



# **More Alternatives for Disconnection Detection (MADD)**

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## More Alternatives for Disconnection Detection (MADD)

- **What is the best way to detect when the DTE Power must be turned off following a disconnection of the UTP cable???**
- **Choices:**
  - Use the DC current sense method
  - Switch to a different method
  - Allow more than one method to be used
- **A simple proposal: let's allow more than one method**

## More Alternatives for Disconnection Detection (MADD)

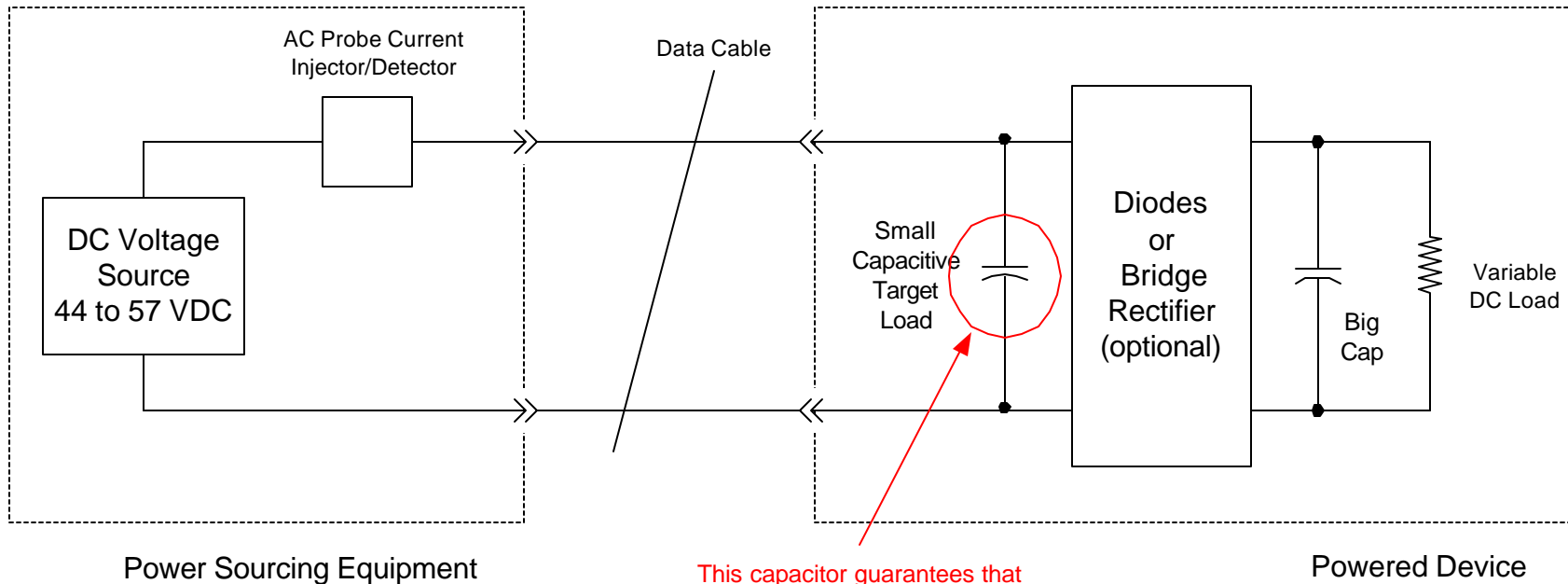
- **Disconnection method requirements:**
  - robust
  - guarantee that DTE power will be removed from the PSE output within “X” msec
  - PSE’s and PD’s must have a specified behavior to guarantee interoperability
- **The proposal is to allow any one, or any combination of the following types of behavior to signify a disconnection**
  - DC load current falls below a given level (5ma to 10ma range, same as before)
  - Ethernet link signal
    - provided that the DTE delivered power is on the same pair set as is used for the Ethernet link pulses
  - (new proposal) AC load current falls below a given level
  - other proposals?
- **How would this concept work?**
  - The PSE could implement any one or combination of the above methods
  - The PD must have compliant behavior to all of the allowed methods
    - As before, the PD must always maintain a minimum DC load
    - The PD must contain a device that establishes and maintains link (PHY, etc...)
    - The PD must contain a minimum AC load (if approved)

