



KE2 FanControl

Installation Instructions



For condensed installation information, please refer to *Quick Start Q.2.1* or the *Quick Start Label Inside the KE2 Fan Control*.

Installation, Wiring and Startup Instructions

1 Installation-Mechanical

- 1.1 For ease of transport and installation, the panel may be removed from the enclosure by loosening and removing the four nuts in the corners of the panel. Some units will have two additional mounting bolts. This will allow mounting of the enclosure without the possibility of damaging the electrical components.
- 1.2 The enclosure should be mounted with the supplied bolts such that the knockouts are on the bottom. This will assure a weatherproof installation.

2a Installation-PRESSURE connections

- 2a.1 The pressure transducers are mounted on a tee fitting near the bottom of the enclosure. A 1/4" pressure line should be connected to the outlet of the condenser in a convenient location and run to the pressure tee fitting. In retrofit applications, the sensing line may already exist and may be used. The transducers are supplied with a Schrader depressor style fitting and copper gasket for the stainless housed transducer; If a pressure transducer needs replacing, it can be replaced without having to reclaim the system charge.
- 2a.2 The pressure transducer cables are already connected to the proper terminals on the VFD and P470. No additional installation is needed.
- 2a.3 The KE2 Fan Control is provided with an electronic control that will control pressure during any bypass or alarm condition. The default cut-in setting is 205 psig (VFD setpoint + 20 psi) and cut-out is 185 psig (VFD setpoint). The pressure connection should be as suggested above. **Appendix B** reviews the setting of the P470 pressure control. If VFD head pressure setpoint is changed, the P470 must be set to 20 psig over VFD Setpoint.
- 2a.4 All connections, including the ones inside the KE2 Fan Control, should be checked for leaks.

2b Installation-TEMPERATURE connections

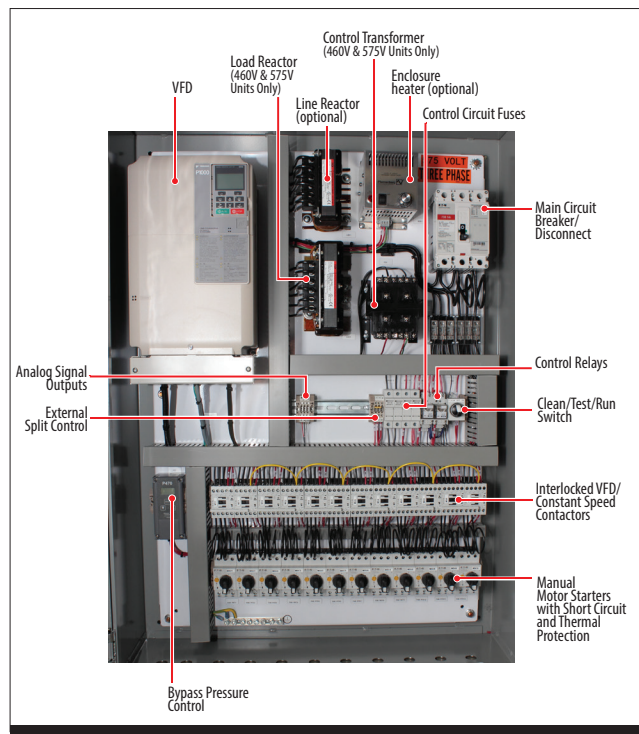
- 2b.1 KE2 Fan units supplied with the temperature control in lieu of the pressure control option are shipped with the 2 temperature sensors coiled inside the cabinet. Both sensors are supplied with 10 foot leads. The sensors must be field installed at the appropriate control point. In most applications, the sensors will be located in close proximity.
- 2b.2 The sensors are already connected to the proper terminals on the VFD and A419 temperature controls. If it is necessary to extend the wires, 18 gage twisted shield pair should be used. The sensors should not be extended beyond 100 ft.

