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DANGER

Danger: In order to reduce the chance of death, personal injury and/or property damage, carefully observe the instructions that follow:

The service manuals of MARINE POWER are intended for use by professional, qualified technicians. Attempting repairs or service without the appropriate training, tools, and equipment could cause death or injury to you or others. This could also damage the vehicle, or cause the vehicle to operate improperly.

Proper vehicle service and repair are important to the safety of the service technician and to the safe, reliable operation of all motor vehicles. If you need to replace a part, use the same part number or an equivalent part. Do not use a replacement part of lesser quality.

The service procedures we recommend and describe in this service manual are effective methods of performing service and repair. Some of the procedures require the use of tools that are designed for specific purposes.

Accordingly, any person who intends to use a replacement part, a service procedure, or a tool that is not recommended by MARINE POWER, must first establish that there is no jeopardy to personal safety or the safe operation of the vehicle.

This manual contains various “Dangers”, “Warnings” and “Cautions” that you must observe carefully in order to reduce the risk of personal injury during service or repair. Improper service or repair may damage the vehicle or render the vehicle unsafe. These “Dangers”, “Warnings” and “Cautions” are not exhaustive. General Motors can not possibly warn of all the potentially hazardous consequences of your failure to follow these instructions.

This manual covers service procedures to vehicles that are equipped with a Supplemental Inflatable Restraint. Refer to the “Warnings” in Dangers, Warnings and Cautions in Supplemental Inflatable Restraint. Refer to Supplemental Inflatable Restraint component and wiring location views in Supplemental Inflatable Restraint before performing a service on or around Supplemental Inflatable Restraint components or wiring. Failure to follow these “Dangers”, “Warnings” and “Cautions” could cause air bag deployment, personal injury, or otherwise unnecessary Supplemental Inflatable Restraint repairs.

In order to help avoid accidental air bag deployment and personal injury, whenever you service a vehicle that requires repair of the Supplemental Inflatable Restraint and another vehicle system, we recommend that you first repair the Supplemental Inflatable Restraint, then go on to the other system.

2011 Marine Electronic Fuel Injection (EFI) Service Manual

This manual provides information on the diagnosis, the service procedures, the adjustments, and the specifications for the marine engines.

Because the marine engines cover a broad range of uses, some of the instructions, figures, or references contained within this manual may not pertain to every customer or engine application. This information is furnished to ensure completeness and is to be followed only where appropriate.

The technicians who understand the material in this manual better serve the vehicle owners.

When this manual refers to a brand name, a part number, or a specific tool, you may use an equivalent product in place of the recommended item. All information, illustrations, and specifications in this manual are based on the latest product information available at the time of publication approval. ~~AT EUP OAJUY OUA reserves the right to make changes at any time without notice.~~

Section 0

Dangers, Warnings, and Cautions

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Dangers, Warnings, and Cautions

Definition of Danger, Warning, Caution, and Note

The diagnosis and repair procedures in a GM Service Manual contain both general and specific Dangers, Warnings, Cautions, Notes or Importants. GM is dedicated to the presentation of service information that helps the technician to diagnose and repair the systems necessary for the proper operation of the vehicle, however, certain procedures may present a hazard to the technician if they are not followed in the recommended manner. Dangers, Warnings, Cautions and Notes or Importants are elements designed to prevent these hazards, however, not all hazards can be foreseen. This information is placed at strategic locations within the service manual. This information is designed to prevent the following from occurring:

- Serious bodily injury or death to the technician
- Damage to the vehicle
- Unnecessary vehicle repairs
- Unnecessary component replacement
- Improper repair or replacement of vehicle components.
- Any warning or caution that appears in this service category is referenced from the individual service categories.

