

TWR-LCD

User's Manual

Rev. 1.1

Freescale Semiconductor Inc.



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1 Overview

The Tower LCD Module (TWR-LCD) adds a side mounting TFT QVGA Display to the Freescale Tower System. It can be used with a wide variety of Tower Processor Modules through a SPI and/or external bus interface (EBI).

The TWR-LCD features a 3.2" QVGA TFT LCD Display with touch sensitive overlay, 5-way navigation control, MicroSD Card slot, dedicated MCF51JM microcontroller, and a Piezo Buzzer for audible feedback. The LCD Display Controller is accessible to the dedicated MCF51JM microcontroller through the SPI. The LCD Display Controller is also accessible to any capable Tower MCU module utilizing either the SPI or the EBI. A block diagram for the TWR-LCD is shown in the figure below.

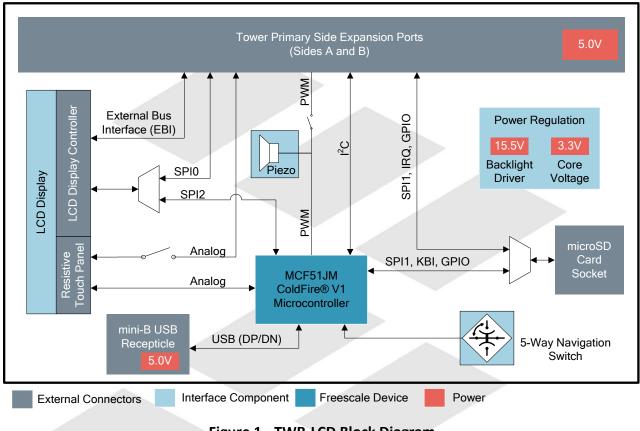


Figure 1 - TWR-LCD Block Diagram





Figure 2 - Tower System with TWR-LCD

2 Reference Documents

The documents listed below should be referenced for more information on the Freescale Tower system and the TWR-LCD. Refer to <u>http://www.freescale.com/tower</u> for the latest revision of all Tower documentation.

- TWR-LCD Schematics
- TWR-LCD Quick Start Guide
- Truly TFT2N0451-E LCD Module Specification

3 Hardware Features

This section provides more details about the features and functionality of the TWR-LCD.

3.1 Power Supply

The TWR-LCD can be powered as a standalone device from the Mini-B USB connector. The TWR-LCD can also be powered from a source in an assembled Tower System via the 5.0V supply on the TWR-ELEV Side Expansion Port. When attached to a Tower Elevator board, it is required that the board be externally powered from the Elevator board; additionally the USB connector on the TWR-LCD can still be used to communicate over USB to the on-board MCF51JM MCU. On-board power regulation will provide the necessary core voltage (3.3V) and backlight driver voltage (15.5V).



3.2 LCD Display / Controller

The TWR-LCD features a Truly Semiconductor 3.2" TFT LCD with an analog resistive touch overlay.

3.2.1 Communication Mode

The LCD utilizes a 240 RGB x 320 QVGA display controller. The display controller is accessible to the on-board MCF51JM MCU through SPI. The controller is also accessible to any compatible Tower MCU module through SPI or the External Bus Interface (EBI) via the primary Tower Side Expansion Ports.

Use SW1-DIP1 and DIP2 to configure the desired interface mode (SPI or EBI). Refer to Section 4 for more configuration details.

SW1-DIP1 (PS2)	SW1-DIP 2 (PS0)	Description			
OFF	ON	Enables SPI communication mode to the LCD Display; can be driven by SPI0 on the Primary Elevator or by the on-board MCF51JM, selectable by JM/ELE (SW1-DIP3)			
ON	OFF	Enables EBI (16b mode) communication to the LCD Display This interface is only accessible from the Tower Elevator MCU			
ON	ON	Enables EBI (8b mode) communication to the LCD Display This interface is only accessible from the Tower Elevator MCU			

Table 1 - LCD Communication Mode Settings

3.2.2 MCU Selection

The LCD can be controlled by either the on-board MCF51JM MCU or a compatible Tower MCU Module.

Use SW1-DIP3 to specify which MCU has access to the display controller. Refer to Section 4 for more configuration details.

