

# Multiplex your most important genetic assays on **one platform**

GenomeLab™ GeXP Genetic Analysis System

**Genomics**

Proteomics

Cell Analysis

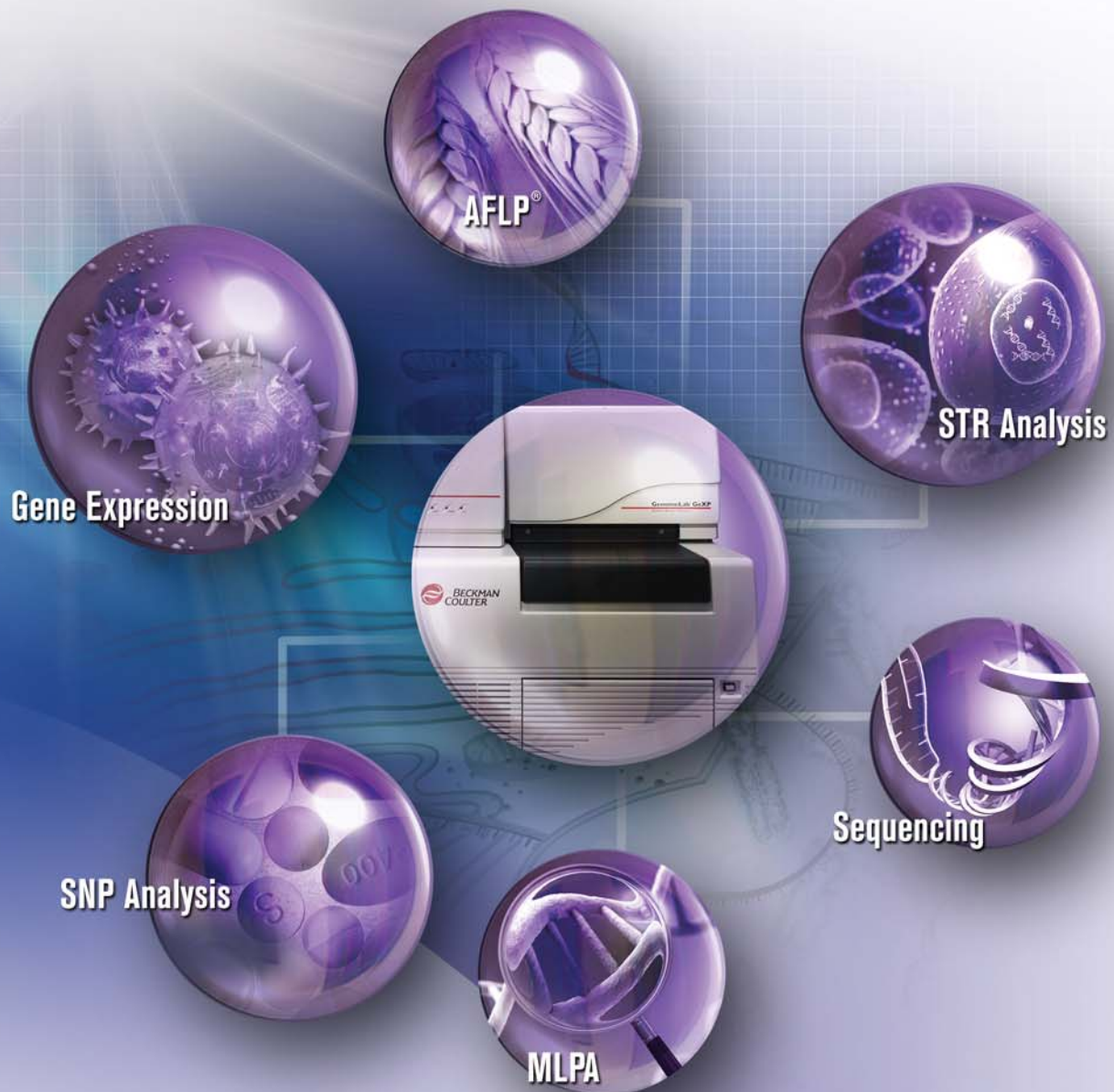
Centrifugation

Lab Tools

Particle Characterization

Bioseparation

Lab Automation



## **Perform your ideal genetic assays on one platform**

### **A broad spectrum of applications**

**Gene Expression**

**Sequencing**

**SNP Analysis**

**STR Analysis**

**AFLP<sup>®</sup>\***

**MLPA<sup>\*\*</sup>**

*Complement your gene expression analysis with LOH studies. Confirm your SNP analysis results by sequencing. Combine MLPA genomic results with quantitative gene expression for the full story. Do all this on one platform, with one capillary array, one gel and one software.*

