

## U.S.C.G. Merchant Marine Exam

DDE – 1000/4000 HP

Q634 General Subjects

(Sample Examination)

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

1. As shown in figure "B" in the illustrated block diagram of a central operating system configured for supervisory control, what is the function of the block "ANALOG (A-D MUX)"? Illustration EL-0094
  - A. A high-speed solid-state switching device called a multiplexer capable of scanning a large number of analog sensors in a short period of time and converting these signals to digital values for processing by the CPU.
  - B. A low-speed solid-state switching device called a multiplexer capable of scanning a small number of analog sensors in a long period of time and converting these signals to digital values for processing by the CPU.
  - C. A low-speed solid-state switching device called a multiplexer capable of scanning a small number of digital sensors in a long period of time and converting these signals to analog values for processing by the CPU.
  - D. A high-speed solid-state switching device called a multiplexer capable of scanning a large number of digital sensors in a short period of time and converting these signals to analog values for processing by the CPU.

Correct answer: A

2. Which of the listed valve types is typically used for the low-pressure stage of a reciprocating air compressor?
  - A. Ring-plate
  - B. Strip-type
  - C. Sliding
  - D. Rotary

Correct answer: B

3. Which of the following statements represents the proper procedural sequence for adjusting the metering rate of an in-line lubricator as used in a ship's service air system hose station? Assume that the pressure regulator has been properly set.
  - A. Establish normal air flow. Determine drip rate. Further open needle valve to increase drip rate or further close needle valve to decrease drip rate, as appropriate.
  - B. Establish normal air flow. Determine drip rate. Further open needle valve to decrease drip rate or further close needle valve to increase drip rate, as appropriate.
  - C. Temporarily shut-off air flow. Determine drip rate. Further open needle valve to increase drip rate or further close needle valve to decrease drip rate, as appropriate. Re-establish normal air flow.
  - D. Temporarily shut-off air flow. Determine drip rate. Further open needle valve to decrease drip rate or further close needle valve to increase drip rate, as appropriate. Re-establish normal air flow.

Correct answer: A

4. Which of the following illustrations represents the proper method of circuit grounding for a low-level analog signal cable? Illustration EL-0124
  - A. A
  - B. B
  - C. C
  - D. D

Correct answer: A

5. Hot water heaters used in potable water systems may have multiple heat sources, such as an electric heating element and a jacket water heated tube bundle. What is the primary purpose of such an arrangement?
- A. Allow electricity to be used in port and jacket water to be used while underway.
  - B. Allow the designated backup heat source to be used in the event of failure of the designated primary heat source, whether in port or underway.
  - C. Allow jacket water to be used in port and electricity to be used while underway.
  - D. Allow both the heat sources to be used when the demand for hot water is high, whether in port or underway.

Correct answer: A

6. What statement is true concerning the term "isochronous" as it applies to prime mover speed control governors?
- A. Isochronous governors are able to maintain constant prime mover speed regardless of load by employing temporary speed droop.
  - B. Isochronous governors are able to maintain constant prime mover speed regardless of load by employing permanent speed droop.
  - C. Isochronous governors are able to maintain constant prime mover load regardless of speed by employing permanent speed droop.
  - D. Isochronous governors are able to maintain constant prime mover load regardless of speed by employing temporary speed droop.

Correct answer: A

7. In a forced-feed lubrication system, what statement is true concerning lube oil reservoir/sump residence time?
- A. The higher the oil level, the shorter the residence time, and the hotter the oil will be as delivered by the pump.
  - B. The higher the oil level, the longer the residence time, and the cooler the oil will be as delivered by the pump.
  - C. The higher the oil level, the shorter the residence time, and the cooler the oil will be as delivered by the pump.
  - D. The higher the oil level, the longer the residence time, and the hotter the oil will be as delivered by the pump.

Correct answer: B

8. Air leakage between the shaft and stuffing box packing in a centrifugal pump is prevented by \_\_\_\_\_.
- A. the stuffing box gland
  - B. lantern rings between the packing rings
  - C. a compressed packing gland
  - D. a liquid seal

Correct answer: D

9. The function of item "7" shown in the illustration is to \_\_\_\_\_. Illustration GS-0153
- A. Prevent separated oil from mixing with the incoming bilge water
  - B. Direct the flow of the oily-water mixture against the coalescer bed
  - C. Support the tank access panel
  - D. Allow the oil accumulated to exit the device, while remaining separated from the liquid

Correct answer: A

10. Referring to the illustrated motorship freshwater cooling system drawing, which cooling system has cooling water passing through passages within components that are continuously undergoing motion? Illustration MO-0212
- A. The main engine jacket water cooling system
  - B. The SSDG cooling water systems
  - C. The main engine injector cooling water system
  - D. The main engine piston cooling water system

Correct answer: D

11. What is the pressure and condition of the refrigerant entering the receiver of a refrigeration system?
- A. subcooled low-pressure liquid
  - B. superheated high-pressure vapor
  - C. subcooled high-pressure liquid
  - D. superheated low-pressure vapor

Correct answer: C

12. In the presence of an open flame or hot surfaces, chlorinated fluorocarbon refrigerants decompose and form what chemical substance?
- A. petroleum crystals
  - B. carbon monoxide
  - C. phosgene gas
  - D. water vapor

Correct answer: C

13. For a typical transverse-framed deep-draft commercial vessel, what is the normal arrangement for the support of decks?
- A. Deck beams are longitudinally arranged, and deck girders are transversely arranged, and both are continuous with the exception of hatches and other openings.
  - B. Deck beams are transversely arranged, and deck girders are longitudinally arranged, and the deck beams are continuous with the exception of hatches and other openings. The deck girders are intercostal.
  - C. Deck beams are transversely arranged, and deck girders are longitudinally arranged, and both are continuous with the exception of hatches and other openings.
  - D. Deck beams are transversely arranged, and deck girders are longitudinally arranged, and the deck girders are continuous with the exception of hatches and other openings. The deck beams are intercostal.

Correct answer: C

14. In general, the thermal bulb for a thermal expansion valve used in a reciprocating air conditioning system is usually charged with what substance?
- A. distilled water
  - B. bees wax
  - C. mercuric sulfate
  - D. the same refrigerant as the system

Correct answer: D

15. To prevent the unnecessary loading of an air conditioning system while maintaining the designed dry bulb temperature and relative humidity in an air conditioning system, what should be done?
- A. admit only enough fresh outside air to provide proper ventilation
  - B. operate the purge recovery unit continuously
  - C. lower the compressor head pressure
  - D. reduce the air reheating system load

Correct answer: A

16. In the illustrated refrigeration system, what is the proper name for the component labeled "A"?  
Illustration RA-0012
- A. filter drier
  - B. accumulator
  - C. compressor
  - D. condenser

Correct answer: C

17. What is the color-coding for a storage container of R-134a refrigerant?
- A. green
  - B. light blue
  - C. grey
  - D. purple

Correct answer: B

18. To prevent motor overload during start-up of a centrifugal refrigeration system, what is true concerning the compressor suction gas variable inlet guide vanes?
- A. opened until the motor is connected across the line at full voltage and current drawn is below full load current
  - B. opened until the motor is connected across the line at full voltage and current drawn is up to full load current
  - C. closed until the motor is connected across the line at full voltage and current drawn is up to full load current
  - D. closed until the motor is connected across the line at full voltage and current drawn is below full load current

Correct answer: D

19. In a refrigeration system, the bulb for the thermal expansion valve is always located where?

- A. in the middle of the evaporator coils
- B. at the evaporator coil inlet
- C. at the evaporator coil outlet
- D. at the beginning of the bottom row of the evaporator coils

Correct answer: C

20. Technicians servicing small refrigeration appliances can employ what type of recovery equipment?

- A. passive only
- B. active only
- C. either active or passive
- D. there is no need to recover the refrigerant

Correct answer: C

21. Which of the valves listed is normally closed when charging the refrigeration system through the high side?

- A. Suction line valve
- B. Dehydrator inlet valve
- C. Thermal expansion valve
- D. Liquid line king valve

Correct answer: D

22. Which of the devices listed is used to maintain a snug interface between the rotating and stationary seal members shown in the illustration? Illustration GS-0071

- A. spring
- B. seal retaining ring
- C. notch and keyway
- D. bellows

Correct answer: A

23. With an increase in temperature, the volume of hydraulic fluid \_\_\_\_\_.

- A. contracts
- B. remains the same
- C. remains constant if pressure decreases
- D. increases

Correct answer: D

24. Both the direction of flow and fluid flow rate of a variable displacement radial piston pump are determined by the relative positions of the \_\_\_\_\_.

