KingHome Heat Pump System Analyzer

All applicable fields must be completed

KingHome
Air comfort for all

Customer / Location Name: _____ Job Address: _____
Dealer: _____ Date: _____
Technician's Name: _____ Installation date: _____

MODEL INFO	Model #	Serial #
Furnace or Fan coil:		
Outdoor Unit:		
Air Cleaner:		
UV Lights:		
Thermostat:		
Electronic Air Cleaner:		
Other:		
Humidifier:		

COMPRESSOR DATA

Comp. Start Voltage: _____ Vac
Comp. Run Amps: U_____ V_____ W_____
Locked Rotor Amps: _____ amps U→V=_____Ω
Refrigerant Pressures Equal? ____yes ____no U->W=_____
Run Cap: _____μF(1Φ only)
Hard Start Kit Used? ____yes ____no W->V=_____

REFRIGERANT PROPERTIES

A. Vapor Line Temp. _____ @ Indoor Coil
at Service Valve: _____°F SuperHeat_____°F (A - B)
B. Vapor Pressure
at Service Valve: _____psig _____°F
C. Liquid Line Temp.
at Service Valve: _____°F Sub-Cooling_____°F (C - D)
D. Liquid Pressure
at Service Valve: _____psig _____°F

INDOOR PROPERTIES

Air Temp Entering Indoor Coil: _____°FDB _____°FWB
Air Temp Leaving indoor Coil: _____°FDB _____°FWB
Airflow: _____cfm
Supply Static *: _____w.c. (Used with Total External Static Method)
Return Static *: _____w.c. (Used with Total External Static Method)
Clg. Metering Device: ____txv ____piston #_____
Htg.Blower Speed Tap: _____ Clg. Blower Speed Tap:_____
Blower Amps: Hi Cool_____ amps Lo Cool_____amps
Heat_____amps
Filter Type: _____
Dip Switch Settings: __ (1) __(2) __(3) __(4) __(5) __(6) __(7) __(8)
Defrost Time Interval: _____ min Easy Select board connections _____

ELECTRICAL INFO

Control Voltage:_____ Vac
Supply Voltage:_____ Vac Φ____
3 Phase (Φ) Voltages: T1→T2_____Vac
T1→T3_____Vac T2→T3_____Vac

OUTDOOR

Air Temp Entering Outdoor Coil:_____°F
Air Temp Leaving Outdoor Coil:_____°F
Outdoor Fan Amps:_____ amps

Htg.Metering Device:____txv ____piston #____
Line Set Length:____ ft
Line Set Size: Suc____in, Liq____in

AIRFLOW

Electric Heat Temp Rise CFM Method

Volts = _____ Amps = _____
Ret. Air Temp.____°F Sup. Air Temp.† ____°F
cfm = _____

Electric Heat Temp Rise Method

$$cfm = \frac{(Volts)(Amps)(3.413)}{1.08(\Delta T)}$$

Total External Static Method *

Ret. Static + Sup. Static = Total External Static
Use the Total External Static in conjunction with the Blower Performance data in the Product Specification Sheets

NOTE: 350-400 CFM PER TON

SYSTEM CAPACITY (Cal. On page 2)

Htg. Capacity (HP): _____btuh
Clg. Capacity (AC/HP):_____btuh

Htg. System Capacity Method

btu's = (cfm)(1.08)(ΔT)
btu's = _____

For split systems, is the indoor unit application - ☐ Horizontal ☐ Vertical

Any traps in the refrigerant line? ☐ Yes ☐ No If yes, where? Inverted or Std.? _____

Suction Drier Installed? ☐ Yes ☐ No If yes, for how long? _____ What is the temperature drop across it? _____

Liquid Drier Installed? ☐ Yes ☐ No If yes, what is the temperature drop across it? _____

Liquid line solenoid valve installed? ☐ Yes ☐ No

Are the refrigerant lines buried? ☐ Yes ☐ No If yes, how far? _____

HEAT PUMP JOBSITE SHEET

REMEMBER:

1. Circle Metering device used.
2. Circle Yes or No at drier locations.
3. Sat. Temp. is pressure converted to Temp.

Formula For Super Heat

Vapor Line Temp. _____

– Minus Sat Temp. _____

Equals Super Heat _____

Formula For Sub Cooling

Sat Temp. _____

– Minus Liquid Line Temp. _____

Equals Sub Cooling _____

Circle One

Heat Mode

Cool Mode

Low side PSIG _____ Saturation Temp. _____

High side PSIG _____ Saturation Temp. _____

Inside Temp. Leaving

DB: _____

WB: _____

Indoor Coil

DB: _____

WB: _____

Liquid Line Temp. _____

Drier Yes or No

LIQUID LINE

Liquid Line Temp. _____

Metering Device

TXV or Piston

Piston size _____

Metering Device

TXV or Pistion size _____

Outdoor Coil

Outdoor Temp.

