



Series DH Digihelic® Differential Pressure Controller  
Specifications - Installation and Operating Instructions





## **SPECIFICATIONS**

**Service:** Air and non-combustible, compatible gases.

**Wetted Materials:** Consult factory.

**Housing Material:** ABS plastic, UL approved 94-V-0.

**Accuracy:**  $\pm 0.5\%$  at 77°F (25°C) including hysteresis and repeatability (after 1 hour warm-up).

**Stability:**  $< \pm 1\%$  per year.

**Pressure Limits:** Ranges  $\leq 2.5$  in. w.c. = 2 psi

5": 5 psi; 10": 5 psi; 25": 5 psi; 50": 5 psi; 100": 9 psi.

**Temperature Limits:** 32 to 140°F (0 to 60°C).

**Compensated Temperature Limits:** 32 to 140°F (0 to 60°C).

**Thermal Effects:** 0.020%/°F (0.036/°C) from 77°F (25°C).

### **Power Requirements:**

High Voltage Power = 100 to 240 VAC, 50 to 400 Hz or 132 to 240 VDC.

Low Voltage Power = 24 VDC  $\pm 20\%$ .

### **Power Consumption:**

Low Voltage Power = 24 VDC - 130 mA max.

High Voltage Power = 100 to 240 VAC, 132 to 240 VDC - 7VA max.

**Output Signal:** 4-20 mA DC into 900 ohms max.

**Zero & Span Adjustments:** Accessible via menus.

**Response Time:** 250 ms (dampening set to 1).

**Display:** 4 digit LCD 0.4" height LED indicators for set point and alarm status.

**Electrical Connections:** Screw terminals.

**Process Connections:** Compression fitting for use with 1/8" ID tubing x 1/4" OD tubing (3.175 mm ID x 6.35 mm OD).

**Enclosure Rating:** Face designed to meet NEMA 4X (IP66).

**Mounting Orientation:** Mount unit in horizontal plane.

**Size:** 1/8 DIN. Panel Cutout: 1.772 x 3.620 in (45 x 92 mm).

**Weight:** 14.4 oz (408 g).

**Serial Communications:** Modbus® Protocol RTU, RS485, 9600 Baud.

**Agency Approvals:** UL Listed, CUL Listed File No. E83725

CE EMC and Low Voltage Directives:

EN61000-4-2

EN61000-4-3\*

EN61000-4-4

EN61000-4-5

EN61000-4-6

EN61000-4-11

EN55011

EN601010

\* Models DH-001 through DH-004, DH-011 through DH-014 pass criteria B. All others pass criteria A.

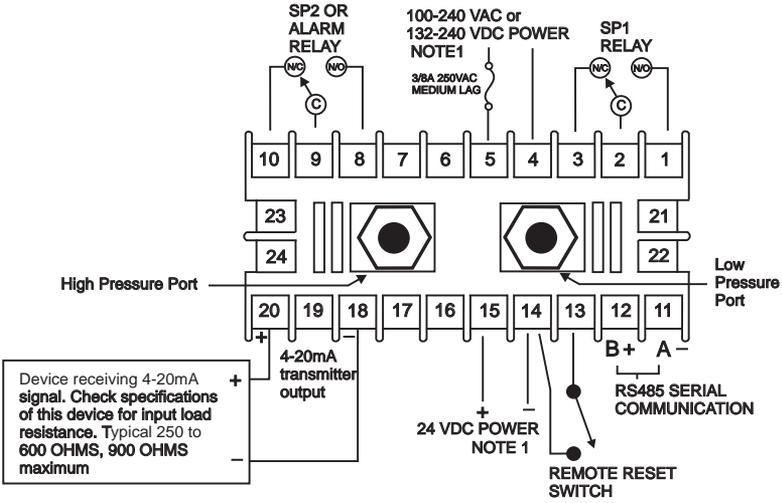
## **Switch SPECIFICATIONS**

**Switch Type:** 2 SPDT relays.

**Electrical Rating:** 8 Amps at 240 VAC resistive.

**Set Point Adjustment:** Adjustable via keypad on face.

# WIRING



## WARNING

If Digihelic® is powered by 24 VDC, the device receiving the 4-20 mA transmitter output MUST NOT share a common ground with the 24 VDC supply or damage to the Digihelic® will result.

## NOTES:

1. The instrument may be powered from the AC line or 24 VDC. Do not wire AC line terminals 4-5 and 24 VDC terminals 14-15 at the same time or damage to the unit will result.
2. For supply connections, wire in accordance with an equivalent national standard or code. Use copper conductors only rated for at least 75°C.
3. Terminals 11-15, 18 and 20 are rated CLASS 2.
4. **ISOLATION:**
  - Relays - 1500 VAC to all other inputs and outputs.
  - AC Line Power (terminals 4-5) - 1500 VAC to all other inputs and outputs.
  - RS485 output - 500 VAC to all other CLASS 2 wiring.
  - The 24 VDC Power, 4-20 mA transmitter, and Remote Reset Switch share a common ground.
5. The Remote Reset Switch must be a dry contact switch.
6. Shielded cable is required for RS485 wiring.



It is not necessary to remove the control chassis from the housing for installation. If the control chassis is removed from the housing, you must follow industry standard practice for control and protection against Electro-Static Discharge (ESD). Failure to exercise good ESD practices may cause damage to the control.



