

Single Digital Display Panel Installation & Operation Instructions

System Studies' digital display pipe alarm and distribution panels combine the remote monitoring capabilities of the High Resolution Dual (pressure/flow) Transducers™ with surfaced-mounted LED displays of panel air consumption and delivery pressure. These new panels also provide independent contact alarming of low pressure and high air consumption.

The Digital Display Panels are designed for use in an office monitored by either a 289H LSS™ or uM260 Micro Monitor™, both of which have the capability of reading the 4-20 milliampers (mA) High Resolution Transducers. The majority of this document addresses panel installation requirements for a 289H LSS monitor. A section on page 10 of the document describes the device requirements that pertain specifically to the uM260 Micro Monitor.

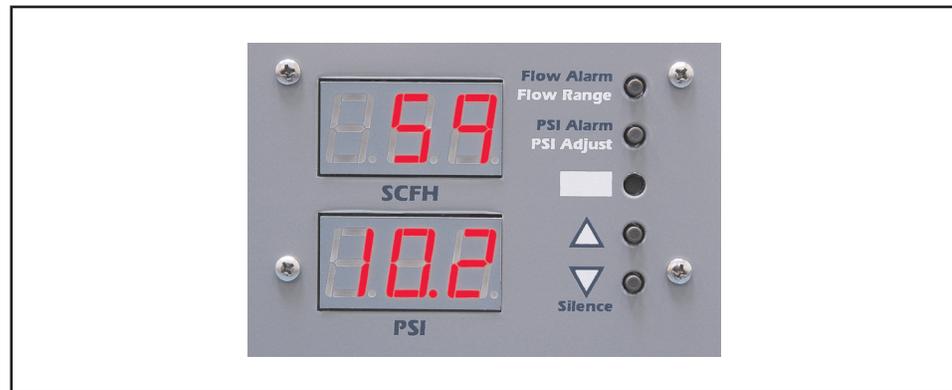


Figure 1: Dual Digital Panel Meter

DDPM Component Description

The panels' dual digital panel meter (DDPM) component (Figure 1) measures approximately 4" x 2.5" and occupies a position on the top half of the panel face near the dual transducer. The upper 3-digit LEDs display panel air consumption from 0 to 950 Standard Cubic Feet per Hour (SCFH), depending upon the range of Flow Finder installed. The lower 3-digit display provides a delivery pressure reading from 0 to 30 pounds per square inch (PSI) in tenths (0.1) of a pound.

Display Controls

DDPM surface controls provide the means for establishing contact alarm setpoints, silencing alarms, changing flow range output (if installed Flow Finders are replaced with new ones of a different flow range), and calibrating pressure based on installation site altitude variations. These flush mounted push-button controls, used individually and in combination, provide adjustment capability and protect against accidental disruption of set values.

Conductor Cables

On the back side of the panel, emerging from the lower right corner of the sealed DDPM component, are four conductor cables (Figure 2). The dark gray one contains the power conductors; the other three are identified by one-inch sections of color-coded heat shrink positioned approximately 1/4" out from the box. The yellow heat shrink identifies the Monitor Cable, blue is used to designate the Alarm Cable, and black identifies the Transducer Cable. The four DDPM cables serve the following functions:

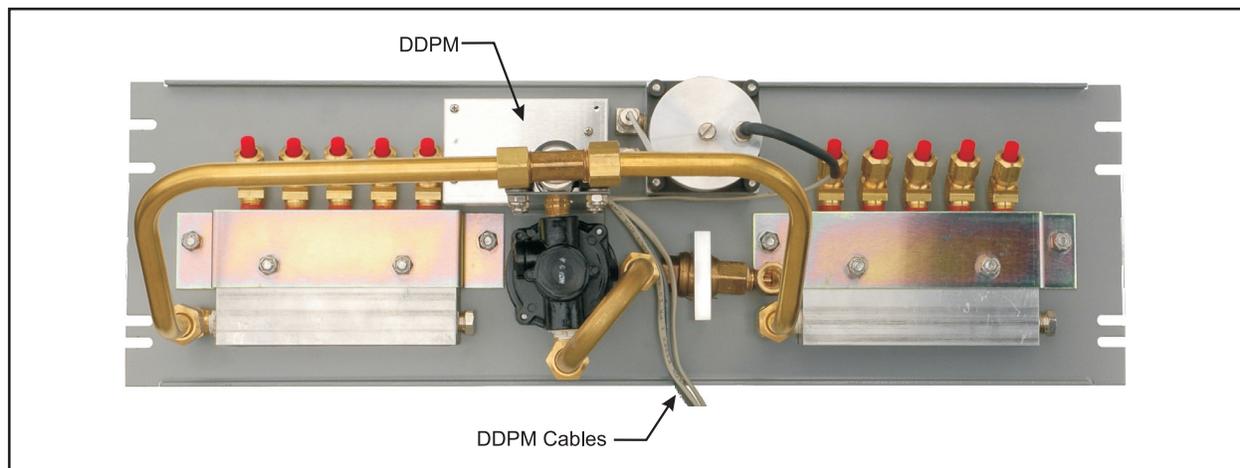


Figure 2: DDPM Component Location

- **Transducer Cable (with black heat shrink).** This 2-pair, 24-gauge cable provides the connection between the panel's High Resolution Dual Transducer and the dual digital panel meter. Please note that this cable is pre-connected to the panel's transducer.
- **Monitor Cable (with yellow heat shrink).** Contains two 24-gauge conductor pairs which are used to complete the wiring of the panel's high resolution transducer from the DDPM to the 289H dedicated connector block (or, in case of uM260 Micro Monitor installation, to the monitor's plug-in Termination Adapter). The blue/white pair is wired on the DDPM to the flow transducer, and the orange/ white pair is connected to the pressure transducer. Cable length: 15 feet.
- **Alarm Cable (with blue heat shrink).** Contains two 24-gauge conductor pairs which are used to connect the DDPM's two contact alarms to the 289H or uM260 termination block. In some applications, these contact alarm pairs are used with a Contact Alarm Expander (Part No. 9800-4450) or a Contact

