

# AutoCAD and Its Applications **Advanced**

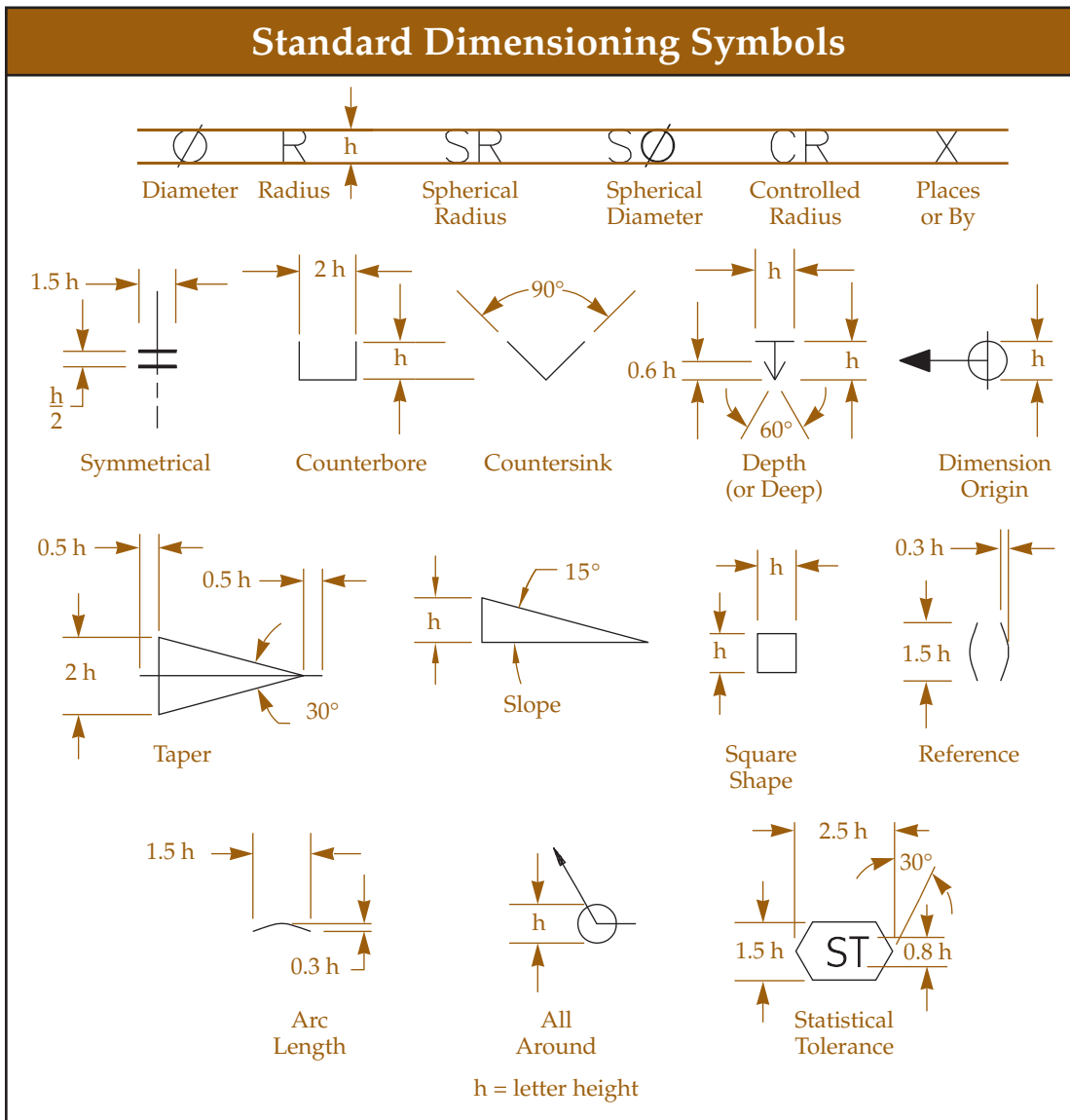
## Reference Material

### Drafting Symbols

Symbols provide a “common language” for drafters all over the world. However, symbols can be meaningful only if they are created according to the relevant standards or conventions. This document describes and illustrates common dimensioning, GD&T, architectural, piping, and electrical symbols.

