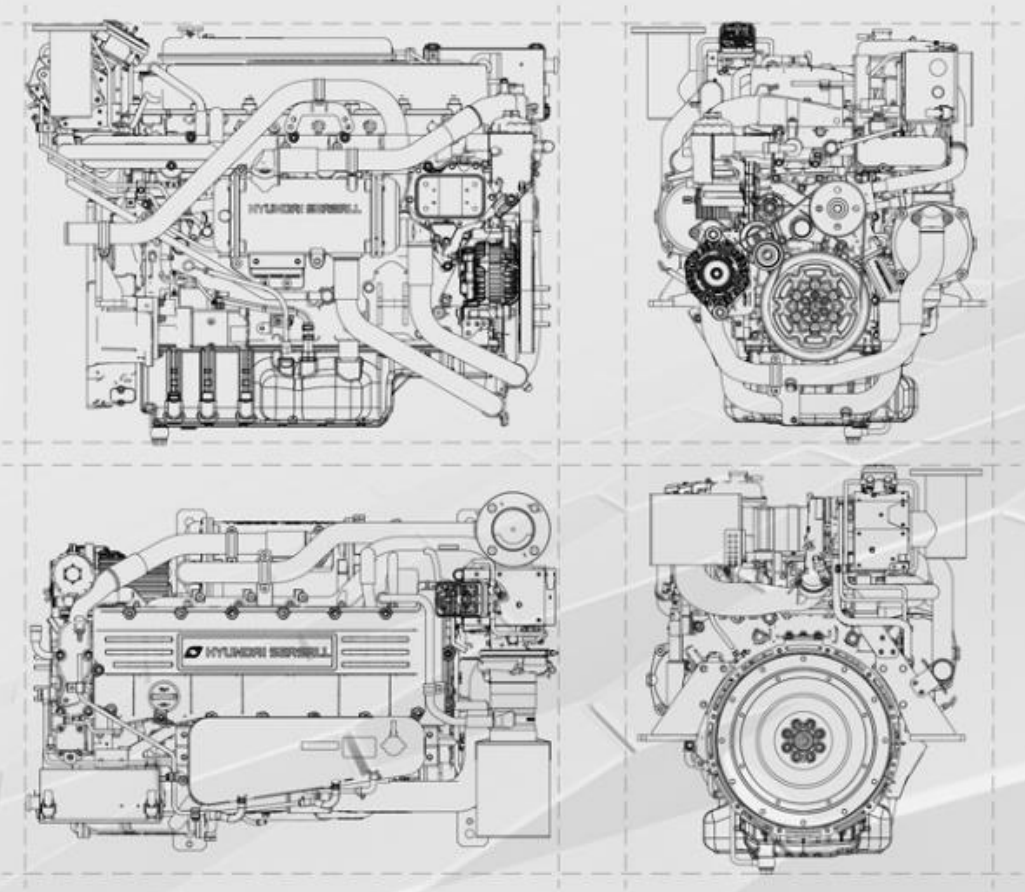
02nd EDITION

Installation & Operation Manual

G7 Series Engines



ABSOLUTE MARINE POWER

HYUNDAI SEASALL

Issued by [2021.10]

TABLE OF CONTENTS

TABLE OF CONTENTS

ABOUT THIS MANUAL

This engine installation and operation manual is provided as guidance for the installation of Hyundai SeasAll engine in a boat, and to describe engine operation. Its purpose is to provide technical information to aid in performing an effective engine installation so as to achieve both maximum performance and service life.

Hyundai SeasAll is committed to making clear and accurate information available for those who maintain, own and repair the H380 Series engines. Hyundai SeasAll values your input regarding revisions and additional information for our manuals.

- The manufacturer is not liable for any damages or losses caused by faulty installation, wrong handling of the equipment and/or deficient maintenance.
- The operator is responsible for the correct and safe operation of the engine and safety of its occupants and general public.
- It is strongly recommended that each operator read and understand this manual before installing and operating the engine.
- This manual as well as safety labels posted on the engine use the following safety alerts to draw your attention to special safety instructions that should be followed.
- This manual able to changed without notice

WARNING

DEVIATION FROM INSTALLATION INSTRUCTIONS AND OPERATION GUIDELINES MAY LEAD TO PERSONAL INJURY OR DEATH TO OPERATORS AND NEARBY PERSONNEL.

CAUTION

DEVIATION FROM INSTALLATION INSTRUCTIONS AND OPERATION GUIDELINES MAY LEAD TO IMPROPER OPERATION, DAMAGE OR DESTRUCTION OF THE ENGINE.

SAFETY PRECAUTIONS

- Read and understand this operator's manual as well as other information supplied by Hyundai SeasAll for safer use of these products. Be sure to check your engine regularly.

- Do not use the engine for a purpose other than what is intended by Hyundai SeasAll. Do not modify the performance of the supplied engine without the express permission of Hyundai SeasAll. This can be dangerous, can shorten the life of your engine and can invalidate your warranty.

- Original and genuine parts supplied from Hyundai SeasAll must be used for inspections and maintenance. Hyundai SeasAll does not guarantee any damage caused by the use of imitation parts.

- Engine inspection and maintenance should be carried out by properly trained and factory approved service engineers.

- The engine should be inspected if the electronic engine control unit shuts down the engine.

- If you don't use the studs for PTO pulley, remove them for safety.

HOT SURFACES AND FLUIDS

- There is always a risk of burns when working with a hot engine. Be aware of hot parts like the turbocharger system, the exhaust system, hot coolant hoses, etc. Wait until the engine is fully cool to do inspection and maintenance.

REFUELING

- Refuel only after the engine completely stops.

- Use only the recommended fuel. The wrong grade of fuel can cause operating problems, can cause the engine to stop and can cause engine damage.

- Pay special attention to safe practices when refueling.

PAINT DAMAGE

- Damage of the engine or parts paint during maintenance and inspection can cause corrosion. Any damage must be repainted after inspection and maintenance.

WELDING ON ENGINE

- Welding directly on the engine block can cause damage to the engine control systems. The ECU and related electronic devices must be disconnected and removed if unavoidable welding is needed.

ENGINE BREAK-IN

INITIAL BREAK-IN PROCEDURE

- The first 20 hours of operation is the engine break-in period. During this period, it is important that the engine is operated as outlined below.
- DO NOT operate engine at idle rpm for extended periods of time during the first 10 hours.
- DO NOT operate at any one constant speed for extended periods of time.
- DO NOT exceed 75% of full throttle during the first 10 hours except during the engine initial Break-In Procedure. During the next 10 hours, occasional operating at full throttle (5 minutes at a time maximum) is permissible.
- AVOID full throttle accelerations from neutral position.

DO NOT operate at all full throttle until engine reaches normal operating temperature. (40℃)

- FREQUENTLY CHECK engine oil level and add oil if necessary.

USING AND ASSEMBLING GENUINE PARTS

- Installation must be done and repairs must be performed using the special tools and procedures specified by Hyundai SeasAll.
- The limited warranty does not apply to any damage to our products caused by the installation or use of parts and accessories which are not manufactured or sold by us.
- Check for compliance with torque tightening requirements. (Contact your Hyundai SeasAll dealer or refer to the manual)
- Any gaskets, O-rings, seals or other sealing parts should be replaced with new parts during repairs.

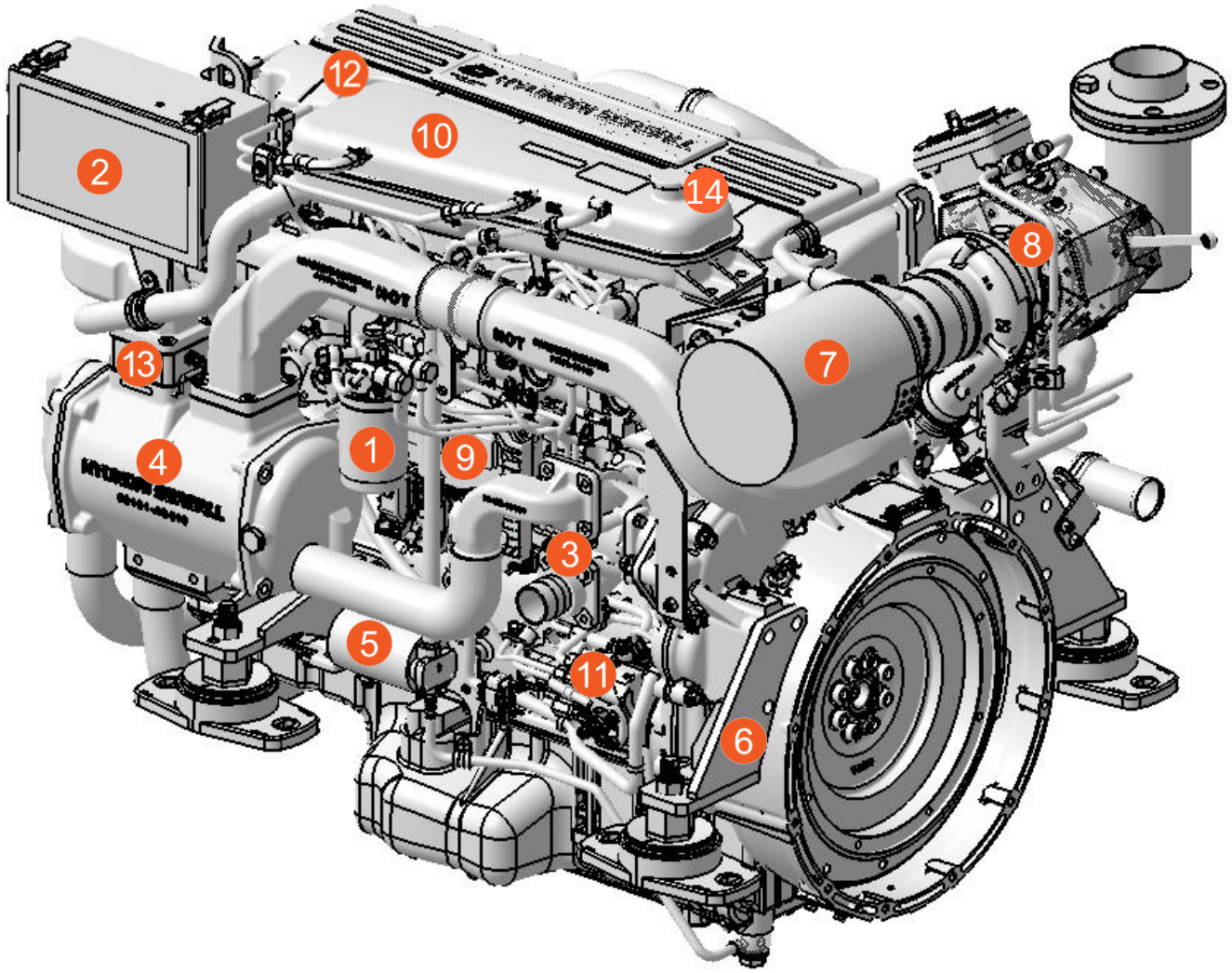
WARNING

DO NOT DRIVE IN SPACE WHERE THERE IS NO AIR CIRCULATION. EMISSION GAS IS HARMFUL.

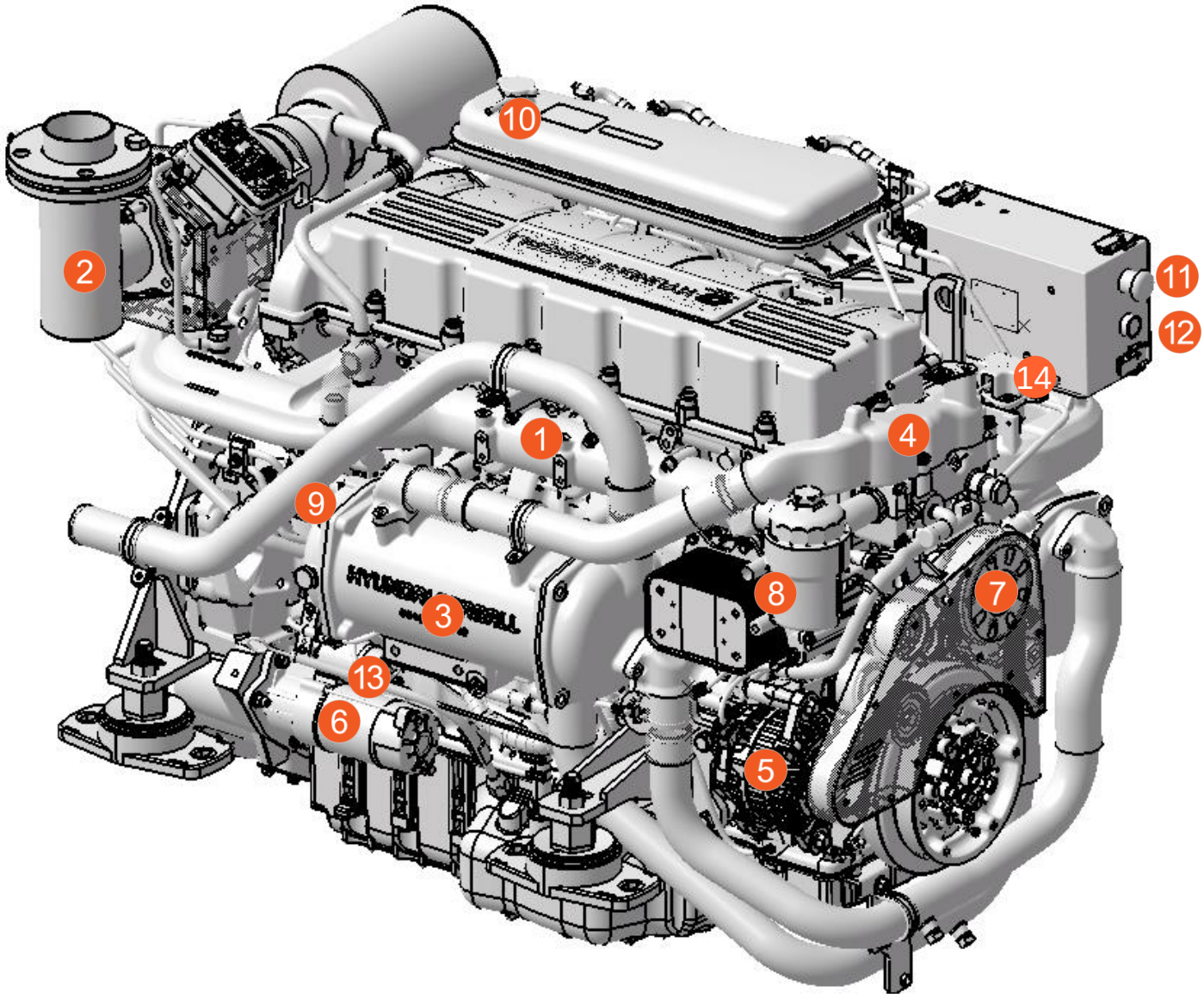
APPROXIMATE STANDARD CONVERSIONS							
	SYMBOL	MULTIPLY BY	SYMBOL		SYMBOL	MULTIPLY BY	SYMBOL
LENGTH	mm	0.039	inch	LENGTH	inch	25.4	mm
	cm	0.4	inch		inch	2.54	cm
	m	3.28	ft		ft	0.3048	m
AREA	mm^2	0.0016	in^2	AREA	in^2	645.2	mm^2
	m^2	10.764	ft^2		ft^2	0.093	m^2
VOLUME	cm^3	0.061	in^3	VOLUME	in^3	16.388	cm^3
	mL	0.06	in^3		in^3	16	mL
	Ldm^3	61.023	in^3		in^3	0.016	Ldm^3
	Ldm^3	0.22	imp.gallon		imp.gallon	4.545	Ldm^3
	Ldm^3	0.264	U.S.gallon		U.S.gallon	3.785	Ldm^3
	m^3	0.76	yd^3		yd^3	1.3	m^3
	m^3	35.315	ft^3		ft^3	0.028	m^3
FORCE	kgf	2.204	lbf	FORCE	lbf	0.453	kgf
	N	0.224	lbf		lbf	4.448	N
TEMP.	°F=9/5x°C+32			TEMP.	°C=5/9x(°F-32)		
PRESSURE	Bar	14.5	psi	PRESSURE	psi	0.068	Bar
	MPa	145	psi		psi	0.0068	MPa
	Pa	0.102	mmWc		mmWc	9.807	Pa
	Pa	0.004	inWc		inWc	249.098	Pa
	KPa	4	inWc		inWc	0.249	KPa
	mWg	39.37	inWc		inWc	0.025	mWg
TORQUE	Nm	0.738	lbf ft	TORQUE	lbf ft	1.356	Nm
WEIGHT	kg	2.205	lb	WEIGHT	lb	0.454	kg
	kg	35.273	oz		oz	0.028	kg
WORK	kJ/kWh	0.43	BTU/lb	WORK	BTU/lb	2.326	kJ/kWh
	MJ/kg	430	BTU/lb		BTU/lb	0.0023	MJ/kg
	kJ/kg	0.24	Kcal/kg		Kcal/kg	4.184	kJ/kg
ENERGY	kJ/kg	0.697	BTU/hph	ENERGY	BTU/hph	1.435	kJ/kg
FUEL CONSUMP.	g/kWh	0.736	g/hph	FUEL CONSUMP.	g/hph	1.36	g/kWh
	g/kWh	0.0016	lb/hph		lb/hph	616.78	g/kWh
FLOW RATE (GAS)	m^3/h	0.588	ft^3/min	FLOW RATE (GAS)	ft^3/min	1.699	m^3/h
FLOW RATE (LIQUID)	m^3/h	4.403	US gal/min	FLOW RATE (LIQUID)	US gal/min	0.2271	m^3/h
SPEED	m/s	3.281	ft/s	SPEED	ft/s	0.3048	m/s
	kph	0.539	knots		knots	1.852	kph
	mph	0.869	knots		knots	1.1508	mph
	kph	0.62	mph		mph	1.61	kph

CHAPTER 1
ENGINE OVERVIEW

ENGINE COMPONENTS



1	FUEL FILTER	8	TURBOCHARGER
2	JUNCTION BOX (Switch Attached)	9	ECU
3	SEAWATER PUMP (Inlet)	10	EXPANSION TANK
4	INTERCOOLER	11	FUEL PUMP
5	OIL EXTRACTION PUMP	12	OIL FILLER CAP
6	ENGINE MOUNTING BRACKETS	13	AIR HEATER
7	AIR FILTER	14	COOLANT FILLER CAP

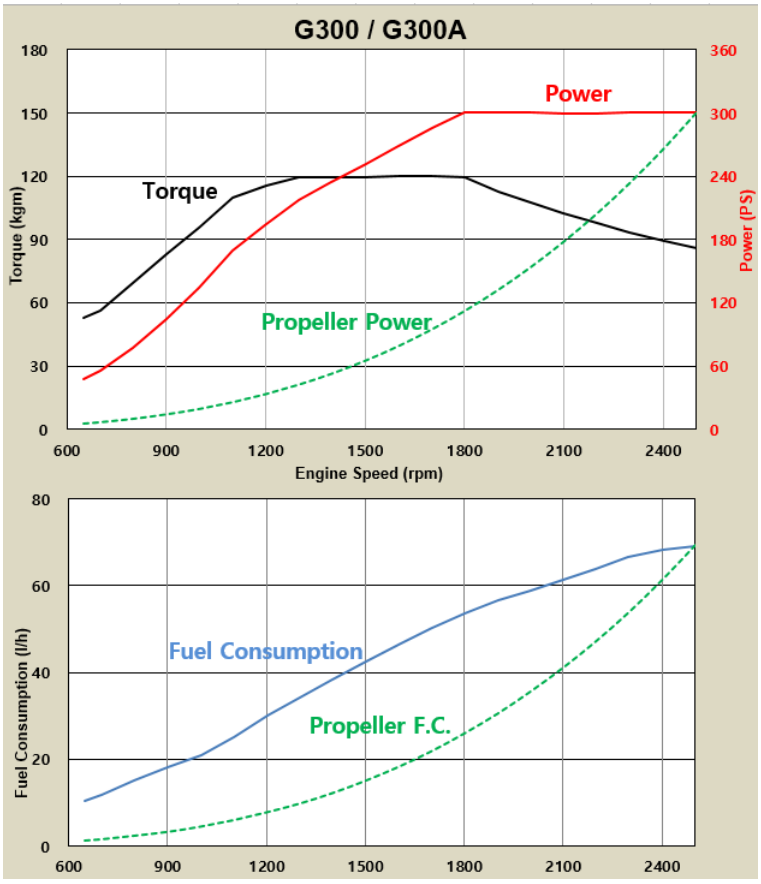


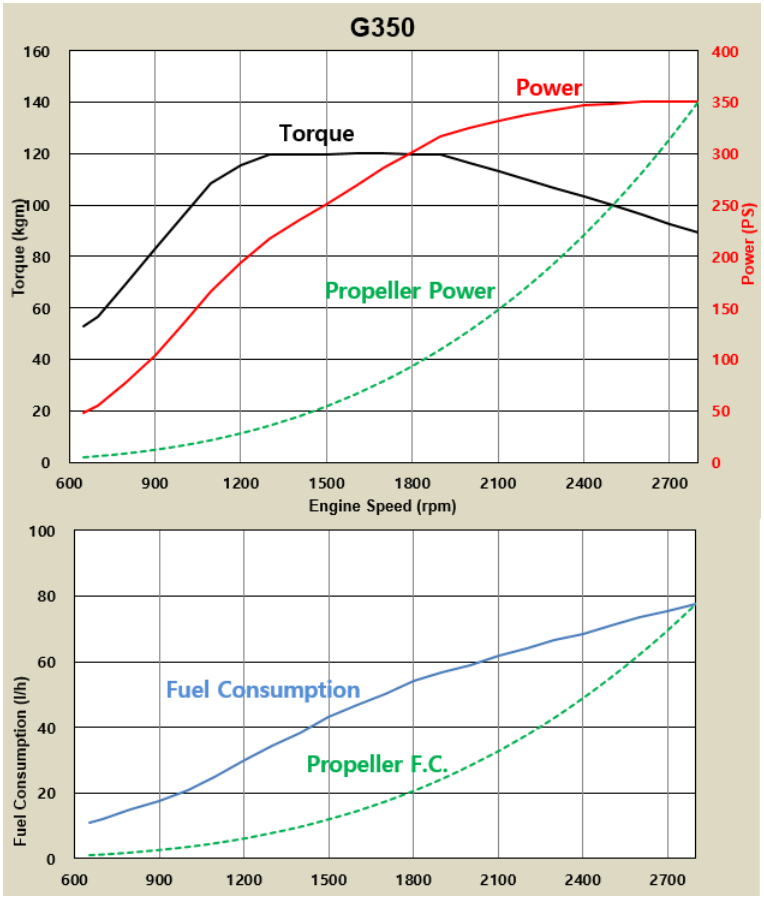
1	EXHAUST MANIFOLD	8	OIL FILTER & OIL COOLER
2	EXHAUST ELBOW	9	OIL SEPARATOR
3	HEAT EXCHANGER	10	COOLANT FILLER CAP
4	THERMOSTAT HOUSING	11	EMERGENCY SWITCH
5	ALTERNATER	12	OIL EXTRACTION SWITCH
6	STARTER MOTOR	13	OIL LEVEL GAUGE
7	WATER PUMP	14	AIR HEATER RELAY

TECHNICAL DATA

Engine type	G300	G300A	G350
	4-stroke, 4-valve per cylinder		
	After cooled, direct injection, water cooling		
Output PS (kW)	300 (221)		350 (257)
rpm at full load	2,500		2,800
Cylinders	I-6		
Ignition sequence	1-5-3-6-2-4		
Displacement [cm^3]	6,798		
Bore [mm]	107		
Stroke [mm]	126		
Compression ratio	17.5 : 1		
Max. torque [kgm] @ speed [rpm]	120.3		
	1,600		
Injection system	Common rail direct injection (Solenoid injector)		
Diesel fuel	at least CN 51 as per DIN EN 590		
Intake air pressure (abs. bar) @ speed [rpm]	2.6		2.5
	2,500		2,800
Coolant quantity (liter)	25.7		
Coolant cap opening pressure (bar)	0.7		
Engine oil (liter)	23.5		
Engine oil pressure (bar)	2.1(650rpm), 5.3(2500rpm), 5.4(2800rpm)		
Exhaust gas pressure (kPa)	10.0 (2500rpm), 10.5 (2800rpm)		
Alternator [A]	90		
Engine diagnosis	yes		
Dry Weight / Gross Weight (kg)	686 /		
Battery capacity (AH)	24V, 100AH		
Idle rpm warmed up (rev/min)	650		
Thermostat opening temp. (℃)	82 (starting to open), 95 (fully open)		
Permissible eng. oil temp (℃)	135		
Permissible eng. coolant temp (℃)	105		
Fuel Efficiency(L/h)	69.2		77.6

PERFORMANCE CURVES

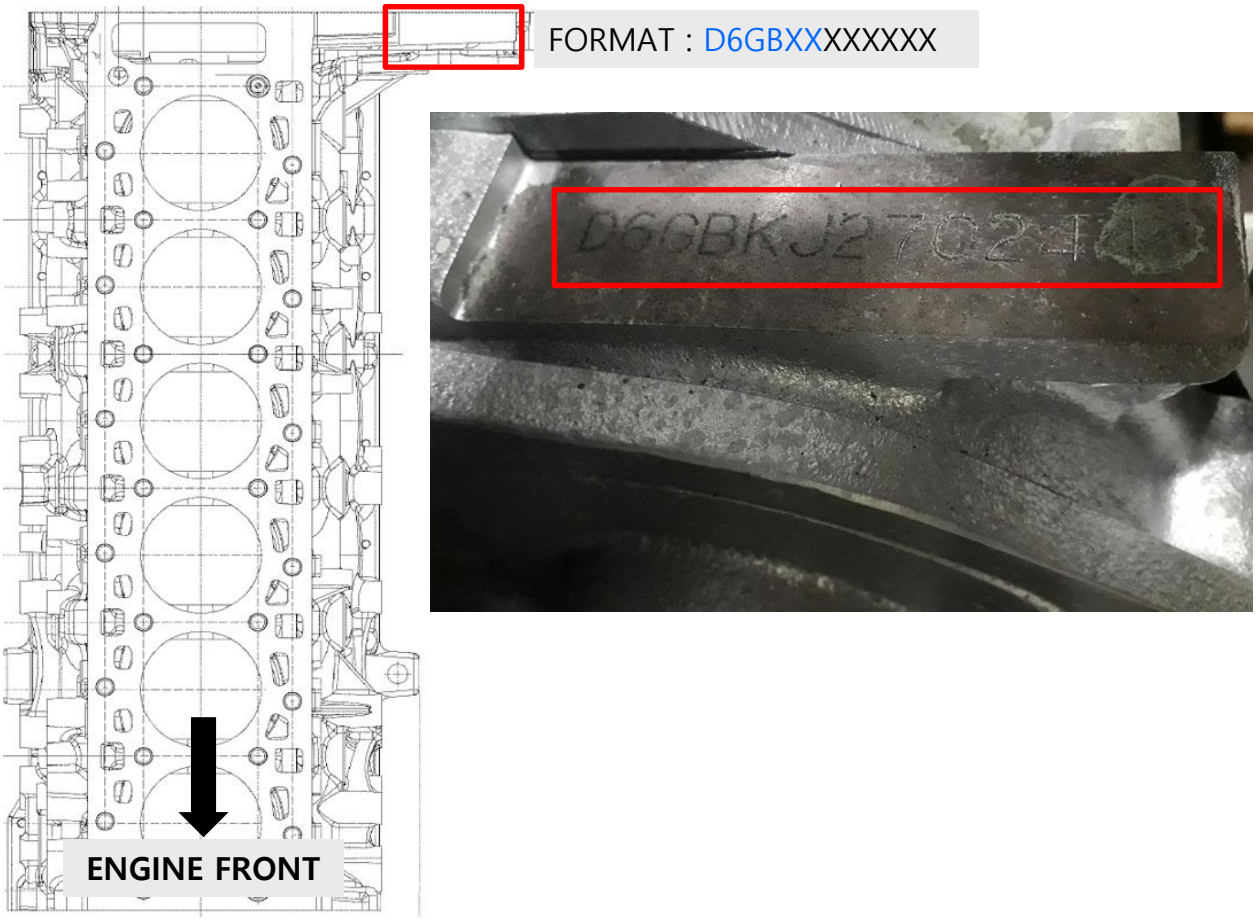




ENGINE IDENTIFICATION

Engine identification is affixed to the engine block and the JUNCTION box (See figure).

