



Surgical Kit Tracking System

WHITE PAPER

RFID 4u[®]

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INTRODUCTION

Every day, hospitals deal with massive amounts of tools, equipment and supplies, which have to be properly inventoried, allocated, cleaned, maintained, serviced, used, returned and discarded. This is a major challenge, especially if there are vendors involved that perform part of the services beyond supplying simple consumables.

There are vendors that service large amount of hospitals around the country and provide their surgery departments with single-use as well as reusable surgical kits that include tools and parts for surgeries (for instance in orthopedics, the kits include implants, special screws, mallets, prongs, forceps, etc.). These surgical kits are received at the hospital, autoclaved, opened, certain parts used and the kits are then returned back to the vendor. Upon receiving, the vendor has to autoclave and inventory the returned kits, audit what's missing, resupply with correct parts, store the kits, and ship them again to back to the client hospital.

RFID4U has developed the Surgical Kit Tracking System that uses RFID tags attached to the kits and software based on TAGMATIKS, the cutting-edge rapid deployment sensory adaptive network platform.

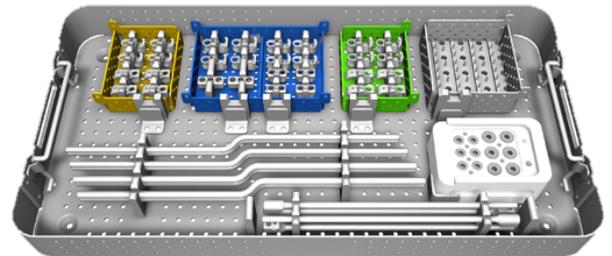


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1. SOLUTION OVERVIEW

RFID4U has developed the Surgical Kit Tracking System that uses RFID tags attached to the kits and software platform based on TAGMATIKS and our Radio Frequency Sensory Adaptive Network platform (RF-SAN).

The RFID4U Surgery Kit Tracking System Software Application enables:

- Automatic registration of shipping and receiving of kits
- Item assignment to kits
- Kit auditing (several stages) and resupply
- Inventory control
- Kit location
- Status update (received, autoclaved, audited, refilled, backordered, recalled, expired, etc.)
- Communication with the ERP system

Same system can be duplicated in the hospitals to track surgery kits (and possibly other items) throughout their whole life-cycle.

RFID tags are attached to individual kits. There are two types of tags used. For reusable **non-sterile kits**, rugged tags that withstand autoclave are attached to the kits. For single use **sterile kits**, printed labels embedded with RFID tag are preferred.

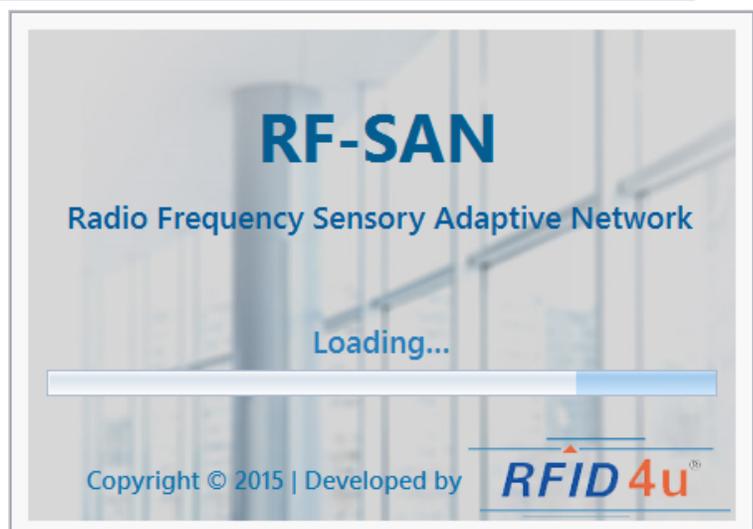
Fixed RFID readers are deployed as portals at dock doors, conveyors and pick areas. **Handheld RFID readers** with barcode scanners are used to associate the tags with the products that are barcoded.

2. RF-SAN APPLICATION

The RF-SAN Application is a desktop application that is connected to the background ERP system over the network and provides a main dashboard and the capability to perform audits, shipping, receiving, tag commissioning, decommissioning and kit building, as well as administrative functions.

