USB Power Delivery ENGINEERING CHANGE NOTICE

Title: PDP Clarifications
Applied to: USB Power Delivery Specification Revision 3.0 Version 1.1

Brief description of the functional changes proposed:
Clarify minimum and optional current values in PDOs for Fixed Voltages. Minimum requirement incorrectly identified as a maximum. Optional higher currents not clearly indicated for anything but 20V so adjusting text, figure and tables in 10.2.2 to make this clearer.

Benefits as a result of the proposed changes:
Improving specification clarity.

An assessment of the impact to the existing revision and systems that currently conform to the USB specification:
None.

An analysis of the hardware implications:
None.

An analysis of the software implications:
None.

An analysis of the compliance testing implications:
None.

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Actual Change Requested

(a). Sections 10.2.2

From Text:

10.2.2   Normative Voltages and Currents

The voltages and currents a Source with a PDP of x Watts **Error! Reference source not found.** support are as defined in Table 10-2.

Table 10-2 Normative Voltages and Currents

PDP (W)	Current at 5V (A)	Current at 9V (A)	Current at 15V (A)	Current at 20V (A)
$0.5 \leq x \leq 15$	$x \div 5$			
$15 < x \leq 27$	3	$x \div 9$		
$27 < x \leq 45$	3	3	$x \div 15$	
$45 < x \leq 60$	3	3	3	$x \div 20$
$60 < x \leq 100$	3	3	3	$x \div 20$[1]
[1] Requires a 5A cable.				

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Figure illustrates the maximum current and power rails that a Source **Error! Reference source not found.** support at each voltage for a given PDP.
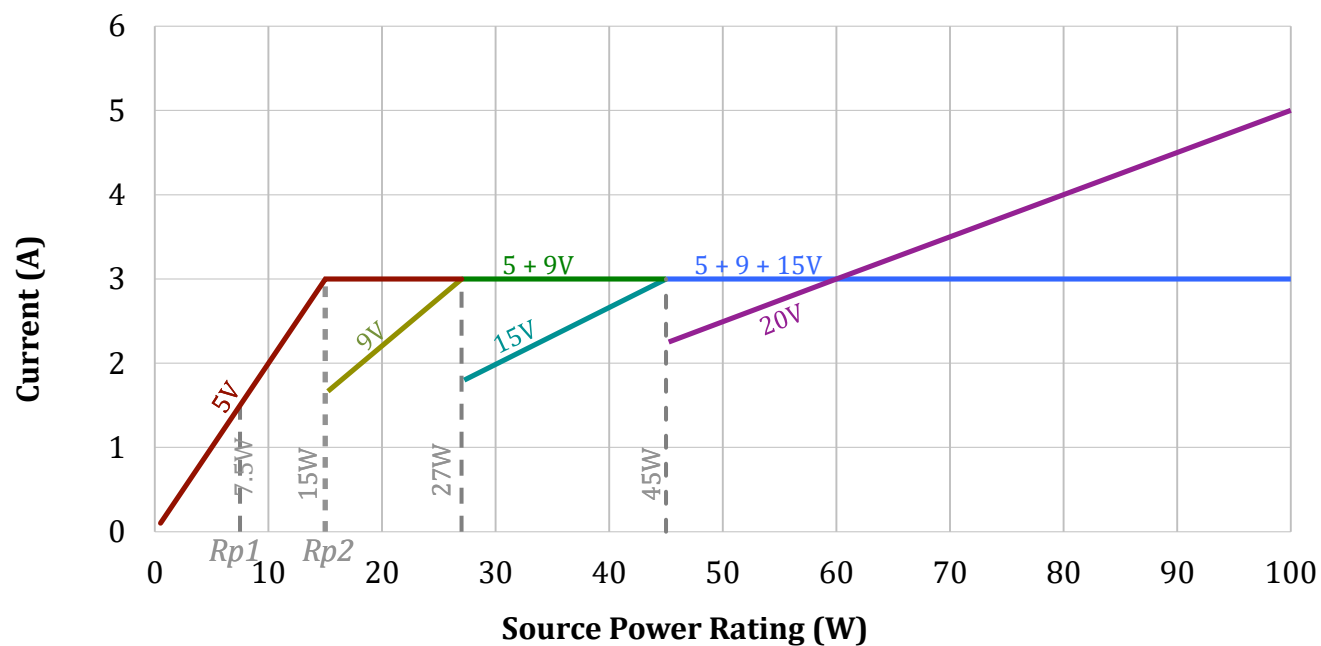
Figure shows an example of an adapter with a rating at 50W. The adapter is required to support 20V at 2.5A, 15V at 3A, 9V at 3A and 5V at 3A.

