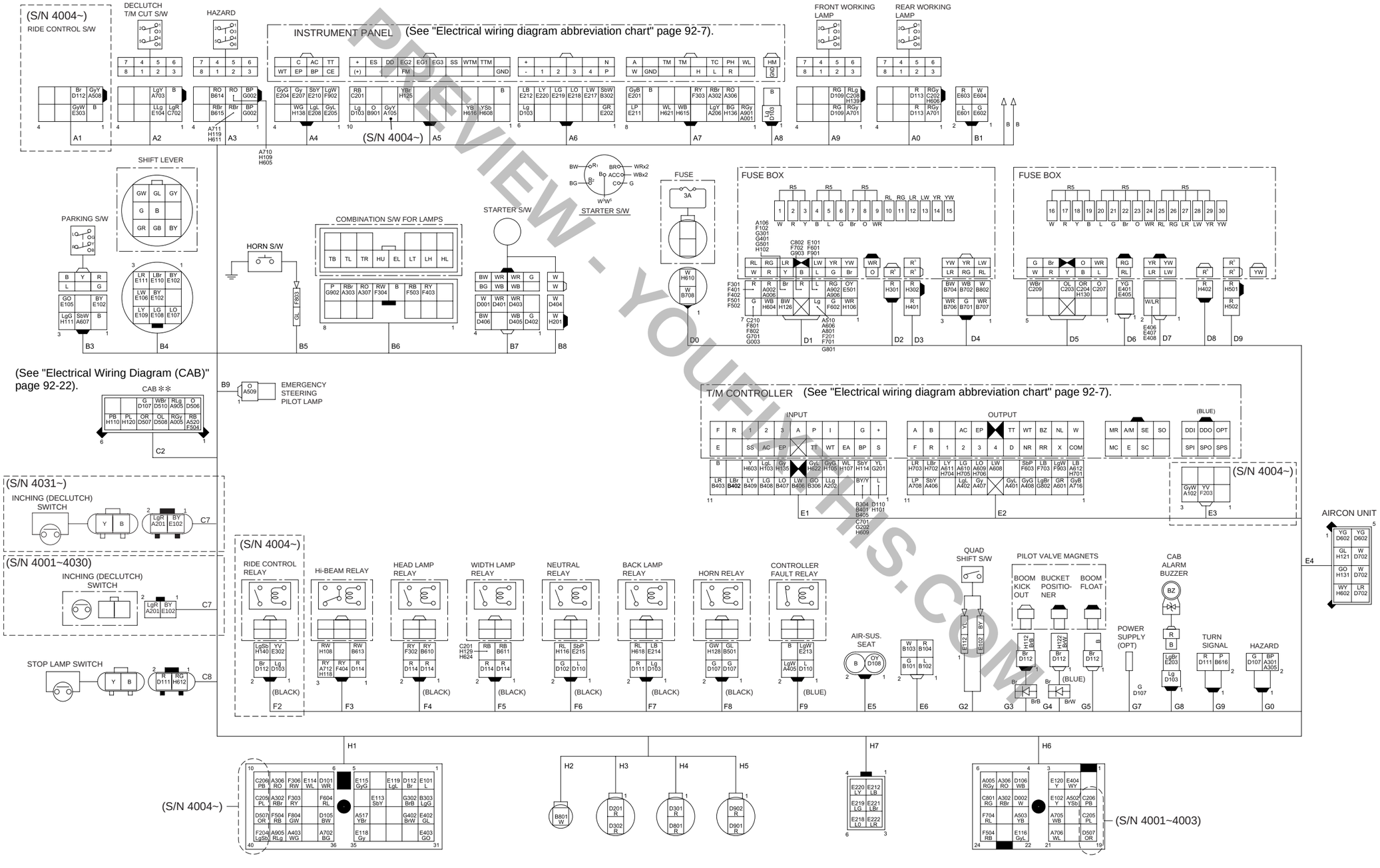
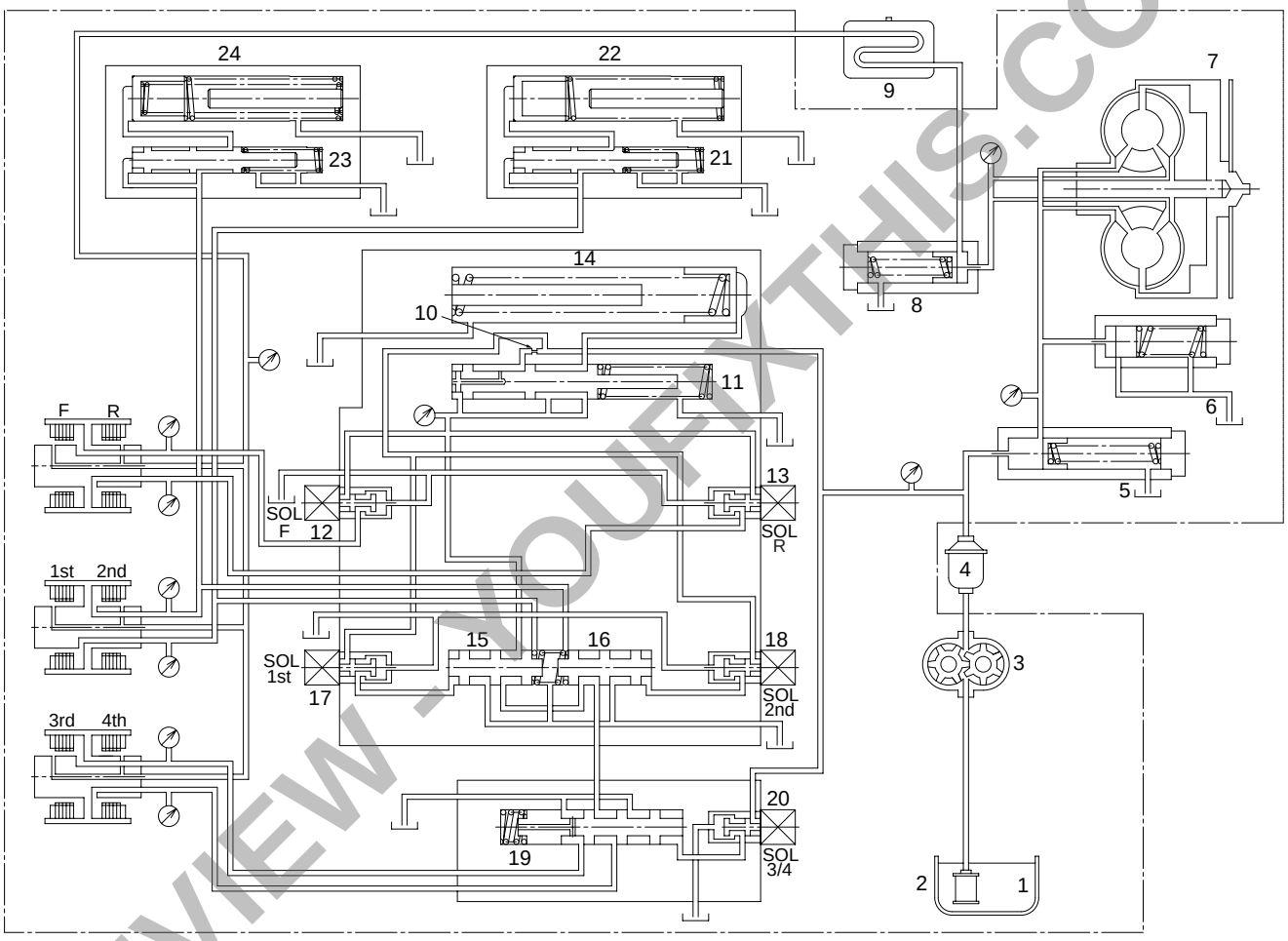
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Hydraulic System Diagram