JM/ELE	ON	Enables SPI connection from SPI0 of Primary Elevator Connector
(SW1-DIP3)	OFF	Enables SPI connection from on-board MCF51JM MCU

Table 2 - Display Driver MCU Selection

Setting the JM/ELE (SW1-DIP3) configuration switch to the "Off" position will isolate the SPI signals from the Tower MCU allowing a direct connection between the on-board MCF51JM MCU and the LCD display controller.

Setting the JM/ELE configuration switch to the "On" position will cause both the on-board MCF51JM MCU and Tower MCU SPI signals to be simultaneously connected to the LCD display controller. It is required that on-board MCF51JM MCU firmware detect the status of the JM/ELE signal and tri-state the on-board MCF51JM MCU SPI signals.



If utilizing a Tower MCU module to drive the SPI to the LCD display controller, use SW1-DIP5 to specify the desired SPI chip select.

Table 3 - Towe	r MCU SP	I CS Selection
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SPI CS SEL (SW1-DIP5)	ON	Select SPI0 CS1 as the chip-select for LCD SPI interface
	OFF	Select SPI0 CS0 as the chip-select for LCD SPI interface

3.2.3 Resistive Touch Overlay

The TWR-LCD display features an integrated analog resistive touch panel. The panel can be access by either the on-board MCF51JM MCU or a compatible Tower MCU module. The selection of which MCU interfaces the Touch Panel is independent of which MCU is driving the LCD display controller (designated by JM/ELE).

Use SW1-DIP6 to specify which MCU has access to the resistive touch panel. Refer to Section 4 for more configuration details.

Table 4 - Resistive Touch MCU Selection

TP SEL	ON	Disables MCF51JM connection to the LCD Touch Panel Use SW5 to enable ADC connection from Primary Elevator Connector
(SW1-DIP6)	OFF	Enables MCF51JM connection to the LCD Touch Panel Ensure that all switches on SW5 DIP are OFF

Setting the TP SEL (SW1-DIP6) configuration switch to the "Off" position will indicate to the on-board MCF51JM MCU that it is the interfacing MCU to the touch panel's analog signals.

Setting the TP SEL configuration switch to the "On" position will indicate to the on-board MCF51JM MCU that the tower MCU Module is the interfacing MCU to the touch panel's analog signals. It is required that on-board MCF51JM MCU firmware detect the status of the To SEL signal and tri-state the respective on-board MCF51JM MCU ADC signals.

SW5 is used to isolate the touch panel's analog signals from the Tower Elevator Side Expansion Port. This ensures correct isolation of the analog signals when the on-board MCF51JM MCU is used. SW5-DIP[4:1] should all be set to the "Off" position if the on-board MCF51JM MCU is being used to interface the resistive touch panel.

SW5-DIP 1	Touch Panel	ON	Connects AN4 (TWR-ELEV) to XPLS Touch Panel Signal
	Isolation (XPLS)	OFF	Disconnects AN4 from Touch Panel
SW5-DIP 2	Touch Panel	ON	Connects AN5 (TWR-ELEV) to XMNS Touch Panel Signal
	Isolation (XMNS)	OFF	Disconnects AN5 from Touch Panel

Table 5 - Resistive Touch Analog Isolation Settings



SW5-DIP 3	Touch Panel	ON	Connects AN6 (TWR-ELEV) to YMNS Touch Panel Signal	
SW5-DIP 3 Isolation (YMNS)		OFF	Disconnects AN6 from Touch Panel	
SW5-DIP 4	Touch Panel	ON	Connects AN7 (TWR-ELEV) to YPLS Touch Panel Signal	
3W5-DIF 4	Isolation (YPLS)	OFF	Disconnects AN7 from Touch Panel	

3.3 MicroSD Card

The Tower System defines a Secure Digital interface as shown in 0. The SD Card interface is multiplexed over the SPI1 signals and two GPIOs such that the host can communicate with the SD memory card in the SD Card slot using the SPI mode or the one- or four-bit SD mode. The MicroSD Card slot is accessible to either the on-board MCF51JM MCU or a compatible Tower MCU Module. Use SW1 –DIP4 to select which MCU has access to the MicroSD Card slot. Refer to Section 4 for more configuration details.

