

BACnet INTERMITTENT FAN POWERED—WITHOUT HEAT

CARRIER CONTROL PACKAGE NO. 4780

Application:

Intermittent fan powered terminals are designed to provide heating and cooling for perimeter zones. These terminals are also used in interior zones, where a combination of primary air mixed with recirculated air provides increased air movement and improved ventilation. A typical application is shown in Fig. 1. Design, load requirements, downstream (external) static pressure, fan performance and sound level acceptability govern terminal selection and sizing. The controls provide variable air volume (VAV) control of the primary air during cooling and heating. When the primary air source is cooling, should the zone require heat, the fan operates to draw in air from the ceiling plenum to provide heat to the zone (the fan set point is set to a CFM value slightly above the minimum cooling CFM set point.) These terminals require low inlet static pressure, permitting the use of smaller, more energy efficient primary air fan systems. A wall-mounted space temperature (SPT) sensor located in each zone will sense load requirements and activate the control sequence to accommodate cooling or heating. The control operates the fan during cooling when the zone's cooling load falls below a user-adjustable minimum airflow set point. This feature prevents cold air 'dumping' from the diffusers, while providing improved ventilation at a lower minimum airflow. This control package provides the following sequences of operations:

A. Cooling: (refer to numbers on flow diagram). See Fig. 2.

- 1-2 indicates that maximum primary airflow is established by the user-defined maximum cooling airflow set point until the zone comes under control at 2. The fan is disabled.

2. Beginning at 2, the primary airflow is regulated over a throttling range by the damper until the minimum cooling airflow set point is reached at 3. (It must be noted that the minimum cooling airflow set point could be set to zero by the user. In this case, the damper will fully close if the zone temperature continues to fall.) As the primary airflow is reduced, the fan will operate to increase air circulation and improve ventilation when the primary airflow falls below the user-defined airflow set point.

- 3-4 indicates that, should the zone temperature continue to fall, the damper will hold the user-defined minimum cooling airflow set point.

B. Heating: (when the primary air source is providing heated air, refer to numbers on flow diagram). See Fig. 2.

1. Upon receiving a heating signal generated by the air source equipped with BACnet controls (or a primary air temperature sensor is installed to detect that the air source is heating), should the zone temperature fall below the occupied heating set point, the Heating mode is in effect at 4'.
2. The damper is throttled between the user-defined minimum heating airflow set point at 4' and the user-defined maximum heating airflow set point at 6. The fan remains off during this cycle.
3. The control may be configured to provide constant volume heating. In that case the damper will maintain the minimum heating airflow set point at 4' to supply a constant volume of heated air to the zone.

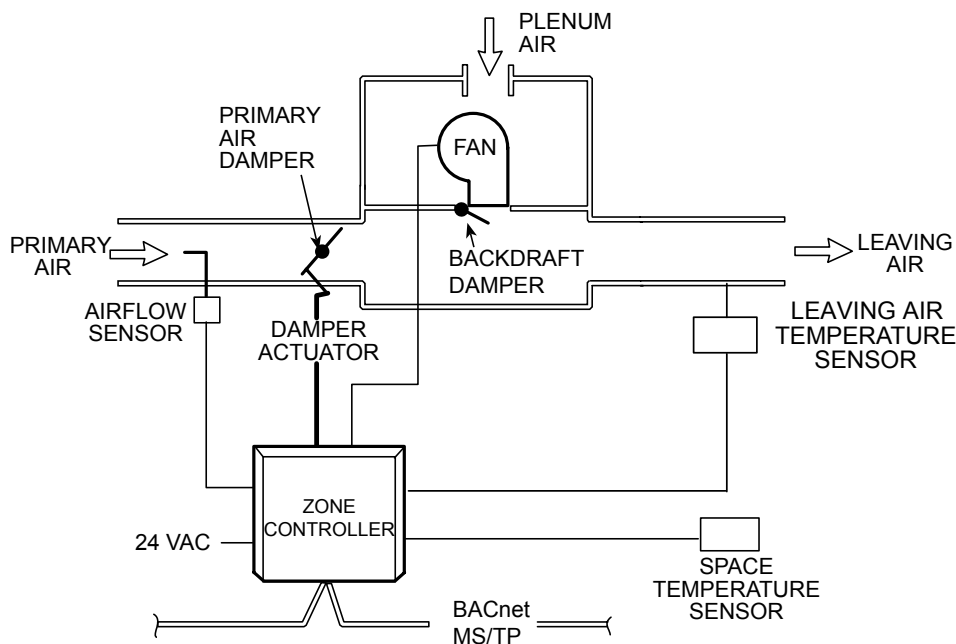


Figure 1 - Intermittent Fan Powered Air Terminal—Without Heat

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06/15/2010

JOB NAME	JOB NUMBER	LOCATION	PAGE NUMBER	DRAWING NUMBER
BUYER	BUYER #	SHEET	1 OF 4	45M/N/R-D-4780

- C. Morning warm-up: (configured to provide variable volume heating)

Upon receiving a morning warm-up signal generated by the air source equipped with BACnet controls, the primary air damper will go to the maximum heating airflow set point if the zone temperature is below the occupied heating set point at 6. This allows the warm primary air to be delivered to the zone. As the zone temperature rises above the occupied heating set point, the primary airflow will be reduced to the minimum heating airflow set point at 4'. The terminal fan will remain off.

- D. Unoccupied time period: (cooling)

When the unoccupied period is reached, the user-defined occupied cooling set point is reset upward to a user-defined unoccupied cooling set point. If the primary air source is operating, the primary air damper will throttle in the same manner (as per A) during the unoccupied period, using the unoccupied cooling set point.