## MADD Summary

- **The 802.3af working group should agree to pursue alternative methods of detecting a disconnection**
- **We should agree to allow multiple methods pending demonstration on each proposed method of:**
  - technical feasibility
  - economic feasibility

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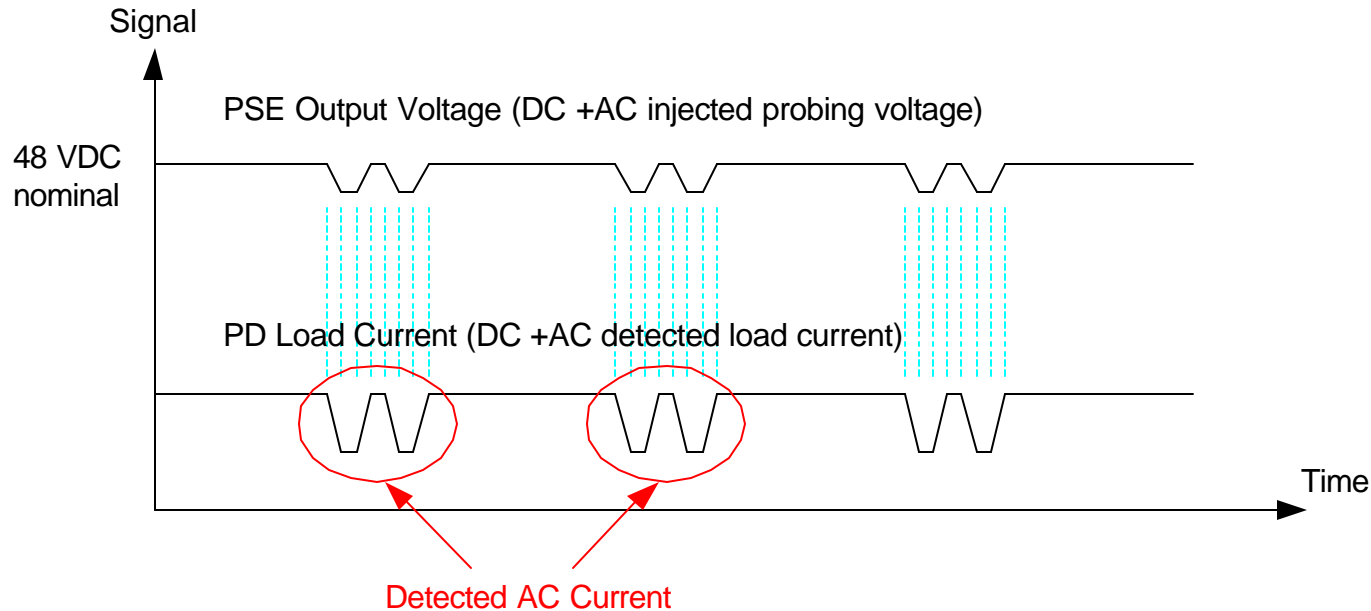
- Possible detection method using an AC minimum load
- The PSE
  - uses a low frequency, small amplitude AC EMF superimposed upon the DC output voltage, then detects the AC current
- The PD
  - contains a simple capacitor, for example 100nF at the PD input



This capacitor guarantees that there will be a minimum AC current in response to the AC probing signal. The DC current is ignored and independent from the AC signal.