- A. pump shaft and central valve
- B. floating ring and cylinder body
- C. floating ring and pump shaft
- D. pump shaft and horizontal ports

Correct answer: B

25. Which of the listed components of a hydraulic system would enable the pump to be temporarily shut down, and yet still provide an instantaneous source of hydraulic force?
- A. Modulator
  - B. Accumulator
  - C. Sump actuator
  - D. Pressure compensator valve

Correct answer: B

26. In a series circuit, what is the applied voltage (or sum of the applied voltages) equal to?
- A. the total current divided by the total resistance
  - B. the total resistance divided by the total current
  - C. the sum of the individual currents multiplied by the number of resistors
  - D. the sum of the individual voltage drops

Correct answer: D

27. Which statement is true concerning the total power consumed in a parallel circuit?
- A. The total power is equal to the sum of the powers consumed by each individual load.
  - B. The total power is never more than the power consumed by the largest load.
  - C. The total power is always less than the power consumed by the smallest load.
  - D. The total power is the sum of the powers consumed by each load (resistor) divided by the number of loads.

Correct answer: A

28. If a digital multimeter set up to measure AC volts reads low value, but constantly changing "ghost voltages" when its leads are disconnected, what does this indicate?
- A. The digital multimeter test leads are acting as an antenna.
  - B. The digital multimeter AC voltage range is at its lowest value.
  - C. Stray electromagnetic fields from electrical equipment exist in the air.
  - D. All the above conditions must exist.

Correct answer: D

29. When a battery-operated megohmmeter (insulation tester) is used to perform a dielectric absorption test, the resistance is measured and recorded from each conductor to ground each minute for 10 consecutive minutes. What condition accounts for a gradual rise in resistance each successive minute?
- A. The insulation is contaminated with moisture.
  - B. The insulation has direct continuity with ground.
  - C. The insulation is in good condition.
  - D. The insulation is cracked and otherwise deteriorated.

Correct answer: C

30. As the electrolyte level in the cells of a lead-acid battery evaporates over time, what will tend to happen to the specific gravity of the electrolyte in the cells as the level drops due to evaporation?
- A. The specific gravity of the electrolyte will decrease as only the sulfuric acid will evaporate from the electrolyte solution.
  - B. The specific gravity of the electrolyte will increase as only the water will evaporate from the electrolyte solution.
  - C. The specific gravity of the electrolyte will remain unchanged as both the water and sulfuric acid will evaporate from the electrolyte solution.
  - D. Although the specific gravity will change due to evaporation, there is no predictable tendency either way.

Correct answer: B

31. As shown in the illustrated diagnostic setup for locating a shorted field coil of a ten-pole synchronous motor, if 240 VAC/60 Hz is applied across the brushes, what would be the individual voltage drops measured across each field coil assuming that none of the field coils are shorted? Illustration EL-0202
- A. 6 VAC
  - B. 12 VAC
  - C. 24 VAC
  - D. 48 VAC

Correct answer: C

32. As shown in figure "B" of the typical ground fault relay shown in the illustration, what statement concerning the leakage current setting adjustment is true? Illustration EL-0223
- A. Setting the leakage current for too high or too low a value may result in incidental damage due to a ground fault.
  - B. Setting the leakage current for too high a value may increase the likelihood of nuisance trips and setting the leakage current for too low a value may result in incidental damage due to a ground fault.
  - C. Setting the leakage current for too high or too low a value may increase the likelihood of nuisance trips.
  - D. Setting the leakage current for too low a value may increase the likelihood of nuisance trips and setting the leakage current for too high a value may result in incidental damage due to a ground fault.

Correct answer: D

33. Which of the procedures or conditions listed could result in damaging a transistor beyond repair?
- A. Providing incorrect polarity to the collector circuit
  - B. Installing a transistor whose current rating exceeds the design circuit current
  - C. Applying silicone grease between the heat sink and the transistor mounting
  - D. Providing insufficient voltage to the input circuit

Correct answer: A



34. According to 46 CFR Subchapter J, what is true concerning the installation of batteries used for diesel engine starting?
- A. be located as close as possible to the engine
  - B. have sufficient capacity to provide at least 50 starts consecutively without recharging
  - C. only be of the nickel alkaline type
  - D. be located in a locker on the weather deck

Correct answer: A

35. Which of the illustrated motors has an open, drip-proof (ODP) motor enclosure? Illustration EL-0001
- A. A
  - B. B
  - C. C
  - D. D

Correct answer: C

36. What is the functional purpose of a generic electromagnetic relay?
- A. remotely open and/or close contacts by the presence or absence of a permanent magnetic field
  - B. remotely open and/or close contacts by the presence or absence of voltage across a capacitor
  - C. remotely open and/or close contacts by the action or absence of current flowing through a coil
  - D. remotely open and/or close contacts by the presence or absence of a permanent electrostatic field

Correct answer: C

37. Which of the wave shapes shown in the illustration is termed a sinusoidal wave? Illustration EL-0088
- A. A
  - B. B
  - C. C
  - D. D

Correct answer: A

38. Ships requiring extremely rapid maneuvering response using propeller shaft speed and direction as the sole means of controlling propeller thrust are most likely to use what type of drive system?
- A. Direct or geared diesel drive
  - B. Steam turbine geared drive
  - C. Gas turbine geared drive
  - D. Diesel-electric drive

Correct answer: D

39. Upon failure of the normal power supply, by what means is the emergency generator placed on the line and connected to the emergency bus?
- A. power failure alarm bus
  - B. line connection feeder
  - C. bus tie feeder
  - D. automatic bus transfer device

Correct answer: D

40. A common type of molded case circuit breaker has both thermal and magnetic trip elements. If a branch circuit breaker has only thermal or magnetic trip elements (but not both), it is common to use multiple series-connected protective devices to provide both short-circuit and overload protection. If a motor branch circuit is protected with both a thermal trip-type circuit breaker and fuses, what is the protective purpose of the fuses used in this arrangement?
- A. sustained overload protection
  - B. short duration surge protection
  - C. time-delay protection
  - D. short-circuit protection

Correct answer: D

41. A thermal-magnetic molded case circuit breaker for a 300 kW alternator is rated at 500 amperes at full continuous load. Which of the following conditions will MOST likely trip the breaker?
- A. Sustained current draw of 450 amperes indefinitely
  - B. Sustained current draw of 500 amperes for 3 hours
  - C. Momentary current draw of 1000 amperes for 3 seconds
  - D. Instantaneous current draw of 10,000 amperes for .03 seconds

Correct answer: D

42. A bearing temperature monitoring system such as that used for measuring selected propulsion plant bearings uses what technology?
- A. self-powered thermocouples (TC)
  - B. self-powered resistance temperature detectors (RTD)
  - C. externally powered thermocouples (TC)
  - D. externally powered resistance temperature detectors (RTD)

Correct answer: D

43. Which of the listed pressure-control valves would be used in a hydraulic system to temporarily divert some, or all of the pump discharge until the additional flow was required?
- A. unloading valve
  - B. compound, pressure-relief valve
  - C. sequence valve
  - D. counterbalance valve

Correct answer: A

44. A vessel is in compliance with federal regulations regarding the discharge of sewage by \_\_\_\_\_.
- A. treating sewage in an approved system
  - B. pumping the sewage ashore to an approved container
  - C. holding all sewage onboard
  - D. all of the above

Correct answer: D

45. The rudder torque capacity of the four-ram steering gear illustrated, is rated at 44,210,000 inch-pounds with one power unit in operation. If the four-ram system was able to be operated as a two-ram system with both power units on line, what would be the available torque? Illustration GS-0067
- A. 11,052,500 inch-pounds
  - B. 22,105,000 inch-pounds
  - C. 44,210,000 inch-pounds
  - D. 88,420,000 inch-pounds

Correct answer: B

46. For a pneumatic transmission system for instrumentation purposes, if a pneumatic pressure indicator has a calibrated scale of 0 to 1000 psig, what would be the actual measured pressure if the transmitted pneumatic signal pressure to the indicator is 9 psig, assuming the industry standard of 3 to 15 psig is used for instrument air?
- A. 300 psig
  - B. 500 psig
  - C. 600 psig
  - D. 750 psig

Correct answer: B

47. The device shown in the illustration is commonly known as a/an \_\_\_\_\_. Illustration GS-0071
- A. spring seal
  - B. soft-packing seal
  - C. quad seal
  - D. mechanical seal

Correct answer: D

48. Which of the following statements is true concerning the gauge labeled "A" of the illustrated gauge manifold set? Illustration RA-0001
- A. The gauge labeled "A" is a compound gauge and is usually color-coded red.
  - B. The gauge labeled "A" is a standard pressure gauge and is usually color-coded red.
  - C. The gauge labeled "A" is a standard pressure gauge and is usually color-coded blue.
  - D. The gauge labeled "A" is a compound gauge and is usually color-coded blue.

