Product Catalog

Large Commercial Split System

Model RAUP - TTV
200 - 620 MBH
5000 - 21000 CFM
50 Hz

RAUP - TTV
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Model Number Description (RAUP - TTV)

Unit Model Number Description

The product is identified by a multiple-character model number that precisely identifies a particular type of unit. An explanation is shown below. It will enable the owner or Service Engineer to define operation, components and applicable accessories for a specific unit.

Standard Product Model Nomenclature

R	A	U	P	2	5	0	D	1	A	X	A	S	0	A
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

DIGIT 1,2,3 Remote Condensing Unit / Air-Cooled / Up-Flow

DIGIT 4 Development Sequence

DIGIT 5,6,7 Nominal Cooling Capacity [MBH]

250 = 250	400 = 400	600 = 600
300 = 300	500 = 500	

DIGIT 8 Electrical Rating / Utilization Range
D = 380-415V / 3Phase / 50Hz

DIGIT 9 Factory Mounted Control

1 = DOL Starter with Unitary Controller, UC-2C / UC-4C
2 = Soft Starter (for Compressor Only) with UC-2C / UC-4C
3 = DOL Starter with EX2 (only available with Low Ambient Kit)

DIGIT 10 Minor Design Sequence
C = Modular RAUP Design

DIGIT 11 Factory Installed Options
X = None
1 = Corrosion Resistant Fin

DIGIT 12 Refrigerant Type
A = R22
B = R407C

DIGIT 13 Operating Ambient
S = Standard Design
H = High Ambient Option
L = Low Ambient Kit

DIGIT 14 Future Use

DIGIT 15 Service Indicator

T	T	V	2	5	0	Q	D	1	D	0	0	0	A	A
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

DIGIT 1,2 Indoor Unit / Cooling Only

DIGIT 3 Air Flow Configuration
V = Vertical, [Models 250 - 600 Only]

DIGIT 4,5,6 Nominal Cooling Capacity [MBH]

250 = 250	400 = 400	600 = 600
300 = 300	500 = 500	

DIGIT 7 Development Sequence

DIGIT 8 Electrical Rating / Utilization Range
D = 380-415V / 3 Phase / 50Hz

DIGIT 9 Factory Mounted Control
1 = DOL Starter (4 Wire)

DIGIT 10 Installed Motor kW

MTR, kW	TTV Models
I = 3.7	TTV 250
K = 5.5	TTV 300/400
L = 7.5	TTV 500
M = 11	TTV 600

DIGIT 11 Future Use
DIGIT 12 Future Use
DIGIT 13 Future Use

DIGIT 14 Minor Design Sequence

DIGIT 15 Service Indicator

General Data 200-620 MBH Condensing Units

General Data 20-55 Ton Condensing Units

		RAUP 250	RAUP 300	RAUP 400	RAUP 500	RAUP 600
Performances (1)						
Gross Cooling Capacity [R22](1)	(kW)/(MBH)	73.9/253	90.3/308	113.9/389	147.9/505	180.5/617
Gross Cooling Capacity [R407C]	(kW)/(MBH)	70.2/240	85.8/293	108.2/370	140.5/480	171.5/586
Unit Capacity Steps (%)		100-50	100-50	100-75-50-25	100-75-50-25	100-75-50-25
Total Compressor Power Input (1)	(kW)	25.2	26.8	36.2	50.4	53.6
Main Power Supply		400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
Utilization Range				400V +.- 10%		
Sound Power Level	(dB(A)	87	89	89	90	92
Compressor						
Number		2	2	4	4	4
Type				Hermetic Scroll		
Model		2x13T	2 x15T	2x(10T+10T)	2 x (13T+13T)	2 x (15T+15T)
Speeds Number				1		
Motors Number				1		
Unit MCA Amps (4)	(A)	55	59	93	104	107
RLA / LRA (2)	(A)	22.9/135	24.2/175	20.7/130	22.9/135	24.2/175
Motor RPM	(rpm)			2900		
Sump Heater (Optional) per compressor	(W)	65W - 240V	75W - 240V	65W - 240V	65W - 240V	75W - 240V
Liquid and Suction connection						
Suction Connection	brazed	2 1/8”	2 1/8”	1 5/8”	2 1/8”	2 1/8”
Liquid Connection	brazed	7/8”	7/8”	7/8”	7/8”	7/8”
Coil						
Type				Plate Fin		
Tube Size	(mm)			9.52		
Tube Type				Smooth		
Height	(mm)	1860	1860	1860	1860	1860
Length	(mm)	1782	1782	1782	1782	1782
Quantity		1	1	2	2	2
Face Area	(m2)	3.3	3.3	3.3	6.6	6.6
Rows		2+3	3	2	2+3	3
Fins Per Foot (fpf)		144	144	144	144	144
Fan						
Type				Propeller / Direct		
Number		2	2	4	4	4
Diameter	(mm)/(in)			711/28		
Drive Type				Direct		
Speeds Number				1		
Motors Quantity		2	2	4	4	4
Motors kW (2)	kw/hp			0.55/0.75		
FLA/LRA (2)	(A)			1.8/5.7		
Motor RPM	(rpm)			900		
Dimensions						
Height	(mm)	1911	1911	1911	1911	1911
Width	(mm)	1002	1002	1992	1992	1992
Length	(mm)	2264	2264	2264	2264	2264
Weight Uncrated	(kg)	583	593	990	1153	1177
Weight Crated	(kg)	603	613	1025	1188	1212
System Data						
Refrigerant Circuit		1	1	2	2	2
Refrigerant Charge (3)						
Approximate per circuit	(kg)	12.0	15.0	10.0	12.0	15.0
RAUP Only						

Notes

[1] at 7deg C SST and 35 deg C Ambient, 400V, Subcooling 8.3K, Superheat 11.1K
[2] Per Motor @ 400V
[3] Per Circuit
[4] Minimum Circuit Ampacity (MCA) is 125% of the largest compressor RLA plus 100% of the other compressor RLA plus the sum of the condenser fan FLA.
[5] High Ambient and Low Ambient Options Available.

General Data Indoor (Blower Coil) Units

General Data Indoor (Blower Coil) Units

		TTV 250	TTV 300	TTV 400	TTV 500	TTV 600
Evaporator Coil	Rows/FPF	3/144	3/144	3/144	4/144	4/144
Evaporator Rated Air Flow	Cfm	7760	9240	12120	15130	18080
	Cmh	13180	15700	20590	25700	30720
Configuration		Vertical with vertical fan discharge configurations				
Face Area	Sq. ft/m2	16.7/1.55	19.2/1.78	26.2/2.44	34.8/3.24	37.98/3.53
Tube Material		Copper				
Tube Type		Smooth Bore				
Tube Size (OD)	in/mm	3/8 / 9.5	3/8 / 9.5	3/8 / 9.5	0.5 / 12.7	0.5 / 12.7
No. Of Circuits		2	2	2	2	2
Refrigerant Flow Control		TXV				
Drain Connection Size	in	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Evaporator Fan/Motor						
Drive Type		Belt				
FLA/LRA (each) (2)		8/42	12/82	12/82	16/104	23/153
No of Motors	Std. HP(kw)	1-5(3.7kw)	1-7.5(5.5kW)	1-7.5(5.5kW)	1-10(7.5kw)	1-15(11kw)
	Hi Static	10(7.5)	15(11)	15(11)	20(15)	20(15)
Diameter of Fan	in/mm	15.7/400	15.7/400	15.4/390	17.7/450	17.7/450
Width of Fan	in/mm	12.6/320	12.6/320	15.4/390	14.2/360	14.2/360
No of Fans		1	1	2	2	2
Indoor Fan Type		Centrifugal FC				
Fan Pulley Pitch Diameter	in	7	10	11	13	13
Air Qty. - Max	cfm	8900	10600	13800	16700	21800
- Min	cfm	5900	7000	9100	11000	14400
Fan Motor Type		TEFC 400V/ 3P/ 50Hz				
Std. Fan Speed (Std. Factory Set)		828	870	923	725	780
@ ESP including filters in /Pa		1/250	1/250	1.2/300	1.2/300	1.2/300
Max. Allowable Fan RPM		1100	1100	1200	1000	1000
Motor Pulley Pitch Diameter	in	4	6	7	6.5	7.0
Filters						
Size	(Qty) in	(8) 16x20	(4) 15x20, (2) 16x20	(6) 16x25	(2) 16x20, (1) 20x25	(3) 20x20
Std. 1" Washable			(1) 16x25, (2) 15x25	(3) 20x25	(6) 16x25, (3) 25x25	(6) 20x25
Suction Line OD	in	2 1/8	1 5/8	2 1/8	2 1/8	2 1/8
Liquid Line OD	in	5/8	7/8	1 1/8	1 1/8	1 1/8
Approx. Operating Weight	lbs/kg	778/353	928/421	1073/487	1510/685	1651/749
Unit Dimensions	HxWxD mm	1219x1808x1040	1372x1808x1040	1520x2088x1040	1653x2596x1275	1777x2596x1275

Trane double walled Quantum Climate Changer Air Handlers are available for semi custom configurations and specialized indoor conditions.

System Performance Matrix

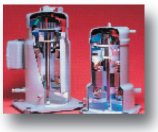
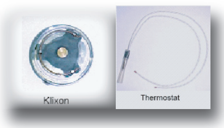
System Performance Matrix										
R22								Condenser Fan Motor	Indoor Fan Motor	Total Compressor Motor
MODEL		Evaporator Airflow		Total Capacity		Sensible Capacity				
Outdoor	Indoor	CFM	CMH	MBH	kW	MBH	kW	kW x Qty	kW	kW
RAUP 250	TTV 250	7760	13184	278	81	197	58	0.55 x 2	3.7	21
RAUP 300	TTV 300	9240	15699	333	98	237	69	0.55 x 2	5.5	25.2
RAUP 400	TTV 400	12120	20592	421	123	303	89	0.55 x 4	5.5	33.6
RAUP 500	TTV 500	15130	25706	541	159	395	116	0.55 x 4	7.5	42
RAUP 600	TTV 600	18080	30718	658	193	493	144	0.55 x 4	11	50.4

R 407C								Condenser Fan Motor	Indoor Fan Motor	Total Compressor Motor
MODEL		Evaporator Airflow		Total Capacity		Sensible Capacity				
Outdoor	Indoor	CFM	CMH	MBH	kW	MBH	kW	kW x Qty	kW	kW
RAUP 250	TTV 250	7760	13184	264	77	187	55	0.55 x 2	3.7	21
RAUP 300	TTV 300	9240	15699	316	93	225	66	0.55 x 2	5.5	25.2
RAUP 400	TTV 400	12120	20592	400	117	288	84	0.55 x 4	5.5	33.6
RAUP 500	TTV 500	15130	25706	514	151	375	110	0.55 x 4	7.5	42
RAUP 600	TTV 600	18080	30718	625	183	468	137	0.55 x 4	11	50.4

Capacities based on ambient temperature of 95 F [35 C]. Coil on coil temperature of 80 / 67 F [26 / 19 C] EDB/EWB.
Rated at 400V / 3P / 50Hz
Capacities are gross and do not include the evaporator fan motor heat deduction
Custom Matches & configuration are available with the Trane Quantum Climate Changer air handler.

Features Summary

Features Summary

Features	Benefits	
Scroll Compressors 	o Less vibration and a Quieter Operation o Durability / Extended Life Built in dirt saperator to prevent dirt reaching the bearings High volume oil sump prevents excessive oil loss. o Comprehensive Compressor Protection for added reliability. o Tandem Capability Achieves high part load efficiencies and additional part load control. o High emergy efficiency ratio and outstanding endurance	o Advanced & reliable refrigerant & oil management technology for large scroll compressors. o Low friction and high volumetric efficiency efficiency achieved by ensuring orbiting scrolls, orbit on an oil flim that minimizes friction & wear, and at the same time ensuring absolute radial tightness. Radial contact is minimized via opposing floating seals.
Smart Controls 	Simple but sophistacated control using microprocessor technology enables: * temperature setpoints and zone temperatures to be fed to the controller for optimized comfort cooling with minimum installation downtime. * Diagnose problems accurately and swiftly minimizing downtime. * Preprogrammed compressor sequencing	ensures maximum compressor protection against cycling. * Fully factory packaged starters enable the installer to power up, charge, pipe and run the system with minimum site electrical installation. * Special intergrated system level control using system level Trane ICS.
Safeties & Protection 	All condensing units come standard with: o Compressor overheat , overcurrent and phase loss protection . o High and low pressure safety switches to protect the system against operations outside recommended pressure limits.	o Reverse rotation protection on compressors through safeties that trip the system on high temperature. o Compressor time delays and on-off sequencing logic that is built into the microprocessor algorithm for maximum protection.
Robust Casing 	o Stainless Steel & Corossion Resistant Coated external bolts. o High efficiency Trane slit fin coils. o Weather resisant baked matt polyester powder painted GI panels. o Heavy gauge welded steel base with mounting holes.	o Corossion resistant coated coils as an option.
Modular Installation	o Modular designs allow for side by side installation to save valuable space.	o Small footprint saves valuable footprint and costly transportation.
Wide Application Envelope	o High and Low ambient options are available for wider operational envelops.	
Pre Matched Compact Air Handlers 	o Small foot print o Multiple fan arrangements. Vertical or horizontal discharge configurations. o Up to 2.5"[625Pa] ESP o Baked Polyester Powder Painted GI panels for an attractive long lasting finish.	o 25mm Alluminium foil faced fiberglass insulation. o Double Inlet Double Width Forward curved fans o Standard 25mm washable air filters. o Oversized motor options for higher static operation.
Custom Matched Quantum Climate Changer 	o Highly flexible double walled 25mm or 50 mm indoor or outdoor Quantum Climate Changer Air Handler (QCC) o 100% fresh air selections possible with the QCC.	o Suitable for back up cooling with chilled water systems.

* Some items are optional and not standard.

Quantum Climate Changer Capacity Chart

Quantum Climate Changer Capacity Chart

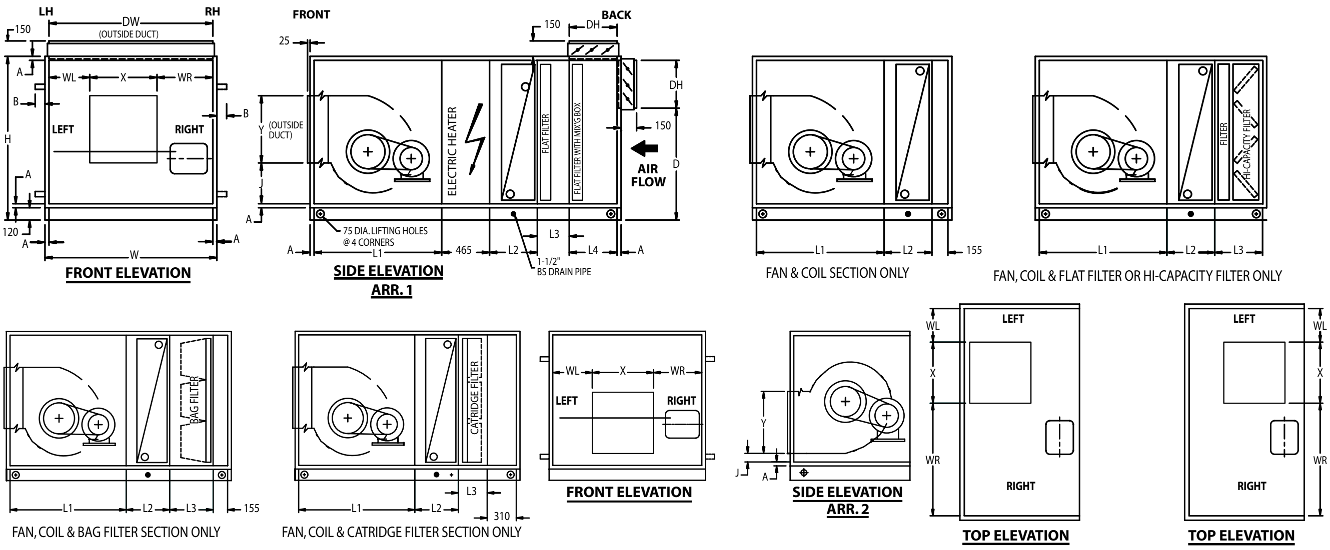
Model Size	Coil Face Area	Airflow At 2.5m/s Face Velocity	Cooling Capacity R22		Cooling Capacity R407C		External Static Pressure	Motor Installed Power
			Total	Sensible	Total	Sensible		
	m2	m3/s	kW	kW	kW	kW	Pa	kW
003	0.2	0.6	12	10	11.8	9	300	1.5
004	0.4	1.0	22	16	21	15	300	1.5
006	0.6	1.4	34	25	33	23	300	2.2
008	0.7	1.9	48	33	45	32	300	3
010	0.9	2.3	56	40	54	38	300	4
012	1.2	3.0	77	54	73	51	300	4
014	1.4	3.6	95	66	90	62	300	5.5
016	1.6	4.1	106	74	101	70	300	5.5
020	1.9	5.0	131	91	125	87	500	11
025	2.4	6.2	163	113	155	107	500	11
030	2.9	7.4	194	135	184	128	500	11
035	3.4	8.7	225	157	214	149	500	15
040	4.0	10.1	254	179	241	170	500	15
045	4.5	11.5	277	199	263	189	500	18.5
050	5.0	12.9	294	217	279	206	500	22
060	6.0	15.2	352	258	334	245	500	30
065	6.6	16.8	370	278	352	264	750	37
070	7.2	18.4	385	296	366	281	750	37
080	7.8	20.0	397	314	377	298	750	45
085	8.5	21.6	406	330	385	314	750	45
090	9.1	23.2	413	346	392	329	750	55
095	9.8	24.9	415	361	394	343	750	55

Note:

1. Cooling capacities are based on EDB 26.7 C /EWB 19.4 C and 7 deg C SST, 51.7 dec C Condensing Temp.
2. Cooling capacities reflected above are not based on a system match.
3. For actual custom system capacity with Trane condensing units, please refer to your local Trane representative.
4. Please refer to the dimensional chart belro for standard Trane Quantum Climate Changer dimensionsAll dimennsions.

Quantum Climate Changer Dimensional Chart

CLCP Dimensional Data Chart [HDT Configurations]

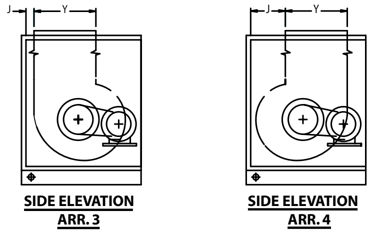


	LENGTH
CASING	**A**
25mm PANEL	39mm
50mm PANEL	64mm
HEADER	**B**
25mm PANEL	100mm
50mm PANEL	75mm

	LENGTH	
	003-025	**030-095**
COIL SECTION	**L2**	**L2**
1 & 2 ROW	310mm	310mm
4 ROW	310mm	465mm
6 ROW	465mm	465mm
8,10 & 12 ROW	620mm	620mm

(FD Coils Available on 4, 6 Row Only)

	LENGTH
FILTER SECTION	**L3**
FLAT FILTER	155mm
BAG FILTER 15" DEPTH	620mm
BAG FILTER 22" DEPTH	775mm
HI–CAPACITY 12" DEPTH	620mm
CARTRIDGE 4" DEPTH	310mm
CARTRIDGE 12" DEPTH	620mm



MODEL	MOTOR KW	FAN SECTION L1		FLAT FILTER WITH MIX SEC L4	25MM CASING			50MM CASING			DAMPER	
		ARR 1, 2	ARR 3, 4		H	W	D	H	W	D	DW	DH
003(0404)	0.18 - 3	775	775	310	818	698	469	868	748	494	620	310
	0.18 - 3											
004(0604)	0.37 - 3	775	775	310	818	1008	469	868	1058	494	930	310
	0.37 - 3											
006(0804)	0.55 - 7.5	930	930	310	818	1318	469	868	1368	494	1240	310
008(1004)	0.75 - 7.5	930	930	310	818	1628	469	868	1678	494	1550	310
010(0806)	1.1 - 7.5	930	930	465	1128	1318	624	1178	1368	649	1240	465
	11	1085	1240									
012(1006)	1.1 - 15	1085	1240	465	1128	1628	624	1178	1678	649	1550	465
014(1206)	1.5 - 15	1085	1240	465	1128	1938	624	1178	1988	649	1860	465
016(1008)	1.5 - 7.5	1085	1240	465	1438	1628	934	1488	1678	959	1550	465
	11 - 18.5	1395	1550									
020(1208)	2.2 - 7.5	1085	1240	465	1438	1938	934	1488	1988	959	1860	465
	11 - 18.5	1240	1395									
025(1210)	2.2 - 15	1240	1550	465	1748	1938	1244	1798	1988	1269	1860	465
	18.5 - 22	1550	1705									
030(1212)	3 - 15	1240	1550	620	2058	1938	1399	2108	1988	1424	1860	620
	18.5 - 30	1550	1705									
035(1412)	4 - 22	1395	1550	620	2058	2248	1399	2108	2298	1424	2170	620
	30 - 45	1550	1705									
040(1612)	4 - 22	1550	1705	620	2058	2558	1399	2108	2608	1424	2480	620
	30 - 45	1705	1860									
045(1812)	4 - 22	1550	1705	620	2058	2868	1399	2108	2918	1424	2790	620
	30 - 45	1705	1860									
050(2012)	5.5 - 22	1705	1860	620	2058	3178	1399	2108	3228	1424	2790	620
	30 - 45	1860	2015									
060(2014)	7.5 - 22	1705	1860	930	-	-	-	2418	3228	1424	2790	930
	30 - 45	1860	2015									
065(2214)	7.5 - 22	1860	1860	930	-	-	-	2418	3538	1424	2790	930
	30 - 75	2015	2015									
070(2412)	7.5 - 22	1860	1860	1085	-	-	-	2418	3848	1269	2790	1085
	30 - 75	2015	2015									
080(2614)	7.5 - 75	2015	2015	1085	-	-	-	2418	4158	1269	2790	1085
085(2814)	7.5 - 75	2015	2015	1240	-	-	-	2418	4468	1114	2790	1240
090(3014)	11 - 75	2015	2015	1240	-	-	-	2418	4778	1114	2790	1240
095(3214)	11 - 75	2015	2015	1240	-	-	-	2418	5088	1114	2790	1240

General Data Coils

Refrigerant Coil Circuits (1/2” Interwined Refrigerant Coil Circuiting)

Dimensions

Model Size	Coil Face Area		Actual Fin Height		Finned Length		Total Circ.	No. of Dist	Piping Ø		
									Liquid		Suction
	Ft^2	M^2	in	mm	in	mm			1/4”	3/16”	O.D.
003	2.5	0.23	21	533	17	432	16	1/1	28.6	22.2	41
004	4.3	0.40	21	533	29	737	16	1/1	28.6	22.2	41
006	6.1	0.56	21	533	41	1041	16	1/1	28.6	22.2	41
008	7.9	0.73	21	533	53	1346	16	1/1	28.6	22.2	41
010	9.7	0.90	34	864	41	1041	26	1/1	35	28.6	41
012	12.5	1.16	34	864	53	1346	26	1/1	35	28.6	41
014	15.3	1.42	34	864	65	1651	26	1/1	35	28.6	41
016	17.1	1.59	46	1168	53	1346	36	1/1/1/1	28.6	22.2	41
020	21.0	1.95	46	1168	65	1651	36	1/1/1/1	28.6	22.2	41
025	26.0	2.42	58	1473	65	1651	45	1/1/1/1	35	28.6	41
030	31.5	2.93	70	1778	65	1651	52	1/1/1/1	35	28.6	41
035	37.3	3.47	70	1778	77	1956	52	1/1/1/1	35	28.6	41
040	43.2	4.02	70	1778	89	2261	52	1/1/1/1	35	28.6	41
045	49.0	4.56	70	1778	101	2565	52	1/1/1/1	35	28.6	41
050	54.8	5.10	70	1778	113	2870	52	1/1/1/1	35	28.6	41
060	64.0	5.93	40	1016	113	2870	31	1/1/1/1	28.6	22.2	41
			41	1041	113	2870	32	1/1/1/1			
065	70.8	6.56	40	1016	125	3175	31	1/1/1/1	28.6	22.2	41
			41	1041	125	3175	32	1/1/1/1			
070	77.6	7.19	40	1016	137	3480	31	1/1/1/1	28.6	22.2	41
			41	1041	137	3480	32	1/1/1/1			
080	84.4	7.82	40	1016	149	3785	31	1/1/1/1	28.6	22.2	41
			41	1041	149	3785	32	1/1/1/1			
085	91.1	8.45	40	1016	161	4089	31	1/1/1/1	28.6	22.2	41
			41	1041	161	4089	32	1/1/1/1			
090	97.9	9.08	40	1016	173	4394	31	1/1/1/1	28.6	22.2	41
			41	1041	173	4394	32	1/1/1/1			
095	104.5	9.71	40	1016	185	4699	31	1/1/1/1	28.6	22.2	41
			41	1041	185	4699	32	1/1/1/1			

Note: * Evaporator coil distributor quantity

1 Will determine piping design of the system.

2 RAUP condensing units are not to be manifolded together, other than what has been pre designed on individual factory installed compressor manifolds.

General Data Coils

Refrigerant Coil Circuits (1/2” Standard Refrigerant Coil Circuiting)

Dimensions

Model Size	Coil Face Area		Actual Fin Height		Finned Length		Total Circ.	No. of Dist	Fin Height	Piping Ø		
										Liquid		Suction
	Ft^2	M^2	in	mm	in	mm				1/4”	3/16”	O.D.
003	2.5	0.23	21	533	17	432	8	1	–	28.6	22.2	41.2
004	4.3	0.40	21	533	29	737	8	1	–	28.6	22.2	41.2
006	6.1	0.56	21	533	41	1041	8	1	–	28.6	22.2	41.2
008	7.9	0.73	21	533	53	1346	8	1	–	28.6	22.2	41.2
010	9.7	0.90	34	864	41	1041	13	1	–	35	28.6	41.2
012	12.5	1.16	34	864	53	1346	13	1	–	35	28.6	41.2
014	15.3	1.42	34	864	65	1651	13	1	–	35	28.6	41.2
016	–	–	–	–	–	–	–	–	–	–	–	–
020	–	–	–	–	–	–	–	–	–	–	–	–
025	–	–	–	–	–	–	–	–	–	–	–	–
030	31.5	2.93	70	1778	65	1651	26	2	70	35	28.6	41.2
035	37.3	3.47	70	1778	77	1956	26	2	70	35	28.6	41.2
040	43.2	4.02	70	1778	89	2261	26	2	70	35	28.6	41.2
045	49.0	4.56	70	1778	101	2565	26	2	70	35	28.6	41.2
050	54.8	5.10	70	1778	113	2870	26	2	70	35	28.6	41.2
060	–	–	–	–	–	–	–	–	–	–	–	–
			–	–	–	–	–	–	–			
065	–	–	–	–	–	–	–	–	–	–	–	–
			–	–	–	–	–	–	–			
070	–	–	–	–	–	–	–	–	–	–	–	–
			–	–	–	–	–	–	–			
080	–	–	–	–	–	–	–	–	–	–	–	–
			–	–	–	–	–	–	–			
085	–	–	–	–	–	–	–	–	–	–	–	–
			–	–	–	–	–	–	–			
090	–	–	–	–	–	–	–	–	–	–	–	–
			–	–	–	–	–	–	–			
095	–	–	–	–	–	–	–	–	–	–	–	–
			–	–	–	–	–	–	–			

Note: * Evaporator coil distributor quantity
1 Will determine piping design of the system.
2 RAUP condensing units are not to be manifolded together, other than what has been pre designed on individual factory installed compressor manifolds.

