PENN BARRY™

IPCM

INTELLIGENT PRESSURE CONTROL MODULE
INSTALLATION AND OPERATIONS MANUAL

FOR CONSTANT
PRESSURE CONTROL
APPLICATIONS

VERSION 1.0

1. CONTENTS

2. IPCM SYSTEM OVERVIEW

2.0. PURPOSE:

The purpose of this manual is to assist the user in successfully installing, configuring, and commissioning the Intelligent Pressure Control Module (IPCM) from PennBarry™.

2.1. INTRODUCTION:

The Intelligent Pressure Control Module (IPCM) is designed to maintain constant pressure within a duct system by controlling fan motor speed. The IPCM uses Duct Sentry™, a proprietary progressive tuned closed loop algorithm to maintain constant pressure within the duct. Real-time monitoring with event interdiction and notification are possible via two enable inputs and 2 SPDT relay outputs as well as visual and audible alarm cues.

Inputs:
- Two (2) Discrete (digital) inputs enable the IPCM
- Two (2) Pneumatic: the IPCM measures two pressure reference points. The first is atmospheric pressure and the second is the duct being controlled.

Outputs:
- Two (2) Dry SPDT relay outputs for appliance interlocks or system status
- One (1) Analog 0-10 VDC speed signal for motor or VFD control

The IPCM is a programmable controller that enables users to set system parameters, monitor duct pressure and control fan motor rpm through a simple interface consisting a multi-function input keypad and LCD display. Its multi-color backlight display provides rapid visual confirmation of system status and mode of operation. An audible alarm is also available. These features differentiate the IPCM from competitor's products as well as make it suitable for a broad range of applications.

2.2. APPLICATIONS:

The PennBarry™ IPCM is ideally suited for multi-story, high-rise applications where controlling duct pressure is a concern and it is common for a central shaft to have numerous duct penetrations and where duct load pressures vary widely throughout the day depending on tenant use. Applications include but are not limited to:

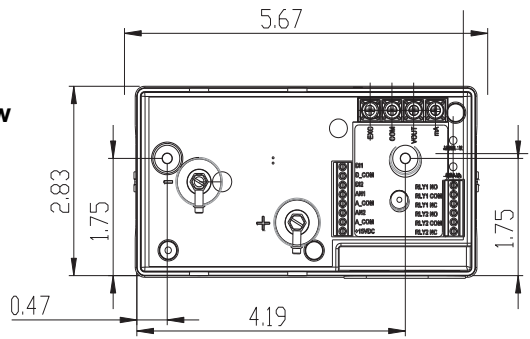
- Exhaust systems, Clothes dryers, Kitchen hoods, Bathroom exhaust
- Supply or make-up air applications to control neutral room pressure to insure safe operation of appliances
- Low pressure applications (-1.25 to +1.25 “Wg) requiring precise pressure control

Warning: The IPCM is design to operate with great precision between -1.25 and +1.25 in wg. Subjecting the diaphragm transducer to pressures outside this range my rupture the diaphragm causing irreparable damage and will violate system warranty. Programing limits, see section 7, may indicate -9.999 to +9.999 in wg. These are software coding limits and by no means represent the actual physical capabilities of the system. Do not use the IPCM in environments where the pressures fall outside -1.25 to +1.25 in wg.

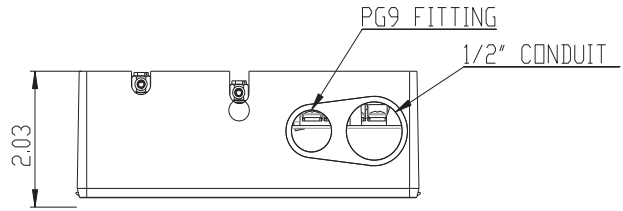
2.3. SPECIFICATIONS QUICK REFERENCE TABLE:

Electrical	
DC Power Supply	18 - 32 VDC
Current Consumption	100 mA
Output	0-5 VDC / 0-10 VDC / 4-20 mA (loop powered)
Relays	3.0 A @ 125 VAC / 30 VDC
Environmental	
Temperature Range	21.2° to 140°F / -6° to 60°C
Humidity	5% to 95% RH (non-condensing)
Media	Air / non-conductive / non-explosive gases
Overpressure	10 psi / 68.95 kPa
Physical	
Weight	8.9 oz / 252 gr
Pressure fittings	Two Barbed fittings for 3/16 ID tubing
Case	Fire Retardant Plastic UL94V-0
Performance	
Accuracy RSS	+/- 1.00% Full Scale (FS)
Hysteresis	+/- 0.1% FS
Non-repeatability	+/- 0.05% FS

Back View

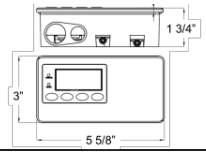
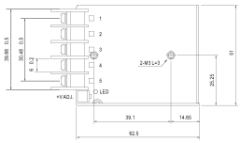
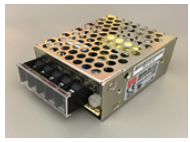
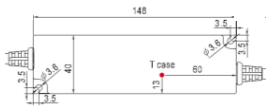
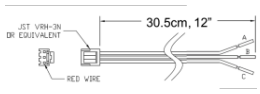
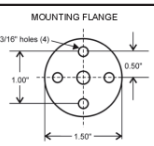
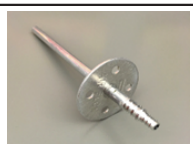


Bottom View



2.4. COMPONENTS:

The standard IPCM application package is made up of several components:

Item Description	Quantity	Dimensions	Physical View
IPCM Intelligent Pressure Control Module P/N 30381-0	1		
Power Supply 100-240 VAC Input 24VDC Output P/N 30382-0	1*		
Power Supply 90-305 VAC Input 24VDC Output P/N 30383-0	1*		
Wire Harness P/N30393-0	1		
Pressure Probe P/N 30413-0	1		
High Temperature Silicon Tubing	1-piece 2 meter (~6ft) length	N/A	
Hardware	1- Large metal cap 1- Small metal cap 1 - Electrical feed through grommet	N/A	
IOM Installation Operation Manual	1	N/A	

* Only 1 power supply provided depending on specified application voltage.

