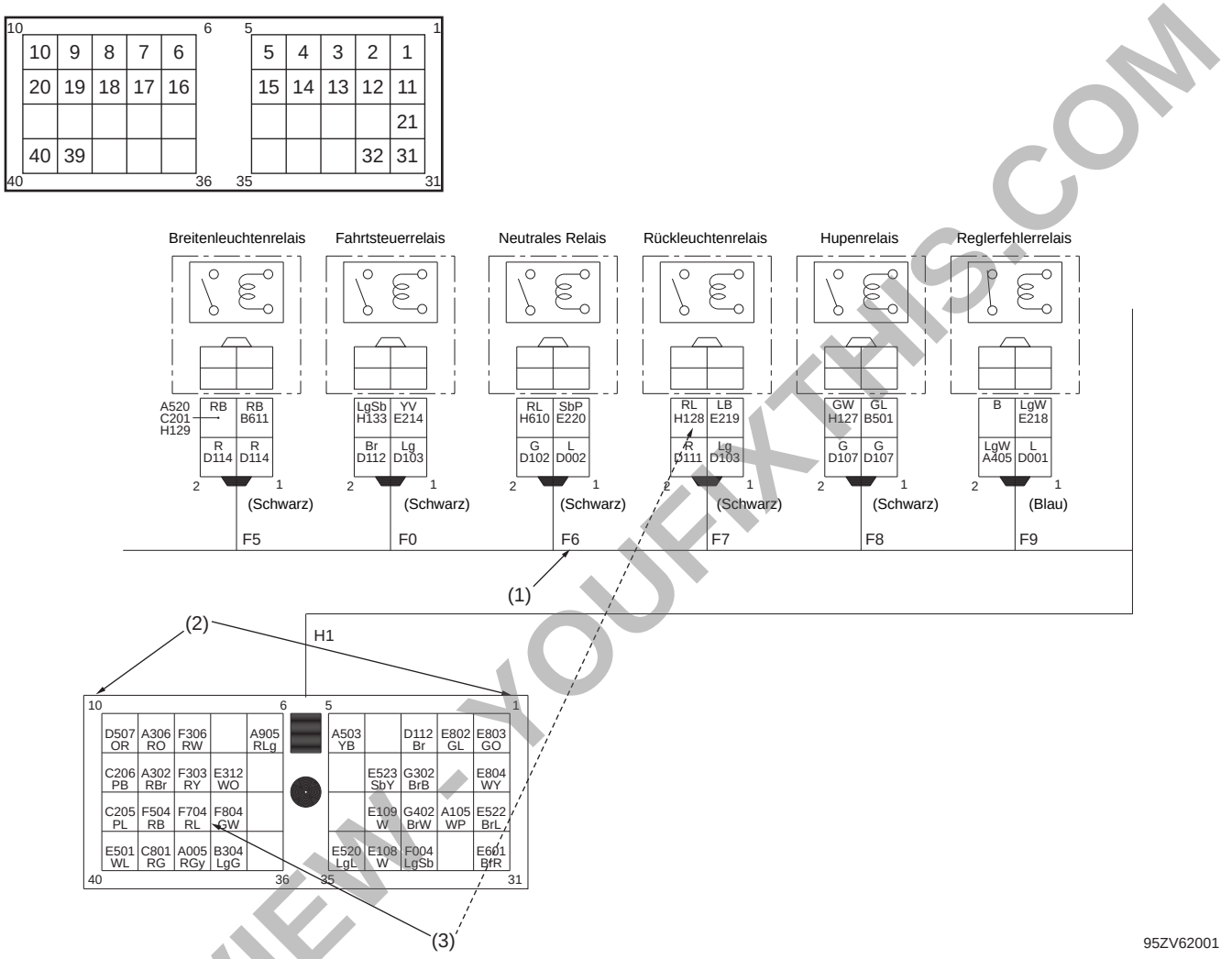
Verwendung des elektrischen Schaltplans (DEUTSCH)

Beispiel



Für den elektrischen Schaltplan wird die Adressenmethode verwendet. Damit wird jeder Steckvorrichtung und jeder Anschlußklemme ein Symbol zugeordnet, damit die Klemme, an die das andere Ende des Kabels angeschlossen werden muß, leicht gefunden werden kann.

Beispiel 1
Symbol unterhalb (oder oberhalb) der Steckvorrichtung, wie z. B. F6:
Zeigt die Adresse der Steckvorrichtung an.

Beispiel 2
Symbol an der Mehrklemmen- Anschlußstelle, wie z. B. 1 und 10:
Zeigt die Klemmennummer und die Zählrichtung an.

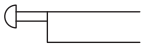
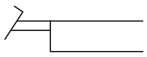
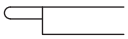
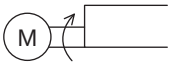
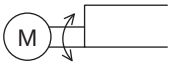
Beispiel 3
Überprüfung der anderen Steckvorrichtungsklemme, wo F704 RL (Artikel (3)) angeschlossen ist:

1. F704
   Zeigt, daß die Klemme an die vierte Klemme der F7-Steckvorrichtung angeschlossen ist.
   Überprüfen Sie die Beschreibung in der vierten Klemme des F7-Steckvorrichtung (F704). Zie gibt an, daß die Steckvorrichtung F704 an H128 angeschlossen ist. Dies bedeutet, daß die vierte Klemme der F7-Steckvorrichtung an die 28. Klemme der H1-Steckvorrichtung angeschlossen ist.
2. RL
   Zeigt die Farbe des Kabels an. „ RL ” bedeutet, daß der lsolierdraht rot ist, und „ L ” bedeutet, daß sich auf dem roten lsoliermaterial ein blauer Streifen befindet.

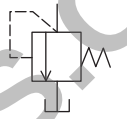
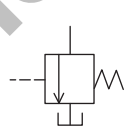
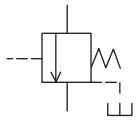
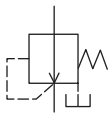
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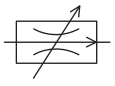
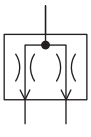
Operation methods

Spring	
Adjustable spring	
Control methods Lever	
Push button	
Pedal or treadle	
Mechanical control Plunger	
Spring	
Solenoid control Single acting solenoid	
Double acting solenoid	
Electric motor control Unidirectional	
Bidirectional	
Detent	

Pressure control valve

Single flow path valve, Normally closed	
Single flow path valve, Normally open	
Pressure relief valve	
Unloading valve	
Sequence valve	
Pressure reducing valve	

