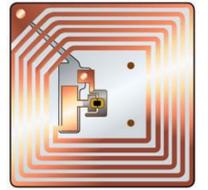


# A Novel RFID\* and Barcode Sample Tracking System for Room Temperature and Ultra Low Temperature BioBank Samples



**CSols**  
laboratory systems integration



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## Overview

A scalable sample tracking system specifically designed for hierarchical storage of both room temperature and low temperature biobank specimens is described. The CSols RTrackIT™ software system can be configured to precisely map any sampling/sub-sampling regimens, label type and storage locations. The system can be used with MS SQL Server or Oracle relational databases in a single or multi-user configuration for biobanks of different sizes.

### Sample Trees for new donations and retrospective labelling

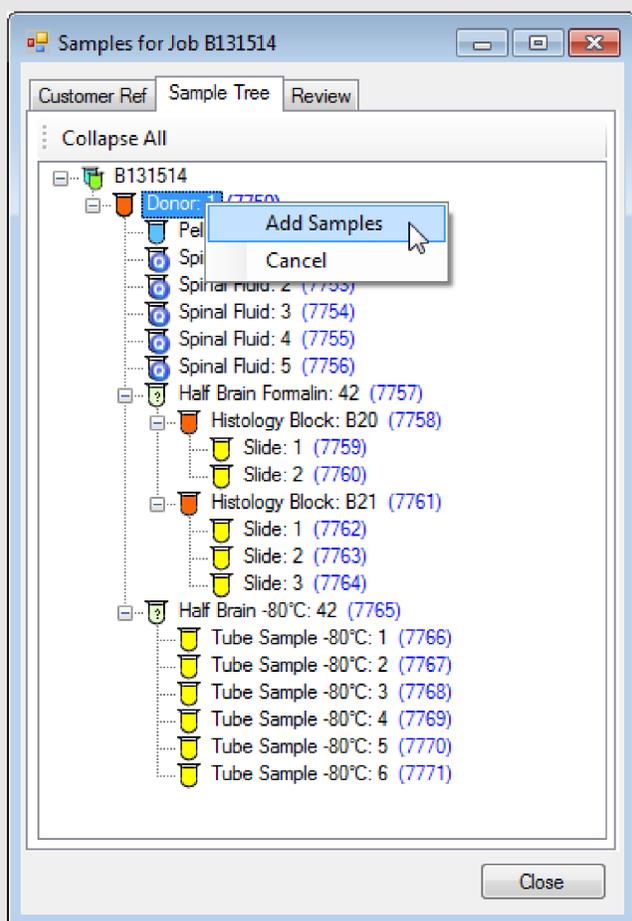


Figure 1: Example of a configurable sample tree

The registration of new and existing donations is made easy through the ability to create re-usable sample tree templates. These allow biobanks to map their unique sampling/dissection protocols and then use the preconfigured sample tree to automatically register all of the sub samples in their protocol in a single step. The software also ensures that all discrete sub samples are uniquely identified and linked with the primary donation.

Name	Type	Description	Print Labels
Spinal Fluid	Wash	Spibal fluid	<input checked="" type="checkbox"/>
Brain Slice	Prepared	Slices wax section of brain	<input checked="" type="checkbox"/>
Wax Section	Prepared	Wax section of brain	<input checked="" type="checkbox"/>
Tube Sample -80°C	Prepared	Tube Sample	<input checked="" type="checkbox"/>
Slide	Prepared	Slide	<input checked="" type="checkbox"/>
Brain	Customer	A donated brain	<input checked="" type="checkbox"/>
Donor	Customer	Donated brain and spinal fluid	<input checked="" type="checkbox"/>
Histology Block	Customer	Histology Block	<input checked="" type="checkbox"/>
Half Brain -80°C	Unknown	Half brain stored in freezer	<input checked="" type="checkbox"/>
Half Brain Formalin	Unknown	Half Brain in Formalin	<input checked="" type="checkbox"/>
Brain Sub	Lab	Brain sub sample	<input checked="" type="checkbox"/>
Pellet	Lab	Spinal Fluid Pellet	<input checked="" type="checkbox"/>

Figure 2: Configuring label definitions

## Labelling

The sample tree also allows for the storage of biographical details such as the biobank donation identifier and label types (RFID/2D or 2D bar code) and label designs that have been assigned by default to specific sub samples types.

The RTrackIT™ software supports all types of label technologies including 2D barcoded and RFID based labels to ensure the right label type and right label size is used for the right storage / temperature combination.

All labels can be printed with both human readable text and barcoded information. All RFID unique tag identities are paired with generated sample identities and stored in the database to allow for the easy locating of stored materials.

### Multipurpose RFID labels

In addition specially developed RFID labels can be supplied which will support a variety of uses and containers, including storage in Liquid Nitrogen, use with wax cassettes and labelling of plastic bags. The low temperature compatible labels feature an adhesive that supports storage in ultra low temperature freezers including -80°C, -120°C and Liquid Nitrogen. These special RFID labels can easily be used to over-label existing frost covered vials whilst still frozen. They have been used successfully to over-label sample vials on six continents and 60 year old vials held in liquid Nitrogen freezers for long term storage.



Figure 3: RFID label embedded in wax in cassette holder allows for easy sample tracking

The RFID labels are partially white and clear and they can be overprinted with both barcodes and human readable text for fail-safe operation.



Figure 4: Label with RFID and failsafe labelling



Figure 5: Cryogenic RFID labelled sample containers

## Hardware

Standard off the shelf personal computer workstations, laser printers, RFID readers and high speed RFID label printers can be used to make the system cost effective, future-proof and compatible with existing infrastructure.



Figure 5: High speed RFID printer and assortment of RFID readers, scanners and antennae

To support the use of RFID labels, workstations can consist of readers and, if required antennae, external to freezers. Collecting Sample IDs in this way is much faster than scanning barcodes and allows for the rapid scanning of boxes or plastic bags containing multiple samples. This helps support to e.g. Human Tissue Act (HTA) audits, allowing for a 100% inventory to be performed in just a few hours instead of months.



Figure 6: Entire box of containers can be read in a single read

The ability to read RFID labels without having to handle containers means that inventory can be rapidly checked without removing material completely from the freezers thereby reducing thaw, freeze cycles. Specimens can also be more quickly located in storage once an external request has been made. An added bonus is a reduction in freezer electricity use due to faster sample handling capabilities.

## Discussion & Conclusion

In combination with industry standard RFID scanners, printers and special labels, the RTrackIT™ software solutions allows biobanks to freely use both 2D barcode and RFID labels for simple or complex dissection protocols on an extensive range of container types. Moreover the flexible design helps support both new and existing numbering and nomenclature systems to allow the system to be used in any type of biobank.

### About CSols Ltd.

CSols is a well-established and successful company producing, delivering and supporting software solutions that dramatically improve costs, quality and compliance in laboratories. CSols clients include: University of Bristol / MRC UK Brain Banks, Central Manchester NHS Trust (Manchester Royal Infirmary MRI), Charing Cross Hospital, Falun Hospital, Galway University Hospital, Heart of England NHS Trust (Heartlands Hospital), Imperial College Healthcare Trust (Charing Cross Hospital), Leeds Teaching Hospitals NHS Trust (St. James Hospital), Lund University Hospital & Oxford University Hospital Trust (John Radcliffe Hospital).

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\* RFID = Radio Frequency Identification