Installation

3. INSTALLATION:

In this section, recommendations are provided to guide you through the installation process. Where and how to identify a suitable mounting location for the IPCM as well as preparatory steps, precautions and step-by-step installation procedures are provided.

3.0. INSTALLATION SEQUENCE:

1. Read Installation Instructions before starting installation
2. Locate suitable area (per section 3.1 and 3.2) to mount the IPCM
3. Remove the front panel per section 3.4
4. Make electrical connections to the base and route wires through slots provided
5. Connect pressure tubing to High pressure port (+) route tubing through slot provided
6. With electrical and tubing connections made, set IPCM module in desired location and mark location for the two fastening screws
7. Drill holes for fastening screws/wall anchors etc. as required
8. Mount IPCM base – Screw base housing in place, making sure to not over tighten the fastening screws in an effort to prevent stress cracks
9. Align front panel to base and snap together applying pressure equally to both ends

3.1. INSTALLATION PRECAUTIONS:

Read these installation instructions carefully before installing and commissioning the IPCM. **Failure to follow these instructions may result in personal injury or equipment damage**. Before installing the IPCM verify the area conditions around the installation site.

The IPCM is not rated for installation in wet or outdoor environments. Do not install in an explosive or hazardous environment.

The IPCM is a precision electronic device; avoid areas with electrical noise created by high power equipment and devices. Avoid locations with severe vibrations, extreme heat, or excessive moisture.

Take electrostatic discharge precaution during installation. Protect internal components from dirt, dust, metal chips, and other debris. Failure to protect components from debris may cause an internal electrical short or overheating of components during operation.

3.2. INSTALLATION LOCATION:

Locate the IPCM in an accessible area where it can be monitored and adjusted as needed. It is recommended the controller be located within 20m (~60ft) of the duct pressure probe location and 50m (150 ft) of the fan with EC motor or VFD. Review the following layout drawing prior to installation (page 9).

The area must have clearance space around the IPCM for the electrical and pneumatic connections. The IPCM can be located and mounted on any vertical non-heated surface using the two mounting holes in the base of the unit. Avoid mounting near fans, louvers, or doorways. Avoid locations with vibrations, extreme heat, or excessive moisture. Do not mount near high voltage equipment or conductors.

3.3. INSTALLATION LAYOUT DRAWING:

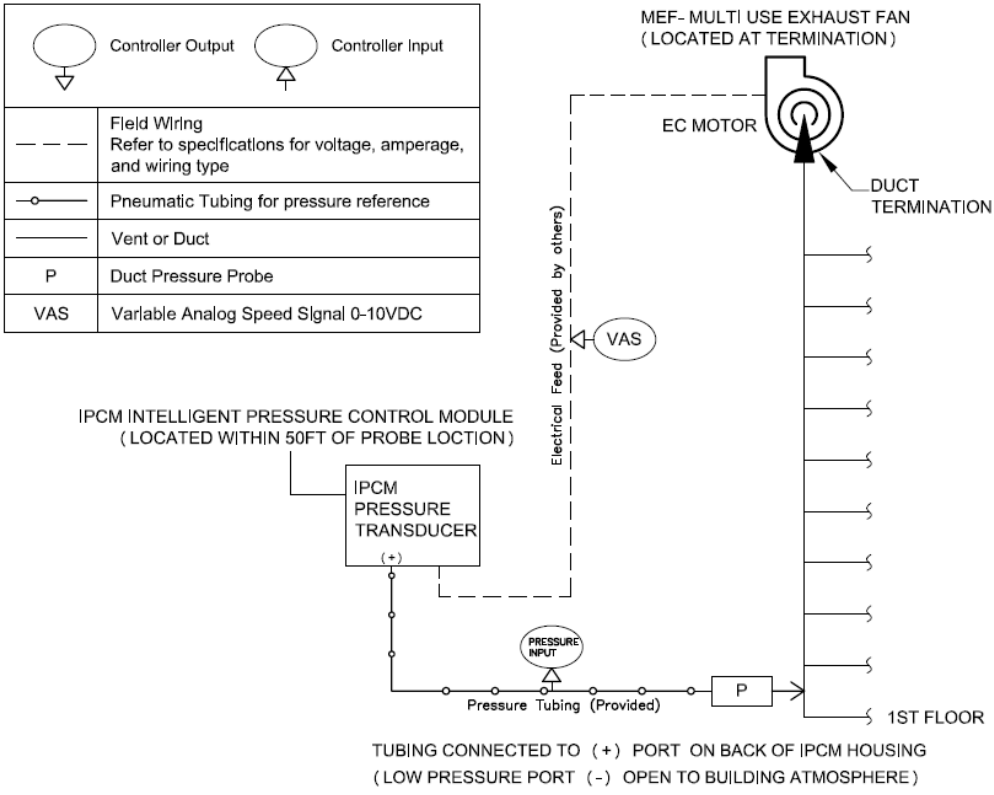


Figure 1: Installation Layout Drawing

3.4. INSTALLATION PREPARATION:

Disassembly:

The IPCM consists of two major sub-assemblies:

- Front Panel
- Base

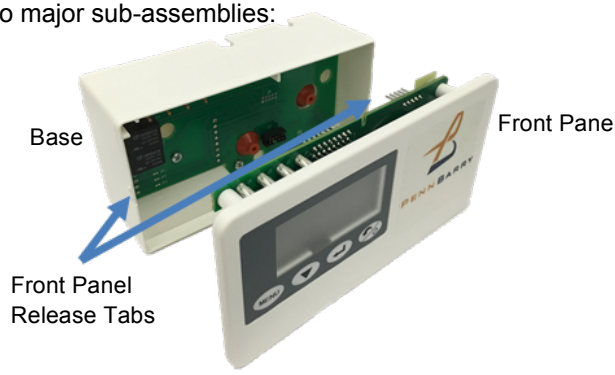


Figure 2: Disassembly – Removal of front Panel

To remove the front panel from the base, apply inward pressure on the sides of the base to release (unlatch) the snap fitting tabs, first one side then the other. Once the tabs are unlatched pull the front panel forward to remove it from the base. If the unit does not separate stop and inspect to see if tabs are unlatched. Repeat the process until the front panel is freed from the base.