Correct answer: D

49. Which of the listed numeric values represents the smallest size drill?
- A. 0
  - B. 1
  - C. 60
  - D. 80

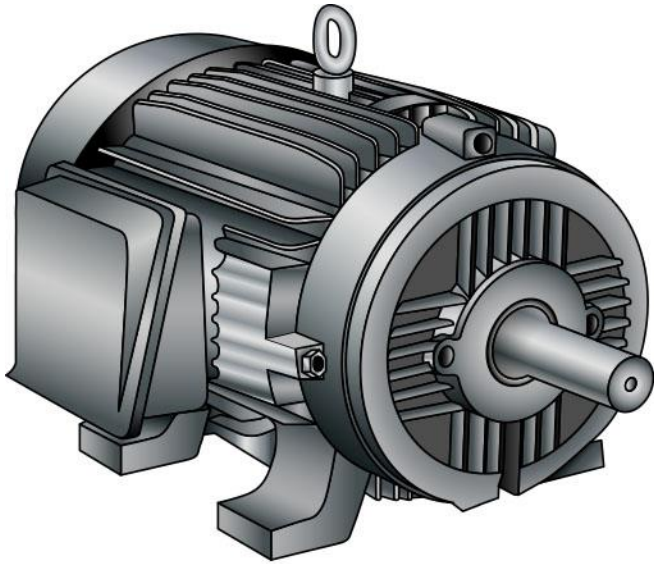
Correct answer: D

Q634 General Subjects  
U.S.C.G. Merchant Marine Exam  
DDE – 1000/4000 HP  
Illustrations: 12

50. Which of the following bilge pumping applications would most likely use a non-automated centrifugal pump under manual supervision?
- A. Shaft alley bilges
  - B. Engine room bilges
  - C. Dry cargo-hold bilges
  - D. Machinery space bilges

