

Electrical – Electronic – Control Engineeri

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In the circuit 'B' of the illustration, what would be the result of the upper heating element being burned out and open circuited? Illustration EL-0041

low heat (series) position would result in no heat at all medium heat (single) position would result in no heat at all high heat (parallel) position would result in medium heat

Illustrations: EL0041_AO_030915WM

As shown in figure "1" of the illustration, a correctly connected synchronous transmission causes the receiver to be in correspondence with the transmitter. If the receiver is out of correspondence, 180 degrees out of zero, but the torque direction is correct as shown in figure "2", what figure shows the incorrect connections responsible for this condition? Illustration EL-0150

B

Illustrations: EL0150_AO_091611WM

As shown in the illustrated wiring diagram for an engine order telegraph system, what statement concerning the constant ringing and trouble alarm is true? Illustration EL-0113

The constant ringing and trouble alarm sounds when the acknowledge handle and indicator arrow are not on the same order.

Illustrations: EL0113_AO_070715WM

At a minimum threshold, how many milliamps of current through the body produces a painful sensation that most people would perceive as an electric shock?

3 to 7 mA

Illustrations: EFFECTS OF ELECTRICAL CURRENT

At a minimum threshold, how many milliamps of current through the body produces a condition where most people would be unable to let go of the energized electrical conductor due to involuntary muscular contraction?

10 to 16 mA

Illustrations: EFFECTS OF ELECTRICAL CURRENT

At a minimum threshold, how many milliamps of current through the body produces a condition where most people would experience respiratory paralysis and be unable to breathe while still in contact with the energized conductor?

30 mA

Illustrations: EFFECTS OF ELECTRICAL CURRENT

At a minimum threshold, how many milliamps of current through the body produces a condition where most people would suffer ventricular fibrillation and could only be resuscitated with a ventricular defibrillator?

75 mA for 5 sec.

Illustrations: EFFECTS OF ELECTRICAL CURRENT

In using a portable growler for the purpose of locating a shorted stator coil in an AC motor as shown in the illustration, what statement is true as the feeler is moved from slot to slot around the stator? Illustration EL-0200

The feeler will vibrate in synchronism with the 60 Hz AC power source and produce a growling noise when the feeler is moved over a slot containing a shorted coil.

Illustrations: EL0200_AO_051815WM

A digital multimeter is set up as shown in the illustration to evaluate the single-circuit stator windings of a squirrel cage induction three-phase motor. The following readings are taken: From T1 to T2 reads "OL" ohms. From T2 to T3 reads "OL" ohms. From T3 to T1 as shown reads "1.6" ohms. What condition is indicated? Illustration EL-0219

Phase A (associated with T1) and Phase C (associated with T3) are undamaged. Phase B (associated with T2) is open-circuited.

Illustrations: EL0219_WM_101118
See REF1805

As shown in the illustrated wound-rotor induction motor how is the direction of rotation of the motor reversed? Illustration EL-0148

Any two of the "T1, T2, and T3" leads are reversed only.

Illustrations: EL0148_WM_100918

What are the operational characteristics of the split phase motor shown in figure "B" of the illustration? Illustration EL-0215
The motor is reversible and dual-voltage, configured for high volts.

Illustrations: EL0215_AO_051815WM

Within the split phase family of single phase motors, what are the operational characteristics of the motor shown in figure "B" of the illustration? Illustration EL-0207

Relatively high starting torque and relatively low running efficiency

Illustrations: EL0207_WM_101018

As shown in figures "A", "B", "C", and "D" of the illustration, what is the usual means by which the rotation direction of the motor is reversed? Illustration EL-0207

Interchanging leads T5 and T8

Illustrations: EL0207_WM_101018

Which of the pictured motors within the split phase family of single phase induction motors represents a capacitor start, induction run motor? Illustration EL-0146

A

Illustrations: EL0146_AO_091611WM

According to the sample sheet of a typical "List of Motors and Controls" as shown in the illustration, which of the following motor applications features a means of keeping the motor windings warm and dry when the motor is idle? Illustration EL-0204

Amidship mooring winch

Illustrations: EL0204_AO_051815WM

Which of the following statements describes what will occur if the motor torque-speed and current-speed curves shown in the illustration is required to carry 150% of full load? Illustration EL-0056

The stator current will increase.

Illustrations: EL0056_WM_100518

The torque-speed and current-speed curves for a three-phase induction motor with a squirrel-cage rotor are shown in figures "A" and "B" of the illustration. Which of the following statements is true concerning the depicted curves? Illustration EL-0056

Starting current is approximately 4.75 times the normal full load current value.

Illustrations: EL0056_WM_100518

Assuming that the 3-phase power source has a phase sequence of A-B-C and that the motor is connected as shown in figure "A", if the motor has a counterclockwise (CCW) rotation, what statement is true concerning the motors connected as shown in the other figures? Illustration EL-0156

Motors "B" and "D" would have a clockwise (CW) rotation and motor "C" would have a counterclockwise (CCW) rotation.

