

# Requests for Adoption

IEEE 802.3dd – Power over Data Lines of Single  
Pair Ethernet (Maintenance #17) Task Force

George Zimmerman (Chair) – CME Consulting / ADI, APL Group,  
Cisco, CommScope, Marvell, SenTekSe

May 25, 2021

# Stewart\_3dd\_01a\_04272021.pdf slide 3

## $V_{sig\_disable}$ and $V_{PUP}$ Tracking Proposed Remedy



Table 104-5—Valid PD detection signature characteristics, measured at PD PI

Parameter	Conditions	Min	Max	Unit
$V_{good}$	$7mA < I_{PD} < 17mA$ , PD exiting RESET state	4.05	4.55	V
$I_{signature\_limit}$	$V_{PD} < V_{sig\_disable\_max}$	—	24	mA
$V_{sig\_disable}$	$V_{PD}$ rising	4.6	5.75	V
$V_{sig\_enable}$	$V_{PD}$ falling	3.6	4.3	V

Table 104-8—SCCP electrical requirements

Item	Parameter	Symbol	Unit	Min	Max	PSE/ PD Type	Additional information
1	PSE Pull-up Voltage (Classes 0 to 9)	$V_{PUP}$	V	$V_{good\_PSE\_max}$	5	All	See Table 104-3
	PSE Pull-up Voltage (Classes 10 to 15)				5.5		

Technical, 802.3bu, Page 54, Table 104-5

### Comment

Transitions from DO\_CLASSIFICATION to MDI\_POWER1 pragmatically occur between  $V_{PUP,max}$  and  $V_{sig\_disable,max}$ . In 802.3bu, for Classes 0-9, this decision region spans 0.75V. In 802.3cg, for Classes 10-15,  $V_{PUP}$  changed to 5.5V, without a corresponding change to  $V_{sig\_disable}$ . The resulting decision region is reduced to 0.25V.

### Suggested Remedy

Modify 104-5 as follows, splitting  $V_{sig\_disable}$  into two rows

Table 104-5—Valid PD detection signature characteristics, measured at PD PI

Parameter	Conditions	Min	Max	Unit
$V_{good}$	$7mA < I_{PD} < 17mA$ , PD exiting RESET state	4.05	4.55	V
$I_{signature\_limit}$	$V_{PD} < V_{sig\_disable\_max}$	—	24	mA
$V_{sig\_disable}$ , Classes 0 to 9	$V_{PD}$ rising	4.6	5.75	V
$V_{sig\_disable}$ , Classes 10 to 15	$V_{PD}$ rising	6.0	7.5	V
$V_{sig\_enable}$	$V_{PD}$ falling	3.6	4.3	V

3 // 27 April 2021

Need to Address: **Consensus**  
 Solution Form: **Consensus**  
 Solution Details: **Consensus**

# Stewart\_3dd\_01a\_04272021.pdf slide 4

## Cable Resistance Measurement and $V_{\text{Report\_PD}}$



- For CRM, the PD reports its voltage to the PSE so the PSE can perform a  $\Delta V/\Delta I$  calculation. Accuracy is +/-20mV.
- The existing +/-20mV tolerance requirement does not allow power coupling network resistance to be, optionally, measured
  - Removing the negative tolerance requirement allows greater design flexibility
  - Regardless any measurement error is capped by  $R_{\text{Cable, max}}$  and there is no risk to interoperability

$$R_{\text{Cable}} = \min(R_{\text{Cable\_initial}} \times K_{\text{RMF}}, R_{\text{Loop(max)}}) \Omega \quad (104-4b)$$

► Change +/- to +

Table 104-10—VOLT\_INFO register table

Bit(s)	Name	Description	R/W <sup>a</sup>
b[15:8]	Reserved	Value always 0	RO
b[7:0]	Voltage at PD PI during Presence Pulse	<del>±</del> 20 mV tolerance, 10 mV per LSB	RO

Need to Address: **Consensus**  
 Solution Form: **Consensus**  
 Solution Details: **Consensus**