Correct answer: C

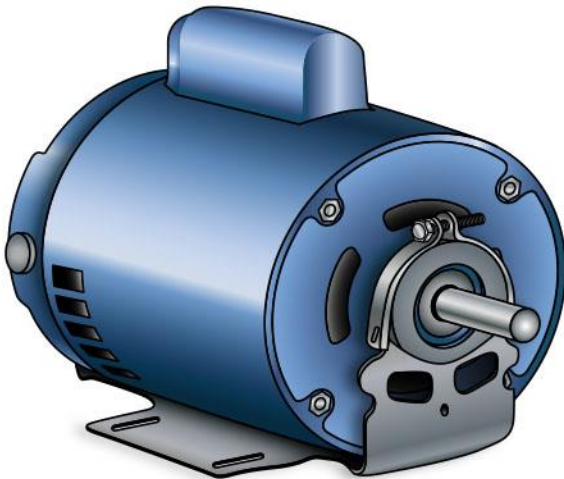
## EL-0001



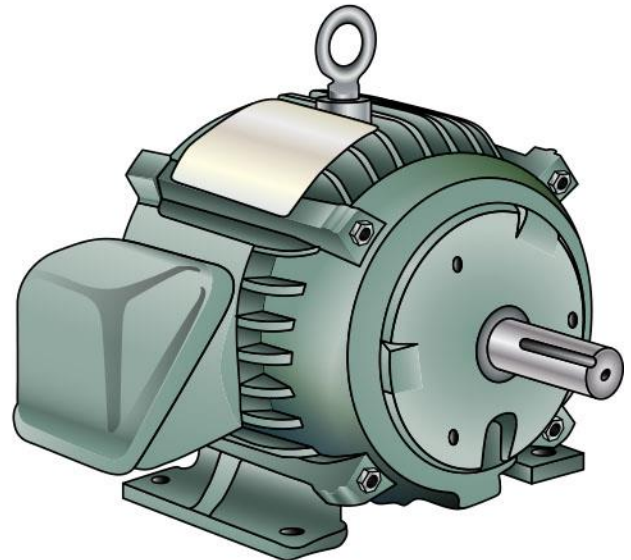
**A**



**B**



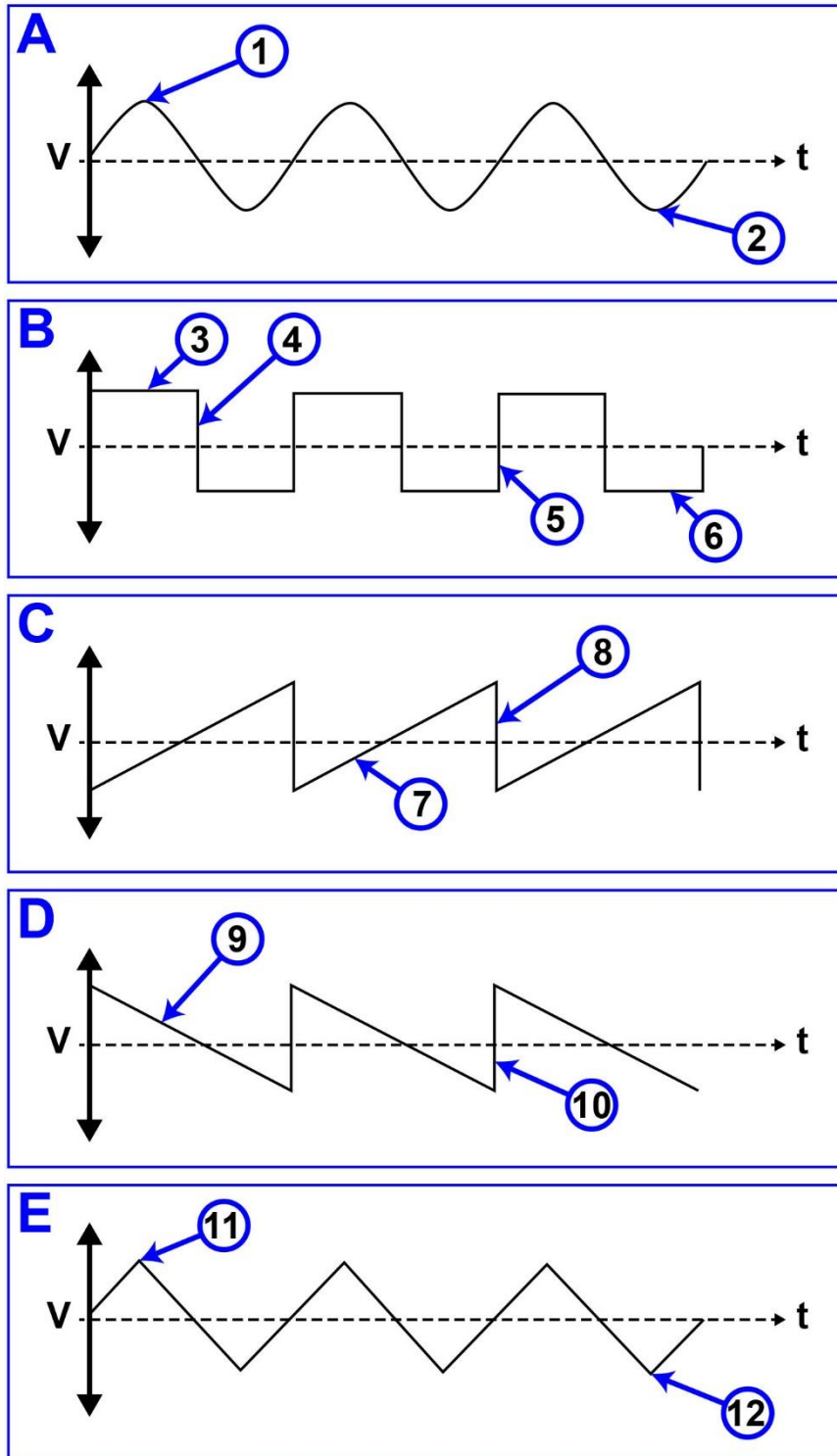
**C**



**D**

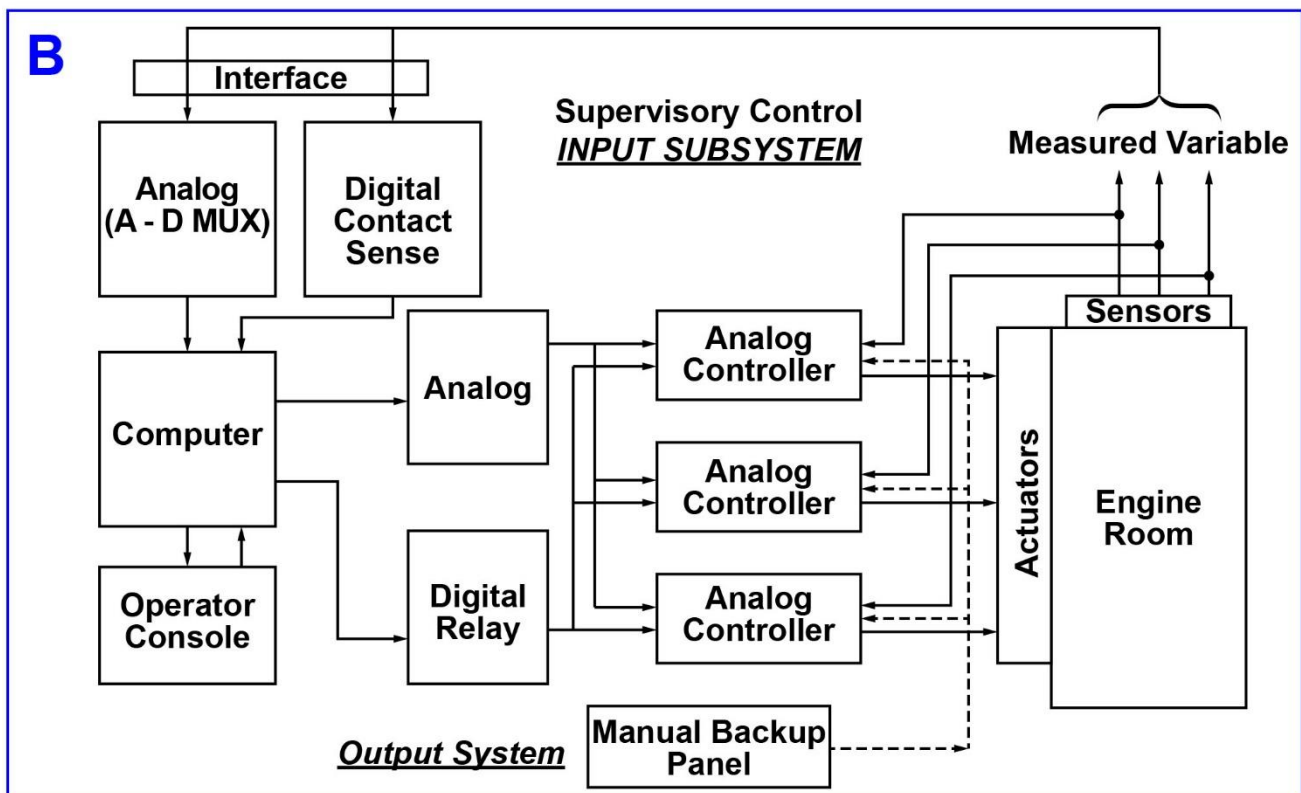
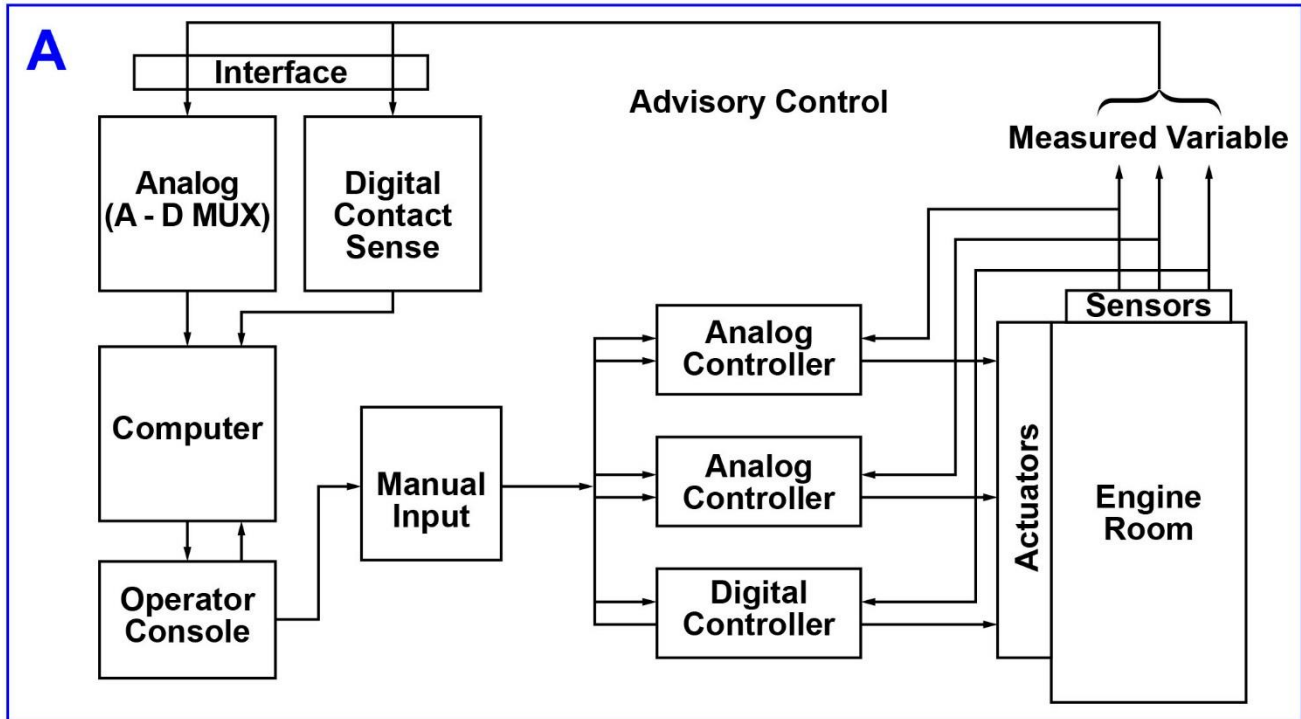
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## EL-0088



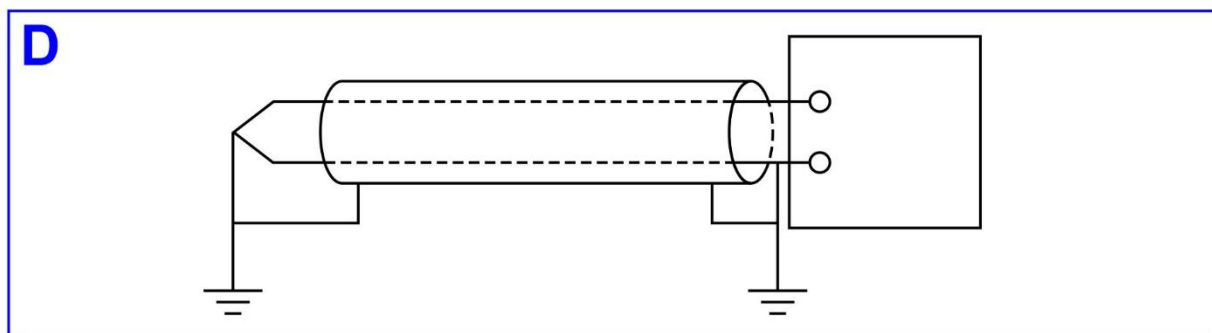
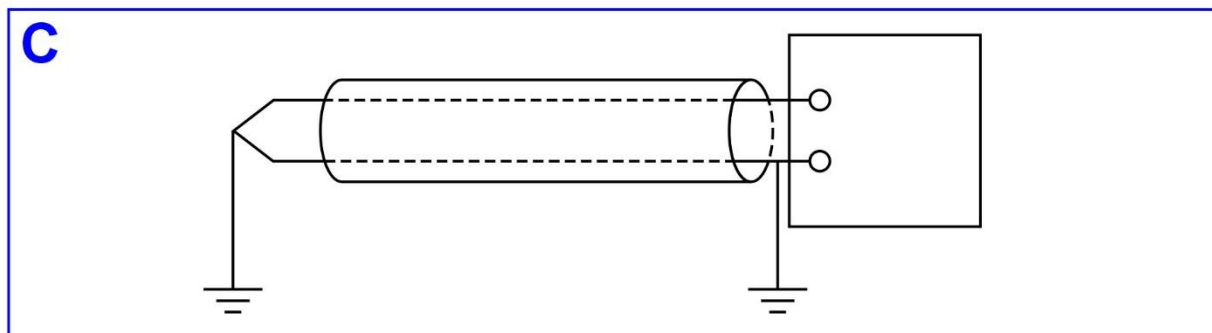
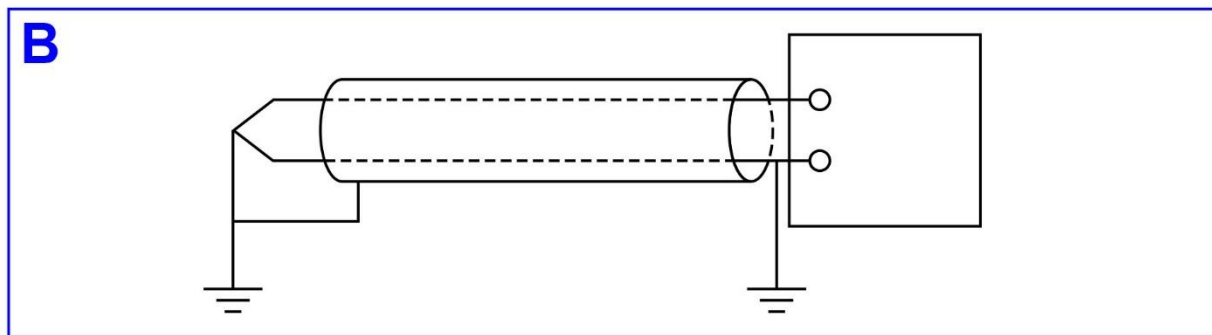
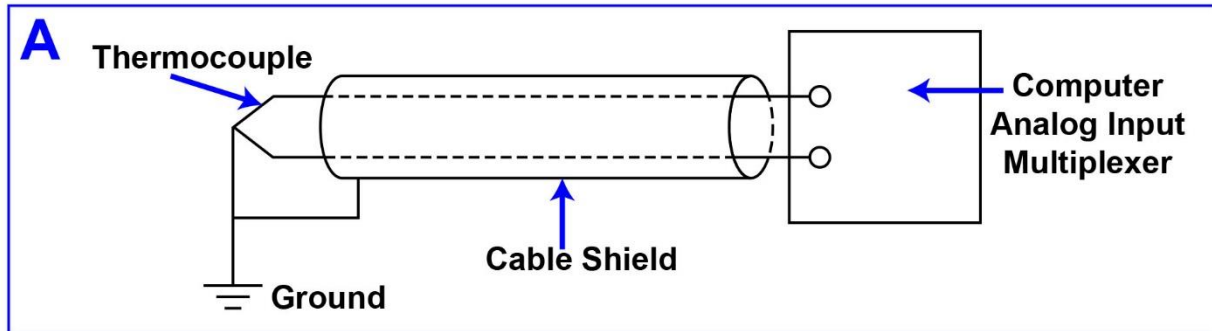
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## EL-0094