The main dashboard is divided into three areas based on the functions it provides:

1. Audit Functions
2. Main Functions
3. Admin Functions





3. AUDIT FUNCTIONS

One of the most important functions of this system are the Audit Functions. This is where the kit status, its components and their status and replenishment is tracked. The system makes the user follow a set of procedures that ensure all information is entered and significantly reduces errors. These functions can be modified or extended to fit specific procedures of a particular customer.

In this example, the Audit Functions are divided into First Audit, Second Audit, Shipping and Receiving. During the first audit the kits are checked for missing items and reason codes are entered. During the second audit, kits are checked, whether they were refilled correctly. The shipping process assigns the kits to orders and the receiving process brings them back to inventory.

3.1 First Audit

During the first audit the kits are checked for missing items and reason codes are entered. The kit information is entered by reading an RFID tag attached to the kit, by reading a barcode attached to the kit or by manual entry. All data is populated into a list, which is then manually reviewed and status and amount of each item is entered using numbers and reason codes.

Radio Frequency Sensory Adaptive Network - [First Audit]

First Audit Device Name: Device 1 Read Tags (F2) Undo (F3)

SET DETAILS Order #: 95518384 Set #: 01.632.011E Lot #: EV09410 Set Notes: N/A Case #: 1 / 1

Component #	Description	U/M	BOM Qty	Back Order Quantity	Billing / Missing		Write Off		Component Notes	Clear Audit
					Qty	Reason Code	Qty	Reason Code		
✓ 04.632.770 ...	7.0MM TI MATRIX POLYAXIAL	EA	4	0	0		0			
✓ 04.632.775 ...	7.0MM TI MATRIX POLYAXIAL	EA	4	0	0		0			
✓ 04.632.780 ...	7.0MM TI MATRIX POLYAXIAL	EA	4	0	0		0			
✓ 04.632.790 ...	7.0MM TI MATRIX POLYAXIAL	EA	4	0	0		0			
✓ 04.632.799 ...	7.0MM TI MATRIX POLYAXIAL	EA	4	0	0		0			
✓ 04.632.825 ...	8.0MM TI MATRIX POLYAXIAL	EA	2	0	0		0			
✓ 04.632.830 ...	8.0MM TI MATRIX POLYAXIAL	EA	2	0	0		0			
✓ 04.632.835 ...	8.0MM TI MATRIX POLYAXIAL	EA	4	0	0		0			
✓ 04.632.840 ...	8.0MM TI MATRIX POLYAXIAL	EA	4	0	0		0			
✓ 04.632.845 ...	8.0MM TI MATRIX POLYAXIAL	EA	4	0	0		0			
✓ 04.632.850 ...	8.0MM TI MATRIX POLYAXIAL	EA	4	0	0		0			
✓ 04.632.855 ...	8.0MM TI MATRIX POLYAXIAL	EA	4	0	0		0			

Total Count : 34 Actual Count : 0

Buttons: Near Expiry, Back Ordered Items, Notes, Missing Items, Added in Field

Sort By: Manual Audit (F4), Create Order (F5), Complete Without Order (F6), Recommission (F7), Item Swap (F8), F9 - Select / Deselect Row

- The missing quantity and a reason code can be entered row by row as the kit gets audited. The reason codes are predefined but there is an option for a Custom Reason code.
- Same process is applied to the Write Offs.

BOM Qty	Back Order Quantity	Billing / Missing		Write Off		Component Notes
		Qty	Reason Code	Qty	Reason Code	
4	0	2		0		
4	0	0				
4	0	0				
4	0	0				
2	0	0				
2	0	0				
4	0	0				
4	0	0				

