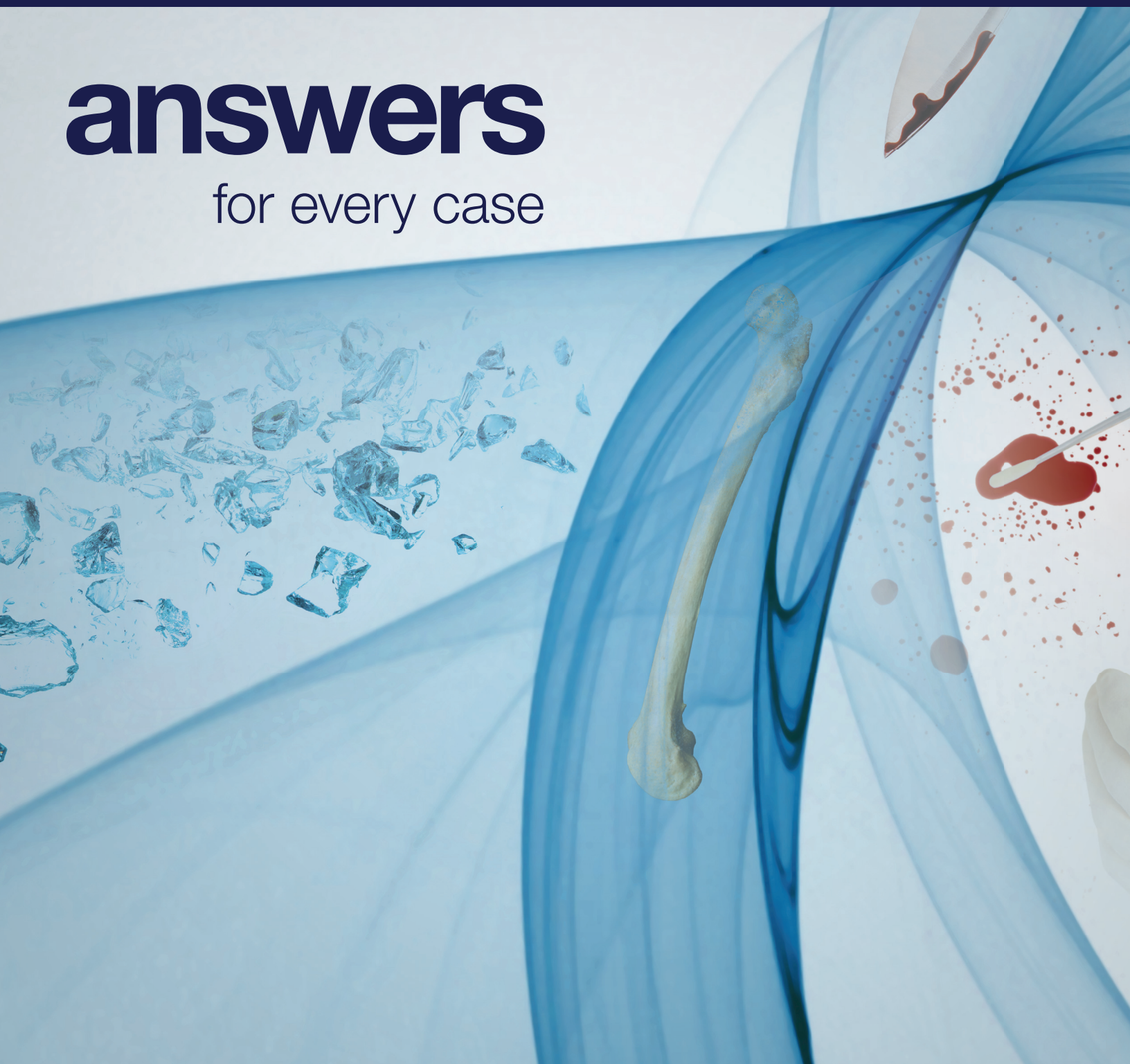


applied biosystems

# answers

for every case



Integrated human identification  
(HID) solutions

**ThermoFisher**  
SCIENTIFIC

# From evidence to answers: your partner in forensics

When the world seeks the truth, it turns to you. But uncovering the truth presents complex challenges that require a partner you can depend on. That's why listening to and answering you is our highest priority, and informing everything we do—so you can focus on making a difference.

Thermo Fisher Scientific offers you simple, complete, end-to-end workflows for forensic DNA analysis to help resolve difficult cases and provide investigative leads in a forensically responsible and relevant manner. We are committed to delivering unparalleled support and continued innovation to meet your needs today and tomorrow.

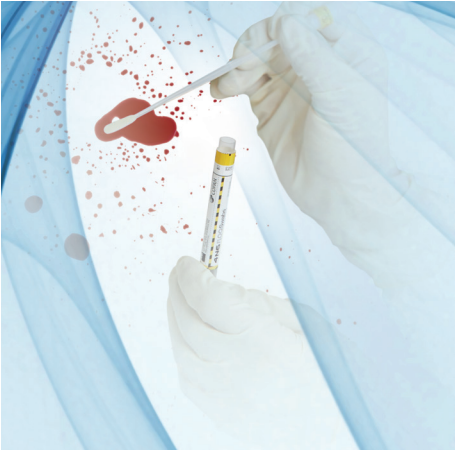


## Bringing you ISO 18385 forensic DNA-grade products

Many of our HID products are manufactured at our location in Warrington, UK—a facility that meets the guidelines for ISO 18385 certification. As part of our long-standing commitment to the continual adoption of new methods that help ensure high-quality manufacturing, we have made significant investments across all aspects of production to minimize human DNA contamination. The result: powerful forensic DNA-grade solutions that enable you to provide answers with certainty and confidence.



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# Sample preparation and extraction

Forensic samples are among the most difficult specimens to process. The quantity and quality of genomic DNA extracted and purified from a forensic sample is directly correlated to the success of downstream analysis. We provide a comprehensive range of sample preparation and extraction solutions, including the Applied Biosystems™ PrepFiler™ extraction chemistry product line, AutoMate Express™ extraction instrument, and Card Processing Automation 200 (CPA200™) system.

## AutoMate Express Forensic DNA Extraction System and PrepFiler DNA Extraction Kits

The Applied Biosystems™ AutoMate Express™ Forensic DNA Extraction System is an easy-to-use, robust benchtop instrument that offers maximum flexibility and utilizes the Applied Biosystems™ PrepFiler Express™ and PrepFiler Express BTA™ (bone, tooth, and adhesive) chemistries packaged in prefilled, foil-sealed cartridges.

The PrepFiler kits are specifically designed to improve the quantity and quality of DNA isolated from forensic samples, increasing the ability to obtain maximum information from downstream STR analysis.

### Key features

- Designed to maximize results in a variety of samples— from high-quantity reference samples to compromised crime scene samples
- Offers easy setup and reduced hands-on time for faster time-to-results while minimizing the risk of contamination
- Optimized for the latest generation of Applied Biosystems™ quantification tools and STR kits
- Processes 1–13 samples in a single run
- Integrated circuit (IC) card with an unmatched range of variable elution options from 20 µL to 250 µL (Figure 1)

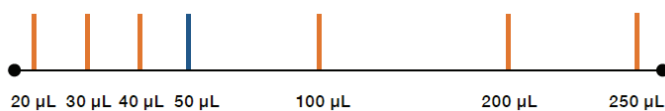


Figure 1. The AutoMate Express system comes with a preprogrammed card with a wide range of elution volumes.

## Prep-n-Go Buffer

Applied Biosystems™ Prep-n-Go™ Buffer is a superior buffer designed to help enable high-quality direct PCR amplification of single-source samples collected on untreated paper or buccal swabs. This product expands direct PCR amplification capabilities to laboratories that use a wide variety of substrates, and is readily adaptable to both manual and automated workflows.

## Card Processing Automation 200 instrument

The Applied Biosystems™ Card Processing Automation 200™ (CPA200™) instrument is a semiautomated puncher designed to process human blood or saliva DNA samples, collected on filter paper or cards, in forensic and paternity laboratories. The CPA200 instrument combines ease of use with full sample traceability and integrity to help improve downstream results in low- and medium-throughput laboratories.





