CEBM019905

Shop Manual

HD1500-7

DUMP TRUCK

SERIAL NUMBERS **A30001-A30048, A30056-A30057, A30065-A30066, A30071-A30072, A30076-A30077, A30081-A30084**

With SDA12V160 Engine

KOMATSU®

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FAILURE CODE [DW78KZ] REAR BRAKE COOLING VALVE: OPEN OR SHORT CIRCUIT

Action code	Failure code	Description	Rear brake cooling valve: Open or short circuit (Retarder controller system)
E01	DW78KZ		
Contents of trouble	• Since no current flows or overcurrent flows in BCV relay primary side, BCV relay cannot be turned ON/OFF. Accordingly, BCV solenoid cannot be driven.		
Controller Response	• Stops supplying current when BCV circuit is disconnected. • Turns output to BCV relay (CNR02-V) primary side OFF.		
Problem that appears on machine	• Since retarder is not cooled, it may overheat.		
Related information	• For troubleshooting for BCV relay (CNR02-V) secondary side, see [**B@C7NS**] or [**B@C8NS**]..		

Refer to page 8 in the electrical schematic for reference.

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective CNR02-V (BCV relay)	Turn starting switch OFF and disconnect CNR02-V (BCV relay), then perform troubleshooting without turning starting switch ON.		
			CNR02-V (female: Wiring harness side)	Resistance	
			Between (59) – (17)	100 – 500 Ω	
	2	Grounding fault in wiring harness (Contact with ground circuit)	Turn starting switch OFF and disconnect CNR02-V (BCV relay), then perform troubleshooting without turning starting switch ON.		
			Between CNR02-V (female) (59) – ground	Resistance	Min. 1 MΩ
	3	Disconnection in wiring harness (Disconnection in wiring or defective contact in connector)	Turn starting switch OFF and disconnect CNR02-V (BCV relay) and RCM3, then perform troubleshooting without turning starting switch ON.		
			Between RCM3 (female) (18) – CNR02-V (female) (59)	Resistance	Max. 1 Ω
			Between CNR02-V (female) (17) – (ground)	Resistance	Max. 1 Ω
	4	Defective retarder controller	If no other problems are found, the retarder controller may be defective.		

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FAILURE CODE [DXJ7KY] MID CLUTCH ECMV OUTPUT CIRCUIT: SHORT TO POWER

Action code	Failure code	Description	Mid clutch ECMV output circuit: Short circuit to power source line (Transmission controller system)
E03	DXJ7KY		
Contents of trouble	• When output to Mid clutch ECMV is turned "OFF", current flows to circuit.		
Controller Response	• Shifts up and holds the gear speed as shown in Table 2 depending on the gear speed before failure. • Turns lock up to OFF.		
Problem that appears on machine	• Once the gear shift lever is set to neutral, the machine cannot move off in any gear speeds.		
Related information	• Electric current of output to ECMV can be checked by monitoring function (code: 31640 (mA)).		

	Cause		Standard value in normal state/Remarks on troubleshooting		
Possible causes and standard value in normal state	1	Defective mid clutch ECMV	1) Turn starting switch OFF. 2) Connect T-adapter to connector CN15 (M,PS) (male).		
			Between CN15 (M,PS) (male) (1) – (2)	Resistance	5 – 15 Ω
			Between CN15 (M,PS) (male) (1), (2) – ground	Resistance	Min. 1 MΩ
	2	Hot short in wiring harness (a contact with 24 V circuit)	1) Turn starting switch OFF. 2) Disconnect connectors ATC3 and CN15 (M,PS). 3) Connect T-adapter to ATC3 (female). 4) Turn starting switch ON.		
			Between ground and wiring harness between ATC3 (female) (16) – CN15 (M,PS) (female) (1)	Voltage	Max. 1V
	3	Defective transmission controller	1) Turn starting switch OFF. 2) Connect T-adapter to connector ATC3 (female).		
			Between ATC3 (female) (16) – (3)	Resistance	5 – 15 Ω

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TABLE 3. SEAL RING SPECIFICATIONS AND WEAR LIMITS

No.	Description		Specifications			Remedy
			Standard - New	Tolerance	Minimum - Used	
22	Transmission input shaft seal ring (34.5 mm dia. seal ring)	Width	2.56 mm (0.101 in.)	-0.01 to -0.03 mm (-0.0004 to -0.0012 in.)	2.30 mm (0.091 in.)	Replace
		Thickness	1.70 mm (0.067 in.)	±0.1 mm (±0.004 in.)	1.55 mm (0.061 in.)	
23	Transmission input shaft seal ring (89 mm dia. seal ring)	Width	3.00 mm (0.118 in.)	-0.01 to -0.03 mm (-0.0004 to -0.0012 in.)	2.70 mm (0.106 in.)	
		Thickness	3.70 mm (0.146 in.)	±0.12 mm (±0.0047 in.)	3.55 mm (0.140 in.)	
24	No. 3 carrier seal ring	Width	4.00 mm (0.157 in.)	-0.01 to -0.03 mm (-0.0004 to -0.0012 in.)	3.60 mm (0.118 in.)	
		Thickness	4.50 mm (0.177 in.)	±0.12 mm (±0.0047 in.)	4.35 mm (0.171 in.)	
25	No. 4 carrier cover seal ring	Width	4.00 mm (0.157 in.)	-0.01 to -0.04 mm (-0.0004 to -0.0016 in.)	3.60 mm (0.118 in.)	
		Thickness	5.00 mm (0.248 in.)	±0.15 mm (±0.0059 in.)	4.85 mm (0.191 in.)	
26	Bearing cage seal ring (front)	Width	4.00 mm (0.157 in.)	-0.01 to -0.04 mm (-0.0004 to -0.0016 in.)	3.60 mm (0.118 in.)	
		Thickness	4.00 mm (0.157 in.)	±0.15 mm (±0.0059 in.)	3.85 mm (0.152 in.)	
27	Bearing cage seal ring (rear)	Width	4.50 mm (0.177 in.)	-0.01 to -0.03 mm (-0.0004 to -0.0012 in.	4.05 mm (0.159 in.)	
		Thickness	5.20 mm (0.157 in.)	±0.12 mm (±0.0047 in.)	5.05 mm (0.199 in.)	
28	Input shaft & intermediate shaft seal ring	Width	3.00 mm (0.118 in.)	-0.01 to -0.03 mm (-0.0004 to -0.0012 in.)	2.70 mm (0.106 in.)	
		Thickness	1.70 mm (0.067 in.)	±0.1 mm (±0.004 in.)	1.55 mm (0.061 in.)	
29	No 1 carrier collar (2 ea.), No. 7 clutch hub (2 ea.) & Output shaft collar (3 ea.)	Width	4.50 mm (0.177 in.)	-0.01 to -0.03 mm (-0.0004 to -0.0012 in.)	4.05 mm (0.159 in.)	
		Thickness	5.50 mm (0.217 in.)	±0.15 mm (±0.0059 in.)	5.35 mm (0.211 in.)	

