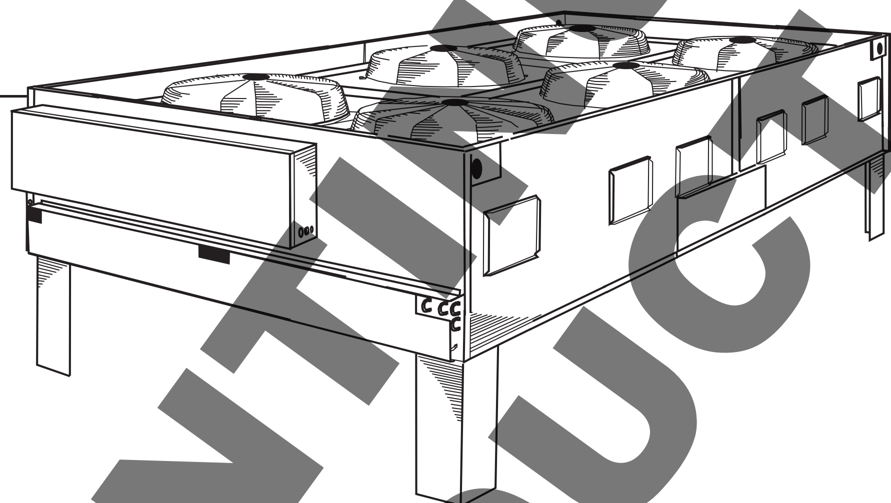
TVC Direct Drive Air-Cooled Condenser

REFRIGERATION TRENTON PRODUCTS ™

PRODUCT DATA & INSTALLATION

Four to Twelve Fan Motors

Bulletin T50-TVC-PDI-28
1068832



CONTENTS

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NOMENCLATURE

TVC 096 A - T4 D

TVC = Vertical Air Flow Condenser
THC = Horizontal Air Flow Condenser

Nominal Capacity (Tons - THR)
Rated at 25 °F (13.8 °C) TD, 30" fan, 850 RPM motor, 12 FPI, smooth tubing, 0° subcooling, sea level, 60 Hz

Fan and Motor
A = 30" fan with 850 RPM motor
B = 30" fan with 550 RPM motor
C = 30" fan with 1140 RPM motor

Power Supply*
S2 = 208-230/1/60
T3 = 208-230/3/60
T4 = 460/3/60
T5 = 575/3/60
S6 = 200-220/1/50
T7 = 200-220/3/50
T9 = 380-400/3/50

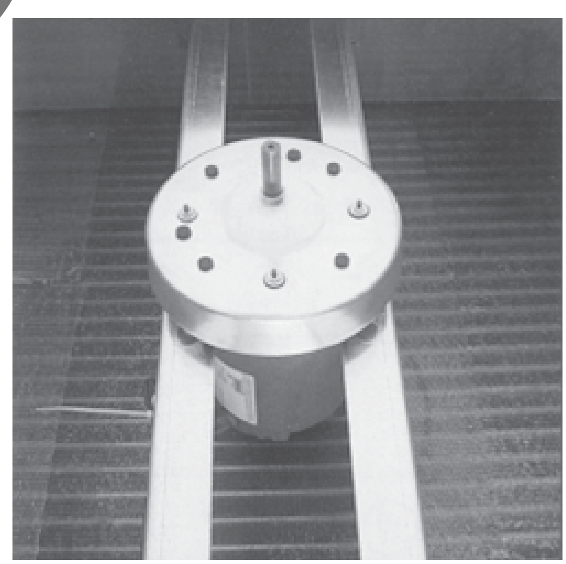
Generation
D = Latest generation (A, B, C older series)

** Subject to availability*

PRODUCT FEATURES

Sturdy Construction

Thermospan™ Coil Design



Rugged Heavy-Gauge Motor Mounts

PRODUCT FEATURES

- **New narrow width condenser design** to suit shipment in containers.
- **THERMOSPAN™** coil design feature eliminates tube failure on tube sheets.
- **Standard 850 RPM** quiet low speed dual voltage (230/460) fan motors with male electrical plug, moisture slinger, and rainshield for complete weather protection.
- **Optional 550 ultra low and 1140 RPM high speed** motors available.
- **Rugged heavy-gauge** galvanized steel rail motor mounts/support.
- **All fan sections individually baffled** with full height partitions, and clean-out panels.
- **Complete selection** of electrical fan cycling and speed control options.
- **Heavy-gauge** galvanized steel cabinet construction assembled with zinc plated huck bolts supported on heavy-duty legs.
- **Several optional fin material and spacing available.**

STANDARD FEATURES

Standard features include:

- Thermospan™ Coil Design
- 850 RPM Motor c/w 30" Fan
- Fan Sections Individually Baffled with Full Height Partitions and Clean-out Panels
- Rugged Heavy-Gauge Galvanized Steel Rail Motor Mount
- Heavy-Gauge Galvanized Steel Cabinet
- Zinc Plated Huck Bolts
- Heavy Duty Legs
- 2-Fan Wide Units Have Two Equal Circuits
- Copper Tube, (3/8 O.D. on 1-6 Fan, 1/2 O.D. on 8-12 Fan) Aluminum Fin Condenser Coils
- Terminal Block
- Single Entering Electrical Service
- Control Circuit Voltage – 230 V

OPTIONAL FEATURES (FACTORY MOUNTED)

Optional features include:

- Multiple Refrigeration Circuits
- Fan Cycling – Ambient Thermostat/Fan Row with Contactors
- Fan Cycling – Pressure Control/Fan Row w/Contactors
- Johnson P66 Variable Speed Fan Control
- Hoffman Three Phase Variable Speed Fan Control
- Individual Fan Motor Fusing
- Individual Ambient Thermostat or Pressure Control
- Non-Fused Disconnect
- Adjustable Flooded Head Pressure Control
- Extended Leg Kits (36" or 48") with Cross Bracing for Extra Rigidity
- Optional 2 HP 1140 RPM Motor c/w 30" Fan
- Optional 550 RPM Motor c/w 30" Fan
- Optional Fin Spacing
- Optional Fin Materials
- Optional Coil Coating
- Voltages Available for 60Hz or 50Hz

CAPACITY DATA - 850 RPM MODELS - R22, R404A & R507
(SINGLE ROW MODELS)

TVC Model Number	Fans Long	TOTAL HEAT OF REJECTION CAPACITY MBH *(KW)*							Max. No. of Feeds	MBH @ 1° F TD Per Feed (12 FPI)
		TEMPERATURE DIFFERENCE (TD)								
		12 FPI					10 FPI	8 FPI		
		1°F *(0.56°C)*	10°F *(5.56°C)*	15°F *(8.3°C)*	20°F *(11.1°C)*	30°F *(16.7°C)*	1°F *(0.56°C)*	1°F *(0.56°C)*		
TVC056	4	**26.94** *(7.888)*	**269.4** *(78.88)*	**404.1** (118.3)	**538.8** *(157.8)*	**808.2** *(236.6)*	**25.06** *(7.338)*	**22.90** *(6.705)*	21	1.2829
TVC063	4	**30.28** *(8.866)*	**302.8** *(88.66)*	**454.2** *(133.0)*	**605.6** *(177.3)*	**908.4** *(266.0)*	**28.77** *(8.424)*	**26.65** *(7.803)*	28	1.0814
TVC068	4	**33.00** *(9.662)*	**330.0** *(96.62)*	**495.0** *(144.9)*	**660.0** *(193.2)*	**990.0** *(289.9)*	**32.34** **(9.469)**	**30.36** *(8.889)*	35	0.9429
TVC079	5	**37.86** *(11.09)*	**378.6** *(110.9)*	**567.9** *(166.3)*	**757.2** *(221.7)*	**1136** *(332.6)*	*35.96* *(10.53)*	**33.31** *(9.753)*	28	1.3521
TVC085	5	**41.25** *(12.08)*	**412.5** *(120.8)*	**618.8** *(181.2)*	**825.0** *(241.6)*	**1238** *(362.3)*	**40.42** *(11.83)*	**37.95** *(11.11)*	35	1.1786
TVC095	6	**45.43** *(13.30)*	**454.3** *(133.0)*	**681.5** *(199.5)*	**908.6** *(266.0)*	**1363** *(399.1)*	**43.15** *(12.63)*	**39.97** *(11.70)*	28	1.6225
TVC103	6	**49.49** *(14.49)*	**494.9** *(144.9)*	**742.4** *(217.4)*	**989.8** *(289.8)*	**1485** *(434.7)*	**48.50** *(14.20)*	**45.53** *(13.33)*	35	1.4140

Correction Factors for Other refrigerants - Use R22 Values Multiplied By

R134a	R407A	R407B	R407C
0.94	0.97	0.97	1.00

NOTES:

(1) Above capacity data based on 0°F subcooling and at sea level.
(2) TD = Condensing temperature - ambient temperature
(3) Standard fin spacing is 12 FPI on all models.
(4) For High Altitude applications apply the following correction factors: 0.94 for 2000 feet, 0.88 for 4000 feet and 0.81 for 6000 feet.
(5) For 50Hz capacity multiply by 0.92.

CAPACITY DATA - 850 RPM MODELS - R22, R404A & R507
(DOUBLE ROW MODELS)

TVC Model Number	Fans Long	TOTAL HEAT OF REJECTION CAPACITY MBH *(KW)* — TEMPERATURE DIFFERENCE (TD) — 12 FPI					10 FPI	8 FPI	Max. No. of Feeds	MBH @ 1° F TD Per Feed (12 FPI)
		1°F *(0.56°C)*	10°F *(5.56°C)*	15°F *(8.3°C)*	20°F *(11.1°C)*	30°F *(16.7°C)*	1°F *(0.56°C)*	1°F *(0.56°C)*		
TVC044	2	**20.88** *(6.114)*	**208.8** *(61.14)*	**313.2** *(91.70)*	**417.6** *(122.3)*	**626.4** *(183.4)*	**19.42** *(5.686)*	**17.75** *(5.197)*	34	0.6141
TVC049	2	**23.50** *(6.881)*	**235.0** *(68.81)*	**352.5** *(103.2)*	**470.0** *(137.6)*	**705.0** *(206.4)*	**22.33** *(6.538)*	**20.68** *(6.055)*	45	0.5222
TVC054	2	**25.84** *(7.566)*	**258.4** *(75.66)*	**387.6** *(113.5)*	**516.8** *(151.3)*	**775.2** *(227.0)*	**25.32** *(7.414)*	**23.77** *(6.960)*	56	0.4614
TVC057*	2	**27.53** *(8.061)*	**275.3** *(80.61)*	**413.0** *(120.9)*	**550.6** *(161.2)*	**825.9** *(241.8)*	**26.15** *(7.657)*	**24.22** *(7.092)*	45	0.6118
TVC064*	2	**30.68** *(8.983)*	**306.8** *(89.83)*	**460.2** *(134.7)*	**613.6** *(179.7)*	**920.4** *(269.5)*	**30.07** *(8.804)*	**28.23** *(8.266)*	56	0.5479
TVC073	3	**35.25** *(10.32)*	**352.5** *(103.2)*	**528.8** *(154.8)*	**705.0** *(206.4)*	**1058** *(309.6)*	**33.49** *(9.806)*	**31.02** *(9.083)*	68	0.5184
TVC081	3	**38.76** *(11.35)*	**387.6** *(113.5)*	**581.4** *(170.2)*	**775.2** *(227.0)*	**1163** *(340.5)*	**37.98** *(11.12)*	**35.66** *(10.44)*	85	0.4560
TVC086*	3	**41.29** *(12.09)*	**412.9** *(120.9)*	**619.4** *(181.3)*	**825.8** *(241.8)*	**1239** *(362.7)*	**39.23** *(11.49)*	**36.34** *(10.64)*	68	0.6072
TVC096*	3	**46.02** *(13.47)*	**460.2** *(134.7)*	**690.3** *(202.1)*	**920.4** *(269.5)*	**1381** *(404.2)*	**45.10** *(13.21)*	**42.34** *(12.40)*	85	0.5414
TVC112	4	**53.89** *(15.78)*	**538.9** *(157.8)*	**808.4** *(236.7)*	**1078** *(315.6)*	**1617** *(473.4)*	**50.12** *(14.68)*	**45.80** *(13.41)*	42	1.2831
TVC126	4	**60.57** *(17.73)*	**605.7** *(177.3)*	**908.6** *(266.0)*	**1211** *(354.7)*	**1817** *(532.0)*	**57.54** *(16.85)*	**53.30** *(15.61)*	56	1.0816
TVC137	4	**65.99** *(19.32)*	**659.9** *(193.2)*	**989.9** *(289.8)*	**1320** *(386.4)*	**1980** *(579.7)*	**64.67** *(18.94)*	**60.71** *(17.78)*	70	0.9427
TVC158	5	**75.71** *(22.17)*	**757.1** *(221.7)*	**1136** *(332.5)*	**1514** *(443.4)*	**2271** *(665.0)*	**71.92** *(21.06)*	**66.62** *(19.51)*	56	1.3520
TVC172	5	**82.49** *(24.15)*	**824.9** *(241.5)*	**1237** *(362.3)*	**1650** *(483.1)*	**2475** *(724.6)*	**80.84** *(23.67)*	**75.89** *(22.22)*	70	1.1784
TVC190	6	**90.85** *(26.60)*	**908.5** *(266.0)*	**1363** *(399.0)*	**1817** *(532.0)*	**2726** *(798.0)*	**86.31** *(25.27)*	**79.95** *(23.41)*	56	1.6223
TVC206	6	**98.99** *(28.98)*	**989.9** *(289.8)*	**1485** *(434.8)*	**1980** *(579.7)*	**2970** *(869.5)*	**97.01** *(28.40)*	**91.07** *(26.67)*	70	1.4141

Correction Factors for Other refrigerants - Use R22 Values Multiplied By

R134a	R407A	R407B	R407C
0.94	0.97	0.97	1.00

NOTES:

(1) Above capacity data based on 0°F subcooling and at sea level.
(2) TD = Condensing temperature - ambient temperature
(3) Standard fin spacing is 12 FPI on all models.
(4) For High Altitude applications apply the following correction factors: 0.94 for 2000 feet, 0.88 for 4000 feet and 0.81 for 6000 feet.
(5) For 50Hz capacity multiply by 0.92.
(6) *Derate capacity by 8% on these models when operating on 208-230/1/60.

GENERAL SPECIFICATIONS - 850 RPM MODELS
(SINGLE ROW MODELS)

TVC MODEL NUMBER	Fans Long	Max. No. of Feeds	R22 Refrigerant Charge (1)		Air Flow Rate(4)	Sound Level (5)	Piping Connections: APPLICABLE FOR 16º F TO 30º F DESIGN TD			Piping Connections: APPLICABLE FOR 10º F TO 15º F DESIGN TD			Weights (6)
			Normal (2)	90% FULL (3)			Inlet	Outlet	Qty.	Inlet	Outlet	Qty.	
			lbs *(kg)*	lbs *(kg)*	CFM *(m³/h)*	dBA	INCHES *(mm)*	INCHES *(mm)*		INCHES *(mm)*	INCHES *(mm)*		lbs *(kg)*
TVC056	4	21	**26** *(11.9)*	**172** *(78.2)*	**35900** *(60994)*	61	**2 5/8** *(66)*	**2 1/8** *(54)*	1	**2 1/8** *(54)*	**1 3/8** *(35)*	1	**1650** *(750)*
TVC063	4	28	**33** *(14.9)*	**225** *(102.1)*	**35200** *(59805)*	61	**2 5/8** *(66)*	**2 1/8** *(54)*	1	**2 1/8** *(54)*	**1 3/8** *(35)*	1	**1810** *(823)*
TVC068	4	35	**39** *(17.9)*	**277** *(126.1)*	**34300** *(58276)*	61	**2 5/8** *(66)*	**2 1/8** *(54)*	1	**2 1/8** *(54)*	**1 5/8** *(41)*	1	**1990** *(905)*
TVC079	5	28	**39** *(17.8)*	**277** *(125.8)*	**44100** *(74926)*	62	**2 5/8** *(66)*	**2 1/8** *(54)*	1	**2 1/8** *(54)*	**1 5/8** *(41)*	1	**2300** *(1045)*
TVC085	5	35	**51** *(23.0)*	**345** *(157.0)*	**42900** *(72887)*	62	**2 5/8** *(66)*	**2 5/8** *(66)*	1	**2 1/8** *(54)*	**1 5/8** *(41)*	1	**2530** *(1150)*
TVC095	6	28	**53** *(24.1)*	**339** *(154.0)*	**52900** *(89877)*	63	**3 1/8** *(79)*	**3 1/8** *(79)*	1	**2 5/8** *(66)*	**2 1/8** *(54)*	1	**2880** *(1309)*
TVC103	6	35	**63** *(28.5)*	**418** *(189.8)*	**51500** *(87499)*	63	**3 1/8** *(79)*	**3 1/8** *(79)*	1	**2 5/8** *(66)*	**2 1/8** *(54)*	1	**3150** *(1432)*

(1) For R407A, R507 use R22 Charge x 0.87. For R407-C use R22 Charge x 0.97.
For R134a and R502 use R22 Charge. For R12 use R22 Charge X 1.1.
(2) Normal Charge is the refrigerant charge for warm ambient or summer operation. For low ambient or winter charge with flooded head pressure control and fan cycling see Page 47 and Page 48.
(3) 90% FULL is the liquid refrigerant weight at 90% of internal volume and is for reference ONLY.
(4) For 50Hz Fan Data use 60Hz CFM (m^3/h) X 0.83.
(5) Sound Pressure Level at approx. **32.8 ft.** *(ten metre)* distance.
(6) Less weight of refrigerant charge.
* Derate air flow rate by 12% on these models when operating on 208-230/1/60.

GENERAL SPECIFICATIONS - 850 RPM MODELS

(DOUBLE ROW MODELS)

TVC MODEL NUMBER	Fans Long	Max. No. of Feeds	R22 Refrigerant Charge (1)		Air Flow Rate(4)	Sound Level (5)	Piping Connections						Weights (6)
							APPLICABLE FOR 16º F TO 30º F DESIGN TD			APPLICABLE FOR 10º F TO 15º F DESIGN TD			
			Normal (2)	90% FULL (3)			Inlet	Outlet	Qty.	Inlet	Outlet	Qty.	
			lbs *(kg)*	lbs *(kg)*	CFM *(m³/h)*	dBA	INCHES *(mm)*	INCHES *(mm)*		INCHES *(mm)*	INCHES *(mm)*		lbs *(kg)*
TVC044	2	34	**16** *(7.2)*	**98** *(44.5)*	**29900** *(50800)*	*61*	**2 1/8** *(54)*	**1 3/8** *(35)*	2	**1 3/8** *(35)*	**1 1/8** *(28)*	*2*	**1070** *(486)*
TVC049	2	45	**19** *(8.7)*	**125** *(57.0)*	**28800** *(48931)*	*61*	**2 1/8** *(54)*	**1 3/8** *(35)*	2	**1 3/8** *(35)*	**1 1/8** *(28)*	*2*	**1200** *(545)*
TVC054	2	56	**23** *(10.3)*	**153** *(69.5)*	**27700** *(47062)*	*61*	**2 1/8** *(54)*	**1 3/8** *(35)*	2	**1 3/8** *(35)*	**1 1/8** *(28)*	*2*	**1330** *(605)*
TVC057*	2	45	**25** *(11.3)*	**157** *(71.3)*	**35300** *(59975)*	*61*	**2 1/8** *(54)*	**1 5/8** *(41)*	2	**1 3/8** *(35)*	**1 1/8** *(28)*	*2*	**1400** *(636)*
TVC064*	2	56	**29** *(13.3)*	**192** *(87.2)*	**34300** *(58276)*	*61*	**2 1/8** *(54)*	**1 5/8** *(41)*	2	**1 5/8** *(41)*	**1 1/8** *(28)*	*2*	**1590** *(723)*
TVC073	3	68	**28** *(12.7)*	**181** *(82.1)*	**43200** *(73397)*	*63*	**2 5/8** *(66)*	**1 5/8** *(41)*	2	**2 1/8** *(54)*	**1 3/8** *(35)*	*2*	**1720** *(782)*
TVC081	3	85	**33** *(15.2)*	**227** *(103.4)*	**41600** *(70678)*	*63*	**2 5/8** *(66)*	**1 5/8** *(41)*	2	**2 1/8** *(54)*	**1 3/8** *(35)*	*2*	**1920** *(873)*
TVC086*	3	68	**34** *(15.4)*	**231** *(104.9)*	**53000** *(90047)*	*63*	**2 5/8** *(66)*	**1 5/8** *(41)*	2	**2 1/8** *(54)*	**1 3/8** *(35)*	*2*	**2060** *(936)*
TVC096*	3	85	**40** *(18.3)*	**283** *(128.6)*	**51500** *(87499)*	*63*	**2 5/8** *(66)*	**1 5/8** *(41)*	2	**2 1/8** *(54)*	**1 3/8** *(35)*	*2*	**2340** *(1064)*
TVC112	4	42	**52** *(23.8)*	**344** *(156.3)*	**71800** *(121988)*	*64*	**2 5/8** *(66)*	**2 1/8** *(54)*	2	**2 1/8** *(54)*	**1 3/8** *(35)*	*2*	**2780** *(1264)*
TVC126	4	56	**65** *(29.7)*	**449** *(204.3)*	**70500** *(119780)*	*64*	**2 5/8** *(66)*	**2 1/8** *(54)*	2	**2 1/8** *(54)*	**1 3/8** *(35)*	*2*	**3100** *(1409)*
TVC137	4	70	**79** *(35.7)*	**555** *(252.2)*	**68600** *(116551)*	*64*	**2 5/8** *(66)*	**2 1/8** *(54)*	2	**2 1/8** *(54)*	**1 5/8** *(41)*	*2*	**3460** *(1573)*
TVC158	5	56	**78** *(35.6)*	**553** *(251.6)*	**88100** *(149682)*	*65*	**2 5/8** *(66)*	**2 1/8** *(54)*	2	**2 1/8** *(54)*	**1 5/8** *(41)*	*2*	**4000** *(1818)*
TVC172	5	70	**101** *(46.0)*	**691** *(314.0)*	**85800** *(145774)*	*65*	**2 5/8** *(66)*	**2 5/8** *(66)*	2	**2 1/8** *(54)*	**1 5/8** *(41)*	*2*	**4460** *(2027)*
TVC190	6	56	**106** *(48.1)*	**678** *(308.1)*	**106000** *(180094)*	*66*	**3 1/8** *(79)*	**3 1/8** *(79)*	2	**2 5/8** *(66)*	**2 1/8** *(54)*	*2*	**4850** *(2205)*
TVC206	6	70	**126** *(57.1)*	**835** *(379.7)*	**103000** *(174997)*	*66*	**3 1/8** *(79)*	**3 1/8** *(79)*	2	**2 5/8** *(66)*	**2 1/8** *(54)*	*2*	**5400** *(2455)*

(1) For R407A, R507 use R22 Charge x 0.87. For R407-C use R22 Charge x 0.97.
For R134a and R502 use R22 Charge. For R12 use R22 Charge X 1.1.

