



ELECTRICAL TROUBLESHOOTING FOR HVAC LEVEL II TRAINING PROGRAM

Electrical troubleshooting Level II is a Five-Day Program based on the attributes of Level I with a continued focus on understanding how to find the answers and understand the HVAC electrical components. There will be mandatory homework every evening. Students will complete over 190 'hands on' electrical tests/questions. The objective is to assist the student so he/she can be more efficient, effective and replace fewer parts. All language is in the 'blue collar' style and all analogies pertain to what the technician experiences on a daily basis. All students must complete a "Skills Analysis" test to which is used to determine their Level of experience. Electronic modules continue to be responsible for much of the confusion therefore this program will focus on the most popular styles found in the field today.

Topics Covered:

DAY 1

- Approximately ½ day for review. This will be adjusted based on the results of the student's Skills Analysis. Emphasis will be placed on the students using the same language and analogies so they can teach other when working on the lab boards.
- The afternoon will be spent on the PCL lab boards. This lab contains a variety of unique switches/switching action (motor actuator feeding relay coil, relay breaking both the hot and neutral.) and different styles of high/low firing valves.
The lab allows for a review of flame rectification and the testing of the flame signal using both the Flame Rod and Purple Peeper systems.
Manufacturer's wiring diagrams seldom outline what occurs inside the module so the student is not able to simplify the diagram nor does he/she always know what reading the meter should indicate at the various terminals. Our wiring diagrams do show and explain what occurs inside so the sequence represents commonsense and the electrical troubleshooting is logical. We place a strong emphasis on understanding the sequence and using a 'methodical thought process' to eliminate the majority of service problems/testing without ever using a meter. With this board, simply knowing the sequence and being able to see the action inside the module eliminates half of all problems. This will increase the student's level of understanding and confidence so this approach can be applied to other modules.
My 'Flame Testing Capacitor Kit' will allow the student to measure the mu signal even though the spark igniter and sensor are the same component.

DAY 2

- Review of the homework questions from the previous evening.
- Cover the generalities that apply to mid-efficiency furnaces.
 - Non-positive venting action.
 - Mid-efficiency and chimney liners.
 - Expected results if venting is not effective.
 - Hazard associated with only one roll-out switch installed.
 - Minimum checks that must be made after re-setting a rollout.
- Operation of the White Rogers 50A50 module. Students will create a York mid-efficiency furnace by using a small propane range burner.



Mechanical Service Contractors of Canada

PRACTICAL ELECTRICITY FOR HVAC LEVEL II TRAINING PROGRAM

DAY 3

- Review homework questions from the previous day.
- Wiring and operation of a heat/cool thermostat (single and two- stage). Use a heating/cooling thermostat, separate fan centre and multi-speed motor to demonstrate the action of the circulating blower.
- Electrical motors; capacitors, potential relays, current relays, combination 220 and 110 motors, low voltage-high amperage, common motor problems and solutions.

DAY 4

- Review homework questions from the previous day.
- Basics of three-phase motors with an emphasis on 'voltage imbalance', 'phantom voltage' and the resistance of each winding.
- Two hundred and twenty volt systems.
- Air flow, velocity and static pressure.
- Diagnosing 'free wheeling' fans and fans that are overloaded.
- Low voltage controllers.
- Counter electromotive force and its effect on transformers and motors.

DAY 5

- The day will be devoted to the Carrier MVP series furnace. Five operating units (based on 15 students) will be available so the students can complete the 34 step lab.



Rick Finlay - Rick has over 30 years of management experience in various industrial manufacturing companies and is the President of Hydrocarbon Training & Services Ltd. Rick has been involved with creating and delivering training programs for hourly workers, supervisors, mid-management and executive staff. He has the ability to relate to his audience and 'speak their language'. After retiring from corporate life, Rick completed his propane gas endorsements required for the recreational vehicle apprenticeship program and formed a company doing RV repairs and currently holds an Interprovincial Red Seal certificate as an RV Technician, working with propane / electronic appliances, as well as re-construction and repairs to structural components. During this period, Rick began teaching and partnered with Brent Pennington, the former managing partner of Hydrocarbon Training & Services Ltd. The similarities between the components used in the heating refrigeration, construction heater and RV propane / natural gas appliances made the training aspect a natural fit. In fact today, Rick owns the Company.

Brent and Rick will continue to work together to ensure the original content and style are preserved for the benefit of the students.