- **SERIAL NUMBER ON THE ENGINE BLOCK**

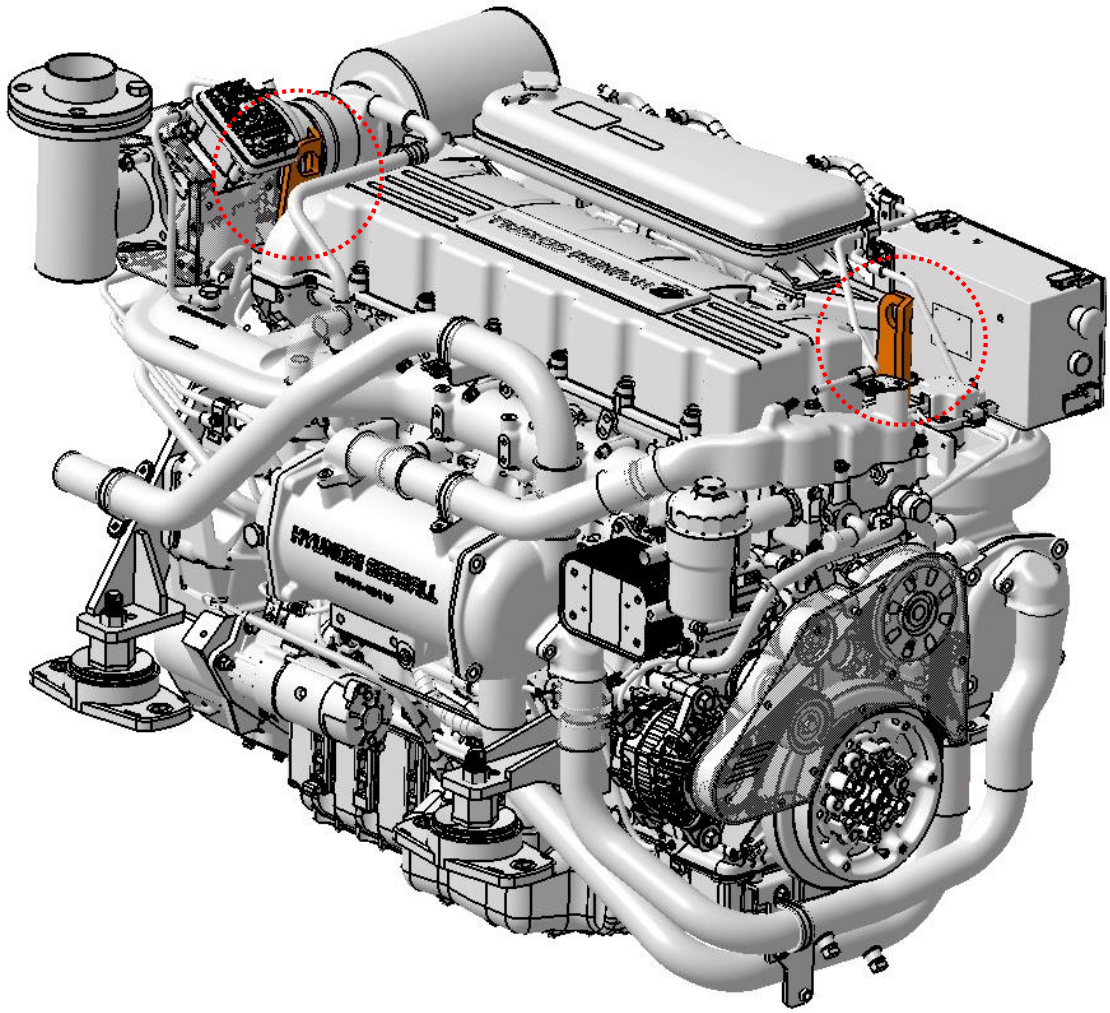


- **ENGINE NAME PLATE**

HYUNDAI SEASALL	
Hyundai SeasAll co., Ltd.	
Engine Family	D6GB
Engine Type	G300 / G300A
Engine Serial No.	XXXXXXXX
Rated Power @ Speed	300 PS @ 2500 rpm
No. Of Cylinder	6
Bore(mm) X Stroke (mm)	107 X 126
Manufacture Date.	MM/YYYY

HYUNDAI SEASALL	
Hyundai SeasAll co., Ltd.	
Engine Family	D6GB
Engine Type	G350
Engine Serial No.	XXXXXXXX
Rated Power @ Speed	350 PS @ 2800 rpm
No. Of Cylinder	6
Bore(mm) X Stroke (mm)	107 X 126
Manufacture Date.	MM/YYYY

ENGINE HANGER



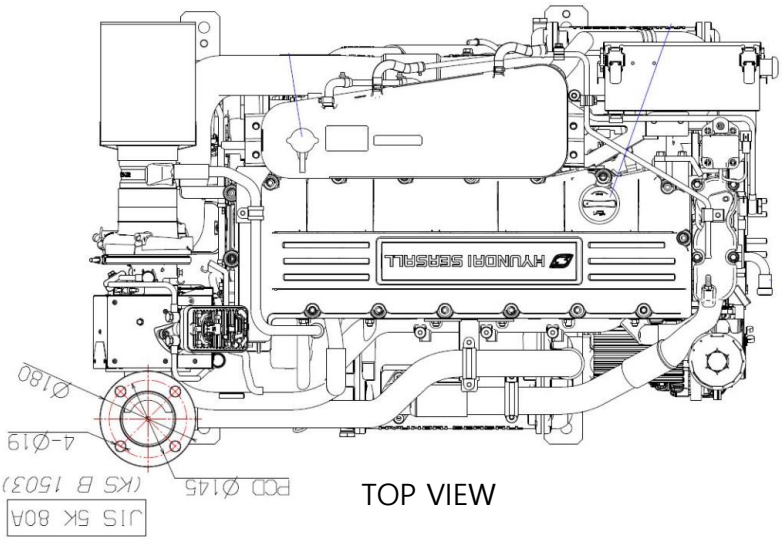
- To lift the engine, use the two engine eyes (see figure).

- To avoid engine damage, take care that engine lift chains or belts do not hit or touch surrounding parts during engine lifting.

- Keep the engine horizontal when you install or remove the engine from the engine room by using correct installation tools or adjusting the length of lifting belts or chains.

- Use strong enough lifting belts or chains to carry the engine weight safely.

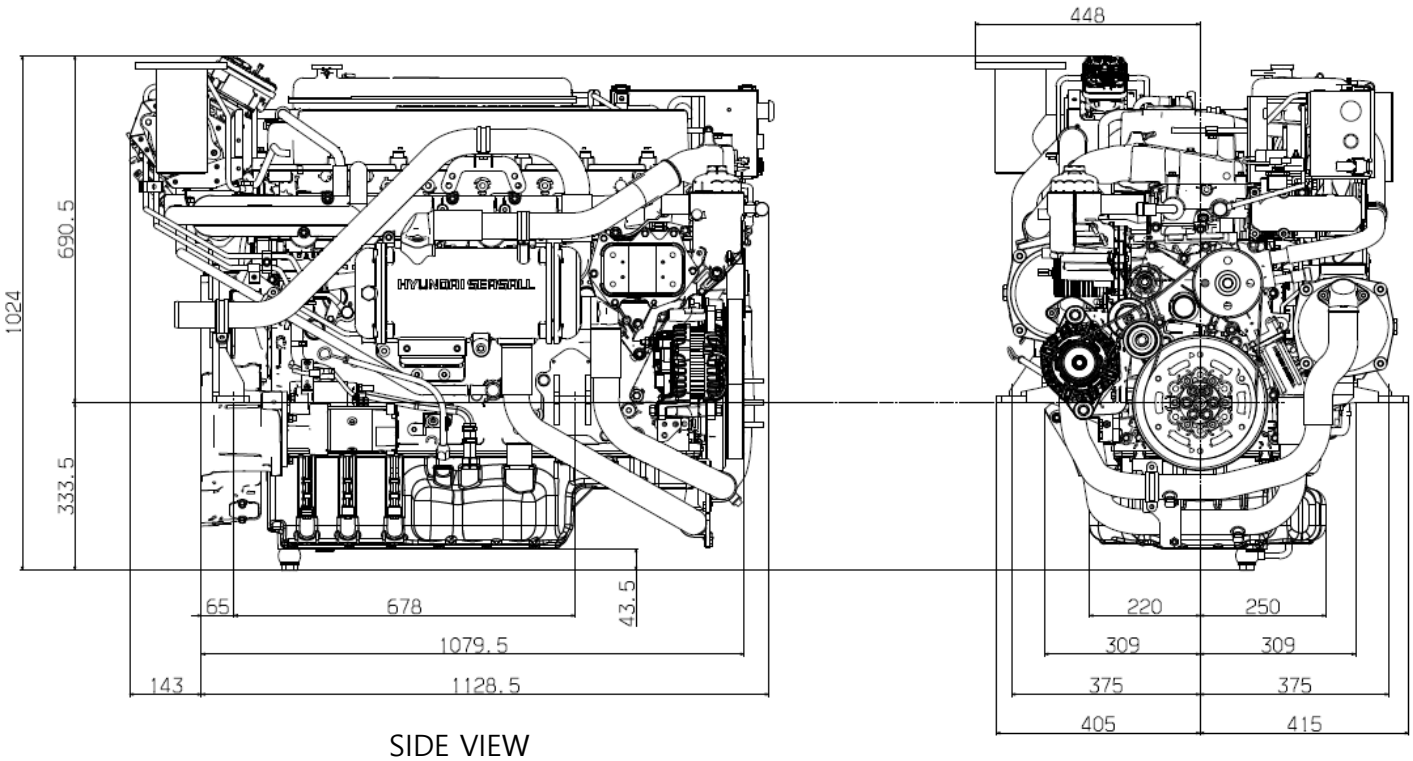
ENGIEN DIMENSIONS



TOP VIEW

T/M ASSEMBLY BOLT PATTERN

- BELL-HOUSING : SAE 2
- FLYWHEEL : SAE 11-1/2

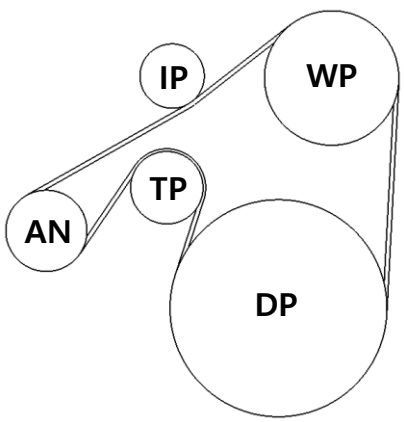


SIDE VIEW

FRONT VIEW

BELT INSTALLATION

MODEL : G7	
AN	ALTERNATOR
DP	DRIVE PULLEY
IP	IDLER PULLEY
TP	TENSIONER PULLEY
WP	WATER PUMP PULLEY



CHAPTER 2
ENGINE OPERATION

STARTING ENGINE

- Before starting the engine, you should check engine oil, coolant, gearbox oil, fuel gauge, seawater pump, battery, water valves and so on.

- When you start the engine, check that the engine throttle lever ① is in the neutral position. If not, the engine may not start or there is possibility of the boat moving inadvertently. If your boat is equipped with a neutral safety switch, the engine will only crank when the engine throttle lever is in the neutral position. You can also check this on the EOI.

- After starting the engine, release the key ② immediately to prevent damage to the starter motor.

- Avoid maximum rpm and WOT (Wide Open Throttle) before the cold engine is fully warmed up.(40℃).

- When cold starting, it may take a few more seconds to start the engine.

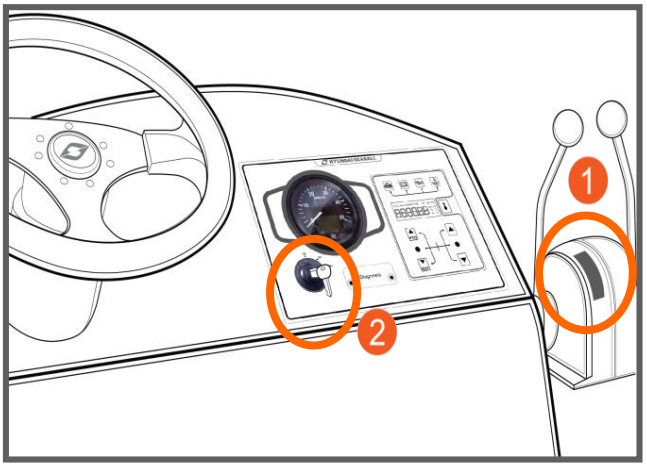
- If the engine does not start in 10 seconds, Turn off the key and wait After 10 seconds try again. This method can help avoid starter motor damage.

- The engine room requires a constant supply of fresh air.
- Be sure that adequate ventilation systems are installed.

STOPPING ENGINE

- The engine should be run for a few minutes at idle (in neutral) before turning it off. This will avoid boiling and even out the temperature. This is especially important if the engine has been operated at high engine speeds and loads.

- Never switch off the main switches while the engine is running. This could damage some parts like alternator.

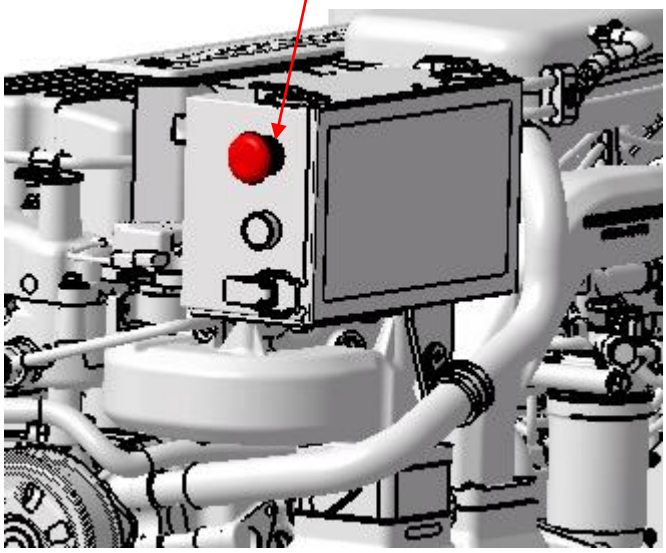


WARNING

DO NOT DRIVE IN SPACE WHERE THERE IS NO AIR CIRCULATION. EMISSION GAS IS HARMFUL.

EMERGENCY STOP

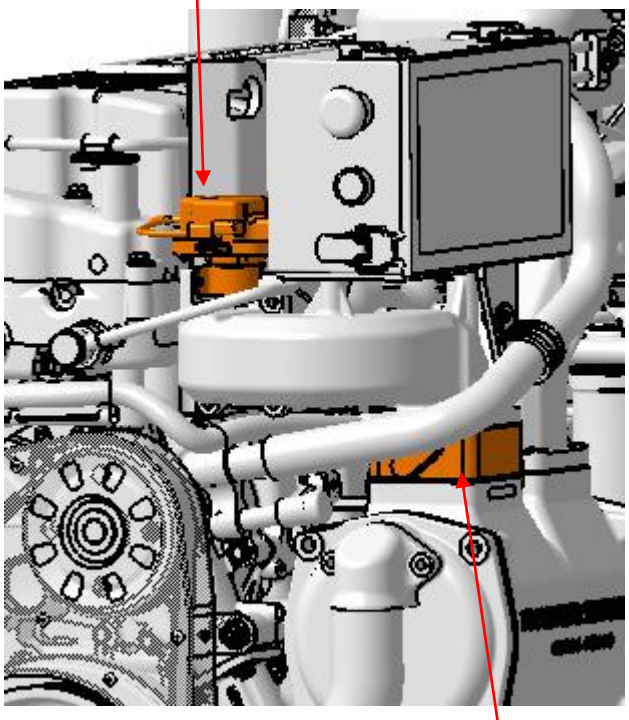
Emergency Stop Switch



- You can stop the engine by pushing this button. After releasing the switch by twisting the button, you can start the engine again. (Normally, the button should be in the 'out' position.)
- When the switch is pressed or it doesn't work normally, the engine doesn't crank.
- We recommend that you check this switch first if there is any cranking problem.
- You can use this switch to avoid unexpected engine starting during maintenance.
- You can use this switch in any emergency situation.

INTAKE AIR HEATER

Air Heater Relay

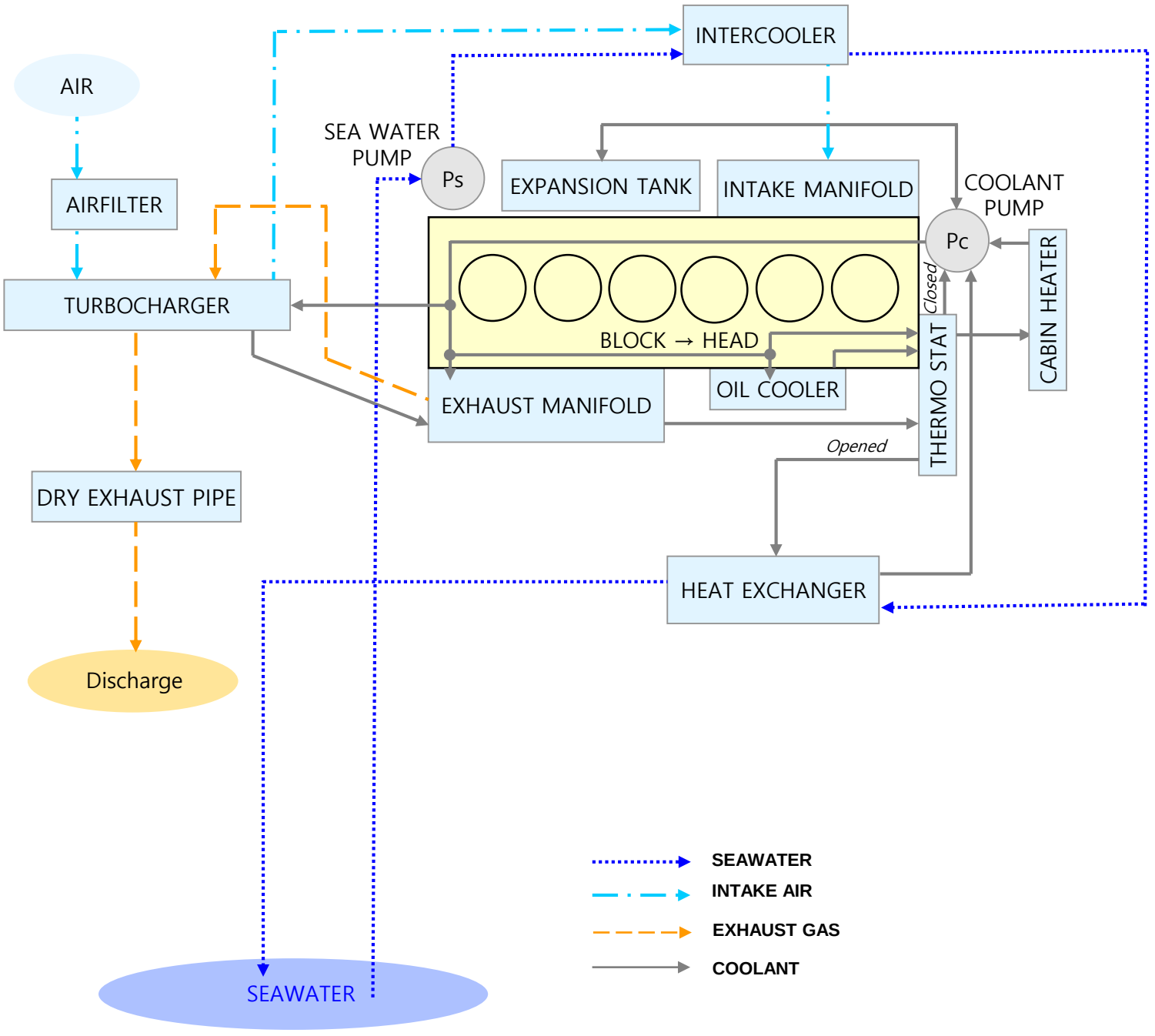


Air Heater

- When turning the start switch ON, the coolant temperature sensor senses the engine coolant temperature and the control unit (ECU) controls the preheating time in accordance with the sensed coolant temperature.
  (Work at temperature fell to below zero)
- When the engine is started, the control unit (ECU) operates the air heater for a certain time. This preheats the engine and helps to reduce white smoke at start-up. (Work at temperature fell to below zero)
- If the indicator lamp blinks regardless of condition, check the related circuit for a blown fuse, fused relay etc. since this indicates a problem in the preheating heater system.