(2) Normal Charge is the refrigerant charge for warm ambient or summer operation. For low ambient or winter charge with flooded head pressure control and fan cycling see Page 47 and Page 48.

(3) 90% FULL is the liquid refrigerant weight at 90% of internal volume and is for reference ONLY.

(4) For 50Hz Fan Data use 60Hz CFM (m^3/h) X 0.83.

(5) Sound Pressure Level at approx. **32.8 ft.** *(ten metre)* distance.

(6) Less weight of refrigerant charge.

* Derate air flow rate by 12% on these models when operating on 208-230/1/60.

ELECTRICAL DATA - 850 RPM MODELS

60Hz

NO. OF FAN MOTORS	208-230/1/60			208-230/3/60			460/3/60			575/3/60		
	TOTAL FLA	MCA	MOP	TOTAL FLA	MCA	MOP	TOTAL FLA	MCA	MOP	TOTAL FLA	MCA	MOP
4	13.6	16.0	20	19.6	20.8	25	8.8	9.4	15	6.8	7.2	15
5	N/A	N/A	N/A	24.5	25.7	30	11.0	11.6	15	8.5	8.9	15
6	20.4	21.3	25	29.4	30.6	35	13.2	16.0	20	10.2	10.6	15
8	N/A	N/A	N/A	39.2	40.4	50	17.6	21.0	25	13.6	16.0	20
10	N/A	N/A	N/A	49.0	50.2	60	22.0	26.0	30	17.0	21.0	25
12	N/A	N/A	N/A	58.8	61.0	70	26.4	31.0	35	20.4	26.0	30

M.C.A. = Minimum Circuit Ampacity (AMPS)
M.O.P. = Maximum Overcurrent Protection (AMPS)
N/A = Not Available

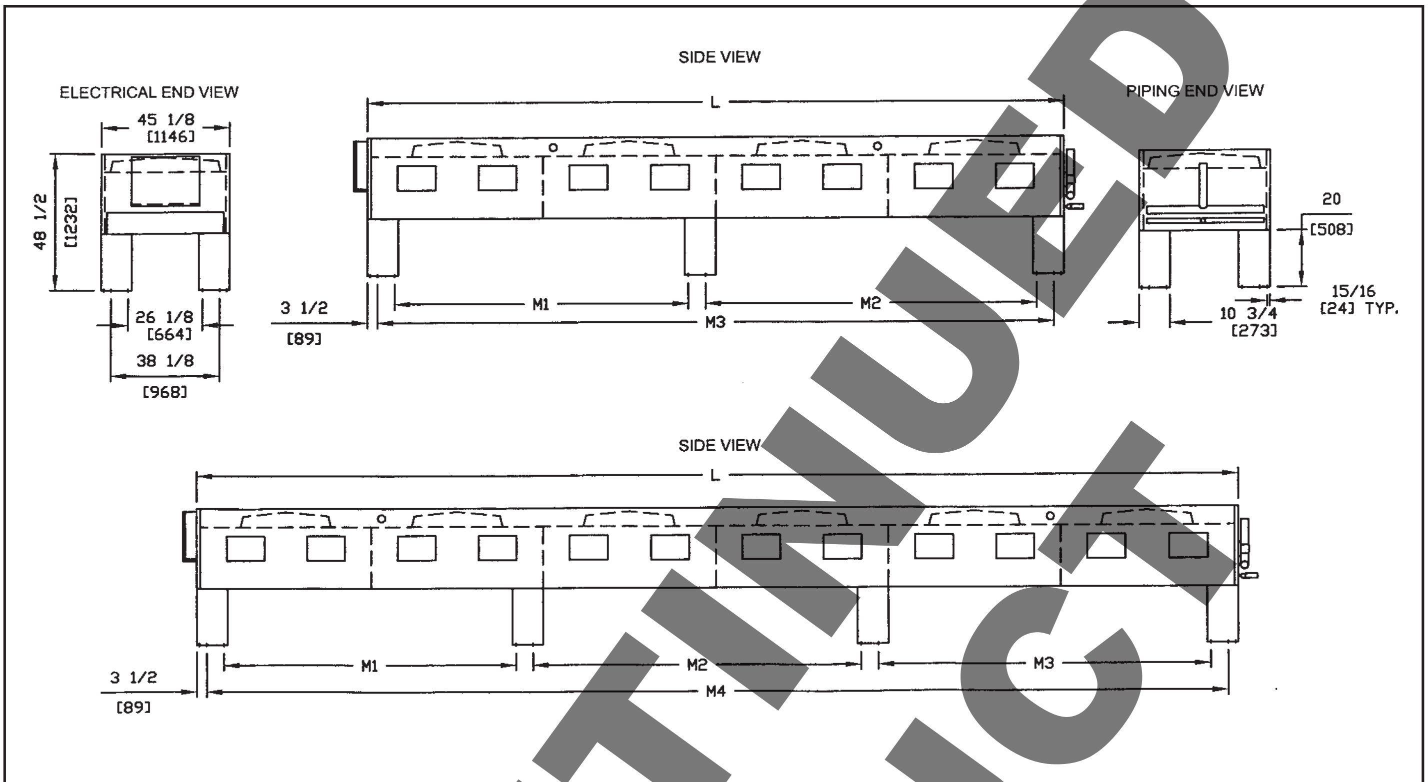
ELECTRICAL DATA - 700 RPM MODELS

50Hz

NO. OF FAN MOTORS	200-220/1/50			200-220/3/50			380-400/3/50		
	TOTAL FLA	MCA	MOP	TOTAL FLA	MCA	MOP	TOTAL FLA	MCA	MOP
4	14.4	15.3	20	15.2	16.2	20	6.8	7.2	15
5	N/A	N/A	N/A	19.0	21.0	25	8.5	8.9	15
6	21.6	25.1	30	22.8	26.0	30	10.2	10.6	15
8	N/A	N/A	N/A	30.4	36.0	40	13.6	16.0	20
10	N/A	N/A	N/A	38.0	41.0	50	17.0	21.0	25
12	N/A	N/A	N/A	45.6	51.0	60	20.4	26.0	30

M.C.A. = Minimum Circuit Ampacity (AMPS)
M.O.P. = Maximum Overcurrent Protection (AMPS)
N/A = Not Available

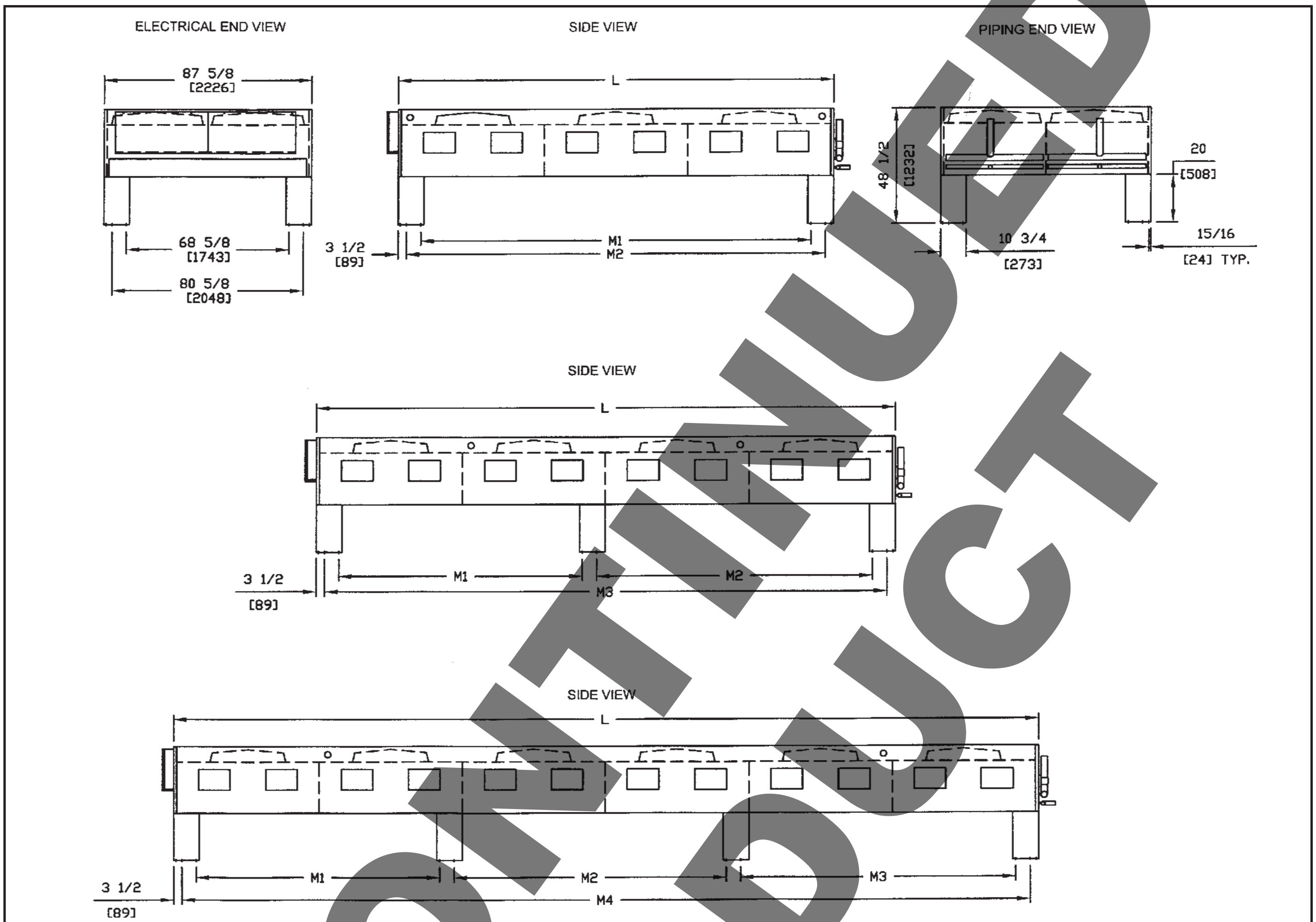
DIMENSIONAL DATA - SINGLE ROW TVC MODELS



DIMENSIONS - Inches (mm)

TVC MODEL NUMBER	FAN LONG	L		M1		M2		M3		M4	
		INCHES	*mm*	**INCHES**	*mm*	**INCHES**	*mm*	**INCHES**	*mm*	**INCHES**	*mm*
TVC056	4	**242 1/2**	*6160*	**102 1/4**	*2597*	**115 1/4**	*2927*	**235 1/2**	*5982*	**-**	*-*
TVC063	4	**242 1/2**	*6160*	**102 1/4**	*2597*	**115 1/4**	*2927*	**235 1/2**	*5982*	**-**	*-*
TVC068	4	**242 1/2**	*6160*	**102 1/4**	*2597*	**115 1/4**	*2927*	**235 1/2**	*5982*	**-**	*-*
TVC079	5	**302 1/2**	*7684*	**102 1/4**	*2597*	**54**	*1372*	**115 1/4**	*2927*	**295 1/2**	*7506*
TVC085	5	**302 1/2**	*7684*	**102 1/4**	*2597*	**54**	*1372*	**115 1/4**	*2927*	**295 1/2**	*7506*
TVC095	6	**362 1/2**	*9208*	**102 1/4**	*2597*	**114**	*2896*	**115 1/4**	*2927*	**355 1/2**	*9030*
TVC103	6	**362 1/2**	*9208*	**102 1/4**	*2597*	**114**	*2896*	**115 1/4**	*2927*	**355 1/2**	*9030*

DIMENSIONAL DATA - DOUBLE ROW TVC MODELS

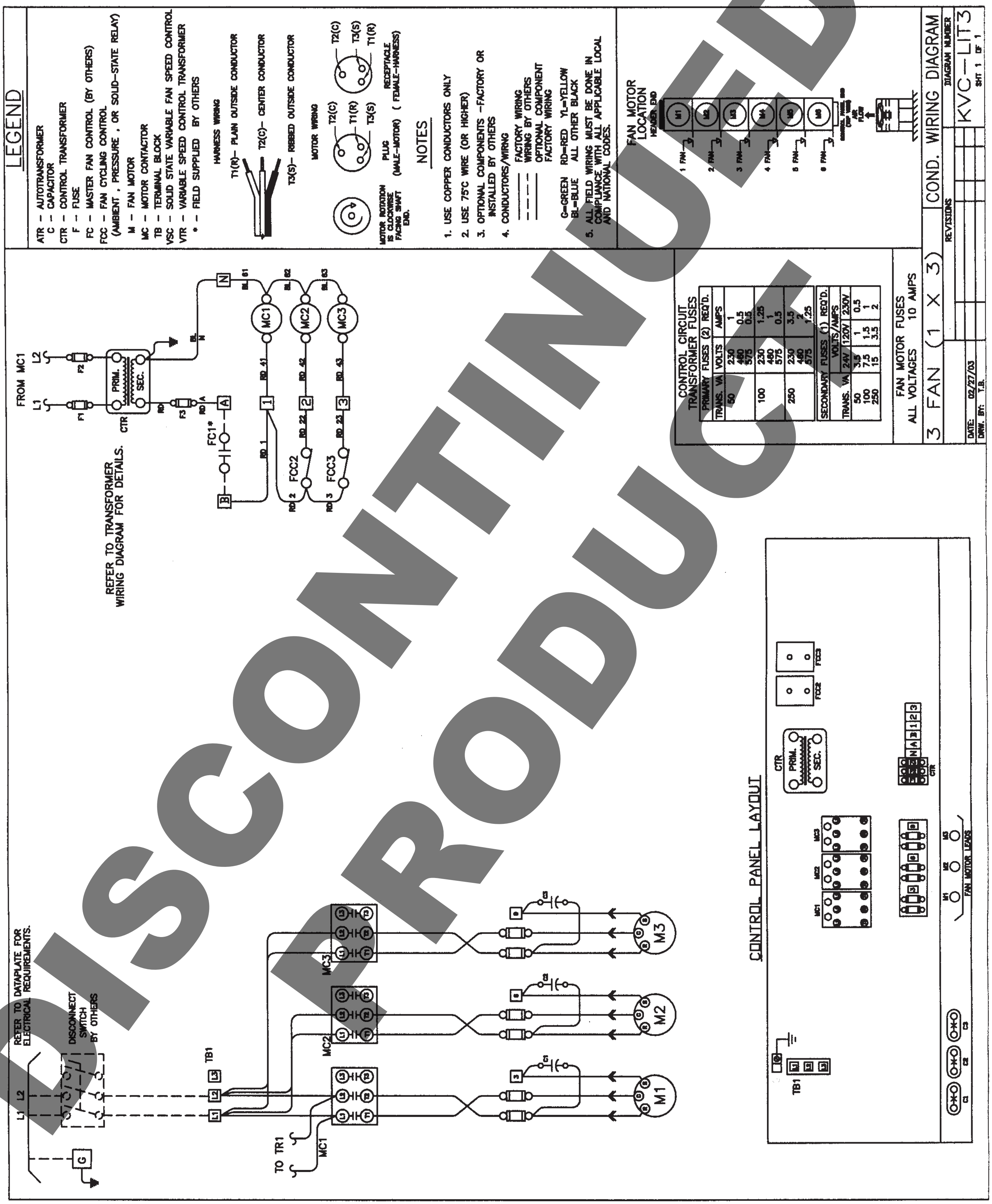


DIMENSIONS - Inches (mm)

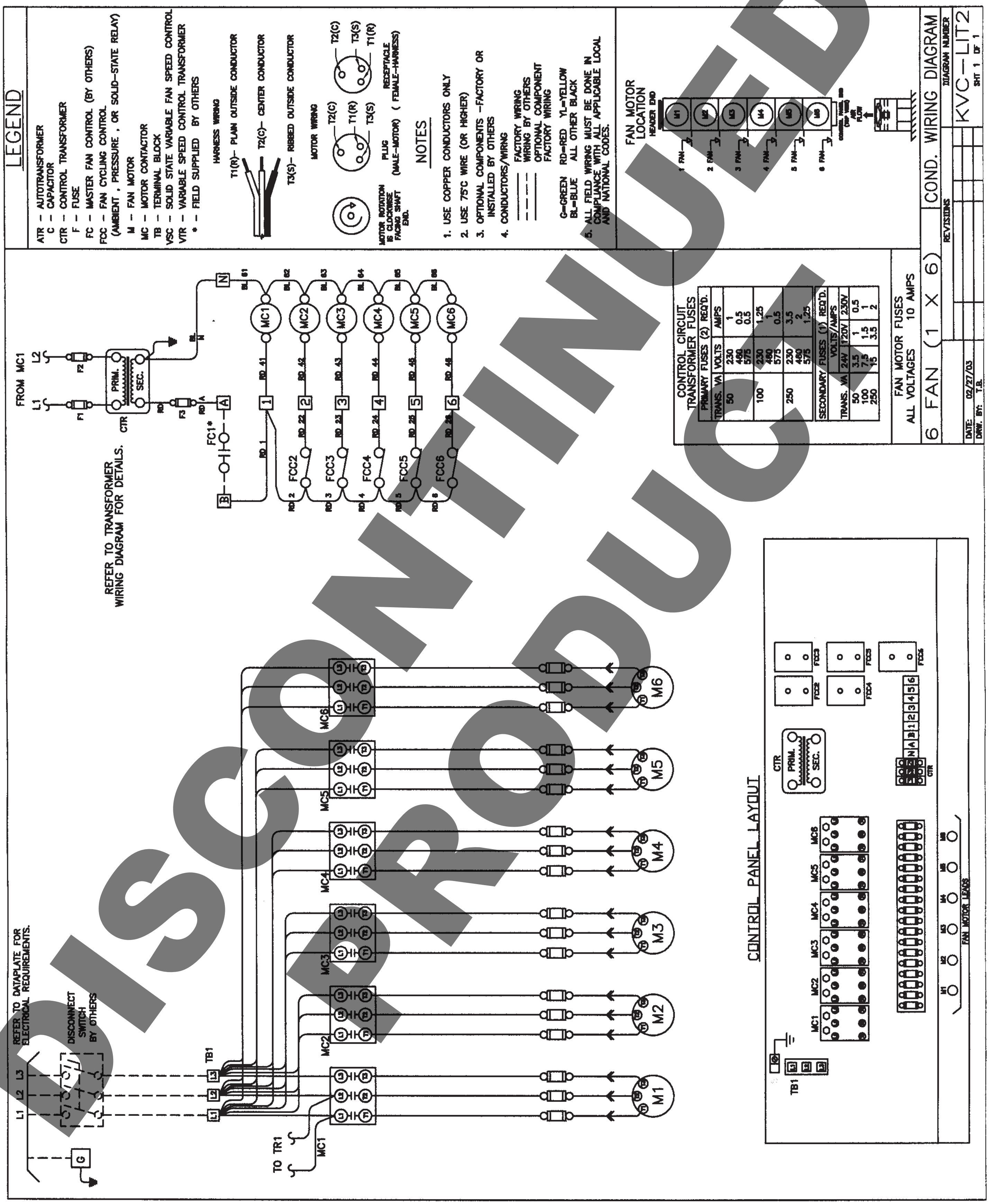
TVC MODEL NUMBER	FAN LONG	L		M1		M2		M3		M4	
		INCHES	*mm*	INCHES	*mm*	INCHES	*mm*	INCHES	*mm*	INCHES	*mm*
TVC044	2	96 1/2	*2451*	77 1/2	*1969*	89 1/2	*2273*	-	-	-	-
TVC049	2	96 1/2	*2451*	77 1/2	*1969*	89 1/2	*2273*	-	-	-	-
TVC054	2	96 1/2	*2451*	77 1/2	*1969*	89 1/2	*2273*	-	-	-	-
TVC057	2	122 1/2	*3112*	103 1/2	*2629*	115 1/2	*2934*	-	-	-	-
TVC064	2	122 1/2	*3112*	103 1/2	*2629*	115 1/2	*2934*	-	-	-	-
TVC073	3	143 1/2	*3645*	124 1/2	*3162*	136 1/2	*3467*	-	-	-	-
TVC081	3	143 1/2	*3645*	124 1/2	*3162*	136 1/2	*3467*	-	-	-	-
TVC086	3	182 1/2	*4636*	163 1/2	*4153*	175 1/2	*4458*	-	-	-	-
TVC096	3	182 1/2	*4636*	163 1/2	*4153*	175 1/2	*4458*	-	-	-	-
TVC112	4	242 1/2	*6160*	102 1/4	*2597*	115 1/4	*2927*	235 1/2	*5982*	-	-
TVC126	4	242 1/2	*6160*	102 1/4	*2597*	115 1/4	*2927*	235 1/2	*5982*	-	-
TVC137	4	242 1/2	*6160*	102 1/4	*2597*	115 1/4	*2927*	235 1/2	*5982*	-	-
TVC158	5	302 1/2	*7684*	102 1/4	*2597*	54	*1372*	115 1/4	*2927*	295 1/2	*7506*
TVC172	5	302 1/2	*7684*	102 1/4	*2597*	54	*1372*	115 1/4	*2927*	295 1/2	*7506*
TVC190	6	362 1/2	*9208*	102 1/4	*2597*	114	*2896*	115 1/4	*2927*	355 1/2	*9030*
TVC206	6	362 1/2	*9208*	102 1/4	*2597*	114	*2896*	115 1/4	*2927*	355 1/2	*9030*

