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# Using SmartVue for Signal Conversion

In most processes some level of signal conversion is usually necessary and generally requires additional hardware. When using the SmartVue the need for addition signal conversion hardware can be eliminated by assigning unused inputs and outputs for this purpose.

The SmartVue is capable of converting virtually all of its signal inputs to outputs of the same or different signal types. The signals can be scaled, inverted, or using thresholds analog inputs can be converted to digital outputs. For added flexibility digital inputs can also be used to control analog outputs, producing two unique fixed analog output levels for both the high and low input states.

In the following examples you will see how to convert inputs to outputs of various types and view live conversion data using the monitor data feature.

## **Current Loop Input to Frequency Output Conversion**

In this example we will convert a current loop signal providing engine RPM to a frequency output to connect to a stand alone RPM gauge.

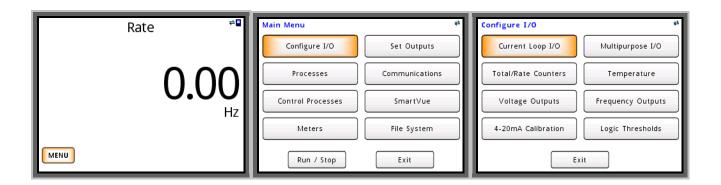


Let's assume the engine controller outputs 0 to 10,000 RPM using a 4 to 20mA signal and the RPM gauge indicates 0 to 12,000 RPM with a frequency input range of 0 to 5,000Hz.

We will use current loop input #1 and frequency output #2 for the signal conversion using the conversion tables below.

Current L	oop Input #1	Frequency (	Dutput #2
Signal Value (mA)	Scaled Value (RPM)	Scaled Value (RPM)	Signal Value (Hz)
4	0	0	0
20	10,000	12,000	5,000

Let's start by setting the scaling, units, and labels for current loop input #1 and frequency output #2 as shown by the following screens.



Configure I/O - Current Loop I/O 72	Configure I/O - 4-20mA IN 1 72	Configure I/O - 4-20mA IN 1 72
	Løbel: RPM IN	Label: RPM IN
	Units: mA	Units: RPM
4-20mA IN 1 4-20mA OUT 1	Min Value: 4.00 mA = 4.00 mA	Min Value: 4.00 mA = 4.00 RPM
4-20mA IN 2 4-20mA OUT 2	Max Value: 20.00 mA = 20.00 mA	Max Value: 20.00 mA = 20.00 RPM
Exit	OK Cancel	OK Cancel
Configure I/O - 4-20mA IN 1	Configure I/O - 4-20mA IN 1 72	Configure I/O - 4-20mA IN 1 **
Label: RPM IN	Label: RPM IN	Label: RPM IN
Units: RPM	Units: RPM	Units: RPM
Min Value: 4.00 mA = 0.00 RPM	Min Value: 4.00 mA = 0.00 RPM	Min Value: 4.00 mA = 0.00 RPM
Max Value: 20.00 mA = 20.00 RPM	Max Value: 20.00 mA = 10000.00 RPM	Max Value: 20.00 mA = 10000.00 RPM
OK Cancel	OK Cancel	OK Cancel
Configure 1/0 - Current Loop 1/0 #		
Configure I/O - Current Loop I/O 🛛 🕫		
4-20mA IN 1 4-20mA OUT 1		
4-20mA IN 2 4-20mA OUT 2		
Exit		
LAN		



### Min/Max Value

The "Min Value" and "Max Value" entries are lower and upper scaling points and do not limit the signal range. Setting the "Min Value" to 8mA = 2500 RPM and "Max Value" to 16mA = 7500 RPM would produce the same results.

Now that the current loop input is configured and scaled let's configure the frequency output.

Configure I/O **	Configure I/O - Frequency Outputs 🕫	Configure I/O - FREQ OUT 2
Current Loop I/O Multipurpose I/O		Løbel: RPM OUT
Total/Rate Counters Temperature	Frequency OUT 1	Units: Hz Min: 0.00 Hz = 0.00 Hz
Voltage Outputs Frequency Outputs	Frequency OUT 2	Min: 0.00 Hz = 0.00 Hz Max: 6125.00 Hz = 6125.00 Hz
	Trequency out 2	
4-20mA Calibration Logic Thresholds		
Exit	Exit	OK Cancel
Configure I/O - FREQ OUT 2 P	Configure I/O - FREQ OUT 2 *	Configure I/O - FREQ OUT 2
Label: RPM OUT	Label: RPM OUT	Label: RPM OUT
Units: RPM	Units: RPM Min: 0.00 RPM = 0.00 Hz	Units: RPM Min: 0.00 RPM = 0.00 Hz
Min: 0.00 RPM = 0.00 Hz Max: 6125.00 RPM = 6125.00 Hz	Min: 0.00 RPM = 0.00 Hz Max: 12000.00 RPM = 6125.00 Hz	Min: 0.00 RPM = 0.00 Hz Max: 12000.00 RPM = 5000.00 Hz
OK Cancel	OK Cancel	OK Cancel
Configure I/O - FREQ OUT 2 *	Configure I/O - Frequency Outputs #	Configure I/O #
Label: RPM OUT		Current Loop I/O Multipurpose I/O
Units: RPM Min: 0.00 RPM = 0.00 Hz	Frequency OUT 1	Total/Rate Counters Temperature
Max: 12000.00 RPM = 5000.00 Hz	Frequency OUT 2	Voltage Outputs Frequency Outputs
		4-20mA Calibration Logic Thresholds
OK Cancel	Exit	Exit

With the I/O scaling completed it is time to connect a process to the current loop input. Configure "Process 1" by following the screens below.

