

USB Power Delivery ENGINEERING CHANGE NOTICE

Title: Cable Reset Issues

Applied to: USB Power Delivery Specification Revision 3.0 Version 2.0

Brief description of the functional changes proposed:

This ECN fixes issues that are broken in the current specification in the following two places:

- If a Cable Plug receives a Soft_Reset Message and there is a Transmission Error, it continues into executing a Cable Reset which exits all Active Modes which the Cable Plug should never do on its own and without the VCONN source knowing it exited all modes
- When a UFP (VCONN Source) executes a Soft Reset to the Cable Plug and that communication fails (SenderResponseTimer timeout for example), it proceeds to a Cable Reset which only a DFP can do

Benefits as a result of the proposed changes:

Consistency on executing Cable Reset in various sections of the specification

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

Corrects some aspects of the specification which could impact certain systems that deviated from the specification differently from what is described in this ECN. In general Transmission Errors and SenderResponseTimer timeouts are rare and so the impact is minimal.

An analysis of the hardware implications:

If the Cable Plug or the VCONN-Source UFP is a hardware implementation, then this could cause a hardware change. Otherwise most state machines are implemented in software and this would result in a software change if not already implemented this way.

An analysis of the software implications:

State machine changes for Cable Plug Soft Reset and VCONN Source Soft Reset or Cable Reset of a Cable Plug if not implemented in hardware (see above)

An analysis of the compliance testing implications:

Currently not tested in compliance and so no changes should result in the compliance tests

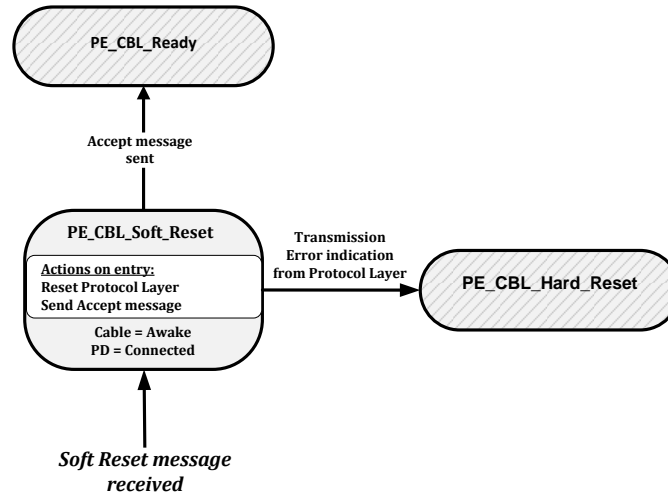
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Actual Change Requested

(a). Figure 8-140 and Section 8.3.3.24.2.1.1

From Text:

Figure 8-140 Cable Plug Soft Reset State Diagram



8.3.3.24.2.1.1 PE_CBL_Soft_Reset State

The **PE_CBL_Soft_Reset** state **Shall** be entered from any state when a Reset Message is received from the Protocol Layer.

On entry to the **PE_CBL_Soft_Reset** state the Policy Engine **Shall** reset the Protocol Layer in the Cable Plug and **Shall** then request the Protocol Layer to send an **Accept** Message.

The Policy Engine **Shall** transition to the **PE_CBL_Ready** state when:

- The **Accept** Message has been sent.

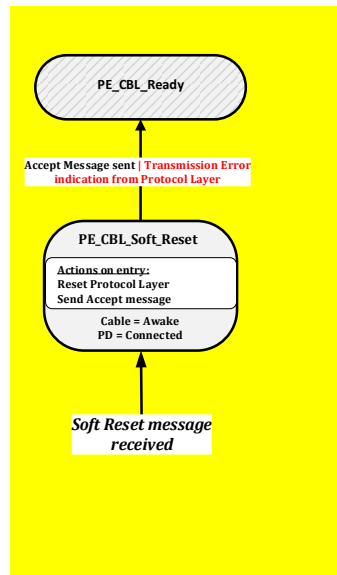
The Policy Engine **Shall** transition to the **PE_CBL_Hard_Reset** state when:

- The Protocol Layer indicates that a transmission error has occurred.

