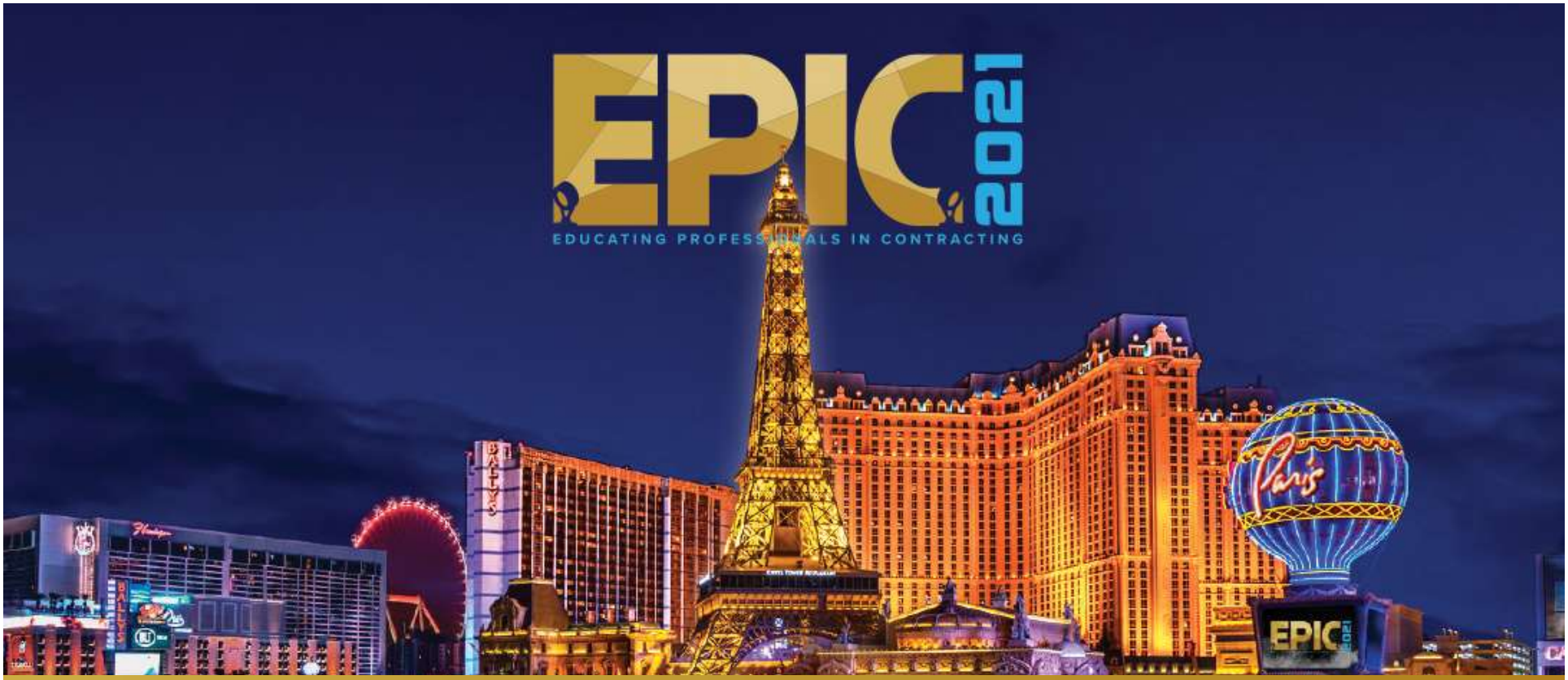

Higher Tech Sales – A Diagnostic Approach

Presented By: James R. Leichter

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Your Presenter: James R. Leichter

President & CEO, Aptora Corporation, Mr. HVAC LLC, RA Tax and Accounting Inc., founder of FlatRateSoftware.com

James is a successful entrepreneur and master mechanic whose accomplishments include being the founder of MrHVAC.com, the CEO and founder of Aptora, the President of RA Tax and Accounting and a partner with Pro-American Investments.