WIRING DIAGRAMS

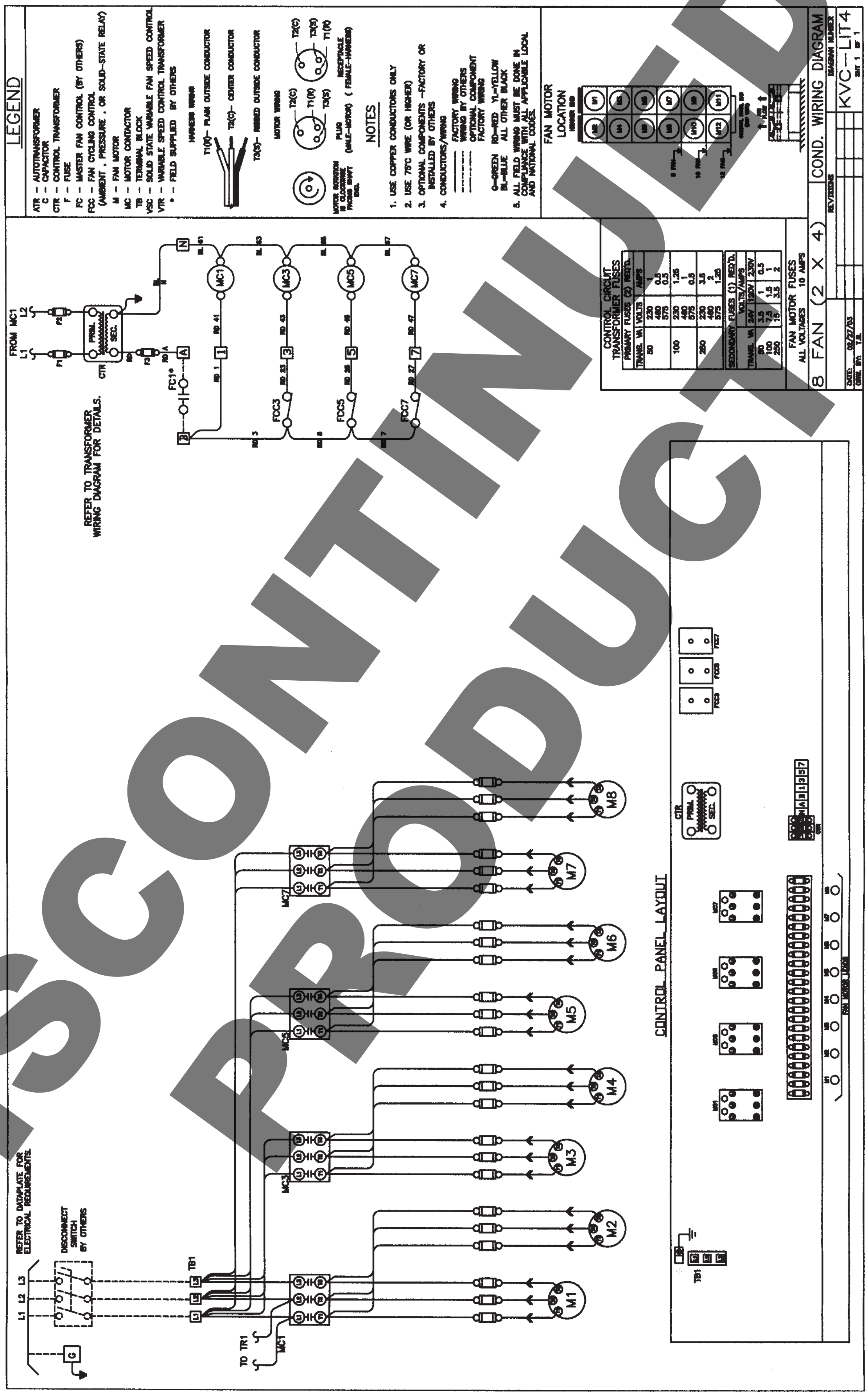
(SINGLE ROW MODELS - SINGLE PHASE UNIT)



WIRING DIAGRAMS
(SINGLE ROW MODELS - THREE PHASE UNIT)

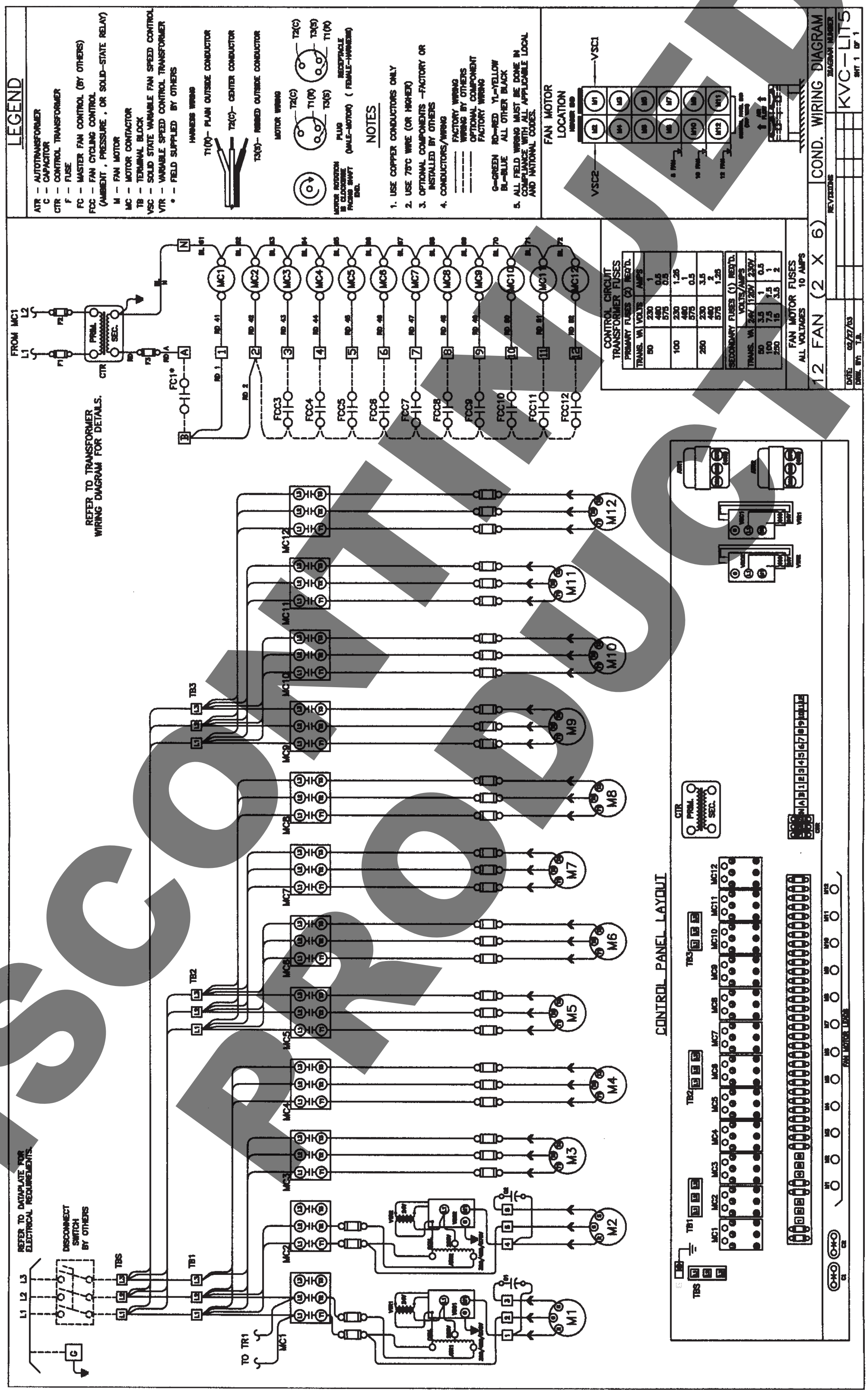


WIRING DIAGRAMS
(DOUBLE ROW MODELS - THREE PHASE UNIT)



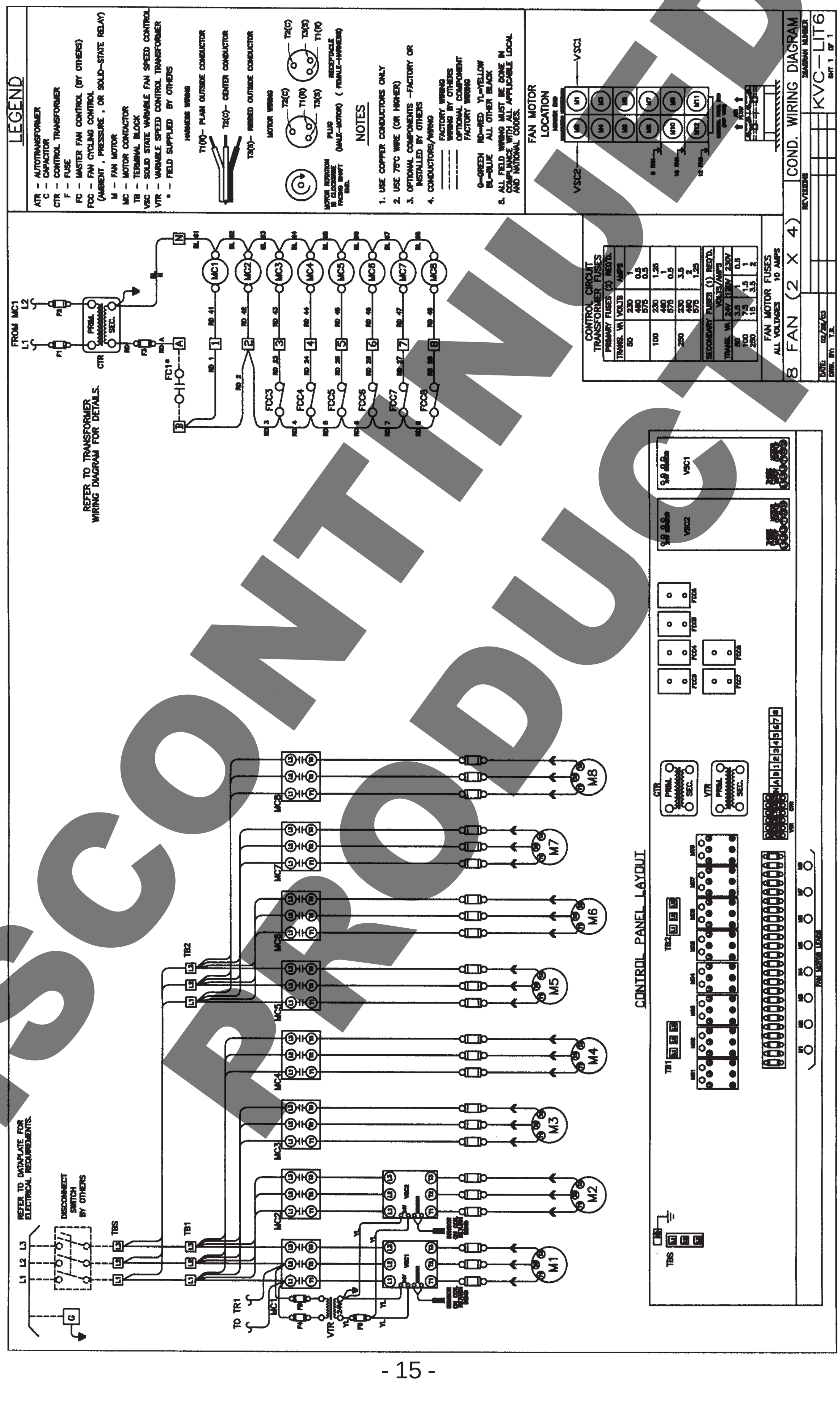
WIRING DIAGRAMS

(DOUBLE ROW MODELS WITH SINGLE PHASE FAN SPEED CONTROL (P66)



WIRING DIAGRAMS

(DOUBLE ROW MODELS WITH THREE PHASE HOFFMAN FAN SPEED CONTROL)



CAPACITY DATA - 550 RPM MODELS - R22, R404A & R507

(SINGLE ROW MODELS)

TVC Model Number	Fans Long	TOTAL HEAT OF REJECTION CAPACITY MBH *(KW)* — TEMPERATURE DIFFERENCE (TD) — 12 FPI					10 FPI	8 FPI	Max. No. of Feeds	MBH @ 1° F TD Per Feed (12 FPI)
		1°F *(0.56°C)*	10°F *(5.56°C)*	15°F *(8.3°C)*	20°F *(11.1°C)*	30°F *(16.7°C)*	1°F *(0.56°C)*	1°F *(0.56°C)*		
TVC056	4	**20.21** *(5.917)*	**202.1** *(59.17)*	**303.2** *(88.76)*	**404.2** *(118.3)*	**606.3** *(177.5)*	**18.79** *(5.502)*	**17.18** *(5.030)*	14	1.4436
TVC063	4	**22.53** *(6.597)*	**225.3** *(65.97)*	**338.0** *(98.95)*	**450.6** *(131.9)*	**675.9** *(197.9)*	**21.40** *(6.266)*	**19.83** *(5.806)*	18	1.2517
TVC068	4	**23.76** *(6.957)*	**237.6** *(69.57)*	**356.4** *(104.4)*	**475.2** *(139.1)*	**712.8** *(208.7)*	**23.28** *(6.816)*	**21.86** *(6.401)*	23	1.0330
TVC079	5	**28.01** *(8.201)*	**280.1** *(82.01)*	**420.2** *(123.0)*	**560.2** *(164.0)*	**840.3** *(246.0)*	**26.61** *(7.791)*	**24.65** *(7.218)*	28	1.0004
TVC085	5	**29.70** *(8.696)*	**297.0** *(86.96)*	**445.5** *(130.4)*	**594.0** *(173.9)*	**891.0** *(260.9)*	**29.10** *(8.520)*	**27.32** *(7.999)*	35	0.8486
TVC095	6	**33.62** *(9.844)*	**336.2** *(98.44)*	**504.3** *(147.7)*	**672.4** *(196.9)*	**1009** *(295.3)*	**31.93** *(9.349)*	**29.58** *(8.661)*	28	1.2007
TVC103	6	**35.64** *(10.44)*	**356.4** *(104.4)*	**534.6** *(156.5)*	**712.8** *(208.7)*	**1069** *(313.1)*	**34.92** *(10.22)*	**32.78** *(9.598)*	35	1.0183

Correction Factors for Other refrigerants - Use R22 Values Multiplied By

R134a	R407A	R407B	R407C
0.94	0.97	0.97	1.00

NOTES:

(1) Above capacity data based on 0°F subcooling and at sea level.
(2) TD = Condensing temperature - ambient temperature
(3) Standard fin spacing is 12 FPI.
(4) For High Altitude applications apply the following correction factors: 0.94 for 2000 feet, 0.88 for 4000 feet and 0.81 for 6000 feet.
(5) For 50Hz capacity multiply by 0.92.

CAPACITY DATA - 550 RPM MODELS - R22, R404A & R507

(DOUBLE ROW MODELS)

TVC Model Number	Fans Long	TOTAL HEAT OF REJECTION CAPACITY MBH *(KW)* — TEMPERATURE DIFFERENCE (TD) — 12 FPI					10 FPI	8 FPI	Max. No. of Feeds	MBH @ 1° F TD Per Feed (12 FPI)
		1°F *(0.56°C)*	10°F *(5.56°C)*	15°F *(8.3°C)*	20°F *(11.1°C)*	30°F *(16.7°C)*	1°F *(0.56°C)*	1°F *(0.56°C)*		
TVC044	2	15.81 *(4.629)*	158.1 *(46.29)*	237.2 *(69.44)*	316.2 *(92.58)*	474.3 *(138.9)*	14.70 *(4.304)*	13.44 *(3.935)*	34	0.4650
TVC049	2	17.16 *(5.024)*	171.6 *(50.24)*	257.4 *(75.37)*	343.2 *(100.5)*	514.8 *(150.7)*	16.30 *(4.773)*	15.10 *(4.421)*	34	0.5047
TVC054	2	18.35 *(5.373)*	183.5 *(53.73)*	275.3 *(80.59)*	367.0 *(107.5)*	550.5 *(161.2)*	17.98 *(5.265)*	16.88 *(4.942)*	34	0.5397
TVC057	2	20.37 *(5.964)*	203.7 *(59.64)*	305.6 *(89.47)*	407.4 *(119.3)*	611.1 *(178.9)*	19.35 *(5.666)*	17.93 *(5.250)*	34	0.5991
TVC064	2	22.00 *(6.442)*	220.0 *(64.42)*	330.0 *(96.62)*	440.0 *(128.8)*	660.0 *(193.2)*	21.49 *(6.292)*	20.24 *(5.926)*	42	0.5238
TVC073	3	25.73 *(7.534)*	257.3 *(75.34)*	386.0 *(113.0)*	514.6 *(150.7)*	771.9 *(226.0)*	24.45 *(7.159)*	22.64 *(6.629)*	45	0.5718
TVC081	3	27.52 *(8.058)*	275.2 *(80.58)*	412.8 *(120.9)*	550.4 *(161.2)*	825.6 *(241.7)*	26.97 *(7.897)*	25.32 *(7.414)*	56	0.4914
TVC086	3	30.56 *(8.948)*	305.6 *(89.48)*	458.4 *(134.2)*	611.2 *(179.0)*	916.8 *(268.4)*	29.03 *(8.500)*	26.89 *(7.873)*	68	0.4494
TVC096	3	33.00 *(9.662)*	330.0 *(96.62)*	495.0 *(144.9)*	660.0 *(193.2)*	990.0 *(289.9)*	32.24 *(9.440)*	30.36 *(8.889)*	85	0.3882
TVC112	4	40.42 *(11.83)*	404.2 *(118.3)*	606.3 *(177.5)*	808.4 *(236.7)*	1213 *(355.0)*	37.59 *(11.01)*	34.35 *(10.06)*	28	1.4436
TVC126	4	44.82 *(13.12)*	448.2 *(131.2)*	672.3 *(196.8)*	896.4 *(262.5)*	1345 *(393.7)*	42.58 *(12.47)*	39.44 *(11.55)*	37	1.2114
TVC137	4	47.51 *(13.91)*	475.1 *(139.1)*	712.7 *(208.7)*	950.2 *(278.2)*	1425 *(417.3)*	46.56 *(13.63)*	43.71 *(12.80)*	46	1.0328
TVC158	5	56.03 *(16.41)*	560.3 *(164.1)*	840.5 *(246.1)*	1121 *(328.1)*	1681 *(492.2)*	53.22 *(15.58)*	49.30 *(14.44)*	56	1.0005
TVC172	5	59.39 *(17.39)*	593.9 *(173.9)*	890.9 *(260.8)*	1188 *(347.8)*	1782 *(521.7)*	58.20 *(17.04)*	54.64 *(16.00)*	70	0.8484
TVC190	6	67.23 *(19.68)*	672.3 *(196.8)*	1008 *(295.3)*	1345 *(393.7)*	2017 *(590.5)*	63.87 *(18.70)*	59.16 *(17.32)*	56	1.2005
TVC206	6	71.27 *(20.87)*	712.7 *(208.7)*	1069 *(313.0)*	1425 *(417.4)*	2138 *(626.0)*	69.85 *(20.45)*	65.57 *(19.20)*	70	1.0181

Correction Factors for Other refrigerants - Use R22 Values Multiplied By

R134a	R407A	R407B	R407C
0.94	0.97	0.97	1.00

NOTES:

(1) Above capacity data based on 0°F subcooling and at sea level.
(2) TD = Condensing temperature - ambient temperature
(3) Standard fin spacing is 12 FPI.
(4) For High Altitude applications apply the following correction factors: 0.94 for 2000 feet, 0.88 for 4000 feet and 0.81 for 6000 feet.
(5) For 50Hz capacity multiply by 0.92.

GENERAL SPECIFICATIONS - 550 RPM MODELS - R22

(SINGLE ROW MODELS)

TVC MODEL NUMBER	Fans Long	Max. No. of Feeds	R22 Refrigerant Charge [1]		Air Flow Rate[4]	Piping Connections						Weights [5]
			Normal [2]	90% FULL [3]		APPLICABLE FOR 16º F TO 30º F DESIGN TD			APPLICABLE FOR 10º F TO 15º F DESIGN TD			
						Inlet	Outlet	Qty.	Inlet	Outlet	Qty.	
			lbs *(kg)*	lbs *(kg)*	CFM *(m^3/h)*	INCHES *(mm)*	INCHES *(mm)*		INCHES *(mm)*	INCHES *(mm)*		lbs *(kg)*
TVC056	4	14	**26** *(11.9)*	**172** *(78.2)*	**23300** *(39587)*	**2 1/8** *(54)*	**1 5/8** *(41)*	1	**2 1/8** *(54)*	**1 3/8** *(35)*	1	**1650** *(750)*
TVC063	4	18	**33** *(14.9)*	**225** *(102.1)*	**22900** *(38907)*	**2 5/8** *(66)*	**1 5/8** *(41)*	1	**2 1/8** *(54)*	**1 3/8** *(35)*	1	**1810** *(823)*
TVC068	4	23	**39** *(17.9)*	**277** *(126.1)*	**22300** *(37888)*	**2 5/8** *(66)*	**1 5/8** *(41)*	1	**2 1/8** *(54)*	**1 3/8** *(35)*	1	**1990** *(905)*
TVC079	5	28	**39** *(17.8)*	**277** *(125.8)*	**28700** *(48761)*	**2 5/8** *(66)*	**2 1/8** *(54)*	1	**2 1/8** *(54)*	**1 5/8** *(41)*	1	**2300** *(1045)*
TVC085	5	35	**51** *(23.0)*	**345** *(157.0)*	**27900** *(47402)*	**2 5/8** *(66)*	**2 1/8** *(54)*	1	**2 1/8** *(54)*	**1 5/8** *(41)*	1	**2530** *(1150)*
TVC095	6	28	**53** *(24.1)*	**339** *(154.0)*	**34400** *(58446)*	**3 1/8** *(79)*	**2 1/8** *(54)*	1	**2 1/8** *(54)*	**1 5/8** *(41)*	1	**2880** *(1309)*
TVC103	6	35	**63** *(28.5)*	**418** *(189.8)*	**33500** *(56917)*	**3 1/8** *(79)*	**2 5/8** *(66)*	1	**2 5/8** *(66)*	**1 5/8** *(41)*	1	**3150** *(1432)*

NOTES:

(1) For R407A, R507 use R22 Charge x 0.87. For R407-C use R22 Charge x 0.97.
For R134a and R502 use R22 Charge. For R12 use R22 Charge x 1.1.