Illustrations: EL0156_AO_091611WM

What type of motor is illustrated by the schematic of figure "B" of the illustration and what type of starting relay is used? Illustration EL-0209

capacitor start, induction run motor using a potential starting relay

Illustrations: EL0209_AO_051815WM

Which of the pictured motors is a square core shaded pole motor used to drive very small electrical loads and is non-reversible _____ . Illustration EL-0208

B

Illustrations: EL0208_WM_101018

Which of the illustrated motors has a totally enclosed, fan-cooled (TEFC) motor enclosure? Illustration EL-0001

A

Illustrations: EL0001_WM_100518

As shown in the two-speed single winding three phase motor connection diagrams illustrated in figure "B", what is the connection scheme associated with low speed operation? Illustration EL-0118

series delta

Illustrations: EL0118_AO_022818WM

If a digital multimeter is set up as shown in figure "A" of the illustration to test an AC contactor coil, what would the display read if the coil is open-circuited? Illustration EL-0214

OL ohms

Illustrations: EL0214_WM_101118

See REF1805

As shown in figure "A" of the illustration, if in troubleshooting the control circuit using on-line techniques with a voltmeter with the start button depressed and the following readings are taken, what is the problem? "X1" to "X2" reads 115 VAC; "1" to "X2" reads 115 VAC; "2" to "X2" reads 0 VAC; and "3" to "X2" reads 0 VAC. Illustration EL-0123

the stop button is open-circuited

Illustrations: EL0123_WM_100918

Which device will stop the motor shown in the illustration in case of a short-circuit (high current) motor fault? Illustration EL-0080

disconnect switch fuses FU1, FU2, and FU3

Illustrations: EL0080_WM_100518

As shown in the illustrated electrically operated watertight door controller, how is the rotation direction of the door motor reversed? Illustration EL-0115

reversing the direct current direction through the motor armature and maintaining the same direct current direction through the motor series field

Illustrations: EL0115_WM_100918

As shown in the illustration, what type of starter is illustrated? Illustration EL-0104

reduced voltage primary resistance starter

Illustrations: EL0104_WM_100918

In the illustrated motor controller, what do the contacts across terminals "3" and "4" of the control circuit represent?

Illustration EL-0017

normally-closed overload relay contact

Illustrations: EL0017_WM_070819

As shown in the illustration, which of the following conditions will occur as a result of a momentary loss of power?

Illustration EL-0017

The motor will automatically restart when power is restored.

Illustrations: EL0017_WM_070819

As shown in the illustration, assuming power is available at the control circuit, which listed action will occur FIRST when the "off-run" switch is placed in the "run" position? Illustration EL-0017

The contactor coil "M" energizes.

Illustrations: EL0017_WM_070819

If the motor shown in the illustration will not start when the "off-run" switch is placed in the run position, which of the listed components should be checked FIRST? Illustration EL-0017

check the overload relay for tripped condition, reset as necessary

Illustrations: EL0017_WM_070819

When a motor is started by the controller shown in figure "C" of the illustration, what circuit components are in the holding current flow path through the control circuit while the motor is in operation? Illustration EL-0010

the stop button contacts, the "B1" contacts, the "M" contacts, the "M" coil and the "OL" contacts

Illustrations: EL0010_AO_022515WM

As shown in figure "A" and "B" of the illustration, the potable water pump is short cycling by the action of the pressure switch as a result of an unusually high level in the potable water hydro pneumatic header tank. What is most likely the cause? Illustration EL-0043

The potable water hydro-pneumatic header tank is in need of recharging with compressed air due to absorption of air into the water over time.

Illustrations: EL0043_AO_030915WM

In the illustration shown, what type of protection is provided the potable pump drive motor? Illustration EL-0043
thermal overload protection and low voltage release

Illustrations: EL0043_AO_030915WM

Which of the following statements is true concerning the motor controller circuit shown in the illustration? Illustration EL-0004

The controller is configured for use with a three phase non-reversible squirrel-cage induction motor.

Illustrations: EL0004_AO_062617WM

Which of the following illustrated manual motor starters represents the wiring diagram illustrated in figure "A"? Illustration EL-0023

1

Illustrations: EL0023_AO_091817WM

As shown in figure "B" of the illustration, when the DC motor in figure "A" is operating at minimum speed what are the armature and field characteristics? Illustration EL-0153

The motor is operating at minimum armature voltage and maximum field current.

Illustrations: EL0153_AO_042715WM

As shown in figure "A" of the illustrated digital multimeter screen, what would be the significance of the symbol indicated by "2" being illuminated? Illustration EL-0047

the selector switch is in the continuity/diode test position and the secondary function pushbutton is toggled for diode

Illustrations: EL0047_WM_100518

As shown in figures "B" and "C" of the illustration, what should be the switch position and which test lead terminal jacks should be used if your intent is to measure DC currents anticipated as high as 200 milliamps? Illustration EL-0047

switch position "6" and terminal jacks "1 and 4"

Illustrations: EL0047_WM_100518

What controls rudder movement when the Operation Selector Switch shown in figure "A" of the illustration is in the "Controller" position? Illustration EL-0097

non-follow-up controller

Illustrations: EL0097_AO_041315WM

As shown in figure "A" of the illustration, fine adjustments such as "rate of turn signal" have no effect on steering stand operation when the 'operation selector switch' is in what position? Illustration EL-0097

NFU

Illustrations: EL0097_AO_041315WM

Erratic operation of the device represented in the diagram labeled "A" shown in the illustration could be traced to what condition? Illustration EL-0092

improper contact at "R" slip rings or "S" connections

Illustrations: EL0092_WM_100518

If it is required that the coils 'R1-R2-R3' in the indicator of figure "A", turn opposite to those in the transmitter, as shown in the illustration, what action should be taken? Illustration EL-0092

Interchange leads 'R1' and 'R3'.