## ID NIMBUS Presto system with KingFisher technology

The fully automated ID NIMBUS™ Presto system allows you to efficiently purify nucleic acids from lysed samples in a 96 deep-well plate for use in sensitive downstream analyses such as DNA quantification and STR amplification. With rapid, automated processing and high-quality yields from even the most challenging samples, forensic labs can enjoy faster turnaround times with lasting confidence in results. The compact ID NIMBUS Presto system combines the Thermo Scientific™ KingFisher™ Presto Purification System with the Hamilton Microlab™ NIMBUS™ liquid handling workstation. The system is specifically scripted for use with the Applied Biosystems™ PrepFiler™ and PrepFiler™ BTA Automated Forensic DNA Extraction Kits.

The deck-mounted KingFisher Presto system utilizes magnetic particle-based technology to facilitate high-quality nucleic acid purification. A dual-position turntable allows processing of one plate while the integrated Microlab NIMBUS liquid handler simultaneously prepares and transports a second plate, without the need for manual intervention.

### Key features

#### Less hands-on time

- Purify more samples with less hands-on time—up to 96 samples in about 1 hour
- Simple setup and walk-away workflow
- Minimal manual touchpoints to help reduce human error and contamination risk
- Highly skilled forensic scientists can focus on more complex tasks

#### High reproducibility

- Minimal variation in each sample and run
- Increased process standardization
- Consistent, reliable, accurate results from a variety of forensically relevant sample types (Figure 2)

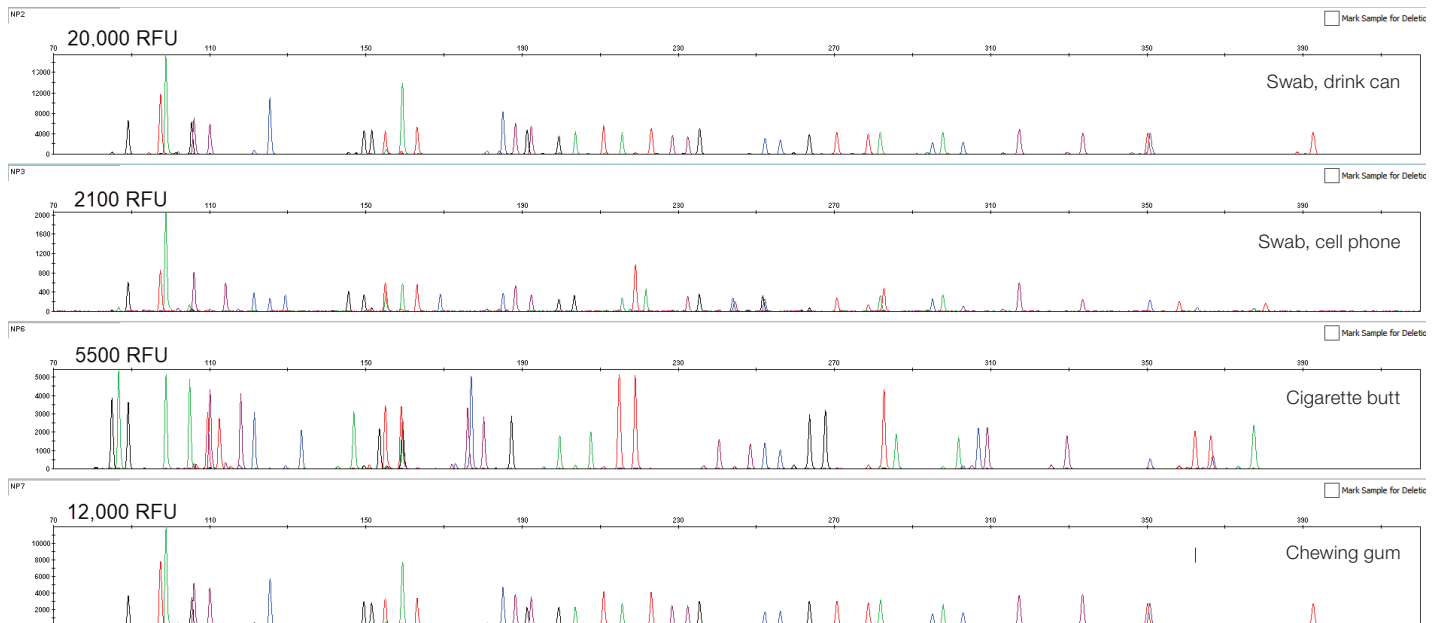
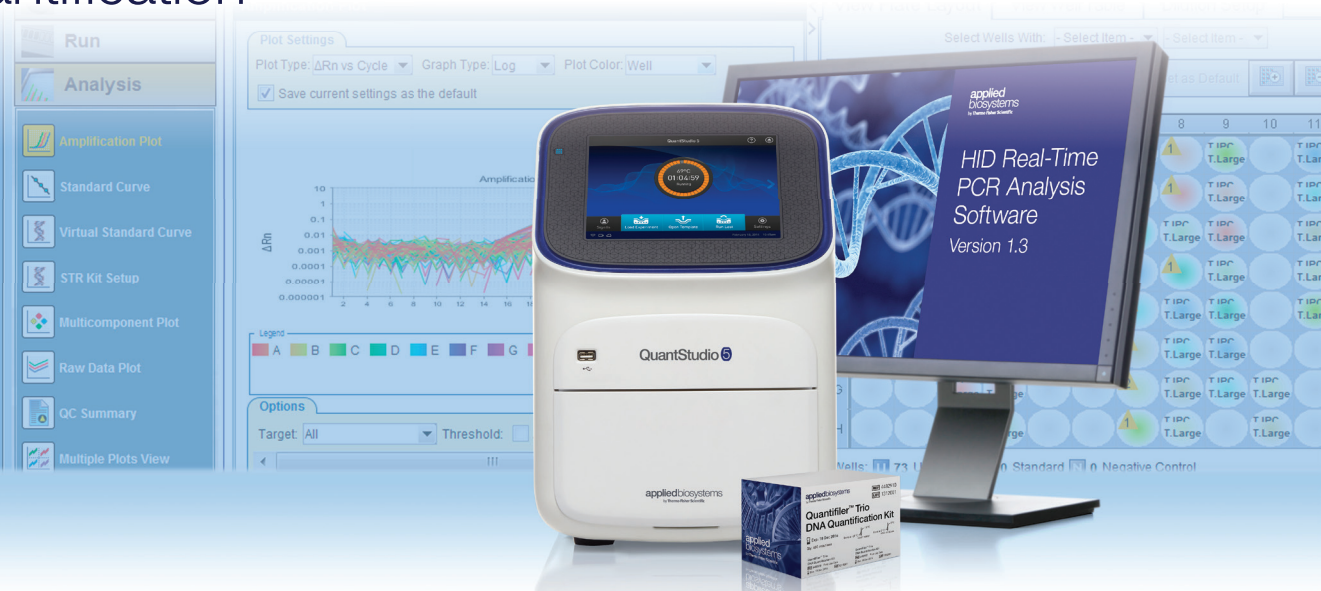


Figure 2. Applied Biosystems™ 3500xL Genetic Analyzer electropherograms of case-type samples amplified with the Applied Biosystems™ GlobalFiler™ PCR Amplification Kit. The y-axes are scaled separately per sample as indicated.

# DNA quantification



The quantification step of the casework workflow is key to determining how a sample will be processed downstream. Our quantification instrumentation, kits, and software enable forensic labs to achieve accurate results in less time for even the most challenging casework samples.

- Improved amplification efficiency results in fewer off-scale, over-amplified, or under-amplified samples and reduces the need for reanalysis
- DNA quantification provides key sample information that enables forensic workflow decisions

The Applied Biosystems™ Quantifiler™ Trio DNA Quantification Kit, which can be analyzed on the Applied Biosystems™ QuantStudio™ 5 Real-Time PCR System for HID, contains targets that measure both quantity and quality of total human DNA and Y-specific DNA. It may also be used to streamline processing of samples from sexual assault kits by assessing swab evidence directly to rapidly detect the presence of a male contributor, facilitating a Y-screen “direct to DNA” workflow.

