TAKAYA CORP.

FIXTURELESS TESTER

APT-9411 CE/CJ

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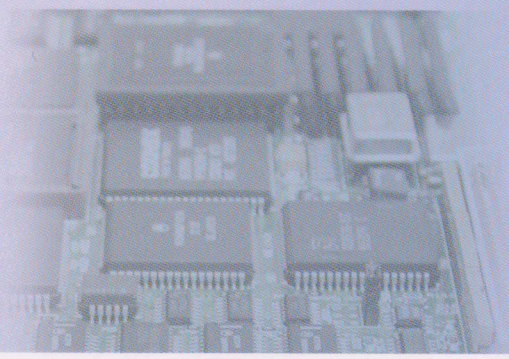
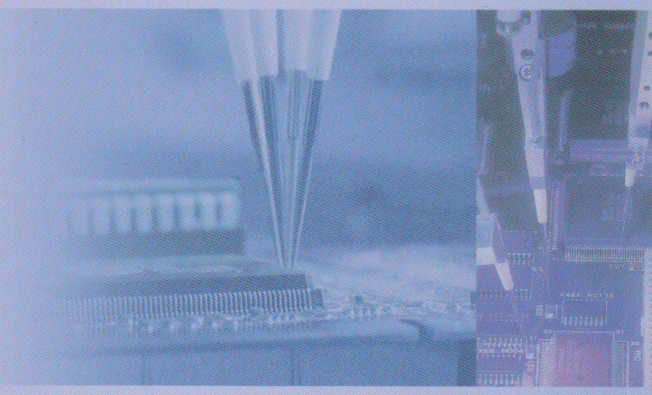
The APT-9411 series is a flying probe test system for detection of manufacturing defects on printed circuit boards using 4 high speed independently moving probes, thus removing the requirement for a conventional bed-of-nails fixture. In 1987, Takaya pioneered the concept of a flying probe tester combining advanced test techniques and precision mechanical systems. Since then, Takaya, as market leader for flying probe test systems, has focused its research and development resources on getting to market fast with the new product, to meet rapidly changing technological requirements and changing user needs.

The APT-9411 series is the latest generation of tester that integrates the probe movement and positioning control technology and the measuring techniques that Takaya has accumulated over many years. In this model, we have achieved the highest positioning accuracy, the highest inspection speed and the best test coverage as well as extended AOI functions and many other features.

Takaya has an installed base of more than 1,500 flying probe test systems in major electronic manufacturing and EMS (Electric Manufacturing Service) / CM (Contract Manufacturing) plants in over 40 countries. Designed by Takaya with worldwide acclaim and confidence, the APT-9411 series will make a big contribution for your development in the EMS & CM business, as well as helping you to reduce your operating costs and improve quality levels in a wide range of your SMT products.

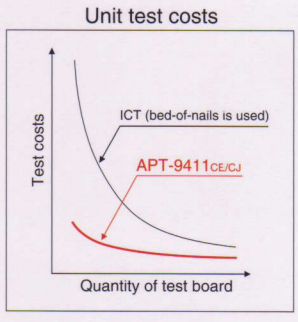




HOW TAKAYA FLYING PROBER ADDS VALUE TO YOUR COMPANY

LOWERING TESTING COSTS

Bed-of-nails are commonly used for testing PCBs using ICT/MDA techniques. Usually, it takes one or even several weeks to manufacture the bed-of-nails and the associated costs are high. Consequently, when ICT/MDA is used for low and medium volume production such as prototyping and NPI (New product introduction), unit test costs are very high and valuable time is lost waiting for the manufacture of the bed-of-nails. This results in reduced profits for your board assembly business. Since the APT-9411 series utilizing 4 high speed independently moving probes doesn't require conventional bed-of-nails and begins to test right from the beginning of the board assembly by just creating the test program, the tester is ideally suited for high board mix prototype applications as well as low and medium volume production runs.



LOWERING COSTS OF ENGINEERING CHANGES

When circuit design changes result in shifting test points and/or circuit patterns, the bed-of-nails for the ICT/MDA must be remanufactured or modified, which requires not only unnecessary costs but also introduces extra delays. However, the APT-9411 series can promptly respond to circuit board design changes by simply correcting probing positions in the test program. This is one of the important benefits of using the APT-9411 series.

REDUCING PERSONNEL FOR VISUAL INSPECTION

ICT/MDA is unable to inspect bypass condensers and connectors for reasons concerned with the circuitry and/or electronic capabilities. Such devices normally require visual inspection. However, automated optical inspection (AOI) added to the APT-9411 series enables you to inspect components that are difficult to measure electrically, thus enhancing test coverage and reducing visual inspection costs.

EASY ACCESS TO FINE-PITCH SMT DEVICES

The APT-9411 series ensures high precision probing contact and utilizes its AOI function to correct probing co-ordinates automatically based on actual positioning errors on each board. With these features, test points of less than 25mil (0.65mm) pitch or the contact lands of less than 20mil (0.5mm) in diameter are accessible with accuracy by the 4 moving probes. This helps reduce your DFT (Design for test) work and allows fault detection of fine-pitch SMT boards where no contact lands are available for bed-of-nails. Therefore, the APT-9411 series is best suited for the inspection of the SMT boards.

PROTECTING THE GLOBAL ENVIRONMENT

Preserving and disposing the bed-of-nails costs time and money. In addition, as the bed-of-nails is mainly composed of metal and resin, it's expensive to dispose of as industrial waste in order and not to affect the global environment. In contrast, the APT-9411 series doesn't cause these expenses and doesn't produce any industrial waste. That is, the APT-9411 series is eco-friendly and contributes to environmental protection.

QUALITY IMPROVEMENT OF PRODUCTION LINES

The APT-9411 series assumes the role of improving the quality on your entire mass-production assembly line where test time is restricted. The best practical example is a periodical sampling inspection for possible programming errors or careless mistakes in component settings on the pick & place machines.

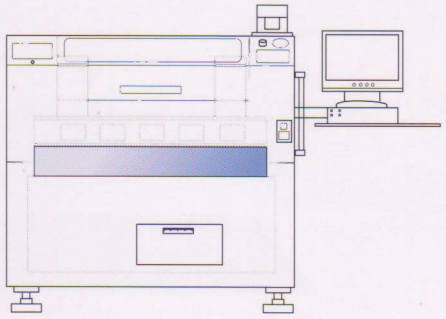
RESPONDING TO CHANGING NEEDS

The APT-9411 series has a full range of options to extend its capability according to the needs of a great variety of users. In addition, the APT-9411 series responds to the changing needs of inspection, as electronic components progress, because it is designed to easily integrate other measurement instruments. The APT-9411 series, with its integrated expandability, is a new-generation board tester that can serve you for many years to come.

HIGHLY-ADVANCED MECHANISMS CAPABLE OF THE WORLD'S HIGHEST POSITIONING ACCURACY AND ULTRAHIGH-SPEED TEST

STRONG AND RIGID XY STAGE

We drew a conclusion from the long history in developing flying probe testers that the most important parts for the positioning accuracy of the moving probes is the XY stage in the mechanical section. Because, even if the various precision components including the motors, the slide rails, etc. are excellent in terms of accuracy and/or performance, the XY stage that deforms during time inevitably leads to inaccurate probing contact. Accordingly, the tester's XY stage, crucial to stable and accurate probe contact, is made of highly polished native granite, whose surface accuracy remains unchanged even after years of prolonged use. Therefore, the APT-9411 series that remains almost unaffected by extreme environmental conditions, its age and use and the movement of installation location ensures high precision and stable probing contact in order to keep testing SMT boards for a long period.

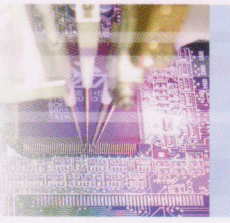


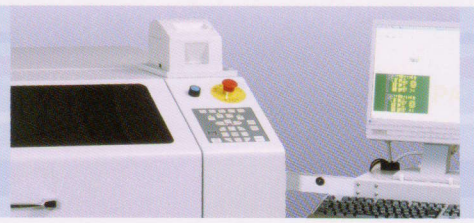
SUPERFINE MECHANISM

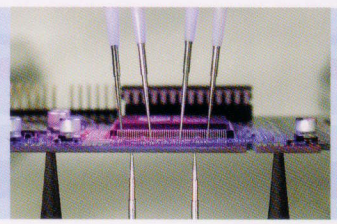
As the mechanical section in the APT-9411 series is designed based on a thorough analysis of structure, vibration and material, the tester is able to balance the competing goals of probe movement speed and positioning accuracy. In addition, the tester is extremely durable and is stable in the XY positioning contact due to the use of high-precision components in the actuators, and therefore always gives the best performance.

FAST PROBE MOVEMENT

All the XYZ axes combined with AC servo motor that has a superior rotating characteristic are controllable on high speed and smoothness. In addition, the APT-9411 series cuts down the stabilization time for the probe's positioning and inhibits probe vibration occurring when they come to a standstill, due to the servo drive system employing the latest digital control technology. The APT-9411 series attained fast probe movement with accuracy to test PCBs in the shortest times.







REDUCING TEST TIMES

The APT-9411 series realizes high-speed inspection using 4 independently moving probes and 2 fixed bottom probes. So, the combination measurement using these 6 probes that implements double-digit numbers of test steps quickly dramatically cuts down test time. In addition, the tester incorporates an excellent algorithm to rearrange test steps and other features to optimize the flying height according to each component, which will result in faster probe movement.

HIGH PRECISION PROBE

The probes have surprisingly fine clearance of less than 10μm between the plunger and the housing to simplify test access on very little contact lands. In addition, the clamper mechanism and the lifting base for the support bars help the boards not to have a downward curvature and thus ensuring reliable probing contact. These factors also help detect faults on today's leading edge SMT products where are only small contact lands remain.

FUNCTIONAL DESIGN

The ergonomic design to reduce the strain on the operator ensures an excellent operational performance and deadens distracting noise during operation. In addition, the APT-9411 series requires minimal floorspace and no air supply for standard operation.

LAN-BASED DATA MANAGEMENT

The software allows use of versatile function such as network system and multi-tasking available in Windows®XP. Test results and the measurement values on each board are output to network computers and/or a repair station in real time via LAN. This facilitates your quality management and repair work.

ACCURATE AND HIGH-SPEED MEASUREMENT ON SMT BOARDS

ACCURATE, COMPREHENSIVE TEST COVERAGE

Phase detection measurement and Guarding function ensures precise measurements in parallel circuits, 4-wire Kelvin measurement for low-value resistances by eliminating the effect of probe contact resistance, etc... Taking advantage of the latest measuring technologies, the APT-9411 series measures a wide range of components at high speed and accurately

CARES FOR THE STRESS ON ICs

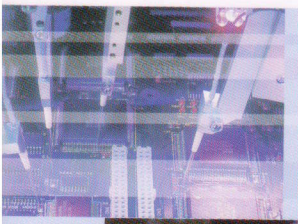
In consideration of electric stress on increasing low voltage-driven ICs, the measuring signals applied across LCR components is automatically set less than 0 3V in all ranges In addition, the APT-9411 series incorporates Automatic discharge circuits in order to protect the measuring unit from electrically-charged condensers on the board under test and to stabilize measurements

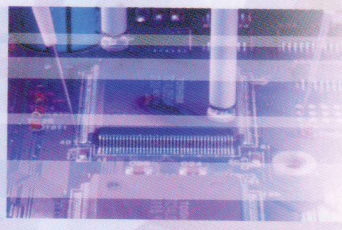
ACCURATE AND FLEXIBLE CONTACT

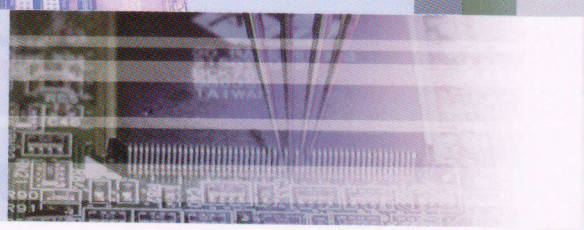
The probes can be spaced as closes as 0.2mm In addition, both XYθ position alignment and elastic alignment are made not only across the whole board but also to specific test areas. These features enable the tester to make the probe contact on very small test lands with accuracy allowing fault detection of the smaller micro chips, 0201 type (0 6x0 3mm).

STRESSLESS PROBE CONTACT

Probe access is programmable based on board topology. Probing speed is slowed down just before contacting the test lands to minimize stress and possible damage to test lands. You can also safely test sensitive SMT boards.







SIMPLIFIED VISION TEST SYSTEM

ADVANCED IMAGE PROCESSING TECHNOLOGY

The APT-9411 series incorporates a high performance image processing unit that ensures reliable and accurate automatic optical test. Accordingly the tester inspects missing, misalignment, or reversed components that are normally not measured during electrical test.

INTELLIGENT LED ILLUMINATION

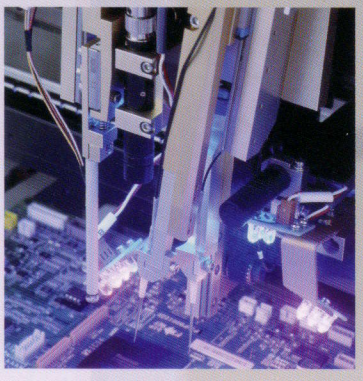
The image processing software based upon advanced algorithms and the two-colored LED lighting systems that controls the brightness independently on a per-component and per-test basis, enhance the performance of the optical test.

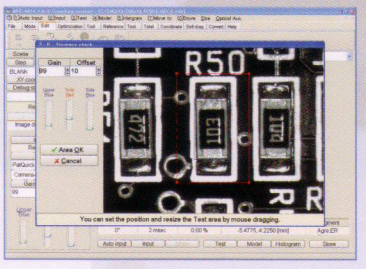
AUTO-CONFIGURATION

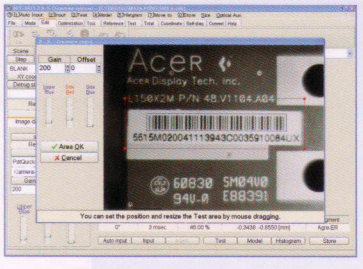
The APT-9411 series offers a versatile auto-configuration function developed with respect to the contents of each test step. Therefore, you can use the mouse to input, debug and correct the image data for judgment criteria with almost no knowledge about the image processing technology.

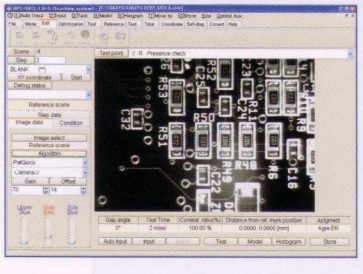
2ND CAMERA WITH WIDE VIEWING ANGLE

The high-performance micro CCD camera installed nearby the flying probes as standard allows simplified vision test on the whole work area of the flying probes where the camera gets in the viewing field. In addition, the APT-9411 series enable to install the 2nd camera (option) that uses a wide-field lens. With this option, as large numbers of components are efficiently processed in one movement of the camera, you can make a simplified vision test faster and put it to use for scanning barcodes /QR codes as well as testing large size components.









IC OPEN TEST SYSTEM

DETECT UNSOLDERED IC LEADS

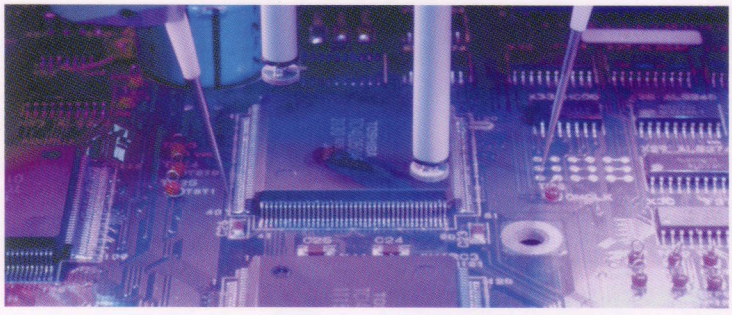
IC Open test system is a powerful option to detect unsoldered IC leads in the bus circuits that are hard to detect by measuring internal protection diodes. A unique sensing probe technology is introduced to detect unsoldered IC leads on QFPs and SOPs, as well as unconnected solder balls of most BGAs.

HIGH DETECTION CAPABILITY

A unique mechanical structure on the Z-axes enables precision vertical contact of the sensing probe on IC packages in order to detect assembly faults. In addition, bottom-side IC open test probes are also available as an option for contact underside contact of IC packages.

HIGH-SPEED AND SAFE TEST

As the measurement probe and the sensing probe installed on the Z-axis switch positions quickly to go down, the tester ensures high-speed test. In addition, the system gives you easy access to test and ensures no physical and electrical damage to either the IC or the leads.



RELIABLE TEST

PREVENT MISJUDGMENT CAUSED BY PROBE CONTACT ERROR

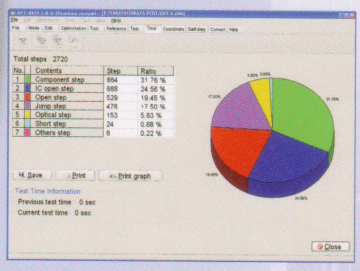
To prevent possible misjudgment caused by probe contact error on test lands with irregular-shaped solders, the APT-9411 series corrects coordinates and retests failed steps during testing by slightly shifting the probes in XY directions automatically.

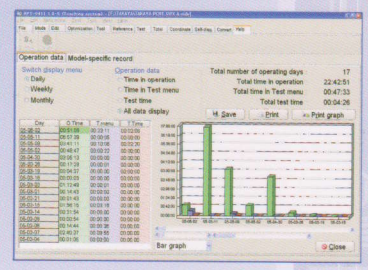
TESTER CARE

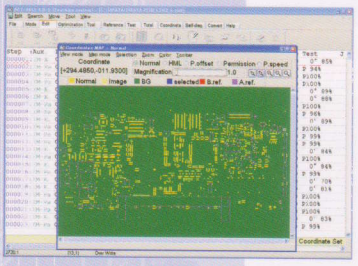
Various self-diagnosis routines indicate problem areas if anything goes wrong with the tester. Also, the measuring unit will be automatically diagnosed each time the tester is started-up, you can ensure normal performance in test.

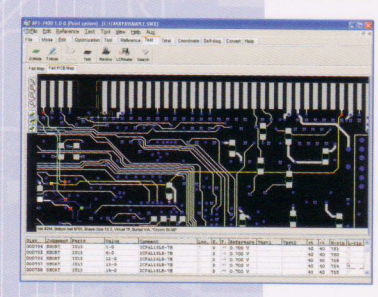
EASY MAINTENANCE

Reminder function facilitates periodical inspection and maintenance of probes and so on. In addition, the tester is able to record the self-diagnosis results and maintenance data for easy maintenance management.









EASY PROGRAMMING

EASY & USER-FRIENDLY SOFTWARE

The software is designed to facilitate the test programming for personnel that doesn't have specialized skills and knowledge about test and measurement. The operation menu is user-friendly and the test program list can be easily customized, so even beginners can create and correct the test programs with ease.

CAD DATA CONVERSION

CAD data converters that well-known software manufacturers are selling for Takaya Flying probe testers facilitate the creation of basic test programs. Part names, XY coordinates etc., the basic parts of test programs are converted from the existing CAD data in a very short time. In addition, you have a choice to integrate certain CAD data converters with the extensional system software as option. This will further reduce the lead time to test, because you can create and correct the test program while looking at the graphic menu clearly displaying the schematics and the component layout.

VERSATILE ATG FUNCTION

Versatile programming support tools help automatic generation of reference values, measuring conditions, etc... In addition to ATG functions, many powerful debug tools (ex. Waveform-analysis, Peripheral circuitry representation function, Search-and-change function) are provided to speed-up test generation.

COORDINATES MAP DISPLAY

The software is equipped with a powerful search function and batch correction function that facilitates correction of test programs. In addition, graphical display of XY coordinates map provides assistance for easy correction of XY coordinates and accessible probes and/or High-fly zone setting with a mouse action.

MEETING THE USER NEEDS

- Group separation test for panelized boards
- A wide variety of graphs and spreadsheet format outputs
- Seamless management of double-sided board programs
- Password function to prevent test program tampering
- Visual test support system using magnified camera image
- Cluster test function effective for block check of circuits
- Group sequential test for mass production environments
- Test program management system by barcode/QR code
- Automatic alignment of reference offset following probe replacement
- LCRD meter facilitating failure analysis and repair

USER-FRIENDLY EXPANDABILITY OF TEST CAPABILITIES

The APT-9411 series is equipped with input-output terminals to other inspection systems. In addition, the tester can be connected to a wide variety of optional devices that enhance overall test coverage according to user needs.

COMMUNICATION INTERFACE

The APT-9411 series is equipped with jointing terminals for measuring signals from other inspection systems. In addition, the tester allows versatile DDE communication with other application software. Therefore the test capabilities of the APT-9411 series are further expandable via a wide variety of inspection systems available in the market such as Boundary Scan.

