U.S.C.G. Merchant Marine Exam

Chief Engineer-OSV

Q684 Electrical-Electronic-Control Engineering

(Sample Examination)

Choose the best answer to the following Multiple Choice Questions.

1. Which of the following represents a characteristic of an ungrounded electrical distribution system?

- (A) Double ground faults on different phases will not cause an outage.
- (B) Accidental contact between one power bus conductor and ground does not cause an outage.
- (C) Ground detection systems are unnecessary.
- (D) Accidental contact between one power bus conductor and ground will always cause an outage.

If choice B is selected set score to 1.

2. As shown in the illustrated adaptive digital steering control system functional block diagram and listed system interface signals table, what would the rudder order signal output voltage to the rudder servo amplifier be for a rudder order of 20 degrees left rudder, assuming left rudder signals are negative and right order signals are positive in polarity? Illustration EL-0191

- (A) -2.25 VDC
- (B) -4.0 VDC
- (C) -5.0 VDC
- (D) +5.0 VDC

If choice C is selected set score to 1.

3. What computer network device maintenance procedure is recommended to be increased in frequency when the equipment is located in areas of high vibration?

- (A) Periodically cleaning or replacing equipment enclosure air filters.
- (B) Periodically testing network connections with network analyzers.
- (C) Periodically blowing out equipment enclosures with compressed air.
- (D) Periodically checking the connections between devices and components.

If choice D is selected set score to 1.

4. When troubleshooting the modems, network interface cards, hubs, switches, and routers of a network, what technique represents the most logical first step?

- (A) Replacing suspected faulty network devices with known good devices.
- (B) Testing the network cabling with an appropriate network analyzer.
- (C) Running a network utility diagnostic program and generating a report.
- (D) Observing the status indicator lights of the suspected faulty network device.

If choice D is selected set score to 1.

5. Referring to figure "B" of the illustrated control circuit schematic diagram, which of the following statements is true when the motor is running in the forward direction? Illustration EL-0011

- (A) The normally open (NO) "F" contacts are closed.
- (B) The normally closed (NC) "F" contacts are closed.
- (C) The normally open (NO) "R" contacts are closed.
- (D) The normally closed (NC) "R" contacts are open.

If choice A is selected set score to 1.

6. In the illustration shown, what type of protection is provided to the potable pump drive motor? Illustration EL-0043

- (A) thermal overload protection and low voltage release
- (B) magnetic overload protection and low voltage protection
- (C) thermal overload protection and low voltage protection
- (D) magnetic overload protection and low voltage release

If choice A is selected set score to 1.

7. As shown in figure "B" of the illustrated block diagram of the signal processing flow path, the block "TRANSDUCER" represents a sensing and transmitting device designed to sense and measure a physical parameter and convert it into a proportional force or signal of what type? Illustration EL-0095

- (A) digital electrical signal
- (B) electro-mechanical force
- (C) analog electrical signal
- (D) pneumatic signal

If choice C is selected set score to 1.

8. What would be considered the first line of defense in trying to prevent the build-up of dust on printed circuit boards associated with computer network devices?

- (A) Removal of access panels, followed by vacuuming out the equipment with a vacuum cleaner.
- (B) Periodically cleaning or replacing any equipment enclosure air filters.
- (C) Removal of access panels, followed by blowing out the equipment with compressed air.
- (D) Periodically flushing out the equipment enclosure with an approved solvent.

If choice B is selected set score to 1.

9. What is an ammeter used to measure?

- (A) the voltage between two points in a circuit
- (B) circuit continuity
- (C) current flow in a circuit
- (D) total or partial circuit resistance

If choice C is selected set score to 1.

10. Which of the following devices represents primary storage, where the processor is able to directly read instructions and data and directly return results of its computation in fetch/execute cycles?

- (A) Various optical disks
- (B) Random access memory
- (C) Hard disk drive
- (D) Magnetic tape drive

If choice B is selected set score to 1.

11. Under what circumstance would a hand-held portable phase sequence indicator be used should the main switchboard mounted fixed phase sequence indicator be inoperative?

- (A) preparing to make the shore power connection
- (B) installing a new synchroscope
- (C) replacing a defective solenoid
- (D) paralleling alternators

If choice A is selected set score to 1.

12. On an older two-generator, two-motor DC diesel-electric drive system as shown in the illustration, if both the A1 and A2 contactors are dropped out, both the S1 and S2 contactors are dropped out, and both the G1 and G2 contactors are pulled in, what is the configuration of the plant? Illustration EL-0141

- (A) The gas turbine generator provides power to the main propulsion motors, and the auxiliary diesel-generator provides power to the bow thruster motor as needed.
- (B) The main propulsion generators provide power to the main propulsion motors, and the gas turbine generator provides power to the bow thruster motor as needed.
- (C) The gas turbine generator provides power to the main propulsion motors and provides power to the bow thruster motor as needed.
- (D) The main propulsion generators provide power to the main propulsion motors, and the auxiliary diesel-generator provides power to the bow thruster motor as needed.

If choice B is selected set score to 1.

13. What type of electric propulsion system converter is shown in the illustration? Illustration EL-0155

- (A) pulse width modulation converter
- (B) cycloconverter
- (C) synchroconverter
- (D) controlled rectifier converter

If choice C is selected set score to 1.

14. Without the benefit of a specially designed enclosure window for thermo graphic analysis, what must be done to obtain accurate, but safe readings using infrared thermo graphic techniques?

- (A) The infrared camera recording is taken after waiting a suitable period of time after de-energizing and isolating in accordance with safety procedures.
- (B) The infrared camera recording is taken before de-energizing and isolating in accordance with safety procedures.
- (C) The infrared camera recording is taken immediately after de-energizing and isolating in accordance with safety procedures.
- (D) The infrared camera recording is taken while energized with the enclosure door open in accordance with safety procedures.

If choice C is selected set score to 1.

15. As shown in figures "A", "B", and "C" of the illustration, what is the purpose of the regenerating mode when transitioning from ahead to astern operation with a fixed-pitch propeller as driven by an AC synchronous propulsion motor? Illustration EL-0162

- (A) It allows the shaft to use inertia to very gradually slow down to a stop before reversing direction.
- (B) It allows the shaft to instantly reverse directions with virtually no slow down period.
- (C) It allows regenerative braking to slow down the shaft to a stop before reversing direction.
- (D) It allows regenerative acceleration to accelerate the shaft after the reversal of direction has taken place.

If choice C is selected set score to 1.

16. Assuming the alternator shown in figure "A" of the illustration is equipped with a diode plate as configured in figure "D", what is the purpose of the diode plate? Illustration EL-0037

- (A) It inverts exciter armature DC to AC for rotating main field excitation, but does not eliminate the need for brushes.
- (B) It rectifies exciter armature AC to DC for rotating main field excitation, but does not eliminate the need for brushes.
- (C) It rectifies exciter armature AC to DC for rotating main field excitation and eliminates the need for brushes.
- (D) It inverts exciter armature DC to AC for rotating main field excitation and eliminates the need for brushes.

If choice C is selected set score to 1.

17. As shown in the illustrated alternator protection scheme diagram, what device provides the input to the over current inverse time relay "OCIT", the over current instantaneous trip "OC (inst.) and the negative phase sequence relay "NPS"? Illustration EL-0067

- o (A) potential transformer
- • (B) current transformer
- o (C) thermal monitor sensors
- o (D) infrared sensors

If choice B is selected set score to 1.

18. Upon loss of field excitation of a generator operating in parallel with others, what must be done?

- o (A) The parallel-connected generators still producing a voltage must have their fields over-excited to compensate for the loss of field excitation of the one generator.
- o (B) The parallel-connected generator which has suffered the loss of field excitation must have its prime mover immediately stopped.
- o (C) The parallel-connected generator which has suffered the loss of field excitation must have its prime mover immediately reduced to idle speed.
- • (D) The parallel-connected generator which has suffered the loss of field excitation must be immediately disconnected from the bus by tripping its circuit breaker.

If choice D is selected set score to 1.

19. As shown in figure "A" of the illustration, under what conditions will the thyristor conduct? Illustration EL-0154

- • (A) when the anode is more positive than the cathode and when the gate is briefly pulsed with a voltage more positive than the cathode
- o (B) when the anode is more negative than the cathode and when the gate is briefly pulsed with a voltage more positive than the cathode
- o (C) when the anode is more positive than the cathode and when the gate is briefly pulsed with a voltage more negative than the cathode
- o (D) when the anode is more negative than the cathode and when the gate is briefly pulsed with a voltage more negative than the cathode

If choice A is selected set score to 1.

20. How is speed control of a DC propulsion motor accomplished?

- • (A) adjusting the input voltage to the motor
- o (B) the use of static power converters
- o (C) the use of a load-commutated inverter
- o (D) adjusting the output frequency of the electric power source

If choice A is selected set score to 1.

21. For the purposes of shipboard practice, voltages above what threshold would be considered high voltage?

- (A) 440 VAC
- (B) 1000 VAC
- (C) 4160 VAC
- (D) 6600 VAC

If choice B is selected set score to 1.

22. When troubleshooting a printed circuit board, one technique that can be used is swapping the suspected damaged board with a new board. When installing the new board which was stored in a specially manufactured antistatic bag, how may damage due to electrostatic discharge be prevented?

- (A) Before touching the board, you should discharge any static buildup on yourself by touching a conductive surface or use a grounding wrist strap, and the board should be handled by its insulated edges only.
- (B) Before touching the board, you should discharge any static buildup on yourself by touching a conductive surface or use a grounding wrist strap, and the board should be handled by grasping trace solder surfaces.
- (C) Before touching the board, you should discharge any static buildup on the board by touching the board to a conductive surface, and the board should be handled by grasping trace solder surfaces.
- (D) Before touching the board, you should discharge any static buildup on the board by touching the board to a conductive surface, and the board should be handled by its insulated edges only.

If choice A is selected set score to 1.

23. Why are external shunts sometimes used with ammeters?

- (A) to increase meter sensitivity
- (B) to permit shunts with larger resistances to be utilized
- (C) to prevent damage to the meter movement from heat generated by the internal shunt
- (D) to reduce reactive power factor error

If choice C is selected set score to 1.

24. Some shipboard high voltage systems have the neutral point of the generators bonded to the ship's hull with a neutral grounding resistor. What is the purpose of this resistor?

- (A) To prevent nuisance ground fault trips
- (B) To minimize the magnitude of the ground fault current
- (C) To completely eliminate ground fault current
- (D) To maximize the magnitude of the ground fault current

If choice B is selected set score to 1.

25. In the illustrated one-line diagram, if the ship's service generator on line fails, what statement is true concerning the operation of the emergency diesel-generator? Illustration EL-0014

- (A) It will automatically start and automatically supply power to the 450 VAC section of the main bus through the automatic bus transfer device.
- (B) It will automatically start but the automatic bus transfer device must be manually shifted to 'Emergency Power' to supply the 450 VAC section of the emergency bus.
- (C) It will automatically start and automatically supply power to the 450 VAC section of the emergency bus through the automatic bus transfer device.
- (D) It must be manually started but once running will automatically supply power to the 450 VAC section of the emergency bus through the automatic bus transfer device.

If choice C is selected set score to 1.

26. What is the third color band on a resistor used to indicate?

- (A) tolerance of the resistor
- (B) second significant figure of the resistance
- (C) first significant figure of the resistance
- (D) number of zeros following the first two significant figures in the resistance value

If choice D is selected set score to 1.

27. As shown in the illustration, by what means are all the "MS" contacts opened and closed? Illustration EL-0073

- (A) manual operation of the master switches
- (B) solenoid switches
- (C) magnets
- (D) operating coils

If choice A is selected set score to 1.

28. When the operating handle of a molded-case circuit breaker is in the mid-position, what does this indicate?

- (A) the circuit breaker is switched off
- (B) the circuit breaker is switched on
- (C) the circuit breaker has been reset
- (D) the circuit breaker has tripped

If choice D is selected set score to 1.

29. As shown in figure "B" of the illustration, if the source voltage at the branch circuit breaker is 220 VAC, what would be the applied voltage to the load? Illustration EL-0083

- (A) 55 volts
- (B) 110 volts
- (C) 165 volts
- (D) 220 volts

If choice A is selected set score to 1.

30. As shown in the illustrated adaptive digital steering control system functional block diagram and listed system interface signals table, what would the rudder order signal output voltage to the rudder servo amplifier be for a rudder order of 15 degrees right rudder, assuming left rudder signals are negative and right order signals are positive in polarity? Illustration EL-0191

- (A) -1.33 VDC
- (B) -3.75 VDC
- (C) +3.75 VDC
- (D) +5.0 VDC

If choice C is selected set score to 1.

31. While standing an "at sea watch" onboard a modern rectified DC diesel-electric drive ship you notice the transformer core temperature slowly rising. What should be your FIRST action?

- (A) check the transformer ventilation fans for proper operation
- (B) send the oiler to look for fires in the transformer
- (C) notify the bridge that you need to slow down
- (D) reduce load by tripping lighting circuits

If choice A is selected set score to 1.

32. Which of the listed devices may be used as a digital device?

- (A) variable choke
- (B) diode
- (C) thermistor
- (D) variable resistor

If choice B is selected set score to 1.

33. In the illustrated motor controller, the motor fails to start. A voltmeter reading between 1 and 5 reads line voltage, while the voltmeter reading between 2 and 5 reads 0 VAC. What is most likely the problem? Illustration EL-0007

- (A) an open stop switch contact (when not pushed in)
- (B) an open main contactor "M" coil
- (C) an overload "OL" relay contact
- (D) an open start switch contact (when pushed in)

If choice A is selected set score to 1.

34. As shown in the illustrated diagnostic setup for locating a shorted field coil of a ten-pole salient pole alternator, if 240 VAC/60 Hz is applied across the brushes, what would be the voltage drop across field coil No.4 if that field coil had shorted turns and the other field coils were free of shorts? Illustration EL-0202

- (A) 17 VAC
- (B) 24 VAC
- (C) 25 VAC
- (D) 32 VAC

If choice A is selected set score to 1.