- 2b.3 The KE2 Fan unit is supplied with an electronic temperature control that will control temperature during any bypass or alarm condition. The default setting must be supplied at the time of order. If no default is supplied, the unit must be setup at the time of installation. Appendix A reviews the setting of the A419 temperature control. When setting up the control, it must be a minimum of 5 degrees above the VFD setting.

3 Wiring (See Figure 1)

- 3.1 Check controller model number and electrical specifications to be sure the proper voltage and phase will be supplied. Refer to **Figure 3**
- 3.2 Run power wires to the KE2 Fan Control and through the most suitably placed knockout. Wiring must adhere to local codes and all required wiring precautions taken.
- 3.3 Making sure no power is connected to the controller branch circuit; connect phase wires L1, L2 and L3 to **circuit breaker A**. L1 should be connected to the leftmost connection point, L2 to the middle and L3 to the rightmost. A 5/32" or 4mm Allen wrench should be used and screws torqued to 10.6 to 13.3 inch pounds.
- 3.4 Motor leads are connected to **motor starters**. Each motor starter has three terminals, and is used for one fan motor. Phasing should be consistent, i.e. U/T1 to the leftmost, V/T2 to the middle and SW/T3 to the rightmost terminal. Wires are connected to the terminals and screws torqued to 10.6 to 13.3 inch pounds.

Figure 1 - General Wiring



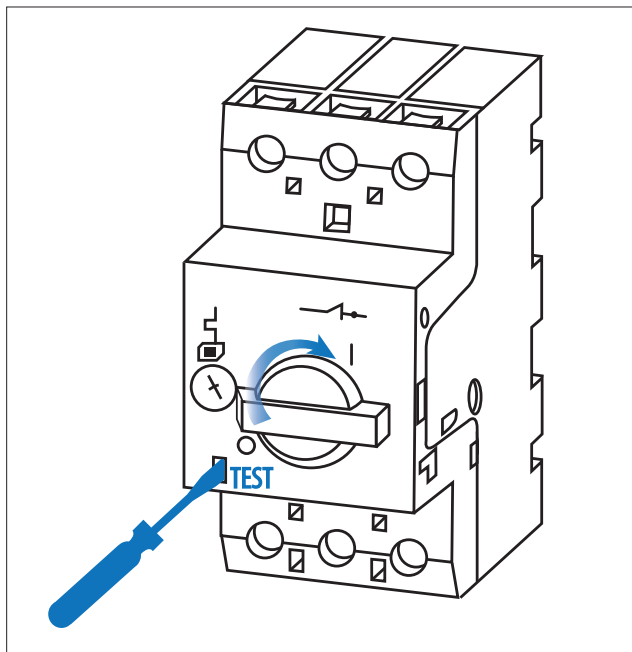
3.5 Overload setting

- 3.5.1 Motor starters must be set to 115%, or less, of motor nameplate FLA. Setting too low will cause nuisance trips while setting too high will not adequately protect the motor. Checking each motor is recommended.
- 3.5.2 Motor protectors are Class 10A- trip within 10 seconds, phase failure sensitive to IEC/EN 60947, temperature compensated, manual reset.

3.6 Motor Starter Testing (See Figure 2)

- 3.6.1 Motor Overload must be in the On position. Insert a small flat bladed screwdriver gently into the slot labeled TEST near the knob. The spring loaded knob will rotate to the off position
- 3.6.2 It may be reset by rotating the knob to the upright position

Figure 2- Motor Starter



4 Startup

CAUTION: Make sure all people and objects are clear of the fans.

- 4.1 Energize **main circuit breaker/disconnect**. See **Figure 1**. The fans will run. If system head pressure is below setpoint, the fans will run at low speed in the reverse direction (blowing through the condenser coil). If system head pressure is above setpoint, the fans will run at high speed in the forward direction.

