

PRESSURE PAN DIAGNOSTIC GUIDELINES

FOR DUCT SYSTEMS LOCATED IN UNCONDITIONED ATTIC, CRAWL SPACE, AND GARAGE

1.0 OVERVIEW

A Pressure Pan is used to measure the difference between House Pressure and Duct Pressure, thereby indicating the relative degree of leakage in each duct run. Duct leakage is not quantified, but Pressure Pan readings can help prioritize duct leakage sealing. Pressure Pan diagnostics are used for duct systems outside the living space (in the attic, crawl space, and garage). If a significant amount of ducting is inside the living space or in a conditioned basement, Pressure Pan diagnostics give unreliable results.

Pressure Pan testing is performed by placing a gasketed pan over each supply register and return grille, one at a time, with the air handler off and the blower door pressurizing (or depressurizing) the house to 50 Pa. The larger the pressure difference between the Duct Pressure and the House Pressure, the leakier the duct run/branch being tested is—and the pattern of Pressure Pan readings often allows for quick identification of major leakage sites.

If the duct system were perfectly tight, the Pressure Pan readings would be zero (because House Pressure is 50 Pa and Duct Pressure is 50 Pa). If a duct were completely disconnected, the Pressure Pan reading could be 50 Pa (because House Pressure is 50 Pa and Duct Pressure is the same as outdoors, which is zero). Pressure Pan readings are commonly in the 0 Pa to 20 Pa range. “Tight” systems have readings under 1.5 Pa (see 3.3).

2.0 FIELD PROCEDURE

Begin by installing the Blower Door and setting up the house for standard Blower Door testing. Additional steps required for Pressure Pan Diagnostics are outlined below.

2.1 House Preparation

1. Turn off the air handler, and remove the filter(s) from the duct system.
2. Make sure all registers, grilles, and dampers are fully open (they cannot be sealed with plastic during Pressure Pan testing).
 - *Exception:* If a supply register is located in semi-conditioned space (e.g., garage, utility room, basement, etc.), seal off that register (so it does not show up as duct leaks).
3. Temporarily seal outside air inlets connected to the duct system (such as fresh air make-up ducts).
4. Make sure unconditioned areas containing ducts (attic, crawlspace, garage) are open to the outside as much as possible.
 - Open adjustable vents, doors, windows, etc. to outdoors.
 - The unconditioned space must be fully open to outdoors.
 - With a House Pressure of 50 Pa, pressure between the house and the space containing the ducts should be no less than 45 Pa. A greater pressure difference will make Pressure Pan reading difficult to interpret.

2.2 Equipment Set-Up

1. **Connect tubing** between the Pressure Pan and the **Channel A Input** tap on the Digital Gauge.
2. Switch the **Channel** knob to “**A**”.
3. Turn **Mode** knob to “Time Select” and toggle the Select switch downward to select **1-Second Average**.
4. Set the **Range** toggle switch on **Low Range** (200 Pa).
5. Set the **Mode** knob to **Pressure**.

2.3 Conducting Pressure Pan Tests

1. Draw a rough sketch of the house, showing the location of each supply register and return grille.
2. Turn on Blower Door fan and set House Pressure to 50 Pa.
3. Firmly place the Pressure Pan completely over the first register or grille to be tested.
 - Make sure the gasket forms a good seal around the register/grille.
4. After the reading has stabilized, record the pressure reading on sketch.
5. Repeat the test for each register and grille in the house.

2.4 Tips on Taking Pressure Pan Readings

1. If the register or grille is larger than the Pressure Pan, do one of the following:
 - Temporarily seal off the register/grille completely and insert the hose connected to the gauge through the seal (preferably in the middle), or
 - Seal off part of the register/grille and place the Pressure Pan over the remaining open area (press firmly enough for the gasket to create a complete seal).
Note: when inserting the hose through a sealed-off register, leaks between the boot and sheathing may cause artificially high readings from jets of air striking the end of the hose.
2. When two registers are closely connected to the same duct run (such as two registers on opposite sides of a partition wall), seal one of them closed and use the Pressure Pan on the other unsealed register. After taking the reading, remove the seal before proceeding to the next location.
3. Pressure Pan readings must be taken one at a time (two people cannot simultaneously measure two separate registers). Having two different registers covered by a Pressure Pan at the same time could affect accuracy of both readings.

