

# **Stepper Motor Vibration Noise Measurement Using Agilent USB Data Acquisition**

Application Note



**Agilent Technologies**

## Introduction

Various office automation (OA) devices are used in the office, including scanners, printers and fax machines.

The stepper motor is essential in the operation of such equipment. The downside of having the stepper motor, however, is the humming generated during its operation, which ultimately contributes to environmental noise in the office.

For this reason, the manufacturer of the stepper motor needs to evaluate and identify the magnitude of vibration. This is necessary for product improvement as well as market acceptance and recognition.

This application note describes the measurement of the stepper motor vibration noise using the Agilent USB DAQ.

## Test Measurement Setup

A simple test setup is sufficient to measure the vibration magnitude of the stepper motor at different frequencies. Refer to Figure 1 for the test setup. The devices needed in the test setup are as follows:

- High sampling USB DAQ
- Vibration sensor

This setup would allow the data acquisition process to be faster, simpler, and more efficient.

The stepper motor is driven by frequency input in a specific range, for example 50 Hz to 20 kHz. This depends on the stepper motor's characteristics. The stepper motor will rotate, producing difference magnitude of vibration.

The vibration produced from the motor will be input to the DAQ through the vibration sensor that is attached to the motor body.

In this test setup, the vibration magnitudes at specified frequencies are characterized. Figure 2 shows an example of the graph of the characterized data.

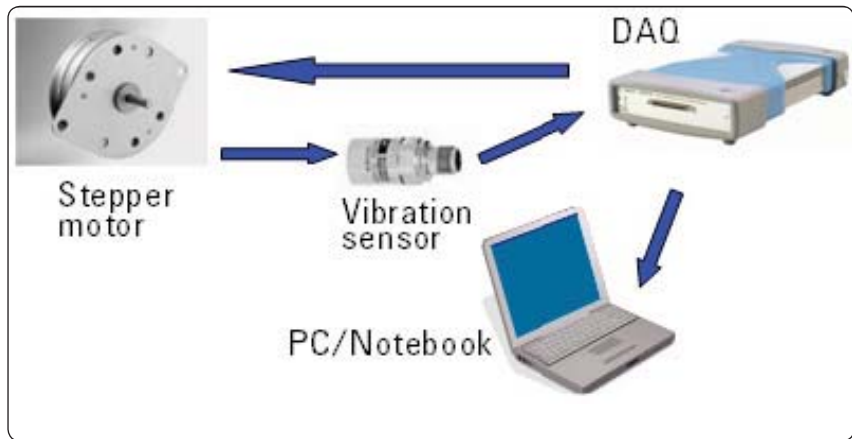


Figure 1. Vibration measurement using USB DAQ device

From Figure 2, it is obvious that the vibration noise of the stepper motor reaches its peak at certain frequencies.

This characteristics data will be very useful for motor manufacturer in knowing how their products perform at difference frequencies. The manufacturer of OA equipment can recalibrate the design of the stepper motor at the specific frequency range. This will help to reduce the vibration noise level as much as possible.

## Conclusion

With the obtained vibration noise data using the USB DAQ, the response characteristic can be observed by the stepper-motor manufacturers. This will lead to further improvement in the motor structure and efficiency.

The motor manufacturers can identify the motor vibration at specific frequencies and difference positions in the scanner during the design stage. This will help them to minimize the vibration noise level.

Agilent USB DAQ is cost-effective and simple to operate.

## Related Agilent Literature

- *System Developer Guide-Using USB in the Test and Measurement Environment* Application Note, literature number 1465-12

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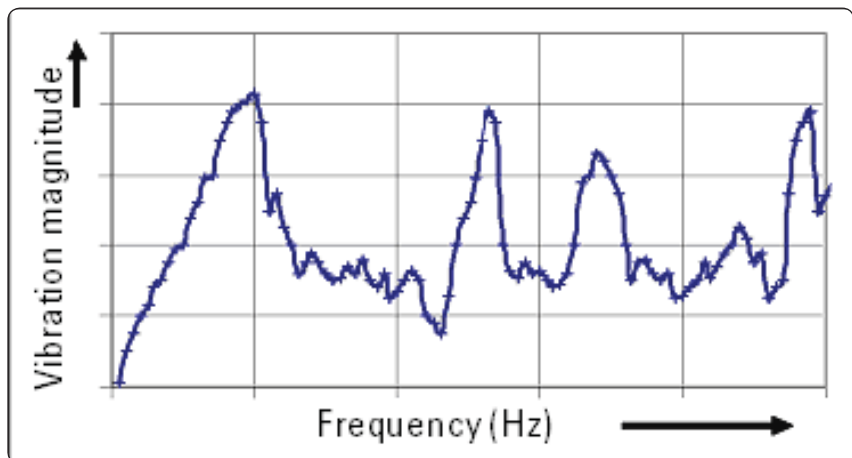


Figure 2. Vibration magnitude characteristic vs driving frequency graph



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