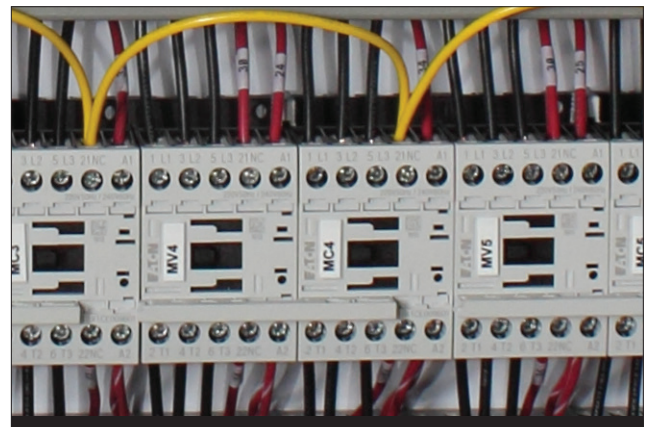
- 4.2 Turn the **CLEAN/RUN/TEST** switch to **CLEAN** position. All fans should run backwards at high speed. Swap any motor leads on motors that run in the wrong direction. Turn the switch to the **TEST** position. All motors should run in the forward direction at high speed. If they run in the reverse direction, swap two leads on the incoming power before the disconnect/circuit breaker or afterwards if no other means of power shut-off is available.

5 After all mounting, wiring and mechanical connections are made; remove the plastic vent protector from the top of the drive. It is slightly raised; a gentle pull upward will release it from the drive. The protector prevents debris from entering the drive during installation, removing it afterwards assures proper cooling air flow through the drive.

6 Full Speed Operation

- 6.1 When required, the KE2 Fan will switch from VFD control to across-the-line full speed motor control, to assure maximum energy efficiency.
- 6.2 When load or ambient conditions change, the KE2 Fan control returns to variable speed operation. This operation is fully automatic and no user input or setup is required.
- 6.3 The VFD display will still show speed variation but no alarms are sent or needed.
- 6.4 Status of the running mode may be ascertained by observing the buttons on the fan contactors. A raised button is de-energized, a pulled in button is energized.

Figure 3- Contactors MC4 and MV4





7 Cleaning

- 7.1 The KE2 Fan Control is equipped with a **CLEAN** function to help with maintenance.
- 7.2 The **CLEAN/RUN/TEST** switch is moved to the **CLEAN** setting and the fans will run at high speed in the reverse direction. Condenser cooling will still take place but at reduced efficiency.
- 7.3 Water or cleaning solution may be used during this function based on condenser manufacturer instructions or cautions.
- 7.4 The **CLEAN** function is not meant to replace all coil cleaning, particularly if the condenser is subject to oily or corrosive contaminants.
- 7.5 By using the **CLEAN** function on a routine basis, dry contaminants, e.g. dust and plant matter like cottonwood seeds, can be removed before they build up and affect condenser efficiency.
- 7.6 After using the **CLEAN** function, the switch should be returned to the normal position.
- 7.7 For a more thorough cleaning, individual fans may be turned off by rotating the motor's starter knob to the off position for a particular fan.

8 Expected displays

- 8.1 During operation, the display may exhibit the following:
- 8.2 **EFI** thru **EF7** - These signify the input being used to control operation, they will reset shortly.
- 8.3 **OH**, **OHI** - signifies overheat of the drive heat-sink. During this display the KE2 Fan Control will run the fans at full speed. After cooldown, the drive will automatically reset and resume normal VFD operation.
- 8.4 **CrST** - Unit is processing a run command and will shortly resume VFD operation.
- 8.5 The **ALM** will be illuminated during these displays but will reset shortly.

9 Alarms and Faults

- 9.1 During any alarm or fault the KE2 Fan Control will switch to constant speed (CS) bypass. Head pressure will be controlled by the bypass pressure control. The KE2 Fan Control has been tested and set to automatically recover from most fault conditions, however specific conditions of an application may register an alarm.
- 9.2 **ALM** will be illuminated and persist until the cause of the alarm is corrected.
- 9.3 **GF** - Ground Fault - check motor wiring and windings. Motor starters should have tripped
- 9.4 **LF** - Output phase loss. Check motor wiring and

connections. Confirm that proper drive capacity is being used.