Flow control valve

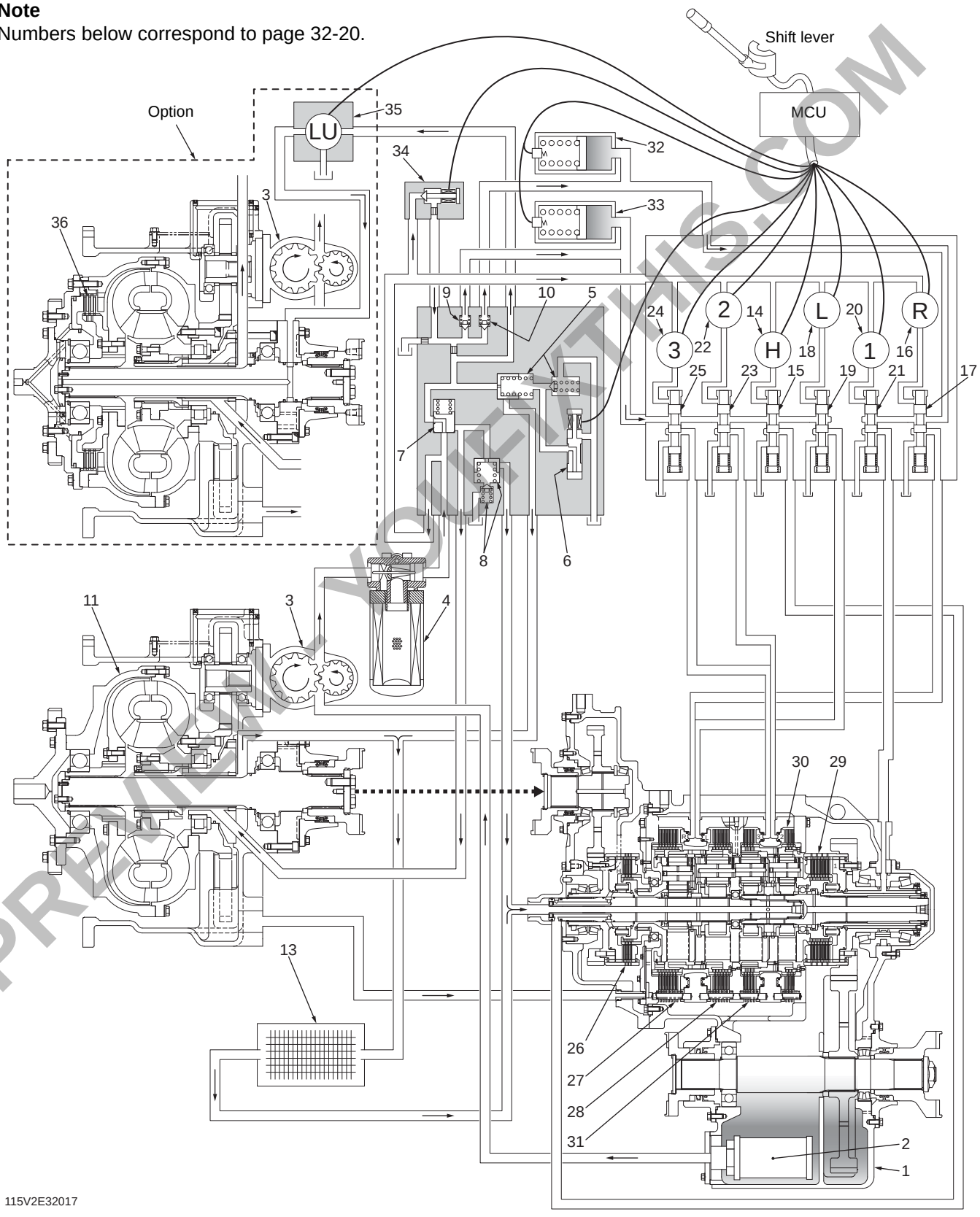
Flow control valve, Adjustable non-compensated	
Pressure compensated flow control valve fixed	
variable	
Flow dividing valve	

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Hydraulic System Diagram

Note
Numbers below correspond to page 32-20.



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Quantum fault code information

These codes show the fault codes for the engine failure displayed on the MODM error log monitor, or checked by the diagnostic switch (option).

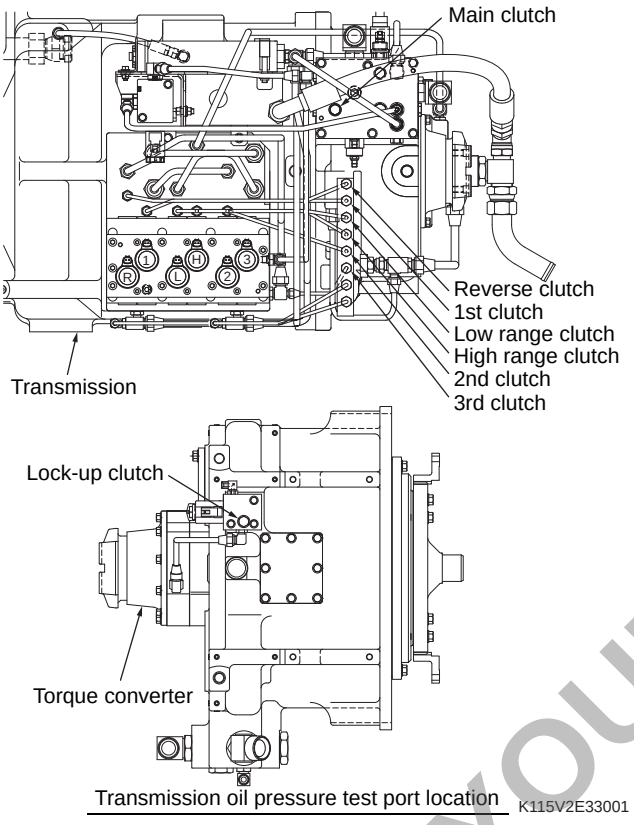
Please note that not all are used in the 115ZV-2 machine application. Refer to Cummins Engine trouble-shooting fault codes list for more information.

FAULT CODE/ LAMP	DESCRIPTION	QSB4.5 (60ZV-2)	QSB6.7 (70ZV-2) (70TMV-2)	QSC8.3 (80ZV-2)	QSC8.3 (85ZV-2)	QSM11 (90ZV-2)	QSM11 (92ZV-2)	QSX15 (95ZV-2)	QSK19 (115ZV-2)	QST30 (135ZV-2)
EG111 Red	Engine Control Module (ECM) - critical internal failure.	○	○	○	○	○	○	○		○
EG113 Yellow	Engine Timing Actuator Circuit - shorted high.									○
EG114 Yellow	Engine Timing Actuator Circuit - shorted low.									○
EG115 Red	Engine Speed / Camshaft Position Sensor Circuit - lost both of two signals from the magnetic pickup sensor.	○	○	○	○	○	○	○	○	○
EG121 Yellow	Engine Speed / Position Sensor Circuit - lost one of two signals from the magnetic pickup sensor.					○	○	○		○
EG122 Yellow	Intake Manifold Pressure Sensor #1 Circuit - shorted high.	○	○	○	○	○	○	○	○	○
EG123 Yellow	Intake Manifold Pressure Sensor #1 Circuit - shorted low.	○	○	○	○	○	○	○	○	○
EG124 Yellow	Intake Manifold Pressure - above normal operation.	○	○	○	○					
EG131 Red	Accelerator Pedal Position Sensor Circuit - shorted high.	○	○	○	○	○	○	○		○
EG132 Red	Accelerator Pedal Position Sensor Circuit - shorted low.	○	○	○	○	○	○	○		○
EG133 Red	Remote Accelerator Pedal Position Sensor Circuit - shorted high.								○	○
EG134 Red	Remote Accelerator Pedal Position Sensor Circuit - shorted low.								○	○
EG135 Yellow	Engine Oil Pressure Sensor Circuit - shorted high.	○	○	○	○	○	○	○	○	○
EG141 Yellow	Engine Oil Pressure Sensor Circuit - shorted low.	○	○	○	○	○	○	○	○	○
EG143 Yellow	Engine Oil Pressure Low - warning.	○	○	○	○	○	○	○		○
EG144 Yellow	Engine Coolant Temperature Sensor Circuit - voltage above normal or shorted high.	○	○	○	○	○	○	○	○	○
EG145 Yellow	Engine Coolant Temperature Sensor Circuit - voltage below normal or shorted low.	○	○	○	○	○	○	○	○	○
EG146 Yellow	Engine Coolant Temperature High - warning.	○	○	○	○				○	
EG151 Red	Engine Coolant Temperature High - critical.	○	○	○	○	○	○	○	○	○
EG153 Yellow	Intake Manifold Air Temperature Sensor Circuit - voltage above normal or shorted high.	○	○	○	○	○	○	○	○	○
EG154 Yellow	Intake Manifold Air Temperature Sensor Circuit - voltage below normal or shorted low.	○	○	○	○	○	○	○	○	○
EG155 Red	Intake Manifold Air Temperature Sensor High - critical.	○	○	○	○	○	○	○	○	○
EG166 Yellow	Rack Position Sensor #1 Circuit - shorted high.									○
EG172 Red	Rack Actuator Position #1 Circuit - grounded circuit.									○

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T/M type: PS400D02 - S/N 0101~



Transmission oil pressure test port location K115V2E33001

2. Measuring port: PF 1/4

3. Oil pressure gauge: 5 MPa (50 kgf/cm^2) (1,000 psi) with 2~3 m (6~10 ft.) hose

Note
Warm-up the engine before measuring the clutch oil pressure and time lag

Clutch oil pressure measurement procedure

Standard measurement value

Main pressure (engine speed)	Idling (LI)	2.6±0.2 MPa (27±2 kgf/cm^2) (384±28 psi)
	Maximum (HI)	2.6±0.2 MPa (27±2 kgf/cm^2) (384±28 psi)
Clutch pressure (engine speed)	Idling (LI)	2.1~2.5 MPa (21.5~25.5 kgf/cm^2) (305~363 psi)
	Maximum (HI)	2.1~2.5 MPa (21.5~25.5 kgf/cm^2) (305~363 psi)

1. Press the brake pedal, and set and confirm the transmission shift lever is at the neutral position.

2. Set and confirm the parking brake is at the "ON" position.

3. Press the brake pedal, and lower the bucket onto the ground.

4. Stop the engine.

5. Attach the pressure gauge to the pressure measurement port. Place the gauge inside the operator's area, and start the engine.

