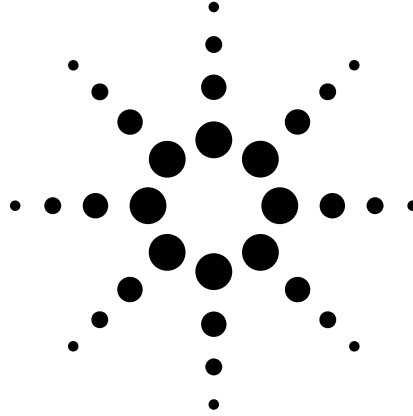


Agilent 5DX Series 3

System Specifications



Key Specifications

System Application

The Agilent 5DX Series 3 is designed for In-line Automated Process Testing of solder connections on PCB assemblies, with pass-thru or pass-back loading. The system can be used for all standard joint-types and fully supports inspection of single and double-sided boards having dimensions up to 457 x 609 mm (18 x24 in.).

Test Approach

Digital cross-sectional X-ray images of solder joints are automatically generated and analyzed. The analysis results includes a complete quantitative description of each joint, as well as a list of all defective solder connections found. Special confirmation and adjustment routines provide solder thickness of key solder joint parameters.

Solder Thickness Measurement Repeatability

Solder thickness from 0.05 to 0.25 mm (0.002 to 0.010 in.) can be measured with a repeatability standard deviation of less than 4% for all component types except capacitors and through-hole. Note: the minimum repeatability standard deviation is 0.0025 mm (0.0001 in.).

Performance Specifications

Test Speed (joint/sec)

The exact speed depends on the density of the component layout on the circuit board. Generally speaking, the more dense the circuit board, the higher the test speed. The typical range in test speeds is from 80 to 140 joints/second (including inspection, alignment, surface map, and board handling time).

Image Acquisition Time (including movement)

Up to 5 images per second

Load/Unload Time

12 seconds per panel for pass-through mode, 15 seconds for pass-back mode, 6 seconds per panel using dual loading

Alignment Time

3 to 8 seconds (depending on board size)

Surface Map Time (Points/Second)

Up to 5 points/sec (typical map density is 1 point / 645–2580 sq. mm (1–4 sq. inches)

General Specifications: Agilent 5DX Series 3 Model Specifications

| | Model 5100A* | Model 5300A† | Model 5400A |
|-------------------------|---------------------------------------|--------------------------------------|--------------------------------------|
| Description | Standard Pitch | Very Fine Pitch | Ultra Fine Pitch |
| Field of View | From 15. to 20.mm (0.6 to 0.8 in.) | From 5. to 20.mm (0.2 to 0.8 in.) | From 5. to 20.mm (0.2 to 0.8 in.) |
| Joint Pitch | 0.5 mm & up (0.020 in. & up) | 0.3 mm† & up (0.012 in.† & up) | 0.2 mm† & up (0.008 in.† & up) |
| Top Clearance | 25. mm* (1.0 in.*) | 9.4 to 25. mm* (0.37 to 1.0 in.*) | 9.4 to 25. mm* (0.37 to 1.0 in.*) |
| Bottom Clearance | 30 mm* (1.2 in.*) | 30 mm* (1.2 in.*) | 30 mm* (1.2 in.*) |

* Measured from the bottom of the circuit board including a maximum warpage of 2mm (0.080 in.) for 5100A systems and 1.5mm (0.060 in.) for 5300A/5400A systems. If components at the maximum top clearance are used, slices cannot extend more than 0.5mm (0.020 in.) below the bottom surface of the board.

† Assuming pad width is 50% of pitch.

‡ 5300 provides additional fov's that may reduce programming effort required to efficiently inspect 20 mil pitch components.

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Board Specifications / Tolerances

Board Handling Size (width x length)

Max.: 457 x 609 mm* (18.0 x 24.0 inches*)
Min.: 102 x 127 mm† (4.0 x 5.0 inches†)
Aspect Ratio: Board length > = 0.5 x board width*

* Boards are handled on the width edges.

† Smaller boards are possible with the use of board carriers.

Maximum Test Area ^A

Standard (width x length)
356 x 597 mm (14.0 x 23.5 in.)

With expanded test area option (width x length)
445 x 597 mm (17.5 x 23.5 in.)

Board thickness ^A

Max.: 3.2 mm (0.125 in.)
Min.: 0.5 mm (0.020 in.)

^A Maximum and minimum board thickness limits can be exceeded with the use of board carriers.

Board Width Tolerance

± 0.7 mm (0.0275 in.)

Board Edge Clearance

3 mm (0.118 in.) on parallel edges of the board
(top and bottom side clearance requirement)

Board Warpage (after reflow and wave soldering)

Normal board usage requires a warpage of less than 1%* of any linear dimension (0.01 inch/inch or 0.01 mm/mm), assuming that the overall board dimensions still fit within the board clearance and width specifications. Maximum board warpage cannot exceed 2 mm† (0.08 in.†). Board warpage of 0.5% or less is required to maximize throughput for some device types.

