



LCD-4.3-WQVGA-10R-B to LCD-4.3-WQVGA-20R-A Display Kit Migration

Application Note 585

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Abstract

This application note describes the differences between the LCD-4.3-WQVGA-10R-B and the LCD 4.3-WQVGA-20R-A display kits.

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Revision History

REV	EDITOR	DESCRIPTION	APPROVAL	DATE
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1 Introduction

This application note describes the differences between the LCD-4.3-WQVGA-10R-B Display Kit and the LCD-4.3-WQVGA-20R-A Display Kit. The primary audience for this document is customers who currently use the LCD-4.3-WQVGA-10R-B Display Kit and will be transitioning to the newer LCD-4.3-WQVGA-20R-A Display Kit.

The transition to the new display kit was prompted by Sharp's discontinuance of the LQ043T1DG01 display used in the LCD-4.3-WQVGA-10R-B Display Kit. Sharp provided an alternative LQ043T1DG28 display as a replacement that Logic PD has designed into the LCD-4.3-WQVGA-20R-A Display Kit.

No updates are required to the touch screen driver to support the 4-wire resistive touch panel used on the LCD-4.3-WQVGA-20R-A. However, the LQ043T1DG28 display does not have on-board LCD initialization and instead requires a SPI interface to perform LCD initialization. The LCD-4.3-WQVGA-20R-A Display Kit includes an MSP430 microcontroller that provides the needed LCD initialization over SPI. This solution was created to provide customers with a near drop-in replacement.

The MSP430 is not required for customers looking to integrate the same or similar panel into their design. The DM3730/AM3703 SOM-LV, DM3730/AM3703 Torpedo SOM, and DM3730/AM3703 Torpedo + Wireless SOM can connect to the SPI interface. Please see Logic PD's [AN 535 LCD Integration with DM3730 Development Kits](#)¹ for information about how to connect these SOMs to an LCD with a SPI interface.

2 Scope of Document

Although this document addresses the differences between the two 4.3" WQVGA LCDs, it is meant to be a high-level perspective. When it comes to designing in the LCD-4.3-WQVGA-20R-A, please review the appropriate schematics, hardware design files, and other applicable documentation specific to the product. These documents are available on the [Display Kit product page](#)² on Logic PD's support site.

3 How to Identify Your Display Kit

You can determine which display kit you have by referencing the Logic PD part number on the white sticker attached to the back of the display kit. The red rectangle in both Figure 3.1 and Figure 3.2 below identifies the location of the sticker on each display kit.

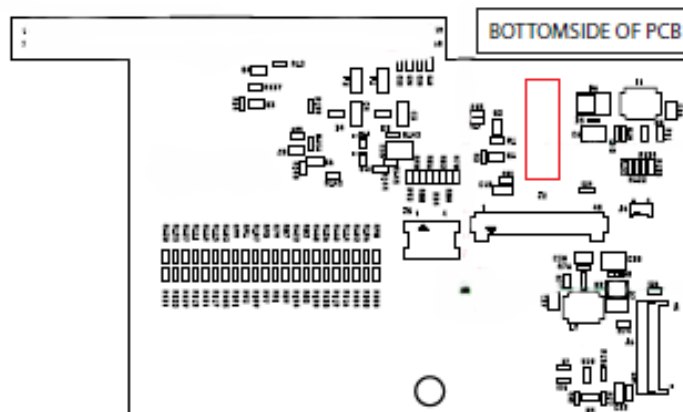


Figure 3.1: Location of Sticker on LCD-4.3-WQVGA-10R-B Display Kit

¹ <http://support.logicpd.com/DesktopModules/Bring2mind/DMX/Download.aspx?portalid=0&EntryId=588>