DANGER Define

When encountering a DANGER, you will be asked to take a necessary action or not to take a prohibited action. If a DANGER is not heeded, the following consequences may occur:

- Serious bodily injury or death to the technician
- Serious bodily injury or death to other technicians in the workplace area

WARNING Define

When encountering a WARNING, you will be asked to take a necessary action or not to take a prohibited action. If a WARNING is not heeded, the following consequences may occur:

- Serious bodily injury to the technician
- Serious bodily injury to other technicians in the workplace area
- Serious bodily injury to the driver and/or passenger(s) of the vehicle, if the vehicle has been improperly repaired

CAUTION Define

CAUTIONS call special attention to a necessary action or to a prohibited action. If a CAUTION is not heeded, the following consequences may occur:

- Damage to the vehicle
- Unnecessary vehicle repairs
- Unnecessary component replacement
- Improper operation or performance of the system or component under repair

- Damage to any systems or components which are dependent upon the proper operation of the system or component under repair
- Improper operation or performance of any systems or components which are dependent upon the proper operation or performance of the system or component under repair
- Damage to fasteners, basic tools, or special tools
- The leakage of coolant, lubricant, or other vital fluids

NOTE or IMPORTANT Define

NOTE and IMPORTANT statements emphasize a necessary characteristic of a diagnostic or repair procedure. NOTE or IMPORTANT statements are designed to do the following:

- Clarify a procedure
- Present additional information for accomplishing a procedure
- Give insight into the reason or reasons for performing a procedure in the manner recommended
- Present information that will help to accomplish a procedure in a more effective manner
- Present information that gives the technician the benefit of past experience in accomplishing a procedure with greater ease

Actions to Take When Working with Fuel Warning

Warning: Fuel Vapors can collect while servicing fuel system components in enclosed areas such as the vessels cabin or engine compartment. To reduce the risk of fire and increased exposure to vapors:

- **Use forced air ventilation such as a fan set outside of the vessels engine compartment.**
- **Plug or cap any fuel system openings in order to reduce fuel vapor formation.**
- **Clean up any spilled fuel immediately.**
- **Avoid sparks and any source of ignition.**
- **Use signs to alert others in the work area that fuel system work is in process.**

Batteries Produce Explosive Gases Warning

Warning: Batteries produce explosive gases. Batteries contain corrosive acid. Batteries supply levels of electrical current high enough to cause burns. Therefore, in order to reduce the risk of personal injury while working near a battery, observe the following guidelines:

- **Always shield your eyes.**
- **Avoid leaning over the battery whenever possible.**

- Do not expose the battery to open flames or sparks.
- Do not allow battery acid to contact the eyes or the skin.
 - Flush any contacted areas with water immediately and thoroughly.
 - Get medical help.

Battery Disconnect Warning

Warning: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle.

Camshaft Position Actuator Removal and Installation Warning

Warning: Do not push or pull on the reluctor wheel of the camshaft position (CMP) actuator during removal or installation. The reluctor wheel is retained to the front of the CMP actuator by 3 roll pins. Pushing or pulling on the wheel may dislodge the wheel from the front of the actuator. The actuator return spring is under tension and may rotate the dislodged reluctor wheel, causing personal injury.

Exhaust Service Warning

Warning: In order to avoid being burned, do not service the exhaust system while it is still hot. Service the system when it is cool.

Fuel System Pressure Warning

Warning: Do not open the fuel system while the engine is running. Allow the fuel system pressure to drop before opening the system. The fuel system is under very high pressure. Failure to comply could result in personal injury.

Gasoline/Gasoline Vapors Warning

Warning: Gasoline or gasoline vapors are highly flammable. A fire could occur if an ignition source is present. Never drain or store gasoline or diesel fuel in an open container, due to the possibility of fire or explosion. Have a dry chemical

(Class B) fire extinguisher nearby.

Fire Extinguisher Warning

Warning: Place a dry chemical (Class B) fire extinguisher nearby before performing any service procedures. Failure to follow these precautions may result in personal injury.

