TRANE®

4TWR4024E-SF-1B-EN

Service Facts

Split System Heat Pump
4TWR4024E1000A

⚠ CAUTION

UNIT CONTAINS R-410A REFRIGERANT!
R-410A OPERATING PRESSURE EXCEEDS THE LIMIT OF R-22. PROPER SERVICE EQUIPMENT IS REQUIRED. FAILURE TO USE PROPER SERVICE TOOLS MAY RESULT IN EQUIPMENT DAMAGE OR PERSONAL INJURY.

SERVICE
USE ONLY R-410A REFRIGERANT AND APPROVED POE COMPRESSOR OIL.

IMPORTANT — This document contains a wiring diagram, a parts list, and service information. This is customer property and is to remain with this unit. Please return to service information pack upon completion of work.

⚠ WARNING: HAZARDOUS VOLTAGE - DISCONNECT POWER and DISCHARGE CAPACITORS BEFORE SERVICING

PRODUCT SPECIFICATIONS

OUTDOOR UNIT ①②	4TWR4024E1000A
POWER CONNS. — V/PH/HZ ③	208/230/1/60
MIN. BRCH. CIR. AMPACITY	14
BR. CIR. PROT. RTG. – MAX. (AMPS)	25
COMPRESSOR	CLIMATUFF®
NO. USED - NO. SPEEDS	1 - 1
VOLTS/PH/HZ	208/230/1/60
R.L. AMPS ⑦ - L.R. AMPS	10.9 - 62.9
FACTORY INSTALLED	
START COMPONENTS ⑧	NO (Uses BAYKSKT263)
INSULATION/SOUND BLANKET	NO
COMPRESSOR HEAT	NO
OUTDOOR FAN	PROPELLER
DIA. (IN.) - NO. USED	23 - 1
TYPE DRIVE - NO. SPEEDS	DIRECT - 1
CFM @ 0.0 IN. W.G. ④	2850
NO. MOTORS - HP	1 - 1/8
MOTOR SPEED R.P.M.	825
VOLTS/PH/HZ	200/230/1/60
F.L. AMPS	0.64
OUTDOOR COIL — TYPE	SPINE FIN™
ROWS - F.P.I.	1 - 24
FACE AREA (SQ. FT.)	18.75
TUBE SIZE (IN.)	3/8
REFRIGERANT CONTROL	EXPANSION VALVE
REFRIGERANT	
LBS. — R-410 (O.D. UNIT) ⑤	7 LBS. - 5 OZ.
FACTORY SUPPLIED	YES
LINE SIZE - IN. O.D. GAS ⑥	3/4
LINE SIZE - IN. O.D. LIQ. ⑥	3/8
CHARGING SPECIFICATION	
SUBCOOLING	10°F (see note next page for TEM6)
DIMENSIONS	H X W X D
CRATED (IN.)	38 x 30.1 x 33
WEIGHT	
SHIPPING (LBS.)	208
NET (LBS.)	174

TUBING INFORMATION

LINE TYPE		REFRIGERANT TO ADD AT SPECIFIED ADDITIONAL LENGTH				
Suction	**Liquid**	**20 ft**	**30 ft**	**40 ft**	**50 ft**	**60 ft**
3/4"	3/8"	3 oz	8 oz	15 oz	21 oz	27 oz

① Certified in accordance with the Air-Source Unitary Heat Pump Equipment certification program, which is based on AHRI standard 210/240.
② Rated in accordance with AHRI standard 270.
③ Calculated in accordance with Natl. Elec. Codes. Use only HACR circuit breakers or fuses.
④ Standard Air — Dry Coil — Outdoor
⑤ This value approximate. For more precise value see unit nameplate.
⑥ Max. linear length 60 ft.; Max. lift - Suction 60 ft.; Max lift - Liquid 60 ft. For greater length consult refrigerant piping software Pub. No. 32-3312-0* (* denotes latest revision).
⑦ This value shown for compressor RLA on the unit nameplate and on this specification sheet is used to compute minimum branch circuit ampacity and max. fuse size. The value shown is the branch circuit selection current.
⑧ No means no start components. Yes means quick start kit components. PTC means positive temperature coefficient starter.

⚠ CAUTION

HOT SURFACE!
DO NOT TOUCH TOP OF COMPRESSOR.
May cause minor to severe burning.

⚠ CAUTION

CONTAINS REFRIGERANT!
SYSTEM CONTAINS OIL AND REFRIGERANT UNDER HIGH PRESSURE. RECOVER REFRIGERANT TO RELIEVE PRESSURE BEFORE OPENING SYSTEM.
Failure to follow proper procedures can result in personal illness or injury or severe equipment damage.

⚠ WARNING

THIS INFORMATION IS INTENDED FOR USE BY INDIVIDUALS POSSESSING ADEQUATE BACKGROUNDS OF ELECTRICAL AND MECHANICAL EXPERIENCE. ANY ATTEMPT TO REPAIR A CENTRAL AIR CONDITIONING PRODUCT MAY RESULT IN PERSONAL INJURY AND OR PROPERTY DAMAGE. THE MANUFACTURER OR SELLER CANNOT BE RESPONSIBLE FOR THE INTERPRETATION OF THIS INFORMATION, NOR CAN IT ASSUME ANY LIABILITY IN CONNECTION WITH ITS USE.

⚠ CAUTION

RECONNECT ALL GROUNDING DEVICES.
ALL PARTS OF THIS PRODUCT CAPABLE OF CONDUCTING ELECTRICAL CURRENT ARE GROUNDED. IF GROUNDING WIRES, SCREWS, STRAPS, CLIPS, NUTS OR WASHERS USED TO COMPLETE A PATH TO GROUND ARE REMOVED FOR SERVICE, THEY MUST BE RETURNED TO THEIR ORIGINAL POSITION AND PROPERLY FASTENED.