3.0 INTERPRETING PRESSURE PAN READINGS

Pressure Pan testing does not measure magnitude of duct leakage, but rather indicates the severity of leakage in each duct branch. Use the following guidelines in interpreting Pressure Pan readings.

3.1 Prioritizing Duct Leaks

1. Size of Pressure Pan numbers can be used to prioritize leakage repair.
 - A larger reading (e.g., 10 Pa) is typically more important than a smaller reading (e.g., 1 Pa).
2. Closeness of the leak to the air handler is also important.
 - When comparing Pressure Pan readings of equal size, ducts closer to the air handler should generally receive a higher priority than one located further away (because leaks closer to the air handler are under greater pressure).
3. When comparing Pressure Pan readings of *equal size*, remember:
 - Supply side leaks should typically be given higher priority than return side leaks, because supply ducts carry conditioned air.
 - Return side leaks in the garage or appliance enclosure are a high priority for health and safety reasons, because they can cause spillage in natural draft appliances and draw in combustion gases (and in a garage, automobile exhaust and vapors from stored chemicals).
4. When prioritizing return leaks, consider the temperature of the air being drawn in.
 - Return side leaks in the attic can be more important in systems with air conditioning, because super-heated attic air can greatly reduce system efficiency.
 - The same size leak in a cool crawl space would cause much less energy loss.

3.2 Other Factors to Keep in Mind

1. Gaps between duct boots and the sheathing will appear as duct leaks in Pressure Pan readings.
 - Always check for these gaps on ducts having Pressure Pan readings of 1 Pa or higher.
 - Although they are relative low pressure leaks, they are easily accessed and should be sealed.
2. Do not attempt to take Pressure Pan readings on “Toe space” registers (usually located under kitchen and bathroom cabinets). They are usually not connected directly to the duct system, and Pressure Pan readings on them will be misleading.
3. The condition of the air conditioning inside (evaporator) coil should be checked before performing Pressure Pan diagnostics. A dirty coil will tend to increase Pressure Pan readings.
4. Always check to make sure registers and dampers are fully open. Closed or partially-closed registers or dampers will create large Pressure Pan readings.
5. Large (“catastrophic”) duct leaks can affect adjacent branches and thereby cause misleading Pressure Pan readings in those branches.
 - After large leaks are repaired, Pressure Pan readings in nearby branches usually improve.

- “Mid-repair” Testing: It is best to re-test suspected registers (those located near a large leak or disconnection, which initially had readings of 2 Pa or higher) after sealing the catastrophic leak—to make sure they still have Pressure Pan readings that justify spending time on them.
6. If a House Pressure of 50 Pa cannot be achieved due to catastrophic Shell leaks, Pressure Pan readings will be more difficult to interpret.
 - Repair catastrophic Shell leaks before performing Pressure Pan diagnostics, or
 - Temporarily seal off the leaks sufficiently to achieve a 50 Pa House Pressure.
 7. When the FAU or any part of the return system is located in a garage, always make sure the garage is effectively “outside the house.”
 - Open the drive-through door (so pressure in the garage is equal to outdoor pressure).
 - Close all doors and windows between the house and the garage.
 - Make sure any inlet (e.g., fresh air make-up duct) connected to the duct system is temporarily sealed.
 - Temporarily seal any supply registers located in the garage (permanent sealing of them should be recommended to the homeowner).

3.3 Classifying Duct Systems by Pressure Pan Test Results

1. “Tight” Duct Systems

- All Pressure Pan readings are 1.4 Pa or lower.
- Not more than 2 readings are greater than 1.0 Pa.
- Repairs for duct leakage are generally not considered cost-effective.
- Repairs should be made to correct a health and safety problem (e.g., return leaks in a garage or appliance enclosure).

2. “Leaky” Duct Systems

- 3 or more Pressure Pan readings are 2.1 Pa or higher.
- Duct leakage repair is warranted.
- For each reading above 1.5 Pa, the associated duct run should be repaired/sealed.
- Start with the highest Pressure Pan reading and work to the lowest.
- Perform Mid-Repair testing after sealing catastrophic leaks (to re-evaluate relative leakage in adjacent duct runs).

3. “In Between” Systems

- These are systems with Pressure Pan test results “in between” those of “Tight” and “Leaky” systems.
- Field tests have shown systems in this category typically average more than 350 CFM₅₀ duct leakage, and duct repair and sealing is usually warranted.
- Duct leakage testing will determine how far from target the duct leakage is.