- E. Unoccupied time period: (heating)

When the unoccupied period is reached, the user-defined occupied heating set point is reset downward to a user-defined unoccupied heating set point. If the primary air source is operating, the primary air damper will operate in the same manner (as per B) during the unoccupied period, using the unoccupied heating set point.

- F. Demand controlled ventilation (option):

This mode is initiated when the zone is occupied and the air source is not heating. It occurs when the BACnet control receives a cooling signal from the air source equipped with BACnet controls, or when a primary air temperature sensor is installed to detect the air source operation is cooling. The control will monitor a CO₂ sensor (optional) and determine if ventilation is adequate. The zone CO₂ level is compared to the ventilation set point. If the CO₂ level is above the set point (insufficient ventilation), the airflow set point is increased appropriately to maintain proper ventilation. Should the zone's temperature fall below the heating set point, the control will suspend

ventilation override and reduce the airflow to the minimum cooling airflow set point until the zone recovers.

- G. Humidity control (option):

This mode is initiated when the zone is occupied and the primary air source is cooling. It occurs when the BACnet control receives a cooling signal from the air source equipped with BACnet controls, or when a primary air temperature sensor is installed to detect the air source operation is Cooling. The control will monitor a relative humidity (RH) sensor (optional) and determine if the zone's RH is above the humidity set point. If the RH level is above the RH set point, the airflow control point is increased to displace the humid air in the space with air from the primary air source (which has a lower dew point). To ensure non-simultaneous operation of both heating and cooling, should the increased airflow cause the zone's temperature to fall below the heating set point, the control will first suspend the airflow override and reduce the airflow to the minimum cooling set point. This will cause the fan to induce plenum air heat to warm the zone. If after supplying plenum heat for the user-specified heat delay, the heat was insufficient to raise the zone's temperature, then heating will be enabled and will operate as per B. The airflow override will resume when the zone's temperature recovers and be disabled once the zone's RH level falls below the zone's RH set point.

- H. Damper override:

The damper override function is energized through the use of a field-supplied smoke control panel connected to the air source equipped with BACnet controls. The smoke control panel and installation must be in accordance with UL864 and local codes. The damper override function overrides the airflow setting used by the logic. It will cause the terminal to provide the configured maximum cooling airflow when the air source is in the Pressurization mode, and to disable the fan (if operating) and fully close the primary air damper when the air source is in the Evacuation mode.

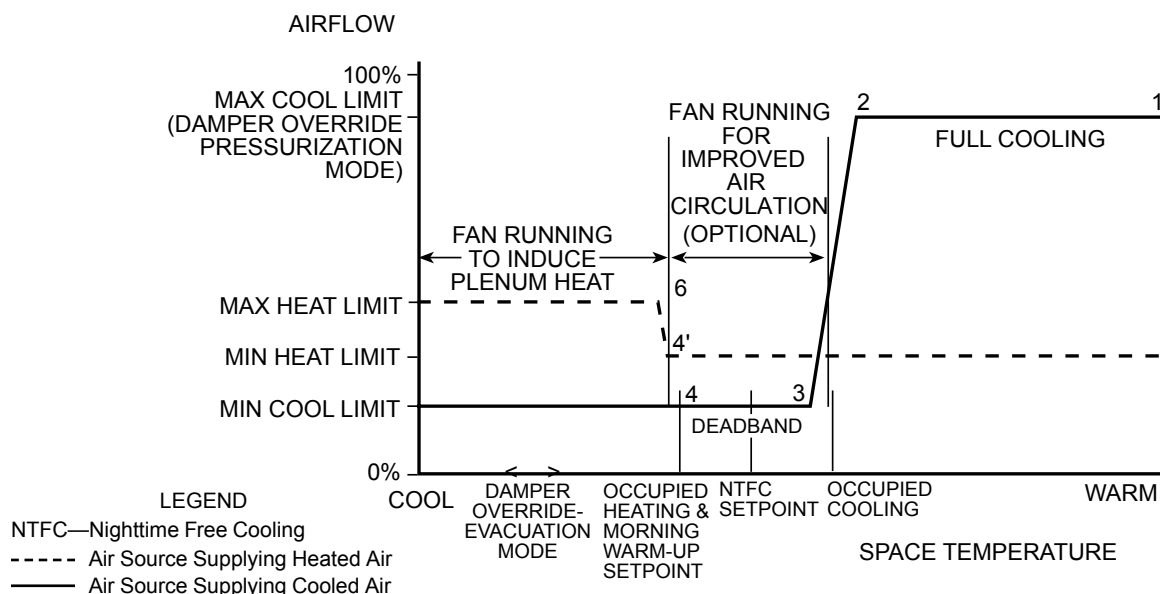


Figure 2 - Sequence of Operation for Intermittent Fan Powered Air Terminal—Without Heat

I. Nighttime free cooling:

The logic calculates a nighttime free cooling (NTFC) temperature set point halfway between the occupied heating and occupied cooling temperature set points. Upon receiving a NTFC signal generated by the air source equipped with BACnet controls (or a primary air temperature sensor is installed to detect the air source is operating in the NTFC mode), the primary air damper will modulate between the maximum and minimum cooling airflow

set points to maintain the zone's NTFC temperature set point. The terminal fan will remain off.

J. Primary air source shuts off:

1. The damper will fully close and the control will recalibrate the airflow transducer.
2. If the primary air source remains off (no primary air), the damper will be repositioned to 50% open to allow the air source to restart.

JOB NAME	JOB NUMBER	LOCATION	PAGE NUMBER	DRAWING NUMBER
BUYER	BUYER #	SHEET	3 OF 4	45M/N/R-D-4780