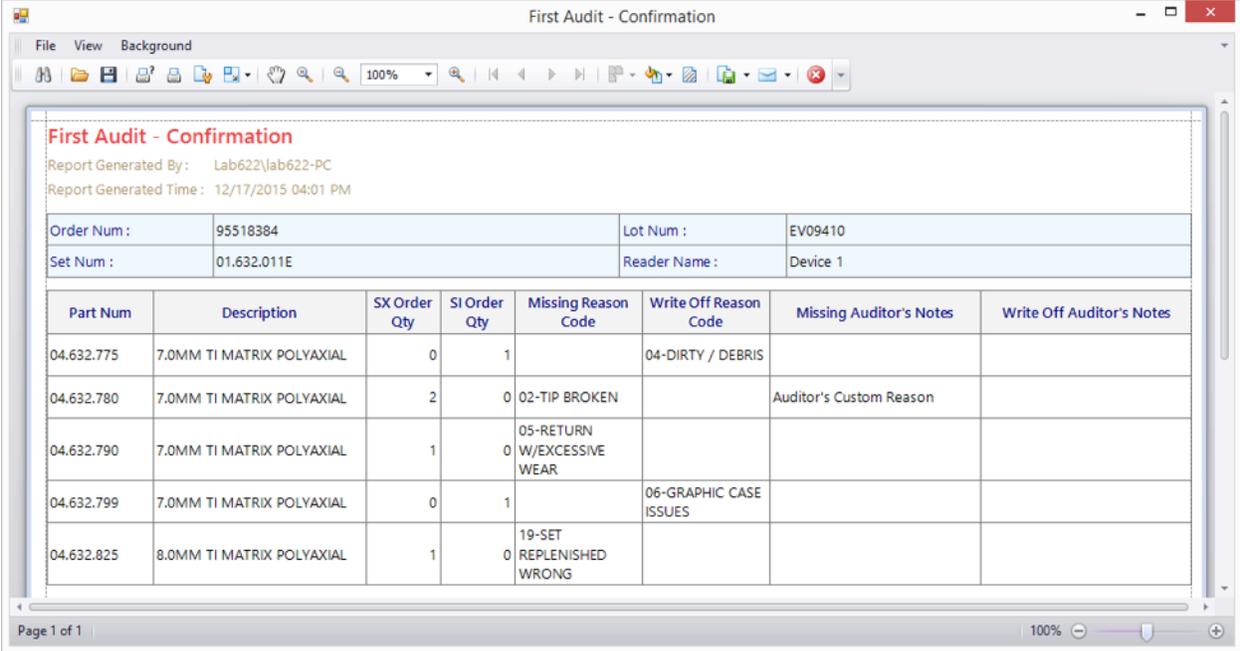
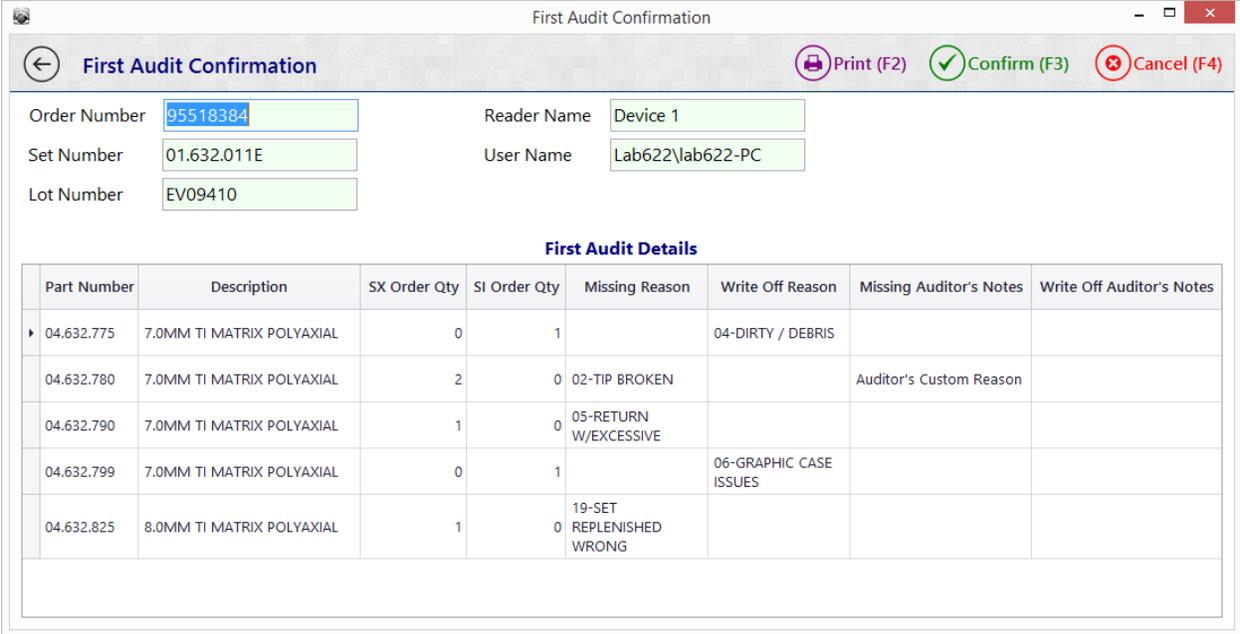
Reason Code

