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Spec No: 002-04742

Spec Title: AN204742 - F2MC-8FX Family, MB95200 Series Vacuum Cleaner Demo

Replaced by: None

AN204742

F²MC-8FX Family, MB95200 Series Vacuum Cleaner Demo

This application note describes the functionality of MB95200 Series Vacuum Cleaner Demo.

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1 Introduction

The vacuum cleaner is widely used in family today. It can be distinguished in two kinds by the control way: mechanical and intelligent. The first kind is low-cost but it brings much disturbance to the power line which is not allowed in many areas of the world. The second kind can deal with the disturbance problem at a little higher cost and also has various functions. In the following part, we will introduce a low-cost, high-stability demo based on Cypress MB95F200 series MCU for vacuum cleaner.

It supports the following features:

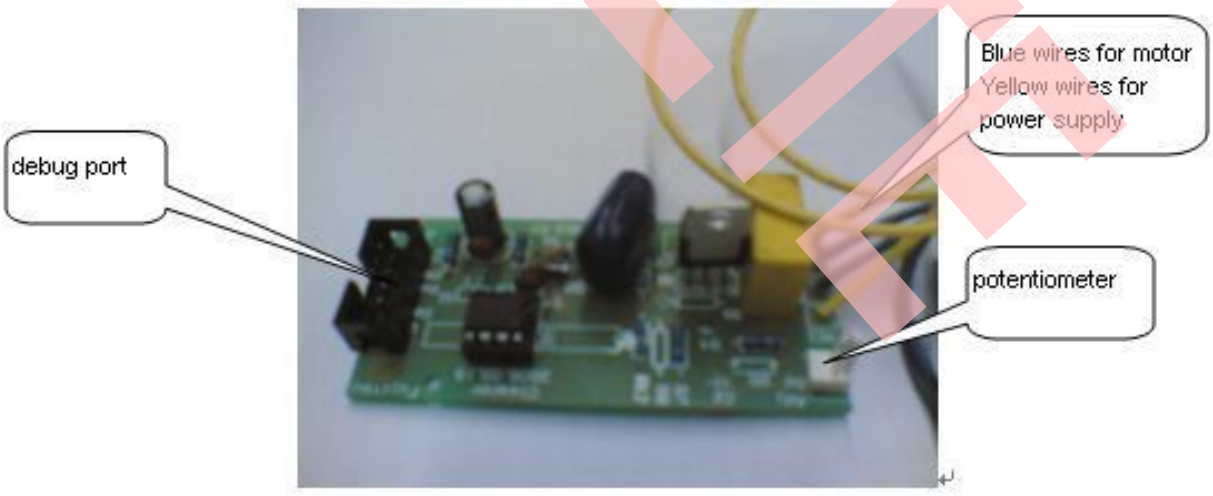
- Non-isolated powered by 220v using RC block
- Zero-cross and Frequency Detecting to power line
- A/D input for speed setup
- PWM to modulate SCR

2 Demo Platform

2.1 Platform

This design has little components but it is of high quality. It is easy to connect and fix. The yellow wires are connected to the 220v AC. The blue wires are connected to the AC motor. User can change the speed by potentiometer. Please refer to the Figure 1.

Figure 1. Vacuum Cleaner Demo



2.2 Operation Notice

Because the system is powered by 220v without any isolated part, before you operate the demo, please see the advice below:

1. DO NOT TOUCH THE DEMO WHEN IT WORKS!
2. When you debug the system, please use low AC power (12v-20v) supply which can avoid system failure.

3 Function

Figure 2 is the top view of a vacuum cleaner. The knob in the centre is connected to a potentiometer. Turning the knob can change the motor speed. When the prominence on the knob aims at the 'MIN', the motor will run at a minimum speed; while when the prominence aims at the 'MAX', the motor will run at maximum speed.

