

PROGRAMMING USER DEFINED PRESSURE UNITS ON THE GC51 RANGEABLE INDICATING PRESSURE TRANSMITTER

The GC51 Rangeable Indicating Pressure Transmitter is a compact and flexible instrument often used in tank level applications. It can be easily programmed with user defined units to display level in feet or gallons of water.

PIP #: TR-PI-101

Applicable to:
GC51



Figure 1 - GC51 Transmitter

Water Level Displayed in Feet Application:

This example is to measure and control municipal water tank level, with an operational range from 150 to 210 feet of water. GC51 pressure transmitters can be purchased with numerous pressure ranges. For this application a transmitter with 0 to 100 psi pressure range has been selected. The water pump requirement is to turn on at 150 feet of water and to turn off at 210 feet of water.

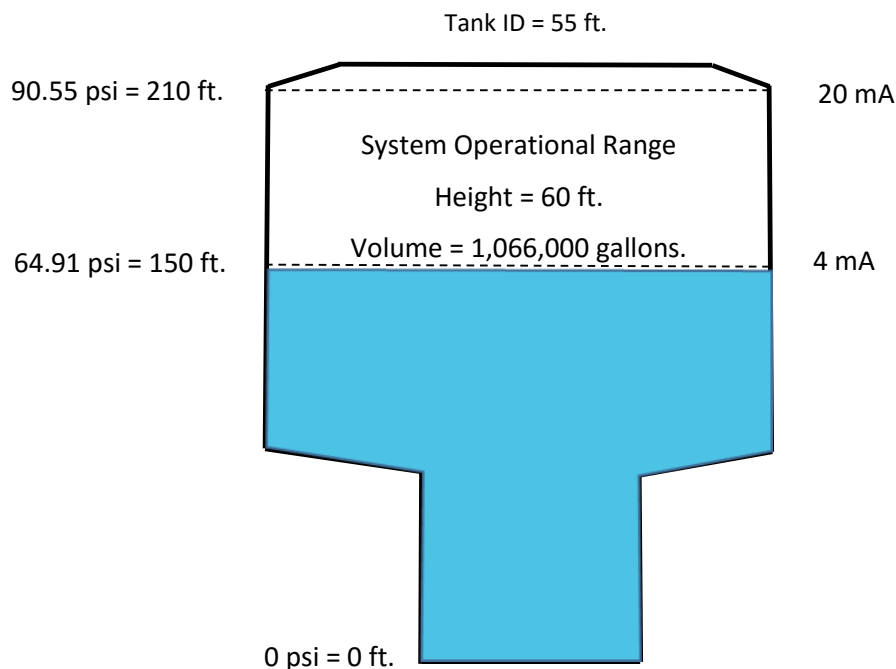


Figure 2 - Municipal Water Tank Example

Installation:

Remove the lid from the transmitter by turning it counter clockwise to expose electrical terminal block. Wire transmitter per manual instructions (see diagram below for reference).

