performance Specifications

Drive speeds, 2WD and 4WD	
Stowed	40 ft / 6.8 - 7.4 sec 12.2 m / 6.8 - 7.4 sec
Raised or extended	40 ft / 40 - 45 sec 12.2 m / 40 - 45 sec
Drive speeds, TraX option	
Stowed	40 ft / 9 - 11 sec 12.2 m / 9 - 11 sec
Raised or extended	40 ft / 40 - 45 sec 12.2 m / 40 - 45 sec
Gradeability	See Operator's Manual
Braking distance, maximum	
High range on paved surface	3 - 4 ft 0.9 - 1.2 m
Boom function speeds, maximum from platform controls	
Jib boom up, S-45 models	48 - 53 seconds
Jib boom down, S-45 models	28 - 33 seconds
Platform level (10° range of motion)	3 - 5 seconds
Boom up	50 - 60 seconds
Boom down	50 - 60 seconds
Boom extend	30 - 60 seconds
Boom retract	15 - 35 seconds
Turntable rotate, 360° Stowed	70 - 100 seconds
Turntable rotate, 360° Not stowed	120 - 140 seconds

For operational specifications, refer to the Operator's Manual.

Hydraulic Oil Specifications

Hydraulic Fluid Specifications

Genie specifications require hydraulic oils which are designed to give maximum protection to hydraulic systems, have the ability to perform over a wide temperature range, and the viscosity index should exceed 140. They should provide excellent antiwear, oxidation prevention, corrosion inhibition, seal conditioning, and foam and aeration suppression properties.

Cleanliness level, minimum	ISO 15/13
Water content, maximum	250 ppm
Recommended Hydraulic Fluid	
Hydraulic oil type	Chevron Rando HD Premium
ISO Grade	32
Viscosity index, maximum	200
Optional Hydraulic Fluids	
Mineral based	Shell Tellus S2 V 32 Shell Tellus S2 V 46 Shell Tellus S4 VX 32 Shell Donax TG (Dexron III) Chevron 5606A
Biodegradable	Petro Canada Environ MV 46
Fire resistant	UCON Hydrolube HP-5046

Note: Genie specifications require additional equipment and special installation instructions for the approved optional fluids. Consult Genie Product Support before use.

NOTICE Optional fluids may not have the same hydraulic lifespan and may result in component damage.

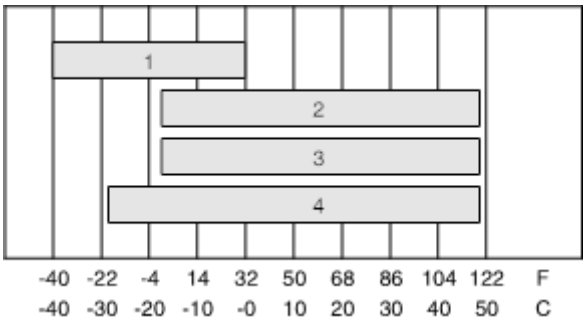
Note: Extended machine operation can cause the hydraulic fluid temperature to increase beyond its maximum allowable range. If the hydraulic fluid temperature consistently exceeds 200°F / 90°C an optional oil cooler may be required.

NOTICE

Do not top off with incompatible hydraulic fluids. Hydraulic fluids may be incompatible due to the differences in base additive chemistry. When incompatible fluids are mixed, insoluble materials may form and deposit in the hydraulic system, plugging hydraulic lines, filters, control valves and may result in component damage.

Note: Do not operate the machine when the ambient air temperature is consistently above 120°F / 49°C.

Hydraulic Fluid Temperature Range



Ambient air temperature

1 Chevron hydraulic oil 5606A
2 Petro-Canada Environ MV 46
3 UCON Hydrolube HP-5046D
4 Chevron Rando HD premium oil MV

Chevron Rando HD Premium Oil MV Fluid Properties

ISO Grade	32
Viscosity index, maximum	200
Kinematic Viscosity, maximum cSt @ 200°F / 100°C cSt @ 104°F / 40°C	 7.5 33.5
Brookfield Viscosity, maximum cP @ -4°F / -20°C cP @ -22°F / -30°C	 1040 3310
Flash point	375°F / 190°C
Pour point	-58°F / -50°C
Maximum continuous operating temperature	171°F / 77°C

Note: A hydraulic oil heating system is recommended when the ambient temperature is consistently below 0°F / -18°C.

Note: Do not operate the machine when the ambient temperature is below -20°F / -29°C with Rando HD Premium MV.

Specifications

Chevron 5606A Hydraulic Oil Fluid Properties

ISO Grade	15
Viscosity index, maximum	300
Kinematic Viscosity, maximum cSt @ 200°F / 100°C cSt @ 104°F / 40°C cSt @ -40°F / -40°C	 5.5 15.0 510
Flash point	180°F / 82°C
Pour point	-81°F / -63°C
Maximum continuous operating temperature	124°F / 51°C

Note: Use of Chevron 5606A hydraulic fluid, or equivalent, is required when ambient temperatures are consistently below 0°F / -17°C unless an oil heating system is used.

NOTICE

Continued use of Chevron 5606A hydraulic fluid, or equivalent, when ambient temperatures are consistently above 32°F / 0°C may result in component damage

Petro-Canada Environ MV 46 Fluid Properties

ISO Grade	46
Viscosity index, maximum	154
Kinematic Viscosity, maximum cSt @ 200°F / 100°C cSt @ 104°F / 40°C	 8.0 44.4
Flash point	482°F / 250°C
Pour point	-49°F / -45°C
Maximum continuous operating temperature	180°F / 82°C

Shell Tellus S4 VX Fluid Properties

ISO Grade	32
Viscosity index, maximum	300
Kinematic Viscosity, maximum cSt @ 200°F / 100°C cSt @ 104°F / 40°C	 9 33.8
Brookfield Viscosity, maximum cSt @ -4°F / -20°C cSt @ -13°F / -25°C cSt @ -40°F / -40°C	 481 702.4 2624
Flash point	>100
Pour point	-76°F / -60°C
Maximum continuous operating temperature	103°F / 75°C

UCON Hydrolube HP-5046 Fluid Properties

ISO Grade	46
Viscosity index, maximum	192
Kinematic Viscosity, maximum cSt @ 149°F / 65°C cSt @ 104°F / 40°C cSt @ 0°F / -18°C	 22 46 1300
Flash point	None
Pour point	-81°F / -63°C
Maximum continuous operating temperature	189°F / 87°C

Hydraulic Component Specifications

Drive Pump	
Type: bi-directional variable displacement piston pump	
Flow rate @ 2500 rpm	0 - 28 gpm 0 - 122.6 L/min
Drive pressure, maximum	3625 psi 250 bar

Charge Pump	
Type	gerotor
Displacement per revolution	0.85 cu in 13.9 cc
Flow rate @ 2500 rpm	9 gpm 34 L/min
Charge pressure @ 2500 rpm	310 psi 21.4 bar

Function Pump	
Type	gear, pressure balanced
Displacement	1.04 cu in 17 cc
Flow rate @ 2500 rpm	10.69 gpm 40.5 L/min

Auxiliary pump	
Type: fixed displacement gear pump	
Displacement per revolution	1.75 gpm 6.62 L/min
Auxiliary pump relief pressure	3200 psi 220.6 bar

Function manifold	
Function relief valve pressure	3200 psi / 220.6 bar
Boom extend relief valve pressure	1950 psi 134 bar
Steer regulator all models	2 gpm / 7.6 lpm
Oscillate relief valve pressure (@2500 rpm)	650 psi 49 bar

Traction Manifold	
Hot oil relief pressure	280 psi 19.3 bar

Two-speed drive motors, 2WD and 4WD models	
Displacement per revolution low speed	0.99 cu in / 16.3 cc
Displacement per revolution high speed	1.83 cu in / 30 cc

Hydraulic Filters	
Medium pressure filter	Beta 3 ˆ 200
Medium pressure filter bypass pressure	51 psi 3.5 bar
Hydraulic tank return filter	10 micron with 25 psi / 1.7 bar bypass

Specifications

Manifold Component Specifications

Plug torque	
SAE No. 4	13 ft-lbs / 18 Nm
SAE No. 6	18 ft-lbs / 24 Nm
SAE No. 8	50 ft-lbs / 68 Nm
SAE No.10	55 ft-lbs / 75 Nm
SAE No. 12	56 ft-lbs / 75.9 Nm

Specifications

Ford MSG-425 EFI Engine

Displacement	153 cu in 2,5 liters
Number of cylinders	4
Bore and Stroke	3.5 x 3.9 in 89 x 100 mm
Horsepower	60 @ 2500 rpm 45 kW @ 2500 rpm
Firing order	1 - 3 - 4 - 2
Low idle, standby	1000 rpm 33,3 Hz
Low idle, function enable	1600 rpm 53,3 Hz
High idle	2500 rpm 83,3 Hz
Compression ratio	9.7:1

Compression pressure

Pressure (psi or bar) of lowest cylinder must be at least 75% of highest cylinder.

Lubrication system	
Oil pressure (operating temperature @ 2000 rpm)	29 - 39 psi 2,75 - 4,1 bar
Oil capacity (including filter)	6.7 quarts 6,4 liters
Oil Pressure switch	
Oil pressure switch point	7.5 psi 0,51 bar

Normal engine cranking speedOil viscosity requirements

Extreme operating temperatures may require the use of alternative engine oils. For oil requirements, refer to the Engine Operator Handbook on your machine.

Electronic fuel pump	
Fuel pressure, static	60 psi 4,1 bar
Fuel flow rate	0.58 gpm 2,2 L/min

Fuel requirement

For fuel requirements, refer to the engine Operator Manual for your engine.

Ignition system	
Spark plug type	Motorcraft AYFS-32Y-R
Spark plug gap	0.049 - 0.053 in 1,25 - 1,35 mm
Engine coolant	
Capacity	11.5 quarts 10,9 liters
Coolant temperature switch	
Temperature switch point	230°F 110°C
Starter motor	
Normal engine cranking speed	200 - 250 rpm
Current draw, normal load	140 - 200A
Current draw, maximum load	800A
Alternator	
Output	95A, 13.8V DC
Battery	
Type	12V DC, Group 34/78
Quantity	1
Cold cranking ampere @ 0°F	900A
Reserve capacity @ 25A rate	200 minutes

Specifications

Deutz D2011 L03i Engine

Displacement	142 cu in 2.33 liters
Number of cylinders	3
Bore and stroke	3.7 x 4.4 inches 94 x 112 mm
Horsepower	48 @ 2800 rpm 36 kW @ 2800 rpm
Firing order	1 - 2 - 3
Low idle	1500 rpm 313 Hz
High idle	2500 rpm 521.7 Hz
Compression ratio	19:01
Compression pressure	362 to 435 psi 25 to 30 bar
Governor	centrifugal mechanical
Valve clearance, cold	
Intake	0.012 in 0.3 mm
Exhaust	0.020 in 0.5 mm
Lubrication system	
Oil pressure	20 to 44 psi 1.4 to 3 bar
Oil capacity (including filter)	9.5 quarts 9 liters
Oil viscosity requirements	
-22° F to 86° F/ -30° C to 30° C	5W-30 (synthetic)
-4° F to 90° F / -20° C to 32° C	10W-40
Above 23° F / -5° C	20W-50

Units ship with 15W-40.
Extreme operating temperatures may require the use of alternative engine oils. For oil requirements, refer to the Engine Operator Handbook on your machine.

Oil temperature switch	
Temperature switch point	300°F 149°C
Oil pressure switch	
Oil pressure switch point	22 psi 1.5 bar
Fuel injection system	
Injection pump make	Bosch
Injection pump pressure, maximum	15000 psi 1034 bar
Injector opening pressure	3046 psi 210 bar
Fuel requirement	
For fuel requirements, refer to the engine Operator's Manual on your machine.	
Starter motor	
Current draw, no load	90A
Brush length, new	0.72 in 18.5 mm
Brush length, minimum	0.27 in 7 mm
Battery	
Type	12V DC, Group 34/78
Quantity	1
Cold cranking ampere	900A
Reserve capacity @ 25A rate	200 minutes
Alternator output	60A @ 14V DC
Fan belt deflection	3/8 to 1/2 inch 9 to 12 mm

Specifications

Deutz D 2.9 L4 Tier IV Engine

Displacement	177 cu in 2,9 liters
Number of cylinders	4
Bore and stroke	3.6 x 4.3 inches 92 x 110 mm
Horsepower	48.8 @ 2600 rpm 37 kW @ 2600 rpm
Firing order	1 - 3 - 4 - 2
Low idle	1500 rpm 313 Hz
High idle	2500 rpm 521.7 Hz
Compression ratio	18.4:1
Compression pressure	362 - 435 psi 25 - 30 bar
Governor	electronic
Lubrication system	
Oil pressure (@ 2000 rpm)	40 to 60 psi 1,4 to 3 bar
Oil capacity (including filter)	9.4 quarts 9 liters
Oil viscosity requirements	**Low ash oil required**
-22° F to 86° F/ -30° C to 30° C	5W-30 (synthetic)
-4° F to 90° F / -20° C to 32° C	10W-40
Above 23° F / -5° C	20W-50

Units ship with 15W-40.
Extreme operating temperatures may require the use of alternative engine oils. For oil requirements, refer to the Engine Operator Handbook on your machine.

Oil temperature switch	
Temperature switch point	257°F 125°C
Oil pressure switch	
Oil pressure switch point	20 psi 1,4 bar
Engine coolant	
Capacity	10 quarts 9,4 liters
Fuel injection system	
Injection pump make	Bosch
Injection pump pressure, maximum	15000 psi 1034 bar
Injector opening pressure	3046 psi 210 bar
Fuel requirement	
For fuel requirements, refer to the engine Operator's Manual on your machine.	
Starter motor	
Cranking speed	150 - 250 RPM
Current draw, normal load	250A to 400A
Output	3.2kW
Battery	
Type	12V DC
Quantity	1
Cold cranking ampere	1000A
Reserve capacity @ 25A rate	200 minutes
Alternator output	95A @ 14V DC
Fan belt deflection	3/8 - 1/2 inch 9 - 12 mm

Specifications

Deutz D 2.9 L4 Stage IV Engine

Displacement	177 cu in 2,9 liters
Number of cylinders	4
Bore and Stroke	3.6 x 4.3 in 92 x 110 mm
Horsepower	48.8 @ 2600 rpm 36,4 kW @ 2600 rpm
Firing order	1 - 3 - 4 - 2
Low idle, standby	1000 rpm
Low idle, function enable	1500 rpm
High idle	2500 rpm
Compression ratio	18.4:1
Compression pressure	362 - 435 psi 25 - 30 bar
Governor	electronic
Lubrication system	
Oil pressure (@ 2000 rpm)	40 - 60 psi 1,4 - 3 bar
Oil capacity (including filter)	9.4 quarts 9 liters
Oil viscosity requirements	**Low ash oil required**
-22° F to 86° F/ -30° C to 30° C	5W-30 (synthetic)
-4° F to 104° F / -20° C to 40° C	10W-40
Above 5° F / -15° C	15W-40
Unit ships with 15W-40. Extreme operating temperatures may require the use of alternative engine oils. For oil requirements, refer to the Engine Operator Manual for your engine.	
Oil temperature switch	
Temperature switch point	257°F 125°C
Oil Pressure switch	
Oil pressure switch point	20 psi 1,4 bar
Installation torque	8 - 18 Ft-lbs 11 - 24 Nm
Engine coolant	
Capacity	10.7 quarts 10,1 liters
Fuel injection system	
Injection pump make	Bosch
Injection pump pressure, maximum	15000 psi 1034 bar
Injector opening pressure	3046 psi 210 bar
Fuel requirement	
For fuel requirements, refer to the engine Operator Manual for your engine.	
Starter motor	
Current draw, normal load	250A - 400A
Brush length, new	0.72 in 18,5 mm
Brush length, minimum	0.27 in 7 mm
Battery	
Type	12V DC
Quantity	1
Cold cranking ampere	1000A
Reserve capacity @ 25A rate	220 minutes
Alternator output	95A @ 14V DC
Fan belt deflection	3/8 - 1/2 in 9 - 12 mm

Deutz TD 2.2 L3 Engine

Displacement	134 cu. in 2,2 liters
Number of cylinders	3
Bore and Stroke	3.6 x 4.3 inches 92 x 110 mm
Horsepower net intermittent @ 2600 rpm	49 hp 36 kW
Induction system	turbocharged
Firing order	1 - 2 - 3
Low idle, standby	1000 rpm
Low idle, function enable	1500 rpm
High idle	2400 rpm
Governor	electronic
Lubrication system	**Low ash oil required**
Oil pressure, hot (@ 2000 rpm)	40 to 60 psi 2,8 to 4,1 bar
Oil capacity (including filter)	8 quarts 7,6 liters
Oil viscosity requirements	
-22°F to 86°F / -30°C to 30°C	5W-30 (synthetic)
-4°F to 104°F / -20°C to 40°C	10W-40
Above 5°F / -15°C	15W-40
Unit ships with 15W-40. Extreme operating temperatures may require the use of alternative engine oils. For oil requirements, refer to the Engine Operator Manual for your engine.	

Oil temperature switch	
Installation torque	8 - 18 ft-lbs 11 - 24 Nm
Temperature switch point	257°F 125°C
Oil Pressure switch	
Installation torque	8 - 18 ft-lbs 11 - 24 Nm
Pressure switch point	17.4 psi 1,2 bar
Fuel requirement	
For fuel requirements, refer to the engine Operator Manual for your engine.	
Engine coolant capacity	2.2 gallons 8,3 liters
Unit ships with Ethylene Glycol engine coolant. Consult your local supplier for compatibility before mixing alternative engine coolants.	
Starter motor	
Current draw, normal load	140 - 200A
Cranking speed	250 - 350 rpm
Battery – Engine starting and control system	
Type	12V DC, Group 31
Quantity	1
Battery capacity, maximum	1000A
Reserve capacity @ 25A rate	200 Minutes
Alternator output	95A @ 14V DC

Specifications

Perkins 404F-E22T Engine

Displacement	134 cu in 2,2 liters
Number of cylinders	4
Bore and Stroke	3.31 x 3.94 in 84 x 100 mm
Horsepower	48 @ 2800 rpm 38 kW @ 2500 rpm
Firing order	1 - 3 - 4 - 2
Low idle, standby	1000 rpm 500 Hz
Low idle, function enable	1500 rpm 750 Hz
High idle	2500 rpm 1250 Hz
Compression ratio	18:1
Compression pressure	426 psi 29,4 bar
Pressure (psi) of lowest cylinder must be within 50 psi / 3.45 bar of highest cylinder	
Governor	electronic
Valve clearance, cold	
Intake	0.008 in 0,2 mm
Exhaust	0.008 in 0,2 mm
Lubrication system	
Oil pressure (@ 2000 rpm)	40 - 60 psi 1,4 - 3 bar
Oil capacity (including filter)	9.4 - 11.2 quarts 8,9 - 10,6 liters
Oil viscosity requirements	
Below 86°F / 30°C	5W-20
-4°F to 104°F / -20°C to 40°C	10W-30
Above 14°F / -10°C	15W-40
Unit ships with 15W-40. Extreme operating temperatures may require the use of alternative engine oils. For oil requirements, refer to the Engine Operator Manual for your engine.	
Oil pressure sending unit	
Oil pressure switch point	14.2 psi 1 bar
Fuel injection system	
Injection pump make	Zexel
Injection pressure	2133 psi 147 bar
Fuel requirement	
For fuel requirements, refer to the engine Operator Manual for your engine.	
Alternator output	85A @ 12V DC
Fan belt deflection	3/8 in 10 mm
Starter motor	
Current draw, no load	140A - 200A
Brush length, new	0.7480 in 19 mm
Brush length, minimum	0.5 in 12,7 mm
Battery	
Type	12V DC
Quantity	1
Cold cranking ampere	1000A
Reserve capacity @ 25A rate	200 minutes
Engine coolant	
Capacity	7.7 quarts 7,3 liters
Coolant temperature switch	
Temperature switch point	221° F 105° C

Specifications

Machine Torque Specifications

Platform rotator	
1-8 center bolt, GR 5	
Dry	615 ft-lbs 834 Nm
3/8 -16 bolts, GR 8	
Dry *(use blue thread locking compound)	35 ft-lbs* 47.5 Nm*
Turntable rotate assembly	
Rotate bearing mounting bolts, lubricated	160 ft-lbs 217 Nm
Drive motor/brake mounting bolts, dry *(use blue thread locking compound)	49 ft-lbs* 66.4 Nm*
Drive motor/brake mounting bolts, lubricated	37 ft-lbs 50 Nm
Drive motor and hubs	
Drive hub mounting bolts, dry	210 ft-lbs 284 Nm
Drive hub mounting bolts, lubricated	160 ft-lbs 217 Nm

TraX™ Torque Specifications

Hub adapter to drive hub fasteners	
Lug nut torque, lubricated	180 ft-lbs 244 Nm
Idler and bogey wheel fasteners	
3/4-10 bolts, GR 8, lubricated	281 ft-lbs 381 Nm

Specifications

Machine Component Weights

Primary boom assembly, S-40 XC/HF	2000 lbs 907 kg
Primary boom assembly, S-45 XC/HF	2370 lbs 1075 kg
Turntable assembly (does not include boom, jib or engine)	3050 lbs 1385 kg
Counterweight, S-40 XC/HF	1750 lbs 795 kg
Counterweight, S-45 XC/HF	3250 lbs 1475 kg
Drive chassis assembly (does not include tire options)	4200 lbs 1905 kg
Drive motor and hub	130 lbs 60 kg
Engine assembly, max.	700 lbs 318 kg
Primary boom lift cylinder	400 lbs 181 kg
Primary boom extend cylinder	275 lbs 125 kg
Jib boom assembly (does not include platform)	350 lbs 160 kg
Jib boom cylinder	65 lbs 30 kg
Oscillate cylinder	35 lbs 16 kg
Platform, 6 ft / 1,8 m	275 lbs 125 kg
Platform, 8 ft / 2,4 m	315 lbs 143 kg
Battery	30 lbs 14 kg

Hydraulic Hose and Fitting Torque Specifications

Your machine is equipped with Parker Seal-Lok™ ORFS or 37° JIC fittings and hose ends. Genie specifications require that fittings and hose ends be torqued to specification when they are removed and installed or when new hoses or fittings are installed.

Seal-Lok™ Fittings

(hose end - ORFS)

SAE Dash Size	Torque
-4	18 ft-lbs / 25 Nm
-6	30 ft-lbs / 41 Nm
-8	40 ft-lbs / 55 Nm
-10	60 ft-lbs / 81 Nm
-12	85 ft-lbs / 115 Nm
-16	110 ft-lbs / 150 Nm
-20	150 ft-lbs / 205 Nm
-24	230 ft-lbs / 315 Nm

JIC 37° Fittings

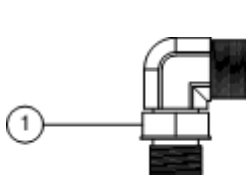
(swivel nut or hose connection)

SAE Dash Size	Thread Size	Flats
-4	7/16-20	2
-6	9/16-18	1 1/2
-8	3/4-16	1 1/2
-10	7/8-14	1 1/2
-12	1 1/16-12	1 1/4
-16	1 5/16-12	1
-20	1 5/8-12	1
-24	1 7/8-12	1

SAE O-ring Boss Port

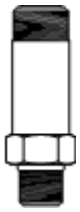
(tube fitting - installed into Aluminum)
(all types)

SAE Dash Size	Torque
-4	14 ft-lbs / 19 Nm
-6	23 ft-lbs / 31,2 Nm
-8	36 ft-lbs / 49 Nm
-10	62 ft-lbs / 84 Nm
-12	84 ft-lbs / 114 Nm
-16	125 ft-lbs / 169,5 Nm
-20	151 ft-lbs / 204,7 Nm
-24	184 ft-lbs / 249,5 Nm



Adjustable Fitting

1 jam nut



Non-adjustable fitting

SAE O-ring Boss Port

(tube fitting - installed into Steel)

SAE Dash Size		Torque
-4	ORFS / 37° (Adj) ORFS (Non-adj) 37° (Non-adj)	15 ft-lbs / 20,3 Nm 26 ft-lbs / 35,3 Nm 22 ft-lbs / 30 Nm
-6	ORFS (Adj / Non-adj) 37° (Adj / Non-adj)	35 ft-lbs / 47,5 Nm 29 ft-lbs / 39,3 Nm
-8	ORFS (Adj / Non-adj) 37° (Adj / Non-adj)	60 ft-lbs / 81,3 Nm 52 ft-lbs / 70,5 Nm
-10	ORFS (Adj / Non-adj) 37° (Adj / Non-adj)	100 ft-lbs / 135,6 Nm 85 ft-lbs / 115,3 Nm
-12	(All types)	135 ft-lbs / 183 Nm
-16	(All types)	200 ft-lbs / 271,2 Nm
-20	(All types)	250 ft-lbs / 339 Nm
-24	(All types)	305 ft-lbs / 413,5 Nm

Specifications

Torque Procedure

Seal-Lok™ fittings

1 Replace the O-ring. The O-ring must be replaced anytime the seal has been broken. The O-ring cannot be re-used if the fitting or hose end has been tightened beyond finger tight.

Note: The O-ring in Parker Seal Lok™ fittings and hose end are custom-size O-rings. They are not standard size O-rings. They are available in the O-ring field service kit (Genie part number 49612).

2 Lubricate the O-ring before installation.

3 Be sure the O-ring face seal is seated and retained properly.

4 Position the tube and nut squarely on the face seal end of the fitting, and tighten the nut finger tight.

5 Tighten the nut or fitting to the appropriate torque. Refer to the appropriate torque chart in this section.

6 Operate all machine functions and inspect the hose, fittings and related components to confirm there are no leaks.

JIC 37° fittings

1 Align the tube flare (hex nut) against the nose of the fitting body (body hex fitting) and tighten the hex nut to the body hex fitting to hand tight, approximately 30 in-lbs / 3.4 Nm.

2 Using a permanent ink marker, make a reference mark on one the flats of the hex nut and continue the mark onto the body of the hex fitting. Refer to Illustration 1.

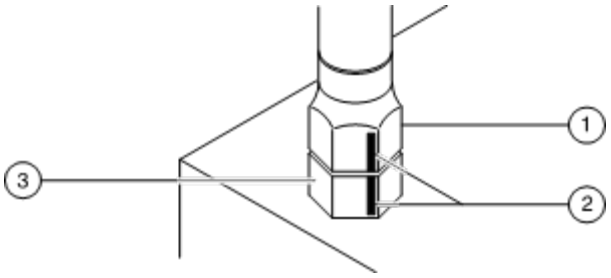


Illustration 1

1 hex nut
2 reference mark
3 body hex fitting

3 Working clockwise on the body hex fitting, make a second mark with a permanent ink marker to indicate the proper tightening position. Refer to Illustration 2.

Note: Use the JIC 37° Fitting table in this section to determine the correct number of flats, for the proper tightening position.

Note: The marks indicate the correct tightening positions have been determined. Use the second mark on the body hex fitting to properly tighten the joint after it has been loosened.

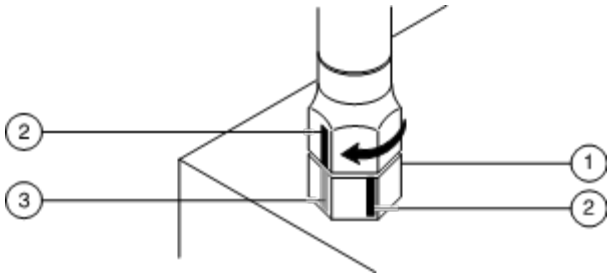


Illustration 2

1 body hex fitting
2 reference mark
3 second mark

4 Tighten the hex nut until the mark on the hex nut is aligned with the second mark on the body hex fitting.

5 Operate all machine functions and inspect the hose, fittings and related components to confirm there are no leaks.

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 appropriate operator's manual on your machine.

☑ Be sure that all necessary tools and parts are available and ready for use.

☑ Use only Genie approved replacement parts.

☑ Read each procedure completely and adhere to the instructions. Attempting shortcuts may produce hazardous conditions.

Machine Configuration:

☑ Unless otherwise specified, perform each repair procedure with the machine in the following configuration:

- Machine parked on a firm, level surface
- Key switch in the off position with the key removed
- The red Emergency Stop button in the off position at both the ground and platform controls
- Wheels chocked
- All external AC power supply disconnected from the machine
- Boom in the stowed position
- Turntable secured with the turntable rotation lock

About This Section

Most of the procedures in this section should only be performed by 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.

Symbols Legend



Safety alert symbol—used to alert personnel to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER Indicates a imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION Indicates a potentially hazardous situation which, if not avoided, may cause minor or moderate injury.

NOTICE Indicates a potentially hazardous situation which, if not avoided, may result in property damage.

⊙ Indicates that a specific result is expected after performing a series of steps.

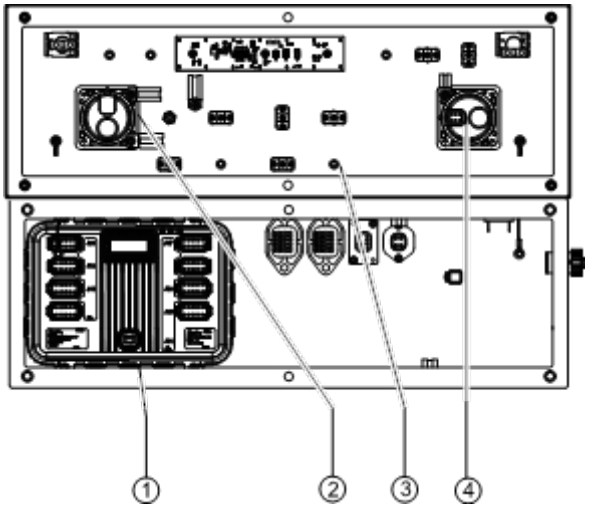
☒ Indicates that an incorrect result has occurred after performing a series of steps.

Control System

1-1 ALC-600 Control Module

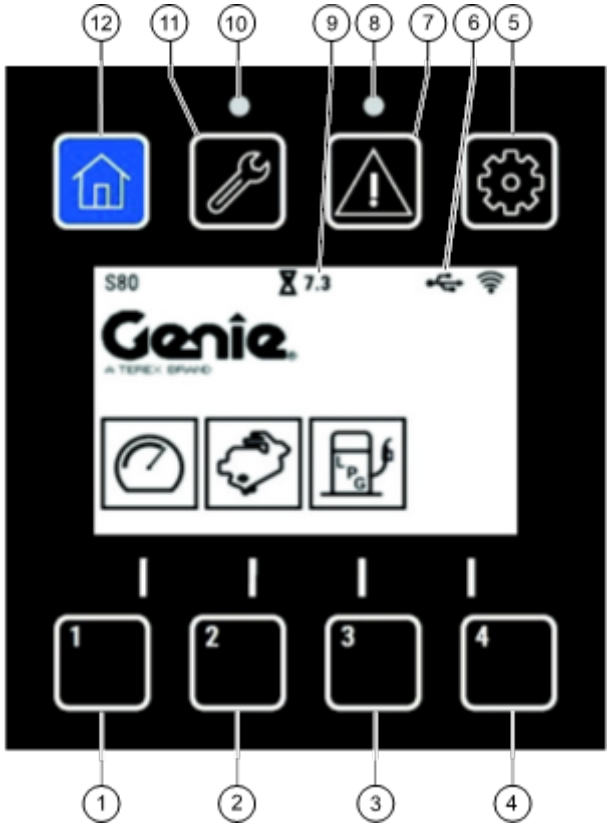
Platform Controls

The platform control box contains the ALC-600 platform Control Module. The platform Control Module receives all signals from the platform switches, joysticks and foot switch, and provides operator feedback through an Indicator Module. The joystick controllers at the platform controls utilize Hall Effect technology and require no calibration. Automatic calibration of center voltage occurs on power up if the signal value is in the valid range. Each joystick controller should operate smoothly and provide proportional speed control over its entire range of motion. The remaining boom functions operate by on/off toggle switches.



1 ALC-600 platform control module
2 primary boom up/down and turntable rotate left/right joystick controller
3 LED indicator module
4 drive/steer joystick controller

1-2 How to Enter ALC-600 Service Mode



ALC-600 Control System Display

1 Number 1 or Escape
2 Number 2 or UP arrow
3 Number 3 or DOWN arrow
4 Number 4 or OK
5 Settings menu
6 USB drive detected
7 Faults menu
8 Fault LED Indicator
9 Engine hours
10 Maintenance LED indicator
11 Maintenance menu
12 Home menu

The Control System on this machine allows access to calibrations through the Service Mode. The procedures that follow will require the operator to be in Service Mode. Service Mode can only be entered at machine start up and requires a special code.

1 Turn the key switch to ground controls.

2 Push and hold buttons numbered **2** and **3** underneath the display screen.

3 Pull out the red Emergency Stop button.

4 You will be prompted for a password. Enter **3 - 3 - 2 - 4**.

5 Press the Gear button to access the settings menu.

Note: There will be a delay while the menu is being loaded on the display screen.

6 The machine will now operate normally and allow the viewing and modification of calibrations and parameters.

Note: When a parameter is changed in Service Mode, the change is effective immediately when button 4 (OK) is pushed. Machine restart is not required. A confirmation beep accompanies every save (button 4).

Note: Pushing in the red Emergency Stop button will exit Service Mode.

Note: If there has been no input for 10 minutes while in Service Mode, the ALC-600 will power down and Service Mode will be exited, unless the engine is running.

1-3 Full Machine Calibration

Full machine calibration must be completed in the proper sequence when the ALC-600 controller (TCON) in the ground control box has been replaced.

How to Fully Calibrate the Machine

Calibration procedures shall only be completed by qualified technicians that have Genie factory service training.

⚠WARNING Tip-over hazard. Failure to calibrate the machine in the proper sequence could cause the machine to tip over resulting in death or serious injury.

Note: A digital level will be required to perform this procedure.

Note: Start this procedure with the boom in the stowed position.

Full machine calibration must be completed in the following sequence:

- Select model, engine, tires, and region, then cycle power. Refer to Repair Section Display Module.
- Turntable level sensor. Refer to Repair Procedure, *How to Calibrate the Turntable Level Sensor*.
- Load cell sensor. Refer to Repair Procedure, *How to Calibrate the Load Cell Sensor.*
- Primary boom angle sensor. Refer to Repair Procedure, *How to Calibrate the Primary Boom Angle Sensor*.
- Primary boom length sensor. Refer to Repair Procedure, *How to Calibrate the Primary Boom Length Sensor*.
- Select option configuration. Refer to Repair Section, Display Module, *Options.*

Control System

1-4
Machine Functions

How to Adjust the Joystick Maximum Speed Setting

The maximum speed of a joystick controlled machine function can be modified from the ground controls display. Whenever a hydraulic cylinder, drive motor or hydraulic pump is replaced, the maximum speed setting should be adjusted to maintain optimum performance. The maximum speed settings on the joystick can be changed to compensate for hydraulic pump wear to maintain peak performance from the machine.

Note: Perform this procedure with the boom in the stowed position.

1 Enter the Service Mode. See Repair Procedure, *How to Enter the Service Mode*.

2 Press the **SETTINGS** button above the display screen.

3 Select **SPEEDS** from the display screen.

4 Navigate to the desired function's Maximum Speed setting.

5 Select the desired setting to change and press **OK**.

6 In the parameter adjustment screen, use the display buttons to change the parameter. Note that the factory default speed is considered 100% for maximum speeds.

7 Scroll and press **OK**. The change is effective immediately.

8 Start the engine from the ground controls.

9 Start a timer and activate the machine function that needs to be adjusted. Using the ground control functions is the same as asking for full joystick deflection at the platform.

10 Record the time it takes for that function to complete a full cycle (ie; boom up).

11 Compare the machine function time with the function times listed in Refer to Specifications, *Performance Specifications*. Determine whether the function time needs to increase or decrease.

12 Adjust the parameter in the ground display to achieve the proper function cycle time.

How to Adjust the Joystick Ramp Rate Setting

The ramp rate setting is an adjustment that controls the way boom functions start and stop. There are two types of ramp rates to adjust on separate menus:

Ramp Up Time -- the amount of time it takes to accelerate to speed.

Ramp Down Time -- the amount of time it takes to decelerate to a stop

The ramp rate settings of a joystick can be changed to compensate for hydraulic pump wear to maintain peak performance from the machine.

Note: Perform this procedure with the boom in the stowed position.

1 Enter the Service Mode. See Repair Procedure, *How to Enter the Service Mode*.

2 Press the **SETTINGS** button above the display screen.

3 Select **SPEEDS** from the display screen.

4 Navigate to the desired function's Ramp setting.

5 Select the desired setting to change and press **OK**.

6 In the parameter adjustment screen, use the display buttons to change the parameter. Note that the ramp rate is expressed in seconds to complete the ramp.

7 Scroll and press **OK**. The change is effective immediately.

8 Start the engine from the ground controls.

9 Start a timer and activate the machine function that needs to be adjusted. Using the ground control functions is the same as asking for full joystick deflection at the platform.

10 Record the time it takes for that function to complete the ramp.

11 Compare the machine function time with the function times listed in Specifications, *Performance Specifications*. Determine whether the ramp time needs to increase or decrease.

12 Adjust the parameter in the ground display to achieve the proper ramp time.

Note: Refer to Repair Procedure, *Display Module Menus* for ramp rates.

Control System

How to Adjust the Joystick Threshold Setting

The threshold setting of a joystick is the minimum output at which a function proportional valve can open and allow the function to operate.

The boom function threshold current should be operating at near zero speed, smoothly with no vibrations.

Note: Perform this procedure with the boom in the stowed position.

1 Enter the Service Mode.

2 Press the **SETTINGS** button above the display screen.

3 Select **SPEEDS** from the display screen.

4 Navigate to the desired function's Threshold setting.

5 Select the desired setting to change and press **OK**.

6 In the parameter adjustment screen, use the display buttons to change the parameter. Note that the factory default speed is considered 100% for threshold values.

7 Scroll and press **OK**. The change is effective immediately.

8 Switch the machine control to platform control and start the engine from the platform controls..

9 Using the joystick, verify that the function engages smoothly and without sudden movement or excessive joystick dead spots.

10 Adjust the parameter in the ground display to achieve a smooth function threshold.

1-5 How to Enter ALC600 Software Update Mode

1 Go to the Genie website https://www.genielift.com/en/support/firmware, select your **Machine Model** and select **Search**.

2 Download the software to a USB flash drive. If zipped, extract the files to the USB flash drive.

3 With the machine off, open the GBOX (ground box) lid and then remove the four Torx head screws securing the Display Controller (DISCON) door and remove the door to expose the USB port.

4 Insert the flash drive into the USB port.

5 Set key switch to ground and pull out the red ground ESTOP while holding buttons 1 and 4.

6 The Display Controller will go into the bootloader mode.

7 Browse and select the desired software. Follow the on-screen guidance to start the update procedure.

8 When complete, turn off machine.

9 Remove USB flash drive, re-install the Display Controller door and close the GBOX (ground box).

10 Power up normally.

11 As the display controller starts, operator shall verify on the start-up screen that the proper software and revision are displayed.