65V2E32014

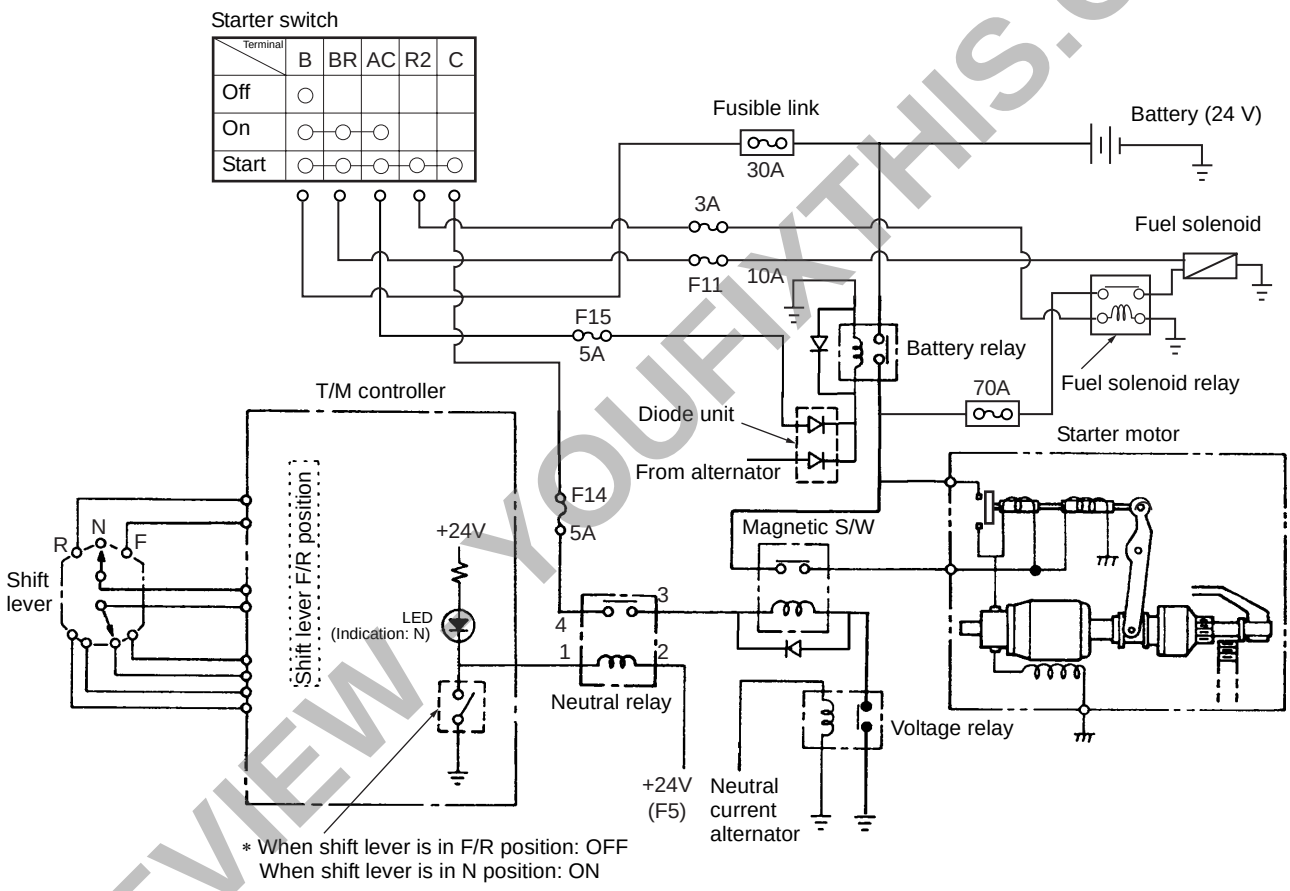
1. Transmission case
2. Suction strainer
3. Torque converter pump
4. Line filter
5. Clutch pressure regulator valve
6. Torque converter inlet pressure regulator valve
7. Torque converter
8. Torque converter outlet pressure regulator valve
9. Oil cooler
10. Fixed orifice A
11. Main pressure detection valve
12. Forward solenoid valve
13. Reverse solenoid valve
14. Main accumulator
15. 1st speed shift spool
16. 2nd speed shift spool
17. 1st speed solenoid valve
18. 2nd speed solenoid valve
19. 3rd, 4th speed shift spool
20. 3rd, 4th speed solenoid valve
21. 1st speed pressure detection valve
22. 1st speed accumulator
23. 2nd speed pressure detection valve
24. 2nd speed accumulator