### Standard Dimensioning Symbols

The size of dimensioning symbols varies with text size, but it should be consistent with the height of the text. In the following illustration,  $h$  = text height.

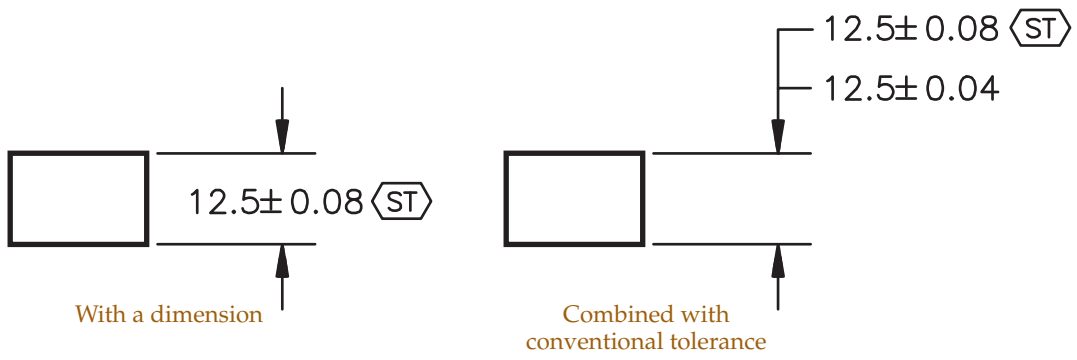
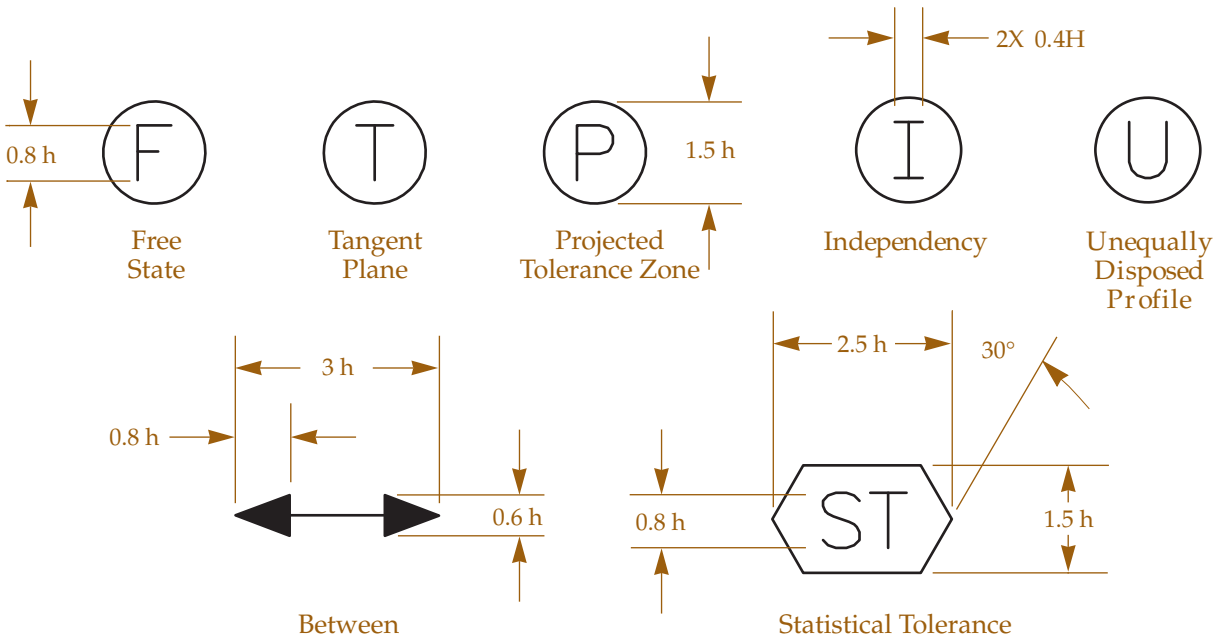


