



8.0, 9.1, and 10.3 L Industrial Engines

Owner's Manual and Maintenance Log

EPA Certified Engines

2023



8.0, 9.1, & 10.3 L Owner's Manual

Service Parts

To ensure that your engine continues to run reliably and efficiently for as long as possible, use only genuine Industrial Irrigation parts.

For genuine Industrial Irrigation service parts for your engine, or for technical assistance in servicing your engine, call:

Industrial Irrigation 800-289-6478

Maintenance Providers

Maintenance and repair services may be performed by you or any qualified engine service provider that you choose. However, your engine warranty does not cover damage or failure caused by improper maintenance or repairs.

Owners Manual & Maintenance Log Storage & Use

Store this Owner's Manual and Maintenance Log in a safe, visible place by your engine. The maintenance log must be updated whenever your engine is serviced.

Disclaimer

All information and specifications in this manual are based on the latest data available at the time of the publication. Industrial Irrigation reserves the right to make changes or improvements at any time without notice.



8.0, 9.1, & 10.3 L Owner's Manual

TABLE OF CONTENTS	Page
U.S. EPA Legal Requirements	3
Safety Symbols & Precautions	4
Fuels	7
Starting, running, and stopping the engine	8
Engine maintenance	9
<ul style="list-style-type: none">• Schedule• Air filter• Alternator/water pump belt• Battery• Fuses• Engine oil & filter• Engine coolant, radiator, and cooling system• Spark plugs, wires• PCV system• Checking for gas leaks• Natural Gas & LPG fuel filters• LPG regulator/vaporizer• Natural Gas & LPG fuel lock-off valves	
Diagnostics	26
<ul style="list-style-type: none">• How to retrieve fault codes• Fault Code List	
Specifications	35
Engine Identification	36
Engine Warranty	37
<ul style="list-style-type: none">• Warranty provisions• Base warranty period• Emissions-related warranty period• Owner's obligations• Component lists	
Maintenance Log	39



8.0, 9.1, & 10.3 L Owner's Manual

U.S. EPA Legal Requirements

This engine has been certified by the U.S. Environmental Protection Agency (EPA) as a stationary and constant-speed mobile engine. It is illegal to operate this engine in a variable-speed (foot pedal speed control) application.

To ensure emissions compliance, the U.S. EPA requires you to do one of the following two options:

1. Operate and maintain your engine as specified in this Owner's Manual. In addition, you are required by law to keep detailed maintenance records.
2. If you do not operate and maintain your engine as specified in this Owner's Manual, your engine will be considered a non-certified engine.

In this case, you must:

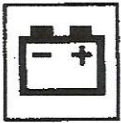
- Keep a maintenance plan and records of conducted maintenance.
- To the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions.
- Conduct an initial performance test within 1 year of engine startup to demonstrate compliance. Contact your regional EPA office for instructions on how to conduct an initial performance test.

Per section 113 of the U.S. Clean Air Act, failure to abide by these legal requirements can result in fines up to \$47,531 per day.

A maintenance plan and log are provided at the back of this manual for you to record your engine maintenance. Update the log each time you service your engine.

SAFETY SYMBOLS

This section identifies the ISO 8999 symbols that may be used in this manual.



Battery



Electrical hazards



Engine coolant fill level



Engine coolant temperature



Engine oil fill level



Engine oil pressure



Hot surface warning



Warning



Read the handbook



No Smoking or Flame

SAFETY PRECAUTIONS - STARTING



WARNING

Starting an engine incorrectly may cause injury to the operator and/or cause damage to the engine. Engine operators must be instructed in the correct procedures before attempting to start any engine.

Before Starting

- Inspect the engine, intake, exhaust, cooling system, and drivetrain to verify that the engine is fully assembled and not in the process of being serviced.
- Ensure the engine is free to turn without obstruction.
- Check that all safety guards are in their correct position and secure.
- Check that the coolant level in the radiator overflow bottle is between "Add" and "Full".
- Check that the oil level on the dipstick is between "Add" and "Full".
- Check that the fuel supply is connected, shut-off valves are open, and there are no leaks.
- If an LPG fuel system is being used, verify that there is fuel in the cylinder/tank.
- If a natural gas fuel system is being used, verify that the correct fuel supply pressure is being supplied to the engine.
- Check that the battery is connected and charged.
- When possible, disengage any driven equipment while starting.

SAFETY PRECAUTIONS - ELECTRICAL

The battery produces flammable and explosive hydrogen gas. The battery electrolyte contains poisonous and corrosive sulfuric acid. The precautions listed below must be followed to ensure operator safety.

- Do not smoke or allow any flame near the battery.
- With the engine stopped and the ignition switch in the OFF position, disconnect the negative battery cable from the battery before working on the engine.
- Be careful not to short circuit battery positive to ground with tools when working on the engine.
- Avoid getting battery electrolyte in your eyes or on your skin or clothes. If electrolyte gets in your eyes, flush with clean water immediately and get medical help. If electrolyte gets on your skin, wash immediately with soap and water and get medical help if you feel pain or burning. Remove and wash any clothing that is exposed to electrolyte.
- Never remove any electrical cables while the battery is connected in the circuit.
- Be careful to not short-circuit or cross battery positive and negative.
- Never 'flash' any connection to check the current flow.
- The ECU Wiring Harness, battery, and alternator must be disconnected before commencing any electric welding when a pole strap is directly or indirectly connected to the engine.
- When charging the battery, only do a slow charge (5 A or less), and ensure there is good ventilation.

