

3.5-inch Form Factor Mounting Screw Locations and Depths

1 Executive Summary

This document describes the screw mounting capability for 3.5-inch hard drives from Western Digital brands and affiliates.

Western Digital meets all specification requirements as defined by the industry-standard Storage Networking Industry Association (SNIA) (details of applicable documents provided).

On chassis which utilize the side mounting holes, Western Digital hard drives provide 4x side mount locations as specified by SNIA. The legacy 6x location will not be supported by all Western Digital hard drive products.

For those customers who are using the bottom mount holes, Western Digital hard drives may support either standard hole locations or alternate hole locations, as defined by SNIA.

Please ensure that both standard and alternate bottom mount hole locations are supported by your chassis or disk drive trays to ensure maximum compatibility for your system and flexibility with current and future Western Digital 3.5-inch hard drives.

2 Applicable Documents

The governing document from SNIA for 3.5-inch screw mount is defined in SFF-8301, with detailed locations for mounting holes for both the standard and the alternative bottom mount locations.

3 Background

Over the years, the number of disks within the hard drive casting has increased. With hard drive designs of 3 disks or fewer, there were minimal vertical space challenges, which allowed maximized screw penetration. As 4- and greater-disk platforms were being designed, the vertical spacing was challenged which in some instances forced minimization of the amount of bottom hole penetration while still staying within the industry standard requirements. To help avoid any additional changes in the future, Western Digital has moved newer designs to the "alternate" screw location for bottom mounts. Your design or adoption of bottom mount carriers to accept either set of screw locations provides Western Digital with the maximum flexibility to provide high-capacity and high-efficiency hard drive designs moving forward. This document describes the different mounting conditions of present and future Western Digital hard drives.

Described in this document are the details of the following different mounting conditions. See section 5.1, Tapped depth, fastener penetration, and thread engagement for detail.

- 1 to 3-disk products. These provide the deepest bottom hole screw depth penetration.
- 4-disk products. These reduce the screw depth penetration capability while still meeting the SNIA standard.
- 5-disk products. These further reduce the screw depth penetration capability while also still meeting the SNIA standard.
- 6 disk and higher products. These use alternate bottom mount locations while still meeting the SNIA standard.
 - Please be aware that anyone using bottom mount hole locations must prepare to accommodate both standard bottom hole locations as well as the alternate locations.

4 Industry Standard Details

4.1 Screw positions

Source: SNIA, SFF-8301 Specification for Form Factor of 3.5" Disk Drives Rev 1.9 January 19, 2018

"The pair of bottom mounting holes located by dimension A7 is required. One additional pair of bottom mounting holes are required, either the pair of mounting holes located by dimension A6 or the pair of mounting holes located by dimension A13. Providing all three pairs of mounting holes (located by dimensions A7, A6 and A13) is allowed."

TABLE 3-1 3.5" DISK DRIVE DIMENSIONS

Dimension	Millimeters		Inches	
		Max		Max
A 1	17.80	Max	0.700	Max
A 1	26.10	Max	1.028	Max
A 1	42.00	Max	1.654	Max
A 2	147.00	Max	5.787	Max
A 3	101.60		4.000	
A 4	95.25		3.750	
A 5	3.18		0.125	
A 6	44.45		1.750	
A 7	41.28		1.625	
A 8	28.50		1.122	
A 9	101.60		4.000	
A10	6.35		0.250	
A11	0.25		0.010	
A12	0.50		0.020	
A13	76.20		3.000	
Threads				
Size	6-32 UNC-2B			
Fastener penetration	2.39	Min	0.094	Min
	3.56	Max	0.140	Max
Fastener penetration applies to fasteners used to mount the device. The device shall accept the maximum fastener penetration.				