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Engine Start Circuit

Engine start circuit diagram



65ZV62014

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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 dia.	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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Failure code

The failure code is indicated in the failure code inspection window of the controller.

Code		Failure	Detection condition	Mode
Transmission Input Circuit Malfunction	11	Shift lever F and R contact ON at the same time	In case the failure continues for more than 3 seconds	A
	12	Shift lever any of more than two 1·2·3·4 contacts on at the same time	The same as the above	A
	23	Shift lever all 1·2·3·4 contacts OFF	In case all 1·2·3·4 signal OFF continues for more than 3 seconds	A
	25	QUAD switch malfunction	In case the switch is ON for more than 10 seconds	A
	26	Inching switch malfunction	In case the switch is ON for more than 3 minutes	A
Machine System Input Malfunction	31	Air cleaner element clogging	In case the failure continues for more than 2 seconds	B
	32	Transmission oil temperature high	The same as the above	B
	33	Engine water temperature high	The same as the above	B
	34	Engine oil pressure low	In case the failure continues for more than 2 seconds during engine running	B
	35	Brake oil pressure low	In case the brake oil pressure is low during engine running	B
Transmission Output Circuit Malfunction	51	1st solenoid valve malfunction	Output circuit is disconnected or short-circuited	A
	52	2nd solenoid valve malfunction	The same as the above	A
	53	3rd/4th solenoid valve malfunction	The same as the above	A
	55	F solenoid valve malfunction	The same as the above	A
	56	R solenoid valve malfunction	The same as the above	A
	72	Machine speed sensor malfunction	Input circuit is disconnected or short-circuited	A
	81	F·1 solenoid valve malfunction	Output circuit is disconnected or short-circuited	A
	82	F·2 solenoid valve malfunction	The same as the above	A