Alarm Multiplier Panel (P/N 9800-4451) to split contact alarming between the 289H/uM260 and other equipment, such as a Dantel monitor. Cable length: 15 feet.

- **Power Cable.** Consists of a single 22-gauge pair of conductors. The red insulated wire, or “hot” side, is supplied with a 0.5 amp fuse and two Molex™ connectors, which make it possible to easily insert the required Power Direct Connect Module (see explanation below). Cable length: 15 feet.

One DDPM is provided on the Digital Distribution Panel (P/N 9800-3782), Legacy Digital Distribution Panel (P/N 9800-3682), and Digital Single Pipe Panel (P/N 9800-3783). The Digital Dual Pipe Panel (P/N 9800-3780) is equipped with two DDPMs, one for each pipe.

The procedures in this document describe the power and grounding requirements for digital display panels that are purchased individually (i.e., not included on a factory-assembled equipment rack). They also address the simple procedure of wiring both the contact alarms and the 4 to 20 mA pressure and flow transducers to the 289H LSS connector block or to a uM260 Micro Monitor termination adapter. Finally, complete setup and operation instructions are provided for the dual digital panel meter (DDPM) component.

Installation and Wiring

DC Power Conversion

In order for a System Studies digital pipe or distribution panel LED display to function, it must be powered by a -48V DC central office battery source and converted down to a lower voltage. Rack assemblies containing multiple digital panels utilize a DC to DC Converter (Part No. 9800-3196), which accommodates 18 dual digital panel meters. Panels sold individually are supplied with a Power Direct Connect - Module (Part No. 9800-3197), which allows for the proper regulation of -48V DC CO power. This module is supplied with a mounting plate and two Molex™ connectors, which simplify its installation on the panel (Figure 3).

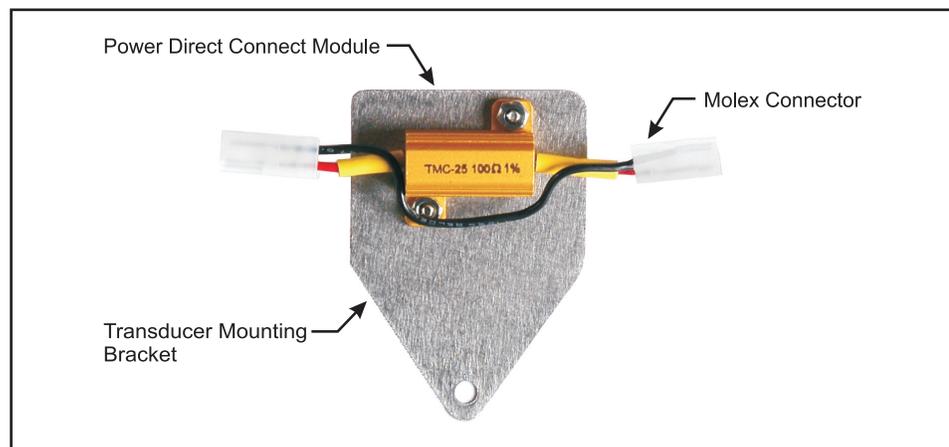


Figure 3: Power Direct Connect Module

The information below describes panel installation procedures and the requirements for connecting –48V DC central office battery power and wiring the panel’s monitoring devices. Please note that the DDPM is pre-wired to the panel’s High Resolution Dual Transducer(s), but the internally connected device pairs must be run to the 289H or uM260 device termination equipment as explained below.

Procedure:

*Shipment
Inspection*

- 1) Remove the panel from the shipping carton, and check the contents thoroughly for damage.

Note: System Studies is not responsible for damages sustained during shipment or unpacking. If it is apparent that the panel has been damaged, please notify the shipping agent before you proceed with the installation.

- 2) Before beginning the panel installation, make sure you have a copy of the central office work order that was prepared for the installation. The work order identifies the installation location of the powered digital panel, the fuse bay and fuse number required for power connection. For a single panel installation, a 0.5 amp fuse at the fuse bay is adequate; two digital panels powered by the same pair would require a 1.0 amp fuse. The DDPM should use the same power source as the 289H, but it should have a separate power pair to the fuse.

Installation in Rack

- 3) Install the panel in the designated equipment rack location using the mounting bolts and washers supplied. If two people are not available for the installation, first determine where the bolts and washers will be set. Then partially screw in one of the top bolts, slide the panel in position on the rack placing the panel groove under the bolt, level the panel, and screw in the opposite side bolt through the groove into the rack. Tighten these bolts and install the remaining bottom ones.
- 4) Locate the DDPM module on the back side of the panel, and identify the four cables emerging from the lower right corner of the module. Figure 2 shows the back of a Digital Distribution Panel. As you can see, one of the cables (the one with the black heat shrink) is pre-connected to the wire cover of the high resolution transducer. The three coiled 15-foot cables provide the electrical connections to the incoming power and to the 289H/uM260 monitoring equipment.

