

U.S.C.G. Merchant Marine Exam

DDE – Unlimited HP

Q620 Motor Plants

(Sample Examination)

Choose the best answer to the following Multiple-Choice Questions:

1. You are assigned to a river push boat fitted with main propulsion diesel engines operating on the cycle represented in the polar timing diagram shown in the illustration. What combustion cycle event has a duration of 103o? Illustration MO-0206
- A. Intake
 - B. Compression
 - C. Power
 - D. Exhaust

Correct answer: C

2. Prior to starting the main propulsion diesel engines fitted on your river push boat, the crankcase oil level must be checked. At what checked level would you be required to add make-up oil?
- A. When the oil level drops below the ADD mark on the side of the dipstick marked ENGINE STOPPED and OIL COLD.
 - B. When the oil level drops below the FULL mark on the side of the dipstick marked ENGINE STOPPED and OIL COLD.
 - C. When the oil level drops to between the ADD and FULL marks on the side of the dipstick marked ENGINE STOPPED and OIL COLD.
 - D. When the oil level drops to where it is no longer visible on the side of the dipstick marked ENGINE STOPPED and OIL COLD.

Correct answer: A

3. In preparation for getting a tug-barge unit underway, if enough time has elapsed since the last main engine shutdown, it may be necessary to blow down the engine's cylinders to expel any accumulated water or oil. What statement concerning cylinder blow down is true?
- A. The engine is rolled over with fuel delivery and with the cylinder test valves (indicator cocks) closed.
 - B. The engine is rolled over with no fuel delivery and with the cylinder test valves (indicator cocks) closed.
 - C. The engine is rolled over with fuel delivery and with the cylinder test valves (indicator cocks) open.
 - D. The engine is rolled over with no fuel delivery and with the cylinder test valves (indicator cocks) open.

Correct answer: D

4. You are on a river towboat using main propulsion engines of the type shown in the illustration. What statement represents the procedure for inspection of the lower cylinder liner bore while in place inside the engine? Illustration MO-0227
- A. With the particular piston positioned at BDC and the corresponding oil pan hand hole cover removed, inspect the lower liner bore through the crankcase opening.
 - B. With the particular piston positioned at TDC and the corresponding oil pan hand hole cover removed, inspect the lower liner bore through the crankcase opening.
 - C. With the particular piston positioned at TDC and the corresponding air box hand hole cover removed, inspect the lower liner bore through the crankcase opening.
 - D. With the particular piston positioned at BDC and the corresponding air box hand hole cover removed, inspect the lower liner bore through the crankcase opening.

Correct answer: B

5. You are analyzing the data used for trend analysis for a two-stroke main propulsion diesel engine on your river push boat. Although the engine has yet to experience a safety shutdown on high crankcase pressure, over time the crankcase pressure (which normally runs in a vacuum) has gradually become less negative. Which of the following failures would most likely be responsible for this condition?
- A. Worn piston compression rings
 - B. Dribbling injector needle valve
 - C. Burned cylinder exhaust valve
 - D. Leaking crankcase handhole cover

Correct answer: A

6. When checking the crankcase oil level on an off-line diesel generator set engine on your ship-docking tug, what should be the oil level as indicated on the dipstick?
- A. The actual level is unimportant as long as it is visible on the dipstick.
 - B. The level should be below the ADD mark on the dipstick.
 - C. The level should be well above the FULL mark on the dipstick.
 - D. The level should be between the FULL and ADD marks on the dipstick.

Correct answer: D

7. You are about to check the valve lash adjustment on #1 cylinder's intake and exhaust valves of an auxiliary diesel engine fitted on the ship-docking tug to which you are assigned. You want to adjust the valve lash on both valves without having to reposition the crankshaft between adjustments. What should be the position of #1 piston to insure both the intake and exhaust valves are both in a position to facilitate valve adjustment?
- A. The crankshaft should be barred in the direction of rotation with #1 piston at TDC having just completed an exhaust stroke.
 - B. The crankshaft should be barred in the direction of rotation with #1 piston at BDC having just completed an intake stroke.
 - C. The crankshaft should be barred in the direction of rotation with #1 piston at TDC having just completed a compression stroke.
 - D. The crankshaft should be barred in the direction of rotation with #1 piston at BDC having just completed a power stroke.

Correct answer: C

8. An engine that emits black smoke through the stack may indicate a misfiring cylinder. Assume that the auxiliary diesel engines on your articulated tug-barge unit have a fuel injection system that permits the injectors to be disabled for troubleshooting purposes by loosening the high-pressure fuel injection line fitting at the injector nozzle while the engine is running and noting the response of the engine in terms emission of black smoke. Which of the following statements is true?
- A. After disabling the injector of a given cylinder, if the engine previously producing black smoke now produces a clear stack, this indicates that the cylinder associated with the disabled injector is misfiring.
 - B. After disabling the injector of a given cylinder, if the engine previously producing a clear exhaust now produces black smoke, this indicates that the cylinder associated with the disabled injector is misfiring.
 - C. After disabling the injector of a given cylinder, if the engine previously producing black smoke continues to produce equally dense black smoke, this indicates that the cylinder associated with the disabled injector is misfiring.
 - D. After disabling the injector of a given cylinder, if the engine previously producing black smoke now produces even denser black smoke, this indicates that the cylinder associated with the disabled injector is misfiring.

Correct answer: A

9. An auxiliary diesel engine on your towboat is equipped with an electric starting motor such as is shown in the illustration. For what reason is there a significant gap in distance between the start solenoid plunger (C) and the rod that is used to close the starter motor contacts. Illustration MO-0051
- A. Upon starter solenoid coil energization, this gap delays the closure of the starter motor contacts until after engagement of the pinion to the flywheel ring gear.
 - B. Upon starter solenoid coil energization, this gap prevents chattering and associated arcing of the starter motor contacts.
 - C. Upon starter solenoid coil energization, this gap compensates for starter motor armature reaction to minimize arcing at the brushes.
 - D. Upon starter solenoid coil energization, this gap delays the engagement of the pinion to the flywheel ring gear until after the starter motor contacts close.

Correct answer: A

10. The main propulsion diesel engines used to power the ship-docking tug to which you are assigned are started with vane-type air-starting motors designed to operate at 250 psig. The in-line lubricator should provide 3 drops of oil per cranking minute, as long as the in-line lubricator oil viscosity is as specified. If the start air pressure is within the normal range and the oil viscosity is correct, but the oil injection rate is only 1 drop per minute, what should be done?
- A. The in-line lubricator oil injection metering needle valve should be further opened.
 - B. The starting air pressure supplied to the air-starting motors should be increased.
 - C. The oil in the in-line lubricator should be replaced with oil of lower viscosity than specified.
 - D. The in-line lubricator oil injection metering needle valve should be further closed.

Correct answer: A

11. The main engines on your harbor tug utilize a starting system with two air-start motors similar to that shown in the illustration. Upon pushing the start button, the solenoid air valve energizes open, but the air start relay valve fails to receive pilot air, and thus the starter motors and engine fail to rotate. Which of the listed conditions would most likely be the cause of the failure to start? Illustration MO-0200
- A. The lower pinion fails to engage, which in turn does not allow the upper pinion to engage. Because engagement of both pinions is required to supply air to the air-start motors, the engine does not start.
 - B. The lower pinion fails to retract, which in turn does not allow the upper pinion to retract. Because retraction of both pinions is required to supply air to the air-start motors, the engine does not start.
 - C. The upper pinion fails to retract, which in turn does not allow the lower pinion to retract. Because retraction of both pinions is required to supply air to the air-start motors, the engine does not start.
 - D. The upper pinion fails to engage, which in turn does not allow the lower pinion to engage. Because engagement of both pinions is required to supply air to the air-start motors, the engine does not start.

Correct answer: A

12. A diesel generator set on your salvage tug has a simplex lube oil strainer of the type shown in the illustration, situated on the discharge side of the lube oil pump. At a specified engine rpm and lube oil temperature, you notice that the pressure drop becomes unacceptably high. When you rotate the cleaning handle you notice that it is extremely difficult to rotate. What should be done? Illustration MO-0057
- A. The cleaning handle (A) should be forced to rotate, even if it requires an extender handle to produce greater rotating torque.
 - B. No special consideration need be taken as long as the cleaning handle (A) rotates, even if it rotates with great difficulty.
 - C. After stopping the engine, the drain plug (B) should be removed to drain the accumulated sludge from the strainer sump.
 - D. After stopping the engine, the strainer element should be withdrawn and soaked in solvent to break up the heavy deposits on the disk stack (C).

Correct answer: D

13. When interpreting the engine lube oil supply header pressures for the main engines on your river push boat, what statement is true assuming that the lube oil pump is engine-driven?
- A. As the lube oil temperature increases, the supply header pressure tends to decrease, and as the engine rpm increases, the supply header pressure tends to increase.
 - B. As the lube oil temperature increases, the supply header pressure tends to decrease, and as the engine rpm increases, the supply header pressure tends to decrease.
 - C. As the lube oil temperature increases, the supply header pressure tends to increase, and as the engine rpm increases, the supply header pressure tends to increase.
 - D. As the lube oil temperature increases, the supply header pressure tends to increase, and as the engine rpm increases, the supply header pressure tends to decrease.

Correct answer: A

14. In terms of the diesel fuels burned in auxiliary and main propulsion diesel engines used on board towing vessels, which of the listed fuel properties would be most critical to consider when transferring and forwarding fuel in extremely low ambient temperature conditions?
- A. Ash content
 - B. Flash point
 - C. Heating value
 - D. Pour point

Correct answer: D

15. The main engines on the harbor tug to which you are assigned are fitted with duplex secondary spin-on fuel filters. Concerning the selector handle, what statement is true?
- A. The selector handle is placed in the "BOTH" position when the engine is running at high load or rpm to accommodate higher fuel delivery requirements. When the engine is running at low load or rpm, the selector handle is placed in either the "1" or "2" position.
 - B. The selector handle is placed in the "BOTH" position when the engine is running at low load or rpm. When the engine is running at high load or rpm, the selector handle is placed in either the "1" or "2" position depending upon which filter element is clean.
 - C. The selector handle is normally placed in the "BOTH" position regardless of the load or rpm on the engine in order to be able to double the fuel handling throughput at any load or rpm and allow the engine speed to be changed without worrying about the selector handle position.
 - D. The selector handle is placed in either position the "1" or "2" position regardless of the load or rpm on the engine. The selector handle is temporarily placed in the "BOTH" position only when transitioning from a restricted filter element over to a clean filter element.

Correct answer: D

16. The manufacturer of the diesel generator set drive engines used aboard your ship-docking tug recommends that no more than a 2 psig pressure drop across a fuel primary metal-edge suction strainer be allowed before recommended servicing. Assuming that the strainer inlet pressure is 4 psig, what would be the minimum allowable outlet pressure before recommended servicing?
- A. 2 psig
 - B. 2" Hg
 - C. 6 psig
 - D. 6" Hg

Correct answer: A

17. The river push boat to which you are assigned has diesel generators fitted with fuel injectors with the operating principle as shown in the illustration. In figure "B" which plunger rotation position corresponds to the engine running under no load at idle RPM? Illustration MO-0144
- A. 1
 - B. 2
 - C. 3
 - D. 4

Correct answer: B

18. The harbor tug to which you are assigned has diesel generators fitted with injectors with the operating principle as shown in the illustration. What statement is true concerning the metering principle used in this system? Illustration MO-0146
- A. The amount of fuel injected is dependent upon the cylinder compression pressure and the cylinder compression temperature.
 - B. The amount of fuel injected is dependent upon the pressure of the inlet fuel to the injector and the length of time the orifice is open during metering.
 - C. The amount of fuel injected depends upon the injector pre-load torque setting.
 - D. The amount of fuel injected is dependent upon the distance of plunger travel.

Correct answer: B

19. The main propulsion diesel engines on your ship-docking tug are fitted with conventional hydraulically operated injector nozzles of the orifice type. When testing an injector by performing a pop-test on an injector test stand, you observe no leakage prior to reaching the popping pressure, the pressure holds at just below the popping pressure, the actual popping pressure is within specification, but the spray pattern is distorted. What maintenance is required?
- A. The injector spindle and nozzle holder bore must be reconditioned or replaced.
 - B. The injector needle valve and seat must be reconditioned or replaced.
 - C. The injector spring compression must be readjusted or a broken spring replaced.
 - D. The injector nozzle tip orifices must be reconditioned by cleaning or the tip replaced.

Correct answer: D

20. You suspect that a diesel generator set on your salvage tug has a defective unit injector because the engine, although warm, is running roughly. The two-stroke engine is fitted with mechanically operated unit injectors. When you push and hold down the No. 3 cylinder injector follower, there is no real change, as the engine continues to run roughly as before. What does this indicate?
- A. The No. 3 cylinder unit injector is faulty. You have successfully isolated the faulty unit injector.
 - B. Either the No. 1 or No. 2 cylinder unit injector is faulty. The No. 4, No. 5 and No. 6 cylinder unit injectors are functioning properly.
 - C. The No. 3 cylinder unit injector is functioning properly. One of the other cylinder unit injectors must be faulty.
 - D. Either the No. 4, No. 5, or No. 6 cylinder unit injector is faulty. The No. 1 and No. 2 cylinder unit injectors are functioning properly.

Correct answer: A

21. The towboat to which you are assigned has main diesel engines fitted with intake and exhaust systems as shown in the simplified illustration. What is the primary purpose of the intercooler? Illustration MO-0180
- A. Eliminate the need for water jacketing of the exhaust receiver.
 - B. Provide cooling to the turbocharger turbine.
 - C. Increase the charge air density to increase the engine power output.
 - D. Provide cooling to the turbocharger blower.

Correct answer: C

22. The diesel engines on your towing vessel are all protected with dry-type air filters. The air filters should be inspected and replaced in accordance with manufacturer instructions. What is the generally accepted criteria that would dictate when filter replacement becomes necessary?
- A. The air filter element should be replaced when the pressure rise across the element decreases below the specified minimum.
 - B. The air filter element should be replaced when the pressure drop across the element increases above the specified maximum.
 - C. The air filter element should be replaced when the pressure rise across the element increases above the specified maximum.
 - D. The air filter element should be replaced when the pressure drop across the element decreases below the specified minimum.

Correct answer: B

23. In order to determine the restriction across a dry-type air filter on one of the diesel engines on your ship-docking tug, the engine should be operating at rated speed and load. What instrument would give the most accurate measurement of air filter element restriction?
- A. A water manometer
 - B. A bourdon tube vacuum gauge
 - C. A mercury manometer
 - D. A bourdon tube compound gauge

Correct answer: A

24. The ship-docking tug to which you are assigned has a fire pump drive engine as shown in the illustration. What statement concerning common air inlet and exhaust outlet pressures is true, if the engine is running at rated speed? Illustration MO-0180
- A. The common exhaust outlet pressure will be lower than the common air inlet pressure.
 - B. The common exhaust outlet pressure will be equal to the common air inlet pressure.
 - C. There is no predictable, consistent relationship between the common exhaust outlet and air inlet pressures.
 - D. The common exhaust outlet pressure will be higher than the common air inlet pressure.

Correct answer: A

25. Assuming the use of ultra-low sulfur content diesel fuel, what combination of conditions associated with harbor tug engine room operations would require the most frequent draining of exhaust systems of condensation?
- A. Summer operations with lengthy ship escort transit times
 - B. Winter operations with prolonged idling on station
 - C. Summer operations with prolonged idling on station
 - D. Winter operations with lengthy ship escort transit times

Correct answer: B

26. A main propulsion diesel engine on your towing vessel produces gray to black smoke under virtually all load conditions as observed at the stack. The heavier the load on the engine, the darker the smoke becomes. What condition would most likely account for this?
- A. Excessively restricted exhaust silencer/muffler
 - B. Excessively worn exhaust valve guides
 - C. Leaking exhaust manifold cooling water jackets
 - D. Leaking exhaust piping expansion joints

Correct answer: A

27. Your salvage tug is fitted with cooling water systems serving the main propulsion diesel engines as shown in the illustration. Which heat exchanger/cooler application and aspect would most likely require periodic mechanical cleaning with a specially designed brush? Illustration MO-0137
- A. The inside of the tubes of the RW/FW heat exchanger
 - B. The outside of the tubes of the RW/FW heat exchanger
 - C. The inside of the tubes of the lube oil cooler
 - D. The outside of the tubes of the lube oil cooler

Correct answer: A

28. The freshwater cooling systems serving the main engines on your ship-docking tug are arranged as shown in the illustration. If coolant drain valves are inadvertently opened during engine operation, what combination set of symptoms would most likely result? Illustration MO-0138
- A. Low level in the jacket water expansion tank. Low freshwater outlet temperature from the engine. Low freshwater pump(s) discharge pressure.
 - B. High level in the jacket water expansion tank. High freshwater outlet temperature from the engine. High freshwater pump(s) discharge pressure.
 - C. Low level in the jacket water expansion tank. High freshwater outlet temperature from the engine. High freshwater pump(s) discharge pressure.
 - D. Low level in the jacket water expansion tank. High freshwater outlet temperature from the engine. Low freshwater pump(s) discharge pressure.

Correct answer: D

29. In comparison to a naturally aspirated 4-stroke cycle engine, what characteristics are associated with turbocharging?
- A. The exhaust gas pressure on the engine exhaust manifold is decreased, and the intake air temperature to the cylinders is decreased.
 - B. The exhaust gas pressure on the engine exhaust manifold is decreased, and the intake air temperature to the cylinders is increased.
 - C. The exhaust gas pressure on the engine exhaust manifold is increased, and the intake air temperature to the cylinders is decreased.
 - D. The exhaust gas pressure on the engine exhaust manifold is increased, and the intake air temperature to the cylinders is increased.

Correct answer: D

30. The two-stroke cycle main propulsion engines on the harbor tug to which you are assigned are fitted with turbochargers for scavenging purposes. Assume that you are checking the air box drains in an installation that is valved with external drain piping to a drains tank. When you open the air box drain valves, no drainage occurs when in fact there is an accumulation of oil and moisture on the floor of the air boxes. What should you do?
- A. Blow through the drain openings with compressed air to clear the drains.
 - B. Mechanically poke through the drain openings with a rod to clear the drains.
 - C. Increase the air box pressure to blow the air box drain openings clear.
 - D. Increase the crankcase pressure to blow the air box drain openings clear.

Correct answer: B

31. A Roots-blown, two-stroke cycle main propulsion engine on the ship-docking tug to which you are assigned is emitting excessive, bluish-tinged smoke from the stack. Further investigation reveals excessive lube oil consumption. What condition would most likely account for this?
- A. Leaking fuel injector needle valve
 - B. Restricted blower air intake filter
 - C. Worn blower rotor shaft seals
 - D. Restricted scavenging air intake ports

Correct answer: C

32. The lubricating oil system supporting the main propulsion reduction gear on the salvage tug to which you are assigned is fitted with a sea water cooled 4-pass shell and tube lube oil cooler. The water box sacrificial zinc anodes must be inspected periodically. Which of the following listed actions correctly states maintenance criteria pertaining to scale build-up on the zincs as the result of mineral deposits (not to be confused with corrosion scaling)?
- A. Any accumulated scale build-up on sacrificial zinc anodes should be left intact to ensure proper protection from galvanic corrosion.
 - B. Any sacrificial zinc anodes with accumulated scale build-up should be replaced regardless of the degree of deterioration.
 - C. Any accumulated scale build-up on sacrificial zinc anodes should be scraped off until the zinc anodes are shiny.
 - D. There is no need to check for scale build-up on the sacrificial zinc anodes as this phenomenon is not physically possible.

Correct answer: C

33. A diesel engine driven winch on your towing vessel is fitted with a reversing reduction gear equipped with dry-type friction clutches. Which of the operational conditions listed below is most likely to result in clutch slippage and associated clutch disc wear?
- A. Habitually engaging the clutch at engine idle speed
 - B. Habitually disengaging the clutch at high engine speed
 - C. Habitually disengaging the clutch at engine idle speed
 - D. Habitually engaging the clutch at high engine speed

Correct answer: D

34. The main engines on your articulated tug-barge unit are equipped with over speed trip devices as shown in the illustration. What statement concerning the operation of the over speed trip is true? Illustration MO-0171
- A. The overspeed trip senses centrifugal force proportional to engine speed and limits the engine speed to the rated speed, while allowing the engine to continue to run at the rated speed.
 - B. The overspeed trip senses oil pressure proportional to engine speed and shuts the engine down at a pre-determined, specified maximum speed setting.
 - C. The overspeed trip senses centrifugal force proportional to engine speed and shuts the engine down at a pre-determined, specified maximum speed setting.
 - D. The overspeed trip senses oil pressure proportional to engine speed and limits the engine speed to the rated speed, while allowing the engine to continue to run at the rated speed.

Correct answer: C

35. The main engines on your harbor tug are protected with a low crankcase oil level detector protective device designed to provide an alarm when the main sump oil level drops below a certain level. It is malfunctioning, and upon investigation you determine from the technical manual that the oil level detector is a sealed unit. What statement best represents the best strategy to remedy this situation?
- A. The oil level detector seals must be broken before adjustments can be made, as long as new seals are established before placing the unit back into operation.
 - B. The oil level detector is adjusted just as if it was an unsealed unit, but the seals must be re-established before placing the unit back into operation.
 - C. The oil level detector is adjusted just as if it was an unsealed unit, without regard to any seals associated with the unit.
 - D. The oil level detector must be replaced with a new detector if it is found to be defective, since field adjustments are not possible on this type of unit.