Table 6 - MicroSD Card Slot MCU Selection

ELE uSD	ON	MicroSD is connected to the SPI1 of Primary Elevator Connector
(SW1-DIP4)	OFF	MicroSD is connected to the on-board MCF51JM MCU

Setting the EuSD (SW1-DIP4) configuration switch to the "Off" position will isolate the SD signals from the Tower MCU allowing a direct connection between the on-board MCF51JM MCU and the MicroSD Card slot.

Setting the EuSD configuration switch to the "On" position will cause both the on-board MCF51JM MCU and Tower MCU SD signals to be simultaneously connected to the MicroSD Card slot. It is required that on-board MCF51JM MCU firmware detects the status of the EuSD signal and tri-state the on-board MCF51JM MCU SD signals.

Elevator				
Pin #	Name	Group	Description	I/O
B7	SDHC_CLK / SPI1_CLK	SDHC / SPI 1	SDHC or SPI Clock	0
В9	SDHC_D3 / SPI1_CS0_b	SDHC / SPI 1	SDHC Chip Select / Data or SPI Chip Select	0
B10	SDHC_CMD / SPI1_MOSI	SDHC / SPI 1	SDHC Command or SPI Master Out / Slave In	0
B11	SDHC_D0 / SPI1_MISO	SDHC / SPI 1	SDHC Data or SPI Master In / Slave Out	I
B22	B22 GPIO2 / SDHC_D1		General Purpose I/O or SDHC Data	I/O
A10	GPIO8 / SDHC_D2	GPIO / SDHC	General Purpose I/O or SDHC Data	I/O

Table 7 - Tower System SD Card Interface Pinout

The SD Card Detect signal is connected to KBI7 on the on-board MCF51JM MCU and, if configured via EuSD (SW1-DIP4), IRQ_H on the Primary Tower Elevator. This will allow the host controller to monitor the presence of an SD memory card. To ensure that he SD Card Detect is handled properly, the MCF51JM must configure the SD Card Detect GPIO/KBI (PTG3 / KBIP7) as an internal pull-up. This is



done by setting the appropriate register values for PTEPE (PTGPE3=1) for GPIO and additionally KBI1ES (KBEDG7=0) for KBI functionality. Refer to the MCF51JM128 Reference Manual, Section 9, for additional details. The SD Card Detect signal must be configured as an internal pull-up regardless of which host MCU is accessing the MicroSD Card slot.

3.4 5-way Navigation Switch

The TWR-LCD features a 5-way Navigation Switch. This switch will allow user interaction with the TWR-LCD providing a method to indicate Up (North), Down (South), Right (East), Left (West), and Select (Center). The corresponding directional signals are connected to the on-board MCF51JM MCU. It is intended that the on-board MCF51JM MCU firmware either respond directly to the Navigation Switch or relay the signal detection to the Tower MCU module through the I2C interface.

It is possible to connect the 5-way Navigation Switch directly to the Tower Elevator by making a hardware modification to the TWR-LCD.

The following resister will should to be populated to create a direct connection to the Tower Elevator: R19, R22, R23, R24, R26, R28, R29, R32, R41, R44

The resisters are intentionally unpopulated in the final design to ensure maximum compatibility with additional Freescale Tower MCU and Peripheral Modules.

Populating these resisters will enable to following connections:

Tower Elevator Connection
GPIO7 (Pin A11)
GPIO8 (Pin A10)
GPIO5 (Pin B52)
GPIO1 (Pin B21)
GPIO9 (Pin A9)

Refer to the "Optional Nav Switch Connections to Elevator" section within the TWR-LCD schematics for additional details.

3.5 Mini-B USB Connection

The TWR-LCD features a Mini-B USB connection on the lower right corner of the module. The USB connector is used to provide power to the TWR-LCD module when operating in stand-alone mode (not connected to the tower system). The USB data signals are connected to the on-board MCF51JM MCU allow a connection to exist between a host device and the TWR-LCD.

In Boot Loader mode, if the USB cable is connected to a host PC, the TWR-LCD will enumerate as a Mass Storage Device. If an appropriate compiled binary (.s19) file is placed in the root directory of the



enumerated storage drive, the TWR-LCD will parse the binary file and reprogram the main application running on the TWR-LCD. Refer to Section 3.6 for more details.

3.6 Bootloader

The TWR-LCD includes a USB bootloader that allows simple "drag and drop" reprogramming. This section will describe how to use the bootloader.

