**VXM Stepping Motor Controller**

**Application Note # AN109**

**Coil Winding with VXM-1-1, VXM-3, VXM-4**

Two VXM controllers in a bussed configuration (VXM1-1, VXM-3, VXM-4) have the capability to do highly coordinated motion. An application for winding wire or filament on a spool requires speed/start/stop coordination between spool RPM and traverse speed.

Using the send data to Slave command ([command,...]) and program associate command (PMAx) the VXM can start two motors simultaneously running at different speeds. Refer to Appendix G in the VXM User’s Manual for more information.

With the U65 and U66 commands (Master Stop/Kill Slave*) it is possible to accomplish a coordinated stop over long distances and time without calculating distances at speeds to exact ratios.

**Master Stop Slave Commands**

**U65**
Decelerate motor on Slave to a stop.
Memory usage = 2 bytes.

**U66**
Kill operation on Slave. This command will immediately interrupt any running program. The user outputs will be reset, all looping and hold flags will be reset, and if a motor is moving it will be stopped immediately. If the motor speed is above 1000 steps/sec. when the interrupt occurs, the motor may lose position due to mechanical overshoot.
Memory usage = 2 bytes.

**Materials Needed:**
1. Motor driven linear traverse for wire guiding
2. Constant tensioner for wire and wire guide arm
3. Step motor with gear reduction for spool rotation

*NEW COMMANDS: available only on VXM firmware versions 1.36 & up,

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Gear motor distance/speed is determined by these formulas:

- \( \text{Rev/sec} = \frac{\text{Steps/sec}}{(400 \times \text{gear ratio})} \)
- \( \text{Steps/sec} = \frac{\text{Rev/sec} \times (400 \times \text{gear ratio})}{\text{Steps/sec}} \)
- \( \text{Steps} = \frac{\text{Revolutions}}{(400 \times \text{gear ratio})} \)
- \( \text{Revolutions} = \frac{\text{Steps} \times (400 \times \text{gear ratio})}{\text{Steps/sec}} \)

Refer to “Units & Directions” in the VXM User’s Manual for information on linear traverse units.

The example below assumes the winding motor is motor 3 (gear motor rotating spool.)

<table>
<thead>
<tr>
<th>Example #1</th>
<th>Motors run</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mtr 1 Traverse Coordinated to Mtr 3 Rotation</td>
<td>2</td>
<td>Motors 1 and 3 start/run/stop same time Traverse stops Rotation at end</td>
</tr>
</tbody>
</table>

```plaintext
E
PMA0, ;Set Program Associate Master/Slave to program 0 PM-0, ;Select and clear program 0 (Traverse) A1M5,S1M3000, ;set Acceleration and Speed (Traverse) LM0, ;set Loop Marker here I1M6000, ;Traverse Positive 6000 steps LA-10, ;Run out and back 10x U65, ;Decelerate Mtr 3 (Rotation) to a stop ;Next is Accel, Speed and a negative Continuous run on Mtr 3 [PM-0,A1M5,S1M800,LM0,U77,I1M-16000000,L0,]
```

The example below assumes the winding motor is motor 1

<table>
<thead>
<tr>
<th>Example #2</th>
<th>Motors run</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mtr 3 Traverse Coordinated to Mtr 1 Rotation</td>
<td>2</td>
<td>Motors 1 and 3 start/run/stop same time Rotation stops Traverse at end</td>
</tr>
</tbody>
</table>

```plaintext
E
PMA0, ;Set Program Associate Master/Slave to program 0 PM-0, ;Select and clear program 0 (Rotation) A1M5,S1M800, ;set Acceleration and Speed (Rotation) I1M-15000000, ;Rotate Negative 15000000 steps U65, ;Decelerate Mtr 3 (Traverse) to a stop ;Next is Accel, Speed and Alternating Continuous Traverse [PM-0,A1M5,S1M3000,LM0,I1M6000,I1M-6000,L0,]
```