1. When troubleshooting a refrigeration problem involving a sweating or frosted suction line, one probable cause is?

A. Restricted drier or strainer
B. Expansion valve stuck open
C. Expansion valve open too wide
D. Overcharge of refrigerant

2. A grounded compressor motor winding is indicated by?

A. A mild shock on contact
B. An infinity reading
C. A large shock
D. A low resistance reading on the ohmmeter

3. The oil level in a sight glass on a compressor should be at or slightly?

A. Above the center of the sight glass
B. Above the top of the sight glass
C. Below the center of the sight glass
D. Below the top of the sight glass

4. When checking a room thermostat for accuracy with a thermometer, the contacts should "make" (close) at?

A. No less than 2° below the temperature indicated by the thermometer
B. No less than 1° below the temperature indicated by the thermometer
C. No more than 2° above the temperature indicated by the thermometer
D. No more than 1° above the temperature indicated by the thermometer

5. To check for a faulty thermostat, place a reliable thermometer as close to the sensing element as possible and allow it to remain there?

A. At least ten minutes
B. At least five minutes
C. At least fifteen minutes
D. At least twelve minutes

6. The type of relay which is positional type and must be properly mounted for satisfactory operation?

A. Hot wire relays
B. Amperage (current) relays
C. Solid-state relays
D. Potential (voltage) relays
7. The type of starting relays used on motors of almost any size is?

A Solid-state relays  
B Hot wire relays  
C Amperage (current) relays  
D Potential (current) relays  

8. The amperage (current) relay is an electromagnetic-type relay and must be?

A Bolted at three points minimum  
B Properly mounted for satisfactory operation  
C Secured with at least two mounting screws  
D Mounted facing the compressor  

9. To check a potential relay, turn off the electrical current, remove the wire from terminal #2 and touch it to terminal #1 and then?

A Stand back  
B Place an ammeter on the common wire to the motor  
C Place a voltmeter on the ground wire  
D Place an ammeter on the hot wire  

10. Check temperature rise of water through the condenser if plugged strainers, pumps, or spray nozzles cause high refrigerant temperature. Rise should not be more than?

A 15°F  
B 5°F  
C 20°F  
D 10°F  

11. When a capillary tube is used the suction line will be cooler than normal and may be frosted over if?

A An undercharge of refrigerant exists  
B An overcharge of refrigerant exists  
C The refrigerant is properly charged  
D R 22 or R 12 is used as the refrigerant  

12. On suction lines 7/8 in. OD (outside diameter) install the remote bulb at about?

A The 3 or 6 o'clock position  
B The 2 or 4 o'clock position  
C The 4 or 8 o'clock position  
D The 5 or 7 o'clock position
13. When a thermostatic expansion valve is stuck open, there will be a/an?

A  Excessive amount of sweating on the suction line
B  Hot and very dry suction line
C  The evaporator coil will be misty
D  The evaporator coil will be frozen

14. When a considerable amount of refrigerant has been lost from a system because of leaks, a certain amount of oil has been lost also and should be replaced at the ratio of?

A  1 pint of oil to 5 lbs of refrigerant
B  One-half pint of oil to 5 lbs refrigerant
C  1 pint of oil to 10 lbs of refrigerant
D  One-half pint of oil to 10 lbs of refrigerant

15. To solve the problem of flash gas in liquid lines extended vertically for more than approximately 20 feet the liquid refrigerant must be?

A  Frozen
B  Sub-cooled
C  R 12 or R 22
D  Superheated

16. Moisture that has entered the system can cause many serious problems. The most obvious problem is?

A  Rust and corrosion
B  Evaporation
C  Sub cooling in the flow control orifice
D  Freezing of the moisture in the flow control orifice

17. Because it is safer, the voltage used in the control circuit of transformers is?

A  18 volts
B  24 volts
C  20 volts
D  25 volts

18. When replacing a transformer, always check to be sure there is?

A  No short to cause the replacement transformer to burn out
B  A spare
C  A ground wire and hot wire
D  Mounting bracket
19. The fan controls are used on heating systems to start and stop the fan motor on an increase or decrease in temperature inside the furnace and are manufactured in what types?

A  Adjustable  
B  Non-adjustable 
C  Adjustable and non-adjustable  
D  Pneumatic

20. The relay used to de-energize the condenser fan motor and energize the hot gas solenoid for the defrost and slab release cycle, on demand from the freeze relay and to energize the condenser fan motor and de-energize the hot gas solenoid at the end of the slab release cycle is the?

A  Power relay 
B  Defrost control relay 
C  Lockout relay  
D  Freeze relay

21. One of the specific procedures for connecting gauges to a system containing refrigerant where it is certain both pressures are above 0 psig, is?

A  Crack the system discharge service valve off the back seat 
B  Crack open the high side gauge valve and allow a small amount of refrigerant vapor to escape 
C  Crack the system suction service valve off the back seat  
D  Front-seat the valves on the gauge manifold

22. The degree of wetting is a function of the compositions of the base metal and the filler metal and of the temperature. Good wetting can only occur?

A  With proper stimulation 
B  On perfectly clean and oxide-free surfaces 
C  With surfactant application to the oxide-free surfaces 
D  With oil release agents

23. When torch brazing minimum insertion distance is equal to the diameter of the inner tube and therefore the clearance between walls of the inner and outer tubes should be?

A  .002 - .006 inches 
B  .003 - .007 inches 
C  .001 - .005 inches 
D  .004 - .008 inches

24. When flux becomes saturated with oxides, its viscosity?

A  Increases  
B  Decreases 
C  Doesn't change  
D  Absorbs
25. In refrigeration a restricted hot gas bypass line will cause?
A  Evaporator coils to energize
B  Suction line ice over
C  Evaporator coils to ice over
D  Either suction or evaporator freeze up

26. Shortage of refrigerant in air conditioning will cause?
A  Refrigerant over charge
B  Low return air temperature
C  Compressor cycling on overload
D  Low head pressure

27. High pressure control is checked by installing a pressure gauge on?
A  The suction line
B  The condensing line
C  The discharge inlet side
D  The compressor discharge service valve

28. The proper fan belt tension is a maximum of?
A  1/2 inch deflection
B  1 inch deflection
C  3/4 inch deflection
D  2 inch deflection

29. A temperature rise of the water in a water-cooled condenser less than 10°F indicates the condenser is?
A  Clean and scaling is not a problem
B  Scaled and must be cleaned
C  Collecting mucilage
D  Eliminating mucilage and requires chlorination

30. A leaking valve in the oil separator will allow the discharge pressure to go into the compressor crankcase rather than the condenser and will cause?
A  Only the discharge pressure to stabilize
B  The discharge pressure and the suction pressure to stabilize
C  A lower than normal discharge pressure and a higher than normal suction pressure
D  A lower than normal suction pressure and higher than normal discharge pressure

31. An overcharge of refrigerant will cause both the suction and discharge pressure to be?
A  Higher than normal
B  Lower than normal
C  The same
D  Either higher or lower than normal
32. Over temperature protective devices are required by?