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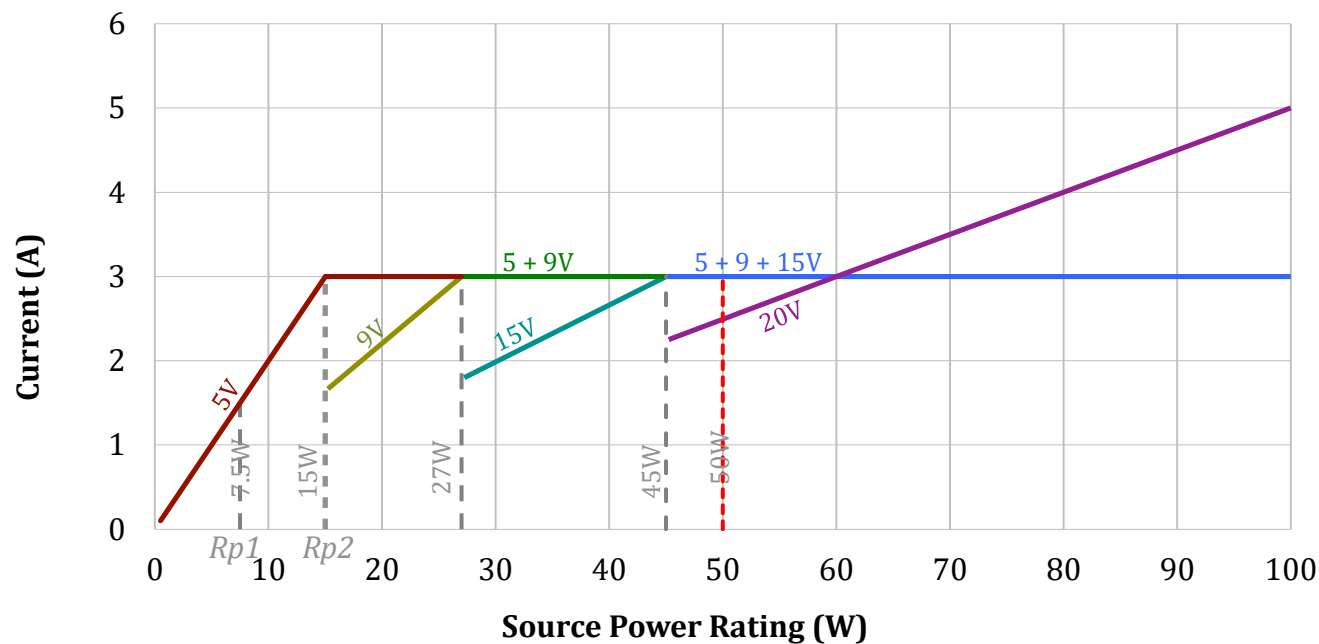
Figure 10-2 Source Power Rule Example

Table , Table , Table and Table show the Fixed Supply PDOs that **Error! Reference source not found.** be supported for each of the **Error! Reference source not found.** voltages defined in Table .

