CAT® Lift Trucks

Service Manual

K21, K25 Gasoline Engine

K21
K25

For use with GP15N-GP35N, P3000-P7000
Chassis Service Manual.

99789-67100

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GENERAL INFORMATION

SECTION GI

CONTENTS

HOW TO USE THIS MANUAL GI-2
- Description GI-2
- Definition of Terms GI-2
- Definition of Units GI-2
- Description GI-2

PRECAUTIONS FOR SAFETY AND QUALITY .. GI-3
- Safe Operation GI-3
- Correct Operation GI-4
- Precautions for Radio Equipment Installation . GI-4

PRECAUTIONS GI-5
- Precautions in Draining Engine Coolant GI-5
- Precautions for Disconnecting Fuel Piping GI-5
- Precautions for Removing and Disassembling GI-5
- Precautions for Inspection, Correction, and Replacement GI-5
- Precautions for Assembly and Installation GI-5
- Parts Requiring Angle Tightening GI-6
- Caution with Use of Power Tools GI-6
- Precautions for Liquid Gasket Application GI-6

TIGHTENING TORQUE GI-7
- Standard Bolt Tightening Torque GI-7
- Engine Part Tightening Torque GI-8

SPECIAL SERVICE TOOLS GI-10

ENGINE OUTSIDE DRAWINGS GI-11

MAIN SPECIFICATIONS GI-12

STANDARD AND REPAIR LIMIT GI-15

STAMPED LOCATION OF ENGINE NO. GI-19

TROUBLE DIAGNOSIS GI-20
- Engine Adjustment GI-21
- Engine LPG Fuel System GI-26

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MAINTENANCE

SECTION MA

MA

CONTENTS

ENGINE MAINTENANCE MA-2
Specifications MA-2
Tightening Torque MA-6
Maintenance Schedule MA-8
Oil and Grease, and Capacity MA-9
On Board Inspection and Service MA-10

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ENGINE TUNE-UP

SECTION ET

ET

CONTENTS

SPECIFICATIONS ET-2
TIGHTENING TORQUE ET-3
TROUBLE DIAGNOSIS ET-4
ENGINE INSPECTION AND ADJUSTMENT ET-9
Engine Body Related ET-9
Ignition and Fuel Systems ET-13

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MAIN SPECIFICATIONS OF IGNITION SYSTEM

Engine type			K21			K25		
Engine control system			Electric controls			Electric controls		
Fuel specification			Gasoline	LPG	Combined	Gasoline	LPG	Combined
Ignition device			Non-contact type (Engine Control System)			Non-contact type (Engine Control System)		
Ignition coil (with power transistor)		Hanshin Electric type	AIC-4002G			AIC-4002G		
Crankshaft position sensor	Crankshaft position sensor (POS)	Hitachi Unisia Automotive	A29-640			A29-640		
	Camshaft position sensor (PHASE)	Hitachi Unisia Automotive	A29-660			A29-660		
Distributor (with ignition coil)		Mitsubishi Electric type	—			—		
Spark plug		NGK type	FR2A-D, FR2B-D			FR2A-D, FR2B-D		
		Gap (mm)	0.9			0.9		

FUEL SYSTEM AND ENGINE SPEED CONTROL SYSTEM

Engine type	K21			K25		
Engine control system	Electric controls			Electric controls		
Fuel specification	Gasoline	LPG	Combined	Gasoline	LPG	Combined
Fuel device standard type	Electric controlled fuel injection device (Engine Control System)			Electric controlled fuel injection device (Engine Control System)		
Fuel device	Gasoline injector	LPG injector	Gasoline & LPG	Gasoline injector	LPG injector	Gasoline & LPG
Air-fuel ratio control device	Air-fuel ratio feedback control			Air-fuel ratio feedback control		
Starting auxiliary device	Electric throttle control actuator			Electric throttle control actuator		
Idle load control type	Electric throttle control actuator			Electric throttle control actuator		
Engine speed control type	Electric throttle control actuator			Electric throttle control actuator		