35. For troubleshooting purposes, the key indicator to the safety and general condition of high voltage circuitry is insulation resistance. For a 6.6 kV high voltage system, what would be the recommended minimum insulation resistance value?

- (A) 1 megohm
- (B) 5.6 megohms
- (C) 6.6 megohms
- (D) 7.6 megohms

If choice D is selected set score to 1.

36. As shown in figure "6" of the illustration, what does the symbol represent as used in electrical drawings? Illustration EL-0026

- (A) limit switch with one set of normally open contacts
- (B) normally closed contact held open mechanically by an interlock
- (C) maintaining type push button with an electrical interlock
- (D) maintaining type push button with a mechanical interlock

If choice D is selected set score to 1.

37. If a digital multimeter is set up as shown in figure "A" of the illustration, what would be displayed on the screen if the fuse being tested is blown? Illustration EL-0210

- (A) OL volts
- (B) 0.001 ohms
- (C) 470 ohms
- (D) OL ohms

If choice D is selected set score to 1.

38. When measuring DC current flow using an analog or digital multimeter set up as a milliammeter, how is the meter connected?

- (A) in series with the power source and load
- (B) insuring correct polarity
- (C) in parallel with the power source and load
- (D) using the lowest range possible to prevent instrument damage

If choice A is selected set score to 1.

39. Using the catalog selection chart shown in Illustration EL-0180, determine the correct catalog number for a motor starter that meets the following criteria:

NEMA	Open enclosure
3-pole	Rated at 45 continuous amperes
Vertically mounted	Electronic overload relay-Ground fault feature set
Reversing starter	Operating coil rated at 24 VAC/60 Hz

- (A) AE19GNVB5G045
- (B) AN19AN0A5E005
- (C) AN59GNVT5G045
- (D) CN16GNVT5G045

If choice C is selected set score to 1.

40. What are the operational characteristics of the two alternators with the speed droop curves shown in figure "A" of the illustration? Illustration EL-0025

- (A) machine "A" is a droop machine, while machine "B" is an isochronous machine
- (B) machine "A" and machine "B" are both isochronous machines
- (C) machine "A" and machine "B" are both droop machines
- (D) machine "A" is an isochronous machine, while machine "B" is a droop machine

If choice A is selected set score to 1.

41. If you hear a loud buzzing noise coming from a magnetic motor controller, what should you do?

- (A) feel the outside of the casing with your hand to see if it is hot
- (B) assume that the controller is operating normally
- (C) assume that the motor is operating at a full load
- (D) notify the electrician or watch engineer of the problem

If choice D is selected set score to 1.

42. When a high voltage system insulation test value is suspect or recorded during an annual survey, a polarization index test is performed. What is the polarization index?

- (A) The polarization index is the ratio of the insulation resistance taken at one minute to the insulation resistance taken at ten minutes.
- (B) The polarization index is the ratio of the insulation resistance taken at thirty minutes to the insulation resistance taken at one minute.
- (C) The polarization index is the insulation resistance taken at ten minutes.
- (D) The polarization index is the ratio of the insulation resistance taken at ten minutes to the insulation resistance taken at one minute.

If choice D is selected set score to 1.

43. What is the name of a TCP/IP application run from the command prompt that sends datagrams once every second in the hope of an echo response from another machine (network device) being addressed to test network connectivity and to verify that TCP/IP is running?

- (A) TRACERT
- (B) FTP
- (C) IPCONFIG
- (D) PING

If choice D is selected set score to 1.

44. While underway onboard a DC diesel-electric drive ship, you notice excessive sparking of the brushes on the main propulsion motor. What should be your FIRST action?

- (A) decrease the speed of the main generator
- (B) decrease the main generator voltage
- (C) notify the bridge that you will need to slow down to reduce the electrical load
- (D) decrease the motor field current

If choice C is selected set score to 1.

45. Which of the following is a disadvantage of electric drive propulsion systems?

- (A) Main propulsion power may also be directed to ships electrical service distribution.
- (B) The propeller speed and direction of rotation are easily controllable.
- (C) Propulsion motors are required along with electrical power generation machinery.
- (D) Location of electric power generation machinery is flexible.

If choice C is selected set score to 1.

46. What item (or items) constitute routine AC motor controller maintenance?

- (A) cleaning with carbon tetrachloride
- (B) performing a visual inspection and tightening connections
- (C) blowing out with high-pressure compressed air
- (D) cleaning with soap and water

If choice B is selected set score to 1.

47. A resistance in a circuit of unknown value is to be tested using the voltmeter/ammeter method. How should the two meters be connected?

- (A) the ammeter in series and the voltmeter in parallel with the resistance
- (B) the ammeter in parallel and the voltmeter in series with the resistance
- (C) both meters in series with the resistance
- (D) both meters in parallel with the resistance

If choice A is selected set score to 1.

48. For the purposes of safety and determining the shock hazard, nominal voltage is defined as the normal electrical system design voltage. This can be determined from what is displayed on nameplates, data plates, schematics, or single-line diagrams. What does the nominal voltage represent?

- (A) phase to hull ground voltage
- (B) phase to neutral voltage
- (C) phase to phase voltage
- (D) average of phase to phase and phase to hull ground voltages

If choice D is selected set score to 1.

49. In testing a hand cranked megger prior to use, what statement is true?

- (A) With the test leads shorted or open, the pointer should go to infinite ohms.
- (B) With the test leads shorted or open, the pointer should go to zero ohms.
- (C) With the test leads shorted, the pointer should go to zero ohms, and with the tests leads open, the pointer should go to infinite ohms.
- (D) With the test leads shorted, the pointer should go to infinite ohms, and with the tests leads open, the pointer should go to zero ohms.

If choice C is selected set score to 1.

50. Which electrical schematic symbol represents a normally closed thermostat? Illustration EL-0059

- (A) 1
- (B) 6
- (C) 8
- (D) 9

If choice C is selected set score to 1.

51. How is the main propeller shaft rotation of a conventional AC turbo-electric drive normally reversed? (Assume that no converters or inverters are used.)

- (A) reversing the field polarity of the AC propulsion motor
- (B) reversing the field polarity of the AC propulsion generator
- (C) reversing the phase sequence applied to the AC propulsion motor
- (D) reversing the steam turbine direction of rotation

If choice C is selected set score to 1.

52. If a digital multimeter is set up as shown in figure "A" of the illustration to test a capacitor, what would the display read if the capacitor is functioning properly? Illustration EL-0213

- (A) the ohmic value would read very low and remain at that value
- (B) the ohmic value would initially read very low, but over time the ohmic value would gradually rise to an extremely high value (OL ohms)
- (C) the ohmic value would initially read very high (OL ohms), but over time the ohmic value would gradually drop to an extremely low value
- (D) the ohmic value would read very high (OL ohms) and remain at that value

If choice B is selected set score to 1.

53. In addition to short circuits and sustained overloads, in what other situation are fuses likely to blow?

- (A) low fuse holder clip to fuse contact resistance
- (B) oversized fuses in terms of amp rating
- (C) low ambient temperatures
- (D) loose fuse holder clips

If choice D is selected set score to 1.

54. While standing an "at sea watch" onboard a modern rectified DC diesel-electric drive ship you notice the transformer core temperature slowly rising. What should be your FIRST action?

- (A) check the transformer ventilation fans for proper operation
- (B) notify the bridge that you need to slow down
- (C) reduce load by tripping lighting circuits
- (D) send the oiler to look for fires in the transformer

If choice A is selected set score to 1.

55. In mounting a transducer for a depth sounding system, what would represent an ideal location?

- (A) Mount the transducer aft of the position where the bow wave re-enters the sea.
- (B) Mount the transducer close to propellers but far away from sea water hull outlet openings.
- (C) Mount the transducer far away from propellers but close to sea water hull outlet openings.
- (D) Mount the transducer forward of the position where the bow wave re-enters the sea.

If choice D is selected set score to 1.

56. What statement is true concerning read only memory (ROM)?

- (A) ROM is non-volatile memory and the contents of ROM are lost when the power is removed.
- (B) ROM is non-volatile memory and the contents of ROM are not lost when the power is removed.
- (C) ROM is volatile memory and the contents of ROM are not lost when the power is removed.
- (D) ROM is volatile memory and the contents of ROM are lost when the power is removed.

If choice B is selected set score to 1.

57. Why is it necessary to perform periodic testing of correctly rated and properly installed circuit breakers?

- (A) to insure they will be able to withstand at least 125% of applied voltage
- (B) to insure they can trip faster as they increase in age
- (C) to insure they will continue to provide the original degree of protection
- (D) to insure they do not exceed their interrupting capacity

If choice C is selected set score to 1.

58. An ohmmeter used to test for front-to-back resistance of a PN junction diode should produce roughly what ratio?

- (A) 100:1
- (B) 500:1
- (C) 1000:1
- (D) 5000:1

If choice A is selected set score to 1.

59. As chief engineer, to prevent the motorization of an alternator what safety device would you have checked quarterly?

- (A) The reverse power relay.
- (B) The high load alarm point for the alternator.
- (C) The over current relay.
- (D) The high frequency alarm for the alternator.

If choice A is selected set score to 1.

60. Which of the listed temperature measuring devices installed on a large turbo-electric alternating current propulsion generator would be the most reliable for monitoring generator temperatures to avoid premature winding insulation failure?

- (A) Temperature sensors measuring the temperature of the cooling air associated with the generator air cooler.
- (B) Temperature sensors measuring the temperature of the cooling water associated with the generator air cooler.
- (C) Current transformers are the most reliable means of monitoring generator temperatures.
- (D) Temperature sensors inserted in the stator slots for measuring stator winding temperature.

If choice D is selected set score to 1.

61. When taking voltage measurements, for reasons of electrical safety, what should be the proper sequence of actions?

- (A) First, measure the actual voltage. Next, select the proper PPE and voltage tester to use based on this measured voltage. Finally, take voltage measurements with confidence.
- (B) First, determine the nominal voltage from the nameplate. Next, select the proper PPE and voltage tester to use based on this nameplate voltage. Finally, take voltage measurements with confidence.
- (C) First, measure the actual voltage. Next, select the proper voltage tester to use based on this measured voltage. Finally, take voltage measurements with confidence.
- (D) When taking voltage measurements, the sequence of steps is not critical as long as PPE is worn and a voltage tester is used. Voltage measurements can be taken with confidence.

If choice B is selected set score to 1.

62. As shown in figure "C" of the illustration, what are the purposes of the coupling capacitor Cc and the bypass capacitor Cbp respectively? Illustration EL-0045

- (A) Cc blocks any AC component associated with the input from reaching the base. Cbp helps minimize degeneration of the AC output signal.
- (B) Cc blocks any DC component associated with the input from reaching the base. Cbp helps maximize degeneration of the AC output signal.
- (C) Cc blocks any DC component associated with the input from reaching the base. Cbp helps minimize degeneration of the AC output signal.
- (D) Cc blocks any AC component associated with the input from reaching the base. Cbp helps maximize degeneration of the AC output signal.

If choice C is selected set score to 1.

63. In the illustration what is the component labeled "C"? Illustration EL-0033

- (A) trip bar
- (B) connection terminal
- (C) moving contact
- (D) fixed contact

If choice D is selected set score to 1.

64. As shown in the illustrated adaptive digital steering control system functional block diagram and listed system interface signals table, what would the rudder order signal output voltage to the rudder servo amplifier be for a rudder order of 20 degrees left rudder? Assume that left rudder order signals are negative in polarity and that right rudder order signals are positive in polarity. Illustration EL-0191

- (A) - 2.25 VDC
- (B) - 4.0 VDC
- (C) - 5.0 VDC
- (D) + 5.0 VDC

If choice C is selected set score to 1.

65. Referring to the illustration of a DC diesel-electric drive system, what type of DC propulsion motors are used? Illustration EL-0141

- (A) shunt wound where the field is separately excited from a controlled rectifier
- (B) shunt wound where the field is separately excited from a non-controlled rectifier
- (C) series wound where the field is wired in series with the armature
- (D) shunt wound where the field is wired in parallel with the armature

If choice B is selected set score to 1.

66. Before work may safely commence on a high voltage system, what must first be done after disconnection and isolation?

- (A) The circuit must be grounded first, then tested and proved dead with an off-line tester.
- (B) The circuit must be grounded first, then tested and proved dead with a live-line tester.
- (C) The circuit must be tested and proved dead first with a live-line tester, then grounded.
- (D) The circuit must be tested and proved dead first with an off-line tester, then grounded.

If choice C is selected set score to 1.

67. The greatest cause of electrical failures is the breakdown of insulation. What factors would you use to determine the frequency of cleaning of electrical apparatus to avoid future failures?

- (A) Visual determination of accumulated dirt on the windings.
- (B) Increasing insulation measurements.
- (C) Decreasing operating temperature of the motor.
- (D) Based solely on a fixed number of days between cleaning.

If choice A is selected set score to 1.

68. Which of the following describes the action when the handle is moved to the "start" position of a drum-type motor controller used with a compound wound DC motor?

- (A) Full line voltage is supplied to the shunt field, series field, and armature.
- (B) Reduced voltage is supplied to the shunt field, series field, and armature.
- (C) Full line voltage is supplied to the shunt field, and reduced voltage is supplied to the series field and the armature.
- (D) Full line voltage is supplied to the shunt and series fields, and reduced voltage is supplied to the armature.

If choice C is selected set score to 1.

