TRANE®

RT-DS-9
May 1998
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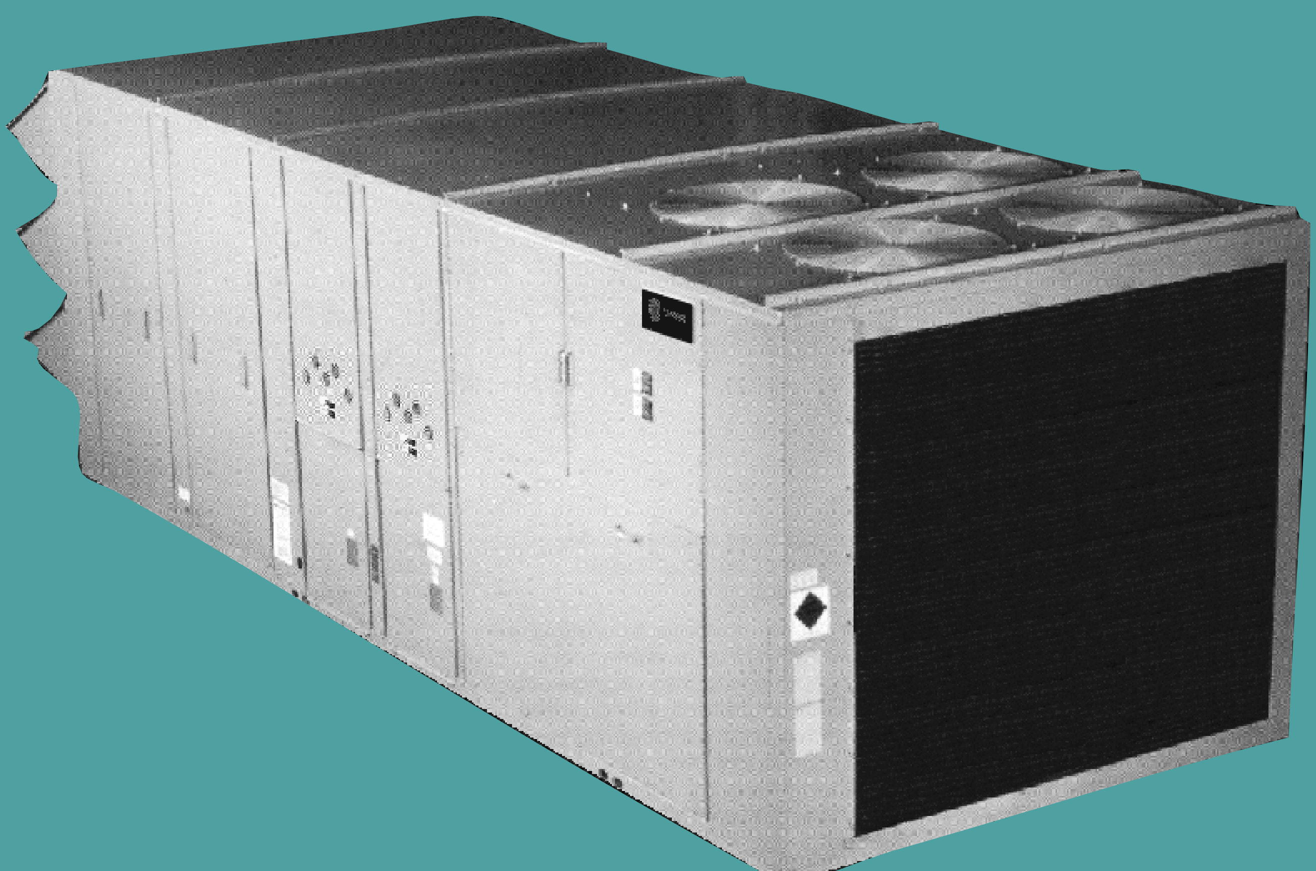
Packaged Rooftop Air Conditioners

27 1/2 to 50 Ton - 60 Hz Voyager Commercial

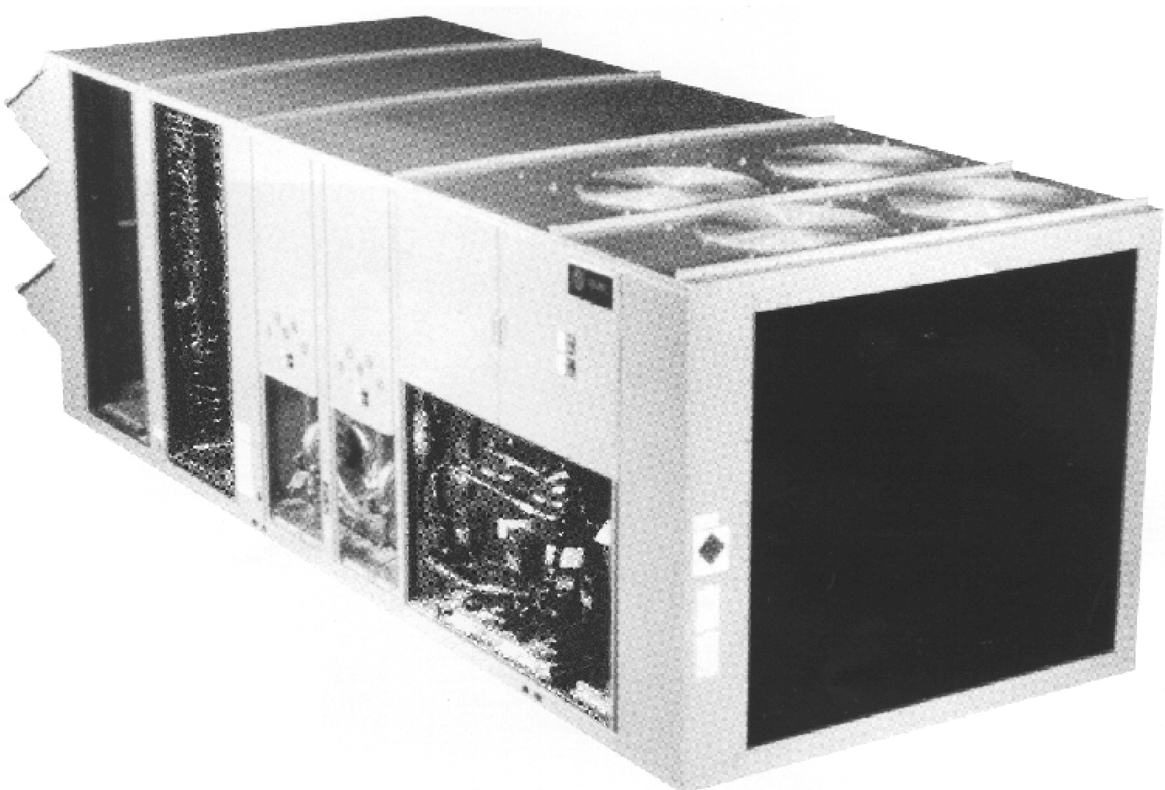
RT-DS-9



TRANE®

Features and Benefits

Simply THE BEST VALUE℠



Over the years the Voyager™ product line has developed into the most complete line of commercial packaged units available. We were first with the Micro when we developed microelectronic unit controls and we move ahead again with Voyager Commercial products.

The Voyager Commercial line of package units begins with $27^{1}/_{2}$ and includes 30, 35, 40, and 50 ton units.

Five new sizes meet the needs of the changing commercial rooftop marketplace.

Our customers demand units that will have exceptional reliability, meet stringent performance requirements, and be competitively priced. These same requirements drove the design of the original light commercial Voyager and have been carried forward into Voyager Commercial.

Voyager Commercial's features and benefits are comprised of cutting edge technologies like the reliable 3-D® Scroll compressor, Trane engineered microprocessor controls, computer-aided run testing, and Integrated Comfort™ Systems. So, whether you're the contractor, the engineer, or the owner you can be certain that when you've chosen Voyager Commercial, you've chosen…*Simply the best value!*

Features and Benefits

Standard Features
- Factory installed and commissioned microelectronic controls
- Trane 3-D™ Scroll Compressors
- Dedicated downflow or horizontal configuration
- CV or VAV control
- FROSTAT™ coil frost protection on all units
- Supply air overpressurization protection on VAV units
- Supply airflow proving
- Emergency stop input
- Compressor lead-lag
- Occupied-Unoccupied switching
- Timed override activation
- FC supply fans
- UL and CSA listing on standard options
- Two inch standard efficiency filters
- Finish exceeds salt spray requirements of ASTM B117
- Sloped condensate drain pans

Optional Features
- Electric heat
- Natural gas heat
- LP gas heat (kit only)
- Power Exhaust
- Barometric Relief
- High Efficiency 2" Throwaway Filters
- High Efficiency 4" Throwaway Filters
- High Efficiency supply fan motors
- Manual fresh air damper
- Economizer with dry bulb control
- Economizer with reference enthalpy control
- Economizer with differential (comparative) enthalpy control
- Inlet guide vanes on VAV units
- Variable frequency drives on VAV units (with or without bypass)
- Service Valves
- Through-the-base electrical provision
- Factory mounted disconnect with external handle (non-fused)
- Factory powered 15A GFI convenience outlet
- Field powered 15A GFI convenience outlet
- Integrated Comfort™ System Control Option
- Ventilation Override
- Hinged Service Access
- Factory installed Condenser Coil Guards

Contents

Features and Benefits

• Trane 3-D® Scroll Compressor

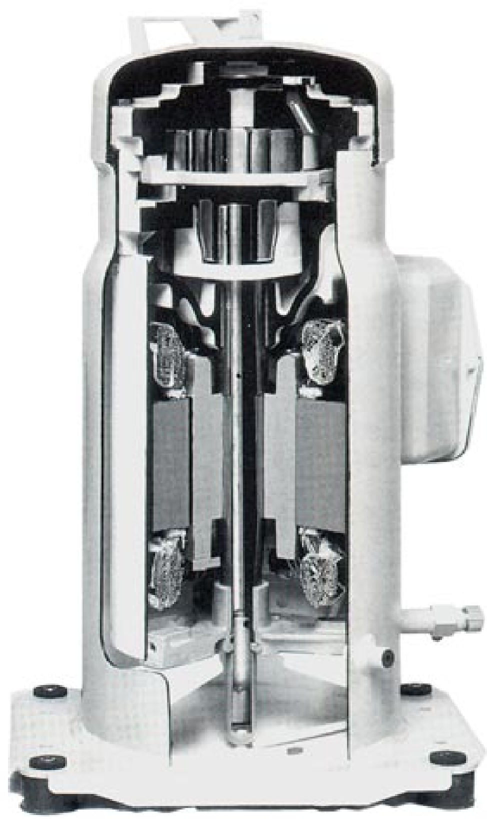
Simple Design with 70% Fewer Parts
Fewer parts than an equal capacity reciprocating compressor means significant reliability and efficiency benefits. The single orbiting scroll eliminates the need for pistons, connecting rods, wrist pins and valves. Fewer parts lead to increased reliability. Fewer moving parts, less rotating mass and less internal friction means greater efficiency than reciprocating compressors.

The Trane 3-D Scroll provides important reliability and efficiency benefits. The 3-D Scroll allows the orbiting scrolls to touch in all three dimensions, forming a completely enclosed compression chamber which leads to increased efficiency. In addition, the orbiting scrolls only touch with enough force to create a seal; there is no wear between the scroll plates. The fixed and orbiting scrolls are made of high strength cast iron which results in less thermal distortion, less leakage, and higher efficiencies. The most outstanding feature of the 3-D Scroll compressor is that slugging will not cause failure. In a reciprocating compressor, however, the liquid or dirt can cause serious damage.

Low Torque Variation
The 3-D Scroll compressor has a very smooth compression cycle with torque variations that are only 30 percent of that produced by a reciprocating compressor. This means the scroll compressor imposes very little stress on the motor for greater reliability. Low torque variation means reduced noise and vibration.

Suction Gas Cooled Motor
Compressor motor efficiency and reliability is further optimized with this design. Cool suction gas keeps the motor cooler for longer life and better efficiency.

Proven Design Through Testing and Research
With over twenty years of development and testing, Trane 3-D Scroll compressors have undergone more than 400,000 hours of laboratory testing and field operation. This work combined with over 25 patents makes Trane the worldwide leader in air conditioning scroll compressor technology.



One of two matched scroll plates — the distinguishing feature of the scroll compressor.

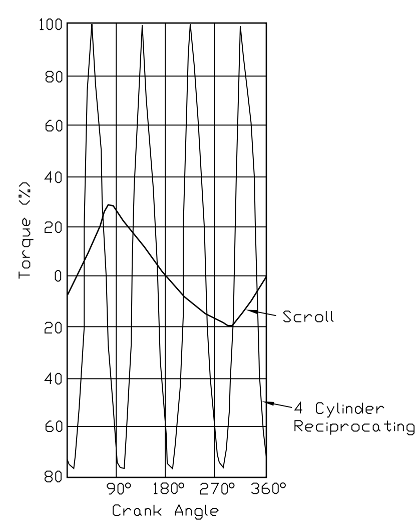
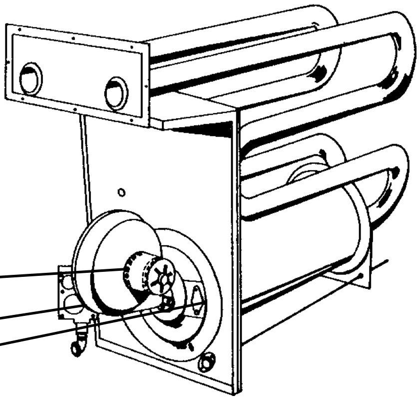


Chart illustrates low torque variation of 3-D Scroll compressors reciprocating compressor.

Features and Benefits

Quality and Reliability



Drum and Tube Heat Exchanger

Micro Controls

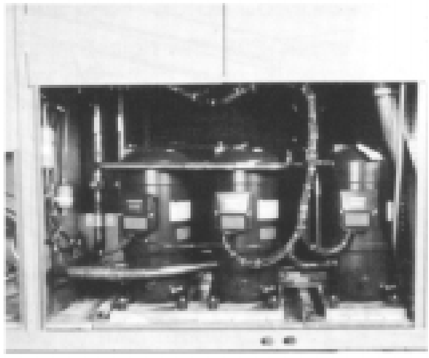
- For over 10 years Trane has been working with micro-processor controls in the applied equipment markets. These designs have provided the technology that has been applied to the Voyager units.
- The Micro provides unit control for heating, cooling and ventilating utilizing input from sensors that measure outdoor and indoor temperature.
- The Micro improves quality and reliability through the use of time-tested micro-processor controls and logic.
  The Micro:
  — prevents the unit from short cycling, considerably improving compressor life.
  — ensures that the compressor will run for a specific amount of time which allows oil to return for better lubrication, enhancing the reliability of the commercial compressor.
- The Voyager with the Micro reduces the number of components required to operate the unit, thereby reducing possibilities for component failure.

Drum and Tube Heat Exchanger

- The drum and tube heat exchanger is designed for increased efficiency and reliability and has utilized improved technology incorporated in the large roof top commercial units for almost 20 years.

  The heat exchanger is manufactured using aluminized steel with stainless steel components for maximum durability. The requirement for cycle testing of heat exchangers is 10,000 cycles by ANSI Z21.47. This is the standard required by both UL and AGA for cycle test requirements. Trane requires the design to be tested to 2 $^{1}/_{2}$ times this current standard. The drum and tube design has been tested and passed over 150,000 cycles which is over 15 times the current ANSI cycling requirements.
- The negative pressure gas valve will not allow gas flow unless the combustion blower is operating. This is one of our unique safety features.
- The forced combustion blower supplies pre-mixed fuel through a single stainless steel burner screen into a sealed drum where ignition takes place. It is more reliable to operate and maintain than a multiple burner system.
- The hot surface ignitor is a gas ignition device which doubles as a safety device utilizing a continuous test to prove the flame. The design is cycle tested at the factory for quality and reliability.
- All the gas/electric rooftops exceed all California seasonal efficiency requirements. They also perform better than required to meet the California NOx emission requirements.

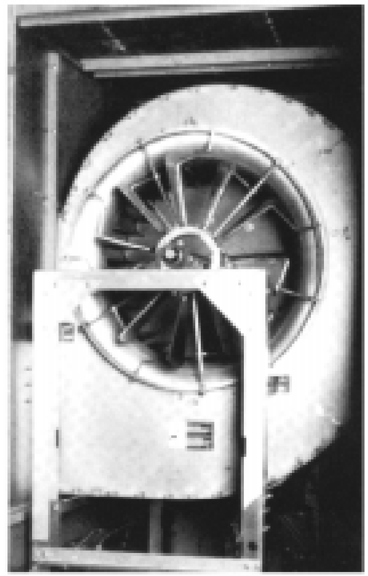
Features and Benefits



Excellent Part-Load Efficiency

- The Scroll compressor's unique design allows it to be applied in a passive parallel manifolded piping scheme, something that a "recip" just doesn't do very well.

  When the unit begins stage back at part load it still has the full area and circuitry of its evaporator and condenser coils available to transfer heat. In simple terms this means superior part-load efficiencies (IPLV) and lower unit operating costs.



FC Fans with Inlet Guide Vanes

- Trane's forward-curved fans with inlet guide vanes pre-rotate the air in the direction of the fan wheel, decreasing static pressure and horsepower, essentially unloading the fan wheel. The unloading characteristics of a Trane FC fan with inlet guide vanes result in superior part load performance.

Rigorous Testing

- All of Voyager's designs were rigorously rain tested at the factory to ensure water integrity.
- Actual shipping tests are performed to determine packaging requirements. Units are test shipped around the country. Factory shake and drop tested as part of the package design process to help assure that the unit will arrive at your job site in top condition.
- Rigging tests include lifting a unit into the air and letting it drop one foot, assuring that the lifting lugs and rails hold up under stress.
- We perform a 100% coil leak test at the factory. The evaporator and condenser coils are leak tested at 200 psig and pressure tested to 450 psig.
- All parts are inspected at the point of final assembly. Sub-standard parts are identified and rejected immediately.
- Every unit receives a 100% unit run test before leaving the production line to make sure it lives up to rigorous Trane requirements.

Ease of Installation

Contractors look for lower installation (jobsite) costs. Voyager's conversionless units provide many time and money saving features.

Conversionless Units

- The dedicated design units (either downflow or horizontal) require no panel removal or alteration time to convert in the field — a major cost savings during installation.

Improved Airflow

- U-shaped airflow allows for improved static capabilities. The need for high static motor conversion is minimized and time isn't spent changing to high static oversized motors.

Single Point Power

A single electrical connection powers the unit.

Micro™

- The function of the Micro replaces the need for field installed anti-shortcycle timer and time delay relays. The Micro ensures that these controls are integral to the unit. The contractor no longer has to purchase these controls as options and pay to install them.
- The wiring of the low voltage connections to the unit and the zone sensors is as easy as 1-1, 2-2, and 3-3. This simplified system makes it easier for the installer to wire.

Features and Benefits

Serviceability

Today's owners are more conscious of the cost of service and maintenance. Voyager was designed with input from service contractors. Their information helped us design a unit that would get the serviceman off the job quicker and save the owner money. Here is why Voyager can save money in service.

Voyager's Simpler Design
The Voyager design uses fewer parts than previous units. Since it is simpler in design, it is easier to diagnose.

Micro

- The Micro requires no special tools to run the Voyager unit through its paces. Simply place a jumper between Test 1 and Test 2 terminals on the Low Voltage Terminal Board and the unit will walk through its operational steps automatically.
  — The unit automatically returns control to the zone sensor after stepping through the test mode a single time, even if the jumper is left on the unit.
- As long as the unit has power and the "system on" LED is lit, the Micro is operational. The light indicates that the Micro is functioning properly.
- The Micro features expanded diagnostic capabilities when utilized with Trane's Integrated Comfort™ Systems.
- Some Zone Sensor options have central control panel lights which indicate the mode the unit is in and possible diagnostic information (dirty filters for example).

Easy Access Low Voltage Terminal Board
Voyager's Low Voltage Terminal Board is external to the electrical control cabinet. It is extremely easy to locate and attach the thermostat wire. This is another cost and time-saving installation feature.