(2) Normal Charge is the refrigerant charge for warm ambient or summer operation. For low ambient or winter charge with flooded head pressure control and fan cycling see Page 47 and Page 48.

(3) 90% FULL is the liquid refrigerant weight at 90% of internal volume and is for reference ONLY.

(4) For 50Hz Fan data use 60Hz CFM (m^3/h) x 0.83.capacity multiply by 0.92.

(5) Less weight of refrigerant charge.

GENERAL SPECIFICATIONS - 550 RPM MODELS - R22

(DOUBLE ROW MODELS)

TVC MODEL NUMBER	Fans Long	Max. No. of Feeds	R22 Refrigerant Charge (1)		Air Flow Rate(4)	Piping Connections						Weights (5)
						APPLICABLE FOR 16º F TO 30º F DESIGN TD			APPLICABLE FOR 10º F TO 15º F DESIGN TD			
			Normal (2)	90% FULL (3)		Inlet	Outlet	Qty.	Inlet	Outlet	Qty.	
			lbs (kg)	lbs (kg)	CFM (m^3/h)	INCHES (mm)	INCHES (mm)		INCHES (mm)	INCHES (mm)		lbs (kg)
TVC044	2	34	16 (7.2)	98 (44.5)	19400 (32961)	1 5/8 (41)	1 1/8 (28)	2	1 3/8 (35)	7/8 (22)	2	1070 (486)
TVC049	2	34	19 (8.7)	125 (57.0)	18700 (31771)	1 5/8 (41)	1 1/8 (28)	2	1 3/8 (35)	7/8 (22)	2	1200 (545)
TVC054	2	34	23 (10.3)	153 (69.5)	18000 (30582)	1 5/8 (41)	1 1/8 (28)	2	1 3/8 (35)	7/8 (22)	2	1330 (605)
TVC057	2	34	25 (11.3)	157 (71.3)	22900 (38907)	1 5/8 (41)	1 1/8 (28)	2	1 3/8 (35)	1 1/8 (28)	2	1400 (636)
TVC064	2	42	29 (13.3)	192 (87.2)	22300 (37888)	2 1/8 (54)	1 3/8 (35)	2	1 3/8 (35)	1 1/8 (28)	2	1590 (723)
TVC073	3	45	28 (12.7)	181 (82.1)	28100 (47742)	2 1/8 (54)	1 3/8 (35)	2	1 5/8 (41)	1 1/8 (28)	2	1720 (782)
TVC081	3	56	33 (15.2)	227 (103.4)	27000 (45873)	2 1/8 (54)	1 3/8 (35)	2	1 5/8 (41)	1 1/8 (28)	2	1920 (873)
TVC086	3	68	34 (15.4)	231 (104.9)	34500 (58616)	2 1/8 (54)	1 3/8 (35)	2	1 5/8 (41)	1 1/8 (28)	2	2060 (936)
TVC096	3	85	40 (18.3)	283 (128.6)	33500 (56917)	2 1/8 (54)	1 5/8 (41)	2	1 5/8 (41)	1 1/8 (28)	2	2340 (1064)
TVC112	4	28	52 (23.8)	344 (156.3)	46700 (79343)	2 1/8 (54)	1 5/8 (41)	2	2 1/8 (54)	1 3/8 (35)	2	2780 (1264)
TVC126	4	37	65 (29.7)	449 (204.3)	45800 (77814)	2 5/8 (66)	1 5/8 (41)	2	2 1/8 (54)	1 3/8 (35)	2	3100 (1409)
TVC137	4	46	79 (35.7)	555 (252.2)	44600 (75775)	2 5/8 (66)	1 5/8 (41)	2	2 1/8 (54)	1 3/8 (35)	2	3460 (1573)
TVC158	5	56	78 (35.6)	553 (251.6)	57300 (97353)	2 5/8 (66)	2 1/8 (54)	2	2 1/8 (54)	1 5/8 (41)	2	4000 (1818)
TVC172	5	70	101 (46.0)	691 (314.0)	55800 (94804)	2 5/8 (66)	2 1/8 (54)	2	2 1/8 (54)	1 5/8 (41)	2	4460 (2027)
TVC190	6	56	106 (48.1)	678 (308.1)	68900 (117061)	3 1/8 (79)	2 1/8 (54)	2	2 1/8 (54)	1 5/8 (41)	2	4850 (2205)
TVC206	6	70	126 (57.1)	835 (379.7)	67000 (113833)	3 1/8 (79)	2 5/8 (66)	2	2 5/8 (66)	1 5/8 (41)	2	5400 (2455)

NOTES:

(1) For R407A, R507 use R22 Charge x 0.87. For R407-C use R22 Charge x 0.97. For R134a and R502 use R22 Charge. For R12 use R22 Charge x 1.1.

(2) Normal Charge is the refrigerant charge for warm ambient or summer operation. For low ambient or winter charge with flooded head pressure control and fan cycling see Page 47 and Page 48.

(3) 90% FULL is the liquid refrigerant weight at 90% of internal volume and is for reference ONLY.

(4) For 50Hz Fan data use 60Hz CFM (m^3/h) x 0.83.capacity multiply by 0.92.

(5) Less weight of refrigerant charge.

ELECTRICAL DATA - 550 RPM MODELS

60Hz

NO. OF FANS	208-230/3/60			460/3/60			575/3/60		
	TOTAL FLA	MCA	MOP	TOTAL FLA	MCA	MOP	TOTAL FLA	MCA	MOP
4	11.2	11.9	15	5.2	5.5	15	4.4	4.7	15
5	14.0	16.0	20	6.5	6.8	15	5.5	5.8	15
6	16.8	21.0	25	7.8	8.1	15	6.6	6.9	15
8	22.4	26.0	30	10.4	10.7	15	8.8	9.1	15
10	28.0	31.0	35	13.0	15.1	20	11.0	11.3	15
12	33.6	41.0	45	15.6	15.9	20	13.2	16.0	20

M.C.A. = Minimum Circuit Ampacity (AMPS)
M.O.P. = Maximum Overcurrent Protection (AMPS)

ELECTRICAL DATA - 450 RPM MODELS

50Hz

NO. OF FANS	200-220/3/50			380-400/3/50		
	TOTAL FLA	MCA	MOP	TOTAL FLA	MCA	MOP
4	8.7	9.3	15	4.0	4.3	15
5	10.9	11.4	15	5.0	5.3	15
6	13.1	16.0	20	6.0	6.3	15
8	17.4	21.0	25	8.0	8.3	15
10	21.8	26.0	30	10.0	10.3	15
12	26.2	31.0	35	12.0	12.3	15

M.C.A. = Minimum Circuit Ampacity (AMPS)
M.O.P. = Maximum Overcurrent Protection (AMPS)

CAPACITY DATA - 1140 RPM MODELS - R22, R404A & R507

(SINGLE ROW MODELS)

TVC Model Number	Fans Long	TOTAL HEAT OF REJECTION CAPACITY MBH *(KW)* — TEMPERATURE DIFFERENCE (TD) — 12 FPI					10 FPI	8 FPI	Max. No. of Feeds	MBH @ 1° F TD Per Feed (12 FPI)
		1°F *(0.56°C)*	10°F *(5.56°C)*	15°F *(8.3°C)*	20°F *(11.1°C)*	30°F *(16.7°C)*	1°F *(0.56°C)*	1°F *(0.56°C)*		
TVC056	4	**31.79** *(9.308)*	**317.9** *(93.08)*	**476.9** *(139.6)*	**635.8** *(186.2)*	**953.7** *(279.2)*	**29.57** *(8.658)*	**27.02** *(7.911)*	21	1.5138
TVC063	4	**36.64** *(10.73)*	**366.4** *(107.3)*	**549.6** *(160.9)*	**732.8** *(214.6)*	**1099** *(321.8)*	**34.81** *(10.19)*	**32.25** *(9.443)*	28	1.3086
TVC068	4	**40.92** *(11.98)*	**409.2** *(119.8)*	**613.8** *(179.7)*	**818.4** *(239.6)*	**1228** *(359.4)*	**40.10** *(11.74)*	**37.64** *(11.02)*	35	1.1691
TVC079	5	**45.80** *(13.41)*	**458.0** *(134.1)*	**687.0** *(201.2)*	**916.0** *(268.2)*	**1374** *(402.3)*	**43.51** *(12.74)*	**40.31** *(11.80)*	28	1.6357
TVC085	5	**51.14** *(14.97)*	**511.4** *(149.7)*	**767.1** *(224.6)*	**1023** *(299.5)*	**1534** *(449.2)*	**50.12** *(14.68)*	**47.05** *(13.78)*	35	1.4611
TVC095	6	**54.97** *(16.10)*	**549.7** *(161.0)*	**824.6** *(241.4)*	**1099** *(321.9)*	**1649** *(482.9)*	**52.22** *(15.29)*	**48.37** *(14.16)*	28	1.9632
TVC103	6	**61.37** *(17.97)*	**613.7** *(179.7)*	**920.6** *(269.5)*	**1227** *(359.4)*	**1841** *(539.1)*	**60.15** *(17.61)*	**56.46** *(16.53)*	35	1.7534

Correction Factors for Other refrigerants - Use R22 Values Multiplied By

R134a	R407A	R407B	R407C
0.94	0.97	0.97	1.00

NOTES:

(1) Above capacity data based on 0°F subcooling and at sea level.
(2) TD = Condensing temperature - ambient temperature
(3) Standard fin spacing is 12 FPI.
(4) For High Altitude applications apply the following correction factors: 0.94 for 2000 feet, 0.88 for 4000 feet and 0.81 for 6000 feet.
(5) For 50Hz capacity multiply by 0.92.

CAPACITY DATA - 1140 RPM MODELS - R22, R404A & R507

(DOUBLE ROW MODELS)

TVC Model Number	Fans Long	TOTAL HEAT OF REJECTION CAPACITY MBH *(KW)*							Max. No. of Feeds	MBH @ 1° F TD Per Feed (12 FPI)
		TEMPERATURE DIFFERENCE (TD)								
		12 FPI					10 FPI	8 FPI		
		1°F *(0.56°C)*	10°F *(5.56°C)*	15°F *(8.3°C)*	20°F *(11.1°C)*	30°F *(16.7°C)*	1°F *(0.56°C)*	1°F *(0.56°C)*		
TVC044	2	**25.06** *(7.338)*	**250.6** *(73.38)*	**375.9** *(110.1)*	**501.2** *(146.8)*	**751.8** *(220.1)*	**23.30** *(6.822)*	**21.30** *(6.237)*	34	0.7371
TVC049	2	**28.67** *(8.395)*	**286.7** *(83.95)*	**430.1** *(125.9)*	**573.4** *(167.9)*	**860.1** *(251.8)*	**27.24** *(7.976)*	**25.23** *(7.387)*	45	0.6371
TVC054	2	**32.04** *(9.381)*	**320.4** *(93.81)*	**480.6** *(140.7)*	**640.8** *(187.6)*	**961.2** *(281.4)*	**31.40** *(9.194)*	**29.48** *(8.632)*	56	0.5721
TVC057	2	**33.41** *(9.782)*	**334.1** *(97.82)*	**501.2** *(146.7)*	**668.2** *(195.6)*	**1002** *(293.5)*	**31.74** *(9.293)*	**29.40** *(8.608)*	45	0.7424
TVC064	2	**38.04** *(11.14)*	**380.4** *(111.4)*	**570.6** *(167.1)*	**760.8** *(222.8)*	**1141** *(334.1)*	**37.28** *(10.92)*	**35.00** *(10.25)*	56	0.6793
TVC073	3	**43.01** *(12.59)*	**430.1** *(125.9)*	**645.2** *(188.9)*	**860.2** *(251.9)*	**1290** *(377.8)*	**40.85** *(11.96)*	**37.84** *(11.08)*	68	0.6325
TVC081	3	**48.06** *(14.07)*	**480.6** *(140.7)*	**720.9** *(211.1)*	**961.2** *(281.4)*	**1442** *(422.2)*	**47.10** *(13.79)*	**44.22** *(12.95)*	85	0.5654
TVC086	3	**50.11** *(14.67)*	**501.1** *(146.7)*	**751.7** *(220.1)*	**1002** *(293.4)*	**1503** *(440.2)*	**47.61** *(13.94)*	**44.10** *(12.91)*	68	0.7369
TVC096	3	**57.06** *(16.71)*	**570.6** *(167.1)*	**855.9** *(250.6)*	**1141** *(334.1)*	**1712** *(501.2)*	**55.92** *(16.37)*	**52.50** *(15.37)*	85	0.6713
TVC112	4	**63.59** *(18.62)*	**635.9** *(186.2)*	**953.9** *(279.3)*	**1272** *(372.4)*	**1908** *(558.6)*	**59.14** *(17.32)*	**54.05** *(15.83)*	42	1.5140
TVC126	4	**73.29** *(21.46)*	**732.9** *(214.6)*	**1099** *(321.9)*	**1466** *(429.2)*	**2199** *(643.8)*	**69.62** *(20.38)*	**64.49** *(18.88)*	56	1.3088
TVC137	4	**81.83** *(23.96)*	**818.3** *(239.6)*	**1227** *(359.4)*	**1637** *(479.2)*	**2455** *(718.8)*	**80.19** *(23.48)*	**75.28** *(22.04)*	70	1.1690
TVC158	5	**91.61** *(26.82)*	**916.1** *(268.2)*	**1374** *(402.4)*	**1832** *(536.5)*	**2748** *(804.7)*	**87.03** *(25.48)*	**80.62** *(23.61)*	56	1.6359
TVC172	5	**102.3** *(29.95)*	**1023** *(299.5)*	**1535** *(449.3)*	**2046** *(599.1)*	**3069** *(898.6)*	**100.3** *(29.37)*	**94.12** *(27.56)*	70	1.4614
TVC190	6	**109.9** *(32.18)*	**1099** *(321.8)*	**1649** *(482.7)*	**2198** *(643.6)*	**3297** *(965.4)*	**104.4** *(30.57)*	**96.71** *(28.32)*	56	1.9625
TVC206	6	**122.7** *(35.93)*	**1227** *(359.3)*	**1841** *(538.9)*	**2454** *(718.5)*	**3681** *(1078)*	**120.3** *(35.22)*	**112.9** *(33.06)*	70	1.7529

Correction Factors for Other refrigerants - Use R22 Values Multiplied By

R134a	R407A	R407B	R407C
0.94	0.97	0.97	1.00

NOTES:

(1) Above capacity data based on 0°F subcooling and at sea level.
(2) TD = Condensing temperature - ambient temperature
(3) Standard fin spacing is 12 FPI.
(4) For High Altitude applications apply the following correction factors: 0.94 for 2000 feet, 0.88 for 4000 feet and 0.81 for 6000 feet.
(5) For 50Hz capacity multiply by 0.92.

GENERAL SPECIFICATIONS - 1140 RPM MODELS

(SINGLE ROW MODELS)

TVC MODEL NUMBER	Fans Long	Max. No. of Feeds	R22 Refrigerant Charge (1)		Air Flow Rate(4)	Piping Connections						Weights (5)
						APPLICABLE FOR 16º F TO 30º F DESIGN TD			APPLICABLE FOR 10º F TO 15º F DESIGN TD			
			Normal (2)	90% FULL (3)		Inlet	Outlet	Qty.	Inlet	Outlet	Qty.	
			lbs (kg)	lbs (kg)	CFM (m^3/h)	INCHES (mm)	INCHES (mm)		INCHES (mm)	INCHES (mm)		lbs (kg)
TVC056	4	21	**26** *(11.9)*	**172** *(78.2)*	**48100** *(81722)*	**2 5/8** *(66)*	**2 1/8** *(54)*	1	**2 1/8** *(54)*	**1 5/8** *(41)*	1	**1650** *(750)*
TVC063	4	28	**33** *(14.9)*	**225** *(102.1)*	**47200** *(80193)*	**3 1/8** *(79)*	**2 1/8** *(54)*	1	**2 5/8** *(66)*	**1 5/8** *(41)*	1	**1810** *(823)*
TVC068	4	35	**39** *(17.9)*	**277** *(126.1)*	**46000** *(78154)*	**3 1/8** *(79)*	**2 5/8** *(66)*	1	**2 5/8** *(66)*	**1 5/8** *(41)*	1	**1990** *(905)*
TVC079	5	28	**39** *(17.8)*	**277** *(125.8)*	**59100** *(100411)*	**3 1/8** *(79)*	**2 5/8** *(66)*	1	**2 5/8** *(66)*	**2 1/8** *(54)*	1	**2300** *(1045)*
TVC085	5	35	**51** *(23.0)*	**345** *(157.0)*	**57500** *(97693)*	**3 1/8** *(79)*	**2 5/8** *(66)*	1	**2 5/8** *(66)*	**2 1/8** *(54)*	1	**2530** *(1150)*
TVC095	6	28	**53** *(24.1)*	**339** *(154.0)*	**70900** *(120459)*	**3 1/8** *(79)*	**3 1/8** *(79)*	1	**3 1/8** *(79)*	**2 1/8** *(54)*	1	**2880** *(1309)*
TVC103	6	35	**63** *(28.5)*	**418** *(189.8)*	**69000** *(117231)*	**3 1/8** *(79)*	**3 1/8** *(79)*	1	**3 1/8** *(79)*	**2 5/8** *(66)*	1	**3150** *(1432)*

NOTES:

(1) For R407A, R507 use R22 Charge x 0.87. For R407-C use R22 Charge x 0.97. For R134a and R502 use R22 Charge. For R12 use R22 Charge x 1.1.

(2) Normal Charge is the refrigerant charge for warm ambient or summer operation. For low ambient or winter charge with flooded head pressure control and fan cycling see Page 47 and Page 48.

(3) 90% FULL is the liquid refrigerant weight at 90% of internal volume and is for reference ONLY.

(4) For 50Hz Fan data use 60Hz CFM (m^3/h) x 0.83.capacity multiply by 0.92.

(5) Less weight of refrigerant charge.

GENERAL SPECIFICATIONS - 1140 RPM MODELS

(DOUBLE ROW MODELS)

TVC MODEL NUMBER	Fans Long	Max. No. of Feeds	R22 Refrigerant Charge (1) Normal (2)	R22 Refrigerant Charge (1) 90% FULL (3)	Air Flow Rate(4)	Piping Connections: APPLICABLE FOR 16º F TO 30º F DESIGN TD Inlet	Outlet	Qty.	APPLICABLE FOR 10º F TO 15º F DESIGN TD Inlet	Outlet	Qty.	Weights (5)
			lbs (kg)	lbs (kg)	CFM (m^3/h)	INCHES (mm)	INCHES (mm)		INCHES (mm)	INCHES (mm)		lbs (kg)
TVC044	2	34	16 (7.2)	98 (44.5)	40100 (68130)	2 1/8 (54)	1 3/8 (35)	2	1 3/8 (35)	1 1/8 (28)	2	1070 (486)
TVC049	2	45	19 (8.7)	125 (57.0)	38600 (65581)	2 1/8 (54)	1 3/8 (35)	2	1 5/8 (41)	1 1/8 (28)	2	1200 (545)
TVC054	2	56	23 (10.3)	153 (69.5)	37100 (63033)	2 1/8 (54)	1 3/8 (35)	2	1 5/8 (41)	1 1/8 (28)	2	1330 (605)
TVC057	2	45	25 (11.3)	157 (71.3)	47300 (80363)	2 1/8 (54)	1 5/8 (41)	2	1 5/8 (41)	1 1/8 (28)	2	1400 (636)
TVC064	2	56	29 (13.3)	192 (87.2)	46000 (78154)	2 1/8 (54)	1 5/8 (41)	2	2 1/8 (54)	1 3/8 (35)	2	1590 (723)
TVC073	3	68	28 (12.7)	181 (82.1)	57900 (98372)	2 5/8 (66)	1 5/8 (41)	2	2 1/8 (54)	1 3/8 (35)	2	1720 (782)
TVC081	3	85	33 (15.2)	227 (103.4)	55700 (94634)	2 5/8 (66)	1 5/8 (41)	2	2 1/8 (54)	1 3/8 (35)	2	1920 (873)
TVC086	3	68	34 (15.4)	231 (104.9)	71000 (120629)	2 5/8 (66)	2 1/8 (54)	2	2 1/8 (54)	1 3/8 (35)	2	2060 (936)
TVC096	3	85	40 (18.3)	283 (128.6)	69000 (117231)	2 5/8 (66)	2 1/8 (54)	2	2 1/8 (54)	1 5/8 (41)	2	2340 (1064)
TVC112	4	42	52 (23.8)	344 (156.3)	96200 (163444)	2 5/8 (66)	2 1/8 (54)	2	2 1/8 (54)	1 5/8 (41)	2	2780 (1264)
TVC126	4	56	65 (29.7)	449 (204.3)	64500 (160556)	3 1/8 (79)	2 1/8 (54)	2	2 5/8 (66)	1 5/8 (41)	2	3100 (1409)
TVC137	4	70	79 (35.7)	555 (252.2)	91900 (156138)	3 1/8 (79)	2 5/8 (66)	2	2 5/8 (66)	1 5/8 (41)	2	3460 (1573)
TVC158	5	56	78 (35.6)	553 (251.6)	118000 (20482)	3 1/8 (79)	2 5/8 (66)	2	2 5/8 (66)	2 1/8 (54)	2	4000 (1818)
TVC172	5	70	101 (46.0)	691 (314.0)	115000 (195385)	3 1/8 (79)	2 5/8 (66)	2	2 5/8 (66)	2 1/8 (54)	2	4460 (2027)
TVC190	6	56	106 (48.1)	678 (308.1)	142000 (241258)	3 1/8 (79)	3 1/8 (79)	2	3 1/8 (79)	2 1/8 (54)	2	4850 (2205)
TVC206	6	70	126 (57.1)	835 (379.7)	138000 (234462)	3 1/8 (79)	3 1/8 (79)	2	3 1/8 (79)	2 5/8 (66)	2	5400 (2455)

NOTES:

(1) For R407A, R507 use R22 Charge x 0.87. For R407-C use R22 Charge x 0.97.
For R134a and R502 use R22 Charge. For R12 use R22 Charge x 1.1.

(2) Normal Charge is the refrigerant charge for warm ambient or summer operation. For low ambient or winter charge with flooded head pressure control and fan cycling see Page 47 and Page 48.

(3) 90% FULL is the liquid refrigerant weight at 90% of internal volume and is for reference ONLY.

(4) For 50Hz Fan data use 60Hz CFM (m^3/h) x 0.83.capacity multiply by 0.92.

(5) Less weight of refrigerant charge.

ELECTRICAL DATA - 1140 RPM MODELS

60Hz

NO. OF FANS	208-230/3/60			460/3/60			575/3/60		
	TOTAL FLA	MCA	MOP	TOTAL FLA	MCA	MOP	TOTAL FLA	MCA	MOP
4	26.4	31.0	35	12.4	13.2	15	10.0	10.6	15
5	33.0	36.0	40	15.5	16.3	20	12.5	16.0	20
6	39.6	46.0	50	18.6	21.0	25	15.0	17.0	20
8	52.8	61.0	70	24.8	25.6	30	20.0	20.6	25
10	66.0	71.0	80	31.0	36.0	40	25.0	25.6	30
12	79.2	91.0	100	37.2	41.0	45	30.0	36.0	40

M.C.A. = Minimum Circuit Ampacity (AMPS)
M.O.P. = Maximum Overcurrent Protection (AMPS)

ELECTRICAL DATA - 1140 (950) RPM MODELS

50Hz

NO. OF FANS	200-220/3/50			380-400/3/50		
	TOTAL FLA	MCA	MOP	TOTAL FLA	MCA	MOP
4	21.6	23.0	25	10.4	11.1	15
5	27.0	31.0	35	13.0	16.0	20
6	32.4	36.0	40	15.6	16.3	20
8	43.2	46.0	50	20.8	26.0	30
10	54.0	55.4	60	26.0	31.0	35
12	64.8	71.0	80	31.2	36.0	40

M.C.A. = Minimum Circuit Ampacity (AMPS)
M.O.P. = Maximum Overcurrent Protection (AMPS)

RECEIVER SELECTIONS

(SINGLE ROW MODELS)

Model	Fan Long	Single Circuit Per Fan Wide								Two Equal Circuits Per Fan Wide							
		Std. Size				Over Size				Std. Size				Over Size			
		Capacity* Lbs. *(kg)*	Diameter Inches *(mm)*	Length Inches *(mm)*	Qty.	Capacity* Lbs. *(kg)*	Diameter Inches *(mm)*	Length Inches *(mm)*	Qty.	Capacity* Lbs. *(kg)*	Diameter Inches *(mm)*	Length Inches *(mm)*	Qty.	Capacity* Lbs. *(kg)*	Diameter Inches *(mm)*	Length Inches *(mm)*	Qty.
TVC056	4	**219** *(99.7)*	**10 3/4** *(273)*	**72** *(1814)*	1	**182** *(82.8)*	**10 3/4** *(273)*	**60** *(1524)*	2	**119** *(54.2)*	**8 5/8** *(219)*	**60** *(1524)*	2	**182** *(82.8)*	**10 3/4** *(273)*	**60** *(1524)*	2
TVC063	4	**295** *(134.0)*	**10 3/4** *(273)*	**96** *(2419)*	1	**182** *(82.8)*	**10 3/4** *(273)*	**60** *(1524)*	2	**119** *(54.2)*	**8 5/8** *(219)*	**60** *(1524)*	2	**182** *(82.8)*	**10 3/4** *(273)*	**60** *(1524)*	2
TVC068	4	**295** *(134.0)*	**10 3/4** *(273)*	**96** *(2419)*	1	**182** *(82.8)*	**10 3/4** *(273)*	**60** *(1524)*	2	**182** *(82.8)*	**10 3/4** *(273)*	**60** *(1524)*	2	**182** *(82.8)*	**10 3/4** *(273)*	**60** *(1524)*	2
TVC079	5	**295** *(134.0)*	**10 3/4** *(273)*	**96** *(2419)*	1	**219** *(99.7)*	**10 3/4** *(273)*	**72** *(1829)*	2	**182** *(82.8)*	**10 3/4** *(273)*	**60** *(1524)*	2	**219** *(99.7)*	**10 3/4** *(273)*	**72** *(1829)*	2
TVC085	5	**295** *(134.0)*	**10 3/4** *(273)*	**96** *(2419)*	1	**219** *(99.7)*	**10 3/4** *(273)*	**72** *(1829)*	2	**182** *(82.8)*	**10 3/4** *(273)*	**60** *(1524)*	2	**219** *(99.7)*	**10 3/4** *(273)*	**72** *(1829)*	2
TVC095	6	**182** *(82.8)*	**10 3/4** *(273)*	**60** *(1512)*	2	**295** *(134.0)*	**10 3/4** *(273)*	**96** *(2438)*	2	**182** *(82.8)*	**10 3/4** *(273)*	**60** *(1524)*	2	**295** *(134.0)*	**10 3/4** *(273)*	**96** *(2438)*	2
TVC103	6	**219** *(99.7)*	**10 3/4** *(273)*	**72** *(1814)*	2	**295** *(134.0)*	**10 3/4** *(273)*	**96** *(2438)*	2	**219** *(99.7)*	**10 3/4** *(273)*	**72** *(1829)*	2	**295** *(134.0)*	**10 3/4** *(273)*	**96** *(2438)*	2

NOTE:
These receiver selections are for R22 @ 90% full. Please ensure receiver sizing is appropriate for the application.
Receivers are optional items.
* Capacity per receiver (R22). Multiply capacity by 0.87 for R404A/R507.

RECEIVER SELECTIONS

(DOUBLE ROW MODELS)

Model	Fan Long	Single Circuit Per Fan Wide								Two Equal Circuits Per Fan Wide							
		Std. Size				Over Size				Std. Size				Over Size			
		Capacity* Lbs. (kg)	Diameter Inches (mm)	Length Inches (mm)	Qty.	Capacity* Lbs. (kg)	Diameter Inches (mm)	Length Inches (mm)	Qty.	Capacity* Lbs. (kg)	Diameter Inches (mm)	Length Inches (mm)	Qty.	Capacity* Lbs. (kg)	Diameter Inches (mm)	Length Inches (mm)	Qty.
TVC044	2	95 (43.0)	8 5/8 (219)	48 (1219)	2	119 (54.2)	8 5/8 (219)	60 (1524)	2	70 (31.7)	8 5/8 (219)	36 (914)	4	95 (43.0)	8 5/8 (219)	48 (1219)	4
TVC049	2	95 (43.0)	8 5/8 (219)	48 (1219)	2	119 (54.2)	8 5/8 (219)	60 (1524)	2	70 (31.7)	8 5/8 (219)	36 (914)	4	95 (43.0)	8 5/8 (219)	48 (1219)	4
TVC054	2	119 (54.2)	8 5/8 (219)	60 (1524)	2	182 (82.8)	10 3/4 (273)	60 (1524)	2	70 (31.7)	8 5/8 (219)	36 (914)	4	95 (43.0)	8 5/8 (219)	48 (1219)	4
TVC057	2	119 (54.2)	8 5/8 (219)	60 (1524)	2	182 (82.8)	10 3/4 (273)	60 (1524)	2	70 (31.7)	8 5/8 (219)	36 (914)	4	95 (43.0)	8 5/8 (219)	48 (1219)	4
TVC064	2	119 (54.2)	8 5/8 (219)	60 (1524)	2	219 (99.7)	10 3/4 (273)	72 (1829)	2	70 (31.7)	8 5/8 (219)	36 (914)	4	95 (43.0)	8 5/8 (219)	48 (1219)	4
TVC073	3	182 (82.8)	10 3/4 (273)	60 (1524)	2	219 (99.7)	10 3/4 (273)	72 (1829)	2	95 (43.0)	8 5/8 (219)	48 (1219)	4	119 (54.2)	8 5/8 (219)	60 (1524)	4
TVC081	3	182 (82.8)	10 3/4 (273)	60 (1524)	2	219 (99.7)	10 3/4 (273)	72 (1829)	2	95 (43.0)	8 5/8 (219)	48 (1219)	4	119 (54.2)	8 5/8 (219)	60 (1524)	4
TVC086	3	182 (82.8)	10 3/4 (273)	60 (1524)	2	295 (134.0)	10 3/4 (273)	96 (2438)	2	95 (43.0)	8 5/8 (219)	48 (1219)	4	119 (54.2)	8 5/8 (219)	60 (1524)	4
TVC096	3	182 (82.8)	10 3/4 (273)	60 (1524)	2	295 (134.0)	10 3/4 (273)	96 (2438)	2	95 (43.0)	8 5/8 (219)	48 (1219)	4	119 (54.2)	8 5/8 (219)	60 (1524)	4
TVC112	4	219 (99.7)	10 3/4 (273)	72 (1829)	2	182 (82.8)	10 3/4 (273)	60 (1524)	4	119 (54.2)	8 5/8 (219)	60 (1524)	4	182 (82.8)	10 3/4 (273)	60 (1524)	4
TVC126	4	295 (134.0)	10 3/4 (273)	96 (2438)	2	182 (82.8)	10 3/4 (273)	60 (1524)	4	119 (54.2)	8 5/8 (219)	60 (1524)	4	182 (82.8)	10 3/4 (273)	60 (1524)	4
TVC137	4	295 (134.0)	10 3/4 (273)	96 (2438)	2	182 (82.8)	10 3/4 (273)	60 (1524)	4	182 (82.8)	10 3/4 (273)	60 (1524)	4	182 (82.8)	10 3/4 (273)	60 (1524)	4
TVC158	5	295 (134.0)	10 3/4 (273)	96 (2438)	2	219 (99.7)	10 3/4 (273)	72 (1829)	4	182 (82.8)	10 3/4 (273)	60 (1524)	4	219 (99.7)	10 3/4 (273)	72 (1829)	4
TVC172	5	295 (134.0)	10 3/4 (273)	96 (2438)	2	219 (99.7)	10 3/4 (273)	72 (1829)	4	182 (82.8)	10 3/4 (273)	60 (1524)	4	219 (99.7)	10 3/4 (273)	72 (1829)	4
TVC190	6	182 (82.8)	10 3/4 (273)	60 (1524)	4	295 (134.0)	10 3/4 (273)	96 (2438)	4	182 (82.8)	10 3/4 (273)	60 (1524)	4	295 (134.0)	10 3/4 (273)	96 (2438)	4
TVC206	6	219 (99.7)	10 3/4 (273)	72 (1829)	4	295 (134.0)	10 3/4 (273)	96 (2438)	4	219 (99.7)	10 3/4 (273)	72 (1829)	4	295 (134.0)	10 3/4 (273)	96 (2438)	4

NOTE:
These receiver selections are for R22 @ 90% full. Please ensure receiver sizing is appropriate for the application.
Receivers are optional items.
* Capacity per receiver (R22). Multiply capacity by 0.87 for R404A/R507.

CONDENSER THEORY

The purpose of a refrigeration system is to absorb heat from an area where it is not wanted and reject this heat to an area where it is unobjectionable. By referring to the diagram below, it can be seen that only a few components are required to perform this task.

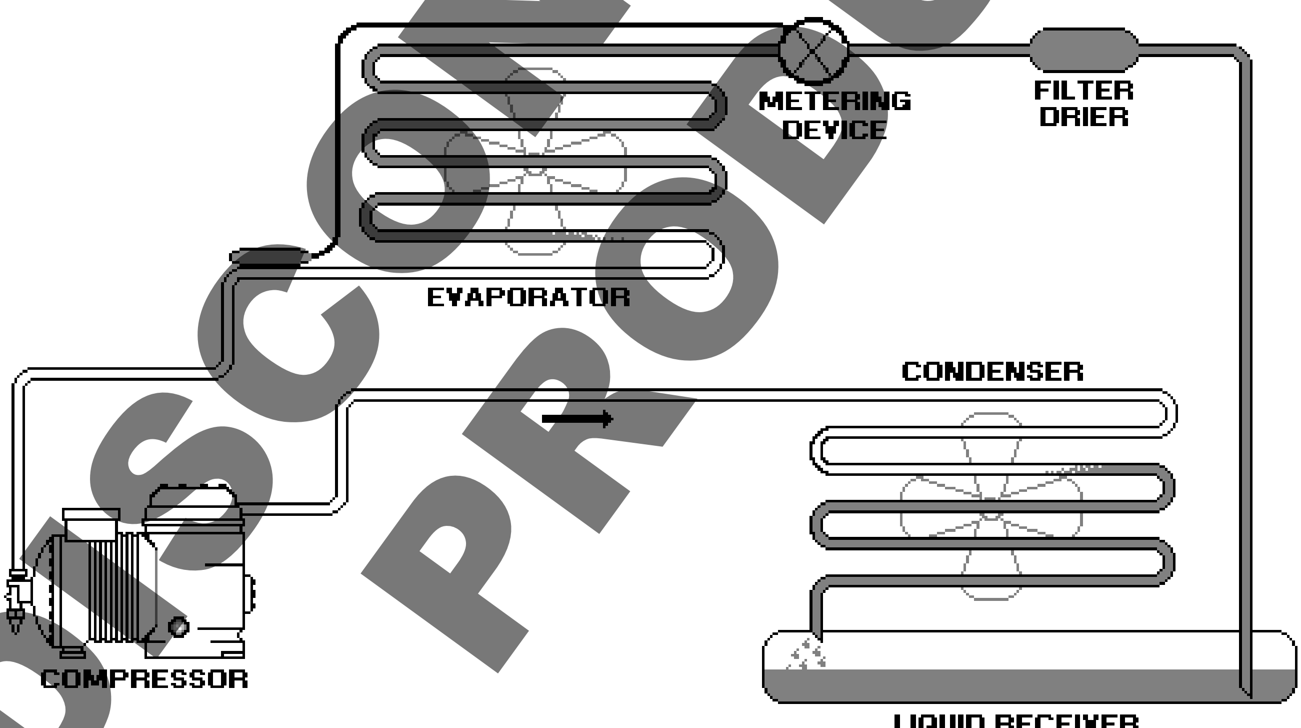
High pressure/high temperature vapor leaves the compressor and is forced into the condenser via the discharge line. The condenser first desuperheats the vapor down to its saturation point. This saturation point can be expressed as the condensing temperature of the refrigerant and varies with condenser size, load and ambient temperature.

Now the condenser must remove the latent heat of condensation from the refrigerant so that it may fully condense. After the refrigerant has fully condensed, it will be subcooled to some extent.

The liquid leaving the condenser is still at a high pressure but at a much lower temperature and drains into the receiver. As the liquid level in the receiver increases, the vapor is allowed to vent back up to the condenser via the condensate line.

Because the dip tube almost reaches the bottom of the receiver, only liquid will enter the liquid line. This liquid now passes through the metering device where its pressure is reduced to the evaporating pressure. The temperature will drop with pressure since the refrigerant will always attempt to meet its saturation point during a change of state.

The condensing temperature decreases as the ambient temperature drops and/or as the condenser surface increases.



THE BASIC REFRIGERATION CYCLE

GLOSSARY OF TERMS

Balance point - after a system stabilizes, the heat added to the refrigerant during the refrigeration cycle will equal the heat rejected at the condenser. The balance point usually refers to the actual TD that the system is operating at. The balance point could refer to a low side balance or a high side balance. For example, a system operating with a **120 ºF** *(48.9 ºC)* condensing temperature in a **90 ºF** *(32.2 ºC)* ambient will have a condenser balance point of **30 ºF** *(-1.1 ºC)* TD.

Circuit - a circuit can be considered a group of feeds. A condenser may be sized to handle several refrigeration systems at one time. Each system is considered one circuit and the number of feeds required for each circuit depends on the THR for that particular system. Each circuit has its own inlet and outlet header. The number of circuits on a condenser can not exceed the total number of feeds available.

Compression Ratio - Compression ratio equals the discharge pressure in pounds per square inch absolute (psia) divided by the suction pressure in psia. The compression ratio in a compressor increases as suction pressure decreases and as discharge pressure increases. (at sea-level, psia is equal to psig plus 14.7).

Compressor Capacity - can be defined as the actual refrigerating capacity available at the evaporator and suction line after considering the overall system balance point. Compressor capacity is mainly affected by the evaporating and condensing temperatures of the system.

Condensate Line - (also called "Drain Leg") is a term that describes the refrigerant line between the condenser and the receiver.
The condensate line should drop vertically and is typically larger than the liquid line. This is to promote free draining of the refrigerant from the condenser to the receiver.

Condenser Temperature Difference (TD) - is the difference between the condensing temperature of the refrigerant and the temperature of the air entering the condenser.

.

Condensing Temperature (CT) - is the temperature where the refrigerant vapor condenses back to a liquid. This temperature varies with condenser size. Condensing temperature should be kept as low as possible to maintain higher refrigerating capacity and system efficiency

Desuperheat - refers to the lowering of refrigerant superheat. Hot vapor entering a condenser must first be desuperheated before any condensing of the refrigerant can take place.

Evaporating Temperature - the temperature at which heat is absorbed in the evaporator, at this temperature, the refrigerant changes from a liquid to a vapor. This evaporating temperature is dependent on pressure and must be lower than the surrounding temperature for heat transfer to take place.

Feed - a single path for refrigerant flow inside a condenser. This path begins at the inlet header and terminates at the condenser's outlet header. These feeds can be grouped together to accommodate one or more circuits.

Heat of Compression - heat is added to the refrigerant as it is compressed. Evidence of this can be observed on the pressure-enthalpy diagram for the refrigerant being used. The amount of this heat is dependent on the refrigerant type and compression ratio.

Additional heat from friction also increases the heat of compression. All of this heat along with the heat absorbed in the evaporator, suction line and any motor heat must be rejected by the condenser.

Latent Heat of Vaporization (also Latent Heat of Condensation) - refers to the heat required to fully vaporize or condense a refrigerant. This latent heat varies with temperature and pressure. Latent heat is often referred to as *hidden heat* since adding heat to a saturated liquid or removing heat from a saturated vapor will result in a *change of state and heat content* but not a change in temperature.

Liquid Line - is the piping between the receiver and the metering device. On systems without a receiver, the liquid line runs between the condenser and the metering device.

GLOSSARY OF TERMS

Open Drive - This term is given to a compressor where its driving motor is separate from the compressor. In this type of compressor, motor heat is not transferred to the refrigerant.

Refrigerating Effect - the total amount of heat absorbed by the evaporator. This heat includes both *latent heat* and *superheat.* This value is usually expressed in BTU/Hour, (BTUH), or 1000 BTU/Hour (MBH)

Saturation - occurs whenever the refrigerant exists in both a vapor and liquid state, example: a cylinder of refrigerant is in a saturated condition or state of equilibrium. Any heat removed from a saturated vapor will result in condensation. Conversely, any heat added to a saturated liquid will result in evaporation of the refrigerant. Temperature pressure charts for the various refrigerants indicate saturation values. For a single component refrigerant, each temperature value can only have one pressure when the refrigerant is either a saturated vapor or saturated liquid.
A single component refrigerant can not change state until it approaches its saturation temperature or pressure. For refrigerant blends, the pressure-temperature relationship is more complex. Simply stated, Dew point temperature (saturation point in evaporator-low side) and Bubble point temperature (saturation point in condenser-high side) are used to define their saturated condition.

Subcool - to reduce a refrigerant's temperature below its saturation point or bubble point. Subcooling of the refrigerant is necessary in order to maintain a solid column of liquid at the inlet to the metering device. Subcooling can take place naturally (in the condenser) or it can be accomplished by a suction liquid heat exchanger or a mechanical sub-cooler (separate refrigeration system).

Superheat - to heat a refrigerant above its saturation point or dew point. The "amount of superheat" is the *difference* between the actual refrigerant temperature and its saturation temperature. This value is usually expressed in degrees Fahrenheit or degrees Celsius.

Total Heat of Rejection (THR) is the heat absorbed at the evaporator plus the heat picked up in the suction line plus the heat added to the refrigerant in the compressor. Condensers are sized according to the required THR. Compressor capacity and the heat of compression are usually enough to determine the THR.

CONDENSER SELECTION

During a condenser selection process, the application engineer should choose a condenser which is large enough to reject all of the heat added to the refrigerant during the refrigerating cycle. When the condenser is sized to equal the total heat of rejection (THR) at design conditions, enough heat will be rejected to maintain the required condensing temperature. This will ensure that sufficient refrigeration capacity will be maintained at the evaporator during the warm summer period when it is needed the most.

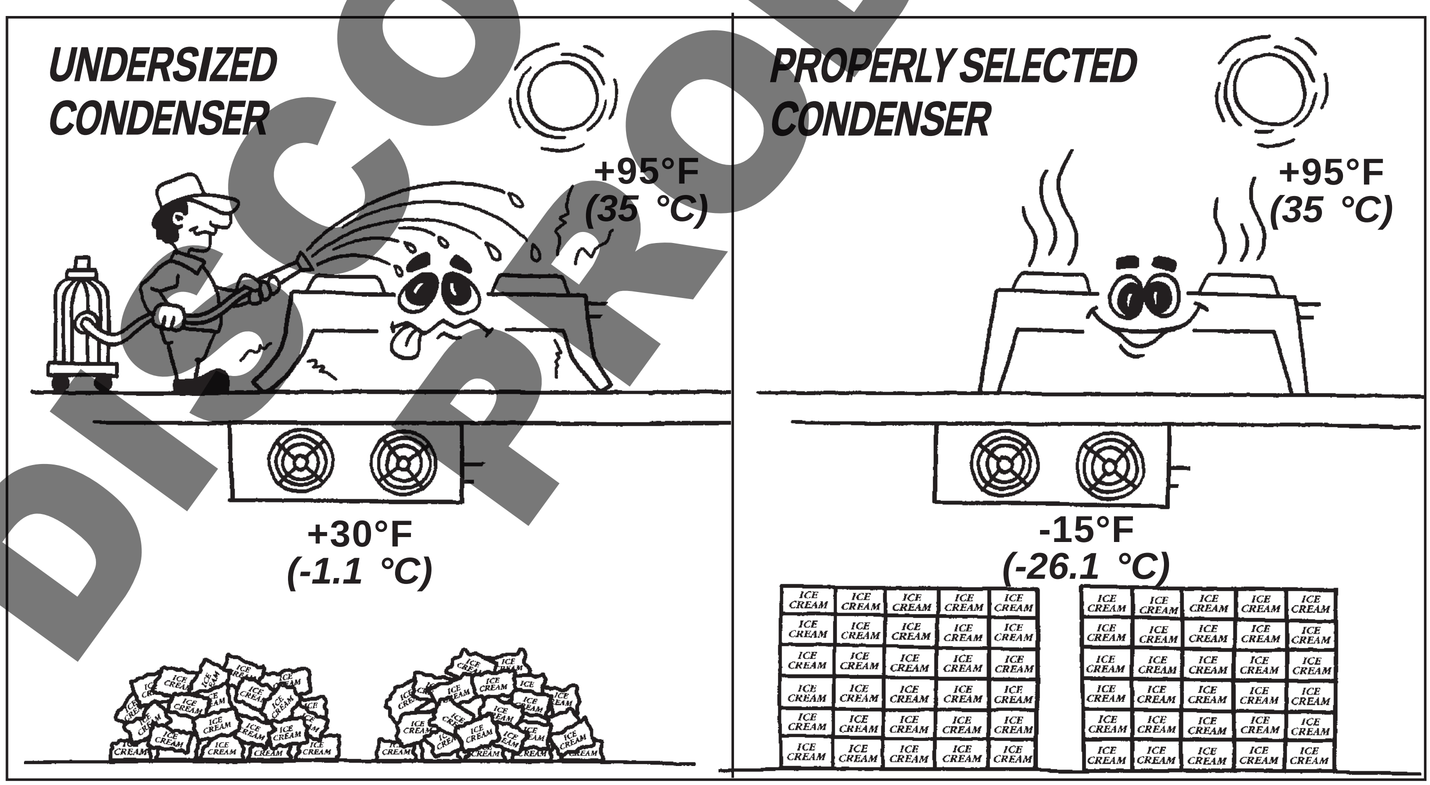
If a condenser is undersized, the condensing temperature (CT) will be driven upwards. This naturally occurs as the system seeks its new balance point. As the CT increases, the operating temperature difference (TD) °F the condenser also increases. Even though the capacity of the condenser increases with the higher TD, the refrigerating capacity of the compressor will decrease due to the higher condensing temperature.
An undersized condenser may perform satisfactorily when ambient temperatures are below design, but the overall system capacity will not be high enough during the warmer periods.