Correct answer: D

36. The rated speed of the main propulsion diesel engines on your towing vessel is 900 rpm. The installed centrifugal over speed trip device similar to the one shown in the illustration is designed to shut down the engine at 110% of rated speed. Upon testing the over speed trip device, you determine that the actual shutdown occurs at 945 rpm. Which of the following would account for this? Illustration MO-0101
- A. The jam nut was not properly tightened against the adjusting nut (items 13) when the over speed trip was last set.
 - B. The throw-out weight (item 10) link bolt (item 15 and 16) is binding within the spring guide (item 14) drilling.
 - C. The compression spring (item 12) was excessively compressed when the over speed trip was last set.
 - D. The throw-out weight (item 10) pivot bolt (not labelled) is binding within the counterweight (item 1 through 9) drilling.

Correct answer: A

37. The auxiliary oil-fired water-tube steam boiler on your tug is equipped with a water column similar to that shown in the illustration. The most accurate way to determine the boiler water level is by alternately opening and reclosing the tri-cocks. At what point is the normal operating water level (NOWL) of the boiler? Illustration MO-0093
- A. At a point coinciding with the uppermost tri-cock
 - B. At a point coinciding with the middle tri-cock
 - C. At a point coinciding with the lowermost tri-cock
 - D. The level can normally be anywhere within the water column

Correct answer: B

38. When cleaning burner atomizers associated with an oil-fired auxiliary boiler fitted on your harbor tug, which of the following metals would be recommended to use in fabricating a tool for the purposes of carbon removal?
- A. Copper
 - B. Chrome-moly steel
 - C. Tungsten
 - D. Titanium

Correct answer: A

39. You are observing the flame condition on an oil-fired auxiliary boiler installed on your coast-wise tug through an observation window peephole. The flame is a reddish color accompanied by a noticeably panting/pulsating furnace. What would be the correlating color of the gases exhausting from the stack under these conditions?
- A. Light brown haze
 - B. Dense black smoke
 - C. White smoke
 - D. Clear stack

Correct answer: B

40. The engine manufacturer for the main engines used on your harbor tug specifies a supplemental coolant additive consisting of molybdate and nitrite be used to supplement the heavy-duty antifreeze for the closed, re-circulating freshwater cooling system. A test-strip comparison chart as shown in the illustration is used for coolant testing purposes. If the molybdate concentration color corresponds to row 2 and the nitrite concentration color corresponds to column B, what statement is true? Illustration MO-0211
- A. The molybdate and nitrite concentrations levels are too high, and a portion of the coolant must be drained and replaced with fresh water.
 - B. It is not possible to determine the molybdate and nitrite concentration levels from the information given.
 - C. The molybdate and nitrite concentrations levels are too low, and additional supplementary coolant additive is required.
 - D. The molybdate and nitrite concentrations levels are within acceptable limits, and no further correction is required.

Correct answer: C

41. In a closed, re-circulating freshwater cooling system used for the towing winch drive engine on your coastwise towing vessel, what function would chemical treatment with pure ethylene glycol mixed with fresh water primarily perform?
- A. Freezing point and boiling point depression
 - B. Freezing point depression and boiling point elevation
 - C. Freezing point elevation and boiling point depression
 - D. Freezing point and boiling point elevation

Correct answer: B

42. A main propulsion diesel engine on your ship docking tug has experienced a safety shutdown due to high lubricating oil temperature. What is the appropriate response?
- A. Allow the engine to cool off for two minutes, then restart and monitor the lubricating oil temperature to verify the cause of the shutdown.
 - B. Immediately perform the engine inspections to determine the cause of the high oil temperature safety shutdown.
 - C. Immediately restart the engine and monitor the oil temperature to verify the cause of the shutdown.
 - D. Allow 2 hours for the engine to cool down before attempting to inspect the engine and correct the cause of the trip before attempting to restart the engine.

Correct answer: D

43. After a main diesel engine on your river push boat has experienced a safety shutdown due to excessive crankcase pressure, why is it important to wait 2 hours before opening the crankcase to investigate the cause of the trip?
- A. Opening the crankcase before 2 hours has elapsed may result in the engine spontaneously restarting.
 - B. Opening the crankcase before 2 hours has elapsed may result in a crankcase explosion.
 - C. Opening the crankcase before 2 hours has elapsed may result in excessively rapid cooling.
 - D. Opening the crankcase before 2 hours has elapsed may result in crankshaft rotation.

Correct answer: B

44. When rolling over a main engine on your river push boat prior to starting with the cylinder test valves open to expel any fluids accumulated within the cylinders, a rather large amount of water is discharged. What is the appropriate response?
- A. Start the engine, but monitor all fluid levels very closely, especially that of the jacket water.
 - B. Start the engine, but maintain the jacket water expansion tank level higher than normal.
 - C. Start the engine, but run the engine with the cylinder test valves cracked slightly open.
 - D. Do not allow the engine to be started until the cause of the water discharge has been determined and corrected.

Correct answer: D

45. Suppose the diesel generator set drive engines are of the type shown in the illustration on your ship docking tug. What description best represents the operating cycle and aspiration method? Illustration MO-0165
- A. Roots-blown, two-stroke cycle engine
 - B. Crankcase scavenged, two-stroke cycle engine
 - C. Roots-blown, four-stroke cycle engine
 - D. Naturally aspirated, two-stroke cycle engine

Correct answer: A

46. Suppose the diesel generator set drive engines are of the type shown in the illustration on your towing vessel. Assuming the engine is naturally aspirated, within an individual cylinder in terms of piston stroke and position, under what circumstances are the intake and exhaust valves both open? Illustration MO-0163
- A. When the piston is at bottom dead center (BDC) transitioning from the intake stroke to the compression stroke.
 - B. When the piston is at bottom dead center (BDC) transitioning from the power stroke to the exhaust stroke.
 - C. When the piston is at top dead center (TDC) transitioning from the compression stroke to the power stroke.
 - D. When the piston is at top dead center (TDC) transitioning from the exhaust stroke to the intake stroke.

Correct answer: D

47. The ship-docking tug to which you are assigned has main engines fitted with injectors similar to those shown in the illustration. What statement is true concerning the operating principle of this type of injector? Illustration MO-0151
- A. The fuel pressure within the annulus is a needle valve opening force, the compression load on the spring is a needle valve closing force.
 - B. The fuel pressure within the annulus and the compression load on the spring are both needle valve opening forces.
 - C. The fuel pressure within the annulus is a needle valve closing force, the compression load on the spring is a needle valve opening force.
 - D. The fuel pressure within the annulus and the compression load on the spring are both needle valve closing forces.

Correct answer: A

48. The harbor tug to which you are assigned has a main engine fuel system as shown in the illustration. Besides preventing the attached fuel oil pump and the hand priming fuel oil pump from discharging through the other, what other purpose do the anti-flood check valves serve? Illustration MO-0152
- A. They prevent backflow of fuel from the engine to the day tank when the engine is shut down and when the day tank is located below the engine.
 - B. They prevent backflow of fuel from the engine to the day tank when the engine is running and when the day tank is located above the engine.
 - C. They prevent backflow of fuel from the engine to the day tank when the engine is shut down and when the day tank is located above the engine.
 - D. They prevent backflow of fuel from the engine to the day tank when the engine is running and when the day tank is located below the engine.

Correct answer: A

49. The deck winch drive engine onboard your salvage tug uses a lubricating oil filtration scheme as shown in the illustration. What type of filtration system is illustrated? Illustration MO-0182
- A. Full-flow filtration
 - B. Sump filtration
 - C. Bypass filtration
 - D. Shunt filtration

Correct answer: C

50. The main propulsion engines onboard your harbor tug use a lubricating oil system as shown in the illustration. What item number represents the scavenging lube oil pump? Illustration MO-0183
- A. 2
 - B. 4
 - C. 9
 - D. 12

Correct answer: B

51. The generator drive engines fitted on your harbor tug are started by the type of starter shown in figure "A" of the illustration. What type of starter is shown? Illustration MO-0201
- A. Turbine type air motor
 - B. Axial piston hydraulic motor
 - C. Radial piston hydraulic motor
 - D. Sliding vane air motor

Correct answer: B

52. The harbor tug to which you are assigned is fitted with 4-stroke cycle, 6-cylinder in-line diesel generator sets. Using the chart shown in the illustration, what is the firing order of the engines? Illustration MO-0164
- A. 1-4-2-6-3-5
 - B. 1-5-3-6-2-4
 - C. 1-2-3-4-5-6
 - D. Not enough information is provided to determine the firing order.

Correct answer: B

53. The river push boat to which you are assigned is fitted with generator engines as partly shown in the illustration. What statement is true concerning the cylinders? Illustration MO-0163
- A. The cylinder walls are integral (non-replaceable) to the cylinder block.
 - B. The cylinder liners are of the jacketed type and are replaceable inserts.
 - C. The cylinder liners are of the dry type and are replaceable inserts.
 - D. The cylinder liners are of the wet type and are replaceable inserts.

Correct answer: D

54. The ship-docking tug to which you are assigned is fitted with auxiliary diesel engines of the type shown in the illustration. In terms of valve operating gear and cylinder liner type, what statement is true? Illustration MO-0006
- A. This is a pushrod operated overhead valve engine with wet cylinder liners.
 - B. This is an overhead cam engine with wet cylinder liners.
 - C. This is a pushrod operated overhead valve engine with jacketed cylinder liners.
 - D. This is an overhead cam engine with jacketed cylinder liners.

Correct answer: A

55. The tractor tug to which you are assigned is fitted with main propulsion diesel engines of the type shown in the illustration. In terms of valve operating gear, cylinder liner type, and connecting rod type, what statement is true? Illustration MO-0227
- A. This is a pushrod operated overhead valve engine, with jacketed cylinder liners and conventional connecting rods.
 - B. This is a pushrod operated overhead valve engine, with wet cylinder liners and hinged-strap, fork-and-blade connecting rods.
 - C. This is an overhead cam engine, with wet cylinder liners, and marine-type connecting rods.
 - D. This is an overhead cam engine, with jacketed cylinder liners and hinged-strap, fork-and-blade connecting rods.

Correct answer: D

56. The river push boat to which you are assigned has diesel generators fitted with intake and exhaust systems as shown in the illustration. What does the component labeled "2" represent? Illustration MO-0176
- A. Wet muffler
 - B. Charge air cooler
 - C. Exhaust manifold
 - D. Charge air manifold

Correct answer: D

57. The tractor tug to which you are assigned has main engines fitted with intake and exhaust systems as shown in the illustration. What statement best describes the configuration of the multiple turbochargers? Illustration MO-0177
- A. Two (2) turbochargers are used and configured in series for a two-staging effect to boost charge air pressure.
 - B. Four (4) turbochargers are used, two for each cylinder bank, to reduce exhaust back pressure.
 - C. Four (4) turbochargers are used and configured in series for a four-staging effect to boost charge air pressure.
 - D. Two (2) turbochargers are used, one for each cylinder bank, to reduce exhaust back pressure.

Correct answer: D

58. The freshwater cooling systems serving the main engines of the towing vessel to which you are assigned are arranged as shown in the illustration. What statement best describes the arrangement of the freshwater keel cooler shown in the system diagram? Illustration MO-0138
- A. The keel cooler is mounted on the outside of the hull above the water line.
 - B. The keel cooler is mounted on the inside of the hull above the water line.
 - C. The keel cooler is mounted on the outside of the hull below the water line.
 - D. The keel cooler is mounted on the inside of the hull below the water line.

Correct answer: C

59. The winch drive engine on the harbor tug to which you are assigned is fitted with a Roots-type blower as shown in the illustration. What statement is true concerning this blower? Illustration MO-0082
- A. Rotor "1" turns counter-clockwise, and rotor "2" turns clockwise. Area "3" is the discharge passage, and area "4" is the suction passage.
 - B. Rotor "1" turns clockwise, and rotor "2" turns counter-clockwise. Area "3" is the suction passage, and area "4" is the discharge passage.
 - C. Rotor "1" turns clockwise, and rotor "2" turns counter-clockwise. Area "3" is the discharge passage, and area "4" is the suction passage.
 - D. Rotor "1" turns counter-clockwise, and rotor "2" turns clockwise. Area "3" is the suction passage, and area "4" is the discharge passage.

Correct answer: A

60. The ship-docking tug to which you are assigned is fitted with main propulsion engines driving through pneumatic airflex clutches as shown in the illustration. What statement is true concerning this type of clutch? Illustration MO-0141
- A. The clutch is an expanding type clutch and expands to engage against the clutch drum when inflated.
 - B. The clutch is a constricting type clutch and constricts to engage against the clutch gland when inflated.
 - C. The clutch is an expanding type clutch and expands to engage against the clutch gland when inflated.
 - D. The clutch is a constricting type clutch and constricts to engage against the clutch drum when inflated.

Correct answer: D

61. Suppose one of the overhead camshafts on the V-type main propulsion diesel engines on your tug are fitted on the forward end with the device shown in the illustration. In addition to serving as a counterweight, what other function does the device serve? Illustration MO-0101
- A. Overspeed trip
 - B. Torsional vibration damper
 - C. Harmonic balancer
 - D. Overload sensor

Correct answer: A

62. The steam generating plant on your articulated tug-barge unit is of the forced-circulation type. Which figure of the illustration represents a steam generator or boiler of this type? Illustration MO-0197
- A. 1
 - B. 2
 - C. 3
 - D. 4

Correct answer: C

63. Since towing vessels take on fresh water from shore as a source of make-up water for the closed, re-circulating cooling water systems supporting diesel engines, what property of the make-up water is most important in contributing to cooling system problems?
- A. The amount of dissolved oxygen (and other various gases)
 - B. The degree of contamination with microbiological organisms
 - C. The degree of contamination of suspended solids, such as sand
 - D. The amount of dissolved solids associated with mineral content

Correct answer: D

64. What statement concerning fuel cetane rating and the ignition delay period is true as it applies to towboat main propulsion diesel engines?
- A. The ignition delay period is the lag in time between when fuel injection actually begins and when combustion actually begins, and the higher the cetane rating of the fuel the longer the ignition delay period.
 - B. The ignition delay period is the lag in time between when fuel injection actually begins and when combustion actually begins, and the higher the cetane rating of the fuel the shorter the ignition delay period.
 - C. The ignition delay period is the lag in time between when fuel injection is initiated and when fuel injection actually begins, and the higher the cetane rating of the fuel the longer the ignition delay period.
 - D. The ignition delay period is the lag in time between when fuel injection is initiated and when fuel injection actually begins, and the higher the cetane rating of the fuel the shorter the ignition delay period.

Correct answer: B

65. The main engines on your ocean-going tug are fitted with speed control governors of the type shown in the illustration. What is the purpose of the compensation system, consisting of the buffer cylinder, buffer piston, buffer springs, and compensation needle valve? Illustration MO-0158
- A. It senses the engine speed setting delivered from the bridge.
 - B. It limits engine speed to a maximum value to prevent over speeding.
 - C. It senses the actual engine speed of rotation.
 - D. It prevents engine hunting when responding to load changes.

Correct answer: D

66. Suppose the main propulsion diesel engines on your river pushboat are fitted with pressure-compensated governors as shown in the illustration. What function does the engine lube oil pressure connection provide? Illustration MO-0156
- A. It is used as a governor lubricant and as a hydraulic power medium for the power cylinder.
 - B. It is used solely for the purpose of achieving engine shutdown on low engine lube oil pressure.
 - C. It is used solely for the purpose of activating an alarm on low engine lube oil pressure.
 - D. It is used for both activating an alarm and achieving engine shutdown on low engine lube oil pressure.

Correct answer: D

67. The oil of a speed control governor on one of your tug's main diesel engines is foaming excessively, and internally governor parts are sticking due to corrosion. What is the most likely cause?
- A. The oil is excessively contaminated with water.
 - B. The type of oil used is incompatible with governor seals.
 - C. The oil is excessively contaminated with solids.
 - D. The viscosity grade of the oil is improper for existing temperature conditions.

Correct answer: A

68. The salvage tug to which you are assigned is fitted with a totally pneumatic propulsion control system as shown in the illustration. If the astern clutch fails to engage from all control locations, but the ahead clutch properly engages from all control locations, which of the following system faults best accounts for these symptoms? Illustration MO-0168
- A. The control lever at the pneumatic remote control station has a blocked astern clutch engagement pilot port.
 - B. The control lever at the engine room control station has a blocked astern clutch engagement pilot port.
 - C. The astern clutch engagement pilot air tubing has separated from the clutch actuator 4-way control valve at the clutch control panel.
 - D. The ahead clutch engagement pilot air tubing has separated from the clutch actuator 4-way control valve at the clutch control panel.

Correct answer: C

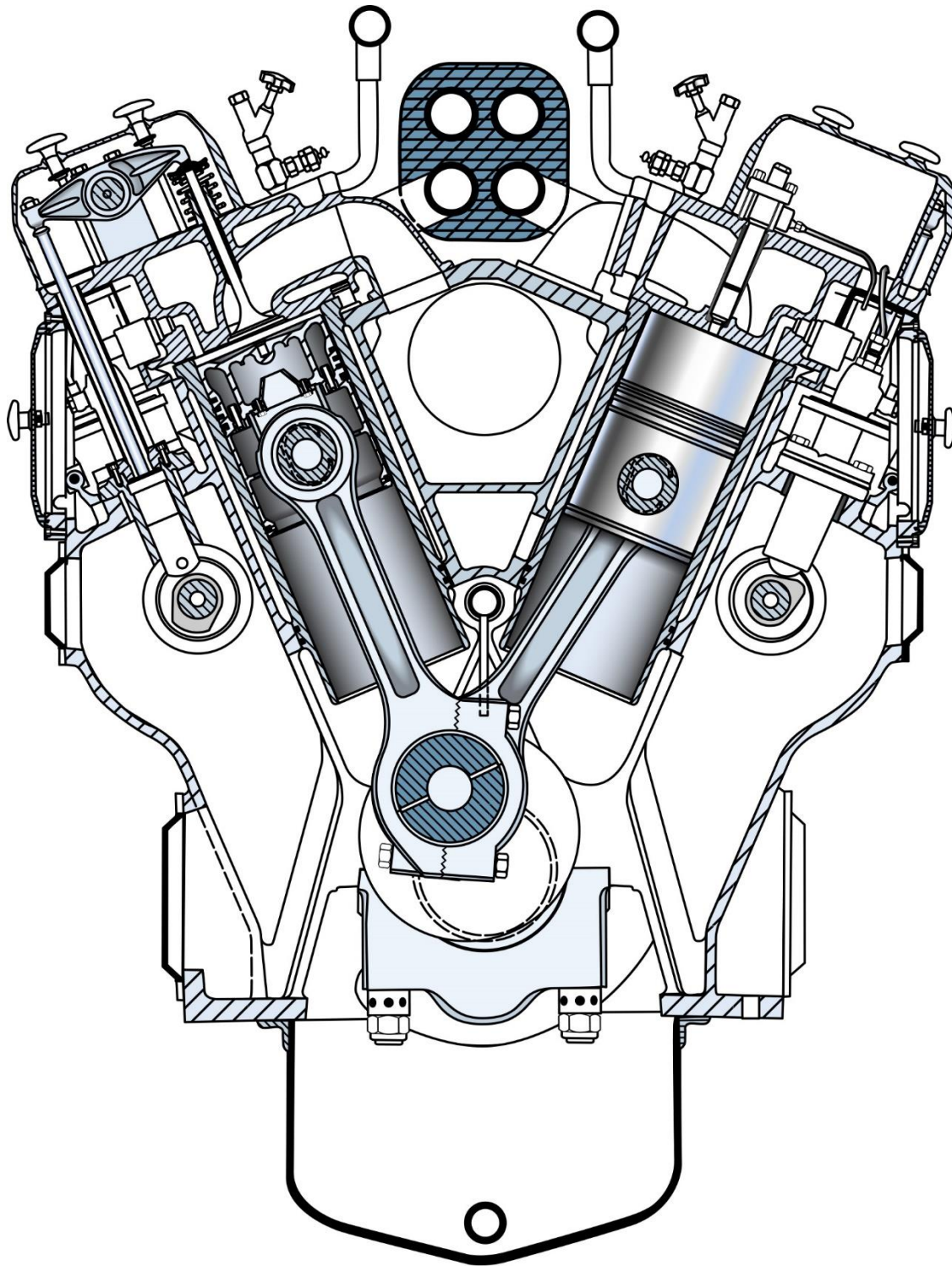
69. Suppose the generator set drive engines on your ship docking tug are fitted with hydraulic isochronous governors such as shown in the illustration. How is the speed set point conveyed from the generator control panel on the main switchboard conveyed to the governor fitted on the diesel engine? Illustration MO-0160
- A. Mechanically via cable connections
 - B. Hydraulically via tubing connections
 - C. Electrically via wire connections
 - D. Pneumatically via tubing connections

Correct answer: C

70. The ship-docking tug to which you are assigned is fitted with a totally pneumatic propulsion control system as shown in the illustration. If the astern clutch fails to engage from the engine room control station, but engages properly from all remote control stations, which of the following system faults best accounts for these symptoms? Illustration MO-0168
- A. The local/remote transfer valve at the engine room control station has a blocked local port.
 - B. The clutch actuator 4-way control valve at the clutch control panel has a restricted astern clutch quick exhaust port opening.
 - C. The astern clutch engagement pilot air tubing has separated from the clutch actuator 4-way control valve at the clutch control panel.
 - D. The control lever at the engine room control station has a blocked astern clutch engagement pilot port.