James' company MrHVAC.com is a website dedicated to improving the lives of contractors. It includes industry articles, specialized HVAC calculators, forms, templates and one of the most extensive operations manuals in the country.

As the founder of Aptora Corporation, he has created some of the most popular software programs in the service industry including Flat Rate Plus® and Total Office Manager®.

James is well known for his burning passion to help contractors and it shows in his unique speaking style. He has hosted management workshops all around the United States and has conducted onsite consulting since 1996 with hundreds of contractors.

Aptora MrHVAC.com Flat Rate Software RA Tax and Accounting Reliable, Accurate Service Since 1992

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Evaluating Service Department Profitability

How do we know if our service department is losing money? We need fully departmentalized income statements – down to NPBT.

- **Residential**
  - Demand Service
  - Replacements
  - Service Agreements
- **Commercial**
  - Demand Service
  - Replacements
  - Service Agreements

Let's Start With a Discussion on Diagnostics

Your Initial Diagnostic Findings

Your written diagnosis should contain two parts.

Part 1: Required Repairs

Your initial diagnosis and recommendations are designed to accomplish these objectives:

1. Get the system operational, addressing the client's original concerns.
2. Make certain that the entire system is absolutely safe to operate. This is not negotiable.
3. Place the system in a condition so that it should run approximately one year without requiring other repairs.
4. This work will be written out as "Required Repairs". We recommend that this amount be sub-totaled on the invoice.

Your Extended Diagnostic Findings

Part 2: Highly Recommended Repairs

Once your required repairs have been completed, you will now provide your recommendations for any other work that is needed to accomplish the following:

1. Get the system back to the manufacturer's original efficiency rating and capacity, as is reasonably possible.
2. Put the system in a state of condition so that it will likely run for several more years with nothing more than routine maintenance.
3. Address any IAQ or comfort issues that you have or that the client has mentioned.

Every Visit is a Safety Check

Every time you go on a service or maintenance call, you are on a safety check. You must be methodical and assertive.

- Every service call is a safety check.
- Be sure that you have evaluated the system for all safety issues that must be addressed.
- It does not matter why you were sent on the call.
- Put your finding is writing and verbally address them with the client.

Technicians Must Have Access to Parts and Supplies

The Importance of Inventory Control

You will be able to increase your department's efficiency.

- Inventory control on your demand service vehicles must be managed successfully.
- You must conquer this challenge, or you will not have accurate financials, Financial dashboards will be full of information holes, and your service department will not reach maximum efficiency.
- Remember, the requirement for service technicians is at least $750 in gross profit per person-day. That will not happen when techs are wasting time; especially while driving around picking up parts.

The Importance of Inventory Control

Technicians must have the correct parts and supplies to be great.

- It is important that technicians have quick access to the parts and supplies needed to perform quality work.
- If the technician does not have the items they need, they will be tempted to take shortcuts. This is not good for the client, and it will hurt the company's revenue. I have written a lot on this topic and invite you to search for my other articles on truck stocking and replenishment.

Just Google "James R Leichter truck stocking and replenishment."

Quick Overview of Truck Stock Replenishment Steps (1 of 2)

1. Identify someone in your company as the Warehouse Manager. This can be a title added to an existing person's current title.
2. Create a pseudo parts supply house in your building. Build a counter. Secure it. Techs are not allowed in. Do the best you can. Call it <Your Company Name> Supply. Add that name into Total Office Manager as a vendor.
3. Establish a well thought out truck stock list. Set minimum and maximum quantity on hand. You need one week worth of parts that cover approximately +90% of all service calls. Start with demand service.
4. Clean out each truck. Optimize and organize its storage. Stock each truck with that list and only that list. Monitor and adjust that list (just like a retail store would do).