The QuantStudio 5 Real-Time PCR System is designed for forensic scientists who need a simple, reliable, and affordable real-time PCR system that doesn't compromise on performance or quality. The system offers a sensitive, robust solution for forensic DNA quantification. With maximum dye versatility, this HID solution offers accurate, trusted results in a small benchtop footprint.

We've designed Applied Biosystems™ HID Real-Time PCR Analysis Software v1.3 specifically for the HID application to help you take full advantage of the data and capabilities offered by the Quantifiler kits and maximize sample-processing efficiency. The software offers the ability to calculate DNA quantity from sample data with a virtual standard curve, which is defined by the user and reduces variation. The software includes quantification and STR setup features, as well as data quality review functionality (Figure 3). By providing predefined templates for Quantifiler and STR kit runs, sample setup time is minimized.

The screenshot shows the 'Create New Standard Curve' dialog box in the software. It contains the following fields and options:

- Virtual Standard Curve \***: A dropdown menu set to 'Standard 1'.
- Is Standard Curve Default?**: A checked checkbox.
- Expiration Date \***: A date picker set to 'Jun 15, 2017'.
- Select Kit \***: A dropdown menu set to 'Quantifiler Trio'.
- Targets \***: A section with three sub-sections, each containing 'Y-Intercept' and 'Slope' input fields:
  - T.Y**: Y-Intercept: 0.0, Slope: 0.0
  - T.Large Autosomal**: Y-Intercept: 0.0, Slope: 0.0
  - T.Small Autosomal**: Y-Intercept: 0.0, Slope: 0.0
- Comments**: A text area for notes.

At the bottom are 'Reset Fields', 'OK', and 'Cancel' buttons.

Figure 3. Enhanced data analysis using virtual standard curve functionality.

# GlobalFiler PCR amplification kits

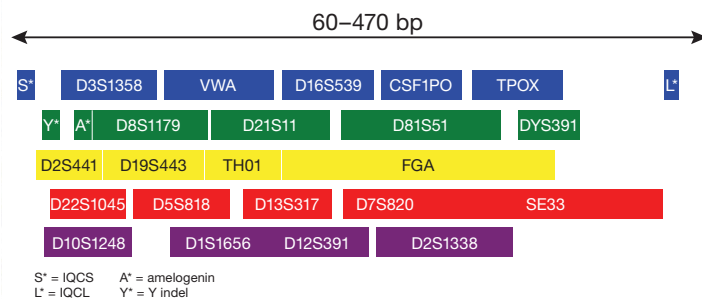
Around the world, forensic labs are asked to do more with less. That's why GlobalFiler STR kits are tailored to combine maximum data recovery power with reduced amplification time. As part of our fully integrated and validated forensic workflow, this 6-dye, 24-locus panel is designed to deliver superior lab performance—all facilitated by our comprehensive training, service, and support. One of the GlobalFiler kits is also available with an internal quality control system (IQC) as part of a fully integrated and verified forensic workflow.

Both the Applied Biosystems™ GlobalFiler™ and GlobalFiler™ Express kits are approved for use by laboratories generating DNA profiles for inclusion in the US National DNA Index System (NDIS) Combined DNA Index System (CODIS) database.



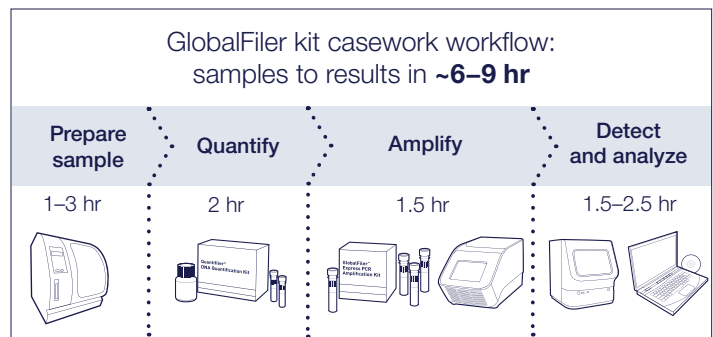
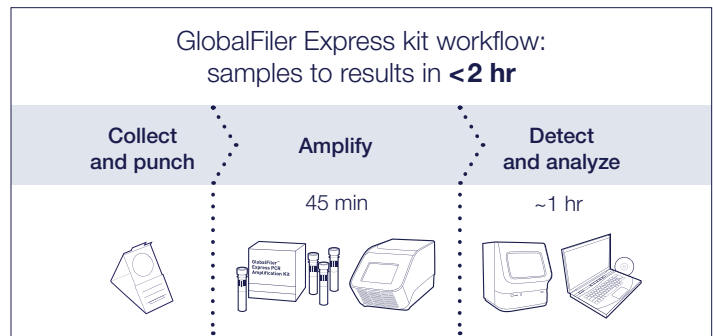
The GlobalFiler kits contain all of the STR loci commonly used in major global databases, including all markers recommended for inclusion by the CODIS Core Loci Working Group and those markers commonly used in Europe (Figure 4).

- Probability of identity (PI) values:  $3.24 \times 10^{-24}$  (Asian),  $3.09 \times 10^{-26}$  (U.S. Hispanic),  $3.71 \times 10^{-26}$  (U.S. Caucasian),  $6.18 \times 10^{-27}$  (African American)
- Includes 10 powerful mini-STR loci for increased information recovery from highly degraded samples
- Enhanced buffer system enables superior performance on samples containing inhibitors
- Expanded sensitivity and the flexibility to add up to 15  $\mu\text{L}$  of sample enables increased allele recovery from low-quantity DNA samples



**Figure 4. Multiplex configuration of the GlobalFiler kit.** The kit includes all 24 loci, with only 1 locus partially exceeding 400 bp. Ten mini-STR loci are smaller than 220 bp, and all gender-specific markers are located in the green VIC™ dye channel for convenience of interpretation. The IQC Small (IQCS) and IQC Large (IQCL) markers are only present in the GlobalFiler IQC kit.

- Enables amplification times of 45 minutes for GlobalFiler Express kit and 80 minutes for GlobalFiler and GlobalFiler IQC kits (Figure 5)
- GlobalFiler Express kit is compatible with Prep-n-Go Buffer, which significantly expands throughput capabilities while maximizing sample integrity and data quality
- Applied Biosystems™ GlobalFiler™ IQC kit contains two IQC markers to help assess degradation or inhibition in casework samples



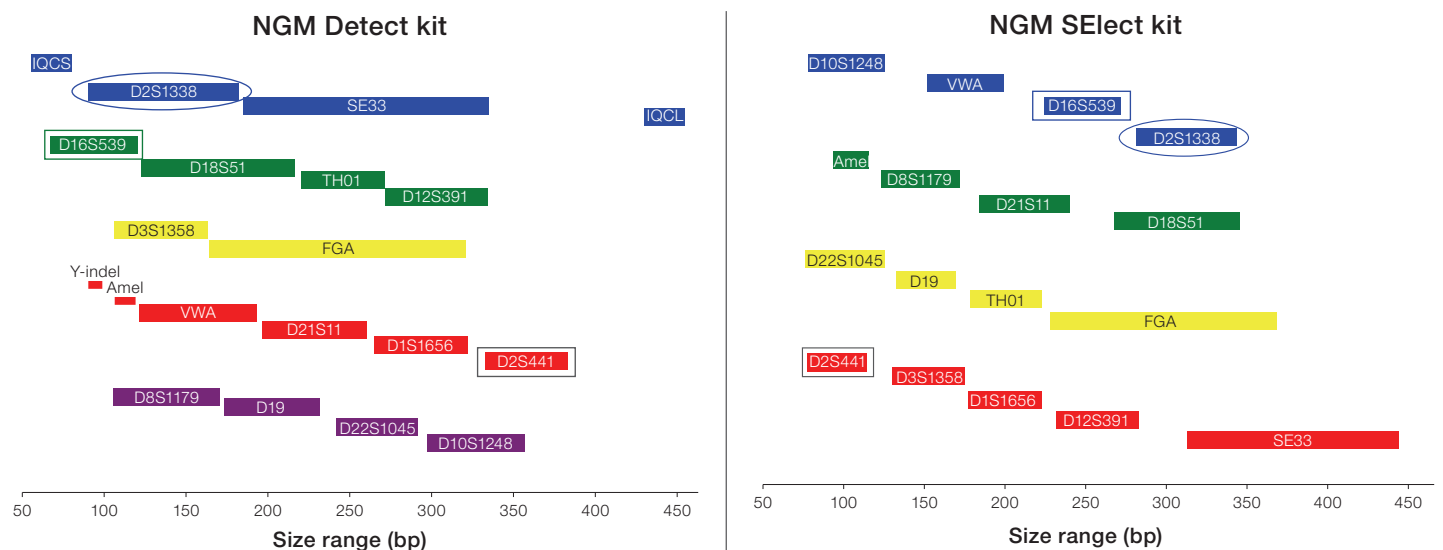
**Figure 5. Typical workflow for up to 48 samples using Applied Biosystems™ thermal cyclers, genetic analyzers, and robust system analysis software.**