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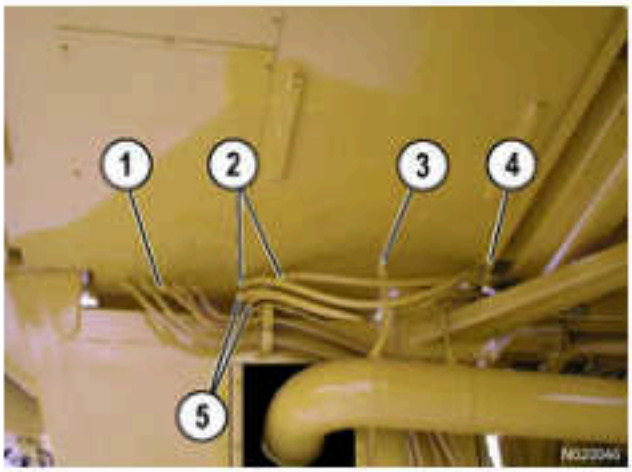


FIGURE 2-4. CAB HYDRAULIC AND HVAC

1. Hydraulic Hoses
2. Heater Hoses
3. HVAC Drain
4. Clamp
5. A/C Hoses

9. Disconnect two heater hoses (2, Figure 2-4) from the fittings underneath the cab. Remove clamp (4) securing the hoses to the bottom of the cab.
10. Disconnect five hydraulic hoses (1).
11. Disconnect two air conditioner hoses (5).
12. Cap all hoses and fittings to prevent contamination.

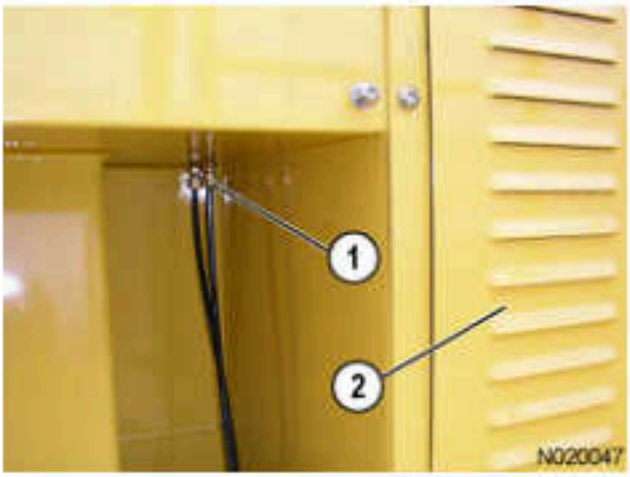


FIGURE 2-5. VACUUM HOSES

1. Vacuum Hoses
2. Filter Cover

13. Remove the access cover from the exterior of the RH side of the cab. Disconnect two vacuum hoses (1, Figure 2-5) from the front of the cab.

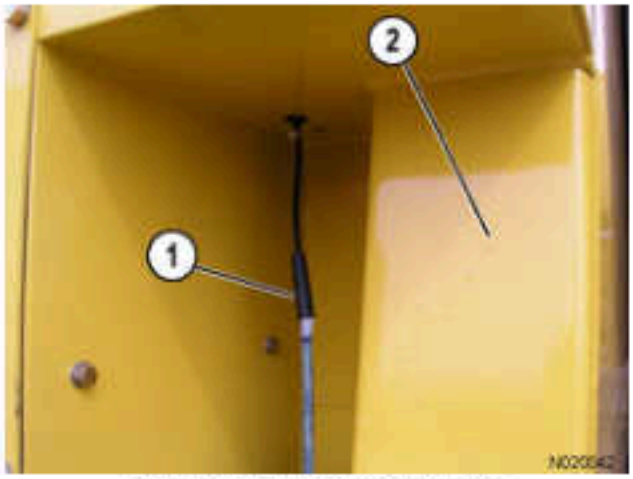


FIGURE 2-6. RADIO ANTENNA

1. Radio Antenna
2. LH Front ROPS Beam

14. Remove the access cover from the exterior of the LH side of the cab. Disconnect radio antenna (1, Figure 2-6).



FIGURE 2-7. CAB MOUNT

1. Cap Screw
2. Harness

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Example -

Measurements: A = 3 mm B = 7 mm

C = 20 mm D = 6 mm

Top view formula: (3 + 7) / 2 = 5 mm

The quotient of 5 mm in this example is 2 mm over the allowable maximum of 3 mm. Loosen the cap screws at the front transmission mounts and remove the locking plates. Use a hoist to move the transmission 2 to 5 mm towards the center of the truck. Moving the transmission 2 to 5 mm would result in a quotient of 3 mm or less, meeting the specification.