Figure 2. Top View of Vacuum Cleaner



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4 Hardware

In this system, transformer is not used to transform 220v AC to the MCU-acceptable voltage. The MCU is hanged on the power line in the way of floating GND. The RC block will reduce the current that going through the MCU system. D and D1 makes up the rectifier stage. The voltage between the Vss and Vcc of MCU is restrained to about 5V by D1. Two PWM output pins are connected to the gate of TRIAC to open the TRIAC at the zero-cross point. The two PWM have the same phase, duty and frequency. P12 is used for zero-cross detecting.

Figure 3 shows the schematic diagram.

Figure 3. Vacuum Cleaner

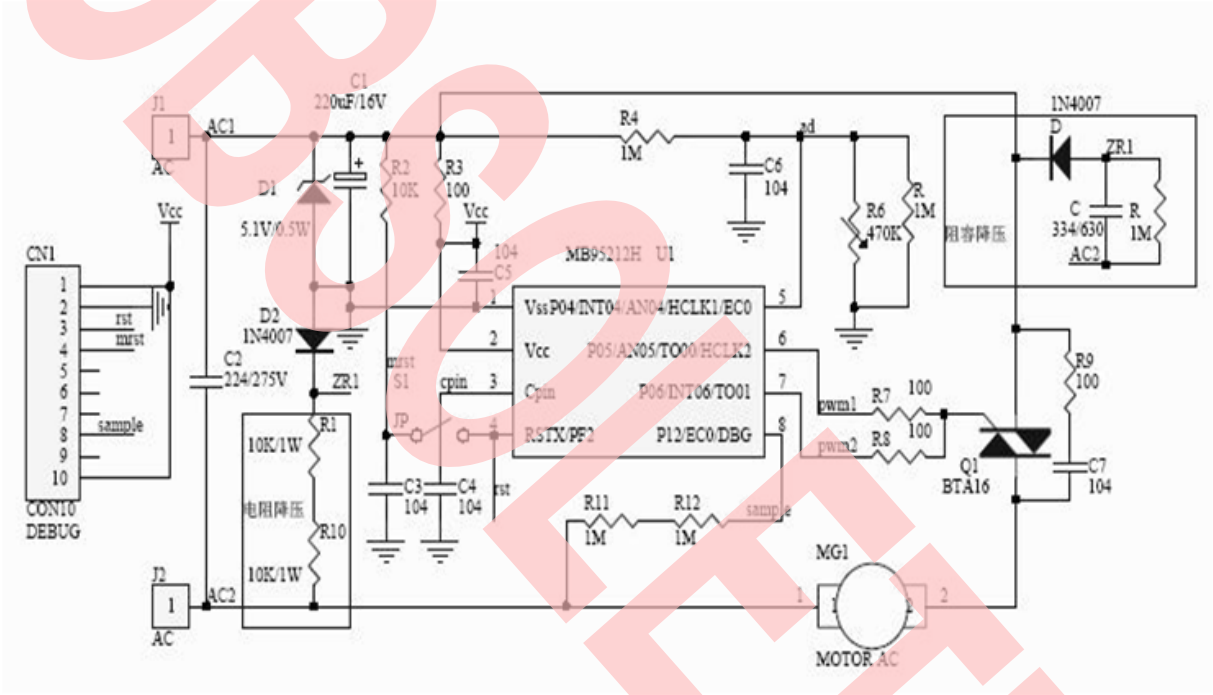


Table 1 gives the MCU pin assignment.

Table 1. MCU Pin Assignment

Number	Pin	Direction	Function
5	P04	INPUT	A/D input
6,7	TO00/TO01	OUTPUT	PWM output to SCR gate
8	P12/DBG	INPUT/DUAL DIRECTION	Zero-cross detecting/Debug port

