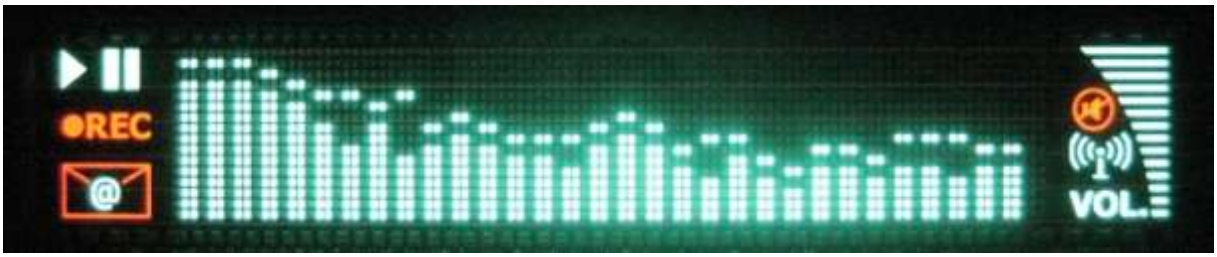
Futaba MDM166A display



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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.

Revision: 1.2 (2011-02-18)

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General information

The Futaba MDM166A Vacuum Fluorescent Display (VFD) is a customer-specific display used in some Targa computer series. The display offers 25 symbols, a graphical area with 96x16 pixels and an internal clock, which is kept running by the microcontroller. The module offers a clock display even if not utilized or connected to a host. Each of the symbols can be controlled separately and the volume bars offer even two intensity levels. The host connection uses an USB interface and the display installs as a HI-Device.

Connectors

There are two connectors (CN1 & CN2) on the display for power supply and the USB interface. ~~The power supply connector CN2 is optional, as the main power can be retrieved from the USB interface.~~ The display sinks up to 370 mA (all pixels and symbols active) and requests 500 mA over the USB interface (CN1). For using the display under the USB interface, a wire needs to be connected between pin 1 of CN1 (USB supply) to pin 1 of CN2 (5V supply) to invoke the start-up on connect.

Warning!

The start-up current of the display is above the 500 mA limit of the USB port and can lead to damages on the USB port and/or other peripherals. A possible worst case scenario is the damage of the complete computer including data loss. So be warned and to prevent this scenario, use the floppy connector to supply 5 V to the display additionally to the USB supply. The power supply must supply at least 1000 mA for safe operation of the display.

Pin	Signal	Description	Standard colour
1	Vcc	USB +5V	Red
2	Gnd	Ground	Black
3	D+	Data plus	Green
4	D-	Data minus	White

Table 1: Connector 1

Pin	Signal	Description
1	Vcc	+5V
2	Gnd	Ground
3	Gnd	Ground
4	none	No pin (Revision C) not connected (Revision D)

Table 2: Connector 2

Protocol basics

Datagrams

The protocol uses a simple escape sequence structure, enclosed in datagrams. One datagram can contain commands, serially sequenced inside. The size of the datagram content must not exceed 63 bytes to fulfil the maximum datagram and USB data block size of 64 bytes.

Offset	Size	Name	Description
0x00 (00)	1 byte	Length	Length of the successive data (0 ≤ length ≤ 63 bytes)
0x01 (01)	*length* bytes	Data	*length* bytes of data containing command(s)

Table 3: datagram structure

Commands

The commands are always preceded by the command identifier and the data, depending on the command identifier. More than one command can be sequenced inside of a datagram.

Offset	Size	Name	Description
0x00 (00)	1 byte	Prefix	Command prefix, fixed to 0x1b (27)
0x01 (01)	1 byte	ID	Identifier of the command (see Table 5)
0x02 (02)	n bytes	Data	Additionally data depending on the command

Table 4: command structure

Command details

The following commands are currently known.

Command	ID	Description
Set Clock (page 5)	0x00 (00)	Actualize the time of the display
Show Small Clock (page 5)	0x01 (01)	Display small clock on display
Show Big Clock (page 6)	0x02 (02)	Display big clock on display
Set Symbol (page 6)	0x30 (48)	Enable or disable a symbol
Set Dimming Level (page 6)	0x40 (64)	Set the dimming level of the display
Reset (page 7)	0x50 (80)	Reset all configuration data to default and clear display
Set RAM Address (page 7)	0x60 (96)	Set the actual graphic RAM offset for next data write
Set Pixel Data (page 7)	0x70 (112)	Write pixel data to RAM of the display
Show Test Pattern #1 (page 8)	0xf0 (240)	Shows vertical test pattern
Show Test Pattern #2 (page 8)	0xf1 (241)	Shows horizontal test pattern

Table 5: command overview

Command: Set Clock

Set the actual time of the controller. The time values are binary coded decimals (BCDs).

Offset	Size	Value	Description
0x00 (00)	1 byte	0x00 ≤ x ≤ 0x59	Minute (BCD)
0x01 (01)	1 byte	0x00 ≤ x ≤ 0x23	Hour (BCD)

Table 6: Set Clock command data

Command: Show Small Clock

Show the actual clock in small centrally arranged in the upper row. The clock is controlled and updated by the display (and is kept running on host disconnect). Any graphic output to the display will stop the clock output.