3.6.1 Obtaining the S19 file

The bootloader accepts srecord or S19 files that it uses to program the board. In the example projects this file can be found in the <project directory>/bin/ folder and will end in an ".s19" file extension. This file will get overwritten every time the project is compiled.

To create an S19 file, click on the "Standard Settings..." button on your project, and look for the Linker category. Select "ColdFire Linker" and make sure that the "Generate S-Record File" option is checked. Also make sure that the "Max S-Record Length" field is set to 32.

3.6.2 Using the Bootloader

Connect the on-board USB connector to a Windows computer using the included mini-B to A USB cable and press reset while holding down the BTLD push button.

The badge board will then enumerate as a Mass Storage Device. Inside the newly added storage device, there will be an empty file named "READY.TXT".

×	Name 🔺	Size Type	Date Modified
	READY.TXT	0 KB Text Document	4/18/2008 8:20 AM
	×		Name - Size Type

Copy and paste the S19 file into the enumerated drive. Upon successful programming, you will hear two beeps from the board and the S19 file will appear on the removable drive.

Reset or power cycle to TWR-LCD to execute the new application.



For additional information regarding using and creating the TWR-LCD Bootloader refer to the TWR-LCD Lab Guide Document.

3.7 Elevator Connections

The TWR-LCD features two 80-pin connectors that interface to the Side Expansion Ports on the Primary Elevator board in a Tower System. The Primary Elevator Side Expansion Port connectors, comprised of sides A and B, are utilized by the TWR-LCD. **Error! Reference source not found.** provides the pinout for the Primary Elevator Connector. An "X" in the "Used" column indicated that there is a connection from the TWR-LCD to that pin on the Elevator connector. An "X" in the "Jmp" column indicates that a jumper is available that can configure or isolate the connection from the Elevator connector.

	TWR-LCD Primary Connector									
Pin	Name	Usage	Used	l Jmp Pin Name		Usage	Used	Jmp		
B1	5V	5V Power	Х		A1	5V	5V Power	х		
B2	GND	Ground	Х		A2	GND	Ground	х		
B3	3.3V				A3	3.3V				
B4	ELE_PS_SENSE				A4	3.3V				
B5	GND	Ground	X		A5	GND	Ground	х		
B6	GND	Ground	X		A6	GND	Ground	х		
Β7	SDHC_CLK / SPI1_CLK	uSD Clock	Х	X	A7	SCLO		Х		
B8	SDHC_D3 / SPI1_CS1_b				A8	SDA0		Х		
B9	SDHC_D3 / SPI1_CS0_b	uSD Chip Select / Data3	Х	Х	A9	GPIO9 / CTS1				
B10	SDHC_CMD / SPI1_MOSI	uSD MOSI / Command	Х	Х	A10	GPIO8 / SDHC_D2	uSD Data2	х	х	
B11	SDHC_D0 / SPI1_MISO	uSD MISO / Data0	Х	Х	A11	GPIO7 / SD_WP_DET				
	Ĩ	P	T		1				1	
B12	ETH_COL				A12	ETH_CRS				
B13	ETH_RXER				A13	ETH_MDC				
B14	ETH_TXCLK				A14	ETH_MDIO				
B15	ETH_TXEN				A15	ETH_RXCLK				
B16	ETH_TXER				A16	ETH_RXDV				
B17	ETH_TXD3				A17	ETH_RXD3				
B18	ETH_TXD2				A18	ETH_RXD2				
B19	ETH_TXD1				A19	ETH_RXD1				
B20	ETH_TXD0				A20	ETH_RXD0				
B21	GPIO1 / RTS1				A21	SSI_MCLK				
B22	GPIO2 / SDHC_D1	SD Data1	Х	Х	A22	SSI_BCLK				
B23	GPIO3			/	A23	SSI_FS				
B24	CLKINO				A24	SSI_RXD				
B25	CLKOUT1				A25	SSI_TXD				
B26	GND	Ground	Х		A26	GND				
B27	AN7	Touch Panel YPLS	Х	X	A27	AN3				
B28	AN6	Touch Panel XMNS	X	Х	A28	AN2				
B29	AN5	Touch Panel YMNS	Х	х	A29	AN1				