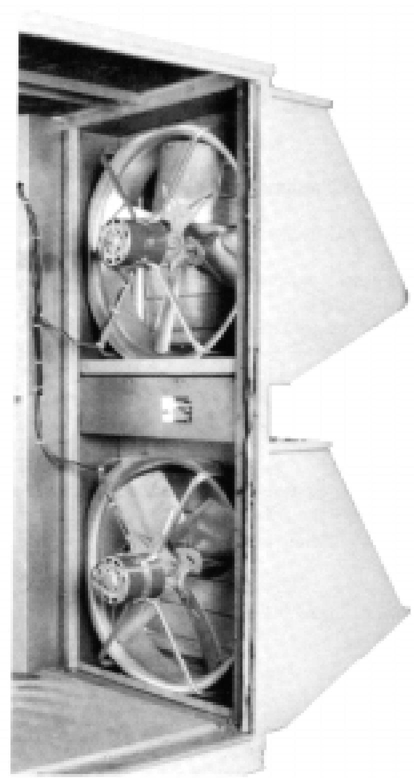
Value

Low Ambient Cooling
All Voyager Commercial units have cooling capabilities down to 0 F as standard.

Power Exhaust Option
Provides exhaust of the return air when using an economizer to maintain proper building pressurization. Great for relieving most building overpressurization problems.

Micro Benefits

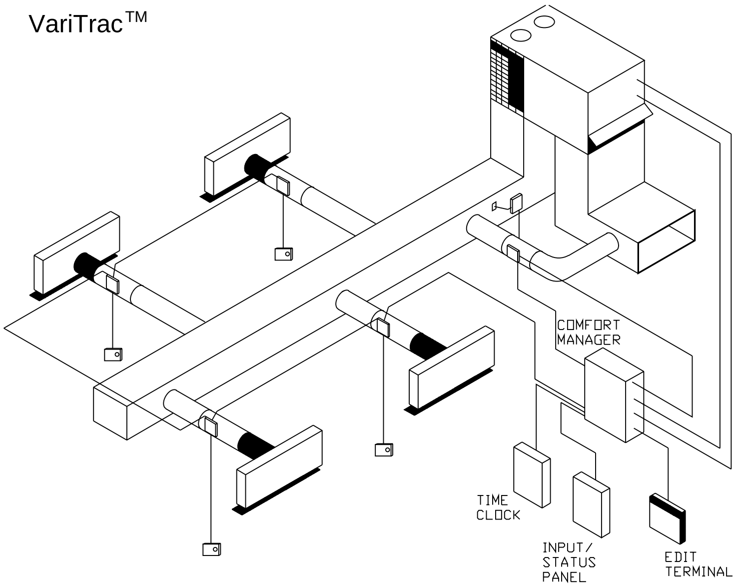
- The Micro in the Voyager units has built-in anti-short-cycle timer, time delay relay and minimum "on" time controls. These controls are functions of the Micro and are factory tested to assure proper operation.
- The Micro softens electrical "spikes" by staging on fans, compressors and heaters.
- Intelligent Fallback is a benefit to the building occupant. If a component goes astray, the unit will continue to operate at predetermined temperature setpoint.
- Intelligent Anticipation is a standard feature of the Micro. It functions constantly as the Micro and zone sensor work together in harmony to provide tighter comfort control than conventional electro-mechanical thermostats.



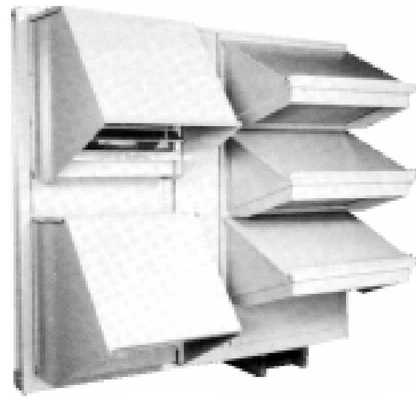
Horizontal Discharge with Power Exhaust Option

Features and Benefits

VariTrac™



VariTrac™
Trane's changeover VAV System for light commercial applications is also available. Coupled with Voyager Commercial, it provides the latest in technological advances for comfort management systems and can allow thermostat control in every zone served by VariTrac™.



Downflow and Horizontal Economizers
The economizers come with three control options dry bulb, enthalpy and differential enthalpy. (Photo above shows the three fresh air hoods on the Horizontal Discharge Configuration).

Trane Communication Interface or TCI is available factory or field installed. This module when applied with the Micro easily interfaces with Trane's Integrated Comfort™ System.

Trane factory built roof curbs are available for all units.

One of Our Finest Assets:
Trane Commercial Sales Engineers are a support group that can assist you with:
— Product
— Application
— Service
— Training
— Special Applications
— Specifications
— Computer Programs and more

TRANE®

Model Number Description

YC	D	480	A	4	H	A	1	A	4	F	D	1	A
12	3	456	7	8	9	10	11	12	13	14	15	16	17

Digit 1, 2 — Unit Function
TC = DX Cooling, No Heat
TE = DX Cooling, Electric Heat
YC = DX Cooling, Natural Gas Heat

Digit 3 — Unit Airflow Design
D = Downflow Configuration
H = Horizontal Configuration

Digit 4, 5, 6 — Nominal Cooling Capacity
330 = 27.5 Tons
360 = 30 Tons
420 = 35 Tons
480 = 40 Tons
600 = 50 Tons

Digit 7 — Major Development Sequence
A = First

Digit 8 — Power Supply (See Note 1)
E = 208/60/3
F = 230/60/3
4 = 460/60/3
5 = 575/60/3

Digit 9 — Heating Capacity (See Note 4)
0 = No Heat (TC only)
L = Low Heat (YC only)
H = High Heat (YC only)
Note: When second digit is "E" for Electric Heat, the following values apply in the ninth digit.
A = 36 KW
B = 54 KW
C = 72 KW
D = 90 KW
E = 108 KW

Digit 10 Design Sequence
A = First

Digit 11 — Exhaust
0 = None
1 = Barometric Relief
(Available w/Economizer only)
2 = Power Exhaust Fan
(Available w/Economizer only)

Digit 12 — Filter
A = Standard 2" Throwaway Filters
B = High Efficiency 2" Throwaway Filters
C = High Efficiency 4" Throwaway Filters

Digit 13 — Supply Fan Motor, HP
1 = 7.5 Hp Std. Eff.
2 = 10 Hp Std. Eff.
3 = 15 Hp Std. Eff.
4 = 20 Hp Std. Eff.
5 = 7.5 Hp Hi. Eff.
6 = 10 Hp Hi. Eff.
7 = 15 Hp Hi. Eff.
8 = 20 Hp Hi. Eff.

Digit 14 — Supply Air Fan Drive Selections (See Note 3)
A = 550 RPM
B = 600 RPM
C = 650 RPM
D = 700 RPM
E = 750 RPM
F = 790 RPM
G = 800 RPM
H = 500 RPM
J = 525 RPM
K = 575 RPM
L = 625 RPM
M = 675 RPM
N = 725 RPM

Digit 15 — Fresh Air Selection
A = No Fresh Air
B = 0-25% Manual Damper
C = 0-100% Economizer, Dry Bulb Control
D = 0-100% Economizer, Reference Enthalpy Control
E = 0-100% Economizer, Differential Enthalpy Control
F = "C" Option and Low Leak Fresh Air Damper
G = "D" Option and Low Leak Fresh Air Damper
H = "E" Option and Low Leak Fresh Air Damper

Digit 16 — System Control
1 = Constant Volume
2 = VAV Supply Air Temperature Control w/o Inlet Guide Vanes
3 = VAV Supply Air Temperature Control w/Inlet Guide Vanes
4 = VAV Supply Air Temperature Control w/Variable Frequency Drive w/o Bypass
5 = VAV Supply Air Temperature Control w/Variable Frequency Drive and Bypass
Note: Zone sensors are not included with option and must be ordered as a separate accessory.

Digit 17+ — Miscellaneous
A = Service Valves (See Note 2)
B = Through the Base Electrical Provision
C = Non-Fused Disconnect Switch with External Handle
D = Factory-Powered 15A GFI Convenience Outlet and Non-Fused Disconnect Switch with External Handle
E = Field-Powered 15A GFI Convenience Outlet
F = ICS Control Option — Trane Communication Interface, Supply Air Sensing and Clogged Filter Switch
G = Ventilation Override
H = Hinged Service Access
J = Condenser Coil Guards

Note:
1. All voltages are across the line starting only.
2. Option includes Liquid, Discharge, Suction Valves.
3. Supply air fan drives A thru G are used with 27.5-35 ton units only and drives H thru N are used with 40 & 50 ton units only.
4. Electric Heat KW ratings are based upon voltage ratings of 240/480/600 V. Voltage offerings are as follows (see table 21-2 for additional information):

		KW				
Tons	Voltage	36	54	72	90	108
27.5 to 35	240	x	x			
	480	x	x	x	x	
	600		x	x	x	
40 and 50	240		x			
	480		x	x	x	x
	600		x	x	x	x

Table 10-1 — General Data — 27.5-30 Tons

	27.5 Ton		30 Ton	
Cooling Performance[1]				
Nominal Gross Capacity	330,000		360,000	
Natural Gas Heat[2]	Low	High	Low	High
Heating Input (BTUH)	350,000	600,000	350,000	600,000
First Stage	250,000	425,000	250,000	425,000
Heating Output (BTUH)	283,500	486,000	283,500	486,000
First Stage	202,500	344,500	202,500	344,500
Steady State Efficiency (%)[3]	81.00	81.00	81.00	81.00
No. Burners	1	2	1	2
No. Stages	2	2	2	2
Gas Connection Pipe Size (in.)	3/4	1	3/4	1
Electric Heat				
KW Range[5]	27-90		27-90	
Capacity Steps:	2		2	
Compressor				
Number/Type	2/Scroll		2/Scroll	
Size (Nominal)	10/15		15	
Unit Capacity Steps (%)	100/40		100/50	
Motor RPM	3450		3450	
Outdoor Coil — Type	Lanced		Lanced	
Tube Size (in.) OD	3/8		3/8	
Face Area (sq ft)	51.33		51.33	
Rows/Fins Per Inch	2/16		2/16	
Indoor Coil — Type	Hi-Performance		Hi-Performance	
Tube Size (in.) OD	1/2		1/2	
Face Area	31.67		31.67	
Rows/Fins Per Inch	2/14		2/14	
Refrigerant Control	TXV		TXV	
No. of Circuits	1		1	
Drain Connection No./Size (in)	1/1.25		1/1.25	
Type	PVC		PVC	
Outdoor Fan Type	Propeller		Propeller	
No. Used/Diameter	3/28.00		3/28.00	
Drive Type/No. Speeds	Direct/1		Direct/1	
CFM	24,800		24,800	
No. Motors/HP/RPM	3/1.10/1125		3/1.10/1125	
Indoor Fan Type	FC		FC	
No. Used	1		1	
Diameter/Width (in)	22.38/22.00		22.38/22.00	
Drive Type/No. Speeds	Belt/1		Belt/1	
No. Motors/HP	1/7.50/10.00		1/7.50/10.00	
Motor RPM	1760		1760	
Motor Frame Size	213/215T		213/215T	
Exhaust Fan Type	Propeller		Propeller	
No. Used/Diameter (in)	2/26.00		2/26.00	
Drive Type/No. Speeds/Motors	Direct/2/2		Direct/2/2	
Motor HP/RPM	1.0/1075		1.0/1075	
Motor Frame Size	48		48	
Filters — Type Furnished	Throwaway		Throwaway	
No./ Recommended Size (in)[6]	16/16 x 20 x 2		16/16 x 20 x 2	
Refrigerant Charge (Lbs of R-22)[4]	46.00		46.60	
Minimum Outside Air Temperature For Mechanical Cooling	0 F		0 F	

Notes:
1. Cooling Performance is rated at 95 F ambient, 80 F entering dry bulb, 67 F entering wet bulb. Gross capacity does not include the effect of fan motor heat. Tested in accordance with ARI Standard 360.
2. Heating Performance limit settings and rating data were established and approved under laboratory test conditions using American National Standards Institute standards. Ratings shown are for elevations up to 4,500 feet.
3. Steady State Efficiency is rated in accordance with DOE test procedures.
4. Refrigerant charge is an approximate value. For a more precise value, see unit nameplate and service instructions.
5. Maximum KW @ 208V = 41, @ 240V = 54.
6. Filter dimensions listed are nominal. For actual filter and rack sizes see the Unit Installation, Operation, Maintenance Guide.

General Data

Table 11-1 — General Data — 35-40 Ton

	35 Ton		40 Ton	
Cooling Performance[1]				
Nominal Gross Capacity	420,000		480,000	
Natural Gas Heat[2]	Low	High	Low	High
Heating Input (BTUH)	350,000	600,000	400,000	800,000
First Stage	250,000	425,000	300,000	600,000
Heating Output (BTUH)	283,500	486,000	324,000	648,000
First Stage	202,500	344,500	243,000	486,000
Steady State Efficiency (%)[3]	81.00	81.00	81.00	81.00
No. Burners	1	2	1	2
No. Stages	2	2	2	2
Gas Connection Pipe Size (in.)	3/4	1	3/4	1
Electric Heat				
KW Range[5]	27-90		41-108	
Capacity Steps:	2		2	
Compressor				
Number/Type	2/Scroll		3/Scroll	
Size (nominal)	15		15/15/10	
Unit Capacity Steps (%)	100/50		100/60/40	
Motor RPM	3450		3450	
Outdoor Coil — Type	Lanced		Lanced	
Tube Size (in.) OD	3/8		3/8	
Face Area	51.33		69.79	
Rows/Fins Per Inch	2/16		2/16	
Indoor Coil — Type	Hi-Performance		Hi-Performance	
Tube Size (in.) OD	1/2		1/2	
Face Area (sq. ft.)	31.67		37.50	
Rows/Fins Per Inch	3/15		2/14	
Refrigerant Control	TXV		TXV	
No. of Circuits	1		2	
Drain Connection No./Size (in)	1/1.25		1/1.25	
Type	PVC		PVC	
Outdoor Fan Type	Propeller		Propeller	
No. Used/Diameter	3/28.00		4/28.00	
Drive Type/No. Speeds	Direct/1		Direct/1	
CFM	24,800		31,700	
No. Motors/HP/RPM	3/1.10/1125		4/1.10/1125	
Indoor Fan Type	FC		FC	
No. Used	1		1	
Diameter/Width (in)	22.38/22.00		25.00/25.00	
Drive Type/No. Speeds	Belt/1		Belt/1	
No. Motors/HP	1/7.50/10.00/15.00		1/10.00/15.00	
Motor RPM	1760		1760	
Motor Frame Size	213/215/254T		215/254T	
Exhaust Fan Type	Propeller		Propeller	
No. Used/Diameter (in)	2/26.00		2/26.00	
Drive Type/No. Speeds/Motors	Direct/2/2		Direct/2/2	
Motor HP/RPM	1.0/1075		1.0/1075	
Motor Frame Size	48		48	
Filters — Type Furnished	Throwaway		Throwaway	
No./Recommended Size (in)[6]	16/16 x 20 x 2		17/16 x 20 x 2	
Refrigerant Charge (Lbs of R-22)[4]	51.50		24.50/42.50 per circuit	
Minimum Outside Air Temperature For Mechanical Cooling	0 F		0 F	

Notes:
1. Cooling Performance is rated at 95 F ambient, 80 F entering dry bulb, 67 F entering wet bulb. Gross capacity does not include the effect of fan motor heat. Tested in accordance with ARI Standard 360.
2. Heating Performance limit settings and rating data were established and approved under laboratory test conditions using American National Standards Institute standards. Ratings shown are for elevations up to 4,500 feet.
3. Steady State Efficiency is rated in accordance with DOE test procedures.
4. Refrigerant charge is an approximate value. For a more precise value, see unit nameplate and service instructions.
5. Maximum KW @ 208V = 41, @ 240V = 54.
6. Filter dimensions listed are nominal. For actual filter and rack sizes see the Unit Installation, Operation, Maintenance Guide.

General Data

Table 12-1 — General Data — 50-Ton

	50 Ton	
Cooling Performance[1]		
Nominal Gross Capacity	587,000	
Natural Gas Heat[2]	Low	High
Heating Input (BTUH)	400,000	800,000
First Stage	300,000	600,000
Heating Output (BTUH)	324,000	648,000
First Stage	243,000	486,000
Steady State Efficiency (%)[3]	81.00	81.00
No. Burners	1	2
No. Stages	2	2
Gas Connection Pipe Size (in.)	3/4	1
Electric Heat		
KW Range[5]	41-108	
Capacity Steps:	2	
Compressor		
Number/Type	3/Scroll	
Size (nominal)	15	
Unit Capacity Steps (%)	100/67/33	
Motor RPM	3450	
Outdoor Coil — Type	Lanced	
Tube Size (in.) OD	3/8	
Face Area (sq. ft.)	69.79	
Rows/Fins Per Inch	2/16	
Indoor Coil — Type	Hi-Performance	
Tube Size (in.) OD	1/2	
Face Area	37.50	
Rows/Fins Per Inch	3/13	
Refrigerant Control	TXV	
No. of Circuits	2	
Drain Connection No./Size (in)	1/1.25	
Type	PVC	
Outdoor Fan Type	Propeller	
No. Used/Diameter	4/28.00	
Drive Type/No. Speeds	Direct/1	
CFM	31,700	
No. Motors/HP/RPM	4/1.10/1125	
Indoor Fan Type	FC	
No. Used	1	
Diameter/Width (in)	25.00/25.00	
Drive Type/No. Speeds	Belt/1	
No. Motors/HP	1/10.00/15.00/20.00	
Motor RPM	1760	
Motor Frame Size	215/254/256T	
Exhaust Fan Type	Propeller	
No. Used/Diameter (in)	2/26.00	
Drive Type/No. Speeds/Motors	Direct/2/2	
Motor HP/RPM	1.0/1075	
Motor Frame Size	48	
Filters — Type Furnished	Throwaway	
No./Recommended Size (in)[6]	17/16 x 20 x 2	
Refrigerant Charge (Lbs of R-22)[4]	23.90/49.50 per circuit	
Minimum Outside Air Temperature For Mechanical Cooling	0 F	

Notes:
1. Cooling Performance is rated at 95 F ambient, 80 F entering dry bulb, 67 F entering wet bulb. Gross capacity does not include the effect of fan motor heat. Tested in accordance with ARI Standard 360.
2. Heating Performance limit settings and rating data were established and approved under laboratory test conditions using American National Standards Institute standards. Ratings shown are for elevations up to 4,500 feet.
3. Steady State Efficiency is rated in accordance with DOE test procedures.
4. Refrigerant charge is an approximate value. For a more precise value, see unit nameplate and service instructions.
5. Maximum KW @ 208V = 41, @ 240V = 54.
6. Filter dimensions listed are nominal. For actual filter and rack sizes see the Unit Installation, Operation, Maintenance Guide.

General Data

Table 13-1 — Economizer Outdoor Air Damper Leakage (Of Rated Airflow)

	ΔP Across Dampers (In. WC)	
	0.5 (In.)	1.0 (In.)
Standard	1.5 %	2.5 %
Optional “Low Leak”	0.5 %	1.0 %

Note: Above data based on tests completed in accordance with AMCA Standard 575.

Application Considerations

Exhaust Air Options
When is it necessary to provide building exhaust?

Whenever an outdoor air economizer is used, a building generally requires an exhaust system. The purpose of the exhaust system is to exhaust the proper amount of air to prevent over or under-pressurization of the building.

A building may have all or part of its exhaust system in the rooftop unit. Often, a building provides exhaust external to the air conditioning equipment. This external exhaust must be considered when selecting the rooftop exhaust system.

Voyager Commercial rooftop units offer two types of exhaust systems:

1
Power exhaust fan.

2
Barometric relief dampers.

Application Recommendations

Power Exhaust Fan
The exhaust fan option is a dual, nonmodulating exhaust fan with approximately half the air-moving capabilities of the supply fan system. The experience of The Trane Company is that a non-modulating exhaust fan selected for 40 to 50 percent of nominal supply cfm can be applied successfully.

The power exhaust fan generally should not be selected for more than 40 to 50 percent of design supply airflow. Since it is an on/off nonmodulating fan, it does not vary exhaust cfm with the amount of outside air entering the building. Therefore, if selected for more than 40 to 50 percent of supply airflow, the building may become underpressurized when economizer operation is allowing lesser amounts of outdoor air into the building. If, however, building pressure is not of a critical nature, the non-modulating exhaust fan may be sized for more than 50 percent of design supply airflow. Consult Table 25-2 for specific exhaust fan capabilities with Voyager Commercial units.

