



IEEE 802.3af DTE Power via MDI Resistive Signature and Detection Protocol Follow-up

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With Acknowledgements to:

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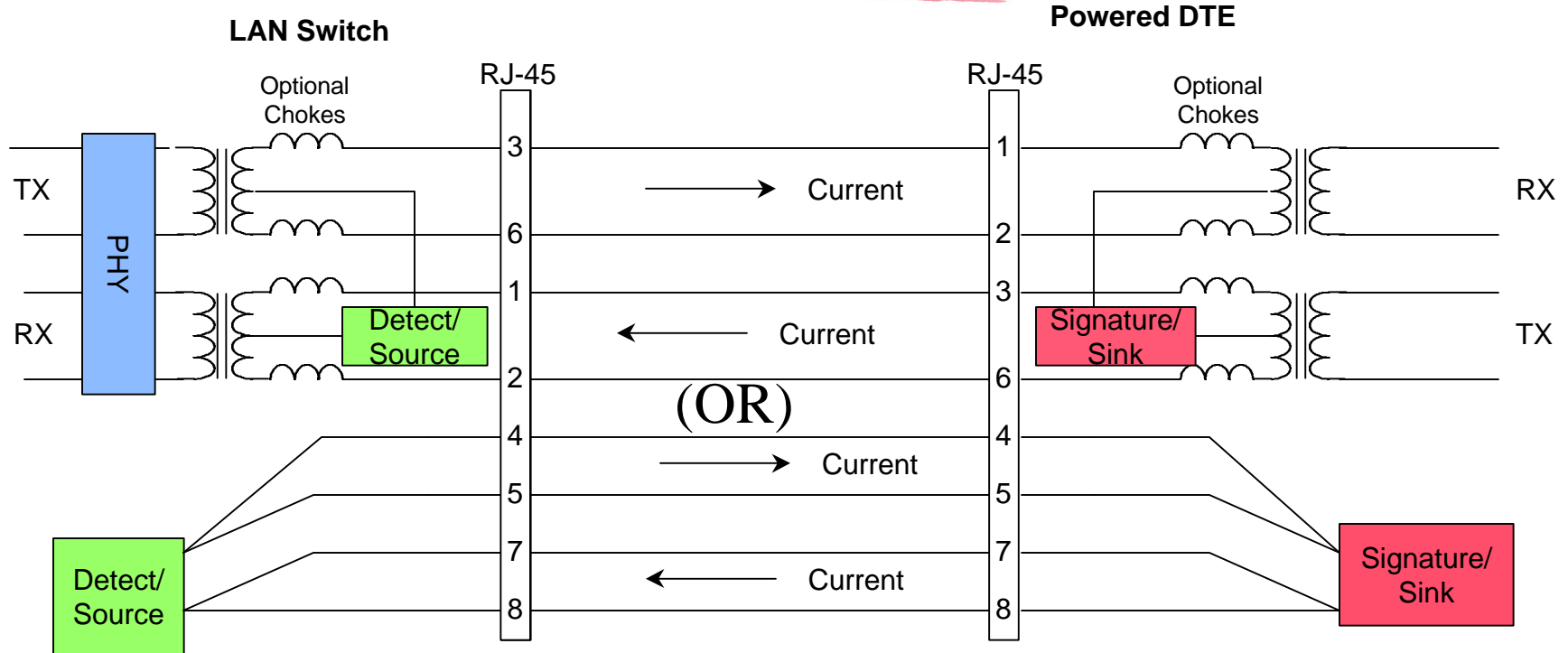


Detection and Signature Protocol Overview



- At the Source:
 - PROBE (low voltage and high resistance) for power-request signature from DTE.
 - APPLY full voltage (low resistance) after signature is detected.
 - REMOVE voltage when current becomes too high or too low.
- At the Load:
 - PRESENT power-request signature (high-resistance) while in off condition.
 - ACCEPT power at load resistance when full voltage is offered.
 - MAINTAIN appropriate current
- Between the Source and Load:
 - Limit Inrush Current

