# Picomotor drivers

**How do the Picomotor drivers work?**
Our drivers generate the 120-V waveforms required to drive the piezo in the Picomotor. These drivers alter the direction of the screw rotation by changing the rise and fall times of an electrical pulse. Due to inertia, the screw doesn't turn during fast rise or fall times. During slow rise or fall times, the screw rotates. Therefore, a pulse with a fast rise time and slow fall time results in a counterclockwise rotation, while one with a slow rise time and fast fall time results in a clockwise rotation. In order to avoid applying a reverse bias that would damage the piezo, the waveform is offset by 120 V when going in one of the two directions.

**What do the driving pulses look like from the Picomotor controllers?**
For the Model 8732 multi-axis driver, the maximum pulse rate is 1.5 kHz with an amplitude of 120 V. Most of the frequency content, however, is below 50 kHz. The total pulse width is 500 µs. The rising edge is 15 µs and the 120-V plateau is 200 µs in duration. The falling edge, therefore, is 285 µs in duration. For the Model 8801 economical multi-axis driver, the characteristics are similar, except that the maximum pulse rate is 1 kHz and there is some 1 MHz ringing on the plateau just following the rising edge.

**Can I use a computer to control the Picomotors?**
Yes, the Picomotors can be controlled either through an RS-232 or a GPIB interface using the Model 8732 driver. (LabVIEW programs are available for the Model #8732. Please contact Technical Support for more information.) There are only two necessary instructions: the direction and the number of "steps" to take. Alternatively, you could use a Model 8620 control pad to control the driver. The Model 8701 and 8801 drivers can be controlled by the manual control pad, or through either analog or digital TTL-level signals.

**When the Picomotor is biased at 120 V is there any extraneous movement, when you are changing channels or directions, as the 120-V offset in the driver waveform is discharged?**
With the Model 8732 multi-axis driver, there is no movement either when changing channels or when changing directions. However, with the Model 8801 economical multi-axis driver and the Model 8701

single-axis driver, there will be minimal movement because the bleed off is slow and the piezo is decoupled from the screw. At most, you will see two steps worth, or about 50 nm. If you're concerned about this, a simple solution is to approach the position from the "dir=low" direction so that the bias is at 0 V. Or, you can send two additional "compensating" steps to the driver when changing directions.

**What happens if I apply a negative voltage to the Picomotor?**

Any negative bias or reverse bias will depole the piezo. The Picomotor controllers manufactured by New Focus always provide a positive bias. In order to provide the ability to have the falling edge of the pulse first, the waveform is offset by 120 V. Once the piezo is depoled, its efficiency is greatly reduced. The device can be repaired, but it is considered a non-warranty repair.

**What's the maximum length of cable that I can have between the driver and a micrometer replacement actuator?**

The cable for the micrometer replacement actuator (MRA) is a 4-wire telephone cable with approximately 28-gauge wire. With this small-diameter wire, the maximum length of the cable is about 25 feet or 7.6 meters. Beyond this length, the Picomotor will not function properly because the resistance in the wire significantly distorts the high-voltage waveform that drives the piezo. You can cut and splice cables to make a longer one. Keep in mind that each MRA only uses two of the four wires: the yellow and green wires. The red and black wires are not connected. Note: if you use a thicker wire such as a 20-gauge wire, it is possible to extend the micrometer-replacement actuator cable to 100 ft.

**What's the voltage and current draw for the Model 830X MRA running at 1 kHz?**

For all drivers, the maximum voltage draw is 120 V and the peak current draw is 1.25 A. For the Model 8701 and 8801 drivers, the average current draw is 25 mA. For the Model 8732 driver, with its higher maximum speed of 1.5 kHz, the average current draw is 37.5 mA.

**How much electromagnetic interference can I expect from the Picomotor?**

Electrically, you can model the Picomotor as a capacitor at the end of a cable. Because the power and return lines are physically close to one another, the electromagnetic loop is quite small; so EMI effects will be minimal. You can minimize the effects by keeping the wiring away from electromagnetically sensitive devices.

Please send questions about these products to
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