Relieving Fuel Pressure Warning

Warning: Remove the fuel tank cap and relieve the fuel system pressure before servicing the fuel system in order to reduce the risk of personal injury. After you relieve the fuel system pressure, a small amount of fuel may be released when servicing the fuel lines, the fuel injection pump, or the connections. In order to reduce the risk of personal injury, cover the fuel system components with a shop towel before disconnection. This will catch any fuel that may leak out. Place the towel in an approved container when the disconnection is complete.

Shop Towel Fuel Leak Warning

Warning: Wrap a shop towel around the fuel pressure connection in order to reduce the risk of fire and personal injury. The towel will absorb any fuel leakage that occurs during the connection.

of the fuel pressure gauge. Place the towel in an approved container when the connection of the fuel pressure gauge is complete.

Clean Spark Plug Recess Caution

Notice: Clean the spark plug recess area before removing the spark plug. Failure to do so could result in engine damage because of dirt or foreign material entering the cylinder head, or by the contamination of the cylinder head threads. The contaminated threads may prevent the proper seating of the new plug. Use a thread chaser to clean the threads of any contamination.

Component Fastener Tightening Caution

Caution: Replacement components must be the correct part number for the application. Components requiring the use of the thread locking compound, lubricants, corrosion inhibitors, or sealants are identified in the service procedure. Some replacement components may come with these coatings already applied. Do not use these coatings on components unless specified. These coatings can affect the final torque, which may affect the operation of the component. Use the correct torque specification when installing components in order to avoid damage.

Cover and Plug Openings Caution

Caution: Cap the fittings and plug the holes when servicing the fuel system in order to prevent dirt and other contaminants from entering the open pipes and passages.

Electrical Wiring Routing Caution

Caution: Note the correct routing of the electrical wiring. Failure to reinstall the wiring properly could result in damage to the wiring.

Excessive Force and Oxygen Sensor Caution

Caution: The oxygen sensor may be difficult to remove when the engine temperature is below 48°C (120°F). Excessive force may damage threads in the exhaust manifold or the exhaust pipe.

Fastener Caution

Caution: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Do not use paints, lubricants, or corrosion inhibitors on fasteners, or fastener joint surfaces, unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems. When using fasteners that are threaded

directly into plastic, use extreme care not to strip the mating plastic part(s). Use hand tools only, and do not use any kind of impact or power tools. Fastener should be hand tightened, fully seated, and not stripped.

Fuel Injector Balance Test Caution

Caution: Do Not repeat any portion of this test before running the engine in order to prevent the engine from flooding.

Fuel Pressure Caution

Caution: Do not allow the fuel pressure to exceed the specified value because damage to the fuel pressure regulator or the fuel pressure gauge may result.

Fuel Rail Caution

Caution:

- Use care when servicing the fuel system components, especially the fuel injector electrical connectors, the fuel injector tips, and the injector O-rings. Plug the inlet and the outlet ports of the fuel rail in order to prevent contamination.
- Do not use compressed air to clean the fuel rail assembly as this may damage the fuel rail components.
- Do not immerse the fuel rail assembly in a solvent bath in order to prevent damage to the fuel rail assembly.

Handling Electrostatic Discharge Sensitive Parts Caution

Caution: Electrostatic discharge (ESD) can damage many solid-state electrical components. ESD susceptible components may or may not be labeled with the ESD symbol. Handle all electrical components carefully. Use the following precautions in order to avoid ESD damage:

- Touch a metal ground point in order to remove your body's static charge before servicing any electronic component; especially after sliding across the vehicle seat.
- Do not touch exposed terminals. Terminals may connect to circuits susceptible the ESD damage.
- Do not allow tools to contact exposed terminals when servicing connectors.
- Do not remove components from their protective packaging until required to do so.
- Avoid the following actions unless required by the diagnostic procedure:
 - Jumpering or grounding of the components or connectors.
 - Connecting test equipment probes to components or connectors. Connect the ground lead first when using test probes.
- Ground the protective packaging of any component before opening. Do not rest solid-state components on metal workbenches, or on top of TVs, radios, or other electrical devices.