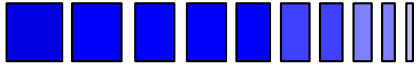




PRODUCT SPECIFICATION



Date: May 29, 2017

Spec. No. SGCO 3000
EcoPower Rev L

SGCO 3000 EcoPower™

CLIP-ON FUEL SAVING TWO SPEED GENERATOR SET
With SG+ Controller

TECHNICAL SPECIFICATION

Approval:



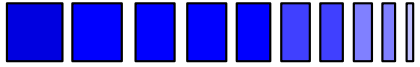


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GENERAL DESCRIPTION

Manufacturer	Thermo King Corporation
Construction	<ol style="list-style-type: none">1. The generator set is designed for mounting to the upper front structure of an ISO container.2. The design incorporates a quick connection to the upper container corner castings or header pin mounting.3. Additional attaching points on the container vertical structural members provide a secure mounting arrangement.4. These lower mounting bolts are retained by a steel plate, stainless steel hinge, and positive ¼ turn latch.5. A bolt storage tube is welded to the frame to secure the bolt between trips.6. The rotor washer clip to prevent spinning off during normal use positively retains the lower mounting bolt/plate washer assembly. Provision tube for mounting bolt when not in use.7. The Genset envelope considered the need to access the refrigeration unit control box while mounted on all common refrigeration units from Thermo King, Carrier, Klinge, and Seacold for either 8'6" or 9'6" containers.8. Genset components (filters, hoses, wire harness, etc.) are installed and securely fastened to ensure dependable, long-term operation and ease of serviceability.9. All wires/hoses/tubes etc. are fastened properly to protect integrity and prevent wire chafing.10. Ring terminals are used on all high voltage connections
Structural Design	<ol style="list-style-type: none">1. The Genset is designed to withstand & operate satisfactorily in over-the-road trucking, railway operations, & aboard ships.2. The Genset is rated to withstand shock levels of a minimum 3 g's acceleration force in the horizontal direction & 6 g's acceleration force in the vertical direction.3. The Genset is designed to have no harmful resonance frequencies between 20 and 100 Hz and is rated for vibration levels of 2 g's in all directions.
Structural Frame	<ol style="list-style-type: none">1. Steel/material: Fuel tank, ASTM-A-469 (METRIC 11320.10) 0,134" (3,5mm) Structural member, ASTM-A-635 (METRIC 11342.10 and 11416.10) 0,250" (6,0mm)2. Structural steel frame and integral fuel tank is chemically cleaned through an 2 stage pretreatment (sandblast) and a 6 stage chemical pretreatment with a multi-metal iron phosphate passivation, primed with a epoxy-polyester powder (1.5-2.0) mils and top coated with a black polyester TGIC (triglycidyl isocyanurate) powder (2.5-4.0) mils. for a final mil thickness of 3.5-5.0
Panels, Doors, and Bumpers	<ol style="list-style-type: none">1. Panels and doors are chemically cleaned through a 6-stage pretreatment line with a multi-metal iron phosphate passivation and top coated with white polyester (2.5-4.0) mils TGIC (triglycidyl isocyanurate) powder.2. Door material: Aluminum, .063" (1.6mm) thick3. Panel material: Aluminum, .063" (1.6mm) minimum thickness4. Two solid rubber bumpers are installed to protect the Genset housing during handling (see installation diagram for actual dimensions). The upper bumper is 6.5" wide x 2" high x 1½" thick. The lower bumper is 7" wide x 6" high x ¾" thick.
Hardware	<ol style="list-style-type: none">1. All hardware (screws, washers, nuts, & clamps) are stainless steel for maximum protection from salt-water corrosion.2. Powerpack mounting bolts and lower unit mounting bolts are zinc dichromate steel for strength and corrosion resistance.



