Application Engineering Corner

SIZING PARALLEL FAN POWERED TERMINALS

Parallel flow (variable volume) fan powered terminals are selected based on their capacity to handle the primary airflow. The same rules which apply to the selection of single duct terminals can be used, except that water coils are not in the primary airstream path, and will not affect sound levels. The pressure drop of the water coils, however, which are on the fan inlet in Titus parallel fan units, must be added to the expected discharge pressure at the fan flow rate when entering the fan curve tables.

The fan is selected based on the minimum airflow requirements for the space or the heating load required. In most cases the fan can be downsized from the cooling flow requirement considerably, reducing both first cost and operating cost. The fan is selected from the fan curves. The downstream static pressure of the secondary air may not be the same as the primary air, however. If the secondary airflow requirements are less than the primary air requirements, the static pressure will be reduced. The following equation can be used to determine the static pressure at reduced airflows. (Do not forget to add water coil pressure drops to the fan requirement).

$$Ps_2 = Ps_1 (V_1 / V_2)^2$$

Where:
- Ps_1 = Primary Air Static Pressure
- Ps_2 = Secondary (Fan) Air Static Pressure
- V_1 = Primary Air Velocity
- V_2 = Secondary (Fan) Air Velocity

To select a Titus parallel fan powered terminal, refer to the published fan curves and primary air pressure drop curves, together with the application and sound power data.

In the parallel flow type of unit, when the primary air is ON, the fan is typically OFF, and vice versa. As shown in the Figure 1, the primary air and the fan discharge air follow parallel paths into a common plenum. Therefore both airflows will encounter the same downstream resistance at a given flow rate.

Since the primary and secondary airflows come from two different sources-and often at two different specified flow rates-the volume vs. pressure relationship in each of these airflows must be checked to ensure adequate flow rates under actual job conditions.

Example: Select a Model DTQP for a maximum of 1400 cfm of primary air with 1.00″ wg inlet static pressure. The fan airflow required is 1150 cfm. The downstream resistance offered by the duct and diffusers has been determined to be 0.30″ static pressure at 1150 cfm.

Primary Air: From the air inlet pressure table, a size 4 with a 12″ inlet will handle 1400 cfm of primary air with a minimum static pressure drop of 0.23″ through the primary air section. But since the downstream resistance is 0.30″ at 1150 cfm,

$$\left(\frac{1400}{1150}\right)^2 \times 0.30'' = 0.44'' \text{ sp}$$

The overall primary air static pressure drop is

0.23″+ 0.44″= 0.67″ sp

Since a 1.0″ static pressure is available at the inlet, the selection will work. The damper in the primary air section will do some throttling to hold the maximum air flow to 1400 cfm.

Secondary Air (Fan): From the fan curves, a size 4, without coils, terminal will handle 1150 cfm at 0.30″ static pressure, with the proper setting of the standard SCR speed control.

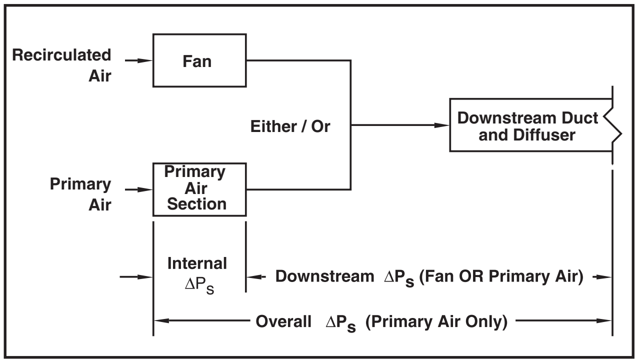

Figure 1. Schematic Diagram of Airflow in Parallel Flow (Variable Volume) Models

TRENTON YARBROUGH

Example model DTQP with panels removed

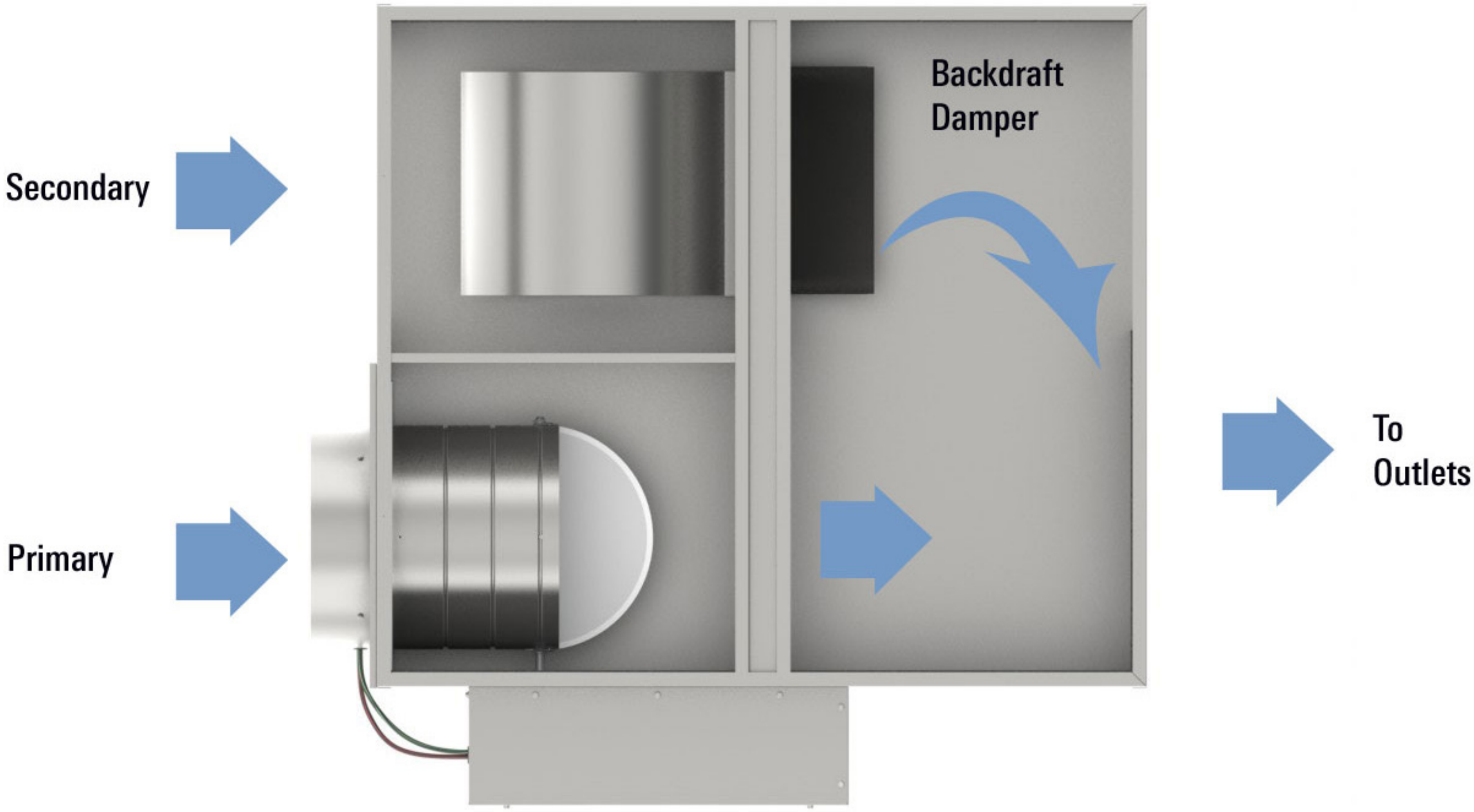

Figure 2. Actual Arrangement of Components Shown in the Previous Schematic Diagram on page 24