

# **KODIAK MARINE**

## **Marine Operators Manual**

**4.3L 5.3L AND 6.2L SIDI INJECTED MARINE  
ENGINES**



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**KM 10875**





**WARNING—DANGER OF DEATH OR PERSONAL INJURY**



**WARNING: Extreme High Fuel Rail Pressure.** The SIDI Fuel Injectors and fuel rail have extreme high fuel pressures. Do not attempt to remove or service these parts. This poses a potentially hazardous situation that if not avoided, could result in severe personal injury or death, damage to engine and or property.



**WARNING: FOLLOW INSTRUCTIONS**

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment. Failure to follow instructions can cause personal injury and/or property damage



**WARNING: FOLLOW ALL SAFETY PRECAUTIONS AND REGULATIONS**

Anyone involved in operation of equipment shall be familiar with the information in the warnings, cautions and notes. These safety precautions are mandatory and used to augment formal safety (U.S. Coast Guard) regulations. Anyone operating this equipment should become thoroughly familiar with details of operation of the equipment. Such knowledge, constantly and properly practiced is the only method for ensuring safety as well as reliable and economical equipment. In any boating situation, common sense and logic rule the waterways.



**WARNING: ELECTRICAL SHOCK HAZARD**

The ignition system can cause severe shock if proper precautions are not taken.



**WARNING: OVER-SPEED PROTECTION**

The engine is equipped with an over-speed protection device to protect against runaway or damage to the engine with possible personal injury, loss of life, or property damage. Diagnostic codes such as over temperature or low oil pressure may cause engine speed reduction.



### **WARNING: PROPER USE**

Any unauthorized modifications to or use of this engine outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the engine. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.



### **CAUTION: POSSIBLE DAMAGE TO ENGINE OR PROPERTY**



### **CAUTION: BATTERY CHARGING**

To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.



### **CAUTION: ELECTROSTATIC DISCHARGE**

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts.

- Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).
- Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.
- Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.

### **IMPORTANT DEFINITIONS**

A **WARNING** indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

A **CAUTION** indicates a potentially hazardous situation that, if not avoided, could result in damage to engine or property.

A **NOTE** provides other helpful information that does not fall under the warning or caution categories.



**WARNING: Engine Damage may occur:** All Generation V GM engines must be vacuum filled with coolant. If you need assistance or have questions call your local service dealer. Failure to vacuum fill this engine with the recommended coolant may void all warranty (See page 58)



**CAUTION: WELDING** When welding on the vessel, disconnect the battery switch along with the connectors for the Engine Control Module (ECM). If left connected there is a chance of permanent damage to the ECM.



**WARNING: CARBON MONOXIDE EXPOSURE**  
Carbon Monoxide is an odorless, colorless and tasteless gas that cannot be smelled, seen or tasted. Over exposure to carbon monoxide gas may lead to brain damage, unconsciousness or even death.

## Carbon Monoxide

Carbon Monoxide is a poisonous hazardous gas that is produced when items containing carbon are burned. Items such as wood, charcoal, gasoline, natural gas, propane and petroleum products such as oil all produce carbon monoxide when burned.

Carbon Monoxide is found in many areas and is produced by all types of internal combustion engines, heaters, charcoal grills, and any other open flame appliances. There are many possible situations for the accumulation of carbon monoxide to occur in your vessel. Wind direction, boat speed, being close to other vessels are just a few of the possible ways that would permit exposure to carbon monoxide gases. It is important that regular inspections of the exhaust system and engine fresh air vents are clean and free of obstructions.

Check that all maintenance is properly performed by a qualified technician. Adequate air ventilation in all of the areas of your boat are necessary in order to prevent the build-up of carbon monoxide gas.

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## **INTRODUCTION**

KEM Equipment, Inc. is pleased that you have selected a **Kodiak** engine for your requirements. KEM Equipment, Inc. takes great pride in our tradition of quality products produced from the **GM Powertrain** line of marine gasoline engines.

KEM Equipment, Inc. engines are inspected and tested before leaving the factory. However, certain checks should be made before placing the engine into regular service. **Please read the initial start-up inspection requirements in the Maintenance section of this manual.**

**This Marine Operators Manual covers the 4.3L, 5.3L, AND THE 6.2L SIDI Direct Fuel Injected Marine Engines.**

In this manual we have included tables for General Engine Specifications and tables for General Maintenance. Using this Manual will help you get acquainted with your engine and its functions, as well as help with routine service and maintenance to keep your Kodiak Marine Engine performing to its full potential. General engine specifications and quick reference guides starts on page 21.

KEM Equipment Inc. reserves the right to discontinue models or accessories at any time or to change specifications or designs without notice and without incurring obligation.

Please read and follow any and all specific warnings, cautions and notations contained in this text.

KEM Equipment, Inc., / Kodiak Marine reserves the right to request any pertinent maintenance information of your engine prior to authorization of warranties. Overall safety and equipment reliability depend on continuous observation of sound operating practices. Always observe required scheduled maintenance activities as outlined. Never attempt to correct problems or repairs for which you are not qualified. At the end of this manual, you will find a list of qualified Kodiak Marine service dealers to assist you in your area.



### **WARNING:**

- Always STOP the engine before refueling.**
  - Always STOP the engine prior to any inspection / check or repair work.**
  - Always maintain proper ventilation when working around gas or oil.**
  - Always run the bilge blower for a minimum of 10 minutes prior to starting the engine.**
  - Do not stand close or hover over the engine prior to starting.**
- Ensure all safety guards are in place prior to starting the engine.**



## How to Use this Manual

This manual is designed to help you get to know your engine and become familiar with the engines various controls. During instruction, you will learn how to take care of your engine and what services need to be performed to keep it in excellent running condition. The table of contents will assist you in locating a specific subject. Please contact a service dealer if you have reached a point of needing further instruction. Any un-authorized work can void any potential warranties. We urge you to read this manual prior to startup of the engine.

KEM Equipment, Inc. engines are built with a variety of standard and/or optional components to suit a broad range of customer requirements. This manual **does not** identify equipment as standard or optional. All the equipment described in this manual may or may not be found on your engine. The description and specifications contained in this manual were in effect at the time of publication.

## SIDI Fuel Injection

Direct injection moves the location of fuel entering the combustion chamber closer to the point of ignition within the combustion chamber, this creates more combustion efficiency. This moves to create a cleaner burn of fuel within the air fuel ratio mixture during the combustion cycle. The results of this burn is lower exhaust port temperatures and a leaner mixture, meaning that a considerable less amount of fuel is required to produce the same horsepower as a conventional port fuel injection system.





**WARNING: Engine Damage may occur: All Generation V GM engines must be vacuum filled with coolant. If you need assistance or have questions call your local service dealer. Failure to vacuum fill this engine with the recommended coolant may void all warranty. (See page 58)**

# **ENGINE IDENTIFICATION**

## **Model Identification**

An identification placard is affixed to the engine. The label contains the engine family number and a model, which identifies the engine from other KEM engines.

The engine model number and serial number are required when seeking information concerning the engine and/or ordering replacement service parts.

<b>KEM EQUIPMENT, INC.</b> 10800 SW HERMAN RD. TUALATIN OR 97062			<b>MAX RATED KW</b> [ ]	
<b>EMISSION CONTROL INFORMATION</b>				
<b>ENGINE FAMILY</b> [ ]	<b>SERIAL NUMBER</b> [ ]	<b>DISP:</b> [ ]		
<b>EXHAUST EMISSION CONTROL SYSTEM</b> [ ]		<b>MODEL NO.</b> [ ]		
<b>THIS ENGINE IS CERTIFIED TO OPERATE ON GASOLINE. THIS MARINE ENGINE COMPLIES WITH U.S. EPA EXHAUST REGULATIONS FOR [ ] AND CALIFORNIA EMISSIONS REGULATIONS FOR [ ] SPARK IGNITED MARINE ENGINES</b>				
<b>REFER TO THE OWNER'S MANUAL FOR MAINTENANCE SPECIFICATION AND ADJUSTMENTS.</b>				

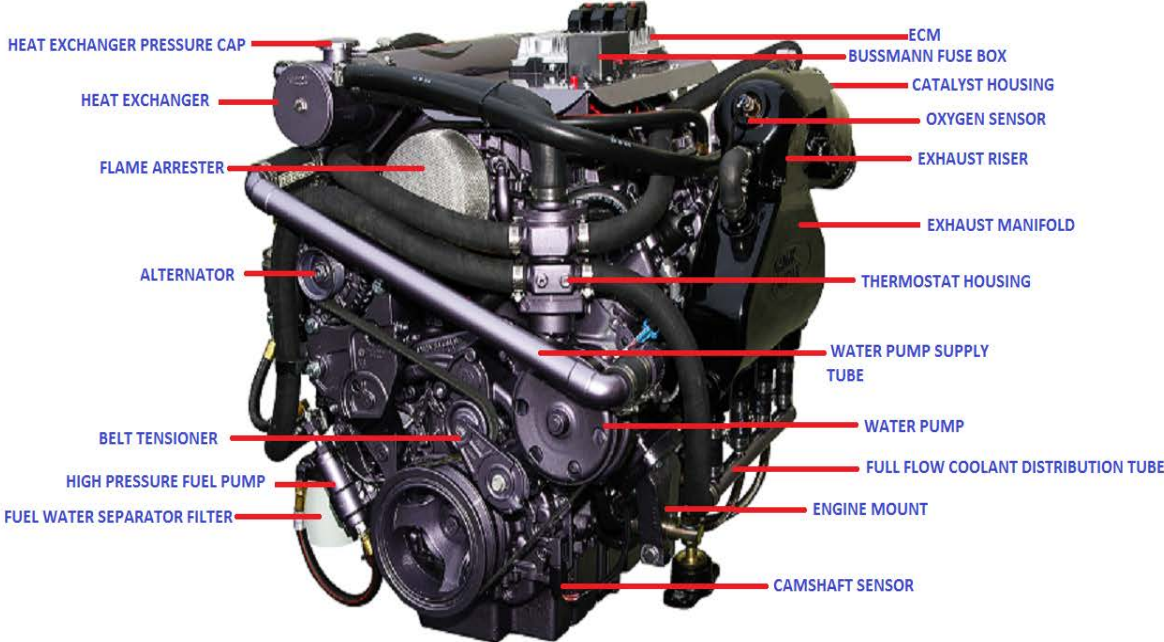
This manual covers the **4.3L, 5.3L** and the **6.2L SIDI Direct fuel Injected Marine Engines.**

Fill in the information from your engine serial tag in the above representation of the engine serial tag for future reference.

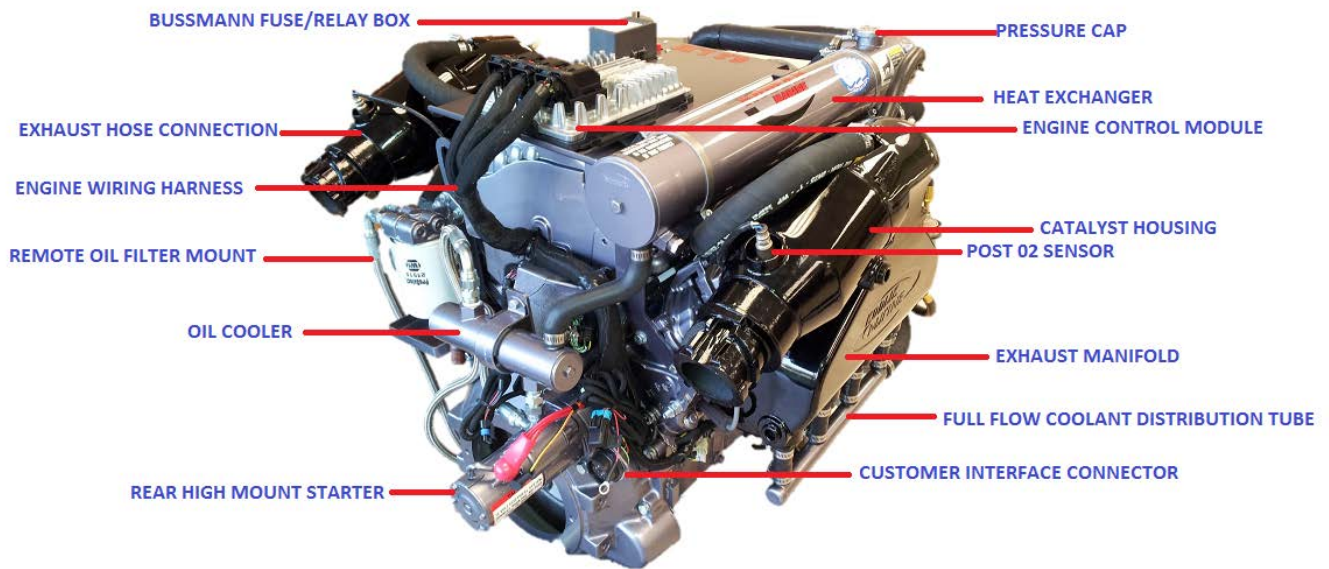
**MODEL:** This is the part number for the engine, and this number should be recorded for ease of obtaining information or parts for this engine.