FUNCTIONAL TEST

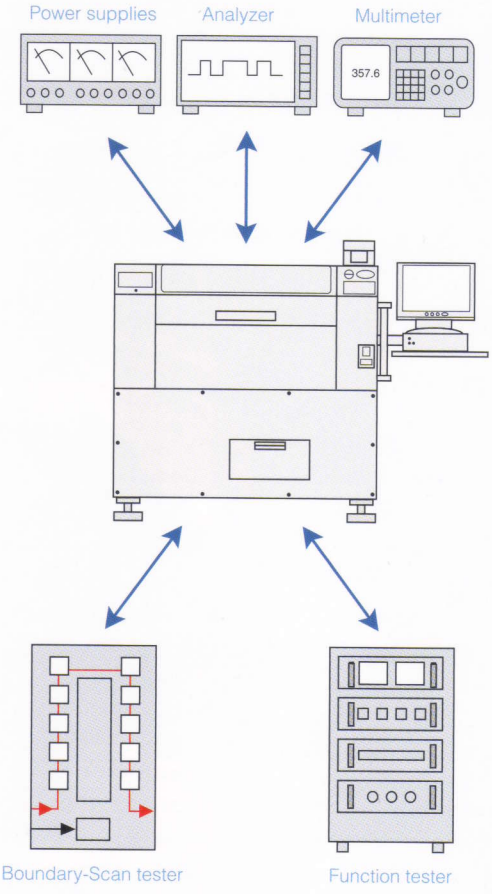
The APT-9411 series can be expanded to provide functional-test capabilities. With its Programmable DC Power Supply, the tester is capable of testing switching devices that require a relatively large current-voltage to turn on and activating a part of the circuit to measure the current flow. In addition, GPIB-controlled programmable power supplies and Power Relay Board allow Power-on test, multiple supply of different power sources, etc...

POWERFUL OPTION

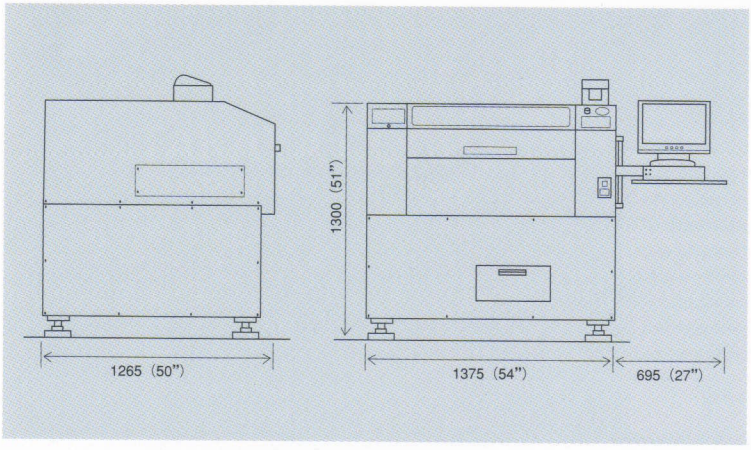
The APT-9411 series is provided with high performance coaxial cables containing a buffer circuit that connects the flying probes directly to the external instrumentation and facilitates the measurement of high-frequency signals. With Extension Scanner and Coaxial Scanner, the test capabilities of the APT-9411 series can be expanded to meet the most-demanding test requirements.

AUTOMATED CONVEYOR SYSTEM

An in-line unit can be built-to-order to establish full automatic operation in your production line or Rack-to-rack system. Shuttle conveyor stations are also available as an option to insert or pull the PCBs in or out of the tester easily.



APT-9411CE-A WITH SHUTTLE CONVEYER STATION



We can also custom-make APT-9401SL to suit extra large PCBs up to L635× W610mm (25"×24").

