Home Inventory Tracker

Functional Specification

1/3/2012
Computer Science 340
Brigham Young University

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Overview

Home Inventory Tracker (HIT) is a system for tracking home storage inventories. Virtually all homes have closets, storage rooms, pantries, and other places where people store supplies of food, paper products, and other items. Tracking the inventory of these storage areas can be a problem. In a room or closet that is full of stuff, it is hard to tell exactly what's in there and how much you've got. Questions such as, "How much X do we have?", "Have any items expired?", and "What do I need to buy at the store to make sure I have a 3-month supply?" are difficult to answer. With HIT, these and other questions are easily answered.

Here's how a fictitious user named Janet might use HIT to manage her home inventory.

- Janet goes shopping and comes home with a batch of items.
- Before storing the items, Janet uses a barcode scanner to swipe the barcodes on each of the new items, allowing HIT to keep track of them. After scanning the items, HIT prints an individual barcode label for each item that was scanned. Janet puts a label on each item, and places everything in the appropriate storage unit.
- Whenever Janet takes an item out of storage to use it, she uses a barcode scanner to swipe the label on the item to notify HIT that the item has been removed. And, when she transfers an item from one storage unit to another, she scans the barcode on the item to tell HIT that it has been transferred.

By scanning and labeling each item in this way, HIT is able to provide Janet with a lot of useful information about her storage inventory. Specifically, HIT is able to:

- Print a report of all items that have expired (so they can be thrown away)
- Print a report of all items that have been recently removed from storage (so they can be replaced)
- Print useful statistics about each item, including historical usage statistics, inventory levels, and how long items remained in storage before being used.

HIT also lets Janet organize the items in her storage into groups that are meaningful to her. For example, if Janet has ten different kinds of soup in storage, she can organize all of the different kinds of soup items into a single group named "SOUP". This allows her to keep track of how much soup she has on hand, regardless of what kind it is.

Optionally, HIT can also help Janet make sure she has an N-month supply of an item in stock (where N is some number of months). For example, suppose that Janet wants to have a 3-month supply of soup on hand at all times. If she tells HIT how much soup is needed for a 3-month supply, HIT can always tell her how much soup she needs to buy to achieve the desired level. If she specifies the 3-month levels for all items in her food storage, HIT can always tell her what she needs to buy in order to maintain a 3-month food supply. This is very helpful when determining what needs to be purchased on a shopping trip.

Data Dictionary

Object	Product Container
Definition	A generic term for Storage Units and Product Groups. These objects can "contain" Products and Items, and are referred to generically as "product containers".

Object	Storage Unit		
Definition	A Storage Unit is a room, closet, pantry, cupboard, or some other enclosed area where items can be stored.		
Attributes			
Name	Type	Description	Constraints
Name	String	Name of the Storage Unit.	Must be non-empty. Must be unique among all Storage Units.
Products	Collection of Product	Products contained in this Storage Unit.	None.
Items	Collection of Item	Items contained in this Storage Unit.	None.
Product Groups	Collection of Product Group	Top-level Product Groups created by the user within this Storage Unit.	A Storage Unit may not have two top-level Product Groups with the same name.

Object	Product		
Definition	A bar-coded product that can be stored in a Storage Unit. Example Products are: Town House Light Buttery Crackers, 13 oz, Barcode 030100169079 Colgate Toothpaste - Cavity Protection, 6.40 oz, Barcode 035000509000 Alcon Lens Drops, 0.17 fl oz, Barcode 300650192057		
Attributes			
Name	Type	Description	Constraints
Creation Date	Date	The date this Product was added to the system.	Equal to the earliest Entry Date for any Item of this Product.
Barcode	String	Manufacturer's barcode for the Product.	Must be non-empty.
Description	String	Textual description of the Product.	Must be non-empty.
Size	(Float, Unit)	The size of the Product. For example, "13 oz", "5 lbs", "0.17 fl oz".	The magnitude can be any positive float value (zero is not allowed). The unit of measurement can be any of the following: count, pounds, ounces, grams, kilograms, gallons, quarts, pints, fluid ounces, liters. If the unit of measurement is "count", the magnitude must be "1".
Shelf Life	Integer	The Product's shelf life, measured in months. A value	Must be non-negative.

		of zero means “unspecified”.	
3-Month Supply	Integer	The number of this Product required for a 3-month supply. A value of zero means “unspecified”.	Must be non-negative.
Containers	Collection of Product Container	Product Containers that contain this Product.	At most one Product Container in a Storage Unit may contain a particular Product.

Object	Item		
Definition	A physical instance of a particular Product. An Item corresponds to a physical container with a barcode on it. For example, a case of soda might contain 24 cans of Diet Coke. In this case, the Product is “Diet Coke, 12 fl oz”, while each physical can is a distinct Item.		
Attributes			
Name	Type	Description	Constraints
Product	Product	The Product of which this Item is an instance.	Must be non-empty.
Barcode	String	Unique barcode for this Item. This barcode is generated by Inventory Tracker, and is different from the manufacturer’s barcode.	Must be a valid UPC barcode and unique among all Items.
Entry Date	Date	The date on which the Item was entered into the system.	Must be non-empty. Cannot be in the future or prior to 1/1/2000.
Exit Time	DateTime	The date and time at which the Item was removed from the system.	This attribute is defined only if the Item has been removed from storage. Cannot be in the future or prior to 12 AM on the Item’s Entry Date.
Expiration Date	Date	The date on which this Item will expire. This is calculated based on this Item’s Entry Date and the Product’s Shelf Life.	This attribute is defined only if the Product’s Shelf Life attribute has been specified.
Container	Product Container	Product Container that contains this Item.	Empty if the Item has been removed from storage. Non-empty if the Item has not been removed from storage. (Before it is removed, an Item is contained in one Product Container. After it is removed, it is contained in no Product Containers.)

Object	Product Group		
Definition	A user-defined group of Products. Product Groups are used by users to aggregate related Products so they can be managed as a collection. For example, if a user has four different kinds of toothpaste in storage, they could create a Product Group named "Toothpaste", and put all of the toothpaste Products in that Product Group.		
Attributes			
Name	Type	Description	Constraints
Name	String	String provided by the user that describes the Product Group.	Must be non-empty and unique within the parent Product Container.
Container	Product Container	Product Container that contains this Product Group.	Must be non-empty. A Product Group is always contained within one Product Container.
3-Month Supply	(Float, Unit)	The total amount of Products in this Product Group required for a 3-month supply. For example, a value of "100 count" means that we must have at least 100 of the Products in this Product Group to have a 3-month supply. A value of "500 lbs" means that we must have at least 500 pounds of the Products in this Product Group to have a 3-month supply. A value of "48 quarts" means that we must have at least 48 quarts of the Products in this Product Group to have a 3-month supply.	The magnitude can be any non-negative float value. Zero means "unspecified". The unit of measurement can be any of the following: count, pounds, ounces, grams, kilograms, gallons, quarts, pints, fluid ounces, liters. If the unit of measurement is "count", the magnitude must be an integer (i.e., no fraction).
Products	Collection of Product	Products contained in this Product Group.	None.
Items	Collection of Item	Items contained in this Product Group.	None.
Product Groups	Collection of Product Group	Child Product Groups created by the user within this Product Group.	A Product Group may not have two child Product Groups with the same name.

A Product is created the first time an Item of the Product is added to the system (i.e., when an unknown product barcode is detected). At that time, the user is asked to provide information about the Product (Description, Size, etc.).

Each Product Container (Storage Unit or Product Group) contains Products, Items, and Product Groups.

When a new Item is added to the system, it is placed in a particular Storage Unit (called the "target Storage Unit"). The new Item is added to the same Product Container that contains the Item's Product

within the target Storage Unit. If the Item's Product is not already in a Product Container within the target Storage Unit, the Product is placed in the Storage Unit at the root level.

A Product may be in any number of Storage Units. However, a Product may not be in multiple different Product Containers within the same Storage Unit at the same time. That is, a Product may appear at most once in a given Storage Unit.

An Item is contained in exactly one Product Container at a time (until it is removed, at which point it belongs to no Product Container at all).

Optionally, the user may specify 3-month supply quotas for individual Products and entire Product Groups. If specified, the 3-month supply quota for a Product indicates the amount of that Product that is needed in storage to have a 3-month supply. (For example, for "Corn Chex Cereal" the 3-month supply quota might be "18 count".) Similarly, the 3-month supply quota for a Product Group indicates the aggregate amount of Products in that Product Group that is needed to have a 3-month supply. (For example, if the user created a Product Group named "Toothpaste" that contains several types of toothpaste, they might specify a 3-month supply quota of "54 ounces".) The quota for a Product Group includes all Products in the Product Group and its child Product Groups, recursively.

Functional Overview

This section provides an overview of HIT's functionality. Specific details about each feature are given in later sections.

Inventory View

When the user runs HIT, they are presented with the Inventory View (Figure 1).

