Freescale Semiconductor
Users Guide

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16-bit MCU: S12XHY256 Automotive Cluster Demo

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1 S12XHY Dashboard Cluster Demo Board

The dashboard is run with the S12XHY 16-bit MCU, which is responsible for driving all the board functionality. The hardware comes complete with four VID-23 shaft illuminated motors, 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

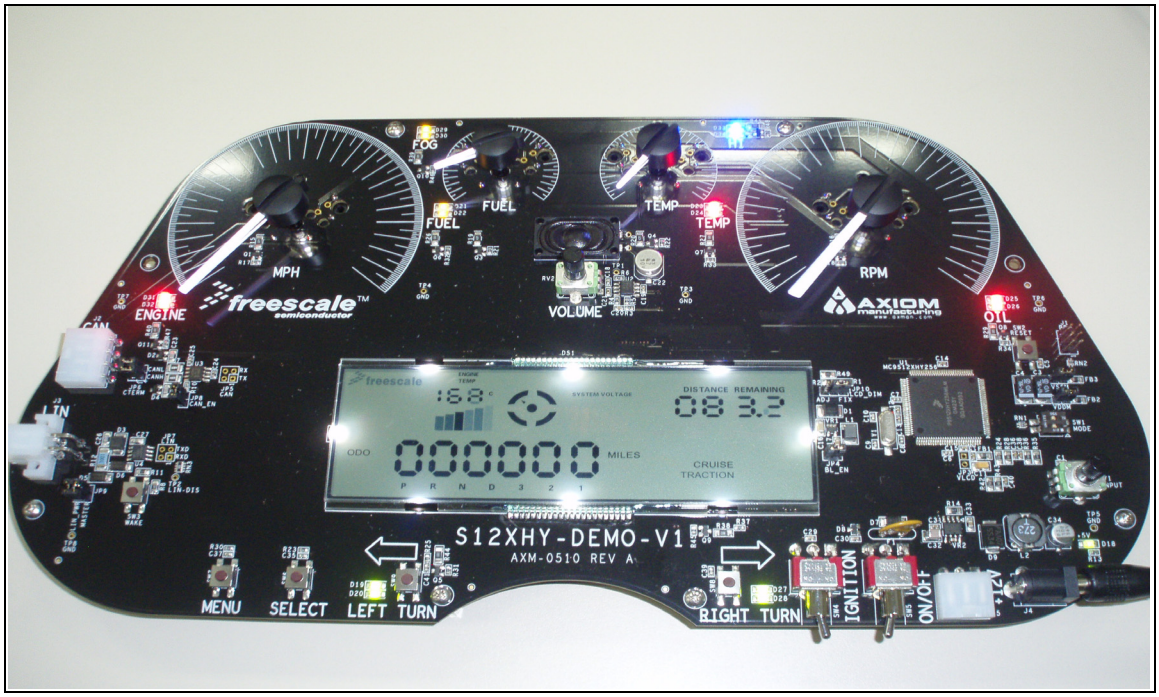

Figure 1. S12XHY dashboard cluster demo board

2 How to setup and operate the demo board

The demo is very straightforward to setup. It requires a 12 volt DC supply, which is connected at the bottom right side of the board as shown in Figure 1. Switch 5 should be set to the on position (This demo does not use switch 4, ignition switch, so it can be in any state). The demo will then start automatically in the initiation phase, as described below, and all motors will return-to-zero all at once.