*The GenomeLab GeXP supports a variety of applications, including DNA sequencing and fragment analysis. Furthermore, this flexible system allows you to run more than one application on the same plate and up to 192 samples unattended.*



### **Gene Expression**

The GenomeLab GeXP Genetic Analysis System is a multiplexed quantitative solution that reproducibly measures subtle, biologically relevant changes in gene expression. This system can detect down to 0.5-fold changes in gene expression, providing much more meaningful information than ever before. In addition, the GeXP multiplex feature allows multiple reference (housekeeping) genes, genes of interest and an internal control to be analyzed in a single well for improved accuracy.

#### **Reduce bottlenecks with our high-throughput, low-cost solution.**

Finally, quantitative gene expression that's cost-effective too. The GenomeLab GeXP Genetic Analysis system utilizes a patented, highly multiplexed reverse transcription PCR<sup>\*\*\*</sup> approach to quickly and efficiently look at the expression of multiplexed gene sets with greater sensitivity and speed. Building on more than a decade of innovative leadership in laboratory automation and capillary electrophoresis technology, the GenomeLab GeXP expedites your pathway to discovery.

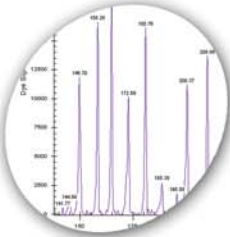


The GenomeLab GeXP Genetic Analysis System supports researchers who have completed their initial discovery work with literature or large-scale screening technologies. The system provides a multiplexed, quantitative gene expression and multipurpose genetic analysis platform. *Please ask your local sales representative to calculate your own personal cost savings by making the simple change to multiplexed gene expression profiling.*



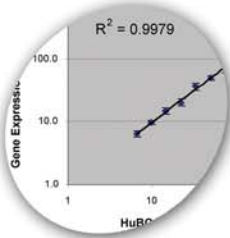
### High-throughput quantitative gene expression.

With the capacity to analyze up to 30 genes per reaction, the scalable GenomeLab GeXP enables the examination of up to 5,760 data points unattended in 24 hours.



### Cost-effective and time-saving gene expression.

By lowering PCR expenses and improving efficiency, the multiplex power built into the GenomeLab GeXP System enables you to analyze up to 30 genes per sample at a dramatically reduced cost per gene expression result with considerable time savings.



### High accuracy and reproducibility you can trust.

With unrivaled linearity ( $R^2 > 0.99$  for most genes), the GeXP delivers precise gene expression profiling that can detect gene expression changes down to 0.5 fold. A very high signal-to-noise ratio increases sensitivity and reproducibility across samples for more accurate and informative results.



### Low sample requirement.

Our multiplexing capability, coupled with capillary electrophoresis readout, can be efficiently used to look at focused sets of genes using as little as 5-50 ng of total RNA.

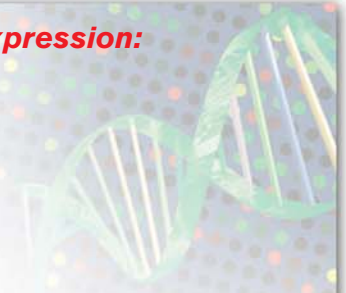


### Comprehensive software tools.

The GenomeLab GeXP has a sophisticated set of software tools that will guide you all the way from designing primers to data management of high-throughput gene expression studies.