Main Menu	# <b>.</b>	Processes 1/2	44 <mark>-</mark>	Process 1	45 🗖
Configure I/O	Set Outputs	Process 1	Process 2	Name: RPM CONV	
Processes	Communications	Sample Process Total/Rate	Disabled	Type: Total/Rate	
Control Processes	SmartVue	Process 3 Disabled	Process 4 Disabled	Input: Counter 1	¥
Meters	File System				
Run / Stop	Exit	Exi		ОКС	ancel



Process 1 🍟	Process 1 #	Proces	s 1 🕫
Name: RPM CONV	Name: RPM CONV	N	ame: RPM CONV
Type: Current Loop Input 🤤	Type: Current Loop Input 🗳	T I	Type: Current Loop Input 🗳
Input: 4-20mA IN 1	Input: 4-20mA IN 1 🤤	I	nput: 4-20mA IN 1 🗳
OK Cancel	OK Cancel		OK Cancel

Each process can be configured with different input scaling, but in this case let's load the scaling and labels that we entered during the I/O configuration by pressing "Load Settings from IOConfig".

Process 1 - 4-20mA IN 1	47 🖬
Label:	
Units: mA	
Min Value: 4.00 mA =	4.00 mA
Max Value: 20.00 mA = 2	0.00 mA
Zero Offset: 0.00 mA	
Load Settings from IOCo	nfig
ОК Салсе	el 🕑

On select inputs the "Input Filter" menu is available to adjust the sample interval and averaging. In this case let's use the fastest sample interval of 20ms and no averaging (1 Sample).

Process 1 - 4-20mA IN 1 🍄	Process 1 - Input Filter	Processes 1/2	<b>₽</b> ∎
Label: RPM IN		Proce	ss 1 Process 2
Units: RPM	Sample Interval: 20 ms	RPM C CLI	Disabled
Min Value: 4.00 mA = 0.00 RPM			
Max Value: 20.00 mA = 10000.00 RPM	Average: 1 Samples	Proce	
Zero Offset: 0.00 RPM	Average Time Period: 0.02 Seconds	Disat	Disabled
Load Settings from IOConfig			
	OK Cancel		Exit

Now that we have a process configured to read and scale the current loop input #1 we can connect this process to frequency output #2.

Main Menu	4 <b>-</b>	Set Outputs - Page 1 of 2	2 ₽	Set Outputs p1 - Frequency OUT 2 - **
Configure I/O	Set Outputs			Enabled: Yes (auto disable) 👌
Processes	Communications	0-10V OUT 1	0-10V OUT 2	
Control Processes	SmartVue	4-20mA OUT 1	4-20mA OUT 2	Process/Control: P1: RPM CONV
Meters	File System	Frequency OUT 1	Frequency OUT 2	Data Point: CLI: RPM IN
Run / Stop	Exit	Ex Ex	it D	OK Cancel
Set Outputs p1 - Frequen	ncy OUT 2 - 🕶 🖬	Set Outputs p1 - Frequen	icyOUT2- ₽₽	Set Outputs p2 - Frequency OUT 2 - RPM OUT ** Source - P1: RPM CONV (CLI:RPM IN)
Enabled: Ye	es (auto disable)	Enabled: Ye	s (auto disable)	Min: 0.00 RPM = 1.00 Hz
Process/Control:	P1: RPM CONV	Process/Control:	P1: RPM CONV	Max: 100.00 RPM = 10.00 Hz
Data Point:	CLI: RPM IN	Data Point:	CLI: RPM IN	
				Load Settings from IOConfig
ОК	Cancel	ОК	Cancel	OK Cancel
Set Outputs p2 - Frequer Source - P1: RPM CONV (CL	n <mark>cy OUT 2 - RPM OUT ♯</mark> ■ I:RPM IN)	Set Outputs - Page 1 of 2	2 🕫	
Min: 0.00 RPM	= 0.00 Hz	0-10V OUT 1	0-10V OUT 2	
Max: 12000.00 RPM	= 5000.00 Hz	4-20mA OUT 1	4-20mA OUT 2	
		Frequency OUT 1	Frequency OUT 2	
Load Settings	from IOConfig			
ОК	Cancel	Ex Ex	it 🕞	

Current loop input #1 is now connected to frequency output #2 with the required scaling.



Yes (auto disable)

When an output is enabled with the "auto disable" feature, the output will automatically be disabled if either an input error occurs or an input setting is changed that can affect the outputs value.



To confirm the conversion is working as expected you can use the "Monitor Data" feature to see a live view of the inputs and outputs.