Barometric Relief Dampers
Barometric relief dampers consist of gravity dampers which open with increased building pressure. As the building pressure increases, the pressure in the unit return section also increases, opening the dampers and relieving air. Barometric relief may be used to provide relief for single story buildings with no return ductwork and exhaust requirements less than 25 percent.

Altitude Corrections
The rooftop performance tables and curves of this catalog are based on standard air (.075 lbs/ft). If the rooftop airflow requirements are at other than standard conditions (sea level), an air density correction is needed to project accurate unit performance.

Figure 17-1 shows the air density ratio at various temperatures and elevations. Trane rooftops are designed to operate between 40 and 90 degrees Fahrenheit leaving air temperature.

The procedure to use when selecting a supply or exhaust fan on a rooftop for elevations and temperatures other than standard is as follows:

1
First, determine the air density ratio using Figure 17-1.

2
Divide the static pressure at the nonstandard condition by the air density ratio to obtain the corrected static pressure.

3
Use the actual cfm and the corrected static pressure to determine the fan rpm and bhp from the rooftop performance tables or curves.

4
The fan rpm is correct as selected.

5
Bhp must be multiplied by the air density ratio to obtain the actual operating bhp.

In order to better illustrate this procedure, the following example is used:

Consider a 30-ton rooftop unit that is to deliver 11,000 actual cfm at 1.50 inches total static pressure (tsp), 55 F leaving air temperature, at an elevation of 5,000 ft.

1
From Figure 17-1, the air density ratio is 0.86.

2
Tsp=1.50 inches/0.86=1.74 inches tsp.

3
From the performance tables: a 30-ton rooftop will deliver 11,000 cfm at 1.74 inches tsp at 668 rpm and 6.93 bhp.

4
The rpm is correct as selected — 668 rpm.

5
Bhp = 6.93 x 0.86 = 5.96 .

Compressor MBh, SHR, and kw should be calculated at standard and then converted to actual using the correction factors in Table 17-2. Apply these factors to the capacities selected at standard cfm so as to correct for the reduced mass flow rate across the condenser.

Heat selections other than gas heat will not be affected by altitude. Nominal gas capacity (output) should be multiplied by the factors given in Table 17-3 before calculating the heating supply air temperature.

Acoustical Considerations
Proper placement of rooftops is critical to reducing transmitted sound levels to the building. The ideal time to make provisions to reduce sound transmissions is during the design phase. And the most economical means of avoiding an acoustical problem is to place the rooftop(s) away from acoustically critical areas. If possible, rooftops should not be located directly above areas such as: offices, conference rooms, executive office areas and classrooms. Instead, ideal locations might be over corridors, utility rooms, toilets or other areas where higher sound levels directly below the unit(s) are acceptable.

Several basic guidelines for unit placement should be followed to minimize sound transmission through the building structure:

1
Never cantilever the compressor end of the unit. A structural cross member must support this end of the unit.

2
Locate the unit's center of gravity close to or over column or main support beam.

3
If the roof structure is very light, roof joists must be replaced by a structural shape in the critical areas described above.

4
If several units are to be placed on one span, they should be staggered to reduce deflection over that span.

It is impossible to totally quantify the effect of building structure on sound transmission, since this depends on the response of the roof and building members to the sound and vibration of the unit components. However, the guidelines listed above are experience-proven guidelines which will help reduce sound transmissions.

Clearance Requirements
The recommended clearances identified with unit dimensions should be maintained to assure adequate serviceability, maximum capacity and peak operating efficiency. A reduction in unit clearance could result in condenser coil starvation or warm condenser air recirculation. If the clearances shown are not possible on a particular job, consider the following:

- Do the clearances available allow for major service work such as changing compressors or coils?
- Do the clearances available allow for proper outside air intake, exhaust air removal and condenser airflow?
- If screening around the unit is being used, is there a possibility of air recirculation from the exhaust to the outside air intake or from condenser exhaust to condenser intake?

Actual clearances which appear inadequate should be reviewed with a local Trane sales engineer.

When two or more units are to be placed side by side, the distance between the units should be increased to 150 percent of the recommended single unit clearance. The units should also be staggered for two reasons:

1
To reduce span deflection if more than one unit is placed on a single span. Reducing deflection discourages sound transmission.

2
To assure proper diffusion of exhaust air before contact with the outside air intake of adjacent unit.

Duct Design
It is important to note that the rated capacities of the rooftop can be met only if the rooftop is properly installed in the field. A well designed duct system is essential in meeting these capacities.

The satisfactory distribution of air throughout the system requires that there be an unrestricted and uniform airflow from the rooftop discharge duct. This discharge section should be straight for at least several duct diameters to allow the conversion of fan energy from velocity pressure to static pressure.

However, when job conditions dictate elbows be installed near the rooftop outlet, the loss of capacity and static pressure may be reduced through the use of guide vanes and proper direction of the bend in the elbow. The high velocity side of the rooftop outlet should be directed at the outside radius of the elbow rather than the inside.

Selection Procedure

Selection of Trane commercial air conditioners is divided into five basic areas:
1
Cooling capacity
2
Heating capacity
3
Air delivery
4
Unit electrical requirements
5
Unit designation

Factors Used In Unit Cooling Selection:
1
Summer design conditions — 95 DB/ 76 WB, 95 F entering air to condenser.
2
Summer room design conditions — 76 DB/66 WB.
3
Total peak cooling load — 321 MBh (27.75 tons).
4
Total peak supply cfm — 12,000 cfm.
5
External static pressure — 1.0 inches.
6
Return air temperatures — 80 DB/ 66 WB.
7
Return air cfm — 4250 cfm.
8
Outside air ventilation cfm and load — 1200 cfm and 18.23 MBh (1.52 tons).
9
Unit accessories include:
a
Aluminized heat exchanger — high heat module.
b
2” Hi-efficiency throwaway filters.
c
Exhaust fan.
d
Economizer cycle.

Step 1 — A summation of the peak cooling load and the outside air ventilation load shows: 27.75 tons + 1.52 tons = 29.27 required unit capacity. From Table 18-2, 30-ton unit capacity at 80 DB/67 WB, 95 F entering the condenser and 12,000 total peak supply cfm, is 30.0 tons. Thus, a nominal 30-ton unit is selected.

Step 2 — Having selected a nominal 30-ton unit, the supply fan and exhaust fan motor bhp must be determined.

Supply Air Fan:
Determine unit static pressure at design supply cfm:

External static pressure	1.20 inches
Heat exchanger (Table 24-1)	.14 inches
High efficiency filter 2” (Table 24-1)	.09 inches
Economizer (Table 24-1)	.076 inches
Unit total static pressure	1.50 inches

Using total cfm of 12,000 and total static pressure of 1.50 inches, enter Table 22-1. Table 22-1 shows 7.27 bhp with 652 rpm.

Step 3 — Determine evaporator coil entering air conditions. Mixed air dry bulb temperature determination.

Using the minimum percent of OA (1,200 cfm ÷ 12,000 cfm = 10 percent), determine the mixture dry bulb to the evaporator. RADB + %OA (OADB - RADB) = 80 + (0.10) (95 - 80) = 80 + 1.5 = 81.5F

Approximate wet bulb mixture temperature:
RAWB + OA (OAWB - RAWB) = 66 + (0.10) (76-66) = 68 + 1 = 67 F.

A psychrometric chart can be used to more accurately determine the mixture temperature to the evaporator coil.

Step 4 — Determine total required unit cooling capacity:
Required capacity = total peak load + O.A. load + supply air fan motor heat.

From Figure 16-1, the supply air fan motor heat for 7.27 bhp = 20.6 MBh.

Capacity = 321 + 18.23 + 20.6 = 359.8 MBh (30 tons)

Step 5 — Determine unit capacity:
From Table 18-2 unit capacity at 81.5 DB. 67 WB entering the evaporator, 12000 supply air cfm, 95 F entering the condenser is 361 MBh (30.1 tons) 279 sensible MBh.

Step 6 — Determine leaving air temperature:
Unit sensible heat capacity, corrected for supply air fan motor heat 279 - 20.6 = 258.4 MBh.

Supply air dry bulb temperature difference = 258.4 MBh ÷ (1.085 x 12,000 cfm) = 19.8 F.

Supply air dry bulb: 81.5 - 19.8 = 61.7.

Unit enthalpy difference = 361 ÷ (4.5 x 12,000) = 6.7
Btu/lb leaving enthalpy = h (ent WB) = 31.62
Leaving enthalpy = 31.62 Btu/lb - 6.7 Btu/lb = 24.9 Btu/lb.

From Table 17-1, the leaving air wet bulb temperature corresponding to an enthalpy of 24.9 Btu/lb = 57.5.
Leaving air temperatures = 61.7 DB/57.5 WB

Selection Procedure

Heating capacity selection:

1
Winter outdoor design conditions—5 F.

2
Total return air temperature — 72 F.

3
Winter outside air minimum ventilation load and cfm — 1,200 cfm and 87.2 MBh.

4
Peak heating load 225 MBh.

Utilizing unit selection in the cooling capacity procedure.

Mixed air temperature = RADB + %O.A. (OADB - RADB) = 72 + (0.10) (0-72) = 64.8 F.

Supply air fan motor heat temperature rise = 20,600 BTU ÷ (1.085 x 12,000) cfm = 1.6 F.

Mixed air temperature entering heat module = 64.8 + 1.6 = 66.4 F.

Total winter heating load = peak heating + ventilation load - total fan motor heat = 225 + 87.2 - 20.6 = 291.6 MBh.

Electric Heating System
Unit operating on 480/60/3 power supply. From Table 21-1, kw may be selected for a nominal 30-ton unit operating on 480-volt power. The high heat module — 90 KW or 307 MBh will satisfy the winter heating load of 291.6 MBh.

Table 21-1 also shows an air temperature rise of 23.6 F for 12,000 cfm through the 90 kw heat module.

Unit supply temperature at design heating conditions = mixed air temperature + air temperature rise = 66.4 + 23.6 = 90 F.

Natural Gas Heating System
Assume natural gas supply — 1000 Btu/ft^3. From Table 21-3, select the high heat module (486 MBh output) to satisfy 291.6 at unit cfm.

Table 21-3 also shows air temperature rise of 37.3 F for 12,000 cfm through heating module.

Unit supply temperature design heating conditions = mixed air temperature + air temperature rise = 66.4 + 37.3 = 103.7 F.

Air Delivery Procedure
Supply air fan bhp and rpm selection. Unit supply air fan performance shown in Table 22-1 includes pressure drops for dampers and casing losses. Static pressure drops of accessory components such as heating systems, and filters if used, must be added to external unit static pressure for total static pressure determination.

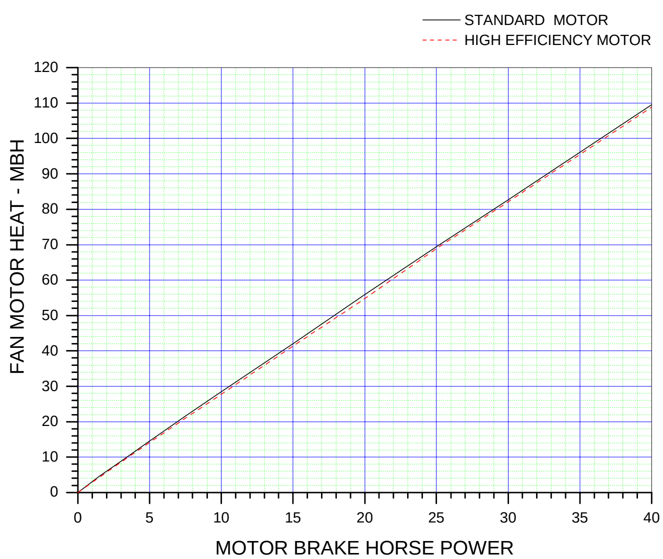
The supply air fan motor selected in the previous cooling capacity determination example was 7.27 bhp with 652 rpm. Thus, the supply fan motor selected is 7.5 hp.

To select the drive, enter Table 25-1 for a 30-ton unit. Select the appropriate drive for the applicable rpm range. Drive selection letter C with a range of 650 rpm, is required for 652 rpm. Where altitude is significantly above sea level, use Table 17-2 and 17-3, and Figure 17-1 for applicable correction factors.

Unit Electrical Requirements
Selection procedures for electrical requirements for wire sizing amps, maximum fuse sizing and dual element fuses are given in the electrical service selection of this catalog.

Unit Designation
After determining specific unit characteristics utilizing the selection procedure and additional job information, the complete unit model number can be developed. Use the model number nomenclature on page 9.

Figure 16-1 — Fan Motor Heat



NOTES:
1. Fan motor heat (MBh) includes 1.1 correction factor for motor efficiency.
2. Capacities shown. Table 12-1 are gross values; heat gain from evaporator fan motor must be included in unit capacity determination.

Performance Adjustment Factors

Table 17-1— Enthalpy of Saturated AIR

Wet Bulb Temperature	Btu Per Lb.
40	15.23
41	15.70
42	16.17
43	16.66
44	17.15
45	17.65
46	18.16
47	18.68
48	19.21
49	19.75
50	20.30
51	20.86
52	21.44
53	22.02
54	22.62
55	23.22
56	23.84
57	24.48
58	25.12
59	25.78
60	26.46
61	27.15
62	27.85
63	28.57
64	29.31
65	30.06
66	30.83
67	31.62
68	32.42
69	33.25
70	34.09
71	34.95
72	35.83
73	36.74
74	37.66
75	38.61

Figure 17-1 — Air Density Ratios

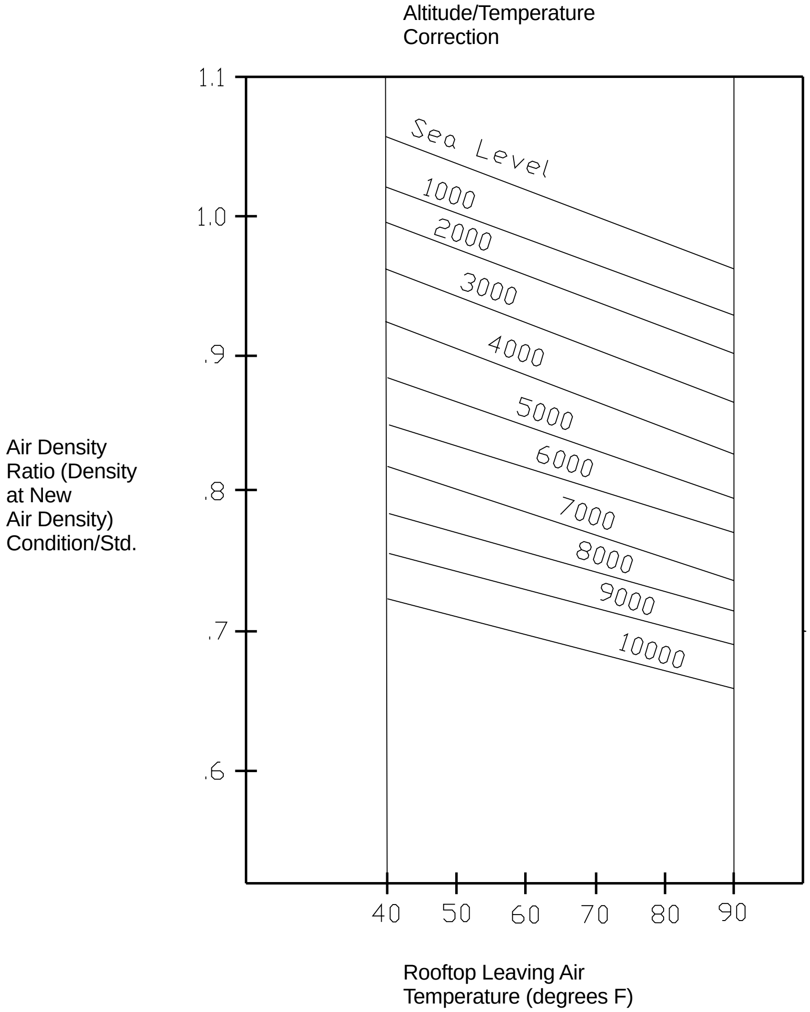


Table 17-2 — Cooling Capacity Altitude Correction Factors

	Altitude (Ft.)							
	Sea Level	1000	2000	3000	4000	5000	6000	7000
Cooling Capacity Multiplier	1.00	0.99	0.99	0.98	0.97	0.96	0.95	0.94
KW Correction Multiplier (Compressors)	1.00	1.01	1.02	1.03	1.04	1.05	1.06	1.07
SHR Correction Multiplier	1.00	.98	.95	.93	.91	.89	.87	.85
Maximum Condenser Ambient	115 F	114 F	113 F	112 F	111 F	110 F	109 F	108 F

Note:
SHR = Sensible Heat Ratio

Table 17-3 — Gas Heating Capacity Altitude Correction Factors

	Altitude (Ft.)						
	Sea Level To 2000	2001 To 2500	2501 To 3500	3501 To 4500	4501 To 5500	5501 To 6500	6501 To 7500
Capacity Multiplier	1.00	.92	.88	.84	.80	.76	.72

Note:
Correction factors are per AGA Std 221.30 — 1964, Part VI, 6.12. Local codes may supersede.

Table 18-1 — 27.5 Ton Gross Cooling Capacities (MBh)

		Ambient Temperature — Deg F																							
		85						95						105						115					
	Ent DB	Entering Wet Bulb Temperature — Deg F																							
		61		67		73		61		67		73		61		67		73		61		67		73	
CFM	(F)	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC
	75	293	230	326	182	362	131	280	223	312	175	346	124	266	215	297	168	330	117	252	207	281	160	313	110
8000	80	295	270	327	221	362	172	283	262	313	214	347	165	270	255	298	207	331	158	256	247	282	199	314	151
	85	302	302	328	260	363	212	291	291	314	253	348	205	280	280	299	245	331	198	267	267	284	237	315	190
	90	319	319	330	300	364	250	307	307	317	292	349	243	296	296	302	285	333	236	283	283	288	277	316	228
	75	300	243	333	190	369	134	287	235	318	183	353	127	273	227	303	176	336	120	258	219	286	168	319	113
9000	80	303	287	334	233	370	179	290	280	319	226	354	172	277	272	304	218	337	165	261	261	288	210	320	158
	85	314	314	335	276	371	223	303	303	321	269	355	215	291	291	306	261	338	209	278	278	290	253	321	200
	90	332	332	339	320	372	265	320	320	325	313	356	258	307	307	311	305	340	250	294	294	294	294	322	242
	75	306	255	339	198	375	137	292	247	324	191	359	130	278	240	308	183	341	123	263	231	291	175	323	116
10000	80	310	304	340	244	376	186	297	296	325	237	360	179	283	283	309	229	343	171	270	270	293	221	325	164
	85	325	325	342	291	377	233	313	313	327	284	361	225	300	300	312	276	344	218	287	287	296	268	326	210
	90	343	343	347	340	379	279	331	331	333	332	362	272	318	318	317	317	345	264	304	304	304	304	328	256
	75	311	267	344	205	381	139	297	259	329	198	364	133	282	251	312	190	346	125	267	243	295	181	327	118
11000	80	316	316	345	255	382	192	304	304	330	247	365	185	291	291	314	239	347	178	277	277	297	231	329	170
	85	334	334	348	306	383	243	322	322	333	298	366	235	309	309	317	291	349	230	295	295	301	283	330	219
	90	353	353	353	353	384	293	340	340	340	340	368	285	327	327	326	326	350	277	312	312	312	312	332	269
	75	316	279	348	225	385	142	302	272	333	218	368	136	287	264	316	210	350	129	271	255	299	202	331	121
12100	80	324	324	350	266	387	199	312	312	334	258	369	192	298	298	318	251	351	184	284	284	301	242	332	176
	85	343	343	353	322	388	253	330	330	338	314	371	245	317	317	322	306	353	237	302	302	306	298	335	230
	90	363	363	363	363	390	307	350	350	349	349	373	300	335	335	335	335	355	292	321	321	321	321	337	284

Notes:
1. All capacities shown are gross and have not considered indoor fan heat. To obtain net cooling, subtract indoor fan heat.
2. TGC = Total gross capacity.
3. SHC = Sensible heat capacity.

