



Tools of the Trade

MODULE F2

FOUNDATIONS

PREREQ F1

It is 9:40 AM in Surprise, Arizona. A homeowner says her AC "just isn't keeping up." The tech ahead of you guessed: he looked at the outdoor unit, heard it running, and added refrigerant. The system got worse. You are the second visit. You do not guess. You clip two probes on the copper lines, clamp a meter around a wire, slide a thermometer into a supply vent, and within fifteen minutes you know exactly what is wrong, and you can prove it. The difference between those two technicians is not talent. It is instruments, and knowing what each one tells you.

This module is your introduction to every tool on an Island Breeze truck: what it is, what it measures, why it matters, and how to keep it accurate. You will not master every tool today. You will meet all of them, because every module after this one assumes you know what a manifold, a micron gauge, and a clamp meter are.

Short Version

Hand tools open the equipment. Instruments tell you the truth about it. A multimeter reads electricity (volts, ohms, amps). A manifold or a set of digital probes reads refrigerant pressures and temperatures. A micron gauge proves a system is clean and dry inside before you seal it up. A scale weighs refrigerant in and out so you never guess at charge. A recovery machine pulls refrigerant out of a system legally and safely. New A2L refrigerants (mildly flammable) require A2L-rated versions of the recovery machine and leak detector, plus dedicated hoses. Take care of your instruments and they tell you the truth. Neglect them and they lie to you, and you will make the lie worse by acting on it.

Key Values

ITEM	VALUE	WHY IT MATTERS
Multimeter safety rating	CAT III, 600 V minimum	CAT (measurement category) ratings describe how big a voltage spike the meter can survive. Residential HVAC circuits require CAT III. A lower-rated meter can fail violently on a surge.
Micron gauge range and resolution	Reads at least 0 to 9,999 microns, resolution of 1 micron below 1,000	The evacuation target is 500 microns. A gauge that cannot resolve single microns near 500 cannot prove a decay test.
Refrigerant scale resolution	0.25 oz (about 5 g) or finer, capacity 220 lb	Manufacturer charge adjustments are often specified in fractions of an ounce per foot of line set. A coarse scale cannot follow the spec.

ITEM	VALUE	WHY IT MATTERS
Refrigerant hose rating	800 psi working pressure, 4,000 psi burst, low-loss fittings	R-410A and A2L systems run high pressures. Low-loss fittings are required by EPA rules on recovery equipment and they cut refrigerant loss at every disconnect.
Flare torque, 1/4 inch line	Roughly 10 to 14 ft-lb (always confirm against the manufacturer table)	Under-torqued flares leak. Over-torqued flares crack. A torque wrench removes the guess.
Flare torque, 3/8 inch line	Roughly 24 to 31 ft-lb	Same rule: torque to the table, not to feel.
Flare torque, 1/2 inch line	Roughly 36 to 45 ft-lb	Larger flares need more torque but the crack risk grows too.
Flare torque, 5/8 inch line	Roughly 45 to 60 ft-lb	The big suction flare on mini-splits. The most common leak point when done by feel.
Nitrogen flow purge while brazing	2 to 5 SCFH (standard cubic feet per hour) on a flow meter	Flowing nitrogen displaces oxygen inside the pipe so brazing heat cannot create scale inside the lines.
A2L tool differences	A2L-certified recovery machine, A2L-certified leak detector, flammable-rated recovery cylinders with left-hand threads, dedicated hoses, refrigerant profiles for R-454B and R-32 on gauges, vacuum pump switched away from the work zone, dry powder or CO2 fire extinguisher on site	A2L refrigerants are mildly flammable. Tools that touch them must be designed not to become an ignition source, and cylinders use different hardware on purpose so the wrong tank cannot be connected by accident.

Field Checklist

Run this check every morning before leaving the shop. It takes four minutes and it prevents the worst kind of service call: the one where you arrive and cannot do the job.