Mounting:

Depending on the style of mounting you choose, it may be necessary to make electrical and other physical connections to the back of the base housing before securing the base to the mounting surface. To mount the housing please use appropriate anchoring hardware, and the two mounting points identified below.

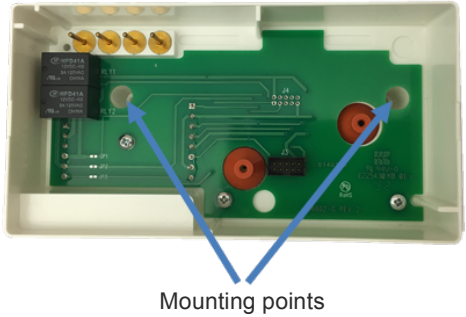


Figure 3: Mounting IPCM

3.5. INSTALLATION - REASSEMBLY:

After connections have been made to the back of the IPCM, refer to section 4, and the IPCM has been properly mounted; reassembly is a simple process.

Carefully align tabs on the front panel with the base housing, making sure the male-type electrical pins line up with the female sockets, see figure below. Apply minimal pressure evenly to the front panel as you insert it into the base and use caution during reassembly. Take care so as to avoid bending electrical pins or damaging the red pressure fittings when inserting the front panel into the base housing. You will hear the tabs engage when the panel is seated properly on the base.

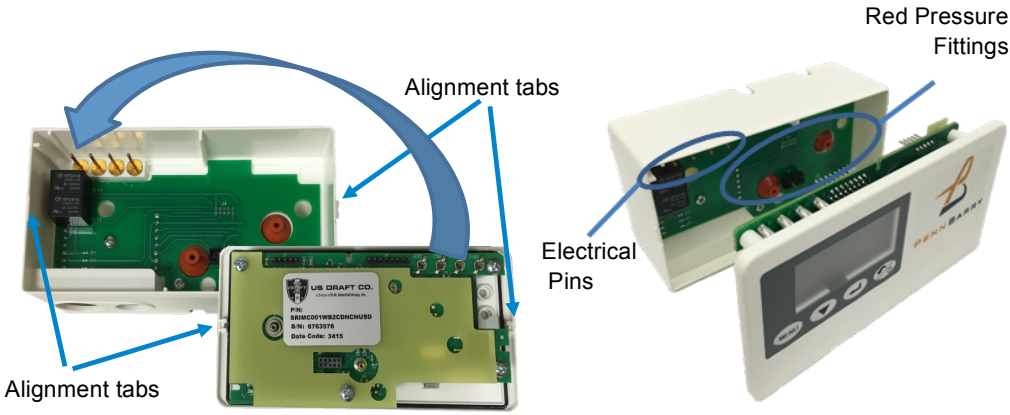


Figure 4: Reassembly - Alignment Tabs and Electrical Pins

Do not use excessive force! The components should fit together with minimal effort. If not, first check for an obstruction between the base and front panel then verify the alignment and try again. Use caution with reassembly. Take care so as to avoid bending or damaging the red pressure fittings or electrical pins when inserting the front panel into the base housing.

4. ELECTRICAL:

4.0. ELECTRICAL – GENERAL SET-UP INFORMATION:

Review the supplied wiring diagram(s) and verify the application connections before attempting to connect the IPCM or the associated equipment.

The IPCM requires 24 VDC input power to operate. The device has a half-wave type power supply so the power supply common is the same as the output signal common. Several devices may be connected to one power supply and share the same signal common. The device is reverse voltage protected and will not operate if the power supply is connected backwards.

The enclosure has a standard ½" conduit opening and a PG9 opening. The IPCM may be installed with either conduit and a conduit coupler or a cable gland type fitting. See Figure below.

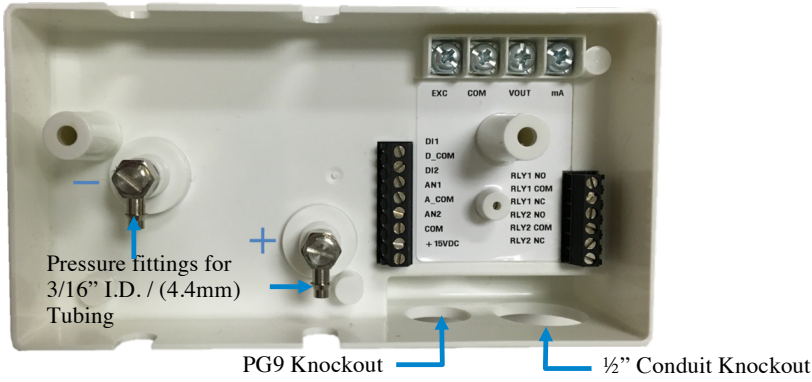


Figure 5: Back view of IPCM

Notes:

Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the National Fire Protection Agency (NFPA), where applicable. Follow the Canadian Electric Code (CEC) in Canada.

Use caution when grounding the secondary of a power supply or when wiring multiple devices. Ensure that the circuit ground points are the same on all devices.

Use shielded cable for all variable voltage analog signal conductors. Do not run in the same conduit with high voltage wiring or wiring used to supply inductive loads such as motors.

4.1. ELECTRICAL - TERMINAL BLOCK DESCRIPTIONS:

The IPCM used discrete digital inputs for the controller enable/ demand commands. Use dry contact(s) or a jumper to enable.