### **Multiple applications for gene expression:**

*Tumor biomarker discovery*  
*Development of signatures*  
*Drug toxicity studies*  
*Stem cell research*  
*Plant genomics*  
*Microarray data validation*



## The eXpress profiling process for gene expression analysis

Simplified for multiplex capability

Beckman Coulter's GenomeLab GeXP Genetic Analysis System uses a simplified two-step multiplex PCR process for multiplexing biomarkers in gene expression assays. Each multiplex integrates biological controls in the same well as target genes and reference (housekeeping) genes. This approach not only reduces reagent consumption, but also eliminates pipetting variation and minimizes the need for technical replicates.

The true flexibility of the system is the ease and specificity of panel generation. By using the eXpress Designer module within the software, scientists can design research-specific panels using accession numbers or proprietary sequences. GeXP protocols accept any desalted, deprotected, unlabeled oligonucleotides.

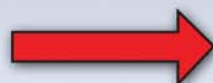
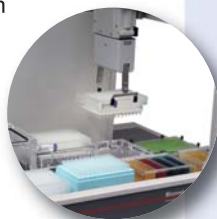
Users can define their targets, or use commercially available multiplexes from Beckman Coulter for analysis.

### Isolate Prepare RNA



Biomek®  
Agencourt® SPRI®  
DTX Reader

For this phase, perform automated total RNA isolation and purification using the Biomek Series automated laboratory workstations and the Agencourt Solid Phase Reversible Immobilization (SPRI) paramagnetic bead-based chemistry.

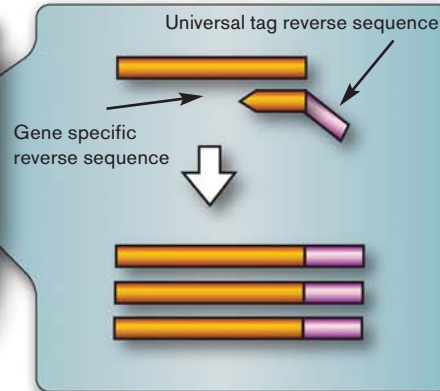


### Prepare (Step 1) Multiplex Reverse Transcription

RT



Reverse transcription of  
mRNA to cDNA (no labeling)



Reverse transcription reaction from total RNA uses gene-specific reverse primers that add a flanking universal reverse sequence to resulting cDNAs.

Pre-designed panels can be used to expedite target screening.

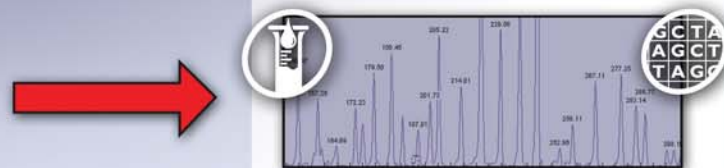
- GenomeLab GeXP Human Metastasis*Plex*
- GenomeLab GeXP Human Breast Cancer*Plex*
- GenomeLab GeXP Rat Multitox*Plex*
- GenomeLab GeXP Human Reference*Plex*

To find out more about these panels, visit [www.CELeader.com](http://www.CELeader.com).



## Prepare (Step 2) Multiplex PCR

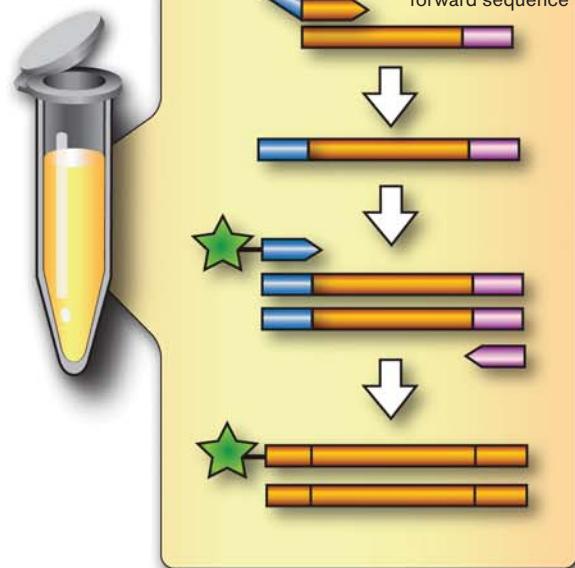
## Analyze and Evaluate Separate and Analyze



### Multiplex PCR with chimeric and universal primer sets

Universal tag forward sequence

Gene specific forward sequence



Samples are ready to load on the GenomeLab GeXP Genetic Analysis System without the need for chemistry clean-up. The multiplex PCR amplified fragments are separated and evaluated using the eXpress Profiler software.