*Cable Connections
and Device Wiring*

- 5) Identify the cable with the blue heat shrink. This cable contains the DDPM’s contact alarm pairs. Route this cable either directly to the 289H LSS connector block or to the plug-in pair termination adapter. Alternatively, you can also connect the contact alarm pairs to one of the two contact alarm expanders provided by System Studies. (The alarm expanders enable the contact alarm to be routed both to a 289H/uM260 and another monitoring system). The blue/white pair is for the “high flow” contact alarm, and the orange/white pair is for the “low delivery” pressure alarm.

Dedicated Block Connections

Figure 4 on the preceding page shows a previously unused dedicated block that accommodates device wiring for a maximum of 100 monitoring pairs. In this example, one Digital Dual Pipe Panel has been wired to the first two vertical rows of pins. Contact alarm pairs 1-4 were terminated on the first row, and the transducer pairs occupy the second row.

- 7) Record the pin designations used for the panel's contact alarms and transducers. This information is required for updating the PressureMAP database. Please submit this information to the person(s) in charge of inputting data into PressureMAP.
- 8) If the device pairs for the digital panel being installed are terminated on a 25-pair section of the block that does not yet have any device pairs connected, run a new cable from the corresponding cable connector to the 289H LSS Dedicated Relay Card. A new cable will be required only if all of the pairs in one of the existing 25-pair groups is filled.

Installing Power Direct Connect Module

- 9) Locate the Power Direct Connect Module that is affixed to the small aluminum mounting bracket (Figure 3). This voltage dropping resistor should be installed in the -48V DC central office battery conductor.
- 10) Uncoil the Power cable. It's the one with the darker colored sheath that contains the single conductor pair, in-line fuse, and Molex™ connectors. Pull the connectors apart and insert the connection module as shown in Figure 5.

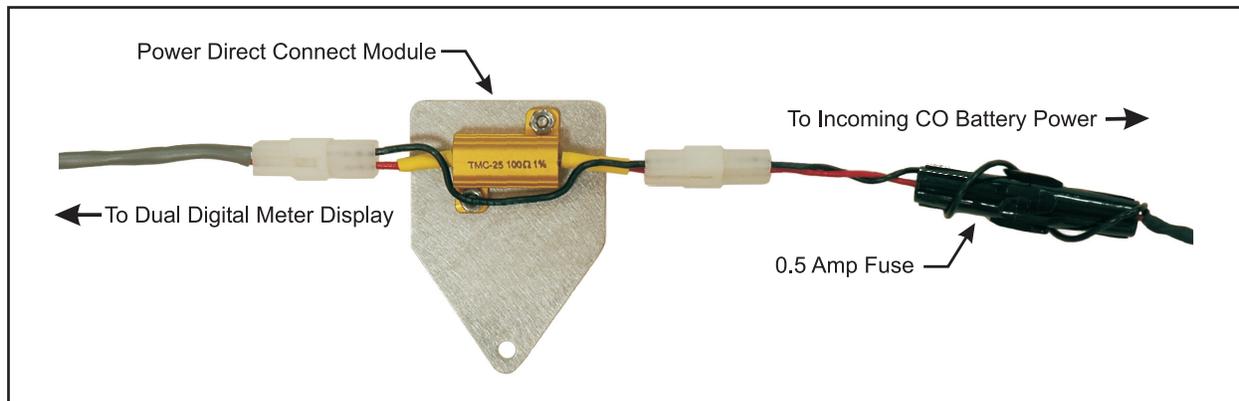


Figure 5: Power Direct Connect Module Installed in Power Cable

- 11) Mount the Power Direct Connect Module to the wire cover of the panel's high resolution transducer as shown in Figure 6. You will need to remove the wire cover using the thumb screw provided, back-thread the screw completely out of the cover, place the bracket in position, and reinstall the wire cover. Make sure the O-ring is in place properly and that none of the wires get crimped when you position the cover. Check that everything is properly sealed and tightened.