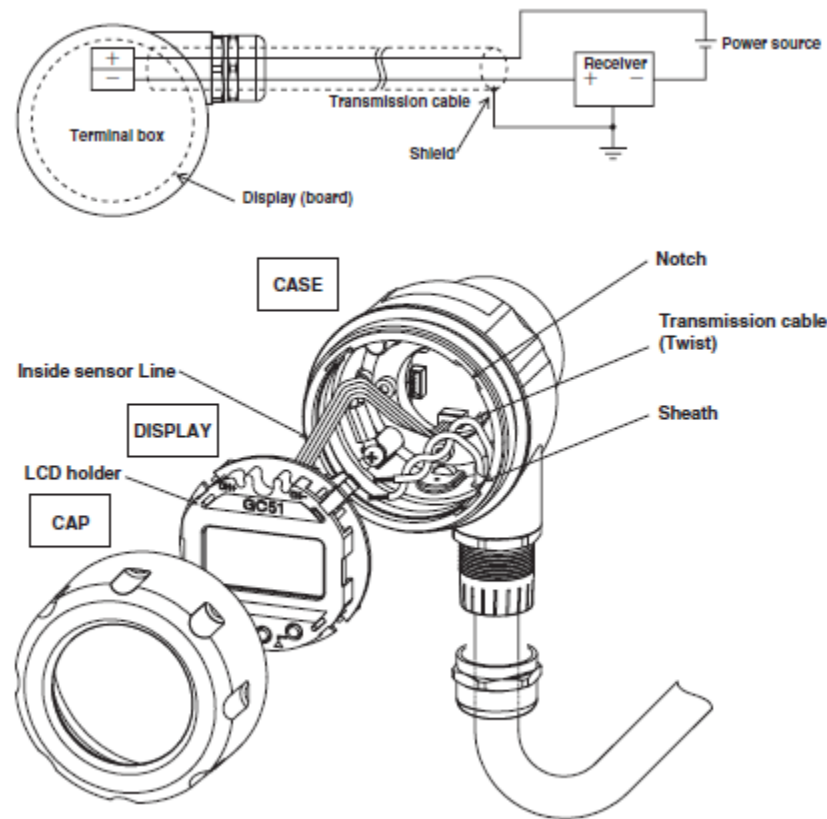
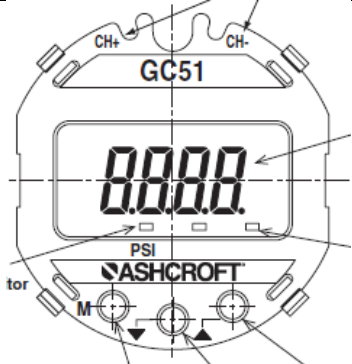












Figure 3 - GC51 Wiring Diagram

The first step is to program the transmitter to read feet of water as the arbitrary units. Then program the offset from 0 psi to 64.9 psi. Which is equivalent to 150 feet of water (4 mA). Next scale down the upper range from 100 psi to 90.9 psi to obtain the equivalent of 210 ft. of water (20 mA). Follow the steps in the next section to rescale the transmitter from 150 ft. to 210 ft. of water.

GC51 Transmitter Height Linear Method:



<ul style="list-style-type: none"> • Press and hold M button for more than three seconds to get into program mode. • Press UP or Down arrow to make changes. • Press and release M button to select changes and to walk through the menu. • Continue to Step-1 after power-on message. • Press and hold M button for more than three seconds to return to measuring mode. 	 <p>A schematic diagram of the GC51 transmitter. It shows a circular device with a central digital display showing '0.000'. Above the display are two buttons labeled 'CH+' and 'CH-'. Below the display are two buttons labeled 'M' and 'tor'. The brand name 'ASHCROFT' is visible below the display.</p>
<p>Step 1</p> <ul style="list-style-type: none"> • Press and hold M button for more than three seconds to get into program mode. • F To enter filter selection. Filter selection, there are five filter selections (selection of 1,2,4,8, and 16 times). • The filter function is used when pressure fluctuates to improve analog output and difficult to read display. • Since we do not expect pressure fluctuation, we select the factory default filter (F4). • Press and release M button to select and move to the next step. 	 <p>A photograph of the GC51 transmitter. The display shows 'F 4' in red. The buttons 'CH+', 'CH-', 'M', and 'tor' are visible.</p>
<p>Step 2</p> <ul style="list-style-type: none"> • To enter configuration mode. There are two pressure modes, linear and non-linear. • Linear mode to rescale in arbitrary user defined units • Non-linear mode to rescale in psi units. • Press UP or Down arrow to display linear mode to use arbitrary units. • Press and release M button to select and move to the next step. 	 <p>A photograph of the GC51 transmitter. The display shows 'n Lin' in red. The buttons 'CH+', 'CH-', 'M', and 'tor' are visible.</p>
<p>Step 3</p> <ul style="list-style-type: none"> • P_64.9 To enter the zero offset pressure corresponding to user defined units • Press Up or Down arrow until 64.9 is displayed. That, is the pressure corresponding to 150 ft. of water. • Press and release M button to select and move to the next step. 	 <p>A photograph of the GC51 transmitter. The display shows 'P 64.9' in red. The buttons 'CH+', 'CH-', 'M', and 'tor' are visible.</p>