The multiplex reaction contains the cDNA for all genes of choice tagged with a universal sequence at the 5' end. Two types of primers are present in the reaction: 1) Chimeric primers contain a gene-specific sequence with a universal tag at the 5' end. They are used to synthesize a double-stranded DNA template. 2) Universal primers have the same sequence as the universal tags in the chimeric primers. The forward universal primer is covalently labeled with a fluorescent dye for detection during capillary electrophoresis.

In the first two cycles, the PCR reaction is driven by the gene-specific sequence of the chimeric primers to

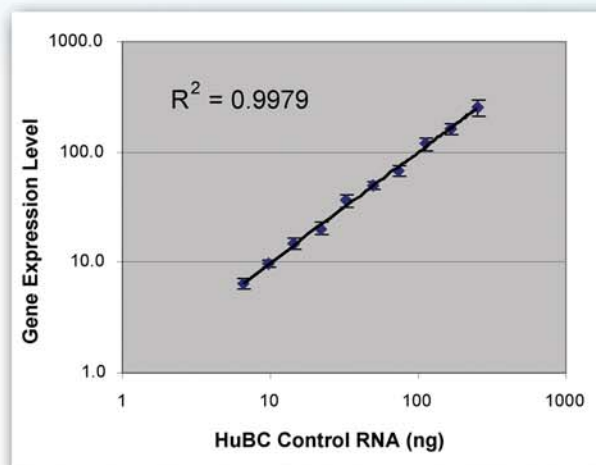
produce amplicons that have universal tags at both ends. The universal primers take over during the third cycle and drive the remaining PCR reactions, due to their 60:1 molar excess relative to the chimeric primers. At this point, all of the templates are amplified with identical universal primers and any sequence bias is minimized.

The result is a pool of amplicons corresponding to the genes of interest. Each amplicon is designed to have a discrete length, and each is labeled with a WellRED fluorescent dye for detection.

## Multiplexed gene expression delivers high sensitivity, accuracy and precision

### Linearity and precision

The GenomeLab GeXP produces gene expression data with superb linearity. A highly linear correlation between the amount of RNA and gene expression level is generated for each gene in a multiplex with an average correlation coefficient ( $R^2$ ) well above 0.99.

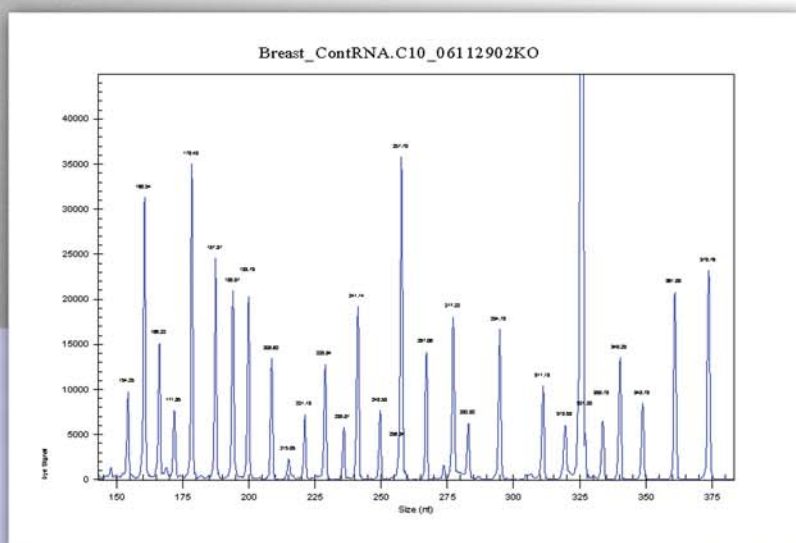


### Accuracy

HuBC control RNA (ng)	6.5	9.8	14.6	21.9	32.9	49.4	74	111	167	250
GEQ value	6.5	9.8	15.0	20.4	36.2	49.8	67.8	118	163	251
Relative accuracy	99%	99%	97%	93%	90%	99%	92%	93%	97%	99%
Average of RA	96%									

