

Control Sequence Introduction

AboveAir has developed a number of standard control sequences in order to meet the needs of a variety of common engineering applications. The following descriptions are intended to help the engineer in selecting the control sequence that will fulfill the project's requirements; alternatively, the engineer may refer directly to the selection table at the end of this document to find the recommended control sequence based on their application's parameters.

Standard Recirculation Control

Standard control systems are typical recirculating systems. In these systems, the outdoor air percentage is fairly low, typically less than 20% of the total supply air.

Temperature Only Control: The temperature only control option is intended to serve the cooling and/or heating needs for a single zone. A space or return mounted temperature sensor serves as the primary control point for all unit operations.

Temperature & Humidity Control: The temperature & humidity control option is intended to serve the cooling, heating, humidification, and/or dehumidification needs for a single zone. A space or return mounted temperature & humidity sensor serves as the primary control point for all unit operations.

Single Zone VAV Control: The single zone VAV control option is similar to the temperature & humidity control option in that it serves the cooling, heating, humidification, and/or dehumidification needs for a single zone. The single zone VAV control option will additionally control the fan speed to match the space load to minimize overall energy usage.

VAV Control: The variable air volume (VAV) control option is intended for true VAV systems; the unit will serve systems with VAV boxes (typically supplied with reheat). The unit will maintain a constant leaving air temperature while varying the fan speed from 30% - 100% of design airflow based on the changing static pressure requirements for the system.

HPOA Control

High percentage outdoor air (HPOA) control systems are designed for systems where the outdoor air will be greater than 20% of the total. Because the mixed air condition becomes increasingly independent of the space conditions with increasing outdoor air proportions, these systems incorporate additional controls and features to temper air year-round.

Neutral Control: The neutral control option is intended for providing tempered outside air to one or more zones. These systems are almost always dedicated outdoor air systems and serve to meet makeup air requirements or minimum OA requirements. The air is typically tempered to approximately the same condition as the spaces served to avoid introducing additional heating, cooling, or humidity loads based on the ambient air conditions.

Neutral air control systems may be provided with fan speed control options. Fan speed may be varied to maintain a static pressure set point (based on either duct or building static pressure) or to maintain a CO₂ set point.

Primary Control: The primary control option is intended for systems serving a single zone with a high outdoor air requirement. This system serves the heating & cooling requirements for the single zone. Additionally, when space conditions are satisfied, this system tempers the air to approximately the same condition as the space to avoiding introducing additional heating, cooling, or humidity loads based on the ambient air conditions like a neutral air system.

This system may also be selected with a single zone VAV option, varying the fan speed to match the space load (subject to minimum fan speed for OA requirements).

VAV Control: The VAV control option is very similar to the Standard VAV control option. The variable air volume (VAV) control option is intended for true VAV systems; the unit will serve systems with VAV boxes (typically supplied with reheat). The unit will maintain a constant leaving air temperature while varying the

fan speed from 30% - 100% of design airflow based on the changing static pressure requirements for the system. However, the HPOA control option adds the ability to dehumidify air at the air handling unit when utilizing a supply air temperature reset schedule and is intended to operate over a much wider range air temperatures entering the unit.

RT-OA Control

Similar to HPOA, the RT-OA control system ensures air delivered to spaces is tempered year-round. The RT-OA control sequences add additional features, including energy recovery options, damper control, and more for the packaged rooftop solutions.

Neutral Control: The neutral control option is intended for providing tempered outside air to one or more zones. These systems are almost always dedicated outdoor air systems and serve to meet makeup air requirements or minimum OA requirements. The air is typically tempered to approximately the same condition as the spaces served to avoid introducing additional heating, cooling, or humidity loads based on the ambient air conditions.

Neutral air control systems may be provided with fan speed control options as well. Fan speed may be varied to maintain a static pressure set point (based on either duct or building static pressure) or to maintain a CO2 set point.

To maximize the efficiency of the equipment an integral energy recovery wheel or plate and frame heat exchanger is recommended.

Primary Control: The primary control option is intended for systems serving a single zone with a high outdoor air requirement. This system serves the heating & cooling requirements for the single zone. Additionally, when space conditions are satisfied, this system tempers the air to approximately the same condition as the space to avoid introducing additional heating, cooling, or humidity loads based on the ambient air conditions like a neutral air system.

This system may also be selected with a single zone

VAV option, varying the fan speed to match the space load (subject to minimum fan speed for OA requirements).

To maximize the efficiency of the equipment, an integral energy recovery wheel or plate and frame heat exchanger is recommended.

VAV Control: The VAV control option is very similar to the Standard VAV control option. The variable air volume (VAV) control option is intended for true VAV systems; the unit will serve systems with VAV boxes (typically supplied with reheat). The unit will maintain a constant leaving air temperature while varying the fan speed from 30% - 100% of design airflow based on the changing static pressure requirements for the system. However, the HPOA control option adds the ability to dehumidify air at the air handling unit when utilizing a supply air temperature reset schedule and is intended to operate over a much wider range air temperatures entering the unit.

To maximize the efficiency of the equipment an integral energy recovery wheel or plate and frame heat exchanger is recommended.

Sequence Selection Table

The following table is provided to help direct the designer to the sequences that will best meet their application's requirements. Details control sequences corresponding to these recommendations may be found at <http://www.aboveair.com>

Control Requirement	OA%	Fan Control Options	Zones Served	Recommended Sequence
System serves zone heating and cooling loads only	<20%	Constant Speed	1	MC-2000S RT (DX Systems) MC-4000S RT (Heat Pump Systems) MC-6000S RT (Chilled Water Systems)
	<20%	Varies with Space Load	1	MC-2000SZ (DX Systems) MC-4000SZ (Heat Pump Systems) MC-6000SZ (Chilled Water Systems)
	20%-100%	Constant Speed (Standard), Varies with Space Load (Optional)	1	MC-3000P (DX Systems) MC-5000P (Heat Pump Systems) MC-7000P (Chilled Water Systems) MC-9000P (Rooftop Units)
System serving zone heating, cooling, humidification, and/or dehumidification loads	<20%	Constant Speed	1	MC-2000S RH (DX Systems) MC-4000S RH (Heat Pump Systems) MC-6000S RH (Chilled Water Systems)
	<20%	Varies with Space Load	1	MC-2000SZ (DX Systems) MC-4000SZ (Heat Pump Systems) MC-6000SZ (Chilled Water Systems)
	20%-100%	Constant Speed (Standard), Varies with Space Load (Optional)	1	MC-3000P (DX Systems) MC-5000P (Heat Pump Systems) MC-7000P (Chilled Water Systems) MC-9000P (Rooftop Units)
System serves VAV boxes	<20%	Varies with duct static pressure	Multiple	MC-2000S RT (DX Systems) MC-4000S RT (Heat Pump Systems) MC-6000S RT (Chilled Water Systems)
	20%-100%	Varies with duct static pressure	Multiple	MC-3000V (DX Systems) MC-5000V (Heat Pump Systems) MC-7000V (Chilled Water Systems) MC-9000V (Rooftop Units)
System provides make-up air or is a dedicated outdoor air system (DOAS)	100%	Constant Speed (Standard), Varies with CO2, duct static pressure, or building pressure (optional)	1 or More	MC-3000N (DX Systems) MC-5000N (Heat Pump Systems) MC-7000N (Chilled Water Systems) MC-9000N (Rooftop Units)