FUELS



Natural gas and LPG are combustible gases, and can be explosive if leaked and contained in a confined area. Keep cigarettes and all other flame sources away from these areas.

If you can hear a fuel leak, shut off the fuel supply at the source immediately and fix the leak or have it serviced. Check the entire fuel supply line from the cylinder/tank to the engine for leaks with a soapy water bubble mixture anytime a cylinder/tank is changed or the fuel supply line is worked on. Fuel leaks should also be checked as part of the regular engine maintenance.

Depending on your engine and fuel system configuration, your engine is designed to run on natural gas, liquid LPG, or vapor LPG. The fuel requirements for each are discussed below. See the "SPECIFICATIONS" section for the required fuel supply pressures for each fuel.

Natural Gas

Your engine is certified to run on "pipeline-quality" and most grades of non-pipeline quality natural gas. Specifically, your engine is certified to run on natural gas that has at least 45% methane content by volume AND an energy content of 700 – 1800 BTU per SCF. If your natural gas supply does not meet both of these specifications, your engine is considered to be being operated as a non-certified engine. See "U.S. EPA Legal Requirements".

LPG

In order to maintain emissions compliance and the engine warranty, use commercial-grade HD-10 or better LPG.

Liquid LPG is drawn off of the bottom side of a LPG tank or cylinder and is a liquid until it has passed through the regulator/vaporizer, at which point it is vaporized to a gas. If you connect vapor LPG to a liquid LPG fuel system, you may starve the engine for fuel, causing it to produce low power and excessive emissions.

IIS does not recommend running your Reliable Horsepower engine utilizing a vapor LPG system. Please contact IIS to discuss your specific application requirements prior to running your engine on a vapor LPG system.



8.0, 9.1, & 10.3 L Owner's Manual

STARTING, RUNNING, & STOPPING THE ENGINE

Observe the safety precautions listed in "SAFETY PRECAUTIONS - STARTING" before starting the engine.

Starting the engine

- Turn the key switch to the ON position and verify that the MIL is illuminated. If not determine why the lamp is not working.
- Turn the key switch to the START position and hold until the engine has started.
- Release the key promptly after the engine starts to avoid grinding the starter.
- Do not crank the engine for more than 15 seconds at a time.
- Allow at least 30 seconds between cranking attempts.
- If the engine does not start after 3 starting attempts, review the "Before Starting" checklist.
-

Running the engine

- Do not race or fully load the engine during the first 3 minutes of operation.
- Verify that the "CHECK ENGINE" light is off while the engine is running. If it is on, refer to the DIAGNOSTICS section.
- Verify that there are no fuel, coolant, or oil leaks while the engine is running. If there are leaks, stop the engine and fix them or have the engine serviced.
- Listen to the engine. If you hear an abnormal noise while the engine is running, turn it off and correct the problem or have the engine serviced.
- No adjustments are necessary to the fuel or ignition systems.
- Your engine is certified to operate under load with set speeds between 1200 and 3000 rpm.

Stopping the engine

- If the engine has been running under load and is hot, run the engine at no load for 3 minutes to allow the engine to cool before stopping the engine.
- Stop the engine by turning the key switch to the OFF position. The engine may run-on for 1-5 seconds while the fuel is depleted from the carburetor and the air/fuel mixture is depleted from the intake manifold.



8.0, 9.1, & 10.3 L Owner's Manual

ENGINE MAINTENANCE

You should properly maintain your engine for the following reasons.

- You are legally required to maintain your engine and keep maintenance records to ensure emissions compliance. See "U.S. EPA Legal Requirements" at the front of this manual.
- Your engine warranty will be void if the engine is not properly maintained.
- Keeping your engine properly maintained will ensure the best engine life, power, and fuel economy.

Scheduled Maintenance

A schedule of the required engine maintenance tasks is listed on the following page. The scheduled maintenance should be performed when the engine reaches the specified operating hours or the specified months have elapsed, whichever comes first.

Daily Maintenance

In addition to the scheduled maintenance, daily checks are required to keep your engine running properly. These checks are listed in the "SAFETY PRECAUTIONS - STARTING" and "STARTING, RUNNING, & STOPPING THE ENGINE" sections.

Maintenance Log

Keep a record of your engine's scheduled maintenance in the Maintenance Log at the back of this manual.



8.0, 9.1, & 10.3 L Owner's Manual

Spare Page



8.0, 9.1, & 10.3 L Owner's Manual

INDUSTRIAL IRRIGATION 8.0, 9.1, & 10.3 L

The following table lists the periodic maintenance required to ensure

MAINTENANCE

Periodic maintenance should be performed after specified intervals have elapsed in months or hours, whichever comes first.