# NGM PCR amplification kits

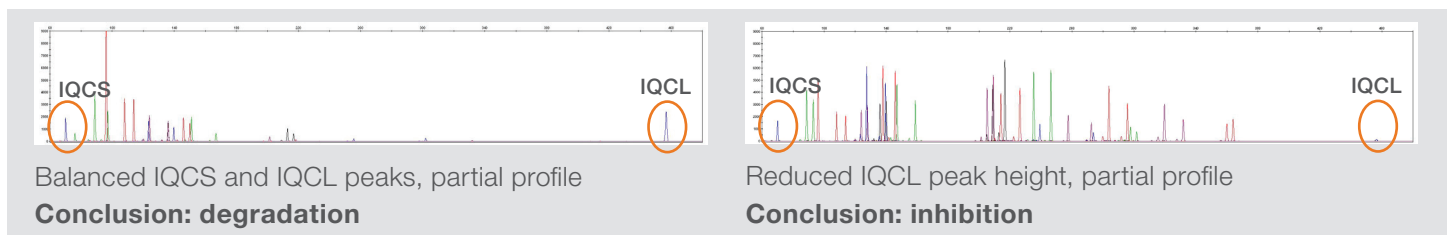
The Applied Biosystems™ NGM™ family of kits delivers exceptional data quality and robustness along with powerful discrimination to support European cross-border data sharing initiatives. The NGM kits amplify all 10 Applied Biosystems™ SGM Plus™ kit loci together with 5 additional loci in the expanded European Standard Set (Figure 6). The kits are supported by our training, service, and applications teams.

Applied Biosystems™ AmpFLSTR™ NGM Select™ kits amplify the expanded set of loci together with the highly discriminating SE33 locus. These kits leverage significant advances in PCR amplification technology to deliver high sensitivity and improved STR performance for forensic and database samples in one easy workflow. The NGM Select Express Kit utilizes the same primer sequences as the NGM Select kit, but employs a new master mix optimized to enable high-quality, direct amplification of single-source samples from swabs and treated/untreated paper substrates, and delivers rapid PCR cycling (<1 hr).

The Applied Biosystems™ NGM Detect™ PCR Amplification Kit offers excellent sensitivity and provides an alternate marker configuration to the NGM Select PCR Amplification Kit format to maximize information recovery, even from degraded casework samples. With 7 mini-STRs, an optimized position for SE33 at <350 bp in the FAM™ dye channel and fast cycling time of <1 hr, the NGM Detect kit is the perfect companion product to NGM Select kits for a dual amplification strategy to help generate maximum allele recovery and confidence in experimental replicates. In addition, the NGM Detect kit contains an additional gender marker, and two IQC markers to help assess degradation or inhibition in casework samples (Figure 7).



**Figure 6. Relative positioning of markers in the NGM Detect and NGM Select kits.** Low MW markers in the NGM Detect kit are high MW markers in the NGM Select kit, and vice versa.



**Figure 7. Analysis of samples using the two quality markers, IQC Small (IQCS) and IQC Large (IQCL), of the IQC system to differentiate between sample degradation and inhibition.**



# VeriFiler PCR amplification kits

Applied Biosystems™ VeriFiler™ Plus and VeriFiler™ Express PCR Amplification Kits meet challenging forensic casework and databasing needs globally. Utilizing our 6-dye STR chemistry, the VeriFiler kits contain a total of 25 markers—23 autosomal STRs, including Penta D and Penta E, and 2 gender discrimination markers (Figure 8). The kits are supported by our comprehensive training, service, and applications teams.

The VeriFiler Express kit offers superior discrimination power and high throughput, with efficient processing—from single-source sample to profile in as little as 2 hours. The VeriFiler Express kit is approved for use by laboratories generating DNA profiles for inclusion in the NDIS (CODIS) database.



With 11 mini-STRs, the VeriFiler Plus kit is specifically designed for challenging sample types: touch, inhibited, or degraded samples, with improved sensitivity and robustness to inhibition. In addition, an IQC system assesses for the presence of inhibitors in the sample to enable distinction between degraded and inhibited samples.

The VeriFiler Plus kit also offers a direct amplification protocol for single-source reference samples, enabling laboratories to process all sample types with a single amplification kit.

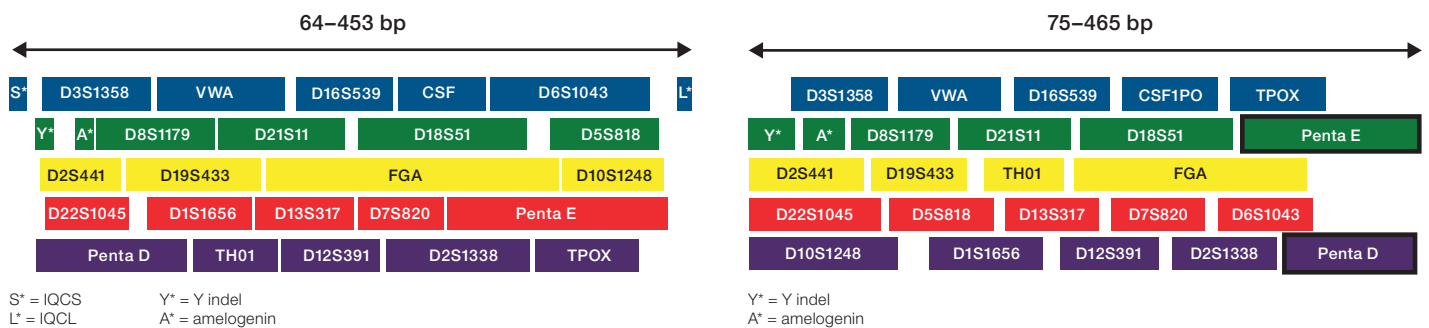


Figure 8. Allele size comparison for VeriFiler Plus kit (left) and VeriFiler Express kit (right).

## Specifications for VeriFiler kits

	VeriFiler Plus kit	VeriFiler Express kit
<b>Improved sensitivity</b>	Kit allows loading up to 17.5 µL of sample volume per 25 µL of reaction	NA
<b>Optimized chemistry</b>	<ul style="list-style-type: none"> <li>Optimized chemistry for challenging sample types: touch, inhibited, or degraded samples</li> <li>Validated with multiple sample collection devices such as treated paper, untreated paper, and swabs for direct amplification of single source samples</li> </ul>	Validated with multiple sample collection devices such as treated paper, untreated paper, and swabs
<b>IQC system</b>	Yes: for distinguishing inhibited and degraded samples; positive control for PCR amplification	No
<b>DNA input</b>	<ul style="list-style-type: none"> <li>500 pg of purified DNA, or up to 17.5 µL of sample volume</li> <li>Treated or untreated paper: 1.2 mm punch</li> <li>Swab: 2 µL (of 400 µL) Prep-n-Go Buffer</li> </ul>	<ul style="list-style-type: none"> <li>Treated or untreated paper: 1.2 mm punch</li> <li>Swab: 2 µL (of 400 µL) Prep-n-Go Buffer</li> </ul>
<b>PCR cycling time</b>	76 min for casework samples	45 min in direct amplification mode for single-source samples

# Yfiler Plus PCR Amplification Kit

Y-STR loci can be valuable in forensic investigations because the Y chromosome can be used to trace male lineage due to its unique genetic inheritance from father to son. Y-STR loci have been serving as a supplementary tool for relationship testing, ancestry identification, familial searching, missing persons and mass disaster victim identification, and sexual assault cases (Figure 9) to detect minor contributions of male DNA in a high background of female DNA.