Main Menu	47 🖬	SmartVue	# <b>.</b>	Monitor Data Input Label	랴 🖬 Signal Scaled
Configure I/O	Set Outputs	Login	Password	4-20mA IN 1 RPM IN 4-20mA IN 2 Tach IN 1 Tach IN 2	6.0997 mA 1312.33 RPM 0.0160 mA 0.02 mA 0 Hz 0.00 Hz 0 Hz 0.00 Hz
Processes	Communications	Brightness	Calibrate Touchscreen	Counter 1 Counter 2 Counter 2	0 Hz 0.00 Hz
Control Processes	SmartVue	Monitor Data	Upload Firmware	DIN 1 DIN 2 DIN 3 DIN 4 DIN 5 DIN 5 DIN 6 Temp (RTD)	LOW LOW LOW LOW LOW LOW LOW LOW LOW LOW LOW LOW LOW LOW
Meters	File System	Information	Date / Time	Output Label	Signal Scaled
Run / Stop	Exit	E	xit	4-20m4 OUT 2 0-10V OUT 1 0-10V OUT 2 FREQ OUT 1 FREQ OUT 2 RPM OUT	3.7239 mA 3.72 mA 0.0000 V 0.00 V 0.0000 V 0.00 V 0.000 V 0.00 V 0.00 Hz 0.00 Hz 546.77 Hz 1312.25 RPM



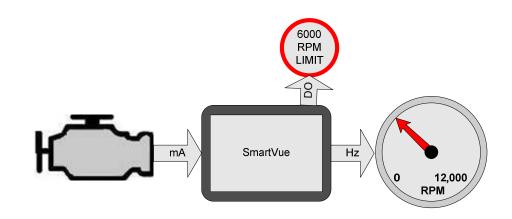
**Monitor Data** 

The monitor data display shows live I/O values using the scaling and labels set in the "Configure I/O" menu.

## **Controlling Digital Outputs**

Analog, counters, and J1939 inputs can be used to toggle digital outputs based on a set of low and high threshold values or latch digital outputs based on a latching threshold.

Using the RPM signal from "Process 1" configured in the previous example, we will configure a digital output to latch at a low level if the engine speed reaches or exceeds 6,000 RPM.

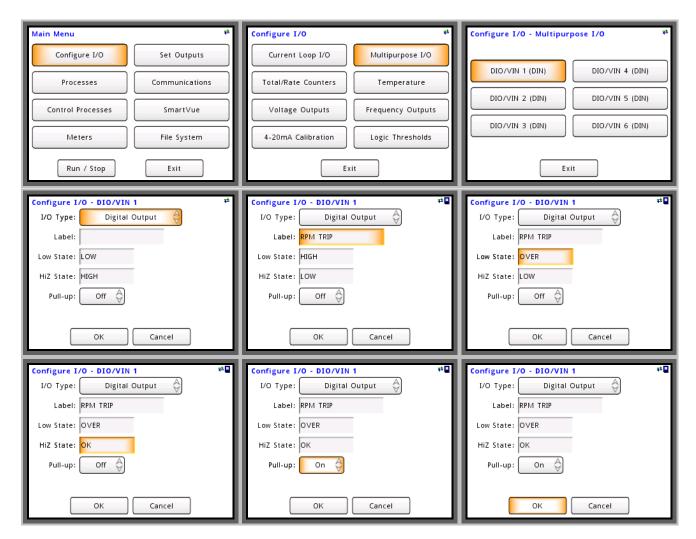




### Controlling Digital Outputs with J1939 Input Data

More options are available when controlling a digital output using a J1939 input. Refer to the user manual and application note 50-0005 "J1939 Engine Monitoring" for more information.

First let's configure multipurpose I/O #1 as a Digital Output and set the low level label to "OVER" and the high impedance (HiZ) label to "OK". These labels are displayed when viewing the output states from the monitor data screen.



1

### Open Collector Outputs

The digital outputs are open collector and can be pulled up as high as 30V. An internal 10K pull-up can be enabled from the "Configure I/O –DIO/VIN" screen.

It is possible to connect multiple open collector outputs together to create logic 'OR' functionality.



Now that we have the digital output configured let's connect it to the RPM process that we had configured in the previous example.

Main Menu	47 🖬	I	Set Outputs - Page 1 of 2	2 ≠∎	Set Outputs - Page 2 of 2	2 72
Configure I/O	Set Outputs	I				
Processes	Communications	I	0-10V OUT 1	0-10V OUT 2	DOUT 1	DIN 4
		I	4-20mA OUT 1	4-20mA OUT 2	DIN 2	DIN 5
Control Processes	SmartVue	I	Frequency OUT 1	Frequency OUT 2	DIN 3	DIN 6
Meters	File System	I				
Run / Stop	Exit		Ex	it 💽	Ex	it 🕞
Set Outputs p1 - DOUT 1	- OVER 🛱	ſ				
Enabled: Y	es (auto disable) 🝦					
Process/Control:	P1: RPM CONV					
Data Point:	CLI: RPM IN					
ОК	Cancel					

Once the process is selected and the output is enabled navigate to the next screen to set the output mode. Here we select the latching mode and configure the output to latch low when the engine speed is greater than or equal to 6000 RPM.