- Multimeter powers on, battery above low warning, leads free of cracks or exposed wire
- Clamp meter zeroed and reading 0.0 A with nothing in the jaw
- Probes or manifold present, hose gaskets intact, no oily residue at fittings (oil residue means a leak)
- Micron gauge powers on and reads atmosphere when open to air
- Refrigerant scale powers on, zeroes with nothing on the platform
- Vacuum pump oil clear and at the fill line, not milky or dark
- Recovery machine present, inlet filter clean, hoses dedicated and capped
- Recovery cylinder below 80 percent full, correct type for the refrigerant on today's jobs
- Nitrogen tank pressure noted, regulator and flow meter attached and undamaged

- Leak detector powers on, completes its warm-up, sensor within its service life
- Torque wrenches stored at their lowest setting, in their cases
- Battery tools charged, spare batteries packed, none left loose in the cab
- Thermometer and psychrometer present, probe tips clean
- Flashlight or headlamp charged
- PPE complete per the F1 standard: safety glasses, gloves, hearing protection

IB STANDARD

Every Island Breeze truck carries the full standard kit, verified weekly against the kit sheet by the technician and spot-checked by the Lead Tech. The kit: insulated hand tool set, nut driver set (1/4 and 5/16), multimeter rated CAT III 600 V, clamp meter, manifold gauge set with 800 psi hoses, digital probe set (two pressure, two pipe-clamp temperature), micron gauge, refrigerant scale, recovery machine, vacuum pump with spare oil, nitrogen tank with regulator and flow meter, electronic leak detector, torque wrench set with flare crowfoot adapters, swage and flare tooling, tubing cutters and deburring tool, thermometer and digital psychrometer, fin comb, coil cleaning sprayer, drain tools, headlamp, and the full PPE set. A2L additions on every truck: A2L-certified recovery machine, A2L-certified leak detector, flammable-rated recovery cylinder with left-hand thread fittings, a dedicated A2L hose set that never touches other refrigerants, and a dry powder fire extinguisher. Missing or broken items are reported the same day, not at the weekly check.

Full Breakdown

Hand tools and their HVAC-specific uses

You already know what a screwdriver is. What you may not know is which ones the trade actually lives on and why.

The 1/4 inch and 5/16 inch nut drivers are the two tools you will touch the most. Nearly every panel screw on residential equipment is one of those two hex sizes. A magnetic-tip nut driver means you stop dropping screws into condenser fan blades.

Insulated screwdrivers and pliers have a rated nonconductive coating so a slip against a live terminal does not become a short circuit through the tool. The rule from F1 still stands: you verify power is off before working, but insulated tools are the backup layer for the day a disconnect is mislabeled.

A service valve wrench (often called a refrigeration ratchet) has square drive openings sized for the valve stems on older equipment and the hex heads on service caps. Channel-lock style pliers handle condensate fittings and fan hubs. An adjustable wrench backs up flare nuts so the line does not twist when you torque the fitting. Wire strippers sized for 18 gauge thermostat wire through 10 gauge power wire cover almost everything residential. A crimper and an assortment of terminals let you make repairs that look factory, not field-improvised.

Two cutting tools matter: a tubing cutter for copper (never a saw, which fills the line with chips) and a deburring tool to clean the cut edge so copper shavings never enter the refrigerant circuit. Shavings in the circuit end up in the metering device, and you will learn in C11 how small that opening is.

Manifold gauges: anatomy and reading them

A manifold gauge set is the classic refrigerant instrument: two gauges, a valve body, and three hoses.

The blue side is the low side. Its gauge is a compound gauge, meaning it reads both pressure (psi above atmospheric) and vacuum (below atmospheric). It connects to the suction line side of the system, the larger, cooler pipe. The red side is the high side. Its gauge typically reads 0 to 500 psi or more and connects to the liquid line side, the smaller, warmer pipe. The center hose, usually yellow, is the utility port: it connects to a refrigerant cylinder, a vacuum pump, or a recovery machine depending on the task.

The two hand wheels on the manifold body do not open the system. They open paths between the hoses inside the manifold. With both wheels closed, the side hoses still read system pressure on the gauges. Opening a wheel connects that side to the center hose. This is the single most misunderstood thing about a manifold: gauges read with the wheels closed; the wheels are for moving refrigerant or vacuum through the center port.