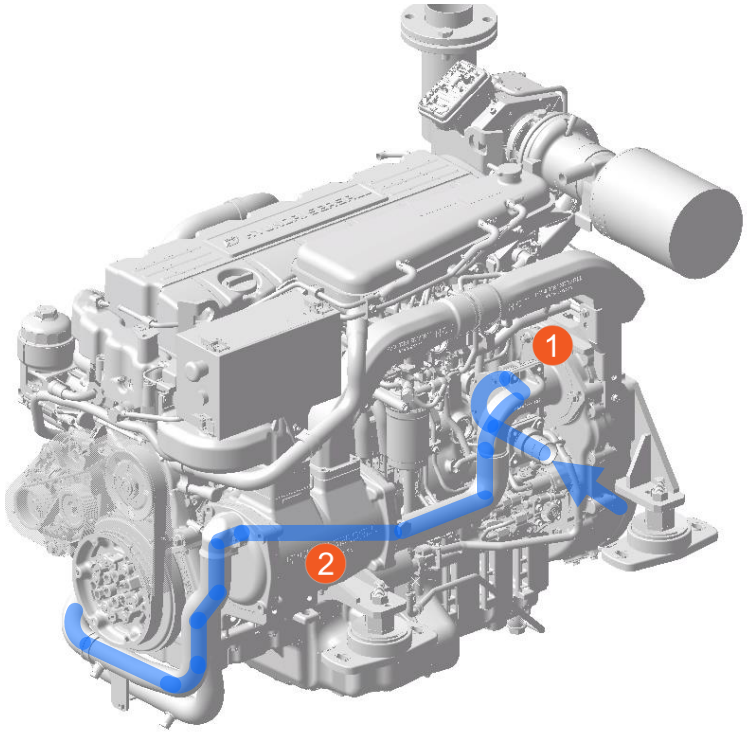
CHAPTER 3
COOLING SYSTEM

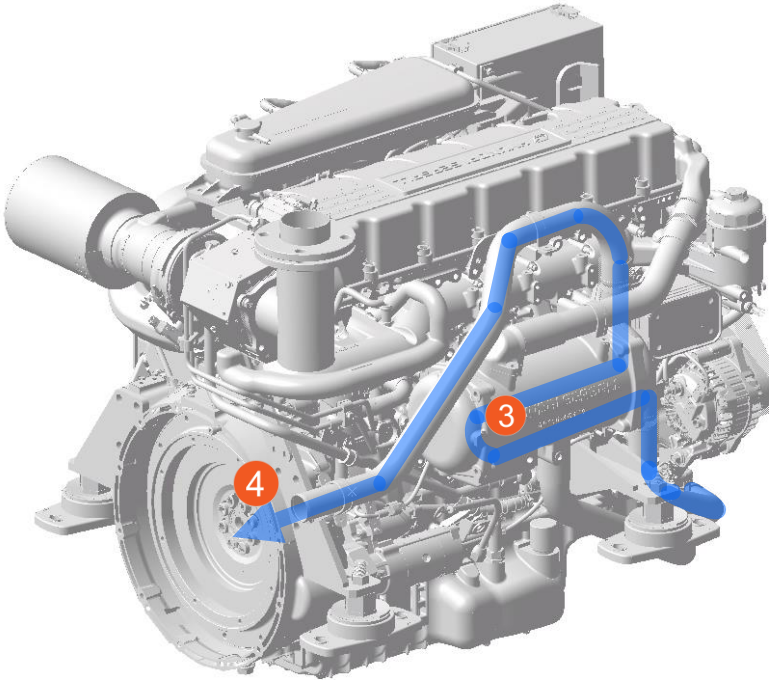
SCHEMATIC DIAGRAM OF ENGINE COOLING



SEAWATER FLOW – opened circuit

Water strainer ← Water valve ← Water pickup
↓
1 Seawater pump
↓
2 Intercooler
↓
3 Heat exchanger
↓
4 Exhaust pipe
↓
Discharge Seawater





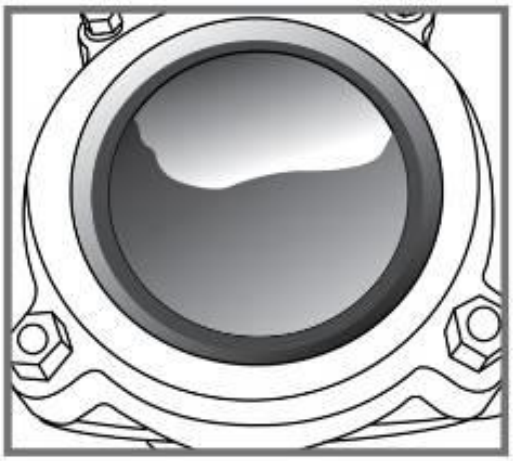
WATER PICKUP

- Water pickup should be installed in an area where it won't pick up air bubbles and will access clean water during all phases of the engine operation.

- After start up, you must check for air bubbles by inspecting the waterline. Bubbles will appear if there is a leakage from the waterline. If bubbles appear, leakage area must be detected and completely sealed prior to engine operation.

- The seawater pickup inner diameter, as well as all other connecting fittings (hoses, connectors, water valve etc.) must be at least the size of the inner diameter of the inlet of the seawater pump. If not, it may inhibit the supply of sufficient water and cause the engine to overheat.

WATER STRAINER



- Strainer should be located in an area where it will be easily accessible for periodic seawater flow inspection and cleaning.
- The size of strainer must be of sufficient capacity to pass the seawater (a flow rate over 400 liters per minute flow rate).
- Strainer must be installed after water inlet valve in order to allow user to shut off seawater when cleaning strainer filter.

CAUTION

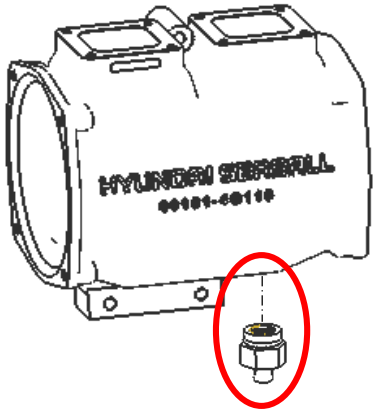
IF THE SEAWATER STRAINER IS NOT PROPERLY ASSEMBLED, AIR CAN BE SUCKED INTO THE COOLING CIRCUIT, DISTURBING THE VACUUM PROCESS. THIS CAN CAUSE THE ENGINE TO OVERHEAT.

CLEANING STRAINER FILTER

- Stop the engine and close the water valve.
- Remove the filter cap.
- Remove the filter element, flush it thoroughly with clean water or compressed air.
- Insert the cleaned filter element and screw on the filter cap.
- Check the cap and the gasket for correct seating and sealing.
- Open the water valve.
- Start the engine and check if there is water leakage.

AUTOMATIC DRAIN VALVE

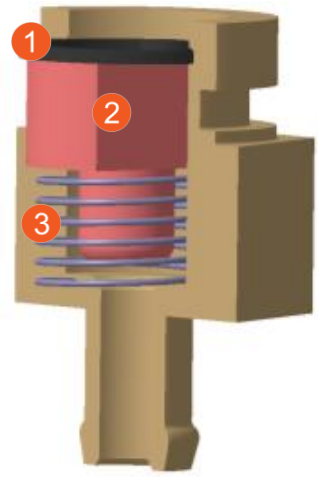
- The Automatic Drain Valve allows condensed water in the intercooler to drain when the engine is a idle or is stopped.



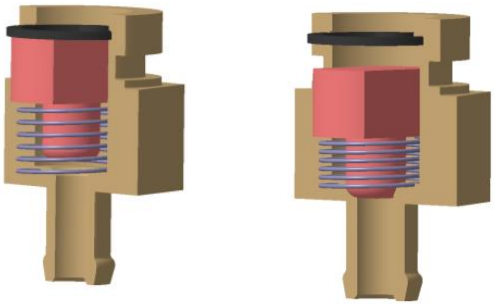
Condensate water drain from intercooler.

CHECKING AUTOMATIC DRAIN VALVE

- Stop the engine and remove the Automatic Drain Valve from the intercooler.
- Removing procedure:
  - Remove the Snap Ring ①
  - Remove the Plunger ②
  - Remove the Spring ③
  - Clean the inside of the Automatic Drain Valve with a cloth or by brushing
- Installation is in the reverse order of removal.
- Put the Automatic Drain Valve on a flat surface. Make sure that Snap Ring ①and plunger ②are in contact.
- If there is more than a 2mm gap between the Snap Ring ①, and the Plunger ②replace the spring.



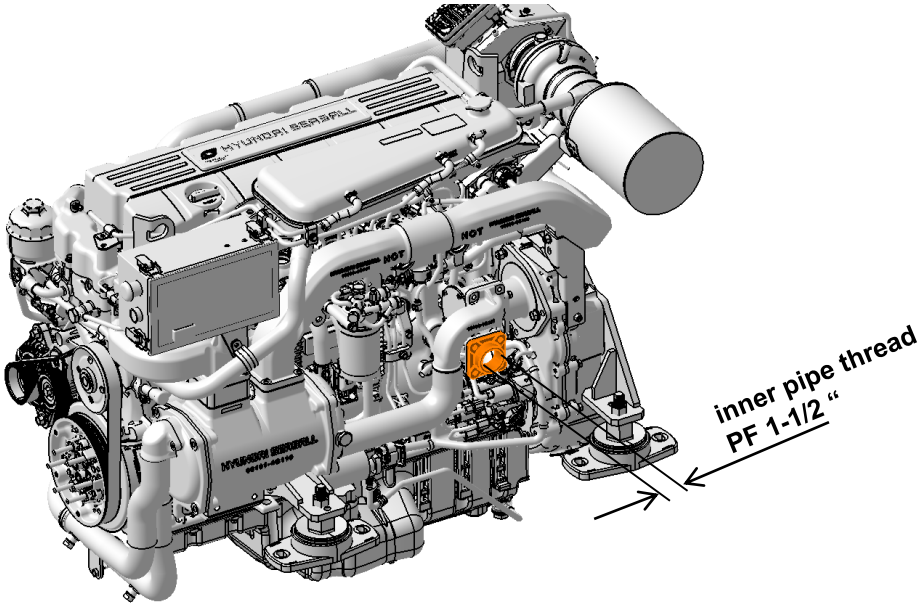
1 Snap-Ring 2 Flunger 3 Spring



Normal **Replace a part**

SEAWATER PUMP

- The inner diameter of hose connected to seawater pump inlet should be PF 1-1/2 inch.
- The cross section of the hose may shrink due to inlet pressure drop. Therefore, the hose from water pickup in the boat's hull to the seawater pump inlet should be as short as possible and must be made of steel wire reinforced material.
- The seawater pump impeller must be checked periodically and replaced if necessary.



CAUTION

IF THE WATERPUMP IS NOT PROPERLY ASSEMBLED, AIR CAN BE SUCKED INTO THE COOLING CIRCUIT, DISTURBING THE VACUUM PROCESS. THIS CAN CAUSE THE ENGINE TO OVERHEAT.

CAUTION

DO NOT RUN THE ENGINE WITHOUT SEAWATER. THE SEAWATER PUMP IMPELLER WILL BE DAMAGED. BEFORE STARTING THE ENGINE, BE SURE TO SUPPLY SEAWATER TO THE PASSAGES.

CAUTION

DO NOT INSTALL ADDITIONAL DEVICES WHICH COULD OBSTRUCT THE FLOW OF SEAWATER. THIS CAN CAUSE THE ENGINE TO OVERHEAT.

CHECKING SEAWATER PUMP & IMPELLER

- Stop the engine and close the water valve.
- Remove the impeller housing cover.
- Remove the impeller from inside the seawater pump.
- Check the condition of impeller and bushing.
- Apply soapy water to impeller when assembling, and reassemble towards rotation direction.
- Replace of the O-ring on the impeller housing cover.
- Open the water valve.
- Start the engine and check if there is water leakage.

CAUTION

DO NOT RUN THE ENGINE WITHOUT SEAWATER. THE SEAWATER PUMP IMPELLER WILL BE DAMAGED. BEFORE STARTING THE ENGINE, BE SURE TO SUPPLY SEAWATER TO THE PASSAGES.

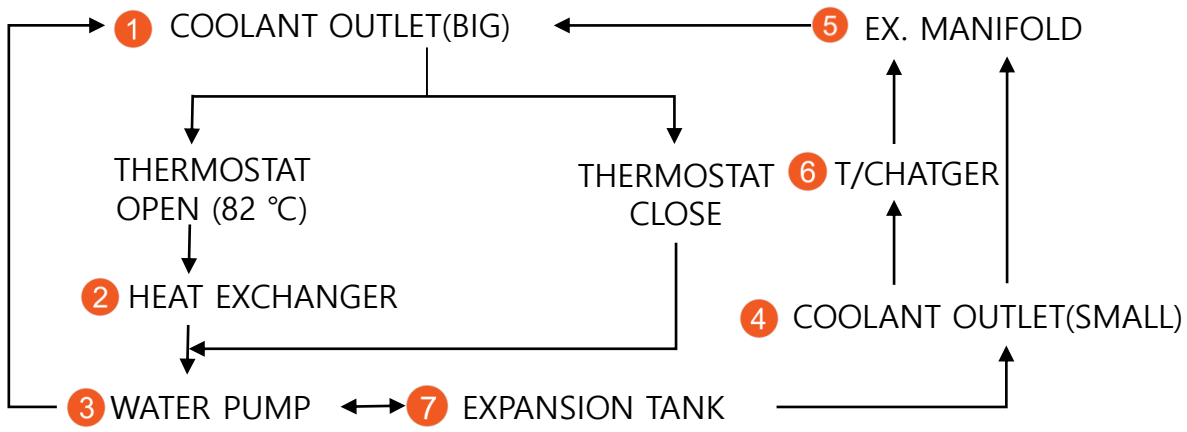
CAUTION

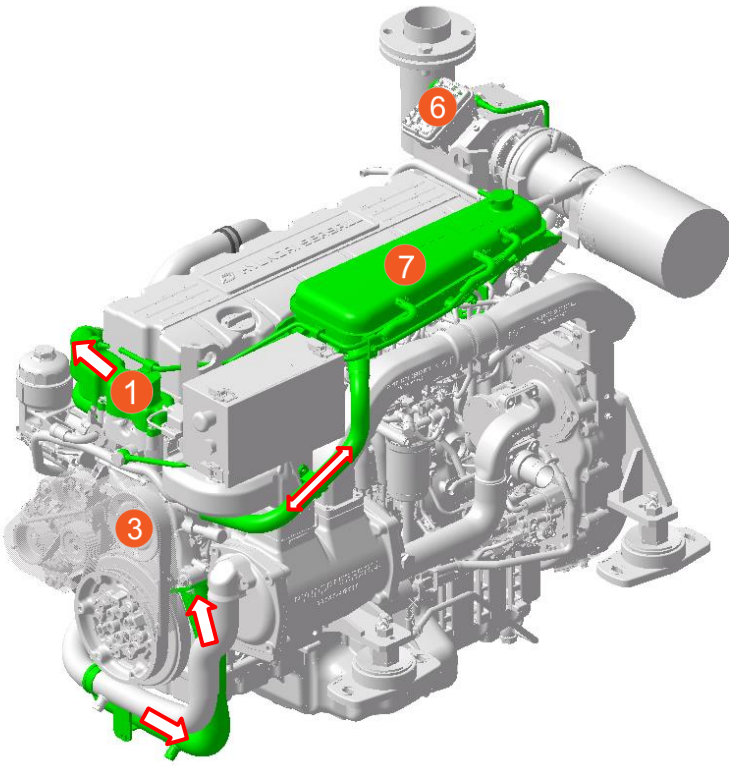
IMPELLER DAMAGE MAY OCCUR IF APPROPRIATE TOOLS ARE NOT USED WHEN REMOVING THE IMPELLER. MAKE SURE TO CHECK O-RING CONDITION AFTER SEAWATER PUMP REASSEMBLY.

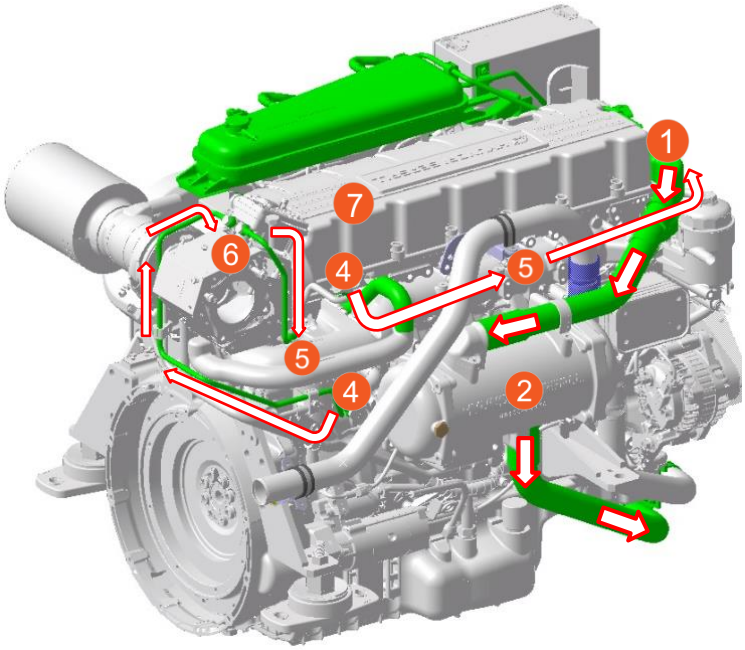
CAUTION

DO NOT INSTALL ADDITIONAL DEVICES WHICH COULD OBSTRUCT THE FLOW OF SEAWATER. THIS CAN CAUSE THE ENGINE TO OVERHEAT.

ENGINE COOLANT FLOW - closed circuit







ENGINE COOLANT

- Engine coolant must be maintained at the “MIN” level marked on the side of the expansion tank when the engine is cold.

- As the engine temperature increases, the pressure inside the cooling system increases to 0.7 bar or more. To maintain proper pressure of the engine cooling system, water may be ejected from the expansion tank. This is normal. Replenish the coolant if this is observed.

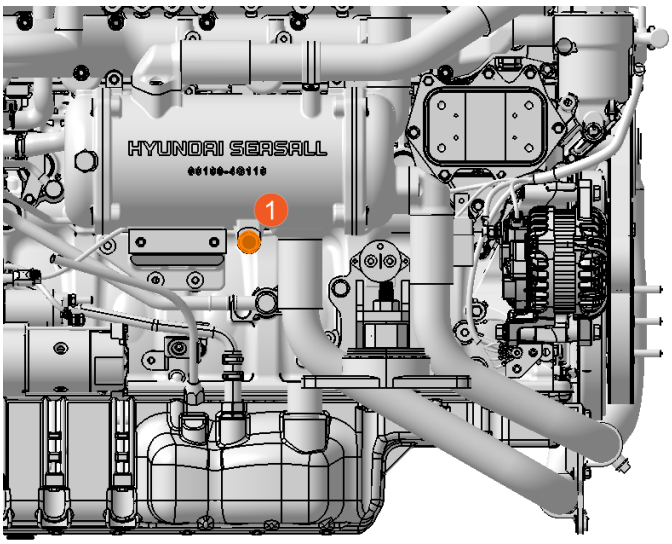
SUPPLEMENTAL ENGINE COOLANT

- If the coolant level is below level 'Low', add enough specified coolant to provide protection against freezing and corrosion. Coolant level should be between the MAX and MIN. But do not exceed level 'MAX'.
- If frequent additions are required, contact an authorized dealer for a cooling system inspection.
- Use only soft (demineralized) water in the coolant mixture.
- The engine has aluminum engine parts and must be protected by an ethylene-glycol-based coolant to prevent corrosion and freezing.
- DO NOT USE alcohol or methanol coolant or mix them with the specified coolant.
- DO NOT USE a solution that contains more than 60% antifreeze or less than 35% antifreeze, which would reduce the effectiveness of the solution. For mixture percentages, refer to the table.

Ambient Temperature	Mixture Percentage(volume)	
	Antifreeze	Water
-15℃ (5℉)	35	65
-25℃ (-13℉)	40	60
-35℃ (-31℉)	50	50
-45℃ (-49℉)	60	40

DRAINING COOLANT

- In order to drain engine coolant, please use a screwdriver to loosen the drain plug. 1
- The drain plug is located under the heat exchanger unit.



REMOVING AIR BUBBLES IN COOLANT

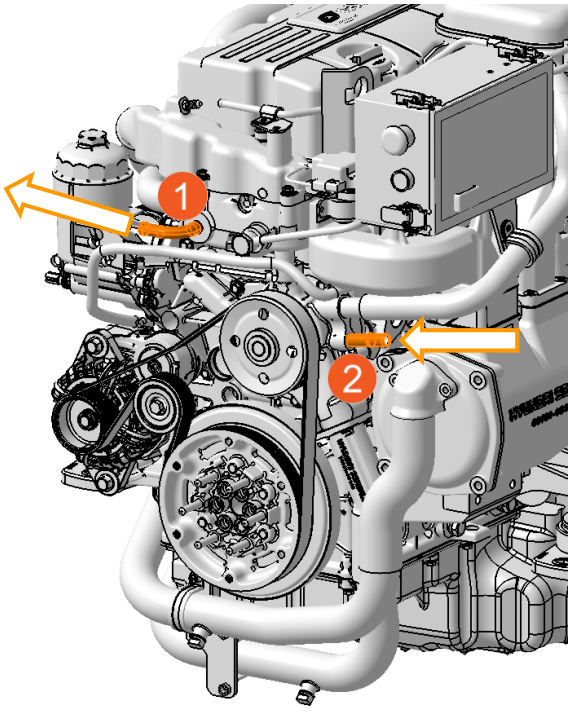
- Start the engine and warm it up at a low rpm.
- Stop the engine and allow the engine to cool, and then open the cap of the expansion tank carefully.

  *NOTE: Never open the cap when the engine is hot. It may cause scalding.
- Refill with coolant if needed.
- Reinstall the expansion tank cap.
- Check the level of the expansion tank regularly.

CABIN HEATER CONNECTION

- In order to use a cabin heater, an extra coolant circulation pump is needed.
- After connecting cabin heater lines, engine coolant must be refilled and checked.
- Check coolant flow direction, as shown in the figure.
- If a cabin heater is installed, the volume of the cooling circuit will be increased. It may be necessary to add an additional expansion tank to avoid losing cooling water as the expansion tank on the engine may not have sufficient capacity.
- Contact your Hyundai SeasAll dealer if you need nipples for cabin heater connection.

Coolant flow direction: ⇨



1 **To cabin heater**
2 **From cabin heater**

※HOSE inner diameter: Φ17

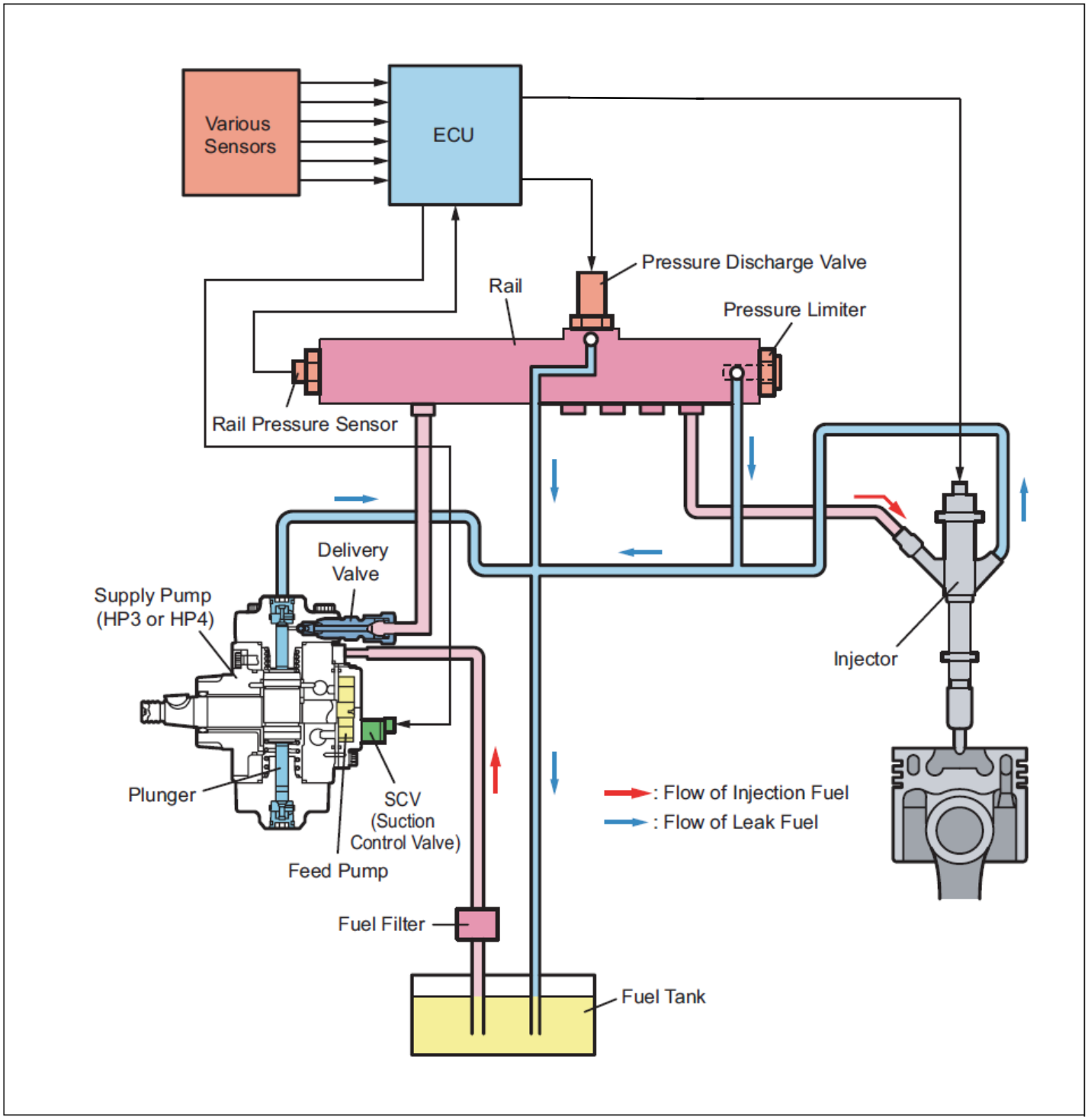
WARNING

NEVER OPEN THE EXPANSION TANK CAP WHEN THE ENGINE IS OPERATING OR HOT. IT COULD RESULT IN SERIOUS PERSONAL INJURY AND MAY CAUSE ENGINE DAMAGE.

CHAPTER 4
FUEL SYSTEM

The fuel supply system of this engine is diesel common rail direction injection. In order to optimize engine combustion, its maximum injection pressure is up to 2,000bar. Multi-injection is possible thanks to the quick response of the solenoid type injector.