Offset	Size	Value	Description
0x00 (00)	1 byte	0x00 ≤ x ≤ 0x01	Time format to use (see Table 8)

Table 7: Show Small Clock command data

Value	Description
0x00 (00)	12 hours format
0x01 (01)	24 hours format

Table 8: time format values

Command: Show Big Clock

Show the actual clock in the middle of the display with big letters (full height). The clock is controlled and updated by the display (and is kept running on host disconnect). Any graphic output to the display will stop the clock output.

Offset	Size	Value	Description
0x00 (00)	1 byte	0x00 ≤ x ≤ 0x01	Time format to use (see Table 8)

Table 9: Show Big Clock command data

Command: Set Symbol

The command controls the symbols on the display. Each symbol can be activated and deactivated, except the volume bar on the right border. These bars offer two intensity levels.

Offset	Size	Value	Description
0x00 (00)	1 byte	0x00 ≤ x ≤ 0x18	Symbol ID (see Table 11)
0x01 (01)	1 byte	0x00 ≤ x ≤ 0x02	Symbol state/intensity (see Table 12)

Table 10: Set Symbol command data

Symbol ID	Symbol states	Description
0x00 (00)	0x00, 0x01	Play
0x01 (01)	0x00, 0x01	Pause
0x02 (02)	0x00, 0x01	Record
0x03 (03)	0x00, 0x01	Message symbol (without the inner @)
0x04 (04)	0x00, 0x01	Message @
0x05 (05)	0x00, 0x01	Mute
0x06 (06)	0x00, 0x01	WLAN (tower base)
0x07 (07)	0x00, 0x01	WLAN strength (1 of 3)
0x08 (08)	0x00, 0x01	WLAN strength (2 of 3)
0x09 (09)	0x00, 0x01	WLAN strength (3 of 3)
0x0a (10)	0x00, 0x01, 0x02	Volume (the word)
0x0b (11)	0x00, 0x01, 0x02	Volume level 1 of 14
0x0c (12)	0x00, 0x01, 0x02	Volume level 2 of 14
0x0d (13)	0x00, 0x01, 0x02	Volume level 3 of 14
0x0e (14)	0x00, 0x01, 0x02	Volume level 4 of 14
0x0f (15)	0x00, 0x01, 0x02	Volume level 5 of 14
0x10 (16)	0x00, 0x01, 0x02	Volume level 6 of 14

0x11 (17)	0x00, 0x01, 0x02	Volume level 7 of 14
0x12 (18)	0x00, 0x01, 0x02	Volume level 8 of 14
0x13 (19)	0x00, 0x01, 0x02	Volume level 9 of 14
0x14 (20)	0x00, 0x01, 0x02	Volume level 10 of 14
0x15 (21)	0x00, 0x01, 0x02	Volume level 11 of 14
0x16 (22)	0x00, 0x01, 0x02	Volume level 12 of 14
0x17 (23)	0x00, 0x01, 0x02	Volume level 13 of 14
0x18 (24)	0x00, 0x01, 0x02	Volume level 14 of 14

Table 11: symbol ID list

Symbol state	Description
0x00 (00)	Symbol off
0x01 (01)	Symbol on
0x02 (02)	Symbol on, high intensity

Table 12: symbol state list

Command: Set Dimming Level

The command controls the brightness level of the display.

Offset	Size	Value	Description
0x00 (00)	1 byte	0x00 ≤ x ≤ 0x02	Brightness level (see Table 14)

Table 13: Set Dimming Level command data

Brightness level	Description
0x00 (00)	Display off
0x01 (01)	Display dimmed
0x02 (02)	Display full brightness

Table 14: brightness levels

Command: Reset

The command resets all parameters to default values, clears the display, resets the clock parameters and set the dimming back to full brightness.

Command: Set RAM Address

The command controls the RAM offset for the next pixel data send to the display (see

Offset	Size	Value	Description
0x00 (00)	1 byte	0x00 ≤ x ≤ 0x5f	RAM offset (byte granularity)

Table 15: Set RAM Address command data

Command: Set Pixel Data). Internal organization of the graphical area is column by row. Every column is represented by a word. The RAM address *should* be word aligned.

Offset	Size	Value	Description
0x00 (00)	1 byte	0x00 ≤ x ≤ 0x5f	RAM offset (byte granularity)

Table 15: Set RAM Address command data

Command: Set Pixel Data

The command transfers pixel data to the display. The data is organized column by row, where one word represents the pixel data for one column. Address pointer is auto incremented by every write.

Note: *The maximum size of the datagram has to be considered when using this command. Prior writing data to the display memory, the offset should be reassigned (see* Command: Set RAM Address*).*

Offset	Size	Value	Description
0x00 (00)	1 byte	0x00 ≤ x ≤ 0x3d	Data size in bytes
0x01 (01)	n bytes		Display data (column x rows)

Table 16: Set Pixel Data command data

Command: Show Test Pattern #1

Shows a test pattern where every even column is lighted.

Command: Show Test Pattern #2

Shows a test pattern where every even row is lighted.

Table register

Revision history

Revision	Date	Changes
1.0	2010-04-06	- Initial revision
1.1	2010-04-08	- Corrected company name “Futaba”
1.2	2011-02-18	- Added warning about the start-up current of the display