Service Facts

Customer Property: Contains wiring and service information. Please retain.

TWA090-SF-4C

Library	Service Literature
Product Section	Unitary
Product	Split System Heat Pumps
Model	TWA
Literature Type	Service Facts
Sequence	4C
Date	September 2001
File No.	SV-UN-S/SP-TWA090-SF-4C 9/01
Supersedes	NEW

Models :

TWA090A300EA TWA090A30SEA
TWA090A400EA TWA090A40SEA
TWA090AW00EA TWA090AW0SEA

Split System Heat Pump Condensers

Product Specifications

MODEL	TWA090A3	TWA090A4	TWA090AW
POWER CONNS.- Volts/Ph/Hz	208-230/3/60	460/3/60	575/3/60
Mininum Branch Cir. Ampacity [1]	35.6	17.9	14.1
Fuse Size - Max. amps	60	25	20
COMPRESSOR			
No. Used - No Speeds	1 - 1		
No. Motors / HP(kW) / R.P.M.	1 / 7.5 (5.59) / 3450		
Volts/Ph/Hz	208-230/3/60	460/3/60	575/3/60
R.L. Amps - L.R. Amps	26.0 - 172.0	13.0 - 90.0	10.3 - 62.3
OUTDOOR FAN - TYPE	Propeller		
No. Used - Dia. in. (mm)	1 - 26 (660.4)		
Type Drive - No. Speeds	Direct - 1		
CFM (M^3/hr)	5890 (10007.1)		
No. Motors - HP (kW)	1 - 0.50 (0.37)		
Motor Speed R.P.M.	1100		
Volts/Ph/Hz	208-230/1/60	460/1/60	575/1/60
F.L. Amps - L.R. Amps	3.1 - 8.1	1.6 - 3.7	1.2 - 3.0
OUTDOOR COIL - TYPE	Plate Fin		
Rows / F.P.I. (mm)	2/18 (457.2)		
Face Area sq. ft. (m^2)	19.2 (1.78)		
Tube Size in. (mm) O.D.	0.375 (9.53)		
REFRIGERANT	Field Supplied		
Lbs. (Kg) of R-22 [4 5]	18.0 (8.16) [3]		
DIMENSIONS	L x W x H		
Outdoor Unit Crated in.	43 x 36 x 43		
Uncrated in.	42 x 34 x 39		
WEIGHT			
Shipping lbs.	390		
Net lbs.	343		

1. Calculated in accordance with currently prevailing National Electric Code.
2. Standard Air - Dry Coil - Outdoor.
3. This value approximate. For more precise value see unit nameplate.
4. Amount of refrigerant charge shown is for Condenser and matching size Evaporator/Air Handler with 25 feet of interconnecting tubing. Use Refrigerant/Tubing table at right for amounts to charge for additional tubing lengths, or for reducing charge for lengths less than 25 feet.
5. Max. linear length 80 ft.; Max. lift/Suction or liquid - 60 ft.; Max. length of pre-charged tubing 40 ft. For greater length refer to Refrigerant Piping Manual pub no. 22-3040.

Optional Equipment

Thermostat- 2H/1C Auto Changeover BAY28x138
Anti-Short Cycle Timer BAYASCT001
Coil Guard Kit BAYGARD024A
Isolator Floor Mtd. Rubber. BAYISLT005A
Isolator Floor Mtd. Spring. BAYISLT023A
Head Pressure Control -
for TWA090A3 ..... BAYLOAM326A
for TWA090A4 ..... BAYLOAM425A
for TWA090AW BAYLOAM015A
Thermostat-
Programmable Night Setback BAYSTAT038A
Thermostat- Outdoor BAYSTATO33A
Thermostat- 2H/1C Manual Changeover BAYSTAT239
Thermostat- Manual Changeover BAYSTAT240
Interlock Relay for Low Ambient Kit BAYRLAY005A
Outdoor Temperature Sensor BAYSENS024
Remote Temperature Sensor BAYSENS025
Duct Temperature Sensor BAYSENS026
Locking Thermostat Cover BAY28x190
Locking Thermostat Wall Mounting Plate BAYMTPL005
Outdoor Temperature Sensor BAYSTAT033

Refrigerant / Tubing

Tubing Sizes		Additional	Additional
Suction	Liquid	Tubing Length	Refrigerant
1-3/8"	1/2"	15'	1 lb., 4 oz.
1-3/8"	1/2"	25'	2 lbs., 1 oz.
1-3/8"	1/2"	32'	2 lbs., 11 oz.
1-3/8"	1/2"	40'	3 lbs., 5 oz.

Amounts shown are based on 1.33 ounces of refrigerant per foot of 1-3/8" and 1/2" lines.

⚠ WARNING: HAZARDOUS VOLTAGE-DISCONNECT POWER BEFORE SERVICING

Failure to **DISCONNECT POWER** before servicing could lead to severe personal injury or death.