Reason Code	Description
01	MISSING PARTS
02	TIP BROKEN
03	ANODIZE/EPOXY COMPROMISED
04	DIRTY / DEBRIS

Custom Reason

Order Creation

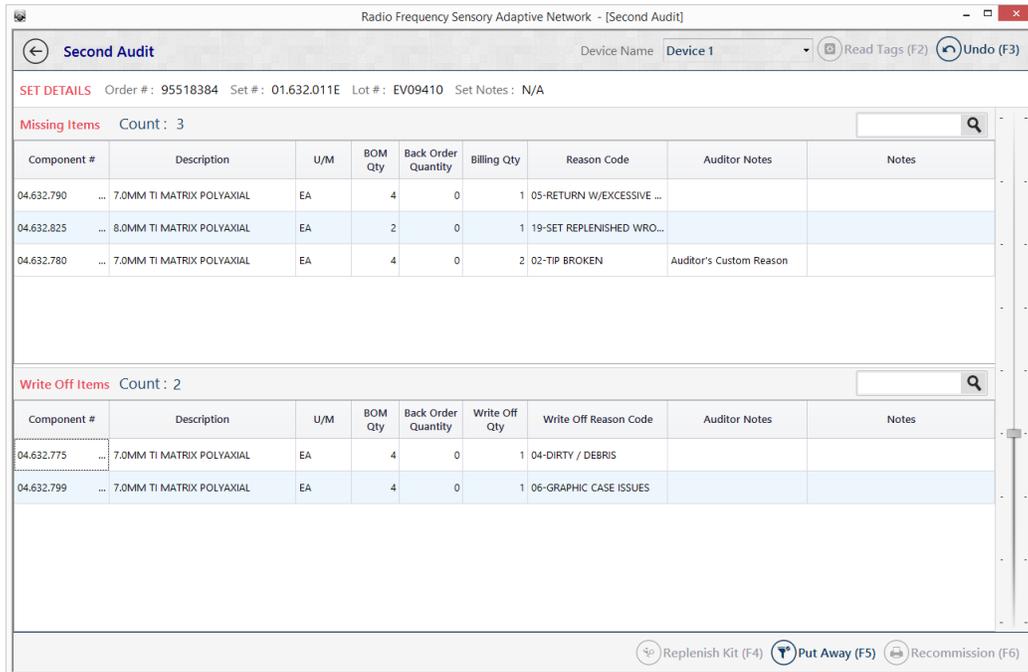
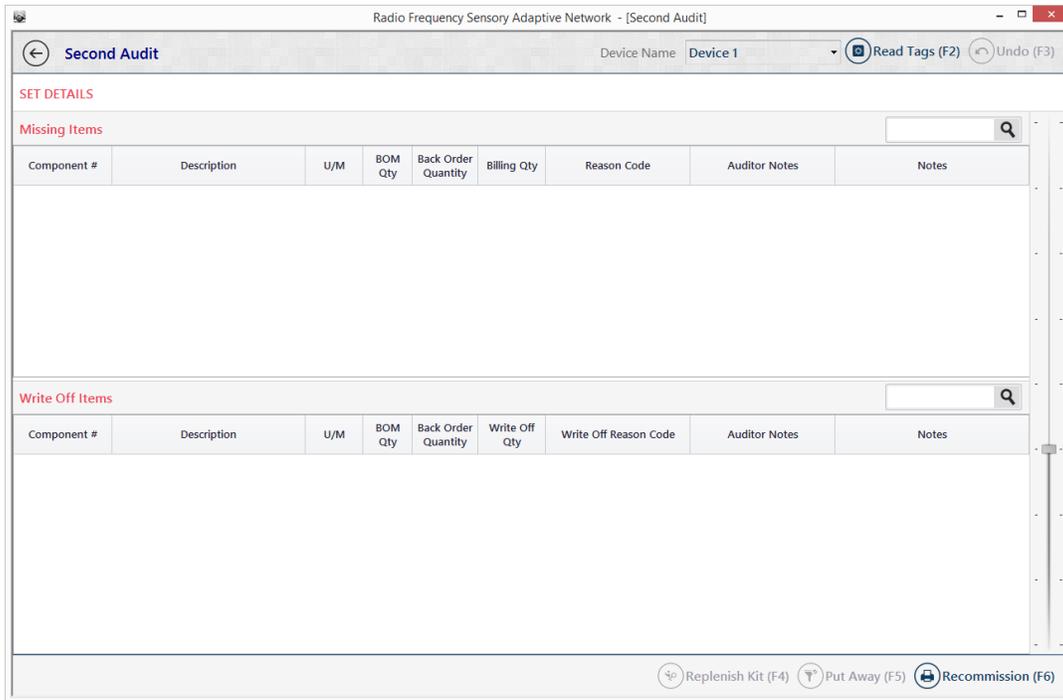
- After all components are audited, an order (for refill process) can be created and a First Audit Confirmation will be displayed, which can be printed out as a First Audit Confirmation Report. Once the report is confirmed, next audit can start.