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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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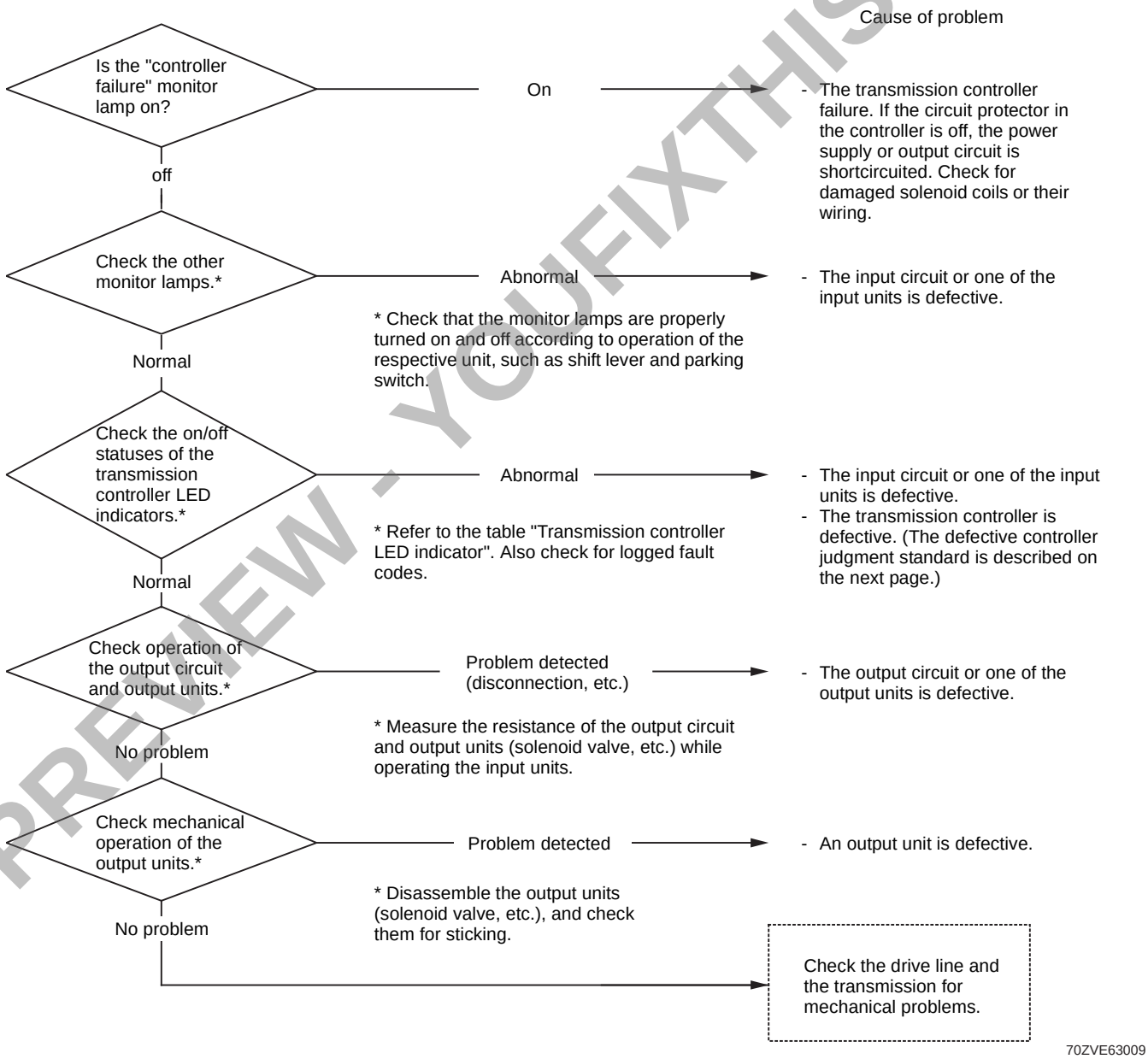
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Electrical Transmission Control System Troubleshooting Flowchart

For a problem regarding transmission control, check the electric control system first, and then check the mechanical system.

To check the electric control system, determine the cause of the problem while referring to the flowchart below, and then solve the problem.

Standard troubleshooting flowchart



70ZVE63009

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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				
Engine	Engine speed (min^{-1}) (rpm)	Minimum no-load speed, Low Idle (LI)		825 ± 50	
		Maximum no-load speed, High Idle (HI)		2,400 ± 30	
		Maximum speed in torque converter stall mode		2,275 ± 100	
		Maximum speed in multiple control valve relief mode		2,300 ± 100	
		Maximum speed in torque converter stall plus multiple control valve relief mode		$1{,}720\ ^{+150}_{-100}$	
Transmission	Clutch pressure MPa (kgf/cm^2) (psi)	Engine speed	Idling (LI)	1.5 (15) (213) or more	
			Maximum (HI)	1.8~2.1 (18~21) (256~299)	
	Clutch time lag (sec)	Neutral→Forward 1st speed (engine speed: 1,500 min^{-1} (rpm))		0.3 ± 0.1	Before wheel move
Hydraulic pressure	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)	17.9 ± 3.0	
			1,500 min^{-1} (rpm)	8.9 ± 1.0	
			Maximum (HI)	5.4 ± 0.5	
	Full steering time (sec)	Engine speed	Idling (LI)	3.4 ± 0.5	
			1,500 min^{-1} (rpm)	2.3 ± 0.3	
			Maximum (HI)	2.3 ± 0.3	
	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
		Fan motor line relief pressure (HI) (Reference values)		∗Low press.: 4.6 ± 0.69 (47 ± 7)(669 ± 100) ∗High press.: 10.3 ± 0.2 (105 ± 2)(1,493 ± 29)	
		Pilot line reducing pressure (LI)		3.5 (36) (512)	
	Fan Max.revolution min^{-1} (rpm)	Engine water temp. <87 ºC (190 ºF)		$1{,}120^{+75}_{-50}$	∗ Low press.: 4.6 ± 0.69
		Engine water temp. >95 ºC (203 ºF)		$1{,}600^{+75}_{-50}$	∗High press.:10.3 ± 0.2

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Inspection and maintenance table