6. As the clutch oil pressure rises just after the engine is started, keep the engine at low-idling before the pressure measurement.

7. Measure and record the pressure in each speed range.

8. Set the declutch ON/OFF switch to ON.
   Press down the brake pedal all the way to the floor to avoid the “fuel saving mode at idle time”.

Note
In the “fuel saving mode at idle time”, the engine is not activated promptly and may not reach the maximum revolution.

9. As the clutch oil pressure rises just after the engine is started, adjust the engine at high-idling before the pressure measurement.

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Bolt tightening torque

Hexagon bolt

1. Thread type
   Metric thread, Unified thread
2. Bolt strength
   8.8 (8T) ~ 10.9 (11T)
3. Thread pitch
   Metric thread: Coarse pitch thread (C), fine pitch thread (F)
   Unified thread: Coarse pitch thread (UNC), fine pitch thread (UNF)

(N-m)

Type	Bolt size			Bolt strength	
	Nominal dimension	Nominal diameter	Pitch	8.8 (8T)	10.9 (11T)
Metric thread	M8	8	(C) 1.25	26	38
	M10	10	(C) 1.5	53	76
			(F) 1.25	55	80
	M12	12	(C) 1.75	90	132
			(F) 1.25	96	142
	M14	14	(C) 2.0	142	206
			(F) 1.5	152	221
	M16	16	(C) 2.0	216	314
			(F) 1.5	226	330
	M18	18	(C) 2.5	299	436
			(F) 1.5	324	476
	M20	20	(C) 2.5	417	608
			(F) 1.5	451	662
	M22	22	(C) 2.5	559	814
			(F) 1.5	598	878
	M24	24	(C) 3.0	721	1,030
			(F) 2.0	770	1,128
	M27	27	(C) 3.0	1,030	1,520
			(F) 2.0	1,128	1,618
	M30	30	(C) 3.5	1,422	2,109
			(F) 2.0	1,569	2,256
	M33	33	(C) 3.5	1,912	2,844
			(F) 2.0	2,059	3,040
Unified thread	5/16	05	18 UNC	25	35
	3/8	06	16 UNC	44	65
	7/16	07	14 UNC	71	103
	1/2	08	13 UNC	103	147
	9/16	09	12 UNC	147	216
	5/8	10	11 UNC	201	294
	3/4	12	10 UNC	358	525
	7/8	14	9 UNC	554	809
	1	16	8 UNC	868	1,275

Note: Tighten the bolts according to the above list, unless otherwise specified.

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Torque Converter and Transmission Group

1. Machine dose not move in any shift lever position.

Check before starting work.

1. Check that the parking brake is released.
2. Check the error code No. shown on the MODM.
3. Check the transmission oil level.
4. Check the fuses of the controller system.
5. Check that the auto brake solenoid valve is released.
6. Check the 70 A fusible link.
   (If the 70 A fusible link is off, no electrical circuits will operate except horn circuit and hazard flasher [opt.].)

Possible cause	Low clutch oil pressure at all the shift lever positions.	Torque converter oil becomes milky and cloudy in color.	Temperature of the torque converter oil is too high.	Filter of the torque converter is clogged.	Setting the declutch ON/OFF switch to OFF allows normal operation.	F5 fuse blows.	Pump is extremely heated.	Pump produces an abnormal (shrieking) noise.					Solution
Air drawn into suction line of the torque converter pump	○	○	○				○	○					Tightening hose band
Defective torque converter pump	○		○				○						Pump replacement
Damaged torque converter			○	○									Disassembly & repair
Sticking modulator valve unit	○												Disassembly & repair
Malfunctioning inching pressure switch					○								Switch replacement
Defective controller	○												Controller replacement
Neutral relay, controller fault relay, lift kickout and lower kickout relay, parking switch wirings short circuited						○							Repairing wiring
Restricted suction line - pinched, plugged, or internally defective.							○	○					Replace hose

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Standard Measurement Values for Performance Check

Measurement conditions
Temperature of torque converter oil: 50~80°C (120~180°F)
Temperature of hydraulic oil: 50~80°C (120~180°F)
Temperature of engine coolant: 50~80°C (120~180°F)

Item				Standard measurement values for performance check		Remarks
System	Measurement item			Normal	Fuel efficient mode	
Engine	Engine speed (min^{-1}) (rpm) (S/N 9001~9100)	Minimum no-load speed, Low Idle (LI)		925±50		775 in hibernate mode
		Maximum no-load speed, High Idle (HI)		1,910±50		
		Maximum speed in torque converter stall mode		1,780±100	1,690±100	
		Maximum speed in multiple control valve relief mode		1,855±100	1,705±100	
		Maximum speed in torque converter stall plus multiple control valve relief mode		1,420 $^{+150}_{-100}$	1,375 $^{+150}_{-100}$	
	Engine speed (min^{-1}) (rpm) (S/N 9101~)	Minimum no-load speed, Low Idle (LI)		925±50		775 in hibernate mode
		Maximum no-load speed, High Idle (HI)		1,910±50	1,700±50	
		Maximum speed in torque converter stall mode		1,780±100	1,690±100	
		Maximum speed in multiple control valve relief mode		1,850±100	1,850±100	
		Maximum speed in torque converter stall plus multiple control valve relief mode		1,420 $^{+150}_{-100}$	1,380 $^{+150}_{-100}$	
Transmission	Main pressure MPa (kgf/cm^2) (psi)	Engine speed	Idling (LI)	2.6±0.2 (27±2) (384±28)		
			Maximum (HI)	2.6±0.2 (27±2) (384±28)		
	Clutch pressure MPa (kgf/cm^2) (psi)		Idling (LI)	2.1~2.5 (21.5~25.5) (305~363)		
			Maximum (HI)	2.1~2.5 (21.5~25.5) (305~363)		
	Clutch time lag (sec)	Neutral→Forward 1st speed (engine speed: 1,500 min^{-1} (rpm))		0.3±0.1		Before wheels move

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Inspection and maintenance table

Refer to Operation & Maintenance Manual for maintenance procedures.

IMPORTANT

Severe application require more frequent maintenance.
Severe conditions include heavy dust, extremely abrasive material, caustic chemicals, extremely wet conditions or abnormally hot or cold ambient temperatures.