Illustrations: EL0092_WM_100518

If coil 'R1-R2-R3' on the transmitter in figure "C" shown in the illustration is turned 30 degrees clockwise, how will the corresponding coils 'R1-R2-R3' on the receivers (indicators) respond? Illustration EL-0092

torque will cause them to align to the same position

Illustrations: EL0092_WM_100518

In actual applications, electrical connections associated with 'R1, R2 and R3' of the transmitter to 'R1, R2, and R3' of the indicators shown in figure "C" of the illustration are made by what means? Illustration EL-0092

slip rings and brushes

Illustrations: EL0092_WM_100518

What functionality do the 'MS 1' contacts of the master switch shown in the illustration provide? Illustration EL-0102

low voltage protection

Illustrations: EL0102_WM_061319

What is the functional purpose of the 'LSH' contacts for the hoist controller circuit shown in the illustration? Illustration EL-0102

it is a limit switch which automatically stops the winch drum rotation in the hoist direction before the hoist block is able to strike the boom

Illustrations: EL0102_WM_061319

As shown in the illustration, what is the functional purpose of the normally closed and normally open auxiliary contacts of the hoist and lower contactors respectively? Illustration EL-0102

the normally closed hoist and lower contactor auxiliary contacts are interlock contacts preventing simultaneous pulling in both the hoist and lower contactors and the normally open contacts extend control power to the speed control circuits

Illustrations: EL0102_WM_061319

The progressive operation of the contactors marked "1A" through "4A" provide the winch hoist controller shown in the illustration with what functionality? Illustration EL-0102

acceleration

Illustrations: EL0102_WM_061319

Which of the listed conditions occur when '4th point lower' is selected on the winch hoist controller shown in the illustration? Illustration EL-0102

Contactors 'L', '1A', '2A' and '3A' pull in.

Illustrations: EL0102_WM_061319

The winch shown in the illustration will operate normally in all speeds in both directions, with the exception that it will not accelerate into 'fifth point' hoist or 'fifth point' lower. What would be a possible cause? Illustration EL-0102

time delay relay '3T' coil is open-circuited

Illustrations: EL0102_WM_061319

As shown in the illustration, what is responsible for maintaining the "UV" relay energized when the master switch handle is moved away from the "off" position? Illustration EL-0102

normally open 'UV' contacts

Illustrations: EL0102_WM_061319

Concerning the illustrated fire detection and alarm system, what statement is true concerning the wiring between zones? Illustration EL-0114

The zones are all connected in series by means of the fire locating switches and the ground locating switches.

Illustrations: EL0114_AO_070715WM

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 shorted? Illustration EL-0213

the ohmic value would read very low and remain at that value

Illustrations: EL0213_WM_092821

See REF1805

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

the actual capacitance value of the capacitor will be displayed which should be within the tolerance range of the capacitor

Illustrations: EL0213_WM_092821

See REF1805

The characteristics of the device shown in figure "8" of the illustration includes a stable voltage and low current while operating. Because of this, it can be suitably used in what type of circuit? Illustration EL-0065

switching and timing circuits

Illustrations: EL0065_WM_100518

What is the name of the device shown in figure "2" of the illustration? Illustration EL-0068

power rectifier diode

Illustrations: EL0068_WM_100518

Which of the pictured solid-state semiconductor devices in the illustration is a rectifier bridge? Illustration EL-0068

3

Illustrations: EL0068_WM_100518

What does the drawing in the illustrated circuit represent? Illustration EL-0063

a three phase full wave rectifier

Illustrations: EL0063_AO_091411WM

All of the schematic diagrams shown in the illustration represent which of the listed solid-state circuits? Illustration EL-0069

Full-wave rectifier

Illustrations: EL0069_AO_091411WM

Given the circuit and individual AC and DC voltage waveforms shown in figure "A" producing the composite voltage waveform shown in figure "B", what would be the value of the average current passing through the load resistor with a resistance of 1 ohm? Illustration EL-0075

20 amps

Illustrations: EL0075_WM_100518

Which of the wave shapes shown in the illustration is termed a ramp or sawtooth wave? Illustration EL-0088

C

Illustrations: EL0088_WM_100518

See REF1808

Which line in figure "B" shown in the illustration represents the trailing edge of the wave? Illustration EL-0088

4

Illustrations: EL0088_WM_100518

See REF1808

The multiplier prefix 'giga' (G) such as used in "gigabytes" represents what multiplication factor?

billion (10 to the 9th power)

Illustrations: METRICPREFIXES

See REF1888

In the illustration shown, what would be the functional name for the coil represented as '1S'? Illustration EL-0012

neutral contactor coil (for autotransformer wye connection)

Illustrations: EL0012_AO_100518WM

As shown in the illustrated devices and symbols, which of the devices represents an open general purpose relay?

