

1114 X-Y IN-CIRCUIT HiTESTER

Automatic Testing
Equipment



IC lead poor contact detection

The 1114 X-Y IN-CIRCUIT HiTESTER has inherited the function for detection of IC lead poor contact using four-terminal measuring that the HIOKI 1111 and 1112 models introduced. In addition to featuring four arms designed to reduce inspection time, this fixture-less mounted board inspection equipment also boosts an improved man-machine interface. Even though the standard configuration comprises an automatic position compensation function, a loading system and a four-terminal measuring function, this system is still a low cost solution.



ISO14001
JQA-E-90091



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Four arms for even faster inspection

Enhancing the capacities of mounted board inspection systems has become a key factor for increasing production efficiency of electrical machinery as the rapid advances in SMT technology have accelerated the trends towards fine pitch boards and diversified small-quantity production.

With the 1114 X-Y IN-CIRCUIT HiTESTER, HIOKI has succeeded in manufacturing a highly reliable piece of equipment for testing mounted boards that weds HIOKI's extensive experience in measuring technology with stable high-precision mechanisms.



◆ Reduces running costs

As fixture is not necessary, running costs can be reduced. A great advantage for diversified small-quantity production.

◆ Quick response to changes in design

Changes in pattern designs are coped with fast and easily by merely changing the test data. The equipment can therefore be applied already at the experimental stages.

◆ Reduces the need for visual inspection

Greatly reducing the need for visual inspection, the Simple Visual Test Function takes care of parts where electrical testing is impossible to conduct.

◆ Setup time reduced

Setup time is reduced as model changes are dealt with by merely changing the test data and fixture replacement is not required.

◆ Prepared for automatic inspection

A loading system is part of the standard equipment and makes it easy to establish an automatic inspection system for reducing personnel costs.



Ease of use coupled with high accuracy

Main features

■ High speed measuring

The maximum 0.05 sec/step high-speed measuring rate reduces test time.

■ Handles fine pitch

The minimum probe interval pitch is 0.2 mm (0.5 mm in the four-terminal probe mode). This allows inspection of fine-pitch boards that jig type probing cannot cope with.

■ Automatic position compensation function is a standard feature

Added to the high-precision mechanism, the position compensation enables probing with even higher accuracy. Using a CCD camera for teaching coordinate data makes debugging and offset settings precise and simple to perform.

■ A wealth of options

A large assortment of optional accessories is available. An optimum system can easily be constructed as options can be selected to match individual usage.

■ Simple Visual Test Function

This greatly reduces the need for visual inspection as the function can determine whether there are parts that escape electrical inspection and also test polarities and displacement.

■ Loading system is standard outfit

The board loading function is part of the standard outfit that makes it simple to establish an automatic inspection system. Interface for HIOKI standard equipment is also provided as standard outfit.

■ Wide inspection area

Inspection of large board sizes measuring from 50 × 50 mm to 500 × 400 mm is possible.

■ High probing accuracy

The probing accuracy is $\pm 100 \mu\text{m}$ and the movement repeatability accuracy is as high as $\pm 50 \mu\text{m}$. This is sufficient for testing fine pitch boards for both short circuits and open circuits.

■ Two keyboard heights

The keyboard can be placed at two heights to accommodate both standing and sitting working postures.



■ User-friendly interface

The employed user interface is a color display running on Windows NT4.0. Multiple windows can be used for creating two sets of data simultaneously or teaching while consulting net lists, etc. This interface contributes to a comfortable user environment.

Windows NT4.0 is a U.S. registered trademark of Microsoft Corporation.



