

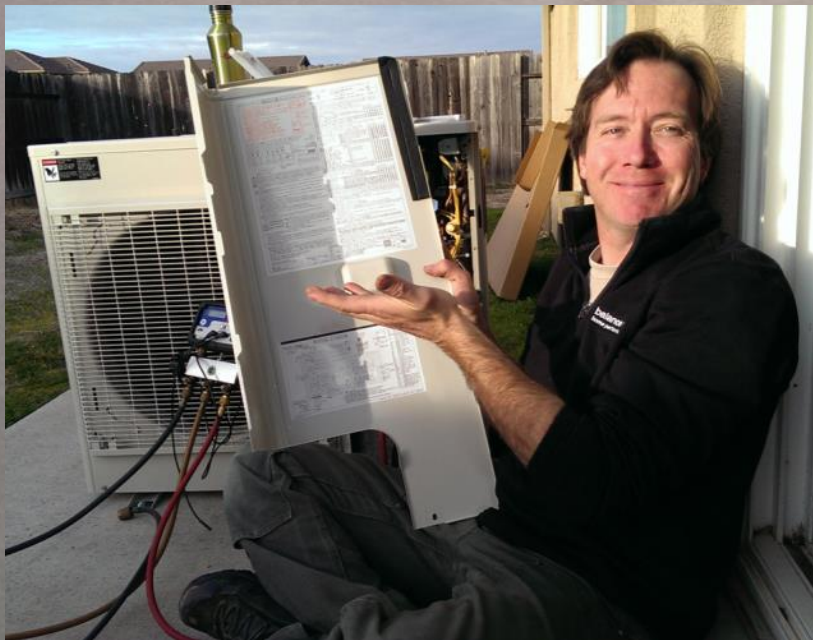
**ELECTRIFICATION AND
DECARBONIZATION.**

CRITICAL DETAILS FOR SUCCESS.

A CAUTIONARY TALE

www.balancepointthp.com

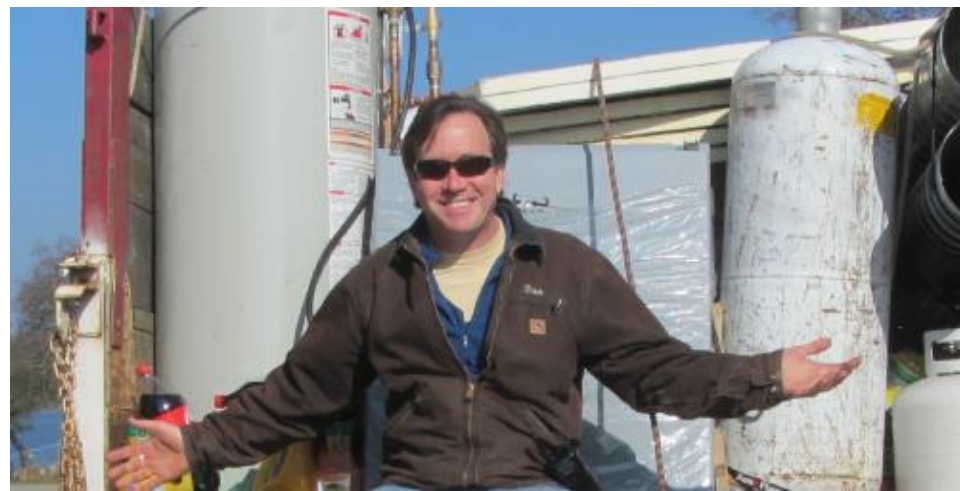
balance point
home performance



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Dan@balancepointthp.com

Construction, Consulting, Training





Now you can Check Charge!!!!

Non invasive testing is
the way to go!



Why Electrify the building stock?

How important is it?

How much time do we have?

Can some homes still use gas?

Is it more important to electrify or to fix building enclosures and duct systems?

Is it important to complete load calculations and install smaller equipment?

Which machines contain more refrigerant, high efficiency machines or low efficiency machines?

