EVTV Pierburg CWA-50 Coolant Pump

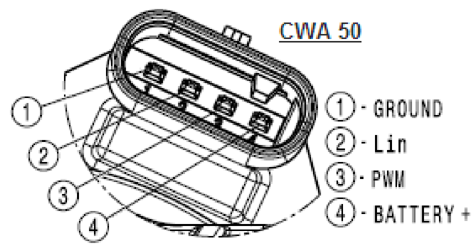
3-11-14   By Klaus Wolter

Coolant temperature: -40°C to 128°C
Operating voltage: 8 to 16V Optimal: 12.5v
Current @ 12.5v: 6.5A
Flow rate: 0 – 30 LPM, 24LPM @ 0.6 bar = 6.3gpm @ 8.7psi
Lifetime: 6,000 hrs
Communication: PWM or LIN-Bus. PWM signal can be from 45Hz to 1100Hz, 13% to 85% duty cycle = min flow to max flow. 7% to 13% duty cycle is pump stopped and error reset.

Power saving mode draws <200uA. The pump is in power saving mode when power is first applied and no PWM or LIN signal is sent. It comes out of power saving mode as soon as the signals are sent and current consumption increases to 20mA while at rest.

Over current shutdown:
The pump constantly monitors its own power consumption during operation. If it exceeds the permissible limit (Due to mechanical blockage of the impeller, etc.) the pump will turned off immediately. Then it tries to restart. Should the current consumption be excessive, the pump switches off again. After 100 attempts to start, no further start attempts are made. The pump is reset by sending a target rotation speed of 0 rpm.
Power saving function:
The pump has a power-saving mode. The pump switches to power saving mode when both control inputs are connected to ground for more than 2.5 seconds. Also, after initially applying power to the pump it will be in the power saving mode.
Response to low temperature:
Below 0 ° the speed of the pump is reduced to 50% in two stages.

Connector Pinout:
Pin 1 is Common or Ground
Pin 2 is LIN-Bus
Pin 3 is PWM input signal
Pin 4 is + 12 to 16v