**SERIAL NUMBER:** This number identifies each individual engine. This number should also be recorded for the ease of obtaining information for this engine. If you have a request or need to order service parts, this serial number will be requested to aid our parts department in fulfilling your order. The serial number will confirm that you are ordering the correct parts for your engine.

# Component Identification



## Component Identification



The illustrations above show the general location of engine controls, engine components and their functions. These illustrations will help identify where these parts are located on the engine. Locations will vary from engine to engine.

## Parts and Service

Replacement parts can be obtained through your local Kodiak engine dealer.

Kodiak dealers are equipped to perform major and minor repairs. They are anxious to see that all of your maintenance and service needs are quickly and courteously completed. Please contact KEM Equipment Inc./Kodiak Marine regarding any favorable or un-favorable experiences with our service dealers.

The engine model number and serial number will be required when seeking information and/or ordering parts. There is a list of service dealers located at the very end of this manual.

Technical support for Kodiak Marine engines can be obtained by contacting KEM Equipment Inc.

## Service Literature

By contacting our Parts Department you can purchase parts and service manuals for Kodiak Marine engines. **503-692-5012**



**WARNING:** The bilge can accumulate explosive fumes. The bilge blower will evacuate the fumes. The bilge blower must be run for a minimum of 10 minutes prior to cranking the engine.



**WARNING:** Do not start or run the engine in a closed or poorly ventilated area where exhaust gases may accumulate. All internal combustion engines give off various fumes and gases while running. Avoid breathing these gases as they may contain poisonous carbon monoxide and other gases, which can endanger your health or life if inhaled steadily for a few minutes.



**CAUTION:** If the engine stalls or falters during starting, wait 3 to 4 seconds before reengaging the starter. This will prevent possible damage to the starter or the engine. Do NOT operate the starter for periods longer than 5-8 seconds at a time. An interval of at least 1 minute should be observed between cranking periods to protect the starter from overheating.

## **PRE-OPERATIONAL INSPECTION**



**WARNING:** Remove the key from the ignition prior to any engine check or operation. Do not energize any engine prior to performing any of the following.

Your KODIAK Marine Engine was inspected and test run before leaving the factory. Before operating a new engine, you must follow any pre-operational instruction.

1. Open the engine hatch cover to let the compartment air out for at least ten minutes.
2. Always make sure you are working in a well-ventilated area when around gasoline.
3. Check engine oil level, remove dipstick wiping clean and recheck your oil level.
4. Inspect the oil and fuel filters for tightness and making sure there are no leaks around these filters.
5. Check coolant level – refill to the appropriate levels.
6. Check for any oil, coolant or fuel leaks.



**CAUTION:** Follow any leaks and repair any abnormal leakage before continuing.

7. Inspect the battery connections for corrosion, clean as necessary
8. Check the battery fluid level and state of charge, fill as needed.
9. Inspect the spark arrester for any obstructions (Bugs, leaves etc.,) clean or replace as needed.
10. Check coolant Hoses for Leaks (follow any leaks and repair)

**NOTE:** It is suggested to use Baking Soda and water to safely clean any corrosion around the Battery connections.

**NOTE:** If the engine is equipped with a stern or jet drive it must be in neutral prior to starting the engine. Starting the engine with the drive engaged imposes unnecessary strain on the battery, starter and driven components.

Inspect the spark arrester for any obstructions (Bugs, leaves etc.,) clean or Replace as needed.

11. Check the exterior of the heat exchanger. Follow and fix any leaks before continuing.
12. Check the alternator belt for any extra play; adjust as necessary. Does not apply to all engines.
13. Tighten all loose nuts and bolts. Check for any loose pieces and tighten as necessary.
14. Start and run the bilge blower for at least 10 minutes.
15. Replace the engine cover.



**CAUTION:** All water must be drained from the raw water side of the heat exchanger when surrounding environment temperature is below 32°F/0°C.

## MALFUNCTION INDICATOR LIGHT



**Caution- Notice to Builder/Installer** This engine requires use of a MIL. A MIL (Malfunction Indicator Lamp) must be installed with this engine to be in compliance with EPA and CARB regulations.

There are two lights on the dash to indicate engine related problems. The operator is responsible to acknowledge any illuminated check engine or check gauges lights during the course of engine operation.

The first indicator is the Check Engine Light. The MIL conveys to the operator that a fault exists that is related to the engine's control system. When this light is illuminated a fault code has been set that requires immediate attention or engine component damage could conceivably occur.

Please stop operation of engine as soon as safely possible. Request that a technician inspect the fault code setting, he or she will connect a scan tool to determine the cause of the MIL illuminating, repair the problem and clear the codes. The MIL related codes are caused by sensor output and/or conditions that adversely affect the operational output of the engine. Some of the components that can cause problems are: crank sensor, cam sensor, fuel injectors, fuel pressure regulators, ignition system and Manifold Air Pressure (MAP) sensor or low fuel pressure.

**NOTE:** If the Check Engine light is illuminated, it will remain on until the problem is corrected and the engine has gone through three consecutive warm up cycles, or if the light has been cleared by a service technician with a scan tool. A warm up cycle is a starting temperature close to ambient increasing to normal operating temperature.

The second indicator is the Check Gauges light. This bulb will illuminate when a non-emissions related issue occurs. Items that can cause these codes are high or low oil pressure and coolant temperature and various power relay operation, system voltage etc. The lighting of this fault indicator would indicate to the operator that the gauges for oil pressure and coolant temperature should be checked immediately and action taken to eliminate engine damage. There are safeties in the calibration that will reduce engine speed if the sensor output is out of the normal range (low oil pressure when the engine is at rated speed for instance). If the engine should turn off for no apparent reason check this lamp. This light will clear on it's own if the fault clears and the ignition switch is turned off then back on. If this light turns off on it's own, the issue will stay in memory for 40 warm up cycles or until a technician clears it manually with a scan tool.

**NOTE:** The lamps will not flash the error codes. To retrieve and reset the error codes a diagnostic scan tool is required. Some vessel manufacturers are using CAN-BUS displays that can retrieve the error codes, but cannot clear them. See the vessel manufacturer's instructions to retrieve the error codes with their device.



## STARTING THE ENGINE

Prior to starting the engine the following must be performed.

1. Check engine oil level.
2. Check for fuel leaks.
3. Run bilge blower for a minimum of 10 minutes
4. Check Coolant level
5. Check bilge for excess water before starting engine



**WARNING:** The bilge can accumulate explosive fumes. The bilge blower will evacuate the fumes. The bilge blower must be run for a minimum of 10 minutes prior to cranking the engine.



**WARNING:** Do not start or run the engine in a closed or poorly ventilated area where exhaust gases may accumulate. All internal combustion engines give off various fumes and gases while running. Avoid breathing these gases as they may contain poisonous carbon monoxide and other gases, which can endanger your health or life if inhaled steadily for a few minutes.



**CAUTION:** The bilge should be checked for excess water prior to starting the engine. Excess water can cause premature starter failure and damage to other engine components.

**NOTE:** This engine is equipped with a computer controlled starter circuit. It is not necessary to hold the ignition switch in start mode until the engine starts, although holding the key on will not cause any issues.



**CAUTION:** If the engine stalls or falters during starting, wait 3 to 4 seconds before re-engaging the starter. This will prevent possible damage to the starter or the engine. Do NOT operate the starter for periods longer than 5-8 seconds at a time. An interval of at least 1 minute should be observed between cranking periods to protect the starter from overheating.



**WARNING: Extreme High Fuel Rail Pressure. The SIDI Fuel Injectors and fuel rail have extreme high fuel pressures. Do not attempt to remove or service these parts. This poses a potentially hazardous situation that if not avoided, could result in severe personal injury or death, damage to engine and or property.**

## **STARTING MODE–FUEL INJECTION**

With the ignition switch in the ON position, before engaging the starter, the ECM energizes the fuel pump relay for 10 seconds allowing the fuel pump to build pressure. The ECM uses the engine coolant temperature (ECT), the throttle position (TPS) and the manifold absolute pressure (MAP) sensors to determine the proper air/fuel ratio for starting. The ECM controls the amount of fuel delivered in the starting mode by changing the pulse width of the injectors.

## **CLEAR FLOOD–FUEL INJECTION**

If the engine becomes flooded, clear the engine by opening the throttle to 100 percent. When the pedal position sensor (PPS) is at wide-open throttle, the ECM reduces the injector pulse width in order to increase the air to fuel ratio. The ECM holds this injector rate as long as the throttle stays wide open and the engine speed is below a predetermined RPM. If the throttle is not held wide open, the ECM returns to the starting mode.

## **COLD ENGINE START**

On a cold engine start, the engine idle speed will be elevated until the coolant temperature reaches operating temperature. As the engine temperature increases the idle speed will gradually decrease, this is a normal engine control function.

## **STOPPING THE ENGINE**

### **NORMAL CONDITIONS**

Let the engine idle for at least one minute prior to stopping the engine to reduce residual heat in engine components. Not doing this will not harm anything, but gives the engine a chance to reduce the temperature of many components.

### **STOPPING THE ENGINE UNDER ABNORMAL CONDITIONS (Overheating)**

1. Put engine in NEUTRAL
2. Place gearshift or bucket control lever in Neutral.
3. Turn key to the OFF position and remove the key from the ignition.
4. If the engine is overheating due to loss of coolant, it is best to stop the engine immediately.
5. Check and adjust the oil and coolant levels.
6. Once the engine has cooled considerably, add your coolant slowly until the heat exchanger is full.



**WARNING:** Allow the engine to cool at least a few minutes before attempting to remove the heat exchanger cap. Cover the cap with a thick cloth and slowly turn counterclockwise allowing the pressure to release **SLOWLY**. When pressure has been completely released, push down on the cap, turn and remove.



**CAUTION:** Do not add coolant until the engine has returned to normal temperature. (When you can place your hand on the engine without burning is usually a good indication).

## **MAINTENANCE INSTRUCTIONS**



**WARNING: Extreme High Fuel Rail Pressure. The SIDI Fuel Injectors and fuel rail have extreme high fuel pressures. Do not attempt to remove or service these parts. This poses a potentially hazardous situation that if not avoided, could result in severe personal injury or death, damage to engine and or property.**



**CAUTION: Neglecting proper maintenance can cause premature component failures.**

### **Initial Start-Up Maintenance**

The initial start-up checks must be made before entering the engine into service. Please refer to the Maintenance Schedule on page 24 and perform the initial start-up operations in the sequence shown in column 1.

### **Routine Maintenance**

Routine maintenance provides the best solution for making sure that the engine is ready when you are. The following are some routine service points:

- Keep the fuel tank filled. A full tank of fuel reduces the possibility of condensation forming in the fuel tank and moisture entering the fuel system.
- Make frequent checks for engine oil, fuel and coolant leaks
- Repair any oil, fuel or coolant leaks
- Check battery condition and cables frequently clean as necessary
- Keep the engine air filter and/or spark arrestor clean
- Monitor engine coolant temperature
- Monitor engine oil pressure and fuel pressure.
- Check voltmeter and charging system
- Lubricate Drive Shaft universal joints as described in the scheduled preventive maintenance section (some applications)

**Knowing normal gauge values will help you determine any abnormal operating conditions.**

### **Maintenance Schedule**

Refer to the Maintenance Schedule on page 24 to ensure that all of the maintenance items listed are checked and replaced at the recommended hours.