The Applied Biosystems™ Yfiler™ Plus PCR Amplification Kit can be used with extracted casework samples or with a direct amplification protocol on single-source reference samples.



The 6-dye Yfiler Plus kit can get more information with its 25 Y-STR markers (or 27 Y-STR loci), including 7 rapidly mutating Y-STR loci and 11 mini-STRs of <220 bp (Figure 10), from low-quantity or low-quality casework samples with its high sensitivity and improved inhibitor tolerance. In particular, the inclusion of seven rapidly mutating Y-STRs with mutation rates above  $1 \times 10^{-2}$  helps to improve resolution of paternal lineages and discriminate between closely related males.

The Yfiler Plus kit is suitable for fast thermal cycling conditions, enabling shorter time-to-results. The kit is also designed to process single-source reference samples using direct PCR amplification (Figure 11).

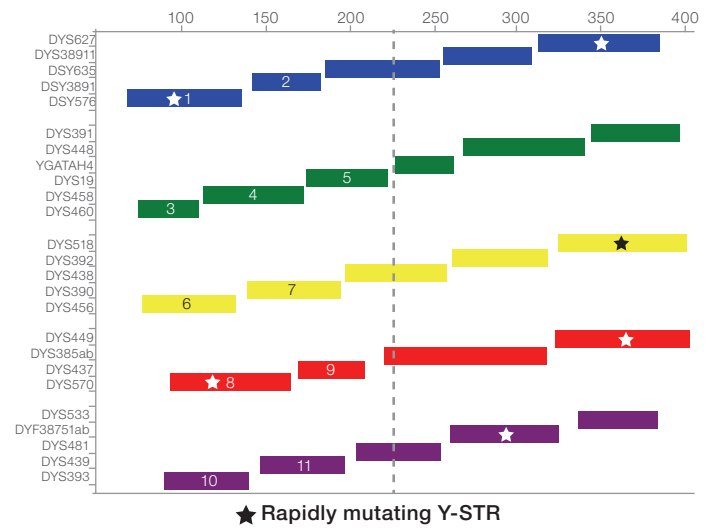


Figure 10. Marker design in the Yfiler Plus kit.

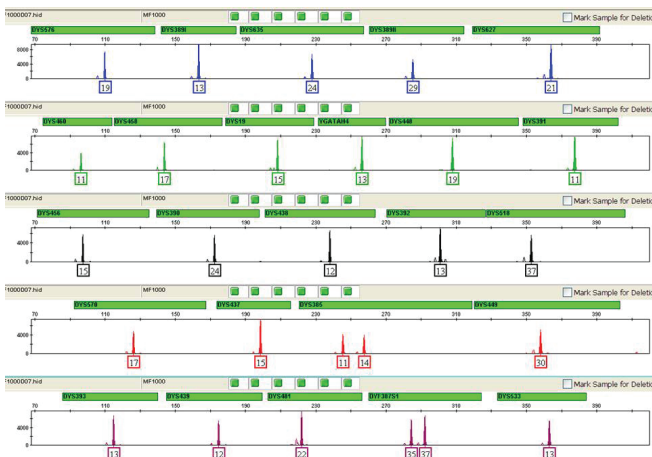


Figure 9. A 1:1,000 male:female mixture, amplified using the Yfiler Plus kit and 30 cycles on an Applied Biosystems™ 3500 Series Genetic Analyzer.

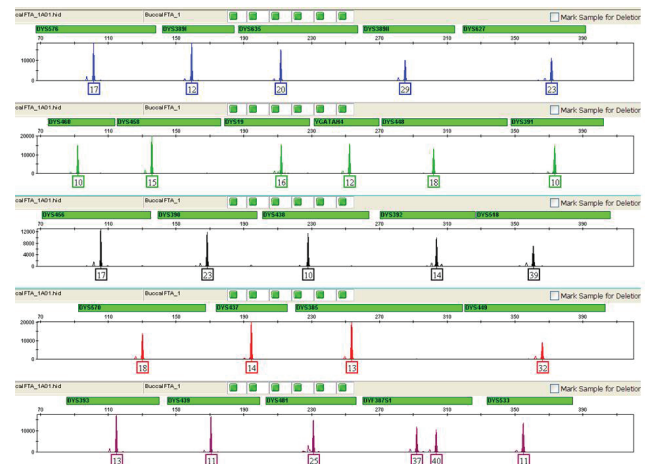


Figure 11. Direct amplification using the Yfiler Plus kit on a 1.2 mm Whatman™ FTA™ punch of buccal cells and 27 cycles on a 3500 Series Genetic Analyzer.

# Thermal cyclers

## **HID Veriti 96-Well Thermal Cycler**

The Applied Biosystems™ HID Veriti™ 96-Well Thermal Cycler features a 96-well (0.2 mL) format with six independent temperature zones to provide precise temperature control and rapid temperature changes for conducting PCR. The large screen allows easy viewing of your temperature profiles. The system has two different options for method navigation. You may select one of the preprogrammed methods or program your own methods. Validated for use with Applied Biosystems™ STR amplification kits, the HID Veriti 96-Well Thermal Cycler delivers the proven reliability you expect from Applied Biosystems™ PCR instruments.



## **ProFlex PCR System**

The Applied Biosystems™ ProFlex™ PCR System combines reliability and performance with flexible configuration and control features that fit how you work today. Interchangeable block formats allow you to maximize your throughput or run independent experiments concurrently. The ProFlex PCR System has five different blocks that can be changed with the flip of a switch, including the first-of-its-kind 3 x 32-well block. Dual 96-well and dual 384-well blocks are available for your high-throughput needs.



# DNA analysis

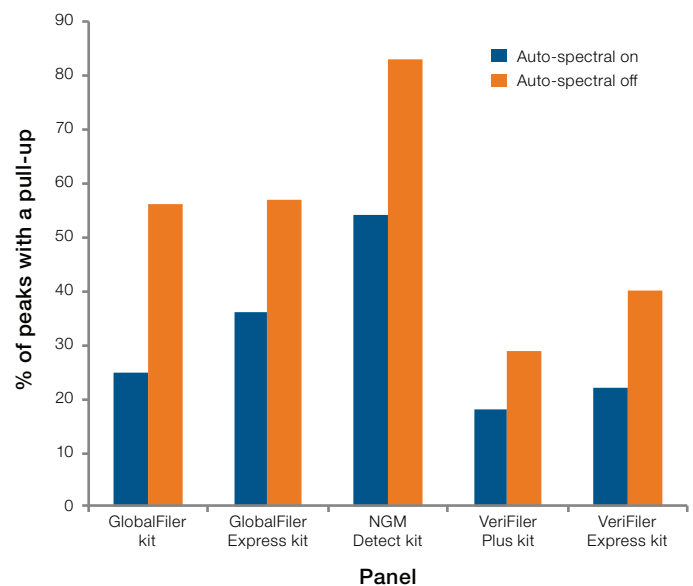
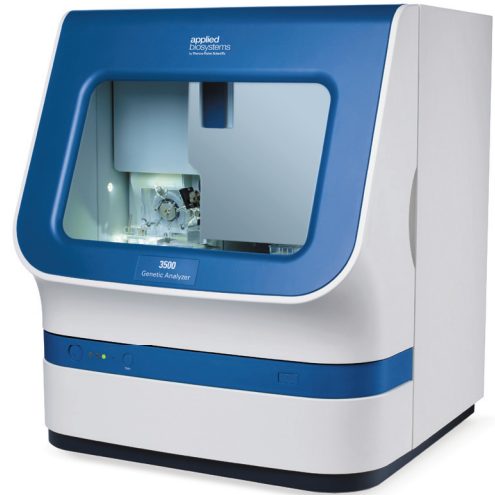
The Applied Biosystems™ 3500 Series instruments are the first genetic analyzers designed with a specific feature set and workflow for HID applications. The complete system combines the instrument with Applied Biosystems™ reagents, consumables, and software, as well as superior support—providing an integrated HID solution that significantly improves ease of use and application efficiency.

