CLEAResult®

Mini Split Heat Pump QI Best Practices and Diagnostic Procedure

Charlie McCracken
New England HVAC Programs

We change the way people use energy™

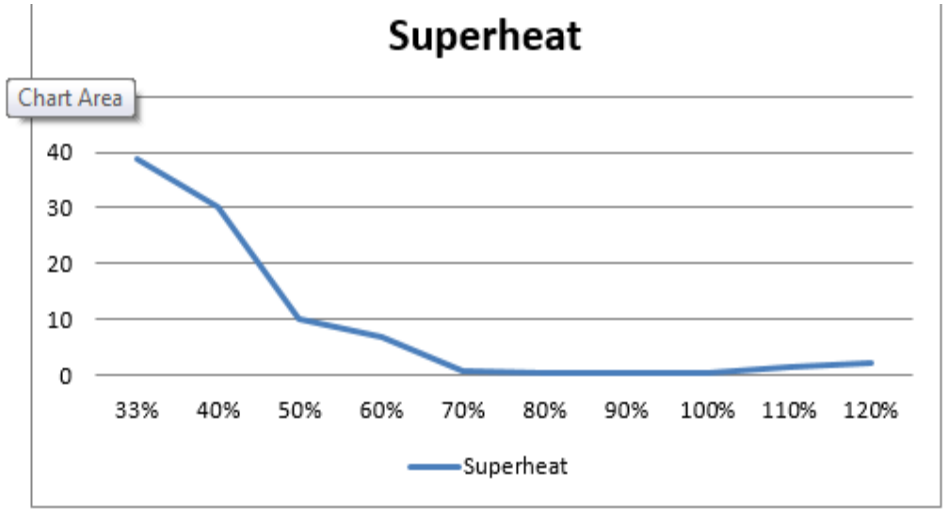
What we will discuss today

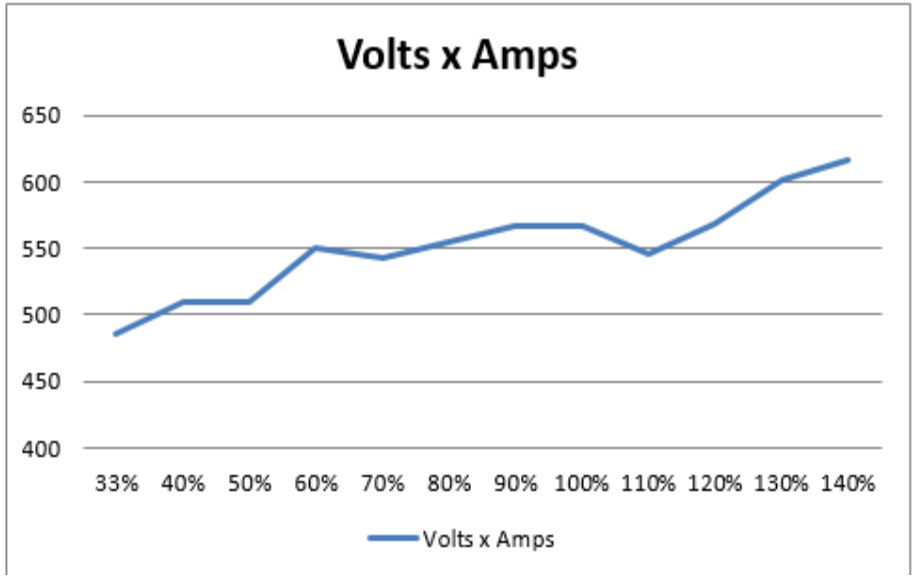
- 2014 Laboratory testing
  - Adjusted charge from 33% to 150%
  - Evaluated Superheat, Capacity, Watts
- 2015 Pilot review
  - 35 Single head MSHPs by 8 trained contractors
  - Helped develop consistent QI protocol
- Quality Installation
  - Sizing, Piping, Leak Testing, Proper Tools
- Multi Head Testing
  - Mitsubishi, Fujitsu, Daikin, LG conform in TEST
  - Other product lines to be evaluated Spring 2017
- 2017 Baseline Study
  - Target: 256 2016 rebated MSHPs SH and MH
  - AC Check and Non Participating Contractors

