

USB Power Delivery ENGINEERING CHANGE NOTICE

Title: Generic Transition Diagram

Applied to: USB Power Delivery Specification Revision 3.2

Version 1.0

Brief description of the functional changes proposed:
Fig 7-23 'generic change for the source to another A/PDO' does not cover case when $I_{new} < I_{stdby}$. Fig 7-23 shows unwanted misalignment with fig 7-29 This ECN removes this figure and the associated table, as all situations are described in other figures.

Benefits as a result of the proposed changes:
Remove the figure to avoid confusion with some other figures

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

An analysis of the hardware implications:

An analysis of the software implications:

An analysis of the compliance testing implications:
CTS to be updated

USB Power Delivery ENGINEERING CHANGE NOTICE

Actual Change Requested

(a). Section 7.3.1.1.1

From Text:

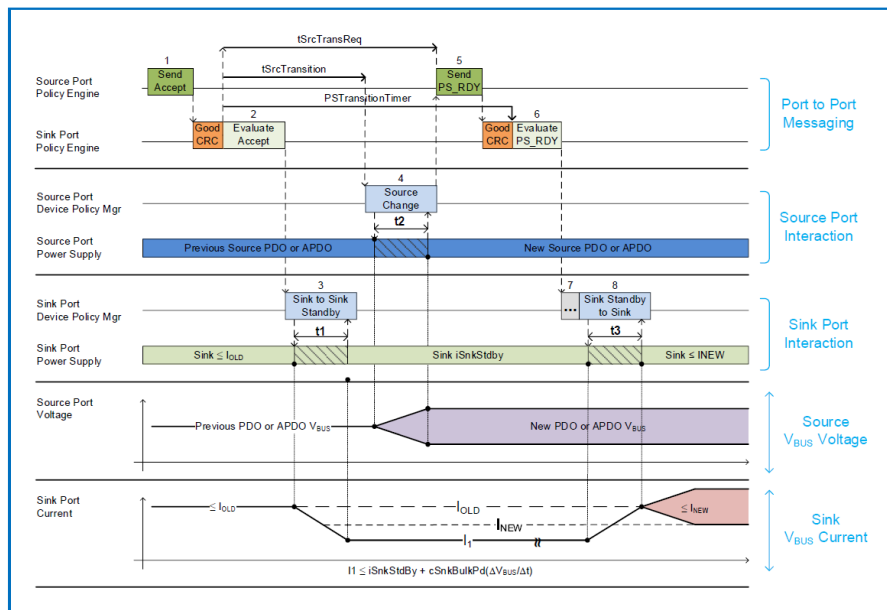
7.3.1.1.1 Generic Transition Diagram for changing the Source to another (A)PDO

The process for changing from one (A)PDO to another (A)PDO is described in general terms in this section. Note it also applies to the transition from [\[USB 2.0\]](#), [\[USB 3.2\]](#), [\[USB4\]](#), [\[USB Type-C 2.3\]](#) or [\[USBBC 1.2\]](#) operation into Power Delivery Mode during the initial Contract negotiation.

The interaction of the Device Policy Manager, the port Policy Engine and the Power Supply that **shall** be followed when increasing the current is shown in [Figure 7-23 “Generic Change for the Source to another \(A\)PDO”](#).

The sequence that **shall** be followed is described in [Table 7.1 “Sequence Description for Changing the Source to another \(A\)PDO”](#). The timing parameters that **shall** be followed are listed in [Table 7.25 “Source Electrical Parameters”](#), [Table 7.26 “Sink Electrical Parameters”](#), and [Table 7.27 “Common Source/Sink Electrical Parameters”](#). Note in this figure, the Sink has previously sent a **Request** Message to the Source.

Figure 7-23 “Generic Change for the Source to another (A)PDO”



USB Power Delivery ENGINEERING CHANGE NOTICE

Table 7.1 "Sequence Description for Changing the Source to another (A)PDO"