	Months	1	4	8	13	17	21	25	
	Hours	100	250	500	750	1000	1250	1500	
ENGINE									
Air filter	(A)			I		R		I	
Alternator/Fan/Water Pump Belt		I	I	I	I	I	I	I	
Battery		I	I	I	I	I	I	I	
Engine coolant		I	I	I	I	R	I	I	
Radiator outside	(A)	C	C	C	C	C	C	C	
Engine oil	(A)	R	R	R	R	R	R	R	
Oil Filter	(A)	R	R	R	R	R	R	R	
Spark Plugs (Platinum tipped)						I			
Spark Plug Wires						I			
Pre-Catalyst and Post-Catalyst Oxygen Sensors									
PCV system				I		I		I	
FUEL SYSTEM									
Check fuel hoses and fittings for gas leakage	(B)	I	I	I	I	I	I	I	
Fuel Filter						R			
LPG Primary Vaporizer/Regulator						I/D			
Fuel Lock-off valve(s)						I			

- Notes:**
 A) Under heavy duty operating condition, more frequent maintenance might be necessary.
 B) At time of LPG cylinder replacement, inspect tank connections for leakage with soapy water.

- Abbreviations:**
 I = Inspection
 R= Replace
 A= Adjust
 C= Clean
 D= Drain
 T= Retighten



AIR FILTER

Part Number: MAA55PA2806

Inspection

1. Remove air filter element from enclosure.
2. Tap filter to knock off loose dirt.
3. Visually check filter.
4. If filter is clean, reinstall old filter.
If filter is dirty, replace with a new filter.



ALTERNATOR-FAN-WATER PUMP BELT

Inspection

Check the belt for visible cracks, missing chunks, and fraying. Small cracks on the inside of the belt are OK. Replace the belt if cracks are visible on the outside of the belt, chunks are missing from the inside of the belt, or the belt is frayed.

Belt Tension

The belt should displace about 1/2" when 20 lbs of force is applied to the midpoint of the belt. If the deflection is greater than 1/2", increase the belt tension. If less than 1/2", reduce the belt tension.

Belt Replacement

1. Release all tension from the old belt.
2. Remove the old belt.
3. Install the new belt.
4. Apply tension to the belt as specified in "Belt Tension".
5. Recheck tension after 25-50 hours of operation.

BATTERY



The battery produces flammable and explosive hydrogen gas. The battery electrolyte contains poisonous and corrosive sulfuric acid. Review the safety precautions in "SAFETY PRECAUTIONS - ELECTRICAL" before working on the battery.

Battery Specifications	
Nominal Voltage:	12 V
Cranking Amps:	800
Cold Cranking Amps:	640
Battery voltage during alternator charging:	13.5 -15.0 V
Fully charged battery with key off @ 20 C (68 F):	12.5 -13.0 V
Half charged battery with key off @ 20 C (68 F):	12.0 - 12.5 V
Discharged battery with key off @ 20 C (68 F):	less than 12.0 V

Battery electrolyte inspection

1. Check electrolyte level.
2. If low, top off with distilled water. Do not overfill.

Battery corrosion inspection

1. Check battery posts and clamps for corrosion.
2. If corroded, remove negative cable first, then positive.
3. Clean both posts and both clamps with a small wire brush.
4. Reconnect cables, positive cable first.

If the engine is cranking slowly or not at all:

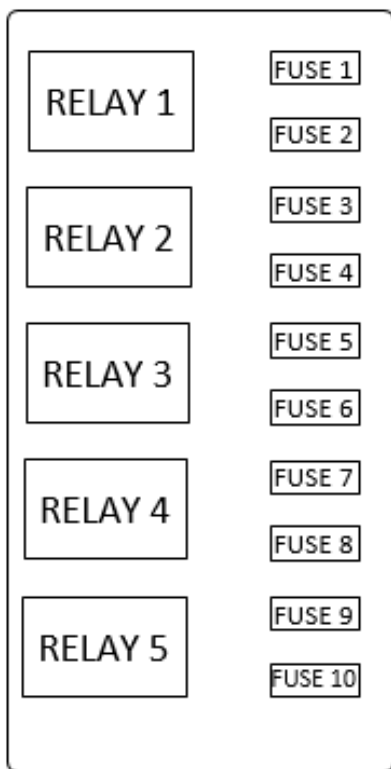
1. Remove the battery negative lead from the battery.
2. Remove the positive lead from the battery.
3. Clean the battery posts and cables with a small wire brush.
4. Replace leads, positive lead first.

If the engine is still cranking slowly or not at all:

1. Remove the battery negative leads.
2. Recharge the battery in a well-ventilated area.
3. Reinstall the battery.

If the engine is still cranking slowly or not at all:

Replace the battery.