Table 18-2 — 30 Ton Gross Cooling Capacities (Mbh)

		Ambient Temperature — Deg F																							
		85						95						105						115					
	Ent DB	Entering Wet Bulb Temperature — Deg F																							
		61		67		73		61		67		73		61		67		73		61		67		73	
CFM	(F)	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC
	75	322	254	358	207	397	144	308	246	342	193	379	137	293	237	326	185	362	129	277	229	309	177	343	122
9000	80	325	298	359	244	398	190	311	290	343	236	380	182	296	282	327	228	362	174	281	273	310	219	344	166
	85	333	333	360	287	399	234	321	321	345	279	381	226	308	308	328	271	363	218	295	295	312	262	345	209
	90	351	351	363	331	400	276	338	338	348	323	382	268	325	325	332	314	365	260	311	311	316	306	346	251
	75	329	266	365	209	404	147	314	258	348	201	386	139	299	249	332	193	368	132	283	241	314	184	349	124
10000	80	333	315	366	255	405	196	318	306	350	247	387	189	304	298	333	239	368	181	287	287	316	230	350	173
	85	345	345	367	302	406	244	332	332	351	294	388	236	318	318	335	286	370	229	304	304	318	277	351	221
	90	363	363	371	350	407	290	350	350	356	342	390	282	336	336	340	334	371	274	322	322	322	322	352	265
	75	335	278	371	216	410	150	320	270	354	208	392	142	304	261	337	200	373	134	288	253	318	191	353	127
11000	80	340	331	372	266	411	203	325	323	355	258	393	195	309	309	338	250	374	187	295	295	320	241	354	179
	85	355	355	374	317	412	255	341	341	357	309	394	247	328	328	341	300	375	237	313	313	323	292	356	231
	90	374	374	379	370	414	304	361	361	363	361	395	296	346	346	346	346	377	287	332	332	331	331	357	279
	75	340	290	376	223	415	152	324	281	358	215	396	145	308	273	341	207	377	137	292	264	323	199	357	129
12000	80	344	344	377	277	416	209	331	331	360	268	397	201	317	317	342	260	378	193	302	302	324	251	358	185
	85	364	364	379	331	417	263	350	350	363	323	399	255	336	336	346	315	380	249	321	321	328	306	360	238
	90	384	384	384	384	419	317	370	370	370	370	400	309	355	355	355	355	381	300	340	340	340	340	362	292
	75	345	303	380	246	420	155	329	294	363	237	401	148	313	286	345	229	381	140	297	277	327	221	361	133
13200	80	353	353	382	289	422	216	339	339	365	280	402	208	325	325	347	272	383	200	310	310	329	263	363	192
	85	374	374	386	348	423	274	359	359	369	340	404	266	344	344	351	331	384	257	329	329	334	323	364	249
	90	395	395	395	395	425	332	380	380	380	380	406	324	365	365	365	365	386	316	349	349	349	349	367	307

Notes:
1. All capacities shown are gross and have not considered indoor fan heat. To obtain net cooling, subtract indoor fan heat.
2. TGC = Total gross capacity.
3. SHC = Sensible heat capacity.

Performance Data

Table 19-1 — 35 Ton Gross Cooling Capacities (Mbh)

		Ambient Temperature — Deg F																							
		85						95						105						115					
	Ent DB	Entering Wet Bulb Temperature — Deg F																							
		61		67		73		61		67		73		61		67		73		61		67		73	
CFM	(F)	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC
	75	379	313	419	246	463	168	363	304	401	238	442	160	345	294	382	229	421	151	327	284	362	220	400	143
10500	80	385	371	420	299	464	227	369	363	402	290	443	218	350	350	383	281	423	210	334	334	363	271	401	201
	85	401	401	423	356	465	284	386	386	405	347	445	276	371	371	386	338	424	267	354	354	366	328	402	257
	90	422	422	428	414	466	340	407	407	411	405	446	331	391	391	391	391	425	322	375	375	374	374	404	313
	75	389	334	428	260	472	172	372	325	409	252	450	164	353	316	389	243	429	155	334	306	368	233	407	147
12000	80	395	395	429	318	473	238	380	380	411	309	452	229	364	364	391	300	430	221	347	347	370	290	408	212
	85	417	417	433	382	474	302	402	402	415	373	453	293	386	386	395	364	431	284	368	368	375	355	409	274
	90	440	440	440	440	476	365	424	424	424	424	455	356	407	407	407	407	434	346	390	390	390	390	412	337
	75	394	348	433	263	477	175	377	339	414	255	455	166	358	329	393	246	433	158	339	319	372	236	410	149
13000	80	404	404	434	331	478	245	388	388	415	322	457	237	372	372	395	312	434	228	355	355	375	303	412	219
	85	427	427	439	400	479	313	411	411	420	391	458	304	394	394	401	381	436	295	377	377	381	372	413	285
	90	451	451	450	450	482	381	434	434	434	434	461	372	417	417	416	416	439	362	398	398	398	398	417	353
	75	399	362	437	271	481	177	381	353	417	263	459	169	363	343	397	254	437	160	343	333	376	244	414	151
14000	80	412	412	439	343	482	252	396	396	420	334	461	243	379	379	399	324	438	235	362	362	378	315	415	226
	85	436	436	445	417	484	324	419	419	426	408	462	315	402	402	406	399	440	306	384	384	384	384	417	296
	90	460	460	460	460	487	396	443	443	443	443	466	387	425	425	425	425	444	378	406	406	406	406	421	368
	75	401	367	438	284	482	178	383	358	419	276	460	170	365	348	398	264	438	161	345	338	376	254	415	153
14400	80	415	415	441	348	484	255	399	399	421	339	462	246	382	382	401	329	439	237	364	364	380	319	417	228
	85	439	439	447	424	485	329	422	422	428	415	464	319	405	405	408	405	441	310	387	387	387	387	418	300
	90	464	464	464	464	489	403	446	446	446	446	468	394	428	428	428	428	445	384	409	409	409	409	422	374

Notes:
1. All capacities shown are gross and have not considered indoor fan heat. To obtain net cooling, subtract indoor fan heat.
2. TGC = Total gross capacity.
3. SHC = Sensible heat capacity.

Table 19-2 — 40 Ton Gross Cooling Capacities (Mbh)

		Ambient Temperature — Deg F																							
		85						95						105						115					
	Ent DB	Entering Wet Bulb Temperature — Deg F																							
		61		67		73		61		67		73		61		67		73		61		67		73	
CFM	(F)	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC
	75	429	334	477	274	530	190	409	322	455	263	506	179	388	310	432	251	481	168	366	297	408	240	455	156
12000	80	433	392	479	322	531	250	413	380	457	310	507	239	392	368	434	298	482	227	371	355	410	285	456	215
	85	444	443	481	379	532	309	425	425	459	367	508	297	406	406	436	354	483	285	387	387	413	342	457	272
	90	466	466	485	436	534	365	449	449	464	424	510	353	430	430	441	412	485	341	410	410	419	400	460	328
	75	443	358	491	280	544	196	421	346	468	268	519	184	400	333	443	256	492	173	377	320	419	243	465	161
14000	80	448	425	493	344	545	263	421	421	470	332	520	252	402	402	446	319	494	240	383	383	421	307	467	228
	85	465	465	495	409	546	329	446	446	473	396	521	317	427	427	449	384	495	304	407	407	425	371	469	292
	90	491	491	502	475	549	392	472	472	471	471	524	380	452	452	452	452	498	368	431	431	434	428	471	355
	75	448	370	496	303	549	199	427	358	472	291	524	187	404	345	448	279	497	176	382	332	423	267	470	164
15000	80	449	449	499	355	551	269	430	430	475	342	525	258	411	411	451	330	499	246	391	391	426	317	472	234
	85	475	475	501	423	552	338	456	456	478	411	527	326	436	436	455	398	501	314	416	416	430	385	474	301
	90	502	502	501	501	555	406	482	482	482	482	529	393	462	462	461	461	503	381	440	440	440	440	476	368
	75	453	381	501	294	555	201	432	369	477	281	529	190	409	356	453	269	502	178	386	343	427	256	474	165
16000	80	457	457	504	365	556	275	438	438	480	353	530	264	418	418	455	340	503	252	398	398	430	327	476	239
	85	484	484	507	437	558	348	465	465	484	425	532	335	444	444	460	412	505	323	423	423	435	399	478	310
	90	511	511	511	511	560	419	491	491	491	491	535	406	470	470	470	470	508	393	449	449	448	448	481	381
	75	461	399	508	327	562	205	438	386	484	315	535	193	416	373	458	302	508	181	392	360	432	289	479	171
17600	80	469	469	511	381	563	285	450	450	487	368	537	273	429	429	462	355	510	261	408	408	436	342	481	248
	85	497	497	515	459	565	362	477	477	492	446	539	350	456	456	467	434	512	337	434	434	442	421	484	324
	90	525	525	528	527	568	438	505	505	504	504	542	426	483	483	483	483	515	413	461	461	460	460	487	400

Notes:
1. All capacities shown are gross and have not considered indoor fan heat. To obtain net cooling, subtract indoor fan heat.
2. TGC = Total gross capacity.
3. SHC = Sensible heat capacity.

Performance Data

Table 20-1 — 50 Ton Gross Cooling Capacities (MBh)

		Ambient Temperature — Deg F																							
		85						95						105						115					
	Ent	Entering Wet Bulb Temperature — Deg F																							
	DB	61		67		73		61		67		73		61		67		73		61		67		73	
CFM	(F)	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC	TGC	SHC
	75	531	429	587	344	649	233	507	415	560	331	620	220	481	400	532	317	589	207	454	385	502	303	557	194
15000	80	538	508	588	410	650	313	515	494	562	397	621	299	490	480	534	382	590	286	460	460	505	367	558	272
	85	556	556	592	487	652	390	535	535	566	473	623	377	512	512	538	459	592	363	488	488	510	444	560	349
	90	586	586	600	565	653	466	564	564	574	552	624	452	541	541	548	537	594	438	516	516	516	516	562	424
	75	543	455	599	363	661	239	518	441	571	349	631	226	492	426	542	336	599	213	464	411	512	322		
17000	80	553	544	600	434	663	326	525	525	573	420	632	313	501	501	544	406	601	299	477	477	514	391		
	85	578	578	606	520	664	413	555	555	579	506	634	399	531	531	551	491	603	385	506	506	521	476		
	90	609	609	617	608	666	496	586	586	585	585	637	482	562	562	561	561	605	468	536	536	536	536		
	75	549	468	604	356	667	241	524	454	576	343	636	229	497	439	547	329	604	215	469	423	516	314		
18000	80	555	555	606	446	668	333	533	533	578	432	637	319	509	509	549	417	605	305	484	484	519	402		
	85	587	587	612	536	670	424	564	564	585	522	639	410	540	540	556	507	607	395	514	514	527	492		
	90	620	620	619	619	672	511	596	596	595	595	642	497	571	571	570	570	611	483	544	544	544	544		
	75	554	480	609	364	672	244	528	466	580	350	640	231	501	451	551	336	608	217	473	436	520	322		
19000	80	564	564	611	457	673	339	541	541	583	443	642	326	517	517	553	428	609	312	492	492	523	413		
	85	596	596	618	551	675	434	573	573	590	537	643	419	548	548	561	522	611	405	522	522	532	507		
	90	629	629	629	629	678	525	605	605	605	605	647	511	579	579	579	579	616	497	553	553	552	552		
	75	559	493	613	371	676	246	533	478	584	357	644	233	506	463	554	343	611	219	477	448	522	328		
20000	80	571	571	615	468	677	346	548	548	587	454	646	332	524	524	557	439	613	318	498	498	527	424		
	85	605	605	623	567	679	444	581	581	595	552	647	429	556	556	566	538	615	415	529	529	536	523		
	90	638	638	638	638	683	540	613	613	613	613	652	525	587	587	587	587	620	511	560	560	560	560		

Notes:
1. All capacities shown are gross and have not considered indoor fan heat. To obtain net cooling, subtract indoor fan heat.
2. TGC = Total gross capacity.
3. SHC = Sensible heat capacity.

Table 21-1 — Electric Heat Air Temperature Rise

KW Input	Total MBH	Cfm												
		8000	9000	10000	11000	12000	13000	14000	15000	16000	17000	18000	19000	20000
36	123	14.2	12.6	11.3	10.3	9.4	8.7	8.1	7.6	—	—	—	—	—
54	184	21.2	18.9	17.0	15.4	14.2	13.1	12.1	11.3	10.6	10.0	9.4	8.9	8.5
72	246	28.3	25.2	22.6	20.6	18.9	17.4	16.2	15.1	14.2	13.3	12.6	11.9	11.3
90	307	35.4	31.5	28.3	25.7	23.6	21.8	20.2	18.9	17.7	16.7	15.7	14.9	14.2
108	369	—	—	—	—	28.3	26.1	24.3	22.6	21.2	20.0	18.9	17.9	17.0

Notes:
1. Air temperature rise = (KW x 3413)/(scfm x 1.085).
2. All heaters on constant volume units provide 2 increments of capacity. All VAV units provide 1 step of heating capacity.
3. Air temperature rise in this table are based on heater operating at 240, 480 or 600 volts.

Table 21-2 — Available Electric Heat KW Ranges

Nominal Unit Size Tons	Nominal Voltage			
	208	240	480	600
27.5	27-41	36-54	36-90	54-90
30.0	27-41	36-54	36-90	54-90
35.0	27-41	36-54	36-90	54-90
40.0	41	54	54-108	54-108
50.0	41	54	54-108	54-108

Notes:
1. KW ranges in this table are based on heater operating at 208, 240, 480, and 600 volts.
2. For other than rated voltage, $KW = \left(\frac{\text{Applied Voltage}}{\text{Rated Voltage}}\right)^2 \times \text{Rated KW}$.
3. Electric heaters up to 54 KW are single element heaters, those above 54 KW are dual element heaters.

Table 21-3 — Natural Gas Heating Capacities

Tons	Unit Model No.	Heat Input MBH (See Note 1)	Heating Output MBH (See Note 1)	Air Temp. Rise, F
27.5-35	YCD/YCH330**L YCD/YCH360**L YCD/YCH420**L	350,000/250,000	283,500/202,500	10-40
27.5-35	YCD/YCH330**H YCD/YCH360**H YCD/YCH420**H	600,000/425,000	486,000/344,500	25-55
40-50	YCD/YCH480**L YCD/YCH600**L	400,000/300,000	324,000/243,000	5-35
40-50	YCD/YCH480**H YCD/YCH600**H	800,000/600,000	648,000/486,000	20-50

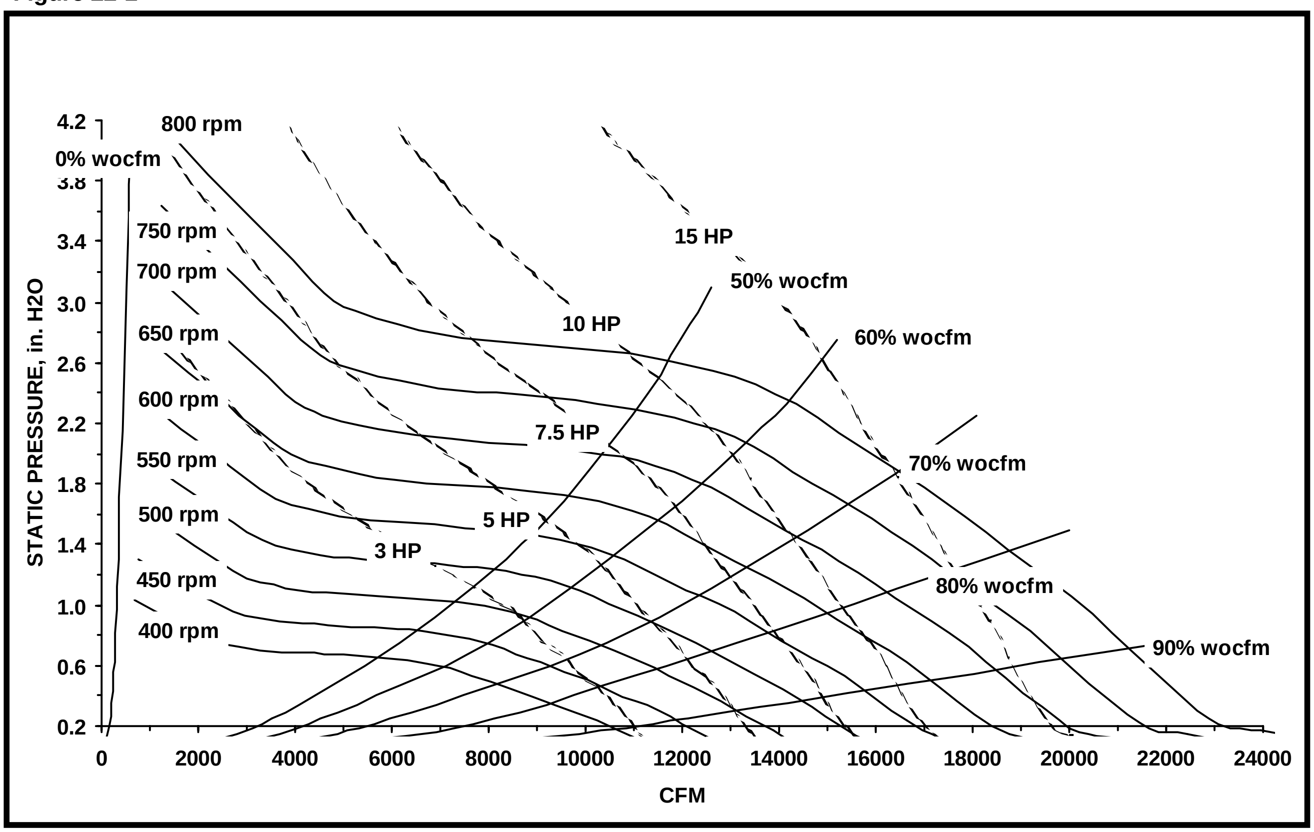
Note:
1. Second stage is total heating capacity. Second Stage/First Stage.

Table 22-1 — Supply Fan Performance — 27.5 - 35 Ton

	Static Pressure (in. wg)[1]																	
	0.25		0.50		0.75		1.00		1.25		1.50		1.75		2.00		2.25	
SCFM	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
8000	341	1.39	401	1.85	451	2.30	501	2.84	552	3.45	599	4.11	644	4.80	686	5.51	726	6.24
8500	355	1.60	412	2.08	462	2.58	508	3.09	556	3.71	602	4.38	646	5.09	688	5.83	728	6.59
9000	368	1.84	423	2.35	473	2.88	516	3.39	561	4.00	606	4.68	649	5.41	691	6.16	730	6.94
9500	382	2.10	435	2.64	484	3.20	526	3.73	568	4.32	611	5.00	653	5.74	694	6.51	732	7.31
10000	396	2.39	448	2.96	495	3.53	537	4.12	576	4.69	616	5.36	657	6.11	697	6.89	735	7.71
10500	410	2.71	461	3.31	506	3.89	549	4.53	585	5.10	623	5.76	662	6.50	701	7.30	738	8.13
11000	425	3.07	474	3.68	518	4.29	560	4.95	597	5.57	631	6.20	668	6.93	705	7.73	742	8.58
11500	440	3.46	488	4.08	530	4.72	571	5.39	608	6.08	641	6.71	676	7.41	711	8.20	747	9.06
12000	455	3.89	501	4.52	542	5.19	582	5.86	619	6.60	652	7.27	684	7.95	718	8.73	752	9.57
12500	470	4.34	515	4.98	555	5.69	593	6.38	630	7.13	664	7.87	694	8.55	726	9.30	758	10.14
13000	485	4.84	528	5.47	569	6.23	605	6.94	641	7.69	675	8.49	706	9.21	734	9.93	765	10.76
13500	501	5.36	542	6.00	582	6.79	617	7.54	652	8.29	686	9.12	717	9.91	745	10.65	774	11.43
14000	516	5.91	555	6.58	595	7.40	630	8.18	664	8.95	697	9.78	729	10.64	757	11.42	784	12.19
14500	532	6.51	570	7.20	609	8.04	643	8.85	676	9.65	708	10.48	740	11.38	768	12.22	795	13.02

Notes:
1. Fan performance table includes internal resistances of cabinet, and 2” standard filters. For other components refer to component static pressure drop table. Add the pressure drops from any additional components to the duct (external) static pressure, enter the table, and select motor bhp.
2. The pressure drop from the supply fan to the space cannot exceed 2.25”.
3. Maximum air flow for 27.5 ton — 12,100 cfm, 30 ton — 13,200 cfm, 35 ton — 14,400 cfm.
4. Maximum motor horsepower for 27.5 ton — 10 hp, 30 ton — 10 hp, 35 ton — 15 hp.