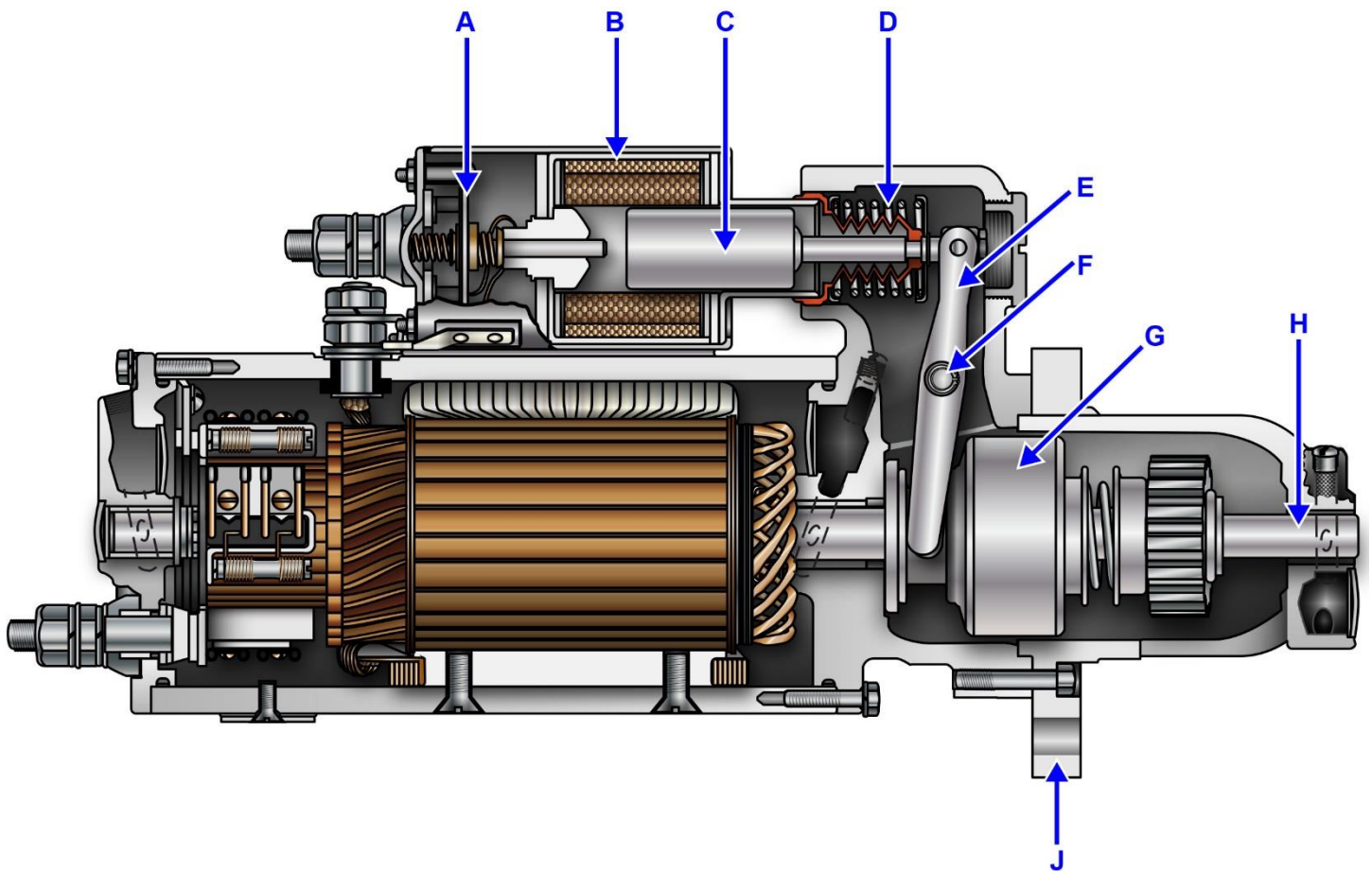
Correct answer: D

MO-0006



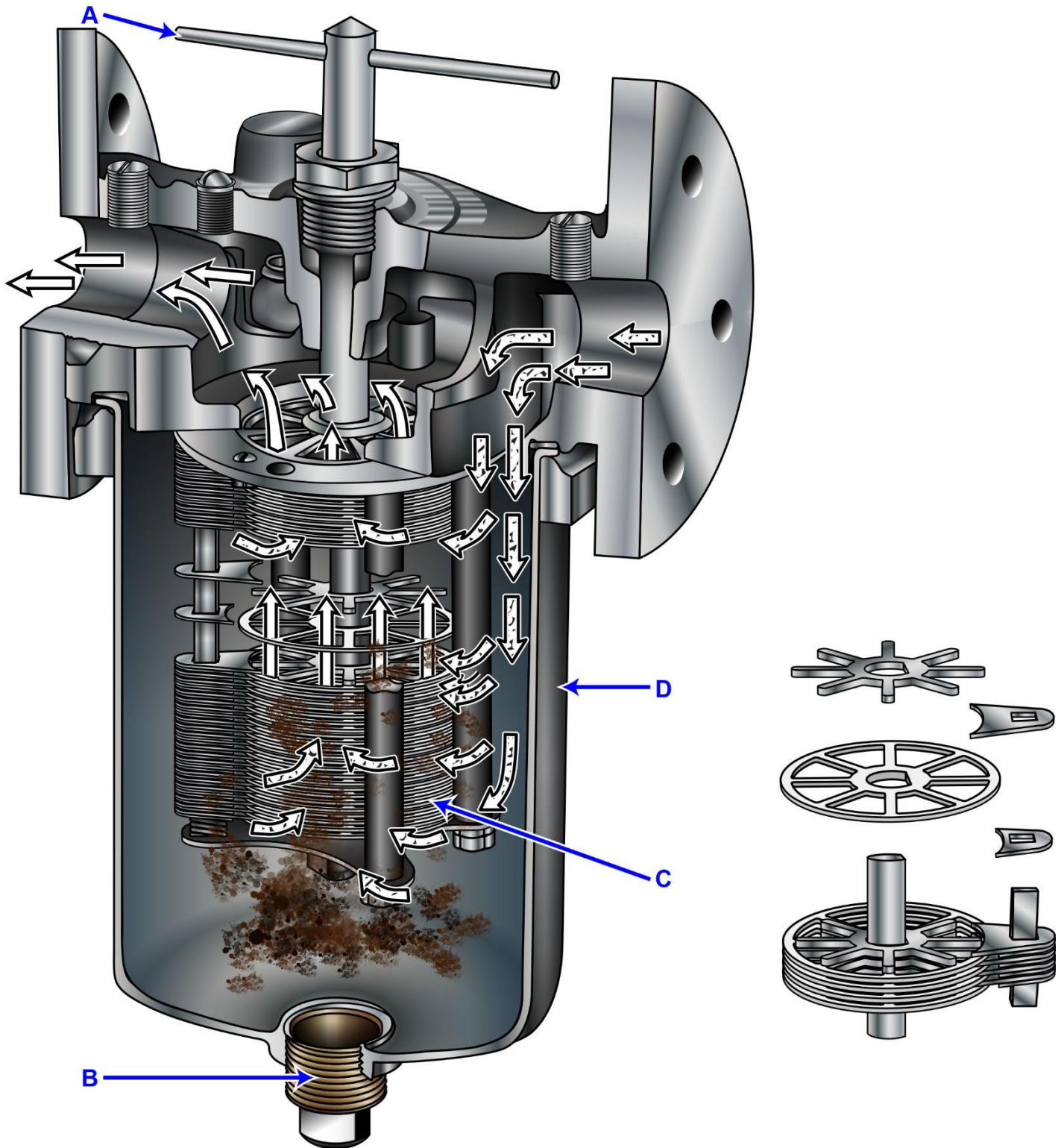
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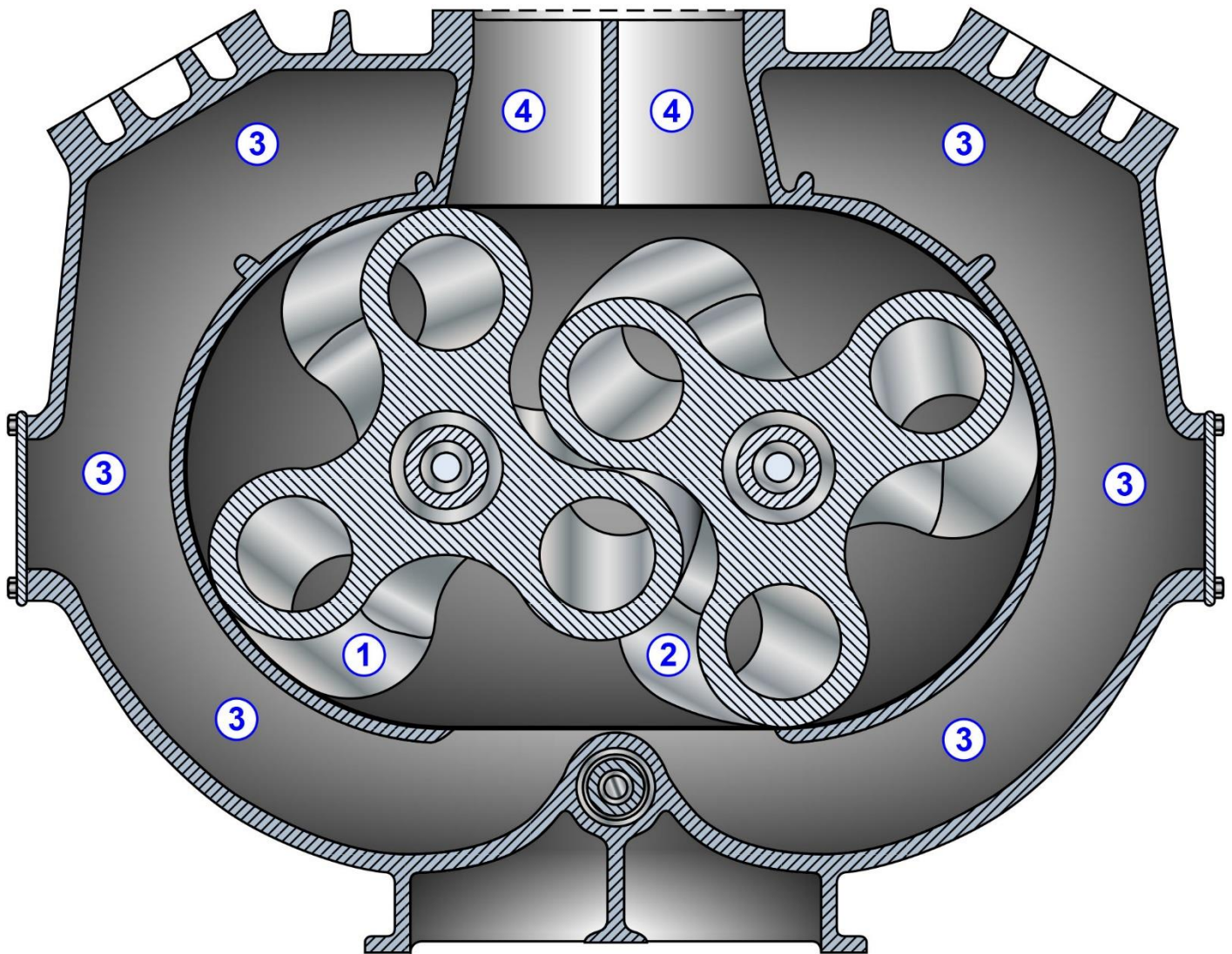
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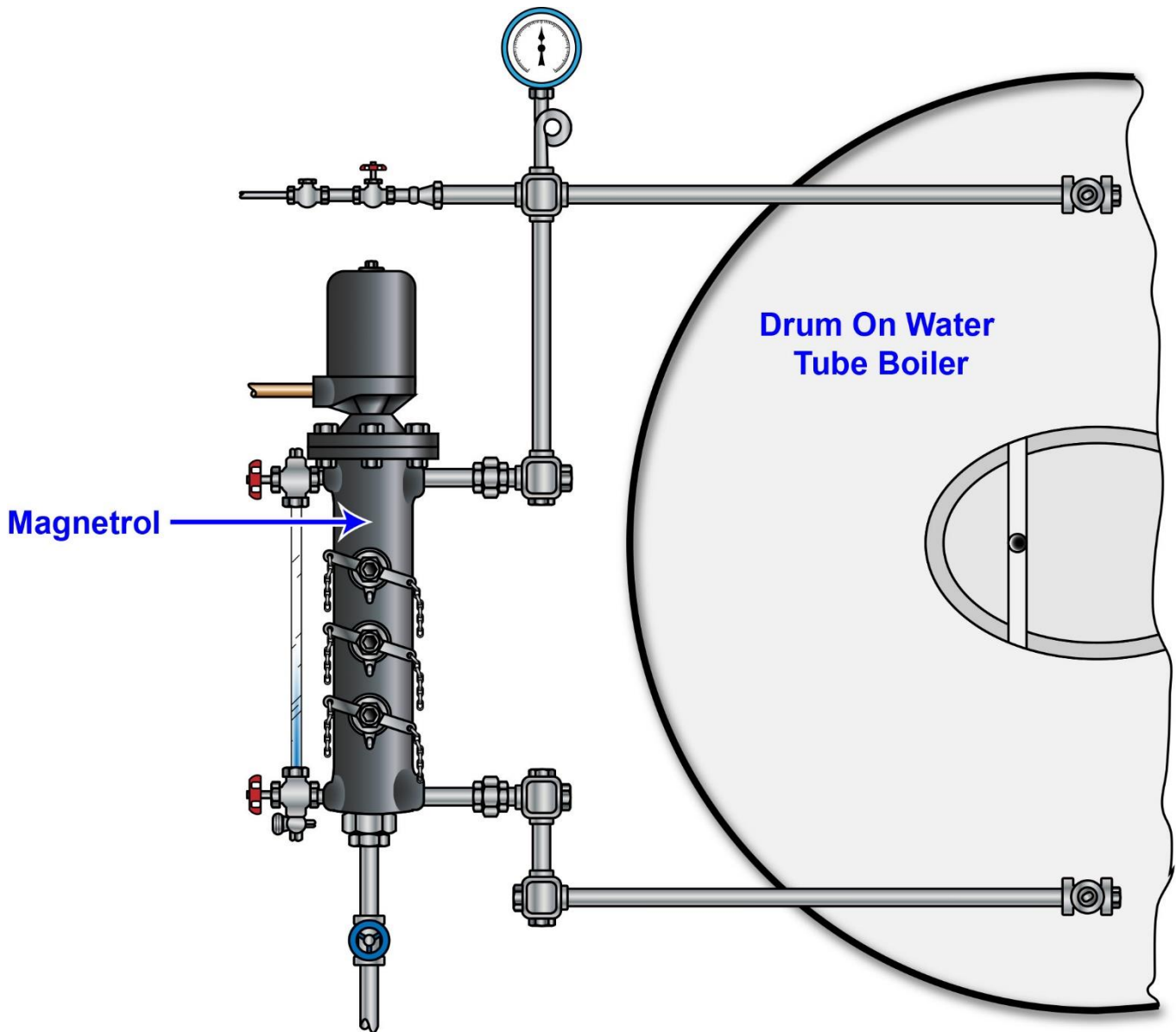
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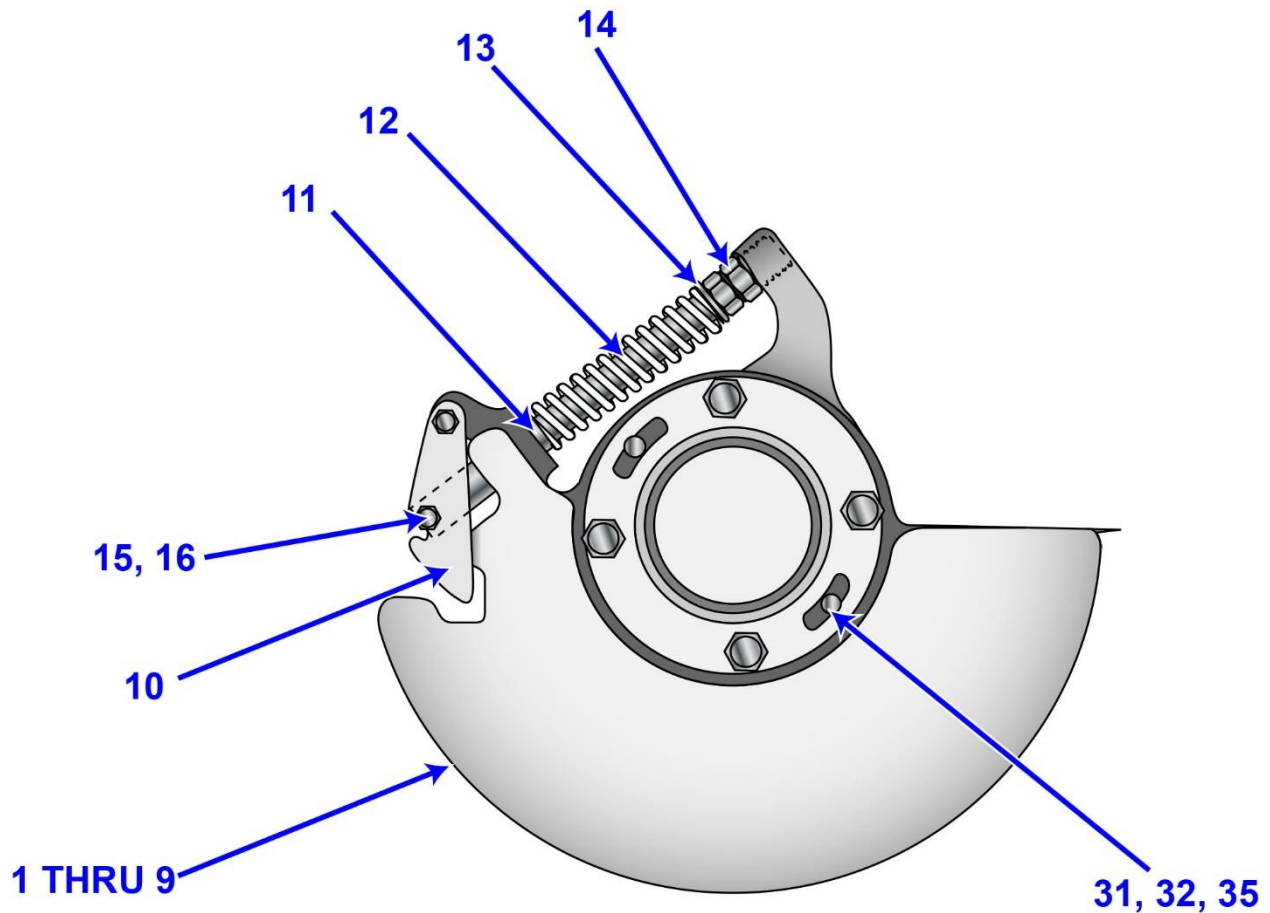
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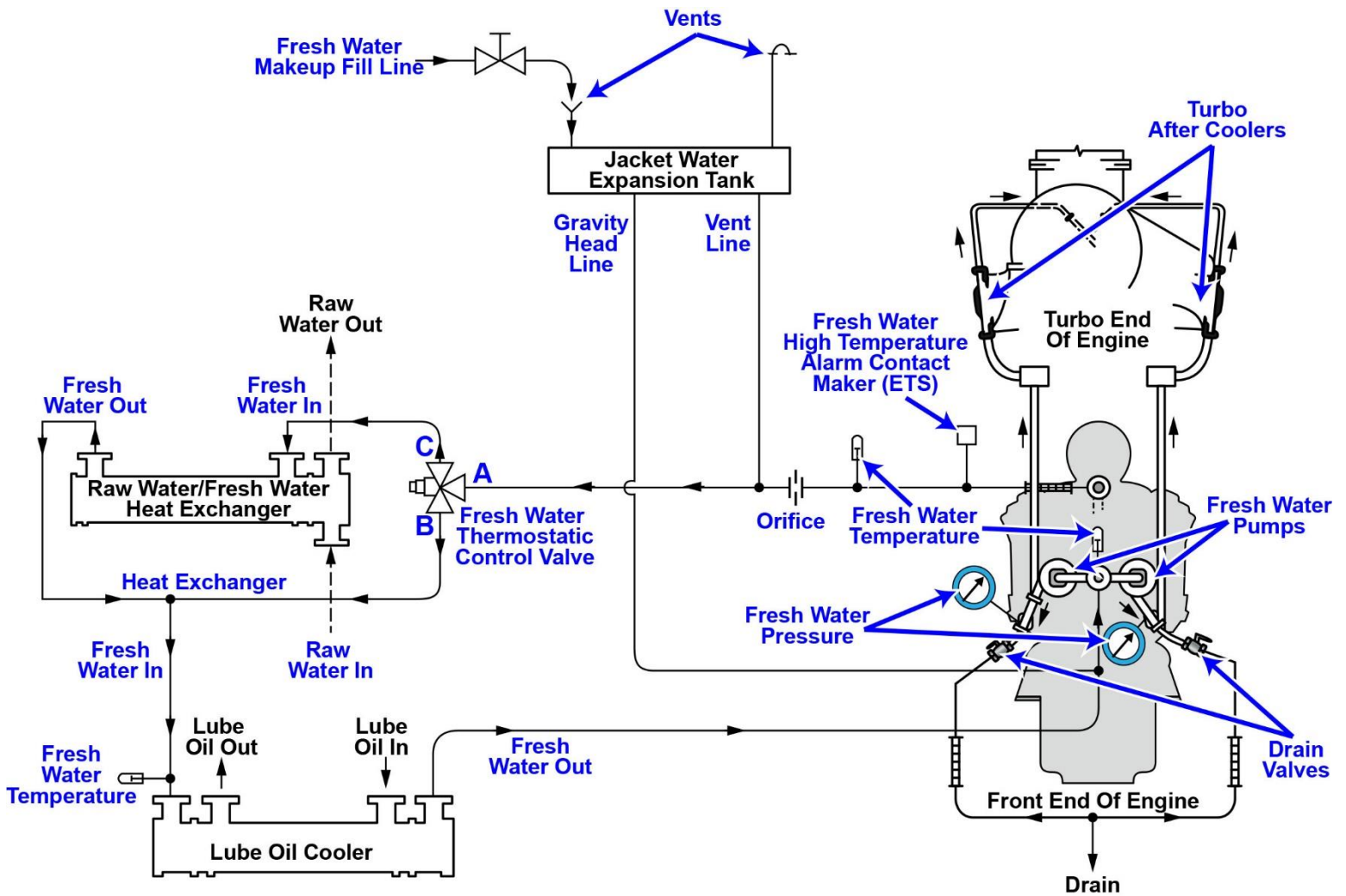
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MO-0101