**The internet says that there are
2,928,437 people in the Denver
Metro Area.**

**Around 1 Million residential
buildings**

**Around 3 Million Pound of
Refrigerant contained in Heat
Pumps and AC units**

The 100 year carbon equivalent is

3,132,000 Tons

Allowable leakage before repair is required?

Around 15% Annually

469,800 Tons carbon eq

Will the next generations of refrigerants (A2L) have a large enough reduction in global warming potential?

REFRIGERANT LEAKAGE

- **WHAT PERCENTAGE OF SYSTEMS LEAK?**
- **ACCIDENTALLY LEAKING SYSTEMS ARE NOT ILLEGAL, NOT TRACKED AND SELLING REFRIGERANT IS VERY PROFITABLE.**
- **MANY TECHNICIANS ARE TRAINED TO INEFFECTIVE STANDARDS FOR LINE SET BUILDING AND TESTING. MANY KNOW THE STEPS BUT DON'T REALLY HAVE A STANDARD FOR WHAT PASSES OR FAILS.**
- **DE MINIMUS RELEASE IS LEGAL**

THE SOLAR ARRAY ON MY HOME, HAS OFFSET 109,086 POUNDS OF CARBON

$$109,086 \text{ LBS CARBON} \div 2,088 \text{ LBS CARBON PER LB R410A} = \\ 52 \text{ LBS OF R410A}$$

IN OTHER WORDS, IF SIX THREE TON HEAT PUMPS ARE ALLOWED TO LEAK COMPLETELY,
IT WOULD BE AS IF MY SOLAR ARRAY WAS NEVER INSTALLED.

Equivalency Calculator

6lbs leaked r410a

=

Driving a commuter car 16,000
miles

We have three problems

The Service/Rating problem

The Structural problem

The practice problem

Get out a calculator

One technician x 1 oz R410A per
service call x 5 service calls per day x
5 days a week =

1.63 tons of carbon equivalent -R410a

(1 oz R410 x 5 jobs x 5 days x 2088 lbs carbon eq ÷ 2000lbs per ton = 1.63 tons)

(.529 tons of carbon equivalent – R32)

Exceptionally Good Practice, one tech per week

LINE SET PLUMBING

- FLARE OR BRAZE
 - WHEN
 - ARE FLARE FITTINGS PROBLEMATIC



FLARE OR BRAZE?

Currently the Legacy systems are pretty much all braze fittings.

All the mini split manufacturers have gone to flare fittings.

Note: these are 45 degree flares

Leakage is very Prevalent we have to do better

2018 ASHRAE study found significant leakage rates in Flare and Compression type fittings.

Leak testing under pressure is a critical step to identifying failed fittings.

Assessment of Leakage Rate and Durability of Field-made Mechanical Joints for Systems Using Low-GWP Flammable Refrigerants (ASHRAE RP-1808)

Line Set Assembly, Refrigerant Charge and Leakage



INSTALLATION

- FLARES ARE OFTEN REQUIRED
 - CUTTERS AND REAMER
 - FLARE TOOL
 - DON'T USE LINE SET NUTS
 - REFRIGERANT OIL ON MATING SURFACES
 - TORQUE WRENCH (NOT ALWAYS GUIDANCE ON WET OR DRY FLAIR NUT THREADS)
 - PRESSURE TEST AT 450 PSI (OVERNIGHT BEST) - BUBBLE TEST FOR LEAKS AT JOINTS
 - EVACUATE TO 100 TO 200 MICRONS (HOLDS BELOW 300 FOR 15 MINUTES)
 - ADJUST CHARGE

INSTALLATION

- ✓ FLARE
- CUTTERS AND REAMER
- FLARE TOOL
- DON'T USE LINE SET NUTS
- REFRIGERANT OIL ON MATING SURFACES
- TORQUE WRENCH (NOT ALWAYS GUIDANCE ON WET OR DRY FLAIR NUT THREADS)
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INSTALLATION