Table 8 - TWR-LCD Primary Elevator Connector Pinout



Pin Name Usage Used Jmp Pin Name Usage Usage Jusage Jusage <thjusage< th=""> Jusage Ju</thjusage<>		TWR-LCD Primary Connector								
B30 AN4 Touch Panel XPLS X X A30 AN0 Image: Constraint of the second o	Pin	Name						Usage	Used	Jmp
B31 GND Ground X A31 GND Ground X B32 DAC1 A32 DAC0 A33 TMR1 A33 B33 TMR3 A33 TMR1 A33 TMR1 A33 B36 TMR2 A34 TMR0 A35 GPI06 A35 B36 S.3V A36 S.3V A36 S.3V A36 B37 FWM7 A37 FWM3 A36 S.3V A36 B38 FWM6 A38 PWM02 A37 FWM3 A37 B39 FWM45 A38 PWM12 A38 FWM12 A38 B40 FWM4 A40 PWM0 Fiezo Buzzer X X B41 CANTX0 A41 RXD0 A42 TXD0 A44 B43 IWRE A43 RXD1 A44 SPI0_CSD_ENE A44 Analog VD1 A44 B43 SPI0_CSD_ENE LCD SPI MOS1	1				1			ouge	0000	51116
B32 DAC1 A32 DAC0 Image: Second Secon				-	~			Ground	x	
B33 TMR3 A33 TMR1 Image: constraint of the second o			Ground	~				Ground	~	
B34 TMR2 A34 TMR0 A35 B35 GPI04 A35 GPI06 A35 B36 3.3v A36 3.3v A37 B37 PWM7 A37 PWM3 A38 B38 PWM5 A39 PWM1 A37 B40 PWM4 A40 PWM0 Piezo Buzzer X B41 CANRXO A41 RXD0 A38 B42 CANRXO A41 RXD0 A43 B43 SPI0_MOSI LCD SPI MISO X X 44 TXD1 B44 SPI0_CSD_b LCD SPI Chip Select X X 445 Analog V2D A38 B45 SPI0_MOSI LCD SPI Chip Select X X 445 Analog Vref A34 B46 SPI0_CSL_b LCD SPI Chip Select X A44 Analog Vref A53 GPI014 E45 B47 SPI0_CSL_b LCD SPI Chip Select X A49 GND E60 E60										
B35 GPI04 A35 GPI06 Image: Constraint of the co										
B36 3.3V A36 3.3V A37 B37 PWM7 A37 PWM3 Image: Constraint of the second s										
B37 PWM7 A37 PWM3 A38 B38 PWM6 A38 PWM2 Image: Constraint of the second s										
B38 PWM6 A38 PWM2 Image: Constraint of the second s										
B39 PWM15 A39 PWM1 Image: Constraint of the second										
B40 PWM4 A40 PWM0 Piezo Buzzer X X B41 CANRX0 A41 RXD0 Image: Cancer and the second seco										
B41 CANRX0 A41 RXD0 A41 RXD0 B42 CANTX0 A42 TXD0 Image: Constraint of the second of								Diozo Duzzor	v	v
B42 CANTXO A42 TXDO Image: constraint of the second								Piezo Buzzer	^	Х
B43 1WIRE A43 RXD1 Image: constraint of the sector										
B44 SPI0_MISO LCD SPI MISO X X A44 TXD1 B45 SPI0_MOSI LCD SPI MOSI X X A45 Analog VDD Image: Constraint of the second sec										
B45 SPI0_MOSI LCD SPI MOSI X X A45 Analog VDD B46 SPI0_CS0_b LCD SPI Chip Select X X A46 Analog VSS					v					