Illustration EL-0005

A

Illustrations: EL0005_WM_100518

See REF1887

What would be the source current and transformer current as shown in figure "B" of the illustration, with the secondary tap connected as shown, if the supply voltage at the branch circuit breaker is 440 VAC and the unity power factor load current draw is 50 amps? Illustration EL-0083

source current is 12.5 amps, transformer current is 37.5 amps.

Illustrations: EL0083_WM_100518

As shown in the wiring diagram of the semi-automatic navigation lighting panel circuit, what would cause the buzzer to sound and for the indicator light to illuminate in the line section for a particular navigation running light? Illustration EL-0108

a burned out navigation light in effected line section

Illustrations: EL0108_WM_051619

In the lighting distribution circuit shown in the illustrated lighting panel L110 of the illustration, if all circuit breakers are closed and due to a problem with the relevant feeder circuit breaker, there is a loss of power on the incoming phase A, which of the following statements is true? Illustration EL-0013

Half of the accommodation lighting circuits on the 01 deck, port side would lose power.

Illustrations: EL0013_WM_100518

As shown in the illustrated plots of uncorrected and temperature corrected insulation resistance readings for a particular piece of equipment, at what point in time should the equipment have been refurbished or replaced? Illustration EL-0120
no refurbishment or replacement was necessary through 2011

Illustrations: EL0120_WM_100918

What is the resistance reading at "2" on the megger scale shown in figure "A" of the illustration? Illustration EL-0044
40 megohms

Illustrations: EL0044_AO_030915WM

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 not blown and has proper continuity? Illustration EL-0210
0.001 ohms

Illustrations: EL0210_WM_101018
See REF1805

In order to definitively determine whether or not fuse "2", shown in the illustration is blown using an on-line testing technique, across what points would you connect the voltmeter leads? Illustration EL-0062
the bottom of fuse "2" to the top of either fuse "1 or 3"

Illustrations: EL0062_WM_100518

Which of the following is a pictured three phase power transformer, usually used to step down line voltage for supplying reduced voltage lighting circuits? Illustration EL-0177
D

Illustrations: EL0177_WM_101018

As shown in the illustration, which of the lighting fixtures represents an incandescent bulb? Illustration EL-0122
B

Illustrations: EL0122_WM_10918

What is indicated by gradual blackening at the ends of component "4" shown in figures "B" and "C" of the illustration? Illustration EL-0081
The tube is nearing the end of its useful life.

Illustrations: EL0081_WM_100518

During start-up of the circuit shown in figure "B" of the illustration, it is noted that the ends of component "4" alternately glow and become dark without the tube illuminating. What is the most probable cause for this condition? Illustration EL-0081
component "3" is shorted and therefore unable to produce the high voltage required to start the lamp

Illustrations: EL0081_WM_100518

Which of the listed types of lighting fixtures does the diagram shown in figure "A" of the illustration represent? Illustration EL-0081
Low pressure mercury fluorescent

Illustrations: EL0081_WM_100518

What is the functional purpose component "5" as shown in figure "B" of the illustration? Illustration EL-0081
initially heat the fluorescent tube filaments at startup and cause the ballast to strike the arc to fire the tube after warm-up

Illustrations: EL0081_WM_100518

What is the purpose of the capacitor within component "5" of the circuit shown in figure "B" of the illustration? Illustration EL-0081
prolong the life of the component's contacts

Illustrations: EL0081_WM_100518

As shown in the illustration, what maintenance would be required of the circuit components? Illustration EL-0058
Clean the glass surrounding the individual navigation lights as needed.

Illustrations: EL0058_WM_100518

As shown in the illustration of a vessels navigational lighting circuit, if port running light "1" burns out, the trouble buzzer will sound and the port running light trouble lamp will illuminate. Switching to port running light "2" clears the alarm. If port running light "1" is replaced with a light of a smaller wattage and the circuit is switched back to port running light "1", which of the following is true? Illustration EL-0058

There may be insufficient current to energize the trouble relay coil and to open the contacts to silence the alarm.

Illustrations: EL0058_WM_100518

As shown in the illustration, the change-over switch is what type of device? Illustration EL-0058
double-pole, double-throw switch

Illustrations: EL0058_WM_100518

As shown in the illustration, what are the characteristics of the trouble relay contacts? Illustration EL-0058
two sets of normally closed contacts which open when the trouble relay coil is energized

Illustrations: EL0058_WM_100518

What type of circuit is represented by the diagram shown in the illustration? Illustration EL-0058
navigation running light circuit

Illustrations: EL0058_WM_100518

As shown in the illustration, what event would give the same indication that would occur when a stern light circuit fuse blows open? Illustration EL-0058
stern light "2" burns out

Illustrations: EL0058_WM_100518

Which of the illustrated safety disconnect switches represents a double throw switch? Illustration EL-0176
B and D

Illustrations: EL0176_WM_101018

As shown in the illustration, which of the following pieces of equipment is provided with a remote pushbutton station? Illustration EL-0165
Cargo Oil Transfer Pump No. 1

Illustrations: EL0165_AO_050415WM

As shown in figure "B" of the illustration, with respect to the common equipment grounding conductor, what statement is true? Illustration EL-0125

The common equipment grounding conductor is solidly-grounded at the source and this is the least common arrangement onboard merchant vessels.