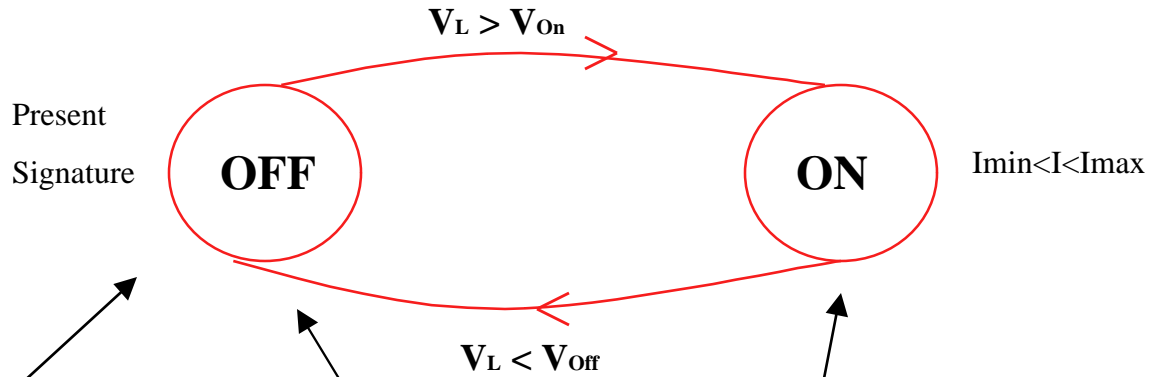
Common Mode, Direct Connect



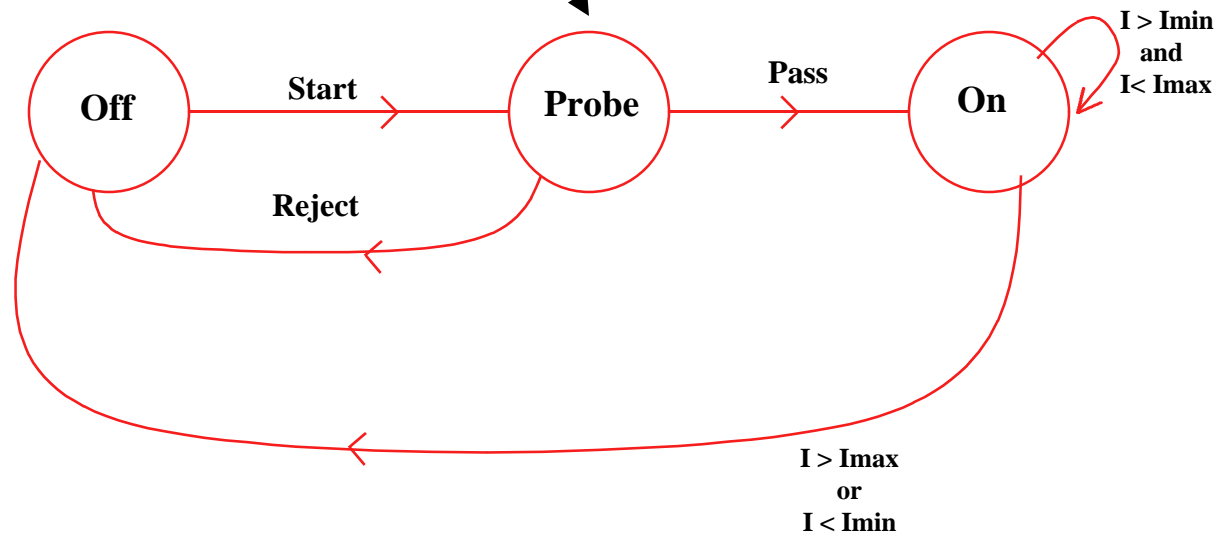
Protocol at DTE and Source



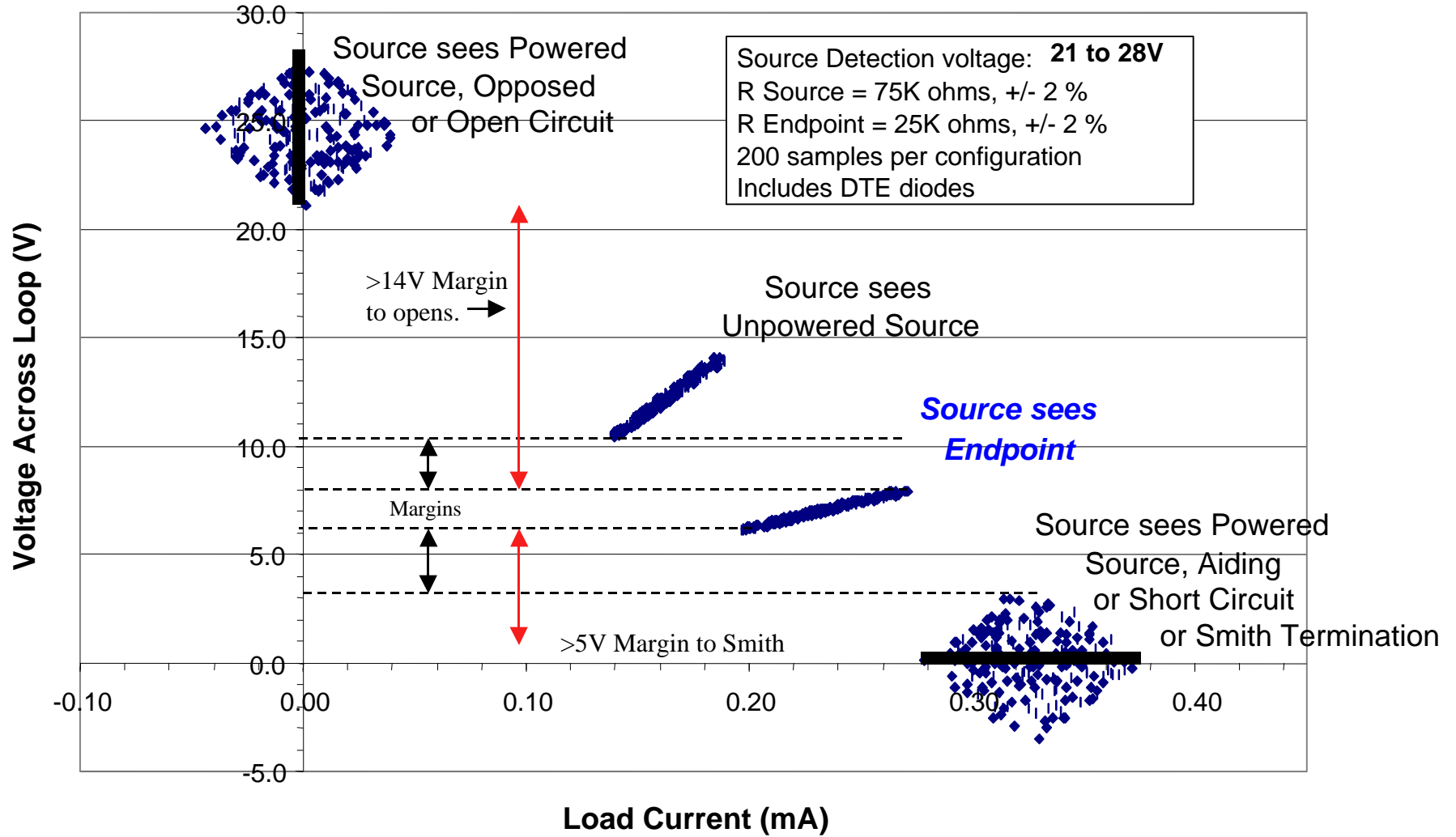
DTE:



Source:



Signature Margins



Hazard Matrix Experiment



An approximate 24.2V power supply with a 75K Ohm Series Resistor was applied to wires 4,5 and 7,8 and the resulting voltage across the pairs was measured and recorded. This was also done for wires 1,2 and 3,6. The following Hazard Matrix Table shows how the resulting margins under a variety of conditions compare to the margins illustrated in the previous Signature Margin Table. Most equipment clustered around the expected “Open” or “Short” circuit regions as expected.