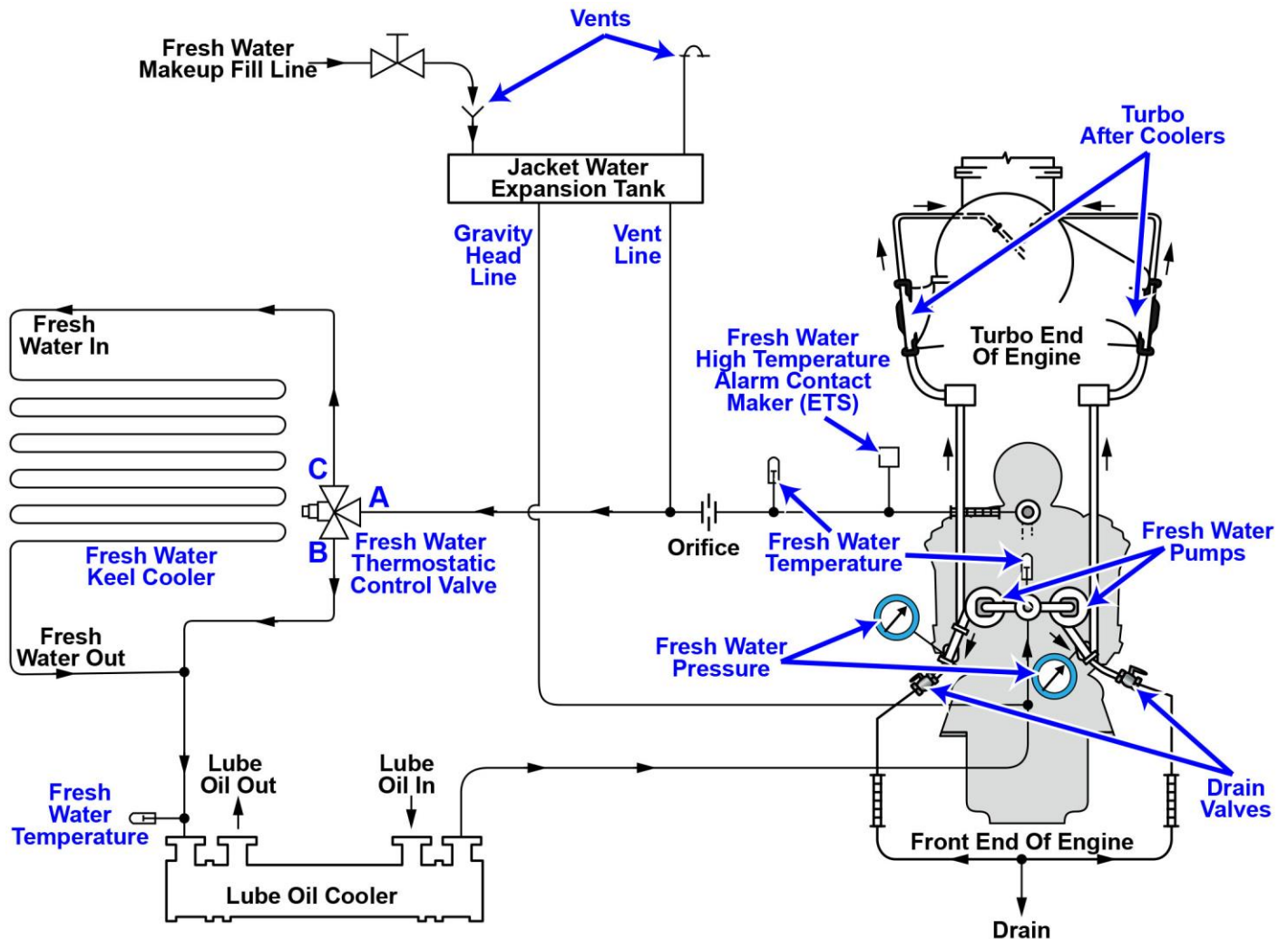
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MO-0137 EMD Engine Fresh Water Cooling System with Heat Exchanger



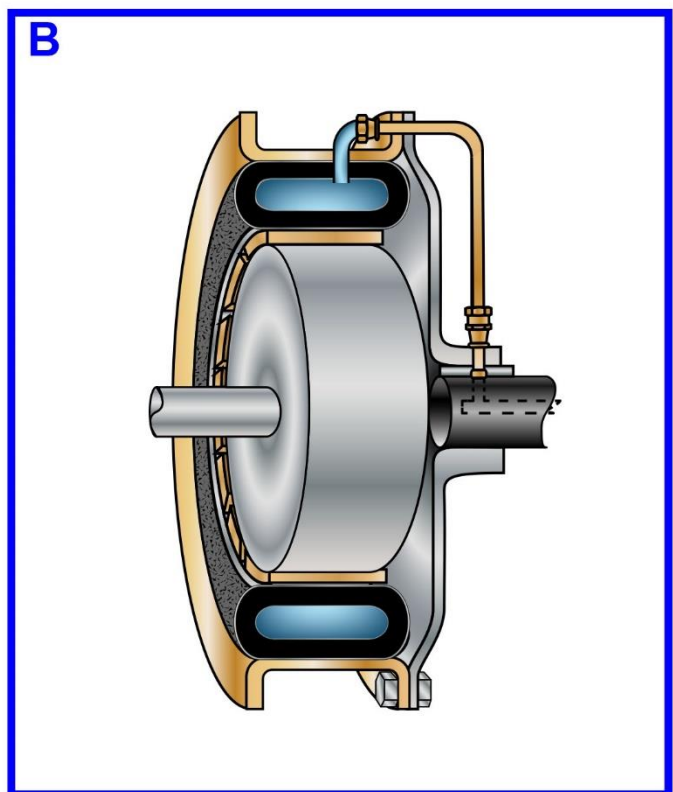
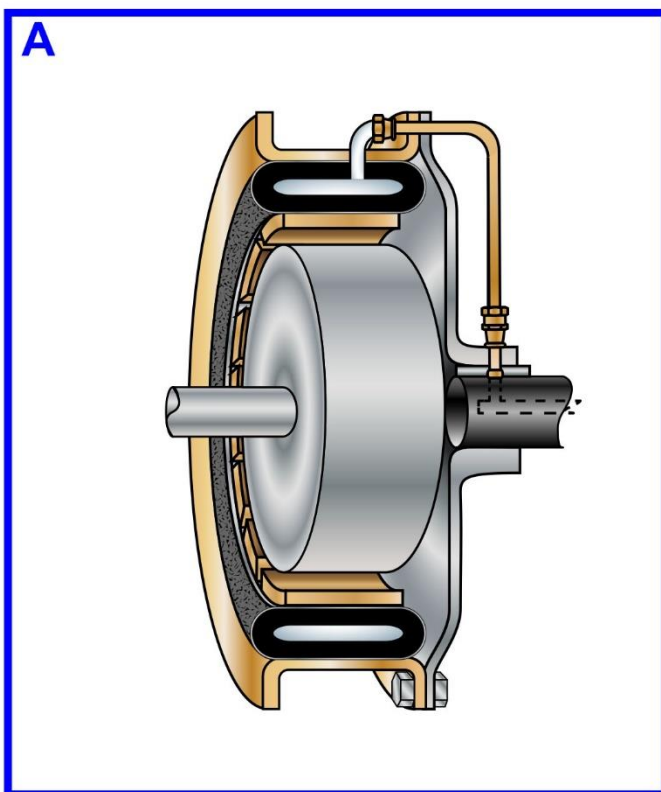
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MO-0138 EMD Engine Fresh Water Cooling System with Keel Cooler



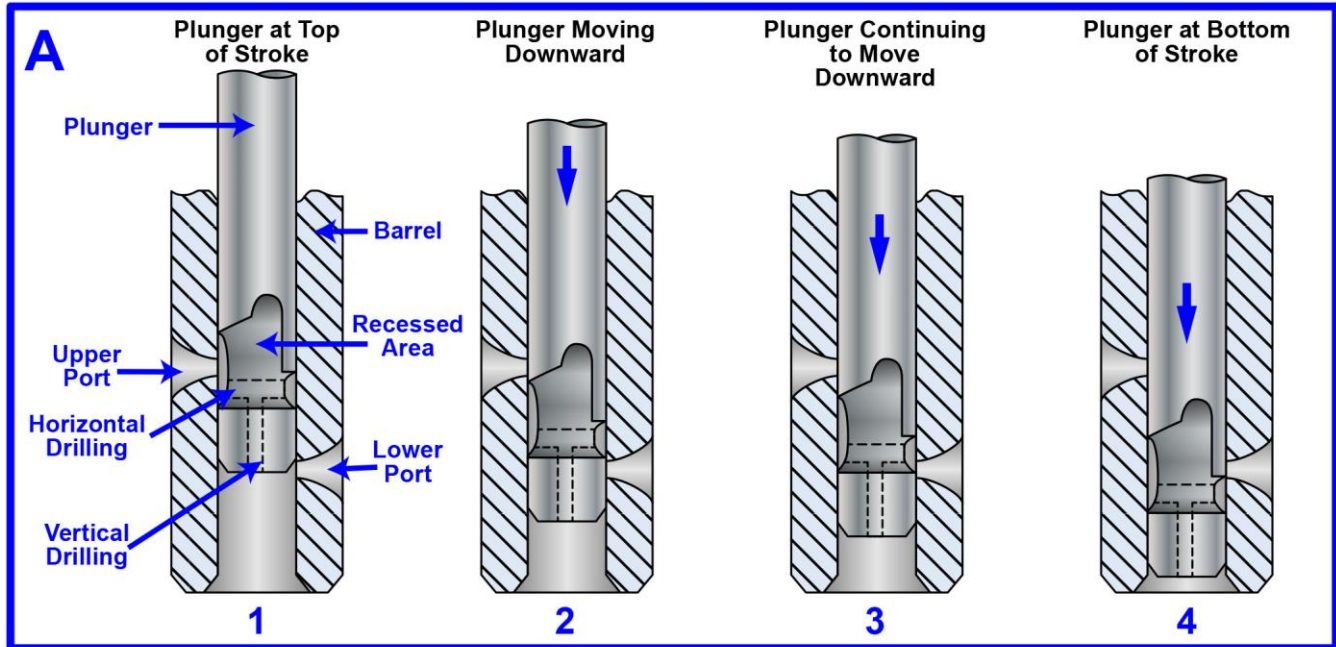
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MO-0141 Pneumatic Airflex Clutch Operation

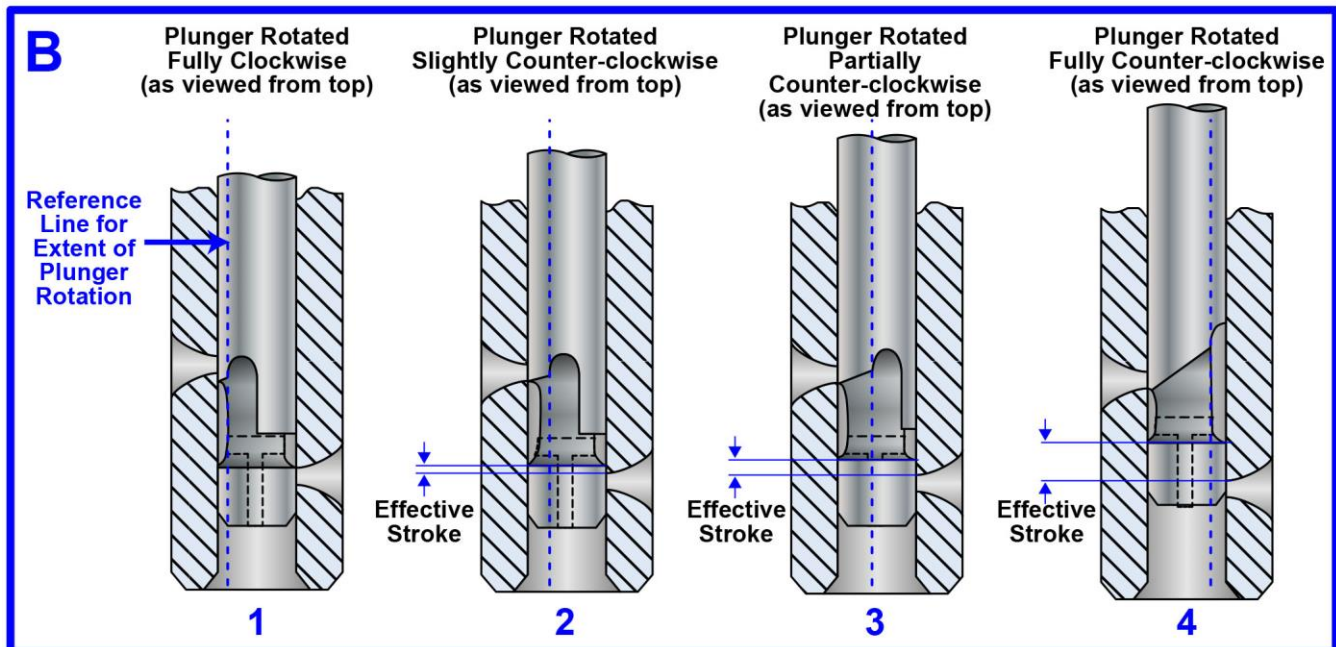


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MO-0144 Detroit Diesel 71 Series Engine Unit Injector



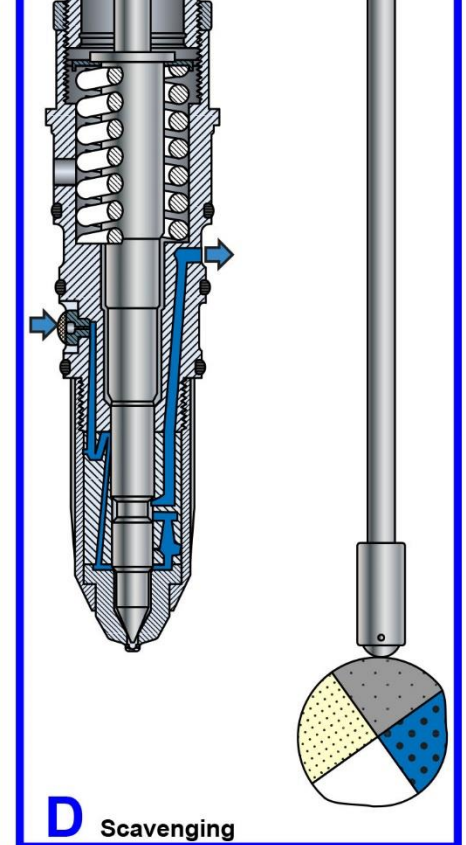
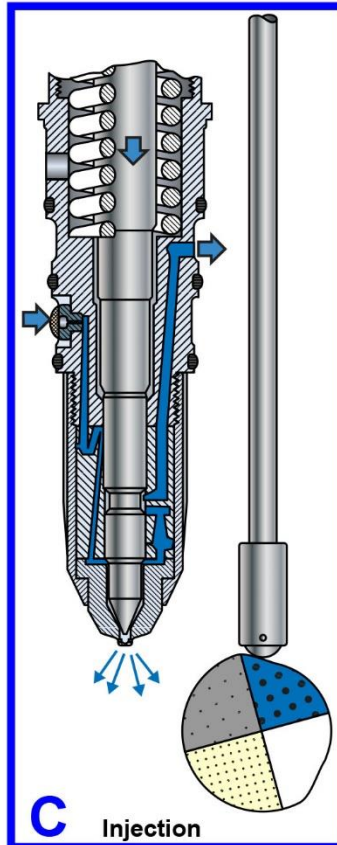
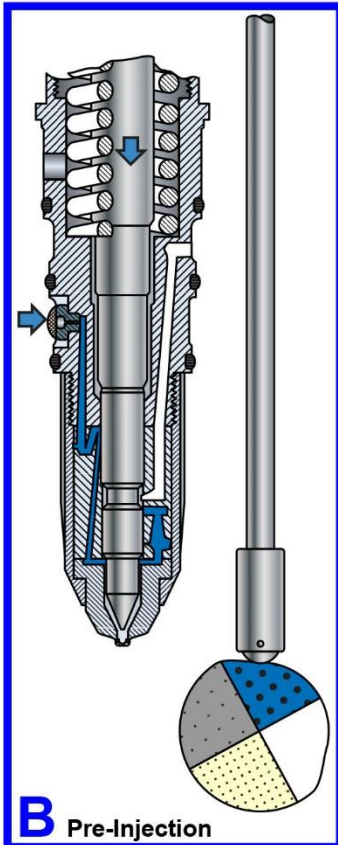
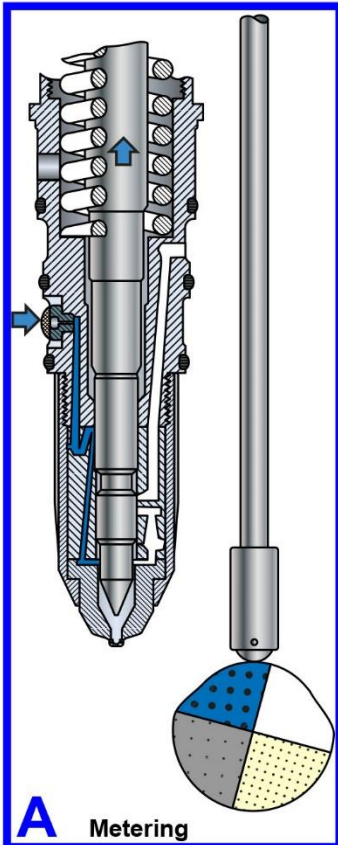
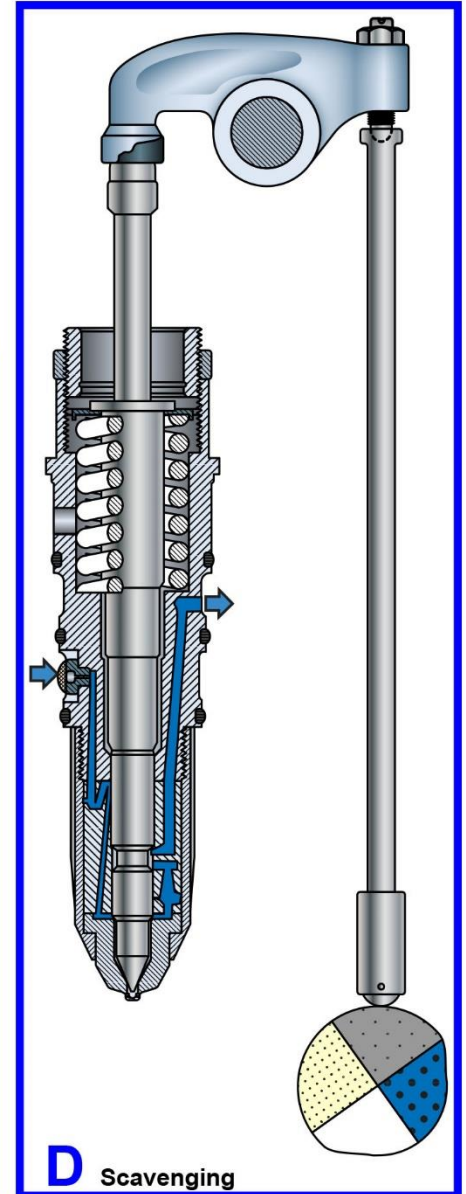
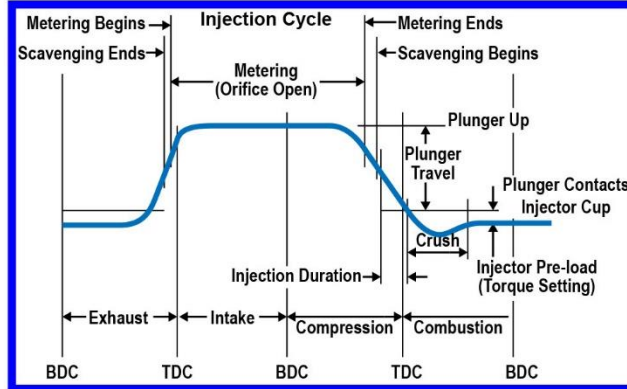
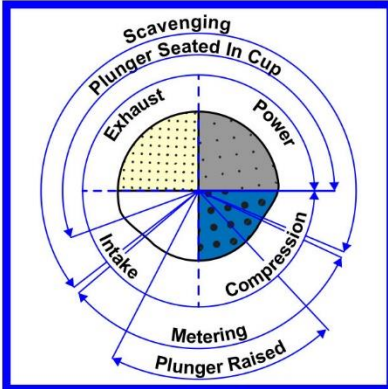
Injector Operation as a Function of Vertical Plunger Travel