Oversizing a condenser increases project costs and can also lead to undesirable operating conditions.

Low ambient control devices such as pressure regulators and fan cycling switches operate to maintain a sufficient pressure in the condenser during low ambient periods.
On systems utilizing a receiver and flooding type of head pressure control, more refrigerant will be required to flood the condenser in order to achieve the desired condensing pressure.

Consider an air conditioning system with an oversized condenser which is only used during the summer time and does not have any type of head pressure control. This particular system may experience problems due to a lack of subcooling. Since the condenser was oversized the amount of natural subcooling available is less. *The maximum amount of natural subcooling possible is the difference between the condensing temperature and the ambient temperature.* If this amount of subcooling is not enough to offset the pressure losses in the liquid line, then flashing is certain to occur.

Flashing produces vapor at the metering device which was designed to meter 100% liquid. One cure for this is to apply head pressure control devices to the system that will increase the head pressure and ensure adequate liquid subcooling.



CONDENSER SELECTION

PRELIMINARY DATA REQUIREMENTS

There are several factors that influence the size of an air cooled condenser. Before a condenser can be properly selected, this information must be obtained. It may be convenient for you to refer to the calculation worksheets as you read through the following information.

1. What are the Desired Evaporating and Condensing Temperatures?

The evaporating temperature is needed to determine the THR (total heat of rejection) of the condenser. As the evaporating temperature is lowered, the heat of compression increases due to the higher compression ratio. This affects THR.

The required condensing temperature (CT) must be known before the temperature difference can be determined. This is necessary since condenser capacity varies with temperature difference. The required compressor capacity will determine the maximum CT since the compressor can only provide this capacity at certain operating conditions. You could also refer to Table 1 for CT recommendations. The heat of compression varies with compression ratio. Both evaporating and condensing temperatures affect the compression ratio.
Often customers may request a specified TD value (i.e **10, 15 ^{o}F,** *(5.5 ^{o}C, 8.3 ^{o}C)* etc.). The condensing temperature is then established as being the sum of this TD value and the design ambient temperature.
(i.e **10 + 95 = 105 ^{o}F** *(5.5 + 35 = 40.5 ^{o}C)*)

2. Compressor Capacity

Determine the capacity of the compressor at the desired evaporating and condensing conditions. Remember, *tons refrigeration* does not necessarily equal *horsepower.* As the evaporating temperature decreases and/or the condensing temperature increases, *tons refrigeration* per horsepower decreases. One ton refrigeration equals **12000 Btuh** *(3519W)*.

3.Condenser Ambient Design Temperature

This will be the maximum design temperature of the air entering the condenser. It is typical to add about 5 ^{o}F to the maximum outdoor design temperature in some instances to compensate for radiation from a dark surface such as a black roof.

4. Type of Compressor

It is necessary to identify the type of compressor to be utilized in the application so that accurate heat of rejection information may be obtained. For example, open-drive compressors can be belt driven or direct coupled to the motor. Electrical energy from the motor is converted to heat energy which is not transferred to the refrigerant as in a refrigerant cooled compressor.
In a hermetic refrigerant cooled compressor, the cool suction vapor picks up heat as it travels through the warm motor windings. The condenser must be sized to reject this heat along with any other heat absorbed by the refrigerant. It can be observed in Table 2 that hermetic refrigerant cooled compressors have higher heat of rejection factors.

5. Heat of Compression

As the refrigerant is compressed in the compressor, its heat content increases due to the physical and thermodynamic properties of the refrigerant. Additional heat from friction between moving parts in the compressor also increases the heat content of the refrigerant. The amount of heat added to the refrigerant is dependent on the refrigerant type, the compression ratio and the type of compressor.

Accurate THR or heat of compression factors may be available from the compressor manufacturer. Always attempt to access this information prior to using other methods. If this information is not available, refer to the heat of rejection factors in Table 2.

However, in situations where your application exceeds the limits of this table, such as in compound compression and cascade systems, one of the following calculations may be performed.

For OPEN DRIVE COMPRESSORS

Total heat of Rejection = Compressor Capacity (Btuh) + (2545 x BHP)
(KW) + (3410 x KW)

(BHP - Brake Horsepower of the motor)

For SUCTION COOLED COMPRESSORS:

Total heat Rejection = Compressor Capacity (BTUH) + (3413 x KW)

(KW may be obtained from the power input curve for that compressor)

6. What is the Refrigerant Type?

A condenser's capacity can vary by 8 to 10% due to differences in physical and thermodynamic properties. Refer to the correct refrigerant capacity table or use factor as indicated. (see P. 4)

7. Altitude

The volume of a given mass of air increases as it rises above sea level. As its volume increases, its density decreases. As the air becomes less dense, its heat capacity decreases. Therefore, more air volume would have to be forced through the condenser at **6,000 feet** *(1852 m) above* sea level than *at* sea level.

Since condenser capacities are based on operation at sea level, an altitude correction factor must be applied to the total heat of rejection. Basically, the load on the condenser will be increased to a point which will compen sate for the higher altitude.

CONDENSER SELECTION

8. Are you Replacing a Water Cooled Condenser with a Remote Air Cooled Condenser?

If this is the case, it should be remembered that the compressor will operate at a higher discharge pressure after converting to air cooled. To help minimize the resulting loss in capacity, the condenser should be sized generously. In other words, you may consider keeping the balance point of the condenser as low as possible.

9. Is this an application for multiple circuits?

If you wish to utilize the condenser for multiple circuits, then all of the above data must be obtained for EACH circuit. After obtaining this information, proceed to the MULTIPLE CIRCUIT WORKSHEET (for single circuit applications refer to the SINGLE CIRCUIT WORKSHEET.

TABLE 1 - CONDENSING TEMPERATURE GUIDELINES

Evaporating Temperature	Condensing Temperature Guidelines (at 85°F to 105°F *(29.4 to 40.5 °C)* Ambient Temperature)					TD* °F	TD* *(°C)*
	85 °F *(29.4 °C)*	**90 °F** *(32.2 °C)*	**95 °F** *(35 °C)*	**100 °F** *(37.8 °C)*	**105 °F** *(40.6 °C)*		
Low Temp Systems **(-40 °F to +9 °F Evap Temps)** *(-40 °C to -12.7°C Evap Temps)*	**95-100 °F** *(35-37.8 °C)*	**100-105 °F** *(37.8-40.6 °C)*	**105-110 °F** *(40.6-43.3 °C)*	**110-115 °F** *(43.3-46.1 °C)*	**115-120 °F** *(46.1-48.9 °C)*	**10-15**	*(5.6-8.3)*
Medium Temp Systems **(+10 °F to +34 °F Evap Temps)** *(-12.2 °C to 1.11 °C Evap Temps)*	**100-105 °F** *(37.8-40.6 °C)*	**105-110 °F** *(40.6-43.3 °C)*	**110-115 °F** *(43.3-46.1 °C)*	**115-120 °F** *(46.1-48.9 °C)*	**120-125 °F** *(48.9-51.7 °C)*	**15-20**	*(8.3-11.1)*
High Temp Systems **(+35 °F to +50 °F Evap Temps)** *(1.6 °C to 10 °C Evap Temps)*	**105-110 °F** *(40.6-43.3 °C)*	**110-115 °F** *(43.3-46.1 °C)*	**115-120 °F** *(46.1-48.9 °C)*	**120-125 °F** *(48.9-51.7 °C)*	**125-130 °F** *(51.7-54.4 °C)*	**20-25**	*(11.1-13.9)*
Air Conditioning Systems **(+40 °F to +50 °F Evap Temps)** *(4 °C to 10 °C Evap Temps)*	**110-115 °F** *(43.3-46.1 °C)*	**115-120 °F** *(46.1-48.9 °C)*	**120-125 °F** *(48.9-51.7 °C)*	**125-130 °F** *(51.7-54.4 °C)*	**130-135 °F** *(54.4-57.2 °C)*	**25-30**	*(13.9-16.7)*

* TD - Condenser TD guideline

TABLE 2 - HEAT OF REJECTION FACTORS

EVAPORATOR TEMPERATURE		CONDENSING TEMPERATURE															
		90°F *(32°C)*		**100°F** *(38°C)*		**105°F** *(41°C)*		**110°** *(43°C)*		**115°F** *(46°C)*		**120°F** *(49°C)*		**130°F** *(55°C)*		**140°F** *(60°C)*	
°F	*°C*	OPEN	**HERM**	OPEN	**HERM**	OPEN	**HERM**	OPEN	**HERM**	OPEN	**HERM**	OPEN	**HERM**	OPEN	**HERM**	OPEN	**HERM**
-40	*-40*	*	**1.66**	*	**1.73**	*	**1.76**	*	**1.80**	*	**1.90**	*	**2.00**	*	*	*	*
-30	*-34*	1.37	**1.57**	1.42	**1.62**	1.44	**1.65**	1.47	**1.68**	*	**1.74**	*	**1.80**	*	*	*	*
-20	*-29*	1.33	**1.49**	1.37	**1.53**	1.39	**1.55**	1.42	**1.58**	1.44	**1.61**	1.47	**1.65**	*	*	*	*
-10	*-23*	1.28	**1.42**	1.32	**1.46**	1.34	**1.48**	1.37	**1.50**	1.39	**1.53**	1.42	**1.57**	1.47	**1.64**	*	*
0	*-18*	1,24	**1.36**	1.28	**1.40**	1.30	**1.42**	1.32	**1.44**	1.34	**1.47**	1.37	**1.50**	1.41	**1.56**	1.47	**1.62**
10	*-12*	1.21	**1.31**	1.24	**1.34**	1.26	**1.36**	1.28	**1.38**	1.30	**1.40**	1.32	**1.43**	1.36	**1.49**	1.42	**1.55**
20	*-7*	1.17	**1.26**	1.20	**1.29**	1.22	**1.31**	1.24	**1.33**	1.26	**1.35**	1.28	**1.37**	1.32	**1.43**	1.37	**1.49**
30	*-1*	1.14	**1.22**	1.17	**1.25**	1.18	**1.26**	1.20	**1.28**	1.22	**1.30**	1.24	**1.32**	1.27	**1.37**	1.32	**1.42**
40	*4*	1.12	**1.18**	1.15	**1.21**	1.16	**1.23**	1.17	**1.24**	1.18	**1.25**	1.20	**1.27**	1.23	**1.31**	1.28	**1.35**
50	*10*	1,09	**1.14**	1.12	**1.17**	1.13	**1.19**	1.14	**1.20**	1.16	**1.22**	1.17	**1.23**	1.20	**1.26**	1.24	**1.29**

OPEN - Direct Drive or Belt Drive open compressors
HERM - Hermetic or semi-Hermetic, Refrigerant (suction) cooled motor compressors.

WORKSHEETS - SINGLE CIRCUIT

SINGLE CIRCUIT WORKSHEET

(REFER TO P. 32 FOR GUIDELINES, SEE SAMPLE SELECTION ON P. 36)

JOB REF: ________________

1. SYSTEM DATA REQUIREMENTS

EVAP TEMP = ________ **ºF** *(ºC)*   COND TEMP= ______________ **ºF** *(ºC)*

COMPR. CAPACITY= ________________ Btuh / 1000 = __________ MBH *(KW)*

COND. DESIGN AMBIENT TEMP= _________________ (AT) **ºF** *(ºC)*   TD= _____ (Cond. Temp. - Ambient Temp)

COMPRESSOR TYPE= ☐ OPEN ☐ HERMETIC (Refrigerant cooled)

REFRIGERANT= R ____________ REF. FACTOR= ___________ (see P. 4)

ALTITUDE= ☐ AT SEA LEVEL or ___________ **FEET** *(m)*   ALT. FACTOR= ________________ (See P.4)

2. THR (Total Heat of Rejection) CALCULATION

COMPR. CAPACITY **(MBH)** *(KW)* X HR f X ALT **f** *(m)* X REF f =THR **(MBH)** *(KW)*

__________________ X ______________ X __________________ X ____________ = ______________

Where HR f =Heat of rejection factor (see Table 2, P. 27)
ALT f = Altitude/elevation factor (Sea level=1, or above factor)
REF f = Refrigerant Correction factor (R22 = 1)
Alternate refrigerant based on factors from P. 4
R12 = 1/.95 = 1.05, R134a = 1/.94 = 1.06,
R502 = 1/.98 = 1.02, R404A/R507/R407A/B = 1/.97 = 1.03
THR = Total Heat of Rejection (MBH, factored in R22) to be rejected by condenser

3. CONDENSER MODEL SELECTION

Refer to the R22 CAPACITY section (P. 4) and select a condenser at the TD (required above) that will closely match the above calculated THR value. (NOTE: use the R22 capacity Table. The above calculation has already been adjusted for alternate types).

COND. MODEL # ____________________

For the model selected record the THR PER **1ºF** TD value = __________ (B) (see P. 4)
(*PER 1 ºC*)

4. ACTUAL CONDENSING TEMP CALCULATION

THR (from sec. 2) / value (B) = ATD (actual Temperature Difference)

________________ / ____________________ = ______________

To find the Actual Condensing Temp. (ACT) just add the Actual Temperature Difference (ATD) to the design Ambient Temperature (AT).

ATD + AT = ACT

________ + ________ = ________ **ºF** *(ºC)*

NOTE: The Actual Condensing Temp. MUST EQUAL or BE LESS THAN the condensing temp recorded in section 1 above. This ensures the compressor capacity is maintained when operating the condenser at the designed ambient temperature.

For further assistance please contact your local TRENTON sales representative.

WORKSHEETS - MULTIPLE CIRCUITS

MULTIPLE CIRCUIT WORKSHEET

(REFER TO P. 32 FOR GUIDELINES & SEE SAMPLE SELECTION ON P. 37)

1. SYSTEM DATA REQUIREMENTS **JOB REF:** ____________________

CONDENSER DESIGN AMBIENT TEMP = __________ (AT) **ºF** *(ºC)*

ALTITUDE = ☐ SEA LEVEL or ______________ FEET FACTOR = ____________________ (See P. 4)

CIRCUIT INFORMATION

	CIRC # 1	CIRC # 2	CIRC # 3	CIRC # 4
OPEN	☐	☐	☐	☐
HERMETIC	☐	☐	☐	☐
EVAP. TEMP ºF =	________	________	________	________
CONDENSING TEMP =	________	________	________	________
COMPR CAP. **(MBH)** *(KW)* =	________	________	________	________
REFRIGERANT =	________	________	________	________
TD = (Cond Temp - Amb.)	________	________	________	________

2. THR (Total Heat of Rejection) CALCULATION

	COMPR CAPACITY (MBH)	X	HRf	X	ALTf	X	REFf	= THR **(MBH)** *(KW)*	/ TD	= CL
CIRC # 1	________	X	______	X	______	X	______	= ______	/ ____	= ____
CIRC # 2	________	X	______	X	______	X	______	= ______	/ ____	= ____
CIRC # 3	________	X	______	X	______	X	______	= ______	/ ____	= ____
CIRC # 4	________	X	______	X	______	X	______	= ______	/ ____	= ____

TOTAL THR Capacity (MBH / 1 ºF TD) = ____

Where HR f = Heat of rejection factor (see Table 2, P. 27)
ALT f = Altitude/elevation factor (Sea level=1, see P. 2 for Higher)
REF f = Refrigerant Correction factor (R22 = 1)
R12 = 1/.95 = 1.05, R134a = 1/.94 = 1.06,
R502 = 1/.98 = 1.02, R404A / R507 / R407A/B = 1/.97 = 1.03
Alternate refrigerant based on factors from P. 4
THR = Total Heat of Rejection (MBH) to be rejected by condenser (R22 capacity)
TD = Condensing Temp - Ambient Temperature
CL = Circuit loading per **1ºF** *(1ºC)* TD

3. CONDENSER SELECTION

Refer to the R22 CAPACITY selection (P.4) and select a condenser at the **1ºF** *(1ºC)* TD that will closely match the above Total THR Capacity (**MBH/ 1ºF** *(KW/1ºC)* TD).

COND. MODEL # ________ For the model selected, refer to P. 4 and enter...
Max no. of Feeds = ____________ (A)
MBH @ 1ºF TD per feed = ____________ (B)
(*KW @ 1ºC* TD)

calculate the number of feeds required for each circuit.

	CL (**MBH / 1º F** TD) / (*KW* / *1ºC* TD)	(B) value	= NF number of feeds required (round off to nearest whole #)
CIRC # 1	________ /	________	= ________
CIRC # 2	________ /	________	= ________
CIRC # 3	________ /	________	= ________
CIRC # 4	________ /	________	= ________

Total number of feeds required NF = ________
(must not exceed value (A))
If number of feeds required exceeds number of feeds available then select the next larger size condenser model that can handle the number and repeat above process.

4. ACTUAL CONDENSING TEMP (per circuit) CALCULATION

First calculate the ATD (Actual TD) as follows: { THR (from sec. 2) / NF value} / value (B) = ATD (Actual Temperature Difference)

	{ THR (from sec. 2)	/ NF value}	/ value (B)	= ATD
CIRC # 1	{________	/ ________ }	/ ________	= ________
CIRC # 2	{________	/ ________ }	/ ________	= ________
CIRC # 3	{________	/ ________ }	/ ________	= ________
CIRC # 4	{________	/ ________ }	/ ________	= ________

To find the Actual Condensing Temperature (ACT) just add the Actual Temperature Difference (ATD) to the design ambient (AT)

	ATD	+ AT	= ACT
CIRC # 1	______	+ ______	= ______ **ºF** (*ºC*)
CIRC # 2	______	+ ______	= ______ **ºF** (*ºC*)
CIRC # 3	______	+ ______	= ______ **ºF** (*ºC*)
CIRC # 4	______	+ ______	= ______ **ºF** (*ºC*)

NOTE: The Actual Condensing Temp. MUST EQUAL or BE LESS THAN the condensing temp recorded in section 1 above. This ensures the compressor capacity is maintained when operating the condenser at the design ambient tremperature. For further assistance please contact your local TRENTON sales representative.

WORKSHEETS - SAMPLE SELECTION #1

(IMPERIAL UNITS)

Preliminary Data Given:

1. Evaporating temp = -20 °F
2. Condensing temp = 105 °F
3. Compressor capacity = 296,000 Btuh
4. Design ambient = 90 °F

Use WORKSHEET - SINGLE CIRCUIT (P 34) to complete selection of condenser

JOB REF: TC 1500

1. SYSTEM DATA REQUIREMENTS

EVAP TEMP = -20 °F COND TEMP= 105 °F

COMPR. CAPACITY= 296,000 Btuh / 1000 = 296 MBH

COND. DESIGN AMBIENT TEMP= 90 (AT)°F TD= 15 (Cond. Temp. - Ambient Temp)

COMPRESSOR TYPE= ☐ OPEN ☑ HERMETIC (Refrigerant cooled)

REFRIGERANT= R 22 REF. FACTOR= 1 (see P. 4)

ALTITUDE =☑ AT SEA LEVEL or ______ FEET ALT. FACTOR= 1 (See P.4)

2. THR (Total Heat of Rejection) CALCULATION

COMPR. CAPACITY (MBH)	X	HR f	X	ALT f	X	REF f	=	THR (MBH)
296	X	1.55	X	1	X	1	=	458.8

3. CONDENSER MODEL SELECTION

COND. MODEL # TVC064 (850 RPM) For the model selected record the THR PER 1°F TD value = 30.68 (B) (see P. 4)

4. ACTUAL CONDENSING TEMP CALCULATION

THR (from sec. 2)	/	value (B)	= ATD (actual Temperature Difference)
458.8	/	30.68	= 14.95 °F

To find the Actual Condensing Temp. (ACT) just add the Actual Temperature Difference (ATD) to the design Ambient Temperature (AT).

ATD	+	AT	=	ACT
14.95	+	90	=	104.95 °F

Above selection using condenser model TVC064 ensures condensing temperature will be at 105 °F or below during design ambient conditions. See SAMPLE SELECTION # 2 for multiple circuit selections.

WORKSHEETS - SAMPLE SELECTION # 2
(IMPERIAL UNITS)

Preliminary Data Given:

1. Location at Reno, Nevada, 95 °F design ambient and 4,000 feet elevation.
2. Multiple circuits required with evaporating temperatures, condensing temperatures, compressor capacities and refrigerant types as listed below.

Use WORKSHEET-MULTIPLE CIRCUITS (P. 35) to complete selection of condenser.