Relative accuracy (RA) of GeXP in detecting 0.5-fold change in the amount of Human Breast CancerPlex control RNA

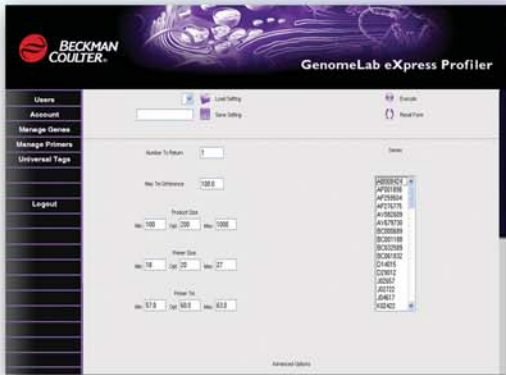
The GenomeLab GeXP is sensitive enough to precisely detect even small changes in gene expression. The 0.5-fold increases in RNA concentration are consistently and accurately quantified by the GeXP for all genes in a multiplexed assay.



### Human breast cancer electropherogram

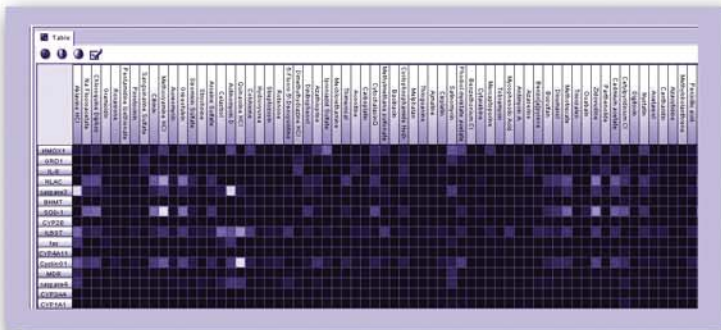
Simultaneously analyze 24 functional genes associated with breast tumor progress and three reference (housekeeping) genes.

# Gene expression eXpress Profiler software



## eXpress Profiler

GenomeLab eXpress Profiler takes the uncertainty out of assay design by providing fast, automated primer design, multiplex development and calculation of relative gene expression values.

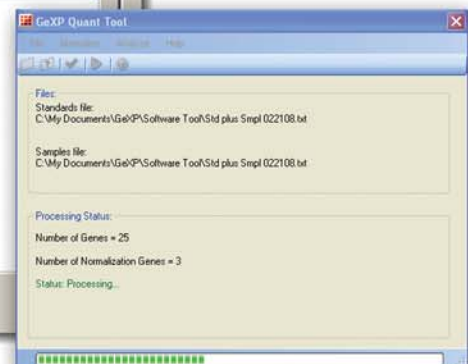
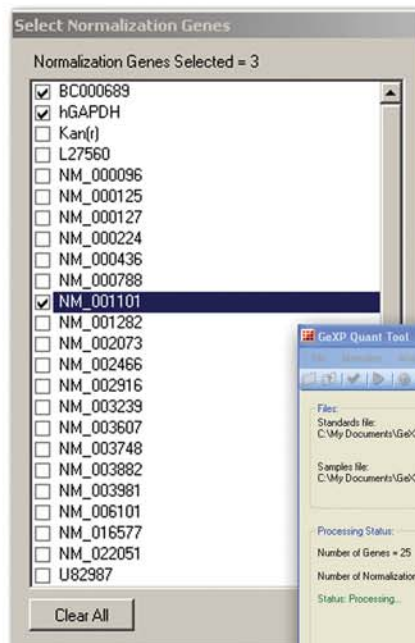


## eXpress Analysis

With the eXpress Analysis module, fragment data is easily identified and associated with the design file using the software's QC functionality. Report output from the eXpress Analysis module can be imported into the eXpress Map for visualization as a high-density array image (heat map). This analysis can also be imported into spreadsheet software, third-party analysis software or LIMS.

