INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS
PRESSURE CONTROL OPTION WITH ECM MOTORS

CARNES COMPANY 448 S. Main St., P. O. Box 930040, Verona, WI 53593-0040 Phone: (608)845-6411 Fax: (608)845-6504 www.carnes.com

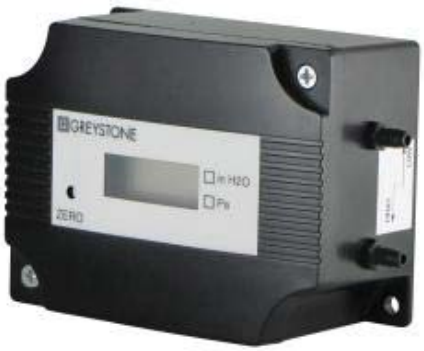
CAUTION!

DO NOT INSTALL, USE OR OPERATE THIS EQUIPMENT UNTIL THIS MANUAL HAS BEEN READ AND UNDERSTOOD. READ AND SAVE THESE INSTRUCTIONS FOR FUTURE USE.

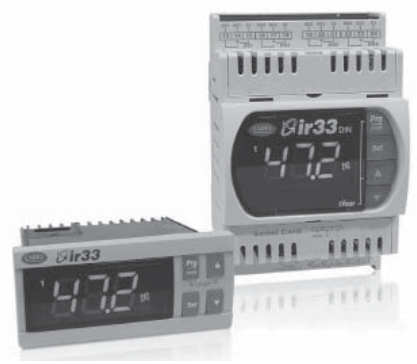
The Carnes Pressure control system uses the flexibility of our highly efficient EC motors and controllers in conjunction with accurate pressure measuring equipment and a versatile setpoint control unit to maintain a user-defined duct static pressure.

The system consists of the following three components:

A direct drive Carnes fan with Eco-Drive motor and Automation Control Unit (ACU).



A static pressure tap located in the duct, connected to an electronic pressure transducer.



A setpoint control with three character, digital display.

NOTE: Fan must be sized appropriately for the system it is connected to as well as all intended system configurations.

NOTE: The ACU can be used to manually control the output of the motor independently from the rest of the pressure control system. This is beneficial for system balancing as well as for fine tuning of the setpoint control system. Refer to the Carnes ECM - ACU Control Specification Sheet for details on how to operate the ACU controller.

STARTUP PROCEDURE

Follow these basic steps when installing and commissioning your pressure control system.

1. Install and wire the fan, setpoint controller, and pressure transducer.
2. Run the fan independently from the pressure setpoint system to verify proper operation and performance. Refer the ACU control specification sheet for instructions on how to operate the fan apart from the pressure control system as well as how to use the Startup Mode.
3. Power on the remaining components of the pressure control system.
4. Program the desired setpoint in the setpoint control unit. Press and hold the “Set” button until “St1” begins to flash on the display. Use the up and down arrows to change the value to your desired setpoint. Press “Set” to save the setpoint.
5. Verify that the system is performing within the desired specs.

Refer to the Installation section of this document for details on how to install and operate each component of the pressure control system.

INSTALLATION

Static Pressure Tap:

The purpose of the static pressure tap is to sample the pressure created in the duct by the fan. Typically, the pressure will be negative (LOW) if on the inlet side of the fan and will be positive (HIGH) if on the outlet of the fan.

- Install the pressure tap away from any openings, elbows, transitions, or the fan. Ideally, the pressure tap would be at least 2 duct diameters away from any features that may inhibit laminar air flow.
- The pressure tap needs to be installed such that the tube is perpendicular to the airstream.
- Attach flexible tubing to the outlet of the pressure tap. Follow any applicable codes or requirements when choosing a flexible tube to use.

Pressure Transducer:

The purpose of the pressure transducer is to translate the duct pressure reading from the static pressure tap into a 0-10VDC signal. The transducer can be field-configured to operate within three pressure ranges as described below.