B46 SPI0_CS0_b LCD SPI Chip Select X X A46 Analog VSS Image: Constraint of the select X X A47 Analog Vref Image: Constraint of the select X X A47 Analog Vref Image: Constraint of the select X X A47 Analog Vref Image: Constraint of the select X X A48 Analog Vref Image: Constraint of the select X X A48 Analog Vref Image: Constraint of the select X X A48 Analog Vref Image: Constraint of the select X X A48 Analog Vref Image: Constraint of the select X X A48 Analog Vref Image: Constraint of the select X X A48 Analog Vref Image: Constraint of the select X X A43 GPI014 Image: Constraint of the select X X A53 GPI015 Image: Constraint of the select X X A53 GPI017 Image: Constraint of the select X X A55 USB0_DM Image: Constraint of the select X X A										
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B48 SPI0_CLK LCD SPI Clock X X A48 Analog Vref										
B49 GND Ground X A49 GND Image: Constraint of the second of										
B50 SCL1 A50 GPI014 A50 GPI014 B51 SDA1 A51 GPI05 A51 GPI05 A51 B52 GPI05 / SD_CARD_DET A52 GPI016 A53 GPI017 A53 B53 USB0_DP_PDOWN A53 GPI017 A54 USB0_DM A54 B54 USB0_DM_PDOWN A54 USB0_DM A54 USB0_DM A54 B55 IRQ_H SD Detect X X A55 USB0_DP A54 B56 IRQ_G A54 USB0_DD A54 USB0_DD A55 B57 IRQ_F A55 USB0_VBUS A55 USB0_VBUS A55 B58 IRQ_E A53 TMR7 A55 B66 B60 IRQ_C A59 TMR6 A55 B61 IRQ_B A61 TMR4 A61 TMR4 A61 A62 RSTIN_b A63 RSTOUT_b Reset X A64 EIS_CSO_b LCD		_			Х					
B51 SDA1 A51 GPIO15 B52 B52 GPIO5 / SD_CARD_DET A52 GPIO16 B53 USB0_DP_PDOWN A53 GPIO17 D D B54 USB0_DP_PDOWN A54 USB0_DP D D D D B55 IRQ_H SD Detect X X A55 USB0_DP D <t< td=""><td></td><td></td><td>Ground</td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td></t<>			Ground	X						
B52 GPIO5 / SD_CARD_DET A52 GPIO16 Image: constraint of the state of t				-						
B53 USB0_DP_PDOWN A53 GPI017 Image: constraint of the system of t										
B54 USB0_DM_PDOWN A54 USB0_DM A54 USB0_DM B55 IRQ_H SD Detect X X A55 USB0_DP Image: Constraint of the system of the				4						
B55 IRQ_H SD Detect X X A55 USB0_DP Image: Constraint of the system of										
B56 IRQ_G A56 USB0_ID Image: Constraint of the system of the syst										
B57 IRQ_F A57 USB0_VBUS Image: Constraint of the system of the sy		—	SD Detect	X	X					
B58 IRQ_E A58 TMR7 A58 TMR7 B59 IRQ_D A59 TMR6 Image: Constraint of the second of th						1				
B59IRQ_DA59TMR6A59B60IRQ_CA60TMR5A60B61IRQ_BA61TMR4A61B62IRQ_AA62RSTIN_bA62B63EBI_ALE / EBI_CS1_bA63RSTOUT_bResetXB64EBI_CS0_bLCD EBI Chip SelectXXA64CLKOUT0B65GNDGroundXA65GNDGroundXB66EBI_AD15LCD EBIXA66EBI_AD14LCD EBIXB67EBI_AD16LCD EBIXA67EBI_AD13LCD EBIXB68EBI_AD17A68EBI_AD12LCD EBIXA69EBI_AD11LCD EBIX							-			
B60IRQ_CIRQ_BA60TMR5IRQ_BB61IRQ_BA61TMR4IB62IRQ_AA62RSTIN_bIB63EBI_ALE / EBI_CS1_bA63RSTOUT_bResetXB64EBI_CS0_bLCD EBI Chip SelectXXA64CLKOUT0IB65GNDGroundXA65GNDGroundXB66EBI_AD15LCD EBIXA66EBI_AD14LCD EBIXB67EBI_AD16LCD EBIXA67EBI_AD13LCD EBIXB68EBI_AD17IA68EBI_AD12LCD EBIXIB69EBI_AD18IA69EBI_AD11LCD EBIXI				-						