SAFETY NOTICE

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 of seller cannot be responsible for the interpretation of this information, nor can it assume any liability in connection with its use.

RE-CONNECT 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.

Sequence of Operation

General

Operation of the unit heating and cooling cycles is automatic for **HEAT** and **COOL** functions. (The optional automatic changeover thermostat, when in the **AUTO** position, automatically changes to heat or cool with sufficient room temperature change.) The fan switch can be placed in either the **ON** position, causing continuous evaporator (indoor) fan operation, or the **AUTO** position causing fan operation to coincide with heating or cooling run cycles.

Cooling Mode

*(**Note: TSH & TSC*** are contacts internal to the indoor thermostat.)

With the disconnect switch in the **ON** position, current is supplied to the compressor crankcase heater(s) and control transformer, and the **ODF** relay is energized through normally closed contacts of the **DFC**. The cooling cycle is enabled through the low voltage side of the control transformer to the **"R"** terminal on the indoor thermostat. With the system switch in the **AUTO** position and **TSC-1** contacts closed, power is supplied to the **"O"** terminal on the low voltage terminal board of the outdoor unit. This energizes the switch-over valve **(SOV)** and places it in the cooling position (it is in heating position when not energized). The **EDR** relay is also energized at this time; **EDR-1** contacts open to allow the **EDC** to function only in the cooling mode, and **EDR-2** contacts open removing power from the **DFC** so the timer does not run in cooling mode.

When the indoor temperature rises 1 & 1/2 degrees, **TSC-2** contacts close, supplying power to the **"Y"** terminal on the outdoor unit, and from the **"Y"** terminal to the compressor contactor **(CC)**. This starts the outdoor fan motor and compressor. The **TSC-2** contacts also provide power to the **"G"** terminal, which provides power to the **"F"** fan relay starting the indoor fan motor.

Heating Mode

With the disconnect switch in the **"ON"** position, current is supplied to the compressor crankcase heater(s) and transformer. Starting at the **"R"** terminal on the indoor thermostat, current goes through the system switch (which is in **"AUTO"** position) to the **TSH-1** contacts. When closed, these contacts supply power to terminal **"Y"** on the indoor thermostat as well as to the heating anticipator. The switch-over valve will not energize because of the high resistance of the heating anticipator in the **T-STAT**. Power is provided from **"Y"** to the compressor contactor **(CC)** which starts the outdoor fan motor and compressor. The indoor thermostat contact **TSH-1** also provides power to **"G"** terminal on the indoor thermostat energizing the fan relay **"F"**, which starts the indoor fan motor. Refrigerant then leaves the compressor, passes through the switch-over valve and the indoor coil, on through the expansion valve into the outdoor coil, and returns to the compressor.

Supplementary Heat

The **1st stage of supplementary heat** is brought on when the indoor temperature drops 1 & 1/2 degrees below the thermostat setting. **TSH-2** contacts close providing power to the **"W"** terminal on the indoor thermostat and to the supplementary heater control circuit. ***Note:*** the Fan relay ***"F"*** must have been energized and ***"F-AUX"*** contacts closed.

Additional supplementary heat and outdoor thermostats may have been added (not shown in schematic). If the outdoor temperature falls below the setting on the outdoor thermostat, these additional heaters will come on. When the outdoor air temperature rises, and the outdoor T-stat setpoint is reached, the system will revert back to second stage heating. When the indoor ambient is satisfied, **TSH-2** contacts will open and the unit will revert back to first stage heating position, and then off.

For **emergency heat** (use of supplementary electric heat only), an emergency (EMERG) heat switch is provided within the thermostat. When placed in the emergency heat position, it will disable the compressor, bypass the outdoor thermostats, and engage the supplementary electric heaters and indoor fan.