Set Outputs p1 - DOUT 1 - OVER 🛛 🍄	Set Outputs p2 - DOUT 1 - OVER ** Source - P1: RPM CONV (CLI:RPM IN)	Set Outputs p2 - DOUT 1 - OVER * Source - P1: RPM CONV (CLI:RPM IN)
Enabled: Yes (auto disable) 🗳	Mode: Latching 🧳	Mode: Latching
Process/Control: P1: RPM CONV	Latch Output: Low when RPM IN	Latch Output: Low 🕀 when RPM IN
Data Point: CLI: RPM IN	is <=	is >= 🔆 0.00 RPM
OK Cancel	Pressing "OK" will clear the latch condition           OK         Cancel	Pressing "OK" will clear the latch condition           OK         Cancel
Set Outputs p2 - DOUT 1 - OVER Source - P1: RPM CONV (CLI:RPM IN)		
Mode: Latching		
Latch Output: Low when RPM IN		
is >=		
Pressing "OK" will clear the latch condition           OK         Cancel		

Monitor Data Input Label	후 Signal Scaled	Monitor Data Input Label	후 Signal Scaled	Monitor Data Input Label	≉ Signal Scaled
4-20mA IN 1 RPM IN 4-20mA IN 2 Tach IN 1 Tach IN 2 Counter 1 Counter 2 Counter 3 DIN 4 DIN 5 DIN 5 DIN 6 Temp (RTD)	11.6857 mA 4803.57 RPM 0.015 mA 0.02 mA 0 Hz 0.00 Hz 0 Hz 0.00 Hz LOW L0W LOW L0W LOW L0W LOW L0W LOW L0W CONN	4-20mA IN 1 RPM IN 4-20mA IN 2 Tach IN 2 Counter 1 Counter 2 Counter 3 DIN 3 DIN 4 DIN 5 DIN 6 Temp (RTD)	14.2921 mA 6432.55 RPM 0.018 mA 0.02 mA 0 Hz 0.00 Hz 0 Hz 0.00 Hz 0 Hz 0.00 Hz 0 Hz 0.00 Hz 0 Hz 0.00 Hz LOW L0W LOW L0W LOW L0W LOW L0W LOW L0W LOW L0W LOW L0W CONN	4-20mA IN 1 RPM IN 4-20mA IN 2 Tach IN 2 Counter 1 Counter 2 Counter 3 DIN 3 DIN 3 DIN 5 DIN 5 DIN 6 Temp (RTD)	10.0935 mA 3308.43 RPM 0.0152 mA 0.02 mA 0 Hz 0.00 Hz 0 Hz 0.00 Hz LOW L0W LOW L0W LOW L0W LOW L0W LOW L0W LOW L0W LOW L0W CONN
Output Label	Signal Scaled	Output Label	Signal Scaled	Output Label	Signal Scaled
4-20mA OUT 1 4-20mA OUT 2 0-10V OUT 1 0-10V OUT 2 DOUT 1 RPM TRIP FREQ OUT 1 RPM OUT	3.7239 mA 3.72 mA 3.7239 mA 3.72 mA 0.0000 V 0.00 V 0.0000 V 0.00 V HIZ 000 V 0.000 Hz 0.00 Hz 0.00 Hz 2001.46 Hz 4803.50 RPM	4-20mA OUT 1 4-20mA OUT 2 0-10V OUT 1 0-10V OUT 2 DOUT 1 RPM TRIP FREQ OUT 1 FREQ OUT 2 RPM OUT	3.7239 mA 3.72 mA 3.7239 mA 7.72 mA 0.0000 V 0.00 V 0.0000 V 0.00 V LOW OVER 0.000 Z 0.00 Hz 2680.20 Hz 6432.48 RPM	4-20mA OUT 1 4-20mA OUT 2 0-10V OUT 1 0-10V OUT 2 DOUT 1 RPM TRIP FREQ OUT 1 FREQ OUT 2 RPM OUT	3.7239 mA 3.72 mA 3.7239 mA 3.72 mA 0.0000 V 0.00 V 0.0000 V 0.00 V LOW OVER 0.000 Hz 1586.77 Hz 3808.25 RPM

Now that the output is being controlled we can view the output state using the "Monitor Data" feature.

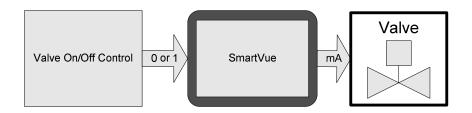
In the first window above the engine speed has not reached the 6,000 RPM limit so the digital output "RPM TRIP" is in the high impedance state, the second window shows the engine speed exceeded the 6,000 RPM threshold and the digital output is now switched low and in the third window the engine speed has returned to a level below 6000 RPM and the digital output is still low due to the latching functionality.

The output latch condition can be cleared either by entering the "DOUT 1" configuration screen and pressing "OK" or directly from the meter screen by pressing a meter indicator button that is linked to "DOUT 1". See the SmartVue user manual for information on configuring meter indicators.

