CAT® Lift Trucks

Service Manual

Liquefied Petroleum Gas Supplement

4G63	AA0001-ZZ9999
4G64	AA0001-ZZ9999
6G72	0A0001-0Z9999

For use with 4G63, 4G64 & 6G72 Engine Service Manuals. 99729-85100

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4. Throttle and Governor Operation:

Upon engine cranking the ECU will automatically set the throttle valve to a predetermined position for best engine starting.

NOTE: there is no need to depress the accelerator pedal at start-up.

When the engine starts the ECU automatically opens the throttle valve to allow the engine to reach 1200 RPMs. The ECU monitors engine temperature and will set a fast idle if the engine is cold. There is a gradual return to base idle of 700 RPM as the engine temperature increases. After the short startup routine, the operator can operate the lift truck normally.

This sub-system also incorporates a RPM governing feature. The ECU will limit maximum engine RPM to 2700 regardless of the foot pedal position and load. If the engine RPM exceeds the maximum preprogrammed RPM of 3100 for an excess of 2 seconds the ECU will close the fuel lock-off valve which will shut the engine off. This is a safety feature to protect the engine and is called over speed protection.

5. Operating Specifications 4G63 / 4G64 Engines:

Idle speed (Cold Engine)	700 – 1200 RPM based on engine temperature
Idle speed (Warm Engine)	700 RPM
Max governed speed (no load)	2700 RPM
Ignition timing	10° BTDC
Over speed protection	Yes
Condition	3100 RPM for more than 2 sec.
Result	Close fuel lock-off. Engine shut down.
Over temperature protection	Yes
Condition	Above 105 deg. C
Result	Check engine light flashes
Condition	Above 115 deg. C
Result	Limp home mode Max. engine speed reduced to 1200 RPM and engine is shut down if operated in excess of 45 seconds while temperature remains in excess of 115 deg. C
Fuel lock-off protection	Only open when ECU detects an engine RPM.
Closed loop fuel control	Yes
Condition	A/F ratio out of spec.
Result	Check engine light illuminated and LIMP Home mode and max speed is reduced to 1800 RPM.

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S-15G Fuel System Troubleshooting:

Introduction: The majority of possible malfunctions can cause differing symptoms depending on the specific cause and frequency of occurrence. For example, an intermittent electrical short could sometimes prevent an engine from starting and at other times cause intermittent stalling or rough operation.

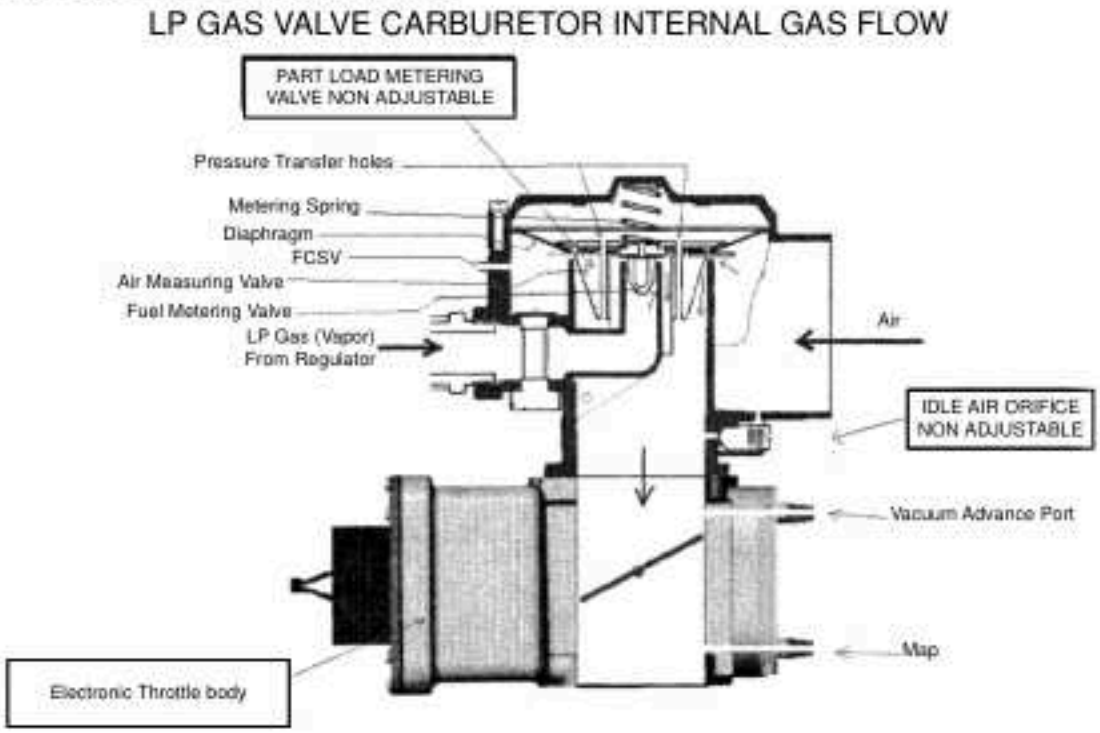
1. Trouble Shooting Detail:

1.1 Problem: Engine "turns over" when starter motor is engaged, but will not start.
Analysis: First, Check LPG tank and supply hoses and filters. Most often there are 2 reasons an engine will not start if there is fuel available. Either the malfunction is in the ignition system or the fuel supply system. **Note: This manual is intended as a supplement to detail the engine management system. The ignition system and test methods are covered in more detail in the chassis service manual.** Once it is established the ignition system is working properly, the fuel supply system will need to be evaluated. It needs to be determined if LPG fuel is being supplied to the engine. The following steps should be followed:

1) Connect the diagnostic monitor to the ECU and go to the "S" screen.
2) Turn the key to the "run" position, but do not engage the starter motor. The data stream should begin counting. If there is no Data Stream, check the data monitor cables for proper installation. If there is still no data stream, the engine management system may not be getting power. Check the electrical connections that supply power and ground to the engine management wiring harness. (See wiring harness schematic). If all the connections are intact, remove the connector from the ECU and use a Fluke 87, OTC 600, or equivalent meter to test for a 12V-power supply on pin #4 and for ground on pin 8.
3) If 12 volt power to pin 4 and/or ground connection to pin 8 is not indicated, use general electrical troubleshooting procedures to track down the cause. (Reference the engine management wiring harness in the schematic section of this manual and the chassis wiring harness schematic in the chassis service manual.)
4) If the ground and power supply are working correctly, turn the key off and reconnect the ECU connector. View the data monitor while engaging the starter motor by moving the key to the start position for approximately 10 seconds.
5) While the starter motor is engaged and viewing the data monitor, check to see if a RPM is being displayed in Engine Speed indicator. If no RPM is being registered, this may signify a wiring problem between the distributor and the ECU on pin #1. Investigate and repair. If no problem is found an ECU failure may have occurred. Replace ECU.
6) If the RPM is being registered, check the lock off valve for proper function. The lock off will open only when the ECU detects a RPM during starting which is a method of reducing the chance of a LPG leak. Disconnect the connector from the wiring harness to the lock off. Connect the electrical meter to the connector on the wiring harness and check for 12-volt power to the lock off when the starter motor is engaged and while the Data monitor is registering RPM. If no power is being supplied to the lock off during starting, inspect and repair the wiring harness. If no wiring problem is detected, an ECU failure may have occurred.Replace ECU
7) If power is being supplied to the lock off, but it is not opening properly, test LP lock off Solenoid coil for open circuit. Repair as needed.

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3.6. Mixer and Throttle Body Illustration



3.7. Three Way Catalytic Converter



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