### 4.3L SIDI GENERAL ENGINE SPECIFICATIONS

ENGINE TYPE	GM LV1 V6 OHV
COOLANT CAPACITY	4 US GALLONS
RECOMMENDED COOLANT	DEXCOOL 50/50 MIX
HIGH PRESSURE FUEL FILTER/REGULATOR	NAPA #3737
SPARK PLUGS	AC DELCO #41-114 GM #12622441
SPARK PLUG GAP	1.025 mm .040 +/- .002
SPARK ARRESTOR	A7600ESV38
OIL PAN CAPACITY	8 QUARTS W/REMOTE FILTER
OIL FILTER REMOTE LOCATION	NAPA # 1515
WATER SEPERATOR FILTER	NAPA # 3225
SERPENTINE BELT	NAPA #25-060716
FUEL PRESSURE BEFORE FUEL RAIL	4 BAR 58 PSI
FUEL TYPE	REGULAR UNLEADED
RECOMMENDED ENGINE OIL	0W-20 DEXOS 1 GM SPEC #15827

### 4.3L VVT DIRECT INJECTED MARINE ENGINE SPECIFICATIONS

DISPLACEMENT	4301cc 262 ci
ENGINE ORIENTATION	LONGITUDINAL
COMPRESSION RATIO	11.0:1
VALVE CONFIGURATION	OVERHEAD VALVE
VALVES PER CYLINDER	2
VALVE LIFTERS	HYDRAULIC ROLLER
FIRING ORDER	1-6-5-4-3-2
BORE AND STROKE	99.6mm X 92mm
FUEL SYSTEM	DIRECT INJECTED
PCV SYSTEM	PCV VALVE
ENGINE ROTATION	CCW FROM FLYWHEEL END

<b>5.3L SIDI GENERAL ENGINE SPECIFICATIONS</b>	
ENGINE TYPE	GM L83 V8 OHV
COOLANT CAPACITY	5 US GALLONS
RECOMMENDED COOLANT	DEXCOOL 50/50 MIX
HIGH PRESSURE FUEL FILTER/REGULATOR	NAPA #3737
SPARK PLUGS	AC DELCO #41-114 GM #12622441
SPARK PLUG GAP	1.025 mm .040 +/- .002
SPARK ARRESTOR	A7600ESV38
OIL PAN CAPACITY	9 QUARTS W/ REMOTE FILTER
OIL FILTER REMOTE LOCATION	NAPA # 1515
WATER SEPERATOR FILTER	NAPA # 3225
SERPENTINE BELT	NAPA #25-060716
FUEL PRESSURE BEFORE FUEL RAIL	4 BAR 58 PSI
FUEL TYPE	REGULAR UNLEADED
RECOMMENDED ENGINE OIL	0W-20 DEXOS 1 GM SPEC #15827
<b>5.3L VVT DIRECT INJECTED MARINE ENGINE SPECIFICATIONS</b>	
DISPLACEMENT	5328cc 325 ci
ENGINE ORIENTATION	LONGITUDINAL
COMPRESSION RATIO	11.0:1
VALVE CONFIGURATION	OVERHEAD VALVE
VALVES PER CYLINDER	2
VALVE LIFTERS	HYDRAULIC ROLLER
FIRING ORDER	1-8-7-2-6-5-4-3
BORE AND STROKE	96.01 mm X 92mm
FUEL SYSTEM	SIDI DIRECT INJECTED
PCV SYSTEM	PCV VALVE
ENGINE ROTATION	CCW FROM FLYWHEEL END

### 6.2L SIDI GENERAL ENGINE SPECIFICATIONS

ENGINE TYPE	GM L86 V8 OHV
COOLANT CAPACITY	5 US GALLONS
RECOMMENDED COOLANT	DEXCOOL 50/50 MIX
HIGH PRESSURE FUEL FILTER/REGULATOR	NAPA #3737
SPARK PLUGS	AC DELCO #41-114 GM #12622441
SPARK PLUG GAP	1.025 mm .040 +/- .002
SPARK ARRESTOR	F040J6
OIL PAN CAPACITY	9 QUARTS W/REMOTE FILTER
OIL FILTER REMOTE LOCATION	NAPA # 1515
WATER SEPERATOR FILTER	NAPA # 3225
SERPENTINE BELT	NAPA #25-060716
FUEL PRESSURE BEFORE FUEL RAIL	4 BAR 58 PSI
FUEL TYPE	PREMIUM UNLEADED ONLY
RECOMMENDED ENGINE OIL	0W-20 DEXOS 1 GM SPEC #15827

### 6.2L VVT DIRECT INJECTED MARINE ENGINE SPECIFICATIONS

DISPLACEMENT	6162cc 376 ci
ENGINE ORIENTATION	LONGITUDINAL
COMPRESSION RATIO	11.5:1
VALVE CONFIGURATION	OVERHEAD VALVE
VALVES PER CYLINDER	2
VALVE LIFTERS	HYDRAULIC ROLLER
FIRING ORDER	1-8-7-2-6-5-4-3
BORE AND STROKE	103.25mm X 92mm
FUEL SYSTEM	DIRECT INJECTED
PCV SYSTEM	PCV VALVE
ENGINE ROTATION	CCW FROM FLYWHEEL END

<b>MAINTENANCE SCHEDULE</b>									
<b>ENGINE CHECK POINTS</b>	<b>SERVICE INTERVAL</b>								
	<b>DAILY</b>	<b>EVERY 25 HOURS</b>	<b>EVERY 50 HOURS</b>	<b>EVERY 75 HOURS</b>	<b>EVERY 100 HOURS</b>	<b>EVERY 150 HOURS</b>	<b>EVERY 200 HOURS</b>	<b>EVERY 300 HOURS</b>	<b>EVERY 400 HOURS</b>
<b>GENERAL MAINTENANCE</b>									
<b>Inspect fuel system for leaks</b>	<b>PRIOR TO ANY SERVICE OR MAINTENANCE ACTIVITY</b>								
<b>Inspect engine for fluid leaks</b>	X								
<b>Check engine oil</b>	X								
<b>Replace engine oil and filter</b>			X						
<b>Inspect accessory drive belts</b>	X				X				X
<b>Inspect ECM isolation mounts for cracks and wear; replace as necessary</b>			X						
<b>Inspect throttle control function</b>	X								
<b>Check for MIL at key on. If MIL remains illuminated after starting (it is indicating a fault), refer to page 16</b>	X								
<b>Check engine compression</b>									X
<b>ENGINE COOLANT</b>									
<b>Check engine coolant level</b>	X								
<b>Replace coolant</b>									X
<b>Inspect coolant hoses for leaks, cracks, swelling, or deterioration</b>	X				X				X
<b>ENGINE ELECTRICAL SYSTEM</b>									
<b>Inspect battery for case damage and corroded cables</b>	X								X
<b>Inspect electrical and ignition system</b>					X				X
<b>Replace spark plugs</b>									X
<b>FUEL SYSTEM</b>									
<b>Replace fuel/water separator filter</b>					X				
<b>Check fuel pressure</b>						Service Dealer			
<b>Inspect all fuel hoses and fittings for leaks</b>	X								X
<b>AIR INTAKE</b>									
<b>Check for leaks in air intake and filtration system</b>	X				X				
<b>Inspect spark arrestor element</b>			X						
<b>Clean flame arrestor element</b>	Clean or replace flame arrestor element as conditions require or every 100 hours								
<b>Inspect throttle body for loose bolts or vacuum leaks</b>	X				X				
<b>ENGINE EXHAUST SYSTEM</b>									
<b>Inspect engine for exhaust leaks</b>	X								
<b>Inspect exhaust system for cracks, leaks, gaskets, and loose bolts</b>					X				



## **CHANGING ENGINE OIL AND FILTER**

Under normal operating conditions, the engine oil and filter must be changed every 100 hours or every 12 months whichever occurs first. Use of premium quality oil and filters is recommended. The oil and filter should be changed more often if the engine is operating in severe conditions, such as dirty areas, or during cold weather. No oil additives or break-in oil are recommended.

### **Engine Oil Level Check**



**CAUTION:** Do not operate the engine with the oil level below the bottom of the dipstick or 'Add' mark on the dipstick, or above the top or 'Full' mark on the dipstick.

The engine oil level should be checked daily. It is recommended that the oil be checked just before the engine is started for the first time for the day. The oil level should be between the 'ADD' and the 'FULL' marks on the dipstick.

### **Adding Engine Oil**

It is normal to add some oil in the period of time between oil changes. The amount will vary with the severity of operation. When adding or replacing engine oil, be sure the oil meets or exceeds the recommended specification.

### **Engine Oil Quality**

To achieve proper engine performance and durability, it is important that you use only engine lubricating oils of the correct type in your engine. Quality oil also provides maximum efficiency for crankcase ventilation systems, which reduces pollution.

### **Engine Oil Recommendation**

GM recommends motor oils meeting the Dexos 1 standard. The GM spec for this oil is #15827. Motor oils meeting this spec receive the green Dexos 1 symbol below.



## Oil Filter

**NOTE: Ensure the old filter gasket is removed prior to installing the new filter.**

The Kodiak **GM Powertrain** engines use an AC Delco (or equivalent) oil filter as original equipment. An equivalent oil filter must be used when servicing the engine (see Engine Specifications starting on page 21 for the recommended oil filter for your engine).

The filter protects your engine from harmful, abrasive, or sludgy particles without blocking the flow of oil to vital engine parts.

To replace the filter, use a proper filter wrench to remove the filter. Clean the filter-mounting base and lightly coat the gasket surface of the new filter with engine oil. Hand tighten the filter until the gasket contacts the base, then tighten another ½ turn. Fill the engine with the correct amount of oil, run the engine and check for oil leaks at the drain plug and filter gasket. Tighten as necessary to stop any oil leakage.

## Flame Arrester

The purpose of the flame arrester is to contain any possible flame that gets into the intake manifold due to an engine failure, but also serves other purposes.



**CAUTION: Service the flame arrester more frequently under severely dusty or dirty conditions.**

Your flame arrester filters air entering the engine induction system and acts as a silencer. Air that contains dirt and grit produces an abrasive fuel mixture and can cause severe damage to the cylinder walls and piston rings. Damage to the cylinder walls and piston rings will cause high oil consumption and short engine life. A restricted or dirty flame arrester can cause a low power situation. Therefore it is extremely important that the flame arrester be serviced at the recommended intervals.

1. Clean screen by washing with solvent.
2. Blow dry or allow dripping dry prior to installation
3. Remove all dust and foreign matter from spark arrester

Make sure the flame arrester is seated properly on the throttle body when reinstalled. Do not operate engine without flame arrester.

## COOLING SYSTEM

KEM Equipment and GM Powertrain recommends the use of DEX COOL coolant in all GM engines. A 50/50 mixture is recommended.



**WARNING: Engine Damage may occur:** All Generation V GM engines must be vacuum filled with coolant. If you need assistance or have questions call your local service dealer. Failure to vacuum fill this engine with the recommended coolant may void all warranty.



**WARNING:** Never remove the heat exchanger cap under any condition while the engine is operating. Failure to follow these instructions could result in damage to the cooling system, engine, or cause personal injury.



**CAUTION:** DO NOT add coolant or water to any engine that has become overheated until the engine cools. Adding coolant or water to an extremely hot engine can result in a cracked block or cylinder head.

### COOLANT LEVEL



**CAUTION:** DO NOT mix DEX-COOL (pink/orange colored) with traditional (green) ethylene glycol. Refer to the mixture chart on the container for additional antifreeze protection information. DO NOT use alcohol or methanol antifreeze, or mix them with the specified coolant. Plain water may be used in an emergency (except in freezing temperatures), replace water with the specified coolant as quickly as possible to avoid damage to the system.

Check the coolant level of the heat exchanger daily and only when the engine is cool. Generally a good time to do this is just prior to starting the engine for the first time each day.

Plain water may be used in an emergency, but replace it with the specified coolant as quickly as possible to avoid damage to the system. Do not let the engine run hot with only water acting as the primary coolant.

## Heat Exchanger

1. Check the coolant level in the heat exchanger daily (prior to operation)
2. Make sure the coolant level is within  $\frac{3}{4}$  to 1- $\frac{1}{2}$  inches below the filler neck seat
3. Check the condition of the rubber seal on the coolant filler cap
4. Make sure the rubber seal is clean and free of any dirt particles.
5. Make sure the filler neck is clean then replace cap.
6. Check all hoses and connections for leaks.
7. Check coolant overflow tank level, fill to cold line (prior to operation)
8. Check all hoses for cracks, frayed points, or spongy areas (replace as necessary).