69. In a dual element time-delay cartridge-type fuse, what type of protection is provided for motor applications?

- (A) short-circuit protection using a fusible link AND sustained overload protection using a spring loaded soldered joint
- (B) short-circuit protection using a spring loaded soldered joint AND sustained overload protection using a fusible link
- (C) sustained overload protection using a spring loaded soldered joint only
- (D) short-circuit protection using a fusible link only

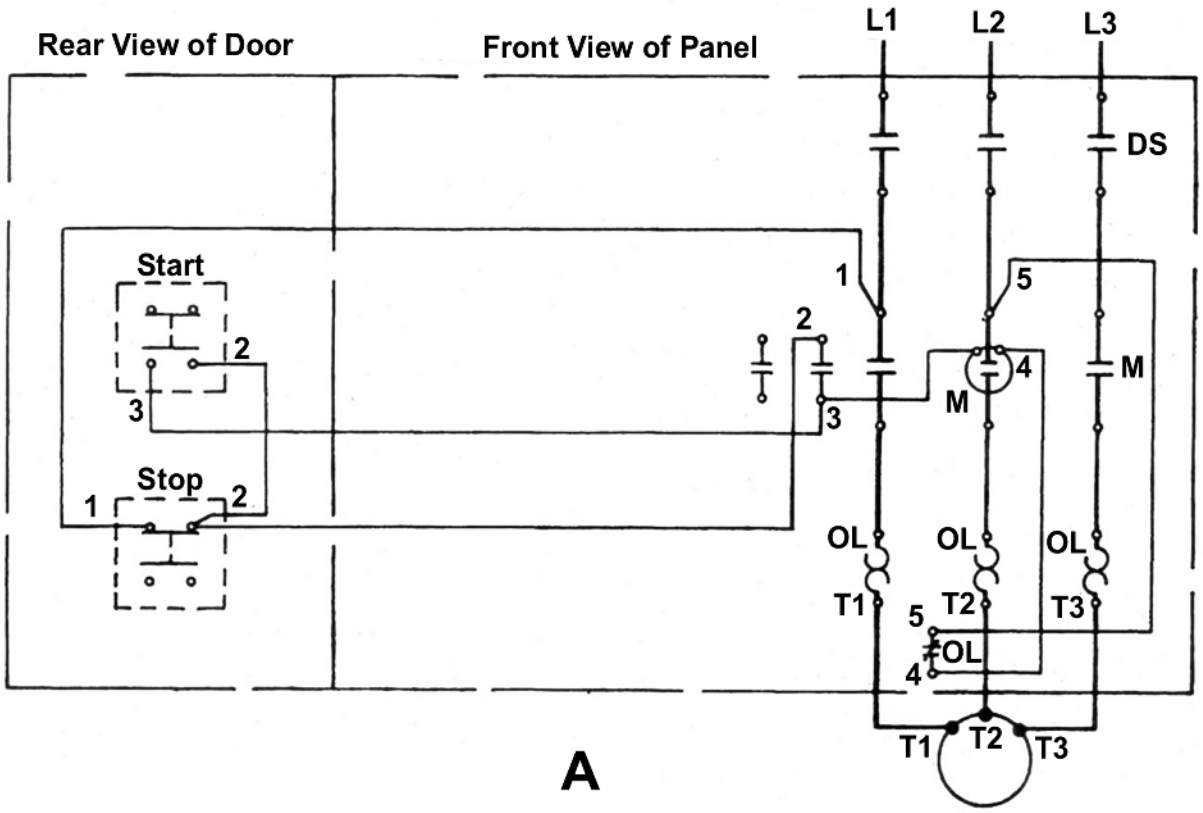
If choice A is selected set score to 1.

70. To prevent shaft currents in an alternator, the outboard bearing shell or outboard bearing pedestal is insulated. If the methodology used is the insulated bearing pedestal, how is the pedestal insulation evaluated?

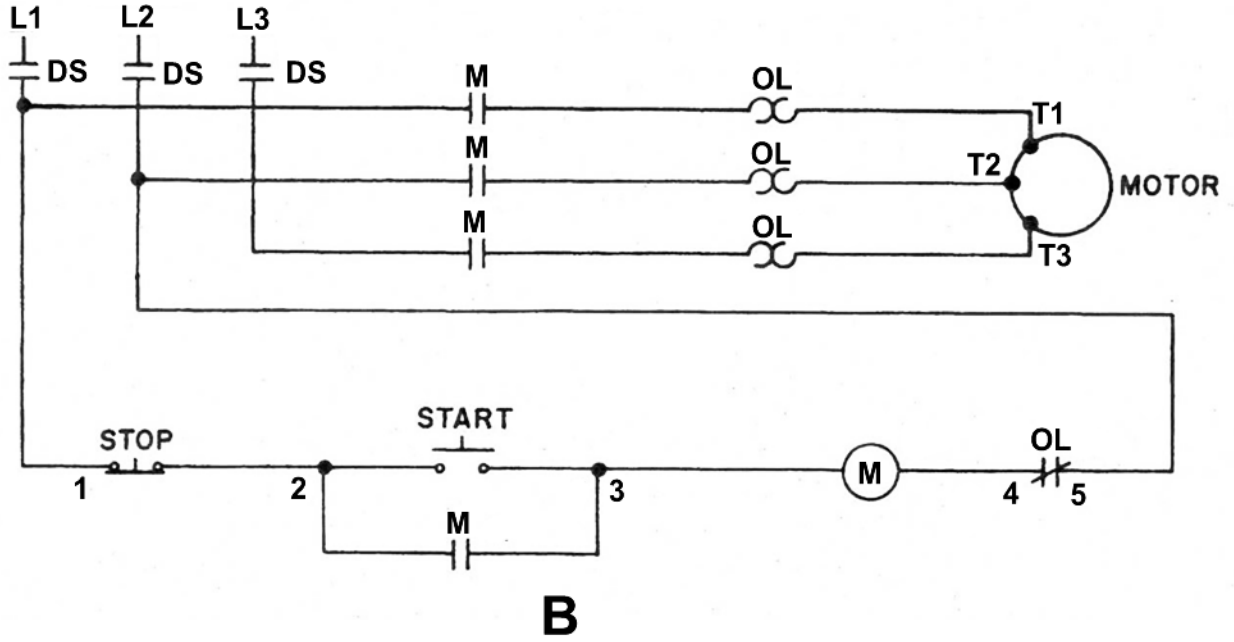
- (A) Measuring the resistance between the bearing pedestal and the bearing bedplate of a disassembled machine with a digital multimeter setup as an ohmmeter.
- (B) Measuring the resistance between the bearing pedestal and the bearing bedplate of an assembled machine with a 500-Volt megohmmeter.
- (C) Measuring the resistance between the bearing pedestal and the bearing bedplate of an assembled machine with a digital multimeter setup as an ohmmeter.
- (D) Measuring the resistance between the bearing pedestal and the bearing bedplate of a disassembled machine with a 500-Volt megohmmeter.

If choice D is selected set score to 1.

EL-0007



A



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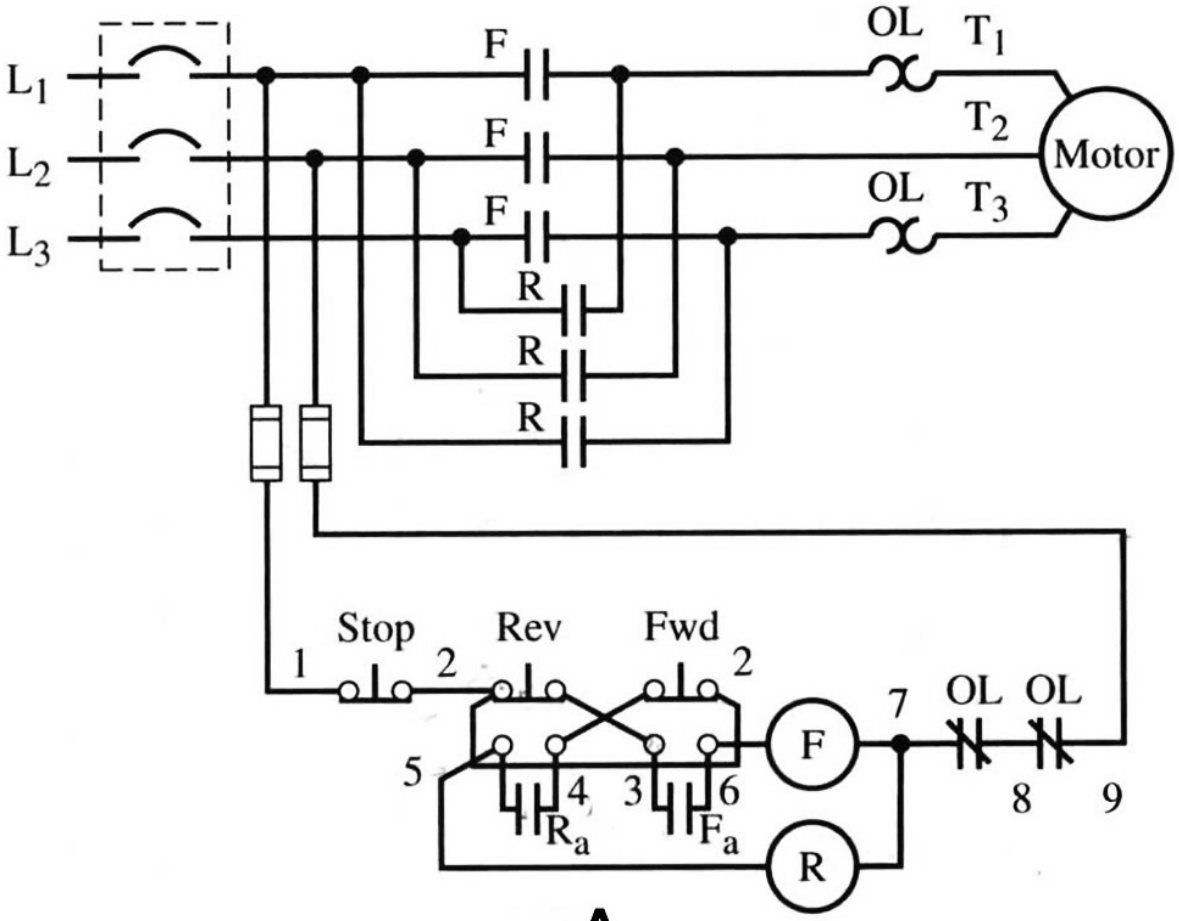
EL-0011



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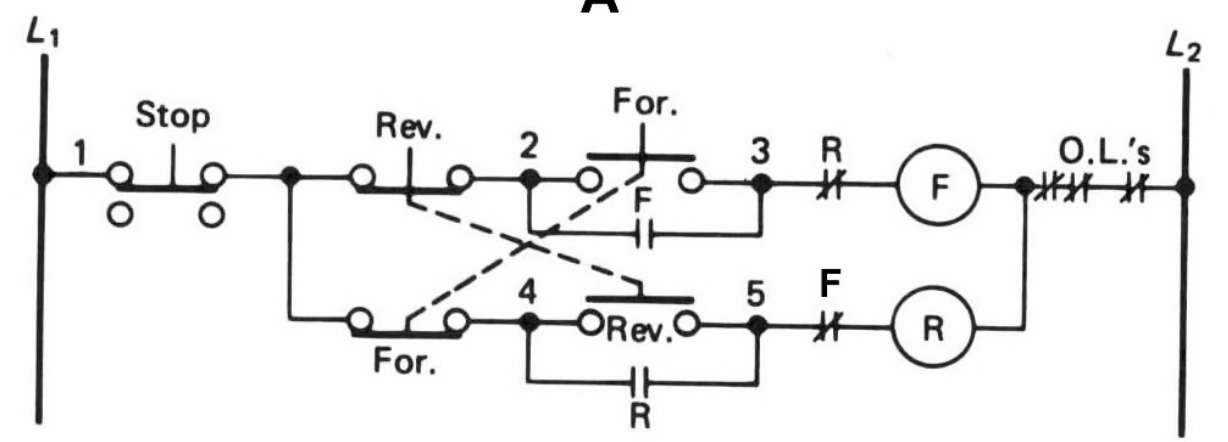
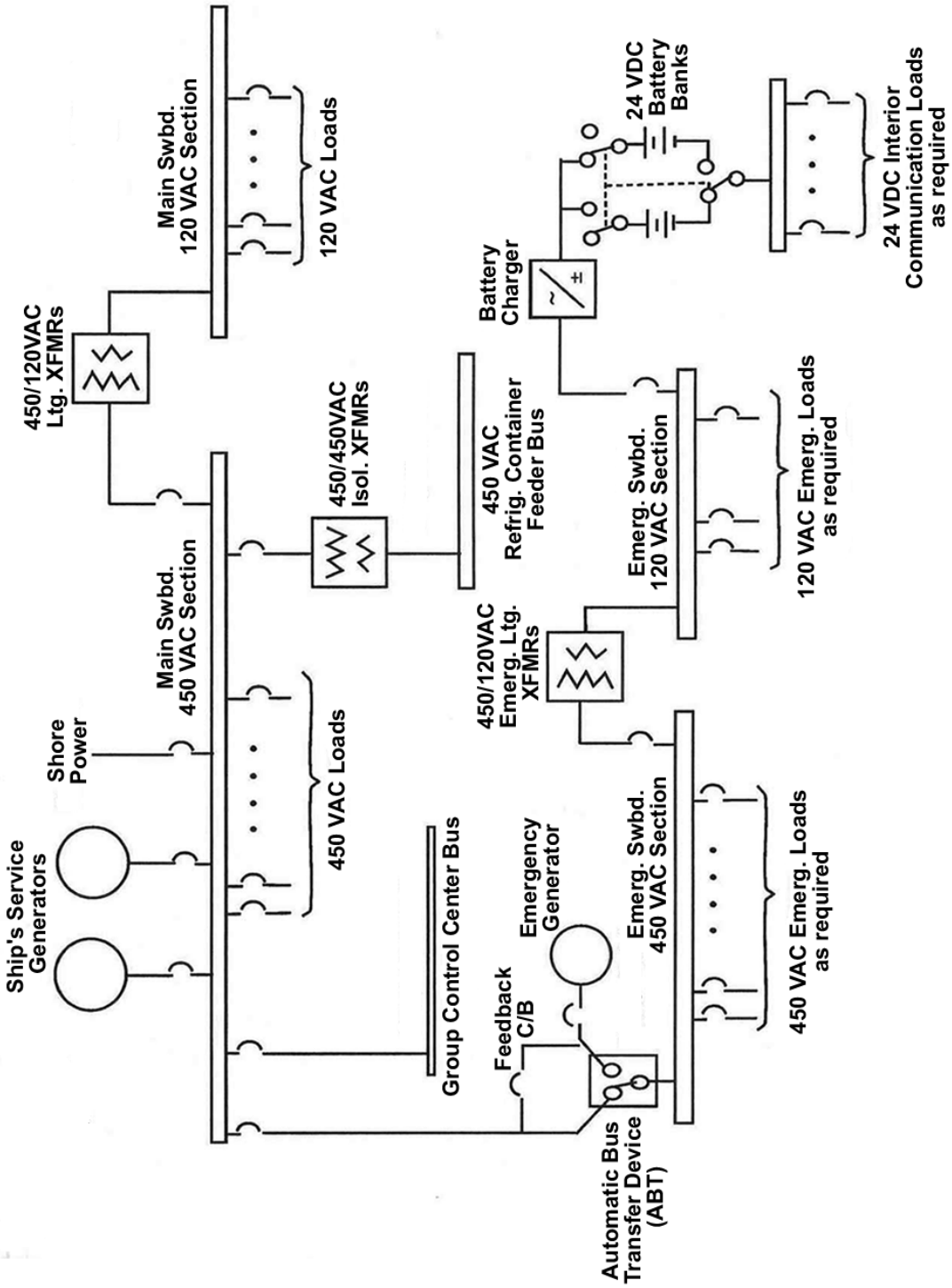


