USB Type-C ENGINEERING CHANGE NOTICE

Title: TBT3 Cable Requirements Update
Applied to: USB Type-C Specification Release 2.0

Brief description of the functional changes proposed:

Updates to TBT3 Cable requirements for accuracy.

Benefits as a result of the proposed changes:

Accurate description of functional requirements for TBT3 cables.

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

None

An analysis of the hardware implications:
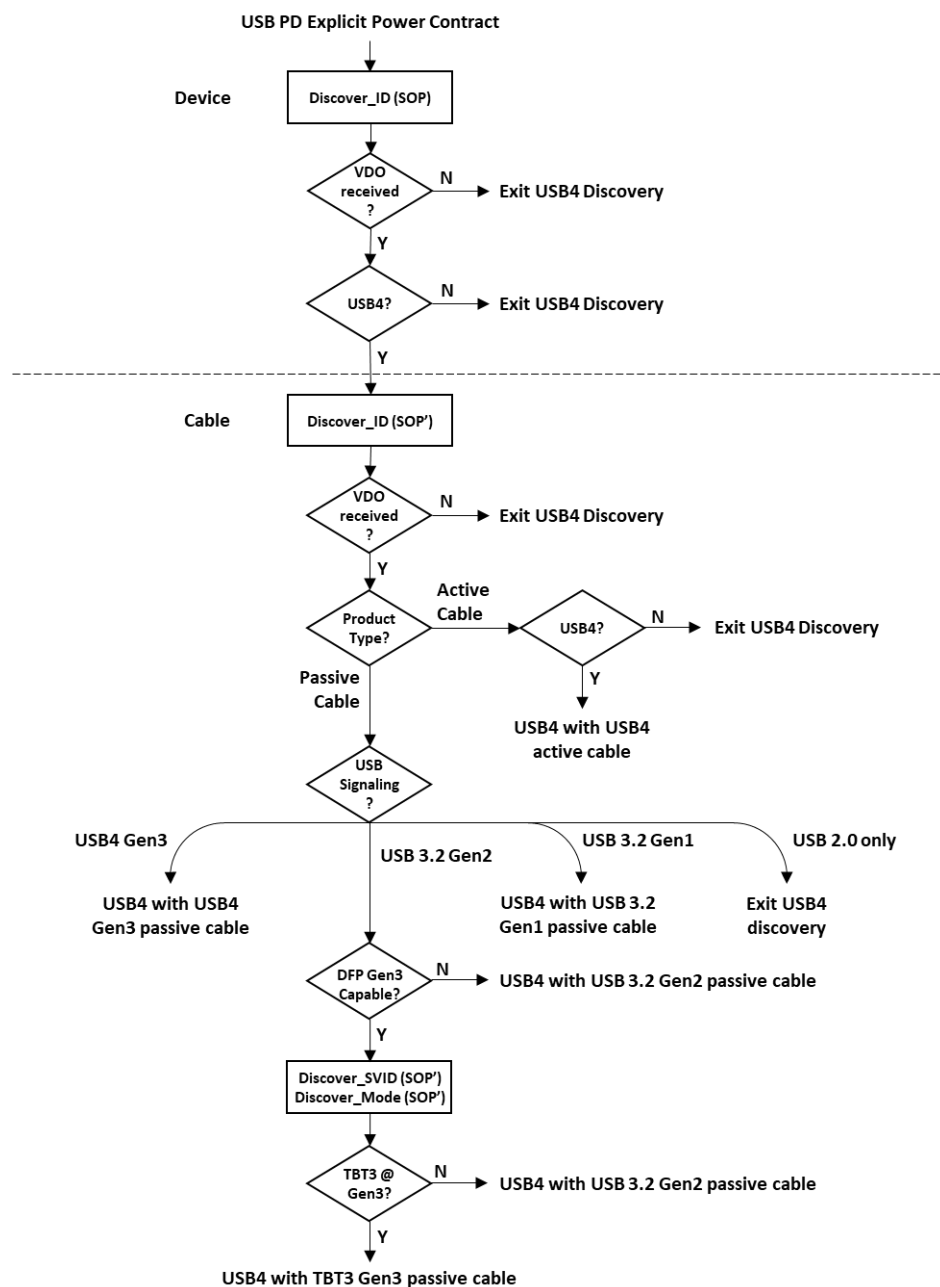
None

An analysis of the software implications:

None

An analysis of the compliance testing implications:

None

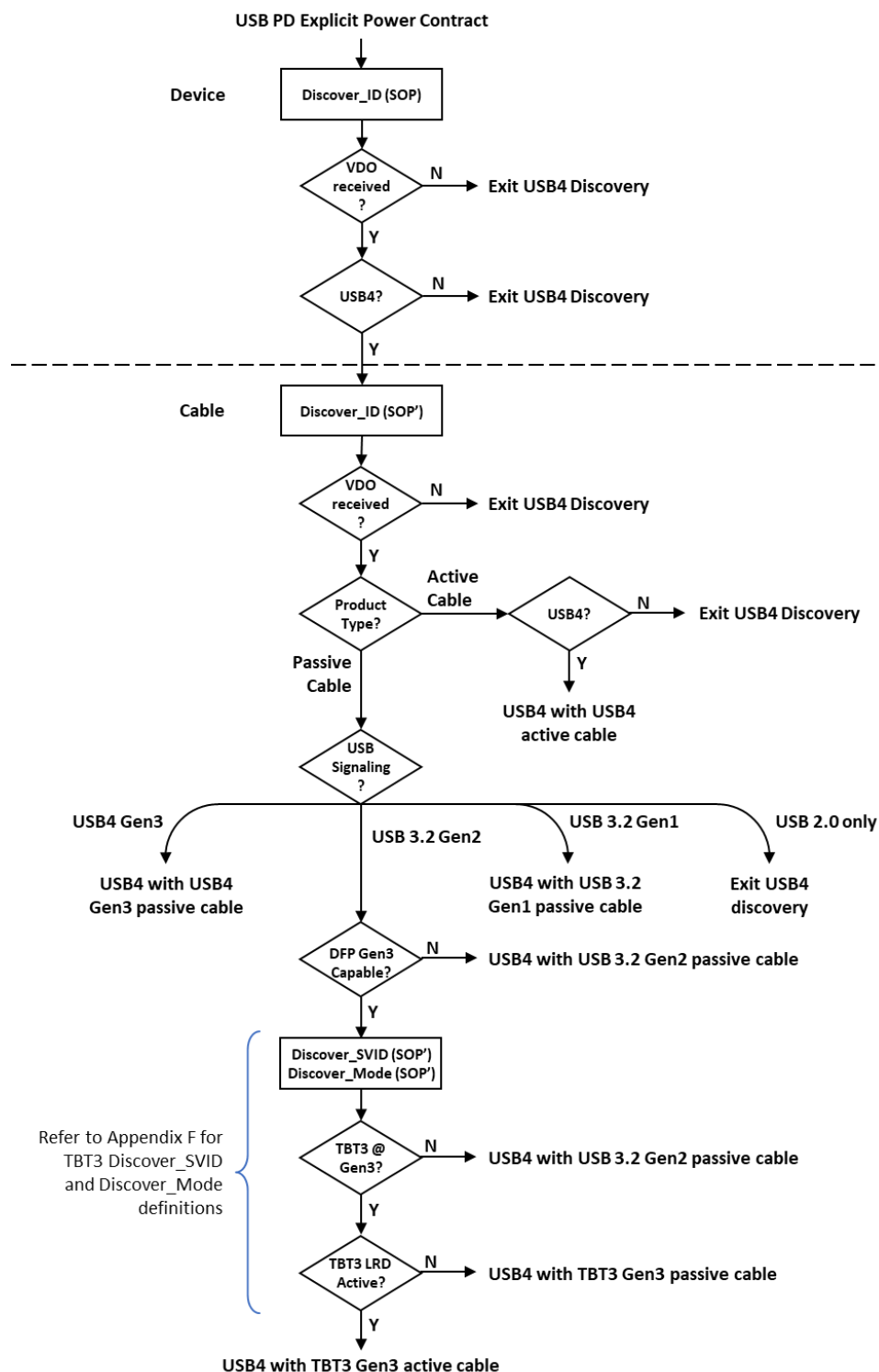# USB Type-C ENGINEERING CHANGE NOTICE

Actual Change Requested

(a). Section 5.4.3 USB4 Discovery and Entry Flow

From Text:

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To Text:

USB PD Explicit Power Contract

Device

Discover_ID (SOP)

VDO received ? —N→ Exit USB4 Discovery

Y

USB4? —N→ Exit USB4 Discovery

Y

- -

Cable

Discover_ID (SOP')

VDO received ? —N→ Exit USB4 Discovery

Y

Product Type? —**Active Cable**→ USB4? —N→ Exit USB4 Discovery

Y

USB4 with USB4 active cable

Passive Cable

USB Signaling ?

USB4 Gen3 → **USB4 with USB4 Gen3 passive cable**

USB 3.2 Gen2

USB 3.2 Gen1 → **USB4 with USB 3.2 Gen1 passive cable**

USB 2.0 only → **Exit USB4 discovery**

DFP Gen3 Capable? —N→ USB4 with USB 3.2 Gen2 passive cable

Y

Discover_SVID (SOP')
Discover_Mode (SOP')

Refer to Appendix F for TBT3 Discover_SVID and Discover_Mode definitions

TBT3 @ Gen3? —N→ USB4 with USB 3.2 Gen2 passive cable

Y

TBT3 LRD Active? —N→ USB4 with TBT3 Gen3 passive cable

Y

USB4 with TBT3 Gen3 active cable

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(b). Section 5.4.3.2 USB4 Cable Discovery (SOP')

From Text:

Some existing Thunderbolt 3 active cables may support *USB4* operation, such cables will indicate that it supports rounded data rates in the Discover Mode VDO response – discovery and use of this cable is optional.