Wiring to housing terminals while chassis is removed may cause distortion of the internal connector and possible damage to the connector when the chassis is reinstalled. It is strongly recommended that the control housing be wired with the chassis installed.

## INSTALLATION

Mount the instrument in a location that will not be subject to excessive temperature, shock or vibration. All models are designed for mounting in an enclosed panel.

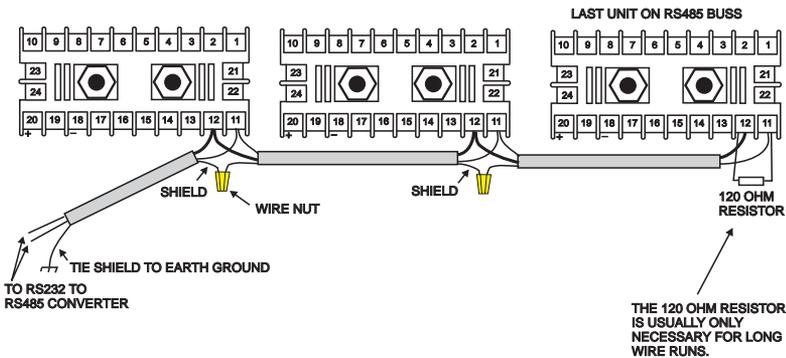
Select the position desired for the instrument on the panel. Prepare the panel by cutting and deburring the required opening.

From the front of the panel, slide the instrument through the cut out. The housing gasket should be against the housing flange before installing.

From the rear of the panel slide the mounting collar over the housing. Hold the housing with one hand and using the other hand, push the collar evenly against the panel until the springs are compressed. The ratchets will hold the mounting collar and housing in place.

## DIGIHELIC® CONTROLLER RS485 WIRING

- RS485 WIRING TO DAISY CHAIN INSTRUMENTS ON THE RS485 BUSS  
UP TO 128 UNITS MAY BE DAISY CHAINED



MULTIPLIER DESCRIPTOR  
VISIBLE WITH SOME VELOCITY  
AND FLOW RANGE

FRONT PANEL

PRESSURE  
VALUE

SP1  
DESCRIPTOR  
SP2  
DESCRIPTOR



UNITS

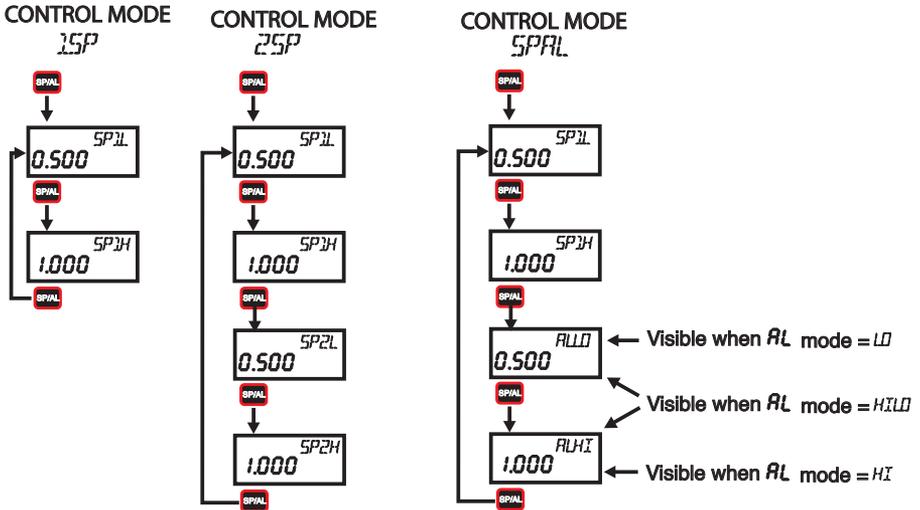
ALARM  
DESCRIPTOR

KEY FUNCTIONS

	HOME POSITION FUNCTION	MAIN MENU FUNCTION	SUB MENU FUNCTION
 SP/AL	Sequences the display through SET POINT and ALARM settings	Return to home position	Return to home position
 MENU	Allows access to the menus	Return to home position	Return to previous menu
 UP ARROW		Sequences through menus	Increments a value
 DOWN ARROW		Sequences through menus	Decrements a value
 ENTER	Displays full scale range of unit	Enter into SUB MENU	Changes a value or setting. Press ENTER and display will blink. Adjust with UP or DOWN arrows. Press ENTER to store. Display will stop blinking.
 RESET	Clears or resets an Alarm (alarm set for manual reset)		Peak/Valley SUB MENU resets display to present value.

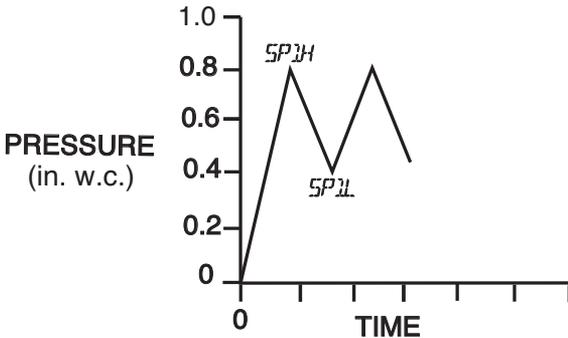
# SETTING SET POINTS AND ALARMS

The **SP/AL** hot key provides direct access to the Set Point and Alarm MENU. The Set Point and Alarm MENUS that are displayed are based upon the Control (Ctrl) SUB MENU.