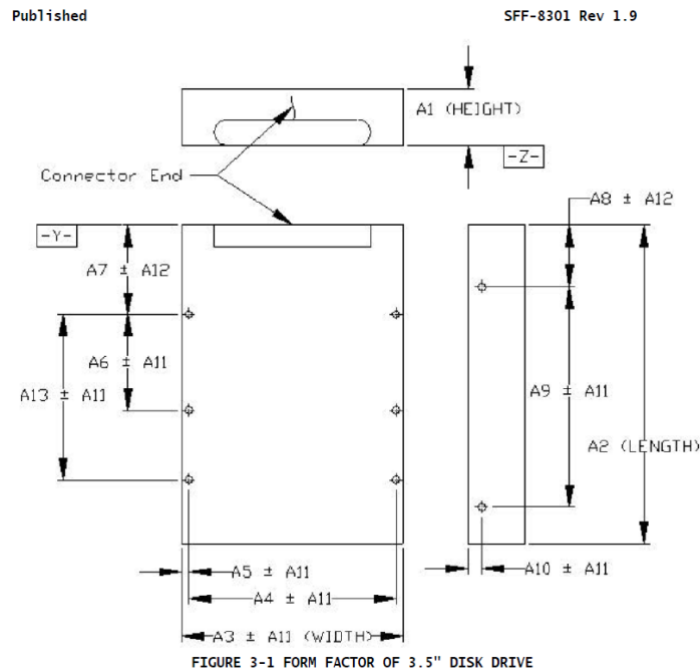


Figure 1. Bottom mount holes, SNIA requirements for alternate screw locations

4.1.1 Alternate bottom mount screw locations

Shown in Figure 2 are the legacy standard bottom hole mounting locations for many currently-shipping Western Digital products. Shown in Figure 3 are alternate bottom hole mounting locations presently used in high capacity Western Digital hard disk drives.

For mounting designs utilizing bottom holes, please ensure your sled design accommodates both standard and alternate bottom hole locations.

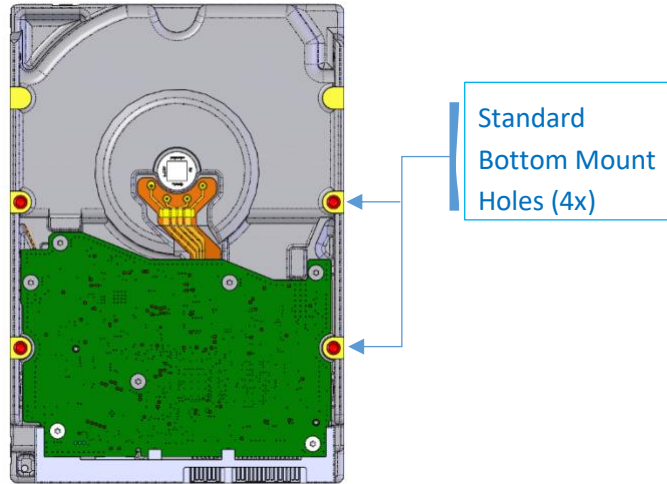


Figure 2. Bottom mount holes, standard locations (4x)

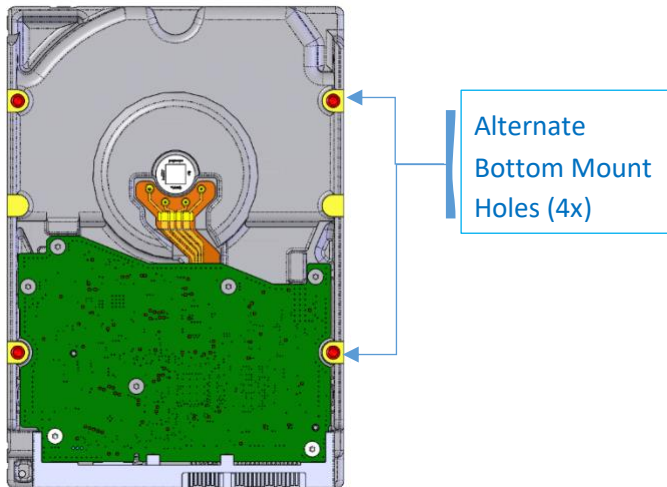


Figure 3. Bottom mount holes, alternate locations (4x)

4.1.2 Alternate side mount screw locations

Shown in Figure 4 are the legacy side hole mounting locations for many currently-shipping Western Digital products. This legacy side hole mounting provides 4 locations as specified per SNIA requirement and two additional locations. Providing 6 mounting locations was a de-facto standard, but not required. Western Digital does not recommend using the 2 center locations based on not being called out in SFF-8301, and not being supported by all of our products.