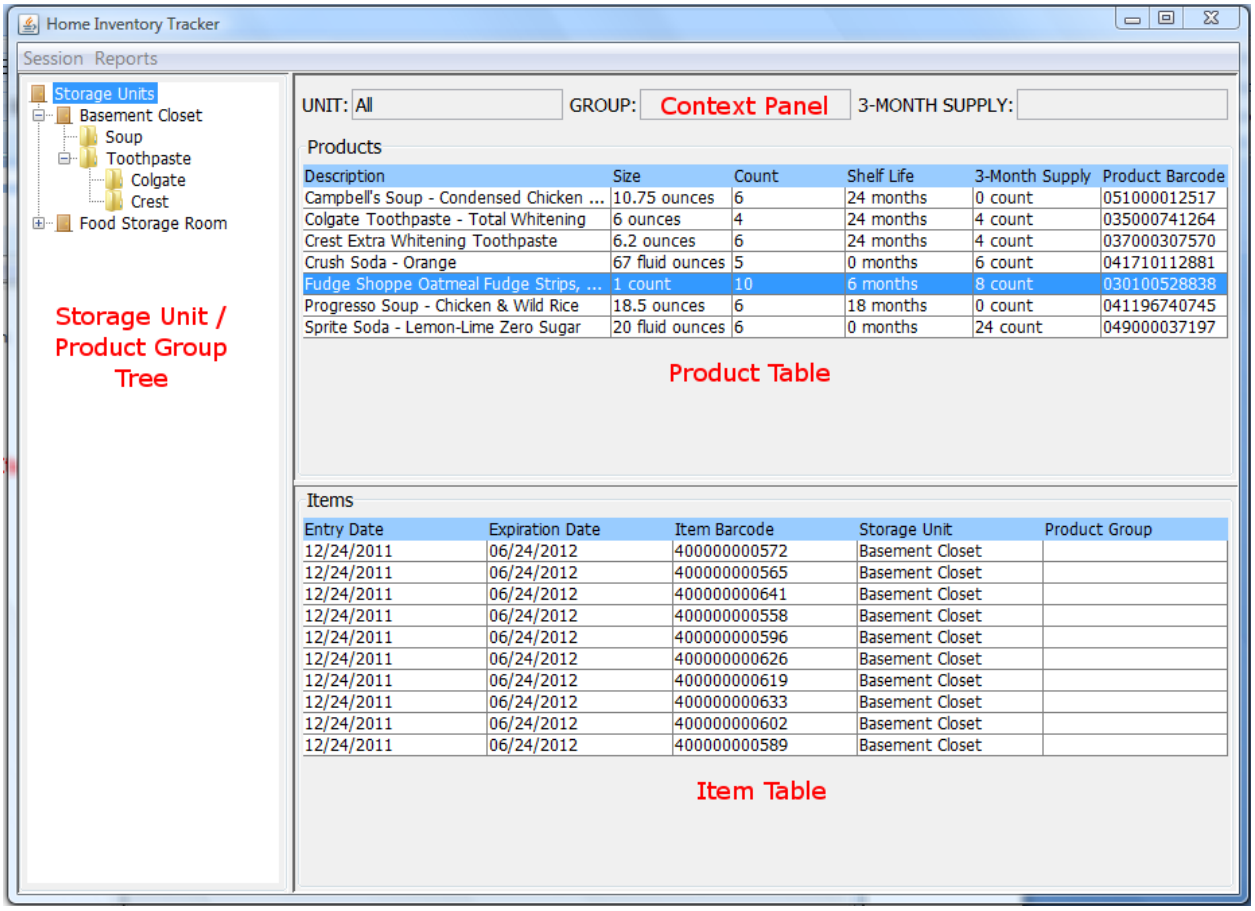


Figure 1 - Inventory View

Storage Unit / Product Group Tree

On the left side is the Storage Unit / Product Group tree, which is a tree view containing all of the Storage Units created by the user. Under each Storage Unit is a hierarchy of Product Groups created by the user within that Storage Unit. When the user runs HIT for the first time, the tree is empty except for the "Storage Units" root node. The children of a Product Container (Storage Unit or Product Group) node are sorted by name (ascending).

The right side of the Inventory View contains three areas: 1) The Context Panel, 2) the Product Table, and 3) the Item Table.

Context Panel

The Context Panel contains information about the node that is currently selected in the Storage Unit / Product Group Tree. There are four possible cases:

1) No node is selected in the Storage Unit / Product Group tree. In this case, the UNIT, GROUP, and 3-MONTH SUPPLY context fields are all empty.
2) The root "Storage Units" node is selected. In this case, the UNIT context field has the value "All", and the GROUP and 3-MONTH SUPPLY context fields are empty.
3) A Storage Unit node is selected. In this case, the UNIT context field contains the name of the selected Storage Unit, and the GROUP and 3-MONTH SUPPLY context fields are empty.
4) A Product Group node is selected. In this case, the UNIT context field contains the name of the Storage Unit containing the selected Product Group, the GROUP context field contains the name of the selected Product Group, and the 3-MONTH SUPPLY context field contains the value of the selected Product Group's 3-month supply attribute (or empty if this attribute is unspecified).

Product Table

The Product Table contains information about the Products contained in the node currently selected in the Storage Unit / Product Group tree. There are three possible cases:

1) No node is selected in the Storage Unit / Product Group tree. In this case, the Product Table is empty.
2) The root "Storage Units" node is selected. In this case, the Product Table displays all Products in the system.
3) A Product Container (Storage Unit or Product Group) node is selected. In this case, the Product Table displays the Products that are contained directly (i.e., not recursively) in the selected Product Container.

The Product Table displays the Description, Size, Count, Shelf Life, 3-Month Supply, and Product Barcode for each Product. The table is sorted by Description (ascending). The Count column displays the number of Items of that Product contained in the selected node. Specifically, if the root "Storage Units" node is selected, Count is the total number of Items of that Product in the entire system. If a Product Container (Storage Unit or Product Group) node is selected, Count is the number of Items of that Product contained in the selected Product Container.

Item Table

The Item Table contains information about the Items for the Product currently selected in the Product Table. There are three possible cases:

1) No Product is selected in the Product Table. In this case the Item Table is empty.
2) A Product is selected in the Product Table.
    a. If the root "Storage Units" node is selected in the Storage Unit / Product Group Tree, the Item Table displays all Items of the selected Product in the entire system.

b. If a Product Container (Storage Unit or Product Group) node is selected in the Storage Unit / Product Group tree, the Item Table displays the Items of the selected Product contained in the selected Product Container.

The Item Table displays the Entry Date, Expiration Date, Item Barcode, Storage Unit, and Product Group for each Item. The table is sorted by Entry Date (ascending). The Expiration Date column contains the Item's expiration date, or empty if this is unspecified. The Storage Unit column contains the name of the Storage Unit that contains the Item. The Product Group column contains the name of the Product Group that contains the Item, or empty if the Item is not in a Product Group.

Context Menus

Inventory View contains several context menus that allow users to perform a variety of different tasks. This section provides an overview of these menus. The details of each menu operation are described in later sections.

1) The Root Context Menu (Figure 2) is accessed by selecting and then right-clicking on the "Storage Units" root node in the Storage Unit / Product Group tree. This menu provides the following operations:
   a. "Remove Items" allows the user to remove Items from the system.
   b. "Add Storage Unit" allows a user to create a new Storage Unit.

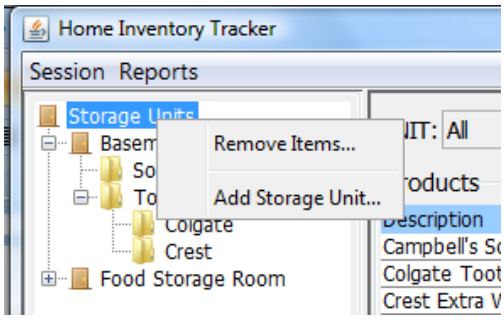


Figure 2 – Root Context Menu

2) The Storage Unit Context Menu (Figure 3) is accessed by selecting and then right-clicking on a storage unit node in the Storage Unit / Product Group tree. This menu provides the following operations:
   a. "Add Items" allows the user to add new Products and Items to the selected Storage Unit.
   b. "Transfer Items" allows the user to transfer existing Items into the selected Storage Unit.
   c. "Add Product Group" allows the user to create a new Product Group within the selected Storage Unit.
   d. "Edit Storage Unit" allows the user to edit the attributes of the selected Storage Unit.
   e. "Delete Storage Unit" allows the user to delete the selected Storage Unit.

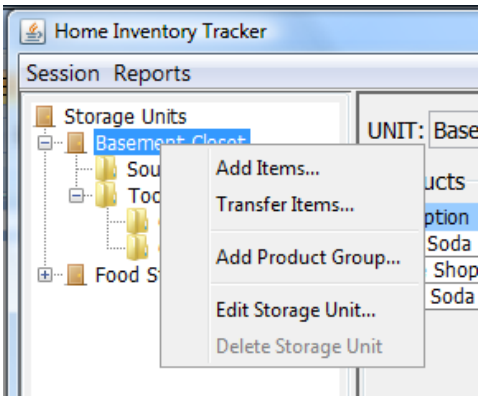


Figure 3 - Storage Unit Context Menu

3) The Product Group Context Menu (Figure 4) is accessed by selecting and then right-clicking on a product group node in the Storage Unit / Product Group tree. This menu provides the following operations:
    a. "Add Product Group" allows the user to create a new Product Group within the selected Product Group (i.e., create a sub Product Group).
    b. "Edit Product Group" allows the user to edit the attributes of the selected Product Group.
    c. "Delete Product Group" allows the user to delete the selected Product Group.

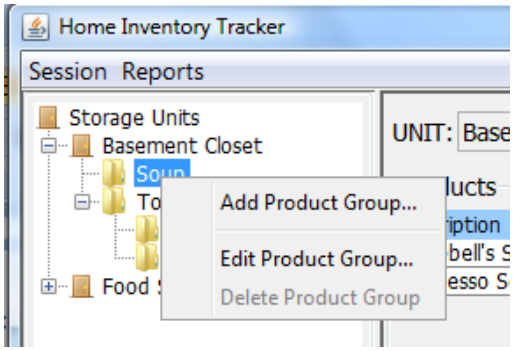


Figure 4 - Product Group Context Menu

4) The Product Context Menu (Figure 5) is accessed by selecting and then right-clicking on a product in the Product Table. This menu provides the following operations:
    a. "Edit Product" allows the user to edit the attributes of the selected Product.
    b. "Delete Product" allows the user to delete the selected Product.