Warning: ***Do not apply external power to the IPCM enable/demand input(s).***

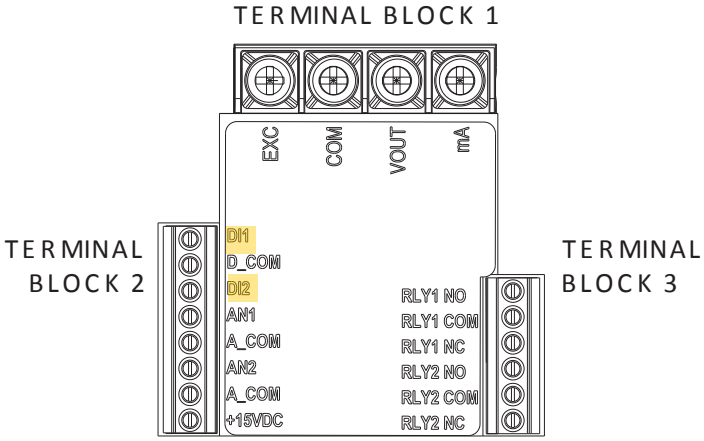


Figure 6: Back view of IPCM

Block #	Terminal	Input / Output	Description
1	EXC	Input	Power Supply Input 18-30 VDC
	COM	Common	Power Supply and Analog Signal Common
	VOUT	Output	Analog signal (0 - 10 VDC) for fan motor speed control
	mA	-	Analog 4-20 mA signal (not used)
2	DI1	Input	DI1 - enable/demand input #1
	D_COM	Common	Common for DI1 and DI2 inputs
	DI2	Input	DI2 - enable/demand input #2
	AN1	-	Not Used
	A_COM	-	Not Used
	AN2	-	Not Used
	A_COM	-	Not Used
	+15VDC	-	Output (Not Used)
3	RLY1 NO	Output	Relay 1 - NO (Normally Open)
	RLY1 COM	Common	Relay 1 – Common (return from
	RLY1 NC	Output	Relay 1 - NC
	RLY2 NO	Output	Relay 2 - NO
	RLY2 COM	Common	Relay 2 - Common
	RLY2 NC	Output	Relay 2 - NC

4.2. ELECTRICAL WIRING DIAGRAM:

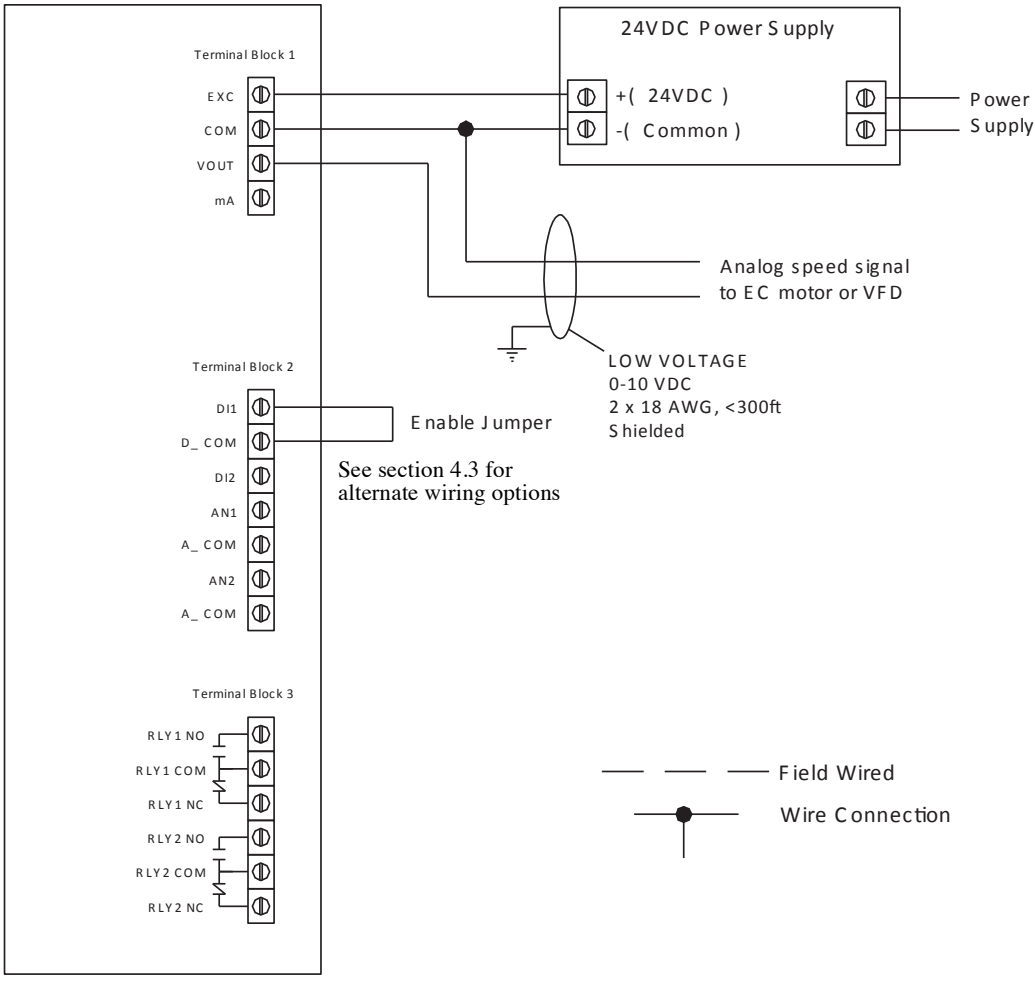


Figure 7: Terminal Block Wiring Diagram

4.3. ELECTRICAL – OPTIONAL ENABLE CONNECTIONS:

The majority of IPCM systems run in a continuous modulating mode of operation with **DI1** jumped to **D_COM** on terminal block #2. See illustration **A** below. When the ability to enable and disable the system is desired, a dry contact or switch will need to be wired between **DI1** and **D_COM**. Refer to illustration **B** below.

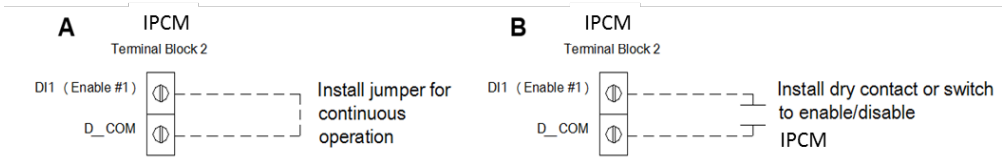


Figure 8: Terminal Block

4.4. ELECTRICAL – OPTIONAL STATUS CONNECTIONS:

The IPCM has two dry SPDT relay contacts for status output. Each relay corresponds to a digital input. Relay 1 is active when DI1 is enabled and relay 2 is active when DI2 is enabled.

