illumına®

HiScan® and iScan Systems

Cutting-edge array scanners supporting rapid, sensitive, and accurate imaging of Illumina BeadChips for industry-leading genetic analysis results.

Highlights

- **Highest Data Quality**
  Proven Infinium®, GoldenGate®, and gene expression assays produce high call rates and provide industry-leading coverage

- **High Sample Throughput**
  Fast optical scanners dramatically reduce scan times; optimized automation options maximize output

- **Flexible**
  Multiple formats, applications, and automation options

Flexible, Scalable Systems

As array products from Illumina increase in complexity, with higher densities and a greater number of features, it is important to have a scanner that keeps pace. The cutting-edge HiScan and iScan systems are array scanners that support rapid, sensitive, and accurate imaging of BeadArray™ technology–based genetic analysis products (Table 1). Illumina scientists and engineers have developed these high-resolution scanners to deliver industry-leading data quality for a broad range of applications with the flexibility to meet a variety of throughput needs.

The HiScan and iScan systems support the broad portfolio of innovative Illumina assays for genotyping, CNV analysis, DNA methylation, and gene expression profiling. Automating

assay processing with a liquid-handling robot and the AutoLoader 2.x reduces hands-on time and enables scanning to occur 24 hours per day. Scanners and components are modular, creating a tunable system that can be configured to meet any level of throughput needed.

Innovative Imaging System

Both the HiScan and iScan systems use high-performance lasers, optics, and detection systems to offer submicron resolution and unmatched throughput rates. The result is industry-leading scan times without sacrificing data quality and reproducibility. The latest HumanOmni BeadChips have been optimized to take advantage of the higher performance components of the HiScan system, offering industry-leading throughput, and the highest number of high-value content markers.

With a high signal-to-noise ratio, high sensitivity, low limit of detection, and broad dynamic range, both scanners produce exceptional data quality for use in any biomarker screening or validation study. The high call rates (> 99% achieved with the Infinium Assay) enable powerful genome-wide association studies and high-resolution CNV analysis, accurately detecting even single copy number changes. In addition, these systems can be used for fast, accurate screening in agrigenomics and for validating complex disease studies. Methylation and gene expression profiling also benefit from the sensitive measurement and wide dynamic range.

Table 1: HiScan and iScan Systems at a Glance

System	HiScan	iScan
Avg. scan time per sample (HumanOmni2.5-8 BeadChip)	6.5 minutes	11.4 minutes
Avg. samples per week* (manual)† (HumanOmni2.5-8 BeadChip)	256	256
Avg. samples per week (automated)‡ (HumanOmni2.5-8 BeadChip)	1,088	608

* Five-day work week.
† Manual: 1 FTE, 1 HiScan or iScan system, 16 BeadChips/batch, 2 batches/FTE/Tecan robot.
‡ Automated: 1FTE, 1 HiScan or iScan system, 2 Tecan robots, 1 AutoLoader 2.x, 24 BeadChips/batch, 2 batches/FTE/Tecan robot.

Table 2: Weekly Throughput of Selected Illumina BeadChips with a Single HiScan or iScan System

BeadChip	Approximate Scan Time Per Sample (minutes)		Manual Loading* (Samples Per Week)		With Automation† (Samples Per Week)	
	HiScan	iScan	HiScan	iScan	HiScan	iScan
Infinium HumanOmni5	15	26	128	128	480	272
Infinium HumanOmni2.5-8	6.5	11.4	256	256	1,088	608
Infinium HumanOmniExpress+	6.1	7.5	256	256	1,152	960
Infinium Methylation450K	5.0	5.0	384	384	1,440	1,440
Infinium HumanCytoSNP-12	1.8	2.9	384	384	1,728	1,728
Infinium HD iSelect (12x1)	2.9	2.9	384	384	1,728	1,728
Infinium HD iSelect (24x1)	1.0	1.0	768	768	3,456	3,456
BovineLD	0.3	0.3	768	768	3,456	3,456
Universal-32 BeadChip for GoldenGate Genotyping	0.3	0.3	1,440	1,440	1,440	1,440

* Manual: 1FTE, 1 HiScan or iScan system, 16 BeadChips/batch, 2 batches/FTE/Tecan robot per week.
† Automated: 1FTE, 1 HiScan or iScan system, 2 Tecan robots, 1 AutoLoader 2.x, 24 BeadChips/batch, 2 batches/FTE/Tecan robot per week.

High-Throughput Readout

Recent BeadArray product density advancements have increased genomic coverage for whole-genome genotyping, resolution for cytogenetics and CNV detection, and sample throughput for gene expression, DNA methylation, and focused genotyping products. The HiScan and iScan systems possess the advanced laser and optics components capable of handling even the highest density multisample arrays, producing high-quality data with rapid turnaround times (Table 2).

By scanning BeadChips in minutes rather than hours, labs can process an entire project's samples in record time. This dramatic drop in analysis time translates directly into faster time to results and reduced project costs.

Figure 1: Example of a Dual Scanner-AutoLoader 2.x Configuration

690 mm
1600 mm
850 mm
2350 mm

Two iScan systems with an AutoLoader 2.x fit easily on typical lab benches. System height excluding monitor is 510 mm. Additional configurations of iScan and HiScan systems with AutoLoaders are possible.

Fully Automation Compatible

For labs with throughput requirements that exceed the capacity of manual operation, Illumina offers optional equipment and software to automate the system. This increases the throughput of assay sample processing and supports 24-hour-per-day scanning. A fully automated system under LIMS control represents the most robust and highest throughput configuration.
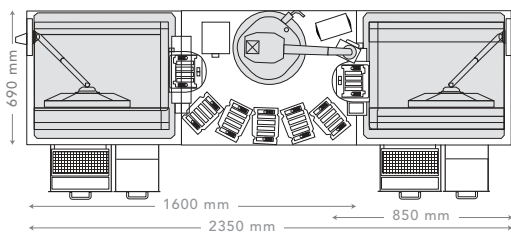
Liquid-Handling Robot

A customized Tecan liquid-handling robot (ordered from, and supported by, Illumina) can be included with either the HiScan or iScan system to automate assay protocols. To reduce labor requirements and ensure consistent processing, the entire Infinium or GoldenGate assay pre- and post-PCR workflows (after optional DNA quantitation) can be performed by the robot.

This configuration of scanner plus robot yields outstanding reproducibility and high throughput. User-to-user variability is eliminated with uniform robotic pipetting.

AutoLoader 2.x

For walkaway BeadChip loading and scanning with either the HiScan or iScan system, Illumina offers the AutoLoader 2.x. The AutoLoader maximizes scanner use by providing continuous, unattended operation and the ability to load one or two scanners at a time. This enables processing of thousands of samples per week, resulting in improved assay efficiency while decreasing overall cost. The AutoLoader has a minimal footprint, so that even a dual-scanner configuration easily fits on a typical lab bench (Figure 1).

LIMS Integration

Accurate sample information, workflow enforcement, and data tracking are ensured with an optional integrated Infinium or GoldenGate Laboratory Information Management System (LIMS) designed specifically for Illumina products. Illumina LIMS features an easy-to-use custom interface, positive sample tracking (posID), and tools to manage entire projects.

Samples are validated and followed throughout the workflow to ensure correct assay processing. Integrated tools support project management tasks such as managing concurrent projects, tracking progress and viewing queues, and assigning samples to a project, principal investigator, or institution. Downstream processes, such as generating and emailing notifications and reports, are performed automatically.

A fully automated LIMS-controlled HiScan or iScan system reduces the burden on support staff and minimizes costly errors when processing hundreds or thousands of samples per day.

Workstation and Software

The HiScan and iScan systems include a computer workstation that controls all aspects of the scanner. This automated system provides laser control, precision mechanics control (including focus motor), detection of excitation signals, image registration, image extraction, and data output (Table 3).

Illumina's GenomeStudio® software supports data analysis, featuring visualization tools, advanced data manipulation attributes, and extensive reporting capabilities. GenomeStudio software consists of application-specific modules with a common framework. This modular architecture makes the HiScan and iScan systems truly multipurpose instruments for wide-ranging genetic analysis, while providing a consistent user environment and tools for integrated analysis.

Table 4: Site Requirements

Parameter	Specification
Power	Dedicated circuit, 100–120/200–240 VAC, 50/60 Hz, 360 VA, 15A for 110 V Reader/12A for 220 V Reader
Pressured Pneumatic Line	30–35 psi pressurized air for isolation table with 5 μm element filter
Environmental Conditions	• Up to 2,000 m elevation • 10–30°C • 10–90% relative humidity • Overvoltage II installation category

Installation and Support

Comprehensive installation and training is included with every scanner purchase. Site requirements are listed in Table 4. Field Application Scientists perform extensive on-site training for the purchased array application following installation by a Field Service Engineer. Illumina's Technical Support Scientists provide ongoing technical support.

Warranty and Service

Illumina has one of the industry's best service organizations, with a strong drive to ensure customer satisfaction. A comprehensive 12-month warranty that covers the scanner, hardware, accessories, and installed option packages is included with each system purchase.

The Standard Warranty includes:
• Emergency on-site service calls during normal business hours
• One on-site preventive maintenance service
• Software upgrades for the applications purchased
• Parts, labor, and consumables for system maintenance or repairs
• Phone support and assistance

Flexible extended warranty options ensure that every system continues to operate at optimum performance.

Table 3: Scanner Specifications

Parameter	HiScan	iScan
Pixel Resolution	0.375 μm	0.53 μm
Laser Excitation	532 nm and 660 nm dual-laser excitation	532 nm and 658 nm dual-laser excitation
Image File Output	TIFF or JPG data file output with automatic image quality analysis (uncompressed or compressed)	TIFF or JPG data file output with automatic image quality analysis (uncompressed or compressed)
Dimensions (W x H x D)	71.9 cm × 74.5 cm × 69.9 cm	52 cm × 45 cm × 66 cm
Dimensions of Air Table (W x H x D)	N/A	61 cm × 6 cm × 69 cm
Weight	136 kg	65 kg

Summary

The cutting-edge HiScan and iScan array scanners support a wide breadth of applications. For the highest throughout and fastest time to answer, choose the HiScan system. The iScan system offers an accessible entry point into high-throughput array studies, with no compromises in terms of data quality or breadth of applications. Both systems include industry-leading support, ensuring that researchers get the most out of their array system for superior genetic analysis studies.

To learn more about Illumina genetic analysis products, visit www.illumina.com.

Ordering Information

Product	Catalog No.
HiScan System, 110 V/220 V	SY-103-1001
iScan System, 110 V/220 V	SY-101-1001
AutoLoader 2.x, Single-Scanner Configuration, 110 V/220 V	SY-202-1001
AutoLoader 2.x, Dual-Scanner Configuration, 110 V/220 V	SY-202-1002

FOR RESEARCH USE ONLY