

# MODEL 420

## INSTALLATION AND OPERATION

**BASICS** - The *Model 420*<sup>TM</sup> controller is engineered to provide speed control of a solenoid-controlled pump that is linearly proportional to a 4-20 ma signal. You can set the high and low currents to be the low or high speeds in a range of 1 to 499 Strokes/Minute. A stroke is defined as the pumping of one of the pump “water” chambers. The system requires 110 volts AC to power it and delivers 12 volts DC to the pump solenoid. You must use the appropriate pump solenoid when using a *Model 420*. The system is programmed using the 5-button keypad on the circuit board. The system can be operated using the toggle switch on the cover of the unit or by connecting a “SPDT center-off” switch (or a set of dry-contacts) remotely. The connections for remote usage are a terminal strip, also on the circuit board. The system uses *Strokes/Minute* units which are very useful in estimating fluid delivery rates and permit linear calculations. The enclosure is a NEMA 4X and the external control switch has a waterproof boot on it but common sense dictates avoiding hosing the unit etc. The unit always comes up in a 4-20 mode and is ready to run seconds after power is applied.



**SETUP** – It’s very simple; hit the **Set** button to enter Setup mode and then adjust the values and move the cursor (using the left and right arrow buttons) and raise or lower the values (using the up and down arrow buttons) until you have all the values where you want them. Then hit the **Set** button again to get out of Setup mode. The practice of using the 4-20 signal to stop the pump should be set using 4ma as “off” by default and 5ma as the slowest speed or 20ma as “off” in the reverse setup. Putting a zero as a speed can sometimes create math problems for the processor. The system is now ready to **Run** (or **Jog**). Not much job security here, it’s that straightforward. Keep in mind that the sensor supplying the loop current, the Model 420 unit, the pump, and even the fluid (“heads” and viscosity) and the air supply to the pump all have tolerances on their performance. You most likely will have to “dial in” the system to get the exact flows you want. So don’t tighten the cover until your happy with the performance. Then you can button up the system and keep the settings away from “tweakers”.

**RUN** – To run the system, just flip the switch to the right. The display will tell you the loop current and also the pump speed.

**JOG** – To run the pump to purge it, prime it, or simply to pump a little product; just flip the switch to the left. The unit will display the pump speed which is the average of the setup high and low speeds.

**IMPORTANT** - Two critical things to remember: don’t use zero as a speed and always observe signal polarity and current limits.

**CALCULATING VOLUMETRIC DELIVERY**- The pump manufacturer supplies information about the delivery of fluid per pump stroke (emptying of one chamber) but please remember that factors like inlet and outlet head, inlet air pressure and flow delivery, viscosity and cavitation all effect the volumetric flow. The reason the *Model 420* doesn’t calculate the flow is because it would rarely be right. There are too many process variables to hit the values this way. You will have to take a bit of time to calculate the theoretical output and then “dial in” the system to get the best result. Once you understand and control the variables though, the unit will help your pump deliver with the accuracy you expect from a positive-displacement pump.

## QUICK TOUR

**A-**The **Display** control changes the contrast on the LCD display. You will probably never touch it unless the temperature around the unit is unusually high or low. If there is no information on the display, someone probably fiddled with the control. Just bring it full counter-clockwise and then back off until you have the desired contrast.

