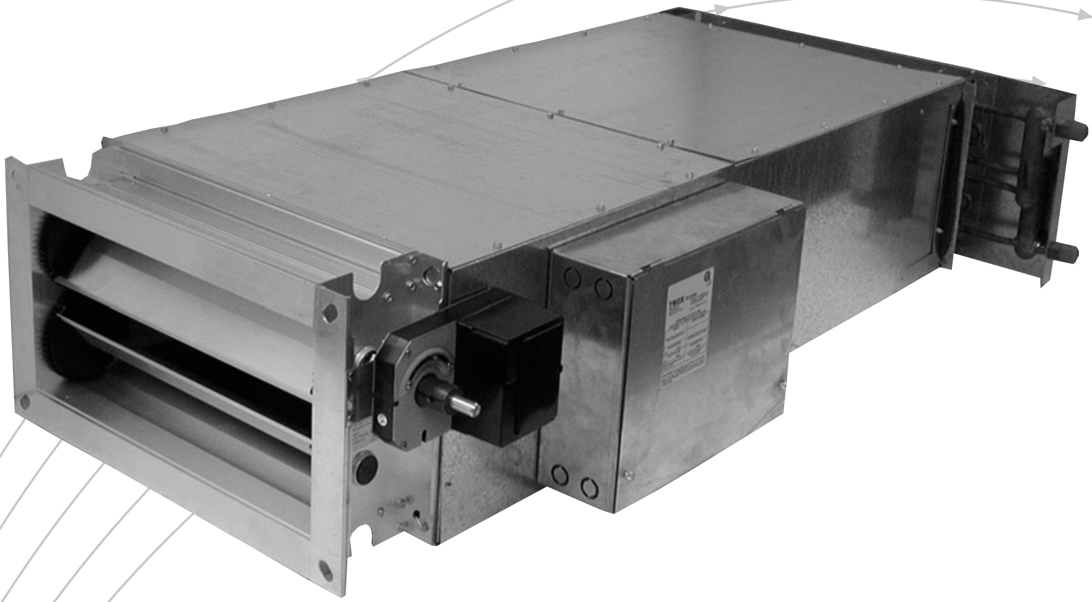
TB-111203

Fan Terminals

for Underfloor Air Distribution Applications



TROX® TECHNIK

Trox USA, Inc.
926 Curie Drive
Alpharetta, Georgia 30005-8369
USA

Telephone 770-569-14 33
Facsimile 770-569-14 35
e-mail tb11@troxusa.com

Contents

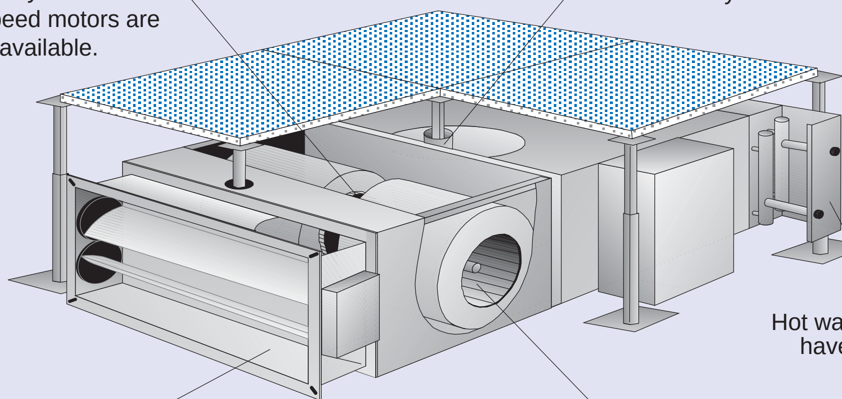
TROX TMFT and FT series fan terminals are designed specifically for application in underfloor air distribution systems. Their low profile design allows their installation in finished floor installations as low as twelve (12) inches. Their small footprint assures their fit within the access floor support structure and allows most maintenance to be performed by the removal of a single floor tile.

TROX underfloor fan terminals are also engineered for pressurized floor supply applications. TROX is the world leader in underfloor air distribution and, as such, understands and designs around the differences between pressurized floor cavity supply and the ducted delivery typically employed by overhead air distribution systems. These terminals are designed to operate at the highest energy efficiency possible in order to support sustainable building practices and preserve the environment.

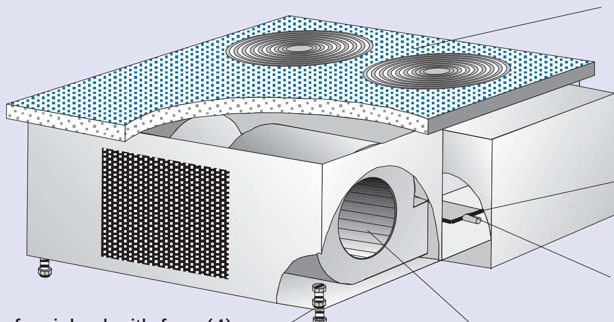
Raised access flooring systems are usually employed due to their superior management of power, voice and data cables that service the office space. The same cavity that houses these services can be used as a supply air plenum to extend the space service delivery of the access floor platform to mechanical systems as well. However, every effort should be exerted to assure that the HVAC system is as compact and simple as possible as minimal disturbance to the floor cavity is the key to a successful raised floor service platform.

TROX underfloor fan terminals are designed to minimize ductwork and plenum partitions within the floor cavity while, in combination with TROX FB series high induction floor diffusers, providing space occupants comfort, control and air quality levels unparalleled by any other conditioned air delivery system.

FT SERIES TERMINAL FEATURES
FTC, FTV, FTU, FTG, FTR and FTD Models



TMFT SERIES TERMINAL FEATURES
TMFT-C and TMFT-E Models



Principles of Underfloor Air Distribution

A 1999 survey (see figure 1) by the Building Owners and Managers Association (BOMA) polled members who make corporate leasing decisions to determine the major issues that lead them to choose one space over another. These members were asked to rate some 80 attributes (covering everything from lease rates/terms to aesthetics, security and services) according to their importance in leasing decisions. Results identified the three most important decision criterion as:

1. Comfortable Space Temperature
2. Tenant Control over the Space Temperature
3. Acceptable Indoor Air Quality

Furthermore, the number of respondents who expressed dissatisfaction with their current facility's degree of temperature control exceeded that of all other issues polled. Underfloor air distribution systems address all three concerns.

Underfloor air systems (see figure 3) supply conditioned air to the space using high induction floor diffusers. These outlets are typically tapped directly into the pressurized raised floor plenum, but may be ducted as well. Outlet airflows are generally limited to about 100 cfm and supply temperatures maintained between 60 and 63 F as the discharge is very near the occupants.

The high induction diffusers discharge air vertically in a spiraling pattern. As the air rises, it entrains ambient air, mixing it to reduce the temperature and velocity differences between supply and room air. At the point where its velocity has been reduced to about 50 fpm, the air stream can no longer support mixing, its energy depleted. A boundary layer forms at this elevation, the area below which is referred to as the Mixing Zone, characterized by well mixed supply and room air.

Ambient air above the boundary layer remains thermally stratified with the warmest air resident at the higher elevations of the space. In the absence of convective heat sources, this air would remain stratified, as there is no force present to disturb this equilibrium. However, introduction of people and equipment creates natural convection currents that rise along the surface of the heat source. When these sources are introduced at or below the boundary layer, their ascent induces conditioned air across the boundary layer, and this air rises to cool and ventilate the source.

Air movement through the upper level of the space is unidirectional, driven only by buoyancy forces. The level above the boundary layer is referred to as the Displacement Zone. Convective gains that originate above the boundary rise naturally and can be neglected in space airflow calculations, but are reflected in the refrigeration equipment sizing.

Maintenance of mixing zone depths to no more than four feet isolates respiration and the contaminants that accompany it within the stratified zone. As such, cross respiration between occupants is minimized and these contaminants are conveyed directly to the overhead return. Minimizing mixing zone depth also maximizes isolation of convective heat gains, many of which occur at desktop level.

BUILDING ATTRIBUTE	Percent of Respondents Rating Attribute Very Important	Percent of Respondents Dissatified with Current Facility	**WEIGHTED SCORE**
Comfortable Space Temperature	95.3%	26%	121.3
Tenant Control of Temperature	85.0%	35%	120.0
Indoor Air Quality	93.5%	19%	112.5
Acoustics & Noise Control	90.3%	17%	107.3
Availability of On-site Parking	84.4%	20%	104.8
After Hours Security	89.3%	15%	104.3
Quality of Maintenance	93.0%	11%	104.0
Management Responsiveness	92.2%	11%	103.3
Cost of Parking	77.9%	25%	102.9
Management's Ability to Meet Needs	91.8%	11%	102.8

Figure 1: Top Concerns of Office Tenants

Characteristics of Stratified Systems

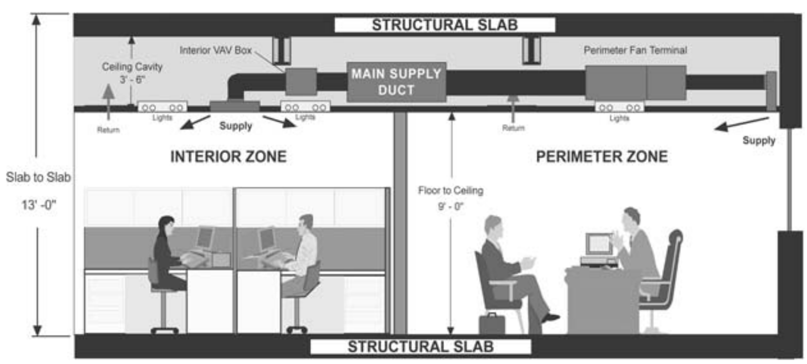
Almost all air distribution systems installed in commercial buildings in North America to date have been mixed air systems. The designer's objective for these systems is the achievement of rapid and complete mixing of the conditioned supply with room air. This reduces the potential of occupant discomfort due to drafts. If complete mixing occurs, temperatures and contamination levels are equal throughout the space. Space heat gains are also equally distributed in the space. Temperature and contamination levels of the return air are also similar to those within the space. This is referred to as dilution ventilation.

Stratified systems such as UFAD are designed to limit the degree of mixing within the space. Movement of conditioned air through the stratified volume of the space is unidirectional (in a vertical direction), driven only by the natural convection currents associated with space heat gains and the natural buoyancy of the air. Distinct temperature and contaminant gradients form as the air makes its vertical ascent to an overhead return outlet.

Both the temperature and contamination levels increase as the air rises, resulting in the exhaust of air that is warmer and more polluted than that at occupied levels of the space.

Conventional UFAD systems attempt to limit mixing to about the four foot height so that it ceases just below the respiratory level of the space. This enables the convection plumes that rise through the stratified volume of the room to capture the respiratory contaminants and convey them directly to the overhead return.

Return air temperatures are largely determined by the height of the mixed zone. The projection of the supply air outlet determined the level at which mixing ceases and stratification begins. Convective heat gains that originate at (or near) this level are conveyed by convection plumes to the overhead return and need not be considered in the space supply airflow calculations. Return air temperatures 5 to 8^{o}F warmer than those at the occupied level of the space are typical for UFAD systems that limit mixing to the four foot level.



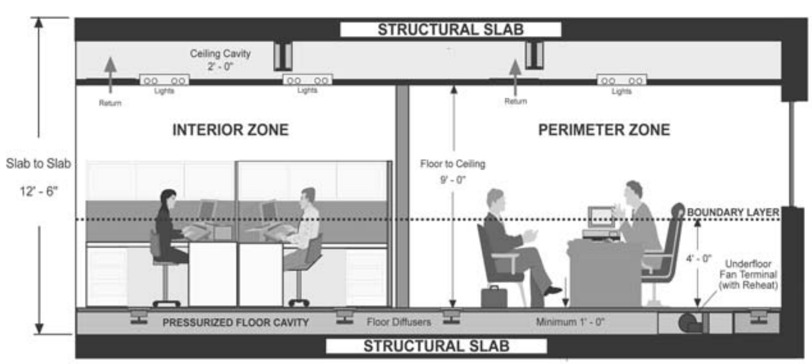
OPERATIONAL SPECIFICATIONS

Supply Air Temperature	55 - 57F
Room Control Temperature	72 - 75F
Space Relative Humidity	50 - 55%
Return Air Temperature	72 - 75F

DESIGN OBJECTIVES

Complete mixing of supply and room air, resulting in minimal temperature gradients in the space. Resultant ventilation strategy is dilution ventilation, where a homogeneous mixture of air is found throughout the conditioned space.

Figure 2: Overhead Air Distribution



OPERATIONAL SPECIFICATIONS

Supply Air Temperature	60 - 63F
Room Control Temperature	72 - 75F
Space Relative Humidity	50 - 55%
Return Air Temperature	78 - 82F

DESIGN OBJECTIVES

Mixing of supply and room air in the lower level of the space. Managed stratification from just below the repiratory level to the ceiling, resulting in a displacement ventilation strategy in the upper portions of the room.

Figure 3: Underfloor Air Distribution

Temperature Control and Zoning

in UFAD System Applications

Most underfloor air distribution systems utilize the cavity created by the raised access floor and the structural slab as a pressurized supply air plenum. A major advantage of this approach is that it significantly reduces (or eliminates) the ductwork required for space conditioning. This elimination, however, often requires modification of the conventional methods by which thermal zoning of the space is accomplished.

In order to maximize the benefits of the raised floor service platform, including the UFAD system, the temperature control and zoning strategy should efficiently match employed equipment to the load charcteristics of the space it serves. This section examines some of the most common profiles encountered in office areas and matches them to successful temperature control strategies.

In order to support the service flexibility of the platform, the amount of equipment and ductwork placed within the plenum should be limited to that which is absolutely necessary to maintain proper temperature and zoning control.

Temperature Control in Interior Open Office Areas

Interior areas (generally defined as the floor area at least fifteen feet from an outside wall exposed to direct solar and/or outdoor temperature) usually experience relatively small and gradual changes in thermal load. As such, these areas normally require less automatic control of conditioned airflow to maintain comfortable conditions.

In most underfloor systems, diffusers within interior areas are fed directly by the pressurized plenum and some manual means for occupant adjustment of the outlet airflow is provided. This strategy for temperature control in (interior) open office areas is illustrated in figure 4 below. In the case of TROX FB Series floor outlets, occupants can easily adjust the delivered outlet airflow without removal of the diffuser face or other components. In effect, each diffuser in the space supplies its own "microzone", affording each occupant control over his/her area instead of subjecting a number of occupants to the control of a single space thermostat.

Pressure in the floor plenum is usually maintained constant by means of a static pressure controller that positions a pressure regulation damper feeding the plenum. This senses changes in plenum pressure affected by the adjustment of individual diffuser airflows and compensates by repositioning a pressure regulation damper feeding the floor plenum.

Such a control and zoning strategy results in a system that is simple to maintain and which presents minimal obstruction to the relocation of data, power or mechanical services to the space.

Temperature Control in Private Interior Offices

Interior partitioned offices also experience minor and infrequent load changes when occupied. However, these spaces are frequently unoccupied and therefore some type of control that responds to the resultant reduced loads is warranted, otherwise the unmetered delivery of supply air during such unoccupied periods can significantly overcool the space, making it uncomfortable for the occupant upon his/her return.

Figure 5 illustartes the use of a thermostatically controlled (VAV) floor outlet such as the TROX FB-VAV series diffuser. These outlets incorporate an electronic actuator which repositions the air volume damper upon a signal from a temperature sensor or thermostat in the space throttling the space airflow delivery according to the cooling requirements thus sensed. These diffusers can also be directed by a space occupancy sensor to maintain a set back condition during unoccupied periods.

Modular fan terminals (TMFT series) could also be used for such an application, although the employment of the more passive strategy presented in figure 4 is more economical and probably just as effective in most cases.

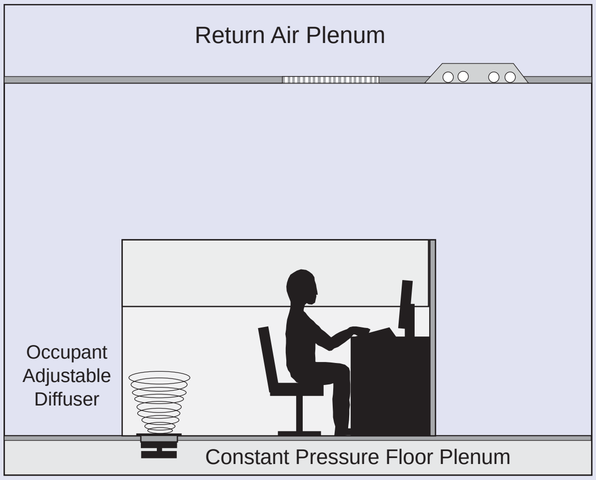


Figure 4:Temperature Control in Interior Open Office Areas

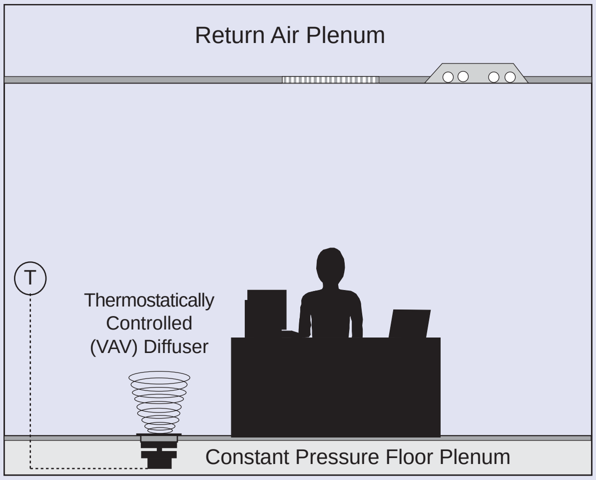


Figure 5: Temperature Control in Private Interior Offices

Temperature Control Perimeter Areas

Zoning and control of perimeter areas requires considerably more consideration. Perimeter areas are subjected to load changes that are greater in magnitude and frequency than those in interior areas. This is primarily due to varying solar loads and transmission gains/losses through the skin of the building. As such, the conditioned air supply to each of these zones must be variable and should be controlled automatically due to the frequency and intensity of the experienced load shifts.

Fan powered terminals are regularly employed for conditioning of perimeter areas in UFAD applications. Like their overhead counterparts, these terminals typically consist of a small blower operated by a fractional horsepower motor and some type of integral (electric or hot water) reheat coil. These terminals are commonly configured to discharge into a common discharge plenum feeding several "swirl" or linear bar type floor outlets. Primary (conditioned) air is usually taken directly from the pressurized floor cavity, eliminating the need for conditioned air inlet ductwork or a primary air valve as required on overhead fan terminal designs.

TROX FT series terminals are specifcally designed for such applications. These terminals are available in six different configurations, each available with either electric or hot water reheat. The configurations vary primarily according to the operation of the integral fan (constant versus cycled) and the source of air used for reheat. Descriptions of these models are presented on page 8 while the application chart on page 9 details their operation and capacities.

While the application of fan terminals in UFAD systems in many ways parallels that of overhead system design, there are certain differences that should be observed and considered in the specification of these devices fpr UFAD applications. These differences are identified and examined on pages 10 through 13.

Temperature Control in Conference/Assembly Areas

Automatic temperature control should also be considered when dealing with other areas subjected to significantly varying load and/or occupancy conditions. The expected magnitude and frequency of these changes should dictate the extent of automatic control employment.

Conference rooms are often subjected to wide variations in occupancy as well as extended unoccupied periods.Systems serving such spaces should be capable of satisfying maximum demand, but also of significant airflow turndown during reduced load conditions. In cases where conference or assembly areas have one or more perimeter exposures, some means of reheat is often required as well.

TROX TMFT series fan terminals are spefically designed for such applications. These modular terminals require no inlet or discharge duct connections as the fan terminal delivery is accomplished through two floor diffusers mounted in the floor tile directly above it. These terminals provide a (three) stepped control of outlet airflow in reponse to the signal from a space temperature sensor. TMFT-C terminals (designed for interior conference rooms) incorporate a shut off damper which closes during unoccupied periods to prevent air leakage into the space. TMFT-E models (designed for perimeter conference areas) incorporate an electric heater to allow space reheat as well. All TMFT models are furnished with low speed motors in order to assure that critical space noise levels are maintained.

Temperature Control in Corner and Executive Offices

Occasionally, a single office may possess two or more exposures or may simply be of such importance that any comfort complaint is unacceptable. For these areas, TMFT-E terminals are ideal as they provide accurate temperature control and very low space noise levels.