Around the rim of each analog gauge are temperature scales for specific refrigerants. These convert pressure to saturation temperature, the temperature at which that refrigerant boils at that pressure. You will spend all of F5 on this idea. For now: the needle position tells you a pressure and, via the scale, a coil temperature.

Hoses deserve respect. They are rated around 800 psi working pressure with a 4,000 psi burst rating, they have a gasket in each end that wears out, and they hold a small amount of whatever refrigerant last passed through them. Low-loss fittings, small valves built into the hose ends, trap that refrigerant instead of venting it when you disconnect. EPA rules require low-loss fittings on recovery equipment hoses, and good practice puts them on everything.

IB STANDARD

Hose discipline is a kit rule, not a preference. R-410A hoses and A2L hoses are separate, labeled sets. A hose that has carried R-454B never connects to an R-410A system, and the reverse. Mixed refrigerant traces contaminate recovery cylinders, and reclaimers reject contaminated refrigerant.

Digital probes vs analog manifolds: when each wins

Digital probes are small wireless sensors that screw directly onto the service ports and clamp onto the pipes. A pressure probe reads pressure and computes saturation temperature for the refrigerant you select in the app. A clamp probe reads pipe temperature. Together they compute superheat and subcooling (the two numbers you will learn to love in F6) automatically and stream everything to your phone.

When probes win: almost all diagnostics. They connect with less refrigerant loss because there are no hoses to fill, they remove the math errors, they log data over time so you can watch a system stabilize, and the readings land in your documentation automatically.

When the analog manifold wins: any time you need to move something. Recovery, evacuation, charging, and nitrogen pressure testing all need hoses and a manifold (or a charging-specific digital manifold). An analog

manifold also needs no batteries, which matters at 6 PM on the fourth call of a summer day. And reading an analog needle teaches you the pressure-temperature relationship in a way an app that does the math for you never will.

The honest answer is both live on the truck. Probes for reading, manifold for moving.

Multimeter: anatomy, CAT ratings, and the modes a tech actually uses

A multimeter measures electrical values. Anatomy: a display, a rotary dial that selects the mode, and jacks where the test leads plug in. The black lead always lives in the jack marked COM (common). The red lead moves: it goes in the V-ohm jack for voltage and resistance, and into a separate amps jack on meters that measure current through the leads. Putting the red lead in the amps jack and then probing a voltage source is one of the fastest ways to destroy a meter, because the amps jack is a near-short circuit by design.

CAT ratings: CAT stands for measurement category, and it describes the size of voltage transient (a brief spike, such as from a lightning strike or motor switching) the meter can absorb without failing dangerously. CAT II covers plug-in loads. CAT III covers fixed equipment and distribution wiring, which is where HVAC equipment lives. CAT IV covers the utility service entrance. The IB floor is CAT III 600 V. The rating is printed next to the jacks. A cheap unrated meter can rupture in your hand during a transient. This is not a scare story; it is why the rating system exists.

The modes a tech actually uses:

1. AC voltage (V with a wavy line). Confirms power is present and at the right level: roughly 240 V at the condenser, 120 V at the furnace, 24 V on the control circuit. Also the mode for the most important safety act you perform: verifying power is OFF before you touch anything.
2. Ohms (the omega symbol). Measures resistance, only ever on a de-energized, disconnected component. Tells you if a winding, fuse, or safety switch has continuity (a complete path) or is open (broken path).
3. Continuity (speaker symbol). Ohms with a beeper. Fast yes-or-no path checking.
4. Capacitance (a symbol like two plates). Tests capacitors, which you will meet properly in F8. The component must be discharged first; F1 covered why.
5. DC voltage (V with straight lines). For control boards, sensors, and inverter electronics later in the course.

Auto-ranging meters pick the scale for you. Trust the mode you selected, not the meter to read your mind: a meter set to DC volts touching an AC circuit reads near zero, which has fooled techs into believing a live circuit was dead. Mode first, then measure.

Clamp meter

A clamp meter (also called an amp clamp) measures current, the flow of electricity, without breaking into the circuit. The jaw clamps around ONE conductor and senses the magnetic field the current creates. Around one wire: real reading. Around two wires of the same circuit: the fields cancel and you read near zero.