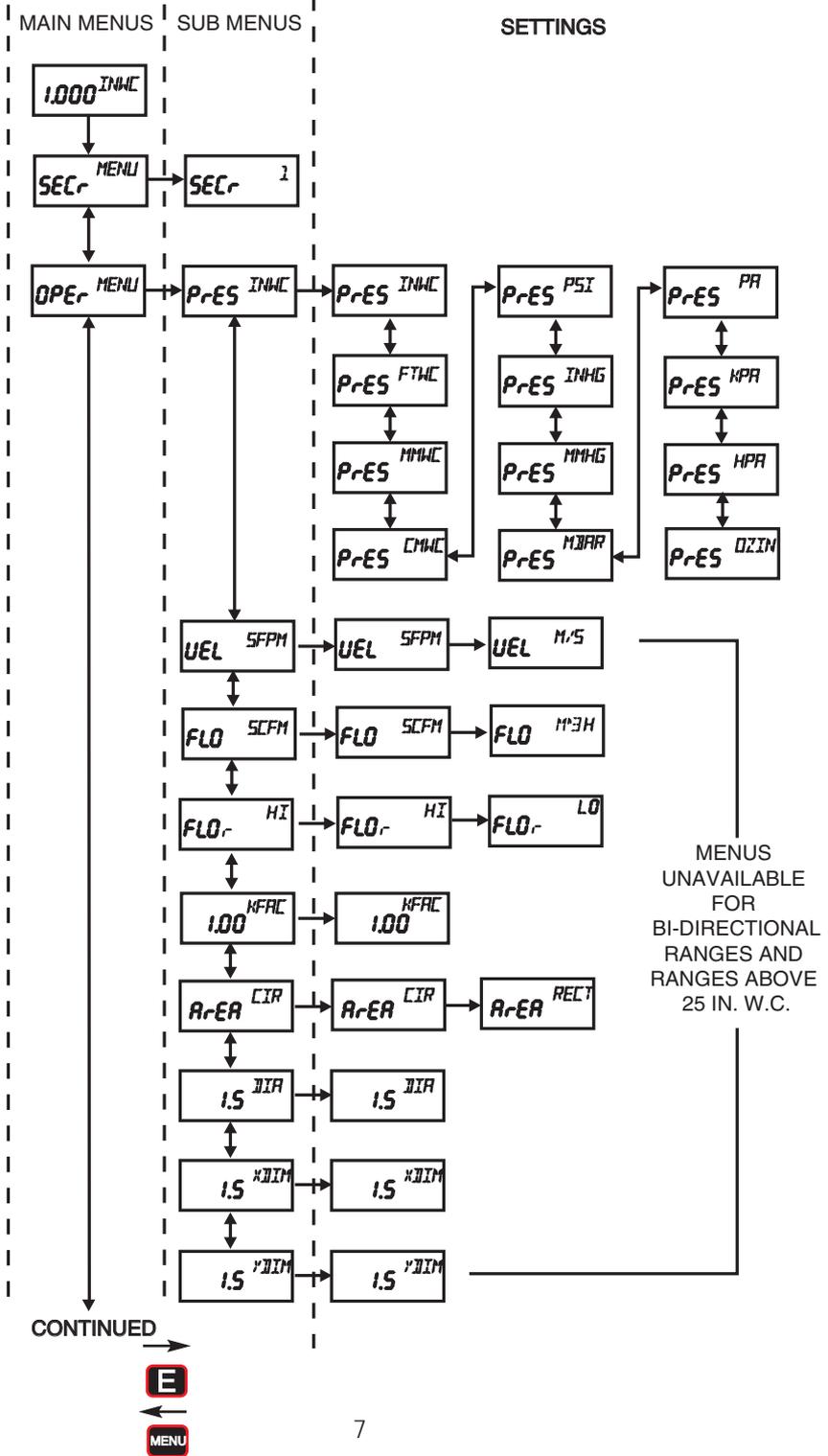
## SET POINT ADJUSTMENT

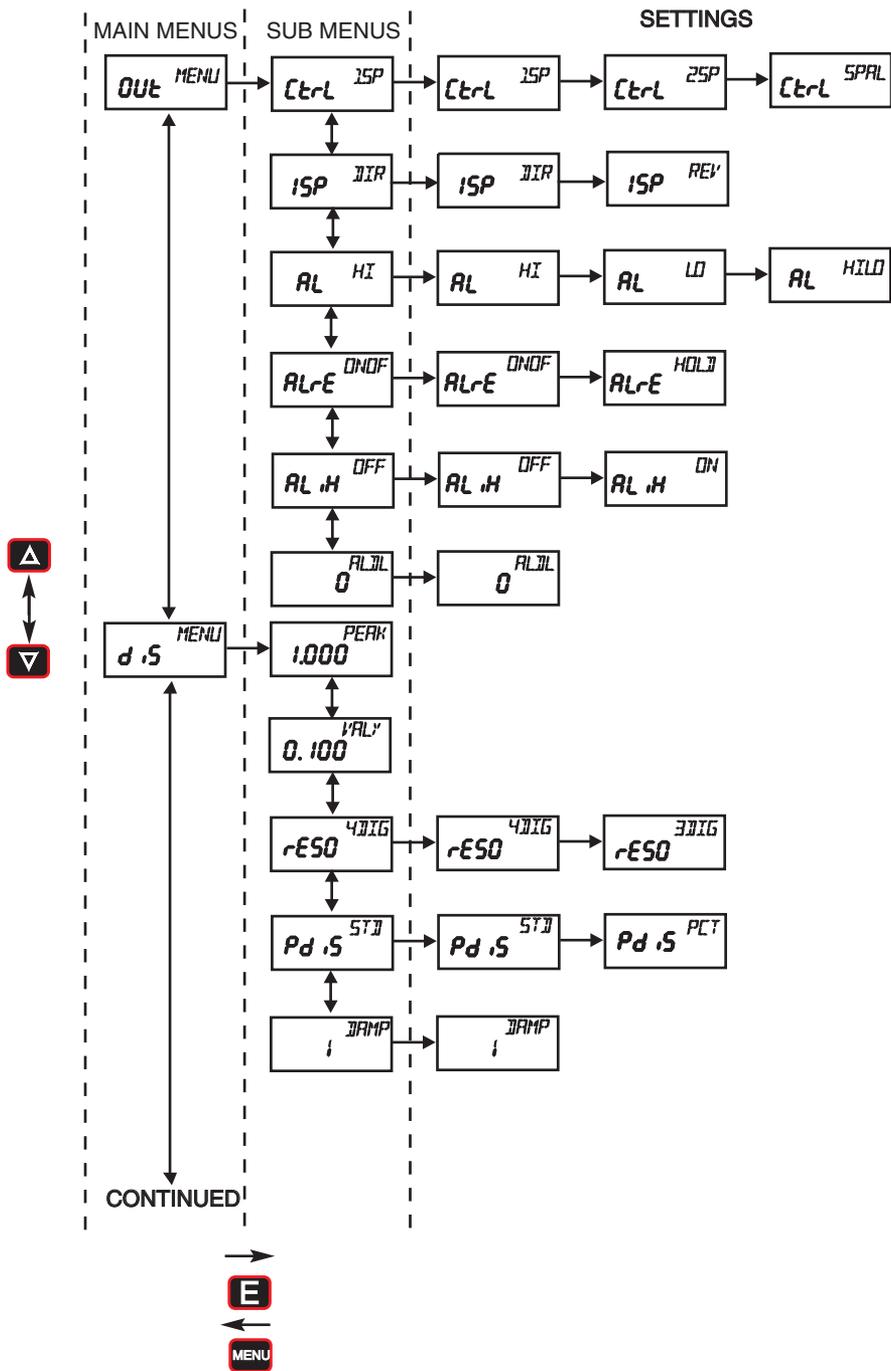
Adjusting the Digihelic® Controller Set Points is quick and simple. Instead of setting a set point and deadband, simply adjust *SP1H* or *SP2H* for the desired relay turn on point, and then adjust *SP1L* or *SP2L* for the desired relay turn off point.