Inline deployment example

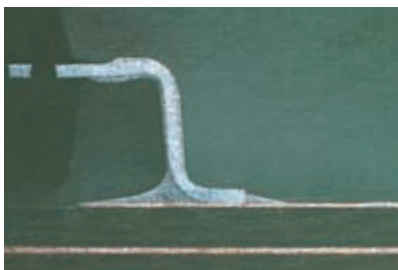
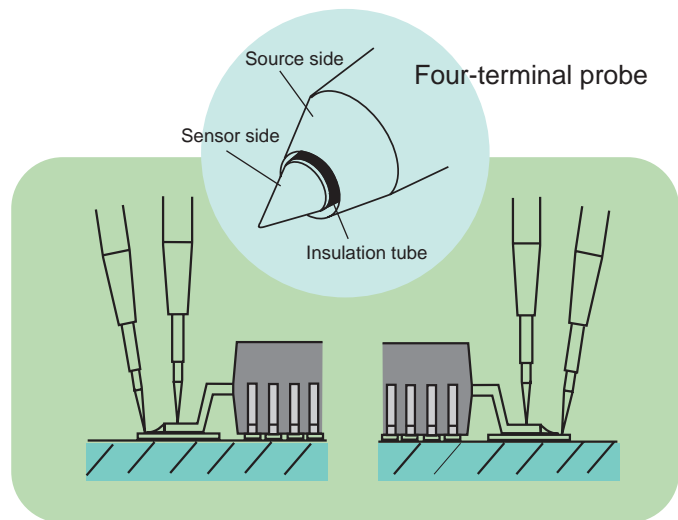
Testing of IC leads for poor contact

Detection of both IC lead float and poor contact with electrical conductivity

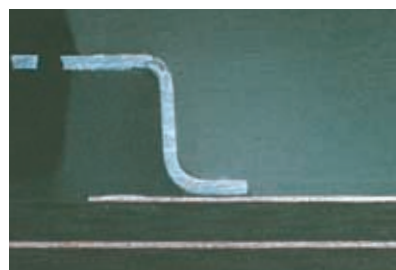
Contact resistance between IC leads and patterns can be measured with high accuracy using the four-terminal resistance measuring method and judgment performed by comparison with data for conforming articles. The electrical detection method guarantees a highly reliable test process.

■ Precision probe for four-terminal measuring

IC lead testing is conducted using a four-terminal probe that is not susceptible to contact resistance or wiring resistance. This method can also be employed for component testing.



Non-defective



Lead float



Poor contact

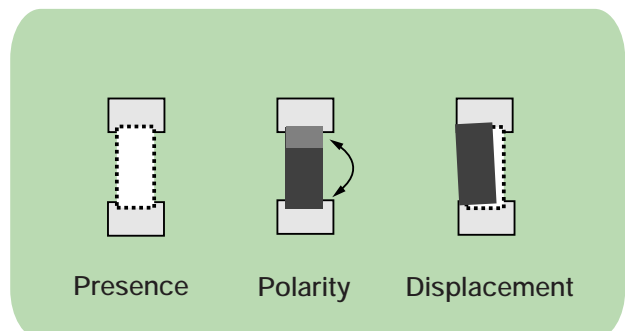
Simple Visual Test function

The position compensation CCD camera (standard outfit) enables inspection of components that defeat electrical testing. This greatly reduces the burden of visual inspections.

The visual mode allows inspection of chip component presence and polarity test, and the alignment mode can be used for displacement inspection in addition to component presence and polarity test. Adding an optional component compensation camera allows inspection of components other than integrated circuits and other chip components.



Position compensation and visual test image data are displayed on the built-in monitor, thus eliminating the need for a special monitor for image display.



In addition to being employed for automatic position compensation and visual test, the CCD camera can be used for a number of other functions.

■ Coordinate data teaching

The camera can be used for simple and accurate coordinate data input and data revision for debugging.

■ Bad mark detection

The camera can also be used for detection of inspection marks used for multiple-sample boards as well as inspection only involving the step of image detection of marks.

Convenient features

■ Self diagnostic function

When the 1114 starts up, it automatically conducts a self-test. This prevents erroneous judgements and facilitates maintenance.

■ Statistical data

Test results can be statistically processed, displayed and printed out. Data can be obtained in various ways, according to group, module, test step, in the order of high off-spec ratio, etc. and used for pre-process feedback and quality inspection.

■ Function for re-test

This feature prevents erroneous judgement caused by improper probe contact, flux or pattern displacement. Both a function for re-test of off-spec steps only and a retry function are available.

■ NG map display

Allows map display of off-spec positions and printing via a printer for fast search for off-spec components when repairs are undertaken.

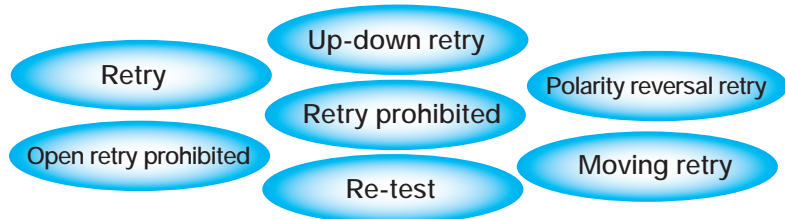
■ Module and group divisions

Continuous test steps can be arranged according to modules or groups. The ability to make judgements and settings according to module and group units can be efficiently utilized in the case of multiple sample boards.

