

TWR-S08PT60

Lab Guide

Rev 1.0



Contents

1	Purpose	3
2	Software Requirements.....	3
3	Default Jumper Settings.....	3
4	Lab 1—Touch Sensing Interface (TSI) with low power demo.....	5
5	Lab 2—Potentiometer demo	5
6	Lab 3—Accelerometer demo	6
7	Lab 4—UART loop demo	6
8	Lab 5—IR demo	6
9	Lab 6—SPI demo	7
10	Lab 7—Flash and EEPROM demo	8
11	Lab 8—BLDC demo.....	10

1 Purpose

These labs will show the various MC9S08PT60 demo examples on the Tower System module. LAB1 to LAB6 are integrated in a single project TWR-S08PT60_lab, while others are independent. You can switch from LAB1 to LAB6 via the keyboard interface SW2 and/or SW3. The demo examples include TSI with low power, potentiometer, accelerometer, IR, UART loop demo, and SPI demo. You can also play with the standalone Flash & EEPROM lab (TWR-S08PT60_flash_lab), as well as the BLDC demo (TWR-S08PT60_bldc_demo).

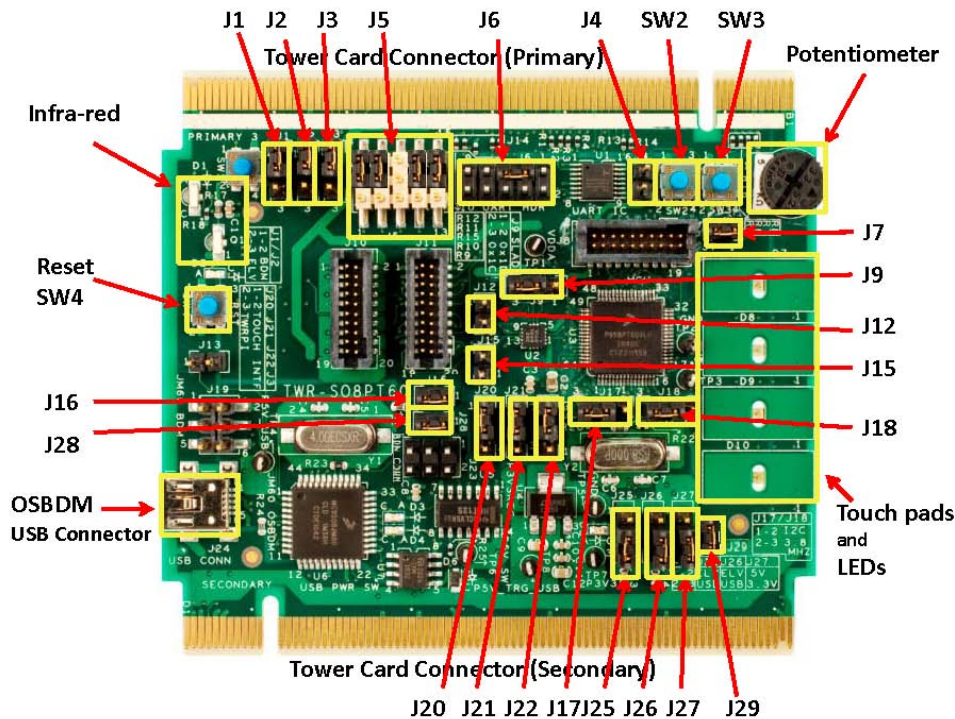
2 Software Requirements

Compiler, linker, and debugger:
 CodeWarrior 10.1 or newer with S08PT60 service pack
http://www.freescale.com/webapp/sps/site/homepage.jsp?code=CW_HOME

Tower System Tool Kits:
 P&E virtual serial toolkit V2.05
<http://www.pemicro.com/osbdm/index.cfm>

3 Default Jumper Settings

Before working with labs, make sure that the default jumpers on the TWR-S08PT60 Tower System Module are as the following table before applying power to the module. The picture below outlines the position of the affected jumpers and the components.



Default Jumper Settings Table

Jumper	Setting	Description
J1	1 - 2	USB to UART2 (Rx)
J2	1 - 2	USB to UART2 (Tx)
J5	2 - 3	UART (SCI0 Tx)
	5 - 6	UART (SCI0 Rx)
	11 - 12	Infrared (Tx)
	14 - 15	Infrared (Rx)
J6	3 - 5	UART (Rx to Tx)
J7	1 - 2	Potentiometer
J9	2 - 3	Accelerometer default address
J12	open	Accelerometer INT1
J15	open	Accelerometer INT2
J16	1 - 2	OSBDM to onboard PT60 (BKGD)
J17	2 - 3	External clock (EXTAL)
J18	2 - 3	External clock (XTAL)
J20	2 - 3	TWRPI to PT60
J21	2 - 3	TWRPI to PT60
J22	2 - 3	TWRPI to PT60
J25	2 - 3	Power supply 5V selection
J26	2 - 3	Power supply 3.3V selection
J27	2 - 3	Power supply level selection
J28	1 - 2	OSBDM to onboard PT60 (/RESET)
J29	1 - 2	Power supply for PT60 and IDD measurement

Note: All other jumpers are OPEN.