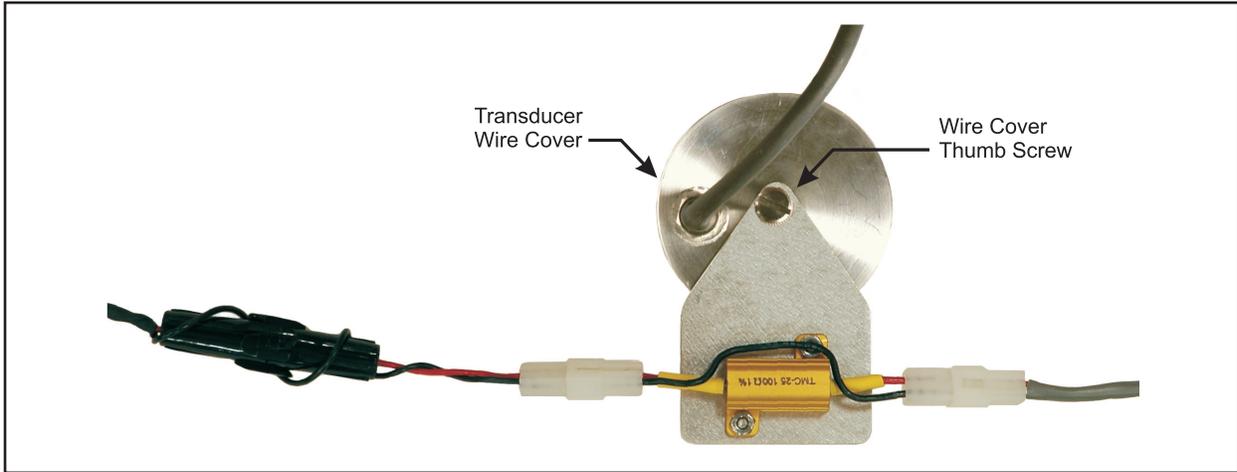


Figure 6: Power Direct Connect Module Mounted on TD Wire Cover

Power Connection

- 12) Before connecting the DDPM's power cable to the CO battery, you should remove the CO battery fuse at the CO fuse panel. This will help to prevent blowing a fuse, should one of the grounded CO battery wires inadvertently touch a metal surface during the hookup procedure.
- 13) Connect the DDPM power cable's red conductor (the one with the installed Power Direct Connect Module and in-line fuse) to the -48V DC CO Battery power lead. Splice the black 48V DC return conductor to the CO Battery ground (return) wire.

Important: In order for the panel to function with the 289H LSS, the black conductor must also be grounded to the CO battery return conductor at the 289H LSS equipment (Figure 7). The DDPM ground connection and the 289H return conductors **must** be electrically connected.

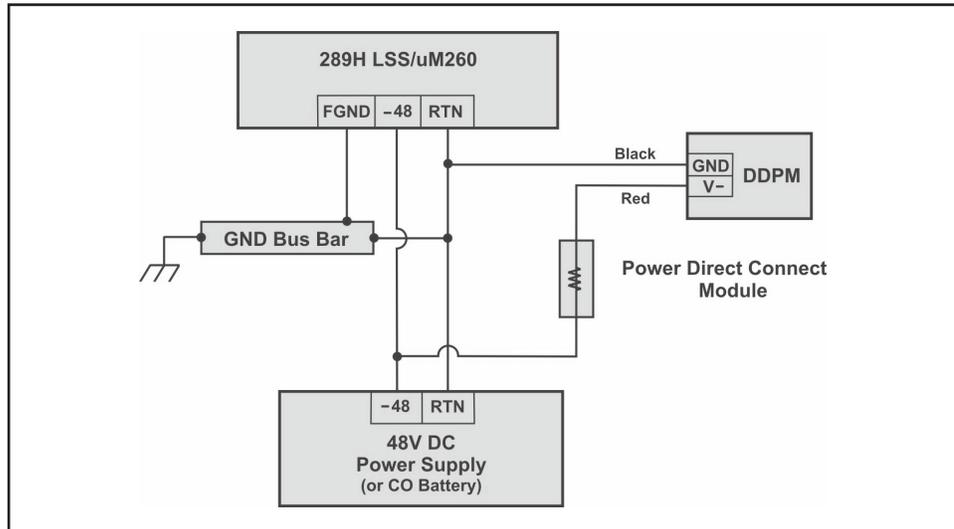


Figure 7: DDPM Wiring Schematic

- 14) Once the power leads have been connected, replace the CO Battery fuse that you removed at the beginning of the wiring procedure. This completes the power supply hookup for the digital display panels.

Panel Pneumatic Connections

The requirements for hooking up the pneumatics for the new digital panel differ slightly depending upon the panel being installed and the type of central office dryer air feed used in the CO. The following are some general instructions for both the Digital Distribution Panel and the Digital Pipe Panels.

Digital Distribution Panel Air Source Connection

This panel is equipped with one source input valve (for ½" plastic tubing) at the back of the panel. The input valve tees off and feeds both of the panel's Flow Finder Manifolds. The following procedures explain how to perform the necessary air feed connections:

- 1) Supply an appropriate length of ½" tubing, either from the central office manifold (if one is being used) or directly from the office air source to the back of the Digital Distribution Panel.
 - 2) Turn the shutoff valve on the face of the Distribution Panel to the OFF position. Also make sure that the shutoff valves on the Flow Finder Manifold to the individual chambers are in the closed position (tightened the valves clockwise).
 - 3) Connect the ½" air feed to the panel's input connector. This ¼" NPT-F fitting is located at the back of the panel on the right side of the shutoff valve. Notice that the output from the shutoff valve (looking at the back of the panel) is already tubed into the pressure regulator.
 - 4) Set the delivery pressure at the central office air source to between 12 and 15 PSI (according to company guidelines). Note that output pressure at the Digital Distribution Panel will be set to 10 PSI. This pressure differential makes it possible to accurately regulate output from the panel.
 - 5) Connect 3/8" tubing for cables in the vault to the distribution panel's manifolds at the back of the panel. Secure them firmly in place with an open end wrench.
 - 6) With power supplied to the Digital Distribution Panel, zero adjust the PSI display on the front of the panel as described below to compensate for variations in absolute pressure that occur at different altitudes:
 - A) Press and hold the recessed *Setup* button (#3) and the *Pressure* button (#2). Observe the rightmost decimal LED on the PSI display (this confirms that you are in the setup mode). Then release the *Setup* button while still
- Incoming Air Feed*
- Cable Pneumatics*
- Zero PSI Adjustment*

holding down the *Pressure* button. This displays the current pressure reading.

