

DM-140GINK display



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If there are any errors or more commands/information for this display, feel free to inform me and I will update this documentation. Please note that this documentation can be used for free but is **not** released as public domain.

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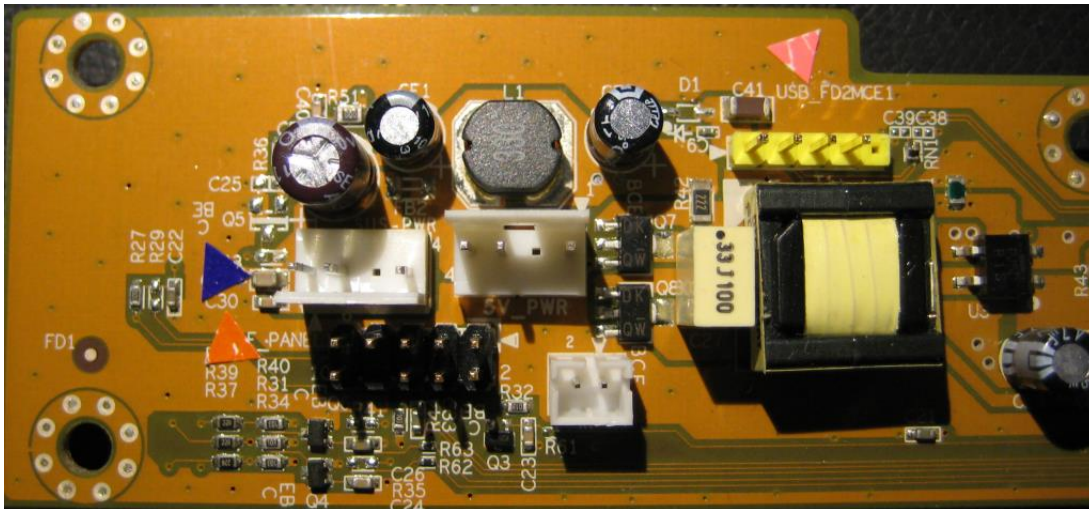
GENERAL INFORMATION	4
CONNECTORS	4
USB IDENTIFIER	5
PROTOCOL BASICS	6
Display modes and memory	6
Datagrams	6
PROTOCOL DETAILS	7
Command: Panel Blank	7
Command: Set Symbol	7
Command: Write Text	8
Command: Clear	9
Command: Set Display Mode	9
None display mode	9
Text display mode	9
Graphic display mode	10
Command: Set Graphic	10
Command: Graphic Area	11
TABLE REGISTER	12
REVISION HISTORY	13

General information

The DM-140GINK Vacuum Fluorescent Display (VFD) is a display used in some FSC (e.g. Scaleo E) and with other PCB designs (copied) in other computer series by different vendors. The display offers 23 symbols and a graphical area with 112x16 pixels. Each of the symbols can be controlled separately and the host connection uses an USB interface and the display installs as a HI-Device.

Connectors

The following connector description is based on the “TRITON DISPLAY BOARD” from an FSC Scaleo E HTPC. If you own another variant of the DM-140GINK display feel free to send me detailed photos and pinouts to extend this section.



Picture 1 Triton Display Board connectors

Each connector has its pin 1 marked by a white triangle. The following connectors are available:

Connector	Colour	Pins	Position	Description
SUS_PWR	white	3 (4)	mid-left	Suspend power supply (5V only)
5V_PWR	white	3 (4)	mid-right	power supply (5V only)
F_PANEL	black	9 (10)	bottom left	Power Button/LED connection
RF	white	2	bottom right	RF_BT front button signal
USB_FD2MCE1	yellow	4 (5)	top right	USB connector

Table 1 Triton Display Board connector overview

Both power connectors (5V_PWR & SUS_PWR) have to be connected to a suitable 5 V power supply.