Injector Operation as a Function of Extent of Plunger Rotation

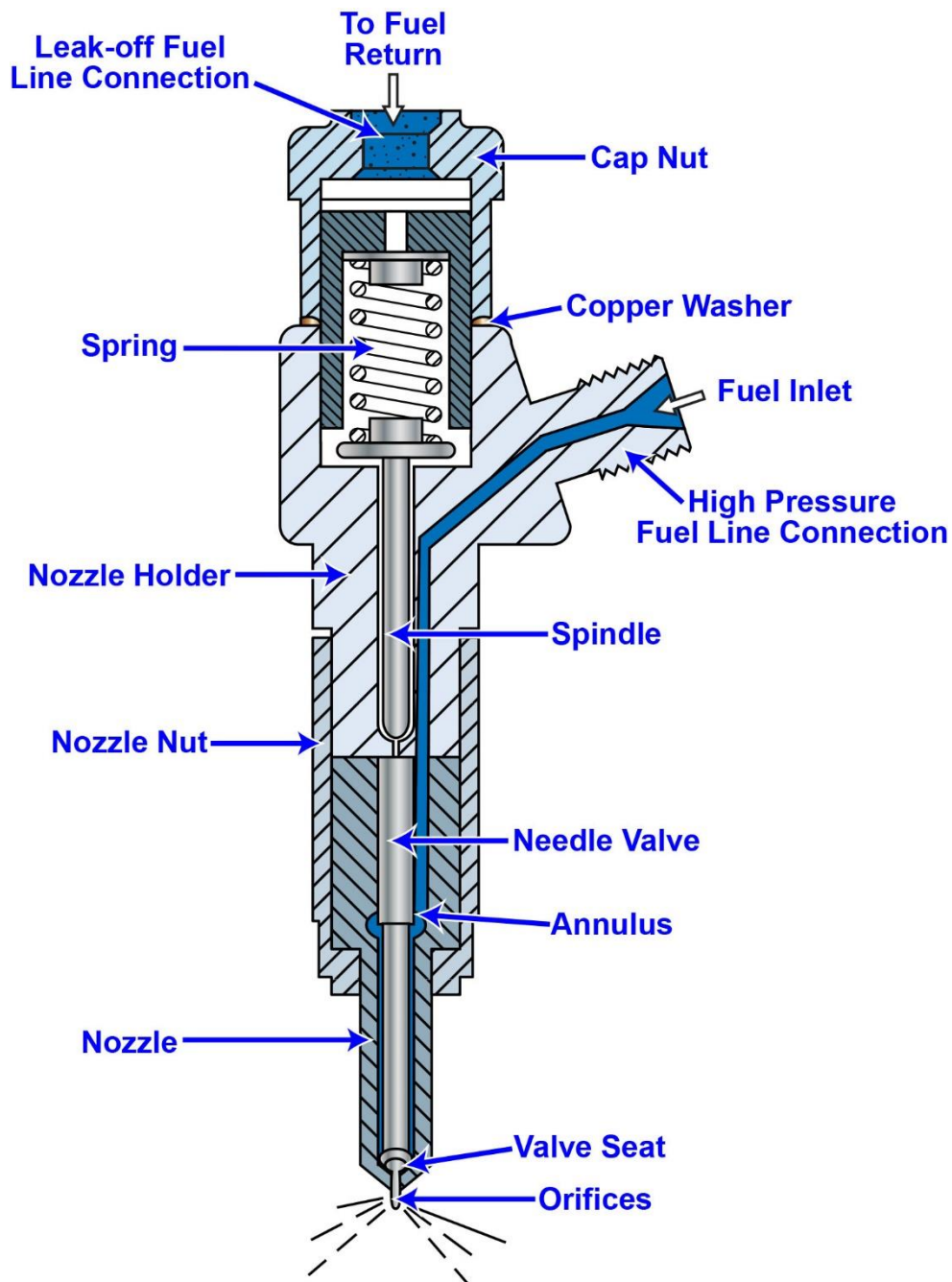
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MO-0146 Cummins PT Injection System Injector



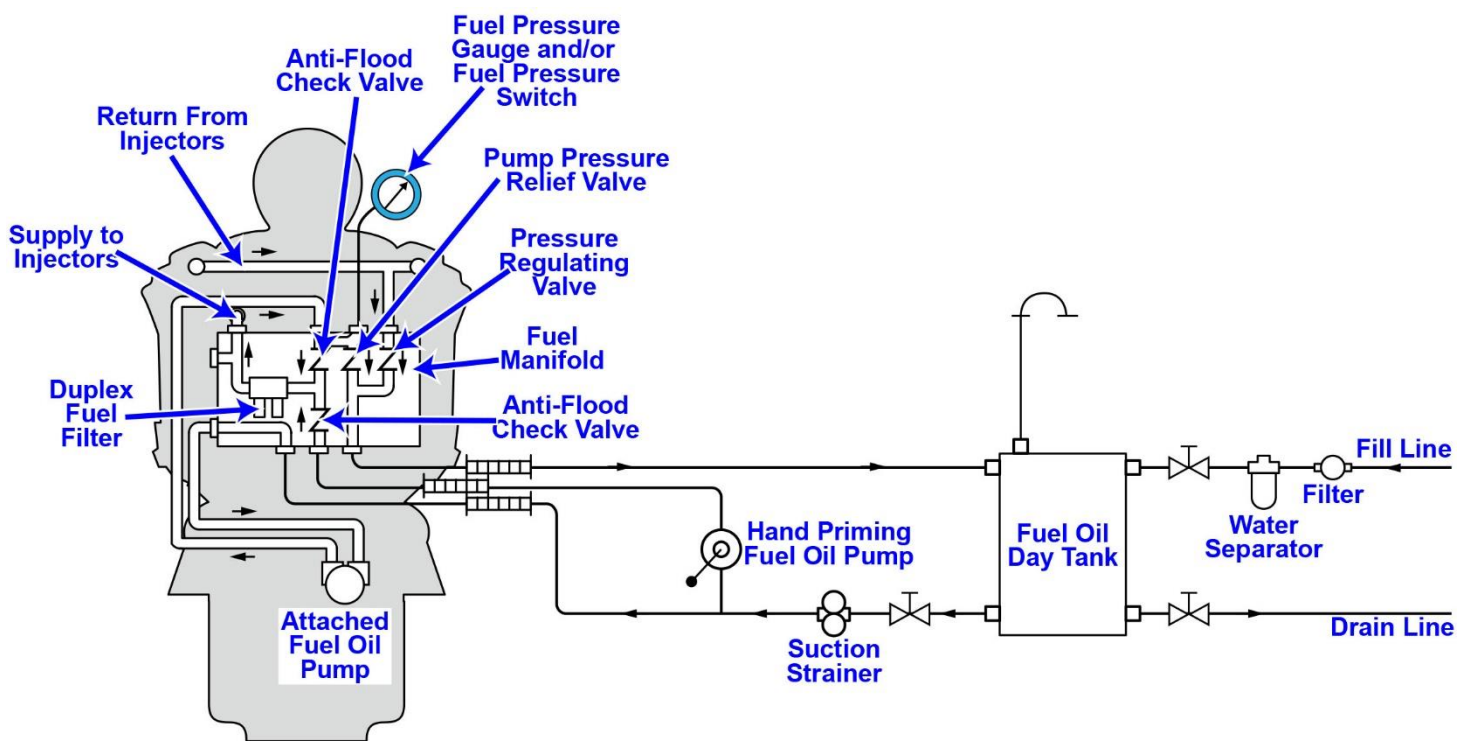
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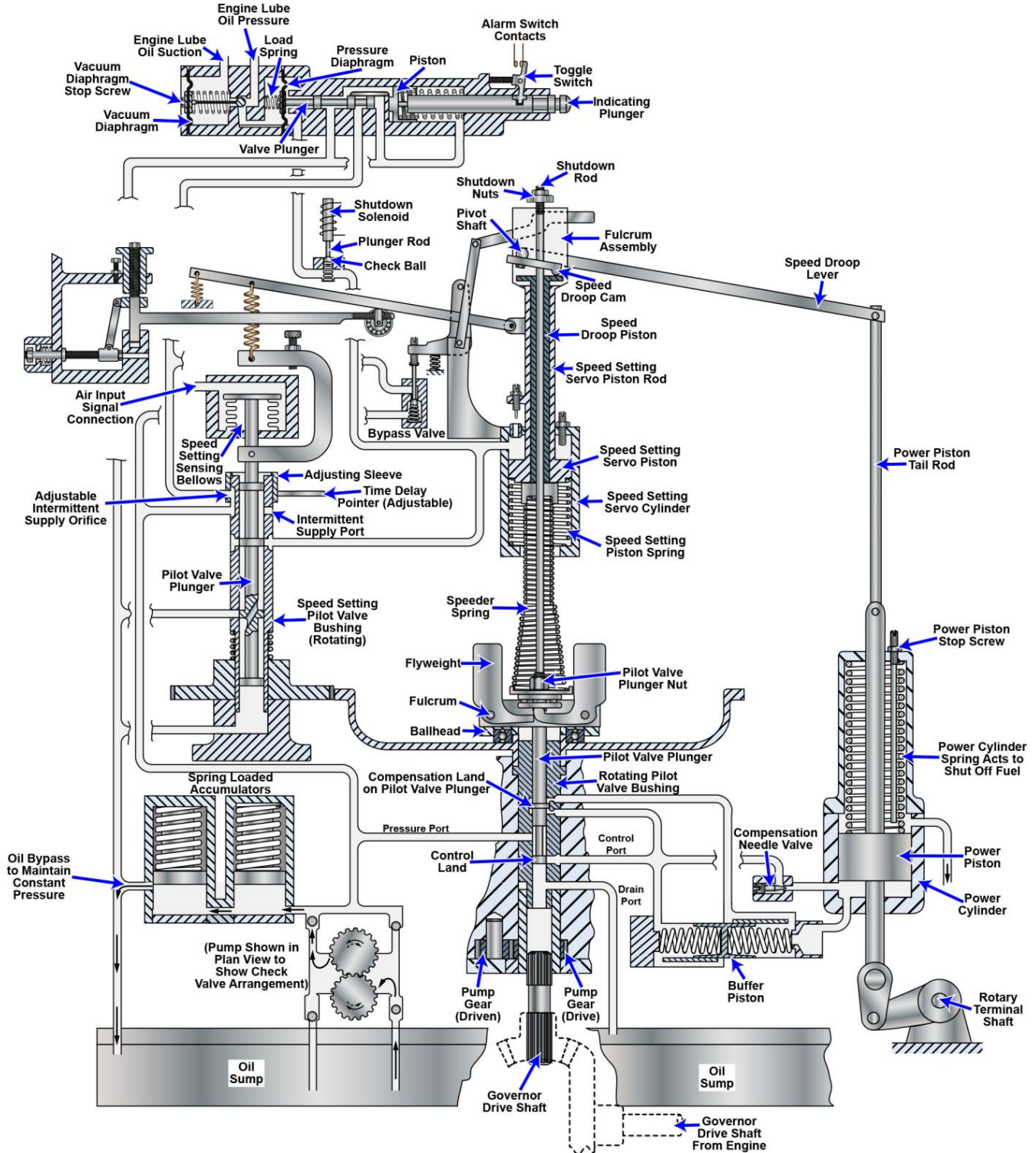
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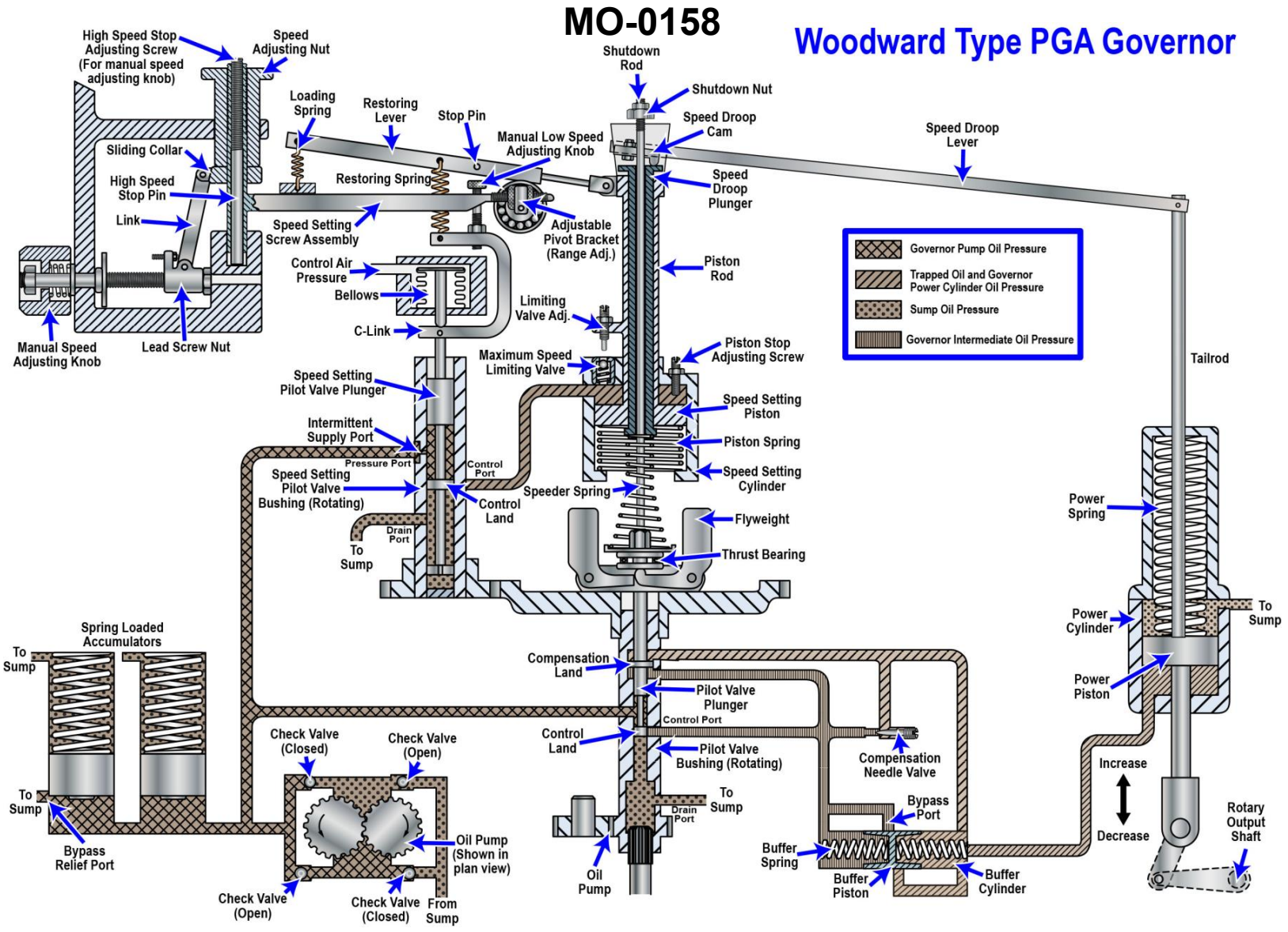


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MO-0156 Woodward Type PGA Governor Schematic Diagram

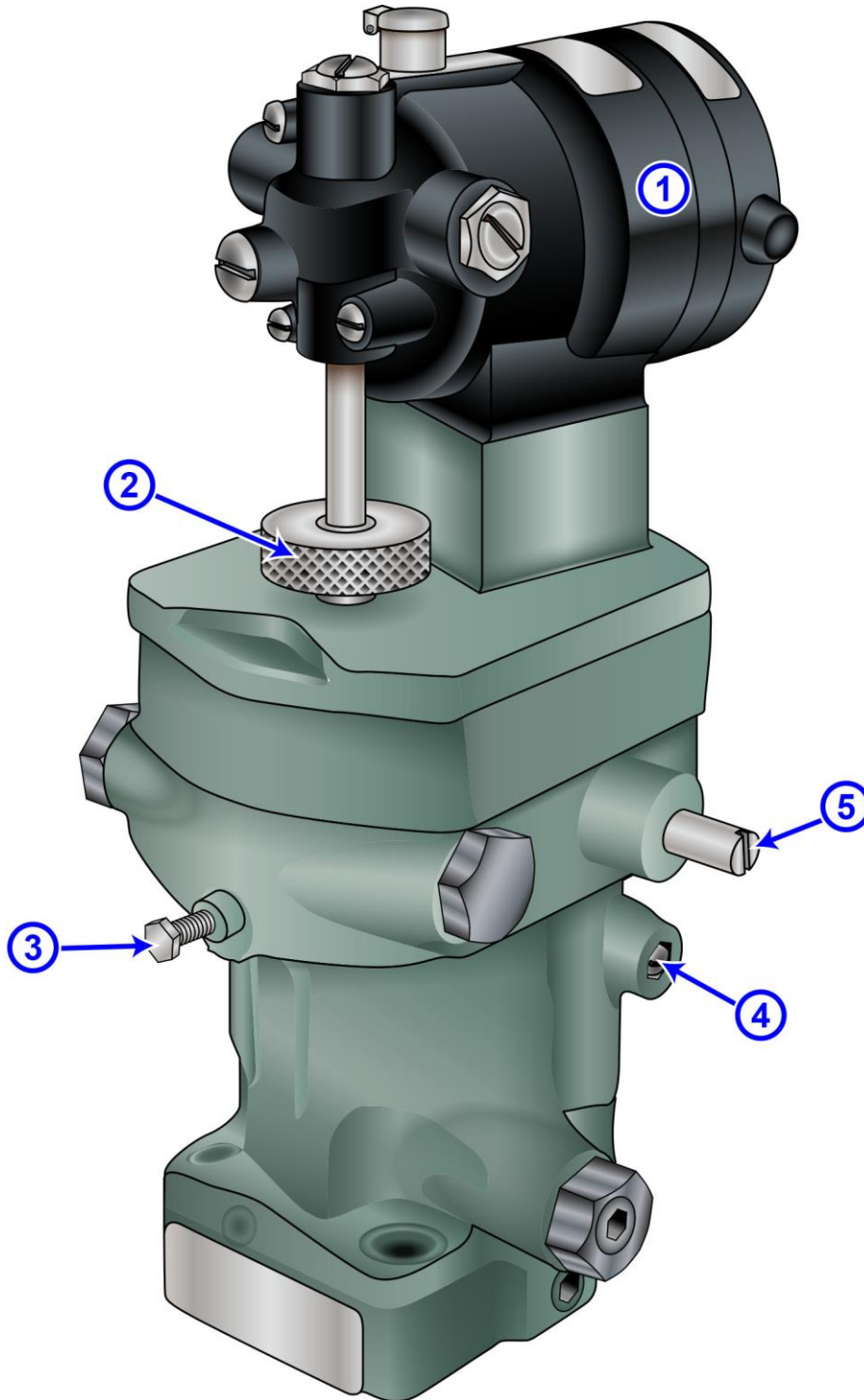


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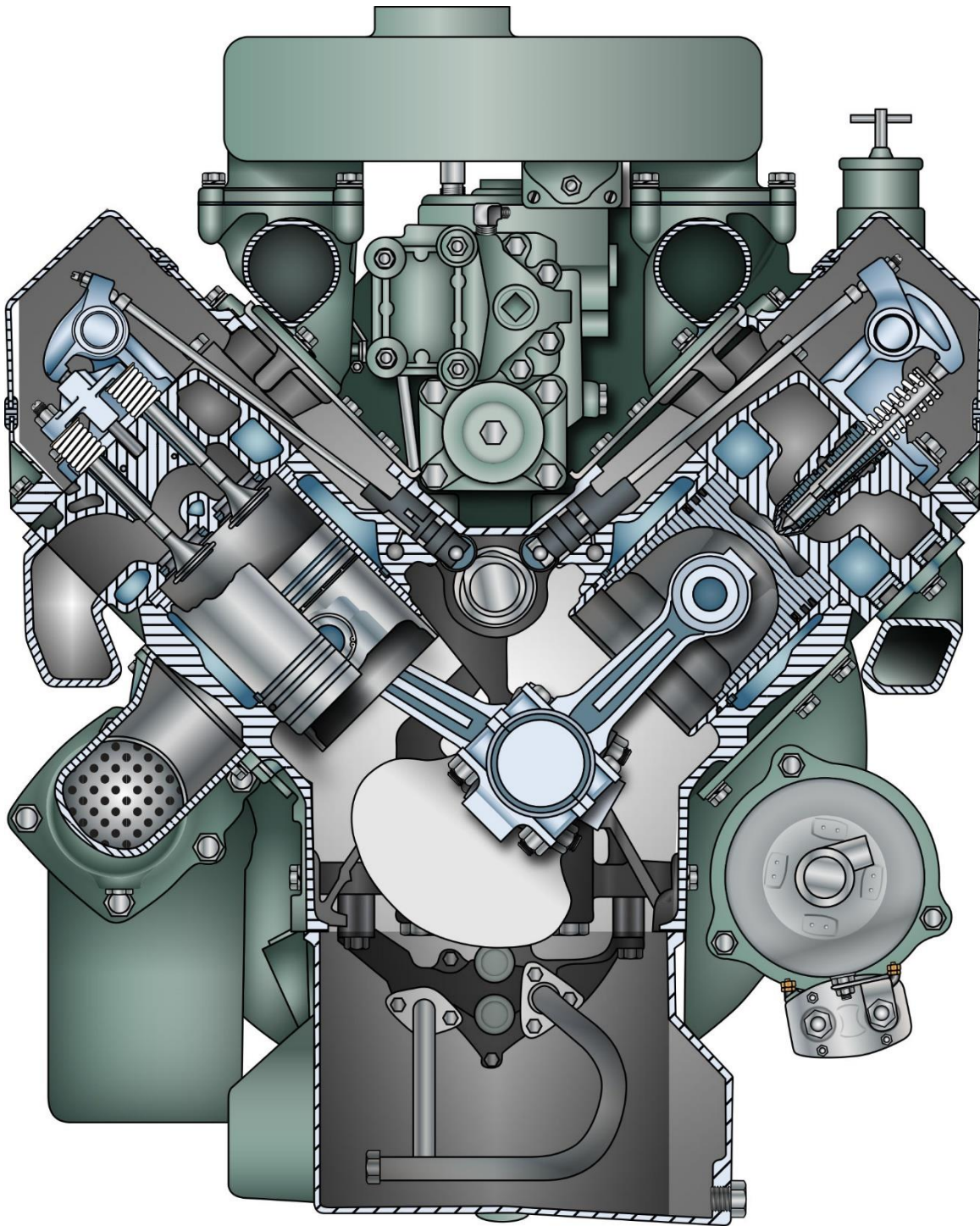
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MO-0160 Woodward Type PSG Governor