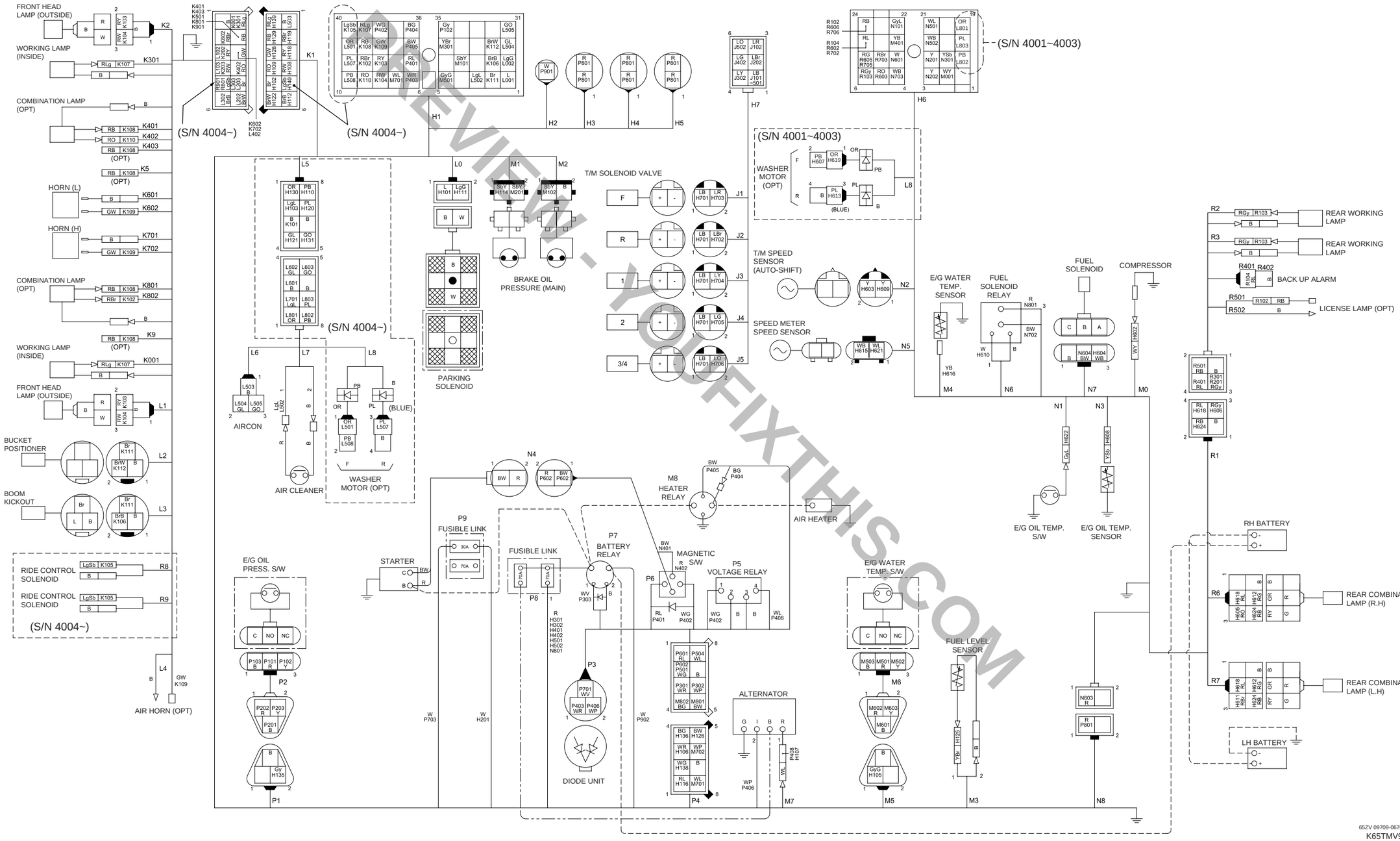
△ : First time replacement or cleaning only

Section	Item for check	Operating hours						When Required
		10	50	250	500	1000	2000	
Engine	Check Engine Oil Level	○						
	Check Engine Coolant Level	○						
	Check Warning Lamps	○						
	Check Exhaust Gas	○						
	Drain Water and Sediment from Fuel Filter	○						
	Check Fuel Level	○						
	Check Drive Belt	○						
	Check Air Intake System	○						
	Check Cooling Fan	○						
	Drain Water and Sediment from Fuel Tank		○					
	Replace Engine Oil and Oil Filter Cartridge			○				
	Clean Fuel Prefilter				○			
	Replace Fuel Filter Cartridge				○			
	Inspect Automatic Belt Tensioner Pulley					○		
	Clean Fuel Tank						○	
	Check and Adjust Valve Lash Clearance						○	
	Check Vibration Damper						○	
	Clean or Replace Air Cleaner Element							○
	Clean Radiator / Air Cooler / Hydraulic Oil Cooler Fins							○
	Clean or Replace Air Cleaner Element	After six cleanings or once a year ○						
	Replace Coolant	Every 2 years or 3000 hours ○						
Transmission & Torque Converter	Check Transmission Oil Level	○						
	Replace Transmission Oil Filter Cartridge			△	○			
	Replace Transmission Oil					○		
	Clean or Replace Transmission Breather					○		

