ADVANCED MOTION CONTROLS

Commutation Phasing Worksheet

Introduction

This Application Note may be used to determine the correct drive commutation sequence for your brushless motor. Use this worksheet if the manufacturer's commutation sequence diagram is available. If the diagram is not provided, determine the proper motor phasing in accordance with the instructions given in the Analog Product Family Hardware Installation Manual.

Note: The manufacturer's commutation sequence diagram may not represent the actual phasing sequence of your motor. If this is the case, this procedure will not work properly for your application. Please contact the motor manufacturer for confirmation.

Procedure

1. On the manufacturer's commutation sequence chart, locate the motor phase waveform that peaks at hall state 1-0-0.
2. Based on the above waveform, place the letter corresponding to the high volt phase next to Drive Phase C in Figure 1.
3. Place the letter corresponding to the low volt phase on the above waveform next to Drive Phase A in Figure 1.
4. Place the letter corresponding to the remaining phase next to Drive Phase B in Figure 1.
5. On the manufacturer's commutation sequence chart, locate the motor phase waveform that peaks at hall state 0-1-0.
6. Compare the high volt phase indicated on the 0-1-0 waveform to the phase corresponding to Drive Phase A in Figure 1. If these do not match, switch the motor phases corresponding to Drive Phases A and C in Figure 1.
7. Connect the motor phase wires to your Advanced Motion Controls drive as indicated in Figure 1.

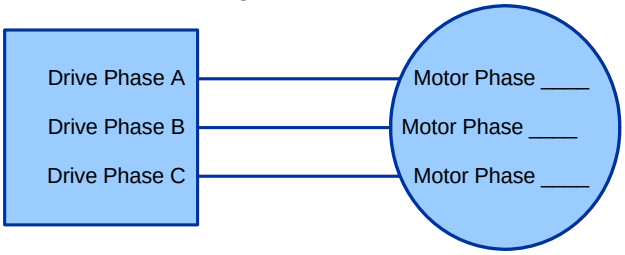

Figure 1: Phasing of Motor Windings

If it is desired to change the direction of motion, proceed as follows:

- Interchange Hall 1 and Hall 3
- Interchange Motor A and Motor B

If the motor runs rough, vibrates heavily, runs faster in one direction than another, or does not run at all, then determine the correct phasing by proceeding through all six possible motor phasing combinations in accordance with the instructions given in the Installation Manual.

Example

For this example, refer to Figure 2 for motor phasing information. Note that in Figure 2, Hall Sensors are labeled S1, S2, and S3, and motor phases are Motor A, Motor B, and Motor C. The back EMF labels V_{xy} refer to the voltage level of motor phase x with respect to motor phase y. Therefore, when V_{ab} is at a peak value, phase A is high and phase B is low.

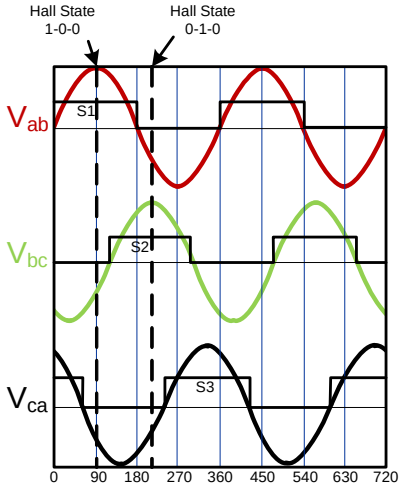

Figure 2: Sample Back EMF and Hall State Motor Phasing Diagram

It can be seen in Figure 1 that for the hall state 1-0-0, V_{ab} is at its peak. Thus, phase A is high, and phase B is low. Place motor phase B next to drive phase A, and motor phase A next to drive phase C. The remaining phase, motor phase C is placed next to drive phase B. According to the sample diagram in Figure 2, for hall state 0-1-0, V_{bc} is at its peak, therefore phase B is high, and phase C is low. Since phase B is the motor phase, which corresponds, to drive phase A, the combination has been confirmed. If motor phase B did not correspond to drive phase A, we would switch the motor phases which correspond to drive phases A and C.