NOTE: Keep the shafts parallel when adjusting the position of the transmission.

Side view formula: (20 - 6) / 2 = 7 mm

The quotient of 7 mm in this example is 4 mm over the allowable maximum of 3 mm. Use a hoist to lift the transmission enough to install shims (2, Figure 5-8) below mounting pins (1). A general guideline to follow is to divide the difference by two. This is the number of shims to install. Since the difference in this example is 4 mm, install two shims at each front mount.

NOTE: DO NOT install additional shims at the rear mounts. Adjust the transmission height by shimming the front mounts, only.

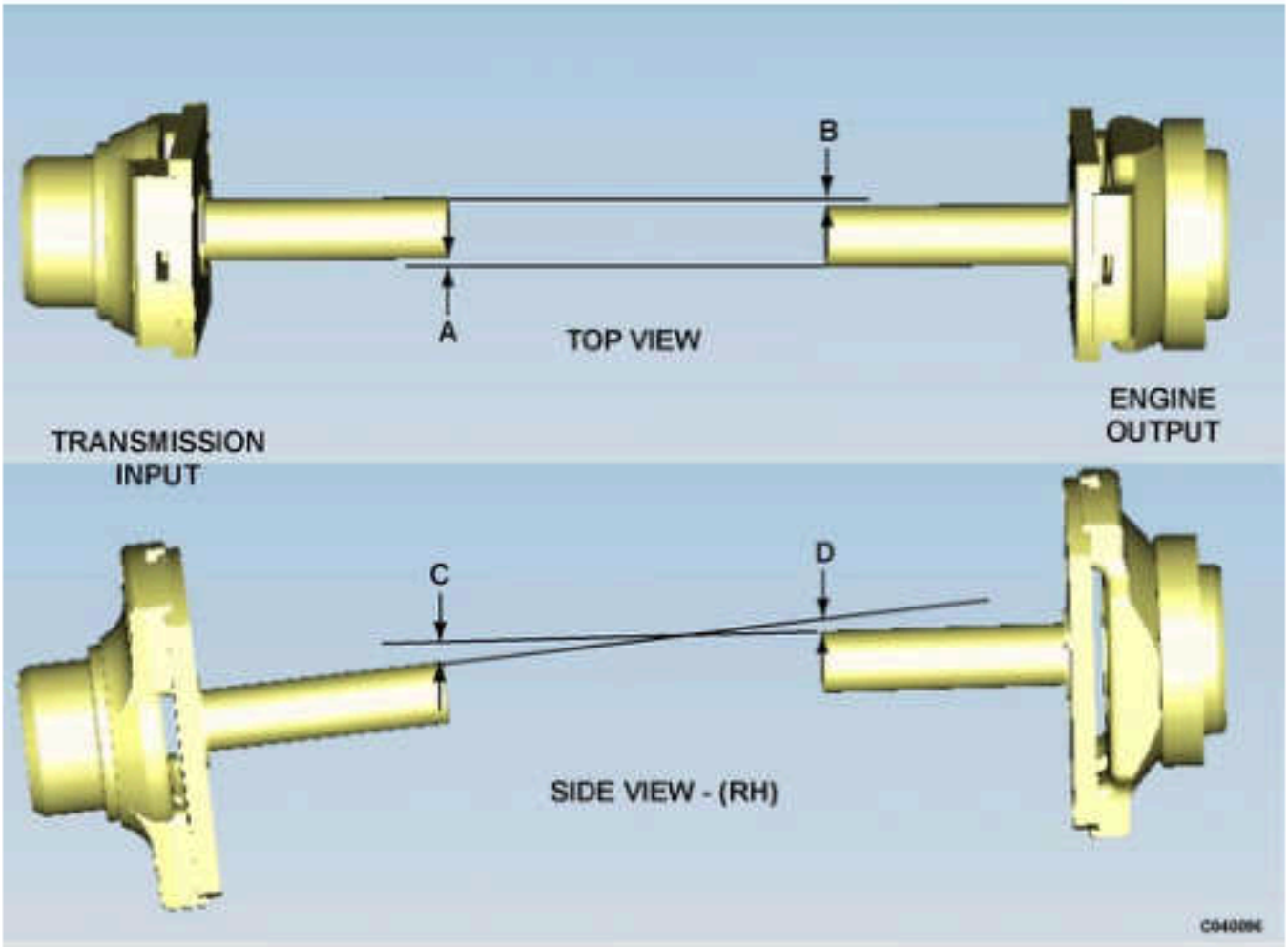


FIGURE 5-7. MEASURING DRIVE LINE ANGLES

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CKT#	DESCRIPTION	SHT/ZONE
0	CHASSIS GROUND	2-D2, 3-D2, 4-C1, 5-A1, 7-B8, 9-D3, 8-A7, 8-D2, 9-A8, 9-D5,11-B6, 12-A7, 12-B5,12-B7,12-C7, 12-D1,12-D7,13-A8, 14-A5,14-B8,14-C8, 14-D8,15-A8, 2-A8, 11-C8,12-C5,14-C3, 11-C7,19-B3,19-A6, 18-A3,17-A8,16-A3, 19-C7,10-C2, 4-C8
1	BATTERY DIRECT POWER (+24V)	2-A1, 4-B1, 9-A2, 16-A2
2	BATTERY DIRECT POWER (+12V)	11-A1,2-A2,16-A2
3	CONTROL POWER RELAY (+24V)	2-B4
4	CONTROL POWER RELAY (+12V)	2-B3
5VR	+5 V SUPPLY SIGNAL GROUND	7-B2,C2
5VR2	RETARD LVER POWER	7-C2
0AT	AMBIENT AIR TEMPERATURE GROUND	9-D6
11	BATTERY DISCONNECT SW POWER(+24V	2-D3,3-A8,6-A7, 8-A7,8-C3,11-C1, 12-D1,13-A1,14-C1, 16-A1,17-A8
11CLL	LEFT TURN SIGNAL RELAY POWER	12-D5
11CLR	RIGHT TURN SIGNAL RELAY POWER	12-C5
11D	LIGHT CONTROL POWER	13-B2,12-D2
11DL	LEFT LO BEAM HEAD LIGHT RELAY	13-A5
11DR	RIGHT LO BEAM HEAD LIGHT RELAY	13-B5
11E1	FUSE CNF02-21 QSK50 ENGINE MODULE	4-A2
11E2	FUSE CNF02-22 QSK50 ENGINE MODULE	4-A2
11E3	FUSE CNF02-23 QSK50 ENGINE MODULE	4-A2
11E4	FUSE CNF02-24 QSK50 ENGINE MODULE	4-A2
11H	HORN SIG FROM STRG COLUMN BUTTON	11-C3
11HA	PWR TO LT/RT HI BEAM OUTSIDE POS	13-B7
11HB	PWR TO LT/RT HI BEAM INSIDE POS	13-C7
11LA	PWR TO LT/RT LOW BEAM OUTSIDE POS	13-B5
11LB	PWR TO LT/RT LOW BEAM INSIDE POS	13-A5