Figure 22-1



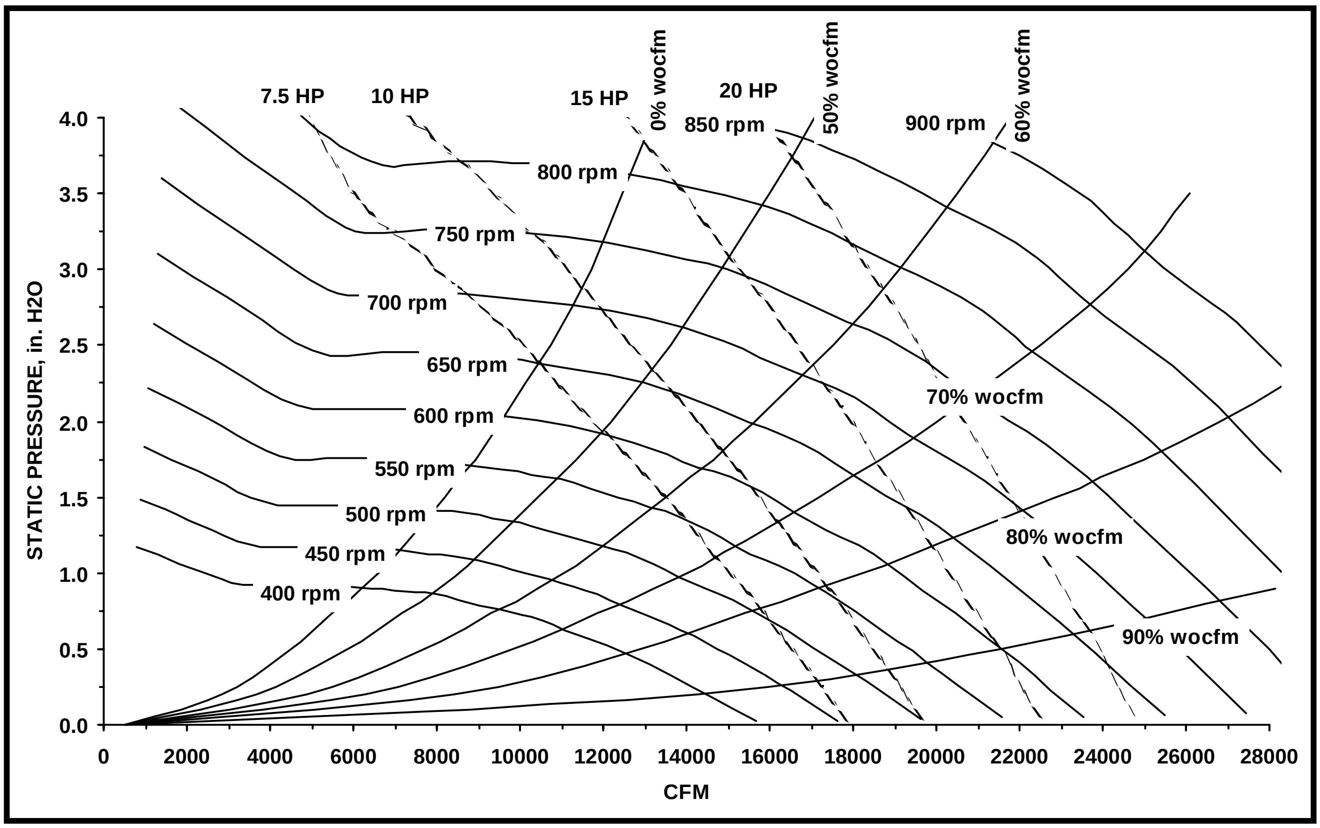
Performance Data

Table 23-1 — Supply Fan Performance — 40 and 50 Ton

	Static Pressure (in. wg)[1]																			
	0.25		0.50		0.75		1.00		1.25		1.50		1.75		2.00		2.25		2.50	
SCFM	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
12000	351	2.84	394	3.45	436	4.12	473	4.77	510	5.46	545	6.19	578	6.94	610	7.71	641	8.49	672	9.28
13000	373	3.49	413	4.16	454	4.86	488	5.57	523	6.29	557	7.05	589	7.83	619	8.64	649	9.47	679	10.32
14000	396	4.24	434	4.97	470	5.69	506	6.47	537	7.23	570	8.02	601	8.83	631	9.68	659	10.55	687	11.44
15000	418	5.10	455	5.88	488	6.64	524	7.48	554	8.29	583	9.11	614	9.96	643	10.83	671	11.74	698	12.66
16000	441	6.07	476	6.91	508	7.73	540	8.57	572	9.47	599	10.33	627	11.21	656	12.12	684	13.05	710	14.01
17000	465	7.18	498	8.06	528	8.94	557	9.80	589	10.75	618	11.69	643	12.60	669	13.54	696	14.50	722	15.49
18000	488	8.43	520	9.34	549	10.27	577	11.19	606	12.14	635	13.16	660	14.14	684	15.10	709	16.10	735	17.12
19000	512	9.82	542	10.75	570	11.74	597	12.72	623	13.68	651	14.74	679	15.81	702	16.83	724	17.85	748	18.91
20000	536	11.36	564	12.31	591	13.36	617	14.40	642	15.41	668	16.46	695	17.60	720	18.70	741	19.77	762	20.85

Notes:
1. Fan performance table includes internal resistances of cabinet, and 2" standard filters. For other components refer to component static pressure drop table. Add the pressure drops from any additional components to the duct (external) static pressure, enter the table, and select motor bhp.
2. The pressure drop from the supply fan to the space cannot exceed 2.50".
3. Maximum air flow for 40 ton — 17,600 cfm, 50 ton — 20,000 cfm.
4. Maximum motor horsepower for 40 ton — 15 hp, 50 ton — 20 hp.

Figure 23-1



Performance Data

Table 24-1 — Component Static Pressure Drops (in. W.G.)[1]

Nominal Tons	CFM Std Air	Heating System: Gas Heat Low	Heating System: Gas Heat High	Heating System: Electric Heat[3] 1 Element	Heating System: Electric Heat[3] 2 Element	ID Coil Adder	Filters[2]: High Eff. Filters 2”	Filters[2]: High Eff. Filters 4”	Inlet Guide Vanes	Economizer
27.5	8000	0.08	0.06	0.05	0.06	0.00	0.04	0.03	0.05	0.04
	9000	0.10	0.08	0.07	0.07	0.00	0.05	0.04	0.07	0.04
	10000	0.13	0.10	0.08	0.09	0.00	0.06	0.05	0.08	0.05
	11000	0.15	0.12	0.10	0.11	0.00	0.08	0.05	0.10	0.06
	12000	0.18	0.14	0.12	0.13	0.00	0.09	0.07	0.12	0.07
30	9000	0.10	0.08	0.07	0.07	0.00	0.05	0.04	0.07	0.04
	10000	0.13	0.10	0.08	0.09	0.00	0.06	0.05	0.08	0.05
	11000	0.15	0.12	0.10	0.11	0.00	0.08	0.05	0.10	0.06
	12000	0.18	0.14	0.12	0.13	0.00	0.09	0.07	0.12	0.07
	13000	0.21	0.16	0.14	0.15	0.00	0.11	0.08	0.14	0.09
35	10500	0.14	0.11	0.09	0.10	0.11	0.07	0.05	0.09	0.06
	11500	0.17	0.13	0.11	0.12	0.12	0.08	0.06	0.11	0.07
	12500	0.20	0.15	0.13	0.14	0.14	0.10	0.07	0.13	0.08
	13500	0.23	0.18	0.15	0.16	0.16	0.11	0.08	0.15	0.10
	14500	0.26	0.20	0.18	0.19	0.18	0.13	0.10	0.18	0.11
40	12000	0.01	0.03	0.08	0.13	0.00	0.09	0.07	0.04	0.07
	13000	0.01	0.04	0.10	0.15	0.00	0.11	0.08	0.05	0.08
	14000	0.02	0.05	0.11	0.18	0.00	0.12	0.09	0.05	0.09
	15000	0.02	0.05	0.13	0.20	0.00	0.14	0.10	0.06	0.10
	16000	0.02	0.06	0.15	0.23	0.00	0.16	0.12	0.07	0.11
	17000	0.02	0.07	0.17	0.26	0.00	0.18	0.13	0.08	0.12
50	15000	0.02	0.05	0.13	0.20	0.09	0.14	0.10	0.06	0.10
	16000	0.02	0.06	0.15	0.23	0.10	0.16	0.12	0.07	0.11
	17000	0.02	0.07	0.17	0.26	0.11	0.18	0.13	0.08	0.12
	18000	0.03	0.08	0.19	0.29	0.12	0.20	0.15	0.09	0.14
	19000	0.03	0.08	0.21	0.32	0.13	0.23	0.16	0.10	0.16
	20000	0.03	0.09	0.23	0.36	0.14	0.25	0.18	0.11	0.18

Notes:
1. Static pressure drops of accessory components must be added to external static pressure to enter fan selection tables.
2. Throwaway filter option limited to 300 ft/min face velocity.
3. Electric Heaters 36-54 KW contain 1 element; 72-108 KW 2 elements.

Performance Data

Table 25-1 — Supply Air Fan Drive Selections

Nominal Tons	7.5 HP RPM	7.5 HP Drive No	10 HP RPM	10 HP Drive No	15 HP RPM	15 HP Drive No	20 HP RPM	20 HP Drive No
27.5T	550	A						
	600	B						
	650	C						
	700		700	D				
	750		750*	E				
30T	550	A						
	600	B						
	650	C						
	700		700	D				
	750		750	E				
35T	600	B						
	650		650	C				
	700		700	D				
	790				790**	F		
	800				800*	G		
40T	500		500	H				
	525		525	J				
	575		575	K				
	625				625	L		
	675				675	M		
	725				725	N		
50T	525		525	J				
	575		575	K				
	625				625	L		
	675				675	M		
	725						725	N

Note:
*For YC gas/electrics only.
**For TC and TE Cooling only and with electric heat units only.

Table 25-2 — Power Exhaust Fan Performance

Exhaust Airflow (Cfm)	External Static Pressure — Inches of Water: High Speed ESP	Med Speed ESP	Low Speed ESP
3500	0.900	—	—
4000	0.860	—	—
4500	0.820	—	—
5000	0.780	—	0.400
5500	0.745	—	0.380
6000	0.700	—	0.360
6500	0.660	—	0.330
7000	0.610	0.400	0.300
7500	0.560	0.365	0.260
8000	0.505	0.330	0.215
8500	0.445	0.300	0.170
9000	0.385	0.255	0.120
9500	0.320	0.210	0.070
10000	0.255	0.165	0.020
10500	0.190	0.125	—
11000	0.125	0.060	—
11500	0.065	0.000	—
12000	0.005	—	—

Notes:
1. Performance in table is with both motors operating.
2. High speed = both motors on high speed. Medium speed is one motor on high speed and one on low speed. Low speed is both motors on low speed.
3. Power Exhaust option is not to be applied on systems that have more return air static pressure drop than the maximum shown in the table for each motor speed tap.

Electrical Service Sizing

To correctly size electrical service wiring for your unit, find the appropriate calculations listed below. Each type of unit has its own set of calculations for MCA (Minimum Circuit Ampacity), MOP (Maximum Overcurrent Protection), and RDE (Recommended Dual Element fuse size). Read the load definitions that follow and then find the appropriate set of calculations based on your unit type.

Set 1 is for cooling only and cooling with gas heat units, and set 2 is for cooling with electric heat units.

Load Definitions

LOAD1 = CURRENT OF THE LARGEST MOTOR (COMPRESSOR OR FAN MOTOR)

LOAD2 = SUM OF THE CURRENTS OF ALL REMAINING MOTORS

LOAD3 = CURRENT OF ELECTRIC HEATERS

LOAD4 = ANY OTHER LOAD RATED AT 1 AMP OR MORE

Set 1. Cooling Only Rooftop Units and Cooling with Gas Heat Rooftop Units

MCA = (1.25 x LOAD1) + LOAD2 + LOAD4

MOP = (2.25 x LOAD1) + LOAD2 + LOAD4

Select a fuse rating equal to the MOP value. If the MOP value does not equal a standard fuse size as listed in NEC 240-6, select the next lower standard fuse rating. NOTE: If selected MOP is less than the MCA, then reselect the lowest standard maximum fuse size which is equal to or larger than the MCA, provided the reselected fuse size does not exceed 800 amps.

RDE = (1.5 x LOAD1) + LOAD2 + LOAD4

Select a fuse rating equal to the RDE value. If the RDE value does not equal a standard fuse size as listed in NEC 240-6, select the next higher standard fuse rating. NOTE: If the selected RDE is greater than the selected MOP value, then reselect the RDE value to equal the MOP value.

DSS = 1.15 x (LOAD1 + LOAD2 + LOAD4)

Select a disconnect switch size equal to or larger than the DSS value calculated.

Set 2. Rooftop units with Electric Heat

To arrive at the correct MCA, MOP, and RDE values for these units, you must perform two sets of calculations. First calculate the MCA, MOP, and RDE values as if the unit was in cooling mode (use the equations given in Set 1). Then calculate the MCA, MOP, and RDE values as if the unit were in the heating mode as follows.

(Keep in mind when determining LOADS that the compressors and condenser fans don't run while the unit is in the heating mode).

For units using heaters less than 50 kw.

MCA = 1.25 x (LOAD1 + LOAD2 + LOAD4) + (1.25 x LOAD3)

For units using heaters equal to or greater than 50 kw.

MCA = 1.25 x (LOAD1 + LOAD2 + LOAD4) + LOAD3

The nameplate MCA value will be the larger of the cooling mode MCA value or the heating mode MCA value calculated above.

MOP = (2.25 x LOAD1) + LOAD2 + LOAD3 + LOAD4

The selection MOP value will be the larger of the cooling mode MOP value or the heating mode MOP value calculated above.

Select a fuse rating equal to the MOP value. If the MOP value does not equal a standard fuse size as listed in NEC 240-6, select the next lower standard fuse rating. NOTE: If selected MOP is less than the MCA, then reselect the lowest standard maximum fuse size which is equal to or larger than the MCA, provided the reselected fuse size does not exceed 800 amps.

RDE = (1.5 x LOAD1) + LOAD2 + LOAD3 + LOAD4

The selection RDE value will be the larger of the cooling mode RDE value or the heating mode RDE value calculated above.

Select a fuse rating equal to the RDE value. If the RDE value does not equal a standard fuse size as listed in NEC 240-6, select the next higher standard fuse rating. NOTE: If the selected RDE is greater than the selected MOP value, then reselect the RDE value to equal the MOP value.

DSS = 1.15 x (LOAD1 + LOAD2 + LOAD3 + LOAD4)

NOTE: Keep in mind when determining LOADS that the compressors and condenser fans don't run while the unit is in the heating mode.

The selection DSS value will be the larger of the cooling mode DSS or the heating mode DSS calculated above.

Select a disconnect switch size equal to or larger than the DSS value calculated.

Electrical Data

Table 27-1 — 27.5-50 Ton Electrical Service Sizing Data[1]

						Fan Motors							
			Compressor			Supply		Condenser			Exhaust		
Model	Electrical Characteristics	Allowable Voltage Range	No/Ton	RLA (Ea.)	LRA (Ea.)	HP	Standard/ Hi-Efficiency FLA	No.	HP	FLA (Ea.)	No.	HP	FLA (Ea.)
TC/TE/YC*330	208/60/3	187-229	1/10,1/15	41.9/62.8	269/409	7.5	22.3/21.5	3	1.1	7.0	2	1.0	6.7
						10.0	29.7/29.0						
	230/60/3	207-253		41.9/62.8	247/376	7.5	19.6/18.8			7.0			6.7
						10.0	26.4/25.2						
	460/60/3	414-506		18.1/27.3	95/142	7.5	9.8/9.4			3.5			2.9
						10.0	13.2/12.6						
	575/60/3	517-633		14.6/21.8	76/114	7.5	7.8/7.5			2.8			2.3
						10.0	10.3/10.1						
TC/TE/YC*360	208/60/3	187-229	2/15	62.8	409	7.5	22.3/21.5	3	1.1	7.0	2	1.0	6.7
						10.0	29.7/29.0						
	230/60/3	207-253		62.8	376	7.5	19.6/18.8			7.0			6.7
						10.0	26.4/25.2						
	460/60/3	414-506		27.3	142	7.5	9.8/9.4			3.5			2.9
						10.0	13.2/12.6						
	575/60/3	517-633		21.8	114	7.5	7.8/7.5			2.8			2.3
						10.0	10.3/10.1						
TC/TE/YC*420	208/60/3	187-229	2/15	62.8	409	7.5	22.3/21.5	3	1.1	7.0	2	1.0	6.7
						10.0	29.7/29.0						
						15.0	44.4/41.5						
	230/60/3	207-253		62.8	376	7.5	19.6/18.8			7.0			6.7
						10.0	26.4/25.2						
						15.0	38.6/36.0						
	460/60/3	414-506		27.3	142	7.5	9.8/9.4			3.5			2.9
						10.0	13.2/12.6						
						15.0	19.3/18.0						
	575/60/3	517-633		21.8	114	7.5	7.8/7.5			2.8			2.3
						10.0	10.3/10.1						
						15.0	15.4/14.5						
TC/TE/YC*480	208/60/3	187-229	2/15,1/10	62.8/62.8/41.9	409/409/269	10.0	29.7/29.0	4	1.1	7.0	2	1.0	6.7
						15.0	44.4/41.5						
	230/60/3	207-253		62.8/62.8/41.9	376/376/247	10.0	26.4/25.2			7.0			6.7
						15.0	38.6/36.0						
	460/60/3	414-506		27.3/27.3/18.1	142/142/95	10.0	13.2/12.6			3.5			2.9
						15.0	19.3/18.0						
	575/60/3	517-633		21.8/21.8/14.6	114/114/76	10.0	10.3/10.1			2.8			2.3
						15.0	15.4/14.5						
TC/TE/YC*600	208/60/3	187-229	3/15	62.8	409	10.0	29.7/29.0	4	1.1	7.0	2	1.0	6.7
						15.0	44.4/41.5						
						20.0	58.7/56.1						
	230/60/3	207-253		62.8	376	10.0	26.4/25.2			7.0			6.7
						15.0	38.6/36.0						
						20.0	51.0/49.4						
	460/60/3	414-506		27.3	142	10.0	13.2/12.6			3.5			2.9
						15.0	19.3/18.0						
						20.0	25.5/24.7						
	575/60/3	517-633		21.8	114	10.0	10.3/10.1			2.8			2.3
						15.0	15.4/14.5						
						20.0	20.4/19.6						

Notes:
1. All customer wiring and devices must be installed in accordance with local and national electrical codes.

Table 27-2 — 27.5 - 50 Ton Electrical Service Sizing Data — Electric Heat Module (Electric Heat Units Only)

		Models: TED/TEH 330 thru 600 Electric Heat FLA				
Nominal Unit Size (Tons)	Nominal Unit Voltage	KW Heater				
		36	54	72	90	108
		FLA	FLA	FLA	FLA	FLA
27.5	208	74.9	112.4	—	—	—
30.0	230	86.6	129.9	—	—	—
35.0	460	43.3	65.0	86.6	108.3	—
	575		52.0	69.3	86.6	—
40.0	208	—	112.4	—	—	—
50.0	230	—	129.9	—	—	—
	460	—	65.0	86.6	108.3	129.9
	575	—	52.0	69.3	86.6	103.9

Notes:
1. All FLA in this table are based on heater operating at 208, 240, 480, and 600 volts.

VAV Units Only

Sequence of Operation

1

Supply Air Pressure Control

- **Inlet Guide Vane Control**
  Inlet guide vanes are driven by a modulating 2-10 vdc signal from the VAV Module. A pressure transducer measures duct static pressure, and the inlet guide vanes are modulated to maintain the supply air static pressure within an adjustable user-defined range. The range is determined by the supply air pressure setpoint and supply air pressure deadband, which are set through a unit mounted potentiometer.

  Inlet guide vane assemblies installed on the supply fan inlets regulate fan capacity and limit horsepower at lower system air requirements. When in any position other than full open, the vanes pre-spin intake air in the same direction as supply fan rotation. As the vanes approach the full-closed position, the amount of “spin” induced by the vanes increases at the same time that intake airflow and fan horsepower diminish. The inlet guide vanes will close when the supply fan is shut down.