# Geometric Dimensioning and Tolerancing Symbols

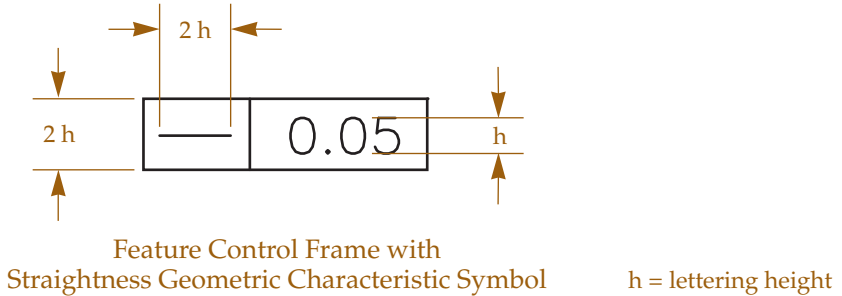
You can either create your own library of GD&T symbols, or use one of AutoCAD's GD&T fonts to insert the symbols as text. The following tables show how to construct the symbols.

GD&T Symbol Creation																																																		
<p>Datum Feature Symbol</p>																																																		
<p>Datum Target Symbol</p> <p>Movable Datum Target Symbol</p>		<table border="0"> <tr> <td rowspan="3">Form</td> <td>—</td> <td>Straightness</td> </tr> <tr> <td>▭</td> <td>Flatness</td> </tr> <tr> <td>○</td> <td>Circularity</td> </tr> <tr> <td rowspan="2">Profile</td> <td>⊂</td> <td>Cylindricity</td> </tr> <tr> <td>⌒</td> <td>Profile of a line</td> </tr> <tr> <td rowspan="3">Location</td> <td>⊕</td> <td>Profile of a surface</td> </tr> <tr> <td>⊙</td> <td>Position</td> </tr> <tr> <td>⊖</td> <td>Concentricity</td> </tr> <tr> <td rowspan="3">Orientation</td> <td>≡</td> <td>Symmetry</td> </tr> <tr> <td>∥</td> <td>Parallelism</td> </tr> <tr> <td>⊥</td> <td>Perpendicularity</td> </tr> <tr> <td rowspan="2">Runout</td> <td>↗</td> <td>Angularity</td> </tr> <tr> <td>↗ or ↘</td> <td>Circular runout</td> </tr> <tr> <td colspan="2"> <p>Target Point and Target Area</p> </td> <td> <table border="0"> <tr> <td rowspan="2">Runout</td> <td>↗ or ↘</td> <td>Total runout</td> </tr> <tr> <td>↗ or ↘</td> <td>Circular runout</td> </tr> </table> <p>Geometric Characteristic Symbols</p> </td> </tr> <tr> <td colspan="3"> <table border="0"> <tr> <td> <p>Ⓜ MMC, maximum material condition or MMB, maximum material boundary</p> </td> <td> <p>RFS, regardless of feature size (no symbol, RFS is assumed unless otherwise specified)</p> </td> <td> <p>Ⓛ LMC, least material condition or LMB, least material boundary</p> </td> </tr> <tr> <td colspan="3"> <p>Material Condition Symbols</p> </td> </tr> </table> </td> </tr> </table>	Form	—	Straightness	▭	Flatness	○	Circularity	Profile	⊂	Cylindricity	⌒	Profile of a line	Location	⊕	Profile of a surface	⊙	Position	⊖	Concentricity	Orientation	≡	Symmetry	∥	Parallelism	⊥	Perpendicularity	Runout	↗	Angularity	↗ or ↘	Circular runout	<p>Target Point and Target Area</p>		<table border="0"> <tr> <td rowspan="2">Runout</td> <td>↗ or ↘</td> <td>Total runout</td> </tr> <tr> <td>↗ or ↘</td> <td>Circular runout</td> </tr> </table> <p>Geometric Characteristic Symbols</p>	Runout	↗ or ↘	Total runout	↗ or ↘	Circular runout	<table border="0"> <tr> <td> <p>Ⓜ MMC, maximum material condition or MMB, maximum material boundary</p> </td> <td> <p>RFS, regardless of feature size (no symbol, RFS is assumed unless otherwise specified)</p> </td> <td> <p>Ⓛ LMC, least material condition or LMB, least material boundary</p> </td> </tr> <tr> <td colspan="3"> <p>Material Condition Symbols</p> </td> </tr> </table>			<p>Ⓜ MMC, maximum material condition or MMB, maximum material boundary</p>	<p>RFS, regardless of feature size (no symbol, RFS is assumed unless otherwise specified)</p>	<p>Ⓛ LMC, least material condition or LMB, least material boundary</p>	<p>Material Condition Symbols</p>		
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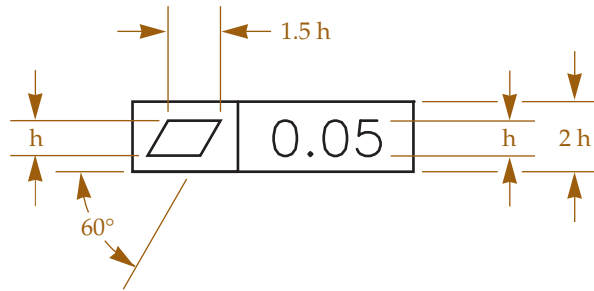
# GD&T Symbol Creation