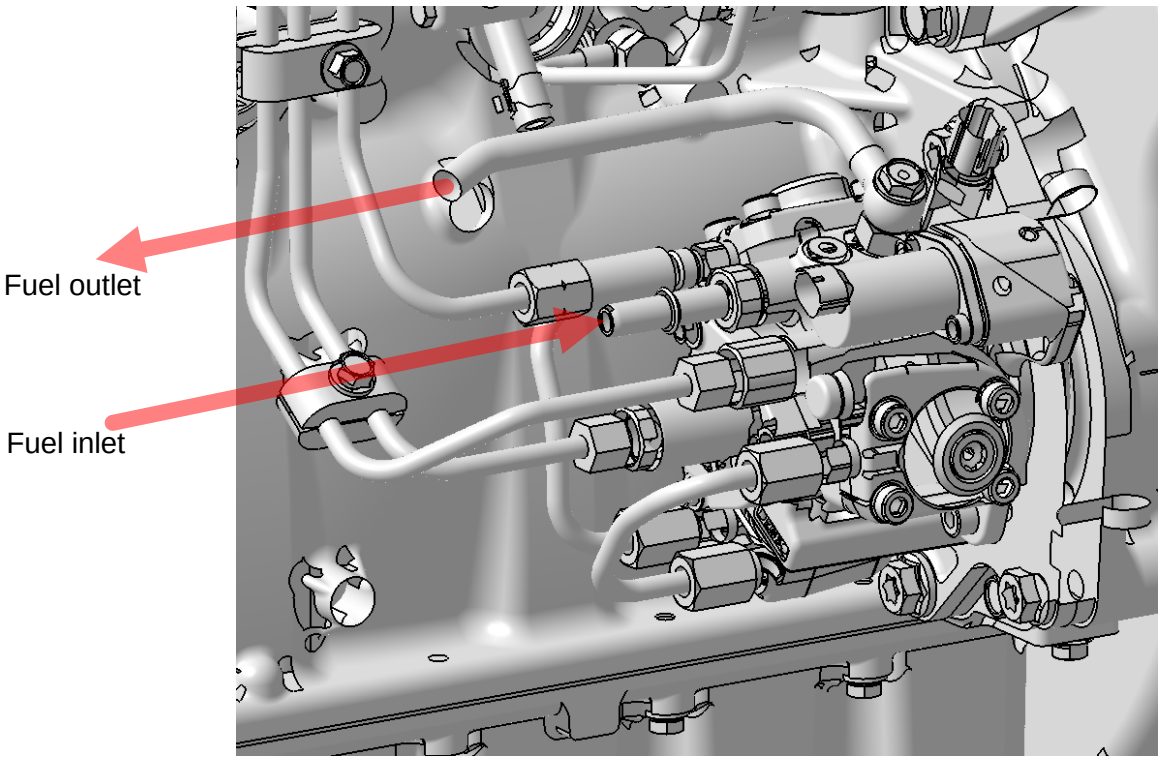
Overall System Flow (Fuel)



FUEL FLOW

Fuel tank
↓
Primary fuel filter with water detection sensor (Separate Item)
↓
1 High pressure pump (Built-in low pressure fuel pump function)
↓
2 Main Fuel filter
↓
1 High pressure pump (High pressure fuel)
↓
3 Common rail
↓
4 Injector(Installed inside the head cover) return
↓
1 High pressure pump (Return fuel)
↓
5 Fuel tank return

※ The inner diameter of the fuel hoses should be less than Ø12.



RECOMMENDED FUEL QUALITY

The following fuels should be used for engine operation:

- Standard summer / winter diesel fuel according to DIN EN 590 (classes A-F)
- Diesel fuel according to DIN EN 590 (classes 0-4) in arctic climates
- Summer diesel fuel according to California and U.S. federal regulations
- Winter diesel fuel if lubricity is comparable to diesel fuel according to DIN EN 590
- Mixture of diesel fuel with 5 Vol.% RME according to DIN 51606
- Other admixing or additional use of additives or special fuels is not permitted

DRAINING WATER FROM Primary fuel filter

- The water separator for a diesel engine plays the important role of separating water from fuel and accumulating the water in its base.
- If your fuel is not well suited to your engine, more frequent drainage will be required.
- To check and drain the water in fuel filter:

  1) Loosen the drain plug (part 1) and drain water.

  2) After water is drained, securely tighten the drain plug.

CAUTION

HYUNDAI SEASALL'S GUARANTEES OR WARRANTIES ARE VOID IN CASES WHERE DAMAGE TO FUEL INJECTON COMPONENTS (HIGH PRESSURE PUMP, INJECTORS, ETC.) CAN BE ATTRIBUTED TO THE USE OF UNQUALIFIED FUELS.

IF WATER ACCUMULATED IN THE FUEL FILTER IS NOT DRAINED AT PROPER TIMES, DAMAGE TO MAJOR ENGINE PARTS MAY OCCUR. WHEN REPLACING THE FUEL FILTER CARTRIDGE, USE ONLY GENUINE HYUNDAI SEASALL PARTS.

CHANGING FUEL FILTER CARTRIDGE

< MAIN FILTER >

When replacing a fuel filter element

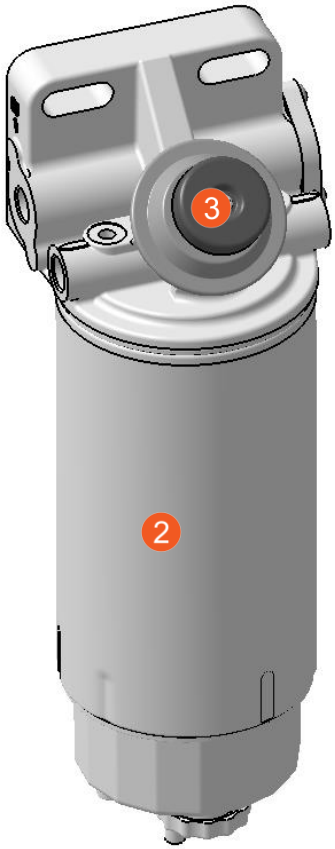
- Clean around the fuel filter.
- Loosen air vent bolt 1 on fuel filter and relieve the pressure in the fuel line.
- Replace the filter element. 2

(Replacement of the filter cartridge) 2

1) Check if there is any gasket on the cartridge when replacing it.
2) Apply oil to gasket and tighten it sufficiently by hand.
3) Tightening torque regulation :
   43.1±2Nm (4.4±0.2 kgf.m, 31.8±1.4 lb.ft)

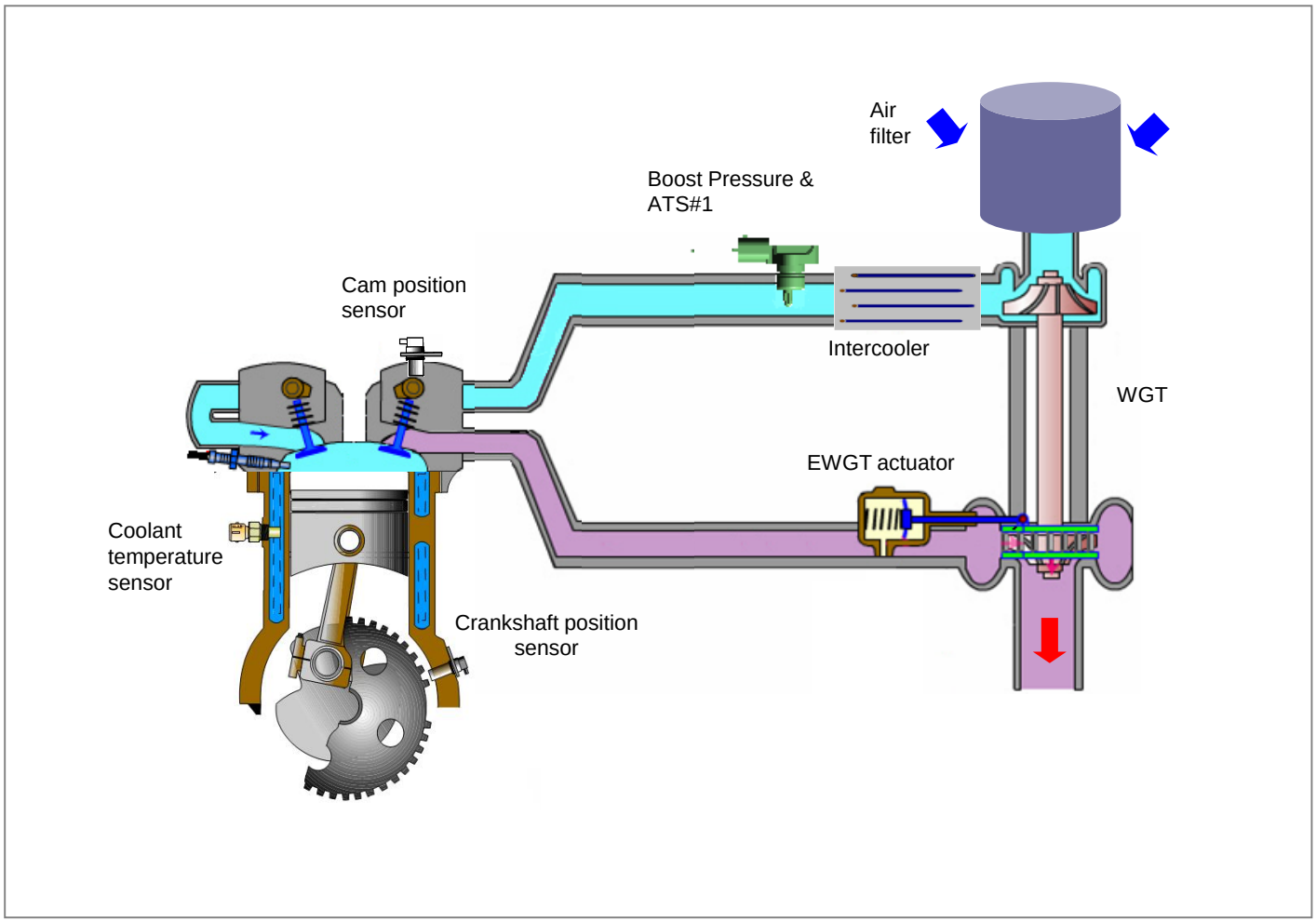
- Pump until fuel drains from air vent, using priming pump. 3 (Pumping time can be reduced by filling a new cartridge with fuel before mounting)
- Air bleeding of cylinder head side is not necessary when replacing a filter and generally it is possible to start the engine using the normal cranking procedure.
- Tighten the air vent bolt 1.
- Start the engine and check if there is fuel leakage.

< PRIMARY FILTER >



CHAPTER 5
INTAKE & EXHAUST SYSTEM

The intake air system of this engine is optimized by EWGT and a highly efficient intercooler system. The pressure of the air system is up to about abs. 2.7 bar in order to optimize engine combustion.



ENGINE AIR CONSUMPTION

-. Engine need to proper intake air for combustion this requires a minimum inner area of air supply ducting the area can be calculated by using the formula

A = cross section of area in cm^2

A = 1.9 X Engine power(KW)

➔ A= 1.9 X 257(KW) = 489cm^2

∴ diameter= **Ø249.6**

<TABLE1>

Number of pipe bends (90°)	Length of pipe (Meters)				
	1	2	3	4	5
1	1	1.04	1.09	1.13	1.20
2	1.39	1.41	1.43	1.45	1.49
3	-	1.70	1.72	1.74	1.78

-. Minimum intake diameter is Ø249.6, when use longer ducts or more bends are used the area is corrected by multiplying by coefficient from<Table1> We recommend position of air pipe that distance 25~35cm from around air filter. Air inlet must never be installed in the transom stern. In this area is mixed with water and exhaust gases

ex) Length of pipe : 3M , Number of pipe bands : 2

➔ Ø249.6 X 1.43 = Ø356.9

※ Minimum Banding R = 2 X O.D of pipe(90° cases)

ENGINE ROOM VENTILATION

-. Engine room need to proper ventilation for optimum ship operation this requires a minimum inner area of air ventilation the area can be calculated by using the formula.

A = 1.65 X Engine power(KW)

➔ A= 1.65 X 257(KW) = 424cm^2 ∴ diameter= **Ø232.4**

-. Minimum ventilation diameter is Ø232.4, when use longer ducts or more bends are used the area is corrected by multiplying by coefficient from<Table1> The supply for air at intake and exhaust pipe should be the same size. The Distance between air inlets and air outlets should be as long as possible. If the distance too short, results in a bad ventilation effect.

The suction fan is to be installed in the exhaust air duct so that ventilate the engine room more effectively and keep low temperature in engine room

Extraction fan capacity(Air Flow m^3/min) =**0.07** X Engine power(KW)

➔Extraction fan capacity = 0.07 X 257(KW) = 18.0m^3/min

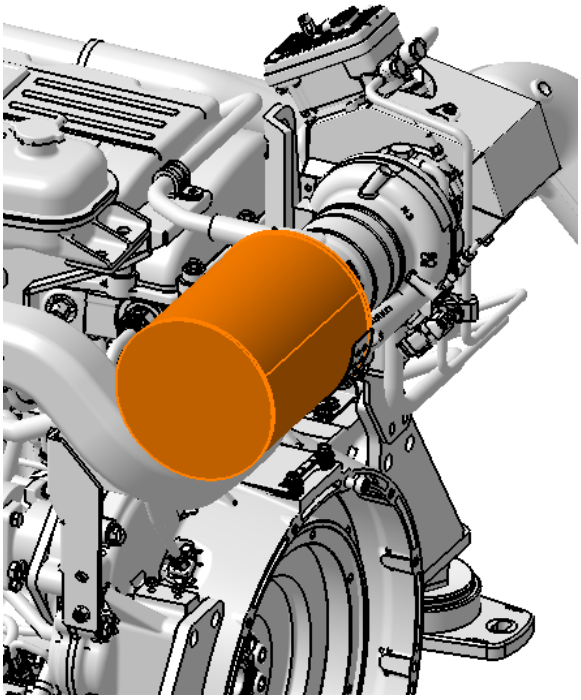
※ General pressure drop of Engine room = 0.1~0.5kPa

ex) Length of pipe : 3M , Number of pipe bands : 2

➔ Ø232.4 X 1.43 = **Ø332.3**

CHECK AIR FILTER

- The original Hyundai SeasAll air cleaner may be cleaned and reused.
- If the air filter is very dirty, it can increase airflow resistance and reduce flow of air to the engine. This can result in reduced power and fuel efficiency.
- Cleaning the air filter should be carry out periodically according to the procedure below.
- Do not clean the filter element with gasoline or other solvent cleaners.



CLEANING AIR FILTER

- Remove the air filter from engine.
- Put the air filter on a flat surface and shake dust out.
- Wash out the dust with running water of low pressure from the inside toward the outside.
- Dry the wet air filter in the shade for 2 ~3 hour. You can reduce drying time by blowing with a hair dryer on COLD or by blowing with low pressure compressed air.

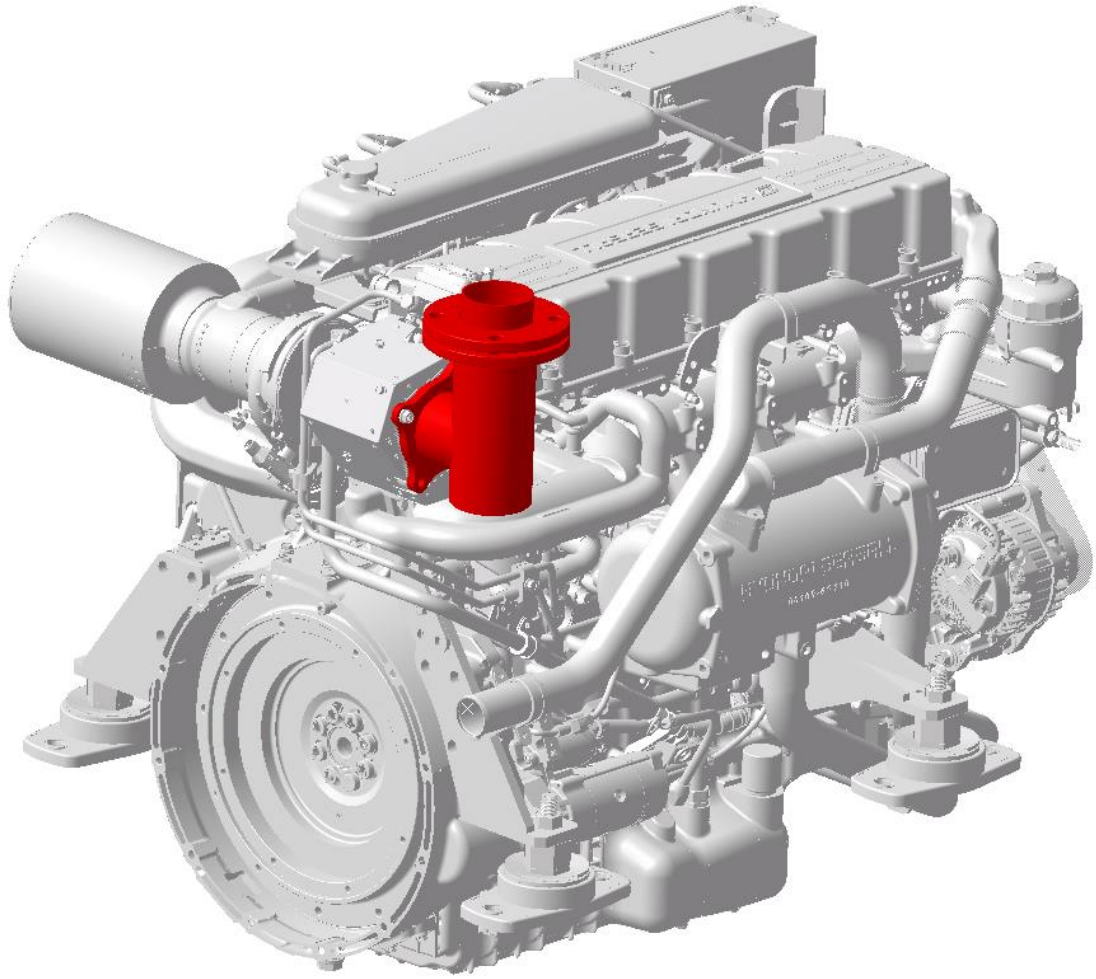
  (CAUTION) Do not use high pressure air, high pressure water or hot air to clean and/or dry the air filter. These can damage the performance of the air filter.
- Reassemble air filter to engine.

CAUTION

WHEN REMOVING THE AIR FILTER, BE CAREFUL THAT DUST OR DIRT DO NOT ENTER THE AIR INTAKE, OR DAMAGE MAY RESULT. AND DO NOT RUN WITHOUT AIR CLEANER. THIS COULD RESULT IN EXCESSIVE ENGINE WEAR. USE OF NON-GENUINE PARTS COULD DAMAGE THE TURBO CHARGER OR ENGINE.

EXHAUST SYSTEM

- DO NOT extend or bend the pipe in exhaust line excessively.
- The exhaust gas pressure should not exceed 110± 10 mmHg @ 2,500 / 2,800 rpm for the best performance of the engine. Be sure that rain does not fall into the exhaust elbow.

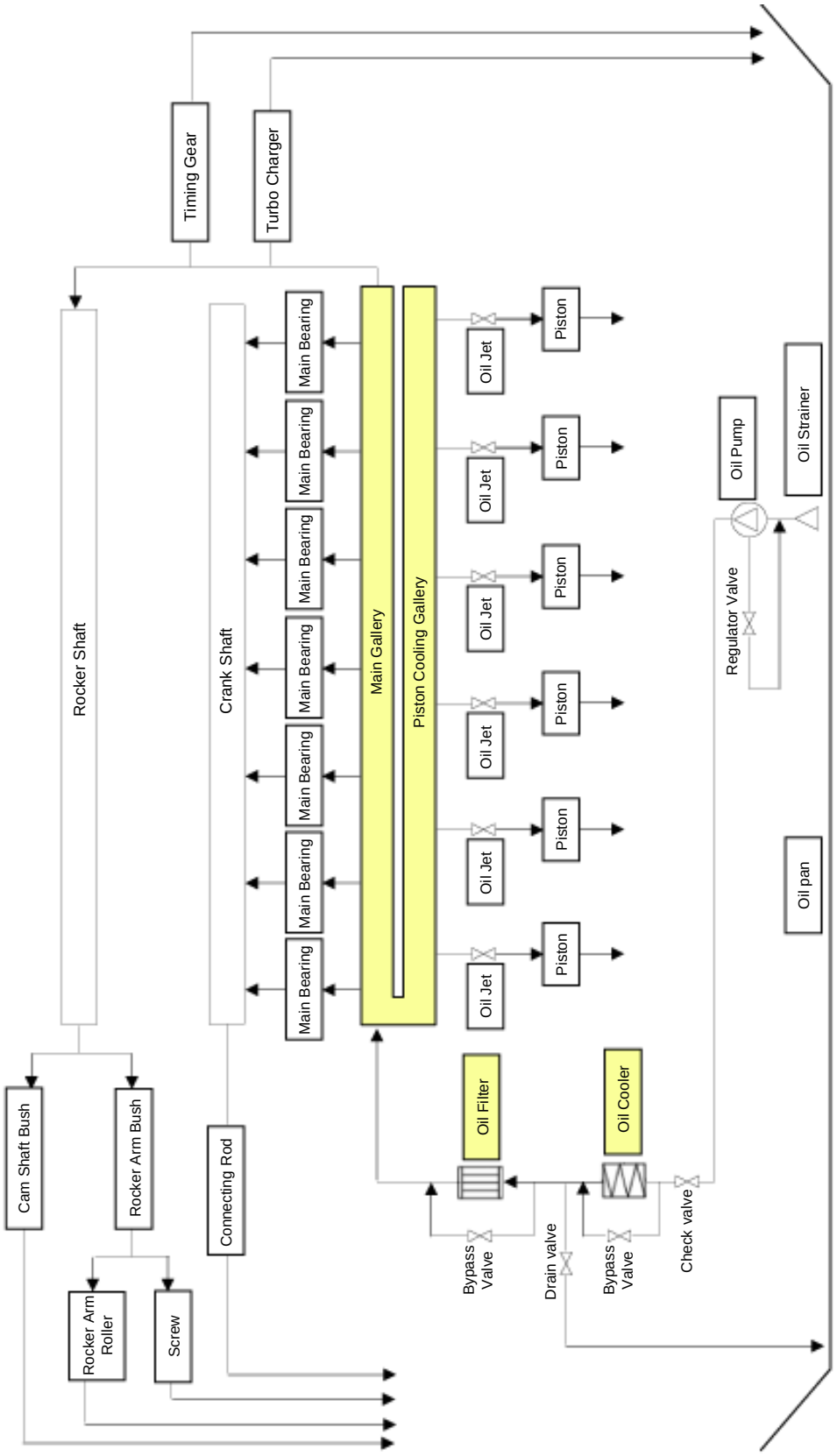


CAUTION

IF IN DOUBT ABOUT EXHAUST SYSTEM INSTALLATION, PLEASE CONTACT YOUR NEAREST HYUNDAI SEASALL DEALER.

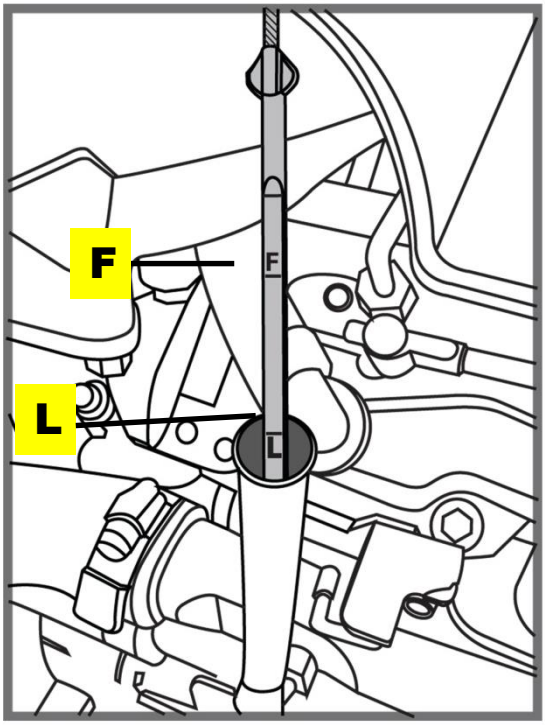
CHAPTER 6
LUBRICATION SYSTEM

SCHEMATIC DIAGRAM OF ENGINE LUBRICATION



2. ENGINE OIL LEVEL CHECKS

- The engine oil level must be checked at regular intervals.
- Be sure the boat is level.
- Start the engine and allow it to reach normal operating temperature.
- Turn the engine off and wait about 5 minutes, until the oil has returned to the oil pan.
- Pull the dipstick out, wipe it clean, and re-insert it fully.
- Pull the dipstick out again and check the level. The level should be between F and L. If it is near or at L, add enough oil to bring the level to F. Do not fill with engine oil above the F mark.