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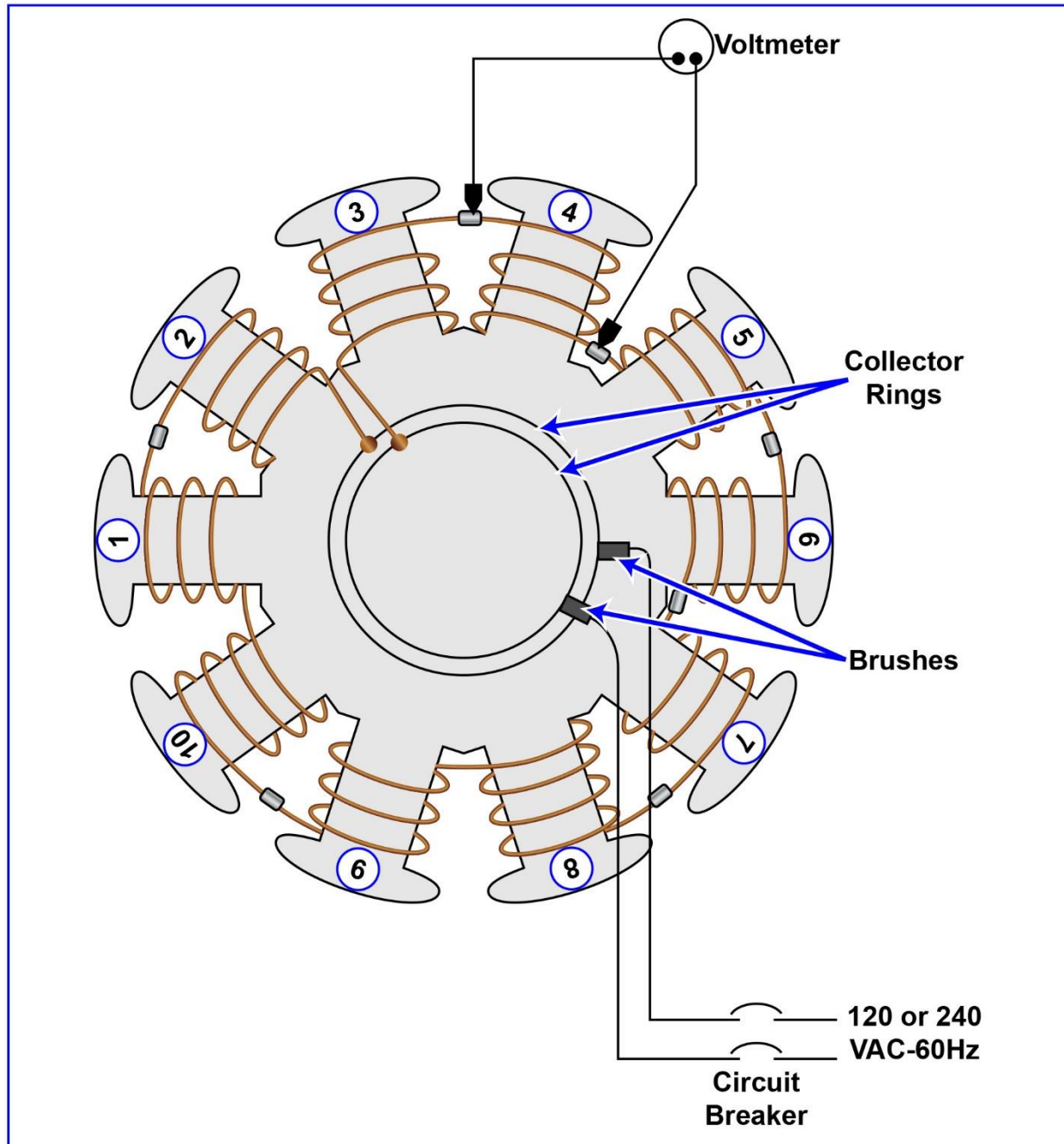
## EL-0124 Signal Cabling Circuit