△ : First time replacement or cleaning only

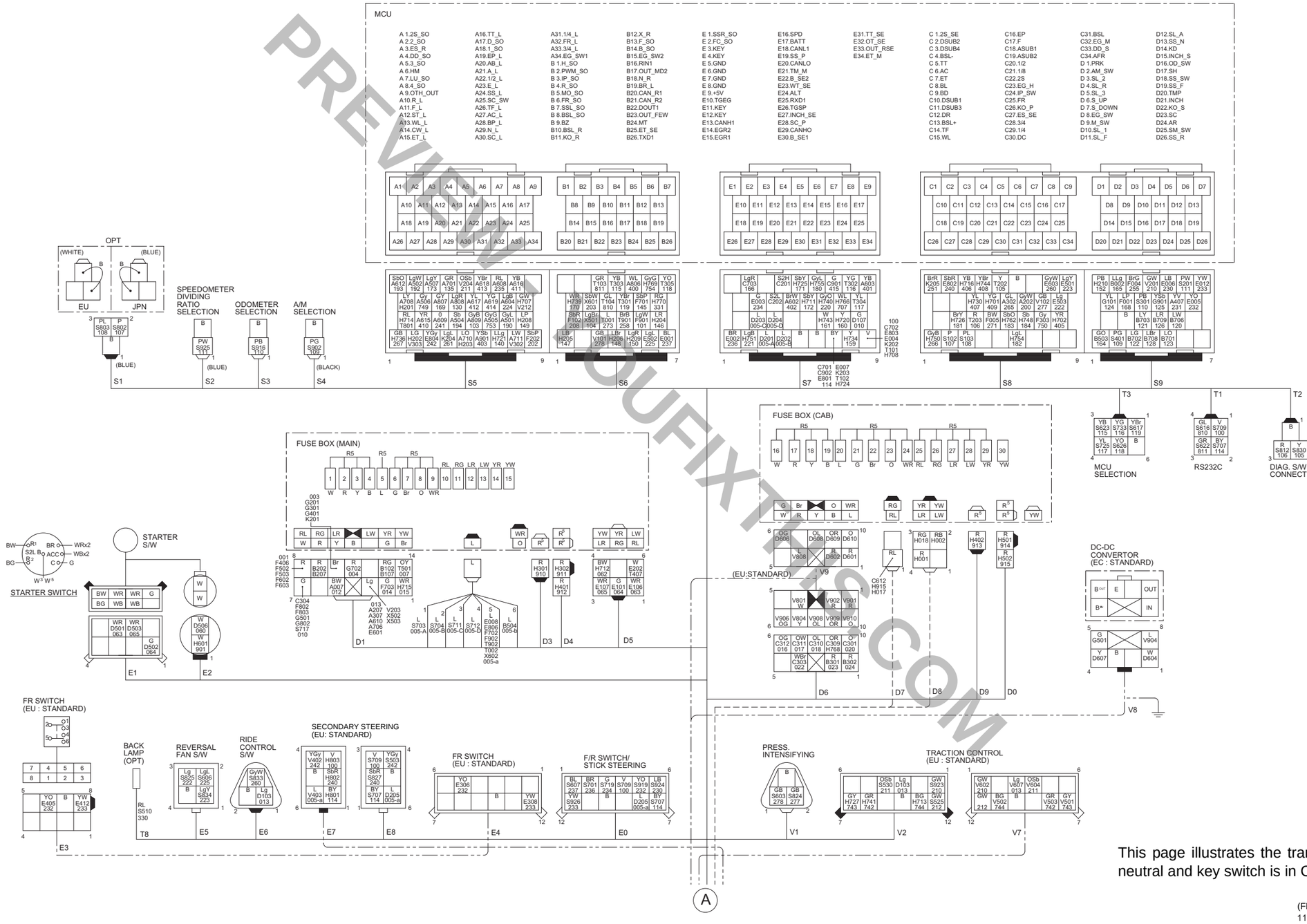
Section	Item for check	Operating hours						When Required
		10	50	250	500	1000	2000	
Engine	Check Engine Oil Level	○						
	Check Engine Coolant Level	○						
	Drain Water and Sediment from Fuel Prefilter	○						
	Check Drive Belt	○						
	Check Air Intake System	○						
	Check Cooling Fan	○						
	Check Warning Lamps	○						
	Check Fuel Level	○						
	Check Exhaust Gas	○						
	Drain Water and Sediment from Fuel Tank		○					
	Replace Fuel Filter Cartridge			○				
	Replace DCA4 Coolant Filter Cartridge			○	○ *1			
	Clean Crankcase Breather Tube			○				
	Adjust Belt Tension			○				
	Replace Engine Oil and Oil Filter Cartridge				○			
	Check and Adjust Injection Timing					○		
	Check Engine Compression Pressure					○		
	Check Injection Pressure					○		
	Replace Fuel Tank Breather					○		
	Clean Fuel Tank						○	
	Check and Adjust Valve Lash Clearance						○	
	Check Vibration Damper						○	
	Clean Crankcase Breather						○	
	Clean or Replace Air Cleaner Element							○
	Clean Radiator / Air cooler / Hydraulic oil cooler Fins							○
	Replace Ether Cylinder							○
	Clean or Replace Air Cleaner Element	After six cleanings or once a year ○						
	Replace Coolant	Every 2 years or 3000 hours ○						

Note:
*1 applies to machines from S/N 9101 and thereafter. Refer to the Operation & Maintenance Manual for details.

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Electrical Wiring Diagram (2/3) (S/N 9001~9006)



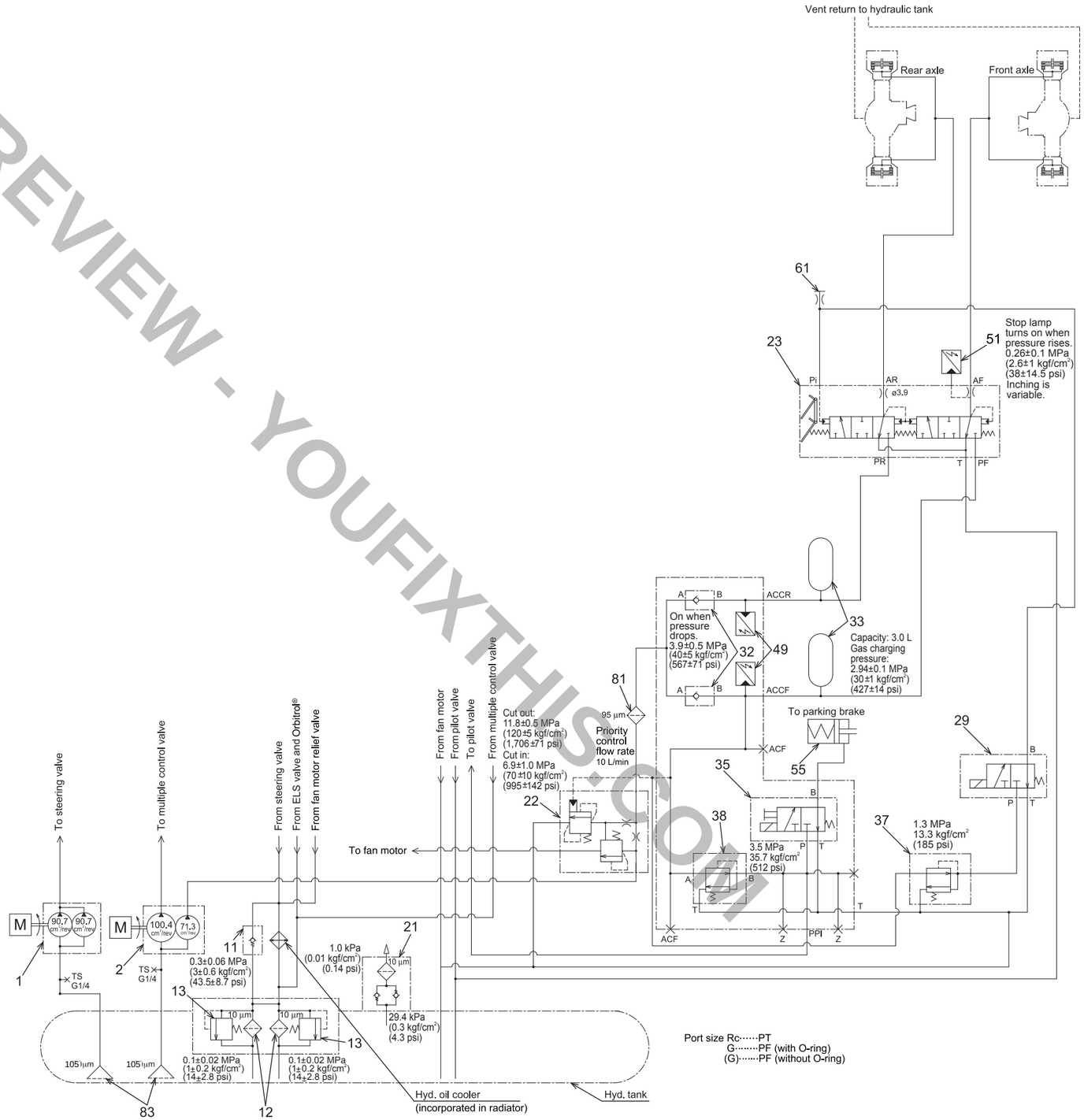
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This page illustrates the transmission is in neutral and key switch is in OFF position.

