



Western Technical College

32404382 Automotive Climate Control

Course Outcome Summary

Course Information

Description	Provides principles and test procedures to diagnose automotive heating, ventilating and air conditioning system concerns. Includes testing and repairing to current federal and state environmental standards.
Career Cluster	Transportation, Distribution and Logistics
Instructional Level	Technical Diploma Courses
Total Credits	3
Total Hours	108

Textbooks

Fundamentals of Automotive Technology. 2nd Edition. Copyright 2018. CDX Automotive. Publisher: Jones & Bartlett Publishers. **ISBN-13**: 978-1-2842-0995-5. Required.

Learner Supplies

Safety glasses with side eye protection that meet Z87 OSHA guidelines. **Vendor**: To be discussed in class. Required.

Six inch ankle high, quality leather work shoes - \$75.00-100.00. **Vendor**: To be discussed in class. Required.

Pocket knife, six inch metal pocket ruler (English/metric measurement), small pocket flashlight, and pocket flat head screwdriver - \$20.00. **Vendor**: To be discussed in class. Required.

Success Abilities

1. Cultivate Passion: Expand a Growth-Mindset
2. Live Responsibly: Develop Resilience
3. Live Responsibly: Embrace Sustainability
4. Live Responsibly: Foster Accountability
5. Refine Professionalism: Act Ethically

6. Refine Professionalism: Improve Critical Thinking
7. Refine Professionalism: Practice Effective Communication

Program Outcomes

1. Demonstrate professionalism appropriate for the auto service industry.
2. Perform diagnosis, service, and repair of automotive electrical and electronic systems.
3. Perform diagnosis, service, and repair of automotive heating and air conditioning systems.

Course Competencies

1. Diagnose general A/C system.

Assessment Strategies

- 1.1. Written Product
- 1.2. Written Objective Test
- 1.3. Skill Demonstration

Criteria

You will know you are successful when:

- 1.1. you select the correct [TOOLS, EQUIPMENT, INSTRUMENTS, MATERIALS, SUPPLIES]
- 1.2. you performance & leak test an A/C system
- 1.3. you identify refrigerant & oil type, capacity, applicable vehicle service history, service precautions, & technical service bulletins
- 1.4. you inspect condition of oil removed from system
- 1.5. you connect proper gauge set and record system pressure and temperature readings
- 1.6. you identify and interpret various heating & air conditioning concerns including abnormal noises
- 1.7. you interpret HVAC data & diagnostic trouble codes

Learning Objectives

- 1.a. Identify and interpret heating and air conditioning problems; determine needed action.
- 1.b. Research vehicle service information including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins.
- 1.c. Performance test A/C system; identify problems.
- 1.d. Identify abnormal operating noises in the A/C system; determine needed action.
- 1.e. Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings.
- 1.f. Inspect condition of refrigerant oil removed from A/C system; determine needed action.
- 1.g. Determine recommended oil and oil capacity for system application.
- 1.h. Leak test A/C system; determine needed action.
- 1.i. Using a scan tool, observe and record related HVAC data and trouble codes.

2. Diagnose refrigeration system components.

Assessment Strategies

- 2.1. Written Objective Test
- 2.2. Written Product
- 2.3. Skill Demonstration

Criteria

You will know you are successful when:

- 2.1. you diagnose conditions that interpret system operation
- 2.2. you determine the need for an additional A/C filter
- 2.3. you identify hybrid electric electric vehicle A/C circuits and service precautions

Learning Objectives

- 2.a. Determine need for an additional A/C system filter; perform needed action.
- 2.b. Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.

- 2.c. Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation; determine needed action

3. Repair refrigeration system components.

Assessment Strategies

- 3.1. Written Product
- 3.2. Skill Demonstration

Criteria

You will know you are successful when:

- 3.1. you inspect, remove, and replace A/C compressor, drive belts, pulleys, tensioners, & clutch
- 3.2. you inspect, remove, and replace hoses, lines, mufflers, fittings, o-rings, seals, service valves, and accumulator/receiver drier
- 3.3. you inspect, remove and replace expansion valve or orifice tube, and condenser
- 3.4. you determine required oil type & quantity for components removed or replaced
- 3.5. you inspect evaporator water drain & determine procedure to replace evaporator
- 3.6. you inspect for proper condenser air flow and visually inspect for signs of leaks

Learning Objectives

- 3.a. Inspect, remove, and/or replace A/C compressor drive belts, pulleys, tensioners and visually inspect A/C components for signs of leaks; determine needed action.
- 3.b. Remove, inspect, reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity.
- 3.c. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform needed action.
- 3.d. Inspect for proper A/C condenser airflow; determine needed action.
- 3.e. Remove, inspect, and replace receiver/drier or accumulator/drier; determine recommended oil type and quantity.
- 3.f. Remove, inspect, and install expansion valve or orifice (expansion) tube.
- 3.g. Inspect evaporator housing water drain; perform needed action.
- 3.h. Determine procedure to remove and reinstall evaporator; determine required oil type and quantity.
- 3.i. Remove, inspect, reinstall, and/or replace condenser; determine required oil type and quantity.
- 3.j. Inspect, test, service or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.

4. Diagnose HVAC operating systems and related controls.

Assessment Strategies

- 4.1. Written Objective Test
- 4.2. Written Product
- 4.3. Skill Demonstration

Criteria

You will know you are successful when:

- 4.1. you inspect and test HVAC system vacuum, mechanical, and electrical components to include control panel, cables, motors, linkages, etc.
- 4.2. you inspect & test blower system components including motors, resistors, switches, relays, wiring, etc.
- 4.3. you diagnose compressor clutch control and temperature control systems

Learning Objectives

- 4.a. Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action.
- 4.b. Diagnose A/C compressor clutch control systems; determine needed action.
- 4.c. Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine needed action.
- 4.d. Inspect and test HVAC system control panel assembly; determine needed action.
- 4.e. Inspect and test HVAC system control cables, motors, and linkages; perform needed action.
- 4.f. Diagnose temperature control problems in the HVAC system; determine needed action.

5. Repair HVAC operating systems and related controls.

Assessment Strategies

- 5.1. Written Product
- 5.2. Skill Demonstration

Criteria

You will know you are successful when:

- 5.1. you inspect operation of HVAC system components to include ducts, doors, hoses, cabin filters, outlets, etc.
- 5.2. you determine procedure to replace heater core
- 5.3. you identify source of A/C system odors

Learning Objectives

- 5.a. Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; perform needed action.
- 5.b. Identify the source of A/C system odors.
- 5.c. Check operation of automatic or semi-automatic HVAC control systems; determine needed action.
- 5.d. Determine procedure to remove, inspect, reinstall, and/or replace heater core.

6. Perform refrigerant recovery, recycling and handling.

Assessment Strategies

- 6.1. Written Objective Test
- 6.2. Written Product
- 6.3. Skill Demonstration

Criteria

You will know you are successful when:

- 6.1. you identify, recover, evacuate, add oil if needed, and charge and A/C system
- 6.2. you test system for sealants
- 6.3. you use refrigerant handling equipment according to manufacturers standards
- 6.4. you label & store refrigerant properly

Learning Objectives

- 6.a. Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.
- 6.b. Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required.
- 6.c. Recycle, label, and store refrigerant.
- 6.d. Evacuate and charge A/C system; add refrigerant oil as required.