- If there are no missing / write off components, the user can complete the audit process without an order creation.

3.2 Second Audit

The second audit functions much like the First Audit. The difference is in the screen that is divided into two sections Missing Items and Write Off Items. Once the case is read, the screen is populated with the Missing and Write Off items that were found during the First Audit.



Put Away

- The Missing and Write Off items are checked against the kit, whether they were replenished correctly and the kit can be Put Away.
- Once the Put Away button is pressed, the application will display the Second Audit Confirmation screen shown below. In this step, a label (which is placed on the kit and signifies that it has completed both audits) is printed and the results of the Second Audit are sent to the ERP system.

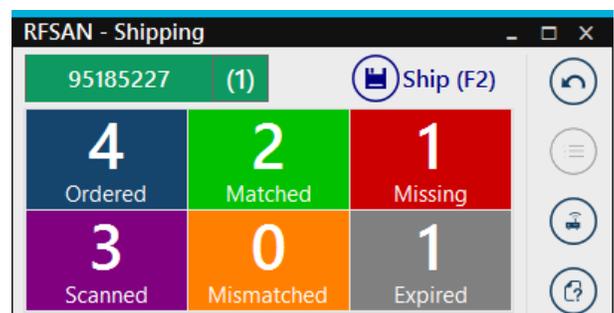
3.3 Shipping

The Shipping functions matches the sets to the customer order and takes them out of the inventory.

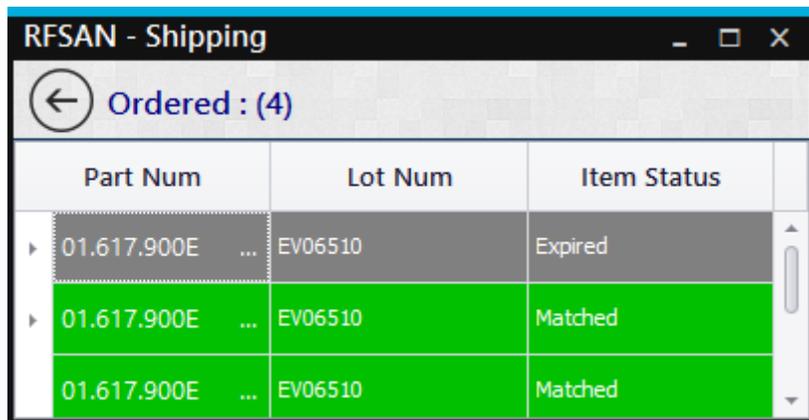
Order Details

Order details are shown on a dashboard, which can be customized to a particular business process. In this case, we have these fields:

- Ordered - Number of cases in the order.
- Scanned - Number of scanned cases.
- Matched - Number of cases matched with ordered case.
- Missing - Number of missing cases in ordered cases.
- Mismatched - Number of cases not matched with order.
- Expired - Number of cases with expired sterile items.