FUSES

Relay

1	Ignition
2	Main Power
3	Auto Start
4	Starter
5	Spare

Fuse

1	Ignition
2	Main Power
3	Auto Start
4	Starter
5	ECU Panel
6	Control Panel
7	Spare
8	Keyswitch Power
9	Spare
10	Spare



ENGINE OIL AND FILTER REPLACEMENT



Filter:	GSA556438384
Oil Grade:	SAE 10W-30 for 100 Hour break-in period SAE 15W-40 for Continuous Duty in all applications where operating temperatures are above 30 F. SAE 10W-30 for Continuous Duty in applications where operating temperatures are below 30 F. -NOTE- Use of lighter weight oil in continuous duty applications, especially in temperatures above 30 F can potentially increase oil consumption.
Ash Content:	.9% or Less
API Certification:	SN
Oil Pan Capacity:	12 quarts (Up to 1 additional quart is required for oil filter) *

*** Engine Models requiring an Oil Cooler will need additional capacity. (See Oil Cooler Below)**

DRAIN THE ENGINE OIL

1. Remove the oil filler cap.
2. Remove the oil drain plug and drain the oil into a container.

REPLACE THE OIL FILTER

1. Remove the oil filter.
2. Check and clean the oil filter installation surface.
3. Check that the part number of the new oil filter is correct.
4. Apply clean engine oil to the gasket of the new oil filter and screw on until finger tight.
5. Tighten it an additional $\frac{3}{4}$ turn.



8.0, 9.1, & 10.3 L Owner's Manual

REFILL WITH ENGINE OIL

1. Clean and install the oil drain plug.
2. Fill with fresh engine oil. Do not overfill.
3. Install the oil filler cap.
4. Start engine and check for oil leaks.
5. Recheck the engine oil level.

OIL COOLER

Certain applications will require an oil cooler. Recommended oil temperature range is 190-240°F. An approved oil cooler is available through Industrial Irrigation; please call for pricing and information specific to your application. When filling engine with oil cooler, begin with 12 quarts in the engine and then adjust level as needed after running. Cooler hoses and other factors will cause oil capacity to vary.

Dispose of your used oil at your local oil recycling center.

ENGINE COOLANT, RADIATOR, AND COOLING SYSTEM



To avoid being scalded or burned, never remove the radiator cap unless the engine is off and coolant has fully cooled. The coolant in the radiator is pressurized when hot and may boil over when the radiator cap is loosened.

When using antifreeze coolant, mix the antifreeze coolant with water, observing instructions attached to antifreeze container. Use only antifreeze approved for aluminum components in a 50/50 mixture ratio.

Clean radiator outside

Clean outside of radiator with dry compressed air.

Inspect cooling system, hoses and connections

Check hoses and fittings for loose connections or for any sign of oil deterioration or soft spots in the hoses. Retighten connections or replace hoses if needed.

Check coolant level. If low, top off coolant with a premixed 50/50 mixture of antifreeze and water.

Engine Coolant Replacement

1. Open overflow bottle cap.
2. Drain old coolant.
3. Flush system with fresh, clean water.
4. Slowly refill system with premixed 50/50 antifreeze/water mixture.
5. Idle engine with radiator cap off to allow air to escape.
6. Top off coolant in overflow bottle if needed.
7. Stop engine.
8. Replace radiator cap and close overflow bottle cap.



SPARK PLUGS & WIRES

Ignition System Part Specifications	
Ignition Coils	OEA0518151018
Spark plugs part number	GSA5519313641 Delco Platinum 41-817
Spark plug gap	.035 in (0.89 mm)
Spark plug wires	OEA0518151075

Spark plug inspection

1. Remove one plug from each bank.
2. Inspect plugs for fouling and erosion.
3. Clean or replace plugs if needed.

Ignition wires inspection

1. Visually check ignition wires.
 - Look for spark arcing while the engine is running.
 - Check for cracks in the wire insulation.
2. If arcing and/or cracked insulation is evident, replace the entire set of ignition wires.



POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

Part Number: RMA55L263

Inspection

1. Remove the PCV valve from the engine.
2. Shake the valve. You should hear the valve rattle, indicating that the cartridge is moving freely.
3. If the valve does not rattle, clean it with carburetor cleaner.
4. If the valve still does not rattle, replace the valve.

CHECKING FOR GAS LEAKS



Natural gas and LPG are combustible gases, and can be explosive if leaked and contained in a confined area. Keep cigarettes and all other flame sources away from these areas.

Inspection

1. If you can hear a fuel leak, shut off the fuel supply at the source immediately and fix the leak or have it serviced.
2. If there are no audible leaks, spray the fuel line up to the lock-off valve with a soapy water mixture. A stream of bubbles indicates leak sources.
3. Tighten fittings and clamps as needed to eliminate slow leaks.
4. Start the engine.
5. Check the fuel supply line from the lock-off valve to the engine with a soapy water mixture.
6. If any fuel line components (hoses, pipe, fittings, etc.) need to be replaced, first bleed the fuel out of the line by shutting off the gas supply at the source with the engine running at idle. Wait for the engine to stop before disassembling the fuel line.

NATURAL GAS & LPG FUEL FILTERS



Fuel filters are recommended to protect both your fuel system and engine.

