Freescale Semiconductor
Users Guide

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MC9S12HY64 Automotive Cluster Demo Users Guide

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1 Demonstration Board Hardware

The dashboard is developed with Freescale's low cost 16-bit microcontroller the MC9S12HY, which is responsible for driving all the board functionality. The hardware comes complete with four motors that are shaft-illuminated (providing an aesthetic back-light for the needle pointers), a 160-segment LCD display, molex CAN and LIN connections, a piezoelectric speaker to demonstrate sound capability, and a series of switches and LEDs to emulate standard dashboard functionality.

Contents

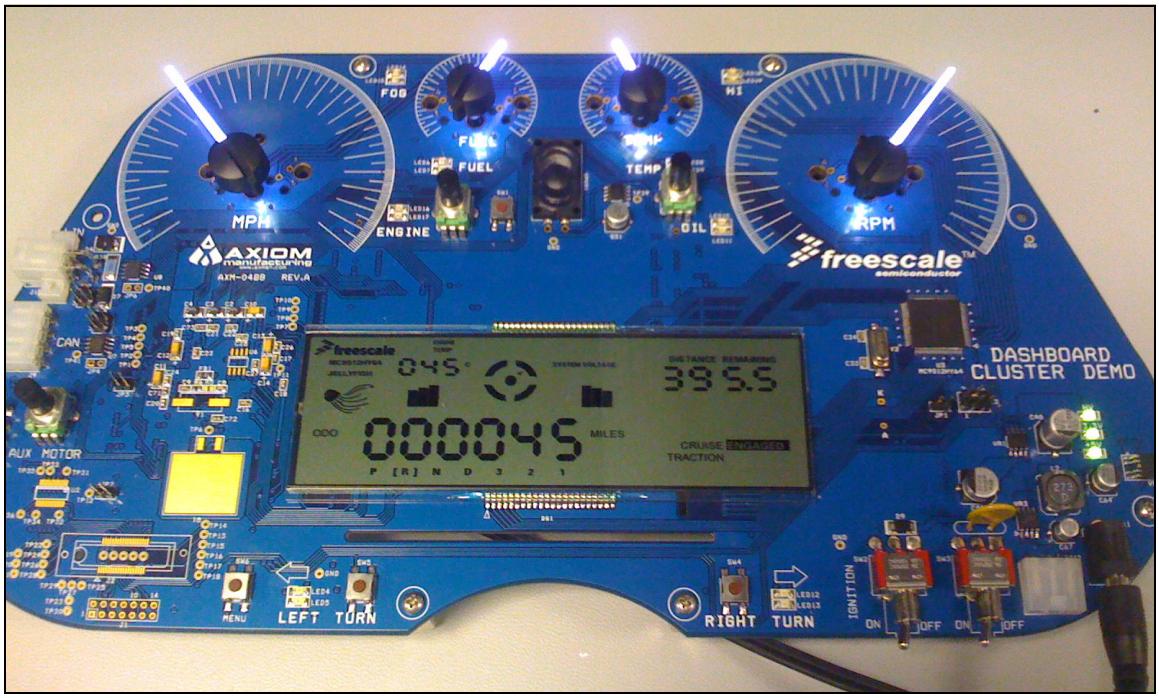

Figure 1. MC9S12HY Dashboard Cluster Demo Board

2 How to Set Up and Operate the Demo

The demo is very straightforward to set up. It requires a 12 V DC supply, which is connected at the bottom right-hand side of the board, as shown in Figure 1. Switch three should be set to the on position. (This demo does not use switch two, the ignition switch, so it can be in any state.) The demo will then start automatically in the initialization phase (described below) and all motors will return to zero all at once.