- Any tile can be clicked to view the item details. The user has option to view the sterile item details by clicking the icon on the left of that row. There is an option to select and deselect the cases, as well as remove the tags from the shipment list (for instance on expired items).

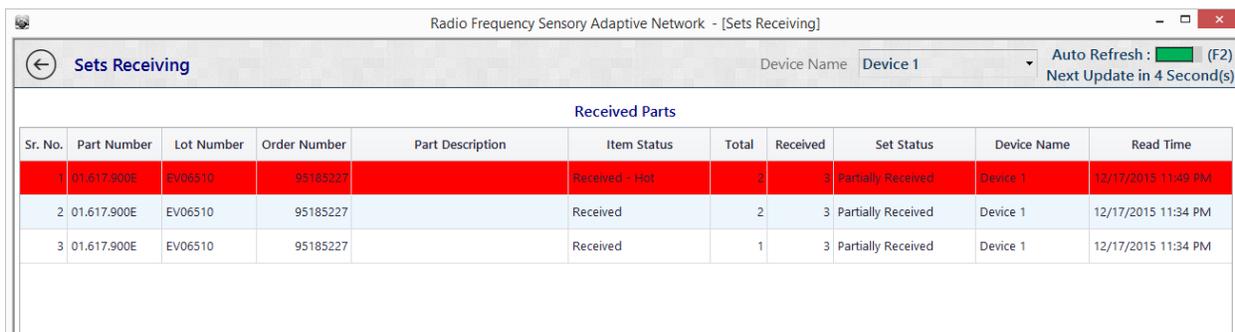


Part Num	Lot Num	Item Status
01.617.900E ...	EV06510	Expired
01.617.900E ...	EV06510	Matched
01.617.900E ...	EV06510	Matched

3.4 Receiving

The Receiving process is used for receiving the used cases from the hospital. It allows to immediately identify the priority items, that need to be handled immediately as they are in demand. Similarly to the auditing and shipping, RFID tags on the received cases are read and list of received parts is automatically populated.

If any “hot” (priority) cases are received, then the application will highlight the row in red as shown below. There is an option to mark a case as “hot” as well.



Sr. No.	Part Number	Lot Number	Order Number	Part Description	Item Status	Total	Received	Set Status	Device Name	Read Time
1	01.617.900E	EV06510	95185227		Received - Hot	2	3	Partially Received	Device 1	12/17/2015 11:49 PM
2	01.617.900E	EV06510	95185227		Received	2	3	Partially Received	Device 1	12/17/2015 11:34 PM
3	01.617.900E	EV06510	95185227		Received	1	3	Partially Received	Device 1	12/17/2015 11:34 PM

4. MAIN FUNCTIONS

The main functions of the system deal with the RFID tags and their assignment to kits. In this case, the main functions also allow to commission and decommission the tag and build a kit.

4.1 Commission

In order to be able to inventory using RFID tags, the tags have to be assigned to kits by commissioning. The kit details are entered by scanning a barcode label on the kit or by manual entry and based on the barcode value, the kit detail fields are filled automatically. There are different color codes for different types of kits.

For commissioning, a kit is selected and a kit tag created, which will be printed by an RFID printer or encoded by RFID reader. If there is more than one tag in the vicinity, a particular tag has to be selected to be associated.

