

## PWM Relay Control plus External Ratio Adjust

### Operating Description

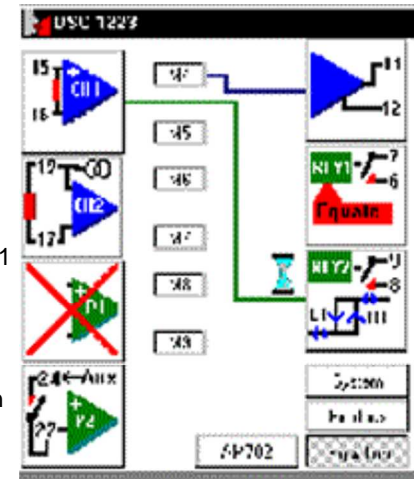
CH1 is the process variable being controlled and is scaled for (4 to 20mA) input and is equal to (0 to 1 Process) output.

CH2 is connected to a panel mounted potentiometer and is used to change the gain in the PWM output on RLY1. CH2 is scaled for (0 to 5k Ohm) input is equal to (0..1 Ratio) output.

RY2 is a direct acting relay alarm, RLY2 will switch on when the input to CH1 is 4.5mA. As CH1 is scaled for 4 to 20 = 0 to 1 the trip point entered for

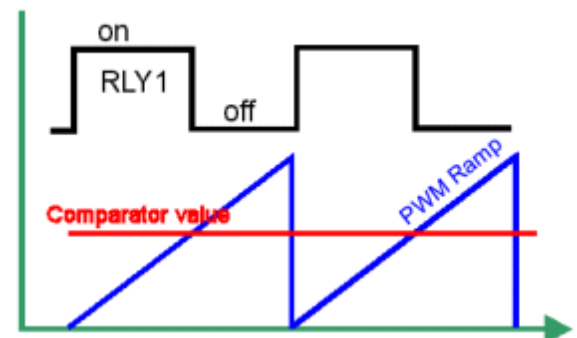
$$\text{RYL2 is } \frac{4.5 - 4}{16} = 0.03125$$

The equation used to Pulse Width Modulate (PWM) RLY1 from 0 to 100% on time based on the value of CH1 x CH2. If the input of P2 (terminal 22) is connected to Aux (Terminal 24) then the input from CH1 will be set to 100% in the ration calculation.



### PWM Equation Points Of Interest

1. Operation is based on the idea that the equation will update at a consistent time interval. Each time the equation runs values are retrieved from memories and updated as required.
2. To prevent the relay from chattering when the input value is the same as the PWM ramp value, the input is buffered.
3. To prevent the possibility of two negative input values being multiplied together and producing a positive number readings below 0 on CH1 are returned as 0.



### Declarations

USC Components	Eng. Unit/Label	Description
<b>Memory</b>		
Mem4	ExtRatio	(0..1) Value read at CH1 multiplied by the value read in CH2.
Mem5	PWMramp	(0..120) This is a ramp or staircase value that starts at 0 and increases by Con_c every "timer seconds" up a maximum value of Con_a.
Mem6	CompValu	(0..120) Comparator value, this is a copy of memory 4 times Con_a updated every Con_j counts.
Mem7	UpdateCnt	(0..2) PWM comparator input update counter.
<b>Constant</b>		
Con_a	PwmPerod	(60) Set the PWM period = $TimerSec \times (Con_a) \times (Con_i) = 120 \times 0.5 \times 2 = 60$ seconds.
Con_b	MinInVal	(0) Minimum input value.
Con_c	RampInc	(1) Ramp increment and minimum ramp value.
Con_g	PwmLimit	(59) PWM signal limiter, This sets the maximum possible on time of the relay. $TimerSec \times Con_g \times Con_i = 59 \times 0.5 \times 2 = 60$ seconds.
Con_i	EquCon	Used to multiply by 2.
Con_j	InUpdteT	(1) Set input update time. Udate Time = $TimerSec \times (Con_j + 1) = 0.5 \times (1 + 1) = 1$ second.

### Notes

This application has been written with USC Config 105. An AM702-02 can be used in trim mode to adjust the PWM period, PWM limit, relay trip points, relay delays and input/output calibrations while the USC is in operation. If importing this application into USC Config 103 run the verify wizard before programming.

### USC Programs

File	Comment
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First Issue.

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Convert to USC config 105 standard.

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