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



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# **OVERVIEW**

A scaleable sample tracking system specifically designed for hierarchical storage of both room temperature and low temperature biobank specimens is described. The CSols RFTrackIT<sup>M</sup> 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 and can be deployed nationally or internationally as a Cloud based system using MS Azure.

Sample Browser Search - Clear   New Donation   Export Import		Site Browser			
□	ample Name BB Number   1/2 Brain Fixed00002303 A09/CS123   1/2 Brain Frozen00002304 A09/CS123   CSF00002374 A09/CS123	Location \Histology Lab\Shelf3 \Histology Lab\Shelf3 \Histology Lab\Shelf3	Sample Name BB Number Status Seth's Office Seth's Desk SWDBB Office Phase 2, Level 3, Freezer Room Panasonic1 Panasonic2 Panasonic5		

### LABELLING

The sample tree also allows for the storage of biographical details such as the biobank donation identifier and label types (combined RFID/2D(QR) or 2D(QR) and label designs that have been assigned by default to specific sub samples types. A large number of sample fields are available for uploading historical data.

CSols RFTrackIT<sup>™</sup> software supports all types of label technologies including 2D(QR) barcodes and RFID based labels to ensure the right label type and right label size is used for the right storage / temperature combination. All labels are printed with selectable sample field text, 2D(QR), container and sample type and unique SystemID. All RFID unique tag identities are paired with generated sample identities and are stored in the database to allow for the easy locating of stored materials. 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 paraffin wax cassettes and labelling of plastic bags.







Figure 1: Example of a fully configurable sample and site 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 and labels appropriate to the container size and storage conditions are produced.

🖳 Sa	💀 Sample Definitions (Testing)										
	Image	Name	Description	Short Name (for labels)	Container Type	Label Type	Data Fields				
<b>}</b>	装	1cm slice	1cm sice	1cmsl	Small Plastic 🗸	LASER_Smal_18x25mm ~					
	1	1ml Homogenate	1 ml Homogenate vial	1mHom	Small Tube 🗸 🗸	RFID_Small_17x25mm ~					
	Ū	2ml Homogenate	2ml Homogenato	2rrlHom	2ml homogen 🖂	RFID_Small_17x25mm ~					
	Ī	7ml Bjou	7ml Bijou	7mlbju	7 ml Bijou tube 🖂	RFID_Small_17x25mm ~					
	4	Brain	Brain Donation	Erain	White Round 🗠	LASER_Modium_1&x50mm ~					
		Brain Half (Formalin	Brain Half (Formalin)	ErFm	White Round 🗸	RFID_Medium_24x44mm V					
	P	Brain Half (Frozen)	Brain Half (Frozen)	ErFrz	Large Plastic 🗸	RFID_Small_17x25mm V					
	٦	Calcarine cortex (gr	Calcarine cortex (gry mtr) <0.5ml Epndrf>	Calgy	0.5 ml Eppen 🗸	RFID_Small_17x25mm V					
	٦	Caudate nucleus	Caudate nucleus (gry mtr) <0.5ml Epnd	CaGry	0.5 ml Eppen 🗸	RFID_Small_17x25mm V					
		Cerebellum	Cerebelum	CrbIm	Large Plastic 🗸	LASER_Medium_18x50mm V					
	Ū	Cerebellum	Cerebelum <0,5ml Eppendf>	Cettim	0.5 ml Eppen 🗸	RFID_Small_17x25mm V					
		Cerebellum (3)	Cerebelum (3) <srb></srb>	Cer3SB	Small Plastic 🗸	LASER_Medium_18x50mm V					
	Ū	Cerebellum (gry mtr)	Cerebellum (gry mtr) <0.5ml Epridif>	CrbG.5	0.5 ml Eppen V	RFID_Small_17x25mm V					
	Ī	Cerebellum (RNA)	Cerebelum (RNA) <7ml Bijou>	CRNA-7	7 ml Blou tube 🗸 🗸	RFID_Small_17x25mm V					
	Ī	Cerebellum(2)	Cerebellum(2) <2ml Homogenate>	CrLm-2	2ml homogen V	RFID_Small_17x25mm V					

Figure 2: Sample types are defined with images, label descriptions, container and label type and sample specific data fields

embedded in paraffin wax cassettes to enable positive identification and tracking of embedded tissue samples

The low temperature compatible labels feature an adhesive that supports storage in ultra low temperature freezers including -80°C, -120°C, -150°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 5: An entire box or plastic bag of containers can be read in a single read

# **DISCUSSION & CONCLUSION**

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 e.g. Human Tissue Act (HTA) audits, allowing for a 100% inventory to be performed in just a few hours instead of months. 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 freeze/thaw 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. In combination with industry standard RFID scanners, printers and special labels, the RFTrackIT™ software solutions allow 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.

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## HARDWARE

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



Figure 3: High speed RFID printer , Windows PC/Tablet and an assortment of RFID readers, scanners and antennae

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\* RFID = Radio

Frequency Identification

**Further Information** Email: rftrackit@csols.com or click the 2D(QR) Code below



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