Pin	Signal	Description
1	not connected	12 V on standard floppy connector, not used by the display
2	Gnd/no pin	Ground or no pin (5V_PWR)
3	Gnd/no pin	Ground or no pin (SUS_PWR)
4	5 V	5 V power supply

Table 2 Power connectors 5V_PWR and SYS_PWR (white header)

The USB connector (USB_FD2MCE1) pin layout.

Pin	Signal	Description	Standard colour
1	Vcc	USB +5V (not needed)	Red
2	D-	Data minus	White
3	D+	Data plus	Green
4	Gnd	Ground	Black
5	n.p.	no pin	

Table 3: Connector USB_FD2MCE1 (yellow pin header)

The front panel connector (F_PANEL) needs some connections to get the USB device working.

Pin	Signal	Description
1	???	unknown
2	BOOT	H signal shows "Scaleo E" on VFD and starts USB device
3	???	unknown
4	???	unknown
5	Gnd	Ground
6	/PWR_ON	low active signal of the power button (pulled up to +5 V SUS_PWR)
7	???	unknown
8	no pin	
9	Gnd	Ground
10	???	unknown

Table 4: Connector F_PANEL (black pin header)

To get the display working pull pin 2 high (e.g. to +5 V power supply).

USB Identifier

There are some USB Vendor and Device Identifier used by the different implementations/copies of this display. The following table lists all identifier known to me.

Vendor ID	Device ID
0x1509	0x925D
0x040B	0x7001

Feel free to contact me on other identifiers using the same protocol described in this document.

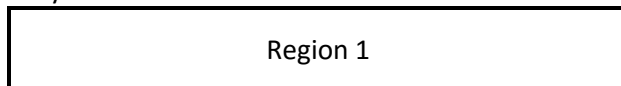
Protocol basics

Display modes and memory

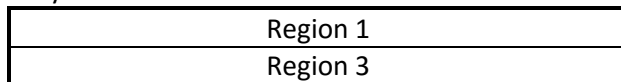
The display module offers two different display modes: text and graphics. Each mode is exclusive and cannot be used at the same time. The on-board memory holds up to four different graphic pages and four virtual text pages. The text pages are rendered directly on the graphic pages memory on text input. So there is no possibility to utilise eight data pages (4 graphic + 4 text pages).

The display memory is organised in columns. A word (two bytes) keeps the pixel data of one column and 112 words of the complete display. The text mode uses up to four different text regions to organise the display. The amount of regions depends on the chosen organisation when setting the text display mode.

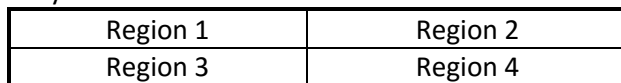
Layout 1



Layout 2



Layout 3



Datagrams

The USB device uses datagrams of 8 bytes for every transmission. The first transmitted datagram contains the command structure. Depending on the command and amount of data, additional datagrams can be used to transfer all data. These additional datagrams are organised as pure data without any additional protocol overhead.

Offset	Size	Name	Description
0x00 (00)	1 byte	packet count	Amount of datagrams transmitted (including command datagram) (value ≥ 1)
0x01 (01)	1 byte	command	Command
0x02 (02)	6 bytes	command parameter	Additional parameter of the command or 0x00
...			
0x07 (07)			

Table 5: basic command datagram

The table shows the basic command structure for every command. Every specific command described in the next section adapts this structure.

Protocol details

Following command codes are available by the display module.

Command	Name	Description
0x01 (01)	PanelBlank	unknown function (see page 7)
0x02 (02)	SetSymbol	(re-)set symbols (see page 7)
0x03 (03)	WriteText	output text to display (see page 8)
0x04 (04)	Clear	clear memory (see page 9)
0x05 (05)	SetDisplayMode	set display mode (see page 9)
0x06 (06)	SetGraphic	set graphic data (see page 10)
0x07 (07)	GraphicArea	unknown function (see page 11)

Table 6: command overview

Command: Panel Blank

The functionality of this command is unknown to me.