A  UL (Underwriters Laboratories)
B  NEC (National Electrical Code)
C  SBCCI and NRA
D  UL and NEC

33. NEC requires loss of air flow protection in electric heaters. Each heater must be electrically interlocked with the fan so the heater cannot operate unless the fan circuit is

A  De-energized and air is still
B  Energized and air is therefore flowing
C  In the outlet mode and 10 percent fresh air is flowing
D  In the inlet mode and 15 percent fresh air is flowing

34. The gauge manifold set consists of?

A  A compound manifold and a pressure gauge
B  A compound gauge, pressure switch and manifold
C  Gauge, manifold and regulator
D  A compound gauge, pressure gauge and manifold

35. The application of heat above a temperature of 800°F is?

A  Crazy
B  Welding
C  Brazing
D  Torching

36. A term used for metal-joining processes at temperatures below 800°F is?

A  Soldering
B  Brazing
C  Welding
D  Torching

37. If the heat pump compressor short cycles on defrost control, which is not a possible cause?

A  Defective defrost relay
B  Shortage of refrigerant
C  Defective defrost control
D  Refrigerant overcharge

38. If a room thermostat must be calibrated more than , the thermostat should be replaced.

A  10°F
B  5°F
C  15°F
D  12°F
39. Amperage relays are?
A Stationary types
B Rotational types
C Positional types
D Multistage types

40. An amperage relay too large for a motor may not allow the relay contacts to?
A Switch
B Open
C Modulate
D Close

41. A thermostatic expansion valve adjusted for too great a superheat may be adjusted by?
A Measuring the temperature of the condensing line at the point where the bulb is clamped
B Measuring the temperature of the suction line at the point where the bulb is clamped
C Increasing the suction line pressure
D Decreasing the suction line pressure

42. Continuity of a shorted motor winding is indicated by?
A Less than normal resistance
B More than normal resistance
C Infinity
D No change on the ohmmeter

43. Devices producing a small electric current when heated are?
A Thermostats
B Thermocouples
C Ohmmeters
D Voltmeters

44. The amount of current produced by a thermocouple when heated is?
A 24 volts
B 24 amps
C 30 amps
D 30 mvs

45. Seven and three eighths inches equals how many millimeters?
A 18.7325
B 187.325
C 188.913
D 185.838
46. Low suction pressure on a heat pump may be caused by?

A  Ductwork small or restricted
B  Leaking check valves
C  Dirty indoor air filters
D  Leaking reversing valve

47. A noisy condition that occurs when the compressor is pumping oil or liquid refrigerant is?

A  A sticking motor starter or contactor
B  A burner coil
C  Slugging
D  A burned starter & contactor

48. Oil failure controls are used to protect the compressor from?

A  Liquid flashing
B  Superheating
C  Proper lubrication
D  Improper lubrication

49. Controls that will stop the compressor motor to protect it from overheating and prevent the compressor from pumping oil out of the crankcase and also used as a temperature control on smaller units are?

A  High-pressure controls
B  Low-pressure controls
C  Capacitors
D  Outdoor thermostats

50. When checking a low-pressure control, with the compressor running, front-seat the suction service valve and observe the pressure on the?

A  Dual gauge when the pressure control starts the compressor
B  Compound gauge when the pressure control stops the compressor
C  Compound gauge when the pressure control starts the compressor
D  Suction line when the pressure control stops the compressor

51. The best way to check a capacitor is by the use of a?

A  Capacitor analyzer
B  Running capacitor analyzer
C  Amperage relay
D  Voltage relay
52. Solid-state starting relays will start virtually all split-phase 115-volt hermetic compressors up to?

A  1/2 horsepower  
B  1 horsepower  
C  1/3 horsepower  
D  1/4 horsepower

53. A common cause of high discharge pressure is not?

A  Overcharge of refrigerant  
B  Non-condensable gases
C  Leaking compressor head gasket  
D  Compressor discharge service valve front-seated

54. A thermostatic expansion valve adjusted for too great a superheat or an improperly located feeler bulb will result in?

A  High suction pressure  
B  Improper suction pressure  
C  High discharge pressure  
D  Low suction pressure

55. If the superheat is found improperly adjusted, it may be adjusted by?

A  Measuring the temperature of the suction line at the point where the bulb is clamped
B  Measuring the temperature of the discharge line at the point where the bulb is clamped
C  Observing the temperature differential for changes
D  Super-charging the refrigerant

56. Subtracting the difference between the temperature at the evaporator inlet and the temperature at the evaporator outlet is?

A  Not an accurate measure of superheat  
B  An accurate measure of superheat  
C  Used to measure superheat differential pressure  
D  Normally used to obtain supercharge readings

57. When the refrigerant velocity is too low in the refrigerant lines, the oil will not be returned to the?

A  Compressor properly  
B  Quickly enough  
C  Condenser properly cooled  
D  Refrigerant lines
58. Shortage of refrigerant, a liquid line that is too small, or a liquid line that has too high a vertical lift may cause?

A  High pressure readings  
B  Liquid flashing  
C  Low pressure readings  
D  Superheating  

59. Excessive air flow over the evaporator, an overcharge of refrigerant, or a bad suction valve in the compressor is generally due to?

A  Suction pressure too low  
B  Under-loaded evaporator  
C  Evaporator too large  
D  Suction pressure too high  

60. A temperature-sensing device that terminates the defrost period when the evaporator temperature reaches approximately 50°F (10°C) is?

A  A humiliplate  
B  A mullion heater  
C  A defrost limiter  
D  A defrost timer  

61. A grounded motor winding will be indicated by?

A  Excessive amperage  
B  An overload condition  
C  Shorted winding  
D  Grounded winding  

62. If the amperage draw is excessive during motor replacement?

A  Replace the entire motor  
B  Correct the situation before leaving the job  
C  Replace the starting switch  
D  Replace bad bearings  

63. Devices that when heated produce a small electrical current are?

A  Thermocouples  
B  Pilot burners  
C  Burner orifices  
D  Surge arresters
64. Devices used to detect ice/frost on the outdoor coil during the heating cycle are?