Time-Temperature Defrost Operation

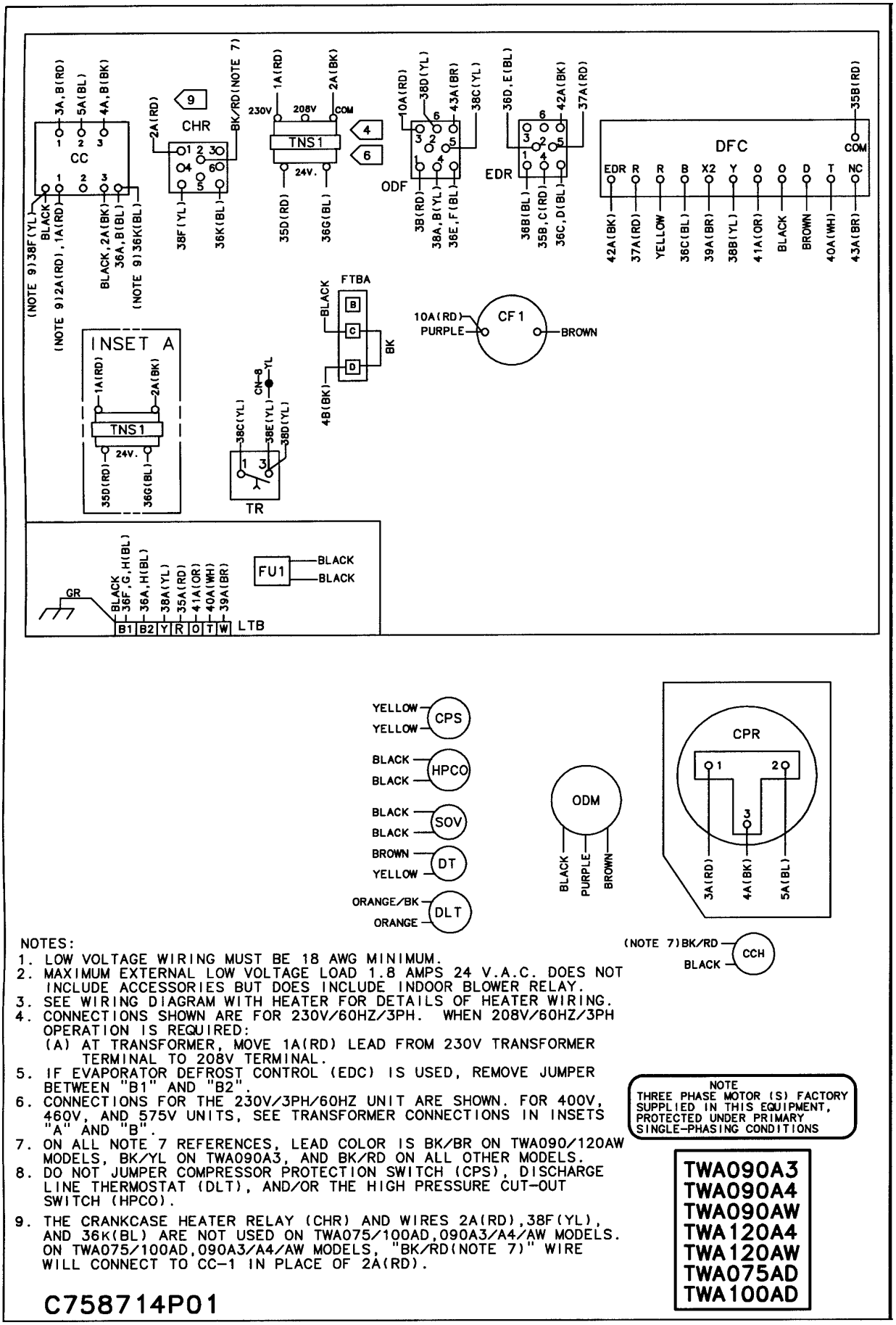
During the heating cycle, the outdoor coil may require a defrost cycle which is controlled by the defrost timer control **(DFC)**. It is energized continuously allowing a defrost cycle every 50,70, or 90 minutes. When the **(DT)** closes at the appropriate line temperature setpoint, the defrost control **(DFC)** opens the circuit to the outdoor fan relay and energizes the switch-over valve **(SOV)**, placing the unit in the cooling mode.The compressor will start 30 seconds after the initiation of the defrost cycle in which the outdoor fan relay **ODF** switches the 30 second delay-on-make time delay relay **TR** . With the fan off, hot gas enters the outdoor coil, and causes defrost. When the liquid line temperature reaches 70 Degrees. F, or a ten minute time cycle expires, the **(DFC)** energizes the fan relay and de-energizes the **SOV,** which returns the unit to the heating mode. Supplementary electric heat is brought on to control indoor temperature during the defrost cycle.

NOTE: Do not change from the 70 minute full timing cycle in Southern U.S. ("Sunbelt") areas. In Northern climates, especially in areas of frequent snow, change the timer to the 50 minute cycle selection.

"T" (Thermistor) Circuit

The **"T"** circuit, used with both the manual and the automatic changeover thermostats in the Heat Pump applications, is used for anticipation of outdoor condition changes. This thermistor varies in resistance as the temperature varies in an inverse proportional relationship. It is located in the outdoor unit on the **DFC** and is in series with a fixed value resistor on the thermostat between **"R"** and **"T"** terminals. Should this "T" circuit from the outdoor unit become inoperative, the thermostat could be out of calibration by as much as 6 to 10 degrees. Before attempting to calibrate the thermostat, be sure to check this circuit for proper operation.