11PF	PRE-LUBE PUMP PWR SUPPLY	2-B5
11PS	PRE-LUBE	2-B5
11S	SAFETY SWITCH ON	2-B2
11T	CLEARANCE LIGHT RELAY POWER	12-D5
1KPP	CAN PROGRAMMING CONNECTOR	10-C2
1MS	JUMPER	6-C6
12	CONTROL POWER (+24V)	2-D4,3-D,15-A1, 6-A7,8-A8,9-B1, 11-A4,17-A5,12-A2, 14-C1,15-D2
12AC	A/C AND HEATER SYSTEM POWER	15-C1
12H	HOIST LIMIT PROX. SWITCH	14-C3
12KPP	CAN PROGRAMMING CONNECTOR	10-C2
12V	CONTROL POWER (+12V)	11-A1,2-A4,16-B4
13	KEYSWITCH ON (ACC)	2-D1,3-A8,4-C7 3-C1,6-B7
13A	SWITCHED BATT POWER (+24V)	6-A5,6-B5,6-B6, 6-B7,8-A7
14R1	ALTERNATOR R OUTPUT	2-C6
1S	KEYSWITCH ON (BR)	2-B3
1BL1	SPARE WIRE #L1	13-A7
1BL2	SPARE WIRE #L2	13-A7
21	KEYSWITCH START (C)	2-C2
21LPR	LIFT PUMP SIG RETURN	4-C3
21LPS	LIFT PUMP SIG	4-C3
21PS	START SIGNAL (AFTER PRE-LUBE)	2-B5
21PSW	ENGINE OIL PRESSURE SWITCH	2-B6
21PT	PRE-LUBE TIMER START	2-C3
21S	KEYSWITCH START	2-C2
21WR	WATER IN FUEL SIG RETURN	4-C3
21WS	WATER IN FUEL SIG	4-C3
22C	FAN CLUTCH CNTRL INPUT	15-C8
22D1	FAN CLUTCH GND GULL ON	15-B8
24E1	ALTERNATE LOW IDLE SWITCH	4-B5
24F1	1ST GEAR RANGE FILL SIGNAL	6-D2
24F2	2ND GEAR RANGE FILL SIGNAL	6-D2
24F3	3RD GEAR RANGE FILL SIGNAL	6-D2
24FH	HIGH GEAR RANGE FILL SIGNAL	6-C2
24FL	LOW GEAR RANGE FILL SIGNAL	6-D2
24FM	MEDIUM GEAR RANGE FILL SIG.	6-C2
24FR	REVERSE GEAR RANGE FILL SIG.	6-D2
2S	ATC BATTERY DIRECT POWER	6-A5
2S2	SECOND GEAR RANGE SIG # SHIFTER	S-D6
2S3	3RD GEAR RANGE SIGNAL # SHIFTER	S-D6
2S4	4th GEAR RANGE SIGNAL # SHIFTER	S-C6
2S5	5th GEAR RANGE SIGNAL - SHIFTER	S-C6
2S6	SIXTH GEAR RANGE SIG - SHIFTER	S-C6
2SA	RIGHT STARTER START SIGNAL	2-C6
2SB	LEFT STARTER START SIGNAL	2-B6
2SCI	ATC +24V POWER SUPPLY	6-A5
2SD	DRIVE SIGNAL - SHIFTER	S-C6
2SF1	F1 START SELECT SW. BOTTOM LT.	S-A3
2SF2	F1 START SELECT SW TOP LT.	S-A3
2SL	LOW GEAR RANGE - SHIFTER	S-D6
2SLH	LIMP HOME SIGNAL	S-A3
2SN	NEUTRAL SIGNAL - SHIFTER	2-C2,5-C6,9-A7
2SNI	NEUTRAL SIGNAL (VHMS)	9-A7
2SR	REVERSE SIGNAL - SHIFTER	14-A1,5-C6
2SSP	TRANSMISSION SHIFTER POWER	5-A1
2ST	EDP SWITCH SIGNAL INPUTS	3-D2