² <http://support.logicpd.com/ProductDownloads/LegacyProducts/DisplayKits.aspx>

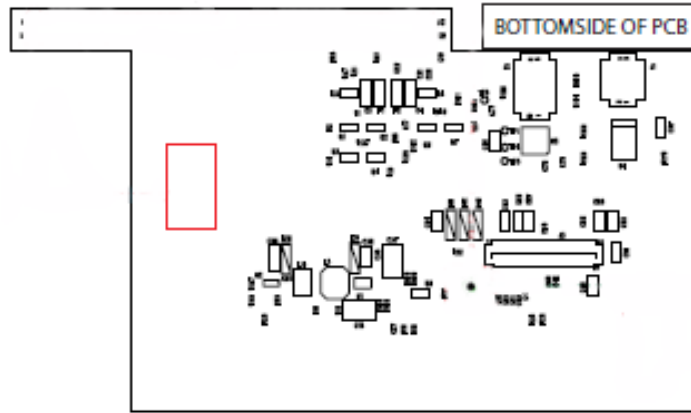


Figure 3.2: Location of Sticker on LCD-4.3-WQVGA-20R-A Display Kit

While the location of the label could change over time, determining which display kit you have based on the Logic PD part number should remain valid. See Table 3.1 below to determine which display you have based on the Logic PD part number. To identify the location of the Logic PD part number on the sticker, refer to the [Logic PD website](http://www.logicpd.com/part-number-and-serial-number-sticker/).³

Table 3.1: Logic PD Display Part Numbers

Display Kit	Associated Part Number
LCD-4.3-WQVGA-10R-B	1018108
LCD-4.3-WQVGA-20R-A	1023328 or later

Logic PD assigns a display number to each display kit that is used by software to configure the LCD. Table 3.2 below provides the display number assigned by Logic PD to each display kit. Examples in Section 8 explain how these display numbers are used.

Table 3.2: Display Numbers

Display Kit	Associated Display Number
LCD-4.3-WQVGA-10R-B	15
LCD-4.3-WQVGA-20R-A	28

4 Features Comparison

Table 4.1 below gives a general feature set description of the LCD-4.3-WQVGA-10R-B and LCD-4.3-WQVGA-20R-A display kits.

Table 4.1: Display Kit Feature Comparison

Feature	LCD-4.3-WQVGA-10R-B	LCD-4.3-WQVGA-20R-A
Pixels	480 x 272	480 x 272
Color Depth	16	16
Contrast	300:1	500:1
Brightness (nits)	500	360
Viewing Angle (H° x V°)	120 x 100	160 x 135
Response Time (ms)	45	40

³ <http://www.logicpd.com/part-number-and-serial-number-sticker/>

5 Electrical Comparison

The electrical specifications for both the LCD-4.3-WQVGA-10R-B and LCD-4.3-WQVGA-20R-A display kits meet the standard input logic levels for 3.3V logic, as described in Table 5.1.

Table 5.1: Display Kit Standard Input Logic Levels

Parameter	LCD-4.3-WQVGA-10R-B	LCD-4.3-WQVGA-20R-A	Units
Input Signal High Voltage (Vih)	2.0	2.0	V
Input Signal Low Voltage (Vil)	0.8	0.8	V

6 Mechanical Comparison

This section describes the mechanical similarities and differences between the LCD-4.3-WQVGA-10R-B and LCD-4.3-WQVGA-20R-A display kits.

Both display kits have identical horizontal and vertical measurements. Table 6.1 lists the mechanical differences between the display kits.

Table 6.1: Display Kit Mechanical Differences

Feature	LCD-4.3-WQVGA-10R-B	LCD-4.3-WQVGA-20R-A
Thickness (mm)	8.7	7.9
Sharp Display Dimensions (mm) W x H x D	105.5 x 67.2 x 5.05	105.5 x 67.2 x 4.2

7 Pin Comparison

Table 7.1 below shows the differences in the signals between the LCD-4.3-WQVGA-10R-B and LCD-4.3-WQVGA-20R-A display kits. However, these signals are not accessible since inline resistors are not populated. All other signals have the same functionality.

Table 7.1: Display Kit Pin Comparison

Signal	LCD-4.3-WQVGA-10R-B	LCD-4.3-WQVGA-20R-A	Notes
51	No connect	SPI_CS_R	Requires R20 to be populated
50	No connect	SPI_CLK_R	Requires R21 to be populated
49	No connect	SPI_DATA_OUT_R	Requires R27 to be populated
48	No connect	SPI_DATA_IN_R	Requires R28 to be populated

8 Software Comparison

The code changes to the Logic PD software offerings include adjustments to the DISPC_POL_FREQ register. Additional updates were made to the LCD power-up and power-down sequences in the DM3730 Android Ice Cream Sandwich 4.0.4 BSP and the DM37x Linux BSP when using display 28.

Table 8.1 below identifies the versions of Logic PD software components that are compatible with each display kit.