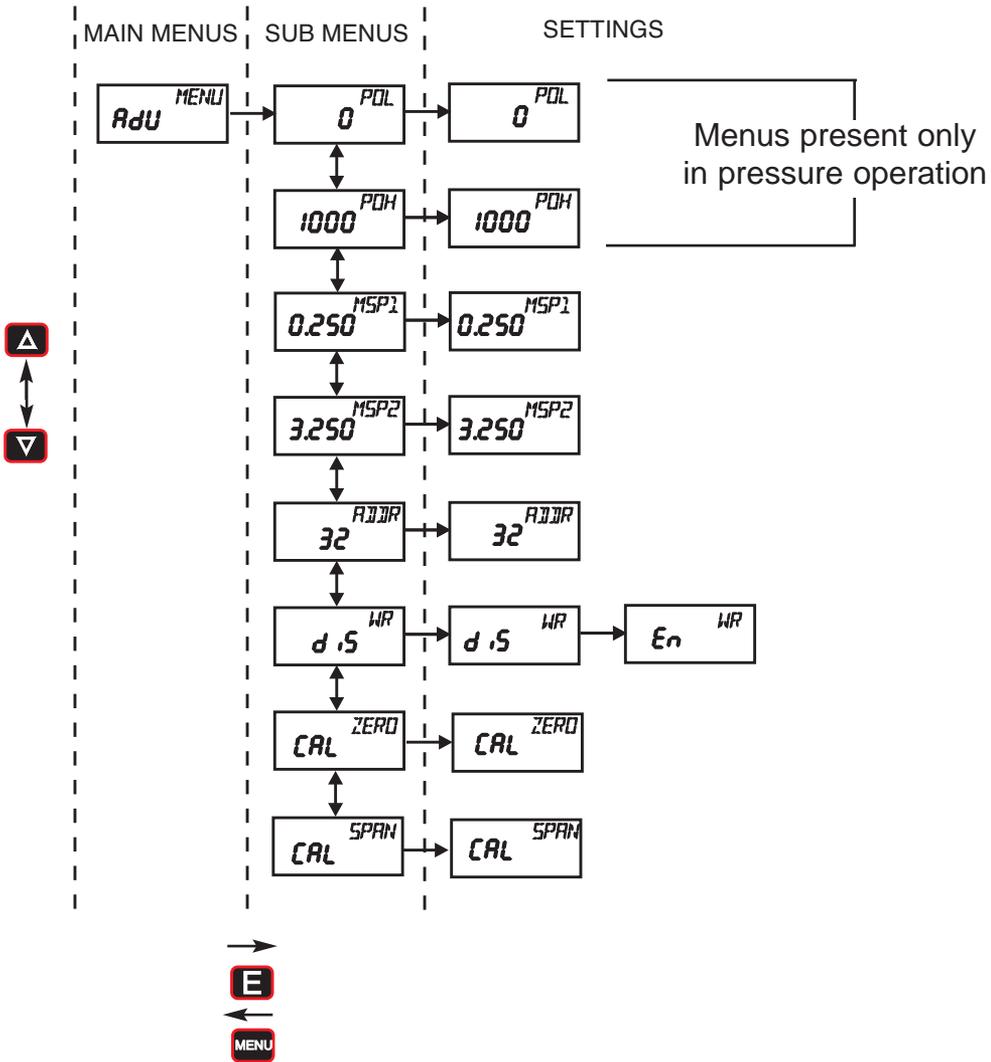


In the above graph, an instrument with a 1.0" range would have the SP1 relay turn on at 0.8" and off at 0.4". *SP1H* sets the relay turn on point, and *SP1L* sets the relay turn off point. The relays outputs normally function in the direct acting mode, which means the relays turn on with an increase in pressure. SP1 may be configured to act as a reverse acting relay (refer to the 1SP SUB MENU setting, page 15). When set for reverse acting, *SP1H* sets the relay turn OFF point, and *SP1L* sets the relay turn ON point. SP2 is always direct acting.

# MENU MAP







## Main Menu Selections (Upper Right Display Reads MENU)

- SEC* Security - Lock out access to Set Point and Alarm settings, or lock out access to all settings.
- OPER* Operation - Selection of Pressure, Velocity or Flow and corresponding engineering units.
- OUT* Output - Select a Single Set Point, 2 Set Points, or a Set Point and an Alarm mode of operation.
- d.S* Display - Monitor and adjust display related settings: Peak, Valley, display resolution, % output and dampening.
- Adv* Advanced functions - Modify advanced function parameters, transmitter output scaling, Modbus® Protocol communication settings, Maintenance Set Point settings and calibration.

# MAIN MENUS and SUB MENUS

## SEC<sub>r</sub> (Security) MAIN MENU

*SEC<sub>r</sub>* is the only SUB MENU in the security MENU. When the security SUB MENU is selected, the present security level is displayed in the upper right hand display. To change the security level, adjust the number displayed to the number shown in the following table for the desired security level.

Security Level Displayed	Access	Password Value to Enter
1	All menu access	10
2	Menu Access SP/AL Locked	70
3	SP/AL Access Menus Locked	90
4	All settings locked	111

The password values shown in the table cannot be altered, so retain a copy of these pages for future reference.

## OPE<sub>r</sub> (Operation) MAIN MENU

The *OPE<sub>r</sub>* MENU selects the measurement type of the instrument. The SUB MENUS are:

*PRES* - Pressure

*KFAC* - K Factor

*XDIM* - X Dimension

*VEL* - Velocity

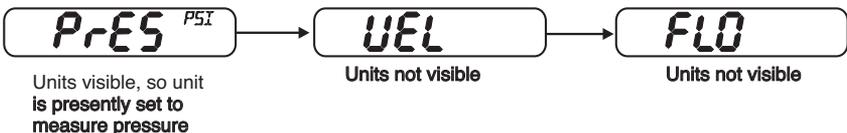
*AREA* - Area

*YDIM* - Y Dimension

*FLO* - Flow

*DIA* - Diameter

If the instrument is set for Velocity, the *OPE<sub>r</sub>* MENU will have an additional *KFAC* SUB MENU. If the instrument is set for Flow, the *OPE<sub>r</sub>* MENU will have additional *KFAC* and *AREA* SUB MENUS. These will be discussed under Velocity and Flow. When scrolling through the *OPE<sub>r</sub>* SUB MENUS, the measurement type the unit is currently set for will show the units in the upper right display. The other measurement types will have a blank upper right display.



## PrES (Pressure) SUB MENU

For pressure measurement, the following units are available:

*INWC* - Inches of water column

*MMHG* - Millimeters of mercury

*FTWC* - Feet of water column

*MBAR* - Millibar

*MMWC* - Millimeters of water column

*PA* - Pascal

*CMWC* - Centimeters of water column

*KPA* - Kilopascals

*PSI* - Pounds per square inch

*HPA* - Hectopascals

*INHG* - Inches of mercury

*OZIN* - Ounce inches

**Table 1 Pressure Range vs. Available Units**

INWC	FTWC	MMWC	CMWC	PSI	INHG	MMHG	MBAR	PA	KPA	HPA	OZIN
.1000		2.540	.2540			.1868	.2491	24.91		.2491	
.2500		6.350	.6350			.4671	.6227	62.27		.6227	.1445
.5000		12.70	1.270			.9342	1.245	124.5	.1245	1.245	.2890
1.000		25.40	2.540			1.868	2.491	249.1	.2491	2.491	.5780
2.500	.2083	63.50	6.350		.1839	4.671	6.227	622.7	.6227	6.227	1.445
5.000	.4167	127.0	12.70	.1806	.3678	9.342	12.45	1245	1.245	12.45	2.890
10.00	.8333	254.0	25.40	.3613	.7356	18.68	24.91	2491	2.491	24.91	5.780
25.00	2.083	635.0	63.50	.9032	1.839	46.71	62.27	6227	6.227	62.27	14.45
50.00	4.167	1270	127.0	1.806	3.678	93.42	124.5		12.45	124.5	28.90
100.0	8.333	2540	254.0	3.613	7.356	186.8	249.1		24.91	249.1	57.80

**NOTE:** *OVFL* (over flow) or *UNFL* (under flow) will appear when the ranges have been exceeded above or below full scale by 2%.