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To Text:

Figure 8-240 Cable Plug Soft Reset State Diagram



8.3.3.24.2.1.1 PE_CBL_Soft_Reset State

The **PE_CBL_Soft_Reset** state **shall** be entered from any state when a Reset Message is received from the Protocol Layer.

On entry to the **PE_CBL_Soft_Reset** state the Policy Engine **shall** reset the Protocol Layer in the Cable Plug and **shall** then request the Protocol Layer to send an **Accept** Message.

The Policy Engine **shall** transition to the **PE_CBL_Ready** state when:

- The **Accept** Message has been sent
- The Protocol Layer indicates that a transmission error has occurred.

The Policy Engine **shall** transition to the **PE_CBL_Hard_Reset** state when:

- The Protocol Layer indicates that a transmission error has occurred.

(b). Sections 8.3.3.24.2.3

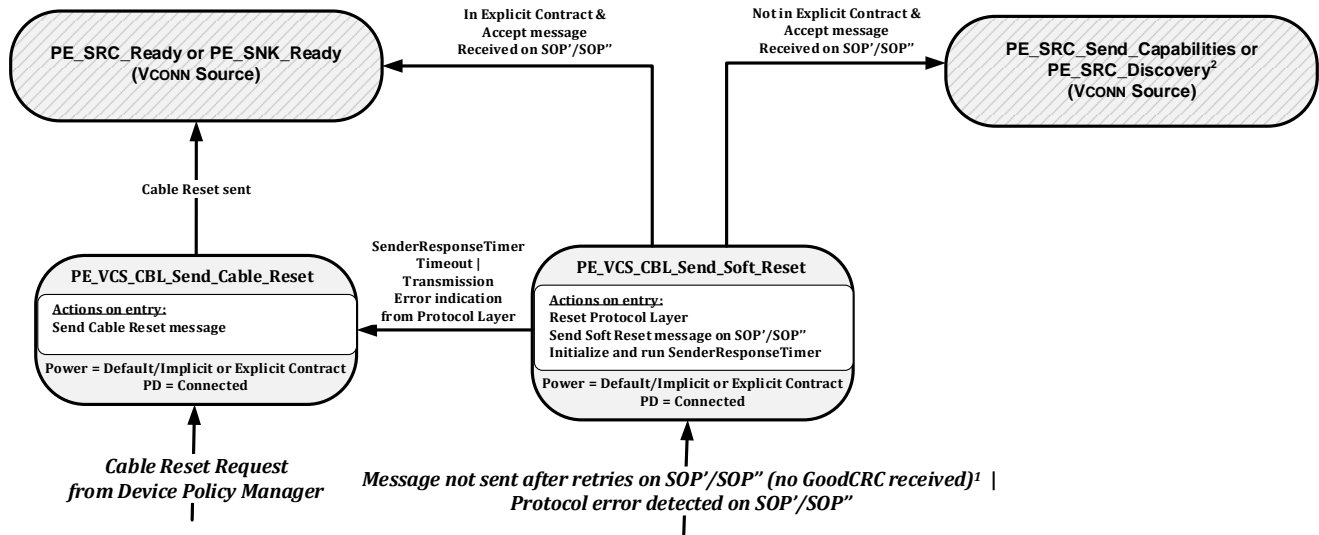
From Text:

8.3.3.24.2.3 VCONN Source SOP'/SOP'' Soft Reset or Cable Reset of a Cable Plug or VPD State Diagram

Figure 8-142 below shows the state diagram for the Policy Engine in a VCONN Source when performing a Soft Reset or Cable Reset of a Cable Plug or VPD on **SOP'/SOP''**. The following sections describe operation in each of the states.