A Time-temperature defrost controls  
B Schematic controls  
C Heat pump defrost controls  
D Defrost thermostat

65. The purpose of the primary control is?

A To control the operation of the oil burner and the ignition procedure  
B To sense the stack temperature  
C To furnish combustion air to the flame  
D To supply fuel oil to the burner

66. The method for leak detection not satisfactory in a heavy concentration is?

A Halide-torch leak detection  
B Electronic leak detection  
C Soap-bubble detection  
D Evacuation

67. Phos-copper filler metals should not be used on ferrous metals or base metals containing more than 10% nickel because of the?

A Formation of an "oxide coat" over the base metals  
B Poisonous cadmium fumes  
C Phosphorous embrittlement of the joint  
D Excessive oxygen mixture

68. Devices used to activate motor starters or contactors are?

A Battery operated  
B Computer activated  
C Electromagnetically-operated  
D Motion activated

69. Shorted compressor motor windings?

A Are indicated by a greater than normal resistance  
B Will immediately blow fuses or trip the circuit breaker  
C Always cause the motor to shut down  
D Can draw excessive amperage

70. In a compressor, the ____________ resistance indicated is between the start and run terminals.

A Positive  
B Negative  
C Most  
D Least
71. A sufficient amount of frost, or ice, will not be removed from the coil to allow proper refrigeration to occur, if the defrost termination point is?

A  Too low  
B  Too high  
C  Ignored  
D  Set incorrectly  

72. Potential relays operate?

A  On the electromagnetic principle  
B  Using electrical resistance  
C  Using the "Domino Principle"  
D  Using a self-regulating conductive ceramic  

73. The primary purpose of a motor starter or contactor is to?

A  Make the compressor start up more quickly  
B  Increase the overall efficiency of the compressor  
C  Provide switching action of high current and voltage required by a compressor  
D  Protect the compressor  

74. The voltage rating of any capacitor must be ___________ the one being replaced.

A  No more than two percent higher or lower than  
B  No more than five percent higher or lower than  
C  Equal to  
D  Equal to or greater than  

75. Potential relays are ___________ relays.

A  Backup  
B  Current  
C  Sequencing  
D  Starting  

76. A ___________ Start Kit is designed for use when conditions are encountered that prevent the PSC motor from starting normally.

A  Compressor  
B  Hard  
C  Jump  
D  PSC
77. An overcharge of refrigerant will cause?

A  A low discharge pressure
B  A high discharge pressure
C  The system to seize
D  The condenser tubes to freeze

78. Which is extremely dangerous to refrigeration systems?

A  Too much refrigerant
B  Too little refrigerant
C  Moisture
D  Lack of maintenance

79. A refrigerant leak?

A  Can be ignored without serious consequences
B  Should be found and repaired
C  Is usually difficult and laborious to repair
D  Requires tools to pinpoint

80. The power element of a thermostatic expansion valve contains a(n) _________ charge.

A  Electromagnetic
B  Slight
C  Thermal
D  Vapor

81. The result of moisture freezing in the refrigerant flow control orifice is poor refrigeration, accompanied by a?

A  Lower than normal suction pressure
B  Copper color on the steel valves and parts
C  Higher than normal suction and discharge pressure
D  Discoloration of the oil

82. The defrost termination point is the?

A  Temperature at which the defrost period ends
B  Point at which the defrost period ends
C  Point when all the frost has melted
D  Point when the system returns to normal operation

83. To check for shorted motor windings, first?

A  Perform a visual inspection of the wire insulation
B  Use the ohmmeter to check the continuity from one terminal to another
C  Remove all external wiring from the motor terminals
D  Consult the motor manufacturer's data to determine the correct resistance requirements
84. Of prime importance to reliable torch brazing is?
   A  Taking enough time to do a good job - not rushing
   B  Being knowledgeable about the properties of various metals
   C  The general cleanliness of all surfaces
   D  Using high quality tools

85. To braze steel to copper, use?
   A  Phos-copper brazing alloys
   B  Silver brazing alloys
   C  Steel brazing alloys
   D  Filler metal

86. Applying "finger" pressure to check for correct belt tension should result in approximately _______inch(es) total deflection.
   A  2
   B  1 1/2
   C  1
   D  1/2

87. Do not use hand-held instruments to take high voltage measurements higher than?
   A  599
   B  600
   C  700
   D  750

88. Hard start capacitor kits should be wired in?
   A  Series
   B  Parallel
   C  Dual phase
   D  Split phase

89. Which is not a type of main burner?
   A  Inshot
   B  Inset
   C  Slotted port
   D  Ribbon

90. The ____________ allows the oil pressure to build up to preset operating pressure on compressor start.
   A  Time delay switch
   B  Control circuit
   C  Thermostat
   D  Pressure control
91. The _______ of an oil failure control unit (used to protect a compressor from improper lubrication) is based on 120 or 240 volts ac applied in an ambient temperature of 75 degrees Fahrenheit with the cover in place.

A  Sensitivity  
B  Reading  
C  Time delay  
D  Sequencing

92. In refrigeration, controls used to open the control circuit when the refrigerant pressure in the low side of the system falls below a given pressure are called _______ pressure controls.

A  Suction  
B  Discharge  
C  Low  
D  Dual

93. Relays operating on the electromagnetic principle are called _______ relays.

A  Starting  
B  Potential  
C  Solid-state  
D  Self-regulating

94. Thermostatic expansion valves operate as a result of _______ inside the evaporator.

A  Pressure and temperature  
B  Superheat  
C  Feeler bulbs  
D  Flow control devices

95. Ice in the orifice of a refrigerant flow control device is usually indicated by?

A  Poor operation  
B  Poor operation and a lower than normal suction  
C  Poor operation, a lower than normal suction and low discharge pressure  
D  Poor operation, a lower than normal suction, noise and low discharge pressure

96. When the defrost termination point is too low?

A  The system will shut down  
B  The system will not go into the defrost cycle  
C  Proper refrigeration will not occur  
D  The defrost period will be too long and the temperature within the cabinet will go too high
97. If a motor hums and tries to start because the starting switch is stuck open?