## Serpentine Belt

**NOTE: Make sure the belt tensioner is within the proper operating range.**

**Kodiak Marine** engines utilize serpentine belts on the front of the engine. This type of belt system incorporates a belt-tensioning device that keeps the belt at the proper tension. This belt should be checked routinely for cracks or 'checking' on the grooved side of the belt. If cracks or 'checking' are apparent, the belt must be changed.

## FUEL INJECTION SYSTEM



**WARNING:** Extreme High Fuel Rail Pressure. The SIDI Fuel Injectors and fuel rail have extreme high fuel pressures. Do not attempt to remove or service these parts. This poses a potentially hazardous situation that if not avoided, could result in severe personal injury or death, or damage to engine and or property.



**CAUTION:** Failure to change the fuel system filter as recommended can result in premature failure of fuel injection system components.



**WARNING:** Use extreme care when changing the fuel filter. Gasoline is highly flammable and under pressure. It should not be exposed to open flame, sparks, or hot engine components. Allow the engine to cool to ambient temperature prior to changing fuel filters.



**WARNING:** Fuel is under Extreme HIGH Pressure, consult equipment service dealer before servicing any part of the fuel system.



**WARNING:** The bilge can accumulate explosive fumes. The bilge blower will evacuate the fumes. The bilge blower must be run for a minimum of 10 minutes prior to cranking the engine.

### Fuel Water Separator Filter

A fuel/water separator filter is used in the fuel supply line to the engine. The fuel filter is located in the supply line between the fuel tank, fuel pump and the engine. This filter helps to protect the fuel injectors and other fuel system components from any harmful debris that may be present in the fuel tank. This filter must be changed every 500 hours or every 6 months whichever occurs first.

## Fuel Recommendation



**WARNING:** Use extreme care when changing the fuel filter. Gasoline is highly flammable and under pressure. It should not be exposed to open flame, sparks, or hot engine components. Allow the engine to cool to ambient temperature prior to changing fuel filters.



**WARNING:** The bilge can accumulate explosive fumes. The bilge blower will evacuate the fumes. The bilge blower must be run for a minimum of 10 minutes prior to cranking the engine.

## Fuel Type

### 4.3L and 5.3L SIDI ENGINES

Unleaded **87 Octane** or better fuel is recommended. Lower octane fuels will reduce overall engine performance. Maximum Ethanol content is 10%.

**6.2L ENGINE USE PREMIUM 91 MINIMUM OCTANE** Lower octane fuels will reduce overall engine performance. Maximum Ethanol content is 10%.

## Fuel Quality Changes

**NOTE:** Sudden changes in fuel quality, including geographical regions may effect engine operation.

## Power Loss at Higher Elevations

Fuel injected engines will lose 3.5% power for every 1000 feet the engine is operated above sea level. All fuel injection systems installed by KEM Equipment, Inc. are equipped with a “manifold absolute pressure sensor” (MAP Sensor). The MAP sensor senses barometric pressure and automatically corrects the fuel system calibration for changes in altitude. This means the air/fuel mixture will always be optimized, regardless of elevation (or barometric pressure); however, the engine will still lose 3.5% power for every 1000 ft. increase in elevation. All engines will experience power loss when operated at elevations above sea level, unless they are turbocharged or supercharged. Turbochargers and superchargers are mechanical pumps that put extra air into the engine to make up for the lower air density at higher elevations.

## IGNITION SYSTEM



**WARNING:** High voltage ignition system. Electrical shock hazard.



**WARNING:** The bilge can accumulate explosive fumes. The bilge blower will evacuate the fumes. The bilge blower must be run for a minimum of 10 minutes prior to cranking the engine.

### Type of Ignition System

The ignition on Kodiak SIDI engines are controlled by a MEFI 7 ECM, and do not use a distributor.



**CAUTION:** Always use the recommended spark plug for your engine, hotter or colder plugs, or similar plugs that are not exact equivalents to the recommended plugs can cause permanent engine damage, reduce the engines useful life, and cause many other problems such as hard starting, spark knock and run-on, premature failure of catalyst and exhaust emissions may occur.

Spark plugs should be replaced at the recommended intervals as described in the Maintenance Schedule on page 24. Use only the recommended spark plugs or an equivalent as described in the General Specifications. Spark plug gap should be adjusted as recommended in the General Specifications, use the quick reference guide for your individual engine starting on page 21.

## **TROUBLESHOOTING**



**WARNING:** The bilge can accumulate explosive fumes. The bilge blower will evacuate the fumes. The bilge blower must be run for a minimum of 10 minutes prior to cranking the engine.

**NOTE:** A Malfunction Indicator Light must be installed with this engine to be compliant with EPA and CARB regulations. Proper connections will be covered in the wiring section of this manual. Contact your engine installer if this MIL has not been installed. Operating without a MIL installed, may affect your warranty.

The largest percentage of all malfunctioning equipment will be due to simple or small problems. Most operating troubles that might be encountered with a new or well-maintained unit will be of a minor nature. Consequently, if you experience any problems starting or operating your engine, look for a simple cause rather than failure of a major component. The following list should cover the most common problems.

- Loose or corroded battery connections are more common than battery failure.
- Loose ignition wire connection – more common than distributor, coil or ignition.
- Severe weather conditions – temps below 32°F/0°C - can cause condensation on the inside of the engine.
- Operating conditions (load changes).
- Change of periodic servicing.
- Change of grade or purity of fuel. Contaminated fuel will often foul engine components.
- Change of operator.

Engine troubles that develop as a result of normal use and wear usually give plenty of advance notice or warning. These problems usually develop as a result of neglected periodic maintenance. Whenever engine performance appears less than normal in any area, you should consult with your KODIAK service dealer immediately. Do not wait for a problem to develop. Careful attention to periodic/regular maintenance will prevent most problems. Refer to the periodic maintenance section for checklists.

If you need assistance, refer to the list of Kodiak Approved service dealers on pages 58-59 in this manual.



## Engine Does Not Crank



**WARNING:** Make sure there are no fuel leaks before going any further. Clean up any spills and always work in a well-ventilated area.



**WARNING:** To avoid any electrical injuries always replace any broken wires before proceeding.



**WARNING:** The bilge can accumulate explosive fumes. The bilge blower will evacuate the fumes. The bilge blower must be run for a minimum of 10 minutes prior to cranking the engine.

- Check battery cables – adjust any loose connections and clean any corrosion.
- Check battery charge.
- Check electrical leads – something may be loose or disconnected.
- Check all fuses and relays.
- Refer to Pre-Operational checklist for further checks.

### Engine Will Crank Intermittently

Having to turn the key to START several times.

- Check the ignition switch for loose, corroded, disconnected or broken wires. Tighten or replace as necessary.

### When The Engine Makes A Stuttering Or Chattering Noise.

- Check the battery cables for loose connections.
- Check battery charge – charge if necessary.
- Check the starter motor and solenoid switch for loose or disconnected wires.
- Check ground connections for loose, corroded, disconnected or broken wires.

If all electrical connections have been checked for loose connections, corrosion, broken wires and disconnected wires and after you have reviewed and performed the Operational Instructions, contact your service dealer.

## Engine Cranks but Does Not Start



**CAUTION:** Failure to change the fuel system filter as recommended can result in premature failure of the fuel injection system components.



**WARNING:** Use extreme care when changing the fuel filter. Gasoline is highly flammable and under pressure. It should not be exposed to open flame, sparks, or hot engine components. Allow the engine to cool to ambient temperature prior to changing fuel filters.



**WARNING:** Extreme High Fuel Rail Pressure. The SIDI Fuel Injectors and fuel rail have extreme high fuel pressures. Do not attempt to remove or service these parts. This poses a potentially hazardous situation that if not avoided, could result in severe personal injury or death, damage to engine and or property.



**WARNING:** The bilge can accumulate explosive fumes. The bilge blower will evacuate the fumes. The bilge blower must be run for a minimum of 10 minutes prior to cranking the engine.

- Check fuel tank level.
- See clear flood mode on page 18
- Check for signs of fuel leaks.
- Check fuel lines.
- Check fuel pressure.
- Inspect for crimps, kinks, blockage or any disconnected lines.
- Inspect for any leakage (leaks may allow air in the lines blocking fuel flow.)
- Follow and repair any leaks before continuing.
- Contact your service dealer for more advanced diagnosis
- Check fuel pressure (service dealer)
- Clean up any fuel spills or leaks prior to attempting to start the engine.

## Engine Runs Hot



**WARNING:** Never remove the radiator cap under any condition while the engine is operating. Failure to follow these instructions could result in damage to the cooling system, engine, or cause personal injury.



**WARNING:** The bilge can accumulate explosive fumes. The bilge blower will evacuate the fumes. The bilge blower must be run for a minimum of 10 minutes prior to cranking the engine.



**CAUTION:** DO NOT add coolant or water to any engine that has become overheated until the engine cools. Adding coolant or water to an extremely hot engine can result in a cracked block or cylinder head.

The following items may cause the engine to overheat.

- Low coolant level
- Loose or broken belt
- Inoperative thermostat
- Inoperative water pump – seawater or circulation or sand trap
- Clogged inlet strainer – seawater or circulation from jet drive
- Clogged heat exchanger tube(s)
- Low oil level
- Ruptured, plugged or kinked hoses

If you perform the Pre-Operational and Operation Procedures as outlined, you will find that these items are subsequently checked on a regular basis. The habit of performing the Pre-Operational and Operational procedures is your best method of ensuring all steps are taken and followed periodically.

## EMISSIONS



### **WARNING: PROPER USE**

Any unauthorized modifications to or use of this engine outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the engine. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

This engine is certified for inboard use only in jet drive and stern drive vessels. Installation of this engine in outboard applications is a violation of the Clean Air Act.

This engine and the installed system components are designed to meet the current CARB and EPA emissions requirements.

## **STORAGE (Lay-Up) ONE MONTH**

1. Check coolant protection and fluid levels.
2. Add proper amount of marine formula Stabil fuel additive or equivalent to the fuel tank.
3. Start the engine
4. Treat upper cylinders by spraying engine fogger or equivalent into the air intake for about one minute.
5. Allow engine to stop while spraying
6. Shut off ignition switch.
7. Disconnect battery
8. Leave spark plugs in holes (or seal with suitable threaded plugs).
9. Cover all openings into the engine with dust proof cap or shields.



**CAUTION:** Make sure the raw water side of the heat exchanger and fuel/oil cooler are drained when ambient temperature is or may go below 32°F/0°C.

## **STORAGE (Lay-Up) FOR INDEFINITE PERIOD**

1. Add proper amount of marine formula Stabil fuel additive or equivalent to the fuel tank.
2. Drain oil from crankcase, refill with recommended engine oil, (SAE 10W40) or equivalent.
3. Shut off ignition switch
4. Check coolant protection and fluid levels.
5. Disconnect and remove battery.
6. Leave spark plugs in holes (or seal with suitable threaded plugs).
7. Cover all openings into the engine with dust proof cap or shields.

The following inspections shall be run on your engine at the indicated intervals (or more if needed). These inspections ensure that your engine will continue to perform at a level it was designed to. Make sure that all inspections are performed at their assigned intervals.

## 100, 400, 500, 800, 900, Hour Inspection



**WARNING:** Make sure key is not in ignition and no electrical equipment is energized prior to any engine check or operation. Do not energize engine prior to performing the following steps.

1. Open engine hatch cover and let compartment air out for ten minutes or more.
2. Make sure that no electrical equipment is energized
3. Change engine oil and filter.
4. Check coolant level (Make sure fluids are at the proper levels).
5. Check for oil, coolant, and fuel leaks, (Correct any leaks prior to proceeding further).
6. Check charge and fluid level of battery (Inspect connections for corrosion, and clean as necessary).
7. Check flame arrestor (Make sure that it is cleaned replaced as necessary).
8. Inspect the exterior of the heat exchanger (clean if necessary).
9. Check alternator belt (adjust if necessary).
10. Check for loose bolts, nuts, or any loose pieces.
11. Start bilge blower (Let blower run for 10 minutes).
12. Close engine cover.

### 400-Hour Inspection



**WARNING:** Make sure key is not in the ignition and no electrical equipment is energized prior to any engine check or operation. Do not energize engine prior to performing the following steps.

