

Pollution Control Unit (PCU) Advanced Filter Monitoring System

Summary:

The PCU filter monitor module utilizes advanced proprietary algorithms to make determinations about filter loading percentages as well as fault conditions, such as missing filters and missing doors. These algorithms take into consideration known characteristics and interactions of many specific filter combinations, stored calibration values derived from measurements taken at the time of test and balance, and measurements of the dynamically changing current operating conditions such as demand ventilation. Personnel servicing the PCU have direct access to operating characteristics and fault conditions thru the use of an HMI (human machine interface), which is conveniently located directly on the PCU. Accurate monitoring of PCU filter conditions not only ensures proper operation of the PCU, but can also reduce the operating cost of the PCU by reporting the condition of each individual filter module. This can eliminate the needless replacement of filters that have not yet reached the end of their useful life.

Features and Benefits:

- Monitors pressure drop across each filter module of the Pollution Control Unit (PCU)
- Fans and Cooking equipment will shut off for Missing Door (of the unit) fault or Missing Filter fault.
- Detects Filter Clogged Condition and indicates via a light on the hood or electrical control panel face. If clogged condition persists for 24 hours, an audible alarm will begin to sound. If the clogged condition continues to persist for an additional 48 hours, a signal will be sent to the electrical control package that will prevent the fans and cooking equipment from restarting the next time they have been manually turned off.

Startup and Calibration Procedure:

- Install the Unit in the field per guidelines on Drawings and Operation & Maintenance Manual.
- Go the Config menu on the HMI screen located on the PCU and enter the number of PCU modules used, as well as type of filters in each module. NOTE: Step may be skipped if set by factory.
- Run the fan at 100% airflow to calibrate the PCU unit. Initiate the Calibration sequence, more details are outlined under HMI Operation on following pages.

Fault Conditions:

- “Filtr Clogged” – Filter Module of the PCU is clogged
- “Filtr Missing” – Filter missing from the PCU
- “PCU Clogged” – Total Pressure Drop of PCU has exceeded allowable limits
- “72hr Clog” – Clogged condition persisted for 72 hours

- “Missing Door” – Door missing on the PCU
- “Calibration Required” – Calibration sequence has not been initiated on the unit

PCU Filter Monitor Module – HMI Operation:



The HMI for the PCU filter pressure monitor is a “Smart” rocker switch with a built in organic LED monochrome graphic display. The rocker switch has 3 momentary switches, one is actuated when the top portion of the rocker is depressed, the second one is actuated when the middle portion of the rocker is depressed, and the third is actuated when the bottom portion of the rocker is depressed. This configuration allows for navigation through menus and making selections.

General navigation rules:

1. The top button will generally be used to go to the previous (next level up) menu.
2. The bottom button will generally be used to step through available selection choices.
3. The middle button will generally be used to select or enter the current selection choice.

Because OLEDs degrade with usage, the HMI will turn off and revert to the top menu level after 2 minutes of inactivity. Depressing any button will re-enable the HMI.

Top level Menu:

- **Screen saver**, automatically selected after 2 minutes of inactivity. Normally the screen saver will be a blank screen, but if there is a fault it will flash the fault screen listed below.
- **PCU logo**, first selection when exiting screen saver state.
- **Filter status**, displays up to 5 filter percentages or “missing” if a module’s filters are missing. “Calibration required” will be displayed if the calibration sequence has not been completed.
- **Pressures**, this menu has 2 screens which can be stepped through using the bottom button. The current pressure for up to 5 filter modules are displayed on the first screen. The second screen displays the total for the entire PCU, the inlet static, discharge static pressure.
- **Faults**, screen displays “No faults” if there are no faults, “Calibration required” if the PCU has not yet been calibrated or one or more of the following faults.
 - “Fltr Clogged”
 - “Fltr Missing”
 - “PCU Clogged”
 - “72hr Clog”
 - “Missing Door”
- **Reset faults**, after a fault has been activated and the necessary correction action is taken this menu choice is selected to clear the fault.

- **Calibration**, a 4 digit PIN (1234) is entered using bottom and middle buttons. Once entered correctly the new filter calibration sequence is started. "Calibrating" will be displayed until the calibration is complete. A percentage complete will also be displayed. Fan speed must be maintained at 100% for the entire calibration time, if fluctuations are detected the calibration sequence will restart from zero percent.
- **Config**, has sub-menu, see below
- **Information**, this menu has 4 screens, which can be stepped through using the bottom button. The first screen displays the filter type for up to 5 modules. The second screen displays the software revision, number of modules, the configuration number currently selected, PCU number and software CRC. The third screen displays the calibration values for modules 1 through 3. The fourth screen displays the calibrations values for modules 4 and 5, the total calibration value for all 5 modules and the inlet calibration value.

Configuration Sub-menu:

A 4 digit PIN (5678) is entered using bottom and middle buttons. Once entered correctly the menu choices below may be selected. Configuration is done at the factory.

- **Configure PCU modules**, steps through the process of configuration. First the module count is entered, then the filter type for each module. The bottom button can be used to step through the available filter types. Once the desired filter type is displayed, press the middle button to select it and move to the next module.
- **PCU number**, the number for this PCU will be displayed in reverse video and is selected using the bottom and middle buttons.