

PROGRAMMING GC55 DIFFERENTIAL PRESSURE TRANSMITTER TO MONITOR AND CONTROL A WATER CHILLER SYSTEM

PIP #: TR-PI-106

Applicable to:
GC55

The GC55 digital pressure transmitter is compact, flexible with high differential pressure ranges (75-300 psi ranges). Also, it can be easily programmed with user defined units or psi to meet the needs of a wide variety of applications including water chiller differential pressure control application demonstrated below.



Figure 1 - GC55 Transmitter

Water Chiller Differential Pressure Control Application:

This example demonstrates the control of an industrial water chiller system HVAC application to assure sufficient water flow to the air handlers and to detect blockage. It consists of maintaining the water flow from 30 to 35 psi of differential pressure by using the analog output to control the VFD secondary pump. Also, to activate an audible warning alarm if chiller differential pressure exceeds 40 psi and to shut down the system it exceeds 50 psi in case of coil blockage. An external normally opened relay shall be used to activate the audible alarm and normally closed to shut down the water chiller system. For this application a transmitter with 0 to 75 psi differential pressure range shall be used with 1-5 V analog output, and two switches. Figure 2 is an illustration of a water chiller system diagram for reference.

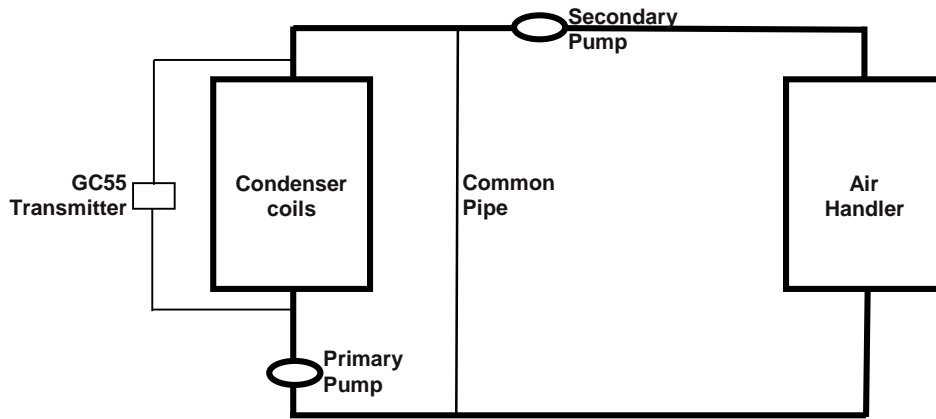


Figure 2 - Water Chiller System Diagram

Installation:

Remove cover by removing the four screws to access electrical connections. Also to expose MODE Up and Down buttons. Connect transmitter, analog controlling output, audible warning alarm and system shutdown switches per application, diagrams below and manual instructions.

Electrical Connections

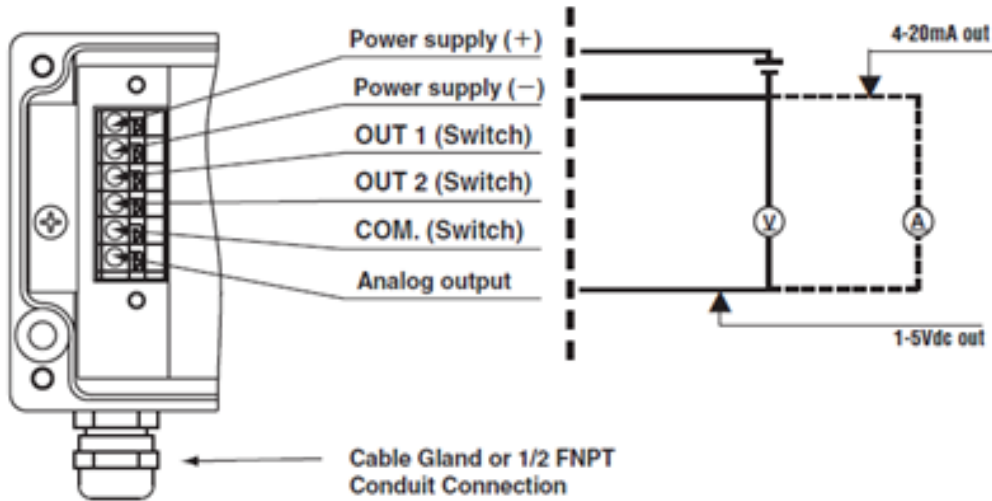








Figure 3 - Electrical schematic

GC55 Transmitter Program Method:


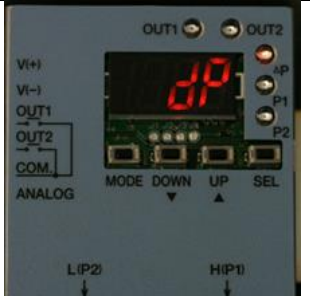
Proceed with recommendations below to control the water chiller differential pressure within 30 to 35 psi. Offset the analog output from 0 psi to 30 psi. That, is 40 % of full range corresponding to 30 psi (1 V analog output). Scale down the upper range from 75 psi to 35 psi. 46.7% of full scale equivalent to 35 psi (5 V analog output). Subsequent, set switches to sound an alarm if differential pressure reaches 40 psi, shutdown water chiller system if differential pressure reaches 50 psi and return to normal state when differential pressure drops to 35 psi.






