KeepRite® REFRIGERATION

PRODUCT DATA & INSTALLATION

Bulletin K50-KCM-PDI-6

Part # 1087820

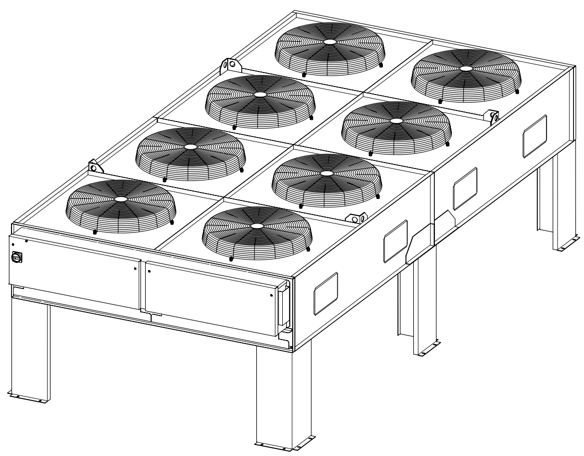
PRODUCT SUPPORT
web: **k-rp.com/kcm**
email: **acc-fc@k-rp.com**
call: **1-844-893-3222 x526**
scan:

KCM Air Cooled Condensers

60 Hz

R407A R407C R448A R404A R507 R22 R410A R134a

Electrical Power:
208-230/1/60, 208-230/3/60,
460/1/60, 460/3/60, 575/1/60, 575/3/60



INCLUDES RATINGS FOR LOW GWP REFRIGERANTS

CONTENTS

NOMENCLATURE

K CM 095 - T3 A - A 2 4 V

Brand Name:
K = KeepRite

Product name
CM = Medium Sized Condenser

Nominal Tons (R404A, 25°F TD, 60Hz)

Voltage
S2 = 208-230/1/60
T3 = 208-230/3/60
S4 = 460/1/60
T4 = 460/3/60
S5 = 575/1/60
T5 = 575/3/60
S6 = 200-220/1/50
T7 = 200-220/3/50
S7 = 380-400/1/50
T9 = 380-400/3/50

Design version

Motor
A = 1075 RPM, 3/4 HP Motor
M = EC Motor - Motor Only
(Conventional Shafted Style Motor)

Fans Wide
1 = Inline; 2 = Double Wide

Fans Deep

Application
V = Vertical Air Discharge
H = Horizontal Air Discharge

STANDARD FEATURES INCLUDE

- Compatible with Low GWP Refrigerants
- Horizontal or Vertical Air Discharge
- Heavy Gauge Galvanized Steel Cabinet
- ThermoSpan™ Coil Design eliminates tube failures on tube sheet
- Internally Enhanced Tubing with Enhanced Fin optimizes coil performance
- Energy Efficient PSC and 3 Phase Fan Motors with Internal Overload Protection
- Quiet 'Swept Wing' Fan Blade
- Fan Sections Individually Baffled with Clean-out Panels
- Zinc Plated Huck Bolts
- Heavy Duty 24" Legs
- Double fan wide models have Two Equal Circuits
- Control Circuit Voltage – 230 V
- Unit shipped with Nitrogen Holding Charge

AVAILABLE OPTIONS

- Multiple Refrigeration Circuits
- Ambient or Pressure Fan Cycling Control with Contactor
- Efficient Variable Speed EC Motors
- Variable speed motor with controller for header fan motors
- Individual Fan Motor Fusing
- Non-Fused Disconnect
- Receiver with or without Heater and Insulation
- Adjustable Flooded Head Pressure Control (factory mounted if ordered with receiver option)
- Optional Fin Materials and Coatings
- Voltages Available for 60Hz or 50Hz
- Extended 48" Leg Kit with Cross Bracing
- Horizontal Configuration
- Optional Fin Materials
- Optional Coil Coatings

CAPACITY DATA - SINGLE ROW MODELS

MODEL KCM	FPI	FAN CONFIG.	TOTAL HEAT OF REJECTION - MBH *(KW)* PER 1 °F *(0.56 °C)* TD										MAX. NO. OF FEEDS
			R407A R448A		R407C		R404A R507		R22 R410A		R134a		
009	10	1 x 1	**4.22**	*(1.24)*	**4.18**	*(1.22)*	**4.40**	*(1.29)*	**4.49**	*(1.32)*	**4.27**	*(1.25)*	8
010	12	1 x 1	**4.58**	*(1.34)*	**4.53**	*(1.33)*	**4.77**	*(1.40)*	**4.87**	*(1.42)*	**4.62**	*(1.35)*	8
011	10	1 x 1	**5.09**	*(1.49)*	**5.03**	*(1.48)*	**5.30**	*(1.55)*	**5.41**	*(1.58)*	**5.14**	*(1.51)*	8
012	12	1 x 1	**5.47**	*(1.60)*	**5.41**	*(1.59)*	**5.70**	*(1.67)*	**5.81**	*(1.70)*	**5.53**	*(1.62)*	8
013	8	1 x 2	**5.97**	*(1.75)*	**5.91**	*(1.73)*	**6.22**	*(1.82)*	**6.34**	*(1.86)*	**6.03**	*(1.77)*	10
014	10	1 x 2	**6.63**	*(1.94)*	**6.57**	*(1.92)*	**6.91**	*(2.03)*	**7.05**	*(2.07)*	**6.70**	*(1.96)*	10
016	12	1 x 2	**7.34**	*(2.15)*	**7.27**	*(2.13)*	**7.65**	*(2.24)*	**7.80**	*(2.29)*	**7.42**	*(2.17)*	10
017	8	1 x 2	**7.87**	*(2.15)*	**7.79**	*(2.28)*	**8.20**	*(2.40)*	**8.36**	*(2.45)*	**7.95**	*(2.33)*	16
018	10	1 x 2	**8.45**	*(2.48)*	**8.36**	*(2.45)*	**8.80**	*(2.58)*	**8.98**	*(2.63)*	**8.54**	*(2.50)*	16
020	12	1 x 2	**9.07**	*(2.66)*	**8.97**	*(2.63)*	**9.45**	*(2.77)*	**9.64**	*(2.82)*	**9.16**	*(2.69)*	16
021	8	1 x 2	**9.80**	*(2.87)*	**9.70**	*(2.84)*	**10.21**	*(2.99)*	**10.41**	*(3.05)*	**9.90**	*(2.90)*	16
022	10	1 x 2	**10.18**	*(2.98)*	**10.07**	*(2.95)*	**10.60**	*(3.11)*	**10.81**	*(3.17)*	**10.28**	*(3.01)*	16
024	12	1 x 2	**10.89**	*(3.19)*	**10.78**	*(3.16)*	**11.34**	*(3.32)*	**11.57**	*(3.39)*	**11.00**	*(3.22)*	16
025	8	1 x 3	**11.70**	*(3.43)*	**11.58**	*(3.39)*	**12.19**	*(3.57)*	**12.43**	*(3.64)*	**11.82**	*(3.46)*	24
028	10	1 x 3	**12.81**	*(3.75)*	**12.67**	*(3.71)*	**13.34**	*(3.91)*	**13.61**	*(3.99)*	**12.94**	*(3.79)*	24
030	12	1 x 3	**13.73**	*(4.02)*	**13.58**	*(3.98)*	**14.30**	*(4.19)*	**14.58**	*(4.27)*	**13.87**	*(4.06)*	24
032	8	1 x 3	**13.52**	*(4.25)*	**14.37**	*(4.21)*	**15.12**	*(4.43)*	**15.43**	*(4.52)*	**14.67**	*(4.30)*	21
033	10	1 x 3	**15.21**	*(4.46)*	**15.05**	*(4.41)*	**15.84**	*(4.64)*	**16.16**	*(4.74)*	**15.37**	*(4.50)*	21
035	12	1 x 3	**16.13**	*(4.73)*	**15.96**	*(4.68)*	**16.80**	*(4.92)*	**17.14**	*(5.02)*	**16.30**	*(4.78)*	21
037	8	1 x 4	**16.84**	*(4.94)*	**16.67**	*(4.88)*	**17.54**	*(5.14)*	**17.89**	*(5.24)*	**17.02**	*(4.99)*	24
039	10	1 x 4	**17.93**	*(5.25)*	**17.74**	*(5.20)*	**18.68**	*(5.47)*	**19.05**	*(5.58)*	**18.12**	*(5.31)*	24
041	12	1 x 4	**18.90**	*(5.54)*	**18.71**	*(5.48)*	**19.69**	*(5.77)*	**20.08**	*(5.89)*	**19.10**	*(5.60)*	24
043	8	1 x 4	**19.77**	*(5.79)*	**19.57**	*(5.73)*	**20.60**	*(6.04)*	**21.01**	*(6.16)*	**19.98**	*(5.86)*	32
045	10	1 x 4	**20.91**	*(6.13)*	**20.69**	*(6.06)*	**21.78**	*(6.38)*	**22.21**	*(6.51)*	**21.12**	*(6.19)*	32
048	12	1 x 4	**21.97**	*(6.44)*	**21.74**	*(6.37)*	**22.89**	*(6.71)*	**23.34**	*(6.84)*	**22.20**	*(6.51)*	32

NOTES:
- Above capacity data based on 0°F subcooling and at sea level.
- 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.
- Capacities at other TD within a range of 10 to 30 °F *(5.6 to 16.7°C)* are directly proportional to TD, or use formula: Capacity = Rated capacity x TD.
- For 50 HZ capacity multiply by 0.92. (no derate with EC motors)
- Capacities for R448A, R407A and R407C are based on mean temperature. Mean temperature is the average temperature between the saturated condensing temperatures at the inlet and outlet of the condenser. For dew point ratings, consult factory.
- For R449A, use R448A data.

CAPACITY DATA - DOUBLE ROW MODELS

MODEL KCM	FPI	FAN CONFIG.	TOTAL HEAT OF REJECTION - MBH *(KW)* PER 1 °F *(0.56 °C)* TD										MAX. NO. OF FEEDS
			R407A R448A		R407C		R404A R507		R22 R410A		R134a		
034	8	2 x 2	**15.74**	*(4.61)*	**15.57**	*(4.56)*	**16.39**	*(4.80)*	**16.72**	*(4.90)*	**15.90**	*(4.66)*	32
036	10	2 x 2	**16.90**	*(4.95)*	**16.72**	*(4.90)*	**17.60**	*(5.16)*	**17.95**	*(5.26)*	**17.07**	*(5.00)*	32
040	12	2 x 2	**18.14**	*(5.32)*	**17.95**	*(5.26)*	**18.89**	*(5.54)*	**19.27**	*(5.65)*	**18.33**	*(5.37)*	32
042	8	2 x 2	**19.60**	*(5.74)*	**19.40**	*(5.68)*	**20.42**	*(5.98)*	**20.82**	*(6.10)*	**19.80**	*(5.80)*	32
044	10	2 x 2	**20.35**	*(5.96)*	**20.14**	*(5.90)*	**21.20**	*(6.21)*	**21.62**	*(6.34)*	**20.56**	*(6.03)*	32
047	12	2 x 2	**21.78**	*(6.38)*	**21.55**	*(6.32)*	**22.68**	*(6.65)*	**23.14**	*(6.78)*	**22.00**	*(6.45)*	32
051	8	2 x 3	**23.40**	*(6.86)*	**23.15**	*(6.79)*	**24.37**	*(7.14)*	**24.86**	*(7.29)*	**23.64**	*(6.93)*	48
056	10	2 x 3	**25.61**	*(7.51)*	**25.35**	*(7.43)*	**26.68**	*(7.82)*	**27.21**	*(7.98)*	**25.88**	*(7.58)*	48
060	12	2 x 3	**27.45**	*(8.04)*	**27.16**	*(7.96)*	**28.59**	*(8.38)*	**29.17**	*(8.55)*	**27.74**	*(8.13)*	48
063	8	2 x 3	**29.04**	*(8.51)*	**28.73**	*(8.42)*	**30.25**	*(8.86)*	**30.85**	*(9.04)*	**29.34**	*(8.60)*	42
066	10	2 x 3	**30.42**	*(8.91)*	**30.10**	*(8.82)*	**31.69**	*(9.29)*	**32.32**	*(9.47)*	**30.74**	*(9.01)*	42
070	12	2 x 3	**32.26**	*(9.46)*	**31.93**	*(9.36)*	**33.61**	*(9.85)*	**34.28**	*(10.05)*	**32.60**	*(9.55)*	42
073	8	2 x 4	**33.68**	*(9.87)*	**33.33**	*(9.77)*	**35.09**	*(10.28)*	**35.79**	*(10.49)*	**34.03**	*(9.97)*	48
078	10	2 x 4	**35.86**	*(10.51)*	**35.48**	*(10.40)*	**37.35**	*(10.95)*	**38.10**	*(11.17)*	**36.23**	*(10.62)*	48
082	12	2 x 4	**37.81**	*(11.08)*	**37.41**	*(10.96)*	**39.38**	*(11.54)*	**40.17**	*(11.77)*	**38.20**	*(11.19)*	48
086	8	2 x 4	**39.55**	*(11.59)*	**39.13**	*(11.47)*	**41.19**	*(12.07)*	**42.02**	*(12.31)*	**39.96**	*(11.71)*	64
090	10	2 x 4	**41.81**	*(12.25)*	**41.38**	*(12.13)*	**43.55**	*(12.76)*	**44.43**	*(13.02)*	**42.25**	*(12.38)*	64
095	12	2 x 4	**43.94**	*(12.88)*	**43.48**	*(12.74)*	**45.77**	*(13.41)*	**46.69**	*(13.68)*	**44.40**	*(13.01)*	64

NOTES:
- Above capacity data based on 0°F subcooling and at sea level.
- 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.
- Capacities at other TD within a range of 10 to 30 °F *(5.6 to 16.7°C)* are directly proportional to TD, or use formula: Capacity = Rated capacity x TD.
- For 50 HZ capacity multiply by 0.92. (no derate with EC motors)
- Capacities for R448A, R407A and R407C are based on mean temperature. Mean temperature is the average temperature between the saturated condensing temperatures at the inlet and outlet of the condenser. For dew point ratings, consult factory.
- For R449A, use R448A data.

ELECTRICAL DATA

SINGLE ROW MODELS

MODEL KCM	# FANS	208-230/3/60			460/3/60			575/3/60			208-230/1/60			460/1/60			575/1/60		
		FLA	MCA	MOP	FLA	MCA	MOP	FLA	MCA	MOP	FLA	MCA	MOP	FLA	MCA	MOP	FLA	MCA	MOP
009	1	2.3	2.9	15	1.2	1.4	15	0.9	1.1	15	3.6	4.5	15	1.7	2.1	15	1.4	1.8	15
010	1	2.3	2.9	15	1.2	1.4	15	0.9	1.1	15	3.6	4.5	15	1.7	2.1	15	1.4	1.8	15
011	1	2.3	2.9	15	1.2	1.4	15	0.9	1.1	15	3.6	4.5	15	1.7	2.1	15	1.4	1.8	15
012	1	2.3	2.9	15	1.2	1.4	15	0.9	1.1	15	3.6	4.5	15	1.7	2.1	15	1.4	1.8	15
013	2	4.6	5.2	15	2.3	2.6	15	1.8	2.0	15	7.2	8.1	15	3.4	3.8	15	2.8	3.2	15
014	2	4.6	5.2	15	2.3	2.6	15	1.8	2.0	15	7.2	8.1	15	3.4	3.8	15	2.8	3.2	15
016	2	4.6	5.2	15	2.3	2.6	15	1.8	2.0	15	7.2	8.1	15	3.4	3.8	15	2.8	3.2	15
017	2	4.6	5.2	15	2.3	2.6	15	1.8	2.0	15	7.2	8.1	15	3.4	3.8	15	2.8	3.2	15
018	2	4.6	5.2	15	2.3	2.6	15	1.8	2.0	15	7.2	8.1	15	3.4	3.8	15	2.8	3.2	15
020	2	4.6	5.2	15	2.3	2.6	15	1.8	2.0	15	7.2	8.1	15	3.4	3.8	15	2.8	3.2	15
021	2	4.6	5.2	15	2.3	2.6	15	1.8	2.0	15	7.2	8.1	15	3.4	3.8	15	2.8	3.2	15
022	2	4.6	5.2	15	2.3	2.6	15	1.8	2.0	15	7.2	8.1	15	3.4	3.8	15	2.8	3.2	15
024	2	4.6	5.2	15	2.3	2.6	15	1.8	2.0	15	7.2	8.1	15	3.4	3.8	15	2.8	3.2	15
025	3	6.9	7.5	15	3.5	3.7	15	2.7	2.9	15	10.8	15.1	20	5.1	5.5	15	4.2	4.6	15
028	3	6.9	7.5	15	3.5	3.7	15	2.7	2.9	15	10.8	15.1	20	5.1	5.5	15	4.2	4.6	15
030	3	6.9	7.5	15	3.5	3.7	15	2.7	2.9	15	10.8	15.1	20	5.1	5.5	15	4.2	4.6	15
032	3	6.9	7.5	15	3.5	3.7	15	2.7	2.9	15	10.8	15.1	20	5.1	5.5	15	4.2	4.6	15
033	3	6.9	7.5	15	3.5	3.7	15	2.7	2.9	15	10.8	15.1	20	5.1	5.5	15	4.2	4.6	15
035	3	6.9	7.5	15	3.5	3.7	15	2.7	2.9	15	10.8	15.1	20	5.1	5.5	15	4.2	4.6	15
037	4	9.2	9.8	15	4.6	4.9	15	3.6	3.8	15	14.4	15.3	20	6.8	7.2	15	5.6	6.0	15
039	4	9.2	9.8	15	4.6	4.9	15	3.6	3.8	15	14.4	15.3	20	6.8	7.2	15	5.6	6.0	15
041	4	9.2	9.8	15	4.6	4.9	15	3.6	3.8	15	14.4	15.3	20	6.8	7.2	15	5.6	6.0	15
043	4	9.2	9.8	15	4.6	4.9	15	3.6	3.8	15	14.4	15.3	20	6.8	7.2	15	5.6	6.0	15
045	4	9.2	9.8	15	4.6	4.9	15	3.6	3.8	15	14.4	15.3	20	6.8	7.2	15	5.6	6.0	15
048	4	9.2	9.8	15	4.6	4.9	15	3.6	3.8	15	14.4	15.3	20	6.8	7.2	15	5.6	6.0	15

DOUBLE ROW MODELS

MODEL KCM	# FANS	208-230/3/60			460/3/60			575/3/60			208-230/1/60			460/1/60			575/1/60		
		FLA	MCA	MOP	FLA	MCA	MOP	FLA	MCA	MOP	FLA	MCA	MOP	FLA	MCA	MOP	FLA	MCA	MOP
034	4	9.2	9.8	15	4.6	4.9	15	3.6	3.8	15	14.4	15.3	20	6.8	7.2	15	5.6	6.0	15
036	4	9.2	9.8	15	4.6	4.9	15	3.6	3.8	15	14.4	15.3	20	6.8	7.2	15	5.6	6.0	15
040	4	9.2	9.8	15	4.6	4.9	15	3.6	3.8	15	14.4	15.3	20	6.8	7.2	15	5.6	6.0	15
042	4	9.2	9.8	15	4.6	4.9	15	3.6	3.8	15	14.4	15.3	20	6.8	7.2	15	5.6	6.0	15
044	4	9.2	9.8	15	4.6	4.9	15	3.6	3.8	15	14.4	15.3	20	6.8	7.2	15	5.6	6.0	15
047	4	9.2	9.8	15	4.6	4.9	15	3.6	3.8	15	14.4	15.3	20	6.8	7.2	15	5.6	6.0	15
051	6	13.8	14.4	20	6.9	7.2	15	5.4	5.6	15	21.6	25.1	30	10.2	10.6	15	8.4	8.8	15
056	6	13.8	14.4	20	6.9	7.2	15	5.4	5.6	15	21.6	25.1	30	10.2	10.6	15	8.4	8.8	15
060	6	13.8	14.4	20	6.9	7.2	15	5.4	5.6	15	21.6	25.1	30	10.2	10.6	15	8.4	8.8	15
063	6	13.8	14.4	20	6.9	7.2	15	5.4	5.6	15	21.6	25.1	30	10.2	10.6	15	8.4	8.8	15
066	6	13.8	14.4	20	6.9	7.2	15	5.4	5.6	15	21.6	25.1	30	10.2	10.6	15	8.4	8.8	15
070	6	13.8	14.4	20	6.9	7.2	15	5.4	5.6	15	21.6	25.1	30	10.2	10.6	15	8.4	8.8	15
073	8	18.4	20.1	25	9.2	9.5	15	7.2	7.4	15	28.8	30.1	35	13.6	15.1	20	11.2	11.6	15
078	8	18.4	20.1	25	9.2	9.5	15	7.2	7.4	15	28.8	30.1	35	13.6	15.1	20	11.2	11.6	15
082	8	18.4	20.1	25	9.2	9.5	15	7.2	7.4	15	28.8	30.1	35	13.6	15.1	20	11.2	11.6	15
086	8	18.4	20.1	25	9.2	9.5	15	7.2	7.4	15	28.8	30.1	35	13.6	15.1	20	11.2	11.6	15
090	8	18.4	20.1	25	9.2	9.5	15	7.2	7.4	15	28.8	30.1	35	13.6	15.1	20	11.2	11.6	15
095	8	18.4	20.1	25	9.2	9.5	15	7.2	7.4	15	28.8	30.1	35	13.6	15.1	20	11.2	11.6	15

M.C.A. = Minimum Circuit Ampacity

M.O.P. = Maximum OverCurrent protection

GENERAL SPECIFICATIONS - R407A
SINGLE ROW MODELS

MODEL	FANS	R407A REFRIG. CHARGE (1)		AIR FLOW RATES	SOUND LEVEL (5)	PIPING CONNECTIONS						APPROX. SHIPPING WEIGHTS
						16°F to 30°F DESIGN TD			10°F to 15°F DESIGN TD			
KCM	LONG	NORMAL (2)	90% FULL (3)			INLET	OUTLET	QTY	INLET	OUTLET	QTY	
		LBS *(Kg)*	LBS *(Kg)*	CFM *(m^3/h)*	dBA	INCHES *(mm)*	INCHES *(mm)*		INCHES *(mm)*	INCHES *(mm)*		LBS *(Kg)*
009	1	4.07 *(1.83)*	15.4 *(7.04)*	6870 *(11672)*	51	1 1/8 *(29)*	7/8 *(22)*	1	1 1/8 *(29)*	7/8 *(22)*	1	245 *(111)*
010	1	4.07 *(1.83)*	15.4 *(7.04)*	6640 *(11281)*	51	1 1/8 *(29)*	7/8 *(22)*	1	1 1/8 *(29)*	7/8 *(22)*	1	250 *(114)*
011	1	4.95 *(2.27)*	19.8 *(9.02)*	6620 *(11247)*	51	1 1/8 *(29)*	7/8 *(22)*	1	1 1/8 *(29)*	7/8 *(22)*	1	265 *(120)*
012	1	4.95 *(2.27)*	19.8 *(9.02)*	6400 *(10874)*	51	1 1/8 *(29)*	7/8 *(22)*	1	1 1/8 *(29)*	7/8 *(22)*	1	270 *(123)*
013	2	5.72 *(2.59)*	20.9 *(9.59)*	14800 *(25145)*	53	1 3/8 *(35)*	1 1/8 *(29)*	1	1 1/8 *(29)*	7/8 *(22)*	1	410 *(186)*
014	2	5.72 *(2.59)*	20.9 *(9.59)*	14400 *(24466)*	53	1 3/8 *(35)*	1 1/8 *(29)*	1	1 1/8 *(29)*	7/8 *(22)*	1	415 *(189)*
016	2	5.72 *(2.59)*	20.9 *(9.59)*	13900 *(23616)*	53	1 3/8 *(35)*	1 1/8 *(29)*	1	1 1/8 *(29)*	7/8 *(22)*	1	420 *(191)*
017	2	7.81 *(3.54)*	30.8 *(14.0)*	14200 *(24126)*	53	1 5/8 *(41)*	1 1/8 *(29)*	1	1 3/8 *(35)*	1 1/8 *(29)*	1	450 *(205)*
018	2	7.81 *(3.54)*	30.8 *(14.0)*	13700 *(23276)*	53	1 5/8 *(41)*	1 1/8 *(29)*	1	1 3/8 *(35)*	1 1/8 *(29)*	1	455 *(207)*
020	2	7.81 *(3.54)*	30.8 *(14.0)*	13300 *(22597)*	53	1 5/8 *(41)*	1 1/8 *(29)*	1	1 3/8 *(35)*	1 1/8 *(29)*	1	460 *(209)*
021	2	9.68 *(4.42)*	39.6 *(17.9)*	13700 *(23276)*	53	1 5/8 *(41)*	1 1/8 *(29)*	1	1 3/8 *(35)*	1 1/8 *(29)*	1	480 *(218)*
022	2	9.68 *(4.42)*	39.6 *(17.9)*	13200 *(22427)*	53	1 5/8 *(41)*	1 1/8 *(29)*	1	1 3/8 *(35)*	1 1/8 *(29)*	1	490 *(223)*
024	2	9.68 *(4.42)*	39.6 *(17.9)*	12800 *(21747)*	53	1 5/8 *(41)*	1 1/8 *(29)*	1	1 3/8 *(35)*	1 1/8 *(29)*	1	500 *(227)*
025	3	11.9 *(5.39)*	46.2 *(21.2)*	21300 *(36189)*	54	2 1/8 *(54)*	1 3/8 *(35)*	1	1 3/8 *(35)*	1 1/8 *(29)*	1	630 *(286)*
028	3	11.9 *(5.39)*	46.2 *(21.2)*	20600 *(35000)*	54	2 1/8 *(54)*	1 3/8 *(35)*	1	1 3/8 *(35)*	1 1/8 *(29)*	1	640 *(291)*
030	3	11.9 *(5.39)*	46.2 *(21.2)*	19900 *(33810)*	54	2 1/8 *(54)*	1 3/8 *(35)*	1	1 3/8 *(35)*	1 1/8 *(29)*	1	650 *(295)*
032	3	14.7 *(6.70)*	59.4 *(27.2)*	20500 *(34830)*	54	2 1/8 *(54)*	1 3/8 *(35)*	1	1 5/8 *(41)*	1 1/8 *(29)*	1	680 *(309)*
033	3	14.7 *(6.70)*	59.4 *(27.2)*	19900 *(33810)*	54	2 1/8 *(54)*	1 3/8 *(35)*	1	1 5/8 *(41)*	1 1/8 *(29)*	1	695 *(316)*
035	3	14.7 *(6.70)*	59.4 *(27.2)*	19200 *(32621)*	54	2 1/8 *(54)*	1 3/8 *(35)*	1	1 5/8 *(41)*	1 1/8 *(29)*	1	710 *(323)*
037	4	16.2 *(7.37)*	63.8 *(28.8)*	28400 *(48252)*	55	2 5/8 *(67)*	1 5/8 *(41)*	1	2 1/8 *(54)*	1 3/8 *(35)*	1	810 *(368)*
039	4	16.2 *(7.37)*	63.8 *(28.8)*	27500 *(46723)*	55	2 5/8 *(67)*	1 5/8 *(41)*	1	2 1/8 *(54)*	1 3/8 *(35)*	1	825 *(375)*
041	4	16.2 *(7.37)*	63.8 *(28.8)*	26600 *(45194)*	55	2 5/8 *(67)*	1 5/8 *(41)*	1	2 1/8 *(54)*	1 3/8 *(35)*	1	840 *(382)*
043	4	20.0 *(9.11)*	81.4 *(36.8)*	27400 *(46553)*	55	2 5/8 *(67)*	1 5/8 *(41)*	1	2 1/8 *(54)*	1 3/8 *(35)*	1	880 *(400)*
045	4	20.0 *(9.11)*	81.4 *(36.8)*	26500 *(45024)*	55	2 5/8 *(67)*	1 5/8 *(41)*	1	2 1/8 *(54)*	1 3/8 *(35)*	1	900 *(409)*
048	4	20.0 *(9.11)*	81.4 *(36.8)*	25600 *(43495)*	55	2 5/8 *(67)*	1 5/8 *(41)*	1	2 1/8 *(54)*	1 3/8 *(35)*	1	920 *(418)*

(1) Refrigerant charge conversion factors:

R448A	R407C	R404A	R507	R22	R410A	R134a
0.96	1.0	0.91	0.91	1.05	0.92	1.06

(2) Normal charge is the refrigerant charge for warm ambient or summer operation.
(3) 90% full is the liquid refrigerant weight at 90% of internal volume and is **for reference only.**
(4) For 50 Hz fan data use 60 Hz CFM *(m^3/h)* X 0.83 (no derate with EC motors)
(5) Sound pressure level at 30 ft. *(10 m)*
(6) For R449A, use R448A data.

GENERAL SPECIFICATIONS - R407A
DOUBLE ROW MODELS

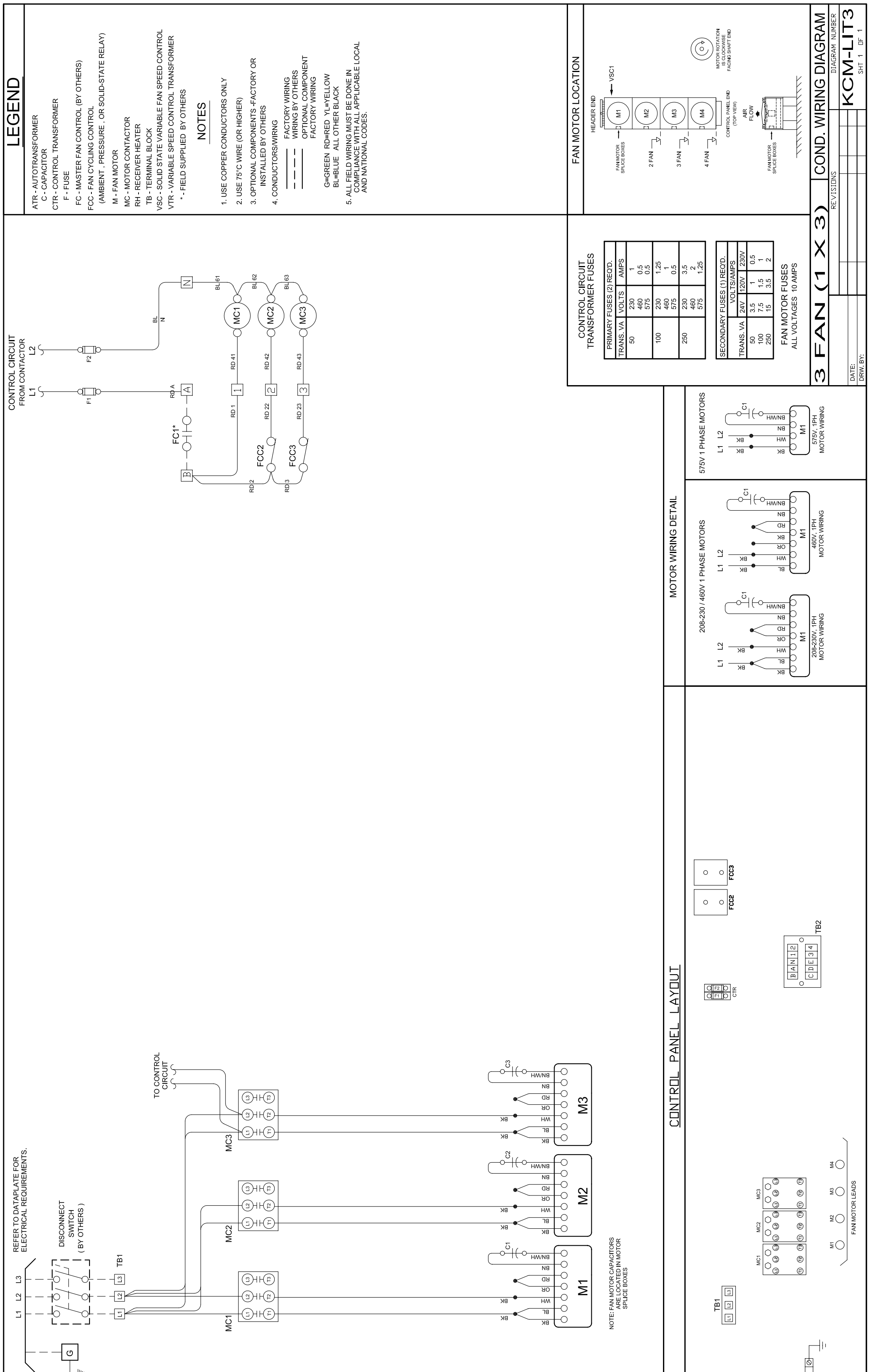
MODEL KCM	FANS LONG	R407A REFRIG. CHARGE (1)		AIR FLOW RATES	SOUND LEVEL (5)	PIPING CONNECTIONS						APPROX. SHIPPING WEIGHTS
						16°F to 30°F DESIGN TD			10°F to 15°F DESIGN TD			
		NORMAL (2)	90% FULL (3)			INLET	OUTLET	QTY	INLET	OUTLET	QTY	
		LBS *(Kg)*	LBS *(Kg)*	CFM *(m³/h)*	dBA	INCHES *(mm)*	INCHES *(mm)*		INCHES *(mm)*	INCHES *(mm)*		LBS *(Kg)*
034	2	**15.6** *(7.10)*	**61.6** *(27.9)*	**28400** *(48252)*	55	**1 5/8** *(41)*	**1 1/8** *(29)*	2	**1 3/8** *(35)*	**1 1/8** *(29)*	2	**830** *(377)*
036	2	**15.6** *(7.10)*	**61.6** *(27.9)*	**27500** *(46723)*	55	**1 5/8** *(41)*	**1 1/8** *(29)*	2	**1 3/8** *(35)*	**1 1/8** *(29)*	2	**845** *(384)*
040	2	**15.6** *(7.10)*	**61.6** *(27.9)*	**26600** *(45194)*	55	**1 5/8** *(41)*	**1 1/8** *(29)*	2	**1 3/8** *(35)*	**1 1/8** *(29)*	2	**860** *(391)*
042	2	**19.5** *(8.83)*	**79.2** *(35.9)*	**27400** *(46553)*	55	**1 5/8** *(41)*	**1 1/8** *(29)*	2	**1 3/8** *(35)*	**1 1/8** *(29)*	2	**900** *(409)*
044	2	**19.5** *(8.83)*	**79.2** *(35.9)*	**26500** *(45024)*	55	**1 5/8** *(41)*	**1 1/8** *(29)*	2	**1 3/8** *(35)*	**1 1/8** *(29)*	2	**920** *(418)*
047	2	**19.5** *(8.83)*	**79.2** *(35.9)*	**25600** *(43495)*	55	**1 5/8** *(41)*	**1 1/8** *(29)*	2	**1 3/8** *(35)*	**1 1/8** *(29)*	2	**940** *(427)*
051	3	**23.8** *(10.8)*	**93.5** *(42.4)*	**42600** *(72378)*	57	**2 1/8** *(54)*	**1 3/8** *(35)*	2	**1 3/8** *(35)*	**1 1/8** *(29)*	2	**1190** *(541)*
056	3	**23.8** *(10.8)*	**93.5** *(42.4)*	**41200** *(69999)*	57	**2 1/8** *(54)*	**1 3/8** *(35)*	2	**1 3/8** *(35)*	**1 1/8** *(29)*	2	**1210** *(550)*
060	3	**23.8** *(10.8)*	**93.5** *(42.4)*	**39800** *(67621)*	57	**2 1/8** *(54)*	**1 3/8** *(35)*	2	**1 3/8** *(35)*	**1 1/8** *(29)*	2	**1230** *(559)*
063	3	**29.5** *(13.4)*	**120** *(54.4)*	**41100** *(69829)*	57	**2 1/8** *(54)*	**1 3/8** *(35)*	2	**1 5/8** *(41)*	**1 1/8** *(29)*	2	**1290** *(586)*
066	3	**29.5** *(13.4)*	**120** *(54.4)*	**39700** *(67451)*	57	**2 1/8** *(54)*	**1 3/8** *(35)*	2	**1 5/8** *(41)*	**1 1/8** *(29)*	2	**1320** *(600)*
070	3	**29.5** *(13.4)*	**120** *(54.4)*	**38400** *(65242)*	57	**2 1/8** *(54)*	**1 3/8** *(35)*	2	**1 5/8** *(41)*	**1 1/8** *(29)*	2	**1350** *(614)*
073	4	**32.5** *(14.7)*	**127** *(57.7)*	**56800** *(96504)*	58	**2 5/8** *(67)*	**1 5/8** *(41)*	2	**2 1/8** *(54)*	**1 3/8** *(35)*	2	**1540** *(700)*
078	4	**32.5** *(14.7)*	**127** *(57.7)*	**55000** *(93446)*	58	**2 5/8** *(67)*	**1 5/8** *(41)*	2	**2 1/8** *(54)*	**1 3/8** *(35)*	2	**1570** *(714)*
082	4	**32.5** *(14.7)*	**127** *(57.7)*	**53100** *(90217)*	58	**2 5/8** *(67)*	**1 5/8** *(41)*	2	**2 1/8** *(54)*	**1 3/8** *(35)*	2	**1600** *(727)*
086	4	**40.0** *(18.2)*	**162** *(73.5)*	**54800** *(93106)*	58	**2 5/8** *(67)*	**1 5/8** *(41)*	2	**2 1/8** *(54)*	**1 3/8** *(35)*	2	**1670** *(759)*
090	4	**40.0** *(18.2)*	**162** *(73.5)*	**53000** *(90048)*	58	**2 5/8** *(67)*	**1 5/8** *(41)*	2	**2 1/8** *(54)*	**1 3/8** *(35)*	2	**1710** *(777)*
095	4	**40.0** *(18.2)*	**162** *(73.5)*	**51200** *(86989)*	58	**2 5/8** *(67)*	**1 5/8** *(41)*	2	**2 1/8** *(54)*	**1 3/8** *(35)*	2	**1750** *(795)*

(1) Refrigerant charge conversion factors:

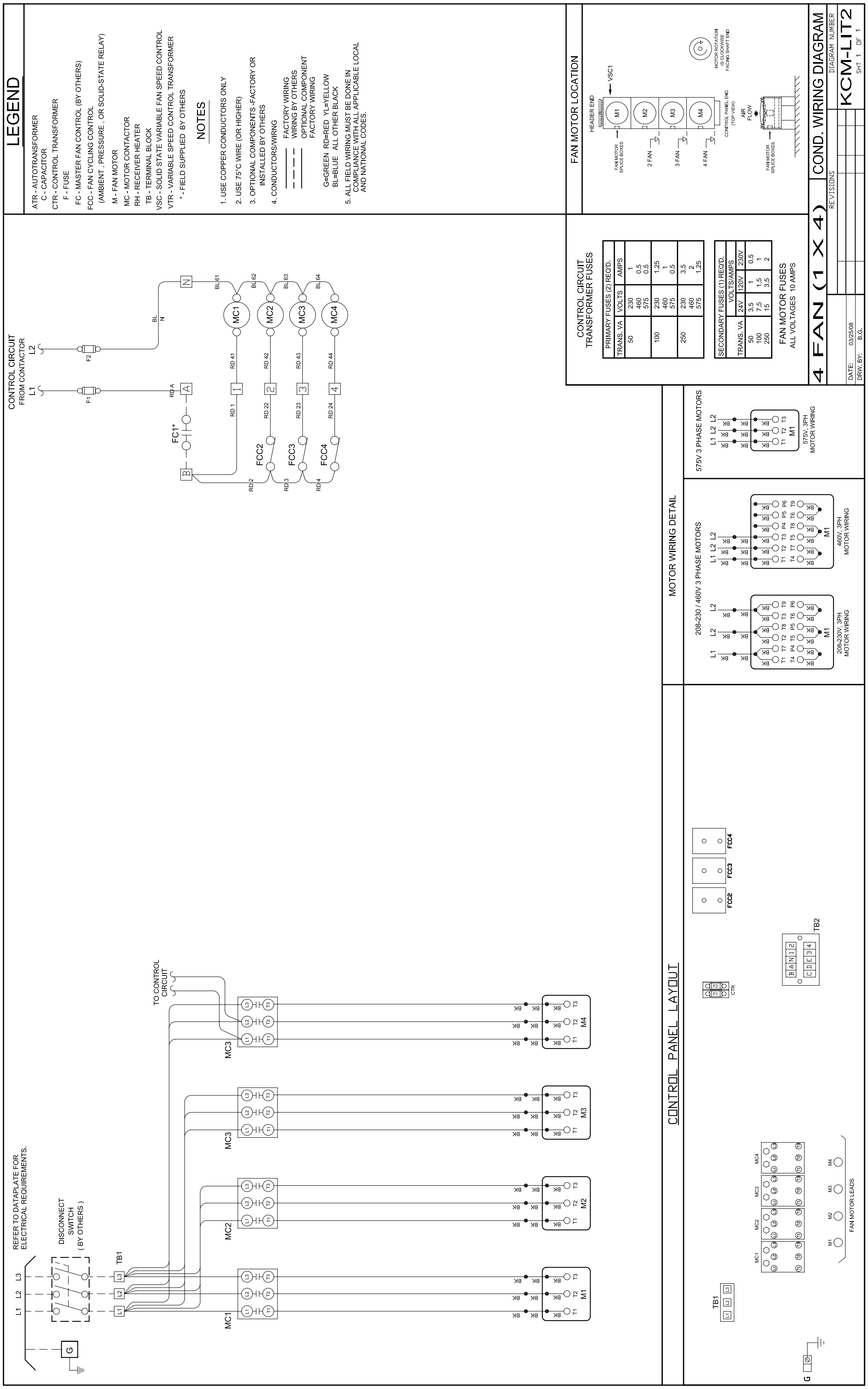
R448A	R407C	R404A	R507	R22	R410A	R134a
0.96	1.0	0.91	0.91	1.05	0.92	1.06

(2) Normal charge is the refrigerant charge for warm ambient or summer operation.
(3) 90% full is the liquid refrigerant weight at 90% of internal volume and is **for reference only.**
(4) For 50 Hz fan data use 60 Hz CFM *(m³/h)* X 0.83 (no derate with EC motors)

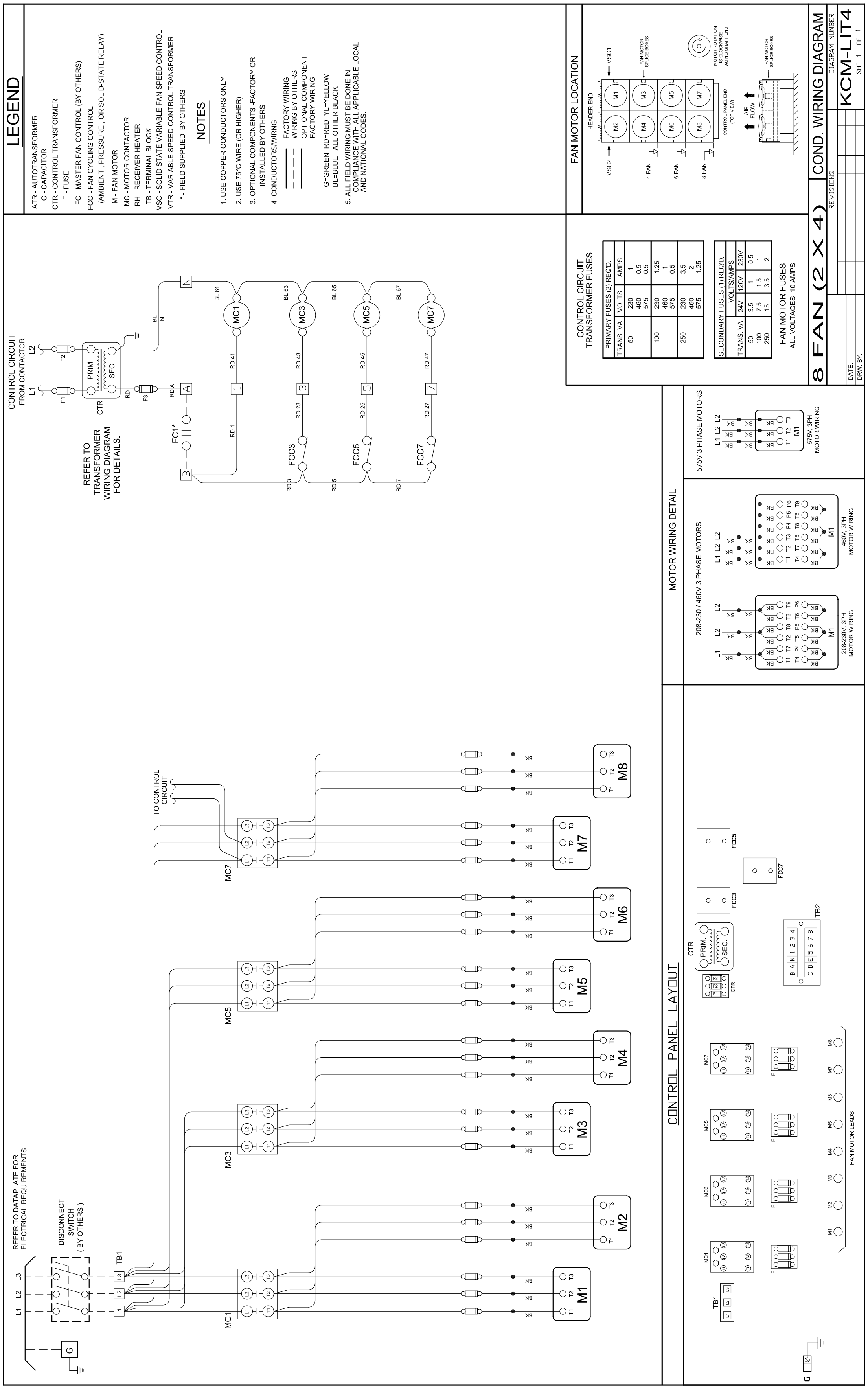
WIRING DIAGRAM
(SINGLE ROW MODELS - SINGLE PHASE UNITS)



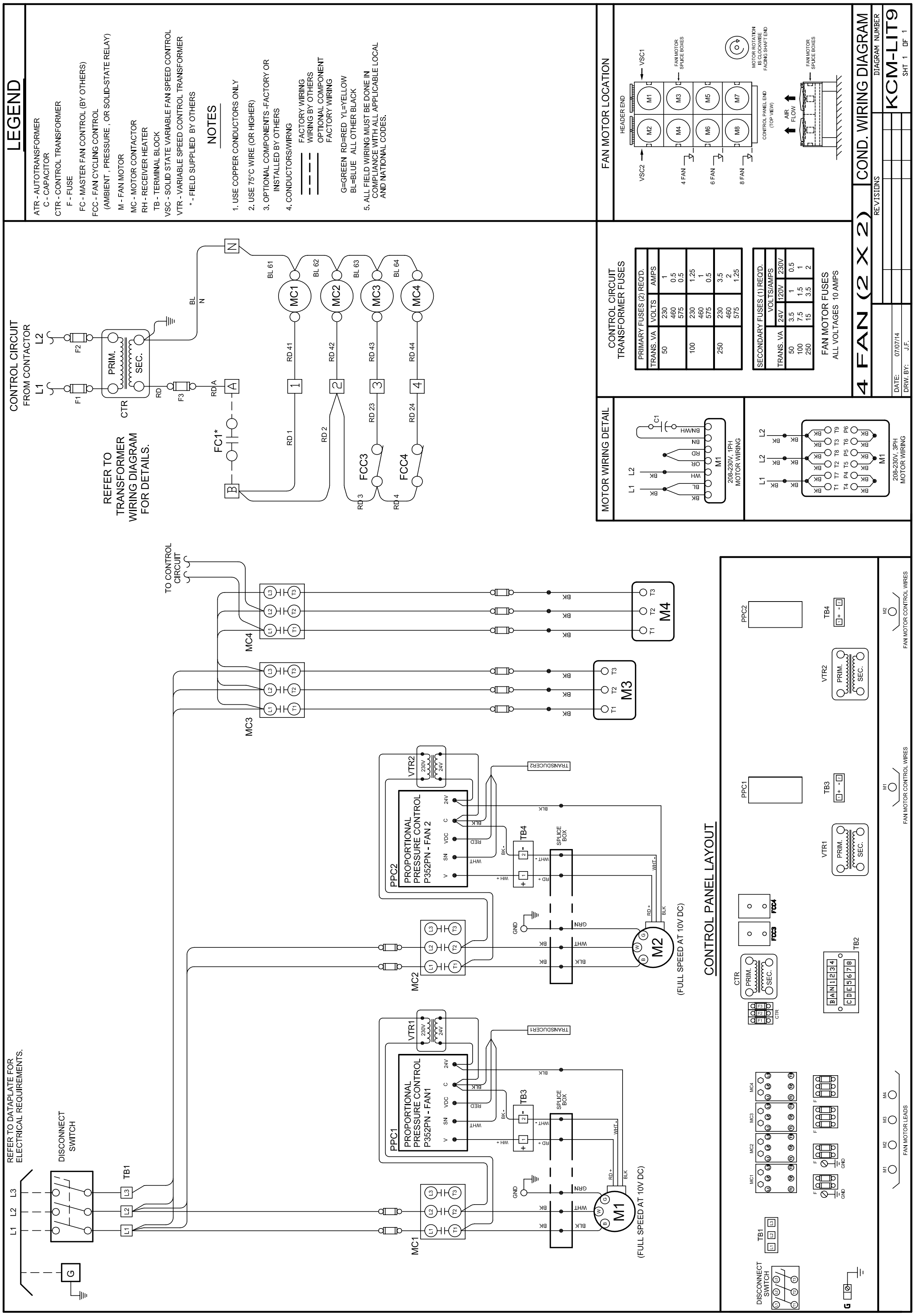
WIRING DIAGRAM
(SINGLE ROW MODELS - THREE PHASE UNITS)



WIRING DIAGRAM
(DOUBLE ROW MODELS - THREE PHASE UNITS)



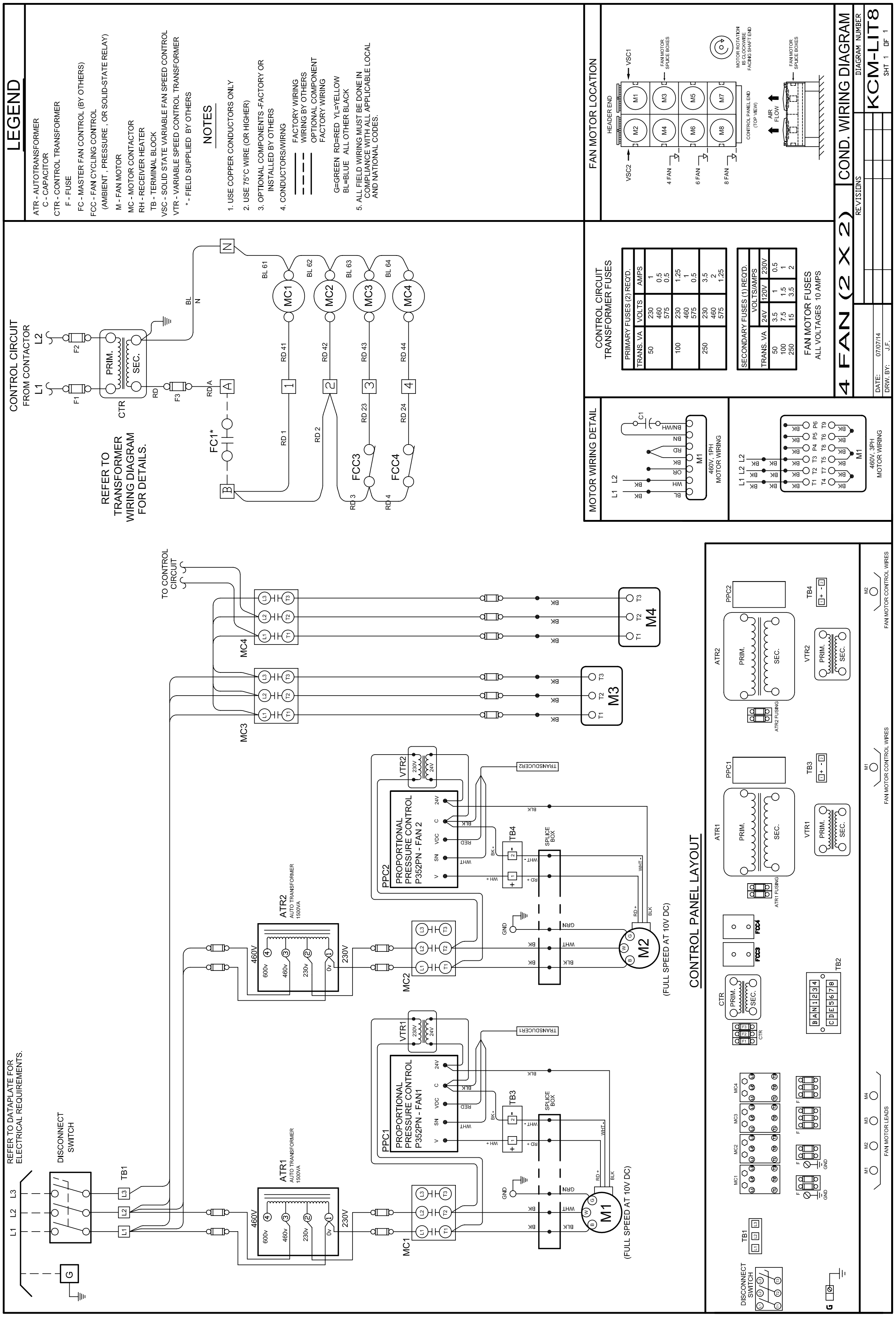
WIRING DIAGRAM
(VARIABLE SPEED MOTOR(S) WITH CONTROLLER FOR HEADER FAN CONTROL - 208-230V MODELS)



PRIMARY FUSES (2) REQ'D.		
TRANS. VA	VOLTS	AMPS
50	230 460 575	1 0.5 0.5
100	230 460 575	1.25 1 0.5
250	230 460 575	3.5 2 1.25

SECONDARY FUSES (1) REQ'D.			
TRANS. VA	VOLTS/AMPS 24V	120V	230V
50	3.5	1	0.5
100	7.5	1.5	1
250	15	3.5	2

WIRING DIAGRAM
(VARIABLE SPEED MOTOR(S) WITH CONTROLLER FOR HEADER FAN CONTROL - 460V MODELS)



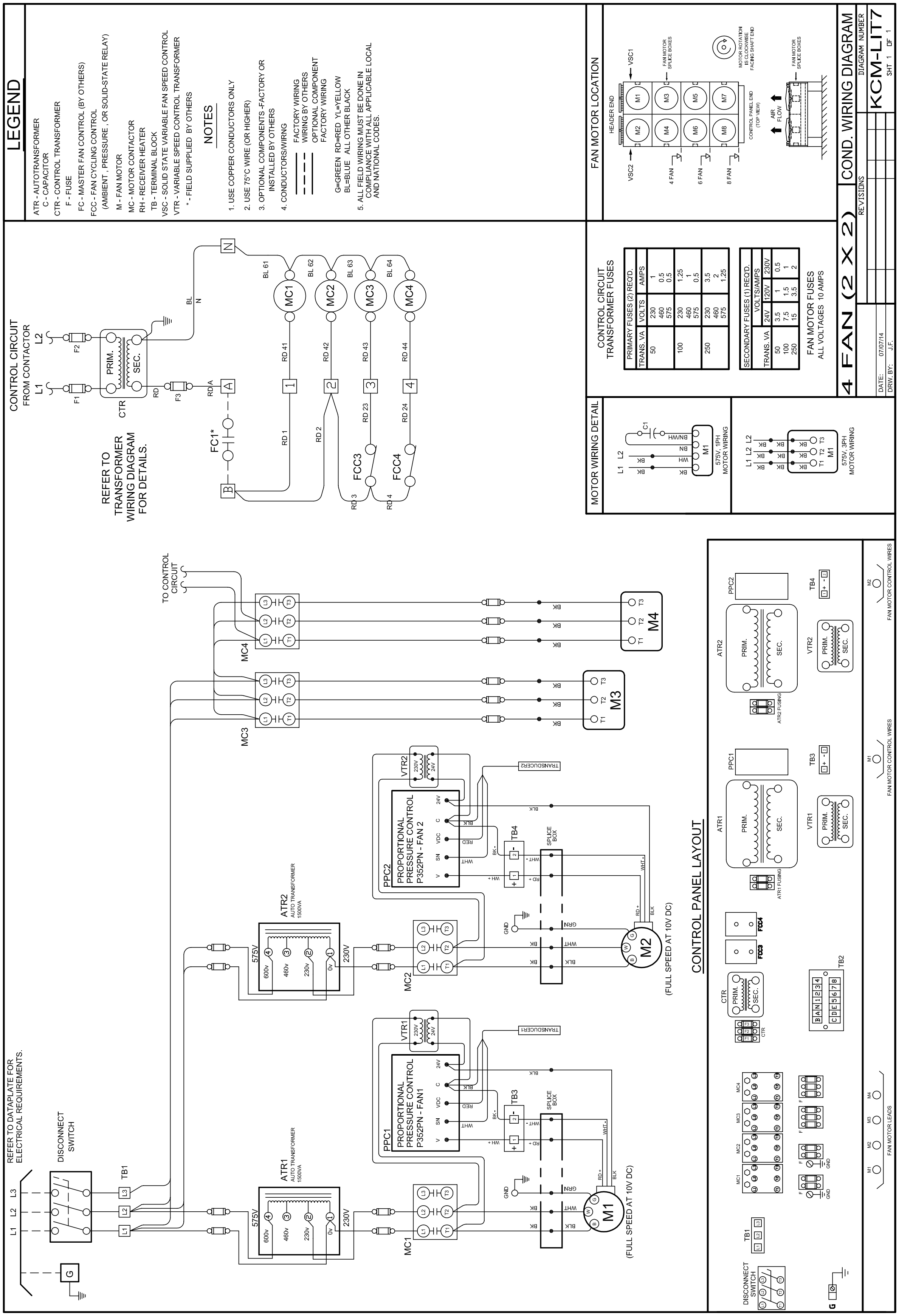
CONTROL CIRCUIT TRANSFORMER FUSES

PRIMARY FUSES (2) REQ'D.		
TRANS. VA	VOLTS	AMPS
50	230 460 575	1 0.5 0.5
100	230 460 575	1.25 1 0.5
250	230 460 575	3.5 2 1.25

SECONDARY FUSES (1) REQ'D.			
	VOLTS/AMPS		
TRANS. VA	24V	120V	230V
50	3.5	1	0.5
100	7.5	1.5	1
250	15	3.5	2

FAN MOTOR FUSES
ALL VOLTAGES 10 AMPS

WIRING DIAGRAM
(VARIABLE SPEED MOTOR(S) WITH CONTROLLER FOR HEADER FAN CONTROL - 575V MODELS)



Air cooled condensers utilizing electrically commutated motor (EC motor) technology offer many benefits; Improved Efficiency, Reduced Sound Levels, Speed Control, Simplicity and Reliability

Efficiency

The speed control function of an EC motor allows the condenser to run at optimized energy levels at different operating conditions. Up to 75% in energy savings can be realized when comparing the EC motor speed control method to a conventional fan cycling method. See table below for power consumption and energy savings comparisons.

Sound

As EC motor speeds vary for different operating conditions they also offer reduced sound levels when compared to conventional motor running full speed. Sound levels are reduced on cooler days and in evenings.

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Head Pressure Control

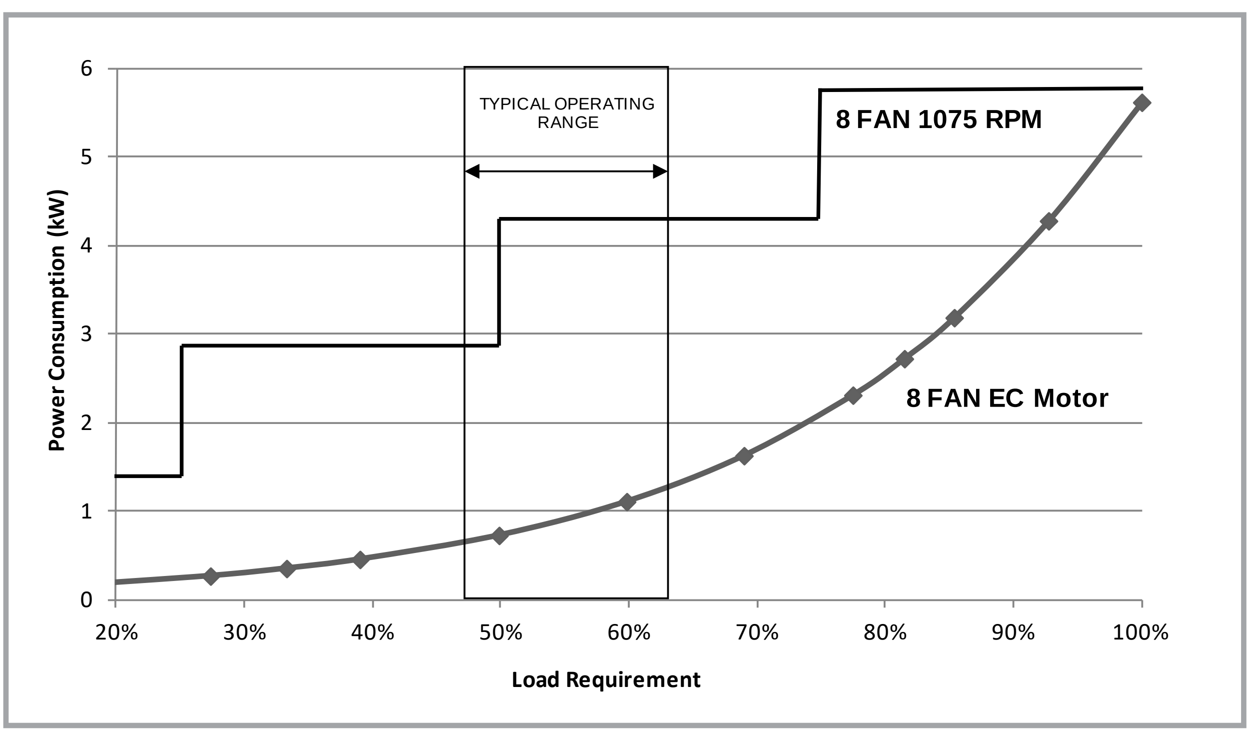
EC motors make it easier to maintaining stable head pressures when motor speeds are varied according to operating conditions. System optimization is further enhanced compared to the system shock from conventional cycling banks of fans off and on.

Simplicity and Reliability

The installation and control of EC motors is very simple compared to other methods of speed control used on conventional AC motors. Lower running operating temperatures and smooth transitional speed changes make EC motors durable and reliable.

POWER CONSUMPTION COMPARISON

8 Fan KCM Condenser with Electronically Commutated Motor
vs.
8 Fan Standard Motor 1075 RPM KCM Condenser
(Capacity: 46 MBH/TD)



ELECTRICAL DATA - OPTIONAL EC MOTORS

SINGLE ROW MODELS

MODEL KCM	# FANS	208-230/1/60			460/1/60			208-230/3/60 *			460/3/60 *		
		FLA	MCA	MOP	FLA	MCA	MOP	FLA	MCA	MOP	FLA	MCA	MOP
009	1	5.0	6.3	15	2.5	3.1	15	N/A	N/A	N/A	N/A	N/A	N/A
010	1	5.0	6.3	15	2.5	3.1	15	N/A	N/A	N/A	N/A	N/A	N/A
011	1	5.0	6.3	15	2.5	3.1	15	N/A	N/A	N/A	N/A	N/A	N/A
012	1	5.0	6.3	15	2.5	3.1	15	N/A	N/A	N/A	N/A	N/A	N/A
013	2	10.0	11.3	15	5.0	5.6	15	8.7	9.4	15	4.2	4.6	15
014	2	10.0	11.3	15	5.0	5.6	15	8.7	9.4	15	4.2	4.6	15
016	2	10.0	11.3	15	5.0	5.6	15	8.7	9.4	15	4.2	4.6	15
017	2	10.0	11.3	15	5.0	5.6	15	8.7	9.4	15	4.2	4.6	15
018	2	10.0	11.3	15	5.0	5.6	15	8.7	9.4	15	4.2	4.6	15
020	2	10.0	11.3	15	5.0	5.6	15	8.7	9.4	15	4.2	4.6	15
021	2	10.0	11.3	15	5.0	5.6	15	8.7	9.4	15	4.2	4.6	15
022	2	10.0	11.3	15	5.0	5.6	15	8.7	9.4	15	4.2	4.6	15
024	2	10.0	11.3	15	5.0	5.6	15	8.7	9.4	15	4.2	4.6	15
025	3	15.0	16.3	20	7.5	8.1	15	8.7	9.4	15	4.2	4.6	15
028	3	15.0	16.3	20	7.5	8.1	15	8.7	9.4	15	4.2	4.6	15
030	3	15.0	16.3	20	7.5	8.1	15	8.7	9.4	15	4.2	4.6	15
032	3	15.0	16.3	20	7.5	8.1	15	8.7	9.4	15	4.2	4.6	15
033	3	15.0	16.3	20	7.5	8.1	15	8.7	9.4	15	4.2	4.6	15
035	3	15.0	16.3	20	7.5	8.1	15	8.7	9.4	15	4.2	4.6	15
037	4	20.0	21.3	25	10.0	10.6	15	13.7	16.0	20	6.7	7.3	15
039	4	20.0	21.3	25	10.0	10.6	15	13.7	16.0	20	6.7	7.3	15
041	4	20.0	21.3	25	10.0	10.6	15	13.7	16.0	20	6.7	7.3	15
043	4	20.0	21.3	25	10.0	10.6	15	13.7	16.0	20	6.7	7.3	15
045	4	20.0	21.3	25	10.0	10.6	15	13.7	16.0	20	6.7	7.3	15
048	4	20.0	21.3	25	10.0	10.6	15	13.7	16.0	20	6.7	7.3	15

DOUBLE ROW MODELS

MODEL KCM	# FANS	208-230/1/60			460/1/60			208-230/3/60 *			460/3/60 *		
		FLA	MCA	MOP	FLA	MCA	MOP	FLA	MCA	MOP	FLA	MCA	MOP
034	4	20.0	21.3	25	10.0	10.6	15	13.7	16.0	20	6.7	7.3	15
036	4	20.0	21.3	25	10.0	10.6	15	13.7	16.0	20	6.7	7.3	15
040	4	20.0	21.3	25	10.0	10.6	15	13.7	16.0	20	6.7	7.3	15
042	4	20.0	21.3	25	10.0	10.6	15	13.7	16.0	20	6.7	7.3	15
044	4	20.0	21.3	25	10.0	10.6	15	13.7	16.0	20	6.7	7.3	15
047	4	20.0	21.3	25	10.0	10.6	15	13.7	16.0	20	6.7	7.3	15
051	6	30.0	36.0	40	15.0	15.6	20	17.4	21.0	25	8.4	8.8	15
056	6	30.0	36.0	40	15.0	15.6	20	17.4	21.0	25	8.4	8.8	15
060	6	30.0	36.0	40	15.0	15.6	20	17.4	21.0	25	8.4	8.8	15
063	6	30.0	36.0	40	15.0	15.6	20	17.4	21.0	25	8.4	8.8	15
066	6	30.0	36.0	40	15.0	15.6	20	17.4	21.0	25	8.4	8.8	15
070	6	30.0	36.0	40	15.0	15.6	20	17.4	21.0	25	8.4	8.8	15
073	8	40.0	46.0	50	20.0	20.6	25	26.1	31.0	35	13.0	16.0	20
078	8	40.0	46.0	50	20.0	20.6	25	26.1	31.0	35	13.0	16.0	20
082	8	40.0	46.0	50	20.0	20.6	25	26.1	31.0	35	13.0	16.0	20
086	8	40.0	46.0	50	20.0	20.6	25	26.1	31.0	35	13.0	16.0	20
090	8	40.0	46.0	50	20.0	20.6	25	26.1	31.0	35	13.0	16.0	20
095	8	40.0	46.0	50	20.0	20.6	25	26.1	31.0	35	13.0	16.0	20

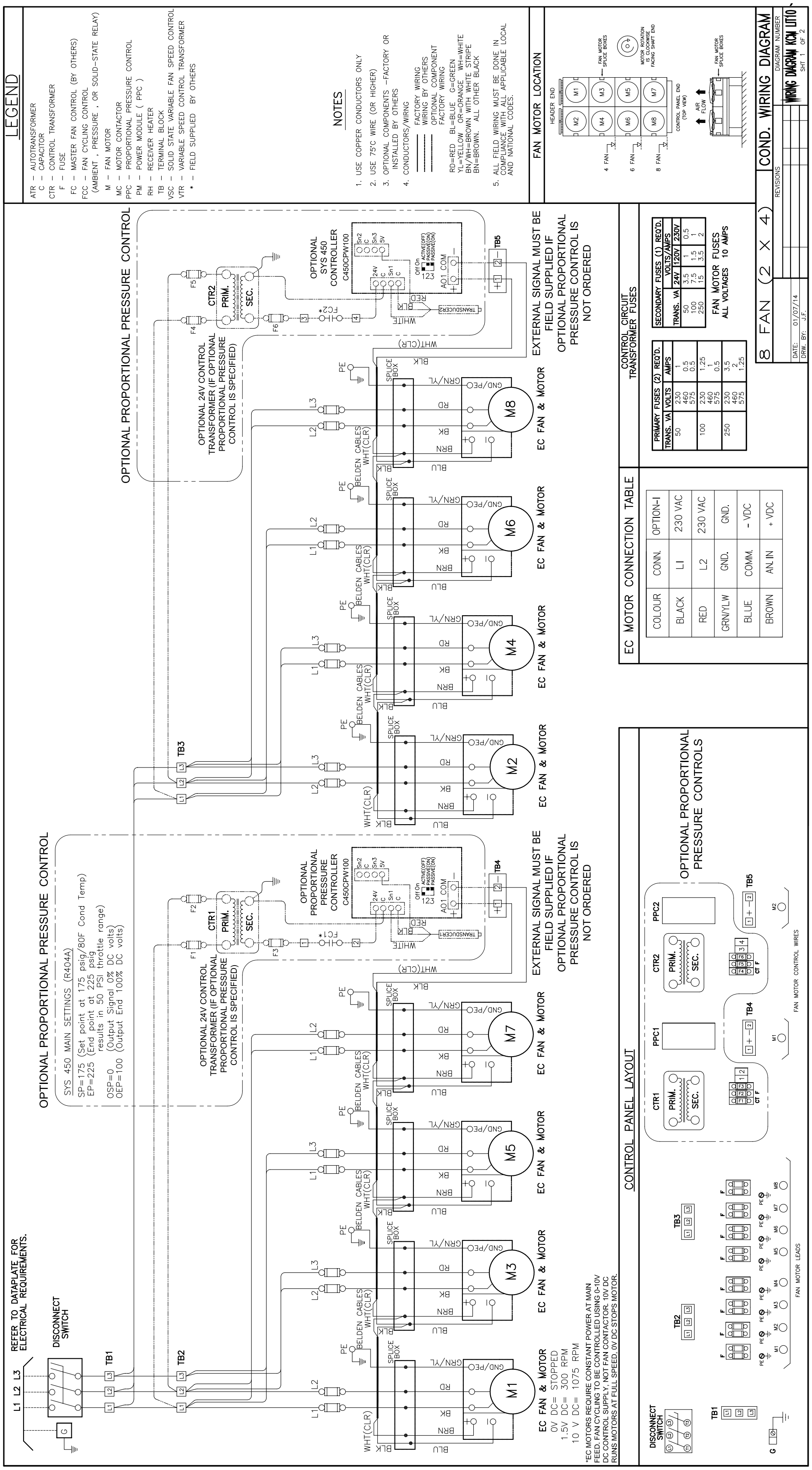
MCA = Minimum Circuit Ampacity
MOP = Maximum Overcurrent Protection

* Units use single phase motors that are phase split.

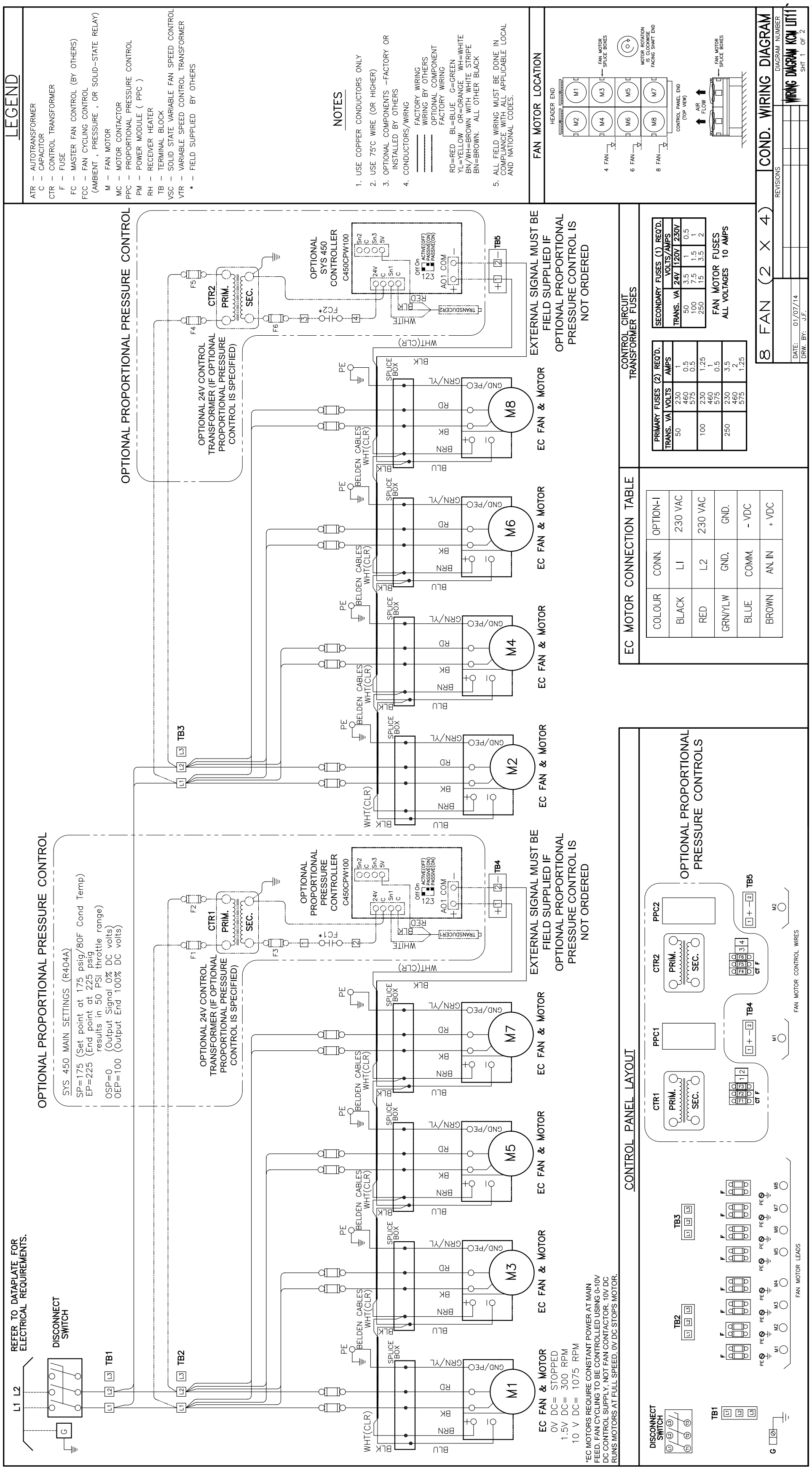
KCM

EC MOTOR WIRING
(THREE PHASE - DOUBLE ROW MODELS - ECM w/ OPTIONAL PROPORTIONAL PRESSURE CONTROL)

EC MOTORS
60Hz



EC MOTOR WIRING
(SINGLE PHASE - DOUBLE ROW MODELS - ECM w/ OPTIONAL PROPORTIONAL PRESSURE CONTROL)



Motors With Built-in Variable Speed –
Optional "M" Fan/Motor Code
(see Nomenclature, pg. 2)

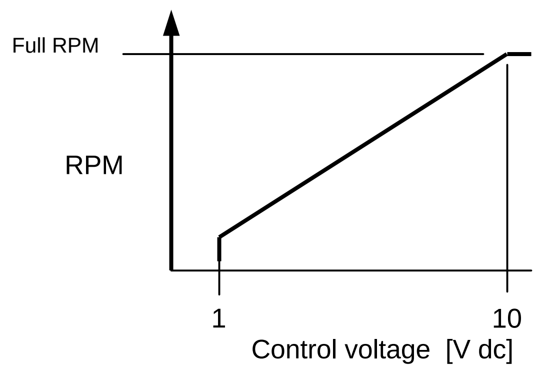
Units with a "M" motor designation use EC motor only with a removeable fan blade. Ideally the motors on the condenser should all be EC and simultaneously slow down/speed up together. This provides for maximum energy savings. However some applications may exist where just the last fan or pair of fans (ones closest to header) are solely EC motors. (The remaining conventional type motors are then cycled off by fan cycling pressure controls).

Important Warnings:
(Please read before handling motors)

1. When connecting the unit to the power supply, dangerous voltages occur. Due to motor capacitor discharge time, do not open the motor within 5 minutes after disconnection of all phases.
2. With a Control voltage fed in or a set speed value being saved, the motor will restart automatically after a power failure.
3. Dangerous external voltages can be present at the motor terminals even when the unit is turned off.
4. The Electronics housing can get hot.
5. The cycling on and off of EC motors should be controlled by the DC control voltage (i.e. 10V DC will turn motor off). Excessive cycling of the motor by line voltage contactors may cause stress on the motors and reduce the motor life.

Speed adjustment Characteristics

The EC motor varies its speed linearly based on a 1-10V input signal. At 10 VDC, the motor runs at full speed. At 0 to approx. 1 VDC, the motor turns off. A chart of the speed control curve is shown below. The motor can be controlled at any speed below its nominal RPM.



Control Signal

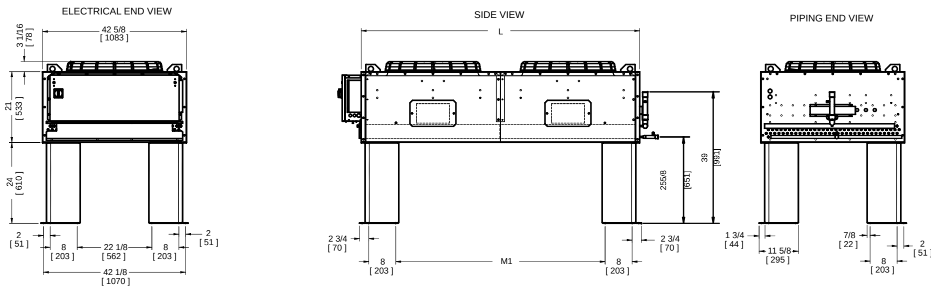
The input control signal can be supplied by an external control signal or from a factory installed proportional pressure control. Units with factory installed proportional pressure controls require no installation wiring and are adjusted with initial factory settings. These may require further adjustments to suit local field conditions.

External Control Signal (Supplied by others)

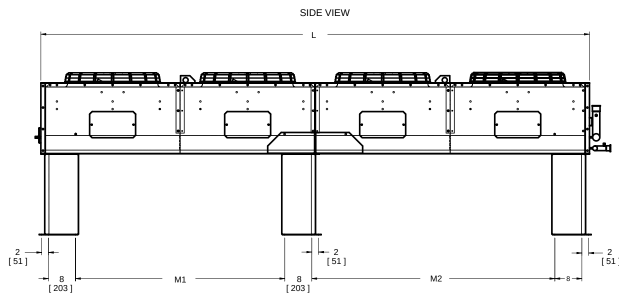
Contact control manufacturer for setup of external controller to provide a 0-10 VDC control signal. Wire the control signal to terminal board in unit control box. See EC diagrams on pages 17-18 for typical external signal control wiring.

DIMENSIONAL DATA - VERTICAL AIR - SINGLE ROW MODELS

1 - 3 FANS LONG



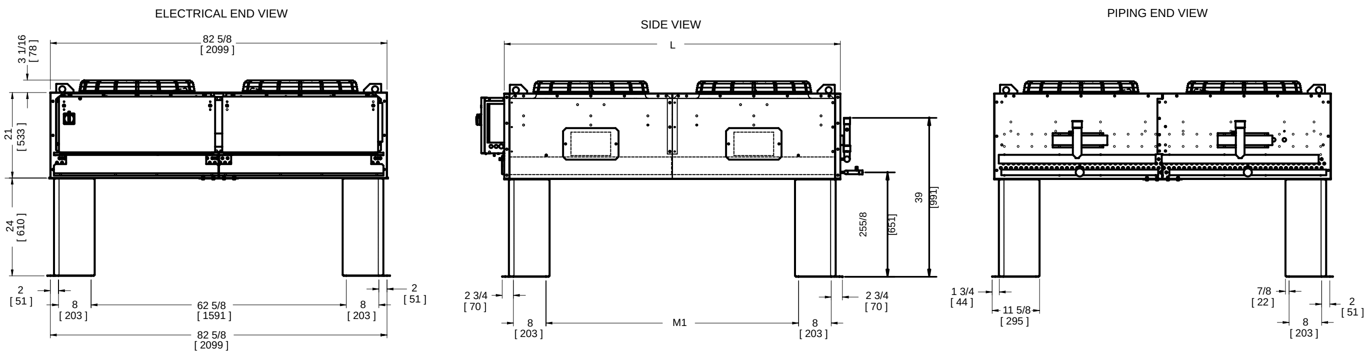
4 FANS LONG



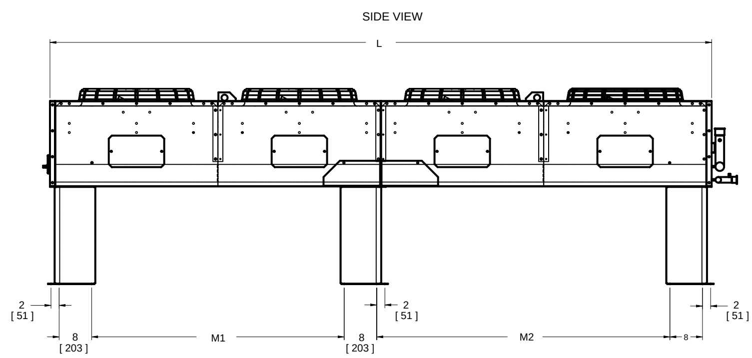
MODEL KCM	FANS LONG	L		M1		M2	
		Inches	mm	Inches	mm	Inches	mm
009	1	42½	*1080*	22	*559*	-	-
010							
011							
012							
013	2	82½	*2096*	62	*1575*	-	-
014							
016							
017							
018							
020							
021							
022							
024							
025	3	122½	*3112*	102	*2591*	-	-
028							
030							
032							
033							
035							
037	4	162½	*4162*	62	*1575*	72	*1829*
039							
041							
043							
045							
048							

DIMENSIONAL DATA - VERTICAL AIR - DOUBLE ROW MODELS

1 - 3 FANS LONG

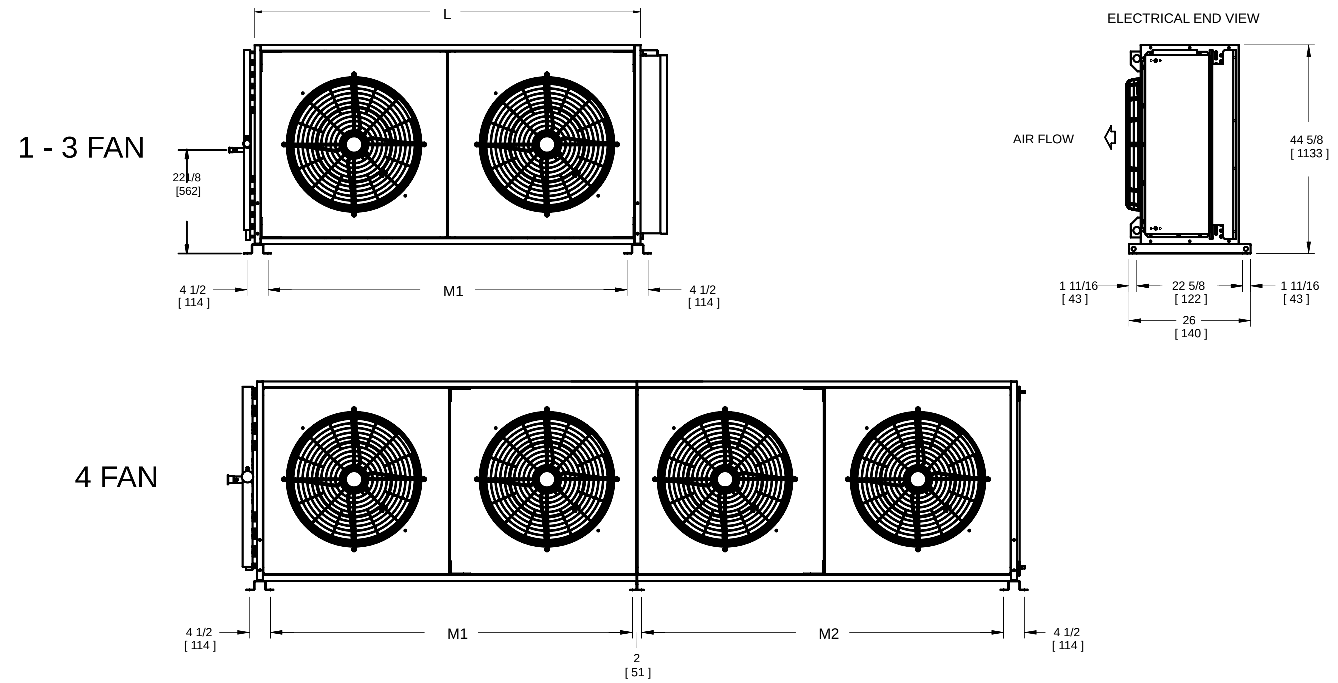


4 FANS LONG



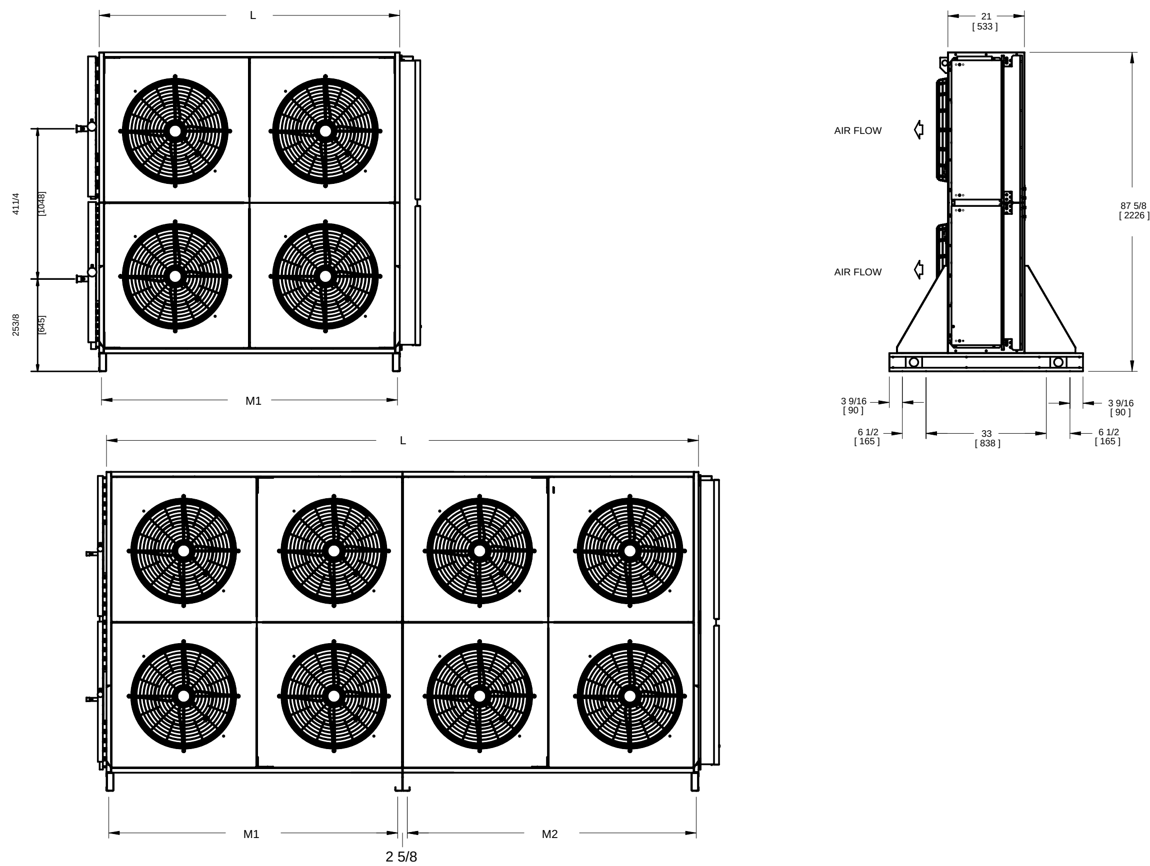
MODEL KCM	FANS LONG	L		M1		M2	
		Inches	*mm*	Inches	*mm*	Inches	*mm*
034	2	82½	*2096*	62	*1575*	-	-
036							
040							
042							
044							
047							
051	3	122½	*3112*	102	*2591*	-	-
056							
060							
063							
066							
070							
073	4	162½	*4128*	62	*1575*	72	*1829*
078							
082							
086							
090							
095							

DIMENSIONAL DATA - HORIZONTAL AIR - SINGLE ROW MODELS



<table>
<tr><th rowspan="2">MODEL KCM</th><th rowspan="2">FANS LONG</th><th colspan="2">L</th><th colspan="2">M1</th><th colspan="2">M2</th></tr>
<tr><th>Inches</th><th>mm</th><th>Inches</th><th>mm</th><th>Inches</th><th>mm</th></tr>
<tr><td>009</td><td rowspan="4">1</td><td rowspan="4">42½</td><td rowspan="4">1080</td><td rowspan="4">36¾</td><td rowspan="4">933</td><td rowspan="4">-</td><td rowspan="4">-</td></tr>
<tr><td>010</td></tr>
<tr><td>011</td></tr>
<tr><td>012</td></tr>
<tr><td>013</td><td rowspan="9">2</td><td rowspan="9">82½</td><td rowspan="9">2096</td><td rowspan="9">76¾</td><td rowspan="9">1949</td><td rowspan="9">-</td><td rowspan="9">-</td></tr>
<tr><td>014</td></tr>
<tr><td>016</td></tr>
<tr><td>017</td></tr>
<tr><td>018</td></tr>
<tr><td>020</td></tr>
<tr><td>021</td></tr>
<tr><td>022</td></tr>
<tr><td>024</td></tr>
<tr><td>025</td><td rowspan="6">3</td><td rowspan="6">122½</td><td rowspan="6">3112</td><td rowspan="6">116¾</td><td rowspan="6">2965</td><td rowspan="6">-</td><td rowspan="6">-</td></tr>
<tr><td>028</td></tr>
<tr><td>030</td></tr>
<tr><td>032</td></tr>
<tr><td>033</td></tr>
<tr><td>035</td></tr>
<tr><td>037</td><td rowspan="6">4</td><td rowspan="6">162½</td><td rowspan="6">4128</td><td rowspan="6">77 3/8</td><td rowspan="6">1965</td><td rowspan="6">77 3/8</td><td rowspan="6">1965</td></tr>
<tr><td>039</td></tr>
<tr><td>041</td></tr>
<tr><td>043</td></tr>
<tr><td>045</td></tr>
<tr><td>048</td></tr>
</table>

DIMENSIONAL DATA - HORIZONTAL AIR - DOUBLE ROW MODELS



MODEL KCM	FANS LONG	L		M1		M2	
		Inches	*mm*	Inches	*mm*	Inches	*mm*
034	2	82½	*2096*	81¼	*2064*	-	-
036							
040							
042							
044							
047							
051	3	122½	*3112*	121¼	*3080*	-	-
056							
060							
063							
066							
070							
073	4	162½	*4128*	79¼	*2015*	79 5/6	*2015*
078							
082							
086							
090							
095							

RECEIVER OPTIONS
SINGLE ROW MODELS

SINGLE CIRCUIT PER FAN WIDE

MODEL KCM	FAN LONG	OPTION 1							OPTION 2							OPTION 3						
		CAPACITY * R407A		DIAMETER		LENGTH		QTY.	CAPACITY * R407A		DIAMETER		LENGTH		QTY.	CAPACITY * R407A		DIAMETER		LENGTH		QTY.
		LBS	kg.	IN	mm	IN	mm		LBS	kg.	IN	mm	IN	mm		LBS	kg.	IN	mm	IN	mm	
009	1	27.3	(12.4)	6	152	30	762	1	41.8	(19.0)	6 5/8	168	36	914	1	67.0	(30.5)	8 5/8	219	36	914	1
010	1	27.3	(12.4)	6	152	30	762	1	41.8	(19.0)	6 5/8	168	36	914	1	67.0	(30.5)	8 5/8	219	36	914	1
011	1	27.3	(12.4)	6	152	30	762	1	41.8	(19.0)	6 5/8	168	36	914	1	67.0	(30.5)	8 5/8	219	36	914	1
012	1	27.3	(12.4)	6	152	30	762	1	41.8	(19.0)	6 5/8	168	36	914	1	67.0	(30.5)	8 5/8	219	36	914	1
013	2	33.0	(15.0)	6	152	36	914	1	41.8	(19.0)	6 5/8	168	36	914	1	67.0	(30.5)	8 5/8	219	36	914	1
014	2	33.0	(15.0)	6	152	36	914	1	41.8	(19.0)	6 5/8	168	36	914	1	67.0	(30.5)	8 5/8	219	36	914	1
016	2	33.0	(15.0)	6	152	36	914	1	41.8	(19.0)	6 5/8	168	36	914	1	67.0	(30.5)	8 5/8	219	36	914	1
017	2	41.8	(19.0)	6 5/8	168	36	914	1	67.0	(30.5)	8 5/8	219	36	914	1	90.5	(41.1)	8 5/8	219	48	1219	1
018	2	41.8	(19.0)	6 5/8	168	36	914	1	67.0	(30.5)	8 5/8	219	36	914	1	90.5	(41.1)	8 5/8	219	48	1219	1
020	2	41.8	(19.0)	6 5/8	168	36	914	1	67.0	(30.5)	8 5/8	219	36	914	1	90.5	(41.1)	8 5/8	219	48	1219	1
021	2	67.0	(30.5)	8 5/8	219	36	914	1	90.5	(41.1)	8 5/8	219	48	1219	1	114	(51.8)	8 5/8	219	60	1524	1
022	2	67.0	(30.5)	8 5/8	219	36	914	1	90.5	(41.1)	8 5/8	219	48	1219	1	114	(51.8)	8 5/8	219	60	1524	1
024	2	67.0	(30.5)	8 5/8	219	36	914	1	90.5	(41.1)	8 5/8	219	48	1219	1	114	(51.8)	8 5/8	219	60	1524	1
025	3	67.0	(30.5)	8 5/8	219	36	914	1	90.5	(41.1)	8 5/8	219	48	1219	1	138	(62.6)	10 3/4	273	48	1219	1
028	3	67.0	(30.5)	8 5/8	219	36	914	1	90.5	(41.1)	8 5/8	219	48	1219	1	138	(62.6)	10 3/4	273	48	1219	1
030	3	67.0	(30.5)	8 5/8	219	36	914	1	90.5	(41.1)	8 5/8	219	48	1219	1	138	(62.6)	10 3/4	273	48	1219	1
032	3	78.8	(35.8)	8 5/8	219	42	1067	1	114	(51.8)	8 5/8	219	60	1524	1	174	(79.1)	10 3/4	273	60	1524	1
033	3	78.8	(35.8)	8 5/8	219	42	1067	1	114	(51.8)	8 5/8	219	60	1524	1	174	(79.1)	10 3/4	273	60	1524	1
035	3	78.8	(35.8)	8 5/8	219	42	1067	1	114	(51.8)	8 5/8	219	60	1524	1	174	(79.1)	10 3/4	273	60	1524	1
037	4	90.5	(41.1)	8 5/8	219	48	1219	1	138	(62.6)	10 3/4	273	48	1219	1	210	(95.5)	10 3/4	273	72	1829	1
039	4	90.5	(41.1)	8 5/8	219	48	1219	1	138	(62.6)	10 3/4	273	48	1219	1	210	(95.5)	10 3/4	273	72	1829	1
041	4	90.5	(41.1)	8 5/8	219	48	1219	1	138	(62.6)	10 3/4	273	48	1219	1	210	(95.5)	10 3/4	273	72	1829	1
043	4	114	(51.8)	8 5/8	219	60	1524	1	174	(79.1)	10 3/4	273	60	1524	1	282	(128)	10 3/4	273	96	2438	1
045	4	114	(51.8)	8 5/8	219	60	1524	1	174	(79.1)	10 3/4	273	60	1524	1	282	(128)	10 3/4	273	96	2438	1
048	4	114	(51.8)	8 5/8	219	60	1524	1	174	(79.1)	10 3/4	273	60	1524	1	282	(128)	10 3/4	273	96	2438	1

TWO EQUAL CIRCUITS PER FAN WIDE

MODEL KCM	FAN LONG	OPTION 1							OPTION 2							OPTION 3						
		CAPACITY * R407A		DIAMETER		LENGTH		QTY.	CAPACITY * R407A		DIAMETER		LENGTH		QTY.	CAPACITY * R407A		DIAMETER		LENGTH		QTY.
		LBS	kg.	IN	mm	IN	mm		LBS	kg.	IN	mm	IN	mm		LBS	kg.	IN	mm	IN	mm	
009	1	17.4	(7.92)	5	127	28	711	2	27.3	(12.4)	6	152	30	762	2	41.8	(19.0)	6 5/8	168	36	914	2
010	1	17.4	(7.92)	5	127	28	711	2	27.3	(12.4)	6	152	30	762	2	41.8	(19.0)	6 5/8	168	36	914	2
011	1	17.4	(7.92)	5	127	28	711	2	27.3	(12.4)	6	152	30	762	2	41.8	(19.0)	6 5/8	168	36	914	2
012	1	17.4	(7.92)	5	127	28	711	2	27.3	(12.4)	6	152	30	762	2	41.8	(19.0)	6 5/8	168	36	914	2
013	2	17.4	(7.92)	5	127	28	711	2	27.3	(12.4)	6	152	30	762	2	41.8	(19.0)	6 5/8	168	36	914	2
014	2	17.4	(7.92)	5	127	28	711	2	27.3	(12.4)	6	152	30	762	2	41.8	(19.0)	6 5/8	168	36	914	2
016	2	17.4	(7.92)	5	127	28	711	2	27.3	(12.4)	6	152	30	762	2	41.8	(19.0)	6 5/8	168	36	914	2
017	2	27.3	(12.4)	6	152	30	762	2	41.8	(19.0)	6 5/8	168	36	914	2	67.0	(30.5)	8 5/8	219	36	914	2
018	2	27.3	(12.4)	6	152	30	762	2	41.8	(19.0)	6 5/8	168	36	914	2	67.0	(30.5)	8 5/8	219	36	914	2
020	2	27.3	(12.4)	6	152	30	762	2	41.8	(19.0)	6 5/8	168	36	914	2	67.0	(30.5)	8 5/8	219	36	914	2
021	2	33.0	(15.0)	6	152	36	914	2	41.8	(19.0)	6 5/8	168	36	914	2	67.0	(30.5)	8 5/8	219	36	914	2
022	2	33.0	(15.0)	6	152	36	914	2	41.8	(19.0)	6 5/8	168	36	914	2	67.0	(30.5)	8 5/8	219	36	914	2
024	2	33.0	(15.0)	6	152	36	914	2	41.8	(19.0)	6 5/8	168	36	914	2	67.0	(30.5)	8 5/8	219	36	914	2
025	3	33.0	(15.0)	6	152	36	914	2	67.0	(30.5)	8 5/8	219	36	914	2	78.8	(35.8)	8 5/8	219	42	1067	2
028	3	33.0	(15.0)	6	152	36	914	2	67.0	(30.5)	8 5/8	219	36	914	2	78.8	(35.8)	8 5/8	219	42	1067	2
030	3	33.0	(15.0)	6	152	36	914	2	67.0	(30.5)	8 5/8	219	36	914	2	78.8	(35.8)	8 5/8	219	42	1067	2
032	3	41.8	(19.0)	6 5/8	168	36	914	2	67.0	(30.5)	8 5/8	219	36	914	2	90.5	(41.1)	8 5/8	219	48	1219	2
033	3	41.8	(19.0)	6 5/8	168	36	914	2	67.0	(30.5)	8 5/8	219	36	914	2	90.5	(41.1)	8 5/8	219	48	1219	2
035	3	41.8	(19.0)	6 5/8	168	36	914	2	67.0	(30.5)	8 5/8	219	36	914	2	90.5	(41.1)	8 5/8	219	48	1219	2
037	4	67.0	(30.5)	8 5/8	219	36	914	2	78.8	(35.8)	8 5/8	219	42	1067	2	114	(51.8)	8 5/8	219	60	1524	2
039	4	67.0	(30.5)	8 5/8	219	36	914	2	78.8	(35.8)	8 5/8	219	42	1067	2	114	(51.8)	8 5/8	219	60	1524	2
041	4	67.0	(30.5)	8 5/8	219	36	914	2	78.8	(35.8)	8 5/8	219	42	1067	2	114	(51.8)	8 5/8	219	60	1524	2
043	4	67.0	(30.5)	8 5/8	219	36	914	2	90.5	(41.1)	8 5/8	219	48	1219	2	114	(51.8)	8 5/8	219	60	1524	2
045	4	67.0	(30.5)	8 5/8	219	36	914	2	90.5	(41.1)	8 5/8	219	48	1219	2	114	(51.8)	8 5/8	219	60	1524	2
048	4	67.0	(30.5)	8 5/8	219	36	914	2	90.5	(41.1)	8 5/8	219	48	1219	2	114	(51.8)	8 5/8	219	60	1524	2

* Based on 90% full.

Refrigerant charge conversion factors:

R448A	R407C	R404A	R507	R22	R410A	R134a
0.96	1.0	0.91	0.91	1.05	0.92	1.06

- For R449A, use R448A data.

RECEIVER OPTIONS
DOUBLE ROW MODELS

SINGLE CIRCUIT PER FAN WIDE

MODEL KCM	FAN LONG	OPTION 1							OPTION 2							OPTION 3						
		CAPACITY * R407A		DIAMETER		LENGTH		QTY.	CAPACITY * R407A		DIAMETER		LENGTH		QTY.	CAPACITY * R407A		DIAMETER		LENGTH		QTY.
		LBS	kg.	IN	mm	IN	mm		LBS	kg.	IN	mm	IN	mm		LBS	kg.	IN	mm	IN	mm	
034	2	41.8	(19.0)	6 5/8	168	36	914	2	67.0	(30.5)	8 5/8	219	36	914	2	90.5	(41.1)	8 5/8	219	48	1219	2
036	2	41.8	(19.0)	6 5/8	168	36	914	2	67.0	(30.5)	8 5/8	219	36	914	2	90.5	(41.1)	8 5/8	219	48	1219	2
040	2	41.8	(19.0)	6 5/8	168	36	914	2	67.0	(30.5)	8 5/8	219	36	914	2	90.5	(41.1)	8 5/8	219	48	1219	2
042	2	67.0	(30.5)	8 5/8	219	36	914	2	90.5	(41.1)	8 5/8	219	48	1219	2	114	(51.8)	8 5/8	219	60	1524	2
044	2	67.0	(30.5)	8 5/8	219	36	914	2	90.5	(41.1)	8 5/8	219	48	1219	2	114	(51.8)	8 5/8	219	60	1524	2
047	2	67.0	(30.5)	8 5/8	219	36	914	2	90.5	(41.1)	8 5/8	219	48	1219	2	114	(51.8)	8 5/8	219	60	1524	2
051	3	67.0	(30.5)	8 5/8	219	36	914	2	90.5	(41.1)	8 5/8	219	48	1219	2	138	(62.6)	10 3/4	273	48	1219	2
056	3	67.0	(30.5)	8 5/8	219	36	914	2	90.5	(41.1)	8 5/8	219	48	1219	2	138	(62.6)	10 3/4	273	48	1219	2
060	3	67.0	(30.5)	8 5/8	219	36	914	2	90.5	(41.1)	8 5/8	219	48	1219	2	138	(62.6)	10 3/4	273	48	1219	2
063	3	78.8	(35.8)	8 5/8	219	42	1067	2	114	(51.8)	8 5/8	219	60	1524	2	174	(79.1)	10 3/4	273	60	1524	2
066	3	78.8	(35.8)	8 5/8	219	42	1067	2	114	(51.8)	8 5/8	219	60	1524	2	174	(79.1)	10 3/4	273	60	1524	2
070	3	78.8	(35.8)	8 5/8	219	42	1067	2	114	(51.8)	8 5/8	219	60	1524	2	174	(79.1)	10 3/4	273	60	1524	2
073	4	90.5	(41.1)	8 5/8	219	48	1219	2	138	(62.6)	10 3/4	273	48	1219	2	210	(95.5)	10 3/4	273	72	1829	2
078	4	90.5	(41.1)	8 5/8	219	48	1219	2	138	(62.6)	10 3/4	273	48	1219	2	210	(95.5)	10 3/4	273	72	1829	2
082	4	90.5	(41.1)	8 5/8	219	48	1219	2	138	(62.6)	10 3/4	273	48	1219	2	210	(95.5)	10 3/4	273	72	1829	2
086	4	114	(51.8)	8 5/8	219	60	1524	2	174	(79.1)	10 3/4	273	60	1524	2	282	(128)	10 3/4	273	96	2438	2
090	4	114	(51.8)	8 5/8	219	60	1524	2	174	(79.1)	10 3/4	273	60	1524	2	282	(128)	10 3/4	273	96	2438	2
095	4	114	(51.8)	8 5/8	219	60	1524	2	174	(79.1)	10 3/4	273	60	1524	2	282	(128)	10 3/4	273	96	2438	2

TWO EQUAL CIRCUITS PER FAN WIDE

MODEL KCM	FAN LONG	OPTION 1							OPTION 2							OPTION 3						
		CAPACITY * R407A		DIAMETER		LENGTH		QTY.	CAPACITY * R407A		DIAMETER		LENGTH		QTY.	CAPACITY * R407A		DIAMETER		LENGTH		QTY.
		LBS	kg.	IN	mm	IN	mm		LBS	kg.	IN	mm	IN	mm		LBS	kg.	IN	mm	IN	mm	
034	2	27.5	(12.4)	6	152	30	762	4	41.8	(19.0)	6 5/8	168	36	914	4	67.0	(30.5)	8 5/8	219	36	914	4
036	2	27.5	(12.4)	6	152	30	762	4	41.8	(19.0)	6 5/8	168	36	914	4	67.0	(30.5)	8 5/8	219	36	914	4
040	2	27.5	(12.4)	6	152	30	762	4	41.8	(19.0)	6 5/8	168	36	914	4	67.0	(30.5)	8 5/8	219	36	914	4
042	2	33.0	(15.0)	6	152	36	914	4	41.8	(19.0)	6 5/8	168	36	914	4	67.0	(30.5)	8 5/8	219	36	914	4
044	2	33.0	(15.0)	6	152	36	914	4	41.8	(19.0)	6 5/8	168	36	914	4	67.0	(30.5)	8 5/8	219	36	914	4
047	2	33.0	(15.0)	6	152	36	914	4	41.8	(19.0)	6 5/8	168	36	914	4	67.0	(30.5)	8 5/8	219	36	914	4
051	3	33.0	(15.0)	6	152	36	914	4	67.1	(30.5)	8 5/8	219	36	914	4	78.8	(35.8)	8 5/8	219	42	1067	4
056	3	33.0	(15.0)	6	152	36	914	4	67.1	(30.5)	8 5/8	219	36	914	4	78.8	(35.8)	8 5/8	219	42	1067	4
060	3	33.0	(15.0)	6	152	36	914	4	67.1	(30.5)	8 5/8	219	36	914	4	78.8	(35.8)	8 5/8	219	42	1067	4
063	3	41.8	(19.0)	6 5/8	168	36	914	4	67.1	(30.5)	8 5/8	219	36	914	4	90.5	(41.1)	8 5/8	219	48	1219	4
066	3	41.8	(19.0)	6 5/8	168	36	914	4	67.1	(30.5)	8 5/8	219	36	914	4	90.5	(41.1)	8 5/8	219	48	1219	4
070	3	41.8	(19.0)	6 5/8	168	36	914	4	67.1	(30.5)	8 5/8	219	36	914	4	90.5	(41.1)	8 5/8	219	48	1219	4
073	4	67.1	(30.5)	8 5/8	219	36	914	4	79.2	(35.8)	8 5/8	219	42	1067	4	114	(51.8)	8 5/8	219	60	1524	4
078	4	67.1	(30.5)	8 5/8	219	36	914	4	79.2	(35.8)	8 5/8	219	42	1067	4	114	(51.8)	8 5/8	219	60	1524	4
082	4	67.1	(30.5)	8 5/8	219	36	914	4	79.2	(35.8)	8 5/8	219	42	1067	4	114	(51.8)	8 5/8	219	60	1524	4
086	4	67.1	(30.5)	8 5/8	219	36	914	4	90.2	(41.1)	8 5/8	219	48	1219	4	138	(62.6)	10 3/4	273	48	1219	4
090	4	67.1	(30.5)	8 5/8	219	36	914	4	90.2	(41.1)	8 5/8	219	48	1219	4	138	(62.6)	10 3/4	273	48	1219	4
095	4	67.1	(30.5)	8 5/8	219	36	914	4	90.2	(41.1)	8 5/8	219	48	1219	4	138	(62.6)	10 3/4	273	48	1219	4

* Based on 90% full.

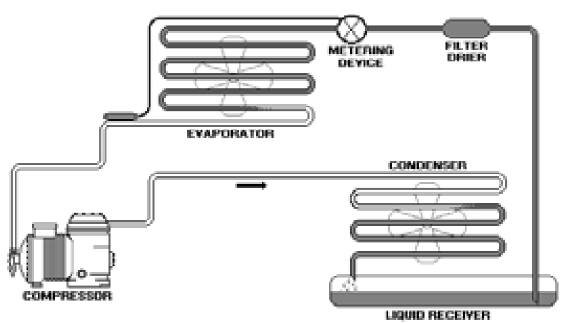
Refrigerant charge conversion factors:

R448A	R407C	R404A	R507	R22	R410A	R134a
0.96	1.0	0.91	0.91	1.05	0.92	1.06

- For R449A, use R448A data.