Quantum Climate Changer Mechanical Specification

Casing

- Casing shall be pentapost perimeter frame with a modular system based on standardized ***double wall panels***.
- Casing strength shall be designed to meet ***European Standard EN 1886: 1998, Casing Strength Class 2A***.
- Casing air leakage rate shall meet ***Eurovent Casing Air Leakage Class B***.
- Panel shall be attached to the frame through a ***self-locking mechanism represented by a wedge and frame, exerting pressure evenly onto the panel and seal attached to the frame***, and hence a better air tight cabinet construction.
- ***Removal of any of the panels*** for any maintenance or repair works, must ***not affect the structural integrity of the unit***.
- There shall be ***no sharp edges or pointed corners*** on the casing exterior that might cause accident or injury.
- There shall be ***no exposed gaps*** between fixed panels and between fixed panels and frame, to minimize potential air leaks.
- The frame shall be made of ***extrued aluminum channels*** fitted together with ***non-mebl corner pieces***.
- The casing construction shall incorporate ***thermal break feature*** in the frame and panel design with ***Thermal Break Ratio, Tr higher than 0.75***.

Panel

- Panels shall be ***50mm thick with injected CFC-frae polyurethance foam insulation*** for a rigid non-vibrating construction.
- The panel construction shall incorporate ***thermal break between the inner and the outer wall***.
- The insulation shall be rot-resistant and shall ***not absorb moisture*** that will promote fungus growth and also cause it lose its insulating properties.
- The insulation material shall be ***totally enclosed in the panel*** to avoid any possibility of insulation being exposed to the air stream.
- The panel insulation material shall have a heat transfer ***"K" value of 0.02 w/mK***.
- The panels shall be ***flush mounted*** to the frames.
- The floor panels shall be ***double wall construction*** to allow maintenance personnel ***access without damage*** to the insulation.
- The outer wall shall be galva-nized steel ***painted with baked polyester powder*** paint that is resistant to nicks and scratch and allow for easy cleaning. The inner wall shall be galvanized stell.
- The paint shall be ***ultra violet resistant, weather resistant and shall not be affected by detergent cleaning***.

Access & Inspection Doors

- The door construction shall consist of a door panel that compresses evenly a durable rubber seal onto a rigid frame.
- ***Opening or closing*** of the door shall ***not affect the structural integrity of the unit***.
- The door shall be ***hinged and able to be lifted off or removed totally*** for easy access.
- Both ***door panel and frame design shall incorporate thermal break feature***.

Base Rail

- The whole unit shall be mounted on a ***galvanized steel base rail*** for ease of shipping and handling.
- The minimum height of the base shall be ***120mm*** to ensure proper air circulation and avoid entrapment of moisture below the unit.
- The base rail is to be ***used in lieu of concrete plinths*** or other additional bases that are used at site.

Fan Section

- Supply fan shall be ***certitied as per AMCA 210 and AMCA 300 Standards***.
- All Centrifugal fans shall be ***dynamically balanced at the factory as complete fan/motor/ drives assembly to ISO 1940***.
- The ***entire fan/motor/drives assembly*** shall be mounted on ***a common framework*** and ***isolated from the unit by Nbber-in-shear or spring isolators***. The fan discharge shall be ***isolated from the casing by a vibration absorbing or flexible duct***.
- Fan shall be ***double width, double inlet, multi blades*** type.
- Fan shall be equipped with bearings with an ***L-50 life of 200,000 hours***.
- Forward curved fan shall be made of ***galvanized steel blades***.
- Backward curved fan shall be made of ***treated and coated heavy gauge steel blades***.
- Fan shaft design shall ***not exceed the first critical speed at any cataloged rpm*** and equipped with ***self-aligning bearings***.

Motor and Drives

- Motors shall be ***totally enclosed fan-cooled with IP54 protection with class F insulation*** and suitable for operation at ambient temperature of 54 degree C.
- The motor mounting base design shall ***allow movement on three dimensions for ease of drives alignment and blet tensioning***.
- Drives shall be constant speed, fixed pitch sheaves, selected at 1.5 service factor.

Coil Section

- Coils performance shall be ***rated in***

Quantum Climate Changer Mechanical Specification

accordance with ARI Standard 410.

- Coil shall be ***fabricatad by the air handling manufacturer*** to maintain consistency in quality and reliability.
- Cooling coils shall be ***cartridge type mounted on steel channel*** for easy removal when required.
- Coil face velocity shall not exceed what is specified on the coil schedule.
- The number of fins provided should be the ***minimum needed to meet the performace reguirements to minimize the pressure drop*** across the coil. Coil casing shall be ***1.5 mm thick galvanized steel*** with drain holes in the bottom channels to ensure condensate drainage.
- Coil tubes shall be copper and ***mechanically expanded*** into aluminum plate fins. No soldering or tinning shall be used in the bonding process.
- The fins shall be ***sine-wave design with slits*** for better heat transfer efficiency and moisture carry-over limit performance.
- Coil shall be designed to ***maximize the utilization of the available unit cross-section area***.
- Coil shall be proof tested at 375 psig (26 bar) and leak tested at 250 psig (17 bar).
- ***Dual pitched sloping drain pan*** shall be installed under the coil to ensure total removal of condensate.
- The drain pan shall be ***1.0mm thick galvanized steel, coated with a mastic compound*** for corrosion protection.
- In case of stacked coils, an ***intermediate drain pan*** shall be installed between the coils to drain condensate to the main drain pan without flooding the lower coil and passing condensate through the air of the lower coil.

Filter Section

- The filter section shall be ***fabricated by the air handling manufacturer with the same casing construction as the unit***.
- Throwaway filters shall be 50mm thick, pleated media type. Filters shall be UL ***Class 2*** with ***dust spot efficiency of 25-30% in accordance to ASHRAE 52-1-1992 Test Standard***.
- Permanent filters shall be 50 mm thick, washable type. Filters shall be ***UL Class 2 with dust spot efficiency of 25-30% in accordance to ASHRAE 52-1-992 Test Standard***.
- Cartridge filters shall be 100mm thick and shall be ***UL Class 2*** with ***dust spot efficiency of 85% or above in accordance to ASHRAE 52-1-1992 Test Standard***.
- Bag filters shall be 380mm deep and shall be ***UL Class 2 with dust spot efficiency of 85% or above in accordance to ASHRAE 52-1-1992 Test Standard***.

Mixing Section

- The mixing section shall be ***fabricated by the air handling manufacturer with the same casing construction as the unit***.
- Damper shall be provided to modulate the volume of outside or return air. Damper shall be <u>***opposed blade type***</u> fitted into a casing of galvanized sheet steel.
- The ***maximum face velocity*** through the dampers shall ***not exceed 5.0 m/s (1000 feet per minute)*** to minimize pressure drop and generated noise.

Note : All underlined features are for 50mm casing design only.

Outdoor Unit Application Considerations

Certain application constraints should be considered when sizing, selecting and installing Trane air-cooled condensing units. Unit reliability is dependent upon these considerations. Where your application varies from the guidelines presented, it should be reviewed with the local Trane sales engineer.

Unit Sizing
Intentionally oversizing a unit to assure adequate capacity is not recommended. Erratic system operation and excessive compressor cycling are often a direct result of an oversized condensing unit. In addition, oversized units are usually more expensive to purchase, install and operate. If oversizing is desired, consider using two units.

Unit Placement
A base or foundation is not required if the selected unit location is level and strong enough to support the unit's operating weight.

Isolation and Sound Emission
The most effective form of isolation is to locate the unit away from any sound sensitive area. Structurally transmitted sound can be reduced by using spring or rubber isolators. The isolators are effective in reducing the low frequency sound generated by compressors and, therefore are recommended for sound sensitive installations. An acoustical engineer should always be consulted on critical applications. For maximum isolation effect, the refrigeration lines and electrical conduct should also be isolated. Use flexible electrical conduit. State and local codes on sound emissions should always be considered. Since the environment in which a sound source is located affects sound pressure, unit placement must be carefully evaluated.

Unit Location
Unobstructed flow of condenser air is essential for maintaining condensing unit capacity and operating efficiency. When determining unit placement, careful consideration must be given to assure proper air flow across the condenser heat transfer surface. Failure to heed these considerations will result in warm air recirculation and coil air flow starvation, resulting in a high pressure compressor cutoff.
Warm air recirculation occurs when discharge air from the condenser fans is recycled back at the condenser coil inlet. Coil starvation occurs when free air flow to the condenser is restricted.

Both warm air recirculation and coil starvation causes reductions in unit efficiency and capacity. In addition, in more severe cases, nuisance unit shutdowns will result from excessive head pressures. Accurate estimates of the degree of efficiency and capacity reduction are not possible due to the unpredictable effect of varying winds, temperatures and coil conditions.
In addition, wind tends to further reduce head pressure. Therefore, it is advisable to protect the air-cooled condensing unit from continuous direct winds exceeding 10 miles per hour.

Debris, trash, supplies, etc., should not be allowed to accumulate in the vicinity of the air-cooled condensing unit. Supply air movement may draw debris between coil fins and cause coil starvation. Special consideration should be given to units operating in low ambient temperatures. Condenser coils and fan discharge must be kept free of snow and other obstructions to permit adequate air flow for satisfactory unit operation.

Effect of Altitude On Capacity
Condensing unit capacities given in the performance data tables. At elevations substantially above sea level, the decreased air density will decrease condenser capacity and efficiency. The adjustment factors in Page 26 can be applied directly to the catalog performance data to determine the unit's adjusted performance.

Ambient Considerations
Start up and operation at lower ambients requires sufficient head pressure be maintained for proper expansion valve operation.
At higher ambients, excessive head pressure may result. Standard operating ambients are 15-43°C. With a low ambient kit comprising crank case heaters and frequency inverters, operation below 15°C is achievable. Minimum ambient condition are based on still conditions.

Refrigerant Piping
Special consideration must always be given to oil return. Minimum suction gas velocities must always be maintained for proper oil return. Utilize appropriate piping tools lines sizing such as the CDS refrigerant piping program.

Equipment Selection

SYSTEM COMPONENTS

To correctly match a condensing unit with a DX coil, it is important to understand the components of the refrigeration system and their functions. A refrigerant system consists of four major components: the compressor, condenser, expansion device and evaporator. Each of these components shown in Fig. 1 must be properly sized and installed in order to operate together and perform correctly.

COMPRESSOR

The function of a compressor is to raise the pressure of the refrigerant gas to a point where the temperature at which the gas will condense is higher than the ambient temperature of the air being used to condense it. For example, if the ambient design air temperature is 100°F, the refrigerant gas will typically be compressed to a pressure where the condensing, or saturation, temperature is 120 - 130°F.

In scroll cpmpressors, the refrigerant gas is compressed between the faces of two interlocking scrolls, one of which orbits while the other remains stationary.

CONDENSER

An air-cooled condenser typically has one or more heat transfer coils and one or more fans. The fans draw ambient air through the coils, which causes the hot refrigerant gas inside the tubes to condense. The capacity of an air-cooled condenser depends upon the temperature and flow rate of the ambient air and the surface area of the coil.

As the high-pressure refrigerant flows through the coil, it begins to condense, but remains at a steady temperature and pressure (for R22) while for R407C the temperature and pressure will drop slightly due to the glide of the refrigerant. The condenser coils are sized such that the refrigerant gas has completely condensed and more heat will be removed from it. This process is known as sub-cooling. Sub-cooling the liquid refrigerant prevents it from flashing back to its vapor state as its pressure drops between the condenser and the expansion device. Sub-cooling also improves the cooling capability of the refrigerant.

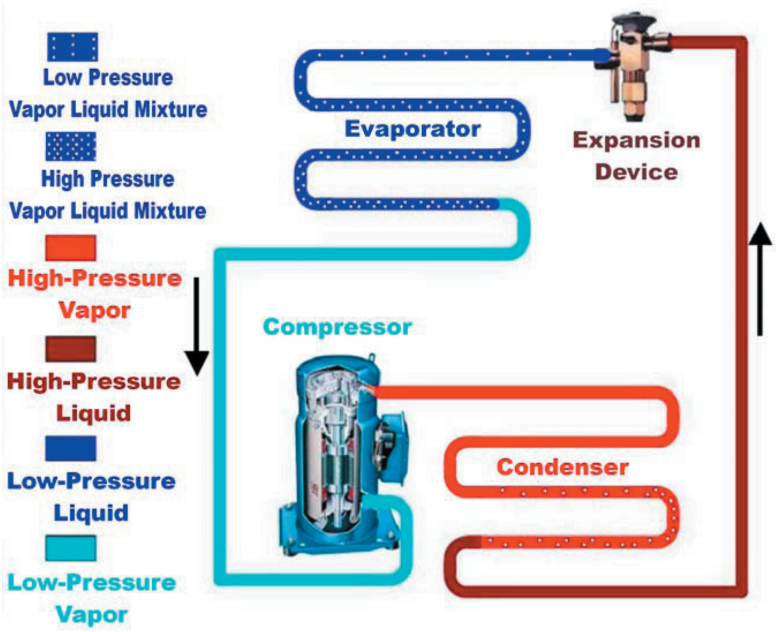


FIG. 1 -MAJOR SYSTEM COMPONENTS

Equipment Selection

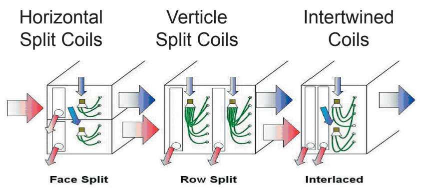


FIG. 2 -EVAPORATOR COIL TYPES

EVAPORATOR

The evaporator coil removes heat from the supply air-stream, cooling the supply air in the process. The evaporator coil generally consists of several rows of copper tubing mechanically bonded to aluminum (or copper) heat transfer fins. Depending on the size and capacity of the coil it may consist of one, or several refrigerant circuits (see Fig. 2).

A refrigerant distributor on each DX evaporator coil circuit feeds low pressure, low temperature liquid refrigerant to the coil tubes. It is critical that all the distributor tubes are the same length so the pressure drop across them will be equal and the refrigerant will be evenly distributed to the coil tubes.

As the liquid refrigerant passes through the coil tubes, heat is tranferred from the supply air stream to the refrigerant. As heat is added to the liquid refrigerant, it begins to evaporate much like water boiling on a stove. The liquid-vapor mixture remains at a constant temperature and pressure until it completely vaporizes (for R22), while for R407C the temperature and pressure will drop slightly due to the glide of the refrigerant. The coil capacity is determined by the type and amount of refrigerant used, the temperature difference between the air and the liquid refrigerant, and the amount of air passing over the coil.

Once the refrigerant has completely evaporated, its ability to cool the air decrease dramatically. If too little refrigerant is fed to the coil, it will evaporate quickly and the air will not be adequately cooled. If too much refrigerant is fed to the coil it will not evaporate at all and liquid refrigerant will return to the compressor. Direct expansion (DX) evaporator coils are designed to evaporate all refrigerant in the coil and then “superheat” the refrigerant gas in the last row or two of the coil tubes. The refrigerant gas is superheated to ensure it does not condense back to its liquid state in the suction line. Superheat is also used to control the expansion device.

EXPANSION DEVICE

The expansion device controls the flow of liquid refrigerrant to the evaporator coil. Trane uses temperature controlled, (thermostatic) expansion valves (TXVs) as shown in Fig. 3. The TXV has two primary components: the valve body and the sensing bulb.

The valve regulates the flow of refrigerant to the evaporator coil. As refrigerant passes through the valve it is adiabatically expanded (that is, without the addition of energy). This causes the pressure and temperature of the liquid refrigerant to drop, making it suitable for cooling the air.

The amount of refrigerant fed to the coil is based on the cooling load of the supply air and the resultant amount

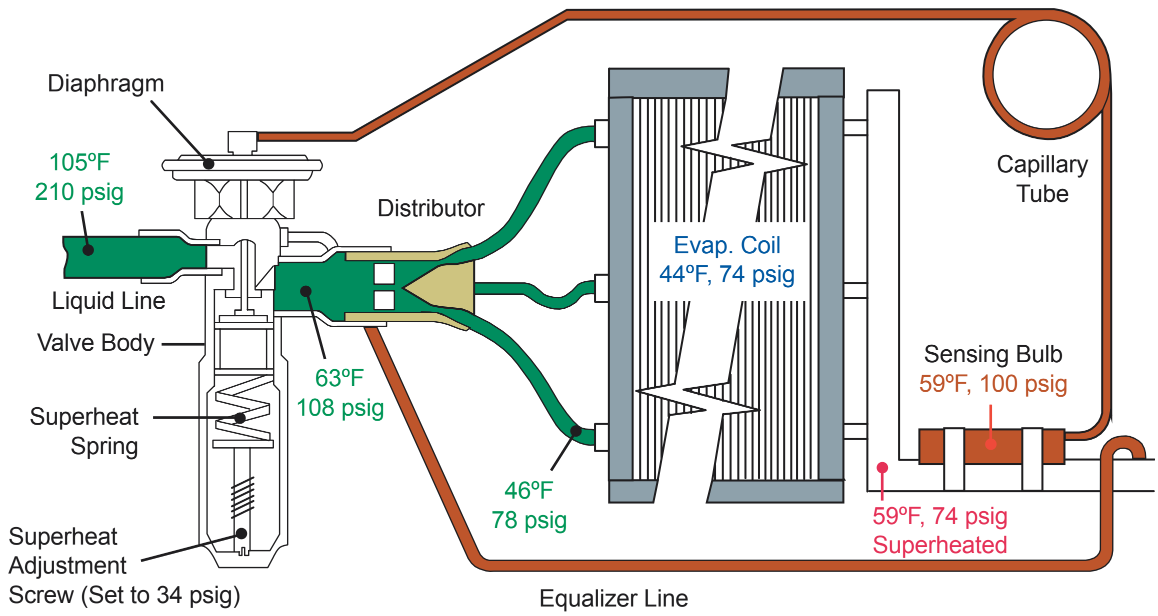


FIG. 3 -THERMAL REXPANSION VALVE (TXV) COMPONENTS

TRANE®

Equipment Selection

of superheat created. As the cooling load increases, the liquid refrigerant absorbs more heat and evaporates more quickly. This means that more of the evaporator coil is available to superheat the refrigerant vapor and it leaves the coil at a higher temperature. Conversely as the cooling load decreases, the liquid refrigerant does not evaporate as quickly so less superheating occurs and the refrigerant leaves the coil at a lower temperature.

The sensing bulb attached to the valve is charged with a mix of liquid and vapor refrigerant. This refrigerant must be the same type as that in the system. The refrigerant vapor in the sensing bulb exerts pressure on a diaphragm in the valve body, which causes the valve to open or close.

As the temperature of the superheated suction gas leaving the evaporator rises due to an increase in the cooling load, refrigerant in the sensing bulb evaporates increasing the pressure on the valve diaphragm. The increased pressure causes the valve to open and allows more refrigerant to flow into the coil to meet the higher cooling demand. When the temperature of the suction gas drops due to a decrease in the cooling load, the gas in the sensing bulb condenses reducing its pressure on the valve diaphragm. This allows the valve to restrict the flow of refrigerant into the coil until the lower cooling demand is adequately met.

The valve body contains a superheat spring that keeps everything in balance. By turning a screw in the bottom of the valve the spring can be set for a certain amount of superheat. For example, if the superheat spring is set for 15 °F of superheat it will exert a pressure on the valve equal to the pressure the vaporized gas in the sensing bulb will exert on the valve diaphragm when the suction gas is superheated by 15 °F. The equalizer line is used to prevent the pressure drop that occurs across the distributor and DX coil from affecting the operation of the expansion valve.

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APPLICATION DESIGN CONDITIONS

Before selecting equipment, you must first establish these basic working parameters:

- The design cooling load
- The design outdoor air temperature
- The refrigerant saturated suction temperature

The design-cooling load is typically found on the job schedule. The design outdoor air temperature may also be listed on the job schedule. If the saturared suction temperature (SST) is not known, assume it is in the range of 40 °F to 45 °F. This represents the standard industry approach.

RAUP Condensing Unit Performance Information

When using a pre-engineered condensing unit, you can use ratings such as those shown in Fig. (RAUP R22, R407C Performance Data) to determine which condensing unit size will satisfy the cooling capacity of the system.

Evaporator Coil Capacity (Tons)	TXV Size
4 to 6	5
6 to 10	8
9 to 13	11
12 to 18	15
16 to 24	20
24 to 36	30

Choose a TXV that matches the tonnage of the evaporator coil it serves

It is recommended to provide and install one TXV per distributor.

For larger coil capacities, refer to the quantity of circuits in the AHU and total AHU tonnage to determine the number and tonnage & quantity of the TXV

	TXV Size	TXV Qty.
RAUP 250	11 (20)	2 (1)
RAUP 300	20 (30)	2 (1)
RAUP 400	20	2
RAUP 500	30	2
RAUP 600	30	2

TXV Qty. listed here is based on the assemption that the Evaporator has similar circuits to the RAUP

TXV Selection when matched with an AHU, should be based primarily on the final system capacity

Correction Factor

Altitude Correction Multiplier For Capacity

Altitude (Ft.)	2,000	4,000	6,000	8,000	10,000
Condensing Unit Only	0.982	0.960	0.933	0.902	0.866
Condensing Unit / Air Handling Unit Combination	0.983	0.963	0.939	0.911	0.881
Condensing Unit With Evaporator	0.986	0..968	0.947	0.921	0.891

Cooling Capacity Correction Factor for CFM/CMH, other than standard

%CFM.CHM Variation From Rated	-20	-10	Rated	+10	+20
Total Cooling Capacity Multiplier	0.96	0.98	1.00	1.02	1.03
Sensible Heat Multaiplier	0.91	0.96	1.00	1.04	1.08

Note: Calculate total and sensible capacities in MBH and multiply by above factors to determine revised capacities

Equipment Selection

Figure 1. Effect of coil face area on cooling capacity (6-row coil, 500 fpm face velocity)

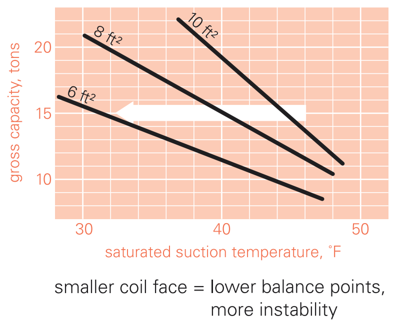
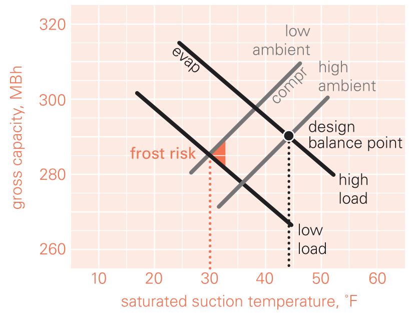


Figure 2. Effect of ambient conditions and load on an air handler and condensing unit



DX Coil Performance Information

The direct expansion (DX) evaporator coil can be selected using the CLCP DX TOPSS program. To select the DX coil, you enter the cooling capacity or the leaving air temperature, and the saturated suction temperature (SST).

SSTs up to 50 °F may be acceptable for certain applications, but humidity control becomes difficult at these higher SSTs. Likewise, design SSTs below 34°F can result in ice building up on the evaporator during periods of reduced load and should be avoided unless provisions are made for periodic coil defrost.

BALANCE POINT CROSS PLOT ILLUSTRATION

A precise system balance point can be obtained by plotting the capacity of the DX coil versus the capacity of the condensing unit at various saturated temperatures. The point at which the two capacity lines intersect is the system balance point.

The initial balance point of the system occurs where the saturated temperature of the evaporator, intersects with the condensing unit's capacity. Thus, the condensing unit SST and the DX coil SST are equal at this initial balance point without any consideration for suction line penalty.

Missized air handler. It's common practice to base the selection of the air handler for a split DX system is at a coil face velocity of 500 fpm and then to match coil capacity (with face area now limited by the size of the air-handler cabinet) with the required load. With the trend towards applications that require less airflow per cooling ton, this sizing method leads to the selection of smaller air handlers. Providing the required cooling capacity with a smaller air handler demands colder suction temperature (Figure 1).

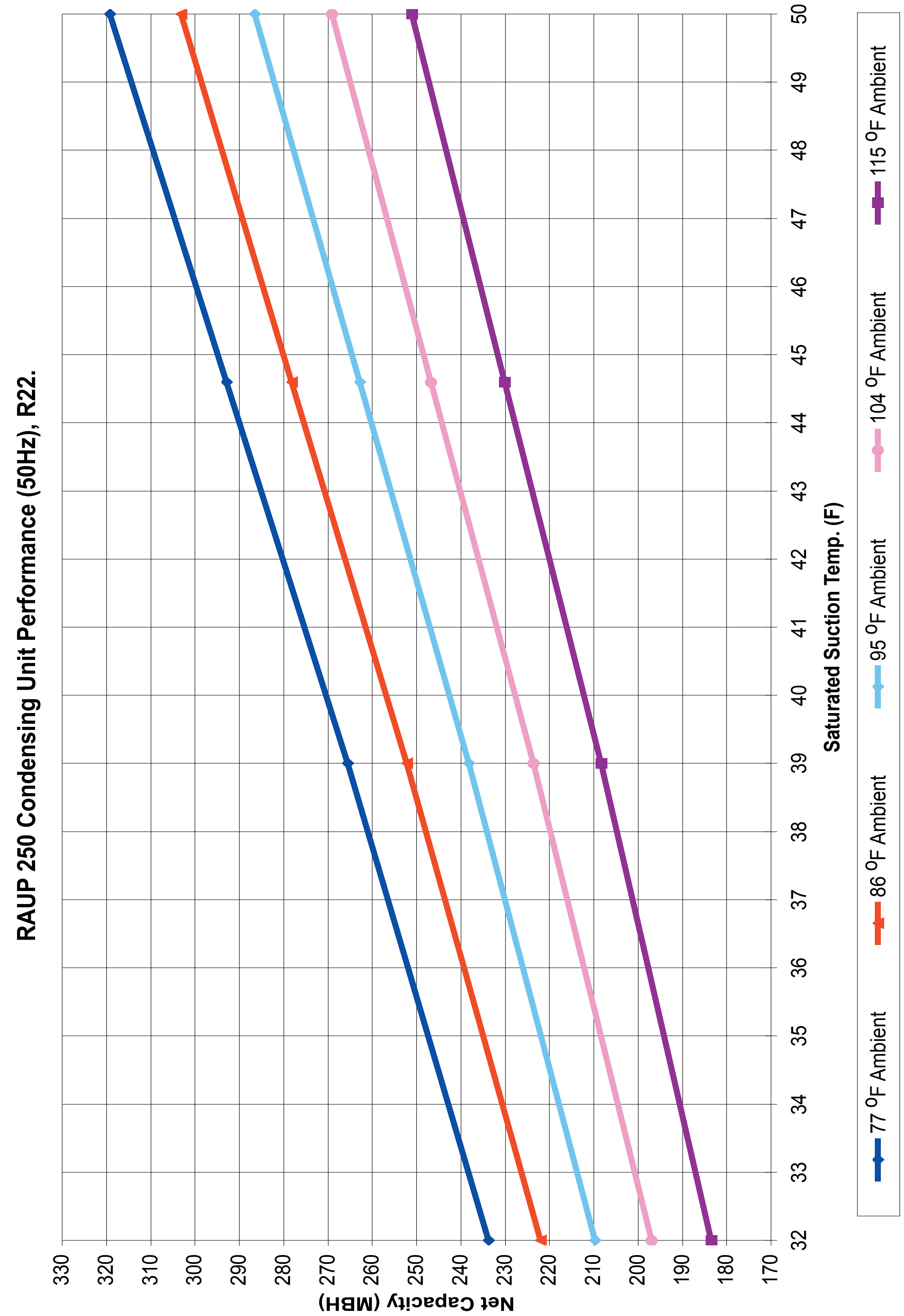
As the cooling load decreases and/or the ambient temperature drops, the capacities of the compressor and evaporator balance at ever lower suction pressures and temperatures. At such conditions, system operation can become unstable and may eventually result in coil frosting and compressor flooding (Figure 2).

When choosing a DX air handler, it's critical to first determine a coil size that allows the evaporator and compressor capacities to balance at an appropriate suction temperature and pressure. You can then pick an air handler that fits the coil. This approach may appear to result in an oversized air handler, but it achieves a match of indoor and outdoor DX components that can operate more reliably at part-load conditions.