4 Lab 1—Touch Sensing Interface (TSI) with low power demo

This lab will pick up with the PT60 lab example pre-loaded into the microcontroller's on-chip flash memory described by the TWR-S08PT60 Quick Start Guide. The TSI example is the default demo upon powering up the module with factory settings and can be entered by running the pre-loaded software and following the steps.

1. Make sure that the PT60 LAB example is downloaded to flash as described in Quick Start Guide.
2. From the Windows Start Menu select "P&E OSBDM OSJTAG Virtual Serial Toolkit->Utilities>Terminal Utility", and configure properties as Port: USB COM, Baud: 9600bps, Parity: None, Bits: 8. Click on "Open Serial Port".
3. Reset the microcontroller by pressing the RESET button labelled "SW4".
4. Release "SW4", the welcome message "Welcome to TWR-S08PT60 demo show!" will be printed on the terminal and the TSI demo mode is entered. The following messages are then outputted to the terminal:
"Test touch pad, touch any pad and see its LED."
"If no touch lasting for 5 seconds, MCU will enter into stop mode!"
"When touch occurs, will wake up MCU and restore normal running!"
"Press and release SW2 to enter potentiometer demo."
5. If any touch pad is touched, the corresponding LED will be toggled, and if no touch for 5 seconds, the microcontroller will enter into stop mode.
6. After the microcontroller enters into stop mode, if holding touch pad for 1 second, the microcontroller will be woken up and print the following message.
"wake PT60 from stop mode!"
"restore PT60 to normal mode!"

5 Lab 2—Potentiometer demo

Lab 2 will demo the on-chip ADC module by measuring the voltage change through the potentiometer. D7, D8 & D9 LEDs will indicate the status according to the ADC result. When the previous lab is running, the potentiometer demo can be entered by following steps

1. Make sure the previous lab is running.
2. Press and release the button labelled "SW2". The following message will be printed on the terminal:
"Test potentiometer, rotate potentiometer and see LED changes."
"Press and release SW3 to enter accelerometer demo."
3. Rotate the potentiometer labelled "R16" to the left, toward the "SECONDARY side". The potentiometer is at the minimum voltage when it stops. The LED labelled "D7" is on. Both "D8" and "D9" are off.
4. Rotate the potentiometer toward "PRIMARY side" until the LED labelled "D8" is lit.
5. Rotate the potentiometer toward "PRIMARY side" until the LED labelled "D9" is lit.

6 Lab 3—Accelerometer demo

This lab will show the accelerometer demo, which gets the three-axis acceleration data via IIC interface. When Lab 2 is running, the accelerometer demo can be entered by following steps:

1. Make sure that LAB2 is running.
2. Press and release the button labelled “SW3”. The following messages will be shown on the terminal:
“Test accelerometer, rotate board and see LED changes.”
“Press and release SW3 to enter UART demo.”
3. Rotate the Tower System module, the LEDs labelled “D7”, “D8”, “D9”, “D10” will switch to on or off according to accelerometer data.

7 Lab 4—UART loop demo

This lab will show how to use serial port for communication with each other and use on-chip CRC engine to validate data integrity. When Lab 3 is running, the UART loop demo can be entered through the following steps:

1. Make sure that Lab 3 is running.
2. Press and release the button labelled “SW3”. The following messages will be shown on the terminal:
“Test UART, if LED flashes, it indicates error.”
“Press and release SW3 to enter IR demo.”
Wait for a few seconds; it will print UART test result:
“UART communicate with CRC verify success!”
Or
“UART communicate with CRC verify fail!”
In the same time, if success, D7, D8, D9 and D10 will be always on, and on the contrary, those LEDs will flash.

8 Lab 5—IR demo

This lab will show how to communicate with the other board via Infrared. When Lab 4 is running, the IR demo can be entered by following steps:

1. Make sure that Lab 4 is running.
2. Make sure that TWR-S08PT60_IR_echo project code is downloaded into the other Tower System module called IR echo node with the same default jumper settings. Cycle power to IR echo node, D10 will flash. Now keep both boards close and make sure that D1 is directed at Q1 from the other board.
3. Press and release the button labelled “SW3”, the following messages will be shown on the terminal:
“Test IR, please use two boards and keep them close!”
“Press and release SW3 to enter into SPI demo.”
If no data is received from IR echo node, it will show the message:

“IR test failed!”