Table 8.1: Overview of LCD Software Support

Software Component	LCD-4.3-WQVGA-10R-B	LCD-4.3-WQVGA-20R-A	Notes
LogicLoader Bootloader	All versions	Version 2.5.3 and later	—
DM3730/AM3703 Android Gingerbread 2.3.4 BSP	All versions	Not supported	—
DM3730 Android Ice Cream Sandwich 4.0.4 BSP	All versions	All versions	—
DM37x Linux BSP	All versions	2.4-2 and later	—
DM37x Windows Embedded CE 6.0 BSP	All versions	Version 3.0.2 and later, coupled with LogicLoader version 2.5.3 and later; video device initialization in LogicLoader is required prior to loading the BSP	Windows Embedded CE 6.0 software is not supported on the DM3730/AM3703 Torpedo + Wireless SOM

Information regarding the specific bit changes can be found in the [AM/DM37x Multimedia Device Technical Reference Manual \(Silicon Revision 1.x\)](#).⁴ Register values used to configure the DM3730/AM3703 processor display controller are included in Section 8.1.

8.1 LogicLoader Bootloader

This section describes how to initialize each display kit and display the LCD settings when using LogicLoader v2.5.3 and later.

8.1.1 LCD-4.3-WQVGA-10R-B Display 15 Settings

The `video-open 15 16` command initializes the display in the LCD-4.3-WQVGA-10R-B Display Kit.

```
losh> video-open 15 16
video-open display: width: 480 height: 272 bpp: 16 disp: 15
```

The `video-add display15 480 272` command saves the current display setting and prints the initial values.

```
losh> video-add display15 480 272

Added Display
-----
Name:          display15
Number:       128
Resolution:   480 x 272
DISPC_CONTROL (0x48050440): 0x00018109
DISPC_SIZE_LCD (0x4805047c): 0x010f01df
DISPC_GFX_SIZE (0x4805048c): 0x010f01df
DISPC_TIMING_H (0x48050464): 0x00100229
DISPC_TIMING_V (0x48050468): 0x0030020a
```

⁴ <http://www.ti.com/product/dm3730>

```
DISPC_DIVISOR (0x48050470): 0x0001000b
DISPC_CONFIG (0x48050444): 0x00000000
DISPC_POL_FREQ (0x4805046c): 0x0003b000
CM_CLKSEL_DSS (0x48004e40): 0x00001009
DISPC_GFX_BA0 (0x48050480): 0x80400000

losh>
```

8.1.2 LCD-4.3-WQVGA-20R-A Display 28 Settings

The `video-open 28 16` command initializes the display in the LCD-4.3-WQVGA-20R-A Display Kit.

```
losh> video-open 28 16
video-open display: width: 480 height: 272 bpp: 16 disp: 28
```

The `video-add display28 480 272` command saves the current display setting and prints the initial values.

```
losh> video-add display28 480 272

Added Display
-----
Name:          display28
Number:        128
Resolution:    480 x 272
DISPC_CONTROL (0x48050440): 0x00018109
DISPC_SIZE_LCD (0x4805047c): 0x010f01df
DISPC_GFX_SIZE (0x4805048c): 0x010f01df
DISPC_TIMING_H (0x48050464): 0x00100229
DISPC_TIMING_V (0x48050468): 0x0030020a
DISPC_DIVISOR (0x48050470): 0x0001000b
DISPC_CONFIG (0x48050444): 0x00000000
DISPC_POL_FREQ (0x4805046c): 0x00000000
CM_CLKSEL_DSS (0x48004e40): 0x00001009
DISPC_GFX_BA0 (0x48050480): 0x80400000

losh>
```

8.2 DM3730 Android Ice Cream Sandwich 4.0.4 BSP

This section describes the required settings for each display kit when using the DM3730 Ice Cream Sandwich 4.0.4 BSP.

8.2.1 LCD-4.3-WQVGA-10R-B Display 15 Settings

Use the commands below in U-Boot to set display settings for the LCD-4.3-WQVGA-10R-B Display Kit.

```
OMAP Logic # setenv display 15
OMAP Logic # saveenv
Saving Environment to NAND...
```



```
Erasing Nand...
Erasing at 0x260000 -- 100% complete.
Writing to Nand... done
OMAP Logic #
```

8.2.2 LCD-4.3-WQVGA-20R-A Display 28 Settings

NOTE: This is the default display configuration for the DM3730 Android Ice Cream Sandwich 4.0.4 BSP v1.0 and later.

Use the commands below in U-Boot to set display settings for the LCD-4.3-WQVGA-20R-A Display Kit.

```
OMAP Logic # setenv display 28
OMAP Logic # saveenv
Saving Environment to NAND...
Erasing Nand...
Erasing at 0x260000 -- 100% complete.
Writing to Nand... done
OMAP Logic #
```

Source code updates required for the modified power-up and power-down sequences can be found in the *kernel/arch/arm/mach-omap2/board-omap3logic-display.c* file of the BSP.