Offset	Size	Value	Description
0x00 (00)	1 byte	0x01 (01)	1 datagram
0x01 (01)	1 byte	0x01 (01)	command PanelBlank
0x02 (02)	1 byte	?	Unknown parameter (BL?)
0x03 (03)	5 bytes	0x00 (00)	unused
..			
0x07 (07)			

Table 7: Panel Blank command data

Command: Set Symbol

The command controls the symbols around the graphics area. The state of all symbols is passed as bitmask in a secondary payload datagram.

Offset	Size	Value	Description
0x00 (00)	1 byte	0x02 (02)	2 datagrams
0x01 (01)	1 byte	0x02 (02)	command SetSymbol
0x02 (02)	6 bytes	0x00 (00)	unused
..			
0x07 (07)			

Table 8: Set Symbol command data

The payload datagram contains the bits controlling the symbols.

Offset	Size	Value	Description
0x00 (00)	1 byte	0x00 (00)	not used
0x01 (01)	1 byte	<bitmask>	bit 0: REC bit 1: Muted bit 2: FF bit 3: Pause bit 4: rewind bit 5: play bit 6: CD bit 7: V
0x02 (02)	1 byte	<bitmask>	bit 0: DVD bit 1: WLAN/IR bit 2: Vol. bit 3: Volume Bar 1 bit 7: Volume Bar 2
0x03 (03)	1 byte	<bitmask>	bit 3: Volume Bar 3 bit 7: Volume Bar 4
0x04 (04)	1 byte	<bitmask>	bit 3: Volume Bar 5 bit 7: Volume Bar 6
0x05 (05)	1 byte	<bitmask>	bit 3: Volume Bar 7 bit 7: Volume Bar 8
0x06 (06)	1 byte	<bitmask>	bit 3: Volume Bar 9 bit 7: Volume Bar 10
0x07 (07)	1 byte	<bitmask>	bit 3: Volume Bar 11 bit 7: Volume Bar 12

Table 9: Set Symbol payload data

The volume bars are numbered from the lowest to the highest bar level.

Command: Write Text

Transfer text data to the display which will be rendered by the module. The text data has to be split into command datagram and payload datagrams.

Offset	Size	Value	Description
0x00 (00)	1 byte	0x01 + x	1 + x datagrams where x can be resolved by (length of text + 7) / 8
0x01 (01)	1 byte	0x03 (03)	command WriteText
0x02 (02)	1 byte	0x01 (01): Region 1 0x02 (02): Region 2 0x03 (03): Region 3 0x04 (04): Region 4	Text region to set. For details on regions see Display modes and memory on page 6
0x03 (03)	1 byte		Length of text in bytes
0x04 (04)	1 byte	0x00 (00) .. 0x6F (111)	Offset of the text in pixels
0x05 (05) .. 0x07 (07)	3 bytes	0x00 (00)	unused

Table 10: Write Text command data

Command: Clear

The command clears the given memory

Offset	Size	Value	Description
0x00 (00)	1 byte	0x01 (01)	one datagram only
0x01 (01)	1 byte	0x04 (04)	command Clear
0x02 (02)	1 byte	0x01 (01): Text 0x02 (02): Graphics	type of data to clear
0x03 (03)	1 byte	0x01 (01): Region 1/Page 1 0x02 (02): Region 2/Page 2 0x03 (03): Region 3/Page 3 0x04 (04): Region 4/Page 4	selects memory region to clear
0x04 (04) .. 0x07 (07)	4 bytes	0x00 (00)	unused

Table 11 Clear command data

Command: Set Display Mode

Due to the different option values depending on initialising none, text or graphics mode, the command documentation is separated for each mode.