Table 10-3 Fixed Supply PDO – Source 5V

Bit(s)	Description
B31…30	Fixed supply
B29	Dual-Role Power
B28	USB Suspend Supported
B27	Unconstrained Power
B26	USB Communications Capable
B25	Dual-Role Data
B24…22	**Error! Reference source not found. – Error! Reference source not found.** be set to zero.
B21…20	Peak Current
B19…10	5V
B9…0	<table><tr><td>**PDP (x)**</td><td>**Current (A)**</td></tr><tr><td>0.5 ≤ x ≤ 15</td><td>x ÷ 5</td></tr><tr><td>15 < x ≤ 100</td><td>3</td></tr></table>

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Table 10-4 Fixed Supply PDO – Source 9V

Bit(s)	Description
B31...30	Fixed Supply
B29...22	**Error! Reference source not found. – Error! Reference source not found.** be set to zero.
B21...20	Peak Current
B19...10	9V
B9...0	<table><tr><td>**PDP (x)**</td><td>**Current (A)**</td></tr><tr><td>0.5 ≤ x ≤ 15</td><td>PDO not required</td></tr><tr><td>15 < x ≤ 27</td><td>x ÷ 9</td></tr><tr><td>27 < x ≤ 100</td><td>3</td></tr></table>

Table 10-5 Fixed Supply PDO – Source 15V

Bit(s)	Description
B31...30	Fixed Supply
B29...22	**Error! Reference source not found. – Error! Reference source not found.** be set to zero.
B21...20	Peak Current
B19...10	15V
B9...0	<table><tr><td>**PDP (x)**</td><td>**Current (A)**</td></tr><tr><td>0.5 ≤ x ≤ 27</td><td>PDO not required</td></tr><tr><td>27 < x ≤ 45</td><td>x ÷ 15</td></tr><tr><td>45 < x ≤ 100</td><td>3</td></tr></table>

Table 10-6 Fixed Supply PDO – Source 20V

Bit(s)	Description
B31...30	Fixed Supply
B29...22	**Error! Reference source not found. – Error! Reference source not found.** be set to zero.
B21...20	Peak Current
B19...10	20V
B9...0	<table><tr><td>**PDP (x)**</td><td>**Current (A)**</td></tr><tr><td>0.5 ≤ x ≤ 45</td><td>PDO not required</td></tr><tr><td>45 < x ≤ 100</td><td>x ÷ 20</td></tr></table>

More current **Error! Reference source not found.** be offered in the PDOs when **Error! Reference source not found.** voltages/currents are supported and a 5A cable is being used (see Section 10.2.3).

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To Text:

10.2.2   Normative Voltages and Currents

The voltages and currents a Source with a PDP of x Watts **Error! Reference source not found.** support are as defined in Table 10-2.

Table 10-2 Normative Voltages and Minimum Currents

PDP (W)	Current at 5V (A)	Current at 9V (A)	Current at 15V (A)	Current at 20V (A)
0 ≤ x ≤ 15	x ÷ 5			
15 < x ≤ 27	3	x ÷ 9		
27 < x ≤ 45	3	3	x ÷ 15	
45 < x ≤ 60	3	3	3	x ÷ 20
60 < x ≤ 100	3	3	3	x ÷ 20[1]
[1] Requires a 5A cable.				

Figure illustrates the minimum current and power rails that a Source **Error! Reference source not found.** support at each voltage for a given PDP. Note: Not illustrated are that currents higher than 3A are allowed to be offered up to a limit of 5A given that a 5A cable is detected by the Source and the voltage times current remains within the Source PDP rating.