Quick Overview of Truck Stock Replenishment Steps (2 of 2)

5. Stock your main warehouse (your building) with inventory equal to what is carried on one or two trucks (more or less, depending on your sales volume).
6. Train technicians to include all item numbers on each invoice (or work order). Monitor their compliance carefully.
7. During the weekend, update Total Office Manager to reflect your inventory stock. Go live the following Monday.
8. Replenish your main warehouse with items sold. Use the Inventory Replenishment Utility to order items. This is done once per week or when appropriate. Establish a firm schedule.
9. In your office, label a bin/box with each truck number. This will be used to store replacement parts.
10. Run the Inventory Reordering by Warehouse report. Pull items for each truck and place them into that bin/box.
11. Technicians will pick up their items during their next regularly scheduled visit to the office (like for a department meeting).

When Technicians Need to Order Parts

1. When technicians need a part in the field, they will create a PO using the Aptora app. If they must pick up the part that day, the PO will be created for the vendor they are visiting.
2. If the tech does not need the part that day or does not know where to get that part, the tech will create a PO from the app using the vendor called <Your Company Name> Supply.
3. The tech will add a detailed description of what they need and what equipment it is for. They will make sure the customer equipment has been added and includes an accurate model and serial number.
4. The Warehouse Manager will monitor the PO List for POs created for <Your Company Name> Supply (create a Global Filter). They will look to see if any of the parts are already on hand. They will order parts as needed.
5. The Warehouse Manager will acquire the parts and communicate with the technician. The technician will use the *Special-Order P*arts feature in their Aptora app. This will notify them as soon as the item is received (through an Item Receipt in Total Office Manager®).

Defining Your Service People

Few service people are true technicians. There are generally four types of people that perform service calls.

- Parts Changers
- Troubleshooters
- Technicians
- Master Technicians (Master Mechanic)

Introducing the Airplane Mechanic or A&P

- If you are a pilot or have worked around airplanes, you might be familiar with an A&P Mechanic. This is an individual who holds an Airframe and/or Powerplant (A&P) certificate which is issued by the Federal Aviation Administration (FAA). These technicians inspect aircraft as well as conduct preventative maintenance and repairs.
- An A&P Mechanic works under a strict code of conduct and must abide by detailed regulations. They are ultimately responsible for judging the airworthiness of the plane and will ground that plane if needed.
- For an A&P, the idea is to avoid making repairs. In the HVAC industry, we often refer to that work as “demand service”. The real goal of an A&P is to conduct high level preventative maintenance. They need to replace components before they fail, since failure can result in the loss of the plane and all the passengers.

Think Like an Airplane Mechanic

If you want to be the ultimate Master HVAC Technician, then you must start asking yourself "what would an airplane mechanic do?"

- HVAC technicians must think like A&Ps with respect to preventative maintenance. It is impressive when a person can determine that a component has failed and knows how to replace it. It is far more impressive when a technician can detect an imminent failure and replace that component before it fails. That is what separates "parts changers" from "technicians".
- Technicians must carry the proper tools and have easy access to a full range or parts and supplies. It is vital to have certain diagnostic tools and understand how to use them.
- Technicians must also have well-stocked trucks. They need to be able to have easy access to the parts needed. When we don't have the correct parts and materials, we tend to take shortcuts that we know we should not take.

Produce Professional Documentation

You are judged by how well you document your work and opinions.

- Because of the seriousness of their work, the A&P is expected to maintain professional level documentation. The work of a HVAC technician is just as serious, and the technician's paperwork should reflect that fact. Document everything that you did. Include your recommendations and classify them as "Required" and "Highly Recommended". If your recommendations are not accepted, document that fact.
- Here is an example. Your required recommendation is to add refrigerant. This action is required to get the heat-pump working. Your highly recommended task is to locate and repair the leak. If they decline, there will likely be a call-back. You will document the fact that refrigerant will likely continue to leak, resulting in additional service calls and fees.

Professionalism Through Vocabulary

We are judged by how we look and how we sound. These two factors may or may not accurately reflect our true selves.