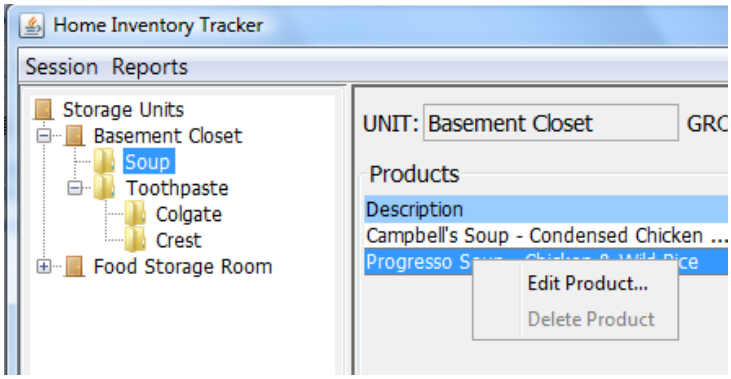


Figure 5 - Product Context Menu

5) The Item Context Menu (Figure 6) is accessed by selecting and then right-clicking an item in the Item Table. This menu provides the following operations:
   a. "Edit Item" allows the user to edit the attributes of the selected Item.
   b. "Remove Item" allows the user to remove the selected Item from the system.

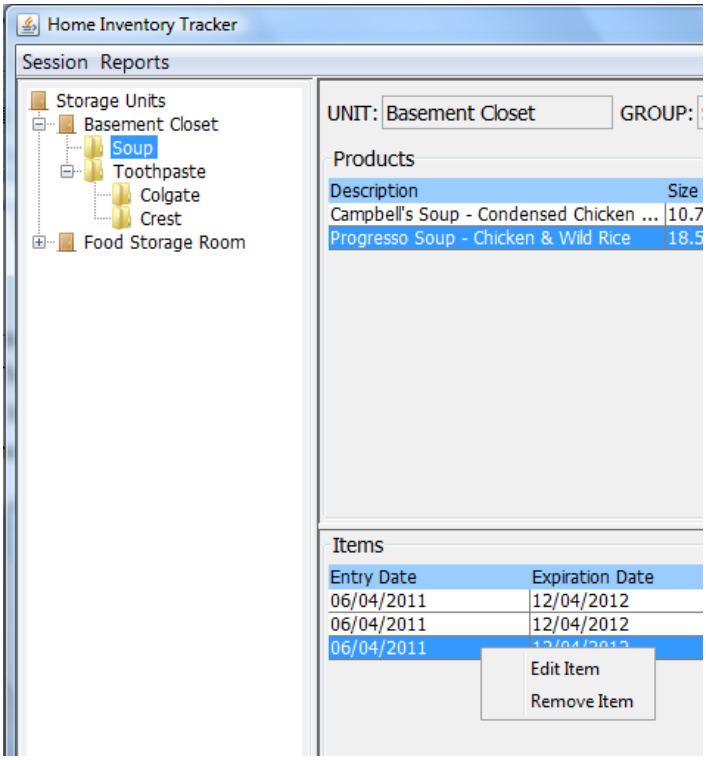


Figure 6 - Item Context Menu

Moving Products and Items

The Inventory View allows the user to move Products and Items from one Product Container to another using drag-and-drop. A Product can be moved by selecting it in the Product Table and dragging it to the destination Product Container in the Storage Unit / Product Group tree. Similarly, an Item can be moved

by selecting it in the Item Table and dragging it to the destination Product Container in the Storage Unit / Product Group tree.

Main View

The Main View, which represents the frame around the main window, provides two menus that allow users to perform several tasks. This section provides an overview of these menus. The details of each operation are described in later sections.

1) The Session Menu (Figure 7) provides the following operations:
    a. "Exit" allows the user to exit the HIT application.

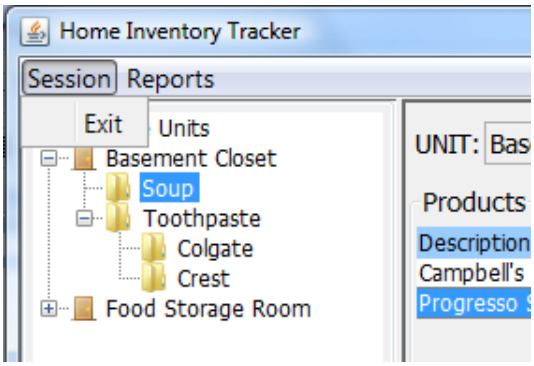


Figure 7 - Session Menu

2) The Reports Menu (Figure 8) allows the user to print a number of different reports, as follows:
    a. "Expired Items" prints a report on all Items in storage that have passed their expiration dates.
    b. "Removed Items" prints a report on all Items that have been recently removed from the system.
    c. "N-Month Supply" prints a report detailing what Items need to be purchased to achieve an N-month supply (where N is specified by the user).
    d. "Product Statistics" prints a report containing statistics about the Products in the system.
    e. "Notices" prints a report showing any discrepancies in the data entered by the user.

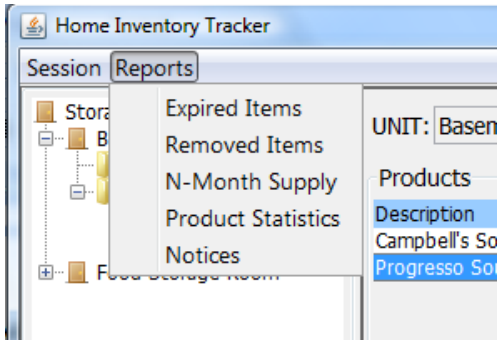


Figure 8 - Reports Menu

Feature Details

This section describes each feature of the HIT application in detail.

Adding Storage Units

The user can add a new Storage Unit by selecting the "Add Storage Unit" option in the Root Context Menu (Figure 2). This menu option is always enabled. When this option is selected by the user, the Add Storage Unit View (Figure 9) is displayed.

The Add Storage Unit View allows the user to enter values for the new Storage Unit's attributes. The OK button is enabled only when all of the attribute values entered by the user are valid. The Cancel button is always enabled.

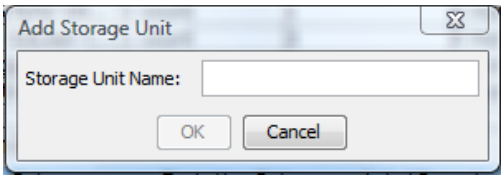


Figure 9 - Add Storage Unit View

If the user clicks OK:

1. A new Storage Unit with the specified attributes is created.
2. A node for the new Storage Unit is inserted into the Storage Unit / Product Group tree at the appropriate position. (Other than adding the new node, the state of the tree is otherwise preserved.)
3. The new tree node is selected.
4. The Add Storage Unit View closes.

If the user clicks Cancel:

1. The operation is canceled.
2. The Add Storage Unit View closes.

Editing Storage Units

The user can edit an existing Storage Unit by selecting the "Edit Storage Unit" option in the Storage Unit Context Menu (Figure 3). This menu option is always enabled. When this option is selected by the user, the Edit Storage Unit View (Figure 10) is displayed.

The Edit Storage Unit View allows the user to modify the attributes of the selected Storage Unit. The OK button is enabled only when all of the attribute values entered by the user are valid. The Cancel button is always enabled.

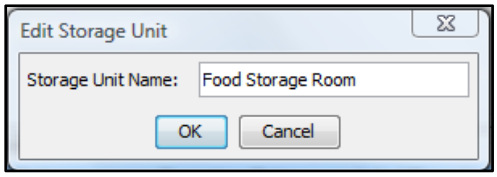


Figure 10 - Edit Storage Unit View

If the user clicks OK:

1. The selected Storage Unit's attributes are changed to the new values specified by the user.
2. The node for the Storage Unit is updated and moved to the appropriate position in the tree. (Other than updating and moving the modified node, the state of the tree is otherwise preserved.)
3. The modified node remains selected.
4. The Storage Unit's attribute values are updated anywhere they appear in the user interface.
5. The Edit Storage Unit View closes.

If the user clicks Cancel:

1. The operation is canceled.
2. The Edit Storage Unit View closes.

Deleting Storage Units

The user can delete an existing Storage Unit by selecting the "Delete Storage Unit" option in the Storage Unit Context Menu (Figure 3). This menu option is enabled only if the selected Storage Unit does not contain any Items (including its Product Groups). In other words, before being allowed to delete a Storage Unit, the user must first remove all Items from the Storage Unit, or transfer them to other Storage Units. A Storage Unit can be deleted if it contains Products, as long as there are no Items.

When the "Delete Storage Unit" option is selected by the user:

1. The selected Storage Unit is deleted.
2. The selected node in the Storage Unit / Product Group tree is removed, including all of its children. (Other than removing the selected node, the state of the tree is otherwise preserved.)
3. No node is selected in the tree.

Adding Product Groups

The user can add a new Product Group by selecting the "Add Product Group" option in the Storage Unit Context Menu (Figure 3) or the Product Group Context Menu (Figure 4). This menu option is always enabled. When this option is selected by the user, the Add Product Group View (Figure 11) is displayed.

The Add Product Group View allows the user to enter values for the new Product Group's attributes. The OK button is enabled only when all of the attribute values entered by the user are valid. The Cancel button is always enabled.