12 Perform a function check.

1-6
Display Module Menus

Screen or Menu	Item	Selection	Default
Display Settings	Backlight	0 - 100%	
	Contrast	0 - 100%	
	Display Inversion	Off • On	Off
Screen or Menu	**Item**	**Selection**	**Default**
Model Configuration	Model	S-40 • S-45 • S-60 • S-65 • S-80 • S-85 • S-60 J • S-80 J	Select Model
	Tires	Rough Terrain • High Float • Trax	Select Tires
(These are locked unless factory defaults are restored)	Engine	Deutz D 2.9L T4 • Deutz TD 2.9L T4 • Deutz D2.9 CN4 • Deutz TD2.9 CN4 • Deutz TCD 2.2L S5 • Deutz TCD 2.2L T4 • Deutz TD 2.2L S5 • Deutz 2011 L03i • Deutz TD2011 L04i • Deutz D436 • Ford MSG425 EFI • GM 3.0L • Kubota D1105 • Kubota D1803 • Perkins 404D 22 • Perkins 404D 22T • Perkins 404F E22T • Perkins 404F E22TA • Weichai WP3.2	Select Engine
	Region:	ANSI/CSA • AUS • CE	Select Region
(Platform configuration is not locked)	Platform Width	Standard Platform 4m Platform	Standard Platform
	Platform Level	Hydraulic • eLevel	Select Platform Level
Screen or Menu	**Item**	**Selection**	**Default**
Options	Footswitch Timeout	10 sec • 2 min • 30 min	2 min
Note: Some options may not be visible with earlier software versions.	Drive Priority	Off • On	Off
	Drive Cutout	Off • On	Off
	Platform Level	**Priority** • Cutout	**Priority**
	Generator	No Generator • Generator Installed	No Generator
	Contact Alarm	Gen 2 • Gen 1 • Off	Gen 2
	Platform Recirculation	Off • On	Off
	Units	US Customary • Metric	US Customary
	Aircraft Proximity	Off • On	Off
	Fuel Level Sensor	Installed • Not Installed	Installed
	Low Fuel Threshold	10% - 100%	10%
	Alarm Setting	Off • Travel • Motion	Off
	Standby RPM	Default • High RPM	Default
	Power Save Timeout	10 min • 30 min • 60 min • 4 hrs • Off	Off
	Plat Level Threshold Cal	Off • On	On
	China IV	Off • On	Off
	White Noise Alarm	Off • On	Off
	Turntable Tilt Cutout	Off • On	Off

Control System

Screen or Menu	Item	Selection
Sensor Calibration	Chassis Tilt	Select OK to calibrate
	Load Sense	Select OK to calibrate
	Boom Angle	Select OK to calibrate
	Boom Length	Select OK to calibrate
	Platform Angle	Select OK to calibrate
Screen or Menu	**Item**	**Selection**
Auto Threshold Calibration	Boom Up / Down Threshold	Select OK to calibrate
	Boom Extend / Retract Threshold	Select OK to calibrate
Screen or Menu	**Item**	**Selection**
Drive Speeds XC / HF models	Forward Threshold	1% - 122%
	Reverse Threshold	1% - 122%
	Forward Max	78% - 150%
	Reverse Max	79% - 150%
	Forward Out of Stow Max	85% - 150%
	Reverse Out of Stow Max	85% - 150%
Screen or Menu	**Item**	**Selection**
Drive Speeds TraX models	Forward Threshold	1% - 149%
	Reverse Threshold	1% - 152%
	Forward Max	64% - 150%
	Reverse Max	65% - 150%
	Forward Out of Stow Max	76% - 150%
	Reverse Out of Stow Max	75% - 150%
Screen or Menu	**Item**	**Selection / Default**
Drive Ramps	Standard Acceleration	0.1 - 10 sec / 4 sec
	Standard Deceleration	0.1 - 5 sec / 1 sec
	Torque Switching Deceleration	0.5 - 5 sec / 4 sec
Screen or Menu	**Item**	**Default**
Deutz D 2.9L T4 Anti-Stall	Threshold	2375 rpm
	Drive Minimum	50%
	Range	125 rpm
	Hysteresis	100 rpm
Screen or Menu	**Item**	**Default**
Deutz D2.9 CN4 Anti-Stall	Threshold	2375 rpm
	Drive Minimum	60%
	Range	125 rpm
	Hysteresis	100 rpm

Screen or Menu	Item	Default
Deutz TD 2.9L T4 Anti-Stall XC / HF models	Threshold Drive Minimum Range Hysteresis	2375 rpm 50% 125 rpm 100 rpm
Screen or Menu	**Item**	**Default**
Deutz TD 2.9L T4 Anti-Stall TraX models	Threshold Drive Minimum Range Hysteresis	2060 rpm 50% 125 rpm 125 rpm
Screen or Menu	**Item**	**Default**
Deutz TD 2.2L S5 Anti-Stall XC / HF models	Threshold Drive Minimum Range Hysteresis	2175 rpm 50% 125 rpm 100 rpm
Screen or Menu	**Item**	**Default**
Deutz TD 2.2L S5 Anti-Stall TraX models	Threshold Drive Minimum Range Hysteresis	2250 rpm 40% 440 rpm 150 rpm
Screen or Menu	**Item**	**Default**
Deutz D2011 Anti-Stall	Threshold Drive Minimum Range Hysteresis	2200 rpm 60 % 700 rpm 200 rpm
Screen or Menu	**Item**	**Default**
Deutz TD2011 L04i Anti-Stall	Threshold Drive Minimum Range Hysteresis	2100 rpm 50% 100 rpm 125 rpm
Screen or Menu	**Item**	**Default**
Perkins 404D 22 Anti-Stall	Threshold Drive Minimum Range Hysteresis	2250 rpm 75% 400 rpm 375 rpm
Screen or Menu	**Item**	**Default**
Perkins 404F E22T Anti-Stall XC / HF models	Threshold Drive Minimum Range Hysteresis	2375 rpm 80% 275 rpm 100 rpm

Control System

Screen or Menu	Item	Default
Perkins 404F E22T Anti-Stall Trax models	Threshold Drive Minimum Range Hysteresis	2300 rpm 40% 275 rpm 100 rpm
Screen or Menu	**Item**	**Default**
Ford MSG425 Anti-Stall	Threshold Drive Minimum Range Hysteresis	2350 rpm 80% 120 rpm 170 rpm
Screen or Menu	**Item**	**Default**
Weichai WP3.2 Anti-Stall	Threshold Drive Minimum Range Hysteresis	2375 rpm 50% 125 rpm 100 rpm
Screen or Menu	**Item**	**Selection**
Primary Lift Speeds	Extend Thresholds Retract Threshold Up Threshold Down Threshold Extend Max Retract Max Up Max Down Max	1% - 190% 1% - 179% 1% - 250% 1% - 253% 68% - 150% 70% - 150% 63% - 150% 63% - 150%
Screen or Menu	**Item**	**Selection / Default**
Primary Lift Ramps	Extend Accelerating Rate Extend Decelerating Rate Retract Accelerating Rate Retract Decelerating Rate Up Accelerating Rate Up Decelerating Rate Down Accelerating Rate Down Decelerating Rate	1 - 5 sec / 2.5 sec 0.25 - 5 sec / 1 sec 1 - 5 sec / 2.5 sec 0.5 - 5 sec / 1 sec 1 - 5 sec / 3 sec 0.5 - 5 sec / 3 sec 1 - 5 sec / 3 sec 1 - 5 sec / 1 sec
Screen or Menu	**Item**	**Selection**
Turntable Speeds	Rotate CW Max Rotate CCW Max Rotate CW Threshold Rotate CCW Threshold CW Out of Stow Max CCW Out of Stow Max	81% - 150% 81% - 150% 1% - 114% 1% - 114% 89% - 150% 89% - 150%

Screen or Menu	Item	Selection / Default
Turntable Ramps	CW Accelerating	1 - 10 sec / 3 sec
	CW Decelerating	0.5 - 2 sec / 2 sec
	CCW Accelerating	1 - 10 sec / 3 sec
	CCW Decelerating	0.5 - 2 sec / 2 sec
Screen or Menu	**Item**	**Selection**
Jib Boom and Platform Speeds	Jib Up Threshold	1% - 112%
	Jib Down Threshold	1% - 118%
	Platform Level Up Threshold	1% - 127%
	Platform Level Down Threshold	1% - 127%
	Platform Rotate CW Threshold	1% - 114%
	Platform Rotate CCW Threshold	1% - 126%
	Jib Up Max Output	90% - 150%
	Jib Down Max Output	87% - 150%
	Platform Level Up Max Output	83% - 150%
	Platform Level Down Max Output	83% - 150%
	Platform Rotate CW Max Output	89% - 150%
	Platform Rotate CCW Max Output	83% - 150%
Screen or Menu	**Item**	**Selection / Default**
Jib Boom and Platform Ramps	Jib Up/Down Ramp	0.2 - 2 sec / 0.75 sec
	Platform Level Ramp	0.2 - 2 sec / 0.75 sec
	Platform Rotate Ramp	0.2 - 2 sec / 0.6 sec
Screen or Menu	**Item**	**Selection**
Machine Disable Options	Drive Disable	On • Off
	Machine Disable	On • Off
	Remote Disable	Disable Engine Start • Drive Speed Cripple • Lift Speed Cripple
Reset Defaults		OK to reset Model Configuration and Options
Software Update		OK to enter Software Update Mode

Control System

Maintenance Menu	Item	Selection / Units
DISCON - Version		OK to show DISCON Software version
CAN Data Recording		OK + Up/Down to set On/Off On: Starts recording Machine CAN bus Data Off: Converts and writes log data to USB storage if device is plugged in, or data is lost
Real Time Data	Tilt Pitch Op.	deg.
	Tilt Roll Op.	deg.
	Boom Angle	deg.
	Boom Length	in • cm
	Platform Angle	deg.
	Platform Angle to Target	deg.
	Platform Load	lb • kg
	Bus Volts	V
	Ambient Temperature	F • C
	Boom Angle LSxx Status	0 • 1
	Boom Retracted LSxx Status	0 • 1
	Drive Enable LST1O	0 • 1
	Cable Tension LSB2S	0 • 1
	Tilt Pitch Secondary	deg.
	Tilt Roll Secondary	deg.
	Boom Angle Secondary	deg.
	Boom length Secondary	in • cm
	Platform Load Secondary	lb • kg
	Platform Angle Secondary	deg.
	Lift Connect	VALID DEVICE / INVALID DEVICE / NO_DEVICE
Stage V Info Note: Not available in all markets.		Regen Log Service Regen
System Information		Software Version
Faults Menu	**Item**	**Default**
Active Machine Faults		List active fault codes and hours meter of occurrence
Machine Fault History		List history fault codes and hours meter of occurrence
	Applies to all machine fault codes	OK on a fault code shows short description
Active Engine Faults		List active engine SPN / FMI codes
	Applies to all engine fault codes	OK on a fault code shows reference to Engine Fault Codes section of manual
Download Fault Log		OK to confirm writing machine faults log to USB storage device
Clear Faults		OK confirms to clear machine history faults log

1-7
How to Replace the Display Controller (DISCON) Module

1 Push in the red Emergency Stop button to the off position at both the ground and platform controls.

2 Disconnect the negative terminal from the start battery and auxiliary battery, if equipped.

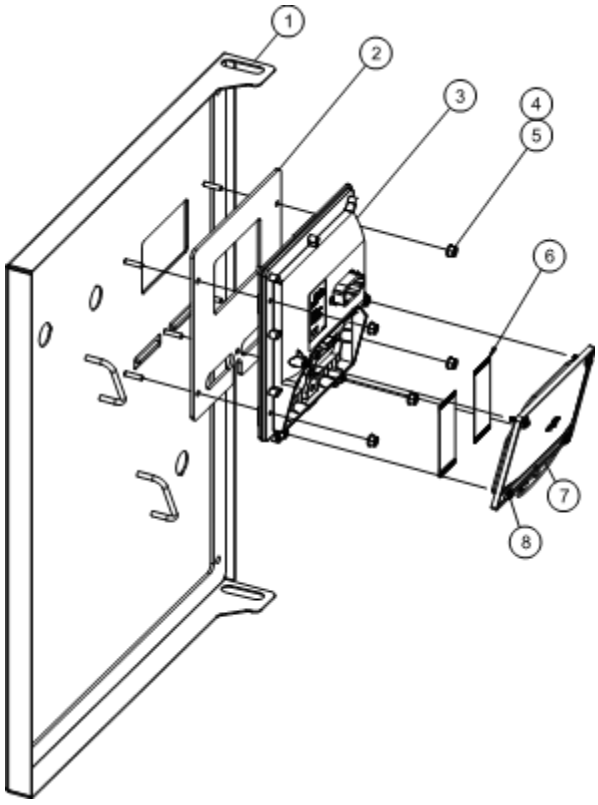


Illustration 1

1 ground box lid
2 DISCON gasket
3 DISCON
4 8/32 nylock nuts
5 #8 flat washers
6 ribbon cable
7 DISCON door
8 Torx head screws

3 Open the ground box lid (1) and disconnect the wire harness going to the display controller (DISCON).

4 Remove the DISCON door from the back by loosening the four Torx head screws (8) and remove the two ribbon cables (6) connecting the ground box overlay to the DISCON.

Note the orientation of the cables for reassembly.

5 Remove the DISCON from the ground control box lid by removing the five hex nuts and washers (4, 5). Discard the nuts and washers.

Note the lanyard attachment point for reassembly.

6 Remove the old DISCON gasket (2) from the ground box lid and clean the lid surface from any dirt, oil or old adhesive residue. Use a 99% solution of isopropyl alcohol to clean the surface. Allow the surface to completely dry.

Note: Both the ground box lid and new gasket must be 70° F / 21° C or higher at the time of application. Application of the new gasket at lower temperatures is not recommended.

7 Peel the adhesive protective film from the back of the new gasket. Carefully line up the new gasket over the ground box lid, making sure the cutouts for the LCD screen, ribbon cables and mounting studs are centered and lining up with the gasket. Apply the new gasket to the ground box lid and work from the center out to eliminate air bubbles and make sure all the gasket edges are securely fixed.

Note: Once applied it is not recommended to lift the gasket and attempt to reposition it.

Control System

8 Install the new DISCON onto the ground box lid and fasten it using the new hex nuts and washers. All five fastening points must be used. Attach the DISCON door's lanyard to the DISCON's mounting stud.

9 Evenly tighten the nuts, beginning with the lower center nut, working out and then up.

10 Install the new ribbon cables, connecting the ground box overlay to the DISCON and reinstall the DISCON door, using the Torx head screws removed in step 4. Be sure to fully lock the tabs after the ribbon cables have been fully inserted.

11 Reconnect the wire harness going to the DISCON, then close and fasten the ground box lid.

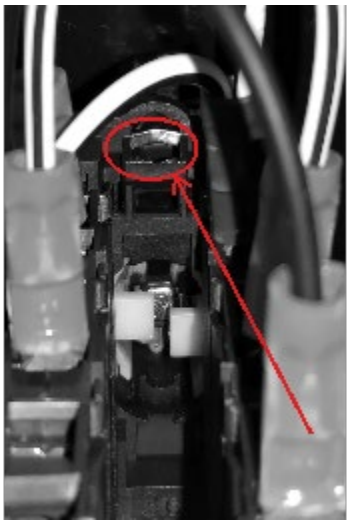
12 Reconnect the negative terminal to the start battery and auxiliary batteries, if equipped.

1-8 How to Replace the Ground Box Control Overlay

1 Push in the red Emergency Stop button to the off position at both the ground and platform controls.

2 Disconnect the negative terminal from the start battery and auxiliary battery, if equipped.

3 Open the ground control box and remove the switch contacts from the function enable switch, key switch and the red emergency stop button. Do not disconnect the wires. Insert a small screwdriver into the loop at the base of the contacts and engage the release mechanism.

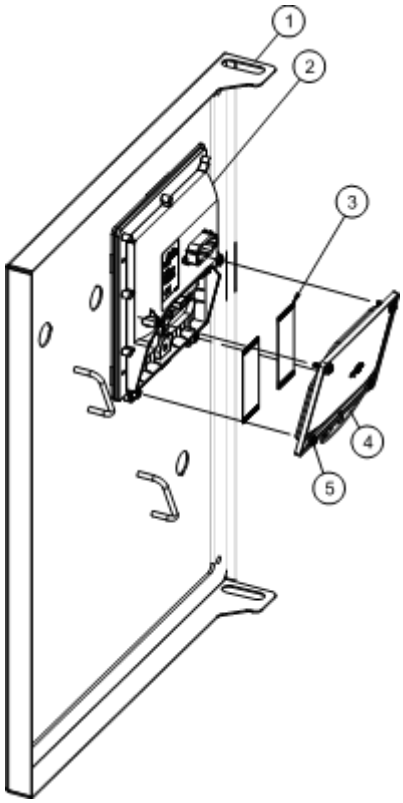


4 Unscrew the nut holding the buttons and key switch and remove the key switch and buttons.

Note the orientation of the key switch so it can be reassembled in the same position.

5 Disconnect the wire harness connected to the DISCON and cut the zip ties securing the harness to the ground box lid. Do not remove the wire harness from the ground box.

6 Remove the DISCON door (4) and disconnect the ribbon cables (3) from the Display Controller (DISCON) (2). Note the orientation of the cables for reassembling.



1 ground box lid
2 DISCON
3 ribbon cables
4 DISCON door
5 Torx head screws

7 Remove the ground box lid (1) from the ground box.

8 Remove the old overlay and clean the ground box lid surface from any dirt, oils or old adhesive residue. Clean the lid with 99% isopropyl alcohol. Allow the surface to completely dry.

9 Before placing the new overlay, make sure the temperature of the lid and overlay is between 80-100° F / 26-38° C. Application below 80° F / 26° C is not recommended.

10 Peel the adhesive protective film from the back of the overlay. Carefully align the overlay, making sure the LCD screen cutout, push buttons and key switch are centered. Apply the overlay to the ground box, applying pressure evenly to eliminate any air bubbles.

Note: Pay particular attention to the outside edges, the LCD cutout edges and the area around the ribbon cables, making sure there is complete contact between the overlay and the ground box.

Note: It is not recommended peeling and reapplying the overlay, so take time to align the overlay before making contact with the ground box.

11 Maintain the temperature of 80-100° F / 26-38° C for a minimum of 20 minutes to allow the adhesive to cure.

12 Install the provided ribbon cables, first to the overlay and then the DISCON. Be sure the connectors are applied evenly in the sockets and the tabs are fully locked.

13 Reinstall the DISCON door using the Torx head screws (5). Tighten, but do not overtighten.

14 Reinstall the ground box door to the ground box, using the fasteners removed in step 7. Tighten the fasteners securely.

Control System

15 Reinstall the E-Stop button, function enable button and key switch and the contact assemblies.

16 Reinstall the wire harness from the ground box to the DISCON. Secure the harness to the ground box lid using zip ties.

17 Close and fasten the ground box lid.

18 Reconnect the negative terminal to the start battery and auxiliary batteries, if equipped.

2-1
Platform Leveling Cylinder

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

How to Remove the Platform Leveling Cylinder

Note: Before cylinder removal is considered, bleed the leveling cylinder to be sure there is no air in the closed loop.

Note: When removing a hose assembly or fitting, the O-ring (if equipped) on the fitting and/or hose end must be replaced. All connections must be torqued to specification during installation. Refer to Specifications, *Hydraulic Hose and Fitting Torque Specifications.*

1 Extend the primary boom until the slave cylinder barrel-end pivot pin is accessible.

2 Raise the jib boom slightly and place blocks under the platform for support.

3 Lower the jib boom until the platform is resting on the blocks just enough to support the platform.

Note: Do not rest the entire weight of the jib boom on the blocks.

4 Tag, disconnect and cap the hydraulic hoses from the slave cylinder. Plug the union hoses from the master cylinder together using a connector.

⚠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.

5 Remove the pin retaining fastener from the slave cylinder rod-end pivot pin. Do not remove the pin.

6 Remove the external snap rings from the slave cylinder barrel-end pivot pin. Do not remove the pin.

7 Place a block under the slave cylinder for support. Protect the cylinder rod from damage.

8 Use a soft metal drift to drive the rod-end pivot pin out.

⚠WARNING Crushing hazard. The platform could fall when the leveling cylinder rod-end pivot pin is removed if not properly supported.

NOTICE Component damage hazard. The leveling cylinder rod may become damaged if it is allowed to fall if not properly supported by the lifting device.

9 Use a soft metal drift and drive the barrel-end pin out.

10 Carefully pull the cylinder out of the primary boom.

Platform Components

How to Bleed the Slave Cylinder

1 Simultaneously activate the primary boom up function and the platform level up function until the boom is fully raised.

2 Simultaneously activate the primary boom down function and the platform level down function until the boom is fully lowered.

2-2 Platform Rotator

The platform rotator is a hydraulically activated helical gear assembly used to rotate the platform 160 degrees.

How to Remove the Platform Rotator

NOTICE

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

Note: When removing a hose assembly or fitting, the O-ring (if equipped) on the fitting and/or hose end must be replaced. All connections must be torqued to specification during installation. Refer to Specifications, *Hydraulic Hose and Fitting Torque Specifications.*

1 Remove the platform. Refer to Repair Procedure, *How to Remove the Platform.*

Note: If the load cell components are disassembled and/or removed from the platform support, the platform overload system will need to be calibrated. Refer to Repair Procedure, *Platform Overload System.*

2 Tag, disconnect and plug the hydraulic hoses from the platform rotator manifold. Cap the fittings on the manifold.

⚠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.

S-45 XC:

3 Support the jib boom leveling arms and the platform mounting weldment with an appropriate lifting device. Do not apply any lifting pressure.

4 Remove the mounting bolts from the platform mounting weldment. Remove the center bolt and slide the platform mounting weldment off of the platform rotator.

⚠WARNING Crushing hazard. The platform mounting weldment may become unbalanced and fall if it is not properly supported.

5 Support the platform rotator with a suitable lifting device. Do not apply any lifting pressure.

S-40 XC:

6 Support the rod end of the platform level cylinder.

7 Remove the pivot pin retaining fasteners from both the slave cylinder rod-end pivot pin and the rotator pivot pin.

8 Use a soft metal drift to remove both pivot pins. Remove the platform rotator from the machine.

⚠WARNING Crushing hazard. The platform rotator may become unbalanced and fall if not properly supported.

Note: When installing the platform rotator fasteners, torque the fasteners to specifications.

9 Lower the jib boom leveling arms.

⚠WARNING Crushing hazard. The platform rotator may become unbalanced and fall if not properly supported.

Note: When installing the platform rotator fasteners, torque the fasteners to specifications.

Platform Components

S-45 XC:

10 Remove the pin retaining fasteners from the jib boom and jib boom leveling arms to platform rotator pivot pins. Do not remove the pins.

11 Support the jib boom leveling arms.

12 Use a soft metal drift to drive both pins out, then remove the platform rotator from the machine.

⚠ CAUTION Bodily injury hazard. The jib boom leveling arms may fall if not properly supported.

13 Lower the jib boom leveling arms.

⚠ WARNING Crushing hazard. The platform rotator could fall when removed from the machine if not properly supported.

Note: When installing the platform rotator fasteners, torque the fasteners to specifications.

How to Bleed the Platform Rotator

Note: This procedure will require two people. Do not start the engine. Use auxiliary power for this procedure.

1 Move the function enable toggle switch to either side and activate the platform rotate toggle switch to the right then the left through two platform rotation cycles, then hold the switch to the right position until the platform is fully rotated to the right.

2 Place a suitable container underneath the platform rotator.

3 Open the top bleed screw on the rotator, but do not remove it.

⚠ 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.

4 Move the function enable toggle switch to either side and hold the platform rotate toggle switch to the left position until the platform is fully rotated to the left. Continue holding the toggle switch until air stops coming out of the bleed screw. Close the bleed screw.

⚠ WARNING Crushing hazard. Keep clear of the platform during rotation.

5 Open the bottom bleed screw on the rotator, but do not remove it.

⚠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.

6 Move the function enable toggle switch to either side and hold the platform rotate toggle switch to the right position until the platform is fully rotated to the right. Continue holding the toggle switch until air stops coming out of the bleed screw. Close the bleed screw.

⚠WARNING Crushing hazard. Keep clear of the platform during rotation.

7 Clean up any hydraulic oil that may have spilled.

8 Rotate the platform fully in both directions and inspect the bleed screws for leaks.

2-3 Platform Overload System

Proper calibration of the platform overload system is essential to safe machine operation. Continued use of an improperly calibrated platform overload system could result in the system failing to sense an overloaded platform. The stability of the machine is compromised, and it could tip over.

How to Perform a Zero Load Platform Calibration

Perform this procedure when platform overload is not operating within the calibration parameters. This procedure will re-calibrate the zero load point without affecting a previous full load calibration. In most cases the machine will maintain full load capacity, however, in some situations the platform load capacity may be reduced until a full load calibration has been performed.

Note: Perform this procedure on a firm, level surface with the machine in the stowed position.

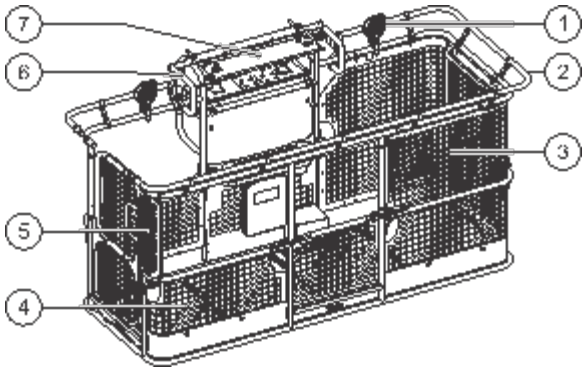
1 Fully retract and lower the boom. Level the platform.

2 Remove all weight, tools, accessories and equipment from the platform.

Note: Options and accessories that are considered integrated components of the platform do not require removal to perform calibration. Refer to *Integrated Options and Accessories*.

⚠DANGER Tip-over hazard. Failure to remove all non-integrated factory and non-factory options and accessories could result in the machine tipping over, causing death or serious injury.

Platform Components



Integrated Options and Accessories

1 platform work lights
2 auxiliary top rail
3 platform full height mesh
4 platform half height mesh
5 swing gate latch guard
6 Contact alarm
7 control box cover

3 Enter Service Mode. Refer to Repair Procedure, *How to Enter the Service Mode*.

4 Press the settings button above the display and select the Calibrations menu.

5 Navigate to the Sensor calibration screen.

6 Navigate to the Load Sense calibration screen.

7 Select and start the calibration procedure.

8 Follow the on-screen prompts to set the zero load.

9 Follow the prompts to accept the weight.

10 Calibration is now complete.

11 Exit Service Mode.

How to Perform a Full Load Platform Calibration

Perform this procedure if the platform support or load cell sensor has been replaced, or if a zero load platform calibration does not return the machine to full load capacity.

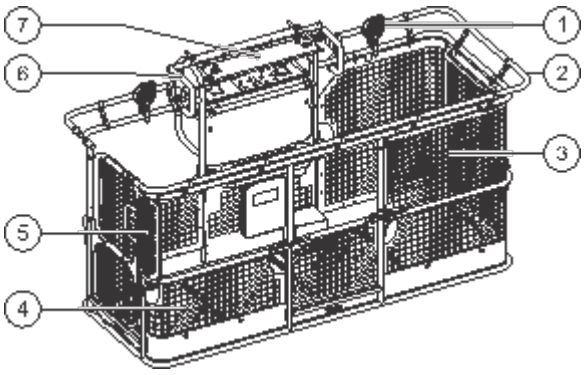
Note: Perform this procedure on a firm, level surface with the machine in the stowed position.

1 Fully retract and lower the boom. Level the platform.

2 Remove all weight, tools, accessories and equipment from the platform.

Note: Options and accessories that are considered integrated components of the platform do not require removal to perform calibration. Refer to *Integrated Options and Accessories*.

⚠ DANGER Tip-over hazard. Failure to remove all non-integrated factory and non-factory options and accessories could result in the machine tipping over, causing death or serious injury.



Integrated Options and Accessories

1 platform work lights
2 auxiliary top rail
3 platform full height mesh
4 platform half height mesh
5 swing gate latch guard
6 contact alarm
7 control box cover

Platform Components

3 Enter Service Mode. Refer to Repair Procedure, *How to Enter the Service Mode*.

4 Press the settings button above the display and select the Calibrations menu.

5 Navigate to the Sensor calibration screen.

6 Navigate to the Load Sense calibration screen.

7 Select and start the calibration procedure.

8 Follow the on-screen prompts to set the zero load.

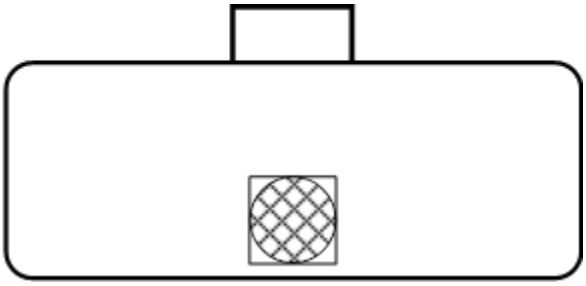
9 Continue with the on screen prompts to set the maximum load.

10 Place a test weight on the platform floor using a suitable lifting device. Place the weight near the center entry point of the platform, as far away from the operator controls as possible.

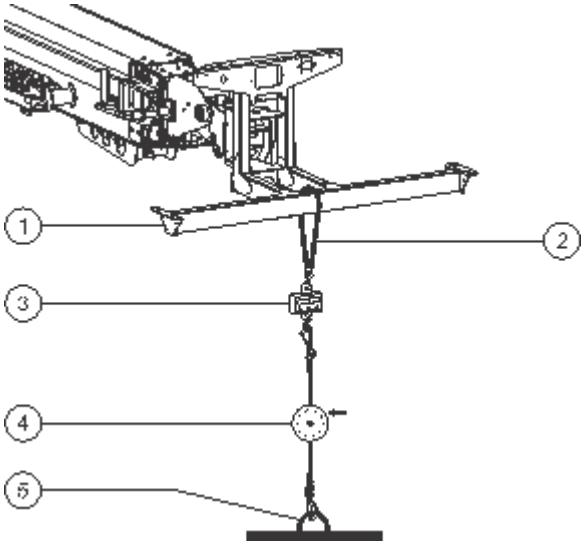
XC models = 1,000 lbs / 454 kg

HF models = 600 lbs / 272 kg

Note: If test weights are not available, you may use an industrial scale to weigh available objects until it equals the platform's maximum capacity.



Note: Alternate method for achieving rated load in the platform is to attach a hanging scale to the bottom of the platform and apply load using a winch or chain hoist until the readout displays the appropriate weight.



Platform hidden from illustration for clarity

1 platform support
2 hanging scale
3 winch or chain hoist
4 anchoring device

Platform Components

11 Follow the prompts to accept the weight.

12 Calibration is now complete.

13 Exit Service Mode.

14 Push in the red Emergency Stop button to the off position.

Confirm calibration:

15 Start the engine from the ground controls.

16 Add an additional 50 lbs / 23 kg of weight or load to the platform.

⊙ Result: The alarm sounds. The engine turns off. The platform overload indicator light flashes at the platform controls and *Platform Overload* is displayed on the LCD screen at the ground controls.

Note: There may be a 2 second delay before the overload indicator lights flash and the alarm sounds.

17 Test all machine functions from the ground controls.

⊙ Result: Engine does not start. Limited APU functionality. Elevate and extend functions do not operate.

18 Remove the weight or rated load from the platform.

How to Replace the Load Cell Sensor

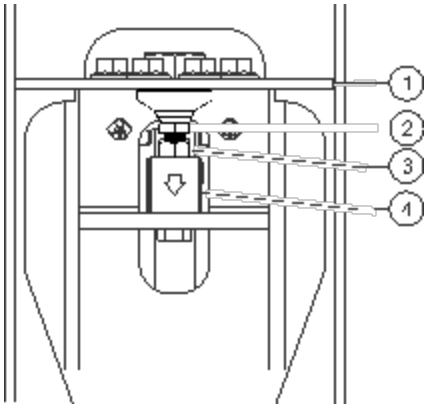
Note: The preload adjustment should only be performed after the load cell sensor has been replaced.

1 Remove all equipment or tools from the platform. Remove the welder if equipped.

2 At the platform, remove the plastic instruction holder from the document mount plate.

3 Tag and disconnect the load cell sensor harness.

4 Loosen the jam nut securing the load cell sensor foot and rotate the foot screw clockwise to remove the preload.



1 flex plate
2 load cell sensor foot
3 jam nut
4 load cell sensor

5 Remove the fasteners securing the load cell sensor and remove the sensor.

Install the new Load Cell Sensor

6 Screw the foot with jam nut into the top of the load cell sensor until the foot bolt extends out of the bottom of the sensor.The foot should not contact the flex plate when assembling onto the platform support.

7 Assemble the load cell and foot assembly to the platform and securely tighten the two mounting screws. Torque the bolts to 101 ft-lbs / 137 Nm.

Set the Load Cell Sensor Preload

8 Rotate the foot screw counter clockwise until the foot just contacts the flex plate (finger tight).

9 Using an open end wrench, continue to rotate the foot counter clockwise an additional 1/2 turn (180°). Then, while holding the foot bolt, securely tighten the jam nut. Torque the jam nut to 55 ft-lbs / 75 Nm.

10 Attach the load cell sensor harness.

11 Install the plastic instruction holder.

12 Calibrate the platform overload system. Refer to, *How to Perform a Full Load Platform Calibration.*

2-4 Platform

How to Remove the Platform

1 Remove the cable clamp from the top of the platform mounting weldment.

2 Remove the mounting fasteners from the power to platform outlet box bracket. Lay the outlet box and bracket assembly off to the side. Do not disconnect the wiring.

3 Remove the foot switch mounting fasteners.

4 Remove the cover plate from the bottom of the foot switch to access the foot switch wire terminals.

5 Tag and disconnect the foot switch wiring from the foot switch. Remove the cable from the back of the platform.

⚠WARNING Electrocution/burn hazard. Contact with electrically charged circuits could result in death or serious injury. Remove all rings, watches and other jewelry.

6 Remove the platform control box mounting fasteners. Lower the control box and set it aside.

NOTICE Component damage hazard. Cables can be damaged if they are kinked or pinched.

Note: If your machine is equipped with an airline to platform option, the airline must be disconnected from the platform before removal.

7 Support and secure the platform to an appropriate lifting device.

8 Remove the platform mounting fasteners and remove the platform from the machine.

⚠WARNING Crushing hazard. The platform could become unstable and fall when it is removed from the machine if not properly supported.

Jib Boom Components

3-1
Jib Boom

How to Remove the Jib Boom

Note: Perform this procedure with the boom in the stowed position.

Note: When removing a hose assembly or fitting, the O-ring (if equipped) on the fitting and/or hose end must be replaced. All connections must be torqued to specification during installation. Refer to Specifications, *Hydraulic Hose and Fitting Torque Specifications.*

1 Remove the platform.

2 Disconnect the electrical connector from the jib boom/platform rotate select valve manifold mounted to the platform support.

3 Tag, disconnect and plug all of the hydraulic hoses from the jib boom/platform rotate select valve manifold. Cap the fittings on the manifold.

⚠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.

4 Remove the platform support.

5 Remove the platform rotator. Refer to Repair Procedure, *How to Remove the Platform rotator*.

6 Remove the pin retaining fastener from the jib boom lift cylinder rod-end pivot pin. Do not remove the pin.

7 Slide both of the jib boom leveling arms off of the jib boom cylinder rod-end pivot pin.

8 Remove the hose and cable cover from the side of the jib boom. Remove the hose and cable separators.

9 Attach a lifting strap from an overhead supporting device to the jib boom.

10 Support the barrel end of the jib boom lift cylinder with a suitable lifting device.

11 Tag, disconnect and plug the jib boom lift cylinder hydraulic hoses. Cap the fittings on the cylinder.

⚠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.

12 Remove the pin retaining fastener from the jib boom lift cylinder barrel-end pivot pin.

13 Use a soft metal drift to remove the pin and let the cylinder hang down.

⚠WARNING Crushing hazard. The jib boom could fall when the barrel-end pivot pin is removed if not properly supported by the lifting device.

14 Remove the pin retaining fastener from the jib boom pivot pin. Use a soft metal drift to remove the pin, then remove the jib boom.

⚠WARNING Crushing hazard. The jib boom may become unbalanced and fall when it is removed from the machine if it is not properly supported by the overhead lifting device.

3-2
Jib Boom Lift Cylinder

How to Remove the Jib Boom Lift Cylinder

Note: Perform this procedure with the boom in the stowed position.

Note: When removing a hose assembly or fitting, the O-ring (if equipped) on the fitting and/or hose end must be replaced. All connections must be torqued to specification during installation. Refer to Specifications, *Hydraulic Hose and Fitting Torque Specifications.*

1 Raise the jib boom slightly and place blocks under the platform support. Lower the jib boom until the platform is resting on the blocks just enough to support the platform.

Note: Do not rest the entire weight of the boom on the blocks.

2 Tag, disconnect and plug the jib boom lift cylinder hydraulic hoses. Cap the fittings on the cylinder.

⚠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.

3 Remove the pin retaining fasteners from the jib boom lift cylinder rod-end pivot pin. Do not remove the pin.

4 Use a soft metal drift to tap the jib boom lift cylinder rod-end pivot pin out enough to lower one of the leveling arms to the ground. Tap the pin the other direction and lower the opposite leveling arm. Do not remove the pin.

5 Support the jib boom lift cylinder with a suitable lifting device.

6 Remove the pin retaining fastener from the jib boom lift cylinder barrel-end pivot pin. Use a soft metal drift to remove the barrel-end pin and let the cylinder hang down.

⚠WARNING Crushing hazard. The jib boom may become unbalanced and fall when it is removed from the machine if it is not properly supported by the overhead lifting device.

7 Attach a lifting strap from an overhead lifting device to the lug on the rod end of the jib boom lift cylinder.

8 Use a soft metal drift to remove the jib boom lift cylinder rod-end pin. Remove the jib boom lift cylinder from the machine.

⚠WARNING Crushing hazard. The jib boom lift cylinder may become unbalanced and fall when it is removed from the machine if it is not properly supported by the lifting device.

Primary Boom Components

4-1 Cable Track

The primary boom cable track guides the 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 Remove the Cable Track

Note: When removing a hose assembly or fitting, the O-ring (if equipped) on the fitting and/or hose end must be replaced. All connections must be torqued to specification during installation. Refer to Specifications, *Hydraulic Hose and Fitting Torque Specifications.*

1 Disconnect the wire connectors from the bottom of the platform control box.

Note: When installing the wire connectors to the bottom of the platform control box, match the color of the connectors to those on the control box to be sure they are installed in the correct location.

2 Disconnect the power to plat cable from the AC outlet box.

3 Remove the hose and cable clamps from the platform support.

4 Tag, disconnect and plug the platform leveling slave cylinder hydraulic hoses from the bulkhead fittings on the top of the primary boom. Cap the bulkhead fittings.

⚠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.

5 Tag, disconnect and plug ports V1 and V2 on the platform rotate/jib manifold. Cap the fittings.

⚠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.

6 Remove the hose and cable cover from the side of the jib boom.

7 Remove the retaining fasteners securing the cable track to the upper tube.

8 Pull the cable track back from the upper tube.

9 Remove the hose and cable clamps from inside the cable track at both ends.

10 Pull the hoses and cables out of the upper tube.

11 Pull the hoses and cables out of the cable track.

12 Remove the retaining fasteners that attach the cable track to the lower tube.

13 Remove the cable track from the machine.

Primary Boom Components

How to Repair the Cable Track

NOTICE Component damage hazard. The boom cable track can be damaged if it is twisted.

Note: A cable track repair kit is available through the Genie Service Parts Department.

1 Visually inspect the cable track and determine which 4-link section needs to be replaced.

2 Carefully remove the snap rings and pins from each end of the damaged section of cable track.

3 Remove the retaining fasteners from the upper black rollers from the 4-link section of cable track to be replaced. Remove the rollers.

4 Lift up the hoses and cables and carefully remove the damaged 4-link section of cable track.

NOTICE Component damage hazard. Hoses and cables can be damaged if they are kinked or pinched.

5 Remove the upper rollers from the replacement section of cable track.

6 Lift up the hoses and cables and carefully insert the new 4-link section of cable track.

NOTICE Component damage hazard. Hoses and cables can be damaged if they are kinked or pinched.

7 Connect the ends of the replacement cable track section to the existing cable track using the pins and snap rings.

8 Install the rollers onto the new section of cable track.

9 Operate the boom extend/retract function through a full cycle to ensure smooth operation of the new section of cable track.

4-2 Primary Boom

How to Remove the Primary Boom

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

Note: When removing a hose assembly or fitting, the O-ring (if equipped) on the fitting and/or hose end must be replaced. All connections must be torqued to specification during installation. Refer to Specifications, *Hydraulic Hose and Fitting Torque Specifications.*

1 Remove the jib boom, if equipped. Refer to Repair Procedure, *How to Remove the Jib Boom*.

2 Remove the cable track. Refer to Repair Procedure, *How to Remove the Cable Track*.

3 Raise the primary boom to the horizontal position.

4 Attach lifting straps from a 1.5 ton / 1500 kg overhead lifting device to the center point of the boom. Support the boom. Do not apply lifting pressure.

5 Remove the turntable end cover.

Primary Boom Components

6 Remove the retaining fasteners from the master cylinder rod-end pivot pin. Use a soft metal drift to remove the pin. Lower the master cylinder against the primary lift cylinder.

NOTICE Component damage hazard. When lowering the master cylinder down, be sure not to damage the master cylinder hoses or fittings.

7 Remove the fasteners from the limit switch mounted to the turntable riser at the pivot end of the boom. Do not disconnect the wiring.

8 Tag, disconnect and plug the primary boom extension cylinder hydraulic hoses. Cap the fittings on the cylinder.

⚠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.

9 Using an overhead supporting device, attach a strap to the rod-end of the primary boom lift cylinder.

10 Remove the retaining fasteners from the primary boom lift cylinder rod-end pivot pin. Use a soft metal drift to remove the pin.

⚠WARNING Crushing hazard. The boom lift cylinder and primary boom will fall if not properly supported.

11 Place a support block across the turntable and lower the lift cylinder on it.

12 Remove the retaining fasteners from the primary boom pivot pin.

13 Remove the primary boom pivot pin with a soft metal drift, then carefully remove the primary boom from the machine and place it on a structure capable of supporting it.