	<ul style="list-style-type: none"> • Press and hold MODE button for more than three seconds to get into program mode. • Press UP or Down arrow to make changes. • Press and release MODE button to select changes and to walk through the menu. • Continue to step-1 after power-on message. • Press and hold MODE button for more than three seconds to return to measuring mode. 	
<p>Step 1</p>	<ul style="list-style-type: none"> • CNP To select hysteresis (HYS) or Window comparator (yin). • Select HYS to control analog output. • Press UP or Down arrow to display HYS. • Press and release MODE button to select and move to the next step. 	
<p>Step 2</p>	<ul style="list-style-type: none"> • SCL To select units (arbitrary or psi). • Press Up or Down arrow until psi is displayed. • Press and release MODE button to select and move to the next step. 	
<p>Step 3</p>	<ul style="list-style-type: none"> • FiL To enter filter selection. There are five filter selections (F0 to F5). • Use the filter function to improve analog output and difficult to read display if pressure oscillates. • Factory default filter (F0) shall be selected since a constant pressure is expected. • Press Up or Down until F-0 is displayed. • Press and release MODE button to select and move to the next step. 	





<p>Step 4</p>	<ul style="list-style-type: none"> • A-L To enter analog output zero reference corresponding to 1 V analog output. • The operational range is from 30 to 35 psi. Therefore, zero reference corresponding to 30 psi 1 V analog output (40.0% of full range) shall be selected. • Press Up or Down arrow until 40.0 is displayed. • Press and release MODE button to select and move to the next step. 	
<p>Step 5</p>	<ul style="list-style-type: none"> • A-H To enter full span of 35 psi corresponding to 5V analog output. • The operational range is from 30 to 35 psi. Therefore, 35 psi 5 V analog output (46.7% of full range) shall be selected. • Press UP or Down arrow until 46.7 is displayed. • Press and hold MODE button for more than three seconds to return to measuring mode. 	

GC55 Transmitter Switch Set Point and Dead Band Set Up Method:

Next, program transmitter to sound an alarm if differential pressure reaches 40 psi, shutdown system it reaches 50 psi and to reset when differential pressure drops to 35 psi.

	<ul style="list-style-type: none"> • Press and hold MODE button less than three seconds to get into program mode. • Press UP or Down arrow to make changes. • Press and release MODE button to select changes and to move to the next step. • Continue to step-1 after once in program mode. • Press and hold MODE button for more than three seconds to return to measuring mode. 	
<p>Step 1</p>	<ul style="list-style-type: none"> • CP1 To select output 1 switch option, differential, high or low pressure. • This application uses differential pressure. • press UP or Down until dp is displayed. • Press and release MODE button to select and move to the next step. 	