Connection Diagram



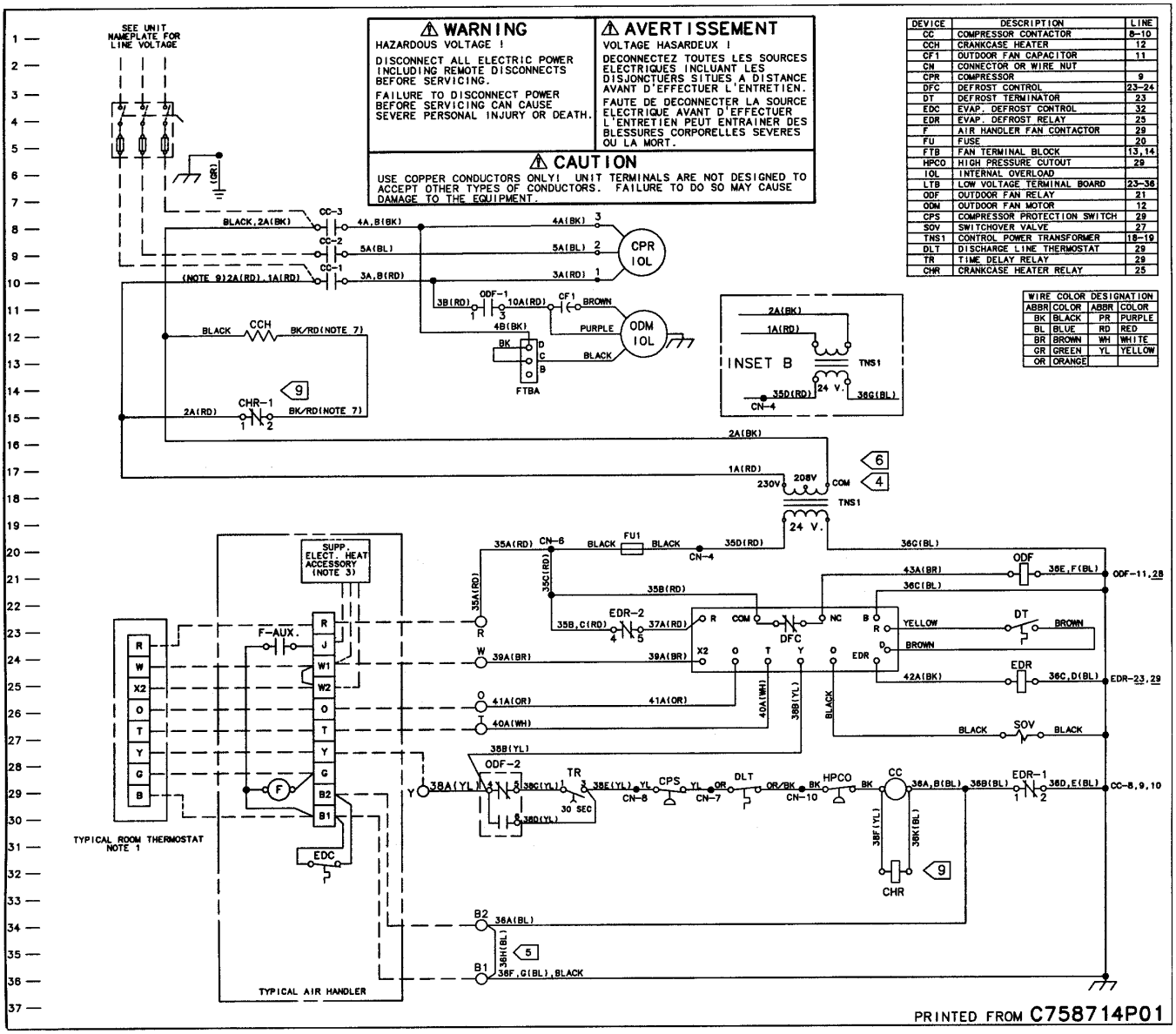
NOTES:
1. LOW VOLTAGE WIRING MUST BE 18 AWG MINIMUM.
2. MAXIMUM EXTERNAL LOW VOLTAGE LOAD 1.8 AMPS 24 V.A.C. DOES NOT INCLUDE ACCESSORIES BUT DOES INCLUDE INDOOR BLOWER RELAY.
3. SEE WIRING DIAGRAM WITH HEATER FOR DETAILS OF HEATER WIRING.
4. CONNECTIONS SHOWN ARE FOR 230V/60HZ/3PH. WHEN 208V/60HZ/3PH OPERATION IS REQUIRED:
   (A) AT TRANSFORMER, MOVE 1A(RD) LEAD FROM 230V TRANSFORMER TERMINAL TO 208V TERMINAL.
5. IF EVAPORATOR DEFROST CONTROL (EDC) IS USED, REMOVE JUMPER BETWEEN "B1" AND "B2".
6. CONNECTIONS FOR THE 230V/3PH/60HZ UNIT ARE SHOWN. FOR 400V, 460V, AND 575V UNITS, SEE TRANSFORMER CONNECTIONS IN INSETS "A" AND "B".
7. ON ALL NOTE 7 REFERENCES, LEAD COLOR IS BK/BR ON TWA090/120AW MODELS, BK/YL ON TWA090A3, AND BK/RD ON ALL OTHER MODELS.
8. DO NOT JUMPER COMPRESSOR PROTECTION SWITCH (CPS), DISCHARGE LINE THERMOSTAT (DLT), AND/OR THE HIGH PRESSURE CUT-OUT SWITCH (HPCO).
9. THE CRANKCASE HEATER RELAY (CHR) AND WIRES 2A(RD),38F(YL), AND 36K(BL) ARE NOT USED ON TWA075/100AD,090A3/A4/AW MODELS. ON TWA075/100AD,090A3/A4/AW MODELS, "BK/RD(NOTE 7)" WIRE WILL CONNECT TO CC-1 IN PLACE OF 2A(RD).