## VEL (Velocity) SUB MENU

For velocity measurement, the following units are available:

*SFPM* - Standard feet per minute

*M/S* - Meters per second

**Table 2 Available Velocity Ranges**

INPUT RANGE INWC	SFPM RANGE	M/S RANGE
0 - 0.1	0 - 1266	0 - 6.431
0 - 0.25	0 - 2002	0 - 10.17
0 - 0.5	0 - 2832	0 - 14.39
0 - 1	0 - 4004	0 - 20.35
0 - 2.5	0 - 6332	0 - 32.17
0 - 5	0 - 8954	0 - 45.48
0 - 10	0 - 12.66 x IK	0 - 64.33
0 - 25	0 - 20.02 x IK	0 - 101.7

**NOTE:** Air velocity and flow readings are based upon standard dry air conditions with an ambient temperature of 70°F and a barometric pressure of 29.92 INHG.

## FLO (Flow) SUB MENU

For flow measurements the following units are available:

*SCFM* - Standard cubic feet per minute

*m<sup>3</sup>H* - Cubic meters per hour

## FLO<sub>r</sub> (Flow Range) SUB MENU

*LO* - 99.99 x 1K flow range

*HI* - 999.9 x 1K flow range

Tables 3 -6 show the flow ranges available, and the maximum duct size that can be set for each input range.

**Table 3**

*FLO<sub>r</sub>* = *LO* Maximum Duct Size (English)

RANGE IN WC	SCFM RANGE	MAX. DUCT SIZE, SQ. FT.
0.1	99.99 x 1K	78.9
0.25	99.99 x 1K	49.9
0.5	99.99 x 1K	35.3
1	99.99 x 1K	24.9
2.5	99.99 x 1K	15.7
5	99.99 x 1K	11.1
10	99.99 x 1K	7.8
25	99.99 x 1K	4.9

**Table 4**

*FLO<sub>r</sub>* = *HI* Maximum Duct Size (English)

RANGE IN WC	SCFM RANGE	MAX. DUCT SIZE, SQ. FT.
0.1	999.9 x 1K	789.8
0.25	999.9 x 1K	499.5
0.5	999.9 x 1K	353.1
1	999.9 x 1K	249.7
2.5	999.9 x 1K	157.9
5	999.9 x 1K	111.7
10	999.9 x 1K	78.9
25	999.9 x 1K	49.9

**Table 5**

*FLO<sub>r</sub>* = *LO* Maximum Duct Size (Metric)

RANGE IN WC	M <sup>3</sup> /Hr RANGE	MAX. DUCT SIZE M <sup>2</sup>
0.1	99.99 x 1K	4.32
0.25	99.99 x 1K	2.73
0.5	99.99 x 1K	1.93
1	99.99 x 1K	1.37
2.5	99.99 x 1K	0.86
5	99.99 x 1K	0.61
10	99.99 x 1K	0.43
25	99.99 x 1K	0.27

**Table 6**

*FLO<sub>r</sub>* = *HI* Maximum Duct Size (Metric)

RANGE IN WC	M <sup>3</sup> /Hr Range	MAX. DUCT SIZE, M <sup>2</sup>
0.1	999.9 x 1K	43.19
0.25	999.9 x 1K	27.31
0.5	999.9 x 1K	19.3
1	999.9 x 1K	13.64
2.5	999.9 x 1K	8.63
5	999.9 x 1K	6.10
10	999.9 x 1K	4.31
25	999.9 x 1K	2.73

## KFAC SUB MENU

*KFAC* K Factor - becomes accessible if the instrument is set for Velocity or Flow. When the Digihelic® Controller is used with a pitot tube, the manufacturer may specify a K Factor. The adjustment range is 0.01 to 2.00. The factory setting is 1.

## AREA, DIA, XDIM and YDIM SUB MENUS

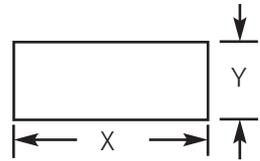
These SUB MENUS become accessible if the instrument is set for flow. When measuring flow, the area of the duct must be specified. Tables 3 and 4 show the input range vs maximum flow and duct size. For a rectangular duct the maximum size is specified in square feet or meters. For a circular duct the maximum size is specified as the diameter. X, Y and circular dimensions are entered in feet with 0.01 foot resolution for  $FLOr = LO$  and 0.1 foot resolution for  $FLOr = HI$ , or entered in millimeters with 1 millimeter resolution.

*AREA* - Area, select *CIR* for a circular duct or *RECT* for a rectangular duct. If a circular duct is selected, the *DIA* SUB MENU will be activated. If a rectangular duct is selected, the *XDIM* and *YDIM* SUB MENUS will be activated.