NOTICE: **Manuf**acturer has a policy of continuous product and product data improvement **and** it reserves the right to change design and specifications without notice.

SUBCOOLING CHARGING IN COOLING ABOVE 55°F OD AMBIENT

The manufacturer recommends installing approved matched indoor and outdoor systems.

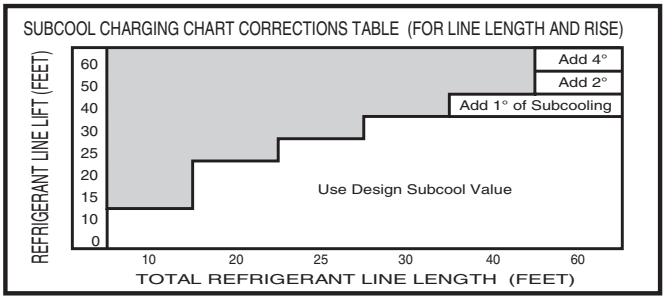
All split systems are AHRI rated with only EEV/TXV indoor systems.

The benefits of installing approved indoor and outdoor split systems are maximum efficiency, optimum performance and the best overall system reliability.

The following charging methods are therefore prescribed for systems with indoor EEV/TXVs.

1. Subcooling (in the cooling mode) is the only recommended method of charging above 55°F ambient temperatures.
2. For best results - the indoor temperature should be kept between 70°F to 80°F. Add system heat if needed.
3. At start-up, or whenever charge is removed or added, the system must be operated for a minimum twenty (20) minutes to stabilize before accurate measurements can be made.
4. Measure Liquid Line Temperature and Refrigerant Pressure at service valves.
5. Determine total refrigerant line length, and height (lift) if indoor section is above the condenser. Use the ***Subcool Charging Chart Corrections Table*** to calculate any additional subcooling required for your specific application.
6. Determine the Design Subcooling from the unit nameplate or Service Facts. Add any additional amount of subcooling calculated in Step 5 to the Design Subcooling to arrive at the final subcooling value.
7. Locate this value in the appropriate column of the ***R-410-A Refrigerant Charging Chart.*** Locate your liquid line temperature in the left column of the chart, and the intersecting liquid line pressure under your calculated subcooling value column. Add refrigerant to raise the pressure to match the chart, or remove refrigerant to lower the pressure. Again, wait twenty (20) minutes for the system conditions to stabilize before adjusting charge again.
8. When system is correctly charged, you can refer to System Pressure Tables to verify typical performance.

2 Ton



SUBCOOLING CHARGING BELOW 55°F OD AMBIENT – IN HEATING ONLY

1. The Subcool Charging Method in cooling is not recommended below 55°F outdoor ambient.
2. The only recommended method of charging at outdoor ambients below 55°F, is to weigh in the charge in the heating mode.
3. Use Nameplate charge plus standard charge adders for line length.
4. Check liquid line temperature and pressure (at the OD valves) to obtain a minimum of 10°F subcooling.
5. Add charge if a minimum of 10°F subcooling is not obtained with the nameplate charge plus line length correction.
6. It is important to return in the spring or summer to accurately charge the system in the cooling mode at outdoor ambients above 55°F.