## Key features

- The innovative “snap-in-and-go” consumable design uses radio frequency identification (RFID) technology to track and record key consumables data
- The HID-specific workflow preconfigured for Applied Biosystems™ STR kits simplifies run setup and software navigation
- Powerful, integrated data collection and QC analysis software provides real-time assessment of data quality and streamlined STR analyses, allowing for more efficient management of re-injections
- The software helps provide superior data quality, with more consistent peak height from capillary to capillary, run to run, and instrument to instrument

We have enhanced our 3500 Series instruments and Applied Biosystems™ GeneMapper™ *ID-X* Software to help decrease data analysis time, increase confidence in results, allow for a more efficient processing workflow, and comply with IT requirements. Combined with our STR kits, Applied Biosystems™ 3500 Data Collection Software v4.0.1 and GeneMapper *ID-X* Software v1.6 offer an efficient workflow.

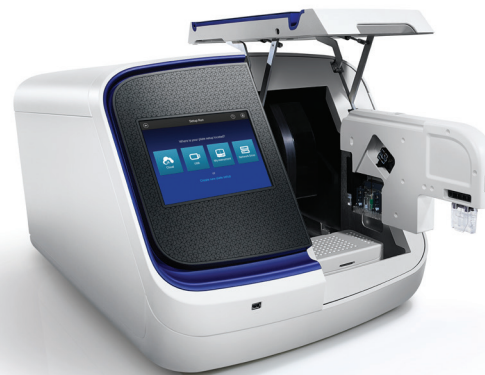
- **Improved data interpretation**—reduced pull-up edits (Figure 12), improved first-pass success rate for database labs, more efficient data transfer to probabilistic genotyping
- **Enhanced user experience**—flexible plate loading, streamlined workflow, support languages, 6-dye installation standard
- **IT support and compliance**—Windows™ 10 system support, CODIS compatibility, internationalization



**Figure 12. Pull-up reduction results.** Samples were analyzed at 1 ng and 2 ng gDNA input using a selection of Applied Biosystems™ autosomal STR kits on the 3500 Genetic Analyzer with Data Collection Software v4.0 and GeneMapper *ID-X* Software v1.6. Each kit demonstrated a reduction of >35% in the number of peaks with a pull-up edit required when the auto-spectral algorithm was applied.



The Applied Biosystems™ SeqStudio™ Genetic Analyzer for HID is an easy-to-use 4-capillary benchtop system that delivers gold-standard STR fragment analysis and Sanger sequencing with just a simple click. It is easily used across a broad range of Applied Biosystems™ STR kits and applications to help you get answers you can trust. The system offers the same data quality, service, and support you've come to expect from Applied Biosystems™ genetic analyzers, with a modernized experience at an affordable price.



### Key features

- **Universal all-in-one cartridge**—unique functionality integrates Applied Biosystems™ POP-1™ polymer, anode buffer, a polymer delivery system, and a four-capillary array to minimize instrument setup and maintenance time; this novel system design allows for an on-instrument reagent life of up to 6 months and 250 injections (1,000 samples) with no hard stops
- **Results you can trust**—optimized data collection software and validated performance (based on SWGDAM Dec 2016 guidelines) with Applied Biosystems STR kits
- **Concordant results**—compared with 3500 Series Genetic Analyzers (Table 1)
- **Reduced pull-up (false secondary peak) editing**—autocalibration utilizing sample-specific spectral data and marker-to-marker calibration reduces pull-up editing (Table 2)
- **Seamless data interpretation**—with GeneMapper *ID-X* Software v1.6
- **Protection and traceability**—with security, audit, and e-signature (SAE) software
- **Easy inventory management**—with RFID-enabled tracking of consumables usage
- **Get up and running quickly**—every SeqStudio system includes service installation and one-day FAS training to help get you up and running quickly in your lab

**Table 1. Concordance results: 3500xL Genetic Analyzer to SeqStudio Genetic Analyzer.\***

Kit	Concordance (%)
GlobalFiler	100
GlobalFiler IQC	100
VeriFiler Plus	100
NGM Detect	100
NGM Select	100
Identifiler Plus	100
MiniFiler	100
Yfiler Plus	100
Yfiler	100
GlobalFiler Express	100
VeriFiler Express	100

\* Nine casework kits were used with 23 gDNA samples plus the positive control, and two direct amplification kits were used with 20 buccal and blood samples plus the positive control, at the kit-recommended inputs of DNA. Samples were injected on 4 instruments with a minimum of 3 injections each.

**Table 2. Low pull-up percentage across sample data.\*\***

Average pull-up peaks per injection	Mean pull-up percentage	Average percent of pull-up ≤3%
1.3	1.6%	88%

\*\* Results are shown for 947 pull-up peaks observed in 730 injections of positive control and 5 gDNA samples amplified with the Applied Biosystems™ MiniFiler™, Identifiler™ Plus, NGM SElect, Yfiler™, GlobalFiler, Yfiler Plus, NGM Detect, or VeriFiler Plus kit at the recommended input. N = 92 injections/kit on 4 SeqStudio instruments; N = 86 for the NGM Detect kit due to failed injections being omitted from the analysis.

# NGS applications

The Applied Biosystems™ Precision ID NGS System for human identification with Applied Biosystems™ Converge™ Software can help you solve tough cases by getting more information from your challenging samples. Now you have help moving those unknown samples from storage to investigative leads.

- mtDNA (Figure 13) from samples recovered at mass disasters and from other unidentified remains can routinely be analyzed to assist in HID and help establish links to related family members
- STR panels provide high-resolution genotyping for analysis of complex mixtures
- Ancestry-informative or phenotypic single-nucleotide polymorphism (SNP) analysis may help generate investigative leads (Figure 14)
- Identity-testing SNPs can associate a degraded crime scene sample to a known reference when partial results are obtained with autosomal STR analysis

With as little as 125 ng of DNA input, you can go from extracted DNA to profile in as little as 5 pipetting steps and 45 minutes of hands-on time (Figure 15). Start processing unsolved and missing-persons cases with NGS in your lab today.

The Applied Biosystems™ Precision ID mtDNA Whole Genome Panel, using the control region data for analysis, is approved for inclusion in the NDIS CODIS database.

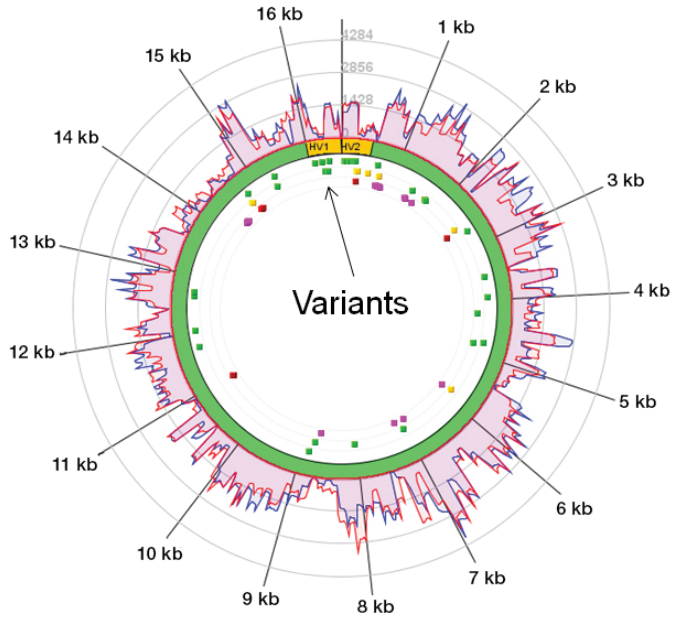


Figure 13. Circular plot analysis of the whole mtDNA genome in the Converge mtDNA analysis module.