DI1 = RELAY 1 DI2 = RELAY2

The relays will energize when all of the following conditions are met:

1. The IPCM is energized
2. The corresponding input is enabled
3. The system pressure is within the high and low pressure limits

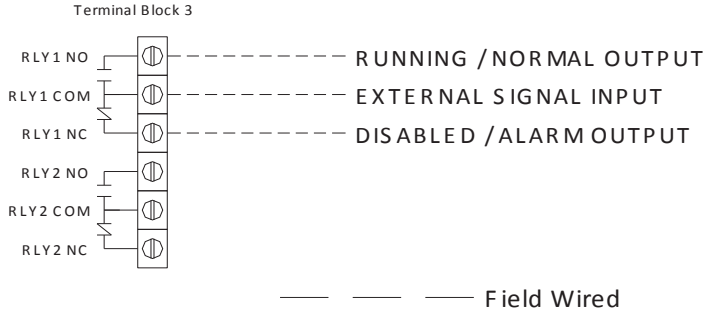


Figure 9: Example Terminal Block #3 wiring connections when DI1 input is used and RLY1 output is use to drive external device/appliance

5. PNEUMATIC:

5.0. DUCT PROBE INSTALLATION

High rise exhaust systems are designed for the duct pressure probe (see section 2.4) to be installed in between the first and second floors of the vertical duct or at the cleanout end of the common for horizontal applications. However, special scenarios may arise requiring alternative installation approaches or techniques. Regardless, **the recommended penetration depth of the pressure probe into the ducted airstream is between 0.25in – 1.0in (5mm -25mm)**. See figure below:

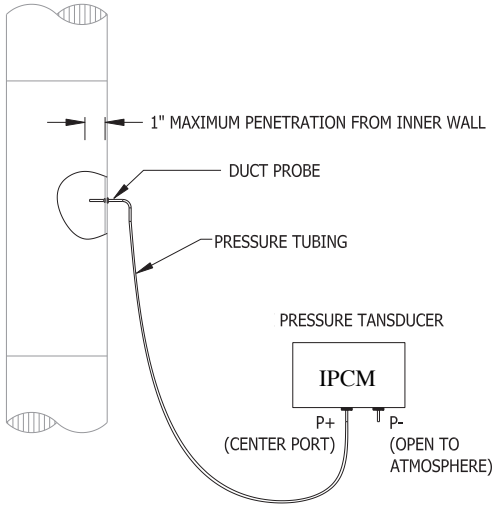


Figure 10: Duct Pressure Probe Installation guidelines

5.1. PRESSURE TUBING:

Connect the tubing between the duct pressure probe and the High port (+) on the IPCM (Figure 5). Use the supplied 5 ft. of 0.170” I.D. high temperature silicone tubing for the pressure connections. It is recommended that the tubing slope back to the vent for draining to prevent condensate from collecting in the sensing line.

If the IPCM is mounted farther than 5 ft. from the duct pressure probe, use 0.25" I.D. rigid tubing. Do not exceed 50 ft. Cut 2 short pieces of the supplied silicone tubing. Use them as couplings between the rigid tubing, the duct pressure probe and the IPCM high port (+) for proper sealing, isolation from heat and ease of installation.

Operations

6. OPERATIONS:

6.0. DISPLAY SCREEN:

The LCD display with multi-color backlight provides the system pressure, output voltage, sequence status and condition/mode. The “status view” is the default screen.

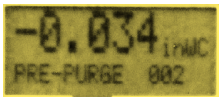
6.1. DESCRIPTION OF OPERATIONS:

The IPCM PI (Proportional-Integral) control algorithm allows the system to maintain a required duct pressure based on an adjustable set point.

The operation sequence has 5 normal modes. The current mode is indicated by the display back light color and written status on the display.

Stand-By (back light OFF)

DI1 and DI2 input circuits are open. IPCM waiting for run command. All outputs are de-energized.

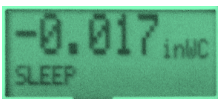


Pre-purge (YELLOW)

DI1 or DI2 circuit is closed. IPCM has run a command and is running the fan to purge the duct system prior to energizing relays 1 and 2. The alarm limits are active.

Run (GREEN)

IPCM has energized relays 1 and 2. The alarm limits are active. The display shows the measured pressure, set point, and the 0-10 DC voltage output.



Sleep (if enabled / GREEN)

The IPCM 0-10VDC output has been at minimum for the Sleep Delay Time and has secured voltage output. When the Sleep Trigger setting is reached the IPCM wakes into Run mode. The alarm limits are still active.

Post Purge (YELLOW)

IPCM DI1 and DI2 input circuits are open. IPCM has de-energized relays 1 and 2. IPCM is running the fan to purge the duct system prior to securing operation and returning to Stand-By mode.

6.2. ALARM:

The alarm function is enabled when DI1 or DI2 circuits are closed creating a run command. The alarm timer begins when a pressure Alarm Limit is exceeded. If the pressure recovers before the alarm timer expires, the timer is reset and the system continues normal operation.