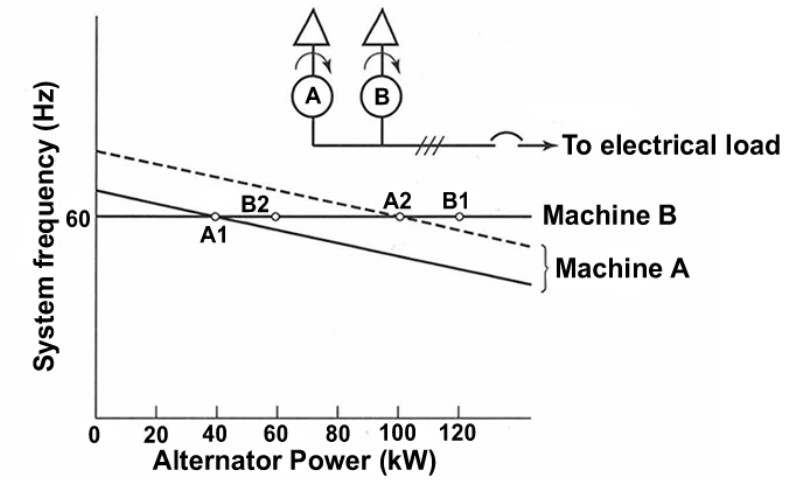
B

EL-0014



EL-0025

A



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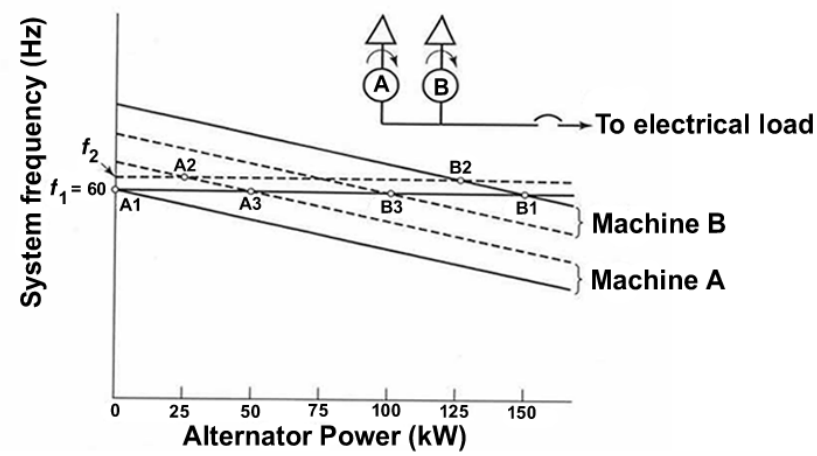

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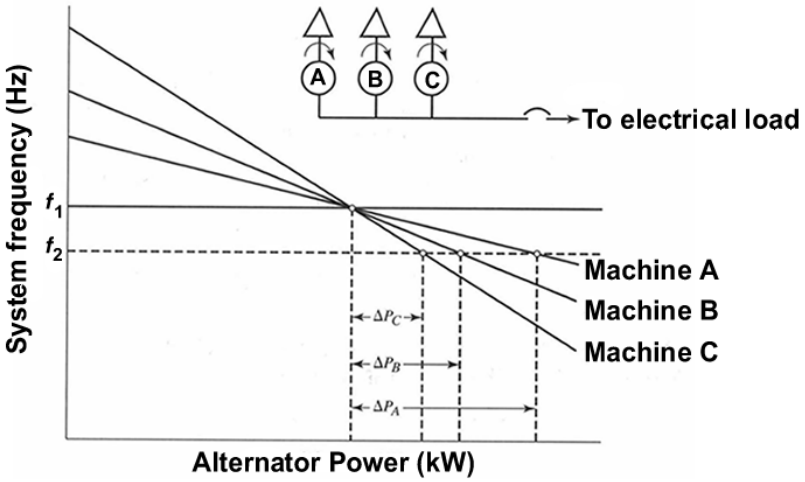


EL-0026

A

B

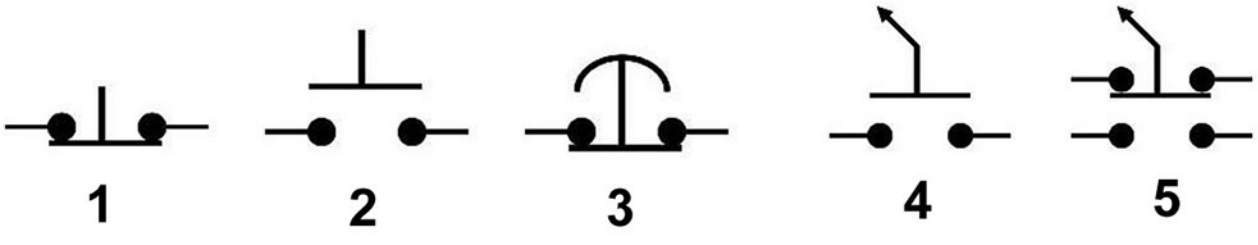
C

D

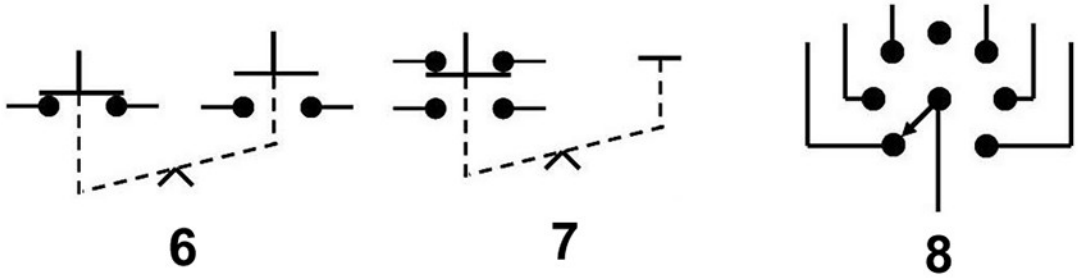
E

F

G



1 2 3 4 5



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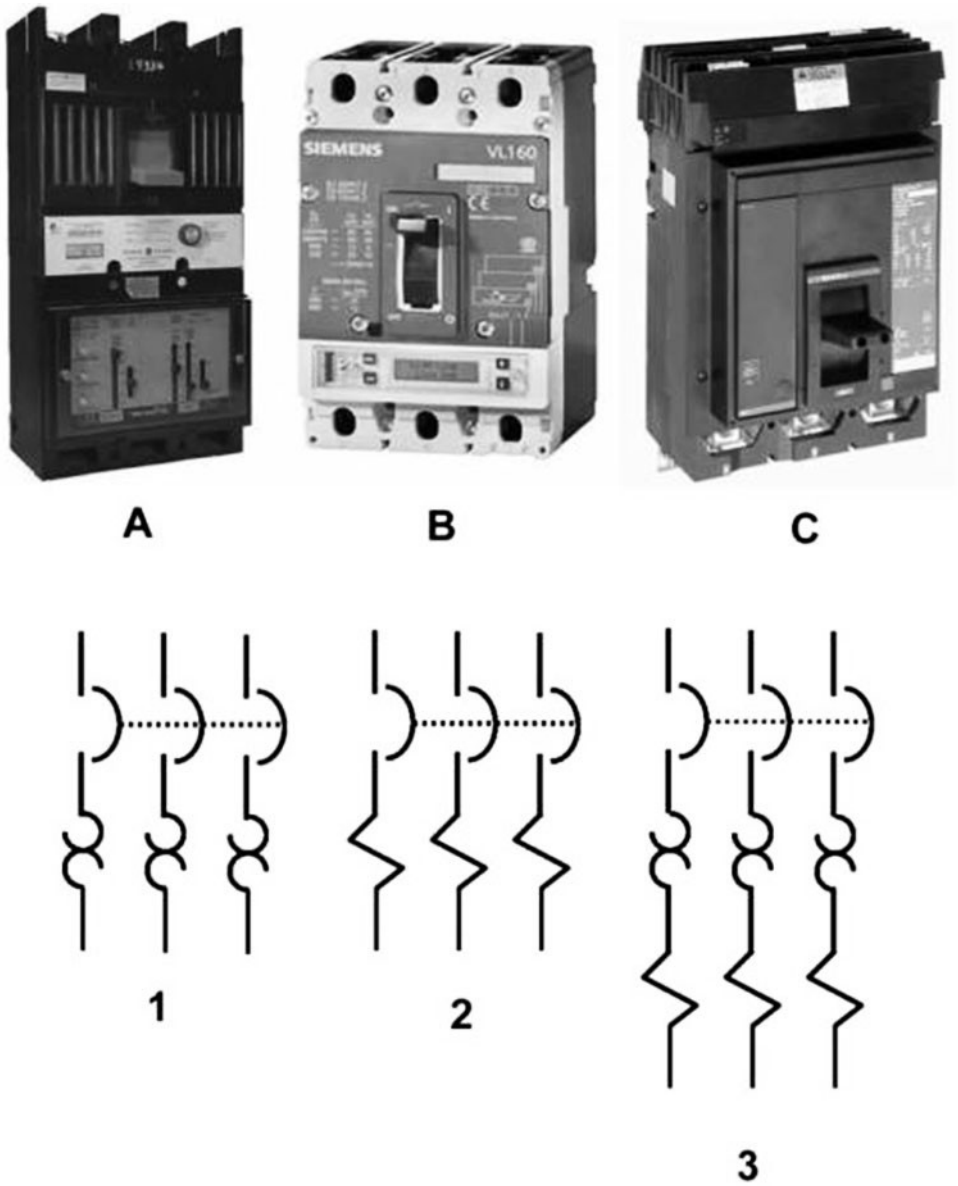

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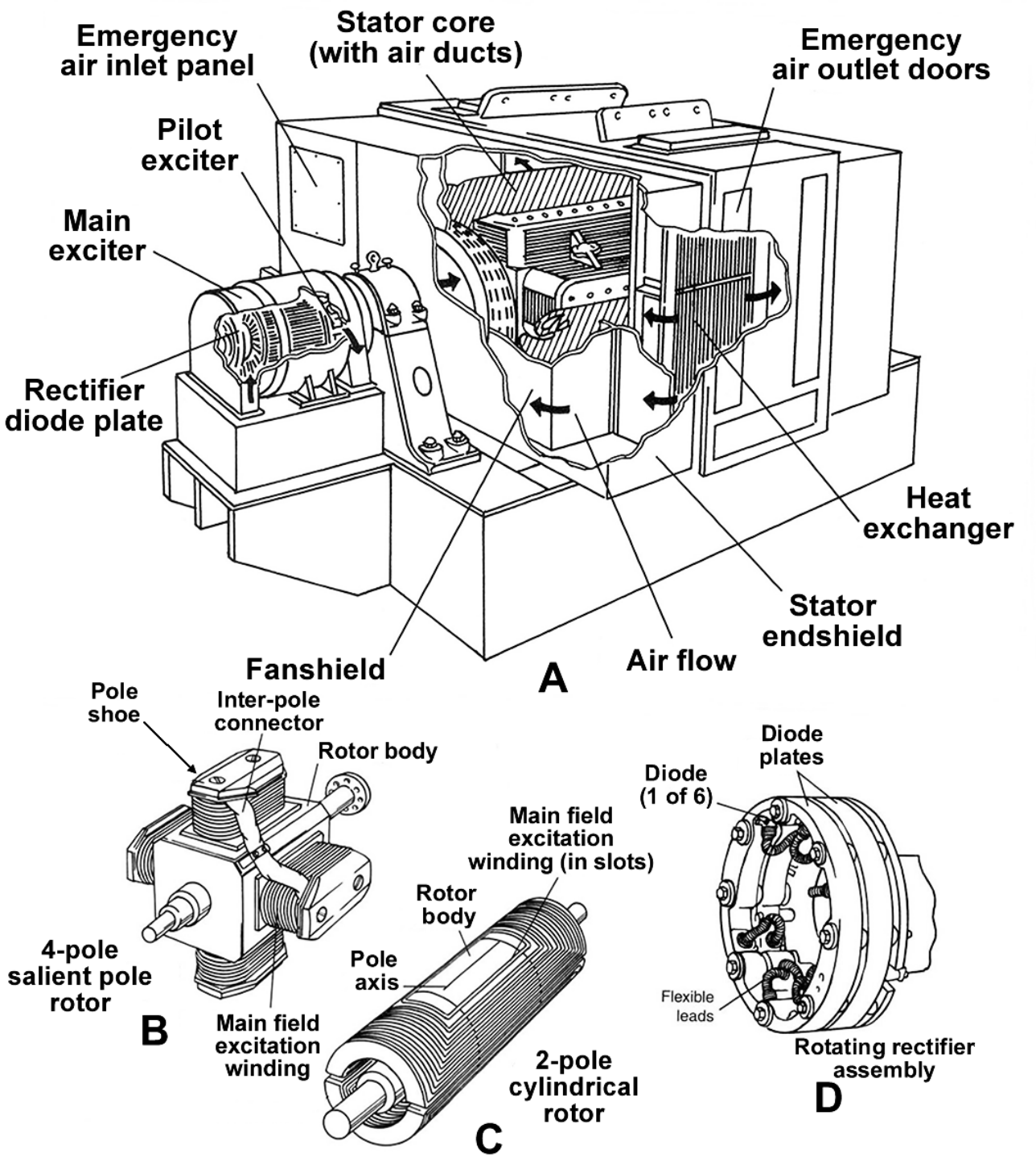