⚠WARNING Crushing hazard. The primary boom could become unbalanced and fall when removed from the machine if not properly attached to the suitable lifting device.

Primary Boom Components

How to Disassemble the Primary Boom

Complete disassembly of the boom is only necessary if the outer or inner boom tube must be replaced. The extension cylinder can be removed without completely disassembling the boom. Refer to Repair Procedure, *How to Remove the Primary Boom Extension Cylinder*.

1 Remove the primary boom. Refer to Repair Procedure, *How to Remove the Primary Boom*.

2 Place blocks under the extension cylinder for support.

3 Remove the external snap rings from the extension cylinder barrel-end pivot pin at the pivot end of the primary end of the primary boom tube. Use a soft metal drift to remove the pin.

4 Remove and label the wear pads from the top side of the primary boom tube at the platform end of the boom.

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

5 Attach a lifting strap from an overhead supporting device to the secondary boom tube at the platform end of the boom for support.

6 Support and slide the secondary boom tube out of the primary boom tube. Place the secondary boom tube on blocks for support.

⚠WARNING Crushing hazard. The secondary boom tube may become unbalanced and fall when removed if it is not properly supported when it is removed from the machine.

Note: During removal, the lifting strap will need to be adjusted for proper balancing.

7 Remove and label the wear pads from the top side of the secondary boom tube at the platform end of the boom.

8 Remove the trunnion pin retaining fasteners at the base end of the secondary boom tube. Use a slide hammer to remove the trunnion pins.

9 Carefully rotate the base end of the extension cylinder until the pin mounting bore is in a vertical position.

10 Remove the external snap rings from the extension cylinder rod-end pivot pin at the platform end of the secondary boom tube. Use a soft metal drift to remove the pin.

11 Support and slide the extension cylinder out of the base end of the secondary boom tube. Place the extension cylinder on blocks for support.

⚠WARNING Crushing hazard. The extension cylinder could become unbalanced and fall when removed from primary boom extension tube if not properly supported.

Note: During removal, the lifting strap will need to be adjusted for proper balancing.

12 Remove and label the wear pads from extension cylinder.

Note: Pay careful attention to the location of each wear pad.

Primary Boom Components

4-3
Primary Boom Lift Cylinder

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

How to Remove the Primary Boom Lift Cylinder

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

1 Raise the primary boom to a horizontal position.

2 Place support blocks across the turntable under the boom lift cylinder

3 Attach a 1.5 ton / 1500 kg overhead supporting device to the primary boom for support.

4 Raise the primary boom with the overhead supporting device slightly to take pressure off the primary boom lift cylinder pivot pins.

5 Support the rod end and the barrel end of the primary boom lift cylinder with a second overhead supporting device.

6 Tag, disconnect and plug the primary boom lift cylinder hydraulic hoses. Cap the fittings on the cylinder.

⚠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.

7 Remove the retaining fasteners from the primary boom lift cylinder rod-end pivot pin. Use a soft metal drift to remove the pin. Lower the lift cylinder onto the blocks. Protect the cylinder rod from damage.

⚠WARNING Crushing hazard. The primary boom will fall if not properly supported when the primary boom rod-end pivot pin is removed.

8 Remove the four mounting fasteners from the lift cylinder barrel-end pivot pin mounting plate.

⚠WARNING Crushing hazard. The primary boom lift cylinder could become unbalanced and fall if not properly supported by the lifting device.

9 With the lift cylinder being supported, carefully pull the lift cylinder toward the platform to remove it from the machine.

⚠WARNING Crushing hazard. The lift cylinder could become unbalanced and fall if not properly supported and secured to the lifting device.

Primary Boom Components

4-4
Primary Boom Extension Cylinder

The primary boom extension cylinder extends and retracts the primary boom extension tube.The primary boom extension cylinder is equipped with counterbalance valves to prevent movement in the event of a hydraulic line failure.

How to Remove the Primary Boom Extension Cylinder

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

Note: When removing a hose assembly or fitting, the O-ring (if equipped) on the fitting and/or hose end must be replaced. All connections must be torqued to specification during installation. Refer to Specifications, *Hydraulic Hose and Fitting Torque Specifications.*

1 Extend the boom until the extension cylinder rod-end pivot pins are accessible in the extension tube.

2 Remove the master cylinder. See the repair procedure, *How to Remove the Master Cylinder*.

3 Raise the primary boom to a horizontal position.

4 At the pivot end of the boom, remove the cover from the end of the #1 boom tube.

5 At the pivot end of the boom, remove the retaining fasteners and blocks securing the extend cylinder to the #2 boom tube through the access holes in the #1 boom tube.

6 Tag, disconnect and plug the primary boom extension cylinder hydraulic hoses. Cap the fittings on the cylinder.

⚠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.

7 At the platform end of the boom, remove the external snap rings from the extension cylinder rod-end pivot pin. Use a soft metal drift to remove the pin.

8 At the pivot end of the boom, remove the retaining fasteners and blocks securing the extend cylinder to the #1 boom tube'

9 Support and slide the extension cylinder out of the primary boom.

⚠WARNING Crushing hazard. The extension cylinder could fall when removed from the extension boom if not properly supported.

NOTICE Component damage hazard. Be careful not to damage the counterbalance valves on the primary boom extension cylinder when removing the cylinder from the primary boom.

NOTICE Component damage hazard. Hoses and cables can be damaged if the primary boom extension cylinder is dragged across them.

Note: Note the length of the cylinder after removal. The cylinder must be at the same length for installation.

Primary Boom Components

4-5 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 boom motion. The master cylinder is located at the base of the primary boom.

How to Remove the Platform Leveling Master Cylinder

Note: When removing a hose assembly or fitting, the O-ring (if equipped) on the fitting and/or hose end must be replaced. All connections must be torqued to specification during installation. Refer to Specifications, *Hydraulic Hose and Fitting Torque Specifications.*

1 Raise the secondary boom until both the rod-end and barrel-end pivot pins on the master cylinder are accessible.

2 Use an overhead supporting device to support the platform. Do not apply lifting pressure.

3 Tag, disconnect and plug the master cylinder hydraulic hoses. Cap the fittings on the cylinder.

⚠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.

4 Attach overhead supporting device to the master cylinder.

5 Remove the retaining fasteners from the master cylinder barrel-end pivot pin.

6 Use a soft metal drift to remove the pin.

7 Remove the retaining fastener from the rod-end pivot pin.

8 Use a soft metal drift to remove the pin.

9 Remove the master cylinder from the machine.

⚠WARNING Crushing hazard. The master cylinder could become unbalanced and fall if not properly attached to the lifting device.

4-6
Primary Boom Angle Sensor

The primary boom angle sensor is used to limit the angle of the primary boom relative to the angle of the turntable and gravity.

How to Calibrate the Primary Boom Angle Sensor

Note: Perform this procedure with the machine on a firm, level surface with the boom in the stowed position.

Note: The turntable level sensor and platform load sensor must be calibrated prior to calibrating the primary boom angle sensor.

Note: This procedure will establish the cross-check angle with the boom limit switch LST3S. If LST3S does not switch its state properly during the calibration, the calibration will be invalidated.

1 Fully retract and lower the boom. Ensure the boom is in contact with the boom rest pad.

2 Enter Service Mode. Refer to Repair Procedure, *How to Enter the Service Mode*.

3 Press the settings button above the display and navigate to the Sensor Calibrations menu.

4 Navigate to the Boom Angle Sensor calibration screen.

5 Select and start the calibration procedure.

6 Start the engine.

7 When the display prompts the operator to lower the boom, press and hold the function enable button and the boom down buttons until the display indicates that the lower calibration point has been obtained. This may require holding the buttons for several seconds after the boom has touched the rest pad.

8 Press **OK** on the display to continue with the procedure to capture the maximum angle point.

9 Operate the boom up function until the boom reaches its maximum angle. Continue holding the function enable and boom up buttons for several seconds until the display indicates that the upper calibration point has been obtained. This may require holding the buttons for several seconds after the boom reaches its maximum angle.

10 Follow the on-screen prompts to lower the boom until the display indicates the calibration is complete. If this step isn't done, the boom will be in the safety envelope when the calibration procedure ends

11 The calibration is now complete.

12 Exit the Service Mode.

Primary Boom Components

4-7
Boom Length Sensor

How to Calibrate the Primary Boom Length Sensor

Note: The turntable level sensor, platform load sensor and primary boom angle sensor must be calibrated before calibrating the boom length sensor.

Note: This procedure will establish the cross-check angle with the boom limit switch LSB1RS. If LSB1RS does not switch its state properly during calibration, the calibration will be invalidated.

1 Fully retract the boom. Ensure the boom angle is above 65°.

2 Enter Service Mode. See Repair Procedure, *How to Enter Service Mode*.

3 Press the settings button above the display and navigate to Sensor Calibrations.

4 Navigate to the Boom Length Sensor calibration screen.

5 Select and start the calibration procedure.

6 Start the engine.

7 When the display prompts the operator to retract the boom, press and hold the function enable and boom retract buttons until the display indicates the retracted calibration point has been obtained. This may require holding the buttons for several seconds after the boom has fully retracted.

8 Press the **OK** button to continue to capture the maximum extension point.

9 Press the function enable and boom extend buttons until the boom reaches its maximum extension. Continue holding the buttons for several seconds after the boom reaches its maximum extension until the display indicates the calibration point has been captured.

10 The calibration is complete.

11 Exit the Service Mode.

5-1
RPM Adjustment - Deutz Models

Refer to Maintenance Procedure in the appropriate Service or Maintenance Manual for your machine, *Check and Adjust the Engine RPM*.

5-2
RPM Adjustment - Perkins Models

Refer to Maintenance Procedure in the appropriate Service or Maintenance Manual for your machine, *Check and Adjust the Engine RPM*.

5-3
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

Deutz models:

1 Remove the tailpipe bracket mounting fasteners from the engine bell housing.

2 Support the drive pump assembly with an appropriate lifting device.

3 Remove all of the engine bell housing fasteners.

4 Carefully pull the pump and bell housing assembly away from the engine and secure it from moving.

NOTICE

Component damage hazard. Hoses can be damaged if they are kinked or pinched.

5 Remove the flex plate mounting fasteners. Remove the flex plate from the flywheel.

Ford models:

1 Disconnect the electrical connectors from both oxygen sensors at the tailpipe and exhaust manifold. Do not remove the oxygen sensors.

2 Remove the exhaust pipe fasteners at the muffler.

3 Support the muffler and bracket assembly with a suitable lifting device.

4 Remove the muffler bracket mounting fasteners from the bell housing. Carefully remove the muffler and bracket assembly from the engine.

Engines

5 Support the engine with an overhead crane or other suitable lifting device. Do not lift it.

6 Remove the engine mounting plate to bell housing fasteners.

7 Raise the engine slightly using the overhead crane and place a block of wood under the oil pan for support.

8 Support the drive pump assembly with an overhead crane or other suitable lifting device. Do not apply any lifting pressure.

9 Remove all of the engine bell housing retaining fasteners.

10 Carefully pull the pump and bell housing assembly away from the engine and secure it from moving.

Perkins models:

1 Remove the fuel filter/water separator mounting fasteners.

2 Remove the fuel filter/water separator and lay it to the side. Do not disconnect the hoses.

3 Support the drive pump assembly with an appropriate lifting device.

4 Remove all of the engine bell housing fasteners.

5 Carefully pull the pump and bell housing assembly away from the engine and secure it from moving.

NOTICE Component damage hazard. Hoses can be damaged if they are kinked or pinched.

6 Remove the flex plate mounting fasteners.

7 Remove the flex plate from the flywheel.

How to Install the Flex Plate

1 Install the flex plate onto the engine flywheel with the rubber vibration isolators towards the pump.

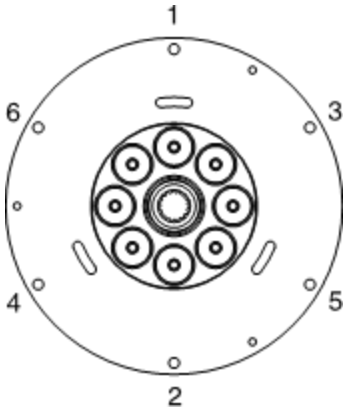
2 Apply Loctite® removable thread sealant to the flex plate fasteners and loosely install the fasteners.

3 **Deutz models:** Torque the flex plate mounting bolts in sequence to 28 ft-lbs / 38 Nm. Then torque the flex plate mounting bolts in sequence to 40 ft-lbs / 54 Nm.

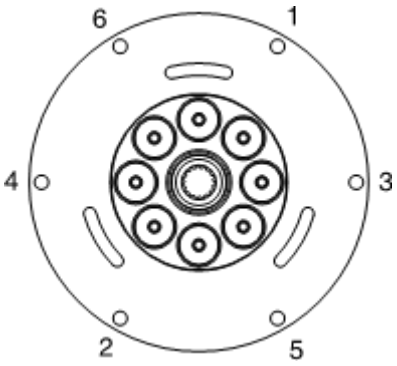
Ford and Perkins models: Torque the flex plate mounting bolts in sequence to 14 ft-lbs / 19 Nm. Then torque the flex plate mounting bolts in sequence to 20 ft-lbs / 27 Nm.

4 Apply a high viscosity coupling grease (Genie part number 128025) to the splines of the pump shaft and flex plate.

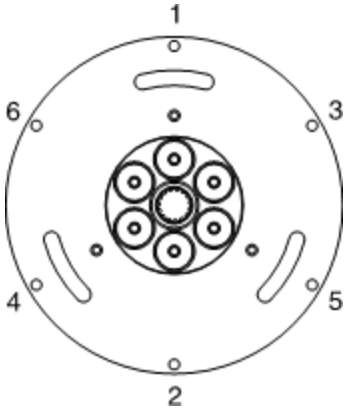
Grease Specification
Shell Alvania® Grease CG, NLGI 0/1 or equivalent.



Ford Models



Deutz Models



Perkins Models

Engines

How to Install the Pump and Bell Housing Assembly

1 Install the pump and bell housing assembly.

Deutz models: Torque the bell housing mounting bolts labeled "C" in sequence to 28 ft-lbs / 38 Nm. Then torque the bell housing mounting bolts labeled "C" in sequence to 40 ft-lbs / 54 Nm.

Ford models: Torque the bell housing mounting bolts labeled "A" and "B" in sequence to 28 ft-lbs / 38 Nm and the mounting bolts labeled "C" to 49 ft-lbs / 66 Nm. Then torque the bell housing mounting bolts labeled "A" and "B" in sequence to 40 ft-lbs / 54 Nm and the mounting bolts labeled "C" to 70 ft-lbs / 95 Nm**.**

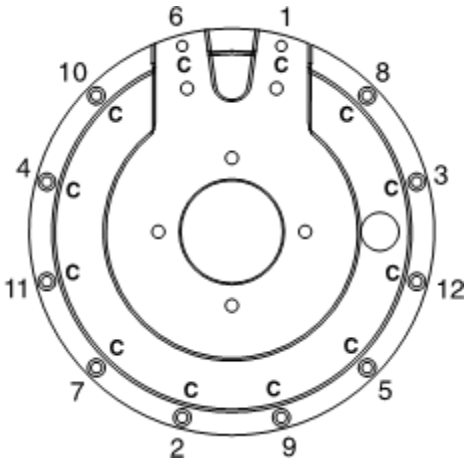
Perkins models: Torque the bell housing mounting bolts labeled "B" in sequence to 28 ft-lbs / 38 Nm and the mounting bolts labeled "A" to 49 ft-lbs / 66 Nm. Then torque the bell housing mounting bolts labeled "B" in sequence to 40 ft-lbs / 54 Nm and the mounting bolts labeled "A" to 70 ft-lbs / 95 Nm.

NOTICE

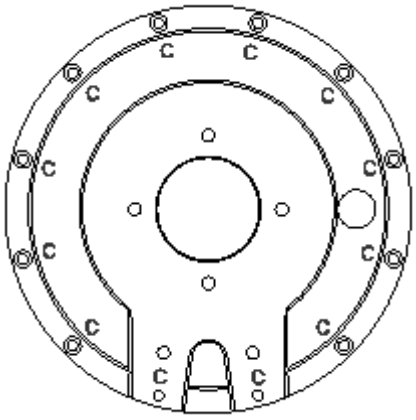
Component damage hazard. When installing the pump, do not force the pump coupler into the flexplate or damage to the pump shaft seal may occur.

NOTICE

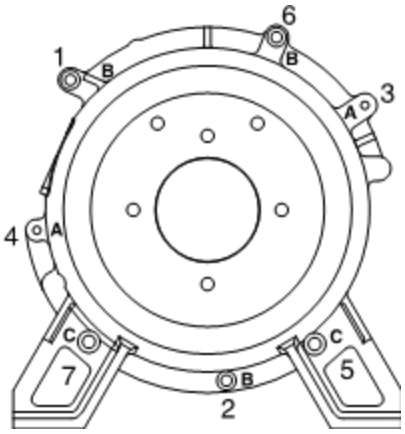
Component damage hazard. Do not force the drive pump during installation or the flex plate teeth may become damaged.



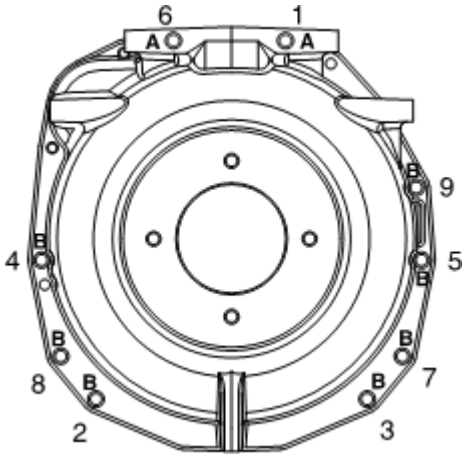
Deutz Models D2011L03i



Deutz Models D 2.9 L4, TD 2.2 L3



Ford Models



Perkins Models

5-4 Diesel Particle Filter Regeneration - Deutz TD 2.2 L3 Engine

The combustion of diesel fuel results in soot, which is separated in the diesel particle filter (DPF). This must be regenerated as the contamination with soot increases. There are 3 types of regeneration.

Passive regeneration:

Under normal operating conditions when the exhaust temperature is >482°F / 250°C the particle filter contamination with soot remains in a permissible range. This process is automatically activated by the engine control unit, the operator does not need to perform any actions.

Standstill regeneration:

If passive regeneration does not attain an adequate reduction of the soot contamination, the particle filter will continue to become contaminated with soot and a standstill regeneration will be required by the operator.

To perform standstill regeneration, refer to the Operator's Manual on your machine.

Service regeneration:

If a fault occurs, the system reacts by reducing the engine performance. This can include limited machine functions, torque reduction, reduced engine rpm and replacement of the DPF.

If standstill regeneration is prohibited by the operator. Service regeneration must be performed by a trained technician with the use of the DEUTZ SerDia software tool and DeCom interface cable. Available from Deutz.

If service regeneration is not performed, replacement of the DPF will be required.

Hydraulic Pump

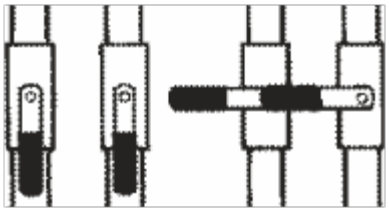
6-1
Function Pump

How to Remove the Function Pump

Note: When removing a hose assembly or fitting, the O-ring (if equipped) on the fitting and/or hose end must be replaced. All connections must be torqued to specification during installation. Refer to Specifications, *Hydraulic Hose and Fitting Torque Specifications.*

1 Locate the two hydraulic tank valves at the hydraulic tank. Close the valves.

NOTICE Component damage hazard. The engine must not be started with the hydraulic tank shut-off 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.



open closed

2 Tag, disconnect and plug the function pump hydraulic hoses. Cap the fittings on the pump.

⚠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.

3 Support the pump with a suitable lifting device.

4 Remove the pump mounting bolts. Carefully remove the pump.

NOTICE Component damage hazard. Be sure to open the two hydraulic tank valves and prime the pump after installing the pump.

6-2
Drive Pump

The drive pump is a bi-directional variable displacement piston pump. The pump output is controlled by the electro-proportional controller, 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 Eaton Hydraulics center. Call Genie Product Support to locate your local authorized service center.

How to Remove the Drive Pump

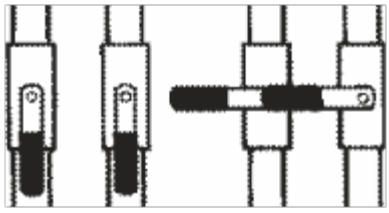
NOTICE Component damage hazard. The work area and surfaces where this procedure will be performed must be clean and free of debris that could get into the hydraulic system and cause severe component damage. Dealer service is recommended.

Note: When removing a hose assembly or fitting, the O-ring (if equipped) on the fitting and/or hose end must be replaced. All connections must be torqued to specification during installation. Refer to Specifications, *Hydraulic Hose and Fitting Torque Specifications.*

1 Disconnect the electrical connectors at the electrical proportional controller located on the drive pump.

2 Locate the two hydraulic tank valves at the hydraulic tank. Close the valves.

NOTICE Component damage hazard. The engine must not be started with the hydraulic tank shut-off 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.



open closed

3 Tag and disconnect and plug the hydraulic hoses from the drive and function pumps. Cap the fittings on the pumps.

⚠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.

4 Support the pump with a lifting device and remove the pump mounting fasteners.

Hydraulic Pump

5 Carefully pull the drive pump out until the pump coupler separates from the flex plate.

6 Remove the drive pump from the machine.

NOTICE

Component damage hazard. The pump(s) may become unbalanced and fall if not properly supported.

NOTICE

Component damage hazard. When installing the pump, do not force the pump coupler into the flexplate or damage to the pump shaft seal may occur.

NOTICE

Component damage hazard. Be sure to open the two hydraulic tank valves and prime the pump after installing the pump.

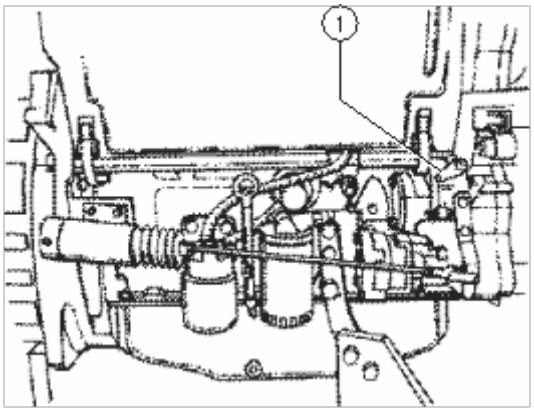
How to Prime the Drive Pump

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

2 **Ford models:** Close the valve on the LPG tank then disconnect the hose from the tank. Then move the fuel select switch to the LPG position.

Perkins 404D-22 models: Disconnect the engine wiring harness from the fuel solenoid at the injector pump.

Deutz D2011 L03i models: Hold the manual fuel shutoff valve clockwise to the closed position.



1 manual fuel shutoff valve

3 Have another person 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 310 psi / 21 bar.

4 **Ford models:** Connect the LPG hose to the LPG tank and open the valve on the tank.

Perkins 404D-22 models: Connect the engine wiring harness to the fuel solenoid.

Deutz D2011 L03i models: Release the manual fuel shutoff valve.

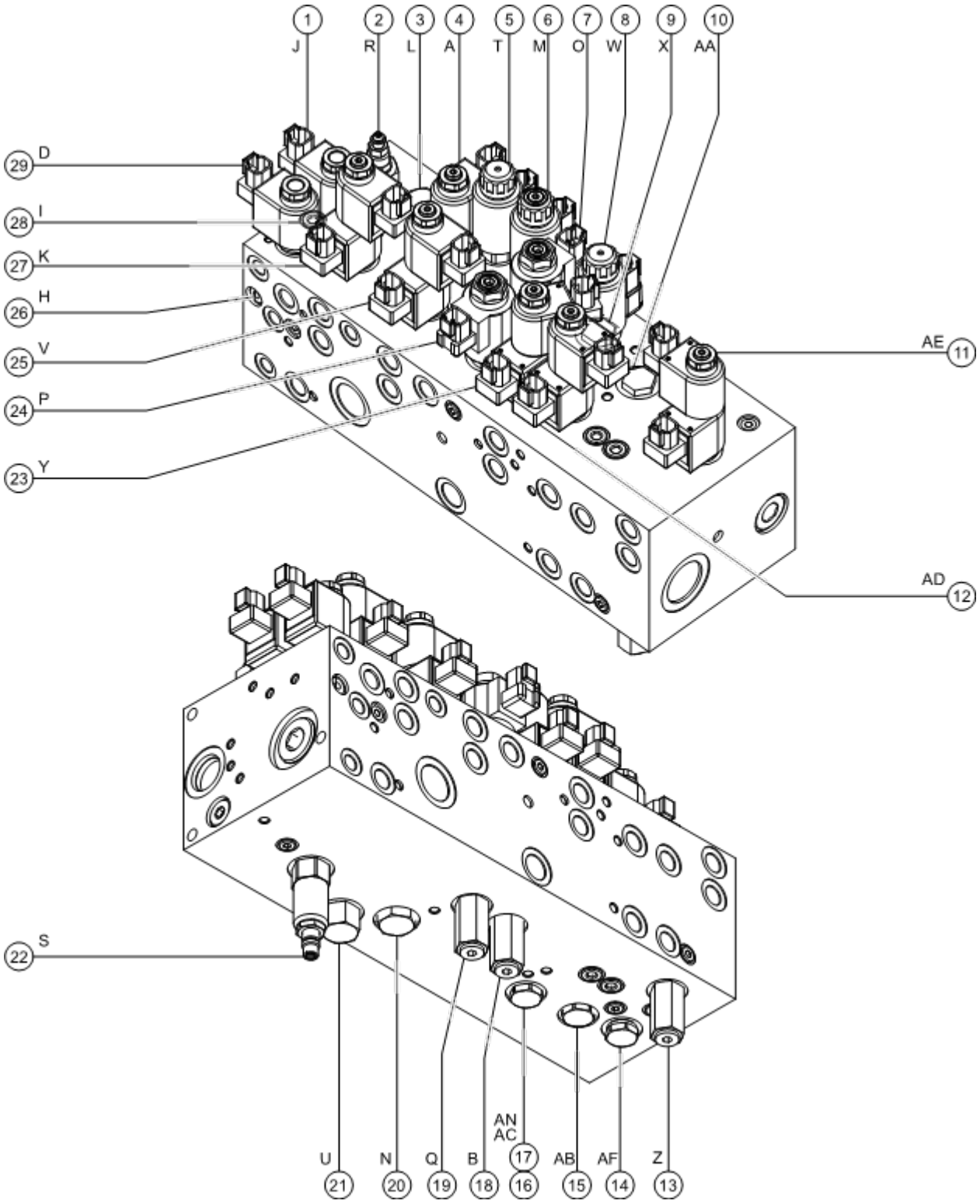
5 Start the engine from the ground controls and check for hydraulic leaks.

7-1
Function Manifold Components

The function manifold is located underneath the ground controls side turntable cover.

Index No.	Description	Schematic Item	Function	Torque
1	Solenoid Valve, 2 position 3 way	J	Release brake when on	26-30 ft-lbs / 35-40 Nm
2	Pressure reducing valve	R	Oscillate circuit pressure control	33-37 ft-lbs / 45-50 Nm
3	Flow control valve	L	Steer actuator fixed speed control	30-35 ft-lbs / 41-47 Nm
4	Solenoid valve, 2 position 2 way	A	Enable full pressure to functions when on	26-30 ft-lbs / 35-40 Nm
5	Proportional solenoid valve	T	Turntable rotate variable speed control	20-25 ft-lbs / 27-34 Nm
6	Flow control valve	M	Boom extension variable speed control	30-35 ft-lbs / 41-47 Nm
7	Solenoid Valve, NO, poppet	O	Boom retract selector	33-37 ft-lbs / 45-50 Nm
8	Proportional solenoid valve	W	Boom variable speed control	20-25 ft-lbs / 27-34 Nm
9	Pressure compensator valve	X	Compensate for pressure variation	30-35 ft-lbs / 41-47 Nm
10	Check valve, 65 psi / 4.5 bar	AA	Isolate Platform level circuit	20-25 ft-lbs / 27-34 Nm
11	Proportional solenoid valve, 3 position 4 way	AE	Select flow direction and speed for jib and rotate	26-30 ft-lbs / 35-40 Nm
12	Proportional solenoid valve, 3 position 4 way	AD	Select flow direction and speed for level adjust	26-30 ft-lbs / 35-40 Nm
13	Relief valve, 3500 psi / 241 bar	Z	limit pressure in Platform level circuit	20-25 ft-lbs / 27-34 Nm
14	Check valve, 30 psi / 2 bar	AF	Prevent jib select tank line from evacuating	20-25 ft-lbs / 27-34 Nm
15	Shuttle valve	AB	Select highest pressure in Platform level circuit	20-25 ft-lbs / 27-34 Nm
16	Check valve. 65 psi / 4.5 bar	AC	Isolate Platform level circuit	20-25 ft-lbs / 27-34 Nm
17	Piston	AN	Pilot open check valve for level adjust	
18	Relief valve, 3200 psi / 221 bar	B	Limit auxiliary pump pressure	20-25 ft-lbs / 27-34 Nm

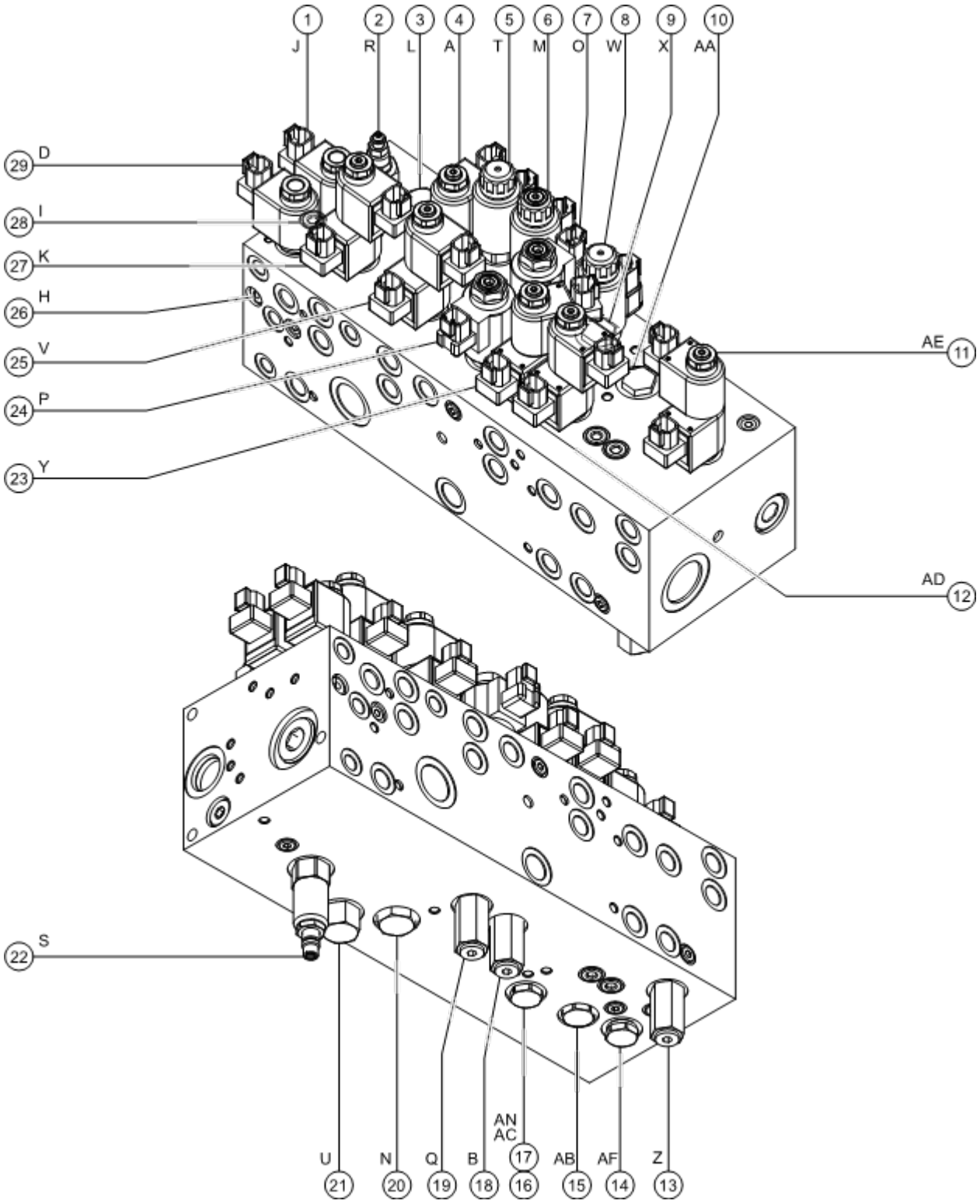
Manifolds


1 J
2 R
3 L
4 A
5 T
6 M
7 O
8 W
9 X
10 AA
29 D
28 I
27 K
26 H
25 V
24 P
23 Y
AE 11
AD 12
22 S
U 21
N 20
Q 19
B 18
AN AC 17
AB 15
AF 14
Z 13
16

Function Manifold Components, continued

Index No.	Description	Schematic Item	Function	Torque
19	Relief valve 1950 psi / 134 bar	Q	Limit boom extend pressure	20-25 ft-lbs / 27-34 Nm
20	Flow control valve	N	Compensate for pressure variation	33-37 ft-lbs / 45-50 Nm
21	Differential sensing valve	U	Compensate for pressure variation	30-35 ft-lbs / 41-47 Nm
22	Sequence valve	S	Redundant pressure limit for oscillate circuit	50-55 ft-lbs / 68-75 Nm
23	Solenoid Valve. spool type	Y	Primary boom up/down selector	26-30 ft-lbs / 35-40 Nm
24	Solenoid Valve. NO, poppet	P	Boom extend selector	33-37 ft-lbs / 45-50 Nm
25	Solenoid Valve, spool type	V	Turntable rotate left/right selector	26-30 ft-lbs / 35-40 Nm
26	Check valve	H	Back flow preventer	8-10 ft-lbs / 10-15 Nm
27	Solenoid Valve, spool type	K	Steer left/right selector	26-30 ft-lbs / 35-40 Nm
28	Orifice Plug, 0.6mm	I	Brake set delay	5-7 ft-lbs / 7-9.5 Nm
29	Solenoid Valve, 2 position 3 way	D	Motor displacement control	26-30 ft-lbs / 35-40 Nm

Manifolds


1 J
2 R
3 L
4 A
5 T
6 M
7 O
8 W
9 X
10 AA
29 D
28 I
27 K
26 H
25 V
24 P
23 Y
AE 11
AD 12
22 S
U 21
N 20
Q 19
B 18
AN AC 17
16
AB 15
AF 14
Z 13

7-2 Valve Adjustments - Function Manifold

How to Adjust the System Relief Valve

Note: Perform this procedure with the boom in the stowed position.

1 Connect a 0 to 5000 psi / 0 to 350 bar pressure gauge to the ptest port on the function manifold.

2 Start the engine from the ground controls.

3 Hold the function enable/rpm select toggle switch to the high idle position. Activate and hold the boom retract toggle switch with the boom fully retracted.

4 Observe the pressure reading on the pressure gauge. Refer to Specifications, *Hydraulic Specifications.*

5 Turn the engine off. Use a wrench to hold the relief valve and remove the cap (item K).

6 Adjust the internal hex socket. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Install the relief valve cap..

⚠WARNING Tip-over hazard. Do not adjust the relief valve higher than specified.

7 Repeat steps 2 through 5 and recheck relief valve pressure.

8 Remove the pressure gauge.

How to Adjust the Boom Extend Relief Valve

Note: Perform this procedure with the machine in the stowed position.

Note: Refer to the Function Manifold Component list to locate the Boom Extend Relief valve.

1 Connect a 0 to 5000 psi / 0 to 350 bar pressure gauge to the ptest port on the function manifold.

2 Start the engine from the ground controls.

3 Press and hold the function enable button. Activate and hold the primary boom extend switch with the boom fully extended.

4 Observe the pressure reading on the pressure gauge. Refer to Specifications, *Hydraulic Component Specifications*.

5 Turn the engine off. Use a wrench to hold the relief valve and remove the cap. Refer to Repair Procedures, *Function Manifold Components,* item BG.

6 Adjust the internal hex socket. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Install the relief valve cap.

⚠WARNING Tip-over hazard. Do not adjust the relief valve higher than specified.

7 Repeat this procedure beginning with step 2 to confirm the relief valve pressure.

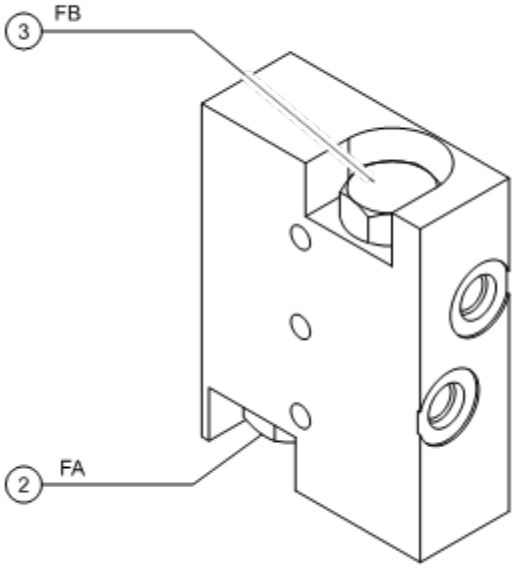
8 Remove the pressure gauge.

Manifolds

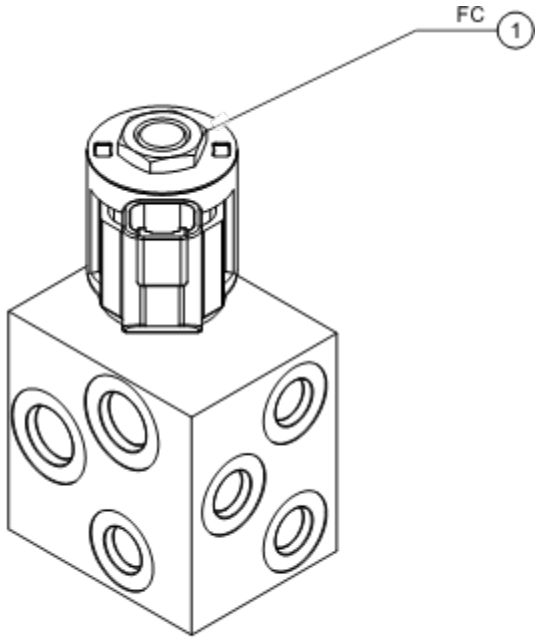
7-3
Jib Boom / Platform Rotate and Generator Manifold Components

The jib boom / platform rotate manifold is mounted to the platform support.