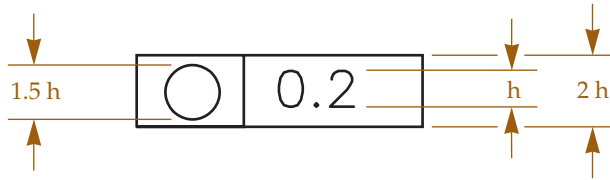
In the feature control frame  
Statistical Tolerancing Methods



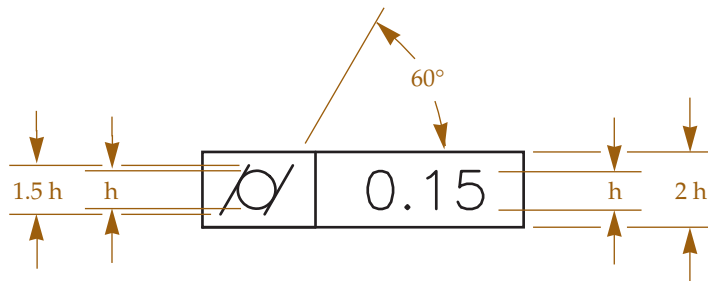
# GD&T Symbol Creation



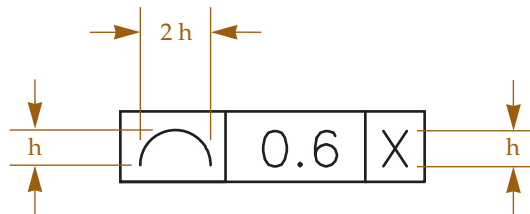
Feature Control Frame with Flatness  
Geometric Characteristic Symbol



Feature Control Frame with Circularity  
Geometric Characteristic Symbol



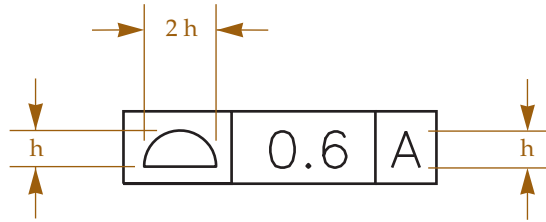
Feature Control Frame with Cylindricity  
Geometric Characteristic Symbol



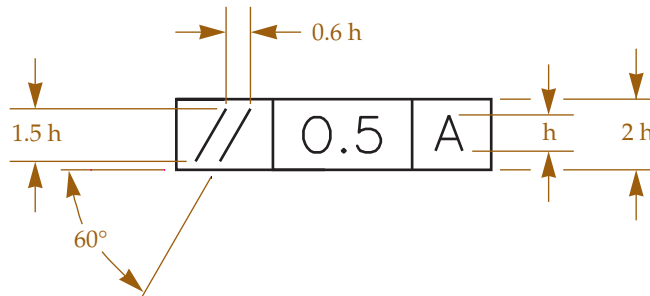
Feature Control Frame with Profile  
of a Line Geometric Characteristic  
Symbol and a Datum Reference