Illustrations: EL0125_WM_100918

In which figure shown in the illustration will the highest voltage be induced? Illustration EL-0028
both figures "B" and "D"

Illustrations: EL0028_AO_030915WM

Which of the following statements is true concerning the following illustration? Illustration EL-0028

The figures represent a basic DC generator

Illustrations: EL0028_AO_030915WM

As shown in the illustration, which brush holder would be appropriate to use in a bidirectional motor? Illustration EL-0029
radial mount

Illustrations: EL0029_WM_100518, EL0029_AO_030915WM

As shown in the illustration, which brush holder is of the reaction type? Illustration EL-0029

4

Illustrations: EL0029_WM_100518, EL0029_AO_030915WM

As shown in the illustration, which brush holder would be appropriate to use in a bidirectional motor? Illustration EL-0029
radial mount

Illustrations: EL0029_WM_100518, EL0029_AO_030915WM

As shown in the illustration, which brush holder is of the reaction type? Illustration EL-0029

4

Illustrations: EL0029_WM_100518, EL0029_AO_030915WM

Which of the diagrams shown in the illustration depicts the proper method of aligning brushes on a commutator for a DC machine? Illustration EL-0057

C

Illustrations: EL0057_AO_033015WM

As shown in the illustrated DC machine which is configured as a generator, what type of machine is illustrated in terms of the configuration of the windings? Illustration EL-0052

shunt wound

Illustrations: EL0052_AO_060216WM

See REF1856

Which electrical schematic symbol represents a normally open thermostat? Illustration EL-0059

9

Illustrations: EL0059_WM_100518

Which of the electrical schematic symbols represents a normally open limit switch? Illustration EL-0059
12

Illustrations: EL0059_WM_100518

Which of the illustrated resistors represents the schematic symbol shown in figure "C"? Illustration EL-0021
figure "6"

Illustrations: EL0021_WM_100518
See REF1822

The electrical diagram shown in figure "B" of the illustration represents what type of DC motor? Illustration EL-0054
compound-wound DC motor

Illustrations: EL0054_WM_060216
See REF1854

Which of the electronic schematic symbols represents the capacitor illustrated in figure "2" of the illustration? Illustration EL-0015
C

Illustrations: EL0015_WM_100518

As shown in figure "6" of the illustration, what does the symbol represent as used in electrical drawings? Illustration EL-0026
maintaining type push button with a mechanical interlock

Illustrations: EL0026_WM_100518

Which of the illustrated schematic symbols represents the type of switch pictured in figure "F" of the illustration? Illustration EL-0026
3

Illustrations: EL0026_WM_100518

Which figure represents the schematic symbol shown in figure "2"? Illustration EL-0034
figure "B"

Illustrations: EL0034_WM_100518

As shown in the illustrated one-line diagram of a two-tiered emergency power system for a passenger ship, what statement is true? Illustration EL-0166
On a restoration of normal ship's power, the final and temporary emergency loads power source is from the main switchboard.

Illustrations: EL0166_WM_101018

Which of the listed figures in the illustration represents a transformer configured for single voltage primary and a tapped secondary? Illustration EL-0055
D

Illustrations: EL0055_WM_100518

A load is connected across the secondary of the step up transformer shown in figure "B" of the illustration and the current drawn by the load is 10 amps. If the turns ratio is 1 to 10 and the input voltage is 110 VAC, what will be the current drawn by the primary? Illustration EL-0055

100 amps

Illustrations: EL0055_WM_100518

If the illustrated device in figure "B" has a step-up ratio of 10 to 1 what voltage would be measured at the secondary shortly after the primary of the device is connected to 110 volts DC with a current of 12 amps? Illustration EL-0055

0 volts

Illustrations: EL0055_WM_100518

The turns ratio of the step down transformer with dual voltage secondary as shown in figure "B" of the illustration is two to one (total). If 440 volts were applied to terminals 'H1' and 'H2', what would be measured across 'X1-X3' and 'X2-X4' assuming that the secondary windings are connected in parallel? Illustration EL-0082

110 volts

Illustrations: EL0082_WM_100518

See REF1852

What power would be consumed by the series resistor in the circuit shown in the illustration if the source is 30 volts, the resistance for R1 is 10 ohms, R2 is 10 ohms and R3 is 10 ohms? Illustration EL-0032

40 watts

Illustrations: EL0032_WM_100518, SERIESPARALLEL869

See REF1822

What does the symbol labeled "OL" represent as shown in the power circuit on lines T1 and T3 to the motor as shown in figure "A" of the illustration? Illustration EL-0011

overload relay thermal heater

Illustrations: EL0011_WM_100518

If the supply voltage is 220 volts 60 Hz, what is the operating voltage of the motor controller control circuit illustrated in figure A of the illustration? Illustration EL-0011