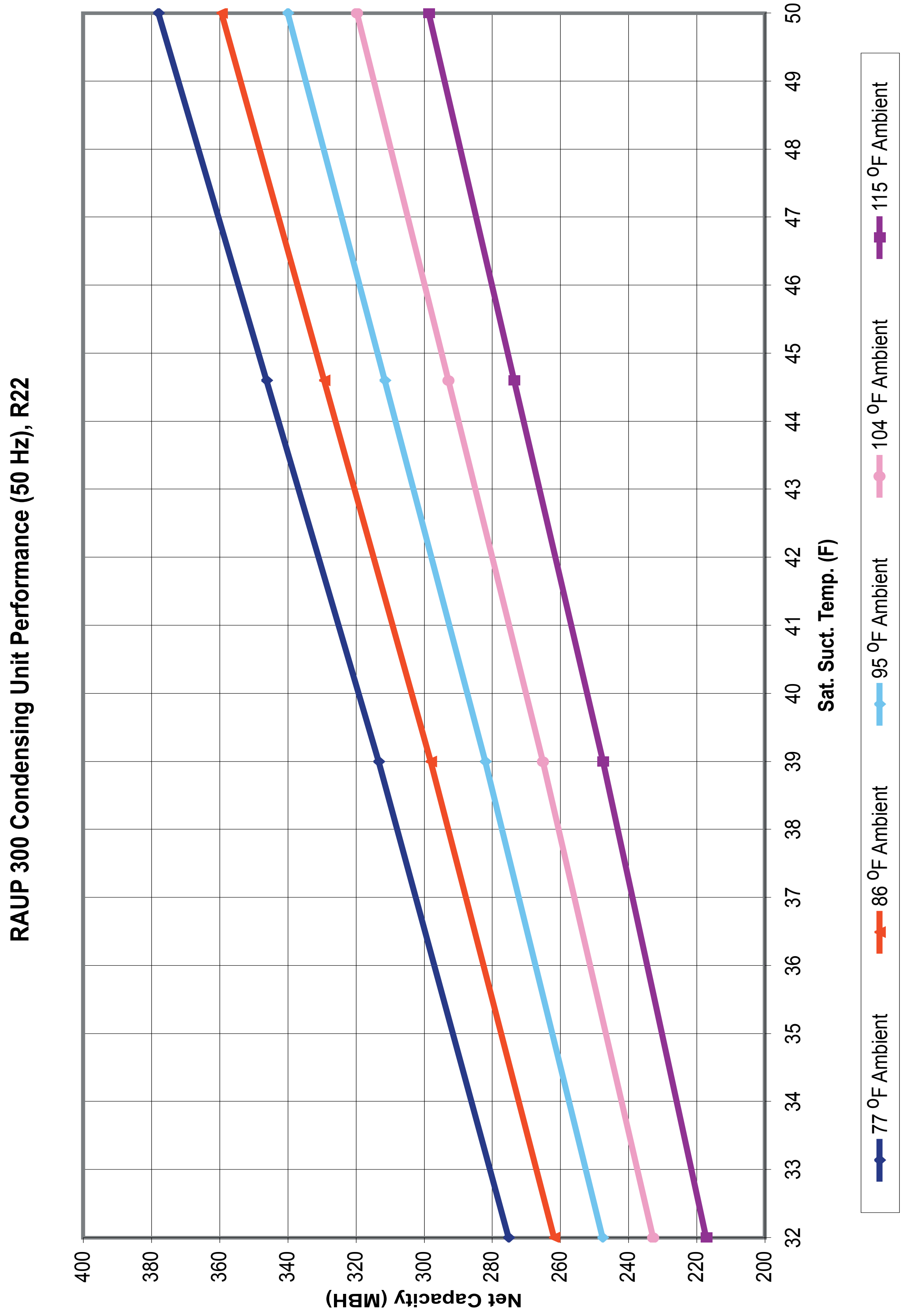
By contrast, when choosing an air handler for a chilled water system, the initial objective is to pick the smallest possible air handler that won't cause water carryover.

Table 1 demonstrates an outcome of these sizing strategies: For comparable systems, the chilled-water air handler usually is smaller–and therefore less costly–than the DX air handler.

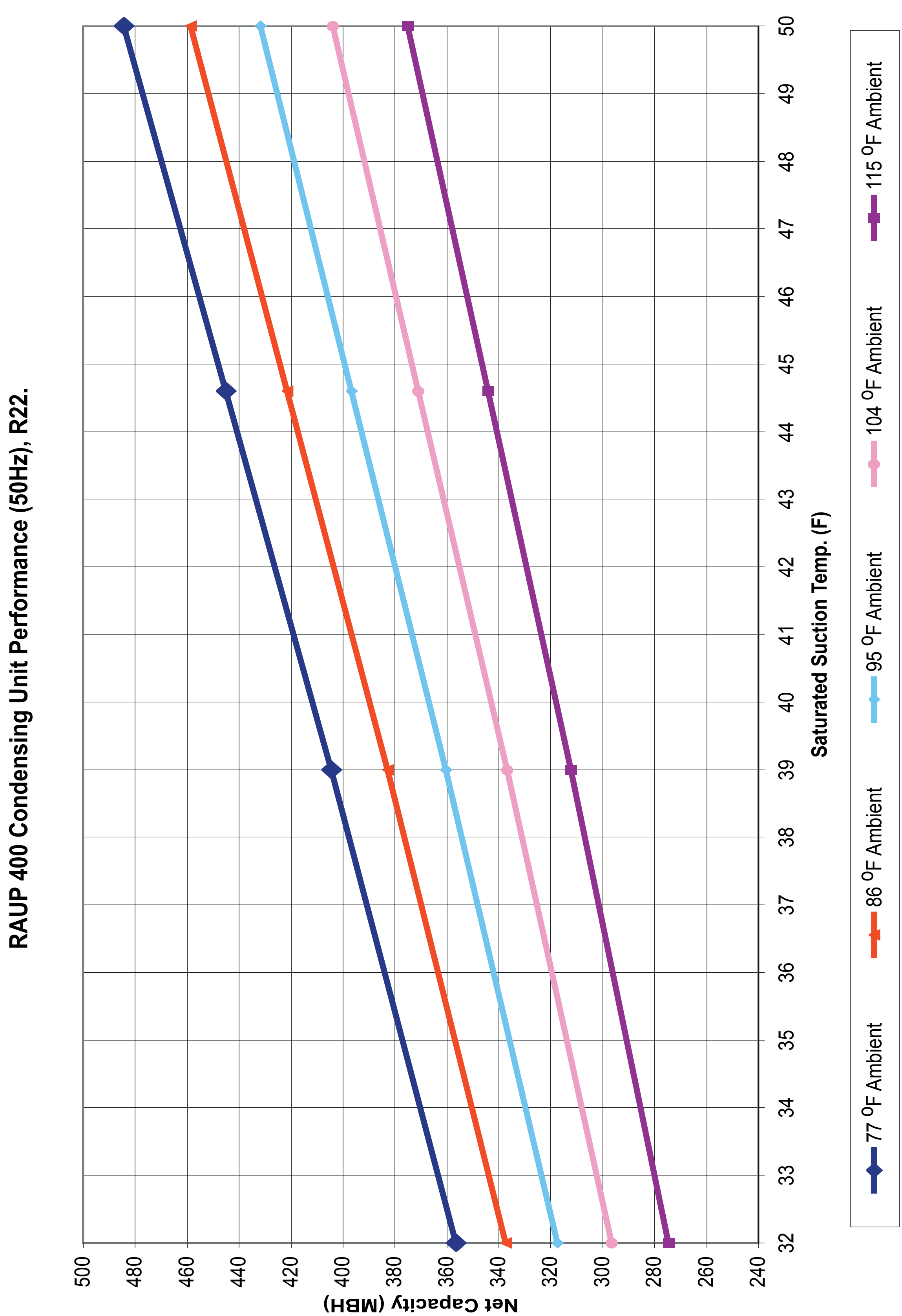
RAUP 250 Condensing Unit Performance (50Hz), R22



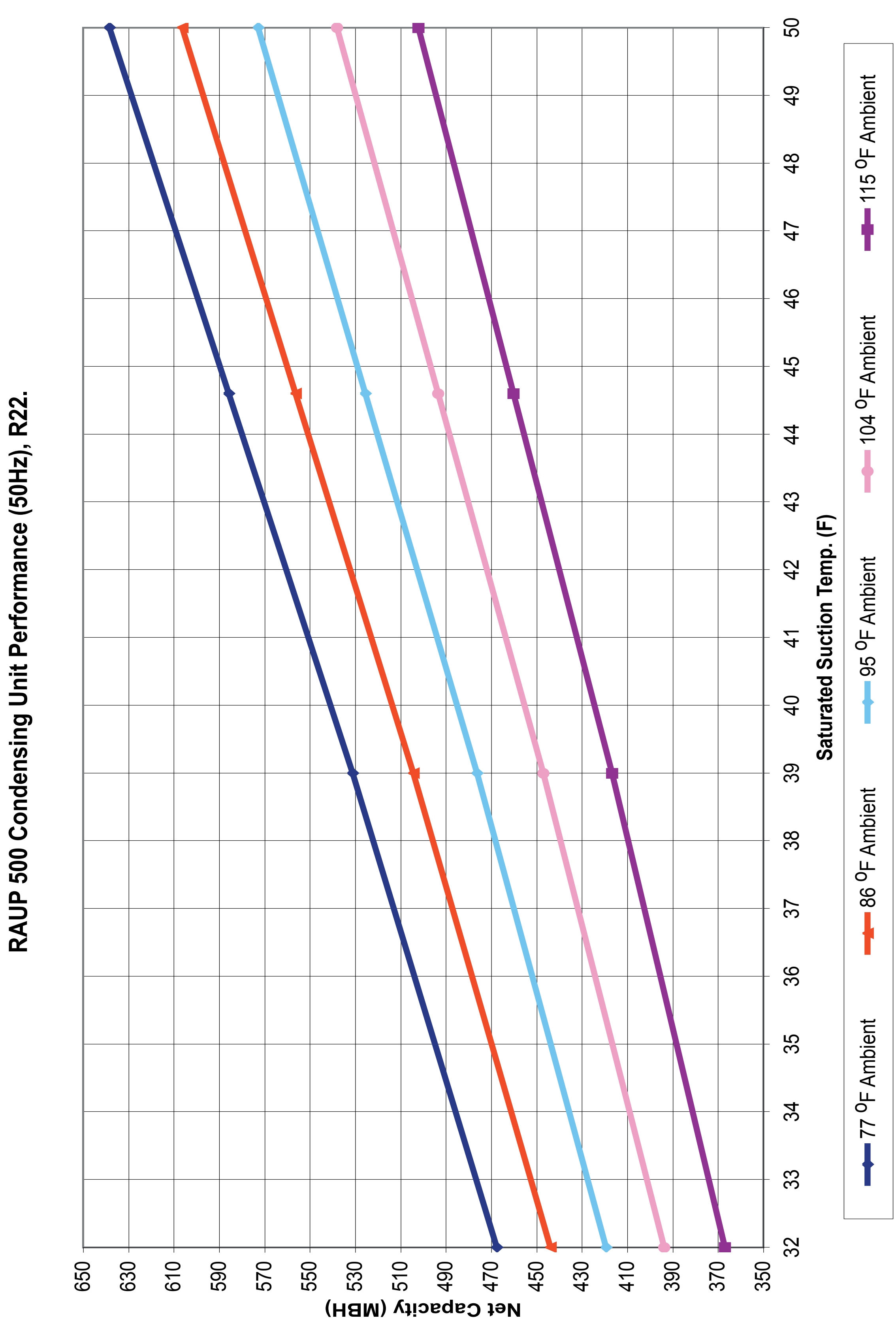
RAUP 300 Condensing Unit Performance (50Hz), R22



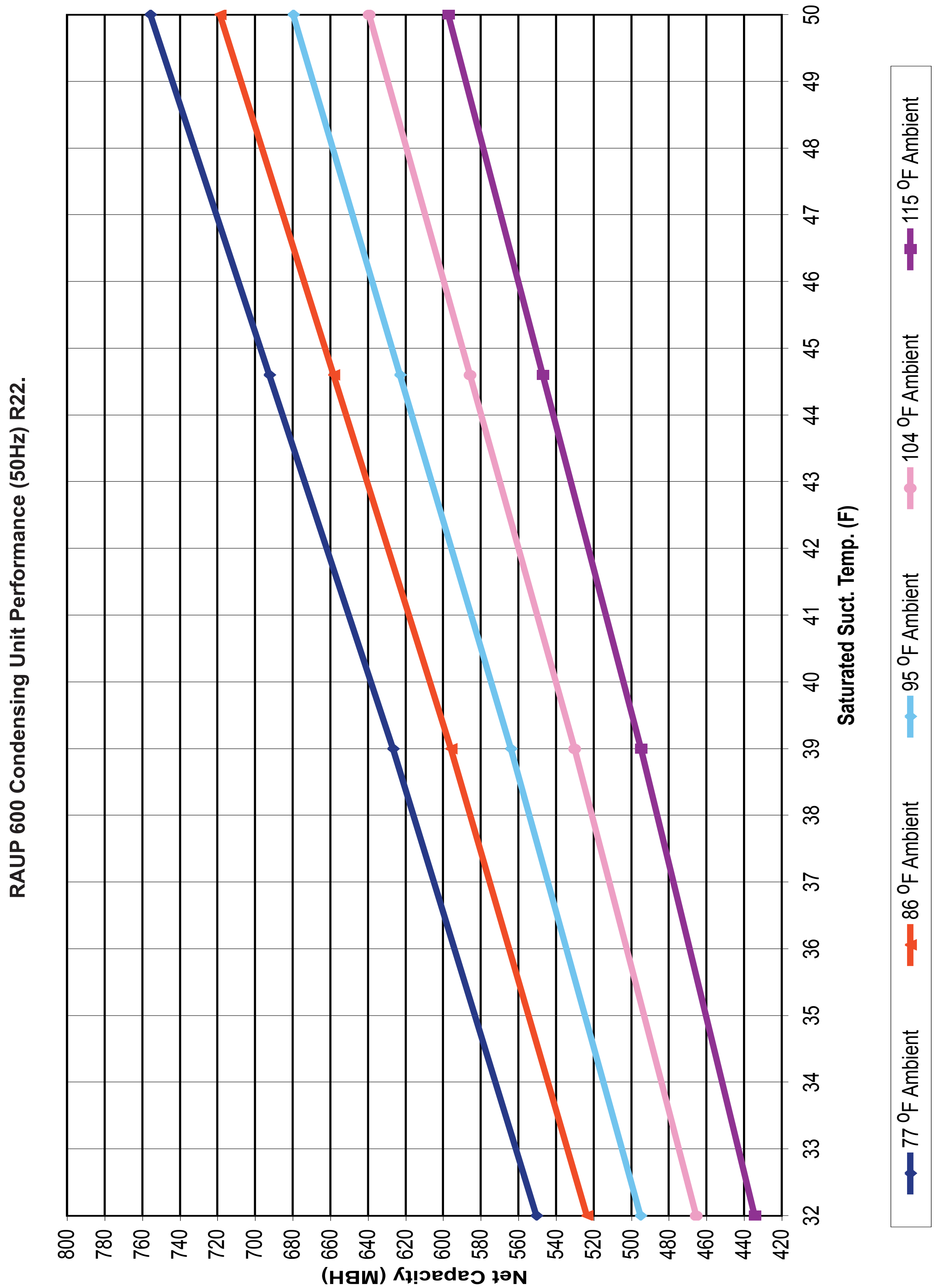
RAUP 400 Condensing Unit Performance (50Hz), R22



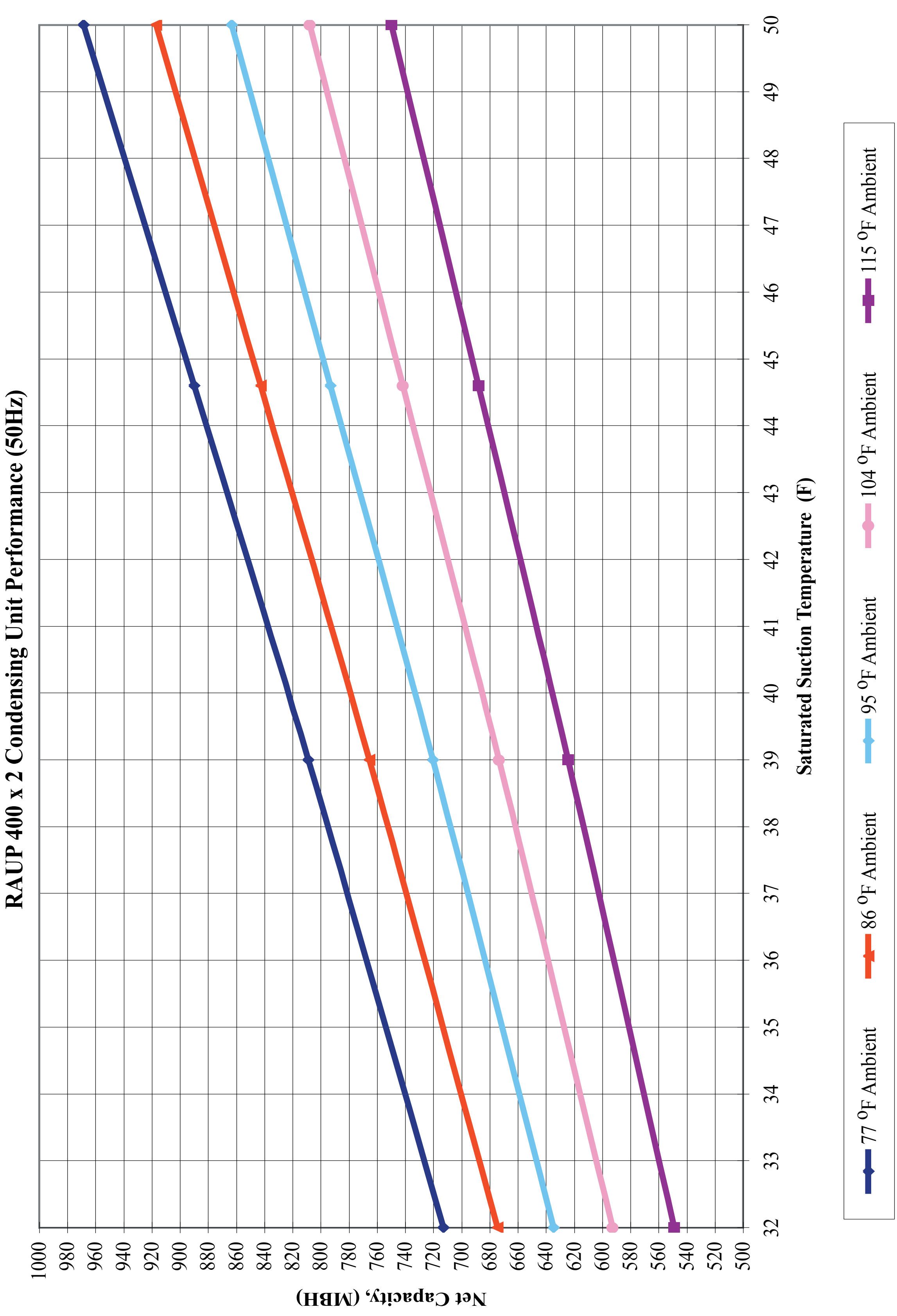
RAUP 500 Condensing Unit Performance (50Hz), R22



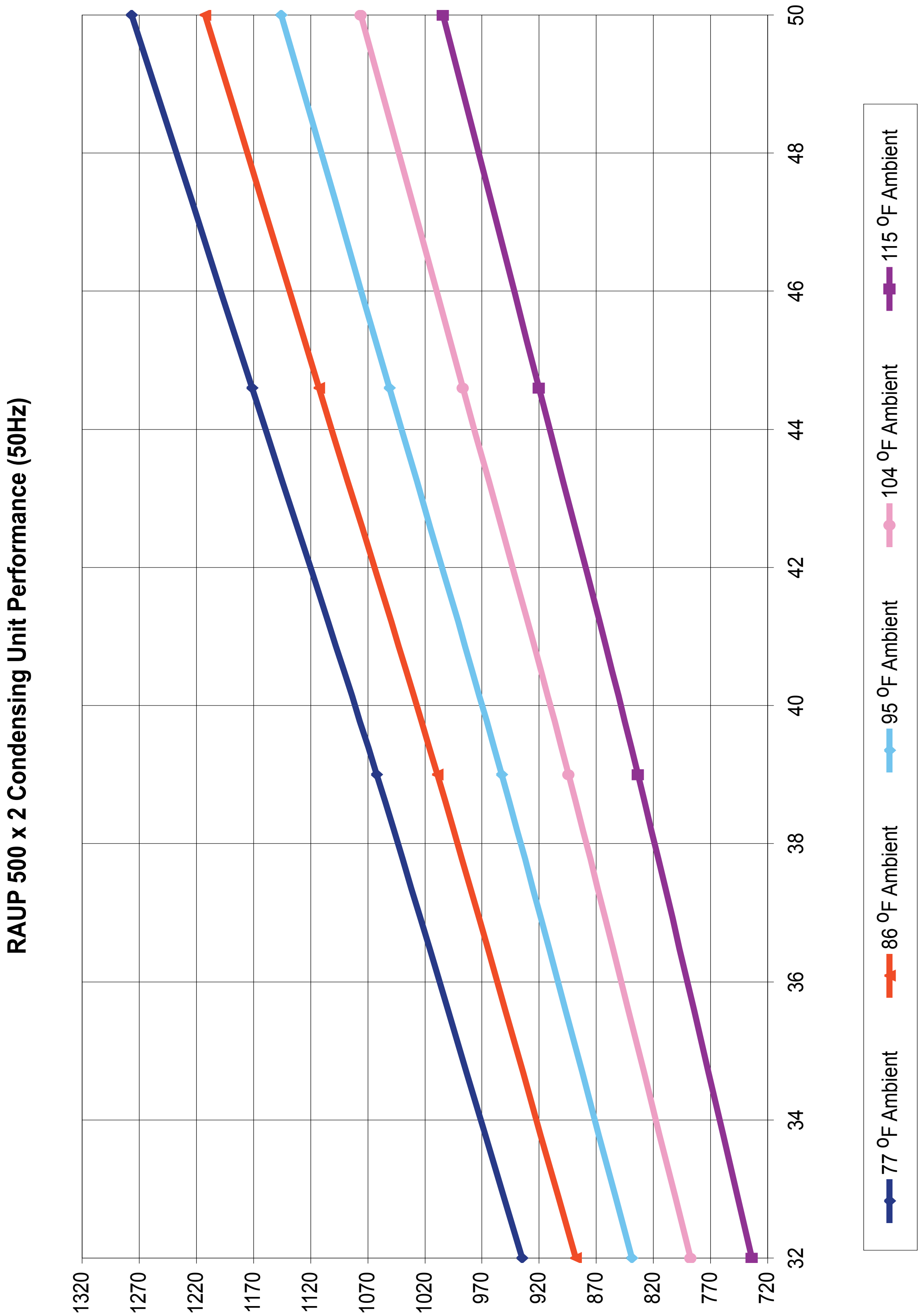
RAUP 600 Condensing Unit Performance (50Hz), R22



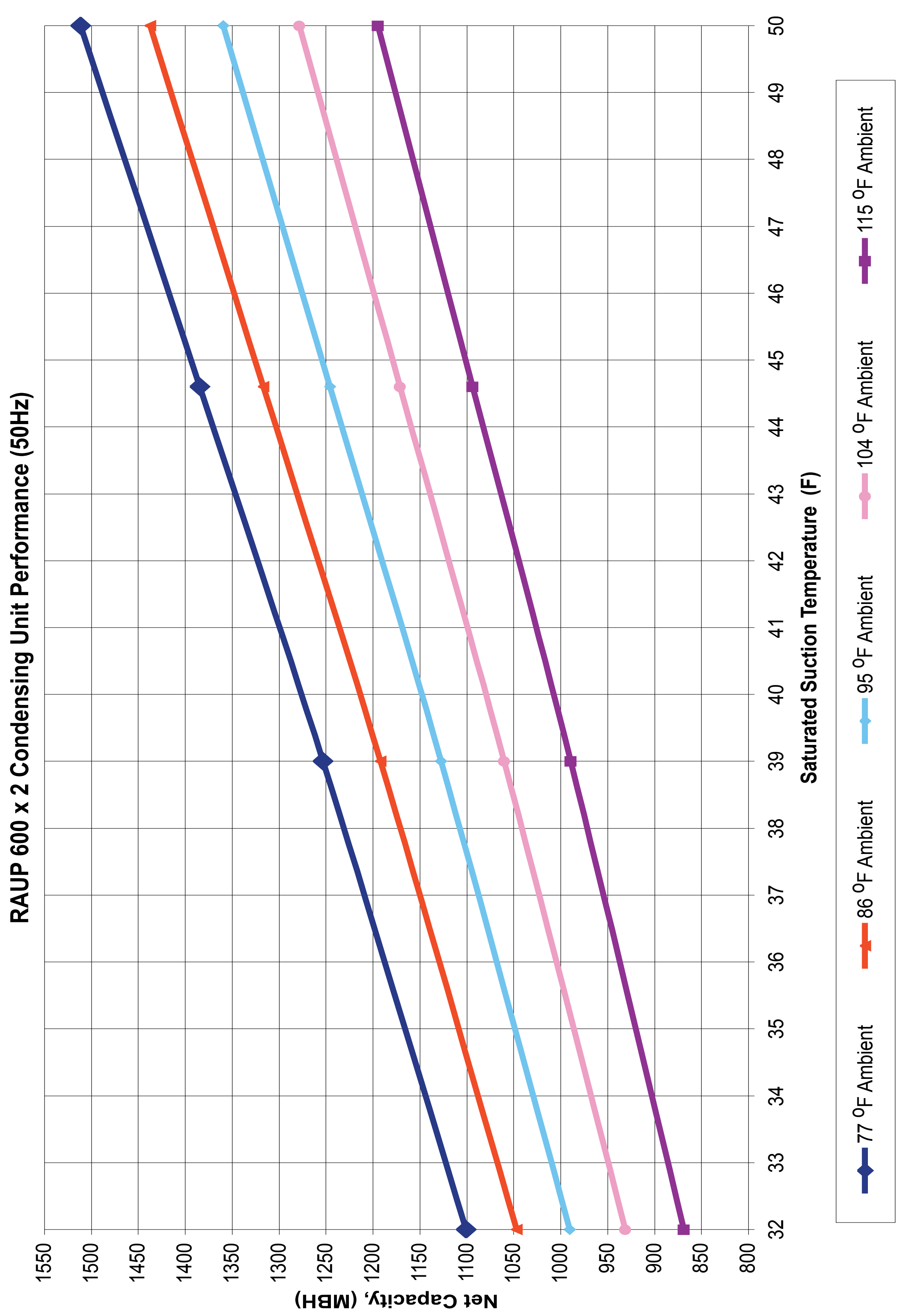
RAUP 400 x 2 Condensing Unit Performance (50Hz)