✓ FLARE

✓ CUTTERS AND REAMER

FLARE TOOL

DON'T USE LINE SET NUTS

REFRIGERANT OIL ON MATING SURFACES

TORQUE WRENCH (NOT ALWAYS GUIDANCE ON WET OR DRY FLAIR NUT THREADS)

PRESSURE TEST AT 450 PSI (OVERNIGHT BEST) - BUBBLE TEST FOR LEAKS AT JOINTS

EVACUATE TO 100 TO 200 MICRONS (HOLDS BELOW 300 FOR 15 MINUTES)

ADJUST CHARGE

Flare Tools



Flare Tools



Flare Tools





1/2" ZoomLock SAE Flare (PZK-F8-HNBR)

Press on fittings seem promising. Although fittings like these still showed failures in third party testing. Leak checking is still critical before putting the system into service.



Navac cordless flaring tool

This tool has good reviews and may improve the quality and durability for field manufactured flare connections.



In early research fittings like this did not perform well enough. At last update fittings like this were not leaking at about 1 year in more recent research. More research is needed.



I have no information about the success of these yet. I can imagine how they could cause problems. Research is needed.

INSTALLATION

✓ FLARE

✓ CUTTERS AND REAMER

✓ FLARE TOOL

DON'T USE LINE SET NUTS

REFRIGERANT OIL ON MATING SURFACES

TORQUE WRENCH (NOT ALWAYS GUIDANCE ON WET OR DRY FLAIR NUT THREADS)

PRESSURE TEST AT 450 PSI (OVERNIGHT BEST) - BUBBLE TEST FOR LEAKS AT JOINTS

EVACUATE TO 100 TO 200 MICRONS (HOLDS BELOW 300 FOR 15 MINUTES)

ADJUST CHARGE

INSTALLATION

- ✓ FLARE
- ✓ CUTTERS AND REAMER
- ✓ FLARE TOOL
- ✓ DON'T USE LINE SET NUTS

REFRIGERANT OIL ON MATING SURFACES

- TORQUE WRENCH (NOT ALWAYS GUIDANCE ON WET OR DRY FLAIR NUT THREADS)
- PRESSURE TEST AT 450 PSI (OVERNIGHT BEST) - BUBBLE TEST FOR LEAKS AT JOINTS
- EVACUATE TO 100 TO 200 MICRONS (HOLDS BELOW 300 FOR 15 MINUTES)
- ADJUST CHARGE

INSTALLATION



INSTALLATION

- ✓ FLARE - NEVER BRAZE
- ✓ CUTTERS AND REAMER
- ✓ FLARE TOOL
- ✓ DON'T USE LINE SET NUTS
- ✓ REFRIGERANT OIL ON MATING SURFACES
- TORQUE WRENCH**
- PRESSURE TEST AT 450 PSI (OVERNIGHT BEST) - BUBBLE TEST FOR LEAKS AT JOINTS
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INSTALLATION



INSTALLATION

- ✓ FLARE
- ✓ CUTTERS AND REAMER
- ✓ FLARE TOOL
- ✓ DON'T USE LINE SET NUTS
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Pressure testing is manufacturer dependent.

You should always be able to test up to the listed test pressure on the unit. Typically 450 psi.

Fujitsu is now calling for 600 psi nitrogen testing.