220 volts AC

Illustrations: EL0011_WM_100518

See REF1843

In the illustration, 1, 2, 3 and 4 are 12 volt batteries. What will be the nominal voltage as read by a voltmeter across the output of the battery bank? Illustration EL-0107

24 volts

Illustrations: EL0107_AO_021618WM

What would be the terminal voltage and ampere-hour capacity of the battery bank if each battery was rated at 50 amp-hours and 6 volts? Illustration EL-0107

12 volts and 100 ampere-hours

Illustrations: EL0107_AO_021618WM

A battery is connected to a circuit containing three resistors in parallel. The values of the three resistors are 2 ohms, 3 ohms, and 6 ohms. What is the voltage of the battery if the total circuit current is 12 amps?

12 volts

Illustrations: PARALLELCIRCUITS1511

See REF1822

What would be the total current flowing in the circuit shown in figure "B" of the illustration if the source is 30 volts, the resistance of R1 is 10 ohms, R2 is 10 ohms and R3 is 10 ohms, respectively? Illustration EL-0032

2 amps

Illustrations: EL0032_WM_100518

See REF1822

What power would be consumed by the series resistor in the circuit shown in the illustration if the source is 30 volts, the resistance for R1 is 10 ohms, R2 is 10 ohms and R3 is 10 ohms? Illustration EL-0032

40 watts

Illustrations: EL0032_WM_100518, SERIESPARALLEL869

See REF1822

What would be the voltage drop across the parallel branches of the circuit shown in figure "B" of the illustration if the source voltage is 30 volts, the resistance for R1 is 10 ohms, the resistance for R2 is 10 ohms and the resistance for R3 is 10 ohms? Illustration EL-0032

10 volts

Illustrations: EL0032_WM_100518

See REF1822

What will be the resulting current when a voltage of 115 VDC is applied to a resistance of 12 ohms in figure "A" of the illustrated circuit with the switch closed? Illustration EL-0018

9.58 amps

Illustrations: EL0018_WM_100518

See REF1841

What will be the resulting current when a voltage of 442.7 VDC is applied to a resistance of 1.25 ohms in figure "A" of the illustrated circuit when the switch is closed? Illustration EL-0018

354.16 amps

Illustrations: EL0018_WM_100518

See REF1841

What will be the resulting current when a voltage of 110 VDC is applied to a resistance of 32 ohms in figure "A" of the illustrated circuit when the switch is closed? Illustration EL-0018

3.44 amps

Illustrations: EL0018_WM_100518

See REF1841

In the illustrated views of a lead acid battery as shown in figures "A" and "B", what battery component has the sole function of preventing the individual plates in the negative plate group from coming into direct contact with the individual plates in the positive plate group? Illustration EL-0031

separators

Illustrations: EL0031_WM_100518

The wet-cell storage batteries shown in the illustration are connected in what configuration? Illustration EL-0070
parallel

Illustrations: EL0070_WM_100518
See REF1824

The individual 6 volt lead-acid batteries, when connected as shown in the illustration, as a battery bank would produce how many volts? Illustration EL-0070
6 volts

Illustrations: EL0070_WM_100518
See REF1824

As shown in figure "A" of the illustration, with the switch closed what statement is true if "R1" and "R2" have unequal resistance values? Illustration EL-0019
The current flow through 'R1' will differ from the current flow through 'R2'.

Illustrations: EL0019_WM_100518
See REF1822

What is the current flow through R1 of the circuit in figure "B" of the illustration with the switch closed if the resistance of R1 is 2 ohms, R2 is 3 ohms and R3 is 6 ohms and the battery voltage is 12 VDC? Illustration EL-0019
6 amps

Illustrations: EL0019_WM_100518
See REF1822

What statement is true concerning the electrical diagram shown in figure "B" of the illustration? Illustration EL-0019
R1', 'R2', and 'R3' are connected in parallel.

Illustrations: EL0019_WM_100518
See REF1822

What is the total resistance of the electrical circuit illustrated in figure "B" if the resistance of R1 is 2 ohms, R2 is 4 ohms, and R3 is 4 ohms and the battery voltage is 6 volts? Illustration EL-0019
1.00 ohms

Illustrations: EL0019_WM_100518
See REF1822

In figure "2" of the diagram shown in the illustration, the three phase power transformer has a step-down turns ratio of four to one. If a three-phase 440 volt supply is connected to terminals "A1-B1-C1", what voltage should develop across terminals 'A2-B2-C2'? Illustration EL-0084
110 volts

Illustrations: EL0084_WM_100518
See REF1811

Which of the listed figures shown in the illustration represents a three phase transformer connected in a wye-delta configuration? Illustration EL-0084
4

Illustrations: EL0084_WM_100518
See REF1811

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

It will automatically start and automatically supply power to the 450 VAC section of the emergency bus through the automatic bus transfer device.

Illustrations: EL0014_WM_022120

What is a purpose of the automatic bus transfer device shown in the illustration? Illustration EL-0014

Provide power to the 450 VAC emergency bus from the emergency generator in the emergency mode.