PRODUCT SPECIFICATION

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	3. This excludes hardware supplied by original equipment manufacturer suppliers.
Nameplate Instructions	English and Spanish language operating instructions
CE Compliance	Compliant with the Machinery Directive 89/392/EEC amending Directive 91/368/EEC, Electro Magnetic Compatibility Directive 89/336/EEC, and Low Voltage Directives 73/23/EEC and 93/68/EEC.
Ambient Temperature Range	Structure: -40°C to 52°C (-40°F to 125°F) Operation and Starting: -26°C to 52°C (-15°F to 125°F) Running: -40°C to 52°C (-40°F to 125°F)
Output Power Rating	15KW. Designed to supply operating power for container refrigeration units complying with ISO 1496-2.
Sound Pressure Level	74 dBA. 5 point average at 7m
Dimensions	Height: 1053 mm (41.45 in) Depth: 710 mm (27.97 in) Length: 2337 mm (92.0 in)
Weight	818 kg (1804 lbs) - Total Weight, including Gen Set, oil, coolant, dry fuel tank and battery. Genset to be provided with decal indicating gross weight inclusive of fuel.



ENGINE

Type	TK 486VG direct injection	Protection	Low oil level and high coolant temperature
Cylinder Arrangement	No. 1 at flywheel end	Serviceability	Starter motor/injector pump mounted on front side of engine
Bore	86 mm (3.39 in) nominal	Paint	Light Gray Water Lacquer
Displacement	2.09 liter (128 in ³)	Timing System	Gear drive for camshaft and injection pump
Horsepower	34.1	Firing Order	1-3-4-2
Oil Pressure (hot)	More than 127 kPa (18.5 psi) @ 1600 rpm	Compression Pressure	More than 2942 kPa (427 psi) @ 250 rpm
Oil Base (Pan) Capacity	12.3 liters (13 quarts)	Nozzle Injection Pressure	21600-22600 kPa (3100 – 3300 psi)
Engine Rotation	Clockwise (viewed from pulley end)	Emission	2010 manufactured engines are compliant with EPA and ARB regulations

ENGINE LUBRICATION SYSTEM

Oil Pump Type	Trochoid	Delivery Volume	15.7 liters (4.15 gallons) / min @ 1000 pump rpm
Oil Type	API CI grade or better -- Use straight or multi-weight oils appropriate for the ambient temperature (delivered with 10W30 oil)	Oil Filters Full Flow: Dual lube Full flow/bypass filter	Thermo King Part # 11-9182
Oil Change Interval	Consult applicable service manual		

ENGINE ELECTRICAL SYSTEM

PreHeat Type	Intake Air Heater	Resistance	0.2 Ohms
Rated Voltage	11 Volts	Rated Current	77 Amperes



FUEL SYSTEM

Fuel Tank	125 gallon steel fuel tank integral with frame. Two filler necks are located on opposite sides of the tank. Tank is fumigated internally to protect against corrosion	Fuel Tank Mounting	Integral to Genset
Fuel Cap	Held with 200 lb tension chain.	Anti-Siphon	Rated at 30GPM.
Automatic Air Bleed System	Thermo King furnishes a patented air removal system for purging air from the injector pump and fuel supply lines. The air bleed system works whether the generator set is operating or shutdown. In the case of long shutdown periods, the automatic air bleed system insures sufficient air free fuel available to the injectors to successfully start the engine without manually bleeding the lines and injector assembly.	Fuel Tank Drainage	Supplied with a drain plug in the bottom of the tank for purging contaminants.
		Fuel Filters	Thermo King's self-evacuating filter (SEF) is both a fuel filter and a water separator in one spin-on canister. Thermo King Part # 11-9342
		Injection Pump Rotation	Clockwise (viewed from gear end)
Transfer Pump Lobe Lift	5.0 mm (0.197 in)	Injection Timed at	See Maintenance Manual
Tightening Torque	41 N-m (27.5 ft-lb)	Injection Lines, ID	1.4 mm (0.055 in)
Nozzle Type	YDM-PD	Injection Lines, OD	6 mm (.236 in)

ENGINE STARTER MOTOR

Voltage	12 V DC	Clutch Type	Over running clutch
Rotation	Clockwise (viewed from pinion end)	Motor Power	2.3 kW
Pull-in Current of Solenoid	52 Amps	Hold-in Current of Solenoid	19 Amps
Method of Engagement	Magnetically-engaged sliding pinion		

SPEED SOLENOID

Voltage	12 V DC	Resistance	4.3 Ohms
Rated Voltage	12.5 Volts	Rated Current	2.9 Amperes
Non –energized position	Low speed		