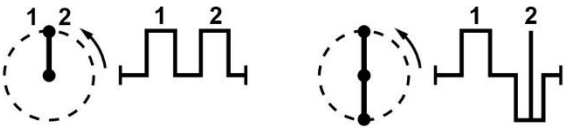

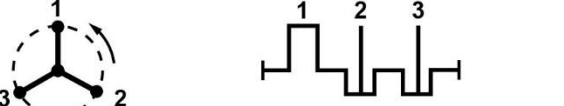

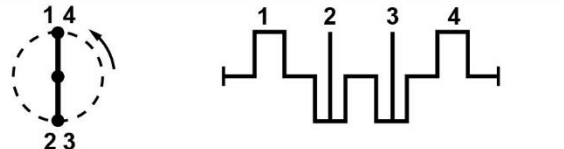
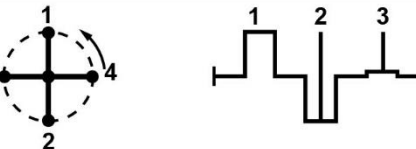
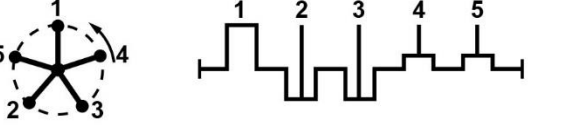
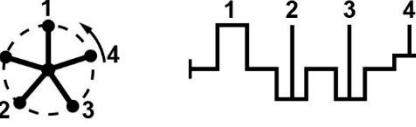
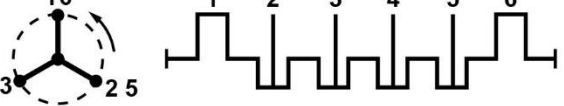
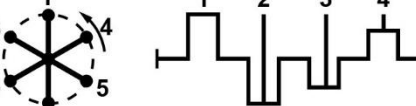
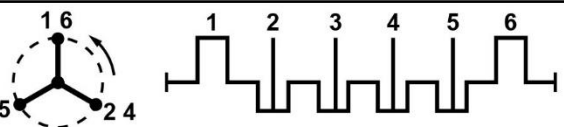
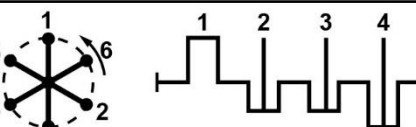
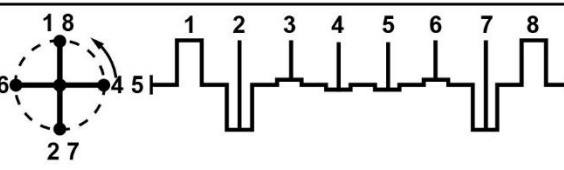
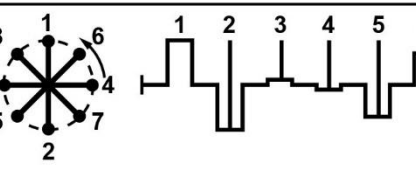
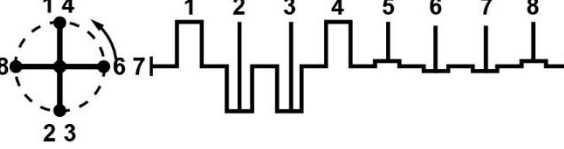
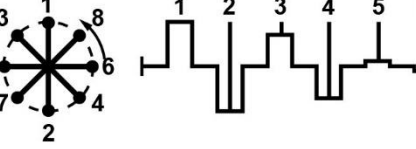
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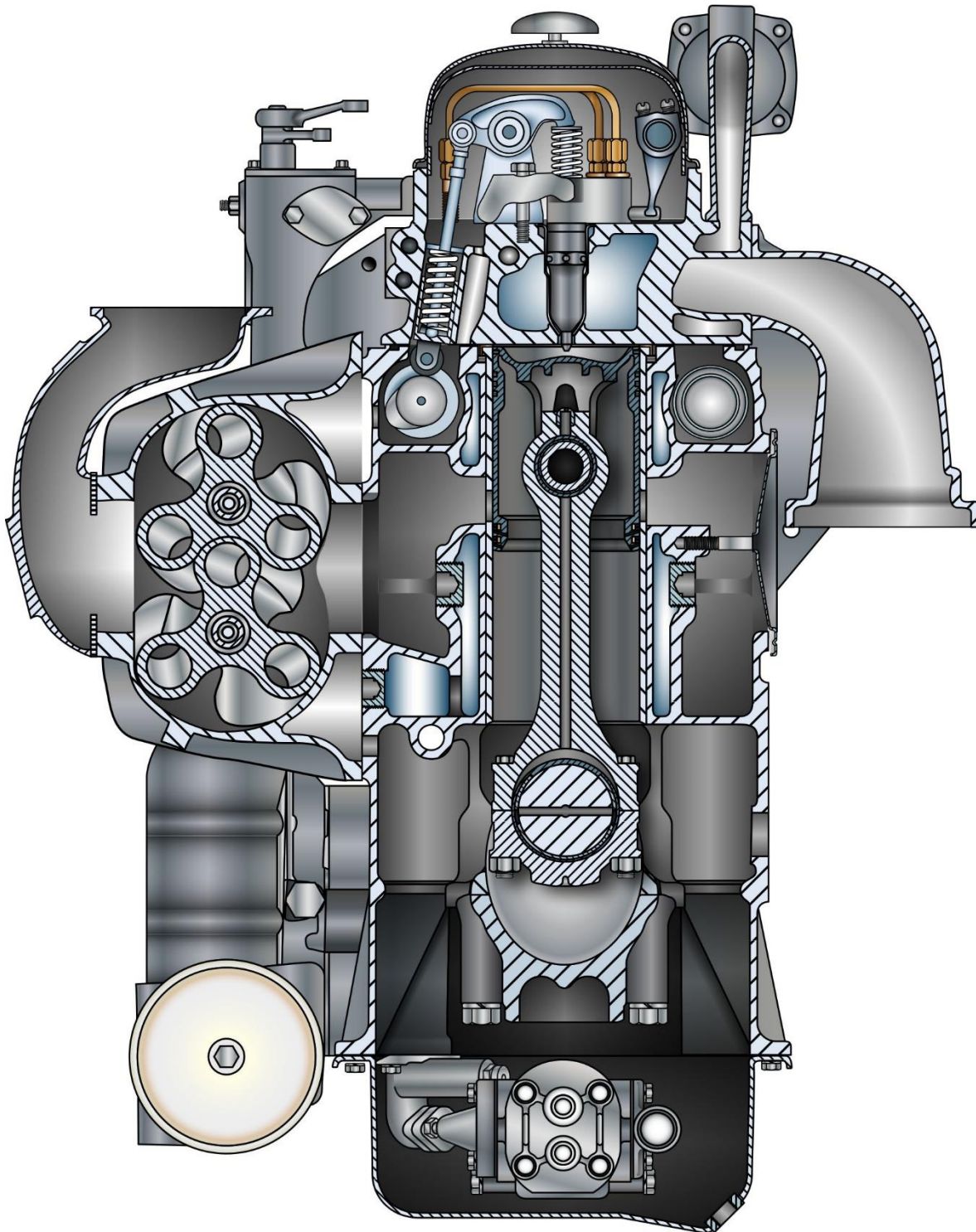
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MO-0164

Number of Cylinders	Four-Stroke Engines		Two-Stroke Engines	
	Arrangement of Cranks	Firing Order	Arrangement of Cranks	Firing Order
2		1-2 1-2		1-2
3		1-3-2		1-2-3
4		1-2-4-3 or 1-3-4-2		1-4-2-3
5		1-3-5-4-2		1-4-3-2-5
6		1-5-3-6-2-4		1-4-5-2-3-6
6		1-4-3-6-2-5		1-6-2-4-3-5
8		1-5-2-6-8-4-7-3		1-6-4-7-2-5-3-8
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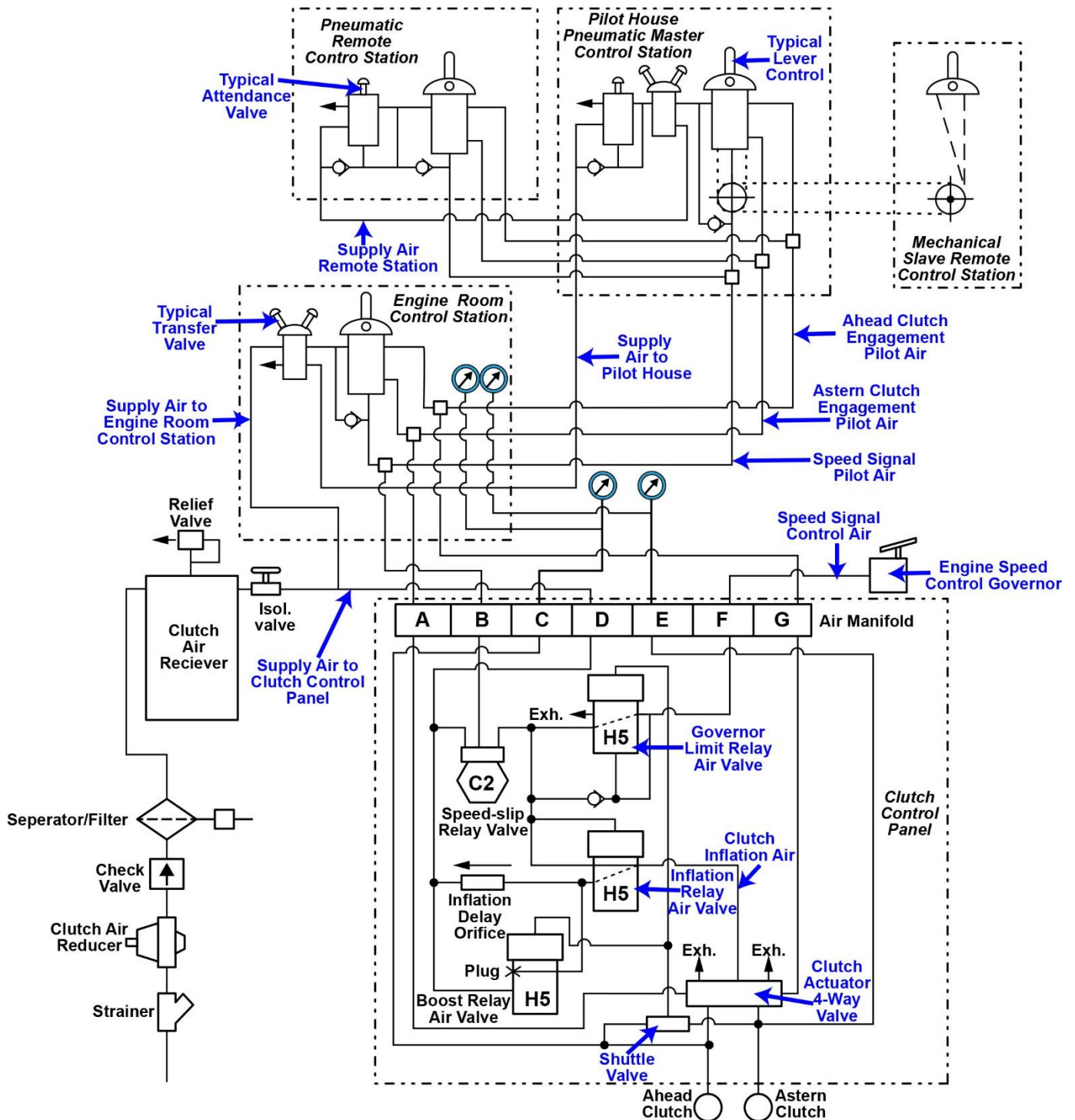
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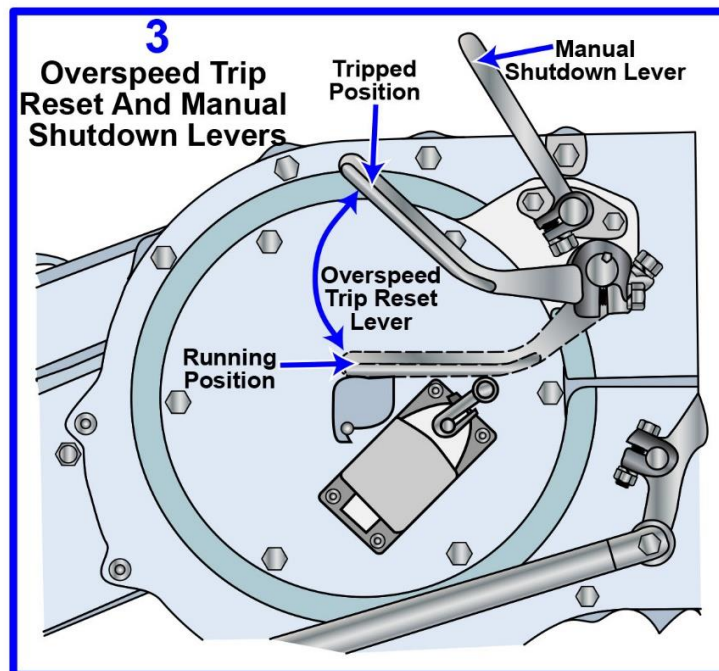
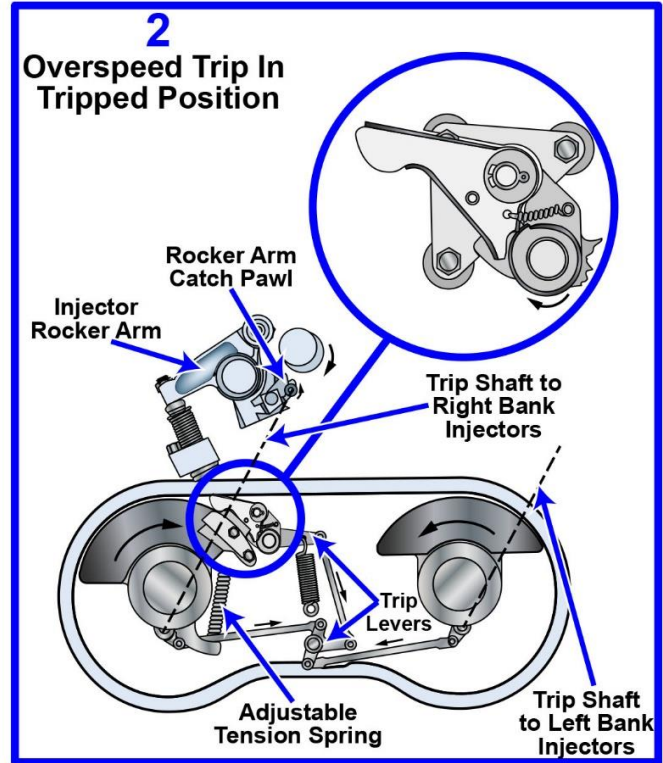
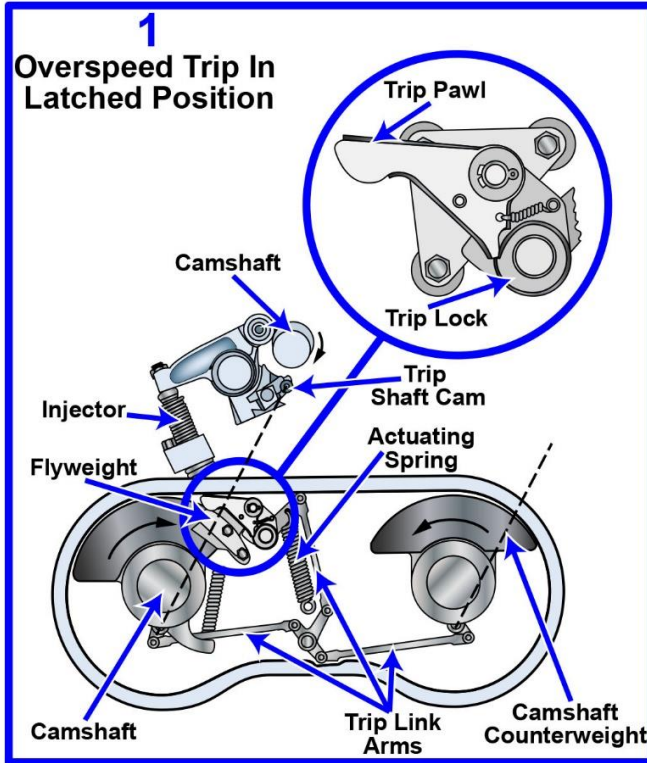
MO-0168 Pneumatic Propulsion Control System



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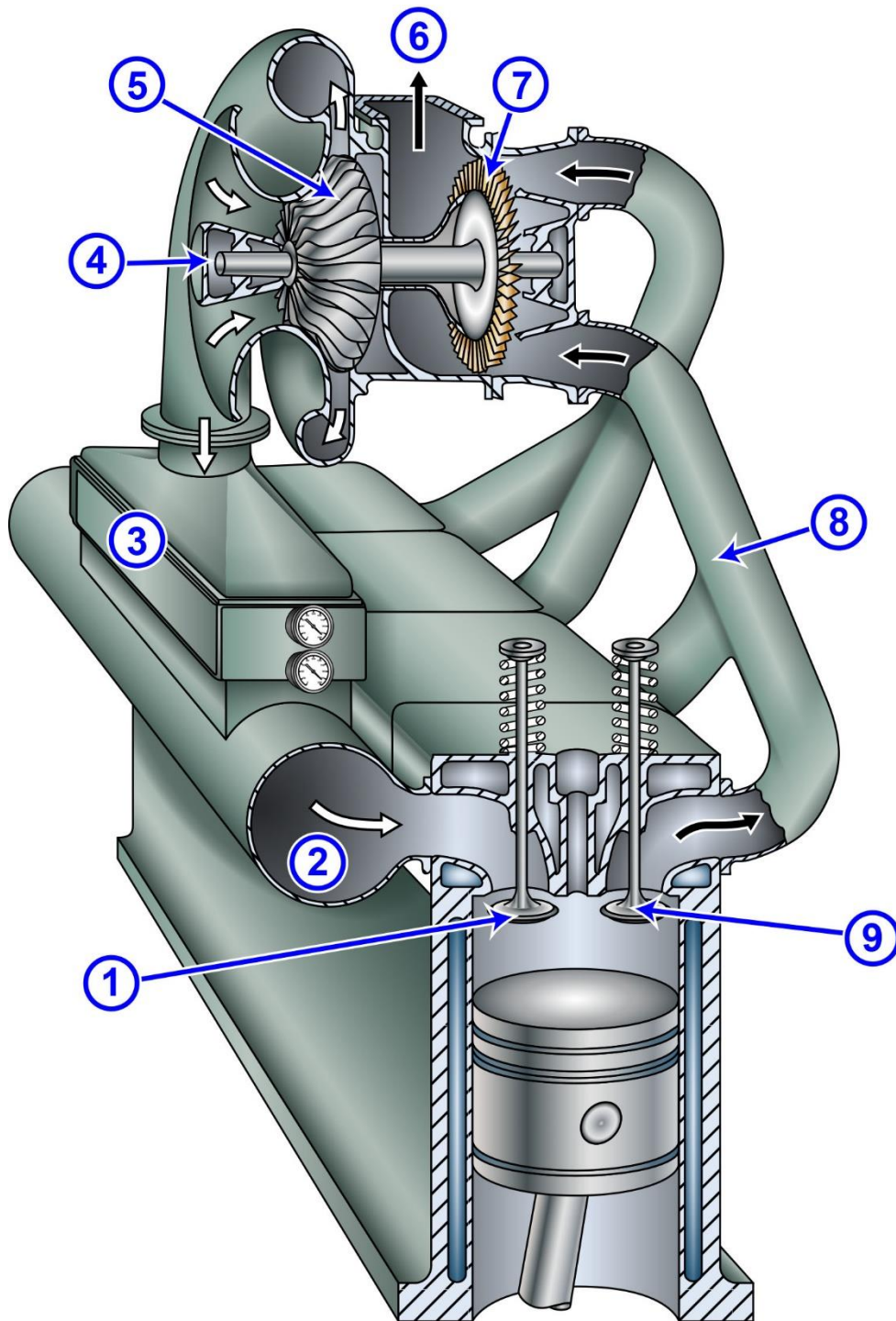
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EMD 645 Overspeed and Manual Trips