Brake Circuit

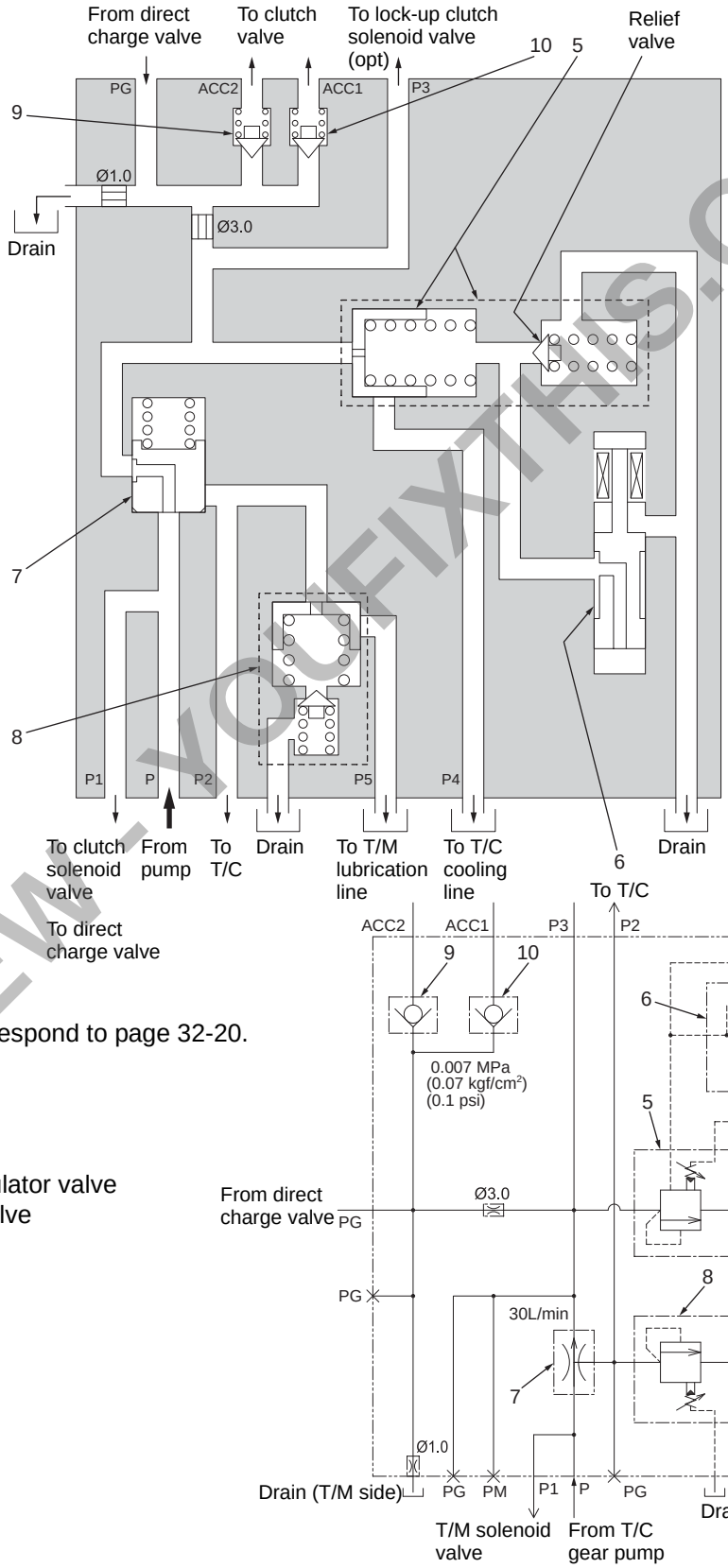
1. Hydraulic pump (Steering)
2. Hydraulic pump (loading + pilot & brake)
3. —
4. —
5. —
6. —
7. —
8. —
9. —
10. —
11. Check valve (oil cooler bypass)
12. Return filter
13. Relief valve (return filter bypass)
14. —
15. —
16. —
17. —
18. —
19. —
20. —
21. Breather valve (oil filling port)
22. Unloader valve
23. Brake valve
24. —
25. —
26. —
27. —
28. —
29. Solenoid valve (for auto-brake)
30. —
31. —
32. Check valve
33. Accumulator
34. —
35. Solenoid valve (for parking brake)
36. —
37. Reducing valve (for auto-brake)
38. Reducing valve (pilot, parking brake, auto-brake)
39. —
40. —
41. —
42. —
43. —
44. —
45. —
46. —
47. —
48. —
49. Pressure sensor (for brake oil pressure) (for secondary steering) (for efficient loading system)
50. —
51. Pressure sensor (for inching & stop lamp)
52. —
53. —
54. —
55. Brake piston chamber (for parking)
56. —
57. —
58. —
59. —
60. —
61. Bleed screw
62. —
63. —
64. —
65. —
66. —
67. —
68. —
69. —
70. —
71. —
72. —
73. —
74. —
75. —
76. —
77. —
78. —
79. —
80. —
81. Line filter
82. —
83. Suction strainer



(FM)
09701-03611
K115V2U92002

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Interior schematic (simple explanation)



Numbers below also correspond to page 32-20.

1. —
2. —
3. —
4. —
5. Clutch pressure regulator valve
6. Proportional relief valve
7. Priority valve
8. T/C inlet relief valve
9. Check valve (1)
10. Check valve (2)

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FAULT CODE/ LAMP	DESCRIPTION	QSB4.5 (60ZV-2)	QSB6.7 (70ZV-2) (70TMV-2)	QSC8.3 (80ZV-2)	QSC8.3 (85ZV-2)	QSM11 (90ZV-2)	QSM11 (92ZV-2)	QSX15 (95ZV-2)	QSK19 (115ZV-2)	QST30 (135ZV-2)
EG173 Yellow	Rack Actuator - mechanically stuck open.									○
EG184 Yellow	Engine Control Module Identification Input State Error.	○	○	○	○					○
EG185 Yellow	Engine Control Module Network Communication Error.									○
EG187 Yellow	Sensor Supply Voltage #2 Circuit - shorted low.	○	○	○	○	○	○	○	○	
EG212 Yellow	Engine Oil Temperature Sensor Circuit - shorted high.					○	○	○		
EG213 Yellow	Engine Oil Temperature Sensor Circuit - shorted low.					○	○	○		
EG214 Red	Engine Oil Temperature High - Critical.					○	○	○		
EG221 Yellow	Ambient Air Pressure Sensor Circuit - shorted high.	○	○	○	○	○	○	○	○	○
EG222 Yellow	Ambient Air Pressure Sensor Circuit - shorted low.	○	○	○	○	○	○	○	○	○
EG227 Yellow	Sensor Supply Voltage #2 Circuit - shorted high.	○	○	○	○	○	○	○	○	
EG231 Yellow	Engine Coolant Pressure Sensor Circuit - shorted high.									○
EG232 Yellow	Engine Coolant Pressure Sensor Circuit - shorted low.									○
EG233 Yellow	Engine Coolant Pressure Low - warning.									○
EG234 Red	Engine Speed High - critical.	○	○	○	○	○	○	○	○	○
EG238 Yellow	Sensor Supply Voltage #3 Circuit - shorted low.	○	○	○	○				○	
EG254 Red	Fuel Shutoff Valve Circuit - shorted low.					○	○	○		○
EG255 Yellow	Fuel Shutoff Valve Circuit - shorted high.					○	○	○		
EG259 Red	Fuel Shutoff Valve - stuck open.									○
EG261 Yellow	Fuel Temperature High - warning.								○	
EG263 Yellow	Fuel Temperature Sensor Circuit - shorted high.								○	
EG265 Yellow	Fuel Temperature Sensor Circuit - shorted low.								○	
EG266 Red	Engine Fuel Temperature - data valid but above normal operational range - most severe level.								○	
EG271 Yellow	Fuel Control Actuator Circuit - shorted low.	○	○	○	○				○	
EG272 Yellow	Fuel Control Actuator Circuit - shorted high.	○	○	○	○				○	
EG281 Yellow	Injection Pump Mechanical System - signal not in range from ECM.	○	○	○	○					
EG284 Yellow	Engine Speed / Position Sensor #1 (Crankshaft) Supply Voltage Circuit - shorted low.							○		
EG285 Yellow	SAE J1939 Data Link Multiplexing PGN Timeout Error.	○	○	○	○	○	○	○	○	

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10. Measure and record the pressure in each speed range.

Note
Change the transmission speed range while keeping the shift lever at the neutral position. Check that the pressure instantaneously lowers just after speed change, and then rises to the original pressure again.

Possible causes for low clutch pressure

Possible cause	Solution
Malfunctioning modulator valve operation	Inspection & repair
Defective MCU	Replacement
Oil leakage from clutch	Disassembly & repair

Time lag measurement procedure

⚠ WARNING

Unexpected movement of the machine may cause an accident resulting in injury or death.
To crawl under the machine, be sure to stop the engine, and block the tires with chocks to prevent them from moving. Give signals to the person in the cab during the work.