A  The motor will not start  
B  Do not attempt to start the motor  
C  Start the motor turning while it is humming  
D  Adjust the starting switch and start the motor 

98. When joining steel to bronze, use __________ to form the joint?

A  Silver brazing alloys  
B  Filler metal  
C  Phos-copper brazing alloys  
D  Mixed brazing alloys 

99. Run capacitors are continuously in the operating circuit and are normally the __________ filled type.

A  Water  
B  Oil  
C  Pressure  
D  Manually 

100. High voltage measurements involve __________ volts or more of electricity.

A  500  
B  550  
C  600  
D  650 

101. Given 20 MFD and 30 MFD connected in series, the capacitance would be?

A  10  
B  12  
C  15  
D  50 

102. A volt meter yielding the highest OHMs would be connected?

A  R to C  
B  S to R  
C  S to C  
D  C to ground 

103. A single phase magnetic starter voltage connected T-1 and T-2 is indicative of?

A  A short  
B  Continuity  
C  High voltage  
D  Low voltage
104. Then____________ prevents nuisance shutdown of the compressor if the oil pressure drops for a short time.

A  Time delay switch  
B  Control circuit  
C  Thermostat  
D  Pressure control  

105. The time delay of an oil failure control (used to protect the compressor from improper lubrication) is based on __________ with the cover in place.

A  120 volts ac applied in an ambient temperature of 75 degrees F  
B  240 volts ac applied in an ambient temperature of 25 degrees C  
C  120 or 240 volts ac applied in an ambient temperature of 75 degrees F  
D  120 or 240 volts ac applied in an ambient temperature of 25 degrees C  

106. The voltage rating of any capacitor must be ______________ the one being replaced?

A  Equal to or greater than  
B  Equal to  
C  Compared to  
D  Comparable to  

107. The most common type of flow control device used on units of 5-ton capacity and above is the ____________ expansion valve?

A  Heat  
B  Temperature  
C  Adjustable  
D  Thermostatic  

108. Free moisture in a refrigeration system creates in the orifice of a refrigerant flow control device.

A  Water droplets  
B  Frost  
C  Ice  
D  Dampness  

109. The temperature at which the defrost period ends is called the defrost ____________ point?

A  Termination  
B  End  
C  Cut-off  
D  Finish
110. A starting switch that is pitted or stuck open will?

A. Allow the motor to start briefly  
B. Allow the motor to start but prevent it from reaching its running speed  
C. Allow the motor to start but cause it to run too fast  
D. Not allow the motor to start

111. Main burners include all of the following types except?

A. Slotted port  
B. Dual port  
C. Ribbon  
D. Inshot

112. You should obtain approximately _____________ inch deflection (total) when "finger" pressure is applied to check belt tension.

A. 2  
B. 1  
C. 7/8  
D. 1/2

113. When using PSC or capacitor-start, capacitor-run motors, the identified terminal should always be connected to the?

A. Supply line or "S" terminal  
B. "R" or "S" terminal  
C. Supply line or "R" terminal  
D. "S" terminal

114. Do not attempt to take high voltage measurements?

A. Without taking extra safety precautions as outlined by OSHA  
B. With hand-held instruments  
C. With hand-held instruments unless extra safety precautions are taken as outlined by OSHA  
D. By yourself

115. Given 10 MFD and 40 MFD connected in series, the capacitance would be?

A. 8  
B. 12  
C. 15  
D. 50
116. A volt meter yielding the highest OHMs would be connected?

A  R to C  
B  S to R  
C  S to C  
D  C to ground

117. According to Air Conditioning Troubleshooting Handbook, refrigeration must be gas tight because?

A  The system will gain moisture  
B  The unit will not work  
C  The gas is poisonous  
D  The system will vibrate

118. The ____________ allows the oil pressure to build up to preset operating pressure on compressor start.

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B  Equal to  
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C  Phos-copper brazing alloys
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B  1
C  7/8
D  1/2

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D  Manually

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B  "R" or "S" terminal
C  Supply line or "R" terminal
D  "S" terminal

138. High voltage measurements involve ____________ volts or more of electricity.

A  500
B  550
C  600
D  650

139. Do not attempt to take high voltage measurements?

A  Without taking extra safety precautions as outlined by OSHA
B  With hand-held instruments
C  With hand-held instruments unless extra safety precautions are taken as outlined by OSHA
D  By yourself
140. The type regulator to use when pressurizing a nitrogen system is?

A  Spring loaded  
B  Diaphragm  
C  Screw  
D  Gage equipped

141. The refrigeration system has a frosted line. The most probable cause is?

A The evaporator fan is not running  
B The expansion valve is stuck open  
C There is an overcharge of refrigerant  
D A dirty air filter

142. The similar capacitors are connected in series. One of the capacitors is 20 volts and the other is 30 volts. The total voltage rating is?

A  50  
B  40  
C  30  
D  20

143. Shorted compressor motor windings?

A  Are indicated by a greater than normal resistance  
B  Will immediately blow fuses or trip the circuit breaker  
C  Always cause the motor to shut down  
D  Can draw excessive amperage

144. The primary purpose of a motor starter or contactor is to?

A  Make the compressor start up more quickly  
B  Increase the overall efficiency of the compressor  
C  Provide the switching action of the high current and voltage required by a compressor  
D  Protect the compressor

145. The voltage rating of any capacitor must be ______________ the one being replaced.

A  No more than two percent higher or lower than  
B  No more than five percent higher or lower than  
C  Equal to  
D  Equal to or greater than
146. Potential relays are _____________ relays.

A  Backup  
B  Current  
C  Sequencing  
D  Starting  

147. An overcharge of refrigerant will cause?

A  A low discharge pressure  
B  A high discharge pressure  
C  The system to seize  
D  The condenser tubes to freeze  

148. A refrigerant leak?

A  Can be ignored without serious consequences  
B  Should be found and repaired  
C  Is usually difficult and laborious to repair  
D  Requires tools to pinpoint  

149. The result of moisture freezing in the refrigerant flow control orifice is poor refrigeration, accompanied by a?

A  Lower than normal suction pressure  
B  Copper color on the steel valves and parts  
C  Higher than normal suction and discharge pressure  
D  Discoloration of the oil  

150. A sufficient amount of frost, or ice, will not be removed from the coil to allow proper refrigeration to occur, if the defrost termination point is?