## Normalize to multiple genes

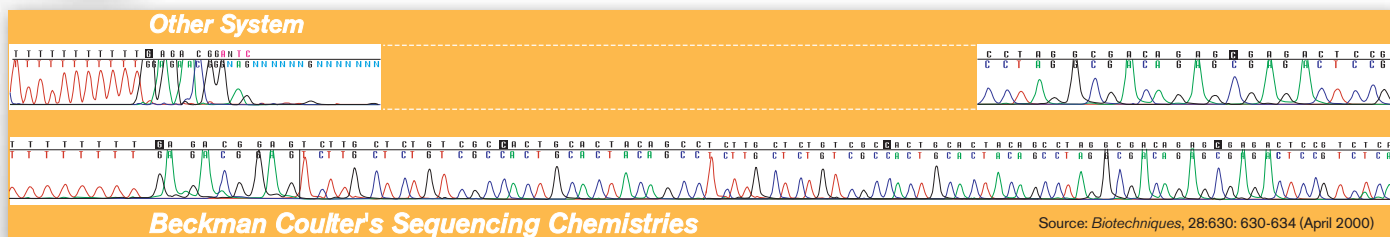
The power of multiplexing allows for the inclusion of several reference (housekeeping) genes in the same reaction. The GenomeLab GeXP makes it possible to normalize gene expression data to multiple reference genes at once, giving you the unprecedented flexibility to choose the best reference gene or genes in your assay system.



## Resolve complex sequences with high-quality information



### Sequencing



Using a novel approach to chemistry, our system features unique DNA sequencing reagents – including linear polyacrylamide gel (LPA), coated capillaries, dITP chemistry and near-infrared dyes – coupled with online denaturation. This results in less correction, more meaningful raw data and higher-quality final analyses. In this example, the GenomeLab GeXP is compared with another automated sequencing system for the completion of a problematic human genome sequence region. A section of gene sequence the other system couldn't

resolve was accomplished using Beckman Coulter's innovative chemistry. The GenomeLab GeXP, in combination with the chemistry kits, provides high sensitivity to dye-labeled sequencing reaction products, robust signal and precise control over electrophoretic separation conditions. This has been optimized for four-color DTCS methods, to deliver robust signal for 700 bases per sample at better than 98% accuracy in about 100 minutes cycle time.



The sequencing process is further simplified by the use of a single master-mix in the GenomeLab DTCS Quick Start Kit. A smaller number of pipetting steps, and the use of larger transfer volumes, help reduce variability and errors in the process.



The GenomeLab Methods Development Kit provides a solution that will enable sequencing of difficult templates (secondary structures, polymerase hard stops, etc.) with uniform dye incorporation and low background fluorescence.

## Multiplex fragment analysis results –

whether you're genotyping, SNP scoring or quantifying microsatellite instability, the accurate and timely assignment of alleles can dramatically impact your lab's productivity. Compatible with assays such as MLVA or MLPA, multiplexing

reduces time and cost and uses fewer samples. We developed the GenomeLab GeXP Genetic Analysis System to provide high-precision DNA sizing and sophisticated software algorithms with these processes in mind.



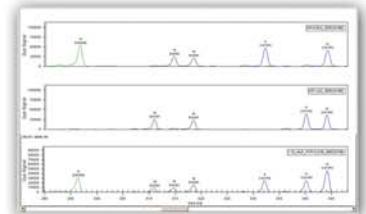
### SNP Analysis

The Genomelab SNPStart Primer Extension Kit is based on single base primer extension technology, a gold standard in the industry. Validated and optimized to multiplex up to 10 SNPs in a single reaction, the SNPStart Kit is ideal for low- to medium-throughput applications. The kit provides greater accuracy and reproducibility by using new controls with one peak for each allele, as well as substantial time and cost savings. SNP genotypes are summarized and reported in a fragment list through automated SNP locus tag assignments.