NOTE
THREE PHASE MOTOR (S) FACTORY SUPPLIED IN THIS EQUIPMENT, PROTECTED UNDER PRIMARY SINGLE-PHASING CONDITIONS

C758714P01

TWA090A3
TWA090A4
TWA090AW
TWA120A4
TWA120AW
TWA075AD
TWA100AD

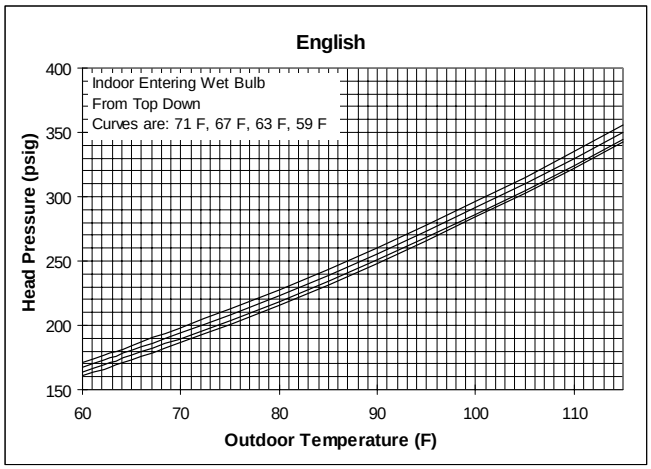
Schematic Diagram

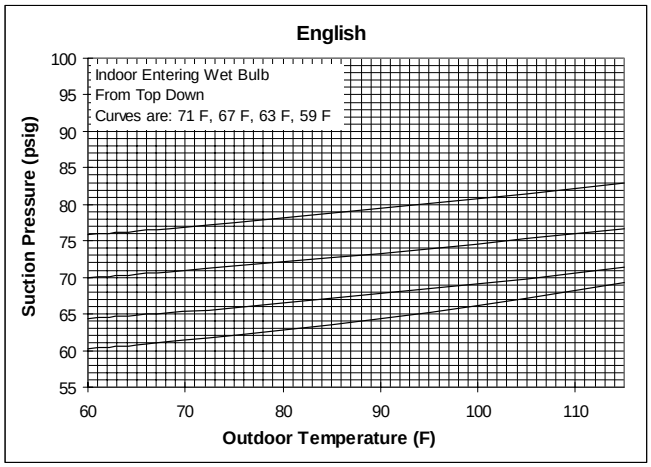


DEVICE	DESCRIPTION	LINE
CC	COMPRESSOR CONTACTOR	8-10
CCH	CRANKCASE HEATER	12
CF1	OUTDOOR FAN CAPACITOR	11
CN	CONNECTOR OR WIRE NUT	
CPR	COMPRESSOR	9
DFC	DEFROST CONTROL	23-24
DT	DEFROST TERMINATOR	23
EDC	EVAP. DEFROST CONTROL	32
EDR	EVAP. DEFROST RELAY	25
F	AIR HANDLER FAN CONTACTOR	29
FU	FUSE	20
FTB	FAN TERMINAL BLOCK	13,14
HPCO	HIGH PRESSURE CUTOUT	29
IOL	INTERNAL OVERLOAD	
LTB	LOW VOLTAGE TERMINAL BOARD	23-36
ODF	OUTDOOR FAN RELAY	21
ODM	OUTDOOR FAN MOTOR	12
CPS	COMPRESSOR PROTECTION SWITCH	28
SOV	SWITCHOVER VALVE	27
TNS1	CONTROL POWER TRANSFORMER	18-19
DLT	DISCHARGE LINE THERMOSTAT	29
TR	TIME DELAY RELAY	29
CHR	CRANKCASE HEATER RELAY	25