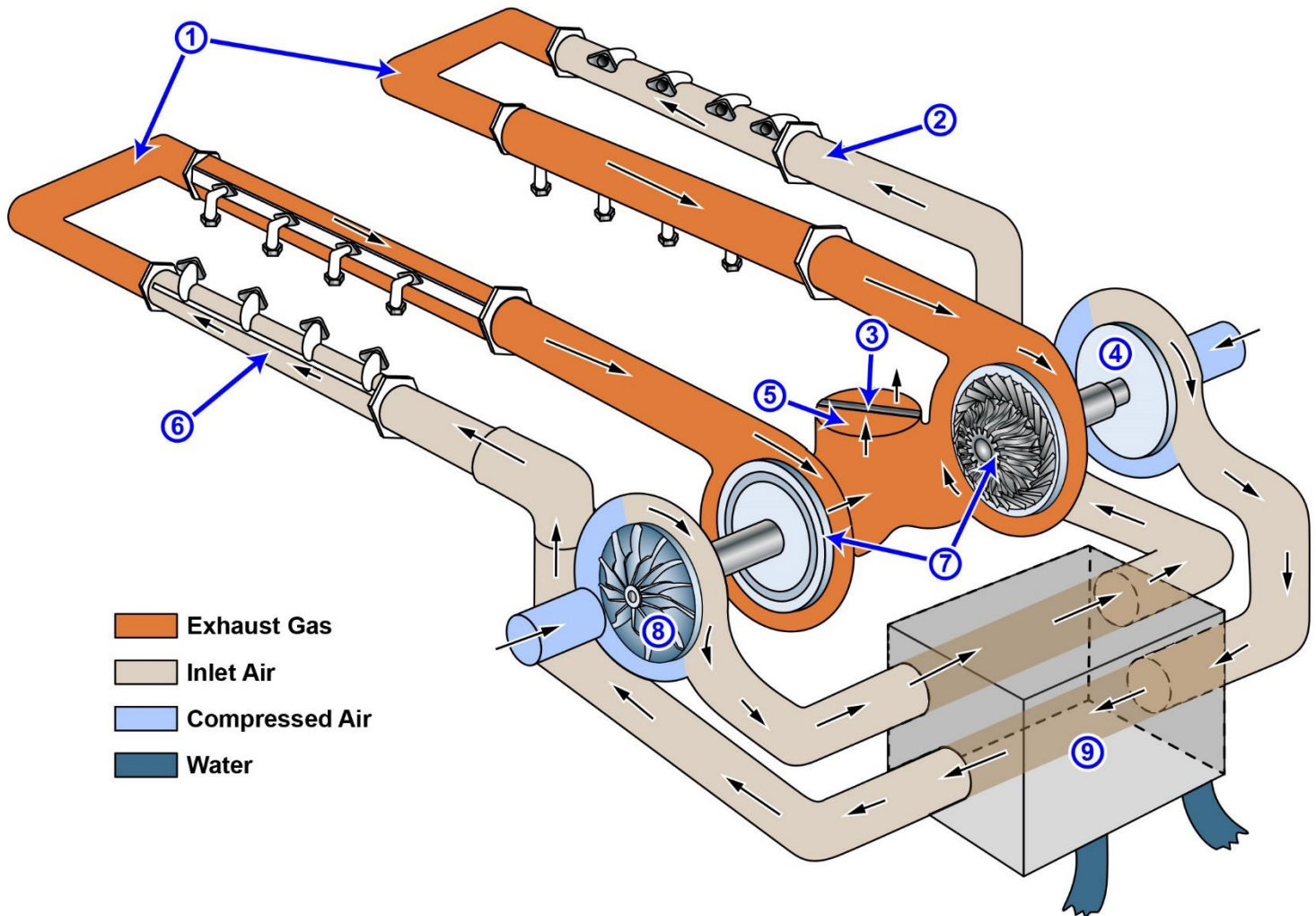
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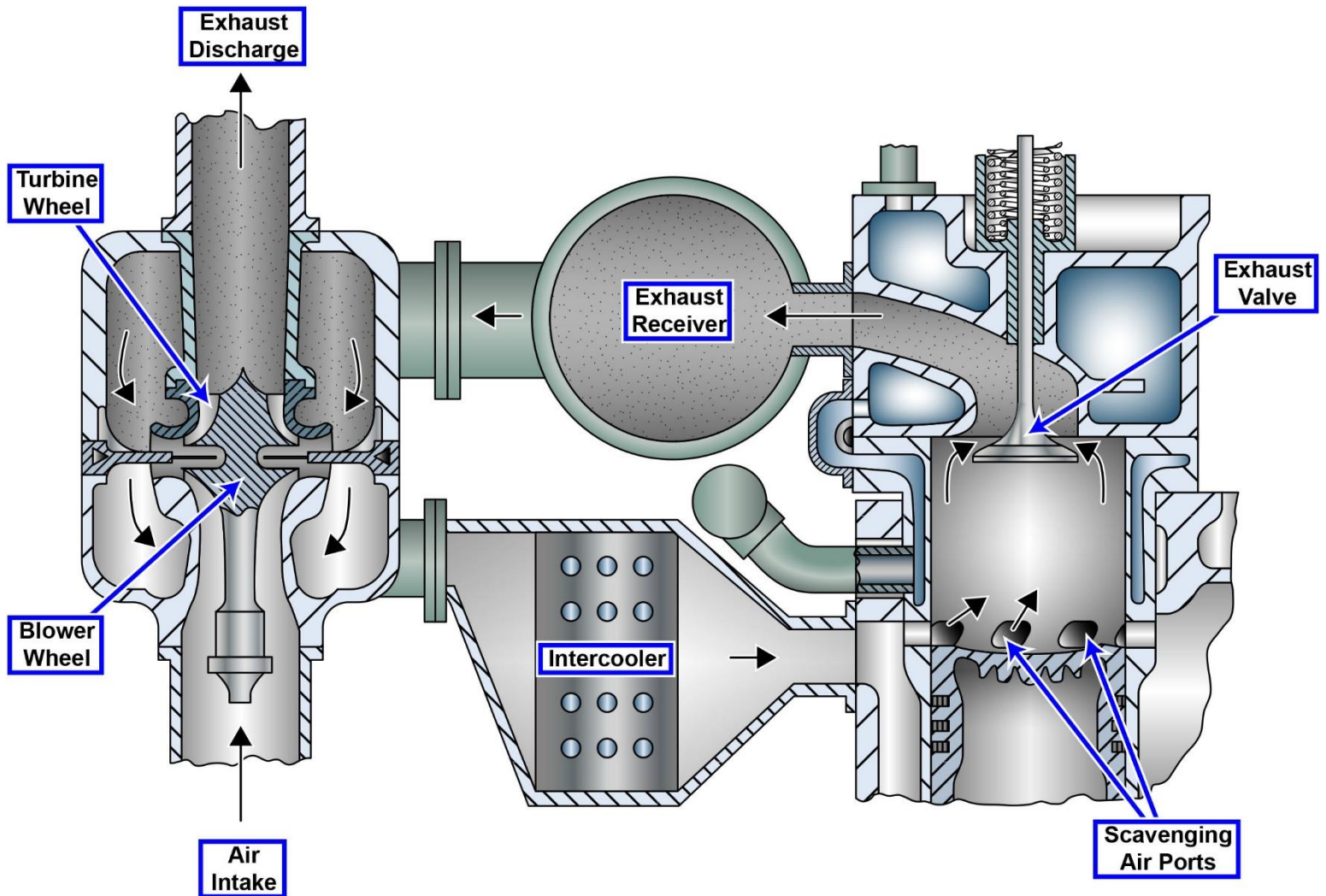
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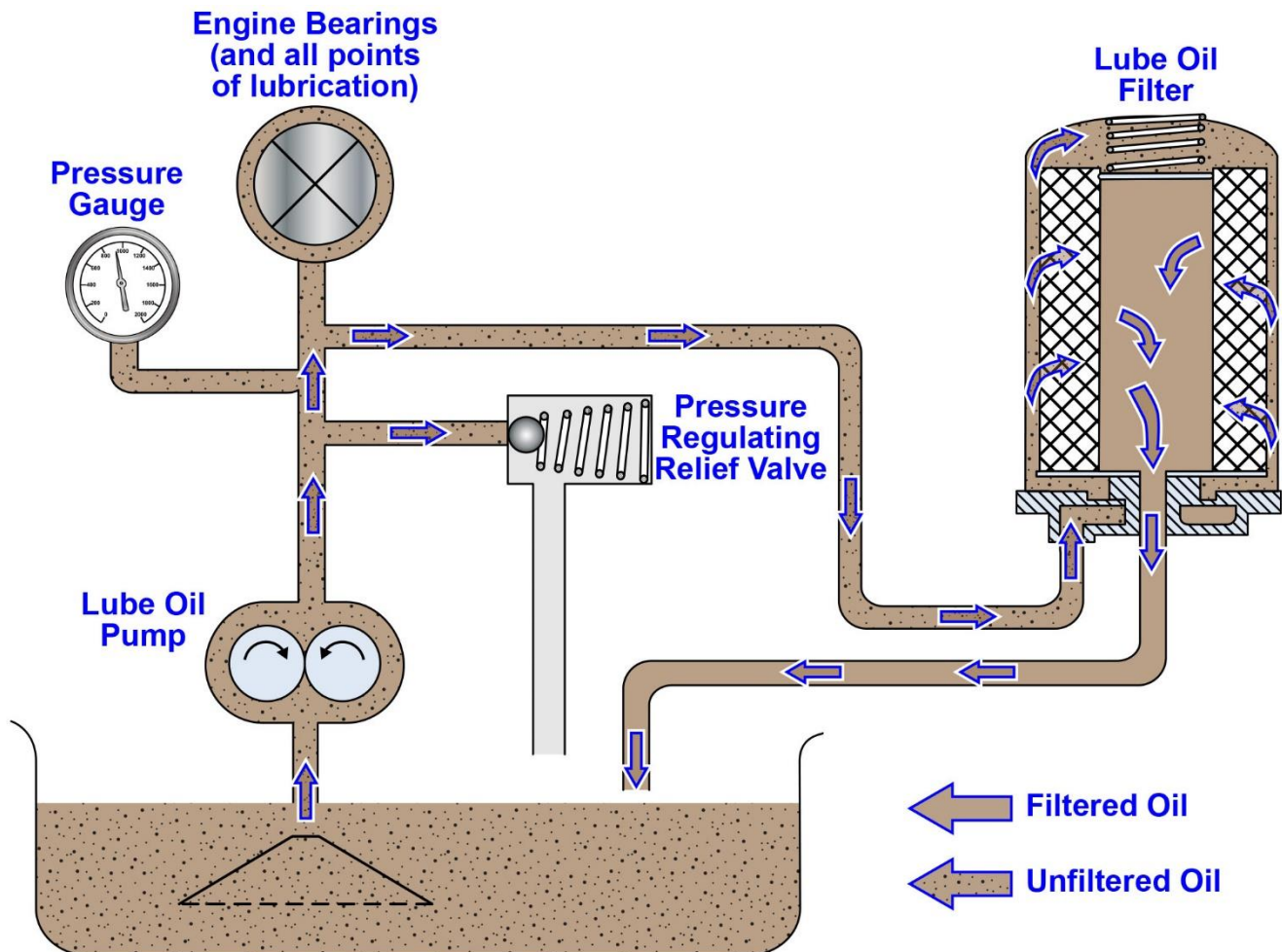
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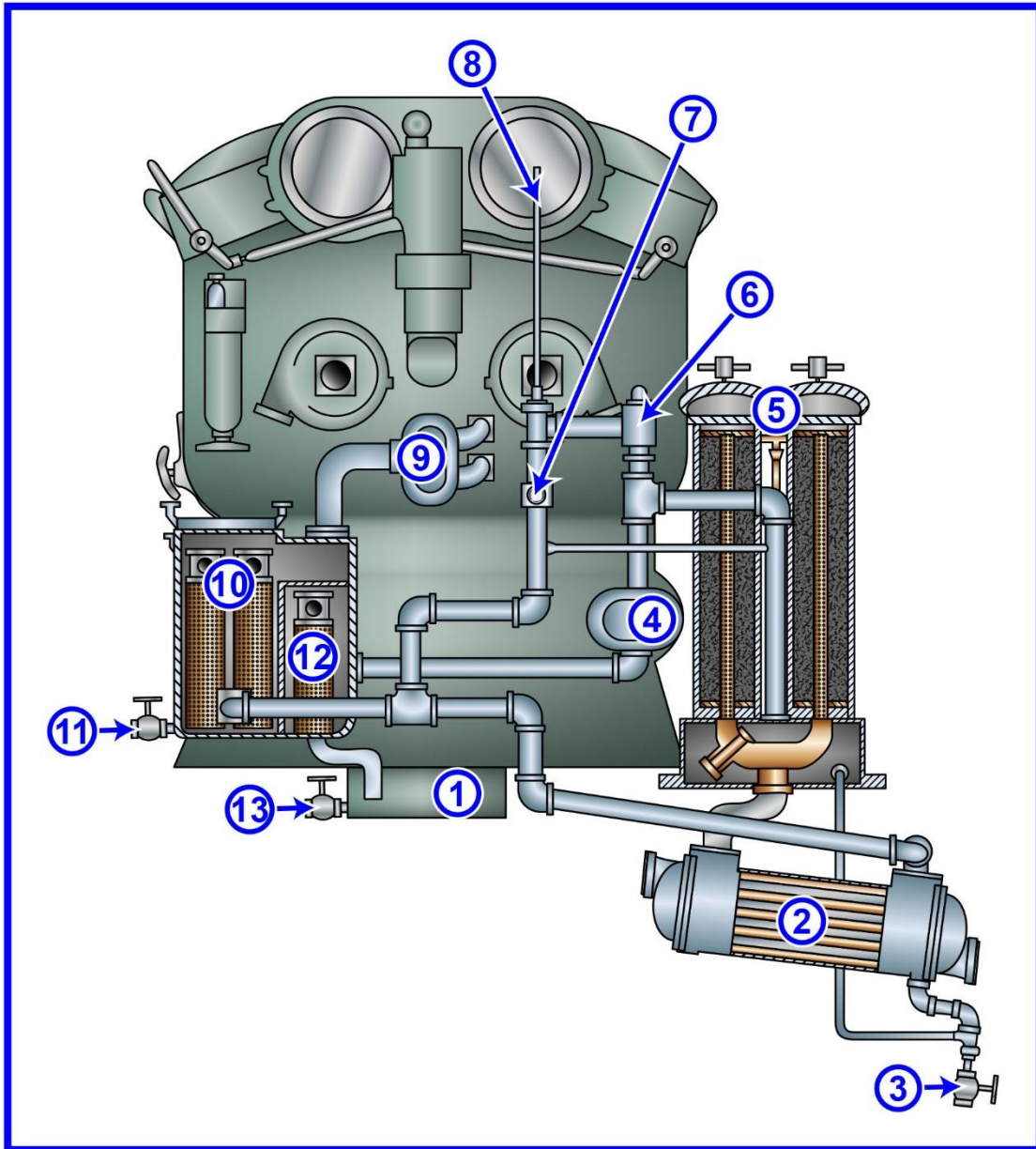
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MO-0182 Simplified Lube Oil Filtration System



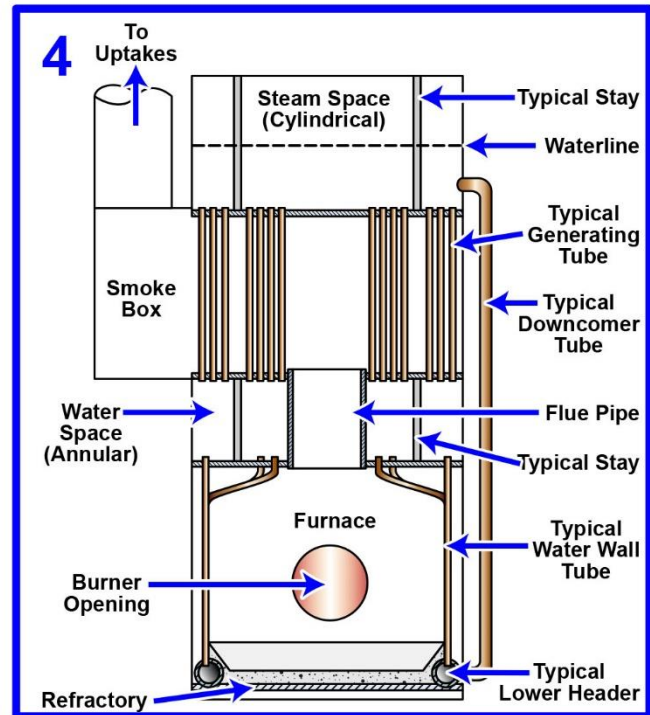
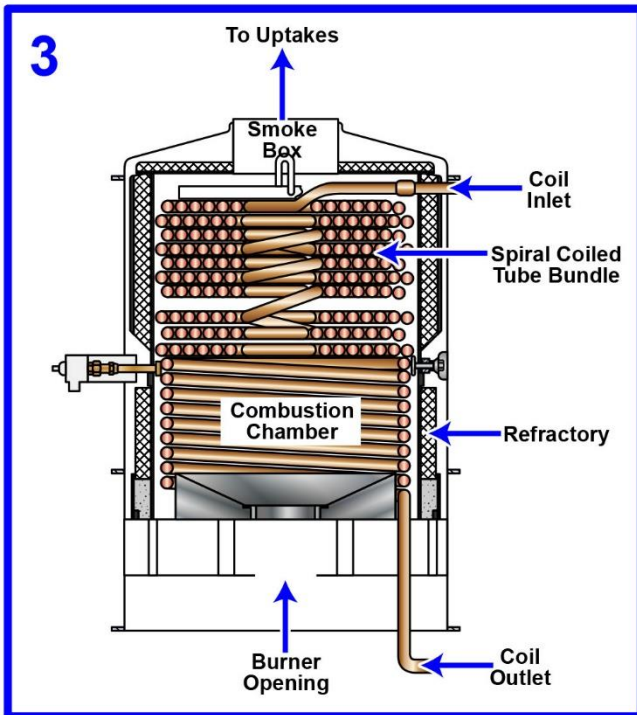
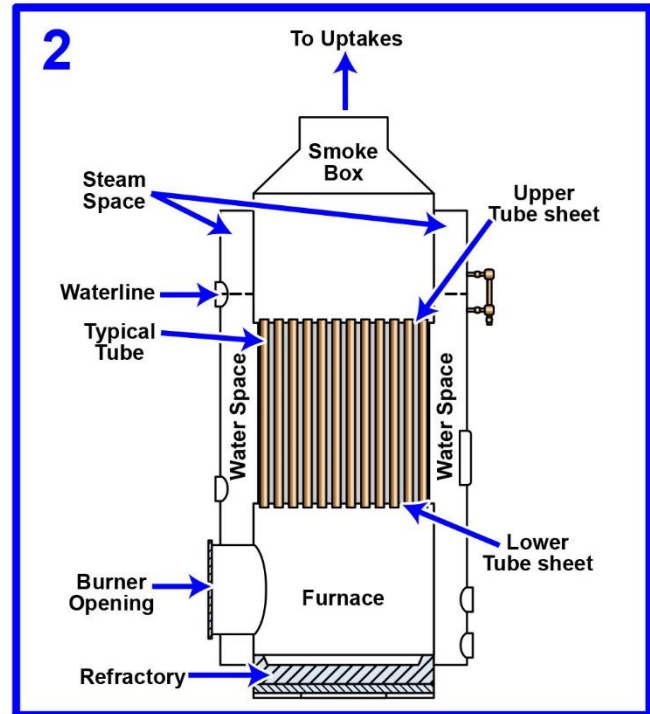
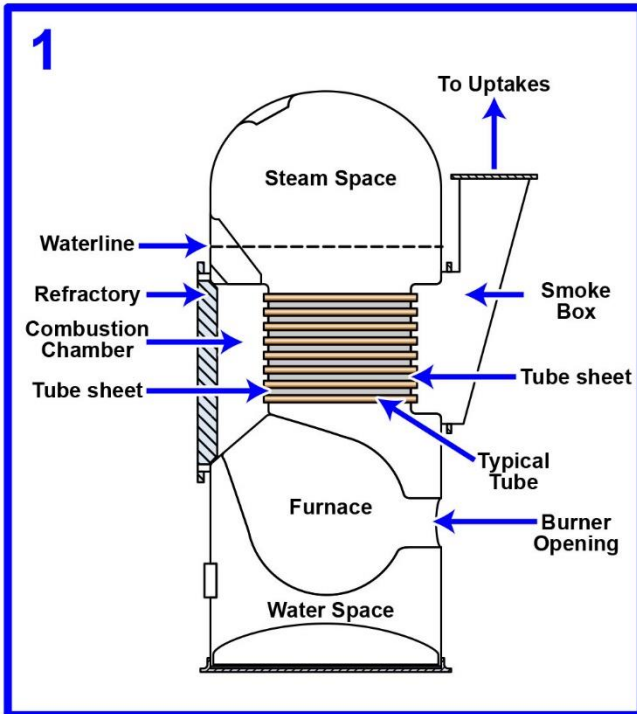
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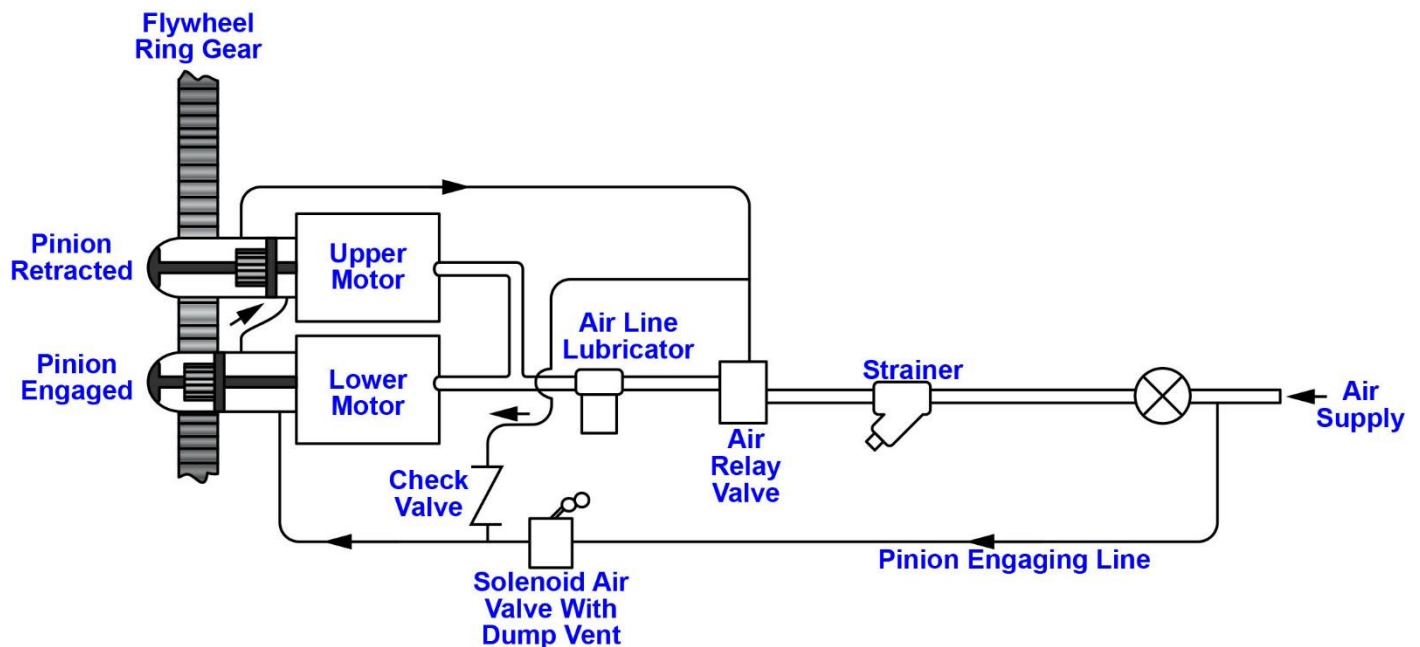
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MO-0200 EMD Air Start System Piping at Engine