Liquid LPG Fuel Filter: **AFC, Inc. Model 455**

RAW Natural Gas Filter: **Oxion, Inc. Model M150**

**Pipeline Natural Gas &
Vapor LP Fuel Filter:** **Maxitrol Model GF60-1-88**

Filter Replacement

1. Shut off the fuel supply at the source with the engine running at idle.
2. Wait for the engine to stop.
3. Remove the old fuel filter.
4. Install the new fuel filter per the filter manufacturer's instructions.
5. Check for leaks. See "Checking for Gas Leaks".



LPG REGULATOR/VAPORIZER

Commercial grade LPG often contains heavy hydrocarbons, compressor oil and other contaminants. Over time, the oil and contaminants will settle to the bottom of the LPG cylinders/tanks. Liquid LPG fuel systems, which draw from the bottom side of the cylinder/tank, are prone to having these contaminants build up in the regulator/vaporizer. The oil and contaminants can degrade the operation of the regulator/vaporizer, and when severe, can degrade the performance of the engine.

Inspection/Drain Procedure

1. With the engine idling, shut off the fuel supply at its source.
2. Wait for the engine to stop running.
3. If a drain valve is in the fuel line downstream of the regulator/vaporizer, open the valve and drain any oil in the line into a container.

If there is no drain valve in the line, remove the regulator/vaporizer from the fuel system. Tilt the regulator/vaporizer so the outlet is down. Drain any oil into a container.

Drain any accumulated liquids from the fuel hose and fuel trim valve.

4. Close the drain valve or reinstall the fuel system components.
5. Check the fuel system for leaks. See "Checking for Gas Leaks".



NATURAL GAS & LPG FUEL LOCK-OFF VALVES

Liquid LPG Lock-Off Valve P/N: **KEA5513111011**

Natural Gas & Vapor LPG Lock-Off Valve P/N: **ASA558215B60**

The fuel lock-off valve is located between the NG regulator and fuel supply or LPG regulator/vaporizer and the fuel cylinder/tank. The Engine Control Module (ECM) opens the fuel lock-off when the engine is cranked and turns it off when the key switch is turned off or the ECM shuts down the engine for low oil pressure or engine overheat.

The lock-off can sometimes "gum up" due to LPG deposits in the lock-off. The procedure below will verify if the lock-off is opening and closing correctly.

Inspection

1. Turn off the engine.
2. Disconnect the fuel lock-off positive and negative wires from the wiring harness.
3. Apply 12 VDC across the lock-off.
4. You should hear the valve open immediately when 12 V is applied and hear the valve close immediately when 12 V is removed. This indicates that the valve is moving freely.

If you cannot hear the valve open and close, replace the valve.



DIAGNOSTICS

How to manage/retrieve/clear fault codes

Diagnostic fault codes can be read through your equipment's electronic display control panel. Please refer to that manual for instructions on how to retrieve and clear codes.



8.0, 9.1, & 10.3 L Owner's Manual

DTC List

DTC	Description	FMI	SPN
125	Load Sensor Voltage Low	4	2452
126	Load Sensor Voltage High	3	2452
136	UEGO Heater Temperature LTE	16	855
137	UEGO Heater Temperature HTE	18	855
139	UEGO Heater Temperature Control	7	855
161	XDRP (+5V) Voltage HTE	3	3509
162	XDRP (+5V) Voltage LTE	4	3509
165	Battery Voltage Higher Than Expected	0	168
166	Battery Voltage Lower Than Expected	1	168
169	DRVP Higher than Expected	20	168
181	Postcat O2 Voltage High	3	3227
182	PostCat O2 Voltage Low	4	3227
183	PreCcat O2 Heater Short Open Fault	5	3217
184	PreCat O2 inactive fault	8	3217
185	PostCat O2 Failed on Rich Side	15	3227
186	PostCat O2 Failed on Lean Side	17	3227
187	PostCat O2 Heater Short Open Fault	5	3227
189	PreCat O2 Failed on Rich Side	15	3217
191	Oil Pressure Voltage Low	4	100
192	Oil Pressure Voltage High	3	100
193	Oil Temperature Voltage Low	4	175
194	Oil Temperature Voltage High	3	175
195	Oil Pressure Low	1	100
196	Oil Pressure Fault	15	100
197	PreCat O2 Failed on Lean Side	17	3217
198	Oil Temperature IR Low	17	175



8.0, 9.1, & 10.3 L Owner's Manual

DTC List (continued)

DTC	Description	FMI	SPN
222	Oil Temperature High	16	175
225	PreCat O2 input high	3	3217
226	PreCat O2 input Low	4	3217
231	MAT Voltage High	3	105
232	MAT Voltage Low	4	105
233	MAT Higher Than Expected	0	105
234	In Range MAT fault	10	105
244	Fan 1 Short Open Fault	5	977
245	Fan 2 Short Open fault	5	1557
251	Natural Gas Fuel LockOff Short Open Fault	5	632
252	Propane Gas Fuel LockOff Short Open Fault	5	516131
253	MIL Open / Short Fault	5	1213
255	Major alarm hardware Fault	5	3607
256	Minor alarm hardware Fault	5	5078
261	ECT Voltage High	3	110
262	ECT Voltage Low	4	110
263	ECT Higher Than Expected	0	110
264	ECT Insufficient activity	10	110
266	ECT Warmup Slower than Expected	1	110
341	MAP Voltage Low	4	106
342	MAP Voltage High	3	106
343	MAP Data Drift High	20	106
344	MAP Data Drift Low	21	106
345	MAP Sticking	2	106
346	MAP Bank1 Bank2 Comparison	14	106
347	Intake Manifold Backfire	0	106