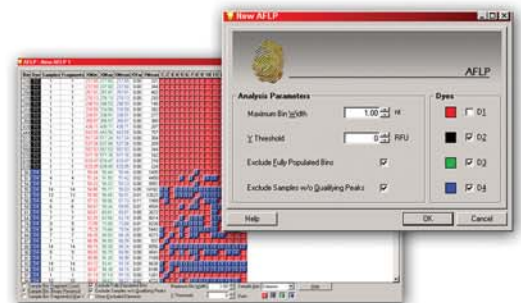
### STR Analysis

The GenomeLab Human STR Primer Kit is used to determine the purity and quality of DNA for sample tracking and monitoring contamination. It is ideal for researchers working with large numbers of DNA samples in clinical trials, tissue culture facilities and core labs.



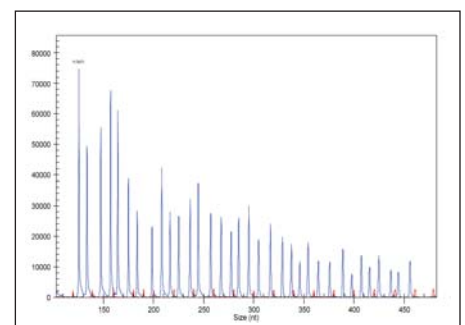
### AFLP

The dominant scoring algorithm automatically scores the presence or absence of AFLP-generated fragments in binary mode (1/0) through an integrated binning process. The dominant scoring results are easily used for phylogenetic analysis. Quantitative analysis is possible by using an option to export the peak heights.



### MLPA

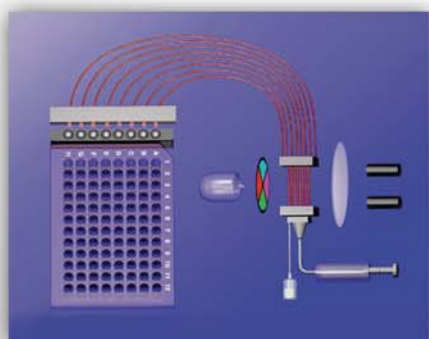
The GeXP is the perfect platform to run the increasingly popular MLPA (Multiplex Ligation-dependant Probe Amplification) assays to test for genetic variations in hereditary cancer, chromosomal aberrations as well as methylation patterns and tumor characterization.



## ***A genetic analysis solution that meets your needs***

The GenomeLab GeXP utilizes single or dual plates with the sample tracking technology option to provide an advanced, industry-leading genetic analysis solution. The result is a fully automated, high-resolution system that adapts well to daily workflow changes in sample type and complexity. The GenomeLab GeXP Genetic Analysis System has the ability to process and track samples in two

96-well plates. An array of eight capillaries takes full advantage of the 96-well plate format, enabling you to process over 192 samples, including thousands of genes, within 24 hours. This level of throughput reduces the cost and complexity associated with microarrays. Samples are automatically denatured online prior to electrokinetic injection.



### **Long-life lasers**

On-column, laser-induced fluorescence with auto capillary alignment ensures sensitive and reliable detection. Long-life diode lasers are used to excite infrared dyes, providing higher sensitivity at a fraction of the cost of argon ion lasers.



### **Dual plates**

This system has the ability to process and track samples in two 96-well plates. An array of eight capillaries takes full advantage of the 96-well plate format, enabling over 192 samples, including thousands of genes, to be processed within 24 hours. Single plate GeXP is also available. *Please ask your sales representative for more details.*



### **Sample tracking made simple**

An integrated barcode reader ensures accurate sample tracking and reporting. It also lets you create GenomeLab GeXP sample setup with automated liquid handlers such as our Biomek Series Laboratory Automation Workstations.

### **WellRED dyes**

Beckman Coulter's WellRED dyes are uniquely designed for use with the GeXP Genetic Analysis System. The WellRED dyes emission spectra is in the near infrared region, providing greater sensitivity and significantly lower background than dyes that emit within the visible end of the spectrum. This results in minimal noise, which can interfere with peak detection and quantitation.

## ***A complete process solution***

As a scientist, you understand the challenges of working with limited amounts of sample, tight deadlines and complex studies. Beckman Coulter has a better way ... a complete solution, all on one platform.