- 9.5 **LF2** - Output current imbalance. Check motor wiring and winding resistance. In extreme cases drive may have to be replaced.
- 9.6 **OLI-OL7**- drive overload. Check model and capacity with motor. Check for proper setting of motor overload protectors.
- 9.7 **ov** - over voltage. Check incoming power supply and drive voltage.
- 9.8 **PF** - input phase loss. Incoming power has lost a phase or has too high an imbalance. Check incoming power and wire connections.
- 9.9 A full explanation of all codes is available in the VFD manual, Section 5.2, included with the KE2 Fan Control.
- 9.10 Contact your KE2 Therm distributor for additional assistance, if needed.

10 Monitoring - The KE2 Fan Control has the ability to monitor and report a number of characteristics of the VFD.

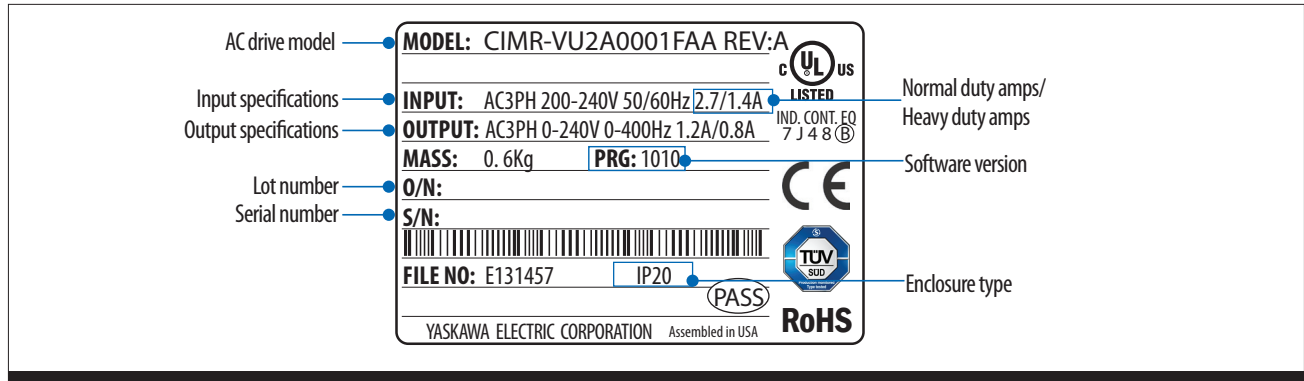
- 10.1 From the main display, press **^** or **v** to scroll to **MON** selection. Pressing the **ENTER** button will show **UI-01**. Using the **^** or **v** buttons will scroll through the monitors. Pressing **ENTER** while in any monitor setting will show the value of the setting. The **Ux-xx** are view only and the values cannot be changed.
- 10.2 Monitors are grouped by function
 - UI-xx** Status monitors
 - U2-xx** Fault tracing
 - U3-xx** Fault history
 - U4-xx** Maintenance monitors
 - U5-xx** PID monitors
 - U6-xx** Control monitors
- 10.3 The most useful monitors are:
 - U5-01** actual head pressure read by the transducer
 - U5-04** head pressure setpoint
 - U4-08** drive heatsink temperature
 - U3-01** to **U3-10** fault history, most recent to 10th most recent, respectively
- 10.4 A full list of monitors is available in the VFD manual, Section 7.1, included with the KE2 Fan Control.

11 Drive Identification See Figure 4.



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Figure 4- Drive Identification



12 Drive reset. If parameters have been changed and the KE2 Fan Control becomes inoperative or erratic, the unit may be reset to factory parameters.

