

Chassis Electrical

Course Outcome Summary

Chippewa Valley Technical College

Information

Course Number	412-307
Credits	5
Contact Hours	160
Developers	Tom McCracken and Lynette Neibauer

Types of Instruction

Type of Instruction	Contact Hours	Outside Hours	Credits
Classroom Presentation	32	0	1
On-Campus Lab	128	0	4
Totals	160		5

Description

This course will study all aspects of electrical systems found on heavy-duty trucks. Battery testing, lighting, starting, charging, in-dash controls, schematic interpretation, and troubleshooting techniques using a digital multi-meter will be practiced. A tool kit is required by each student in this course. Prerequisite(s): 412-306 Truck Chassis II. Co-requisite(s): 412-308 Mechanical Gear Trains and 412-309 Air Conditioning/Refrigeration.

Exit Learning Outcomes Addressed In This Course

Course Level Learning Outcomes

Competencies

1. Perform battery performance tests

Performance Standards

You will demonstrate your competence:

- o in a lab setting
- o given battery test equipment
- o given a variety of battery groups

Your performance will be successful when:

- o you use a hydrometer to test specific gravity
- o you use a voltmeter to check open circuit voltage
- o you determine the state of charge of the battery using hydrometer or voltmeter
- o you identify whether or not you can continue with test based on state of charge of battery
- o you charge battery using battery charger if test indicates state of charge is lower than 75%
- o you load test battery after determining battery has at least 75% charge using AVR
- o you interpret results of load test
- o you perform three-minute charge test if battery failed load test

- o you make recommendations on battery condition
- o you use an electronic battery tester to verify battery condition

2. Diagnose battery related cranking circuit faults

Performance Standards

You will demonstrate your competence:

- o in a lab setting
- o given a truck with battery related cranking circuit fault
- o given necessary tools and test equipment

Your performance will be successful when:

- o you perform visual inspection of battery connections, hold-downs, etc.
- o you check interconnecting cables
- o you check state of charge of each individual battery
- o you load test each battery
- o you determine battery condition based on observations and testing results
- o you perform three-minute charge test based on testing results
- o you perform parasitic drain test
- o you make recommendations regarding condition of battery(s) or interconnecting cables

3. Overhaul major brands of light and heavy duty starters

Performance Standards

You will demonstrate your competence:

- o in a lab setting
- o given various light and heavy duty starters
- o given appropriate tools and equipment
- o given starter specification manuals and service manuals

Your performance will be successful when:

- o FOR BOTH LIGHT AND HEAVY DUTY STARTERS:
- o you perform starter no-load test
- o you locate starter specifications
- o you determine starter condition based on no-load test and specifications
- o you disassemble starter using service manual
- o you identify and describe the function of various starter components
- o you inspect each starter component
- o you test armature for shorts, opens, and grounds
- o you use armature lathe to refinish commutator end
- o you test field coils for shorts, opens, and grounds
- o you inspect solenoid components for reusability based on service manual guidelines
- o you identify pull-in and hold-in windings and test for resistance values
- o you replace brushes and bearings
- o you reassemble the starter

- o you use the JIMCO alternator/starter tester to perform a starter no load test
- o you demonstrate starter no-load test, pull-in winding draw test, hold-in winding draw test, pinion clearance check, and overall starter performance
- o FOR HEAVY DUTY STARTERS (IN ADDITION TO THOSE LISTED ABOVE):
- o you demonstrate proper pinion depth adjustment procedures
- o you mount heavy duty starter in truck and demonstrate starter operation
- o you perform starter load test

4. Assemble starting circuit components

Performance Standards

You will demonstrate your competence:

- o on a written exam
- o in a lab setting
- o given appropriate tools, starting circuit components, and wires
- o given diagram of simplified cranking motor circuit

Your performance will be successful when:

- o you identify starting circuit components
- o you describe the function of each starting circuit component
- o you connect components using proper wire sizes
- o starting circuit operates properly

5. Diagnose starting circuit complaints

Performance Standards

You will demonstrate your competence:

- o in a lab setting
- o given various trucks with light and heavy duty starters
- o given appropriate tools and equipment
- o given starter specification manuals and service manuals

Your performance will be successful when:

- o you verify customer complaint
- o you systematically test each individual component of the starting circuit
- o you perform starter voltage test
- o you perform battery cable test based on starter voltage test results
- o you perform starter solenoid and starter relay voltage drop test
- o you perform starter relay and key switch test
- o you assess test results and make recommendations for needed repairs

6. Overhaul major brands of light and heavy duty alternators

Performance Standards

You will demonstrate your competence:

- o in a lab setting

- o given various light and heavy duty alternators
- o given appropriate tools and equipment
- o given alternator specification manuals and service manuals
- o given JIMCO hookup manuals

Your performance will be successful when:

- o FOR BOTH LIGHT AND HEAVY DUTY ALTERNATORS:
- o you locate correct hookup manual for JIMCO test stand
- o you mount alternator on JIMCO test stand using correct hookup procedures
- o you perform alternator output test
- o you locate alternator specifications in appropriate service manual
- o you determine alternator condition based on alternator output test and specifications
- o you disassemble alternator using service manual
- o you identify and describe the function of various alternator components
- o you inspect each alternator component
- o you test stator for opens, shorts, and grounds
- o you test rotor for shorts, opens, and grounds
- o you check slip rings for excessive wear
- o you replace slip rings if needed
- o you replace brushes and bearings
- o you test rectifier bridge and diodes
- o you test diode trio if equipped
- o you test voltage regulator on integral regulated alternators
- o you reassemble alternator correctly
- o you remount alternator on test stand
- o you perform alternator output test
- o alternator must put out within 10% of rated output

7.

