

USB Type-C ENGINEERING CHANGE NOTICE

Title: USB Type-C ECR TBT3 Enter Mode Vendor Specific Values

Applied to: USB Type-C Specification Release 2.3, Oct 2023

Brief description of the functional changes proposed:

The Thunderbolt Appendix (F) SOP Thunderbolt Mode Response Table F-10 defines bits 30 and 31 as Vendor Specific. The proposal is to make these bits Reserved to avoid confusion.

Table F-10 defines B26 as Intel Vendor Specific B0. This proposal makes B26 Intel Defined.

The Thunderbolt Appendix (F) SOP Enter Mode Table F-13 states bits 31-30 and bit 26 are to be copied from the Device Discover Mode Response and sent on the DFP Enter Mode Response regardless of the DFP policy. This proposal requires B31..30 to be set to 00b. This proposal makes B26 Intel defined to allow Intel to define behavior in a separate specification.

B26 is an Intel specific bit. It shall not be set by a non-Intel DFP. The Intel DFP policy shall determine if this bit is set.

Benefits as a result of the proposed changes:

Interoperability issues observed with UFPs and DFPs setting bits 31 and 30 will no longer occur.

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

The changes proposed only affect vendor specific bits and as such are not expected to impact normal TBT3 behavior.

An analysis of the hardware implications:

Behavior of the TBT3 SOP Mode VDO and Enter Mode is typically implemented in firmware. No hardware change is expected.

An analysis of the software implications:

Firmware update may be required on some UFPs and DFPs. UFPs and DFPs which implemented USB Type-C Rev 2.0 onwards may need to be updated. DFPs implemented before USB Type-C Rev 2.0 are not affected as they followed the Intel Thunderbolt requirements which did not have this issue.

An analysis of the compliance testing implications:

Compliance will need to be updated to reflect the following changes:

- B31..30 in the TBT Discover Mode VDO shall be 00b in Compliance.
- B26 in the TBT Discover Mode VDO is Intel defined and is not checked Compliance.
- B31..30 in the TBT Enter Mode command shall be 00b in Compliance.
- B26 in the TBT Enter mode command is Intel defined and is not checked in Compliance.

USB Type-C ENGINEERING CHANGE NOTICE

Actual Change Requested

(a). Section F.2.5 TBT3 Device Discover Mode Responses, Page 394

From Table F-10 and no Text:

Table F-10 defines the expected Discover Mode VDO responses for a *TBT3* device. In fields where multiple values are listed, device responses *may* vary to match the specific connected device's capabilities.

Table F-10 *TBT3* Device Discover Mode VDO Responses

Message Header							
Rsvd	Number of Objects	Message ID	Cable Plug		Spec Revision	Rsvd	Message Type
0	2	0...7	0 = UFP		10b or 01b	0	1111b
VDM Header							
SVID	VDM Type	VDM Version	Rsvd	Object Position	Command Type	Rsvd	Command
0x8087	1	01b	0	000b	001b	0	00011b

Bit(s)	Value	Parameter
TBT3 SOP VDO		
B31	0 = Not supported 1 = Supported	Vendor specific B1
B30	0 = Not supported 1 = Supported	Vendor specific B0
B29...27	000b	Reserved
B26	0 = Not supported 1 = Supported	Intel specific B0
B25...17	000000000b	Reserved
B16	0 = TBT3 Adapter 1 = TBT2 Legacy Adapter	TBT Adapter
B15...0	0x0001 = TBT Mode	TBT Alternate Mode

USB Type-C ENGINEERING CHANGE NOTICE

To Table F-10 and Text:

Table F-10 defines the expected Discover Mode VDO responses for a **TBT3** device. In fields where multiple values are listed, device responses *may* vary to match the specific connected device's capabilities.