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Figure 8-142 VCONN Source Soft Reset or Cable Reset of a Cable Plug or VPD State Diagram



- 1 Excludes the **Soft_Reset** Message itself.
- 2 Sink only communicates with the Cable Plug when in an Explicit Contract. If the **Discover Identity** Command is being sent at startup then the Policy Engine will subsequently transition to the **PE_SRC_Send_Capabilities** state as normal. Otherwise the Policy Engine will transition to the **PE_SRC_Discovery** state.

8.3.3.24.2.3.1 PE_VCS_CBL_Send_Soft_Reset State

The **PE_VCS_CBL_Send_Soft_Reset** state **Shall** be entered from any state when a Protocol Error is detected on **SOP'/SOP''** by the Protocol Layer (see Section 6.8.1) or when a Message has not been sent after retries on **SOP'/SOP''** while communicating with a Cable Plug/VPD or whenever the Device Policy Manager directs a Soft Reset on **SOP'/SOP''**.

On entry to the **PE_VCS_CBL_Send_Soft_Reset** state the Policy Engine **Shall** request the **SOP'/SOP''** Protocol Layer to perform a Soft Reset, then **Shall** send a **Soft_Reset** Message on **SOP'/SOP''** to the Cable Plug, and initialize and run the **SenderResponseTimer**.

The Policy Engine **Shall** transition to either the **PE_SRC_Ready** or **PE_SNK_Ready** state when:

- There is an Explicit Contract in place and
- An **Accept** Message has been received on **SOP'/SOP''**.

The Policy Engine **Shall** transition to the either the **PE_SRC_Send_Capabilities** state or **PE_SRC_Discovery** state, depending on the DFP's VCONN Source's Power Role, when:

- There is no Explicit Contract in place and
- An **Accept** Message has been received on **SOP'/SOP''**.
-

The Policy Engine **Shall** transition to the **PE_VCS_CBL_Send_Cable_Reset** state when:

- A **SenderResponseTimer** timeout occurs
- Or the Protocol Layer indicates that a transmission error has occurred.

8.3.3.24.2.3.2 PE_VCS_CBL_Send_Cable_Reset State

The **PE_VCS_CBL_Send_Cable_Reset** state **Shall** be entered from any state when the Device Policy Manager requests a Cable Reset.

On entry to the **PE_VCS_CBL_Send_Cable_Reset** state the Policy Engine **Shall** request the Protocol Layer to send **Cable Reset** Signaling.

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The Policy Engine *Shall* transition to either the *PE_SRC_Ready* or *PE_SNK_Ready* state, depending on the Vconn Source's Power Role, when:

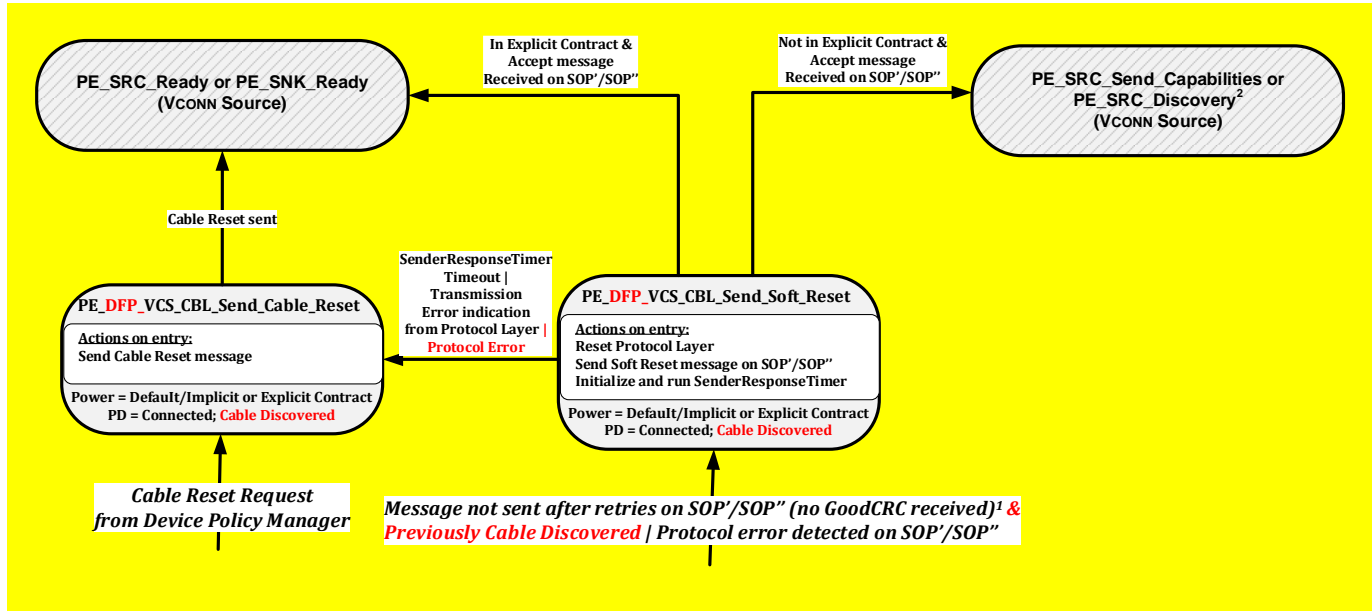
- *Cable Reset* Signaling has been sent.

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8.3.3.24.2.3a VCONN Source SOP'/SOP'' Soft Reset or Cable Reset of a Cable Plug or VPD State Diagram

Figure 8-142a below shows the state diagram for the DFP Policy Engine in a VCONN Source when performing a Soft Reset or Cable Reset of a Cable Plug or VPD on *SOP'/SOP''*. The following sections describe operation in each of the states.

Figure 8-142a DFP and VCONN Source Soft Reset or Cable Reset of a Cable Plug or VPD State Diagram



- 1 Excludes the *Soft_Reset* Message itself.
- 2 Sink only communicates with the Cable Plug when in an Explicit Contract. If the *Discover Identity* Command is being sent at startup then the Policy Engine will subsequently transition to the *PE_SRC_Send_Capabilities* state as normal. Otherwise the Policy Engine will transition to the *PE_SRC_Discovery* state.

8.3.3.24.2.3a.1 PE_DFP_VCS_CBL_Send_Soft_Reset State

The *PE_DFP_VCS_CBL_Send_Soft_Reset* state *Shall* be entered from any state when a Protocol Error is detected on *SOP'/SOP''* by the Protocol Layer (see Section 6.8.1) or when a Message has not been sent after retries on *SOP'/SOP''* while communicating with a Cable Plug/VPD **and when there was previous communication with the cable plug that did not result in a Transmission Error** or whenever the Device Policy Manager directs a Soft Reset on *SOP'/SOP''*.

On entry to the *PE_DFP_VCS_CBL_Send_Soft_Reset* state the *DFP* Policy Engine *Shall* request the *SOP'/SOP''* Protocol Layer to perform a Soft Reset, then *Shall* send a *Soft_Reset* Message on *SOP'/SOP''* to the Cable Plug/VPD, and initialize and run the *SenderResponseTimer*.

The Policy Engine *Shall* transition to either the *PE_SRC_Ready* or *PE_SNK_Ready* state, **depending on the Vconn Source's Power Role**, when:

- There is an Explicit Contract in place and
- An *Accept* Message has been received on *SOP'/SOP''*.

The Policy Engine *Shall* transition to **the** either the *PE_SRC_Send_Capabilities* state or *PE_SRC_Discovery* state, depending on the DFP's VCONN Source's Power Role, when:

- There is no Explicit Contract in place and

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- An **Accept** Message has been received on **SOP'/SOP''**.