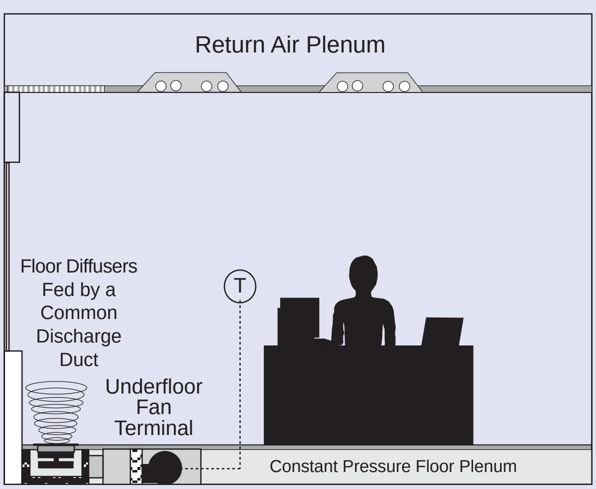


Figure 6:Temperature Control in Perimeter Areas

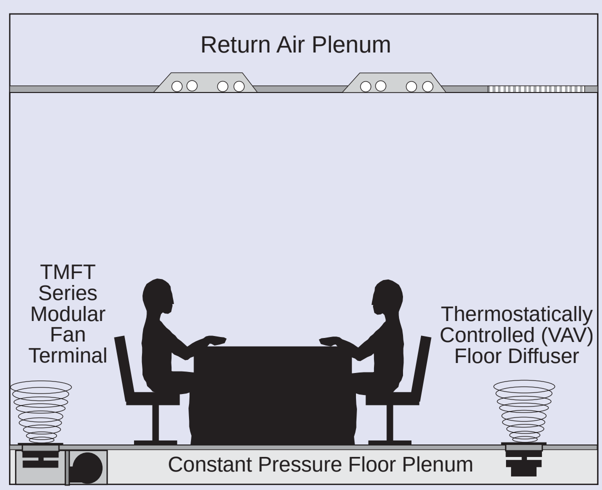


Figure 7: Temperature Control in Conference and Assembly Areas

Basic Model Availabiltiy

TMFT Series Fan T erminals

TMFT series terminals are designed to fit within the floor cavity of an access flooring system and provide conditioned air via two (2) FB200 series diffusers mounted in the floor tile directly above the unit.

These terminals utilize low speed motors with three (3) separate speed windings to allow discharge directly to the space (no ductwork required). An integral controller automatically selects the speed required in accordance to the space demand.

TMFT-C models provide VAV cooling and can be integrated with an occupancy sensor to assure that the fan terminal is off during unoccupied periods. An integral shut-off damper also prevents air leakage from the floor plenum to the space.

TMFT-E models provide variable volume cooling with constant volume electric reheat (using conditioned air from the floor plenum).

See pages 16 and 17 for product details.

FTC and FTV Series Fan T erminals

FTC and FTV series terminals integrate within the access flooring systems without disturbing the structural pedestals. These terminals supply conditioned air to discharge ducts serving perimeter and conference areas.

FTC models provide (cycled) constant volume delivery of cool and reheated air according to the space thermostat demand.

FTV models incorporate high efficiciency variable speed motors to provide VAV space cooling with constant volume reheat. These terminals' integral fans operate continuously.

FTC and FTV models are offered with either hot water or electric reheat coils. Reheat operation is performed using conditioned air from the floor plenum.

All FTC and FTV models include a lined discharge section.

See pages 18 thru 21 for product details.

FTU and FTG Series Fan T erminals

Like all FT series terminals, FTU and FTG models fit within access flooring systems without disturbing structural pedestals. These terminals supply conditioned air to ducts serving perimeter and conference areas.

During periods of maximum cooling or heating demand, these terminals provide fan assisted (constant volume) delivery of conditioned air. A VAV damper throttles plenum air (and the unit fan remains off) during periods requiring normal cooling demands. High efficiency variable speed motors are optional on FTU and FTG series terminals.

All models are offered with either hot water or electric reheat coils. All FTC and FTV models include a lined discharge section.

FTU reheat is performed using conditioned air from the floor plenum.

FTG reheat is accomplished with recirculated room air.

See pages 22 thru 25 for product details.

FTR and FTD Series Fan T erminals

FTR and FTD models fit within an access floor system without disturbing its structural support pedestals. These terminals supply a continuous fan assisted (constant volume) delivery of air to discharge ducts serving perimeter and conference areas.

FTR models adjust the mixture between conditioned (plenum) primary and recirculated (room) air according to space thermostat demand. High efficiency variable speed motors are optional on FTR and FTD terminals.

FTD models utilize a pressure independent VAV damper to throttle ducted primary air. A parallel inlet duct supplies (recirculated) make-up air to maintain its constant volume delivery to the space.

All models are offered with either hot water or electric reheat coils and include lined discharge sections. Reheat is performed using conditioned air from the floor plenum.

See pages 26 thru 29 for product details.

SERIES	MODEL	APPLICATION	UNIT SIZE	MAX. FAN CFM [1]	REHEAT OPERATION/MEDIUM: HOT WATER	REHEAT OPERATION/MEDIUM: ELECTRIC	REHEAT OPERATION/MEDIUM: AIR SOURCE	DUCTWORK [2]: PRIMARY	DUCTWORK [2]: RETURN	FAN OPERATION: COOLING MODE	FAN OPERATION: REHEAT MODE
TMFT	TMFT - C	VAV Cooling	NA	375	NA	NA	Plenum	None	None	Variable Speed (Continuous)	Constant (Max) Speed *(TMFT-E Only)*
	TMFT - E	VAV Cooling + Reheat	NA	375	NA	4.0 kW (Max.)					
FTC	FTC-W	Constant volume (cycled) cooling with hot water or electric reheat using primary air from the floor plenum.[3]	300	325	On/Off	NA	Plenum [3]	None	Option [3]	Constant Speed (Cycled)	Constant Speed (Cycled)
			600	525							
			1200	900							
			1800	1550							
	FTC-E		300	350	NA	4.0 kW (Max.)	Plenum [3]	None	Option [3]	Constant Speed (Cycled)	Constant Speed (Cycled)
			600	600		8.5 kW (Max.)					
			1200	1100		17.0 kW (Max.)					
			1800	1750		22.0 kW (Max.)					
FTV	FTV-W	VAV cooling (variable speed fan motor) with constant volume hot water or electric reheat using primary air from the floor plenum.	600	525	On/Off	NA	Plenum	None	None	Variable Speed (Continuous)	Constant Speed (Continuous)
			1200	900							
			1800	1550							
	FTV-E		600	600	NA	8.5 kW (Max.)	Plenum	None	None	Variable Speed (Continuous)	Constant Speed (Continuous)
			1200	1100		17.0 kW (Max.)					
			1800	1750		22.0 kW (Max.)					
FTU	FTU-W	VAV cooling (fan assisted only during maximum cooling demand) with fan assisted hot water or electric reheat using primary air from the floor plenum.	600	525	On/Off	NA	Plenum	None	None	Constant Speed (Cycled) Operation During Maximum Cooling Only	Constant Speed (Cycled)
			1200	900							
			1800	1550							
	FTU-E		600	600	NA	8.5 kW (Max.)	Plenum	None	None	Constant Speed (Cycled) Operation During Maximum Cooling Only	Constant Speed (Cycled)
			1200	1100		17.0 kW (Max.)					
			1800	1750		22.0 kW (Max.)					
FTG	FTG-W	VAV cooling (fan assisted only during maximum cooling demand) with fan assisted hot water or electric reheat using recirculated room air	600	525	On/Off	NA	Room Air	None	By Others	Constant Speed (Cycled) Operation During Maximum Cooling Only	Constant Speed (Cycled)
			1200	900							
			1800	1550							
	FTG-E		600	600	NA	8.5 kW (Max.)	Room Air	None	By Others	Constant Speed (Cycled) Operation During Maximum Cooling Only	Constant Speed (Cycled)
			1200	1100		17.0 kW (Max.)					
			1800	1750		22.0 kW (Max.)					
FTR	FTR-W	Constant volume room air delivery (continuous fan operation), inlet damper adjusts mixture of plenum and recirculated (room) air according to space temperature. Hot water or electric reheat of recirculated room air	300	325	On/Off	NA	Room Air	None	By Others	Constant Speed (Continuous)	Constant Speed (Continuous)
			600	525		NA					
			1200	900		NA					
			1800	1550		NA					
	FTR-E		300	350	NA	4.0 kW (Max.)	Room Air	None	By Others	Constant Speed (Continuous)	Constant Speed (Continuous)
			600	600		8.5 kW (Max.)					
			1200	1100		17.0 kW (Max.)					
			1800	1750		22.0 kW (Max.)					
FTD	FTD-W	Constant volume air delivery (continuous fan), VAV damper throttles ducted primary air to affect a mixture of primary/room air. Hot water or electric reheat using maximum recirculated room air	600	525	On/Off	NA	Room Air	By Others	By Others	Constant Speed (Continuous)	Constant Speed (Continuous)
			1200	900							
			1800	1550							
	FTD-E		600	600	NA	8.5 kW (Max.)	Room Air	By Others	By Others	Constant Speed (Continuous)	Constant Speed (Continuous)
			1200	1100		17.0 kW (Max.)					
			1800	1750		22.0 kW (Max.)					

APPLICATION NOTES

1. Maximum Fan CFM listed for all FT series terminals assumes a 0.10 in. w.g. static pressure differential between the (positive) floor plenum and the downstream duct system. For other values, consult the performance data charts on page 15. Maximum Fan CFM listed for TMFT models assumes a 0.10 in. w.g. (positive) static pressure differential between the floor plenum and the room. For other values, consult the performance data charts on pages 14
2. All FT series terminals require (insulated) downstream ductwork, by others. Please consult factory for recommended duct sizes and construction.
3. FTC models can also be provided with a remote damper which allows operation of the terminal (reheat cycle only) using recirculated room air. See page 8 for additional details.

Design and Application Considerations

Fan Terminals Used in UFAD Systems

Although fan terminals have long been used in overhead systems, their application in UFAD systems requires certain departures from common practice. This section identifies and discusses some of the differences that might affect the selection and employment of UFAD fan terminals.

PHYSICAL CONSIDERATIONS

The placement of fan terminals in UFAD systems should involve careful consideration of the raised access floor system and its structure. The floor cavity depth should exceed the fan terminal height by at least 1/2". As most raised floor tiles are 1 1/4" thick, this translates into a 10 3/4" deep cavity when a finished floor height (FFH) of twelve (12) inches is employed. A twelve (12) inch finished floor height is the minimum floor height allowed by current fan terminal technology. On the other hand, the use of finished floor heights greater than about sixteen (16) inches may result in a reduction of floor to ceiling height in these spaces as the false ceiling can often not be raised by a similar amount due to sprinkler piping and light fixture interference with the slab understructure above.

In addition to height considerations, UFAD fan terminals should be selected and placed to avoid interference with the structural supports of the raised floor. The floor tiles are typically 24 inch (600 mm) squares supported on each corner by a pedestal. In order to integrate within the support structure, fan terminals should not exceed about twenty (20) inches in either their length or their width. The exception to this is the use of terminals (such as the size 1200 and 1800 models that make provisions for the floor structure. The omission or modification of support pedestals can result in a compromised rating of the flooring system.
It is also important that fan terminals in UFAD systems are located in areas where furniture and/or partitions are not likely to prevent access for future maintenance.

REHEAT CONSIDERATIONS

As with overhead systems, UFAD fan terminals are usually fitted with some type of reheat coil in order to provide heat to perimeter spaces. The chosen reheat medium is usually electric resistance or hot water. While the employment of electric coils usually facilitates relocation of the terminal, three (3) phase power required for their operation is not commonly found in the floor cavity and thus a dedicated power supply must be furnished. The redistribution of this dedicated power system may also complicate relocation.

While terminals with hot water coils typically use less energy than their electric counterparts, their relocation flexibility is severely compromised. However, terminals dedicated to serving perimeter exposures are often not relocated as their placement is dictated by building skin heat exchanges. Although the potential of water leakage would appear to be an issue, these terminals are frequently used in UFAD applications.

The floor cavity in which the terminals are placed also serves as the supply air plenum. As such, most of these terminals take conditioned air from the plenum and thus require no supply duct connection. However, UFAD fan terminals do not have unlimited access to recirculation (room) air for reheat, so any such supply must be ducted. This complicates relocation, adds cost and can potentially create a path for the transmission of unwanted noise to the space.

ACOUSTICAL APPLICATION DATA

Cross Section (Width x Height)	Octave Band Center Frequency (Hz)					
	125	250	500	1000	2000	4000
16" x 10"	0.4	0.8	1.9	4.0	4.0	2.7
20" x 10"	0.3	0.8	1.8	3.8	3.7	2.6
18" x 12"	0.3	0.8	1.7	3.7	3.5	2.5

Table 1: Sound Attenuation (dB/lf) of Lined Ductwork
Assumes 1" fiberglass insulation

	Percentage of Total Flow				
	80	65	50	35	20
Subtract (dB/Oct)	0	1	3	5	7

Table 3: Attenuation Effect of Flow Division

	Number of Sound Sources				
	1	2	3	4	5
Add (dB/Oct)	0	3	5	6	7

Table 4: Effect of Multiple Sources in a Room

Cross Section (Width x Height)	Octave Band Center Frequency (Hz)					
	125	250	500	1000	2000	4000
16" x 10"	0	1	6	11	10	10
20" x 10"	0	1	6	11	10	10
18" x 12"	0	1	6	11	10	10

Table 2: Attenuation (dB) of Lined 90° Elbows
Assumes 1" fiberglass insulation

Component Description	Octave Band Center Frequency (Hz)					
	125	250	500	1000	2000	4000
Floor Tile (Type A)	22	27	32	37	43	48
Floor Tile (Type B)	27	32	38	43	48	53
Ceiling Tile	9	10	12	14	15	15

Table 5: Attenuation (dB) of Typical Floor and Ceiling Tiles. See page 11 for floor tile descriptions.

ACOUSTICAL CONSIDERATIONS

Fan terminals incorporate small AC motor driven blowers that induce air and force it through a higher pressure downstream distribution system. These blowers produce low frequency noise which, if not properly considered and/or treated can disturb space occupants.

Noise generated by these terminals may be transmitted into the space along any of three sound paths. Discharge noise from the fan is transmitted through the downstream ductwork and diffusers. As such, its magnitude is reduced by the attenuation of lined ductwork and fittings as well as flow division or end reflection that occurs before the air is discharged to the space. The attenuation of selected ductwork, components and application effects is presented in tables1 through 4. These attenuation factors include those used for the calculation of space NC values presented in the performance data on pages 14 and 15. Finally, sound levels entering the space can usually be reduced by 8 to 10dB (per octave band) due to the room's attenuation effect.

Casing radiation is caused by vibrations transmitted to the space through the ceiling (or floor) plane. Inlet escape noise is mechanical noise generated by the motor (and to a lesser degree the fan) that passes back through the inlet openings of the terminal. This noise may be transmitted to the space through the ceiling (or floor) or (when return air is ducted from the room) along the return air path.

Most manufacturers' sound data combines casing radiation and inlet escape noise into a single component (called radiated noise). TROX is the only manufacturer who has separated the casing radiation and inlet escape components so that they can be adequately analyzed and treated.

The materials comprising raised floor tiles exhibit far greater attenuation properties than those of commonly used ceiling tiles. Most floor tiles used in North America are of two types (see figure 7. The first (referred to as type A) is a reinforced steel panel in which two steel plates (one flat and the other corrugated) are welded together. The void within the panels is then filled with a cementious mixture which hardens in place. The second (type B) has a steel pan into which cement is poured and dries. This panel is of uniform thickness and weighs 25 to 30% more than the previously described panels. Table 5 (previous page) illustrates the approximate sound attenuation of each of these floor panel types as well that of a typical (5/8" thick, 35lbs./ft^2 mineral fiber) ceiling tile.

In recent years, most fan terminals used in overhead applications have been series types which run continuously and mix conditioned and plenum air to affect a constant volume (variable temperature) discharge to the space. Although the original fan terminals used in overhead systems were variable volume types (in which the unit fan cycled on only when the space required heat), these fan terminals were soon replaced by series models. This was primarily due to the space acoustical disruption caused by the cycling of the fan and electric heater contactors. These noises were easily transmitted through return air openings and ceiling tiles which offered very little low frequency attenuation.

OPERATIONAL CONSIDERATIONS

The variation of fan terminals presented in this catalog affords designers of UFAD systems a number of options regarding the control of space temperatures in perimeter areas.

While FTR, FTV and FTD series terminals incorporate continuous fan operation, other models utilize intermittent strategies. Most versions accommodate provisions for the use of recirculation (room) air for reheat and are available with inlet silencers tailoredto prevent the associated transmission of unwanted noise to the space. This section discusses many of the operational issues and decisions facing the designer.

The superior attenuation of the floor tiles and the sealing of the floor cavity in UFAD systems afford the designer an opportunity to revisit the use of intermittently operated fan terminals.Most of the acoustical issues associated with these terminals were caused by noise transmitted through the ceiling tiles, lighting fixtures or return air openings.

Figure 7: Access Floor Tiles Commonly Used for Office Applications

FTU terminals are designed with fans that operate only during periods requiring space heating or maximum cooling. During periods of reduced cooling demand, a variable volume damper (in the downstream section of the terminal) throttles the supply of conditioned air from the floor plenum to the downstream diffusers (see ductwork system recommendations in the following section for important application guidance). As such, the unit fan remains off most of the time, resulting in reduced energy use. FTG terminals further reduce the space conditioning energy requirements by recirculating room air during the terminal's reheat operation.

Figure 8 (below) illustrates an application of an FTC terminal in which the fan operates only upon a demand for heat. The diffusers connected to the terminal's inlet side are configured to operate as returns when the fan is energized, but act as VAV (non-fan assisted) supply outlets during cooling demand periods. The outlets on the discharge side of the fan provide VAV cooling (while the fan is off) and constant volume heating (the damper remains in its closed position) while the fan is in operation.

DUCTWORK AND INSULATION

The use of the floor cavity as a supply air plenum significantly reduces ductwork and insulation requirements in UFAD systems. As the cavity is conditioned, thermal insulation of the supply ductwork upstream of the terminal is not usually required. Most fan terminals used in UFAD applications have no primary air duct connection, rather they rely on the pressurized floor cavity as their source for conditioned air.

Insulation is often required for acoustical treatment. Discharge (and inlet escape) sound pressure levels should be calculated and appropriate attenuation added by means of insulation, outlet adaptors, and/or inlet silencers.

Insulated ductwork should always be used on the discharge side of terminals serving perimeter spaces. This insulation is necessary to prevent loss of heat into the plenum (and slab) while the reheat coil is energized. The use of fabricated (insulated) ductwork also prevents heat transfer from the building facade and slab that can compromise the terminal unit's ability to cool the space during periods of high solar intensity and/or design outdoor conditions.

INLET DUCTWORK AND DIFFUSERS

FTG, FTR and FTD terminals use recirculated room air for reheat and, therfore, are commonly ducted to floor return registers. Table 5 below lists recommendations for the floor registers required for these applications.

Terminal Size	Inlet Duct Size		Return Registers	
	Width (in.)	Height (in.)	Qty.	Min. Core Area
150/300	18"	10"	1	0.50 ft^2
600	18"	10"	1	0.90 ft^2
1200	18"	10"	2	0.60 ft^2
1800	18"	12"	4	0.60 ft^2

NOTE: Core area listed is for each register.

Table 5: Floor Register Sizing for FTG, FTR and FTD Terminals

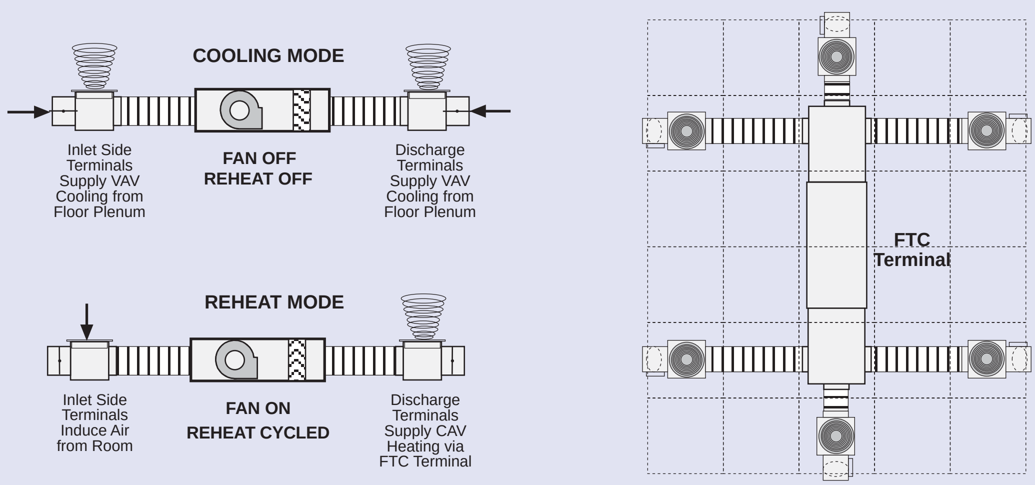


Figure 8: Special Reheat Operational Sequence for FTC Series Terminals

Fan Assisted Reheat with VAV Cooling (Fan Off) Using Dual Function Diffusers

FTU/FTG DISCHARGE DUCT CONSIDERATIONS

FTU and FTG series terminals incorporate VAV throttling dampers parallel to the unit fan that enable off-peak space cooling requirements to be satisfied without use of the unit fan. This not only results in energy savings but also reduced space acoustical levels. During these periods, the fan remains off while conditioned air passes directly from the floor plenum to the ductwork downstream of the terminal and is subsequently discharged to the space.