R-410A REFRIGERANT CHARGING CHART

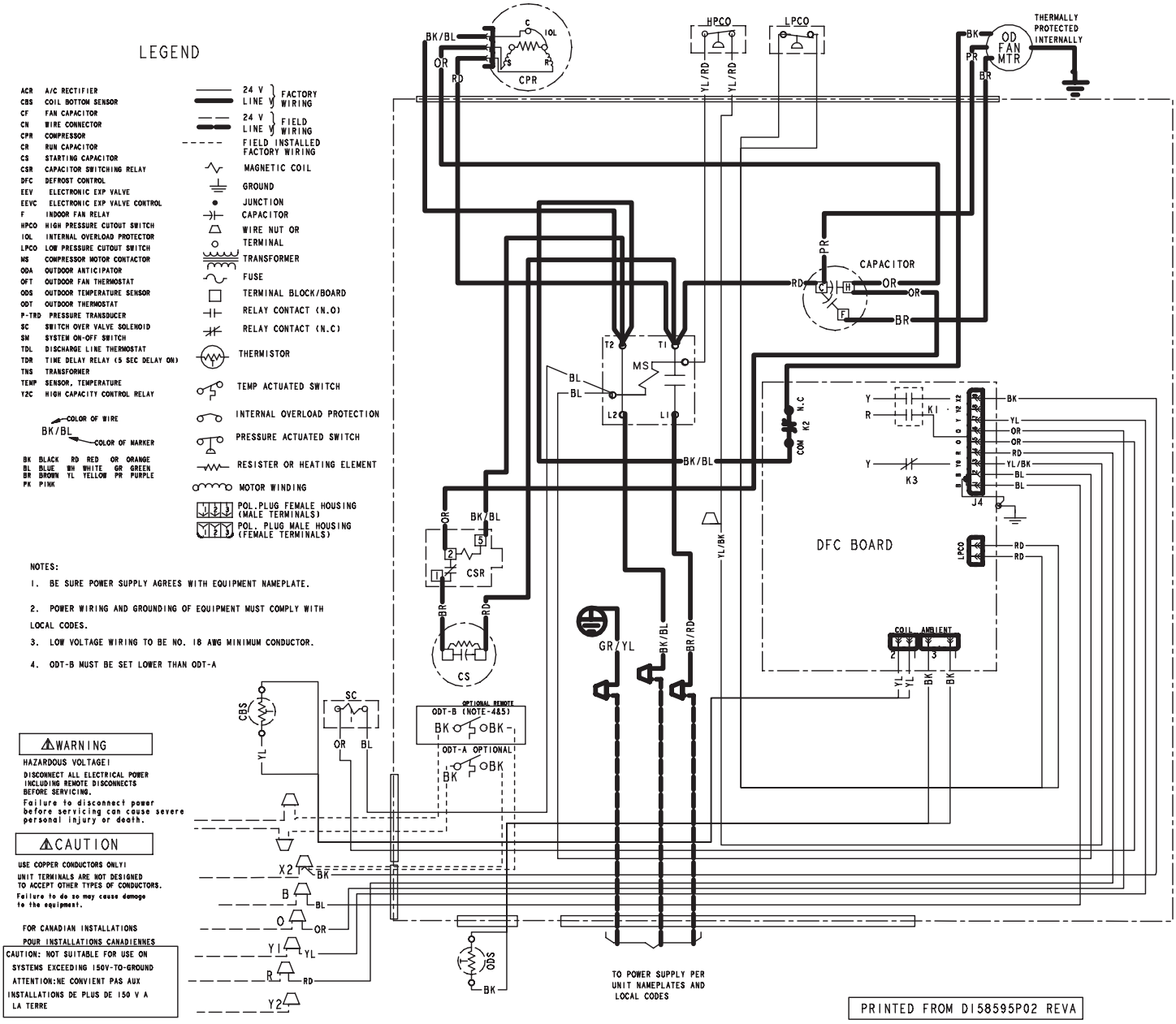
LIQUID TEMP (˚F)	DESIGN SUBCOOLING (˚F)						
	8	**9**	**10**	**11**	**12**	**13**	**14**
	LIQUID GAGE PRESSURE (PSI)						
55	179	182	185	188	191	195	198
60	195	198	201	204	208	211	215
65	211	215	218	222	225	229	232
70	229	232	236	240	243	247	251
75	247	251	255	259	263	267	271
80	267	271	275	279	283	287	291
85	287	291	296	300	304	309	313
90	309	313	318	322	327	331	336
95	331	336	341	346	351	355	360
100	355	360	365	370	376	381	386
105	381	386	391	396	402	407	413
110	407	413	418	424	429	435	441
115	435	441	446	452	458	464	470
120	464	470	476	482	488	495	501
125	495	501	507	514	520	527	533
Refer to Service Facts or Installer's Guide for charging method.							

From Dwg. D154557P01 Rev. 2

SPECIAL SUBCOOLING FOR APPLICATION WITH TEM6 AIR HANDLER

When matched with TEM6A0C36H31, Subcooling is 13 degrees.

WIRING DIAGRAM



DEFROST CONTROL

Defrost Control

The demand defrost control measures heat pump outdoor ambient temperature with a sensor located outside the outdoor coil. A second sensor located on the outdoor coil is used to measure the coil temperature. The difference between the ambient and the colder coil temperature is the difference or delta-T measurement. This delta-T measurement is representative of the operating state and relative capacity of the heat pump system. Measuring the change in delta-T determines the need for defrost. The coil sensor also serves to sense outdoor coil temperature for termination of the defrost cycle.

Fault Detection

A fault condition is indicated by the flashing Fault LED light on the defrost control board located inside the heat pump control box.

In normal operation, the status LED will flash once each second when idle or twice each second with a call for heating or cooling.

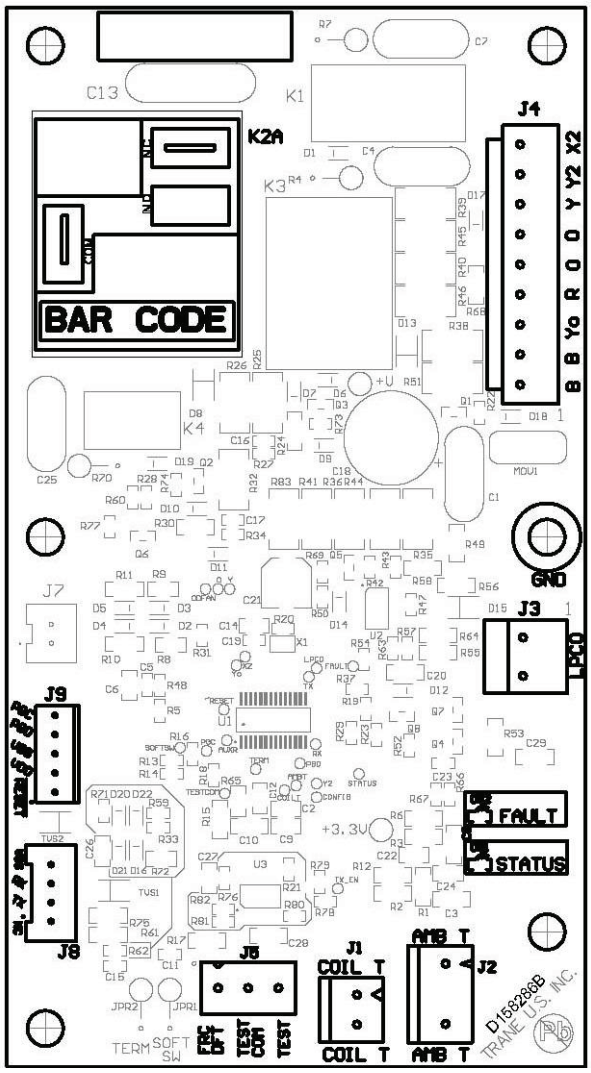
PIN Identification

1. 1. TEST_COMMON (Shorting any of the other pins to this pin causes the function of the other pin to be executed. Leaving this pin open results in the normal mode of operation).
2. 2. FRC_DFT = Forced Defrost (Short TEST_COMMON to this pin speeds up all defrost. Remove the short after defrost initiates.

