

USB Type-C ENGINEERING CHANGE NOTICE

Title: Sink CC Pin Voltages

Applied to: USB Type-C Specification Release 2.4, Oct 2024

Brief description of the functional changes proposed:

Table 4-36 lists Sink CC Pin Voltages for Connect and Current Advertisement Detection for $R_d \pm 10\%$

This table needs several changes:

1. Minimum voltage should be changed to 0.277V (vRd-USB min)
2. Maximum voltage (currently empty) should be 2.042V (vRd-3.0 max)
3. The title of the row should be “vRd-connected” for continuity with Table 4-35 and Table 4-17
4. Add one row “Threshold for detecting disconnect”

Table 4-35 Sink CC Pin Voltages for Connect Detection for R_d and Clamp Voltage $\pm 20\%$

1. Table intro sentence “If a Sink implementation used the CC pin voltage as connect detection, then a threshold above the maximum from this table would be required” is wrong and should be deleted.
2. Add one row “Threshold for detecting disconnect”
3. Rename “vRd-connect” to “vRd-connected” to more clearly reflect meaning

Rename all other instances of “vRd-connect” to “vRd-connected” throughout the spec for consistency.

Benefits as a result of the proposed changes:

Minimum voltage for Disconnect/Connect Threshold was incorrect; will now be correct

Maximum voltage for Disconnect/Connect Threshold was missing; now will be present and usable

vRd-connect will now be defined not just for the “ R_d and Clamp Voltage $\pm 20\%$ ” implementation, but also for the more standard $R_d \pm 10\%$ implementation

An assessment of the impact to the existing revision and systems that currently conform to the USB specification:

This is a clarification of the existing behavior and should not impart any functional change

An analysis of the hardware implications:

This is a clarification of the existing behavior and should not impart any functional change

An analysis of the software implications:

This is a clarification of the existing behavior and should not impart any functional change

An analysis of the compliance testing implications:

This is a clarification of the existing behavior and should not impart any functional change

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Actual Change Requested

(a). Section 4.11.3.2, Page 252

From Text:

Table 4-35 shows the range of the Sink CC pin voltage (v_{Rd}) for a R_d with a variance of $\pm 20\%$ and clamp voltage variation of $\pm 20\%$. If a Sink implementation used the CC pin voltage as connect detection, then a threshold above the maximum from this table would be required.

Table 4-35 Sink CC Pin Voltages for Connect Detection for R_d and Clamp Voltage $\pm 20\%$

	Minimum Voltage (V)	Maximum Voltage (V)
$v_{Rd-connect}$	0.249	2.181

Table 4-36 Sink CC Pin Voltages for Connect and Current Advertisement Detection for $R_d \pm 10\%$

	Minimum Voltage (V)	Maximum Voltage (V)
v_{Rd-USB}	0.277	0.612
$v_{Rd-1.5}$	0.746	1.164
$v_{Rd-3.0}$	1.369	2.042
Threshold between v_{Rd-USB} and $v_{Rd-1.5}$	0.613	0.745
Threshold between $v_{Rd-1.5}$ and $v_{Rd-3.0}$	1.165	1.368
Disconnect/Connect Threshold	2.043	

To Text:

Table 4-35 shows the range of the Sink CC pin voltage (v_{Rd}) for a R_d with a variance of $\pm 20\%$ and clamp voltage variation of $\pm 20\%$. ~~If a Sink implementation used the CC pin voltage as connect detection, then a threshold above the maximum from this table would be required.~~

Table 4-35 Sink CC Pin Voltages for Connect Detection for R_d and Clamp Voltage $\pm 20\%$

	Minimum Voltage (V)	Maximum Voltage (V)
$v_{Rd-connected}$	0.249	2.181
Threshold for detecting disconnect		0.248

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Table 4-36 Sink CC Pin Voltages for Connect and Current Advertisement Detection for $R_d \pm 10\%$

	Minimum Voltage (V)	Maximum Voltage (V)
<i>vRd-USB</i>	0.277	0.612
<i>vRd-1.5</i>	0.746	1.164
<i>vRd-3.0</i>	1.369	2.042
vRd-connected	0.277	2.042
Threshold between <i>vRd-USB</i> and <i>vRd-1.5</i>	0.613	0.745
Threshold between <i>vRd-1.5</i> and <i>vRd-3.0</i>	1.165	1.368
Threshold for detecting disconnect		0.276

(b). Section 4.5.2.2, Page 179

From Text:

Table 4-17 Sink Port CC Pin State

CC Pin State	Port Partner CC Termination	Voltage Detected on CC when port asserts R_d
<i>SNK.Rp</i>	R_p	Above minimum <i>vRd-Connect</i>
<i>SNK.Open</i>	Open, R_a , R_d	Below minimum <i>vRd-Connect</i>
Note: See Section 4.11.3.1.1 for more on CC voltage detection thresholds for a Sink port.		

To Text:

Table 4-17 Sink Port CC Pin State

CC Pin State	Port Partner CC Termination	Voltage Detected on CC when port asserts R_d
<i>SNK.Rp</i>	R_p	Above minimum vRd-Connected
<i>SNK.Open</i>	Open, R_a , R_d	Below minimum vRd-Connected
Note: See Section 4.11.3.1.1 for more on CC voltage detection thresholds for a Sink port.		

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(c). Section 6.3.4.3.8, Page 323-338

From Text:

6.3.4.3.8.9 MSG_Force_Detach

This message is to request the remote plug to disconnect from its attached port. The disconnect method can be done by raising the voltage on the CC line to above *vRd-Connect* or removing *Rd*.

[...]

6.3.5.4.8.1 Entry to Force Detach State

On entry to *Force Detach*, the plug *shall* raise the voltage on the CC-wire above *vRd-Connect*.

To Text:

6.3.4.3.8.9 MSG_Force_Detach

This message is to request the remote plug to disconnect from its attached port. The disconnect method can be done by raising the voltage on the CC line to above *vRd-Connected* or removing *Rd*.

[...]

6.3.5.4.8.1 Entry to Force Detach State

On entry to *Force Detach*, the plug *shall* raise the voltage on the CC-wire above *vRd-Connected*.