3. RECOMMENDED OIL QUALITY

For best performance and maximum protection during all types of operation, select only those lubricants which :

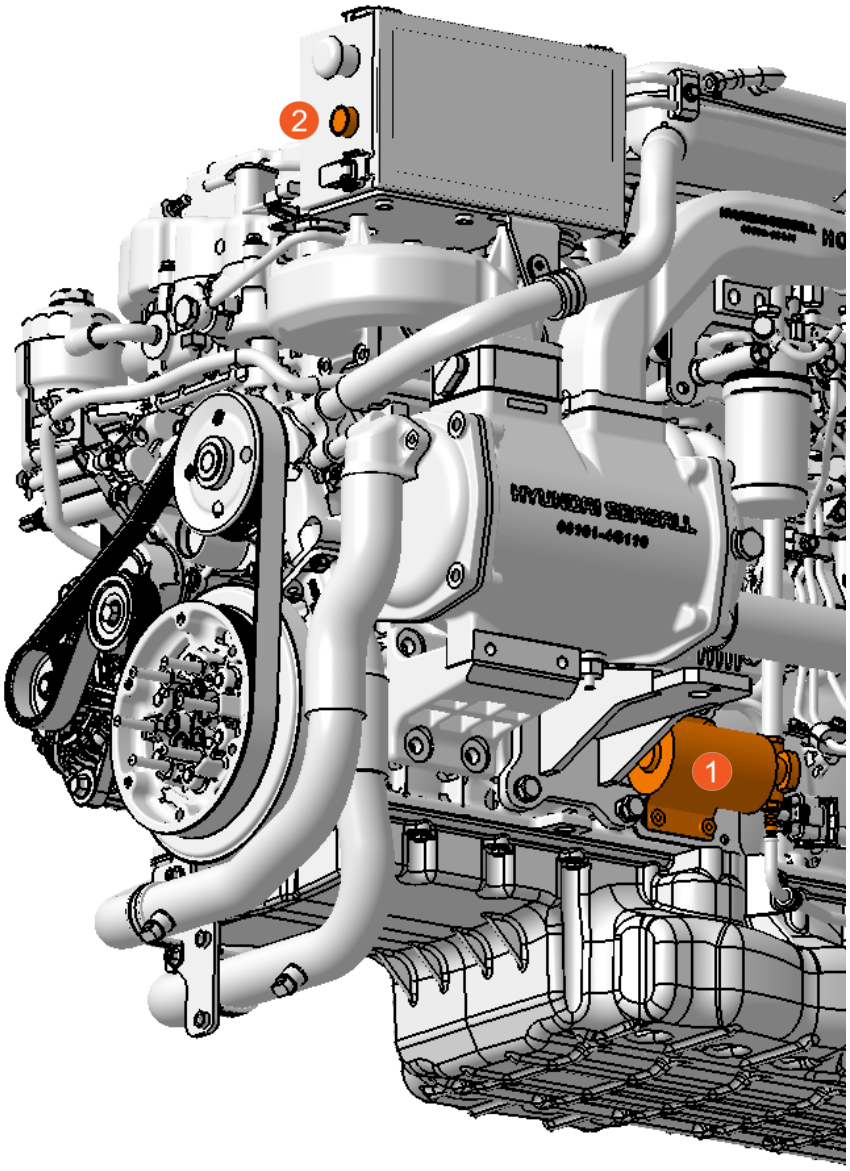
1) Satisfy the requirement of the API or ACEA classification.

2) Have proper SAE grade number for expected ambient temperature range.

Description		Specifications	Limit
Oil quality	ACEA	Above B4	Service oil quality should conform to ACEA or API classification.
	API	Above CH - 4	
	SAE	15W-40	-15°C above
		10W-30	-20°C ~ 40°C
		5W-30	-25°C ~ 40°C
		0W-30	10°C below

ENGINE OIL EXTACTION PUMP

- Allow the engine to warm up at least 5 minutes then turn off engine.
- Remove the engine oil filler cap and oil filter.
- The oil drain hose is connected to the oil extraction pump (1). Route the loose end of the hose into the container being used for the oil change.
- Turn the ignition key on (but do not start the engine) then press and hold the button (2) until the engine oil completely pumped out.
- When you stop pushing the button (2), the pump will turn off.

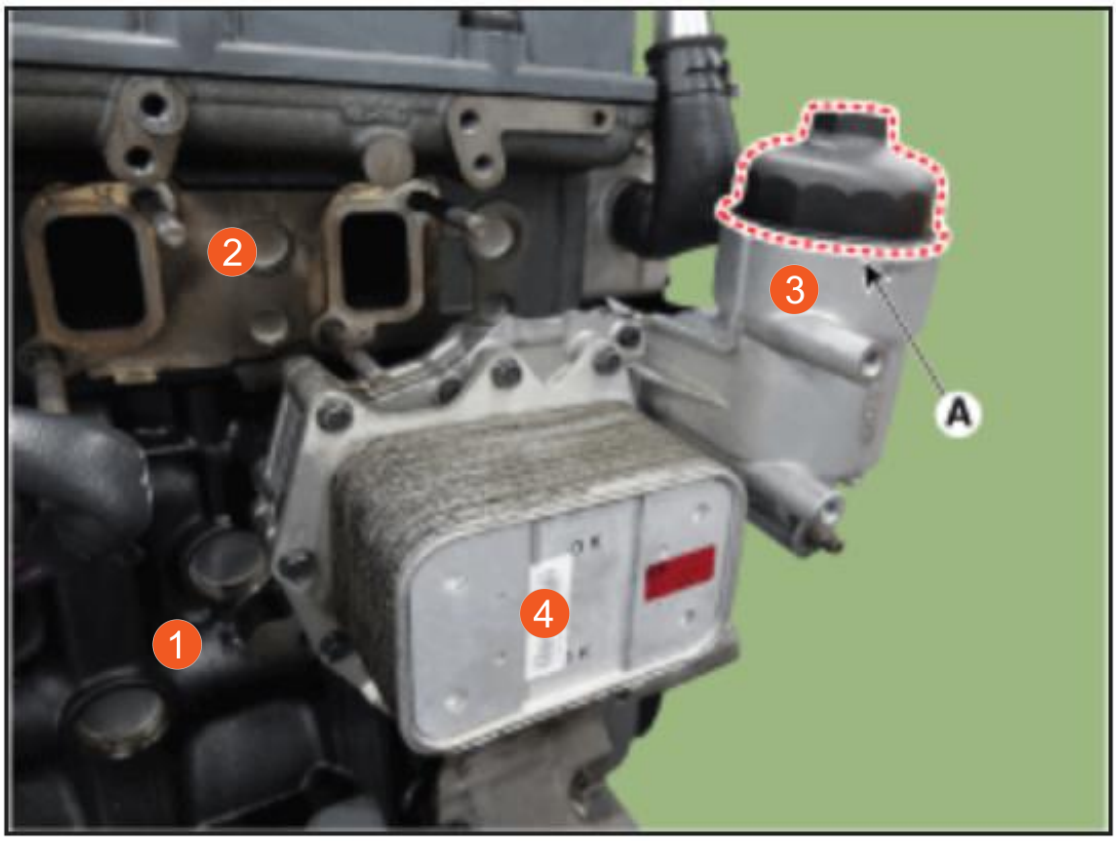


REPLACING OIL FILTER

- Drain the engine oil and Remove the oil filter cap (A)
- Install new oil filter. Be sure to replace the gasket with a new one.
- Run the engine and check for the oil leaks.
- Turn off the engine and check the oil level. Add oil if necessary.

WARNING

USED OIL MUST BE STORED IN A SAFE PLACE AWAY FROM CHILDREN AND SOURCES OF IGNITION. IF YOU HAVE A USED OIL DISPOSAL PROBLEM, PLEASE HAVE THE ENGINE OIL CHANGED BY YOUR NEAREST HYUNDAI SEASALL SERVICE DEALER.

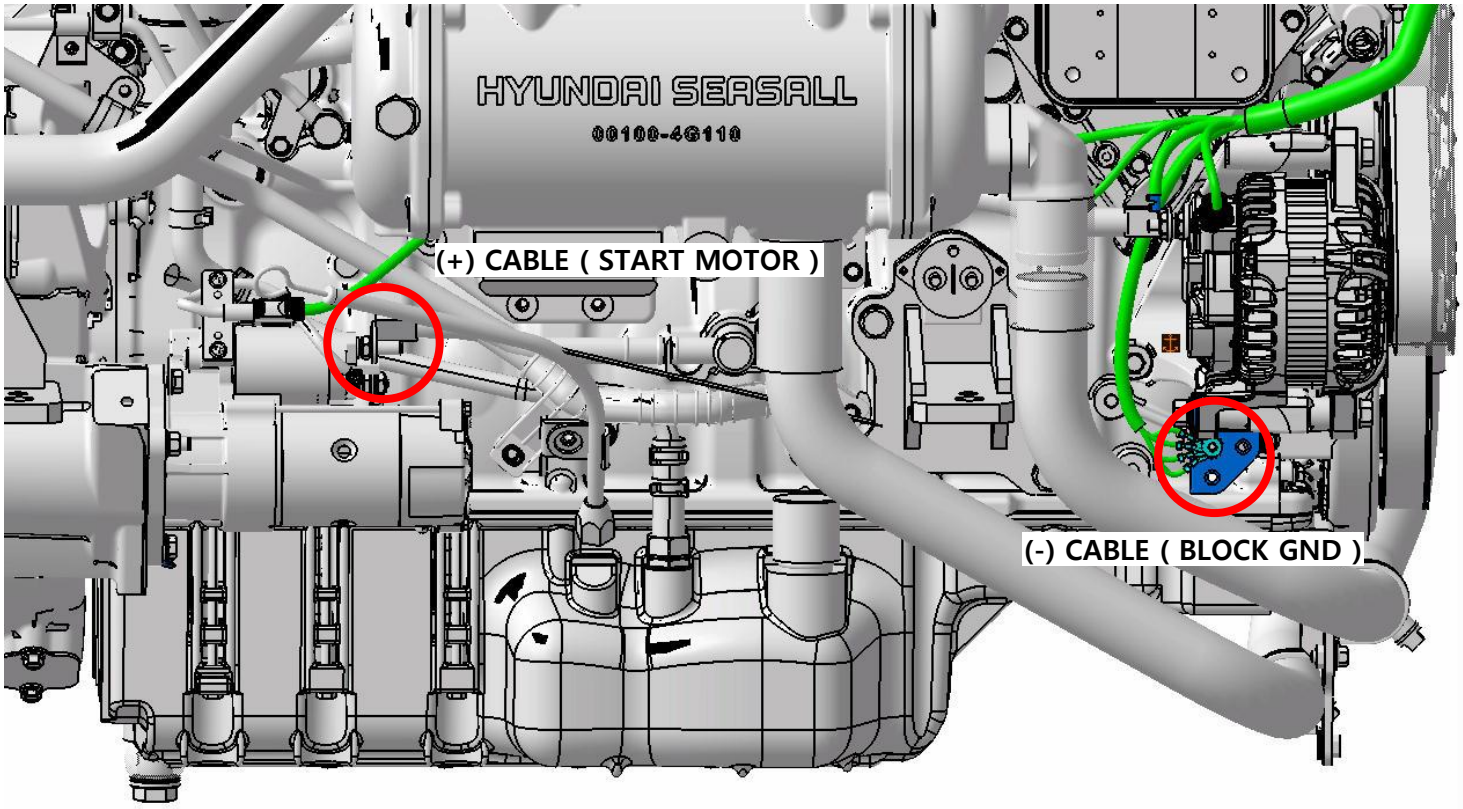


1 Cylinder block
2 Cylinder head
3 Oil filter
4 Oil cooler

CHAPTER 7
ELECTRICAL SYSTEM

BATTERY CABLE CONNECTIONS

1) The cross-section of the battery cables should be at least 40mm^2 and no longer than 4m.
2) If the cable is longer than 4m, the cross-section should be at least 50mm^2.
3) Recommended battery capacity is over 100 amperes.
4) Connect the battery (+) cable to the starter motor.
5) Connect the battery (-) cable to system ground (engine block).
6) Battery cables should be clean and tightly connected.

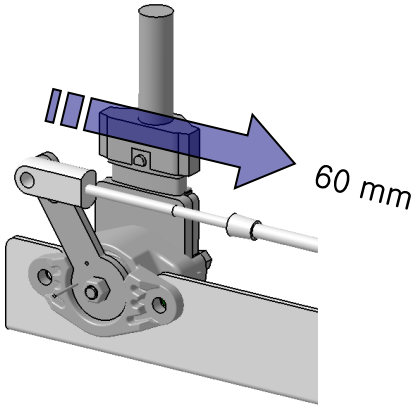


CAUTION

DO NOT TOUCH OR REMOVE ELECTRICAL PARTS WHEN STARTING OR DURING OPERATION.
KEEP HANDS, HAIR, AND CLOTHES AWAY FROM THE FLYWHEEL AND OTHER ROTATING PARTS WHILE THE ENGINE IS RUNNING.

ACCELERATION SENSOR AND CONTROL LEVER

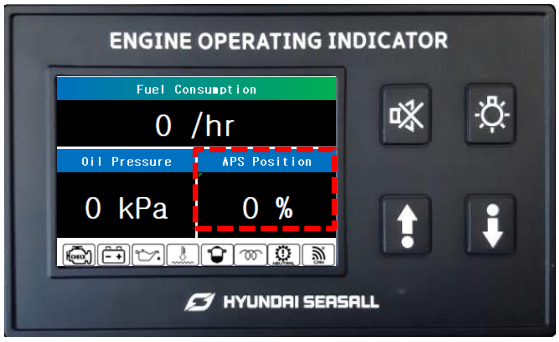
When installing control lever cable to acceleration sensor, be sure that the acceleration sensor lever is fully released to the idle position and fully pulled to the full-load position. The swing distance of lever between idle and full-load position is 40mm.



PROCEDURES FOR CONTROL LEVER INSTALLATION

• Idle position setting

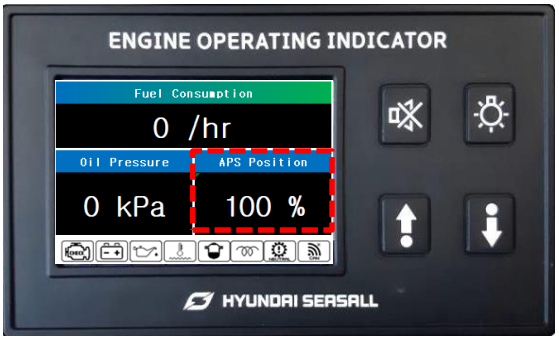
Make sure that the position value indicates 0% in the neutral position.



• Full load position setting

Make sure that the position value indicates full load range of 100% at full forward lever position. If not, disassemble and adjust the base neutral position of the control lever by moving it to the rear until the conditions are met.

• You can see the value of lever position on the LCD display of EOI.



CAUTION

YOU SHOULD PERFORM ABOVE PROCEDURES AFTER CONTROL LEVER INSTALLATATION WITH THE ENGINE NOT RUNNING BUT WITH THE IGNITION KEY ON.

BATTERY CHECKS

Battery inspection is very important in electronically controlled engines. You must check the battery condition regularly.

LOAD TEST

• Connect the load tester clamps to the terminals and proceed with the test as follows.

① If the battery has been charged, remove the surface charge by connecting a 300 ampere load for 15 seconds.

② Connect the voltmeter and apply the specified load.

③ Read the voltage after the load has been applied for 15 seconds.

④ Disconnect the load.

⑤ Compare the voltage reading with the minimum acceptable voltage shown in the table. If the voltage is greater than shown in the table, the battery is good. If the voltage is less than shown in the table, replace the battery.

Voltage	Temperature
18.5 V	20˚C (70˚F) and above
18.4 V	16˚C (60˚F)
18.3 V	10˚C (50˚F)
18.1V	4˚C (40˚F)
17.9 V	-1˚C (30˚F)
17.7 V	-7˚C (20˚F)
17.8 V	-12˚C (10˚F)
17.5 V	-18˚C (0˚F)

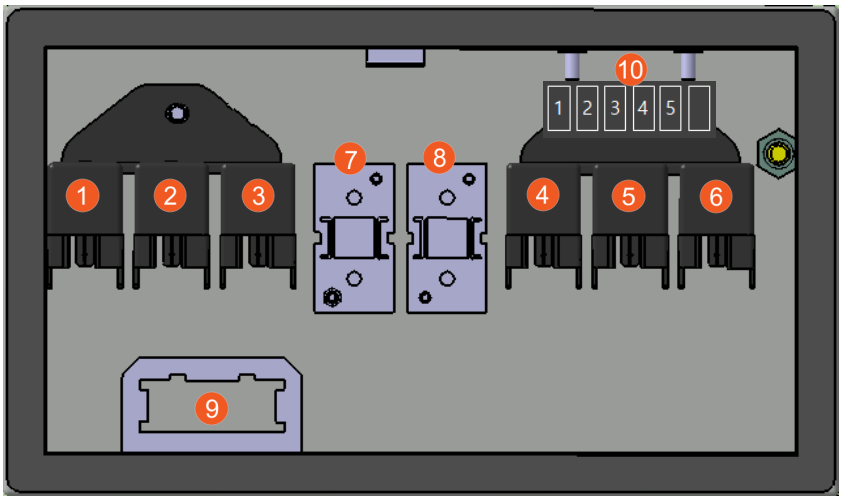
WARNING

BATTERY MUST BE STORED AND WORKED ON IN A SAFE PLACE AWAY FROM CHILDREN AND SOURCES OF IGNITION.
FLUID IN THE BATTERY IS A CORROSIVE ACID AND MUST BE HANDLED WITH CARE. IF SPILLED ON ANY PART OF THE BODY, FLUSH IMMEDIATELY WITH WATER.

CAUTION

DO NOT LOOSEN OR DETACH BATTERY TERMINALS WHILE ENGINE IS RUNNING. DOING SO WILL DAMAGE THE CHARGING SYSTEM AND OTHER ELECTRONIC DEVICES.

JUNCTION BOX (Relays and fuse)



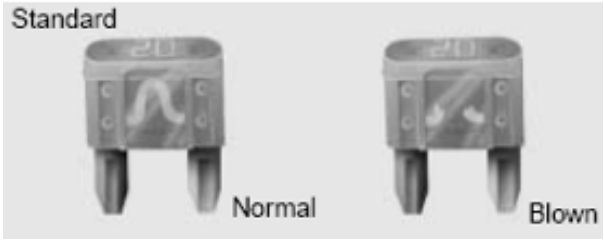
No.	Name
1	Relay1_Spare
2	Glow_sub
3	Main
4	Start
5	Main_filter
6	Oil_pump
7	Midi fuse1 ALT_40A
8	Midi fuse2 ALT_40A
9	Diagnosis port
10	Fuse box

Fuse information

1. Startor_30A
2. Fuel heater_25A
3. Main relay_25A
4. Main filter_20A
5. Ignition_5A

FUSES

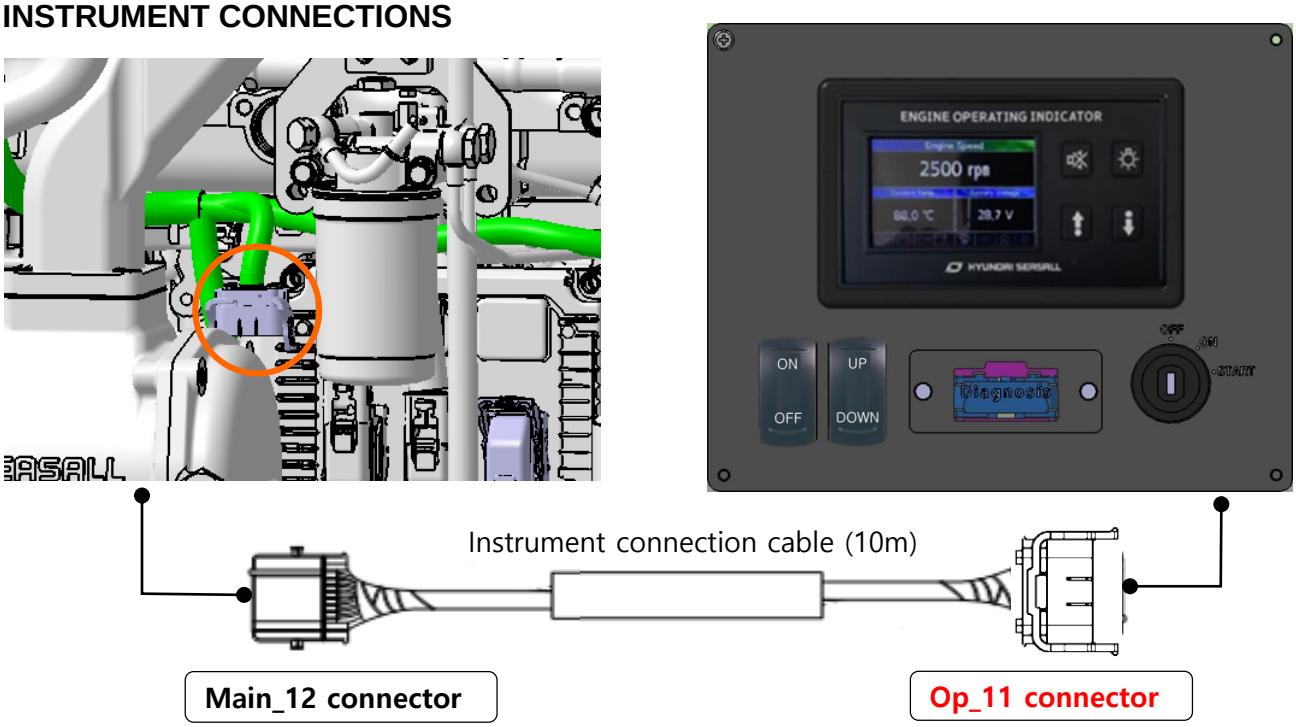
- An engine's electrical system is protected from electrical overload damage by fuses.
- If a fuse has blown, the element inside the fuse will be melted. If the electrical system does not work, first check the fuses in ECU box. Always replace a blown fuse with one of the same rating.
- If the replacement fuse blows, this indicates an electrical problem. Avoid using the system involved and immediately consult a Hyundai SeasAll dealer.

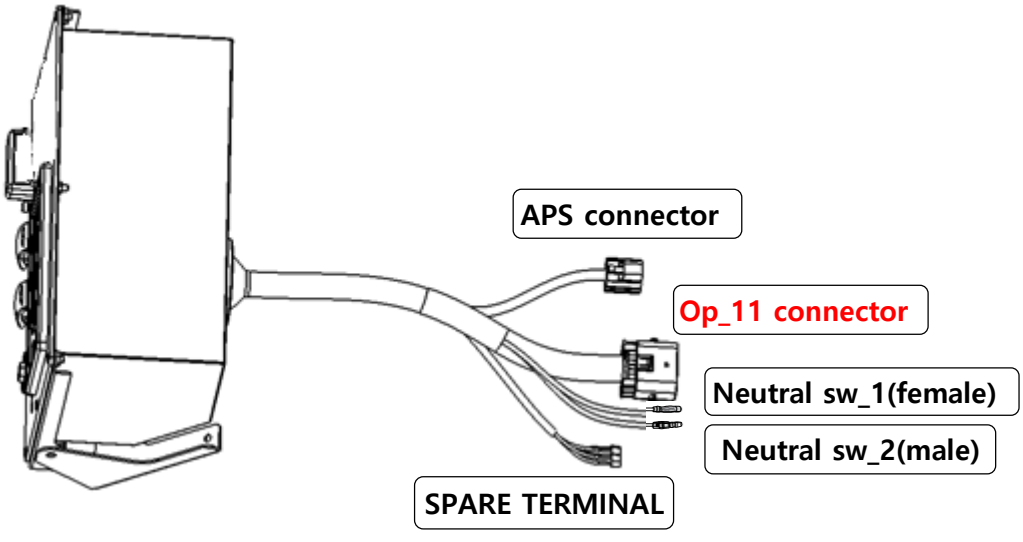


CHAPTER 8
EOI SYSTEM

The Engine Operating Indicator (EOI) system gives you a lot of information about the engine's current operation. You can hear alarm beeps and see information including RPM, coolant temperature, warning lamps, error codes and engine working time. If the switch is on, warning lamps for battery, engine oil, etc. flash. When the engine starts normally, all the lamps turn off. If there is a problem, the specific lamp will come on. In this case, contact your Hyundai SeasAll dealer and have the engine checked as soon as possible.

