

# **DESIGN AND DEVELOPMENT OF A SMALL SATELLITE TESTING BOARD**

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## Abstract

This paper presents the work done in building a test board to test the individual subsystems of the small satellite VIKSAT1 currently being developed at Cleveland State University. The various subsystems of the satellite include the C&DH (command and data handler), the heart of the satellite, which controls and coordinates the subsystems, and requests information about the states of the subsystems. The SPI (serial peripheral interface) protocol is used for the transfer of information within the satellite. The Test board is required, to test the subsystems functionality in the standalone mode, before assembling them on the satellite.

The test circuit uses a Microchip PIC16F877 microcontroller to simulate the C&DH by sending the same set of commands to the subsystem connected to the test board, which the C&DH would send during the actual operation of the satellite. The response from the subsystem is recorded by the test board, relayed to a PC, and verified to check whether the subsystem is functioning correctly.

The PIC16F877 operates in the following two modes:

- 1) USART mode, used to communicate with the ground computer. In this mode the test board simulates the transfer of data from the C&DH to the ground computer.
- 2) SPI mode, used to simulate the information transfer environment in the satellite. The SPI mode allows 8 bit of data to be transmitted and received simultaneously.

The test board program is an assembly language program which can be modified to adapt the test board for each subsystem.

The subsystems that are tested with the Test Board include the Command and Data Handling System, Power Subsystem, Camera subsystem, Altitude control and Determination.

Future work: