TCS-Line Air Cooled Condensers

60 Hz

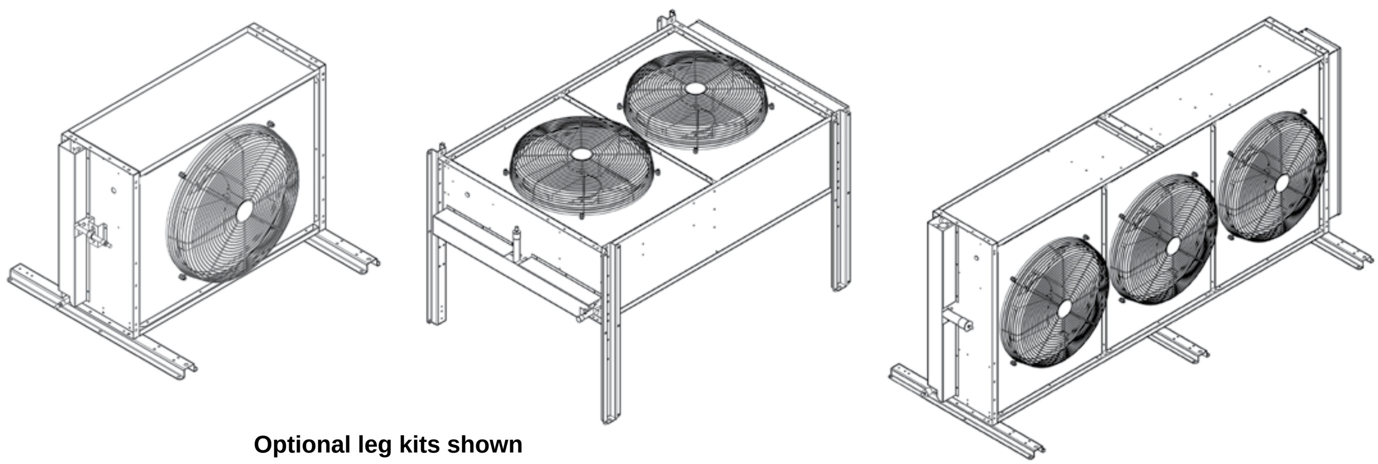
PRODUCT DATA & INSTALLATION

Bulletin T50-TCS-PDI-5
Part # 1085696

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

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



Optional leg kits shown

INCLUDES RATINGS FOR
LOW GWP
REFRIGERANTS

CONTENTS

23/06/17

NOMENCLATURE

T CS 005 - T3 A - XXXX

Brand Name:
T = Trenton

Product Name:
CS = Small Size Air Cooled Condenser

Nominal Capacity:
Tons @ 25°F TD, R404A

Optional Production Variations

Design Generation

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*
**3 Fan Models Only*

STANDARD FEATURES

- 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 Motors with Internal Overload Protection
- Unit shipped with Nitrogen Holding Charge

AVAILABLE OPTIONS

- Optional leg kits for horizontal and vertical configurations
- Multiple Refrigeration Circuits
- Ambient or Pressure Fan Cycling Control with Contactor
- Variable speed motor with controller for header fan motor
- Non-Fused Disconnect
- EC Motors
- Individual Fan Motor Fusing
- 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 for 60 Hz and 50 Hz

CAPACITY DATA

MODEL TCS	FAN CONFIG.	TOTAL HEAT OF REJECTION - MBH *(KW)* PER 1 °F *(0.56 °C)* TD									
		R407A R448A		R407C		R404A R507		R22 R410A		R134a	
002	1 x 1	**1.17**	*(0.34)*	**1.16**	*(0.34)*	**1.22**	*(0.36)*	**1.24**	*(0.36)*	**1.18**	*(0.35)*
003	1 x 1	**1.45**	*(0.42)*	**1.43**	*(0.42)*	**1.51**	*(0.44)*	**1.54**	*(0.45)*	**1.46**	*(0.43)*
005	1 x 1	**2.44**	*(0.72)*	**2.42**	*(0.71)*	**2.55**	*(0.75)*	**2.60**	*(0.76)*	**2.47**	*(0.72)*
006	1 x 1	**2.93**	*(0.86)*	**2.90**	*(0.85)*	**3.05**	*(0.90)*	**3.12**	*(0.91)*	**2.96**	*(0.87)*
008	1 x 1	**3.65**	*(1.07)*	**3.61**	*(1.06)*	**3.80**	*(1.11)*	**3.87**	*(1.14)*	**3.68**	*(1.08)*
010	1 x 2	**4.80**	*(1.41)*	**4.75**	*(1.39)*	**5.00**	*(1.46)*	**5.10**	*(1.49)*	**4.85**	*(1.42)*
012	1 x 2	**5.81**	*(1.70)*	**5.75**	*(1.69)*	**6.05**	*(1.77)*	**6.17**	*(1.81)*	**5.87**	*(1.72)*
014	1 x 2	**6.61**	*(1.94)*	**6.54**	*(1.92)*	**6.89**	*(2.02)*	**7.03**	*(2.06)*	**6.68**	*(1.96)*
016	1 x 2	**7.27**	*(2.13)*	**7.19**	*(2.11)*	**7.57**	*(2.22)*	**7.72**	*(2.26)*	**7.34**	*(2.15)*
019	1 x 3	**8.64**	*(2.53)*	**8.55**	*(2.51)*	**9.00**	*(2.64)*	**9.18**	*(2.69)*	**8.73**	*(2.56)*
024	1 x 3	**10.85**	*(3.18)*	**10.74**	*(3.15)*	**11.30**	*(3.31)*	**11.53**	*(3.38)*	**10.96**	*(3.21)*

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 for 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

MODEL TCS	FAN CONFIG.	MOTOR		208-230/1/60 (208-230/3/60)				460/1/60 (460/3/60)				575/1/60 (575/3/60)			
		HP	Qty.	FLA	MCA	MOP	WATTS	FLA	MCA	MOP	WATTS	FLA	MCA	MOP	WATTS
002	1 x 1	1/6	1	1.1	1.4	15	280	0.6	0.8	15	280	0.5	0.7	15	280
003	1 x 1	1/6	1	1.1	1.4	15	280	0.6	0.8	15	280	0.5	0.7	15	280
005	1 x 1	1/3	1	2.1	2.7	15	410	1.1	1.4	15	410	0.9	1.2	15	410
006	1 x 1	1/3	1	2.1	2.7	15	410	1.1	1.4	15	410	0.9	1.2	15	410
008	1 x 1	1/3	1	2.1	2.7	15	410	1.1	1.4	15	410	0.9	1.2	15	410
010	1 x 2	1/3	2	4.2	4.8	15	820	2.2	2.5	15	820	1.8	2.1	15	820
012	1 x 2	1/3	2	4.2	4.8	15	820	2.2	2.5	15	820	1.8	2.1	15	820
014	1 x 2	1/3	2	4.2	4.8	15	820	2.2	2.5	15	820	1.8	2.1	15	820
016	1 x 2	1/3	2	4.2	4.8	15	820	2.2	2.5	15	820	1.8	2.1	15	820
019	1 x 3	1/3	3	6.3 (3.6)	6.9 (4.6)	15	1230	3.3 (1.9)	3.6 (2.4)	15	1230	2.7 (1.6)	3.0 (2.0)	15	1230
024	1 x 3	1/3	3	6.3 (3.6)	6.9 (4.6)	15	1230	3.3 (1.9)	3.6 (2.4)	15	1230	2.7 (1.6)	3.0 (2.0)	15	1230

GENERAL SPECIFICATIONS

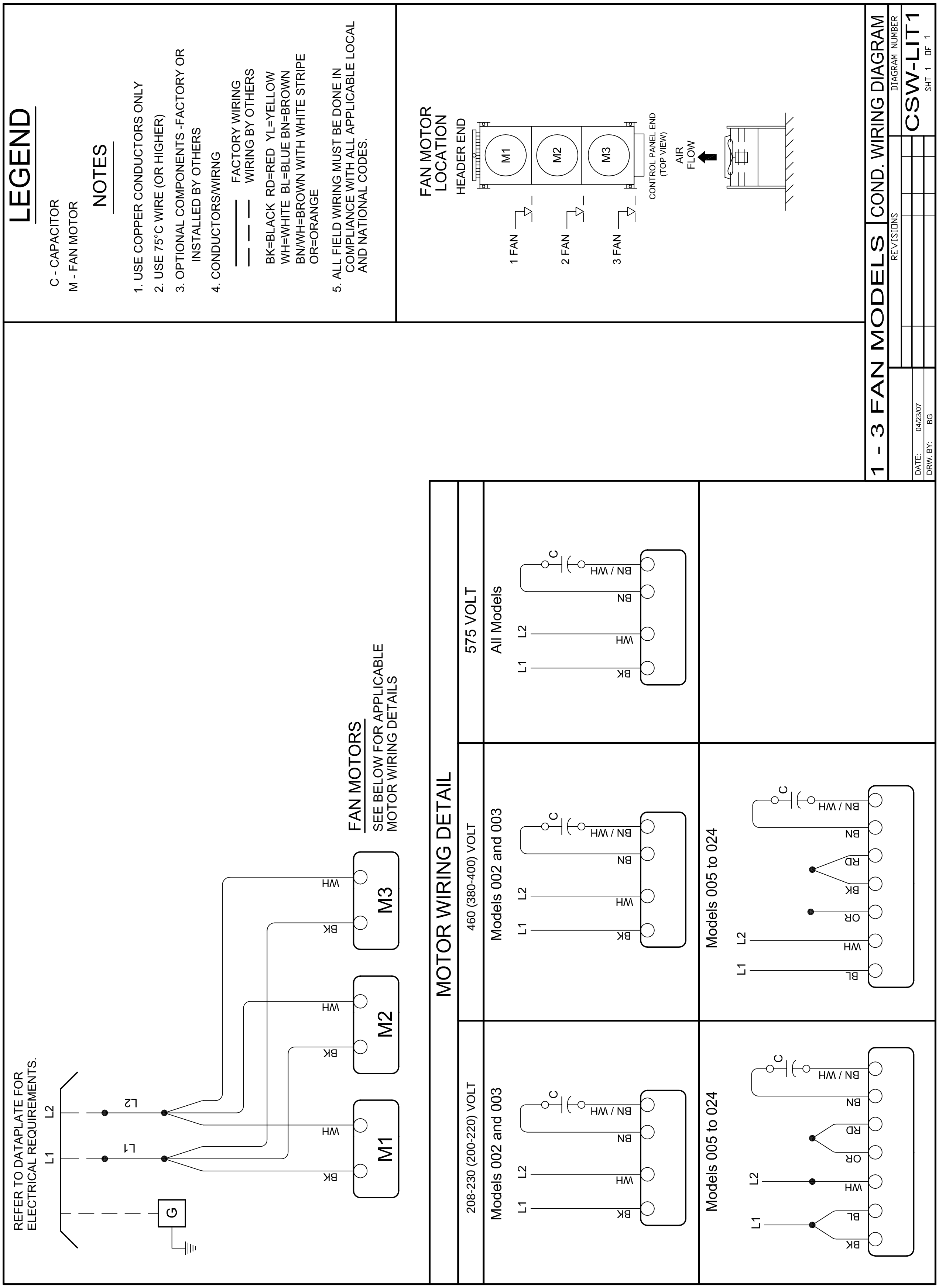
MODEL TCS	FAN CONFIG.	R407A REFRIG. CHARGE (1)				AIR FLOW		SOUND LEVEL (5) dBA		AVAIL. CIRCUITS	CONNECTION SIZES		APPROX. WEIGHT	
		NORMAL (2)		90% FULL (3)		CFM	*(l/s)*	DISCHARGE			INLET	OUTLET	LBS	*(kg)*
		LBS	*(kg)*	LBS	*(kg)*			VERT.	HORIZ.					
002	1 x 1	0.7	*(0.3)*	2.9	*(1.3)*	2180	*(1029)*	55	57	2	5/8	5/8	127	*(58)*
003	1 x 1	1.1	*(0.4)*	4.6	*(2.1)*	1950	*(920)*	55	57	2	5/8	5/8	131	*(59)*
005	1 x 1	1.4	*(0.7)*	6.4	*(2.9)*	4570	*(2157)*	60	61	3	7/8	5/8	150	*(68)*
006	1 x 1	2.1	*(1.0)*	9.4	*(4.3)*	4080	*(1925)*	60	61	4	7/8	5/8	157	*(71)*
008	1 x 1	3.2	*(1.4)*	14.1	*(6.4)*	4570	*(2157)*	60	61	5	1 1/8	7/8	197	*(89)*
010	1 x 2	3.1	*(1.4)*	13.8	*(6.3)*	9140	*(4313)*	62	64	6	1 1/8	7/8	254	*(115)*
012	1 x 2	4.4	*(2.0)*	19.7	*(8.9)*	8160	*(3851)*	62	64	9	1 1/8	7/8	269	*(122)*
014	1 x 2	5.9	*(2.6)*	26.7	*(12.1)*	9410	*(4441)*	62	64	9	1 3/8	7/8	305	*(138)*
016	1 x 2	5.9	*(2.6)*	26.7	*(12.1)*	9140	*(4313)*	63	65	9	1 3/8	7/8	325	*(147)*
019	1 x 3	6.8	*(3.1)*	30.5	*(13.8)*	12240	*(5776)*	63	65	15	1 5/8	1 1/8	381	*(173)*
024	1 x 3	8.9	*(4.1)*	40.0	*(18.2)*	13700	*(6465)*	63	65	15	1 5/8	1 1/8	447	*(203)*