Illustrations: EL0014_WM_022120

What would be the total capacitance of the circuit illustrated in figure "A" if the value of capacitor C1 was 100 microfarads and capacitor C2 was 50 microfarads? Illustration EL-0038

150 microfarads

Illustrations: EL0038_WM_100518

See REF1821

If the circuit shown in the illustration were energized and operating properly, which of the devices listed would be open?

Illustration EL-0007

The start push-button

Illustrations: EL0007_WM_100518

The motor fails to start on an attempted startup. With the start button depressed, a voltmeter reading between 1 and 5, as illustrated in figure "A", indicates line voltage available to the control circuit, what should be your next step in the troubleshooting process? Illustration EL-0007

attempt to reset the overload relay and determine the cause of the overload if applicable

Illustrations: EL0007_WM_100518

What type of electrical diagram is shown in figure "B" of the illustration? Illustration EL-0007

schematic diagram

Illustrations: EL0007_WM_100518

The motor starts when the start button in the illustration is pushed, but stops when the button is released. What is most likely the trouble? Illustration EL-0007

an open auxiliary "M" contact

Illustrations: EL0007_WM_100518

The illustrated motor fails to start and gives a loud hum when the start button is depressed, what should then be your first action? Illustration EL-0007

push the stop button to deenergize the "M" coil

Illustrations: EL0007_WM_100518

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

an open stop switch contact (when not pushed in)

Illustrations: EL0007_WM_100518

What is the name of the component labeled Q1 as shown in section "D" of the regulated DC power supply illustrated?

Illustration EL-0085

NPN bipolar junction transistor

Illustrations: EL0085_WM_100518

See REF1808

In the regulated DC power supply illustrated, what is the function of section "B"? Illustration EL-0085

full wave rectification

Illustrations: EL0085_WM_100518

See REF1808

Which section of the circuit shown in the illustration smoothes out highest degree of pulsations? Illustration EL-0085

C

Illustrations: EL0085_WM_100518

See REF1808

What is the function of section "D" of the circuit shown in the illustration? Illustration EL-0085

a voltage regulator

Illustrations: EL0085_WM_100518

See REF1808

What is the direction of electron current through the load resistor in the circuit shown in the illustration? Illustration EL-0085

Always from the grounded end to point "TP5".

Illustrations: EL0085_WM_100518

See REF1808

In figure "1" of the illustration, what are the trip characteristics associated with this type of circuit breaker? Illustration EL-0033

inverse-time delay characteristic for sustained overloads

Illustrations: EL0033_WM_100518

In figure "A" of the illustration, what is the position of the circuit breaker? Illustration EL-0033

off

Illustrations: EL0033_WM_100518

What is the power consumed by 'R2' in the circuit illustrated in figure "B", if the applied voltage is 24 volts and the resistance of R1 is 3 ohms, R2 is 4 ohms, and R3 is 5 ohms, respectively? Illustration EL-0020

16 watts

Illustrations: EL0020_WM_100518

See REF1806

What is the total resistance of figure "B" of the illustrated circuit if the resistance of R1 is 3 ohms, R2 is 4 ohms, and R3 is 5 ohms? Illustration EL-0020

12 ohms

Illustrations: EL0020_WM_100518

See REF1806

REF1956

The preferred way to clean dust and foreign matter from electrical equipment is by vacuum suction.

REF1957

Low voltage causes a weak magnetic pull so that the contacts do not close tightly. It also causes a relatively high resistance between the stationary and the moving contact surfaces. If this resistance is greater than in the rest of the circuit, the heat generated at the contact surfaces may cause the contacts to weld together.

REF1958

Accidentally-welded contacts may prevent a relay from dropping out (i.e., opening) when it loses coil voltage.

REF1959

Chattering or humming in a circuit breaker, relay or controller may be caused by low operating coil voltage or dirt on the faces of the magnet. Dirty magnet faces prevent the magnetized coil, which is an electromagnet, from holding the contacts firmly closed.

REF1960

If a few turns become short circuited, the coil may weaken and may become unreliable.

REF1964

If you place a load on an operating motor, its rotor will slow down and its slip will increase. The rotating field will induce higher currents in the rotor. This will provide the increased torque that allows the motor to handle the load. However, if the motor is overloaded, it will slow down and stall.

REF1965

AC motor name plates contain information on the temperature rise the motor is designed for. Preserve the information on the name plate, you may have to call an electrician to simply identify a piece of equipment so that you can order a replacement.

REF1966

Universal motors operate on both AC and DC. They have brushes and commutators. They are used to power portable tools, small fans and other fractional horsepower applications.

REF1967

The starting winding on a split-phase induction motor is not designed to carry current when the motor is running. If the cutout switch for this winding does not operate (i.e., fails to open,) the winding will probably burn out. To change the direction of rotation of a three-phase induction motor, switch any two of the phase leads to the stator. An induction motor that operates at a fixed frequency can provide several different speeds only if you reconnect the stator windings (i.e., field windings) to provide a different number of poles.