## **Digital Input Conversion**

With SmartVues' large digital input signal range and variable input threshold voltage a wide variety of digital input signals can be processed and converted to digital outputs, voltage outputs, current loop outputs or frequency outputs.

In this example let's control a 4-20mA valve using a 5V logic signal. To make things more interesting let's use a low logic signal to turn the valve on at 50% (12mA) and a high logic level to turn the valve off (4mA).



Conversion Table				
Digital Input Current Loop Output (mA)				
Low 12				
High 4				

First we can set the digital input threshold value, let's use 2V which is the default.

Configure I/O	₽₽	figure I/O - Logic Thresholds	₽∎ Con	figure I/O - Logic Th	resholds 🏾 🏞 🖬
Current Loop I/O Multipu	urpose I/O	DIO/VIN: 2.00 V		DIO/VIN:	2.00 V
Total/Rate Counters	perature				
Voltage Outputs Frequent	cy Outputs	QENC/FRQ: 2.00 V		QENC/FRQ:	2.00 V
4-20mA Calibration	Thresholds				
Exit		OK Cancel		ок	Cancel

Since we have already assigned the first multipurpose I/O in the example above let's assign the second channel to the valves On/Off control input. Here we set the low state label to "ON" and the high state label to "OFF".

Configure I/O - Multipurpose I/O 🕫	Configure I/O - DIO/VIN 2 **	Configure I/O - DIO/VIN 2 P
DIO/VIN 1 (DOUT) DIO/VIN 2 (DIN) DIO/VIN 2 (DIN) DIO/VIN 3 (DIN) DIO/VIN 6 (DIN) Exit	I/O Type: Digital Input Label: Valve Ctrl Low State: LOW High State: HIGH Pull-up: Off OK Cancel	Label: Valve Ctrl Low State: ON High State: HIGH Pull-up: Off
Configure I/O - DIO/VIN 2 ** I/O Type: Digital Input	Configure I/O - DIO/VIN 2 74 I/O Type: Digital Input	Configure I/O - Multipurpose I/O 🕫
		Configure I/O - Multipurpose I/O *
I/O Type: Digital Input	I/O Type: Digital Input	
I/O Type: Digital Input	I/O Type: Digital Input	DIO/VIN 1 (DOUT) DIO/VIN 4 (DIN)



Next we configure the current loop output scaling and labels. Let's use current loop output channel #1.

Configure I/O *	Configure I/O - Current Loop I/O 🕫	Configure I/O - 4-20mA OUT 1		
Current Loop I/O Multipurpose I/O		Label: <mark>Valve Out</mark> Units: mA		
Total/Rate Counters Temperature	4-20mA IN 1 4-20mA OUT 1	Min Value: 4.00 mA = 4.00 mA		
Voltage Outputs Frequency Outputs	4-20mA IN 2 4-20mA OUT 2	Max Value: 20.00 mA = 20.00 mA		
4-20mA Calibration Logic Thresholds				
Exit	Exit	OK Cancel		
Configure I/O - 4-20mA OUT 1 *	Configure I/O - 4-20mA OUT 1 *	Configure I/O - 4-20mA OUT 1 **		
Units: %	Units: %	Units: %		
Min Value: 4.00 % = 4.00 mA	Min Value: 0.00 % = 4.00 mA	Min Value: 0.00 % = 4.00 mA		
Max Value: 20.00 % = 20.00 mA	Max Value: 20.00 % = 20.00 mA	Max Value: 100.00 % = 20.00 mA		
OK Cancel	OK Cancel	OK Cancel		
Configure I/0 - 4-20mA OUT 1 #	Configure I/O - Current Loop I/O #	Configure I/O #		
Label: Valve Out		Current Loop I/O Multipurpose I/O		
Units: % Min Value: 0.00 % = 4.00 mA	4-20mA IN 1 4-20mA OUT 1	Total/Rate Counters Temperature		
Max Value: 100.00 % = 20.00 mA	4-20mA IN 2 4-20mA OUT 2	Voltage Outputs Frequency Outputs		
		4-20mA Calibration Logic Thresholds		
OK Cancel	Exit	Exit		

At this point we need to configure a process to read the digital input. Since "Process 1" is in use let's use "Process 2" and connect it to the multipurpose I/O "DIN 2".

Main Menu	#∎	Processes 1/2	#∎	Process 2	#∎
Configure I/O	Set Outputs	Process 1	Process 2	Name: Valve	
Processes	Communications	CLI	Disabled	Type: Total/Rate	
Control Processes	SmartVue	Process 3 Disabled	Process 4 Disabled	Input: Counter 1	¥
Meters	File System				
Run / Stop	Exit	Exi	t D	ОК Салсе	