## More Alternatives for Disconnection Detection (MADD)

- Possible PSE voltage and current waveforms

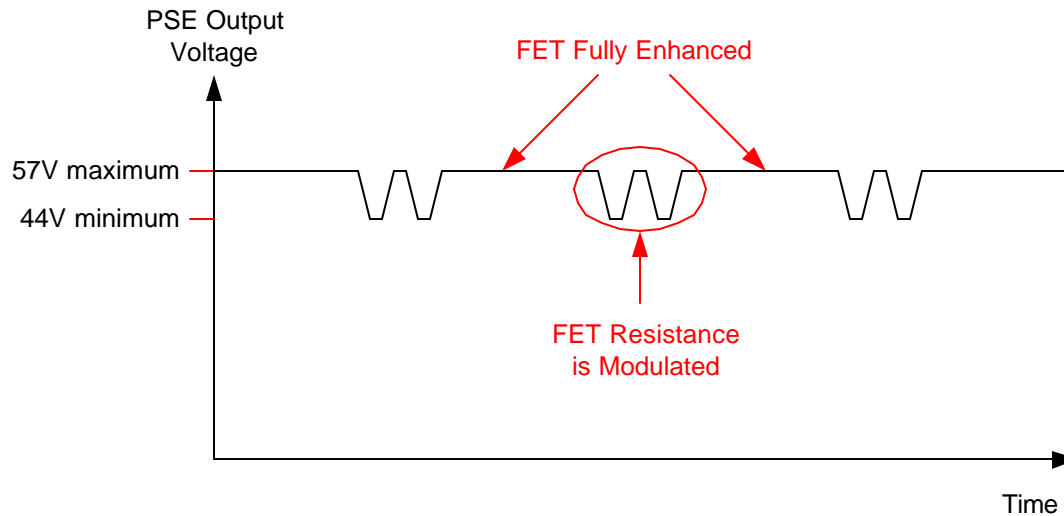
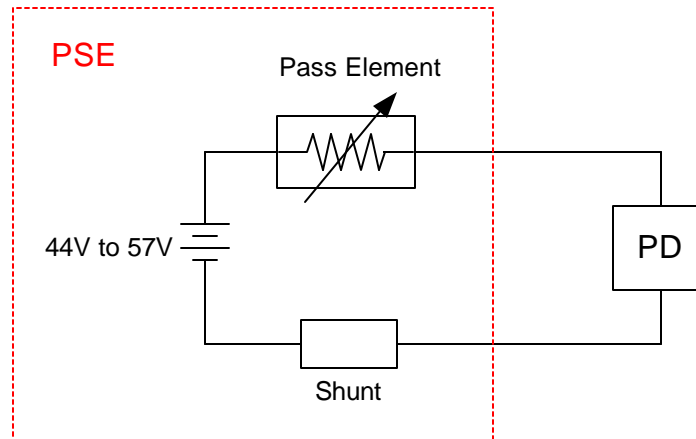


- **Advantages:**

- the PD remains simple
  - needs only one capacitor across the input which may be required for compliance anyway
- the PSE can easily distinguish between the minimum load capacitance and the cable capacitance
- the disconnect detection method is independent of the DC load current