CKT#	DESCRIPTION	SHT/ZONE
27A	QSK KEY SWITCH SIGNAL	4-A4
27B	BATT DIRECT PWR SUPPLY (+24V)	4-C3,16-B2
2BAI	ETHER START CONTROL	2-A5
30A1	PULSE SENSOR RETURN #1	S-B6,8-D4
30A2	PULSE SENSOR RETURN #2	S-B6,5-C7
31	EDP +24 V POWER SUPPLY	3-A5
310	WARNING BUZZER	3-A5
31F	FUEL LEVEL SIGNAL	S-D3
31RR	ARSC SET SIGNAL	7-B3
31S1	ENGINE SPEED SIGNAL #1	S-B5
31S2	ENGINE SPEED SIGNAL #2	S-C7
31SA	ALT. IDLE SELECT SIGNAL	3-A2
31SB	ALT. IDLE SEL. SW. BOTTOM LT.	3-A2
32	EDP BATTERY DIRECT POWER	3-A5
320	SENSOR GROUND	S-C3
320R	RCM SENSOR GROUND	7-B3
32P1	TORQUE CONVER INLET PRESS (+)	S-B3
32P2	TORQUE CONVER OUTLET PRESS (+)	S-B3
32RR	RCM ARSC SET SWITCH	7-B2
32S1	T/M INPUT SHAFT SPEED SIG (+)	S-A5
3252	TRANSMISSION MID SHAFT SPD SENSOR	S-B5
3253	TRANSMISSN OUTPUT SHAFT SPD SENSOR	S-B5,7-D3,9-D4
32SP	SENSOR POWER (+24V)	S-B3
32T1	T/M LUBE INLET TEMP	S-C1
33F	STEERING SYSTEM PRESSURE SW (NO)	7-C5
33G1	STEERING SYSTEM PRESSURE SW (NC)	7-C6
33RR	ARSC SYSTEM SWITCH #1	3-B5
33RS	ARSC SYSTEM SWITCH #2	3-B5
33S1	1ST GEAR RANGE SOL VALVE (+)	6-C2
33S2	2ND GEAR RANGE SOL VALVE (+)	6-A2
33S3	3RD GEAR RANGE SOL VALVE (+)	6-A2
33SH	HIGH GEAR RANGE SOL VALVE (+)	6-B2
33SL	LOW GEAR RANGE SOL VALVE (+)	6-B2
33SM	MID GEAR RANGE SOL VALVE (+)	6-B2
33SR	REVERSE GEAR RANGE SOL VLV (+)	6-A2
33SR1	LO,MID,HI GEAR RANGE SOL VLV RET	6-B2
33SR2	1ST,2ND,&3RD GR RANGE SOL VLV RET	6-A2,6-B2,6-C2
33SR3	LC & REV GEAR RSE SOL VLV RETURN	6-A2,6-C2
33SU	L/C SOLENOID VALVE (+)	6-C2
33T1	RETARDER COOL OIL TEMP-RIGHT	7-A2
33T2	RETARDER COOL OIL TEMP-LEFT	7-A2
33T3	TORQUE CONVERTER OIL TEMP	S-C1
33T4	FRT BRAKE COOL OIL TEMP	7-A1
34BT	AMBIENT AIR TEMPERATURE SENSOR	9-C6
35B	BODY FLOAT SIGNAL	S-A6,9-D4
35B2	ATC BODY FLOAT SIGNAL	S-A5
35S12	LFT REAR WHEEL SPEED SENSOR SIGNAL	7-D2
35SB	REAR WHEEL SPEED SENSOR GROUND	7-C2
35S9	RGT REAR WHEEL SPEED SENSOR SIGNAL	7-C2
37F1	FRONT BRK COOLING FILTER RESTR SIG	7-A5
37F2	HYDRAULIC FILTER RESTRICTION SIG	7-B5
37F3	T/M OIL FILTER RESTRICT SIG	S-B2
37F4	RETARDER BRK CLG FLTR RESTR SIG #1	7-A5
37F5	RETARDER BRK CLG FLTR RESTR SIG #2	7-B5
3761	FRT BRAKE COOL FILTER RESTRICTION	7-A6
3762	HYDRAULIC FILTER RESTRICTION	7-B6
3763	TRANS FILTER RESTRICT SW. #1	S-B2
3764	RETARDER BRAKE COOL FILTER #1	7-A6
3765	RETARDER BRAKE COOL FILTER #2	7-B6
390	PLM SENSOR GROUND	9-A6
39A	GREEN PLM LIGHT CONTROL	9-C2
39AA	GREEN PLM LT POWER SUPPLY	9-D3
39B	AMBER PLM LIGHT CONTROL	9-C3
39BA	AMBER PLM LT POWER SUPPLY	9-C3
39C	RED PLM LIGHT CONTROL	9-B2
39CA	RED PLM LT POWER SUPPLY	9-B3
39F	SENSOR POWER SUPPLY (+24V)	9-A6
39FA	RIGHT REAR SUSPENSION PRESS	9-B6
39FB	LEFT REAR SUSPENSION PRESS	9-B6
39FC	RIGHT FRONT SUSPENSION PRESS	9-B6
39FD	LEFT FRONT SUSPENSION PRESS	9-A6
39FE	INCLINOMETER	9-C6
39G	VHMS SW*HD BATT PWR SUPPLY (+24V)	9-B4
39J	PLM LIGHTS POWER SUPPLY (+24V)	9-B2
39V	VHMS / ORBCOMM INPUT POWER	9-A4
41	HEADLIGHT CONTROL	13-A2
419	ENG CHECK WRN LAMP - BLUE/WHITE	4-B5
419S	ATC WHITE LAMP STATUS	4-A7
41C	CLEARANCE LIGHT SIGNAL	3-A3,5-C8,12-A7
41H	HIGH BEAM CONTROL	13-A3
41HA	LT/RT HI BEAM HI MT OUTSIDE POS	13-B6
41HB	LT/RT HI BEAM HI MT INSIDE POS	13-C6
41LA	LT/RT LOW BEAM LOW MT OUTSIDE POS	13-A6
41LB	LT/RT LOW BEAM LOW MT INSIDE POS	13-A7&B7
41T	CLEAR. LT. CONTROL TOP LT.	13-B3
41TS	CLEARANCE LIGHT SWITCH SIGNAL	12-D5,13-B3
42	FOG,LADDER,ENG SERVICE LT POWER	13-C5,14-B5
42A	LEFT ENGINE SERV LT SW.-1	14-C7
42B	LEFT ENGINE SERV LT SW.-2	14-C7
42EL	RIGHT ENGINE SERV LT SW.	14-C7
43	FORWARD HORN AND DOME LIGHT POWER	11-C1,14-D2
439	QSK QUANTUM UNSWITCHED BATTERY	10-A4