$h$  = lettering height

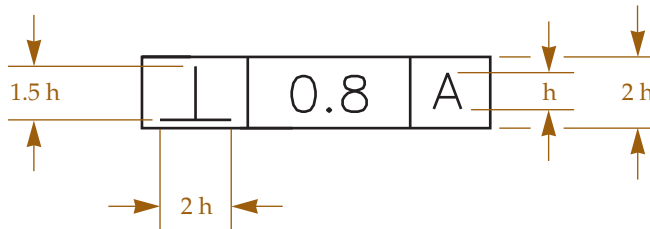
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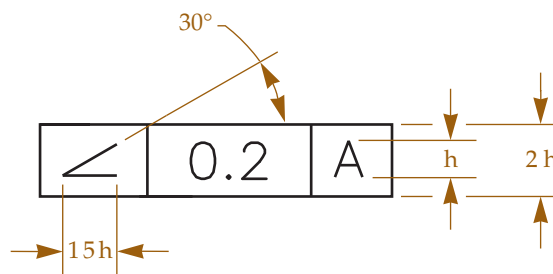
Feature Control Frame with Profile of a Surface Geometric Characteristic Symbol and a Datum Reference



Feature Control Frame with Parallelism Geometric Characteristic Symbol and a Datum Reference



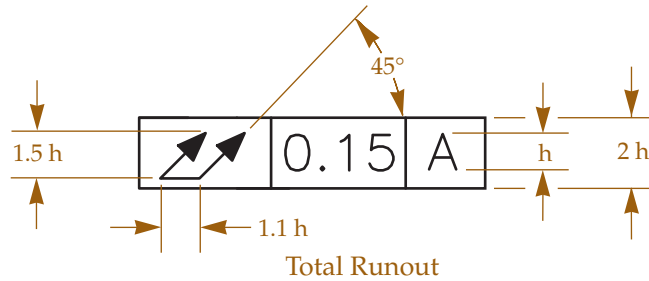
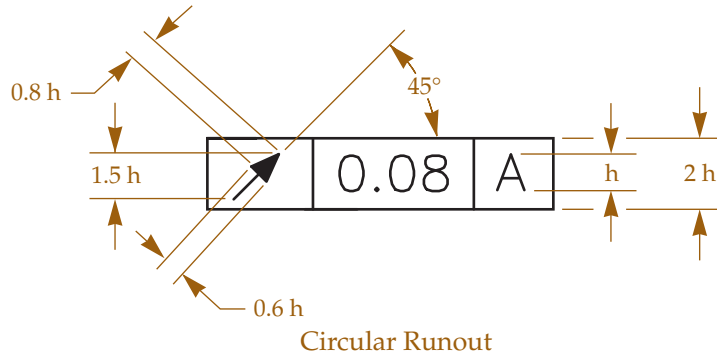
Feature Control Frame with Perpendicularity Geometric Characteristic Symbol and a Datum Reference



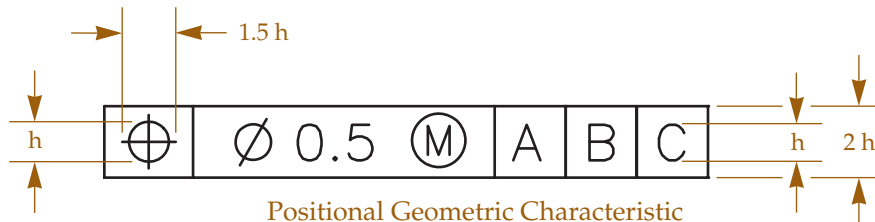
Feature Control Frame with Angularity Geometric Characteristic Symbol and a Datum Reference

$h$  = lettering height

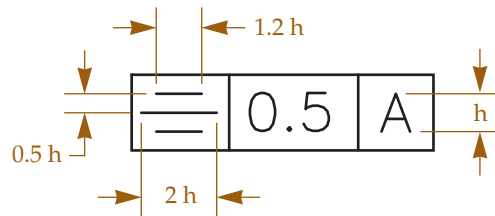
# GD&T Symbol Creation



Runout symbols may be drawn open or filled



Positional Geometric Characteristic  
Symbol and Tolerance in a Feature Control  
Frame with Three Datum References