Process 2 😤	Process 2 #	Process 2 - DIN 2 Process 2
Name: Valve	Name: Valve	Label:
Type: Multipurpose I/O	Type: Multipurpose I/O	Low State: LOW
Input: DIN 2	Input: DIN 2	High State: HIGH
OK Cancel	OK Cancel	Load Settings from IOConfig
Process 2 - DIN 2 🍄	Processes 1/2 #	
Process 2 - DIN 2 Process 2 - DIN 2	Processes 1/2 #	
	Process 1 Process 2 RPM CONV Valve	
Label: Valve Ctrl Low State: ON	Process 1 Process 2	
Label: Valve Ctrl	Process 1 Process 2 RPM CONV Valve	
Label: Valve Ctrl Low State: ON	Process 1 Process 2 RPM CONV CLI DIN	
Label: Valve Ctrl Low State: ON High State: OFF	Process 1 Process 2  RPM CONV CLI Valve DIN Process 3 Process 4	
Label: Valve Ctrl Low State: ON	Process 1 Process 2  RPM CONV CLI Valve DIN Process 3 Process 4	

Now that the process is configured we can connect it to the current loop output assigned to control the valve.

Main Menu	42 🖥	Set Outputs - Page 1 of 2	÷ ++∎	Set Outputs p1 - 4-2	20mA OUT 1 - Valve Out 🛛 🍄 🖬
Configure I/O	Set Outputs				A
Processes	Communications	0-10V OUT 1	0-10V OUT 2	Enabled:	Yes (auto disable) 🤤
		4-20mA OUT 1	4-20mA OUT 2	Process/Control:	P1: RPM CONV
Control Processes	SmartVue	Frequency OUT 1	Frequency OUT 2	Data Baiata	CLI: RPM IN
Meters	File System	Frequency out i	Frequency OUT 2	Data Point:	CLI: RPM IN
Run / Stop	Exit	Exi	it 🕑	ОК	Cancel

Select the process "P2: Valve" and navigate to the next screen to configure the current loop output levels for each input state. To turn the valve on at 50% when the input is low enter 12mA for the "ON (low)" state and to turn the valve off when the input is high enter 4mA for the "OFF (high)" state.

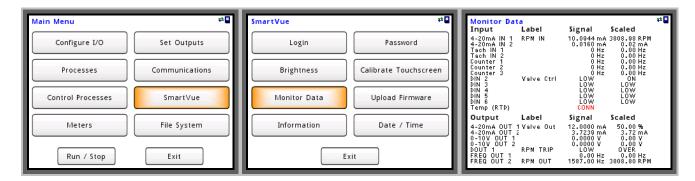
Set Outputs p1 - 4-20mA OUT 1 - Valve Out 🕫	Set Outputs p1 - 4-20mA OUT 1 - Valve Out 🛱	Set Outputs p2 - 4-20mA OUT 1 - Valve Out ** Source - P2: Valve (DIN:Valve Ctrl)
Enabled: Yes (auto disable)	Enabled: Yes (auto disable)	ON (low)> 12.00 mA
Process/Control: P2: Valve	Process/Control: P2: Valve	OFF (high)> 20.00 mA
Data Point: DIN: Valve Ctri	Data Point: DIN: Valve Ctri	Load Settings from IOConfig
OK Cancel	OK Cancel	OK Cancel



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Set Outputs p2 - 4-20mA OUT 1 - Valve Out Context Source - P2: Valve (DIN:Valve Ctrl)	Set Outputs p2 - 4-20mA OUT 1 - Valve Out ** Source - P2: Valve (DIN:Valve Ctrl)	Set Outputs - Page 1 of 2 #
ON (low)> 12.00 mA	ON (low)> 12.00 mA	0-10V OUT 1 0-10V OUT 2
OFF (high)> 4.00 mA	OFF (high)> 4.00 mA	4-20mA OUT 1 4-20mA OUT 2
Load Settings from IOConfig	Load Settings from IOConfig	Frequency OUT 1 Frequency OUT 2
OK Cancel	OK Cancel	Exit D

Now that the digital input is linked to the current loop output navigate to the monitor data screen to view the live I/O data. Here you will see the "4-20mA OUT 1" is 12mA when "DIN 2" is low (ON) and 4mA when "DIN 2" is high (OFF).



I	Monitor Dat	a			₩.
	Input	Label	Signal	Scaled	
	4-20mA IN 1 4-20mA IN 2 Tach IN 2 Counter 1 Counter 2 Counter 3 DIN 2 DIN 3 DIN 4 DIN 5 DIN 6 RED)	RPM IN Valve Ctrl	10.0952 mA 0.0160 mA 0 Hz 0 Hz 0 Hz 0 Hz 0 Hz	3809.52 RPM 0.02 mA 0.00 Hz 0.00 Hz 0.00 Hz 0.00 Hz	
	Output	Label	Signal	Scaled	
	4-20mA OUT 1 4-20mA OUT 2 0-10V OUT 1 0-10V OUT 2 DOUT 1 FREQ OUT 1 FREQ OUT 2			3.72 mA 0.00 V	

# **Converting Quadrature Encoder/Counters and Tachometer inputs**

The SmartVue is capable of using the rate (frequency) or total accumulated from any one of its counter or tachometer inputs to directly control an output.

In this example we will measure the fluid volume within a tank using a quadrature encoder and output a voltage that is proportional to this volume.