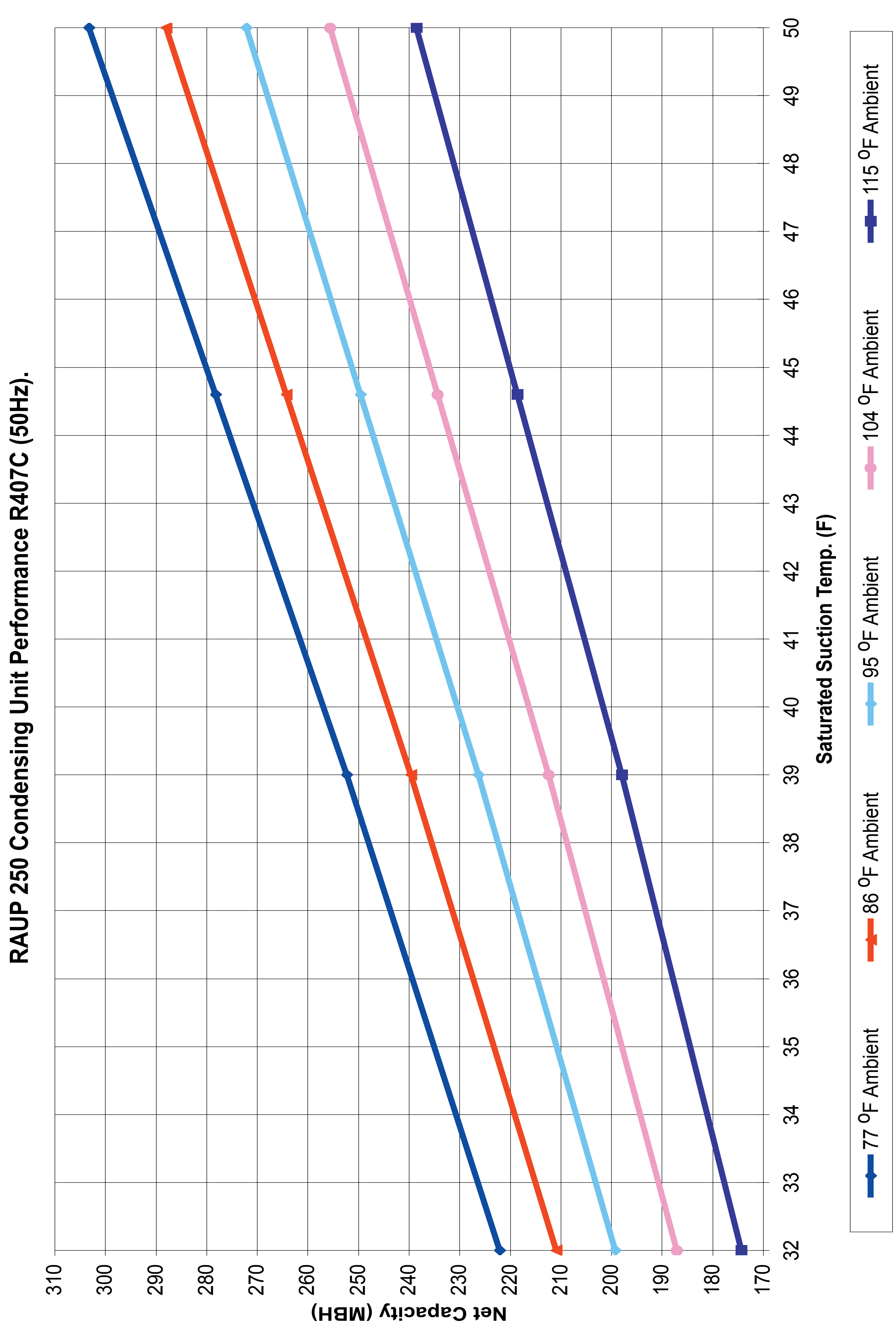
RAUP 500 x 2 Condensing Unit Performance (50Hz)



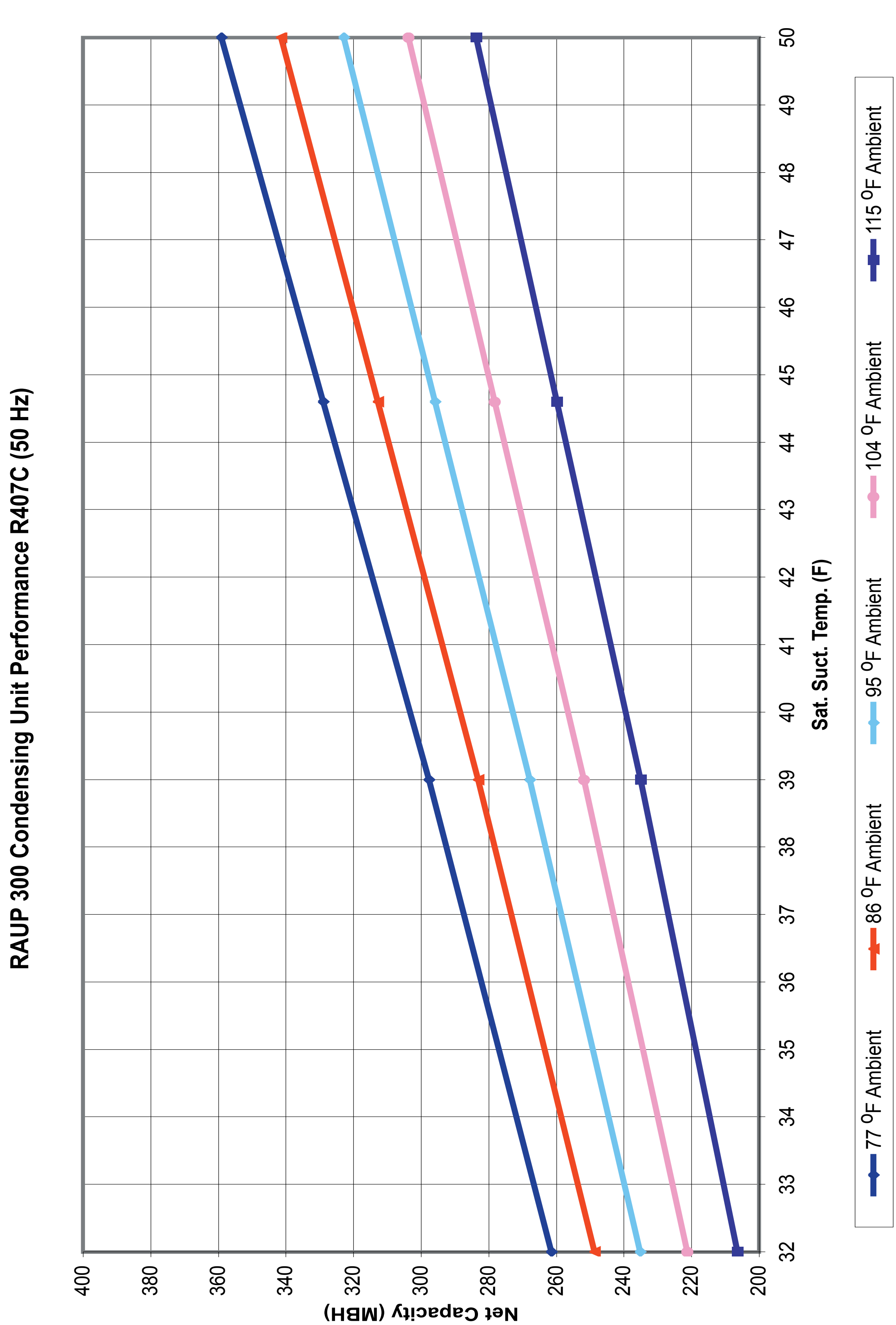
RAUP 600 x 2 Condensing Unit Performance (50Hz)



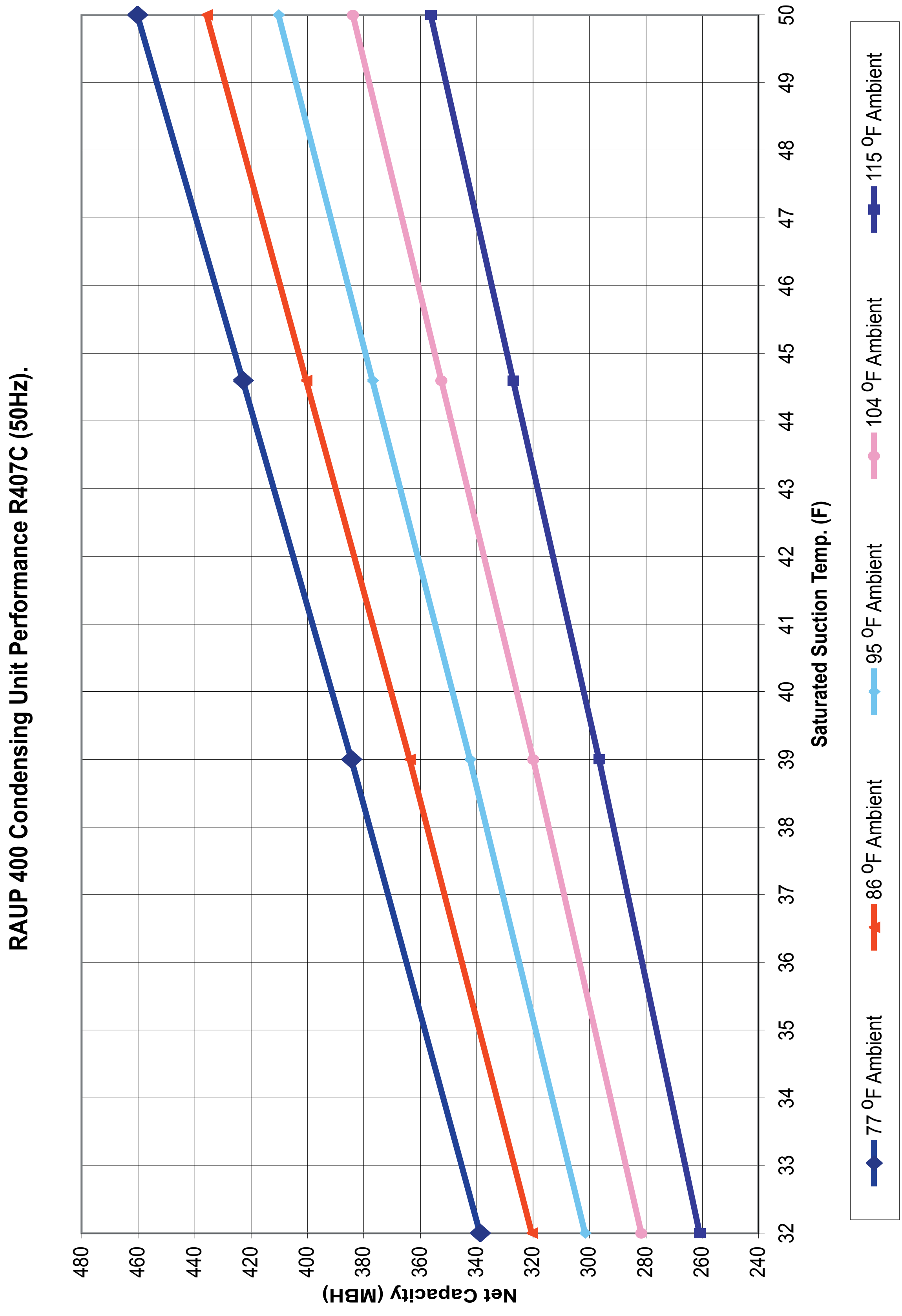
RAUP 250 Condensing Unit Performance R407C (50Hz)



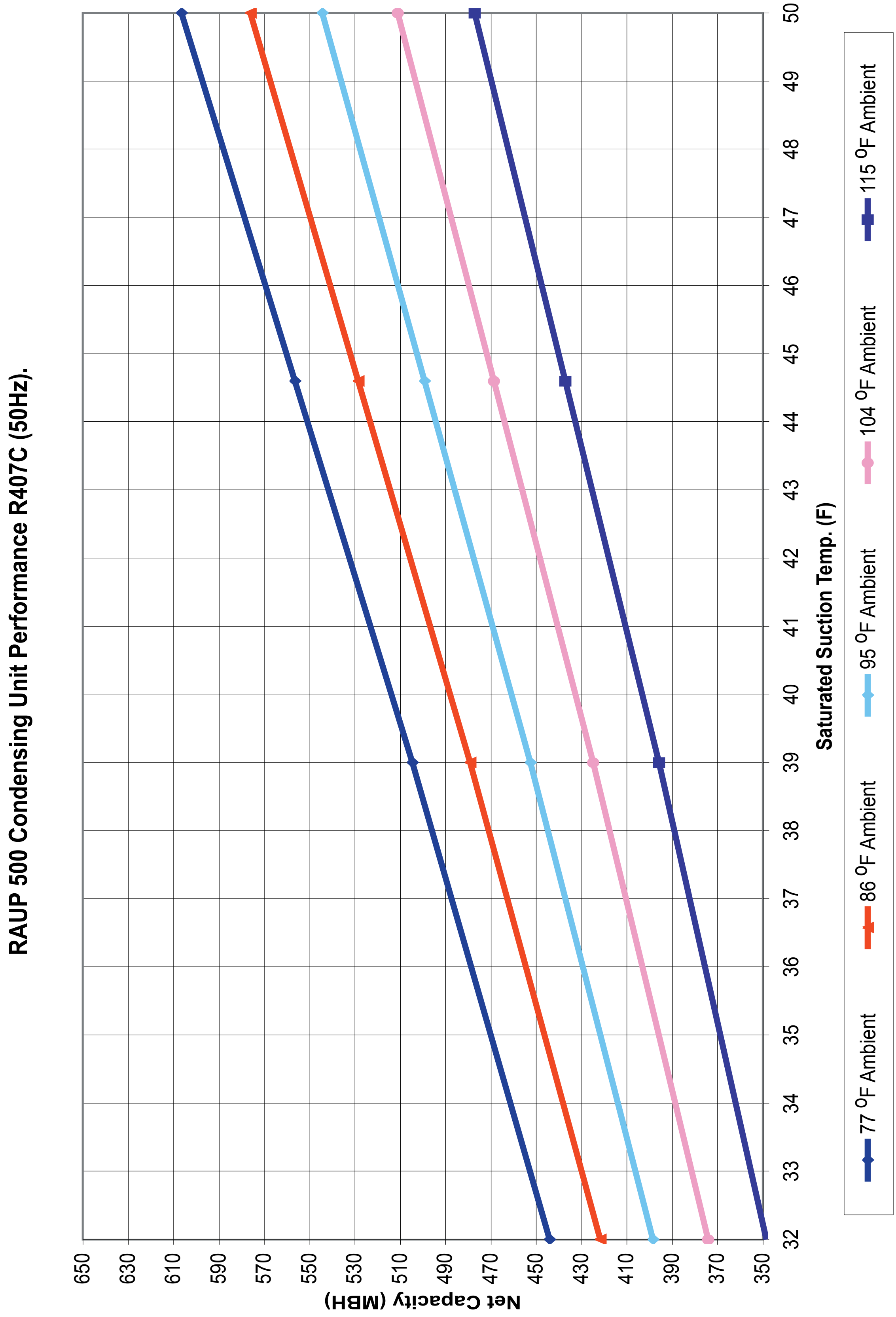
RAUP 300 Condensing Unit Performance R407C (50Hz)



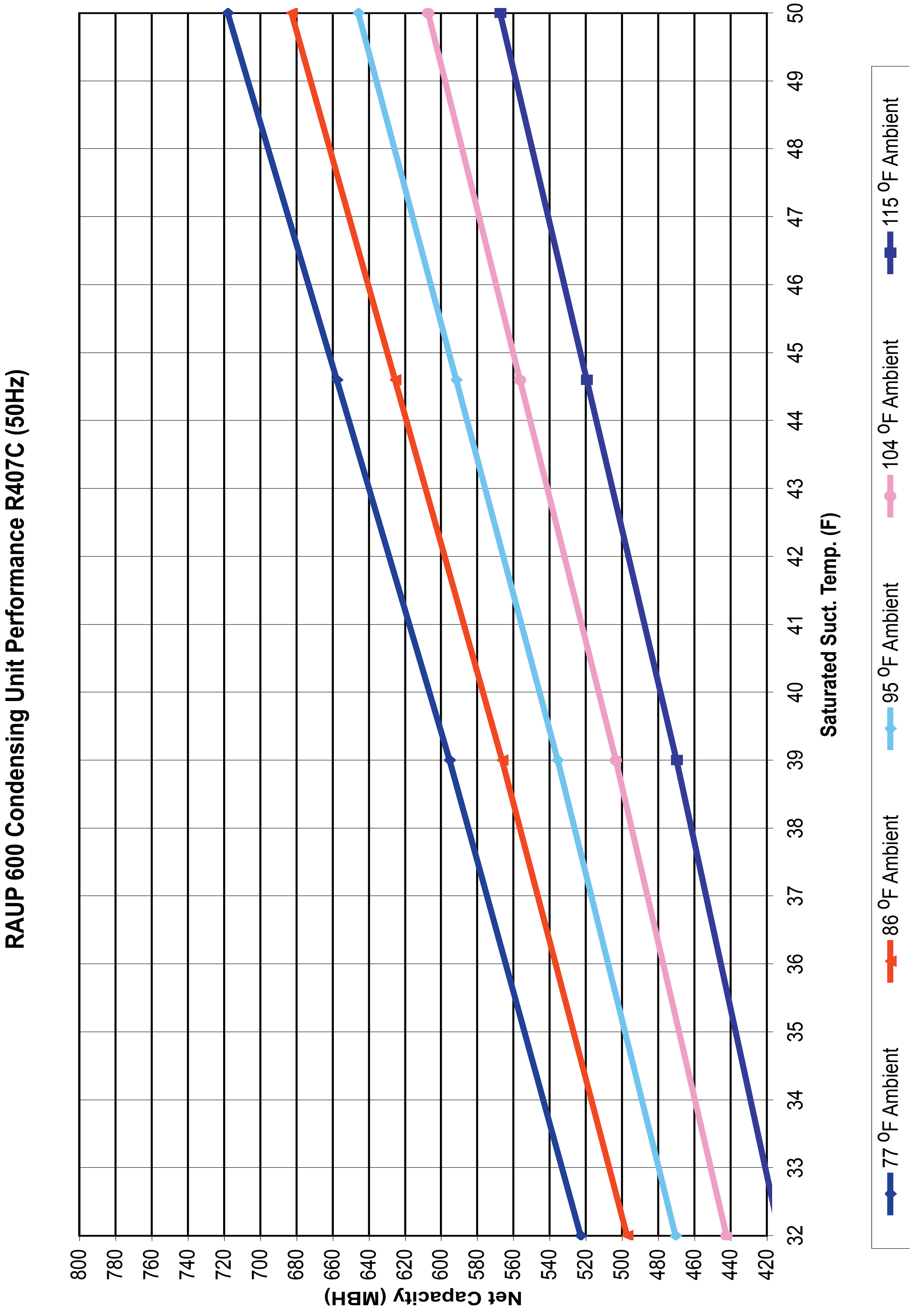
RAUP 400 Condensing Unit Performance R407C (50Hz)



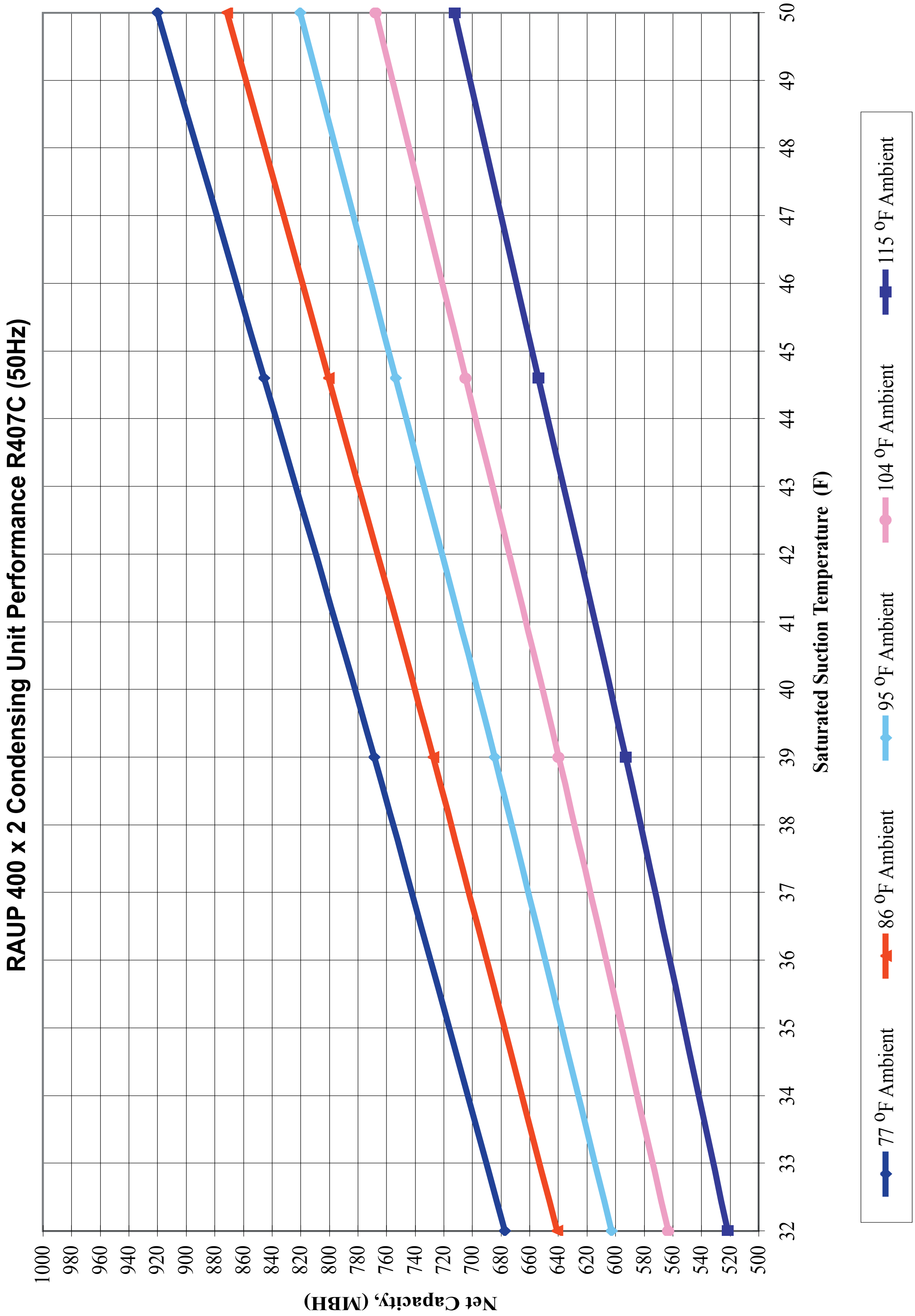
RAUP 500 Condensing Unit Performance R407C (50Hz)



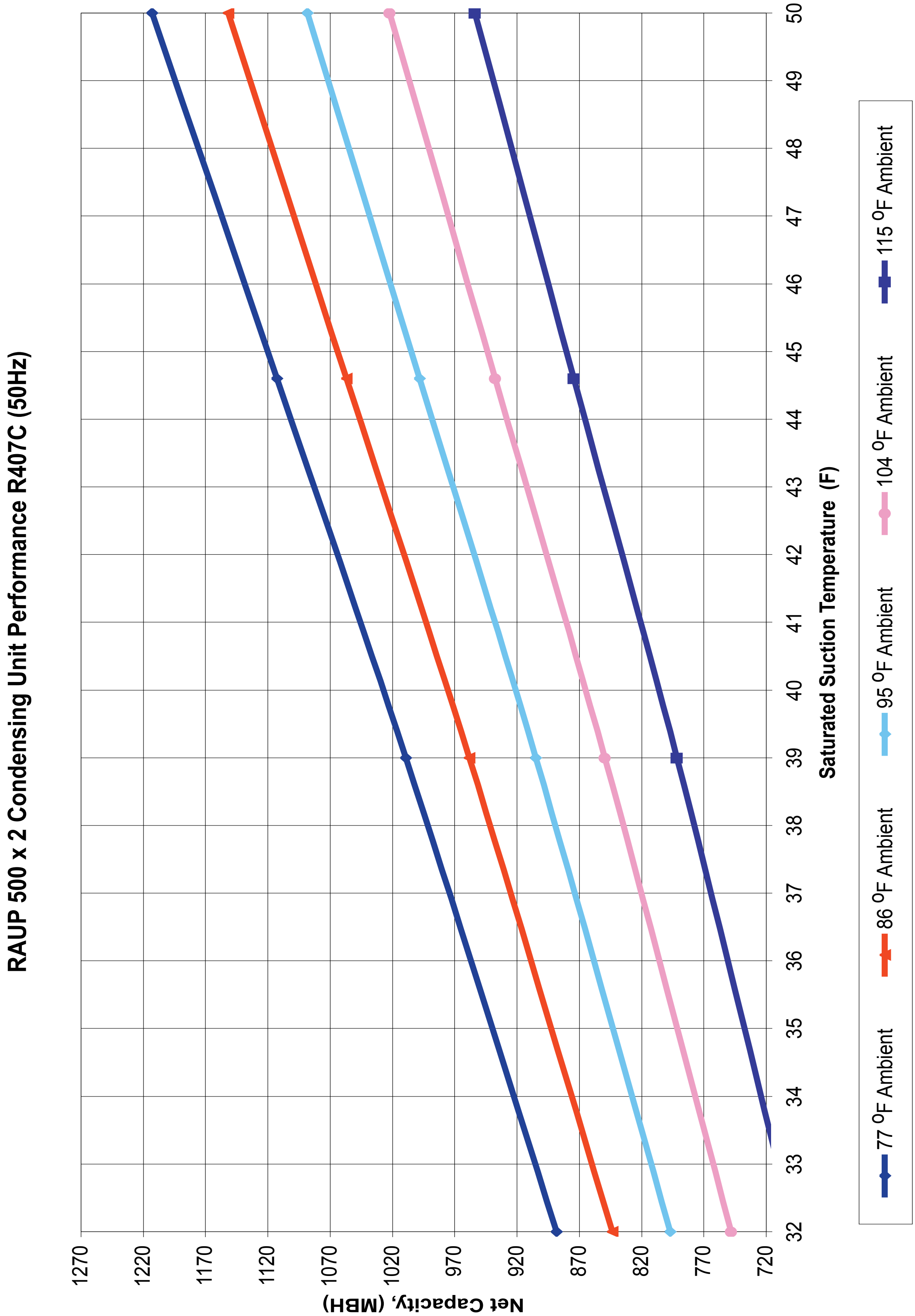
RAUP 600 Condensing Unit Performance R407C (50Hz)



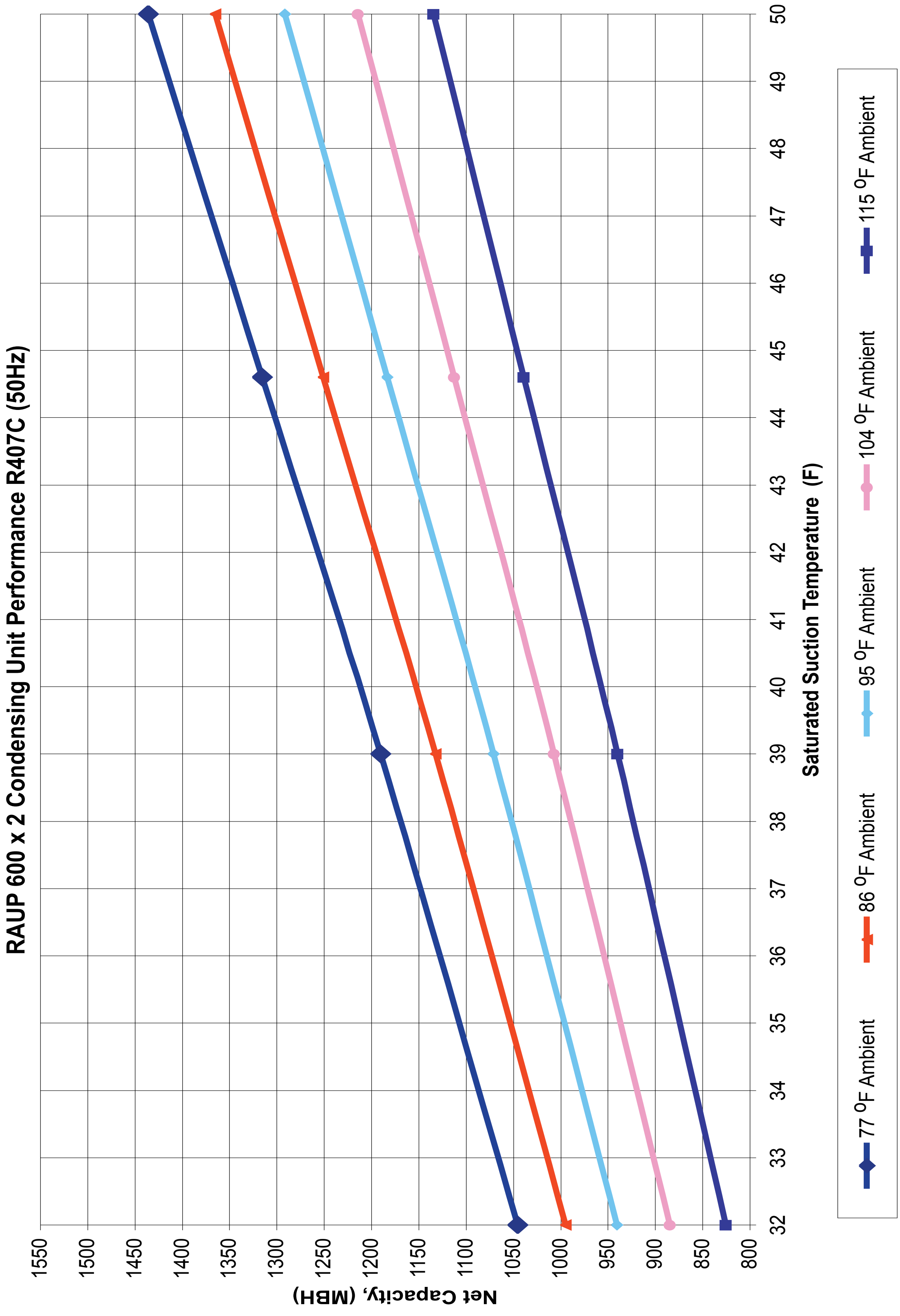
RAUP 400 x 2 Condensing Unit Performance R407C (50Hz)



RAUP 500 x 2 Condensing Unit Performance R407C (50Hz)



RAUP 600 x 2 Condensing Unit Performance R407C (50Hz)



RAUP-TTV System

For ease of selection, 5 pre selected systems with indoor units TTV are available as in the following performance table.