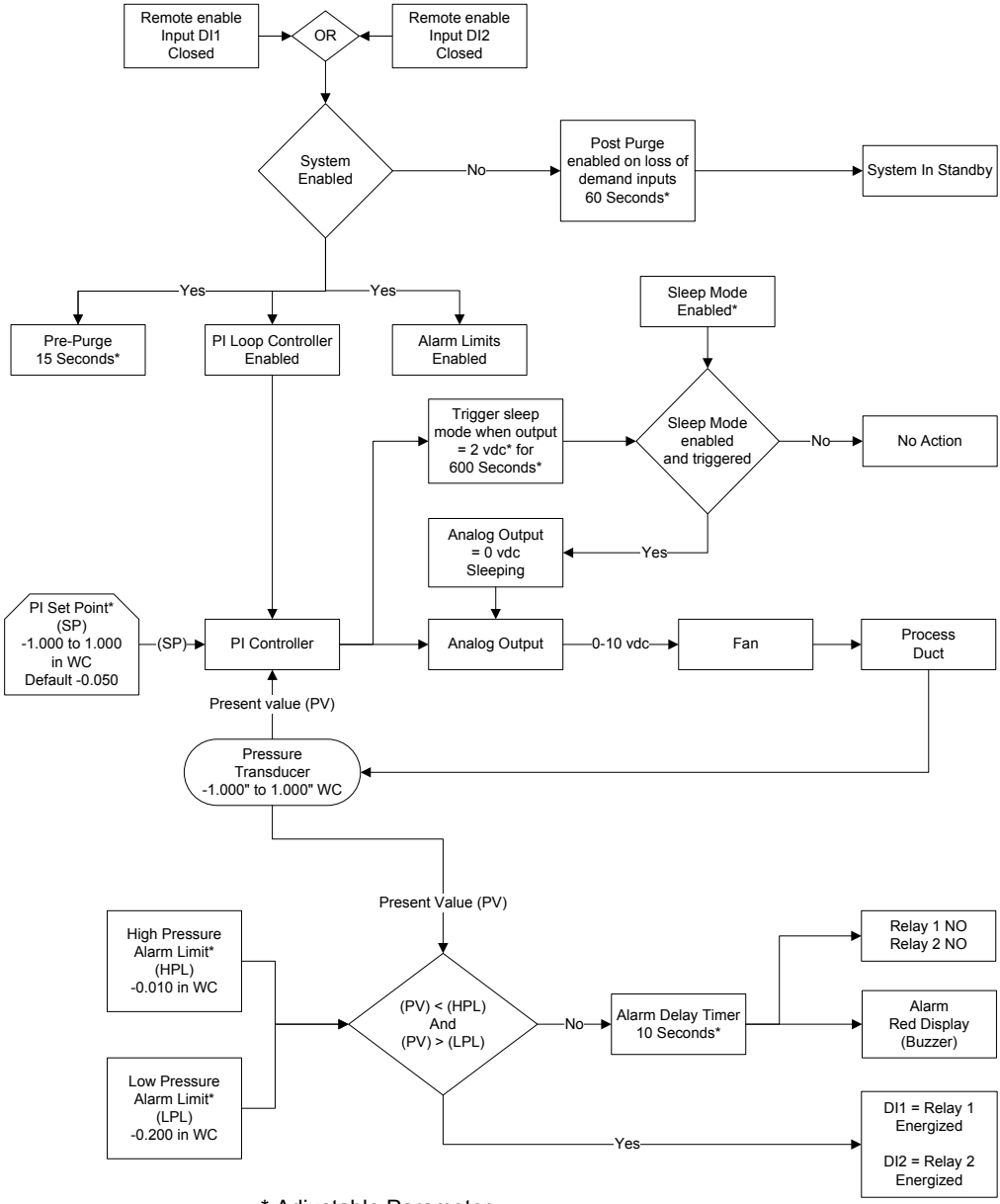
If the pressure does not recover before the timer expires, an alarm annunciation is sent via red display back light and buzzer (if enabled). Relay 1 and 2 are de-energized till the alarm condition is corrected. The alarm timer is adjustable and is auto resetting.

6.3. SLEEP MODE:

The IPCM is equipped with a sleep function that enables a semi-continuous mode of operation based on pressure demand. In sleep mode the IPCM will secure the analog signal output to the fan or VFD once the duct pressure stays below the adjustable sleep threshold for the set amount of time. The system will again enable and run once the duct pressure raises above the adjustable wake threshold.

Note: ***Sleep mode is not to be used for multifamily dryer systems!***

6.4. SEQUENCE OF OPERATION FLOW CHART:



* Adjustable Parameter

User Menu

7. PROGRAMMING GUIDE

Programming your IPCM will take just a few minutes. Programming is accomplished via 4 navigation keys located on the front panel. The built-in LCD display will display selections and options during the programming process.

Figure 11: Membrane Keypad with 4 Navigation buttons

Default settings are set at the factory. A list of parameters and their default settings is provided in section 7.2.

Any changes made are saved in non-volatile memory and are persistent through power cycles. The menu can be accessed at any time after the warm-up mode completes and if there is 30 seconds of inactivity the menu will close and normal operation will continue.

Warning: The IPCM is design to operate with great precision between -1.25 and +1.25 in wg. Subjecting the diaphragm transducer to pressures outside this range my rupture the diaphragm causing irreparable damage and will violate system warranty. Programing limits may indicate -9.999 to +9.999 in wg. These are software coding limits and by no means represent the actual physical capabilities of the system. Do not use the IPCM in environments where the pressures fall outside -1.25 to +1.25 in wg.

7.0. NAVIGATION KEYS:

Menu key – Provides access to the menu structure. To enter the user menu, press and release the **<MENU>** key. This will enter the User menu parameter 1. Pressing the **<MENU>** key a second time advances to parameter 2. Each press of the **<MENU>** key advances the menu item. No values are saved or changed by using the **<MENU>** key.

Down Arrow Key – Allows scrolling of numerical digits, toggles selection and to change the sign of a variable (+/-). Pushing the **<▼>** key cause the digits to move upwards in 1 digit count and will wrap around. The cursor below the digit indicates the digit that is being changed. If you don't need to make a change to a digit press the enter key to move to the next position to the right.

Enter Key – Use this key to move the cursor position from left to right in the current menu screen. Press the **< ↵ >** key to change cursor position to the digit to be modified. Once all of the variable digits have been changed continue to press the **< ↵ >** key to the end of the variable. Press the **< ↵ >** key once more to confirm setting. The display will blink twice alerting that the change has been saved to the memory.

Return / Mute Button - When the buzzer is enabled and a pressure limit alarm has been initiated the audible alarm will sound. The user may mute the alarm to temporarily silence it. If the mute timeout setting is reached the audible will again sound.

Note: *While in the User Menu pressing the Return / Mute Button will command the IPCM to exit and return to the main display scree*n.