Installation:

- Install the pressure transducer in a clean, dry environment. It is not intended for outdoor use.
- It is beneficial to position the transducer in close proximity to the static pressure tap. Avoid long tube runs subject to tight bends or sharp objects.
- The transducer has two mounting holes on the exterior of the case for mounting to a flat surface.
- Connect the tube from the pressure tap to the appropriate port on the transducer. NOTE: the “HIGH” port is for positive pressure measurements and the “LOW” port is for negative pressure measurements.
- To prevent condensation from damaging the transducer, allow at least three inches of tubing to hang below the pressure port or mount the transducer such that moisture in the tube cannot drain toward the pressure port.

Power and Signal Connection:

- Keep low volt power and signal wires away from high voltage mains power by routing through separate conduit.
- Route wire into the transducer through the ½” opening in the enclosure.
- The transducer is to be energized by 24VAC.
- You may provide your own 24VAC source or you can connect to the “AUX” tabs on the ACU.
- Use a minimum of 22 AWG wire for connecting power to the transducer.
- Connect the hot side of the 24VAC to the “PWR” terminal.

- Use the “COM” terminal to connect both the grounded side of the 24VAC and the negative side of the 0-10VDC output signal circuit.
- Connect the positive lead of the 0-10VDC output signal circuit to the “OUT” terminal.
- The pressure transducer and the Setpoint control come from the factory configured per the original order. See the System Operation section below for details on changing the pressure control range.

Automation Control Unit (ACU):

The purpose of the ACU is to receive the 0-10VDC signal from the setpoint control and vary the output of the EC motor accordingly. The ACU is capable of operating the motor without signal input during system balancing. It can also be configured to operate the motor at a pre-set output should the setpoint control signal fail for any reason. Refer to the ACU Control Specification Sheet for detailed instruction on how to use the ACU.

Signal Connection:

- Connect the positive 0-10VDC signal line from the setpoint controller to the tab marked “Signal” on the ACU. This line corresponds with the “Y2” terminal on the setpoint controller.
- Connect the negative 0-10VDC signal line from the setpoint controller to the tab marked “Common” on the ACU. This line corresponds with the “G0” terminal on the setpoint controller. NOTE: the “Neutral” and “Common” tabs of the ACU are internally connected. So, if the ACU and the setpoint control in your system are sharing a power supply, you can avoid running a wire for the negative 0-10VDC signal circuit.

Configuration and Operation:

- Verify that the jumper on the back of the ACU is set to “Opt.”
- The ACU comes from the factory in “startup mode.” This is intended to aide in the system balancing process. More details on how to utilize the startup mode can be found in the ACU Control Specification Sheet. If you wish to get the ACU out of startup mode, simply power cycle the ACU 5 times while there is a positive voltage between 0.1 and 10 VDC present across the “Signal” and “Common” tabs.

Setpoint Control:

The purpose of the Setpoint control is to receive a signal from the pressure transducer, compare it to the user-defined setpoint, and output a signal to the ACU to make the appropriate fan output adjustment. The setpoint control is available in two installation options. The DN33 is designed for DIN rail mounting and the IR33 is intended to be panel mounted. The IR33 has an IP65 index of protection when properly installed in a panel. The IR33 can also be shipped mounted in a NEMA 4 enclosure.

Installation:

- If you have a DN33 controller, follow the applicable codes to install your unit using a standard DIN rail.
- If you have a IR33 controller, install the unit into an enclosure with a 71mm X 29mm cutout. Or, if purchased in a NEMA 4 enclosure, fasten the enclosure securely to a flat surface.

Power and Signal Connection:

- Refer to the diagram on the setpoint controller to locate the termination points below.
- The setpoint controller is to be powered by 24VAC.
- Connect the hot side of the 24VAC to “POWER SUPPLY” terminal “G”
- Connect the grounded side of the 24VAC to “POWER SUPPLY” terminal “G0”
- Connect the signal line from the “OUT” terminal of the pressure transducer to “+B1” on the setpoint controller.
- Connect the signal line from the “COM” terminal of the pressure transducer to “GND” on the setpoint controller.
- Connect the positive lead of the output signal circuit to “AO2” terminal “Y2”.
- Connect the negative lead of the output signal circuit to “AO2” terminal “G0”.