- The military, police, and other emergency services have their own vocabulary.
- So do all other professional industries. Examples include architects, engineers, scientists, doctors, and more.
- To be professional, we must first look professional and then sound professional.
- We are truly judged by how we look and then how we sound.
- A full sheet is on the EGIA EPIC App

HVAC GRAMMAR SCHOOL

Forbidden Words & Phrases	Suggested Alternatives
Air-Cleaner	Air Filtration System (Air Purification)
Bid	Proposal
Boss	(Don't ever say "boss")
Buy/Purchase	Own
Cash On Delivery	Cash on Completion
Change-out	Replace
Checked	Inspected and Tested
Clean & Tune/Check	Precision Tune-up
Credit Application	Account Application
Contract	Agreement
Customer	Client
Deal	Opportunity
Dispatcher	Production Coordinator
Down Payment	Initial Investment
Employee	Co-Worker
Excuse	Explanation
Fixed	Resolved
Girls in the Office	Customer Satisfaction Representative
Heating & Cooling System	Comfort System
Humidifier	Humidification System
Insulation (duct)	Acoustical/Energy Lining
Installer	Installation Technician
Invoice	Technician's Report
Maintenance Contract	Safety & Efficiency Agreement
Maintenance Guy	Precision Tune-up Specialist
Manager [Department]	Department Leader
Monthly Payment	Monthly Investment
Objection	Concern
Oil	Lubricate
Options (IE: humidifier)	Comfort Enhancements
Owner	President
Parts Runner	Material Handling Specialist
Price or Total Price	Investment or Total Investment
Problem	Challenge or Situation
Put It Back	Replaced It
Repairman	Technician
Sales Call	Presentation
Salesman	Systems Consultant
Serviceman	Technician
Signature	Approval
Thermocouple	Pilot Safety
Work For	Work With
Work (IE: "Do the work")	Procedure
Your Price/Cost	Your Investment

Your vocabulary, the words that you use, can be a very powerful tool. Don't ever assume that our customers are technically inclined like us. Use simple, non-technical, easy to understand language, to make your point.

Clear Up Confusion with the Phonetic Alphabet

It is important to be understood. Plus, you can sound more professional at the same time.

The military, pilots, police, and other emergency services use a standardized method of calling out letters. This is known as the “Phonetic Alphabet”. Its use improves efficiency, helps assure understanding, and adds a higher level of professionalism to the service technician.

Alpha	Golf	Mike	Sierra	Yankee
Bravo	Hotel	November	Tango	Zulu
Charlie	India	Oscar	Uniform	
Delta	Juliet	Papa	Victor	
Echo	Kilo	Quebec	Whiskey	
Foxtrot	Lima	Romeo	X-Ray	

Technicians Must Have the Correct Tools

Advanced Diagnostic Tools

In addition to the common tools you may already own, we recommend that you also acquire some specialized tools.

1. Vane Anemometer
2. Wet Bulb/Dry Bulb Digital Thermometer
3. Digital Refrigerant Gauges with Remote Temp. Sensors
4. Combustion Analyzer
5. Carbon Monoxide Detector
6. Digital Manometer
7. Air Quality Analyzer
8. Megohmmeter
9. High Quality True RMS Multimeter
10. Capacitor Tester (unless the multimeter has a good one)
11. LCR/ESR Capacitor Tester (many LCRs do both)

Calculating A\C Performance

Calculate BTU Removal Per Hour

- The capacity of an air conditioning system is usually measured by determining how many BTUs of heat a system can remove per hour of continuous operation.
- By taking the time to calculate system capacity and efficiency, you will know definitively if the system is operating correctly.
- Even if the system is operating at near 100% of its design, we still need to perform a thorough evaluation of the system and each of its components.

Megohmmeter Basics

MEGOHMMETER - A meter capable of measuring resistances greater than 200 megohms.

- Regular ohmmeters typically measure less than 200 megohms.
- Megohmmeters generate high voltage, low current signals for testing the integrity (breakdown strength) of electrical insulation.
- They are called megohmmeters because the insulating resistance of a properly designed product is expressed in megohms (MO).

Using the Megohmmeter

This only covers very basic usage. Further study is needed to get the most out of this important tool.