* Boards with larger warpage percentages can be inspected, but will require additional surface map points and analysis views. Board must still fit general board clearance specifications.

† 1.5 mm (0.06 in.) for the Model 5300A/5400A.

Maximum Acceptable Board Weight (including board carrier)

4.5 Kg (10 lb.)
1 Kg (2.2 lb.) per panel with dual load option

Minimum Acceptable Board Weight

0.03 Kg (.066 lb.)

Maximum Acceptable Board Temperatures (at time of load)

40°C (104°F)

Software Features

Menu Driven Interface

Operator-mode:

Used in normal Automatic Inspection mode. Operator inputs subpanel identification using bar-code or keyboard.

Supervisor-mode:

Allows complete control of the system which includes algorithm setup and debug, CAD data generation, and system diagnostics.

System Confirmation & Adjustment

The system automatically adjusts for the following:

- X-ray beam and rotary detector synchronization
- X and Y homing position
- Z-homing position
- Gray-scale to solder thickness
- Plane of focus

Audit Mode

The Audit Mode provides the operators a review of an inspected board. The operator chooses from the following review parameters:

- Single Step image review
- Individual components
- Defective or marginal joints



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Test Development Software

Semi-automatic software (CadLink) is provided to input and translate the board layout data into machine-readable format. CAMCAD for Agilent Test software is available to translate CAD data to Agilent's Neutral Data File (NDF) format. Component Library provides central management of all test parameters across all board types. Test development Workstation allows the majority of test development to be completed off of Agilent 5DX system.

Test Development Time (typical)

- 2 to 6 hours to translate and verify CAD data (using CAMCAD for Agilent Test)
- 2 to 3 days to set up board (including setting thresholds, laser points, and camera)

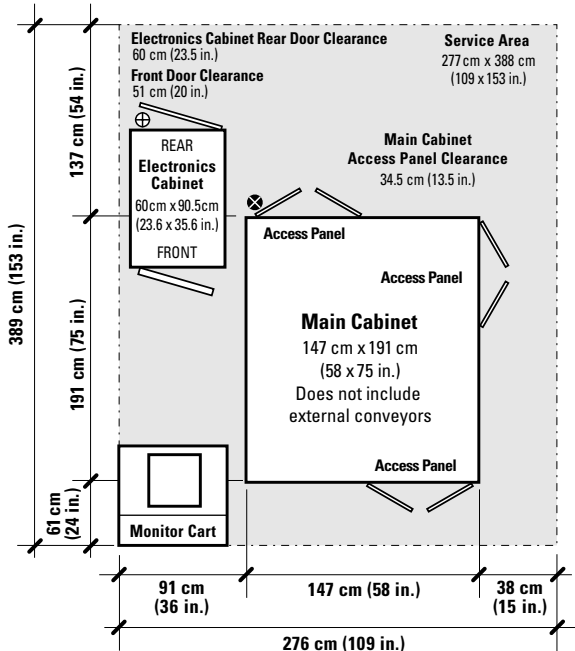
Note: board programming time depends greatly on the board complexity and programmer experience.

Board Alignment

The system aligns on solder joints on the boards under test. Fiducials may be used.

Agilent 5DX System Floor Space Requirements

- ⊗ AIR SERVICE
- ⊕ ELECTRIC SERVICE: Flexible Conduit to allow 92 cm (36 inches) of movement



Algorithms

Modules

Algorithm modules are organized according to device type and joint-type. The algorithms carry out both quantitative measurements and feature detection. The following joint-types are supported:

- JLead
- Gullwing
- BGA
- Melf
- SMT Sockets
- SMT Connector
- LCC
- CHIP Resistor
- Polarized
- Plated Through Hole
- CHIP Capacitor
- Capacitors

Algorithm Quantitative Measurements

The algorithms use detailed analyses of the solder joints to quantitatively measure many aspects of the solder joints. These include quantitative determinations of average solder thickness, detailed solder thickness distributions, pin/pad/fillet positional relationships, void volume, and other solder features that are related to the quality of the solder joint rather than just the presence or absence of solder.

Algorithm Test Reports

- Full reports are provided in the following formats: file, printed, and graphical
- Defect report includes device name, pin number, serial number, defect type, and board name and number
- Graphical display at remote PCs shows exact defect locations for paperless repair

Thresholds

Thresholds are fully adjustable by user for modification of accept/reject levels.