The Policy Engine **Shall** transition to the **PE_DFP_VCS_CBL_Send_Cable_Reset** state when:

- A **SenderResponseTimer** timeout occurs
- Or the Protocol Layer indicates that a transmission error has occurred
- Or when a Protocol Error is detected on **SOP'/SOP''** by the Protocol Layer

8.3.3.24.2.3a.2 PE_DFP_VCS_CBL_Send_Cable_Reset State

The **PE_DFP_VCS_CBL_Send_Cable_Reset** state **Shall** be entered from any state when the Device Policy Manager requests a Cable Reset.

On entry to the **PE_DFP_VCS_CBL_Send_Cable_Reset** state the **DFP** Policy Engine **Shall** request the Protocol Layer to send **Cable Reset** Signaling.

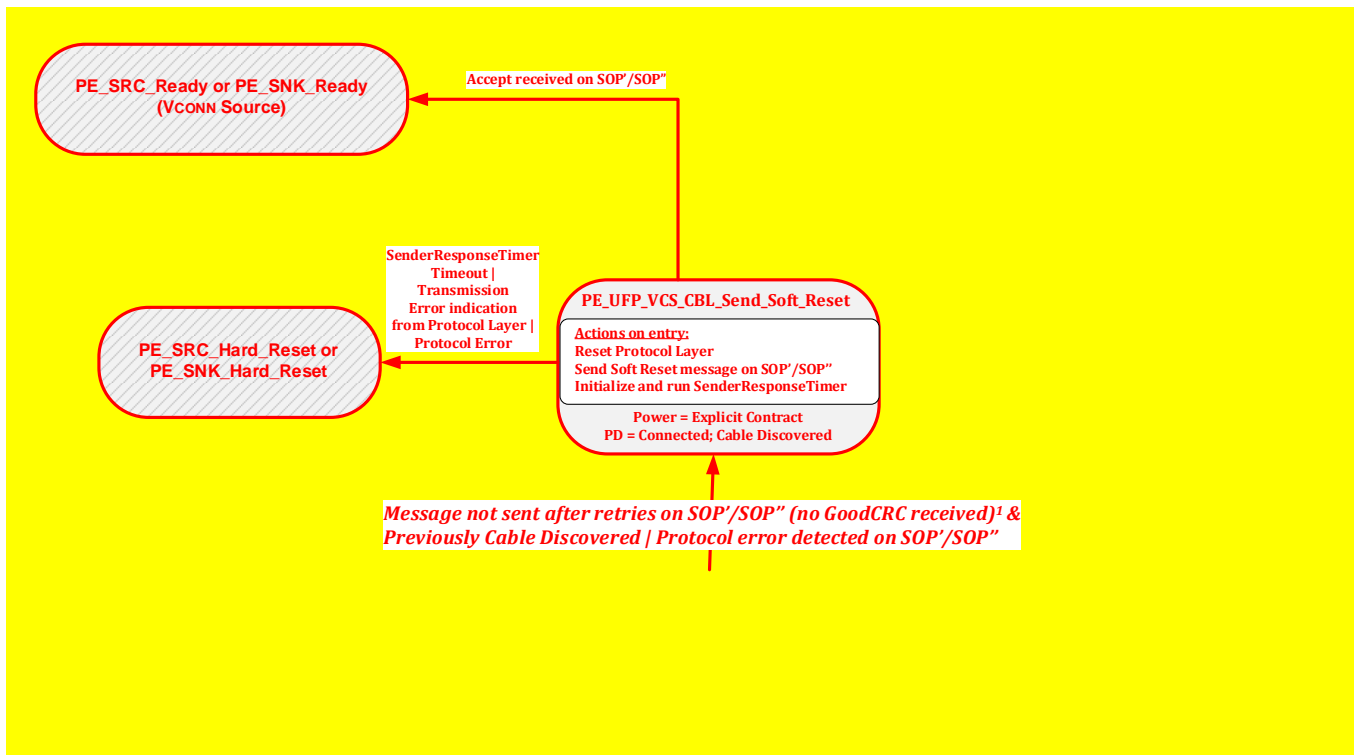
The Policy Engine **Shall** transition to either the **PE_SRC_Ready** or **PE_SNK_Ready** state, depending on the Vconn Source's Power Role, when:

- **Cable Reset** Signaling has been sent.