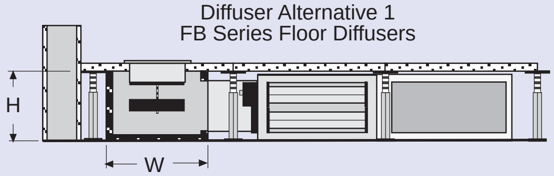
In view of the small pressure differential between the pressurized floor cavity and the space, it is critical that the pressure losses of the ductwork diffusers and other components that comprise the transfer path are sufficiently low to allow delivery of this conditioned air to the space.

Tables 6 and 7 outline discharge ductwork and diffuser recommendations that will assure the proper airflow delivery of these terminals during their (non-fan assisted) normal cooling operation. Table 6 assumes that high induction floor diffusers (FB200 series) are being supplied by the terminal. This table sets forth recommendations for the sizing of the supply ductwork and identifies the minimum as the number of outlets required to assure that the terminal's ***maximum VAV CFM*** is at least 60% of the design volume of the terminal (with the fan operating). The approximate maximum delivery of each outlet when subjected to the specified operational conditions is listed and may be multiplied by the number of outlets to estimate the total airflow to the space with the VAV damper fully open while the fan is off. It should be noted, however, that acoustical analysis for the diffusers should be performed for the airflow they deliver when the fan is energized as that is the worst acoustical condition. This diffuser airflow can be determined by dividing the terminal design airflow (with the fan energized) by the number of diffusers utilized.

Table 7 provides similar information assuming the supply outlets are linear bar type grilles (or registers). In this case, a maximum pressure differential is specified which should guide the proper outlet selection. In particular, the supply outlets should be sized such that their pressure requirement (at their assigned airflow delivery) does not exceed the value in this table.

The use of flexible ductwork and/or multiple outlet plenums with FTU and FTG series terminals is not recommended.

Diffuser Alternative 1
FB Series Floor Diffusers



Terminal Size	Minimum Duct Size		FB200 Diffusers	
	Width (in.)	Height (in.)	Qty.	Max. VAV CFM
600	12"	10"	4	100
1200	18"	10"	8	90
1800	18"	12"	16	70

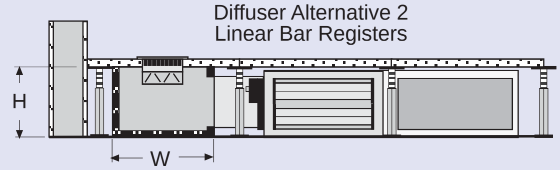
NOTES:

1. Table above is valid for installations where the maximum terminal airflow delivery (during fan operation) is at least 20 CFM per lineal foot of rectangular discharge duct and a minimum (positive) total pressure differential of 0.10 in.w.g. between the VAV damper inlet and the space into which the diffusers discharge.
2. ***Maximum VAV CFM*** shown is the maximum outlet delivery airflow that will occur during VAV cooling operation (fan off), based on the use of the specified number of FB200 series floor diffusers.

Table 6: Discharge Ductwork Recommendations

FTU/FTG Terminals with FB200 Supply Diffusers

Diffuser Alternative 2
Linear Bar Registers



Terminal Size	Minimum Duct Size		Linear Register Max. ΔP_T (in.w.g.)
	Width (in.)	Height (in.)	
600	12"	10"	.085
1200	18"	10"	.070
1800	18"	12"	.045

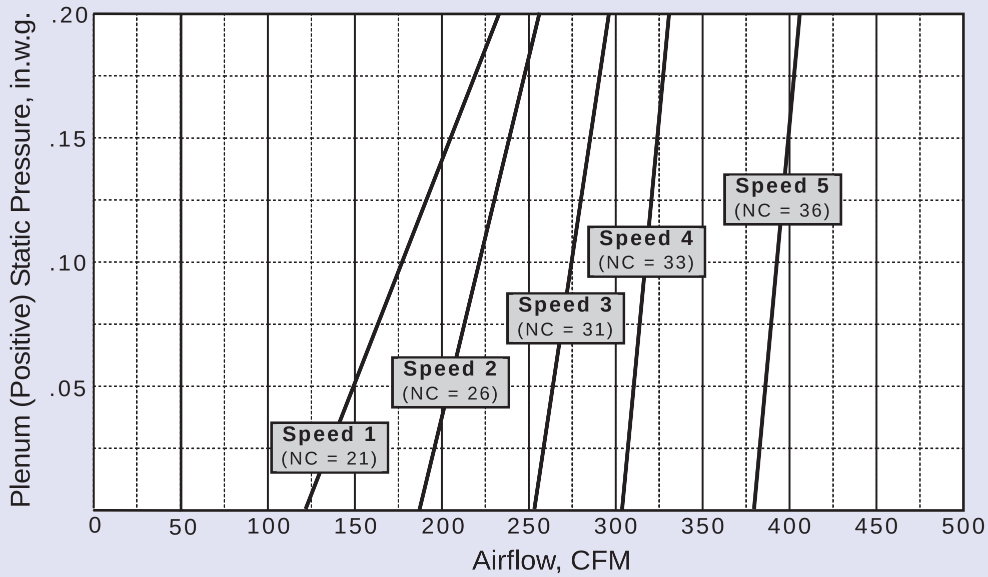
NOTES:

1. Table above is valid for installations where the maximum terminal airflow delivery (during fan operation) is at least 20 CFM per lineal foot of rectangular discharge duct and a minimum (positive) total pressure differential of 0.10 in.w.g. between the VAV damper inlet and the space into which the diffusers discharge.
2. ***Maximum*** ΔP_T is the maximum inlet pressure requirement for the linear supply registers that will allow a delivery of at least 60% of the terminal's design (fan on) cooling airflow during the normal (fan off) VAV cooling mode. Registers should be sized accordingly.

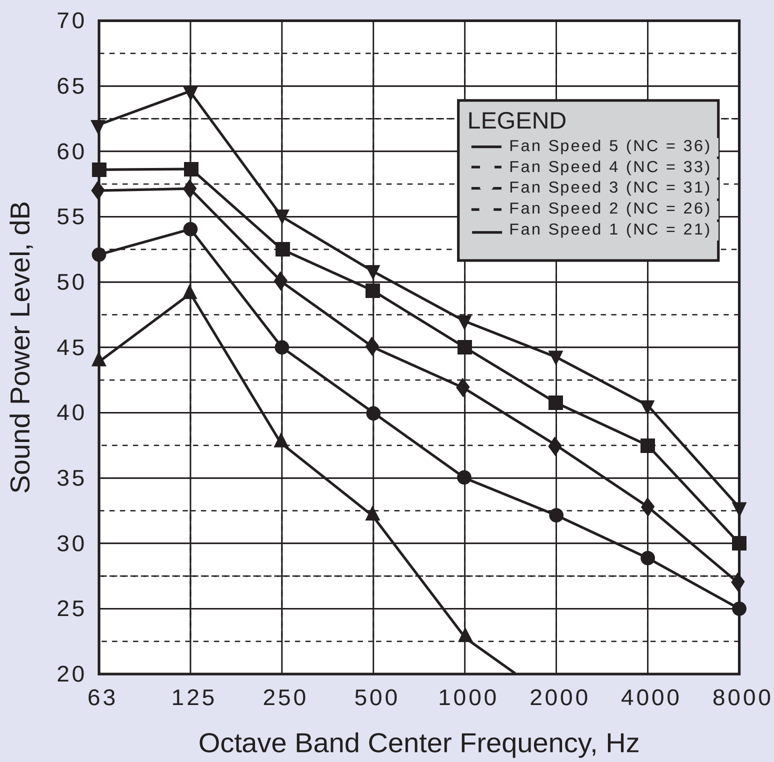
Table 7: Discharge Ductwork Recommendations

FTU/FTG Terminals with Linear Grilles/Registers

Aerodynamic Performance



Acoustical Performance



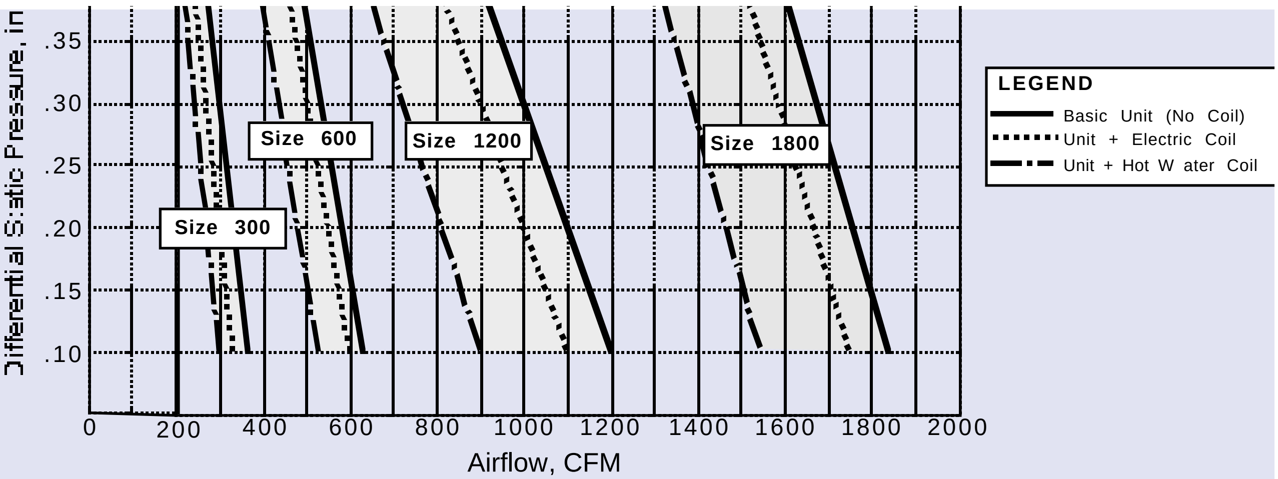
Performance Notes:

Aerodynamic Data:

1. Fan curves shown relate delivered airflow to the positive plenum static pressure.
2. Fan operation varies any three (3) selected speeds shown. Indicate the required speeds in the ordering procedures (page 36).

Acoustical Data:

1. Octave band data shown are sound power levels in decibels (re 10^{-12}W).
2. Data was obtained in accordance with ARI Standard 880-94 with unit operating at the specified rated airflow (cfm).
3. NC values listed are based on the discharge of the total air quantity into the room through two (2) FB200 diffusers mounted in the floor tile directly above the terminal. A room absorption of 10 dB (per octave band) is assumed.



Acoustical Performance

Discharge Noise

Terminal Unit Size	Rated Airflow CFM	Octave Band Center Frequency (Hz)						NC
		125	250	500	1000	2000	4000	
300	350	65	65	59	50	42	40	**26**
600	600	66	68	62	54	46	48	**31**
1200	1100	68	67	64	61	56	53	**29**
1800	1750	68	69	67	65	58	59	**29**

Radiated + Inlet Escape Noise

Terminal Unit Size	Rated Airflow CFM	Octave Band Center Frequency (Hz)						NC
		125	250	500	1000	2000	4000	
300	350	64	67	61	52	47	46	**<15**
600	600	70	70	69	63	61	61	**17**
1200	1100	71	69	67	62	61	59	**17**
1800	1750	69	67	67	65	64	64	**<15**

Inlet Escape Noise (w/o Silencer)

Terminal Unit Size	Rated Airflow CFM	Octave Band Center Frequency (Hz)						NC
		125	250	500	1000	2000	4000	
300	350	57	61	57	51	47	45	**35**
600	600	61	66	66	63	61	61	**36**
1200	1100	71	69	67	62	61	59	**38**
1800	1750	69	67	67	65	64	64	**37**

Inlet Escape Noise (with IAS Silencer)

Terminal Unit Size	Rated Airflow CFM	Octave Band Center Frequency (Hz)						NC
		125	250	500	1000	2000	4000	
600	600	53	56	54	42	38	43	**24**
1200	1100	65	62	58	47	42	44	**32**
1800	1750	65	62	59	52	49	53	**31**

Performance Notes:

Aerodynamic Data:

1. Fan curves shown relate delivered airflow to the differential pressure across the fan terminal (from the pressurized plenum or inlet duct to the unit discharge.
2. Operation at pressure differentials below 0.04 in.w.g. is not recommended.

Acoustical Data:

1. Octave band data shown are sound power levels in decibels (re 10^{-12} W).
2. Data was obtained in accordance with ARI Standard 880-94 with unit operating at the specified rated airflow (cfm).
3. NC values listed are based on the following application assumptions:

Discharge NC Levels:

- 5 feet of lined duct before the first diffuser.
- Discharge through multiple FB200 series floor diffusers, each handling 150 cfm).
- 10 dB room absorption.

Radiated + Inlet Escape NC

- Attenuation of a single pass through a typical raised access floor
- 10 dB room absorption.

Inlet Escape NC Levels:

- Values without silencer assume heating air source is recirculated room air and terminal inlet is coupled to the room by means of a 5 ft insulated (rectangular) duct.
- Values with silencer assume heating air source is recirculated room air passing through an (optional) IAS silencer
- 10 dB room absorption.
- Please note that IAS silencers are not available for size 300 terminals.

TMFT Series Fan Terminals

Features and Operation

PRODUCT INFORMATION INDEX

PRODUCT HIGHLIGHTS

Application

- TMFT-C terminals provide VAV cooling with unoccupied mode shut-off to conference areas and private offices.
- TMFT-E terminals provide VAV cooling with constant volume electric reheat to conference areas and private offices.

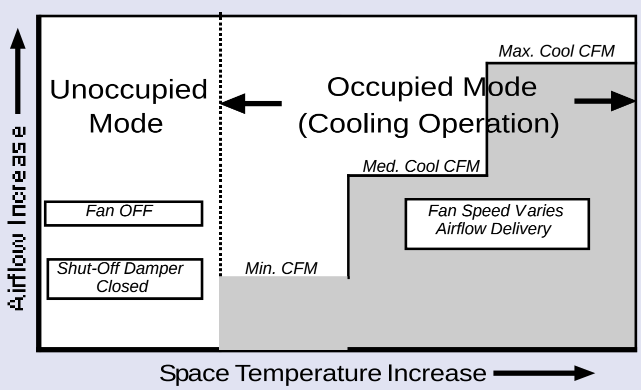
Components

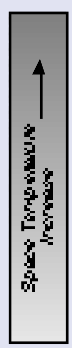
- Motors are PSC (5 speed) type. Terminal controller selects and maintains fan speed in response to space temperature sensor. Any three (3) of the five speeds shown on page 14 may be specified for operation.
- Entire assembly is tested and listed according to UL 1995 and CSA C22.2

Features

- Integrate into the support structure of most raised access floors, with diffusers mounted in floor tile directly above.
- TMFT-E models offer single point power connections (see page 30 for more information).

OPERATIONAL SEQUENCE, TMFT -C





OCCUPIED MODE

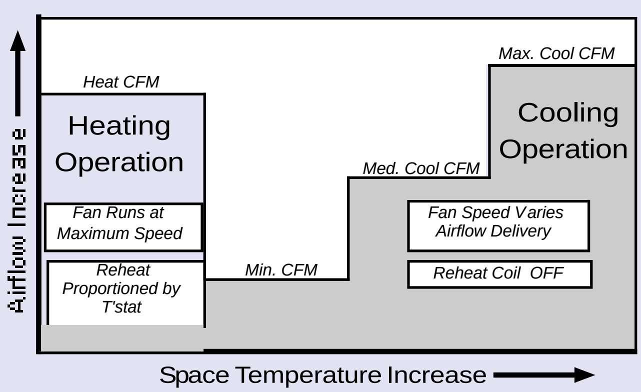
FULL COOLING DEMAND
- Fan delivers max. cooling CFM

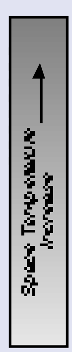
REDUCED COOLING DEMAND
- Fan speed cycled by thermostat

THERMOSTAT SATISFIED
- Fan delivers minimum cooling CFM

UNOCCUPIED MODE
- Fan OFF .
- Shut-Off Damper Closes.

OPERATIONAL SEQUENCE, TMFT -E





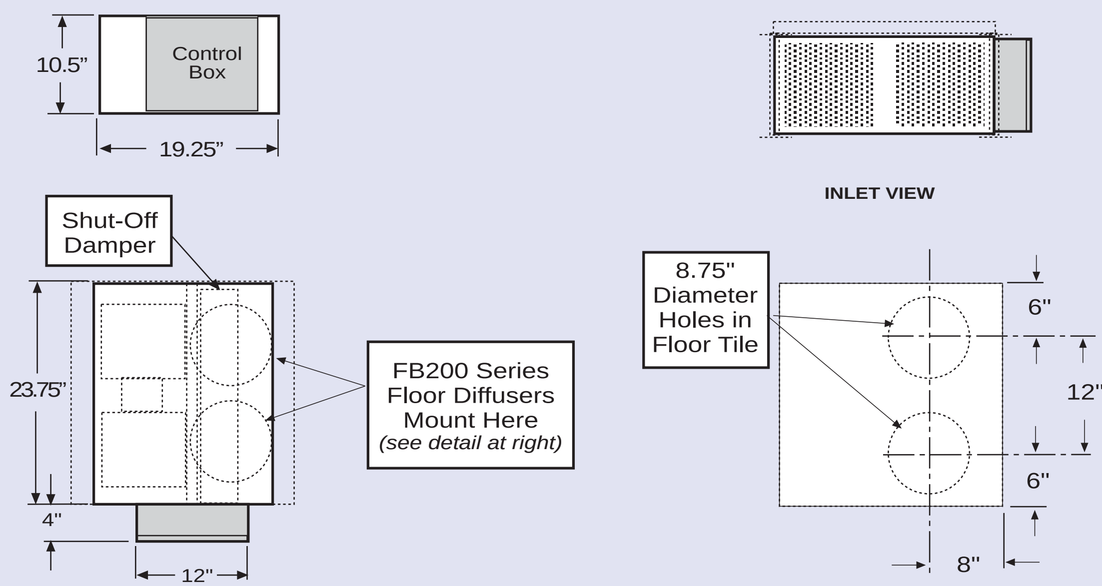
FULL COOLING DEMAND
- Fan delivers max. cooling CFM
- Reheat coil remains off

REDUCED COOLING DEMAND
- Fan speed cycled by thermostat
- Reheat coil remains off

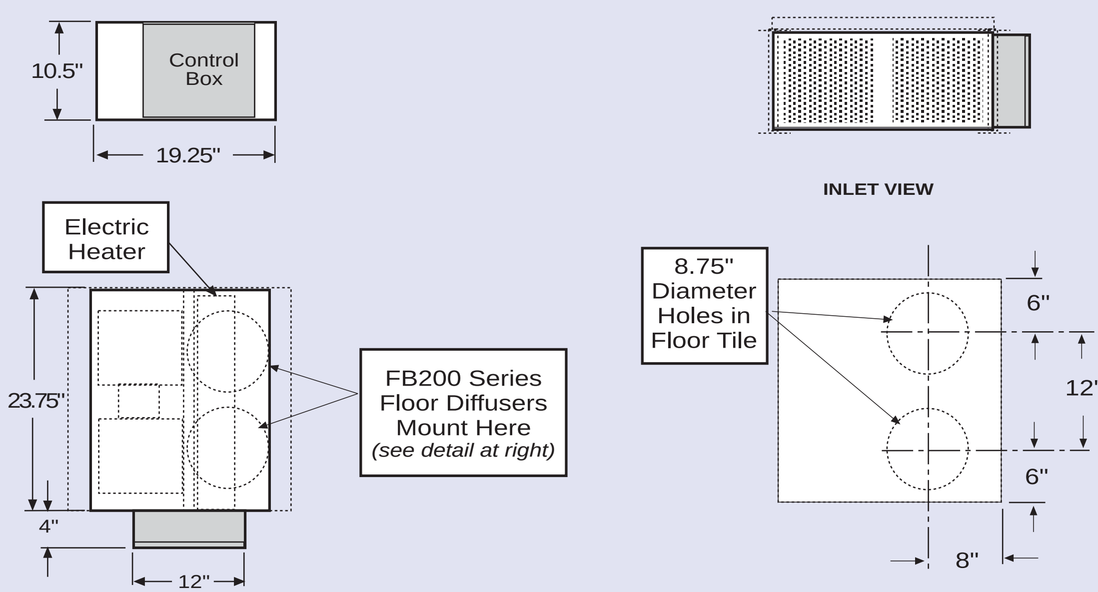
THERMOSTAT SATISFIED
- Fan delivers minimum cooling CFM
- Reheat coil remains off

HEATING DEMAND
- Fan operates on high speed.
- Reheat proportioned by thermostat

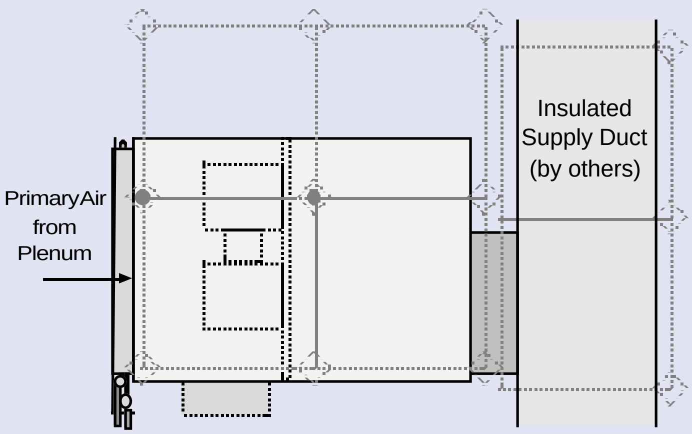
Model TMFT-C



Model TMFT-E



TERMINAL CONFIGURATION



FTC-W/1200 shown

PRODUCT HIGHLIGHTS

Application

- Provides constant volume (cycled) cooling and reheat to perimeter areas in UFAD applications.
- Reheat (hot water or electric) is performed using (conditioned) air from the pressurized floor plenum.