8.0, 9.1, & 10.3 L Owner's Manual

DTC List (continued)

DTC	Description	FMI	SPN
357	PTP/MAP Connectors Switches	7	106
371	PTP Voltage High	3	102
372	PTP Voltage Low	4	102
373	PTP Data Drift High	20	102
374	PTP Data Drift Low	21	102
375	PTP/MAP KeyOn Check	31	106
376	PTT Voltage High	3	1131
377	PTT Voltage Low	4	1131
378	PTT Higher Than Expected	0	1131
414	UEGO Air Cal Sensor Failed Fault	2	3057
415	UEGO Air Cal at Lower Limit	17	3057
416	UEGO Air Cal at Upper Limit	15	3057
421	CAM Sensor Loss Fault	7	637
422	Crank Sensor Loss Fault	7	636
423	Crank Sensor Sync Fault	2	636
424	CAM Sensor Phase Fault	2	637
425	Crank Sensor Other Fault	11	636
426	CAM Sensor Other Fault	11	637
427	Cam Phaser Drive Relay Open or short Gnd	5	637
429	Engine OverSpeed	0	190
433	Fan Speed Unexpected Noise	8	1639
434	Fan Speed Close Loop Control	7	1639
443	UEGO IP Fault	0	3057
451	UEGO Heater Short to gnd fault	4	855
452	UEGO Heater Short to battery fault	3	855
453	UEGO SNS Open Fault	5	3057
454	UEGO SNS Short to GND Fault	4	3057



8.0, 9.1, & 10.3 L Owner's Manual

DTC List (continued)

DTC	Description	FMI	SPN
455	UEGO SNS Short to BATT Fault	3	3057
456	UEGO INRC Open Fault	5	520555
457	UEGO INRC Short to GND Fault	4	520555
458	UEGO INRC Short to Batt Fault	3	520555
459	UEGO SR Open Fault	5	520556
461	UEGO SR Short to GND Fault	4	520556
462	UEGO SR Short to BATT Fault	3	520556
463	UEGO Htr Open Fault	5	855
465	UEGO O2 Failed on Lean Side	18	3057
466	UEGO O2 Failed on Rich Side	16	3057
471	Adaptive Learn Correction on Hi Limit	16	1695
472	Adaptive Learn Correction on Lo Limit	18	1695
473	delta Pressure - Voltage High	3	1391
474	delta Pressure - Voltage Low	4	1391
475	FuelShutOffStuckOpen	12	632
476	Low Fuel Pressure	7	632
477	deltaP Higher Than Expected	16	1391
478	deltaP Lower Than Expected	18	1391
479	deltaP Zero Offset Fault	20	1391
491	Engine EGT -Voltage High	3	173
492	Engine EGT -Voltage Low	4	173
493	EGT Higher Than Expected	0	173
512	EGR Valve Open or Short Grnd	5	2791
541	Throttle Position Voltage High	3	51
541	TPS1 Voltage High	3	51
542	Throttle Position Voltage Low	4	51
542	TPS1 Voltage Low	4	51



8.0, 9.1, & 10.3 L Owner's Manual

DTC List (continued)

DTC	Description	FMI	SPN
543	TPS1 Higher than Expected	0	51
544	Throttle Position adapt low fault	18	51
544	TPS1 Lower than Expected	1	51
545	TPS2 Voltage High	3	3673
546	TPS2 Voltage low	4	3673
547	TPS2 Higher than Expected	0	3673
548	TPS2 Lower than Expected	1	3673
549	TPSSensor Conflict	7	51
551	TPS Intermittent	2	51
552	Throttle Valve H bridge Fault	5	3464
553	Throttle Valve Open Fault	6	3464
554	Throttle Spring Test Fault	2	3464
555	Throttle Valve Stuck	7	3464
556	L Series Throttle fault	5	51
557	L Series Throttle Status	12	51
558	TPS Data Drift High	0	51
559	TPS Data Drift Low	1	51
561	CAN Line Circuit/Bus Error Passive	11	639
562	CAN Tx_Rx Warning	14	639
563	CAN Line Circuit/Bus Error Passive	11	520707
564	CAN Tx_Rx Warning	14	520707
565	OHECS Message Time Out Fault	9	520708
566	GTACP Message Time Out Fault	9	520709
567	GC2 Message Time Out Fault	9	520710
568	EBC1 Message Time Out Fault	9	520711
569	ACS Message Time Out Fault	9	520712
621	CPU Load Higher than Expected	9	629