Let's assume in quadrature (x4) mode the encoder outputs 4000 counts per cm of fluid and the tank has a 1 meter radius. Converting to volume the encoder will produce 127.324 counts per liter which will be used as the K factor when setting up the encoder input.

We start by configuring "Counter 3" as shown by the screens below entering the K factor determined above.

Configure I/O	<del>4</del>	l	Configure I/O - Total/Ra	te Counters 🛛 🍄 🖬	1	Configure I/O - Counte	r 3 Total/Rate 🕈 🖬
Current Loop I/O	Multipurpose I/O	I				K Factor	127.324
Total/Rate Counters	Temperature	I	Counter 1	Tach IN 1		Rate	Total
		I	Counter 2	Tach IN 2		Label:	Label:
Voltage Outputs	Frequency Outputs	I				Units: Hz	Units:
4-20mA Calibration	Logic Thresholds	I	Counter 3			Time Base: Seconds 💝	Mode: Counter 💝
		U					Pull-up: Off 🔷
Exit		Ex	it		ОК	Cancel	

Enter the labels and units for both the rate and total and select the desired time base for the rate. In this example we will select a time base of minutes.

Configure 1/0 - Counter 3 Total/Rate K Factor: 127.324		Configure I/O - Counter 3 Total/Rate # K Factor: 127.324		Configure I/O - Counter 3 Total/Rate **	
Rate	Total	Rate	Total	Rate	Total
Label: Rate	Label:	Label: Rate	Label:	Label: Rate	Label: Volume
Units: L/min	Units:	Units: L/min	Units:	Units: L/min	Units:
Time Base: Seconds 🗳	Mode: Counter 🗳	Time Base: Minutes 👙	Mode: Counter 🗳	Time Base: Minutes	Mode: Counter 🖨
	Pull-up: Off 🗳		Pull-up: Off 🗳		Pull-up: Off 🗳
ОК	Cancel	ОК	Cancel	ОК	Cancel



Since we are connecting to a quadrate encoder set the mode to "Quad x4".

Configure I/O - Counter 3 Total/Rate # K Factor: 127.324		Configure I/O - Counter 3 Total/Rate **•		Configure 1/0 - Counter 3 Total/Rate #0 K Factor: 127.324	
Rate	Total	Rate	Total	Rate	Total
Label: Rate	Label: Volume	Label: Rate	Label: Volume	Label: Rate	Label: Volume
Units: L/min	Units: L	Units: L/min	Units: L	Units: L/min	Units: L
Time Base: Minutes 🖨	Mode: Counter 🗳	Time Base: Minutes	😔 Mode: Quad x4	Time Base: Minutes	Mode: Quad x4
	Pull-up: Off 🗳		Pull-up: Off 🗳		Pull-up: Off 🗳
ОК	Cancel	ОК	Cancel	ок	Cancel

Now that the counter is configured let's setup the voltage output. Assuming the tank holds a maximum of 1000 liters let's configure the voltage output to produce 0V when empty and 10V when full.

Configure I/O - Total/Rate Counters *	Configure I/O ** Configure I/O - Voltage Outputs		
	Current Loop I/O Multipurpose I/O		
Counter 1 Tach IN 1	Total/Rate Counters Temperature	Voltage Out 1	
Counter 2 Tach IN 2	Voltage Outputs Frequency Outputs	Voltage Out 2	
Counter 3 (QEnc 1)		Vollage out 2	
	4-20mA Calibration Logic Thresholds		
Exit	Exit	Exit	
Configure I/O - 0-10V OUT 1 *	Configure I/O - 0-10V OUT 1 *	Configure I/O - 0-10V OUT 1 *	
Label: Volume Out	Label: Volume Out	Label: Volume Out	
Units: V	Units: L	Units: L	
Min Value: 0.00 V = 0.00 V	Min Value: 0.00 L = 0.00 V	Min Value: 0.00 L = 0.00 V	
Max Value: 10.00 V = 10.00 V	Max Value: 10.00 L = 10.00 V	Max Value: 1000.00 L = 10.00 V	
OK Cancel	OK Cancel	OK Cancel	
Configure I/O - 0-10V OUT 1 #	Configure I/O - Voltage Outputs *	Configure I/O *	
Label: Volume Out		Current Loop I/O Multipurpose I/O	
Units: L	Voltage Out 1	Total/Rate Counters Temperature	
Min Value: 0.00 L = 0.00 V Max Value: 1000.00 L = 10.00 V			
Wax value. 1000.00 L = 10.00 V	Voltage Out 2	Voltage Outputs Frequency Outputs	
		4-20mA Calibration Logic Thresholds	
OK Cancel	Exit	Exit	



#### Voltage Outputs

The voltage outputs are isolated and are referenced to the "Isolated 24V-" terminal J1-3.

We will now connect "Process 3" to the quadrature input "QEnc 1". Note when the mode of "Counter 3" is changed to "Quad x2" or "Quad x4" the counter is renamed to "QEnc 1".