Henry's
Blueskin
VP1
Water Tight
Weather Tight

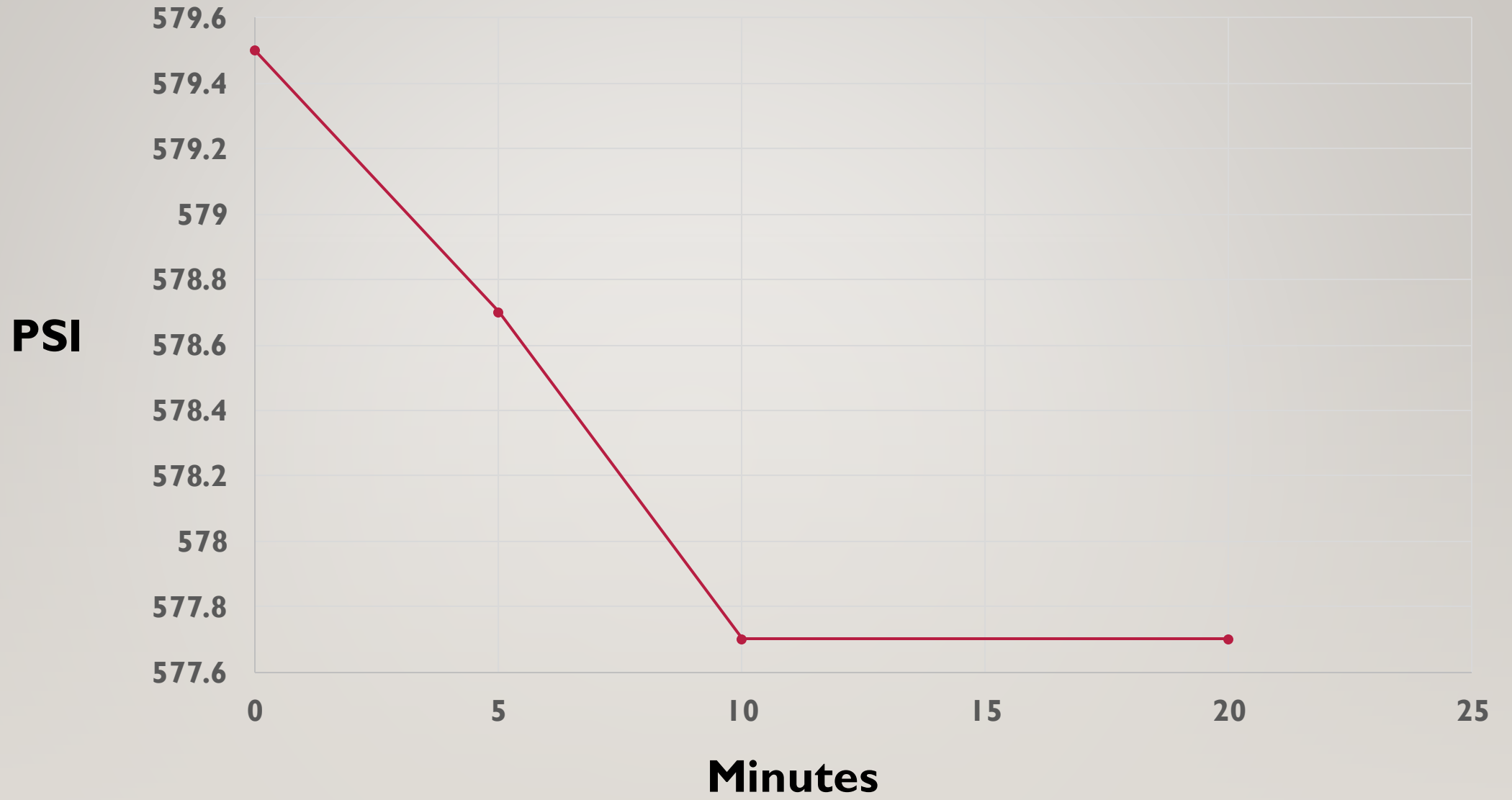


On jobs where you rough in and come back later for finish. Leave your line set pressurized with Nitrogen.