8.3.3.24.2.3b UFP and VCONN Source SOP'/SOP'' Soft Reset of a Cable Plug or VPD State Diagram

Figure 8-142b below shows the state diagram for the UFP Policy Engine in a VCONN Source when performing a Soft Reset of a Cable Plug or VPD on **SOP'/SOP''**. The following sections describe operation in each of the states.

Figure 8-142b UFP and VCONN Source Soft Reset of a Cable Plug or VPD State Diagram



1 Excludes the **Soft_Reset** Message itself.

8.3.3.24.2.3b.1 PE_UFP_VCS_CBL_Send_Soft_Reset State

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The *PE_UFP_VCS_CBL_Send_Soft_Reset* state **Shall** be entered from any state when a Protocol Error is detected on *SOP'/SOP''* by the Protocol Layer (see Section 6.8.1) or when a Message has not been sent after retries on *SOP'/SOP''* while communicating with a Cable Plug/VPD and when there was previous communication with the cable plug that did not result in a Transmission Error or whenever the Device Policy Manager directs a Soft Reset on *SOP'/SOP''*.

On entry to the *PE_UFP_VCS_CBL_Send_Soft_Reset* state the UFP Policy Engine **Shall** request the *SOP'/SOP''* Protocol Layer to perform a Soft Reset, then **Shall** send a *Soft_Reset* Message on *SOP'/SOP''* to the Cable Plug/VPD, and initialize and run the *SenderResponseTimer*.

The Policy Engine **Shall** transition to either the *PE_SRC_Ready* or *PE_SNK_Ready* state, depending on the Vconn Source's Power Role, when:

- An *Accept* Message has been received on *SOP'/SOP''*.

The Policy Engine **Shall** transition to the *PE_SRC_Hard_Reset* or *PE_SNK_Hard_Reset* state depending on the Policy Engine's power role when:

- A *SenderResponseTimer* timeout occurs
- Or the Protocol Layer indicates that a transmission error has occurred
- Or when a Protocol Error is detected on *SOP'/SOP''* by the Protocol Layer

(c). New Text in Section 1.6 Terms and Abbreviations

Term	Description
<i>Cable Discovered</i>	USB Power Delivery ports that have exchanged a Message and a <i>GoodCRC</i> Message response with a Cable Plug or a VPD using the USB Power Delivery protocol so that both the Port and the Cable Plug know that each is PD Capable.
<i>Cable Discovered</i>	<i>See Discovered</i>

(d). Section 6.8.1 (page 206)

From Text:

A Soft Reset **Shall** impact the USB Power Delivery layers in the following ways:

- Physical Layer: Reset not required since the Physical Layer resets on each packet transmission/reception.
- Protocol Layer: Reset *MessageIDCounter*, *RetryCounter* and state machines.
- Policy Engine: Reset state dependent behavior by performing an Explicit Contract negotiation.
- Power supply: **Shall Not** change.

A Soft Reset is performed using a sequence of protocol Messages (see Table 8-8). Message numbers **Shall** be set to zero prior to sending the *Soft_Reset/Accept* Message since the issue might be with the counters. The sender of a *Soft_Reset* Message **Shall** reset its *MessageIDCounter* and *RetryCounter*, the receiver of the Message **Shall** reset its *MessageIDCounter* and *RetryCounter* before sending the *Accept* Message response. Any failure in the Soft Reset process will trigger a Hard Reset when SOP Packets are being used or Cable Reset for any other SOP* Packets; for example a *GoodCRC* Message is not received during the Soft Reset process (see Section 6.8.3 and Section 6.8.4).