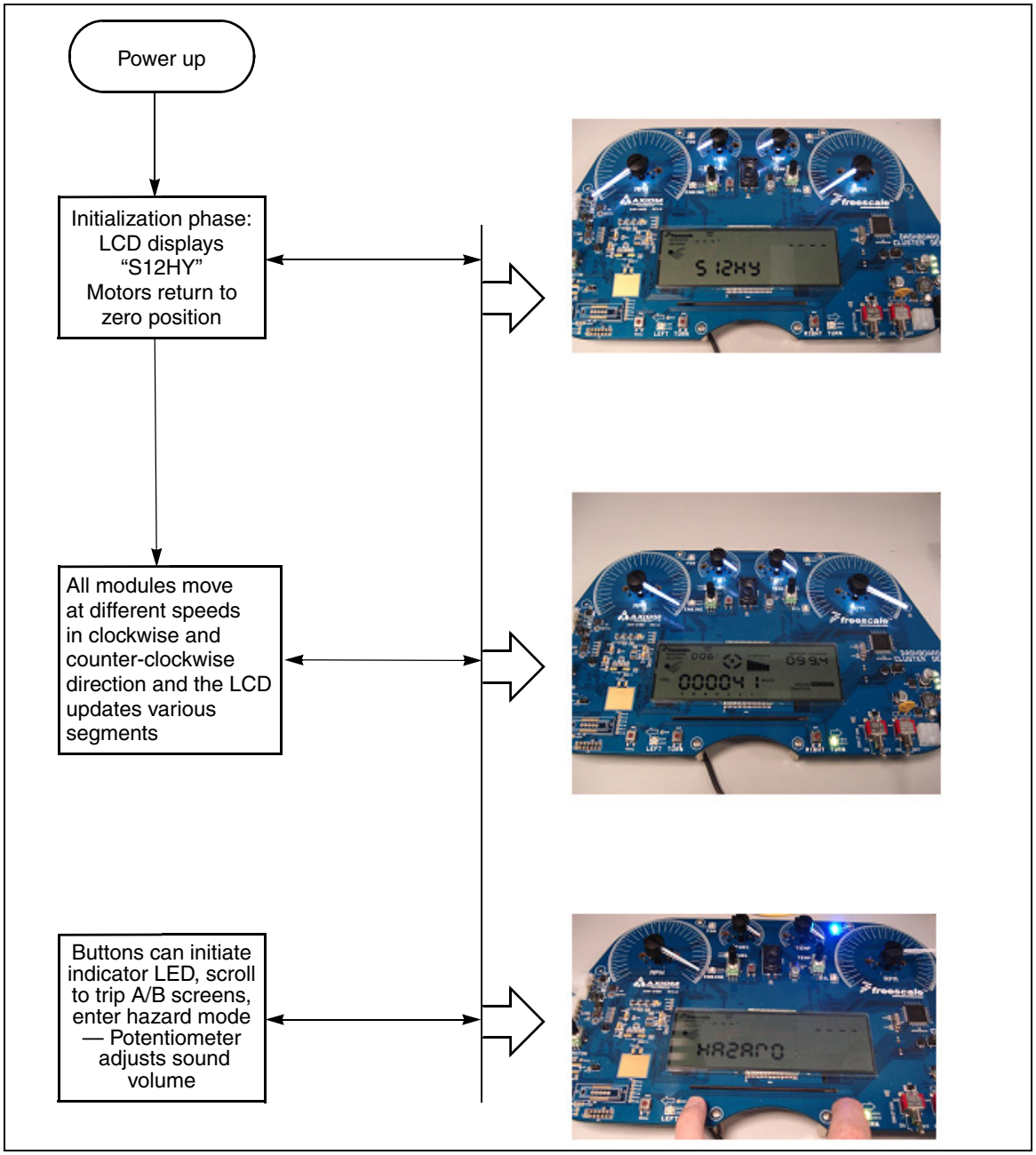

Figure 2. Flow Diagram (With Pictures) of Demo Operation

Besides driving the motors and LCD, the demo incorporates some software solutions that enhance functionality.