Radio Frequency Sensory Adaptive Network - [Commission Kits]

Commission Kits

KIT DETAILS

Read Barcode

Set Lot #: 8259257

Set Part #: 200532

Description:

Asset Type: Sterile

Is Express Care? Yes Set as Default (F2)

Device Name:

Template Name:

Create Kit Tag (F3)

COMMISSIONED KITS Kit Count : 6

Part Num	Lot Num	Asset Type	Seq. Num	Seq. Cnt	Tag Id	
<input checked="" type="checkbox"/>	200532	8259257	Eval Kit	1	4	30540088AC00004000000007
<input checked="" type="checkbox"/>	200532	8259257	Eval Kit	2	4	30540088AC00004000000009
<input checked="" type="checkbox"/>	200532	8259257	Eval Kit	3	4	30540088AC0000400000000A
<input checked="" type="checkbox"/>	200532	8259257	Eval Kit	4	4	30540088AC0000400000000B
<input type="checkbox"/>	200532	8259257	Sterile Kit (4)	1	2	30540088AC00004000000006
<input type="checkbox"/>	200532	8259257	Sterile Kit (0)	2	2	30540088AC00004000000008

Eval Kits (Non-Sterile Kits) Sterile Kits Newly Added Kits

Select Tag to Encode

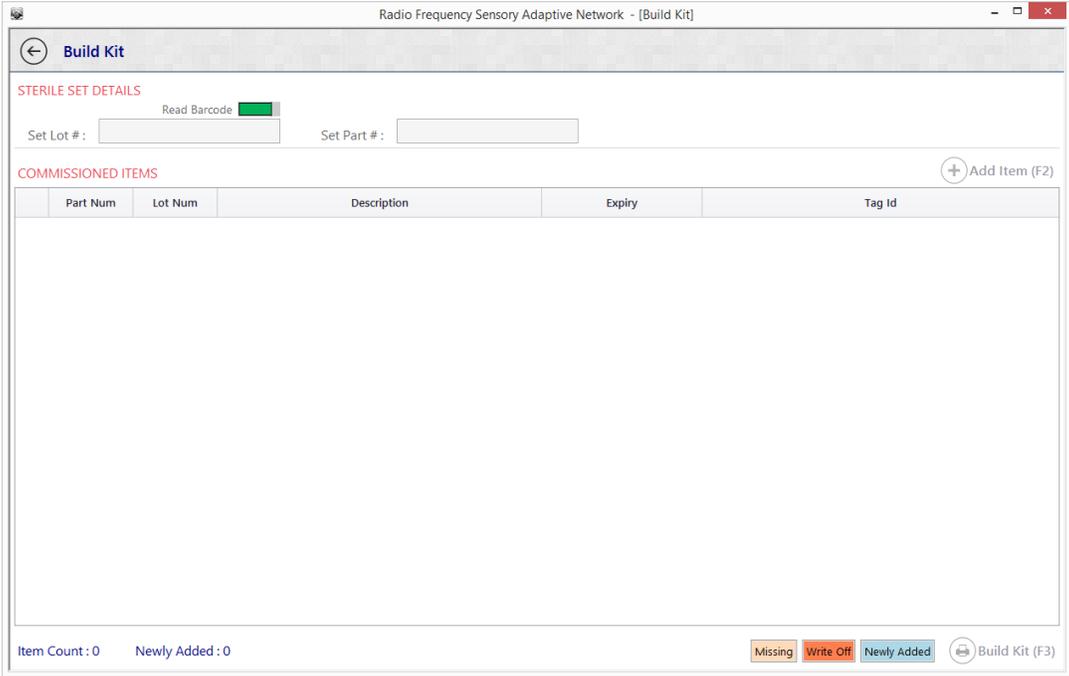
Refresh Tag (F2)

	Tag Id	Source	RSSI	Status
<input type="checkbox"/>	00000000F618B071425442C1	Antenna_2	-68	
<input checked="" type="checkbox"/>	305400B8AC00080000000001F	Antenna_2	-62	Already Associated
<input type="checkbox"/>	305400B8AC000140000000006	Antenna_2	-56	
<input type="checkbox"/>	A1000000000000000000000000	Antenna_2	-49	
<input type="checkbox"/>	A2000000000000000000000000	Antenna_2	-52	
<input checked="" type="checkbox"/>	00000000EFE0000000082633	Antenna_2	-59	Already Associated