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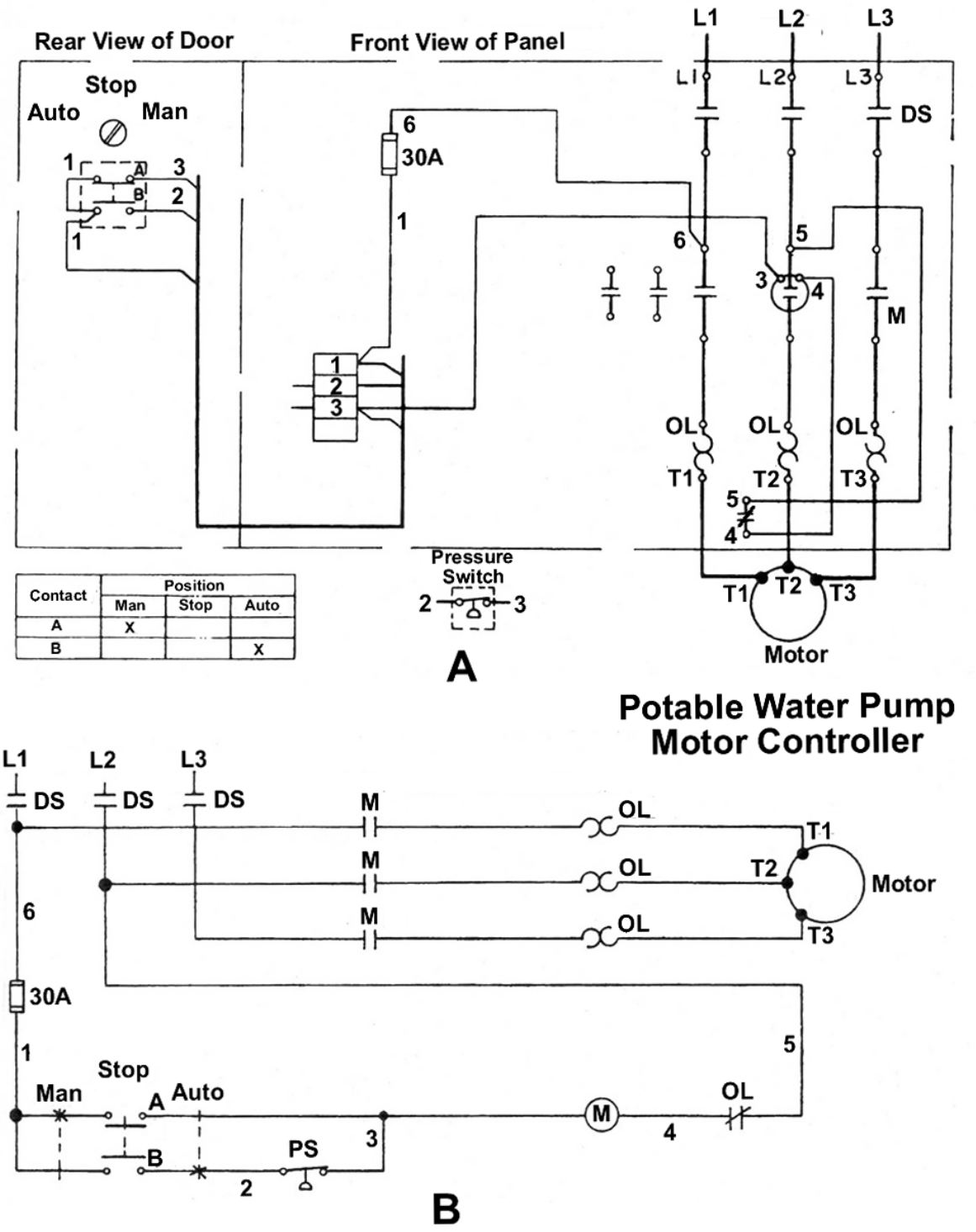

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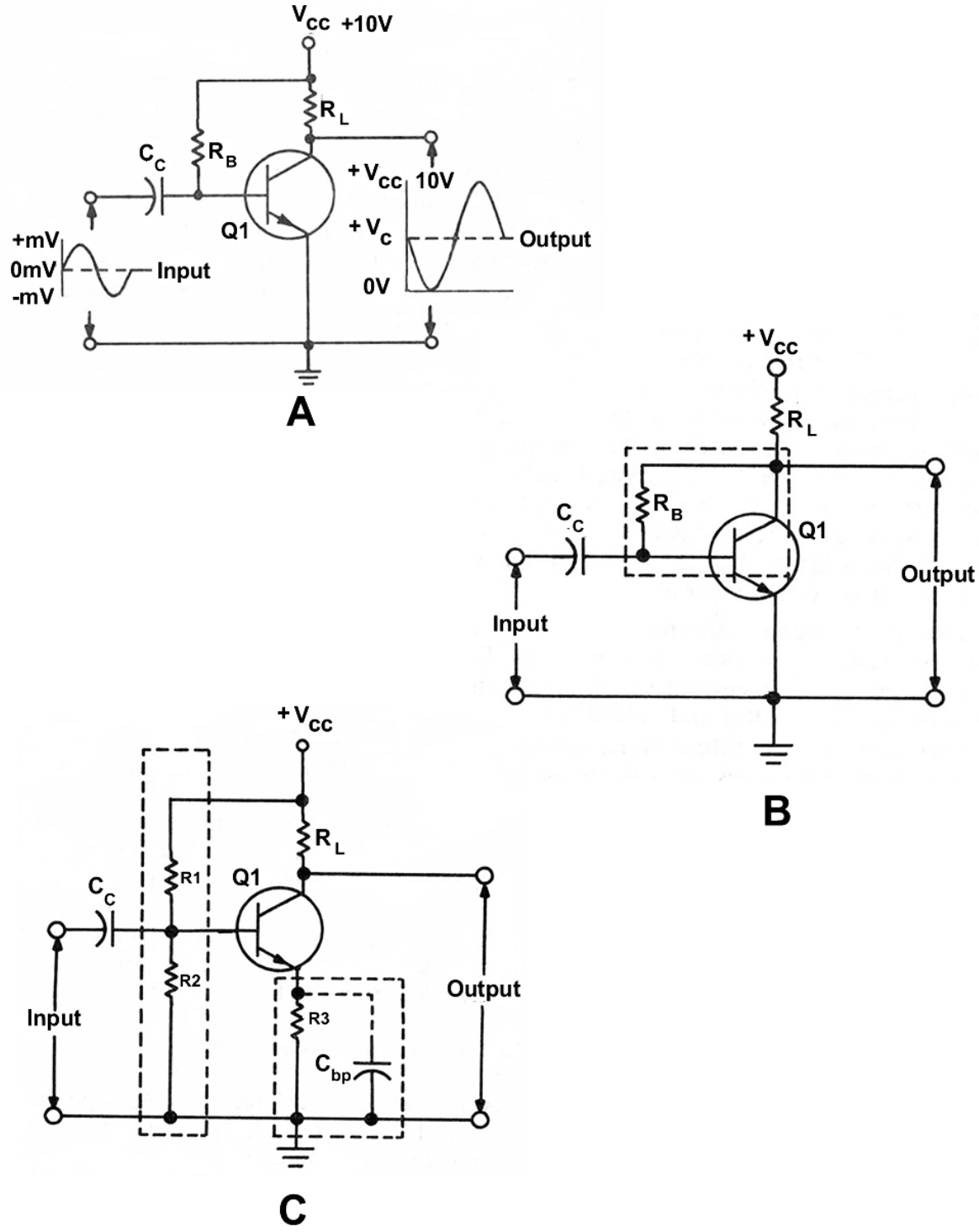
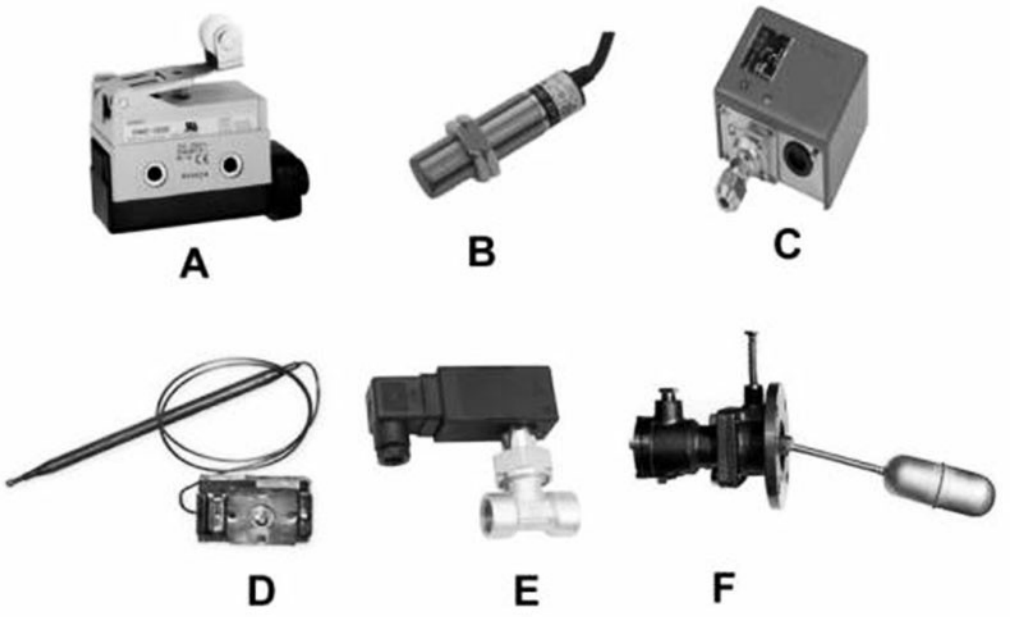
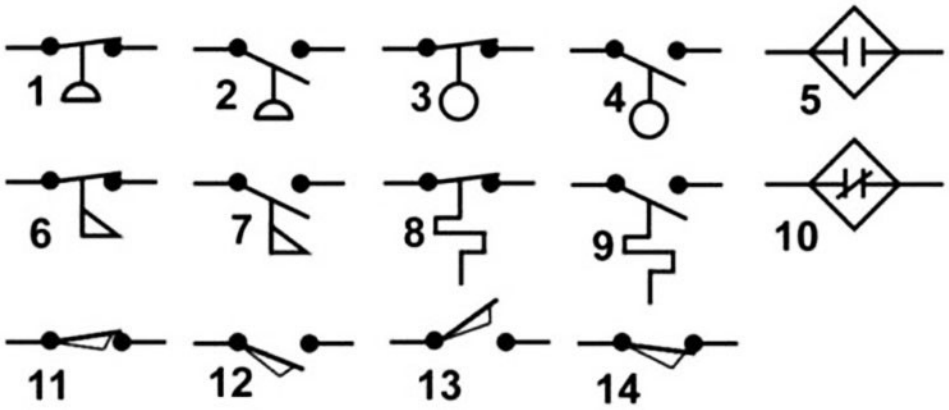


Adapted for testing purposes only from Introduction to Amplifiers, Navy Electricity and Electronics Training Series, Module 8. Naval Education and Training Command. NAVEDTRA 172-08-00-82

EL-0059





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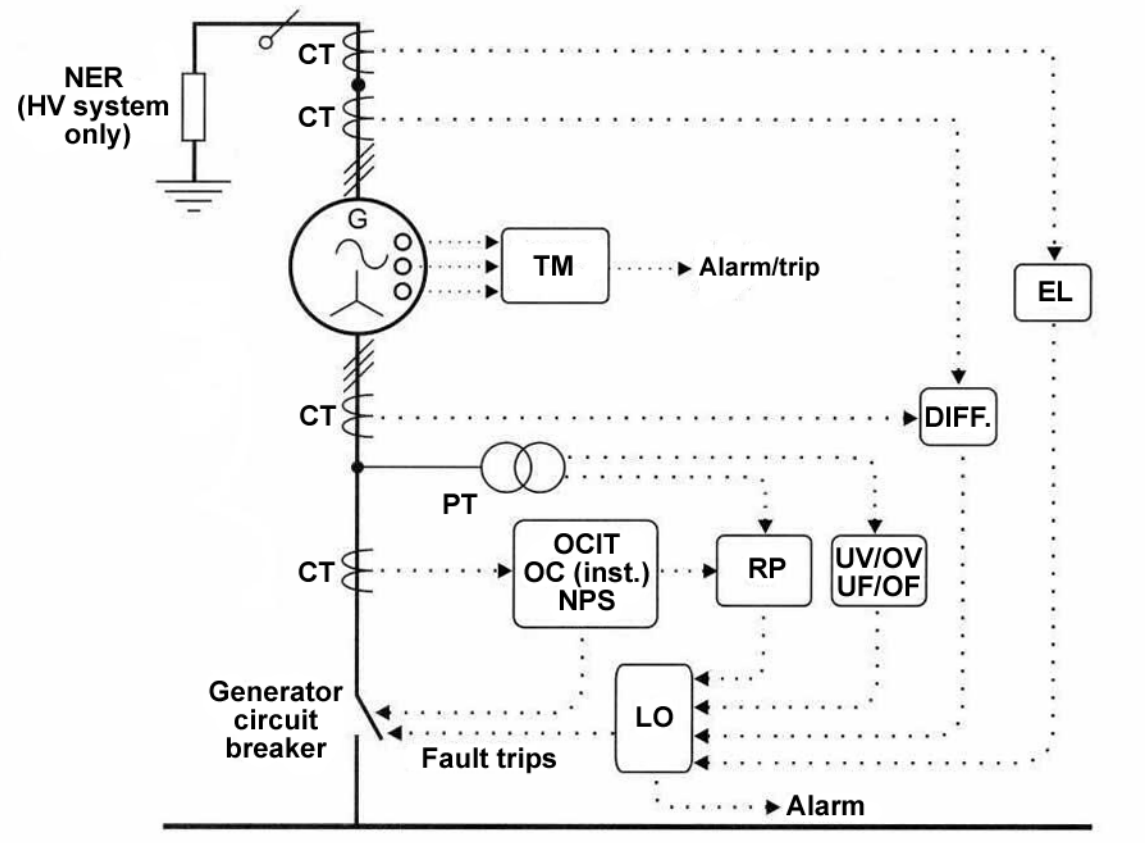