1. Open engine hatch cover and let compartment air out for ten minutes or more.
2. Make sure that no electrical equipment is energized
3. Change engine oil and filter.
4. Check coolant level (Make sure fluids are at the proper levels).
5. Check for oil, coolant, and fuel leaks, (Correct any leaks prior to proceeding further).
6. Check charge and fluid level of battery. (Inspect connections for corrosion, and clean as necessary).
7. Check flame arrestor (Make sure that it is cleaned replaced as necessary).
8. Inspect the exterior of the heat exchanger (clean if necessary).
9. Check alternator belt (adjust if necessary).
10. Remove and replace fuel filter.
11. Remove, clean, adjust, test, and/or replace spark plugs.
12. Check for loose bolts, nuts, or any loose pieces.
13. Start bilge blower (Let blower run for 10 minutes).
14. Close engine cover.

## 800 Hour Inspection



**WARNING:** Make sure key is not in ignition and no electrical equipment is energized prior to any engine check or operation. Do not energize engine prior to performing the following steps.

1. Open engine hatch cover and let compartment air out for ten minutes or more.
2. Make sure that no electrical equipment is energized
3. Change engine oil and filter.
4. Check for oil, coolant, and fuel leaks, (Correct any leaks prior to proceeding further).
5. Check charge and fluid level of battery (Inspect connections for corrosion, and clean as necessary).
6. Check flame arrestor (Make sure that it is cleaned replaced as necessary).
7. Inspect the exterior of the heat exchanger (clean if necessary).
8. Check alternator belt (adjust if necessary).
9. Remove and replace fuel filter.
10. Remove, clean, adjust, test, and/or replace spark plugs.
11. Remove and replace PCV valve, if applicable.
12. Drain and replace coolant in cooling system.
13. Check for loose bolts, nuts, or any loose pieces.
14. Start bilge blower (Let blower run for 10 minutes).
15. Close engine cover.



**CAUTION:** Make sure the raw waterside of heat exchanger and fuel/oil cooler are drained when ambient temperature is below 32 Degrees F.

## **CALIFORNIA EMISSION CONTROL WARRANTY STATEMENT YOUR WARRANTY RIGHTS AND OBLIGATIONS**

The California Air Resources Board and KEM Equipment, Inc. / Kodiak Marine are pleased to explain the emission control system warranty on your 2011 model year inboard/stern drive engine. In California, new inboard/stern drive engines must be designed, built and equipped to meet the State's stringent anti-smog standards. KEM Equipment, Inc. / Kodiak Marine must warrant the emission control system on your inboard/stern drive engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your inboard/stern drive engine.

Your emission control system includes parts such as the fuel injection system, the ignition system, and catalytic converter. Also included may be hoses, belts, connectors and other emission-related assemblies.

Where a warrantable condition exists, KEM Equipment, Inc. / Kodiak Marine will repair your inboard/stern drive engine at no cost to you, including diagnosis, parts and labor.

### **KEM EQUIPMENT, INC. / KODIAK MARINE WARRANTY COVERAGE**

Select emission control parts from model year 2011 and later inboard or stern drive engines are warranted for 3 years. If any emission-related part on your engine is defective under warranty, the part will be repaired or replaced by KEM Equipment, Inc. / Kodiak Marine.

### **OWNER'S WARRANTY RESPONSIBILITIES**

As the inboard/stern drive engine owner, you are responsible for the performance of the required maintenance listed in your owner's manual. KEM Equipment, Inc. / Kodiak Marine recommends that you retain all receipts covering maintenance on your inboard/stern drive engine, but KEM Equipment, Inc. / Kodiak Marine cannot deny warranty solely for the lack of receipts or your failure to ensure the performance of all scheduled maintenance.

As the inboard/stern drive engine owner, you should however be aware that KEM Equipment, Inc. / Kodiak Marine may deny you warranty coverage if your inboard/stern drive engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

You are responsible for presenting your inboard/stern drive engine to a KEM Equipment, Inc. / Kodiak Marine Distribution center as soon as a problem exists. The warranty repairs will be completed in a reasonable amount of time, not to exceed 30 days. If satisfactory repairs have not been completed in this amount of time, contact KEM Equipment for further instructions.

If you have any questions regarding your warranty rights and responsibilities, you should contact KEM Equipment, Inc. / Kodiak Marine at (503) 692-5012.



## GENERAL EMISSIONS WARRANTY COVERAGE

KEM Equipment, Inc. / Kodiak Marine warrants to the ultimate purchaser and each subsequent purchaser that this engine is:

(1) Designed, built and equipped so as to conform with all applicable regulations adopted by the Air Resources Board pursuant to its authority in Chapters 1 and 2, Part 5, Division 26 of the Health and Safety Code; and,

(2) Free from defects in materials and workmanship that cause the failure of a warranted part to be identical in all material respects to that part as described in KEM Equipment Inc. / Kodiak Marine's application for certification.

The warranty period begins on the date the engine or equipment is delivered to an ultimate purchaser or first placed into service. For model year 2011 and later spark-ignition inboard and stern drive marine engines, a period of 3 years.

Subject to certain conditions and exclusions as stated below, the warranty period on your engine's emission-related parts (identified below) is as follows:

(1) Any warranted part that is not scheduled for replacement as required maintenance in the written instructions supplied, is warranted for the warranty period stated above. If the part fails during the period of warranty coverage, the part will be repaired or replaced by KEM Equipment, Inc. / Kodiak Marine according to Subsection (4) below. Any such part repaired or replaced under warranty will be warranted for the remainder of the period.

(2) Any warranted part that is scheduled only for regular inspection in the written instructions supplied is warranted for the warranty period stated above. Any such part repaired or replaced under warranty will be warranted for the remaining warranty period.

(3) Any warranted part that is scheduled for replacement as required maintenance in the written instructions supplied is warranted for the period of time before the first scheduled replacement date for that part. If the part fails before the first scheduled replacement, the part will be repaired or replaced by KEM Equipment Inc. / Kodiak Marine according to Subsection (4) below. Any such part repaired or replaced under warranty will be warranted for the remainder of the period prior to the first scheduled replacement point for the part.

(4) Repair or replacement of any warranted part under the warranty provisions herein must be performed at a warranty station at no charge to the owner.

(5) Notwithstanding the provisions herein, warranty services or repairs will be provided at all KEM Equipment, Inc. / Kodiak Marine distribution centers that are franchised to service the subject engines.

(6) The engine owner will not be charged for diagnostic labor that is directly associated with diagnosis of a defective, emission-related warranted part, provided that such diagnostic work is performed at a warranty station.

(7) KEM Equipment, Inc. / Kodiak Marine is liable for damages to other engine components proximately caused by a failure under warranty of any warranted part.

(8) Throughout the engine's warranty period defined above, KEM Equipment, Inc. / Kodiak Marine will maintain a supply of warranted parts sufficient to meet the expected demand for such parts.

(9) Any replacement part may be used in the performance of any warranty maintenance or repairs and must be provided without charge to the owner. Such use will not reduce the warranty obligations of KEM Equipment, Inc. / Kodiak Marine.

(10) Add-on or modified parts, as defined in Section 1900(b)(1) and (b)(10), Title 13, that are not exempted by the Air Resources Board may not be used. The use of any non-exempted add-on or modified parts by the ultimate purchaser will be grounds for disallowing a warranty claim made in accordance with these warranty procedures and Policies. KEM Equipment, Inc. / Kodiak Marine will not be liable under these warranty procedures and policies to warrant failures of warranted parts caused by the use of a non-exempted add-on or modified part. Following is a list of those critical emission related parts that are covered under the provisions of this emission warranty:

**(1) Fuel Metering System**

- Fuel injection system
- Air/fuel ratio feedback and control system
- Intake valve(s)

**(2) Air Induction System**

- Intake manifold
- Air filter

**(3) Ignition System**

- Spark plugs
- Electronic ignition system
- Ignition control module
- Ignition wires

**(4) Lubrication System**

- Oil pump and internal parts

**(5) Positive Crankcase Ventilation (PCV) System**

- PCV valve
- Oil filler cap

**(6) Exhaust System**

- Exhaust Catalyst
- Oxygen Sensors

**(7) Miscellaneous Items Used in Above Systems**

- Hoses, clamps, fittings, tubing, sealing gaskets or devices, and mounting hardware.
- Pulleys, belts and idlers.
- Vacuum, temperature, check, and time sensitive valves and switches
- Electronic Controls

## **Exclusions**

The repair or replacement of any warranted part otherwise eligible for warranty coverage may be excluded from such warranty coverage if KEM Equipment, Inc. / Kodiak Marine demonstrates that the engine has been abused, neglected, or improperly maintained, and that such abuse, neglect, or improper maintenance was the direct cause of the need for repair or replacement of the part.

Except as provided in the paragraph above, any adjustment of a component that has a factory installed, and properly Operating, Adjustment limiting device (such as an idle limiter cap or plug) is eligible for warranty coverage, under General Emissions Warranty Coverage above.

## **Non-Commercial Applications:**

**Starters, Alternators, and Fuel pumps will be warranted for a period of 2 years or 200 hours, whichever occurs first.**

## **Commercial Applications:**

**Starters, Alternators, and Fuel pumps will be warranted for a period of 1 year or 150 hours, whichever occurs first.**

**KODIAK MARINE ENGINE WARRANTY  
3 YEAR LIMITED WARRANTY  
EFFECTIVE JANUARY 1<sup>st</sup>, 2011**

Products Covered	Length of Warranty (from date of original retail purchase)	
	Non-commercial Non-rental	Commercial/Rental
Inboard Engines 2011 and newer	36 months/480 hours	12 months/480 hours

- The Kodiak Marine Inboard Engine must be purchased from an authorized Kodiak Marine dealer. This limited warranty applies to the first retail purchaser and each subsequent owner during the applicable warranty time period.
- Kodiak Marine will repair or replace, at its option, any part that is proven to be defective in material or workmanship under normal use during the applicable warranty time period. Warranty repairs and replacements will be made without charge for parts or labor. Anything replaced under warranty becomes property of Kodiak Marine. All parts replaced under warranty will be considered as part of the original product and any warranty on those parts will expire coincidentally with the original product warranty.
- **The warranty shall commence after receipt of a properly completed Warranty Registration at the factory, on the date of the first retail purchase and extends to original and subsequent purchasers.** However, in no event shall the duration of this warranty exceed three (3) years or 480 hours, whichever occurs first, measured from the original retail sale date. All subsequent purchasers must inform Kodiak in writing and with a payment of \$100.00 transfer fee to continue the warranty. If Kodiak does not receive notification and payment within 15 days of the resale the warranty will be null and void.
- Third year (3) of the warranty period is limited to defects in the materials and workmanship only. \*You must have your dealer verify hours before the start of the warranty claim and a no exception \$150.00 deductible will apply to each warranty claim during the third year of the warranty period.
- Warranty service must be requested by calling Kodiak Marine to be directed to your closest authorized service center to deliver the product for inspection. A properly completed warranty registration must be on file with KEM. You must take your Kodiak Marine Inboard Engine and proof of the original purchase date, at your expense; to any a designated authorized Kodiak Marine service facility during the dealer's normal business hours. If you are unable to obtain warranty service, or are dissatisfied with the warranty service you receive, take the following steps: First, contact the manager or owner of the dealership involved; normally this should resolve the problem. However, if you should require further assistance, write or call Kodiak Marine:

**Kodiak Marine**  
10800 SW Herman Rd.  
Tualatin, OR 97062  
503-692-5012

**EXCLUSIONS**

THIS WARRANTY DOES NOT EXTEND TO THE FOLLOWING:

- CONDITIONS CAUSED BY LACK OF ROUTINE MAINTENANCE (AS OUTLINED IN THE OPERATOR'S MANUAL)
- CONDITIONS CAUSED BY THE USE OF AN IMPELLER OR IMPELLERS THAT DO NOT ALLOW THE INBOARD ENGINE TO RUN IN ITS RECOMMENDED FULL THROTTLE RPM RANGE
- ALL ELECTRICAL COMPONENTS FOR THE THIRD (3) YEAR
- LABOR AND FREIGHT FOR THE THIRD (3) YEAR
- OPERATION INCONSISTENT WITH THE RECOMMENDED OPERATION/DUTY CYCLE (AS OUTLINED IN THE OPERATOR'S MANUAL)
- PARTS AFFECTED OR DAMAGED BY AN ACCIDENT AND/OR COLLISION
- NORMAL WEAR AND TEAR
- FUEL CONTAMINATION AND WATER ENTERING ENGINE THROUGH THE FUEL INTAKE, AIR INTAKE, OR EXHAUST SYSTEM
- OPERATION WITH FUELS, OILS, ADDITIVES AND LUBRICANTS WHICH ARE NOT SUITABLE FOR USE IN THE PRODUCT
- USE IN AN APPLICATION FOR WHICH THE INBOARD ENGINE WAS NOT DESIGNED, SUCH AS RACING OR COMPETITIVE USE OR ANY OTHER MISUSE OR NEGLECT
- INCORPORATION OF UNSUITABLE ATTACHMENTS OR PARTS
- THE UNAUTHORIZED ALTERATION, IMPROPER INSTALLATION AND/OR RIGGING, OR ANY CAUSES OTHER THAN DEFECTS IN MATERIAL OR WORKMANSHIP
- CORROSION TO ELECTRICAL COMPONENTS, CORROSION DUE TO ELECTROLYSIS, WATER BORN FOREIGN CHEMICALS, IMPROPER SERVICE, OR CORROSION CAUSED BY DAMAGE OR ABUSE
- REIMBURSEMENT FOR TOWING CHARGES, IN AND OUT OF WATER CHARGES, OR TECHNICIAN TRAVEL TIME
- GROWTH OF MARINE ORGANISMS ON MOTOR SURFACES, EXTERNAL OR INTERNAL

DISCLAIMER OF CONSEQUENTIAL DAMAGE AND LIMITATION OF IMPLIED WARRANTIES:  
Kodiak Marine DISCLAIMS ANY RESPONSIBILITY FOR LOSS OF TIME OR USE OF THE INBOARD, REVENUE, OR THE EQUIPMENT IN, WHICH THE INBOARD IS INSTALLED, TRANSPORTATION, COMMERCIAL LOSS, OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGE. ANY IMPLIED WARRANTIES ARE LIMITED TO THE DURATION OF THIS WRITTEN LIMITED WARRANTY.