- **Supply Air Static Pressure Limit**
  The opening of the inlet guide vanes and VAV boxes are coordinated, with respect to time, during unit start up and transition to/from Occupied/Unoccupied modes to prevent overpressurization of the supply air ductwork. However, if for any reason the supply air pressure exceeds the fixed supply air static pressure limit of 3.5” W.C., the supply fan is shut down and the inlet guide vanes are closed. The unit is then allowed to restart four times. If the overpressurization condition occurs on the fifth time, the unit is shut down and a manual reset diagnostic is set and displayed at any of the remote panels with LED status lights or communicated to the Integrated Comfort system.

- **Variable Frequency Drives (VFD) Control**
  Variable frequency drives are driven by a modulating 0-10 vdc signal from the VAV module. A pressure transducer measures duct static pressure, and the VFD is modulated to maintain the supply air static pressure within an adjustable user-defined range. The range is determined by the supply air pressure setpoint and supply air pressure deadband, which are set through a unit mounted potentiometer.

  Variable frequency drives provide supply fan motor speed modulation. The drive will accelerate or decelerate as required to maintain the supply static pressure setpoint. When subjected to high ambient return conditions the VFD shall reduce its output frequency to maintain operation. Bypass control is offered to provide full nominal airflow in the event of drive failure.

2

Supply Air Temperature Controls

- **Cooling/Economizer**
  During occupied cooling mode of operation, the economizer (if available) and primary cooling are used to control the supply air temperature. The supply air temperature setpoint is user-defined at the unit mounted VAV Setpoint Panel or at the remote panel. If the enthalpy of the outside air is appropriate to use “free cooling,” the economizer will be used first to attempt to satisfy the supply setpoint.

  On units with economizer, a call for cooling will modulate the fresh air dampers open. The rate of economizer modulation is based on deviation of the discharge temperature from setpoint, i.e., the further away from setpoint, the faster the fresh air damper will open. Note that the economizer is only allowed to function freely if ambient conditions are below the enthalpy control setting or below the return air enthalpy if unit has comparative enthalpy installed. If outside air is not suitable for “economizing,” the fresh air dampers drive to the minimum open position. A field adjustable potentiometer on the Unitary Economizer Module, Tracer®, or a remote potentiometer can provide the input to establish the minimum damper position.

  At outdoor air conditions above the enthalpy control setting, primary cooling only is used and the fresh air dampers remain at minimum position.

  If the unit does not include an economizer, primary cooling only is used to satisfy cooling requirements.

- **Supply Air Setpoint Reset**
  Supply air reset can be used to adjust the supply air temperature setpoint on the basis of a zone temperature, return air temperature, or on outdoor air temperature. Supply air reset adjustment is available on the unit mounted VAV Setpoint Panel for supply air cooling control.

a

reset based on outdoor air temperature

Outdoor air cooling reset is sometimes used in applications where the outdoor temperature has a large effect on building load. When the outside air temperature is low and the building cooling load is low, the supply air setpoint can be raised, thereby preventing subcooling of critical zones. This reset can lower usage of primary cooling and result in a reduction in primary cooling energy usage.

There are two user-defined parameters that are adjustable through the VAV Setpoint Panel: reset temperature setpoint and reset amount. The amount of reset applied is dependent upon how far the outdoor air temperature is below the supply air reset setpoint. The amount is zero where they are equal and increases linearly toward the value set at the reset amount input. The maximum value is 20 F. If the outdoor air temperature is more than 20 F below the reset temperature setpoint the amount of reset is equal to the reset amount setpoint.

b

reset based on zone or return temperature

Zone or return reset is applied to the zone(s) in a building that tend to overcool or overheat. The supply air temperature setpoint is adjusted based on the temperature of the critical zone(s) or the return air temperature. This can have the effect of improving comfort and/or lowering energy usage. The user-defined parameters are the same as for outdoor air reset.

Logic for zone or return reset control is the same except that the origins of the temperature inputs are the zone sensor or return sensor respectively. The amount of reset applied is dependent upon how far the zone or return air temperature is below the supply air reset setpoint. The amount is zero where they are equal and increases linearly toward the value set at the reset amount potentiometer on the VAV Setpoint panel. The maximum value is 3 F. If the return or zone temperature is more than 3 F below the reset temperature setpoint the amount of reset is equal to the reset amount setpoint.

3
Zone Temperature Control

Unoccupied Zone Heating and Cooling
During Unoccupied mode, the unit is operated as a CV unit. Inlet guide vanes and VAV boxes are driven full open. The unit controls zone temperature to the Unoccupied zone cooling and heating (heating units only) setpoints.

Daytime Warm-up
During occupied mode, if the zone temperature falls to a temperature three degrees below the Morning Warm-up setpoint, Daytime Warm-up is initiated. The system changes to CV heating (full unit airflow), the VAV boxes are fully opened and the CV heating algorithm is in control until the Morning Warm-up setpoint is reached. The unit is then returned to VAV cooling mode. The Morning Warm-up setpoint is set at the unit mounted VAV Setpoint panel or at a remote panel.

Morning Warm-up (MWU)
Morning warm-up control (MWU) is activated whenever the unit switches from unoccupied to occupied and the zone temperature is at least 1.5 F below the MWU setpoint. When MWU is activated the VAV box output will be energized for at least 6 minutes to drive all boxes open, the inlet guide vanes are driven full open, and all stages of heat (gas or electric) are energized. When MWU is activated the economizer damper is driven fully closed. When the zone temperature meets or exceeds the MWU setpoint minus 1.5 F, the heat will be staged down. When the zone temperature meets or exceeds the MWU setpoint then MWU will be terminated and the unit will switch over to VAV cooling.

CV Units Only

Sequence of Operation

1
Occupied Zone Temperature Control

Cooling/Economizer
During occupied cooling mode, the economizer (if provided) and primary cooling are used to control zone temperature. If the enthalpy of outside air is appropriate to use “free cooling”, the economizer will be used first to attempt to satisfy the cooling zone temperature setpoint; then primary cooling will be staged up as necessary.

On units with economizer, a call for cooling will modulate the fresh air dampers open. The rate of economizer modulation is based on deviation of the zone temperature from setpoint, i.e., the further away from setpoint, the faster the fresh air damper will open. First stage of cooling will be allowed to start after the economizer reaches full open.

Note that the economizer is allowed to function freely only if ambient conditions are below the enthalpy control setting or below the return air enthalpy if unit has comparative enthalpy. If outside air is not suitable for “economizing,” the fresh air dampers drive to the minimum open position. A field adjustable potentiometer on the Unitary Economizer Module (UEM), Tracer or a remote potentiometer can provide the input to establish the minimum damper position.

At outdoor air temperatures above the enthalpy control setting, primary cooling only is used and the outdoor air dampers remain at minimum position.

If the unit does not include an economizer, primary cooling only is used to satisfy cooling requirements.

Heating

Gas Heating
When heating is required the UCP initiates the heating cycle by energizing the K5 relay, heating relay(s), and the ignition control module(s). The K5 relay brings on the combustion fan motor. The ignition control module(s) begin the ignition process by preheating the hot surface ignitor(s). After the hot surface ignitor is preheated the gas valve is opened to ignite first stage. If ignition does not take place the ignition control module(s) will attempt to ignite 2 more times before locking out. When ignition does occur the hot surface ignitor is deenergized and then functions as a flame sensor. The UCP will energize the supply fan contactor 45 seconds after the initiation of the heat cycle. If more capacity is needed to satisfy the heating setpoint, the UCP will call for the second stage of heat by driving the combustion blower motor to high speed.

When the space temperature rises above the heating setpoint, the UCP deenergizes the K5 relay, the heating relays, and the ignition control module, terminating the heat cycle.

Electric Heating
When heat is required, the UCP initiates first stage heating by energizing the first stage electric heat contactor. The first stage electric heater bank(s) will be energized if the appropriate limits are closed. The UCP will cycle first stage heat on and off as required to maintain zone temperature. If first stage cannot satisfy the requirement, the UCP will energize the second stage electric heat contactor(s) if the appropriate limits are closed. The UCP will cycle second stage on and off as required while keeping stage one energized.

The supply fan is energized approximately 1 second before the electric heat contactors. When the space temperature rises above the heating setpoint, the UCP deenergizes the supply fan and all electric heat contactors.

Supply Air Tempering
This feature is available only with TRACER® or with systems using programmable zone sensors (CV only with economizer). For gas and electric heat units in the Heat mode but not actively heating, if the supply air temperature drops to 10 F below the occupied zone heating temperature setpoint, one stage of heat will be brought on to maintain a minimum supply air temperature. The heat stage is dropped if the supply air temperature rises to 10 F above the occupied zone heating temperature setpoint.

Auto Changeover
When the System Mode is “Auto,” the mode will change to cooling or heating as necessary to satisfy the zone cooling and heating setpoints. The zone cooling and heating setpoints can be as close as 2 F apart.

Unoccupied Zone Temperature Control Cooling and Heating
Both cooling or heating modes can be selected to maintain Unoccupied zone temperature setpoints. For Unoccupied periods, heating or primary cooling operation can be selectively locked out at the remote panels or TRACER.

Conventional Thermostat Interface
An interface is required to use a conventional thermostat instead of a zone sensor module with the UCP. The Conventional Thermostat Interface (CTI) is connected between conventional thermostat and the UCP and will allow only two steps of heating or cooling. The CTI provides zone temperature control only and is mutually exclusive of the Trane Communications Interface.

Control Sequences of Operation Common to Both VAV and CV Units

Ventilation override (VOM)
Ventilation override allows an external system to assume control of the unit for the purpose of exhaust or pressurization. There are two inputs associated with ventilation override, the initiate input and the select input. When the UCP senses a continuous closed condition on the initiate input at the low voltage terminal board the unit will begin ventilation override depending on the condition of the select input. The default condition of the select input is exhaust (input open). A closed select input will yield pressurization. The component state matrix for ventilation override is as follows:

System Component	Exhaust	Pressurization
Heat/Cool	off	off
IGV	closed	open
Supply Fan	off	on
Exhaust Fan	on	off
Outside Air Damper	closed	open
Return Air Damper	open	closed
VAV Boxes	n/a	open

Coil Freeze Protection FROSTAT™
The FROSTAT system eliminates the need for hot gas bypass and adds a suction line surface temperature sensor to determine if the coil is in a condition of impending frost. If impending frost is detected primary cooling capacity is shed as necessary to prevent icing. All compressors are turned off after they have met their minimum 3 minute on times. The supply fan is forced on until the FROSTAT device no longer senses a frosting condition or for 60 seconds after the last compressor is shut off, whichever is longer.

Occupied/Unoccupied Switching
There are 3 ways to switch Occupied/ Unoccupied:

1
NSB Panel

2
Electronic time clock or field-supplied contact closure

3
TRACER

Night Setback Sensors
Trane's night setback sensors are programmable with a time clock function that provides communication to the rooftop unit through a 2-wire communications link. The desired transition times are programmed at the night setback sensor and communicated to the unit.

Night setback (unoccupied mode) is operated through the time clock provided in the sensors with night setback. When the time clock switches to night setback operation, the outdoor air dampers close and heating/cooling can be enabled or disabled. As the building load changes, the night setback sensor communicates the need for the rooftop heating/cooling (if enabled) function and the evaporator fan. The rooftop unit will cycle through the evening as heating/cooling (if enabled) is required in the space. When the time clock switches from night setback to occupied mode, all heating/cooling functions begin normal operation.

When using the night setback options with a VAV heating/cooling rooftop, airflow must be maintained through the rooftop unit. This can be accomplished by electrically tying the VAV boxes to the VAV heat relay contacts on the Low voltage terminal board or by using changeover thermostats. Either of these methods will assure adequate airflow through the unit and satisfactory temperature control of the building.

Timed override Activation—ICS
When this function is initiated by pushing the override button on the ICS sensor, TRACER will switch the unit to the occupied mode. Unit operation (occupied mode) during timed override is terminated by a signal from TRACER.

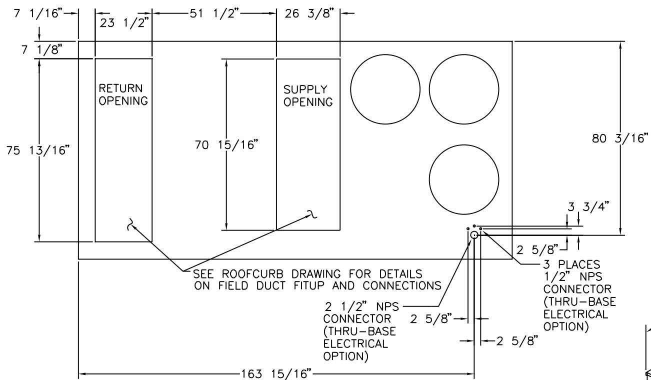
Timed override Activation—Non-ICS
When this function is initiated by the push of an override button on the programmable zone sensor, the unit will switch to the occupied mode. Automatic Cancellation of the Timed override Mode occurs after three hours of operation.

Comparative Enthalpy Control of Economizer
The Unitary Economizer Module (UEM) receives inputs from optional return air humidity and temperature sensors and determines whether or not it is feasible to economize. If the outdoor air enthalpy is greater than the return air enthalpy then it is not feasible to economize and the economizer damper will not open past its minimum position.

Fan Failure Switch
The fan failure switch will disable all unit functions and “flash” the Service LED on the zone sensor.

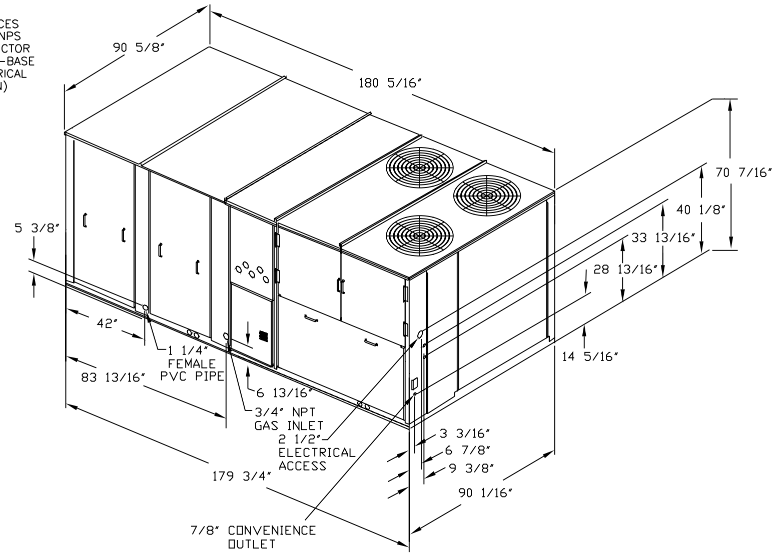
Emergency Stop Input
A binary input is provided on the UCP for installation of field provided switch or contacts for immediate shutdown of all unit functions. The binary input is brought out to Low Voltage Terminal Board One (LTB1).

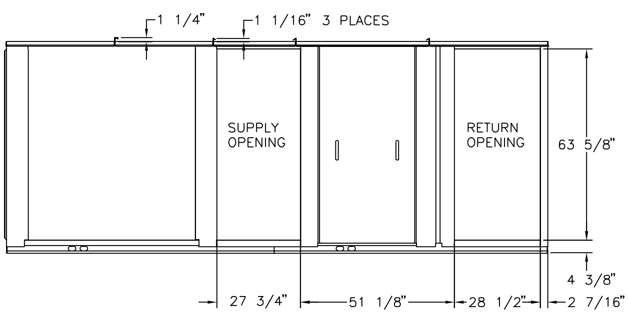
Figure 31-1 — 27.5-35 Tons (TC, TE, YC Low Heat)



TOP VIEW SHOWING DUCT OPENINGS IN BASE FOR DOWNFLOW CONFIGURATION

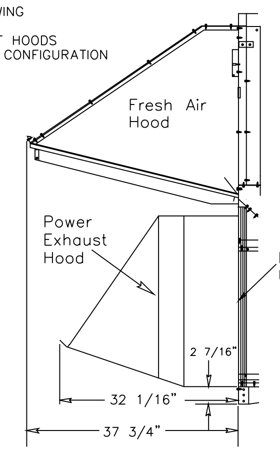
NOTES:
1. ALL DIMENSIONS INCHES.
2. THRU-BASE ELECTRICAL LOCATIONS ARE PRESENT ONLY WHEN OPTION IS ORDERED.

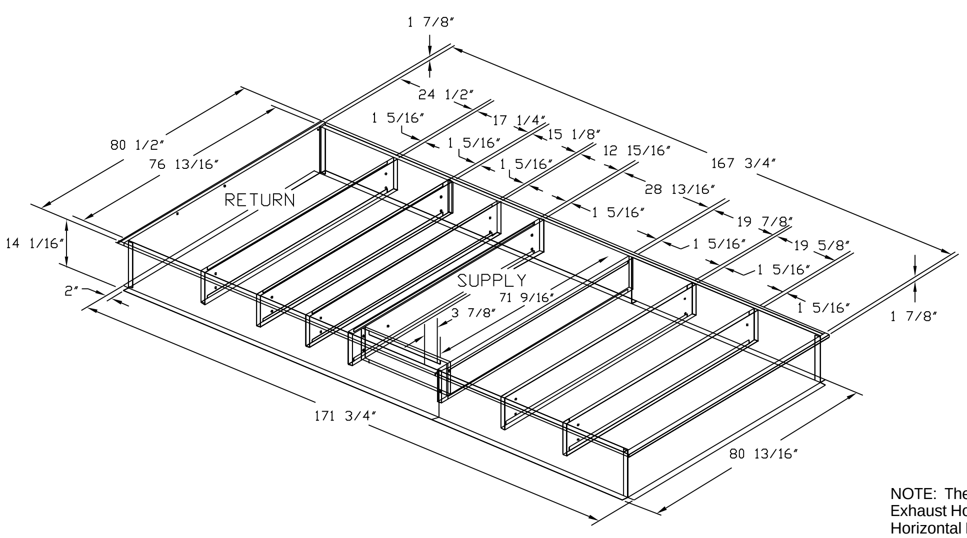




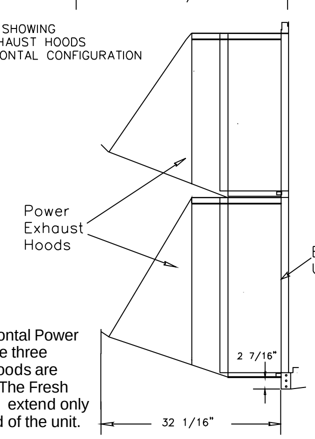
REAR VIEW DUCT OPENINGS FOR HORIZONTAL UNIT

SIDE VIEW SHOWING FRESH AIR AND POWER EXHAUST HOODS FOR DOWNFLOW CONFIGURATION





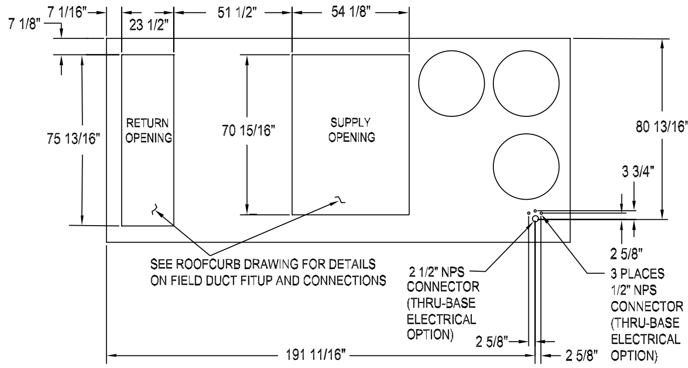
SIDE VIEW SHOWING POWER EXHAUST HOODS FOR HORIZONTAL CONFIGURATION



NOTE: The Two Horizontal Power Exhaust Hoods and the three Horizontal Fresh Air Hoods are located side by side. The Fresh Air Hoods (not shown) extend only 23 15/16" from the end of the unit.