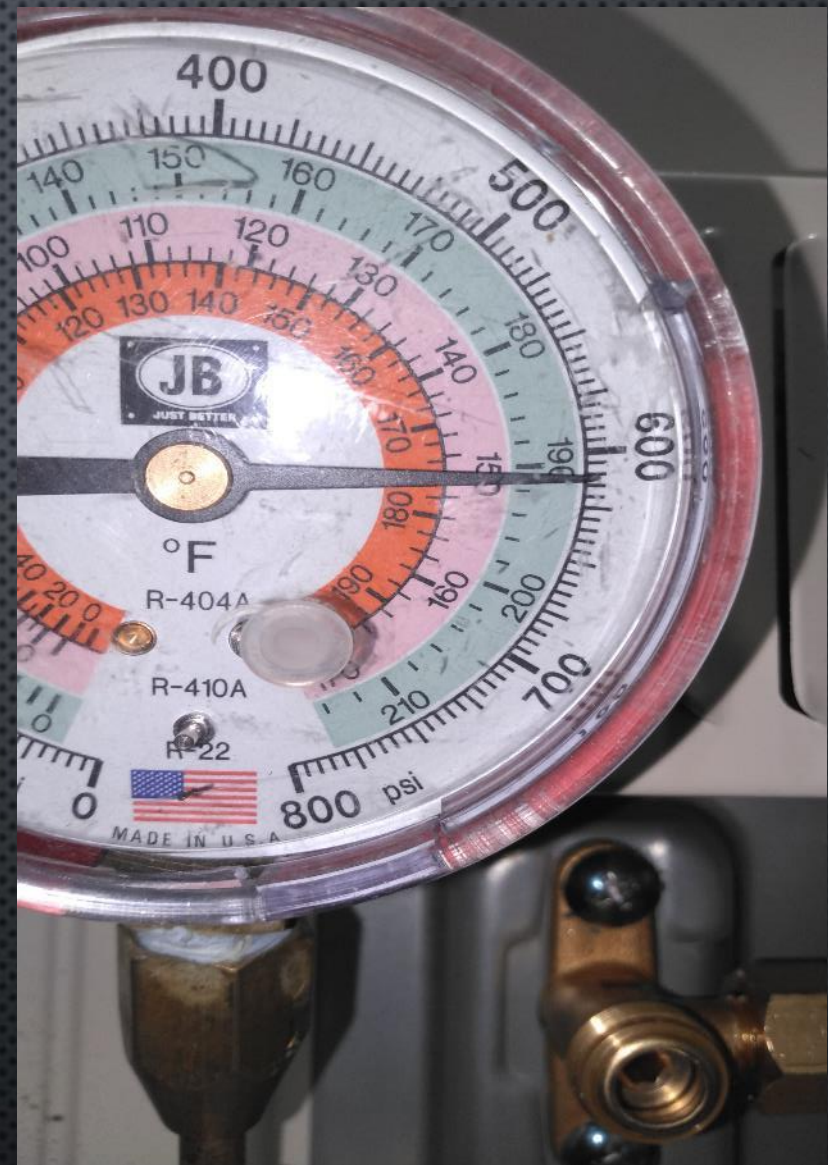