Diagnose charging circuit complaints

Performance Standards

You will demonstrate your competence:

- o in a lab setting
- o given various light and heavy duty charging circuits
- o given appropriate tools and equipment
- o given appropriate manuals

Your performance will be successful when:

- o you perform alternator amperage output test
- o you perform alternator voltage output test
- o you assess charging circuit operation based on amperage output and voltage output test results
- o you perform generator wiring test
- o you determine generator replacement or overhaul needs

8. Interpret OEM electrical circuit wiring diagrams

Performance Standards

You will demonstrate your competence:

- o in a classroom setting
- o given Freightliner FLA/FLD basic wiring diagrams
- o given Mack CH & CL main wiring diagram
- o given International 9670 main wiring diagram
- o in a lab setting
- o given a heavy duty truck and trailer
- o given a multimeter and test light

Your performance will be successful when:

- o USING DIAGRAMS:
- o you identify symbols used in wiring schematics and diagrams
- o you differentiate between schematic and diagram layouts
- o you identify Type 1 and Type 2 circuit breaker locations
- o you color code each specific lighting circuit using different colors (headlamp, turn, tail, brake, clearance, and dash) on each diagram (Freightliner, Mack, and International)
- o you explain system operation based on electrical circuit wiring diagrams
- o IN THE LAB SETTING:
- o you locate vehicle power distribution center and identify fuse ratings for specific circuits (head lamps, tail lamps, turn signals, and blower motor)
- o you locate circuitry for various lighting circuits on a vehicle
- o you compare actual vehicle power distribution and lighting circuits to corresponding vehicle wiring diagram

9. Troubleshoot truck accessory electrical circuit complaints, i.e., lights, wiring, instrumentation, and other electrical accessories

Performance Standards

You will demonstrate your competence:

- o in a classroom setting
- o given Freightliner FLA/FLD basic wiring diagrams
- o given Mack CH & CL main wiring diagram
- o given International 9670 main wiring diagram
- o in a lab setting
- o given a heavy duty truck and trailer
- o given appropriate tools and equipment
- o given a multimeter and test light

Your performance will be successful when:

- o you place an ammeter in each circuit (head lamps, tail lamps, turn signals, and blower motor) and record current flow
- o you check operation of all inside and outside lighting on truck and trailer
- o HEAD LAMP/TAIL LAMP CIRCUITS:

- o you remove head lamp assembly
- o you list wire number and color for each wire for the head lamp assembly and compare to wiring diagram
- o you explain function of each wire color for the head lamp assembly
- o you locate the dimmer switch and identify each wire number and color for the dimmer switch assembly; compare to wiring diagram
- o you check voltage drop of head lamp assembly on high and low beam
- o you remove headl amp switch from truck
- o you draw the wiring for back of the switch and identify each wire number or color and compare to wiring diagram
- o you explain the function of each wire number or color
- o you draw a simple wiring diagram based on head lamp operation of truck
- o you remove tail lamps
- o you check wire connector or lamp socket using test lamp or multimeter for proper operation
- o you identify wire numbers and colors and compare to wire diagram
- o you list the function of each wire number and color
- o TRAILER CORD
- o you test trailer cord operation using test light
- o you draw the location of the 7 male contacts of the trailer plug and list the colors for each contact and compare to wiring diagram
- o you remove the plug from trailer cord and cut wires
- o you rewire the plug to the trailer cord matching colored wires to correct contacts
- o you test the trailer cord for proper operation
- o TURN SIGNAL
- o you locate flasher assembly
- o you explain function of flasher
- o you identify the turn signal assembly brand or manufacturer
- o you locate first connector and draw connector
- o you list the wire number and color locations in the connector
- o you explain the function of each wire number or color listed
- o you explain the routing of electrical current through the turn signal assembly whenever the operator has the right signal turned on
- o HEATER/AIR CONDITIONING/BLOWER MOTOR
- o you locate the blower motors
- o you explain how the motor speeds are controlled on this system
- o you locate blower motor resistor
- o you draw the outline of the connector at the rear of the fan switch
- o you identify each wire by number and color
- o you explain the function of each wire
- o you check the applied voltage to the blower motor when in low, medium, and high speed positions
- o you outline the steps for removing and replacing a blower motor
- o you remove and replace a blower motor