- 12.1 Make sure the drive is stopped by pressing **STOP** button
- 12.2 Enter the parameter menu by pressing (up) repeatedly until **PAR** is displayed
- 12.3 Press **ENTER** and **AI-01** is displayed
- 12.4 Press **RESET** until the **-01** blinks
- 12.5 Press **▲** button twice to show **AI-03**
- 12.6 Press **ENTER** to show **0000**
- 12.7 Enter **1110** and press **ENTER**
- 12.8 Press **ESC** repeatedly to return to **F0.00** display
- 12.9 Turn **TEST** switch clockwise and release to start unit, unit will start in approximately 5 seconds

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Table 1 - Replacement Parts

| Part Description | Manufacturer Part Number |
|------------------------------------|-----------------------------|
| Fuse - Incoming power | KLDR ½ (575V) KLDR 1 (480V) |
| Fuse - Control voltage | FLM 2 |
| Drive transducer (stainless steel) | KE2#20754 |
| Bypass pressure control transducer | KE2#20202 |
| Pressure control | P470EB-1C |
| Control relays | Request part number |
| VFD | Request part number |
| Contact Module | See Table 2 |

14 Optional split condenser wiring (Figure 5)

- 14.1 For split condenser applications, connect motor wiring so that all odd numbered fans are grouped on the split condenser circuit. Refer to **Figure 5**. Consult condenser manufacturer's literature for correct piping.
- 14.2 If specified, an electronic thermostat is provided for self-contained split condenser fan operation. The included temperature control is fully wired and has a default setting of 30°F.
- 14.3 If ambient temperature reaches setpoint, the KE2 Fan Control automatically splits the condenser. When ambient rises above setpoint, the unit returns to full capacity.
- 14.4 The automatic control can also be set to respond to an external signal, when desired.
- 14.5 For best results, the temperature probe should be routed out the opening for the pressure sensing line and fastened in a location that best represents air temperature.
- 14.6 If specified, an auxiliary switch block is included to allow control of the split condenser valve. See **Appendix A** for full instructions for the A419 temperature control.

Figure 5- Optional Split Condenser Wiring

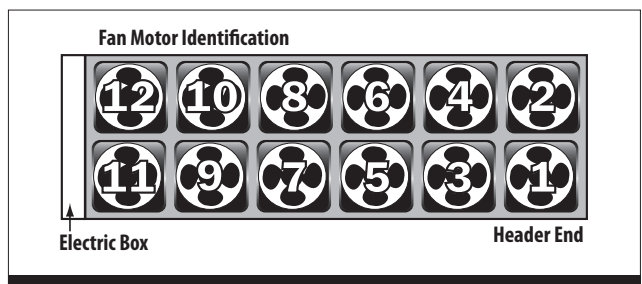
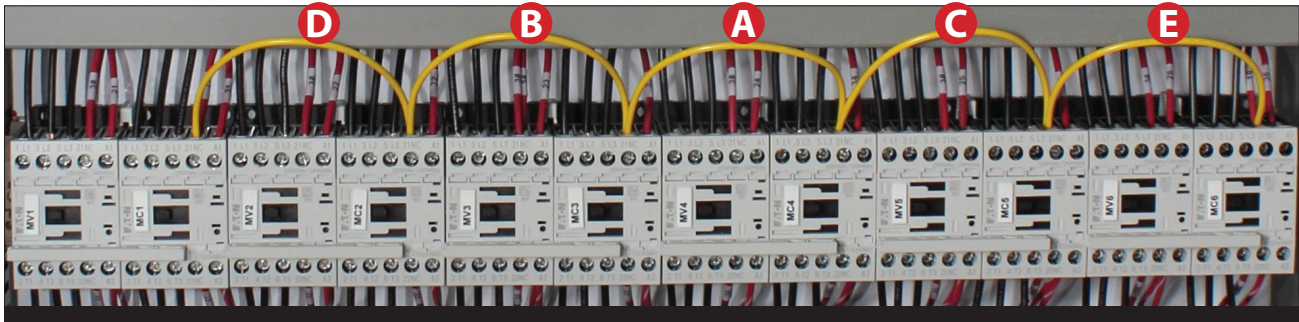