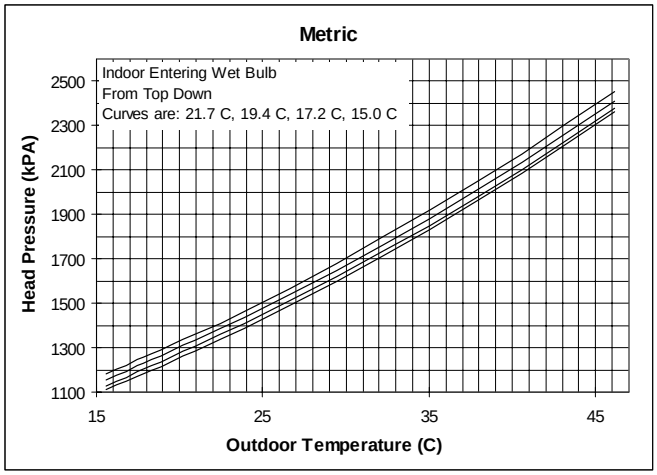
WIRE COLOR DESIGNATION			
ABBR	COLOR	ABBR	COLOR
BK	BLACK	PR	PURPLE
BL	BLUE	RD	RED
BR	BROWN	WH	WHITE
GR	GREEN	YL	YELLOW
OR	ORANGE		

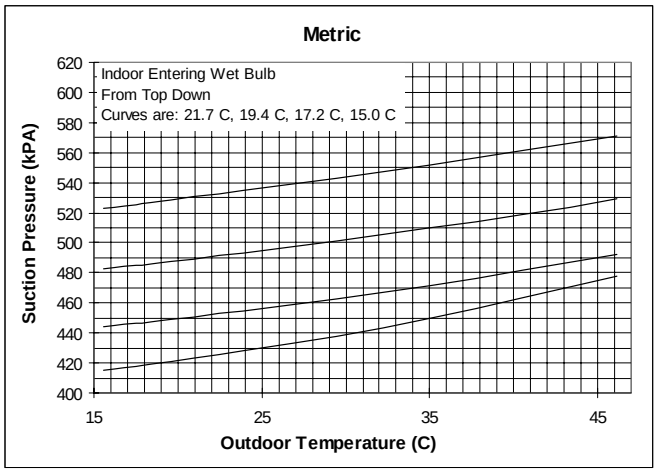
Pressure Curves - Cooling
Split System Heat Pump
TWA090A . .E Condensing Unit with:
TWE090A . .C Air Handler





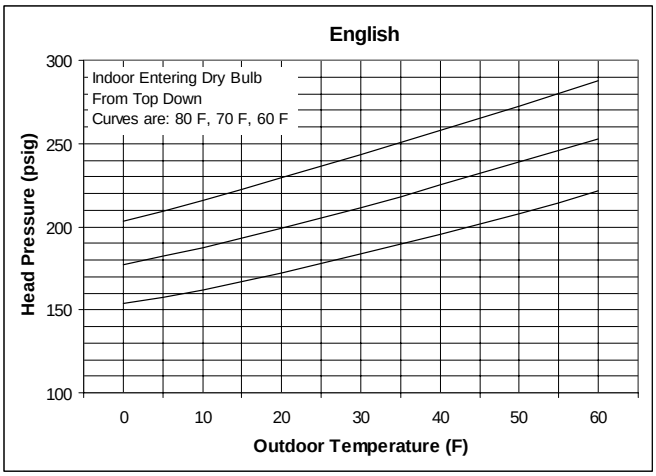
Pressure Curves - Cooling
Split System Heat Pump
TWA090A . .E Condensing Unit with:
TWE090A . .C Air Handler