Components

- Motors are PSC type, furnished with a start capacitor. Blowers are forward curved centrifugal type.
- Entire assembly is tested and listed according to UL 1995 and CSA C22.2

Features

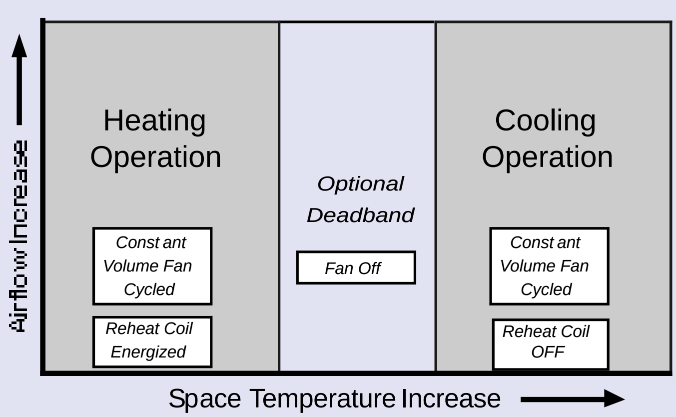
- Units are specifically designed to integrate into the support structure of most raised access flooring systems.
- Single point connections for most power delivery systems (see electric heat information, page 30).
- See page 3 for a summary of product features.

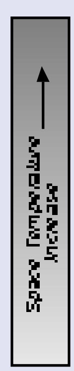
PRODUCT SUMMARY

Model/ Size	Maximum Fan CFM	Reheat Provisions			Fan Operation	Available Accessories			
		Hot Water	Electric	Air Source		IFR	IAS	MOA	MIA
FTC-W/300	300	●		Plenum	CAV *(Cycled)*	●		●	●
FTC-E/300	325		●	Plenum	CAV *(Cycled)*	●		●	●
FTC-W/600	500	●		Plenum	CAV *(Cycled)*	●		●	●
FTC-E/600	600		●	Plenum	CAV *(Cycled)*	●		●	●
FTC-W/1200	875	●		Plenum	CAV *(Cycled)*	●		●	●
FTC-E/1200	1100		●	Plenum	CAV *(Cycled)*	●		●	●
FTC-W/1800	1550	●		Plenum	CAV *(Cycled)*	●			
FTC-E/1800	1750		●	Plenum	CAV *(Cycled)*	●			

PRODUCT INFORMATION INDEX

OPERATIONAL SEQUENCE





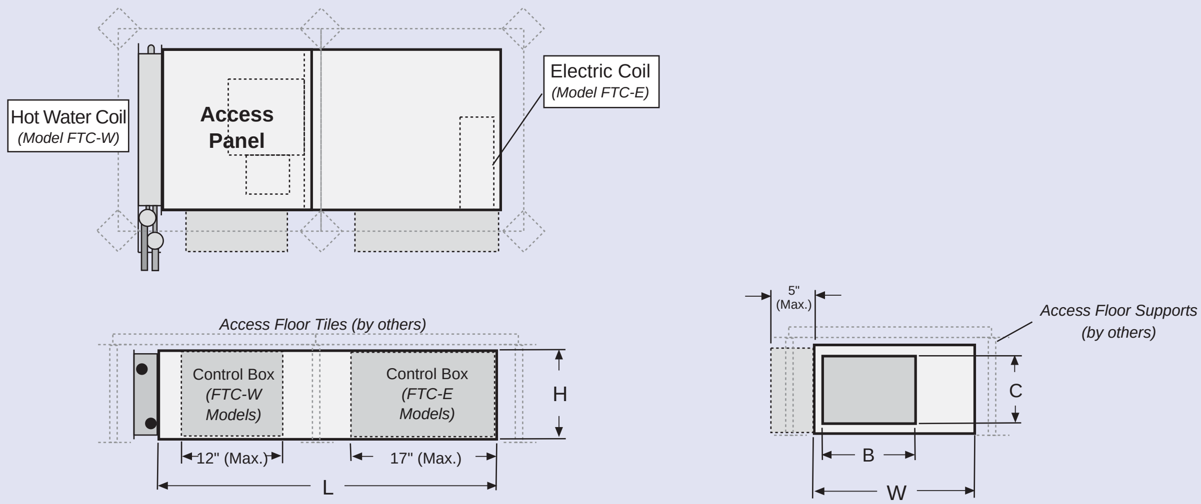
FULL COOLING DEMAND
- CAV fan operates continuously
- Reheat coil remains off

REDUCED COOLING DEMAND
- CAV fan cycled by space thermostat
- Reheat coil remains off

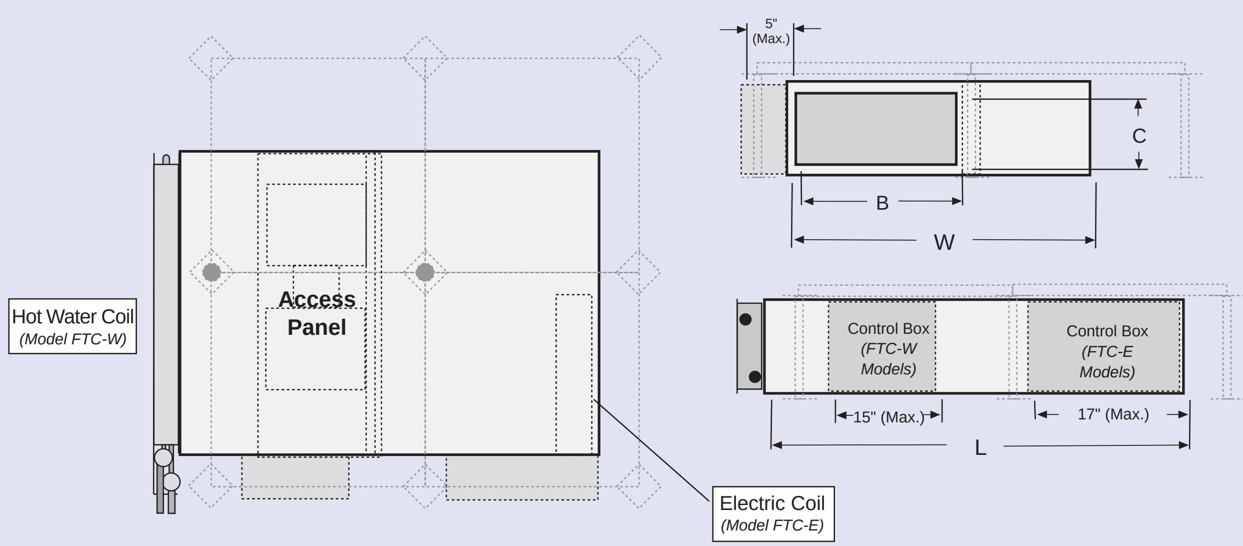
(OPTIONAL DEADBAND)
- CAV fan remains of
- Reheat coil remains off

HEATING DEMAND
- CAV fan operates continuously
- Reheat coil cycled by space thermostat

Sizes 300 and 600

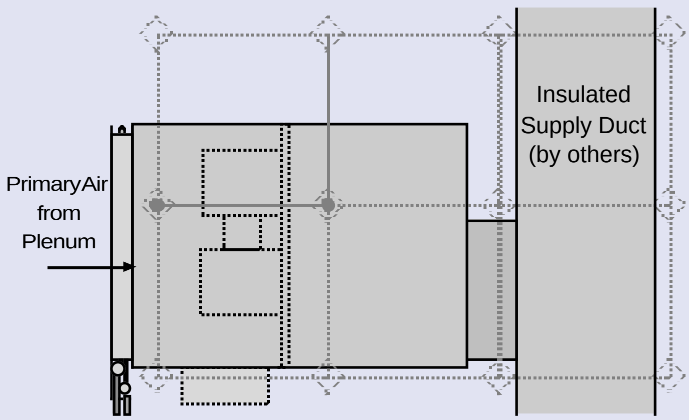


Sizes 1200 and 1800



Model/Size	Motor HP	L	W	H	B	C
FTC-E/300	$^{1}/_{10}$	40"	17"	10 $^{1}/_{2}$"	9"	5"
FTC-W/300	$^{1}/_{10}$	40"	19"	10 $^{1}/_{2}$"	17"	8"
FTC-E/600	$^{1}/_{6}$	40"	19"	10 $^{1}/_{2}$"	11"	8"
FTC-W/600	$^{1}/_{6}$	40"	19"	10 $^{1}/_{2}$"	17"	8"
FTC-../1200	$^{1}/_{3}$	46"	38"	10 $^{1}/_{2}$"	20"	8"
FTC-../1800	$^{1}/_{3}$	46"	38"	12 $^{1}/_{2}$"	20"	10 "

TERMINAL CONFIGURATION



FTV-W/1200 shown

PRODUCT HIGHLIGHTS

Application

- Provides constant volume (cycled) cooling and reheat to perimeter areas in UFAD applications.
- Reheat (hot water or electric) is performed using (conditioned) air from the pressurized floor plenum.

Components

- Motors are high efficiency (electronically controlled) variable speed models. Blowers are forward curved centrifugal type.
- Entire assembly is tested and listed according to UL 1995 and CSA C22.2.

Features

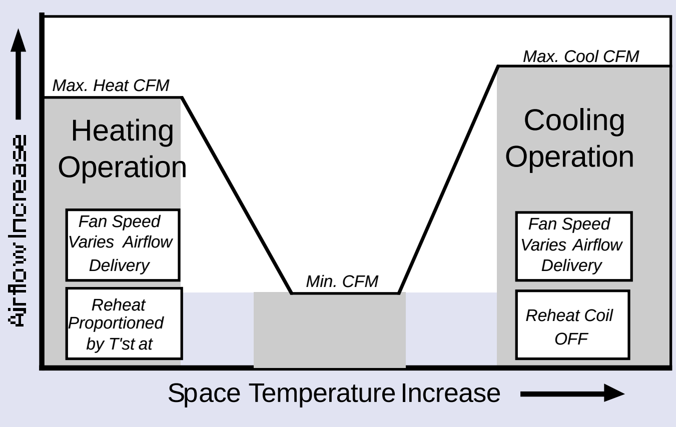
- Units are specifically designed to integrate into the support structure of most raised access flooring systems.
- Single point connections for most power delivery systems (see electric heat information, page 30).
- See page 3 for a summary of product features.

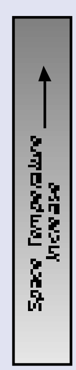
PRODUCT SUMMARY

Model/ Size	Maximum Fan CFM	Reheat Provisions			Fan Operation	Available Accessories			
		Hot Water	Electric	Air Source		IFR	IAS	MOA	MIA
FTV-W/600	500	●		Plenum	Variable Speed	●	●	●	
FTV-E/600	600		●	Plenum	Variable Speed	●	●	●	
FTV-W/1200	875	●		Plenum	Variable Speed	●	●	●	
FTV-E/1200	1100		●	Plenum	Variable Speed	●	●	●	
FTV-W/1800	1550	●		Plenum	Variable Speed	●	●		
FTV-E/1800	1750		●	Plenum	Variable Speed	●	●		

PRODUCT INFORMATION INDEX

OPERATIONAL SEQUENCE





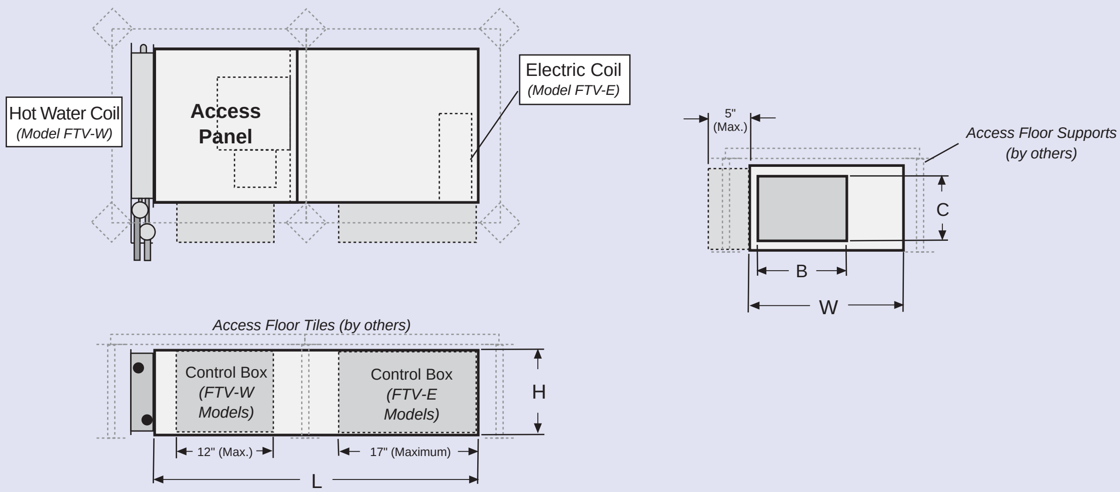
FULL COOLING DEMAND
- VAV fan delivers max. cooling CFM
- Reheat coil remains off

REDUCED COOLING DEMAND
- Fan speed varied by space thermostat
- Reheat coil remains off

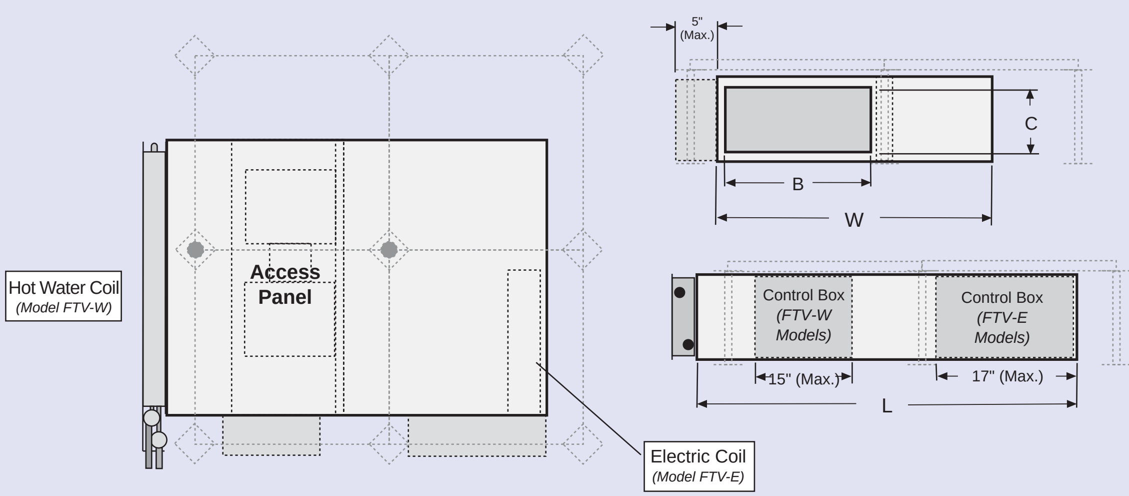
THERMOSTAT SATISFIED
- Fan delivers minimum cooling CFM
- Reheat coil remains off

HEATING DEMAND
- Fan speed varied by space thermostat
- Reheat proportioned by thermostat

Size 600



Sizes 1200 and 1800

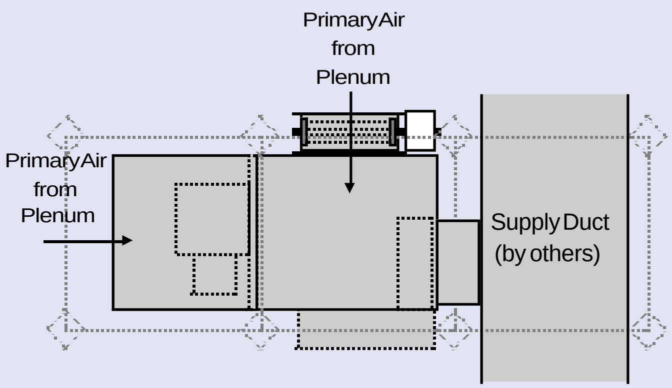


Model/Size	Motor HP	L	W	H	B	C
FTV-W/600	1/6	40"	19"	10 1/2"	17"	8"
FTV-E/600	1/6	40"	19"	10 1/2"	11"	8"
FTV-W/1200	1/3	46"	38"	10 1/2"	20"	8"
FTV-E/1200	1/3	46"	38"	10 1/2"	20"	8"
FTV-W/1800	1/3	46"	38"	12 1/2"	20"	10"
FTV-E/1800	1/3	46"	38"	12 1/2"	20"	10"

FTU Series Fan Terminals

Features and Operation

TERMINAL CONFIGURATION



FTU-E/600 Shown

PRODUCT HIGHLIGHTS

Application

- Provides variable volume cooling and constant volume (cycled) reheat to perimeter areas in UFAD applications.
- Reheat (hot water or electric) is performed using (conditioned) air from the pressurized floor plenum.

Components

- Motors are PSC type, high efficiency (high efficiency variable speed motors are an optional feature). Blowers are forward curved centrifugal type.
- Entire assembly is tested and listed according to UL 1995 and CSA C22.2

Features

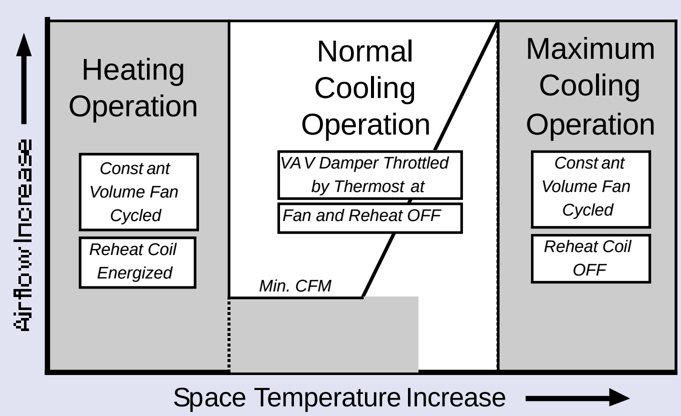
- Units are specifically designed to integrate into the support structure of most raised access flooring systems
- Single point connections for most power delivery systems (see electric heat information, page 30).
- See page 3 for a summary of product features.