Defrost Control Checkout

Normal operation requires:

1. Status LED on board flashing 1 time/second in standby or 2 times/second with a call for heating or cooling.
2. 24V AC between R & B
3. 24V AC between Y, Y0 & B with unit operating
4. Defrost initiation when FRC_DFT pin is shorted to TEST_COMMON pin.



Test Sensors

Measure the temperature the subject sensor is exposed to. If the sensor is mounted on a tube, place the lead on an Annie A-8 (or equiv.) temperature tester on the same tube near the sensor and insulate the bulb.

Unplug the sensor and measure the resistance with a good quality ohmmeter (Simpson 260 or equiv.). Read the value as quickly as possible to prevent the meter current from changing the resistance reading.

Using the chart, locate (as close as possible) the actual sensor temperature. The measured resistance should be relatively close to the resistance value shown in the chart.

Defrost Control Thermistor Table

TEMP °F	TEMP °C	THERMISTOR RESISTANCE (OHMS)	Volts DC
-15.00	-26.11	135976	2.50
-10.00	-23.33	115112	2.40
-5.00	-20.56	97745	2.29
0.00	-17.78	83247	2.17
5.00	-15.00	71108	2.05
10.00	-12.22	60916	1.93
15.00	-9.44	52333	1.81
20.00	-6.67	45076	1.69
25.00	-3.89	38927	1.56
30.00	-1.11	33703	1.45
35.00	1.67	29253	1.33
40.00	4.44	25452	1.22
45.00	7.22	22198	1.12
50.00	10.00	19405	1.02
55.00	12.78	17002	0.93
60.00	15.56	14930	0.85
65.00	18.33	13138	0.77
70.00	21.11	11586	0.70

Defrost Control Thermistor Table (continued)

75.00	23.89	10238	0.63
80.00	26.67	9065	0.57
85.00	29.44	8043	0.52
90.00	32.22	7150	0.47
95.00	35.00	6368	0.42
100.00	37.78	5682	0.38
105.00	40.56	5079	0.35
110.00	43.33	4548	0.31
115.00	46.11	4079	0.28
120.00	48.89	3665	0.26
125.00	51.67	3298	0.23
130.00	54.44	2972	0.21
135.00	57.22	2683	0.19

Example:

Sensor temp. = 19°F
Measured Resistance = 46K ohms
This sensor is good since the measured value is relatively close to the chart value.

DEMAND DEFROST QUICK SPECS

COMPRESSOR	SCROLL	SCROLL
MNEMONIC NO CNT	07255	07256
GROUP NOMENCLATURE [a]	G01	G02
SUPERSEDURE CNT	NA	NA
OD FAN TYPE – PSC/ECM	PSC	ECM
	1-SPD	1-SPD
DEFROST ENABLED: Y = ON COIL TEMPERATURE =	≤52 °F [b]	≤52 °F [b]
DEFROST PERMIT: Y = ON COIL TEMPERATURE =	≤32 °F [b]	≤32 °F [b]
MIN DEFROST TIME (MINUTES)	1	1
TARGET DEFROST TIME (MINUTES)	4	4
MAX TIME OVERRIDE (MINUTES)	15	15
DEFROST TERMINATE COIL TEMPERATURE (Factory Setting)	47°F	47°F
DEFROST HI TERMINATE COIL TEMPERATURE (Cut Jumper 2)	70° F	70°F
SOV SWITCH-OVER DELAY AFTER DEFROST TERM. (SECONDS)	12	12
DEFEAT SWITCH-OVER DELAY (SECONDS) (Cut Jumper 2)	0	0
LOW AMBIENT HEAT PUMP LOCK OUT	-7° F	-7° F
LOW AMBIENT HEAT PUMP RESUME	3° F	3° F
LPCO INPUT TO CONTROL	YES	YES
LPCO BYPASS IN/OUT DEFROST (MINUTES)	1	1

[a] GROUP suffix for drawing number D158283
[b] ≤ (EQUAL OR LESS THAN)