Main Menu	4÷	Processes 1/2	44 🖬	Process 3 Process 3
Configure I/O	Set Outputs	Process 1	Process 2	Name: Tank Volume
Processes	Communications	RPM CONV CLI	Valve DIN	Type: Disabled
Control Processes	SmartVue	Process 3 Disabled	Process 4	
Meters	File System			
Run / Stop	Exit	Exi		OK Cancel
Process 3	47 🗖	Process 3	<b>⇔</b>	Process 3 📫
Name: Tank Volume		Name: Tank Volume		Name: Tank Volume
Type: Total	/Rate	Type: Total/F	Rate	Type: Total/Rate
Input: Counter 1		Input: QEnc 1		Input: QEnc 1
ОК	Cancel	ОК	Cancel	OK Cancel
Process 3 - Counter 3 To	tal/Rate ₽∎	Process 3 - Counter 3 Tot	al/Rate ₽₽	
K Factor: 1		K Factor:	127.324	
Rate	Total	Rate	Total	
Label:	Label:	Label: Rate	Label: Volume	
Units: Hz	Units:	Units: L/min	Units: L	
Time Base: Seconds 令		Time Base: Minutes 🖨		
Load Settings from IOConfig		Load Settings f	rom IOConfig	
		ОК	Cancel	

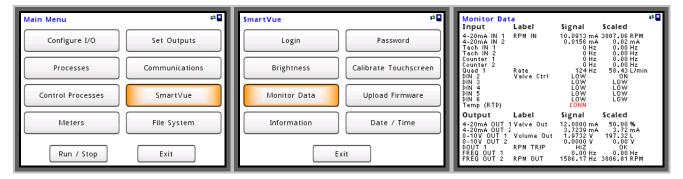
Now that both the counter input and process have been configured we can attach the process to the voltage output.

Processes 1/2	# <b>.</b>	Main Menu	±.∎	Set Outputs - Page 1 of 2	2 🕫
	cess 2	Configure I/O	Set Outputs		
	alve IN	Processes	Communications	0-10V OUT 1	0-10V OUT 2
Process 3 Proc	cess 4	Control Processes	SmartVue	4-20mA OUT 1	4-20mA OUT 2
Tank Volume Total/Rate Dis	abled			Frequency OUT 1	Frequency OUT 2
		Meters	File System		
Exit	$\triangleright$	Run / Stop	Exit	Ex Ex	it 🕑

Since we are connected to a Total/Rate process we can connect the output to either the processes total or rate data point. We want the voltage output to change based on the volume of fluid in the tank so select the "Total: Volume" data point.

Set Outputs p1 - 0-10V OUT 1 - Volume Out  ₽□	Set Outputs p1 - 0-10V OUT 1 - Volume Out 🛛 🍄 🖬	Set Outputs p1 - 0-10V OUT 1 - Volume Out 😤
Enabled: Yes (auto disable) ᅌ	Enabled: Yes (auto disable)	Enabled: Yes (auto disable) 🗳
Process/Control: P1: RPM CONV	Process/Control: P3: Tank Volume 🤤	Process/Control: P3: Tank Volume
Data Point: CLI: RPM IN	Data Point: Rate: Rate 🗳	Data Point: 🗾 Total: Volume 🤤
OK Cancel	OK Cancel	OK Cancel
Set Outputs p1 - 0-10V OUT 1 - Volume Out 🛛 🇮 🖬	Set Outputs p2 - 0-10V OUT 1 - Volume Out * Source - P3: Tank Volume (Total:Volume)	Set Outputs p2 - 0-10V OUT 1 - Volume Out ** Source - P3: Tank Volume (Total:Volume)
Enabled: Yes (auto disable) 🔗	Min: 0.00 L = 0.00 V	Min: 0.00 L = 0.00 V
Process/Control: P3: Tank Volume	Max: 100.00 L = 10.00 V	Max: 1000.00 L = 10.00 V
Data Point: 🛛 Total: Volume 🗳		
OK Cancel	Load Settings from IOConfig	Load Settings from IOConfig
Set Outputs - Page 1 of 2 **		
0-10V OUT 1 0-10V OUT 2		
4-20mA OUT 1 4-20mA OUT 2		
Frequency OUT 1 Frequency OUT 2		
Exit		

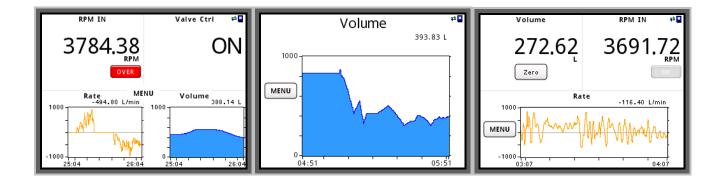
Now that the configuration is complete we can view the tank level voltage output from the monitor data screen. We can see the tank level is at 197.32L and the voltage output is at 1.9732V. We can also see that the tank is filling at a rate of 58.43L/min.



# **Meter Display**

Normally SmartVue is configured to display process data directly on the meter screen, but as shown in the examples above it can also process data in the background while saving the meter display area for data of higher importance.

For users not familiar with the meter display capabilities of SmartVue a few meter samples are shown below. The data displayed on these meters are generated by the I/O and processes configured in the previous examples. See the SmartVue user manual for information on configuring meters.





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