



Selection of APR Controls Related to Oil Entrainment

Technical Support

Product Installation Tips

This bulletin will address suction line diameter as it relates to selecting the correct APR Control and allowing for capacity modulation while maintaining proper oil entrainment.

As an HVAC Professional, you know a number of factors have an effect on proper oil entrainment; proper evaporator design, correct capacity balance with the compressor, proper use of traps, and correct refrigerant line sizing.

Selection Process

When we assist a client in selecting an APR Control, we verify:

1. *Best piping practices have been followed.*
2. *The equipment is designed to allow for proper oil entrainment.*

Therefore our selection process is specific to the tonnage of the equipment, refrigerant type, suction line diameters, and length of the run.

Sizing Overview

Refrigerant lines are sized for full load conditions. When a system has an APR Control installed and is operating at part load conditions, the APR Control is modulating, redirecting refrigerant from the evaporator reducing the amount of liquid refrigerant sent to the TXV and, thus reducing the velocity of the refrigerant in the suction line returning to the compressor.

Packaged Unit Example: A Packaged Unit has very little piping, and refrigerant flow is turbulent, therefore in most cases suction velocity and oil entrainment is not as critical a concern as it is in split systems. Thus, we can select an APR Control that will provide maximum allowable modulation in a package unit; up to approximately 75% of full capacity of the lead stage.

Split System Example: When sizing an APR Control for a Split System the following must be taken into account to ensure oil entrainment; total tonnage of the lead stage, suction line length, suction line diameter, and positioning of the condensing unit as it relates to the air handler.

Our technical team is very conservative when selecting the proper APR Control; this allows us to ensure that we can maintain minimum velocity to ensure oil entrainment up any suction riser (Even if there are no risers we concern ourselves with the possibility that one might be installed in the field). As shown in the examples below, suction line diameter has a direct impact on the amount of capacity modulation the APR Control is able to provide.



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Simple Example 1: 1-1/8" Suction Line

Unit Information	System Size	System Stage	Suction Line Size	Suction Line Length	Condenser	Refrigerant Type
	5 Ton Split System	Single Stage	1-1/8"	Length 25 Ft.	10 Ft. Above Evaporator	R-410A

With a 1-1/8" Suction line using R-410A refrigerant you need to maintain a minimum of approximately 2.2 tons* **(1)** of refrigerant through the circuit in order to ensure proper oil entrainment to the compressor. Therefore, with a 5 ton split system using a 1-1/8" suction line proper APR Control is the APR-410-2 which allows for 2.5 tons of capacity reduction. This means that the APR Control will never modulate below the required 2.2 tons in turn ensuring oil will always flow back to the compressor.

Simple Example 2: 7/8" Suction Line

Unit Information	System Size	System Stage	Suction Line Size	Suction Line Length	Condenser	Refrigerant Type
	5 Ton Split System	Single Stage	7/8"	25 feet	10 Ft. Above Evaporator	R-410A

With a 7/8" suction line using R-410A refrigerant you need to maintain a minimum of approximately 1.1 tons* **(2)** of refrigerant through the circuit in order to ensure proper oil entrainment to the compressor. Therefore, with a 5 ton split system using a 7/8" suction line the proper APR Controls is the APR-410-3 which allows for 3.5 tons of capacity reduction. This means that the APR Control will never modulate below the required 1.1 tons in turn ensuring oil will always flow back to the compressor.

(1) * Selection is based on maximum allowable modulation.

(2) * Minimum tonnage values are based on ASHRAE guidelines at a 40°F Saturated Suction Temp (SST) with 15°F of Superheat and 90°F Liquid Temperature.

Technical Support

Whether you're installing the APR Control on new equipment or retrofitting an existing system, Rawal Devices' Technical Support can provide the technical application and device expertise you need. Call 800-727-6447 or email techsupport@rawal.com

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