7.1. PARAMETER LIST:

IPCM Parameter List				
<MENU>	**Parameter**	**Range**	**Factory**	**Unit**
↓	US Draft Mode	yes / no	yes	
	PI Set Point	(-9.999) - 9.999	-0.050	in WC
	PI Proprtion	00.00 - 99.99	03.00	
	PI Intergral	000.0 - 999.9	002.0	seconds
	PI Direction	Bacwrd / Forwrd	Bacwrd	
	Sleep Enable	Enable / Disabl	Disabl	
	Sleep Trig Volt	00.00 - 10.00	02.00	VDC
	Sleep Exit Press	(-9.999) - 9.999	0.005	in WC
	Sleep Delay Time	000 - 999	600	seconds
	Minimal Output	00.00 - 10.00	02.00	VDC
	Starting Output	00.00 - 10.00	02.00	VDC
	Pre-Purge Time	000 - 999	015	seconds
	Post-Purge Time	000 - 999	060	seconds
	Alarm High Limit	(-9.999) - 9.999	-0.010	in WC
	Alarm Low Limit	(-9.999) - 9.999	-0.200	in WC
	Alarm Delay	000 - 999	010	seconds
	Mute Timeout	000 - 999	030	seconds
	Alarm Enable	Enable / Disabl	Enable	
	Buzzer Enable	Enable / Disabl	Disabl	
	Output Mode	4-20mA / 0-5V / 0-10V	0-10 V	VDC
	Pressure Mode	Bi-DIR / UniDIR	Bi-DIR	
	Filter Setting	001 - 100	001	
	Password Admin	Enable / Disabl	Disabl	
	Zero Calibration	Enable	Disabl	
	Span Calibration	Enable	Disabl	
	Resume Cal Value	Enable	Disabl	
<↵>	Return	Main Display		

7.2. PARAMETER DESCRIPTIONS AND SYSTEM DEFAULTS:

Press and release the **<MENU>** key to enter the User menu. Then press and release the **<MENU>** key to advance to each proceeding parameter.

US DRAFT MODE **YES / NO**

Do not alter! This parameter sets the control program application

Factory default = yes

PI SET POINT **-9.999 to 9.999 in WC**

Target set point pressure

Factory default = -0.050 in WC

PI PROPORTION **00.00 - 99.99**

Proportional band gain setting. The larger the value the larger the change of output proportional to error between Set Point (SP) and the measured pressure: Present Value (PV)

Factory default = 03.00

PI INTEGRAL **000.0 - 999.9 Seconds**

Integral time, this is the error correction for the proportional band. The larger the Ti the slower the control action

Factory default = 002.0 Seconds

PI DIRECTION **Backward / Forward**

Action direction of the controller. This is the direction of the analog output in relation to PV and SP

Factory default : Bacwrd

SLEEP ENABLE	Enable / Disable

Sleep Enable enables / disables the sleep mode function

Factory default : Disabl(e)

Sleep Mode - Description of Operation

If the analog output remains equal to or below the **Sleep Trig Volt** (sleep trigger voltage) for the set **Sleep Delay Time** period, the fan is placed into sleep (standby) for energy savings.

When the system pressure (load) increases, the measured pressure will increase above the **Sleep Exit Press**(ure). Once the measured pressure is above the **Sleep Exit Press**(ure) the analog output is enabled and the IPCM resumes normal modulation of fan speed.

SLEEP TRIG VOLT	00.00 - 10.00 VDC

The control output level required to enter sleep mode

Factory default : 02.00 VDC

Note: setting must be ≥ Minimal Output setting

SLEEP EXIT PRESS	-9.999 to 9.999 in WC

The measured pressure required to exit sleep mode

Factory default : 0.005 in WC

Note: setting must be ≤ Alarm High Limit setting

SLEEP DELAY TIME **000 - 999 Seconds**

The amount of time the Sleep Trigger (Voltage) is required to be enabled prior to entering sleep mode

Factory default : 600 Seconds

MINIMAL OUTPUT **00.00 - 10.00 VDC**

The controller's minimum 0-10 DC voltage output level

Factory default : 02.00 VDC

STARTING OUTPUT **00.00 - 10.00 VDC**

The controller's starting 0-10 DC voltage output level when first enabled to run

Factory default : 02.00 VDC

PRE-PURGE TIME **000 - 999 Seconds**

The minimum amount of time the controller runs the fan upon a new demand cycle prior to closing output relays. The controller will stay in this mode till the alarm limits are within range.

Factory default : 015 Seconds

POST-PURGE TIME **000 - 999 Seconds**

The amount of time the controller runs prior to securing fan and entering the standby mode after both DI1 and DI2 enable inputs are de-energized.

Factory default : 060 Seconds

ALARM HIGH LIMIT **-9.999 to 9.999 in WC**

The upper pressure limit. Combined with the Alarm Low Limit, an operational range is made for system operation**.** Must be set for a higher pressure than set point.

Factory default : -0.010 in WC

ALARM LOW LIMIT **-9.999 to 9.999 in WC**

The lower pressure limit. Combined with the Alarm High Limit, an operational range is made for system operation. Must be set to a lower pressure than set point.

Factory default : -0.200 in WC

ALARM DELAY **000 - 999 Seconds**

The allowable time that the system can operate if system pressure is outside of the operational range set by the Alarm High Limit and the Alarm Low Limit. The timer delays the alarm and the disabling of the relay outputs.

Factory default : 010 Seconds

MUTE TIMEOUT **000 - 999 Seconds**

Time that the buzzer is deactivated before reactivating after the mute button is depressed

Factory default : 030 Seconds

ALARM ENABLE **Enable / Disable**

Enables the alarm limits for operation

Factory default : Enable

BUZZER ENABLE **Enable / Disable**

Enables the alarm buzzer

Factory default : Disabl(e)

OUTPUT MODE **4 - 20mA / 0 - 5 VDC / 0 - 10 VDC**

Determines the type and VDC scale of analog output

Factory default : 0 - 10 VDC

PRESSURE MODE **Bi-DIR / UniDIR**

Sets the transducer scale for either bi-directional or unidirectional operation (+/- 1.00 or 0.00-1.00 "WC)

Factory default : Bi-DIR

FILTER SETTING **001 - 100**

Sets up a data averaging filter, the lowest numbers provide the fastest output response but highest analog output noise. In an extremely turbulent flow or pressure noisy environment use higher numbers until the pressure display flickering is reduced.

Factory default : 001

PASSWORD ADMIN **Enable / Disable**

Enables or disables the 4 digit numeric password

Factory default : Disabl(e)

Procedure: Select menu item **PASSWORD ADMIN**, the system will prompt to input the password, when the input is complete press the Enter key to save the password and complete the setup. When password protection is enabled, you must enter the correct password before you can enter the menu the view or change parameters.

Save the password in a safe location. If you forget the password use the back- door password of 0159 and reset the password if desired.

ZERO CALIBRATION

"Tares" out any 0 pressure error.

Procedure: Remove the tubing so that both ports open to atmosphere and zero differential pressure is applied to the IPCM.