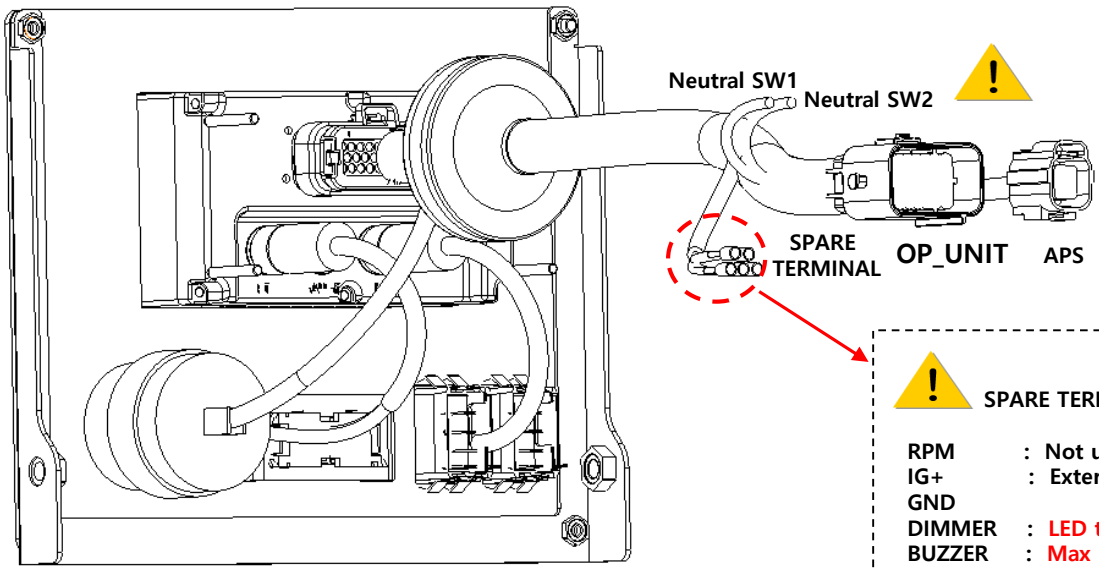
INSTRUMENT CONNECTIONS





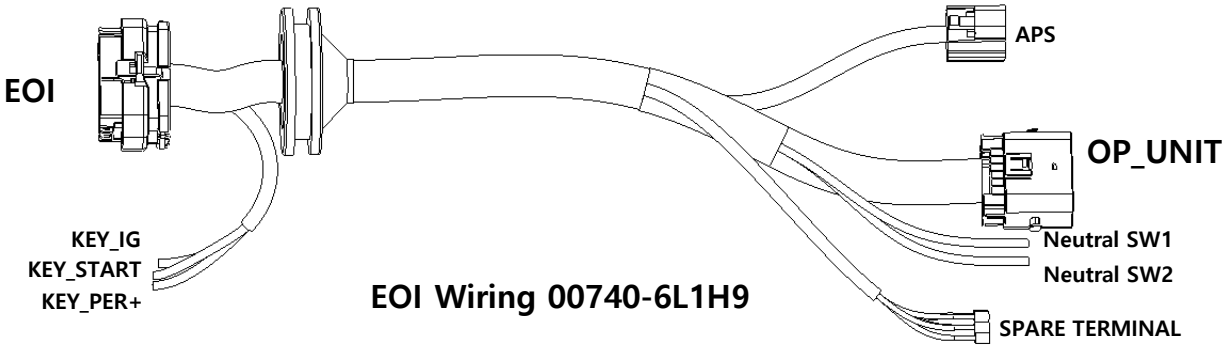
※ If there is no neutral switch, you must connect the neutral switch-1 and neutral switch-2 of the instrument connection cable.

EOI BOX (inside) & HARNESS

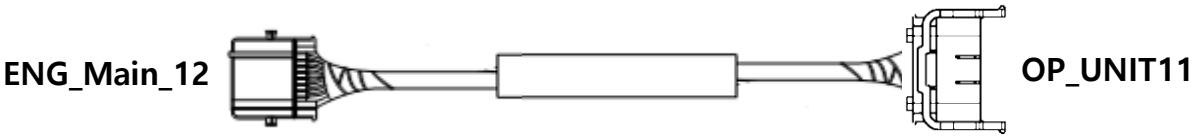


SPARE TERMINAL INFO.

RPM	:	Not use
IG+	:	External gauge max 3A
GND		
DIMMER	:	LED type lamp control
BUZZER	:	Max 500mA



EOI Wiring 00740-6L1H9



CLUSTER Wiring 00740-4H1HG (10m)
EXTN Wiring 00740-4H1HH (5m)

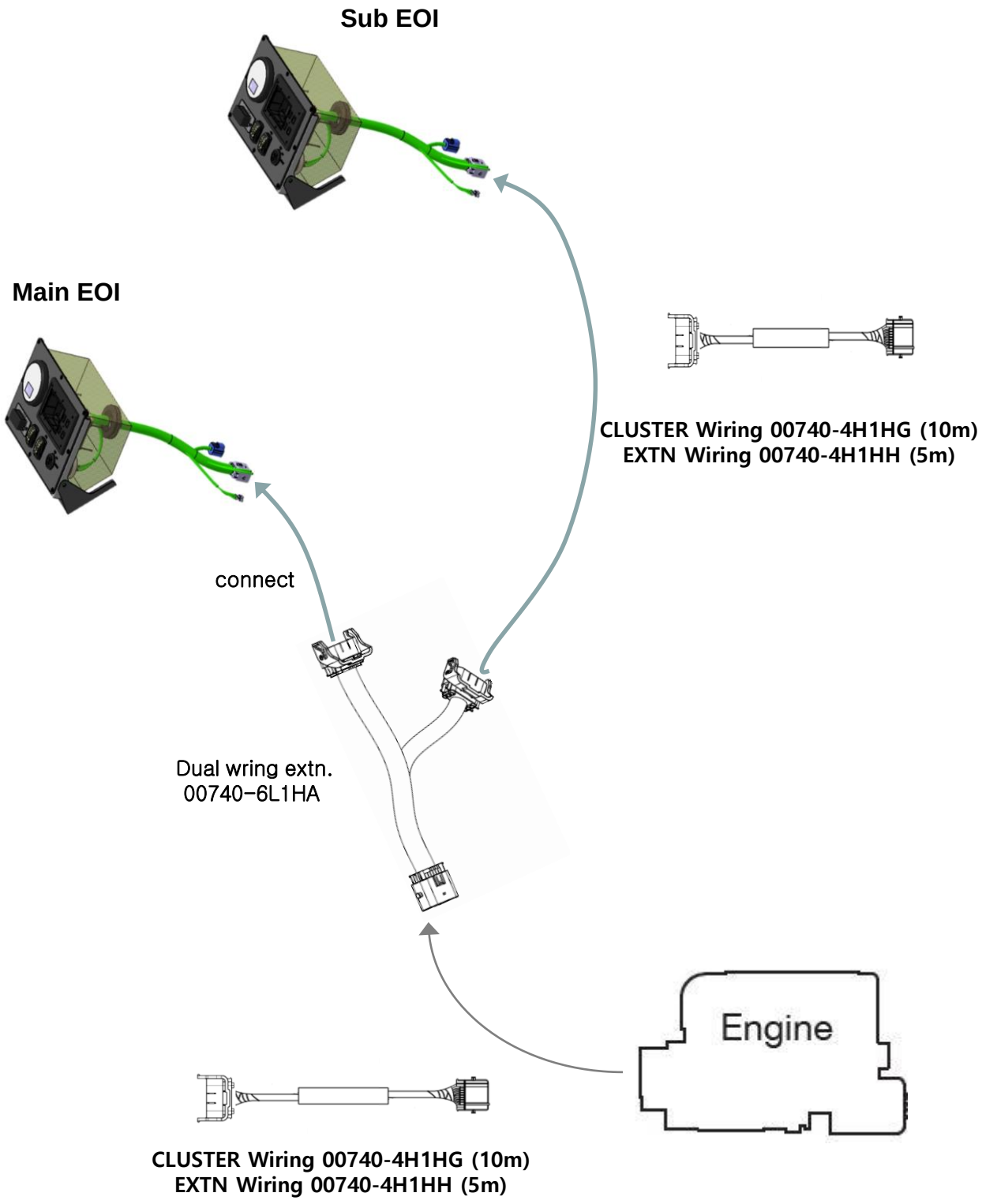
WARNING

LISTEN FOR A CLICK WHEN LOCKING CONNECTORS.
THIS SOUND INDICATES THAT THEY ARE SECURELY LOCKED.

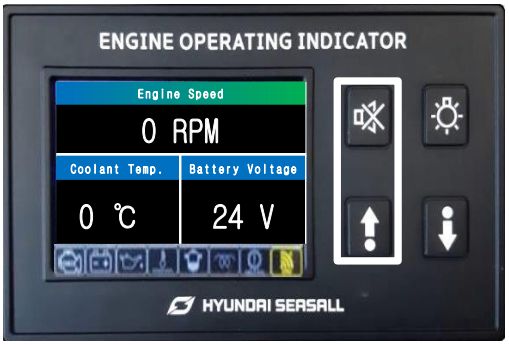
CAUTION

- DO NOT CONNECT EXTRA INSTRUMENTS WHICH DRAW OVER 1 AMPERE. THE EOI WILL BE DAMAGED BY OVERLOAD.
- FOR USER'S SAFETY, ENGINE WILL NOT CRANK OR START IF GEAR POSITION LEVER IS NOT IN NEUTRAL OR NOT CONNECTED TO THE EOI EXTERNAL CONNECTION

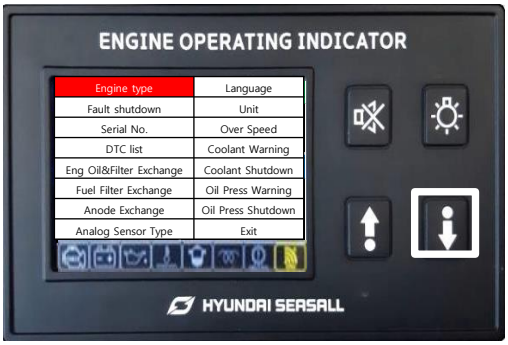
DUAL EOI SYSTEM (G,H,L engine series)



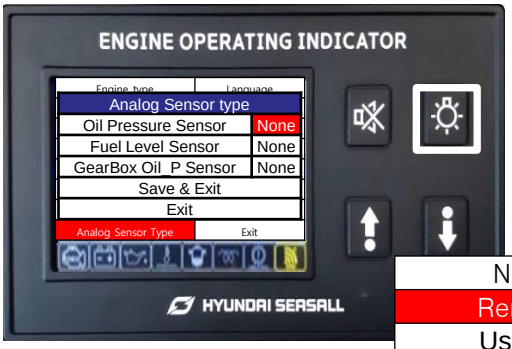
DUAL EOI SYSTEM SETTING GUIDE



+ **3s long button press**

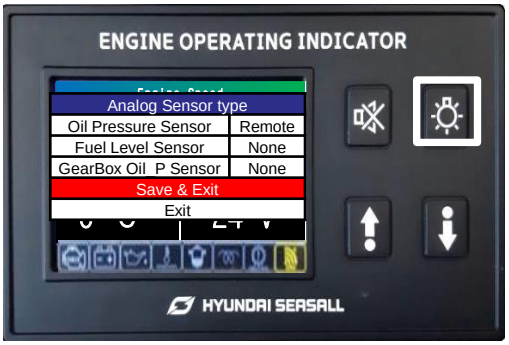


Menu move

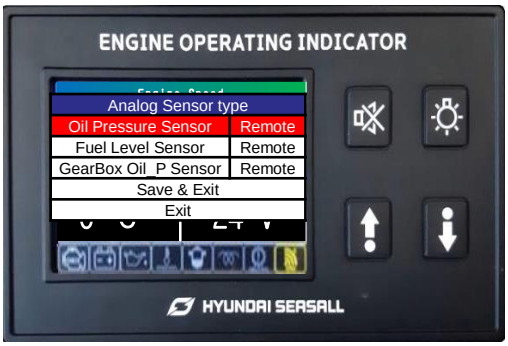


Sensor type change
“ Remote “

None
Remote
User(V)
User(Ω)
0.5~4.5V
VDO_P28
VDO_P10



Save & Exit -> recheck for Analog Sensor type “ Menu “

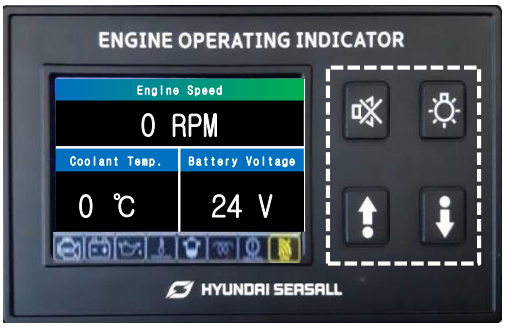


Feul level, GearBox oil_P sensor is automatically changed.

EOI FUNCTION

1. EOI
2. Key switch
3. PTO Up / Down switch
4. PTO / IDLE select switch
5. Diagnosis Port

EOI BUTTON FUNCTION



Symbol color

Y	Red color	Yellow color

Short button press function	
	Mute -> Alarm sound “OFF”
	Page move (page up)
	Dimmer control 4 step / Menu select button
	Page move (Page down)
Long button press (Hot Key function)	
	5s long button -> button sound "ON or OFF"
	5s long button -> Language change "KOREAN or ENGLISH"
	5s long button -> Running Time initialization
	5s long button -> Serial No.
+	3s long button -> Setup menu
+	3s long button -> Time parameter show (rating time)

SWITCHES

1) Function switch - use to change the information display on the LCD.
2) PTO / IDLE change switch – use to enable PTO / IDLE RPM adjustment function
3) UP / DOWN switch – use to raise or lower PTO / IDLE RPM.

PTO MODE

1) Used to adjust the fixed RPM of PTO.
2) When PTO switch is ON, engine speed will be upgraded 700RPM (initial RPM) .
3) You can adjust the RPM using the UP / DOWN switch.
4) When PTO switch is OFF, engine speed will be returned to the value set for IDLE RPM.
5) Adjustable RPM area : 700 RPM ~ 1900 RPM

IDLE ADJUSTMENT MODE (PTO OFF MODE)

1) When the engine is idle, it is adjusted to increase or decrease by the RPM value set with the up and down switches.

HOT KEY BUTTON FUNCTION

5s long button press

Button Sound on/off

5s long button press

Running Time Clear

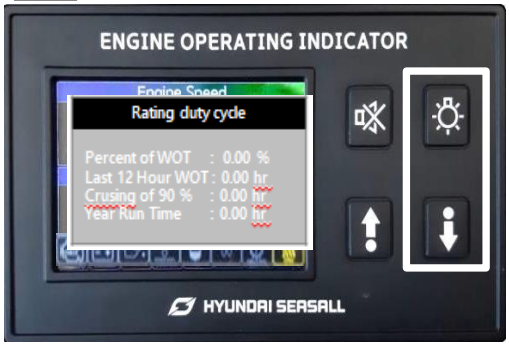
5s long button press

Language support “English or Korean”

5s long button press

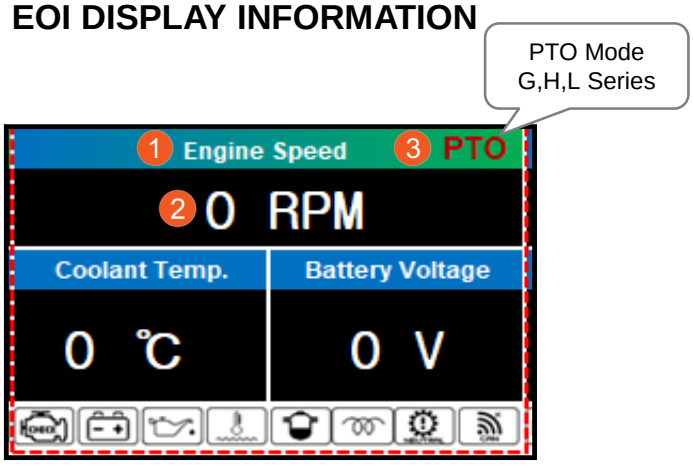
EOI Serial No. check

\+ 3s long button press



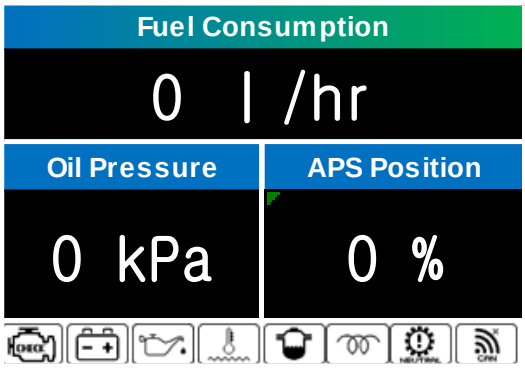
Rating duty cycle time check

EOI DISPLAY INFORMATION

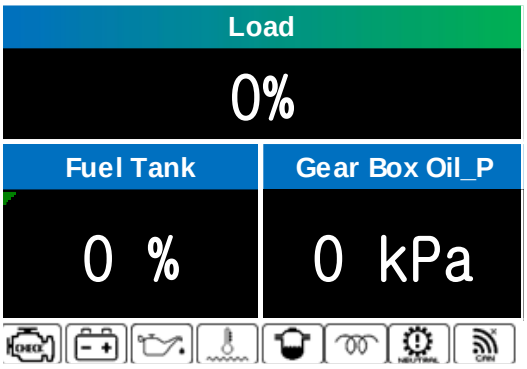


Part	Description
1	Engine parameters name
2	Prameters data value
3	G, H, L Series PTO mode indicate

2page Layout TRIPLE : ECU and sensor data



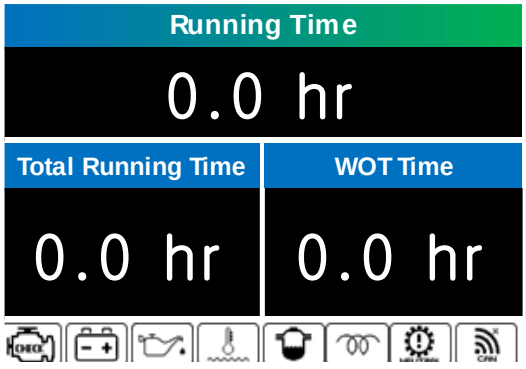
3page Layout TRIPLE: External Sensor data



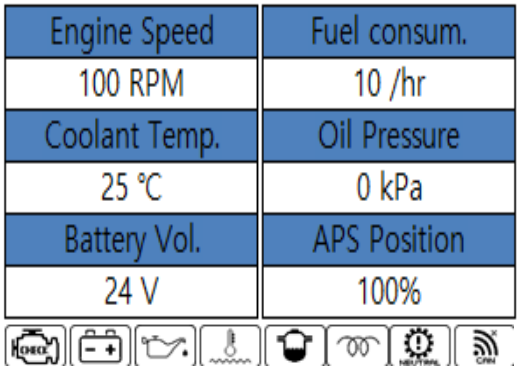
- **Calculated value "Load "**

Fuel consumption / Max fuel consumption *100

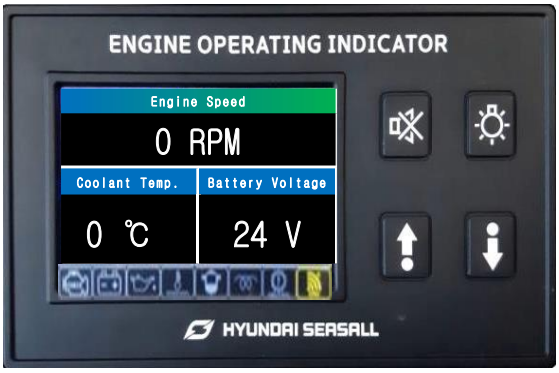
4page Layout TRIPLE: Time parameter



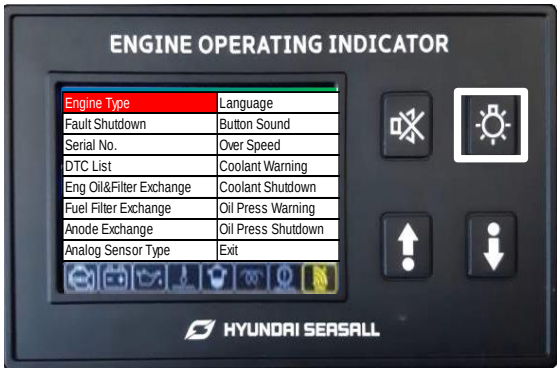
5page Layout SIX : Engine ECU parameter



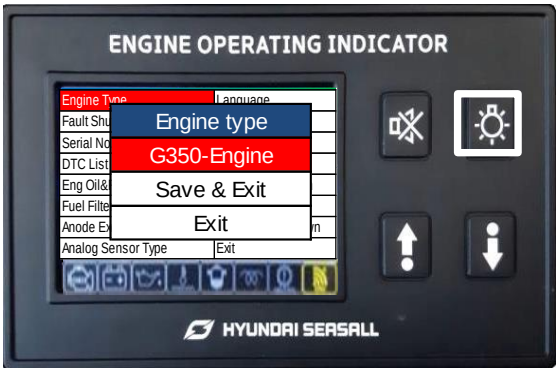
SYSTEM SETTINGS



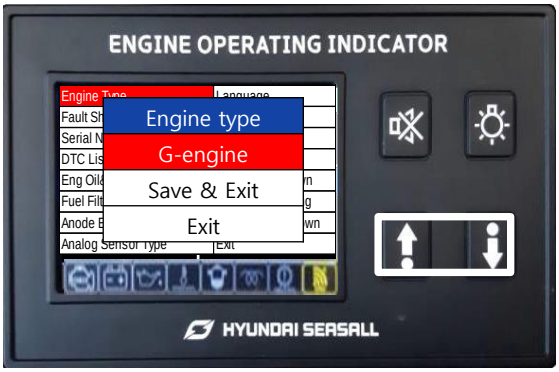
+ 3s long button press



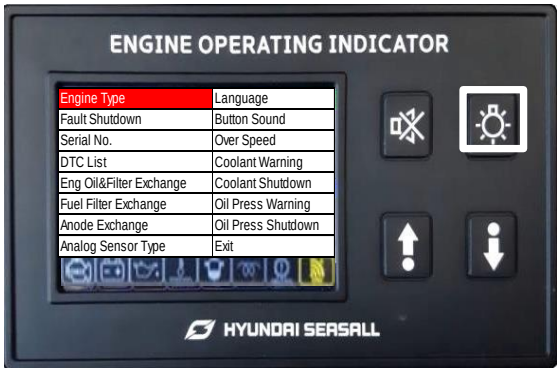
Select Button



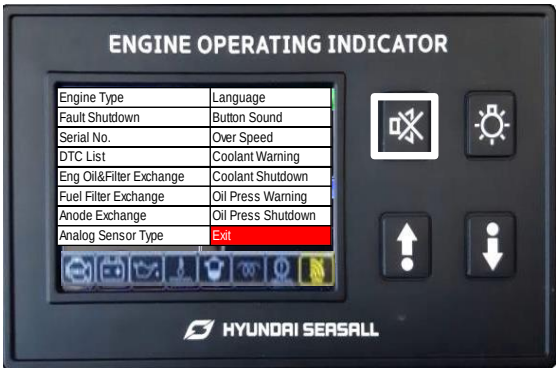
Press the Menu button and select engine series



Page move



Hold down the MENU button to save settings and return to the setup page.



Menu setup page Exit → hotkey function "EXIT"

MENU DESCRIPTION SYSTEM CONFIG

(When selecting the engine type, it is automatically selected.)