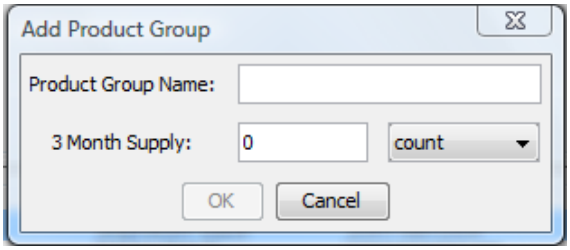


Figure 11 - Add Product Group View

If the user clicks OK:

1. A new Product Group with the specified attributes is created within the selected Product Container (Storage Unit or Product Group).
2. A node for the new Product Group is inserted into the Storage Unit / Product Group tree at the appropriate position. (Other than adding the new node, the state of the tree is otherwise preserved.)
3. The new tree node is selected.
4. The Add Product Group View closes.

If the user clicks Cancel:

1. The operation is canceled.
2. The Add Product Group View closes.

Editing Product Groups

The user can edit an existing Product Group by selecting the "Edit Product Group" option in the Product Group Context Menu (Figure 4). This menu option is always enabled. When this option is selected by the user, the Edit Product Group View (Figure 12) is displayed.

The Edit Product Group View allows the user to modify the attributes of the selected Product Group. The OK button is enabled only when all of the attribute values entered by the user are valid. The Cancel button is always enabled.

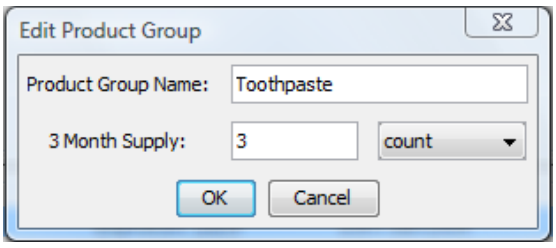


Figure 12 - Edit Product Group View

If the user clicks OK:

1. The selected Product Group's attributes are changed to the new values specified by the user.

2. The node for the Product Group is updated and moved to the appropriate position in the tree. (Other than updating and moving the modified node, the state of the tree is otherwise preserved.)
3. The modified node remains selected.
4. The Product Group's attribute values are updated anywhere they appear in the user interface.
5. The Edit Product Group View closes.

If the user clicks Cancel:

1. The operation is canceled.
2. The Edit Product Group View closes.

Deleting Product Groups

The user can delete an existing Product Group by selecting the "Delete Product Group" option in the Product Group Context Menu (Figure 4). This menu option is enabled only if the selected Product Group does not contain any Items (including its sub Product Groups). In other words, before being allowed to delete a Product Group, the user must first remove all Items from the Product Group, or transfer them to other Product Containers. A Product Group can be deleted if it contains Products, as long as there are no Items.

When the "Delete Product Group" option is selected by the user:

1. The selected Product Group is deleted.
2. The selected node in the Storage Unit / Product Group tree is removed, including all of its children. (Other than removing the selected node, the state of the tree is otherwise preserved.)
3. No node is selected in the tree.

Adding Items

The user can add Items to a Storage Unit by selecting the "Add Items" option in the Storage Unit Context Menu (Figure 3). This menu option is always enabled. When this option is selected by the user, the Add Item Batch View (Figure 13) is displayed.

The Add Item Batch View allows the user to add Items to the selected Storage Unit by entering Product barcodes. Product barcodes are entered into the "Product Barcode" field. The "Use barcode scanner" checkbox is used to indicate whether barcodes are being entered manually or with a scanner. The "Entry Date" field lets the user specify the entry date for the new Items (this field is automatically initialized to the current date). The "Count" field lets the user specify how many Items with the specified barcode are being entered (this field is automatically initialized to one). When the Add Item Batch View is displayed, the keyboard focus is automatically given to the "Product Barcode" field.

There are two different modes:

1) Barcodes are entered manually. The user types in the barcode for a Product, and then clicks the "Add Item" button. This causes "Count" Items of the specified Product with the specified "Entry

Date" to be added to the Storage Unit. The "Add Item" button is enabled only if the "Product Barcode" field is non-empty, and the "Count" field contains a valid positive integer value.

2) Barcodes are entered with a barcode scanner. When the user scans a Product barcode, HIT adds "Count" Items of the specified Product with the specified "Entry Date" to the Storage Unit. In this mode, the "Add Item" button is not used and is always disabled. If the "Count" field does not contain a valid positive integer value, an error message is displayed.

In either mode, after an Item is entered, the "Entry Date" field is reinitialized to the current date, the "Count" field is reinitialized to one, and the keyboard focus is given to the "Product Barcode" field.

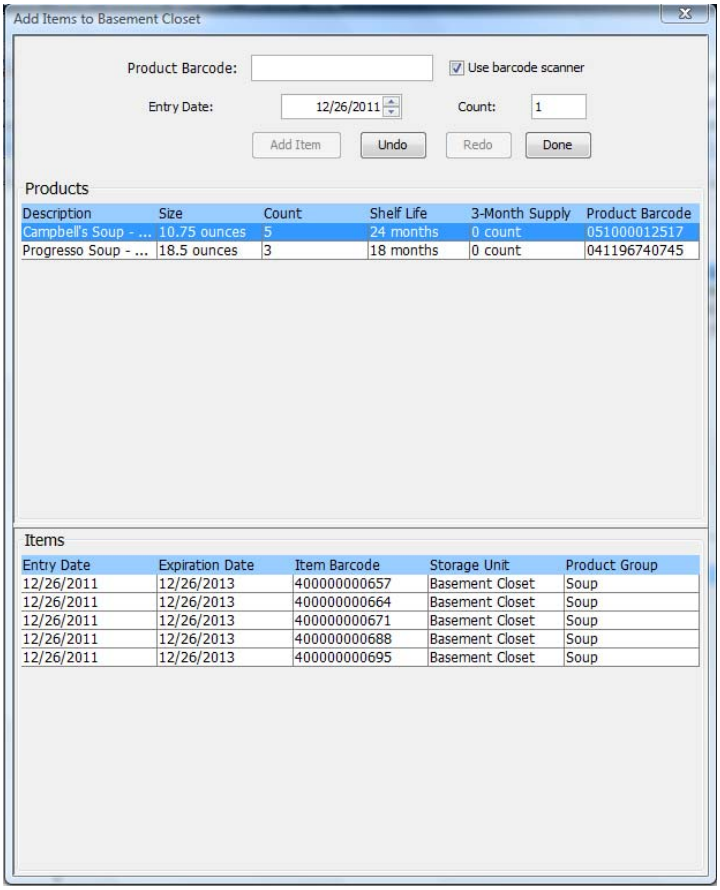


Figure 13 - Add Item Batch View

New Items are added to the Product Container within the target Storage Unit that contains the Item's Product. If the Item's Product is not already in the Storage Unit, it is automatically added to the Storage Unit at the top level before the Items are added.

The Product Table displays information about the Products that have been entered during the current batch. There is one row for each distinct Product. The "Count" column displays the number of Items of the Product that have been added during the batch. The Product Table is sorted chronologically in the order that Products were added to the batch.

The Item Table displays information about the Items added during the current batch. If no Product is selected in the Product Table, the Item Table is empty. If a Product is selected in the Product Table, the Item Table displays information about the Items added during the batch for the currently-selected Product. The Item Table is sorted chronologically in the order that Items were added to the batch.

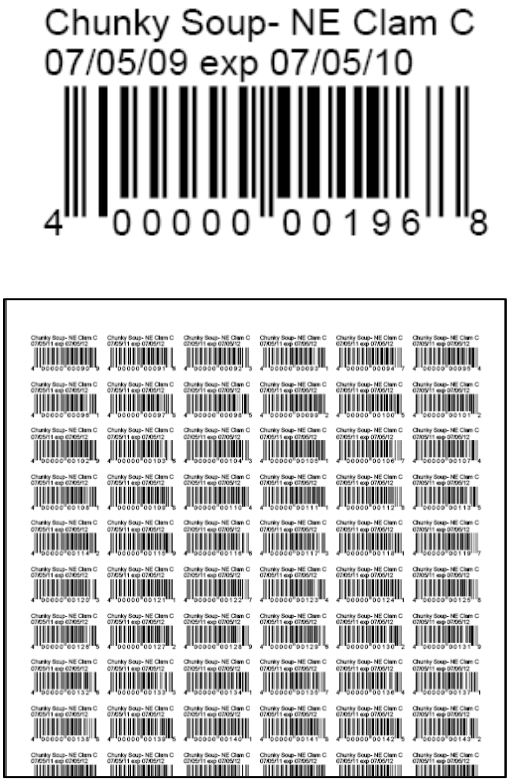


Figure 14 - Printed Barcode Labels

Within a batch, the user can use the “Undo” and “Redo” buttons to undo and redo the adding of Products and Items. When the “Undo” button is clicked by the user, the Item(s) most recently added are removed, and all side-effects of adding the Item(s) are undone. (As described in the next section on Adding Products, this may include undoing the creation of a new Product.) The “Undo” button is enabled only if there are Items within the current batch to be removed. When the “Redo” button is clicked by the user, the most recently undone add operation is redone. The “Redo” button is enabled only if there are previously undone operations that may be redone.

As Items are added and removed, the Item counts are immediately updated wherever they appear in the HIT user interface, including in the Add Item Batch View and the Inventory View. This includes when undo and redo operations are performed.

The user clicks the “Done” button to complete the current batch. When this button is clicked, all operations performed during the batch that have not been undone become permanent, and the Add Item Batch View closes.

At this point, if Items were added during the batch, HIT prints barcode labels for all Items added during the batch (Figure 14). The printed labels contain the following information:

1) 12-digit UPC barcode that uniquely identifies the Item
2) Product Description
3) Item Entry Date
4) Item Expiration Date (if defined)

Adding Products

In the Add Item Batch View (Figure 13), when the product barcode entered by the user is unrecognized by the system (i.e., a new Product is being added for the first time), the Add Product View (Figure 15) is displayed.