Shown in Figure 5 are alternate side hole mounting locations presently used in some high capacity Western Digital hard disk drives. This alternate side hole mounting provides 4 locations as specified per SNIA requirement, no additional locations is provided.

For mounting designs utilizing side holes, please ensure your sled design accommodates both legacy and alternate side hole locations.

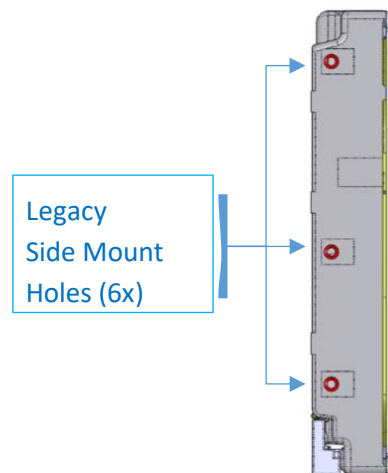


Figure 4. De-facto Standard Side mount holes, legacy locations, 6X

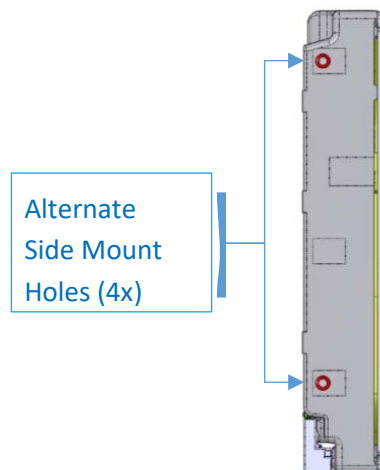


Figure 5. Side mount holes, alternate locations, 4X

5 Western Digital Product Mounting Guidance

5.1 Tapped depth, fastener penetration, and thread engagement

Per SFF-8301 rev 1.9, all mounting holes must be tapped per 6-32UNC-2B, with depths and penetrations listed in Table 1 below in comparison to various Western Digital products.

Table 1. Side and Bottom Mounts Minimum thread depth and max fastener penetration for different Western Digital products

		SFF-8301 rev 1.9 Section 3.2		1 to 3 disk		4 disk		5 disk		6 disk	
		Side	Bottom	Side	Bottom	Side	Bottom	Side	Bottom	Side	Bottom
Min Thread Depth	threads	3	3	3.4	8.0	3.5	5.0	3.7	5.0	3.5	5.0
	mm	2.39	2.39	2.70	6.35	2.77	4.00	2.90	4.00	2.77	4.00
Max Fastener Penetration	threads	4.48	4.48	8.0	8.0	7.9	5.0	7.9	5.0	7.9	5.0
	mm	3.56	3.56	6.32	6.35	6.3	4.00	6.3	4.00	6.3	4.00

		SFF-8301 rev 1.9 Section 3.2		7 & 8 disk		≥ 9 disk	
		Side	Bottom	Side	Bottom	Side	Bottom
Min Thread Depth	threads	3	3	3.8	4.8	3.8	4.8
	mm	2.39	2.39	3.02	3.80	3.02	3.80
Max Fastener Penetration	threads	4.48	4.48	7.7	4.8	4.5	4.8
	mm	3.56	3.56	6.10	3.80	3.56	3.80

Exclusion to “5 disk” above table: The Specification for Max Fastener Penetration was increased in SFF-8301 rev 1.9. The bottom mount design for following legacy 5-disk products do not meet the new increased spec, however it satisfies the original specification SFF-8300 rev 2.4.