Why it earns its place: current is the truth-teller about load. A compressor's amp draw compared to its nameplate RLA (rated load amps) tells you how hard it is working. A blower motor pulling above its rating is fighting something, often airflow. Most clamp meters also include voltage and ohms modes, and the better

ones add inrush capture, which freezes the brief startup current spike that a normal reading misses. You will use inrush constantly in D23.

Micron gauge: theory and placement

After any system is opened for repair, the air and moisture inside must be removed before refrigerant goes in. Moisture plus refrigerant plus oil forms acid, and acid eats compressors from the inside. The removal process is evacuation: a vacuum pump pulls the system down to a deep vacuum so water actually boils away at room temperature.

The micron gauge measures how deep that vacuum is. A micron here is a unit of absolute pressure: 760,000 microns is normal atmospheric pressure, and 500 microns, the target, is a near-perfect vacuum. The compound gauge on your manifold is useless at these levels; its entire vacuum scale is crushed into the last sliver of needle travel. The micron gauge is an electronic instrument (most use a thermistor sensor, which senses how the thinning gas changes heat flow) and it resolves single microns where it counts.

Placement is the part everyone gets wrong. The gauge must read the SYSTEM, not the pump. Mount it on the system side, as far from the pump as practical, ideally on a port away from where the vacuum hose connects. A gauge mounted at the pump reads the pump's vacuum, which is always better than the system's. Mount it upright so pump oil cannot migrate into the sensor, because oil contamination is the number one killer of micron gauge accuracy.

The decay test: pull down to target, valve off the pump, and watch. A tight, dry system holds. A rise that climbs and keeps climbing is a leak. A rise that climbs and levels off is moisture still boiling out. C15 turns this into a full procedure; today you only need to know what the instrument is and where it goes.

Refrigerant scale

A refrigerant scale is a precision platform scale built for cylinders. The cylinder sits on it during charging or recovery, and the display tracks weight change, which is refrigerant moved. Resolution matters: 0.25 oz or finer, because manufacturer charging tables work in fractions of an ounce per foot of line set. Capacity matters: 220 lb covers any cylinder you will lift.

The discipline is simple and absolute: zero the scale with the cylinder on it before you open a valve, write down or photograph the final number, and never bump the platform mid-job. Weighing charge in and out is the difference between knowing a system's charge and guessing at it, and it is also how recovered refrigerant gets documented. Place the scale on a hard, level surface: gravel and rock landscaping, the default Phoenix yard, will rock the platform and corrupt the reading. Carry a small rigid board for exactly this.

Recovery machine anatomy

The recovery machine is a pump that pulls refrigerant out of a system and pushes it into a recovery cylinder. Venting refrigerant is illegal; recovery is how every drop is captured. The machine is a refrigeration circuit in a box: an inlet where system refrigerant enters, a compressor, a condenser with a fan to turn the vapor back to liquid, and an outlet to the cylinder. An inlet filter drier protects the machine from debris and acid, and it gets replaced on a schedule, not when it clogs.

Two operational facts to bank now, expanded in C14 and C15: machines built after November 15, 1993 must be EPA certified and use low-loss fittings, and recovery cylinders are never filled past 80 percent of capacity, because liquid refrigerant expands with temperature and a hydraulically full cylinder is a bomb.

IB STANDARD

The A2L recovery machine on each truck is a separate, A2L-certified unit. A2L-certified means the machine is designed so its own electrical components cannot ignite the mildly flammable refrigerant passing through it. It pairs only with flammable-rated recovery cylinders, which use left-hand threads so a standard hose cannot be connected by mistake, and with the dedicated A2L hose set. The standard machine never touches R-454B or R-32. No exceptions, including "it was just a few ounces."

PHOENIX FIELD NOTE

Recovery machines reject heat through their condenser, and at 112 F ambient they struggle. Work in shade where possible, keep the recovery cylinder out of direct sun (a hot cylinder raises cylinder pressure and slows recovery to a crawl), and consider an ice-water bath for the cylinder on big recoveries. A machine that thermally overloads mid-job is not broken; it is hot. Let it cool, improve its airflow, and restart.