LED FAULT CODES

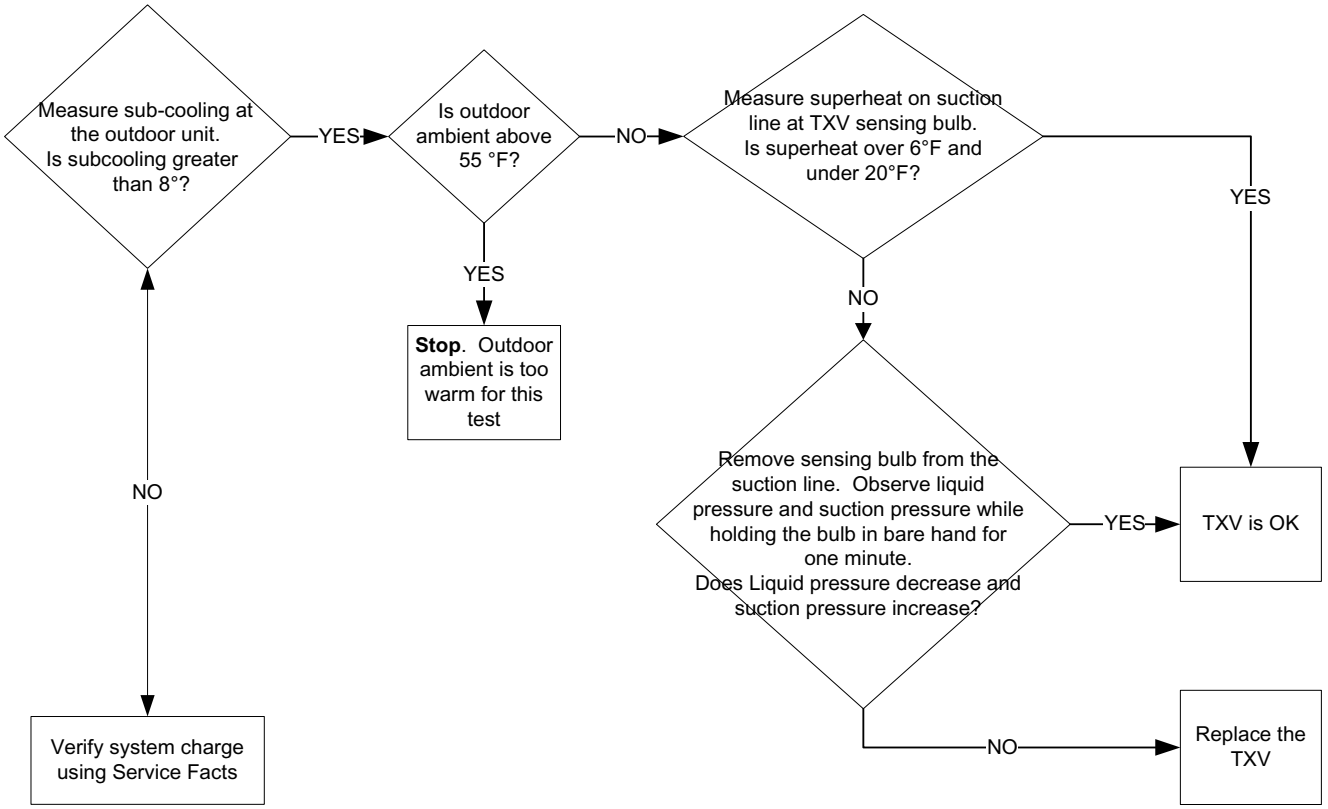
LED FAULT CODES	FAULT DESCRIPTION	DEFROST CONTROL BEHAVIOR
1 FLASH	Ambient Temp Sensor is out of range (open/shorted)	Initiate a 15 minute forced Defrost after every 60 minutes of runtime. See Note 1 & 3.
2 FLASH	Coil Temp Sensor is out of range (open/shorted)	Initiate a 15 minute forced Defrost after every 60 minutes of runtime. See Note 3.
3 FLASH	Low Pressure Switch is open	3 flash goes away when/if LPCO closes
4 FLASH	Hard Lock Out (can only be cleared with power cycle)	Occurs after 4th trip of LPCO. Note 7
5 FLASH	Soft Lock Out	5 flash goes away after soft lockout periods expires. See Note 2.
6 FLASH	Defrost cycles too close together	Heating Short Cycle Fault triggers 6 flash & 5 flash codes. Follow Soft Lock Out sequence until Hard Lock Out (4 flash) or can clear if conditions no longer exists.
7 FLASH	In Timed Defrost mode. Check Ambient sensor placement and verify SOV is operating properly.	Implied sensor fault (calibration/range) set after defrost and reset after 15 minutes run time after defrost. See Note 5.
8 FLASH	In Timed Defrost mode. Check Coil sensor placement and verify SOV is operating properly.	Outdoor temperature is below -7'F. See Note 6.
9 FLASH	Low Ambient Soft Lockout. Outdoor temperature dropped below 3F. (OFF at -7F/ON at 3F)	Outdoor temperature is below -7'F. See Note 6.

1. Initiate Adaptive/Timed Defrost so long as Coil Temp Sensor is functional. Monitor actual time in defrost and add or reduce run time until next forced defrost based on achieving a 4 minute (+/- 1) defrost period.
2. 1st LPCO trip results in a 15 minute soft lockout period.
   - 2nd LPCO trip results in a 30 minute soft lockout period.
   - In COOLING mode, 3rd LPCO trip results in a 4 hour soft lockout period (Frozen ID coil).
   - 4th LPCO trip results in a hard lockout.
   - In HEATING mode, 3rd LPCO trip results in an 18 hour soft lockout period or will clear if ODT rises above 40F for 30 minutes or more.
   - 4th LPCO trip results on a hard lockout.
3. If both Coil Temp Sensor and Ambient Temp Sensor are failed, initiate a 15 minute forced defrost after ever 60 minutes of run time.
4. Do not track if Y cycles off or if defrost takes 15 minutes (Max Time Override). Ambient Sensor reading is monitored at the end of defrost and should not deviate more than +/-5F. Ambient Sensor must report a lower temperature than the Coil Sensor immediately after defrost (Coil Sensor should always be higher than Ambient Sensor when defrost terminates).
5. Do not track if Y cycles off or if defrost takes 15 minutes (Max Time Override). Coil Sensor reading is monitored at the end of defrost and reading must be less than Ambient Sensor after 15 minutes of run time.
6. Once ambient drops to -7F or lower, wait 5 minutes before soft lockout begins. During soft lock out the Y signal passes through to the X2 output. Resume operation when ambient temperature rises to 3F or higher and after a 15 minute soft lockout period expires.
7. During a Hard Lockout, the X2 relay opens so that the Y signal does not pass though.