Hazard Matrix



Condition: Make and Model	Status	1,2,3,6 Voltage (V)	4,5,7,8 Voltage (V)
Open Circuit:		24.200	24.200
Loop Back:		24.2 or 0.05	24.2 or 0.05
Full Short:		0.015	0.015
Partial Short:		0 or 24.2	0 or 24.2
Legacy:			
Compaq Netelligent 1108, 100BASE-TX Class II Repeater	ON	0.049	0.033
	OFF	0.049	0.033
Intel Express 510T Switch	ON	24.210	0.049
	OFF	24.180	0.049
Cisco Systems Fasthub 100 Series	ON	24.210	24.210
	OFF	24.180	24.180
3Com Superstack II Baseline 10/100 Switch	ON	24.180	0.049
	OFF	24.190	0.049
3Com Superstack II Switch 3300	ON	24.200	0.049
	OFF	24.190	0.049
3Com Fast Etherlink XL 10/100 Nic Card	ON	0.025	0.049
3Com Etherlink III PCMCIA 10BASE-T	OFF	0.049	0.048
Intel 8255x PCI 10/100 Ethernet Adapter	ON	0.049	0.049
3Com Etherlink III Bus-Master PCI Ethernet Adapter	ON	24.200	24.200
HP LaserJet 4MV Printer	ON	24.200	24.200
HP Ethernet Family Adapter with LAN Remote Power	ON	0.049	0.049
HP Color LaserJet 4500 DN	ON	0.049	0.050
Cisco Catalyst 3500 Series XL	ON	0.033	24.190
	OFF	0.033	24.190
Dana Minihub-8	ON	24.200	24.200

Hazard Matrix



<u>Condition: Make and Model</u>	<u>Status</u>	<u>1,2,3,6 Voltage (V)</u>	<u>4,5,7,8 Voltage (V)</u>
Legacy (Cont.):			
Ericsson Touchwave Webswitch 1608	ON	24.200	24.200
Cisco Access Digital Gateway Selsius	ON	24.200	24.200
Cisco 3620 Router	ON	24.200	24.200
Cisco 3620 Router "Con" Port	ON	24.200	24.200
Cisco 3620 Router "Aux" Port	ON	24.200	24.200
Cisco Access Analog Station Gateway	ON	24.200	24.200
	OFF	24.200	24.200
3Com NBX 100, 10BASE-T Uplink	ON	24.200	24.200
3Com NBX 100, Base 100 Ethernet Port	ON	24.200	24.200
AT&T Fax Machine 3510D Data Port	ON	24.200	24.200
	OFF	24.200	24.200
Cisco Access Analog Trunk Gateway (Ethernet)	ON	24.200	24.200
	OFF	24.200	24.200
Network Alchemy Ethernet HUB Card Data Port	ON	24.200	0.049
Network Alchemy Ethernet HUB Card Expansion Port	ON	1.790	24.200
Nortel Norstar Application Module	ON	0.049	0.049
3Com Office Connect Ethernet HUB 8C	ON	24.200	24.200
Canary 6 Port 100BASE-T4 Hub	ON	24.180	24.180
	OFF	24.190	24.190
HP Advanstack J2410A, 100VG	ON	24.190	24.190
*-Transceiver Slot	OFF	24.190	24.190
HP Advanstack J2410A, 100VG	ON	24.190	22.510
*-Extension Slot	OFF	24.190	24.190
Cisco Catalyst 6500	ON	24.1946	0.089
	OFF	24.2	0.04919
Lucent Cajun P120 Switch	ON	24.19	0.049
	OFF	24.1982	0.049
Lucent IP exch Adapter/8	ON	24.202	24.201
	OFF	24.203	24.2
Lucent/Ascend Superpipe 155	ON	0.0487	0.0487
	OFF	0.0487	0.0487