- Test insulation resistance of motor wires and windings by using megohmmeter between T1, T2, & T3 leads. Each reading between phases should be within one or two ohms of each other; A to B, B to C, A to C.
- Use megohmmeter to test insulation resistance to ground of motor windings on 500-volt scale; minimum reading is 1,000 ohms of resistance per volt of incoming power that motor will be connected to.
- Test motor for resistance to ground with megohmmeter, if reading is below 500,000 ohms motor is grounded and must be replaced.

Using the Megohmmeter

Test Wires and Grounding Systems

1. Be sure all power supplies are off and secured.
2. Touch either of the megohmmeter's leads to the ground being used for that electrical system. For example, if the system you are testing is a condensing unit, connect a lead to the cabinet itself, since it is grounded.
3. Touch the other lead to the copper wire you are testing.
4. Anything reading between 2 megohms and 1,000 megohms is usually considered a good reading. Anything less than 2 megohms indicates an insulation problem.
5. This process can be used to evaluate almost any high voltage circuit.
   - Test motors, pumps, and circuits.
   - Test grounding systems
   - Analyze motors and controls
   - ALWAYS test compressors BEFORE performing major work. You don’t want to cleanup a system, fix leaks, charge it, turn it on, and find out the compressor failed or fails in a short period of time later.

Use a CO Detector

Carbon monoxide detectors are an essential tool, but they do not prove that a system is safe.

- ALWAYS test outgoing air at the plenum and various air vents.
- Be sure your CO detector is in good working order and have it calibrated per the manufacturer's recommendations.
- WARNING: NEVER use a CO detector to PROVE a furnace is SAFE. Use a CO detector to prove the furnace is UNSAFE.

Tip: Test the furnace when it is cold and when it is hot. Be sure furnace has been operating for at least 15 minutes. You need the heat exchanger to be hot.

Use a Combustion Analyzer

Test flue emissions for correct levels. Adjust burners and\or combustion air as needed.

- Measure Oxygen (O2)
- 2% to 6% (I adjust to the middle of acceptable range)
- Measure Carbon Dioxide (CO2)
  - Carbon Dioxide: Between 8 1/2% to 10% in the flue gas.
- Measure Carbon Monoxide (CO).
  - Carbon Monoxide: As close to zero as possible.
- Calculate COAF (CO air free) and excess air (EA).
  - The limit in flue gases is 400 ppm CO air free, according to ANSI Z 21.1

Use an Air Quality Analyzer

An air quality analyzer is an easy way to assess a client's air quality. You can set it up in a central area and let it run until you have completed your service or maintenance work.

- Measure and Document
  - Carbon Dioxide (CO2),
  - Formaldehyde (HCHO)
  - Volatile Organic Compound (TVOC)
  - Particle Matter (PM2.5/PM10)
- Always test outgoing air at the return intake, plenum, various air vents, and most rooms.

What is a True RMS Multimeter?

If you are not using a True RMS multimeter, you might not be making a correct diagnosis.

- RMS stands for Root Mean Square and TRMS (True RMS) for True Root Mean Square. The TRMS instruments are much more accurate than the RMS when measuring AC current.
- True RMS responding multimeters measure the "heating" potential of an applied voltage. Unlike an "average responding" measurement, a True RMS measurement is used to determine the power dissipated in a resistor. The power is proportional to the square of the measured True RMS voltage, independent of waveshape.

Use a True RMS Multimeter

There are lots of components that need to be evaluated.

- Test switches, contacts, disconnects, etc. for electrical resistance. They should read 0.08 ohms or less.
- Test and record motor voltage balance. An imbalance can cause higher than acceptable operating temperatures. Voltage difference between poles should not exceed 1%.
- Test for adherence to nameplate voltage while motor is running. Voltage variation should not be below 90% or exceed 110% of nameplate.
- Test for voltage drop. Measure and record no-load voltage at the breaker and then measure full load voltage at the motor or compressor.

It’s All About Airflow

When it comes to HVAC, nothing matters until we have complete and proper airflow across the evaporator coil and condensing coil.

- Always begin your diagnostics or maintenance by making sure that all coils and fan blades are clean.
- Inspect the duct work and verify that the static pressure is within acceptable ranges.
- Verify that there is proper airflow and address any airflow issues before doing anything else.