## Concept of Creating and Measuring AC Probe Signal

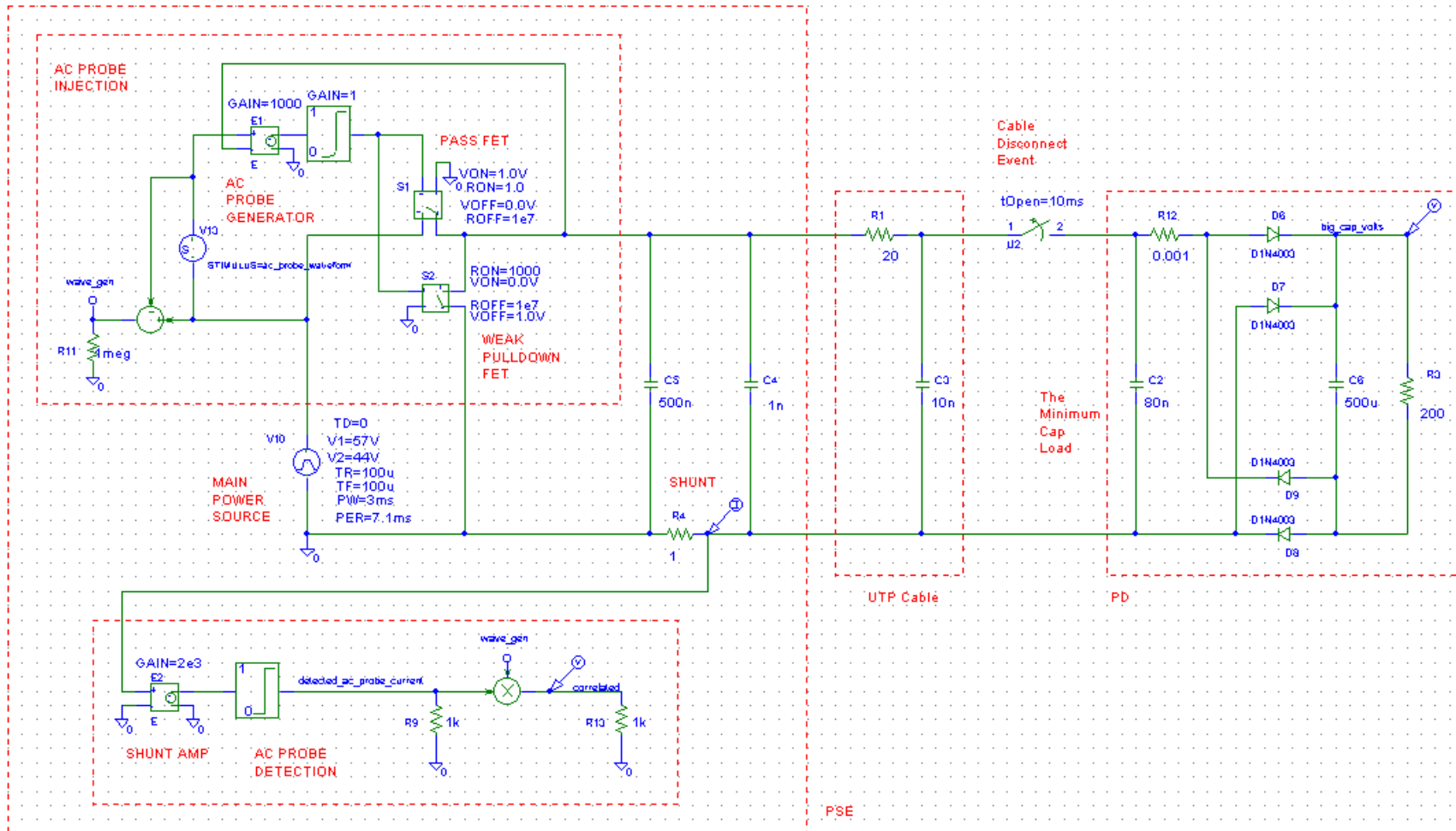
- Concept: create an AC signal by modulating the FET resistance (low freq, amplitude, duty cycle)
- Detect the AC current in the loop, can use synchronous detection



AC Probe Injection By Modulation of the Pass Element (FET)