1. SYSTEM DATA REQUIREMENTS JOB REF: TC2000

CONDENSER DESIGN AMBIENT TEMP = 95 (AT) °F

ALTITUDE = ☐ SEA LEVEL or 4,000 FEET FACTOR = 1.14

(See P. 4)

CIRCUIT INFORMATION

	CIRC # 1	CIRC # 2	CIRC # 3	CIRC # 4
OPEN	☐	☐	☐	☐
HERMETIC	☑	☑	☑	☑
EVAP. TEMP °F =	+20	+10	-10	-20
CONDENSING TEMP =	110	110	105	105
COMPR CAP. (MBH) =	13	25	4.6	31.5
REFRIGERANT =	22	22	404A	404A
TD = (Cond Temp - Amb.)	15	15	10	10

2. THR (Total Heat of Rejection) CALCULATION

COMPR CAPACITY (MBH)		X HRf	X ALTf	X REFf	= THR (MBH)	/ TD	= CL
CIRC # 1	13	1.33	1.14	1	19.71	15	1.314
CIRC # 2	25	1.38	1.14	1	39.33	15	2.622
CIRC # 3	4.6	1.48	1.14	1.03	7.99	10	.799
CIRC # 4	31.5	1.55	1.14	1.03	57.33	10	5.733

TOTAL THR Capacity (MBH / 1 °F TD) = 10.468

3. CONDENSER SELECTION

Refer to the R22 CAPACITY (850 RPM) selection (P. 4) and select a condenser at the 1°F TD that will closely match the above Total THR Capacity (MBH/ 1°F TD).

COND. MODEL # TVC024

For the model selected, refer to P. 2 and enter...

Max no. of Feeds = 22 (A)

MBH @ 1°F TD per feed = .5264 (B)

calculate the number of feeds required for each circuit.

	CL (MBH / 1° F TD)	/ (B) value	= NF number of feeds required (round off to nearest whole #)
CIRC # 1	1.314	.5264	2.49 (3)
CIRC # 2	2.622	.5264	4.98 (5)
CIRC # 3	.799	.5264	1.52 (2)
CIRC # 4	5.733	.5264	10.89 (11)

Total number of feeds required NF = 21

(must not exceed value (A))

If number of feeds required exceeds number of feeds available then select the next larger size condenser model that can handle the number and repeat above process.

4. ACTUAL CONDENSING TEMP (per circuit) CALCULATION

First calculate the ATD (Actual TD) as follows: {THR (from sec. 2) / NF value} / value (B) = ATD (Actual Temperature Difference)

	THR	/ NF	/ value (B)	= ATD
CIRC # 1	19.71	3	.5264	12.48
CIRC # 2	39.33	5	.5264	14.95
CIRC # 3	7.99	2	.5264	7.60
CIRC # 4	57.33	12	.5264	9.10

To find the Actual Condensing Temperature (ACT) just add the Actual Temperature Difference (ATD) to the design ambient (AT)

	ATD	+ AT	= ACT
CIRC # 1	12.48	95	107.48 °F
CIRC # 2	14.95	95	109.95 °F
CIRC # 3	7.6	95	102.60 °F
CIRC # 4	9.1	95	104.10 °F

LOW AMBIENT OPERATION

GENERAL

When a remote air cooled condenser is installed outdoors, it will be subjected to varying temperatures. Within many areas, winter to summer annual temperatures swings can be as high as **120 ºF** *(48.9 ºC)* or so, this will have a major impact on the performance of the condenser. As the ambient temperature drops, the condenser capacity increases due to the wider temperature difference between ambient and condensing. As this happens, the condensing temperature also drops as the system finds a new balance point. Although the overall system capacity will be higher at lower condensing temperatures, other problems can occur. The capacity of an expansion valve is affected by both the liquid temperature entering the valve and the pressure drop across it. As the condensing temperature decreases, the pressure drop across the metering device also decreases. A lower pressure drop decreases the capacity of the valve. Although lower liquid temperatures increase the capacity of the metering device, the increase is not large enough to offset the loss due to the lower pressure drop.

The following three sections cover the various options used to control condensing temperatures.

(i) Fan Cycling

Cycling of the condenser fans helps control the condensing temperature. With this approach to solving low ambient problems, fans are taken off-line either one at a time, or in pairs. It is not recommended that multiple fan condensers cycle more than two fans per step. The reason for this is that the pressure in the condenser will increase drastically as several fans are taken off-line at the same time. This will result in erratic operation of the refrigeration system and applies additional stress to the condenser tubes. It is preferable to control the condensing temperature as smoothly as possible. Fans should be cycled independently on a condenser where the fans are all in a single row. On two row condensers, the fans should be cycled in pairs.

Ambient temperature sensing controls can be set to bring on certain fans when the outdoor temperature reaches a predetermined setpoint. Pressure sensing controls are set to bring on certain fans when the condensing pressure reaches the setpoint on the control. Temperature or pressure setpoints and differentials should be set in such a way as to prevent short cycling of the fans. Constant short cycling will produce a volatile condensing pressure while decreasing the life of the fan motors.

For recommended fan cycling switch settings, refer to Table 4. Differential settings on fan cycling temperature controls should be about **5 ºF** *(2.8 ºC)*. On fan cycling pressure controls, a differential of approximately 35 psig is recommended.

On supermarket applications (using 6-12 Fan models) condenser fans may be cycled individually (not in pairs) and therefore lower differential settings may apply and will depend on the specific application.

Fans closest to the inlet header should be permitted to run whenever the compressor is running. If these initial fans are wired through a cycling control, the life of the condenser may be shortened due to the additional stress placed on the tubes and headers. Table 3 shows the fan cycling options available for all condenser models.

(ii) Variable Motor Speed Control

If additional head pressure control is required beyond the last step of fan cycling variable fan motor speed may be used. Variable motor speed is optional on all condenser models. A varying motor speed may be accomplished using a modulating temperature or modulating pressure control. A variable speed controller can be an electronic or solid state device which varies the voltage going to the motor depending on the temperature or pressure of the medium being sensed.

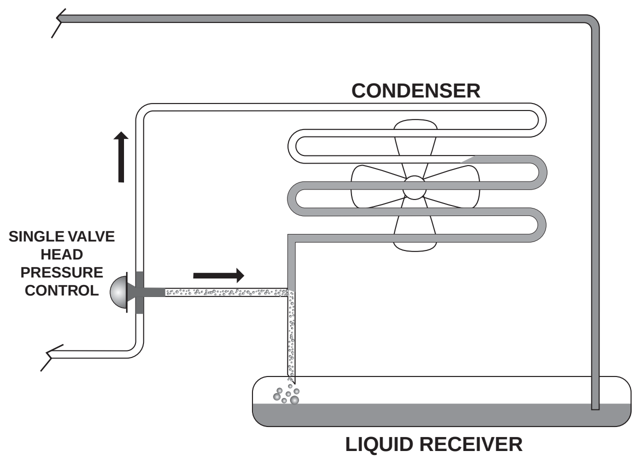
(iii) Refrigerant Regulating Controls

Pressure regulating controls are available from a number of valve manufacturers. The purpose of such a control is to regulate the refrigerant flow in such a way as to maintain a pre-selected condensing pressure. In lower ambient temperatures, these valves throttle to maintain the desired pressure and in doing so, flood the condenser with liquid refrigerant.

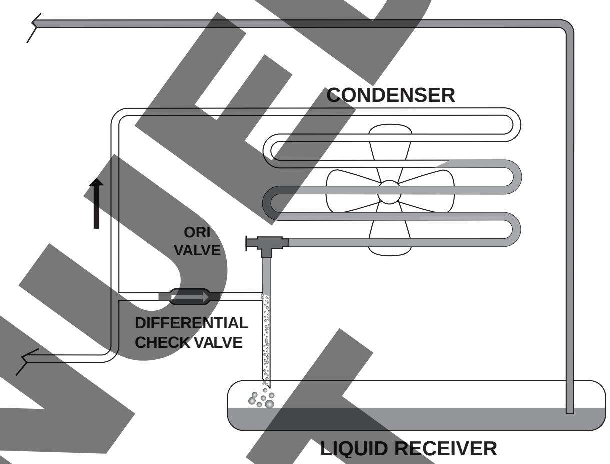
The larger the condenser surface is, the higher its capacity will be. When a condenser is flooded, its useful condensing surface is reduced. This is because the refrigerant occupies the space which would otherwise be used for condensing.

Some control/check valve combinations will regulate refrigerant flow depending on the pressure at the inlet of the condenser.These are often referred to as *inlet regulators.* As the valve closes, hot gas bypasses the condenser through a differential check valve to increase the pressure at the receiver.

LOW AMBIENT OPERATION



SINGLE VALVE CONDENSER PRESSURE CONTROL
(Regulates inlet pressure or outlet pressure depending on valve design)



ORI / ORD CONDENSER PRESSURE CONTROL

This will flood the condenser until the condensing pressure increases to a point which will again open the valve. Other valves regulate the refrigerant at the outlet of the condenser to provide a similar effect. These are commonly referred to as *outlet regulators.* There are also combination inlet/outlet regulators with a differential check valve or other type of condenser bypass arrangement incorporated within the valve.

Controls which regulate the flow of refrigerant based on condenser inlet pressure are typically used in conjuction with a check valve having a minimum opening differential across the condenser. Outlet regulators typically require a check valve with a fixed pressure differential setting of between 20 and 35 psi. The differential is needed to compensate for pressure drop through the condenser during flooding and associated discharge piping.

Systems equipped with a condenser flooding arrangement should always use a receiver having sufficient liquid holding capacity. Additional liquid required for flooding is only required during the winter low ambients and must be stored somewhere in the system at the higher ambients. Failure to use an adequately sized receiver will result in liquid back-up in the condenser during the warmer summer months. This will cause the system to develop very high pressures in the high side resulting in a high pressure safety control trip.

Determining Additional Flooded Refrigerant Charge

Additional charge will vary with the condenser design TD and the coldest expected ambient temperature. Condensers designed for low TD applications (low temperature evaporators) and operating in colder ambients will require more additional charge than those designed for higher TD applications (high temperature evaporators) and warmer ambients.

Refer to Table 5 to determine the required added refrigerant charge at the selected TD and ambient temperatures.

These charges are based on condensers using Fan Cycling options with their last fan (Single Row Fan Models) running or last pair of fans running (Double Row Fan models).

WARNING: Do not over charge when charging by a sightglass. Liquid lines feeding the TXV at the evaporator must have a solid column of liquid (no bubbles) however bubbles at the sightglass (located adjacient to the receiver) may be normal due to the result of a higher pressure drop at that point. Bubbles could also appear in the glass whenever the regulating valves start to flood the condenser. Always record the number of drums or the weight of refrigerant that has been added or removed in the system. Overcharged systems may result in compressor failure as well as other serious mechanical damage to the system components.

LOW AMBIENT OPERATION

TABLE 3 - FAN CYCLING CONTROL SCHEDULE

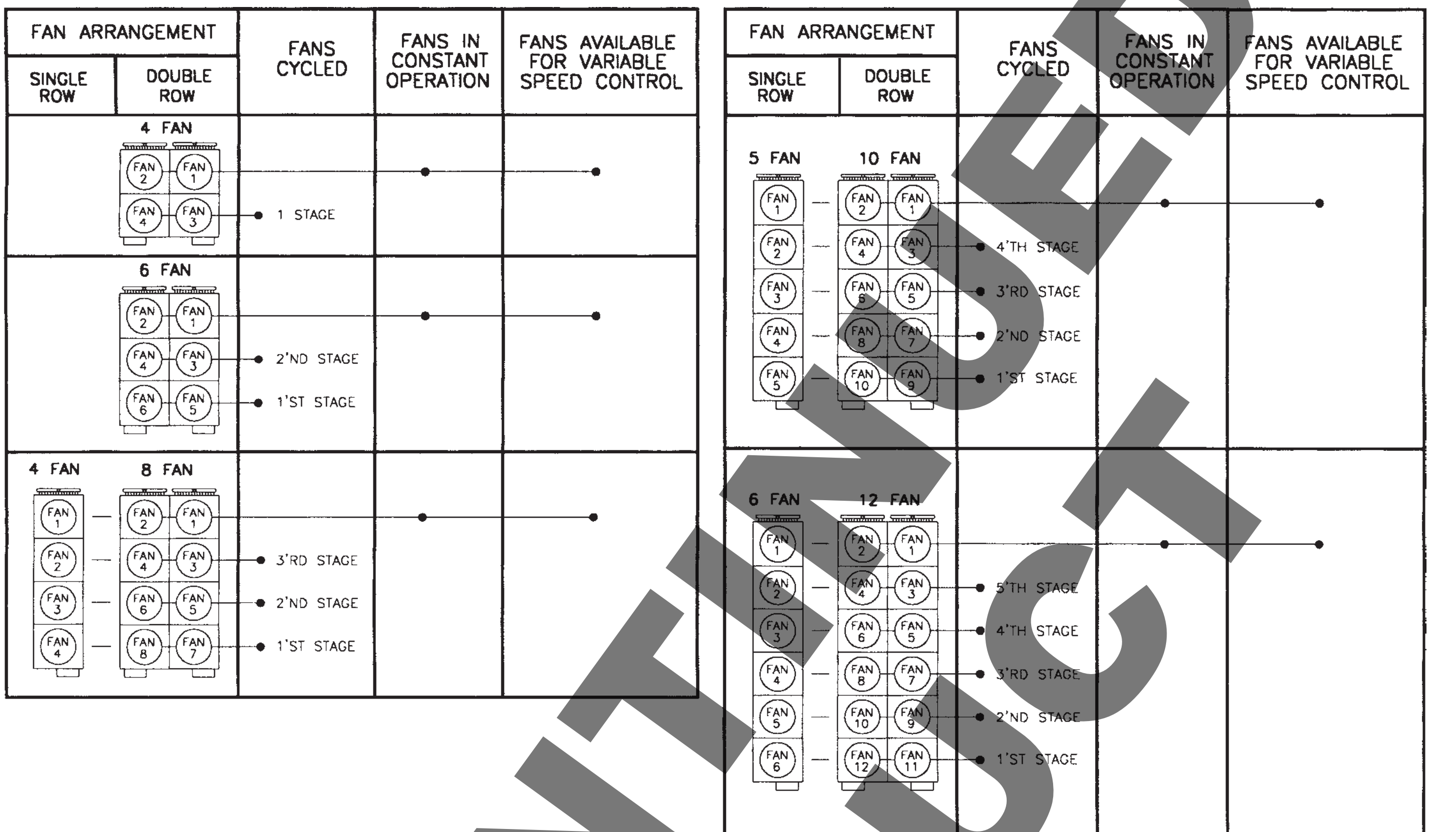


TABLE 4 - AMBIENT FAN CYCLING THERMOSTAT SETTINGS

Number of Fans on Condenser		Design T.D. ºF *(ºC)*	Thermostat Setting * ºF *(ºC)*				
Single Row Models	Double Row Models		1st Stage	2nd Stage	3rd Stage	4th Stage	5th Stage
2	**4**	**30** *(16.7)* **25** *(13.9)* **20** *(11.1)* **15** *(8.3)* **10** *(5.6)*	**60** *(15.6)* **65** *(18.3)* **70** *(21.1)* **75** *(23.9)* **80** *(26.7)*				
3	**6**	**30** *(16.7)* **25** *(13.9)* **20** *(11.1)* **15** *(8.3)* **10** *(5.6)*	**60** *(15.6)* **65** *(18.3)* **70** *(21.1)* **75** *(23.9)* **80** *(26.7)*	**40** *(4.4)* **55** *(12.8)* **60** *(15.6)* **65** *(18.3)* **75** *(23.9)*			
4	**8**	**30** *(16.7)* **25** *(13.9)* **20** *(11.1)* **15** *(8.3)* **10** *(5.6)*	**60** *(15.6)* **65** *(18.3)* **70** *(21.1)* **75** *(23.9)* **80** *(26.7)*	**50** *(10.0)* **55** *(12.8)* **65** *(18.3)* **70** *(21.1)* **75** *(23.9)*	**30** *(-1.1)* **40** *(4.4)* **50** *(10.0)* **60** *(15.6)* **70** *(21.1)*		
5	**10**	**30** *(16.7)* **25** *(13.9)* **20** *(11.1)* **15** *(8.3)* **10** *(5.6)*	**60** *(15.6)* **65** *(18.3)* **70** *(21.1)* **75** *(23.9)* **80** *(26.7)*	**55** *(12.8)* **60** *(15.6)* **65** *(18.3)* **70** *(21.1)* **75** *(23.9)*	**45** *(7.2)* **50** *(10.0)* **60** *(15.6)* **65** *(18.3)* **70** *(21.1)*	**30** *(-1.1)* **35** *(1.7)* **40** *(4.4)* **55** *(12.8)* **65** *(18.3)*	
6	**12**	**30** *(16.7)* **25** *(13.9)* **20** *(11.1)* **15** *(8.3)* **10** *(5.6)*	**55** *(12.8)* **65** *(18.3)* **70** *(21.1)* **75** *(23.9)* **80** *(26.7)*	**50** *(10.0)* **60** *(15.6)* **65** *(18.3)* **70** *(21.1)* **75** *(23.9)*	**40** *(4.4)* **55** *(12.8)* **60** *(15.6)* **65** *(18.3)* **70** *(21.1)*	**30** *(-1.1)* **45** *(7.2)* **50** *(10.0)* **60** *(15.6)* **65** *(18.3)*	**25** *(-3.9)* **35** *(1.7)* **40** *(4.4)* **50** *(10.0)* **60** *(15.6)*

* NOTE: These are typical settings. Further adjustments may be necessary to suit actual field conditions.

LOW AMBIENT OPERATION

TO DETERMINE WINTER CHARGE, ADD THE SUM OF THE NORMAL CHARGE AND ADDITIONAL WINTER CHARGE

TABLE 5
R22 WINTER OPERATION CHARGE - Lbs • Deg °F
Flooded Condensers with Fan Cycling

Model	Summer Charge	Additional Winter Charge (lbs.)																			
		Design TD = 25					Design TD = 20					Design TD = 15					Design TD = 10				
		Ambient °F					Ambient °F					Ambient °F					Ambient °F				
	lbs.	40	20	0	-20	-40	40	20	0	-20	-40	40	20	0	-20	-40	40	20	0	-20	-40
TVC056	26	0	0	26	45	56	0	14	43	57	66	3.1	46	62	71	79	51	69	80	88	94
TVC063	33	0	0	33	56	70	0	17	54	71	82	3.9	58	77	89	98	64	87	100	110	117
TVC068	39	0	0	40	68	84	0	21	65	85	99	4.7	69	93	107	118	77	104	121	132	141
TVC079	39	0	0	22	60	79	0	0	52	78	94	0	54	85	102	114	65	99	117	129	139
TVC085	51	0	0	29	77	101	0	0	68	101	121	0	69	109	132	147	84	127	151	167	179
TVC095	53	0	0	0	66	97	0	0	50	96	120	0	44	103	131	149	66	125	153	171	184
TVC103	63	0	0	0	78	115	0	0	59	114	143	0	52	122	155	176	78	148	181	202	219
TVC044	16	0	18	28	34	39	8	26	34	40	44	24	35	42	47	50	37	46	51	55	58
TVC049	19	0	21	34	42	47	10	32	42	48	53	29	43	51	57	61	45	55	62	67	71
TVC054	23	0	25	40	49	56	12	37	49	57	63	35	51	60	67	72	54	65	73	79	84
TVC057	25	0	28	44	54	61	13	41	54	63	69	38	56	66	73	79	59	72	80	87	92
TVC064	29	0	32	52	63	72	16	48	64	74	81	45	66	78	86	93	69	84	94	102	108
TVC073	28	0	9	40	54	64	0	35	54	66	74	30	57	70	79	86	61	77	88	95	101
TVC081	33	0	10	48	65	76	0	41	65	79	89	37	68	84	95	103	73	93	105	114	121
TVC086	34	0	10	48	66	77	0	42	66	80	90	37	69	85	96	105	73	94	106	116	123
TVC096	40	0	12	57	78	92	0	50	78	95	107	44	82	102	115	125	88	112	127	138	147
TVC112	52	0	0	53	90	111	0	28	86	114	132	6.2	92	123	143	157	102	139	160	176	188
TVC126	65	0	0	66	112	140	0	35	108	142	165	7.8	115	154	179	197	127	174	201	220	235
TVC137	79	0	0	80	135	168	0	42	130	171	198	9.4	138	186	215	236	153	209	241	264	282
TVC158	78	0	0	45	119	157	0	0	105	157	188	0	107	169	204	228	130	197	234	258	277
TVC172	101	0	0	58	154	203	0	0	135	202	242	0	138	219	263	294	167	255	301	333	358
TVC190	106	0	0	0	131	195	0	0	100	192	241	0	88	206	261	298	131	250	305	341	369
TVC206	126	0	0	0	156	231	0	0	119	227	285	0	104	244	310	353	156	296	362	405	437

Note: For R134a and R502 use R22 charge
For R404A and R507 use R22 charge x 0.87
For R407C use R22 charge x 0.97
For R12 use R22 charge x 1.10
For 90% full volume charge see P. 8 & 9.