General Specifications

Model	APT-9411 CE / CJ
Contact probes	4 flying probes (top side) 2 fixed probes (bottom side)
Sense probes for IC open test (option)	2 flying sense probes (top side) 6 (max.) fixed sense probes (bottom side)
Signal terminals for extension test (bottom side, option)	3-ch terminals for power supplies 12-ch coaxial terminals for external measuring signal 64 terminals for analog in-circuit test probes
Motors	High speed / high torque AC servo motors (X, Y, Z axes)
Test speed (at 2.5mm pitch movement)	Combination test method : Max. 0.03 ~ 0.05sec / step Single test method : Max. 0.08 ~ 0.10sec / step
Positioning resolution	X, Y axes : 1.25μm (0.05mil) Z axis : 50μm (2mil), approx.
Positioning X,Y repeatability	±35μm (1.4mil) or less
Flying probe specifications	Type : High precision spring probe Tip form / Admit current : Needle, small 4-crown or pyramid / Max.3A
Minimum probe contact pitch	0.2mm (8mil), approx. in use of needle probes
Minimum probe contact pad size	120 ~ 150μm (5 ~ 6mil), in use of needle probes
Internal measuring sources	DC-constant current / DC-constant voltage / AC-constant voltage
Measuring ranges	Low value resistance : 40mΩ ~ 400Ω (in 4-wire Kelvin measurement) Resistors : 0.4Ω ~ 40MΩ Capacitors : 4pF ~ 40mF Inductors : 4μH ~ 400H AC impedance : 33Ω ~ 330KΩ Diodes / Transistors : 0.1V ~ 2.5V (VF) or ON test Zener diode : 0.4V ~ 40V DC voltage : 80mV ~ 80V AC voltage : 80mV ~ 50Vrms (f = 2KHz or less) DC current (option) : 100μA ~ 1A Short/Open measurement : 1Ω ~ 400Ω (programmable) Digital transistors / FETs : ON test Opto couplers : ON test Relays/Switching devices (option) : ON test (max. driving voltage : DC24V/1A) IC leads in bus-circuits (option) : Open test Gain measurement (option) : Transistors, opto couplers, etc.
Guarding	Max. 2 points / step
Test steps	Max. 320,000 steps
Reference data input for judgment	From good sample board(s), automatic generation based on nominal value, or absolute value
Judgment tolerance set	-99% ~ +999% or over/less of reference value
Vision test system TOS-5 / 4 / 41 (customer choice of model in the order)	Model No. TOS-5 : High speed & high accuracy processing, with reading function of barcode & QR code TOS-4 : High speed & high accuracy processing TOS-41 : Normal speed & normal accuracy processing Camera : B/W micro-CCD camera, View field : 12 × 8mm (0.47" × 0.32"), approx. Camera-2 (option) : B/W micro-CCD camera, View field : 32 × 24mm (1.26" × 0.95"), approx. Illumination : Red / blue-LEDs (illumination intensity is controllable) Search method : Pattern matching Application : Coordinates alignment, simple vision test, visual test aid, etc Simple vision test items : Missing components, position, polarity, etc. Image registration : Max. 240 scenes
Testable PCBs specifications	XY : Max. 540 × 460mm (21" × 18") Thickness : Max. 5mm (0.2") Clearance : Top side 40mm (1.57") or less, Bottom side 95mm (3.74") or less
PC specifications	PC / AT compatible (with CD-ROM drive, keyboard, mouse) OS : Windows®XP
Display	15" LCD
Printer	Thermal type
Power	AC200V, 220V, 240V (single phase) 50/60Hz 2.5KVA
Environmental requirements	Temperature : 23 ± 7°C (73 ± 13°F) Humidity : 20 ~ 80% (no condensation)
Main body dimensions / Weight	W 1,375 × D 1,265 × H 1,300mm (54" × 50" × 51") / 1,200Kgs (2,650lb.)
Options	Vision test system TOS-5, TOS-4 or TOS-41 (customer choice in the order) 2nd B/W micro-CCD camera with wide-angle lens IC Open test system for Top side, IC open sense probes for bottom side Programmable DC power supply board, Programmable DC power supplies for power ON test GP-IB card for programmable DC power supplies, Power relay board for power supplies Extension scanner board for additional bottom side probes Coaxial scanner board for external measuring system Coaxial robot cable with buffer AMP for flying probes (for external HF measuring system) I/O board for external equipment, PCB support jig for use with odd shaped boards, Bottom fixed probe unit Vacuum unit for reforming warped PCB, Shuttle conveyer station for APT-9411CE-A, so on.

※APT-9411CE is the model that CE mark and TÜV mark were acquired.
※Windows® is a registered trademark of Microsoft Corporation.
※Specifications are subject to change without any obligation on the part of the manufacturer.

WORLDWIDE SALES AND SERVICE NETWORK

Our worldwide sales and service network present in over twenty locations guarantees the maintenance and service support of Takaya flying probe testers.

THE BEST SOLUTION

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INDUSTRIAL EQUIPMENT DIVISION

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