Typical Lab Test Data

Mitsubishi FH09

Tested at the MEA Training Center
Southborough, MA
November 24-25, 2014





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2015 Field Testing

- 35 Units tested
- Single Zone
- Real World Test Data
  - Developed “Passing” Parameters
  - Superheat <5F and Amps < 110% of AHRI

Yellow Jacket
MANTOOTH

Fieldpiece SRH3 /
SDP-2

Fieldpiece SC77
True RMS

MSHP Information Required

Date: _____ Time: _____ AM/PM

Condenser Ambient Temp	_____	°F DB
Suction Line Pressure	_____	psig
Vapor Line Temp	_____	°F
Return Dry Bulb Temp	_____	°F DB
Return Wet Bulb Temp	_____	°F WB
Supply Dry Bulb Temp	_____	°F DB
Supply Wet Bulb Temp	_____	°F WB

L1:	_____	amps
L2:	_____	amps

Cooling Mode Diagnoses

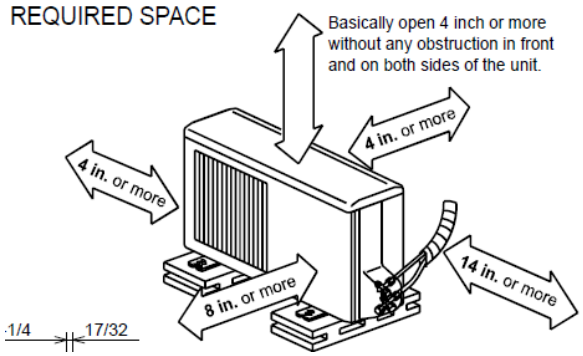
Status	Superheat	Amps (% of AHRI)	Typical Causes
Correctly Installed	< 5 degrees F	< =110%	Correct installation
Undercharged	> 5 F (often >10)	N/A	Leaky flare connection No charge adjustment made
Overcharged	Fluctuating, 5-10F	> 110%	Too much refrigerant added
Line set contamination	Approx. 5F	> 110%	Incorrect vacuum applied/ moisture in line

Amperage from published AHRI rated conditions of 95/80/67F at 230 volts

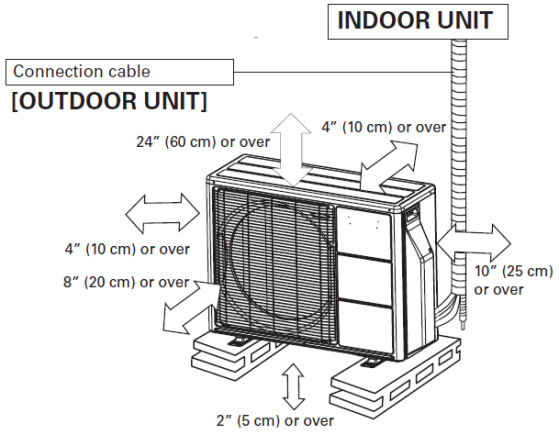
Quality Installation Checklist

- Sizing
- Piping
- Condensate
- Line Set Covers
- Clearances
- Wall Mounts/Stands
- Surge Protector?
- Homeowner Education

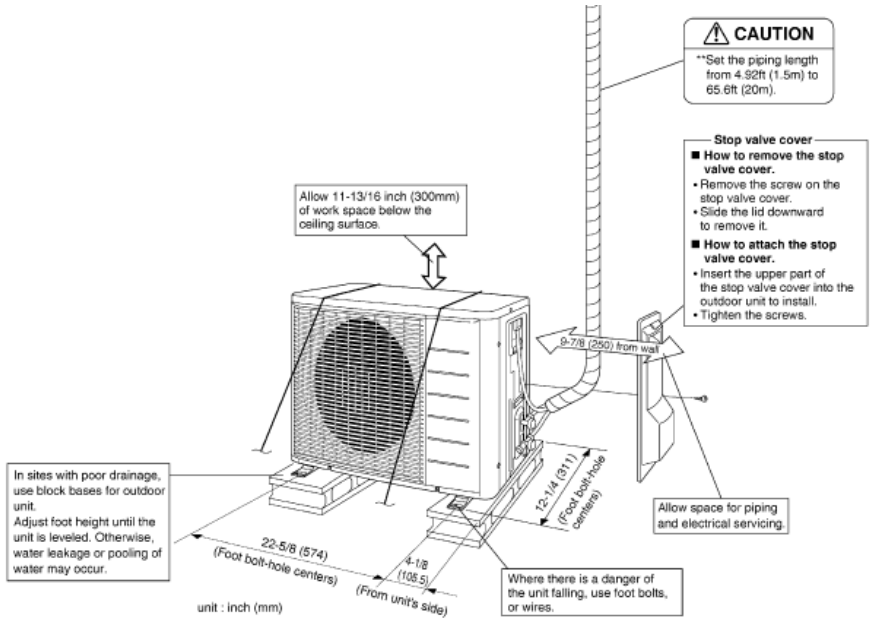
Single Zone Condensers



Mitsubishi



Fujitsu



Daikin

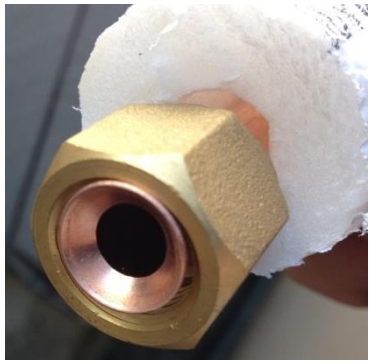
Quality Installation Best Practices

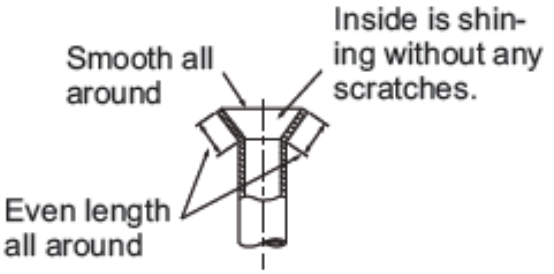
- Consider Using Line Sets with Better Insulation

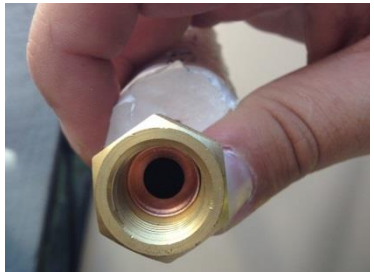
3/8” Insulation

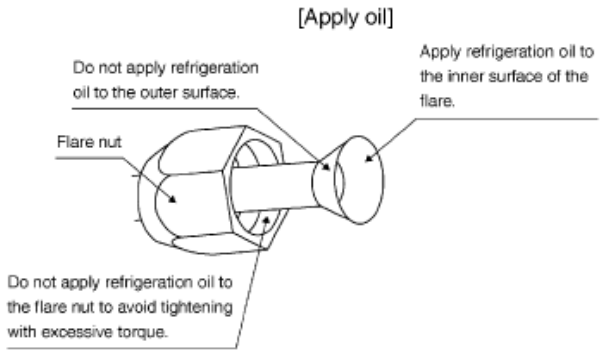
1/2” Insulation
Tear/UV Resistant
Mold/Mildew Resistant
Meets Flame/Smoke Rating

Buy a New Flaring Tool and Use Torque Wrenches

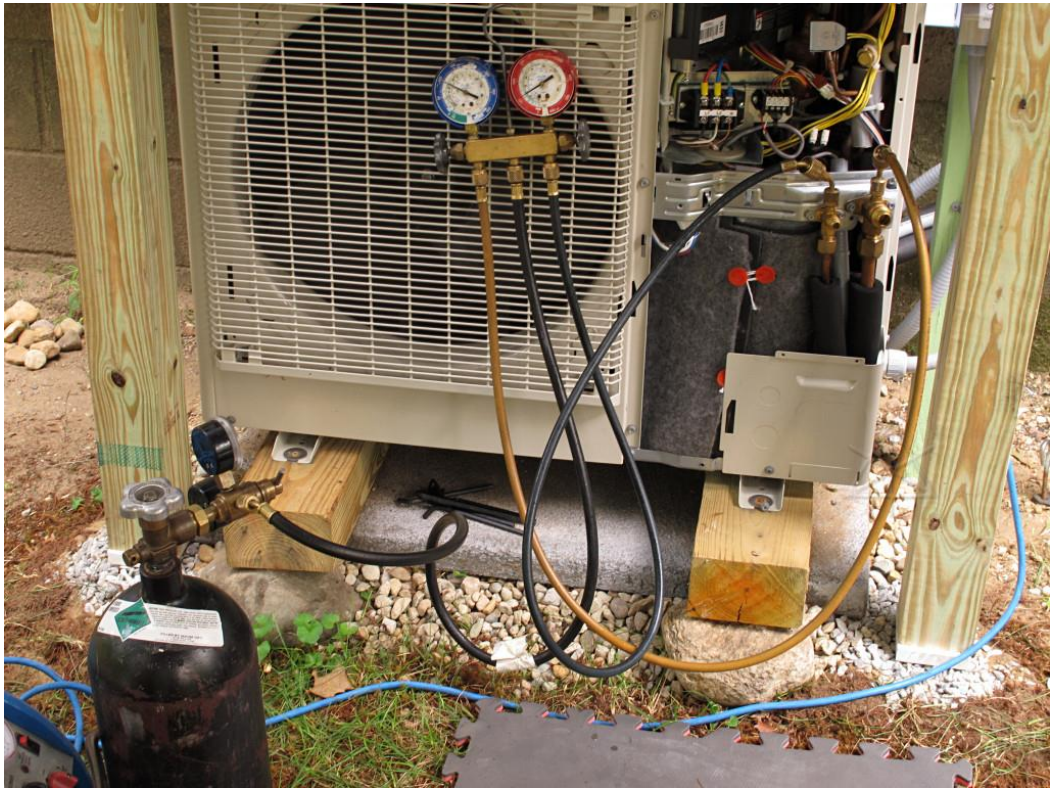






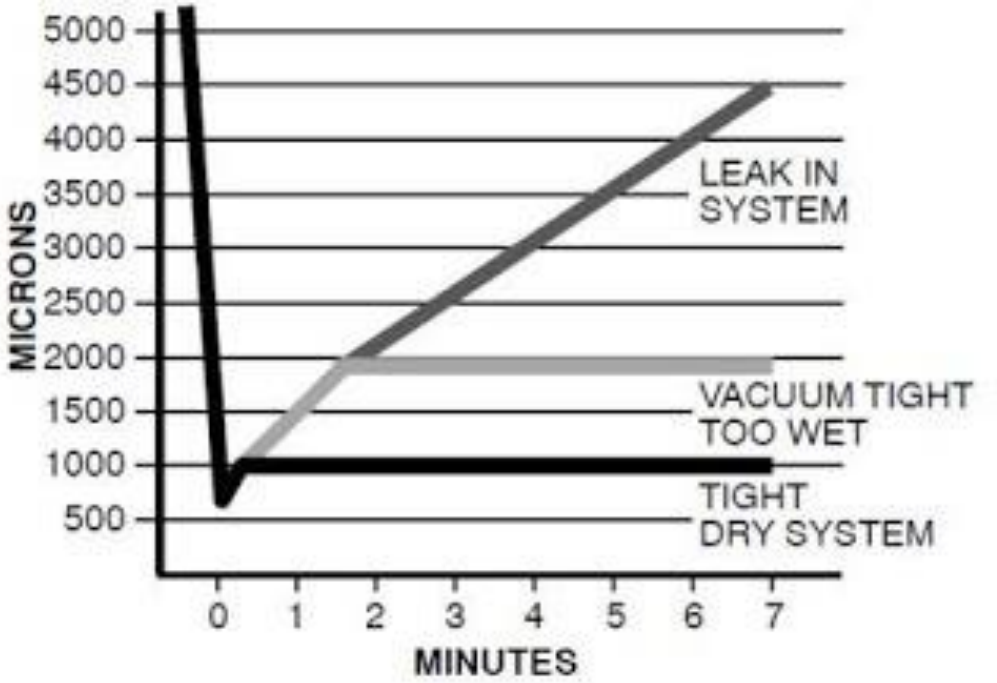


Do a Proper Leak Test and Evacuation

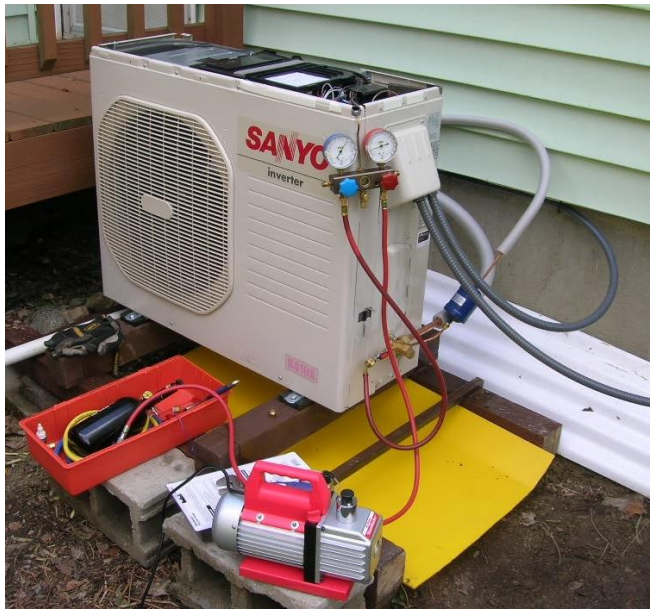


Vacuum Refrigerant Lines

- Some OEMs DO NOT specify

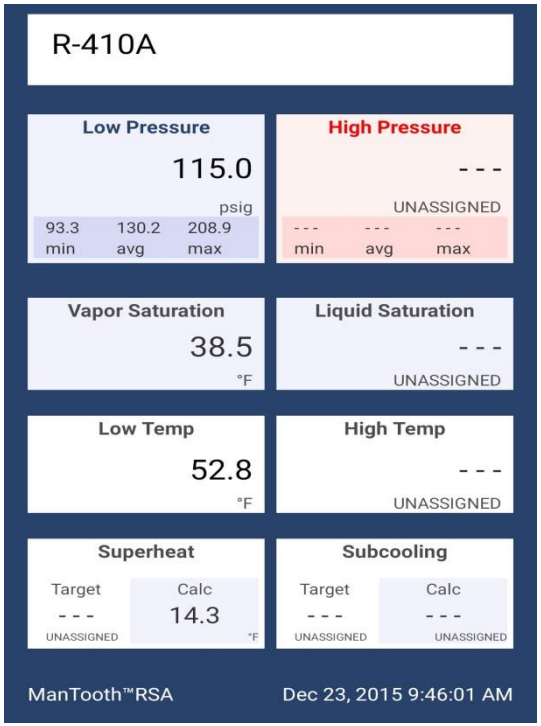


Deep Vacuum Chart; Carrier Service Manuals

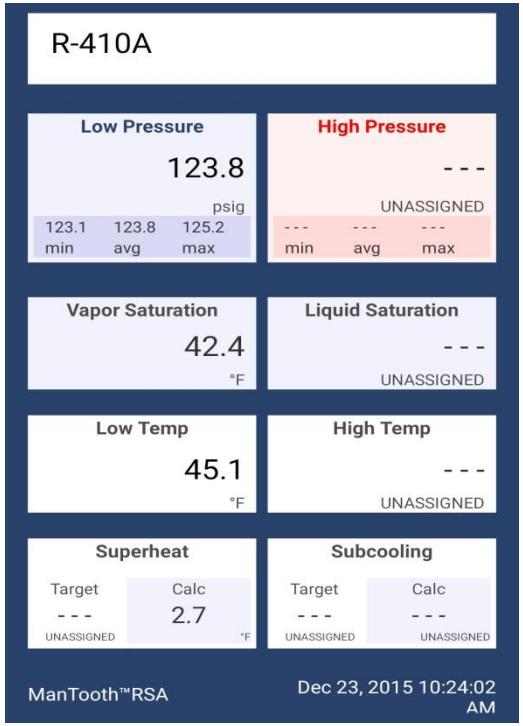


Undercharged MSHPs

- SH> 5F
- Note the time stamps in bottom right



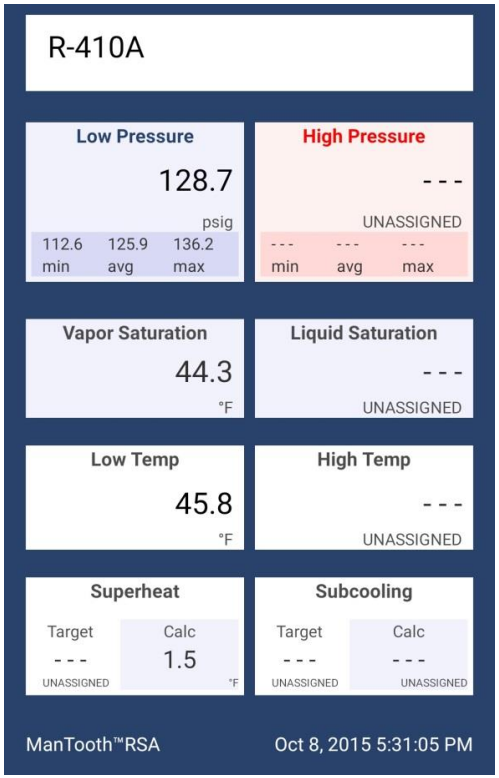
1.5 # Under Charged

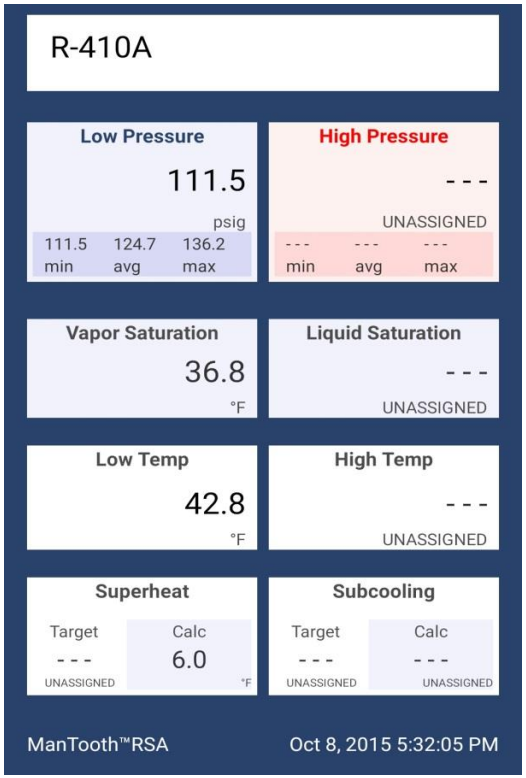


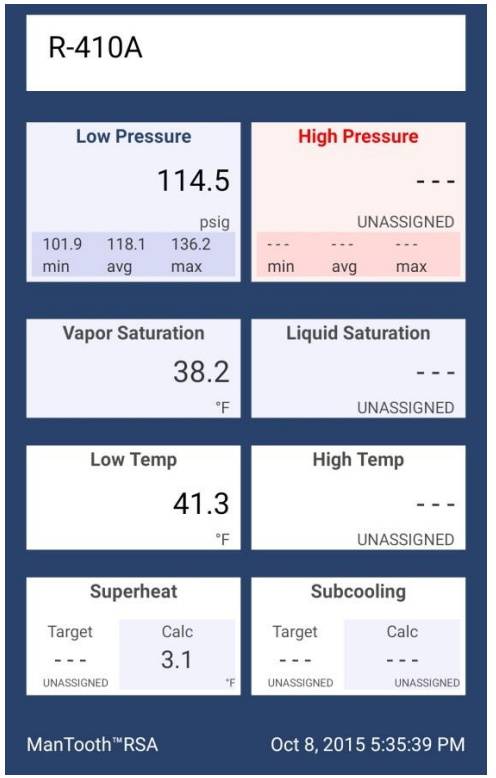
100%

Overcharged MSHP

- EEV “Hunts” until 8 oz removed
- Note the time stamps in bottom right







Screening Procedure in Cooling

- Always Connect/Disconnect to Service Port while running
- Set MSHP into OEM TEST Mode
  - Or set Thermostat 2-3F< Room, Fan on MH
- Should find most significant issues
- Always follow OEM instructions if charge adjustment is indicated

Screening Procedure in Cooling

- Could be used by:
  - Program QA
  - Contractors to QA technicians
  - Quick determination if system charge is the cause of a customer comfort or bill complaint

Cooling Mode Diagnosis - Example

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9,000 BTU Tier 2 MSHP AHRI 16.1 EER = 560 Watts
Watts / (Volts x Power Factor) = Amps
560 w/ (230 v x 0.95 pf) = 2.6 amps at AHRI Rated Conditions
Measured SH = 3.2F
Measured Amps = 2.8 = 108% of AHRI
PASS!

NEEP MSHP Listing 2016 Summary

COOLING Capacity (BTUH) at AHRI 95/80/67	COOLING Watts at AHRI 95/80/67 @ 230 volts	COOLING Amps at AHRI 95/80/67 @ 230 volts	COOLING MassSave H&C Tier 1 18/9 Tier 2 20/11
Ave. 9,000	615	2.8	1
Ave. 12,000	912	4.2	1
Ave. 15,000	1,158	5.3	1
Ave. 18,000	1,370	6.3	1
Ave. 24,000	1,609	7.4	1
Ave. 9,000	578	2.6	2
Ave. 12,000	898	4.1	2
Ave. 15,000	1,111	5.1	2
Ave. 18,000	1,400	6.4	2
Ave. 24,000	1,760	8.1	2

2017 MSHP Baseline Study

- Target of 256 Single and Multi Head Rebated MSHPs will be evaluated
- Installations by Participating and Non-Participating Contractors