(1) Refrigerant charge conversion factors:

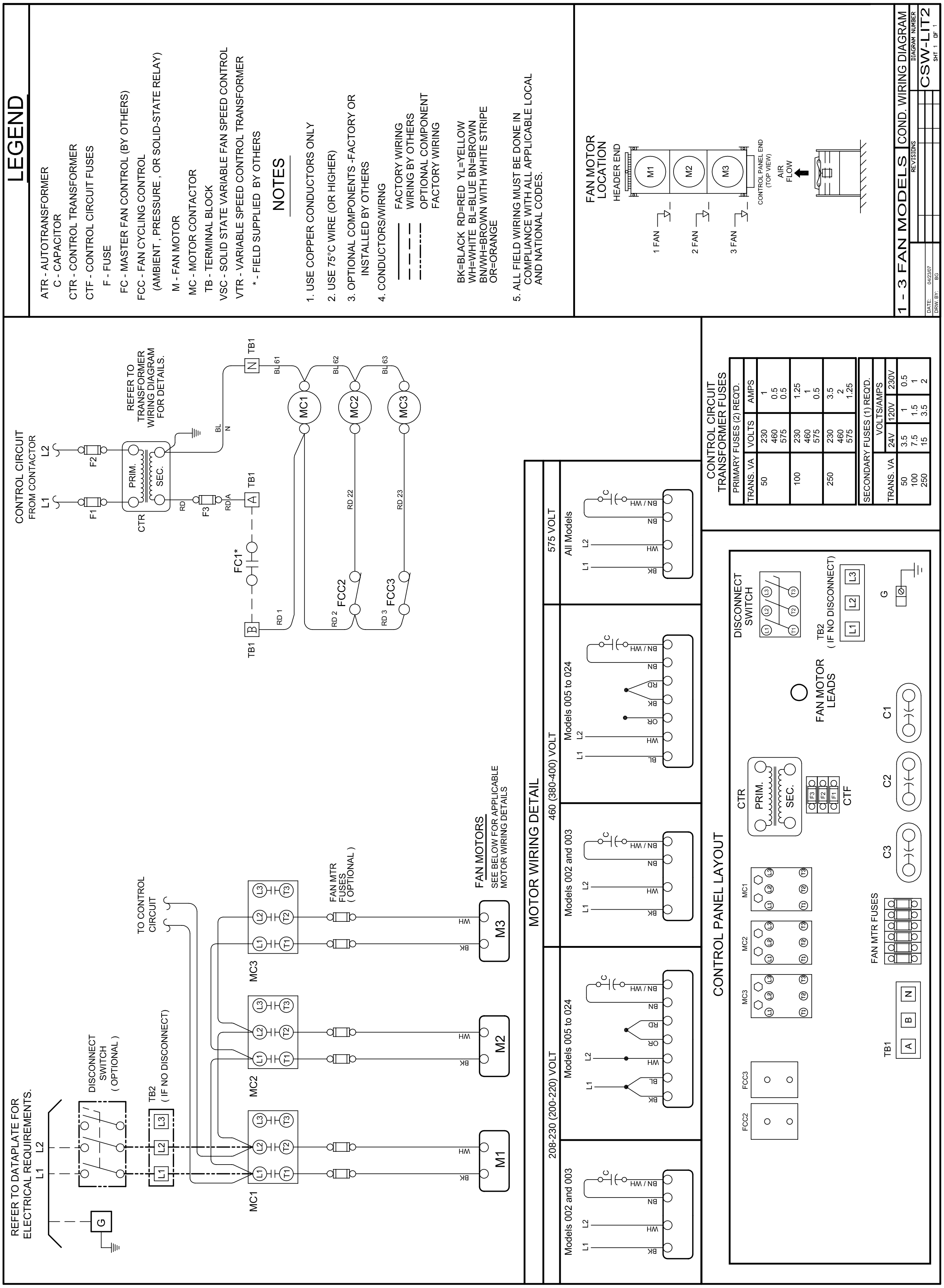
R448A	R407C	R404A	R507	R22	R410A	R134a
0.96	1.0	0.91	0.91	1.05	0.92	1.06

(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)
(5) Sound pressure level at 10 ft. *(3 m)*
(6) For R449A, use R448A data.

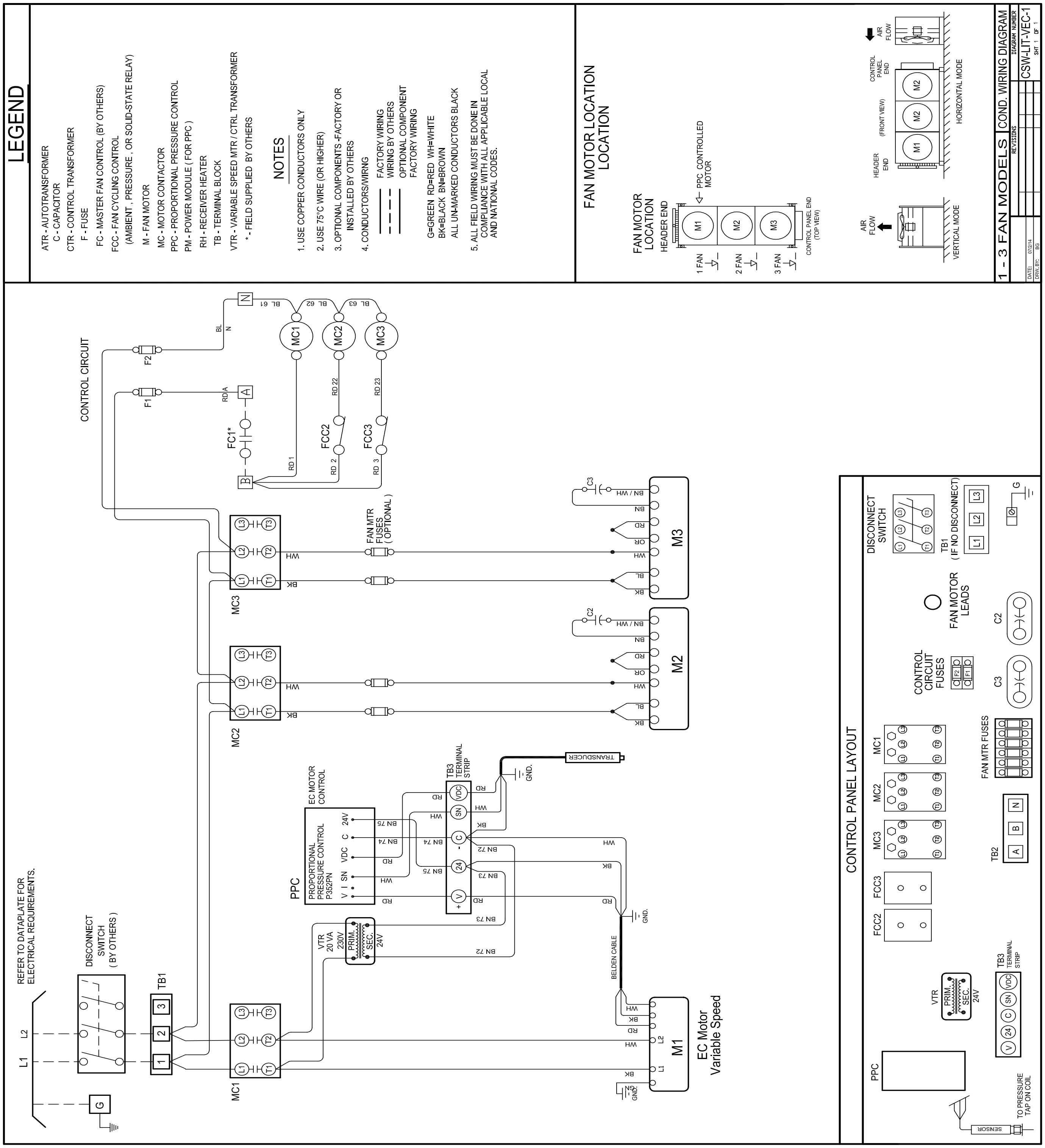
WIRING DIAGRAM
(STANDARD WITHOUT OPTIONS)



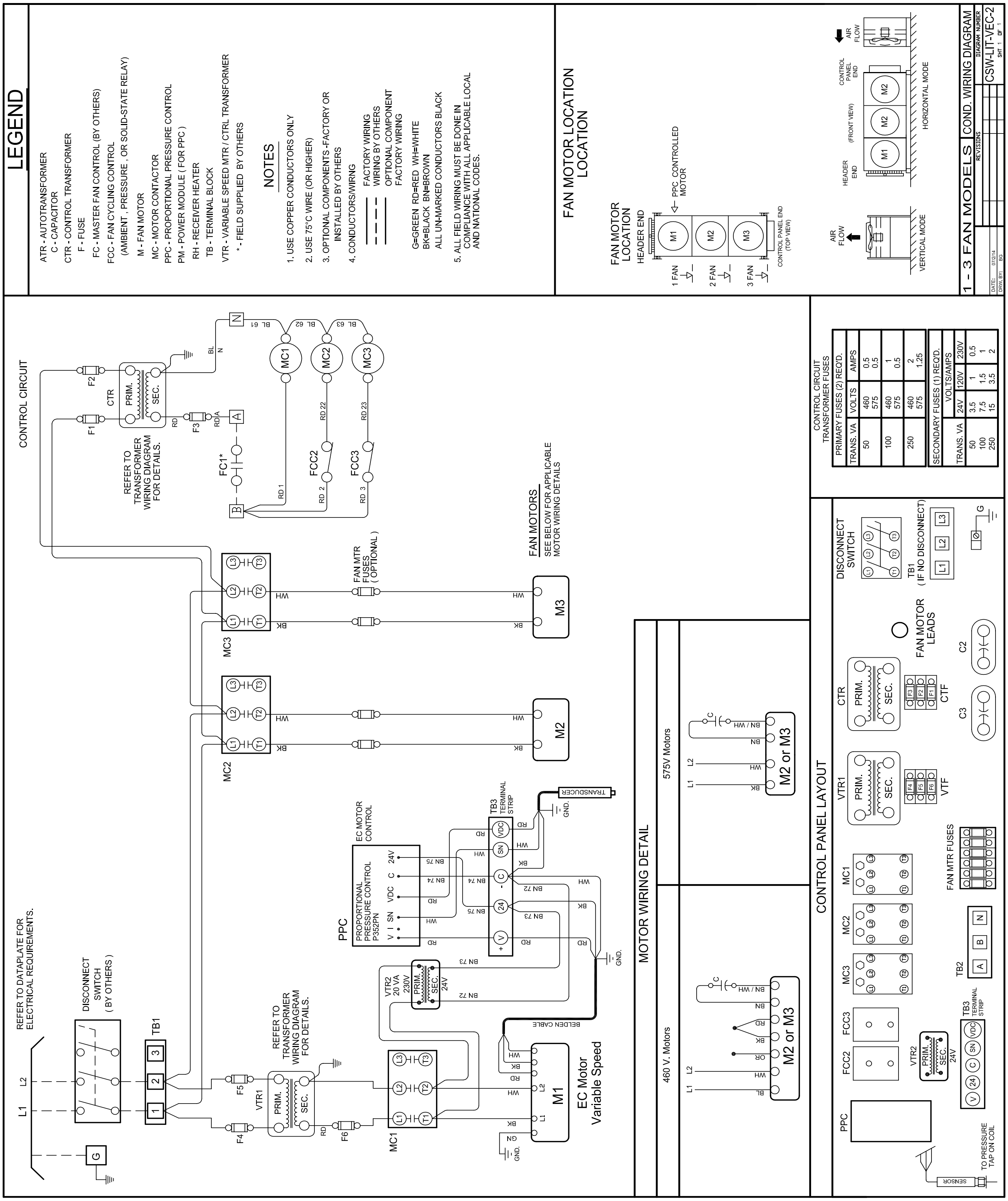
WIRING DIAGRAM
(MODELS WITH FAN CYCLING CONTROL)



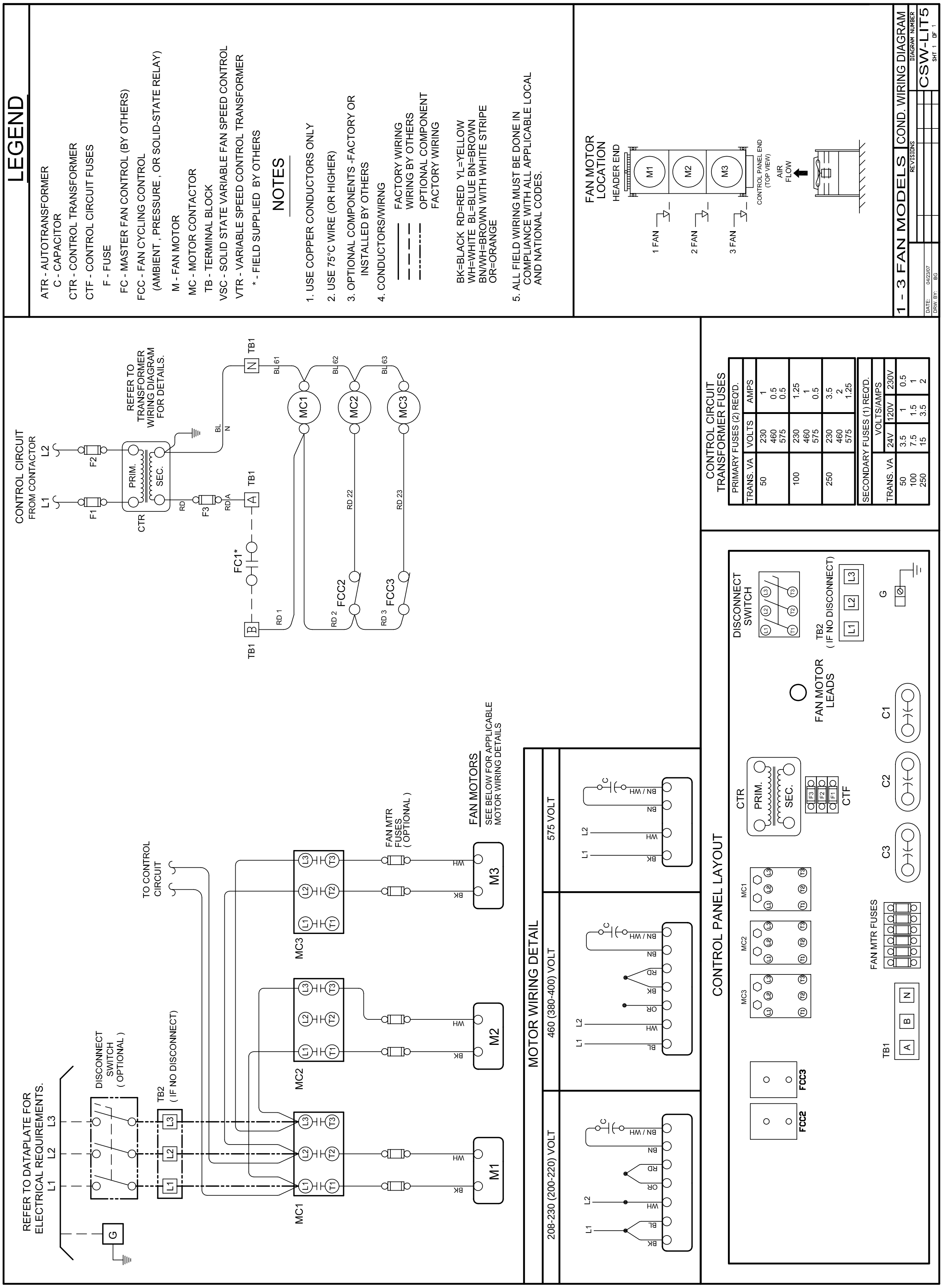
WIRING DIAGRAM
(VARIABLE SPEED MOTOR WITH CONTROLLER FOR HEADER FAN CONTROL - 208-230V MODELS)



WIRING DIAGRAM
(VARIABLE SPEED MOTOR WITH CONTROLLER FOR HEADER FAN CONTROL - 460V AND 575V MODELS)



WIRING DIAGRAM
(THREE PHASE WIRING MODELS BCS 019 - 024)



LEGEND

- ATR - AUTOTRANSFORMER
- C - CAPACITOR
- CTR - CONTROL TRANSFORMER
- CTF - CONTROL CIRCUIT FUSES
- F - FUSE
- FC - MASTER FAN CONTROL (BY OTHERS)
- FCC - FAN CYCLING CONTROL (AMBIENT , PRESSURE , OR SOLID-STATE RELAY)
- M - FAN MOTOR
- MC - MOTOR CONTACTOR
- TB - TERMINAL BLOCK
- VSC - SOLID STATE VARIABLE FAN SPEED CONTROL
- VTR - VARIABLE SPEED CONTROL TRANSFORMER
- * - FIELD SUPPLIED BY OTHERS

NOTES

1. USE COPPER CONDUCTORS ONLY
2. USE 75°C WIRE (OR HIGHER)
3. OPTIONAL COMPONENTS -FACTORY OR INSTALLED BY OTHERS
4. CONDUCTORS/WIRNG
   - FACTORY WIRING
   - WIRING BY OTHERS
   - OPTIONAL COMPONENT FACTORY WIRING

   BK=BLACK RD=RED YL=YELLOW
   WH=WHITE BL=BLUE BN=BROWN
   BN/WH=BROWN WITH WHITE STRIPE
   OR=ORANGE
5. ALL FIELD WIRING MUST BE DONE IN COMPLIANCE WITH ALL APPLICABLE LOCAL AND NATIONAL CODES.

CONTROL CIRCUIT TRANSFORMER FUSES

PRIMARY FUSES (2) REQ'D.

TRANS. VA	VOLTS	AMPS
50	230	1
	460	0.5
	575	0.5
100	230	1.25
	460	1
	575	0.5
250	230	3.5
	460	2
	575	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

1 - 3 FAN MODELS | COND. WIRING DIAGRAM
REVISIONS
DIAGRAM NUMBER CSW-LIT5
SHT 1 OF 1
DATE: 04/23/07
DRW. BY: BG

ABOUT EC MOTORS

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.

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.

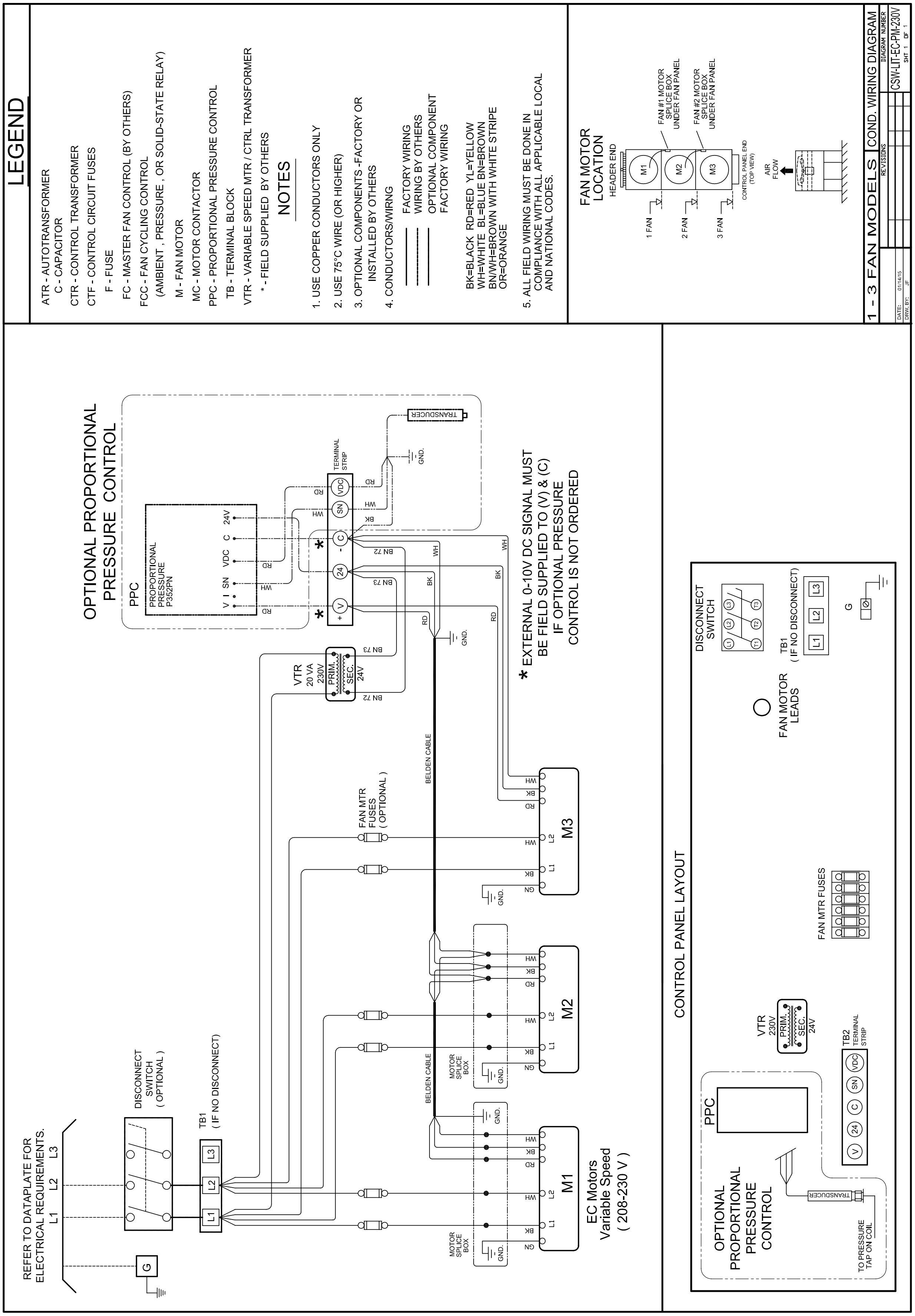
ELECTRICAL DATA
(OPTIONAL EC MOTORS)

MODEL	FAN CONFIG.	208-230/1/60 (208-230/3/60)						460/1/60 (460/3/60)					
		MOTOR		FLA	MCA	MOP	WATTS	MOTOR		FLA	MCA	MOP	WATTS
TCS		HP	Qty.					HP	Qty.				
002	1 x 1	1/3	1	1.7	2.1	15	210	N/A	N/A	N/A	N/A	N/A	N/A
003	1 x 1	1/3	1	1.7	2.1	15	210	N/A	N/A	N/A	N/A	N/A	N/A
005	1 x 1	1/3	1	3	3.8	15	340	1/3	1	1.4	1.8	15	340
006	1 x 1	1/3	1	3	3.8	15	340	1/3	1	1.4	1.8	15	340
008	1 x 1	1/3	1	3	3.8	15	340	1/3	1	1.4	1.8	15	340
010	1 x 2	1/3	2	6	6.8	15	680	1/3	2	2.8	3.2	15	680
012	1 x 2	1/3	2	6	6.8	15	680	1/3	2	2.8	3.2	15	680
014	1 x 2	1/3	2	6	6.8	15	680	1/3	2	2.8	3.2	15	680
016	1 x 2	1/3	2	6	6.8	15	680	1/3	2	2.8	3.2	15	680
019	1 x 3	1/3	3	9 (5.2)	9.8 (5.6)	15	1020	1/3	3	4.2 (2.4)	4.6 (2.6)	15	1020
024	1 x 3	1/3	3	9 (5.2)	9.8 (5.6)	15	1020	1/3	3	4.2 (2.4)	4.6 (2.6)	15	1020

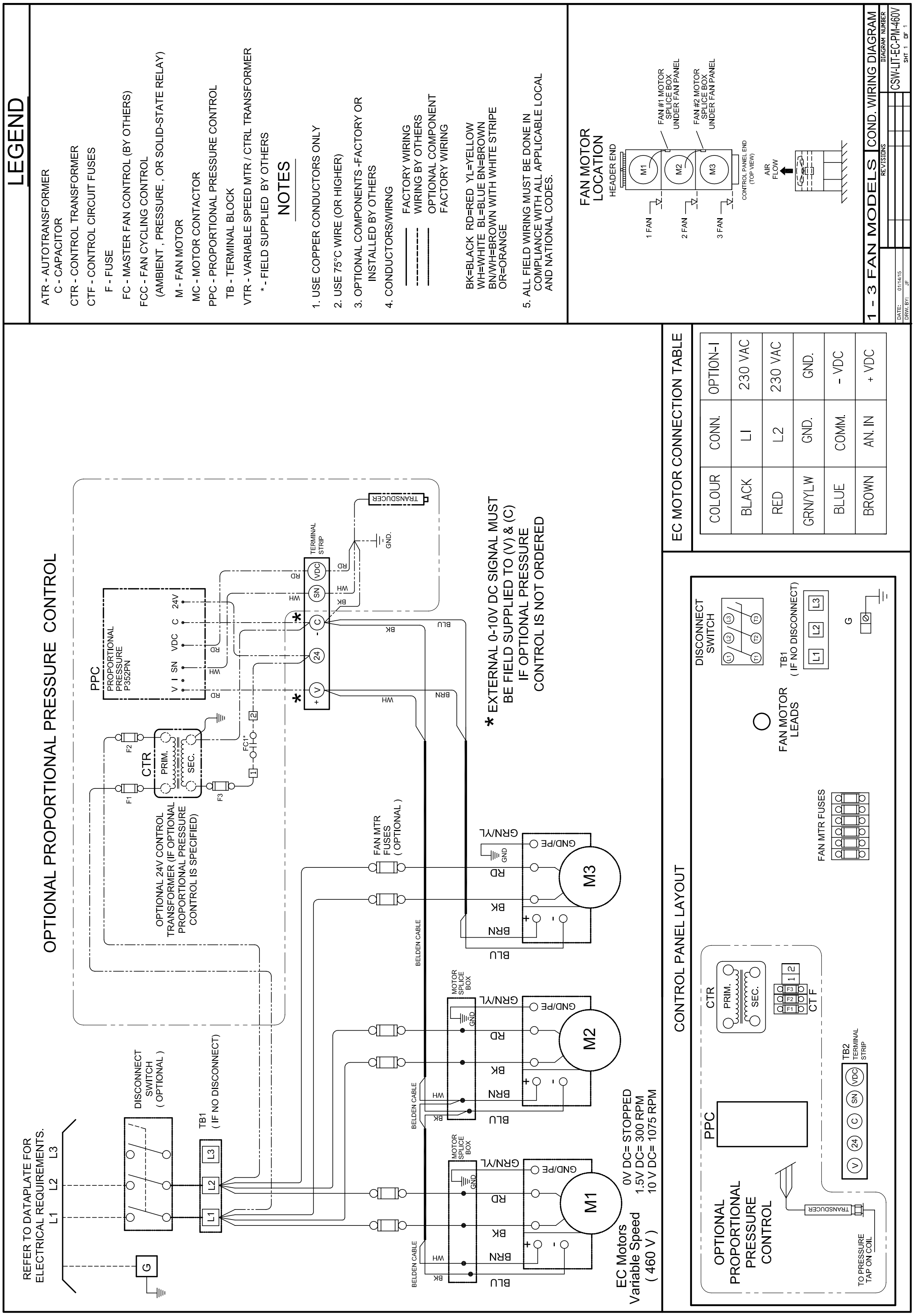
TCS

EC MOTOR WIRING DIAGRAM
208-230/1/60 (208-230/3/60)

EC MOTORS 60Hz



EC MOTOR WIRING DIAGRAM
460/1/60 (460/3/60)



COLOUR	CONN.	OPTION-I
BLACK	L1	230 VAC
RED	L2	230 VAC
GRN/YLW	GND.	GND.
BLUE	COMM.	- VDC
BROWN	AN. IN	+ VDC

Motors With Built-in Variable Speed –

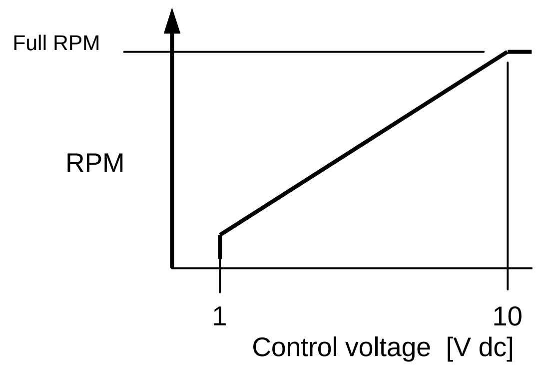
Units with an EC (electronically commutated) motor provide variable speed control. ECM motors use DC motors with integral AC to DC conversion allowing direct connection to AC mains with the energy saving and control benefits of a DC motor. Ideally the motors on the condenser should all be EC and simultaneously 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) is 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, danger ous 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. 0V 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

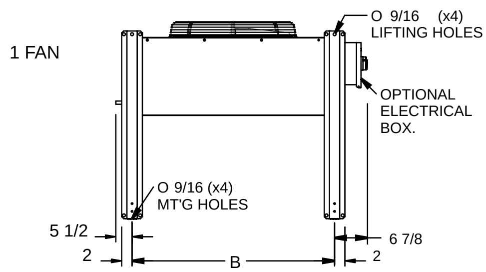
The input control signal can be supplied by an external control signal or from a factory installed proportional pressure control. Units with factory installed proportional pressure controls require no installation wiring and are adjusted with initial factory settings. These may require further adjustments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

External Control Signal (Supplied by others)

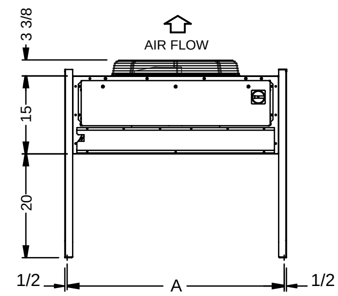
Contact control manufacturer for setup of external controller to provide a 0-10 VDC control signal. Wire the control signal to terminal board in unit control box. See EC Diagram on P.12 for typical external signal control wiring.

DIMENSIONAL DATA
VERTICAL AIR DISCHARGE UNITS

1 FAN

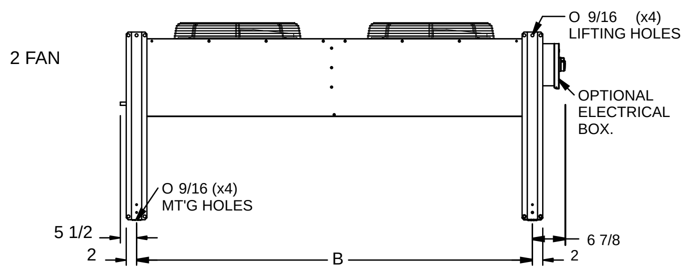


SIDE VIEW



TYPICAL END VIEW
ELECT. BOX END

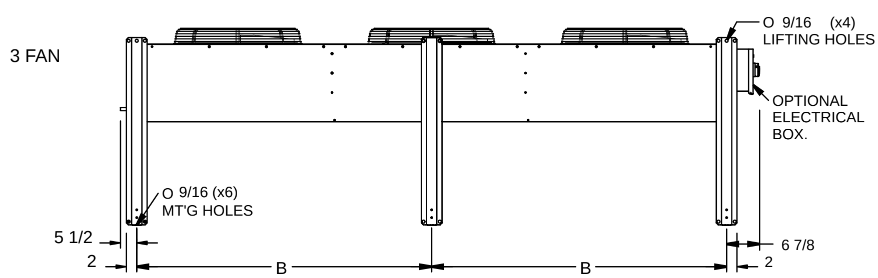
2 FAN



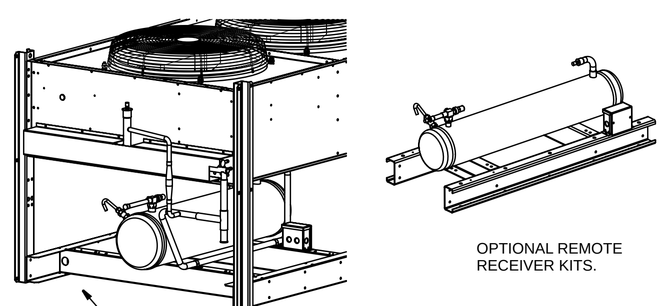
ELECTRICAL CONNECTION 7/8”

UNITS ARE SHIPPED IN HORIZONTAL AIR FLOW CONFIGURATION LESS OPTIONAL MOUNTING LEGS AS STANDARD. VERTICAL AIR DISCHARGE MODELS REQUIRE LEG KIT OPTION SHIPPED LOOSE AND SOLD SEPARATELY .

3 FAN



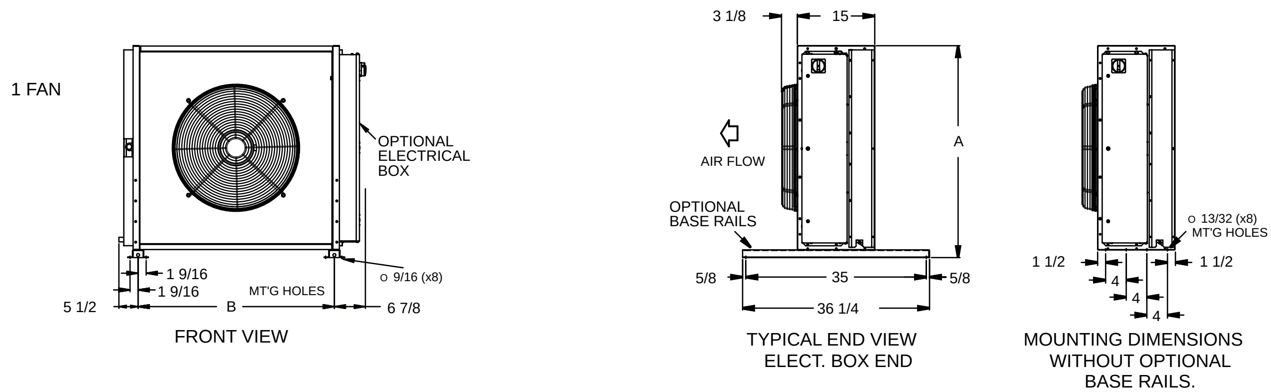
MODEL TCS	FAN CONFIG.	MOUNTING DIMENSIONS			
		A		B	
		INCHES	*(mm)*	INCHES	*(mm)*
002	1 x 1	24 1/8	*(613)*	25 1/2	*(648)*
003	1 x 1	24 1/8	*(613)*	25 1/2	*(648)*
005	1 x 1	31 5/8	*(803)*	38	*(965)*
006	1 x 1	31 5/8	*(803)*	38	*(965)*
008	1 x 1	41 5/8	*(1057)*	38	*(965)*
010	1 x 2	41 5/8	*(1057)*	55 1/2	*(1410)*
012	1 x 2	41 5/8	*(1057)*	55 1/2	*(1410)*
014	1 x 2	41 5/8	*(1057)*	75 1/2	*(1918)*
016	1 x 2	41 5/8	*(1057)*	75 1/2	*(1918)*
019	1 x 3	41 5/8	*(1057)*	41 1/2	*(1054)*
024	1 x 3	41 5/8	*(1057)*	56 1/2	*(1435)*

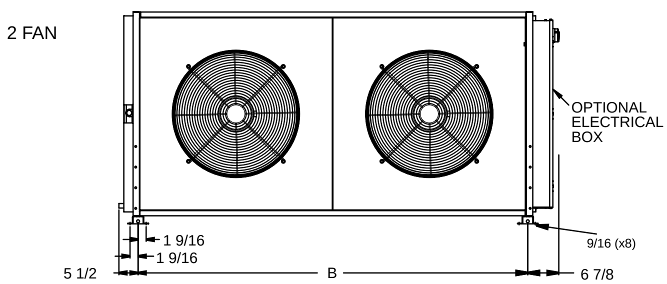


OPTIONAL REMOTE RECEIVER KITS.

Optional Factory Mounted
Receiver kits fit within standard
unit leg configuration.
Legs included with receiver option.

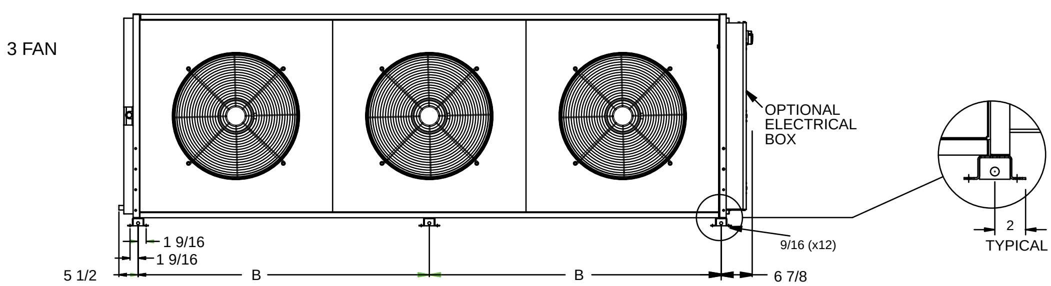
DIMENSIONAL DATA
HORIZONTAL AIR DISCHARGE UNITS





ELECTRICAL CONNECTION 7/8"

UNITS ARE SHIPPED IN HORIZONTAL AIR FLOW CONFIGURATION LESS OPTIONAL MOUNTING LEGS AS STANDARD.



MODEL TCS	FAN CONFIG.	MOUNTING DIMENSIONS			
		A		B	
		INCHES	*(mm)*	INCHES	*(mm)*
002	1 x 1	23 5/8	*(600)*	25 1/2	*(648)*
003	1 x 1	23 5/8	*(600)*	25 1/2	*(648)*
005	1 x 1	31 1/8	*(791)*	38	*(965)*
006	1 x 1	31 1/8	*(791)*	38	*(965)*
008	1 x 1	41 1/8	*(1045)*	38	*(965)*
010	1 x 2	41 1/8	*(1045)*	55 1/2	*(1410)*
012	1 x 2	41 1/8	*(1045)*	55 1/2	*(1410)*
014	1 x 2	41 1/8	*(1045)*	75 1/2	*(1918)*
016	1 x 2	41 1/8	*(1045)*	75 1/2	*(1918)*
019	1 x 3	41 1/8	*(1045)*	41 1/2	*(1054)*
024	1 x 3	41 1/8	*(1045)*	56 1/2	*(1435)*

RECEIVER OPTIONS

MODEL TCS	FAN CONFIG.	REFRIG. CHARGE - 90% FULL LIQUID R407A		OPTION 1						OPTION 2						OPTION 3					
				CAPACITY * R407A		DIAMETER		LENGTH		CAPACITY * R407A		DIAMETER		LENGTH		CAPACITY * R407A		DIAMETER		LENGTH	
		LBS	*(kg)*	**LBS**	*(kg)*	**IN**	*(mm)*	**IN**	*(mm)*	**LBS**	*(kg)*	**IN**	*(mm)*	**IN**	*(mm)*	**LBS**	*(kg)*	**IN**	*(mm)*	**IN**	*(mm)*
002	1 x 1	*2.9*	*1.3*	*17*	*(7.8)*	5	*(127)*	28	*(711)*	---	---	---	---	---	---	---	---	---	---	---	---
003	1 x 1	*4.6*	*2.1*	*17*	*(7.8)*	5	*(127)*	28	*(711)*	---	---	---	---	---	---	---	---	---	---	---	---
005	1 x 1	*6.5*	*3.0*	*17*	*(7.8)*	5	*(127)*	28	*(711)*	*27*	*12*	6	*(152)*	30	*(762)*	---	---	---	---	---	---
006	1 x 1	*9.4*	*4.3*	*17*	*(7.8)*	5	*(127)*	28	*(711)*	*27*	*12*	6	*(152)*	30	*(762)*	---	---	---	---	---	---
008	1 x 1	*14*	*6.4*	*17*	*(7.8)*	5	*(127)*	28	*(711)*	*27*	*12*	6	*(152)*	30	*(762)*	---	---	---	---	---	---
010	1 x 2	*14*	*6.3*	*17*	*(7.8)*	5	*(127)*	28	*(711)*	*27*	*12*	6	*(152)*	30	*(762)*	*42*	*19*	6 5/8	*(168)*	38	*(965)*
012	1 x 2	*20*	*8.9*	*27*	*(12)*	6	*(152)*	30	*(762)*	*42*	*19*	6 5/8	*(168)*	38	*(965)*	*67*	*30*	8 5/8	*(218)*	36	*(914)*
014	1 x 2	*27*	*12*	*27*	*(12)*	6	*(152)*	30	*(762)*	*42*	*19*	6 5/8	*(168)*	38	*(965)*	*67*	*30*	8 5/8	*(218)*	36	*(914)*
016	1 x 2	*27*	*12*	*27*	*(12)*	6	*(152)*	30	*(762)*	*42*	*19*	6 5/8	*(168)*	38	*(965)*	*67*	*30*	8 5/8	*(218)*	36	*(914)*
019	1 x 3	*30*	*14*	*42*	*(19)*	6 5/8	*(168)*	38	*(965)*	*67*	*30*	8 5/8	*(218)*	36	*(914)*	*114*	*52*	8 5/8	*(218)*	60	*(1524)*
024	1 x 3	*40*	*18*	*42*	*(19)*	6 5/8	*(168)*	38	*(965)*	*67*	*30*	8 5/8	*(218)*	36	*(914)*	*114*	*52*	8 5/8	*(218)*	60	*(1524)*

* 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.

LOW AMBIENT OPERATION

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.

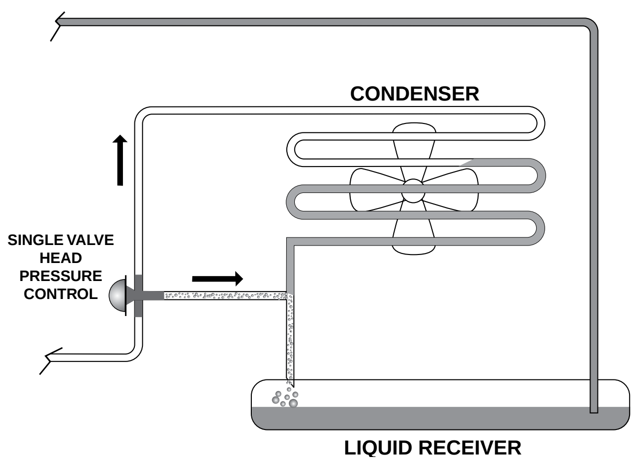
(ii) Variable Motor Speed Control

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.

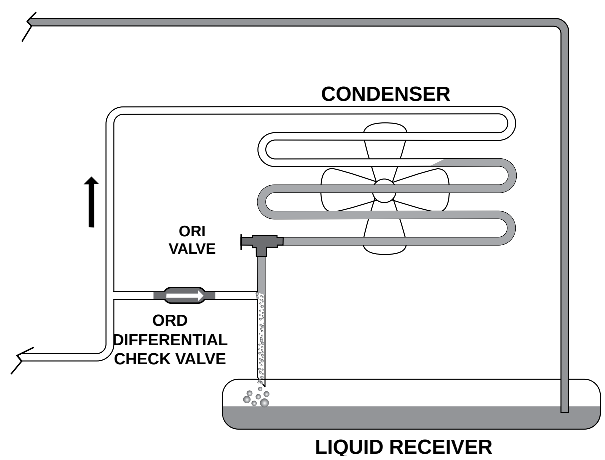
(iii) Refrigerant Regulating Controls

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.



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 tables on pages 21-22 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.

Table 1 - Fan Cycling Control Schedule

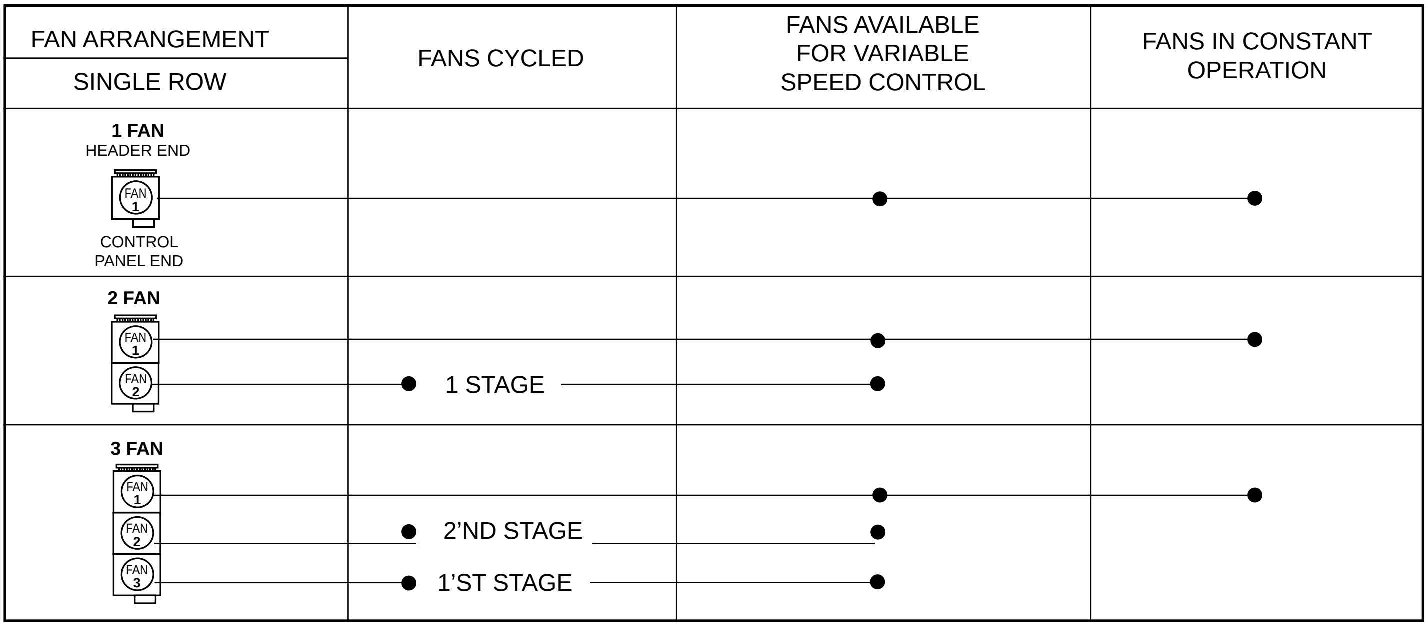


Table 2 - Ambient Fan Cycling Thermostat Cut-Out Settings

NUMBER OF FANS ON CONDENSER Single Row Models	DESIGN T.D. °F *(°C)*	THERMOSTAT SETTINGS °F *(°C)* 1st Stage	2nd Stage
2	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	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)*

Table 3 - Pressure Fan Cycling Cut-In Control Settings

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

- For R449A, use R448A data.

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

LOW AMBIENT OPERATION
WINTER OPERATION CHARGE -
FLOODED CONDENSER WITH FAN CYCLING

Design TD = 25

MODEL TCS	FAN CONFIG.	REFRIGERANT CHARGE R407A				ADDITIONAL WINTER CHARGE - USING FAN CYCLING (2 and 3 FAN) and FLOODED CONTROLS — AMBIENT TEMP. - °F *(°C)*									
		90% FULL		SUMMER		40 *(-4.4)*		20 *(-6.7)*		0 *(-18)*		-20 *(-29)*		-40 *(-40)*	
		LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*
002	1 x 1	3.3	*(1.5)*	0.8	*(0.3)*	0.7	*(0.3)*	1.0	*(0.4)*	1.1	*(0.4)*	1.1	*(0.6)*	1.2	*(0.6)*
003	1 x 1	5.3	*(2.4)*	1.2	*(0.6)*	1.1	*(0.4)*	1.5	*(0.7)*	1.7	*(0.8)*	1.9	*(0.9)*	2.0	*(0.9)*
005	1 x 1	7.4	*(3.4)*	1.7	*(0.8)*	1.4	*(0.7)*	2.2	*(1.0)*	2.4	*(1.1)*	2.6	*(1.2)*	2.8	*(1.2)*
006	1 x 1	10.8	*(5.0)*	2.4	*(1.1)*	2.2	*(1.0)*	3.1	*(1.4)*	3.4	*(1.5)*	3.7	*(1.8)*	4.0	*(1.8)*
008	1 x 1	16.2	*(7.3)*	3.6	*(1.7)*	3.2	*(1.4)*	4.6	*(2.1)*	5.2	*(2.3)*	5.6	*(2.5)*	5.9	*(2.8)*
010	1 x 2	15.8	*(7.2)*	3.5	*(1.7)*	0.0	*(0.0)*	2.6	*(1.2)*	4.6	*(2.1)*	5.5	*(2.5)*	6.4	*(2.9)*
012	1 x 2	22.7	*(10.2)*	5.1	*(2.3)*	0.0	*(0.0)*	3.9	*(1.8)*	6.6	*(3.0)*	7.9	*(3.6)*	9.0	*(4.1)*
014	1 x 2	30.7	*(14.0)*	6.8	*(3.1)*	0.0	*(0.0)*	5.2	*(2.4)*	8.9	*(4.1)*	10.8	*(4.8)*	12.3	*(5.6)*
016	1 x 2	30.7	*(14.0)*	6.8	*(3.1)*	0.0	*(0.0)*	5.2	*(2.4)*	8.9	*(4.1)*	10.8	*(4.8)*	12.3	*(5.6)*
019	1 x 3	35.0	*(15.8)*	7.8	*(3.5)*	0.0	*(0.0)*	1.8	*(0.8)*	1.8	*(0.8)*	10.5	*(4.7)*	12.2	*(5.5)*
024	1 x 3	46.0	*(20.9)*	10.2	*(4.6)*	0.0	*(0.0)*	2.3	*(1.0)*	2.3	*(1.0)*	13.8	*(6.3)*	16.1	*(7.3)*

NOTES:

To determine Winter Charge, ADD the sum of the Summer Charge and the Additional Winter Charge.

