

ABSTRACT FOR PROPOSED PAPER FOR THE 2001 MAPLD CONFERENCE

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TITLE:

***A RATIONALE AND ROAD MAP FOR STANDARDIZATION OF LOGIC ELEMENT
MANUFACTURER DATA PRESENTATION***

As a result of the failure of the Wide Field Infrared Explorer Instrument, (WIRE), shortly after orbit insertion, an internal failure review took place at SDL. The failure was traced to a Programmable Logic element that fired pyro-technic aperture cover release devices immediately upon power up of the circuitry, rather than after the spacecraft had initially stabilized. Full sun entered the instrument aperture causing high pressure boil off of the solid hydrogen cryogen in a few hours rather than the planned 4 month mission life. This device had an idiosyncrasy that would allow the outputs to come up momentarily in indeterminate states. This occurred only during initial power up after the device had been un-powered for over an hour. If the device was powered up multiple times within the space of an hour, the outputs would come up in the desired off state correctly each time. The test procedures used to test the circuitry in which this device played a primary logic role was not adequate to assure that this odd power up transient condition would be caught. This problem continued undetected all through Space Dynamics Laboratory, (SDL), box level tests, and was also undetected during spacecraft systems tests at Goddard Space Flight Center. The test methodology at GSFC was also flawed in that it didn't specifically test for this anomaly.

The conclusion of the internal review at SDL was that the test procedures at the box and system level were not adequately thought out and allowed the tests to be conducted in a way that did not precisely simulate the way the circuitry would be activated and used on-orbit. Therefore, the specific logic element can not be directly blamed for the failure. However, SDL reviewers also came to the conclusion after discussions with the manufacturer and deep delving into the manufacturer data that the idiosyncrasy was known to the manufacturer and should have been more easily and freely communicated to the element user community.

The purpose of this paper is to provide a rationale for a standardized format for reporting all performance parameters of logic elements including all known or reported anomalous operations or failures.

The paper will consist of three sections:

1. The WIRE experience and at least one other actual case will be cited to demonstrate the ambiguity in some manufacturer specifications and the resulting loss or near loss of hardware functionality.
2. A sample set of data specification forms using fictional data will be presented to demonstrate the needs of at least part of the user community.
3. A roadmap of actions by the user community will be shown which could lead to voluntary adoption of a standard by the manufacturer community.

The paper will not claim to have the only correct answer in terms of the form or format for reporting data, nor will it claim to have the only correct roadmap to motivate the manufacturers. Rather, the paper will be presented as a means of starting dialog in the user community and the manufacturer community that should lead to an acceptable standard format and adoption by the manufacturers.

The paper will be prepared and presented by SDL, but will have strong contributing authorship and review by several experts in the user community outside of SDL.