Ductless Mini-split
Aftermarket Products
Learning objectives

• What accessories are necessary to properly install mini-split equipment?

• What are the proper installation techniques to ensure a professional finished appearance?

• How can the correct accessories and products make it easier to install ductless mini-split equipment?
Agenda

Ductless Mini-split Overview

Lineset Installation and Protection

Condensate Management

Mounting

Support

Electrical

Indoor Air Quality

Cleaning & Maintenance
How does a mini-split system work?

- **Evaporator**
- **Refrigerant and heat transfer cycle**
- **Condenser**
- **Cooled air**
- **Hot (room) air**
Ductless mini-split system components

Example system

External condensers

Single  Multi  VRF (multi)

Internal evaporators

Ceiling cassette  Wall mounted  Floor unit  Ceiling ducted  High wall unit
Ductless mini-split systems

Established technology globally is now a fast-growing product category in the U.S. market. **Demand for mini-split installations will continue to grow!**

**Ductless mini-split market**

- **2013:** ~5% of market
- **2018:** 10-12% of market
- **2023E:** 23-31% of market

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**Opportunity to leverage innovative products that improve the installation process and save resources!**

Source: Navigant Research
Agenda

Ductless Mini-split Overview

**Lineset Installation and Protection**

Condensate Management

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Cleaning & Maintenance
Pre-insulated and paired linesets
Pre-insulated and paired linesets

Wear resistant, low-friction, embossed coating will not tear and allows for easy pulling through walls.

Malleable copper tubing and insulation easily shapes to fit any application without kinking.
Pre-insulated and paired linesets

**Length markings** for fast, accurate measuring and cutting

**Pre-paired linesets** makes installation easier and improves lineset management when installing multiple units.

**Remember:** When calculating the needed amount of lineset, account for any obstacles, such as turns, that would affect the amount of line needed. *Measure twice, install once!*  

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Pre-insulated and paired linesets

Considerations:

- Insulation should be **no less than 1/2" thick** to ensure IMC and IRC codes are met.

- Ensure copper tubing meets **ASTM B280 standard** and any additionally required local codes or standards.
Pre-insulated and paired linesets

Considerations:

**Wide temperature range?**

- **Meets ASTM C534 standard**
  Does not absorb moisture or prematurely disintegrate from freeze/thaw cycles.

**Fire resistance?**

- **Meets UL-94 HF-1 standard**
  Most aggressive rating for plastic, low-density foams. Similar to ASTM E84 standard found on lineset insulation.

**UV resistant coating?**

- **Meets Internal Accelerated Life UV Testing**
  Maintains over 60% of tensile strength after 3+ years of UV exposure*. Little to no coloration change.

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*Based on super UV testing and calculation. Years are subject to various testing conditions.*
Flexible lineset connector

A flexible lineset connects between the refrigerant line and a wall mounted mini-split evaporator. Allows for an **easier, kink free installation of the mini-split evaporator to the wall bracket.**
Flexible lineset connector

Copper stubs allow for easy flaring and quick connections.

Stainless steel internal piping and jacketing allows for bending without kinking.

Multiple lengths and lineset size options will ensure the right connector is used for any given job.
Lineset bender

Designed for use as an **internal pipe bender** to offer the installer fast, easy and “kink-free” bends in soft copper linesets.

- **Does not damage insulation**
- **Easy retraction**, very flexible
- **Multiple sizes** for most mini-split/VRF applications
Lineset bender

- **Hassle free** - no need for springs or heavy and expensive equipment
- “**Kink-free**” bends
- **Bends both lines** simultaneously
- **Insulation removal unnecessary**
- **Forms compound bends** for tight spaces
- **Reusable** if clean with resealable straps
- **Soft copper only**
- Lets you **reach high** to make your first bend out of the wall
Push-to-connect refrigerant fittings

Flame-free fittings for connecting refrigerant lines
Push-to-connect refrigerant fittings

**Push-in connection**
Cut, deburr, clean and inspect, mark insertion depth, then push piping into the fitting.

**Easy release removal**
Place the release tool against the fitting and pull the piping from the fitting.

NOTE: Ensure the refrigerant has been pumped from the system before disconnecting linesets.
Push-to-connect refrigerant fittings

Considerations:

Flame-free connections
No flaring or brazing needed

Remember:
Tight spaces, such as crawlspaces or attics, make proper brazing difficult or impossible.
Use the right solution for the specific problem!

Sight window
Visually verify pipe seating
Push-to-connect refrigerant fittings

Compatible with mini-split ductless and unitary ducted residential systems

Allows HCFC and HFC refrigerants
- R134a, R404A, R290, R500, R407A, R600a, R22, R410A, R407C, R32

Maximum rated pressure:
- 653psi (45bar) ~ 870psi (60bar)

Works with copper and coated aluminum* linesets

*To avoid galvanic corrosion, do not use uncoated aluminum linesets directly with fittings.
Flaring process and possible leak causes

### Flaring process tools
- **Flaring hand tool with burnishing cone**
- **Pipe cutting tool**
- **Flare gauge**

### Common Causes of Refrigerant Leaks
- **Burrs on the flare**
- **Thinning flare**
- **Over or under sizing**
- **Flare misalignment**
- **Flare weakening/cracking**
- **Poor flare seal**

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Flare and swage drill bits

Precision drill bit kits that can **create a professional flare or swage in less than five seconds** with an impact drill.

- Forms consistently without splits, burrs, blemishes or uneven edges that typically cause fitting connection leaks
- Recommended for copper and aluminum line sets

For best results, use a drill capable of 1,800 RPM’s or higher. If swage or flare takes longer than 10 seconds, the drill most likely is not operating at 1,800 RPM’s.
Flare and swage drill bits

**FORGING**

Steel is heated and formed into the desired form through compression and repetitive blows from a hammer or die.

*Force keeps the steel’s grain structure tight, increasing strength.*

**CASTING**

Steel is heated into molten state and poured into a cast then ejected or broken out of the mold.

*Steel’s grain expands in cast, weakening the structure.*

**The forging process creates a stronger, more durable steel bit!**
Flare gasket

Gasket-like seal designed specifically for making a tight, leak-resistant connection between 45-degree flared tubing connections.

Conical rings for multiple points of contact reducing effects of misaligned flares.

Stamped copper seal with coating dramatically increases integrity of the fittings.
Considerations:

**Fittings**
Works with common aluminum and brass fittings.

**Refrigerants**
Compatible with all common refrigerants using POE and PVE oils.

**Wide operating temperature range**
Rated for -40°F to 300°F operation.

**Rated for high pressure systems**
Pressure rated up to 10,000 psi.
Independently tested to one million high pressure square wave pulse cycles.
Lineset ducting

System of ducting designed to **protect and conceal exposed ducted and ductless HVAC piping.**
Lineset ducting

- Protects linesets from environmental factors.
- Complements any residence or business with a finished look.
- Helps organize multiple lineset applications.
- Building codes can require that the line set be covered.
Ducting protects exposed line sets, condensate lines, and control cables from **weather, vandalism, pet and pest damage.**

**Weather and fire resistant; UV stabilized.**
- Tested to over 2,000 hours.
- Temp range: (-4°F to 140°F)

**Protects linesets from pets, pest, and vandals.**
- Flat bottom channel and elbow hugs wall, eliminates insect, bird nests
Lineset ducting

Aesthetically, the finished look of a ducted line set is **far superior to** that of exposed piping.

Exposed linesets leave a sloppy unprofessional look. Covered linesets leave a finished appearance making the equipment and contractor look professional.
Lineset ducting

• Helps organize multiple lineset applications on larger jobs.

• Multiple line sets will require several routes to connect the fan coils to the condenser.

Requires corners, turns, and bends in the ducting making multiple fittings necessary.
Adjustable lineset ducting

**Patented Multi-stage Adjustability**
Allows the duct to expand to accommodate multiple zone line sets.

![Diagram of adjustable ducts]

**Multi-zone: 2.25" to 3.5"**
**Single zone: 1.75" to 2.5"

**Interior Adjustable Tabs**
Allows the cover to quickly snap in and secures the cover in place.

![Diagram of interior tabs]

**Multi-zone: 4 tabs**
**Single zone: 3 tabs**

Easily covers wall obstacles
Adjustable lineset ducting

Covers and fittings for the majority of applications; available in a wide assortment of sizes, grades, and colors.

**Widths**

- $2^{3/4}''$
- $3''$
- $3^{1/2}''$
- $3^{3/4}''$
- $4^{1/2}''$
- $4^{1/2}''$
- $5^{1/2}''$

**Maximum Depths**

$4^{1/2}''$ size adjusts from $2^{1/4}''$ deep to $3^{1/2}''$, offering maximum depth for multiple linesets.
Lineset ducting

**Ducting is not just for the exterior!**

- Covering the line set on the interior is equally as important as covering it on the exterior.
- Interior ducting frequently covers the condensate pump, or drain line, as well as the lineset and power cables.
Lineset ducting

Installation details

1. Simple screw in place fittings
2. Zip tie linesets, condensate lines, and control cables
3. Snap lock closure

Lineset ducting kits are available to simplify the installation process.

- Ducting (12’)
- Wall inlet (1)
- 90° ell (1)
- End fitting (1)
- 2 couplers (2)

Everything needed for a standard single DMS install in one box.
Lineset installation accessories

**Lineset cover cutter**
- Provides a quick, clean, straight cut for lineset covers
- Recommended for residential and commercial HVAC lineset covers
- Works 3.75" ducting and below
- Light-weight at 1.15 lbs
- Easy one touch open/close
- Advanced corrosion resistance

**UV-resistant wrap**
- Provides UV protection from lineset cover to condensing unit
- Deteriorating lineset insulation is an air conditioning efficiency issue
- The International Energy Conservation Code (IECC) mandates a UV-resistant, non-adhesive wrap for linesets
Telescoping wall sleeve

It is necessary to use a wall sleeve to **seal the penetration for the line set to prevent unwanted infiltration.**

3" diameter sleeve, adjustable length from 5-7"

Don’t leave a hole in the wall
Tamper-resistant locking caps

Locking caps seal standard Schrader service valves on all mini-splits to help prevent refrigerant theft and refrigerant huffing.
Tamper-resistant locking caps

Guarding refrigerant gasses for unauthorized access has become not only good practice it is now the law.

**International Mechanical Code**

**1101.10 Locking port caps.** Refrigerant circuit access ports located outdoors shall be fixed with locking-type tamper-resistant caps.

**International Residential Code**

**M1411.6 Locking access port caps.** Refrigerant circuit access ports located outdoors shall be fitted with locking-type tamper-resistant caps or shall be otherwise secured to prevent unauthorized access.
Tamper-resistant locking caps

- Keyed so only HVAC technicians can get access.
- Fits onto standard Schraeder valves.
- Torque limiter prevents overtightening.
- Resists crushing and removal without key.
- 5/16" available for ductless mini-split applications.
Agenda

Ductless Mini-split Overview

Lineset Installation and Protection

Condensate Management

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Cleaning & Maintenance
Consequences of a clogged condensate line

About **one in 50 insured homes** has a property damage claim caused by **water damage** or freezing each year.

Ensuring the condensate drain line is clear and draining correctly may prevent extensive damage to the home or office!

Source: https://www.iii.org/fact-statistic/facts-statistics-homeowners-and-renters-insurance
## Condensate removal options

<table>
<thead>
<tr>
<th>Unit type</th>
<th>Condensate removal options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No pump</strong></td>
<td></td>
</tr>
<tr>
<td>Ceiling ducted unit</td>
<td>Gravity</td>
</tr>
<tr>
<td>Wall mounted unit</td>
<td>Gravity</td>
</tr>
<tr>
<td>Floor unit</td>
<td>Condensate pump</td>
</tr>
<tr>
<td>Lift pump</td>
<td></td>
</tr>
<tr>
<td>Ceiling cassette</td>
<td>1.6' to 2.3'</td>
</tr>
<tr>
<td>Gravity</td>
<td>Gravity</td>
</tr>
<tr>
<td>Condensate pump</td>
<td>Pumps to 39.4'</td>
</tr>
</tbody>
</table>

- **Ceiling ducted unit**
- **Wall mounted unit**
- **Floor unit**
- **Ceiling cassette**
- **Gravity**
- **Condensate pump**
Issues with tubing condensate drain lines

- Vinyl tubing, commonly used as a drain line, is easily constricted.
- Decreases in diameter will decrease flow rate.
- Good chance of condensation overflow.
- Increase the potential for microbial growth.
Condensate drain hoses prevent restrictions in the condensate line. Drain hoses for gravity draining ductless equipment are available in the following:

- **No-kink**
  - Prevents kinks from forming, causing potential restrictions in the drain line
  - Accepted standard internationally

- **Smooth bore**
  - Reduces resistance and maximizes condensate flow, resists clogging

- **Insulated**
  - Prevents moisture from forming on outside of condensate line when transitioning through unconditioned space
Drain-up piping hose kits are used for indoor AC units in the field of light commercial including VRF.

Insulated drain hoses will greatly reduce install time, since there is no need to cut and cement plastic pipes for the drain assembly.
Drain-up piping hose kits

**Pre-insulated hose/exclusive insulation technology**
Decrease on-site insulation work and reduce risks of condensation after installation.

**Pre-connected hose with fittings/no cement or adhesives needed**
Connect fittings to PVC with just a hose band to reduce installation time and easily perform maintenance.

**Transparent fittings**
Connections to PVC pipes are visible to insure a secure fit and water-flow check.

**Water leakage check sheet**
Easily identify leaks when they occur under the water leakage test.
Condensate drain adapters

Condensate drain adapters are designed for joining the mini-split OEM drain pipe of the evaporator to the pipe or hose of a different size.

**Wide size range**
14 — 20 conversion dimension sizes per adapter

**Flexible end**
Accommodates PVC tubing to PVC tubing

**Color-coded**
Easily identify sizes by color code

*Fits 11/16” pipe size*  
*Fits 5/8” pipe size*
In-line Check Valve

In-line check valve for ductless mini-split condensate lines with gravity drain permits free condensate flow while blocking odors and insects.

Meets IMC 307.2.4.1

“Ductless mini-split equipment that produces condensate shall be provided with an inline check valve located in the drain line, or a trap.”

The only product that satisfies this code requirement.
A condensate sensor switch is an essential component to a properly functioning mini-split system and is required by International Mechanical Code.

**IMC 307.2.3.1 Water-level monitoring devices**

On downflow units and all other coils that do not have a secondary drain or provisions to install a secondary or auxiliary drain pan, a water-level monitoring device shall be installed inside the primary drain pan. This device shall shut off the equipment served in the event that the primary drain becomes restricted. Devices installed in the drain line shall not be permitted.
Condensate sensor switch

- Installs directly on primary drain pan or clipped to coils above primary drain pan
- Onboard LED indicator can be mounted to side of unit
- Can be wired in both normally open and normally closed systems
- Meets IMC requirements
- Inexpensive insurance
- Multi-voltage
- No batteries required
Condensate pump terminology

**Flow**
Volume of *water moved per hour*

An evaporator unit produces between 0.13 and 0.2 US gallons of condensate per hour for each 3500 Btu of cooling

**A 35,000 Btu unit produced 2 gallons of condensate per hour!**

**Suction lift**
Vertical distance water is being sucked from reservoir to pump

**Pressure head**
Vertical distance which water is being discharged up from the pump

**Distance**
How far it will pump in the horizontal plane

An evaporator unit produces between 0.13 and 0.2 US gallons of condensate per hour for each 3500 Btu of cooling.

A 35,000 Btu unit produced 2 gallons of condensate per hour!
Types of mini pumps

**Piston**
- Can be quiet
- Small
- Very flexible in installation
- Low energy
- Can not run dry
- Siphoning will kill them
- Requires reservoir filter to remain clean

**Rotary Diaphragm**
- Can be quiet at high flow rates
- Small
- Flexible in installation
- Low energy
- Can run dry
- Requires reservoir filter to remain clean

**Centrifugal**
- Noisy
- Higher volume
- Sit below condensate source
- **Should not use!**
Piston mini pumps

Flexible install options, easy to conceal

Suitable AC models:
Up to 4 Tons
Lift: 5 feet
Head: 33 feet
Voltage: 100V to 250V

• Ultra-slim profile and Integral hanging loop and separate reservoir facilitates attachment in vertical applications

• Self priming

• Modular terminals for fast connection

• Voltage specific Silent+ models and Univolt models available

Typical pump locations

- Ultra-slim profile and Integral hanging loop and separate reservoir facilitates attachment in vertical applications
- Self priming
- Modular terminals for fast connection
- Voltage specific Silent+ models and Univolt models available
Piston pumps: Concealed

**For remote mounted pump applications**

Suitable AC models:
Up to 4 Tons
Lift: 5 feet
Head: 33 feet
Voltage: 100V to 250V

- Self priming
- Pump installs remotely above ceiling or inside lineset cover
- Pan mount and inline style reservoir included
- Modular terminals for fast connection
- Gravity inlet
- Quiet and fully potted
- Voltage specific Silent+ models and Univolt models available

**For higher head or larger BTU applications**

Suitable AC models:
Up to 13 Tons
Lift: 5 feet
Head: 49 feet
Voltage: 100V to 250V
Piston mini tank pump

**Designed for use with ceiling cassettes**

![Piston mini tank pump image]

**Suitable AC models:**
- Up to 13 Tons
- Lift: 0 feet
- Head: 49 feet
- Voltage: 230V

<table>
<thead>
<tr>
<th>Lift</th>
<th>Head</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 ft</td>
<td>49 ft</td>
<td>230V</td>
</tr>
</tbody>
</table>

- High performance piston technology, includes anti-siphon device and Thermal protection
- Accepts standard 5/8” drain hose from any mini-split, Extra large reservoir capacity minimizes pump operation
Piston pumps: Surface mount

Easiest to install and maintain

Suitable AC models:
Up to 4 Tons
Lift: 0 feet
Head: 33 feet
Voltage: 100V to 250V

• Accepts standard 5/8” drain hose from any mini-split.
• Extra large reservoir capacity minimizes pump operation.
• Cleanable replaceable plastic filter accepts water treatment tablet.
• No need to disturb evaporator to clean filter, reservoir clips out from front for easy removal and replacement.
• All components clip apart for easy disassembly without tools.
• Quiet and fully potted.
Rotary diaphragm pumps: Surface Mount

For high wall indoor units. Easy to install.

Suitable AC models:
Up to 4.5 Tons
Lift: 0 feet
Head: 33 feet
Voltage: 100V to 250V

- Low profile unit designed to be positioned within high wall unit shadow line
- Rotary Diaphragm pump mitigates noise at higher flow rates
- Capacitance technology: Soft start variable flow, pump speed optimized in response to flow rate
- Noise Level: 19dB(A)
- Can run dry
- Optional easy fit installation insert provided
- Position inlet left or right for installation flexibility
- Univolt technology
Why would we use mini pumps?

Because people will accept this

But not this!
Condensate siphoning

The biggest installation problem

Siphoning is the effect of water being pulled down and out of the pump by gravity.
Condensate siphoning

**Anti-siphoning device will solve this problem!**

- Fitted on the discharge hose close to the pump, non directional
- Saves time and cost on the installation
Draining from mini-split to PVC

3/4" PVC to 5/8" Pipe to Pipe Rubber Connector/ Adaptor

Allows the connection of a mini-split OEM drain tube directly to a 3/4" PVC pipe.

Ensure both ends are fully installed to connector fitting and secured with zip ties.
Tank pumps are an automatic condensate removal pump for water dripping off an air conditioner evaporative coil or cooling gases within a condensing furnace.

The pump is controlled by a float/switch mechanism which turns the pump on when water collects in the tank, and automatically switches off when the tank drains.
Tank pump component overview

**Check valve**
Prevents water from re-entering the tank

**Multiple inlets**
3 inlet options for connection

**Reliable float arm**
Design ensures consistent activation of pump to remove condensate

**Thermal overload protection**
Prevents dangerous overheating that can cause motor failure

**Longer cord**
6' foot power cord to easily position pump

**Compact design**
For easy installation
Tank pump component overview

**High level safety switch**
Turns the AC/furnace off while the M4R pumps condensate

**Multiple inlets**
4 tapered inlet options. Comes with 3 inlet covers

**Check valve and clip**
“Twist and click” removable check valve prevents water from re-entering the tank. Retaining clip secures the adaptor

**Debris filters**
On either side of the 4 inlets.

**Quick release tank**
For fast install and maintenance

**Compact design**
Low profile design allows for easy installation while retaining ample tank capacity

**Bubble level**
Built-in for easy installation
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Wall-bracket condenser mounts

Securing ductless mini-split condenser units **above ground level** is important.

- Prevents damage
- Allows for proper air flow
- Decreases the amount of dirt and debris inside
- Allows for ease of installation and maintenance
Wall-bracket condenser mounts

Ductless mini-split condensers should never be allowed to sit directly on the ground.

- Easily Damaged
- More susceptible to dirt clogging fins
- Not as robust as ducted condensers
- Need to be anchored for support
- Usually high and thin with a narrow base
## Wall-bracket condenser mounts

<table>
<thead>
<tr>
<th>Type</th>
<th>Features</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heavy Duty Steel</strong></td>
<td>Made from heavy duty steel with galvanized finish</td>
<td>300lb.</td>
</tr>
<tr>
<td></td>
<td>This bracket offers extra integral cross bracing for ultimate stability</td>
<td></td>
</tr>
<tr>
<td><strong>Galvanized Finish</strong></td>
<td>Made from heavy duty steel with a hot dipped galvanized finish</td>
<td>330lb.</td>
</tr>
<tr>
<td></td>
<td>Features a sliding cross bar for exceptional equipment width range</td>
<td></td>
</tr>
<tr>
<td><strong>Hurricane Rated</strong></td>
<td>Made from heavy duty steel with a hot dipped galvanized finish</td>
<td>500 lb.</td>
</tr>
<tr>
<td></td>
<td>Having a top cross bar allows this bracket to be installed under a</td>
<td></td>
</tr>
<tr>
<td></td>
<td>window or other obstacle</td>
<td></td>
</tr>
<tr>
<td><strong>Under The Window</strong></td>
<td>Made from heavy duty steel with a hot dipped galvanized finish</td>
<td>176lb.</td>
</tr>
<tr>
<td></td>
<td>Having a top cross bar allows this bracket to be installed under a</td>
<td></td>
</tr>
<tr>
<td></td>
<td>window or other obstacle</td>
<td></td>
</tr>
</tbody>
</table>

*Model WBB500HR approved Miami-Dade County, Florida NOA No. 21-1012.03 Expiration Date 10/06/2026*
Evaporator supporter

Specially designed support tool allows a single technician to install or service a mini-split evaporator unit.

- Accommodates most mini-split brands and evaporator weights up to 100-pounds.

- **Allows single person installation.** Pays for itself in labor savings after just one installation.

- Simple clip on support.

- Soft gasket material on support feet and support arms protect wall surfaces and evaporator coil encasement finishes from scratches.
Rubber and polymer condenser risers

Risers are designed to prevent mini-split condensers, or lineset piping, from sitting directly on the ground or roof.

- Light durable weather resistant
- Low or high profile rubber pad with built-in aluminum channel
- Track holds 3/8” hex bolts
- Accepts strut hardware
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Mini-split stand kits

Pre-fabricated support solution for ground level mini-splits and small AC units.

- Strong and sturdy base for individual or multiple units.
- Rugged ASTM-A36 galvanized steel corrosion resistant support.
- Pre-boxed – quick assembly.
- Use in regions requiring higher clearance due to accumulated snow.
Condenser pads

High-quality resin support solution provides a strong and stable equipment platform for uneven surfaces.

- Extreme durability (does not chip)
- Absorbs vibrations
- High anchoring strength for securing equipment
- UV, freeze, and thaw resistant
- Waterproof

- Chemical resistance against R-407c and R-410A, compressor oil, coil cleaners, and salt solution

Confirm requirements with your town or city’s zoning codes prior to installation!
Challenges of properly supporting ground level condenser units

**Condensation**
- Condensation water weight, along with the system’s weight can potentially damage lines and tubes running underneath the unit.

**Concrete pads**
- Vibration from operation can cause the pad to sink becoming un-level.
- Over time, concrete can break or chip.

**Environment**
- Harsh weather conditions require proper support.
Multi-frame support system

**Modular support system for roof-mounting mini-splits and larger VRF/VRV systems.**

**40” x 48” Multiples**
- Extension kits

**Sturdy**
- Load rated up to 1,102 lbs per frame module

**Height adjustable**
- 13”–18” and 13”–26” (length, stud)

**Versatile**
- Accommodates various unit sizes.

**Fast installation**
- Systems can easily be assembled and moved in minutes instead of fabricated in days
Surface Accommodations

Plastic Foot

- Does not corrode
- Anti-vibration rubber pads improve stability
- Suitable for any roof surface

Molded plastic feet do not penetrate the roof!

Disadvantages of Metal Foot

- Can damage roof membrane leading to unwanted penetration
- Susceptible to corrosion

*Work to a maximum foot pressure and UDL of 417.7psf and 156.6psf respectively.*
Weather Resistance

Galvanized steel protects against the elements*

Wind rated up to 100mph in exposed environments

Suitable for internal or external applications (-40°F to 176°F)

*Salt mist test conducted in accordance with ASTM B117-11 to simulate an accelerated environmental test. Acetic acid salt spray conducted in accordance with ASTM G85-11 to simulate an accelerated environmental test. Results validate the 10 year product guarantee issued by Big Foot Systems.
“H-Frame” support kit

Flexible, support solution for small and large pipework systems, ductwork runs and cable trays.

- Accepts a range of struts or threaded bars and is the most flexible choice on the market
- 50% Higher Coefficient of Friction; better surface to surface grip than rubber feet
- Maximum stability; EPDM mat conforms better to uneven surfaces than rubber
- Optimum weight distribution over whole footprint
- Pre-threaded hole suitable for M12 bar
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**Electrical**

Indoor Air Quality

Cleaning & Maintenance
National Electric Code 440.14 requires an accessible means to disconnect the system from electricity.

Additionally, a 3-pole switch can be useful when local building codes mandates an equipment disconnect on indoor units.

As always, follow all local codes and requirements!
Harmful effects of voltage disturbances

**Disruptive effects**
- Electronic component interprets voltage transient as command.
- Microprocessor and integrated circuit damage on all systems. Mini-splits are very susceptible!

**Dissipative effects**
- Repetitive energy level surges or sags, resulting in long-term equipment degradation.
- Circuit boards, compressors and motor damage on all systems

**Destructive effects**
- Well in excess of the surge current rating of a surge protector resulting in immediate equipment failure.
- A direct lightning strike will destroy both the equipment and the SPD.

- **Surge/Spike**
  - In excess of 25% of rated line voltage

- **Swell**
  - Momentary increase in voltage

- **Sag**
  - Momentary reduction in voltage

- **Brownout**
  - Lag or drop in line voltage, sometime dropping out completely

- **Outage**
  -
Surge Protective Devices (SPD’s) protect equipment from electrical surges, brownouts, and other voltage disturbances.

- **Unique integrated circuit** (GDT’s + MOV’s) allows for 15 hits at nominal discharge current without failure and 1 hit at maximum surge current.
- **Thermally-fused components** to eliminate catastrophic failures due to extreme sustained overvoltage.
**Integrated circuit** (MOV’s + GDT’s) combines the fast-switching protection and safety of MOV’s, with the robustness and longevity of GDT’s. The circuit allows for 15 “hits” at nominal discharge current without failure and 1 “hit” at maximum surge current.

**Metal Oxide Varistors** (MOV)

**Gas Discharge Tubes** (GDT)

**Unique integrated circuit**

Fast “clamping” reaction, degrades over time

Not as fast, but more robust (<60kA)

Fast reaction time and more robust, providing contractors with an SPD having the only lifetime product warranty!
Surge protective devices

Quality SPD’s are **UL 1449 listed** and have **thermally protected MOVs** with the NEC’s **highest Short Circuit Current Rating** (SCCR) @200kA to ensure the safety of every install.

Thermally-fused components eliminate catastrophic failures due to extreme sustained overvoltage.
Surge protective devices

**Save valuable jobsite installation time** with 30 amp fused, 60 amp fused, and 60 amp non-fused disconnect boxes featuring a factory-installed, prewired surge protective device.

**Powder-coated steel**
Weather-rated under NEMA 4X

**Additional access**
Three extra 1/2" knockouts

**Tabbed into the disconnect**
Avoids any potential code violations with multiple wires being plugged in

**Locking hinged cover**
Prevents unauthorized access
Series Voltage Monitoring Devices

**Over/under voltage auto cut-off device with auto restore** ideal for mini-split and inverter-based systems. Available pre-wired with an RSH-50 surge protector in a NEMA3R enclosure.

**Diagnostics indicators**
Power indicator and alarm LED’s

**Push button, programmable cut-off set points**
Adjustable from 90-300 volts for a wide range of input voltage

**Surge protection**
Available terminals for adding surge protection

120/240 Single Phase, 60 Amp Double Pole Capacity Relays (handles loads 15-60 Amps)
Voltage Monitoring Devices

Voltage monitoring devices provide **advanced voltage monitoring by defining the input voltage range**. If the voltage goes above or below the desired range, power to the system is cut off. When line voltage returns to normal levels, the circuit allows the condenser to resume operation via the auto restore function. Brownout and surge protection device is ideal for 120/240V applications such as mini-splits and inverter-based systems.

Set desired high/low cut off points between 90-300Vac
Interconnect cables are used to connect the condenser to the evaporator during mini-split installations.

- Using the correct interconnect cable will decrease installation errors
- 4/C 14 Gauge shielded
- Class B stranded bare copper per ASTM B-3 and B-8
- 600V max
- Black jacket sunlight and moisture resistant
- Temperature range: -30°F to 90°F (75°F wet)
Agenda

Ductless Mini-split Overview

Lineset Installation and Protection

Condensate Management

Mounting

Support

Electrical

Indoor Air Quality

Cleaning & Maintenance
Indoor Air Quality (IAQ)

Indoor Air Quality (IAQ) refers to the air quality within and around buildings and homes, especially as it relates to the health and comfort of occupants.

**Utilizing air quality products and technologies prevents long-term and short-term health effects from indoor air pollutants.**

- **Filtration**
  - Reduces dust, pollen, mold, and dander, as air circulates through your central air system.

- **Purification**
  - Reduces or inactivates indoor air pollutants such as odors, VOCs (Volatile Organic Compounds), and bacteria.*

- **UV Inactivation**
  - UV-C light can inactivate specific, targeted bacteria where the UV-C light shines.**

*MS2 virus and Staphylococcus epidermis bacteria.

**SARS COV-2, MS2 virus, Bacillus thuringiensis bacteria, Aspergillus niger mold, and Serratia marcescens.
Benefits of UV Inactivation

**UV-C light deactivates the DNA of targeted bacteria, mold and viruses*** destroying their ability to multiply and cause disease.

*MS2 virus and Staphylococcus epidermis bacteria*
Mini-split Germicidal Ultraviolet Light

Utilizes UV-C light to deactivate the DNA of targeted bacteria, mold and viruses.*

- Dual-lamp design with high-ambient temperature operation
- Autosensing dual-voltage specification 120V/230V
- Proprietary hexagonal lamp design allows lamps to be directionally clocked to optimize UV intensity
- Heavy-duty lamp shield protects lamp from breakage
- Ozone free
- Quick-disconnect lamp system for easy lamp replacement

*MS2 virus and Staphylococcus epidermis bacteria
Agenda

Ductless Mini-split Overview

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Cleaning & Maintenance
Effects of an unmaintained system

**Limited heat transfer** from the coils to outside air, making it harder to keep the environment at the desired temperature.

**Increased energy costs** due to the system working harder to compensate from reduced efficiency.

**Costly repairs or replacement.** The average A/C repair costs $300. Condenser coil replacements can range from $1,900 to 2,900.

Regular cleaning and maintenance are critical to maintain a properly functioning mini-split system.

Source: https://www.hvac.com/blog/prepared-hvac-repair-costs/
Mini-split cleaning kit

Non-corrosive coil cleaner safely cleans HVAC/R coils indoor evaporator of mini-split units. NSF approved.

- Will not harm aluminum, copper or steel and acts as a corrosion inhibitor with no heat transfer loss
- Safer to use because of its low toxicity – application and cleanup are safe, simple, and easy
- May be left in sprayer – will not corrode parts

Kit contents include:
- Cleaning Solution
- C-Band Frame Assembly
- Single Use Funnel Bags
- Drain Pail
- Installation Instructions
Evaporator coil cleaner & disinfectant

Strong disinfectant. Self-rinsing coil cleaner.

Features
- Controls mold and mildew. Cleans and deodorizes. Cuts grease and grime without scrubbing. No rinsing required.
- Disinfects against Canine Parvovirus. Kills Legionella pneumophila. Effective via AOAC methodology against a wide variety of organisms
- Virucidal against Herpes Simplex Virus Type 1 & 2, Canine Parvovirus
- Disinfects against Legionella Pneumophila

Application
- Designed specifically for HVAC equipment in homes, nursing homes, institutions, offices, schools, motels and hotels.

Recommended for:
- Disinfecting and cleaning A/C evaporator coils, HVAC catchpans, floors, walls, tabletops
- Must rinse thoroughly and dry prior to applying coatings

Can be used against SARS-CoV-2, the cause of COVID-19.

Source: EPA Website, 40 CFR 158.2203
Antimicrobial coil coating

Spray-Applied Antimicrobial Coil Coating

**Features**

- Powered by Agion compound, EPA registration No. 71227-7-88165
- Protects from mold and mildew caused by fungal growth
- Prevents microbial odor development on floors and ceilings
- Extends equipment life
- UV resistant

**Application**

- Ideal for HVAC tubing, internal components and cabinet walls
- Hospitals, schools and anywhere else bacteria, mold and fungi are a concern
- Not intended for ductwork, insulation, duct board, blower wheels, or electrical components unless otherwise specified

1 can covers 0-2.5 tons unit (0-9 kw) coverage of coils only
Enhance your Indoor Air Quality with coil cleaner and coating products

Coil cleaners clean and disinfect evaporator coils while coil coating protects against mold, mildew and microbial odor to ensure a healthy A/C environment.
Refrigerant leak sealants

Sealant revitalizes mini-split systems by permanently sealing small, hard-to-find micro gas leaks.

- For use in systems up to 2 tons or 24,000 BTUs
- Infuses into system through standard 1/4" or 5/16" service port using an HVAC manifold or with proper refrigerant gas container
- For use in copper and aluminum coils
- UV formula adds the ability for a UV light source to detect larger leaks for system assessment
Lineset cleaner and scrubber

Cleans refrigeration line sets when installing new compressors after burnouts or when converting to R-410A refrigerant.

- Removes oil, sludge, carbon and other deposits found inside A/C and refrigeration linesets
- Chemically and mechanically cleans
- Stays active during the entire cleaning process
- Scrubbing action cleans more completely than chemicals alone
- Cost effective, reusable system
Corrosion resistant coatings specifically designed for the protection of HVAC coils and components. Perfect for DIY application.

- Designed for the protection of HVAC coils and components
- Formulated to improve adhesion, moisture resistance, UV protection, and corrosion resistance
- Extends the life and efficiency of HVACR equipment
- Can be applied on-site or at premises after HVAC units have been manufactured and installed