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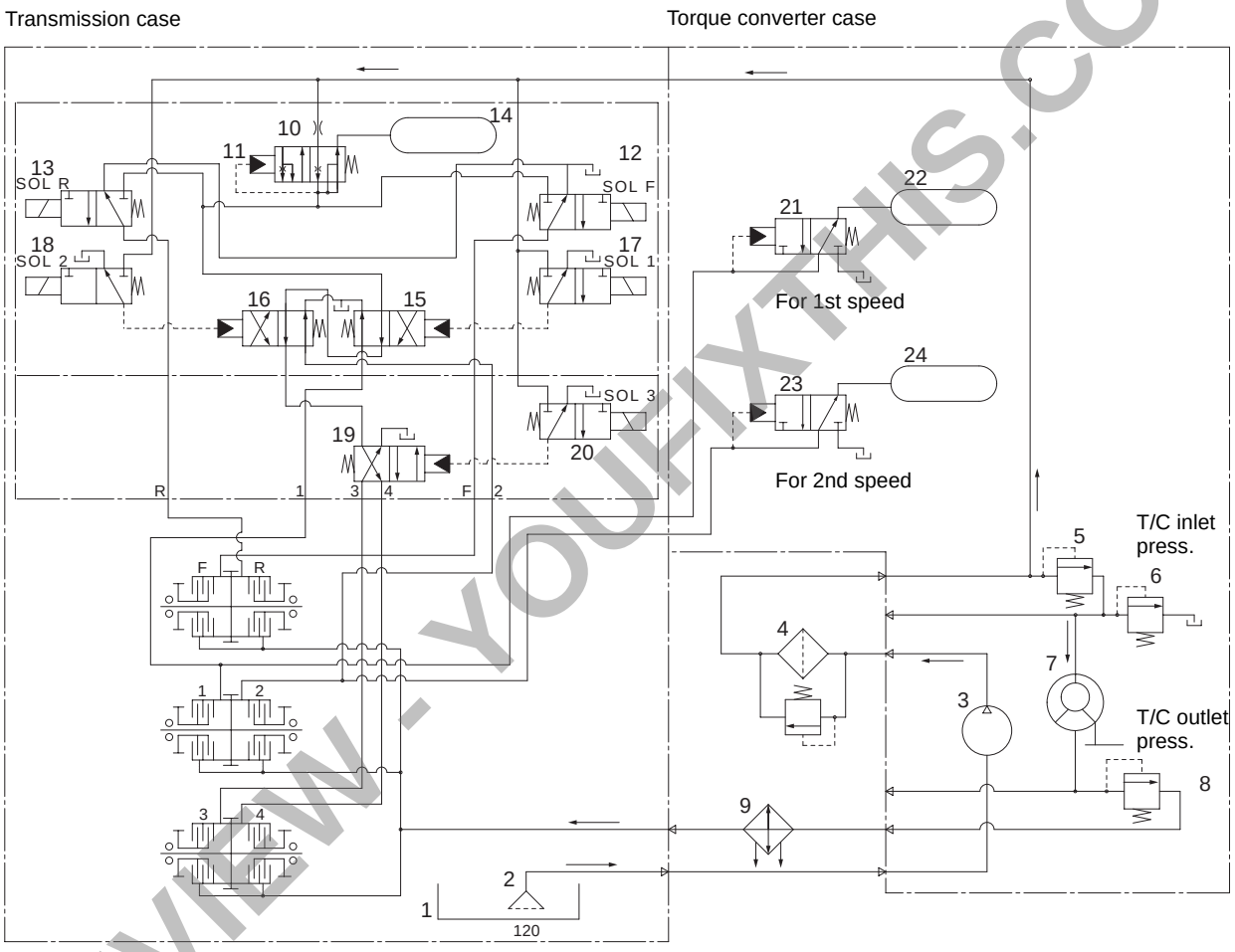
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65ZV 09709-06700US2/2
K65TMV92003

Hydraulic Circuit Diagram



K65ZV32004

1. Transmission case
2. Suction strainer
3. Torque converter pump
4. Line filter
5. Clutch pressure regulator valve
6. Torque converter inlet pressure regulator valve
7. Torque converter
8. Torque converter outlet pressure regulator valve
9. Oil cooler
10. Fixed orifice A
11. Main pressure detection valve
12. Forward solenoid valve
13. Reverse solenoid valve
14. Main accumulator
15. 1st speed shift spool
16. 2nd speed shift spool
17. 1st speed solenoid valve
18. 2nd speed solenoid valve
19. 3rd, 4th speed shift spool
20. 3rd, 4th speed solenoid valve
21. 1st speed pressure detection valve
22. 1st speed accumulator
23. 2nd speed pressure detection valve
24. 2nd speed accumulator

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(kgf-m)

Type	Bolt size			Bolt strength	
	Nominal dimension	Nominal dia.	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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Code		Failure	Detection condition	Mode
Transmission Output Circuit Malfunction	83	F·3 solenoid valve malfunction	The same as the above	A
	85	R·1 solenoid valve malfunction	The same as the above	A
	86	R·2 solenoid valve malfunction	The same as the above	A
	87	R·3/4 solenoid valve malfunction	The same as the above	A
	FF	No failure record memorized		A

Malfunction mode symbol

Mode A
Transmission control input/output circuit malfunction.

1. If there was some abnormality during engine running, abnormal condition is memorized in the controller memory.

2. If more than one failure code is in memory the newest failure code will be displayed first (1 time only).

Mode B
Malfunction at chassis side.