The Add Product View allows the user to enter values for the new Product's attributes. The OK button is enabled only when all of the attribute values entered by the user are valid. The Cancel button is always enabled.

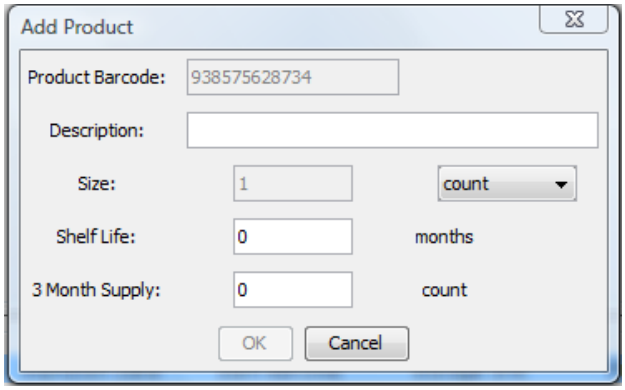


Figure 15 - Add Product View

When the Add Product View appears, the "Product Barcode" field is disabled and displays the product barcode previously entered by the user in the Add Item Batch View. At this point, HIT searches the web for the barcode and tries to determine the identity of the new Product. While this lookup is being done, the "Description" field is disabled and contains the message: "Identifying Product – Please Wait". When the web search is complete, if HIT successfully identified the Product, it fills the "Description" field with a description of the Product. If HIT failed to identify the Product, the "Description" field is emptied. The "Description" field is then enabled to allow the user to edit the Product's description (regardless of whether or not it was successfully identified).

If the user clicks the OK button, the new Product is added to the system, and the user is returned back to the Add Item Batch View where one or more Items of the newly created Product are added to the system. If the user clicks the Cancel button, the operation is aborted, and the user is returned to the Add Item Batch View.

Editing Products

The user can edit an existing Product by selecting the "Edit Product" option in the Product Context Menu (Figure 5). This menu option is enabled only if a Product is currently selected in the Product Table. When this option is selected by the user, the Edit Product View (Figure 16) is displayed.

The Edit Product View allows the user to modify the attributes of the selected Product. The OK button is enabled only when all of the attribute values entered by the user are valid. The Cancel button is always enabled.

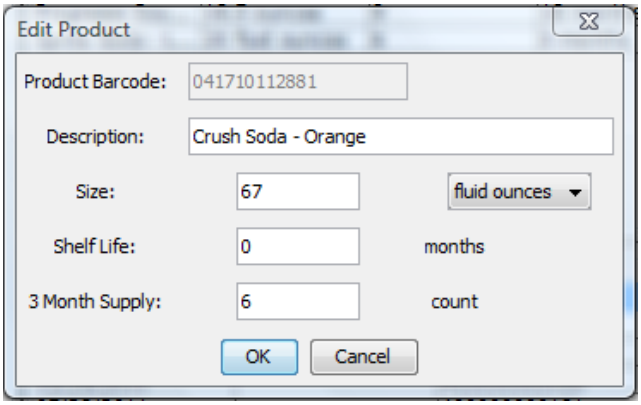


Figure 16 - Edit Product View

If the user clicks OK:

1. The selected Product's attributes are changed to the new values specified by the user.
2. The Product Table is re-sorted if needed to reflect changes in the Product's Description.
3. The modified Product remains selected.
4. The Product's attribute values are updated anywhere they appear in the user interface.
5. The Edit Product View closes.

If the user clicks Cancel:

1. The operation is canceled.
2. The Edit Product View closes.

Deleting Products

The user can delete an existing Product by selecting the "Delete Product" option in the Product Context Menu (Figure 5). The functionality of this command depends on what kind of node is currently selected in the Storage Unit / Product Group Tree. There are three possible cases:

1) No node is selected in the Storage Unit / Product Group tree. In this case, the "Delete Product" menu option is disabled.
2) The root "Storage Units" node is selected. In this case, the "Delete Product" command removes the selected Product from the system entirely, including all historical data about the Product.

The “Delete Product” menu option is enabled only if there are no Items of this Product remaining anywhere in the system. When the “Delete Product” option is selected by the user:

a. The selected Product is deleted from the system entirely, including all historical information about the Product.
b. The selected Product is removed from the Product Table.
c. No Product is selected in the Product Table.

3) A Product Container (Storage Unit or Product Group) node is selected. In this case, the “Delete Product” command removes the selected Product from the selected Product Container only (i.e., not from the entire system). The “Delete Product” menu option is enabled only if there are no Items for the selected Product remaining in the selected Product Container. When the “Delete Product” option is selected by the user:

a. The selected Product is deleted from the selected Product Container.
b. The selected Product is removed from the Product Table.
c. No Product is selected in the Product Table.

Editing Items

The user can edit an existing Item by selecting the “Edit Item” option in the Item Context Menu (Figure 6). This menu option is enabled only if an Item is currently selected in the Item Table. When this option is selected by the user, the Edit Item View (Figure 17) is displayed.

The Edit Item View lets the user modify the Entry Date of the selected Item. (The Item’s Description and Label Barcode are also displayed, but these cannot be modified.) The OK button is enabled only when the Entry Date entered by the user is valid. The Cancel button is always enabled.

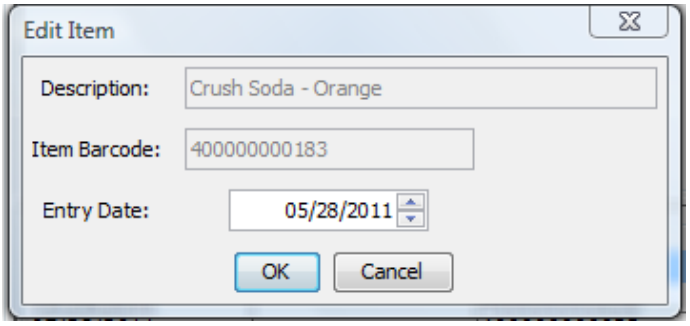


Figure 17 - Edit Item View

If the user clicks OK:

1. The selected Item’s attributes are changed to the new values specified by the user.
2. The Item Table is re-sorted if needed to reflect changes to the Item’s Entry Date.
3. The modified Item remains selected.
4. The Item’s attribute values are updated anywhere they appear in the user interface.
5. The Edit Item View closes.

If the user clicks Cancel:

1. The operation is canceled.
2. The Edit Item View closes.

Removing Items

Whenever a user removes an Item from storage, they notify HIT by selecting the Item in the Item Table and selecting the "Remove Item" option in the Item Context Menu (Figure 6). When an Item is removed, it is taken out of its containing Storage Unit, but HIT retains the Item for historical purposes (i.e., for calculating statistics and reporting).

When the "Remove Item" option is selected by the user:

1. The selected Item is removed from its containing Storage Unit.
2. The Exit Time is stored in the Item, and it is retained for historical purposes.
3. The selected Item is removed from the Item Table.
4. No Item is selected in the Item Table

Putting Products in a Product Container

The user can put a Product in a Product Container by selecting the Product in the Product Table and dragging it to the target Product Container in the Storage Unit / Product Group Tree. The effect of this operation depends on whether or not the Product is already contained in the destination Storage Unit. (Remember, a Product can be in only one Product Container in a given Storage Unit. However, a Product may appear in multiple Storage Units.) The logic is as follows:

Target Product Container = the Product Container the user dropped the Product on

Target Storage Unit = the Storage Unit containing the Target Product Container

If the Product is already contained in a Product Container in the Target Storage Unit

> Move the Product and all associated Items from their old Product Container to the Target Product Container

Else

> Add the Product to the Target Product Container

Moving Items to a Product Container

The user can move an Item to a Product Container by selecting the Item in the Item Table and dragging it to the target Product Container in the Storage Unit / Product Group Tree. The effect of this operation depends on whether or not the Item's Product is already contained in the destination Storage Unit. (Remember, a Product can be in only one Product Container in a given Storage Unit. However, a Product may appear in multiple Storage Units. Also, an Item is always contained in exactly one Product Container.) The logic is as follows:

Target Product Container = the Product Container the user dropped the Item on

Target Storage Unit = the Storage Unit containing the Target Product Container

If the Item's Product is already in a Product Container in the Target Storage Unit

> Move the Product and all associated Items from their old Product Container to the Target Product Container

Else

> Add the Product to the Target Product Container

Move the selected Item from its old Product Container to the Target Product Container

Transferring Items to a Storage Unit

As described in the previous section, the user can move Items between Product Containers using drag-and-drop. Alternatively, the user can transfer Items from one Storage Unit to another by selecting the "Transfer Items" option in the Storage Unit Context Menu (Figure 3). This menu option is always enabled. When this option is selected by the user, the Transfer Item Batch View (Figure 18) is displayed.

The Transfer Item Batch View allows the user to move Items to the selected Storage Unit by entering Item barcodes (i.e., the barcodes printed on labels when Items are added to the system, and that uniquely identify each Item). Item barcodes are entered into the "Item Barcode" field. The "Use barcode scanner" checkbox is used to indicate whether barcodes are being entered manually or with a scanner. When the Transfer Item Batch View is displayed, the keyboard focus is given to the "Item Barcode" field.

There are two different modes:

1) Barcodes are entered manually. In this mode, the user types in the barcode for an Item, and then clicks the "Transfer Item" button. The "Transfer Item" button is enabled only if the "Item Barcode" field is non-empty.
2) Barcodes are entered with a barcode scanner. In this mode, the "Transfer Item" button is not used and is always disabled.

