**ACCESSORY KIT INSTALLATION INSTRUCTIONS**

2TC03700124

**FURNACE TWINNING CONTROL**

For use with the following furnace models:

ALL SINGLE STAGE DIRECT DRIVE BLOWER MODEL GAS FURNACES
ALL DIRECT DRIVE BLOWER MODEL OIL FURNACES
TWO BELT DRIVE MODEL GAS FURNACES MAY BE TWINNED WITH THE ADDITION OF ACCESSORY MODEL 2TS03700106

**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, supports both single and dual stage heating/cooling thermostats. Fan sensors continuously monitor the fan motors for proper system operation. The system shuts down if either fails to operate.

**WARNING**

Before installing this control, disconnect electrical power to both furnaces. Failure to cut power could result in electric 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 direct drive PSC or multi-speed blower motor.

**NOTE:** This kit should not be applied with two stage furnaces.

**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 THERMOSTAT 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 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.

**CAUTION**

Delay-on timer kit part no. 373-21144-001 is required on furnaces with 1 hp or greater blower motors. Premature motor failure can occur if this kit is not used.
When the room thermostat is satisfied, the "W" circuits to both furnaces will be de-energized. The furnace blowers will continue to operate for the standard blower off delay (BOD) set at the time of installation. If the standard BOD is set for 60 seconds, the twinning control will energize the blowers for an additional 5 seconds.

**COOLING** - When the room thermostat cooling 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 "Y" circuit(s) to the condensing units (either 1 or 2). This will provide total cooling capacity under control of the single stage room thermostat. If only one fan is sensed "ON" while a thermostat signal is present, relays in the twinning control close both fan (R-G) circuits.

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

**TWO STAGE THERMOSTAT 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 one of the furnaces. This will provide 50% heating capacity. When first stage of the room thermostat is satisfied, the "W" circuit to the active furnace will be de-energized.

The furnace blowers will continue to operate for the standard blower off delay (BOD) set at the time of installation. If the standard BOD is set for 60 seconds, the twinning control will energize the blowers for an additional 5 seconds. On the next heating cycle, the previously inactive furnace will be utilized as first stage.

This will provide equal run time on both units.

**HEATING, STAGE TWO** - With the system operating on first stage, as detailed above, when the second stage thermostat heating circuit "W2" is energized, the twinning control will energize the "W" circuit in the second furnace. This will provide 100% heating capacity.

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**
The twinning control fan sensors continuously monitor
the fan motors for proper system operation. The
system shuts down if either fails to operate.

If, during a call for heat, cooling or fan, only one
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 which furnace blower
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.

**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. If a
side entrance return system is used, the common
return duct must be divided equally so as to supply
each furnace with an equal amount of return air.

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.

**WARNING**

If a return duct is connected to only one furnace
(with a connection between the two furnaces) an
imbalance in the air flow will occur and the furnace
furthest from the return plenum will overheat.

**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.

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**NOTE:** All wiring must be in accordance with both the National Electric Code, latest edition, and all local electrical codes.

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**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.

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**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.

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**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.

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**FIGURE 3: JUMPERED TERMINALS**

WIRE MUST BE POSITIONED BETWEEN CLAMP AND TERMINAL BLOCK
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 FAN / LED 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 FAN / LED SENSORS ON ALL DIRECT DRIVE MODELS
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 of the motor speed wires as shown in Figures 4 & 6.

SECTION 2 - WIRING FAN / LED SENSORS ON 230 VOLT BELT DRIVE UNITS
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 5. Cut the existing wire ties if more usable wire length is needed.

Pull this wire so that it wraps tightly around the core (See Figure 5). 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 Figure 6.
FIGURE 6: FURNACE CONTROL WIRING

TWINNING CONTROL

Thermostat connections:
- (1st Stage Heat) W1
- (2nd Stage Heat) W2
- (1st Stage Cool) Y1
- (2nd Stage Cool) Y2

Inputs: 24VAC, 50-60Hz

Outputs: 2A max. (each funct.)

Tstat anticipator setting: 0.15A

Fault signal:
- Flash 1 = Furnace 1
- Flash 2 = Furnace 2
- Flash 3 = Both

Fan/LED sensor inputs:
- WHT (w/terminals)
- WHT (w/o terminals)

Note: WHT LED sensor wires not used (tape)

See instructions for electrical specifications of remote device.