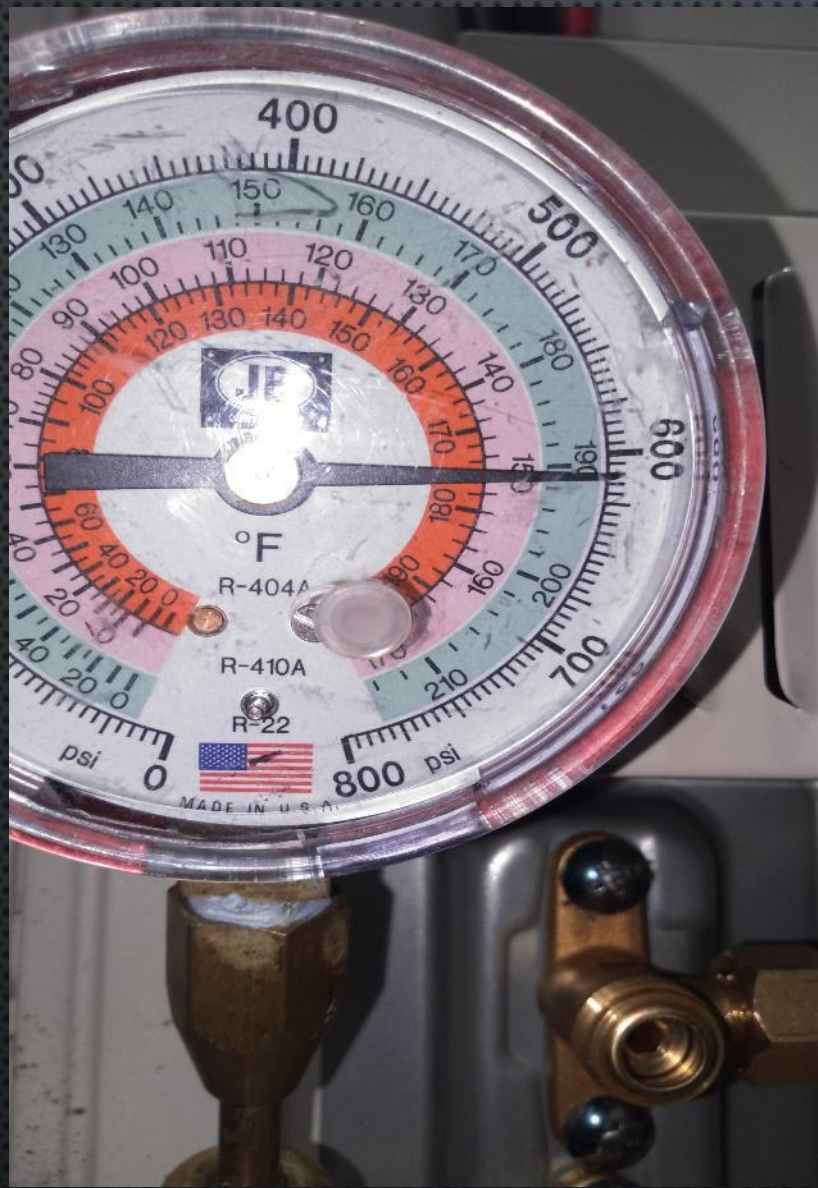