Standard measurement value

Clutch time lag (sec)	Neutral→1st forward speed (engine speed: 1,500 min^{-1} (rpm))	0.3±0.1

1. Press the brake pedal, and set and confirm the transmission shift lever is at the neutral position.
2. Set and confirm the parking brake is at the "ON" position.
3. Press the brake pedal.
4. Lower the boom to the lowest limit, and fully roll back the bucket until the bucket contacts to the stopper.
5. Set the parking brake switch to the "OFF" position. Do not apply the service brakes.
6. Set the transmission shift lever to the neutral 1st speed.
7. Keep the engine speed at 1,500 min^{-1} (rpm).
8. Move the shift lever to the forward position. At the same time, start the stop watch to measure the time required before the machine moves.

Possible causes for clutch time lag

Possible cause	Solution
Defective accumulator limit switch	Replacement
Malfunctioning modulator valve operation	Inspection & repair
Defective MCU	Replacement
Defective clutch	Disassembly & repair

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(kgf-m)

Type	Bolt size			Bolt strength	
	Nominal dimension	Nominal diameter	Pitch	8.8 (8T)	10.9 (11T)
Metric thread	M8	8	(C) 1.25	2.7	3.9
	M10	10	(C) 1.5	5.4	7.8
			(F) 1.25	5.6	8.2
	M12	12	(C) 1.75	9.2	13.5
			(F) 1.25	9.8	14.5
	M14	14	(C) 2.0	14.5	21.0
			(F) 1.5	15.5	22.5
	M16	16	(C) 2.0	22.0	32.0
			(F) 1.5	23.0	33.7
	M18	18	(C) 2.5	30.5	44.5
			(F) 1.5	33.0	48.5
	M20	20	(C) 2.5	42.5	62.0
			(F) 1.5	46.0	67.5
	M22	22	(C) 2.5	57.0	83.0
			(F) 1.5	61.0	89.5
	M24	24	(C) 3.0	73.5	105.0
			(F) 2.0	78.5	115.0
	M27	27	(C) 3.0	105.0	155.0
			(F) 2.0	115.0	165.0
	M30	30	(C) 3.5	145.0	215.0
			(F) 2.0	160.0	230.0
	M33	33	(C) 3.5	195.0	290.0
			(F) 2.0	210.0	310.0
Unified thread	5/16	05	18 UNC	2.5	3.6
	3/8	06	16 UNC	4.5	6.6
	7/16	07	14 UNC	7.2	10.5
	1/2	08	13 UNC	10.5	15.0
	9/16	09	12 UNC	15.0	22.0
	5/8	10	11 UNC	20.5	30.0
	3/4	12	10 UNC	36.5	53.5
	7/8	14	9 UNC	56.5	82.5
	1	16	8 UNC	88.5	130.0

Note: Tighten the bolts according to the above list, unless otherwise specified.

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2. Machine dose not move at a certain shift lever position. (OR:Machine moves only in a certain shift lever position.)

Check before starting work.

1. Check the error code No. shown on the MODM.

Possible cause	Machine does not move at a certain shift lever position, but moves at all the other positions.	Machine moves at a certain shift lever position, but hesitates to move at any other positions.	Torque converter oil looks and smells as if it was scorched (black).	Clutch oil pressure is low at a certain position only. At all the other positions, the pressure is normal.	Resistance of the solenoid valve coil is infinite Ω.	24V power is not supplied to the solenoid valve.	Even when pressing solenoid valve, machine does not move.	Clutch oil pressure is always high despite shift lever position.	Clutch can be engaged at a certain shift lever position, though the clutch will not be engaged at any other position.	F5 fuse blows.	Machine may move even when shift lever is in "NEUTRAL".	Solution
Clutch slipping	○		○				○					Disassembly & repair
Seized clutch		○	○								○	Disassembly & repair
Clutch oil leaks internally.	○		○	○			○					Disassembly & repair
Coil of clutch solenoid valve is defective.	○			○	○							Solenoid valve replacement
Harness of clutch solenoid valve disconnected	○					○						Repair cable
Clutch solenoid valve or clutch valve sticking in OFF position	○			○								Replacement or repair
Clutch solenoid valve or clutch valve sticking in ON position		○						○			○	Replacement or repair
Shift lever switch sticking in ON (regardless of position)		○							○		○	Shift lever replacement
Shift lever switch sticking in OFF (regardless of position)	○											Shift lever replacement
Damaged clutch solenoid valve diode										○		Solenoid valve replacement
Defective controller	○	○						○	○	○		Controller replacement
Short circuited clutch solenoid or wiring										○		Repair cable

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Item				Standard measurement values for performance check		Remarks
System	Measurement item			Normal	Fuel efficient mode	
Hydraulic line	Cylinder drift (when boom and bucket are horizontal and with no load) (mm/min) (in/min)	Boom cylinder		3 (1/8) or less		
		Bucket cylinder		4 (5/32) or less		
	Boom rising time (no load) (sec)	Engine speed	Idling (LI)	25±3.0		
			1,500 min^{-1} (rpm)	10.5±1.0		
			Maximum (HI)	8.4±0.5		
	Full steering time (sec)	Engine speed	Idling (LI)	5.0±0.5		
			1,500 min^{-1} (rpm)	3.9±0.3		
			Full accelerated engine speed	3.9±0.5		
	Relief valve setting pressure MPa (kgf/cm^2) (psi)	Loading line main relief pressure (HI)		20.6±0.5 (210±5) (2,986±71)		
		Loading line overload relief pressure (LI)		23.5±0.5 (240±5) (3,413±71)		Run engine at lowest possible speed while setting
		Steering line main relief pressure (HI)		20.6±0.5 (210±5) (2,986±71)		
		Steering line overload relief pressure (LI)		$24.5\ ^{+1.0}_{0}$ (250^{+10}_{0}) ($3,555\ ^{+142}_{0}$)		Run engine at lowest possible speed while setting
		Pilot line reducing pressure (LI)		3.5 (36) (512)		Run engine at lowest possible speed while setting
	Fan maximum revolution (HI) min^{-1} (rpm)	Engine water temp. <80ºC (180ºF) T/C oil temp. <110ºC (230ºF) Hydraulic oil temp. <90ºC (195ºF)		$1,120\ ^{+75}_{-200}$		
		Engine water temp. >95ºC (205ºF) T/C oil temp. >115ºC (240ºF) Hydraulic oil temp. >95ºC (205ºF)		$1,300\ ^{+100}_{-50}$		
	Fan minimum revolution (LI) min^{-1} (rpm)	Engine water temp. <60ºC (140ºF) Engine idle revolution		$900\ ^{+50}_{-200}$		