B) While holding the *Pressure* button (#2), press the *Up Arrow* or *Down Arrow* buttons (#4 and #5) to display a zero PSI value.

C) Release the buttons to store the adjusted value.

Delivery Pressure Adjustment

7) Turn the panel's On/Off valve to the ON position, and adjust delivery pressure to 10 PSI, using the lower LED display for reference. Check all pneumatic connections for leaks and correct any leaking connections if necessary.

Air Feed to Cables

8) Using a flat head screwdriver, turn on air flow to the individual manifold ports. Measure flow rates using a Flow Gauge. (The digital SCFH display cannot be used for individual cable flow rates. It displays total panel air consumption.) Notice that the distribution panel's individual manifold ports are color-coded, and colored stickers are used to identify the flow rates of the internal Flow Finders. Match the color with the appropriate scale on the Flow Gauge face when reading flow rates.

Note: If the gauge's needle is pegged, press the times-two switch and double the flow value indicated.

Digital Pipe Panel Air Source Connection

Like the Digital Distribution Panel, the single and dual Digital Pipe Panels are equipped with a source input valve (for 1/2" plastic tubing) at the back of the panel.

Source Air Feed

1) Place an appropriate length of 1/2" tubing from the central office manifold (if one is being used) or from the office air source to the back of the pipe panel.

A 1/4" NPT-F fitting is used on the panel for this connection. One input is supplied for both single and dual pipe panels.

Air Pipe Connection

2) Using a wrench, remove the red plug from the 45 degree fitting that is connected to the Flow Finder at the back of the panel. Connect the designated 1/2" air pipe to the fitting using a 1/4" NPT-M AMP fitting or equivalent. Secure the connection. Repeat the above steps for the other side if the Digital Pipe Panel being installed is a dual panel.

Zero PSI Adjustment

3) Zero adjust the PSI display on the front of the panel as described in step 6 of the *Digital Distribution Panel Air Source Connection* instructions above.

Delivery Pressure Adjustment

4) Open the On/Off valve at the front of the Digital Pipe Panel, and set the delivery pressure to 10 PSI using a C pressure gauge on the panel's High Resolution Dual (pressure/flow) Transducer. Repeat the steps 3 and 4 if you are installing a Dual Digital Pipe Panel.

5) Check all pneumatic connections for leaks and make corrections, if necessary.

Digital Panel Wiring Requirements for uM260 Micro Monitor

The uM260 Micro Monitor, designed for smaller offices with no more than 16 transducers and four contact alarm devices, is intended to be used with a 21-pair Termination Adapter. This adapter contains four rows of locking jaw terminal adapters for securing monitoring pair tip and ring conductors. Device numbers are printed on the circuit board to identify where the designated pairs should be terminated (Figure 8).

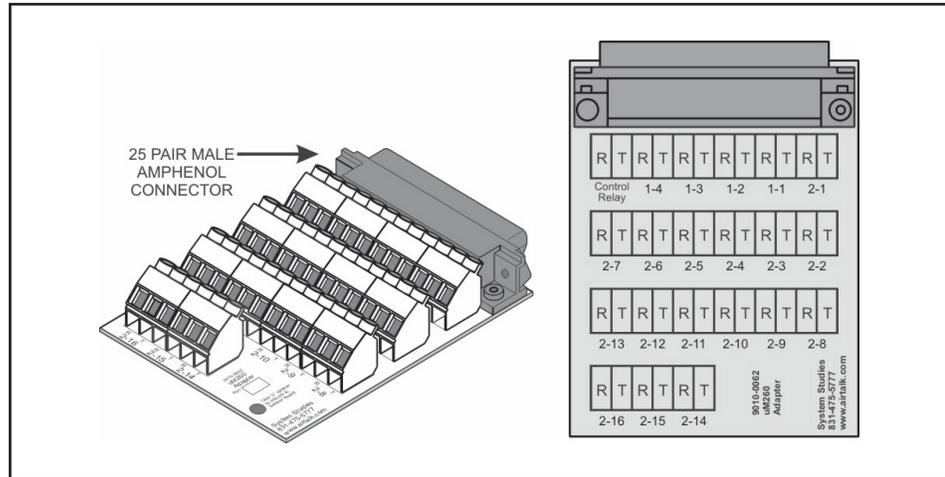


Figure 8: 21-Pair Termination Adapter

Tip/Ring Designations

Since most digital panels are equipped with a High Resolution Dual Transducer, a minimum of two sets of conductor terminals are used in the transducer group—one for the flow sensor, the other for the pressure sensor. Two or more sets of conductors are also used for the panel’s high flow and low pressure contact alarms.

Figure 9 illustrates the connector terminals used for a digital panel installation. A Digital Distribution Panel and a single Digital Pipe Panel each requires two pairs of contact alarm terminals and two pairs of transducer terminals. Connect the tip and ring conductors from the flow transducer to the terminal jaws designated as *2-1* on the Termination Adapter. The tip conductor has *blue* insulation; the ring conductor has *blue/white* insulation. Next, connect the tip and ring conductors from the pressure transducer to the terminal jaws designated as *2-2*. The tip conductor has *orange* insulation; the ring conductor has *orange/white* insulation.