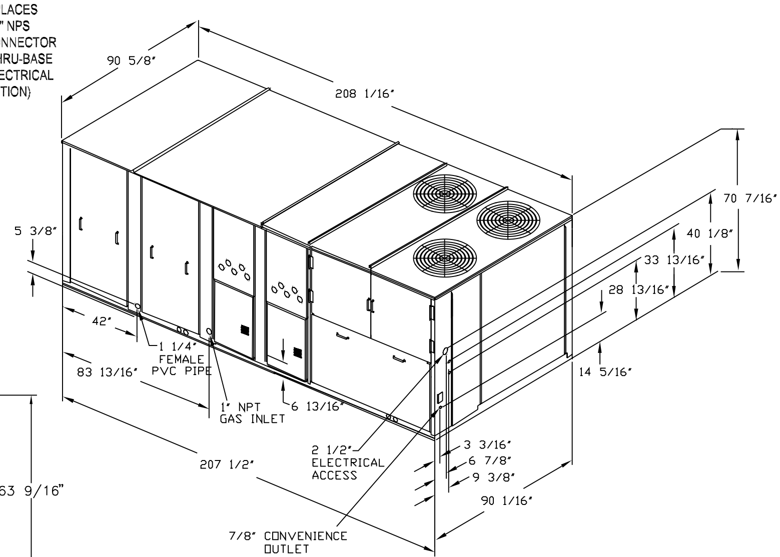
Dimensional Data

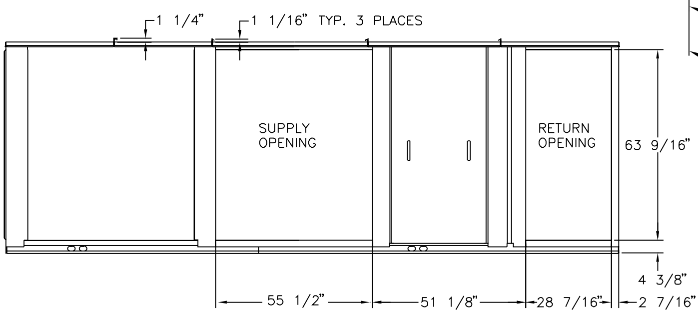
Figure 32-1 — 27.5-35 Tons (YC High Heat)



TOP VIEW SHOWING DUCT OPENINGS
IN BASE FOR DOWNFLOW CONFIGURATION

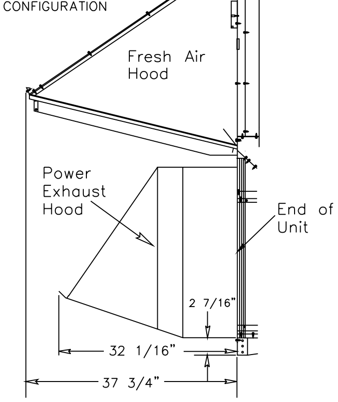
NOTES:
1. ALL DIMENSIONS INCHES.
2. THRU-BASE ELECTRICAL LOCATIONS ARE PRESENT ONLY WHEN OPTION IS ORDERED.

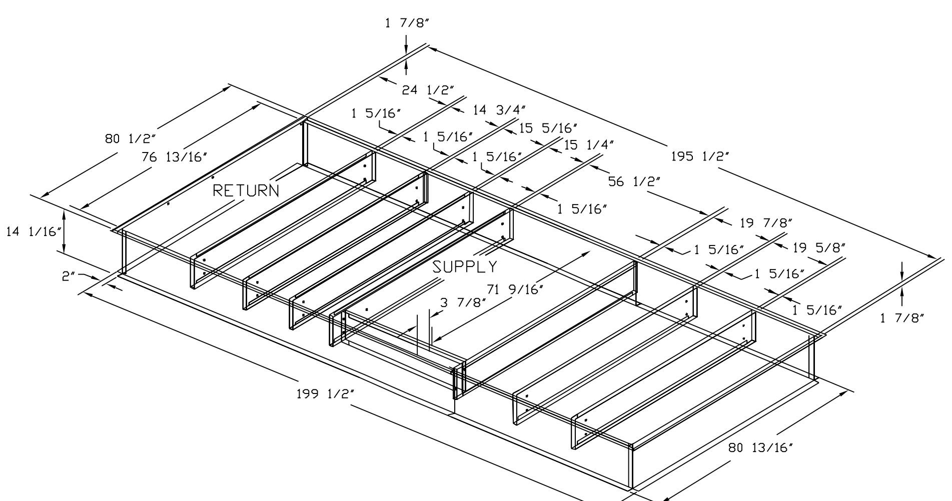




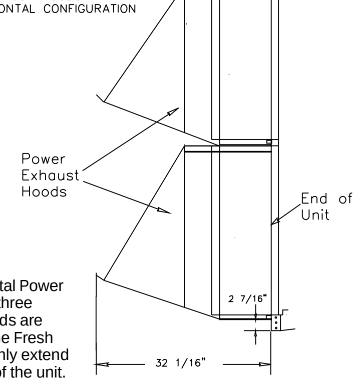
REAR VIEW DUCT OPENINGS
FOR HORIZONTAL UNIT

SIDE VIEW SHOWING
FRESH AIR AND
POWER EXHAUST HOODS
FOR DOWNFLOW CONFIGURATION





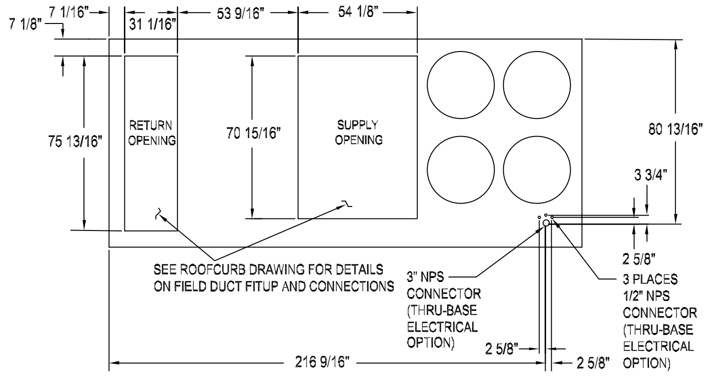
SIDE VIEW SHOWING
POWER EXHAUST HOODS
FOR HORIZONTAL CONFIGURATION



NOTE: The Two Horizontal Power Exhaust Hoods and the three Horizontal Fresh Air Hoods are located side by side. The Fresh Air Hoods (not shown) only extend 23 15/16" from the end of the unit.

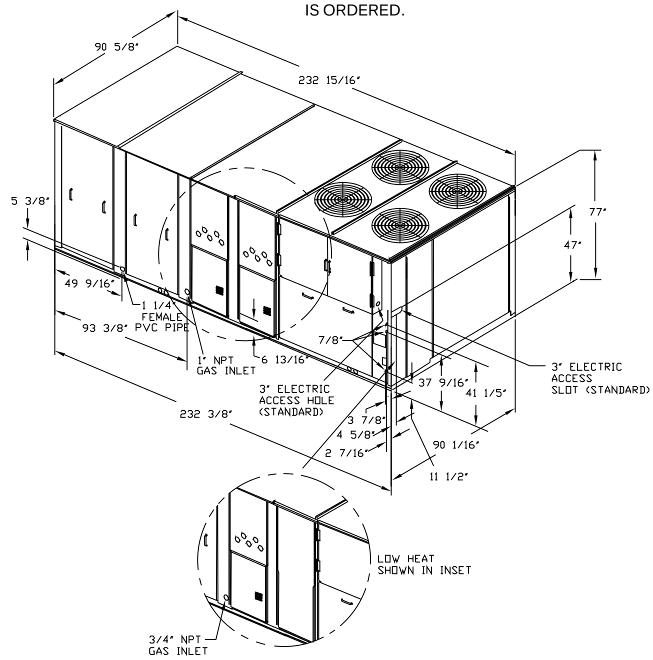
Dimensional Data

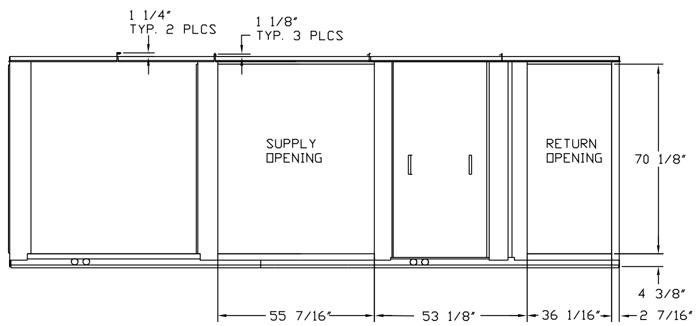
Figure 33-1 — 40-50 Tons (TC, TE, YC Low & High Heat)



TOP VIEW SHOWING DUCT OPENINGS IN BASE FOR DOWNFLOW CONFIGURATION

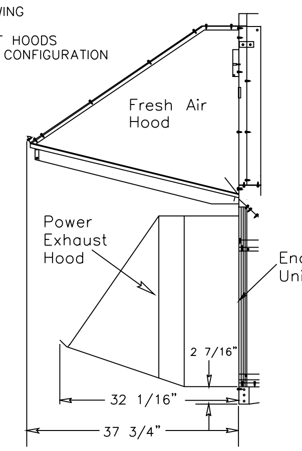
NOTES:
1. ALL DIMENSIONS INCHES.
2. THRU-BASE ELECTRICAL LOCATIONS ARE PRESENT ONLY WHEN OPTION IS ORDERED.

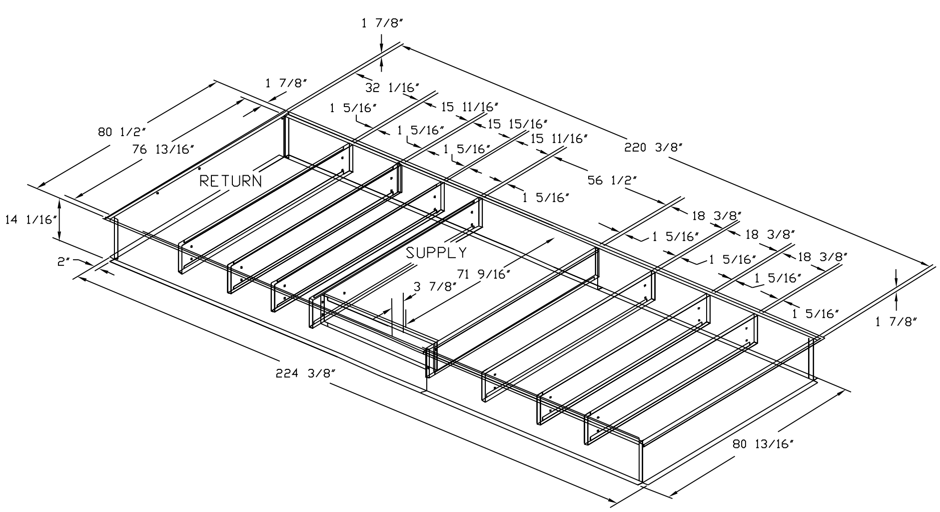




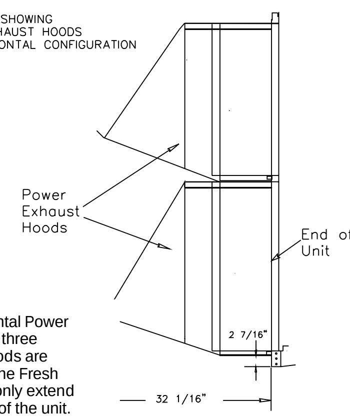
REAR VIEW SHOWING DUCT OPENINGS FOR HORIZONTAL UNIT

SIDE VIEW SHOWING FRESH AIR AND POWER EXHAUST HOODS FOR DOWNFLOW CONFIGURATION





SIDE VIEW SHOWING POWER EXHAUST HOODS FOR HORIZONTAL CONFIGURATION



NOTE: The Two Horizontal Power Exhaust Hoods and the three Horizontal Fresh Air Hoods are located side by side. The Fresh Air Hoods (not shown) only extend 23 15/16" from the end of the unit.

Table 34-1 — Approximate Operating Weights — Lbs.[2]

Unit Model	Basic Unit Weights (1) YC Low Heat	YC High Heat	TC	TE
****D330**	3650	4012	3520	3553
****H330**	3650	4077	3565	3598
****D360**	3730	4092	3600	3633
****H360**	3730	4142	3600	3633
****D420**	3815	4177	3685	3718
****H420**	3815	4227	3685	3718
****D480**	4665	4785	4440	4475
****H480**	4690	4815	4440	4475
****D600**	4835	4955	4610	4645
****H600**	4860	4985	4610	4645

Notes:
1. Basic unit weight includes minimum HP Supply Fan motor.
2. Optional high static and high efficiency motor weights are in addition to the standard motor weight included in the basic unit weight.

Table 34-2 — Point Loading Percentage of Total Unit Weight[1]

POINT LOADING - % OF TOTAL UNIT WEIGHT					
A	B	C	D	E	F
21	23	12	16	17	12

1. Point Loading is identified with corner A being the corner with the compressors. As you move clockwise around the unit as viewed from the top, mid-point B, corner C, corner D, mid-point E and corner F.

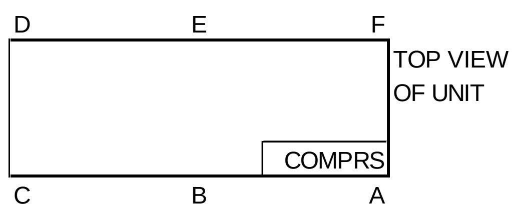


Table 34-3 — Component Weights

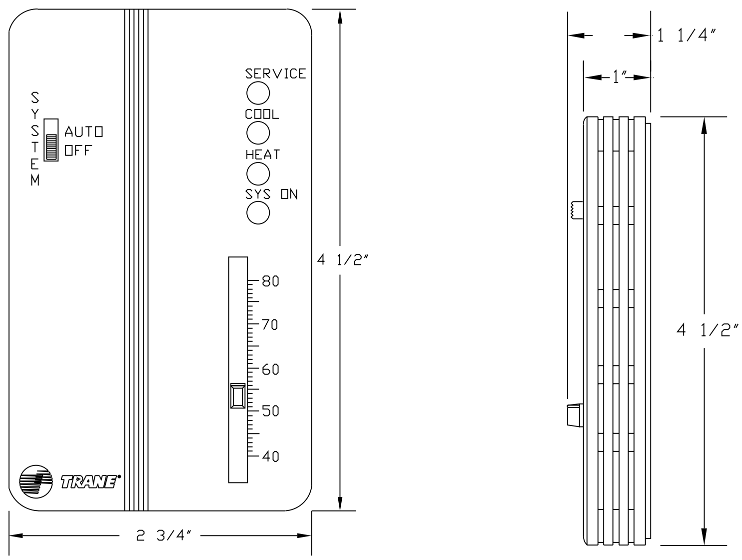
Unit Model	Barometric Relief	Power Exhaust	Hi-Static/ Hi-Eff Supply Fan Motors (2)	0-25% Manual Damper	Econo	Inlet Guide Vanes	Variable Frequency Drives (VFD's) W/O Bypass	Variable Frequency Drives (VFD's) With Bypass	Service Valves	Thru-the Base Electric	Non-Fused Disconnect Switch	Factory GFI with Disconnect Switch	Roof Curb Weights Lo	Roof Curb Weights Hi
**D330	110	165	120	50	260	55	85	115	11	6	30	85	310	330
**H330	145	200	120	50	285	55	85	115	11	6	30	85	310	330
**D360	110	165	120	50	260	55	85	115	11	6	30	85	310	330
**H360	145	200	120	50	285	55	85	115	11	6	30	85	310	330
**D420	110	165	120	50	260	55	115	150	11	6	30	85	310	330
**H420	145	200	120	50	285	55	115	150	11	6	30	85	310	330
**D480	110	165	125	50	290	70	115	150	18	6	30	85	365	
**H480	145	200	125	50	300	70	115	150	18	6	30	85	365	
**D600	110	165	125	50	290	70	115	150	18	6	30	85	365	
**H600	145	200	125	50	300	70	115	150	18	6	30	85	365	

Table 34-4 — Minimum Operating Clearances for Unit Installation

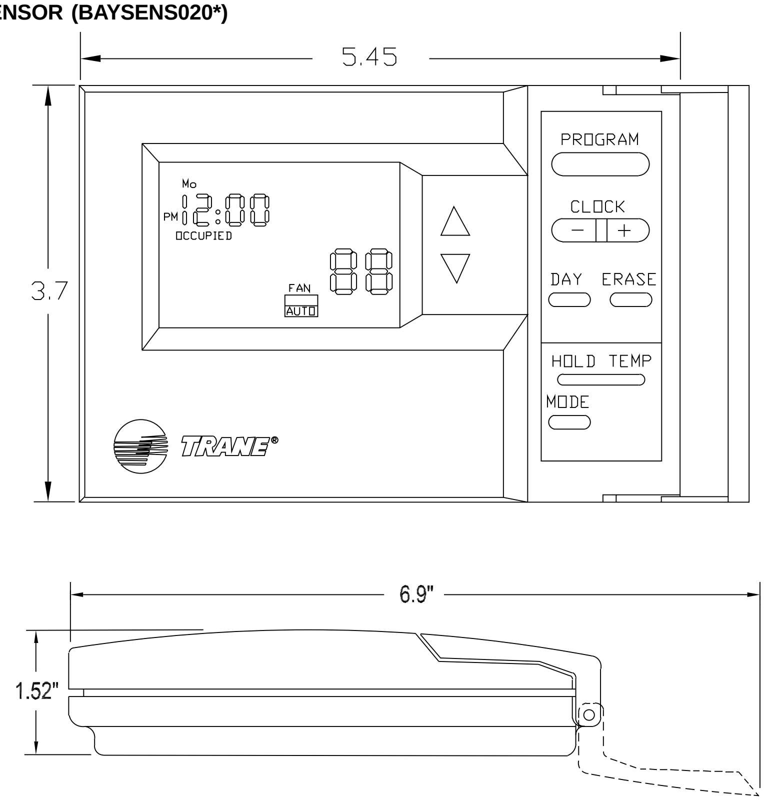
	Econo/Exhaust End	Condenser Coil[2] End / Side	Service Side Access
Single Unit[1]	6 Feet	8 Feet / 4 Feet	4 Feet
Multiple Unit[1,3]	12 Feet	16 Feet / 8 Feet	8 Feet

Notes:
1. Horizontal and Downflow Units, all sizes.
2. Condenser coil is located at the end and side of the unit.
3. Clearances on multiple unit installations are distances between units.

SINGLE SETPOINT SENSOR WITH SYSTEM FUNCTION LIGHTS (BAYSENS021*)



PROGRAMMABLE NIGHT-SETBACK SENSOR (BAYSENS020*)

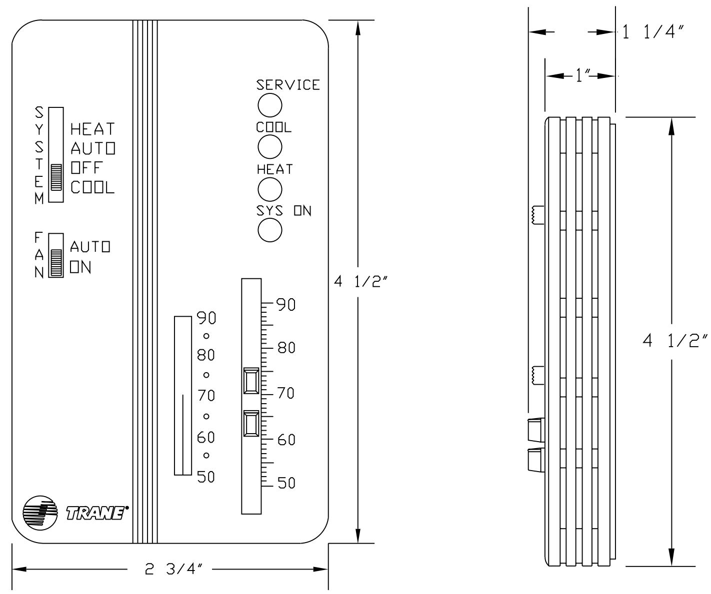


NOTE: Remote sensors are available for use with all zone sensors to provide remote sensing capabilities.