		SFF-8300 rev 2.4 Section 3.2		5 disk WD60EFRX, WD60PURX, WD60PURZ, WD60EJRX	
		Side	Bottom	Side	Bottom
Min Thread Depth	threads	3	3	3.5	3.8
	mm	2.38	2.38	2.77	3.02
Max Fastener Penetration	threads	3.8	3.8	7.9	3.8
	mm	3.02	3.02	6.3	3.02

Industry form factor does not specify the minimum required thread engagement, but recommended screw lengths are included in Table 2 below.

Note: Using the screw length guidance in Table 2 based on sheet metal thickness, these screw options will work for all side and bottom mount applications as well as alternate locations.

Table 2. Recommended screw lengths for 6-32UNC mounting screws for given sheet metal thicknesses

Sheet Metal Thickness		Screw length	Engagement (in threads)
inches	mm	inches	
.006" to .038"	0.16 to 0.95	1/8"	2.8 to 3.8
.038" to .069"	0.95 to 1.75	** 5/32"	2.8 to 3.8
.069" to .100"	1.75 to 2.54	3/16"	2.8 to 3.8
.100" to .131"	2.54 to 3.33	** 7/32"	2.8 to 3.8
.131" to .163"	3.33 to 4.13	1/4"	2.8 to 3.8

*** Denotes less common screw lengths*

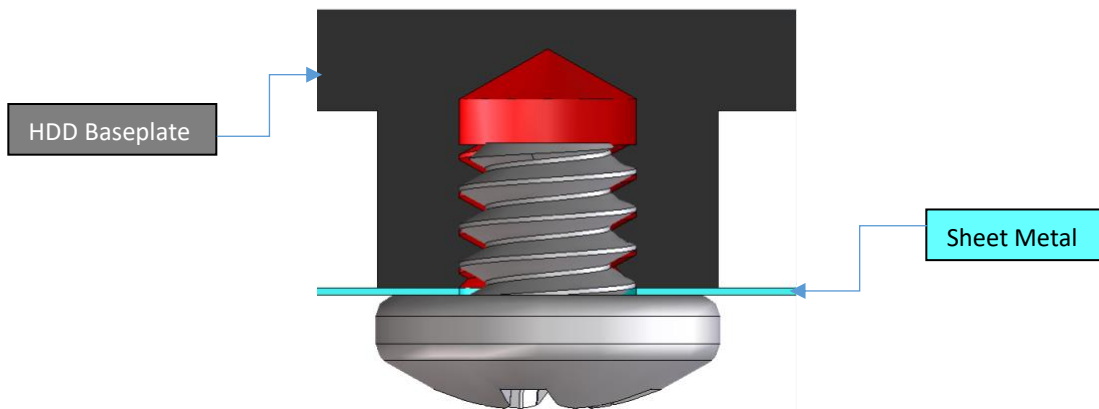


Figure 6. Bottom mount hole, 6-32UNC X 1/8" (3.8 threads engagement)