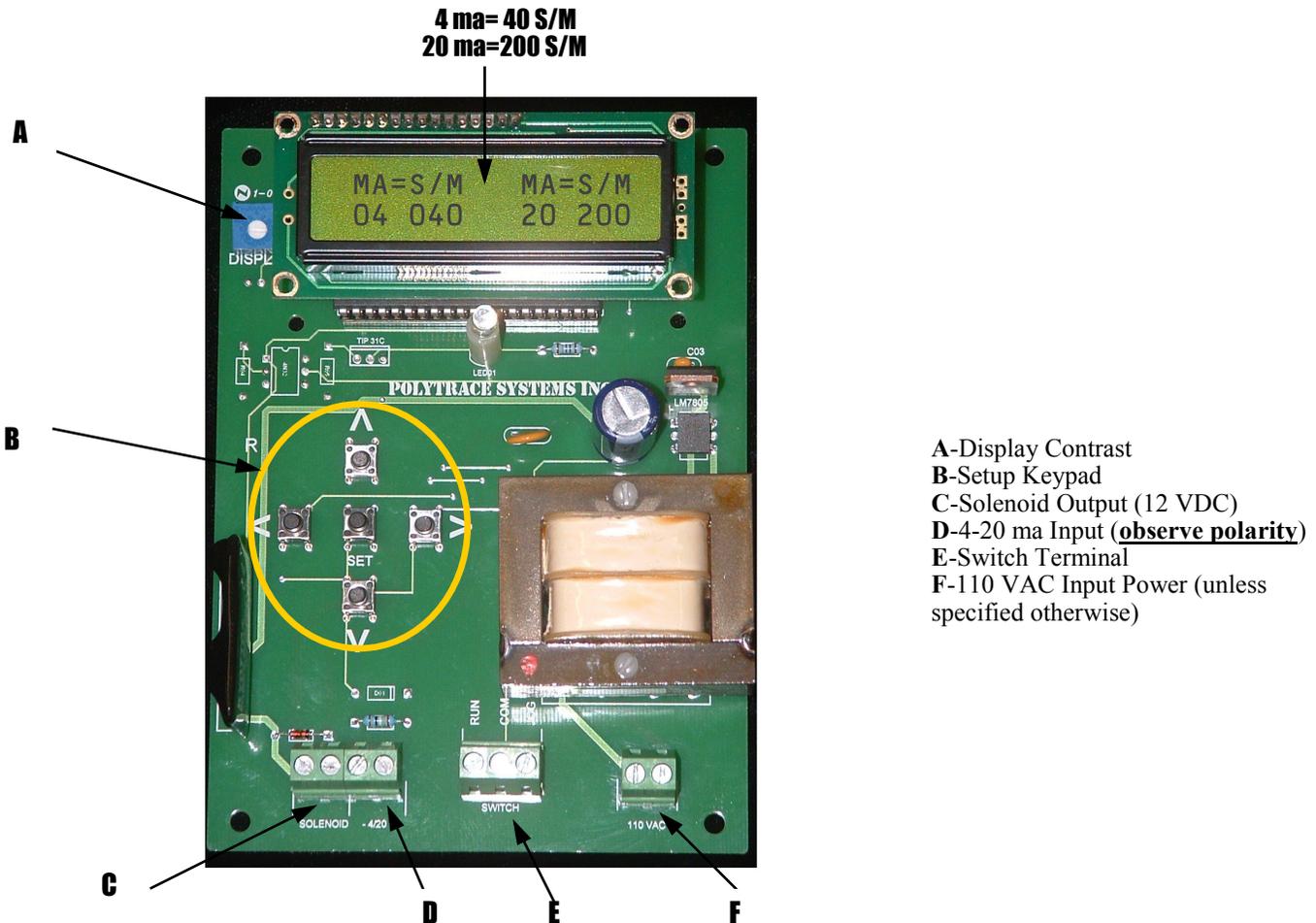
**B-**The Setup Keypad has **Set** key in the center and four keys with arrows around it. They are for **right**, **left**, **up** and **down**. The right and left move the cursor on the display accordingly and the up and down change the values highlighted by the cursor accordingly. They are only used to set the unit up. Once you have “dialed in” the unit, you probably won’t be using them and they are inside the unit, out of harm’s way.

**C-** The **Solenoid** output provides 12 volts DC for the pumps integral solenoid. You must use the correct pump solenoid in order for the pump to operate properly.

**D-** The **4-20** ma input gets hooked into the control loop. You must observe the proper polarity in order for the controller to work properly and to protect it from damage. If you connect the 4-20 input to a current source of greater magnitude you may damage the A/D converter in the system so pay attention the maximum current in the loop.

**E-** The **Switch** terminal connects the control switch to the system. If the **Run** terminal (blue wire) and the **Common** terminal (black) are connected, the system reads 4-20 ma. If the **Jog** (yellow) and the **Common** (black) are connected, the system will run the pump at the average of the high and low speeds programmed. Never connect all three wires together; you wont hurt anything but you will confuse the processor and the system wont function properly. You can disconnect the unit’s switch and connect any dry contact set that can function as a SPDT switch. So relays, switches and even PLCs are possible as control devices.

**F-** The **110 VAC** input is the only way to power the standard unit (220 vVAC and 12 VDC versions are available by specifying) Just make sure the connections are neat and that for safety reasons no conductor is exposed . This is the only location on the circuit board where more than 12 volts is present.



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