AFE18-60A

ALL FUEL SYSTEM CONTROL BOARD INSTALLATION INSTRUCTIONS

DESCRIPTION

The AFE18 control is designed for use in heat pump applications where the indoor coil is located above/downstream of a gas or fossil fuel furnace.   It will operate with single and two stage heat pumps and single and two stage furnaces. The AFE18 control will turn the heat pump unit off when the furnace is turned on. An anti-short cycle feature is also incorporated which initiates a 3 minute timed off delay when the compressor goes off. On initial power up or loss and restoration of power, this 3 minute timed off delay will be initiated. The compressor won't be allowed to restart until the 3 minute off delay has expired. Also included is a 5 second de-bounce feature on the "Y, E, W1 and O" thermostat inputs. These thermostat inputs must be present for 5 seconds before the AFE18 control will respond to it.

An optional outdoor thermostat, OT18-60A, can be used with the AFE18 to switch from heat pump operation to furnace operation below a specific ambient temperature setting, i.e. break even temperature during heating. When used in this manner, the "Y" heat demand is switched to the "W1" input to the furnace by the outdoor thermostat and the furnace is used to satisfy the first stage "Y" heat demand. On some controls, if the outdoor thermostat fails closed in this position during the heating season, it will turn on the furnace during the cooling season on a "Y" cooling demand. In this situation, the furnace produces heat and increases the indoor temperature thereby never satisfying the cooling demand. The furnace will continue to operate and can only be stopped by switching the thermostat to the off position or removing power to the unit and then replacing the outdoor thermostat. **When the AFE18 receives a "Y" and "O" input from the indoor thermostat**, it recognizes this as a cooling demand in the cooling mode. If the outdoor thermostat is stuck in the closed position switching the "Y" demand to the "W1" furnace input during the cooling mode as described above, the AFE18 won't allow the furnace to operate. The outdoor thermostat will have to be replaced to restore the unit to normal operation.

AFE18-60A INSTALLATION

⚠ WARNING

HIGH VOLTAGE
Disconnect ALL power before servicing or installing this kit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

The AFE18-60A should be installed on the side of the furnace close to the 24Vac controls wires for field connections. The system must be connected in accordance with the wiring diagram supplied with the AFE18 control and shown in these instructions. Standard thermostat cables can be used for wiring connections between the thermostat and heat pump unit. See Fig. 1.

ATTENTION INSTALLING PERSONNEL

As a professional installer you have an obligation to know the product better than the customer. This includes all safety precautions and related items.

Prior to actual installation, thoroughly familiarize yourself with this Instruction Manual. Pay special attention to all safety warnings. Often during installation or repair it is possible to place yourself in a position which is more hazardous than when the unit is in operation.

Remember, it is **your** responsibility to install the product safely and to know it well enough to be able to instruct a customer in its safe use.

Safety is a matter of common sense...a matter of thinking before acting. Most dealers have a list of specific good safety practices...follow them.

The precautions listed in this Installation Manual are intended as supplemental to existing practices. However, if there is a direct conflict between existing practices and the content of this manual, the precautions listed here take precedence.

An optional outdoor thermostat, OT18-60A, can be installed in the heat pump unit and used with the AFE18. When used, the tab on the AFE18 control board next to the terminal strip for the heat pump field wiring connections must be broken for the outdoor thermostat to function with the control. The thermostat can be field adjusted to a break-even temperature set point appropriate for the installation. Refer to the installation instructions provided with the OT18-60A for the appropriate mounting location for the heat pump unit.

OPERATION

1.0 COOLING

On heat pump units, when the room thermostat is set to the cooling mode, 24Vac is constantly supplied to terminal "O" of the AFE18 at the thermostat input and to the reversing valve. The constant 24Vac at the "O" terminal of the AFE18 is a signal that the unit is in the cooling mode and its software won't allow the furnace to be turned on.

1.1. On a demand for cooling on a single stage heat pump, the room thermostat energizes "Y" and "G". This supplies 24Vac to terminals "G" and "Y" of the AFE18. If the 3 minute anti-short delay has expired, the "Y" output to the heat pump unit will be energized and the compressor and condenser fan will start. On ASZ two stage heat pumps, the room thermostat energizes "Y1" and "G". This supplies 24Vac to terminals "G" and "Y1" of the AFE18. If the 3 minute anti-short delay has expired, the "Y" output to the heat pump unit will be energized and the compressor will operate on low stage and condenser fan and indoor fan will operate on low speed.

1.2 When an "Y2" demand is initiated on ASZ two stage heat pumps, 24Vac is supplied to terminal "Y2" of the AFE18 and terminal "Y2" of the heat pump. The control board in the ASZ unit changes the compressor to high stage and condenser fan and indoor fan to high speed operation. When the "Y2" demand is satisfied, the control board in the ASZ unit will return the compressor to low stage and condenser fan and indoor fan back to low speed operation. **On some digital/ electronic thermostats, "Y2" will remain energized until the first stage demand "Y" is satisfied.**

1.3 When the "Y" cooling demand is satisfied, the room thermostat removes the 24Vac from terminals "Y" and "G" and the unit turns off. The 3 minute anti-short cycle delay is initiated for the compressor.