Vacuum pump anatomy and oil care

The vacuum pump does the evacuating; the micron gauge does the proving. A two-stage rotary vane pump (two pumping chambers in series) reaches deeper vacuum than single-stage and is the standard. Anatomy: an intake port where the hose connects, the vane cartridge, an oil reservoir with a sight glass, a gas ballast valve (cracked open early in evacuation, it helps the pump exhaust moisture instead of absorbing it), and an exhaust.

The oil is not a lubricant detail. The oil IS the seal that lets the pump reach deep vacuum, and it absorbs the moisture pulled from systems. Wet oil turns milky and the pump's ultimate vacuum collapses. The care rule: check the sight glass before every use, change the oil when it is anything but clear, and on a wet system change it mid-job if needed. Oil is cheap in effort compared to a failed evacuation repeated at 4 PM.

For A2L work, position the pump and its switch away from the immediate work zone. The pump's exhaust and its motor switch are both managed as potential ignition sources around a refrigerant that can burn.

Leak detectors: a preview

You will meet leak detection properly in D27. Today, know what is on the truck: an electronic leak detector (a heated-sensor sniffer that signals when refrigerant molecules hit it), bubble solution (the timeless soap test, cheap and unambiguous), and UV dye equipment on some trucks. Electronic detector sensors have a service life measured in hours of use and they must warm up before they are trustworthy. The A2L detector is a separate, A2L-certified unit designed to sense R-454B and R-32 reliably and to be intrinsically safe around them.

Nitrogen regulator and flow meter

Nitrogen is the trade's inert workhorse: it pressurizes systems for leak testing and it flows through lines during brazing so the inside of the pipe stays clean. It arrives in a high-pressure cylinder, often above 2,000 psi, which

is why it never connects to anything without a regulator.

The regulator screws onto the cylinder and steps that pressure down to a usable level. Two gauges: cylinder pressure (how much is left) and outlet pressure (what you are delivering). The flow meter is a separate device for brazing: it meters a gentle trickle, 2 to 5 SCFH, because a purge needs flow, not pressure. Pressure testing uses the regulator set to the system's rated test pressure, never above the nameplate test pressure, and never with oxygen or compressed air, which can explode when they meet refrigerant oil.

Thermometers and psychrometers

Temperature is half of every refrigerant measurement, so the thermometer family matters more than it looks.

A pipe-clamp thermocouple grips the copper line and reads line temperature, the number that pairs with pressure to give superheat and subcooling. Strap-on contact matters: a loose clamp on a dirty pipe reads the air, not the copper.

An air probe thermometer reads supply and return air temperatures, giving you temperature split, one of the fastest health checks on a system.

A psychrometer measures humidity along with temperature. The number you need from it is wet bulb temperature, a reading that accounts for moisture in the air. Charging a fixed-orifice system (C17) requires indoor wet bulb. A digital psychrometer reads it directly.

An infrared (IR) thermometer reads surface temperature from a distance. Useful for quick scans, untrustworthy for precision: shiny copper reflects IR badly and reads wrong. Never compute superheat from an IR gun.

PHOENIX FIELD NOTE

Instrument accuracy specifications assume the instrument itself is at a sane temperature. A probe that sat in a 140 F truck cab reads high until it acclimates; give probes and gauges several minutes at the unit before trusting them. LCD displays black out in direct summer sun and recover in shade. And store electronics in the cab or an insulated tote, not the bed boxes, where summer interior temperatures will cook batteries and drift sensors.

Specialty tools: swage, flare, and tubing tools

Copper joining has its own toolset, covered hands-on in C16. The preview:

A swage tool expands the end of one copper tube so another tube of the same size slips inside it, creating a brazeable joint without a coupling. A flare tool shapes the tube end into a 45 degree cone that seals against a fitting when the flare nut draws it tight; this is the standard mini-split connection. A tubing bender curves soft copper without kinking it. The tubing cutter and deburring tool from the hand tool section complete the set.

The torque wrench belongs in this family. Flare joints fail two ways: too loose (leak) and too tight (cracked flare, leak later). The manufacturer table gives a torque value for each line size, the torque wrench with a crowfoot flare adapter hits that value, and the joint stops being a matter of feel. After use, torque wrenches are stored wound down to their lowest setting so the internal spring does not take a set and drift out of calibration.

