CAT® Lift Trucks

Service Manual

GK45 Engine
Electronic Control System

GK45

GP40N-GP55N

99739-41100

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ENGINE TUNE-UP

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Diagnosis Chart by Symptom

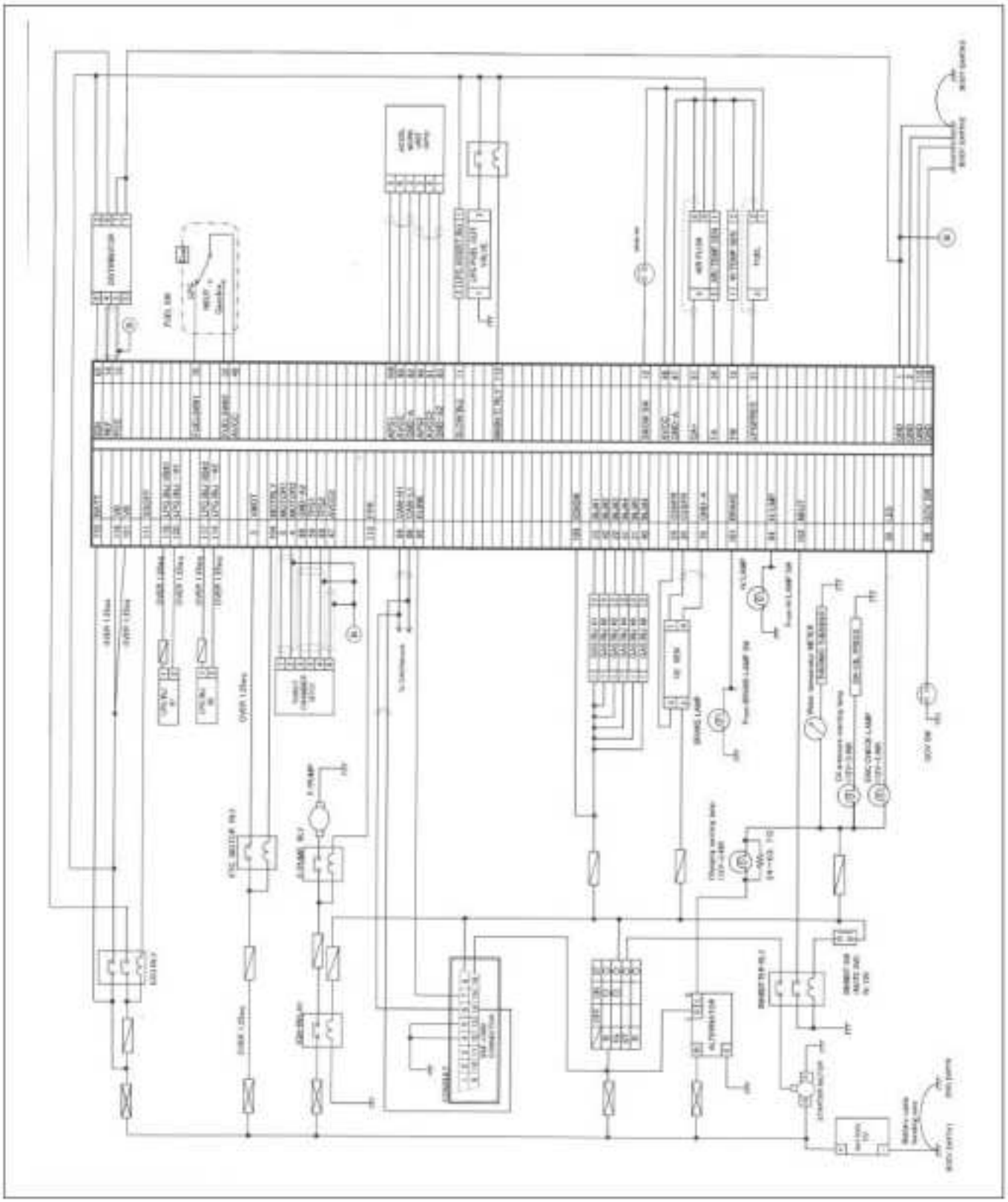
GK45 ENGINE RELATIONSHIP BETWEEN MALFUNCTIONING SYMPTOMS AND THE SENSOR CIRCUIT

The table below shows the possible symptoms caused by the malfunction of each sensor circuit.