SYSTEM PERFORMANCE DATA R22							Outdoor Ambient F (C)																			
Outdoor Unit	Indoor Unit	Indoor Unit	Evap. On Coil Temp.				75 (24)					86 (30)					95 (35)					104 (40)				
		CFM	EDB		EWB		TC		SCH		PI	TC		SCH		PI	TC		SCH		PI	TC		SCH		PI
		CMS	F	C	F	C	MBH	kW	MBH	kW	kW	MBH	kW	MBH	kW	kW	MBH	kW	MBH	kW	kW	MBH	kW	MBH	kW	kW
			75	24	61	16	276	81	218	64	17	264	77	212	62	19	252	74	206	60	21	239	70	200	59	24
RAUP 250	TTV 250	7760	77	25	64	18	290	85	209	61	17	278	81	206	60	19	260	76	195	57	21	251	74	193	57	24
		3.7	80	27	67	19	304	89	207	61	17	292	86	204	60	19	278	81	197	58	21	262	77	191	56	24
			86	30	71	22	-		-		-	-		-		-	-		-		-	-		-		-
			75	24	61	16	206	60	165	48	14	197	58	251	74	22	301	88	247	72	25	286	84	240	70	28
RAUP 300	TTV 300	9240	77	25	64	18	217	63	158	46	15	208	61	241	71	22	316	93	237	69	25	299	88	230	67	28
		4.4	80	27	67	19	228	67	157	46	15	218	64	240	70	22	333	98	237	69	25	317	93	228	67	28
			86	30	71	22	243	71	166	49	15	233	68	-		-	-		-		-	-		-		-
			75	24	61	16	419	123	335	98	26	399	117	327	96	30	380	111	315	92	34	359	105	309	90	38
RAUP 400	TTV 400	12120	77	25	64	18	444	130	324	95	26	423	124	313	92	30	401	117	305	89	34	379	111	295	87	38
		5.7	80	27	67	19	462	135	319	93	26	442	129	314	92	30	421	123	303	89	34	398	117	294	86	38
			86	30	71	22	-		-		-	-		-		-	-		-		-	-		-		-
			75	24	61	16	536	157	440	129	33	513	150	426	125	37	490	143	416	122	42	464	136	371	109	47
RAUP 500	TTV 500	15130	77	25	64	18	565	165	418	122	33	540	158	410	120	37	515	151	397	116	42	487	143	385	113	47
		7.1	80	27	67	19	592	173	420	123	33	568	166	409	120	37	541	159	395	116	42	514	151	386	113	47
			86	30	71	22	-		-		-	-		-		-	-		-		-	-		-		-
			75	24	61	16	645	189	542	159	40	621	182	528	155	45	594	174	517	151	50	564	165	502	147	56
RAUP 600	TTV 600	18080	77	25	64	18	682	200	518	152	40	656	192	512	150	45	627	184	496	145	50	595	174	482	141	56
		8.5	80	27	67	19	714	209	514	150	40	686	201	508	149	45	658	193	493	144	50	623	182	480	141	56
			86	30	71	22	-		-		-	-		-		-	-		-		-	-		-		-

SYSTEM PERFORMANCE DATA R407C							Outdoor Ambient F (C)																			
Outdoor Unit	Indoor Unit	Indoor Unit	Evap. On Coil Temp.				75 (24)					86 (30)					95 (35)					104 (40)				
		CFM	EDB		EWB		TC		SCH		PI	TC		SCH		PI	TC		SCH		PI	TC		SCH		PI
		CMS	F	C	F	C	MBH	kW	MBH	kW	kW	MBH	kW	MBH	kW	kW	MBH	kW	MBH	kW	kW	MBH	kW	MBH	kW	kW
			75	24	61	16	262	77	207	61	17	251	74	201	59	19	239	70	196	57	21	227	66	190	56	24
RAUP 250	TTV 250	7760	77	25	64	18	276	81	199	58	17	264	77	195	57	19	247	72	185	54	21	238	70	184	54	24
		3.7	80	27	67	19	289	85	197	58	17	277	81	194	57	19	264	77	187	55	21	249	73	182	53	24
			86	30	71	22	-		-		-	-		-		-	-		-		-	-		-		-
			75	24	61	16	195	57	156	46	14	187	55	239	70	22	286	84	234	69	25	271	79	228	67	28
RAUP 300	TTV 300	9240	77	25	64	18	206	60	150	44	15	197	58	229	67	22	300	88	225	66	25	284	83	219	64	28
		4.4	80	27	67	19	216	63	149	44	15	207	61	228	67	22	316	93	225	66	25	301	88	217	63	28
			86	30	71	22	-		-		15	-		-		-	-		-		-	-		-		-
			75	24	61	16	398	117	319	93	26	379	111	311	91	30	361	106	299	88	34	341	100	294	86	38
RAUP 400	TTV 400	12120	77	25	64	18	421	123	308	90	26	402	118	298	87	30	381	112	290	85	34	360	105	281	82	38
		5.7	80	27	67	19	439	129	303	89	26	420	123	298	87	30	400	117	288	84	34	378	111	280	82	38
			86	30	71	22	-		-		-	-		-		-	-		-		-	-		-		-
			75	24	61	16	510	149	418	122	33	488	143	405	119	37	465	136	396	116	42	441	129	352	103	47
RAUP 500	TTV 500	15130	77	25	64	18	536	157	397	116	33	513	150	390	114	37	489	143	377	110	42	463	136	366	107	47
		7.1	80	27	67	19	562	165	399	117	33	540	158	389	114	37	514	151	375	110	42	488	143	366	107	47
			86	30	71	22	-		-		-	-		-		-	-		-		-	-		-		-
			75	24	61	16	613	179	515	151	40	590	173	502	147	45	564	165	491	144	50	536	157	477	140	56
RAUP 600	TTV 600	18080	77	25	64	18	648	190	493	144	40	624	183	486	142	45	596	175	471	138	50	565	165	458	134	56
		8.5	80	27	67	19	678	199	488	143	40	652	191	482	141	45	625	183	468	137	50	592	173	456	133	56
			86	30	71	22	-		-		-	-		-		-	-		-		-	-		-		-

Notes

TC Gross Total Capacity
SC Sensible Capacity
PI Power Imput, kW Compressors

All Capacities are gross and do not include a deduction for evaporator fan motor heat..
Interpolation is allowed. Do not extrapolate.

Indoor Unit Fan Performance Data

Evaporator For Performance - TTV 250 — **English Unit**

External Static Pressure (in. wg)

	0.5		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
CFM	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
6207	634	1.9	661	2.0	713	2.3	764	2.5	812	2.8	860	3.1	907	3.4	953	3.7	999	4.1
6760	662	2.2	687	2.3	736	2.7	784	2.8	831	3.1	876	3.5	919	3.8	961	4.1	1002	4.4
7760	725	3.1	748	3.3	791	3.5	834	4.0	876	4.2	917	4.4	958	4.8	999	5.2	1036	5.5
7880	732	3.2	755	3.4	798	3.6	840	4.1	881	4.3	922	4.6	963	4.9	1003	5.3	1040	5.7
9010	805	4.5	825	4.7	866	5.1	903	5.3	941	5.9	977	6.3	1013	6.5	1049	6.8	1065	7.1
9460	835	5.1	855	5.3	894	5.8	931	6.1	967	6.5	1001	7.0	1036	7.3	1071	7.7	1105	8.0

SI Unit

External Static Pressure (Pa)

	124.5		149.4		199.2		249		298.8		348.6		398.4		448.2		498	
CMS	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW
2.9	634	1.417	661	1.492	713	1.716	764	1.865	812	2.089	860	2.313	907	2.537	953	2.761	999	3.1
3.2	662	1.641	687	1.716	736	2.0	784	2.089	831	2.313	876	2.611	919	2.835	961	3.059	1002	3.3
3.7	725	2.313	748	2.462	791	2.611	834	3.0	876	3.134	917	3.283	958	3.582	999	3.880	1036	4.1
3.7	732	2.388	755	2.537	798	2.686	840	3.1	881	3.208	922	3.432	963	3.656	1003	4.0	1040	4.3
4.3	805	3.358	825	3.507	866	3.805	903	4.0	941	4.402	977	4.701	1013	4.850	1049	5.074	1065	5.3
4.5	835	3.805	855	4.0	894	4.328	931	4.552	967	4.850	1001	5.223	1036	5.447	1071	5.746	1105	6.0

Std. Motor is 5hp (3.7kW). High Static Option is 10hp (7.5kW)

Evaporator For Performance - TTV 300 — **English Unit**

External Static Pressure (in. wg)

	0.5		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
CFM	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
7440	692	2.7	717	2.9	762	3.2	807	3.5	851	3.8	894	4.0	936	4.4	976	4.7	1016	5.1
7880	719	3.1	743	3.3	786	3.5	829	4.0	870	4.3	911	4.5	952	4.8	992	5.2	1030	5.6
9000	790	4.4	810	4.5	852	5.0	890	5.2	927	5.6	964	6.2	1000	6.4	1036	6.6	1072	7.0
9240	806	4.7	825	4.9	866	5.3	904	5.6	940	6.0	977	6.5	1012	6.8	1047	7.1	1082	7.4
10130	865	6.0	882	6.1	919	6.5	956	7.0	990	7.3	1023	7.7	1057	8.3	1089	8.8	1121	9.1
11260	924	8.0	958	8.2	990	8.5	1023	9.0	1057	9.6	1088	9.9	1118	10.2	-	-	-	-

SI Unit

External Static Pressure (Pa)

	124.5		149.4		199.2		249		298.8		348.6		398.4		448.2		498	
CMS	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW
3.5	692	2.0	717	2.2	762	2.4	807	2.6	851	2.8	894	3.0	936	3.3	976	3.5	1016	3.8
3.7	719	2.3	743	2.5	786	2.6	829	3.0	870	3.2	911	3.4	952	3.6	992	3.9	1030	4.2
4.2	790	3.3	810	3.4	852	3.7	890	3.9	927	4.2	964	4.6	1000	4.8	1036	4.9	1072	5.2
4.4	806	3.5	825	3.7	866	4.0	904	4.2	940	4.5	977	4.9	1012	5.1	1047	5.3	1082	5.5
4.8	865	4.5	882	4.6	919	4.9	956	5.2	990	5.4	1023	5.7	1057	6.2	1089	6.6	1121	6.8
5.3	924	6.0	958	6.1	990	6.3	1023	6.7	1057	7.2	1088	7.4	1118	7.6	-	-	-	-

Std. Motor is 7.5hp (5.5kW). High Static Option is 15hp (11kW)

Evaporator For Performance - TTV 400 — **English Unit**

External Static Pressure (in. wg)

	0.5		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
CFM	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
9680	609	2.9	737	3.2	799	3.6	861	4.0	918	4.4	971	4.8	1021	5.2	1068	5.6	1115	6.2
10140	631	3.3	754	3.5	812	3.9	873	4.4	930	4.8	983	5.2	1032	5.8	1078	6.2	1124	6.6
11260	687	4.3	798	4.6	854	4.9	906	5.4	960	5.9	1014	6.4	1062	6.9	1108	7.4	1152	7.9
12120	730	5.2	835	5.4	887	5.9	937	5.9	986	6.8	1036	7.4	1085	8.0	1131	8.6	1175	8.9
12390	744	5.5	847	5.8	897	6.2	947	6.7	994	7.2	1043	7.8	1093	8.3	1139	8.9	1182	9.4
13520	802	6.8	900	7.1	943	7.6	990	8.2	1035	8.7	1078	9.3	1123	9.8	1169	10.5	1213	11.1
14670	863	8.6	954	8.9	996	9.4	1035	9.9	1079	10.6	1154	11.3	1200	12.1	-	-	-	-

SI Unit

External Static Pressure (Pa)

	124.5		149.4		199.2		249		298.8		348.6		398.4		448.2		498	
CMS	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW
4.6	609	2.2	737	2.4	799	2.7	861	3.0	918	3.3	971	3.6	1021	3.9	1068	4.2	1115	4.6
4.8	631	2.5	754	2.6	812	2.9	873	3.3	930	3.6	983	3.9	1032	4.3	1078	4.6	1124	4.9
5.3	687	3.2	798	3.4	854	3.7	906	4.0	960	4.4	1014	4.8	1062	5.2	1108	5.5	1152	5.9
5.7	730	3.9	835	4.0	887	4.4	937	4.4	986	5.1	1036	5.5	1085	6.0	1131	6.4	1175	6.6
5.8	744	4.1	847	4.3	897	4.6	947	5.0	994	5.4	1043	5.8	1093	6.2	1139	6.6	1182	7.0
6.4	802	5.1	900	5.3	943	5.7	990	6.1	1035	6.5	1078	6.9	1123	7.3	1169	7.8	1213	8.3
6.9	863	6.4	954	6.6	996	7.0	1035	7.4	1079	7.9	1154	8.4	1200	9.0	-	-	-	-

Std. Motor is 7.5hp (5.5kW). High Static Option is 15hp (11kW)

Indoor Unit Fan Performance Data

Evaporator For Performance - TTV 500 — English Unit

External Static Pressure (in. wg)

	0.5		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0		2.2		2.4		2.5	
CFM	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
12060	479	2.6	509	2.9	570	3.5	638	4.5	698	5.5	745	6.3	787	6.9	826	7.6	865	8.2	904	8.9	943	9.6	963	9.9
12780	489	2.9	516	3.2	574	3.7	634	4.6	702	5.8	754	6.8	796	7.6	834	8.2	871	8.9	907	9.6	944	10.3	963	10.6
13940	511	3.5	536	3.8	587	4.4	638	5.0	695	6.0	758	7.4	808	8.5	849	9.4	885	10.2	920	10.9	953	11.6	970	12.0
15130	532	4.2	556	4.5	602	5.1	651	5.8	697	6.5	751	7.6	810	9.1	859	10.4	899	11.5	934	12.3	967	13.2	983	13.5
16260	553	5.0	577	5.3	622	6.0	664	6.6	710	7.4	753	8.1	802	9.3	858	10.9	907	12.4	947	13.7	982	14.7	998	15.2
17420	577	5.9	601	6.2	642	6.9	682	7.6	722	8.4	766	9.2	805	10.0	850	11.1	902	12.8	951	14.6	992	16.0	1010	16.6
18310	597	6.6	619	7.0	658	7.7	698	8.5	734	9.2	775	10.0	815	10.9	854	11.8	897	13.1	945	14.7	991	16.6	-	-

SI Unit

External Static Pressure (Pa)

	124.5		149.4		199.2		249		298.8		348.6		398.4		448.2		498		547.8		597.6		622.5	
CMS	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW
5.7	479	1.9	509	2.2	570	2.6	638	3.4	698	4.1	745	4.7	787	5.2	826	5.7	865	6.1	904	6.6	943	7.2	963	7.4
6.0	489	2.2	516	2.4	574	2.8	634	3.4	702	4.3	754	5.1	796	5.7	834	6.1	871	6.6	907	7.2	944	7.7	963	7.9
6.6	511	2.6	536	2.8	587	3.3	638	3.7	695	4.5	758	5.5	808	6.3	849	7.0	885	7.6	920	8.1	953	8.7	970	9.0
7.1	532	3.1	556	3.4	602	3.8	651	4.3	697	4.9	751	5.7	810	6.8	859	7.8	899	8.6	934	9.2	967	9.9	983	10.1
7.7	553	3.7	577	4.0	622	4.5	664	4.9	710	5.5	753	6.1	802	6.9	858	8.1	907	9.3	947	10.2	982	11.0	998	11.3
8.2	577	4.4	601	4.6	642	5.2	682	5.7	722	6.3	766	6.9	805	7.5	850	8.3	902	9.6	951	10.9	992	11.9	1010	12.4
8.6	597	4.9	619	5.2	658	5.7	698	6.3	734	6.9	775	7.5	815	8.1	854	8.8	897	9.8	945	11.0	991	12.4	-	-

Std. Motor is 10hp (7.5kW). High Static Option is 20hp (15kW)

Evaporator For Performance - TTV 600 — English Unit

External Static Pressure (in. wg)

	0.5		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0		2.2		2.4		2.5	
CFM	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
14460	569	5.0	592	5.3	635	5.9	682	6.6	728	7.4	777	8.5	832	9.9	882	11.4	923	12.6	959	13.6	992	14.5	1008	14.9
14900	579	5.3	602	5.7	643	6.3	689	7.0	733	7.8	777	8.6	831	10.1	885	11.8	929	13.1	966	14.2	999	15.2	1015	15.7
15960	605	6.3	625	6.6	667	7.3	705	8.0	749	8.9	789	9.6	831	10.6	881	12.1	932	13.9	977	15.5	1014	16.8	-	-
17030	631	7.4	651	7.7	691	8.5	727	9.2	765	10.0	806	10.9	843	11.7	882	12.7	928	14.2	977	16.1	-	-	-	-
18090	658	8.6	677	9.0	714	9.8	751	10.6	785	11.3	821	12.2	860	13.2	895	14.0	931	15.1	973	16.6	-	-	-	-
19160	686	9.9	705	10.4	739	11.2	775	12.1	808	12.9	840	13.7	876	14.7	912	15.7	945	16.6	-	-	-	-	-	-
20220	713	11.4	732	11.9	765	12.8	799	13.7	832	14.6	862	15.4	893	16.3	927	17.4	-	-	-	-	-	-	-	-
21280	740	13.1	759	13.6	792	14.5	823	15.4	856	16.4	886	17.3	-	-	-	-	-	-	-	-	-	-	-	-
21900	756	14.1	775	14.6	808	15.6	838	16.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SI Unit

External Static Pressure (Pa)

	124.5		149.4		199.2		249		298.8		348.6		398.4		448.2		498		547.8		597.6		622.5	
CMS	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW	RPM	kW
6.8	569	3.7	592	4.0	635	4.4	682	4.9	728	5.5	777	6.3	832	7.4	882	8.5	923	9.4	959	10.2	992	10.8	1008	11.1
7.0	579	4.0	602	4.3	643	4.7	689	5.2	733	5.8	777	6.4	831	7.5	885	8.8	929	9.8	966	10.6	999	11.3	1015	11.7
7.5	605	4.7	625	4.9	667	5.4	705	6.0	749	6.6	789	7.2	831	7.9	881	9.0	932	10.4	977	11.6	1014	12.5	-	-
8.0	631	5.5	651	5.7	691	6.3	727	6.9	765	7.5	806	8.1	843	8.7	882	9.5	928	10.6	977	12.0	-	-	-	-
8.5	658	6.4	677	6.7	714	7.3	751	7.9	785	8.4	821	9.1	860	9.9	895	10.4	931	11.3	973	12.4	-	-	-	-
9.0	686	7.4	705	7.8	739	8.4	775	9.0	808	9.6	840	10.2	876	11.0	912	11.7	945	12.4	-	-	-	-	-	-
9.5	713	8.5	732	8.9	765	9.6	799	10.2	832	10.9	862	11.5	893	12.2	927	13.0	-	-	-	-	-	-	-	-
10.1	740	9.8	759	10.2	792	10.8	823	11.5	856	12.2	886	12.9	-	-	-	-	-	-	-	-	-	-	-	-
10.3	756	10.5	775	10.9	808	11.6	838	12.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Std. Motor is 15hp (11kW). High Static Option is 20hp (15kW)

Notes

To determine power of the motor to be installed, the following correction factors have to be applied to the fan Shaft Absorbed hp.

Fan Motor hp = Absorbed Fan Shaft hp x Correction Factor

Correction Factor = 1.2 for absorbed Fan Shaft < 10kW (13.4hp)

Correction Factor = 1.15 for absorbed Fan Shaft > 10kW (13.4hp)

Fan Motor Heat (MBH) = 2.55 x BH

Data Includes pressure drop due to filters and wet coil.

RAUP Performance Data - R22 (50Hz)

Gross Cooling Capacities - RAUP 250 R22 Refrigerant

Outdoor Ambient Temperature — 46 C (115 F)

Saturated Suction Temperature C	F	25 C (77 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	30 C (86 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	35 C (95 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	40 C (104 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	45 C (113 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)
0	32	68.4	234	19.0	16.4	238	4.0	58	65.0	222	21.0	18.4	267	4.0	58	61.4	210	23.3	20.6	299	4.0	58	57.6	197	25.8	23.1	335	4.0	58	53.7	183	28.6	25.7	373	4.0	58
2	36	73.7	252	19.5	16.9	246	4.3	63	70.0	239	21.6	19.0	275	4.3	63	66.1	226	23.9	21.2	308	4.3	63	62.0	212	26.4	23.6	343	4.3	63	57.8	197	29.2	26.3	382	4.3	63
4	39	77.8	266	20.0	17.3	252	4.6	67	73.9	252	22.0	19.4	281	4.6	67	69.7	238	24.4	21.6	314	4.6	67	65.5	224	26.9	24.1	349	4.6	67	61.0	208	29.7	26.8	388	4.6	67
6	43	83.3	285	20.6	17.9	260	5.0	73	79.1	270	22.7	20.0	290	5.0	73	74.7	255	25.0	22.3	323	5.0	73	70.2	240	27.6	24.7	359	5.0	73	65.4	223	30.4	27.4	397	5.0	73
8	46	87.6	299	21.1	18.4	267	5.4	78	83.2	284	23.2	20.5	297	5.4	78	78.6	268	25.5	22.7	330	5.4	78	73.8	252	28.1	25.2	366	5.4	78	68.8	235	30.9	27.9	405	5.4	78
10	50	93.5	319	21.7	19.0	276	5.8	84	88.8	303	23.9	21.1	306	5.8	84	83.9	286	26.2	23.4	340	5.8	84	78.8	269	28.8	25.9	376	5.8	84	73.5	251	31.6	28.6	415	5.8	84

7C SST/35C Amb. 76.7 261.82 25.25

Gross Cooling Capacities - RAUP 300 R22 Refrigerant

Outdoor Ambient Temperature — 46 C (115 F)

Saturated Suction Temperature C	F	25 C (77 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	30 C (86 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	35 C (95 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	40 C (104 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	45 C (113 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)
0	32	80.6	275	22.1	16.1	234	4.0	58	76.6	262	24.3	18.0	262	4.0	58	72.5	248	26.7	20.2	292	4.0	58	68.2	233	29.3	22.5	326	4.0	58	63.6	217	32.2	25.0	363	4.0	58
2	36	86.9	297	22.7	16.6	241	4.3	63	82.6	282	24.9	18.6	269	4.3	63	78.2	267	27.4	20.7	300	4.3	63	73.5	251	30.0	23.0	334	4.3	63	68.6	234	32.9	25.6	371	4.3	63
4	39	91.7	313	23.2	17.0	247	4.6	67	87.3	298	25.5	19.0	275	4.6	67	82.6	282	27.9	21.1	306	4.6	67	77.6	265	30.6	23.4	340	4.6	67	72.4	247	33.5	26.0	377	4.6	67
6	43	98.4	336	23.9	17.6	255	5.0	73	93.6	320	26.2	19.6	284	5.0	73	88.6	303	28.6	21.7	315	5.0	73	83.0	284	31.3	24.0	349	5.0	73	77.8	266	34.3	26.6	386	5.0	73
8	46	103.6	354	25.4	18.0	262	5.4	78	98.5	336	26.7	20.0	290	5.4	78	93.2	318	29.2	22.2	322	5.4	78	87.6	299	31.9	24.5	356	5.4	78	81.8	280	34.9	27.1	393	5.4	78
10	50	110.7	378	25.3	18.6	270	5.8	84	105.2	359	27.5	20.7	300	5.8	84	99.5	340	30.0	22.8	331	5.8	84	93.6	320	32.7	25.2	365	5.8	84	87.4	299	35.7	27.7	402	5.8	84

7C SST/35C Amb. 90.9 310.38 28.9

Gross Cooling Capacities - RAUP 400 R22 Refrigerant

Outdoor Ambient Temperature — 46 C (115 F)

Saturated Suction Temperature C	F	25 C (77 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	30 C (86 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	35 C (95 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	40 C (104 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	45 C (113 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)
0	32	104.4	357	29.8	16.5	240	4.0	58	98.8	337	33.0	18.6	270	4.0	58	92.9	317	36.8	20.8	302	4.0	58	86.8	296	40.8	23.3	338	4.0	58	80.4	275	45.2	26.0	376	4.0	58
2	36	112.3	384	30.6	17.1	247	4.3	63	106.3	363	33.8	19.1	277	4.3	63	100.0	342	37.6	21.4	310	4.3	63	93.5	319	41.6	23.8	346	4.3	63	86.6	296	46.2	26.5	385	4.3	63
4	39	118.4	405	31.2	17.5	253	4.6	67	112.1	383	34.4	19.5	284	4.6	67	105.5	360	38.2	21.8	316	4.6	67	98.6	337	42.4	24.3	352	4.6	67	91.4	312	46.8	27.0	391	4.6	67
6	43	126.8	433	32.0	18.0	262	5.0	73	120.0	410	35.4	20.1	292	5.0	73	113.0	386	39.2	22.4	325	5.0	73	105.6	361	43.2	24.9	361	5.0	73	98.0	335	47.8	27.6	401	5.0	73
8	46	133.2	455	32.6	18.5	268	5.4	78	126.1	431	36.0	20.6	299	5.4	78	118.7	405	39.8	22.9	332	5.4	78	111.0	379	44.0	25.4	368	5.4	78	103.0	352	48.4	28.1	408	5.4	78
10	50	141.8	484	33.6	19.1	277	5.8	84	134.3	459	37.0	21.2	308	5.8	84	126.4	432	40.8	23.6	342	5.8	84	118.3	404	44.8	26.1	378	5.8	84	109.8	375	49.4	28.8	418	5.8	84

7C SST/35C Amb. 115.8 395.54 39.5

Gross Cooling Capacities - RAUP 500 R22 Refrigerant

Outdoor Ambient Temperature — 46 C (115 F)

Saturated Suction Temperature C	F	25 C (77 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	30 C (86 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	35 C (95 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	40 C (104 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	45 C (113 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)
0	32	136.9	468	38.0	16.4	238	4.0	58	130.0	444	42.0	18.4	267	4.0	58	122.8	419	46.6	20.6	299	4.0	58	115.3	394	51.6	23.1	335	4.0	58	107.4	367	57.2	25.7	373	4.0	58
2	36	147.4	503	39.0	16.9	246	4.3	63	140.0	478	43.2	19.0	275	4.3	63	132.2	452	47.8	21.2	308	4.3	63	124.1	424	52.8	23.6	343	4.3	63	115.6	395	58.4	26.3	382	4.3	63
4	39	155.5	531	40.0	17.3	252	4.6	67	147.7	504	44.0	19.4	281	4.6	67	139.5	476	48.8	21.6	314	4.6	67	130.9	447	53.8	24.1	349	4.6	67	122.0	417	59.4	26.8	388	4.6	67
6	43	166.6	569	41.2	17.9	260	5.0	73	158.3	541	45.4	20.0	290	5.0	73	149.5	511	50.0	22.3	323	5.0	73	140.3	479	55.2	24.7	359	5.0	73	130.9	447	60.8	27.4	397	5.0	73
8	46	175.2	599	42.2	18.4	267	5.4	78	166.4	568	46.4	20.5	297	5.4	78	157.2	537	51.0	22.7	330	5.4	78	147.6	504	56.2	25.2	366	5.4	78	137.6	470	61.8	27.9	405	5.4	78
10	50	186.9	638	43.4	19.0	276	5.8	84	177.5	606	47.8	21.1	306	5.8	84	167.7	573	52.4	23.4	340	5.8	84	157.5	538	57.6	25.9	376	5.8	84	147.0	502	63.2	28.6	415	5.8	84

7C SST/35C Amb. 153.3 523.64 50.5

Gross Cooling Capacities - RAUP 600 R22 Refrigerant

Outdoor Ambient Temperature — 46 C (115 F)

Saturated Suction Temperature C	F	25 C (77 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	30 C (86 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	35 C (95 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	40 C (104 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)	45 C (113 F) Capacity (kw)	Capacity (MBH)	P.I. (kW)	HP (bar)	HP (Psig)	LP (bar)	LP (Psig)
0	32	161.2	550	44.2	16.1	234	4.0	58	153.3	524	48.6	18.0	262	4.0	58	145.0	495	53.4	20.2	292	4.0	58	136.3	466	58.6	22.5	326	4.0	58	127.2	435	64.4	25.0	363	4.0	58
2	36	173.8	594	45.4	16.6	241	4.3	63	165.2	564	49.8	18.6	269	4.3	63	156.3	534	54.8	20.7	300	4.3	63	147.0	502	60.0	23.0	334	4.3	63	137.2	469	65.8	25.6	371	4.3	63
4	39	183.5	627	46.4	17.0	247	4.6	67	174.5	596	51.0	19.0	275	4.6	67	165.1	564	55.8	21.1	306	4.6	67	155.2	530	61.2	23.4	340	4.6	67	144.9	495	67.0	26.0	377	4.6	67
6	43	196.9	672	47.8	17.6	255	5.0	73	187.2	640	52.4	19.6	284	5.0	73	177.2	605	57.2	21.7	315	5.0	73	166.0	567	62.6	24.0	349	5.0	73	155.5	531	68.6	26.6	386	5.0	73
8	46	207.2	708	50.8	18.0	262	5.4	78	197.0	673	53.4	20.0	290	5.4	78	186.4	637	58.4	22.2	322	5.4	78	175.2	599	63.8	24.5	356	5.4	78	163.7	559	69.8	27.1	393	5.4	78
10	50	221.3	756	50.6	18.6	270	5.8	84	210.4	719	55.0	20.7	300	5.8	84	199.0	680	60.0	22.8	331	5.8	84	187.2	639	65.4	25.2	365	5.8	84	174.9	597	71.4	27.7	402	5.8	84

7C SST/35C Amb. 181.8 620.76 57.8

Capacity =Gross Total Capacity
P.I. =Compressor Power Input rated at 400V/50Hz
HP =High Pressure Gauge
LP =Low Pressure Gauge
Pressures and power output here are calculated and subject to variation depending on site conditions.