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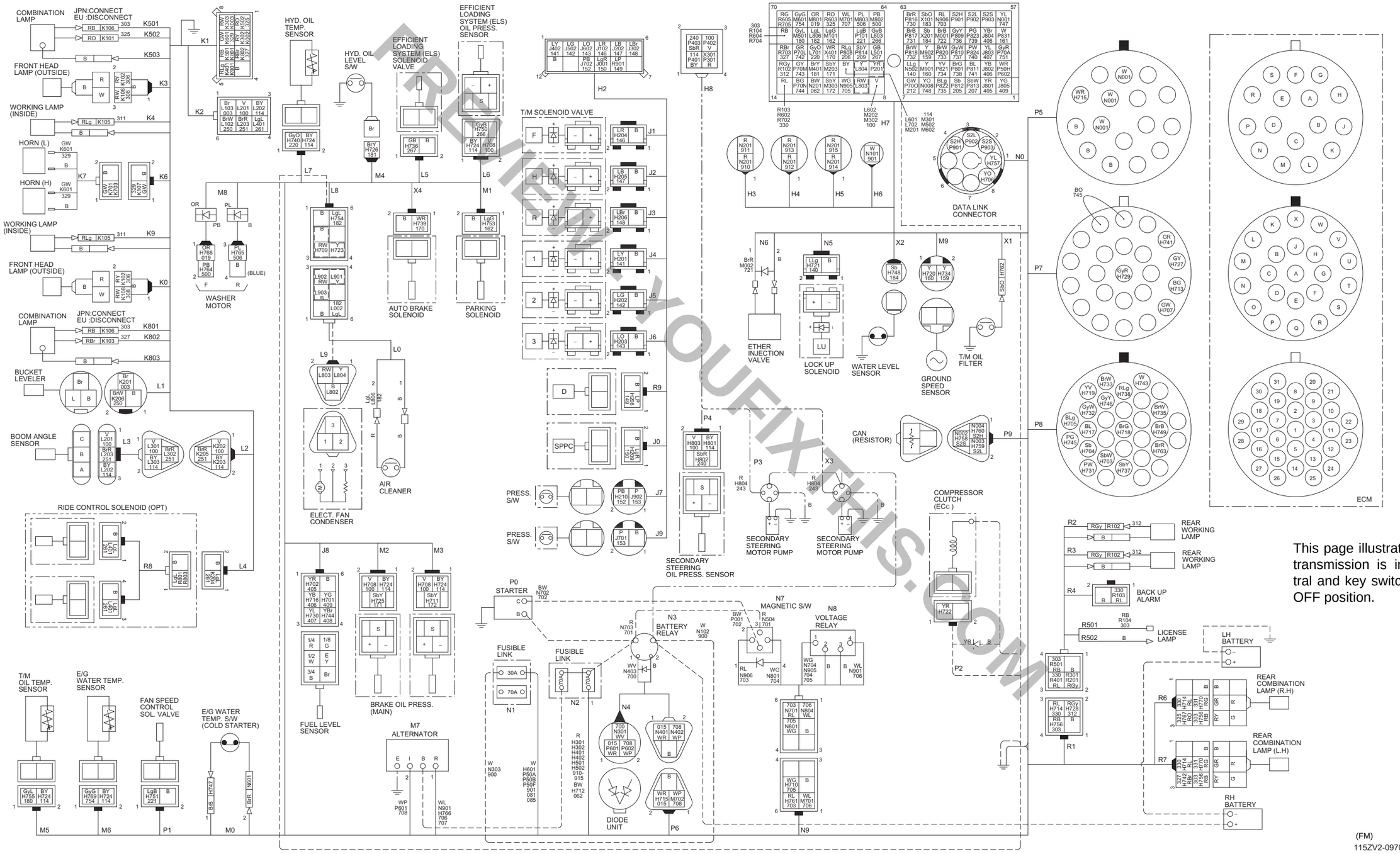
△ : First time replacement or cleaning only

Section	Item for check	Operating hours						When Required
		10	50	250	500	1000	2000	
Transmission & Torque Converter	Check Transmission Oil Level	○						
	Replace Transmission Oil Filter			△	○			
	Replace Transmission Oil					○		
	Clean or Replace Transmission Breather					○		
Axle system	Check Tire for Damage, Air and Tread Depth	○						
	Greasing (Axle support)		○					
	Check Tire Air Pressure		○					
	Greasing (Pillow block bearing unit)			○				
	Check Differential Gear Oil			○				
	Check Planetary Gear Oil			○				
	Check Tightness of Wheel Bolts			○				
	Greasing (Differential seals)					○		
	Greasing (2nd Propeller Shaft Spline)						○	
	Replace Differential Gear Oil						○	
	Replace Planetary Gear Oil						○	
	Greasing (1st Propeller Shaft)	Every 12000 hours ○						
	Greasing (2nd Propeller Shaft)	Every 12000 hours ○						
	Greasing (3rd Propeller Shaft)	Every 12000 hours ○						
Steering system	Check Steering Wheel Operation	○						
	Greasing (Steering Cylinder)		○					
	Clean Filter for Orbitrol®			△			○	
Brake system	Check Service Brake Operation	○						
	Check Parking Brake Operation	○						
	Check Parking Brake Oil			○				
	Clean Filter for Brake Line			△			○	
	Replace Parking Brake Oil						○	
	Check Service Brake Disk Wear						○	
	Check Brake Accumulator						○	
Loading system	Check Hydraulic Oil Level	○						
	Greasing		○					
	Replace Hydraulic Oil Return Filter			△		○		
	Replace Hydraulic Oil, Clean Filter						○	
	Replace Filter in the Hydraulic Tank Cap (S/N ~9150)						○	
	Replace Filter in the Hydraulic Tank Breather Valve (S/N 9151~)						○	
	Replace Bucket Teeth (option)							○
	Replace Cutting Edge (option)							○

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Electrical Wiring Diagram (3/3) (S/N 9001~9006)

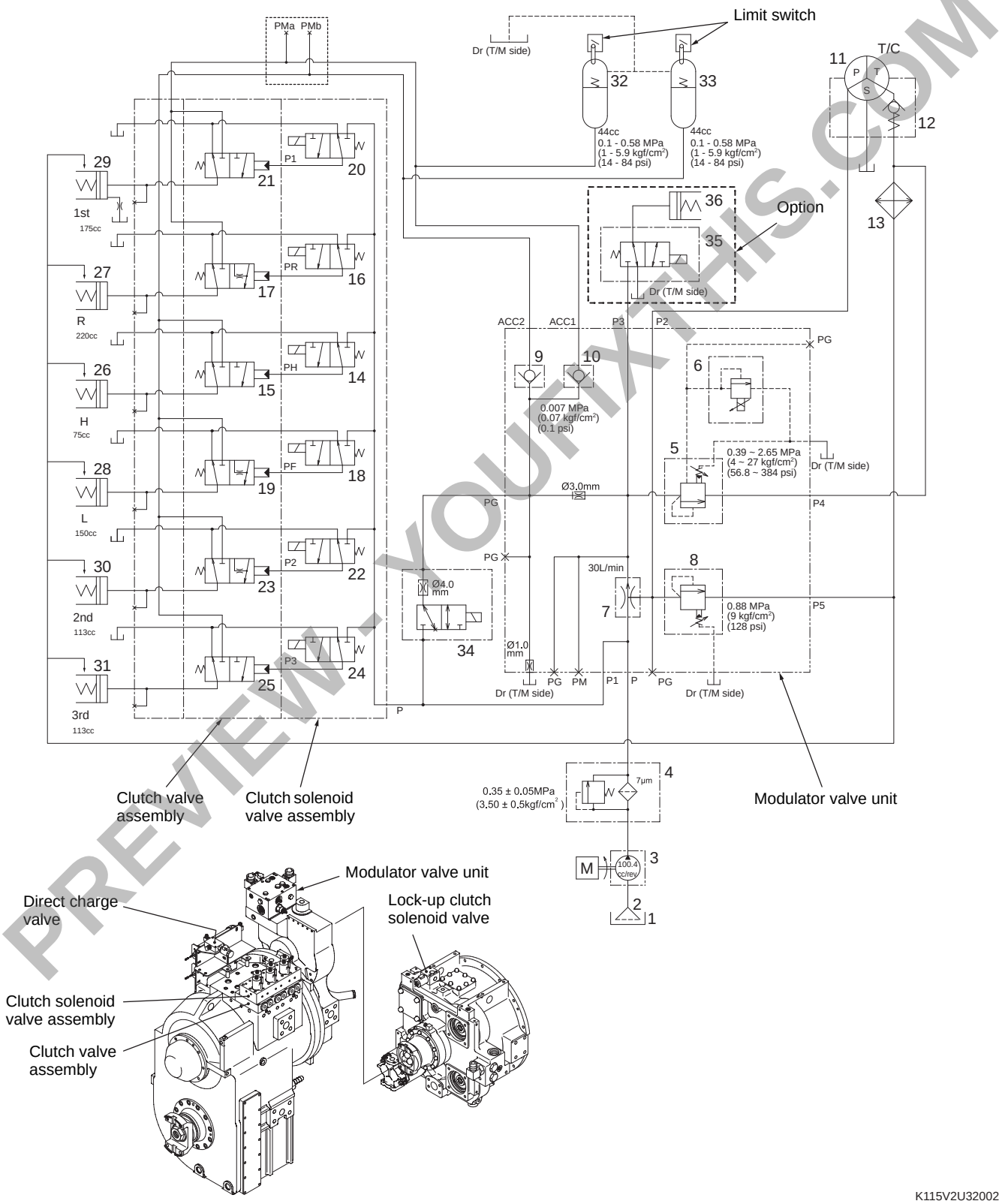


This page illustrates the transmission is in neutral and key switch is in OFF position.