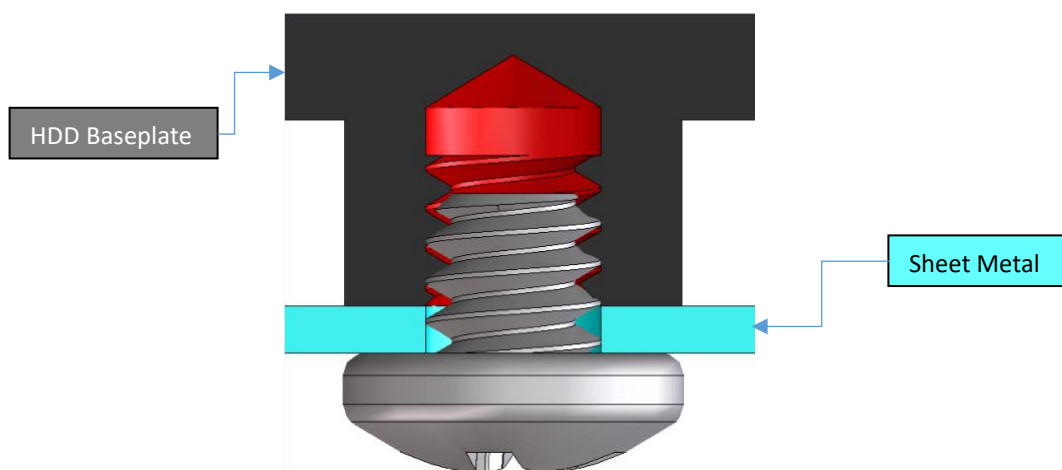


Figure 7. Bottom mount hole, 6-32UNC X 1/8" (2.8 threads engagement)

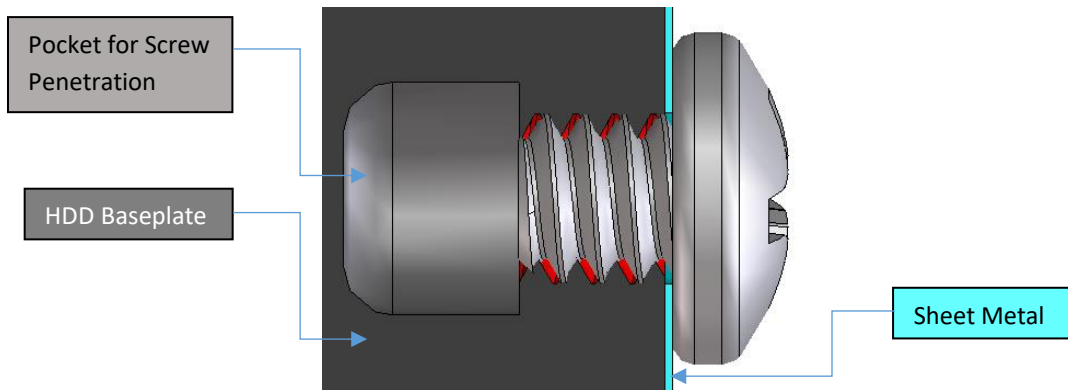


Figure 8. Side mount hole, 6-32UNC x 1/8" (3.8 threads engagement)

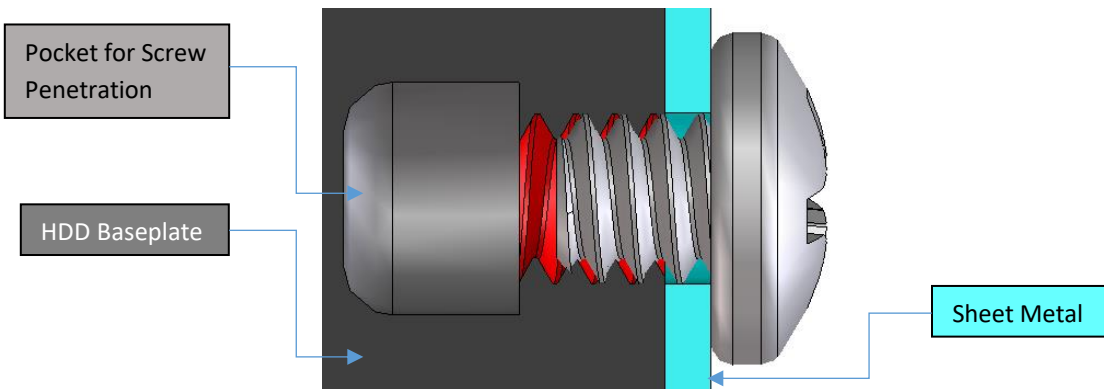


Figure 9. Option 2 – Side mount hole, 6-32UNC X 1/8" (2.8 threads engagement)

Appendix A

For further information on the 3.5-inch form factor, go to <https://www.snia.org>.

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