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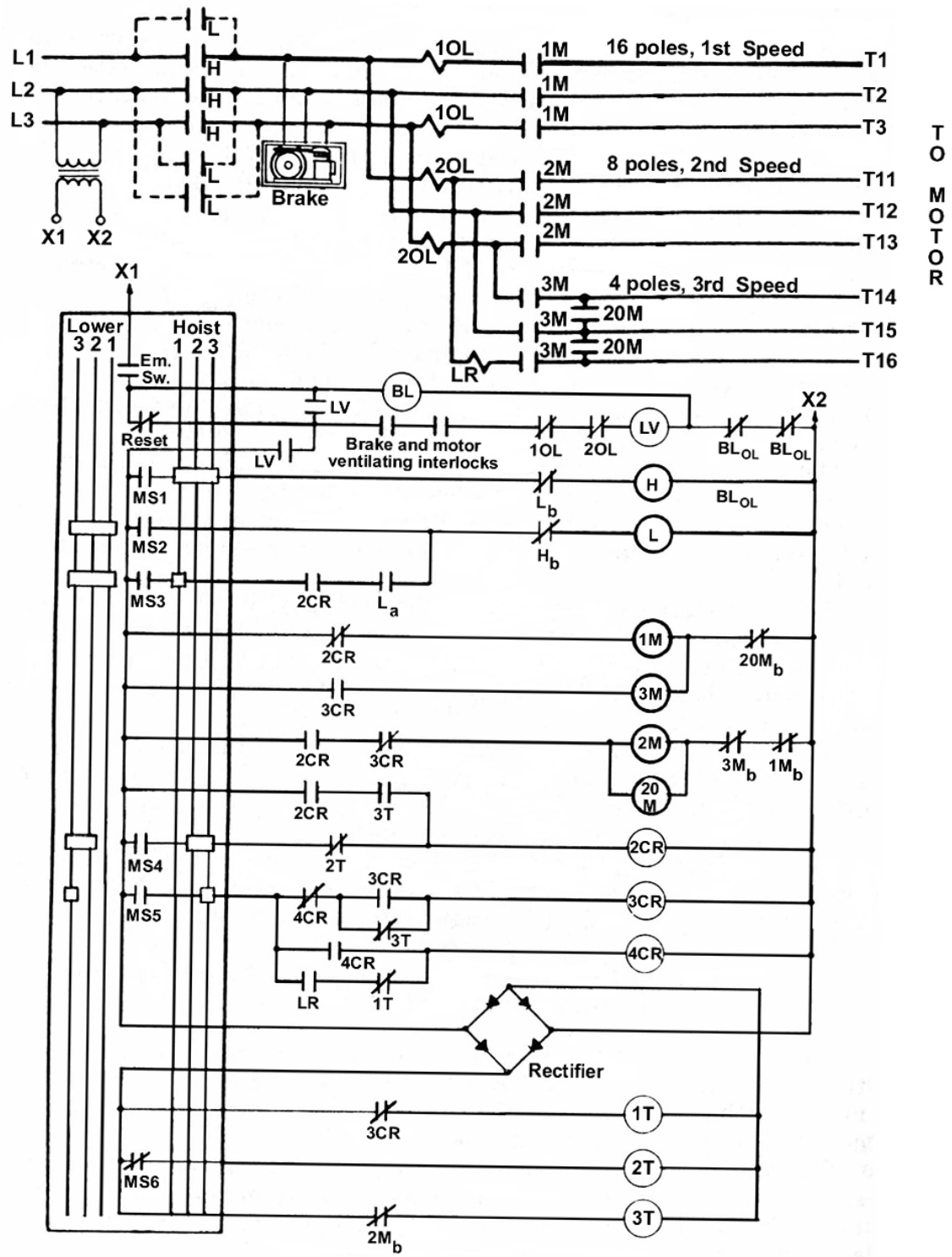

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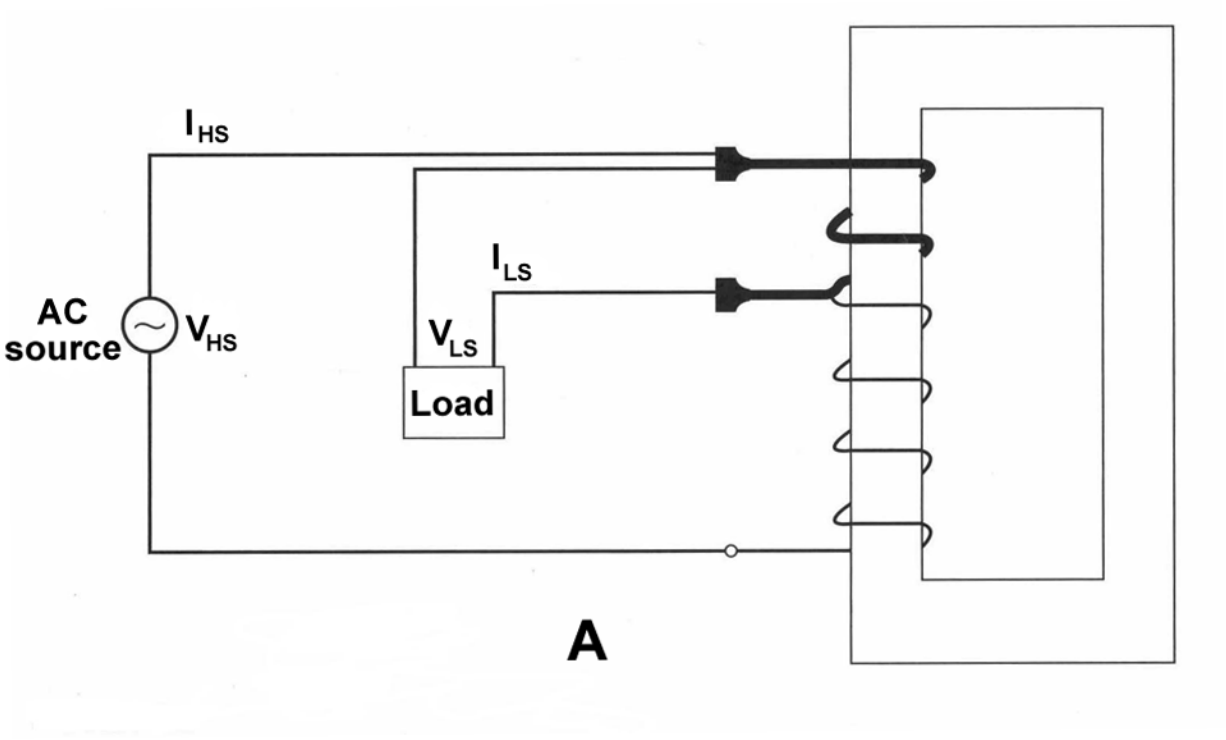

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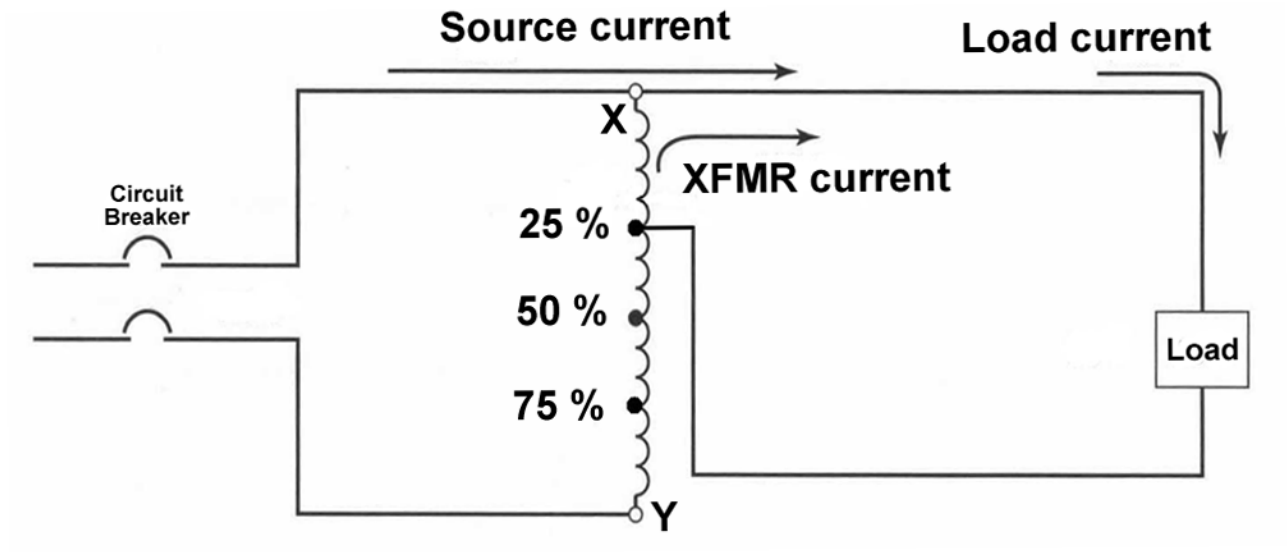
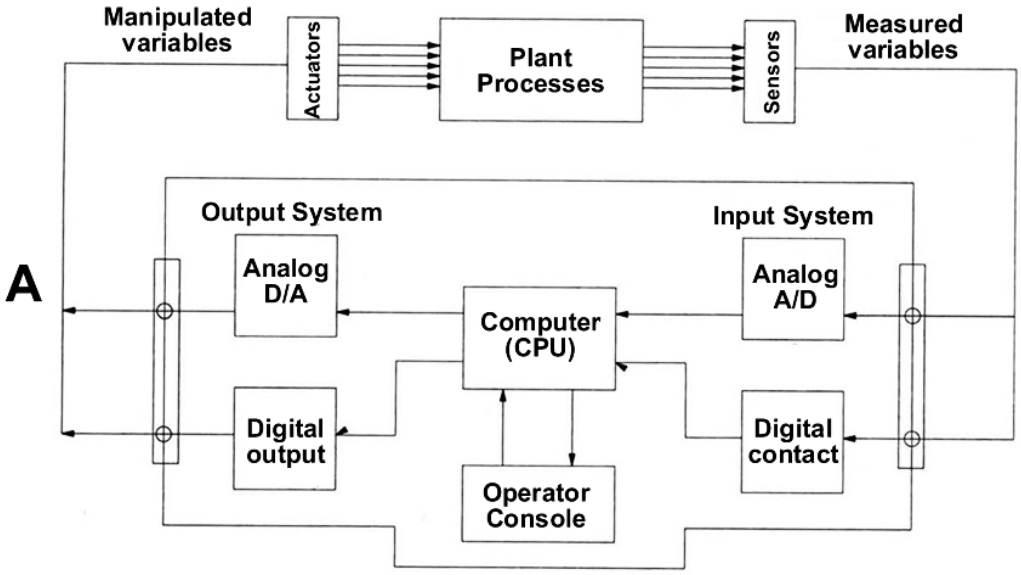