**Non-Commercial Applications:**

**Starters, Alternators, and Fuel pumps will be warranted for a period of 2 years or 200 hours, whichever occurs first.**

**Commercial Applications:**

**Starters, Alternators, and Fuel pumps will be warranted for a period of 1 year or 150 hours, whichever occurs first.**

Some states do not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusions and limitations may not apply to you. This warranty gives you specific legal rights, and you may also have other rights, which vary state to state.

## ON BOARD DIAGNOSTIC (OBD) MEFI CONTROLLED MARINE ENGINE



**WARNING:** Fire, Shock, and Burn Danger: When performing any diagnostics or service work use caution. This system has extreme fuel pressures and a high voltage ignition.



**CAUTION:** Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts. Discharge body static: before handling the control. (Make sure power to the control is turned off, contact a grounded surface and maintain contact while, handling the control). Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards. Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.



**WARNING:** Extreme High Fuel Rail Pressure. The SIDI Fuel Injectors and fuel rail have extreme high fuel pressures. Do not attempt to remove or service these parts. This poses a potentially hazardous situation that if not avoided, could result in severe personal injury or death, damage to engine and or property.

1. Verify that none of the following preliminary inspections/tests reveal the cause of the vehicle concern before beginning diagnosis.
  - Ensure that the battery is fully charged.
  - Ensure that the battery cables are clean and tight.
  - Inspect for any open fuses.
  - Ensure that the grounds are clean, tight, and in the correct location.
  - Inspect the easily accessible systems or the visible system components for obvious damage or conditions that could cause the concern. This would include checking to ensure that all connections/connectors are fully seated and secured.
  - Inspect for aftermarket devices that could affect the operation of the system.
  - Search for applicable service bulletins.
2. Ensure that the battery is fully charged.
3. Ensure that the battery cables are clean and tight.
4. Inspect for any open fuses.
5. Ensure that the grounds are clean, tight, and in the correct location.
6. Inspect the easily accessible systems or the visible system components for obvious damage or conditions that could cause the concern. (This would include checking to ensure that all connections/connectors are fully seated and secured.)

7. Inspect for aftermarket devices that could affect the operation of the system.
8. Search for applicable service bulletins.
9. Install a scan tool. Verify that the scan tool powers up.
10. Ignition ON, Engine OFF, verify communication with all of the control modules on the vehicle.
  
11. Verify that SPN 65559 is not set; if SPN 65559 is set, refer to *SPN 65559*

**ATTEMPT TO START THE ENGINE:** Verify that the engine cranks.

- If the engine does not crank, refer to *SPN 66001* or *SPN 66002* (if equipped). If the engine is not equipped with an ECM controlled starter relay, repair the starting system.
- Attempt to start the engine. Verify the engine starts and idles.

**Important:** Do not clear any SPNs unless instructed to do so by a diagnostic procedure.

Use the appropriate scan tool selections to obtain SPNs from each of the vehicle modules.

Verify there are no SPNs reported from any module.

If any SPNs are present diagnose any current SPNs in the following order:

- Any of the following: 630, 65580, 65581, or 65582.
- SPN 627.
- Component level SPNs.
- System level SPNs.
- Any remaining SPNs.

## **DIAGNOSTIC ERROR CODES:**

### **SPN 94**

#### **SPN Descriptors**

**SPN 94 FMI 3:** Fuel Pressure Sensor Voltage Above Normal or Shorted High

**SPN 94 FMI 4:** Fuel Pressure Sensor Voltage Below Normal or Shorted Low

**SPN 94 FMI 15:** Fuel Pressure Data Valid But Above Normal Range-Least Severe Level

**SPN 94 FMI 17:** Fuel Pressure Data Valid But Below Normal Range-Least Severe Level

### **SPN 98**

#### **SPN Descriptor**

**SPN 98 FMI 17:** Oil Level Switch Signal Data Valid But Below Normal Range-Least Severe Level

### **SPN 100**

#### **SPN Descriptors**

**SPN 100 FMI 3:** Engine Oil Pressure (EOP) Sensor Circuit Voltage Above Normal or Shorted High

**SPN 100 FMI 4:** Engine Oil Pressure (EOP) Sensor Circuit Voltage Below Normal or Shorted Low

**SPN 100 FMI 17:** Engine Oil Pressure (EOP) Sensor Data Valid But Below Normal Range-Least Severe Level

### **SPN 105**

#### **SPN Descriptors**

**SPN 105 FMI 3:** Manifold Air Temperature (MAT) Sensor Circuit Voltage Above Normal or Shorted High

**SPN 105 FMI 4:** Manifold Air Temperature (MAT) Sensor Circuit Voltage Below Normal or Shorted Low

### **SPN 106**

#### **SPN Descriptors**

**SPN 106 FMI 0:** Manifold Absolute Pressure (MAP) Sensor Circuit Voltage Data Valid But Above Normal

**SPN 106 FMI 1:** Manifold Absolute Pressure (MAP) Sensor Circuit Voltage Data Valid But Below Normal

**SPN 106 FMI 3:** Manifold Absolute Pressure (MAP) Sensor Circuit Voltage Above Normal or Shorted High

**SPN 106 FMI 4:** Manifold Absolute Pressure (MAP) Sensor Circuit Voltage Below Normal or Shorted Low



## **SPN 108**

### **SPN Descriptors**

**SPN 108 FMI 2:** Barometric Pressure (BARO) Sensor Voltage Data Erratic, Intermittent or Incorrect

**SPN 108 FMI 3:** Barometric Pressure (BARO) Sensor Voltage Above Normal or Shorted High

**SPN 108 FMI 4:** Barometric Pressure (BARO) Sensor Voltage Below Normal or Shorted Low

**SPN 108 FMI 10:** Barometric Pressure (BARO) Sensor Abnormal Rate of Change

## **SPN 110**

### **SPN Descriptors**

**SPN 110 FMI 3:** Engine Coolant Temperature (ECT) Sensor Circuit Voltage Above Normal or Shorted High

**SPN 110 FMI 4:** Engine Coolant Temperature (ECT) Sensor Circuit Voltage Below Normal or Shorted Low

**SPN 110 FMI 15:** Engine Coolant Temperature (ECT) Sensor Circuit Voltage Data Valid But Above Normal Range-Least Severe Level

## **SPN 174**

### **SPN Descriptors**

**SPN 174 FMI 3:** Fuel Temperature (FT) Sensor Circuit Voltage Above Normal or Shorted High

**SPN 174 FMI 4:** Fuel Temperature (FT) Sensor Circuit Voltage Below Normal or Shorted Low

## **SPN 627**

### **SPN Descriptor**

**SPN 627 FMI 15:** System Voltage Data Valid But Above Normal Range-Least Severe Level

**SPN 627 FMI 17:** System Voltage Data Valid But Below Normal Range-Least Severe Level

## **SPN 630, 65580, 65581, or 65582**

### **SPN Descriptors**

**SPN 630 FMI 13:** Cal Memory Out of Calibration

**SPN 65580 FMI 12:** CPU Bad Intelligent Device or Component

**SPN 65581 FMI 12:** MHC Failure Bad Intelligent Device or Component

**SPN 65582 FMI 12:** NV RAM Failure Data Erratic, Intermittent or Incorrect

## **SPN 636**

### **SPN Descriptors**

**SPN 636 FMI 2:** Crankshaft Position (CKP) Sensor Circuit Data Erratic, Intermittent or Incorrect

**SPN 636 FMI 8:** Crankshaft Position (CKP) Sensor Signal Abnormal Frequency or Pulse Width

## **SPN 651, 652, 653, 654, 655, 656, 657, or 658**

### **SPN Descriptors**

**SPN 651 FMI 3:** Fuel Injector 1 Voltage Above Normal or Shorted High  
**SPN 651 FMI 5:** Fuel Injector 1 Current Below Normal or Open Circuit  
**SPN 652 FMI 3:** Fuel Injector 2 Voltage Above Normal or Shorted High  
**SPN 652 FMI 5:** Fuel Injector 2 Current Below Normal or Open Circuit  
**SPN 653 FMI 3:** Fuel Injector 3 Voltage Above Normal or Shorted High  
**SPN 653 FMI 5:** Fuel Injector 3 Current Below Normal or Open Circuit  
**SPN 654 FMI 3:** Fuel Injector 4 Voltage Above Normal or Shorted High  
**SPN 654 FMI 5:** Fuel Injector 4 Current Below Normal or Open Circuit  
**SPN 655 FMI 3:** Fuel Injector 5 Voltage Above Normal or Shorted High  
**SPN 655 FMI 5:** Fuel Injector 5 Current Below Normal or Open Circuit  
**SPN 656 FMI 3:** Fuel Injector 6 Voltage Above Normal or Shorted High  
**SPN 656 FMI 5:** Fuel Injector 6 Current Below Normal or Open Circuit  
**SPN 657 FMI 3:** Fuel Injector 7 Voltage Above Normal or Shorted High  
**SPN 657 FMI 5:** Fuel Injector 7 Current Below Normal or Open Circuit  
**SPN 658 FMI 3:** Fuel Injector 8 Voltage Above Normal or Shorted High  
**SPN 658 FMI 5:** Fuel Injector 8 Current Below Normal or Open Circuit

## **SPN 65541, 65542, 65543, 65544, 65545, 65546, 65547, or 65548**

### **SPN Descriptors**

**SPN 65541 FMI 4:** Ignition Coil 1 Voltage Below Normal or Shorted Low  
**SPN 65541 FMI 5:** Ignition Coil 1 Current Below Normal or Open Circuit  
**SPN 65542 FMI 4:** Ignition Coil 2 Voltage Below Normal or Shorted Low  
**SPN 65542 FMI 5:** Ignition Coil 2 Current Below Normal or Open Circuit  
**SPN 65543 FMI 4:** Ignition Coil 3 Voltage Below Normal or Shorted Low  
**SPN 65543 FMI 5:** Ignition Coil 3 Current Below Normal or Open Circuit  
**SPN 65544 FMI 4:** Ignition Coil 4 Voltage Below Normal or Shorted Low  
**SPN 65544 FMI 5:** Ignition Coil 4 Current Below Normal or Open Circuit  
**SPN 65545 FMI 4:** Ignition Coil 5 Voltage Below Normal or Shorted Low  
**SPN 65545 FMI 5:** Ignition Coil 5 Current Below Normal or Open Circuit  
**SPN 65546 FMI 4:** Ignition Coil 6 Voltage Below Normal or Shorted Low  
**SPN 65546 FMI 5:** Ignition Coil 6 Current Below Normal or Open Circuit  
**SPN 65547 FMI 4:** Ignition Coil 7 Voltage Below Normal or Shorted Low  
**SPN 65547 FMI 5:** Ignition Coil 7 Current Below Normal or Open Circuit  
**SPN 65548 FMI 4:** Ignition Coil 8 Voltage Below Normal or Shorted Low  
**SPN 65548 FMI 5:** Ignition Coil 8 Current Below Normal or Open Circuit