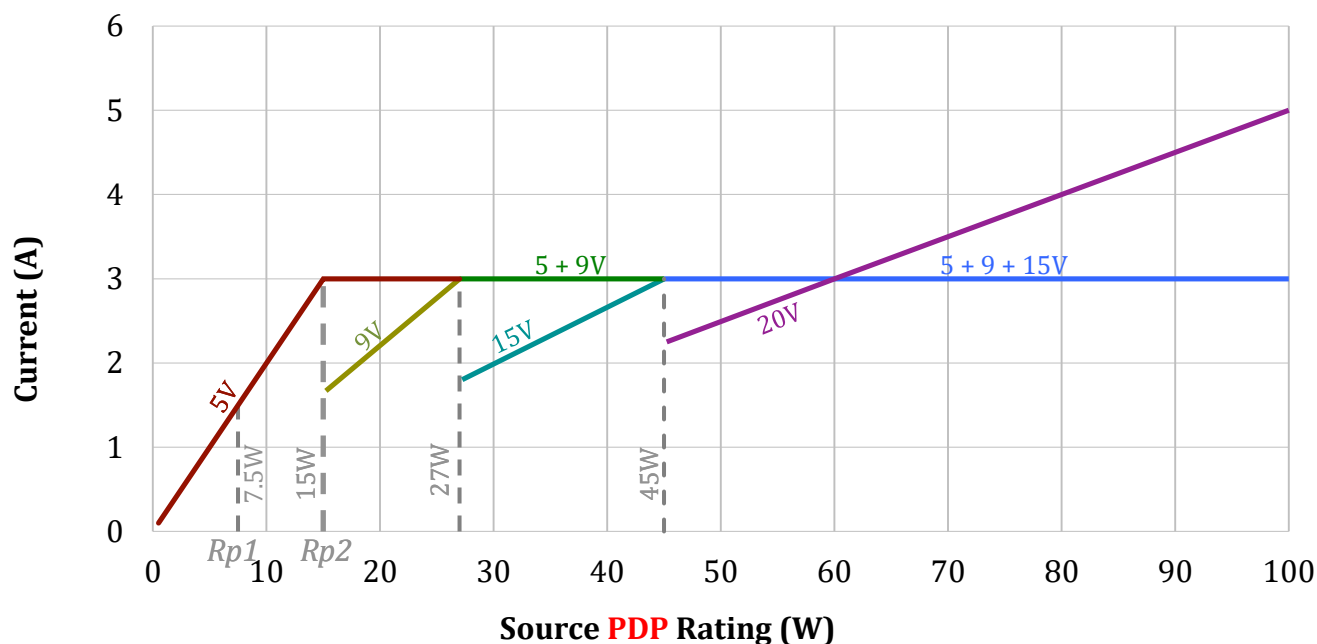**Figure 10-1 Source Power Rule Illustration**

Figure shows an example of an adapter with a rating at 50W. The adapter is required to support 20V at 2.5A, 15V at 3A, 9V at 3A and 5V at 3A.

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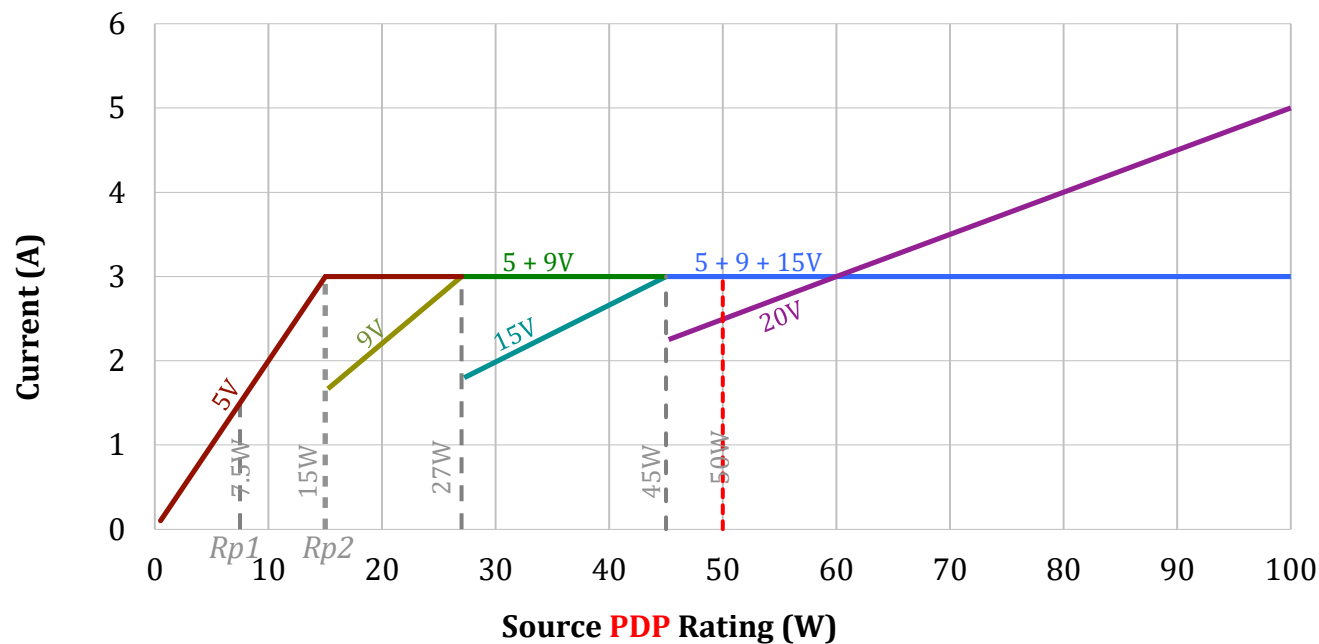**Figure 10-2 Source Power Rule Example**