- Customers selected at random
- Contractors advised & encouraged to participate in advance, or attend site visit
- No repairs will be made or suggested

Contractor Support Resource

844-615-8315
HVAC@clearesult.com

Mass Save Heating & Cooling
Rhode Island Heating & Cooling
c/o CLEAResult
50 Washington Street
Westborough, MA 01581

Quality Installation Checklist

Quality Installation Checklist	
☐	AHRI Listed: meeting at least 18 SEER / 9 HSPF or higher.
☐	Was a Manual J V8 load calculation performed? (Not a requirement)
☐	Continuous piping insulation, at minimum R-3 or 3/8" in thickness, is required. In no application should there be more than 2" of exposed copper piping following installation.
☐	Refrigerant lines must be leak tested and evacuated per manufacturer's recommendations. This may be either the deep vacuum or triple evacuation method.
☐	All visible line sets must run through line set covers, sized accordingly to fit the number of line sets used. Covers are level and/or plumb, meeting the expectations of the homeowner.
☐	Refrigerant lines meet the manufacturer's minimum and maximum lengths. If longer than the precharged distance, technician added _____ oz. per _____' of line set.
☐	Condensate piping should be terminated outside in the shortest, most vertical and direct way possible. Condensate shall not terminate over walkways where accumulating/not draining properly could damage building components.
☐	Equipment installation shall meet all manufacturers' specified clearances. Typically side-discharge, these condensers require at least 4" between the condenser and any obstruction like a wall.
☐	Outdoor equipment in heating dominated climate shall be placed on a stand or wall mounted, at minimum 6" above grade, or above the seasonal snow line as recommended by local code.
☐	Condenser should be protected with a UL listed surge protector, either whole home or individual.
☐	System operation was explained to homeowner, to include: avoiding large set backs and use of auto changeover.

