

## Keeping his cool Florida HVAC technician battles the critters in his daily drive to keep Florida comfortable

Technology  
at Work

Fluke offers lots of great instruments, but no Serpent Removal Tool.

Too bad. Joe Stuart could use one.

Stuart works as a commercial HVAC technician in central Florida, ground zero for the invasive species onslaught.

In addition to everyday problems – failed fan motors, frozen bearings, overheated compressors – he’s grappled with snakes wrapped around electrical connectors, pulled dead rodents out of fan blades, battled squirrels with a taste for insulation and evicted lizards, birds and bats that turned HVAC equipment into condos.

A 15-year veteran in the business, Stuart handles mainly maintenance and trouble calls for East Coast Refrigeration out of DeLand, Fla., just north of Orlando and west of Daytona Beach. In the steam bath of a Florida summer, the air conditioning and refrigeration systems he services for hospitals, laboratories, food suppliers, restaurants and other commercial customers are not just nice to have. They are vital.

A broken system can spoil thousands of dollars worth of food, close a lab or office and drive patrons out of the building. Florida heat challenges technicians too. “It’ll be 95 degrees on the street, but on the rooftops, over 110 degrees,” says Stuart. “That’s tough on equipment. It leads to a lot of 15-hour days.”



Measuring current with a Fluke-179 DMM and current clamp.

### Typical calls – and not so typical

A buddy helped Stuart get his start at age 18, working as a technician’s helper and installing air conditioning ductwork. One day a co-worker suggested he

could find more rewarding work – and better pay – as a service tech. So Stuart enrolled in the HVAC program at Daytona Beach Community College. Two years later, he began phase two of his career.



Measuring current with the Fluke T5 Electrical Tester.

Up on the roof, Stuart pulled the covers from the motor starters and saw at once that the circuit breakers had been tripped, probably by a power surge caused by the squirrel incident. "I reset them one by one," Stuart recalls, "checking the amperage using the Fluke T5-1000 to make sure each motor was pulling what it should. I got 'em all started and all the amps were right where they needed to be." The cooks went back to frying eggs, and Stuart headed out the door to his next call.

### Five Fluke favorites

Stuart calls the T5-1000 Electrical Tester his "first line" tool. "I put that right in my kit for testing voltage, amps, continuity and such," he says.

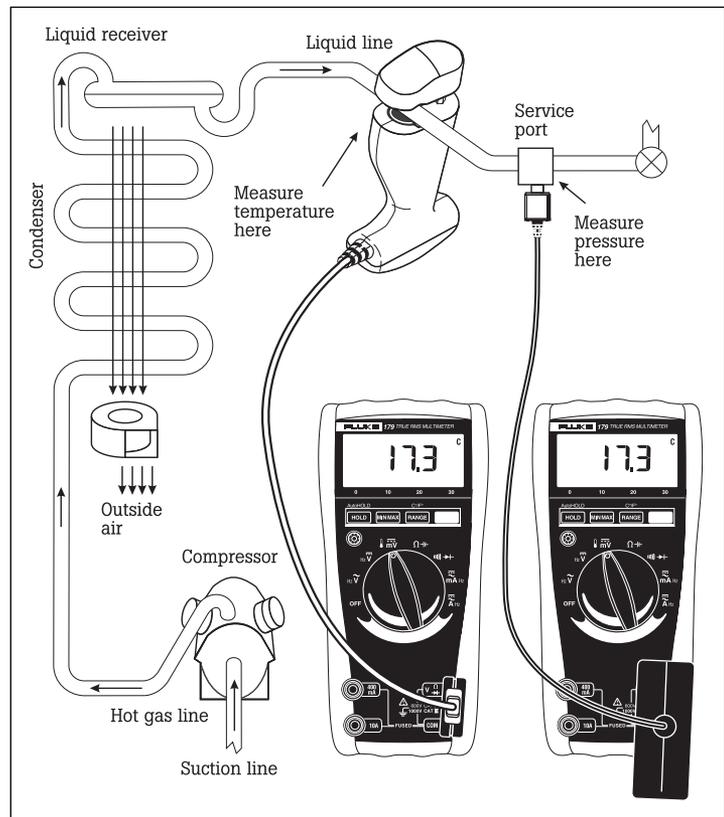
- First line measurement of current, voltage, continuity and resistance.
- Quick assessments when the higher range of a DMM is not required.