# MADD, Simulations of Detection Using AC Current

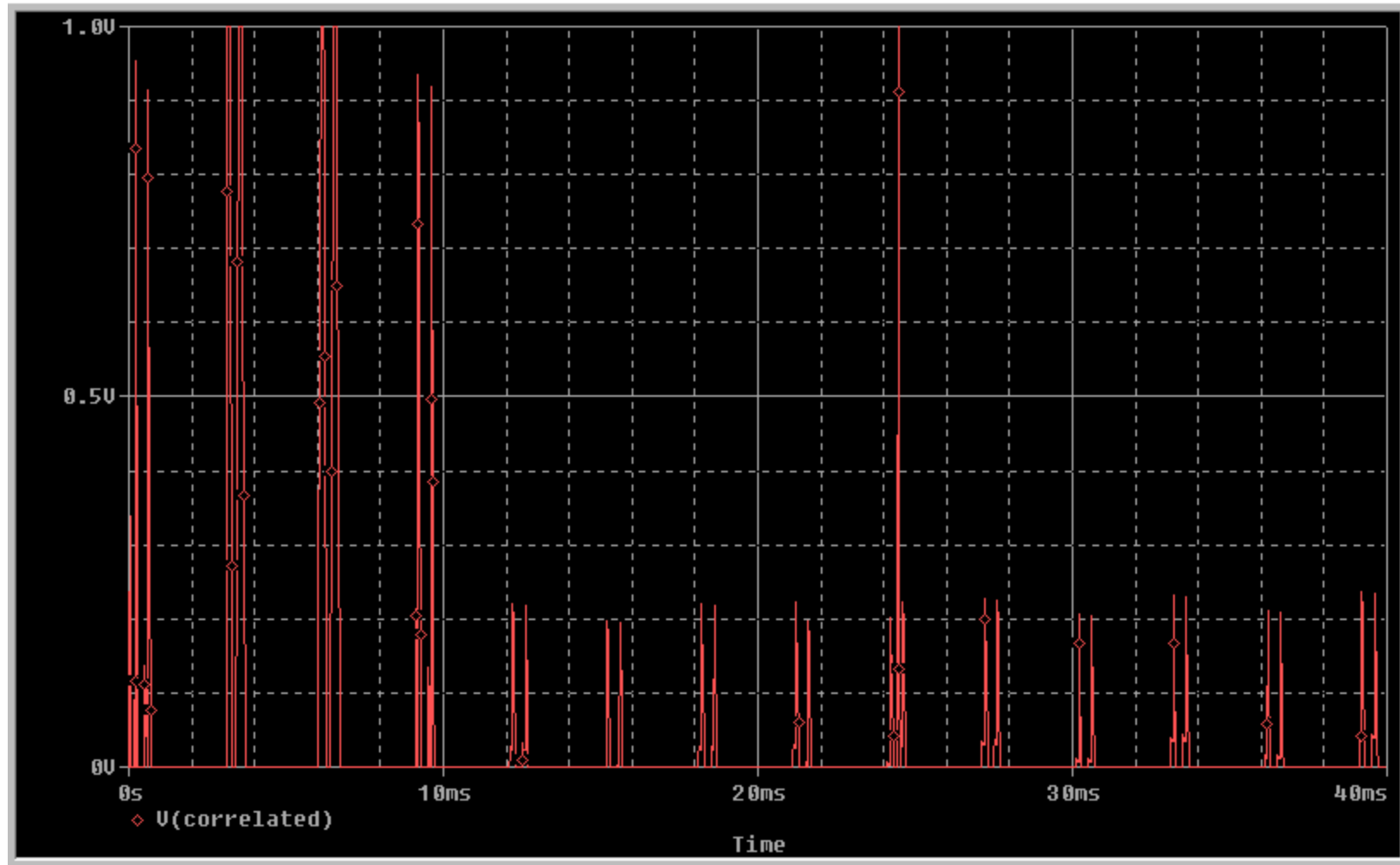
- Here is an example in Pspice of a system that detects the PD by using an AC current
- Stimulus is provided by modulating the FET On resistance in the PSE switch
  - the cable is unplugged at 10ms, a long cable is simulated
  - the PSE source is also changing from 44V to 57V and back every 7ms to demonstrate DC load independence





## MADD, Simulations of Detection Using AC Current

- Here is the correlated output of the detector, before filtering or manipulation, etc...
  - the cable is unplugged at 10ms, the detected current drops
  - note that most non-synchronous current is ignored



## MADD Conclusions

- **Alternative methods of detecting a disconnection can work**
- **Alternative methods of detecting a disconnection may be lower cost**
- **The PSE is free to choose its preferred method**
- **The PD must have the all of the required behavior, so the list of allowed methods must be small and low cost**
  - Minimum DC current - PD must draw more than say 5ma to 10ma
  - Ethernet link - PD may require a PHY, or equivalent
  - Minimum AC current - PD input would require say 80nF minimum