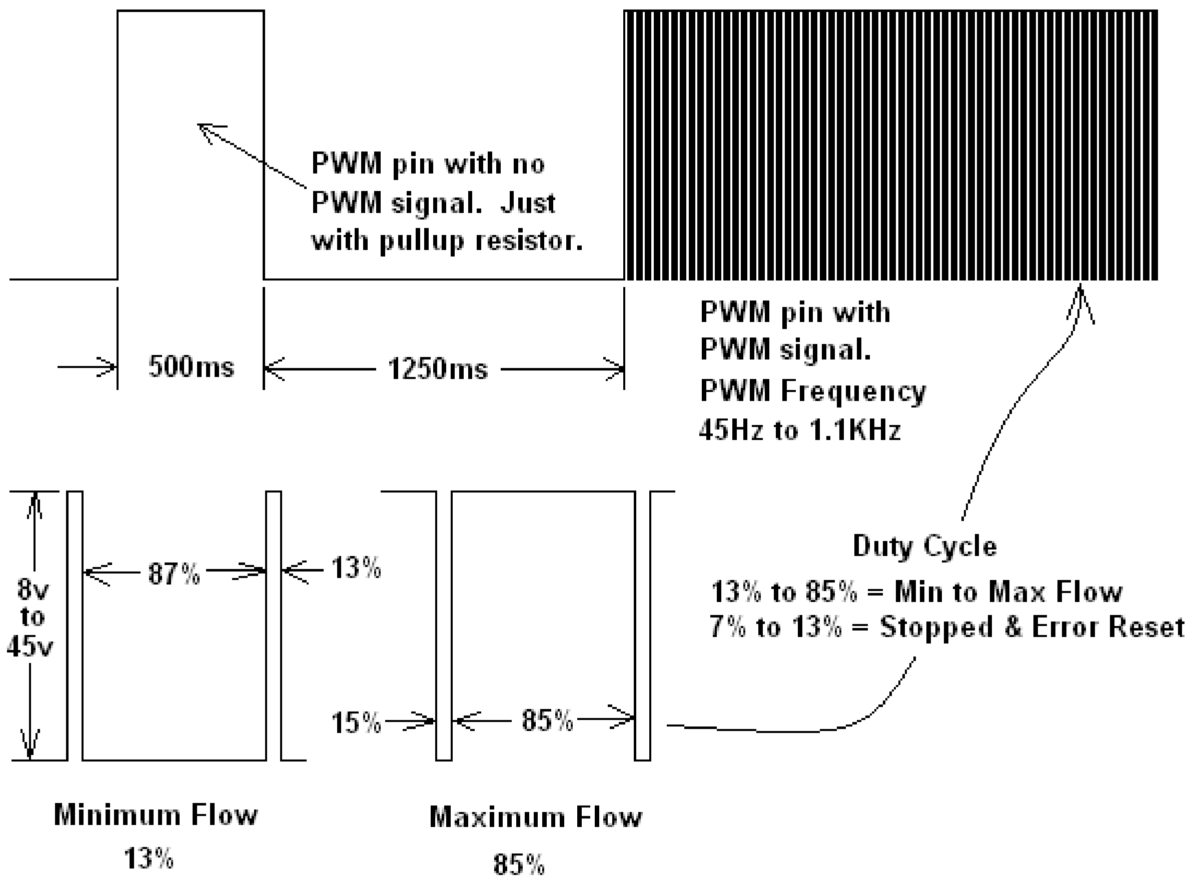


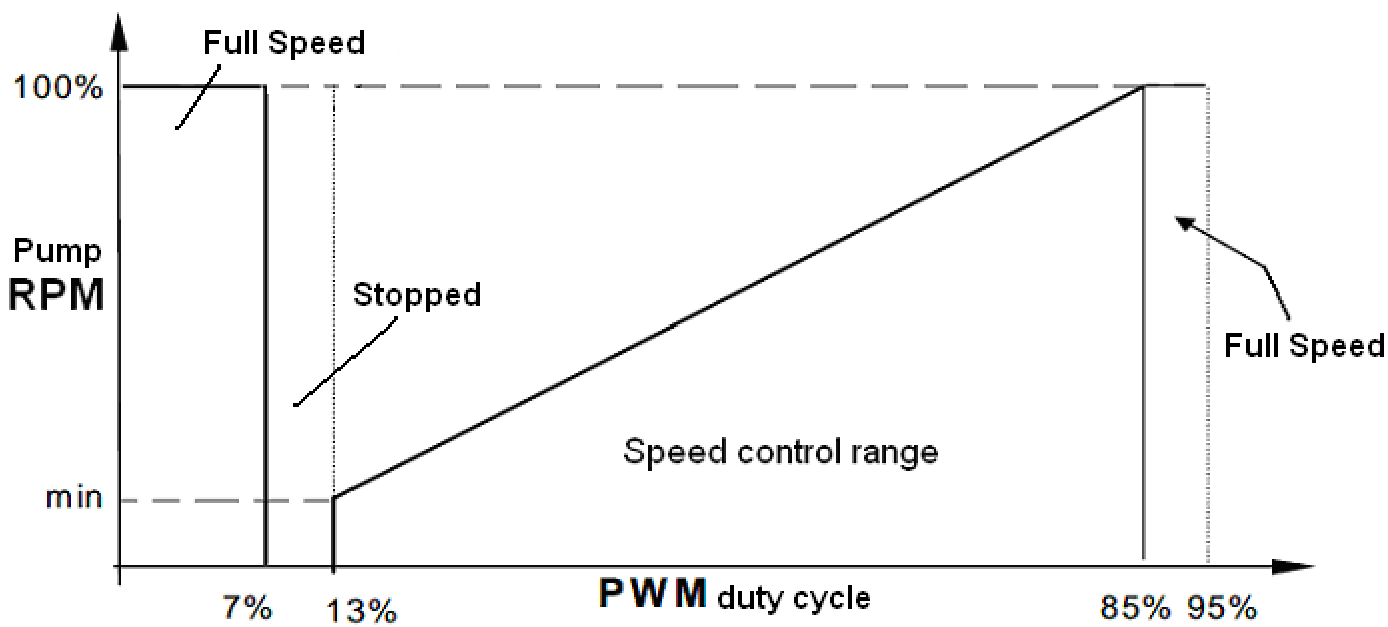
The pump should be run with the rotor axis in a horizontal position to maximize life. It can also be run at a ±30° angle provided that the outlet is pointed up

I did some experimenting on PWM control of this pump. The PWM was pulled up to the supply voltage via a 1K resistor. The PWM pin will then produce a square wave with it being high for 500ms (½ second) and low for 1250ms (1-1/4 second), for a total period of 1750ms (1-3/4 second) as shown below.