Index No.	Description	Schematic Item	Function	Torque
1	Solenoid Valve, 2 position 3 way	FC	Platform rotate/jib boom select	18-20 ft-lbs / 25-27 Nm
2	Counterbalance valve	FA	Platform rotate right	30-35 ft-lbs / 41-47 Nm
3	Counterbalance valve	FB	Platform rotate left	30-35 ft-lbs / 41-47 Nm



Platform Rotate Manifold



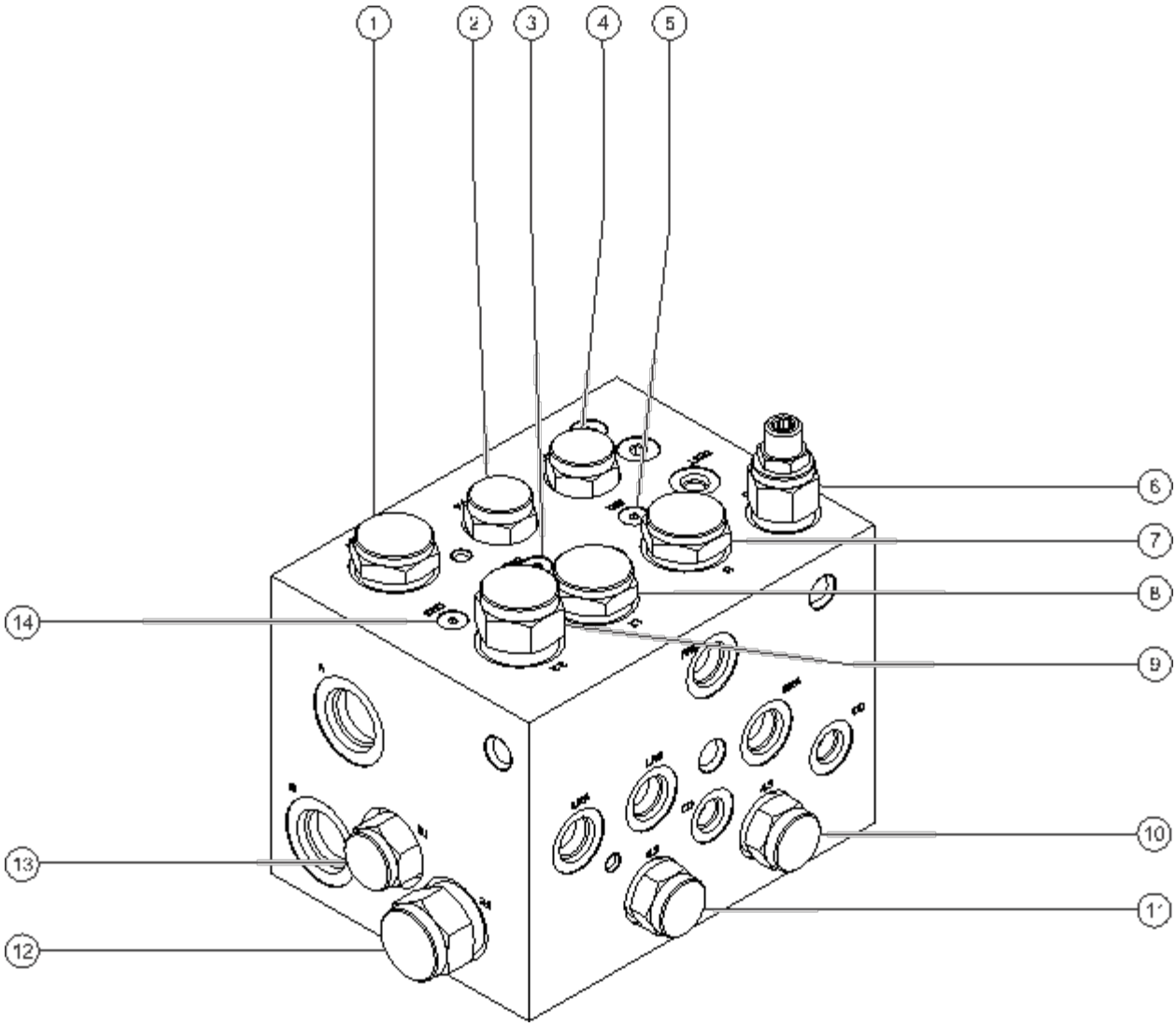
Jib Select Manifold

7-4
Traction Manifold Components, 4WD

The traction manifold is mounted inside the drive chassis at the non-steer end of the machine.

Index No.	Description	Schematic Item	Function	Torque
1	Flow divider/combiner valve	DK	Divides flow between diagonal pairs of motors: LF+RR=50%, LR+RF=50%	80-90 ft-lbs / 108-122 Nm
2	Check valve, 5 psi / 0.34 bar	DC	Prevents cavitation in LF motor	35-40 ft-lbs / 14-16 Nm
3	Orifice, 0.040 inch / 1 mm	DA	Prevents scrub at high steer angles by allowing some bypass flow around the left flow divider	
4	Check valve, 5 psi / 0.34 bar	DF	Prevents cavitation in RF motor	35-40 ft-lbs / 14-16 Nm
5	Orifice, 0.040 inch / 1 mm	DN	Prevents scrub at high steer angles by allowing some bypass flow around the left flow divider	
6	Relief valve, 280 psi / 19.3 bar	DI	Hot oil shuttle relief	35-40 ft-lbs / 14-16 Nm
7	Flow divider/combiner valve, 24 gpm / 91 lpm	DM	Combines return flow from RF and RR motors	80-90 ft-lbs / 108-122 Nm
8	Flow divider/combiner valve, 24 gpm / 91 lpm	DB	Combines return flow from LF and LR motors	80-90 ft-lbs / 108-122 Nm
9	Check valve	DD	Prevents cavitation in LF and RR motors	60-70 ft-lbs / 81-95 Nm
10	Check valve, 5 psi / 0.34 bar	DH	Prevents cavitation in RR motor	35-40 ft-lbs / 14-16 Nm
11	Check valve, 5 psi / 0.34 bar	DE	Prevents cavitation in LR motor	35-40 ft-lbs / 14-16 Nm
12	Check valve	DG	Prevents cavitation in RF and LR motors	60-70 ft-lbs / 81-95 Nm
13	Shuttle valve, fixed	DJ	Directs oil from low pressure side to hot oil relief valve	80-90 ft-lbs / 108-122 Nm
14	Orifice, 0.40 inch / 1 mm	DL	Prevents scrub at high steer angles by allowing some bypass flow around the left flow divider	

Manifolds



7-5 Valve Adjustments - Traction Manifold

How to Adjust the Charge Pressure Relief Valve

1 Connect a 0 to 600 psi / 0 to 50 bar pressure gauge to the test port on the drive pump.

2 Hold the charge pressure relief valve located on the traction manifold and loosen the jam nut.

3 Turn the external stem clockwise fully until it stops. Tighten the jam nut.

4 Start the engine and move and hold the function enable/rpm select toggle switch to the high rpm (rabbit symbol) position. Note the reading on the pressure gauge.

5 Turn the engine off.

6 Remove the pressure gauge from the drive pump. Connect the gauge to the test port located on the traction manifold.

7 Hold the charge pressure relief valve and loosen the jam nut.

8 Start the engine and move and hold the function enable/rpm select toggle switch to the high rpm (rabbit symbol) position.

9 Adjust the relief valve until the pressure reading on the gauge is 30 psi / 2 bar less than the pressure reading on the pump. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Install the valve cap or tighten the jam nut.

10 Turn the engine off and remove the pressure gauge.

7-6 Valve Adjustments - Oscillate Relief Valve

How to Adjust the Oscillate Relief Valve

1 Connect a 0 to 1500 psi / 0 to 100 bar pressure gauge to the diagnostic nipple located on the OSC-TEST port on the function manifold.

2 Start the engine from the Ground Control box and press the enable button.

3 Continue pressing the enable button and observe the pressure reading on the pressure gauge. Refer to Specifications, *Hydraulic Specifications*.

4 Loosen the nut of the pressure reducing valve on the function manifold.

5 Adjust the hex screw. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Tighten the jamb nut.

⚠WARNING Tip-over hazard. Do not adjust the pressure reducing valve higher than specified.

6 Repeat step 3 to confirm the valve pressure.

7 Turn the engine off, remove the pressure gauge.

Manifolds

How to Set Up the Directional Valve Linkage

Note: Adjustment of the oscillate directional valve linkage is only necessary when the linkage or valve has been replaced.

Note: Perform this procedure with the machine on a firm, level surface with the boom in the stowed position.

1 Use a "bubble type" level to verify the working surface is completely level.

⚠WARNING Tip-over hazard. Failure to perform this procedure on a level floor could compromise the stability of the machine resulting in the machine tipping over.

2 Check the tire pressure in all four tires and add air if needed to specification.

Note: The tires on some machines are foam-filled and do not need air added to them.

3 Remove the non-steer end drive chassis cover and axle covers.

4 Disconnect the directional valve linkage from the axle.

5 To level the drive chassis, start the engine and use a floor jack to raise the right or left side of the steer axle until the drive chassis is level.

Example: Standing at the non-steer end of the machine, if the drive chassis is leaning to the left, jack up the right side of the steer axle.

6 Verify the drive chassis is level to the working surface.

7 Measure the gap between the drive chassis and the non-steer axle on both sides (from the inside of the drive chassis).

⊙ Result: The gap is between 0.15 to 0.17 inches / 3,8 to 4,3 mm.

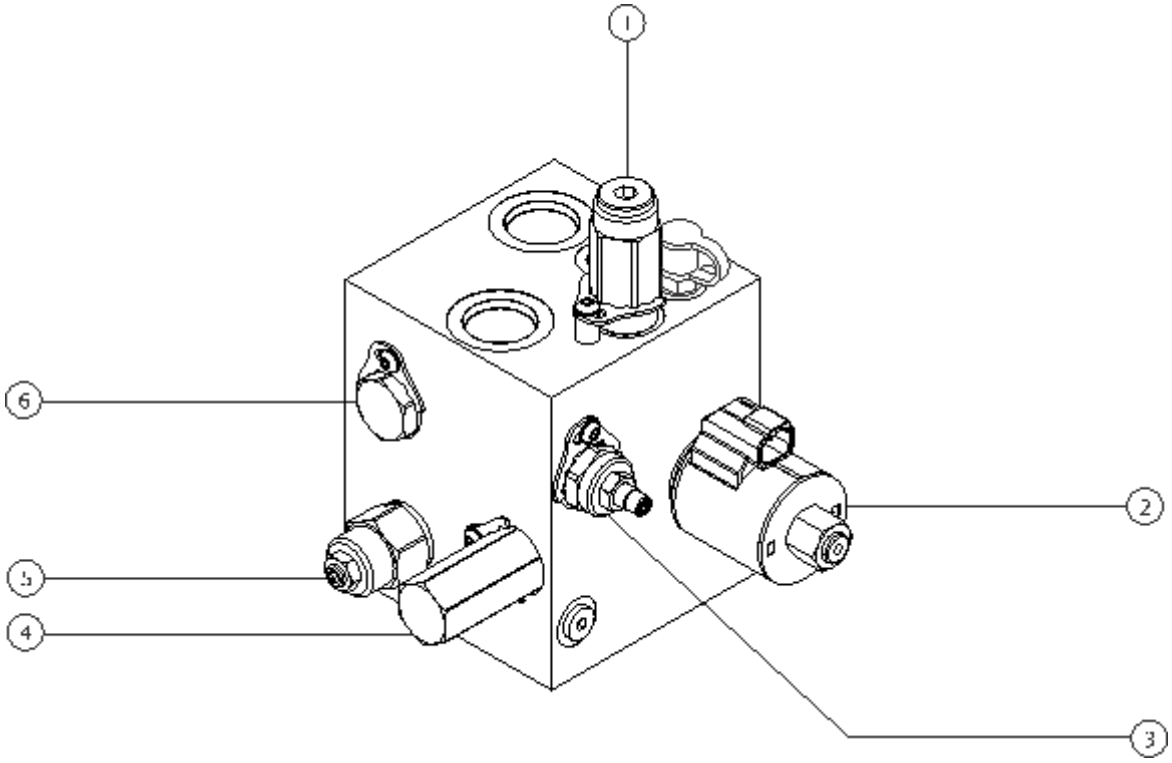
☒ Result: The gap is not within specification. Add or remove shims from the axle stop bars.

8 Adjust the ball joint and secure the linkage to the axle. Tighten the jam nut.

7-7
Generator Manifold

The generator manifold is mounted on the turntable tray by the fuel tank.

Index No.	Description	Schematic Item	Function	Torque
1	Relief valve	GA	Generator relief valve	50 ft-lbs / 67 Nm
2	Solenoid Valve	GB	Charge pressure circuit	60-65 ft lbs / 81-88 Nm
3	Needle valve	GD	Charge pressure circuit	50 ft-lbs / 67 Nm
4	Differential sensing valve	GC	Pilot valve to diverter valve	50 ft-lbs / 67 Nm
5	Counterbalance valve	CF	Adds backpressure to generator circuit	
6	Check valve	GE	Prevents oil to generator	24-26 ft-lbs / 32.5-35.3 Nm



Manifolds

7-8 Valve Coils

How to Test a Coil

A properly functioning coil provides an electromotive force which operates the solenoid valve. Critical to normal operation is continuity within the coil that provides this force field.

Since coil resistance is sensitive to temperature, resistance values outside specification can produce erratic operation. When coil resistance decreases below specification, amperage increases. As resistance rises above specification, voltage increases.

While valves may operate when coil resistance is outside specification, maintaining coils within specification will help ensure proper valve function over a wide range of operating temperatures.

⚠WARNING Electrocution/burn hazard. Contact with electrically charged circuits could result in death or serious injury. Remove all rings, watches and other jewelry.

1 Tag and disconnect the wiring from the coil to be tested.

2 Test the coil resistance.

⊙ Result: The resistance should be within specification, plus or minus 30%.

⊙ Result: If the resistance is not within specification, plus or minus 30%, replace the coil.

Valve Coil Resistance Specification

Note: The following coil resistance specifications are at an ambient temperature of 68°F / 20°C. As valve coil resistance is sensitive to changes in air temperature, the coil resistance will typically increase or decrease by 4% for each 18°F / 10°C that your air temperature increases or decreases from 68°F / 20°C.

Valve Coil Resistance Specification	
Solenoid valve, 3 position 4 way, 10V DC schematic item (BT)	4Ω
Solenoid Valve, 2 position 3 way, 10V DC schematic items (BU, BV, BX, and BZ)	4Ω
Solenoid valve, 3 position 4 way, 10V DC schematic items (CD and CF)	5Ω
Proportional solenoid valve, 12V DC schematic items(BI and CH)	5Ω
Solenoid Valve, 2 position 3 way, 10V DC schematic item (CC)	6.8Ω
Solenoid Valve, 2 position 3 way, 12V DC (schematic item CE)	4.8Ω

How to Test a Coil Diode

Properly functioning coil diodes protect the electrical circuit by suppressing voltage spikes. Voltage spikes naturally occur within a function circuit following the interruption of electrical current to a coil. Faulty diodes can fail to protect the electrical system, resulting in a tripped circuit breaker or component damage.

⚠WARNING Electrocution/burn hazard. Contact with electrically charged circuits could result in death or serious injury. Remove all rings, watches and other jewelry.

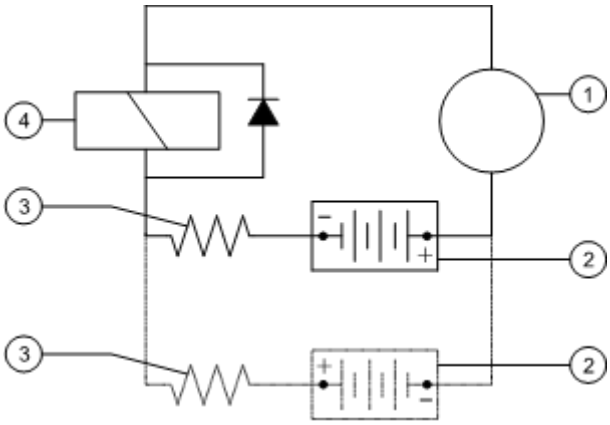
1 Test the coil for resistance. Refer to Repair Procedure, *How to Test a Coil*.

2 Connect a 10W resistor to the negative terminal of a known good 9V DC battery. Connect the other end of the resistor to a terminal on the coil.

Resistor 10Ω

Genie part number 27287

Note: The battery should read 9V DC or more when measured across the terminals.



1 multimeter
2 9v DC battery
3 10Ω resistor
4 coil

Note: Dotted lines in illustration indicate a reversed connection as specified in step 6.

3 Set a multimeter to read DC current.

Note: The multimeter, when set to read DC current, should be capable of reading up to 800 mA.

4 Connect the negative lead to the other terminal on the coil.

5 Momentarily connect the positive lead from the multimeter to the positive terminal on the 9V DC battery. Note and record the current reading.

6 At the battery or coil terminals, reverse the connections. Note and record the current reading.

⊙ Result: Both current readings are greater than 0 mA and are different by a minimum of 20%. The coil is good.

7 Result: If one or both of the current readings are 0 mA, or if the two current readings do not differ by a minimum of 20%, the coil and/or its internal diode are faulty and the coil should be replaced.

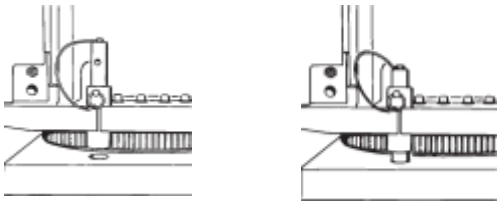
Turntable Rotation Components

8-1
Turntable Rotation Assembly

How to Remove the Turntable Rotation Drive Hub Assembly

Note: When removing a hose assembly or fitting, the O-ring (if equipped) on the fitting and/or hose end must be replaced. All connections must be torqued to specification during installation. Refer to Specifications, *Hydraulic Hose and Fitting Torque Specifications.*

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

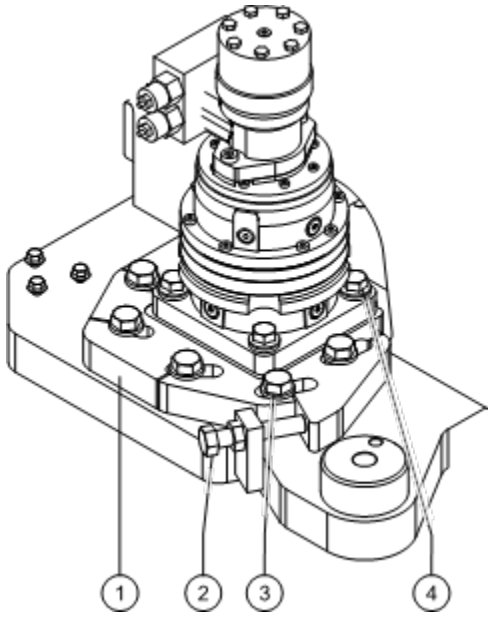


unlocked locked

2 Tag, disconnect and plug the hydraulic hoses from the drive motor. Cap the fittings on the motor.

⚠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.

3 Attach a suitable lifting device to the turntable rotator assembly.



1 backlash pivot plate
2 adjustment bolt with locknut
3 backlash pivot plate mounting bolts
4 drive hub mounting bolts

4 Back off the locknut and loosen the adjustment bolt.

5 Loosen the backlash pivot plate mounting fasteners and slide the assembly away from the turntable rotate gear.

6 Remove the turntable drive hub mounting fasteners.

7 Carefully remove the drive hub assembly from the machine.

⚠WARNING Crushing hazard. The turntable rotate drive hub assembly could become unbalanced and fall when removed from the machine if not properly supported by the lifting device.

Turntable Rotation Components

When installing the drive hub assembly:

8 Install the turntable rotator assembly. Apply removable thread locking compound to fastener threads.Torque the backlash pivot plate mounting fasteners to 160 ft-lbs / 217 Nm.

How to Adjust the Turntable Rotation Gear Backlash

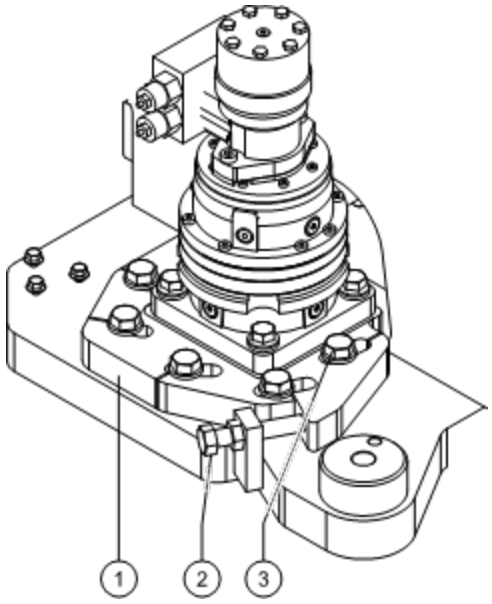
The turntable rotation drive hub is mounted on an adjustable plate that controls the gap between the rotation motor pinion gear and the turntable bearing ring gear.

Note: Perform this procedure with the machine on a firm, level surface with the boom in the stowed position.

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

Note: The turntable rotation lock pin is located next to the boom rest pad.

2 Loosen the backlash pivot plate mounting fasteners.



1 backlash pivot plate
2 adjustment bolt with lock nut
3 backlash pivot plate mounting bolts

Turntable Rotation Components

3 Push the backlash pivot plate towards the turntable as far as possible (this will push the rotation gear into the turntable bearing ring gear).

4 Loosen the lock nut on the adjustment bolt.

5 Turn the adjustment bolt clockwise until it contacts the backlash pivot plate.

6 Turn the adjustment bolt 1/2 turn counterclockwise. Tighten the lock nut on the adjustment bolt.

7 Rotate the backlash pivot plate away from the turntable until it contacts the adjustment bolt. Then torque the mounting fasteners on the backlash pivot plate to specification. Refer to Specifications, *Machine Torque Specifications*.

8 Rotate the turntable through an entire rotation. Check for tight spots that could cause binding. Readjust if necessary.

How to Calibrate the Turntable Tilt Sensor

Note: Perform this procedure on a firm, level surface with the machine in the stowed position.

Note: A digital level will be required to perform this procedure.

1 Enter Service Mode. Refer to Repair Procedure, *How to Enter the Service Mode*.

2 Press the settings button above the display and navigate to the Sensor Calibrations menu.

3 Navigate to the Chassis Tilt Sensor calibration screen.

4 Select and start the calibration procedure.

5 If the machine is not sufficiently level, the procedure will fail with the message that the chassis no not sufficiently level. Move the machine to a more level location if this occurs.

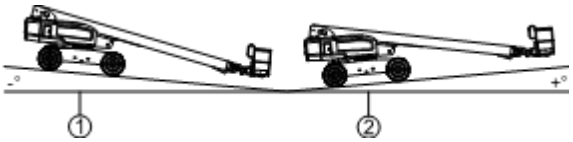
6 The first calibration is machine pitch. This is the pitch of the machine from the platform end to the counterweight end of the machine.

7 Place the digital level onto the swing chassis bearing plate, which is located to the left of the fuel tank. Orient the level along the pitch axis of the machine.

8 Enter the value as seen on the digital level into the ground control display. If the digital level is showing a negative value, enter it as a positive number. Press **OK** when the value on the ground control display matches the value of the digital level (excluding the plus/minus sign).

Turntable Rotation Components

9 A graphic of the machine pitch will now be shown on the display. By pressing the **UP** or **DOWN** buttons, the graphic will change to show the counterweight being uphill or downhill. Select the image that corresponds to the current pitch of the machine and press **OK**.



Turntable Pitch

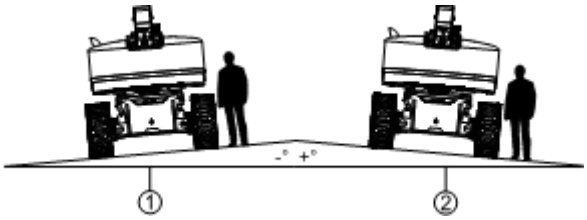
1 uphill
2 downhill

10 The next calibration of the machine is the machine roll. This is the angle of the machine from side to side.

11 Place the digital level onto the swing chassis bearing plate, which is located to the left of the fuel tank. Orient the level along the roll axis of the machine.

12 Enter the value as seen on the digital level onto the ground control display. If the level is showing a negative value, enter it as a positive number. Press **OK** when the value on the ground control display matches the value of the digital level sensor (excluding the plus/minus sign).

13 A graphic of the machine roll will now be shown on the display. By pressing the **UP** and **DOWN** buttons, the graphic will change to show whether the operator is on the uphill or downhill side of the machine.. Select the image that corresponds to the current roll of the machine and press **OK.**



Turntable Roll

1 uphill
2 downhill

14 The calibration is now complete.

15 Exit the Service Mode.

Axle Components

9-1 Oscillating Axle Cylinders

The oscillating axle cylinders extend and retract between the drive chassis and the oscillating axle. The cylinders are equipped with counterbalance valves to prevent movement in the event of a hydraulic line failure. The valves are not adjustable.

How to Remove an Oscillating Axle Cylinder

Note: Perform this procedure with the machine on a firm, level surface with the boom in the stowed position.

Note: When removing a hose assembly or fitting, the O-ring (if equipped) on the fitting and/or hose end must be replaced. All connections must be torqued to specification during installation. Refer to Specifications, *Hydraulic Hose and Fitting Torque Specifications.*

1 Rotate the turntable until the boom is between the steer tires or tracks.

2 Tag, disconnect and plug the oscillating axle cylinder hydraulic hoses. Cap the fittings on the oscillate cylinder.

⚠ 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.

3 Remove the pin retaining fasteners from the rod-end pivot pin. Use a soft metal drift to remove the pin.

4 Attach a lifting strap from an overhead lifting device to the barrel end of the oscillating cylinder.

5 Remove the pin retaining fasteners from the barrel-end pivot pin. Use a soft metal drift to remove the pin.

6 Remove the oscillate cylinder from the machine.

⚠ CAUTION Crushing hazard. The oscillate cylinder may become unbalanced and fall when removed from the machine if not properly attached to the lifting device.

10-1 Track Assembly

How to Remove a Track Assembly

Note: Perform this procedure with the machine on a firm, level surface with the boom in the stowed position.

1 Chock the tracks at the opposite end of the machine to prevent the machine from rolling.

2 Center a lifting jack of ample capacity (20,000 lbs / 10,000 kg) under the drive chassis between the tracks.

3 Lift the machine until the tracks are off the ground and then place jack stands under the drive chassis for support.

4 Remove the lug nut bolts holding each half sprocket on the drive hub. Rotate the sprockets until only one sprocket is contacting the track. Remove the lower half sprocket from the track assembly.

5 Rotate the remaining half sprocket 180° so that it is free of the track.

6 Attach a lifting strap from an overhead crane to the center-point of the track assembly, above the sprocket.

7 Remove the fasteners holding the TRAX mounting pin located underneath the axle. Remove the pin supporting the TRAX assembly.

8 Carefully remove the track assembly from the drive hub and set aside.

⚠ CAUTION Crushing hazard. The track assembly could become unbalanced and fall when removed from the machine if not properly supported by the overhead crane.

How to Replace the Track

1 Remove the track assembly from the machine. See How to Remove a Track Assembly.

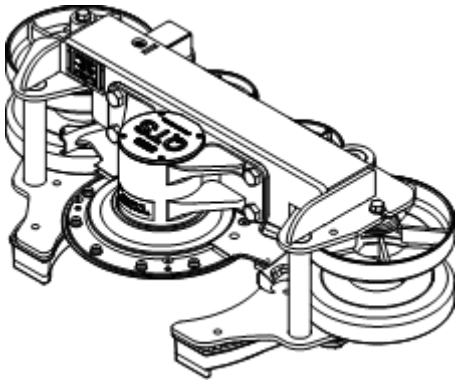
Note: The sprocket is comprised of two halves. Before removing the track assembly from the machine and to ease the removal of the sprocket, drive the machine until one complete half of the sprocket is located above the undercarriage of the track assembly.

2 Loosen the grease plug on the track tension cylinder to relieve the track tension. Clean up any grease that has spilled.

3 Remove the 2 sprocket retaining fasteners. Remove the sprocket half from the track assembly.

4 Carefully remove the track from the undercarriage.

5 Use an overhead crane to lay the undercarriage on its side with the drive sprocket bearing assembly facing upward and the track tension cylinder towards the ground.



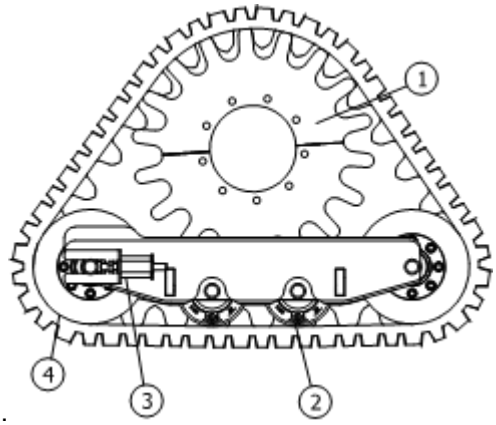
Track Components

6 Install the new track onto the undercarriage.

7 Attach a lifting strap from an overhead crane to the center-point of the track, above the sprocket.

8 Use the overhead crane to raise the track assembly to an upright position. Rest the assembly on the floor or ground to remove any slack in the lower portion of the track.

Note: Be sure the idler and bogey wheels are aligned with the inside surface of the track



1 half sprocket
2 bogey wheel
3 tensioner assembly
4 idler wheel

9 Rotate the sprocket half until the split tooth of the sprocket is lower than the other side.

10 Using an overhead crane or other suitable lifting device, lift up on the rubber track to create enough room to install the other sprocket half.

11 Install the sprocket half, removed in step 3, while engaging the sprocket teeth with the rubber track.

Note: Be sure to align the split tooth in both of the sprocket halves.

12 Insert a pin or rod through the wheel stud hole closest to the split tooth to hold the sprocket in place.

13 Insert a pointed pry bar into the wheel stud hole near the top of the sprocket. Insert another pointed pry bar into the wheel stud hole at the opposite side of the split tooth.

14 Using the pry bars, lift the sprocket half into position. Install the 2 sprocket retaining fasteners and torque to specification. Refer to Section 2, Specifications.

15 Attach a lifting strap from an overhead crane to the center-point of the track assembly, above the sprocket.

16 Install the track assembly onto the drive hub. Install the lug nuts and torque to specification. Refer to Specifications.

⚠ CAUTION Crushing hazard. The track assembly could become unbalanced and fall when installed onto the machine if not properly supported by the overhead crane.

17 Adjust the track tension. Tighten the tensioner nut on both sides of the idler wheel until there is about 0.75-1.0 inch / 19-25 mm of droop between the inside of the rubber track and the bottom surface of the bogey wheels.

Fault Codes



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 procedure with the machine in the following configuration:
  - Machine parked on a firm, level surface
  - Key switch in the off position with the key removed
  - The red Emergency Stop button in the off position at both the ground and platform controls
  - Wheels chocked
  - All external AC power supply disconnected from the machine
  - Boom in the stowed position
  - Turntable secured with the turntable rotation lock
  - Welder disconnected from the machine (if equipped with the weld cable to platform option)

Before Troubleshooting:

- ☑ Read, understand and obey the safety rules and operating instructions in the appropriate operator's manual on your machine.
- ☑ Be sure that all necessary tools and test equipment are available and ready for use.
- ☑ Read each appropriate fault code thoroughly. Attempting short cuts may produce hazardous conditions.
- ☑ Be aware of the following hazards and follow generally accepted safe workshop practices.

⚠WARNING Electrocution/burn hazard. Contact with electrically charged circuits could result in death or serious injury. Remove all rings, watches and other jewelry.

Note: Two persons will be required to safely perform some troubleshooting procedures.

Control System Fault Codes

Control System

How to Retrieve Control System Fault Codes

The machine control system contains two different types of fault codes

Active Faults: These faults have been detected in the current operating session. The presence of an active fault will be reflected by the System Fault Indicator lights and the alarm.

Logged Faults: The faults contained in the fault log have occurred in the past and may or may not still be in effect.

Both faults may be viewed by pressing the Fault Button above the ground display and navigating to either the Active Machine Faults screen or the Machine Fault Log screen. The list of faults will by shown by fault code and the hour meter of when it occurred.

The fault lists can be browsed. To learn more about a fault entry, select it and press OK. A screen will be shown that describes the fault in more detail.

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
1	Engine Can Bus	13	Not detected	Engine CANBUS CAN+ or CAN- shorted to supply.	Disable engine start for tier 4F engines.	* Verify with a voltmeter that CAN+ and CAN- lines are not shorted.* Measure the resistance between D228CAN+ (YL, TCON J9-3) and D228CAN- (GR, TCON J9-4); should be between 55 and 65 ohms. * D228CAN+ (YL, TCON J9-3) should be between 1V and 5V. * D228CAN- (GR, TCON J9-4) should be between 1V and 5V. Remove short(s) and cycle power.
6	Key switch	19	Fault	Detects both ground and platform controls are selected.	Machine will not be functional.	* Verify wiring at the key switch. * Replace key switch.
7	Engine Warning	21	Fault	The engine has triggered the Engine Warning Lamp condition.	Machine will function as normal.	* Check the engine fault codes with an engine diagnostic tool.
8	Engine Stop	21	Fault	The engine has triggered the Engine Stop Lamp condition.	Control system will not allow engine restart until power cycle. Engine may stop itself, depending on the engine option.	* Check the engine fault codes with an engine diagnostic tool. Note: The control system shuts off the engine immediately upon receiving this fault from the engine.
11	Engine Start Switch	27	Active at startup	Engine Start Switch active at startup.	Engine will not start.	* Cycle power to allow the machine to re-test the fault.
12	Machine CAN Bus	13	Not detected	Machine CANBUS CAN+ or CAN- shorted to supply.	Machine will not be functional.	* Verify with a voltmeter that CAN+ and CAN- lines are not shorted. *Measure the resistance between D82CAN+ (YL, TCON J5-3) and D81CAN- (GR, TCON J5-4); should be between 55 and 65 ohms. * D81CAN+ (YL, TCON J5-3) should be between 1V and 5V. * D81CAN- (GR, TCON J5-4) should be between 1V and 5V. * Remove short(s) and cycle power.
13	Jib Up/Down Switch	27	Active at startup	Toggle switch input was detected as HIGH at start-up.	The Jib Up or Down functions will not operate.	* Verify with a voltmeter that the Jib Up/Down Toggle Switch (TS8) is operating properly. * C43JU (BL, PCON J17-6) should be 0 V with the switch OFF and 12 V with the switch held in the UP position. * C44JD (BL/BK, PCON J17-8) should be 0 V with the switch OFF and 12 V with the switch held in the DOWN position. * Cycle power to allow the machine to re-test the fault.

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
14	Alternator	15	Fault	Fault occurs if voltage is below 12.3 VDC for 10 seconds while engine is running.	None.	* Release foot switch and cycle power. * Test / Replace alternator.
15	Foot Switch	19	Timeout	Foot switch depressed too long without action.	Machine will not be functional.	* Release foot switch and cycle power. * If problem persists, with a voltmeter verify that C24FS (WH, PCON J12-2) is LOW when foot switch is released and 12 V when held down.
		27	Active at startup	Foot switch input was detected as HIGH at start-up, or the foot switch was held for too long and caused the foot switch timer to elapse.		
		28	Timeout	Foot switch depressed too long without action.		
17	Aux Pump Coil	9	Shorted to GND	TCON detected that C27AUX circuit is shorted to GND.	Machine will not be functional.	* Check C27AUX (RD, TCON J3-3) wiring. *With a voltmeter verify that C27AUX (RD, TCON J3-3) is 0 V when the Auxiliary Power toggle switch is OFF and 12 V when switch is ON. * Verify the terminals of the APU solenoid have a resistance greater than 5 ohms. If not, replace the solenoid.
		11	Shorted to supply voltage	TCON detected that C27AUX circuit is shorted to 12 V.		
19	Platform Aux Enable Switch	27	Active at startup	Aux button held at startup.	Machine will not be functional.	* Release Aux button, check DISCON overlay and ribbon cable if issue persists.
21	Pri Boom Up / Down Joystick	8	Shorted to GND	Circuit C164PUD is below 4.5 V or shorted to GND.	Boom Up and Down functions will not operate.	* Leave joystick in neutral position and cycle power. * If fault persists, with a voltmeter check that C164PUD (RD/WH, PCON J18-3) is at 2. 5V +/- 0.2 V at startup and does not go above 4.5 V or below 0.5 V when fully stroked in each direction. * Replace joystick if voltage check fails.
		11	Shorted to supply voltage	Circuit C164PUD is above 4.5 V or shorted to 12 V.		
		27	Active at startup	Circuit C164PUD voltage was not within the startup voltage range of 2.5 V +/- 0.2 V.		

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
22	Pri Boom Up coil	9	Shorted to GND	TCON detected that C1PBU circuit is shorted to GND.	Boom Up function will not operate.	* With a voltmeter, measure Y22. Proper resistance should be between 5 - 60 ohms. Replace Y22 if resistance is outside of those values. * Verify wiring for C1PBU (RD, TCON J4-10) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C1PBU circuit is shorted to 12 V.	Boom Up and Down functions will not operate.	
24	Pri Boom Angle	13	Not detected	No CAN messages have been received by the TCON from the Angle Sensor.	Machine limited to recovery functions.	* Verify sensor power P85PWR (GR, TCON J6-7) is at 12 V while the system is running. * Verify the sensor is receiving power. Unplug the sensor and verify 12 V across pins 2 (+) and 1 (-) on the harness connector. * Verify the CAN bus wiring. With the sensor still unplugged, measure resistance across harness connector pins 3 and 4. If resistance is not between 55 and 65 ohms, check CAN wire harnesses. * Replace sensor if necessary.
		14	Cross check failed	The two internal sensing channels inside the Angle Sensor have registered a significant difference.		* Calibrate boom angle sensor. * Check boom angle sensor mount, ensure all fasteners are tightened to spec. * Replace sensor if issue persists.
		17	Not calibrated	Sensor has been replaced and requires calibration, or calibration in memory has been erased.		* Run the boom angle calibration process and verify fault is no longer active.
		19	Value out of expected range	Min or max boom angle out of expected range. Crosscheck limit switch disagrees with boom angle sensor.	Machine limited to recovery functions.	* Verify that with the boom stowed C68LS (BL, TCON J7-3) is 12V and that the boom is making contact with the LST3S limit switch arm. * Verify that with the boom above 12 degrees C68LS (BL, TCON J7-3) is 0V and that the boom is not making contact with the LST3S limit switch arm. * Check LST3S limit switch for physical damage. * Check bearings in rotary base housing. * Calibrate boom angle sensor.
25	Cable tension	21	Fault	Boom cable tension limit switch LSB2S indicates that the tension is loose on the boom cables.	Boom Up and Extend functions will not operate.	* Return boom to stowed position as quickly as possible. * Verify both boom cables are properly tensioned and that LST3S is properly centered in the bracket. * Verify LSB2S (C59CNK, BL/WH, TCON J7-5) operates properly. Signal should normally by 12 V. If cable tension is loose, signal should be 0 V.

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
26	Pri Boom Ext Coil	9	Shorted to GND	TCON detected that C7PBE circuit is shorted to GND.	Boom Extend function will not operate.	* With a voltmeter, measure Y26. Proper resistance should be between 5 - 60 ohms. Replace Y26 if resistance is outside of those values. * Verify wiring for C7PBE (BK, TCON J4-7) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C7PBE circuit is shorted to 12 V.	Boom Extend and Retract functions will not operate.	
27	Pri Boom Ret Coil	9	Shorted to GND	TCON detected that C8PBR circuit is shorted to GND.	Boom Retract function will not operate.	* With a voltmeter, measure Y25. Proper resistance should be between 5 - 60 ohms. Replace Y25 if resistance is outside of those values. * Verify wiring for C8PBR (BK/WH, TCON J4-8) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C8PBR circuit is shorted to 12 V.	Boom Extend and Retract functions will not operate.	
35	Ground Control Buttons	27	Active at startup	Buttons were held at system start, or are shorted on the ground control panel.	The function associated with the stuck button will not operate.	* Release the ground control buttons and cycle power. * If problem persists, open ground control box and open the Display Controller access door, being careful to keep water out. Verify the ribbon cables are properly seated and dry. * Re-seat and/or replace ribbon cables if necessary. * Replace ground control overlay.
36	Jib Up Coil	9	Shorted to GND	PCON detected that V43JU circuit is shorted to GND.	Jip Up function will not operate.	* With a voltmeter, measure Y68. Proper resistance should be between 5 - 60 ohms. Replace Y68 if resistance is outside of those values. * Verify wiring for V43JU (BL, PCON J13-5) and check for open or short circuits.
		11	Shorted to supply voltage	PCON detected that V43JU circuit is shorted to 12 V.		
40	Jib Select Coil	9	Shorted to GND	PCON detected V18PRR is short to GND.	Jib and platform rotate functions will not operate.	* With a voltmeter, measure Y18. Proper resistance should be between 5 - 60 ohms. Replace Y18 if resistance is outside of those values. * Verify wiring for V18PRR (GR/BK, PCON J12-4) and check for short circuits.
		11	Shorted to supply voltage	PCON detected V18PRR is short to 12 V.		

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
41	Turntable Rotate Joystick	9	Shorted to GND	Circuit C165TTR is below 4.5 V or shorted to GND.	Turntable Rotate functions will not operate.	* Leave joystick in neutral position and cycle power. * If fault persists, with a voltmeter check that C165TTR (WH/RD, PCON J18-2) is at 2. 5V +/- 0.2 V at startup and does not go above 4.5 V or below 0.5 V when fully stroked in each direction. * Replace joystick if voltage check fails.
		11	Shorted to supply voltage	Circuit C165TTR is above 4.5 V or shorted to 12 V.		
		27	Active at startup	Circuit C165TTR voltage was not within the startup voltage range of 2.5 V +/- 0.2 V.	Turntable Rotate functions will not operate from platform controls.	
42	Turntable Rotate CW Coil	9	Shorted to GND	TCON detected that C4TRL circuit is shorted to GND.	Turntable Rotate CW function will not operate.	* With a voltmeter, measure Y24. Proper resistance should be between 5 - 60 ohms. Replace Y24 if resistance is outside of those values. * Verify wiring for C4TRL (WH, TCON J3-12) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C4TRL circuit is shorted to 12 V.	Turntable Rotate functions will not operate.	
43	Turntable Rotate CCW Coil	9	Shorted to GND	TCON detected that C5TRR circuit is shorted to GND.	Turntable Rotate CCW function will not operate.	* With a voltmeter, measure Y23. Proper resistance should be between 5 - 60 ohms. Replace Y23 if resistance is outside of those values. * Verify wiring for C5TRR (WH/BK, TCON J3-1) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C5TRR circuit is shorted to 12 V.	Turntable Rotate functions will not operate.	
44	Drive Enable Toggle Switch	27	Active at startup	Toggle switch input was detected as HIGH at start-up.	Drive Enable switch will not operate, possibly preventing drive while the turntable is rotated.	* Verify with a voltmeter that the Drive Enable Toggle Switch (TS15) is operating properly. * C143DEL (BL/RD, PCON J16-7) should be 0 V with the switch OFF and 12 V with the switch held in the ON position. * Cycle power to allow the machine to re-test the fault.
45	Platform Level Toggle Switch	27	Active at startup	Toggle switch input was detected as HIGH at start-up.	Platform Level Up or Down functions may not operate, depending on which direction the switch fault occurred.	* Verify with a voltmeter that the Platform Level Up/Down Toggle Switch (TS9) is operating properly. * C14PLU (OR, PCON J17-2) should be 0 V with the switch OFF and 12 V with the switch held in the UP position. * C15PLD (OR/BK, PCON J17-3) should be 0 V with the switch OFF and 12 V with the switch held in the DOWN position. * Cycle power to allow the machine to re-test the fault.