Engine type	Fault Shutdown	Serial No	DTC List	Oil&Filter Exchange	
G350	ON		P0001 (Past)	Period Time	250hr
Save & Exit	Save & Exit		P0001 (Currently)	Run Time	0.0hr
Exit	Exit		P0002 (Currently)	Clear Run Time	
				Save & Exit	
				Exit	

Menu select button -> value setting -> Save & Exit

Fuel filter Exchange		Anode Exchange		Analog Sensor type	
Period Time	600hr	Period Time	250hr	Oil Pressure Sensor	0.5~4.5
Run Time	0.0hr	Run Time	0.0hr	Fuel Level Sensor	32~240 Ω
Clear Run Time		Clear Run Time		GearBox Oil_P Sensor	VDO P28
Save & Exit		Save & Exit		Save & Exit	
Exit		Exit		Exit	

** **Refer to chart 1"Service item cycle time clear run time"**

Analog Sensor type	
Oil Pressure Sensor	0.5~4.5 v
Fuel Level Sensor	Level 100
GearBox Oil_P Sensor	VDO P28
Save & Exit	
Exit	

** **Via ECU CAN message " G7 series"**

None
Remote
User(V)
User(Ω)
0.5~4.5V
VDO_P28
VDO_P10

Analog Sensor type	
Oil Pressure Sensor	VDO P10
Fuel Level Sensor	Level 100
GearBox Oil_P Sensor	VDO P28
Save & Exit	
Exit	

** External sensor type user any vendors

Analog Sensor type	
Oil Pressure Sensor	VDO P10
Fuel Level Sensor	240~33 Ω
GearBox Oil_P Sensor	VDO P28
Save & Exit	
Exit	

None
Remote
User(V)
User(Ω)
0.5~4.5V
Level 300 Ω
Level 240~33 Ω
Level 100 Ω

** For example sensor image

fuel range empty "240 Ω" ~ Full "33 Ω" range

Language	Unit	Over Speed	Coolant Warning	Coolant Shutdown
English	Metric	2400 rpm	110 ℃	120 ℃
Save & Exit	Save & Exit	Save & Exit	Save & Exit	Save & Exit
Exit	Exit	Exit	Exit	Exit

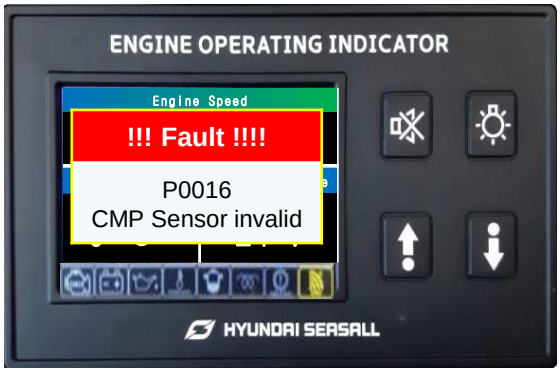
 Hot key 5s push "English" mode

 Hot key 5s push "Sound OFF" mode

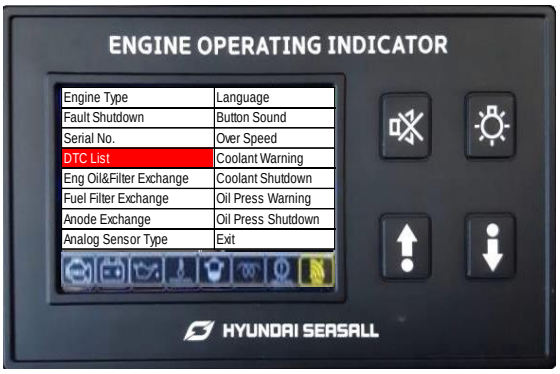
Oil Press Warning	Oil Press Shutdown	Exit
50 kPa	30 kPa	
Save & Exit	Save & Exit	
Exit	Exit	

ALARM MANAGEMENT FAULT DISPLAY AND ALARM

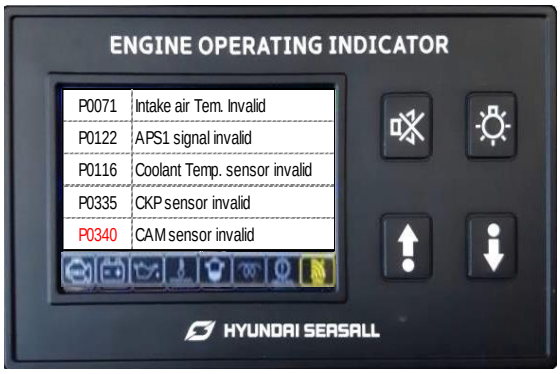
Case 1
Safety Fault list (refer to chart next page)
1. Over speed
2. Water temperature
3. Oil pressure



Case 2
Diagnostic Trouble Code pup-up
(DTC P-CODE information)



Case3 Multi DTC
Diagnostic Trouble Code pup-up
(DTC P-CODE information)



DTC list
Black color P-Code (Past Code)
Red color P-Code (currently DTC)

Case4 Service item alarm

Service item cycle time
refer to chart (next page)

DEFAULT SETTING VALUE OF ENGINE MODEL (CHART 1)

No	Parameter \ Engine type		R	S2	G300	G350	H380	H410	L500	L600	L700
1	Fault shutdown		On	<-	<-	<-	<-	<-	<-	<-	<-
2	Serial No.										
3	DTC List										
4	ENG Oil&Filter Exchange		250	<-	250	<-	<-	<-	<-	<-	<-
5	Fuel Filter Exchange		250	<-	600	<-	<-	<-	<-	<-	<-
6	Anode Exchange		250	<-	250	<-	<-	<-	<-	<-	<-
7	Analog Sensor type	Oil pressure	None	<-	<-	<-	VDO P10	<-	<-	<-	<-
8		Fuel level	None	<-	<-	<-	<-	<-	<-	<-	<-
9		Gear box pressure	None	<-	<-	<-	<-	<-	<-	<-	<-
10	Language		Korean	<-	<-	<-	<-	<-	<-	<-	<-
11	Button sound		On	<-	<-	<-	<-	<-	<-	<-	<-
12	Over speed		4560	<-	3000	3360	2160	2400	2160	2400	2760
13	Coolant warning.		110℃	<-	<-	<-	<-	<-	<-	<-	<-
14	Coolant shutdown		120℃	<-	<-	<-	<-	<-	<-	<-	<-
15	Oil pressure warning		30 kPa	30 kPa	50 kPa	<-	<-	<-	<-	<-	<-
16	Oil pressure shutdown		30 kPa	30 kPa	30 kPa	<-	<-	<-	<-	<-	<-
17	Fuel consumption (max)		39.9	53.8	69.2	77.6	70	81.8	89.2	116.4	143.4

User optional (Fuel level, Gear box pressure sensor type)

** ex) fuel level sensor guide line

empty “240 Ω” ~ full “33 Ω” type

LAMP SYMBOL INFORMATION

Engine check Lamp		Battery charger Lamp		Oil pressure warning Lamp		Water tem. Warning Lamp	
OFF	ON	OFF	ON	OFF	ON	OFF	ON
							

Fuel moisture warning Lamp		Glow Lamp		Neutral s/w Lamp		CAN communication Lamp	
OFF	ON	OFF	ON	OFF	ON	OFF	ON
							


CHECK ENGINE

- This lamp informs you that the engine has a serious problem.
- You can see the DTC on the LCD of the EOI .
- The ECU may limit the engine performance to protect the engine in some cases. You should check the engine at the nearest Hyundai SeasAll dealer immediately.


CHARGING (Red symbol)

- This lamp informs you that charging circuit has a problem (such as with the alternator).
- If this lamp is turned on, you should stop the engine and eliminate electric load, as well as check the alternator, drive belt system and wiring system.


OIL PRESSURE (Red symbol)

- This lamp informs you if the engine oil pressure is low.
- If this lamp is on, you should stop the engine and check the oil level with the oil gauge (dip stick). If the oil is low, refill it. If you refill the oil and the lamp still does not turn off, you should ask your Hyundai SeasAll dealer for maintenance.


COOLANT TEM. (Red symbol)

- This lamp informs you that the engine coolant is abnormally high (110℃ +).
- If the lamp is on, you should stop the engine immediately and check with the nearest Hyundai SeasAll dealer immediately.
- It can be harmful to drive your engine with this lamp on.


WATER SENSOR (Red symbol)

- This lamp informs you to extract water from fuel filter.
- If the lamp is on, you should stop the engine immediately and drain the water in the fuel filter.
- It is recommended to check and drain the water in the fuel filter at regular periods before the lamp turns on.
- It can be harmful to drive your engine with this lamp on.


GLOW LAMP

- Preheating time lamp


NEUTRAL SWITCH STATE

- Neutral switch state lamp
  if neutral s/w turn on, you check NEUTRAL position .


CAN STATE

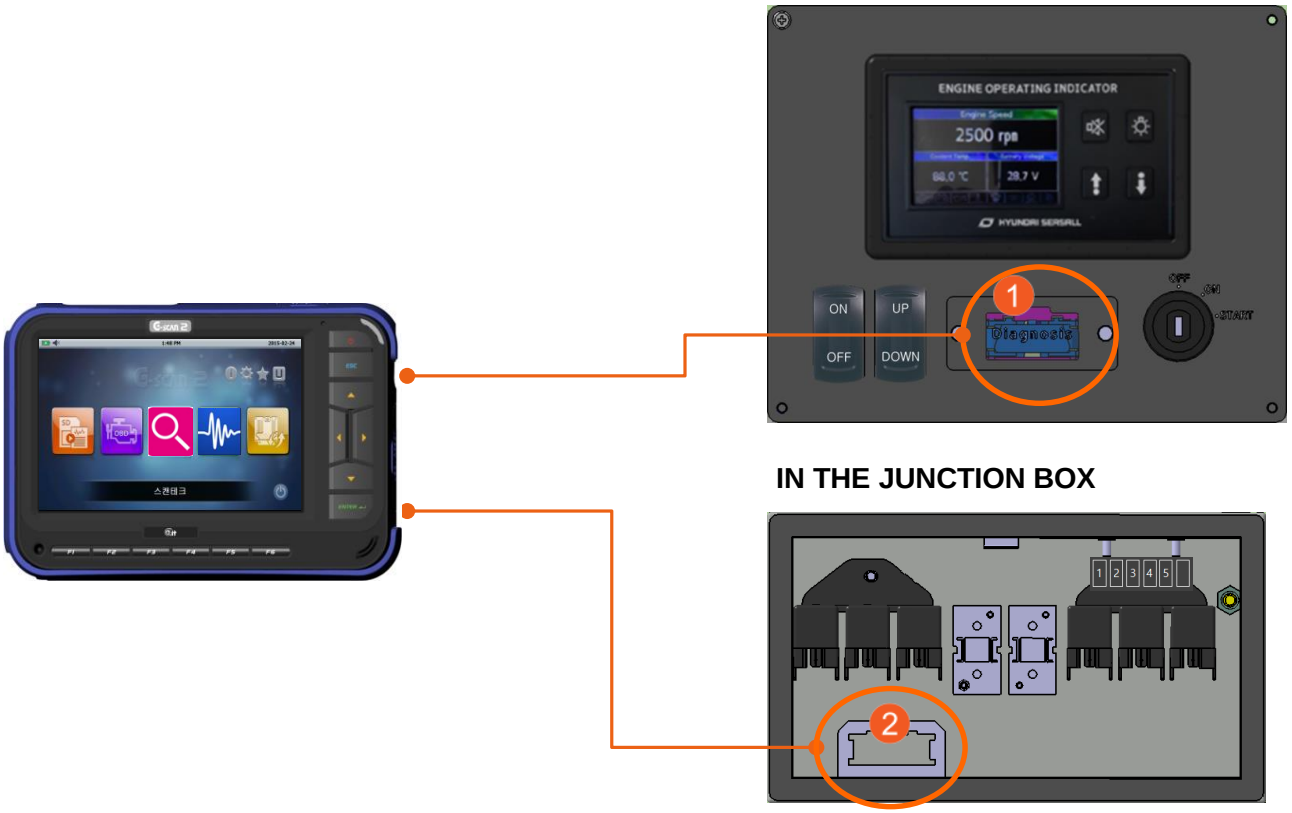
- EOI to ECU CAN communication state
- If this lamp is on, you check EOI to ECU communication line.

G-SCAN

G-scan is a diagnostic tool which can perform the functions of DTC analysis, fault code searching, data analysis and ECU upgrading.

G-SCAN CONNECTIONS

The G-scan can be connected to the diagnostic connector of the EOI (1), as well as to the G-scan connector in the junction box (2).



DIAGNOSTIC TROUBLE CODE (DTC) AND ALARM LIST

If there is a problem in the engine, the EOI display (audible or visible) alarm and related DTC will give you information about it. The DTC display is only for initial assistance and to aid communication with a Hyundai SeasAll dealer if there is an emergency. You should contact your nearest Hyundai SeasAll dealer as soon as possible if a system problem arises.

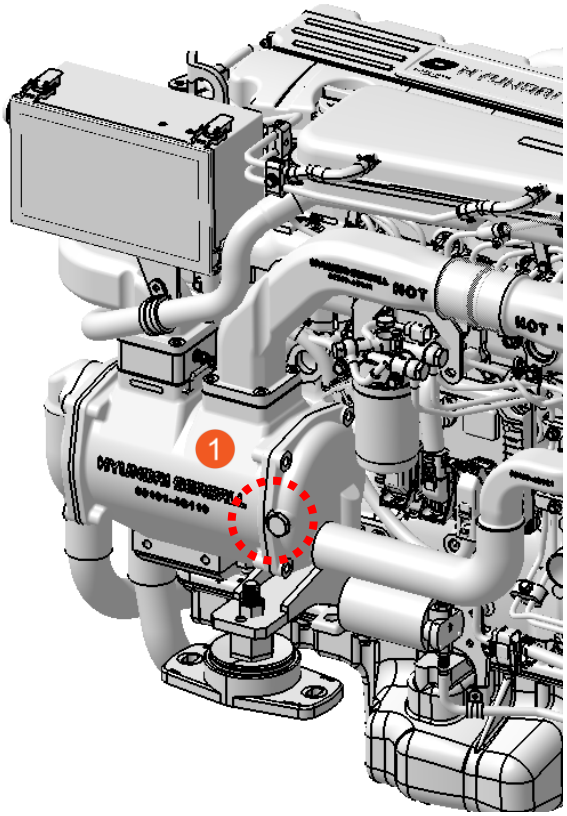
No	ITEM (항목)	DTC CODE (고장코드)	Diagnosis Items DTC NAME (코드 설명)	FAIL SAFE & DEFAULT VALUE (고장발생시 현상)	WARNING LAMP (경고등)	BUZZER (경고음)
1	Intake Temperature (흡기 온도)	P0071	Intake Air Temp. Sensor Signal Invalid (흡기온도 센서 신호 이상)	Sensor default value (센서 기본 값)		
2		P0112	Intake Air Temp. Sensor Signal Low (흡기온도 센서 전압 낮음)			
3		P0113	Intake Air Temp. Sensor Signal High (흡기온도 센서 전압 높음)			
4	Common Rail (커먼레일)	P0088	Common rail pressure exceeds upper limit (연료레일압력 이상 - 시간포함)	Limit rail pressure 70MPa (레일 압력 70MPa 제한)	●	●
5		P0089	PRV Close stuck (PRV 닫힘 고착)			
6		P0090	PRV Open (PRV 단선)		●	●
7		P0091	PRV Short to GND (PRV GND 단락)		●	●
8		P0092	PRV Short to BATT (PRV 배터리 단락)		●	●
9		P009E	PRV Boost time-out (PRV 작동 불량)			
10		P009F	PRV coil short (PRV코일 단락)		●	●
11		P0192	C/Rail Press. Sensor Signal Too Low (연료레일압력 전압 낮음)	Engine Power limit 50% (엔진 출력 50% 제한)	●	●
12		P0193	C/Rail Press. Sensor Signal Too High (연료레일압력 전압 높음)		●	●
13		P0194	C/Rail Press Invalid (연료레일압력 센서 이상)		●	●
14		P0195	PC sensor offset diagnosis (연료레일압력 편차 과다 (수온)		●	●
15		P0196	PC sensor high offset (연료레일압력 순간 편차)	Engine Power limit 30% (엔진 출력 30% 제한)	●	●
16		P1221	C/R press. target press. Invalid (연료레일압력 미달)	Limit rail pressure 60MPa (레일압력 60MPa 제한)	●	●
17		P228D	C/R press. target press Invalid (커먼레일 압력 목표압 초과)	Engine Power limit 50% (엔진 출력 50% 제한)		
18		P1190	Common rail pressure Invalid (실 연료레일압력 초과)			
19		P1191	Multi rail pressure divice invalid (연료분사장치 이중 고장)		●	●
20		P0236	Boost Pressure Sensor Performance Invalid (부스트압 센서 이상)	Default 100kPa (기본 100kPa 고정)		
21		P0237	Boost Pressure Sensor Signal Too Low (부스트압 센서 전압 낮음)			
22		P0238	Boost Pressure Sensor Signal Too High (부스트압 센서 전압 높음)			
23		P0240	Boost Pressuer Sensor Invalid at Idle (부스트 압력 신호 이상 (아이들)	Max torque limit 70% (최대 토크 70% 제한)	●	●
24	Atom Pressure (대기압)	P0106	Atom Press. Sensorl Invalid (대기압 센서 이상)	Sensor default value (센서 기본 값)		
25		P0107	Atom Press. Sensorl Signal too Low (대기압 센서 전압 낮음)			
26		P0108	Atom Press. Sensorl Signal too High (대기압 센서 전압 높음)			
27	Coolant Temperature (냉각수)	P0116	Coolant Temp. Sensor Invalid (냉각수온 센서 신호 이상)			
28		P0117	Coolant Temp. Sensor Signal Too Low (냉각수온 센서 전압 낮음)			
29		P0118	Coolant Temp. Sensor Signal Too high (냉각수온 센서 전압 높음)			
30		P0217	Coolant Temp. exceeds upper limit (냉각수온 과열)	Max torque limit 50% (최대 토크 50% 제한)	●	●
31		P2183	Coolant Temp. Sensor Invalid2 (냉각수온 센서 신호 이상2)			

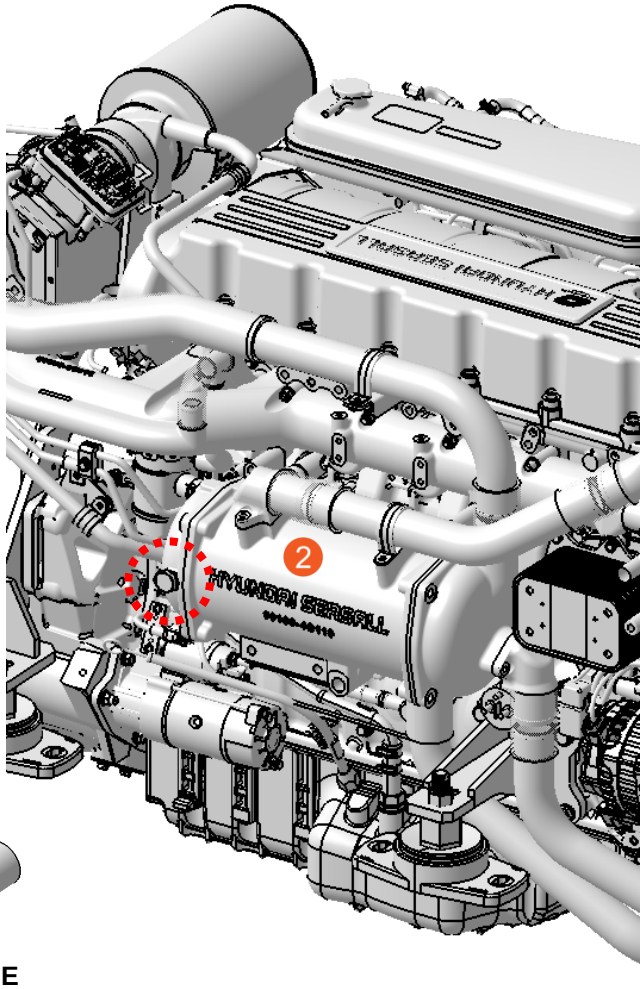
32	APS Sensor (악셀 포지션)	P0122	APS No.1 Signal Too Low (페달위치 센서1 전압 낮음)			
33		P0123	APS No.1 Signal Too High (페달위치 센서1 전압 높음)			
34		P0222	APS Sensor No.2 Signal Too Low (페달위치 센서2 전압 낮음)			
35		P0223	APS Sensor No.2 Signal Too High (페달위치 센서2 전압 높음)			
36		P2121	APS Sensor Signal Invalid (페달 위치 센서 신호 이상)	APS positon 0% fix (악셀 0% 고정)	●	●
37	Fuel Temperature Sensor (연료 온도)	P0181	Fuel Temp.(Pump) Sensor Invalid (연료펌프 연료온도센서 신호 이상)	Sensor default value (센서 기본 값)		
38		P0182	Fuel Temp.(Pump) Sensor Signal Too Low (연료펌프 연료온도센서 전압 낮음)			
39		P0183	Fuel Temp.(Pump) Sensor Signal Too High (연료펌프 연료온도센서 전압 높음)			
40		P0186	Fuel Temp.(Main Filter) Sensor Invalid (메인연료필터 연료온도센서 이상)			
41		P0187	Fuel Temp.(Main Filter) Sensor Signal Too Low (메인연료필터 연료온도센서 전압 낮음)			
42		P0188	Fuel Temp.(Main Filter) Sensor Signal Too High (메인연료필터 연료온도센서 전압 높음)			
43		P0189	Fuel Tem.Sensor Invalid (pump) (연료온도센서(연료펌프) 신호이상)			
44	Injector (인젝터)	P0201	TWV1 output open load Injector coil Invalid (실린더 #1 인젝터 단선/단락)	Engine Power limit 70% (엔진 출력 70% 제한)	●	●
45		P0202	TWV5 output open load Injector coil Invalid (실린더 #5 인젝터 단선/단락)		●	●
46		P0203	TWV3 output open load Injector coil Invalid (실린더 #3 인젝터 단선/단락)		●	●
47		P0204	TWV6 output open load Injector coil Invalid (실린더 #6 인젝터 단선/단락)		●	●
48		P0205	TWV2 output open load Injector coil Invalid (실린더 #2 인젝터 단선/단락)		●	●
49		P0206	TWV4 ooutput open load Injector coil Invalid (실린더 #4 인젝터 단선/단락)		●	●
50		P02EE	TWV1 INJ coil short (실린더 #1 인젝터 코일 단락)		●	●
51		P02EF	TWV2 INJ coil short (실린더 #2 인젝터 코일 단락)		●	●
52		P02F0	TWV3 INJ coil short (실린더 #3 인젝터 코일 단락)		●	●
53		P02F1	TWV4 INJ coil short (실린더 #4 인젝터 코일 단락)		●	●
54		P02F2	TWV5 INJ coil short (실린더 #5 인젝터 코일 단락)		●	●
55		P02F3	TWV6 INJ coil short (실린더 #6 인젝터 코일 단락)		●	●
56		P2146	COM1 output to TWV1,3,5 output Invalid (인젝터그룹1 커먼 회로 이상)	Engine Power limit 70% (엔진 출력 70% 제한)	●	●
57		P2147	COM1 output short to GND (인젝터그룹1 커먼 전압 낮음)		●	●
58		P2148	COM1 output short to BATT (인젝터그룹1 커먼 전압 높음)		●	●
59		P2149	COM2 output to TWV2,3,5 output Invalid (인젝터그룹2 커먼 회로 이상)		●	●
60		P2150	COM1 output short to GND (인젝터그룹2 커먼 전압 낮음)		●	●
61		P2151	COM1 output short to BATT (인젝터그룹2 커먼 전압 높음)		●	●
62		P2A12	TWV1 boost time-out (실린더 #1 인젝터 분사 불량)		●	●
63		P2A14	TWV2 boost time-out (실린더 #2 인젝터 분사 불량)		●	●
64		P2A16	TWV3 boost time-out (실린더 #3 인젝터 분사 불량)		●	●
65		P2A1C	TWV4 boost time-out (실린더 #4 인젝터 분사 불량)		●	●
66		P2A1E	TWV5 boost time-out (실린더 #5 인젝터 분사 불량)		●	●
67		P2A20	TWV6 boost time-out (실린더 #6 인젝터 분사 불량)		●	●

68	CAM & CRANK Sensor (캠 & 크랭크)	P0335	Crank Sensor Invalid (크랭크샤프트센서 이상)		●	●
69		P0336	Crankshaft Position Sensor Performance (크랭크샤프트센서 미 인식)		●	●
70		P0340	Cam Sensor Inavalid (캠포지션 센서 이상)		●	●
71		P0341	Camshaft Position Sensor Performance (캠포지션센서 미인식)		●	●
72		P034A	Ckp and Cam sensor synchronous error (캠&크랭크 동기화 에러)			
73		P0505	Idle speed failure (아이들 제어 실패)			
74	System (시스템)	P0512	Starer Switch Short to BATT (스타터스위치 BATT 단락)		●	●
75		P0615	Starter relay Invalid (스타터 릴레이 BATT 단락)			
76		P0522	OIL pressure sensor Inavalid (오일 압력 센서 이상)			
77		P0523	OIL pressure sensor short to GND (오일 압력 센서 단락)			
78		P0524	OIL pressure low (오일 압력 낮음)			
79		P0541	Air Heater Monitor system failure (에어히터 모니터링 전압 낮음)		●	●
80		P0542	Air Heater Monitor system failure (에어히터 모니터링 전압 높음)		●	●
81		P0562	Battery Voltage Too Low (시스템 전압 낮음)			
82		P0563	Battery Voltage Too high (시스템 전압 높음)		●	●
83		P1383	Glow Relay Output Invalid (에어히터 릴레이 이상)		●	●
84		P1384	Glow Relay Output Short to GND (에어히터 릴레이 GND 단락)		●	●
85		P1616	Main relay Invalid (메인릴레이 이상)		●	●
86		P2503	Charging system Invalid (충전시스템 전압 낮음)	Rail pressure limit 70MPa (레일 압력 70MPa 제한)	●	●
87		P2504	Charging system Invalid (충전시스템 전압 높음)	Max torque limit 70% (최대 토크 70% 제한)	●	●
88		P26E4	Starter relay Invalid (스타터 릴레이 단선/GND 단락)			
89	ECU Communication & CAN (ECU 통신 & CAN)	P009C	ECU Communication Failuer (ECU내부 IC칩#1 통신 고장)			
90		P009D	ECU Communication Failuer (ECU내부 IC칩#2 통신 고장)			
91		P0601	check sum error - Flash area of Main-CPU (ECU 메인 CPU 체크섬 에러)		●	●
92		P0602	QR data is not written (QR 코드 미입력)		●	●
93		P0603	QR data Error (QR 코드 오류)		●	●
94		P0604	QR definition error (QR 코드 이상)		●	●
95		P0606	CPU fault - Main CPU fault (ECU 메인 CPU 이상)		●	●
96		P0607	CPU fault - Sub CPU fault (ECU 서브 CPU 이상)		●	●
97		P060C	CRC error - Flash area of Main-CPU (ECU 메인 CPU 이상)		●	●
98		P062D	VDIC2#1 internal clock Failuer (ECU내부 IC칩#1 ,2 고장)	Engine stop (엔진 정지)		
99		P062E	VDIC2#2 internal clock Failuer (ECU내부 IC칩#1 ,2 고장)			
100		P0642	5V Reference1 Circuit Low (센서 공급 전압1 이상)		●	●
101		P0643	5V Reference1 Circuit High (센서 공급 전압1 이상)		●	●
102		P0652	5V Reference2 Circuit Low (센서 공급 전압2 이상)		●	●
103		P0653	5V Reference2 Circuit High (센서 공급 전압2 이상)		●	●
104		P0658	5V Reference4 Circuit Low (센서 공급 전압4 이상)		●	●
105		P0659	5V Reference4 Circuit High (센서 공급 전압4 이상)		●	●
106		P069E	check sum erroro of Sub-CPU (ECU 서브 체크섬 에러)	Max torque limit 50% (최대 토크 50% 제한)	●	●
107		P0605	ECU sub CPU sw ver. Invalid (ECU 서브 CPU SW버전 불일치 에러)		●	●

108	High Pressure Pump (고압 펌프)	P0627	SCV(+) (-) Invalid (SCV 회로 BATT, GND 단락/단선)	Engine Power limit 70% (엔진 출력 70% 제한)	●	●
109		P0629	SCV(+) (-) Invalid (SCV 회로 BATT 단락)		●	●
110		P1217	Supply pump protection (고압펌프 내부 돌입)			
111		P1218	Supply pump exchange (고압펌프 이상작동)			
112	Turbo (터보)	P2261	SRA internal fault (터보제어기 내부 이상)	Max torque limit 70% (최대 토크 70% 제한)	●	●
113		P2262	Turbo boost pressure Too Low (터보 부스트 압력 낮음)		●	●
114		P2264	Turbo boost pressure Too high (터보부스트 압력 높음)			
115		P2265	Turbo boost pressure Invalid (터보 부스트 압력 이상)	Max torque limit 70% (최대 토크 70% 제한)	●	●
116		P226C	SRA slow response (터보 응답 느림)		●	●
117		P22C9	SRA Span learn failer (터보 밸브 학습 실패)		●	●
118		P3508	SRA Ignition voltage fault (터보 제어기 전압 이상)		●	●
119		P3510	SRA Temp. worning or fault (터보 제어기 내부 온도 이상)		●	●
120		P22C8	SRA valve invalid (터보 밸브 고착)		●	●
121	CAN Communication (CAN 통신)	U0001	CAN1 Node Error (CAN 라인 1 이상)		●	●
122		U0010	CAN2 Node Error (CAN 라인 2 이상)	Max torque limit 70% (최대 토크 70% 제한)	●	●
123		U0019	CAN3 Node Error (CAN 라인 3 이상)		●	●
124		U010C	SRA Can error (터보 제어기 통신 에러)		●	●
125		U0133	Turbo CAN Invalid (터보 CAN 이상)		●	●

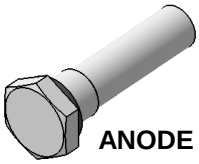
CHAPTER 9
ANTI CORROSION SYSTEM





1 **INTERCOOLER**

2 **HEAT EXCHANGER**



ANODE

1) ANODE for corrosion protection. Must be replaced every 250 hours.