As a suggestion, if you are installing a Digital Dual Pipe Panel, one with two High Resolution Dual Transducers, use terminals 2-1 and 2-2 for the dual transducer monitoring the pipe on the left side of the panel (as viewed from the front). The dual transducer monitoring the second pipe (right side) should be wired to slots 2-3 (flow TD) and 2-4 (pressure TD) on the Termination Adapter. Similarly, the DDPM (Dual Digital Panel Meter) contact alarms on the left side should be wired to slots 1-1 and 1-2. The corresponding devices on the right side should be wired to slots 1-3 and 1-4. Figure 9 illustrates the termination slots to use when wiring digital panel sensors to a uM260’s Termination Adapter.

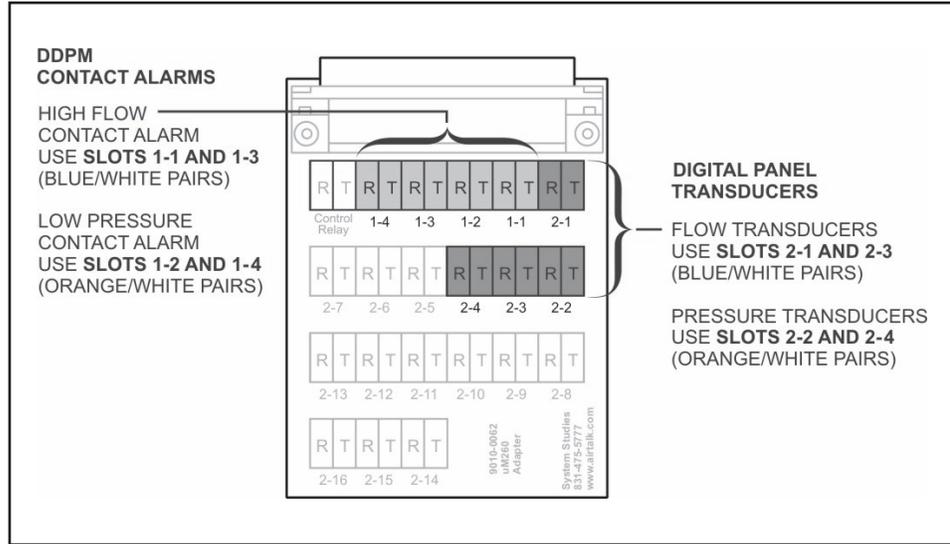


Figure 9: Digital Panel to Termination Adapter Wiring

Possible Digital Reading Errors

Important: Because the panel’s DDPM is polarity sensitive—unlike the high resolution transducers and uM260 Micro Monitor—it is especially important that you identify the tip and ring conductors (as shown above) for each monitoring device. You will need to secure them to the designated “T” and “R” terminal slots.

Once you have terminated the devices, if you see high flows on the DDPM (12 or 13 SCFH, for example) and the pressure reading is at or near zero, you should contact System Studies for instructions on how to check the firmware version of your uM260 monitor. If the firmware is not Version 1.16 or higher, you will need to make arrangements to return the monitor to System Studies for an upgrade.

If, however, you have a monitor with firmware at or above Version 1.16 and you see a DDPM pressure reading in the negative range, this indicates that the pressure and flow monitoring device pairs are likely transposed. For example, the pressure transducer pair (orange and orange/white conductors) may have been punched down in the T and R slots designated as 2-1 on the Termination Adapter, and the flow transducer pair (blue and blue/white) was terminated in slots 2-2.

Digital Panel Controls

DDPM Operation and Adjustment

The front panel of the DDPM consists of two 3-digit LED displays and five tactile buttons (Figure 10). The top display reads flow output in SCFH; the bottom display reads pressure output in PSI. During setup, the LEDs corresponding to the parameter being adjusted will be displayed. For example, the flow display will be used to display the flow alarm setpoint while it is being adjusted.

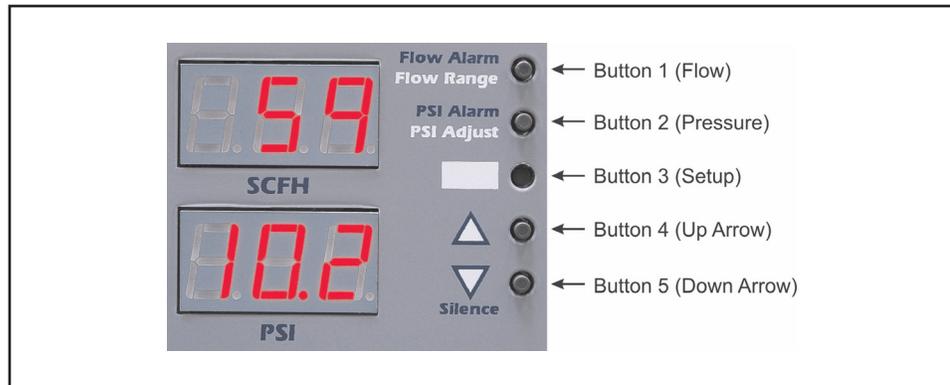


Figure 10: DDPM Switch Designations

The table below indicates what function can be performed by pressing a designated button or multiple buttons.