Circle one: Upflow - Downflow - Horizontal

Suction Line Temp.

VAPOR LINE

Reversing Valve

VOLTS: _____

AMPS:

U: _____

V: _____

W: _____

Compressor

Discharge Line Temp. _____

Accumulator

1. Liquid Line Size: _____

2. Liquid Line Length Vertical/Horizontal: _____

3. Vapor Line Size: _____

4. Vapor Line Length: Vertical/Horizontal: _____

5. Vertical Separation Below/Above: _____

6. Air Handler CFM: _____ **Method Used for CFM:** _____

7. Dipswitch Setting:

NOTE: An outdoor ambient temperature between 40°F and 50°F for heat mode and above 70°F for cool mode is recommended for completion of this sheet.

⌖ MAKE SYSTEM OPERATIONAL CHECK

Allow system to stabilize for 30 minutes after startup. If system is in pulldown with extreme conditions it may not stabilize for several hours.

Measure, then record the following temperature and pressure readings in Table 4 on lines A thru T . Use system drawing below as reference for temperature/pressure reading points.

Determine possible system problem by comparing actual readings with typical readings found in Table 4. Apply them in the Quick System Analysis chart found on page 4 to further identify possible system problem.

☐ SUPERHEAT

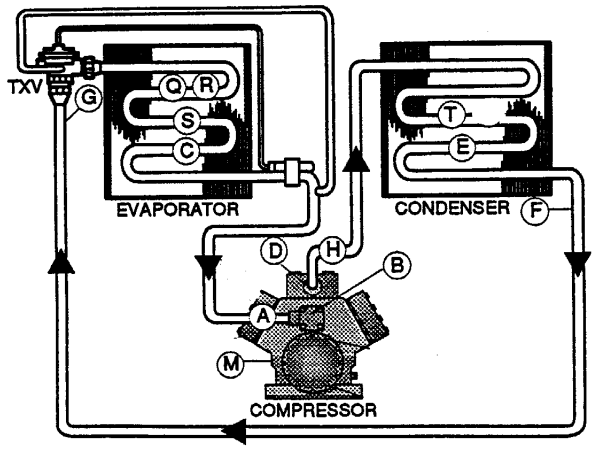
Ⓐ Ⓑ Ⓒ

Compute the superheat by determining saturated suction temperature from Temperature-Pressure Chart on Page 2, and subtracting from actual suction line temperature.

☐ SUBCOOLING

Ⓓ Ⓔ Ⓖ

Compute subcooling by subtracting liquid temperature entering TXV from saturated condensing temperature determined from Temperature-Pressure Chart on Page 4. Subcooling is listed on unit rating plate.



Ⓗ COMPRESSOR TEMPERATURES

Measure temperature of hot gas discharge line near service valve. Temperatures exceeding 300° F cause oil and refrigerant to break down.

Ⓜ Record crankcase temperature. It should not exceed 125° F.

Refer to compressor operating temperature guidelines in Table 3 to determine possible problems.

☐ COMPRESSION RATIO

Ⓟ Calculate the compression ratio by dividing absolute discharge pressure by absolute suction pressure.

Example: 260 psig + 14.7 = 274.7 / 70 psig + 14.7 = 84.7 = 3.24 to 1

☐ CAPACITY (See Table 3)

Ⓠ Ⓡ Ⓣ

- ☐ Measure DB and WB temperatures entering and leaving evaporator and DB temperatures entering and leaving condenser. Record values in Table 3.
- ☐ Use psychrometric chart to determine evaporator ΔH (Btu/lb).
- ☐ For condensing unit capacity look up the condenser CFM in the presale literature. Subtract the heat of compression of 25-30% for reciprocating and 20-25% for scroll compressors.
  Ex: BTUH = 1.10 X CFM X ΔT X .75
- ☐ Use formulas in Table 3 to calculate approximate evaporator and condenser capacities. Compare them to rated values. NOTE: Refer to GTA-3A "Air Properties & Measurement" for more information.

Ⓢ Ⓣ - Capacity Quick Check

- ☐ Calculate temperature drop accross evaporator and rise across condenser. Compare them to typical DB readings in Table 4.