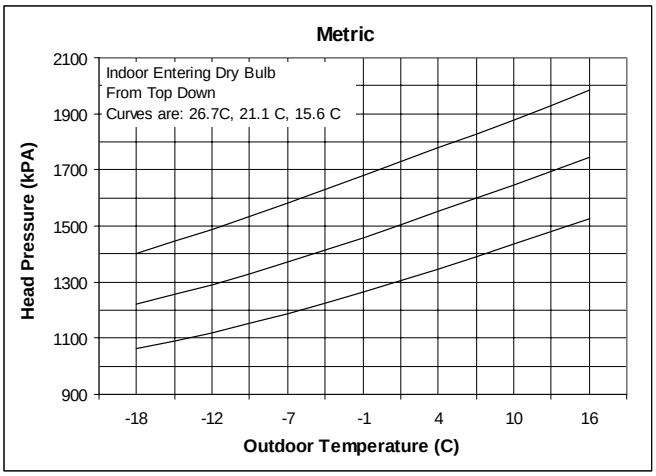


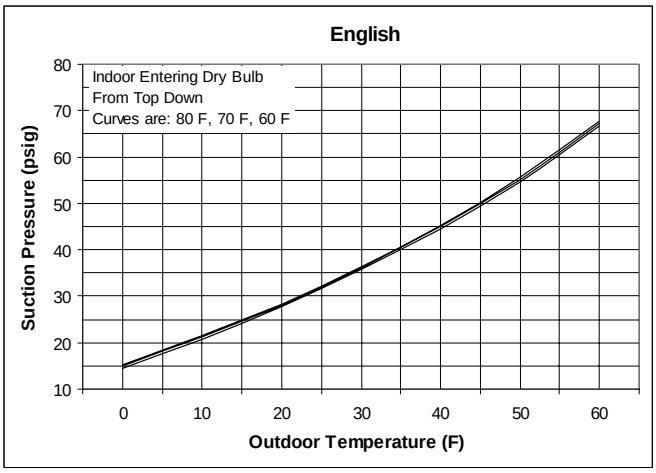


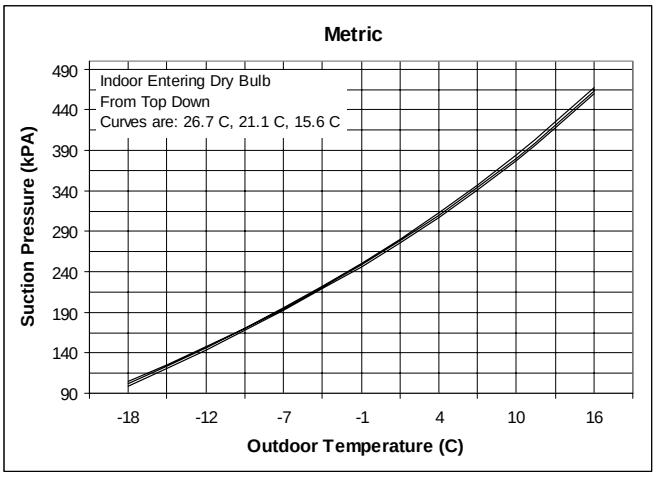
Pressure Curves - Heating

Split System Heat Pump
TWA090A . .E Condensing Unit with:
TWE090A . .C Air Handler