1. If there was some abnormality during engine running, abnormal condition is memorized in the controller memory.

2. If the failure code memorized is more than one the newer failure code flashes on and off first in order.

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Standard measurement value MPa (kgf/cm^2) (psi)

Loading line main relief pressure (at maximum speed)	20.6 ± 0.5 (210 ± 5) (2,986 ± 71)
Loading line overload relief pressure (at idling speed)	23.5 ± 0.5 (240 ± 5) (3,413 ± 71)
Pilot line	3.5 (36) (512)

Hydraulic oil temp
50~80 ºC (120~180 ºF)

Reference

Releasing residual pressure from tank and pipes

Keep the bottom surface of the bucket horizontal, and stop the engine when the bucket is approximately 30 cm (1 ft.) above the ground.

Tilt down the bucket until it comes in contact with the ground. Place the bucket control lever in the roll back position, and then lower the boom.

Push down on, then open the cap of the hydraulic oil tank to release the residual pressure.

Measuring loading circuit main relief pressure

1. Unload the bucket.
2. Lower the boom to the lowest limit.
3. Attach the pressure gauge 30 MPa (300 kgf/cm^2) (5,000 psi) to the multiple control valve port (1).
4. Set the parking brake switch to the "ON" position.
5. Move the bucket control lever to the roll back position. Hold the lever at that position.
6. Increase the engine speed to the maximum, and measure and record the pressure using the pressure gauge.

Adjusting main relief pressure

Loosen the lock nut and adjust the pressure by the adjusting screw.

Turn clockwise the adjusting screw to raise the set pressure, or turn counterclockwise the adjusting screw to lower the set pressure.

IMPORTANT

At the completion of check and adjustment of main relief valve pressure, be sure to tighten the lock nut.

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Code

Code displayed: _0_
(Cab temperature sensor shorted)

1. Disconnect cab temperature sensor.

   Verify that error code changes to _1_ (Cab temperature sensor open).

(a) If error code changes, check cab sensor resistance. (See table 1).

- If sensor resistance is incorrect, replace sensor and retest.

- If resistance is OK, replace control panel.

(b) If error code remains _0_, check wiring back to control panel pin 19 (CAB TEMP) and pin 12 (CAB TEMP RTN) for shorts to each other, to battery, or to ground.

- If wiring is incorrect, repair or replace harness as necessary.

- If wiring is correct, replace control panel.

Code displayed: _1_
(Cab temperature sensor open)

1. Make sure cab temperature sensor is plugged in.

(a) If sensor is plugged in, go to step 2.

(b) If sensor is not plugged in, plug in and retest.

2. Disconnect cab temperature sensor and check cab sensor resistance (see table 1).

(a) If resistance is incorrect, replace cab temperature sensor and retest.

(b) If resistance is correct, check the wiring back to control panel pin 19 (CAB TEMP) and pin 12 (CAB TEMP RTN).

- If wiring is incorrect, repair or replace harness as necessary.

- If wiring is OK, replace the control panel.

Code displayed: _2_
(High pressure switch shorted to ground or battery)

1. Unplug control panel and check pin 7 (HP SWT 1) and pin 15 (HP SWT 2) on wire harness for shorts to ground or to battery or switched battery power.

(a) If short found, trace wire and repair or replace harness as necessary.

(b) If no short found, plug control back in. If code still displays, replace control panel.

Code displayed: _3_
(High pressure switch open on power up)

1. Unplug control panel and check continuity between pin 7 (HP SWT 1) and pin 15 (HP SWT 2) on wire harness.

(a) If continuity OK, plug control back in. If code still displays, replace control panel.

(b) If no continuity, remove the high pressure switch from its fitting and check its continuity.

- If no continuity, replace the high pressure switch.

- If continuity is OK, check continuity of circuits (HP SWT 1) and (HP SWT 2) between high pressure switch and control panel.

    - If continuity is OK, reconnect switch and control panel. If code still displays, replace control panel.

    - If no continuity, repair or replace harness as necessary.

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Hydraulic tank specifications

Type			Semi-closed type
Capacity (at center of oil level sight gauge) L (gal)			62 (16 US gal)
Return filter		Filtration area (cm^2)	10,400
		Filtration particle size (μm)	10
		Relief valve opening pressure (filter bypass) (MPa) (kgf/cm^2) (psi)	0.1 ± 0.02 (1.0 ± 0.2) (14 ± 2.8)
Suction strainer	Loading Pilot & brake Steering	Filtration area (cm^2)	1,640
		Filtration particle size (μm)	105
Breather valve (oil filling port)		Suction valve setting pressure (kPa) (kgf/cm^2) (psi)	1 (0.01) (0.14)
		Discharge valve setting pressure (kPa) (kgf/cm^2) (psi)	29 (0.3) (4.3)
		Filtration area (cm^2)	235
		Filtration particle size (μm)	10
		Pushing load before turning cap required for venting pressure, removing or installing cap N (kgf) (lb)	186 ~ 216 (19 ~ 22) (42 ~ 48)