GENERATOR

Type	Synchronous type generator consisting of a 4 pole alternator wound field design with brushless exciter	Insulation	Class H per NEMA Standard MG-1-1.65
Maximum Temperature Rise	105 °C in accordance with NEMA Standard MG 1-22.40	Method of Cooling	Drive disc radial fan
Varnish Treatment – Generator Stator & Exciter Stator	Double Vacuum Pressure Impregnated with polyester resin, top coated with EG43 grey varnish. Exposed windings brushed with black poly-butylene.	Varnish Treatment - Rotor	Double Vacuum Pressure Impregnated with polyester resin, top coated with EG43 varnish.
Rear Bearing	Single bearing, 6307. Double contact sealed, including a medium fill of Mobil 28 grease.	Engine Flywheel Housing	Cast steel housing. Cast surfaces are machined for the mounting bolts.
Generator Rating (Nominal)			
Output Power	15 KW	Voltage	460 / 230
Kilovolt-Amperes	18.75 kVA	Phases	3
Power Factor	0.8	Frequency	60 Hz
RPM	1800		

ELECTRICAL POWER RECEPTACLE

Type	ESL 1911-01	Voltage	460 V
Current Limit	32 Amps	Protection	Spring loaded water/dirt protection cover

AIR FILTER

Filter Type	Heavy duty media filter with cyclonic action and pressure drop indicator
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HOSES

Intake Air Hose	High temperature structural EPDM
Coolant Hoses	High temperature EPDM



MUFFLER

Stainless Steel Material	Noise reducing baffle design
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RADIATOR COIL

Protection	E-coat coating for corrosion resistance or equivalent.	Tube Material	Copper, internally cross-hatched.
Fin Space	2.54 mm (0.100 in)	Fin Material	Aluminum
Pipe Material, Copper	According to DIN 1787 wall thickness 0.762 mm (0.030 in)	Configuration	Vertical
Surface Area	9.6 m ² (103 ft ²)	Coolant Fluid	Caltex coolant – equivalent of Texaco ELC #16445 & rated to -40°C (-40°F) or equivalent

RADIATOR FAN

Type	Propeller	Diameter	381 mm (15.0 in)
Number of Fans / Blades	1 / 6	Speed	1800 / 1500 rpm
Blade Material	Aluminum	Drive	Direct off engine water pump
Hub Material	Steel	Pitch	31°
Air Flow	1400 cfm		

BATTERY

Type	Maintenance free 12 VDC	Cold Cranking Amps	925 Amps at -18°C (0°F)
Recharging	Solid-state battery charging, 26 Amps output integrated into SG+ controller.	Terminal Posts	Round post terminals and standard battery cable connections are provided
		Dimensions	330 x 173 x 238 mm (13 x 6.8 x 9.4 in)



SG+ MICROPROCESSOR CONTROLLER

The SG+ Microprocessor Controller is a one-piece self contained microprocessor for diesel generator sets. This system automatically controls the generator set operation by providing:

- ◆ Ability to operate at variable speeds for enhanced fuel consumption
- ◆ Automatic unit preheat and engine start-up during initial start-up or unattended restart
- ◆ Variable air intake heater preheat time
- ◆ Automatic Pre-Trip capability
- ◆ Provides unit shutdown protection due to high engine coolant temperature, low engine oil pressure, low engine oil level, fuel relay feedback failure or 230/460V alternator overload
- ◆ Automatic unit restart attempt 20 minutes after:
 - High engine water temperature
 - Engine failure to start
 - Check fuel alarm
 - 230/460V alternator overload
 - Fuel relay feedback failure
 - Low engine oil pressure
- ◆ Exterior Deutsch downloading port with protective cap provided.
- ◆ Delayed alternator excitation for 15 seconds, or until engine coolant temperature increases to 32°C (90°F) (selectable)
- ◆ Internal self-checking /diagnostic capability
- ◆ Hour meter
- ◆ Multi language menu capability

SG+ CONTROLLER INTERFACE

The SG+ controller interface contains the following features and components:

A. LCD Digital Display

B. Alarm LED

C. Power LED

D. Six keypad keys:

1. "Escape" use escape a new setting or jump to the parent menu
2. "Up" use to scroll up through the menu display, or increase the value of a setting
3. "Down" use to scroll down through the menu display, or decrease the value of a setting
4. "Enter" use to enter or execute controller menu tasks or commands
5. "Alarm" use to go directly to the alarm list menu and view the alarm information in the display
6. "Language" use to change the display language. English and Spanish are currently available.

E. Unit On/Off switch



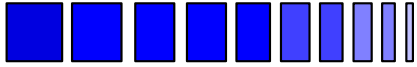
SG+ CONTROLLER INPUTS/OUTPUTS/MENUS

Microprocessor Inputs:	Microprocessor Outputs:
<ul style="list-style-type: none">♦ Engine oil pressure♦ Alternator Voltage♦ Battery Voltage♦ Engine Coolant temperature♦ Air filter switch♦ Coolant level sensor♦ Engine oil pressure switch♦ Engine oil level sensor♦ Air heater (preheat) feedback♦ Fuel pull relay feedback♦ Fuel hold relay feedback♦ Excitation feedback♦ Flywheel sensor	<ul style="list-style-type: none">♦ Start relay♦ Preheat relay♦ Fuel pull relay♦ Fuel hold relay♦ On light♦ Alarm light
Display Menus:	
<ol style="list-style-type: none">1. Data Menu<ul style="list-style-type: none">♦ Analog inputs♦ Digital inputs♦ Digital outputs♦ Internal states2. Alarm list Menu3. Message list Menu4. Commands Menu<ul style="list-style-type: none">♦ PTI♦ Manual function test5. Misc. Functions Menu<ul style="list-style-type: none">♦ Date/time♦ °C/°F mode♦ Program version♦ Timers/counters6. Configuration Menu7. Event log Menu	

SG+ ALARMS/MESSAGES/OPERATING INSTRUCTIONS

Alarms/Messages/Operating instructions

See Thermo King SGCO Maintenance Manual.



OPTIONS

CUSTOMER SPECIFIED COLOR

The frame assembly and panels can be painted per customer request but must be noted in advance.

CUSTOMER UNIT SERIAL NUMBER DECALS

Customer decals can be included per customer request but must be noted in advance.

MOUNTING: HEADER PIN / QUICK CLAMP

Mounting configuration based on customer's container box fleet requirements.

FUEL MONITORING

Capable of logging any event which causes changes in fuel levels outside of the range of normal genset operations.