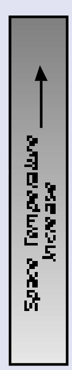
PRODUCT SUMMARY

Model/ Size	Maximum Fan CFM	Reheat Provisions			Fan Operation	Available Accessories			
			Electric	Air Source		IFR	IAS	MOA	MIA
FTU-W/600	500	●		Plenum	CAV (Cycled)	Not Available			
FTU-E/600	600		●	Plenum	CAV (Cycled)				
FTU-W/1200	875	●		Plenum	CAV (Cycled)				
FTU-E/1200	1100		●	Plenum	CAV (Cycled)				
FTU-W/1800	1550	●		Plenum	CAV (Cycled)				
FTU-E/1800	1750		●	Plenum	CAV (Cycled)				

PRODUCT INFORMATION INDEX

OPERATIONAL SEQUENCE





FULL COOLING DEMAND

- CAV fan delivers maximum CFM
- Reheat coil remains off

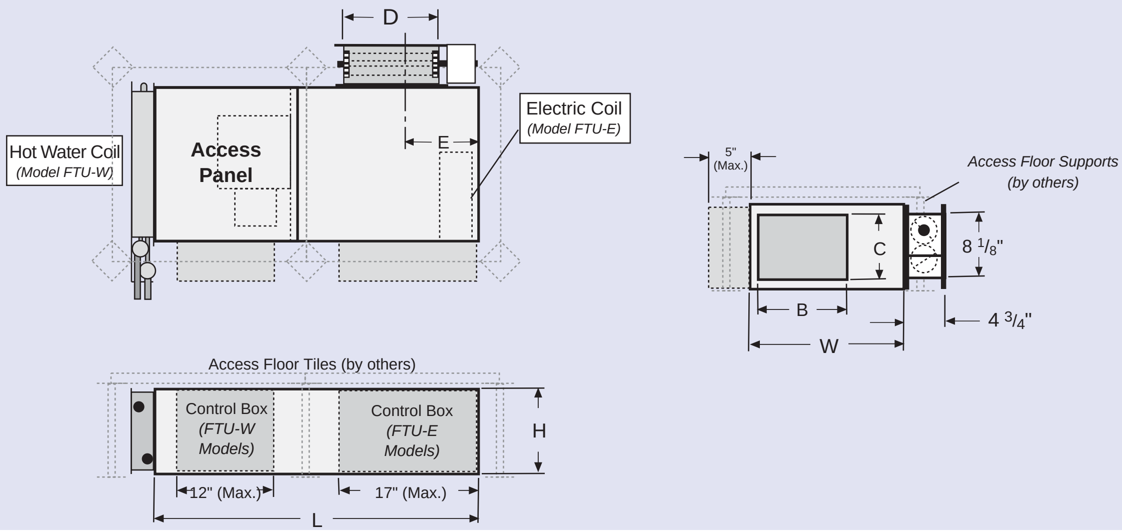
REDUCED COOLING DEMAND

- Fan off, VAV damper throttles in response to thermostat to provide VAV cooling (non-fan assisted) to the space
- Reheat coil remains off

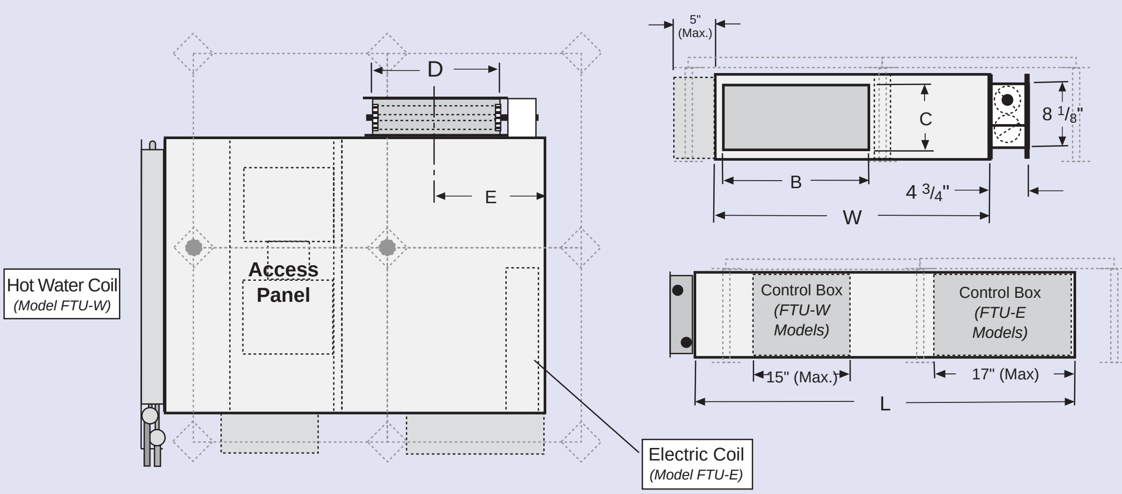
HEATING DEMAND

- CAV fan cycled by space thermostat
- Reheat coil energized (during fan operation)

Size 600



Sizes 1200 and 1800

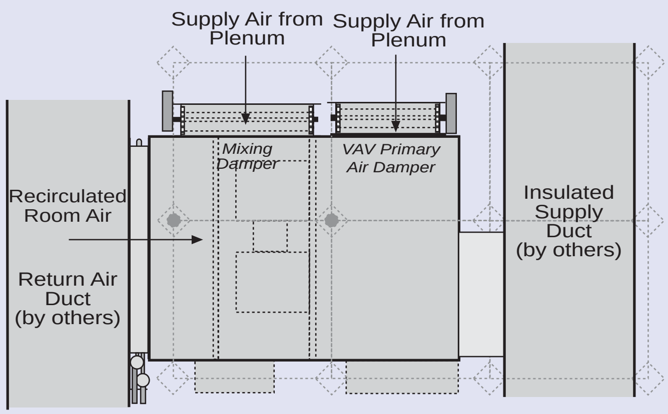


Model/Size	Motor HP	L	W	H	B	C	D	E
FTU-W/600	1/6	40"	19"	10 1/2"	17"	8"	11 3/4"	12"
FTU-E/600	1/6	40"	19"	10 1/2"	11"	8"	11 3/4"	12"
FTU-W/1200	1/3	46"	38"	10 1/2"	20"	8"	15 3/4"	11 3/8"
FTU-E/1200	1/3	46"	38"	10 1/2"	20"	8"	15 3/4"	11 3/8"
FTU-W/1800	1/3	46"	38"	12 1/2"	20"	10"	19 3/4"	11 3/8"
FTU-E/1800	1/3	46"	38"	12 1/2"	20"	10"	19 3/4"	11 3/8"

FTG Series Fan Terminals

Features and Operation

TERMINAL CONFIGURATION



FTG-W/1800 Shown

PRODUCT HIGHLIGHTS

Application

- Provides variable volume cooling and constant volume (cycled) reheat to perimeter areas in UFAD applications.
- Reheat (hot water or electric) is performed using (recirculated) room air.

Components

- Motors are PSC type (high efficiency, variable speed motors are optional). Blowers are forward curved centrifugal type.
- Entire assembly is tested and listed according to UL 1995 and CSA C22.2.

Features

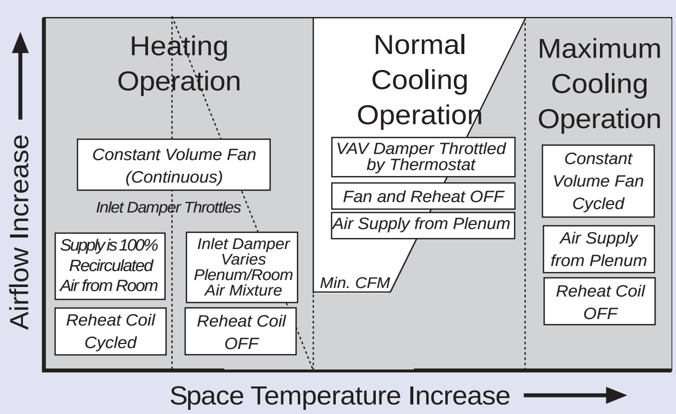
- Units are specifically designed to integrate into the support structure of most raised access flooring systems.
- Single point connections for most power delivery systems (see electric heat information, page 30).
- See page 3 for a summary of product features.

PRODUCT SUMMARY

Model/ Size	Maximum Fan CFM	Reheat Provisions			Fan Operation	Available Accessories			
		Hot Water	Electric	Air Source		IFR	IAS	MOA	MIA
FTG-W/600	500	●		Recirculated	CAV (Cycled)	●	●		●
FTG-E/600	600		●	Recirculated	CAV (Cycled)	●	●		●
FTG-W/1200	875	●		Recirculated	CAV (Cycled)	●	●		●
FTG-E/1200	1100		●	Recirculated	CAV (Cycled)	●	●		●
FTG-W/1800	1550	●		Recirculated	CAV (Cycled)	●	●		
FTG-E/1800	1750		●	Recirculated	CAV (Cycled)	●	●		

PRODUCT INFORMATION INDEX

OPERATIONAL SEQUENCE



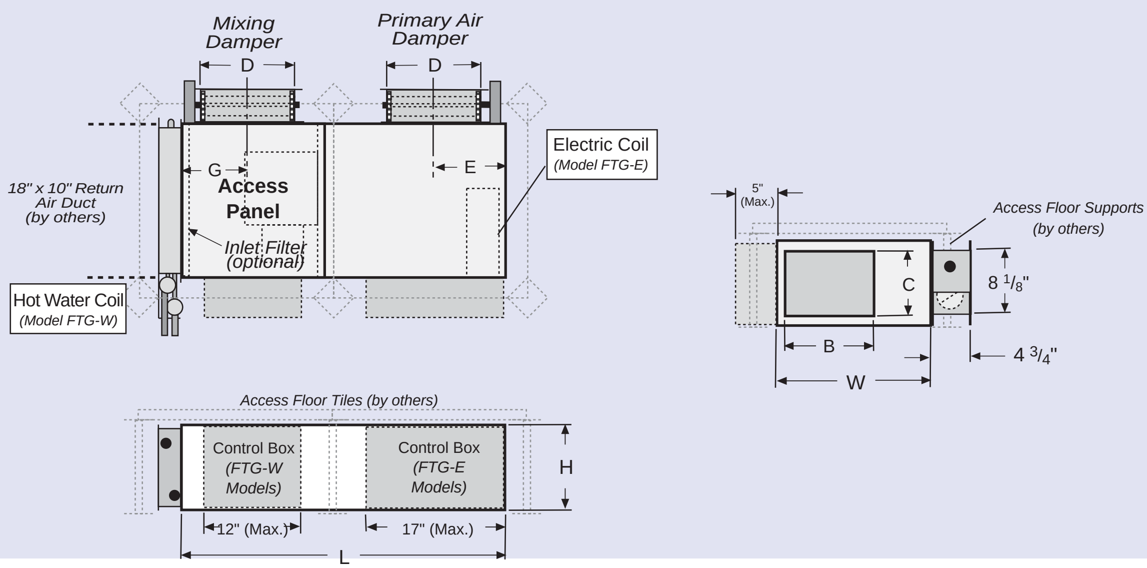
FULL COOLING DEMAND
- CAV fan delivers maximum CFM (plenum air)
- Reheat coil remains off

REDUCED COOLING DEMAND
- Fan off, VAV damper throttles to provide VAV cooling (non-fan assisted) using plenum air
- Reheat coil remains off

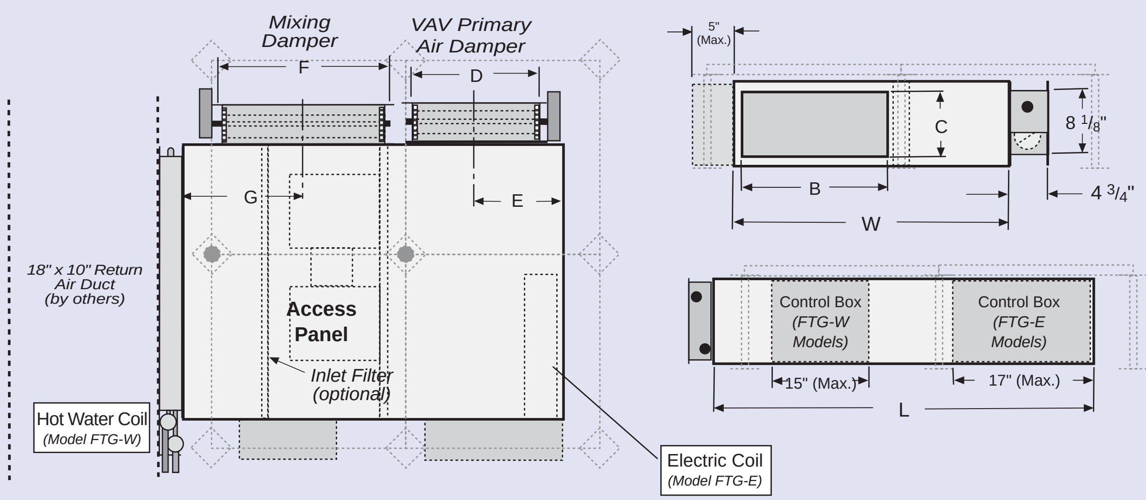
MINIMAL COOLING DEMAND
- CAV fan runs contiuously, inlet damper throttles to vary mixture of plenum and recirculated air
- Reheat coil remains off

HEATING DEMAND
- CAV operates continously (100% Room Air)
- Reheat coil cycled by space thermostat

Size 600

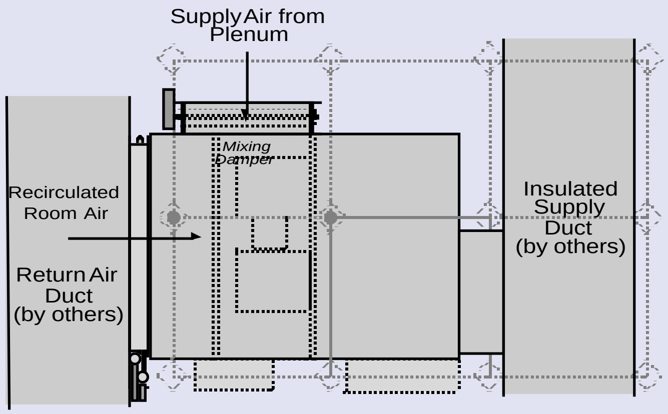


Sizes 1200 and 1800



Model/Size	Motor HP	L	W	H	B	C	D	E	F	G
FTG-W/600	1/6	40"	19"	10 1/2"	17"	8"	11 3/4"	12"	11 3/4"	8 1/4"
FTG-E/600	1/6	40"	19"	10 1/2"	11"	8"	11 3/4"	12"	11 3/4"	8 1/4"
FTG-W/1200	1/3	46"	38"	10 1/2"	20"	8"	15 3/4"	11 3/8"	19 3/4"	11 7/8"
FTG-E/1200	1/3	46"	38"	10 1/2"	20"	8"	15 3/4"	11 3/8"	19 3/4"	11 7/8"
FTG-W/1800	1/3	46"	38"	12 1/2"	20"	10"	19 3/4"	11 3/8"	19 3/4"	11 7/8"
FTG-E/1800	1/3	46"	38"	12 1/2"	20"	10"	19 3/4"	11 3/8"	19 3/4"	11 7/8"

TERMINAL CONFIGURATION



FTR-W/1200 Shown

PRODUCT HIGHLIGHTS

Application

- Provides constant volume cooling and reheat to perimeter areas in UFAD applications.
- Reheat (hot water or electric) is performed using (recirculated) room air

Components

- Motors are PSC type (high efficiency variable speed motors are an optional feature). Blowers are forward curved centrifugal type.
- Entire assembly is tested and listed according to UL ``1995 and CSA C22.2.

Features

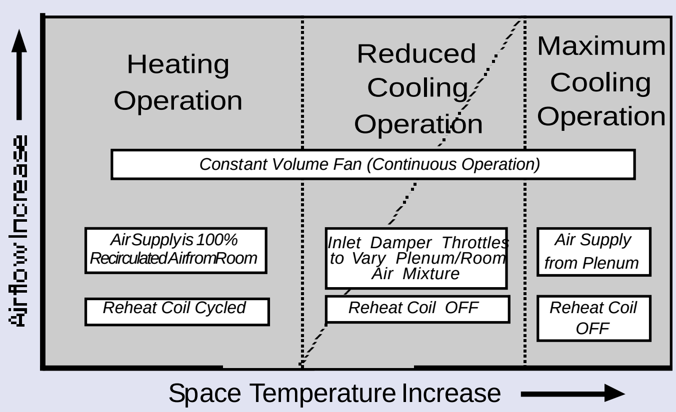
- Units are specifically designed to integrate into the support structure of most raised access flooring systems
- Single point connections for most power delivery systems (see electric heat information, page 30).
- See page 3 for a summary of product features.

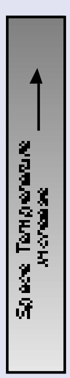
PRODUCT SUMMARY

Model/ Size	Maximum Fan CFM	Reheat Provisions			Fan Operation	Available /Accessories			
		Hot Water	Electric	Air Source		IFR	IAS	MOA	MIA
FTR-W/300	300	●		Plenum	Continuous			●	●
FTR-E/300	325		●	Plenum	Continuous			●	●
FTR-W/600	500	●		Plenum	Continuous	●	●	●	●
FTR-E/600	600		●	Plenum	Continuous	●	●	●	●
FTR-W/1200	875	●		Plenum	Continuous	●	●	●	●
FTR-E/1200	1100		●	Plenum	Continuous	●	●	●	●
FTR-W/1800	1550	●		Plenum	Continuous	●	●		
FTR-E/1800	1750		●	Plenum	Continuous	●	●		

PRODUCT INFORMATION INDEX

OPERATIONAL SEQUENCE





FULL COOLING DEMAND

- CAV fan runs continuously (supply air from pressurized floor plenum)
- Reheat coil remains off

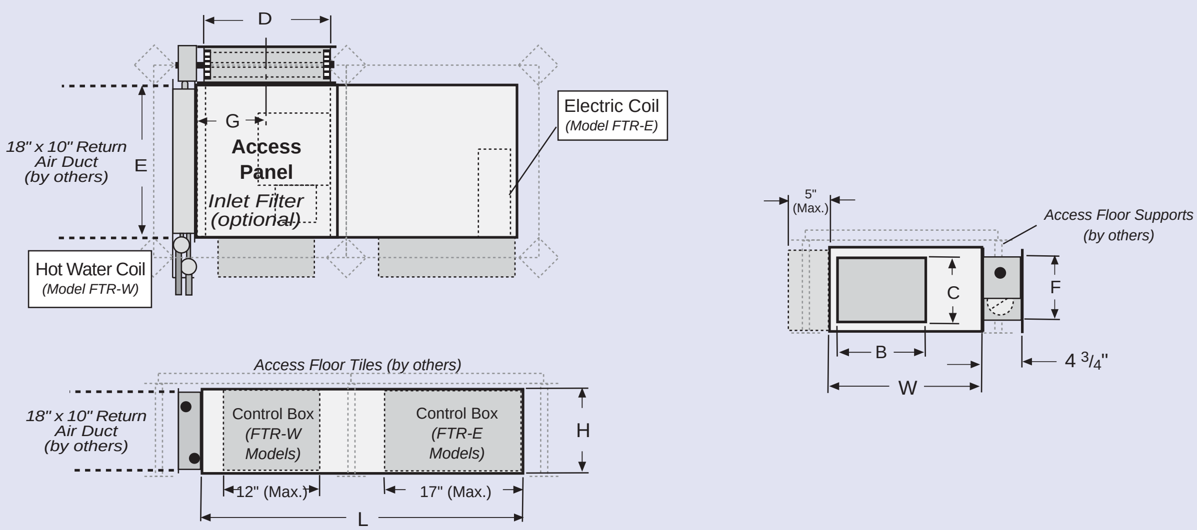
REDUCED COOLING DEMAND

- CAV fan runs contiuously, inlet damper throttles to vary mixture of plenum and recirculated air
- Reheat coil remains off

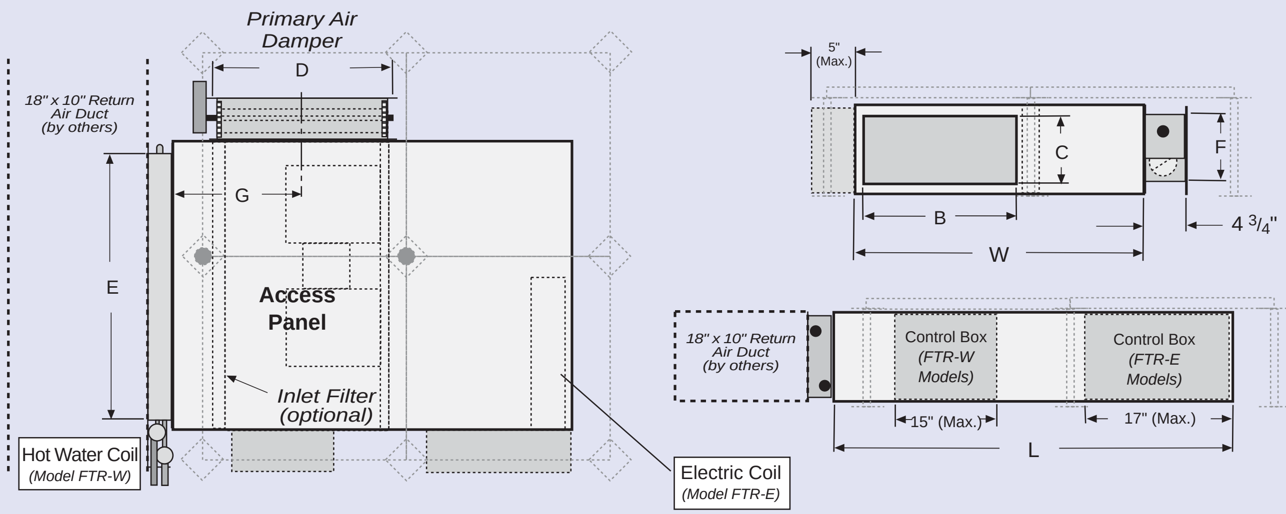
HEATING DEMAND

- CAV operates continously (100% Room Air)
- Reheat coil cycled by space thermostat

Sizes 300 and 600



Sizes 1200 and 1800

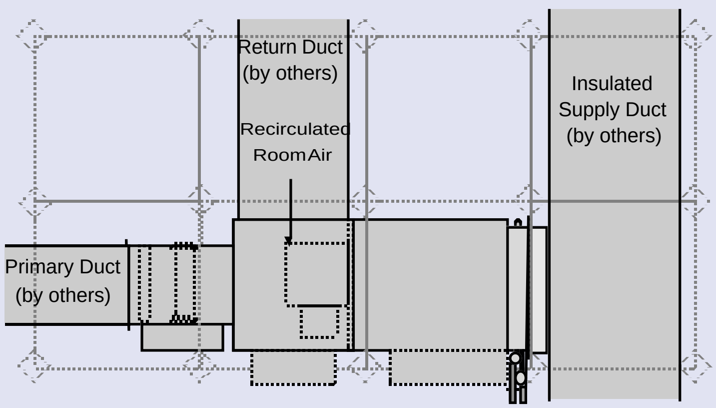


Model/Size	Motor HP	L	W	H	B	C	D	E	F	G
FTR-E/300	1/10	40"	19"	10 1/2"	9"	5"	15 3/4"	-	8"	8 1/4"
FTR-W/300	1/10	40"	19"	10 1/2"	17"	8"	15 3/4"	18"	8"	8 1/4"
FTR-E/600	1/6	40"	19"	10 1/2"	11"	8"	15 3/4"	-	8"	8 1/4"
FTR-W/600	1/6	40"	19"	10 1/2"	17"	8"	15 3/4"	18"	8"	8 1/4"
FTR-../1200	1/3	46"	38"	10 1/2"	20"	8"	19 3/4"	23 5/8"	8"	12 7/8"
FTR-../1800	1/3	46"	38"	12 1/2"	20"	10"	19 3/4"	35 1/2"	10"	12 7/8"

FTD Series Fan Terminals

Features and Operation

TERMINAL CONFIGURATION



FTD-W/600 Shown

PRODUCT HIGHLIGHTS

Application

- Provides (series type) constant volume cooling and reheat to perimeter areas in UFAD applications. Primary air is ducted to an integral (pressure independent) VAV control assembly
- Reheat (hot water or electric) is performed using (recirculated) room air

Components

- Motors are PSC type (high efficiency, variable speed motors are an optional feature). Blowers are forward curved centrifugal type.
- Entire assembly is tested and listed according to UL ``1995 and CSA C22.2.