Electrical Component Inspection and Replacement

The airplane mechanic's goal is to replace components before they fail.

- Recommend replacing any component with silver coated contact that shows signs of pitting or corrosion. This includes switches, relays and especially contactors.
- Recommend replacing any terminal or electrical connection that shows signs of high heat, corrosion, pitting, or wear. Don't forget to inspect compressor terminals, fuse boxes, and breaker seats.
- Recommend replacing any motor that shows clear signs of high continued operating temperatures.
- Recommend replacing any motor or pump whose bearings indicate signs of excessive wear or unacceptable mechanical 'play'.
- Recommend replacing fuses that appear to be in poor condition.
- Verify correct wire\breaker size. Verify one conductor per breaker. Tighten all electrical connections. Inspect seats. Verify proper grounding. Verify that the furnace and a\c have their own dedicated circuit.

Electrical Component Replacement

Be careful and methodical. We do not want call-backs.

- Inspect breaker switches for signs of high heat. Replace breakers that are suspected of being ‘weak’; especially when they are more than ten years old.
- Carefully inspect and test all electrical systems and ALWAYS seek permission before replacing.
- Recommend replacing fuses that appear to be in poor condition.
- Open breaker panels and side panels (if allowed in your area). Verify correct wire\breaker size. Verify one conductor per breaker. Tighten all electrical connections. Inspect seats. Verify proper grounding. Verify that the furnace and a\c have their own dedicated circuit.
- Inspect breaker switches for signs of high heat. Replace breakers that are suspected of being ‘weak’; especially when they are more than ten years old.
- Carefully inspect and test all electrical systems and ALWAYS seek permission before replacing.

Identifying Code Violations

Service technicians need to be familiar with all local and national codes related to their job. Your priority are safety related codes.

- Condensing Furnace Flue Pipe Assembly
- Non-Condensing Furnace Flue Pipe Assembly
- Makeup Air
- Gas Piping
- Electrical Grounding and Isolation
- Electrical Safety Disconnect Switches
- Breaker and Fuse Sizing
- Duct Fasteners
- The list goes on and on . . .

Other Repair Opportunities

Service technicians must look for other legitimate repair opportunities that others might miss.

- Replace leaking Schrader valves and replace missing or improper service valve caps.
- Don’t forget the humidifier - even in the summertime. Replace bad Saddle Valves. Water panels should be replaced each year.
- Repair or replace condensate and other drain lines. Recommend the replacement of any non-PVC drain assembly. Copper is ideal for commercial work.
- Upgrade thermostats – even at lower profit margins.

Tip: All of this is very difficult when quoting a client “risky” time and material pricing. Flat rate users will notice sales of “extras” will increase significantly.

Ongoing Technical Training is Required

Conduct Regular Training

Regular, well thought out, consistent training is an absolute must if you are going to have a successful service department.

- Weekly meetings on various service-related topics.
- Thirty minutes each.
- No management or HR issues are discussed.
- Everyone gets paid.
- Everyone shows up on time.
- Start and stop on time.

Design the “Perfect Service Call”

It Starts with Service Dispatching

We must give technicians time to do their job, otherwise we cannot ask them to meet our KPI requirements.

- Technicians must be carefully controlled by the dispatchers (CSR).We must maximize their billable time and minimize their unbillable activities.
- Dispatch technicians from their home to the first call of the day.
- Dispatch one call at a time. Schedule four per day. Don’t bother the technician while on the job.
- Technicians must keep office informed of progress and advise if the call will take over 1.5 hours (residential - working time). Commercial work and geographical considerations may change this time. Your business might have a different requirement.
- Technicians must only come to the office when it is allowed.