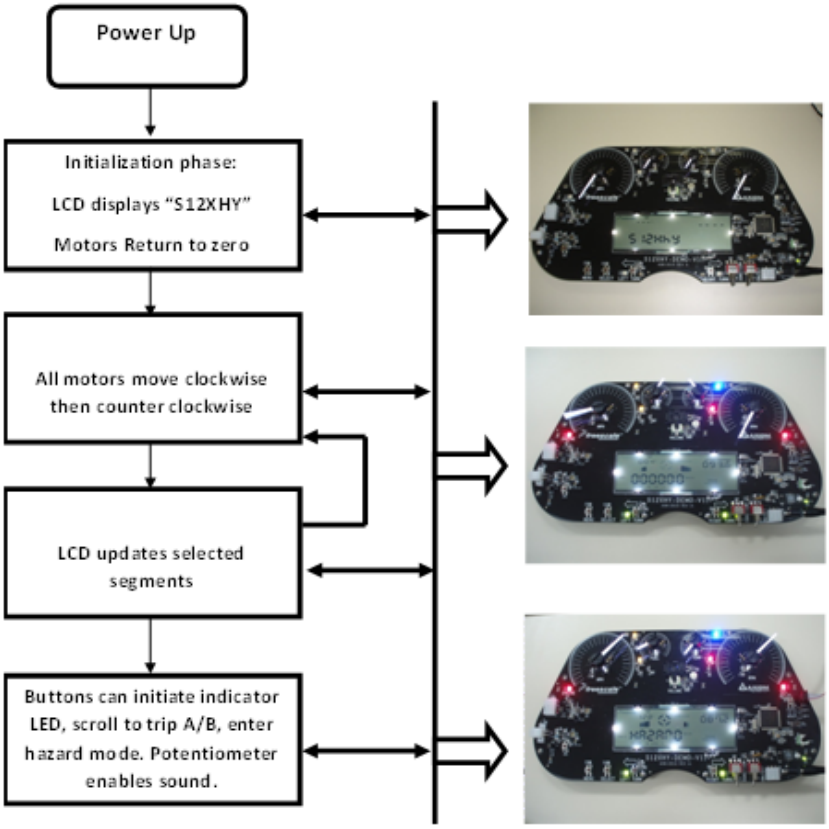

Figure 2. Flow diagram with images of demo operation

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

- Pressing switch 9 activates a horn sound and pressing switch 8 toggles the cruise control on and off.
- 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 notice the digits change.
- By pressing the indicator switches simultaneously, the demo will enter a hazard mode and will shutdown operation and begin to flash and display 'hazard' on the LCD. Normal operation is commenced by letting go of the switches.
- The piezoelectric speaker plays a continuous indicator relay clicking sound. Turning the "VOLUME" potentiometer varies the amplitude of the PWM signal that is fed to the piezoelectric speaker.
- The four motor indicators light are controlled as follows:
  - MENU, switch 7, controls MPH indicator light. Pressing the MENU switch for a second will turn off MPH indicator for 10s.
  - SELECT, switch 6, controls FUEL indicator light. Pressing the SELECT switch for a second will turn off FUEL indicator for 10s.

  - LEFT TURN, switch 9, controls TEMP indicator light. Pressing the LEFT TURN switch for a few second (after the horn sound has passed), will turn off TEMP indicator for 10s.
  - RIGHT TURN, switch 8, controls RPM indicator light. Pressing the RIGHT TURN switch for a second will turn off RPM indicator for 10s.
- This demo is capable of identifying RTZ (return-to-zero) position either by SSD (Stepper Stall Detection) hardware module or by SSD software logic at demo power up. This is configured at project compilation time, the current SSD implementation is displayed while the four stepper motors are calibrating the zero position at power up:
  - SSd-h- for SSD HW RTZ implementation.
  - SSd-S- for SSD SW RTZ implementation.

For this S12XHY demo you will see SSd-h- message.

NOTE

SSD is only active during startup at RTZ calibration. After RTZ position has been determined the motors deactivate this logic and start moving CW and CCW.

The odometer value displayed on the LCD is also of importance. The user will notice that on switching on or switching off the demo, the odometer value is maintained despite the S12XHY device having no EEPROM. The demo uses an emulated EEPROM software driver, available freely 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 upon POR, why isn't the other values restored?
   - This is for demonstration purposes and as such only the odometer value has been programmed with the EEE driver. Other values such as the trip A/B meter can be implemented in the same way.
3. How is the shaft pointers illuminated?
   - The motors include an integrated white LED, which is connected directly to a GPIO. It should be pointed out that these require a GPIO each. So, controlling the GPIO in a general manner for initiating LEDs is how it's done.
4. The demo board contains a CAN and LIN Molex connector, do these work?
   - Yes, they work; but have not been enabled on this demo.
5. Where can I find the schematics of the demoboard? Is the demo code available?
   - When you purchase the board, Axiom provides a CD with both schematics and software. The firmware for this demo is not openly available.
6. I don't like the piezoelectric speaker sound, can I change it?

— Yes, you can. Since a PWM signal being fed via an amplifier to the piezoelectric speaker, it is possible to alter the PWM signal, and be more creative with it.

4 Additional Resources and Materials

Application Notes:

These application notes are available at http://www.freescale.com

- Introduction to the Stepper Stall Detector Module (*document AN3330*).
- Migrating Applications from S12HY64 to S12XHY256 16-bit Automotive Cluster Migration *(document AN4201)*
- High Speed Stall Detection on the S12HY and S12XHY Family (*document AN4024*)

Useful websites:

- For software examples, VID motor documentation, cluster demo schematics, and LCD glass documentation visit http://www.axman.com/?q=node/377
- For EEE driver software visit http://www.freescale.com/16bit

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