LOW AMBIENT OPERATION

TO DETERMINE WINTER CHARGE, ADD THE SUM OF THE NORMAL CHARGE AND ADDITIONAL WINTER CHARGE

TABLE 5A

R22 WINTER OPERATION CHARGE - *Kg • Deg* ºC

Flooded Condensers with Fan Cycling

Model	Summer Charge	Additional Winter Charge (*Kg.*)																			
		Design TD =*13.*9					Design TD =*11.1*					Design TD = *8.3*					Design TD =*5.60*				
		Ambient °C					Ambient °C					Ambient °C					Ambient °C				
	Kg	*40*	*20*	*0*	*-20*	*-40*	*40*	*20*	*0*	*-20*	*-40*	*40*	*20*	*0*	*-20*	*-40*	*40*	*20*	*0*	*-20*	*-40*
TVC056	11.9	0.0	0.0	12.0	20.4	25.3	0.0	6.3	19.6	25.8	29.9	1.4	20.9	28.0	32.5	35.7	23.1	31.5	36.4	39.9	42.6
TVC063	14.9	0.0	0.0	15.1	25.6	31.7	0.0	7.9	24.6	32.3	37.4	1.8	26.2	35.1	40.7	44.7	29.0	39.5	45.6	50.0	53.4
TVC068	17.9	0.0	0.0	18.1	30.7	38.1	0.0	9.5	29.5	38.8	45.0	2.1	31.5	42.2	48.9	53.7	34.8	47.4	54.8	60.0	64.1
TVC079	17.8	0.0	0.0	10.2	27.1	35.8	0.0	0.0	23.8	35.6	42.7	0.0	24.4	38.5	46.4	51.8	29.5	44.9	53.1	58.7	63.0
TVC085	23.0	0.0	0.0	13.2	35.0	46.1	0.0	0.0	30.7	45.9	55.0	0.0	31.4	49.7	59.8	66.9	38.0	57.9	68.5	75.7	81.3
TVC095	24.1	0.0	0.0	0.0	29.8	44.3	0.0	0.0	22.8	43.6	54.7	0.0	19.9	46.9	59.4	67.7	29.8	56.8	69.3	77.6	83.8
TVC103	28.5	0.0	0.0	0.0	35.4	52.5	0.0	0.0	27.0	51.7	64.8	0.0	23.6	55.6	70.4	80.2	35.4	67.4	82.2	92.0	99.3
TVC044	7.2	0.0	8.0	12.7	15.6	17.6	3.8	11.9	15.6	18.1	19.9	11.0	16.1	19.1	21.2	22.8	16.9	20.7	23.1	25.0	26.5
TVC049	8.7	0.0	9.7	15.5	18.9	21.4	4.7	14.5	19.0	22.0	24.2	13.4	19.6	23.2	25.8	27.8	20.6	25.2	28.2	30.4	32.2
TVC054	10.3	0.0	11.4	18.2	22.3	25.3	5.5	17.0	22.4	25.9	28.6	15.8	23.1	27.3	30.4	32.7	24.3	29.7	33.2	35.9	38.0
TVC057	11.3	0.0	12.5	20.0	24.5	27.7	6.0	18.7	24.6	28.5	31.4	17.3	25.3	30.0	33.3	35.9	26.7	32.6	36.5	39.4	41.7
TVC064	13.3	0.0	14.7	23.5	28.8	32.6	7.1	22.0	28.9	33.5	36.9	20.4	29.8	35.3	39.2	42.2	31.4	38.3	42.9	46.3	49.0
TVC073	12.7	0.0	3.9	18.1	24.7	29.0	0.0	15.7	24.7	29.9	33.6	13.9	25.9	32.0	36.1	39.3	27.5	35.1	39.9	43.3	46.1
TVC081	15.2	0.0	4.6	21.6	29.5	34.7	0.0	18.8	29.5	35.8	40.3	16.6	31.0	38.3	43.3	47.0	33.0	42.1	47.8	51.9	55.2
TVC086	15.4	0.0	4.7	21.9	29.9	35.2	0.0	19.0	29.9	36.3	40.8	16.8	31.4	38.8	43.8	47.6	33.4	42.6	48.4	52.6	55.9
TVC096	18.3	0.0	5.6	26.1	35.6	41.9	0.0	22.7	35.6	43.2	48.6	20.0	37.4	46.3	52.3	56.8	39.8	50.8	57.7	62.7	66.6
TVC112	23.8	0.0	0.0	24.1	40.9	50.7	0.0	12.7	39.3	51.7	59.8	2.8	41.8	56.1	65.0	71.5	46.3	63.1	72.9	79.9	85.3
TVC126	29.7	0.0	0.0	30.1	51.1	63.4	0.0	15.9	49.2	64.7	74.9	3.6	52.4	70.2	81.4	89.5	57.9	78.9	91.2	100.0	106.7
TVC137	35.7	0.0	0.0	36.2	61.4	76.2	0.0	19.0	59.1	77.7	89.9	4.3	62.9	84.3	97.7	107.5	69.5	94.8	109.6	120.1	128.2
TVC158	35.6	0.0	0.0	20.4	54.3	71.5	0.0	0.0	47.7	71.2	85.3	0.0	48.8	77.0	92.7	103.7	58.9	89.7	106.2	117.5	126.1
TVC172	46.0	0.0	0.0	26.3	70.0	92.2	0.0	0.0	61.5	91.8	110.1	0.0	62.9	99.3	119.6	133.7	76.0	115.7	136.9	151.5	162.6
TVC190	48.1	0.0	0.0	0.0	59.7	88.5	0.0	0.0	45.6	87.2	109.3	0.0	39.8	93.7	118.8	135.3	59.7	113.6	138.7	155.2	167.6
TVC206	57.1	0.0	0.0	0.0	70.8	105.0	0.0	0.0	54.0	103.3	129.6	0.0	47.2	111.1	140.8	160.4	70.8	134.7	164.4	184.0	198.6

Note: For R134a and R502 use R22 charge
For R404A and R507 use R22 charge x 0.87
For R407C use R22 charge x 0.97
For R12 use R22 charge x 1.10
For 90% full volume charge see P. 8 & 9

INSTALLATION

INSPECTION

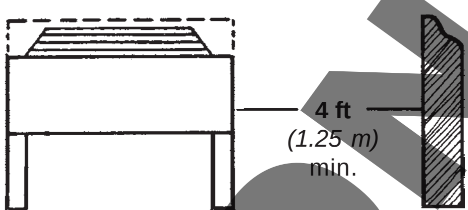
A thorough inspection of the equipment, including all component parts and accessories, should be made immediately upon delivery. Any damage caused in transit, or missing parts, should be reported to the carrier at once. The consignee is responsible for making any claim for losses or damage. Electrical characteristics should also be checked at this time to ensure that they are correct.

LOCATION

Before handling and placing the unit into position a review of the most suitable location must be made. This condenser is designed for outdoor installation.
A number of factors must be taken into consideration when selecting a location. Most important is the provision for a supply of ambient air to the condenser, and removal of heated air from the condenser area.
Higher condensing temperatures, decreased performance, and the possibility of equipment failure may result from inadequate air supply.
Other considerations include:
1. Customer requests
2. Loading capacity of the roof or floor.
3. Distance to suitable electrical supply.
4. Accessibility for maintenance.
5. Local building codes.
6. Adjacent buildings relative to noise levels.

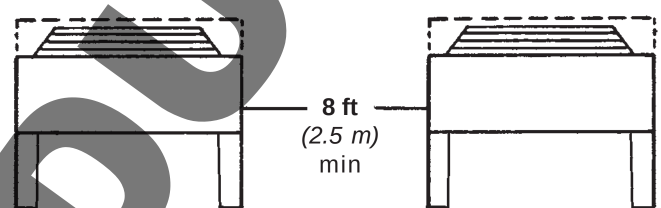
WALLS OR OBSTRUCTIONS

All sides of the unit must be a minimum of **4 feet** *(1.25 m)* away from any wall or obstruction. Overhead obstructions are not permitted. If enclosed by three walls, the condenser must be installed as indicated for units in a pit.



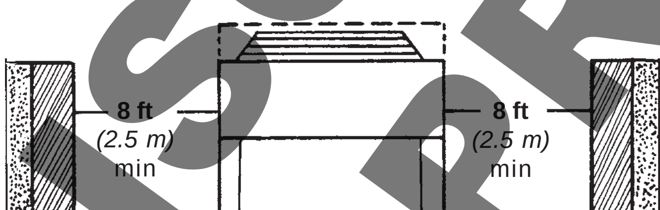
MULTIPLE UNITS

A minimum of **8 feet** *(2.5 m)* is required between multiple units placed side by side. If placed end to end, the minimum distance between units is **4 feet** *(1.25 m)*.



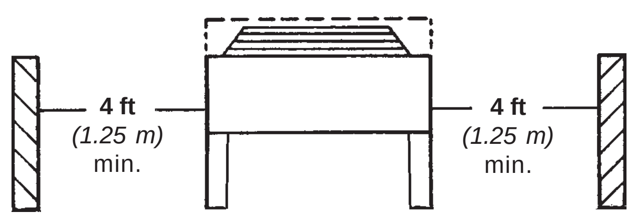
UNITS IN PITS

The top of the condenser must be level with, or above the top of the pit. In addition, a minimum of **8 feet** *(2.5 m)* is required between the unit and the pit walls.



LOUVERS/FENCES

Louvers/fences must have a minimum of 80% free area and **4 feet** *(1.25 m)* minimum clearance between the unit and louvers/fence. Height of louver/fence must not exceed top of unit.



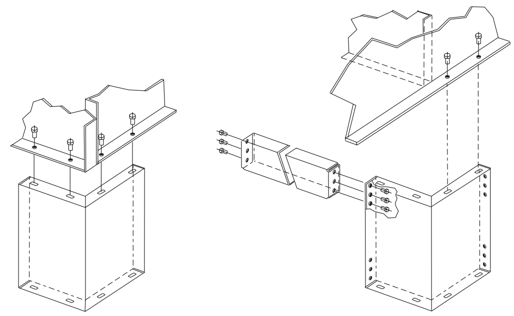
PLACEMENT

Once a suitable location is selected ensure all the remote mounting parts (legs and hardware) are available. Refer to Fig.1 (P. 44) and the dimensional data for the leg mounting locations. On 8, 10 and 12 fan models a **66-1/8”** ***(1680 mm)*** channel is also included for maximum support. Single row 4, 5 and 6 fan models use a **23”** *(600 mm)* channel.

INSTALLATION

LEG INSTALLATION INSTRUCTIONS

Fig. 1



CORNER LEG

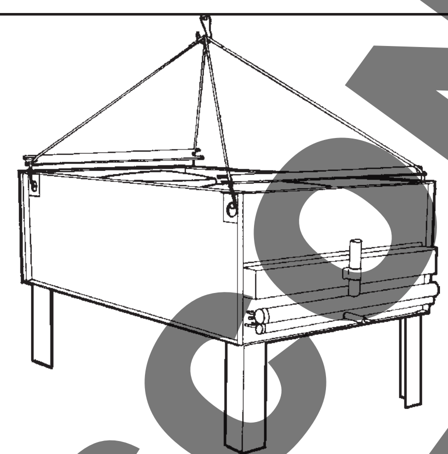
CENTRE LEG WITH SUPPORT CHANNEL
(RIGHT HAND SIDE FACING HEADER END SHOWN)
USED ON 4, 5 AND 6 FAN MODELS ONLY

1) Assemble center leg and centre channel as shown.
   Remove 2 bolts from bottom flange of unit side panels that match the hole pattern on the top flanges of both legs. Attach center leg and channel assembly using hardware provided at divider panel locations required for applicable model as shown in dimensional data.
   Replace bolts that were removed from side panels to secure leg assembly to bottom flanges of side panels.

2) Assemble four corner legs to bottom flanges on unit side panels and end panels using hardware provided, at matching mounting hole patterns. All corner legs are the same.

Air cooled condensers are large, heavy mechanical equipment and must be handled as such. A fully qualified and properly equipped crew with necessary rigging should be engaged to set the condenser into position.
Lifting brackets or holes have been provided at the corners for attaching lifting slings. Spreader bars must be used when lifting so that the lifting force must be applied vertically. See Fig. 2. **Under no circumstances should the coil headers or return bends be used in lifting or moving the condenser.**

Fig. 2



Ensure the unit is placed in a level position (to ensure proper drainage of liquid refrigerant and oil). The legs should be securely anchored to the building structure, sleeper or concrete pad. The weight of the condenser is not enough to hold in place during a strong wind, **the legs must be anchored.**

REFRIGERANT PIPING
All refrigeration piping must be installed by a qualified refrigeration mechanic. The importance of correct refrigerant pipe sizing and layout cannot be over-emphasized. Failure to observe proper refrigerant piping practices can result in equipment failure which may not be covered under warranty.
All air cooled condensers are supplied complete with headers and refrigerant connections sized for connecting to standard refrigeration tubing.These connections may not be the same as the actual line sizes required for the field installation. Refer to a recognized source (ASHRAE charts, manufacturer's engineering manuals etc.) for line sizing.

DISCHARGE LINES
The proper design of discharge lines involves following objective:
(1) to minimize refrigerant pressure drop, since high pressure losses increase the required compressor horsepower per ton of refrigeration.

Discharge lines must be pitched away from the compressor to ensure proper drainage of oil being carried in the line.
A discharge check-valve at the bottom of a vertical riser will prevent oil (and liquid refrigerant) from draining back to the compressor during the off-cycle. When the vertical lift exceeds **30 feet** *(9 m)*, insert close-coupled traps in the riser at **30 feet** *(9 m)* intervals.

An alternate method of handling the oil problem would be the addition of an oil separator see Figure 4 (b).

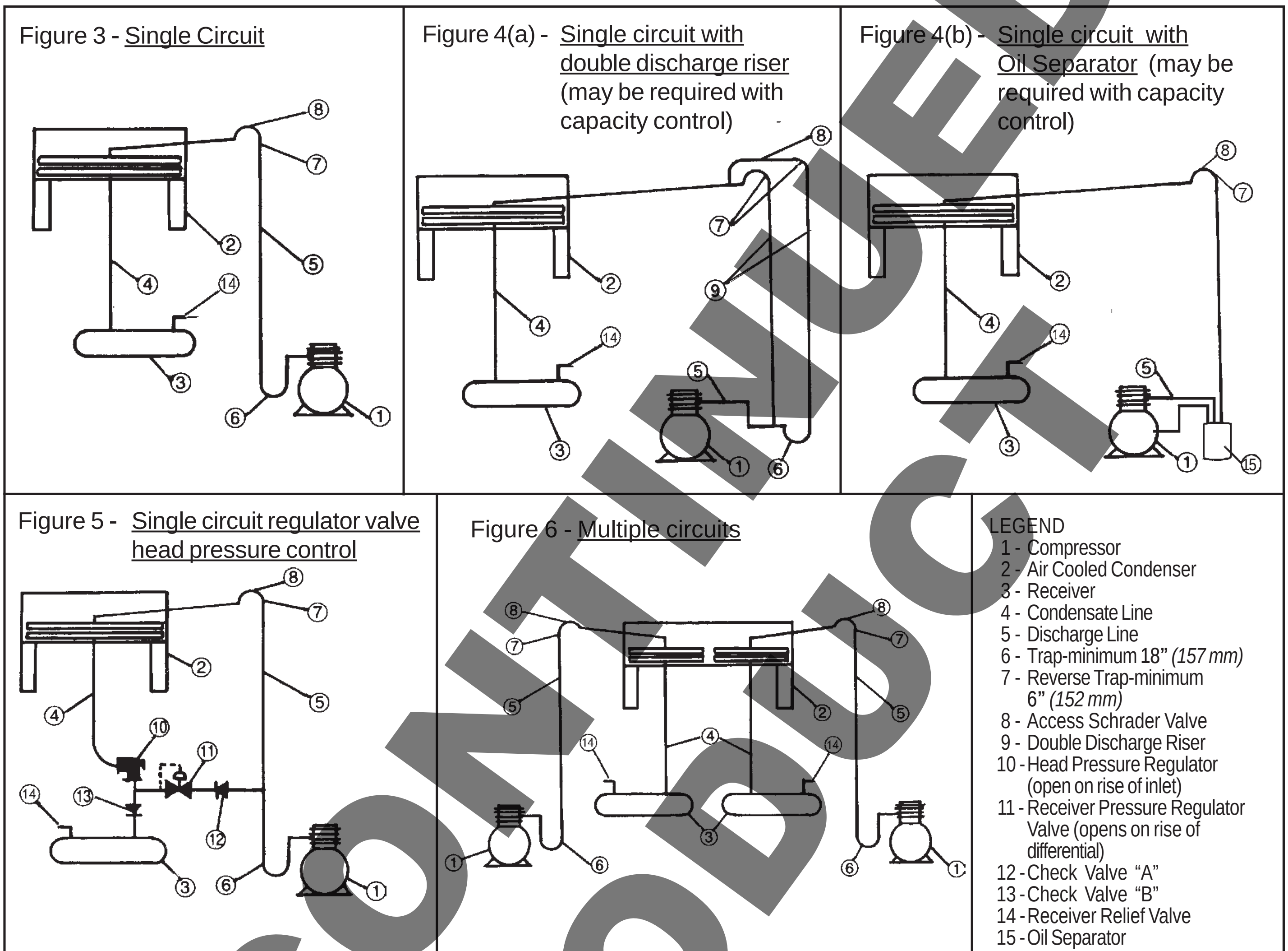
A reverse trap should be installed at the top of all vertical risers. The top of the reverse trap should be the highest point in the discharge line and should have an access valve installed to allow the reclaimation of non-condensible gas from the system.

Pulsation of the hot gas in the discharge line is an inherent characteristic of systems utilizing reciprocating compressors. The discharge line must be rigidly supported along its entire length to prevent transmission of vibration and movement of the line.

CONDENSATE LINES
The condensate line must be designed to allow free drainage of refrigerant from the condenser coil to the receiver. Refer to Fig. 5 for typical condensate line piping when utilizing head pressure regulating valves.

Fig. 3 - 6

TVC TYPICAL SYSTEM PIPING



ELECTRICAL WIRING

All wiring and connections to the air cooled condenser must be made in accordance with the National Electrical Code and all local codes and regulations. Any wiring diagrams shown are basic and do not necessarily include electrical components which must be field supplied. (see pages 13-17 for typical wiring diagrams). Refer to the Electrical Specifications table on pages 10, 24 and 31 for voltage availability and entering service requirements.

SYSTEM START-UP CHECKS

1. Check the electrical characteristics of all components to be sure they agree with the power supply.
2. Check tightness of all fans and motor mounts.
3. Check tightness of all electrical connections.
4. Upon start-up, check fans for correct rotation. Air is drawn through the condenser coil. To change rotation on 3 phase units reverse any two (2) fan motor leads.
5. All system piping must be thoroughly leak checked before a refrigerant charge is introduced.

MAINTENANCE

A semi annual inspection should be carried out by a qualified refrigeration service mechanic. The main power supply must be disconnected.

1. Check electrical components. Tighten any loose connections.
2. Check control capillary tubes and lines for signs of wear due to excessive vibration or rubbing on metal parts. Secure if necessary.
3. Check tightness of all fans and motor mounts. Remove any deposits which could effect fan balance. Note: Fan motors are permanently lubricated and require only visual inspection.
4. Clean the condenser coil using a soft brush or by flushing with cool water or coil cleansers available through NRP (National Refrigeration Products Inc.)
5. Update service log information (back page of service manual)

SERVICE PARTS LIST

PART DESCRIPTION	MODELS	PART NUMBER
FAN MOTORS-60 Hz *		
850 RPM Models		
208/230-1-60	850 RPM (3/4 HP)	1048725-001
208/230/460 -3-60	850 RPM (1 HP)	1079828-001
575-3-60	850 RPM (1 HP)	1089453-001
550 RPM Models		
208/230/460 -3-60	550 RPM (1/2 HP)	1068176-001
575-3-60	550 RPM (1/2 HP)	1068177-001
1140 RPM Models		
208/230/460 -3-60	1140 RPM (2 HP)	1079830-001
575-3-60	1140 RPM (2 HP)	1079831-001
MOTOR MOUNT RAIL (2 REQ'D)	ALL	1071666
MOTOR RAIN SHIELD*	ALL	1043295
MOTOR RAIN SLINGER*	ALL	106098
FAN BLADES		
30" 22º 4 BLADE	044,049,054,073,081	1077801
30" 28º 4 BLADE	056,063,068,079,085,095,103 057,064,086,096,112,126,	1077802
FAN GUARD - 35" DIA.	ALL	1048603
MOUNTING LEGS		
20" LEGS	ALL	1073085
36" LEGS	ALL	1071668
48" LEGS	ALL	1071669
CROSS CHANNEL-SINGLE FAN WIDE	ALL	1075076
CROSS CHANNEL-DOUBLE FAN WIDE	ALL	1075077
45º CROSS BRACE FOR 36" AND 48"	ALL	1075078

* Fan motor service kit part number with - 001 suffix includes a rain shield and slinger.

FINISHED GOODS WARRANTY

The terms and conditions as described below in the General Warranty Policy cover all products manufactured by National Refrigeration.

GENERAL WARRANTY POLICY

Subject to the terms and conditions hereof, the Company warrants all Products, including Service Parts, manufactured by the Company to be free of defects in material or workmanship, under normal use and application for a period of one (1) year from the original date of installation, or eighteen (18) months from the date of shipment from the Company, whichever occurs first. Any replacement part(s) so supplied will be warranted for the balance of the product's original warranty. The part(s) to be replaced must be made available in exchange for the replacement part(s) and reasonable proof of the original installation date of the product must be presented in order to establish the effective date of the warranty, failing which, the effective date will be based upon the date of manufacture plus thirty (30) days. Any labour, material, refrigerant, transportation, freight or other charges incurred in connection with the performance of this warranty will be the responsibility of the owner at the current rates and prices then in effect. This warranty may be transferred to a subsequent owner of the product.

THIS WARRANTY DOES NOT COVER

(a) Damages caused by accident, abuse, negligence, misuse, riot, fire, flood, or Acts of God (b) damages caused by operating the product in a corrosive atmosphere (c) damages caused by any unauthorized alteration or repair of the system affecting the product's reliability or performance (d) damages caused by improper matching or application of the product or the product's components (e) damages caused by failing to provide routine and proper maintenance or service to the product (f) expenses incurred for the erecting, disconnecting, or dismantling the product (g) parts used in connection with normal maintenance, such as filters or belts (h) products no longer at the site of the original installation (i) products installed or operated other than in accordance with the printed instructions, with the local installation or building codes and with good trade practices (j) products lost or stolen.

No one is authorized to change this WARRANTY or to create for or on behalf of the Company any other obligation or liability in connection with the Product(s). There is no other representation, warranty or condition in any respect, expressed or implied, made by or binding upon the Company other than the above or as provided by provincial or state law and which cannot be limited or excluded by such law, nor will we be liable in any way for incidental, consequential, or special damages however caused.

The provisions of this additional written warranty are in addition to and not a modification of or subtraction from the statutory warranties and other rights and remedies provided by Federal, Provincial or State laws.

PROJECT INFORMATION

System	
Model Number	Date of Start-Up
Serial Number	Service Contractor
Refrigerant	Phone
Electrical Supply	Fax

SERVICE PARTS LIST

Service Parts List
Label
To Be Attached
HERE

NATIONAL REFRIGERATION & AIR CONDITIONING CANADA CORP.
159 Roy Blvd., Brantford, Ontario, Canada N3R 7K1
Phone (519) 751-0444 • Fax (519) 753-1140

01/06/09