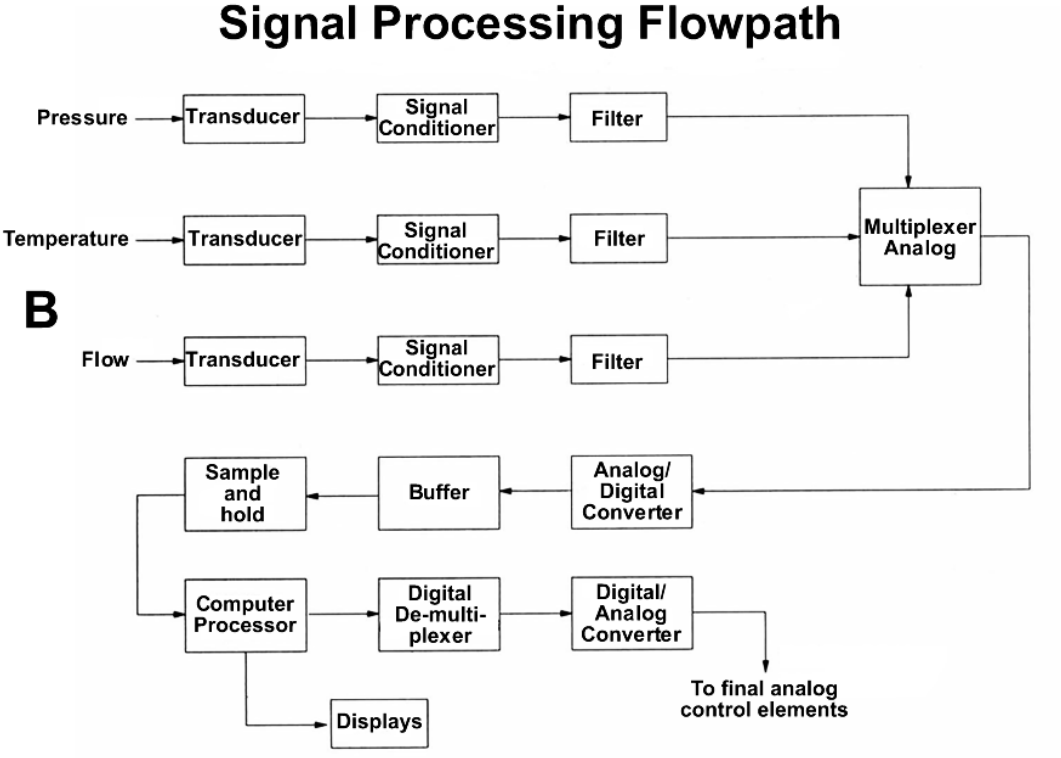
B

EL-0095

Direct Digital Control



Signal Processing Flowpath



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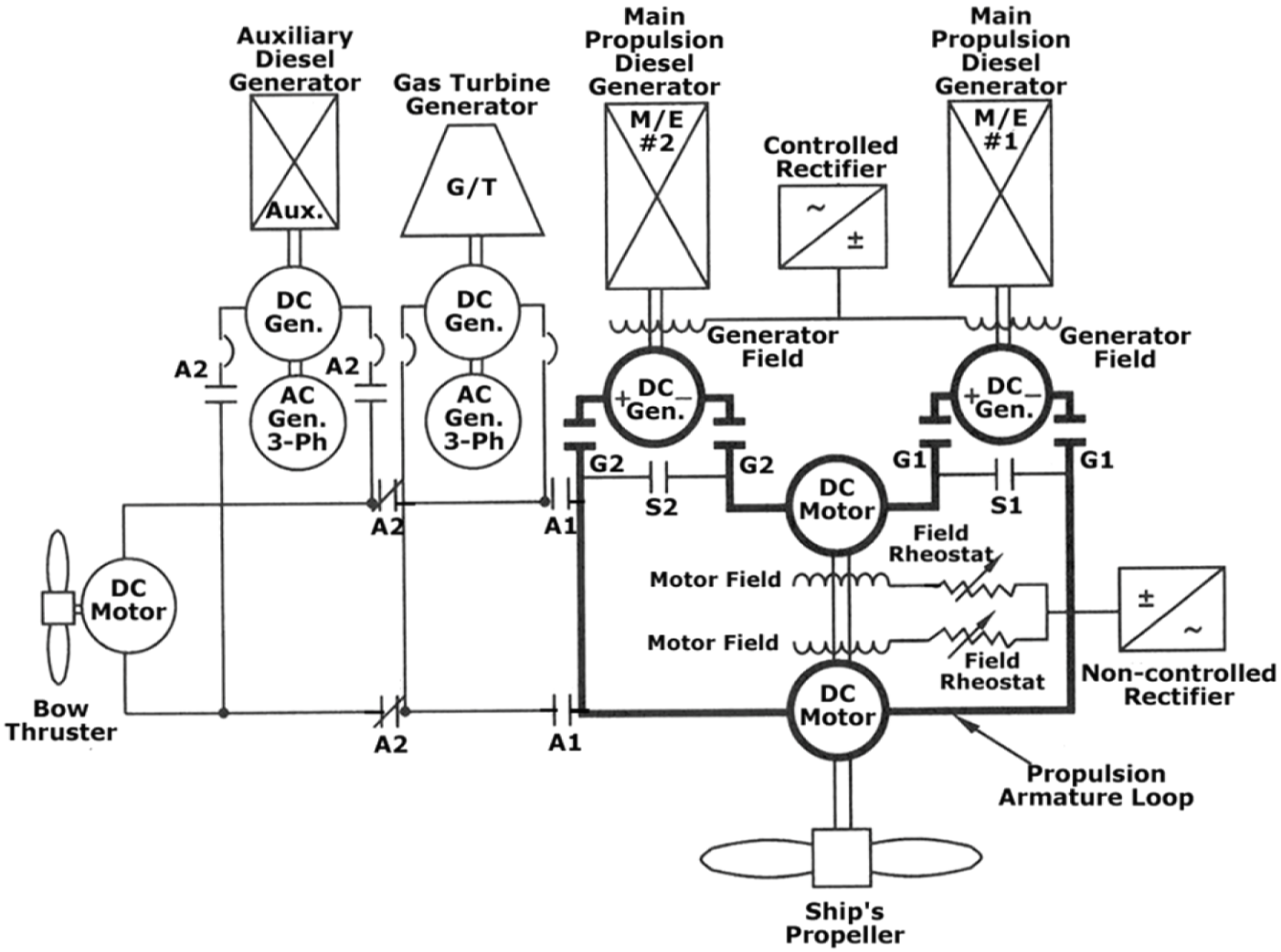

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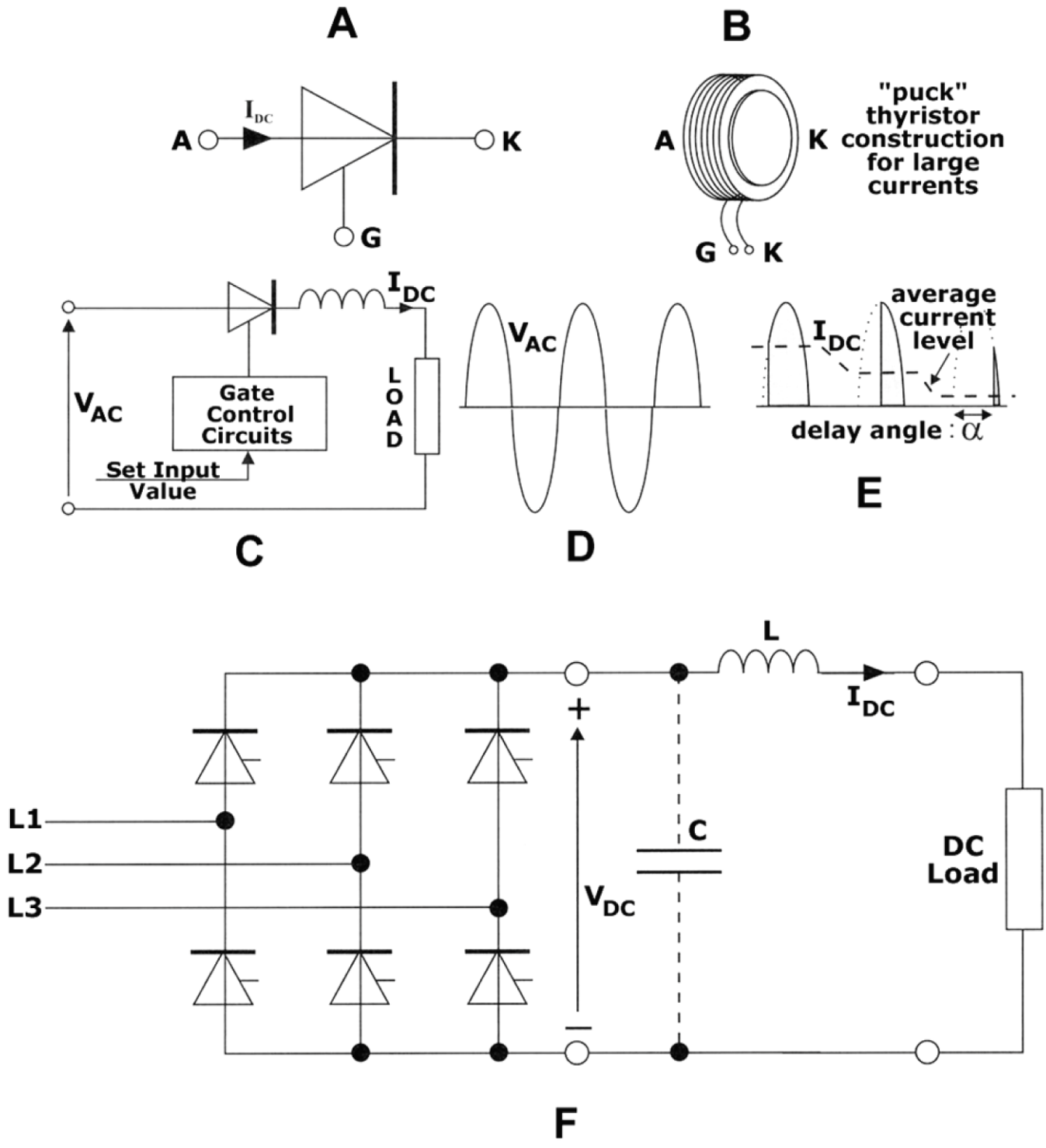

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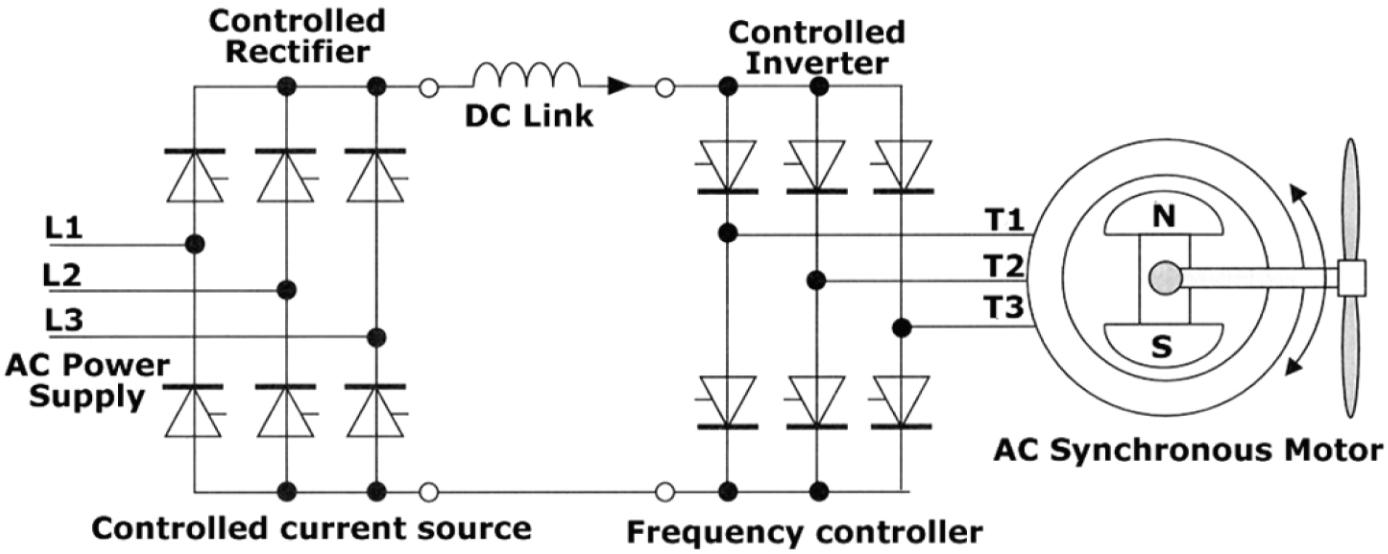

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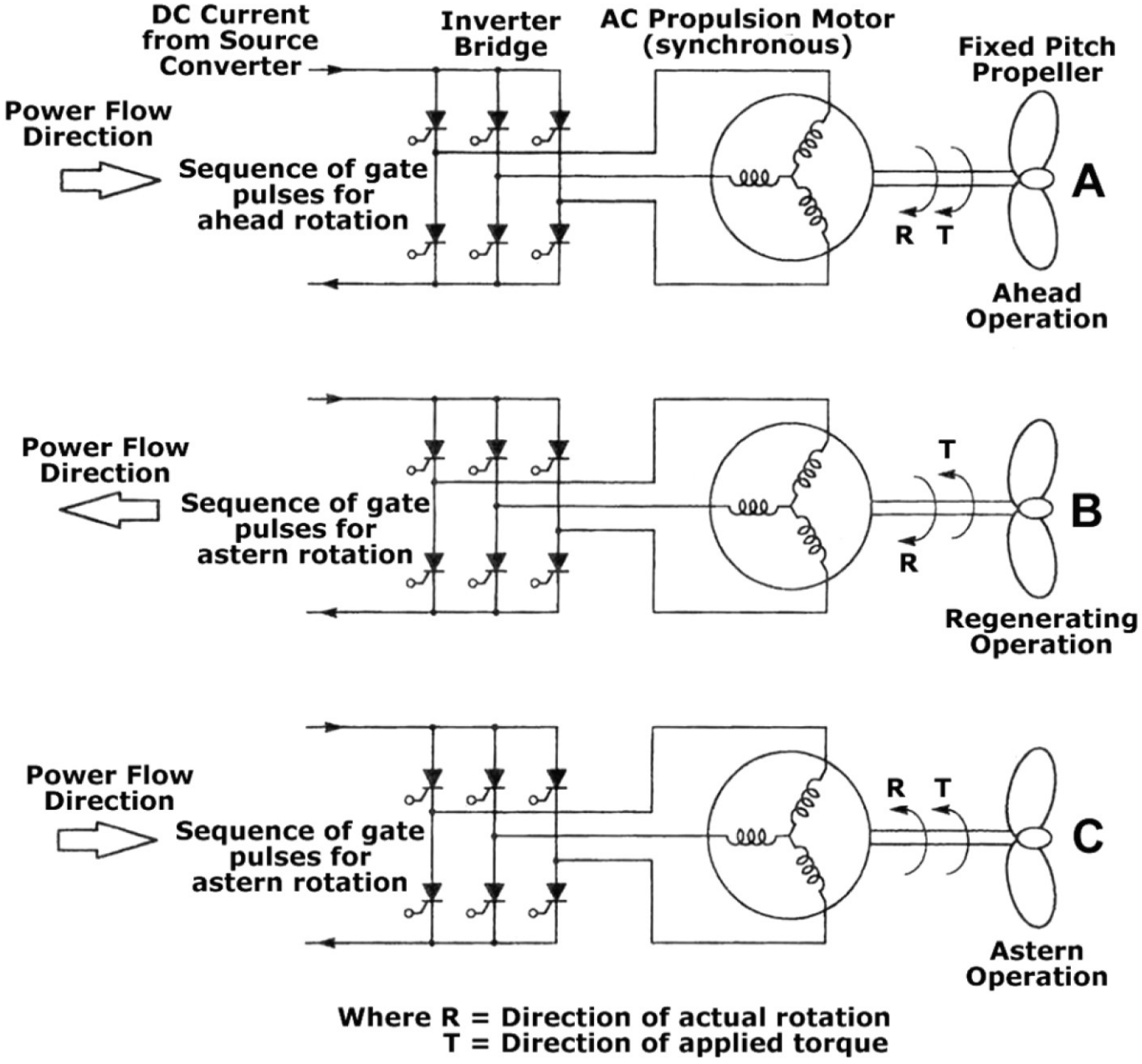


EL-0180

Catalog Number Selection Chart

Example Catalog Number

A N 1 9 A N 0 A 5E 005

Device Type
A = Starter
C = Contactor

Standard
E = IEC
N = NEMA

Device Assembly Configurations
70 = Multi-speed
1 = Non-reversing
5 = Reversing

OLR Type
5 = Contactor only-no overload relay
6 = Starter w/C306 bi-metallic OLR
9 = Starter w/C440 electronic overload