Hazard Matrix



<u>Condition: Make and Model</u>	<u>Status</u>	<u>1,2,3,6 Voltage (V)</u>	<u>4,5,7,8 Voltage (V)</u>
Legacy (Cont.):			
3Com SuperStack 2 (Baseline Switch)	ON	24.202	24.202
	OFF	24.202	24.203
Cisco 2600 Router	ON	24.202	24.202
	OFF	24.202	24.203
Cisco 3600 Router	ON	0.0489	0.0498
	OFF	0.0489	0.0498
Lucent Tel Connect 8	ON	0.0489	0.0488
	OFF	0.0489	0.048
Lucent Cajun P333 Switch	ON	24.199	0.0343
	OFF	24.2	0.0343
Neo-Legacy:			
Cisco Catalyst 3500 Series XL with in-line power	ON	24.180	24.180
	OFF	24.180	24.180
3Com NBX 100 IP Phone	ON	24.200	24.200
*-Data Port	OFF	24.200	24.200
3Com NBX 100 IP Phone	ON	24.200	24.200
*-Voice Port	OFF	24.200	24.200
3Com NBX Analog Adapter	ON	24.200	24.200
*-Data Port	OFF	24.200	24.200
3Com NBX Analog Adapter	ON	24.200	24.200
*-Voice Port	OFF	24.200	24.200
3Com NBX 100 DSS/BLF Adjunct	ON	24.200	24.200
	OFF	24.200	24.200
Cisco 30 UIP IP Phone	ON	24.200	24.200
*-Data Port	OFF	24.200	24.200

Hazard Matrix



Condition: Make and Model	Status	1,2,3,6 Voltage (V)	4,5,7,8 Voltage (V)
Neo-Legacy(Cont.):			
Cisco 30 UIP IP Phone	ON	24.200	24.200
*-Voice Port	OFF	24.200	24.200
Avaya IP Exchange Server	ON	0.020	0.020
Avaya IP Exchange Adapter LAN Port	ON	24.200	24.200
Avaya IP Exchange Adapter Voice Port	ON	24.200	24.200
Cisco 12 SPT IP Phone	ON	24.200	24.200
*-Data Port	OFF	24.200	24.200
Cisco 12 SPT IP Phone	ON	24.200	24.200
*-Voice Port	OFF	24.200	24.200
Power Device:			
	ON	-4to+4 or 21to28	-4to+4 or 21to28
	OFF	11 to 14	11 to 14
Crosstalk:			
		24.200	24.200
Random Plug:			
		0 to 24.2	0 to 24.2
Analog/Digital/PBX Telephone:			
Analog Phone Wall Jack	ON	24.200	-1.340
Lucent Merlin Legend ETR 18D	OFF	24.200	24.200
Lucent 8410D Phone (Holmdel)	OFF	9.420	24.200
Lucent MLX 20L Telephone	OFF	24.200	24.200
Lucent MLX 16DP Telephone	OFF	24.200	24.200
Lucent Partner ETR 34D (Phone)	Line	24.202	24.202
	Aux	24.202	24.203
Lucent Partner ETR 18D (Phone)	Line	24.202	24.203
Lucent 8410D Digital Telephone	OFF	6.260	24.200

Hazard Matrix



Condition: Make and Model	Status	1,2,3,6 Voltage (V)	4,5,7,8 Voltage (V)
T1/E1/ISDN:			
3Com NBX 100, T1 Input Slot	ON	24.200	24.200
Definity PBX (E1 Interface)	ON	22.35	22.56
	OFF	22.35	22.51
Definity PBX (T1 Interface)	ON	24.19	24.2
	OFF	24.2	24.2
Test Equipmet:			
IXIA 1600 Traffic Generator	ON	0.049	0.050
Netcom Systems Smartbits SMB-1000	ON	0.049	0.049
Fluke DSP-100 LAN Cablemeter	ON	0.034	0.034
	OFF	2.110	2.200
Fluke DSP-SR Smart Remote Cablemeter	ON	0.035	0.035
	OFF	2.290	2.270
Patch Check 1529 Cable Crossover Tester	ON	0.056	0.057
Isolation:		>1500V	>1500V
ATM:		?	?
Firewire UTP:		?	?
Token Ring:			
	ON	24.2	24.2
	OFF	24.2	24.2
POTS:			
	ON	24.2	24.2
	OFF	24.2	24.2

Conclusions



- In a random sampling of a large number of Devices and Hazard Matrix test conditions, only one item had 48V power applied using the Proposed Protocol.
- The one device that had power applied was a Lucent telecom device designed to accept phantom power on pins 1,2 and 3,6 which dutifully performed a power reset function.
- Voltage margins to other equipment exceeded 4V.