Select menu item ZERO CALIBRATION, the display shows the current pressure value, press the Enter key. If the reading is within allowed limits the unit will respond with the message that calibration was successful.

SPAN CALIBRATION

"Tares" out any Span pressure error. This must be done with the +Full Range (FR) pressure applied.

This has been set at Factory and should not be set in the field.

RESUME CAL VALUE

Restores factory calibration settings in case a calibration may have been performed incorrectly

RETURN Main Display

Press **< ↵ >** key to exit to main display or the **<MENU>** key to return to the first parameter of User Menu.

Blank

Testing
And
Troubleshooting

PENN BARRY™

8. TESTING AND TROUBLESHOOTING:

The IPCM system operation should be tested periodically to verify functionality. It is critically important to test during the commissioning phase of the system life cycle. Many of the tests require no use of tools and can be administered using built-in menu commands.

The IPCM has been programmed to monitor for High and Low pressure limit alarms. These alarms can be caused by either a hard or a soft condition and are used to notify user(s) when the system is outside of normal operating conditions.

8.0. FAULT CONDITIONS:

A **hard condition** is when a system component is non-functional. A **soft condition** is a result of a system condition caused by the present dynamics of the system or environment. Some of these variables are:

1. Changing building pressure
2. Outside weather
3. Controller parameters not adjusted properly for system conditions
4. Varying supply voltage
5. System load larger than design capacity
6. Duct mechanical issue (lint buildup, debris, duct leakage)
7. Natural draft larger than low pressure limit

General Fault Description	Actions
IPCM does not enable/run	1. Check wiring 2. Verify power supply
Display does not change pressure reading	1. Verify pressure probe is connected and not blocked 2. Verify tubing is not blocked, pinched or cut 3. Verify tubing is connected to the high port on IPCM per the installation instructions
Display pressure does not read 0.000" WC with both ports open to the atmosphere	1. Perform **ZERO CALIBRATION** in User Menu
Fan will not run	1. Verify system wiring 2. Check supply voltage 3. Check disconnect ***Refer to the fan IOM for more guidance***

8.1. ALARM LIST:

	Description	Possible Causes
Alarm (Red Display)	The alarm message indicates that the monitored pressure has exceeded either the **Alarm High Limit** or the **Alarm Low Limit** for longer than the alarm delay time	1. Fan not operational
		2. Vent blockage
		3. Vent probe connected to incorrect port on IPCM
		4. IPCM tubing, port or probe blocked or restricted
		5. Set point pressure set too low
		6. Pressure alarm limits set too tight or incorrectly
		7. PI control settings not aggressive enough for system load changes
		8. Sleep Exit Pressure is set > than the Alarm High Limit
		9. Alarm delay time is too short for the system response
		10. Too large of load for system capacity
		11. System natural draft is greater than the Alarm Low Limit pressure setting

8.2. FUNCTION TEST:

To test controller functions and to determine whether the condition is hard or soft, manipulate the IPCM pressure signal and observe the system response.

(Test is based on a negative pressure duct set point of < -0.01" WC)

1. Remove IPCM sensing tube from High pressure port.
2. The IPCM should:
    a. Ramp the fan to full speed (if set point is a negative pressure below -0.01" WC)
    b. The display should read 0.00" WC (+/- 0.02" WC)
        i. if the display is offset more than 0.02" WC perform a ZERO Calibration
    c. The IPCM should go into a high pressure limit alarm when the high pressure limit is set below 0.00" WC and after the pressure limit timer times out
3. Reconnect the IPCM sensing tube to High pressure port.
    a. The alarm should clear when monitored pressure returns within normal range
    b. Fan speed should ramp down and modulate to maintain set point

If all of the actions are correct and match the flow chart the control system is working normally and indicates that the alarm condition is soft.

Commissioning

9. SYSTEM COMMISSIONING PROCEDURES:

Do not skip any steps! Skipping steps may create a hazardous condition or damage equipment!

9.0. PRE-COMMISSIONING CHECKS:

1. Check that disconnect(s) are open/ de-energized
2. Verify all system components are installed properly and are secure
3. Verify wiring connections are correct per wiring diagram(s) and terminals are tight
4. Verify vent probe and pressure sensing tubing is installed and connected to correct port on the IPCM
5. Verify fan assemblies are clear of obstructions and personnel.

9.1. SYSTEM COMMISSIONING PROCEDURE:

Warning: Do not proceeded unless the system is complete and ready to be commissioned. The following procedures require the IPCM and associated components to be energized.

1. Verify pre-commission checks have been completed.
2. Prior to energizing disconnect(s) verify equipment voltage supplies.
3. **Verify all personnel and equipment is/are clear of rotating equipment!**
4. Set up VFD (if applicable)
    a. Energize VFD.
    b. Verify VFD is in remote control.
5. Energize power supply for the IPCM.
6. Check fan rotation on EC motor or VFD / 3 phase motor (refer to fan IOM).
    a. Close disconnect to fan.
    b. Open disconnect to fan.
    c. Verify rotation as indicated on fan.
    d. Correct rotation and retest if required (refer to fan IOM for procedure).
    e. Close disconnect to fan.
7. Perform the IPCM function test
    a. Correct any issues and retest
8. If there are no issues, place system into operation and observe.
    a. Adjust parameter settings as required for desired system operation.
9. Fill out commissioning form.

IPCM COMISSIONING FORM

Job Name: _____ **Company:** _____

Date: _____ **Technician:** _____

Installation Checks

	Yes / No
Components installed per installation instructions	
Wiring correct per wiring diagrams	
Pressure probe and tubing connected correctly	
All debris removed from fan assembly	
Duct system clear of obstructions	

Electrical Data

IPCM power supply voltage Input: _____ VAC Output: _____ VDC

EC Motor Data

Supply voltage @ disconnect _____ VAC

Fan rotation correct _____ (Yes / No)

Amperage @ full load _____ Amp

Induction Motor Data

Supply voltage at VFD _____ L1-L2 _____ L1-L3 _____ L2-L3 VAC

VFD in Remote _____ (Yes / No)

Motor Ratings: _____ Volts _____ FLA _____ HZ

Fan rotation correct _____ (Yes / No)

Amperage @ full load _____ Amp

Results

Function 1test (8.2) | PASS | FAIL |

System is online and operational: _____

Notes