<sup>a</sup>RO = Read only

# Stewart\_3dd\_01a\_04272021.pdf slide 5

## DO\_CLASSIFICATION: present\_iwakeup



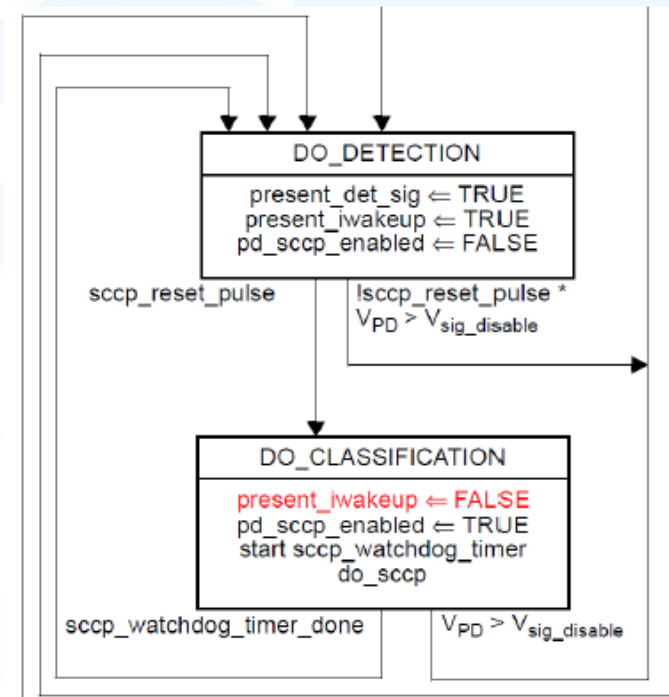
Technical, 802.3bu, Page 53, Figure 104-8

### Comment

The PD state machine, as written, requires present\_iwakeup to be TRUE in DO\_CLASSIFICATION based on an assignment derived from DO\_DETECTION. During classification the PD is engaged in SCCP signaling and cannot simultaneously present the iwakeup signature.

### Suggested Remedy

Modify Figure 104-8 as follows, specifically setting present\_iwakeup to FALSE in DO\_CLASSIFICATION.



Need to Address: Consensus  
Solution Form: Consensus  
Solution Details: Consensus

# Stewart\_3dd\_01a\_05112021.pdf slide 3

## [04/27/21] Post-sleep Classification

Technical, 802.3bu, Page 53, Figure 104-8

### Comment

The PD state machine, as written, does not allow a PD to respond to SCCP classification on PD\_SLEEP exit.

### Suggested Remedy

Change

wakeup

TRUE: the PD requires the full operating voltage at the PI.  
FALSE: the PD is ready to go to sleep.

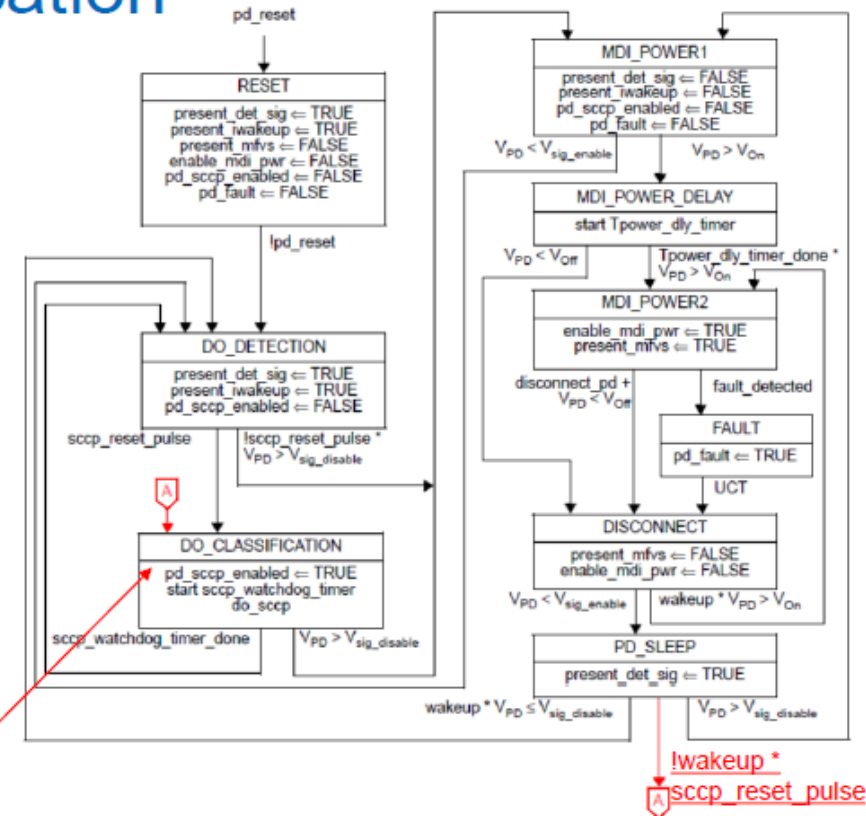
To

wakeup

An implementation specific variable enabling the PD to request wakeup.