Features

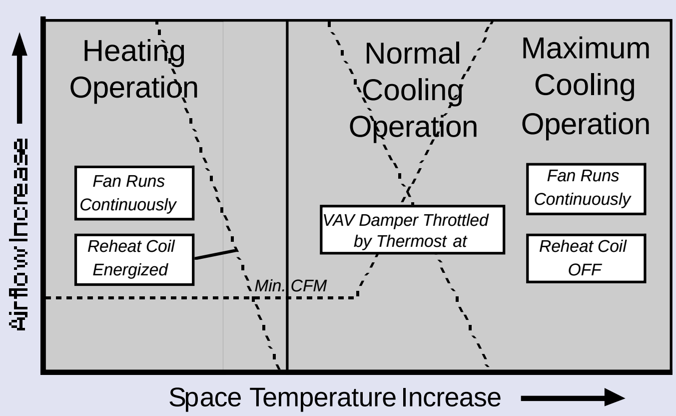
- Units are specifically designed to integrate into the support structure of most raised access flooring systems
- Single point connections for most power delivery system (see electric heat information, page 30).
- See page 3 for a summary of product features.

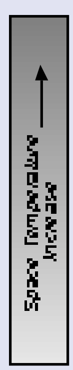
PRODUCT SUMMARY

Model/ Size	Maximum Fan CFM	Reheat Provisions			Fan Operation	Options/Accessories			
		Hot Water	Electric	Air Source		IFR	IAS	MOA	MIA
FTD-W/600	500	●		Room	Continuous	●	●	●	●
FTD-E/600	600		●	Room	Continuous	●	●	●	●
FTD-W/1200	875	●		Room	Continuous	●	●	●	●
FTD-E/1200	1100		●	Room	Continuous	●	●	●	●
FTD-W/1800	1550	●		Room	Continuous	●	●		
FTD-E/1800	1750		●	Room	Continuous	●	●		

PRODUCT INFORMATION INDEX

OPERATIONAL SEQUENCE





FULL COOLING DEMAND

- Fan delivers constant volume CFM
- 100% of Air Derived from Primary Duct

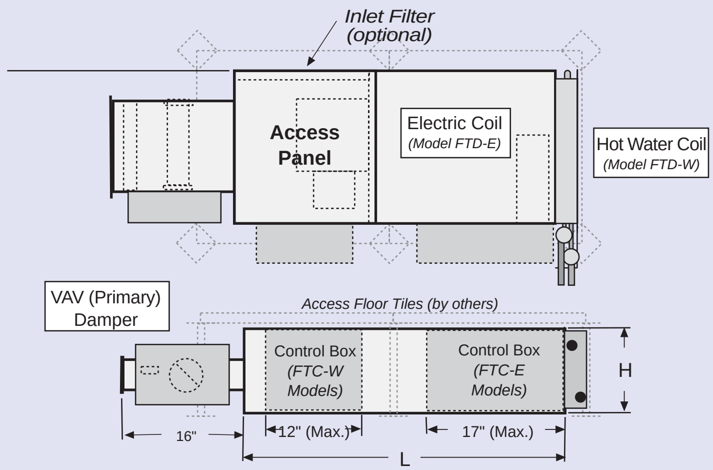
REDUCED COOLING DEMAND

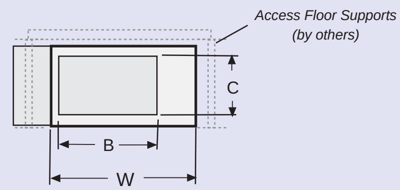
- VAV damper throttles primary air in response to thermostat. Fan induces room air to maintain constant volume discharge.
- Reheat coil remains off

HEATING DEMAND

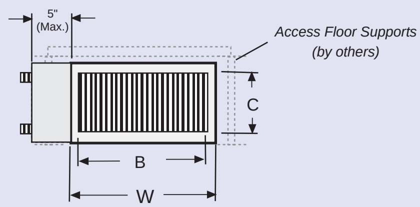
- Fan delivers maximum recirculated (room) air
- Reheat coil cycled by thermostat to maintain space temperature.

Size 600



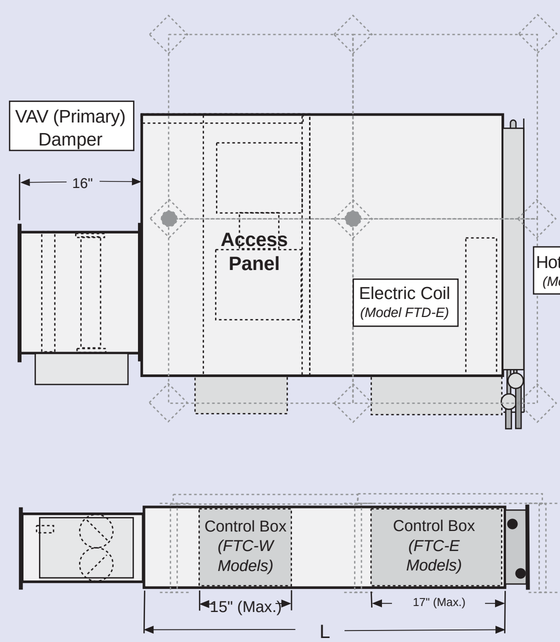


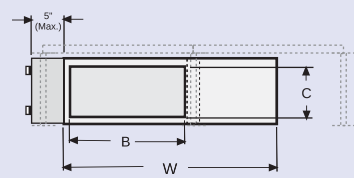
DISCHARGE VIEW, FTD-E MODELS



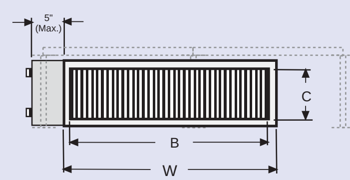
DISCHARGE VIEW, FTD-W MODELS

Sizes 1200 and 1800

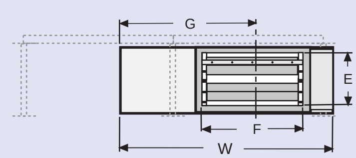




DISCHARGE VIEW, FTD-E MODELS



DISCHARGE VIEW, FTD-W MODELS



INLET VIEW, ALL MODELS

Model/Size	Motor HP	L	W	H	B	C	E	F	G
FTD-E /600	1/6	40"	19"	10 1/2"	11"	8"	3 15/16"	11 3/4"	6 7/8"
FTD-W /600	1/6	40"	19"	10 1/2"	17"	8"	3 15/16"	11 3/4"	6 7/8"
FTD-E /1200	1/3	46"	38"	10 1/2"	20"	8"	7 7/8"	11 3/4"	25 7/8"
FTD-W /1200	1/3	46"	38"	10 1/2"	18"	8"	7 7/8"	11 3/4"	25 7/8"
FTD-E /1800	1/3	46"	38"	12 1/2"	20"	10"	7 7/8"	19 7/8"	21 7/8"
FTD-W /1800	1/3	46"	38"	12 1/2"	31 1/2"	10"	7 7/8"	19 7/8"	21 7/8"

Electric Reheat Coils

General Information

CODE REQUIREMENTS AND COMPLIANCE

Electric reheat coils incorporated in TROX fan terminals are specifically designed and rated for UFAD applications. All of these coils and their accessories comply with UL and NEC requirements. The fan terminals in which they are incorporated have been tested and listed as assemblies according UL 1995 and CSA 22.2 standards.

U.L. and N.E.C. Requirements for Electric Heaters

U.L. Standard 1995 and the and National Electrical Code (NEC) have established the following (minimum) requirements for electric resistance heaters applied to fan terminals:

U.L. and NEC require the manufacturer to provide two types of **overtemperature protection**. Electric heaters furnished in TROX UFAD fan terminals include a disc type automatic reset limit which deenergizes the heater in the event of overheating. A secondary (replaceable fuse link) limit operates at a higher temperature and deenergizes the unit in case the primary fails.

U.L. and NEC require that heaters in excess of 48 amps be subdivided into circuits of less than 48 amps and built in fusing be provided by the manufacturer. The overcurrent device (fuse or circuit breaker) must be rated for 125% of the circuit load.

U.L. and NEC require that terminal units with electric heating provisions incorporate a method to **prevent the heating element from operating unless the fan circuit is energized**. TROX fan terminals incorporate a fan interlock relay to prevent the element from energizing when the fan terminal motor is not energized. A differential pressure (airflow) switch that confirms airflow through the heater before energizing the element is also available.

Transformers (with primary overcurrent protection) are required for heater operation whenever the heater voltage is different from the control voltage. Class II transformers meeting this requirement are provided with TROX fan terminals incorporating electric heating coils.

U.L. requires that a **grounding** lug (standard) be installed by the manufacturer for field wiring connection.

NEC requires that an equipment **disconnect switch** be installed on or within sight of the electric heater. Options 1 through 3 (below) may be specified to satisfy this requirement.

U.L. requires that the terminal manufacturer supply the heater element **contactors** as an integral part of the listed assembly.

ELECTRIC HEATER COMPONENTS

Standard Components

The following components are provided with all TROX fan terminals incorporating electric heating coils:

Magnetic contactors are U.L. rated for 100,000 cycle operation. Deenergizing contactors (which open the minimum number of power lines to interrupt the flow of current to the stage of the heater they are controlling) are standard on all three phase heaters. They do not disconnect all of the heater power supply lines but comply with U.L. requirements. Disconnecting contactors (standard on single phase heaters) disconnect all ungrounded power lines.

All heaters are equipped with **disc type automatic reset thermal safety cutouts** that deenergize the element in the event of overheating and reenergize it automatically when the disc temperature has been restored below its design cutout temperature (145ºF). One time **manually replaceable secondary fuse links** (cut out temperatures of 300ºF) are also provided as backup in case the primary overprotection fails. These fuse links are replaceable without removal of the heater.

Class II transformers (up to 30 amps per step) include internal primary overcurrent protection. These transformers step down primary (supply) voltage to a 24VAC secondary output to provide control voltage to integral and/or associated control circuits.

Fan interlock relays utilize external voltage from the fan motor circuit to prevent the heater element from being energized unless the fan is running.

Optional Components

All TROX fan terminals with electric heat can be provided with these optional components (for other options, contact factory). Only one accessory (each) from groups 1 and 2 may be specified.

Group 1 (Disconnect) Options

Door interlocking disconnect switch automatically disconnects power to the heater control box upon opening of its hinged door. These switches are available in fused (option 1) or unfused (option 2) versions. A **toggle type disconnect** switch (option3) is also available.

Group 2 (Contactor) Options

Disconnecting (magnetic) contactors (option 4) break all ungrounded lines. Some local codes require these contactors. These are standard in single phase heaters, but optional on all three phase models. **Mercury contactors** (option 5) are normally used where silent operation or fequent cycling is desired.

Other Options

Positive pressure airflow switches (option 6) replace the fan interlock relay and assure that air is flowing across the heater element before it is energized.

Manually resetable secondary cutouts (option 7) with a 175ºF cutout temperature replace standard fuseable links. A button (inside the control box) must be manually reset to restore power to the elements upon its having broken the circuit.

A protective screen (option 8) may be provided to protect installing and service personnel from inadvertently contacting the heater element. This is standard on TMFT-E terminals.

USEFUL ENGINEERING CALCULATIONS

1. *Conversion:* 1 kW = 3413 BTU

2. *Load Requirement:* $\text{kW} = \dfrac{\text{CFM x Temperature Rise (}^{o}\text{F)}}{3160}$

3. *Line Current (1 phase):* $\text{Amps} = \dfrac{\text{kW x 1000}}{\text{Volts}}$

4. *Line Current (3 phase):* $\text{Amps} = \dfrac{\text{kW x 1000}}{\text{Volts x 1.73}}$

5. *Air Temperature Rise:* $\Delta T\ (^{o}\text{F}) = \dfrac{\text{kW x 3160}}{\text{CFM}}$

NOTE: Terminal heating mode airflow should always exceed 70 CFM/kW.

Line Power Voltage/ Phase	25A Breaker					30A Breaker				
	Terminal Size					Terminal Size				
	TMFT-E	**300**	**600**	**1200**	**1800**	**TMFT-E**	**300**	**600**	**1200**	**1800**
120V/1ϕ	2.3	2.3	2.1	NR	NR	2.7	2.7	2.3	NR	NR
208V/3ϕ	4.0*	4.0*	6.4	5.8	5.8	4.0*	4.0*	7.5*	7.2	7.2
277V/1ϕ	4.0*	4.0*	5.3	5.1	5.1	4.0*	4.0*	6.3	6.1	6.1
480V/3ϕ	4.0*	4.0*	8.5*	15.5	15.5	4.0*	4.0*	8.5*	17.0*	22.0*

* *maximum recommended kW for standard heater. Call factory for applications beyond listed values.*

Table 8: Maximum Heater kW for Various Breaker Ratings

ELECTRIC HEATER ORDERING INFORMATION

FTU - E / 1800 / **15.0 / 2 / 00002 / 480** **/0**

Electric Heater kW/Steps
See page 9 and table 8 (above) for maximum kW limitations

Electric Heater Accessories
List numerically (e.g. 000 = None)
(Choose max. one each group 1 and 2 options)

GROUP 1 OPTIONS
1 Door interlocking disconnect (fused)
2 Door interlocking disconnect (non-fused)
3 Toggle disconnect (non-fused)

GROUP 2 OPTIONS
4 Disconnecting contactors (1 per step)
5 Mercury (deenergizing) contactors (1 per step)

6 Positive pressure airflow switch
7 Manual reset (secondary) limit
8 Protective screen

Power Supply
120 120VAC/1ϕ
208 208VAC/3ϕ
277 277VAC/1ϕ
480 480VAC/3ϕ
Note: 3 phase power supply requires 4th (neutral) wire

Hot Water Coil Performance Data

FTC-W, FTV-W, FTU-W, FTG-W, FTR-W and FTD-W Models

UNIT SIZE	Water Flow GPM	Head Loss Ft. H_2O	AIRFLOW RATE (CFM) 100	200	300	400	500	600
300 600	1.0	0.1	8.8	13.2	16.2	18.3	19.9	21.2
	2.0	0.4	9.3	14.7	18.6	21.6	24.0	26.1
	3.0	0.8	9.5	15.3	19.6	22.9	25.8	28.2
	4.0	1.4	9.5	15.6	20.1	23.7	26.7	29.4
	5.0	2.0	9.6	15.8	20.4	24.2	27.4	30.2

COIL SIZE	Water Flow GPM	Head Loss Ft. H_2O	AIRFLOW RATE (CFM) 450	600	750	900	1050	1200
1200	2.0	0.5	25.5	29.2	32.2	34.7	36.9	38.8
	3.5	1.2	27.6	32.3	36.2	39.7	42.3	44.9
	5.0	2.3	28.6	33.7	38.0	41.7	45.0	47.9
	6.5	3.7	29.2	34.5	39.1	43.0	46.5	49.7
	8.0	5.4	29.6	35.1	39.8	43.9	47.6	50.9

COIL SIZE	Water Flow GPM	Head Loss Ft. H_2O	AIRFLOW RATE (CFM) 800	1000	1200	1400	1600	1800
1800	2.0	0.4	39.9	43.7	46.8	49.5	51.7	53.7
	3.5	1.0	45.2	50.4	54.9	58.7	62.1	65.1
	5.0	1.9	47.6	53.6	58.7	63.3	67.3	70.9
	6.5	3.0	49.0	55.5	61.0	66.0	70.4	74.5
	8.0	4.3	50.0	56.7	62.6	67.8	72.6	76.9

PERFORMANCE NOTES:

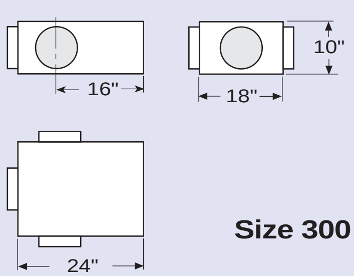
1. All water coils are of two row, multi-circuit construction.
2. Heating capacities in tables are MBH and are based on an entering air relative humidity of 80%.
3. Performance data in tables is based on a 110ºF temperature differential between entering water and entering air. For other temperature differentials, multuiply the MBH value in the table by the appropriate correction factor from the table below:

For EWT -EAT equal to:	70ºF	80ºF	90ºF	100ºF	110ºF	120ºF	130ºF
Multiply table value by:	0.63	0.71	0.81	0.90	1.00	1.09	1.19

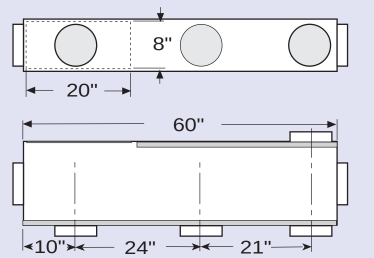
4. The air temperature rise (ATR) may be estimated by the equation, ATR = 927 x MBH / CFM.
5. The water temperature drop (WTD) may be estimated by the equation, WTD =2.04 x MBH / GPM.

INLET/OUTLET ADAPTORS

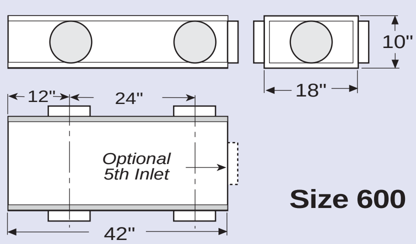
Options MIA and MOA



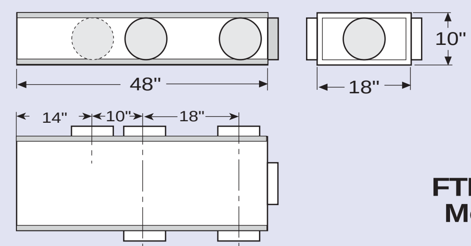
Size 300



Size 1200
Except FTD Models



Size 600

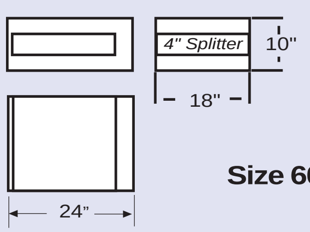


FTD 1200 Models

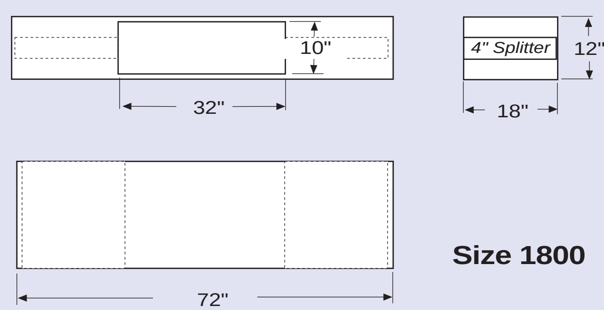
NOTES:
1. Multiple outlet and inlet adaptors are not available for size 1800 terminals.
2. Multiple outlet adaptors are not recommended for use with FTU or FTG series terminals (see page 13 for further details).