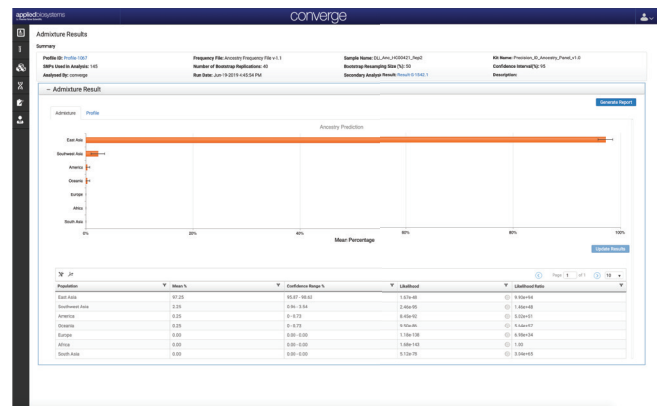


Figure 14. Graphical representation of ancestry analysis. Admixture prediction is shown with confidence range and population likelihoods, including variability estimates based on bootstrapping analysis.

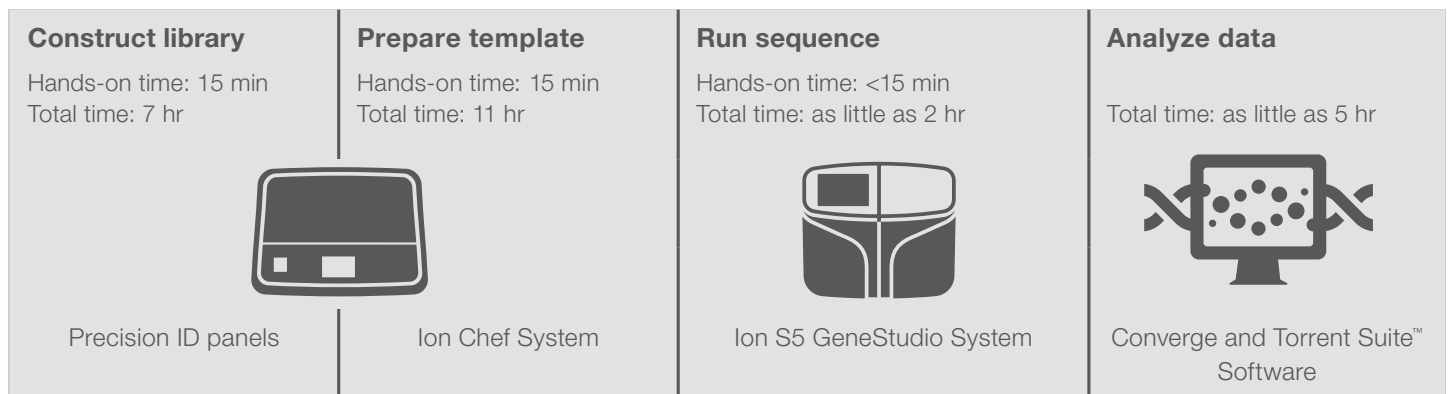


Figure 15. Adopting NGS for forensic DNA analysis in your laboratory is simpler than ever, when you combine the Ion Chef™ System and Ion GeneStudio™ S5 series systems with optimized Applied Biosystems™ Precision ID library preparation, template preparation, and sequencing kits and forensically relevant panels.

# Data interpretation

## GeneMapper ID-X Software

With the advent of higher-throughput instrumentation and more robust amplification technology, the bottleneck in the forensic laboratory has shifted from sample processing to data analysis. GeneMapper ID-X Software is a complete software solution that combines expert-system and expert-assistant capabilities to alleviate the time-consuming tasks associated with data review. Depending on whether you are processing database or casework samples, the user-defined thresholds and automated tools can either allow the software to make the final genotype call or support review, editing, and further processing of the sample (Figure 16). This software helps reduce manual effort in database uploading and offers better integration capabilities with third-party systems. The GeneMapper ID-X platform is recognized as the industry standard for forensic data analysis and is an NDIS-approved expert system.

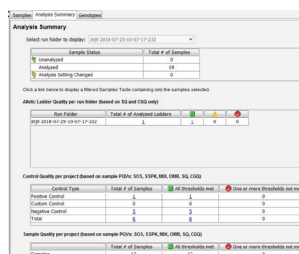
When combined with 3500 Data Collection Software v4.0.1 packages and Applied Biosystems™ STR kits, GeneMapper ID-X Software significantly helps to enhance productivity and confidence, as well as IT support and compliance, in your HID laboratory's data interpretation workflow. These software solutions offer the following benefits:

- **Improved data interpretation**—reduced pull-up edits with Applied Biosystems STR kits, maintaining of minor-allele detection while reducing pull-up in multiple-contributor samples, more efficient data transfer to probabilistic genotyping software, improved first-pass success rate for database labs with off-scale data recovery (Figure 17)
- **Enhanced user experience**—flexible plate loading, streamlined workflow, language support, 6-dye installation standard
- **IT support and compliance**—Windows 10 system support, CODIS compatibility, and internationalization

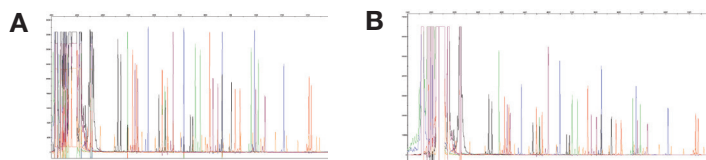
## Converge Software

Converge Software offers streamlined solutions for kinship and paternity testing (Figure 18); next-generation sequencing (NGS) analysis of STR markers, single-nucleotide polymorphisms (SNPs), and mitochondrial DNA (mtDNA); CE to NGS comparisons of STR profiles;

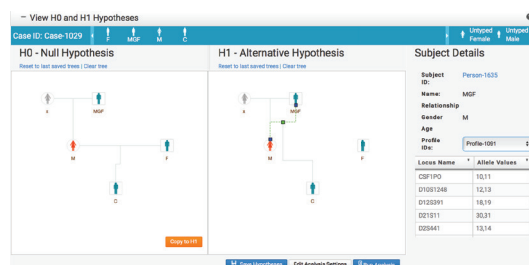
and case management. Designed to centralize all data management operations, such as analysis, reporting, and storage, Converge Software offers an all-inclusive, validated platform that elevates data processing efficiency.



**Figure 16. The “Analysis Summary” tab provides an easy-to-view summary of analysis results including ladder, control, and sample quality for efficient data evaluation.** In this example, 6 control and 12 GlobalFiler Express reference samples were run on a 3500xL Genetic Analyzer with 3500 Data Collection Software v4.0 utilizing the off-scale recovery and pull-up reduction features. The red boxes indicate that there are no controls or samples needing manual review when the GeneMapper ID-X software is validated for use as an expert system.



**Figure 17. 3500 Data Collection Software v4.0.1, when used in connection with GeneMapper ID-X Software v1.6, helps increase first-pass success rate and decrease manual interpretation by significantly reducing the number of samples resulting in off-scale data.** (A) GeneMapper ID-X Software v1.6 raw data electropherogram of a single-source database sample injected with the Any6Dye VB dye set, disabling off-scale scale recovery (OSR). The data are saturated at ~32,000 RFU, resulting in 6 off-scale alleles, 16 marker-level off-scale flags, and evident pull-up and pull-down under the saturated peaks. (B) GeneMapper ID-X Software v1.6 raw data electropherogram of the same single-source database sample reinjected with the J6-OSR dye set, enabling OSR. The data are not saturated, with the primer front capped at 65,000 RFU. There are no off-scale data, no marker-level flags, and a significant decrease in pull-up and pull-down under the previously saturated peaks.



**Figure 18. Kinship and paternity module.** Users can quickly and easily create a variety of hypotheses by drawing pedigree trees and setting comprehensive analysis parameters, including application of mutation models and population substructures.