To Text:

A Soft Reset **Shall** impact the USB Power Delivery layers in the following ways:

- Physical Layer: Reset not required since the Physical Layer resets on each packet transmission/reception.
- Protocol Layer: Reset *MessageIDCounter*, *RetryCounter* and state machines.
- Policy Engine: Reset state dependent behavior by performing an Explicit Contract negotiation.

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- Power supply: *Shall Not* change.

A Soft Reset is performed using a sequence of protocol Messages (see Table 8-8). Message numbers *Shall* be set to zero prior to sending the *Soft_Reset/Accept* Message since the issue might be with the counters. The sender of a *Soft_Reset* Message *Shall* reset its *MessageIDCounter* and *RetryCounter*, the receiver of the Message *Shall* reset its *MessageIDCounter* and *RetryCounter* before sending the *Accept* Message response. Any failure in the Soft Reset process will trigger a Hard Reset when SOP Packets are being used or Cable Reset **sent by the DFP only** for any other SOP* Packets; for example a *GoodCRC* Message is not received during the Soft Reset process (see Section 6.8.3 and Section 6.8.4).

(e). Table 6-73 from section 6.12.5

From Text:

Table 6-73 Applicability of Reset Signaling

Signaling Type	DFP	UFP	Cable Plug SOP'	Cable Plug SOP''	VPD ²
Transmitted Message/Signaling					
<i>Soft_Reset</i>	N	N	NA	NA	NA
<i>Hard_Reset</i>	N	N	NA	NA	NA
<i>Cable_Reset</i>	CN ¹	CN ¹	NA	NA	NA
Received Message/Signaling					
<i>Soft_Reset</i>	N	N	N	N	N
<i>Hard_Reset</i>	N	N	N	N	N
<i>Cable_Reset</i>	DR	DR	N	N	N
Note 1: <i>Shall</i> be supported when transmission of SOP' Packets are supported and the Port can supply V _{CONN} . Note 2: VPD includes CT-VPDs when not Connected to a Charger. PD communication with a CT-VPD <i>Shall</i> only take place when not Connected to a Charger					

To Text:

Table 6-73 Applicability of Reset Signaling

Signaling Type	DFP	UFP	Cable Plug SOP'	Cable Plug SOP''	VPD ²
Transmitted Message/Signaling					
<i>Soft_Reset</i>	N	N	NA	NA	NA
<i>Hard_Reset</i>	N	N	NA	NA	NA
<i>Cable_Reset</i>	CN ¹	CN ¹ NA	NA	NA	NA
Received Message/Signaling					
<i>Soft_Reset</i>	N	N	N	N	N
<i>Hard_Reset</i>	N	N	N	N	N
<i>Cable_Reset</i>	DR	DR	N	N	N

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Signaling Type	DFP	UFP	Cable Plug SOP'	Cable Plug SOP''	VPD ²
	<p>Note 1: Shall be supported when transmission of SOP' Packets are supported and the Port can supply VCONN.</p> <p>Note 2: VPD includes CT-VPDs when not Connected to a Charger. PD communication with a CT-VPD Shall only take place when not Connected to a Charger</p>				

(f). Table 8-71 from Section 8.3.3.27

From Text:

Table 8-71 Policy Engine States

State name	Reference
VCONN Source Soft Reset or Cable Reset	
<i>PE_VCS_CBL_Send_Soft_Reset</i>	Section 8.3.3.24.2.3.1
<i>PE_VCS_CBL_Send_Cable_Reset</i>	Section 8.3.3.24.2.3.2

To Text:

State name	Reference
VCONN Source Soft Reset or Cable Reset	
<i>PE_DFP_VCS_CBL_Send_Soft_Reset</i>	Section 8.3.3.24.2.3a.1
<i>PE_DFP_VCS_CBL_Send_Cable_Reset</i>	Section 8.3.3.24.2.3a.2
<i>PE_UFP_VCS_CBL_Send_Soft_Reset</i>	Section 8.3.3.24.2.3b.1