PACIFIC

Nitrogen Pressure









INSTALLATION

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- ✓ TORQUE WRENCH (NOT ALWAYS GUIDANCE ON WET OR DRY FLAIR NUT THREADS)
- ✓ PRESSURE TEST AT 450 PSI (OVERNIGHT BEST) - BUBBLE TEST FOR LEAKS AT JOINTS
- EVACUATE TO 100 TO 200 MICRONS (HOLDS LESS THAN 100 MICRONS OF DRIFT IN 15 MINUTE DECAY TEST)**
- ADJUST CHARGE







PASS

Decay Test Result

146.0 Microns

Final Vacuum

0.0 Microns/s

Avg. Decay Rate

0:31:01

Time to Ultimate P/D

0:09:56

Time in Decay

0:40:58

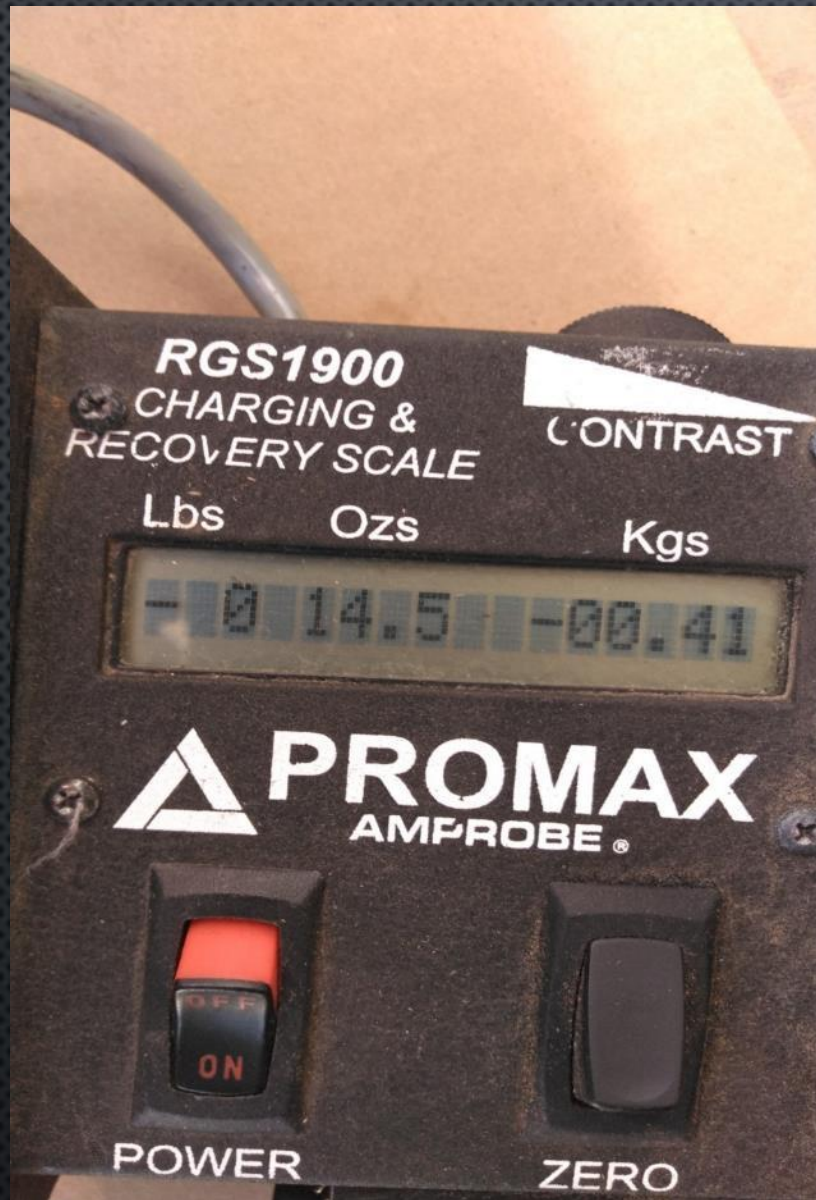
Total Elapsed Time

| Customer | Equipment | Other Stats | Values |
|----------|--|--|--|
| Chase | Make: Fujitsu Model: AOU9RLFC Serial: KYN008018 | Ultimate Pull Down: Avg. Ambient Temp: Device Name: Date: Start Time: End Time: | 112.8 Microns 18.0°C BluVac+ Pro 11/23/2020 11:23:14 AM 12:04:12 PM |

INSTALLATION

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- ✓ EVACUATE TO 100 TO 200 MICRONS (HOLDS BELOW 300 FOR 15 MINUTES)

ADJUST CHARGE



Charge adjustment is primarily weigh in for mini splits.

Some manufacturers have models where you can check super heat and sub cool.