1. Pressing switch 5 activates a horn sound and pressing switch 4 toggles the cruise control on and off.
2. Pressing the menu switch allows the user to scroll through the odometer, trip A meter, and trip B meter. This is indicated clearly on the LCD, and the user will also see the digits change.
3. By pressing switch 4 and 5 simultaneously, the demo will enter hazard mode, shut down the operation, enable an alarm sound, and begin to flash and display “hazard” on the LCD. Release the switches to return the demo to normal operation.
4. The piezoelectric speaker plays a continuous indicator relay clicking sound. Turning the potentiometer varies the amplitude of the PWM signal that is fed to the piezoelectric speaker.

Further incorporated into this demo are two significant software solutions. First, it should be noted that the MC9S12HY does not contain a hardware stepper stall detect module (SSD), which means that the motor cannot detect the zero position and cannot determine when the end of travel has been reached. But this demo is capable of both — an integrated driver capable of performing stall detect with microstepping is used to enhance the motor functionality for these purposes.

Second, the user will notice that the odometer value displayed on the LCD is maintained even after powering the demo off and then back on, despite the MC9S12HY device having no EEPROM. The demo uses an emulated EEPROM software driver, available for free on the Freescale website, which uses the device’s D-flash to read and write the odometer values.

3 FAQs and Talking Points

1. Is the SSD software available for general use?
   — An application note, AN4024 has been released explaining the SSD software technique and is available with demo software.
2. Only the odometer value is restored at POR — why aren’t the other values restored?
   — This application is for demonstration purposes, so only the odometer value has been programmed with the EEE driver. In a production application other values, such as the trip A/B meter, can be implemented in the same way.
3. How are the shaft pointers illuminated?
   — Each motor includes an integrated white LED which is connected directly to a GPIO. (It should be pointed out that these require one GPIO each.) Shafts are illuminated by controlling the GPIO in a manner normally used for initiating LEDs.
4. What is Jellyfish?
   — This is the internal code name for this device, which is why a jellyfish symbol and the word “Jellyfish” appear on the LCD screen.
5. There are a number of other components that do not seem to be used, as well as some non-populated components. What are they?
   — The non-populated components are for the 32-bit MPC5606S device. This board was built with a footprint for both MPC5606S (found on the underside of the board) and MC9S12HY. This is

why some LEDs and potentiometers do not operate with this demo: the MC9S12HY does not support them.

6. The demo board contains a CAN and LIN molex connector. Do these work?
   — Yes, but they have not been enabled on this demo.
7. Where can I find the schematics of the demo, and is there demo code available?
   — Axiom will provide a CD with both schematics and software when you purchase the board. The firmware for this demo is not openly available.
8. Is it possible to have a backlit LCD?
   — It is not included on this demo, but it is possible. However, it may be difficult to implement if the LCD has already been soldered to the board. The backlight requires a 5 V DC power supply and a GPIO has been made available on this demo for this purpose.
9. I see a connection for auxiliary motors on the left-hand side of the board — what is it for?
   — This connector allows the connection of additional motors, but is not available for the MC9S12HY (which can drive a maximum of only four motors). It is for the MPC5606S only.
10. If I don't like the piezoelectric speaker sound, can I change it?
   — Yes. This is a PWM signal being fed via an amplifier, and it is possible to alter it.

4 Additional Resources and Materials

Application notes available at www.freescale.com:

- Application note titled *Introduction to the Stepper Stall Detector Module* (document AN3330).
- Application note titled *Comparison of the S12XS CRG Module with S12P CPMU Module* (document AN3622) gives an explanation of the CPMU clock module.
- Application note titled *High Speed Stall Dtection on the S12HY Family* (document AN4024).
- Application note titled *MC9S12HY Family Demonstration Lab Training* (document AN4021).

Application video:

- A video tutorial demostrating the S12HY driving motors and LCD is available at S12HY Product Summary Page.

Useful websites:

- http://www.axman.com/?q=node/353 — contains software examples, VID motor documentation, and LCD glass documentation.
- http://www.axman.com/?q=node/366 — contains schematics
- www.freescale.com/16bit — EEE driver software.

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