Contactor Frame Size *

Suffix	NEMA Size	Continuous Amperes
A =	00	9
B =	0	18
D =	1	27
G =	2	45
K =	3	90
N =	4	135
S =	5	270
T =	6	540
U =	7	810
V =	8	1215

NEMA Enclosure
N = Open

For Starters

Starter Mounting Option
0 = Horizontal
V = Vertical

For Contactors only
2 = Two-pole
3 = Three-pole
4 = Four-pole
5 = Five-pole

AC Coil Suffix

Suffix	Coil Volts and Hertz
A	= 120/60 or 110/50
B	= 240/60 or 220/50
C	= 480/60 or 440/50
D	= 600/60 or 550/50
E	= 208/60
H	= 277/60
J	= 208-240/60 **
K	= 240/50
L	= 380-415/50
N	= 550/50
T	= 24/60, 24/50 ***
U	= 24/50
V	= 32/50
W	= 48/60
Y	= 48/50

C440 OLR Designation (FVNR and FVR only)
5E = Standard feature set SEL Reset, SEL Class (10A, 10, 20, 30)
5G = Ground fault feature set SEL Reset, SEL Class (10, 20)

C440 FLA Range (FVNR and FVR only)

NEMA Size 00
1P6 = 0.33-1.65A
005 = 1-5A
020 = 4-20A

NEMA Size 0
1P6 = 0.33-1.65A
005 = 1-5A
020 = 4-20A

NEMA Size 1
1P6 = 0.33-1.65A
005 = 1-5A
020 = 4-20A
045 = 9-45A

NEMA Size 2
005 = 1-5A
020 = 4-20A
045 = 9-45A

NEMA Size 3
100 = 20-100A ****

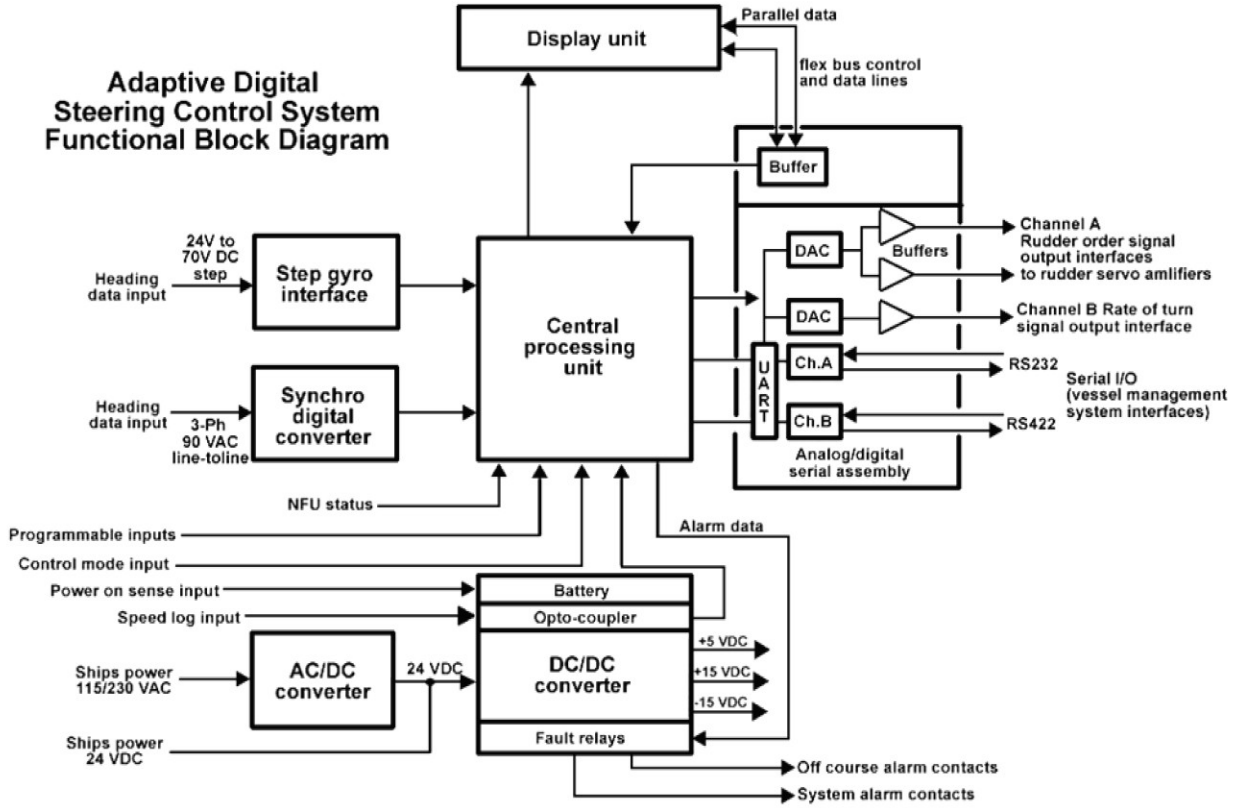
NEMA Size 4 **
300 = 60-300A ****

NEMA Size 5 **
300 = 60-300A ****

Notes:

* For contactor only orders, add B to end of catalog number if NEMA size 00-2, 6.
** NEMA sizes 00 and 0 only.
*** NEMA sizes 00 and 0 only. Sizes 1-8 are 24/60 only.
**** NEMA sizes 4 and 5 require the use of CTs with 1-5A OL relay. Size 4 starters are not shipped as assembled units. Order CN15NN01 contactor 1-5A OL (C440A1A005SAX or C440A2A005SAX) with 60-300A CTs (ZEB-XCT300).

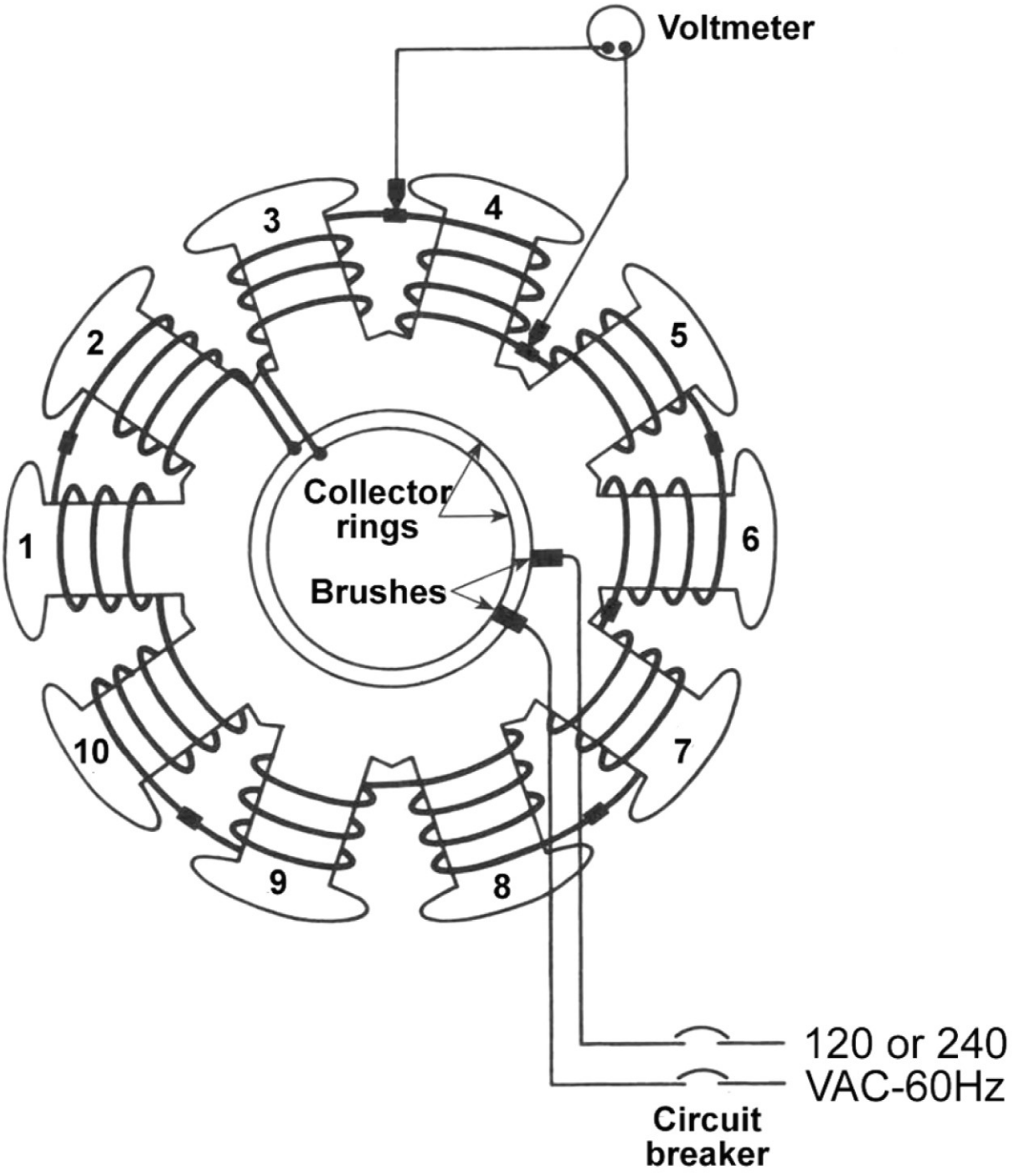
EL-0191



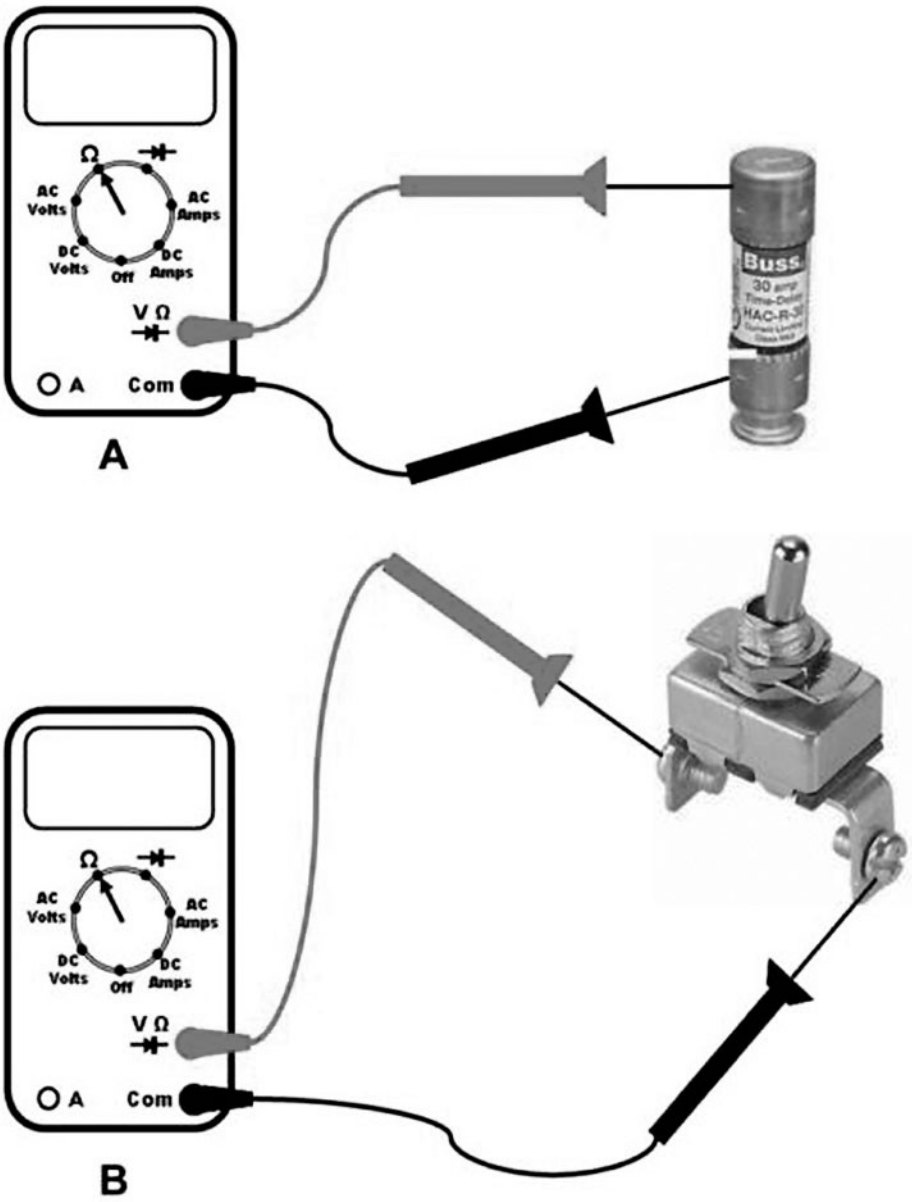
Adaptive Digital Steering System Interface Signals

Inputs	
Speed log input	
Pulsed	200 pulse/nautical mile (PPNMI) format (contact closure)
Serial	RS-232 (channel A or C) or RS-422 (channel B) communications in NMEA 0183 format, $VBW, $VHW
Navigator (vessel management system) input	Serial data for heading order, rate order, and cross track error information in RS-232 or RS-422 communication on channel A, B or C, in NMEA format $APB, $HSC, $HTR, $HTC or $XTE.
Compass	
Step data	Positive or negative step data (24 or 70 V)
Synchro	1X, 90X or 360X
Data	$HDT (on channels A, B or C)
Serial data	
Mode switch sense contacts	External switched opened or closed to inform autopilot to change from Standby mode to an automatic mode
NFU sense contacts	External contacts to indicate when the NFU controller is active
Power failure circuits	Closed contacts on external power switch to activate power failure alarm
Outputs	
Interface to external rudder servo control amplifiers	Bipolar analogue voltage proportional to the rudder order. ± 11.25 V (maximum limit) equal to ± 45° or rudder
Rate of turn interface	Bipolar analogue voltage proportional to a turn rate indicator. ± 4.5 V (max) equal to ±90° turn/min. Resolution equal to 0.5°/min.

EL-0202



EL-0210



EL-0213