■ Support pin teaching

Setting of support pins is easy as the set support pin positions for each board can be retained as data.

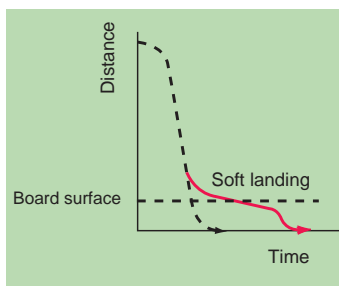
Multiple re-test functions



Accurate probe contact

■ Soft landing

The speed of the probe's descent is controlled. The speed is decelerated just before the probe contacts the board to decrease the impact force and prevent damage to the board. The speed can be set for test steps, groups, the entire process.



■ Appropriate probe angle

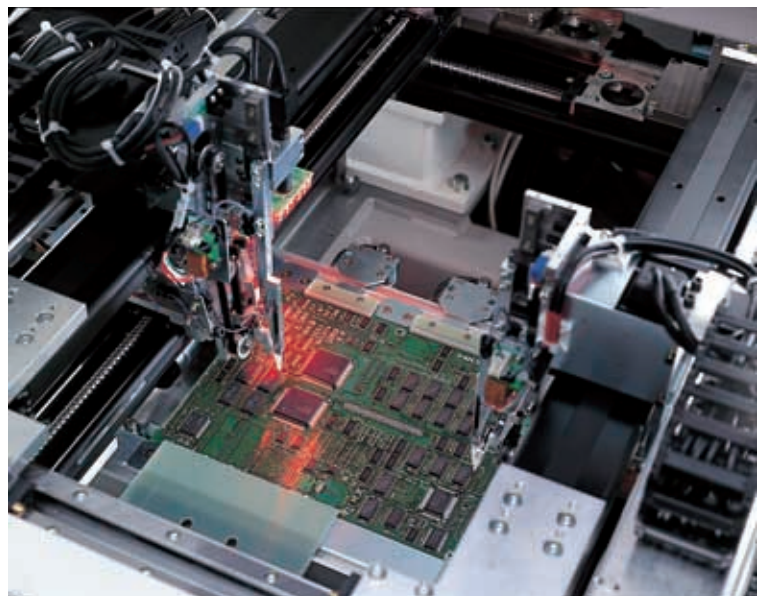
The L and R probes allow probing with little slipping and from all directions of the component. They are maintained at an appropriate angle of 10° X direction, 5° in Y direction and 11.1° in total (the ML and MR probes are vertically oriented). When probes are mounted at a large angle, slipping occurs easily and board warping will greatly affect the probing position.

■ Optimum probe stroke

The optimum Z-axis stroke length can be set to accommodate the height of mounted components. The up/down speed can also be set to maintain an appropriate inspection pace.

■ Contact check

In the four-terminal probe mode, contact failures due to flux or displacement can be automatically detected. This further enhances inspection reliability.



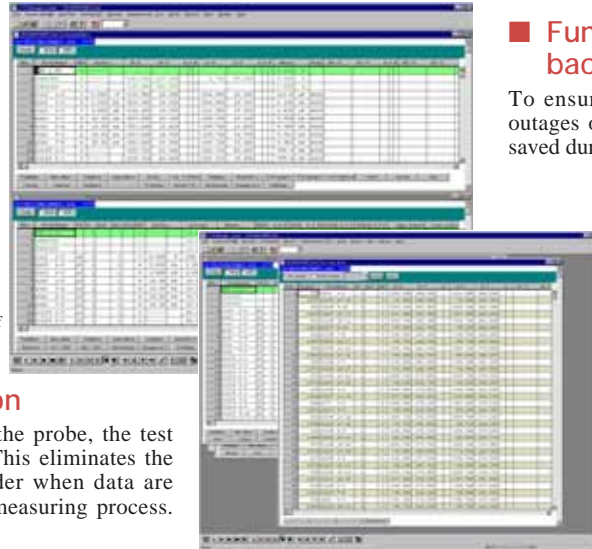
Supports high inspection ratio Speedy and accurate data creation

To accommodate different needs, test data can be gathered in two ways: step XY where both edges of each component are probed and pattern XY where one point in one pattern is probed. Various input methods are also available.

Coordinate data creation methods

- Teaching using CCD camera.
- Input via digitizer
- CAD linking software (request price quotation)
- Loading of HIOKI X-Y IN-CIRCUIT HITESTER data. (MS-DOS format)

MS-DOS is a U.S registered trademark of Microsoft Corporation.



Test order optimization

To reduce the travel distance of the probe, the test order is automatically arranged. This eliminates the need for considering the test order when data are created and ensures an efficient measuring process.

Function for automatic backup of test data

To ensure that data are not lost due to power outages or other problems, data are periodically saved during inspection and editing.

Password protection function

Setting a password can prevent unauthorized personnel from inadvertently altering test data.

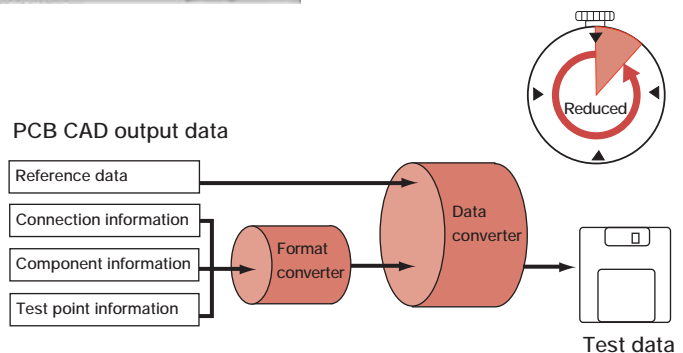
File merge

Two types of data can be joined into one type.

Create refined data quickly

CAD-ATE link software

Allows creation of test data by conversion of data from the customer's CAD system. Please consult us on this software option that also enables efficient use of the data of existing equipment such as chip mounters, etc.



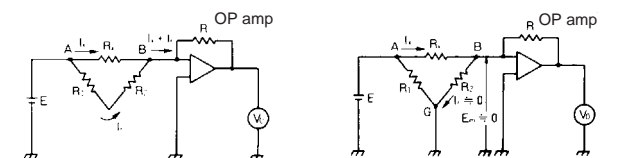
★★★★★ High Inspection Ratio ★★★★★

LCR separated measurement

Parallel circuits are split up into L, C and R elements for measurement to achieve an inspection with even higher detection ratio.

Guarding

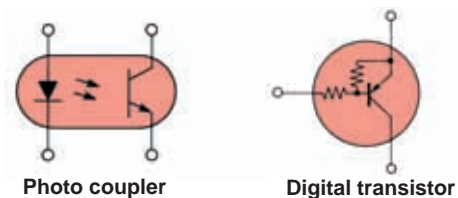
By employing guarding the mounting value of each component can be measured in a condition that corresponds to when the component is independent of the peripheral circuits. Guarding with maximum 2 points per step is possible.



- (1) No guarding
The current I_r from the peripheral circuit affects the measuring.
- (2) Guarding applied
As $E_m \rightleftharpoons 0$, $I_r \rightleftharpoons 0$. This means that I_x can be measured alone.

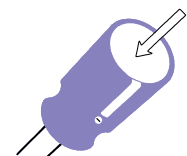
Photo couplers and digital transistors can also be inspected

NG or OK status of a photo coupler can be judged in its mounted condition. Testing of digital transistors (resistance input transistor) is also possible.



Testing of aluminum electrolytic capacitors for reversed insertion

A function is available for testing mounted aluminum electrolytic capacitors for reversed insertion. Please consult us for this as the probing specifications are special.



Fulfills miscellaneous needs

A system to fulfill special needs can easily be constructed as options can be selected to match individual usage.

An abundance of options

- 1940-11 POSITION COMPENSATION CAMERA for MR ARM
- 1940-21 COMPONENT POSITION COMPENSATION CAMERA for MR ARM
- 1940-22 COMPONENT POSITION COMPENSATION CAMERA for ML ARM

Probing with high accuracy can be achieved by mounting a position compensation camera on each arm. **Component position compensation** compensates for the displacement of components following mounting. Used when direct contact with component leads is employed. Up to three of the cameras mentioned above can be mounted simultaneously. (A position compensation camera is attached to the ML arm as standard equipment.)