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
46	Platform Rotate CW Coil	9	Shorted to GND	PCON detected that V17PRL circuit is shorted to GND.	Platform Rotate CW function will not operate.	* With a voltmeter, measure Y70. Proper resistance should be between 5 - 60 ohms. Replace Y70 if resistance is outside of those values. * Verify wiring for V17PRL (GR, PCON J12-5) and check for open or short circuits.
		11	Shorted to supply voltage	PCON detected that V17PRL circuit is shorted to 12 V.		
47	Platform Rotate CCW Coil	9	Shorted to GND	PCON detected that V18PRR circuit is shorted to GND.	Platform Rotate CCW function will not operate.	* With a voltmeter, measure Y71. Proper resistance should be between 5 - 60 ohms. Replace Y71 if resistance is outside of those values. * Verify wiring for V18PRR (GR/BK, PCON J12-4) and check for open or short circuits.
		11	Shorted to supply voltage	PCON detected that V18PRR circuit is shorted to 12 V.		
51	Drive Joystick	9	Shorted to GND	Circuit C160DRV is below 4.5 V or shorted to GND.	Drive Forward and Reverse functions will not operate.	* Leave joystick in neutral position and cycle power. * If fault persists, with a voltmeter check that C160DRV (WH/RD, PCON J18-10) is at 2. 5V +/- 0.2 V at startup and does not go above 4.5 V or below 0.5 V when fully stroked in each direction. * Replace joystick if voltage check fails.
		11	Shorted to supply voltage	Circuit C160DRV is above 4.5 V or shorted to 12 V.		
		27	Active at startup	Circuit C160DRV voltage was not within the startup voltage range of 2.5 V +/- 0.2 V.		

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
52	Drive Forward Pump Coil	9	Shorted to GND	TCON detected that C30FWD circuit is shorted to GND.	Drive forward and brake release will not operate.	* With a voltmeter, measure Y6. Proper resistance should be between 5 - 60 ohms. Replace Y6 if resistance is outside of those values. * Verify wiring for C30FWD (WH, TCON J2-6) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C30FWD circuit is shorted to 12 V.	Drive forward, brake release and engine will not operate.	
53	Drive Reverse Pump Coil	9	Shorted to GND	TCON detected that C31REV circuit is shorted to GND.	Drive reverse and brake release will not operate.	* With a voltmeter, measure Y5. Proper resistance should be between 5 - 60 ohms. Replace Y5 if resistance is outside of those values. * Verify wiring for C31REV (WH/BK, TCON J2-7) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C31REV circuit is shorted to 12 V.	Drive reverse, brake release and engine will not operate.	
54	Brake Release Coil	9	Shorted to GND	TCON detected that C32BRK circuit is shorted to GND.	Drive, steer and brake release will not operate.	* With a voltmeter, measure Y2. Proper resistance should be between 5 - 60 ohms. Replace Y2 if resistance is outside of those values. * Verify wiring for C32BRK (WH/RD, TCON J2-9) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C32BRK circuit is shorted to 12 V.	Machine will not be functional.	
55	High Drive Speed Coil	9	Shorted to GND	TCON detected that C29MS circuit is shorted to GND.	Drive functions will not operate.	* With a voltmeter, measure Y27. Proper resistance should be between 5 - 60 ohms. Replace Y27 if resistance is outside of those values. * Verify wiring for C29MS (RD/WH, TCON J2-8) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C29MS circuit is shorted to 12 V.		
56	Telematics Device	13	Not detected	M7 telematics device not detected.	Information only.	* Cycle power. If fault persists, check telematics ready connector wiring. If there are no wiring issues replace M7.
61	Steer Joystick	9	Shorted to GND	Circuit C159STD or C159STA is below 4.5 V or shorted to GND.	Drive and steer functions will not operate.	* Leave joystick in neutral position and cycle power. * If fault persists, identify which circuit is the steer circuit. Check C159STA (BL/WH, PCON J18-11) for a joystick steer option. Check C159STD (BL/RD, PCON J18-9) for the rocker joystick steer option. With a voltmeter check that the circuit is at 2. 5V +/- 0.2 V at startup and does not go above 4.5 V or below 0.5 V when fully stroked in each direction. * Replace joystick if voltage check fails.
		11	Shorted to supply voltage	Circuit C159STD or C159STA is above 4.5 V or shorted to 12 V.		
		27	Active at startup	Circuit C159STD or C159STA voltage was not within the startup voltage range of 2.5 V +/- 0.2 V.		

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
62	Prox Override Toggle Switch	27	Active at startup	Toggle switch input was detected as HIGH at start-up.	Override will not operate.	* Verify with a voltmeter that the Jib Up/Down Toggle Switch (TS8) is operating properly. * C43JU (BL, PCON J17-6) should be 0 V with the switch OFF and 12 V with the switch held in the UP position. * C44JD (BL/BK, PCON J17-8) should be 0 V with the switch OFF and 12 V with the switch held in the DOWN position. * Cycle power to allow the machine to re-test the fault.
69	AC Generator Output	9	Shorted to GND	TCON detected that C45GEN circuit is shorted to GND.	Generator function will not operate.	* With a voltmeter, measure Y29. Proper resistance should be between 5 - 60 ohms. Replace Y29 if resistance is outside of those values. * Verify wiring for C45GEN (GR/WH, TCON J3-2) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C45GEN circuit is shorted to 12 V.		
71	TCON	9	Fault	Output to the Estop Circuit is shorted to Ground (B-).	Unable to enter any ground or platform modes, as Estop is considered OFF in this state.	* Cycle power to allow the machine to re-test the fault.
72	Lift Guard Contact Alarm Switch	14	Cross check failed	PCON detected that inputs from SW30 (contact alarm proximity sensor) are the same voltage.	Boom Up, Extend and Turntable rotate functions will not operate. All platform controls inhibited.	* Using a voltmeter, verify that the voltage on C248CA (OR/BK, PCON J12-1) is always the opposite of C247CA (OR, PCON J12-11). * Check wiring for open or short circuits. * Verify SW30 is receiving power and ground by verifying 12 V across C31 pins 1 and 3. * Replace SW30 if necessary.
		21	Fault	Switch failure.		
73	Engine Oil Pressure	12	Sensor value too high	Engine oil pressure sender is shorted to 12V.	Engine will not operate.	* With a voltmeter, check that C25PSR (WH/BK, TCON J6P9) is not shorted to 12V and voltage is between 0.1-11.5V. * Replace sender if necessary
		24	Too low	The engine oil pressure is measured as too low, potentially damaging the engine.	Engine may not attempt to start until system power cycle. Engine may be turned off by control system immediately.	* Stop engine as soon as possible. * Verify the engine oil level. * Verify the engine oil pump. * Power on the machine and start the engine. At the ground controls display, view the engine oil pressure gauge for proper operation. * If engine uses an analog oil pressure sensor, verify it is sending an analog voltage on C25PSR (WH/BK, TCON J6-9).

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
74	Engine Temperature	15	Sensor value too low	Engine temperature sensor is shorted to ground.	Engine will not operate.	* With a voltmeter, check that C26TSR (WH/RD, TCON J6P8) is not shorted to ground and voltage is between 0.1-11.5V. * Replace sensor if necessary.
		23	Too high	The engine coolant temperature is measured as too high, potentially damaging the engine.	Engine will not restart until machine power is cycled. Engine may stop itself, depending on the engine option.	* Stop engine as soon as possible. * Verify the engine coolant level. * Verify the engine coolant/water pump. * Power on the machine and start the engine. At the ground controls display, view the engine temperature gauge for proper operation. * If engine uses an analog temperature sensor, verify it is sending an analog voltage on C26TSR (WH/RD, TCON J6-10).
76	Platform Load Sensor	13	Not detected	Load sensor not detected on the communications bus.	Boom Up, Extend and Turntable Rotate functions will not operate.	* Verify sensor power P26PWR (BK, PCON J13-9) is at 12 V while the system is running. * Verify 12 V across pins on C27-2 (+) and C27-3 (-) on the harness connector. * Measure resistance across C27 pins 4 and 5 on the harness connector. If resistance is not between 55 and 65 ohms, check CAN wire harnesses. * Replace sensor if necessary.
		14	Cross check failed	The two internal sensing channels inside the Load Sensor have registered a significant difference.	Boom Up, Extend and Turntable Rotate functions will not operate.	* Check that the load sensor is mounted correctly and all fasteners are tightened to spec. * Calibrate load sensor. * Replace sensor if issue persists.
		15	Value to low	Platform load sensor out of calibration.	Machine limited to recovery functions.	* Make sure the platform is not touching the ground or an overhead obstruction. Cycle power and check that fault is no longer reported. * Perform the platform overload calibration procedure. * Replace sensor if necessary.
		17	Not calibrated	Platform load sensor out of calibration.		* Calibrate load sensor. * Replace sensor if issue persists.
		21	Fault	Platform load sensor out of calibration.		* Check that the load sensor is mounted correctly and all fasteners are tightened to spec. * Calibrate load sensor. * Replace sensor if issue persists.

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
78	Platform Controller (PCON)	13	Not detected	TCON has not detected the PCON primary processor on the communications bus.	Controls from the platform will not operate.	* Verify PCON is receiving power. Check for 12 V on J15-2 (+) and J15-1 (-). * Verify PCON is receiving ESTOP signals. With ground ESTOP pulled out and keyswitch set to Platform, verify 12 V is reaching PCON J15-10. * Verify CAN bus is functional. Pull out connector J15 from the PCON and with a voltmeter set to resistance verify that pins 3 and 4 on the harness connector measure between 110 and 130 Ohms. Check wiring and boom cable for open or short circuits if resistance check fails. * Replace PCON if necessary.
		29	Software version mismatch	PCON software is out of date.	Machine limited to recovery functions	* Download latest software from firmware site and update machine.
		36	Not detected	PCON not detected.	Controls from the platform will not operate.	* Verify PCON is receiving power. Check for 12 V on J15-2 (+) and J15-1 (-). * Verify PCON is receiving ESTOP signals. With ground ESTOP pulled out and keyswitch set to Platform, verify 12 V is reaching PCON J15-10. * Verify CAN bus is functional. Pull out connector J15 from the PCON and with a voltmeter set to resistance verify that pins 3 and 4 on the harness connector measure between 110 and 130 Ohms. Check wiring and boom cable for open or short circuits if resistance check fails. * Replace PCON if necessary.
79	Display Controller (DISCON)	13	Not detected	TCON has not detected the DISCON on the communications bus.	Controls from the ground will not operate.	* Verify DISCON is operating by checking that the display on the front is operating properly. * If there is no display, try to power up the DISCON by setting the key switch to Ground, pull out the ground ESTOP and press the Ground Function Enable button. The display should start. * If there is still no display, check DISCON power on J10 pins 2 (+) and 1 (-). * If DISCON operates but fault persists, check the CAN bus wiring. Disconnect J10 and with a voltmeter set to resistance verify that the resistance between pins 3 and 4 on the harness connector are between 55 and 65 ohms. Check CAN wiring if resistance check fails. * Replace DISCON if required.
		29	Software version mismatch	DISCON software is out of date.	Machine limited to recovery functions.	* Download latest software from firmware site and update machine.

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
80	Turntable Controller (TCON)	13	Not detected	The DISCON has not detected the TCON on the CAN bus.	Machine limited to recovery functions.	* Verify TCON is receiving power. Check for 12 V on J5-2 (+) and J5-1 (-). * Verify TCON is receiving ESTOP signals. With ground ESTOP pulled out and key switch set to Ground, verify 12 V is reaching TCON J5-9 and J5-12. * Verify CAN bus is functional. Pull out connector J5 from the TCON and with a voltmeter set to resistance verify that pins 3 and 4 on the harness connector measure between 55 and 65 Ohms. Check wiring and boom cable for open or short circuits if resistance check fails. * Replace TCON if necessary.
		29	Software version mismatch	TCON software is out of date.		* Download latest software from firmware site and update machine.
82	Overload	21	Recovery	This is a flag that indicates that the platform was overloaded and that auxiliary function enable was used while overloaded.	Advisory condition. Machine is fully functional.	* Power up the machine in service mode and clear the flag in the service menu on the ground control display.
83	Disabled	21	By owner	The telematics module has locked out machine operation.	Machine will not be functional, or have limited functionality, depending on the telematics option.	* Call machine owner to re-enable machine functions.
84	Chassis Angle	13	Not detected	The tilt sensor S80 has not been detected on the CAN bus.	Boom Up, Extend and Drive functions will not operate.	* Verify S8O is receiving power. Disconnect sensor connector and verify harness connector pins 1 and 2 measure 12 V. * Verify CAN bus wiring. With a voltmeter set to resistance, check the resistance between pins 3 and 4 on the harness connector (not the sensor's integrated connector). Resistance should be between 55 and 65 ohms. Check CAN wiring if resistance check fails. * Replace sensor if required.
		17	Not calibrated	Tilt sensor not calibrated.	Machine limited to recovery functions.	* Calibrate tilt sensor.
		21	Turntable Tilt Sensor Internal Error.	An internal error flag has been exhibited in the tilt sensors.	Boom Up, Extend, Turntable Rotate and Drive functions will not operate until stowed. Boom Up and Extend inhibited while stowed.	* Cycle power to allow the machine to re-test the fault. * Replace tilt sensor.

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
88	Function Enable Coil	9	Shorted to GND	TCON detected that C155PCE circuit is shorted to GND.	Only Auxiliary Power is available.	* With a voltmeter, measure Y74. Proper resistance should be between 5 - 60 ohms. Replace Y74 if resistance is outside of those values. * Verify wiring for C155PCE (OR/RD, TCON J2-5) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C155PCE circuit is shorted to 12 V.		
89	Fuel Level Sensor	12	Sensor value too high	Fuel level sensor shorted to 12 V.	None. Informational only.	* Verify sensor power. * Replace sensor if necessary.
		15	Sensor value too low	Fuel level sensor shorted to ground.		
92	Turntable Rotate Flow Coil	9	Shorted to GND	TCON detected that C6TRF circuit is shorted to GND.	Turntable Rotate functions will not operate.	* With a voltmeter, measure Y13. Proper resistance should be between 5 - 60 ohms. Replace Y13 if resistance is outside of those values. * Verify wiring for C6TRF (WH/RD, TCON J4-1) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C6TRF circuit is shorted to 12 V.		
94	Primary Boom Length	13	Not detected	No CAN messages have been received by the TCON from the Length Sensor.	Boom Up, Extend and Turntable Rotate functions will not operate.	* Verify sensor power P85PWR (GR, TCON J6-7) is at 12 V while the system is running. * Verify the sensor is receiving power. Unplug the sensor and verify 12 V across pins 1 (+) and 2 (-) on the harness connector. * Verify the CAN bus wiring. With the sensor still unplugged, measure resistance across harness connector pins 3 and 4. If resistance is not between 55 and 65 ohms, check CAN wire harnesses. * Replace sensor if necessary.
		14	Cross check failed	The two internal sensing channels inside the Length Sensor have registered a significant difference.	Machine limited to recovery functions.	* Verify that the boom angle sensor cord is hooked up to the bracket on the boom and that the cord extends and retracts smoothly. * Calibrate boom length sensor. * Replace sensor if necessary.
		17	Not calibrated	Boom length sensor not calibrated.		* Calibrate boom length sensor.
		19	Value out of expected range	Min or max length out of expected range. Crosscheck limit switch disagrees with length sensor.		* Verify that with the boom retracted C24LS (OR/RD TCON J7-4) is 12V and that the boom is making contact with the LSB1RS limit switch arm. * Verify that when the boom is extended at least 10" C24LS (OR/RD, TCON J7-4) is OV and that the boom is not making contact with the LSB1RS limit switch arm. * Check LSB1RS limit switch for physical damage. * Calibrate length sensor.

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
95	Engine RPM	13	Not detected	Control system has detected no or too low RPM.	Engine start disabled.	* Verify wiring at the alternator. * Check tach signal at alternator while trying to start the engine. * Replace alternator.
98	Platform Level Angle	10	Envelope exceeded	Control system has detected that the platform angle's error from the set point exceeds 10 degrees.	All functions are disabled in engine mode.	* Operate manual platform level up or platform level down auxiliary power to reset the error or power the machine off and back on.
		13	Not detected	No CAN messages have been received by the TCON from the Angle Sensor.	Boom Up and Extend functions will not operate.	* Verify sensor power. * Verify the CAN bus wiring.
		14	Cross check failed	The two internal sensing channels inside the Angle Sensor have registered a significant difference.	Machine limited to recovery functions.	* Calibrate boom length sensor. * Replace sensor if necessary.
		17	Not calibrated	Platform level angle sensor not calibrated.	Boom Up and Extend limited.	* Calibrate platform level angle sensor.
		19	Value out of expected range	Platform angle is outside the min and max range by 2%.	Boom Up and Extend functions will not operate.	* Calibrate platform level angle sensor.
99	Primary Boom Extend / Retract Flow Coil	9	Shorted to GND	TCON detected that C9PEF circuit is shorted to GND.	Boom Extend and Retract functions will not operate.	* With a voltmeter, measure Y15. Resistance should be between 5 - 60 ohms. Replace Y15 if resistance is outside of those values. * Verify wiring for C9PEF (BK/RD, TCON J4-5) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C9PEF circuit is shorted to 12 V.		

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
100	Platform Level Up Coil	9	Shorted to GND	PCON detected that V14PLU circuit is shorted to GND.	Platform Level Up function will not operate.	* With a voltmeter, measure Y20. Proper resistance should be between 5 - 60 ohms. Replace Y20 if resistance is outside of those values. * Verify wiring for V14PLU (OR, PCON J12-6) and check for open or short circuits.
		11	Shorted to supply voltage	PCON detected that V14PLU circuit is shorted to 12 V.	Platform Level Up and Level Down functions will not operate.	
101	Platform Level Down Coil	9	Shorted to GND	PCON detected that V15PLD circuit is shorted to GND.	Platform Level Down function will not operate.	* With a voltmeter, measure Y19. Proper resistance should be between 5 - 60 ohms. Replace Y19 if resistance is outside of those values. * Verify wiring for V15PLD (OR/BK, PCON J12-7) and check for open or short circuits.
		11	Shorted to supply voltage	PCON detected that V15PLD circuit is shorted to 12 V.	Platform Level Down and Level Up functions will not operate.	
110	Platform Rotate Toggle Switch	27	Active at startup	Toggle switch input was detected as HIGH at start-up.	Platform Rotate Left or Right will not operate, depending on which side of the switch was faulted.	* Verify with a voltmeter that the Platform Rotate Toggle Switch (TS7) is operating properly. * C17PRL (GR, PCON J16-4) and C18PRR (GR/BK, PCON J17-5) should be 12 V when the switch is pressed in their respective directions. * Cycle power to allow the machine to re-test the fault.
116	Model Configuration	13	Not detected	Machine is not fully configured.	Machine will not operate.	* If there are Sensor Not Detected faults, correct those faults first. * Verify the correct sensors are present on the machine per model configuration. • Boom angle sensor. • Platform angle sensor.
		31	Setup invalid			
140	Boom	10	Safety Envelope Exceeded	The system has determined that the platform position has exceeded the safety envelope boundary.	All functions will not operate except for the recovery procedure.	• Use Auxiliary Power and the boom retract and/or down functions to bring the platform back within the operational envelope.
150	Sensor Power P26PWR	9	Shorted to GND	PCON detected that P26PWR circuit is shorted to GND.	Boom Up and Extend functions will not operate.	* Turn on machine and verify sensor power P26PWR (BK, PCON J13-9) is at 12 V. * Inspect wiring for open or shorts circuits.
		11	Shorted to supply voltage	PCON detected that P26PWR circuit is shorted to 12 V.		
152	Primary Boom Up/Down Flow Coil	9	Shorted to GND	TCON detected that C3PBF circuit is shorted to GND.	Boom Up and Down functions will not operate.	* With a voltmeter, measure Y12. Proper resistance should be between 5 - 60 ohms. Replace Y12 if resistance is outside of those values. * Verify wiring for C3PBF (RD/WH, TCON J4-4) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C3PBF circuit is shorted to 12 V.		

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
160	LF Steer Coil	9	Shorted to GND	TCON detected that C37STL circuit is shorted to GND.	Steer Left function will not operate.	* With a voltmeter, measure Y3. Proper resistance should be between 5 - 60 ohms. Replace Y3 if resistance is outside of those values. * Verify wiring for C37STL (BL/BK, TCON J4-11) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C37STL circuit is shorted to 12 V.		
161	RF Steer Coil	9	Shorted to GND	TCON detected that C36STR circuit is shorted to GND.	Steer Right function will not operate.	* With a voltmeter, measure Y4. Proper resistance should be between 5 - 60 ohms. Replace Y4 if resistance is outside of those values. * Verify wiring for C36STR (BL, TCON J4-12) and check for open or short circuits.
		11	Shorted to supply voltage	TCON detected that C36STR circuit is shorted to 12 V.		
179	Platform Recirculation Coil	9	Shorted to GND	TCON detected the platform recirculation coil is shorted to GND.	None. Informational only.	* Verify wiring at J13-11.
		11	Shorted to supply voltage	TCON detected the platform recirculation coil is shorted to 12 V.		
185	ESTOP Source	9	Shorted to GND	TCON detected that ESTOP 1 is at 0 V but ESTOP 3 is at 12 V.	ESTOP circuit cannot complete, preventing machine functions.	* Using a voltmeter and with the system turned OFF, check the resistance between TCON J5 pins 9 and 10. Replace TCON if resistance is more than 5 ohms. * Check P79PWR (BK, TCON J5-9) and P23PWR (RD, TCON J5-10) for open or short circuits.
		11	Shorted to supply voltage	TCON detected that ESTOP 1 is at 12 V but ESTOP 3 is at 0 V.		
186	ESTOP Return	9	Shorted to GND	Mismatched signals detected on ESTOP Return circuits. Either: * PCON ESTOP 2 and ESTOP 4 do not match, or * TCON ESTOP 2 and ESTOP 4 do not match.	ESTOP circuit cannot complete, preventing machine functions.	* Inspect PCON J15 pins 11 and 12 for open or short circuits. Using a voltmeter, set to diode test mode and make sure the diode tests ok with the anode at pin 12 and cathode at pin 11. If test fails, replace the PCON. * Inspect TCON J5 pins 11 and 12 for open or short circuits. Using a voltmeter, set to diode test mode and make sure the diode tests ok with the anode at pin 12 and cathode at pin 11. If test fails, replace the PCON. * Check P23RET (BK) for shorts to ground or power.
		11	Shorted to supply voltage			

Control System Fault Codes

ID	Component	ID	Name	Cause	Effect	Solution
206	TCON / PCON	13	TCON Bank Power Not Detected	The bank power on the TCON is no longer present.	None.	* Check J1, Bank Power, on TCON is making a good connection. * Verify pin 1 is grounded. * Verify pins 2, 3, 4 are 12V. * Replace TCON.
			PCON Bank Power Not Detected	The bank power on the PCON is no longer present.		* Check J11, Bank Power, on PCON is making a good connection. * Verify pin 1 is grounded. * Verify pins 3, 4 are 12V. * Replace PCON.
240	Turntable Sensor Power	9	P85PWR Short to B-	P85PWR is shorted to B-.	Boom Up and Extend inhibited.	* Cycle power to allow the machine to re-test the fault.
		11	P85PWR Short to B+	P85PWR is shorted to B+.		
241	Turntable Sensor Power	9	P109PWR is shorted to B-	P109PWR Short to B-.	Boom Up and Extend inhibited.	* Cycle power to allow the machine to re-test the fault.
		11	P109PWR is shorted to B+	P109PWR Short to B+.		
263	Platform Level Loop Coil	9	Shorted to GND	TCON detected the platform level loop coil is shorted to GND.	None. Informational only.	* Verify wiring at J13-4.
		11	Shorted to supply voltage	TCON detected the platform level loop coil is shorted to 12 V.		

Engine Fault Codes

Some engine options have their own Electronic Control Module that contains more detailed fault information that is specific to the engine. This system can be accessed by using the engine's dedicated service tool. This service tool may be connected to the Engine Service Connector, located to the right of the battery tray.

The ground controls display and fault menu will show basic engine faults, such as low oil pressure and high coolant temperature. It will also show faults for engine warning and engine stop, which correspond to the engine warning lamp and engine stop lamp indicators that the engine may require.

More advanced faults specific to the engine will require the use of a corresponding engine service tool.

Deutz D 2.9 L4 Tier IV Engine Fault Codes

SPN = Suspect Parameter Number
FMI = Failure Mode Identifier
KWP = Keyword Protocol

SPN	FMI	KWP	Description
51	3	1019	EGR-Valve, short circuit to battery
51	3	1024	Position sensor error of actuator EGR-Valve; signal range check high
51	3	1226	EGR-Valve; short circuit to battery (A02)
51	3	1227	EGR-Valve; short circuit to battery (A67)
51	4	1020	EGR-Valve; short circuit to ground
51	4	1025	Position sensor error actuator EGR-Valve; signal range check low
51	4	1228	EGR-Valve; short circuit to ground (A02)
51	4	1229	EGR-Valve; short circuit to ground (A67)
1	4	1232	Actuator error EGR-Valve; Voltage below threshold
51	5	1015	Actuator error EGR-Valve; signal range check low
51	5	1017	Actuator EGR-Valve; open load
51	5	1023	Actuator error EGR-Valve; signal range check low
51	5	1223	Actuator EGR-Valve; open load
51	6	1014	Actuator error EGR-Valve; signal range check high
51	6	1022	Actuator error EGR-Valve; signal range check high
51	6	1224	Actuator EGR-Valve; over current
51	6	1230	Actuator error EGR-Valve; Overload by short-circuit
51	7	1016	Actuator position for EGR-Valve not plausible
51	11	1231	Actuator error EGR-Valve; Power stage over temp due to high current
51	12	1018	Actuator EGR-Valve; powerstage over temperature
51	12	1021	Mechanical actuator defect EGR-Valve
51	12	1225	Actuator EGR-Valve; over temperature
94	1	474	Low fuel pressure; warning threshold exceeded
94	1	475	Low fuel pressure; shut off threshold exceeded
94	3	472	Sensor error low fuel pressure; signal range check high
94	4	473	Sensor error low fuel pressure; signal range check low
97	3	464	Sensor error water in fuel; signal range check high
97	4	465	Sensor error water in fuel; signal range check low
97	12	1157	Water in fuel level prefilter; maximum value exceeded
100	0	734	High oil pressure; warning threshold exceeded
100	0	735	High oil pressure; shut off threshold exceeded
100	1	736	Low oil pressure; warning threshold exceeded
100	1	737	Low oil pressure; shut off threshold exceeded
100	3	732	Sensor error oil pressure; signal range check high
100	4	733	Sensor error oil pressure sensor; signal range check low
102	2	88	Charged air pressure above warning threshold
102	2	89	Charged air pressure above shut off threshold
102	4	777	Sensor error charged air press.; signal range check low

Deutz D 2.9 L4 Tier IV Engine Fault Codes

SPN = Suspect Parameter Number
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SPN	FMI	KWP	Description
105	0	996	High charged air cooler temperature; warning threshold exceeded
105	0	997	High charged air cooler temperature; shut off threshold exceeded
105	3	994	Sensor error charged air temperature; signal range check high
105	4	995	Sensor error charged air temperature; signal range check low
108	3	412	Sensor error ambient air press.; signal range check high
108	4	413	Sensor error ambient air press.; signal range check low
110	0	98	High coolant temperature; warning threshold exceeded
110	0	99	High coolant temperature; shut off threshold exceeded
110	3	96	Sensor error coolant temp.; signal range check high
110	4	97	Sensor error coolant temp.; signal range check low
111	1	101	Coolant level too low
132	11	1	Air flow sensor load correction factor exceeding the maximum drift limit; plausibility error
132	11	2	Air flow sensor load correction factor exceeding drift limit; plausibility error
132	11	3	Air flow sensor low idle correction factor exceeding the maximum drift limit
132	11	4	Air flow sensor load correction factor exceeding the maximum drift limit
157	3	877	Sensor error rail pressure; signal range check high
157	4	878	Sensor error rail pressure; signal range check low
168	0	1180	Physical range check high for battery voltage
168	1	1181	Physical range check low for battery voltage
168	2	47	High battery voltage; warning threshold exceeded
168	2	48	Low battery voltage; warning threshold exceeded
168	3	45	Sensor error battery voltage; signal range check high
168	4	46	Sensor error battery voltage; signal range check low
171	3	417	Sensor error environment temperature; signal range check high
171	4	418	Sensor error environment temperature; signal range check low
172	0	1182	Physical range check high for intake air temperature
172	1	1183	Physical range check low for intake air temperature
172	2	9	Sensor ambient air temperature; plausibility error
172	2	983	Intake air sensor; plausibility error
172	3	981	Sensor error intake air; signal range check high
172	4	982	Sensor error intake air sensor; signal range check low
174	0	481	High low fuel temperature; warning threshold exceeded
174	0	482	High Low fuel temperature; shut off threshold exceeded
175	0	740	Physical range check high for oil temperature
175	0	745	High oil temperature; warning threshold exceeded
175	0	746	High oil temperature; shut off threshold exceeded
175	1	741	Physical range check low for oil temperature

Deutz D 2.9 L4 Tier IV Engine Fault Codes

SPN = Suspect Parameter Number
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SPN	FMI	KWP	Description
175	2	738	Sensor oil temperature; plausibility error
175	2	739	Sensor oil temperature; plausibility error oil temperature too high
175	3	743	Sensor error oil temperature; signal range check high
175	4	744	Sensor error oil temperature; signal range check low
190	0	389	Engine speed above warning threshold (FOC-Level 1)
190	2	421	Offset angle between crank- and camshaft sensor is too large
190	8	419	Sensor camshaft speed; disturbed signal
190	8	422	Sensor crankshaft speed; disturbed signal
190	11	390	Engine speed above warning threshold (FOC-Level 2)
190	12	420	Sensor camshaft speed; no signal
190	12	423	Sensor crankshaft speed; no signal
190	14	391	Engine speed above warning threshold (Overrun Mode)
190	14	1222	Camshaft- and Crankshaft speed sensor signal not available on CAN
411	0	791	Physical range check high for differential pressure Venturiunit (EGR)
411	1	792	Physical range check low for differential pressure Venturiunit (EGR)
411	3	795	Sensor error differential pressure Venturiunit (EGR); signal range check high
411	4	381	Physical range check low for EGR differential pressure
411	4	796	Sensor error differential pressure Venturiunit (EGR); signal range check low
412	3	1007	Sensor error EGR cooler downstream temperature; signal range check high
412	4	1008	Sensor error EGR cooler downstream temperature; signal range check low
520	9	306	Timeout Error of CAN-Receive-Frame TSC1TR; Setpoint
597	2	49	Break lever mainswitch and break lever redundancy switch status not plausible
624	3	971	SVS lamp; short circuit to batt.
624	4	972	SVS lamp; short circuit to grd.
624	5	969	SVS lamp; open load
624	12	970	SVS lamp; powerstage over temperature
630	12	376	Access error EEPROM memory (delete)
630	12	377	Access error EEPROM memory (read)
630	12	378	Access error EEPROM memory (write)
639	14	84	CAN-Bus 0 "BusOff-Status"
651	3	580	Injector 1 (in firing order); short circuit
651	4	586	High side to low side short circuit in the injector 1 (in firing order)
651	5	568	Injector 1 (in firing order); interruption of electric connection
652	3	581	Injector 2 (in firing order); short circuit
652	4	587	High side to low side short circuit in the injector 2 (in firing order)
652	5	569	Injector 2 (in firing order); interruption of electric connection
653	3	582	Injector 3 (in firing order); short circuit
653	4	588	High side to low side short circuit in the injector 3 (in firing order)
653	5	570	Injector 3 (in firing order); interruption of electric connection

Deutz D 2.9 L4 Tier IV Engine Fault Codes

SPN = Suspect Parameter Number
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SPN	FMI	KWP	Description
654	3	583	Injector 4 (in firing order); short circuit
654	4	589	High side to low side short circuit in the injector 4 (in firing order)
654	5	571	Injector 4 (in firing order); interruption of electric connection
676	11	543	Cold start aid relay error.
676	11	544	Cold start aid relay open load
677	3	956	Starter relay high side; short circuit to battery
677	3	960	Starter relay low side; short circuit to battery
677	4	957	Starter relay high side; short circuit to ground
677	4	961	Starter relay low side; short circuit to ground
677	5	958	Starter relay; no load error
677	12	959	Starter relay; powerstage over temperature
703	3	426	Engine running lamp; short circuit to battery
703	4	427	Engine running lamp; short circuit to ground
703	5	424	Engine running lamp; open load
703	12	425	Engine running lamp; powerstage over temperature
729	5	545	Cold start aid relay open load
729	12	547	Cold start aid relay; over temperature error
898	9	305	Timeout Error of CAN-Receive-Frame TSC1TE; Setpoint
1079	13	946	Sensor supply voltage monitor 1 error (ECU)
1080	13	947	Sensor supply voltage monitor 2 error (ECU)
1109	2	121	Engine shut off demand ignored
1136	0	1398	Physikal range check high for ECU temperature
1136	1	1399	Physikal range check low for ECU temperature
1136	3	1400	Sensor error ECU temperature; signal range check high
1136	4	1401	Sensor error ECU temperature; signal range check low
1176	3	849	Sensor error pressure sensor upstream turbine; signal range check high
1176	4	850	Sensor error pressure sensor downstream turbine; signal range check high
1180	0	1193	Physical range check high for exhaust gas temperature upstream turbine
1180	0	1460	Turbocharger Wastegate CAN feedback; warning threshold exceeded
1180	0	1462	Exhaust gas temperature upstream turbine; warning threshold exceeded
1180	1	1194	Physical range check low for exhaust gas temperature upstream turbine
1180	1	1461	Turbocharger Wastegate CAN feedback; shut off threshold exceeded
1180	1	1463	Exhaust gas temperature upstream turbine; shut off threshold exceeded
1180	3	1067	Sensor error exhaust gas temperature upstream turbine; signal range check high
1180	11	1066	Sensor exhaust gas temperature upstream turbine; plausibility error
1188	2	1414	Wastegate; status message from ECU missing

Deutz D 2.9 L4 Tier IV Engine Fault Codes

SPN = Suspect Parameter Number
FMI = Failure Mode Identifier
KWP = Keyword Protocol

SPN	FMI	KWP	Description
1188	7	1415	Wastegate actuator; blocked
1188	11	1411	Wastegate actuator; internal error
1188	11	1412	Wastegate actuator; EOL calibration not performed correctly
1188	11	1416	Wastegate actuator; over temperature (> 145øC)
1188	11	1417	Wastegate actuator; over temperature (> 135øC)
1188	11	1418	Wastegate actuator; operating voltage error
1188	13	1413	Wastegate actuator calibration deviation too large, recalibration required
1231	14	85	CAN-Bus 1 "BusOff-Status"
1235	14	86	CAN-Bus 2 "BusOff-Status"
1237	2	747	Override switch; plausibility error
1322	12	610	Too many recognized misfires in more than one cylinder
1323	12	604	Too many recognized misfires in cylinder 1 (in firing order)
1324	12	605	Too many recognized misfires in cylinder 2 (in firing order)
1325	12	606	Too many recognized misfires in cylinder 3 (in firing order)
1326	12	607	Too many recognized misfires in cylinder 4 (in firing order)
2659	0	1524	Physical range check high for EGR exhaust gas mass flow
2659	1	1525	Physical range check low for EGR exhaust gas mass flow
2659	2	1523	Exhaust gas recirculation AGS sensor; plausibility error
2659	2	1527	AGS sensor temperature exhaust gas mass flow; plausibility error
2659	12	1526	Exhaust gas recirculation; AGS sensor has "burn off" not performed
2797	4	1337	Injector diagnostics; timeout error of short circuit to ground measurement cyl. Bank 0
2798	4	1338	Injector diagnostics; timeout error of short circuit to ground measurement cyl. Bank 1
2798	4	1339	Injector diagnostics; short circuit to ground monitoring Test in Cyl. Bank 0
2798	4	1340	Injector diagnostics; short circuit to ground monitoring Test in Cyl. Bank 1
3224	2	127	DLC Error of CAN-Receive-Frame AT1IG1 NOX Sensor (SCR-system upstream cat; DPF-system downstream cat); length of frame incorrect
3224	9	128	Timeout Error of CAN-Receive-Frame AT1IG1; NOX sensor upstream
3248	4	1047	Sensor error particle filter downstream temperature; signal range check low
3699	2	1616	DPF differential pressure sensor and a further sensor or actuator CRT system defective
3699	2	1617	Temperature sensor us. and ds. DOC simultaneously defect
3699	14	1615	Maximum stand-still-duration reached; oil exchange required
4765	0	1039	Physical range check high for exhaust gas temperature upstream (DOC)
4765	1	1042	Physical range check low for exhaust gas temperature upstream (DOC)

Deutz D 2.9 L4 Tier IV Engine Fault Codes

SPN = Suspect Parameter Number
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SPN	FMI	KWP	Description
4766	0	1029	Physical range check high for exhaust gas temperature downstream (DOC)
4766	1	1032	Physical range check low for exhaust gas temperature downstream (DOC)
4768	2	1036	Sensor exhaust gas temperature upstream (DOC); plausibility error
4768	3	1044	Sensor error exhaust gas temperature upstream (DOC); signal range check high
4768	4	1045	Sensor error exhaust gas temperature upstream (DOC) signal range check low
4769	2	1026	Sensor exhaust gas temperature downstream (DOC); plausibility error
4769	3	1034	Sensor error exhaust gas temperature downstream (DOC); signal range check high
4769	4	1035	Sensor error exhaust gas temperature downstream (DOC); signal range check low
523006	3	34	Controller mode switch; short circuit to battery
523006	4	35	Controller mode switch; short circuit to ground
523008	1	648	Manipulation control was triggered
523008	2	649	Timeout error in Manipulation control
523009	9	825	Pressure Relief Valve (PRV) reached maximun allowed opening count
523009	10	833	Pressure relief valve (PRV) reached maximun allowed open time
523212	9	171	Timeout Error of CAN-Receive-Frame ComEngPrt; Engine Protection
523216	9	198	Timeout Error of CAN-Receive-Frame PrHtEnCmd; pre-heat command, engine command
523240	9	179	Timeout CAN-message FunModCtl; Function Mode Control
523350	4	565	Injector cylinder-bank 1; short circuit
523352	4	566	Injector cylinder-bank 2; short circuit
523354	12	567	Injector powerstage output defect
523470	2	826	Pressure Relief Valve (PRV) forced to open; performed by pressure increase
523470	2	827	Pressure Relief Valve (PRV) forced to open; performed by pressure shock
523470	7	876	Maximum rail pressure in limp home mode exceeded (PRV)
523470	11	831	The PRV can not be opened at this operating point with a pressure shock
523470	11	832	Rail pressure out of tolerance range
523470	12	828	Open Pressure Relief Valve (PRV); shut off condition
523470	12	829	Open Pressure Relief Valve (PRV); warning condition
523470	14	830	Pressure Relief Valve (PRV) is open
523550	12	980	T50 start switch active for too long
523601	13	948	Sensor supply voltage monitor 3 error (ECU)
523603	9	126	Timeout Error of CAN-Receive-Frame AMB; Ambient Temperature Sensor

Deutz D 2.9 L4 Tier IV Engine Fault Codes

SPN = Suspect Parameter Number
FMI = Failure Mode Identifier
KWP = Keyword Protocol