<p>Step 4</p>	<ul style="list-style-type: none"> • --- P 90.9 To enter the full scale pressure corresponding to user defined units • Press Up or Down arrow until 90.9 is selected. That, is the pressure corresponding to 210 ft. of water. • Press and release M button to select and move to the next step. 	
<p>Step 5</p>	<ul style="list-style-type: none"> • d To select decimal point position. There are four decimal point selections (0,1, 2, and 3 digits). • Press Up or Down arrow until 0 is display. For this application we are using whole numbers. • Press and release M button to select and move to the next step. 	
<p>Step 6</p>	<ul style="list-style-type: none"> • d _ 150 To enter the minimum arbitrary units in feet of water corresponding to offset pressure of 64.9 psi. • Press Up or Down arrow until 150 is selected. That is the 150 ft. of water corresponding to 64.9 psi. • Press and release M button to select and move to the next step. 	
<p>Step 7</p>	<ul style="list-style-type: none"> • --- d 210 To enter maximum or full scale of arbitrary units in feet of water corresponding to the pressure of 90.9 psi. • Press Up or Down arrow until 210 is selected. That, is the 210 ft. of water corresponding to 90.9 psi. • Press and release M button to select and move to the next step. 	
<p>Step 8</p>	<ul style="list-style-type: none"> • A _ _ 0.0 To enter analog output zero reference corresponding to 4 mA. • The operational range is from 150 to 210 ft. of water. Therefore, we want to set 150 ft. of water as the 0% FS or 4mA analog output. • Press Up or Down arrow until 0.0 is displayed. That is the analog output at 0% FS (4mA at 150 ft. of water). • Press and release M button to select and move to the next step 	

Step 9	<ul style="list-style-type: none"> • ---- • A 100.0 To enter span analog output reference corresponding to 20 mA. • The operational range is from 150 to 210 ft. of water. Therefore, we want to set 210 ft. of water as the span or 20 mA analog output. • Press UP or Down arrow until 100.0 is displayed. That is the analog output at 100% FS (20mA at 210 ft.) • Press and release M button to select and move to the next step 	
Step 10	<ul style="list-style-type: none"> • C Loop check mode allows program and analog output verification with the transmitter pressurized or non-pressurized. It simulates the process and allows for troubleshooting. • Press Up or Down arrow to change within transmitter range (150 to 210 ft. of water). • After verification press and hold M button for more three seconds to return to measuring mode. 	

Function Verification:

The GC51 loop-check allows the user to verify programming and analog output with the transmitter pressurized or non-pressurized.

<ul style="list-style-type: none"> • Once Step-10 is reached, the unit is in Loop-check mode. The system can be verified by increasing or decreasing the height value (150 to 210 ft. of water). • Use the Up or down arrow and observe the display segments get brighter as the height value increases. That, is an indication that the analog output and wiring are reacting properly. 		
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Analog output terminal check:

When the front cover is removed, the analog output check terminals CH+ and CH- are visible at the upper part of the display. The analog output can be checked during measurement mode or loop check (see figure below for reference).

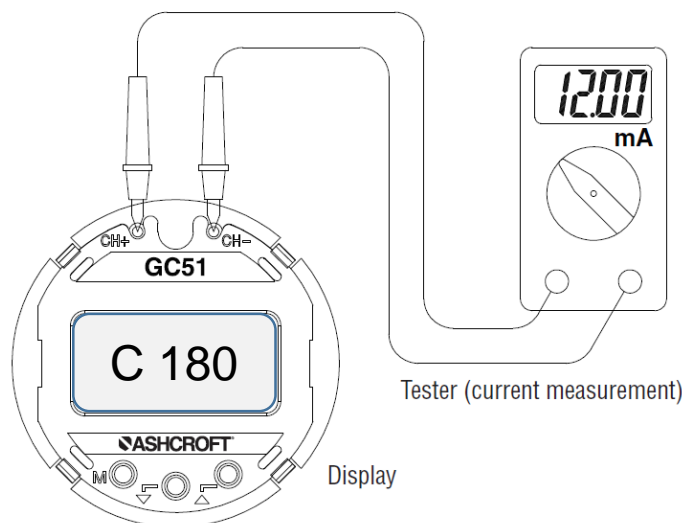


Figure 4 - Analog Output Verification

Analog output check:

Analog output can also be verified by placing an amp-meter in series with the transmitter output and power supply (see manual wiring instructions for reference). Also, analog output can be checked during measurement mode or loop check (see results below for reference).