A  Too low  
B  Too high  
C  Ignored  
D  Set incorrectly  

151. Of prime importance to reliable torch brazing is?

A  Taking enough time to do a good job - not rushing  
B  Being knowledgeable about the properties of various metals  
C  The general cleanliness of all surfaces  
D  Using high quality tools
152. Applying "finger" pressure to check for correct belt tension should result in approximately __________ inch(es) total deflection.

A  2  
B  1 1/2  
C  1  
D  ½  

153. An infinity reading between the start and run terminals indicates a?

A  A grounded winding  
B  A completed circuit  
C  A grounded casing  
D  Open winding  

154. The area has a refrigerant leak. The serviceman should?

A  Dial 911  
B  Contact a supervisor in the area  
C  Use oxygen as soon as possible  
D  Use an approved air pack if entering the area  

155. Contacts should "make" at no more than __________ degrees above the temperature indicated by the thermometer?

A  10  
B  8  
C  5  
D  2  

156. In a compressor, the ___________ resistance indicated is between the start and run terminals.

A  Positive  
B  Negative  
C  Most  
D  Least  

157. Devices used to activate motor starters or contactors are?

A  Battery operated  
B  Computer activated  
C  Electromagnetically-operated  
D  Motion activated
158. Potential relays operate?

A  On the electromagnetic principle  
B  Using electrical resistance  
C  Using the "Domino Principle"  
D  Using a self-regulating conductive ceramic

159. A ____________Start Kit is designed for use when conditions are encountered that prevent the PSC motor from starting normally.

A  Compressor  
B  Hard  
C  Jump  
D  PSC

160. Something extremely dangerous to a refrigeration system is?

A  Too much refrigerant  
B  Too little refrigerant  
C  Moisture  
D  Lack of maintenance

161. The power element of a thermostatic expansion valve contains a(n) ____________ charge.

A  Electromagnetic  
B  Slight  
C  Thermal  
D  Vapor

162. The defrost termination point is the?

A  Temperature at which the defrost period ends  
B  Point at which the defrost period ends  
C  Point when all the frost has melted  
D  Point when the system returns to normal operation

163. To check for shorted motor windings, first?

A  Perform a visual inspection of the wire insulation  
B  Use the ohmmeter to check the continuity from one terminal to another  
C  Remove all external wiring from the motor terminals  
D  Consult the motor manufacturer's data to determine the correct resistance requirements
164. To braze steel to copper, use?

A  Phos-copper brazing alloys  
B  Silver brazing alloys  
C  Steel brazing alloys  
D  Filler metal

165. Do not use hand-held instruments to take high voltage measurements, ___________ volts or more, for centrifugal liquid chillers.

A  600  
B  650  
C  700  
D  750

166. When checking for a faulty thermostat, a reliable thermometer should be?

A  Placed as close to the sensing element as possible  
B  Placed in the return line  
C  Placed in the supply line  
D  Calibrated to ensure a correct reading

167. Of the following, which is not a type of main burner?

A  Inshot  
B  Slotted port  
C  Ribbon  
D  Inset

168. Belt deflection should be?

A  At least one inch  
B  Plus or minus one inch  
C  About one inch  
D  Approximately one inch total deflection

169. The most resistance is between the?

A  Run and common terminals  
B  Run and start terminals  
C  Common and start terminals  
D  Line and run terminals
170. Potential relays are?
A  Positional
B  Non-positional
C  Solid state
D  Hermetic

171. Billy does not know how the wiring was installed. Billy is installing a hard-start kit. Billy should wire the hard-start?
A  Black to black, red to white and white to white
B  In series
C  In parallel
D  Black to black, green to common and white to white

172. Air filters should be replaced every?
A  Week
B  Month
C  Quarter
D  Year

173. The suction pressure is too low for the heat pump. Alice should look for?
A  A dirty indoor or outdoor expansion valve
B  Defective expansion valve power element
C  Bad contactor contacts
D  Ductwork that is small or restricted

174. Joe notices the head pressure is high for the heat pump on the cooling and heating cycle. The most probable cause and remedy is?
A  A bad reversing valve which should be replaced
B  A leaking check valve which should be replaced
C  An overcharge of refrigerant requiring a cleaning of the coils
D  An overcharge of refrigerant requiring removal of the overcharge

175. The defrost temperature should?
A  Close at 28 degrees and open at 68 degrees
B  Close at 68 degrees and open at 28 degrees
C  Close at plus or minus 5 degrees and open at plus or minus 5 degrees
D  Close at 32 degrees and open at 74 degrees
176. Temperature rise of the water through the condenser should not be more than how many degrees?

A  5  
B  10  
C  15  
D  20  

177. To check for a faulty thermostat, place a reliable thermometer as close to the sensing element as possible and allow it to remain there?

A  At least ten minutes  
B  At least five minutes  
C  At least fifteen minutes  
D  At least twelve minutes  

178. The type of relay which is positional type and must be properly mounted for satisfactory operation?

A  Hot wire relays  
B  Amperage (current) relays  
C  Solid-state relays  
D  Potential (voltage) relays  

179. The type of starting relays used on motors of almost any size is?

A  Solid-state relays  
B  Hot wire relays  
C  Amperage (current) relays  
D  Potential (current) relays  

180. The amperage (current) relay is an electromagnetic-type relay and must be?

A  Bolted at three points minimum  
B  Properly mounted for satisfactory operation  
C  Secured with at least two mounting screws  
D  Mounted facing the compressor  

181. To check a potential relay, turn off the electrical current, remove the wire from terminal #2 and touch it to terminal #1 and then?

A  Stand back  
B  Place an ammeter on the common wire to the motor  
C  Place a volt meter on the ground wire  
D  Place an ammeter on the hot wire
182. A grounded compressor motor winding will have the least resistance reading at which terminal?

A  Run  
B  Start 
C  Common 
D  Ground 

183. A burned or pitted contactor will harm the?

A  Motor  
B  Suction line 
C  Discharge line 
D  Run capacitor 

184. An electrical instrument that measures electrical resistance, the opposition to an electric current in small quantities is a/an?

A  Ammeter  
B  Voltmeter 
C  Ohmmeter 
D  Periodontal meter 

185. When checking the low-pressure control, the proper sequence should be to?

A  Leave the compressor running, crack the service valve off the front seat, front-seat the suction service valve and observe the pressure on the compound gage. 
B  Stop the compressor, crack the service valve off the back seat, front-seat the suction service valve and observe the pressure on the compound gage. 
C  Stop the compressor, crack the service valve off the back seat, front-seat the suction service valve and observe the pressure on the compound gage. 
D  Leave the compressor running, crack the service valve off the back seat, front seat the suction service valve and observe the pressure on the compound gage. 