SPN	FMI	KWP	Description
523605	9	300	Timeout Error of CAN-Receive-Frame TSC1AE; Traction Control
523606	9	301	Timeout Error of CAN-Receive-Frame TSC1AR; Retarder
523612	12	387	Internal software error ECU; injection cut off
523612	12	612	Internal ECU monitoring detection reported error
523612	12	613	Internal ECU monitoring detection reported error
523612	12	614	Internal ECU monitoring detection reported error
523612	12	615	Internal ECU monitoring detection reported error
523612	12	616	Internal ECU monitoring detection reported error
523612	12	617	Internal ECU monitoring detection reported error
523612	12	618	Internal ECU monitoring detection reported error
523612	12	619	Internal ECU monitoring detection reported error
523612	12	620	Internal ECU monitoring detection reported error
523612	12	621	Internal ECU monitoring detection reported error
523612	12	623	Internal ECU monitoring detection reported error
523612	12	624	Internal ECU monitoring detection reported error
523612	12	625	Internal ECU monitoring detection reported error
523612	12	627	Internal ECU monitoring detection reported error
523612	12	628	Internal ECU monitoring detection reported error
523612	12	637	Internal ECU monitoring detection reported error
523612	12	1170	Internal software error ECU
523612	14	973	Softwarereset CPU SWReset_0
523612	14	974	Softwarereset CPU SWReset_1
523612	14	975	Softwarereset CPU SWReset_2
523613	0	856	Maximum positive deviation of rail pressure exceeded (RailMeUn0)
523613	0	857	Maximum positive deviation of rail pressure in metering unit exceeded (RailMeUn1)
523613	0	858	Railsystem leakage detected (RailMeUn10)
523613	0	859	Maximum negative deviation of rail pressure in metering unit exceeded (RailMeUn2)
523613	0	860	Negative deviation of rail pressure second stage (RailMeUn22)
523613	0	862	Maximum rail pressure exceeded (RailMeUn4)
523613	1	861	Minimum rail pressure exceeded (RailMeUn3)
523613	2	864	Setpoint of metering unit in overrun mode not plausible
523615	3	594	Metering unit (Fuel-System); short circuit to battery highside
523615	3	596	Metering unit (Fuel-System); short circuit to battery low side
523615	4	595	Metering unit (Fuel-System); short circuit to ground high side
523615	4	597	Metering Unit (Fuel-System); short circuit to ground low side
523615	5	592	Metering unit (Fuel-System); open load
523615	12	593	Metering unit (Fuel-System); powerstage over temperature
523619	2	488	Physical range check high for exhaust gas temperature upstrem (SCR-CAT)
523698	11	122	Shut off request from supervisory monitoring function

Deutz D 2.9 L4 Tier IV Engine Fault Codes

SPN = Suspect Parameter Number
FMI = Failure Mode Identifier
KWP = Keyword Protocol

SPN	FMI	KWP	Description
523717	12	125	Timeout Error of CAN-Transmit-Frame AmbCon; Weather environments
523718	3	1488	SCR mainrelay; short circuit to battery (only CV56B)
523718	4	1489	SCR mainrelay; short circuit to ground (only CV56B)
523718	5	1486	SCR mainrelay; open load (only CV56B)
523718	12	1487	SCR mainrelay; powerstage over temperature (only CV56B)
523766	9	281	Timeout Error of CAN-Receive-Frame Active TSC1AE
523767	9	282	Timeout Error of CAN-Receive-Frame Passive TSC1AE
523768	9	283	Timeout Error of CAN-Receive-Frame Active TSC1AR
523769	9	284	Timeout Error of CAN-Receive-Frame Passive TSC1AR
523770	9	285	Timeout Error of CAN-Receive-Frame Passive TSC1DE
523776	9	291	Timeout Error of CAN-Receive-Frame TSC1TE - active
523777	9	292	Passive Timeout Error of CAN-Receive-Frame TSC1TE; Setpoint
523778	9	293	Active Timeout Errorof CAN-Receive-Frame TSC1TR
523779	9	294	Passive Timeout Error of CAN-Receive-Frame TSC1TR
523788	12	299	Timeout Error of CAN-Transmit-Frame TrbCH; Status Wastegate
523793	9	202	Timeout Error of CAN-Receive-Frame UAA10; AGS sensor service message
523794	9	203	Timeout Error of CAN-Receive-Frame UAA11; AGS sensor data
523895	13	559	Check of missing injector adjustment value programming (IMA) injector 1 (in firing order)
523896	13	560	check of missing injector adjustment value programming (IMA) injector 2 (in firing order)
523897	13	561	check of missing injector adjustment value programming (IMA) injector 3 (in firing order)
523898	13	562	check of missing injector adjustment value programming (IMA) injector 4 (in firing order)
523910	6	1261	Air Pump; over current
523913	3	74	Sensor error glow plug control diagnostic line voltage; signal range check high
523913	4	75	Sensor error glow plug control diagnostic line voltage; signal range check low
523914	3	78	Glow plug control; short circuit to battery
523914	4	79	Glow plug control; short circuit to ground
523914	5	76	Glow plug control; open load
523914	5	1216	Glow plug control release line; short circuit error
523914	11	1217	Glow plug control; internal error
523914	12	77	Glow plug control; powerstage over temperature
523919	2	1378	Sensor air pump airpressure; plausibility error
523920	2	1379	Sensor exhaust gas back pressure burner; plausibility error

Deutz D 2.9 L4 Tier IV Engine Fault Codes

SPN = Suspect Parameter Number
FMI = Failure Mode Identifier
KWP = Keyword Protocol

SPN	FMI	KWP	Description
523922	7	1262	Burner Shut Off Valve; blocked closed
523922	7	1264	Burner Shut Off Valve; blocked closed
523929	0	109	Fuel Balance Control integrator injector 1 (in firing order); maximum value exceeded
523929	1	115	Fuel Balance Control integrator injector 1 (in firing order); minimum value exceeded
523930	0	110	Fuel Balance Control integrator injector 2 (in firing order); maximum value exceeded
523930	1	116	Fuel Balance Control integrator injector 2 (in firing order); minimum value exceeded
523931	0	111	Fuel Balance Control integrator injector 3 (in firing order); maximum value exceeded
523931	1	117	Fuel Balance Control integrator injector 3 (in firing order); minimum value exceeded
523932	0	112	Fuel Balance Control integrator injector 4 (in firing order); maximum value exceeded
523932	1	118	Fuel Balance Control integrator injector 4 (in firing order); minimum value exceeded
523935	12	168	Timeout Error of CAN-Transmit-Frame EEC3VOL1; Engine send messages
523936	12	169	Timeout Error of CAN-Transmit-Frame EEC3VOL2; Engine send messages
523946	0	1158	Zero fuel calibration injector 1 (in firing order); maximum value exceeded
523946	1	1164	Zero fuel calibration injector 1 (in firing order); minimum value exceeded
523947	0	1159	Zerofuel calibration injector 2 (in firing order); maximum value exceeded
523947	1	1165	Zerofuel calibration injector 2 (in firing order); minimum value exceeded
523948	0	1160	Zerofuel calibration injector 3 (in firing order); maximum value exceeded
523948	1	1166	Zerofuel calibration injector 3 (in firing order); minimum value exceeded
523949	0	1161	Zerofuel calibration injector 4 (in firing order); maximum value exceeded
523949	1	1167	Zerofuel calibration injector 4 (in firing order); minimum value exceeded
523960	0	1011	Physical range check high for EGR cooler downstream temp.
523960	0	1458	High exhaust gas temperature EGR cooler downstream; warning threshold exceeded
523960	1	1012	Physical range check low for EGR cooler downstream temp.
523960	1	1459	High exhaust gas temperature EGR cooler downstream; shut off threshold exceeded
523980	14	1187	Bad quality of reduction agent detected
523981	11	918	Urea-tank without heating function (heating phase)
523982	0	360	Powerstage diagnosis disabled; high battery voltage
523982	1	361	Powerstage diagnosis disabled; low battery voltage

Deutz D 2.9 L4 Tier IV Engine Fault Codes

SPN = Suspect Parameter Number
FMI = Failure Mode Identifier
KWP = Keyword Protocol

SPN	FMI	KWP	Description
523988	3	1245	Charging lamp; short circuit to battery
523988	4	1246	Charging lamp; short circuit to ground
523988	5	1243	Charging lamp; open load
523988	12	1244	Charging lamp; over temp.
523998	4	1327	Injector cylinder bank 2 slave; short circuit
523999	12	1328	Injector powerstage output Slave defect
524014	1	1254	Air pressure glow plug flush line; below limit
524016	2	1259	Amount of air is not plausible to pump speed
524016	2	1260	Calculated amount of air is not plausible to HFM reading
524016	11	1258	HFM sensor; electrical fault
524021	11	1263	Burner fuel line pipe leak behind Shut Off Valve
524024	11	1302	Deviation of the exhaust gas temp. setpoint to actual value downstream (DOC) too high
524028	2	1431	CAN message PROEGRActr; plausibility error
524029	2	1432	Timeout Error of CAN-Receive-Frame ComEGRActr - exhaust gas recirculation positioner
524030	7	1440	EGR actuator; internal error
524031	13	1441	EGR actuator; calibration error
524032	2	1442	EGR actuator; status message EGRCust is missing
524033	7	1443	EGR actuator; due to overload in Save Mode
524034	3	1438	Disc separator; short circuit to battery
524034	4	1439	Disc separator; short circuit to ground
524034	5	1436	Disc Separator; open load
524034	12	1437	Disc Separator; powerstage over temperature
524035	12	1341	Injector diagnostics; time out error in the SPI communication
524057	2	1505	Electric fuel pump; fuel pressure build up error
524097	9	1663	Timeout error of CAN-Transmit-Frame DPFBrnAirPmpCtl
524098	9	1664	Timeout error of CAN-Transmit-Frame ComDPFBrnPT
524099	9	1665	Timeout error of CAN-Transmit-Frame ComDPFC1
524100	9	1666	Timeout error of CAN-Transmit-Frame ComDPFHisDat
524101	9	1667	Timeout error of CAN-Transmit-Frame ComDPFTstMon

Deutz D 2.9 L4 Tier IV Engine Fault Codes

SPN = Suspect Parameter Number
FMI = Failure Mode Identifier
KWP = Keyword Protocol

SPN	FMI	KWP	Description
524102	9	1674	Timeout error of CAN-Receive-Frame ComRxDPFBrnAirPmpCtl
524103	9	1675	Timeout error of CAN-Receive-Frame ComRxDPFBrnAirPmp
524104	9	1676	Timeout error of CAN-Receive-Frame ComRxDPFCtl
524105	9	1668	Timeout error of CAN-Transmit-Frame ComEGRMsFlw
524106	9	1677	Timeout error of CAN-Receive-Frame ComRxEGRMsFlw1
524107	9	1678	Timeout error of CAN-Receive-Frame ComRxEGRMsFlw2
524108	9	1669	Timeout error of CAN-Transmit-Frame ComEGRTVActr
524109	9	1679	Timeout error of CAN-Receive-Frame ComRxEGRTVActr
524110	9	1670	Timeout error of CAN-Transmit-Frame ComETVActr
524111	9	1680	Timeout error of CAN-Receive-Frame ComRxETVActr
524112	9	1671	Timeout ComITVActr
524113	9	1681	Timeout error of CAN-Receive-Frame ComRxITVActr
524114	9	1659	Timeout error of CAN-Transmit-Frame A1DOC
524115	9	1660	Timeout error of CAN-Transmit-Frame AT1S
524116	9	1661	Timeout error of CAN-Transmit-Frame SCR2
524117	9	1662	Timeout error of CAN-Transmit-Frame SCR3
524118	9	1672	Timeout error of CAN-Receive-Frame ComRxCM1
524119	9	1673	Timeout error of CAN-Receive-Frame ComRxCustSCR3
524120	9	1682	Timeout error of CAN-Receive-Frame ComRxSCRHtDiag
524121	9	1683	Timeout error of CAN-Receive-Frame ComRxTrbChActr
524122	9	1684	Timeout error of CAN-Receive-Frame ComRxUQSens
524123	9	1685	Timeout error of CAN-Receive-Frame ComSCRHtCtl
524124	9	1686	Timeout error of CAN-Receive-Frame ComTxAT1IMG
524125	9	1687	Timeout error of CAN-Receive-Frame ComTxTrbChActr

Deutz TD 2.2 L3, D/TD 2.9 L4 Stage IV Engine Fault Codes

DTC = Diagnostic Trouble Code
FMI = Failure Mode Identifier
SPN = Suspect Parameter Number

DTC	SPN	FMI	Description
1000	98	2	Engine oil level sensor internal error. Sensor reports error. Open/short transducer.
1001	98	31	Engine oil level out of range. Level low, high, foaming.
1002	98	31	Oil sensor voltage out of range. <8,5V ±0,5V; >16,5V ±0,5V.
1003	98	2	Oil sensor invalid sensor status.
1004	98	31	Oil sensor temperature out of range.
1005	98	14	Oil sensor is broken or disconnected.
1021	100	3	Oil pressure voltage above normal or shorted to high.
1022	100	4	Oil pressure voltage below normal or shorted to low.
1025	100	1	Low oil pressure. Warning threshold exceeded.
1026	100	1	Low oil pressure. Shut off threshold exceeded.
1043	107	0	Air filter differential pressure. Air filter clogged.
1071	411	2	Engine exhaust gas recirculation. Pressure does not change between engine operating points.
1072	411	0	Engine exhaust gas recirculation. Pressure above normal operational range.
1073	411	1	Engine exhaust gas recirculation. Pressure below normal operational range.
1074	411	2	Engine exhaust gas recirculation. Negative measured differential pressure.
1075	411	2	Engine exhaust gas recirculation. Positive measured differential pressure.
1077	411	3	Engine exhaust gas recirculation. Signal value above maximum limit.
1078	411	4	Engine exhaust gas recirculation. Signal value below maximum limit.
1079	108	0	Ambient air pressure sensor above normal operational range.
1080	108	1	Ambient air pressure sensor below normal operational range.
1081	108	15	Fault check max signal range violated for ambient air pressure sensor.
1082	108	17	Fault check min signal range violated for ambient air pressure sensor.
1083	108	2	Ambient air pressure sensor error by component self diagnosis.
1084	3720	0	DPF ash load above normal operational range.
1086	3734	0	DPF soot load exceeded. Remove filter level.
1087	4781	14	DPF soot load exceeded shut off level.
1088	4781	0	DPF soot load exceeded warning level.
1089	4781	16	DPF. Too much standstill time in short time interval.
1090	10156	0	DPF. The standstill-regeneration mode time exceeds the short-limit.
1091	3735	16	DPF. Standstill required and no successful standstill longer than escalation threshold. Moderately severe.
1092	3735	0	DPF. Standstill required and no successful standstill longer than escalation threshold. Most severe.
1093	4766	1	DOC. Regeneration temperature in standstill main phase not reached.
1102	171	2	Ambient air temperature shows a deviation from expected value at cold start conditions.

Deutz TD 2.2 L3, D/TD 2.9 L4 Stage IV Engine Fault Codes

DTC = Diagnostic Trouble Code
FMI = Failure Mode Identifier
SPN = Suspect Parameter Number

DTC	SPN	FMI	Description
111	102	0	Engine intake manifold pressure above normal operational range.
1114	102	1	Engine intake manifold pressure below normal operational range.
1115	102	3	Intake manifold pressure sensor voltage above normal or shorted to high.
1116	102	4	Intake manifold pressure sensor voltage below normal or shorted to low.
1118	102	1	Intake manifold pressure below normal operational range.
1121	102	2	DFC for signal variation check for pressure sensor of the intake manifold.
1122	102	0	Intake air pressure valve sensor, warning condition exceeded.
1123	102	1	Intake air pressure valve sensor, shutoff condition exceeded.
1124	1209	2	Engine exhaust pressure turbine upstream differs from ambient pressure while engine not running.
1125	1209	15	Engine exhaust pressure turbine upstream above upper limit.
1126	1176	1	Engine turbocharger compressor intake pressure below normal operational range.
1127	1209	2	Engine exhaust pressure turbine upstream tuck check failed. Pressure does not change between engine operating points.
1130	1209	3	Engine exhaust pressure sensor voltage above normal or shorted to high.
1131	1209	4	Engine exhaust pressure sensor voltage below normal or shorted to low.
1134	3251	3	DPF voltage above normal or shorted to high.
1135	3251	4	DPF voltage below normal or shorted to low.
1136	3251	14	DPF reporting communication error.
1137	3251	14	DPF reporting data error.
1138	3251	14	DPF reporting fast channel 1 error.
1139	3251	14	DPF reporting fast channel 2 signal range error.
1149	3251	2	DPF difference pressure value not plausible.
1150	3251	0	DPF difference pressure above shut off threshold.
1151	3251	16	DPF difference pressure above warning threshold.
1152	3251	1	DPF difference pressure below shut off threshold.
1153	3251	18	DPF difference pressure below warning threshold.
1161	5571	16	Rail fuel pressure relief valve above normal operational range.
1162	5571	2	Rail fuel pressure relief valve is forced to open, perform pressure increase.
1163	5571	2	Rail fuel pressure relief valve is forced to open. Performed by pressure increase.
1164	5571	16	Rail fuel pressure relief valve is forced to open. Shutoff conditions.
1165	5571	15	Rail fuel pressure relief valve is forced to open. Warning conditions.
1166	5571	0	Open rail fuel pressure relief valve was detected.
1167	5571	2	Unexpected opening of the rail fuel pressure relief valve.
1168	5571	2	Successful rail fuel pressure relief valve opening cannot be ensured.
1169	5571	13	Averaged rail fuel pressure after valve opening is outside the expected tolerance range.

Deutz TD 2.2 L3, D/TD 2.9 L4 Stage IV Engine Fault Codes

DTC = Diagnostic Trouble Code
FMI = Failure Mode Identifier
SPN = Suspect Parameter Number

DTC	SPN	FMI	Description
1170	5571	16	Open time of rail fuel pressure relief valve for wear out monitoring had exceeded.
1171	94	1	Fuel pressure build up during engine start not successful.
1172	1347	5	Electrical fuel pump current below normal or open circuit.
1174	1347	3	Electrical fuel pump voltage above normal or shorted to high.
1175	1347	4	Electrical fuel pump voltage below normal or shorted to low.
119	1231	14	CAN Bus 2 off Error for Application CAN.
1190	7103	13	Rail fuel pressure below set point, speed-dependent threshold exceeded.
1191	7103	13	Rail fuel pressure metering unit. Fuel quantity balance is disrupted.
1194	7103	13	Negative rail fuel pressure governor deviation at zero delivery by metering unit.
1195	7103	1	Rail fuel pressure value is below minimum rail pressure threshold.
1197	7103	0	Maximum rail fuel pressure exceeded.
1198	7103	2	Set point of fuel metering unit in overrun mode not plausible.
120	639	14	CAN Bus 1 off Error for Power train CAN.
1200	5357	14	Shut-off due to undershoot of minimum rail pressure.
1202	157	0	Maximum rail pressure exceeded in limp home mode.
1208	157	3	Engine fuel injector metering rail pressure voltage above normal or shorted to high.
1209	157	4	Engine fuel injector metering rail pressure voltage below normal or shorted to low.
121	520252	2	Wrong checksum in the CAN message EAT Control.
1212	629	12	ECU. Keep alive error during runtime at an external device.
1213	629	12	ECU. Keep alive error during initialization phase at an external device.
1215	629	12	ECU. Read diagnosis error for non volatile memory.
1216	629	12	ECU. Write diagnosis error for non volatile memory.
1218	629	12	ECU. Stack memory threshold overrun.
1219	629	12	ECU. Observation counter irregular switch off counter triggered by engine running.
122	4207	2	TSC1 message checksum fault.
123	4207	2	TSC1 message checksum fault.
1233	5826	15	Emission control system operator inducement level 1 severity above normal operational range.
1235	5826	0	Emission control system operator inducement level 2 severity above normal operational range.
1236	5826	14	Emission control system operator pre-trigger inducement level 2 severity.
124	4207	2	TSC1 message checksum fault.
125	4207	2	TSC1 message checksum fault.
1274	91	3	Accelerator pedal sensor position 1 voltage above normal or shorted to high.
1275	2623	3	Accelerator pedal 1, channel 2 voltage above normal or shorted to high.
1276	29	3	Accelerator pedal 2 voltage above normal or shorted to high.

Deutz TD 2.2 L3, D/TD 2.9 L4 Stage IV Engine Fault Codes

DTC = Diagnostic Trouble Code
FMI = Failure Mode Identifier
SPN = Suspect Parameter Number

DTC	SPN	FMI	Description
1277	2625	3	Accelerator pedal 2, channel 2 voltage above normal or shorted to high.
1280	91	4	Accelerator pedal sensor position 1 voltage below normal or shorted to low.
1281	2623	4	Accelerator pedal 1, channel 2 voltage below normal or shorted to low.
1282	29	4	Accelerator pedal 2 voltage below normal or shorted to low.
1283	2625	4	Accelerator pedal 2, channel 2 voltage below normal or shorted to low.
1289	3509	14	Failure of sensor supply voltage 1 from ECU.
1290	3509	0	Sensor supply voltage 1 from ECU above normal operational range.
1291	3509	6	Sensor supply voltage 1 from ECU current above normal or grounded circuit.
1292	3509	1	Sensor supply voltage 1 from ECU below normal operational range.
1293	3510	14	Failure of sensor supply voltage 2 from ECU.
1294	3510	0	Sensor supply voltage 2 from ECU above normal operational range.
1295	3510	6	Sensor supply voltage 2 from ECU current above normal or grounded circuit.
1296	3510	1	Sensor supply voltage 2 from ECU below normal operational range.
1306	677	3	Engine starter motor relay voltage above normal or shorted to high.
1307	677	4	Engine starter motor relay voltage below normal or shorted to low.
1308	677	5	Engine starter motor relay current below normal or shorted to low.
1310	677	3	Engine starter motor relay voltage above normal or shorted to high.
1311	677	4	Engine starter motor relay voltage below normal or shorted to low.
1323	91	11	Accelerator pedal position 1. Possible error between APP1 and APP2 or APP1 and idle switch.
1326	29	11	Accelerator Pedal 2 Position. Possible error between APP1 and idle switch.
1346	1041	14	Start signal indicator. Terminal 50 was operated too long.
1354	105	0	Engine intake manifold 1 temperature data above normal operational range. Warning threshold exceeded.
1355	105	0	Engine intake manifold 1 temperature above normal operational range. Shutoff threshold exceeded.
1357	1136	0	Engine ECU temperature above normal operational range. Most severe.
1358	1136	1	Engine ECU temperature below normal operational range. Most severe.
1359	1136	15	Engine ECU temperature above normal operational range. Least severe.
1360	1136	17	Engine ECU temperature below normal operational range. Least severe.
1361	1136	2	Engine ECU temperature fault check.
1362	412	15	Engine exhaust gas recirculation temperature above normal operational range.

Deutz TD 2.2 L3, D/TD 2.9 L4 Stage IV Engine Fault Codes

DTC = Diagnostic Trouble Code
FMI = Failure Mode Identifier
SPN = Suspect Parameter Number

DTC	SPN	FMI	Description
1363	412	17	Engine exhaust gas recirculation temperature below normal operational range.
1364	412	3	Engine exhaust gas recirculation temperature voltage above normal or shorted to high.
1365	412	4	Engine exhaust gas recirculation temperature voltage below normal or shorted to low.
1372	51	5	Engine throttle valve 1, position 1 current below normal or open circuit.
1375	51	3	Engine throttle valve 1, position 1 voltage above normal or shorted to high. Short circuit to battery 1.
1376	51	3	Engine throttle valve 1, position 1 voltage above normal or shorted to high. Short circuit to battery 2.
1377	51	4	Engine throttle valve 1, position 1 voltage below normal or shorted to low. Short circuit to ground 1.
1378	51	4	Engine throttle valve 1, position 1 voltage below normal or shorted to low. Short circuit to ground 2.
1379	51	6	Engine throttle valve 1, position 1 current above normal or grounded circuit.
1382	51	7	Engine throttle valve 1 position 1 mechanical system not responding or out of adjustment. Valve stuck closed.
1383	51	7	Engine throttle valve 1 position 1 mechanical system not responding or out of adjustment. Valve stuck open.
1391	51	3	Engine throttle valve 1, position 1 voltage above normal or shorted to high.
1392	51	4	Engine throttle valve 1, position 1 voltage below normal or shorted to low.
1397	105	0	Engine intake manifold 1 temperature above normal operational range.
1398	105	1	Engine intake manifold 1 temperature below normal operational range.
1399	4766	2	DOC temperature too high.
1400	4766	2	DOC temperature too low.
1401	4766	15	DOC outlet temperature above normal operational range.
1402	4766	3	DOC outlet temperature voltage above normal or shorted to high.
1403	4766	4	DOC outlet temperature voltage below normal or shorted to low.
1404	4766	2	DOC intake temperature error.
1405	4766	15	DOC Intake temperature above normal operational range.
1406	4766	3	DOC intake temperature voltage above normal or shorted to high.
1407	4766	4	DOC intake temperature voltage below normal or shorted to low.
1408	4766	2	DOC intake temperature does not change.
142	520256	9	Timeout of EAT control receive message. CAN message is not received.
144	523211	9	Timeout error of CAN receive frame EBC1.
154	523212	9	Timeout error of CAN receive frame engine protection.
1540	520254	8	The stand still regeneration mode time exceeds the long limit threshold.
1541	520255	2	Hoses connected to the dp DPF SENT sensor inverted. Swap hoses.
155	523741	14	Engine shutdown request via CAN.

Deutz TD 2.2 L3, D/TD 2.9 L4 Stage IV Engine Fault Codes

DTC = Diagnostic Trouble Code
FMI = Failure Mode Identifier
SPN = Suspect Parameter Number

DTC	SPN	FMI	Description
1587	97	0	Water in fuel level prefilter; maximum value exceeded.
188	523240	9	Timeout CAN message function mode control.
219	520253	2	Rolling counter fault CAN message EAT Control.
220	4206	2	Fault check for Rolling Counter of TSC1AE.
221	4206	2	Fault check for Rolling Counter of TSC1AR.
222	4206	2	Fault check for Rolling Counter of TSC1TE.
223	4206	2	Fault check for Rolling Counter of TSC1TR.
349	3349	0	Timeout error of CAN receive frame active TSC1AE.
350	3349	0	Timeout error of CAN receive frame passive TSC1AE.
351	3349	0	Timeout error of CAN receive frame active TSC1AR.
352	3349	0	Timeout error of CAN receive frame passive TSC1AR.
353	3349	0	Timeout error of CAN receive frame TSC1TE active.
354	3349	0	TSC1 receive timeout error. Short circuit to ground error.
355	3349	0	Timeout error of CAN receive frame TSC1TR.
356	3349	0	Passive timeout error of CAN receive frame TSC1TR.
361	3349	0	Timeout error of CAN receive frame TSC1AE. Traction Control.
363	3349	0	Timeout error of CAN receive frame TSC1AR. Retarder.
365	3349	0	Timeout error of CAN receive frame TSC1TE. Setpoint.
367	3349	0	Timeout Error of CAN receive frame TSC1TR; control signal.
38	1485	3	ECM main relay voltage above normal or shorted to high.
39	1485	3	ECM main relay voltage above normal or shorted to high of actuator relay 2.
40	1485	3	ECM main relay voltage above normal or shorted to high of actuator relay 3.
41	1485	4	ECM main relay voltage below normal or shorted to low.
42	1485	4	ECM main relay voltage below normal or shorted to low of actuator relay 2.
43	1485	4	ECM main relay voltage below normal or shorted to low of actuator relay 3.
48	168	0	Battery voltage above normal operational range.
49	168	1	Battery voltage low normal operational range.
50	168	3	Battery voltage above normal or shorted to high.
51	168	4	Battery voltage above normal or shorted to low.
516	523982	0	Power stage diagnosis disabled. High battery voltage.
517	523982	1	Power stage diagnosis disabled. Low battery voltage.
52	168	0	High battery voltage. Warning threshold is exceeded.
567	27	5	Engine exhaust gas recirculation 1 valve position current below normal or open circuit.
570	27	3	Engine exhaust gas recirculation 1 valve position voltage above normal or shorted to battery 1.
571	27	3	Engine exhaust gas recirculation 1 valve position voltage above normal or shorted to battery 2.

Deutz TD 2.2 L3, D/TD 2.9 L4 Stage IV Engine Fault Codes

DTC = Diagnostic Trouble Code
FMI = Failure Mode Identifier
SPN = Suspect Parameter Number

DTC	SPN	FMI	Description
572	27	4	Engine exhaust gas recirculation 1 valve position voltage below normal or shorted to ground 1.
573	27	4	Engine exhaust gas recirculation 1 valve position voltage below normal or shorted to ground 2.
574	27	6	Engine exhaust gas recirculation 1 valve position current above normal or grounded circuit.
577	27	7	Engine exhaust gas recirculation 1 valve position. Mechanical system not responding or out of adjustment. Valve stuck closed.
578	27	7	Engine exhaust gas recirculation 1 valve position. Mechanical system not responding or out of adjustment. Valve stuck open.
582	5763	3	Engine exhaust gas recirculation 1, actuator 1 voltage above normal or shorted to high.
583	5763	4	Engine exhaust gas recirculation 1, actuator 1 voltage below normal or shorted to low.
586	3055	14	Internal software error ECU. Injection cut off.
587	190	0	Engine speed above warning threshold. Over speed detection in component engine protection.
588	190	0	Engine speed above warning threshold. FOC-Level 1.
589	190	0	Engine speed above warning threshold. FOC-Level 2.
590	190	0	Engine speed above warning threshold. Overrun Mode.
610	171	15	Environment temperature sensor, temperature above upper physical threshold.
613	171	3	Ambient air temperature sensor voltage above normal or shorted to high.
614	171	4	Ambient air temperature sensor voltage below normal or shorted to low.
615	723	8	Camshaft speed sensor abnormal frequency or pulse width or period.
616	723	14	Camshaft sensor detection. Out of range, signal disrupted, no signal.
617	723	13	Offset angle between crank and camshaft sensor is too large.
618	4201	8	Crankshaft sensor detection. Out of range, signal disrupted, no signal.
619	4201	14	Crankshaft speed sensor. Speed detection, out of range, signal disrupted or no signal.
68	1669	14	CAN Bus ID-5. CAN Hardware registers are not updated within the expected time.
70	110	2	Engine Coolant Temperature. Data erratic, intermittent or incorrect.
709	97	3	Water in fuel indicator 1. Voltage above normal or shorted to high.
710	97	4	Water in fuel indicator 1. Voltage below normal or shorted to low.
721	94	15	Low fuel pressure system, max. physical range exceeded.
723	94	3	Engine fuel pressure sensor voltage above normal or shorted to high.
724	94	4	Engine fuel pressure sensor voltage below normal or shorted to low.
725	94	1	Low fuel pressure system, warning threshold exceeded.
726	94	1	Low fuel pressure, shut off threshold exceeded.
75	110	3	Engine coolant temperature voltage above normal or shorted to high.
76	110	4	Engine coolant temperature voltage below normal or shorted to low.

Deutz TD 2.2 L3, D/TD 2.9 L4 Stage IV Engine Fault Codes

DTC = Diagnostic Trouble Code
FMI = Failure Mode Identifier
SPN = Suspect Parameter Number

DTC	SPN	FMI	Description
77	110	0	High coolant temperature. Warning threshold exceeded.
78	110	0	Coolant temperature. System reaction initiated.
797	676	12	Engine cold start aid relay error.
798	676	5	Engine cold start aid relay current below normal or open circuit.
799	676	5	Engine cold start aid relay current below normal or open circuit.
80	411	2	Intake air massflow not in expected range.
803	676	3	Engine cold start aid relay voltage above normal or shorted to high.
805	676	4	Engine cold start aid relay voltage below normal or shorted to low.
807	2797	14	Engine fuel 1 injector, Group 1. Number of possible injections limited by the injection valve.
815	2797	4	Engine fuel 1 injector, Group 1 voltage below normal or shorted to low.
816	5358	5	Engine cylinder 1 fuel injection quantity current below normal or open circuit.
817	5359	5	Engine cylinder 2 fuel injection quantity current below normal or open circuit.
818	5360	5	Engine cylinder 3 fuel injection quantity current below normal or open circuit.
819	5361	5	Engine cylinder 4 fuel injection quantity current below normal or open circuit.
820	5362	5	Engine cylinder 5 fuel injection quantity current below normal or open circuit.
821	5363	5	Engine cylinder 6 fuel injection quantity current below normal or open circuit.
822	2797	6	Engine fuel 1 injector, Group 1 current above normal or grounded circuit.
823	2798	6	Engine fuel 1 injector, Group 2 current above normal or grounded circuit.
824	5358	6	Engine cylinder 1 fuel injection quantity above normal or grounded circuit. Short circuit of the power stage low-side.
825	5359	6	Engine cylinder 2 fuel injection quantity above normal or grounded circuit. Short circuit of the power stage low-side.
826	5360	6	Engine cylinder 3 fuel injection quantity above normal or grounded circuit. Short circuit of the power stage low-side.
827	5361	6	Engine cylinder 4 fuel injection quantity above normal or grounded circuit. Short circuit of the power stage low-side.
828	5362	6	Engine cylinder 5 fuel injection quantity above normal or grounded circuit. Short circuit of the power stage low-side.
829	5363	6	Engine cylinder 6 fuel injection quantity above normal or grounded circuit. Short circuit of the power stage low-side.
83	111	1	Coolant level too low.
830	5358	6	Engine cylinder 1 fuel injection quantity above normal or grounded circuit. Short circuit between high-side and low-side of the power stage.

Deutz TD 2.2 L3, D/TD 2.9 L4 Stage IV Engine Fault Codes

DTC = Diagnostic Trouble Code
FMI = Failure Mode Identifier
SPN = Suspect Parameter Number

DTC	SPN	FMI	Description
831	5359	6	Engine cylinder 2 fuel injection quantity above normal or grounded circuit. Short circuit between high-side and low-side of the power stage.
832	5360	6	Engine cylinder 3 fuel injection quantity above normal or grounded circuit. Short circuit between high-side and low-side of the power stage.
833	5361	6	Engine cylinder 4 fuel injection quantity above normal or grounded circuit. Short circuit between high-side and low-side of the power stage.
834	5362	6	Engine cylinder 5 fuel injection quantity above normal or grounded circuit. Short circuit between high-side and low-side of the power stage.
835	5363	6	Engine cylinder 6 fuel injection quantity above normal or grounded circuit. Short circuit between high-side and low-side of the power stage.
836	105	3	Engine intake manifold temperature voltage above normal or shorted to high.
837	105	4	Engine intake manifold temperature voltage below normal or shorted to low.
838	2797	14	Engine fuel 1 injector, group 1 missing injector adjustment value programming injector 1.
839	2798	14	Engine fuel 1 injector, group 2 missing injector adjustment value programming injector 2.
840	4257	14	Engine fuel 1 injector, group 3 missing injector adjustment value programming injector 3.
854	7103	5	Engine fuel metering rail pump current below normal or open circuit.
855	7103	3	Engine fuel metering rail pump voltage above normal or shorted to high. Short circuit to battery on the high side power stage.
856	7103	3	Engine fuel metering rail pump voltage above normal or shorted to high. Short circuit to battery on the low side power stage.
857	7103	4	Engine fuel metering rail pump voltage below normal or shorted to low. Short circuit to battery on the high side power stage.
858	7103	4	Engine fuel metering rail pump voltage below normal or shorted to low. Short circuit to battery on the low side power stage.
859	7103	6	Engine fuel metering rail pump current above normal or grounded circuit.
868	629	12	Function monitoring: fault of ECU ADC. Null load test pulse.
869	629	12	Function monitoring: fault of ECU ADC. Test voltage.
870	629	12	ECU. DFC to indicate ICO request from MoCSOP module.
871	91	14	Function monitoring: Monitoring of accelerator pedal position.
875	190	2	Function monitoring: Fault of engine speed check.
876	5357	2	Engine fuel injection error for multiple cylinders. Diagnostic fault check error between level 1 energizing time and level 2 information.

Deutz TD 2.2 L3, D/TD 2.9 L4 Stage IV Engine Fault Codes

DTC = Diagnostic Trouble Code
FMI = Failure Mode Identifier
SPN = Suspect Parameter Number

DTC	SPN	FMI	Description
877	5441	2	Engine fuel injection timing error for multiple cylinders.
878	5357	2	Engine fuel injection error for multiple cylinders. Diagnostic fault check to report the error due to non plausibility in ZFC.
879	523612	12	Internal recovery. Diagnosis fault check to report the error to demand for an ICO due to an error in the PoI2 shut-off.
88	598	10	Clutch switch. Abnormal rate of change.
880	523612	12	Internal recovery. Diagnosis fault check to report the error to demand for an ICO due to an error in the PoI3 efficiency factor.
881	523612	12	Internal recovery. Diagnosis fault check to report the error to demand for an ICO due to an error in change of EOM.
882	5357	2	Engine fuel injection error for multiple cylinders. Diagnosis fault check to report the error to demand for an ICO due to an error in total torque relevant quantity.
883	5357	2	Engine fuel injection error for multiple cylinders. Diagnostic fault check to report the error due to injection quantity correction.
884	5442	2	Engine fuel injection pressure error for multiple cylinders.
885	29	2	Accelerator pedal 2 position.
886	677	2	Engine starter motor relay. Function monitoring: Fault of ECU power train active.
887	513	2	Actual engine percent torque. DFC to report the fault in energizing time comparison.
888	513	2	Actual engine percent torque. DFC to report in torque comparison error.
889	520250	2	Function monitoring: Error in the post-build selectable monitoring.
890	629	12	ECU. Status of the EMM alarm FCCU0 which is read out of the FCCU hardware module.
91	1109	2	Engine protection system approaching shutdown. Engine shut off demand ignored.
92	1109	14	Engine protection system approaching shutdown. Shut off request from supervisory monitoring function.
996	629	12	ECU. Diagnostic fault check to report ABE active state.
997	629	12	Function monitoring: Fault of ECU, WDA active by inquiry/response communication.
998	629	12	Function monitoring: Fault of ECU, Error Pin active suspision of HW fault.
999	629	12	Function monitoring: Fault of ECU, WDA active by overvoltage detection.

The following DTC fault code range shares the same description. Replace the ECU.