Table F-10 **TBT3** Device Discover Mode VDO Responses

Message Header							
Rsvd	Number of Objects	Message ID	Cable Plug		Spec Revision	Rsvd	Message Type
0	2	0...7	0 = UFP		10b or 01b	0	1111b
VDM Header							
SVID	VDM Type	VDM Version	Rsvd	Object Position	Command Type	Rsvd	Command
0x8087	1	01b	0	000b	001b	0	00011b
Bit(s)	Value				Parameter		
TBT3 SOP VDO							
B31...30	00b				Reserved for Legacy Use		
B29...27	000b				Reserved		
B26	Defined by the Intel TBT3 Specification				Intel Defined		
B25...17	000000000b				Reserved		
B16	0 = TBT3 Adapter 1 = TBT2 Legacy Adapter				TBT Adapter		
B15...0	0x0001 = TBT Mode				TBT Alternate Mode		

Description of the TBT3 Mode VDO Response Bits:

- B31 and B30: Shall be set to 00b.
- B26: Intel Defined.

USB Type-C ENGINEERING CHANGE NOTICE

(b). Section F.2.8 TBT3 Device Enter Mode Command, Page 397-398

From Text:

Table F-13 defines the Enter Mode Command that *shall* be sent to the SOP of a **TBT3** device to enable the device for **TBT3** operation.

Table F-13 **TBT3** Device Enter Mode Command

Message Header							
Rsvd	Number of Objects	Message ID	Cable Plug		Spec Revision	Rsvd	Message Type
0	2	0...7	0 = UFP		10b or 01b	0	1111b
VDM Header							
SVID	VDM Type	VDM Version	Rsvd	Object Position	Command Type	Rsvd	Command
0x8087	1	01b	0	000b	000b	0	00100b

Bit(s)	Value	Parameter
TBT3 SOP VDO		
B31	0 = Not supported 1 = Supported	Vendor specific B1
B30	0 = Not supported 1 = Supported	Vendor specific B0
B29...27	000b	Reserved
B26	0 = Not supported 1 = Supported	Intel specific B0
B25	0 = Passive cable 1 = Active cable	Active_Passive
B24	0 = TBT3 Adapter 1 = TBT2 Legacy Adapter	TBT Adapter
B23	0 = Active with bi-directional LSRX ¹ communication or when Passive 1 = Active with uni-directional LSRX ¹ communication	Active Cable Link Training
B22	0 = Not re-timer 1 = Re-timer	Re-timer
B21	0 = Non-Optical 1 = Optical	Cable Type
B20...19	00b = 3 rd Gen Non-Rounded TBT 01b = 3 rd & 4 th Gen Rounded and Non-Rounded TBT 10b...11b = Reserved	TBT_Rounded_Support
B18...16	000b = Reserved 001b = USB3.1 Gen1 Cable (10 Gbps TBT support) 010b = 10 Gbps (USB 3.2 Gen1 and Gen2 passive cables) 011b = 10 Gbps and 20 Gbps (TBT 3 rd Gen active cables and 20 Gbps passive cables) 100b...111b = Reserved	Cable Speed
B15...0	0x0001 = TBT Mode	TBT Alternate Mode

Notes:
1. LSRX in TBT3 is the same communication channel as SBRX in USB4.

The values to be used when sending the **TBT3** Device Enter Mode command to the SOP of a **TBT3** device are determined based on information retained from earlier in the discovery flow as follows:

USB Type-C ENGINEERING CHANGE NOTICE

- B31 and B30: return the values received in the B31 and B30 fields of the TBT3 Device Discover Mode Response.
- B26: return the value received in the B26 field of the TBT3 Device Discover Mode Response.
- B25: return the value received in the B25 field of the TBT3 Cable Discover Mode Response.
- B24: return the value received in the B16 field of the TBT3 Device Discover Mode Response.
- B23: if using a TBT3 cable, return the value received in the B23 field of the TBT3 Cable Discover Mode Response, otherwise set to 0.
- B22: if using a TBT3 cable, return the value received in the B22 field of the TBT3 Cable Discover Mode Response, otherwise set to 0.
- B21: if using a TBT3 cable, return the value received in the B21 field of the TBT3 Cable Discover Mode Response, otherwise set to 0.
- B20...19: if using a TBT3 cable, return the value received in the B20...19 field of the TBT3 Cable Discover Mode Response, otherwise set to 00b.
- B18...16: if using a TBT3 cable, return the value received in the B18...16 field of the TBT3 Cable Discover Mode Response, otherwise set to 010b.