Button	Function
1	Adjust flow alarm setpoint
2	Adjust pressure alarm setpoint
3	Enable setup functions
4	Increase setting
5	Decrease setting
1 & 3	Choose flow range
2 & 3	Apply altitude PSI correction
1 & 5	Reset flow alarm output
2 & 5	Reset pressure alarm output

Table 1: Switch and Function Correlation

Default Settings

Digital Pipe and Distribution Panels are available in a variety of flow ranges, which are specified when ordering. Before shipment, the flow range of the panel's Dual Digital Panel Meter(s) is preset in the factory. Other DDPM default ranges and alarm settings are shown below:

Flow range:	Specified on order and preset in factory (either 9.5, 19.0, 47.5 or 95.0 SCFH)
Pressure range:	-4.2 absolute pressure to 30 PSI
Pressure offset:	0.0 PSI
Pressure alarm:	0.0 PSI
Flow alarm:	Full scale, same as preset flow range

Note: If the flow range is changed, the flow alarm defaults to the full scale for the new flow range. For example, if you replace a panel's Flow Finder with a 0-95 SCFH Flow Finder, the default value becomes 95 SCFH.

Setting Requirements

There are some general requirements that apply to the use of the Dual Digital Panel Meter button settings. These are summarized as follows:

- Function buttons and button combinations must be held for two seconds to enter the setup mode. To confirm that you are in the setup mode, the rightmost decimal LED on the appropriate display is illuminated.
- *Up Arrow / Down Arrow* buttons (#4 and #5) have no effect until an adjustment has been selected.
- Once an adjustment has been selected, the setting will be displayed on the corresponding display.
- Once an adjustment has been selected and the parameter has been changed, the changed value will be stored when the parameter (*Pressure* or *Flow* button) is released for more than two seconds.
- The *Up Arrow / Down Arrow* buttons are used to increase or decrease the setting.
- The *Flow* button (#1) must be held to adjust flow alarm and range.
- The *Pressure* button (#2) must be held to adjust pressure alarm and range.
- The *Pressure* button has no effect on flow settings, and the *Flow* button has no effect on pressure settings.
- When reading in alarm mode, the display flashes the reading for a duration of one second on and one second off.

- After the alarm has been reset (silenced), the display continues to flash the reading (1.5 seconds on and 0.5 seconds off) until the alarm is cleared.
- When a reading exceeds 20mA, the corresponding display will read **PEG**.

Dual Digital Meter Panel Setup

The following procedures explain how to establish and change DDPM settings. These simple, intuitive procedures need to be performed after the power connection has been established and before the panel is placed in operation.

Setting the Flow Contact Alarm

- 1) Press and hold the *Flow* button (#1).
- 2) Press the *Up Arrow* or *Down Arrow* buttons (#4 or #5) to increase or decrease the flow setpoint to the desired level. The changing values are displayed in the top LED display.
- 3) When the desired flow contact alarm value displays, release the buttons to store the alarm setting.

Setting the Pressure Contact Alarm

- 1) Press and hold the *Pressure* button (#2).
- 2) Press the *Up Arrow* or *Down Arrow* buttons (#4 or #5) to increase or decrease the pressure setpoint to the desired level. The values are shown in the bottom LED display.
- 3) When the desired pressure contact alarm value displays, release the buttons to store the alarm setting.

Adjusting Pressure for Altitude

The Dual Digital Panel Meter provides the means of adjusting the displayed pressure value to compensate for variations in absolute PSI readings that occur at different altitudes. To set the altitude offset for your installation:

- 1) Press and hold the recessed *Setup* button (#3) and the *Pressure* button (#2). Observe the rightmost decimal LED on the PSI display (this confirms that you are in the setup mode). Then release the *Setup* button while still holding down the *Pressure* button. This displays the current pressure reading.
- 2) While holding the *Pressure* button (#2), press the *Up Arrow* or *Down Arrow* buttons (#4 and #5) to correct the pressure reading.
- 3) Release the buttons to store the adjusted value.

Dual Digital Meter Panel Operation

The following procedures explain how to: 1) set a new flow range if the panel's on-board Flow Finder needs to be replaced with one of a different range, and 2) silence alarms.

Setting the Flow Range

In rare instances when it is desirable to change the flow rate of the pipe or distribution panel (i.e., replace the panel's Flow Finder with one of a different range), it will be necessary to reset the flow range of the Dual Digital Panel Meter's flow contact alarm as follows:

- 1) Press the *Flow* button (#1) and the recessed *Setup* button (#3) simultaneously. These function buttons must be held for two seconds to enter setup mode. Notice that when you are in the setup mode, the right decimal point on the flow display's LED will be lit until the setting is saved. Release *Setup* button.
- 2) Press the *Up Arrow* or *Down Arrow* buttons (#4 and #5) to scroll through the available ranges (0-9.5, 0-19, 0-47.5, 0-95, 0-475 and 0-950 SCFH).
- 3) Select the appropriate Flow Range and release the keys to store the new value.

Once the new flow range has been set, you may want to reset the flow contact alarm as described on the previous page.

Silencing High Flow or Low Pressure Alarms

When either the pressure or the flow contact alarm initiates, the appropriate display flashes (one second on, one second off). The output of these displays can be silenced or reset as follows:

- 1) For the high flow alarm, press and hold the *Flow* button (#1) and the *Down Arrow* button (#5).
- 2) To reset a low pressure alarm, press and hold the *Pressure* button (#2) and the *Down Arrow* button (#5).

The display will continue to flash, but more rapidly (1.5 seconds on, 0.5 seconds off) until the alarm clears.

Manual Flow Reading Adjustment

The following steps explain how to adjust the indicated flow value shown in the top LED display (SCFH).