FUEL HEATER

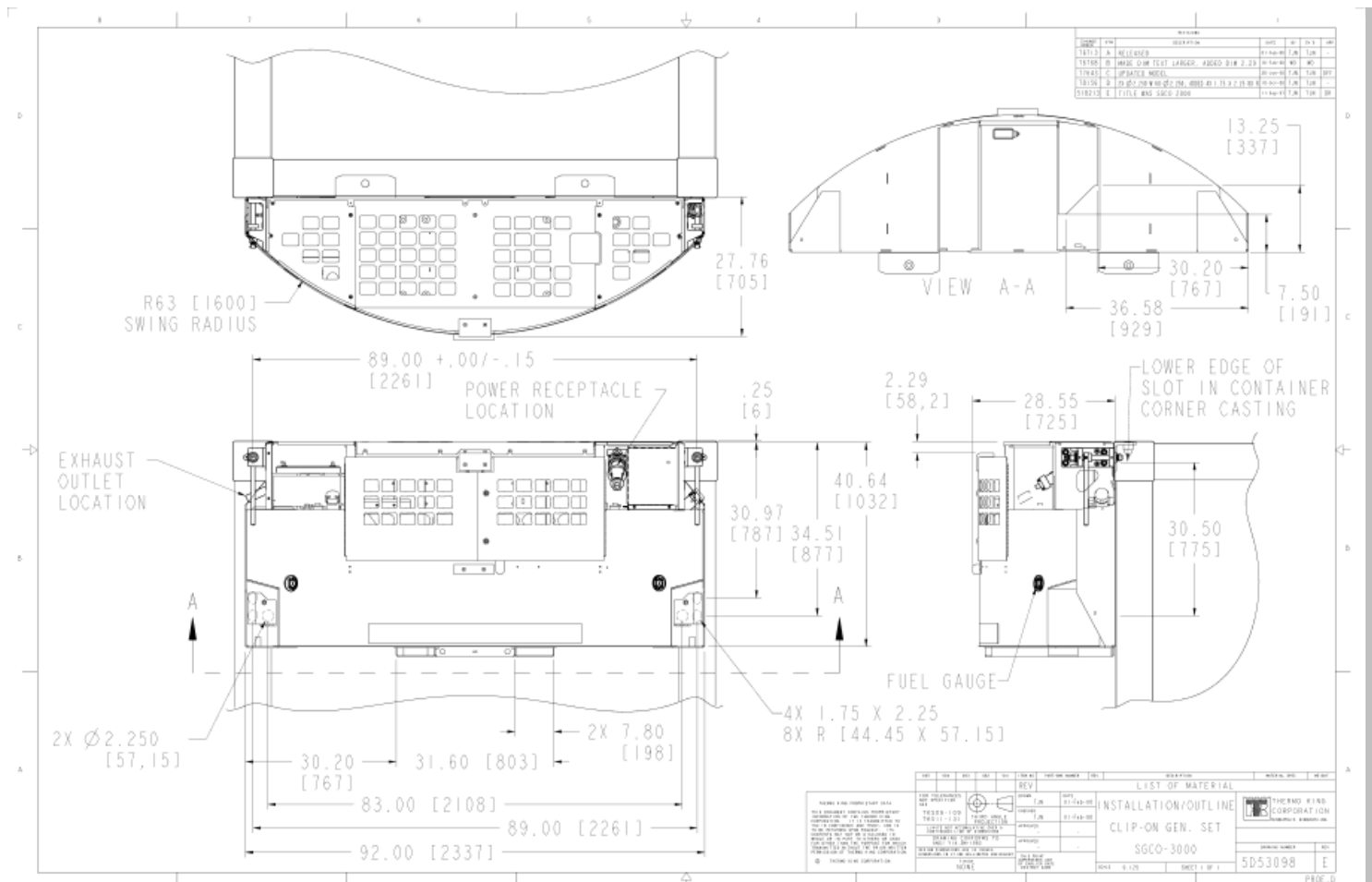
150 W electric fuel heater.

FUEL PRE-FILTER

Cleanable fuel strainer placed in the supply line between fuel tank and transfer pump on the engine. Prevents clogging of the fuel pump inlet screen and also to facilitate visual inspection during pre trip inspection.

BATTERY

Threaded stud post battery terminals..

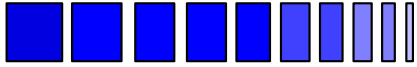


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EMI BULLETIN

EMI 3000 Package

The EMI package includes:

- New 5 Years or 12,000 Hours Extended Life Coolant (ELC)
- New EMI 3000 Water Pump, P/N 11-9442 (includes HNBR elastomer seals and EPDM O-rings)
- New EMI 3000 Dual Element Oil Filter, P/N 11-9182 (identified by black and gold colors)
- New EMI 3000 Dual Element Oil Filter Head, P/N 11-9354
- New EMI 3000 API Rating CG-4 Mineral Oil
- New EMI 3000 Fuel Filter, P/N 11-9342 (identified by black and gold colors)

The EMI 3000 package allows standard genset maintenance intervals to be extended to 3000 hours. However, please note that units equipped with the EMI 3000 package do require regular inspection in accordance with Thermo King pretrip inspection and maintenance recommendations.

CAUTION: With both EMI 3000 and standard (non-EMI 3000) units operating in the field, there are several important rules to remember:

- **Extended Life Coolant (ELC) is RED in color while conventional coolant is GREEN or BLUE-GREEN.**
- **Do NOT add “RED” coolant to cooling systems using “GREEN” or “BLUE-GREEN” coolant.**
- **Do NOT add “GREEN” or “BLUE-GREEN” coolant to cooling systems using “RED” coolant.**
- **The EMI 3000 oil filter is NOT interchangeable with previous oil filters.**

EMI 3000 Components:**Extended Life Coolant and EMI 3000 Water Pump**

A decal tag on the coolant expansion tank will identify units with extended life coolant (ELC). ELC extends the coolant change interval up to 12,000 hours or 5 years. ELC requires a water pump with HNBR elastomer seal bellows and EPDM elastomer O-rings. Therefore ELC should not be used on older units with standard water pumps. All Yanmar (TK 486) engines with serial number L16553 and after include a new EMI 3000 water pump for use with extended life coolant.