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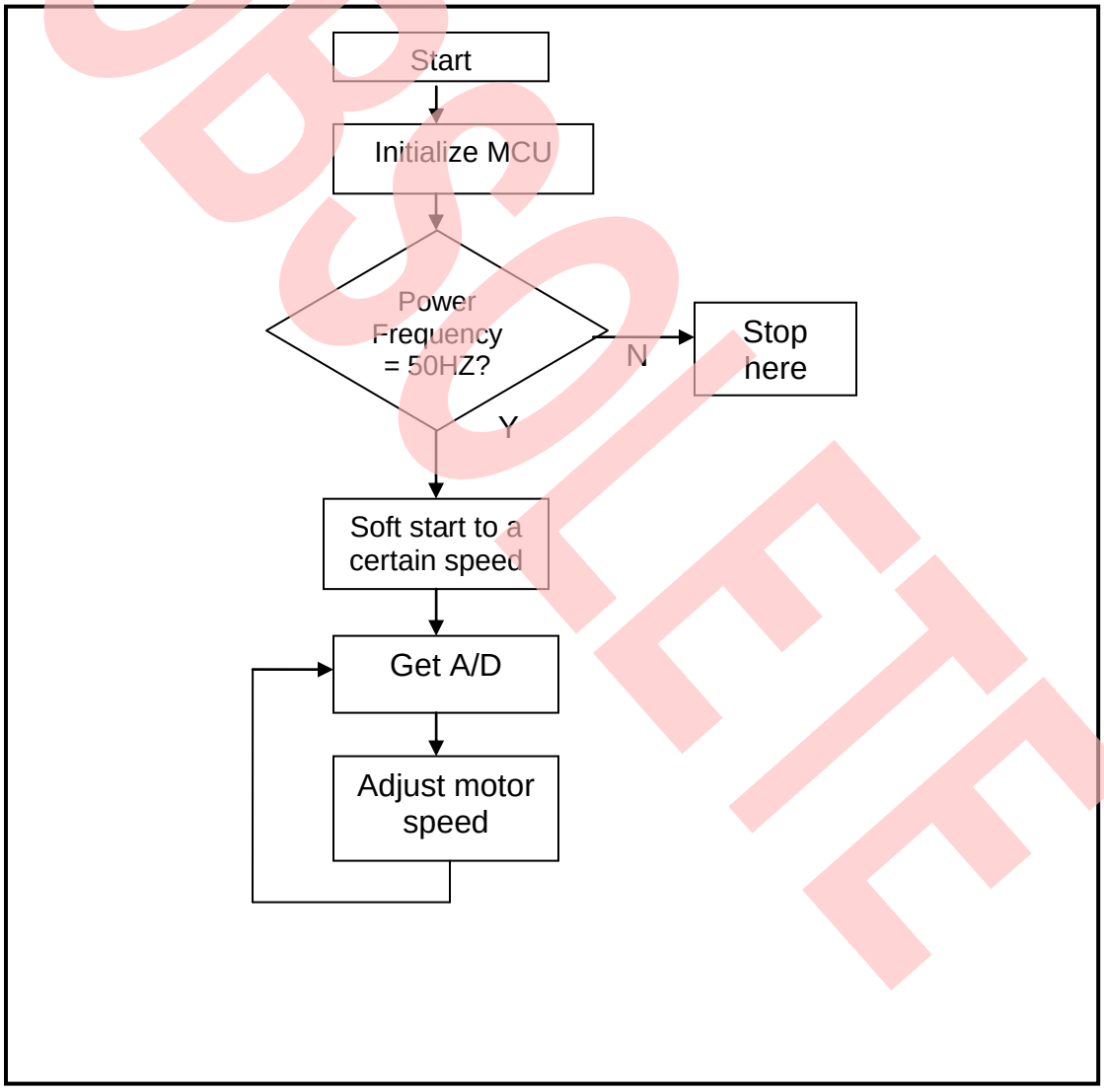
5 Firmware

5.1 Flow Chart

To this system, the firmware implemented three main functions: get speed setup, detect the zero-cross point and adjust the trigger phase of the SCR. Speed setup is gotten by A/D input. The value of the A/D input will control the trigger phase of the SCR. Zero-cross point supplies a reference to the trigger point. Additionally, the frequency of the AC power is important to this design because many parameters are based on 50HZ AC power.

Figure 4 gives the flow chart of the firmware.

