TYPE II

Equipment

1. Type II appliances include split-system residential air conditioners and heat pumps, supermarket refrigeration and industrial process refrigeration. (In split systems, the condenser is located away from the evaporator, usually outside.)

2. Type II refrigeration systems operate at high pressure.

3. R-22 is the most common refrigerant in Type II systems.

4. Type II systems often have a receiver installed between the condenser and metering device.

5. The line between the condenser and the metering device is called the "liquid line."

6. When a Type II system is opened, the filter-drier in the liquid line must be replaced. The filter-drier removes solid contaminants and moisture from the liquid refrigerant.

7. Refrigerant is charged into Type II systems in both liquid and vapor form.

8. Above a charge of 50 lb., charge liquid refrigerant through the liquid line service valve.

9. The liquid line service valve is called a king valve (see textbook, p. 195, Figs. 10-6 and 10-7). The king valve can be adjusted to one of four positions:

    a. Back-seated: This is the normal operating position. Refrigerant flows from the receiver to the expansion valve (metering device). The service (gauge) port is closed.

    b. Cracked off the back seat: This position is used to obtain high-side pressure readings.

    c. Mid-seated: refrigerant also flows through the service port; used for system evacuation and pressure testing.

    d. Front-seated: refrigerant flows only from service port to the receiver where refrigerant is trapped.

10. Vacuum in Type II systems is measured in microns (not inches of Hg). One micron is 1/1000 ("one one-thousandth") of a millimeter (mm) of mercury. One thousand microns = 1 mm Hg vacuum.

11. The pressure in Type II systems is almost a perfect vacuum.

12. Sight glasses can be cleaned with an alcohol spray.

13. Some sight glasses will indicate when moisture is present in the circuit.

14. In some systems, vapor should first be charged into the system until the saturated vapor temperature is above 32°F (where water freezes).

15. If a unit has had a leak or major component failure, take an oil sample for testing.

16. When a system is evacuated quickly with a large (high-capacity) vacuum pump, it is possible that moisture in the system will freeze. If this happens, raise the pressure with dry nitrogen until the ice melts.

17. When evacuating a Type II system, the vacuum pump should be able to pull 500 microns vacuum.

18. Recovery machines are not required to have oil separators.

19. Oil mixed with refrigerant may foam in the crankcase as the compressor starts.

20. Non-condensable gasses in a refrigerant system cause higher compressor discharge pressures.

21. A compressor heater will reduce the amount of refrigerant in the lubricating oil.

22. The accumulator is a refrigerant storage tank located in the suction line, just before the compressor. It allows small amounts of liquid refrigerant to boil off before entering the compressor.

Leak Checks and Repair

23. To check for leaks, look for stains around tubing and fittings. Apply a soap solution and look for bubbles.

24. Open-type compressors (where the motor is separate from the compressor body) can leak around the seal where the motor drive shaft enters the compressor body.

25. Refrigerant leaks in Type II equipment containing at least 50 lb. refrigerant must be repaired:

    a. if the leak rate is at least 35% per year in commercial refrigeration or industrial process equipment

    b. if the leak rate is at least 15% in other equipment.

26. If a Type II system has a refrigerant leak, the system will be undercharged and refrigerant superheat will be excessive.

27. To leak test an empty system, charge with dry nitrogen containing a trace amount of refrigerant such as R-22.

28. Systems charged with R-134a should be leak tested with pressurized N_2.

Recovery Basics – Type II

29. Recovery of refrigerant as liquid is faster than recovery as vapor.

30. Recovery as vapor minimizes loss of oil from the system.

31. Liquid refrigerant can be recovered only if a liquid access port (fitting) is available.

32. If refrigerant is recovered as liquid, there will be vapor in the system which also must be recovered.

33. If a recovery machine is used with a second refrigerant, (i) all traces of the first refrigerant must be removed, (ii) the oil must be changed, (iii) filters must be replaced, and (iv) the recovery machine must be evacuated or "pumped out."

34. R-134a must be recovered with equipment (hoses, gauges, vacuum pump, recovery machine, oil containers) dedicated for use with R-134a only.

35. Water-cooled recovery systems are sometimes used with large refrigeration systems. The cooling water for the recovery unit's condenser is connected to a public water supply tap.

36. Most recycling machines require periodic oil and filter changes.

37. The recovery container should be cooled during refrigerant recovery.

38. Contaminated refrigerant can contain acids, oils and moisture.

Recovery Precautions – Type II

39. All hoses on recovery machines must have "low-loss" fittings to prevent loss of refrigerant when hoses are connected or disconnected.

40. Check recovered refrigerant for non-condensables before it is (i) reused in the same system or (ii) transferred to another system with the same owner.

41. When a recovery cylinder is full (80% by weight), it can be disconnected and an empty recovery cylinder substituted. The empty cylinder must be evacuated before use so it is free of non-condensables.

42. During recovery the system must be off (not operating) with its service valves open. All solenoid valves should be open whenever possible.

43. Before recovering refrigerant, be sure the recovery machine is (i) properly lubricated and (ii) evacuated if necessary.

44. Wait for the recovery machine to turn off. This indicates that most refrigerant has been recovered. If refrigerant is still in the system, the pressure will rise. Some recovery machines will re-start to continue recovery.

45. If a system has parallel compressors, close the equalization connection before starting recovery.

46. Technicians must evacuate Type II and Type III equipment to the following vacuum pressures:

Vacuum Levels Required by EPA Inches of Hg (except as shown otherwise)			
		Recovery equipment manufactured:	
Refrigerant	200 lb. charge	Before 11/15/1993	After 11/15/1993
22	**Under**	**0**	**0**
22	**Over**	**4**	**10**
High	**Under**	**4**	**10**
High	**Over**	**4**	**15**
Low		**25**	**25 mm** absolute

47. If a system cannot be evacuated to the target level because it has leaks, or if recovery to this level would contaminate the refrigerant, you should evacuate the leaking components to the lowest level possible without substantially contaminating the refrigerant. ("Substantially" means to an important degree.)

48. If you are evacuating a leaking component, it must be evacuated to at least 0 psig.

49. Recovery machine compressors are cooled by air or refrigerant, or both.

50. Hermetic compressors use refrigerant flow for cooling. They can overheat when drawing a deep vacuum.

51. Never energize (start) a recovery machine when it is in a deep vacuum or when its service valves are closed.

52. Recover liquid refrigerant from a system's receiver or storage tank.

53. Liquid refrigerant is *usually* in the component that is at the lowest location in the system. (Remember, however, that refrigerant can migrate to the coldest part of a system.)

54. EPA defines a "major repair" as removal of (i) the compressor, (ii) the evaporator, (iii) the condenser or (iv) any auxiliary heat exchanger coil.

55. If a repair is not "major," before the unit is opened it must be:

    a. Evacuated to at least 0 psig (Type I and II)

    b. Pressurized to 0 psig (Type III)

56. System-dependent (passive) recovery devices cannot be used with appliances containing more than 15 lb. refrigerant.

Safety

57. Equipment rooms must have sensors to detect oxygen deprivation (lack of sufficient O_2).

58. Many equipment rooms require monitoring for refrigerant vapors.

59. If a system has multiple pressure relief devices, connect them in parallel, not in series.

60. All N_2 tanks must have a regulator to control outlet pressure.