In either mode, when a barcode is entered, the Item with the specified barcode is transferred to the selected Storage Unit. If the entered barcode is unrecognized by the system, an error message is displayed to the user. After an Item is transferred, the keyboard focus is given to the "Item Barcode" field.

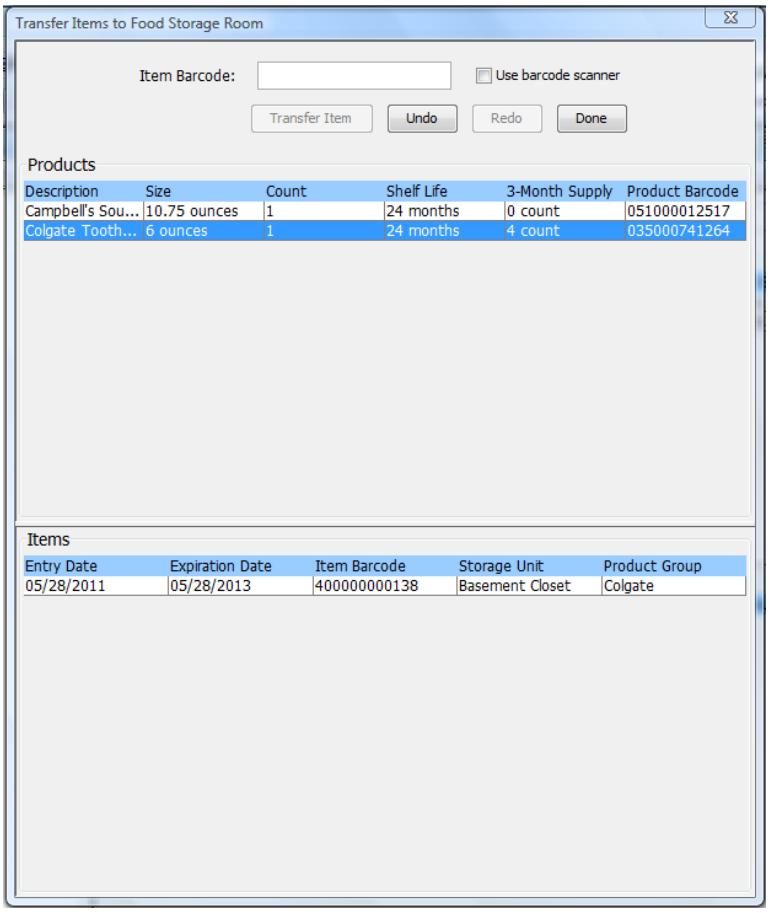


Figure 18 - Transfer Item Batch View

When an Item is transferred into a Storage Unit, it is added to the Product Container within the target Storage Unit that contains the Item's Product. If the Item's Product is not already in the Storage Unit, it is automatically added to the Storage Unit at the top level before the Item is transferred.

The Product Table displays information about the Products that have been transferred during the current batch. There is one row for each distinct Product. The "Count" column displays the number of Items of the Product that have been transferred during the batch. The Product Table is sorted chronologically in the order that Products were added to the batch.

The Item Table displays information about the Items transferred during the current batch. If no Product is selected in the Product Table, the Item Table is empty. If a Product is selected in the Product Table, the Item Table displays information about the Items transferred during the batch for the currently-selected Product. The Item Table is sorted chronologically in the order that Items were added to the batch.

Within a batch, the user can use the "Undo" and "Redo" buttons to undo and redo transfer operations. When the "Undo" button is clicked by the user, the most recent transfer operation is undone. The "Undo" button is enabled only if there are transfer operations in the current batch to be undone. When

the “Redo” button is clicked by the user, the most recently undone transfer operation is redone. The “Redo” button is enabled only if there are previously undone operations that may be redone.

As Items are transferred, the Item counts are immediately updated wherever they appear in the HIT user interface, including in the Transfer Item Batch View and the Inventory View. This includes when undo and redo operations are performed.

The user clicks the “Done” button to complete the current batch. When this button is clicked, all operations performed during the batch that have not been undone become permanent, and the Transfer Item Batch View closes.

Removing Items from a Storage Unit

As described in the earlier section named “Removing Items”, the user can remove an Item from storage by selecting it in the Item Table, and selecting the “Remove Item” menu option. Alternatively, the user can remove Items from storage by selecting the “Remove Items” option in the Root Context Menu (Figure 2). This menu option is always enabled. When this option is selected by the user, the Remove Item Batch View (Figure 19) is displayed.

The Remove Item Batch View allows the user to remove Items by entering Item barcodes (i.e., the barcodes printed on labels when Items are added to the system, and that uniquely identify each Item). Item barcodes are entered into the “Item Barcode” field. The “Use barcode scanner” checkbox is used to indicate whether barcodes are being entered manually or with a scanner. When the Remove Item Batch View is displayed, the keyboard focus is given to the “Item Barcode” field.

There are two different modes:

1) Barcodes are entered manually. In this mode, the user types in the barcode for an Item, and then clicks the “Remove Item” button. The “Remove Item” button is enabled only if the “Item Barcode” field is non-empty.
2) Barcodes are entered with a barcode scanner. In this mode, the “Remove Item” button is not used and is always disabled.

In either mode, when a barcode is entered, the Item with the specified barcode is taken out of its containing Storage Unit, but HIT retains the Item for historical purposes (i.e., for calculating statistics and reporting). If the entered barcode is unrecognized by the system, an error message is displayed to the user. After an Item is removed, the keyboard focus is given to the “Item Barcode” field.

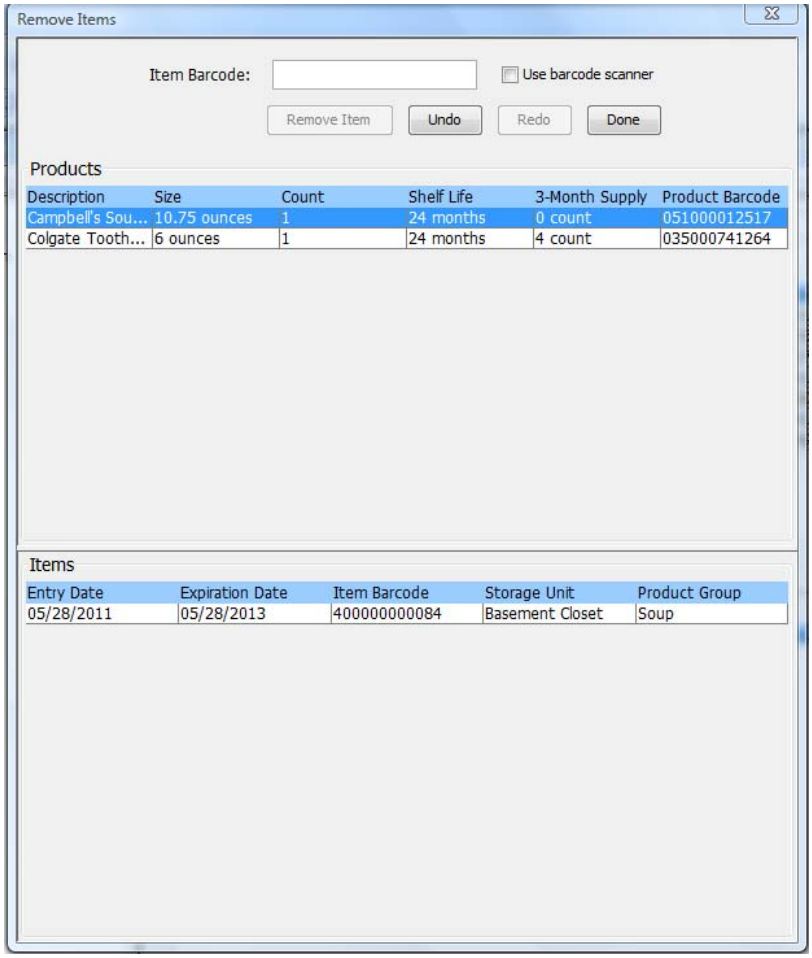


Figure 19 - Remove Item Batch View

The Product Table displays information about the Products that have been removed during the current batch. There is one row for each distinct Product. The "Count" column displays the number of Items of the Product that have been removed during the batch. The Product Table is sorted chronologically in the order that Products were added to the batch.

The Item Table displays information about the Items removed during the current batch. If no Product is selected in the Product Table, the Item Table is empty. If a Product is selected in the Product Table, the Item Table displays information about the Items removed during the batch for the currently-selected Product. The Item Table is sorted chronologically in the order that Items were added to the batch.

Within a batch, the user can use the "Undo" and "Redo" buttons to undo and redo remove operations. When the "Undo" button is clicked by the user, the most recent remove operation is undone. The "Undo" button is enabled only if there are remove operations in the current batch to be undone. When the "Redo" button is clicked by the user, the most recently undone remove operation is redone. The "Redo" button is enabled only if there are previously undone operations that may be redone.

As Items are removed, the Item counts are immediately updated wherever they appear in the HIT user interface, including in the Remove Item Batch View and the Inventory View. This includes when undo and redo operations are performed.

The user clicks the "Done" button to complete the current batch. When this button is clicked, all operations performed during the batch that have not been undone become permanent, and the Remove Item Batch View closes.

Printing the Expired Items Report

The user can print the Expired Items Report by selecting the "Expired Items" option from the Reports Menu (Figure 8). This report displays a list of all Items in the system that have passed their Expiration Date. The purpose of this report is to help the user be aware of and/or discard Items that are out-of-date. (An Item is considered to be expired as of midnight on its Expiration Date.) When the user selects the "Expired Items" menu option, the Expired Items Report View (Figure 20) is displayed.