186. On systems where the low side pressure is below 0 psig, use which of the following?

A  Front-seat the valves on the gauge manifold, back-seat the system service valves to isolate the gauge ports from the rest of the system, make the hose connections to the system, loosen the hose connection to the discharge service valve. 
B  Front-seat the valves on the gauge manifold, front-seat the system service valves to isolate the gauge ports from the rest of the system, make the hose connections to the system, tighten the hose connection to the discharge service valve. 
C  Back-seat the valves on the gauge manifold, front-seat the system service valves to isolate the gauge ports from the rest of the system, make the hose connections to the system, tighten the hose connection to the discharge service valve. 
D  Front-seat the valves on the gauge manifold, back-seat the system service valves to isolate the gauge ports from the rest of the system, make the hose connections to the system, tighten the hose connection to the discharge service valve.
187. Flame detector fumes are likely to be which deadly gas?
A Carbon dioxide
B Carbon monoxide
C Water vapor
D Phosgene

188. Do not work on electrical circuits until they are?
A Opened and tagged
B Tagged and locked
C Opened and locked
D Tagged, opened and locked

189. A method commonly used to check fuses is to?
A Leave the voltage off and check for line voltage across the phases
B Leave the voltage on and use an ohmmeter to check for continuity through it
C Remove the fuse from the fuse box on and use an ohmmeter to check for continuity through it
D Remove the fuse from the fuse box and replace with a known working fuse

190. Compressor bearings that have not received proper lubrication will become?
A Worn
B Crystallized
C Loose
D Tight

191. One of the biggest dangers to a cascade system is?
A Low voltage
B Condensable gases
C Non-condensable gases
D Compressor overload

192. Hand-held instruments should not be used in excess of how many volts?
A 399
B 499
C 599
D 699
193. When an unstable gas supply is experienced, the contractor should?

A  Evacuate the area immediately
B  Install another regulator
C  Install a two stage regulator
D  Increase the gas pressure 5 degrees

194. The following wiring information is available: 1 to 3 is 8 ohms, 1 to 2 is 3 ohms and 2 to 3 is 6 ohms. Line three is which terminal?

A  Start
B  Run
C  Common
D  Overload

195. Compressor bearings that are worn become?

A  Weak
B  Tight
C  Noisy
D  Jammed

196. When using cranes, do all of the following except?

A  Check for the center of gravity
B  Check for specific hoisting instructions
C  Check component and assembly weights
D  Use eyebolt holes to hoist the assembly

197. Triple evacuation of the system should lower the system pressure to ___________ microns or lower.

A  500
B  1,000
C  1,500
D  2,000

198. Motor overheating is usually caused by?

A  Low resistance
B  Low current draw
C  Excessive current draw
D  Bad windings
199. The most common type of flow control device used on units of 5-ton capacity and above is the?

A  Thermostatic expansion valve  
B  Swing check valve  
C  Automatic expansion valve  
D  Liquid line shut-off valve

200. When trying to start split phase hermetic compressors up to 1/3 horsepower the best relay to use is the?

A  Solid-state starting relay  
B  Potential relay  
C  Electromagnetic relay  
D  Starting relay

201. The purpose of the flame detector is to determine?

A  Temperature rises approaching 140 degrees  
B  Whether or not a satisfactory flame has been established in the firebox of an oil burner unit  
C  Flame activity outside the firebox  
D  Detect cad cell socket assembly functions for soot accumulation

202. When pumping down a system, use all of the following procedures except?

A  Install the gauge manifold on the system  
B  Start the unit  
C  Back-seat the liquid line  
D  Front-seat the king valve

203. To properly adjust a fan belt, tighten the adjustment screw until the belt can be flexed about?

A  1 inch top and bottom  
B  1 inch total  
C  1/2 inch either top or bottom  
D  Flexed easily using moderate pressure with only two fingers

204. Flattened tubing may cause?

A  Condensable gases to ignite  
B  Condensation or frost on the inlet side of the flattened area  
C  Frost on either side of the flattened area  
D  Condensation on the outlet side of the kink
205. The control used on heating systems to activate the fan furnace is the?

A  Fan relay  
B  Heating relay  
C  The thermal switch  
D  Modulating motor  

206. When working with refrigerant leaks, do all of the following except?

A  Do not enter an enclosed area without ventilating the entire space  
B  Use the buddy system  
C  Use an air pack  
D  Do not use soap and water to wash the skin  

207. The heat pump is in the heating cycle. The compressor short cycles. The most probable cause is?

A  The defrost control is out of adjustment  
B  There is a defective relay  
C  There is a defective power element on the outdoor expansion valve  
D  There is a defective indoor fan relay  

208. To check for defective bearings, the contractor should move the shaft?

A  Up and down  
B  Left and right  
C  Side to side  
D  To a tilted angle  

209. When an unstable gas supply is encountered, the contractor should use a/an?

A  Special regulator  
B  Two-stage regulator  
C  Pressure relief regulator  
D  Automatic control regulator  

210. A flattened tube may cause?

A  Frost  
B  Oil drips  
C  Higher than normal suction pressure  
D  Higher than normal discharge
211. A common cause of low suction pressure in air conditioning systems is?

A  Frost  
B  Ice  
C  Dirty air filters  
D  Excessive superheat

212. When the winding becomes shorted to the housing the resistance will be?

A  Infinity  
B  Low  
C  High  
D  0

213. Extra refrigerant in the condenser will take up?

A  Space  
B  Horsepower  
C  Voltage  
D  Superheat

214. A properly adjusted belt should have a maximum flex of about ___________ inches.

A  1/2  
B  1  
C  1 1/2  
D  2

215. Current flow is easily determined using a/an?

A  Ammeter  
B  Ohmmeter  
C  Wattmeter  
D  Voltmeter

216. A 48-inch round duct is equivalent to a ___________ rectangular duct.

A  70 X 25  
B  25 X 80  
C  40 X 50  
D  40 X 44

217. Loose bearing can be indicated by all of the following except?

A  Noise  
B  Excessive current flow  
C  Vibration  
D  Low oil pressure
218. Which of the following is not required when entering an enclosed area following a refrigerant leak?