CKT#	DESCRIPTION	SHT/ZONE
44A1	RETARD LIGHT DELAY	12-A2
44B1	BRAKE LIGHT SIGNAL	12-B2
44B2	BRAKE LIGHT APPLY SIGNAL	12-C2
44B3	BRAKE APP. PRESSURE SWITCH	12-B4
44B4	BRAKE LIGHT RELAY SIGNAL (-)	12-B3
44D	CENTER BRAKE LIGHT	12-B4
44FB1	FRONT BRAKE APPLY SIGNAL SW (NO)	7-A5
44FB2	FRONT BRAKE APPLY SIGNAL SW (NC)	7-A7
44L	LEFT REAR RETARD LIGHT	12-B3
44P1	FRONT PPC SENSE SWITCH	7-C5
44P2	PPC SHUTOFF SENSE SWITCH	7-A5
44R	RIGHT REAR RETARD LIGHT	12-A3
44R1	RETARD LIGHT SIGNAL - RIGHT	12-A3
44R2	RIGHT RETARD LT APPLY SWITCH SIG	12-A2
44R3	LEFT RETARD LIGHT APPLY SIGNAL	12-B3
44R4	LEFT RETARD LIGHT RELAY	12-B3
44RL	LEFT REAR BRAKE APPLY SWITCH	12-B4
44RR	RIGHT REAR BRAKE APPLY SWITCH	12-A4
45L	LEFT TURN SIGNAL SOURCE	12-C4
45LL	LEFT TURN LIGHT POWER	12-D6
45R	RIGHT TURN SIGNAL SOURCE	12-C4
45RL	RIGHT TURN SIGNAL POWER	12-C5
45RR	HAZARD LIGHT RELAY POWER	12-C2
46	HAZARD SWITCH POWER SUPPLY	12-C1
46A1	TURN SIGNAL LIGHT SWITCH POWER	12-C1
46F	HAZARD LIGHT SWITCH POWER	12-C3
46H	HAZARD LIGHT FLASHER POWER	12-C2
46R	HAZARD LIGHT DIODES SOURCE	12-D2
47	REAR BACKUP LIGHT AND HORNS	14-A2
47A	BACKUP LIGHT POWER SOURCE	14-A1
47B	BACKUP LIGHT SWITCH	14-B1
47B1	BACKUP LIGHT SWITCH LED	14-B2
47D	DECK MOUNTED BACKUP LIGHTS	14-B2
48	GROUND LEVEL LADDER LT SW.	14-A8
48A	GROUND LEVEL LADDER LT.SW.-1	14-B6
48B	GROUND LEVEL LADDER LT.SW.-2	14-B6
48F	FOG LIGHT POWER	13-C7
48F1	FOG LIGHT SWITCH	13-C6
48FP	FOG LIGHT RELAY	13-D5
48FS	FOG LIGHT SW. TOP LT.	13-C6
49	DIMMER SWITCH	3-A3
49B	SWITCH LED LAMP POWER	3-C2,8-B2,11-D2, 12-C3,
50	CONTROLLER GROUND	2-D2,4-B1,5-A7, 5-C7,6-B5,2-D3, 3-D2,7-A8,7-C2, 8-A8,9-A4,10-C2, 18-A5
509	ENGINE PROTECTION LAMP - RED	4-B5
50RT	STEERING POSITION SENSOR SIGNAL	7-B2
51A1	STEERING ACCUM PRESS - 1 (NO)	7-B5
51A2	STEERING ACCUM PRESS - 2 (NO)	7-B5
51B1	STEERING ACCUM PRESS - 1 (NC)	7-C6
51B2	STEERING ACCUM PRESS - 2 (NC)	7-B6
51C	STEERING BLEEDDOWN SWITCH POWER	14-C2
51R	STEERING BLEEDDOWN TIMER POWER	14-B2
51S	ACCUMULATOR BLEED DOWN SOL POWER	14-B4
51T	STEERING BLEEDDOWN TIMER SOURCE	14-B2
528	ENG WARNING LIGHT - AMBER/YELLOW	4-B5
52BL	BRAKE LOCK SENSE SIGNAL	8-A2
52BP	BRAKE ACCUMULATOR PRESSURE - NO	7-C5
52BPZ	BRAKE ACCUMULATOR PRESSURE - NC	7-C6
52C1	FRT BRAKE COOL SIGNAL (+)	8-A5
52C2	REAR BRAKE COOL SIGNAL (+)	8-B5
52C3	FRT BRAKE COOL VALVE POWER	8-A6
52C4	REAR BRAKE COOL VALVE POWER	8-B7
52EB	EMER. BRAKE SOLENOID POWER	8-C2
52EP	EMER. BRAKE/AUTO APPLY SENSE	7-C5
52L1	PARK BRAKE SWITCH BOTTOM LT.	8-B2
52L3	BRAKE LOCK SWITCH LAMP	8-A3
52L4	PARK BRAKE SWITCH TOP LT.	8-B2
52P	BRAKE SYSTEM SIGNALS POWER	7-D1,8-B5
52PB	PARK BRAKE SOLENOID POWER	8-B2
52PB2	EB/PARK BRAKE SWITCH	8-B3
52PBS	PARK BRAKE PRESSURE - NO	7-B5
52PBS2	PARK BRAKE PRESSURE - NC	7-C6
52PS	BRAKE PEDAL SENSE	7-D2
52R1	FRONT BRAKE PPC SOLENOID RETURN	8-B5
52R2	REAR BRAKE PPC SOLENOID RETURN	8-C5
52RZ2	RETARD LEVER POT.	7-C2
52T1	ASR SYSTEM SWITCH #2	3-B5
52T8	ASR SYSTEM SWITCH #1	3-B5
53G	HOIST LIMIT SW PROXIMITY SW (NC)	14-C3
53H	HOIST LIMIT SW PROXIMITY SW (NO)	14-C3
54A	THROTTLE POSITION SIGNAL	4-A5
54D	POSITION SENSOR POWER SUPPLY	4-A5
54E	POSITION SENSER RETURN	4-A5
54F	ACCELERATOR PEDAL POWER	5-D1,5-D1
54H	THROTTLE	5-D1
55A	MODE CHANGE SIGNAL #1-1	3-B2
55B	IDLE VALIDATION SIGNAL 2	4-A5
55C	IDLE VALIDATION SIGNAL 3	4-A5
55D	MODE CHANGE SIGNAL #2-1	3-B3
55E	MODE CHANGE SIGNAL #1-2	3-B2
55F	MODE CHANGE SIGNAL #2-2	3-B3
55G	IDLE VALIDATION SWITCH RETURN	4-A5

