



Service

Article #1

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“What thread is that?”

by Tony Cripps.

1. Introduction

Ever been confused about what threads are used in our BMC vehicles? We've all heard of Whitworth, SAE, UNC, UNF and A/F, but a little discussion on what all this means can be very helpful when it comes time to repair a thread, or find a screw or a nut that will fit properly.

2. Thread Systems

The formal names for traditional threads used in English machinery are British Standard Fine (BSF), British Standard Whitworth (BSW) and the British Association (BA) threads. Thread pitch is measured in “threads per inch” (TPI) and the included angle between the faces of the threads is 55°. Spanner sizes are given as the diameter of the shank of the bolt – so a ½ Whitworth spanner is a fairly large spanner designed to fit across the flats of very large hexagon head of a ½ diameter bolt or nut. The BA threads are usually found in smaller electrical parts and has a finer thread than the equivalent BSW or BSF diameters.

Diameter (inches)	UNC			UNF			Spanner size (A/F)
	tpi	Tapping drill (mm)	Clearance drill (mm)	tpi	Tapping drill (mm)	Clearance drill (mm)	
1/4	20	5.1	6.5	28	5.5	6.5	7/16
5/16	18	6.6	8.1	24	6.9	8.1	1/2
3/8	16	8	9.7	24	8.5	9.7	9/16
7/16	14	9.4	11.3	20	9.9	11.3	5/8
1/2	13	10.8	13	20	11.5	13	3/4
9/16	12	12.2	14.5	18	12.9	14.5	13/16
5/8	11	13.5	16.25	18	14.5	16.25	15/16
3/4	10	16.5	19.25	16	17.5	19.25	1 1/8
7/8	9	19.5	22.5	14	20.4	22.5	1 5/16
1	8	22.25	25.75	12	23.35	25.75	1 1/2

During WWII, a unified thread system was developed under the auspices of the Society of Automotive Engineers (SAE) which gave rise to Unified National Coarse (UNC), and Unified National Fine (UNF) threads. In these systems, the pitch is still measured in TPI, but the included angle is now 60°. Spanner sizes are given as the dimension across the flats of the bolt head (A/F). So, a ½ SAE spanner has ½” gap between its jaws. The actual diameter of the bolt is much smaller (about 5/16”).

Smaller sizes than $\frac{1}{4}$ UNC or UNF are designated by numbers. For example, the next size down from $\frac{1}{4}$ UNC is a No. 12 thread, often written 12-24 which means No. 12 thread, 24 TPI. An equivalent diameter UNF size is 12-28, indicating 28 TPI.

3. Tapping

Notice that the tapping drill size for a UNF threaded hole is larger for a UNF thread compared to UNC – that is, the coarse threads cut deeper, and have more spacing between them than the fine threads, but the fine threads have a shallower angle, and so a greater “wedging” mechanical advantage when being tightened.

Although the spanner sizes are different, a BSW threaded bolt will screw into a UNC threaded hole, but this should never be considered acceptable since the included angles are different – and so the frictional and load bearing characteristics of the joint will be compromised. Further, the frustration of dealing with an odd-sized bolt head or nut will soon render the practice very undesirable.

4. Applications

In BMC vehicles, most nuts and bolts are UNF where steel parts are joined – a fine thread. Coarse UNC threads are used when the bolt is to be screwed into an alloy part such as the clutch housing. Some threads (e.g. the starter motor cable post) are Whitworth. Some threads in the transmission are designated UNS. These have a finer pitch than the UNF series and are designed for high stress applications.

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Appendix: Decimal and Metric Equivalent of Common Fractions

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DECIMAL AND METRIC EQUIVALENTS OF COMMON FRACTIONS

TRADE MARK
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FRACTIONS OF AN INCH	DECIMALS OF AN INCH	MILLIMETERS	FRACTIONS OF AN INCH	DECIMALS OF AN INCH	MILLIMETERS	FRACTIONS OF AN INCH	DECIMALS OF AN INCH	MILLIMETERS	FRACTIONS OF AN INCH	DECIMALS OF AN INCH	MILLIMETERS
1/16	.015625	.397	1/2	.5	12.7	3/8	.375	9.525	5/8	.625	15.875
1/8	.125	.3175	5/8	.625	15.875	7/8	.875	22.225	1	1.0	25.4
3/16	.1875	.4763	1	1.0	25.4						
1/4	.25	.635									
5/16	.3125	.7937									
3/8	.375	.9525									
7/16	.4375	1.1113									
1/2	.5	12.7									
9/16	.5625	14.288									
5/8	.625	15.875									
11/16	.6875	17.463									
3/4	.75	19.05									
13/16	.8125	20.637									
7/8	.875	22.225									
15/16	.9375	23.813									
1	1.0	25.4									

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