Agilent
Mobile Phone Keypad Test using Agilent USB Data Acquisition Device
Application Note

Agilent Technologies

Introduction

Mobile phones have been an essential gadget for the past few years, with users of all ages. In an attempt to attract costumers, mobile phone manufacturers have reduced the size of mobile phones tremendously and this leads to smaller numeric keypads.

These numeric keypads are tested to ensure their ease of use. One important measurement is the force on the keypad. In order to meet the force specification, the force should be low enough for use but not so low that it allows accidental activation of the keyboard.

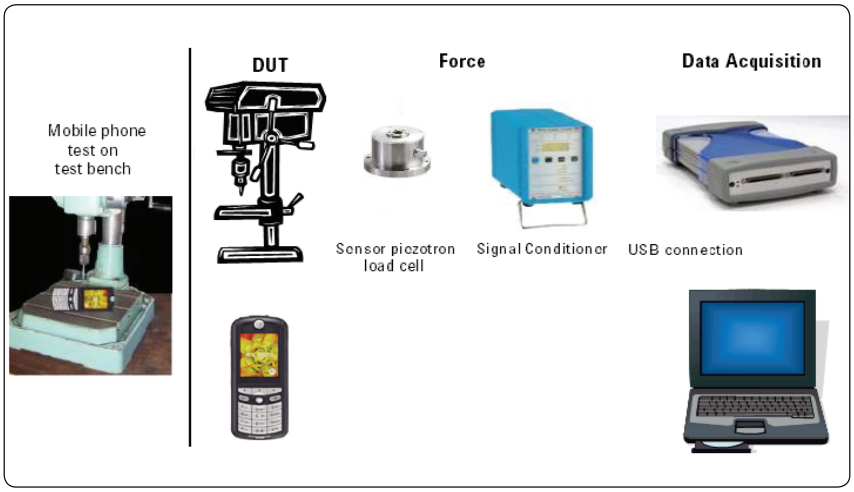

Figure 1. Keypad test system

Keypad Test

A basic keypad test system consists of a universal test machine. It is equipped with a low-capacity force sensor fixed on the test arm. In addition, a T- slot table is used to support the phone or keypad module. In this test, the prong will simulate the motion that occurs when a mobile phone user presses a button on the keypad. During this test, the load profile and displacement characteristic of the keypad are monitored.

For more detailed information, the test system can include electrical contact measurement. This test result would then provide precise measurement for the switch closure position and force. A system with high data-logging capability is recommended. This enables you to observe rapid changes in force, which may occur at very small distances between switch closures.

An example of the keypad test system is illustrated in Figure 1.

In this setup, the device under test (DUT) is the mobile phone. The force sensor is used to measure the force that is used to press the button on the keypad. The force sensor converts this measured force to a voltage output and sends it to the signal conditioner. The signal conditioner amplifies the voltage and filters out any unnecessary noise. The filtered signal is sent to a data-acquisition (DAQ) device for more accurate measurements. The DAQ device then collects this data and sends the data to PC for display and post processing.

An example of a force sensor is the piezoelectric force sensor. Force, like any other type of physical phenomenon measurement, cannot be measured without disturbing the measurement. Most force sensors have elastic sensing components whose deformation is the basis for measuring the acting force. The elastic sensing component must be sensitive and able to endure sufficient deformation.

Large deformation is undesirable because it limits the frequency of system response and because it introduces geometric changes into the force-measuring path. Examples of such errors are linearity and hysteresis. In piezoelectric force transducers, the sensing part is the same as the transduction part, which produces electrical output from an acting force. Therefore, measurement of the deformation is not necessary because it is much smaller when used with other measuring systems.

The geometric disturbance caused by the test is reduced by the high rigidity of piezoelectric force sensors. The high rigidity also provides high natural frequency and rise time. This allows measurement of shock waves in solids, as well as impact-printer and punch-press force.

The force sensor is attached to the test arm. Only the downward force is measured, as this simulates the pressing of the keypad. The force sensor converts this force to a corresponding DC voltage output.

The actual force measured can be easily calculated. If the sensitivity of the force sensor is 20 mV/N and the amplification of the signal conditioner is 10 times, this gives an actual measured reading of 100 mV and actual force of 0.5 N.

This type of test system is well suited for monitoring data over a long period of time. Hence, the PC is an ideal data-collection point in this test system because it comes with relatively deep memory storage.

The Agilent USB DAQ device ensures low switching cost because modern PCs come standard with USB ports. The plug- and- play feature of the USB connectivity simplifies setup and increases the DAQ device's functionality.

Conclusion

There is a need for a test system that is able to acquire and store a lot of data. Ease of use and low switching cost can make it less expensive to develop mobile phones and enable more competitive pricing for consumers. This will then help to offer a more competitive pricing for customers. The Agilent USB DAQ device with its interface to PC, poses itself as the ideal solution to the above testing needs.

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