LINE SET TESTING IS THE KEY TO OUR SUCCESS

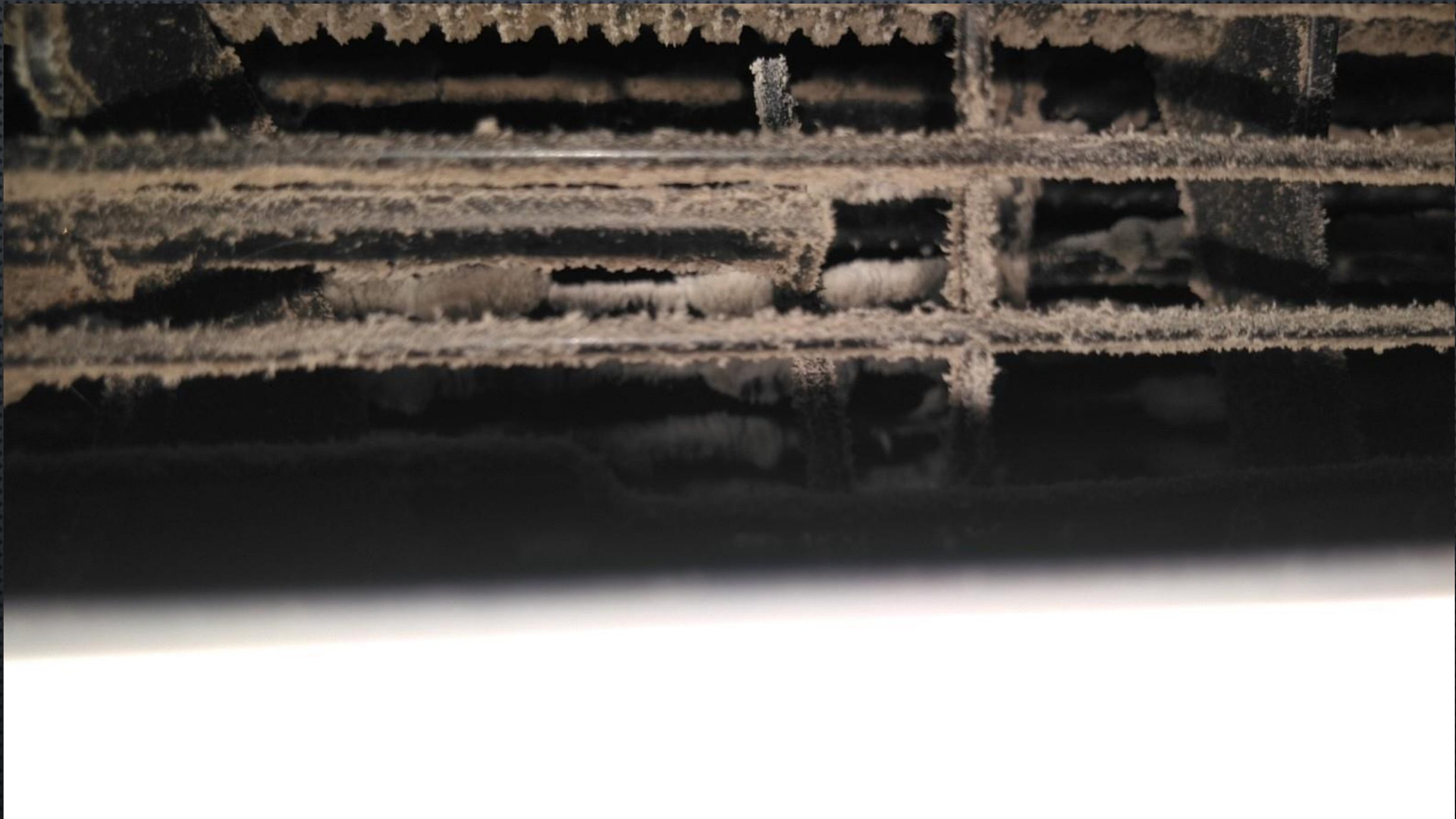
- HAVE A PROCESS
- HAVE A CHECKLIST
- HAVE PASS FAIL CRITERIA

Charge Testing should only be done....

After we know we have adequate airflow as verified by

- Measuring the airflow
- Or at least measuring static pressure and power

Preferably both



Leak testing does not require gauges



GAUGES



Use Transducer Gauges with no hose.

CORE REMOVAL



CORE REMOVAL



LOW LOSS FITTING



LOW LOSS FITTING



LOW LOSS FITTING



HOW YOU UNHOOK IS CRITICAL

**REFRIGERANT SYSTEMS ARE CLOSED LOOP
SYSTEMS. THERE IS NO WHERE FOR THE
REFRIGERANT TO GO.**

**CONSIDER EQUIPMENT CHOICES THAT DO NOT
REQUIRE FIELD MANUFACTURED LINE SET
PLUMBING**

**CONSIDER EQUIPMENT CHOICES THAT DO NOT
REQUIRE FIELD MANUFACTURED LINE SET
PLUMBING**

Heat pump water heaters

Ptac units

Through the wall heat pumps



Commission
your systems
and keep
records!!!!

Thank You For your Time!!



GAVIN HEALY & DAN PERUNKO