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Hydraulic Circuit Diagram

Neutral position



K115V2U32002

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FAULT CODE/ LAMP	DESCRIPTION	QSB4.5 (60ZV-2)	QSB6.7 (70ZV-2) (70TMV-2)	QSC8.3 (80ZV-2)	QSC8.3 (85ZV-2)	QSM11 (90ZV-2)	QSM11 (92ZV-2)	QSX15 (95ZV-2)	QSK19 (115ZV-2)	QST30 (135ZV-2)
EG286 Yellow	SAE J1939 Data Link Multiplexing Configuration Error.	○	○	○	○	○	○	○	○	
EG287 Red	SAE J1939 Multiplexing Accelerator Pedal Sensor System Error.	○	○	○	○	○	○	○		
EG295 Yellow	Ambient Air Pressure Sensor Circuit - data incorrect.					○	○	○		
EG299 Yellow	Engine stopped not using Starter Switch.					○	○	○		
EG311 Yellow	Injector Solenoid Valve Cylinder #1 Circuit - grounded circuit.					○	○			
EG312 Yellow	Injector Solenoid Valve Cylinder #5 Circuit - grounded circuit.					○	○			
EG313 Yellow	Injector Solenoid Valve Cylinder #3 Circuit - grounded circuit.					○	○			
EG314 Yellow	Injector Solenoid Valve Cylinder #6 Circuit - grounded circuit.					○	○			
EG315 Yellow	Injector Solenoid Valve Cylinder #2 Circuit - grounded circuit.					○	○			
EG319 Yellow	Real Time Clock - power Interrupt.					○	○	○		
EG321 Yellow	Injector Solenoid Valve Cylinder #4 Circuit - grounded circuit.					○	○			
EG322 Yellow	Injector Solenoid Valve Cylinder #1 Circuit - open circuit.	○	○	○	○	○	○		○	
EG323 Yellow	Injector Solenoid Valve Cylinder #5 Circuit - open circuit.	○	○	○	○	○	○		○	
EG324 Yellow	Injector Solenoid Valve Cylinder #3 Circuit - open circuit.	○	○	○	○	○	○		○	
EG325 Yellow	Injector Solenoid Valve Cylinder #6 Circuit - open circuit.	○	○	○	○	○	○		○	
EG331 Yellow	Injector Solenoid Valve Cylinder #2 Circuit - open circuit.	○	○	○	○	○	○		○	
EG332 Yellow	Injector Solenoid Valve Cylinder #4 Circuit - open circuit.	○	○	○	○	○	○		○	
EG334 Yellow	Coolant Temperature Sensor Circuit - data erratic, intermittent, or incorrect.	○	○	○	○					
EG341 Yellow	Engine Control Module - data lost.					○	○	○		
EG342 Red	Engine Control Module - out of calibration.									○
EG343 Yellow	Engine Control Module - warning internal hardware failure.	○	○	○	○	○	○	○		○
EG346 Yellow	Engine Control Module - warning software error.									○
EG351 Yellow	Injector Power Supply.	○	○	○	○				○	
EG352 Yellow	Sensor Supply Voltage #1 Circuit - shorted low.	○	○	○	○	○	○	○	○	
EG378 Yellow	Fueling Actuator #1 Circuit - open circuit.							○		
EG379 Yellow	Fueling Actuator #1 Circuit - grounded circuit.							○		
EG386 Yellow	Sensor Supply Voltage #1 Circuit - shorted high.	○	○	○	○	○	○	○	○	

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Cautions on Hydraulic Parts Replacement

After oil or a part is replaced, malfunction or seizure may occur during running-in. Such trouble is often caused by faulty air bleeding or lubrication after replacement.

After replacing oil or a part, be sure to observe the following work procedure to prevent occurrence of trouble.

Work procedure

1. In the case of new oil pump, lubricate its inside with new oil prior to installation, and confirm that it can be turned smoothly by hand.

2. After the oil pump or cylinder was made empty for oil replacement, repair, etc., restart the operation as follows.

(a) Before installing pipes, pour new oil into the pump or the cylinder.

(b) Operate the engine at low-idling speed for 5 minutes or more. Do not operate any hydraulic functions during this period.

(c) While keeping the engine at low-idling speed, move each cylinder 5 times or more respectively.

At this time,
- Move each cylinder to a place near the stroke end so that hydraulic pressure does not go over relief.
- Lower the boom slowly. Dump the bucket slowly. Do not activate the make up valves from rapid activation of circuits.

(d) Perform general operations, and confirm that abnormal sound, heat generation and any other abnormality is not detected.

(e) Observe the hydraulic oil level sight gauge and confirm that there are no bubbles in the hydraulic oil.

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(lb-ft)

Type	Bolt size			Bolt strength	
	Nominal dimension	Nominal diameter	Pitch	8.8 (8T)	10.9 (11T)
Metric thread	M8	8	(C) 1.25	19.5	28
	M10	10	(C) 1.5	39	56
			(F) 1.25	40	59
	M12	12	(C) 1.75	66	97
			(F) 1.25	70	105
	M14	14	(C) 2.0	105	150
			(F) 1.5	110	160
	M16	16	(C) 2.0	160	230
			(F) 1.5	165	245
	M18	18	(C) 2.5	220	320
			(F) 1.5	235	350
	M20	20	(C) 2.5	305	450
			(F) 1.5	330	490
	M22	22	(C) 2.5	410	600
			(F) 1.5	440	650
	M24	24	(C) 3.0	530	760
			(F) 2.0	565	830
	M27	27	(C) 3.0	760	1,120
			(F) 2.0	830	1,190
	M30	30	(C) 3.5	1,050	1,550
			(F) 2.0	1,160	1,660
	M33	33	(C) 3.5	1,410	2,100
			(F) 2.0	1,520	2,240
Unified thread	5/16	05	18 UNC	18.0	26
	3/8	06	16 UNC	32	47
	7/16	07	14 UNC	52	76
	1/2	08	13 UNC	76	105
	9/16	09	12 UNC	110	160
	5/8	10	11 UNC	150	215
	3/4	12	10 UNC	265	385
	7/8	14	9 UNC	410	595
	1	16	8 UNC	640	940

Note: Tighten the bolts according to the above list, unless otherwise specified.

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3. Machine moves at the neutral position. (Example: Machine moves forward at the neutral position.)

Check before starting work.
1. Check that the ground is level.
2. Check the error code No. shown on the MODM.

Possible cause	When the lever is shifted to the forward position, the machine moves forward.	When the lever is shifted to the reverse position, the machine does not move reverse (as if the brake is applied).	Oil is black and smells scorched.	Solution
Seized clutch on forward side *	○	○	○	T/M disassembly & repair
Malfunctioning forward solenoid valve (sticking at ON position) *	○	○		Solenoid valve replacement
Defective controller (malfunctioned after outputting "F") *	○	○		Controller replacement
Defective shift lever (switch stuck in "F" position) *	○			Shift lever replacement

Remarks

* The same possible cause but involving the reverse clutch or circuit could occur with the opposite symptoms.

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Item				Standard measurement values for performance check		Remarks
System	Measurement item			Normal	Fuel efficient mode	
Brake	Performance of service brake	Shift lever position	2nd speed reverse	Slowly increase the engine speed, and check that the machine does not move at the maximum engine speed.		
		Engine speed	Maximum (HI)			
	Performance of parking brake	Shift lever position	3rd speed reverse	Same as above		Before brake check, be sure to disconnect the cable connector of parking brake solenoid valve.
		Engine speed	Maximum (HI)			
	Brake line setting pressure MPa (kgf/cm^2) (psi)	Unloader valve setting pressure	Off (Cut-out)	11.8±0.5 (120±5) (1,706±71)		
			On (Cut-in)	6.9±1.0 (70±10) (995±142)		
		Low-pressure alarm switch setting pressure (For brake accumulator circuit)		3.9±0.5 (40±5) (569±71)		
		Auto brake reducing pressure		1.3 (13) (185)		
	Accumulator charge time (sec)	Engine speed (LI)	The time from the low-pressure alarm is turned off till the unloading valve cuts off pressure	16		
	Number of brake pedal applications	Run engine 1 minute high idle, then stop the engine. (Turn key switch "ON" with engine off.) Step on the brake pedal and release, and check the number of times until the low-pressure alarm is turned on.		at least 11 times		Repeat stepping on the brake pedal as follows: On: 5 sec. Off: 5 sec.
	Declutch engagement (cm) (in)	Engine: Maximum speed/ Declutch pedal: Quick release (Distance the loader rolls back before moving forward.)		15 (6) or less		1/5 slope (approx. 11º), unladen, 1st speed

Note
These are the standard measurement values for the machines at the time when delivered from the factory.

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