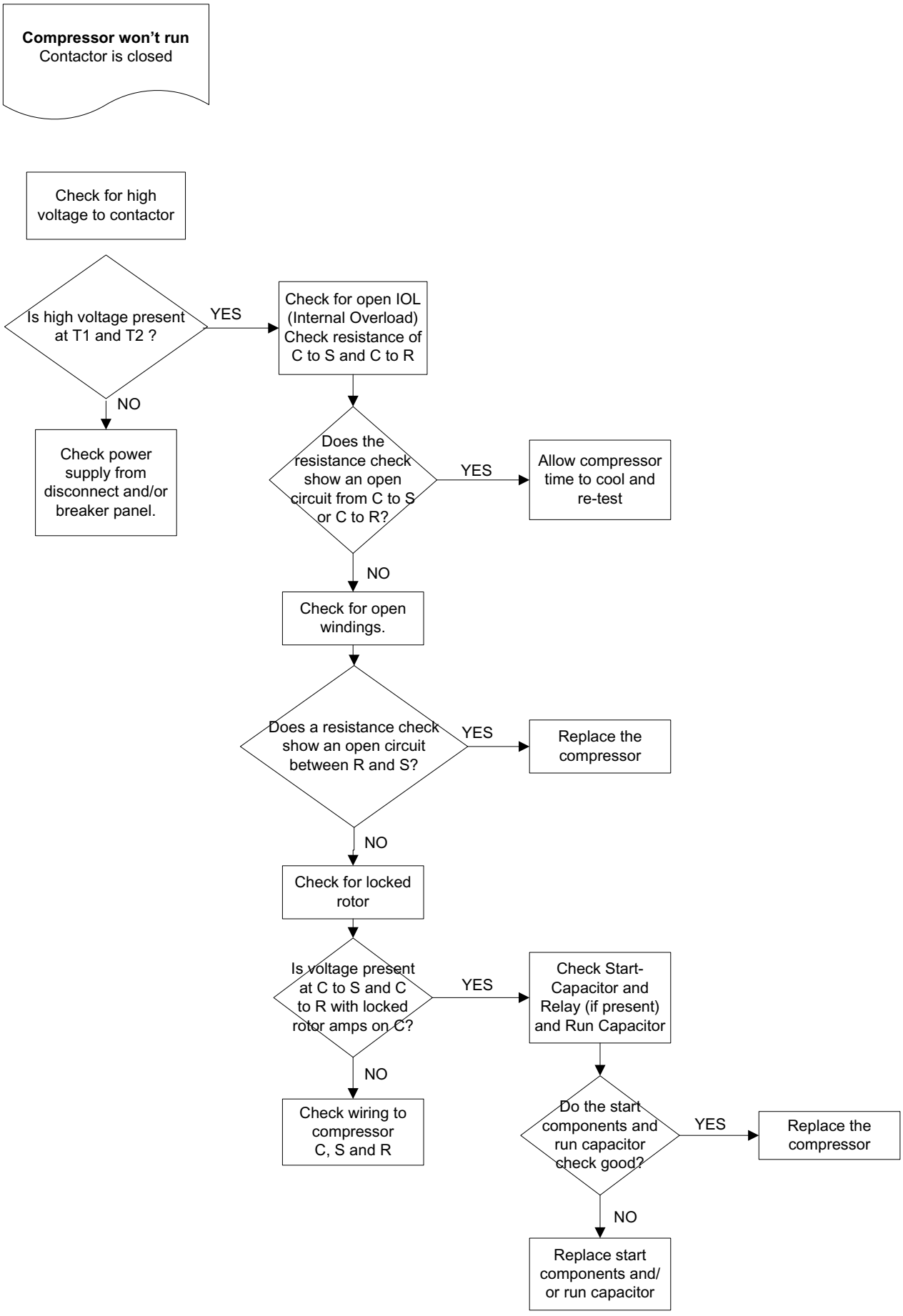
TROUBLESHOOTING

Before starting, insure proper fan motor operation and both indoor and outdoor coils are clean and clear of ice.

Troubleshooting Outdoor TXV / Heating Mode



TROUBLESHOOTING



TROUBLESHOOTING

Compressor fails to start
Contactor check

Is contactor energized? (contacts closed)

YES → Go To: **Compressor won't run**

NO

Check for 24 volts AC across contactor coil

Is voltage present at contactor coil?

YES → Replace contactor

NO

Check control transformer and control fuse

Is the control transformer and fuse good?

YES → Jumper R to Y low voltage terminals at thermostat sub base.

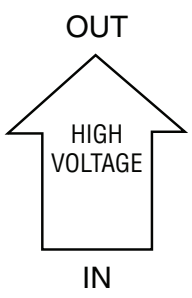
Does the contactor energize?

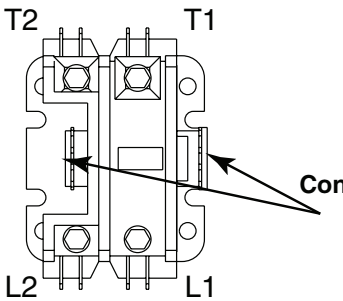
YES → Replace the room thermostat

NO → Repair or replace connecting wiring

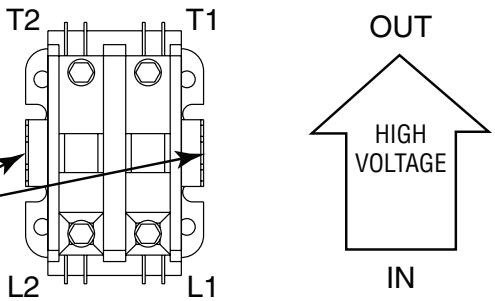
NO → Repair or replace transformer or fuse. Investigate cause for failure (possible short in field wiring)