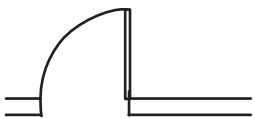




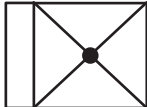
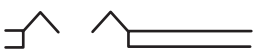

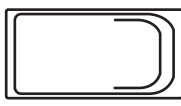



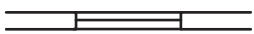

























Feature Control Frame with Symmetry  
Geometric Characteristic  
Symbol and a Datum Reference

$h$  = lettering height

To create GD&T symbols as text, create a style using the gdt.shx font. Then use the lowercase alphabet to type the symbols. The following table shows the symbol produced by each lowercase letter.

Lowercase Letter	Symbol Produced
a	
b	
c	
d	
e	
f	
g	
h	
i	
j	
k	
l	
m	
n	
o	
p	
q	
r	
s	
t	
u	
v	
w	
x	
y	
z	

# Common Architectural Symbols

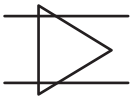

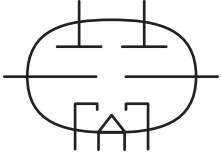



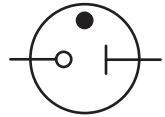



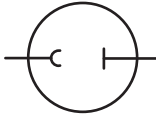



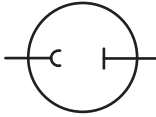


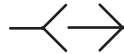





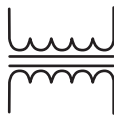






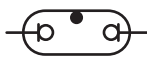



 Exterior Door	 Toilet	 Water Heater
 Interior Door	 Wall Hung Toilet	 Shower
 Pocket Door	 Urinal	 Shower w/ Seat
 Bifold Door	 Oval Vanity Sink	 Tub
 Bypass Door	 Rectangular Vanity Sink	 Washer/Dryer
 Window	 Single Kitchen Sink	 Range
 Lighting Outlet	 Double Kitchen Sink	 Refrigerator
 Recessed Lighting Outlet	 220V Outlet	 Fan
 Wall Lighting Outlet	 Weatherproof Outlet	 Conduit
 Fluorescent Light Fixture	 Thermostat	
 Single Receptacle Outlet	 Doorbell	
 Duplex Convenience Outlet	 Fan Hanger Receptacle	
 Triplex Receptacle Outlet	 Clock Hanger Receptacle	
 Special Outlet	 TV Outlet	
 Floor Single Receptacle Outlet		
 Floor Duplex Receptacle Outlet		
 Single Pole Switch		
 3-Way Switch		



# Single Line Piping Symbols

Name	Screwed			Buttwelded		
	Left Side	Front	Right Side	Left Side	Front	Right Side
90° Elbow						
45° Elbow						
Tee						
45° Lateral						
Cross						
Cap						
Concentric Reducer						
Eccentric Reducer						
Union						
Coupling						

## Common Symbols for Electrical Diagrams

			
Amplifier	Capacitor, Polarized	Twin Triode Using Elongated Envelope	Receiver, Earphone
			
Antenna, General	Circuit Breaker	Voltage Regulator, also, Glow Lamp	Resistor, General
			
Antenna, Dipole	Ground	Phototube	Resistor, Adjustable
			
Antenna, Loop	Chassis Ground	Inductor, Winding, Reactor, General	Resistor, Variable
			
Antenna, Counterpoise	Connectors, Jack and Plug	Magnetic Core Inductor	Transformer, General
			
Battery, Long Line Positive	Engaged Connectors	Adjustable Inductor	Transformer, Magnetic Core
			
Multicell Battery	Triode with Directly Heated Cathode and Envelope Connection to Base Terminal	Ballast Lamp	Shielded Transformer, Magnetic Core
			
Capacitor, General	Pentode Using Elongated Envelope	Fluorescent, 2-Terminal Lamp	Auto-Transformer, Adjustable
			
Capacitor, Variable		Incandescent Lamp	