Design TD = 20

MODEL TCS	FAN CONFIG.	REFRIGERANT CHARGE R407A				ADDITIONAL WINTER CHARGE - USING FAN CYCLING (2 and 3 FAN) and FLOODED CONTROLS — AMBIENT TEMP. - °F *(°C)*									
		90% FULL		SUMMER		40 *(-4.4)*		20 *(-6.7)*		0 *(-18)*		-20 *(-29)*		-40 *(-40)*	
		LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*
002	1 x 1	3.3	*(1.5)*	0.8	*(0.3)*	0.8	*(0.3)*	1.1	*(0.4)*	1.1	*(0.6)*	1.2	*(0.6)*	1.3	*(0.6)*
003	1 x 1	5.3	*(2.4)*	1.2	*(0.6)*	1.3	*(0.6)*	1.7	*(0.8)*	1.9	*(0.9)*	2.0	*(0.9)*	2.1	*(0.9)*
005	1 x 1	7.4	*(3.4)*	1.7	*(0.8)*	1.9	*(0.9)*	2.4	*(1.1)*	2.5	*(1.2)*	2.8	*(1.2)*	2.9	*(1.3)*
006	1 x 1	10.8	*(5.0)*	2.4	*(1.1)*	2.8	*(1.2)*	3.4	*(1.5)*	3.7	*(1.7)*	4.0	*(1.8)*	4.2	*(1.9)*
008	1 x 1	16.2	*(7.3)*	3.6	*(1.7)*	4.1	*(1.9)*	5.2	*(2.3)*	5.6	*(2.5)*	5.9	*(2.8)*	6.2	*(2.9)*
010	1 x 2	15.8	*(7.2)*	3.5	*(1.7)*	1.3	*(0.7)*	4.1	*(1.9)*	4.6	*(2.1)*	6.2	*(2.8)*	6.9	*(3.1)*
012	1 x 2	22.7	*(10.2)*	5.1	*(2.3)*	1.9	*(0.9)*	5.8	*(2.6)*	6.6	*(3.0)*	8.8	*(4.0)*	9.8	*(4.5)*
014	1 x 2	30.7	*(14.0)*	6.8	*(3.1)*	2.6	*(1.2)*	8.0	*(3.6)*	8.9	*(4.1)*	12.0	*(5.4)*	13.3	*(6.1)*
016	1 x 2	30.7	*(14.0)*	6.8	*(3.1)*	2.6	*(1.2)*	8.0	*(3.6)*	8.9	*(4.1)*	12.0	*(5.4)*	13.3	*(6.1)*
019	1 x 3	35.0	*(15.8)*	7.8	*(3.5)*	0.0	*(0.0)*	6.6	*(3.0)*	7.4	*(3.3)*	12.4	*(5.6)*	14.0	*(6.4)*
024	1 x 3	46.0	*(20.9)*	10.2	*(4.6)*	0.0	*(0.0)*	8.7	*(4.0)*	9.7	*(4.4)*	16.3	*(7.4)*	18.4	*(8.4)*

NOTES:

To determine Winter Charge, ADD the sum of the Summer Charge and the Additional Winter Charge.

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
WINTER OPERATION CHARGE - FLOODED CONDENSER WITH FAN CYCLING

Design TD = 15

MODEL TCS	FAN CONFIG.	REFRIGERANT CHARGE R407A				ADDITIONAL WINTER CHARGE - USING FAN CYCLING (2 and 3 FAN) and FLOODED CONTROLS — AMBIENT TEMP. - ° F *(°C)*									
		90% FULL		SUMMER		40 *(-4.4)*		20 *(-6.7)*		0 *(-18)*		-20 *(-29)*		-40 *(-40)*	
		LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*
002	1 x 1	3.3	*(1.5)*	0.8	*(0.3)*	1.0	*(0.4)*	1.2	*(0.6)*	1.2	*(0.6)*	1.3	*(0.6)*	1.3	*(0.7)*
003	1 x 1	5.3	*(2.4)*	1.2	*(0.6)*	1.7	*(0.8)*	1.9	*(0.9)*	2.0	*(0.9)*	2.1	*(1.0)*	2.2	*(1.0)*
005	1 x 1	7.4	*(3.4)*	1.7	*(0.8)*	2.3	*(1.0)*	2.6	*(1.2)*	2.9	*(1.3)*	3.0	*(1.3)*	3.1	*(1.4)*
006	1 x 1	10.8	*(5.0)*	2.4	*(1.1)*	3.3	*(1.5)*	3.9	*(1.8)*	4.1	*(1.9)*	4.3	*(2.0)*	4.4	*(2.0)*
008	1 x 1	16.2	*(7.3)*	3.6	*(1.7)*	5.0	*(2.3)*	5.7	*(2.6)*	6.2	*(2.8)*	6.5	*(3.0)*	6.6	*(3.0)*
010	1 x 2	15.8	*(7.2)*	3.5	*(1.7)*	3.9	*(1.8)*	5.4	*(2.4)*	6.4	*(2.9)*	7.2	*(3.2)*	7.6	*(3.4)*
012	1 x 2	22.7	*(10.2)*	5.1	*(2.3)*	5.4	*(2.4)*	7.7	*(3.5)*	9.0	*(4.1)*	10.2	*(4.6)*	10.9	*(5.0)*
014	1 x 2	30.7	*(14.0)*	6.8	*(3.1)*	7.4	*(3.3)*	10.5	*(4.7)*	12.3	*(5.6)*	13.9	*(6.3)*	14.7	*(6.7)*
016	1 x 2	30.7	*(14.0)*	6.8	*(3.1)*	7.4	*(3.3)*	10.5	*(4.7)*	12.3	*(5.6)*	13.9	*(6.3)*	14.7	*(6.7)*
019	1 x 3	35.0	*(15.8)*	7.8	*(3.5)*	5.9	*(2.8)*	10.9	*(5.0)*	13.4	*(6.2)*	15.4	*(6.9)*	16.4	*(7.5)*
024	1 x 3	46.0	*(20.9)*	10.2	*(4.6)*	7.8	*(3.5)*	14.3	*(6.5)*	17.7	*(8.0)*	20.2	*(9.1)*	21.7	*(9.8)*

NOTES:

To determine Winter Charge, ADD the sum of the Summer Charge and the Additional Winter Charge.

Design TD = 10

MODEL TCS	FAN CONFIG.	REFRIGERANT CHARGE R407A				ADDITIONAL WINTER CHARGE - USING FAN CYCLING (2 and 3 FAN) and FLOODED CONTROLS — AMBIENT TEMP. - ° F *(°C)*									
		90% FULL		SUMMER		40 *(-4.4)*		20 *(-6.7)*		0 *(-18)*		-20 *(-29)*		-40 *(-40)*	
		LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*	LBS	*(kg)*
002	1 x 1	3.3	*(1.5)*	0.8	*(0.3)*	1.2	*(0.6)*	1.3	*(0.6)*	1.3	*(0.7)*	1.4	*(0.7)*	1.4	*(0.7)*
003	1 x 1	5.3	*(2.4)*	1.2	*(0.6)*	1.9	*(0.9)*	2.1	*(1.0)*	2.2	*(1.0)*	2.2	*(1.0)*	2.2	*(1.0)*
005	1 x 1	7.4	*(3.4)*	1.7	*(0.8)*	2.6	*(1.2)*	2.9	*(1.3)*	3.1	*(1.4)*	3.1	*(1.4)*	3.2	*(1.4)*
006	1 x 1	10.8	*(5.0)*	2.4	*(1.1)*	3.9	*(1.8)*	4.2	*(1.9)*	4.4	*(2.0)*	4.5	*(2.1)*	4.6	*(2.1)*
008	1 x 1	16.2	*(7.3)*	3.6	*(1.7)*	5.7	*(2.6)*	6.3	*(2.9)*	6.6	*(3.0)*	6.8	*(3.1)*	6.8	*(3.1)*
010	1 x 2	15.8	*(7.2)*	3.5	*(1.7)*	5.8	*(2.6)*	7.2	*(3.2)*	7.8	*(3.5)*	8.4	*(3.9)*	8.9	*(4.1)*
012	1 x 2	22.7	*(10.2)*	5.1	*(2.3)*	8.3	*(3.7)*	10.2	*(4.6)*	11.1	*(5.1)*	12.0	*(5.4)*	12.7	*(5.7)*
014	1 x 2	30.7	*(14.0)*	6.8	*(3.1)*	11.2	*(5.1)*	13.9	*(6.3)*	15.1	*(6.8)*	16.3	*(7.4)*	17.2	*(7.8)*
016	1 x 2	30.7	*(14.0)*	6.8	*(3.1)*	11.2	*(5.1)*	13.9	*(6.3)*	15.1	*(6.8)*	16.3	*(7.4)*	17.2	*(7.8)*
019	1 x 3	35.0	*(15.8)*	7.8	*(3.5)*	11.7	*(5.3)*	15.1	*(6.8)*	16.9	*(7.7)*	18.2	*(8.3)*	19.6	*(8.9)*
024	1 x 3	46.0	*(20.9)*	10.2	*(4.6)*	15.4	*(7.0)*	19.8	*(9.0)*	22.3	*(10.1)*	23.9	*(10.9)*	25.7	*(11.7)*

NOTES:

To determine Winter Charge, ADD the sum of the Summer Charge and the Additional Winter Charge.

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.

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

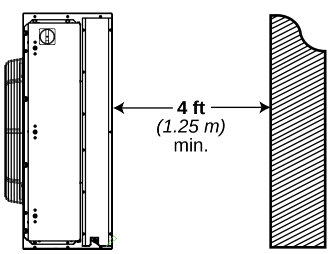
Before handling and placing the unit into position a review of the most suitable location must be made. This condenser is designed for outdoor installation.
A number of factors must be taken into consideration when selecting a location. Most important is the provision for a supply of ambient air to the 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.