Tool care and calibration

Instruments drift. The habits that keep them honest:

1. Field-check against known references. A multimeter should read a known wall outlet around 120 V. A micron gauge open to atmosphere should read atmosphere. A thermometer in a cup of ice water slurry should read 32 F. A scale should repeat the same reading when a known weight is placed twice. These thirty-second checks catch most drift before it costs a misdiagnosis.
2. Replace consumables on schedule: hose gaskets, leak detector sensors, vacuum pump oil, recovery machine filter driers, meter batteries.
3. Annual calibration for the precision instruments: micron gauge, scale, torque wrenches, and probes, either through the manufacturer's service or a calibration check against a verified reference, logged.
4. Storage discipline: cases exist for a reason. A micron gauge rattling loose in a bin is a micron gauge with a damaged sensor.
5. If an instrument gives a reading that physics says is impossible (negative superheat, a vacuum better than the pump can pull, a 600 V reading on a 240 V circuit), suspect the instrument first. One outlier reading is usually a measurement problem, not a system problem.

PHOENIX FIELD NOTE

Battery tools at 115 F. Lithium batteries hate heat: charging a hot battery damages it, and storage in a sealed truck bed box through a Phoenix summer permanently kills capacity. The IB habits: batteries ride in the cab, never the bed boxes; let a hot battery cool before charging it; charge overnight indoors in summer; and watch for tools cutting out early on hot afternoons, which is thermal protection doing its job, not a broken tool. Hose gaskets and o-rings also age fast in dry desert heat; inspect them more often than the manual suggests.

Common Mistakes

1. Opening the manifold hand wheels to "get a reading." The gauges read with the wheels closed. Opening the wheels moves refrigerant through the center hose, and if the center hose is open to air, you just vented refrigerant, which is illegal.
2. Clamping the amp clamp around two conductors. The magnetic fields cancel and the meter reads near zero. One conductor, one reading.
3. Measuring ohms on a live circuit. The ohms function pushes its own small signal and expects no other voltage. Live-circuit ohms readings are garbage at best and a damaged meter at worst.
4. Mounting the micron gauge at the vacuum pump. You are measuring the pump, not the system. The pump always looks better than the system. Mount the gauge on the system side, away from the pump connection, upright.
5. Trusting milky vacuum pump oil. Wet oil cannot pull a deep vacuum. The pump runs, sounds fine, and never reaches target, and the tech blames a leak that does not exist.
6. Skipping the scale zero, or bumping it mid-charge. Every ounce of accuracy depends on a stable zero on a stable surface.

7. Using one hose set for everything. A2L refrigerants and R-410A require separated hoses. Cross-contamination ruins recovered refrigerant and violates the kit standard.
8. Flares by feel. Hand-tight plus a grunt is not a torque spec. Use the wrench and the table.
9. Buying or carrying an unrated multimeter. If it does not say CAT III 600 V or better at the jacks, it does not go on an HVAC circuit.
10. Treating an impossible reading as a system fault. Verify the instrument first: check its battery, its connection, its zero, and its sanity against a known reference. Then believe it.

