



Investigation of Sensing for DTE Power Via MDI

Jennifer Rasimas, Stephen Jackson

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Overview

- **A study of load detection through direct sensing by the LAN powering source.**
 - Scope of Study
 - Experimental Goals
 - Experiments
 - Suggested Operational Parameters
 - Implementation Strategy

Scope of Study

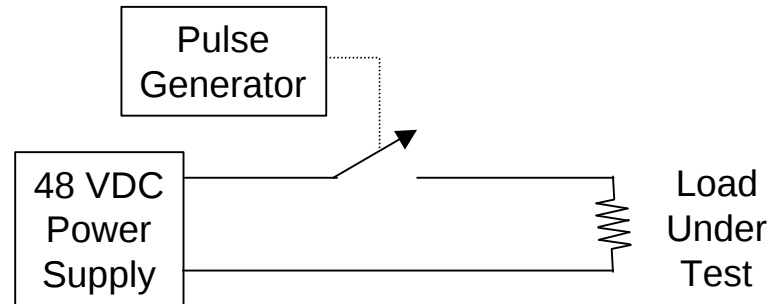
- **To investigate a means of remotely evaluating a LAN loop and attached equipment.**
 - Must safely determine the characteristics of LAN cabling and any remotely attached terminals.
 - Must not damage termination resistors and attached foreign equipment, or start fires.
 - Must lend itself to integration with an isolated power source.
- **Possible options for remote sensing:**
 - A current limited source requires very low current to not damage termination resistors, resulting in low signal to noise.
 - Power-limited sensing with short-duration pulses at a higher current, gives higher SNR and sensing accuracy.

Theory: Power-Limited sensing is the best solution.

Experimental Goals

- **To investigate the feasibility of using power limited pulse sensing.**
- **To determine the physical parameters for such a probing means:**
 - Define a power level that is safe and non-destructive for non powered LAN and other devices;
 - Determine the characteristics of the pulse for safe and accurate probing;
 - Study the effect of repetitive probe pulses.

Experiments



Goal: to find a pulse that will not damage or degrade termination resistors.

- 1). Worst case situation of “unlimited” source current, zero loop length, and minimum 49.9Ω 0805 termination resistor:
 - A $100\mu\text{s}$ pulse was determined to be safe, not damaging or degrading the characteristics of termination resistors;
 - Equivalent energy of this pulse is equal to 0.0046J .
- 2). Trials were performed on 20 different resistors for single and up to three consecutive $100\mu\text{s}$ pulses at a 50% duty cycle:
 - No change was seen in the value for any of the subject resistors.

Suggested Operational Parameters

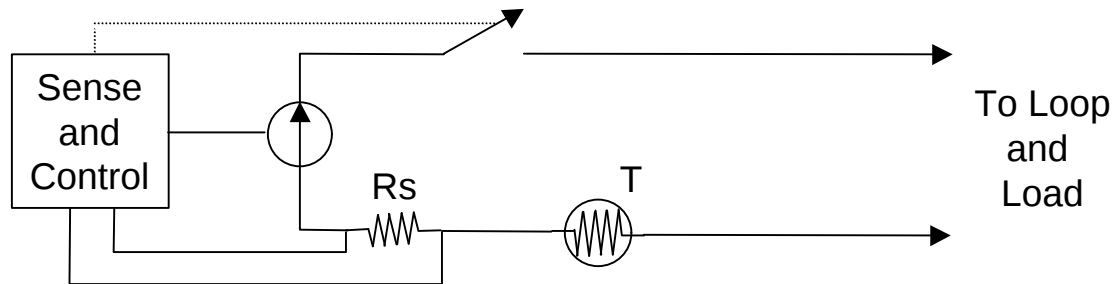
- **Detection Method**

- 100µs pulses from a current limited power supply.
- Periodically apply a limited series of polling pulses to evaluate the characteristics of the loop and any connected device.
- A sense circuit monitors the loop current for excessive draw (shorts, terminations) or under draw (no connect, opens, leakage).
- An algorithm determines that safe load conditions exist and switches on continuous power.

- **Associated Power Supply Attributes**

- Must continuously monitor load current and voltage output to be within the safe operating area.
- Immediately disconnects power if over or under current, or voltage, conditions are seen.
- Tied to algorithm so any fault restarts the sense polling process.

Implementation Strategy



- **Sensing easily integrates into power supply design.**
- **The key elements for power source and sensing are:**
 - Isolated current and voltage limited power supply;
 - Loop current sense resistor R_s ;
 - Sampling pulse and power control switch;
 - Voltage and current sensing monitor and algorithm controller;
 - Current limiting thermistor for fail safe power limiting.