RAUP Performance Data - R407C (50Hz)

RAUP Performance Data - R407C (50Hz)

Gross Cooling Capacities - RAUP 250 R407C Refrigerant

46 C (115 F)

Outdoor Ambient Temperature

Saturated Suction Temperature		25 C (77 F)							30 C (86 F)							35 C (95 F)							40 C (104 F)							45 C (113 F)						
		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP	
C	F	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)
0	32	65.0	222	19.0	16.4	238	4.0	58	61.7	211	21.0	18.4	267	4.0	58	58.3	199	23.3	20.6	299	4.0	58	54.8	187	25.8	23.1	335	4.0	58	51.0	174	28.6	25.7	373	4.0	58
2	36	70.0	239	19.5	16.9	246	4.3	63	66.5	227	21.6	19.0	275	4.3	63	62.8	215	23.9	21.2	308	4.3	63	58.9	201	26.4	23.6	343	4.3	63	54.9	188	29.2	26.3	382	4.3	63
4	39	73.9	252	20.0	17.3	252	4.6	67	70.2	240	22.0	19.4	281	4.6	67	66.2	226	24.4	21.6	314	4.6	67	62.2	212	26.9	24.1	349	4.6	67	57.9	198	29.7	26.8	388	4.6	67
6	43	79.2	270	20.6	17.9	260	5.0	73	75.2	257	22.7	20.0	290	5.0	73	71.0	243	25.0	22.3	323	5.0	73	66.7	228	27.6	24.7	359	5.0	73	62.2	212	30.4	27.4	397	5.0	73
8	46	83.2	284	21.1	18.4	267	5.4	78	79.0	270	23.2	20.5	297	5.4	78	74.7	255	25.5	22.7	330	5.4	78	70.1	239	28.1	25.2	366	5.4	78	65.4	223	30.9	27.9	405	5.4	78
10	50	88.8	303	21.7	19.0	276	5.8	84	84.3	288	23.9	21.1	306	5.8	84	79.7	272	26.2	23.4	340	5.8	84	74.8	256	28.8	25.9	376	5.8	84	69.8	239	31.6	28.6	415	5.8	84

7C SST/35C Amb.	72.8	248.73	25.25

Gross Cooling Capacities - RAUP 300 R407C Refrigerant

46 C (115 F)

Outdoor Ambient Temperature

Saturated Suction Temperature		25 C (77 F)							30 C (86 F)							35 C (95 F)							40 C (104 F)							45 C (113 F)						
		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP	
C	F	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)
0	32	76.6	261	22.1	16.1	234	4.0	58	72.8	249	24.3	18.0	262	4.0	58	68.9	235	26.7	20.2	292	4.0	58	64.8	221	29.3	22.5	326	4.0	58	60.4	206	32.2	25.0	363	4.0	58
2	36	82.5	282	22.7	16.6	241	4.3	63	78.5	268	24.9	18.6	269	4.3	63	74.2	254	27.4	20.7	300	4.3	63	69.8	238	30.0	23.0	334	4.3	63	65.2	223	32.9	25.6	371	4.3	63
4	39	87.2	298	23.2	17.0	247	4.6	67	82.9	283	25.5	19.0	275	4.6	67	78.4	268	27.9	21.1	306	4.6	67	73.7	252	30.6	23.4	340	4.6	67	68.8	235	33.5	26.0	377	4.6	67
6	43	93.5	319	23.9	17.6	255	5.0	73	88.9	304	26.2	19.6	284	5.0	73	84.1	287	28.6	21.7	315	5.0	73	78.9	269	31.3	24.0	349	5.0	73	73.9	252	34.3	26.6	386	5.0	73
8	46	98.4	336	25.4	18.0	262	5.4	78	93.6	320	26.7	20.0	290	5.4	78	88.5	302	29.2	22.2	322	5.4	78	83.2	284	31.9	24.5	356	5.4	78	77.8	266	34.9	27.1	393	5.4	78
10	50	105.1	359	25.3	18.6	270	5.8	84	100.0	341	27.5	20.7	300	5.8	84	94.5	323	30.0	22.8	331	5.8	84	88.9	304	32.7	25.2	365	5.8	84	83.1	284	35.7	27.7	402	5.8	84

7C SST/35C Amb.	86.3	294.86	28.9

Gross Cooling Capacities - RAUP 400 R407C Refrigerant

46 C (115 F)

Outdoor Ambient Temperature

Saturated Suction Temperature		25 C (77 F)							30 C (86 F)							35 C (95 F)							40 C (104 F)							45 C (113 F)						
		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP	
C	F	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)
0	32	99.2	339	29.8	16.5	240	4.0	58	93.8	320	33.0	18.6	270	4.0	58	88.3	301	36.8	20.8	302	4.0	58	82.5	282	40.8	23.3	338	4.0	58	76.4	261	45.2	26.0	376	4.0	58
2	36	106.7	364	30.6	17.1	247	4.3	63	101.0	345	33.8	19.1	277	4.3	63	95.0	325	37.6	21.4	310	4.3	63	88.8	303	41.6	23.8	346	4.3	63	82.3	281	46.2	26.5	385	4.3	63
4	39	112.5	384	31.2	17.5	253	4.6	67	106.5	364	34.4	19.5	284	4.6	67	100.2	342	38.2	21.8	316	4.6	67	93.7	320	42.4	24.3	352	4.6	67	86.8	297	46.8	27.0	391	4.6	67
6	43	120.4	411	32.0	18.0	262	5.0	73	114.0	389	35.4	20.1	292	5.0	73	107.3	367	39.2	22.4	325	5.0	73	100.3	343	43.2	24.9	361	5.0	73	93.1	318	47.8	27.6	401	5.0	73
8	46	126.5	432	32.6	18.5	268	5.4	78	119.8	409	36.0	20.6	299	5.4	78	112.7	385	39.8	22.9	332	5.4	78	105.4	360	44.0	25.4	368	5.4	78	97.8	334	48.4	28.1	408	5.4	78
10	50	134.7	460	33.6	19.1	277	5.8	84	127.6	436	37.0	21.2	308	5.8	84	120.1	410	40.8	23.6	342	5.8	84	112.4	384	44.8	26.1	378	5.8	84	104.3	356	49.4	28.8	418	5.8	84

7C SST/35C Amb.	110.0	375.76	39.5

Gross Cooling Capacities - RAUP 500 R407C Refrigerant

46 C (115 F)

Outdoor Ambient Temperature

Saturated Suction Temperature		25 C (77 F)							30 C (86 F)							35 C (95 F)							40 C (104 F)							45 C (113 F)						
		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP	
C	F	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)
0	32	130.0	444	38.0	16.4	238	4.0	58	123.5	422	42.0	18.4	267	4.0	58	116.7	398	46.6	20.6	299	4.0	58	109.5	374	51.6	23.1	335	4.0	58	102.1	349	57.2	25.7	373	4.0	58
2	36	140.0	478	39.0	16.9	246	4.3	63	133.0	454	43.2	19.0	275	4.3	63	125.6	429	47.8	21.2	308	4.3	63	117.9	403	52.8	23.6	343	4.3	63	109.8	375	58.4	26.3	382	4.3	63
4	39	147.7	505	40.0	17.3	252	4.6	67	140.3	479	44.0	19.4	281	4.6	67	132.5	453	48.8	21.6	314	4.6	67	124.4	425	53.8	24.1	349	4.6	67	115.9	396	59.4	26.8	388	4.6	67
6	43	158.3	541	41.2	17.9	260	5.0	73	150.4	514	45.4	20.0	290	5.0	73	142.0	485	50.0	22.3	323	5.0	73	133.3	455	55.2	24.7	359	5.0	73	124.3	425	60.8	27.4	397	5.0	73
8	46	166.5	569	42.2	18.4	267	5.4	78	158.1	540	46.4	20.5	297	5.4	78	149.3	510	51.0	22.7	330	5.4	78	140.2	479	56.2	25.2	366	5.4	78	130.7	447	61.8	27.9	405	5.4	78
10	50	177.6	607	43.4	19.0	276	5.8	84	168.6	576	47.8	21.1	306	5.8	84	159.4	544	52.4	23.4	340	5.8	84	149.7	511	57.6	25.9	376	5.8	84	139.7	477	63.2	28.6	415	5.8	84

7C SST/35C Amb.	145.7	497.45	50.5

Gross Cooling Capacities - RAUP 600 R407C Refrigerant

46 C (115 F)

Outdoor Ambient Temperature

Saturated Suction Temperature		25 C (77 F)							30 C (86 F)							35 C (95 F)							40 C (104 F)							45 C (113 F)						
		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP		Capacity		P.I.	HP		LP	
C	F	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)	(kw)	(MBH)	(kW)	(bar)	(Psig)	(bar)	(Psig)
0	32	153.1	523	44.2	16.1	234	4.0	58	145.6	497	48.6	18.0	262	4.0	58	137.7	470	53.4	20.2	292	4.0	58	129.5	442	58.6	22.5	326	4.0	58	120.9	413	64.4	25.0	363	4.0	58
2	36	165.1	564	45.4	16.6	241	4.3	63	157.0	536	49.8	18.6	269	4.3	63	148.5	507	54.8	20.7	300	4.3	63	139.6	477	60.0	23.0	334	4.3	63	130.3	445	65.8	25.6	371	4.3	63
4	39	174.3	595	46.4	17.0	247	4.6	67	165.8	566	51.0	19.0	275	4.6	67	156.8	536	55.8	21.1	306	4.6	67	147.4	504	61.2	23.4	340	4.6	67	137.6	470	67.0	26.0	377	4.6	67
6	43	187.1	639	47.8	17.6	255	5.0	73	177.9	608	52.4	19.6	284	5.0	73	168.3	575	57.2	21.7	315	5.0	73	157.7	539	62.6	24.0	349	5.0	73	147.7	505	68.6	26.6	386	5.0	73
8	46	196.9	672	50.8	18.0	262	5.4	78	187.2	639	53.4	20.0	290	5.4	78	177.1	605	58.4	22.2	322	5.4	78	166.5	569	63.8	24.5	356	5.4	78	155.5	531	69.8	27.1	393	5.4	78
10	50	210.2	718	50.6	18.6	270	5.8	84	199.9	683	55.0	20.7	300	5.8	84	189.1	646	60.0	22.8	331	5.8	84	177.8	607	65.4	25.2	365	5.8	84	166.1	567	71.4	27.7	402	5.8	84

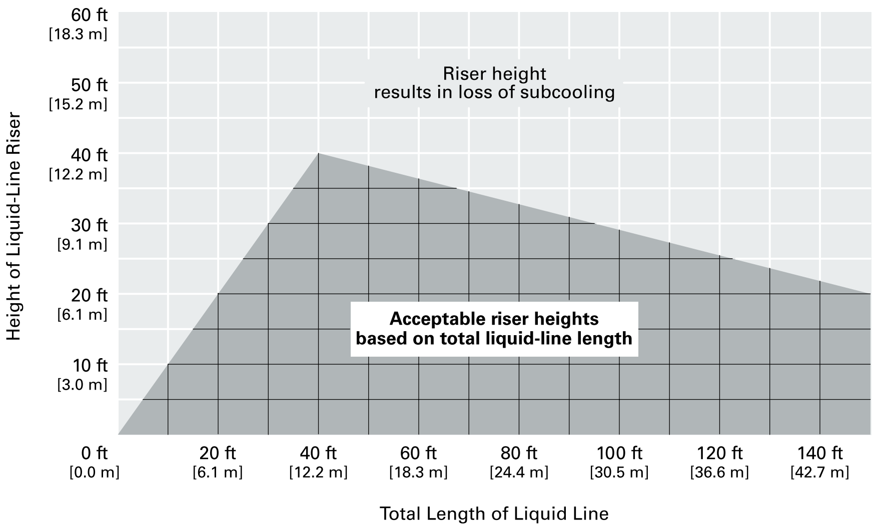
7C SST/35C Amb.	172.7	589.72	57.8

Capacity =Gross Total Capacity
P.I. =Compressor Power Input rated at 400V/50Hz
HP =High Pressure Gauge
LP =Low Pressure Gauge
Pressures and power output here are calculated and subject to variation depending on site conditions.

Line Sizing, Routing, and Component Selection

Riser height limitations defined in this chart assume that the liquid line contains 10 elbows. The effect of additional elbows varies based on the specific characteristics of each installation.

Figure 2. Liquid-Line Riser Limitations for RAUP Condensing Units



Note: Preselected liquid-line diameters are independent of line length or rise, within the permissible guidelines, for properly charged RAUP units in normal air-conditioning applications.

Routing. Install the liquid line with a slight slope in the direction of flow so that it can be routed with the suction line.

A height limitation exists for liquid lines that include a liquid riser because of the loss of subcooling that accompanies the pressure loss in the height of the liquid column, Figure 2 depicts the *permissible* rise in the liquid line (that is,without excessive loss of subcooling). Again, **system designs outside the application envelope of the RAUP unit require Trane review**.

Insulation
The liquid line is generally warmer than the surrounding air, so it does not require insulation. In fact, heat loss from the liquid line improves system capacity because it provides additional subcooling.

Components
Liquid-line refrigerant components necessary for a successful job include a filter drier, access port, moisture-indicating sight glass, expansion valve(s), and ball shutoff valves.

Line Sizing, Routing, and Component Selection

These Components need to be installed as close to the evaporator as possible.

- **Filter drier.** There is no substitute for cleanliness during system installation. The filter drier prevents residual contaminants, introduced during installation, from entering the expansion valve and solenoid valve.

- **Access port.** The access port allows the unit to be charged with liquid refrigerant and is used to determine subcooling. This port is usually a Schraeder valve with a core.

- **Moisture-indicating sight glass.** Be sure to install one moisture-indicating sight glass in the main liquid line. The *sole* value of the sight glass is its moisture indication ability. Use actual measurements of temperature and pressure — not the sight glass — to determine subcooling and whether the system is properly charged.

- **Expansion valve.** The expansion valve is the throttling device that meters the refrigerant into the evaporator coil. Metering too much refrigerant floods the compressor; metering too little elevates the compressor temperature. Choosing the correct size and type of expansion valve is critical to assure that it will correctly meter refrigerant into the evaporator coil throughout the entire operating envelope of the system. **Correct refrigerant distribution into the coil requires an expansion valve for each distributor.**

  For improved modulation, choose expansion valves with balanced port construction and external equalization.

- **Ball shutoff valves.** Adding manual, ball-type shutoff valves upstream and downstream of the filter simplifies replacement of the filter core.

Line Sizing, Routing, and Component Selection

Total length of the suction line, including a maximum rise of 50 feet, must not exceed 150 feet.

Suction Lines

Line sizing. Proper suction-line sizing is required to guarantee that the oil returns to the compressor throughout the system's operating envelope. At the same time, the line must be sized so that the pressure drop does not excessively affect capacity or efficiency. To accomplish both objectives, it may be necessary to use two different line diameters: one for the horizontal run and for vertical drops, and another for the vertical lifts.

Routing. To prevent residual or condensed refrigerant from "free-flowing" toward the compressor, install the suction line so that it slopes slightly — that is, by ¼ inch to 1 inch per 10 feet of run [1 cm per 3 m] — toward the evaporator.

When the application includes a suction riser, oil must be forced to travel the height of the riser. Riser traps and double risers are unnecessary in the suction line. All RAUP units unload such that a single line size, standard preselected, provides sufficient lift to push entrained oil up the permissible riser height. To assure proper oil movement, the **permissible unit separationis 150 ft [45.7 m], including a maximum vertical rise of 50 ft [15 m]**. System designs outside this application envelope require Trane review.

Note: If a suction riser is properly sized, oil will return to the compressor regardless of whether a trap is present. If a suction riser is oversized, adding a trap will not restore proper oil movement.

Avoid putting refrigerant lines underground. Refrigerant condensation or installation debris inside the line, service access, and abrasion/corrosion can quickly impair reliability.

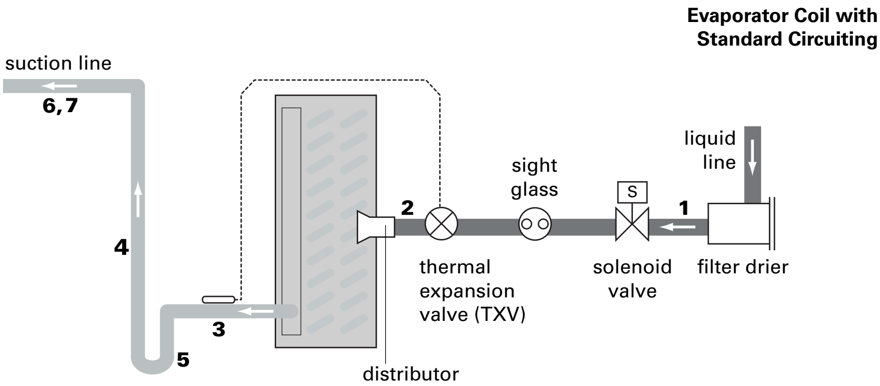
Insulation. Any heat that transfers from the surrounding air to the cooler suction lines increases the load on the condenser (reducing the system's air-conditioning capacity) and promotes condensate formation (adversely affecting indoor air quality). After operating the system and testing all fittings and joints to verify that the system is leak-free, insulate the suction lines to prevent heat gain and unwanted condensation.

- **Access port.** The access port is used to determine suction pressure. This port is usually a Schraeder valve with a core.

Examples of Field-Installed Evaporator Piping

Single-Circuit RAUPs

Figure 3. Type UF Evaporator Coil With One Distributor



1 Pitch the liquid line slightly — 1 in./10 ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.

2 Provide one expansion valve per distributor.

3 Slightly pitch the outlet line from the suction header toward the suction riser — that is, 1 in./10 ft [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.

4 Use the tube diameter recommended for a vertical rise in Table 2 (page6). Assure that the top of the riser is higher than the evaporator coil.

5 Arrange the suction line so that the refrigerant gas leaving the coil flows downward, *past the lowest suction-header outlet*, before turning upward.

6 Pitch the suction line slightly — 1 in./10ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.

7 Insulate the suction line.

Examples of Field-Installed Evaporator Piping

Single or Dual-Circuit RAUPs

Figure 4. Type UF Evaporator Coil With Two Distributors

1 Pitch the liquid line slightly — 1 in./10 ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.

2 Provide one expansion valve per distributor.

3 Slightly pitch the outlet line from the suction header toward the suction riser — that is, 1 in./10 ft [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.

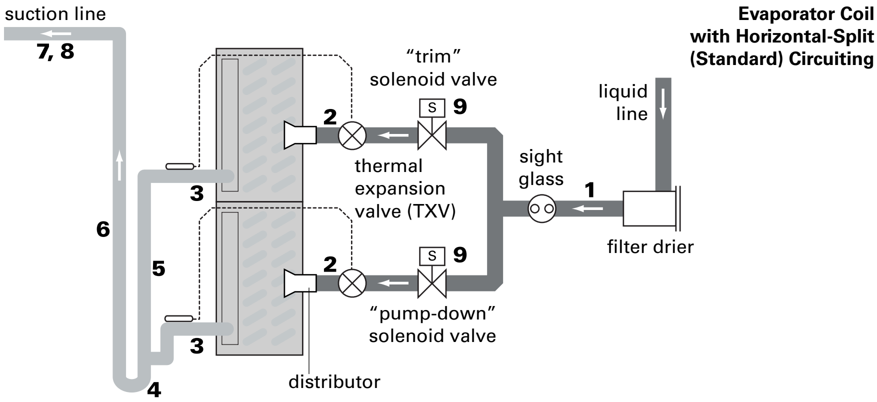
4 Arrange the suction line so that the refrigerant gas leaving the coil flows downward, *past the lowest suction-header outlet*, before turning upward. Use a double-elbow configuration to isolate the TXV bulb from other suction headers.

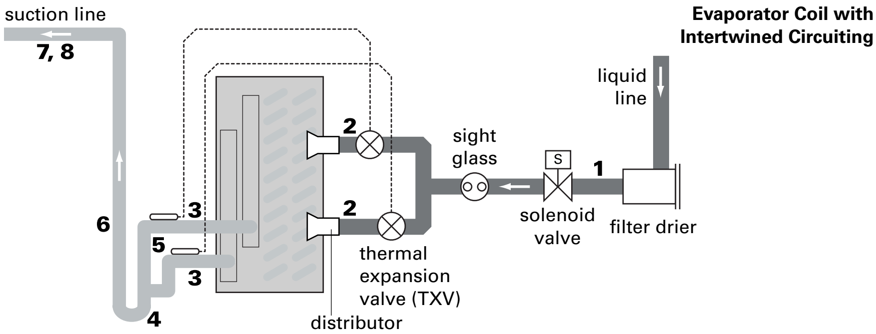
5 Use the “horizontal” tube diameter identified in Table 2 (page 6).

6 Use the tube diameter recommended for a vertical rise in Table 2 (page 6). Assure that the top of the riser is higher than the evaporator coil.

7 Pitch the suction line slightly — 1 in./10ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.

8 Insulate the suction line.





Examples of Field-Installed Evaporator Piping

Single or Multiple-Circuit RAUPs

Figure 5. Type UF Evaporator Coil With Four Distributors

1 Pitch the liquid line slightly — 1 in./ 10 ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.

2 Provide one expansion valve per distributor.

3 Slightly pitch the outlet line from the suction header toward the suction riser — that is, 1 in./10 ft [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.

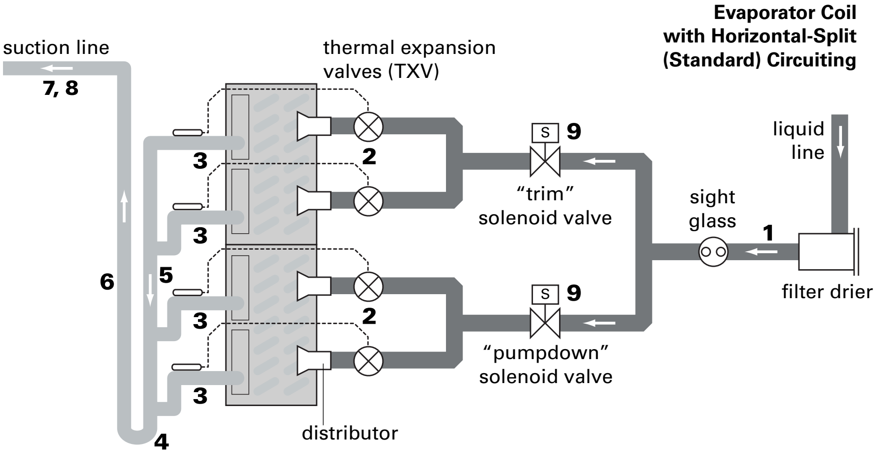
4 Arrange the suction line so that the refrigerant gas leaving the coil flows downward, *past the lowest suction-header outlet*, before turning upward. Use a double-elbow configuration to isolate the TXV bulb from other suction headers.

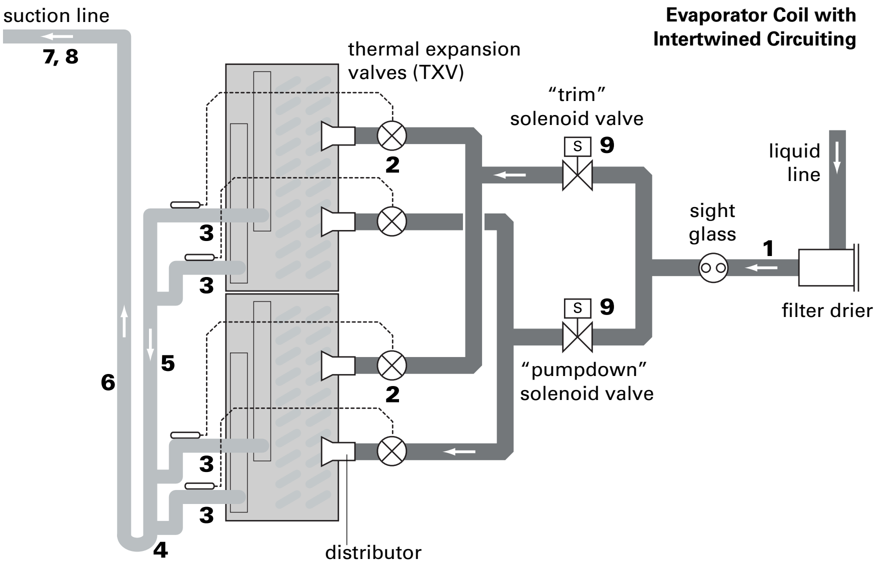
5 Use the "horizontal" tube diameter identified in Table 2 (page 6).

6 Use the tube diameter recom-mended for a vertical rise in Table 2 (page6). Assure that the top of the riser is higher than the evaporator coil.

7 Pitch the suction line slightly — 1 in./10ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.

8 Insulate the suction line.

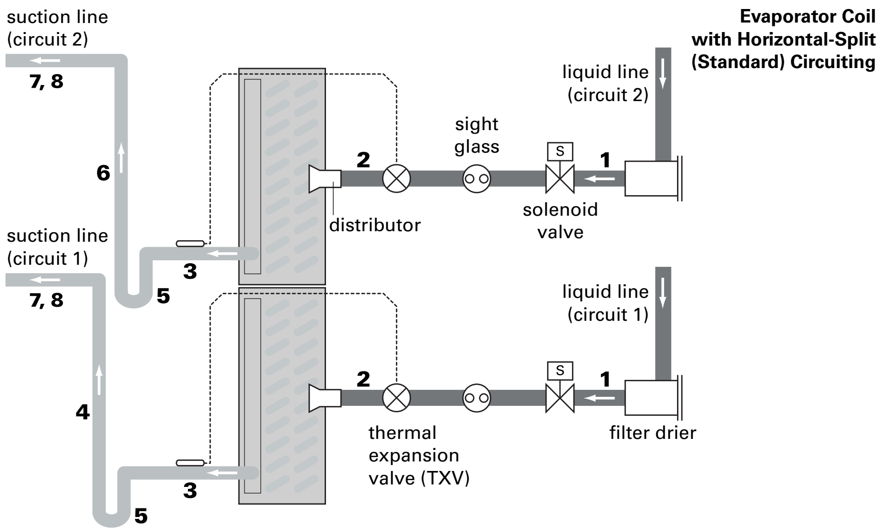




Examples of Field-Installed Evaporator Piping

Single or Multiple-Circuit RAUPs

Figure 6. Type UF Evaporator Coil With Two Distributors



1 Pitch the liquid line slightly — 1 in./ 10 ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.

2 Provide one expansion valve per distributor.

3 Slightly pitch the outlet line from the suction header toward the suction riser — that is, 1 in./10 ft [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.

4 The top of the Circuit 1 suction riser must be higher than the bottom evaporator coil. Use the tube diameter recommended for a vertical rise in Table 2 (page 6).

5 Arrange the suction line so that the refrigerant gas leaving the coil flows downward, *past the lowest suction-header outlet*, before turning upward.

6 The top of the Circuit 2 suction riser must be higher than the top evaporator coil. Use the tube diameter recommended for a vertical rise in Table 2 (page 6).

7 Pitch the suction line slightly — 1 in./10ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.

8 Insulate the suction lines.

Examples of Field-Installed Evaporator Piping

Single or Multiple-Circuit RAUPs

Figure 7. Type UF Evaporator Coil With Four Distributors

1 Pitch the liquid line slightly — 1 in./10 ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.

2 Provide one expansion valve per distributor.

3 Slightly pitch the outlet line from the suction header toward the suction riser — that is, 1 in./10 ft [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.

4 Arrange the suction line so that the refrigerant gas leaving the coil flows downward, *past the lowest suction-header outlet*, before turning upward. Use a double-elbow configuration to isolate the TXV bulb from other suction headers.

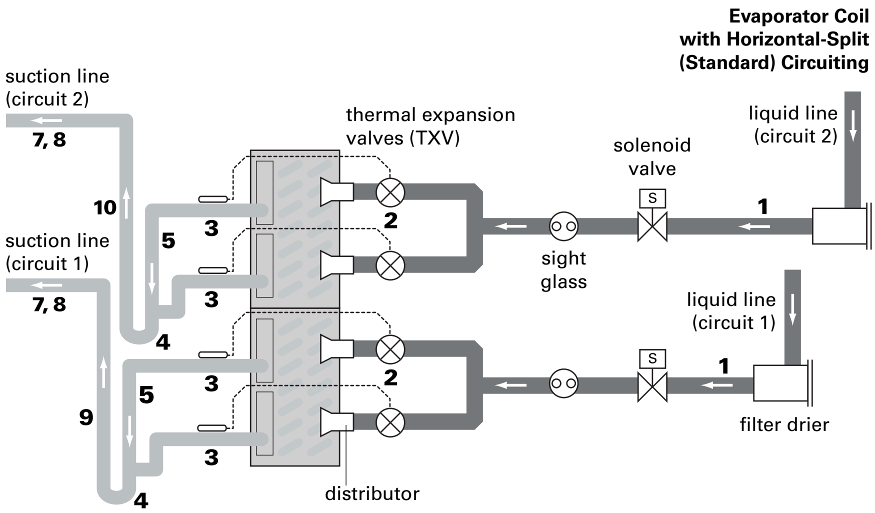
5 Use the "horizontal" tube diameter identified in Table 2 (page 6).

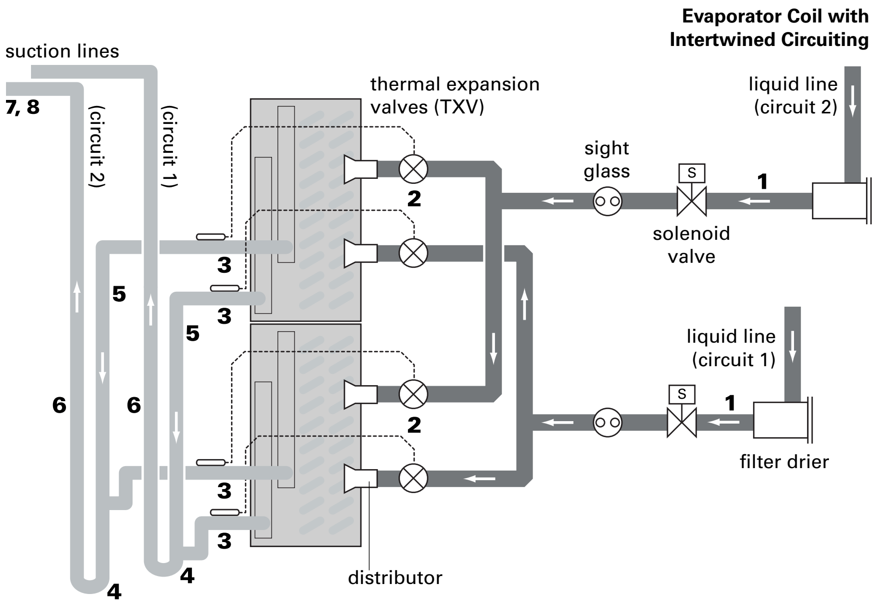
6 Use the tube diameter recommended for a vertical rise in Table 2 (page6). Assure that the top of the riser is higher than the evaporator coil.

7 Pitch the suction line slightly — 1 in./10ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.

8 Insulate the suction line.

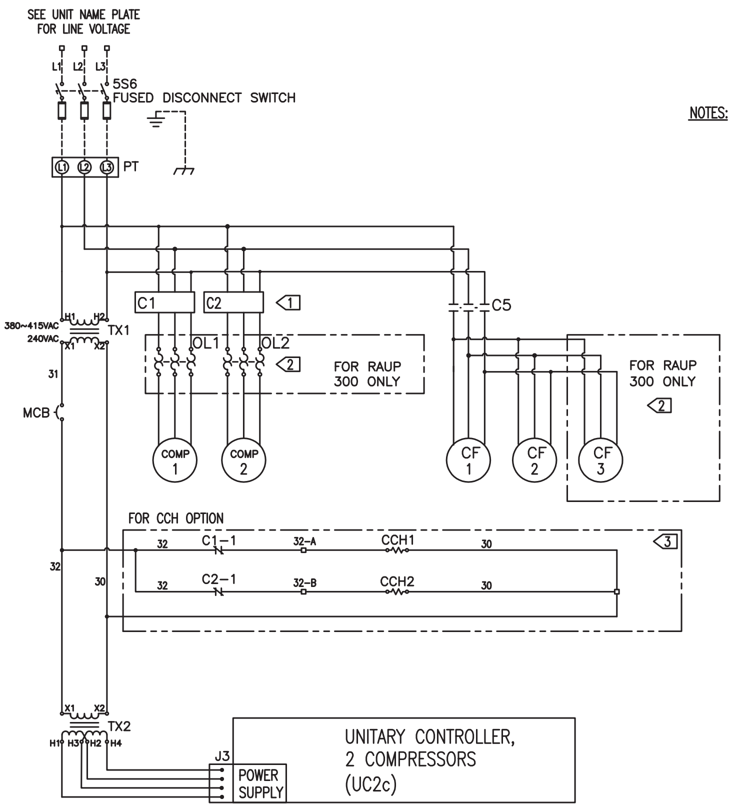
9 The top of the Circuit 2 suction riser must be higher than top evaporator coil. Use the tube diameter recommended for a vertical rise in Table 2 (page 6).





Wiring Diagrams
RAUP 250 / 300

UNIT POWER WIRING



NOTES:

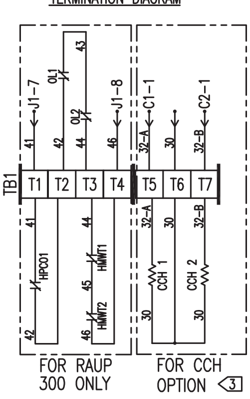
1. COMPRESSOR STARTER (OPTION 1: CONTACTOR; OPTION 2: SOFT STARTER)
2. OVERLOAD CONTACT AND FAN HIGHLIGHTED IS ONLY APPLICABLE WHEN RESPECTIVE MODEL IS SELECTED
3. CCH IS AVAILABLE AS A SPECIAL SALES OPTION
4. REMOVE JUMPER W2, AND INSTALL EVAP FAN AIR FLOW SWITCH, IF AVAILABLE.
5. INSTALL EVAP FAN MOTOR STARTER, INTERLOCK (DRY CONTACT)
6. MUST BE 16–22 AWG, COPPER TWISTED PAIR SHIELDED CABLE. DO NOT RUN WITH HIGH VOLTAGE WIRE.
7. COMPRESSOR SM120/161 ON RAUP 200/250 AND CF MOTORS ARE INTERNALLY PROTECTED.

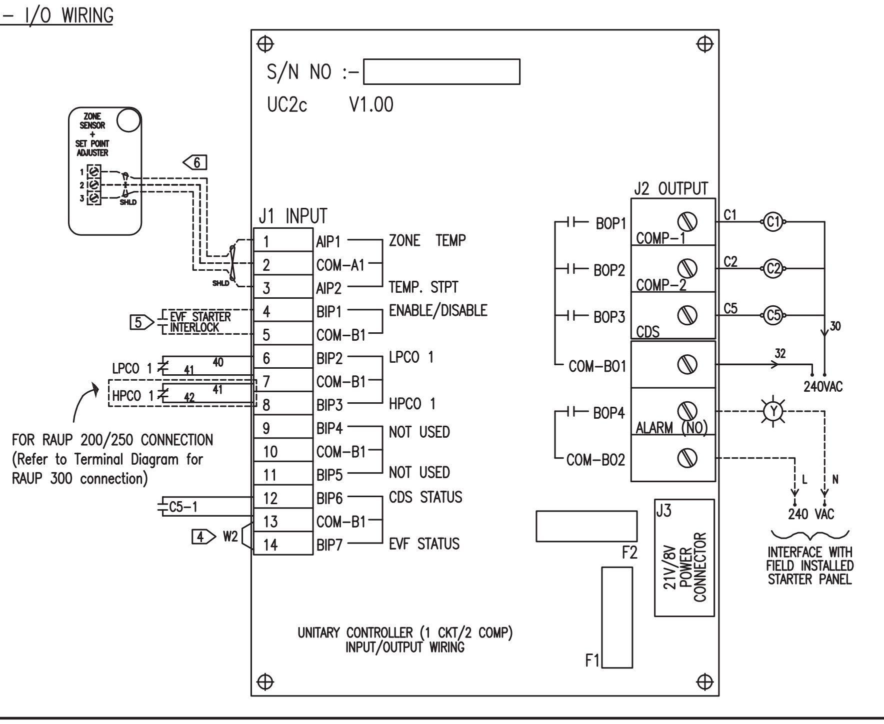
LEGEND

DEVICE DESIGNATION	DESCRIPTION
5S6	SWITCH, FUSED DISCONNECT
C1, C2	STARTER, COMPRESSOR #
C5	STARTER, CDS FAN MOTOR (CONTACTOR)
CCH1, 2	COMPRESSOR CRANKCASE HEATER #
CDS	CONDENSER
CF1, 2, 3	CONDENSER FAN #
COMP1, 2	COMPRESSOR #
EVF	EVAPORATOR FAN
HMWT1, 2	HIGH MOTOR WINDING THERMOSTAT #
HPCO1, 2	HIGH PRESSURE CUT-OUT #
LPCO1, 2	LOW PRESSURE CUT-OUT #
MCB	CIRCUIT BREAKER, MAGNETIC
OL1, 2	OVERLOAD #, (COMPRESSOR)
PT	POWER TERMINAL
TB1	TERMINAL BLOCK
TX1	TRANSFORMER, 380/415V : 240V
TX2	TRANSFORMER, 240V : 21/8V
UC2C	UNITARY CONTROLLER, 2 COMPRESSOR
———— SOLID LINE	PARTS AND WIRING IS DONE AT FACTORY
- - - - HIDDEN LINE	PARTS OR/AND WIRING ARE PROVIDED AND INSTALL AT FIELD

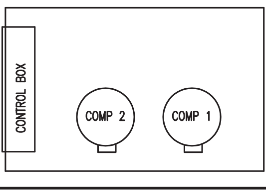
UNITARY CONTROLLER MODULE – I/O WIRING

TERMINATION DIAGRAM

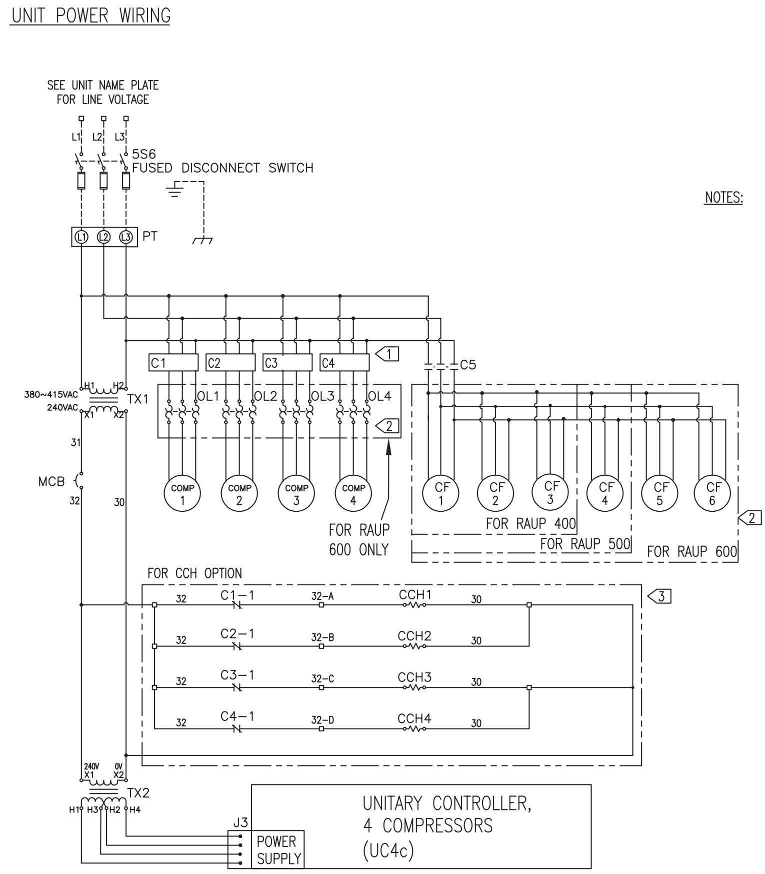




COMPRESSOR LAYOUT



Wiring Diagrams RAUP 400 / 500 / 600



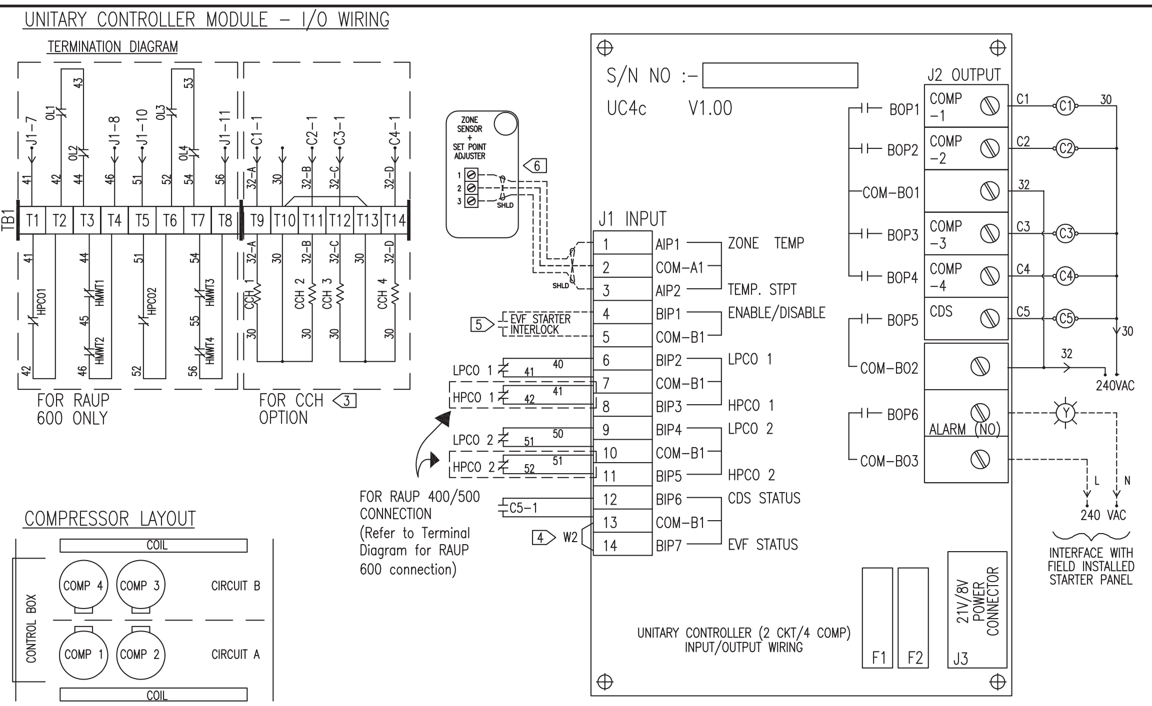
NOTES:

1. COMPRESSOR STARTER (OPTION 1: CONTACTOR; OPTION 2: SOFT STARTER)
2. OVERLOAD CONTACT AND FAN HIGHLIGHTED IS ONLY APPLICABLE WHEN RESPECTIVE MODEL IS SELECTED
3. CCH IS AVAILABLE AS A SPECIAL SALES OPTION
4. REMOVE JUMPER W2, AND INSTALL EVAP FAN AIR FLOW SWITCH, IF AVAILABLE.
5. INSTALL EVAP FAN MOTOR STARTER, INTERLOCK (DRY CONTACT)
6. MUST BE 16-22 AWG, COPPER TWISTED PAIR SHIELDED CABLE. DO NOT RUN WITH HIGH VOLTAGE WIRE.
7. COMPRESSOR SM120/161 ON RAUP 400/500 AND CF MOTOR ARE INTERNALLY PROTECTED.

LEGEND

DEVICE DESIGNATION	DESCRIPTION
5S6	SWITCH, FUSED DISCONNECT
C1, C2, C3, C4	STARTER, COMPRESSOR #
C5	STARTER, CDS FAN MOTOR (CONTACTOR)
CCH1, 2, 3, 4	COMPRESSOR CRANKCASE HEATER #
CDS	CONDENSER
CF1, 2, 3, 4, 5, 6	CONDENSER FAN #
COMP1, 2, 3, 4	COMPRESSOR #
EVF	EVAPORATOR FAN
HMWT1, 2, 3, 4	HIGH MOTOR WINDING THERMOSTAT #
HPCO1, 2	HIGH PRESSURE CUT-OUT #
LPCO1, 2	LOW PRESSURE CUT-OUT #
MCB	CIRCUIT BREAKER, MAGNECTIC
OL1, 2, 3, 4	OVERLOAD #, (COMPRESSOR)
PT	POWER TERMINAL
TB1	TERMINAL BLOCK
TX1	TRANSFORMER, 380/415V : 240V
TX2	TRANSFORMER, 240V : 21/8V
UC4C	UNITARY CONTROLLER, 4 COMPRESSOR

————	SOLID LINE	PARTS AND WIRING IS DONE AT FACTORY
- - - - -	HIDDEN LINE	PARTS OR/AND WIRING ARE PROVIDED AND INSTALL AT FIELD



Mechanical Specifications

Mechanical Specifications

Air Cooled Condensing Unit

- The contractor shall furnish and install a split air cooled condensing unit of size and capacity scheduled at the required working condition.
- The unit shall operate with either a R22 or R407C refrigerant.
- The unit shall be fully wired with starters and controller at the factory.
- All units shall be furnished with hermetic scroll compressors, air cooled condenser and microprocessor control panel.
- Unit shall be able to operate down to 15 C as standard and lower with a low ambeint control option..
- Unit shall be able to operate up to 43 C as standard and up to 53 ºC with a high ambient option.
- The airflow through the condenser shall be handled by multiple direct drive fans. Each fan shall be statically and dynamically balanced. Fan motors shall be with permanently lubricated ball bearings, protected by thermal overloads.
- Units shall be designed and manufactured in accordance with the quality insurance ISO 9001.

Unit Construction

- The unit shall be designed for outdoor application and rust protected with polyester powder paint.
- The unit base, shall be manufactured with GI steel.
- Unit panels shall be removable to facilitate easy service with Allen Key locks.
- Compressor, air intake sections shall be protected with intake grilles as standard.
- Each unit shall be modular in design to facilate a modular installation to minimize installed space.

Condenser Coils

- Air cooled condenser coils shall be smooth bore with 3/8"copper tubes mechanically bonded to configured alluminium W3BS slit fins as standard.
- Coils shall be factory leak tested up to 450psig.
- Higher corrosion resistant fins shall be available as an option.

Refrigerant Circuit

- All units shall have 1 or 2 refrigeration circuits with a minimum of 2 manifolded compressors on each circuit for staging control.
- The manifolding piping shall be designed to ensure relable oil return management.
- Each circuit shall be provided with factory set high and low pressure switches.

Electrical

- Electrical panels shall be fully mounted and wired in the factory with full opening access panel.
- The starting mechanism of the fans and compressors shall be provide by the factory.
- A DOL or Softstarter [for compressors] starting mechanism shall be provided and installed by the factory.

Control System

- Units shall be completely factory wired with microprocessor based controls, starters and terminal block for power wiring.
- Control wiring shall be 230V.
- Compressor overheat , overcurrent and phase loss protection shall be provided.
- High and low pressure safety switches to protect the system against operations outside recommended pressure limits.
- Reverse rotation protection on compressors through safeties that trip the system on high temperature.
- Compressor time delays and on-off sequencing logic that is built into the microprocessor algorythm for maximum protection.
- A dry contact shall be available for remote signalling of general faults.
- Segment LED Display shall provide draguostios for troubleshesoting and setpoint temperatures as well as actual size temperatures.
- A PID based temperature control shall be standard factory installed.

Indoor Unit Air Handler

Unit Casing

- The unit framework shall be constructed of GI steel. Exterior panels shall be fabricated from galvanized steel sheets, cleaned and coated with a baked polyester powder paint.
- All panels in contact with the air stream shall be insulated with 1"2pound dense fiberglass insulation, covered with alluminium foil to prevent moving air contact with fiberglass.
- All panels shall be removable to ensure proper access for servicing and maintainence. Removable panels shall be secured with bolts.

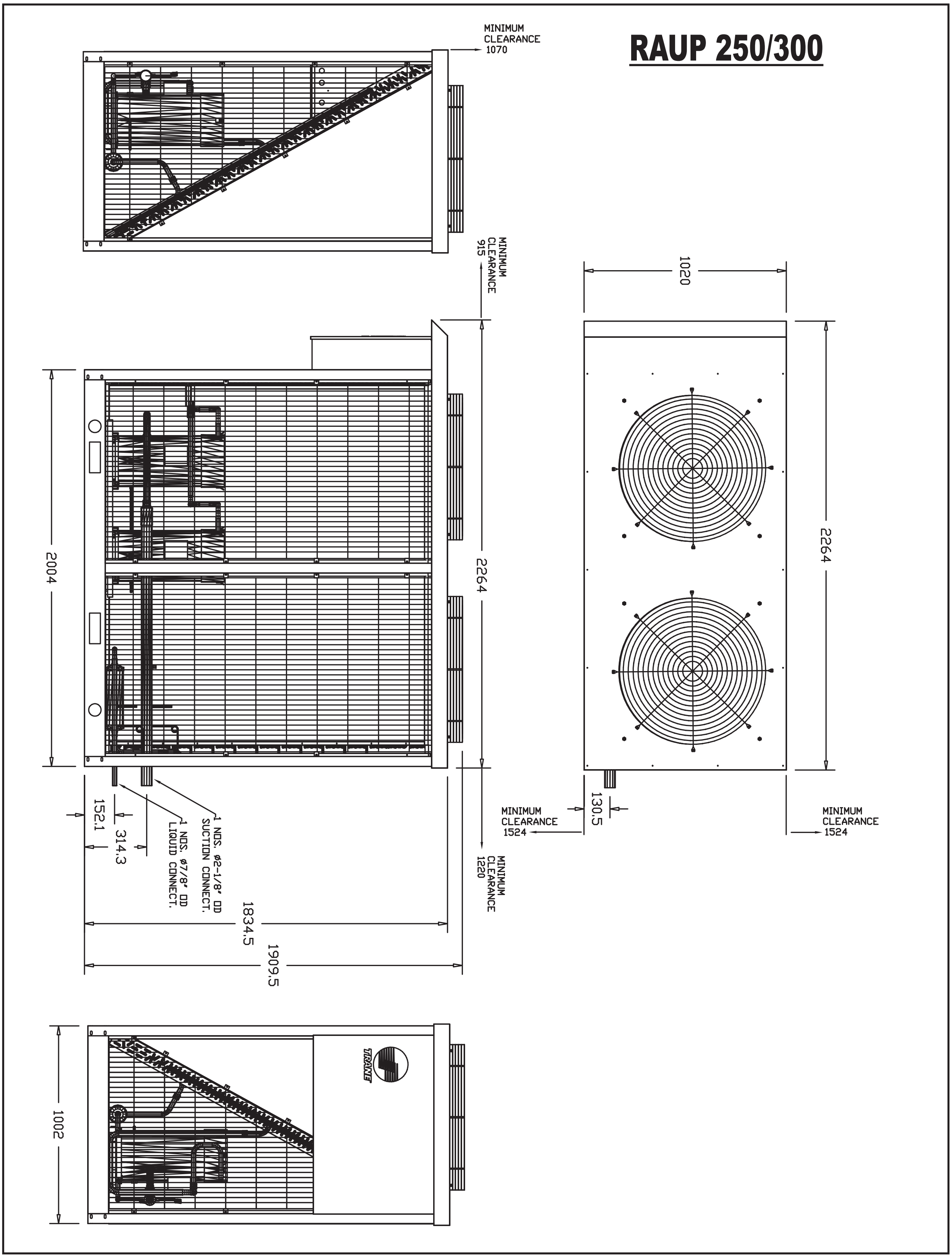
Cooling Coil

- The evaporator coil shall be 1/2 or 3/8"OD seamless copper tubes, mechanically expanded into alluminium fins.
- Coils shall have at least 2 independent circuits for good part load capability (watched with RAUP 400-600).
- Coils shall be leak and proof tested up to 375psig.
- Expansion devices shall be thermal expansion valves.
- Drain pans shall be fabricated of GI, insulated with PE and corossion resistant coated with a corossion resistant coating.

