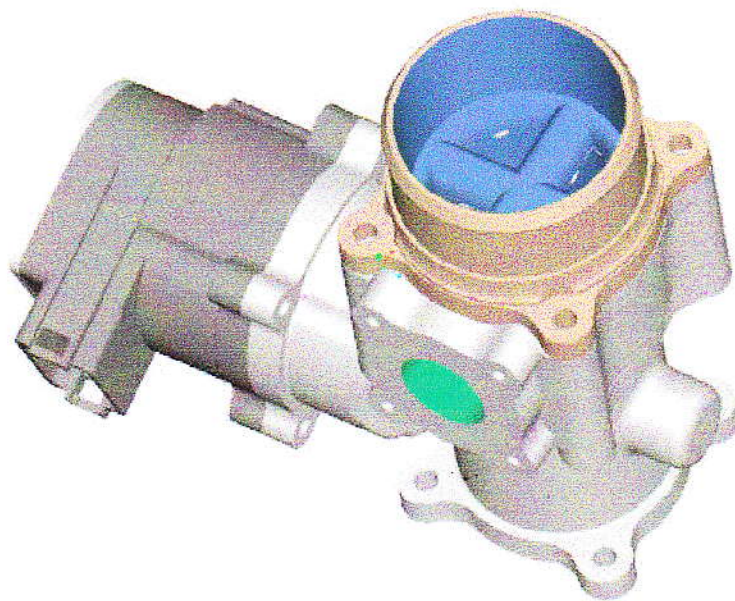


LC50 Fuel Mixer and Speed Control



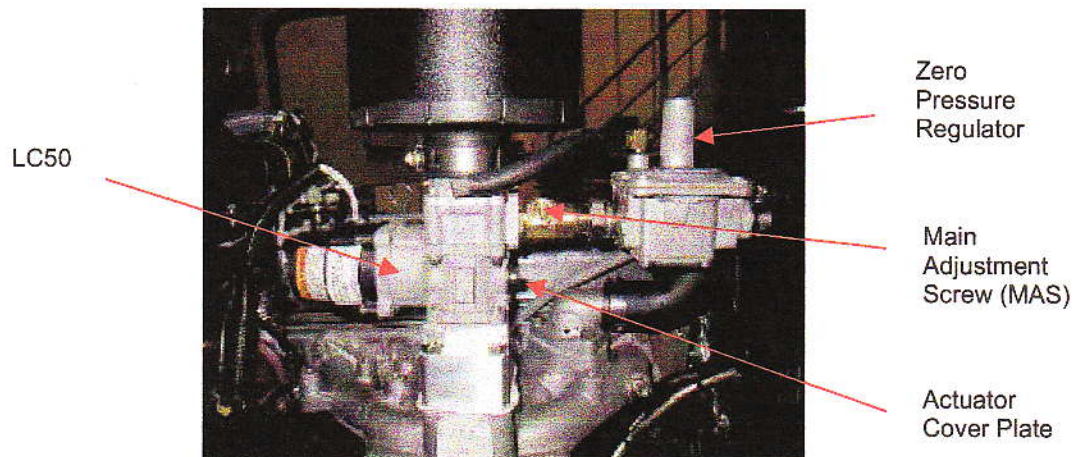
Set-up / Troubleshooting

OLYMPIAN™
GENERATOR SETS

Overview

Effective with April 2, 2001 production all Olympian gas gen-sets (with the exception of the G100F1) will incorporate the Woodward LC50 Fuel Mixer and Speed Control. The key differences between this system and the variable restriction carburetor with separate electronic governor previously used are:

- There are no external speed control linkages.
- The LC50 incorporates a digital speed control which is factory programmed. No on site adjustments of the speed control are required.
- This system utilizes a zero pressure regulator, therefore a lower natural gas inlet pressure is required (4"H₂O).
- Both Natural Gas and LPG Vapor units utilize the same regulator configuration, with the exception of the Ford 642 models where a larger regulator will be used for Natural Gas units.



Set-up Procedure

The gen-set will have been tested at full load for the specified fuel in the factory. Adjustments are not normally required at site. However, in certain circumstances, e.g. if a unit is converted from one fuel to another, or a major component is replaced some set-up will be required.

Tools Required

- Manometer capable of reading between 0 to 20"H₂O (50mBar) for Natural Gas or LP Vapor sets, 0 to 200PSI (14Bar) for LP Liquid sets.
- Lambda sensor (e.g. part number 622-643) or Exhaust Gas Analyzer capable of reading %CO.
- Steel Rule or Vernier gauge with mm scale.