B61IRQ_BA61TMR4A61B62IRQ_AA62RSTIN_bB63EBI_ALE / EBI_CS1_bA63RSTOUT_bResetXB64EBI_CS0_bLCD EBI Chip SelectXXA64CLKOUT0B65GNDGroundXA65GNDGroundXB66EBI_AD15LCD EBIXA66EBI_AD14LCD EBIXB67EBI_AD16LCD EBIXA67EBI_AD13LCD EBIXB68EBI_AD17A68EBI_AD12LCD EBIXA69B69EBI_AD18A69EBI_AD11LCD EBIXA69		—								
B62IRQ_AA62RSTIN_bA62B63EBI_ALE / EBI_CS1_bA63RSTOUT_bResetXB64EBI_CS0_bLCD EBI Chip SelectXXA64CLKOUT0CB65GNDGroundXA65GNDGroundXXB66EBI_AD15LCD EBIXA66EBI_AD14LCD EBIXXB67EBI_AD16LCD EBIXA67EBI_AD13LCD EBIXXB68EBI_AD17A68EBI_AD12LCD EBIXXB69EBI_AD18A69EBI_AD11LCD EBIXX										
B63EBI_ALE / EBI_CS1_bA63RSTOUT_bResetXB64EBI_CS0_bLCD EBI Chip SelectXXA64CLKOUT0B65GNDGroundXA65GNDGroundXB66EBI_AD15LCD EBIXA66EBI_AD14LCD EBIXB67EBI_AD16LCD EBIXA67EBI_AD13LCD EBIXB68EBI_AD17A68EBI_AD12LCD EBIXB69EBI_AD18A69EBI_AD11LCD EBIX				_						
B64EBI_CS0_bLCD EBI Chip SelectXXA64CLKOUT0Image: Constraint of the selectB65GNDGroundXA65GNDGroundXB66EBI_AD15LCD EBIXA66EBI_AD14LCD EBIXB67EBI_AD16LCD EBIXA67EBI_AD13LCD EBIXB68EBI_AD17Image: Constraint of the selectA68EBI_AD12LCD EBIXB69EBI_AD18Image: Constraint of the selectA69EBI_AD11LCD EBIX		_		_						
B65 GND Ground X A65 GND Ground X B66 EBI_AD15 LCD EBI X A66 EBI_AD14 LCD EBI X B67 EBI_AD16 LCD EBI X A67 EBI_AD13 LCD EBI X B68 EBI_AD17 A68 EBI_AD12 LCD EBI X B69 EBI_AD18 A69 EBI_AD11 LCD EBI X	B63			_		A63	RSTOUT_b	Reset	Х	
B66 EBI_AD15 LCD EBI X A66 EBI_AD14 LCD EBI X B67 EBI_AD16 LCD EBI X A67 EBI_AD13 LCD EBI X B68 EBI_AD17 A68 EBI_AD12 LCD EBI X B69 EBI_AD18 A69 EBI_AD11 LCD EBI X	B64		LCD EBI Chip Select	X	Х	A64	CLKOUT0			
B67 EBI_AD16 LCD EBI X A67 EBI_AD13 LCD EBI X B68 EBI_AD17 A68 EBI_AD12 LCD EBI X B69 EBI_AD18 A69 EBI_AD11 LCD EBI X	B65	GND	Ground	X		A65	GND	Ground	Х	
B68 EBI_AD17 A68 EBI_AD12 LCD EBI X B69 EBI_AD18 A69 EBI_AD11 LCD EBI X	B66	EBI_AD15	LCD EBI	х		A66		LCD EBI	Х	
B69 EBI_AD18 A69 EBI_AD11 LCD EBI X	B67	EBI_AD16	LCD EBI	х		A67	EBI_AD13	LCD EBI	Х	
	B68	EBI_AD17				A68	EBI_AD12	LCD EBI	Х	
	B69	EBI_AD18				A69	EBI_AD11	LCD EBI	Х	
	B70	EBI_AD19				A70	EBI_AD10	LCD EBI	Х	
B71 EBI_R/W_b LCD EBI R/W_b X A71 EBI_AD9 LCD EBI X	B71	EBI_R/W_b	LCD EBI R/W_b	Х		A71	EBI_AD9	LCD EBI	Х	
B72 EBI_OE_b A72 EBI_AD8 LCD EBI X	B72	EBI_OE_b				A72	EBI_AD8	LCD EBI	Х	
B73 EBI_D7 A73 EBI_AD7 LCD EBI X	B73	EBI_D7				A73	EBI_AD7	LCD EBI	Х	
B74 EBI_D6 A74 EBI_AD6 LCD EBI X	B74	EBI_D6				A74	EBI_AD6	LCD EBI	Х	