CONDENSER THEORY

THE BASIC REFRIGERATION CYCLE



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.

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°F** *(48.9 °C)* condensing temperature in a **90°F** *(32.2°C)* ambient will have a condenser balance point of **30°F** *(-1.1°C)* 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.

GLOSSARY OF TERMS (cont'd)

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.

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.

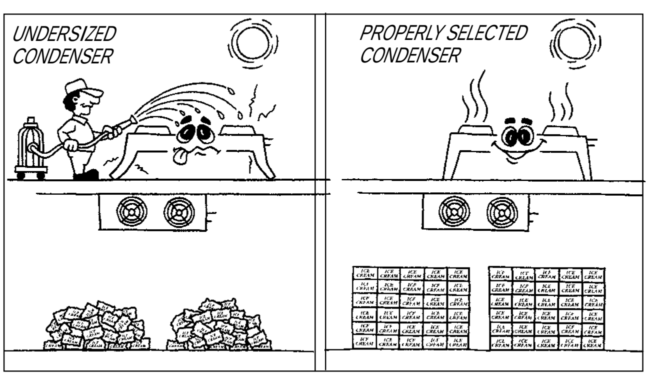
Subcool - to reduce a refrigerant's temperature below its saturation point or bubble point. Subcooling of the refrigerant is necessary in order to maintain a solid column of liquid at the inlet to the metering device. Subcooling can take place naturally (in the condenser) or it can be accomplished by 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 newbalance point. As the CT increases, the operating temperature difference (TD) of 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

PRELIMINARY DATA REQUIREMENTS

There are several factors that influence the size of an aircooled 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°F**, *(5.5°C, 8.3°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°F** *(5.5 + 35 = 40.5°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°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.

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 compensate 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° 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.

GENERAL
When air-cooled condensers are installed outdoors, they will be subjected to varying ambient temperatures. This variance could be as much as 120°F *(48.9 °C)* of swing throughout the summer and winter seasons and will have a major impact on the performance of the condenser. As the ambient temperature drops, the condenser capacity will increase due to the wider temperature difference between ambient and condensing temperature. As this happens, the condensing temperature will also drop as the system finds a new balance point. Although overall system capacity will increase, 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. This lower pressure drop will then decrease 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. To provide adequate pressure drop, some form of head pressure control is required. Refer to the following design methods (covered in order of simplicity and features).

(i) Fan Cycling (Multiple Fans)
Cycling of the condenser fans helps regulate the condensing temperature. Using this approach, as the ambient drops the fans are taken off-line either one at a time, or in pairs. With multiple fan condensers, it is not recommended to cycle more than two fans per step. The reason 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 regulate the condensing temperature as smoothly as possible. Fans should be cycled independently on single row condenser fan models. On double wide condensers, when used with a single refrigeration circuit, the fans should be cycled in pairs.

Ambient temperature or pressure sensing controls can be set to bring on (or off) certain fans when the outdoor temperature or condensing pressures reach a predetermined condition. Temperature or pressure set points and differentials should be correctly set to prevent short cycling of the fans. Constant short cycling will produce volatile condensing pressures, erratic refrigeration performance, decreased fan motor life, and added stress to the condenser tubes.

For recommended fan cycling switch settings, refer to Tables 4 and 5. Differential settings on fan cycling temperature controls should be no lower than 3.5°F *(2°C)*. On fan cycling pressure controls with R404A, a differential of approximately 35 psig is recommended. On supermarket applications remote condenser fans may be cycled individually (not in pairs) and therefore lower differential settings may apply and will depend on the specific application.

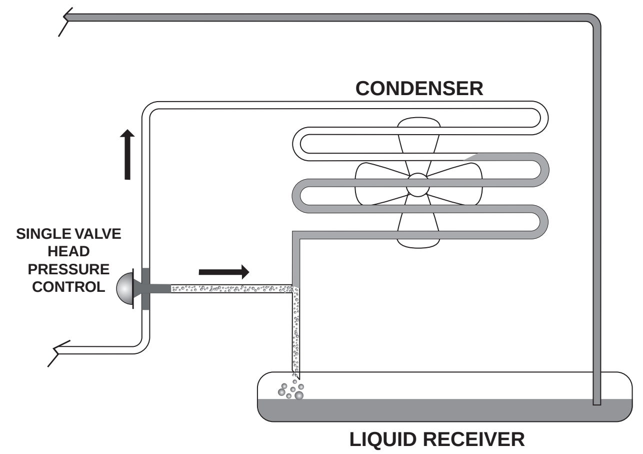
Fans closest to the inlet header must run whenever the compressor is running and should NEVER be cycled since sudden stress changes placed on these inlet tubes and headers will dramatically shorten the life of the condenser. Table 1 shows the fan cycling configurations and options available for all remote condenser models.

(ii) Variable Motor Speed Control
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 EC motor varies the RPM of the motor depending on the temperature or pressure of the medium being sensed.

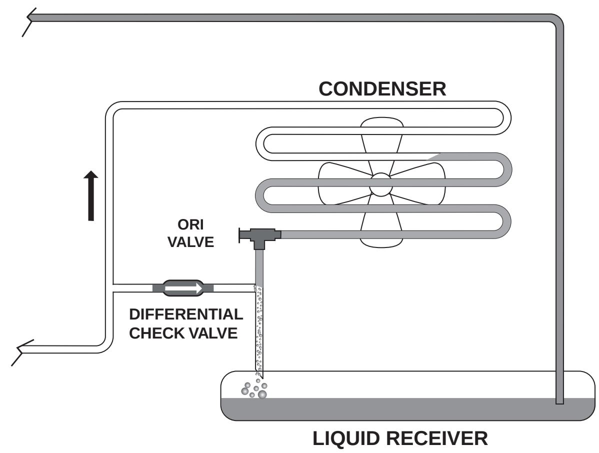
(iii) Refrigerant Regulating Controls
Pressure regulating controls are available from a number of valve manufacturers. The purpose of such a control is to regulate the refrigerant flow in such a way as to maintain a pre-selected condensing pressure. In lower ambient temperatures, these valves throttle 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.

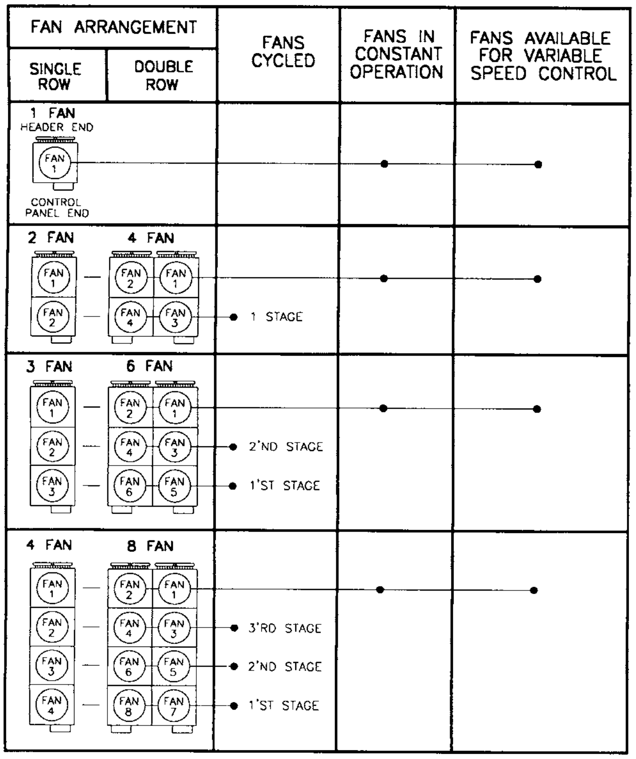
Systems equipped with a condenser flooding arrangement should always use a receiver having sufficient liquid holding capacity. Additional liquid required for flooding is only required during the winter low ambients and must be stored somewhere in the system at the higher ambients. Failure to use an adequately 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 pages 33-34 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 - MOTORS WITH BUILT-IN VARIABLE SPEED

TABLE 3 - FAN CYCLING CONTROL SCHEDULE



FAN CYCLING CONTROLS SHOULD BE SET TO MAINTAIN A MINIMUM OF (5) FIVE MINUTES ON AND (5) MINUTES OFF.

SHORT CYCLING FANS CAN RESULT IN PREMATURE FAILURE OF FAN BLADES AND/OR FAN MOTORS

TABLE 4 - AMBIENT FAN CYCLING THERMOSTAT CUT-OUT SETTINGS

NUMBER OF FANS ON CONDENSER		DESIGN T.D. °F *(°C)*	THERMOSTAT SETTINGS °F *(°C)*		
Single Row Models	**Double Row Models**		**1st Stage**	**2nd Stage**	**3rd Stage**
2	4	30 *(16.7)*	60 *(15.6)*		
		25 *(13.9)*	65 *(18.3)*		
		20 *(11.1)*	70 *(21.1)*		
		15 *(8.3)*	75 *(23.9)*		
		10 *(5.6)*	80 *(26.7)*		
3	6	30 *(16.7)*	60 *(15.6)*	40 *(4.4)*	
		25 *(13.9)*	65 *(18.3)*	55 *(12.8)*	
		20 *(11.1)*	70 *(21.1)*	60 *(15.6)*	
		15 *(8.3)*	75 *(23.9)*	65 *(18.3)*	
		10 *(5.6)*	80 *(26.7)*	75 *(23.9)*	
4	8	30 *(16.7)*	60 *(15.6)*	50 *(10.0)*	30 *(-1.1)*
		25 *(13.9)*	65 *(18.3)*	55 *(12.8)*	40 *(4.4)*
		20 *(11.1)*	70 *(21.1)*	60 *(15.6)*	50 *(10.0)*
		15 *(8.3)*	75 *(23.9)*	65 *(18.3)*	60 *(15.6)*
		10 *(5.6)*	80 *(26.7)*	75 *(23.9)*	70 *(21.1)*

TABLE 5 - PRESSURE FAN CYCLING CUT-IN CONTROL SETTINGS

NUMBER OF FANS ON CONDENSER		DESIGN T.D.	REFRIGERANT	CONTROL SETTINGS - PSIG Pressure Switch Cut-In Settings		
Single Row Models	**Double Row Models**			**1st Stage**	**2nd Stage**	**3rd Stage**
2	**4**	20	R134a	147		
			R22	215		
			R448A R407A R407C R404A R507	220		
3	**6**	20	R134a	147	155	
			R22	215	245	
			R448A R407A R407C R404A R507	220	247	
4	**8**	20	R134a	147	155	160
			R22	215	231	247
			R448A R407A R407C R404A R507	220	238	255

LOW AMBIENT OPERATION - R407A IMPERIAL

SINGLE ROW MODELS

R407A WINTER OPERATION CHARGE - LBS																							
MODEL KCM	FANS LONG	NO. OF FEEDS	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
009	1	8	4.1	3.3	4.5	5.3	5.6	5.9	4.1	5.2	5.7	6.1	6.3	5.0	5.7	6.2	6.4	6.5	5.7	6.3	6.6	6.7	6.8
010	1	8	4.1	3.3	4.5	5.3	5.6	5.9	4.1	5.2	5.7	6.1	6.3	5.0	6.6	6.2	6.4	6.5	5.7	6.3	6.6	6.7	6.8
011	1	8	5.0	4.4	6.1	6.9	7.5	7.9	5.5	6.8	7.5	8.0	8.3	6.6	8.8	8.1	8.5	8.7	7.7	8.4	8.7	8.9	9.0
012	1	8	5.0	4.4	6.1	6.9	7.5	7.9	5.5	6.8	7.5	8.0	8.3	6.6	8.8	8.1	8.5	8.7	7.7	8.4	8.7	8.9	9.0
013	2	10	5.7	0	6.6	10	12	14	5.4	10	13	14	17	8.7	13	15	17	18	13	17	19	20	21
014	2	10	5.7	0	6.6	10	12	14	5.4	10	13	14	17	8.7	13	15	17	18	13	17	19	20	21
016	2	10	5.7	0	6.6	10	12	14	5.4	10	13	14	17	8.7	13	15	17	18	13	17	19	20	21
017	2	16	7.8	0	10	14	18	20	7.4	14	18	20	22	12	18	21	23	25	19	22	25	28	29
018	2	16	7.8	0	10	14	18	20	7.4	14	18	20	22	12	18	21	23	25	19	22	25	28	29
020	2	16	7.8	0	10	14	18	20	7.4	14	18	20	22	12	18	21	23	25	19	22	25	28	29
021	2	16	9.7	0	12	18	22	24	9.2	18	22	25	28	15	22	25	29	31	23	28	31	34	36
022	2	16	9.7	0	12	18	22	24	9.2	18	22	25	28	15	22	25	29	31	23	28	31	34	36
024	2	16	9.7	0	12	18	22	24	9.2	18	22	25	28	15	22	25	29	31	23	28	31	34	36
025	3	24	11.9	0	3.3	17	23	28	0	14	23	28	32	14	25	31	34	37	25	33	37	41	43
028	3	24	11.9	0	3.3	17	23	28	0	14	23	28	32	14	25	31	34	37	25	33	37	41	43
030	3	24	11.9	0	3.3	17	23	28	0	14	23	28	32	14	25	31	34	37	25	33	37	41	43
032	3	21	14.7	0	4.4	21	29	34	0	19	29	35	40	19	31	37	43	46	32	41	46	51	54
033	3	21	14.7	0	4.4	21	29	34	0	19	29	35	40	19	31	37	43	46	32	41	46	51	54
035	3	21	14.7	0	4.4	21	29	34	0	19	29	35	40	19	31	37	43	46	32	41	46	51	54
037	4	24	16.2	0	0	12	25	33	0	8.8	26	35	41	2.2	29	39	44	48	32	43	50	55	58
039	4	24	16.2	0	0	12	25	33	0	8.8	26	35	41	2.2	29	39	44	48	32	43	50	55	58
041	4	24	16.2	0	0	12	25	33	0	8.8	26	35	41	2.2	29	39	44	48	32	43	50	55	58
043	4	32	20.0	0	0	14	32	41	0	11	33	44	51	2.2	35	47	55	61	39	53	62	67	72
045	4	32	20.0	0	0	14	32	41	0	11	33	44	51	2.2	35	47	55	61	39	53	62	67	72
048	4	32	20.0	0	0	14	32	41	0	11	33	44	51	2.2	35	47	55	61	39	53	62	67	72

DOUBLE ROW MODELS

R407A WINTER OPERATION CHARGE - LBS																							
MODEL KCM	FANS LONG	NO. OF FEEDS	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
034	2	32	15.6	0	20	29	34	39	14	29	35	41	44	24	35	42	46	50	36	45	51	54	57
036	2	32	15.6	0	20	29	34	39	14	29	35	41	44	24	35	42	46	50	36	45	51	54	57
040	2	32	15.6	0	20	29	34	39	14	29	35	41	44	24	35	42	46	50	36	45	51	54	57
042	2	32	19.5	0	24	36	43	48	19	35	44	51	55	30	44	52	57	62	46	56	63	68	72
044	2	32	19.5	0	24	36	43	48	19	35	44	51	55	30	44	52	57	62	46	56	63	68	72
047	2	48	19.5	0	24	36	43	48	19	35	44	51	55	30	44	52	57	62	46	56	63	68	72
051	3	48	23.8	0	7.7	34	46	54	0.0	30	46	56	63	30	50	61	68	74	52	66	75	81	86
056	3	48	23.8	0	7.7	34	46	54	0.0	30	46	56	63	30	50	61	68	74	52	66	75	81	86
060	3	48	23.8	0	7.7	34	46	54	0.0	30	46	56	63	30	50	61	68	74	52	66	75	81	86
063	3	42	29.5	0	8.8	42	57	67	0.0	36	57	69	78	36	62	76	85	92	64	81	92	101	108
066	3	42	29.5	0	8.8	42	57	67	0.0	36	57	69	78	36	62	76	85	92	64	81	92	101	108
070	3	42	29.5	0	8.8	42	57	67	0.0	36	57	69	78	36	62	76	85	92	64	81	92	101	108
073	4	48	32.5	0	0	23	52	66	0.0	18	54	70	81	4	57	77	89	98	63	86	99	109	117
078	4	48	32.5	0	0	23	52	66	0	18	54	70	81	4	57	77	89	98	63	86	99	109	117
082	4	48	32.5	0	0	23	52	66	0	18	54	70	81	4	57	77	89	98	63	86	99	109	117
086	4	64	40.0	0	0	29	64	83	0	21	66	87	101	4	70	95	110	121	78	107	123	134	144
090	4	64	40.0	0	0	29	64	83	0	21	66	87	101	4	70	95	110	121	78	107	123	134	144
095	4	64	40.0	0	0	29	64	83	0	21	66	87	101	4	71	95	110	121	78	107	123	134	144

Refrigerant charge conversion factors:

R448A	R407C	R404A	R507	R22	R410A	R134a
0.96	1.0	0.91	0.91	1.05	0.92	1.06

- For R449A, use R448A data.