A  Notification to OSHA
B  Using the buddy system
C  Ventilation of the space
D  Use of an approved air pack

219. Oil pressure failure controls are designed to stop the compressor in?

A  1 minute
B  2 minutes
C  3 minutes
D  4 minutes

220. The best way to check a capacitor is by the use of a/an?

A  Ammeter
B  Ohmmeter
C  Capacitor analyzer
D  Voltmeter

221. The maximum clearance between the walls of the inner and outer tubes should not exceed __________ inches.

A  1/2
B  .05
C  .001
D  .005

222. When the hot gas type of defrost is involved, a valve is used to direct the flow of hot gas around the flow control device.

A  Bi
B  Solenoid
C  Adenoid
D  Riser

223. Brazing normally?

A  Is above 800 degrees
B  Is below 800 degrees
C  Requires the use of flux
D  Should require a yellow flame
224. The thermostat should be replaced when a calibration of more than __________ degrees Fahrenheit is needed.

A 10  
B 5  
C 3  
D 2

225. The oil in the sight level glass should be at?

A Or slightly above the center of the sight glass  
B Or slightly below the center of the sight glass  
C The center of the sight glass  
D The upper top section of the sight glass

226. The proper wire connection for the reversing valve in a heat pump thermostat is the?

A B  
B G  
C 0  
D X

227. When experiencing an unstable gas supply the contractor should use a?

A Larger regulator  
B Two stage regulator  
C Smaller regulator  
D High compression regulator

228. An improperly located feeler bulb will result in a?

A High suction pressure  
B Low suction pressure  
C Broken fan belt  
D Icing situation

229. Heat pump defrost controls are used to detect ________________ on the outdoor coil during the heating cycle.

A Ice and frost  
B Heat  
C Air flow  
D THX operation
230. Which gas when combined with oil will cause an explosion?

A  Nitrogen  
B  Argon  
C  Xenon  
D  Oxygen

231. Amperage relays must be _______________ for satisfactory operation.

A  Properly mounted  
B  Electromagnetic  
C  High voltage  
D  Low voltage

232. Hearing protection is required where sound levels are greater than how many decibels?

A  80  
B  90  
C  100  
D  105

233. The most probable cause for the suction line to be frosted or sweating in refrigeration is?

A  The expansion valve is stuck open  
B  An overcharge of refrigerant  
C  The evaporator is overloaded  
D  The cooling water is shutoff

234. During the winter months a desired relative humidity should be between _____________ percent.

A  30 and 50  
B  40 and 60  
C  50 and 70  
D  60 and 80

235. The most probable cause for high head pressure in a heat pump is?

A  An overcharge of refrigerant  
B  High air temperature  
C  Defective reversing valve  
D  Shortage of refrigerant
236. A plugged capillary tube is caused by?

A  Excessive airflow  
B  Trapped foreign particles  
C  Untrapped foreign particles  
D  Low head pressure

237. Which should not be used to pressurize a system?

A  Air  
B  Nitrogen  
C  Argon  
D  Oxygen

238. The fan belt should be flexible for not more than?

A  1/2 inch  
B  3/4 inch  
C  1 inch  
D  2 inches

239. Starting capacitors found to be out of the range of __________ percent of the mfd rating of the capacitor must be replaced.

A  Oto+ 20  
B  5 to + 20  
C  5 to+ 25  
D  10 to+ 30

240. A device use to measure watts is the?

A  Ammeter  
B  Resistor  
C  Conductor  
D  Capacitor

241. Which is not a common cause of high discharge pressure?

A  Compressor discharge service valve is front-seated  
B  Excessive cooling air  
C  Lack of cooling water  
D  Non-condensable gases
242. The terminal that is the most likely to short is the one with the?

A  Red dot  
B  Double clip  
C  Plus sign  
D  Minus sign 

243. When pressurizing a system with nitrogen, the technician should use a/an?

A  Two stage regulator  
B  Gauge-equipped regulator  
C  Air pack  
D  Strip and peel swab 

244. Phos-copper filler metals should not be used on ferrous metals containing more than percent nickel.

A  10  
B  15  
C  20  
D  25 

245. If tubing is flattened there may be condensation or frost on the _______ side of the kink.

A  Inlet  
B  Outlet  
C  Front  
D  Back 

246. When a flux becomes saturated with oxides its?

A  Viscosity increases  
B  Viscosity decreases  
C  Viscosity remains constant  
D  Saturation index is nullified 

247. Running capacitors that are found to be out of range _________ percent of the mfd rating must be replaced.

A  Plus or minus 5  
B  Plus or minus 10  
C  Plus or minus 15  
D  Plus or minus 20
248. An open winding is indicated by a resistance reading on the ohmmeter of?

A  Low
B  High
C  Infinity
D  Normal

249. Do not allow liquid refrigerant to come into contact with the?

A  Hoses
B  Skin or eyes
C  Regulators
D  Gauges

250. A burned-out defrost valve solenoid coil will prevent operation of the?

A  Defrost circuit
B  THX valve
C  Solenoid coil
D  Hot gas bypass line

251. Minimum insertion distance should be equal to the?

A  Amount of the filler metal
B  Diameter of the outer tube
C  Diameter of the inner tube
D  Clearance of the inner and outer walls

252. When replacing a heating relay, the service technician should always use?

A  Capillary tongs
B  An ohmmeter
C  An exact replacement
D  A replacement either the same or of higher value

253. According to the Air Conditioning and Refrigeration Trouble Shooting Handbook, ________ means that hazards or unsafe practices could result in severe personal injury or death.

A  Beware Of Hazards
B  Caution
C  Warning
D  Danger
254. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, _______ is a reason for the suction line on a refrigeration system to be frosted or sweating.

A. restricted drier or strainer  
B. superheat setting too low  
C. liquid line shutoff valve partially closed  
D. superheat setting too high

255. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, _______ defrost controls are used to detect ice and frost on the outdoor coil during the heating cycle.

A. moisture sensitive  
B. heat pump  
C. heat reactor  
D. mercury

256. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, _______ are devices used to force air through the equipment and into the conditioned space.

A. blowers  
B. ballasts  
C. fans  
D. pumps

257. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, when _______ in the refrigerant lines, the oil will not be returned to the compressor properly. The result is unsatisfactory operation.

A. refrigerant velocity is too high  
B. refrigerant velocity is too low  
C. the trap sticks  
D. the trap won't close

258. When the fresh food compartment or as refrigerator is too warm. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, which of the following is not a good possible cause?