Figure 4. Flow Chart



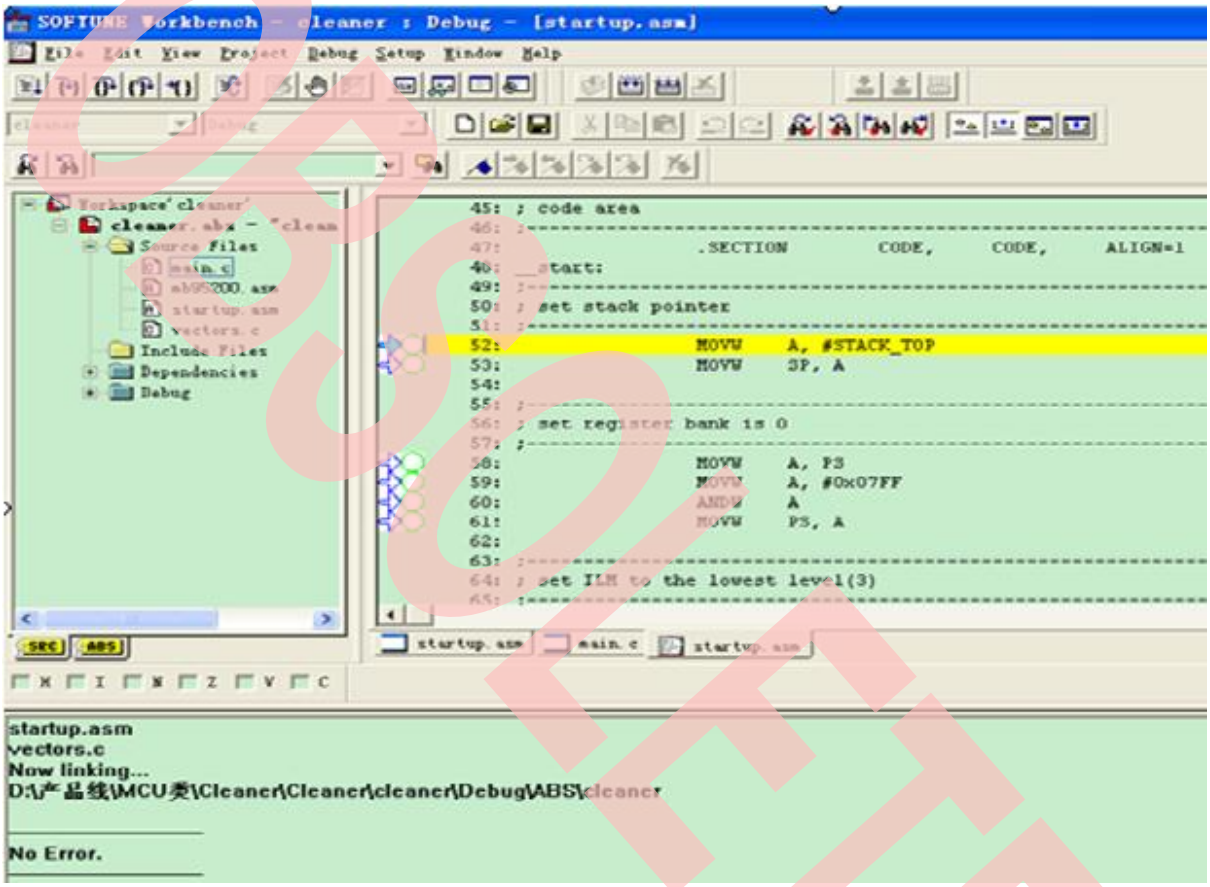
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5.2 Project

This demo uses MB95F212H to implement all the functions. MB2146-08-E and SOFTUNE V3 are used to debug the demo.

The Project is shown in Figure 5.

Figure 5. Project



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6 Document History

Document Title: AN204742 - F²MC-8FX Family, MB95200 Series Vacuum Cleaner Demo

Document Number: 002-04742

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	-	HUAL	11/04/2009	Initial release
*A	5233350	HUAL	06/17/2016	Migrated Spansion Application Note MCU-AN- 500058-E-10 to Cypress format There is no web link for where/how to get the board and firmware mentioned in the document. So this AN is for obsolete.

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