8.3 DM37x Linux BSP

This section describes the required settings for each display kit when using the DM37x Linux BSP v2.4-2 and later.

8.3.1 LCD-4.3-WQVGA-10R-B Display 15 Settings

Use the commands below in U-Boot to set display settings for the LCD-4.3-WQVGA-10R-B Display Kit.

```
OMAP Logic # setenv display 15
OMAP Logic # saveenv display
saveenv - save environment variables to persistent storage

Usage:
saveenv
OMAP Logic #
```

8.3.2 LCD-4.3-WQVGA-20R-A Display 28 Settings

NOTE: This is the default display configuration for the DM37x Linux BSP v2.4-2 and later.

Use the commands below in U-Boot to set display settings for the LCD-4.3-WQVGA-20R-A Display Kit.

```
OMAP Logic # setenv display 28
OMAP Logic # saveenv display
saveenv - save environment variables to persistent storage
```

```
Usage:
saveenv
OMAP Logic #
```

Source code updates required for the modified power-up and power-down sequences can be found in the *kernels/linux-3.0/arch/arm/mach-omap2/board-omap3logic-display.c* file of the BSP.

8.4 DM37x Windows Embedded CE 6.0 BSP

This section describes options available for enabling both display kits for use with the DM37x Windows Embedded CE 6.0 BSP v3.0.2 and later.

NOTE: Windows Embedded CE 6.0 software is not supported on the DM3730/AM3703 Torpedo + Wireless SOM.

8.4.1 LCD-4.3-WQVGA-10R-B Display 15 Settings

There are two options for enabling the LCD-4.3-WQVGA-10R-B Display Kit. Users who want LogicLoader to provide a splash screen prior to booting the DM37x Windows Embedded CE 6.0 BSP can enable display 15 in LogicLoader, then launch their DM37x Windows Embedded CE 6.0 BSP image. The DM37x Windows Embedded CE 6.0 BSP will detect that the LCD is enabled and bypass the LCD initialization routine.

Users who do not enable display 15 in LogicLoader can select the display type in the registry. This is done by setting registry key "LcdType"=dword:F" in the [HKEY_LOCAL_MACHINE\System\GDI\Drivers] section of the *platform.reg* file.

8.4.2 LCD-4.3-WQVGA-20R-A Display 28 Settings

NOTE: This is the default display configuration for the DM37x Windows Embedded CE 6.0 BSP v3.0.2 and later.

Users wanting to enable the LCD-4.3-WQVGA-20R-A Display Kit with the DM37x Windows Embedded CE 6.0 BSP must first initialize the display in LogicLoader. Having the display initialized prior to loading the DM37x Windows Embedded CE 6.0 BSP will signal the display driver to bypass the display initialize routine and use the current configuration.

The LQ043T1DG28 LCD used in the LCD-4.3-WQVGA-20R-A Display Kit has power-up and power-down timing requirements with respect to the LCD_VSYNC and LCD_PANEL_PWR signals. The current DM37x Windows Embedded CE 6.0 BSP display driver architecture assumes that LCD hardware allows the LCD_VSYNC signal to be toggled independent of LCD power and backlight control signal timings. The DM37x Windows Embedded CE 6.0 BSP must have "LcdType"=dword:1C" defined within the BSP *platform.reg* file even when initializing the LCD in LogicLoader; this will guarantee that the proper power-up and power-down timing occurs when entering and exiting standby mode.

9 Summary

Information provided in this application assists customers in using the LCD-4.3-WQVGA-20R-A Display Kit with both the DM3730 SOM-LV Development Kit and DM3730 Torpedo Development Kit and Logic PD software offerings.

While the LCD-4.3-WQVGA-20R-A Display Kit is almost a drop-in replacement for the LCD-4.3-WQVGA-10R-B Display Kit, it has not been tested and validated for use with the AM3517 EVM Development Kit, AM3517 eXperimenter Kit, OMAP-L138 EVM Development Kit, or OMAP-L138 eXperimenter kit. Customers looking to use one of these development kits with the LCD-4.3-WQVGA-20R-A Display Kit must [contact Logic PD](#)⁵ for additional assistance.

⁵ <http://support.logicpd.com/TechnicalSupport/AskAQuestion.aspx>