



**Entry Level HVAC
with Gerald Pinckard**

Objective: To provide basic HVAC training to maintenance staff for improved efficiency in operations, diagnostics and repair.

Description: This class will provide a basic understanding of system operations and a foundation for further learning, to develop improved performance among maintenance staff. It will address refrigeration and electrical theory as well as practical applications for direct expansion air conditioning systems. Also covered are safety considerations when working on and around HVAC systems. An optional module on heat pumps and heat pump operations will be introduced if time permits.

This class will endeavor to create an understanding of system operations and a foundation for further learning. Doing so will create maintenance staff that has improved performance, an atmosphere of confidence, and overall improved efficiency. Safety protocols will be covered at each step.

Limitations: This class is intended as an introductory class only, to provide a solid foundation in the basics of HVAC diagnostics and maintenance. Completion of the class will not produce fully qualified HVAC Technicians but will provide a more advanced skill set for maintenance professionals. Should you desire to continue developing your maintenance staff, more advanced training is available.

Expected Outcome: Benefits resulting from this training include:

- Reduction in expenses previously incurred due to:
 - Broken or damaged equipment resulting from lack of technical understanding and skills.
 - Cost incurred by misdiagnosis leading to replacing the wrong parts.
 - Need for service from contractors.
 - Reduced time of HVAC technician with a pre-diagnosis provided by your staff.
- Improved performance due to increased confidence, efficiency and morale among maintenance staff.
- Move valuable maintenance staff.



Five Modules

Phase I: Refrigeration Theory

Phase II: Electrical

Phase III: Diagnostics

Phase IV: Repair

Phase V: Heat Pump Operation

The Modules

Phase I: Refrigeration Theory

Understanding the physics and chemistry (the why and how) of refrigeration, including the refrigeration components. A fundamental understanding of operations, components and sequences of operations is required to detect irregularities when performing diagnostics.

The Refrigeration Theory Module addresses:

- Refrigeration theory.
- Refrigerant circuitry.
- Understanding the refrigerant a/c and heatpump circuit.
- Air flow basics, (hydrodynamics not included).
- Using, reading and understanding instrumentation, including:
 - compound manifold gauges,
 - volt/ohm meters,
 - amp meters,
 - anemometers,
 - psychrometers.
- Compressors.
- Heat pump operations.

Note: Psychrometrics are not included in introductory level classes.

Phase II: Electrical

Understanding the electricity and why it does what it does. Including components and controls. A fundamental understanding of control sequence of operations.

- Electrical safety.
- Lock-out and tag-out.
- Using and understanding a Volt, ohm and amp meter.
- Electrical circuitry.
- Wiring diagrams, reading and understanding.
- Capacitors and capacitor wiring.
- Motors (PSC, CSCR, shaded pole and three phase).
- Three phase power and three phase unbalance.



Phase III: Diagnostics

Diagnostic techniques translate into other fields of service and repair, providing a ripple-effect of improvement across your facility. Once learned, a proper diagnostic method will save time and money for the business owner by reducing wasted time and materials.

Having maintenance personnel capable of executing proper diagnostic techniques will eliminate expense caused by the “throwing parts at a unit” approach to repair.

This module will provide improved efficiency of your staff above and beyond air conditioning. These techniques will prove useful in all areas of operations.

Step by step instruction on how to troubleshoot an HVAC fault, including:

- Step by step actions to take in the diagnostic procedures.
- Critical data to collect and the most efficient data collection methods.
- How to check the refrigeration charge of a system.
- Charging techniques & procedures.
- Troubleshooting a wiring circuit.
- The importance and care of quality tools and instrumentation.
- Reading and interpreting instrumentation, including: manifold gauges, volt/ohm meter, amp meters, pyrometer, anemometer, and psychrometer.

Phase IV: Repair

The repair module will cover the most common repair requirements faced by maintenance personnel. This module will cover repair techniques and mistakes that will crossover into many other fields experienced by your staff.

- Safety
- Lock-out tag-out
- The do's and don'ts of repairs.
- Wiring.
- Evaporator coil cleaning
- Condenser coil cleaning
- Blower wheel inspection.
- Bearing inspection.
- Fan blade replacement.
- Circuit board, inspection and replacement.
- Belt Drives, alignment and adjustment.
- Belt drive motor loading.

Phase V: Heat Pump Operation

Heat Pump refrigerant circuitry including the reversing valve and it's operation.

Understanding the Heat Pump and it characteristics.

The Defrost cycle, controls and boards.

Controls and Supplemental heat.

The wiring and operation of supplemental heat.



This class will not cover:

- Materials already covered in the EPA Certification program.
 - This is not an EPA certification program.
- Forced Air Heating.
- Boilers.
- Hydronics.
- Electronically Commutated Motors (ECM).
- Advanced repair techniques.
- Low temp. and medium temp. refrigeration systems.
- Psychrometrics.
- Piping practices.
- Checking and Calculating Capacity.
- Load Calculating.
- Capacity checks.
- Evacuations.
- Reclaiming refrigerant.
- Leak testing.
- Brazing and welding.
- Air flow (hydrodynamics)