CKT#	DESCRIPTION	SHT/ZONE
58F2	FRONT BRAKE PPC SOLENOID SUPPLY	8-B5
58L2	LEFT REAR PPC VALVE OUTPUT	8-C5
58P1	REAR BRAKE PPC SOLENOID SUPPLY	8-C5
58R1	REAR PPC VALVE RETURNS	8-C5
58R2	RIGHT REAR PPC VALVE	8-C5
5VR	RCM +5V SENSOR SUPPLY	7-B3
5VR2	RETARD LEVER POT.	7-C2
63	WINDSHIELD WIPER/WASHER POWER	11-B5
63H	WINDSHIELD WIPER HIGH SPEED	11-C7
63HI	WINDSH WIPER HI SPEED CONTROL	11-C6
63L	WINDSHIELD WIPER LOW SPEED	11-C7
63LI	WINDSH WIPER LO SPEED CONTROL	11-B6
63P	WINDSH WIPER PARK SIGNAL	11-C5
63TI	WINDSHIELD WIPER DELAY SW OUTPUT	11-B6
63W	WINDSHIELD WASHER CONTROL	11-B6
64	HORN POWER SUPPLY	11-C2
65	RADIO SW'HD PWR SUPPLY (+12V)	11-A2
65A	ANTENNA CABLE	11-B4
65C	A/C COMP CLUTCH POWER	15-C7
65T	A/C THERMOSTAT SIGNAL	15-C7
67AS	OPERATOR'S AIR SEAT POWER	11-D1
67C	CIGAR LIGHTER	11-B2
67C1	12V AUX PORT #1	11-B2
67C2	12V AUX PORT #2	11-B2
67L	LEFT WINDOW MOTOR - 1	11-D3
67M	LEFT WINDOW MOTOR - 2	11-D3
67P	LEFT WINDOW PWR SUPPLY (+12V)	11-B2
67R	RIGHT WINDOW PWR SUPPLY (+12V)	11-B3
67S	RIGHT WINDOW MOTOR - 1	11-D5
67T	RIGHT WINDOW MOTOR - 2	11-D5
68A	LUBE SYSTEM POWER SUPPLY	11-A5
68B	ETHER START POWER	2-A5
68C	ETHER START SOLENOID	2-A7
68D1	ETHER START SW. BOTTOM LT	2-A6
68FL	LINCOLN LUBE FULL LEVEL POWER	10-A5
68FS	LINCOLN LUBE FULL SIGNAL	10-A5
68G2	LINCOLN LUBE TIMER PRESS. SW.	11-A8
68LA	LINCOLN LUBE ALARM	10-B5
68P1	LINCOLN LUBE TIMER PRESS. SW.	11-A8
68R	LUBE SYS PUMP SOLENOID (-)	11-A6
68SR	LINCOLN LUBE PRESSURE SW.	11-A5
68T	LUBE SYSTEM PUMP SOLENOID (+)	11-A8
71F	BODY SEATED SIGNAL	5-A7
82	SRDM WITCHED BATTERY POWER SUPPLY	8-A5
900	QSK QUANTUM DATALINK (+)	10-A4
901	QSK QUANTUM DATALINK (-)	10-A4
90VH6	VHMS DOWNLOAD PORT RS232 - GND	10-B5
90VHR	VHMS DOWNLOAD PORT RS232 - RX	10-B5
90VHT	VHMS DOWNLOAD PORT RS232 - TX	10-C5
916M	REMOTE THROTTLE SENSOR RETURN	4-B3
916N	FREQ. SIGNAL	4-C4
924	COOLANT LEVEL SENSOR +5V SUPPLY	4-B3
925	COOLANT LEVEL SENSOR RETURN	4-B3
926	COOLANT HIGH LEVEL SIGNAL	4-B3
927	COOLANT LOW LEVEL SIGNAL	4-A3
939G	J1939 CAN SIGNAL (-)	10-A1
939Y	J1939 CAN SIGNAL (+)	10-A1
951	VHMS AUTOTRANSMIT SWITCH	10-C4
952	VHMS MMS COMM SWITCH	10-C4
95G	VHMS PROTOCAL JUMPER GROUND	10-C4
960	VHMS (+12V) OUTPUT	10-C2
960M	ORBCOMM COMM PORT RS232 - RX	10-D6
961A	ORBCOMM DOWNLOAD SWITCH	10-C2
961B	ORBCOMM WAKEUP SWITCH	10-C4
961M	ORBCOMM COMM PORT RS232 - GND	10-D6
962	PLM DOWNLOAD PORT RS232 - TX	10-C5
962M	ORBCOMM COMM PORT RS232 - TX	10-D6
963	PLM DOWNLOAD PORT RS232 # RX	10-C5
965	ORBCOMM SIGNAL	9-A1
966	PLM DOWNLOAD PORT RS232 - GND	10-C5
966S	PLM SELECT JUMPER	10-C4
970	QSK CENSE DIAGNOSTIC RS232 # TX	10-A4
971	QSK CENSE DIAGNOSTIC RS232 # RX	10-A4
976	QSK CENSE DIAGNOSTIC RS232 - GND	10-A4