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## EL-0202



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## EL-0223

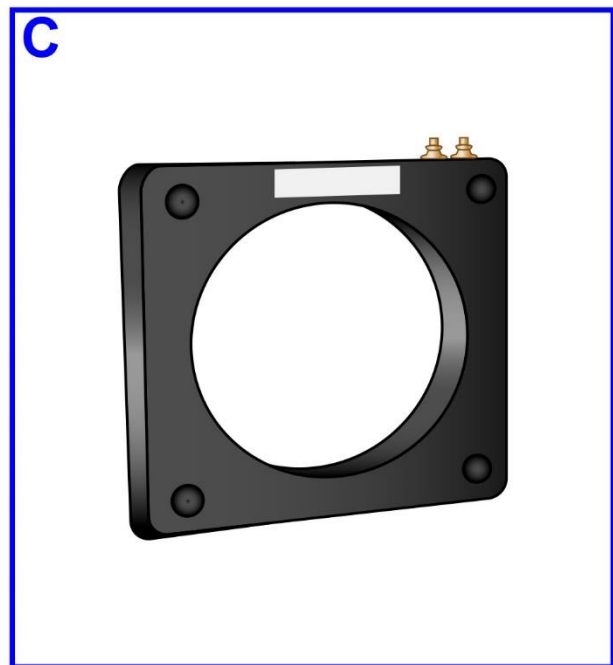
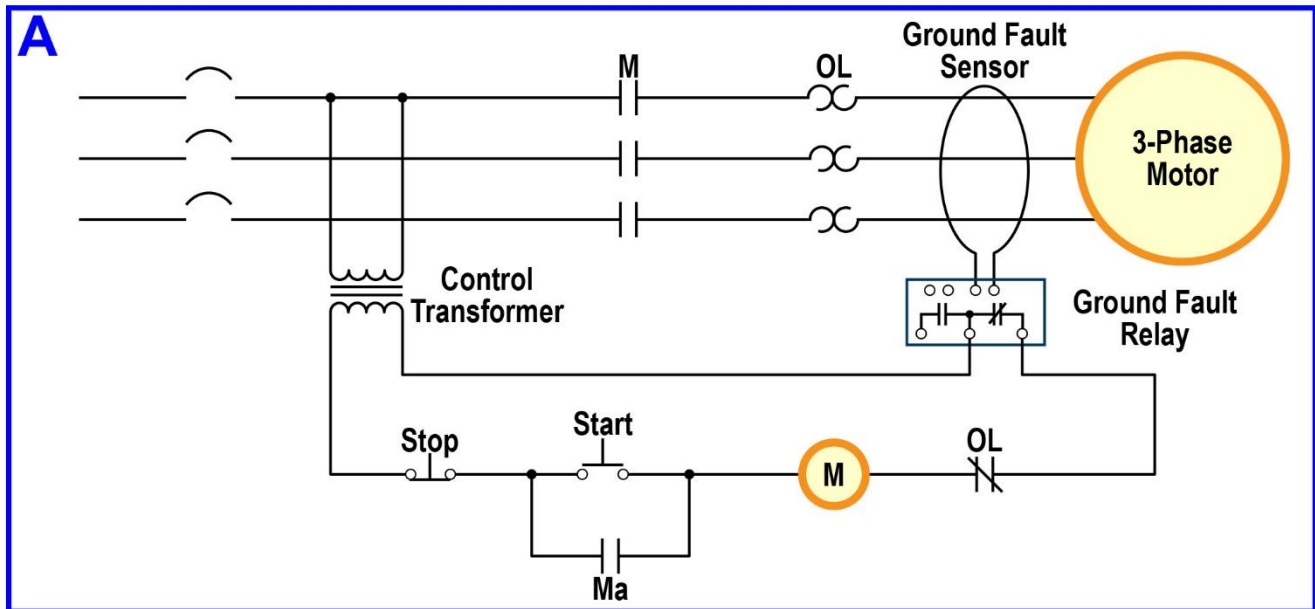
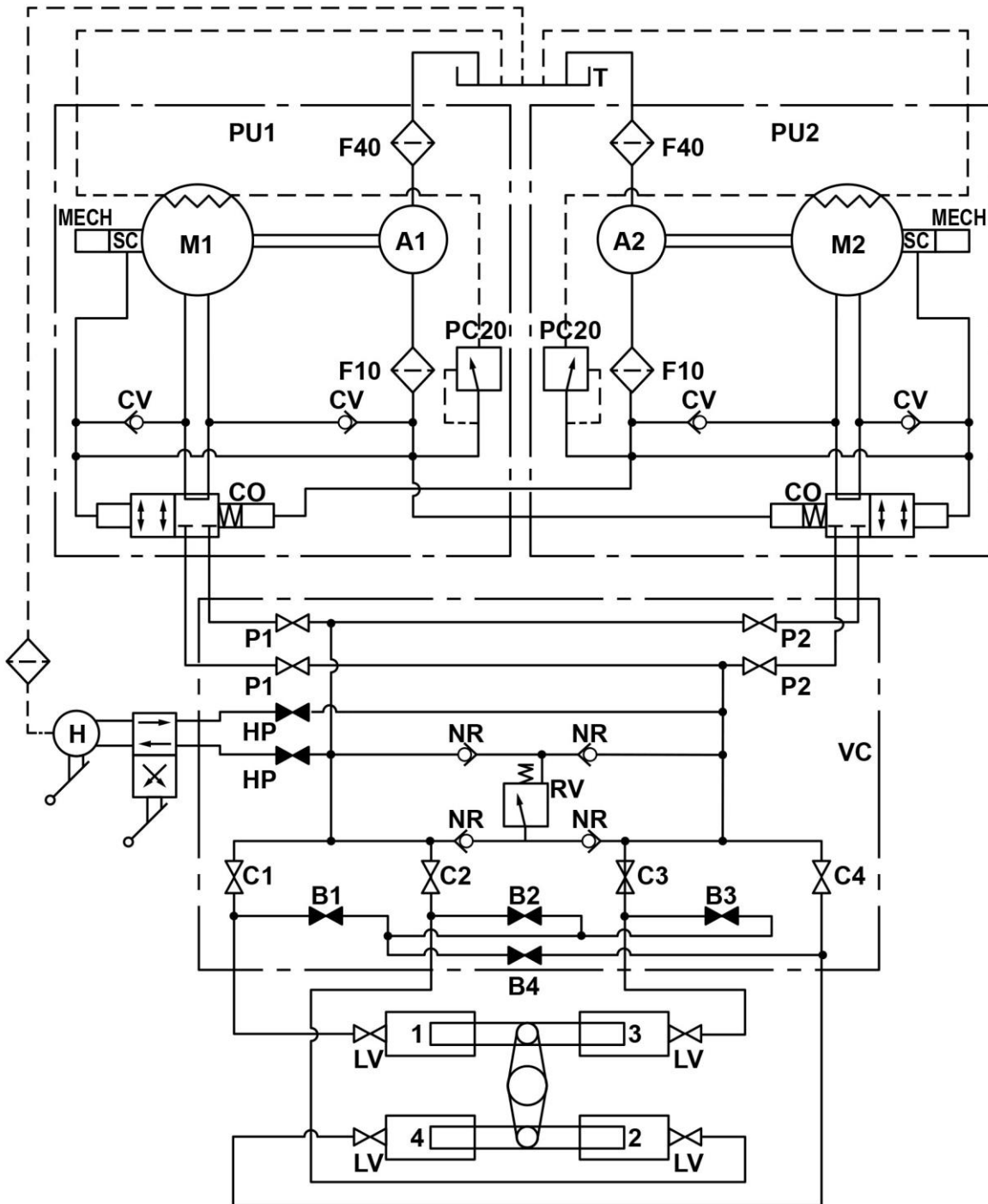


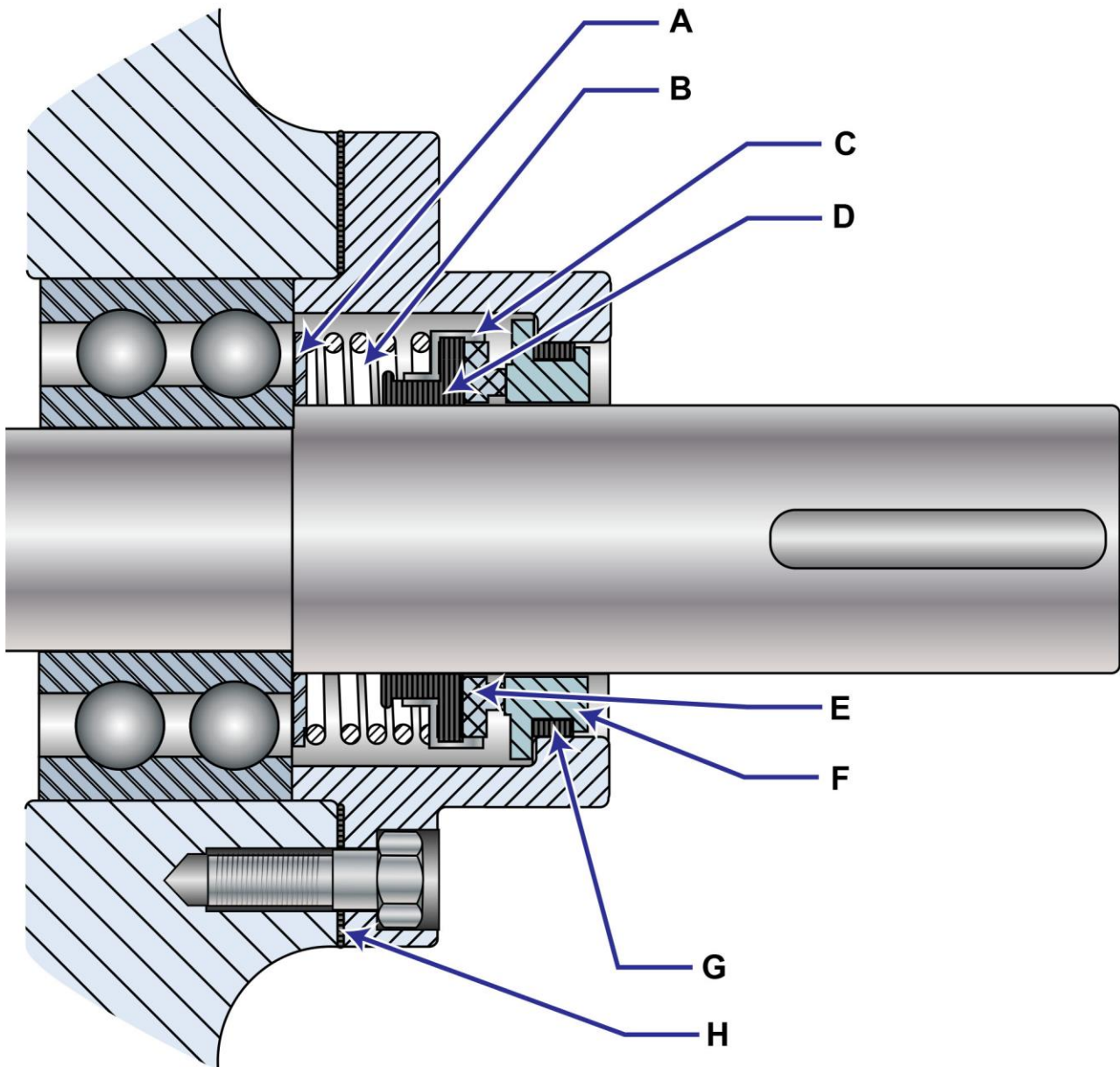
Figure A: Adapted for testing purposes only from MILLER, Industrial Electricity and Motor Controls  
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## GS-0067



