

Temperature Split Airflow Check Procedure

Contrary to “common knowledge” the temperature split should not universally be between 18°F and 20°F. See the table below for the target temperature split for differing indoor conditions. The temperature split test is a fast and easy indication of airflow and capacity. It is a useful screening tool, but not an adequate replacement for direct airflow measurement.

Adapted from Carrier, Adapted from CheckMe!TM Procedures, Adapted from California Title 24.

Criteria

If the temperature split is more than 3°F above the target, the low airflow is low.

If the temperature split is more than 3°F below the target, the air conditioner probably has low capacity due to some fault other than airflow.

If the temperature split falls within 3°F of the target, the air flow is probably OK. Another possibility is that the airflow is low and so is the capacity.

The proper amount of refrigerant depends on the airflow. Whenever airflow is changed, the refrigerant charge test needs to be repeated to ensure proper refrigerant charge. Since the temperature split test is dependent on capacity, changes in refrigerant charge mandate a new temperature split test.

Instrumentation Specifications

Digital Thermometer. Digital thermometer must have thermocouple compatibility and Fahrenheit readout with:

- Accuracy: \pm (0.1% of reading + 1.3° F)
- Resolution: 0.2° F to 1.0° F

Thermocouples. Measurements require three (3) beaded low-mass wire thermocouples and one (1) cotton wick for measuring web-bulb temperatures.

Calibration

Thermometers with their /temperature sensors shall be calibrated monthly to ensure that they are reading accurate temperatures.

The following procedure shall be used to check thermometer/temperature sensor calibration:

1. Fill an insulated cup (foam) with crushed ice. The ice shall completely fill the cup. Add water to fill the cup. Title 24 specifies distilled water; Proctor's laboratory tests show no measurable difference between distilled water and tap water. Even saturated salt water showed less than a 0.2°F difference.
2. Insert two sensors into the center of the ice bath and attach them to the digital thermometer.
3. Let the temperatures stabilize. The temperatures shall be 32°F (plus or minus 1°F). If the temperature is off by more than 1°F make corrections according to the manufacturer's instructions. Any sensors that are off by more than 2°F shall be replaced.
4. Switch the sensors and ensure that the temperatures read on both channels are still within plus or minus 1°F of 32°F.
5. Repeat the process for all sensors.



Calculations

The following steps describe the calculations.

1. Calculate the Actual Temperature Split as the return air dry-bulb temperature minus the supply air dry-bulb temperature.
Actual Temperature Split = $T_{\text{return, db}} - T_{\text{supply, db}}$
2. Determine the Target Temperature Split from the table below using the return air wet-bulb temperature ($T_{\text{return, wb}}$) and return air dry-bulb temperature ($T_{\text{return, db}}$).
3. Calculate the difference between target and actual temperature split (Actual Temperature Split - Target Temperature Split) and compare it to the criteria listed at the top of this sheet. ($\pm 3^\circ\text{F}$ probably OK, outside that range not OK)

Measurement

The following procedure shall be used to obtain measurements

1. Turn system on and let it run for 15 minutes to stabilize temperatures and pressures before taking any measurements. While system is stabilizing, proceed with setting up the temperature measurements.
2. Place wet-bulb thermocouple in water to ensure it is saturated when needed. Do not get the dry-bulb thermocouples wet.
3. Insert the dry-bulb thermocouple in the supply plenum at the center of the airflow.
4. At 12 minutes, insert a dry-bulb thermocouple and a wet-bulb thermocouple into the return plenum at the center of the airflow.
5. At 15 minutes when the return plenum temperatures have stabilized measure and record the return (evaporator entering) air dry-bulb temperature ($T_{\text{return, db}}$) and the return (evaporator entering) air wet-bulb temperature ($T_{\text{return, wb}}$).
6. Measure and record the supply (evaporator leaving) air dry-bulb temperature ($T_{\text{supply, db}}$).

Return Air Wet-Bulb (°F) ($T_{\text{return, wb}}$)																											
	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
70	20.9	20.7	20.6	20.4	20.1	19.9	19.5	19.1	18.7	18.2	17.7	17.2	16.5	15.9	15.2	14.4	13.7	12.8									
71	21.4	21.3	21.1	20.9	20.7	20.4	20.1	19.7	19.3	18.8	18.3	17.7	17.1	16.4	15.7	15.0	14.2	13.4	12.5								
72	21.9	21.8	21.7	21.5	21.2	20.9	20.6	20.2	19.8	19.3	18.8	18.2	17.6	17.0	16.3	15.5	14.7	13.9	13.0	12.1							
73	22.5	22.4	22.2	22.0	21.8	21.5	21.2	20.8	20.3	19.9	19.4	18.8	18.2	17.5	16.8	16.1	15.3	14.4	13.6	12.6	11.7						
74	23.0	22.9	22.8	22.6	22.3	22.0	21.7	21.3	20.9	20.4	19.9	19.3	18.7	18.1	17.4	16.6	15.8	15.0	14.1	13.2	12.2	11.2					
75	23.6	23.5	23.3	23.1	22.9	22.6	22.2	21.9	21.4	21.0	20.4	19.9	19.3	18.6	17.9	17.2	16.4	15.5	14.7	13.7	12.7	11.7	10.7				
76	24.1	24.0	23.9	23.7	23.4	23.1	22.8	22.4	22.0	21.5	21.0	20.4	19.8	19.2	18.5	17.7	16.9	16.1	15.2	14.3	13.3	12.3	11.2	10.1			
77	-	24.6	24.4	24.2	24.0	23.7	23.3	22.9	22.5	22.0	21.5	21.0	20.4	19.7	19.0	18.3	17.5	16.6	15.7	14.8	13.8	12.8	11.7	10.6	9.5		
78	-	-	-	24.7	24.5	24.2	23.9	23.5	23.1	22.6	22.1	21.5	20.9	20.2	19.5	18.8	18.0	17.2	16.3	15.4	14.4	13.4	12.3	11.2	10.0	8.8	
79	-	-	-	-	-	24.8	24.4	24.0	23.6	23.1	22.6	22.1	21.4	20.8	20.1	19.3	18.5	17.7	16.8	15.9	14.9	13.9	12.8	11.7	10.6	9.4	8.1
80	-	-	-	-	-	-	25.0	24.6	24.2	23.7	23.2	22.6	22.0	21.3	20.6	19.9	19.1	18.3	17.4	16.4	15.5	14.4	13.4	12.3	11.1	9.9	8.7
81	-	-	-	-	-	-	-	25.1	24.7	24.2	23.7	23.1	22.5	21.9	21.2	20.4	19.6	18.8	17.9	17.0	16.0	15.0	13.9	12.8	11.7	10.4	9.2
82	-	-	-	-	-	-	-	-	25.2	24.8	24.2	23.7	23.1	22.4	21.7	21.0	20.2	19.3	18.5	17.5	16.6	15.5	14.5	13.4	12.2	11.0	9.7
83	-	-	-	-	-	-	-	-	-	25.3	24.8	24.2	23.6	23.0	22.3	21.5	20.7	19.9	19.0	18.1	17.1	16.1	15.0	13.9	12.7	11.5	10.3
84	-	-	-	-	-	-	-	-	-	25.9	25.3	24.8	24.2	23.5	22.8	22.1	21.3	20.4	19.5	18.6	17.6	16.6	15.6	14.4	13.3	12.1	10.8