

[Click here to get the complete manual](#)

SB4241E00  
Apr. 2007

# **Service Manual**

**G420FE LP/Dual Fuel Engine**

**G420F LP/Gasoline Dual Fuel Engine**

---

**G15S-5, G18S-5, G20SC-5**

**GC15S-5, GC18S-5, GC20SC-5**

**G20E-5, G25E-5, G30E-5**

**GC20E-5, GC25E-5, GC30E-5, GC33E-5**

# Important Safety Information

Most accidents involving product operation, maintenance and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills and tools to perform these functions properly.

**Read and understand all safety precautions and warnings before operating or performing lubrication, maintenance and repair on this product.**

Basic safety precautions are listed in the "Safety" section of the Service or Technical Manual. Additional safety precautions are listed in the "Safety" section of the owner/operation/maintenance publication.

Specific safety warnings for all these publications are provided in the description of operations where hazards exist. WARNING labels have also been put on the product to provide instructions and to identify specific hazards. If these hazard warnings are not heeded, bodily injury or death could occur to you or other persons. Warnings in this publication and on the product labels are identified by the following symbol.



**Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.**

**Do not operate or perform any lubrication, maintenance or repair on this product, until you have read and understood the operation, lubrication, maintenance and repair information.**

Operations that may cause product damage are identified by NOTICE labels on the product and in this publication.

DOOSAN cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are therefore not all inclusive. If a tool, procedure, work method or operating technique not specifically recommended by DOOSAN is used, you must satisfy yourself that it is safe for you and others. You should also ensure that the product will not be damaged or made unsafe by the operation, lubrication, maintenance or repair procedures you choose.

The information, specifications, and illustrations in this publication are on the basis of information available at the time it was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service given to the product. Obtain the complete and most current information before starting any job. DOOSAN dealers have the most current information available.

# Index

## Chapter 1. GENERAL INFORMATION

Precautions before Service .....	7
Tightening Torque .....	10
Recommended Lubricants and Capacities.....	11
Engine Model and Engine Serial Number .....	12
General Specification .....	13
Engine Power and Torque.....	15

## Chapter 2. RECOMMENDED MAINTENANCE

<b>General Maintenance.....</b>	<b>16</b>
Test Fuel System for Leaks.....	16
Inspect Engine for Fluid Leaks .....	16
Inspect Vacuum Lines and Fittings.....	16
Inspect Electrical System .....	16
Inspect Foot Pedal Operation.....	16
Engine Oil Classification.....	17
Checking Engine Oil Level .....	18
Replacing Engine Oil and Filter .....	18
Checking Compressed Pressure.....	19
Adjusting Timing Belt Tension .....	20
<b>Cooling System Maintenance.....</b>	<b>21</b>
Coolant Recommendation.....	21
Check Coolant Level.....	21
Inspect Coolant Hoses .....	21
Checking coolant leaks .....	22
Specific gravity test.....	22
Relation between Coolant concentration and Specific Gravity.....	22
Checking and Adjusting Drive Belt .....	23
Adjusting.....	24
Checking Belt for Damage .....	24
<b>Ignition System Maintenance.....</b>	<b>25</b>
Inspect Battery System .....	25

Inspect Ignition System.....	25
Inspection of Ignition Timing .....	25
Inspection of Spark Plug.....	26
<b>Fuel System Maintenance .....</b>	<b>28</b>
Replace LP Fuel Filter Element.....	28
Testing Fuel Lock-off Operation .....	29
Pressure Regulator/Converter Inspection.....	29
Inspect Air/Fuel Valve Mixer Assembly .....	30
Inspect for Intake Leaks.....	30
Inspect Throttle Assembly.....	30
Checking the TMAP Sensor.....	30
<b>Exhaust System Maintenance.....</b>	<b>30</b>
Inspect Engine for Exhaust Leaks.....	30
<b>Maintenance Schedule .....</b>	<b>31</b>

## Chapter 3. ENGINE MECHANICAL SYSTEM

<b>General Information.....</b>	<b>33</b>
Engine Outline.....	33
Specifications .....	34
Specifications .....	35
Torque Specification.....	38
Special Tools.....	39
Troubleshooting.....	41
<b>Timing Belt System .....</b>	<b>42</b>
Components .....	42
Removal .....	43
Inspection.....	44
Assembly.....	46
<b>PCV Valve .....</b>	<b>48</b>
Outline and Operation Principle .....	48
Service Procedure .....	49
<b>Intake and Exhaust System.....</b>	<b>50</b>
Intake Manifold .....	50
Exhaust Manifold.....	52
<b>Cooling System .....</b>	<b>54</b>
General Description.....	54
Testing and Adjusting .....	55

Cooling System Recommendation .....	58
Coolant Pipe and Hose .....	60
Water Pump.....	61
Thermostat .....	63
<b>Cylinder Head Assembly .....</b>	<b>65</b>
<b>Lubrication System.....</b>	<b>74</b>
General Description .....	74
Testing and Adjusting.....	75
Oil Pressure Switch.....	77
Front Case and Oil Pump.....	78
<b>CAM Shaft, HLA, Timing Chain .....</b>	<b>83</b>
Components .....	83
Removal .....	84
Inspection .....	85
<b>Crankshaft.....</b>	<b>90</b>
<b>Flywheel and Housing .....</b>	<b>94</b>
<b>Piston and Connection Rod .....</b>	<b>95</b>
<b>Cylinder Block.....</b>	<b>110</b>

## **Chapter 4. ENGINE ELECTRICAL SYSTEM**

<b>Specifications .....</b>	<b>118</b>
<b>Ignition System.....</b>	<b>119</b>
Coil-On-Plug Ignition System .....	119
COP Components.....	119
Inspection of Ignition Timing.....	122
Inspection of Ignition Coil Drivers (Power TR) .....	122
Inspection of Ignition Coil .....	123
Inspection of Spark Plug .....	124
<b>Charging System .....</b>	<b>126</b>
General Description .....	126
Troubleshooting .....	128
Disassembly and Installation .....	134
<b>STARTING SYSTEM.....</b>	<b>139</b>
General Description .....	139
Diagnosis Procedure.....	140
Start Relay Tests .....	142

Troubleshooting.....	143
Starter .....	144

## **Chapter 5. ENGINE MANAGEMENT SYSTEM (EMS)**

<b>General Information.....</b>	<b>150</b>
Specifications .....	150
Service Standard.....	155
Component Location.....	156

### **G420FE EMS (Engine Management System)**

<b>Overview .....</b>	<b>160</b>
General Description.....	160
LPG Fuel System Operation .....	163
MPI Gasoline System Operation .....	170
Electronic Throttle System .....	171
Ignition System.....	172
Exhaust System.....	173
SECM.....	175
SECM Wiring Diagrams for G420FE .....	178

### **G420F EMS (Engine Management System)**

<b>Overview .....</b>	<b>180</b>
General Description.....	180
LPG Fuel System Operation .....	183
MPI Gasoline System Operation .....	187
Electronic Throttle System .....	187
Ignition System.....	187
Exhaust System.....	187
SECM.....	187
SECM Wiring Diagrams for G420F .....	188

### **EMS Inspection and Repair.....**

Engine Control Module (SECM) .....	189
Camshaft Position Sensor .....	191
Crank Shaft Position Sensor .....	192
MAP (Manifold Absolute Pressure) Sensor ..	193
IAT (Intake Air Temperature) .....	194