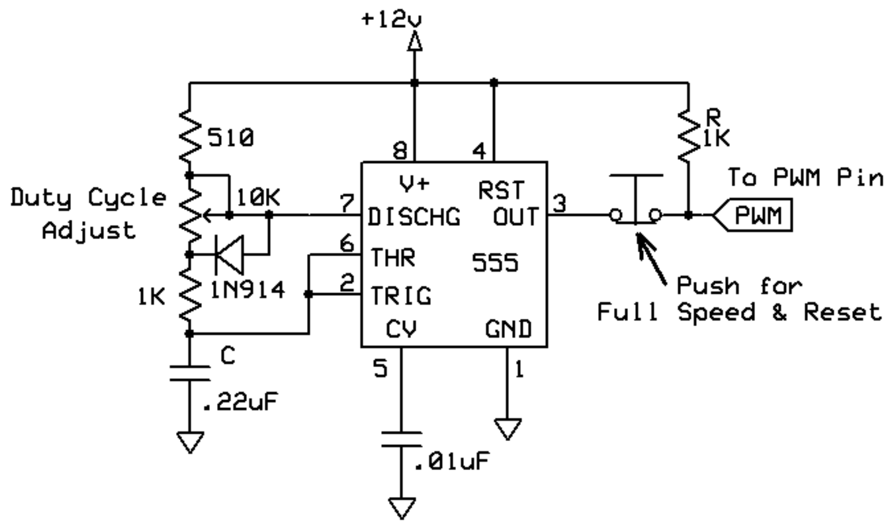
At first I thought that applying power directly to the PWM pin without a pull-up resistor would be a no-no since something in the pump circuitry was pulling it down. However, the Pierburg spec says it's okay and my testing shows no ill effects. Pulling it to power through a 1K resistor works fine too.

I found that if the pump was started by applying voltage to the PWM pin, it would continue to run even with the PWM signal grounded or not connected, at least for a while.... Under these conditions the pump would shut down after about 15 or 20 minutes! To keep the pump running at full output / speed, the PWM must be tied to the supply voltage. A 1K pullup resistor to the power supply works as well.





Ibuilt the following PWM circuit utilizing a 555 timer running at about 500Hz. It allowed me to run the pump from minimum to maximum flow.



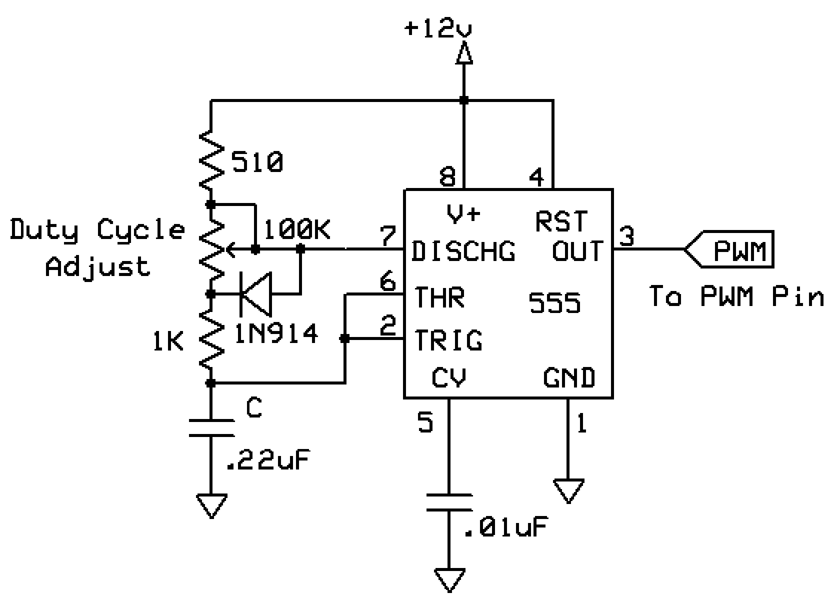
Constant Frequency PWM Circuit

~500Hz

The PWM signal seems to be necessary within a couple of seconds of applying power to the pump and if it's lost for about 4 seconds while the pump is running the pumps comes to a stop. However, after applying DC power to the PWM pin for a few seconds, the pump comes up to full speed and it can then be controlled via PWM again. This is the purpose of the pushbutton switch and pullup resistor in the schematic. But things get better at lower frequencies.

I changed the resistance of the 10K pot to 100K. This reduced the frequency of the circuit to about 70Hz. Now if I lost the PWM signal for 4 seconds or more, and then it reappeared, it would start pumping again! Even if all power was removed, the pump powered up without a signal, the PWM signal could be introduced several minutes later and the pump would start running at the PWM directed speed. This didn't happen when the PWN frequency was ~500Hz. So it seems that for good pump control, lower PWM frequencies are better. From a little testing, I think the PWM signal should be kept below 250Hz. When I increased it to 290Hz the pump would no longer restart upon signal loss for more than 4 seconds. As the RPM / PWM graph from Pierburg mentioned, as shown above, the pump did go to full speed when the PWM duty cycle was 7% or less. It probably also resets everything as mentioned in the spec. However, the duty cycle had to be greater than 0%.

The following is a good simple circuit that I have used to control the speed of the pump and get a better feeling for how it works:



Constant Frequency PWM Circuit

~70Hz