Actuator malfunction ⊖ : Highly possible • : Possible		Symptoms	Im-possible to start		Im-possible to start		Poor idle					Poor driving control								Engine stall				Other		Check that symptoms are detected with self-diagnosis	Check that symptoms are in fail-safe condition	Description/notable characteristics of the symptom
			No initial combustion	Initial combustion	When engine is cold	When engine is warming up	Fast idle is not effective	High idle rpm	Low idle rpm	Inconsistent idle when engine is cold	Inconsistent idle when warming up	Poor power output	Poor acceleration	Engine rpm does not increase smoothly	Surge during acceleration	Surge during constant speed drive	Knocking	Backfire	After-burn	At idle	Driving	During deceleration	During a heavy load	Overheat	Poor fuel consumption			
Crankshaft position sensor (POS, REF)		OPEN	⊖																	⊖	⊖	⊖	⊖			•		• An open circuit in either POS or REF signal makes it impossible for the vehicle to start. • Control signals for fuel system and ignition system are not output.
		Momentarily open			•	•				•	•		•	•	•	•				⊖	•	•	•			•		• The symptom depends on the duration of momentarily open circuit and the operating conditions. Slight shocks and surges may be sensed during driving, while engine stall may be caused during idle.
Mass air flow sensor	Signal	OPEN			•	•		⊖		•	•	•	•	•	•	•							•		•	•	•	• It will be fail-safe condition, and vehicle runs at an engine speed of 800 rpm or less.
		High output			•	•				•	•	•	•	•	•	•				•	•	•	•		•	•	•	• The air-fuel ratio becomes rich. Black smoke may accompany. Poor connection of grounding may be a possible cause.
		Low output			•	•				•	•	•	•	•	•	•	•	•		•	•	•	•		•	•	•	• The air-fuel ratio becomes lean. Contaminated hot wire or suction of air may be suspected.
	Ground	OPEN	⊖																	⊖	⊖	⊖	⊖		•			• It will be over-rich.
	Power supply	OPEN			•	•		⊖		•	•	•	•	•	•	•							•		•			• It will be fail-safe condition, and vehicle runs at an engine speed of 800 rpm or less.
Intake air temperature sensor		OPEN/ SHORT																							•	•		
Engine coolant temperature sensor		OPEN/ SHORT		•	•	•		•		•	•	•	•	•	•	•	•			•	•	•	•		•	•	•	• It will be fail-safe condition, and then MIL turns ON and perform STEP #1 overheat control. This malfunction tends to occur when engine is cold or when the engine coolant temperature is high.
		Resistance is large.		•	•	•		•			•	•	•	•	•	•				•	•	•	•	•	•			• The engine coolant temperature is judged as low. This malfunction tends to occur after warming up.
		Resistance is small.		•	•	•	•		•	•		•	•	•	•	•	•	•	•	•	•	•	•		•	•		• The engine coolant temperature is judged as high. This malfunction tends to occur when engine is cold.
Heated oxygen sensor		OPEN/ SHORT								•	•	•				•				•		•	•		•	•		• It will be base air-fuel ratio.
Vehicle speed sensor		OPEN/ SHORT																	•			•	•		•	•		• Duration of fuel cut becomes shorter or fuel may not be cut.

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Circuit Diagram (DUAL)



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SST Data Monitor Display

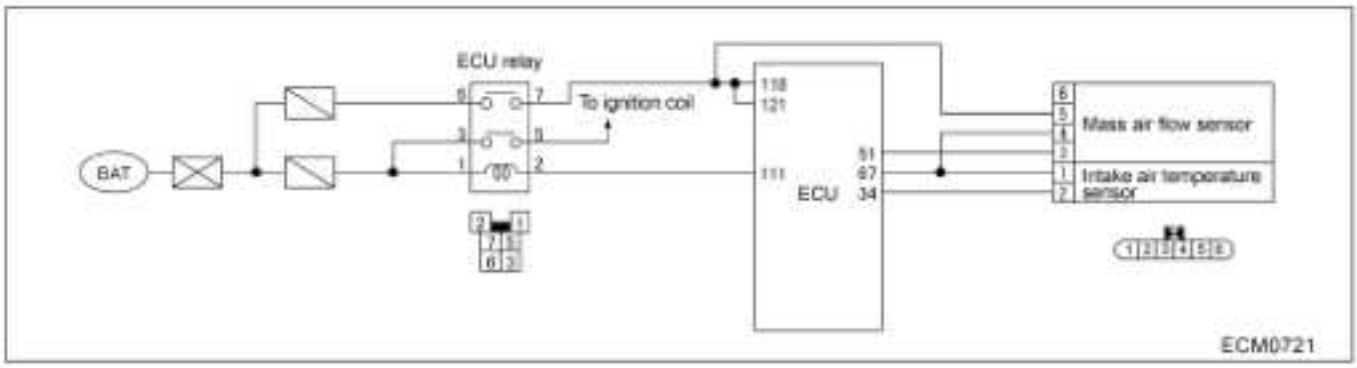
Monitor item	At idle	At approx. 2,000 rpm
Intake air temperature sensor	Values according to intake air temperature	

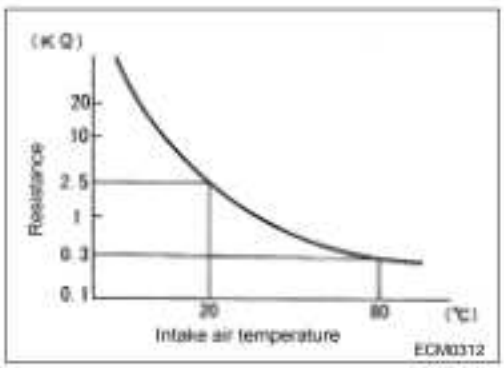
ECU Input/Output Signal Specifications

Measure voltage between terminals shown below and ground using a circuit tester.

Terminal	Signal name	At idle	At approx. 2,000 rpm
34	Intake air temperature sensor signal	Intake air temperature at 20°C (68°F): approx. 3.5V Intake air temperature at 80°C (176°F): approx. 1.2V	

Circuit Diagram





Component Parts Inspection

INTAKE AIR TEMPERATURE SENSOR (JOINED WITH MASS AIR FLOW SENSOR)

Check resistance between intake air temperature sensor (mass air flow sensor connector) terminals 1 and 2.

Resistance

Intake air temperature at approx. 20°C (68°F):

Approx. 2.5 kΩ

Intake air temperature at approx. 80°C (176°F):

Approx. 0.3 kΩ

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