2) When used in salt or brackish water, regular inspection is required. It is strongly recommended to replace the sacrificial anode at the start of each season.

CAUTION

- **DON'T OPERATE ENGINE WITHOUT ANODES. IT IS HARMFUL TO YOUR ENGINE.**
- **CLOSE THE SEAWATER VALVE BEFORE REMOVING ANODES.**
- **MAKE SURE TO CHECK THE ANODE PLUG IN ACCORDANCE WITH THIS MANUAL.**
- **DON'T LOOSEN COOLANT DRAIN PLUG.**

CHAPTER 10
ENGINE STORAGE

The major consideration in preparing your engine for storage is to protect it from rust, corrosion, and damage caused by freezing of trapped water.

The following storage procedures should be followed to prepare your engine for out-of-season storage or prolonged storage (two months or longer and/or winter storage) :

CHECK LIST
• Visual inspection for leaks and damage
• Change engine oil and oil filter
• Replace fuel filter
• Check air filter element and clean if necessary
• Check engine coolant level and top up if necessary
• Check impeller and replace if necessary
• Check anodes and replace if necessary
• Clean the engine
• Flush and drain seawater cooling system
• Fill fuel tank until full and inspect the fuel system
• Remove the battery and store in a cool, dry place

CAUTION

FOR WINTER STORAGE, SEAWATER SHOULD BE DRAINED FULLY BY LOOSENING THE HEAT EXCHANGER ANODE.
REFER TO CHAPTER 9.

WINTER STORAGE

Protect your engine from freezing and corrosion damage by following the procedures indicated below.

• LUBRICATION SYSTEM

-. Start the engine and allow it to reach normal operating temperature.

-. Turn off the engine. Drain the engine oil using the oil extraction pump. If the oil extraction pump is not installed, drain oil by removing the oil pan drain plug.

-. Change the oil and oil filter and refill the engine with new oil according to technical maintenance specifications.

-. Check the oil level on the dipstick and if necessary add more oil to reach the correct oil level.

• FUEL SYSTEM

-. Check for fuel leaks where the line from the fuel tank connects to the engine. Tighten or replace the connection if necessary.

-. Close the fuel valve. Clean the water separating fuel filter. Replace the filter element.

-. After replacing the filter element, open the fuel valve to fill the entire fuel circulation line.

-. Fill the fuel tank with fresh fuel to avoid condensation in the fuel tank.

-. Close the fuel valve.

• COOLING SYSTEM

-. Close the water valve.

-. Connect a freshwater source to the seawater inlet. Run the engine at idle to flush all seawater out of the system.

-.Fill the cooling system (seawater side) with a 30~50% solution of anti-freeze. Circulate into the seawater system by running the engine.

• COOLING SYSTEM

-. If the seawater system is not filled with an antifreeze solution as per the instructions above, completely drain the seawater system by removing the heat exchanger and intercooler anodes.

-. Remove the sea water pump impeller and store in a dark place out of sunlight.

-. Check all connections with inlet hoses. Tighten or replace the connection if necessary.

-. Check the cooling system (heat exchanger, intercooler, thermostat, hoses, clamps, etc.) every 500 hours or every two years, whichever comes first. Replace any worn components.

• INTAKE SYSTEM

-. Remove the air filter from engine.

-. Clean the air filter.

-. Intake part should be kept hermetically sealed.

• ELECTRICAL SYSTEM

-. Disconnect the battery (-) cable to system ground

-. Disconnect the battery (+) cable.

-. Clean the battery cable and terminals.

-. Coat the terminal connection with a battery terminal anti-corrosion agent.

-. Whenever the battery will be stored for an extended period of time, be sure the cells are full of battery is fully charged.

LONG TERM STORAGE

These instructions must be followed in order to obtain warranty coverage for long term storage engines. These procedures are intended to prevent oxidation and deterioration of engine and fuel system components.

Engines stored for more than one (1) year must be inspected properly to ensure that they are in good condition.

- Engines used within one (1) year from factory release.
  - No specific action is required.

- Engines stocked more than one (1) year from factory release(To check every 6 months)
  1) Carefully inspect & check all parts for damage and/or corrosion.
  2) The coolant must be replaced for long term storage. *Use 50% Glycol containing anti-corrosion additives and 50% distilled water.*
  3) Check *all anodes* and replace if required.
  4) Storage conditions should be between 15~30ºC and less than 50% relative humidity.

- Engines for use after long term storage and/or long term inactivity.
  1) Carefully inspect and check all parts for damage and/or corrosion.
  2) The coolant and lubricants must be replaced before using the engine.
  3) The oil filter and fuel filter must be replaced before using the engine.
  4) The seawater pump impeller must be replaced before using the engine.
  5) The thermostat and anodes must be checked and replaced if necessary
  6) Crank the engine without starting to lubricate the inside of the engine. Please disconnect the Crank Position Sensor to prevent engine start while lubricating the engine.
  7) Run the engine 10 minutes at idle RPM with no load before putting into service.
  8) Refer to Pre-Delivery checklist to inspect entire engine condition and installation.

CHAPTER 11
MAINTENANCE

THE INITIAL RUNNING CHECK

BEFORE THE WATER TEST

	Y	N
Seawater inlet valve open		
Engine coolant level		
Cooling system hose clamps tight		
Engine oil level		
Power steering fluid level		
Drive belt tension		
All electrical connections tight		
EOI warning system operation		
Battery fully charged and secured		
All fuel connections tight		
Exhaust system hose clamps tight		
Engine mounts tight		
Engine alignment		
Correct propeller rotation (Installed and torqued)		
Engine coolant and oil drain plug closed		
Throttle, shift and steering system fasteners tightened properly		
Boat drain plug in place (Check before putting boat in water)		

ON THE WATER TEST

	Y	N
Seawater pump operating properly		
Seawater strainer correctly mounted , Clean and tightly closed		
Engine alignment (propulsion only)		
Fuel leaks		
Oil leaks		
Coolant leaks		
Water leaks		
Exhaust leaks and color		
EOI and gauges operating properly		
Engine emergency stop switch operating properly		
Idle RPM, within specifications		
WOT RPM, within specifications (in forward gear)		

PROPULSION CHECKS

Steering operation throughout full range		
Forward - Neutral - Reverse gear proper operation		
Drive line components properly torqued		
Propeller nut torque		

AFTER THE WATER TEST

Fuel, oil, coolant, water and fluid – no leaks		
Oil and fluid levels		
Propeller nut torque		

MAINTENANCE SCHEDULE

○ : Check/Clean, ◇ : Check (Replace if Necessary), ● : Replace

	Daily	250h	600h	1000h	Minimun 1 y /Necessary
Check coolant level and check for leaks [1)]	○				
Clean Seawater strainer	○				
Check for Exhaust system leaks	○				
Check for Fuel system leaks	○				
Check the engine oil level and check for leaks	○				
Check the battery operating voltage	○				
Check the oil level and check the steering system for leaks	○				
Check transmission lubrication level and the propulsion system[2)] for leaks	○				
Engine oil and filter[3)]		●			◇
Check the sacrificial anodes[1)] Anti corrosion system		●			◇
Check hose clamps for tightness and corrosion		◇			◇
Check the electrical system for tight connections		◇			◇
Check tightness of the bolts, nuts and other fasteners		◇	●		◇
Fuel filter and water separator		◇	●		◇
Air filter		◇	●		◇
Drive belt			◇		◇
Heat exchanger tube bundle			◇		◇
Intercooler tube bundle			◇		◇
Checking Intercooler automatic drain valve			◇		◇
Replace the seawater pump impeller			◇	●	◇
Turbocharger				◇	◇

1) Replace the coolant every two years.
2) For detailed propulsion system information, refer to the manufacturer's manual.
3) Replace the engine oil after the first 100 hours of operation.

CAUTION

YOU SHOULD EXERCISE THE UTMOST CARE TO PREVENT INJURY TO YOURSELF OR ENGINE DAMAGE WHENEVER PERFORMING ANY MAINTENANCE OPERATIONS.

A/S PART NUMBER

P/N	DESCRIPTION	QTY	Remarks
26325-52003	OIL FILTER ELEMENT SERVICE KIT	1	
31965-52800	FILTER CATRIDGE-FUEL	1	
00360-6L171	ELEMENT-PRIMARY FILTER	1	
00500-4H170	AIR FILTER	1	
00400-4G160	SEAWATER PUMP ASSEMBLY	1	
00400-4G090	IMPELLER KIT	1	
00400-4G098	MINOR KIT-SEAWATER PUMP	1	
00400-4G099	MAJOR KIT-SEAWATER PUMP	1	
00100-4H102	ANODE	2	
00300-1A004	ENGINE OIL (GENUINE ORIGINAL EQUIPMENT CI-4 , 4L)	6	
25210-52000	V-RIBBED BELT	1	

MAINTENANCE LOG

DATE	MAINTENANCE PERFORMED	ENGINE HOURS

CHAPTER 12
TROUBLESHOOTING GUIDE

■ Starter motor does not crank the engine

Possible Causes	
•Engine stop switch is not in the "ON" position (Switch is pressed)	•Engine is not shifted to neutral position
•Weak battery or battery connections are loose or corroded	•Starter motor solenoid or slave solenoid failure
•Ignition key switch failure	
•Wiring or electrical connection fault	•Defective ECU

■ Engine cranks but does not start

Possible Causes	
•Weak battery or bad starter motor	•Low fuel pressure
•No fuel	•Low compression pressure
•ECU not functioning	•Crank position sensor not functioning
•Incorrect starting procedure	•Fuel is not reaching the engine
•Faulty fuel filter or electric fuel pump	•Bad fuel quality or water in fuel
•Faulty fuse	•Faulty injector

■ Engine starts with difficulty or starts and stalls

Possible Causes	
•Low fuel pressure in fuel rail	•Faulty alternator or voltage regulator
•Leakage in high pressure fuel circuit	•No engine coolant temperature sensor signal
•Faulty fuse	•Low battery voltage
•No rail pressure sensor signal	•Low compression pressure
•Oil level too high or too low	•Clogged fuel filter
•ECU program error or hardware fault	

■ Engine idle is rough

Possible Causes	
•No rail pressure sensor signal	•Low compression pressure
•Wiring harness open or poor connection	•Faulty high pressure fuel pump
•Bad fuel quality or water in fuel	•Faulty injector
•Clogged fuel filter / air filter	•Carbon deposit on the injector

■ Engine rattling, noisy engine

Possible Causes	
•Incorrect compensation of individual injectors	•No engine coolant temperature sensor signal
•Low compression pressure	•Clogged injector return line
•No rail pressure sensor signal	•Faulty injector
•Poor injector O-ring	•Carbon deposit on the injector

■ Uneven acceleration / deceleration

Possible Causes	
•Intermittent faulty fuel line connection	•Oil suction
•No rail pressure sensor signal	•ECU program error or hardware fault
•Leakage in intake system	•Damaged turbocharger or leakage in vacuum line
•Clogged fuel filter	•Low compression pressure
•Leakage in high pressure fuel circuit	•Injector needle stuck

■ Engine stops

Possible Causes	
•Out of fuel	•Crank signals missing
•Fuel feed line not connected	•Fuel pressure regulator valve contaminated, stuck, jammed
•Leakage in high pressure fuel circuit	•Rail pressure regulator valve contaminated, stuck, jammed
•Fuel out of specification	•Faulty alternator or voltage regulator
•Bad fuel quality or water in fuel	•Faulty high/low pressure fuel pump
•Clogged low pressure fuel circuit	•ECU program error or hardware fault

■ Performance loss

Possible Causes	
•Incorrect compensation of individual injectors	•Leakage at the injector
•Clogged air filter	•Fuel or intake air temperature too high
•Oil level too high or too low	•Engine coolant temperature too high
•Damaged turbocharger or intake air leakage	•Low compression pressure
•Clogged fuel filter	•Poor valve clearance

CHAPTER 13
WARRANTY

HYUNDAI SEASALL RATING CATEGORIES FOR MARINE ENGINE

S5 : Pleasure Duty
- Full power operation restricted to within 10% of total use period
  * Continuous maximum output restricted to 0.5 hours within 12 hours period
- Cruising speed (RPM) at engine RPM < 90% of rated speed (RPM)
- Operating less than 400 hours per year

S4 : Special Pleasure Duty / Special Light Duty Commercial
- Full power operation restricted to within 10% of total use period
  * Continuous maximum output restricted to 1 hours within 12 hours period
- Cruising speed (RPM) at engine RPM < 90% of rated speed (RPM)
- Operating less than 1,000 hours per year

S3 : Light Duty Commercial
- Full power operation restricted to within 20% of total use period
  * Continuous maximum output restricted to 2 hours within 12 hours period
- Cruising speed (RPM) at engine RPM < 90% of rated speed (RPM)
- Operating less than 1,500 hours per year

S2 : Medium Duty Commercial
- Full power operation restricted to within 30% of total use period
  * Continuous maximum output restricted to 4 hours within 12 hours period
- Cruising speed (RPM) at engine RPM < 90% of rated speed (RPM)
- Operating less than 3,000 hours per year

S1 : Heavy Duty Commercial
-Uninterrupted and unlimited use at full power.

APPLICATION OF WARRANTY COVERAGE

Warranty coverage is available only to retail customers who purchase from a dealer authorized by Hyundai SeasAll to distribute the product in the country in which the sale occurred, and then only after the Hyundai SeasAll specified pre-delivery inspection process is completed and documented. Warranty coverage becomes available upon proper registration of the product by the authorized dealer. Routine maintenance outlined in the Installation and Operation Manual must be performed in a timely fashion in order to obtain warranty coverage. Hyundai SeasAll reserves the right to make any warranty coverage contingent upon proof of proper maintenance.

This warranty may be rendered invalid at Hyundai SeasAll's discretion based upon:
1) Modifications not authorized by Hyundai SeasAll
2) Handling errors
3) Improperly performed Pre-Delivery Inspection
4) Unsuitable fuels, coolant or lubricants
5) Using the engine outside of the specified duty cycle rating
6) Overloading
7) Improperly performed repairs
8) Improper maintenance interval(s)
9) No submitted Pre-Delivery Inspection Card and Warranty Registration Card

DURATION OF WARRANTY

Leisure Applications

Engine	Rating	Base Engine		Extended Major Components (Includes Base Engine Warranty)	
		year	hour	year	hour
U125/D170/ R200/S270	S5	2	1,000	4	2,000
**H380/L500/ G300	S5	2	-	4	5,000

** Operating less than 1,500 hours per year and Full Power operation < 10% of total use period

- Warranty period is limited by Years or Hours whichever occurs first.
- Major Components : Engine Block Casting, Crankshaft Forging, Connecting Rods, Camshaft Forging, Transmission Cover/Housing, Flywheel Housing, Intake Manifold, Fresh Water Pump Housing and Oil Pan.
- Cylinder Liner or Cylinder Bore scratches are not included in extended major part warranty coverage.

Commercial Applications

Engine	Rating	Base Engine		Extended Major Components (Includes Base Engine Warranty)	
		years	hours	years	hours
U125/D170/ R200/S270	S4	1	1,000	3	2,000
D150/S220 G350/L700	S3	1	1,500	3	6,500
H410/H450 L600	S2	1	3,000	3	8,000
G300 H200/H238/H250/ H310/H345/H380/ L200/L310/L380/ L400/L420/L450/ L460/L500/L530	S1	1	5,000	3	10,000
M70/M100/M130 Q280/Q330/Q360					

- Warranty period is limited by Years or Hours whichever occurs first.
- Major Components : Engine Block Casting, Crankshaft Forging, Connecting Rods, Camshaft Forging, Transmission Cover/Housing, Flywheel Housing, Intake Manifold, Fresh Water Pump Housing and Oil Pan.
- Cylinder Liner or Cylinder Bore scratches are not included in extended major part warranty coverage.

Hyundai SeasAll Rating Categories For Marine Auxiliary Engine

(Ratings in accordance with *ISO 8528*)

Standby Power

1) Operating less than 500 hours per year with average 90% load of the declared Standby Power
2) No overload capability is available for this rating.

Prime Power

1) Average power operation is not exceed 70% of the declared Prime Power.
2) A 10% overload is permissible for 1 hour per 12 hours of operation.
3) Maximum prime power shall not exceed 500 hours per year.

Marin Auxiliary Engine

Engine	Rating	Base Engine		Extended Major Components (Included Base Engine Warranty)	
		year	hour	year	Hour
M40G/M55G/M70G H10G L13G	Standby Power	2	1,000	4	3,000
	Prime Power	1	-	3	10,000

Genset

Model		Warranty Classification	
		Prime Power	Standby Power
60 HZ 1,800 RPM 220V * 3P	HSMG107 HSMG380 HSMG500	1year	2 years/ 1000 hours

WARRANTY STARTING DATE

Warranty Begins:

1) When engine is delivered to the first retail purchaser
2) When the engine is first leased or rented
3) When the products reaches the first day of the 7 month after the product has been shipped from Hyundai SeasAll, the warranty date will be started automatically. If you submit the “Pre-Delivery Inspection Card” and “Warranty Registration Card”, the starting date can be changed to the date on your documents.

WARRANTY REGISTRATION

Warranty Registration Card must be submitted to Hyundai SeasAll within 30 days of the Warranty Starting Date. The Warranty Registration Card identifies information on customer and product, models and serial numbers, date of sale, type of use and the selling dealer etc. If the ‘Warranty Registration Card’ and ‘Pre-Delivery Inspection Card’ are not approved or not submitted to Hyundai SeasAll within 30 days from Warranty Starting Date , Hyundai SeasAll reserves the right to decline warranty reimbursement.

TRANSFER OF WARRANTY COVERAGE BETWEEN OWNERS

This limited warranty is transferable to a subsequent purchaser, but only for the remainder of the unused portion of the limited warranty. To transfer the warranty to the subsequent owner, the revised “Warranty Registration Card” and “Pre-Delivery Inspection Card” should be submitted to Hyundai SeasAll’s distributor or dealer. Upon processing the transfer of warranty, Hyundai SeasAll will verify the warranty registration of the new owner.

WHAT HYUNDAI SEASALL WILL DO

Hyundai SeasAll will pay for all parts and labor needed to repair the damage to the product resulting from a defect in materials or factory workmanship.
The warranty does not apply to any damage or defect that is the result of abnormal use or carelessness.
The repair or replacement of parts, or the performance of service under this warranty does not extend the life of this warranty beyond its original expiration date.

OWNER’S OBLIGATIONS

It is the owner’s obligation to install, operate, maintain and care for Hyundai SeasAll engines in accordance with the instructions and requirements stated in the Installation and Operation Manual.
The owner is responsible for providing enough time and cooperation to get the engine repaired by an authorized dealer, and to deliver it to a proper facility for repair.
The owner is responsible for the cost for warranty inspection, including hauling out, launching and transportation.

BUSINESS PARTNER’S OBLIGATIONS

It is Hyundai SeasAll’s Distributor and/or Dealer’s responsibility to support the retail customer with prompt diagnosis and repair whether or not the engine was sold by the servicing dealer or by the Distributor responsible for the territory.
It is Hyundai SeasAll’s Distributor’s responsibility to communicate all warranty issues to the factory in a timely manner so that they can be quickly resolved.

HOW TO OBTAIN WARRANTY COVERAGE

The customer must provide Hyundai SeasAll with a reasonable opportunity to repair the engine, as well as reasonable access to the product for warranty service. Warranty claims shall be made to a Hyundai SeasAll Authorized Repair Facility to service the product. Purchaser shall not, unless requested by Hyundai SeasAll, ship the product or parts of the product directly to Hyundai SeasAll. The warranty registration card is the only valid registration identification and must be presented to the dealer at the time warranty service is requested in order to obtain coverage.

WHAT IS COVERED

Hyundai SeasAll warrants its products to be free of defects in material and workmanship during the warranty period.

LIMITATIONS – EXPENDABLE PARTS

Not included are the following expendable parts:

- Filters : fuel filter, engine oil filter, air filter
- Lubricants : engine oil, coolant, power steering oil.
- Rubber products : seawater pump impeller, rubber hoses, belts, engine coupler, rubber isolation mounts, bellows.
- Gaskets, anodes.

WHAT IS NOT COVERED

- Fuel injector or filter cleaning
- Belt, cable adjustments or lubrication checks made in connection with normal services.
- Damage caused by neglect, lack of maintenance, accidents, abnormal operation, improper installation or service, unapproved modifications or freezing temperatures.
- Haul-out (crane), launching or towing charges, removal and/or replacement of boat partitions or material for necessary access to the product, all related transportation charges and/or travel time, etc.
- All incidental and/or consequential damages (storage charges, telephone or rental charges of any type, inconvenience or loss of time or income) are the owner's responsibility.
- Use of other than Hyundai SeasAll genuine replacement parts when making warranty repairs.
- Participating in or preparing for racing or other competitive activity.
- Water entering the engine via the air inlet filter or exhaust system or submersion. Water in the starter motor.
- Failure of any parts caused by lack of cooling water.
- Damage caused by blockage of the cooling system by foreign matter.
- Use of fuels and lubricants that are not suitable for use with or on the product as specified in the Installation and Operation Manual.
- Normal wear and tear
- Storage damage (partially painting scratch)
- Cost resulting from ineffective or repeated repairs; improper repairs due to misdiagnosis.
- Owner's personal cost (indirect loss) resulting from maintenance

TRANSMISSION AND STERNDRIVE WARRANTIES

Transmissions and drive systems (ZF Marine, Mercury etc.) are covered under separate warranties, provided and serviced by those companies. For information on those warranties, please see the separate booklets included in the original packaging of your Hyundai SeasAll purchase.

NEW THINKING. NEW POSSIBILITIES.
HYUNDAI SEASALL

WARRANTY REGISTRATION CARD

This card is essential for registration of the customer's warranty.
Please fill out the following registration card in English.

Date of sale

Month	Day	Year

If Warranty Transfer , Check box ☐

■OWNER'S INFORMATION

Name or Company		E-Mail Address	
Country		State / Province / City	
Operating Location			

■ DEALER INFORMATION

Dealer / Installer		Distributor Name	
City		E-Mail Address	

■ ENGINE INFORMATION

Number of Engines	Single ☐ Dual ☐

Engine Model		Gear Model	
Engine Serial No.		Gear/Drive Serial No.	
		Transom Serial No.	

Engine Model		Gear Model	
Engine Serial No.		Gear/Drive Serial No.	
		Transom Serial No.	

■ BOAT INFORMATION

REPOWER ☐

Manufacturer		Material	Steel ☐ Alu. ☐ FRP ☐ Wood. ☐		
Model		LOA	ft	Beam	ft
Boat Type		Hull ID			
Type of Use	Pleasure ☐ Commercial ☐	Planning ☐	Semi Disp. ☐	Displacement ☐	

Dealer's Instructions: Dealers must complete this card to register the warranty. Please return the copy to your national Importer/Distributor immediately. Unregistered engines are subject to warranty rejection.

REMARKS

SIGNATURE : _____

ABSOLUTE MARINE POWER
HYUNDAI SEASALL

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