For more varied and higher-voltage measurements, he uses a Fluke 179 DMM:

- Measure a compressor motor's line voltage to see if it's within tolerances and check voltage balance between phases to troubleshoot performance issues.
- Measure motor capacitance and connector resistance (ohms) and continuity.
- Function as a thermometer using surface or piercing temperature probes.
- With the PV350 Pressure-Vacuum Module, the 179 DMM can measure:
  - Compressor suction and discharge pressure
  - Refrigerant superheat and subcooling values, helping diagnose a clogged filter drier, refrigerant undercharge/overcharge, a faulty metering device, or improper air flow.

Today Stuart's job takes him over hundreds of square miles of lush Florida geography, and challenges him with all the problems found in maintaining complex HVAC and refrigeration systems. There's a full range of electrical and mechanical issues, of course, but also control system problems, air supply balance, compressor performance and the delicate balance of coolant temperature and pressure, superheat, subcooling and air flow that is fundamental to air conditioning and refrigeration performance.

In such complex systems, problems can pop up anywhere. Recently Stuart was called to a national chain restaurant because the kitchen ventilation hoods were not working. Why? A solid hint came when the restaurant manager mentioned that the night before, a wayward squirrel had toasted itself on a nearby power company transformer, knocking out power to the building.



Fluke-179 DMM, 80-PK Pipe Clamp and PV350 Pressure/Vacuum Module, as used in subcooling measurement.



Testing roof-top refrigeration with a Fluke 61 Infrared Thermometer.

For fast and accurate current measurements, Stuart uses a Fluke 337 Clamp Meter.

- Troubleshoot compressor electrical motor faults.
- Check compressor motor line ac current and balance plus ac voltage and balance.

In a business and a state where keeping cool is Job One, Stuart's Fluke 52 Series II digital thermometer is essential.

- Together with the Fluke 80PK-8 Pipe Clamp and an 80TK Thermocouple, use the thermometer to measure pipe temperatures:
  - at the evaporator outlet and the compressor inlet on the suction line for superheat.
  - at the condenser exist for subcooling.
- Use the min/max feature to record temperature overnight and check for fluctuations in refrigerated spaces.

Another key tool is the Fluke 65 Infrared (IR) thermometer. The Fluke 65 uses laser beam targeting to pinpoint the measurement spot. Stuart uses it to quickly:

- Measure temperatures at a distance. For instance, checking the temperature of air supplied through a ceiling duct and looking for leaks.
- Scan for maintenance issues, such as motors or bearings running too hot.

- Measure hot or electrically live surfaces (steam traps, boilers, compressor heads, circuit breakers).
- Check compressor oil sump temperatures and evaporator coil and suction line temperatures.
- Measure the temperature of any object where a contact probe would be difficult to use.

### Relish the challenge

As an experienced HVAC tech, Stuart finds real satisfaction in his work. In 15 years he has seen just about every challenge imaginable, but still relishes the feeling of putting his knowledge and experience to work in the process of problem solving.

"I enjoy what I do," he says. "Every call is different. It requires an understanding of electrical, mechanical and physical principles. I really enjoy the days when I have to do a lot of intensive troubleshooting."

The complexity of HVAC systems can pose real challenges, even for an experienced technician. Stuart recalls one case that nearly had him stumped.

"I got a call from a national chain restaurant – they had no air conditioning in their dining room," Stuart says. "I went up and determined that our high voltage was there. We had our power on the disconnect."

Digging deeper, Stuart checked the transformer that steps power down from 208/230 volts to 24 volts and provides low-voltage control circuit power to the thermostat, relays and contacts. The breaker protecting the transformer was tripped.

"We determined the breaker was tripped, reset it, and boom, it tripped again," he says. On the startup, every contactor began to chatter before the system shut down. To Stuart, that was a sign of a short. Using his T5-1000, Stuart measured the current flowing through the transformer and determined it was far above the three-amp specification.

Working step by step, he disconnected each load in order, disconnecting two contactor coils and three relay coils that ran an indoor blower and two outdoor condenser fan motors. His goal: isolate which load was the "problem load," and probably shorted. He used his Fluke 179 DMM, which has the ability to read higher resistance (ohms) levels, to help track down the culprit. The higher capacity in measuring resistance could be important, since a short could exist even in the presence of high resistance.

"I went through all the loads, and found that I still had problems," Stuart says. "Ok, so now we're down to checking wires. I started looking and I noticed some wires that were running up against some copper piping. I looked closer, and finally saw one wire that had connected to a pressure sensor, that had rubbed through the insulation. I replaced the wire, started the system up, wrote my bill and got down the road."

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