CKT#	DESCRIPTION	SHT/ZONE
FGNDA	ATC DOWNLOAD CONNECTOR	10-B7
FGNDR	RCM DOWNLOAD CONNECTOR	10-B7
FLSH	CAN PROGRAMMING CONNECTOR	10-D2
LF(-)	LEFT FRONT SPEAKER (-)	11-A2
LF(+)	LEFT FRONT SPEAKER (+)	11-A2
LR(-)	LEFT REAR SPEAKER (-)	11-A2
LR(+)	LEFT REAR SPEAKER (+)	11-A2
RF(-)	RIGHT FRONT SPEAKER (-)	11-B2
RF(+)	RIGHT FRONT SPEAKER (+)	11-B2
RR(-)	RIGHT REAR SPEAKER (-)	11-A2
RR(+)	RIGHT REAR SPEAKER (+)	11-A2
RXA	ATC DOWNLOAD CONNECTOR	10-B7
RXR	RCM DOWNLOAD CONNECTOR	10-B7
TXA	ATC DOWNLOAD CONNECTOR	10-B7
TXR	RCM DOWNLOAD CONNECTOR	10-B7
#01	SHIELD FOR 39F/39D/39FD	9-A7
#02	SHIELD FOR 32D/54H/54F	S-D3
#03	SHIELD FOR 39F/39D/39FC	9-B7
#08	SHIELD FOR 54A/54D/54E	4-A5
#09	SHIELD FOR 5VR/35SB/35S9	7-C2
#10	SHIELD FOR 5VR/35SB/35S12	7-D2
#11A	SHIELD FOR 90WHT/90WHR/90WH6	10-C5
#11B	SHIELD FOR 962/963/966	10-C5
#13	SHIELD FOR 916M/50	4-B2
#14	SHIELD FOR 31S1/30A2	S-B6
#15	SHIELD FOR 31S2/30A2	S-C7
#17	SHIELD FOR 5VR/32DR/52R22	7-C3
#18	SHIELD FOR 39F/39D/39FA	9-B7
#19	SHIELD FOR 39F/39D/39FB	9-B7
#20A	SHIELD FOR TXA/RXA/FGNDA	10-B8
#20R	SHIELD FOR TXR/RXR/FGNDR	10-B8
#21	SHIEL FOR 31RR/32RR/32DR	7-B2
#22	#22 SHIELDS TO 6B10	6-C2
#221	SHIELD FOR 33S1/33SR2	6-C2
#222	SHIELD FOR 33S2/33SR2	6-B2
#223	SHIELD FOR 33S3/33SR2	6-A2
#22L	SHIELD FOR 33SL/33SR1	6-B2
#22M	SHIELD FOR 33SM/33SR1	6-B2
#22H	SHIELD FOR 33SH/33SR1	6-B2
#22R	SHIELD FOR 33SR/33SR3	6-A2
#22U	SHIELD FOR 33SU/33SR3	6-C2
#23	SHIELD FOR 939Y/939G	10-A1,4-C3
#24A	SHIELD FOR 30A1/32S1	S-A6
#24B	SHIELD FOR 30A2/32S2	S-B6
#24C	SHIELD FOR 32S3/30A1	S-B6
#24D	SHIELD FOR 32D/32SP/32P1	S-B3
#24E	SHIELD FOR 32D/32SP/32P2	S-B3
#24F	SHIELD FOR 32D/32T1	S-C3
#30	SHIELD FOR 58R1/58L2	B-D6
#31	SHIELD FOR 58R1/58R2	B-C6
#35K	SHIELD FOR 924/92S/926	4-B3
#36	SHIELD FOR 900/901/439	10-A4
#39	SHIELD FOR 5VR/32DR/50RT	7-B2
#40	SHIELD FOR 34BT/0AT	9-D7
#41	SHIELD FOR 970/971/976	10-A4
#46	SHIELD FOR 960M/962M/961M	10-D4
#50	SHIELD FOR 21WR/21WS	4-C3
#51	SHIELD FOR 21LPR/21LPS	4-C3

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