REF1968

A squirrel-cage rotor consists of a laminated iron core that is slotted lengthwise all around its periphery. Solid bars of aluminum, copper, or other conductors are tightly pressed or embedded in its slots. At both ends of the rotor, short-circuiting rings are welded or brazed to the bars to make a solid structure which, if removed as a unit, would resemble a squirrel cage. The squirrel-cage rotor in an AC motor is very simple in construction when compared to a DC motor's armature with its complicated windings.

REF1969

What is the main function in the use of a capacitor for starting a single phase motor? Note: A capacitor-start motor and resistor-start motor are two types of single phase ac induction motors. The capacitor-start type motor develops a very high starting torque, and is used for loads which are hard to start. The resistor-start type motor develops a considerably smaller torque and is used for moderate starting loads, or where the load is applied after the motor has obtained its operating speed. A. Reduce radio interference Incorrect answer. Motors generate electrical "noise" which can interfere with radio reception. A ceramic capacitor properly connected to the motor can reduce the chance of this type of interference. This type of capacitor provides no function in the starting of the motor. B. Split the phase to establish a rotating magnetic field Correct answer. Induction motor action requires a rotating magnetic field. To obtain a rotating magnetic field from a single-phase system, the motor current is split into two separate windings. The capacitor-start motor uses a capacitor in

series with an auxiliary (starting) winding which causes the current in the auxiliary winding to lead the current in the main winding. Consequently, the magnetic field in the auxiliary winding will reach its maximum value before that of the magnetic field in the main winding resulting in rotation of the motor rotor. The capacitor and auxiliary winding are disconnected from the circuit by an automatic switch when the motor reaches approximately 75% of its rated full load speed. C. Reduce the phase angle Incorrect answer. A capacitor inserted in series with the starting winding increases the phase angle (shift) resulting in a starting torque that is greater than that developed by the resistor-start motor. D. Prolong the life of the starting contacts Incorrect answer. Periodic checks and adjustment for any wear or misalignment, as well as the removal of dirt and grease from the contact faces will help prolong the life of contacts, not the use of a capacitor. Capacitor motors. This type of motor also operates only on single-phase AC. It is similar to the split-phase type, with the addition of a capacitor or a condenser that enables it to start much heavier loads. There are several grades of capacitor-type motors available, ranging from the home-workshop type that starts loads from 1 1/2 to 2 times as heavy as the split-phase, to the heavy-duty type that will start almost any type of load. Capacitor motors usually are more efficient than split-phase motors, using less power (watts) per horsepower. The amperage (I) consumed while starting is usually less than half that of the split-phase type. Capacitor motors are commonly used only in sizes up to 10 hp . Capacitor-type motors are frequently used in small portable pumps of low horsepower.

REF1970

You can change the speed of a synchronous motor by changing the frequency of the current to the stator and/or the number of poles in the stator. To reverse a turbo-electric, synchronous motor propulsion unit, change the phase sequence of power to the motor. To change the speed of such a unit, change the speed of the turbine itself. The input power from commercial sources is generally a constant 60 Hz and seldom varies.

REF1971

Sandpaper is a non-conductor of electricity. Emery cloth contains particles that could become embedded in the brushes, cause sparking, and grind and damage the surface of the commutator. The grit side of the sandpaper must face the brushes. The smooth side should follow the curvature of the commutator.

REF1972

The starting winding on a split-phase induction motor is not designed to carry current when the motor is running. If the cutout switch for this winding does not operate (i.e., fails to open,) the winding will probably burn out. If the starting winding remains connected, the motor will draw excessive current from the line. The starting winding may overheat and be damaged. If this happens and the Winding burns out, the motor will not be able to start itself because it will no longer be able to split the single-phase current.

REF1973

To test for an open circuit, you must test each winding separately

REF1974

An "open " coil would provide infinite resistance. Infinite resistance is marked on the face of the meter with the symbol of "infinity."

REF1975

A growler is an instrument that is powered by AC power (i.e., plugged into a wall socket) and pulled across the coils in the stator of an AC motor. If it "growls, " the coil is shorted.

REF308

When paralleling generators and alternators, the machine coming on-line must have a slightly higher voltage so that it picks up some of the load when it is placed "on the by closing the circuit breaker. If machines are not "in phase" (i.e., synchronized) when they are paralleled, severe cross currents will occur and may cause damage. The maximum machines can be out of phase is 180°. Machines operating in parallel are both on line and sharing the load. However, they must have the same frequency, number of phases and phase rotation to do this. When paralleling, if the synchronizing lamps are dark and the synchroscope is at 12 o'clock (i.e., the 0° position), it indicates the oncoming alternator is "in phase" with the bus. To place an alternator "on line", adjust the oncoming machine's speed until the synchroscope revolves slowly in the "fast" direction. Then close the circuit breaker when the synchroscope is at the 12 o'clock (i.e., 0° position). The oncoming alternator should have slightly higher frequency than the "on-line" or bus frequency to: 1. Assume its load immediately, 2. Not "float" on the line, 3. Not "motorize" and activate the reverse power relay. After closing the circuit breaker to "parallel" the two machines, you should balance the loads (kilowatts) between the two machines by adjusting the governor settings.