*DIA* - Diameter, enter the diameter of a duct

*XDIM* - Enter the "X" dimension of a duct

*YDIM* - Enter the "Y" dimension of a duct



## OUT (Output) MAIN MENU

The *OUT* MENU selects the output type of the instrument. The SUB MENUS are:

*CTRL* - Control type

*ISP* - SP1 reverse or direct acting

*AL* - Alarm type

*ALrE* - Alarm reset, manual or auto

*ALH* - Alarm inhibit

*ALDL* - Alarm delay

## Ctrl (Control) SUB MENU

*1SP* - Single set point

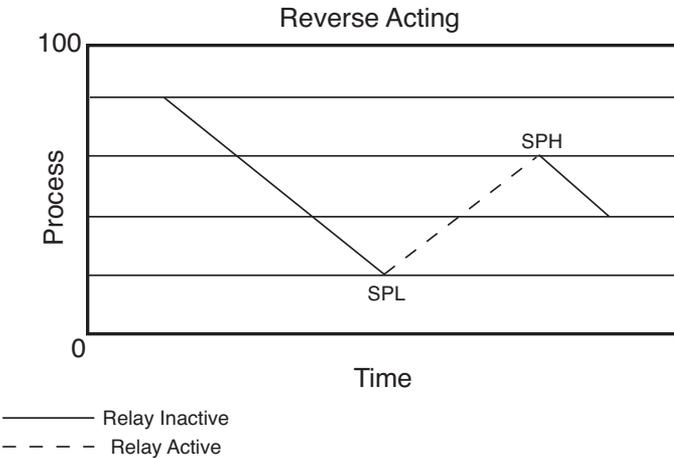
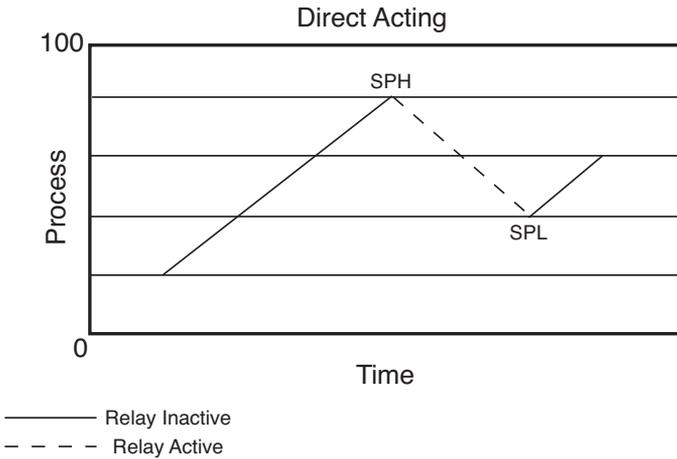
*2SP* - Two fully independent set points

*SPAL* - Single set point and alarm

## 1SP (SP1 Reverse or Direct Acting) SUB MENU

*DIR* - Direct. Relay turns on with increasing pressure

*REV* - Reverse. Relay turns on with decreasing pressure



The following alarm function SUB MENUS are activated when *Ctrl* is set to *SPAL*:

### AL (Alarm Type) SUB MENU

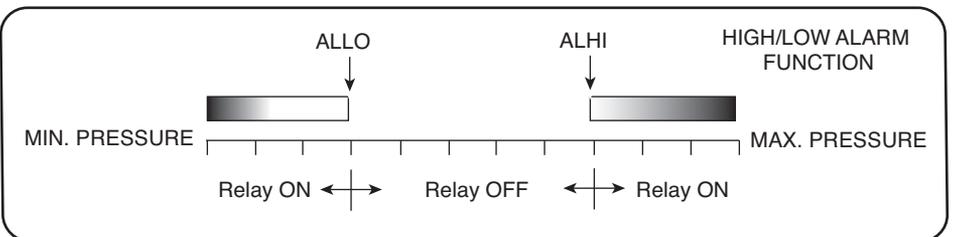
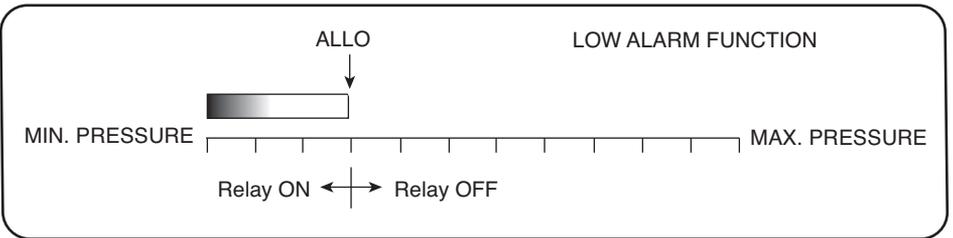
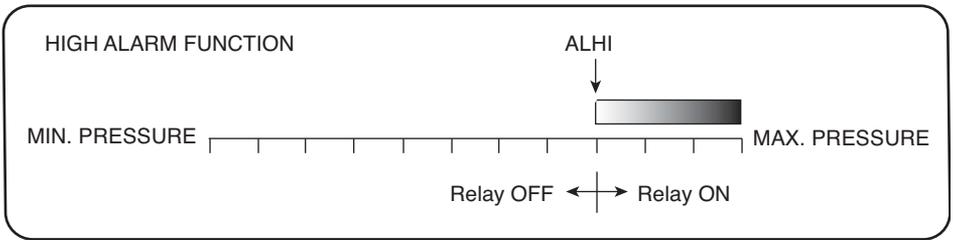
*HI* - High alarm

*LO* - Low alarm

*HILLO* - For a high/low guardband type alarm

### ALARM ADJUSTMENT

Alarm settings are dependent upon the selected alarm mode. The Digihelic® Controller alarm may be configured as a High Alarm, Low Alarm, or High/Low Alarm. Alarm settings are all absolute and may be set to anywhere within the range of the instrument. The dead bands of the alarms are fixed at 1% of full scale.