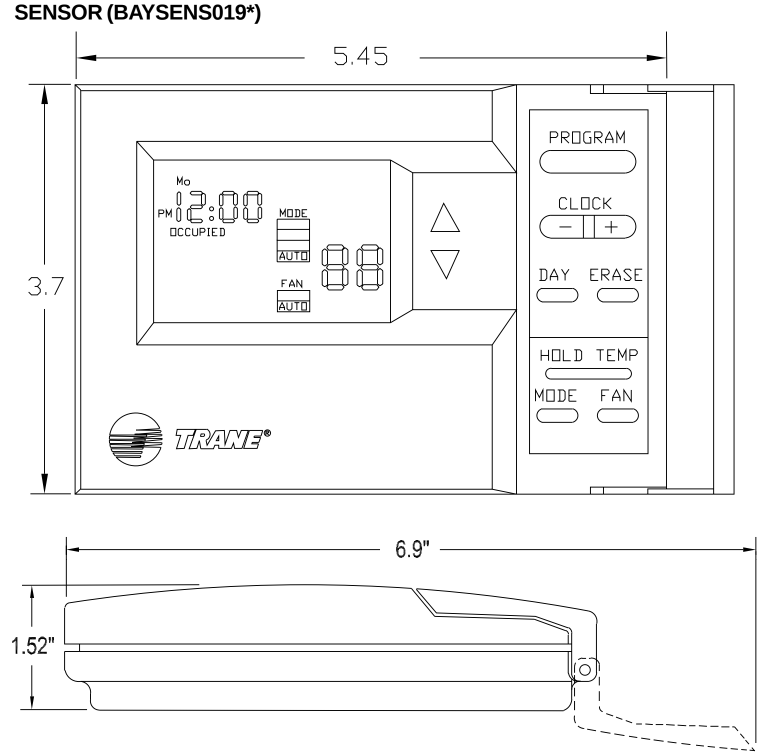
DUAL SETPOINT, MANUAL/AUTOMATIC CHANGEOVER SENSOR WITH SYSTEM FUNCTION LIGHTS (BAYSENS010*)

WITHOUT LED STATUS INDICATORS (BAYSENS008*)

SINGLE SETPOINT WITHOUT LED STATUS INDICATORS (BAYSENS006*)



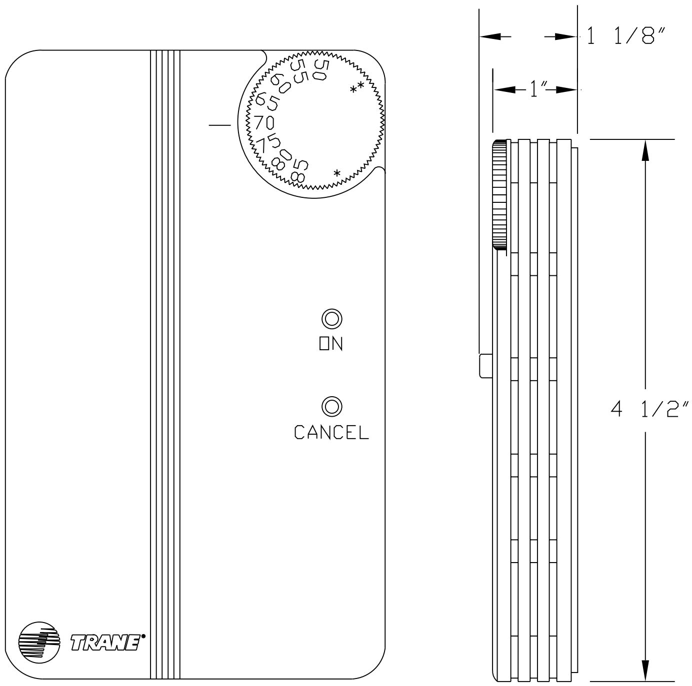
PROGRAMMABLE NIGHT-SETBACK SENSOR (BAYSENS019*)



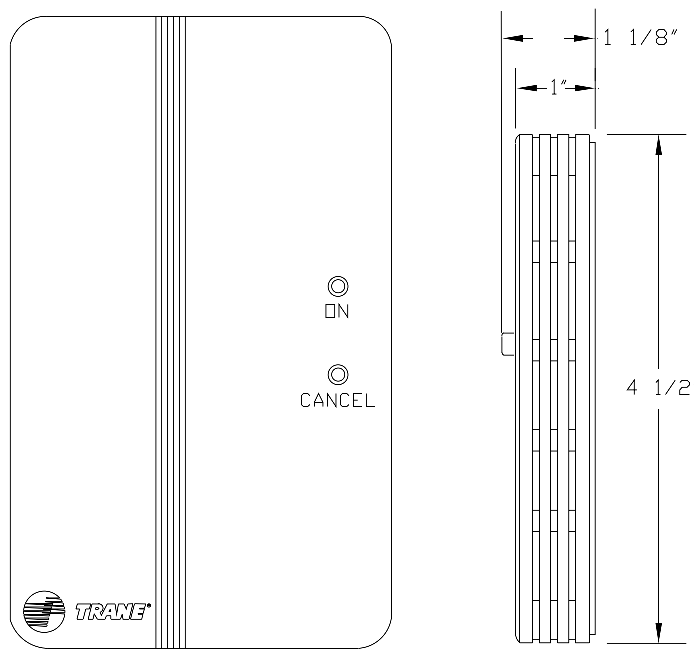
NOTE: Remote sensors are available for use with all zone sensors to provide remote sensing capabilities.

Integrated Comfort™ System Sensors

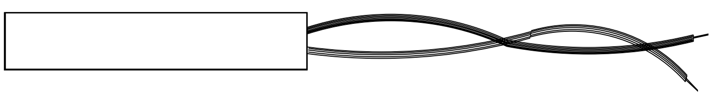
ZONE TEMPERATURE SENSOR W/TIMED OVERRIDE BUTTON AND LOCAL SETPOINT ADJUSTMENT (BAYSENS014*)



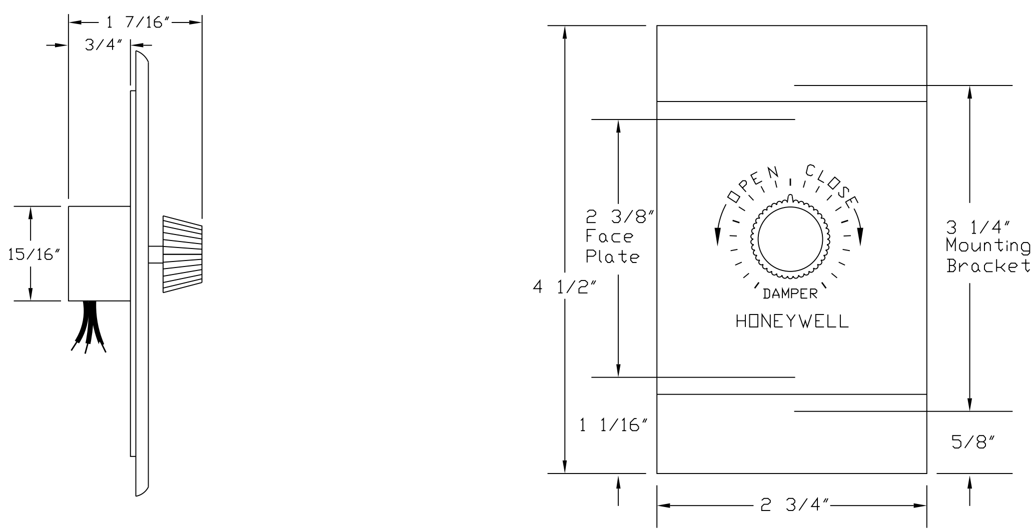
ZONE TEMPERATURE SENSOR W/TIMED OVERRIDE BUTTONS (BAYSENS013*) ALSO AVAILABLE SENSOR ONLY (BAYSENS017*)



TEMPERATURE SENSOR (BAYSENS016*)



REMOTE MINIMUM POSITION POTENTIOMETER CONTROL (BAYSTAT023)



NOTE: Remote sensors are available for use with all zone sensors to provide remote sensing capabilities.

Mechanical Specifications

General
The units shall be dedicated downflow or horizontal airflow. The operating range shall be between 115 F and 0 F in cooling as standard from the factory for all units. Cooling performance shall be rated in accordance with ARI testing procedures. All units shall be factory assembled, internally wired, fully charged with HCFC-22 and 100% run tested to check cooling operation, fan and blower rotation and control sequence before leaving the factory. Wiring internal to the unit shall be numbered for simplified identification. Units shall be UL listed and labeled, classified in accordance to UL 1995/ CAN/CSA No. 236-M90 for Central Cooling Air Conditioners. Canadian units shall be CSA Certified.

Casing
Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. All components shall be mounted in a weather resistant steel cabinet with a painted exterior. Where top cover seams exist, they shall be double hemmed and gasket sealed to prevent water leakage. Cabinet construction shall allow for all maintenance on one side of the unit. Service panels shall have handles and shall be removable while providing a water and air tight seal. Control box access shall be hinged. The indoor air section shall be completely insulated with fire resistant, permanent, odorless glass fiber material. The base of the unit shall have provisions for crane lifting.

Filters
Two inch, throwaway filters shall be standard on all size units. Two inch “high efficiency”, and four inch “high efficiency” filters shall be optional.

Compressors
Trane 3-D® Scroll compressors have simple mechanical design with only three major moving parts. Scroll type compression provides inherently low vibration. The 3-D Scroll provides a completely enclosed compression chamber which leads to increased efficiency. Exhaustive testing on the 3-D Scroll, including start up with the shell full of liquid, has proven that slugging does not fail involutes. Direct-drive, 3600 rpm, suction gas-cooled hermetic motor. Trane 3-D Scroll compressor includes centrifugal oil pump, oil level sightglass and oil charging valve.

Refrigerant Circuits
Each refrigerant circuit shall have independent thermostatic expansion devices, service pressure ports and refrigerant line filter driers factory-installed as standard. An area shall be provided for replacement suction line driers.

Evaporator and Condenser Coils
Condenser coils shall have 3/8” copper tubes mechanically bonded to lanced aluminum plate fins. Evaporator coils shall be 1/2” internally finned copper tubes mechanically bonded to high performance aluminum plate fins. All coils shall be leak tested at the factory to ensure pressure integrity. All coils shall be leak tested to 200 psig and pressure tested to 450 psig. All dual circuit evaporator coils shall be of intermingled configuration.

Outdoor Fans
The outdoor fan shall be direct-drive, statically and dynamically balanced, draw through in the vertical discharge position. The fan motor(s) shall be permanently lubricated and have built-in thermal overload protection.

Indoor Fan
Units shall have belt driven, FC, centrifugal fans with fixed motor sheaves. All motors shall be circuit breaker protected. All indoor fan motors meet the U.S. Energy Policy Act of 1992 (EPACT).

Electric Heaters
Electric heat shall be available for factory installation within basic unit. Electric heater elements shall be constructed of heavy-duty nickel chromium elements internally delta connected for 240 volt, wye connected for 480 and 600 volt. Staging shall be achieved through the unitary control processor (UCP). Each heater package shall have automatically reset high limit control operating through heating element contactors. All heaters shall be individually fused from factory, where required, and meet all NEC and CEC requirements. Power assemblies shall provide single-point connection. Electric heat shall be UL listed or CSA certified.

Gas Heating Section
The heating section shall have a drum and tube heat exchanger(s) design using corrosion resistant steel components. A forced combustion blower shall supply premixed fuel to a single burner ignited by a pilotless hot surface ignition system. In order to provide reliable operation, a negative pressure gas valve shall be used that requires blower operation to initiate gas flow. On an initial call for heat, the combustion blower shall purge the heat exchanger(s) 45 seconds before ignition. After three unsuccessful ignition attempts, the entire heating system shall be locked out until manually reset at the thermostat. Units shall be suitable for use with natural gas or propane (field installed kit) and also comply with California requirements for low NOx emissions. All units shall have two stage heating.

Controls
Unit shall be completely factory wired with necessary controls and terminal block for power wiring. Units shall provide an external location for mounting fused disconnect device. Microprocessor controls shall be provided for all 24 volt control functions. The resident control algorithms shall make all heating, cooling and/or ventilating decisions in response to electronic signals from sensors measuring indoor and outdoor temperatures. The control algorithm maintains accurate temperature control, minimizes drift from set point and provides better building comfort. A centralized microprocessor shall provide anti-short cycle timing and time delay between compressors to provide a higher level of machine protection.

Control Options
Inlet Guide Vanes shall be installed on each fan inlet to regulate capacity and limit horsepower at lower system requirements. When in any position other than full open they shall pre-spin intake air in the same direction as fan rotation. The inlet guide vanes shall close when supply fan is off, except in night setback.

The inlet guide vane actuator motor shall be driven by a modulating dc signal from the unit microprocessor. A pressure transducer shall measure duct static pressure and modulate the inlet guide vanes to maintain the required supply air static pressure within a predetermined range.

Variable Frequency Drives (VFDs) shall be factory installed and tested to provide supply fan motor speed modulation. The VFD shall receive a 2-10 VDC signal from the unit microprocessor based upon supply static pressure and shall cause the drive to accelerate or decelerate as required to maintain the supply static pressure setpoint. When subjected to high ambient return conditions the VFD shall reduce its output frequency to maintain operation. Bypass control to provide full nominal air flow in the event of drive failure shall be optional.

Ventilation Override shall allow a binary input from the fire/life safety panel to cause the unit to override standard operation and assume one of two factory preset ventilation sequences, exhaust or pressurization. The two sequences shall be selectable based open a binary select input.

Outside Air

Manual Outside Air
A manually controllable outside air damper shall be adjustable for up to 25 percent outside air. Manual damper is set at desired position at unit start up.

Economizer shall be factory installed. The assembly includes: fully modulating 0-100 percent motor and dampers, minimum position setting, preset linkage, wiring harness, and fixed dry bulb control. Solid state enthalpy and differential enthalpy control shall be a factory or field installed option.

Exhaust Air

Barometric Relief
The barometric relief damper shall be optional with the economizer. Option shall provide a pressure operated damper for the purpose of space pressure equalization and be gravity closing to prohibit entrance of outside air during the equipment “off” cycle.

Power Exhaust Fan
Power exhaust shall be available on all units and shall be factory installed. It shall assist the barometric relief damper in maintaining building pressurization.

Unit Options

Service Valves
Service valves shall be provided factory installed and include suction, liquid, and discharge 3-way shutoff valves.

Through-The-Base Electrical Provision
An electrical service entrance shall be provided which allows access to route all high and low voltage electrical wiring inside the curb, through the bottom of the outdoor section of the unit and into the control box area.

Non-Fused Disconnect Switch
A factory installed non-fused disconnect switch with external handle shall be provided and shall satisfy NEC requirements for a service disconnect. The non-fused disconnect shall be mounted inside the unit control box.

GFI Convenience Outlet (Factory Powered)
A 15A, 115V Ground Fault Interrupter convenience outlet shall be factory installed. It shall be wired and powered from a factory mounted transformer. Unit mounted non-fused disconnect with external handle shall be furnished with factory powered outlet.

GFI Convenience Outlet (Field Powered)
A 15A, 115V Ground Fault Interrupter convenience outlet shall be factory installed and shall be powered by customer provided 115V circuit.

Hinged Service Access
Filter access panel and supply fan access panel shall be hinged for ease of unit service.

Condenser Coil Guards
Factory installed condenser vinyl coated wire mesh coil guards shall be available to provide full area protection against debris and vandalism.

Accessories

Roof Curb
The roof curb shall be designed to mate with the unit and provide support and a water tight installation when installed properly. The roof curb design shall allow field-fabricated rectangular supply/return ductwork to be connected directly to the curb when used with downflow units. Curb design shall comply with NRCA requirements. Curb shall ship knocked down for field assembly and include wood nailer strips.

Trane Communication Interface (TCI)
Shall be provided to interface with the Trane Integrated Comfort™ System and shall be available factory installed. The TCI shall allow control and monitoring of the rooftop unit via a two-wire communication link.

The following alarm and diagnostic information shall be available:

UCP Originated Data
- Unit operating mode
- Unit failure status
  - Cooling failure
  - Heating failure
  - Emergency service stop indication
  - Supply fan proving
  - Timed override activation
  - High temperature thermostat status
- Zone temperature
- Supply air temperature
- Cooling status (all stages)
- Stage activated or not
- Stage locked out by UCP
- HPC status for that stage
- Compressor disable inputs
- Heating status
- Number of stages activated
- High temperature limit status
- Economizer status
- Enthalpy favorability status
- Requested minimum position
- Damper position
- Dry bulb/enthalpy input status
- Outside air temperature
- Outside relative humidity
- Sensor Failure
  - Humidity sensor
  - OAT sensor
  - SAT sensor
  - RAT sensor
  - Zone temperature sensor
  - Mode input
  - Cooling/heating setpoints from sensors
  - Static pressure transducer
  - Unit mounted potentiometer
  - SAT from potentiometer
  - Air reset setpoint from potentiometer
- Unit Configuration data
  - Gas or electric heat
  - Economizer present
- High temp input status
- Local setpoint
- Local mode setting
- Inlet Guide Vane position

Tracer Originated Data
- Command operating mode
- Host controllable functions:
  - Supply fan
  - Economizer
  - Cooling stages enabled
  - Heating stages enabled
  - Emergency shutdown
- Minimum damper position
- Heating setpoint
- Cooling setpoint
- Supply air tempering enable/disable
- Slave mode (CV only)
- Tracer/Local operation
- SAT setpoint
- Reset setpoint
- Reset amount
- MWU setpoint
- MWU enable/disable
- SAT Reset type select
- Static pressure setpoint
- Static pressure deadband
- Daytime warm-up enable/disable
- Power exhaust setpoint

Mechanical Specifications

Zone Sensors
Shall be provided to interface with the Micro unit controls and shall be available in either manual, automatic programmable with night setback, with system malfunction lights or remote sensor options.

Conventional Thermostat Interface (CTI)
This field installed circuit board shall provide interface with electromechanical thermostats or automation systems. Not available with VAV system control.

Differential Pressure Switches
This field installed option allows dirty filter indication. The dirty filter switch will light the Service LED on the zone sensor and will allow continued unit operation.

Electronic Time Clock
This field installed accessory allows up to 4 units night set-back and unoccupied functions when using a standard (Dual Setpoint) zone sensor module.

Remote Potentiometer
A remote potentiometer shall be available to remotely adjust the unit economizer minimum position.

High Temperature Thermostats
Field installed, manually resettable high temperature thermostats shall provide input to the unit controls to shut down the system if the temperature sensed at the return is 135 F or at the discharge 240 F.

Reference Enthalpy Kit
Field installed enthalpy kit shall provide inputs for economizer control based upon comparison of the outside air stream to a definable enthalpy reference point. May also be factory installed.

Comparative Enthalpy Kit
Field installed enthalpy kit shall provide inputs for economizer control based upon comparison of the enthalpies of the return and outdoor air streams. Also available factory installed.

LP Conversion Kit
Field installed conversion kit shall provide orifice(s) for simplified conversion to liquefied propane gas. No change of gas valve shall be required.

BAYSENS006* — Zone Sensor has one temperature setpoint lever, heat, off or cool system switch, fan auto or fan on switch. Manual changeover. These sensors are for CV units only.

BAYSENS008* — Zone Sensor has two temperature setpoint levers, heat, auto, off, or cool system switch, fan auto or fan on switch. Auto changeover. These sensors are used with CV units.

BAYSENS010* — Zone Sensor has two temperature set point levers, heat, auto, off, or cool system switch, fan auto or fan on switch. Status indication LED lights, System on, Heat, Cool, and Service are provided. These sensors are used with CV units.

BAYSENS013* — Zone temperature sensor with timed override buttons used with Tracer® Integrated Comfort system.

BAYSENS014* — Zone temperature sensor with local temperature adjustment control and timed override buttons used with Tracer Integrated Comfort system. May also be used for Morning Warm-up setpoint and sensor.

BAYSENS016* — Temperature Sensor is a bullet or pencil type sensor that could be used for temperature input such as return air duct temperature.

BAYSENS017* — Remote Sensor can be used for remote zone temperature sensing capabilities when zone sensors are used as remote panels or as a morning warm-up sensor for use with VAV units or as a zone sensor with Tracer Integrated Comfort system.

BAYSENS019* & BAYSENS020* — Electronic programmable sensors with auto or manual changeover with seven day programming. Keyboard selection of heat, cool, auto fan or on. All programmable sensors have System on, Heat, Cool, Service LED/LCD indicators as standard. Night setback sensors have two occupied, and two unoccupied programs per day. Sensors are available for CV zone temperature control and VAV zone temperature control.

BAYSENS021* — Zone Sensor with supply air single temperature setpoint and AUTO/OFF system switch. Status indication LED lights, System ON, Heat, Cool, and Service are provided. Sensors are available to be used with VAV units.

BAYSTAT023* — Remote Minimum Position Potentiometer is used to remotely specify the minimum economizer position.

The Trane Company
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Clarksville, TN 37040
http://www.trane.com

An American Standard Company

Library	**Product Literature**
Product Section	**Unitary**
Product	**Rooftop**
Model	**000**
Literature Type	**Data Sales Catalog**
Sequence	**9**
Date	**May 1998**
File No.	**PL-UN-RT-000-DS-9-598**
Supersedes	**February 1997**
Ordering No.	**RT-DS-9**