8.0, 9.1, & 10.3 L Owner's Manual

DTC List (continued)

DTC	Description	FMI	SPN
622	Flash Memeory Fault	31	629
623	SRAM Memory Fault	11	629
631	Trim Position adapt low fault	18	1442
632	Trim Position adapt high fault	16	1442
633	L Series Trim Position Voltage High	3	1442
634	L Series Trim Position Voltage Low	4	1442
635	L Series Trim Valve Drive fault	5	1442
636	L Series Trim Valve Status	12	1442
637	Throttle Position adapt high fault	16	51
638	Remote Speed reference input high	3	189
639	Remote Speed reference input low	4	189
651	Auto Crank attempts exceeded	12	1675
652	Auto Crank attempt failed	11	1675
653	Starter Control Relay Fault	5	1675
661	CCVS Message Time Out Fault	9	520714
662	TSC1 Message Time Out Fault	9	520700
663	Inter ECU Comms Message Time Out Fault for Master/Slave System Only	9	520713
691	Waste Gate Valve Open or Short Grnd	5	1188
692	Boost pressure Higher than Expected	16	1692
693	Boost pressure Lower than Expected	18	1692
694	Overboost	0	1692
751	Cylinder 1 Misfire	31	1323
752	Cylinder 2 Misfire	31	1324
753	Cylinder 3 Misfire	31	1325
754	Cylinder 4 Misfire	31	1326
755	Cylinder 5 Misfire	31	1327



8.0, 9.1, & 10.3 L Owner's Manual

DTC List (continued)

DTC	Description	FMI	SPN
756	Cylinder 6 Misfire	31	1328
757	Cylinder 7 Misfire	31	1329
758	Cylinder 8 Misfire	31	1330
759	Single/Multiple Cylinder Misfire	31	1322
761	Severe Cylinder Misfire	14	1322
771	High Engine Knock Level Cylinder 1	31	1352
772	High Engine Knock Level Cylinder 2	31	1353
773	High Engine Knock Level Cylinder 3	31	1354
774	High Engine Knock Level Cylinder 4	31	1355
775	High Engine Knock Level Cylinder 5	31	1356
776	High Engine Knock Level Cylinder 6	31	1357
778	High Engine Knock Level Cylinder 7	31	1358
779	High Engine Knock Level Cylinder 8	31	1359
781	Knock Sensor Open Circuit	5	731
782	Knock Sensor short Circuit	6	731
783	Knock 2 Sensor Open Circuit	5	516098
784	Knock 2 Sensor short Circuit	6	516098
812	Synchronizer input high	3	3938
813	Synchronizer input low	4	3938
821	Engine Over Load Fault	0	1204
822	Engine Over Power Fault	0	1247
841	Spark 1 Max Current	6	1268
842	Spark 1 Open Primary	5	1268
844	Spark 2 Max Current	6	1269
845	Spark 2 Open Primary	5	1269
847	Spark 3 Max Current	6	1270
848	Spark 3 Open Primary	5	1270



8.0, 9.1, & 10.3 L Owner's Manual

DTC List (continued)

DTC	Description	FMI	SPN
851	Spark 4 Max Current	6	1271
852	Spark 4 Open Primary	5	1271
854	Spark 5 Max Current	6	1272
855	Spark 5 Open Primary	5	1272
857	Spark 6 Max Current	6	1273
858	Spark 6 Open Primary	5	1273
878	Spark 7 Max Current	6	1274
879	Spark 7 Open Primary	5	1274
881	Spark 8 Open Primary	5	1275
882	Spark 8 Max Current	6	1257
883	HEI-EST Bypass Open / Short Fault	5	725
885	Fuel Pressure Voltage High	3	2980
886	Fuel Pressure Voltage Low	4	2980



8.0, 9.1, & 10.3 L Owner's Manual

SPECIFICATIONS

Component	Part Number or Specification
Air Filter:	MAA55PA2806
Alternator-Fan-Water Pump belt:	GYA554060739
Battery:	12 V, 800 Cranking Amps, 640 Cold Cranking Amps
Oil:	See page 16 for oil specifications and capacity.
Oil Filter:	GSA556438384
Spark Plugs:	GSA5519313641 Delco Platinum 41-817
Spark Plug Gap:	.035 in (0.89 mm)
Spark Plug wires:	OEA0518151075
PCV valve:	RMA55L263
Fuel Filter(s):	See Page 22
Liquid LPG Lock-Off:	KEA5513111011
Natural Gas & Vapor LPG Lock-Off:	ASA558215B60
Knock Sensor	12623730



Engine Identification

Engine part number _____

Engine serial number _____

Engine application _____

Purchased from _____

In-service date _____

Engine hours at delivery _____



Engine Warranty

Warranty Provisions

IIS, Inc. warrants that this engine was designed, built, and equipped so that it fully complies with the applicable emissions standards of U.S. EPA 40 CFR 60 and 1048 at the time of sale from IIS Inc., and that the engine is free of defects in materials and workmanship that may keep it from meeting the emissions standards.

Base Warranty Period

The engine's base warranty period is 2500 hours or 3 years, whichever comes first.

