



# Application Note

## AN\_309

# FT800 Washing Machine Application

**Version 1.0**

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This document is to introduce the setup of the Washing Machine Application running on MSVC. The objective of the Washing Machine Application is to enable users to become familiar with the usage of the FT800, the design flow, and display list used to design the desired user interface or visual effect.

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## 1 Introduction

This application demonstrates an interactive Washing Machine application using Menu and animation, based on the FT800 platform.

The Washing Machine application user interactive function involves the options that can be selected for the washing process. The different stages in a Washing Machine are shown.

### 1.1 Overview

The document will give the basic understanding about the FT800 CPU features Menu and animation using bitmaps.

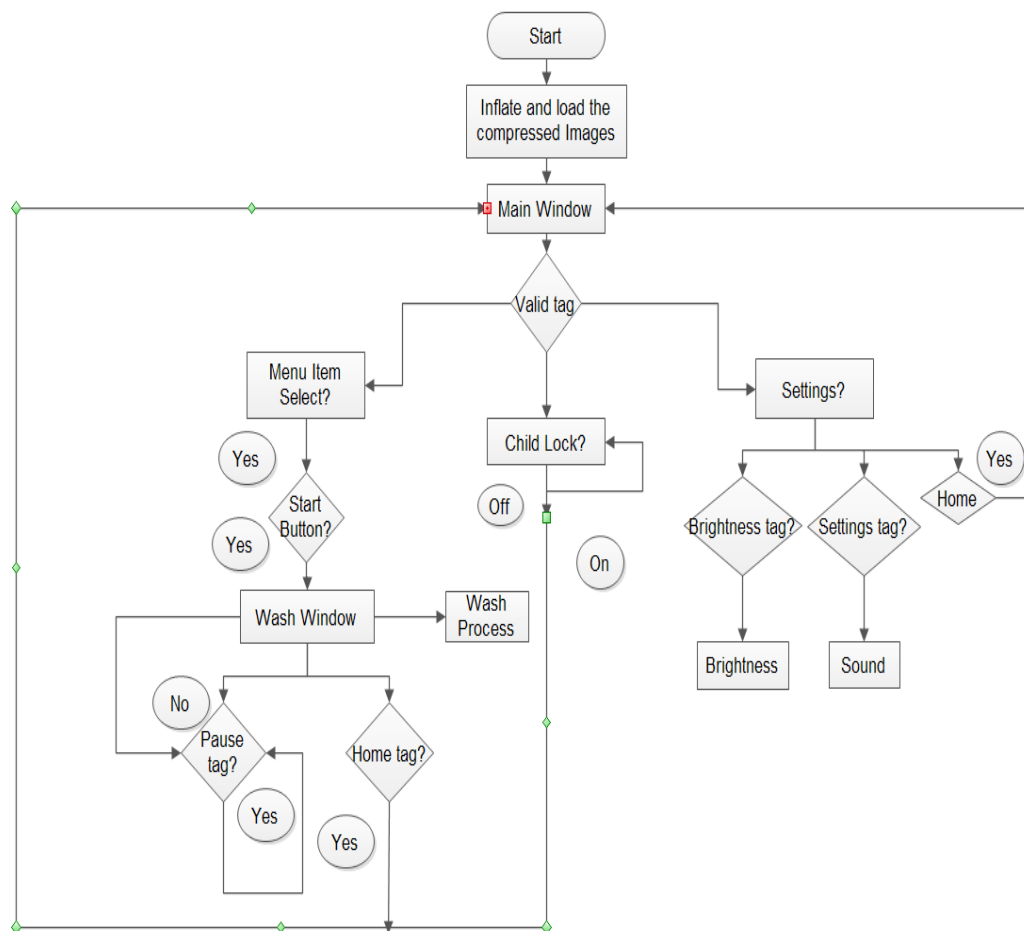
Arduino code of the application requires a SD card to read and load the bitmaps. The bitmaps have to be copied from the Test folder to the SD card root folder.

### 1.2 Scope

This document will be used by software programmers to develop GUI applications by using FT800 with any MCU via SPI.

## 2 Application Flow

### 2.1 Washing Machine Demo Flowchart



**Figure 2-1 Washing Machine Demo Flowchart**

## 3 Description

Parameters needed to be initialized are described below for constructing the display list.

### 3.1 Intialization

#### 3.1.1 Download the Bitmaps

The bitmaps are downloaded into the desired locations. The bitmap handles are also assigned here. The items in the Wash window for different stages are combined into one single image and assigned different cell values. They are then called according to their cell numbers.

Note: After these configurations are set, swap the display list and flush into the J1 Memory.

### 3.2 Functionality

The Washing Machine Demo is a user interactive demo where the user can select and view items that are available.

#### 3.2.1 Main Window

The Main Menu has options for the Wash type such as Eco Cold, Normal, Heavy Duty, Perm Press, Active Wear, Bedding and Wool. The preferred option can then be selected by clicking on it (touch the screen). Each of the options has its own Soil Level, Temperature and Spin Speed which are shown at the centre of the screen.

There are three options on the right side. Child Lock, Settings and Start button.

Estimated time remaining for the process is also shown.

The Menu Items on the left pane, are assigned individual tags. Below the Menu items, a rectangle with only alpha value and a tag is drawn. This rectangle is drawn for the scrolling feature.