Table , Table , Table and Table show the Fixed Supply PDOs that **Error! Reference source not found.** be supported for each of the **Error! Reference source not found.** voltages defined in Table .

Table 10-3 Fixed Supply PDO – Source 5V

Bit(s)	Description
B31…30	Fixed supply
B29	Dual-Role Power
B28	USB Suspend Supported
B27	Unconstrained Power
B26	USB Communications Capable
B25	Dual-Role Data
B24…22	**Error! Reference source not found. – Error! Reference source not found.** be set to zero.
B21…20	Peak Current
B19…10	5V
B9…0	Current based on PDP <table><tr><th>PDP (x)</th><th>Current (A)</th></tr><tr><td>0 ≤ x ≤ 15</td><td>x ÷ 5</td></tr><tr><td>15 < x ≤ 25</td><td>3 ≤ A ≤ x ÷ 5</td></tr><tr><td>25 < x ≤ 100</td><td>3 ≤ A ≤ 5</td></tr></table>

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Table 10-4 Fixed Supply PDO – Source 9V

Bit(s)	Description
B31...30	Fixed Supply
B29...22	**Error! Reference source not found. – Error! Reference source not found.** be set to zero.
B21...20	Peak Current
B19...10	9V
B9...0	Current based on PDP | PDP (x)	Current (A)
0 ≤ x ≤ 15	PDO not required
15 < x ≤ 27	x ÷ 9
27 < x ≤ 45	3 ≤ A ≤ x ÷ 9
45 < x ≤ 100	3 ≤ A ≤ 5	

Table 10-5 Fixed Supply PDO – Source 15V

Bit(s)	Description
B31...30	Fixed Supply
B29...22	**Error! Reference source not found. – Error! Reference source not found.** be set to zero.
B21...20	Peak Current
B19...10	15V
B9...0	Current based on PDP | PDP (x)	Current (A)
0 ≤ x ≤ 27	PDO not required
27 < x ≤ 45	x ÷ 15
45 < x ≤ 75	3 ≤ A ≤ x ÷ 15
75 < x ≤ 100	3 ≤ A ≤ 5	

Table 10-6 Fixed Supply PDO – Source 20V

Bit(s)	Description
B31...30	Fixed Supply
B29...22	**Error! Reference source not found. – Error! Reference source not found.** be set to zero.
B21...20	Peak Current
B19...10	20V
B9...0	Current based on PDP | PDP (x)	Current (A)
0 ≤ x ≤ 45	PDO not required
45 < x ≤ 100	x ÷ 20	

More current **Error! Reference source not found.** be offered in the PDOs when **Error! Reference source not found.** voltages/currents are supported and a 5A cable is being used (see Section 10.2.3).