

NetDCU8/10 PicoMOD1

Display

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1.1 Display Interface

All F&S boards offer an very flexible and powerful interface to control displays (STN, CSTN, TFT). Many different displays can be connected directly to them without the need of any further hardware, only connector and cable are necessary. Even the contrast voltage for STN/ CSTN displays is offered from most of the F&S boards.

It is possible to adjust the starter kit to a new display by setting a few parameters, for example by downloading a small configuration text file (called display driver). On WindowsCE this is done by setting some keys in the registry. On Embedded Linux, this is done by setting environment variables in the boot monitor program. This is explained in separate documents.

From the view of the software (display driver), there are different possibilities.

Some display types are already predefined, so that a simple choice from a list is all that is required.

Many display drivers are available, user can download from The F&S homepage. This configurable display drivers can be modified from the user also. This is explained in separate documents.

New display drivers can be requested from F&S, please send your display specification (pdf file) to support@fs-net.de

Important:

Before any LCD display is connected to NetDCU or PicoMOD, make sure that the board hardware is configured correctly:

NetDCU8:

Display supply 3.3V R14

Display supply 5V R13

TFT displays R16

STN/CSTN displays R15

Ä See NetDCU8 hardware documentation.

NetDCU10

Display supply 3.3V JP2 (default)

Display supply 5V JP1

The display type (TFT/STN/CSTN) is configured by software.

Ä See NetDCU10 hardware documentation.

PicoMOD1

The configuration is done by DIP switches S4 on the starter-kit board

Display supply 3.3V S4/1 off, S4/2 on

Display supply 5V S4/1 on, S4/2 off

TFT displays S4/3 on, S4/4 off

Color STN S4/3 off, S4/4 on

Monochrome STN S4/3 on, S4/4 on

Ä See PicoMOD1 starter-kit hardware documentation.

2 Display Driver under Windows CE

2.1 Introduction

As already mentioned, the display driver is fully configurable via the Windows CE registry. The user has the possibility to adjust the driver to a new display by himself.

The registry key for the driver is:

```
[HKLM\Drivers\Display\SAMSUNG\]
```

Use the following parameters to configure the driver or download a new display-driver-file:

Download of display-driver-file to NetDCU8/10, PicoMOD1:

Start DCUTermi.exe

File • Transmit Text File • ...\xxx.txt

(display-driver-files available from F&S company)

Configure the registry:

Key	Value	Meaning
"Mode"	Dword:	Number of a predefined configuration or of the new user configuration.
"EarlyLCDVoltage"	Dword:	Set this parameter to 1 to power on the LCD voltage very early during the boot-process.

With parameter *Mode* you have the possibility to use one of the predefined configurations stored in the kernel or to define a new configuration in registry. Values between 0 and 99 are reserved for predefined configurations. For your own configuration you have to use a value between 100 and 199.

The following configurations are predefined in the **NetDCU8** kernel:

Mode	Name	Resolution	Type
0	Kyocera KCS3224	320 x 240	CSTN
1	Sharp LM8V31	640 x 480	CSTN
2	Toshiba LTM04C380K	640 x 480	TFT
3	SHARP LQ10V1DG11	640 x 480	TFT
4	Reserved		
5	SHARP LQ057	320 x 240	TFT
6	Kyocera TCG057	320 x 240	TFT

For configurations with `Mode` higher than 99 you have to create a new sub-key with the Name `ModeXXX` where `XXX` is the new mode number. Under this sub-key you can use the following parameters to adjust the driver.

Key	Type	Meaning
"name"	sz:	Name of the driver as a text string. Only for information purposes.
Type	Dword:	See Table 1 Value Type
Config	Dword:	See Table 2 Value Config
Columns	Dword:	Amount of visible pixels in X-direction.
PPL	Dword:	Amount of clocks in X-direction before the HSYNC signal. This value is optional and normally the same as Columns.

Key	Type	Meaning
BLW	Dword:	Beginning-of-line-wait: TFT: Value (0-63) specifies the number of VCLK periods between the falling edge of HSYNC and the start of active data. STN: Determine the delay between VLINE and VCLK by counting the number of the HCLK. BLW[7:2] are reserved. 00 = 16 HCLK, 01 = 32 HCLK, 10 = 48 HCLK, 11 = 64 HCLK.
HSW	Dword:	Horiz-sync-pulse-width: Value (0-255) specifies the number of pixel clock periods to pulse the line clock at the end of each line.
ELW:	Dword:	End-of-line-wait: TFT: Value (0-255) specifies the number of VCLK periods between the end of active data and the rising edge of HSYNC. STN: Bits indicate the blank time in one horizontal line duration time. These bits adjust the rate of the VLINE finely. The unit of ELW is HCLK x 8. Ex) If the value of ELW is 10, the blank time is inserted to VCLK during 80 HCLK.
Rows	Dword:	Amount of visible pixels in Y-direction.
LPP	Dword:	Line per panel: This is an optional parameter and in most cases it is the same as Rows.

Key	Type	Meaning
BFW	Dword:	Beginning-of-frame wait: TFT: Value (0–127) specifies the number of inactive lines at the start of a frame, after vertical synchronization period. STN: BFW must be cleared to zero (disabled).
VSW	Dword:	Vertical sync pulse width: TFT: Value (0–63) specifies the number of line clock periods to pulse the FRP pin at the end of each frame after the end-of-frame wait (EFW) period elapses. Frame clock used as VSYNC signal in active mode. STN: VSW must be cleared to zero (disabled).
EFW	Dword:	End-of-frame line clock wait count: TFT: Value (0–63) specifies the number of inactive lines at the end of a frame, before vertical synchronization period. STN: EFW must be cleared to zero (disabled).
Width	Dword:	Physical width of the display
Height	Dword:	Physical height of the display
Bpp	Dword:	Bits per Pixel. The number of bits that represents one pixel in display memory. See Table 3 Value BPP
ContrastEnable	Dword:	Switch on/off contrast voltage generation.

Key	Type	Meaning
ContrastValue	Dword:	Initial value for contrast voltage.
LCDClk	Dword:	LCD pixel clock in MHz
MSignal	Dword:	Display Enable Signal: 0 low 1 high 2 toggle
EnableCursor	Dword:	1: show cursor on screen.
PhysFrameBuffDraw	Dword:	1: direct draw to frame buffer.
Voltage	Dword:	50 = 5 Volt, 33 = 3.3 Volt Parameter is not used at NetDCU8, configuration must be done by hardware. NetDCU8 Display supply 3.3V R14 Display supply 5V R13 NetDCU10 Display supply 3.3V JP2 Display supply 5V JP1
Rotate	Dword:	0, 90, 180, 270

Table 1 Value **Type**

Value	Meaning
0x00	Default
0x01	Dual Scan Display
0x02	TFT-Display
0x04	Colour-Display
0x08	Monochrome 8Bit Display

This setting has to be done in addition to the hardware configuration as given at the beginning of this chapter.

Table 2 Value **Config**

Symb. Name	Value	Meaning
LCD_VSP	0x00100000	Vertical sync polarity: active low
LCD_HSP	0x00200000	Horizontal sync polarity: active low
LCD_OEP	0x00800000	Output enable polarity: active low
LCD_CLKP	0x00400000	Clock polarity: active low

Table 3
Value BPP, available at **NetDCU8**

BPP	STN	CSTN	TFT
1*	ü		
2*	ü		
4	ü		
8			
16		ü	ü
24			ü

*Cursor and Rotate are not supported for this pixel depth.