Pre-Start Checks

Check the gas pressure at the inlet to the unit is within the specified pressure range (see below):

Natural Gas or LPG Vapor: 4"H₂O (10mBar) to 13.5"H₂O (34mBar)

LPG Liquid: 58PSI (4Bar) to 180PSI (12Bar)

If a new regulator or LC50 have been installed, or if the unit is being converted from Natural Gas to LP Vapor or vice versa, set the regulator, Main Adjustment Screw (MAS) and ignition timing according to the following tables:

Natural Gas 50/60Hz	Isuzu Low Speed	Isuzu High Speed	Ford 425	Ford 642	Ford 1068	Ford 1068T
Regulator Setting (mm down from top edge)	14	13	14	15.5	16	TBC
MAS Setting (mm out from body)	10	11	11	12	19	TBC
Ignition Timing (DBTDC)	24(60Hz) 19(50Hz)	25	grnd-grnd	Wire 674 to wire 53A	Wire 674 to wire 53A	TBC

LPG 50/60Hz	Isuzu Low Speed	Isuzu High Speed	Ford 425	Ford 642	Ford 1068	Ford 1068T
Regulator Setting (mm down from top edge)	14	13	14	12.5	14	NA
MAS Setting (mm out from body)	8	9.5	9	15	16	NA
Ignition Timing (DBTDC)	18	25	grnd-grnd	Wire 674 to wire 5	Wire 674 to wire 5	NA

Install the Lambda sensor in the port provided in the exhaust pipework (or insert an exhaust gas analyzer probe into the exhaust outlet). If using the Lambda sensor, connect as follows:

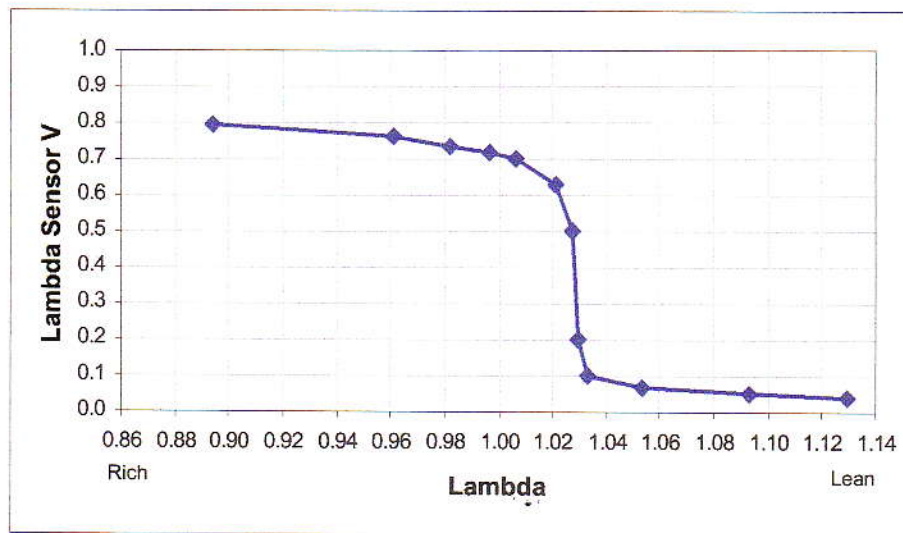
Black wire (signal +ve): Digital voltmeter (positive lead)

Gray wire (signal -ve): Digital voltmeter (negative lead)

White wires (heater): Fused 12V dc supply

Note: It's important to use a digital meter, because an analog meter typically has a low input impedance which can distort the signal.

The Lambda sensor gives an output as follows:



Engine Running Adjustments (1800 RPM Sets)

1. Start the generator set and check Lambda or CO% at no load.
If Lambda < 0.96 (Lambda sensor > 0.75V, or CO > 2.5%) the regulator outlet pressure is set too high, adjust the regulator to reduce the outlet pressure.
If Lambda > 1.04 (Lambda sensor < 0.1V or CO < 0.05%) the regulator outlet pressure is set too low, adjust the regulator to increase the outlet pressure.
2. Increase the load to around 60% of nameplate rating using a load bank, or available building load. Allow the engine time to reach normal operating temperature.
3. Adjust the main adjustment screw (MAS) on the mixer until Lambda = 1.0 (Lambda sensor = 0.7V or CO = 1.0%).