Tech Training: Service Call Presentation

Arriving at the Client's Home

- The technician should be properly uniformed according to current company policy.
- When parking your vehicle, never park your vehicle in the client's driveway. Your truck should be clean and properly lettered according to company policy.
- Park your vehicle on the street, locating it so the client can see it from their front door. This eliminates the chance of automobile fluid staining their driveway, and you never know who will be pulling in or out of the client's driveway or who's parking spot you'll be taking.
- Double-check your appearance. Be certain that your shirt is tucked in. If you're wearing sunglasses, remove them. Do not chew gum or tobacco while on client property. Follow company policy.
- You will need to take business cards, shoe covers, a clean piece of carpet (e.g.: plain door matt), a flashlight, tool container (toolbox, tool bag, tool belt, etc.), service invoice, and a flat rate price book.

Tech Training: Service Call Presentation

Approaching the Front Door

- When approaching the client's front door, never walk across their lawn. Always use cement-paved pathways, don't walk on flowers or bedding!
- Open the outer door (if possible) and knock three times on the door. If no answer, knock three times again. Wait thirty seconds between knocks. Do not use the doorbell until you have tried knocking three times.
- Have a business card in your left hand, with the logo facing up.
- Step back, away from the door, approximately 4 feet (you should be parallel with your toolbox). This allows the client to completely see your upper torso when looking through their peephole or window.

Tech Training: Service Call Presentation

Making Your First Impression

The visual picture the client should see when they open the door is a clean-cut service technician, wearing a clean uniform with a photo ID badge. The client should also be able to look over the technician's right shoulder and see a clearly marked service vehicle parked at the curb.

- Have a business card in your left hand, with the logo facing up.
- When the client answers the door, introduce yourself, using your first name only. Identify the company you're with and why you're there.
- Hand them the business card with your left hand. Your right hand should always remain free, in case the client offers to shake your hand.
- Never offer to shake a lady's hand, but politely do so if she extends her hand.
- Your handshake should be less aggressive than the other person's.

Tech Training: Service Call Presentation

Entering the Residence

- Wait for the client to invite you into their home, or ask “May I come in please?” Put on your shoe covers, pick up your toolbox, and enter their home.
- NEVER place your toolbox on any type of floor. Do not place on carpet, vinyl, tile, hardwood, plywood or cement. Instead, carry a small piece of carpet with you, place the carpet on the floor and then place your toolbox on top of that. An inexpensive, welcome-type mat is a good solution.

Tech Training: Service Call Presentation

Beginning The Service Call

- Use this opportunity to ask your client some important questions:
  - How long have they lived at the residence?
  - How long do they plan to live there?
  - Confirm with them the problem you're here to diagnose (example: "The office indicated that your toilet is leaking?").
  - Allow the client to explain the problem in their own words.
  - Is there anything their system doesn't do that they wish it could?
  - Ask about service history on the equipment.
- Let the client know that you're going to get to work by testing their complete system and that once you have concluded what the problems are, you will report back to them with all the details.
- Assure them that absolutely no repairs will occur without their express prior approval.

Tech Training: Service Call Presentation

Initial Invoice Preparation

- Once you've determined the service problem, document the problem on the invoice. Be sure to list the following:
  - The task number
  - The task description
  - The client's total investment for repairs
  - Mandatory and/or highly recommended repairs
  - Optional repairs and/or upgrades as needed.

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Tech Training: Service Call Presentation

This is the best time to mention your company's service agreement program.

- Ask if they own a SEA. "I just wanted to see if you qualified for the <callout the dollars and cents> discount".
- I will replace your "contactor" for a total investment of $_____.
- Once that work is complete, I'll run your system for approximately fifteen minutes. That will allow me to conduct the rest of the diagnostic process. Nothing else happens without your approval.
- If additional repairs are needed, quote them.
- Sell extra services. There are plenty of legitimate repair opportunities out there.

Let’s Wrap This Up

Approach Your Job With Seriousness and Diligence

You can define your own service level.

- Approach HVAC maintenance with seriousness and diligence, recognizing that lives and safety depend on you. Use only accepted/approved methods, techniques, and practices to perform maintenance or other authorized tasks.
- If you find yourself riding on an airplane, you should hope that it has been maintained by good A&Ps. If they do not do their jobs, people can and have died.
- The same is true for HVAC technicians.