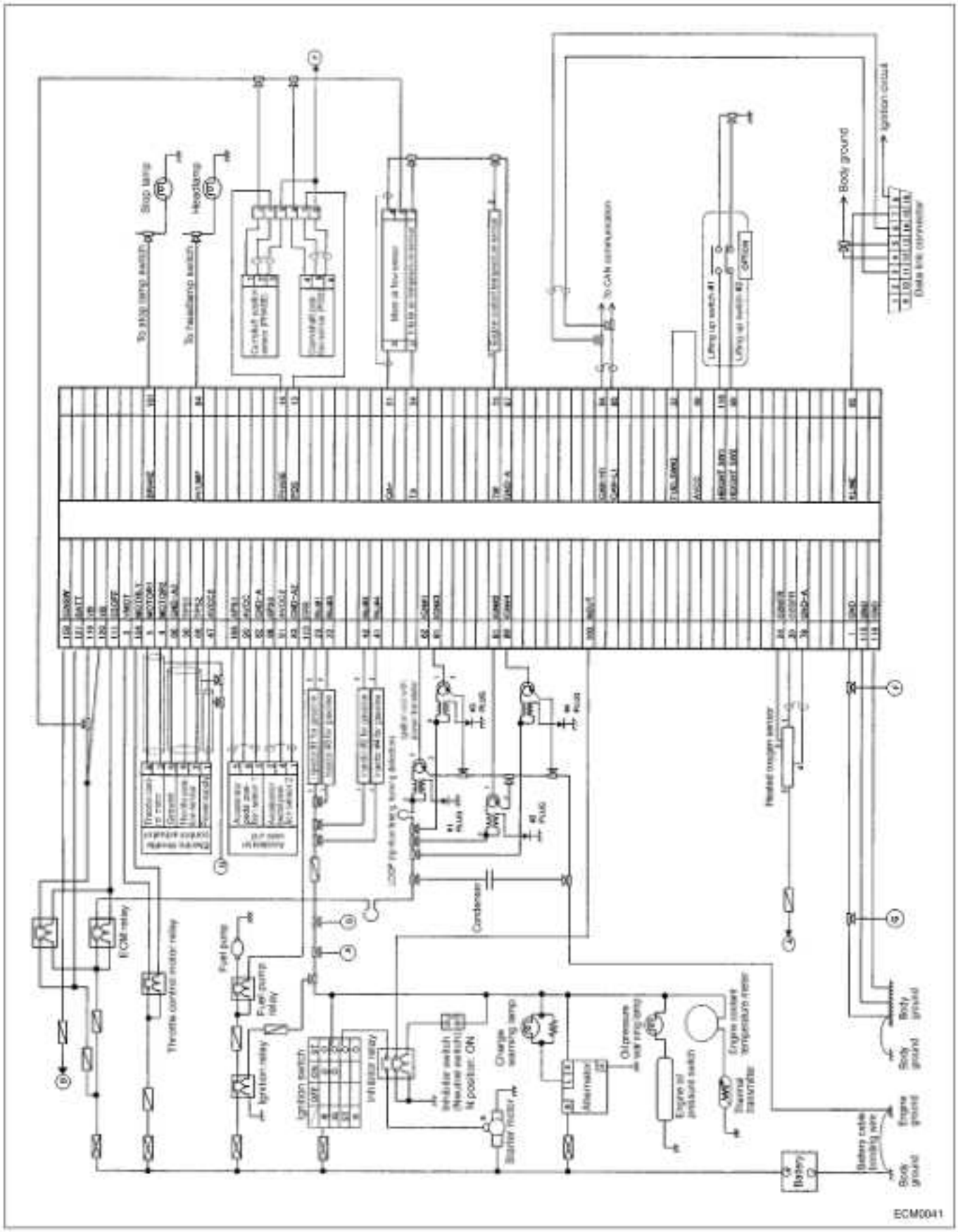
EXHAUST GAS CLEANUP DEVICE LIST

Engine type		K21			K25		
Engine control system		Electric controls			Electric controls		
Fuel specification		Gasoline	LPG	Combined	Gasoline	LPG	Combined
Catalytic device (Reducing HC, CO, Nox)	Type	Three-way catalyst (Monolith)			Three-way catalyst (Monolith)		
	Location	In counter weight with muffler separated			In counter weight with muffler separated		
	Capacity	0.45L			0.45L		
PCV gas recirculation device		Closed type			Closed type		