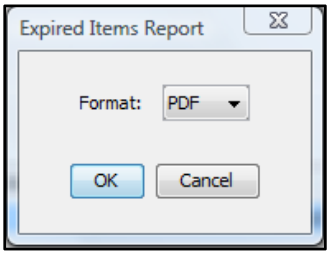


Figure 20 - Expired Items Report View

The Expired Items Report View lets the user choose between PDF and HTML file formats. The OK button is always enabled. If the user clicks the OK button, the Expired Items Report is printed in the selected file format and displayed to the user (Figure 21). The Cancel button is always enabled. If the user clicks the Cancel button, the Expired Items Report View closes and nothing is printed.

Expired Items

Description	Storage Unit	Product Group	Entry Date	Expire Date	Item Barcode
Fudge Shoppe Oatmeal Fudge Strips, 11.5-Ounce (Pack of 6)	Basement Closet		12/24/2010	06/24/2011	400000000589
Fudge Shoppe Oatmeal Fudge Strips, 11.5-Ounce (Pack of 6)	Basement Closet		12/24/2010	06/24/2011	400000000596
Fudge Shoppe Oatmeal Fudge Strips, 11.5-Ounce (Pack of 6)	Basement Closet		12/24/2010	06/24/2011	400000000558
Campbell's Soup - Condensed Chicken Noodle	Basement Closet	Soup	05/28/2009	05/28/2011	400000000084
Colgate Toothpaste - Total Whitening	Basement Closet	Colgate	05/28/2009	05/28/2011	400000000138
Campbell's Soup - Condensed Chicken Noodle	Food Storage Room	Soup	05/28/2009	05/28/2011	400000000251

Figure 21 - Expired Items Report

The expired Items listed in the report are grouped by Product Container (i.e., all expired Items from the same Product Container are listed together). Within a Product Container the Items are sorted primarily by Description (ascending) and secondarily by Entry Date (ascending). The Product Containers themselves are ordered by doing a pre-order traversal of the Storage Unit / Product Group Tree.

Printing the Removed Items Report

The user can print the Removed Items Report by selecting the "Removed Items" option from the Reports Menu (Figure 8). This report displays a list of all Items that have been recently removed from storage. This report is intended to help the user replenish their storage by replacing Items that have been removed. When the user selects the "Removed Items" menu option, the Removed Items Report View (Figure 22) is displayed.

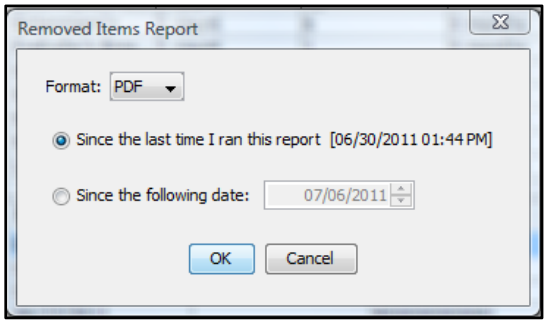


Figure 22 - Removed Items Report View

The Removed Items Report View lets the user choose between PDF and HTML file formats. It also lets the user choose between two different options: 1) Print all Items that have been removed from storage since the last time the Removed Items Report was printed, or 2) Print all Items that have been removed from storage on or after a specified date. The OK button is always enabled. If the user clicks the OK button, the Removed Items Report is printed in the selected file format and displayed to the user (Figure 23). The Cancel button is always enabled. If the user clicks the Cancel button, the Removed Items Report View closes and nothing is printed. The "Since the last time I ran this report" label displays the last date and time at which the Removed Items Report was printed. The date selection field is enabled only if the "Since the following date" option is selected.

Items Removed Since 12/26/2011 02:45 PM

Description	Size	Product Barcode	Removed	Current Supply
Campbell's Soup - Condensed Chicken Noodle	10.75 ounces	051000012517	2	9
Fudge Shoppe Oatmeal Fudge Strips, 11.5-Ounce (Pack of 6)	1 count	030100528838	1	9
Progresso Soup - Chicken & Wild Rice	18.5 ounces	041196740745	1	8
Sprite Soda - Lemon-Lime Zero Sugar	20 fluid ounces	049000037197	1	5

Figure 23 - Removed Items Report

The Removed Items Report lists all Products for which one or more Items have been removed since the selected date/time. The Products are sorted by Description (ascending). The Removed field displays the number of Items that have been removed for that Product. The Current Supply field displays how many Items of the Product are remaining in the system.

NOTE: For each Item, HIT tracks the Entry Date and Exit Time. The reason HIT tracks Exit Time rather than just Exit Date is to enable this report to determine exactly which Items have been removed since the last time the report was run. Otherwise, only Exit Date would be needed.

Printing the N-Month Supply Report

The user can print the N-Month Supply Report by selecting the "N-Month Supply" option from the Reports Menu (Figure 8). When the user selects the "N-Month Supply" menu option, the N-Month Supply Report View (Figure 24) is displayed. After the user specifies the desired number of months, N >= 1, this report displays a list of all Products and Product Groups in the system that have less than an N-month supply. This report is intended to help the user maintain an N-month supply by telling them what Products or Product Groups need to be augmented in order to achieve an N-month supply.

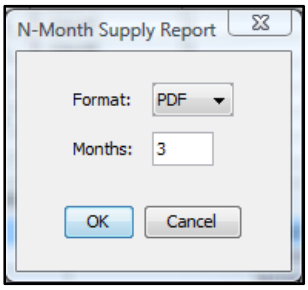
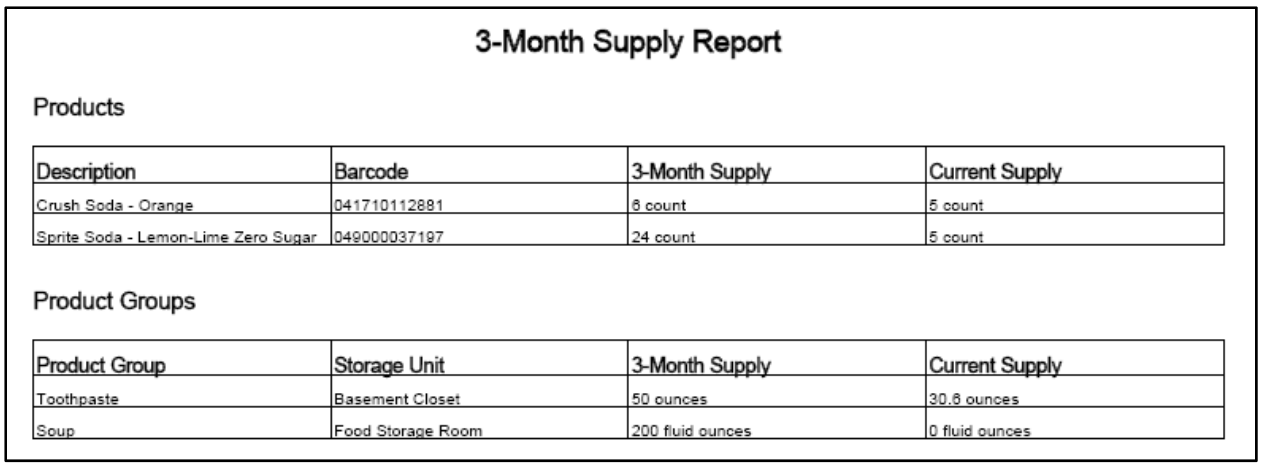


Figure 24 – N-Month Supply Report View

The N-Month Supply Report View lets the user choose between PDF and HTML file formats. It also lets the user choose the number of months for which they want a supply. The OK button is enabled only if the value of the "Months" field is a valid integer in the range 1 - 100 (inclusive). If the user clicks the OK button, the N-Month Supply Report is printed in the selected file format using the specified number of months, and displayed to the user (Figure 25). The Cancel button is always enabled. If the user clicks the Cancel button, the N-Month Supply Report View closes and nothing is printed.



3-Month Supply Report

Products

Description	Barcode	3-Month Supply	Current Supply
Crush Soda - Orange	041710112881	6 count	5 count
Sprite Soda - Lemon-Lime Zero Sugar	049000037197	24 count	5 count

Product Groups

Product Group	Storage Unit	3-Month Supply	Current Supply
Toothpaste	Basement Closet	50 ounces	30.6 ounces
Soup	Food Storage Room	200 fluid ounces	0 fluid ounces

Figure 25 - N-Month Supply Report

The N-Month Supply Report contains two sections: “Products” and “Product Groups”. The “Products” section displays a list of all Products in the system for which a 3-month supply quota has been specified, but that have less than an N-month supply in storage. Products are sorted by Description (ascending). The N-Month Supply field displays how much of the Product is needed to have an N-month supply. This is calculated by scaling the 3-month supply value specified for the Product. The Current Supply field displays the amount of the Product that is currently in storage. For each Product, all Items in the system are counted, regardless of which Storage Units or Product Groups they are in.

