GENERAL

This twinning control accessory allows proper operation of two furnaces when the units are installed on a common duct system in a commercial application. This allows a greater system cfm and heating capacity to be attained than would be available from a single furnace.

The control, shown in Figure 1, may be connected to give single stage heat/cool operation or 2 stage heat/cool operation. Furnace blower failure protection is provided to prevent system operation in the event of a single furnace blower motor failure.

WARNING: Before installing this control, disconnect electrical power to both furnaces. Failure to cut power could result in electrical shock or equipment damage.

CAUTION: This control must not be installed in any location where it could be exposed to water. If the control has been exposed to water in any way, it must not be used.

DESCRIPTION

This accessory includes the twinning control and 2 blower sensor assemblies with 15 ft. wiring harnesses. The control uses only 24 volt field wiring connections. Most electro-mechanical or electronic type room thermostats may be applied with this twinning control, as it has no special requirements. The blower sensors will properly function with any psc, direct drive, multi-speed blower motor.

OPERATIONAL SEQUENCE

The following describes the operation of a twinned furnace system using this control. Both single stage and two stage sequences are shown.

SINGLE STAGE OPERATION

FAN ONLY - When the fan switch on the room thermostat is in the "ON" position, both furnaces will receive the "G" signal, and both blowers will operate. This will allow constant airflow and will reduce air stratification within the conditioned space. Constant airflow is recommended in most commercial applications during the occupied mode.

HEATING - When the room thermostat heating circuit closes, the control will first energize the "G" circuits in both furnaces to start the blowers. One second later, the control will energize the "W" circuits in both furnaces. This will provide total heating capacity under control of the single stage room thermostat.

When the room thermostat is satisfied, the "W" circuits to both furnaces will be de-energized. The furnace blowers will continue to operate for 65 seconds, then the "G" circuits will be de-energized.

TWO STAGE OPERATION

FAN ONLY - When the fan switch on the room thermostat is in the "ON" position, both furnaces will receive the "G" signal, and both blowers will operate. This will allow constant airflow and will reduce air stratification within the conditioned space. Constant airflow is recommended in most commercial applications during the occupied mode.

HEATING, STAGE ONE - When the room thermostat heating circuit "W1" closes, the control will first energize the "G" circuits in both furnaces to start the blowers. One second later, the control will energize the "W" circuit in furnace number two. This will provide 50% heating capacity. When first stage of the room thermostat is satisfied, the "W" circuit to furnace number two will be de-energized. The furnace blowers will continue to operate for 65 seconds, then the "G" circuits will be de-energized.

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When the room thermostat is satisfied, the "W" circuits to both furnaces will be de-energized. The furnace blowers will continue to operate for 65 seconds, then the "G" circuits will be de-energized.
When second stage of the room thermostat is satisfied, the "W" circuit to the second stage furnace will be de-energized. This will allow the system heating capacity to again fall to 50%. The system will cycle off as detailed in stage one above. The second stage furnace usage will also alternate along with the first stage unit as detailed in Stage One above.

COOLING, STAGE ONE - When the room thermostat cooling circuit "Y1" closes, the control will first energize the "G" circuits in both furnaces to start the blowers. One second later, the control will energize the "Y" circuit to condensing unit number two. This will provide 50% cooling capacity. When first stage of the room thermostat is satisfied, the "Y" circuit to condensing unit number two will be de-energized. The furnace blowers will continue to operate for 65 seconds, then the "G" circuits will be de-energized. On the next cooling cycle, condensing unit number one will be utilized as first stage. This will provide equal run time on both units.

COOLING, STAGE TWO - With the system operating on first stage, as detailed above, when the second stage cooling circuit "Y2" is energized, the control will energize the "Y" circuit to the second condensing unit. This will provide 100% cooling capacity. When second stage of the room thermostat is satisfied, the "Y" circuit to the second stage condensing unit will be de-energized. This will allow the system cooling capacity to fall to 50%. The system will cycle off as detailed in stage one above. The second stage condensing unit usage will also alternate along with the first stage unit.

**BLOWER FAILURE LOCKOUT**

If, during a call for heat, cooling or fan, only a single furnace blower is sensed to be "on", the system will shut down. No heating or cooling will take place unless both blowers operate. The LED on the twinning control will blink a fault code indicating the furnace blower that did not operate.