The scrolling feature is done by reading the X and Y coordinates at the particular point and by calculating velocity using the previous as shown below.

```
signed short sy = Ft_Gpu_Hal_Rd16(phost,REG_TOUCH_SCREEN_XY);

if ((sy != -32768) & (scroller.dragprev != -32768)) {
    scroller.vel = (scroller.dragprev - sy) << 4;
} else {
    int change = max(1, abs(scroller.vel) >> 5);
    if (scroller.vel < 0)
        scroller.vel += change;
    if (scroller.vel > 0)
        scroller.vel -= change;
}
scroller.dragprev = sy;    /* previous touch */

scroller.base += scroller.vel;

scroller.base = max(0, min(scroller.base, scroller.limit));
```

The Options on the middle pane, change according to the Menu item selected. The bitmaps used for the "Soil level", "temperature" are changed in color according to the option. The Spin speed bitmap is rotated using the Ft\_Gpu\_CoCmd\_Rotate command.



**Figure 3-1 Main Window Screen**

### 3.2.2 Child Lock

The Child Lock option will lock the screen thereby disabling all the features of the Machine as shown below.

An edge strip with an alpha value of 180 is drawn and the bitmap is placed in the centre with a tag value to go back to the Main Screen



**Figure 3-2 Locked Screen**

### 3.2.3 Settings

The Settings screen has options for Sound and Brightness levels to be adjusted.

The default values for Display is 100 and Sound is 255 which are the highest. They are shown in Level 5 and Level 4 respectively.

The Level buttons are drawn using rectangle commands and assigned tags. Only the selected buttons are drawn with a bigger than default value.

The Home button is selected to go back to main screen.



**Figure 3-3 Settings Screen**

### 3.2.4 Wash Window

When the Start button is pressed, the washing process begins with stages as Pre Wash, Wash, Rinse and Spin.

The different stages are shown with images being loaded one after the other to create an animation effect.

The Time remaining for the whole process to be completed is shown here and in the Main Window as well.

At any point during the process, the user can jump to main window and come back to Wash Window without stopping the process that is happening.

A point is drawn using FT\_POINTS with a low alpha value for the washing process to be displayed. This is termed the Process point.

The progress bar is a bitmap. A rectangle of similar colour to the bitmap is drawn over the bitmap as the washing process goes on. This gives an illusion that the bar progresses as the time reduces.

The time remaining is shown using the text and number commands. The time shown in seconds is not exactly seconds. The seconds here are calculated faster to finish the process earlier.



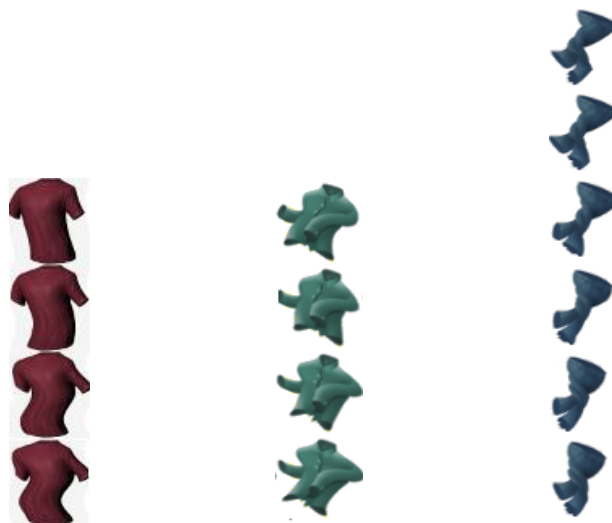
**Figure 3-4 Pre Wash Window**

During the Pre wash stages the bitmaps needed are “dropped” from the top of the display to the Process point. The bitmaps used are shown in the images below. They are “dropped” one after the other during the Pre Wash process to the Process Point.



**Figure 3.2.4-2 Wash, Rinse and Spin Images**

The above displayed bitmaps, used for the Washing process are changed in different angles (as shown below) using external software such as Gimp, or Microsoft Paint.



**Figure 3.2.4-3 Wash, Rinse and Spin Process Images Altered**



These bitmaps are accessed using their respective cell numbers as seen in the image as seen in the code below:

For Wash and Spin:

```
Ft_App_WrCoCmd_Buffer(phost,VERTEX2II(200,60,ProcessFlag-2,BitmapTr));
```

For Rinse:

```
rotate_around(RotX,RotY,th); /* The images are rotated first:*/
```

```
Ft_App_WrCoCmd_Buffer(phost,VERTEX2II(200,60,ProcessFlag-2,BitmapTr));
```

For the Washing process, bubbles bitmaps are moved in different locations using the `ft_random` command. The offset of the bubbles are calculated by using the Display Width and Display Height.

The distance the bubbles move is calculated by adding the "xdiff" and "ydiff" values to the offsets.

```
W_Bubble[i].xOffset = ft_random(FT_DispWidth);
W_Bubble[i].yOffset = ft_random(FT_DispHeight);

W_Bubble[i].xDiff = ft_random(16) ;
W_Bubble[i].yDiff = ft_random(8) ;

Ft_App_WrCoCmd_Buffer(phost,VERTEX2II(W_Bubble[i].xOffset,W_Bubble[i].yOffset,4,0));
W_Bubble[i].xOffset += W_Bubble[i].xDiff;
W_Bubble[i].yOffset += W_Bubble[i].yDiff;
```



**Figure 3-5 Wash Window**

For the Rinsing process, the bitmap is rotated at half its path.



**Figure 3-6 Rinse Window**

For the Spinning process, the bitmaps are displayed one after the other to create an animation effect.



**Figure 3-7 Spin Window**

The Process point displays the text "DONE" when the process is complete.



**Figure 3-8 Process Completed Window**

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## Appendix A– References

### Document References

1. Datasheet for VM800C
2. Datasheet for VM800B
3. FT800 programmer guide FT\_000793.
4. FT800 Embedded Video Engine Datasheet FT\_000792

### Acronyms and Abbreviations

Terms	Description
SPI	Serial Peripheral Interface
GUI	Graphical User Interface

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## Appendix C– Revision History

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