Single Pole Contactor (MS)*





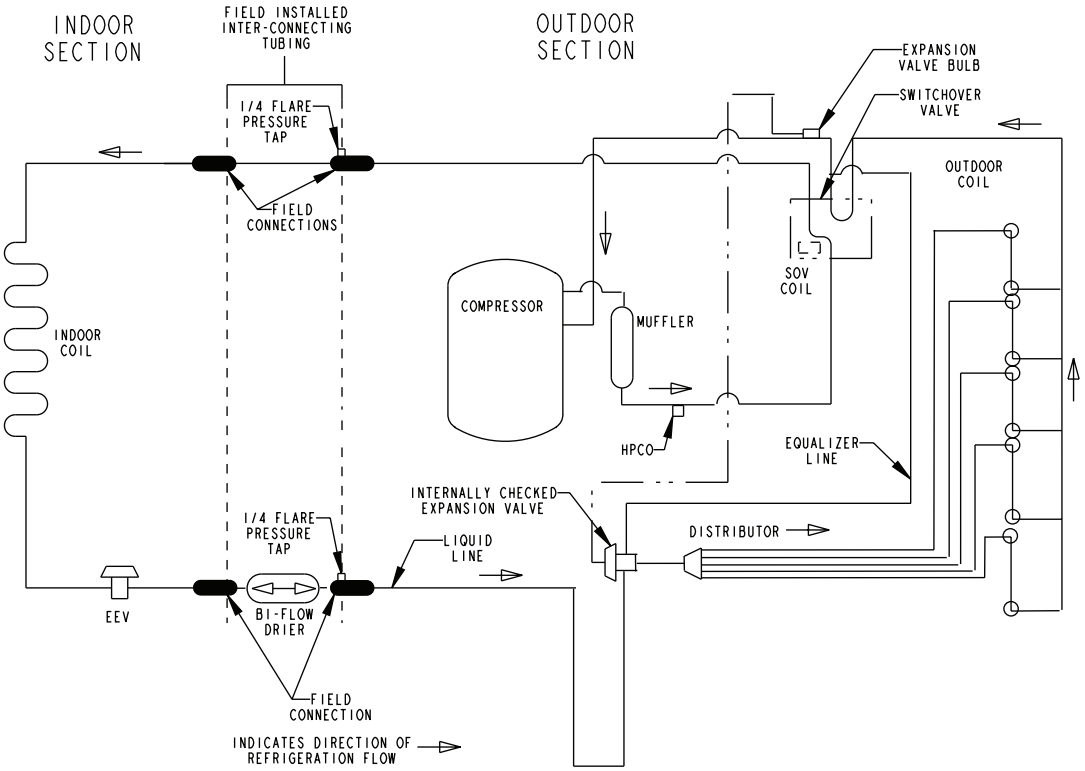
Double Pole Contactor (MS)*



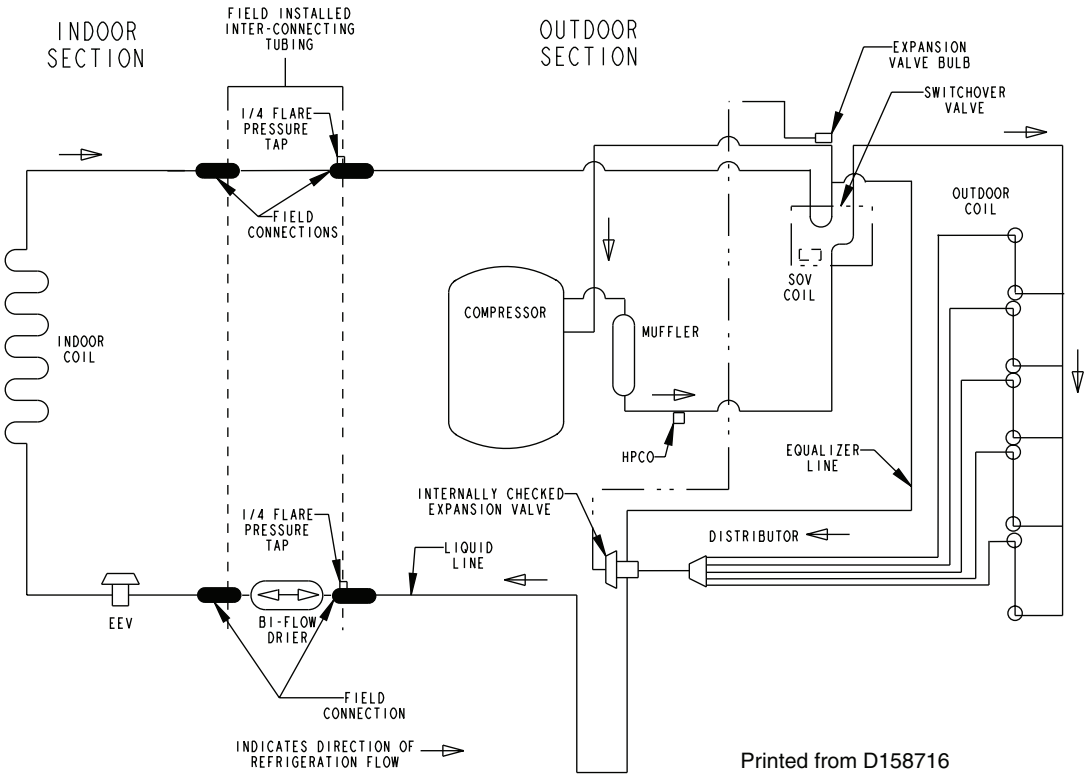
*Refer to Wiring Diagram to determine if a single pole or double pole contactor is used.

REFRIGERANT CIRCUITS

Heating Refrigeration Cycle



Cooling Refrigeration Cycle



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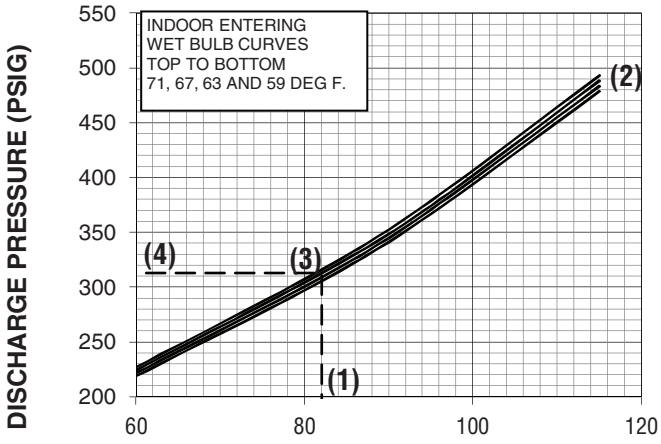
PRESSURE CURVES FOR 4TWR4024E1

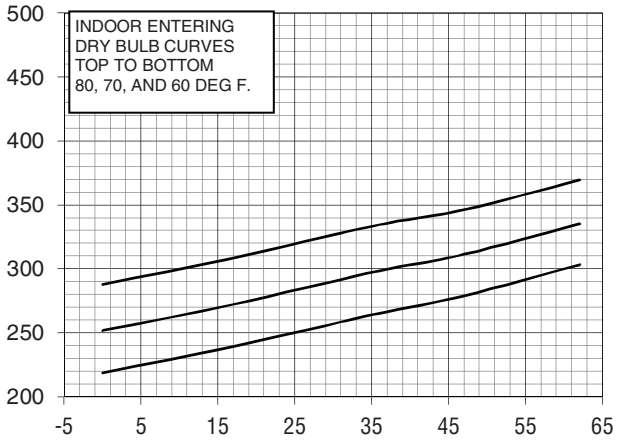
TEM6A0B24H21

Cooling @ 750 SCFM

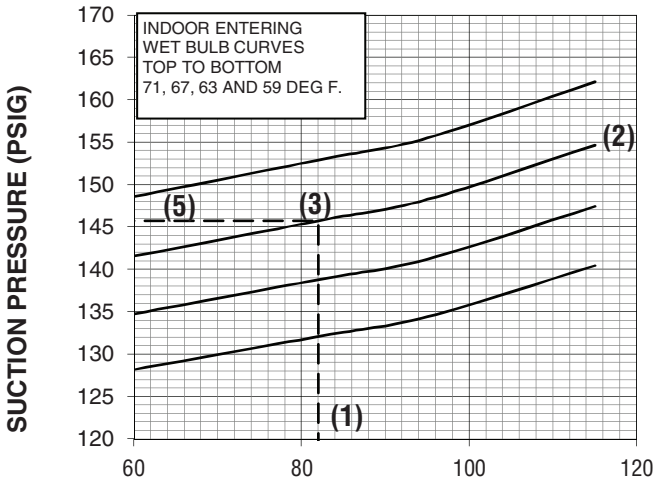


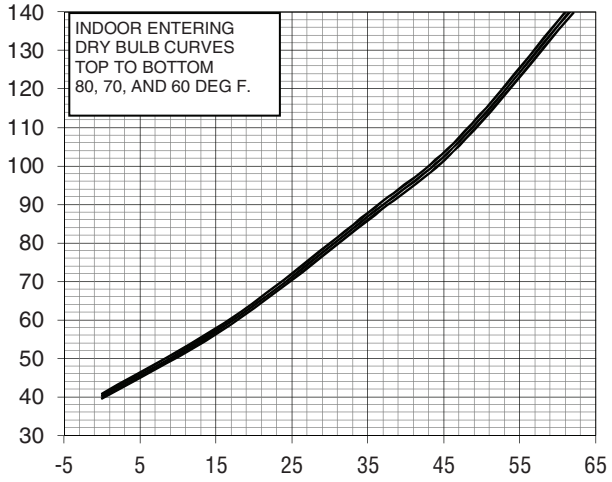
TEM6A0B24H21

Heating @ 800 SCFM



OUTDOOR TEMPERATURE (Degree F)





OUTDOOR TEMPERATURE (Degree F)

COOLING PERFORMANCE CAN BE CHECKED WHEN THE OUTDOOR TEMP IS ABOVE 65 DEG F.

TO CHECK COOLING PERFORMANCE, SELECT THE PROPER INDOOR CFM, ALLOW PRESSURES TO STABILIZE. MEASURE INDOOR WET BULB TEMPERATURE, OUTDOOR TEMPERATURE, DISCHARGE AND SUCTION PRESSURES. ON THE PLOTS LOCATE OUTDOOR TEMPERATURE (1); LOCATE INDOOR WET BULB (2); FIND INTERSECTION OF OD TEMP. & ID W.B. (3); READ DISCHARGE OR SUCTION PRESSURE IN LEFT COLUMN (4).

EXAMPLE: (1) OUTDOOR TEMP. 82 F.
(2) INDOOR WET BULB 67 F.
(3) AT INTERSECTION
(4) DISCHARGE PRESSURE @ 750 CFM IS 313 PSIG
(5) SUCTION PRESSURE @ 750 CFM IS 146 PSIG

ACTUAL:
DISCHARGE PRESSURE SHOULD BE +/- 10 PSI OF CHART
SUCTION PRESSURE SHOULD BE +/- 3 PSIG OF CHART

INTERCONNECTING LINES
GAS - 3/4" O.D.
LIQUID - 3/8" O.D.

DWG.NO. 4TWR4024E1

Trane
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