1 MANIFOLD ANATOMY

Manifold Gauge Set: Anatomy

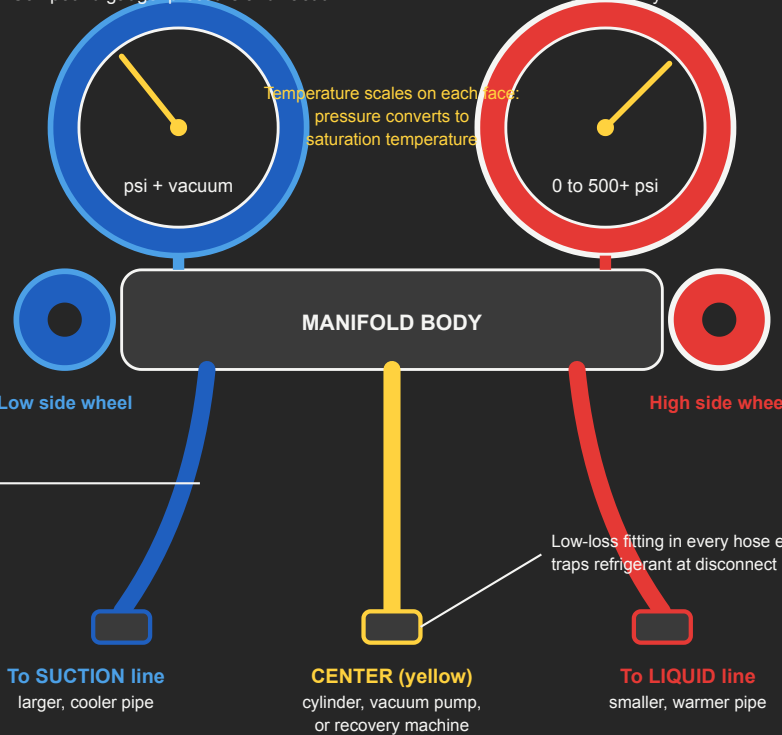
Gauges read with the hand wheels CLOSED. Wheels open a path to the center hose.

LOW SIDE (blue)

HIGH SIDE (red)

Compound gauge: pressure and vacuum

Pressure only

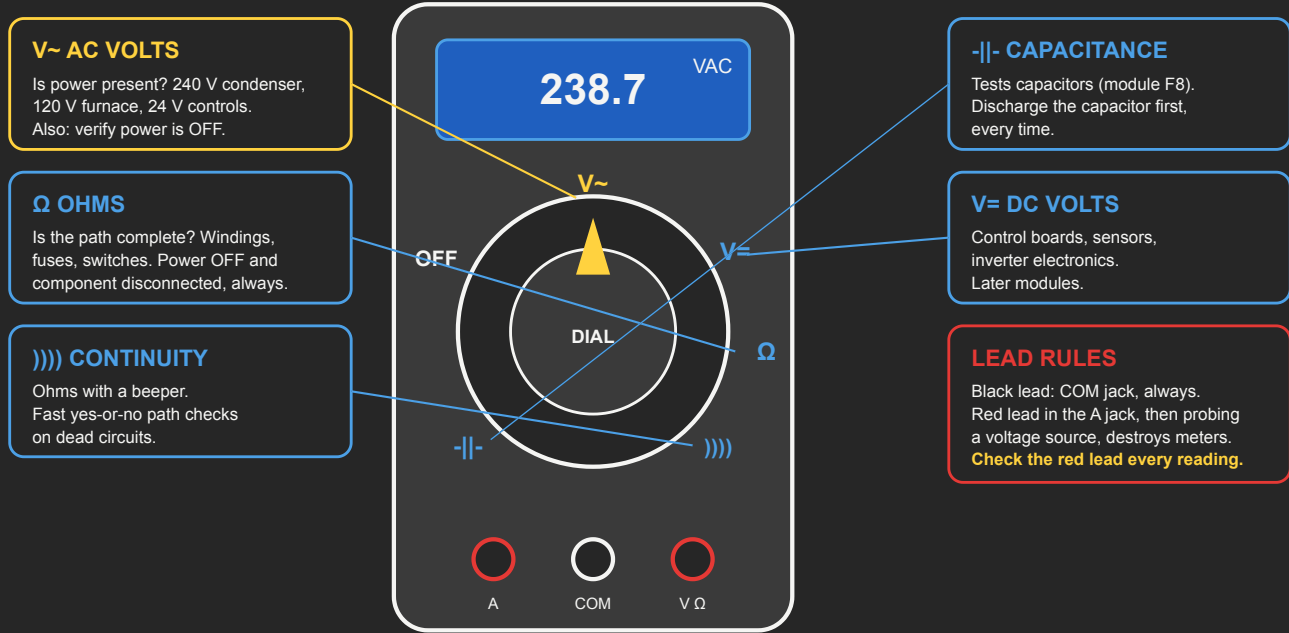


Island Breeze Technician Certification Program: Module F2, Figure 1

2 MULTIMETER MODES

Multimeter: The Modes a Tech Actually Uses

Mode first, then measure. A meter on the wrong mode lies convincingly.