## **SPN 65550, 65551, or 65552**

### **SPN Descriptor**

**SPN 65550 FMI 2:** Knock Sensor (KS) Circuit Data Erratic, Intermittent or Incorrect  
**SPN 65551 FMI 2:** Knock Sensor (KS) Bank 1 Circuit Data Erratic, Intermittent or Incorrect  
**SPN 65552 FMI 2:** Knock Sensor (KS) Bank 2 Circuit Data Erratic, Intermittent or Incorrect

## **SPN 65559**

### **SPN Descriptors**

**SPN 65559 FMI 11:** CAN Bus Hardware Fault Root Cause Unknown

## **SPN 65560**

### **SPN Descriptors**

**SPN 65560 FMI 9:** CAN Bus Governor Command Abnormal Update Rate

## **SPN 65561, 65562, 65563, or 65564**

### **SPN Descriptors**

**SPN 65561 FMI 0:** Oxygen Sensor Bank A Sensor 1 Data Valid But Above Normal

**SPN 65561 FMI 1:** Oxygen Sensor Bank A Sensor 1 Data Valid But Below Normal

**SPN 65561 FMI 3:** Oxygen Sensor Bank A Sensor 1 Voltage Above Normal or Shorted High

**SPN 65561 FMI 4:** Oxygen Sensor Bank A Sensor 1 Voltage Below Normal or Shorted Low

**SPN 65561 FMI 5:** Oxygen Sensor Bank A Sensor 1 Current Below Normal or Open Circuit

**SPN 65562 FMI 0:** Oxygen Sensor Bank A Sensor 2 Data Valid But Above Normal

**SPN 65562 FMI 1:** Oxygen Sensor Bank A Sensor 2 Data Valid But Below Normal

**SPN 65562 FMI 3:** Oxygen Sensor Bank A Sensor 2 Voltage Above Normal or Shorted High

**SPN 65562 FMI 4:** Oxygen Sensor Bank A Sensor 2 Voltage Below Normal or Shorted Low

**SPN 65562 FMI 5:** Oxygen Sensor Bank A Sensor 2 Current Below Normal or Open Circuit

**SPN 65563 FMI 0:** Oxygen Sensor Bank B Sensor 1 Data Valid But Above Normal

**SPN 65563 FMI 1:** Oxygen Sensor Bank B Sensor 1 Data Valid But Below Normal

**SPN 65563 FMI 3:** Oxygen Sensor Bank B Sensor 1 Voltage Above Normal or Shorted High

**SPN 65563 FMI 4:** Oxygen Sensor Bank B Sensor 1 Voltage Below Normal or Shorted Low

**SPN 65563 FMI 5:** Oxygen Sensor Bank B Sensor 1 Current Below Normal or Open Circuit

**SPN 65564 FMI 0:** Oxygen Sensor Bank B Sensor 2 Data Valid But Above Normal

**SPN 65564 FMI 1:** Oxygen Sensor Bank B Sensor 2 Data Valid But Below Normal

**SPN 65564 FMI 3:** Oxygen Sensor Bank 2 Sensor 2 Voltage Above Normal or Shorted High

**SPN 65564 FMI 4:** Oxygen Sensor Bank B Sensor 2 Voltage Below Normal or Shorted Low

**SPN 65564 FMI 5:** Oxygen Sensor Bank B Sensor 2 Current Below Normal or Open Circuit

## **SPN 65565 or 65566**

### **SPN Descriptors**

**SPN 65565 FMI 0:** Fuel Trim Bank 1 Data Valid But Above Normal

**SPN 65565 FMI 1:** Fuel Trim Bank 1 Data Valid But Below Normal

**SPN 65566 FMI 0:** Fuel Trim Bank 2 Data Valid But Above Normal

**SPN 65566 FMI 1:** Fuel Trim Bank 2 Data Valid But Below Normal

## **SPN 65567 or 65568**

### **SPN Descriptors**

**SPN 65567 FMI 8:** Oxygen Sensor Bank 1 Sensor 1 Abnormal Frequency or Pulse Width

**SPN 65567 FMI 10:** Oxygen Sensor Bank 1 Sensor 1 Abnormal Rate of Change

**SPN 65568 FMI 8:** Oxygen Sensor Bank 2 Sensor 1 Abnormal Frequency or Pulse Width

**SPN 65568 FMI 10:** Oxygen Sensor Bank 2 Sensor 1 Abnormal Rate of Change

## **SPN 65570**

### **SPN Descriptors**

**SPN 65570 FMI 2:** Cam Phaser W Data Erratic, Intermittent, or Incorrect

**SPN 65570 FMI 4:** Cam Phaser W Voltage Below Normal or Shorted Low

**SPN 65570 FMI 5:** Cam Phaser W Short High or Open

**SPN 65570 FMI 7:** Cam Phaser W Accuracy Mechanical System Not Responding or Out of Adjustment

## **SPN 65590, 65591, 65592, 65593, 65594, 65595, 65596, 65597, 65598, or 65599**

### **SPN Descriptors**

**SPN 65590 FMI 7:** Misfire Mechanical System Not Responding or Out of Adjustment

**SPN 65591 FMI 7:** Misfire Cylinder 1 Mechanical System Not Responding or Out of Adjustment

**SPN 65592 FMI 7:** Misfire Cylinder 2 Mechanical System Not Responding or Out of Adjustment

**SPN 65593 FMI 7:** Misfire Cylinder 3 Mechanical System Not Responding or Out of Adjustment

**SPN 65594 FMI 7:** Misfire Cylinder 4 Mechanical System Not Responding or Out of Adjustment

**SPN 65595 FMI 7:** Misfire Cylinder 5 Mechanical System Not Responding or Out of Adjustment

**SPN 65596 FMI 7:** Misfire Cylinder 6 Mechanical System Not Responding or Out of Adjustment

**SPN 65597 FMI 7:** Misfire Cylinder 7 Mechanical System Not Responding or Out of Adjustment

**SPN 65598 FMI 7:** Misfire Cylinder 8 Mechanical System Not Responding or Out of Adjustment

**SPN 65599 FMI 7:** Misfire Random Mechanical System Not Responding or Out of Adjustment

## **SPN 65601, 65602, or 65610**

### **SPN Descriptors**

**SPN 65601 FMI 2:** Throttle Position (TP) Sensor 2 Data Erratic, Intermittent or Incorrect

**SPN 65602 FMI 2:** Throttle Position (TP) Sensor 1 Data Erratic, Intermittent or Incorrect

**SPN 65610 FMI 2:** Throttle Position (TP) Sensor 1 and 2 Data Erratic, Intermittent or Incorrect

## **SPN 65604, 65605, or 65613**

### **SPN Descriptors**

**SPN 65604 FMI 2:** Pedal Position (PP) Sensor 2 Data Erratic, Intermittent or Incorrect

**SPN 65604 FMI 12:** Pedal Position (PP) Sensor 2 Bad Intelligent Device or Component

**SPN 65605 FMI 2:** Pedal Position (PP) Sensor 1 Data Erratic, Intermittent or Incorrect

**SPN 65605 FMI 12:** Pedal Position (PP) Sensor 1 Bad Intelligent Device or Component

**SPN 65613 FMI 2:** Pedal Position (PP) Sensor 1 and 2 Data Erratic, Intermittent or Incorrect

## **SPN 65615, 65616, or 65618**

### **SPN Descriptors**

**SPN 65615 FMI 7:** Electronic Throttle Control (ETC) Actuation Fault Mechanical System Not Responding or Out of Adjustment

**SPN 65616 FMI 12:** Electronic Throttle Control (ETC) Process Fault Bad Intelligent Device or Component

**SPN 65618 FMI 7:** Electronic Throttle Control (ETC) Return Fault Mechanical System Not Responding or Out of Adjustment