Emissions-Related Warranty Period

Your engine's emissions-related warranty period is 2500 operating hours or 3 years, whichever comes first. The warranty period on the catalyst is 3500 operating hours or 5 years, whichever comes first.

The engine's operating hours are determined based on the hour meter within the engine ECM that was supplied with your engine. The warranty period begins when your engine is placed into service.

Owner Obligations

This warranty is valid only if you operate and maintain your engine as specified in this Owner's Manual. In particular, you must maintain your engine as specified in the Maintenance Schedule and record your maintenance in the Maintenance Log.



Engine Warranty

Component Lists

Components covered until first scheduled maintenance interval

- Spark plugs

Components Covered under the 2500 hour/3 year Warranty

- CAM sensor
- CRANK sensor
- EFR actuator
- EFR mixer
- EFR pressure sensor
- EFR valve
- Engine Control Module (ECM)
- Engine Coolant Temperature (ECT) sensor
- Electronic throttle
- Exhaust headers (each)
- Exhaust manifold (each)
- Ignition distributor cap and rotor
- Ignition distributor - complete assembly
- Ignition coil
- Ignition wires
- Intake manifold (5.7 & 6.2 L)
- Manifold Absolute Pressure / Intake Air Temp (TMAP) sensor
- Positive Crankcase Ventilation (PCV) valve
- Pre-catalyst wide-range oxygen sensor
- Post-catalyst switching oxygen sensor

Components Covered under the 3500 hour/5 year Warranty

- Catalyst
- Intake Manifold (8.0, 9.1, & 10.3 L)
- Wiring Harness

If you have any questions regarding your warranty rights or responsibilities, contact IIS at 800-289-6478.



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 100 Hour Break-In Period

- Inspect Alternator-Fan-Water Pump belt, Tensioner and Idlers
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 250 Hours or 4 Months

- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 500 Hours or 8 Months

- Inspect air filter
- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage
- Inspect PCV system

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 750 Hours or 13 Months

- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 1000 Hours or 17 Months

- Replace air filter
- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Replace engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Replace spark plugs & inspect spark plug wires
- Inspect PCV system
- Inspect fuel lines, hoses, and fittings for gas leakage
- Replace fuel filter
- Inspect and drain LPG regulator/vaporizer
- Inspect fuel lock-off valve

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 1250 Hours or 21 Months

- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 1500 Hours or 25 Months

- Inspect air filter
- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage
- Inspect PCV system

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 1750 Hours or 29 Months

- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 2000 Hours or 34 Months

- Replace air filter
- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Replace engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Replace spark plugs & inspect spark plug wires
- Inspect PCV system
- Inspect fuel lines, hoses, and fittings for gas leakage
- Replace fuel filter
- Inspect and drain LPG regulator/vaporizer
- Inspect fuel lock-off valve

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 2250 Hours or 38 Months

- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 2500 Hours or 42 Months

- Inspect air filter
- Replace Alternator-Fan-Water Pump belt
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage
- Inspect PCV system

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 2750 Hours or 46 Months

- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 3000 Hours or 50 Months

- Replace air filter
- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Replace engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Replace spark plugs & inspect spark plug wires
- Inspect PCV system
- Inspect fuel lines, hoses, and fittings for gas leakage
- Replace fuel filter
- Inspect and drain LPG regulator/vaporizer
- Inspect fuel lock-off valve

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 3250 Hours or 55 Months

- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 3500 Hours or 59 Months

- Inspect air filter
- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage
- Inspect PCV system

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 3750 Hours or 63 Months

- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 4000 Hours or 67 Months

- Replace air filter
- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Replace engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Replace spark plugs & inspect spark plug wires
- Inspect PCV system
- Inspect fuel lines, hoses, and fittings for gas leakage
- Replace fuel filter
- Inspect and drain LPG regulator/vaporizer
- Inspect fuel lock-off valve

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 4250 Hours or 71 Months

- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 4500 Hours or 76 Months

- Inspect air filter
- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage
- Inspect PCV system

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 4750 Hours or 80 Months

- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Inspect engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Inspect fuel lines, hoses, and fittings for gas leakage

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

MAINTENANCE LOG

Service Interval: 5000 Hours or 84 Months

- Replace air filter
- Inspect Alternator-Fan-Water Pump belt
- Inspect battery
- Replace engine coolant
- Clean radiator outside
- Replace engine oil and filter
- Replace spark plugs & spark plug wires
- Replace pre-catalyst and post-catalyst oxygen sensors
- Inspect PCV system
- Inspect fuel lines, hoses, and fittings for gas leakage
- Replace fuel filter
- Inspect and drain LPG regulator/vaporizer
- Inspect fuel lock-off valve

Date:

Engine Hours:

Mechanic:



8.0, 9.1, & 10.3 L Owner's Manual

Notes



8.0, 9.1, & 10.3 L Owner's Manual

Notes



8.0, 9.1, & 10.3 L Owner's Manual

Notes



8.0, 9.1, & 10.3 L Owner's Manual

Notes