Setpoint Control Operation:

The setpoint controller has the following four buttons on its keypad. You will use these buttons to control all functions of the controller.

Prg/mute	▲	▼	Set

Navigating through menus:

- The **Display menu** is the default menu and will be displayed on the controller during normal operation. In this menu common values can be changed or displayed such as the setpoint or duct static pressure.
  - You may scroll through the Display menu by pressing the ▲ or ▼ arrows.
  - After scrolling, the display will flash between the parameter name and the value of the parameter. You cannot enter the Display menu or the Programming menu while the display is flashing.
  - To cancel the flashing, either wait 60 seconds for the flashing mode to stop, or press and hold the "**Set**" key for 10 seconds.
  - To change a parameter through the Display menu, use the ▲ or ▼ arrows to find the parameter you wish to change. Next, press and hold the **Set** key to cancel the flashing. Then, press and hold the **Set** key again to enter the parameter.
  - Make changes by using the ▲ or ▼ arrows.
  - After the parameter has been changed, press the **Set** key to save and exit.
- The **Programming menu** contains all of the parameters for the setpoint control unit. In order to access the Programming menu, you must enter a passcode.
  - To access the Programming menu, press and hold both the **Prg/mute** and the **Set** buttons until a "0" appears on the display.
  - Next, press the ▲arrow until the number "77" is displayed.
  - Finally, press the **Set** key to enter the Programming menu.
  - By pressing the ▲ or ▼ arrows you can scroll through all of the parameters that are in the programming menu.
  - Pressing the **Set** button will allow you to enter and change each parameter.
  - Pressing the ▲ or ▼ arrows will allow you to change the value of a parameter.
  - Pressing the **Set** button again will exit the parameter and return you to the Programming menu.
  - To save all of your changes and return to the Display menu, press and hold the **Prg/mute** button until the Display menu appears.

SYSTEM OPERATION

With all of the components installed and wired properly, you can begin using the Pressure Control system. If you have made no adjustments to the operating range of the transducer, you should be able to input your setpoint and get your system working without any other parameter changes.

Setpoint:

You can change the setpoint from either the Display menu or the Programming menu. The setpoint parameter is "St1." Note: the value you choose must be within the range that the system is currently configured for. For example, if the system is configured for 0-1 in.W.C. you cannot set the setpoint for over 1 in. W.C.

Pressure Display:

You can view the duct pressure by scrolling to parameter "b1" on the Display menu.

Operating Range:

As mentioned in the pressure transducer section, the Pressure Control system can be configured to operate in one of three pressure ranges. Changing the range to better match your system's actual pressure range can make the systems pressure changes more accurate and can prevent errors in the transducer's readings.

To change the pressure range you must make adjustments to both the pressure transducer and to the setpoint controller.

- In the pressure transducer, choose which one of the three ranges best suits your system. Slide the corresponding switch to the ON position and make sure all other switches are in the OFF position.

Range Setting	Duct Pressure Range (in. WC)	Setpoint Controller (c16) Value
LOW	0-1	1.0
MID	0-2	2.0
HIGH	0-4	4.0

- In the setpoint control, enter the programming menu and scroll to parameter "c16." Change the value to that which corresponds to the range you chose for the pressure transducer in the table above. Exit the programming menu to save the setting.

Reverse/Direct acting mode:

The pressure control system is capable of maintaining negative or positive pressure in a duct system. The typical application is a negative duct pressure as monitored at the inlet of an exhaust fan. An application where positive duct pressure may be experienced would be at the outlet side of a fan.

- For systems operating with a Negative duct pressure, the setpoint controller must be in "Reverse Acting" mode. This mode is active when a  appears on the display. This mode is active when shipped from the factory. To activate reverse acting mode, enter the programming menu and scroll to "c0." Change the value to 2, and then exit to save the change.

- For systems operating with a Positive duct pressure, the setpoint controller must be in "Direct Acting" mode. This mode is active when a  appears on the display. This mode is not active when shipped from the factory. To activate direct acting mode, enter the programming menu and scroll to "c0." Change the value to 1, and then exit to save the change.

PRESSURE CONTROL WIRING DIAGRAM