The “Product Groups” section of the report displays a list of all Product Groups in the system for which a 3-month supply quota has been specified, but that have less than an N-month supply in storage. The Product Groups are displayed in the order defined by a pre-order traversal of the Storage Unit / Product Group Tree. The N-Month Supply field displays how much of the Products in the Product Group is needed to have an N-month supply. This is calculated by scaling the 3-month supply value specified for the Product Group. The Current Supply field displays the amount of the Products in the Product Group that is currently in storage. This is calculated by recursively adding the sizes of all the Items in the Product Group. There are three possible cases:

1) The Product Group’s 3-month supply quota is specified as a “count”. In this case, the Current Supply is calculated by counting all Items in the Product Group, recursively.
2) The Product Group’s 3-month supply quota is specified in terms of “volume”, such as gallons, quarts, liters, etc. In this case, the Current Supply is calculated by summing the volumes of all the Items in the Product Group, recursively. The Current Supply is expressed in the same units as the 3-month supply quota of the Product Group. If the Product Group contains Products whose sizes are specified in “count” or “weight” units instead of “volume”, Items of those Products are omitted from the Current Supply calculation. (Unit inconsistencies such as this may be detected by printing the Notices Report, described later.)
3) The Product Group’s 3-month supply quota is specified in terms of “weight”, such as pounds, ounces, kilograms, etc. In this case, the Current Supply is calculated by summing the weights of all the Items in the Product Group, recursively. The Current Supply is expressed in the same

units as the 3-month supply quota of the Product Group. If the Product Group contains Products whose sizes are specified in "count" or "volume" units instead of "weight", Items of those Products are omitted from the Current Supply calculation. (Unit inconsistencies such as this may be detected by printing the Notices Report, described later.)

Printing the Product Statistics Report

The user can print the Product Statistics Report by selecting the "Product Statistics" option from the Reports Menu (Figure 8). This report displays supply and usage statistics for all of the Products in the system. This report is intended to help the user understand how much of a Product they are using, and how their supply of the Product has changed over time. When the user selects the "Product Statistics" menu option, the Product Statistics Report View (Figure 26) is displayed

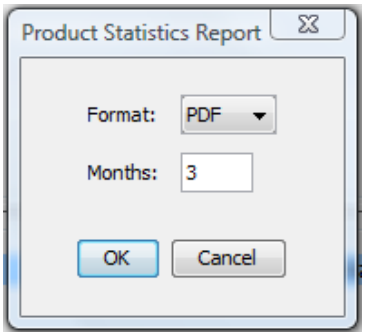


Figure 26 - Product Statistics Report View

The Product Statistics Report View lets the user choose between PDF and HTML file formats. It also lets the user choose the number of months covered by the report's statistics (i.e., the "reporting period"). The OK button is enabled only if the value of the "Months" field is a valid integer in the range 1 - 100 (inclusive). If the user clicks the OK button, the Product Statistics Report is printed in the selected file format using the specified number of months, and displayed to the user (Figure 27). The Cancel button is always enabled. If the user clicks the Cancel button, the Product Statistics Report View closes and nothing is printed.

The Product Statistics Report contains a row of statistics for each Product in the system. Products are sorted by Description (ascending). The following data values are displayed for each Product:

- Description, Barcode, Size, 3-Month Supply, and Shelf Life
- Supply (Current): The number of Items currently in storage for this Product.
- Supply (Average): The daily average number of Items in storage for this Product over the reporting period.
- Supply (Minimum): The daily minimum number of Items in storage for this Product over the reporting period.
- Supply (Maximum): The daily maximum number of Items in storage for this Product over the reporting period.
- Supply (Used): The number of Items for this Product taken out of storage during the reporting period.

- Supply (Added): The number of Items for this Product added to storage during the reporting period.
- Used Age (Average): For all Items of this Product used during the reporting period, the average number of days spent in storage before being used.
- Used Age (Maximum): For all Items of this Product used during the reporting period, the maximum number of days spent in storage before being used.
- Current Age (Average): For all Items of this Product currently in storage, the average number of days spent in storage.
- Current Age (Maximum): For all Items of this Product currently in storage, the maximum number of days spent in storage.

Product Report (3 Months)

Description	Barcode	Size	3-Month Supply	Supply: Cur/Avg	Supply: Min/Max	Supply: Used/Added	Shelf Life	Used Age: Avg/Max	Cur Age: Avg/Max
Campbell's Soup - Condensed Chicken Noodle	051000012517	10.75 ounces		7 / 4.1	4 / 7	4 / 7	24 months	472.5 days / 942 days	60.6 days / 212 days
Colgate Toothpaste - Total Whitening	035000741264	6 ounces	4	3 / 4	3 / 4	1 / 0	24 months	212 days / 212 days	455.3 days / 942 days
Crest Extra Whitening Toothpaste	037000307570	6.2 ounces	4	6 / 6	6 / 6	0 / 0	24 months	0 days / 0 days	205 days / 205 days
Crush Soda - Orange	041710112881	67 fluid ounces	6	4 / 5	4 / 5	2 / 1		104.5 days / 209 days	212 days / 212 days
Fudge Shoppe Oatmeal Fudge Strips, 11.5-Ounce (Pack of 6)	030100528838	1 count	8	6 / 3.2	3 / 10	4 / 7	6 months	275.8 days / 367 days	2 days / 2 days
Progresso Soup - Chicken & Wild Rice	041196740745	18.5 ounces		6 / 6	6 / 6	3 / 3	18 months	68.3 days / 205 days	170.8 days / 205 days
Sprite Soda - Lemon-Lime Zero Sugar	049000037197	20 fluid ounces	24	4 / 5.2	4 / 6	2 / 1		113.5 days / 205 days	205 days / 205 days

Figure 27 - Product Statistics Report

The first day of the reporting period is calculated by subtracting N months from the current date (N is the number of months specified by the user). The last day of the reporting period is the current date (i.e., Items added and removed on the current date are always included in the report). For example, if the report is run on July 4, 2011 with N = 3, the reporting period would be [April 4, 2011 – July 4, 2011].

If a Product was created during the reporting period, statistics for that Product are calculated starting on its Creation Date. Days on which the Product did not exist in the system are not counted.

The supply for a Product on a particular day is defined to be the number of Items for the Product in storage at the end of the day. This is calculated as follows:

Supply for Day = Supply for Previous Day + Items Added on Day – Items Removed on Day

The age of a used Item is calculated as follows:

Age = Number of days between 12 AM on Entry Date and 12 AM on Exit Date

The age of an Item currently in storage is calculated as follows:

Age = Number of days between 12 AM on Entry Date and 12 AM on Current Date

Printing the Notices Report

The user can print the Notices Report by selecting the "Notices" option from the Reports Menu (Figure 8). This report scans the HIT database for data inconsistencies, and prints warning messages describing any potential problems found. Currently, the only problem reported by the Notices Report is a mismatch in the units used to define a Product Group's 3-month supply quota, and the units used to define the Product sizes within the Product Group. For example, if a Product Group's 3-month supply quota is defined in terms of "weight" (such as pounds or ounces), and a Product within the Product Group has a size defined in terms of "volume" (such as gallons or liters), this discrepancy will be reported in the Notices Report. The user can decide whether or not this is actually a problem that needs to be fixed. They should be aware, however, that when such discrepancies exist, Products with sizes that are inconsistent with their Product Group's 3-month supply quota definition are omitted from N-Month Supply Report calculations. In general, the following discrepancies are reported by the Notices Report:

1) A Product Group's 3-month supply quota is defined in terms of "weight", but the Product Group contains Products whose sizes are defined in terms of "count" or "volume".
2) A Product Group's 3-month supply quota is defined in terms of "volume", but the Product Group contains Products whose sizes are defined in terms of "count" or "weight".

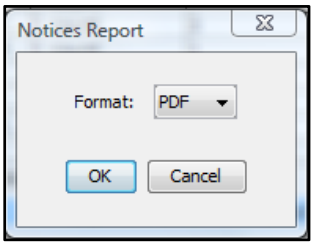


Figure 28 - Notices Report View

When the user selects the "Notices" menu option, the Notices Report View (Figure 28) is displayed. The Notices Report View lets the user choose between PDF and HTML file formats. The OK button is always enabled. If the user clicks the OK button, the Notices Report is printed in the selected file format and

displayed to the user (Figure 29). The Cancel button is always enabled. If the user clicks the Cancel button, the Notices Report View closes and nothing is printed.

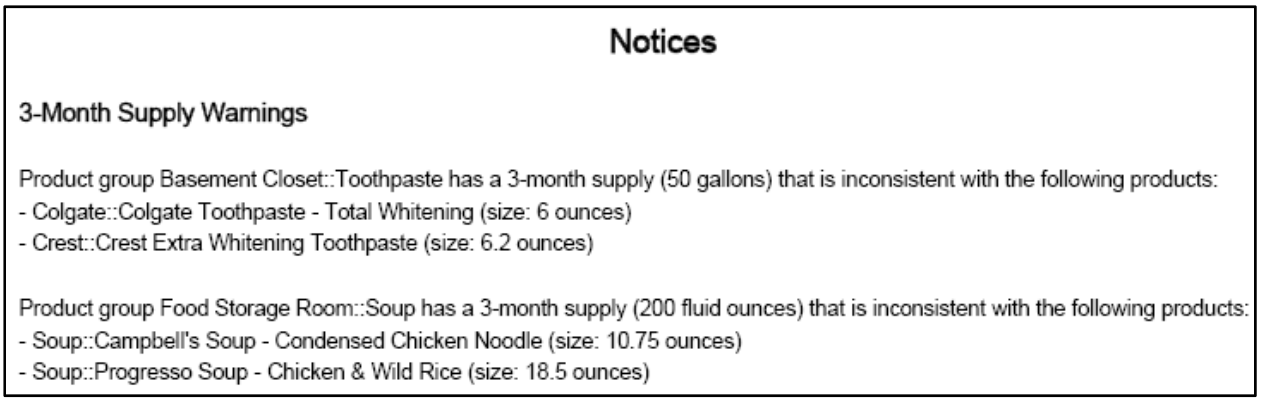


Figure 29 - Notices Report

The Notices Report displays a list of Product Groups that have unit inconsistencies. Product Groups are ordered by doing a pre-order traversal of the Storage Unit / Product Group Tree. Under each Product Group, a list of Products within the group with inconsistent size definitions is displayed. The Products listed under a Product Group are sorted by Description (ascending).