



# UDC 3500 Application Note

## 8-Segment Characterizer

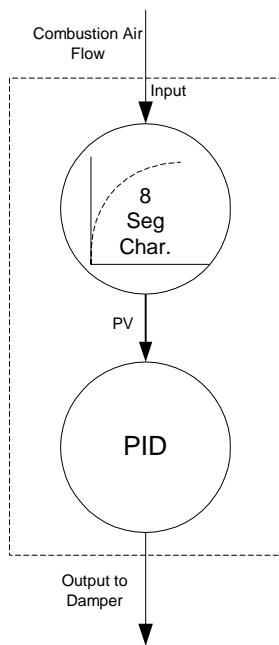
### Description:

This optional feature provides two 8-segment piecewise linear function generator which can approximate almost any curve shape. The characterizer can be applied to any Input or the controller output for Loop or Loop 2. A new feature in the UDC 3500 allows both characterizers to be link together to form a 16- segment characterization curve! When configured for an Input, the characterized Input signal can be used as the input to any math algorithm. The output of the characterizer is available for display, if selected for output, in the lower display.

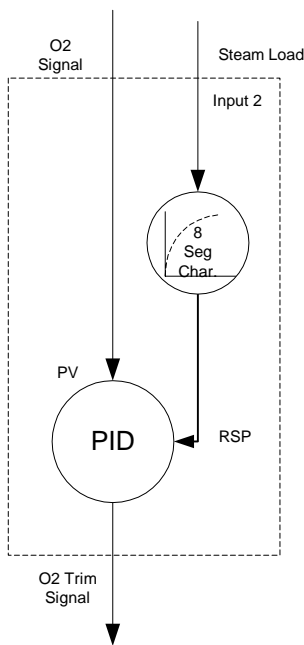
- OC1 XX.X** CHARACTERIZED OUTPUT 1—Displayed if Loop 1 output is characterized.
- OC2 XX.X** CHARACTERIZED OUTPUT 2—Displayed if Loop 2 output is characterized.

### Applications:

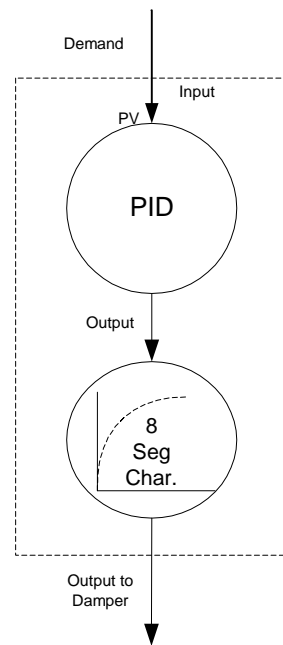
Typical applications include linearizing a process variable, characterizing a remote setpoint, or changing the characteristics of a control valve. The drawings below illustrate where this feature can be applied. Characterization has many uses:



Combustion Air Flow  
*Figure 1*



Steam Load used as  
a Remote Setpoint  
*Figure 2*



Output Signal to a  
control valve  
*Figure 3*

This characterizer is useful because it can be applied to almost any curve shape. The only drawback is the error resulting from the approximation may be too large for use on a process variable signal. If error is a problem, then the two characterizers can be linked together, thus reducing the error a significant amount.



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## Example: Output (Valve) Characterization

As part of a control modernization, the customer wants to change the opening characteristics of an installed valve from “linear” to “quick opening” without changing the valve or the valve plug. Figure 4 shows the relationship between the three basic characteristics.