INLET SILENCERS

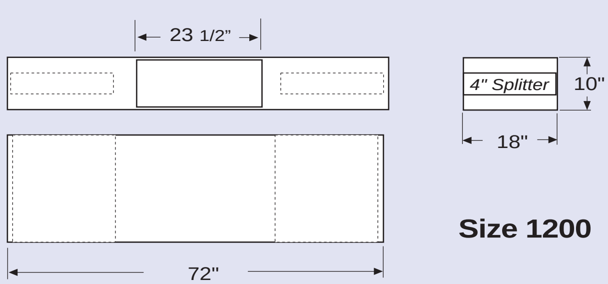
Option IAS



Size 600



Size 1800



Size 1200

NOTES:
1. IAS inlet silencers are not available for size 300 terminals.
2. See page 34 for recommendations regarding inlet registers for use with IAS silencers.

Control Requirements and Considerations

FAN SPEED AND DELIVERY CONTROL

With the exception of the TMFT series (whose speed is determined by the motor windings chosen), the fan terminals presented in this catalog require some means of field adjusting their airflow delivery as this would otherwise be determined solely by the characteristics of the ductwork system to which they are attached. Several options for providing this adjustment are discussed below.

FTV series terminals incorporate variable speed motors whose operational speeds vary in accordance to the cooling demand of the space. These variable speed motors are also offered as options (VSM option) on most of the other terminal models (see product information pages for specific model availability). The use of these motors enables the imposition of maximum and minimum fan airflow (as specified by the designer) by limiting the proportional control signal that determines their operational speed. In addition, the use of these motors allows the designation of separate maximum fan airflow rates for heating and cooling operation.

Alternatively, all of the fan terminals presented (except TMFT and FTV models) can be provided with a manual fan speed controller (adjusted upon installation).

Although possible, it is not recommended that the fan delivery be adjusted by means of dampers installed on the terminal inlet and/or discharge as this may contribute to unstable fan operation as well as increased acoustical levels.

TROX provides precise terminal adjustment and balancing procedures as part of its Installation and Operations Manual, which accompanies the shipment of these units.

TERMINAL UNIT CONTROL REQUIREMENTS

All of the operational sequences shown in this catalog assume that the terminal unit controls are being furnished, sequenced and calibrated by TROX. Controls may also be provided by the temperature control contractor for commissioning and calibration on-site. The following subsections provide information pertinent to these alternatives.

Controls by TROX

The control schematics illustrated on the product information pages of this catalog are easily achieved using control packages furnished by TROX. Each of these consists of a solid state digital control board and a matching space temperature sensor. This control board sequences the fan motor, reheat controls, and dampers integral to the terminal in order to achieve the sequence specified. This control board also incorporates communication capabilities whereby the room conditions, set points and operational status of the terminal and its components may be verified and adjusted remotely.

Controls by the Temperature Control Contractor

Oftentimes the temperature control contractor furnishes the zone temperature controls including the space temperature sensor and those controls which operate the terminal units feeding the zone. Table 9 identifies the signals which must be provided to the various terminals in order to properly sequence their operation. The exact specification of these signals depends upon the sequence being performed, therefore, this table is only intended to establish a broad scope of the control requirements and should not be considered an accurate prediction of the specific project needs.

Terminal Type	Controlled Component					
	Integral Fan [2]	Electric Coil	Hot Water Coil	Primary Damper	Mixing Damper	VAV Damper
FTC-E	CC	CC				
FTC-W	CC		NA [3]			
FTV-E	DC	CC				
FTV-W	DC		NA [3]			
FTU-E	CC	CC				DC
FTU-W	CC		NA [3]			DC
FTG-E	CC	CC			CC	DC
FTG-W	CC		NA [3]		CC	DC
FTR-E		CC			DC	
FTR-W			NA [3]		DC	
FTD-E		CC		DC		
FTD-W			NA [3]	DC		

LEGEND: **CC = Dry Contact Closure** **DC = Proportional DC Signal** **NA = Not Applicable**

Table 9: Control Signals Required to Accomplish Operational Schematics Illustrated

NOTES:

1. The control signals identified in this chart are required in order to perform the operational sequences depicted on the respective models'product information pages. Contact TROX USA for exact specifications of the signals listed.
2. FTR and FTD series fans are intended to run continuously during normal operation, but may be cycled during setback modes by a dry contact closure signal.
3. Hot water valves and actuators are by others and controlled accordingly.
4. Figure 9 (opposite page) illustates the general arrangement of these terminals.

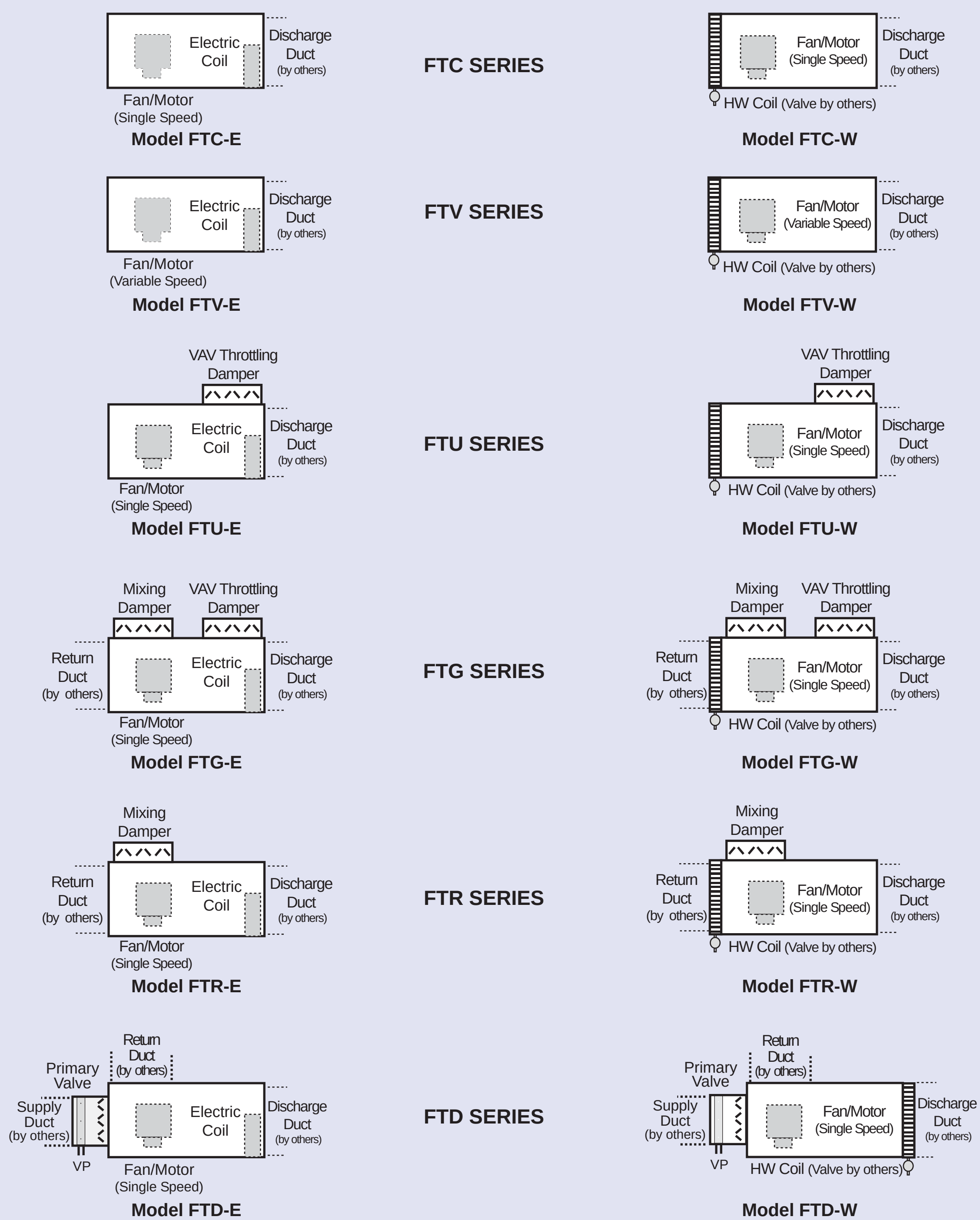


Figure 9: General Configuration of TROX Underfloor Fan Terminals
FTC, FTV, FTU, FTG, FTR and FTD Series

Specifications and Ordering Information

TMFT Series Fan Terminals

SUGGESTED SPECIFICATIONS

GENERAL

1. Furnish and install TROX TMFT series modular fan terminals of capacity shown on the plans and equipment schedules.
2. The fan assembly shall be constructed to fit beneath a single two-foot (nominal) square access floor tile. No modification of the access floor tile or its support structure shall be allowed. Removal of the entire assembly from the access floor cavity shall not require removal of more than two (2) such floor tiles.
3. The unit shall be located and placed upon the structural slab directly beneath the designated floor tile. A compressible gasket shall be provided to seal the top of the terminal against the underside of the floor tile. Adjustable mounting pedestals shall be incorporated within the terminal to allow its incorporation into any floor cavity height between 10 3/4 and 14 inches.
4. The fan assembly shall be constructed to allow placement of two (2) TROX FB200 series floor diffusers in the floor tile directly above. Supply of conditioned air through the outlets shall be accomplished without additional ductwork, plenums or any other appurtenances.

CONSTRUCTION

1. The fan assembly shall consist of two (2) forward curved fans driven by a single direct coupled PSC motor. The fans shall be constructed of galvanized steel and the fan wheels shall be dynamically balanced. The said motor shall be of six (6) pole construction designed to operate at a maximum speed of 800 rpm and shall incorporate five (5) separate speed windings, of which any three may be used in a given application.
2. The assembly shall include a solid state (digital) control board and furnished with a matched room temperature sensor. The controller shall vary the fan speed in accordance to the space temperature offset indicated by the room sensor. This speed variation shall be in the form of a three (finite) step speed control. SCR control shall not be permitted. Indicator lights (optional) on the room temperature sensor shall indicate the (high, medium, low) speed of the assembly at all times during its operation.
3. All electrical components shall be installed in accordance with the National Electrical Code and mounted in a sheet metal control enclosure. The terminal shall be ETL or UL listed as a complete assembly.

MODEL TMFT-C

1. Assembly shall require a single 120VAC/1ϕ power connection (by others) and field wiring and mounting (by others) of the room sensor.
2. Assembly shall receive a signal (by others) indicating occupancy of the space it serves. At that time the unit fans shall be energized and operated at the speed required to satisfy the space cooling load as indicated by the temperature sensor. During unoccupied periods, the fan shall remain de-energized and an integral automatic shut-off damper closed to prevent leakage of conditioned plenum air from into the space.
3. Terminal unit controls shall allow the operation of up to six (6) such terminals off a single room sensor.

MODEL TMFT-E

1. Electric reheat coil shall be of voltage, kW, number of steps and integrated accessories and options as listed in the project schedule.
2. Assembly shall require a single (208VAC/3ϕ, 277VAC/1ϕ or 480VAC/3ϕ) power connection (by others) and field wiring and mounting (by others) of the room sensor. Three phase power supply will also require a fourth (neutral) wire connection.
3. The terminal shall be provided with an integral electric reheat coil. Coil shall be UL listed and elements shall be constructed of nickel chromium, supported by ceramic isolators. All control components shall be mounted in a NEMA 1 enclosure with a hinged access door. Electric coil shall contain a primary automatic reset thermal cutout and provisions for fan interlock.
4. During cooling operation, the terminal control board shall be capable of modulating the fan speed in accordance with the cooling requirements of the space, as indicated by the space temperature sensor. Upon a call for heat, the controller shall modulate the fan speed in accordance with the room heating requirements. The fan shall immediately revert to maximum speed upon the energizing of the electric reheat coil.
5. Terminal unit controls shall allow the operation of up to six (6) such terminals off a single room sensor.

ORDERING INFORMATION

TMFT - E / 134 / 3.0 / 2 / 00006 / 208

Basic Model
TMFT-C or TMFT-E

Operation Speeds
(Select 3 from page 14)
1 150 CFM (*NC21*)
2 200 CFM (*NC26*)
3 275 CFM (*NC31*)
4 325 CFM (*NC33*)
5 400 CFM (*NC36*)

Electric Heater kW/Steps
TMFT-E Models Only

Electric Heater Accessories
TMFT-E Models Only
See page 31 for Ordering Details

Power Supply
120 120VAC/1ϕ (*TMFT-C only*)
208 208VAC/3ϕ (*TMFT-E only*)
277 277VAC/1ϕ
480 480VAC/3ϕ (*TMFT-E only*)
Note: 3 phase power supply requires 4th (neutral) wire

SUGGESTED SPECIFICATIONS

GENERAL

1. Furnish and install TROX FTC fan terminals of size and capacities indicated on plans and schedules.
2. Terminals shall be capable of delivering the scheduled air volume to a common discharge duct or plenum of size and location specified on the project floor plan.
3. Terminals with capacities up to 1200 CFM shall be suitable for mounting within a floor cavity of minimum 10 3/4 inch depth. Terminals delivering 1200 to 1800 CFM shall mount within a floor cavity of 12 1/2" depth.
4. Terminals shall be designed to integrate into the flooring system in which they are installed without disturbance of any structural members. Terminals shall not require bridging or other modifications to the structural support system.
5. The terminal units shall be designed, built, and tested (in accordance with ARI Standard 880) as a single unit. No field assembly or modification (except connection of power/control wiring) shall be required.

CONSTRUCTION

1. Terminal casing shall be minimum 20 ga. galvanized steel, lined with 1/2 inch dual density insulation complying with UL181 and NFPA90A.
2. Terminal unit fans shall be forward curved type. Wheels and housings shall be constructed of corrosion resistant steel.
3. Integral fan motor shall be single speed (PSC type). Any necessary start and/or run capacitor shall be furnished as part of the assembly.

REHEAT COIL DETAILS (FTC-W Models)

1. Integral hot water reheat shall be two (2) row, consisting of aluminum fins attached to copper tubes. Coils shall be tested for 300 psi for operation at pressures up to 230 psi.
2. Coil connections shall be 1/2" copper pipe and shall be protected by a supporting steel angle that rigidly attaches to the coil frame. Coil frame shall be minimum 20 gauge steel.
3. Hot water valves and operators shall be furnished by others.
4. Terminal shall allow a single (120VAC/1ϕ or 277VAC/1ϕ) field power connection and control wiring connections (by others).

REHEAT COIL DETAILS (FTC-E Models)

(See page 30 for additional details)

1. Electric reheat coil shall be of the voltage, KW capacity, number of steps and incorporated accessories listed on the project schedule.
2. Coil shall be UL listed and (as a minimum) include a contactor per step, fan interlock, primary (automatic) and secondary (manual) reset high limits.
3. Entire assembly shall be listed in accordance with UL1995 and CSA22.2 standards and bear mark attesting such listing.
4. Terminal shall require a single (208VAC/3ϕ, 277VAC/1ϕ or 480VAC/3ϕ) field power connection and appropriate control wiring connections (by others). Three phase wiring shall include a fourth (neutral) wire.

STANDARD OPERATION (COOLING with REHEAT)

(Not applicable to dual function diffuser application)

1. Integral fan shall operate on a demand (signal by others) for cooling. Airflow delivery shall remain constant while the fan is running.
2. Upon demand for heat, an integral (hot water or electric) reheat coil shall be energized to reheat conditioned plenum air prior to discharge.
3. Hot water valve (*FTC-W only*) shall be furnished by the TC contractor.

SPECIAL REHEAT ONLY APPLICATION

(Dual function diffuser with inlet and discharge bypass, see page 12)

1. Diffusers on the inlet side of the fan shall be connected by a common rectangular duct (by S/M contractor). Diffusers on the discharge side of the fan will be similarly connected by a common (lined) rectangular duct. Each duct shall terminate into a model VVB bypass terminal (*see page 33*).
2. Integral fan shall operate on a signal (by others) indicating a demand for heat. Fan remains off during all other periods. Airflow delivery shall remain constant while the fan is energized. The dampers in both bypass terminals shall remain closed while the fan is energized, thereby utilizing the diffusers on the inlet side of the fan as return inlets, while the entire supply air delivery is accomplished by those diffusers on the discharge side of the fan terminal.
3. Upon a demand for space cooling, the fan shall be de-energized and both bypass assemblies shall throttle conditioned air from the floor plenum through the diffusers connected to their respective ductwork, thereby, utilizing all of the connected diffusers as supply outlets.

ORDERING INFORMATION

FTC - E / 600 / 6.0 / 1 / 00001 / 480 / B / VVB

Basic Model
FTU-W or FTU-E

Nominal Size
300 600
1200 1800

Electric Heater kW/Steps
FTC-E Models Only

Electric Heater Accessories
FTC-E Models Only
See Page 31 for Ordering Details

Power Supply
120 120VAC/1ϕ (*FTU-W only*)
208 208VAC/3ϕ (*FTU-E only*)
277 277VAC/1ϕ
480 480VAC/3ϕ (*FTU--E only*)
Note: 3 phase power supply requires 4th (neutral) wire

Fan Operation
S Heating & Cooling *(Standard operation)*
H Reheat Only *(Plenum air supply)*
B Reheat Only *(Using VVB bypass and dual function diffusers)*

General Accessories/Options
0 None
MOA Multiple inlet or outlet adaptor
IAS Inlet silencer (*N/A on size 300 models*)
IDS Discharge sleeve
IFR Inlet filter
VVB VAV bypass sections (2)
SCR Fan motor speed controller

SUGGESTED SPECIFICATIONS

GENERAL

1. Furnish and install all TROX FTV fan terminals of size and capacities indicated on plans and schedules.
2. Terminals shall be capable of delivering the scheduled air volume to a common discharge duct or plenum of size and location specified on the project floor plan.
3. Terminals with capacities up to 1200 CFM shall be suitable for mounting within a floor cavity of minimum 10 3/4 inch depth. Terminals delivering 1200 to 1800 CFM shall mount within a floor cavity of 12 1/2" depth.
4. Terminals shall be designed to integrate into the flooring system in which they are installed without disturbance of any structural members. Terminals shall not require bridging or other modifications to the structural support system.
5. The terminal units shall be designed, built, and tested (in accordance with ARI Standard 880) as a single unit. No field assembly or modification (except connection of power/control wiring) shall be required.

CONSTRUCTION

1. Terminal casing shall be minimum 20 ga. galvanized steel, lined with • inch dual density insulation complying with UL181 and NFPA90A.
2. Terminal unit fans shall be forward curved type. Wheels and housings shall be constructed of corrosion resistant steel.
3. Integral fan motor shall be variable speed high efficiency (electronically commutated) type. Any necessary start and/or run capacitor shall be furnished as part of the assembly.
4. All electrical components shall be installed in accordance with the National Electrical Code.

REHEAT COIL DETAILS (FTV-W Models)

1. Integral hot water reheat shall be two (2) row, consisting of aluminum fins attached to copper tubes. Coils shall be tested for 300 psi for operation at pressures up to 230 psi.
2. Coil connections shall be 1/2" copper pipe and shall be protected by a supporting steel angle that rigidly attaches to the coil frame. Coil frame shall be minimum 20 gauge steel.
3. Hot water valves and operators shall be furnished by others.
4. Terminal shall allow a single (120VAC/1ϕ or 277VAC/1ϕ) field power connection and control wiring connections (by others).

REHEAT COIL DETAILS (FTV-E Models)

(See page 30 for additional details)

1. Electric reheat coil shall be of the voltage, KW capacity, accessories and number of steps listed on the project schedule.
2. Coil shall be UL listed and (as a minimum) include a contactor per step, fan interlock, primary (automatic) and secondary (manual) reset high limits.
3. Entire assembly shall be listed in accordance with UL1995 and CSA22.2 standards and bear mark attesting such listing.
4. Terminal shall require a single (208VAC/3ϕ, 277VAC/1ϕ or 480VAC/3ϕ) field power connection and appropriate control wiring connections (by others). Three phase power shall include a fourth (neutral) wire.

OPERATION

UNIT OPERATION (FTV-W)

1. Variable speed fan will vary the unit airflow delivery in accordance to the space temperature sensor or other 0 to 10VDC signal (by others). *See page 34 for additional information.*
2. During reheat operation, an integral hot water coil valve (valve by TC contractor) shall be sequenced to reheat the primary air prior to discharge.
3. Integral fan unit shall remain energized at all times unless otherwise specified.

