Independent Dual Manual 4-20 mA Controls

This note describes how to use a PD540 series Nova Digital Controller with two analog outputs to generate two independently controlled, manually controlled, 4-20 mA signals. The 4-20 mA signals act independently of the sensor input.

To accomplish this, two types of manual 4-20 mA control must be established. One output will be tied to the Set Point. The other will be tied to the manually controlled percent full scale output.

4-20 mA Output Control Using the Set Point

This form of 4 of 20 mA control allows the user to use the Set Point to set the output value of a 4 to 20 mA output. With the scaling established in this note, the user sets what he wants for a mA output using the set point. A SP of 4 will result in the retransmitting output transmitting 4 mA, a SP of 12 will result in the retransmitting output transmitting 12 mA, etc.

Step 1: Retransmission Group Setup
In the Retransmission Group (G.rEt), set the retransmitting outputs to be based on the Set Point. To do this, set the rEt parameter to SP as shown in Figure 1.

Next, setup the values at which 4 mA and 20 mA will be transmitted. Parameter rEtH establishes at what SP value 20 mA will be transmitted, and rEtL established at what SP value 4 mA will be transmitted. Set rEtH to 20.0 and rEtL to 4.0, as shown in Figures 2 and 3.

Figure 1: Set retransmitting output values to be based on SP values

Figure 2: The SP value when 20 mA will be output by retransmitting outputs

Figure 3: The SP value when 4 mA will be output by retransmitting outputs

Step 2: Set Point Setup
To restrict the values the Set Point can be set to for use in this application, establish a high and low range the Set Point can be set to. In the Set Point Group (G.SP) establish Set Point range restrictions with parameters SPrH and SPrL. Set parameter SPrH to 20.0 to establish 20.0 as the maximum value the Set Point can be changed to. Set parameter SPrL to 4.0 to establish 4.0 as the minimum value the Set Point can be changed to. These settings are shown in Figures 4 and 5.

Figure 4: Restricted maximum value the SP may be manually set to

Figure 5: Restricted minimum value the SP may be manually set to

Step 3: Output Configuration
Under the Output Group (G.OUt), set the analog output to be used as the 4-20 mA source to be a retransmitting output (rEt). This is shown in Figure 6.

Variations

Parameters rEtH, rEtL, SPrH, and SPrL can be altered to allow for different scaling for the 4-20 mA output. For example, if the user wanted to have 4 mA transmitted when the SP is 0, and 20 mA transmitted when the SP is 100, rEtH and SPrH would be set to 100, and rEtL and SPrL would be set to 0. Note however that the set point cannot go higher or lower than the max scaled range of the input scale. For example, if the input is scaled for 0.4 to 2.0 VDC, the set point cannot be set to 0.

Figure 6: Setting an analog output to be a 4-20 mA retransmitting output

4-20 mA Output Control Using the Manual Control Feature

This form of 4 to 20 mA control allows the user to use the manual control feature to set the output value of a 4 to 20 mA output with respect to a 0 to 100 percent scale. To control the level of output, the user establishes a percent of full scale output for the 4-20 mA control outputs. An output level of 0 will result in the control output transmitting 4 mA, a output level of 50 will result in the control output transmitting 12 mA, a output level of 100 will result in the control output transmitting 20 mA, etc.

Step 1: Activate Manual Output Control

To control the 4-20 mA control output manually, manual output operation must be enabled. This parameter is found in the Control Group (GCtL). Set the Auto/Manual control parameter (ArM) to manual control (mAn) as shown in Figure 7. With this enabled, the MAN LED will light on the faceplate of the controller.

Figure 7: Setting the Auto/Manual parameter for manual control output operation

Step 2: Output Configuration

Under the Output Group (GOUt), set the analog output to be used as the 4-20 mA source to be a control output by setting it to HEAt. This is shown in Figure 8.

Figure 8: Setting an analog output to be a 4-20 mA control output

The next parameter in the group is HEAt. Here, set the type of output, 4-20 mA or voltage pulse, to be transmitted by the output. For 4-20 mA, select SCr, as shown in Figure 9.

Figure 9: Setting the control output to transmit a 4-20 mA signal

Dual Output Operation

The above process will setup two analog outputs for independent and manual 4-20 mA outputs. One is controlled through the set point. To control this output (Out2 in the above setup example) the set point is changed in the main operating display, setting the 4-20 mA value of the Output 2. The second output (Out3 in the above setup example) is set up in the percent full scale output indication screen shown in Figure 10. Access this screen by pressing the SET/ENT button once from the main operating display. Here, the percent full scale output of Output 3 can be manually set. To return to the main operating display, press enter again.

Figure 10: Percent of full scale output display

Note that the output tied to the set point will only change once the set point is validated by pressing the SET/ENT button after using the up and down arrows to change the set point. The output tied to the percent full scale output display changes immediately as it is changed with the up and down arrow keys.