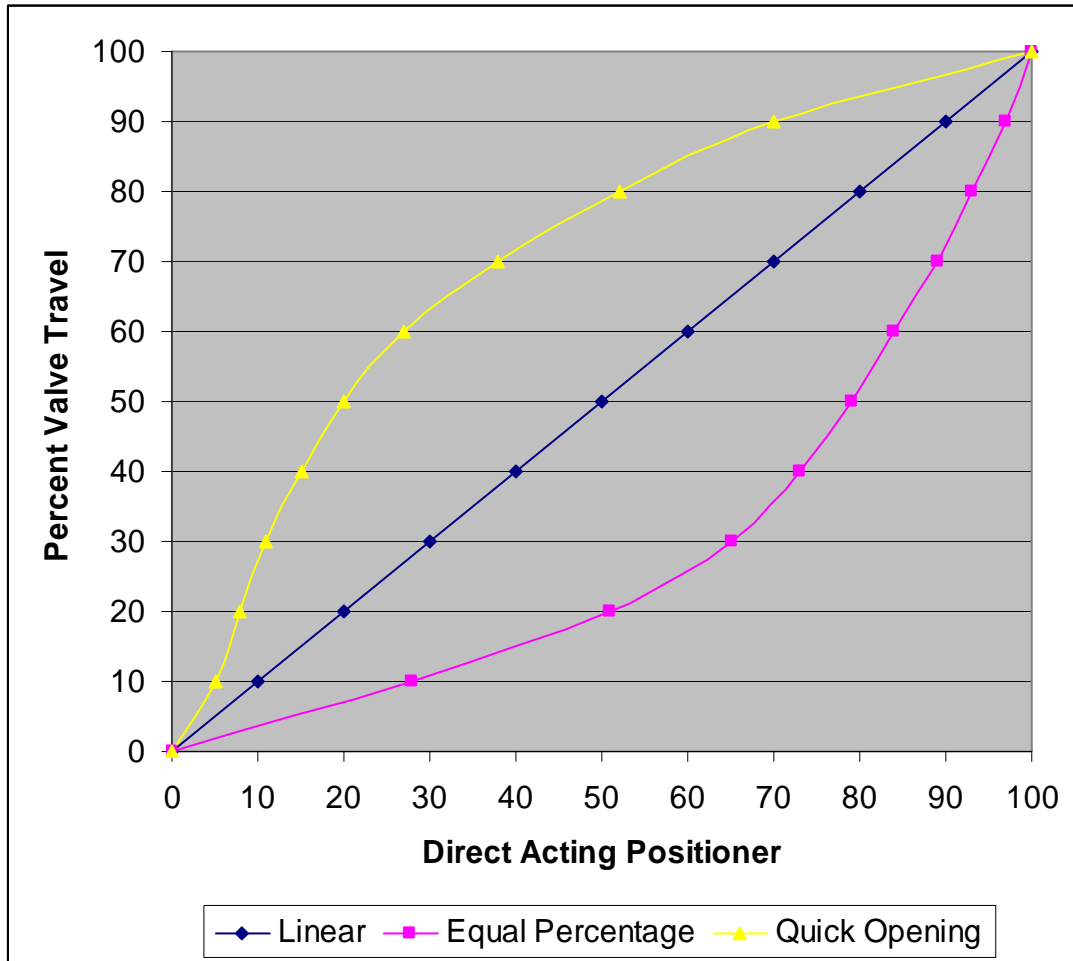


Figure 4



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Figure 5 illustrates how the 8-segment characterizer is configured to provide the customer specified valve opening characteristics. After the characterizer is enabled nine X, Y coordinates are defined to approximate any shape curve. The coordinates, shown in the table, are configured one at a time per prompts in the lower display.

For instances, at Point 4 when the controller calculates 31.00% output ( $X_4$ ), the actual current output signal will be 70.00% ( $Y_4$ ), which equals 15.2 ma.