2.0 HEATING

On heat pump units, when the room thermostat is set to the heating mode, the reversing valve is not energized. This is a signal to the AFE18 that the unit is in the heating mode. As long as the thermostat is set for heating, the reversing valve will be in the de-energized position for heating except during a defrost cycle.

2.1 On a demand for heat on a single stage heat pump, the room thermostat energizes "Y" and "G". This supplies 24Vac to terminal "Y" of the AFE18, to the "Y" terminal of the defrost board in the heat pump and the to the "G" terminal of the furnace. The heat pump and indoor fan will start in the heat mode. On a demand for heat on an ASZ two stage heat pump the room thermostat energizes "Y1" and "G". This supplies 24Vac to terminal "Y1" of the AFE18, to the "Y" terminal of the defrost board in the heat pump and to the "G" terminal of the furnace. The compressor will start in low stage and the condenser fan and indoor fan will start on low speed in the heat mode. As long as 24Vac is present at terminal "Y" of the defrost board during the heating mode, the defrost board accumulates compressor run time.

2.2 When an "Y2" demand is initiated on ASZ two stage heat pumps, 24Vac is supplied to terminal "Y2" of the AFE18 and terminal "Y2" of the heat pump. The control board in the ASZ unit changes the compressor to high stage and condenser fan and indoor fan to high speed operation. When the "Y2" demand is satisfied, the control board in the ASZ unit will return the compressor to low stage and condenser fan and indoor fan back to low speed operation. **On some digital/ electronic thermostats, "Y2" will remain energized until the first stage demand "Y" is satisfied.**

2.2B If outdoor thermostat, OT18-60A, is used and the temperature is below the set point, i.e. break even point, the outdoor thermostat will switch the "Y" heating demand to the "W1" input to the furnace. The AFE18 will remove the "Y" and "Y2" demands from the heat pump if present and remove the "G" demand from the furnace. With the "Y" input to the heat pump removed, the compressor will be turned off and the defrost board will store the compressor's accumulated run time in memory. The furnace will be turned on and remain on until the "Y" demand for heating is satisfied. The indoor blower will operate at the speed designed for furnace only operation. The unit will operate this way on a demand for heating as long as the outdoor thermostat remains in this position.

2.2 When the heat pump demand "Y" is satisfied, the room thermostat will remove the 24Vac from the "Y" terminal and the unit turns off. The defrost board will store the compressor's accumulated run time in memory.

2.3 If the heat pump demand "Y" is not satisfied and a demand for furnace operation is initiated, i.e. "W1" energized, the furnace will be turned on and the heat pump will be turned off. The defrost board will stop accumulating compressor run time and store the accumulated time in memory. The "G" demand to the furnace will be removed and the indoor blower will operate at the speed designed for furnace only operation. On two stage furnaces, if a demand for second stage operation is initiated, i.e."W2" energized, the furnace will change to high heat operation. When the "W2" demand is satisfied, the furnace will change to low heat operation. The furnace will remain on low heat operation until the "W1" demand is satisfied. At this point, the furnace will be turned off, the "Y" demand will be energized to re-start the heat pump and the compressor will start if the 3 minute anti-short cycle delay has expired. **On some digital/electronic thermostats, "W2" will remain energized until the first stage demand "Y" is satisfied and then the furnace and heat pump will be turned off**. When the compressor starts again, the defrost board will start adding compressor run time to the time already stored in memory.

3.0 DEFROST

3.1 During the heating mode, the defrost board in the heat pump unit will check to see if a defrost is needed every 30, 60 or 90 minutes of compressor run time depending on the user selectable setting on the board by monitoring the state of the defrost thermostat attached to the outdoor coil.

3.2 When a defrost cycle is initiated, the defrost board turns off the condenser fan, energizes the reversing valve and supplies 24Vac to terminals "O" and "W2" of the AFE18 to turn on the furnace during the defrost cycle. **When the AFE18 receives 24Vac at terminals "O" and "W2" coming from the heat pump unit and a "Y" demand is present from the indoor thermostat, it recognizes that the unit is in the heating mode and a defrost cycle has been initiated. This is the only occurrence when the AFE18 will allow the heat pump and furnace to operate at the same time.**

3.3 When the temperature of the outdoor coil rises high enough to causes the defrost thermostat to open, the defrost cycle will be terminated. If the defrost thermostat is still closed at the end of the programmed 10 minute override time, the defrost board will automatically terminate the defrost cycle.