A. poor air distribution  
B. bad thermostat  
C. thermostat setting too high  
D. heater stuck
259. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, are the components that control the flow of refrigerant through a compressor.

A. lubrication valves  
B. pump valves  
C. compressor valves  
D. suction valves

260. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, _______ valves are the most common type of flow control devices used on units of 5 ton capacity or above.

A. thermostatic expansion  
B. pneumatic expansion  
C. thermostatic refraction  
D. pneumatic refraction

261. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, the _______ of the feeder bulb is extremely important and in some cases determines the success or failure of the refrigeration plant.

A. location  
B. size  
C. pressure  
D. suction

262. A ________ is a restriction in a refrigerant circuit that occurs when the line has been bent too far and has resulted in a flattened place. Refer to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*

A. plugged line  
B. kinked line  
C. frost line  
D. pressure line

NOTE: Read Chapter 4 (Standard Service Procedures) in detail.

263. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, natural gas furnaces are designed to operate with _______ inches water column pressure in the furnace manifold and lp gas furnaces are designed to operate with _________ inches water column pressure in the furnace manifold, respectively.

A. 3 and 11  
B. 3.5 and 11  
C. 3.5 and 5  
D. 5 and 10
264. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, the preliminary indication of acid caused by moisture in an air conditioning system is ________.

A. A shorted compressor  
B. A slow running compressor  
C. A sweet smell to the freon  
D. Copper plating on steel valves and parts

265. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, when checking the compressor suction valves, start the compressor and reduce the suction pressure to at least 26” vacuum or lower. Stop the compressor and observe the compound gauge. The gauge should not indicate an increase in pressure of more than inches _________ vacuum.

A. 3  
B. 5  
C. 8  
D. 10

266. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, moisture, wax, oil or dirt plugging the expansion valve orifice may be indicated by a/an _________ after shutdown and system has warmed up.

A. Sudden rise in suction pressure  
B. Immediate restart of the compressor  
C. Whistling sound  
D. Loud noise

267. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, an air conditioning gauge manifold set consists of a _______, a pressure gauge, and the manifold that is equipped with hand valves to isolate the different connections.

A. Negative pressure gauge  
B. Hose connector  
C. Compound gauge  
D. Composite gauge

268. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*. After a burned out compressor as been replaced, the system can be pumped down and an approved _________ can be installed in the line at the compressor suction.

A. New service valve  
B. Liquid drier  
C. Sight glass  
D. Clean-up suction line filter-dryer
269. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, means that hazards or unsafe practices will result in severe personal injury or death.

A. Beware of hazards  
B. Caution  
C. Warning  
D. Danger

270. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, a reason for the suction line on a refrigeration system to be frosted or sweating is ________________.

A. A restricted drier or strainer  
B. The superheat setting 15100 low  
C. The liquid line shutoff valve is partially closed  
D. The superheat setting is too high

271. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, when frost appears on the outlet of a liquid line filter dryer, it is a symptom of______________.

A. Excessive sub-cooling  
B. Refrigerant undercharge  
C. Refrigerant overcharge  
D. A plugged filter drier

272. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, an overcharge of refrigerant in the system will cause______________.

A. Evaporator capacity reduction  
B. Liquid carry over  
C. High discharge pressure  
D. Condenser flooding

273. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, oil slugging of the compressor occurs when the______________ is too high.

A. Liquid refrigerant level  
B. Oil level in the compressor crankcase  
C. Superheat setting is too high  
D. Blower setting is too high

274. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, a device used to measure gas pressures both above and below atmospheric pressure is called a______________.

A. Pressure gauge  
B. Barometer  
C. Compound gauge  
D. Altitude gauge
275. According to the *Air Conditioning and Refrigeration Trouble Shooting Handbook*, _________ in which the forces of attraction between the molecules of the molten filler metal and the molecules of the base metals are greater than the inward forces of attraction existing between the molecules of the filler metal.

A. Bonding is the action  
B. Bracing is the process  
C. Oxide coating of the base metals  
D. Wetting is the phenomenon
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162  A  Air Conditioning/Refrigeration Troubleshooting Handbook  73  
163  C  Air Conditioning/Refrigeration Troubleshooting Handbook  84  
164  B  Air Conditioning/Refrigeration Troubleshooting Handbook  311  
165  A  Air Conditioning/Refrigeration Troubleshooting Handbook  435  
166  A  Air Conditioning Refrigerating Troubleshooting Handbook  26  
167  D  Air Conditioning Refrigerating Troubleshooting Handbook  111  
168  D  Air Conditioning/Refrigeration Troubleshooting Handbook  344  
169  B  Air Conditioning/Refrigeration Troubleshooting Handbook  7  
170  B  Air Conditioning/Refrigeration Troubleshooting Handbook  36  
171  C  Air Conditioning/Refrigeration Troubleshooting Handbook  39  
172  B  Air Conditioning/Refrigeration Troubleshooting Handbook  151  
173  D  Air Conditioning/Refrigeration Troubleshooting Handbook  457  
174  D  Air Conditioning/Refrigeration Troubleshooting Handbook  456  
175  A  Air Conditioning/Refrigeration Troubleshooting Handbook  194  
176  B  Air Conditioning/Refrigeration Troubleshooting Handbook  41  
177  A  Air Conditioning/Refrigeration Troubleshooting Handbook  24  
178  B  Air Conditioning/Refrigeration Troubleshooting Handbook  35  
179  D  Air Conditioning/Refrigeration Troubleshooting Handbook  36  
180  B  Air Conditioning/Refrigeration Troubleshooting Handbook  35  
181  B  Air Conditioning/Refrigeration Troubleshooting Handbook  36  
182  C  Air Conditioning/Refrigeration Troubleshooting Handbook  5  
183  A  Air Conditioning/Refrigeration Troubleshooting Handbook  68  
184  C  Air Conditioning/Refrigeration Troubleshooting Handbook  2/3  
185  D  Air Conditioning/Refrigeration Troubleshooting Handbook  29  
186  D  Air Conditioning/Refrigeration Troubleshooting Handbook  263  
187  D  Air Conditioning/Refrigeration Troubleshooting Handbook  431  
188  D  Air Conditioning/Refrigeration Troubleshooting Handbook  435  
189  C  Air Conditioning/Refrigeration Troubleshooting Handbook  148  
190  D  Air Conditioning/Refrigeration Troubleshooting Handbook  16
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