USB Type-C ENGINEERING CHANGE NOTICE

To Text:

Table F-13 defines the Enter Mode Command that *shall* be sent to the SOP of a **TBT3** device to enable the device for **TBT3** operation.

Table F-13 **TBT3** Device Enter Mode Command

Message Header							
Rsvd	Number of Objects	Message ID	Cable Plug		Spec Revision	Rsvd	Message Type
0	2	0...7	0 = UFP		10b or 01b	0	1111b
VDM Header							
SVID	VDM Type	VDM Version	Rsvd	Object Position	Command Type	Rsvd	Command
0x8087	1	01b	0	000b	000b	0	00100b
Bit(s)	Value					Parameter	
TBT3 SOP VDO							
<u>B31...30</u>	<u>00b</u>					<u>Reserved for Legacy Use</u>	
B29...27	000b					Reserved	
B26	<u>Defined by the Intel TBT3 Specification</u>					<u>Intel Defined</u>	
B25	0 = Passive cable 1 = Active cable					Active_Passive	
B24	0 = TBT3 Adapter 1 = TBT2 Legacy Adapter					TBT Adapter	
B23	0 = Active with bi-directional LSRX ¹ communication or when Passive 1 = Active with uni-directional LSRX ¹ communication					Active Cable Link Training	
B22	0 = Not re-timer 1 = Re-timer					Re-timer	
B21	0 = Non-Optical 1 = Optical					Cable Type	
B20...19	00b = 3 rd Gen Non-Rounded TBT 01b = 3 rd & 4 th Gen Rounded and Non-Rounded TBT 10b...11b = Reserved					TBT_Rounded_Support	
B18...16	000b = Reserved 001b = USB3.1 Gen1 Cable (10 Gbps TBT support) 010b = 10 Gbps (USB 3.2 Gen1 and Gen2 passive cables) 011b = 10 Gbps and 20 Gbps (TBT 3 rd Gen active cables and 20 Gbps passive cables) 100b...111b = Reserved					Cable Speed	
B15...0	0x0001 = TBT Mode					TBT Alternate Mode	
Notes:							
1. LSRX in TBT3 is the same communication channel as SBRX in USB4.							

The values to be used when sending the **TBT3** Device Enter Mode command to the SOP of a **TBT3** device are determined based on information retained from earlier in the discovery flow as follows:

- B31 and B30: ~~return the values received in the B31 and B30 fields of the TBT3 Device Discover Mode Response. The DFP shall set these bits to 0b. The UFP shall ignore these bits.~~

USB Type-C ENGINEERING CHANGE NOTICE

- ~~B29..27: The DFP shall set these bits to 0b. The UFP shall ignore these bits.~~
- ~~B26: return the value received in the B26 field of the TBT3 Device Discover Mode Response. An Intel The DFP shall set these this bits to 0b unless instructed by Intel to set to 1b.~~
- B25: return the value received in the B25 field of the TBT3 Cable Discover Mode Response.
- B24: return the value received in the B16 field of the TBT3 Device Discover Mode Response.
- B23: if using a TBT3 cable, return the value received in the B23 field of the TBT3 Cable Discover Mode Response, otherwise set to 0.
- B22: if using a TBT3 cable, return the value received in the B22 field of the TBT3 Cable Discover Mode Response, otherwise set to 0.
- B21: if using a TBT3 cable, return the value received in the B21 field of the TBT3 Cable Discover Mode Response, otherwise set to 0.
- B20...19: if using a TBT3 cable, return the value received in the B20...19 field of the TBT3 Cable Discover Mode Response, otherwise set to 00b.
- B18...16: if using a TBT3 cable, return the value received in the B18...16 field of the TBT3 Cable Discover Mode Response, otherwise set to 010b.