3.4 When the defrost cycle is terminated, the defrost board will de-energize the reversing valve, turn off the furnace and turn on the condenser fan. The unit will now be back in a normal heating mode with a "Y" demand for heating. The defrost board resets the compressor run timer to 0 and starts accumulating compressor run time from this point. This cycle will repeat itself every 30, 60, or 90 minutes of compressor run time depending on the user selected time as long as the unit is in the heating mode.

3.5 The unit will now operate in the heating as described in section 2 until the "Y" demand for heating is satisfied.

WIRING DIAGRAM

WARNING **HIGH VOLTAGE**
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.
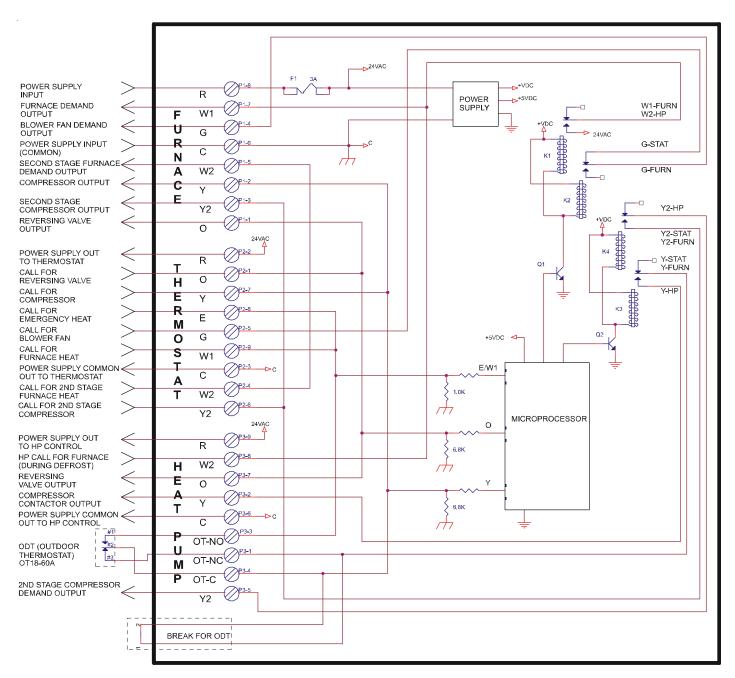
ALL FUEL SYSTEM AFE18-60A CONTROL BOARD

FURNACE

Label	Terminal	Pin
POWER SUPPLY INPUT	R	P1-8
FURNACE DEMAND OUTPUT	W1	P1-7
BLOWER FAN DEMAND OUTPUT	G	P1-4
POWER SUPPLY INPUT (COMMON)	C	P1-6
SECOND STAGE FURNACE DEMAND OUTPUT	W2	P1-5
COMPRESSOR OUTPUT	Y	P1-2
SECOND STAGE COMPRESSOR OUTPUT	Y2	P1-3
REVERSING VALVE OUTPUT	O	P1-1

THERMOSTAT

Label	Terminal	Pin
POWER SUPPLY OUT TO THERMOSTAT	R	P2-2
CALL FOR REVERSING VALVE	O	P2-1
CALL FOR COMPRESSOR	Y	P2-7
CALL FOR EMERGENCY HEAT	E	P2-8
CALL FOR BLOWER FAN	G	P2-5
CALL FOR FURNACE HEAT	W1	P2-9
POWER SUPPLY COMMON OUT TO THERMOSTAT	C	P2-3
CALL FOR 2ND STAGE FURNACE HEAT	W2	P2-4
CALL FOR 2ND STAGE COMPRESSOR	Y2	P2-6

HEAT PUMP

Label	Terminal	Pin
POWER SUPPLY OUT TO HP CONTROL	R	P3-9
HP CALL FOR FURNACE (DURING DEFROST)	W2	P3-8
REVERSING VALVE OUTPUT	O	P3-7
COMPRESSOR CONTACTOR OUTPUT	Y	P3-2
POWER SUPPLY COMMON OUT TO HP CONTROL	C	P3-6
ODT (OUTDOOR THERMOSTAT) OT18-60A	OT-NO	P3-3
	OT-NC	P3-1
	OT-C	P3-4
2ND STAGE COMPRESSOR DEMAND OUTPUT	Y2	P3-5

F1 3A · 24VAC · POWER SUPPLY · +VDC · +5VDC · K1 · K2 · K4 · K3 · Q1 · Q2 · MICROPROCESSOR · E/W1 · O · Y · 1.0K · 6.8K · 6.8K · +5VDC · W1-FURN · W2-HP · G-STAT · G-FURN · Y2-HP · Y2-STAT · Y2-FURN · Y-STAT · Y-FURN · Y-HP

BREAK FOR ODT

FIGURE 1.

ALL FUEL CONTROL BOARD - AFE18-60A

This wiring diagram is for reference only. Not all wiring is as shown above.

Refer to the appropriate wiring diagram for the unit being serviced.

(For use with Heat Pumps in conjunction with 80% or 90% Single-Stage or Two-Stage Furnaces)

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.