Horizontal Air Discharge

(Standard Shipping Configuration)

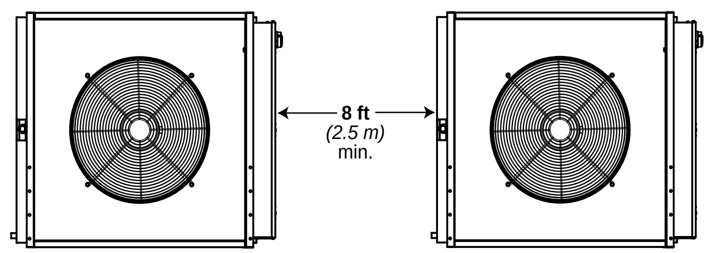
WALLS OR OBSTRUCTIONS

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

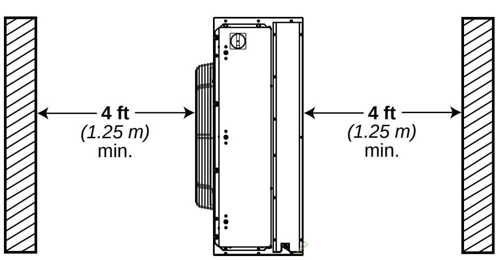
A minimum of **8 feet** *(2.5 m)* is required between multiple units placed side by side. If placed end to end, the minimum distance between units is **4 feet** *(1.25 m)*.



Note: Units shown without optional mounting legs

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 <u>must not exceed</u> top of unit.

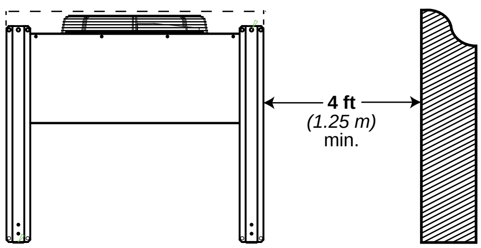


Vertical Air Discharge

(Requires Optional Mounting Leg Kit)

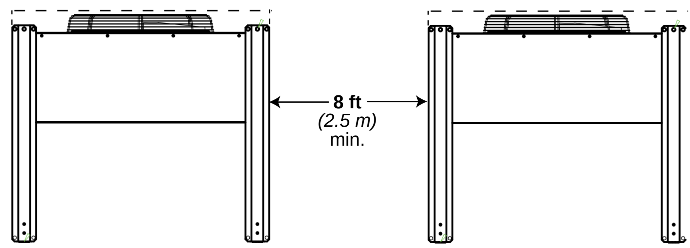
WALLS OR OBSTRUCTIONS

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.



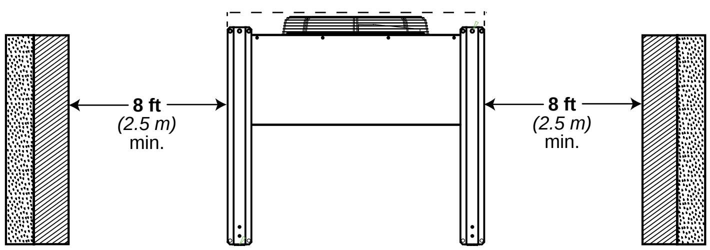
MULTIPLE UNITS

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)*.



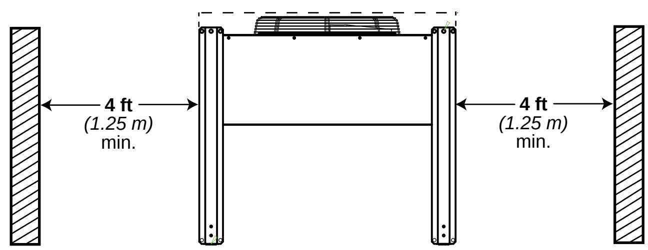
UNITS IN PITS

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.

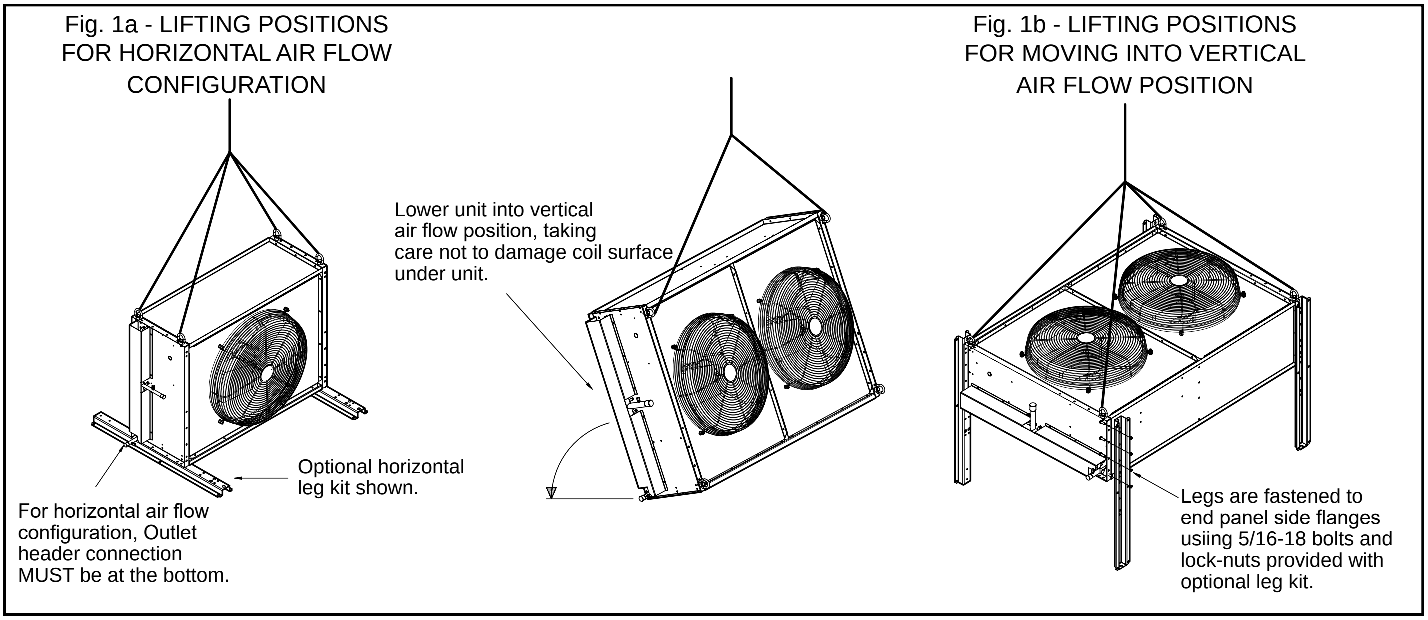


Note: Units shown with optional mounting legs

PLACEMENT

Once a suitable location is selected ensure all the remote mounting parts (legs and hardware) are available. Refer to Fig.1b (P. 26) and the dimensional data on pages 14-15 for the leg mounting locations.

Fig. 1 - LIFTING / OPTIONAL LEG INSTRUCTIONS



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. **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.**

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

Discharge lines should be designed 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** *(10 m)*, insert close-coupled traps in the riser at **30 feet** *(10 m)* intervals.

An alternate method of handling the oil problem would be the addition of an oil separator see Figure 3 (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. 4 for typical condensate line piping when utilizing head pressure regulating valves.

INSTALLATION
TYPICAL SYSTEM PIPING

Fig. 2 - 5

Figure 2 - Single Circuit

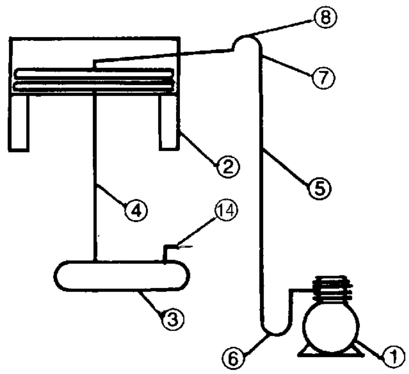


Figure 3(a) - Single circuit with double discharge riser (may be required with capacity control)

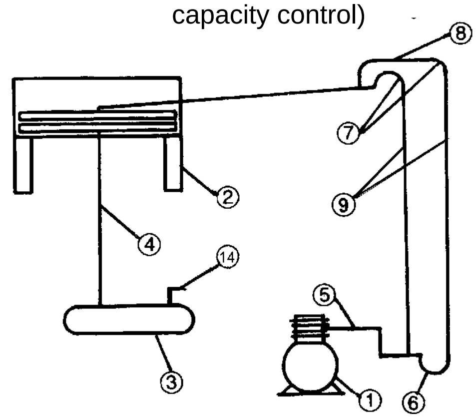


Figure 3(b) - Single circuit with Oil Separator (may be required with capacity control)

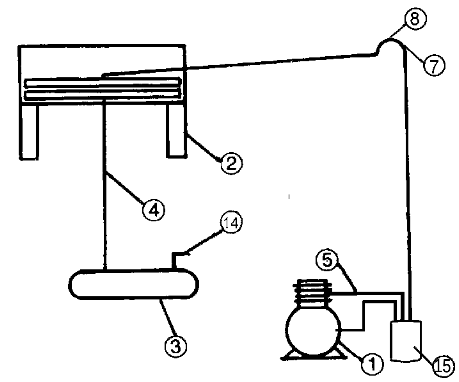


Figure 4 - Single circuit regulator valve head pressure control

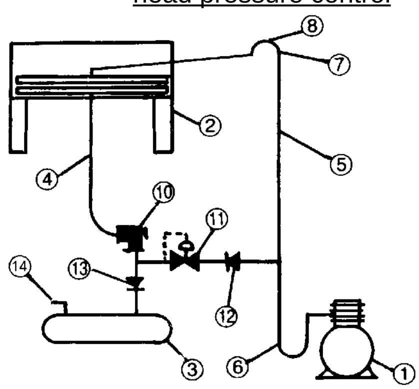
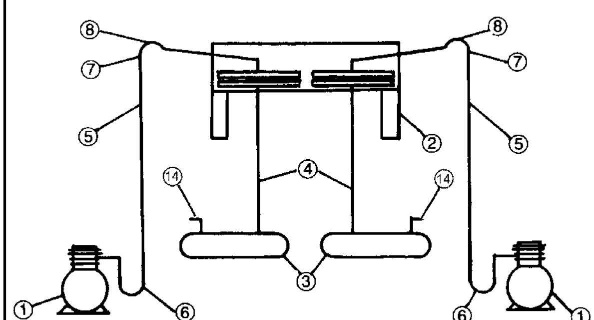


Figure 5 - Multiple circuits



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

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 5-9 and 11-12 for typical wiring diagrams).
Refer to the Electrical Specifications table on pages 4 and 10 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

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: **t-rp.com/tcs**
email: **acc-fc@t-rp.com**
call: **1-844-893-3222 x526**

TROUBLESHOOTING

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

SERVICE PARTS

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

WARRANTY

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

ORDERS

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

SHIPPING

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

"AS BUILT" SERVICE PARTS

Service Parts List
Label
To Be Attached
HERE

NATIONAL REFRIGERATION &
AIR CONDITIONING CANADA CORP.
159 Roy Blvd.
Brantford Ontario Canada N3R 7K1
PHONE: (519) 751-0444 800-463-9517
FAX (519) 753-1140   www.t-rp.com