# Rapid DNA analysis

The newest addition to our DNA analysis portfolio, the Applied Biosystems™ RapidHIT™ ID System, approved by the FBI for uploading to the National DNA Index System (NDIS)\*, offers new ways for forensic scientists, criminal investigators, and public safety agencies to work together in the effort to solve crime faster. The compact and easy-to-use RapidHIT ID System is the ideal platform for generating lab-quality forensic DNA profiles from single-source samples. With just one minute of hands-on time,

the fully automated RapidHIT ID System can generate STR DNA profiles in the lab or in the field. Compatible with established databases, STR profiles are generated using NDIS-approved GlobalFiler Express chemistry.

Paired with Applied Biosystems™ RapidLINK™ Software, the system offers centralized data and full control of DNA results. Transform DNA results into rapid intelligence with the activation of powerful sample matching, familial search, kinship, and staff-elimination database applications.

## Insert swab into cartridge

Bring the analysis tools to the point of action, whether in the lab or in the field.



## Insert sample cartridge

Automatically performs cell lysis, amplification, and capillary electrophoresis (CE).



## DNA results in 90 minutes

RapidLINK Software centralizes data and provides full control of results.



## Solve more crimes and find more answers, together



### In the police station

Law enforcement personnel can generate investigative leads and identify suspects faster

### In the forensic lab

Labs can process urgent samples more efficiently and enable personnel with limited DNA experience

### In the field

Personnel can conduct rapid identification of disaster victims, reunite families, or support other field deployment needs

\* NDIS-approved for use by accredited forensic DNA laboratories with known reference DNA samples and the Applied Biosystems™ RapidHIT™ ID ACE GlobalFiler™ Express sample cartridge.



# HID Professional Services

Since 2007, our HID Professional Services (HPS) team has been supporting customers like you in the successful validation and confident implementation of new technologies and workflows. With a consultative approach to all of our services, the HPS team can work with you to design a service that meets your technical and budgetary needs. Whether you need a complete turnkey solution, or just to validate a single workflow component, you can trust the experience of the HPS team to help you achieve your goals.

Our Laboratory Development Program (LDP) is an option for partnering with the HPS team to meet your needs before, during, and after your validation. It offers a simple, stepwise solution for laboratories that are just starting out or that just need help in certain areas of implementation.

## The HPS team offers an extensive portfolio of services to meet the needs of your laboratory:

- Validations and performance checks
- Automated liquid handlers
- NGS validations and implementation support
- Probabilistic genotyping implementation support
- Y-screen validation
- Laboratory moves
- SOP development
- Accreditation support
- Basic forensic workflow training
- Advanced HID training

## Our validations offer a complete solution from initial consultation to thorough teachback training:

- Consultation to address your unique needs
- Charter to define the scope of the project
- Detailed experimental plan
- Reagents and instrument consumables
- On-site laboratory wet work
- Thorough data analysis
- Comprehensive validation report
- Teachback with lecture and laboratory practical



## Flexible and creative solutions designed to bring down barriers to implementation:

- Wet work can be performed on-site by an HPS specialist, or we can coach you through the wet work, empowering you to accelerate the process when travel is uncertain
- Teachback and other training can be delivered virtually with a combination of prerecorded and live interactive sessions

Our HPS team has performed over 1,400 projects for customers in over 35 countries. Our global team of dedicated validation specialists is available to work with customers around the world. Trust the quality and confidence that come from working with HPS.

## Ordering information

Product	Quantity	Cat. No.
<b>Collection and sample preparation*</b>		
4N6FLOQSwabs, regular tip, 2-mL cuvette, peel-pouch	100 swabs	4479431
4N6FLOQSwabs, regular tip, peel-pouch	100 swabs	4473979
4N6FLOQSwabs for Crime Scene, regular tip, peel-pouch	100 swabs	4479429
NUCLEIC-CARD matrix, 1 spot	50 cards	4474001
Evidence Collection Cotton Swab with SafeDry Tubing	1 piece	9022030
PrepFiler Express Forensic DNA Extraction Kit	52 reactions	4441352
PrepFiler Express BTA Forensic DNA Extraction Kit	52 reactions	4441351
PrepFiler Automated Forensic DNA Extraction Kit	960 reactions	4463353
PrepFiler BTA Automated Forensic DNA Extraction Kit	960 reactions	4463354
PrepFiler Forensic DNA Extraction Kit	100 reactions	4463351
PrepFiler BTA Forensic DNA Extraction Kit	100 reactions	4463352
<b>Amplification kits**</b>		
Quantifiler Trio DNA Quantification Kit	400 reactions	4482910
GlobalFiler IQC PCR Amplification Kit	200 reactions	A43565
GlobalFiler PCR Amplification Kit	200 reactions	4476135
GlobalFiler Express PCR Amplification Kit	200 reactions	4476609
NGM Detect PCR Amplification Kit	200 reactions	A31832
NGM SElect PCR Amplification Kit	200 reactions	4457889
NGM SElect Express PCR Amplification Kit	200 reactions	4472193
VeriFiler Express PCR Amplification Kit	200 reactions	A32014
VeriFiler Plus PCR Amplification Kit	200 reactions	A35495
Yfiler Plus PCR Amplification Kit	500 reactions	4482730
RapidHIT ID ACE GlobalFiler Express Kit	50 reactions	441831
Primary Cartridge GlobalFiler Express 100 Kit	100 reactions	A41841
Precision ID GlobalFiler NGS STR Panel v2	96 reactions (manual)	A33114
Precision ID Ancestry Panel	96 reactions (manual)	A25642
Precision ID Identity Panel	96 reactions (manual)	A25643
Precision ID mtDNA Whole Genome Panel	96 reactions (manual)	A30938
Precision ID mtDNA Control Region Panel	96 reactions (manual)	A31443
<b>Instrumentation†</b>		
AutoMate Express Forensic DNA Extraction System	1 system	4441763
AutoMate Express Forensic DNA Extraction System, with service install	1 system	4456582
HID KingFisher Presto System with 96 DW Head	1 system	5400830CH
CPA200 Instrument	1 system	A34329
QuantStudio 5 Real-Time PCR System for Human Identification, 96-well, 0.2 mL, laptop	1 system	A34321

## Ordering information (cont.)

Product	Quantity	Cat. No.
<b>Instrumentation† (cont.)</b>		
QuantStudio 5 Real-Time PCR System for Human Identification, 96-well, 0.2 mL, desktop	1 system	A34322
3500 Genetic Analyzer for Human Identification	1 system	4406017
3500xL Genetic Analyzer for Human Identification	1 system	4406016
SeqStudio Genetic Analyzer for Human Identification, laptop, with training	1 system	A46228
SeqStudio Genetic Analyzer for Human Identification, desktop, with training	1 system	A46229
RapidHIT ID System‡	1 system	A41810
HID Ion Chef System	1 system	A30070
HID Ion GeneStudio S5 System	1 system	A41431
HID Ion GeneStudio S5 Plus System	1 system	A41432
HID Ion GeneStudio S5 Prime System	1 system	A41433
HID Veriti Thermal Cycler	1 system	4479071
ProFlex 96-Well PCR System	1 system	4484075
<b>Software†</b>		
HID Real-Time PCR Analysis Software v1.3	1 license	A31150
GeneMapper <i>ID-X</i> Software v1.6, Full Installation	1 license	A39975
GeneMapper <i>ID-X</i> Software v1.6, Client Installation	1 license	A39976
GeneMapper <i>ID-X</i> Software v1.6, Client Installation	5 licenses	A39977
RapidLINK Software v1.0	1 license	A41813
Converge Software and Server	1 system	A35131
Case Management and Kinship & Paternity Analysis Module	1 user, 3 years	A31002
<b>HPS†</b>		
STR-Casework Premium Validation		HPS10101
Quantification Premium Validation		HPS10201
STR-Direct Premium Validation		HPS10401
STR-Casework Performance Check		HPS10103
Quantification Performance Check		HPS10203

Additional package sizes are available. Please contact your local representative for more information.

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