	TWR-LCD Primary Connector								
Pin	Name	Usage	Used	Jmp	Pin	Name	Usage	Used	Jmp
B75	EBI_D5				A75	EBI_AD5	LCD EBI	х	
B76	EBI_D4				A76	EBI_AD4	LCD EBI	Х	
B77	EBI_D3				A77	EBI_AD3	LCD EBI	Х	
B78	EBI_D2				A78	EBI_AD2	LCD EBI	Х	
B79	EBI_D1				A79	EBI_AD1	LCD EBI	Х	
B80	EBI_D0				A80	EBI_AD0	LCD EBI	Х	

4 Jumper Table

There are several configuration switches provided for isolation, configuration, and feature selection. Refer to the following table for details. The default installed dip switch settings are shown in ***bold***.

	Configuration Settings	Option	Setting		Description		
			DIP 1 (PS2)	DIP 2 (PS0)			
			OFF	OFF	Not a valid setting		
	DIP 1 / DIP 2	PS2 / PS0	*OFF*	*ON*	Enables SPI communication mode to the LCD Display; can be driven by SPIO on the Primary Elevator or by the on-board MCF51JM, selectable by JM/ELE (SW1-DIP3)		
			ON OFF		Enables EBI (16b mode) communication to the LCD Display This interface is only accessible from the Tower Elevator MCU		
			ON	ON	Enables EBI (8b mode) communication to the LCD Display This interface is only accessible from the Tower Elevator MCU		
	DIP 3		ON		Enables SPI connection from SPIO of Primary Elevator Connector		
	DIP 3	JM/ELE	*0	FF*	Enables SPI connection from on-board MCF51JM MCU		
SW1	DIP 4	ELE uSD	ON		MicroSD is connected to the SPI1 of Primary Elevator Connector		
S	DIF 4		*OFF*		MicroSD is connected to the on-board MCF51JM MCU		
	DIP 5	SPI CS SEL	ON		Select SPI0 CS1 as the chip-select for LCD SPI interface		
		OFF		Select SPI0 CS0 as the chip-select for LCD SPI interface			
	DIP 6	TP SEL	ON		Disables MCF51JM connection to the LCD Touch Panel Use SW5 to enable ADC connection from Primary Elevator Connector		
			OFF		Enables MCF51JM connection to the LCD Touch Panel Ensure that SW5 DIP[4:1] are OFF		
			ON		Enables LCD Backlight		
	DIP 7	LCD BL	OFF		Disables LCD Backlight		
	DIP 8	ELE PWM0	0	N	Piezo Buzzer is controlled by PWM0 of Primary Elevator Connector and on-board MCF51JM		
			OFF		Piezo Buzzer is controlled by on-board MCF51JM only		
	5-way Nav	5-way Navigation Switch	North (Up) East (Right) South (Down) West (Left) Center (Enter)		Indicates "North" signal to onboard MCU		
2					Indicates "East" signal to onboard MCU		
SW2					Indicates "South" signal to onboard MCU		
					Indicates "West" signal to onboard MCU		
					Indicates "Center" signal to onboard MCU		

Table 9 - TWR-LCD Configuration Table



Configuration Settings		Option	Setting	Description
		Touch Panel	ON	Connects AN4 of Primary Elevator Connector to XPLS Touch Panel Signal
	DIP 1	Isolation (XPLS)	*OFF*	Disconnects AN4 from Touch Panel
	DIP 2	Touch Panel	ON	Connects AN5 of Primary Elevator Connector to XMNS Touch Panel Signal
15		Isolation (XMNS)	*OFF*	Disconnects AN5 from Touch Panel
SW5	DIP 3 DIP 4	Touch Panel	ON	Connects AN6 of Primary Elevator Connector to YMNS Touch Panel Signal
		Isolation (YMNS)	*OFF*	Disconnects AN6 from Touch Panel
		Touch Panel	ON	Connects AN7 of Primary Elevator Connector to YPLS Touch Panel Signal
		Isolation (YPLS)	*OFF*	Disconnects AN7 from Touch Panel

4.1 Mechanical Form Factor

The TWR-LCD is designed for the Freescale Tower System as a side mounting peripheral and complies with the electrical and mechanical specification as described in *Freescale Tower Electromechanical Specification*.



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