To Text:

Some existing Thunderbolt 3 active cables may ==not== support *USB4* operation, ~~such cables will indicate that it supports rounded data rates in the Discover Mode VDO response~~ discovery and use of this cable is optional. ==Please refer to Appendix F regarding how to discover and support these cables.==

(c). Section 6.2.1.2 Discovering Cable Characteristics

From Text:

The *USB PD* ***Discover_Identity*** Command is used to discover the characteristics of the active cable. This command shall only be sent to SOP'. All active cables shall respond to the ***Discover_Identity*** Command with Active Cable VDOs that returns information about the cable. Note the active cable shall respond using either *USB PD* Revision 2 or *USB PD* Revision 3 following the *USB PD* Interoperability rules.

To Text:

The *USB PD* ***Discover_Identity*** Command is used to discover the characteristics of the active cable. This command shall only be sent to SOP'. All active cables shall respond to the ***Discover_Identity*** Command with Active Cable VDOs that returns information about the cable. Note the active cable shall respond using either *USB PD* Revision 2 or *USB PD* Revision 3 following the *USB PD* Interoperability rules.

==Table 4-2a summarizes the USB4 cables regarding key identity values that will be returned to *USB PD* Revision 3 **Discover_Identity** commands.==

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Table 4-2a USB4 Cable Identity Summary

USB4™ Cable	Function				ID Header VDO	Passive Cable VDO	Active Cable VDO 1	Active Cable VDO 2		
	USB2	USB3	TBT3	DP	Cable Plug Passive/ Active B29…27	Cable Termination Type B12…11	Cable Termination Type B12…11	Physical connection B10	Active element B9	Optical Isolated Active Cable B2
Passive	Yes	Yes	Yes	Yes	011b	00b/01b	n/a	n/a	n/a	n/a
Re-driver[1]	Yes	Yes	Yes	Opt.	011b	01b[2]	n/a	n/a	n/a	n/a
Re-timer[1]	Yes	Yes	Yes	Opt.	100b	n/a	10b/11b	0b	1b	0b
Hybrid Optical[1]	Yes	Yes	Yes	Opt.	100b	n/a	11b	1b	0b/1b	0b
Optically Isolated	No	Yes	Opt.	No	100b	n/a	11b	1b	0b/1b	1b

Notes:
1. USB4 cables are required to support Thunderbolt™ 3 compatibility at this time. The TBT3-specific identity requirements are defined in Appendix F.
2. The Re-Driver active cable represents as only a Passive Cable that is discovered per Figure 5-1.

(d). Section F.2.9 TBT3 Cable Functional Difference Summary, Table F-14

From Text:

Table F-14 TBT3 Cable Functional Difference Summary

Cable	Function						ID Header VDO	Discover Mode (8087)			
	USB2	USB3	TBT3-Limit	USB4	DP		Passive/ Active B29…27	Re-timer B22	Uni/Bi Directional LSRX[1] B23	Rounded /none B20…19	Optical /none B21
Passive	Yes	Yes	Yes	Yes	Yes		011	0	N/A (0)	N/A (0)	0
TBT3 Re timer	Yes	No	Legacy	No	No		100	1	0	00	0
Re-Timer	Yes	Yes	Yes	Yes	Yes		100	1	1	01	0
Re-Driver	Yes	Yes	Yes	Yes	Yes		100	0	1	01	0
Limit Optical	No	No	Yes No CLx No CC	No	No		100	0	1	00	1
Linear Optical Re-Driver	No	Yes	Yes	Yes	No		100	0	1	01	1

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

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To Text:

Table F-14 TBT3 Cable Functional Difference Summary

| Cable | Function | | | | | SOP' Configuration | | | | | |
| | | | | | | ID Header VDO | Discover Mode (8087) | | | | |
	USB2	USB3	TBT3 Limitations	USB4	DP	Passive/ Active B29...27	Re-timer B22	Passive/ Active B25	Uni/Bi Directional LSRX[1] B23	Rounded /none B20...19	Optical /none B21
Passive	Yes	Yes		Yes	Yes	011b	0b	0b	N/A (0b)	N/A (0b)	0b
TBT3 Re timer	Yes	No	TBT3 legacy[3]	No	No	100b	1b	0b	0b	00b	0b
USB4 Re-Timer (with TBT3)	Yes	Yes		Yes	~~Yes~~ Optional	100b	1b	0b/1b	1b	01b	0b
USB4 Re-Driver (with TBT3)	Yes	Yes		Yes	~~Yes~~ Optional	~~100~~011b[2]	0b	1b	1b	01b	0b
TBT3 Limit Optical	No	No	No CLx No CC[4]	No	No	100b	0b	0b	1b	00b	1b
Linear Optical Re-Driver	No	Yes		Yes	No	100b	0b	1b	1b	01b	1b

Notes:
1. LSRX in TBT3 is the same communication channel as SBRX in USB4.
2. This cable is an active cable, however, to support backward compatibility with TBT3 legacy devices B29...27 should be set to 011.
3. Per USB4™ Chapter 13 definition.
4. This cable does not support end-to-end USB PD communication.