- 1941-01 STAMP UNIT for R ARM
- 1941-02 STAMP UNIT for L ARM

A stamp can be imprinted on boards following inspection. Stamps can be set to be imprinted in accordance with all the test data, such as modules and groups. This helps to prevent off-spec or untested items from being mixed with non-defective items.

●1942-01 LOADING RAILS

A single board to be inspected can be placed on the loading rails. When the 1114 is used in the stand-alone mode (no pre- or postprocessing equipment), the operator can use the loading rails to facilitate loading and unloading of boards.

●1330 MEASUREMENT SECTION CALIBRATION UNIT

Makes it easy to check whether values within the standards are measured in all measurement ranges. Useful for periodic inspection, etc.

●1942-02 PUSHER UNIT

When unloading inspected boards onto the rack-type pusher unit, the boards can be loaded directly into the next processing unit.

●1942-03 AUTOMATIC WIDTH ADJUSTMENT FUNCTION

The width of the loading rails can be adjusted automatically based on the board width data. Simplifies switch to accommodate new types of test items.

●1943-01 BOARD WARP COMPENSATION FUNCTION

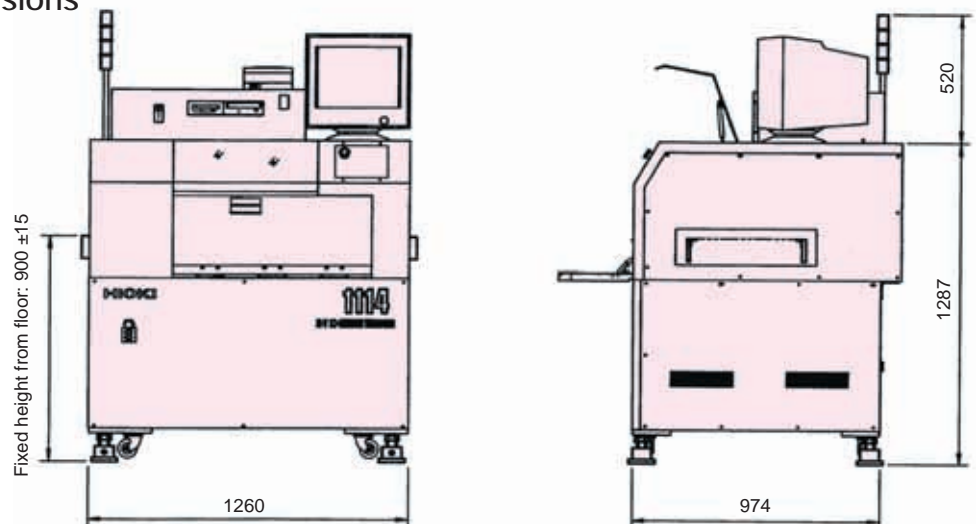
A vacuum pad applied to the underside of boards compensates for board warp when boards are bending upward. (The 1355 VACUUM PUMP is required.)

●1944-01 EXTENSION I/O BOARD

Allows input and output of all the kinds of signals involved in the status I/O output, estimated I/O output and programmable I/O functions. Up to three boards can be mounted.

Various special specification items are also available. Please feel free to consult us in case of special requirements.