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MO-0201 Starting Motors

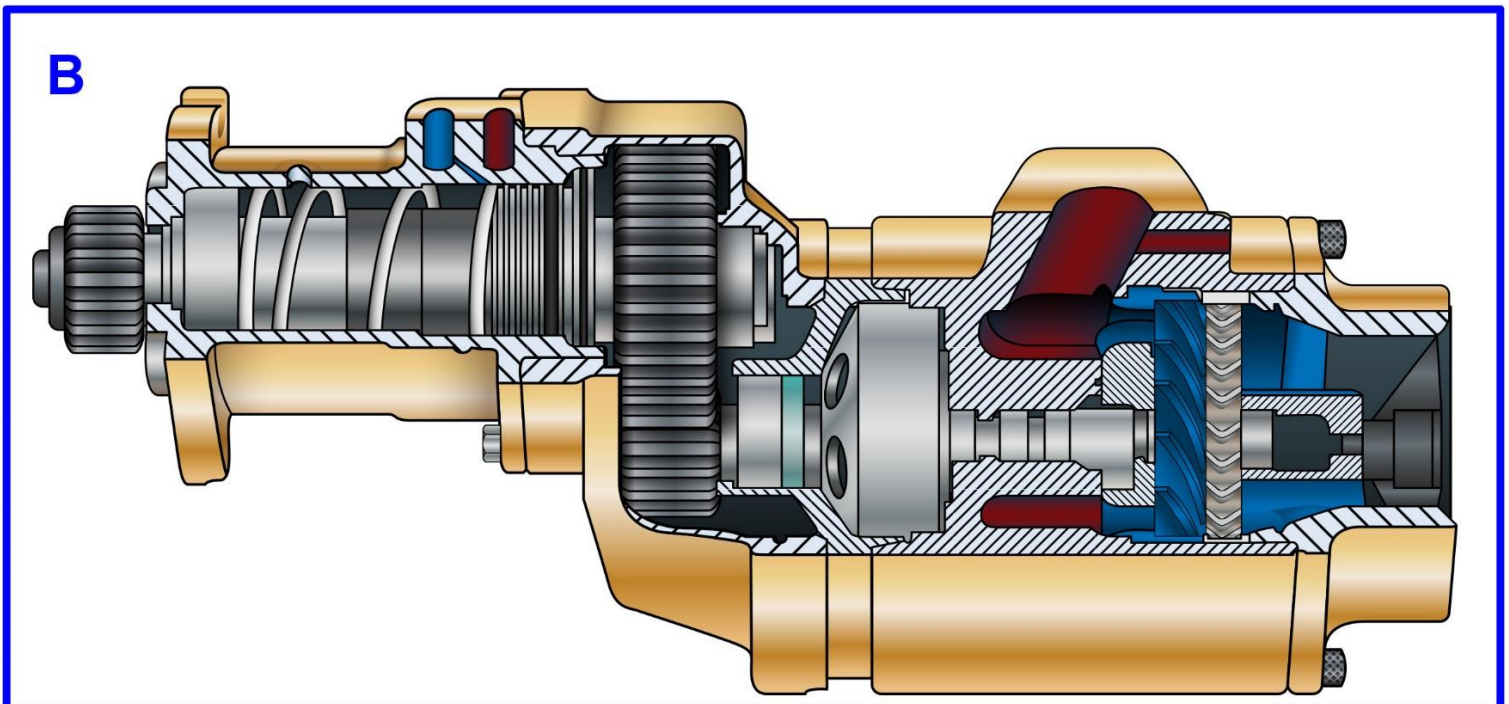
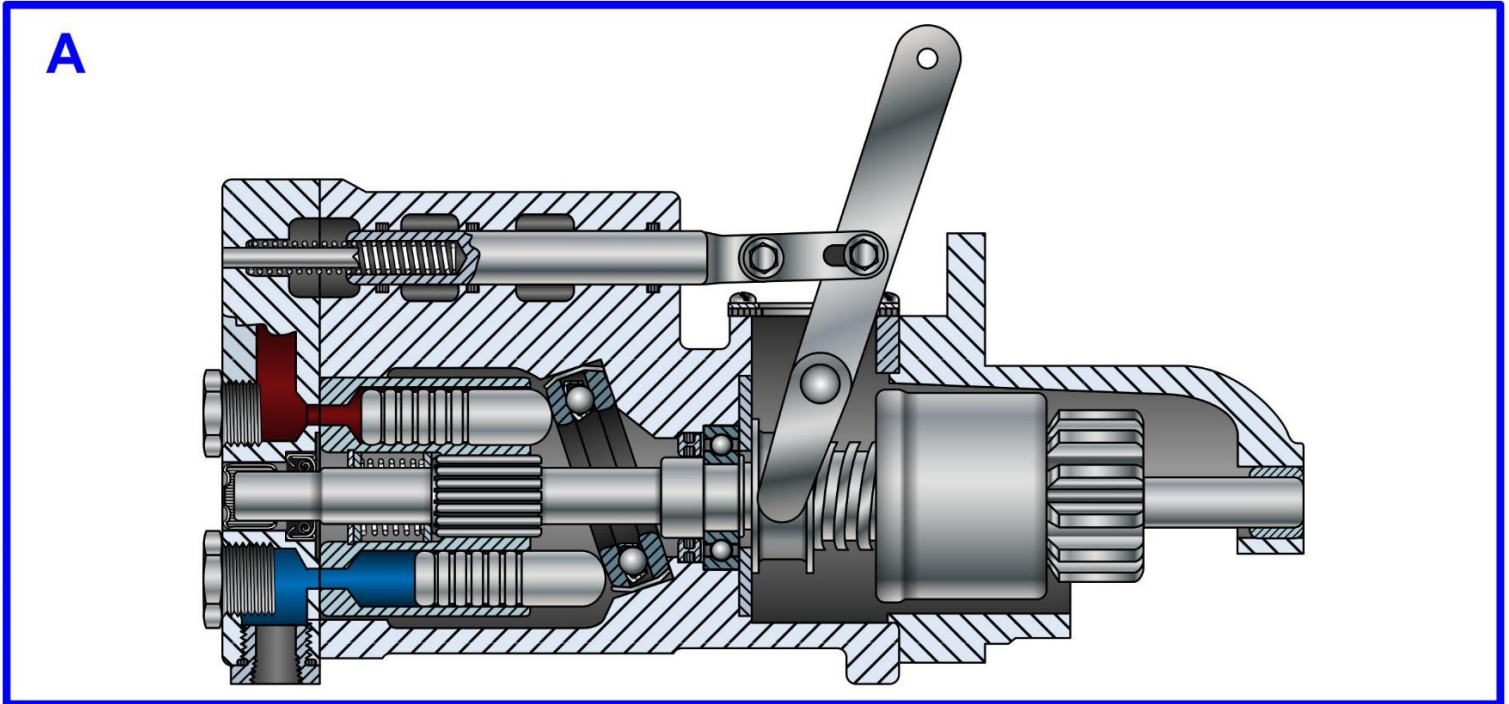
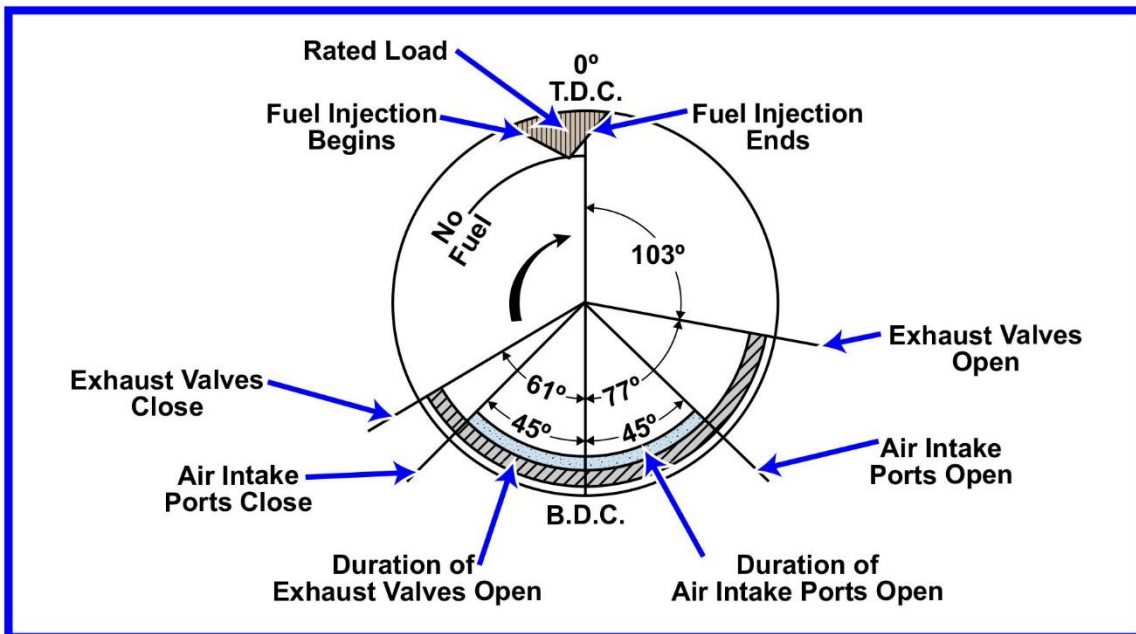
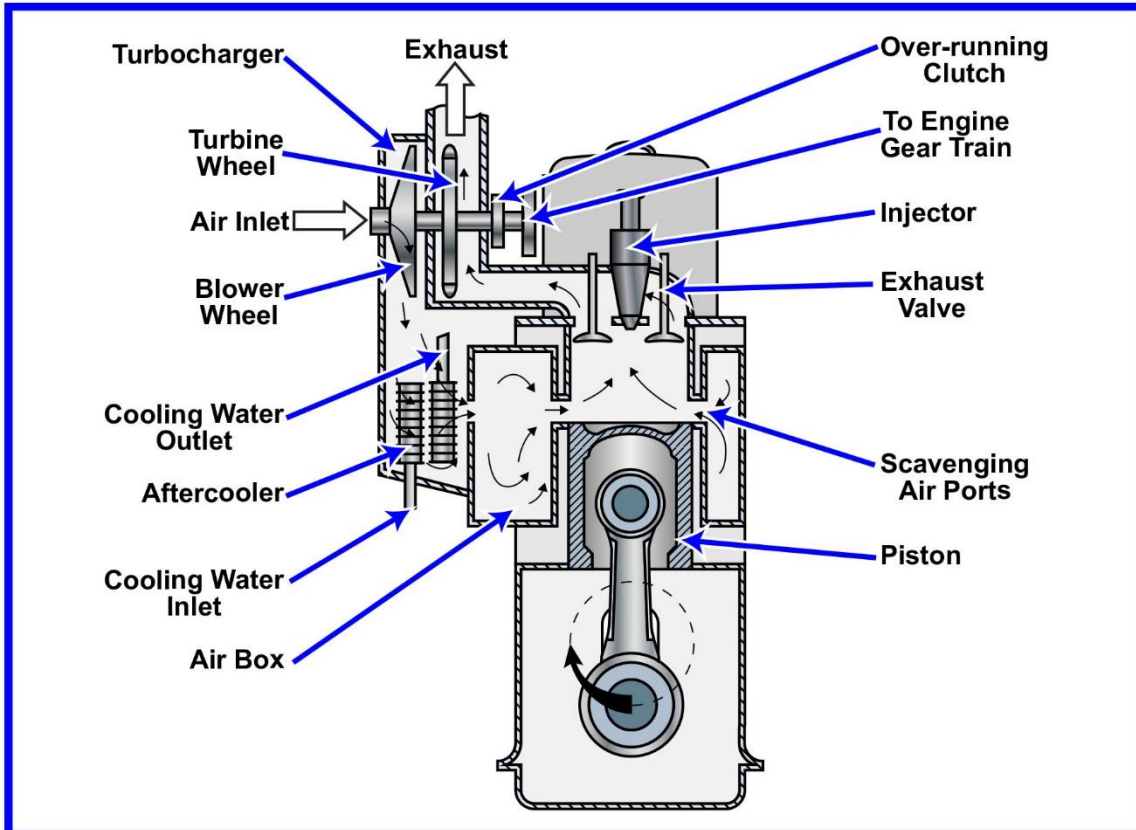


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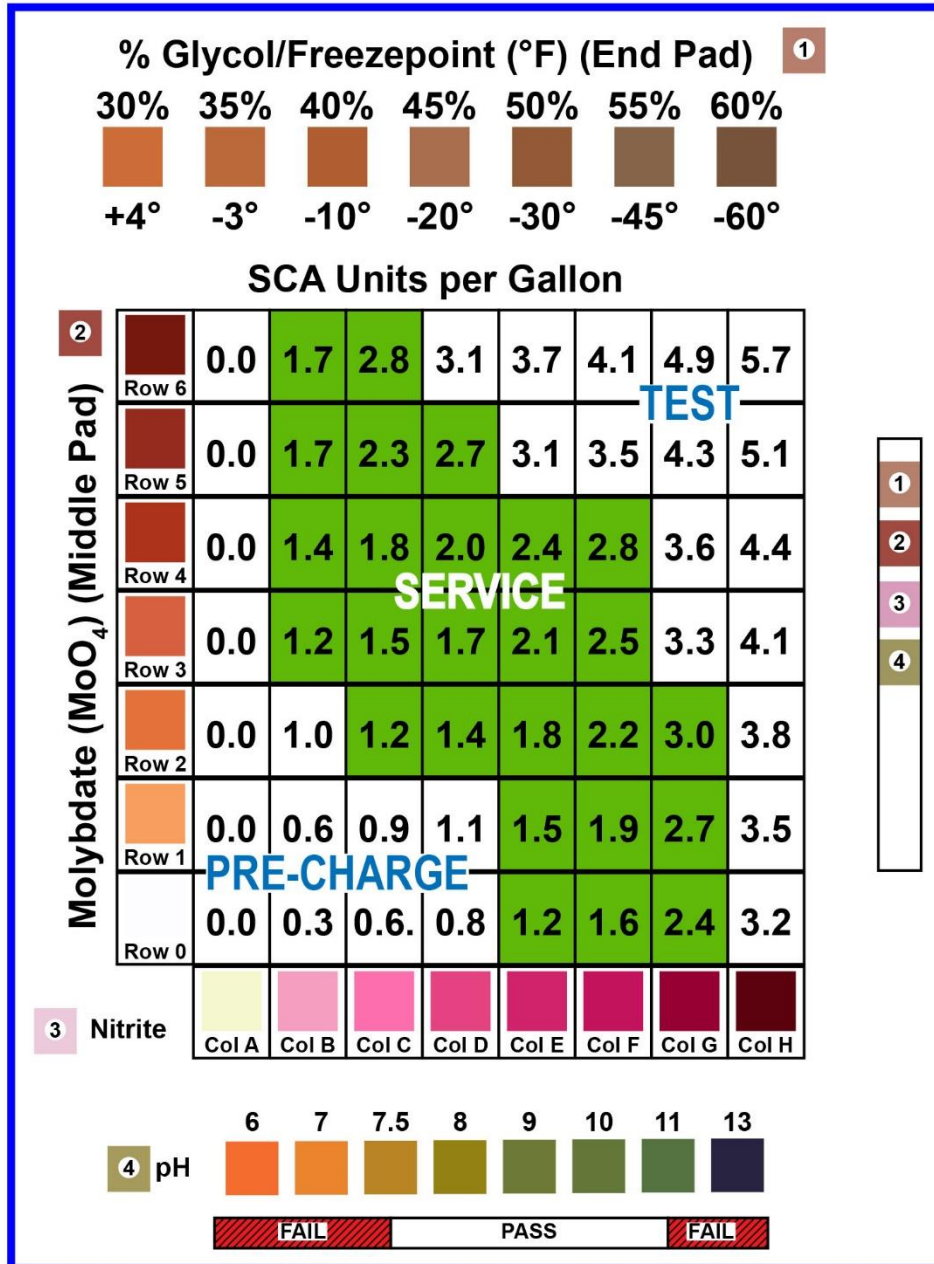
Fig. B: Adapted for testing purposes only from KUIKEN, Diesel Engines for Ship Propulsion and Power Plants
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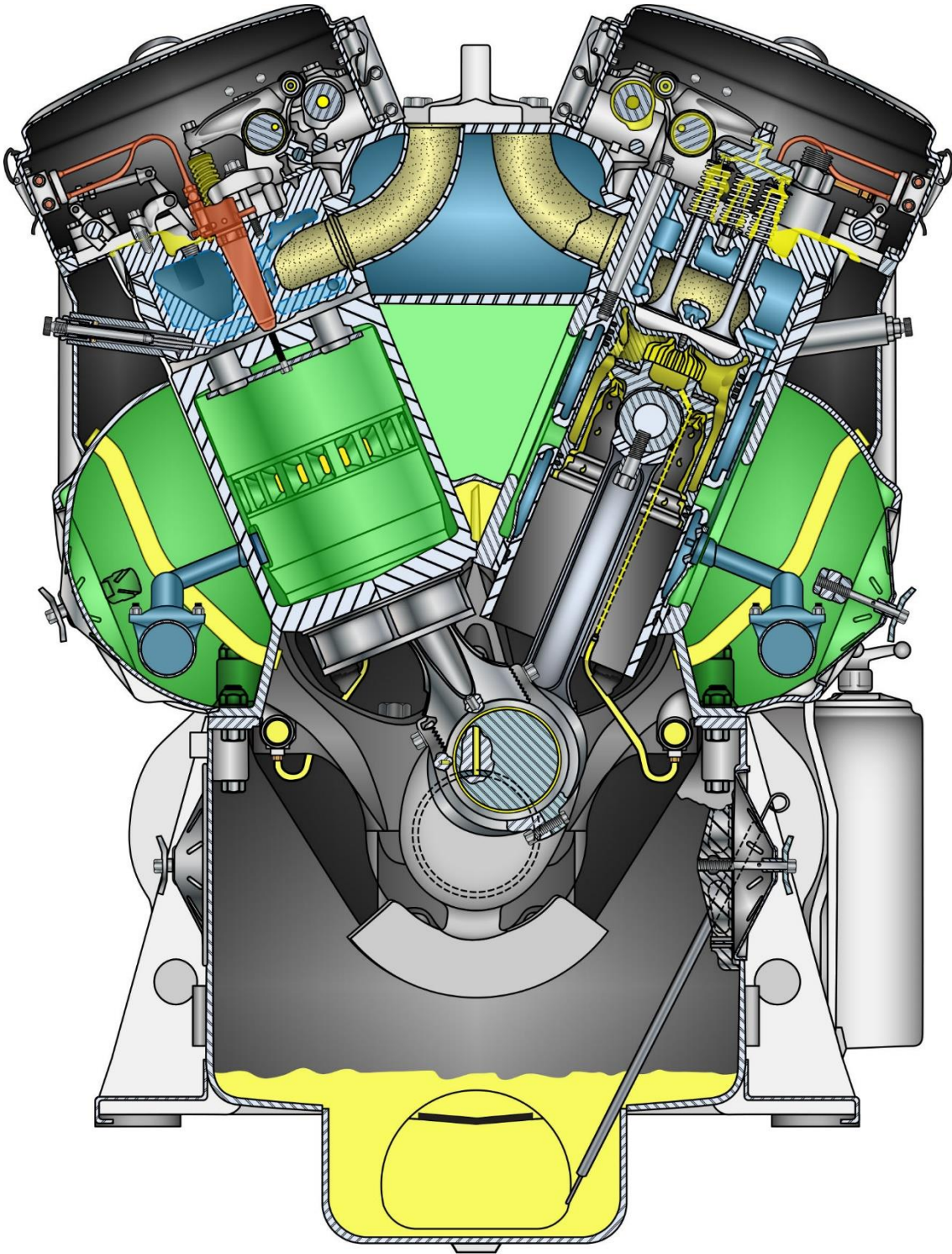
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