None display mode

Offset	Size	Value	Description
0x00 (00)	1 byte	0x01 (01)	one datagram only
0x01 (01)	1 byte	0x05 (05)	command SetDisplayMode
0x02 (02)	1 byte	0x00 (00)	display mode none
0x03 (03) .. 0x07 (07)	5 bytes	0x00 (00)	unused

Table 12 Set Display Mode none command data

Text display mode

Offset	Size	Value	Description
0x00 (00)	1 byte	0x01 (01)	one datagram only
0x01 (01)	1 byte	0x05 (05)	command SetDisplayMode
0x02 (02)	1 byte	0x02 (02)	display mode text
0x03 (03)	1 byte	0x01 (01): Layout 1 0x02 (02): Layout 2 0x03 (03): Layout 3	for details on the layout refer to Display modes and memory on page 6
0x04 (04)	1 byte		scroll delay in 50 ms
0x05 (05)	1 byte	0x00 (00)	unused

Offset	Size	Value	Description
0x06 (06)	1 byte	<bitmask>	bit 0: scroll Region 1 bit 1: scroll Region 2 bit 2: scroll Region 3 bit 3: scroll Region 4 bit 7: global scroll enable For details on the regions refer to Display modes and memory on page 6
0x07 (07)	1 byte	0x00 (00)	unused

Table 13 Set Display Mode text command data

Graphic display mode

Offset	Size	Value	Description
0x00 (00)	1 byte	0x01 (01)	one datagram only
0x01 (01)	1 byte	0x05 (05)	command SetDisplayMode
0x02 (02)	1 byte	0x03 (03)	display mode graphic
0x03 (03)	1 byte	0x01 (01): Page 1 0x02 (02): Page 2 0x03 (03): Page 3 0x04 (04): Page 4	graphic memory page used on output to display (active page)
0x04 (04)	4 bytes	0x00 (00)	unused
..			
0x07 (07)			

Table 14 Set Display Mode graphic command data

Command: Set Graphic

The command transfers one graphic page to the display. One graphic page consists of 112 x 16 pixels where one column (16 Pixels) is represented by two bytes. This results in total of 224 bytes graphics data which is transmitted by the payload datagrams following the command datagram.

The display accepts data for currently invisible graphic pages only. Due to this fact you have to select another graphic page, transfer the graphics data and switch to the desired graphics page using the Command: Set Display Mode (refer to page 10 for details).

Offset	Size	Value	Description
0x00 (00)	1 byte	0x1D (29)	29 datagrams (command + payload)
0x01 (01)	1 byte	0x06 (06)	command Set Graphic
0x02 (02)	1 byte	0x01 (01): Page 1 0x02 (02): Page 2 0x03 (03): Page 3 0x04 (04): Page 4	selects destination graphics page
0x03 (03)	5 bytes	0x00 (00)	unused
..			
0x07 (07)			

Command: Graphic Area

The functionality of this command is unknown to me.

Offset	Size	Value	Description
0x00 (00)	1 byte	0x01 (01)	one datagram only
0x01 (01)	1 byte	0x07 (07)	command Graphic Area
0x02 (02)	1 byte	???	unknown parameter (OOF?)
0x03 (03)	5 bytes	0x00 (00)	unused
.. 0x07 (07)			

Table register

Table 1 Triton Display Board connector overview	4
Table 2 Power connectors 5V_PWR and SYS_PWR (white header)	4
Table 3: Connector USB_FD2MCE1 (yellow pin header)	5
Table 4: Connector F_PANEL (black pin header)	5
Table 5: basic command datagram	6
Table 6: command overview	7
Table 7: Panel Blank command data	7
Table 8: Set Symbol command data	7
Table 9: Set Symbol payload data	8
Table 10: Write Text command data	9
Table 11 Clear command data	9
Table 12 Set Display Mode none command data	9
Table 13 Set Display Mode text command data	10
Table 14 Set Display Mode graphic command data	10

Revision history

Revision	Date	Changes
1.0	2016-07-04	- Initial revision
1.1	2016-07-08	- Added USB Vendor and Device ID list
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