Our integrated GenomeLab solutions and team of experts will help you to deliver the high-throughput and quantitation needed for your application. Simply put, our systems help eliminate the bottlenecks and put you on the fast track to getting the results you need.

### **Automated nucleic acid isolation and purification**

Agencourt sample preparation reagents, coupled with our Biomek Series Laboratory Automation Workstations, provide a top-notch solution for a variety of applications, thus enhancing the productivity, results and economics of your research. Our patented SPRI technology allows for easy automation of nucleic acid purification without sacrificing superior performance. The SPRI systems are designed for PCR product purification, dye-terminator removal, gDNA extraction from whole blood and serum, cDNA purification, simple plasmid purification, nucleic acid isolation and purification from plant material, nucleic acid extraction from mammalian tissue samples, total RNA extraction from tissue and total nucleic acid extraction from formalin-fixed, paraffin-embedded tissue samples.



### **Automated genomic sample and target preparation**

The GenomeLab suite of methods for the Biomek Series Laboratory Automation Workstations automates preparation of multiplexed amplification products, suitable for GenomeLab GeXP analysis. These fully supported methods use superior Agencourt SPRI (Solid Phase Reversible Immobilization) paramagnetic bead-based technology to process 1 to 96 samples in a single run.



### **Multiplexed genetic analysis**

The GenomeLab GeXP Genetic Analysis System is a versatile platform. As a quantitative, high-throughput, multiplexed gene expression profiling solution, it can analyze up to 30 genes per reaction per well with unrivaled sensitivity. This system is also a fully automated, high-throughput sequencing, genotyping and fragment analysis analyzer. In a single setup with one gel and one capillary array within the same plate, short and long templates are sequenced rapidly with high-quality reads and DNA fragments are sized and analyzed quantitatively with high-sensitivity and reproducibility. Fragment analysis applications include: SNP Scoring, Microsatellite Instability (STR), MLPA, MLVA, Loss of Heterozygosity and AFLP Fingerprinting.



The GenomeLab GeXP Genetic Analysis System is an important part of a comprehensive set of interrelated GenomeLab solutions specifically designed to accelerate genetic research.

By encompassing virtually every step of the process, our flexible and highly efficient systems function as an extension of your thinking, helping you make important research decisions faster and with more confidence than ever before.

## ORDERING INFORMATION

### GenomeLab GeXP Genetic Analysis System Part No. A26572

- Integrated barcode reader
- 192 sample capacity, 2 x 96-well sample microplate
- Uses linear polyacrylamide (LPA) – maximizing performance
- Coated eight-capillary array
- Four-wavelength laser-induced fluorescence detection
- 96-well microplate format for samples/buffer
- Eight samples read in parallel
- Automatic gel replenishment
- Automatic sample denaturation and introduction
- Single setup facilitates gene expression analysis, DNA sequencing and fragment analysis

### Specifications

Weight 180 lb (81.6 kg)  
Height 37 in (94 cm)  
Width 24 in (61 cm)  
Depth 26 in (66 cm)  
Power 100-240 VAC, 5A, 50/60 Hz  
Excitation two-diode lasers  
Class 1 laser hazard

For information on our comprehensive line of GenomeLab systems, please contact your local Beckman Coulter representative or visit our web site at [www.CELeader.com](http://www.CELeader.com).

For ordering information, please visit us at [www.beckmancoulter.com/eStore](http://www.beckmancoulter.com/eStore).



### **World-class support at your fingertips**

Wherever you are, our world-class customer service and support is dedicated to making sure your Beckman Coulter system functions at peak efficiency throughout its lifetime. Across the globe, a network of technical and application experts is available online, on site and by phone to help with all your system support needs.

For Research Use Only; not for use in diagnostic procedures.

\*AFLP is a registered trademark of Keygene, N.V.

\*\*MLPA is a registered trademark of MRC Holland, b.v.

\*\*\* The PCR process is covered by patents owned by Roche Molecular Systems, Inc. and F. Hoffmann-La Roche, Ltd.

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