N	X	Y
0	0.0	0.00
1	5.0	25.00
2	10.0	37.00
3	20.0	55.00
4	31.0	70.00
5	45.0	81.00
6	60.0	87.00
7	80.0	94.50
8	100.0	99.99

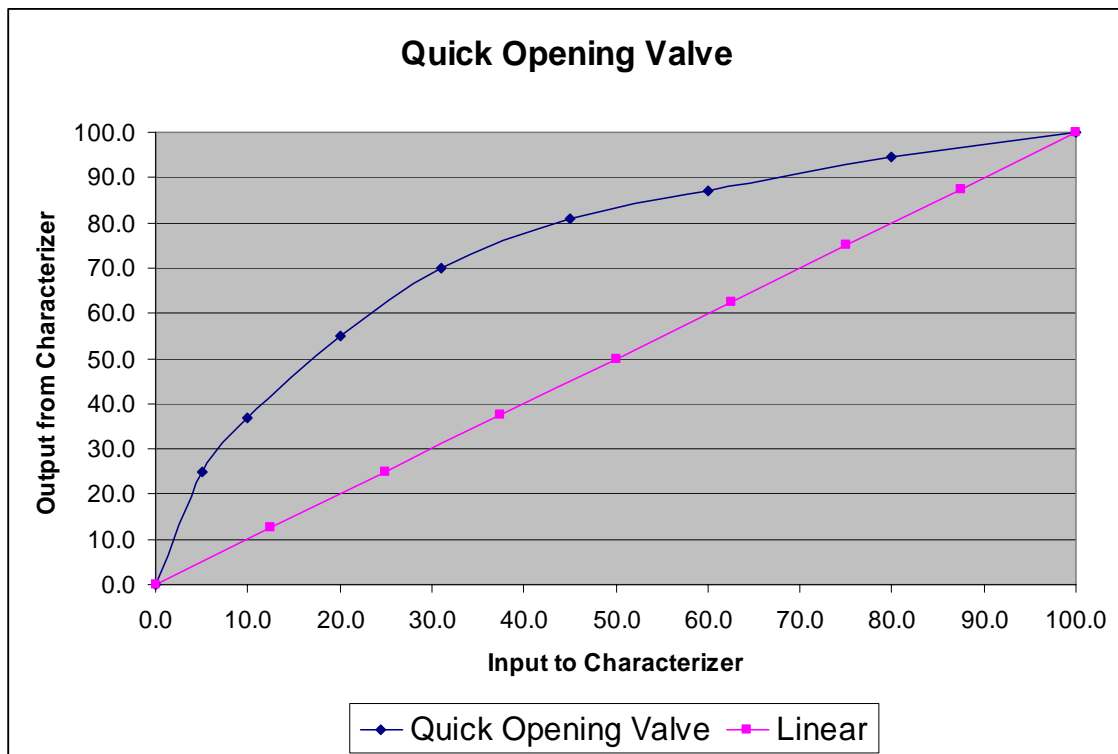


Figure 5



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Function Prompt Lower Display	Selections or Range of Setting Upper Display	Parameter Definition
<b>8SEG CH1</b>	DISABLE INPUT1 INPUT2 INPUT3 INPUT4 INPUT5 L1 OUT L2 OUT	<p><b>8 SEGMENT CHARACTERIZER #1</b>—An eight segment characterizer can be applied to any analog input, Output 1 or Output 2.</p> <p><b>DISABLE</b>—Disables characterizer.</p> <p><b>INPUT 1</b>—Characterizer is applied to Input 1.</p> <p><b>INPUT 2</b>—Characterizer is applied to Input 2.</p> <p><b>INPUT 3</b>—Characterizer is applied to Input 3.</p> <p><b>INPUT 4</b>—Characterizer is applied to Input 4.</p> <p><b>INPUT 5</b>—Characterizer is applied to Input 5.</p> <p><b>LOOP 1 OUTPUT</b>—Characterizer is applied to Loop 1 Output. – Should not be used for Three Position Step Control applications</p> <p><b>LOOP 2 OUTPUT</b>—Characterizer is applied to Loop 2 Output.</p> <p>There are eight (Xn) Input values and eight (Yn) Output values to be selected. The following rules apply:</p> <ul style="list-style-type: none"> <li>• When any analog input is used, the Input Ratio and Bias for that input are applied to the Xn Values.</li> <li>• When one of the Loop outputs is selected, the Xn Input values are the Output from the control algorithm, and the Yn Output is the final control element action. This application is useful for non-linear control elements or Process Variable.</li> </ul>
<p><b>ATTENTION</b> <i>The X values below should be entered as increasing values (from 0% to 100%) from N = 0 to 8.</i></p>		
<b>X0 VALUE</b>	0.00 to 99.99 %	<b>X0 INPUT VALUE (X AXIS)</b>
<b>X1 VALUE</b>	0.00 to 99.99 %	<b>X1 INPUT VALUE (X AXIS)</b>
<b>X2 VALUE</b>	0.00 to 99.99 %	<b>X2 INPUT VALUE (X AXIS)</b>
<b>X3 VALUE</b>	0.00 to 99.99 %	<b>X3 INPUT VALUE (X AXIS)</b>
<b>X4 VALUE</b>	0.00 to 99.99 %	<b>X4 INPUT VALUE (X AXIS)</b>
<b>X5 VALUE</b>	0.00 to 99.99 %	<b>X5 INPUT VALUE (X AXIS)</b>
<b>X6 VALUE</b>	0.00 to 99.99 %	<b>X6 INPUT VALUE (X AXIS)</b>
<b>X7 VALUE</b>	0.00 to 99.99 %	<b>X7 INPUT VALUE (X AXIS)</b>
<b>X8 VALUE</b>	0.00 to 99.99 %	<b>X8 INPUT VALUE (X AXIS)</b>
<b>Y0 VALUE</b>	0.00 to 99.99 %	<b>Y0 INPUT VALUE (Y AXIS)</b>
<b>Y1 VALUE</b>	0.00 to 99.99 %	<b>Y1 INPUT VALUE (Y AXIS)</b>
<b>Y2 VALUE</b>	0.00 to 99.99 %	<b>Y2 INPUT VALUE (Y AXIS)</b>



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<b>Function Prompt Lower Display</b>	<b>Selections or Range of Setting Upper Display</b>	<b>Parameter Definition</b>
<b>Y3 VALUE</b>	0.00 to 99.99 %	<b>Y3 INPUT VALUE (Y AXIS)</b>
<b>Y4 VALUE</b>	0.00 to 99.99 %	<b>Y4 INPUT VALUE (Y AXIS)</b>
<b>Y5 VALUE</b>	0.00 to 99.99 %	<b>Y5 INPUT VALUE (Y AXIS)</b>
<b>Y6 VALUE</b>	0.00 to 99.99 %	<b>Y6 INPUT VALUE (Y AXIS)</b>
<b>Y7 VALUE</b>	0.00 to 99.99 %	<b>Y7 INPUT VALUE (Y AXIS)</b>
<b>Y8 VALUE</b>	0.00 to 99.99 %	<b>Y8 INPUT VALUE (Y AXIS)</b>