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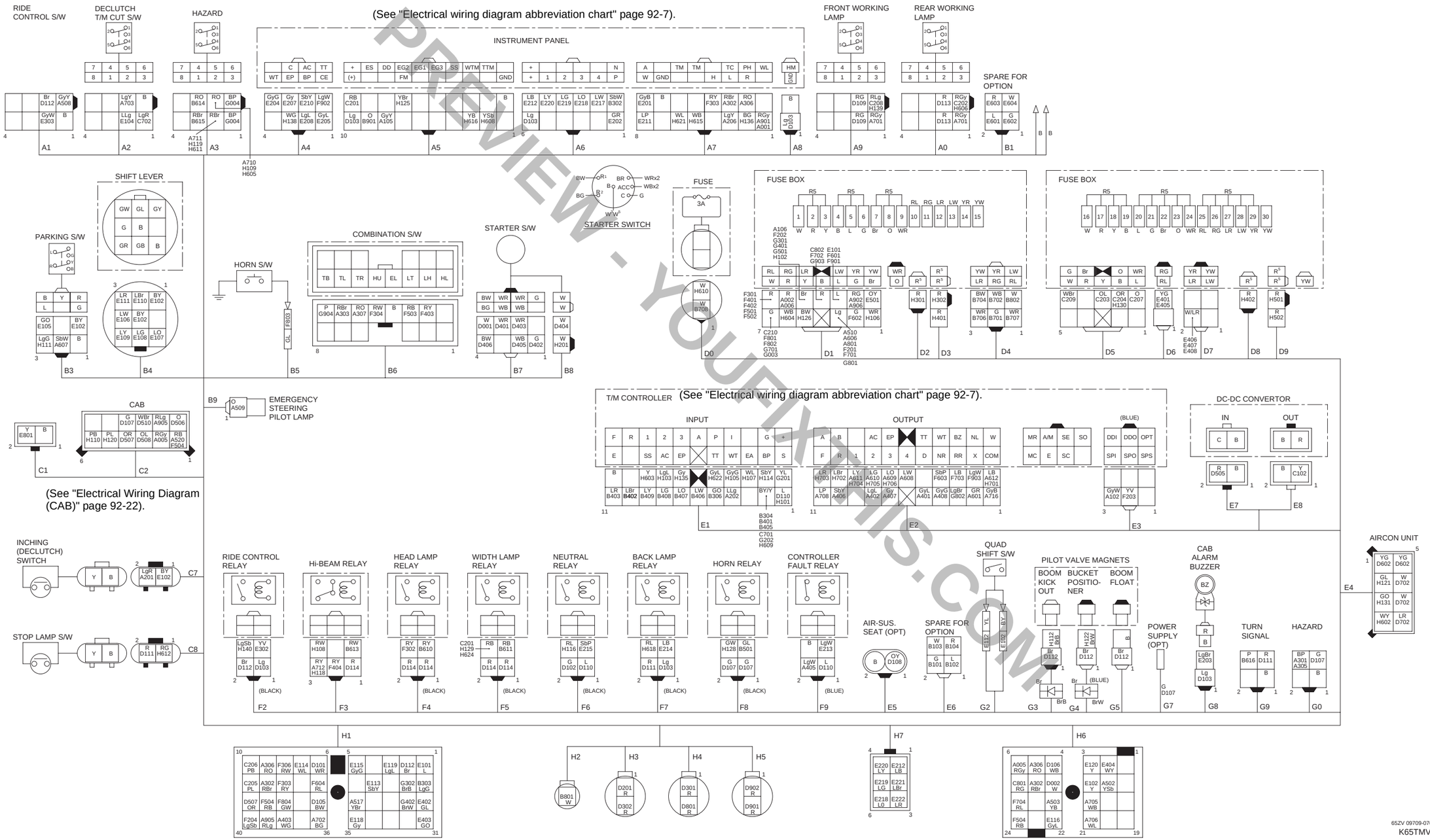
△ : First time replacement or cleaning only

Section	Item for check	Operating hours						When Required
		10	50	250	500	1000	2000	
Axle system	Check Tire for Damage, Air and Tread Depth	○						
	Greasing (Axle support)	○						
	Check Tire Air Pressure		○					
	Check Differential Gear Oil			○				
	Greasing (Pillow block bearing unit)			○				
	Check Tightness of Wheel Bolts			○				
	Greasing (2nd Propeller Shaft)						○	
	Greasing (3rd Propeller Shaft)						○	
	Replace Axle Gear Oil						○	
Steering system	Check Steering Wheel Operation	○						
	Greasing (Steering Cylinder)		○					
	Clean Filter for Orbitrol®			△			○	
Brake system	Check Service Brake Operation	○						
	Check Parking Brake Operation	○						
	Adjust Parking Brake Lining					○		
	Check Service Brake Disk Wear						○	
	Check Brake Accumulator						○	
	Clean Filter for Brake Line			△			○	
Loading system	Check Hydraulic Oil Level	○						
	Greasing		○					
	Replace Hydraulic Oil Return Filter			△		○		
	Replace Hydraulic Oil, Clean Filter						○	
	Replace Filter in the Oil Tank Cap						○	
	Replace Bucket Teeth (option)							○
	Replace Cutting Edge (option)							○

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