UNIT OPERATION (FTV-E)

1. Variable speed fan will vary the unit airflow delivery in accordance to the space temperature sensor or other 0 to 10VDC signal (by others).
2. During reheat, an integral electric coil shall be energized to reheat the primary air prior to discharge.
3. Integral fan unit shall remain energized at all times unless otherwise specified.

ORDERING INFORMATION

FTV - E / 1800 / 1600 / 15.0 / 2 / 00000 / 480 / MOA

Basic Model
FTV-W or FTV-E

Nominal Size
600 1200 1800

Max. Fan CFM

Electric Heater kW/Steps
FTV-E Models Only

Electric Heater Accesssories
FTV-E Models Only
See Page 31 for Ordering Details

Power Supply

120	120VAC/1ϕ (*FTV-W only*)
208	208VAC/3ϕ (*FTV-E only*)
277	277VAC/1ϕ
480	480VAC/3ϕ (*FTV--E only*)

Note: 3 phase power supply requires 4th (neutral) wire

General Accessories/Options

0	None
MOA	Multiple inlet or outlet adaptor
IAS	Inlet silencer
IDS	Discharge sleeve

SUGGESTED SPECIFICATIONS

GENERAL

1. Furnish and install TROX FTU series fan terminals of size and capacities indicated on plans and schedules.
2. Terminals shall be capable of delivering the scheduled air volume to a common discharge duct as specified on the project floor plan.
3. Terminals up to 1200 CFM shall be suitable for mounting in a floor cavity of minimum 10 3/4 inch depth. Terminals up to 1800 CFM shall be capable of mounting in a 12 3/4" floor cavity.
4. Terminals shall be designed to integrate with the raised floor system within which they are installed. Installation shall be performed without disturbance of structural members of the raised floor platform. Terminals requiring bridging or other modification to support system are not acceptable.
5. Terminal units shall be designed, built, and tested in accordance with ARI Standard 880. No field assembly or modification (except connection of power and control wiring) shall be required.

CONSTRUCTION

1. Terminal casing shall be minimum 20 ga. galvanized steel and lined with 3/4 inch dual density insulation complying with UL181 and NFPA90A requirements.
2. Terminal unit fans shall be forward curved type, wheels and housings constructed of corrosion resistant steel.
3. Integral fan motor shall be single speed (PSC type). Any necessary capacitor shall be included as part of the assembly.
4. Primary damper shall be opposed blade type of all aluminum construction. Blades shall be extruded aluminum airfoil type.
5. All electrical components shall be installed in accordance with the National Electrical Code.

REHEAT COIL DETAILS (FTU-W Models)

1. Integral hot water reheat shall be two (2) row, consisting of aluminum fins attached to copper tubes. Coils shall be tested for 300 psi for operation at pressures up to 230 psi.
2. Coil connections shall be 1/2" copper pipe and shall be protected by a supporting steel angle that rigidly attaches to the coil frame. Coil frame shall be minimum 20 gauge steel.
3. Hot water valves and operators shall be furnished by others.
4. Terminal shall allow a single (120VAC/1ϕ or 277VAC/1ϕ) field power connection and control wiring connections (by others).

REHEAT COIL DETAILS (FTU-E Models)

(See page 30 for additional electric heater details)

1. Electric reheat coil shall be of the voltage, KW capacity, number of steps and incorporated accessories listed on the project schedule.
2. Coil shall be UL listed and (as a minimum) include a contactor per step, fan interlock, primary (automatic) and secondary (manual) reset high limits.
3. Entire assembly listed in accordance with UL1995 and CSA22.2 standards and bear mark attesting such listing.
4. Terminal shall require a single (208VAC/3ϕ, 277VAC/1ϕ or 480VAC/3ϕ) field power connection and appropriate control wiring connections (by others).Three phase wiring shall include a fourth (neutral) wire.

OPERATION

COOLING MODE

1. Integral fan shall operate on a signal (by others) indicating a demand for maximum cooling. Airflow delivery shall remain constant while the fan is running.
2. An automatically controlled damper shall be integrated into the terminal, allowing VAV (non-fan assisted) delivery of cool air from the floor cavity to the terminal's discharge duct during periods of normal cooling demand. Damper shall be modulated by a 2 to 10VDC signal (by TC contractor). Damper shall be closed upon activation of the terminal unit fan and remain so at all times the fan is energized.

REHEAT OPERATION (FTU-W Models)

1. Integral fan shall operate on a signal (by others) indicating a demand for heat. Airflow delivery shall remain constant while the fan is energized.
2. An integral hot water coil valve (valve by TC contractor) shall be sequenced to reheat air from the plenum prior to discharge.

REHEAT OPERATION (FTU-E Models)

1. Integral fan shall operate on a signal (by others) indicating a demand for maximum cooling. Airflow delivery shall remain constant while the fan is running.
2. An integral electric reheat coil shall be sequenced to reheat conditioned air from the plenum prior to discharge.

ORDERING INFORMATION

FTU - E / 1800 / 15.0 / 2 / 00002 / 480 / SCR

Basic Model
FTU-W or FTU-E

Nominal Size
600 1200 1800

Electric Heater kW/Steps
FTU-E Models Only

Electric Heater Accessories
FTU-E Models Only
See Page 31 for Ordering Details

Power Supply
120 120VAC/1ϕ (*FTU-W only*)
208 208VAC/3ϕ (*FTU-E only*)
277 277VAC/1ϕ
480 480VAC/3ϕ (*FTU--E only*)
Note: 3 phase power supply requires 4th (neutral) wire

General Accessories/Options
0 None
MIA Multiple inlet adaptor
IAS Inlet silencer
IDS Discharge sleeve
VSM Variable Speed Motor
SCR Speed controller (fan only) *(N/A with VSM option)*

SUGGESTED SPECIFICATIONS

GENERAL

1. Furnish and install all TROX FTG series fan terminals of size and capacities indicated on plans and schedules.
2. Terminals shall be capable of delivering the scheduled air volume to a common discharge duct as specified on the project floor plan.
3. Terminals up to 1200 CFM shall be suitable for mounting in a floor cavity of minimum 10 3/4 inch depth. Terminals up to 1800 CFM shall be capable of mounting in a 12 3/4" floor cavity.
4. Terminals shall be designed to integrate with the raised floor system within which they are installed. Installation shall be performed without disturbance of structural members of the raised floor platform. Terminals requiring bridging or other modification to support system are not acceptable.
5. Terminal units shall be designed, built, and tested in accordance with ARI Standard 880. No field assembly or modification (except connection of power and control wiring) shall be required.

CONSTRUCTION

1. Terminal casing shall be minimum 20 ga. galvanized steel and lined with 3/4 inch dual density insulation complying with UL181 and NFPA90A requirements.
2. Terminal unit fans shall be forward curved type, wheels and housings constructed of corrosion resistant steel.
3. Integral fan motor shall be single speed (PSC type). Any necessary capacitor shall be included as part of the assembly.
4. Primary and inlet dampers shall be opposed blade type of all aluminum construction. Blades shall be extruded aluminum airfoil type.
5. All electrical components shall be installed in accordance with the National Electrical Code.

REHEAT COIL DETAILS (FTG-W Models)

1. Integral hot water reheat shall be two (2) row, consisting of aluminum fins attached to copper tubes. Coils shall be tested for 300 psi for operation at pressures up to 230 psi.
2. Coil connections shall be 1/2" copper pipe and shall be protected by a supporting steel angle that rigidly attaches to the coil frame. Coil frame shall be minimum 20 gauge steel.
3. Hot water valves and operators shall be furnished by others.
4. Terminal shall allow a single (120VAC/1ϕ or 277VAC/1ϕ) field power connection and control wiring connections (by others).

REHEAT COIL DETAILS (FTG-E Models)

(See page 30 for additional electric heater details)

1. Electric reheat coil shall be of the voltage, KW capacity, number of steps and incorporated accessories listed on the project schedule.
2. Coil shall be UL listed and (as a minimum) include a contactor per step, fan interlock, primary (automatic) and secondary (manual) reset high limits.
3. Entire assembly listed in accordance with UL1995 and CSA22.2 standards and bear mark attesting such listing.
4. Terminal shall require a single (208VAC/3ϕ, 277VAC/1ϕ or 480VAC/3ϕ) field power connection control wiring connections (by others). Three phase wiring shall include a fourth (neutral) wire.

OPERATION

COOLING MODE

1. Integral fan shall operate on a signal (by others) indicating a demand for maximum cooling. Airflow delivery shall remain constant while the fan is running.
2. An automatically controlled damper shall be integrated into the terminal, allowing VAV (non-fan assisted) delivery of cool air from the floor cavity to the terminal's discharge duct during periods of normal cooling demand. Damper shall be modulated by a 2 to 10VDC signal (by TC contractor). Damper shall be closed upon activation of the terminal unit fan and remain so at all times the fan is energized.
3. Integral inlet damper shall remain open to the plenum during cooling operation.

REHEAT OPERATION (FTG-W Models)

1. Integral fan shall operate on a signal (by others) demanding heat.
2. Upon such demand, the integral VAV damper shall close and the inlet damper shall be positioned for maximum recirculated air.
3. An integral hot water coil valve (valve by TC contractor) shall be sequenced to reheat the recirculated room air prior to discharge.

REHEAT OPERATION (FTG-E Models)

1. Integral fan shall operate on a signal (by others) demanding heat.
2. Upon such demand, the integral VAV damper shall close and the inlet damper shall be positioned for maximum recirculated air.
3. The integral electric reheat coil shall be energized to reheat the recirculated room air prior to discharge.

ORDERING INFORMATION

FTG - E / 1800 / 15.0 / 2 / 000016 / 480 / SCR

Basic Model
FTG-W or FTG-E

Nominal Size
600 1200 1800

Electric Heater kW/Steps
FTG-E Models Only

Electric Heater Accessories
FTG-E Models Only
See Page 31 for Details

Power Supply

120 120VAC/1ϕ (*FTG-W only*)
208 208VAC/3ϕ (*FTG-E only*)
277 277VAC/1ϕ
480 480VAC/3ϕ (*FTG--E only*)

Note: 3 phase power supply requires 4th (neutral) wire

General Accessories/Options

0 None
MIA Multiple inlet adaptor
IAS Inlet silencer
IDS Discharge sleeve
IFR Inlet filter
VSM Variable Speed Motor
SCR Fan Speed Controller
(N/A with VSM motor option)

SUGGESTED SPECIFICATIONS

GENERAL

1. Furnish and install all TROX FTR series fan terminals of size and capacities indicated on plans and schedules.
2. Terminals shall be capable of delivering the scheduled air volume to a common discharge duct as specified on the project floor plan.
3. Terminals up to 1200 CFM shall be suitable for mounting in a floor cavity of minimum 10 3/4 inch depth. Terminals up to 1800 CFM shall be capable of mounting in a 12 3/4" floor cavity.
4. Terminals shall be designed to integrate with the raised floor system within which they are installed. Installation shall be performed without disturbance of structural members of the raised floor platform. Terminals requiring bridging or other modification to support system are not acceptable.
5. Terminal units shall be designed, built, and tested in accordance with ARI Standard 880. No field assembly or modification (except connection of power and control wiring) shall be required.

CONSTRUCTION

1. Terminal casing shall be minimum 20 ga. galvanized steel and lined with • inch dual density insulation complying with UL181 and NFPA90A requirements.
2. Terminal unit fans shall be forward curved type, wheels and housings constructed of corrosion resistant steel.
3. Integral fan motor shall be single speed (PSC type). Any necessary capacitor shall be included as part of the assembly.
4. Inlet damper shall be opposed blade type of all aluminum construction. Blades shall be extruded aluminum airfoil type.
5. All electrical components shall be installed in accordance with the National Electrical Code.

REHEAT COIL DETAILS (FTR-W Models)

1. Integral hot water reheat shall be two (2) row, consisting of aluminum fins attached to copper tubes. Coils shall be tested for 300 psi for operation at pressures up to 230 psi.
2. Coil connections shall be 1/2" copper pipe and shall be protected by a supporting steel angle that rigidly attaches to the coil frame. Coil frame shall be minimum 20 gauge steel.
3. Hot water valves and operators shall be furnished by others.
4. Terminal shall allow a single (120VAC/1ϕ or 277VAC/1ϕ field power connection and control wiring connections (by others).

REHEAT COIL DETAILS (FTR-E Models)

(See page 30 for additional electric heater details)

1. Electric reheat coil shall be of the voltage, KW capacity, number of steps and incorporated accessories listed on the project schedule.
2. Coil shall be UL listed and (as a minimum) include a contactor per step, fan interlock, primary (automatic) and secondary (manual) reset high limits.
3. Entire assembly listed in accordance with UL1995 and CSA22.2 standards and bear mark attesting such listing.
4. Terminal shall require a single (208VAC/3ϕ, 277VAC/1ϕ or 480VAC/3ϕ) field power connection and appropriate control wiring connections (by others). Three phase wiring shall include a fourth (neutral) wire.

OPERATION

COOLING MODE

1. Integral fan shall operate continously, delivering the specified maximum cooling airflow.
2. An automatically controlled damper shall be integrated into the fan inlet side of the terminal. This damper shall be modulated by a 2 to 10VDC signal (by TC contractor) to vary the inlet air mixture of conditioned air (from the floor plenum) and recirculated (room) air (from an inlet duct, by others).

REHEAT OPERATION

1. Integral fan shall operate on a signal (by others) indicating a demand for heat, delivering the specified maximum heating CFM. Inlet damper shall remain in its minimum position, enabling the delivery of maximum recirculated air through the inlet duct (by others).
2. An integral hot water (*FTR-W models)* or electric (*FTR-E models*) reheat coil shall be sequenced to reheat recirculated (room) air prior to discharge.

Note: Specification of separate cooling and heating maximum CFM's is only possible when VSM motor option is chosen.

ORDERING INFORMATION

FTR - E / 1200 / 10.0 / 1 / 00026 / 480 / VSM

Basic Model
FTR-W or FTR-E

Nominal Size
300 600 1200 1800

Electric Heater kW/Steps
FTR-E Models Only

Electric Heater Accessories
See Page 31 for Ordering Details

Power Supply

120	120VAC/1ϕ (*FTR-W only*)
208	208VAC/3ϕ (*FTR-E only*)
277	277VAC/1ϕ
480	480VAC/3ϕ (*FTR--E only*)

Note: 3 phase power supply requires 4th (neutral) wire

Accessories/Options

0	None
MOA	Multiple inlet or outlet adaptor
IAS	Inlet silencer (*N/A for size 300 models)*
IDS	Discharge sleeve
IFR	Inlet Filter
VSM	Variable speed motor
SCR	Fan speed controller *(N/A with VSM option)*

SUGGESTED SPECIFICATIONS

GENERAL

1. Furnish and install TROX FTD series fan terminals of size and capacities indicated on plans and schedules.
2. Terminals shall be capable of delivering the scheduled air volume to a common discharge duct as specified on the project floor plan.
3. Terminals up to 1200 CFM shall be suitable for mounting in a floor cavity of minimum 10 3/4 inch depth. Terminals up to 1800 CFM shall be capable of mounting in a 12 3/4" floor cavity.
4. Terminals shall be designed to integrate with the raised floor system within which they are installed. Installation shall be performed without disturbance of structural members of the raised floor platform. Terminals requiring bridging or other modification to support system are not acceptable.
5. Terminal units shall be designed, built, and tested in accordance with ARI Standard 880. No field assembly or modification (except connection of power and control wiring) shall be required.

CONSTRUCTION

1. Terminal casing shall be minimum 20 ga. galvanized steel and lined with • inch dual density insulation complying with UL181 and NFPA90A requirements.
2. Terminal unit fans shall be forward curved type, wheels and housings constructed of corrosion resistant steel.
3. Integral fan motor shall be single speed (PSC type). Any necessary capacitor shall be included as part of the assembly.
4. Primary air damper shall be opposed blade type of all aluminum construction. Blades shall be extruded aluminum airfoil type.

. Primary damper shall be fitted with a pressure independent flow controller *(specify by TROX or others)* complete with maximum and minimum primary airflow limits.

5. All electrical components shall be installed in accordance with the National Electrical Code.

REHEAT COIL DETAILS (FTD-W Models)

1. Integral hot water reheat shall be two (2) row, consisting of aluminum fins attached to copper tubes. Coils shall be tested for 300 psi for operation at pressures up to 230 psi.
2. Coil connections shall be 1/2" copper pipe and protected by a supporting steel angle that rigidly attaches to the (20 ga.) coil frame.
3. Hot water valves and operators shall be furnished by others.
4. Terminal shall allow a single (120VAC/1ϕ or 277VAC/1ϕ field power connection and control wiring connections (by others).

REHEAT COIL DETAILS (FTD-E Models)

(See page 30 for electric heater details)

1. Electric reheat coil shall be of the voltage, KW capacity, number of steps and incorporated accessories listed on the project schedule.
2. Coil shall be UL listed and (as a minimum) include a contactor per step, fan interlock, primary (automatic) and secondary (manual) reset high limits.
3. Entire assembly listed in accordance with UL1995 and CSA22.2 standards and bear mark attesting such listing.
4. Terminal shall require a single (208VAC/3ϕ, 277VAC/1ϕ or 480VAC/3ϕ) field power connection and appropriate control wiring connections (by others). Three phase wiring shall include a fourth (neutral) wire.

OPERATION

COOLING MODE

1. Integral fan shall operate continously, delivering a specified (constant) volume of airflow to the space.
2. The primary air damper shall modulate (signal by others) the primary air volume delivery to the integral fan. The fan shall in turn induce air from an inlet duct (by S/M contractor) to make up for any primary air reduction, thereby resulting in a constant volume but variable temperature delivery of air to the space.

REHEAT OPERATION

1. Primary air damper shall modulate to its minimum airflow position. Integral fan shall continue to deliver a constant volume mixture of room and (minimum volume) conditioned air to the space.
2. Upon a further drop in space temperature, an integral hot water (*FTR-D models)* or electric (*FTD-E models*) reheat coil shall be sequenced to reheat the primary/recirculated (room) air mixture prior to its discharge.

ORDERING INFORMATION

FTD - E / 1200 / 1000 / 600 / 10.0 / 1 / 00003 / 480 / VSM

Basic Model
FTD-W or FTD-E

Nominal Size
600 1200 1800

Fan & Max. Primary CFM

Minimum Primary CFM

Electric Heater kW/Steps
FTD-E Models Only

Electric Heater Accessories
FTD-E Models Only
See Page 31 for Details

General Accessories/Options

0	None
MOA	Multiple outlet adaptor
IAS	Inlet silencer
IDS	Discharge sleeve
VSM	Variable speed motor
SCR	Fan speed controller *(N/A with VSM option)*

Power Supply

120	120VAC/1ϕ (*FTD-W only*)
208	208VAC/3ϕ (*FTD-E only*)
277	277VAC/1ϕ
480	480VAC/3ϕ (*FTD--E only*)

Note: 3 phase power supply requires 4th (neutral) wire

Trox International: Companies and Agencies

In North America

Trox USA
926 Curie Drive
Alpharetta, Georgia 30005-8369
Telephone: (770) 569-1433
Telefax: (770) 569-1435
e-mail: tb11@troxusa.com

Head Office & Research Centers

Gebrüder Trox GmbH
Postfach 10 12 63
D-47504 Neukirchen-Vluyn
Telephone 49 28 45/2 02-0
Telefax 49 28 45/2 02-2 65
www.troxtechnik.com
E-mail: trox@troxtechnik.de

Australia
Trox (Australia) Pty Ltd.

Austria
Trox Austria GmbH

Belgium
S.A. Trox Belgium N.V.

Brazil
Trox do Brasil Ltda.

China
Trox Air Conditioning Components (Suzhou) Co., Ltd.

Croatia
Trox Austria GmbH

Czech Republic
Trox Austria GmbH

Denmark
Trox Danmark A/S

Dubai
Trox (U.K.) Ltd.

France
Trox France Sarl

Germany
Hesco Deutschland GmbH
FSL FassadenSystemLüftung GmbH & Co. KG

Great Britain
Trox (U.K.) Ltd.

Hong Kong
Trox Hong Kong Ltd.

Hungary
Trox Austria GmbH

Italy
Trox Italiana S.p.A.

Malaysia
Trox (Malaysia) Sdn. Bhd.

Poland
Trox Austria GmbH

South Africa
Trox (South Africa) (Pty) Ltd.

Spain
Trox Española, S.A.

Switzerland
Trox Hesco (Schweiz) AG

Yugoslavia
Trox Austria GmbH

Overseas Agencies

Abu Dhabi
Argentina
Bosnia-Herz.
Bulgaria
Chile
Cyprus
Egypt
Finland
Greece
Iceland
India
Indonesia
Iran
Ireland
Israel
Jordan
Korea
Latvia
Lebanon
Lithuania
Netherlands
New Zealand
Norway
Oman
Pakistan
Philippines
Portugal
Romania
Russia
Saudi Arabia
Slovakia
Slovenia
Sweden
Taiwan
Thailand
Turkey
Ukraine
Uruguay
Vietnam
Zimbabwe