

USB Type-C ENGINEERING CHANGE NOTICE

Title: Fix Connection State Diagram - Sink with Accessory Support (SWAS) State Transition

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

Brief description of the functional changes proposed:

This ECR corrects an incorrect state transition in the Connection State Diagram for a Sink with Accessory Support (SWAS). The current diagram shows a transition from AttachWait.SNK to Unattached.SNK on "Connection removed" event. This transition should instead go to Unattached.Accessory to prevent synchronization lock issues when connecting to a DRP (Dual-Role Port). Additionally, this ECR corrects three states in Figure 4-14 from optional (dashed outline) to required (solid outline): Powered.Accessory, Try.SNK, and Unsupported.Accessory. Finally, this ECR establishes consistent state naming convention throughout the specification using dot notation.

Benefits as a result of the proposed changes:

1. Eliminates synchronization lock problems between SWAS and DRP ports that can prevent or significantly delay connection establishment
2. Enables reliable and fast connection between SWAS devices and DRP devices
3. Improves user experience by ensuring consistent connection behavior
4. Aligns SWAS state machine behavior with DRP design patterns (SWAS \approx DRP functionally)
5. Corrects the specification diagram to match proper implementation behavior
6. Clarifies that key accessory-related states are required, not optional, for proper SWAS operation
7. Ensures consistent state naming convention throughout the specification

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

This is a clarification/correction to the specification diagram and text. The impact is minimal:

- Correctly implemented systems already follow the corrected behavior and will see no change
- Systems that incorrectly implemented the current diagram may experience connection issues with DRP devices; this ECR documents the correct behavior
- No physical layer or protocol changes required
- This is a documentation fix that clarifies proper state machine implementation
- The state naming consistency change (PoweredAccessory \rightarrow Powered.Accessory) is editorial and does not affect functionality

An analysis of the hardware implications:

State machine implementation may be in hardware (ASIC/FPGA logic), firmware, or a combination depending on device architecture. Devices implementing the state machine in hardware may require design changes to correct the state transition arc from AttachWait.SNK to target Unattached.Accessory (instead of Unattached.SNK) on "Connection removed" event. No changes to physical layer signaling, VCONN provision, or electrical characteristics are required. The change affects only the state machine logic.

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An analysis of the software implications:

Devices implementing the SWAS state machine in firmware/software should update the state transition from AttachWait.SNK on "Connection removed" event to transition to Unattached.Accessory (not Unattached.SNK). This ensures proper de-synchronization behavior when connecting to DRP devices. The clarification that Powered.Accessory, Try.SNK, and Unsupported.Accessory states are required (not optional) confirms that implementations must include these states.

An analysis of the compliance testing implications:

Unknown if current compliance testing procedures specifically verify this state transition behavior. The corrected state diagram clarifies proper connection establishment behavior between SWAS and DRP devices. Recommend review of existing compliance test procedures to determine if additional test cases are needed to verify correct state machine implementation for SWAS devices connecting to DRP partners.

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Actual Change Requested

(a). Section 4.5.2.1, Figure 4-14, Connection State Diagram: Sink with Accessory Support, Page 174

From:

Diagram shows state transition arc:

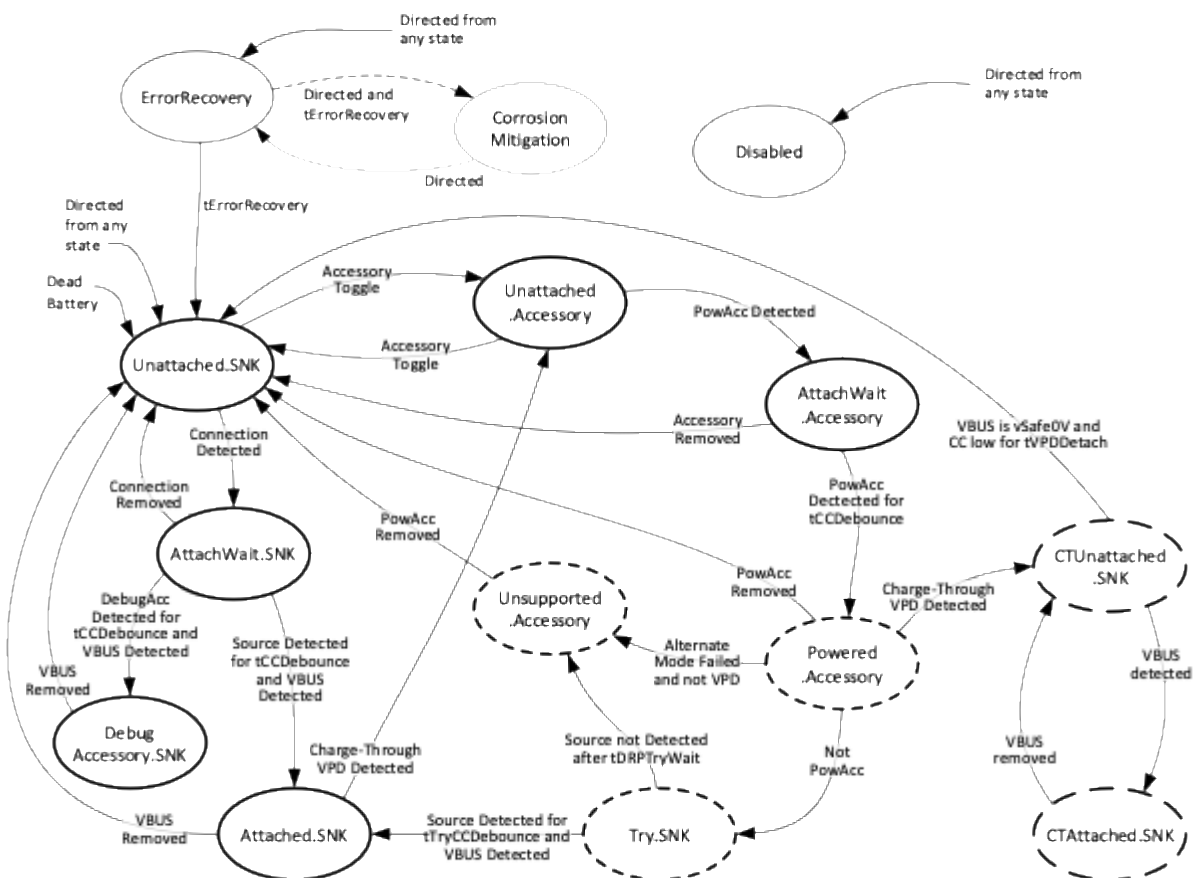
AttachWait.SNK → Unattached.SNK (on "Connection removed" event)

Required vs Optional States

Three states shown with dashed outline (indicating optional states):

- Powered.Accessory
- Try.SNK
- Unsupported.Accessory

Figure 4-14 Connection State Diagram: Sink with Accessory Support



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To:

Diagram shows state transition arc:

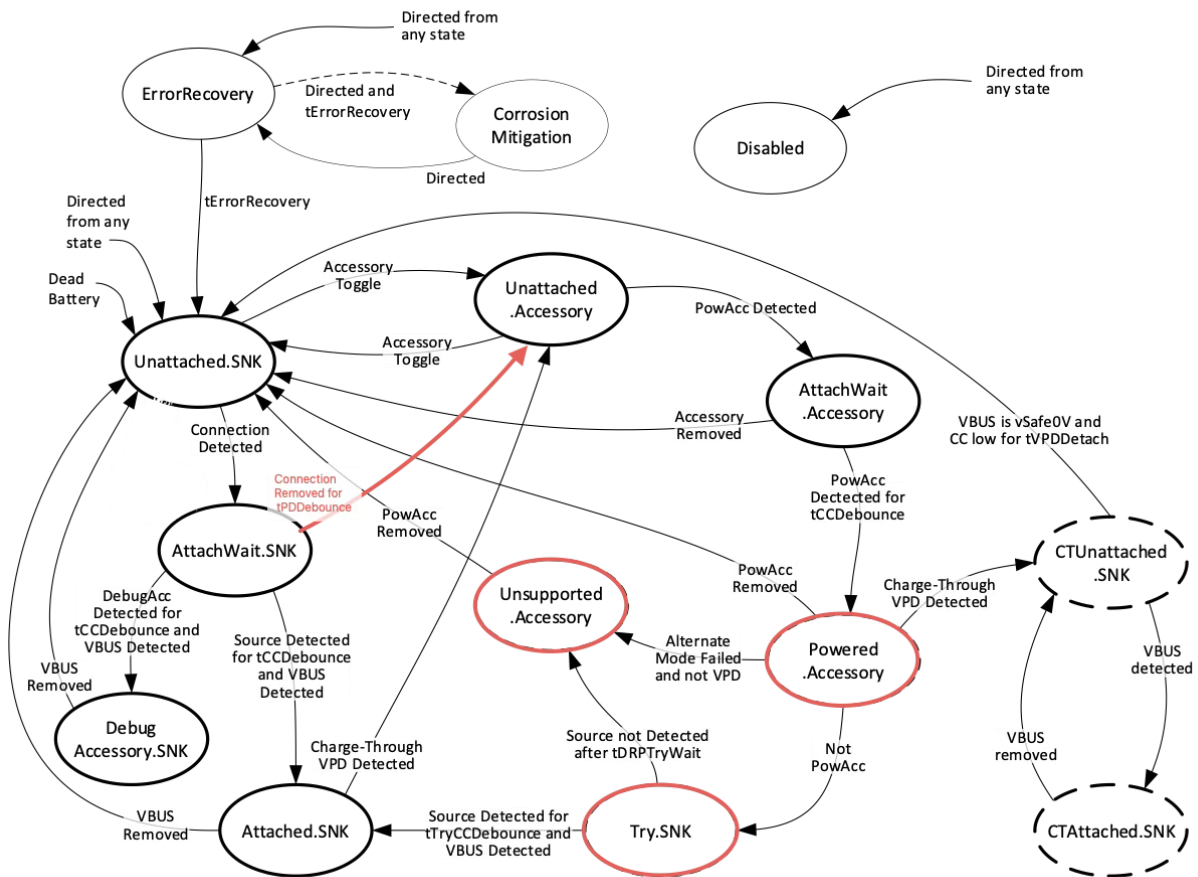
AttachWait.SNK → Unattached.Accessory (on "Connection removed" event)

Required vs Optional States:

Three states shown with solid outline (indicating required states):

- Powered.Accessory (with corrected naming)
- Try.SNK
- Unsupported.Accessory

Figure 4-14 Connection State Diagram: Sink with Accessory Support



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(b). Section 4.5.2.2.4.2, Exiting from AttachWait.SNK State, Page, Page 182

From Text:

A Sink shall transition to Unattached.SNK when the state of both the CC1 and CC2 pins is SNK.Open for at least tPDDebounce.

A DRP shall transition to Unattached.SRC when the state of both the CC1 and CC2 pins is SNK.Open for at least tPDDebounce.

To Text:

A Sink shall transition to Unattached.SNK when the state of both the CC1 and CC2 pins is SNK.Open for at least tPDDebounce.

A Sink with Accessory Support shall transition to Unattached.Accessory when the state of both the CC1 and CC2 pins is SNK.Open for at least tPDDebounce.

A DRP shall transition to Unattached.SRC when the state of both the CC1 and CC2 pins is SNK.Open for at least tPDDebounce.

(c). Throughout Specification - State Name Consistency

From Text:

PoweredAccessory

To Text:

Powered.Accessory

Scope: Global search and replace throughout the entire USB Type-C Specification to ensure consistent state naming convention with dot notation (matching Figure 4-14.).