2.2 Settings Of The Predefined Display Modes

2.2.1 Kyocera

Kyocera KCS3224ASTT-X1
Kyocera KCS057QV1BS-G20
Kyocera KCG047QV1AA-A21
Kyocera KCG057QV1D*-*1

Key	Data-Type	Value
"name"	sz:	Kyocera KCS3224
Type	Dword:	4
Config	Dword:	0x00400000
Columns	Dword:	320
PPL	Dword:	320
BLW	Dword	4
HSW	Dword	3
ELW	Dword	4
Rows	Dword:	240
LPP	Dword:	240
BFW	Dword:	0
VSW	Dword:	2
EFW	Dword:	0
Width	Dword:	115
Height	Dword:	86
Bpp	Dword:	16
ContrastEnable	Dword:	1
ContrastValue	Dword:	0xEA0
LCDCIk	Dword:	2160000
Msignal	Dword:	0
EnableCursor	Dword:	1

To avoid flickering it is recommended to set the registry value „EarlyLCDVoltage:dword=1“.

2.2.2 Sharp LM8V31

Key	Data-Type	Value
"name"	sz:	Sharp LM8V31
Type	Dword:	5
Config	Dword:	0x00400000
Columns	Dword:	640
BLW	Dword	4
HSW	Dword	3
ELW	Dword	4
Rows	Dword:	480
BFW	Dword:	0
VSW	Dword:	2
EFW	Dword:	0
Width	Dword:	151
Height	Dword:	114
Bpp	Dword:	16
ContrastEnable	Dword:	1
ContrastValue	Dword:	0xE5
LCDClk	Dword:	8
Msignal	Dword	0
EnableCursor	Dword:	0
PhysFrameBuffDraw	Dword:	0

2.2.3 Sharp LQ10V1DG11

Key	Data-Type	Value
"name"	Sz:	SHARP LQ10V1DG11
Type	Dword:	6
Config	Dword:	0x00700000
Columns	Dword:	640
BLW	Dword	60
HSW	Dword	64
ELW	Dword	36
Rows	Dword:	480
BFW	Dword:	32
VSW	Dword:	2
EFW	Dword:	11
Width	Dword:	211
Height	Dword:	158
Bpp	Dword:	16
ContrastEnable	Dword:	0
ContrastValue	Dword:	0
LCDCIk	Dword:	25
Msignal	Dword	2
EnableCursor	Dword:	1
PhysFrameBuffDraw	Dword:	0

2.2.4 Sharp LQ057

Key	Data-Type	Value
"name"	sz:	SHARP LQ057
Type	Dword:	6
Config	Dword:	0x00700000
Columns	Dword:	320
PPL	Dword:	320
BLW	Dword:	52
HSW	Dword:	2
ELW	Dword:	4
Rows	Dword:	240
LPP	Dword:	240
BFW	Dword:	5
VSW	Dword:	3
EFW	Dword:	5
Width	Dword:	115
Height	Dword:	86
Bpp	Dword:	16
ContrastEnable	Dword:	0
ContrastValue	Dword:	0
LCDCIk	Dword:	6300000
MSignal	Dword:	0
EnableCursor	Dword:	1

2.2.5 Kyocera TCG057

Key	Data-Type	Value
"name"	sz:	Kyocera TCG057
Type	Dword:	6
Config	Dword:	0x00400000
Columns	Dword:	320
PPL	Dword:	320
BLW	Dword:	30
HSW	Dword:	32
ELW	Dword:	16
Rows	Dword:	240
LPP	Dword:	240
BFW	Dword:	4
VSW	Dword:	2
EFW	Dword:	8
Width	Dword:	115
Height	Dword:	86
Bpp	Dword:	16
ContrastEnable	Dword:	0
ContrastValue	Dword:	0
LDCClk	Dword:	12000000
MSignal	Dword:	0
EnableCursor	Dword:	1

3 Display Driver under Linux

Please check the documentation in directory `doc` on the Linux CD. This documentation is provided by emlix-company www.emlix.com.

4 Important Notice

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