## ALRE (Alarm Reset) SUB MENU

*ON/OFF* - Automatic reset

*HOLD* - Manual reset. An alarm is reset by the RESET key on the front panel, or an external reset switch.

## ALH (Low Alarm Inhibit) SUB MENU

*ON* - Alarm inhibit is on

*OFF* - Alarm inhibit is off

If *ALH* is selected ON, a low alarm condition is suspended upon power up until the process value passes through the alarm set point once.

## ALDL (Alarm Delay) SUB MENU

Sets the amount of time an alarm condition must be continuously met before the alarm condition is recognized. The alarm delay is adjustable from 0-3600 seconds.

## d.S (Display) MAIN MENU

*PEAK* - Peak value

*VAL<sub>4</sub>* - Valley value

*ZERO* - Zero

*rESD* - Resolution

*Pd.S* - Process display

*DAMP* - Dampening level

## PEAK (Peak) SUB MENU

The Peak feature stores the highest pressure reading the instrument has measured since the last reset or power up. At power up *PEAK* is reset to the present pressure reading. To manually reset the *PEAK* value, press the RESET key while in the *PEAK* SUB MENU.

## VAL<sub>4</sub> (Valley) SUB MENU

The valley feature stores the lowest pressure reading the instrument has measured since the last reset or power up. At power up *VAL<sub>4</sub>* is reset to the present pressure reading. To manually reset the *VAL<sub>4</sub>* value, press the RESET key while in the *VAL<sub>4</sub>* SUB MENU.

## ***r*ESD (Resolution) SUB MENU**

The Digihelic® Controller is capable of displaying four digits of resolution. However, at very low pressures the instability of the pressure may cause fluctuations in the least significant digit causing the least significant digit to be of little value. Three digit resolution (***3DIG***) can only be active when there is at least one digit to the right of a decimal.

***3DIG*** - Set display for 3 digit resolution

***4DIG*** - Set display for 4 digit resolution

## ***Pd*S (Process Display) SUB MENU**

***STD*** - Display reads pressure, velocity, or flow values

***PCT*** - Display reads % of full scale value

When the display is reading percent, ***PCT*** is displayed in the upper right of the display. The percent display is only available in pressure operation.

## ***DAMP* (Dampening) SUB MENU**

Adjust from 1-16

Dampening stabilizes the display from instabilities due to things such as vibration and excessive pressure fluctuations. The dampening setting adjusts the amount of readings that are averaged for each display update. Adjust the dampening value until the display reads a stable value for the application.

## ***Adv* (Advanced) MAIN MENU**

***POL*** - Process output low

***ADDR*** - Modbus® Protocol address

***POH*** - Process output high

***WR*** - Modbus® Protocol write enable/disable

***MSP1*** - Maintenance set point 1

***ZERO*** - Zero calibration

***MSP2*** - Maintenance set point 2

***SPAN*** - Span calibration

## ***POL* and *POH* (Process Output Low and High) SUB MENUS**

This feature is used in pressure operation only.

Process output low and high are used to scale the 4-20 mA output. Set ***POL*** to the desired display reading for 4mA output, and set ***POH*** to the desired display reading for 20 mA output. ***POH*** must be higher than ***POL***. ***POL*** may be adjusted 2% BELOW minimum scale up to ***POH***. ***POH*** may be adjusted from ***POL*** to 2% ABOVE maximum scale.

## MSP1 and MSP2 (Maintenance Set Point 1 & 2) SUB MENUS

Adjust for the desired maintenance set points when the unit is placed in the maintenance mode. The deadband is fixed at 2% of full scale. To enter or leave the maintenance mode, press and hold the  for 8 seconds.

## ADDR (Modbus® Protocol Address ) SUB MENU

Modbus® communication instrument address. Set from 1 to 247. This number must match the address number used by the host computer. To obtain the Digihelic® Controller Modbus® register list please visit [www.dwyer-inst.com](http://www.dwyer-inst.com)  
See page 4 for wiring diagram.

## WR (Modbus® Write Protect) SUB MENU

*dS* - Disables write commands from Modbus®. Protocol can only read information from the instrument.

*En* - Enable write commands from Modbus® Protocol. Modbus® can read information from and write information to the instrument.

## ZERO and SPAN (Calibration of Zero and Span) SUB MENUS

The lower display reads *CAL* in this mode.

### ZERO Calibration

**NOTE:** For accurate calibration, DO NOT apply any pressure when performing this function.

With the display reading *ZERO*, press the ENTER key. The upper display will blink. Press ENTER again to complete the zeroing of the instrument or press the *MENU* key to cancel.

### SPAN Calibration

With the display set to *SPAN*, apply full scale pressure to the unit. Press the ENTER key. The upper display will blink. Press ENTER again to complete the calibration or press the *MENU* key to cancel.

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