

1 Purpose

- 1.1 This specification defines the minimal requirements for the manufacture of general purpose rigid and rigid flex Printed Circuit Boards for WATERS Corporation

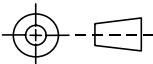
2 Scope

- 2.1 This specification covers end product workmanship and acceptability for rigid and rigid flex Printed Circuit Boards manufactured for WATERS Corporation. It is not intended to dictate specific methods or processes beyond those required to obtain consistent fabrication of quality Printed Circuit Boards.

3 Specifications

3.1 General:

- 3.1.1 See Fabrication Drawing for specific PCB manufacturing instructions.
- 3.1.2 In case of discrepancy between Fabrication notes and this PCB specification, the Fabrication drawing takes precedence.
- 3.1.3 Except as noted in sections 3.2.1 and 3.4.3, WATERS Corporation must approve any modifications to the artwork or deviation from these notes in writing.
- 3.1.4 No individual part of the fabrication process can be outsourced without prior written authorization from WATERS Corporation.
- 3.1.5 Manufacturer shall manufacture printed circuit boards to a minimum UL rating of UL-94V0.
- 3.1.6 Manufacturer shall manufacture printed circuit boards to IPC 6011 / 6012 class 2 Qualification and Performance Specification latest revision and IPC-A-600 Acceptability of PCB's latest revision, unless otherwise specified.
- 3.1.7 Any exceptions to IPC-A-600 will be defined on the Fabrication Drawing notes.
- 3.1.8 Manufacturer must retain PCB files, process documentation, test certifications, and cross section reports for a minimum of three years.
- 3.1.9 WATERS considers its CAD data to be proprietary and confidential information. For that reason, only WATERS personnel or WATERS approved contract manufacturers are authorized to distribute CAD data for any purpose including quoting, DFM/DFT and fabrication.

For Dimensioning and Tolerancing Use Ansi Y14.5M 1982	Unless Otherwise Specified All dimensions are in inches. Dimensions in brackets [] are in metric. Remove all burrs and sharp edges. Tolerances: Decimals .XX = $\pm .01$.XXX = $\pm .005$ Angles = $\pm 1^\circ$ Surface Roughness 63 Do not scale print.	Design:	Waters Corporation 34 Maple Street Milford, Ma. 01757-3696 U.S.A					
		Drawn:				Title: PCB FABRICATION NOTES & SPECIFICATIONS		
THIRD ANGLE PROJECTION		Checked:	Size: A Dwg. No.: 735001870 Rev.: A					
Next Assy:		Engr.:						
This drawing and all information hereon is the property of Waters Corporation. Any copying, reproduction or unauthorized use is forbidden without written consent.		Engr.:						

3.2 Markings:

3.2.1 Manufacturer shall permanently mark printed circuit boards in silkscreen with Vendor ID, Manufacturers UL Logo, Flammability Rating, and Date code (wwyy) and Lot code.

3.3 Stackup:

3.3.1 See detailed stack up view, on the Fabrication Drawing for copper weight, overall thickness and layer construction.

3.3.1.1 Minimum board thickness tolerance shall be +/- 10%

3.4 Annular Ring /Conductor :

3.4.1 The external layer minimum annular ring shall be 0.001 inches.

3.4.2 The Internal layer minimum annular ring shall be tangency, no breakout allowed.

3.4.3 Unless otherwise specified the manufacturer may add tear dropping to prevent breakout to internal and external layer pads. Teardrop shall be added at pad to trace junction to maintain annular ring requirements.

3.4.4 Conductor width tolerance is +/- 0.001 inches or +/- 15% whichever is less on all layers as defined by artwork unless otherwise specified.

3.4.5 No inner or outer layer etch repairs allowed without prior written authorization from WATERS Corporation.

3.5 Drilling:

3.5.1 All holes must be located from the x-y coordinates provided in the NC drill data +/- .003 inches from datum

3.5.2 See hole legend for finished hole sizes, quantities and tolerances.

3.5.3 Manufacturer may remove non-functional inner layer pads without approval from WATERS Corporation.

3.5.4 The copper plating thickness, for plated thru-holes, shall be 0.0008 inches minimum average throughout the entire hole wall as measured per IPC-6012 class 2

3.6 Soldermask:

3.6.1 Primary and Secondary sides require permanent Liquid Photoimageable green soldermask per IPC-SM-840 class T over bare copper.

3.6.2 The Comparative Tracking Index (CTI) shall be 175 or greater.

3.6.3 Soldermask location tolerance to be +/- 0.003 inches of its nominal circuit location.

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	2	of	3	

3.7 Silkscreen:

- 3.7.1 Primary and/or secondary side must use permanent non-conductive epoxy ink (Photoimageable preferred). Lines to be 0.005 inches minimum.
- 3.7.2 Color: White
- 3.7.3 Maximum silkscreen height/thickness shall be < .002 inches.
- 3.7.4 Markings must not cover or be within 0.100 inches from the center of the fiducials
- 3.7.5 Markings must not cover pads, test points or holes.
- 3.7.6 Manufacturer shall use silkscreen rated to a minimum UL rating of UL-94V0

3.8 Test/Inspection:

- 3.8.1 Printed Circuit Boards to be subject to 100% continuity and isolation electrical test per IPC class 2 minimum or class 3.
- 3.8.2 Test Fixture/program to be generated from IPC-D-356 netlist, ODB++ Format, GenCAD or neutral file.
- 3.8.3 Warpage, bow and twist shall not exceed 0.0075 inches per linear inch or be greater than 0.090 inches across any dimension

3.9 Packaging General requirements:

- 3.9.1 Manufacturer to include impedance report (if applicable), test certification, minimum 1 solder sample and cross-section report with first shipment, as a minimum.
- 3.9.2 The Printed Circuit Boards shall be packaged with a vacuum or heat sealable plastic bag, in such a way as to prevent any movement or damage to the boards. Desiccant and color moisture indicators shall be placed inside bag prior to sealing.

Waters Corporation Milford, Massachusetts 01757 USA	Size	Dwg. No.:	Rev:	Ver:
	A	735001870	A	00
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	3	of	3	