DTC	891 - 945	Description
SPN	629	Internal ECU error.
FMI	12	

Perkins 404F-E22T Engine Fault Codes

SPN = Suspect Parameter Number
FMI = Failure Mode Identifier

SPN	FMI	Description
29	3	Accelerator Pedal Position 2: Voltage Above Normal
29	4	Accelerator Pedal Position 2: Voltage Below Normal
91	3	Accelerator Pedal Position 1: Voltage Above Normal
91	4	Accelerator Pedal Position 1: Voltage Below Normal
100	1	Engine Oil Pressure :Low- most severe (3)
108	3	Barometric Pressure : Voltage Above Normal
108	4	Barometric Pressure : Voltage Below Normal
110	3	Engine Coolant Temperature : Voltage Above Normal
110	4	Engine Coolant Temperature : Voltage Below Normal
110	15	Engine Coolant Temperature : High -least severe (1)
168	0	Battery Potential/ Power Input 1 : High- most severe (3)
168	3	Battery Potential/ Power Input 1: Voltage Above Normal
168	4	Battery Potential/ Power Input 1: Voltage Below Normal
172	3	Engine Air Inlet Temperature: Voltage Above Normal
172	4	Engine Air Inlet Temperature: Voltage Below Normal
190	0	Engine Speed : High- most severe (3)
190	8	Engine Speed : Abnormal Frequency, Pulse Width or Period
558	3	Accelerator Pedal1 Low Idle Switch: Voltage Above Normal
558	4	Accelerator Pedal1 Low Idle Switch: Voltage Below Normal
638	6	Engine Fuel Rack Actuator: Current Above Normal
639	14	J1939 Network#1: Special Instruction
723	3	Engine Speed Sensor #2: Voltage Above Normal
723	4	Engine Speed Sensor #2: Voltage Below Normal
723	8	Engine Speed Sensor#2: Abnormal Frequency, Pulse Width or Period"
723	10	Engine Speed Sensor #2: Abnormal Rate of Change
733	3	Engine Rack Position Sensor: Voltage Above Normal
733	4	Engine Rack Position Sensor: Voltage Below Normal
1485	7	ECU Main Relay : Not Responding Property
2840	11	ECU Instance: Other Failure Mode
2840	12	ECU Instance: Failure
2840	13	ECU Instance: Out of Calibration
2970	3	Accelerator Pedal 2 Low Idle Switch: Voltage Above Normal
2970	4	Accelerator Pedal 2 Low Idle Switch: Voltage Below Normal
3241	1	Exhaust Gas Temperature 1: Low-most severe (3)
3241	3	Exhaust Gas Temperature 1: Voltage Above Normal
241	4	Exhaust Gas Temperature 1: Voltage Below Normal
3241	15	Exhaust Gas Temperature 1: High-least severe (1)
3241	16	Exhaust Gas Temperature 1: High-moderate severity (2)
3242	1	Particulate Trap Intake Gas Temp: Low- most severe(3)"
3242	3	Particulate Trap Intake Gas Temp: Voltage Above Normal"
3242	4	Particulate Trap Intake Gas Temp: Voltage Below Normal"
3242	15	Particulate Trap Intake Gas Temp: High - least severe(1)"
3242	16	Particulate Trap Intake Gas Temp: High-moderate severity (2)

Perkins 404F-E22T Engine Fault Codes

SPN = Suspect Parameter Number
FMI = Failure Mode Identifier

SPN	FMI	Description
3251	3	Particulate Trap Differential Pressure: Voltage Above Normal
3251	4	Particulate Trap Differential Pressure: Voltage Below Normal
3473	7	Aftertreatmert #1 Failed to Ignite: Not Responding Properly
3473	11	Aftertreatmert #1 Failed to Ignite : Other Failure Mode
3484	0	Aftertreatmert #1 Ignition : High-most severe (3)
3484	3	Aftertreatmert #1 Ignition : Voltage Above Normal
3484	4	Aftertreatmert #1 Ignition : Voltage Below Normal
3556	6	Aftertreatmert 1 Hydrocarbon Doser 1: Current Above Normal
3610	3	Diesel Particulate Filter Outlet Pressure or 1: Voltage Above Normal"
3610	4	DieselParticulate Filter Outlet Pressure Sensor 1: Voltage Below Normal
3713	7	DPF Active Regeneration Inhibited Due to System Timeout: Not Responding Properly
3713	31	DPF Active Regeneration Inhibited Due to System Timeout
3719	0	Particulate Trap #1 Soot Load Percent: High- most severe (3)
3719	16	Particulate Trap #1 Soot Load Percent: High-moderate severity (2)
4016	6	High Current Auxiliary Power Relay 1: Current Above Normal
4201	3	Engine Speed Sensor #1: Voltage Above Normal
4201	4	Engine Speed Sensor #1: Voltage Below Normal
4201	8	Engine Speed Sensor #1: Abnormal Frequency, Pulse \Nidth, or Period
4201	10	Engine Speed Sensor #1: Abnormal Rate of Change
4765	1	Aftertreatmert #1 Diesel Oxidation Catalyst Intake Gas Temperature: Low-most severe (3)
4765	3	Aftertreatmert #1 Diesel Oxidation Catalyst Intake Gas Temperature: Voltage Above Normal
4765	4	Aftertreatmert #1 Diesel Oxidation Catalyst Intake Gas Temperature: Voltage Below Normal
4765	15	Aftertreatmert #1Diesel Oxidation Catalyst Intake Gas Temperature: High-least severe (1)
4765	16	Aftertreatmert #1 Diesel Oxidation Catalyst Intake Gas Temperature: High-moderate severity (2)
5487	3	Aftertreatmert 1 Burner Unit Combustion Chamber Temperature: Voltage Above Normal
5487	4	Aftertreatmert 1 Burner Unit Combustion Chamber Temperature: Voltage Below Normal
6581	6	Aftertreatmert 1 Hydrocarbon Doser 2 : Current Above Normal

Ford MSG-425 Engine Fault Codes

Code	Description
16	Never crank synced at start
91	FP low voltage
92	FP high voltage
107	MAP Low Voltage
108	MAP High Pressure
111	IAT higher than expected 1
112	IAT low voltage
113	IAT high voltage
116	ECT higher than expected 1
117	ECT/CHT Low Voltage
118	ECT/CHT High Voltage
121	TPS1 lower than TPS2
122	TPS1 low voltage
123	TPS1 high voltage
127	IAT higher than expected 2
129	BP low pressure
134	EGO open/lazy pre-cat 1
140	EGO open/lazy post-cat 1
154	EGO open/lazy pre-cat 2/post-cat 1
160	EGO open/lazy post-cat 2
171	AL high gasoline bank1
172	AL low gasoline bank1
174	AL high gasoline bank2
175	AL low gasoline bank2
182	FT Gasoline Low Voltage
183	FT Gasoline High Voltage
187	FT Gaseaous fuel low voltage
188	FT Gaseaous fuel high voltage
217	ECT higher than expected 2
219	Max govern speed override
221	TPS1 higher than TPS2
222	TPS2 low voltage
223	TPS2 high voltage
236	TIP Active

Code	Description
237	TIP Low Voltage
238	TIP High Voltage
261	Injector Loop Open or Low-side short to Ground
262	Injector Coil Shorted
264	Injector Loop Open or Low-side short to Ground
265	Injector Coil Shorted
267	Injector Loop Open or Low-side short to Ground
268	Injector Coil Shorted
270	Injector Loop Open or Low-side short to Ground
271	Injector Coil Shorted
273	Injector Loop Open or Low-side short to Ground
274	Injector Coil Shorted
276	Injector Loop Open or Low-side short to Ground
277	Injector Coil Shorted
279	Injector Loop Open or Low-side short to Ground
280	Injector Coil Shorted
282	Injector Loop Open or Low- side short to Ground
283	Injector Coil Shorted
285	Injector Loop Open or Low-side short to Ground
286	Injector Coil Shorted
288	Injector Loop Open or Low-side short to Ground
289	Injector Coil Shorted

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Ford MSG-425 Engine Fault Codes

Code	Description
301	Emissions/catalyst damaging misfire
302	Emissions/catalyst damaging misfire
303	Emissions/catalyst damaging misfire
304	Emissions/catalyst damaging misfire
305	Emissions/catalyst damaging misfire
306	Emissions/catalyst damaging misfire
307	Emissions/catalyst damaging misfire
308	Emissions/catalyst damaging misfire
326	Knock 1 Excessive Signal
327	Knock 1 sensor Open
331	Knock 2 Excessive Signal
332	Knock 2 sensor Open
336	Crank sync noise
337	Crank loss
341	Cam sync noise
342	Cam loss
420	Gasoline cat monitor
430	Gasoline cat monitor
524	Oil pressure low
562	Battery Voltage Low
563	Battery Voltage High
601	Flash checksum invalid
604	RAM failure
606	COP failure
615	Start relay coil open
616	Start relay control ground short
617	Start relay coil short to power
627	Fpump relay coil open
628	FPump motor loop open or high-side shorted to ground
628	Fpump relay control ground short
629	FPump motor high-side shorted to power
629	Fpump relay coil short to power

Code	Description
642	5VE1 low voltage
643	5VE1 high voltage
650	MIL open
652	5VE2 low voltage
653	5VE2 high voltage
685	Relay Coil Open
686	Relay Control ground short
687	Relay coil short to power
1111	Fuel rev limit
1112	Spark rev limit
1121	FPP1/2 simultaneous voltages out of range
1122	FPP1/2 do not match each other or the IVS
1151	CL high LPG
1152	CL low LPG
1153	CL high NG
1154	CL low NG
1155	CL high gasoline bank1
1156	CL low gasoline bank1
1157	CL high gasoline bank2
1158	CL low gasoline bank2
1161	AL high LPG
1162	AL low LPG
1163	AL high NG
1164	AL low NG
1165	LPG cat monitor
1166	NG cat monitor
1171	Megajector delivery pressure higher than expected
1172	Megajector delivery pressure lower than expected

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Ford MSG-425 Engine Fault Codes

Code	Description
1173	Megajector comm lost
1174	Megajector voltage supply high
1175	Megajector voltage supply low
1176	Megajector internal actuator fault detection
1177	Megajector internal circuitry fault detection
1178	Megajector internal comm fault detection
1311	Misfire detected
1312	Misfire detected
1313	Misfire detected
1314	Misfire detected
1315	Misfire detected
1316	Misfire detected
1317	Misfire detected
1318	Misfire detected
1511	AUX analog PU1 high
1512	AUX analog PU1 low
1513	AUX analog PU2 high
1514	AUX analog PU2 low
1515	AUX analog PD1 high
1516	AUX analog PD1 low
1517	AUX analog PU3 high
1518	AUX analog PU3 low
1521	CHT higher than expected 1
1522	CHT higher than expected 2
1531	IVS/Brake/Trans-Park interlock failure
1541	AUX analog PUD1 high
1542	AUX analog PUD1 low
1543	AUX analog PUD2 high
1544	AUX analog PUD2 low
1545	AUX analog PUD3 high

Code	Description
1551	AUX DIG1 high
1552	AUX DIG1 low
1553	AUX DIG2 high
1554	AUX DIG2 low
1555	AUX DIG3 high
1556	AUX DIG3 low
1561	AUX analog PD2 high
1562	AUX analog PD2 low
1563	AUX analog PD3 high
1564	AUX analog PD3 low
1611	5VE 1/2 simultaneous out of range
1612	RTI 1 loss
1613	RTI 2 loss
1614	RTI 3 loss
1615	A/D loss
1616	Invalid interrupt
1621	Rx Inactive
1622	Rx Noise
1623	Invalid Packet Format
1624	Shutdown Request
1625	Shutdown Request
1626	CAN Tx failure
1627	CAN Rx failure
1628	CAN addresss conflict failure

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Ford MSG-425 Engine Fault Codes

Code	Description
1629	J1939 TSC1 message receipt lost
1630	J1939 ETC message receipt lost
1631	PWM1-Gauge1 open / ground short
1632	PWM1-Gauge1 short to power
1633	PWM2-Gauge2 open /ground short
1634	PWM2-Gauge2 short to power
1635	PWM3-Gauge3 open / ground short
1636	PWM3-Gauge3 short to power
1641	Buzzer control ground short
1642	Buzzer open
1643	Buzzer control short to power
1644	MIL control ground short
1645	MIL control short to power
2111	Unable to reach lower TPS
2112	Unable to reach higher TPS
2115	FPP1 higher than IVS limit
2116	FPP2 higher than IVS limit
2120	FPP1 invalid voltage and FPP2 disagrees with IVS
2121	FPP1 lower than FPP2
2122	FPP1 high voltage
2123	FPP1 low voltage
2125	FPP2 invalid voltage and FPP1 disagrees with IVS
2126	FPP1 higher than FPP2
2127	FPP2 low voltage
2128	FPP2 high voltage

Code	Description
2130	IVS stuck at-idle, FPP1/2 match
2131	IVS stuck off-idle, FPP1/2 match
2135	TPS1/2 simultaneous voltages out of range
2139	FPP1 lower than IVS limit
2140	FPP2 lower than IVS limit
2229	BP high pressure
2300	Primary Loop Open or Low-side Short to Ground
2301	Primary Coil Shorted
2303	Primary Loop Open or Low-side Short to Ground
2304	Primary Coil Shorted
2306	Primary Loop Open or Low-side Short to Ground
2307	Primary Coil Shorted

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Ford MSG-425 Engine Fault Codes

Code	Description
2309	Primary Loop Open or Low-side Short to Ground
2310	Primary Coil Shorted
2312	Primary Loop Open or Low-side Short to Ground
2313	Primary Coil Shorted
2315	Primary Loop Open or Low-side Short to Ground
2316	Primary Coil Shorted
2318	Primary Loop Open or Low-side Short to Ground
2319	Primary Coil Shorted
2321	Primary Loop Open or Low-side Short to Ground
2322	Primary Coil Shorted
2618	Tach output ground short
2619	Tach output short to power

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Schematics



Observe and Obey:

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

Before Troubleshooting:

- ☑ Read, understand and obey the safety rules and operating instructions in the appropriate operator's manual on your machine.
- ☑ Be sure that all necessary tools and test equipment are available and ready for use.

About This Section

There are two groups of schematics in this section.

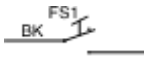
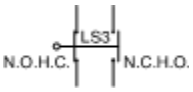
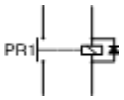
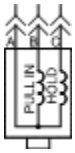
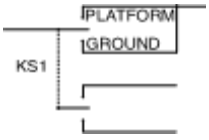
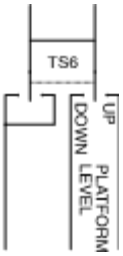
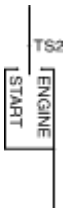
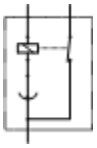
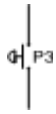
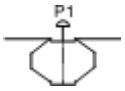
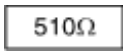
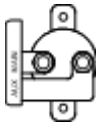
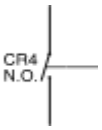
Electrical Schematics

⚠WARNING Electrocution/burn hazard. Contact with electrically charged circuits could result in death or serious injury. Remove all rings, watches and other jewelry.

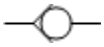
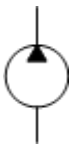
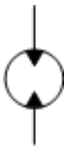
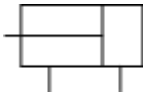
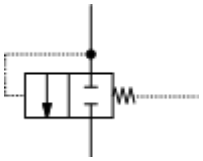
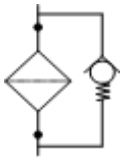
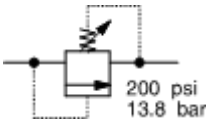
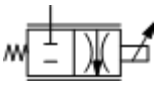
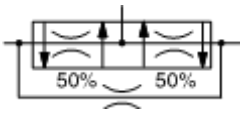
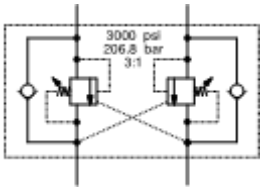
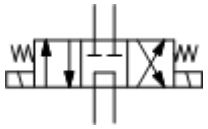
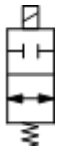
Hydraulic Schematics

⚠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.

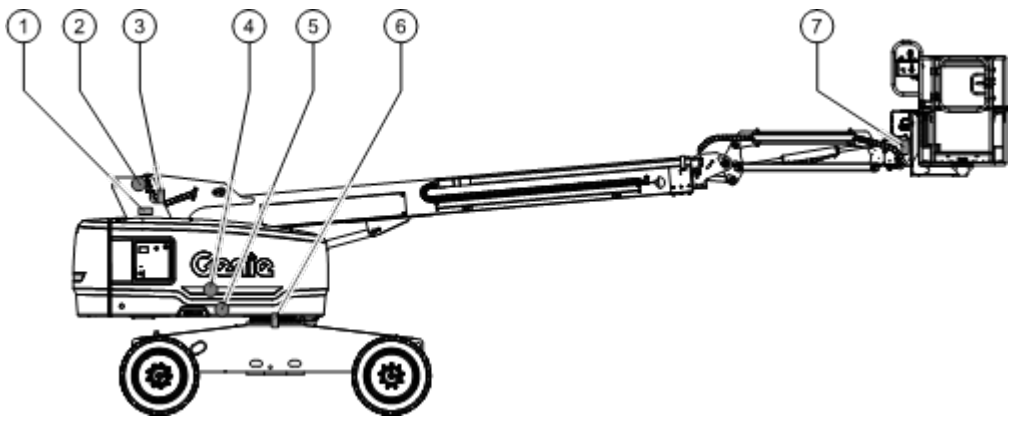
Electrical Symbol Legend

 Battery	 Coil, solenoid or relay	 Horn or alarm	 Flashing beacon	 Gauge
 Diode	 Hour meter	 LED	 Fuse with amperage	 Foot switch
 T-circuits connect	 Limit switch	 Power relay	 Coil with suppression	 Fuel or RPM solenoid
 Connection - no terminal	 T-circuits connect at terminal	 Circuits crossing no connection	 Quick disconnect terminal	 Circuit breaker with amperage
 Key switch	 Toggle Switch DPDT	 Toggle Switch SPDT	 Pump or Motor	 Tilt sensor
 Horn button - normally open	 Emergency Stop button - normally closed	 Resistor with ohm value	 Battery separator	 Gauge sending unit
 Oil temperature switch normally open	 Coolant temperature switch - normally open	 Oil pressure switch normally closed	 Control relay contact normally open	 Diode starting aid, glow plug or flame ignitor

Hydraulic Symbols Legend

 Orifice with size	 Check valve	 Shut off valve	 Brake
 Pump, fixed displacement	 Pump, bi-directional variable displacement	 Motor, bi-directional	 Motor, 2 speed bi-directional
 Cylinder, double acting	 Pump, prime mover (engine or motor)	 Shuttle valve. 2 position, 3 way	 Differential sensing valve
 Filter with bypass relief valve	 Relief valve with pressure setting	 Priority flow regulator valve	 Solenoid operated proportional valve
 Directional valve (mechanically activated)	 Flow divider/combiner valve	 Pilot operated 3 position, 3 way shuttle valve	 Solenoid operated 2 position, 3 way directional valve
 Counterbalance valve with pressure and pilot ratio	 Solenoid operated 3 position 4 way directional valve	 Solenoid operated 3 position, 4 way proportional directional valve	 Solenoid valve, 2 position 2 way

Limit Switch Location Legend

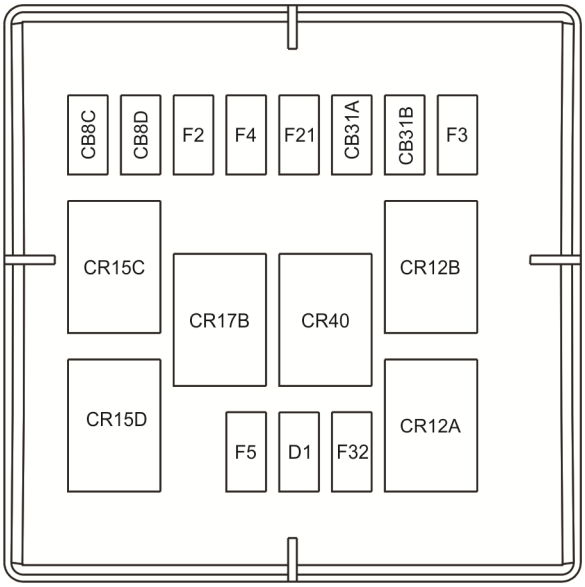


1 LSB1RS
2 String Potentiometer
3 LST3S
4 S17
5 S8O, S8S
6 LST1O
7 S24

Limit Switches and Sensors

LSB1RS	Limit switch boom fully retracted - safety
String pot	Measures boom extension
LST3S	Limit switch boom angle - safety
S17	Boom angle sensor
S8O	Universal tilt sensor - operational
S8S	Universal tilt sensor - safety
LST1O	Limit switch turntable - operational
S24	Load cell - platform overload

Engine Relay Layout - All engines except Perkins 404F



All engines

Fuses

F19	10A	Drive light
F21	5A	Telematic option
CB1	30A	Engine control power
CB2	15A	System control logic power
CB8A	30A	Glow plug 1
CB8B	30A	Glow plug 2
CB9	30A	Engine run / options/ acc
CB10	20A	System control driver power

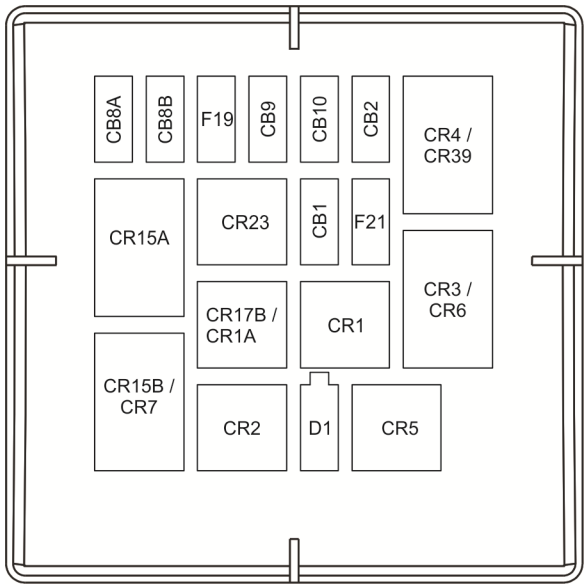
Diode

D1	6A	Alternator Ext.

Relays

CR1	Engine start
CR2	Engine run
CR3 / CR6	low RPM / Fuel pump
CR4 / CR39	High RPM / Aux shut down
CR5	Horn
C15A	Engine glow plug A
CR15B / CR7	Engine glow plug B / LPG solenoid
CR17	Hydraulic oil cooler (option)
CR23	Drive light
CR39	Aux shut down

Engine Relay Layout - Perkins 404F-22T



Perkins 404F-22T only (second relay box)

Fuses

F2	25A	Hyd / Start
F3	1A	Relay power
F4	5A	Eng ECU power
F5	1A	Spare
F21	10A	Fuel / Alt exct
F32	15A	Heater

Circuit Breakers

CB8C	30A	Glow plug 1
CB8D	30A	Glow plug 2
CB31A	20A	Eng ECU 1
CB32B	20A	Eng ECU 2

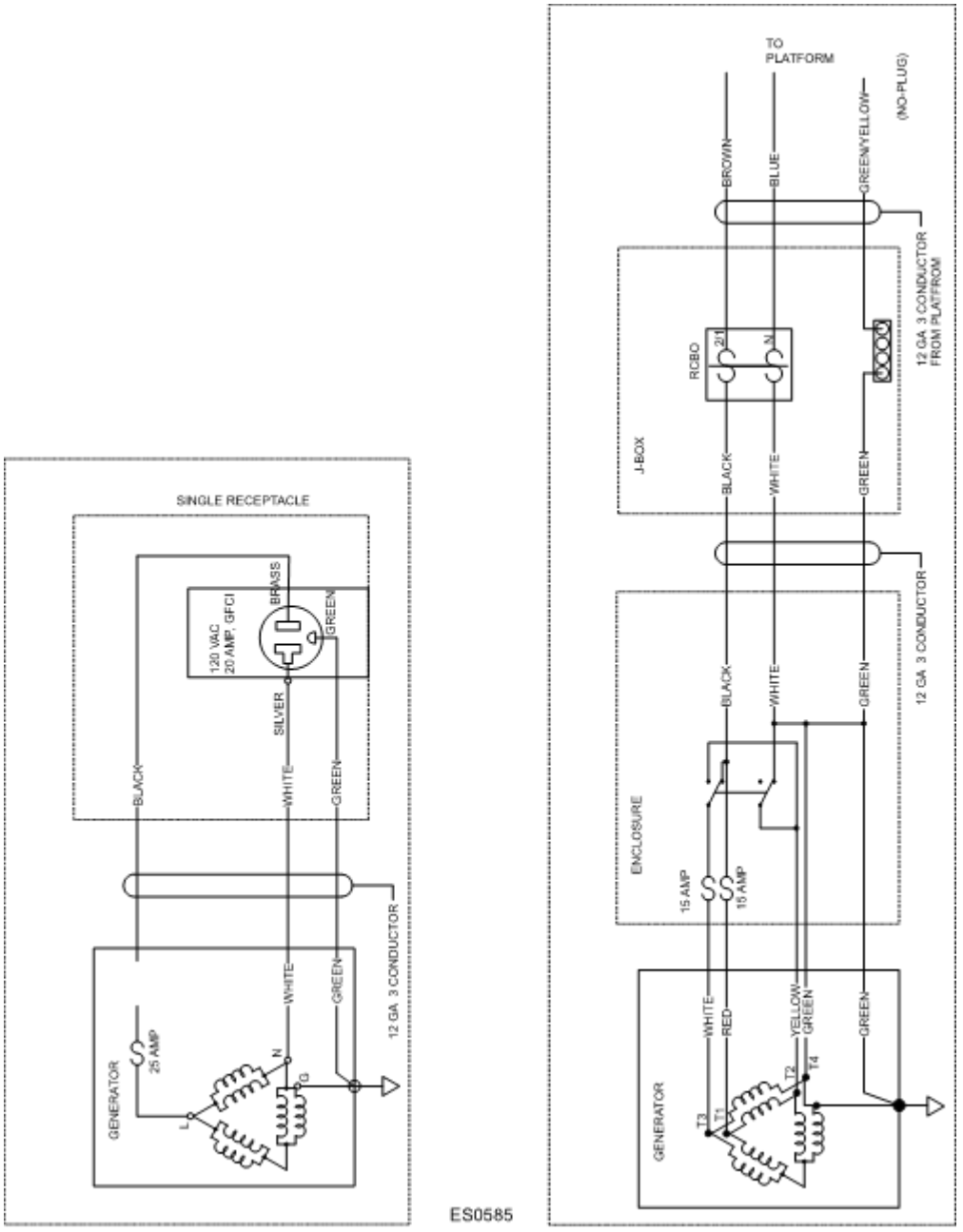
Diode

D1	6A	Alternator Ext.

Relays

CR12A	Engine ECU 1
CR12B	Engine ECU 2
CR15C	Glow plug 1
CR15D	Glow plug 2
CR17B / CR1A	Hyd fan / Start
CR40	Fuel pump

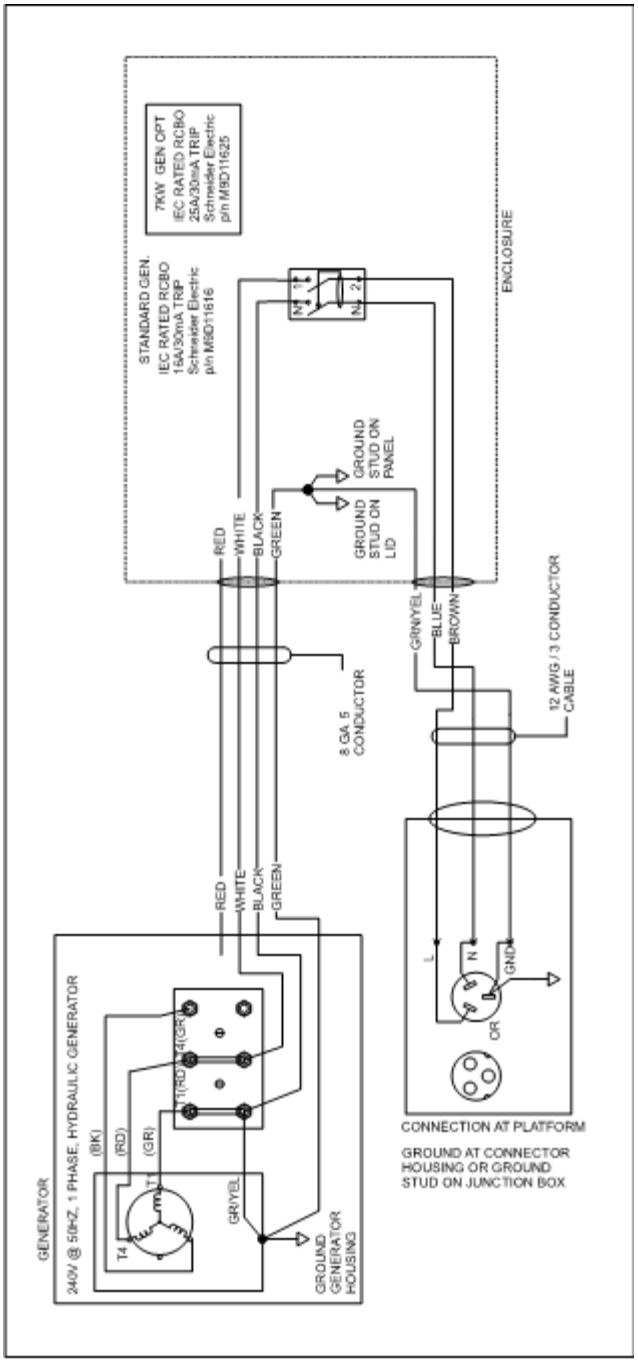
3 kW Generator Receptacle Wiring



3kW 120V/60Hz GENERATOR AC WIRING

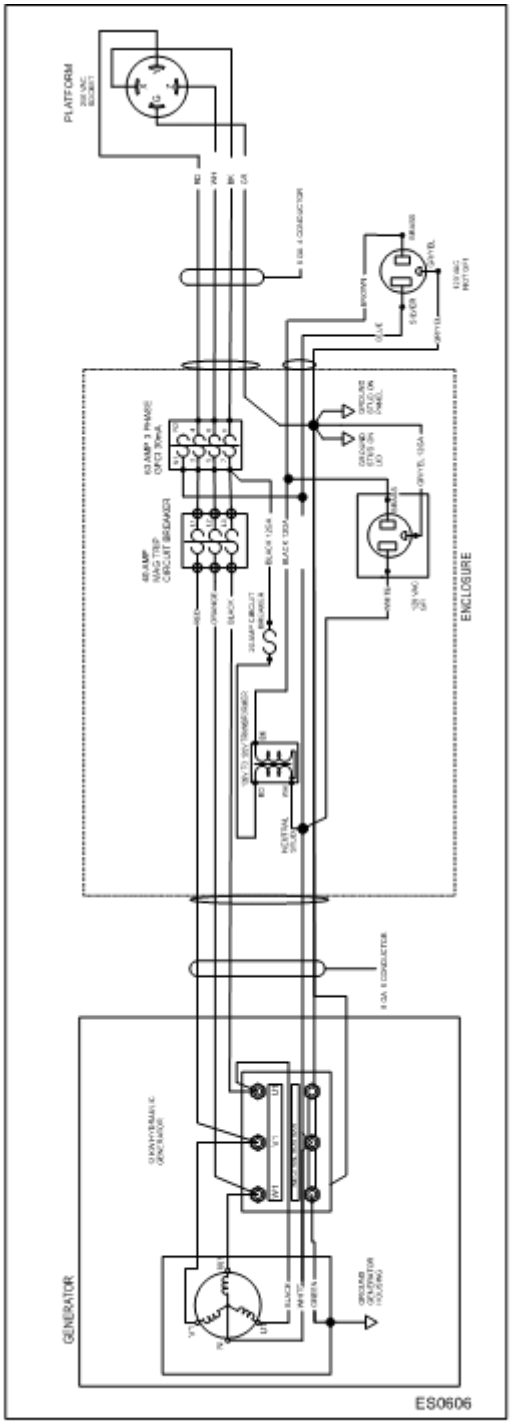
3kW 115V-230V/50Hz GENERATOR AC WIRING

7 kW Generator Receptacle Wiring



7KW WELDER GENERATOR AC WIRING, ES0605

12 kW Generator Receptacle Wiring



12kW WELDER GENERATOR AC SCHEMATIC AND WIRING

Connector Pin Legend

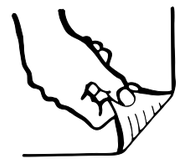
Number	Description
C1	Boom cable - Controls
C2	Boom cable - Power
C3	Boom sensors
C4	Function manifold
C5	Function manifold
C6	Engine
C7	Engine
C8	Engine - Power
C9	Footswitch
C10	Platform options
C11	Platform manifold
C12	Boom cable (platform) - Controls
C13	Drive lights
C14	Hydraulic oil cooler
C15	Flashing beacons
C16	Engine diagnostic port
C17	Boom cable (platform) - power
C18	D2.9 engine connector
C19	LST3S
C20	LST1O
C21	LSB1RS
C22	LSB2S
C23	Generator from engine harness
C24	Welder encloser
C25	GM3.0 vehicle interface conn. 1
C26	GM3.0 vehicle interface conn. 2
C27	Load sense
C28	Boom angle sensor
C29	Boom extension string pot
C30	Canbus terminating resistor
C31	Crew alarm proximity switch
C32	Crew alarm lights
C33	GBOX service port
C34	PBOX service port
C35	404D speed sensor
C36	404D fuel solenoid
C37	Work lights
C41	VEC - black - 8 pin
C42	VEC - gray - 8 pin
C43	VEC - blue - 8 pin
C44	VEC - green - 8 pin
C45	VEC- gray - 2 pin
C46	VEC - black - 2 pin
C47	Function enable
C48	Brake
C49	Motor stroke
C50	Drive pump
C51	Engine ECG
C52	Engine ECG
C53	Platform recirculation valve
C56	Telematics
C57	ACP
C61	VEC2-black- 8 pin
C62	VEC2-black- 8 pin
C63	VEC2-blue- 8 pin
C64	VEC2-green- 8 pin
C65	VEC2-gray- 8 pin
C66	VEC2-black- 8 pin
C72	ECU

Connector Pin Legend

Number	Description
J1	TCON power
J2	TCON engine
J3	TCON functions
J4	TCON functions
J5	TCON logic
J6	TCON limit switches
J7	TCON limit switches
J8	TCON unused
J9	TCON communication
J10	DISCON
J12	PCON power
J13	PCON functions
J14	PCON functions
J15	PCON logic
J16	PCON toggles
J17	PCON toggles
J18	PCON joysticks
J19	PCON unused
J20	Boom angle sensor operational- not used
J21	Boom angle sensor safety- not used
J22	Fuel level sensor
J23	Platform level sensor operational- not used
J24	Platform level sensor safety- not used
J25	Boom function- joystick
J26	Drive function- joystick
J27	404D ECG - black
J28	404D ECG - gray
J29	D2.9 ECU 1
J30	D2.9 ECU 2
J31	D2.9 engine interface
J32	Chassis tilt sensor operational
J33	Chassis tilt sensor safety
J34	D2011 engine interface
J35	LED PCB
J36	Recovery module power
J37	Recovery module I/O

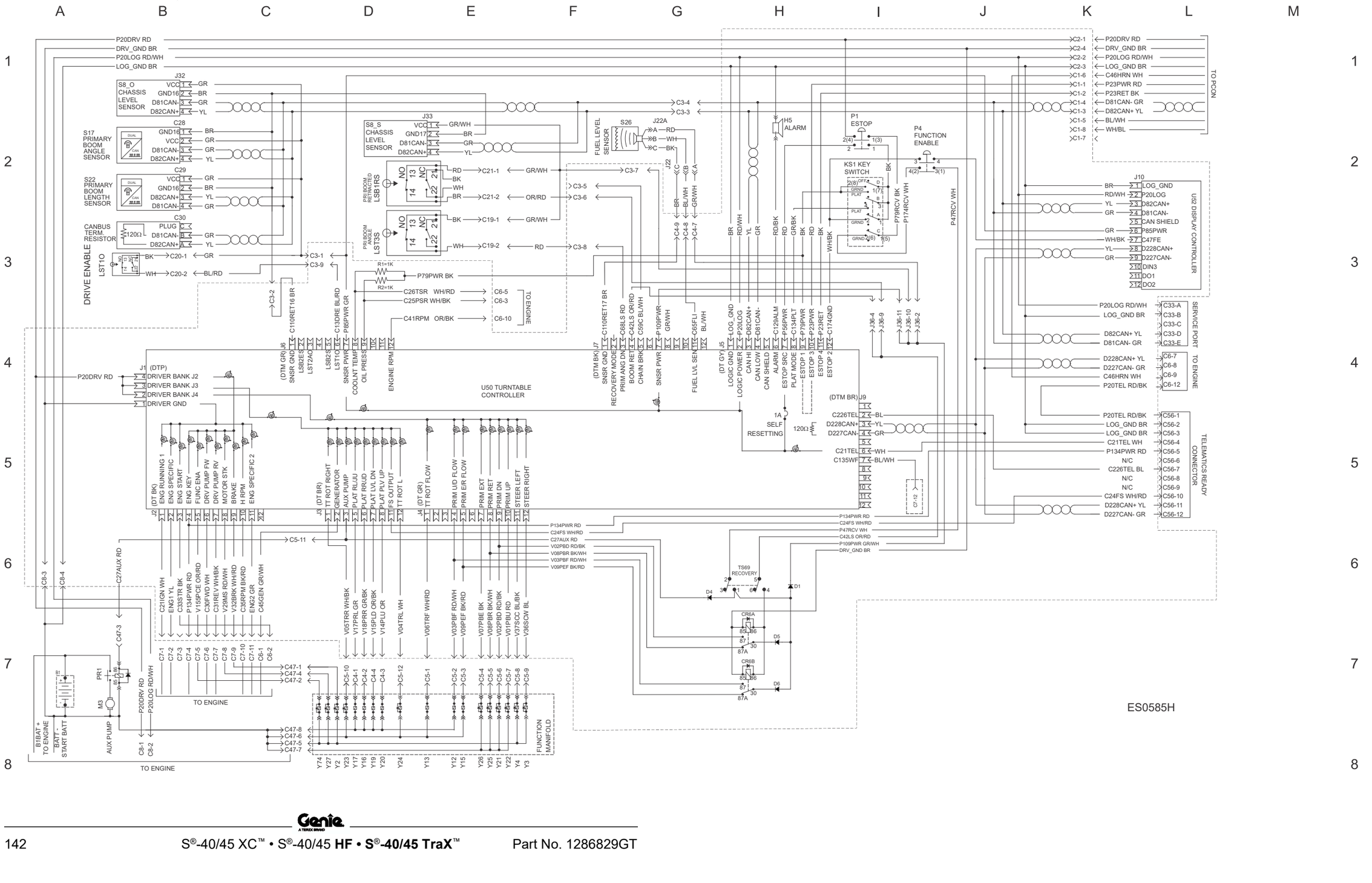
Electrical Schematic, Turntable Controller

Models without Recovery Module



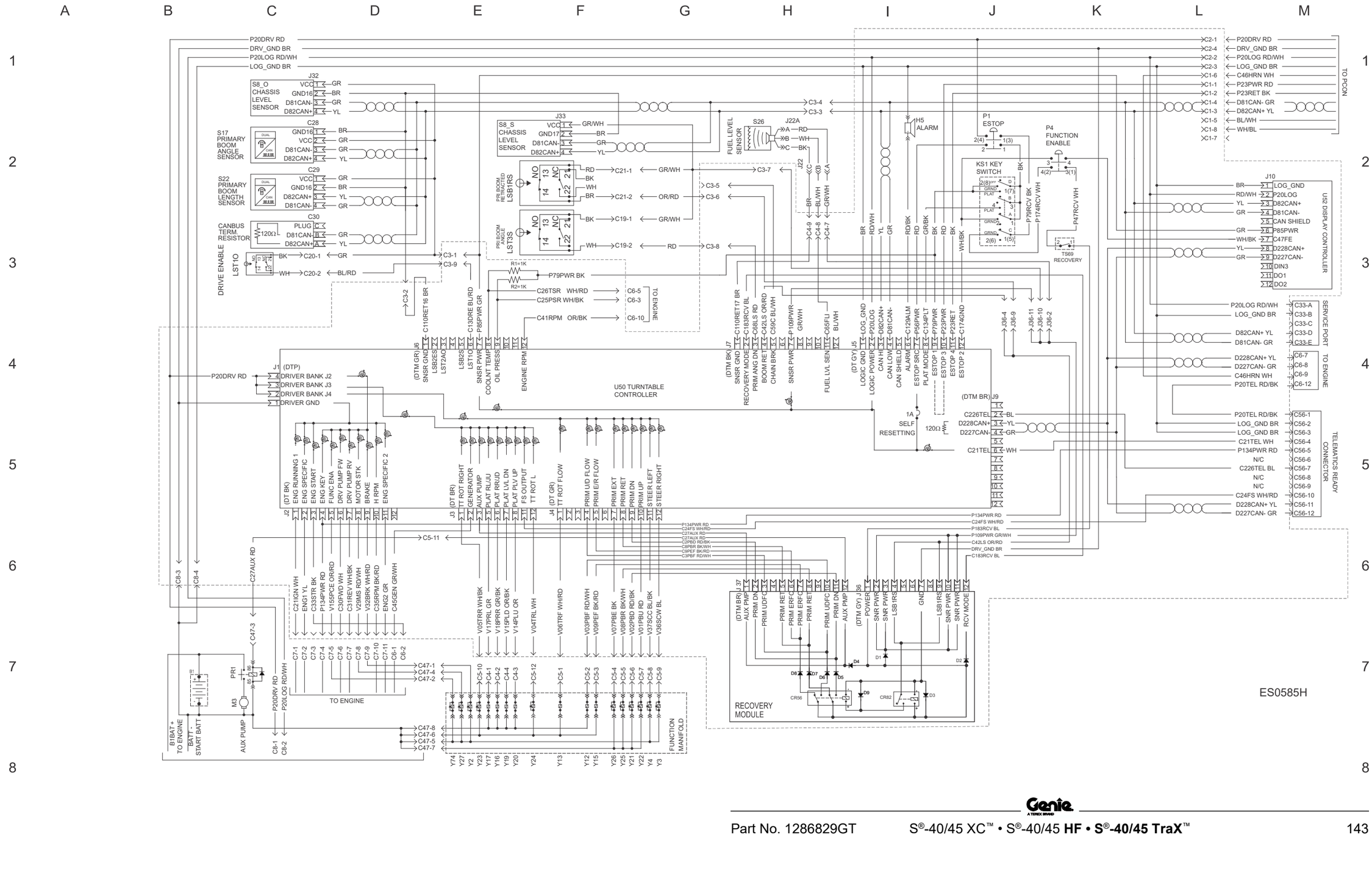
Electrical Schematic, Turntable Controller

Models without Recovery Module



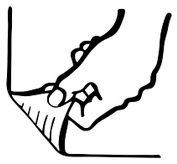
Electrical Schematic, Turntable Controller