The LED can blink, one, two, or three times, with a two-second off interval between fault code sequences. These codes indicate the problem to be in #1, #2, or both furnaces. Following a lockout condition, the control must be reset by removing all inputs from the room thermostat.

**FURNACE FAULT CODE IDENTIFICATION**

Only on furnaces using the Johnson Controls G951 integrated control, if one furnace has a heating fault code, the twinning control will sense the blinking furnace LED.

The twinning control then will blink its LED to identify that a problem exists and in which furnace it is, as detailed above. If this occurs, the twinning control will allow system operation to continue, as long as both blowers are operating. This feature will not work on furnaces not using this integrated control.

**REMOTE LED**

A remote LED may be connected to the twinning control as shown on the connection diagram. This will allow a remote identification of a problem on the room thermostat or other location. The remote LED will blink on/off continually as long as a fault code exists at the twinning control.

**APPLICATION**

**DUCT SYSTEM**

Twinned furnaces must only be applied on a common duct system. A single air supply plenum must be used for both furnaces and coil(s). Separate plenums and supply ducts systems cannot be utilized.

A single return air plenum, common to both furnaces must be used. It is suggested that a return platform be utilized, with bottom air entrance into each furnace.

Both furnaces must be identical models in both heating capacity and cfm capacity. Both furnaces must be operated on the same motor speed tap. The cooling speed connection is used for all heating, cooling, and fan only operation. See typical application, Figure 2.

**NOTE:** When two furnaces are twinned, typical system total airflow will be approximately 85% of additive individual furnaces, i.e., two 2000 cfm units will yield a total 3400 cfm.

**GAS PIPING**

Furnace gas supplies must be provided as specified with the basic furnace instruction. Since the furnaces are side by side, with no space between, gas supplies must enter on the right and left respectively. Follow the details in the basic furnace instruction for proper connection.

**NOTE:** All gas piping must be in accordance with both the national fuel gas code, ANSI Z223.1, latest edition, and/or all local code or utility requirements.

**FURNACE VENTING**

Vent furnaces as detailed in the individual furnace installation instructions. All vents must be in accordance with the national fuel gas code, ANSI Z223.1 latest edition, and/or all local code or utility requirements.
INSTALLATION - ALL MODELS

POWER WIRING CONNECTION

Furnace power supplies must be provided as specified in the basic furnace instruction. Since the furnaces are side by side, with no space between, power supplies must enter on the right and left respectively. Follow the details in the basic furnace instruction to move any power connection points.

The twinning control does not require a 120 volt power supply.

CAUTION: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

NOTE: All wiring must be in accordance with both the national electric code, latest edition, and all local electrical codes.

MOUNTING THE CONTROL

The control should be mounted at a location convenient to both furnaces. The location must be near enough to the furnaces that the 15 ft. blower sensor cables will reach. Mount with #6 screws through the corner locations. The control must be mounted in a location where temperature ranges do not exceed -40°F to 120°F.

CAUTION: if control is mounted on a furnace panel, be sure that the screws do not interfere with any wires, components, or safe working conditions within the furnace.

CONTROL WIRING CONNECTION

The twinning control uses all low voltage wiring between both furnaces and the room thermostat. Use adequate wire size for all control circuit loads just as you would with any thermostat, 18 AWG minimum. Connect the room thermostat to the twinning control. Connect the twinning control to each furnace. All control wiring must be connected as shown in Figure 7.

Each furnace should be identified with a number in order to eliminate confusion. The furnace connected to the twinning kit terminals identified as "furnace #1", will provide the 24 volt power required to power the control itself.

SINGLE STAGE OPERATION

If single stage heat operation is used, the "W1" and "W2" terminals must be jumpered at the twinning control as shown in Figure 3. If single stage cooling is desired, the "Y1" and "Y2" terminals must be jumpered.

FIGURE 3 - JUMPERED TERMINALS

HEAT ANTICIPATOR SETTING

Set the heat anticipator in the room thermostat at .16 amps on single stage installations. This is when both furnaces are always operated together. For two stage systems, set the first stage anticipator at .16 amps and set the second stage anticipator at minimum (lowest setting available). Some electronic thermostats will not have a heat anticipator adjustment.