LOW AMBIENT OPERATION - R407A
METRIC

SINGLE ROW MODELS

R407A WINTER OPERATION CHARGE - kg																							
MODEL KCM	FANS LONG	NO. OF FEEDS	SUMMER CHARGE	ADDITIONAL WINTER CHARGE (kg)																			
				Design TD = 13.9					Design TD = 11.1					Design TD = 8.3					Design TD = 5.6				
				Ambient ° C					Ambient ° C					Ambient ° C					Ambient ° C				
			kg	4.4	-6.7	-17.8	-28.9	-40	4.4	-6.7	-17.8	-28.9	-40	4.4	-6.7	-17.8	-28.9	-40	4.4	-6.7	-17.8	-28.9	-40
009	1	8	1.9	1.5	2.1	2.4	2.5	2.8	1.9	2.3	2.5	2.8	2.9	2.2	2.6	2.8	2.9	3.0	2.6	2.9	3.0	3.1	3.1
010	1	8	1.9	1.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	3.3	2.2	3.3	3.3	3.3	3.3	2.2	3.3	3.3	3.3	3.3
011	1	8	2.3	2.2	3.3	3.3	3.3	3.3	2.2	3.3	3.3	3.3	3.3	3.3	4.4	3.3	3.3	4.4	3.3	3.3	4.4	4.4	4.4
012	1	8	2.3	2.2	3.3	3.3	3.3	3.3	2.2	3.3	3.3	3.3	3.3	3.3	4.4	3.3	3.3	4.4	3.3	3.3	4.4	4.4	4.4
013	2	10	2.5	0	3.3	4.4	5.5	6.6	2.2	4.4	5.5	6.6	7.7	4.4	5.5	6.6	7.7	7.7	6.6	7.7	8.8	8.8	10
014	2	10	2.5	0	3.3	4.4	5.5	6.6	2.2	4.4	5.5	6.6	7.7	4.4	5.5	6.6	7.7	7.7	6.6	7.7	8.8	8.8	10
016	2	10	2.5	0	3.3	4.4	5.5	6.6	2.2	4.4	5.5	6.6	7.7	4.4	5.5	6.6	7.7	7.7	6.6	7.7	8.8	8.8	10
017	2	16	3.5	0	4.4	6.6	7.7	8.8	3.3	6.6	7.7	8.8	10	5.5	7.7	10	10	11	8.8	10	11	12	13
018	2	16	3.5	0	4.4	6.6	7.7	8.8	3.3	6.6	7.7	8.8	10	5.5	7.7	10	10	11	8.8	10	11	12	13
020	2	16	3.5	0	4.4	6.6	7.7	8.8	3.3	6.6	7.7	8.8	10	5.5	7.7	10	10	11	8.8	10	11	12	13
021	2	16	4.4	0	5.5	7.7	10	11	4.4	7.7	10	11	12	6.6	10	12	13	14	10	13	14	15	17
022	2	16	4.4	0	5.5	7.7	10	11	4.4	7.7	10	11	12	6.6	10	12	13	14	10	13	14	15	17
024	2	16	4.4	0	5.5	7.7	10	11	4.4	7.7	10	11	12	6.6	10	12	13	14	10	13	14	15	17
025	3	24	5.4	0	1.1	7.7	11	12	0	6.6	11	13	14	6.6	11	14	15	17	12	15	17	19	20
028	3	24	5.4	0	1.1	7.7	11	12	0	6.6	11	13	14	6.6	11	14	15	17	12	15	17	19	20
030	3	24	5.4	0	1.1	7.7	11	12	0	6.6	11	13	14	6.6	11	14	15	17	12	15	17	19	20
032	3	21	6.7	0	2.2	10	13	15	0	8.8	13	15	18	8.8	14	18	20	21	14	19	21	23	24
033	3	21	6.7	0	2.2	10	13	15	0	8.8	13	15	18	8.8	14	18	20	21	14	19	21	23	24
035	3	21	6.7	0	2.2	9.9	13	15	0	8.8	13	15	18	8.8	14	18	20	21	14	19	21	23	24
037	4	24	7.4	0	0	5.5	12	15	0	4.4	12	17	19	1.1	13	18	20	22	14	20	23	25	26
039	4	24	7.4	0	0	5.5	12	15	0	4.4	12	17	19	1.1	13	18	20	22	14	20	23	25	26
041	4	24	7.4	0	0	5.5	12	15	0	4.4	12	17	19	1.1	13	18	20	22	14	20	23	25	26
043	4	32	9.1	0	0	6.6	14	19	0	4.4	15	20	23	1.1	17	22	25	28	18	24	28	31	33
045	4	32	9.1	0	0	6.6	14	19	0	4.4	15	20	23	1.1	17	22	25	28	18	24	28	31	33
048	4	32	9.1	0	0	6.6	14	19	0	4.4	15	20	23	1.1	17	22	25	28	18	24	28	31	33

DOUBLE ROW MODELS

R407A WINTER OPERATION CHARGE - kg																							
MODEL KCM	FANS LONG	NO. OF FEEDS	SUMMER CHARGE	ADDITIONAL WINTER CHARGE (kg)																			
				Design TD = 13.9					Design TD = 11.1					Design TD = 8.3					Design TD = 5.6				
				Ambient ° C					Ambient ° C					Ambient ° C					Ambient ° C				
			kg	4.4	-6.7	-17.8	-28.9	-40	4.4	-6.7	-17.8	-28.9	-40	4.4	-6.7	-17.8	-28.9	-40	4.4	-6.7	-17.8	-28.9	-40
034	2	32	7.0	0	9	13	15	18	6.6	13	17	19	20	11	15	19	21	22	17	21	23	24	26
036	2	32	7.0	0	9	13	15	18	6.6	13	17	19	20	11	15	19	21	22	17	21	23	24	26
040	2	32	7.0	0	9	13	15	18	6.6	13	17	19	20	11	15	19	21	22	17	21	23	24	26
042	2	32	8.8	0	11	17	20	22	8.8	17	20	23	25	13	20	23	26	29	21	25	29	31	33
044	2	32	8.8	0	11	17	20	22	8.8	17	20	23	25	13	20	23	26	29	21	25	29	31	33
047	2	48	8.8	0	11	17	20	22	8.8	17	20	23	25	13	20	23	26	29	21	25	29	31	33
051	3	48	11	0	3.3	15	21	24	0	13	21	25	29	13	23	28	31	34	23	30	34	37	40
056	3	48	11	0	3.3	15	21	24	0	13	21	25	29	13	23	28	31	34	23	30	34	37	40
060	3	48	11	0	3.3	15	21	24	0	13	21	25	29	13	23	28	31	34	23	30	34	37	40
063	3	42	13	0	4.4	19	26	31	0	17	26	32	35	17	29	34	39	42	29	37	42	46	48
066	3	42	13	0	4.4	19	26	31	0	17	26	32	35	17	29	34	39	42	29	37	42	46	48
070	3	42	13	0	4.4	19	26	31	0	17	26	32	35	17	29	34	39	42	29	37	42	46	48
073	4	48	15	0	0	11	23	30	0	7.7	24	32	37	2.2	26	35	41	44	29	40	45	50	53
078	4	48	15	0	0	11	23	30	0	7.7	24	32	37	2.2	26	35	41	44	29	40	45	50	53
082	4	48	15	0	0	11	23	30	0	7.7	24	32	37	2.2	26	35	41	44	29	40	45	50	53
086	4	64	18	0	0	13	29	37	0	10	30	40	46	2.2	32	43	50	55	35	48	56	62	65
090	4	64	18	0	0	13	29	37	0	10	30	40	46	2.2	32	43	50	55	35	48	56	62	65
095	4	64	18	0	0	13	29	37	0	10	30	40	46	2.2	32	43	50	55	35	48	56	62	65

Refrigerant charge conversion factors:

R448A	R407C	R404A	R507	R22	R410A	R134a
0.96	1.0	0.91	0.91	1.05	0.92	1.06

- For R449A, use R448A data.

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.

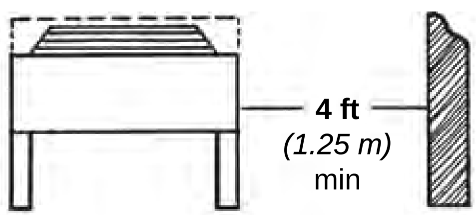
LOCATION

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.

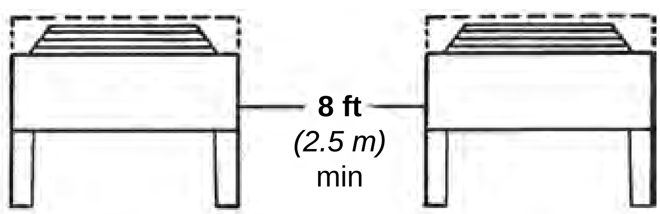
WALLS OR OBSTRUCTIONS

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.



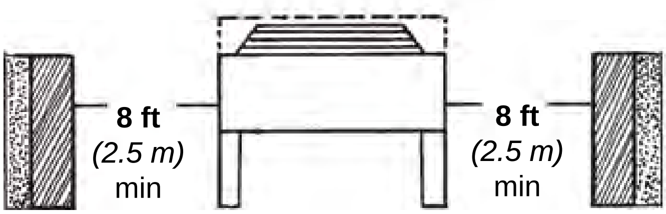
MULTIPLE UNITS

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)*.



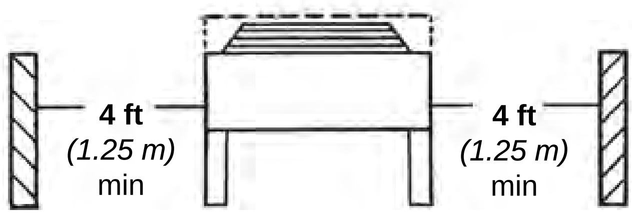
UNITS IN PITS

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.



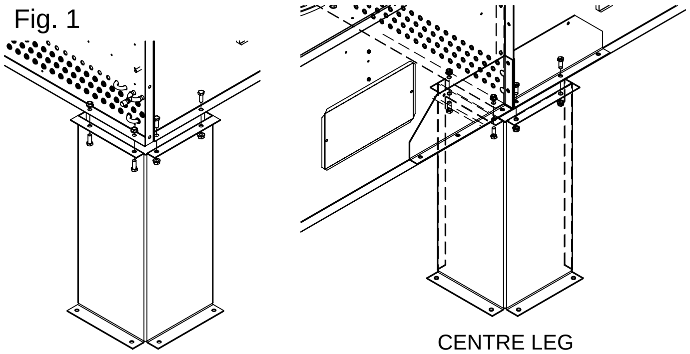
LOUVERS/FENCES

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.



LEG INSTALLATION INSTRUCTIONS

Fig. 1



CORNER LEG

CENTRE LEG
(R.H. SIDE FACING HEADER END SHOWN)
USED ON 4 FAN MODELS ONLY

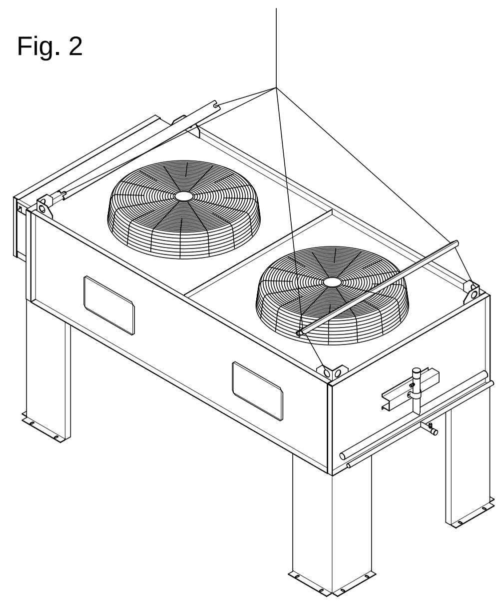
1) Assemble centere leg as shown.
Remove two bolts from bottom flange of unit side panels that match the hole pattern on the top flanges of both legs.
Attach center legs using hardware provided at center divider panel location.
Replace bolts that were removed from from side panels to secure leg assembly to bottom flanges of unit side panels.

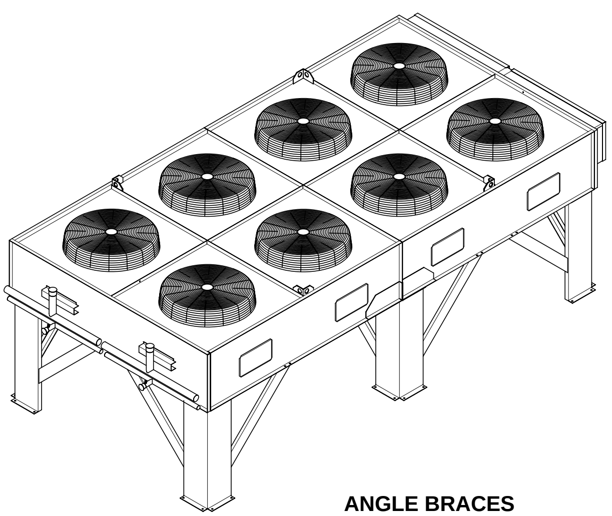
2) Assemble four corner legs to bottom flanges on unit side panels and end panels using hardware provided, at matching mounting hole patterns.
All legs are the same.

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.**

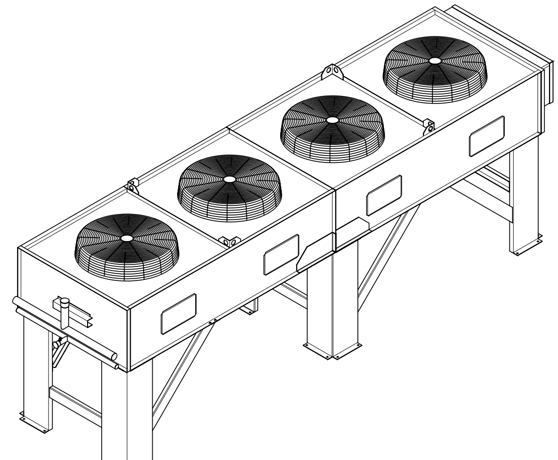
Ensure the unit is placed in a level position (to ensure proper drainage of liquid refrigerant and oil). The legs should be securely anchored to the building structure, sleeper or concrete pad. The weight of the condenser is not enough to hold in place during a strong wind, the legs must be anchored.

Fig. 2





ANGLE BRACES
LOCATE ANGLE BRACES AS SHOWN
FOR OPTIONAL 36” and 48” LEGS.



CROSS BRACES
LOCATE CROSS BRACES AS SHOWN
ON SINGLE FAN WIDE MODELS
FOR OPTIONAL 36” and 48” LEGS.

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.

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 8-14 for typical wiring diagrams). Refer to the Electrical Specifications table on page 5 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

The most effective way to prevent potential problems with this air cooled condenser is to have a **SEMI-ANNUAL INSPECTION** performed by a qualified refrigeration service mechanic.

1. **WHEN SERVICING EQUIPMENT, THE MAIN POWER SUPPLY MUST BE DISCONNECTED TO PREVENT POTENTIAL HAZARDOUS RISK.**
2. Check all electrical components for damage. Tighten any loose connections.
3. Check settings of all controls to ensure proper operation.
4. Look for any wear on wires or refrigerant lines that may have been caused by excessive vibrations or rubbing on metal parts
5. Short cycling fan motors can result in premature failure of the fan blades and/or motors. Failing to correct this problem may, over time, cause the rivets on fan blades to become loose. If this happens, the fan blade may crack or tear, causing extreme vibration, potentially triggering the motor and mounts to fail.
6. Check the tightness of all fan blades and motors. Remove any dirt or debris that could affect the balance of the fan blade.
7. Fan motors are permanently lubricated and require only visual inspection

Fig. 3 - 6

TYPICAL SYSTEM PIPING

Figure 3 - Single Circuit

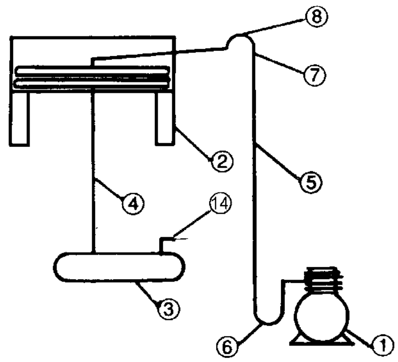


Figure 4(a) - Single circuit with double discharge riser (may be required with capacity control)

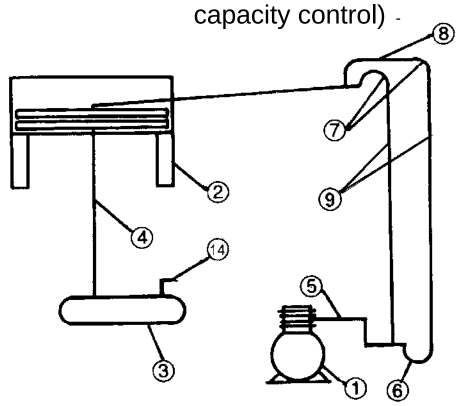


Figure 4(b) - Single circuit with Oil Separator (may be required with capacity control)

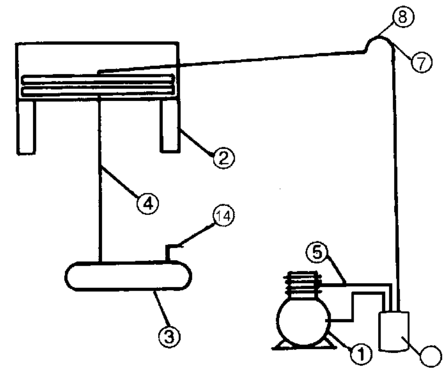


Figure 5 - Single circuit regulator valve head pressure control

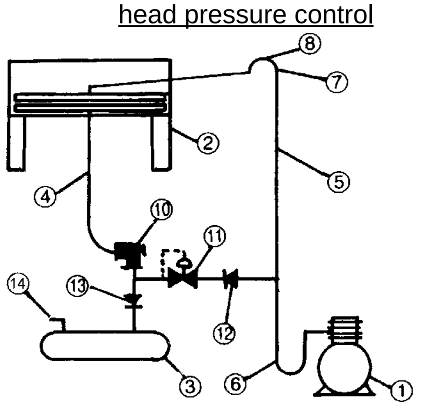
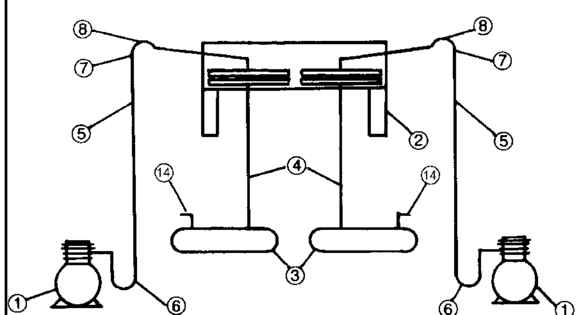


Figure 6 - Multiple circuits



LEGEND

1 - Compressor
2 - Air Cooled Condenser
3 - Receiver
4 - Condensate Line
5 - Discharge Line
6 - Trap-minimum 18” *(157 mm)*
7 - Reverse Trap-minimum 6” *(152 mm)*
8 - Access Schrader Valve
9 - Double Discharge Riser
10 - Head Pressure Regulator (open on rise of inlet)
11 - Receiver Pressure Regulator Valve (opens on rise of differential)
12 - Check Valve “A”
13 - Check Valve “B”
14 - Receiver Relief Valve
15 - Oil Separator

PROJECT INFORMATION

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

PRODUCT SUPPORT RESOURCES

PRODUCT SUPPORT

web: **k-rp.com/kcm**
email: **acc-fc@k-rp.com**
call: **1-844-893-3222 x526**

TROUBLESHOOTING

email: **troubleshooting@k-rp.com**
call: **1-844-893-3222 x529**

SERVICE PARTS

web: **k-rp.com/parts**
email: **parts@k-rp.com**
call: **1-844-893-3222 x526**

WARRANTY

web: **k-rp.com/warranty**
email: **warranty@k-rp.com**
call: **1-844-893-3222 x501**

ORDERS

email: **orders@k-rp.com**
call: **1-844-893-3222 x501**

SHIPPING

email: **shipping@k-rp.com**
call: **1-844-893-3222 x503**

“AS BUILT” SERVICE PARTS LIST

Service Parts List
Label
To Be Attached
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