<ul style="list-style-type: none"> • Connect amp meter per manual instructions or figure above. • Press the Down arrow until 150 is displayed or apply 64.9 psi. • Verify amp meter reading (4.00 mA). • 150 ft. of water corresponds to 0% FS analog signal (4 mA at 150 ft. of water'). 		
<ul style="list-style-type: none"> • Press the Up or Down arrow until 180 is displayed or apply 77.9 psi. • Verify amp meter reading (12.00 mA). • 180 ft. of water corresponds to 50% FS analog signal (12 mA at 180 ft. of water). 		

- Press the Up arrow until 210 is displayed or apply 90.9 psi.
- Verify amp meter reading (20.0 mA).
- 210 ft. of water corresponds to 100% FS analog signal (20 mA at 210 ft. of water).



Water Level Display in Gallons Linear Application:

Guidelines to measure and control municipal water tank level with operational range from 0 to roughly 1,000,000 gallons of water. This application requires the water pump to turn on at 0 gallon and to turn off at 1,000,000 gallons of water operational volume range. The previous example can be used to convert the operational system from pressure to arbitrary units of volume such as gallons. See guidelines below to calculate tank operational volume range.

$$V = \pi r^2 h$$

$$r = 27.5 \text{ ft.}$$

$$h = 60 \text{ ft.}$$

$$V = \pi \times 27.5 \text{ ft.}^2 \times 60 \text{ ft.}$$

$$V = 142550 \text{ ft.}^3$$





$$1 \text{ ft.}^3 = 7.48 \text{ gallons}$$






$$V \text{ in gallons} = 142550 \text{ ft.}^3 \times 7.48 \text{ gallons}$$


$$V \text{ in gallons} = 1,066,274 \text{ gallons} = 1,066 \text{ K gallons}$$

1999 is the maximum value that can be entered for arbitrary units. To accommodate the tank volume, convert 1,066,272 gallons to 1,066 K gallons (scientific units).

GC51 Transmitter Volume Linear Method Steps:



Step 1	<ul style="list-style-type: none"> Press and hold M button for more than three seconds to get into program mode. F To enter filter selection. Filter selection, there are five filter selections (selection of 1,2,4,8, and 16 times). The filter function is used when pressure fluctuates to improve analog output and difficult to read display. Since we do not expect pressure fluctuation, we select the factory default filter (F4). Press and release M button to select and move to the next step. 	
Step 2	<ul style="list-style-type: none"> To enter configuration mode. There are two pressure modes, linear and non-linear. Linear mode to rescale in arbitrary user defined units Non-linear mode to rescale in psi units. Press UP or Down arrow to display linear mode to use arbitrary units. Press and release M button to select and move to the next step. 	
Step 3	<ul style="list-style-type: none"> P_64.9 To enter the zero offset pressure corresponding to user defined units Press Up or Down arrow until 64.9 is displayed. That, is the pressure corresponding to 0 gal. of water. Press and release M button to select and move to the next step. 	
Step 4	<ul style="list-style-type: none"> P_90.9 To enter the full scale pressure corresponding to user defined units Press Up or Down arrow until 90.9 is selected. That, is the pressure corresponding to 1,066 K gal. of water. Press and release M button to select and move to the next step. 	

Step 5	<ul style="list-style-type: none"> • d To select decimal point position. There are four decimal point selections (0,1, 2, and 3 digits). • Press Up or Down arrow until 0 is display. For this application we are using whole numbers. • Press and release M button to select and move to the next step. 	
Step 6	<ul style="list-style-type: none"> • d _ _ _ 0 To enter the minimum arbitrary units in gallons of water corresponding to offset pressure of 64.9 psi. • Enter 0 - Arbitrary units in gallons' correspondent to 64.9 psi. Press Up or Down arrow until 0 is selected. That is the 0 gallons of water corresponding to 64.9 psi. • Press and release M button to select and move to the next step. 	
Step 7	<ul style="list-style-type: none"> • d _ _ _ 1066 To enter maximum or full scale of arbitrary unit's gallons of water corresponding to the pressure of 90.9 psi. • Enter 1066 K- Arbitrary units in gallons. correspondent to 90.9 psi. Press Up or Down arrow until 1066 K is selected. That, is the 1066 K gallons of water corresponding to 90.9 psi. • Press and release M button to select and move to the next step. 	
Step 8	<ul style="list-style-type: none"> • A _ _ 0.0 To enter analog output zero reference corresponding to 4 mA. • The operational range is from 0 to 1066 K gal. of water. Therefore, we want to set 0 gal. of water as the 0% FS or 4mA analog output. • Press Up or Down arrow until 0.0 is displayed. That is the analog output at 0% FS (4mA at 0 gallons of water). • Press and release M button to select and move to the next step 	
Step 9	<ul style="list-style-type: none"> • A _ _ 100.0 To enter span analog output reference corresponding to 20 mA. • The operational range is from 0 to 1066 K gal. of water. Therefore, we want to set 1066 gallons of water as the span or 20 mA analog output. • Press UP or Down arrow until 100.0 is displayed. That is the analog output at 100% FS (20mA at 1000 K gal. of water) • Press and release M button to select and move to the next step 	