✧ **PROCEED TO QUICK SYSTEM ANALYSIS CHART, PAGE 4, TO FURTHER IDENTIFY SYSTEM PROBLEM.**

⌑ ☐ **RECORD SYSTEM PROBLEM:**

_____

_____

_____

_____

If _____ WIFI? ☐Y ☐N

List all active fault codes: _____

REFERENCE CHARTS

PRESSURE -TEMPERATURE CHART

Temp	R-22	R-410A
°F		
	Pressure	Pressure
-50	6.2	3.5
-45	2.7	8.5
-40	0.5	11.6
-35	2.6	14.9
-30	4.9	18.5
-25	7.4	22.5
-20	10.1	26.9
-15	13.2	31.7
-10	16.5	36.8
-5	20	42.5
0	23.9	48.6
5	28.2	55.2
10	32.8	62.3
15	37.7	70
20	43	78.3
25	48.7	87.3
30	54.9	96.8
35	61.5	107
40	68.5	118
45	76	129.7
50	84	142.2
55	92.5	155.5
60	101.6	169.6
65	111.2	184.6
70	121.4	200.6
75	132.2	217.4
80	143.6	235.3
85	155.7	254.1
90	168.4	274.1
95	181.8	295.1
100	195.9	317.2
105	210.7	340.5
110	226.3	365
115	242.7	390.7
120	259.9	417.7
125	277.9	445.9
130	296.8	475.6
135	316.5	506.5
140	337.2	539
145	358.8	572.8
150	381.5	608.1

QUICK SYSTEM ANALYSIS (√)

SYSTEM PROBLEM	OPERATING TRENDS (LOW-NORMAL-HIGH														
	SUCTION PRESSURE			DISCHARGE PRESSURE			SUPERHEAT			SUBCOOLING			AMPERES		
	L	N	H	L	N	H	L	N	H	L	N	H	L	N	H
Overcharge			●			●	●					●			●
Condenser (Air) Restricted			●			●	●			●					●
Non-Condensibles in System			●			●	●			●					●
High Evaporator Load			●			●		●			●				●
Loose TXV Feeder Bulb															
- Oversized TXV															
- Leaking TXV Seat			●			●	●			●					●
- Wrong Equalizer Connection															
- Uninsulated Feeder Bulb															
Undercharge	●			●					●	●			●		
Liquid Line Restriction	●			●					●			●	●		
Low Outdoor Ambient	●			●					●			●	●		
Suction Line Restriction	●			●					●			●	●		
Evaporator Air (Cooler Liquid) Restricte d	●			●			●					●	●		
Undersized TXV															
- Leaking Feeder Bulb	●			●					●			●	●		
- No External Equalizer															
Inefficient Compressor			●	●					●			●	●		
ACTUAL SYSTEM OPERATION (▤)															

INDOOR DRY BULB ADJUSTMENT

Use equations below in conjunction with unit's "Tech Label" information for total and sensible capacities @ indoor dry bulbs other than 80°F entering coil.

Sensible Capacity at Indoor db LOWER than 80°F = $(MBh \times S/T) - \left(\frac{(80\text{-Indoor db}) \times 835 \times \text{Indoor cfm}}{1000}\right)$

Sensible Capacity at Indoor db HIGHER than 80°F = $(MBh \times S/T) + \left(\frac{(\text{Indoor db-80}) \times 835 \times \text{Indoor cfm}}{1000}\right)$

SYSTEM CAPACITY CALCULATOR

Temperature Wet-Bulb (F)	Enthalpy Btu/LB	Temperature Wet-Bulb (F)	Enthalpy Btu/LB	Temperature Wet-Bulb (F)	Enthalpy Btu/LB	Temperature Wet-Bulb (F)	Enthalpy Btu/LB	Temperature Wet-Bulb (F)	Enthalpy Btu/LB	Temperature Wet-Bulb (F)	Enthalpy Btu/LB
40	15.23	48	19.21	56	23.84	64	29.31	72	35.83	80	43.69
41	15.7	49	19.75	57	24.48	65	30.06	73	36.74	81	44.78
42	16.17	50	20.3	58	25.12	66	30.83	74	37.66	82	45.9
43	16.66	51	20.86	59	25.78	67	31.62	75	38.61	83	47.04
44	17.15	52	21.44	60	26.46	68	32.42	76	39.57	84	48.22
45	17.65	53	22.02	61	27.15	69	33.25	77	40.57	85	49.43
46	18.16	54	22.62	62	27.85	70	34.09	78	41.58		
47	18.68	55	23.22	63	28.57	71	34.95	79	42.62		

INDOOR COIL (EVAPORATOR)

	ENTERING	LEAVING	DIFFERENCE
W.B.			
Enthalpy			Δh = Btu/LB

EVAPORATOR CAPACITY

BTUH = 4.5 x cfm x Δh

OUTDOOR COIL (CONDENSOR)

	ENTERING	LEAVING	DIFFERENCE
Air) D.B.			ΔT = f

CONDENSOR CAPACITY (Cooling)

BTUH = 1.08 x COND. Cfm x ΔT x .75 (for recip comp.)
x .80 (for Scroll comp.)

Due to varying field condidtions, a tolerance of 10% must be expected when comparing test data to actual performance.

* Used in the "Total External Static" method in conjunction with the "Blower Performance Data" in Product Specification sheets or the unit's "Tech Label" to calculate airflow.
† Temperature rise is equal to the supply air temp. minus the return air temp. at steady state operation. The supply air temp. should be measured away form the line of sight of the heat exchanger.