Defects Detected

The algorithms identify the following types of defects:

- Shorts
- Missing Component
- Opens
- Solderball
- Misalignment
- Excess solder
- Insufficient solder

Minimum Feature Detection

| Short Width (at 5 mm [0.2 in.] FOV)* | System |
|--------------------------------------|--------|
| 0.045 mm (0.0018 in.) | 5300 |
| 0.035 mm (0.0014 in.) | 5400 |
| Solder Height | |
| 0.0127 mm (0.0005 in.) | 5300 |
| 0.0127 mm (0.0005 in.) | 5400 |

* The reported values for minimum feature detection assume that the feature is in a single plane of focus and that there are no x-ray absorbers in the x-ray path or in the immediate area of the feature other than those found in a typical multi-layer printed circuit board.

Computer System Overview

Computer System

Dual Pentium™ processors, PCI Frame Grabbers

Operator Console

Single ultra VGA color graphic display, keyboard and mouse.

Control Console

Includes X-ray on/off and laser enabled

Operating System

NT 4.0 Workstation Operating System™.

Safety

Design

The system is designed to prevent electrical, mechanical, or radiation hazards to the operator. The system is fully certified to meet all U.S. Federal specifications regarding the use of cabinet X-ray systems in an industrial environment. All design requirements meet or exceed 21 CFR 1020.40, subchapter J. The system meets the applicable international government radiation emission standards (including German and Japanese standards).

Safety Interlocks

Redundant safety interlocks are used to eliminate the possibility of accidental X-ray exposure, laser exposure, and/or physical harm.



Installation Specifications

System Footprint

2.4 m x 3.3 m (7.8 x 10.8 ft) Including electronics cabinet and monitor cart.

Floor Loading

- Total system weight: 3400 kg (7500 lb.)
- Maximum cabinet weight: 3100 kg (6840 lb.)
Electronics rack weight: 254 kg (560 lb.)
Monitor cart: 45 kg (100 lb.)
- Average floor loading—
total system weight/service area:
13.3 kg/sqm (65 lb./sq.ft.)*
- Concentrated loads—
Main cabinet concentrated loads: 776 kg (1710 lb.) on 15.2 cm (6 in.) dia. pad, 4 pads on 127 cm (50 in.) x 107 cm (42 in.) centers
Electronics cabinet concentrated loads: 63 kg (140 lb.) on 3.5 cm (1-3/8 in.) dia. pads, 4 pads on 70 cm (27.5 in.) x 52 cm (20.5 in.) centers

* *service area = 388 cm x 277 cm (153 in. x 109 in.)
Weight of customer added equipment inside service area should be added into calculation for average floor loading*

Power and Air requirements

- 200-240 VAC, single or 3 phase, 7.5 KVA
- 80 psi Compressed Air

Temperature and Humidity requirements

- 16-30°C, 60-86°F
- Relative Humidity 20-60%

Transport

- Optional flow-through with automatic adjustable rail width
- Manual width adjustment with dual board load option
- Transport height levels between 881 mm (34.7 in.) to 922 mm (36.3 in.)
- Transport heights adjustable 19 mm (0.75 in.)
- Passback mode supported
- SMEMA-standards compatible
- More detailed layout information is available in the site preparation guide.

For more information about Agilent Technologies products and solutions in electronics manufacturing, visit our website:

<http://www.agilent.com/go/manufacturing>.

To learn about other Agilent test and measurement products, applications and services, or for a current sales office listing, visit our website:

<http://www.agilent.com/find/tmdir>. You can also contact one of the following centers and ask for a test and measurement sales representative.

United States

Agilent Technologies
Test and Measurement Call Center
P.O. Box 4026
Englewood, CO 80155-4026
Tel: 1 800 452 4844

Canada

Agilent Technologies Canada Inc.
5150 Spectrum Way
Mississauga, Ontario L4W 5G1
Tel: 1 877 894 4414

Europe

Agilent Technologies
European Marketing Organisation
P.O. Box 999
1180 AZ Amstelveen
The Netherlands
Tel: (31 20) 547 9999

Japan

Agilent Technologies Japan Ltd.
Measurement Assistance Center
9-1, Takakura-Cho, Hachioji-Shi,
Tokyo 192-8510, Japan
Tel: (81) 426 56 7832
Fax: (81) 426 56 7840

Latin America

Agilent Technologies
Latin American Region Headquarters
5200 Blue Lagoon Drive, Suite #950
Miami, Florida 33126 U.S.A.
Tel: (305) 267 4245
Fax: (305) 267 4286

Australia/New Zealand

Agilent Technologies Australia Pty Ltd
347 Burwood Highway
Forest Hill, Victoria 3131
Tel: 1 800 629 485 (Australia)
Fax: (61 3) 9272 0749
Tel: 0 800 738 378 (New Zealand)
Fax: (64 4) 802 6881

Asia Pacific

Agilent Technologies
24/F, Cityplaza One, 1111 King's Road,
Taikoo Shing, Hong Kong
Tel: (852) 3197 7777
Fax: (852) 2506 9284

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