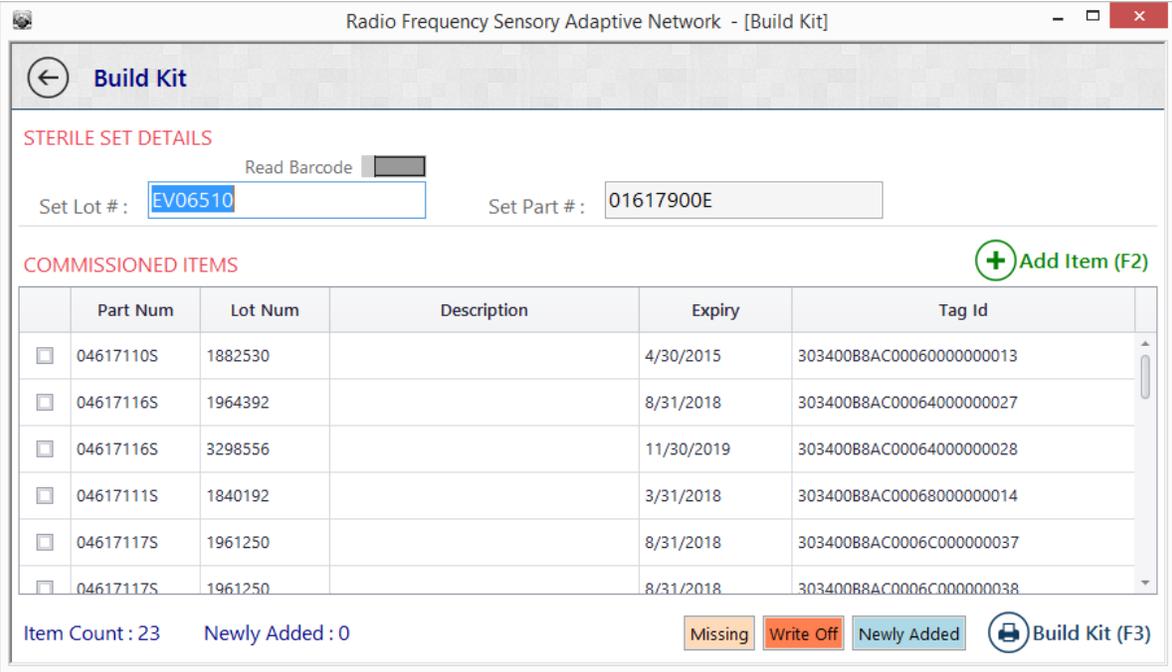
Not Available Select Tag (F3)

4.2 Build the Kit

One of the main functions is the kit building.



- By scanning the barcode or manually entering data the set lot number and set part number will be populated.
- The application will fetch the case details and display in the [Select Case] dialog. Upon selecting the case, item details are shown and a total item count will be displayed at the bottom of the screen. Items can be removed or new items added to the kit.



5. ADMIN FUNCTIONS

There are also several Admin Functions, which deal with the system setup and include:

- Device Function Group – used for device configuration and grouping into function groups, for example Commission (group). This function also enables adding Windows and Put Away printers.
- Configure User Role – specifies which user groups can perform which tasks, whether they are authorized to configure devices, perform first or second audit, ship, receive, commission or decommission a tag.
- Application Properties – barcode printing details, domain configuration, email configuration, SGTIN prefix configuration and other details.
- System Configuration – which devices are used for which processes.
- Reason Code – configuration of the Reason Codes for missing/written off parts.
- Report Scheduler – allows to configure and schedule automatic reports that will be sent by email.
- And other functions.

6. BENEFITS

The RF-SAN system has multitude of benefits:

- Provides a complete status information of each kit.
- Increases efficiency and accuracy through the multiple-stage auditing process.
- Significantly reduces human effort and corresponding errors.
- Scans multiple tags concurrently and automatically.
- Enables a complete visibility of the surgical kits within the supply chain. Based on the tracking information, it is easy to manage their inventory, to see which kits are in inventory and which are out at the customer.
- Provides a complete kit history, including the time they were shipped or returned. This prevents unnecessary manual searches and increases efficiency of kit usage.
- The system also makes it possible to quickly verify that correct kits are shipped to the right customer therefore increasing shipment accuracy and customer satisfaction.