Figure 6 - 12-Fan Default Split Condenser Arrangement



15 Variable Condenser Splitting

15.1 Split Condenser units are provided with a default split, refer to **Table 2**.

| Table 2 -Possible Condenser Fan Split | | |
|---------------------------------------|----------------------|-------------------------------|
| Model | Default Split On/Off | Possible Field Set Variations |
| 12-Fan | 6/6 | 8/4 or 4/8 |
| 10-Fan | 6/4 | 4/6 |
| 8-Fan | 4/4 | 6/2 or 2/6 |
| 6-Fan | 2/4 | 4/2 |

15.2 Changing the number of fan banks to be split is accomplished by moving a jumper, instead of removing it.

15.3 **Figure 6** shows the default configuration of a 12 fan condenser arrangement, setup for Fan Load Matching. When ordering a Split Condenser option, the required fan split should be specified at the time of order for ease of installation. When specified, the appropriate jumper will not be present. Unit is also field configurable.

- The most common configuration is to split the condenser in half, removing the jumper between MC3 and MC4, see **A**

It is also possible to vary the panel for optional configurations:

- 4 fans on and 8 fans off, remove the jumper between MC2 and MC3, see **B**
- 8 fans on and 4 fans off, remove the jumper between MC4 and M5C, see **C**
- 2 fans on and 10 fans off remove the jumper between MC1 and MC2, see **D**
- 10 fans on and 2 fans off, remove the jumper between MC5 and MC6, see **E**

When a Split condenser is not specified, the unit is shipped with all contactors tied together to allow the unit to be matched to the specific installation.

16 Fan Load Matching

16.1 Fan Load Matching is a unique feature of the KE2 Fan Control.

16.2 On standard units, Fan Load Matching is utilized to reduce the number of fans used during low load conditions on condensers that are not split on the refrigerant side.

16.3 When used, a bank or banks of fans is turned off to prevent excessive cycling at low load in cold ambients. If not needed or not desired, no changes are made to the KE2Fan controller

16.4 If conditions warrant fan unloading for low ambient operation, the yellow wire jumpers shown in **Figure 6** can be removed. Actual wire colors used may be different. If bank #6 (motors 11 & 12) is going to be offloaded, the yellow jumper **E** from 5MC to 6MC should be removed to isolate that bank of fans. If both bank 5 and 6 (motors 9, 10, 11 & 12) are to be offloaded, the yellow jumper **C** from 4MC to 5MC should be removed.

16.5 Testing has shown that for best system efficiency, no more than 25% should be off-loaded.



NOTE: Never remove more than one jumper.

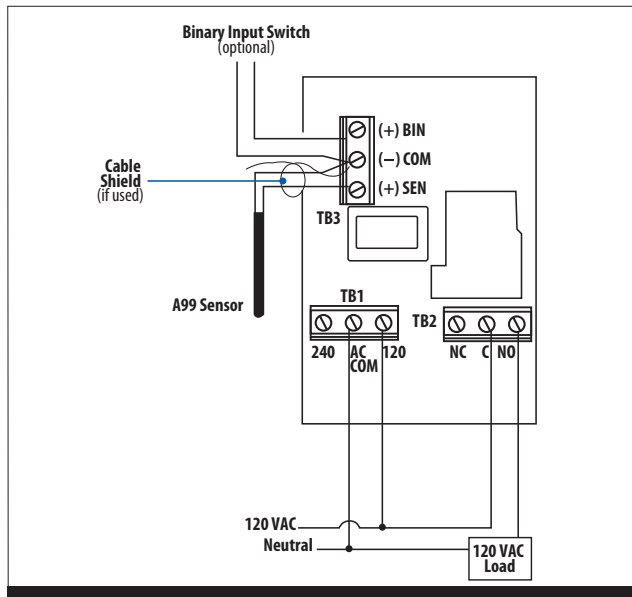


Appendix A Setting the A419 temperature Control

The A419 is an electronic temperature control that will allow self-contained split condenser operation. To operate correctly, the fans must be wired in accordance with **Section 3.5** of the KE2 Fan Control installation instructions.

If response to an external signal is desired, remove the temperature sensor from **(-)COM** and **(+)SEN** terminals and connect a signal from a dry contact (switch closure only, no voltage) in the same locations. See **Figure 7**.

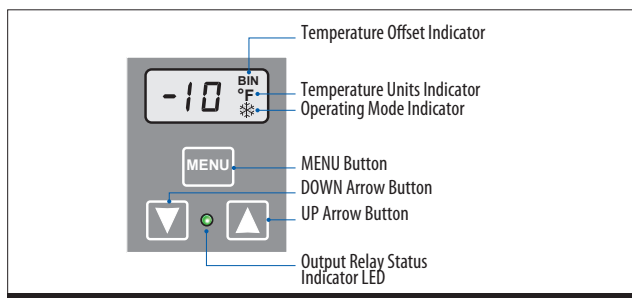
Figure 7 - A419 Wiring



The wires will not be polarized and may be connected to either terminal. When supplied with a signal, the KE2 Fan Control will enter split condenser mode and the display of the **A419** will show **SF**. Removing the signal will return the KE2 Fan Control to full condenser mode.

The front panel of the A419 control has a three button touchpad and LCD for adjusting control function values, and an LED indicator that displays the On/Off status of the SPDT output relay. See **Figure 8**.

Figure 8 - A419 Front Panel



Setting the Setpoint

To view and adjust the temperature setpoint, follow these steps and refer to **Table 3**.



Step 1:

Press and hold the **MENU** button until the display changes to flashing **SP**. This will take about 2 seconds.



Step 2:

Press the **MENU** button again. The current setpoint is displayed.



Step 3:

Press the **Up** or **Down** button to adjust the setpoint temperature.



Step 4:

Press the **MENU** button to save. The display then returns to the sensor temperature.

Table 3 - A419 Function Ranges and Settings

| Function | Range | Factory Setting |
|--------------------------------------|---|-----------------|
| SP - Setpoint | -30 to 212°F | 30 |
| diF - Differential | 1 to 30 (°F or °C) | 5 |
| ASd - Anti-Short Cycle Delay | 0 to 12 minutes | 1 |
| OFS - Temperature Offset | 0 to 50 (° F or °C) | 0 |
| SF - Sensor Failure Operation | 0 = output de-energized 1 = output energized | 1 |



Appendix B Setting the P470 Pressure Control



Step 1:

Press the **Menu** button once and the display changes to a flashing **ci1 (cut-in setpoint 1)**. To change cut-in setpoint 1, proceed to **Step 3**.

To change another setpoint value or the anti-short cycle delay time-interval, proceed to **Step 2**.

Note: After 30 seconds of inactivity, the control reverts to the operating pressure display.



Step 2:

Press the **Up** button once to go to **cutout setpoint 1 (co1)**. Press the **Up** button again to go to **cut-in setpoint 2 (ci2)**, and again to go to **cutout setpoint 2 (co2)**, and once more to go the **anti-short cycle delay (ASD)**.

You may press the **Up** button again to go back to **cut-in setpoint 1**, or press the **Down** button (repeatedly) to scroll through the **parameters in reverse**.



Step 3:

Once the parameter you want to change is flashing on the display, press the **Menu** button once. The current pressure setpoint value (or delay time-interval) is displayed.



Step 4:

Press **Up** or **Down** button to change the setpoint value (or time-interval).



Step 5:

Press the **Menu** button to save the new value. The display then returns to the operating pressure display.

Note: If the menu is not pressed within 30 seconds after changing a setpoint or time-interval value, the control reverts to the previously programmed setpoint or time interval value.