<p>Step 2</p>	<ul style="list-style-type: none"> • A-1 To enter output 1 switch set point. • Set the switch to change state at 40 psi to close the circuit and sound the alarm. • Press UP or Down until 40.0 is displayed. • Press and release MODE button to select and move to the next step. 	 <p>The image shows the Ashcroft controller's LCD display with the number '40.0' in red. The display is surrounded by various labels: 'OUT1', 'OUT2', 'V(+)', 'V(-)', 'ANALOG', 'MODE', 'DOWN', 'UP', 'SEL', 'L(P2)', and 'H(P1)'. There are also several indicator lights and buttons on the right side.</p>
<p>Step 3</p>	<ul style="list-style-type: none"> • B-1 To enter output 1 switch dead band. • Dead band shall be 5 psi to deactivate switch at 35 psi. • Press UP or Down until 5.0 is displayed. • Press and release MODE button to select and move to the next step. 	 <p>The image shows the Ashcroft controller's LCD display with the number '5.0' in red. The display is surrounded by various labels: 'OUT1', 'OUT2', 'V(+)', 'V(-)', 'ANALOG', 'MODE', 'DOWN', 'UP', 'SEL', 'L(P2)', and 'H(P1)'. There are also several indicator lights and buttons on the right side.</p>
<p>Step 4</p>	<ul style="list-style-type: none"> • On1 To delay switch turn on. • This application shall not use delay turn on feature. • Press Up or Down arrow until 0.00 is displayed. • Press and release MODE button to select and move to the next step. 	 <p>The image shows the Ashcroft controller's LCD display with the number '0.00' in red. The display is surrounded by various labels: 'OUT1', 'OUT2', 'V(+)', 'V(-)', 'ANALOG', 'MODE', 'DOWN', 'UP', 'SEL', 'L(P2)', and 'H(P1)'. There are also several indicator lights and buttons on the right side.</p>
<p>Step 5</p>	<ul style="list-style-type: none"> • OF1 To delay switch turn off. • This application shall not use delay turn off feature. • Press Up or Down arrow until 0.00 is displayed. • Press and release MODE button to select and move to the next step. 	 <p>The image shows the Ashcroft controller's LCD display with the number '0.00' in red. The display is surrounded by various labels: 'OUT1', 'OUT2', 'V(+)', 'V(-)', 'ANALOG', 'MODE', 'DOWN', 'UP', 'SEL', 'L(P2)', and 'H(P1)'. There are also several indicator lights and buttons on the right side.</p>
<p>Step 6</p>	<ul style="list-style-type: none"> • CP2 To select output 2 switch option, differential, high or low pressure. • This application uses differential pressure. • press UP or Down until dp is displayed. • Press and release MODE button to select and move to the next step. 	 <p>The image shows the Ashcroft controller's LCD display with the letters 'dp' in red. The display is surrounded by various labels: 'OUT1', 'OUT2', 'V(+)', 'V(-)', 'ANALOG', 'MODE', 'DOWN', 'UP', 'SEL', 'L(P2)', and 'H(P1)'. There are also several indicator lights and buttons on the right side.</p>

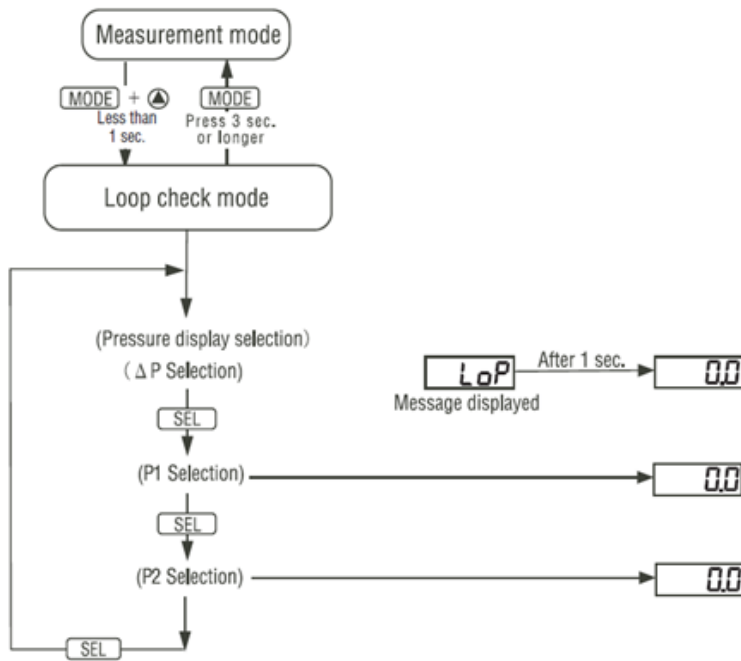
<p>Step 7</p>	<ul style="list-style-type: none"> • A-2 To enter output 2 switch set point. • Set the switch to change state at 50 psi to open the circuit and shut down the system. • Press UP or Down until 50.0 is displayed. • Press and release MODE button to select and move to the next step. 	 <p>The image shows the Ashcroft controller's LCD display with the number '50.0' in red. The display is surrounded by various labels: 'OUT1' and 'OUT2' at the top, 'V(+)' and 'V(-)' on the left, 'ANALOG' at the bottom left, and 'MODE', 'DOWN', 'UP', and 'SEL' buttons at the bottom. There are also 'L(P2)' and 'H(P1)' labels with arrows pointing down at the bottom.</p>
<p>Step 8</p>	<ul style="list-style-type: none"> • B-2 To enter output 2 switch dead band. • Dead band shall be set at 15 psi to deactivate switch at 35 psi. • Press UP or Down until 15.0 is displayed. • Press and release MODE button to select and move to the next step. 	 <p>The image shows the Ashcroft controller's LCD display with the number '15.0' in red. The display is surrounded by various labels: 'OUT1' and 'OUT2' at the top, 'V(+)' and 'V(-)' on the left, 'ANALOG' at the bottom left, and 'MODE', 'DOWN', 'UP', and 'SEL' buttons at the bottom. There are also 'L(P2)' and 'H(P1)' labels with arrows pointing down at the bottom.</p>
<p>Step 9</p>	<ul style="list-style-type: none"> • On2 To delay switch turn on. • This application shall not use delay turn on feature. • Press Up or Down arrow until 0.00 is displayed. • Press and release MODE button to select and move to the next step. 	 <p>The image shows the Ashcroft controller's LCD display with the number '0.00' in red. The display is surrounded by various labels: 'OUT1' and 'OUT2' at the top, 'V(+)' and 'V(-)' on the left, 'ANALOG' at the bottom left, and 'MODE', 'DOWN', 'UP', and 'SEL' buttons at the bottom. There are also 'L(P2)' and 'H(P1)' labels with arrows pointing down at the bottom.</p>
<p>Step 10</p>	<ul style="list-style-type: none"> • OF2 To delay switch turn off. • This application shall not use delay turn off feature. • Press Up or Down arrow until 0.00 is displayed. • Press and hold MODE button for more than three seconds to return to measuring mode. 	 <p>The image shows the Ashcroft controller's LCD display with the number '0.00' in red. The display is surrounded by various labels: 'OUT1' and 'OUT2' at the top, 'V(+)' and 'V(-)' on the left, 'ANALOG' at the bottom left, and 'MODE', 'DOWN', 'UP', and 'SEL' buttons at the bottom. There are also 'L(P2)' and 'H(P1)' labels with arrows pointing down at the bottom.</p>

Function Verification:

The GC55 **loop-check** allows program, analog output and switch verification with the transmitter pressurized or non-pressurized. Please see instructions below to select Loop-Check mode







Loop Check Mode setup steps:

In measurement mode press the MODE key and UP key and release within one second to go into Loop Check Mode. Press and hold MODE key for more than three seconds to return to measurement mode.



Analog Output Verification:







Confirm analog output wiring per figure 3 diagram or installation and maintenance instructions. Analog output can be tested during loop check mode or measurement mode. Change loop check value or apply equivalent pressure to test the analog output (see results below for reference).

<ul style="list-style-type: none"> • Connect volt meter per manual instructions or diagram above. • Press the Up or Down arrow until 30.0 is displayed or apply 30 psi of differential pressure. • Verify volt meter reading (1 V). • 30 psi corresponds to 0% FS analog signal (1 V at 30 psi). 		
<ul style="list-style-type: none"> • Press the Up or Down arrow until 32.5 is displayed or apply 32.5 psi of differential pressure. • Verify volt meter reading (3 V). • 32.5 psi corresponds to 50% FS analog signal (3 V at 32.5 psi). 		
<ul style="list-style-type: none"> • Press the Up arrow until 35.0 is displayed or apply 35 psi of differential pressure. • Verify volt meter reading (5 V). • 35 psi corresponds to 100% FS analog signal (5 V at 35 psi). 		





Switches Verification:

Ensure switch wiring per figure 3 diagram or installation and maintenance instructions. Switches verification can be tested during measurement mode or loop check. Change loop check value or apply equivalent pressures (see results below for reference).

Warning Buzzer Switch Verification

<ul style="list-style-type: none"> • Press the Up or Down arrow until 35.0 is displayed or apply 35 psi of differential pressure. • Switch in normal state (OFF). • Place resistance meter leads per installation diagram above to verify continuity (open circuit). 		
<ul style="list-style-type: none"> • Press the Up arrow until 40.0 is displayed or increase differential pressure up to 40 psi. • Switch turns ON. • Verify resistance meter reading (circuit closes). • External relay energizes. • Relay normally open closes. • Audible alarm turns ON. 		
<ul style="list-style-type: none"> • Press the Down arrow until 35.0 is displayed or decrease pressure to 35 psi. • Verify resistance meter reading (switch turns off). • Switch changes to normal state. • Audible alarm turns OFF. 		

Chiller System Shutdown Switch Verification

<ul style="list-style-type: none"> • Press the Up or Down arrow until 35.0 is displayed or apply 35 psi of differential pressure. • Switch in normal state (Open). • Place resistance meter leads across resistor to verify continuity (open circuit). 		
<ul style="list-style-type: none"> • Press the Up arrow until 50.0 is displayed or increase pressure up to 50 psi. • Switch turns ON (Out 1 turned ON ever since pressure reached 40 psi). • Verify resistance meter reading (circuit closes). • External relay energizes. • Relay normally closed switch opens • Compressor shuts down. 		
<ul style="list-style-type: none"> • Press the Down arrow until 35.0 is displayed or decrease pressure to 35 psi. • Verify resistance meter reading (switch turns off). • Switch changes to normal state. • Chiller returns to normal operation. 	