## **SPN 65620 or 65621**

### **SPN Descriptors**

**SPN 65620 FMI 4:** 5 Volt Reference A Circuit Voltage Below Normal or Shorted Low

**SPN 65621 FMI 4:** 5 Volt Reference B Circuit Voltage Below Normal or Shorted Low

## **SPN 65671 or 65672**

### **SPN Descriptors**

**SPN 65671 FMI 0:** Catalytic Converter A Temperature Sensor Data Valid But Above Normal

**SPN 65671 FMI 1:** Catalytic Converter A Temperature Sensor Data Valid But Below Normal

**SPN 65671 FMI 3:** Catalytic Converter A Temperature Sensor Voltage Above Normal or Shorted High

**SPN 65671 FMI 4:** Catalytic Converter A Temperature Sensor Voltage Below Normal or Shorted Low

**SPN 65672 FMI 0:** Catalytic Converter B Temperature Sensor Data Valid But Above Normal

**SPN 65672 FMI 1:** Catalytic Converter B Temperature Sensor Data Valid But Below Normal

**SPN 65672 FMI 3:** Catalytic Converter B Temperature Sensor Voltage Above Normal or Shorted High

**SPN 65672 FMI 4:** Catalytic Converter B Temperature Sensor Voltage Below Normal or Shorted Low

## **SPN 65673 or 65674**

### **SPN Descriptors**

**SPN 65673 FMI 15:** Catalytic Converter A Temperature Sensor Data Valid But Above Normal Range-Least Severe Level

**SPN 65674 FMI 15:** Catalytic Converter B Temperature Sensor Data Valid But Above Normal Range-Least Severe Level

## **SPN 65675 or 65676**

### **SPN Descriptor**

**SPN 65675 FMI 11:** Catalytic Converter A Efficiency Root Cause Unknown

**SPN 65676 FMI 11:** Catalytic Converter B Efficiency Root Cause Unknown

## **SPN 65677 or 65678**

### **SPN Descriptor**

**SPN 65677 FMI 11:** Catalytic Converter A Exotherm Root Cause Unknown

**SPN 65678 FMI 11:** Catalytic Converter B Exotherm Root Cause Unknown

## **SPN 65690**

### **SPN Descriptors**

**SPN 65690 FMI 3:** Variable Governor Control Voltage Above Normal or Shorted High

**SPN 65690 FMI 4:** Variable Governor Control Voltage Below Normal or Shorted Low

## **SPN 65701 or 65702**

### **SPN Descriptors**

**SPN 65701 FMI 31:** General Warning Sensor 1 Not Available

**SPN 65702 FMI 31:** General Warning Sensor 2 Not Available

## **SPN 65710**

### **SPN Descriptors**

**SPN 65710 FMI 31:** Emergency Stop Warning Not Available

## **SPN 65723**

### **SPN Descriptors**

**SPN 65723 FMI 2:** Camshaft Position (CMP) Sensor Circuit Data Erratic, Intermittent or Incorrect

**SPN 65723 FMI 7 :** Camshaft Position (CMP) Sensor Mechanical System Not Responding or Out of Adjustment

**SPN 65723 FMI 8:** Camshaft Position (CMP) Sensor Signal Abnormal Frequency or Pulse Width

## **SPN 66001**

### **SPN Descriptor**

**SPN 66001 FMI 3:** Starter Relay Low Side Driver Voltage Above Normal or Shorted High

**SPN 66001 FMI 5:** Starter Relay Low Side Driver Current Below Normal or Open Circuit

## **SPN 66002**

### **SPN Descriptor**

**SPN 66002 FMI 4:** Starter Relay High Side Driver Voltage Below Normal or Shorted Low

**SPN 66002 FMI 5:** Starter Relay High Side Driver Current Below Normal or Open Circuit

## **SPN 66003**

### **SPN Descriptor**

**SPN 66003 FMI 3:** Malfunction Indicator Lamp (MIL) Driver Voltage Above Normal or Shorted High

**SPN 66003 FMI 5:** Malfunction Indicator Lamp (MIL) Driver Current Below Normal or Open Circuit

## **SPN 66004**

### **SPN Descriptor**

**SPN 66004 FMI 3:** Service Vehicle Soon Lamp (SVS) Voltage Above Normal or Shorted High

**SPN 66004 FMI 5:** Service Vehicle Soon Lamp (SVS) Current Below Normal or Open Circuit

## **SPN 66005**

### **SPN Descriptor**

**SPN 66005 FMI 3:** Governor Status Lamp (GSL) Voltage Above Normal or Shorted High

**SPN 66005 FMI 5:** Governor Status Lamp (GSL) Current Below Normal or Open Circuit

## **SPN 66006**

### **SPN Descriptor**

**SPN 66006 FMI 3:** DTC Lamp 3 Voltage Above Normal or Shorted High

**SPN 66006 FMI 5:** DTC Lamp 3 Current Below Normal or Open Circuit

## **SPN 66007**

### **SPN Descriptor**

**SPN 66007 FMI 3:** Buzzer Driver Short Voltage Above Normal or Shorted High

**SPN 66007 FMI 5:** Buzzer Driver Current Below Normal or Open Circuit

## **SPN 66008**

### **SPN Descriptor**

**SPN 66008 FMI 3:** DTC Lamp 1 Voltage Above Normal or Shorted High

**SPN 66008 FMI 5:** DTC Lamp 1 Current Below Normal or Open Circuit

## **SPN 66009**

### **SPN Descriptor**

**SPN 66009 FMI 3:** DTC Lamp 2 Voltage Above Normal or Shorted High

**SPN 66009 FMI 5:** DTC Lamp 2 Current Below Normal or Open Circuit

## **SPN 66010**

### **SPN Descriptor**

**SPN 66010 FMI 3:** Slow Mode Lamp Voltage Above Normal or Shorted High

**SPN 66010 FMI 5:** Slow Mode Lamp Current Below Normal or Open Circuit

## **SPN 66013 or 66014**

### **SPN Descriptor**

**SPN 66013 FMI 3:** Powertrain Relay Voltage Above Normal or Shorted High

**SPN 66013 FMI 5:** Powertrain Relay Current Below Normal or Open Circuit

**SPN 66014 FMI 4:** Powertrain Relay Contact Voltage Below Normal or Shorted Low

## **SPN 66017**

### **SPN Descriptors**

**SPN 66017 FMI 4:** Fuel Pump Relay 1 Voltage Below Normal or Shorted Low

**SPN 66017 FMI 5:** Fuel Pump Relay 1 Current Below Normal or Open Circuit

## **SPN 66018**

### **SPN Descriptor**

**SPN 66018 FMI 3:** Tachometer Voltage Above Normal or Shorted High

**SPN 66018 FMI 5:** Tachometer Current Below Normal or Open Circuit

## **SPN 66019 or 66020**

### **SPN Descriptors**

**SPN 66019 FMI 3:** Oxygen Sensor Bank A Sensor 1 Heater Voltage Above Normal or Shorted High

**SPN 66019 FMI 5:** Oxygen Sensor Bank A Sensor 1 Heater Current Below Normal or Open Circuit

**SPN 66019 FMI 8:** Oxygen Sensor Bank A Sensor 1 Heater Abnormal Frequency or Pulse Width

**SPN 66020 FMI 3:** Oxygen Sensor Bank B Sensor 1 Heater Voltage Above Normal or Shorted High

**SPN 66020 FMI 5:** Oxygen Sensor Bank B Sensor 1 Heater Current Below Normal or Open Circuit

**SPN 66020 FMI 8:** Oxygen Sensor Bank B Sensor 1 Heater Abnormal Frequency or Pulse Width

## **SPN 66021 or 66022**

### **SPN Descriptors**

**SPN 66021 FMI 3:** Oxygen Sensor Bank A Sensor 2 Heater Voltage Above Normal or Shorted High

**SPN 66021 FMI 5:** Oxygen Sensor Bank A Sensor 2 Heater Current Below Normal or Open Circuit

**SPN 66021 FMI 8:** Oxygen Sensor Bank A Sensor 2 Heater Abnormal Frequency or Pulse Width

**SPN 66022 FMI 3:** Oxygen Sensor Bank B Sensor 2 Heater Voltage Above Normal or Shorted High

**SPN 66022 FMI 5:** Oxygen Sensor Bank B Sensor 2 Heater Current Below Normal or Open Circuit

**SPN 66022 FMI 8:** Oxygen Sensor Bank B Sensor 2 Heater Abnormal Frequency or Pulse Width

## **SPN 66025**

### **SPN Descriptor**

**SPN 66025 FMI 4:** Fuel Pump Relay 2 Voltage Below Normal or Shorted Low

**SPN 66025 FMI 5:** Fuel Pump Relay 2 Current Below Normal or Open Circuit

## **SPN 66030**

### **SPN Descriptor**

**SPN 66030 FMI 3:** Intercooler Relay Voltage Above Normal or Shorted High

**SPN 66030 FMI 5:** Intercooler Relay Voltage Below Normal or Shorted Low



## **SPN 66040-66043**

### **SPN Descriptor**

**SPN 66040 FMI 3:** OEM Output Driver 1 Voltage Above Normal or Shorted High

**SPN 66040 FMI 5:** OEM Output Driver 1 Current Below Normal or Open Circuit

**SPN 66041 FMI 3:** OEM Output Driver 2 Voltage Above Normal or Shorted High

**SPN 66041 FMI 5:** OEM Output Driver 2 Current Below Normal or Open Circuit

**SPN 66042 FMI 3:** OEM Output Driver 3 Voltage Above Normal or Shorted High

**SPN 66042 FMI 5:** OEM Output Driver 3 Current Below Normal or Open Circuit

**SPN 66043 FMI 3:** OEM Output Driver 4 Voltage Above Normal or Shorted High

**SPN 66043 FMI 5:** OEM Output Driver 4 Current Below Normal or Open Circuit

## **Notice to Builders and Service Dealers**

Generation V Engine Coolant Filling Procedure for the following GM engines:

Kodiak GM 4.3L DI

Kodiak GM 5.3L DI

Kodiak GM 6.2L DI

A heat exchanger and engine block coolant fill and air lock removal tool is necessary and must be used to purge the air lock from the new Generation V GM engines during filling or the refilling of coolant.

### **Procedure for filling or refilling the closed coolant system:**

To fill or re-fill the engine and heat exchanger with coolant, you must be sure the coolant system is leak free at all hose and fitting locations. The filling with coolant and purging of air from the engine is done with vacuum rather than by pressure. If there is a leak present in the plumbing of the closed coolant system, the applied vacuum will not pull the coolant into the engine. Use the detailed instructions that came with the fill kit for the filling and purging of the coolant system.

### **Failure to fill the engine properly with a coolant air evacuation kit may void all warranty.**

Below is a list of easy to use air evacuation purge kits that can be purchased at your local auto parts store. There are also many of these kits listed on the internet.

It will be up to the builder/dealer to choose the kit of choice for this procedure.

#### **Mityvac**

Model #4525

Model #4535

#### **U View**

Airlift coolant refill kit #UVW550000

The above mentioned kits have easy to follow instructions included. Both Manufacturers offer web and phone support if needed.

# UNITED STATES

## Alaska

### **Anchorage**

Silver Streak 907-344-6151  
Professional Marine 907-562-2471

### **Cordova**

Harbor Hydraulics 907-424-3472

### **North Pole**

Arctic Marine 907-488-5242

### **Wasilla**

Valley Diesel and Marine 907-373-2613  
Wasilla Arctic Cat 907-376-5845

### **Fairbanks**

Boat shop Inc.907-479-2518

## Arizona

### **Bullhead**

Holiday RV & Marine 928-763-2322

## California

### **Atascadero**

Jet Boat Performance 805-466-4719

### **Bakersfield**

Custom Boat Works 661-387-1523

### **Chico**

All About Boats 530-892-0100

### **Davis**

Delta Marine 530-750-5000

### **Eureka**

Redwood Marine 707-443-7029

### **Paradise**

Wilson Paradise Marine 530-872-2617

### **Redding**

Redding Performance Marine 530-246-8889  
Dave's Mobile Marine 530-515-5152  
Harrison Marine 530-243-0175  
Outboard Center 530-241-5430  
Shasta Inboards 530-246-2343

### **Shasta Lake**

Redding Boat Works 530-275-1495

### **Yuba City**

Jet stream Concepts 530-674-0655  
Johnson Bait and Marine 530-674-1912

## Idaho

### **Boise**

Whitewater Marine 208-377-5110

### **Lewiston**

Riverview Marina/ Custom Weld 800-859-0356

## Michigan

### **Marne**

Camp & Cruise 616-677-1274

## Montana

### **Billings**

Jim and Tracy's Alignment 406-259-8496

### **Butte**

Rocky Mt. RV 406-494-2555

### **Helena**

One Way Marine 406-443-7373

## Oregon

### **Bend**

All Season RV & Marine 541-382-5009  
Central Lake Marine 541-385-7791

### **Central Point**

Rick's Boat Repair 541-664-8022

### **Coos Bay**

Y Marina 541-888-5501

### **Corvallis**

Southside Marine 541-753-4241

### **Eugene**

Clemens Marine 541-688-5483  
Maxxum Marine 541-686-3577  
Mel's Marine Service 541-689-0136

### **Hermiston**

High Desert Marine 541-567-8419

### **Gold Beach**

Precision Performance 541-247-2232

### **Klamath Falls**

American Marine 541-884-6858

## Oregon (Continued)

### **Medford**

River Marine Sales and Service 503-779-6161  
Performance Marine 541-944-7060

### **Mulino**

Squeeky's Marine 503-632-3257

**Oregon City**

Oregon City Marine 503-656-4276

**Portland**

Advanced Marine 503-762-2294

Pacific Power Boats 503-288-9350

Sigler Marine 503-252-5431

**Salem**

Dennis' Boat Shop 503-363-2898

**South Beach**

Newport Marine and RV 541-867-3704

**Tigard**

Steven's Marine 503-620-7023

**Washington****Chinook**

Chinook Marine Repair 360-777-8361

**Longview**

Columbia Marine Services 360-430-1010

**Seattle**

Coastal Marine Engine 206-784-3703

**Tacoma**

Harbor Services 888-627-3066

**Washougal**

Riverside Marina 360-835-8553

**Woodinville**

Doug's Boats 800-215-3684

3 Rivers Marine 425-415-1575

**British Columbia****Abbotsford BC**

River City Marine 604-852 8599

**Chilliwack, BC**

Cascade Supply & Marine 800-663-2269

Ventures River Boats 604-824-1498

**Kamloops BC**

River City Marine 250-828 0858

**Prince George, BC**

Cycle North 250-964-9091

**Richmond, BC**

California Marine 604-278-1880

**Alberta****Leduc AB**

Go RV and Marine 888-349-4507

**Red Deer, AB**

Outlaw Marine 403-347-4565

**St Albert AB**

River City Marine 780-590-7272

**Sylvan Lake, AB**

Bratt Jet Inc. 403-887-8895

Eagle Marine LTD 403-887-2430

**Northwest Territories**

Yellowknife Motors 867-766-5000

**Russia****Krasnoyarsk**

Ka-Hem Boats 7-902-940-12-07



10800 SW Herman Rd.  
Tualatin, OR 97062  
Ph: 503-692-5012  
Fx: 503-692-1098  
[www.kemequipment.com](http://www.kemequipment.com)

## OEM NOTICE TO ALL BOAT BUILDERS, RIGGERS and END USERS

KEM EQUIPMENT IS ISSUING THIS NOTICE EFFECTIVE  
IMMEDIATELY 6/24/14

### TO MEET EPA and CARB REQUIREMENTS:

**ALL KODIAK CERTIFIED MARINE ENGINES SOLD AFTER JANUARY 2007  
MUST HAVE A CHECK ENGINE AND CHECK GAUGES LAMP.**

**A CAN CONTROL GAUGE MAY BE SUBSTITUTED IF THIS GAUGE WILL  
SET A FAULT LAMP IN THE EVENT OF AN EMISSIONS RELATED, OR  
VITAL ENGINE COMPONENT FAILURE.**

**FAILURE TO INSTALL THESE MALFUNCTION INDICATOR LIGHTS WILL  
VOID ALL ENGINE WARRANTIES.**

**The wiring schematics included in the Kodiak Marine Operators Manuals  
show the correct wiring at the ECM and the Customer Interface Connector.**

**TAG PART # KM10539 IS INSTALLED AT THE STARTER ON THE BATTERY  
CABLE TERMINAL AS A CAUTION; NOTICE TO INSTALLER.**

**THANK YOU FOR YOUR IMMEDIATE ATTENTION TO THIS NOTICE.**

**KEM WARRANTY AND SERVICE DEPARTMENTS.**