Step	Source Port	Sink Port
1	Policy Engine sends the <i>Accept</i> Message to the Sink.	Policy Engine receives the <i>Accept</i> Message.
2	Protocol Layer receives the <i>GoodCRC</i> Message from the Sink. The Policy Engine tells the Device Policy Manager to instruct the power supply to change to the new Source (A)PDO.	Protocol Layer sends the <i>GoodCRC</i> Message to the Source. Policy Engine then starts the <i>PSTransitionTimer</i> and evaluates the <i>Accept</i> Message. There are 3 cases: 1) If the voltage is expected to increase between different (A)PDOs, the Sink Port Current <i>Shall</i> be decreased to <i>iSnkStdby</i> . 2) If the voltage is not expected to increase and I_{NEW} is lower than I_{OLD} the current <i>Shall</i> be reduced to I_{NEW} . 3) If the voltage is not expected to increase and I_{NEW} is greater than or equal to I_{OLD} the Sink Port Current <i>May</i> remain the same.
3		For case 1) in Step 2 the Policy Engine tells the Device Policy Manager to instruct the power supply to reduce current drawn to <i>iSnkStdby</i> within <i>tSnkStdby</i> (t_1); t_1 <i>Shall</i> complete before <i>tSrcTransition</i> . The Sink <i>Shall Not</i> violate transient load behavior defined in Section 7.2.6 "Transient Load Behavior" while transitioning to and operating at the new power level.
4	<i>tSrcTransition</i> after the <i>GoodCRC</i> Message was received the Source starts to change to the new (A)PDO. The Source <i>Shall</i> be ready to operate at the new power level within <i>tSrcReady</i> (t_2). The power supply informs the Device Policy Manager that it is ready to operate at the new power level. The power supply status is passed to the Policy Engine.	
5	The Policy Engine sends the <i>PS_RDY</i> Message to the Sink starting within <i>tSrcTransReq</i> of the end of the <i>GoodCRC</i> Message following the <i>Accept</i> Message.	The Policy Engine receives the <i>PS_RDY</i> Message from the Source.
6	Protocol Layer receives the <i>GoodCRC</i> Message from the Sink.	Protocol Layer sends the <i>GoodCRC</i> Message to the Source. Policy Engine then stops the <i>PSTransitionTimer</i> , evaluates the <i>PS_RDY</i> Message from the Source and tells the Device Policy Manager that the Source is operating at the new (A)PDO. If the <i>PS_RDY</i> Message is not received before <i>PSTransitionTimer</i> times out the Sink sends <i>Hard Reset</i> signaling.
7		The Sink <i>May</i> begin operating at the new power level any time after evaluation of the <i>PS_RDY</i> Message. This time duration is indeterminate.
8		The Sink <i>Shall Not</i> violate the transient load behavior defined in Section 7.2.6 "Transient Load Behavior" while transitioning to and operating at the new power level. The time duration (t_3) depends on the magnitude of the load change.

To Text:

Remove full section 7.3.1.1.1

USB Power Delivery ENGINEERING CHANGE NOTICE

From text:

7.3.1.1 Changing the Source between Different (A)PDOs

In these transition descriptions the term (A)PDO is used to describe any Power Data Object, regardless of whether it is a PDO or an APDO in the Capabilities Message.

This section describes transitions in response to a Request message:

- From one (A)PDO to another (A)PDO
- From an Implicit contract to an Explicit Contract
- From *[USB Type-C 2.3]*operation to the First Explicit Contract

These transitions usually result in a Voltage change but is not required.

The interaction of the Device Policy Manager, the port Policy Engine and the Power Supply in the cases described above, is shown in *Figure 7-23 “Generic Change for the Source to another (A)PDO”*.

The Source Voltage as the transition starts **Shall** be any Voltage within the **Valid** V_{BUS} range of the previous Source PDO or APDO. The Source Voltage after the transition is complete **Shall** be any Voltage within the **Valid** V_{BUS} range of the new Source PDO or APDO. The sequence that **Shall** be followed is described in *Table 7.1 “Sequence Description for Changing the Source to another (A)PDO”*. The timing parameters that **Shall** be followed are listed in *Table 7.25 “Source Electrical Parameters”*, *Table 7.26 “Sink Electrical Parameters”*, and *Table 7.27 “Common Source/Sink Electrical Parameters”*. Note in this figure, the Sink has previously sent a **Request** Message to the Source.

The voltage is considered to increase if the change from V_{OLD} to V_{NEW} is greater than $v_{SmallStep}$. The determination **Shall** be based on the nominal (A)PDO voltage before and after, unless either (A)PDO is Battery or Variable when the worst case of the following is assumed in making this determination.

- Minimum Voltage to Voltage.
- Minimum Voltage to Maximum Voltage.
- Voltage to Maximum Voltage.

The following sections begin with a description of the generic process followed by more specific examples of the most common transitions.

To Text:

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These transitions usually result in a Voltage change but is not required.

The interaction of the Device Policy Manager, the port Policy Engine and the Power Supply

that **Shall** be followed when increasing the current is shown in *Figure 7-25 “Transition Diagram for Increasing the Voltage and Current”* and *7-27 “Transition Diagram for Decreasing the Voltage and Increasing the Current”*. The Source Voltage as the transition starts **Shall** be any Voltage within the **Valid** V_{BUS} range of the previous Source PDO or APDO. The Source Voltage after the transition is complete **Shall** be any Voltage within the **Valid** V_{BUS} range of the new Source PDO or APDO. The sequence that **Shall** be followed is described in *Table 7.3 “Sequence Diagram for Increasing the Voltage and Current”* and *Table 7.5 “Sequence Description for Decreasing the Voltage and Increasing the*

USB Power Delivery ENGINEERING CHANGE NOTICE

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The voltage is considered to increase if the change from V_{OLD} to V_{NEW} is greater than **vSmallStep**. The determination **Shall** be based on the nominal (A)PDO voltage before and after, unless either (A)PDO is Battery or Variable when the worst case of the following is assumed in making this determination.

- Minimum Voltage to Voltage.
- Minimum Voltage to Maximum Voltage.
- Voltage to Maximum Voltage.

The following sections begin with a description of the generic process followed by more specific examples of the most common transitions.