



## Servo Motor Questions and Answers

### QUESTIONS

1. How do I check the quality of the permanent magnets in a permanent magnet brushless (PMBL) servo motor?
2. How do I back drive a PMBL servo motor?
3. How do I determine the forward armature direction of the PMBL motor?
4. How do I determine the number of poles in a PMBL motor?
5. How do I identify the feedback device used in a PMBL servo motor?
6. How do I check and set alignment of a PMBL servo motor?
7. Where do I find armature and feedback connector pin assignments for specific motors I have received for repair?
8. Does my servo motor repair shop need to keep any documentation?
9. What information should my documentation system contain?

**QUESTIONS REPEATED FOLLOWED BY ANSWERS**

1. Question - How do I check the quality of the permanent magnets in a permanent magnet brushless (PMBL) servo motor?

Answer - Back driving a motor and observing the back generated armature voltage on an oscilloscope is a practical method for most shops to use. This procedure will check both the permanent magnet strength and the integrity of the magnetic flux distribution across the magnet.

2. Question - How do I back drive a PMBL servo motor?

Answer – Equipment solutions for back driving motors range from simple to quite elaborate. Generally a variable speed drive that allows speed adjustment up to at least 1,000 RPM is necessary. Some method of coupling the drive motor shaft to the motor under test is required. Couplings can range from duct tape, to hoses and clamps, to commercial quality motor couplings. The size of motors to be tested, the number of tests to be performed dynamically (while back driving), the number of technicians to be using the system, appearance, and many other considerations will be involved in deciding on your particular design.

3. Question - How do I determine the forward armature direction of the PMBL motor?

Answer – There are several methods, but the simplest is a sequential lockup method in which a lockup voltage is first applied positive to the U phase and negative to the V phase. The negative voltage is then moved to the W phase to make the motor jog in the forward direction. (See the Mitsubishi alignment example in the application note AN5000-PD02)

4. Question - How do I determine the number of poles in a PMBL motor?

Answer – Again there are several methods, but locking the rotor with a small lockup voltage and counting the number of distinct lockup positions in one revolution of the rotor is quick and easy. The number of pole pairs is equal to the number of lockup positions. (See the application note AN5000-PD02).

5. Question - How do I identify the feedback device used in a PMBL servo motor?

Answer – There is not a simple answer to this question. Identification ranges from easy to difficult depending upon the feedback device, and you can expect training courses will spend time on this topic. The user manuals for Mitchell Electronics, Inc. test equipment will contain information helpful in this regard. Information from the motor manufacturer (or manufacturer of the machine on which the motor is used) may be helpful. Experience and good shop documentation will be most helpful in the long run.



6. Question - How do I check and set alignment of a PMBL servo motor?

Answer – This is a crucial topic in PMBL servo motor repair and will be covered extensively in any good quality servo motor repair training course. For an introduction to the topic, please read AN5000-PD01 and AN5000-PD02 available at <http://www.mitchell-electronics.com/technicalinfo.html> .

7. Question - Where do I find armature and feedback connector pin assignments for specific motors that I have received for repair?

Answer – This can be a difficult task in some cases, but it is necessary in order to perform tests on the motor and feedback. Sources of information include: Mitchell Electronics, Inc. test equipment user manuals, motor manufacturer documentation, documentation from the manufacturer of the machine on which the motor is used, etc. Often this kind of information will be available from good quality servo motor training courses.

8. Question - Does my servo motor repair shop need to keep any documentation?

Answer – Due to the technical nature of the PMBL motors and feedback devices, good shop documentation on the various motors serviced is essential. Much technician time will be saved and mistakes avoided by referring to well prepared shop documentation whenever specific motors are encountered again for repair.

9. Question - What information should my documentation system contain?

Answer – Requirements may vary with your specific situation, and good training classes will spend time and provide examples on this important topic. Some of the necessary information would include: motor model number and identifying information, feedback model number and identifying information, feedback type and details, feedback forward direction, motor and feedback connector pin designations, armature forward direction, armature generated voltage at 1,000 RPM, static and/or dynamic feedback alignment information and notes, and other notes deemed important by the technician or management.