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SECTION I
GENERAL INFORMATION

1.1 INTRODUCTION

This section contains general information about the Model 4501A Particle Impact Noise Detection System. The system is composed of three instruments: a component shaker, a monitor oscilloscope, and the programmable controller shown in Figure 1.1. Throughout this manual the entire system will be referred to as the 4501A. Individual instruments will be referred to by common name—shaker, oscilloscope, and controller.

1.2 SYSTEM PURPOSE

The 4501A has been designed to detect loose particles in electronic components such as integrated circuits, hybrid circuits, transistors, relays, and switches. The controller is programmable to provide speedy and precise automatic testing in accordance with MIL-STD-883C Method 2020 for hybrids and MIL-STD 750C Method 2052. With the pressing of a single button, this unique, microprocessor-based system will automatically step through any specific shock and vibration sequence previously entered by keyboard programming. The shaker armature displacement is precisely controlled to impart programmed pre-test shocks and co-test shocks, plus vibrations at programmed frequencies, to the component under test. The oscilloscope visually displays impact signals emanating from a test component.

Actual testing requires mounting a test component onto the acoustic emission detection transducer (Impact Sensor) secured to the shaker armature. The shaker is then driven through a series of mechanical shocks and vibrations by the programmable controller. The shocks are performed to free any particles held inside the case of the device either mechanically or electrostatically. During vibration, if a free particle impacts some interior portion of the device, the resultant stress wave will be detected by the transducer. If the ensuing peak electrical signal exceeds a preset threshold, the part is considered failed and is so indicated by the FAIL lamp.

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The system can be used on single components or entire assemblies. Particles with masses of 0.000001 grams and diameters of less than 0.001 inches can be detected at accelerations as low as 2 g's at 40 hertz.

After a test sequence program has been selected and entered into the controller, high speed testing of identical components is easy. Simply mount a component to be tested on the shaker transducer and press the START pushbutton on the controller. Detection of a faulty component will illuminate the FAIL IMPACT INDICATOR lamp and will stop the test if programmed to do so.

1.3 SYSTEM FEATURES

The basic features of the Model 4501A Particle Impact Noise Detection System are described as follows:

* A flexible microprocessor-based controller with simple keyboard entry of all test parameters.
* A specially designed shaker to shock and vibrate the device under test.
* An oscilloscope for visual monitoring of signals created by loose particle impacts.
* A speaker for audio monitoring of signals created by loose particle impacts.
* Intensified oscilloscope display during threshold detector output.
* An indicator lamp that lights each time a particle impact is detected.
* An indicator lamp that lights and remains lit after a particle impact signal exceeds the failure threshold level.
* Numerical display of measured shock and vibration amplitudes.
* Numerical display of programmed frequency and other test parameters.
* Automatic frequency calculation from test package cavity height per MIL-STD 883C Method 2020 requirements.
* Abort function will stop the test on the first detection of a particle impact.
* Keyboard lock with a fixed, code number program entry key prevents inadvertent alteration of the test program.
* Test sequence program maintained in memory by battery power during primary power failure or equipment power off.
* Overriding manual operation when desired.
* Super low noise level for detecting micro-particles.
* Simplified Sensitivity Test Unit (STU) checkout method that meets MIL-STD 883C Method 2020 and MIL-STD 750C Method 2052.

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* RFI suppression and power supply isolation.
* Provision for optional foot pedal operation.

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