- 1) Press and hold down the *Setup* button (#3).
- 2) At the same time hold the *Flow* and *Pressure* buttons (#1 and #2). A small LED light will shine in the bottom right of the top display.

- 3) Release buttons #2 and #3, while continuing to hold button #1.
- 4) Press buttons #4 (*Up Arrow*) to increase and #5 (*Down Arrow*) to decrease indicated flow.
- 5) Release all buttons.

Disabling Tone to a Dedicated Relay

The tone capability (locator tone and pseudo-data tone) of properly configured 289H LSS monitors is not compatible with the digital panel equipment. Consequently, you will need to disable tone on any dedicated relay cards used in offices being fed by digital panels. Figure 11 shows a standard Dedicated Relay Card.

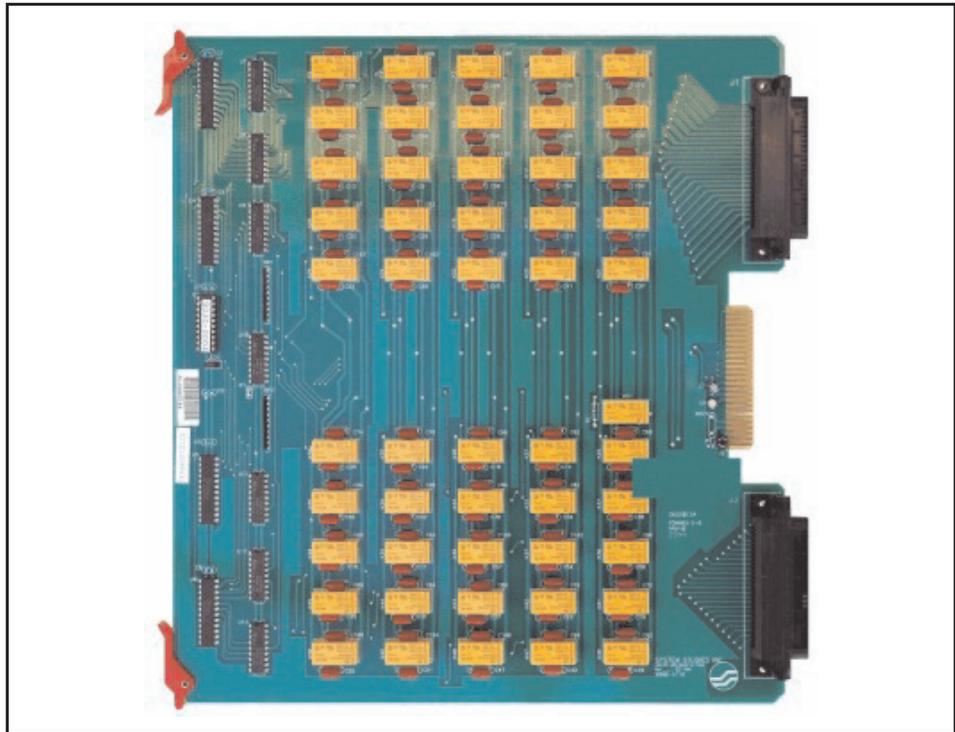


Figure 11: Dedicated Relay Card

- 1) Position the card so that the component side (the one with the orange relays) is facing upward and the card backplane connector (center gold-colored edge connector) is facing to the right (see above).
- 2) Locate the J2 jumpers which are positioned near the bottom of the backplane connector. These individual jumpers are labeled W2 and W3 on the card surface (Figure 12).

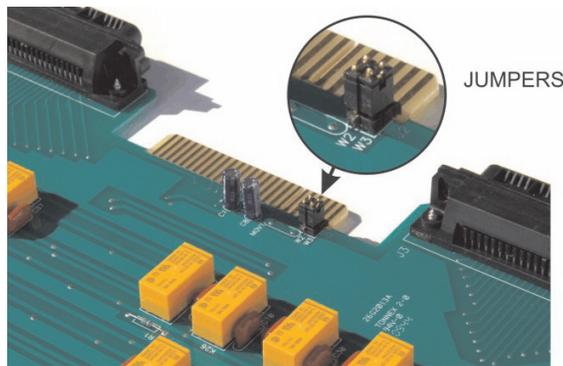


Figure 12: Jumper Location

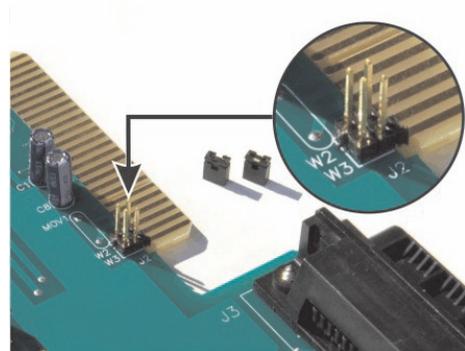


Figure 13: Jumper Removed

Remove both of these connectors by pulling them straight upwards (Figure 13). This simple procedure disables tone capability for all of the relays on the card. Note: you may wish to save these connectors if you foresee ever having to restore tone capability to this card.

- 4) Repeat the above procedure for any other dedicated relay cards monitoring devices in the office.

This completes the single digital display panel installation procedures. Please contact System Studies Incorporated at (800) 247-8255 or (831) 475-5777 if you have any specific questions regarding the monitoring and operation of your new panel.