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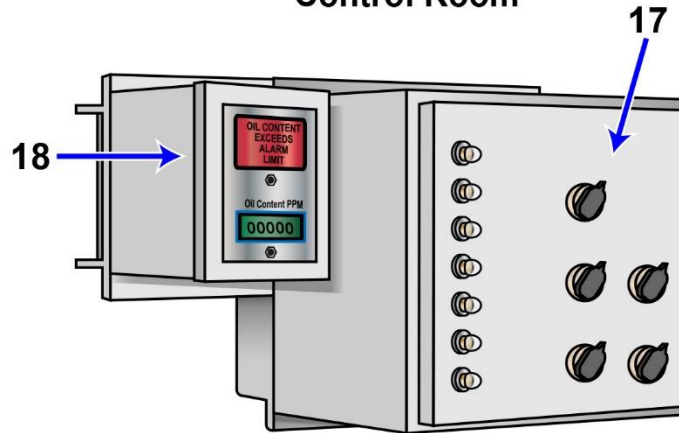
## GS-0071



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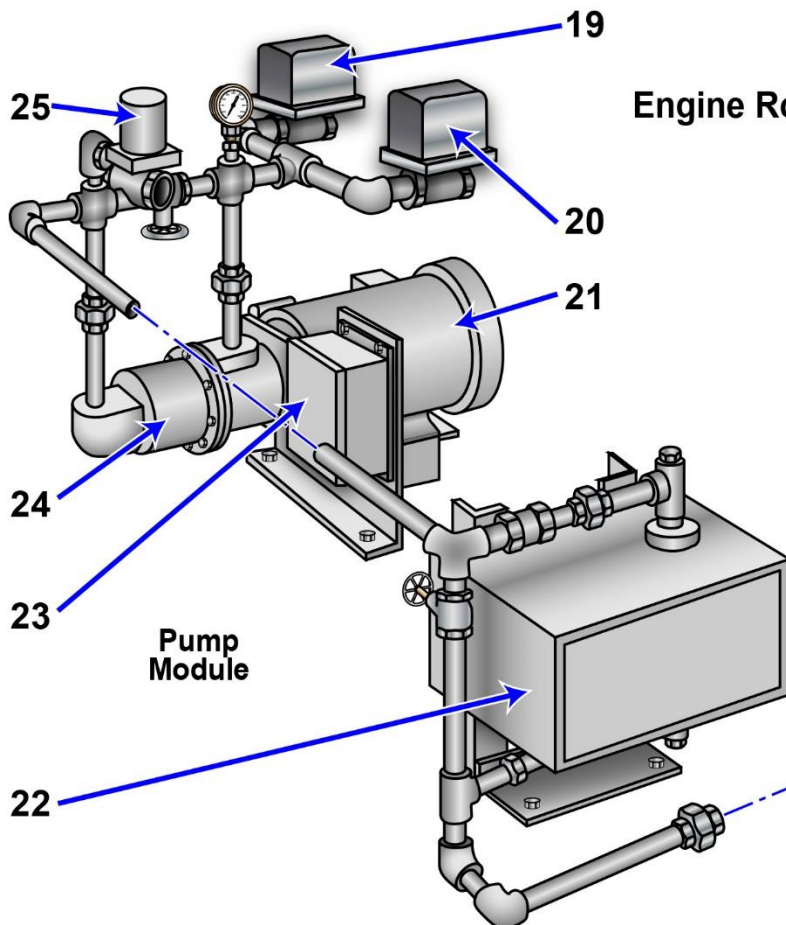
## GS-0153