Fans

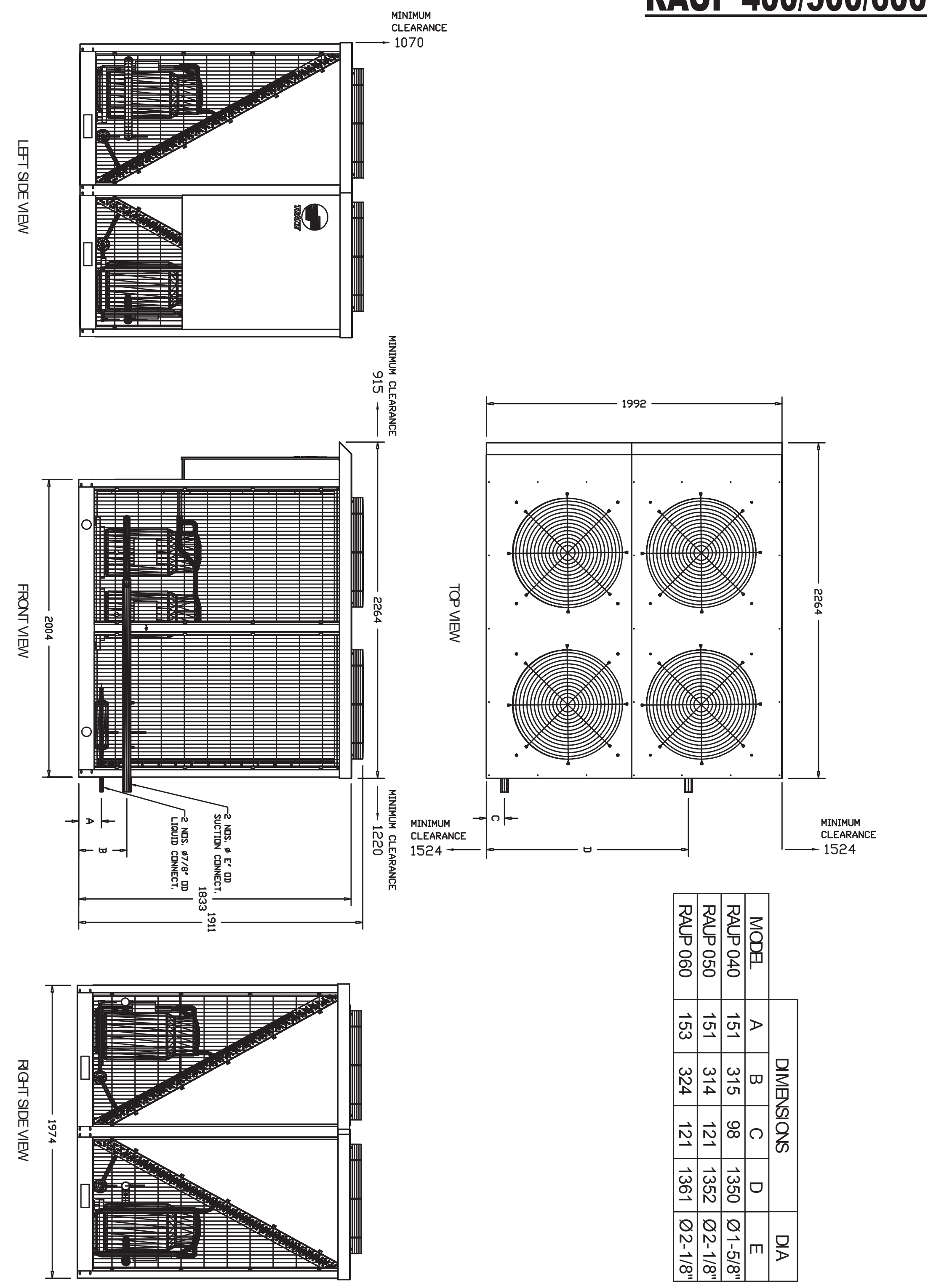
- Supply fans shall be double width double inlet forward curve centrifugal fans, statically and dynamically balanced.
- The drive components shall be fixed pitch drives with multiple V belts. The supply fan motor shall be of a TEFC type, with built in thermal overloads.
- DOL Fan motor starters shall be provided as standard.

Dimension Drawing
Condensing Unit



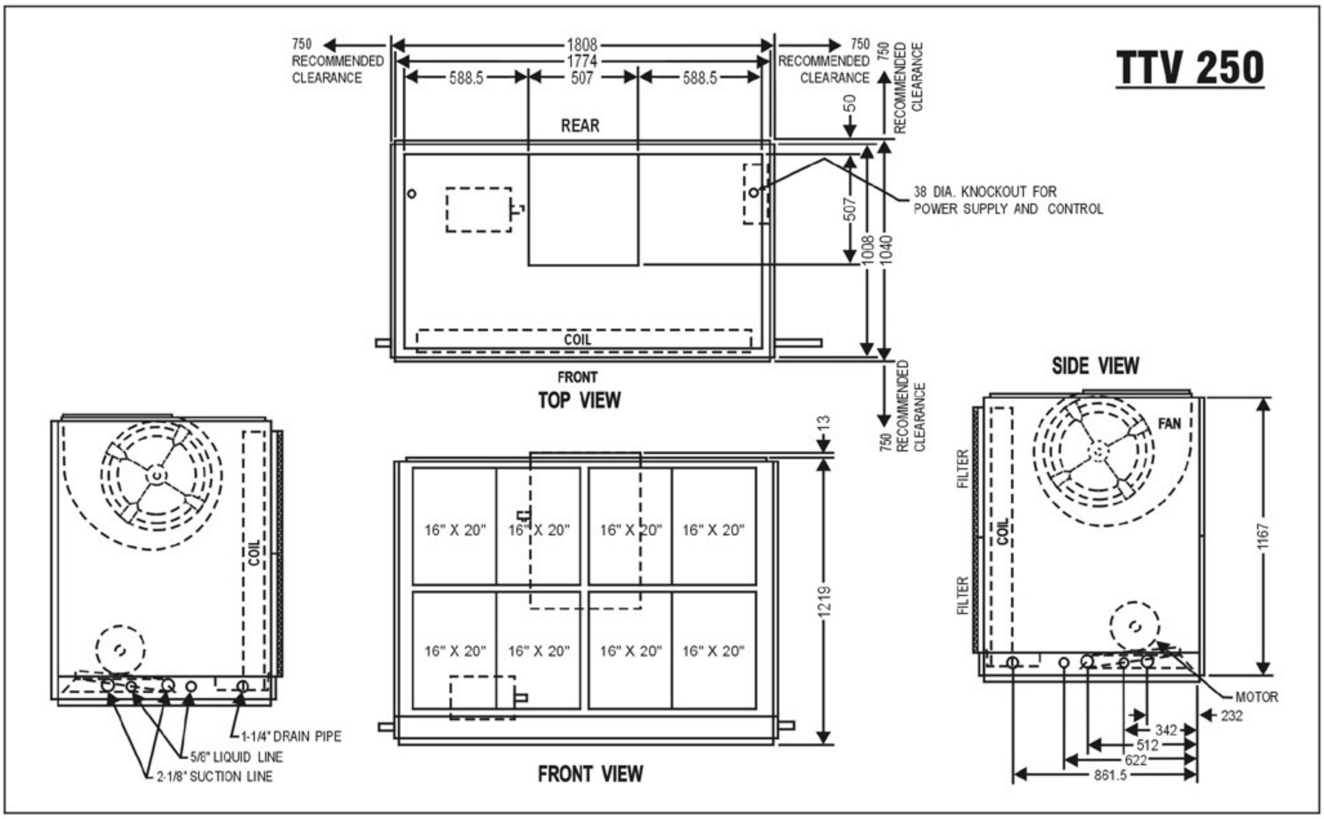
Dimension Drawing Condensing Unit

RAUP 400/500/600

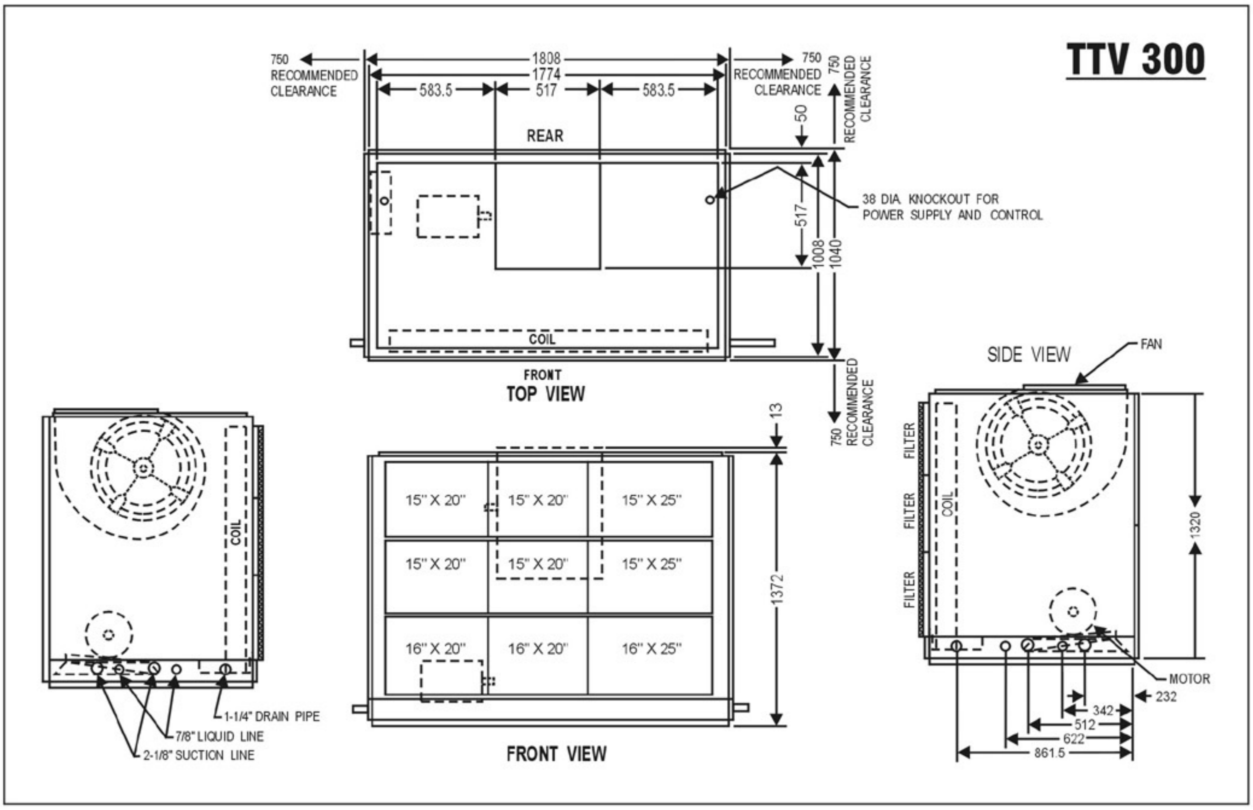


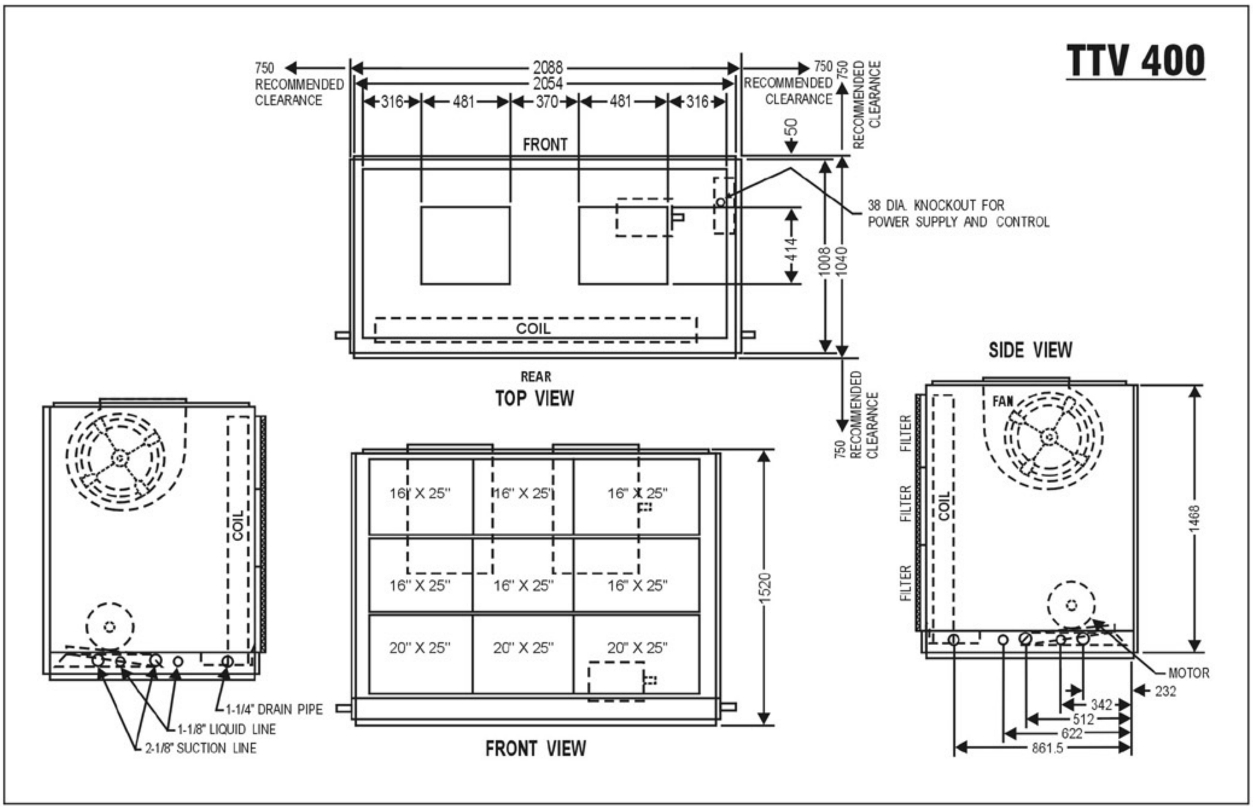
MODEL	DIMENSIONS				DIA
	A	B	C	D	E
RAUP 040	151	315	98	1350	Ø1-5/8"
RAUP 050	151	314	121	1352	Ø2-1/8"
RAUP 060	153	324	121	1361	Ø2-1/8"

Dimension Drawing Indoor (Evaporating) Unit

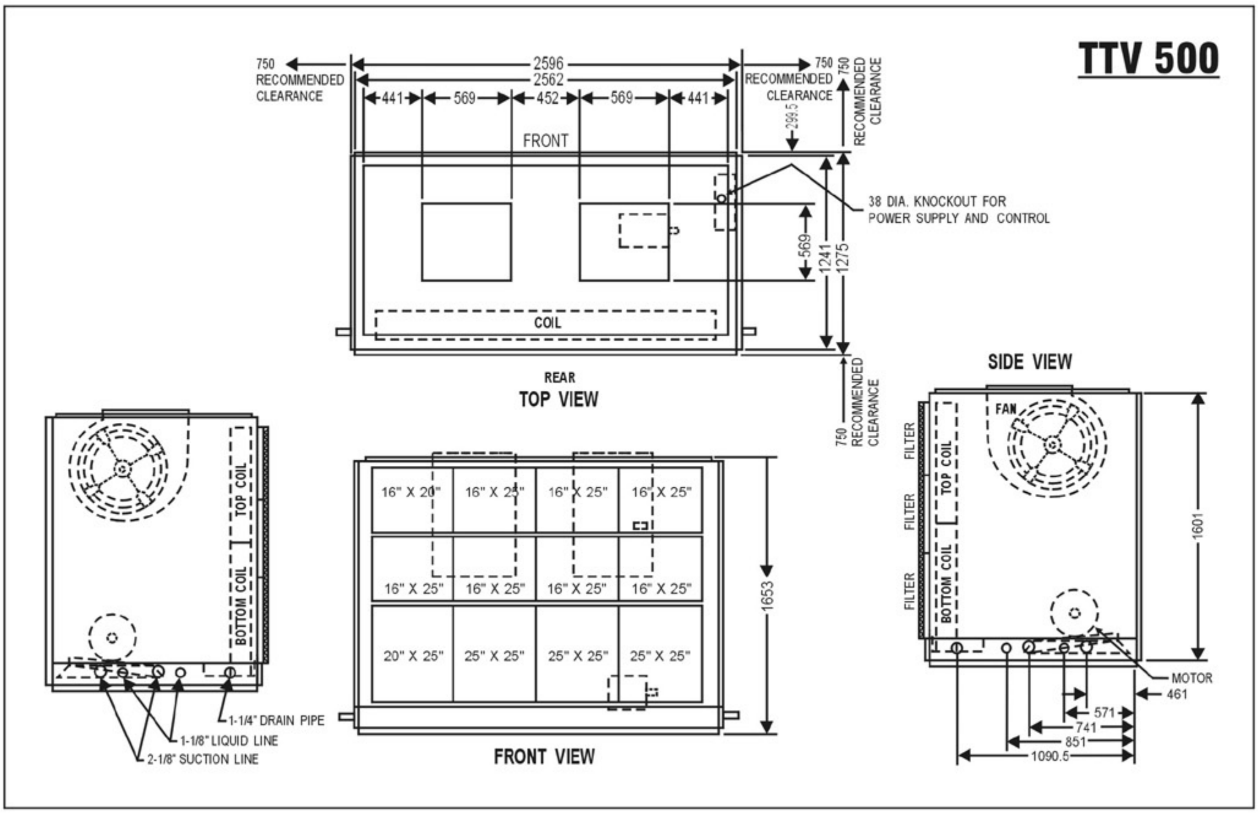


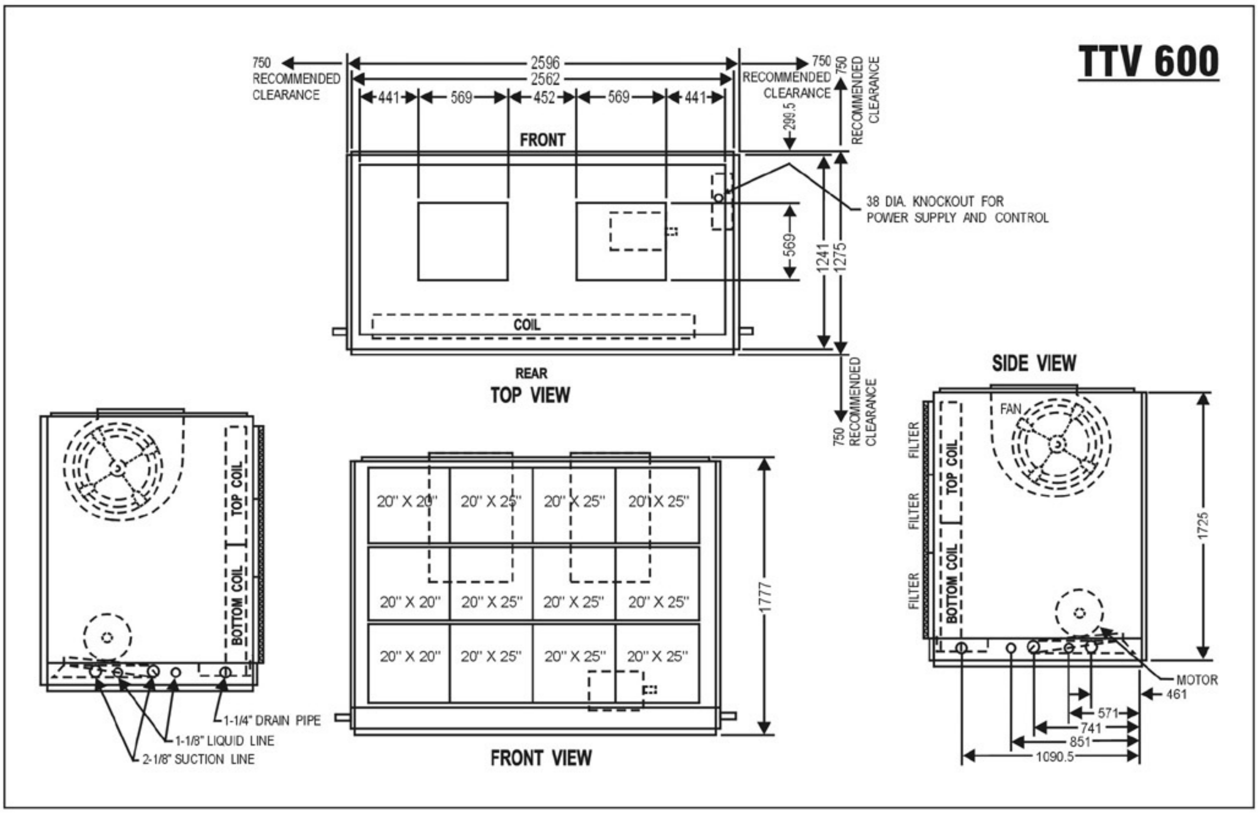
Dimension Drawing Indoor (Evaporating) Unit





Dimension Drawing Indoor (Evaporating) Unit

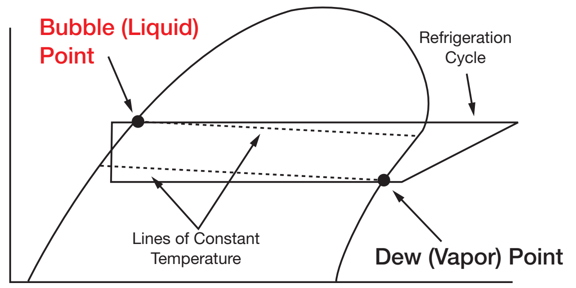




Standard Conversion Table

To Convert From:	To	Multiply By:
Length		
Feet (ft)	meters (m)	.30481
Inches (In)	millimeters (mm)	25.4
Area		
Square Feet (ft^2)	square meters (m^2)	.093
Square Inches (In^2)	square millimeters (mm^2)	645.2
Cubic Feet (ft^3)	Cubic Meters (m^3)	.0283
Cubic Inches (In^3)	Cubic mm (mm^3)	16387
Gallons (gal)	litres (l)	3.785
Gallons (gal)	Cubic meters (m^3)	.003785
Flow		
Cubic feet/min (cfm)	cubic meters/second (m^3/s)	.000472
Cubic feet/min (cfm)	cubic meters/hr (m^3/hr)	1.69884
Gallons/minute (GPM)	cubic meters/hr (m^3/hr)	.2271
Gallons/minute (GPM)	litres/second (l/s)	.06308
Velocity		
Feet per minute (ft/m)	meters per second (m/s)	.00508
Feet per second (ft/s)	meters per second (m/s)	.3048
Energy and Power and Capacity		
British Thermal Units (Btu/h)	Kilowatt (kW)	.000293
British Thermal Units (Btu/h)	Kcalorie (Kcal)	.252
Tons (refrig. effect)	Kilowatt (refrig. effect)	3.516
Tons (refrig. effect)	Kilocalories-per hour (Kcal/hr)	3024
Horsepower	Kilowatt (kW)	.7457
Pressure		
Feet of water (ftH_2O)	Pascals (PA)	2990
Inches of water (inH_2O)	Pascals (PA)	249
Pounds per square inch (PSI*)	Pascals (PA)	6895
PSI*	Bar or KG/CM²	0.06895
*PSIG		

P-H DIAGRAM - BLENDS



To determine superheat, use **Dew (Vapor) Point** values.
To determine subcooling, use **Bubble (Liquid) Point** values.

Useful Formulas

Note: 3-phase amps or KVA can be used in single-phase formulas by multiplying average phase leg current times $\sqrt{3}$ or 1.73.

Example:

$$KVA = \frac{V \times A \times 1.73}{1000}$$

KW = Real Power; KVA = Apparent Power

$$KW = KVA \times \text{Power Factor} = \frac{V \times A \times \text{Power Factor}}{1000}$$

$$\text{Motor KW} = \frac{HP \times .746}{\text{Efficiency}}; \quad \text{Motor KVA} = \frac{HP \times .746}{\text{Eff.} \times \text{Power Factor}}$$

$$\text{Motor HP} = \frac{KW \times \text{Eff.}}{.746} = \frac{KVA \times \text{Power Factor} \times \text{Eff.}}{.746}$$

$$\text{Pump HP} = \frac{GPM \times \text{Total Heat (Ft. Water)}}{\text{Pump Eff.} \times 3960}$$

$$HP = \frac{\text{Torque (lb.-ft.)} \times RPM}{5250}$$

$$\text{Temperature:} \quad \frac{{}^{O}C}{5} = \frac{{}^{O}F-32}{9}$$

$$\text{Refrig. Tons} = \frac{Btu/h}{12000} = \frac{GPM \times \Delta t}{24}$$

TRANE

Standard Conversion Table

Pressure Temperature

Temp °F	R22 Pressure psia	R123 Pressure psia	R134a Pressure psia
0.00	38.728	1.963	21.171
5.00	42.960	2.274	23.777
10.00	47.536	2.625	26.628
15.00	52.475	3.019	29.739
20.00	57.795	3.460	33.124
25.00	63.514	3.952	36.800
30.00	69.651	4.499	40.784
35.00	76.225	5.106	45.092
40.00	83.255	5.778	49.741
45.00	90.761	6.519	54.749
50.00	98.763	7.334	60.134
55.00	107.28	8.229	65.913
60.00	116.33	9.208	72.105
65.00	125.94	10.278	78.729
70.00	136.13	11.445	85.805
75.00	146.92	12.713	93.351
80.00	158.33	14.090	101.39
82.08	-	14.696	-
85.00	170.38	15.580	109.93
90.00	183.09	17.192	119.01
95.00	196.50	18.931	128.65
100.00	210.61	20.804	138.85
105.00	225.46	22.819	149.65
110.00	241.06	24.980	161.07
115.00	257.45	27.297	173.14
120.00	274.65	29.776	185.86
125.00	292.69	32.425	199.28
130.00	311.58	35.251	213.41
135.00	331.37	38.261	228.28
140.00	352.08	41.464	243.92
145.00	373.74	44.868	260.36

*PSIG = PSIA-14.7

Pressure Temperature

Pressure Psia	R407C Temp °F		R410A Temp °F	
	Bubble	Dew	Bubble	Dew
44.00	-0.28	11.47	-16.91	-16.79
46.00	1.86	13.56	-14.90	-14.77
48.00	3.92	15.58	-12.95	-12.82
50.00	5.93	17.53	-11.07	-10.94
55.00	10.68	22.18	-6.59	-6.46
60.00	15.11	26.50	-2.42	-2.29
65.00	19.27	30.56	1.49	1.63
70.00	23.19	34.39	5.17	5.32
75.00	26.90	38.01	8.66	8.81
80.00	30.43	41.46	11.98	12.13
85.00	33.80	44.74	15.14	15.30
90.00	37.02	47.88	18.17	18.32
95.00	40.11	50.89	21.06	21.22
100.00	43.08	53.78	23.85	24.01
110.00	48.70	59.24	29.12	29.28
120.00	53.95	64.35	34.03	34.20
130.00	58.87	69.13	38.65	38.82
140.00	63.53	73.65	43.00	43.18
150.00	67.94	77.93	47.13	47.31
160.00	72.13	81.99	51.05	51.23
170.00	76.14	85.87	54.79	54.98
180.00	79.97	89.58	58.37	58.56
190.00	83.65	93.13	61.08	61.99
200.00	87.18	96.55	65.10	65.29
220.00	93.88	103.00	71.34	71.54
240.00	100.14	109.02	77.16	77.36
260.00	106.02	114.67	82.63	82.83
280.00	111.58	119.99	87.79	87.99
300.00	116.85	125.03	92.68	92.88
320.00	121.86	129.81	97.32	97.53
340.00	126.65	134.36	101.75	101.95
360.00	131.23	138.70	105.99	106.19
380.00	135.63	142.86	110.05	110.24
400.00	139.85	146.84	113.94	114.13
450.00	149.77	156.11	123.06	123.24
500.00	158.90	164.54	131.41	131.58
550.00	167.37	172.23	139.12	139.27
600.00	175.31	179.23	146.28	146.40

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