External dimensions



Specifications

Number of arms	4 arms (L, R, ML, MR)
Test steps	20,000 steps (maximum)
Coordinate specification methods	Step XY/ pattern XY (test in either mode)
Measurement ranges	Resistance: 400 $\mu\Omega$ to 40 M Ω Capacitance: 1 pF to 400 mF Inductance: 1 μ H to 100 H Diodes: 0 to 25 V Zener diodes: 0 to 25 V Digital transistors: 0 to 25 V Photo couplers: 0 to 25 V Short circuit: 0.4 Ω to 40 k Ω Open circuit: 4 Ω to 4 M Ω DC voltage measurement: 0 to 25 V
Test signals	DC constant voltage: 100 mV/400 mV (two ranges) DC constant current: 200 nA to 200 mA (thirteen ranges) AC constant voltage: 0.1 V rms. (one range)
Measurement units	DC voltmeter: 800 μ V to 25 V f.s. (eight ranges) DC ammeter: 100 nA to 25 mA f.s. (seven ranges) AC ammeter: 10 μ A to 10 mA rms. (four ranges)
Criterion range	-99.9% to +999.9% or absolute value
Guarding	2 points/step and down probe channel guard specification
Measurement time	From 0.05 sec/step (X-Y 2.5 mm travel, Z height 5 mm, 2-step simultaneous probing, S/O measuring mode)
Probing accuracy	Each arm within $\pm 100 \mu\text{m}$ (both X and Y directions)
Travel repeatability accuracy	Within $\pm 50 \mu\text{m}$ (probing position)
Minimum travel resolution	X-Y: 1.25 μm /pulse Z: 60.00 μm /pulse
Probe interval pitch	Minimum 0.2 mm (needle probe mode) Minimum 0.5 mm (four-terminal probe mode)
Probe work area	500 W \times 400 D mm
Applicable test board dimensions	Thickness: 0.6 to 3.2 mm External form: Min. 50 \times 50 mm, Max. 500 \times 400 mm
Applicable test board weight	2.0 kgf or less

Component mounting range	Upper surface: Max. 30 mm (including board thickness) Lower surface: Max. 100 mm 3 mm from both sides of board are excluded (required for transport)
Safety devices	Emergency stop button, safety cover, and software for prevention of arms colliding
Alarm devices	Signal tower (three colors), buzzer
Display unit	17-inch color display
Power supply	AC 200 V $\pm 10\%$ (single phase) 50/60 Hz Power consumption: 3 kVA
Pneumatic system	Primary pressure: 0.5 to 0.99 MPa (dry air) Setting pressure (secondary side): 0.5 \pm 0.1 MPa
Compressed air consumption	Max. 0.3 NI/min
Operating environment	Temperature: 23°C $\pm 10^\circ\text{C}$ Humidity: 75% RH maximum (no condensation) Atmosphere: Avoid use in an atmosphere where dust, vibrations, corrosive gases, etc. may occur. Floor strength: 500 kg/m ² or higher
Accessories	Contact probes (4), four-terminal probes (4), one-way clutch, thermal mini-printer, printer cable, ball-point driver, hexagon wrench, grease, grease gun, keyboard, PS2 mouse, PC accessories, setup disk, leveling jacks (4), color display (17 inches), power cord, spare fuse, marking sheet.
Main unit dimensions	Approx. 1260 (W) \times 1287 (H) \times 1058 (D) mm
Mass	Approx. 1000 kg

[Loader unit]

Conveyor belt	Double-sided flat belt (anti-static specifications)
Conveyor width standard	Width on front side
Loading height	900 \pm 15 mm
Conveyor speed	Max. 40 m/min (non-load)
Flow direction	Right \rightarrow left or left \rightarrow right (specify when ordering)
Height of components on board	Upper surface: 30 mm Lower surface: 100 mm

1114 X-Y IN-CIRCUIT HITESTER

■ Factory options

- 1940-11 POSITION COMPENSATION CAMERA for MR ARM
- 1940-21 COMPONENT POSITION COMPENSATION CAMERA for MR ARM
- 1940-22 COMPONENT POSITION COMPENSATION CAMERA for ML ARM
- 1941-01 STAMP UNIT for R ARM
- 1941-02 STAMP UNIT for L ARM
- 1942-01 LOADING RAILS
- 1942-02 PUSHER UNIT
- 1942-03 AUTOMATIC WIDTH ADJUSTMENT FUNCTION
- 1943-01 BOARD WARP COMPENSATION FUNCTION
- 1944-01 EXTENSION I/O BOARD

■ Options

- 1134-02 IMPRESSION SHEETS
- 1164-02 ONE-WAY CLUTCH
- 1164-52 SUPPORT PIN
- 1172-17 CONTACT PROBE
- 1172-41 4-TERMINAL PROBE
- 1196 RECORDING PAPER(25m,10rolls)
- 1330 MEASUREMENT SECTION CALIBRATION UNIT
- 1350 OFFSET BOARD
- 1355 VACUUM PUMP
- 1356 MAINTENANCE TOOL SET
- 1139 1114 DATA COMPOSITION SOFTWARE

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All information correct as of Jan. 9, 2001. All specifications are subject to change without notice.
■ Internet HIOKI website <http://www.hioki.co.jp/>

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