If the received data is wrong, will show “X”, D8 starts to flash, so you need to move the board, and keep D1 and Q1 to be aligned.

If the communication is successful, D10 flashes and the following message appears:

“IR test success!”

9 Lab 6—SPI demo

This lab will show how the master and the slave communicate via SPI0 (8-bit) and SPI1 (16-bit with FIFO).

1. Make sure that power is disconnected from the board. Close the serial port in P&E Terminal Window by clicking “Close Port”.
2. On primary side, connect SPI pins as table below:

Name	Connect (at primary side)
MISO	Connect B11 , B44
MOSI	Connect B10 , B45
SCLK	Connect B7, B48
CS	Connect B9, B46

3. Open the serial port in the P&E Terminal Window. Apply the power to the board.
4. Switch the demo mode from Lab 1 to Lab 5 by following the SW2 and SW3 steps in previous labs.
5. Press and release the button labelled “SW3”, the following messages will be shown on the terminal:
 - “Test SPI communication,SPI0 is the master and SPI1 is the slave with FIFO!”
 - “If success, Green light flashes;”
 - “Otherwise, Red light flashes”
 - “ Press and release SW3 to enter into TSI demo”
6. If SPI0 fails to send data to SPI1, it will show:
 - “Error: SPI0 failed to write data to SPI1!”
 Meanwhile, the LED labelled “D8” will flash.
7. If SPI0 fails to read data from SPI1, it will show:
 - “Error: SPI0 failed to read data from SPI1!”
 Meanwhile, the LED labelled “D9” will flash.
8. If both SPI0 write and read fail, it will show:
 - “Error: SPI0 failed to communicate with SPI1!”
 Meanwhile, the LED labelled “D9” and “D8” will flash.
9. If test success, it will show message:
 - “SPI communication is success!”
 The LED labelled “D10” will flash.
10. Press and release “SW3” to go back the first demo: TSI demo.

10 Lab 7—Flash and EEPROM demo

This lab will show how to use Flash and EEPROM typical operational commands: Erase Verify All Blocks, Erase Verify Flash/EEPROM block, Erase Verify Flash/EEPROM section, Program EEPROM/Flash, Erase EEPROM/Flash sector, Erase EEPROM/Flash block, Erase all blocks. Follow steps below to play with this demo:

1. Make sure the latest P&E OSBDM Virtual Serial Toolkit is installed. Please refer to TWR-S08PT60 Quick Start Guide for installation details
2. Make sure the board is powered with USB connection and the S08PT60_Flash_Lab code is downloaded into the board.
3. Open P&E Terminal Utility, configure properties as below followed by clicking on “Open Serial Port”:
Port: USB COM; Baud: 9600; Parity: None; Bits: 8
4. Press and release SW4 (RESET) button, the welcome message and the commands list will be printed on Terminal.
5. Enter “help” in the command line beginning with “CMD>”. The command list will be printed on Terminal.
6. Enter the command “ev_fb fc00” to erase verify (blank check) the whole flash block containing address 0xfc00, where “fc00” is the address in hex in the flash block. The following message will be shown as a result of the command: “EraseVerify flash block failed (i.e., flash is not blank)!”. This is correct because the flash block contains code that is running.
7. Enter the command “ev_eep 3100” to erase verify (blank check) the whole EEPROM block containing address 0x3100. The following message will be shown as a result of this command: “EraseVerify EEPROM block success (EEPROM is blank)!”. This is correct because the EEPROM block has not been programmed.
8. Enter the command “ev_fs fc00 10” to erase verify (blank check) the flash section starting from 0xfc00 with size of 10 longwords. The following message will be shown as a result of the command: “EraseVerify flash section success (flash section is blank)!” This is correct because this flash section has not been programmed.
9. Enter the command “ev_fs 3200 100” to erase verify (blank check) the flash section starting from 0x3200 with size of 100 longwords. The following message will be shown as a result of the command: “EraseVerify flash section failed (i.e., flash section is not blank)!” This is correct because this flash section has been programmed with the LAB code.
10. Enter the command “ev_eeps 3100 100” to erase verify (blank check) the EEPROM section starting from 0x3100 with size of 100 bytes. The following message will be shown as a result of the command: “EraseVerify EEPROM section success (EEPROM section is blank)!” This is correct because this EEPROM section has not been programmed.
11. Enter the command “ev_all” to erase verify (blank check) all blocks including the flash block and EEPROM block. The following message will be shown as a result of the command: “EraseVerify all