MOUNTING THE BLOWER SENSORS

Included with the control are two, 1-in. black cubes with 12 in., wire leads and a 15 ft. cable. These are the fan/LED sensors and one must be used on each furnace. Taking into account the wiring connections, choose a convenient mounting location for the sensor. It may be mounted on any clean, flat surface using the attached adhesive foam tape. Refer to the correct furnace type section on connecting the sensors before mounting.

SECTION 1 -

WIRING BLOWER SENSORS ON DIRECT DRIVE MODELS WITH REMOTE LED

Locate any two fan motor speed wires that are connected to the furnace control, (eg. red, black or blue) even if they are not used and are connected to a “PARK” terminal. Do not choose the white “neutral wire. Remove these wires from the terminals on the furnace control and connect the two black wires with double spade terminals on the fan/LED sensor in their places. Reconnect the two fan motor speed terminals just removed to the appropriate terminals. Refer to Figures 4 & 7.

CONNECTING THE FAULT SIGNAL LED

If it is desired that the diagnostic LED signals generated by the furnace control be transmitted to the twinning control, use the following steps:

NOTE: This option may be selected only if the furnace control uses a plug-in LED on wire leads.

CAUTION: If not used, the fault signal wires must be individually isolated and taped to prevent shorting to ground.
1. Unplug the white wire leading from the furnace control circuit board to the off-board LED. Cut 3/16” female connector off and strip 1/4” insulation from the wire.

2. Connect this wire to the stripped white wire from the fan/LED sensor using the wire nut provided.

3. Plug the other white wire from the fan/LED sensor back into the furnace control circuit board.

4. Route the 3-wire cable (red/black/white) from the fan/LED sensor along the same path as the thermostat cable to the twinning control. Connect it to the indicated colors of the "fan/LED sensor inputs" of the appropriate furnace section. The cable may be cut to a convenient length. Repeat this procedure for the other furnace.

SECTION 2 - WIRING BLOWER SENSORS ON ALL OTHER DIRECT DRIVE MODELS (WITHOUT REMOTE LED)

Locate any two motor speed wires in the control box area. The motor wires may be used (connected) or unused (taped). Do not use the common (white) wire.

Connect the black blower sensor wires to any two the motor speed wires as shown in Figures 5 & 7.

SECTION 3 - WIRING BLOWER SENSORS ON 230 VOLT BELT DRIVE UNITS

CAUTION: Accessory sensor Model 2TS03700106 must be used or the twinning control will be damaged.

Locate the two black blower motor wires that are connected to the contactor. Remove the strain relief through which these wires pass into the control enclosure.

Remove one of these wires from the contactor. It does not matter which one is chosen.

Wrap this wire around the unused core of the current transformer three times as shown in Figure 6. Cut the existing wire ties is more usable wire length is needed.

Pull this wire so that it wraps tightly around the core (See Figure 6). Secure wire tightly in place using a wire tie. Reconnect the black motor wire onto the contactor. It must connect to the same terminal from which it was removed.

Reconnect the strain relief and re-secure the fan motor wires (as they were originally) with the remaining wire ties.

The current transformer has two short leads with 1/4” male spade terminals. Connect these leads to the two black leads of the fan/LED sensor. See Figures 6 & 7.
TWINNING CONTROL THERMOSTAT CONNECTIONS

FOR SINGLE STAGE OPERATION:
HEATING: JUMPER W1-W2
COOLING: JUMPER Y1-Y2

INPUT: 24VAC, 50-/60 HZ (FROM FURNACE 1 XFMR)
OUTPUTS: 2 A MAX. (EACH FUNCT.)
T'STAT ANTICIPATOR SETTING: 0.16A

FAULT SIGNAL
REDBLK
WHT (with terminals)
WHT (without terminals)
LED Wire Nut

ROOM THERMOSTAT
W1 W2 Y1 Y2 G R C X1 X2

FURNACE #2
G Y W R C

FURNACE #1
G Y W R C

Fan/LED Sensor

SEE INSTRUCTIONS FOR ELECTRICAL SPECIFICATIONS OF REMOTE DEVICE

Optional