Models with Recovery Module

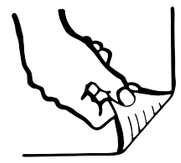


Electrical Schematic, Turntable Controller

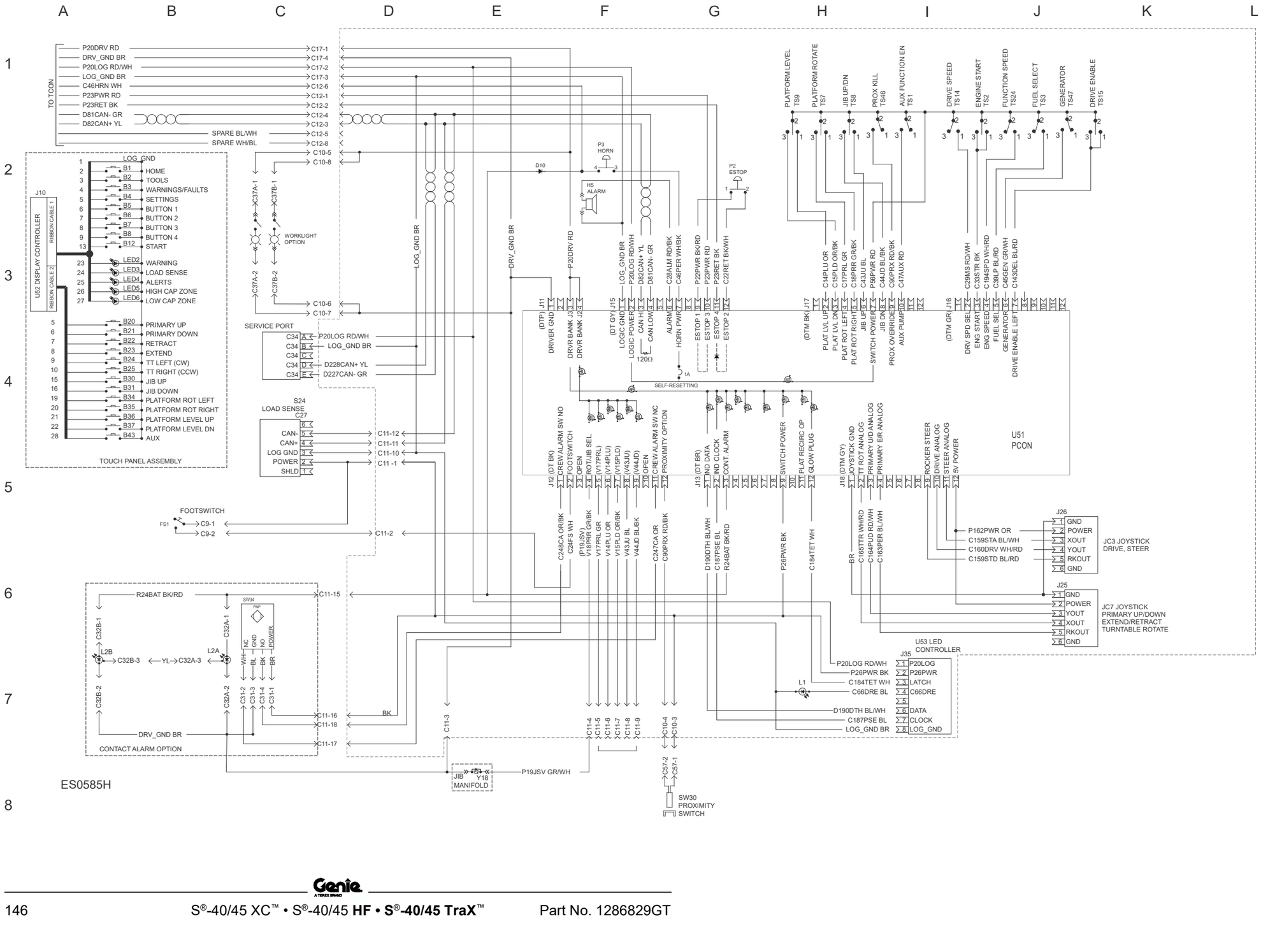
Models with Recovery Module



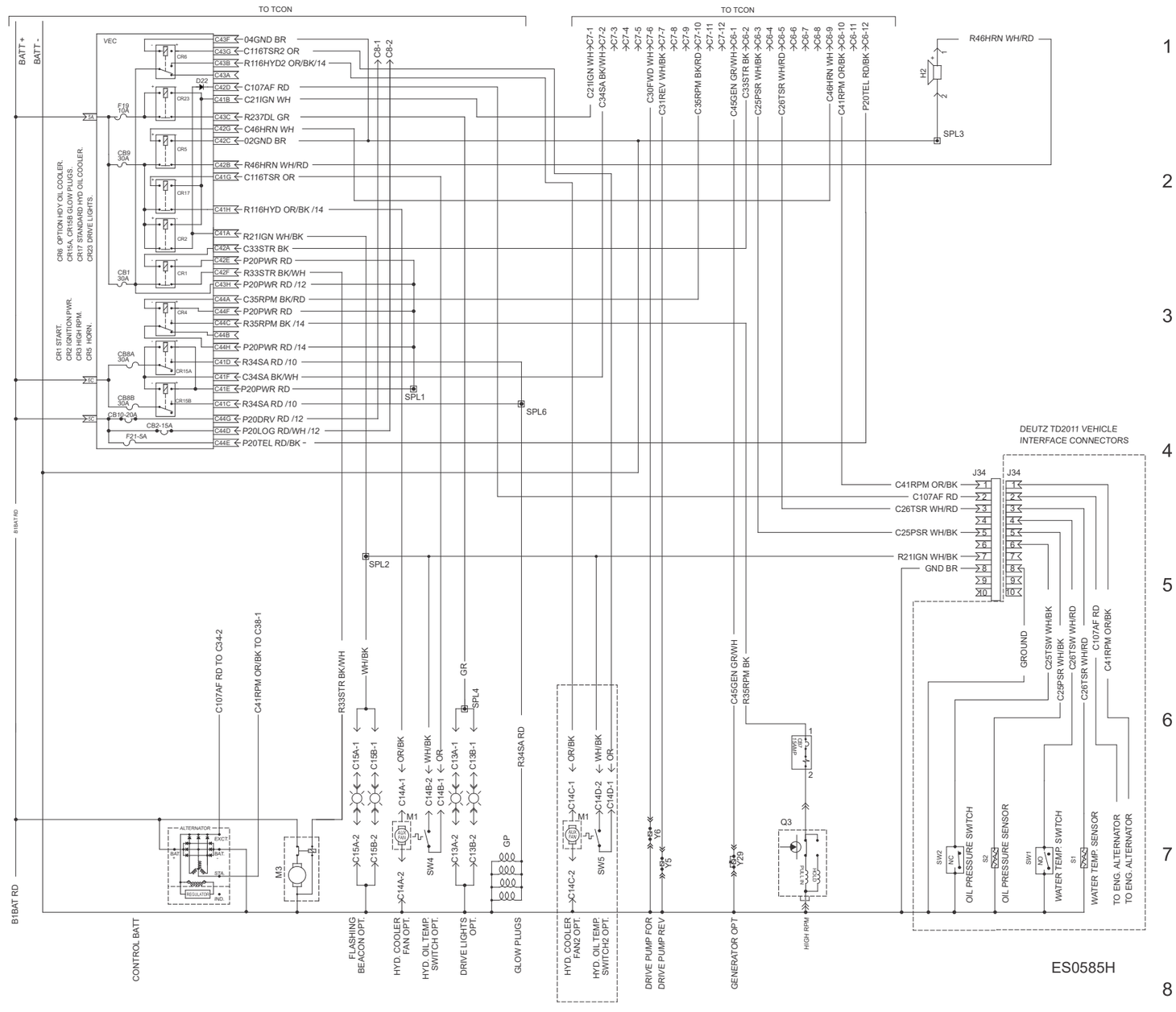
Electrical Schematic, Platform Controller



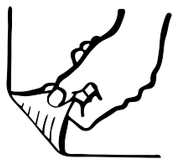
Electrical Schematic, Platform Controller



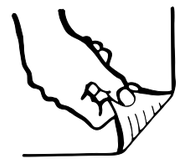
Electrical Schematic, Deutz D2011 L03i Engine



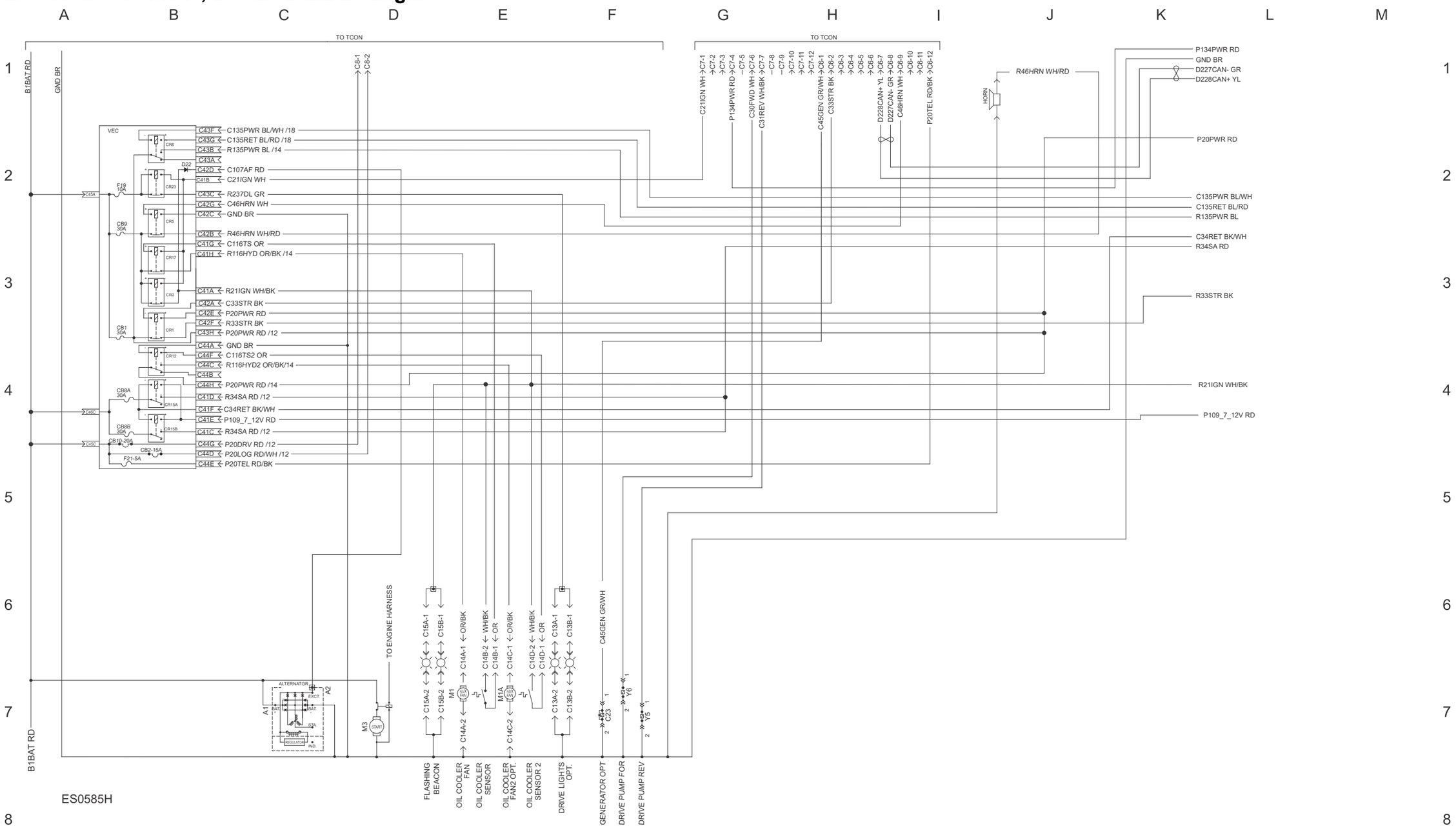
Electrical Schematic, Deutz D2011 L03i Engine



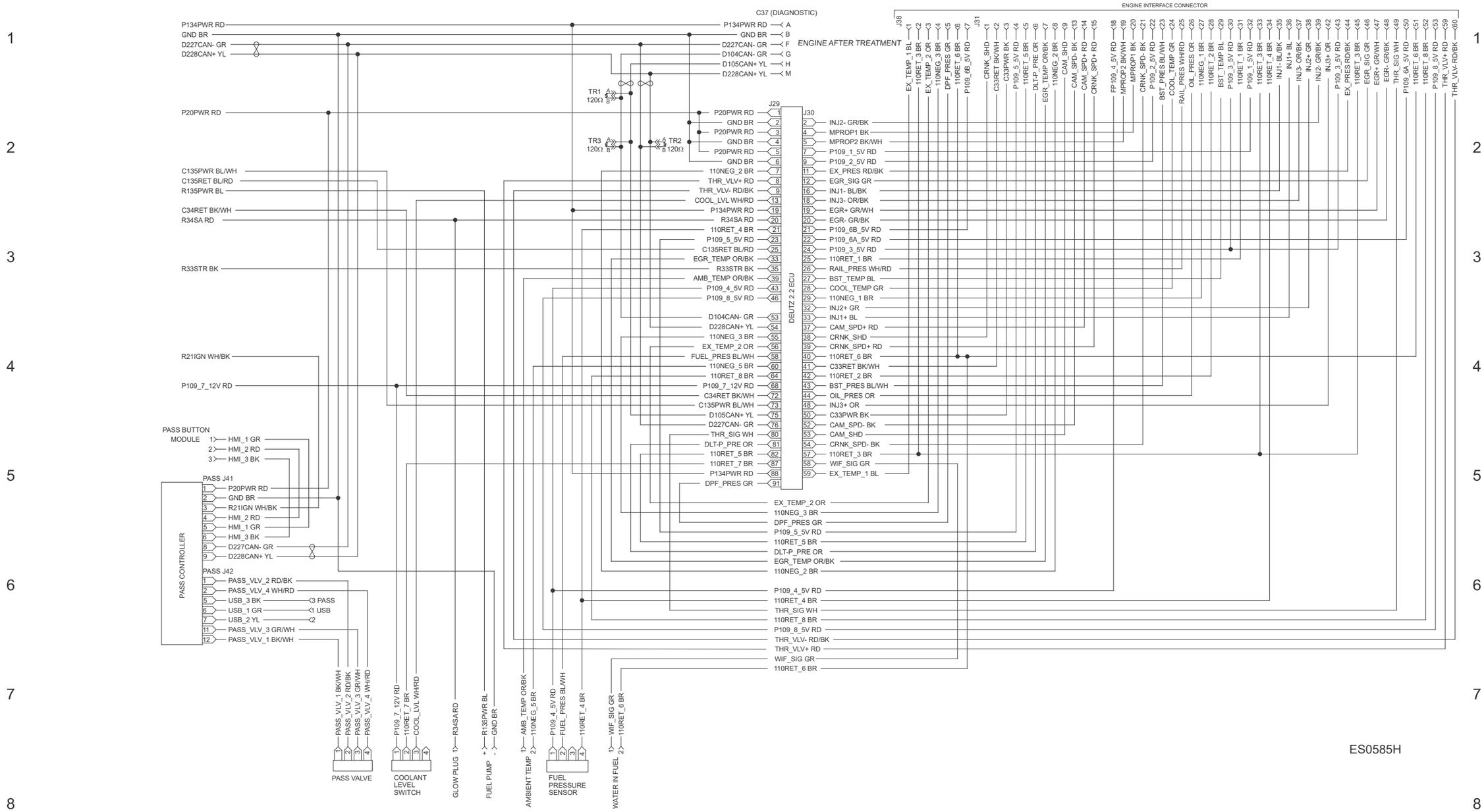
Electrical Schematic, Deutz TD 2.2 L3 Engine



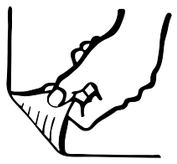
Electrical Schematic, Deutz TD 2.2 L3 Engine



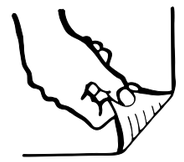
Electrical Schematic, Deutz TD 2.2 L3 Engine



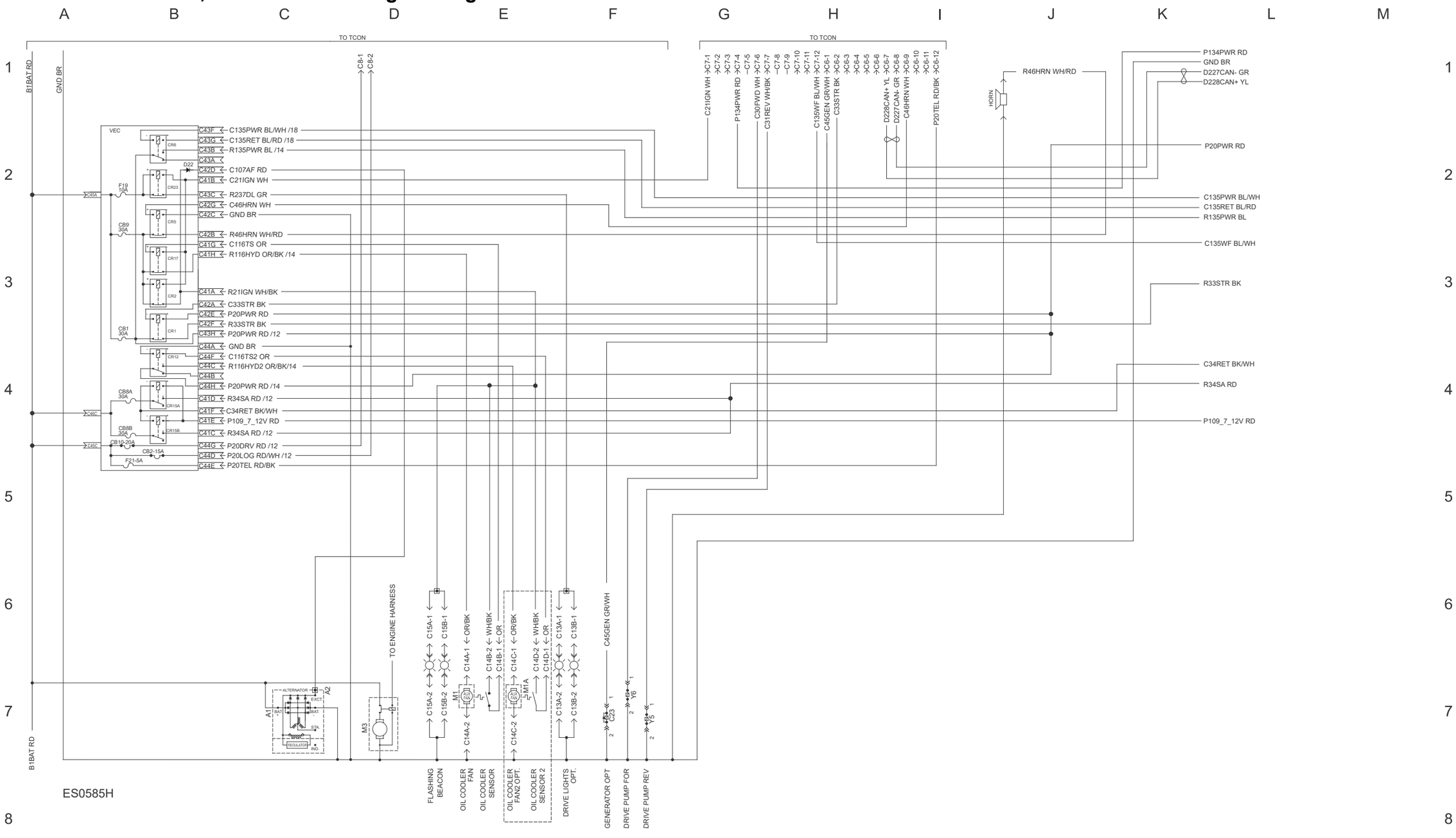
Electrical Schematic, Deutz TD 2.2 L3 Engine



Electrical Schematic, Deutz D 2.9 L4 Stage IV Engine

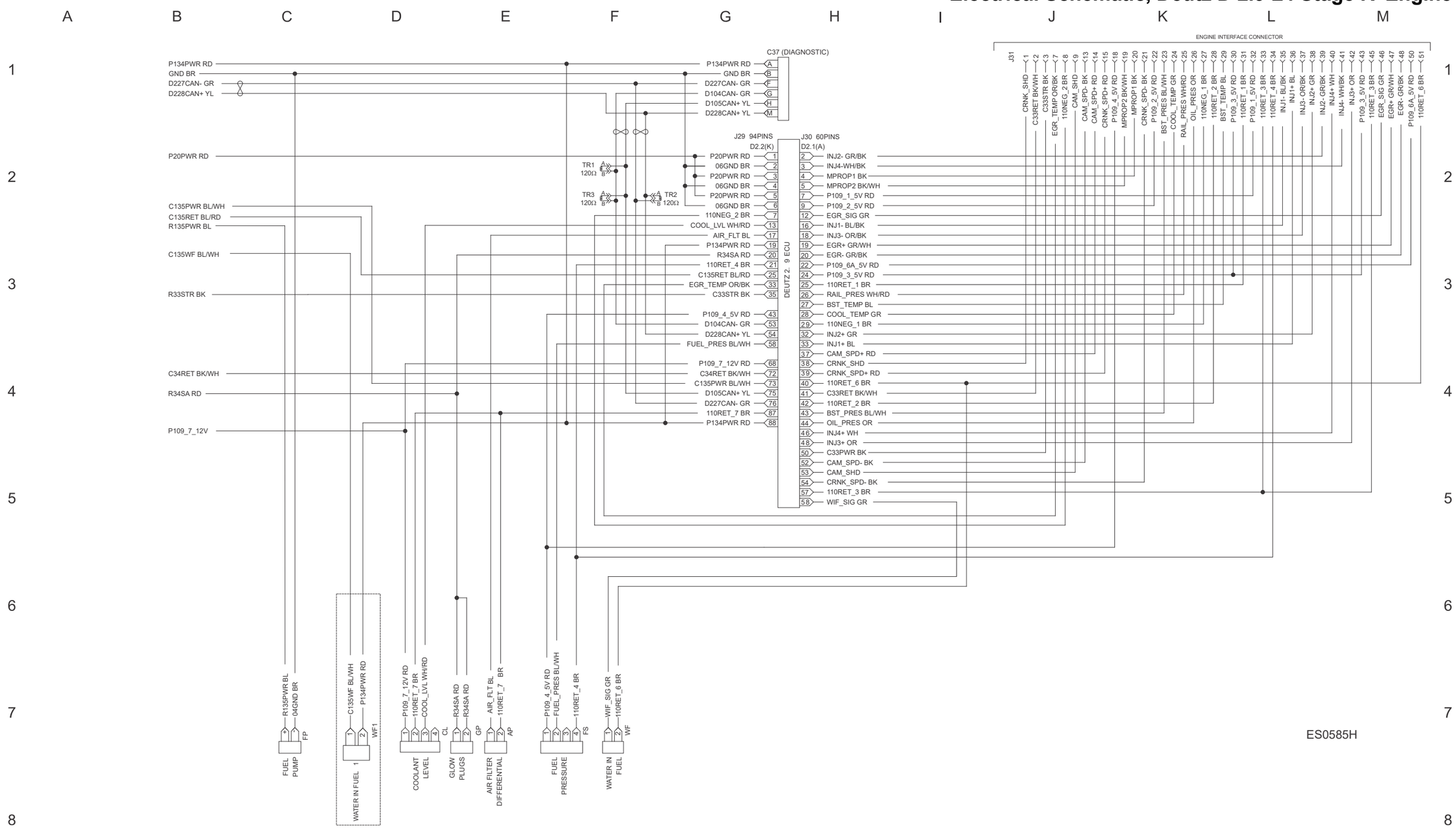


Electrical Schematic, Deutz D 2.9 L4 Stage IV Engine



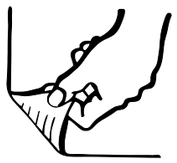
ES0585H

Electrical Schematic, Deutz D 2.9 L4 Stage IV Engine



ES0585H

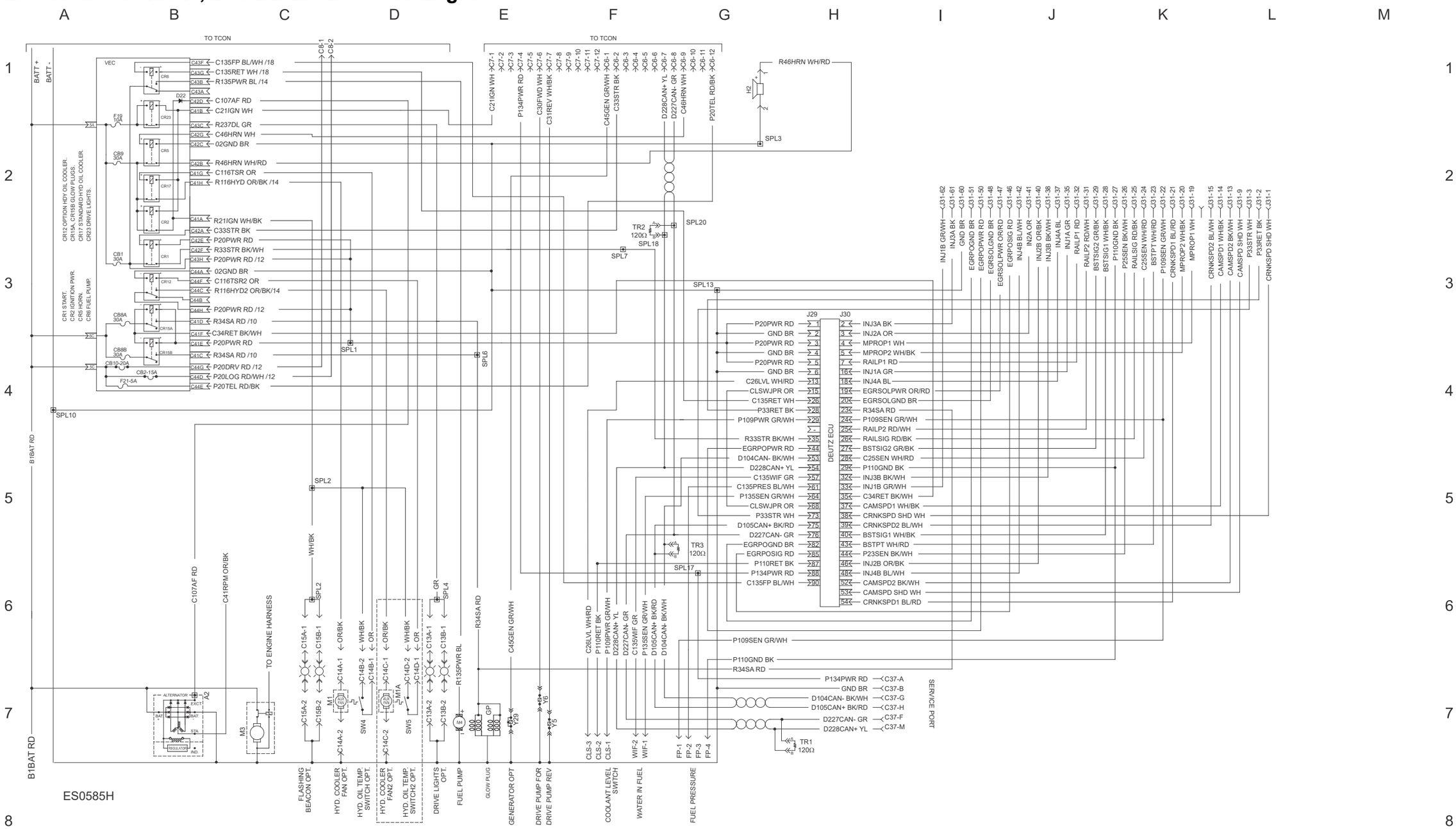
Electrical Schematic, Deutz D 2.9 L4 Stage IV Engine



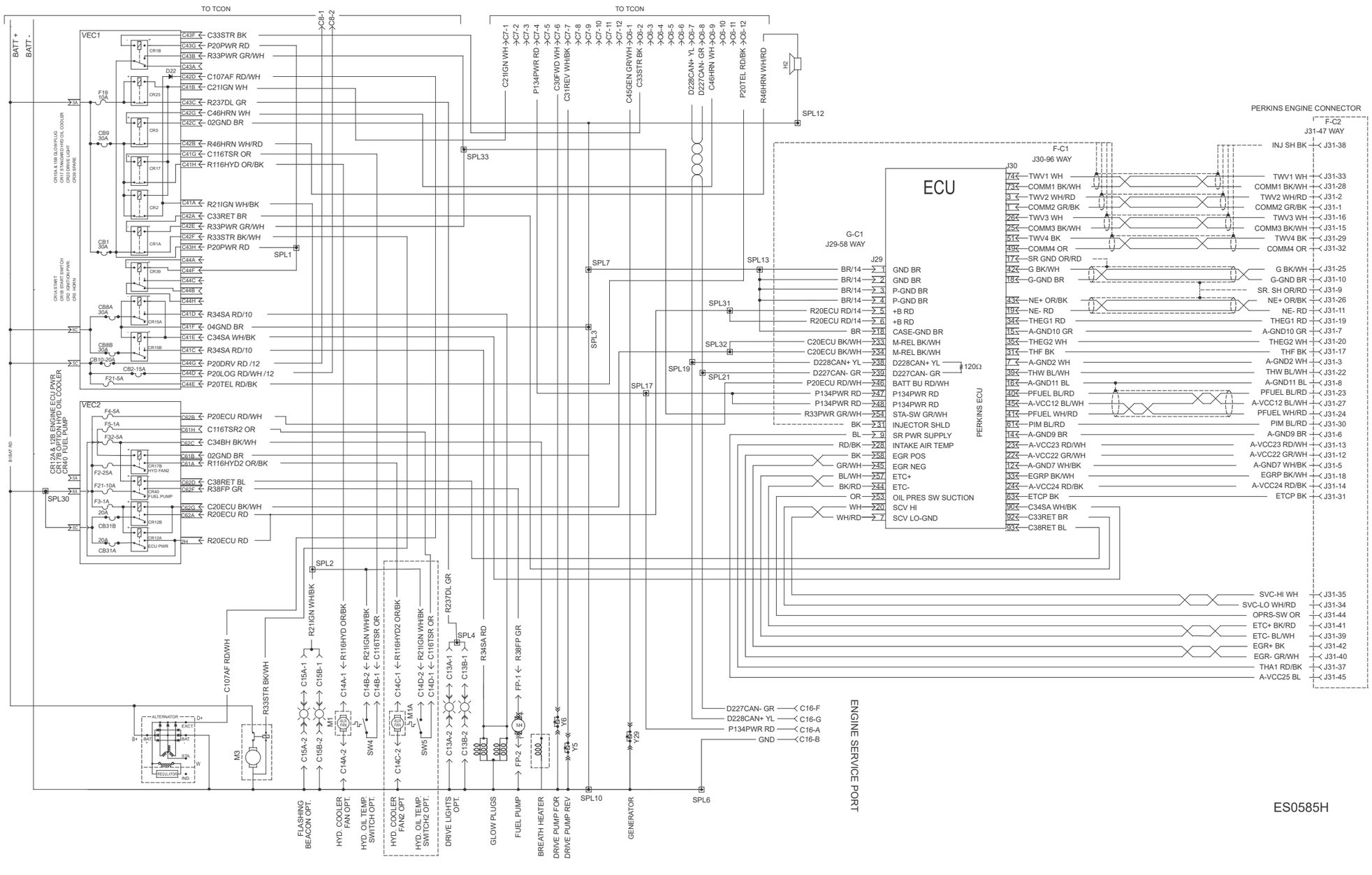
Electrical Schematic, Deutz D 2.9 L4 Tier IV Engine



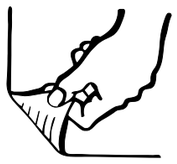
Electrical Schematic, Deutz D 2.9 L4 Tier IV Engine



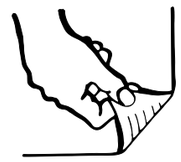
Electrical Schematic, Perkins 404F-E22T Engine



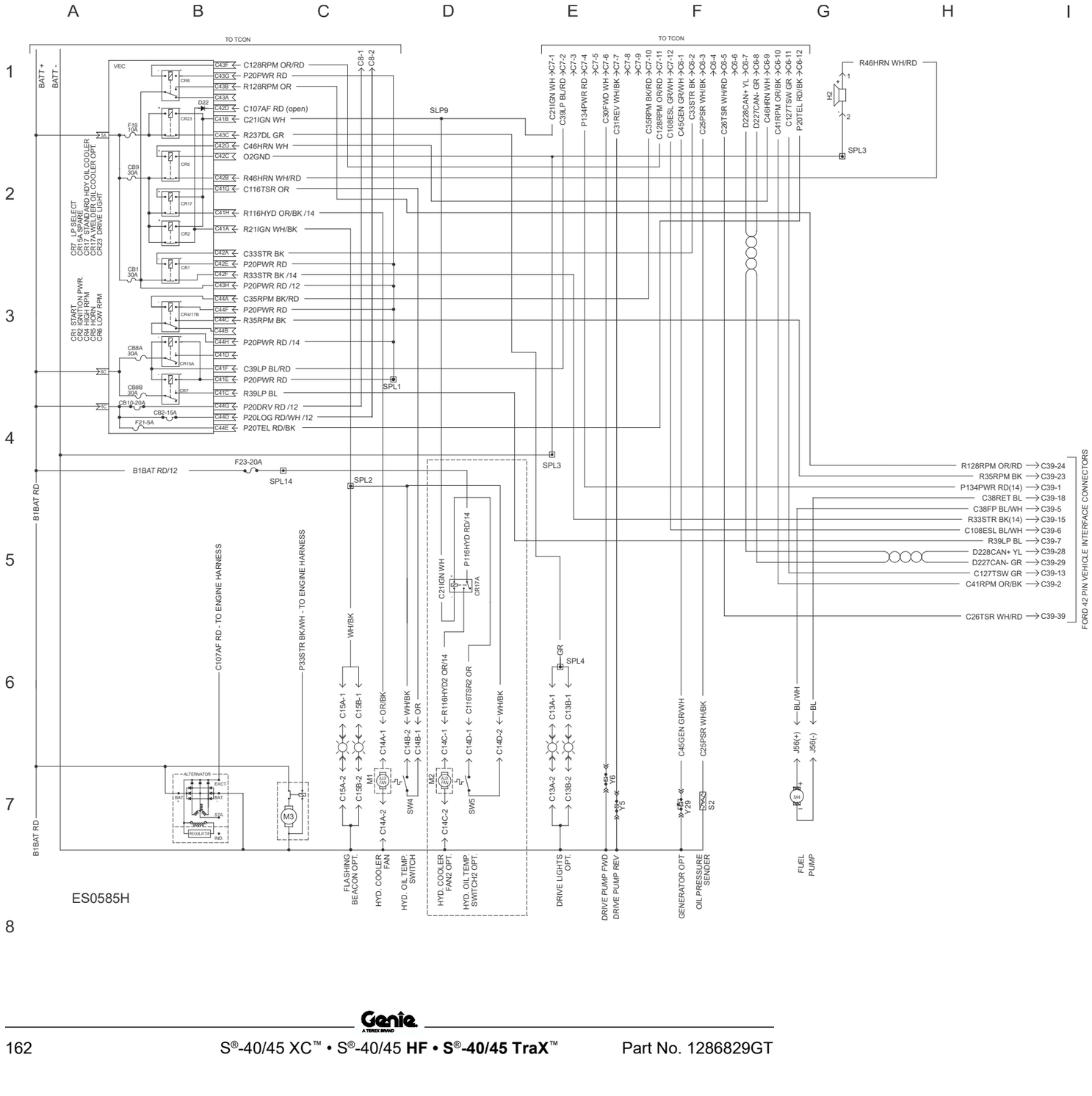
Electrical Schematic, Perkins 404F-E22T Engine



Electrical Schematic, Ford MSG-425 EFI Engine

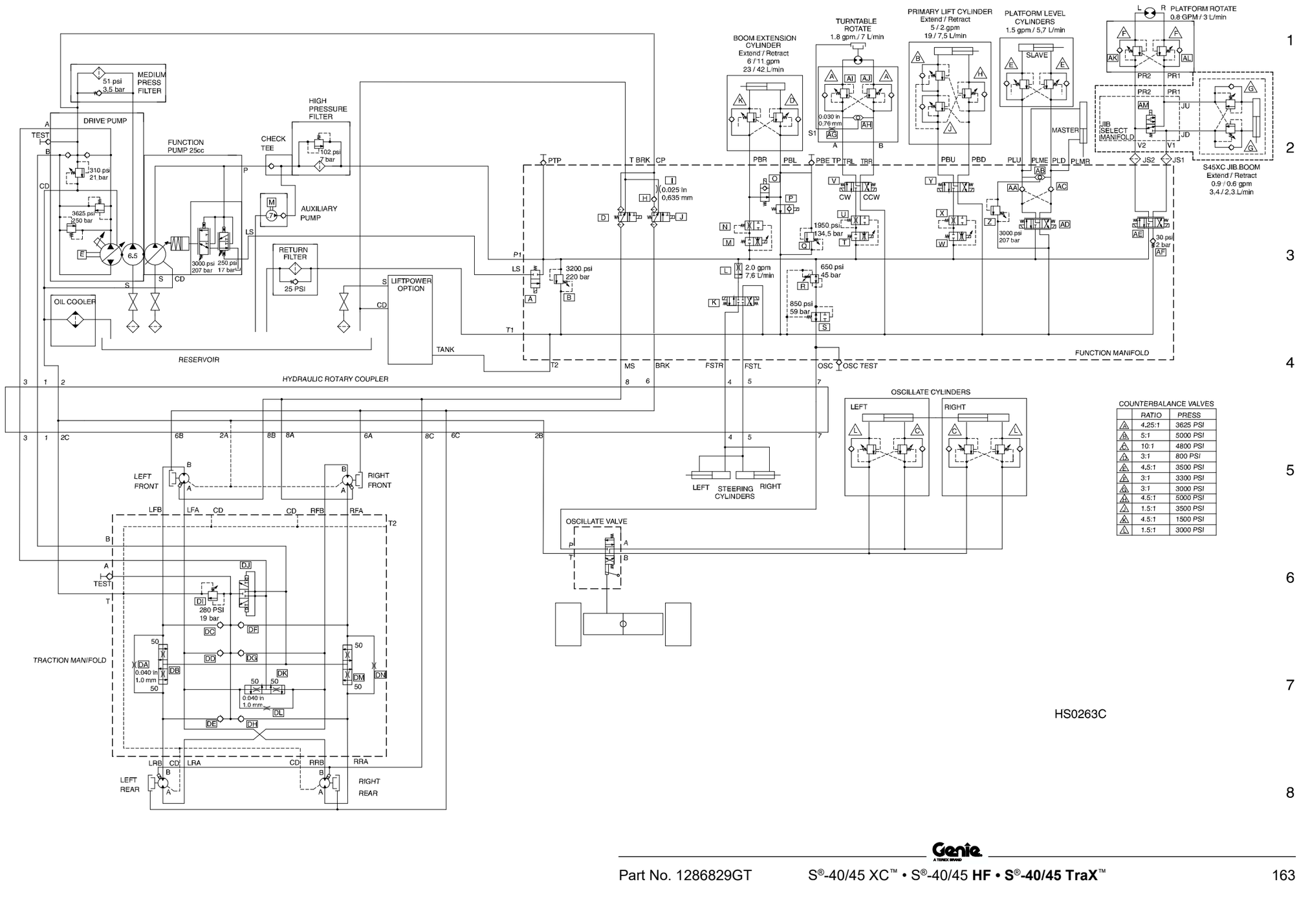


Electrical Schematic, Ford MSG-425 EFI Engine



ES0585H

Hydraulic Schematic

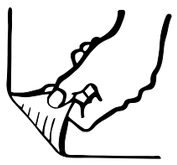


COUNTERBALANCE VALVES

	RATIO	PRESS
A	4.25:1	3625 PSI
B	5:1	5000 PSI
C	10:1	4800 PSI
D	3:1	800 PSI
E	4.5:1	3500 PSI
F	3:1	3300 PSI
G	3:1	3000 PSI
H	4.5:1	5000 PSI
J	1.5:1	3500 PSI
K	4.5:1	1500 PSI
L	1.5:1	3000 PSI

HS0263C

Hydraulic Schematic



California Proposition 65

WARNING

Operating, servicing and maintaining this equipment can expose you to chemicals including engine exhaust, carbon monoxide, phthalates, and lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. These chemicals can be emitted from or contained in other various parts and systems, fluids and some component wear by-products. To minimize exposure, avoid breathing exhaust, do not idle the engine except as necessary, service your equipment and vehicle in a well-ventilated area and wear gloves or wash your hands frequently when servicing your equipment or vehicle and after operation. For more information go to www.P65Warnings.ca.gov/passenger-vehicle.

Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65warnings.ca.gov/diesel.

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