TRUE: the PD requires the full operating voltage at the PI.

FALSE: the PD is ready to go to sleep or is not otherwise requesting full operating voltage.



4/27/21 proposed add:  
present\_wakeup <= FALSE

!wakeup \*  
sccp\_reset\_pulse

Need to Address: **Consensus**  
Solution Form: **Consensus**  
Solution Details: **Consensus**

# Stewart\_3dd\_01a\_05112021.pdf slide 4

## $t_{PDL}$ VS $t_{PDLOW}$



Editorial, 802.3cg, Page 98

### Comment

104.7 text and figures reference  $t_{PDL}$  while Table 104-8 describes  $t_{PDLOW}$ . Harmonize as  $t_{PDL}$ .  $t_{PDLOW}$  was a typo.

### Suggested Remedy

Modify Table 104-8, Row 15

15	Presence-Detect Low Time	<del><math>t_{PDLOW}</math></del>	ms	2.5	7.5	A, B, C, D	PDs that support link segment resistance measurement
				<u>2.8</u>	<u>5.2</u>	E	
				<u>21</u>	<u>31</u>	E	

Need to Address: Consensus  
Solution Form: Consensus  
Solution Details: Consensus

# Stewart\_3dd\_01a\_05112021.pdf slide 5

## PD Backfeed



Technical, 802.3bu, Page 58

### Comment

The existing 802.3bu requirement is only achievable for very low PD bulk cap implementations. New PHYs, e.g. T1L, require significant bulk capacitance. Propose to adopt approach taken in 802.3bt for backfeed requirement.

### Suggested Remedy

#### Replace

#### ~~104.5.6.1 PD discharge~~

~~At a delay of  $T_{OFF\_max}$  (see Table 104-4) after disconnection from the PSE, PD shall not source greater than 410  $\mu$ J out of its PI until  $V_{PD}$  drops below  $V_{Sleep\_PD\_max}$ .~~

*With the following new subclause (145.5.6.1):*

#### 104.5.6.1 Backfeed voltage PD discharge

When either there is no PSE or the PSE is not sourcing power, the PD backfeeds presents voltage back onto the (unpowered) pair. This can cause a current to flow out of the PD.

In order to constrain this current, the voltage across a 5 k $\Omega$  resistor connected across the PD PI shall not exceed  $V_{PUP}$  as defined in Table 104-8, at a delay of  $T_{OFF\_max}$  (see Table 104-4) after the removal of PSE power from the PD PI.

Need to Address: Consensus  
Solution Form: Consensus  
Solution Details: Consensus

# Stewart\_3dd\_01a\_05112021.pdf slide 6

## PD Current During Disconnect



Need to Address: Consensus

Solution Form: Consensus

Solution Details: Consensus

Technical, 802.3bu, Page 56

### Comment

Meeting the  $T_{OFF}$  requirement when significant bulk capacitance is present requires the PD to pull down with a reasonable discharge current. The existing  $I_{Sleep\_PD}$  requirement is at odds with the requirement to discharge the PD bulk cap within  $T_{OFF}$ .

The PD is not presenting a valid detection signature in the DISCONNECT state and the PSE state diagram has a matching  $T_{OFF}$  timer during the PSE's SETTLE\_SLEEP state.

Removing the PD  $I_{Sleep\_PD}$  requirement in the DISCONNECT state allows the PD to discharge itself when disconnected from the PSE. This modification will not affect PSE/PD interoperability.

### 104.5.6.3 Input Current states:

During operation in the DISCONNECT and PD\_SLEEP states, the PD shall not draw current in excess of  $I_{Sleep\_PD}$  as specified in Table 104-7.

### Suggested Remedy

#### **Modify 145.5.6.3**

During operation in the ~~DISCONNECT and~~ PD\_SLEEP states, the PD shall not draw current in excess of  $I_{Sleep\_PD}$  as specified in Table 104-7.