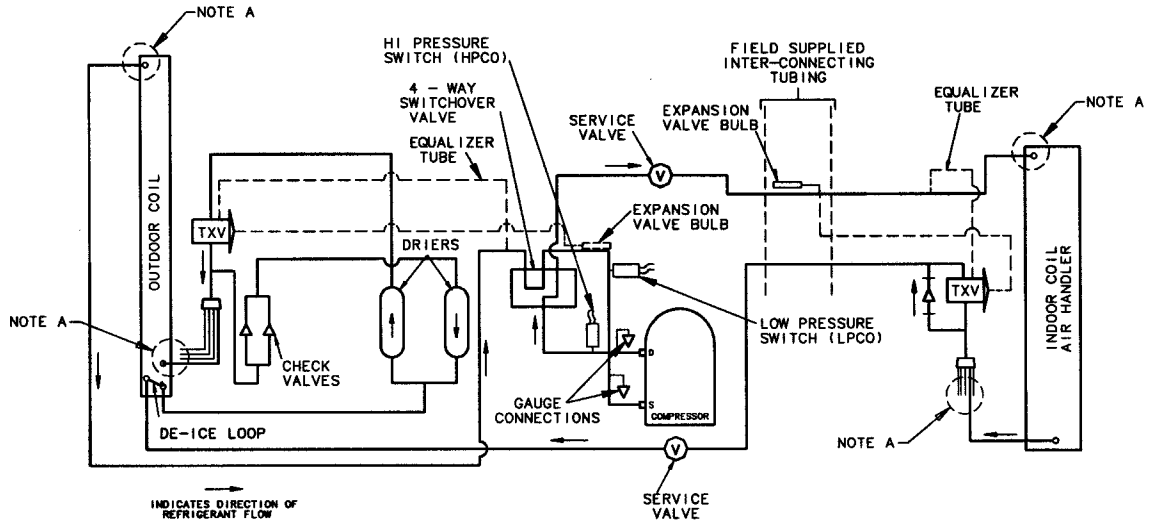




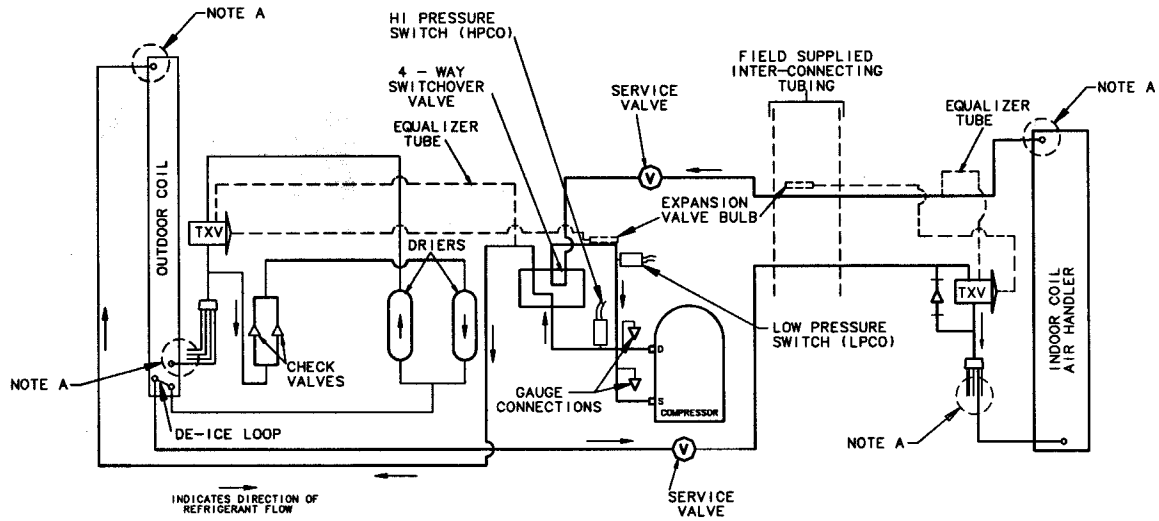
Pressure Curves - Heating

Split System Heat Pump
TWA090A . .E Condensing Unit with:
TWE090A . .C Air Handler

Refrigerant Circuit



HEATING MODE



COOLING MODE

NOTE A: ONLY ONE INDOOR & OUTDOOR COIL ENTRY/EXIT CIRCUIT IS SHOWN; ALL MODELS HAVE MULTIPLE ENTRY/EXIT CIRCUITS.

Trouble Shooting

SYSTEM FAULTS		WHAT TO CHECK MODE	POWER SUPPLY	HIGH VOLTAGE WIRING	COMPRESSOR IOL	RUN CAPACITOR	START CAPACITOR	START RELAY	CONTACTOR CONTACTS	LOW VOLTAGE WIRING	CONTROL TRANSFORMER	THERMOSTAT	CONTACTOR COIL	LOW VOLTAGE FUSE	STUCK COMPRESSOR	INEFFICIENT COMP.	REFRIG. UNDERCHARGE	REFRIG. OVERCHARGE	EXCESSIVE EVAP. LOAD	NONCONDENSABLES	RES. O.D. AIRFLOW	O.D. AIR RECIRCULATION	TXV STUCK OPEN	SUPERHEAT	RES. I.D. AIRFLOW	REF. CIR. RESTRICTIONS	SOV LEAKING	SOV COIL DEFECTIVE	CHECK VALVE LEAKING	DEFROST RELAY DEF.	DEFROST TERM. DEF.	DEFROST CONTROL DEF.
REFRIGERANT CIRCUIT																																
Head Pressure Too High	C																	P		S	P	S				S					
	H																	P		S					P	S					
Head Pressure Too Low	C														S	P								S	S		S			P	
	H														P	P								S	S		S	S		P	
Suction Pressure Too High	C														S		P	P						S	S		S			P	
	H														S										S			P			
Suction Pressure Too Low	C															P									S	P	S				
	H																				S				S		S				
Liquid Refrig. Floodback (TXV)	C																							P						P	
	H																							P						P	
Liquid Refrig. Floodback (Cap Tube)	C																	P			S	S			S	P					
	H																	P			S	S			S	P					
I.D. Coil Frosting	C															P					S	S									
	H																														
Compressor Runs Inadequate or No Cooling/Htg.	C														S	P		S	S						S	P	S	S	S	S	
	H														S	P			S						S	P	S	S		S		
ELECTRICAL																																
Compressor & O.D. Fan Won't Start	C	P	P						S	P	S	P	P																			
	H	P	P						S	P	S	P	P																			
Compressor Will Not Start But O.D. Fan Runs	C		P	S	P	S	S	S						P																		
	H		P	S	P	S	S	S						P																		
O.D. Fan Won't Start	C		P		P			S																								
	H		P		P			S																								
Compressor Hums But Won't Start	C				P	S	S	S						P																		
	H				P	S	S	S						P																		
Compressor Cycles on IOL	C		P	S	P	S	S	S						P	S	P	P	S		S			S	P		S					
	H		P	S	P	S	S	S						P	S	P	P	S		S			S	P		S					
I.D. Blower Won't Start	C	P	P						S	P	S		S												S	P						
	H	P	P						S	P	S		S												S	P						
DEFROST																																
Unit Won't Initiate Defrost	C																												P		P	P
	H																												P		P	P
Defrost Terminates on Time	C																															
	H															P															P	P
Unit Icing Up	C																															
	H															P				S	S								P		S	P

C Cooling H Heating P Primary Causes S Secondary Causes