<p>Step 10</p>	<ul style="list-style-type: none"> • C Loop check mode allows program and analog output verification with the transmitter pressurized or non-pressurized. It simulates the process and allows for troubleshooting. • Press Up or Down arrow to change within transmitter range (0 to 1066 gal. of water). • After verification press and hold M button for more three seconds to return to measuring mode. 	
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Function Verification:

The GC51 loop-check allows the user to verify programming and analog output with the transmitter pressurized or non-pressurized.

<ul style="list-style-type: none"> • Once Step-10 is reached, the unit is in Loop-check mode. The system can be verified by increasing or decreasing the height value (0 to 1066 K gal. of water). • Use the Up or down arrow and observe the display segments get brighter as the height value increases, that is an indication that the analog output is responding accordingly. 		
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Analog output terminal check:

When the front cover is removed, the analog output check terminals CH+ and CH- are visible at the upper part of the display. The analog output can be checked during measurement mode or loop check (see figure below for reference). The analog output can also be verified by placing an amp meter in series with the transmitter output and power supply (see manual wiring instructions for reference).

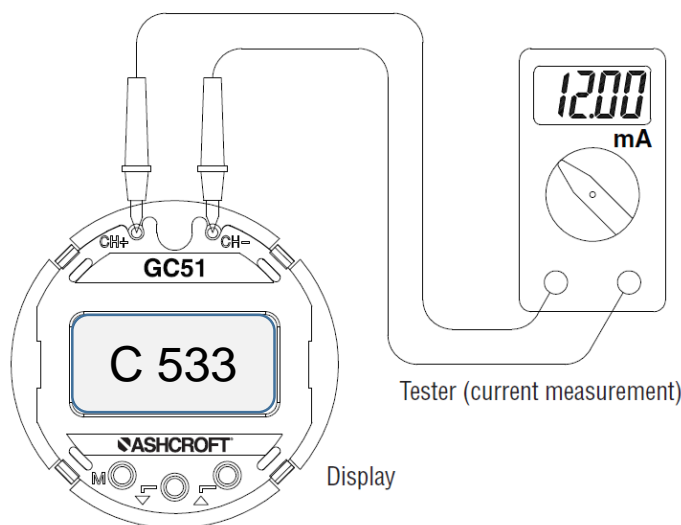






Figure 5 - Analog Output Verification

The analog output can also be verified by placing an amp-meter in series with the transmitter output and power supply (see manual wiring instructions for reference). Likewise, analog output can be checked during measurement mode or loop check.

<ul style="list-style-type: none"> • Connect amp meter per manual instructions or figure above. • Press the Down arrow until 0 is displayed or apply 64.9 psi. • Verify amp meter reading (4.00 mA). • 0 gallons of water corresponds to 0% FS analog signal (4 mA at 0 gallons of water). 		
<ul style="list-style-type: none"> • Press the Up or Down arrow until 500 is displayed or apply 77.9 psi. • Verify amp meter reading (12.00 mA). • 533 K gallons of water corresponds to 50% FS analog signal (12 mA at 533 K gallons of water). 		
<ul style="list-style-type: none"> • Press the Up arrow until 1066 is displayed or apply 90.9 psi. • Verify amp meter reading (20.0 mA). • 1066 K gallons of water corresponds to 100% FS analog signal (20 mA at 1066 K gallons of water). 	