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Circuit Diagram

K-ENGINE ELECTRIC CONTROLLED ECM CIRCUIT DIAGRAM (GASOLINE)



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Diagnosis Chart by Symptom (Cont'd)

RELATIONSHIPS BETWEEN MALFUNCTIONING SYMPTOMS AND ACTUATOR CIRCUITS

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

Symptoms			Impossible to start		Poor starting		Poor idle						Poor driving								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.	During surge and acceleration	During surge and constant speed driving	Knocking	Backfire	After-burn	At idle	Driving	During deceleration	During a heavy load	Engine over temperature (Overheat)	Poor fuel consumption efficiency			
Actuator malfunction ⊕: Highly possible ♦: Possible																													
Gasoline injector	Power supply circuit	OPEN	♦	♦	♦	♦				⊕	⊕	♦	♦	♦	♦					♦	♦	♦	♦						• No fuel injection to cylinder with open circuit, resulting in LEAN output of heated oxygen sensors. • Starting engine is impossible when the circuits for all the cylinders are open.
		Momentarily open														♦				♦		♦	♦						
	Coil	OPEN	♦	♦	♦	♦				⊕	⊕	♦	♦	♦	♦					♦	♦	♦	♦						
		Momentarily open														♦				♦		♦	♦						
	Drive circuit (ECM side)	OPEN	♦	♦	♦	♦			♦	⊕	⊕	♦	♦	♦	♦		♦	♦		♦	♦	♦	♦						
		Momentarily open														♦													
		SHORT	♦	♦	♦	♦				⊕	⊕	♦	♦	♦	♦				♦	♦	♦	♦	♦						• Continuous fuel injection to cylinder with short circuit, resulting in OVER-RICH and misfiring. • Starting engine is impossible when the circuits for all the cylinders are open.
	Nozzle hole	Foreign material intrusion	♦	♦	♦	♦					⊕	♦	♦	♦		♦			♦	♦	♦	♦	♦						• The cylinder with foreign material will keep injecting.
		Clogging	♦	♦	♦	♦		♦		⊕	⊕	♦	♦	♦		♦	♦	♦		♦	♦	♦	♦						• The symptom depends on clogging status. The correction factor of air-fuel ratio becomes larger.
	Ground circuit (ECM)	OPEN	♦																	♦	♦	♦	♦						• Shocks may be sensed and engine stall may be occur depending on the duration of the operation conditions.
		Momentarily open								♦	♦	♦	♦		♦	♦				♦		♦	♦						
Ignition signal circuit		OPEN	♦	♦	♦	♦			♦	♦	♦	♦	♦	♦	♦				♦	♦	♦	♦	♦		♦				• Slight shocks and surges may be sensed depending on the duration of momentarily open circuit and the operating conditions.
		Momentarily open														♦			♦	♦									
Ignition coil	Power supply circuit	OPEN	♦	♦		♦				♦	♦	♦	♦	♦	♦				♦	♦	♦	♦	♦						•
		Momentarily open														♦			♦	♦									• Engine stall may occur if duration of momentarily open circuit is too long.
	Coil	OPEN	♦	♦		♦				♦	♦	♦	♦	♦	♦				♦	♦	♦	♦	♦						• Shocks may be sensed and engine stall may be occur depending on the duration of the operation conditions.
	Ground circuit	OPEN	♦	♦		♦				♦	♦	♦	♦	♦	♦				♦	♦	♦	♦	♦						• Injects fuel toward spark plug on the cylinder with open circuit.
		Momentarily open														♦			♦	♦									

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