Island Breeze Technician Certification Program: Module F2, Figure 2

3 MICRON GAUGE PLACEMENT

Micron Gauge Placement: Measure the System, Not the Pump

A gauge at the pump always reads better than the truth. Mount it on the system side, far from the pump.

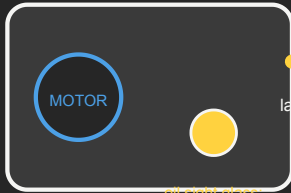
CORRECT: system side, far from the pump connection, mounted upright
Upright keeps pump oil out of the sensor.

Reads the pump's vacuum, not the system's. Always flatters.

WRONG

gauge at pump

VACUUM PUMP



clear = run, milky = change

two-stage rotary vane

SUCTION PORT

core removed for

large-bore vacuum hose, short as practical

THE SYSTEM

(outdoor unit, line set, indoor coil)

MICRON GAUGE

496

microns

LIQUID PORT

DECAY TEST: pull to 500 microns, valve off the pump, watch the gauge

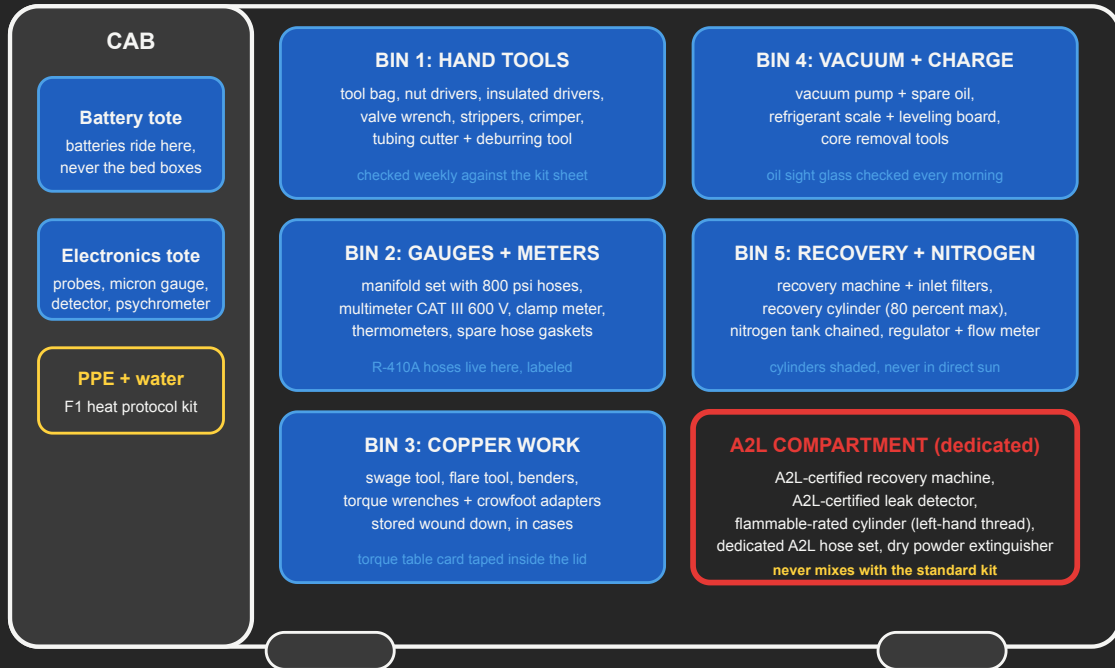
Holds = tight and dry. Rises and levels off = moisture. Rises and keeps rising = leak.

Island Breeze Technician Certification Program: Module F2, Figure 3

4 TRUCK KIT MAP

IB Per-Truck Kit: Layout Map

Every tool has a home. Any tech finds any tool in under ten seconds.



KIT RULES

1. Four-minute morning check before leaving the shop. 2. Weekly verification against the kit sheet, spot-checked by the Lead Tech.
3. Missing or broken items reported the same day. 4. A2L hoses, machine, and cylinder never touch other refrigerants.
5. Electronics and batteries ride in the cab: Phoenix bed boxes cook sensors and lithium batteries.

Island Breeze Technician Certification Program: Module F2, Figure 4