- blocks failed (i.e., all blocks are not blank)!” This is correct because the flash block has been programmed with the LAB code.
12. Enter the command “pg_eep 3100 1 2 3 4 5 6 7 8” to program EEPROM block starting at address 0x3100 with data bytes 1,2,3,4,5,6,7 and 8. The following message will be shown as a result of the command: “Program EEPROM success!”
 13. Enter the command “pg_f fc00 1 2 3 4 5 6 7 8 255 256” to program flash block starting at address 0xFC00 with data bytes 1,2,3,4,5,6,7,8,255 and 256. The following message will be shown as a result of the command: “Program flash success!”
 14. Enter the command “ev_eeps 3100 8” to erase verify (blank check) the EEPROM section starting from 0x3100 with size of 8 bytes. The following message will be shown as a result of the command: “EraseVerify EEPROM section failed (i.e., EEPROM section is not blank)!” This is correct because this EEPROM section has been programmed in Step 12.
 15. Enter the command “ev_fs fc00 10” to erase verify (blank check) the flash section starting from 0xfc00 with size of 10 longwords. The following message will be shown as a result of the command: “EraseVerify flash section failed (i.e., flash section is not blank)!” This is correct because this flash section has been programmed in Step 13.
 16. Enter the command “ers_eeps 3100” to erase the EEPROM sector at address 0x3100. The following message will be shown as a result of the command: “Erase EEPROM sector success!”
 17. Enter the command “ers_fs fc00” to erase the flash sector at address 0xfc00. The following message will be shown as a result of the command: “Erase flash sector success!”
 18. Enter the command “ev_eeps 3100 2” to erase verify (blank check) the EEPROM section starting from 0x3100 with size of 2 bytes. The following message will be shown as a result of the command: “EraseVerify EEPROM section success (EEPROM section is blank)!” This is correct because this EEPROM section has been erased in Step 16.
 19. Enter the command “ev_fs fc00 100” to erase verify (blank check) the flash section starting from 0xfc00 with size of 100 longwords. The following message will be shown as a result of the command: “EraseVerify flash section success (flash section is blank)!” This is correct because this flash section has been erased in Step 17.
 20. Enter the command “ers_fb 3200” to erase the flash block containing the address 0x3200. There is no responding from PT60 even if the RESET (SW4) is pressed and released. This is correct because the LAB code was erased.
 21. If another session is needed, follow Step2 to download the LAB code and play with it again.

11 Lab 8—BLDC demo

This lab will demonstrate how to implement a simple BLDC motor control with the FlexTimer module FTM2 which is designed to support motor control, digital power conversion and other applications that require PWM signals. It will use touch pad 0 and touch pad 1 to control the motor speed and the rotation direction. The start and stop of the motor's spin are controlled via the keyboard interface SW2. This lab requires a special connection from the general purpose TWRPI connectors on the board to the 40-pin daughter card connector P1 on APMOTOR56F800E which can be ordered from the Freescale website: www.freescale.com/tower

The following steps show how to work with this demo:

1. Download S08PT60_BLDC_demo code to the board via OSBDM.
2. Disconnect the USB cable from PC to turn off power to the board.
3. Connect general purpose TWRPI connector of the board to P1 of APMOTOR56F800E as below:

General Purpose TWRPI pin		Motor connector pin
left side connector(J10)	right side connector (J11)	(P1)
	2	1
	3	3
	14	9
	15	11
	16	30
	18	32
	19	34
	20	36
8	13	13
11		15
12		19
7		10
15		12
16		18
		20
		22

On JG1 of APMOTOR56F800E, short Pin 2&3, 5&6,8&9.

4. Apply 9V DC power supply to P2 of APMOTOR56F800E. Check D5, D7 to D10. They are lit.
5. Press and release SW2 which sets motor to be ready state.
6. Touch pad 0, the motor starts to run in clockwise direction. Repeat touching pad 0, the motor speed will be increased up to the maximum. Both D7 and D8 flash to reflect the signals from the hall sensor.

7. Touch pad 1, the motor will decrease the spin speed. Repeat touching pad 1, the motor speed will be decreased to the minimum and then starts to spin in counter-clockwise direction. Both D7 and D8 flash to reflect the signals from the hall sensor.
8. Press and release SW2 to stop motor spinning.
9. Disconnect the power supply from P2 of APMOTOR56F800E.

Learn More: For more information about Freescale products, please visit www.freescale.com/8bit

Freescale, the Freescale logo and CodeWarrior are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Processor Expert is a trademark of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners. © 2011 Freescale Semiconductor, Inc.