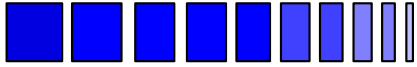
ELC Compatible Water Pump 11-9442**ELC Nameplate 91-9269**

Thermo King ships all water-cooled engines from the factory with a 50% antifreeze concentrate and 50% water mixture in the cooling system. ELC coolants are available in 100% full strength concentrate or (pre-mixed) 50/50 mixture. Thermo King recommends the use of 50/50 pre-mixed ELC coolant to assure that de-ionized water is used. ELC 100% concentrate must be mixed (50/50) with de-ionized or distilled water (NOT tap water) to ensure cooling system integrity.

The following Extended Life Coolants are approved by Thermo King for use in ELC units for five years or 12,000 hours:

- Texaco ELC #16445 (100% concentrate)
- Texaco ELC #16447 (premixed 50/50% mixture)
- Havoline Dex-Cool #7994 (100% concentrate)
- Havoline Dex-Cool #7995 (premixed 50/50% mixture)
- Shell Dexcool #94040
- Shell Rotella #94041
- Havoline XLC #30379 (100% concentrate, Europe)
- Havoline XLC #33013 (premixed 50/50% mixture, Europe)
- Saturn/General Motors Dex-Cool
- Caterpillar ELC
- Detroit Diesel POWERCOOL Plus.

NOTE: Use a glycol refractometer to accurately determine the freeze point and concentration of engine coolant (Anti-Freeze) solution. A refractometer works with both extended life and conventional coolants.

**EMI 3000 Dual Element Oil Filter and Oil Filter Head**

All Yanmar (TK 486) engines with serial number L32024 and after include an EMI 3000 oil filter head (P/N 11-9354) and gasket (P/N 33-2931), EMI 3000 dual element oil filter (P/N 11-9182) and API rated CG-4 mineral oil. These components are required to extend the maintenance interval to 3000 hours.

The EMI 3000 oil filter (identified by black and gold colors) is NOT interchangeable with the previous oil filters. The EMI 3000 oil filter head, gasket and oil filter can be retrofitted on previous Yanmar (TK 486) engines.

API service category CG-4 describes oils for use in high-speed four-stroke-cycle diesel engines used in both heavy-duty on-highway (0.05% wt sulfur fuel) and off-highway (less than 0.5% wt sulfur fuel) applications. CG-4 oils provide effective control over high-temperature piston deposits, wear, corrosion, foaming, oxidation stability, and soot accumulation. CG-4 (or better) mineral oil can be used in older units. However, an EMI 3000 oil filter (and oil filter head) is required to extend recommended maintenance intervals to 3,000 hours.

NOTE: The new oil filter head is equipped with a threaded port to accept an ESOC (Environmentally Safe Oil Change) fitting for quick oil changes.

EMI 3000 Fuel Filter

The new EMI 3000 fuel filter is required to extend the maintenance interval to 3000 hours. It can be interchanged with fuel filters used on previous Thermo King gensets.



Revisions

A	March 6, 2007	Original release
B	March 29, 2007	Update engine emission, official approval request being submitted.
C	June 21, 2007	Update engine emissions for 2008 engines, unit weight, panels doors and bumpers Section, added exterior downloading port to SG+ description.
D	August 24, 2007	Moved fuel heater from fuel system to option section, added option section updated battery section.
E	January 17, 2008	General updates
F	October 28, 2010	Added header pin mount to construction section, changed structural frame pre-treatment method, update emission year, specify high temperature EPDM for hoses, change coolant fluid brand, change battery from thread post to round post, add options for quick clamp, fuel heater, fuel pre-filter, and battery.
L	May 29, 2017	Generator section update