### Control Room

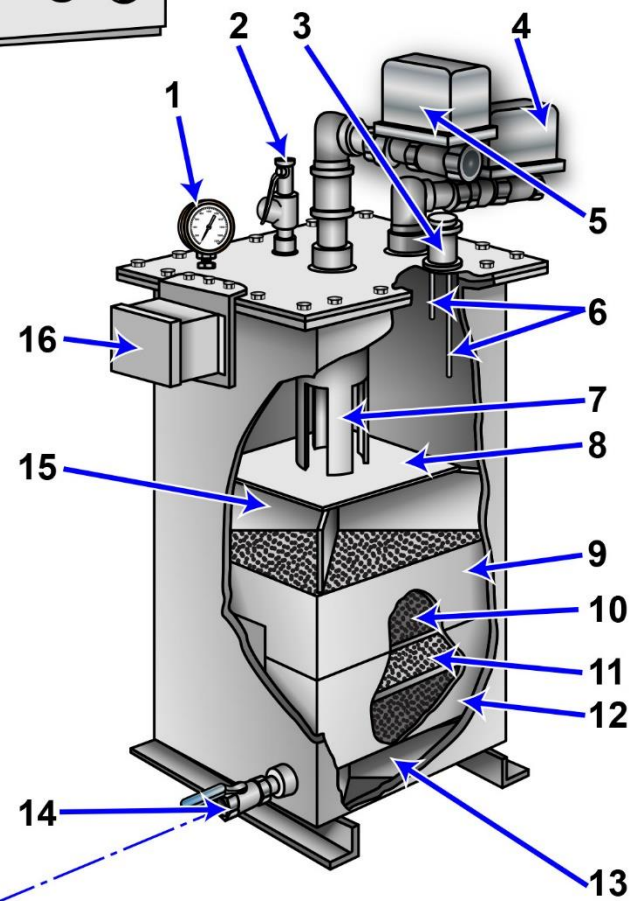


Control Panel  
Assembly

### Engine Room



Pump  
Module

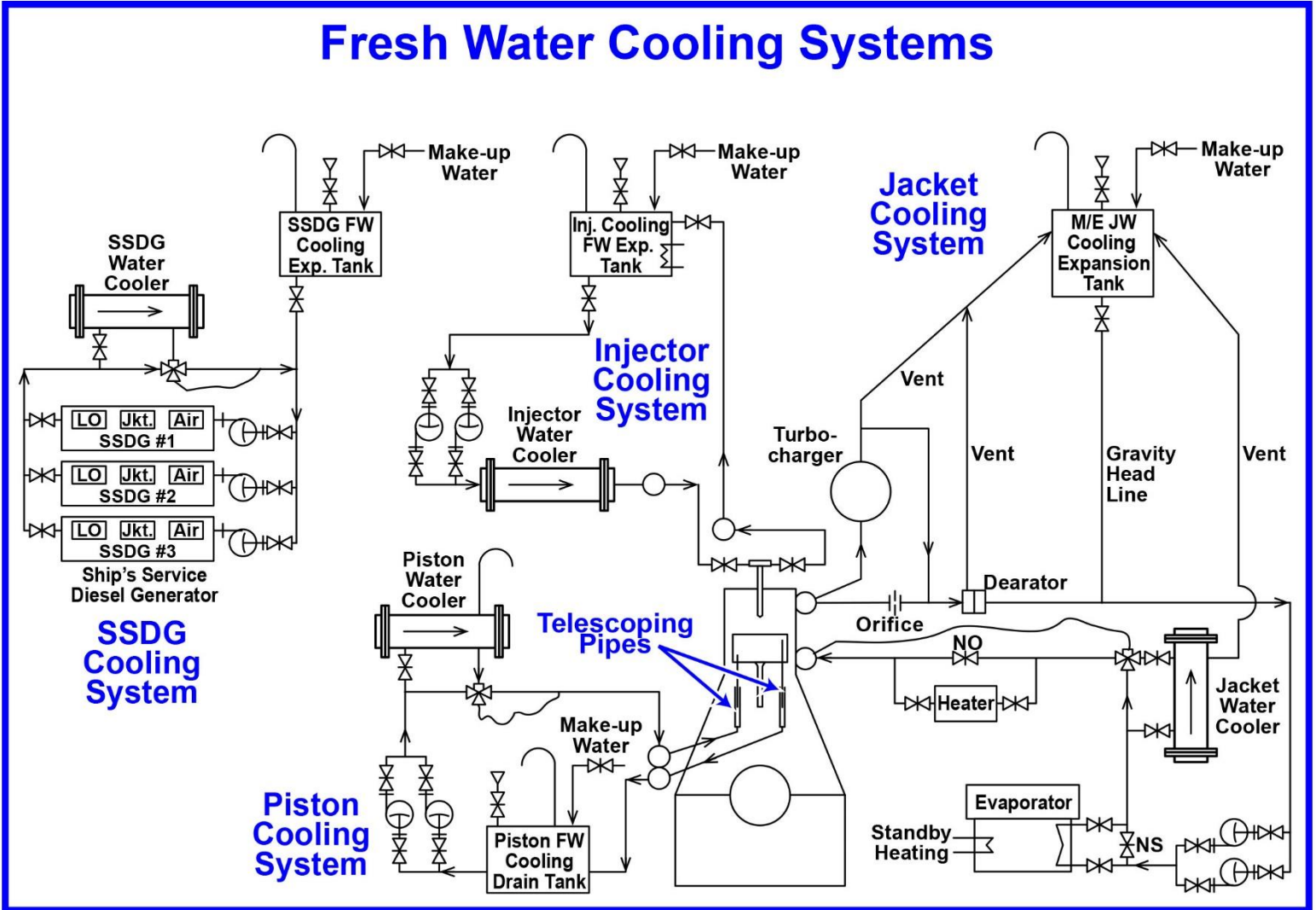


Separator Tank  
Module

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Repair Parts and Special Tools List for Oil Water Separator  
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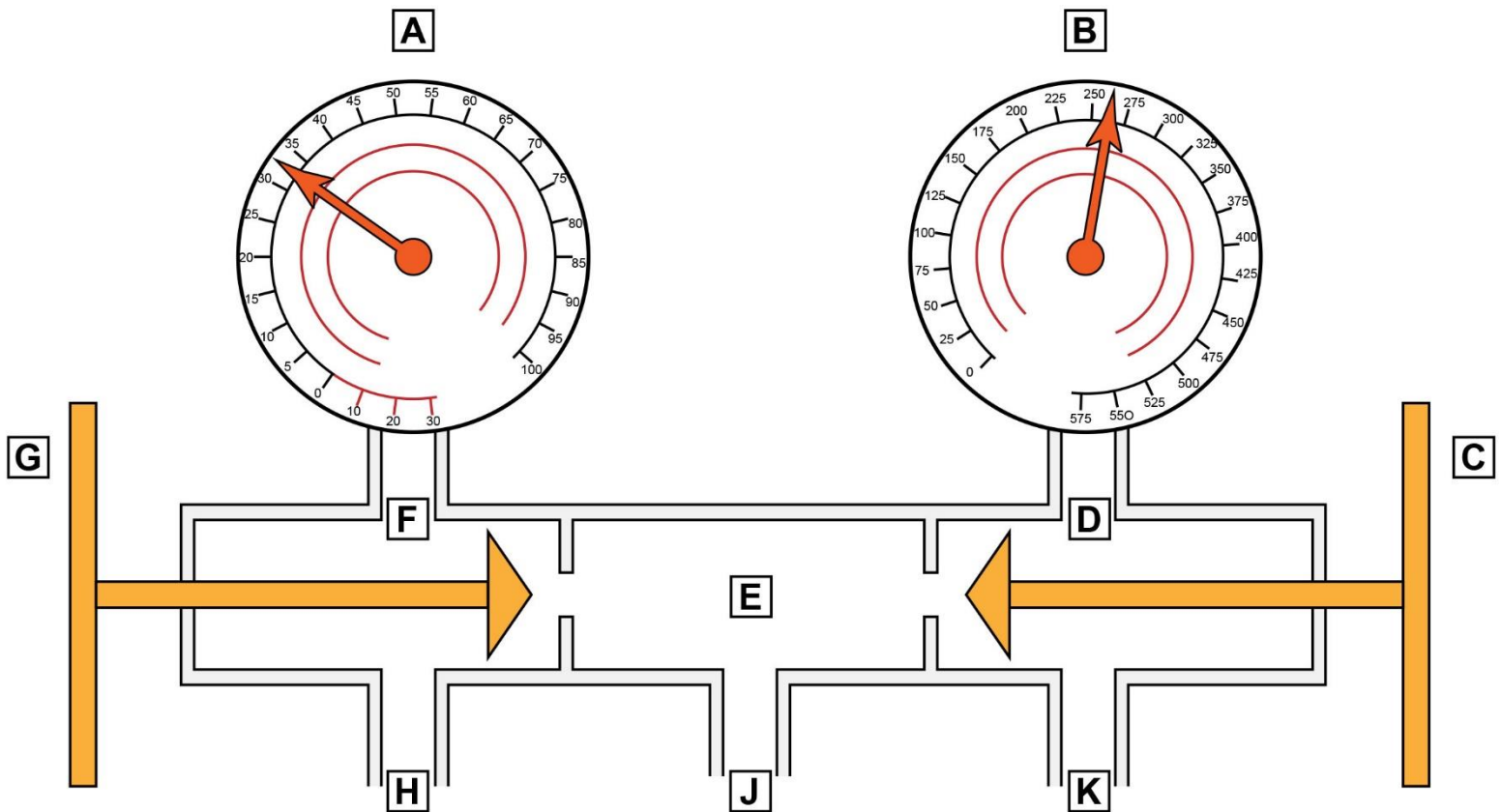
## MO-0212

### Fresh Water Cooling Systems



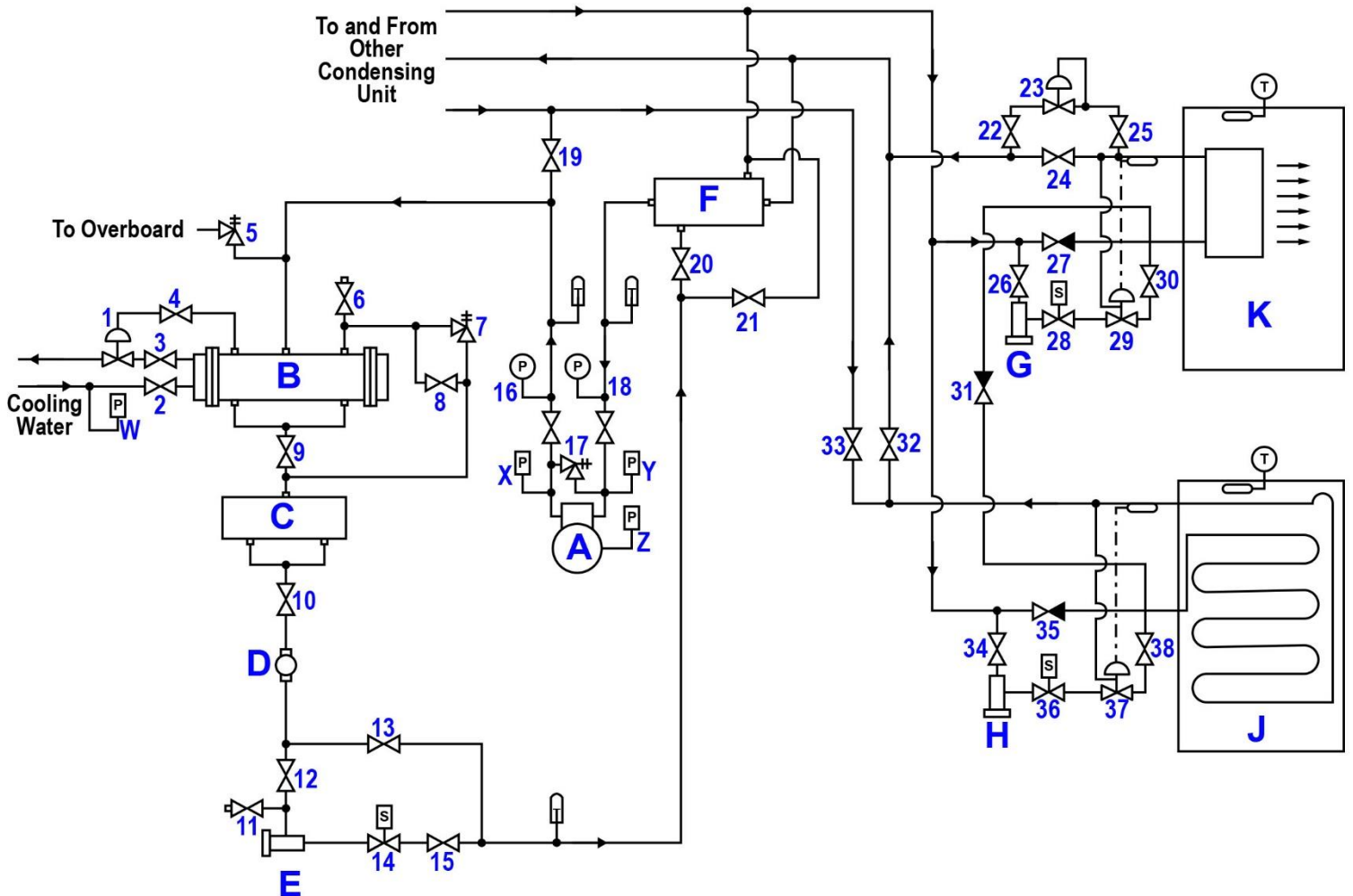
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## RA-0001



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## RA-0012



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