4. Increase the load to 100% of nameplate rating using a load bank (if a load bank is available).
5. If required, adjust the MAS until $\text{Lambda} = 1.0$ ($\text{Lambda sensor} = 0.7\text{V}$ or $\text{CO} = 1.0\%$).
If the screw has been opened completely and Lambda is still too high, either the gas inlet pressure is too low or the gas quality is too poor. It may not be possible to achieve full load in this case.
6. Remove all load from the genset.
If Lambda is between 0.96 and 1.04 ($\text{Lambda sensor} = 0.1 - 0.75\text{V}$ or $\text{CO} = 0.05\% - 2.5\%$) no further adjustments are required.
If the mixture is too lean, $\text{Lambda} > 1.04$ ($\text{Lambda sensor} < 0.1\text{V}$ or $\text{CO} < 0.05\%$) increase the regulator outlet pressure.
If the mixture is too rich, $\text{Lambda} < 0.96$ ($\text{Lambda sensor} > 0.75\text{V}$ or $\text{CO} > 2.5\%$) decrease the regulator outlet pressure.
7. Repeat steps 2 to 6 until the generator set operates with Lambda between 0.96 and 1.04 ($\text{Lambda sensor} = 0.1 - 0.75\text{V}$ or $\text{CO} = 0.05\% - 2.5\%$) at all loads.
8. Stop the genset and check that it can re-start with the new MAS and regulator settings.

Engine Running Adjustments (3600 RPM Sets)

1. Start the generator set.
2. Increase the load to around 60% of nameplate rating using a load bank, or available building load. Allow the engine time to reach normal operating temperature.
3. Adjust the main adjustment screw (MAS) on the mixer until $\text{Lambda} = 1.0$ ($\text{Lambda sensor} = 0.7\text{V}$ or $\text{CO} = 1.0\%$).
4. Increase the load to 100% of nameplate rating using a load bank (if a load bank is available).
5. If required, adjust the MAS until $\text{Lambda} = 1.0$ ($\text{Lambda sensor} = 0.7\text{V}$ or $\text{CO} = 1.0\%$).
If the screw has been opened completely and Lambda is still too high, either the gas inlet pressure is too low or the gas quality is too poor. It may not be possible to achieve full load in this case.
6. Remove all load from the genset.
If Lambda is between 0.96 and 1.04 ($\text{Lambda sensor} = 0.1 - 0.75\text{V}$ or $\text{CO} = 0.05\% - 2.5\%$) no further adjustments are required.
If the mixture is too lean, $\text{Lambda} > 1.04$ ($\text{Lambda sensor} < 0.1\text{V}$ or $\text{CO} < 0.05\%$) adjust the MAS until $\text{Lambda} < 1.04$
If the mixture is too rich, $\text{Lambda} < 0.96$ ($\text{Lambda sensor} > 0.75$ or $\text{CO} > 2.5\%$) adjust the MAS until $\text{Lambda} > 0.96$
7. Increase the load to 60% of nameplate rating.
If Lambda is between 0.96 and 1.04 ($\text{Lambda sensor} = 0.1 - 0.75\text{V}$ or $\text{CO} = 0.05\% - 2.5\%$) no further adjustments are required.

- If the mixture is too lean, $\text{Lambda} > 1.04$ (Lambda sensor $< 0.1\text{V}$ or $\text{CO} < 0.05\%$) adjust the MAS until $\text{Lambda} < 1.04$
- If the mixture is too rich, $\text{Lambda} < 0.96$ (Lambda sensor > 0.75 or $\text{CO} > 2.5\%$) adjust the MAS until $\text{Lambda} > 0.96$
8. Repeat steps 6 to 7 until the generator set operates with Lambda between 0.96 and 1.04 (Lambda sensor = $0.1 - 0.75\text{V}$ or $\text{CO} = 0.05\% - 2.5\%$) at all loads.
 9. Stop the genset and check that it can re-start with the new MAS and regulator settings.

Trouble-shooting

Faults in the system will most likely be external to the LC50 (i.e. gas supply pressure, gas quality, fuel solenoid operation, ignition system), therefore these items should be checked first.

Note: If the outlet pressure of the zero pressure regulator is too high or too low, the engine may not start.

When the above items have been checked and found satisfactory, proceed with the following:

1. Turn off the gas supply and disconnect the wiring loom to the LC50 at the Deutsch connector.
2. Test that the supply voltage to the LC50 is within spec as follows: While cranking the engine, measure the dc voltage between pins 1 and 2 of the Deutsch connector on the wiring loom, it should be > 8 volts. If the voltage is less than 8 volts investigate the reason and rectify.
3. Test that the magnetic pick-up signal is within spec as follows. While cranking the engine, measure the ac voltage between pins 11 and 3. It should be > 1.5 volts. If the voltage is less than 1.5 volts investigate the reason and rectify.
4. Remove the actuator cover plate.
5. Check the butterfly is free to move and does not bind. It should have a spring pressure which pushes it closed. If the butterfly is seized, binds or has no spring pressure, then replace the LC50 assembly.
6. Reconnect the Wiring loom to the LC50 and crank the engine. The butterfly should open to the start fuel limit position (approximately 45 degrees). If not, and all previous tests have proved satisfactory, then replace the LC50 assembly.