'Do It Yourself" series device

## **1 DESCRIPTION**

DMX-512 BUS MONITOR is tool for monitoring of data stream in any DMX-512 system. Is shows values of individual DMX channels as well as value of Start Code. Also absence of a DMX channel or total communication failure are indicated.

Schematics diagram shows picture 1. The circuit is as simple as possible. All activities controls microcomputer IC1. Input signal from DMX-512 bus is processed by RS485 driver (IC2). Output data are indicated on 3-position display (VD1, VD2, VD3). The device is controlled only by two tactile switches "**UP**" (SW2) and "**DOWN**" (SW1). The IC3 voltage stabilizer enables the device to be connected to power supply voltage with large range (from 8 to 20 volts DC). D4 diode protects the device against reverse polarity of supply voltage. Current consumption of the device is about 80 mA.



DMX MONITOR

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### 2 MANUFACTURING PROCESS

Pic. 2 – PCB – component names



Pic. 3 – PCB – component values



All components of the device are placed on one printed circuit board (see pictures 2 and 3). No problems should occur during mounting the PCB. C1, C6 and C9 capacitors are mounted horizontally (no component on the board should be higher than 8 mm). Usage of DIL20 socket is recommended for IC1  $\mu$ P. HS1 heat sink is mounted under IC3 voltage stabilizer to increase power loss. Buttons (fingerboards) are put on SW1, SW2 tactile switches. D1 LED is mounted at the same height above the board as the buttons (fingerboards) of SW1, SW2 are. Four DI5M3x8 spacers are used for easy mounting to a cover panel (an example shows pic. 4).

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The records for the printed circuit board manufacturing and the program for the IC1 µP are attached in the "**dmx\_monitor.zip**" archive (Gerber and Excellon files, layout images, etc.).

The device is powered from external DC voltage source connected to "+V" and "-V" pads on the PCB board. "1", "2" and "3" pads serves for connection to DMX system as shows picture 5.

### Pic. 4 – Example of cover panel





### Pic. 5 – Connection to DMX-512 system (5-wire or 3-wire bus)



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Pic. 6 – Another variant of the monitor construction (complete stand alone tool)



Table 1 – Bill of material				
Amount	Designation	Туре	Value	Remarks
3 pcs	R6 – R8	Resistor, metal, 0207 size	47 Ω	
8 pcs	R14 – R21	Resistor, metal, 0207 size	200 Ω	
1 pc	R2	Resistor, metal, 0207 size	1 kΩ	
5 pcs	R3, R4, R11 – R13	Resistor, metal, 0207 size	2,2 kΩ	
4 pcs	R1, R5, R9, R10	Resistor, metal, 0207 size	10 kΩ	
2 pcs	C2, C3	Ceramic capacitor, RM=5,08	18 pF	
5 pcs	C4, C5, C7, C8, C10	Ceramic capacitor, RM=5,08	100 nF	
1 pc	C1	Electrolytic capacitor, RM=2,54	10 µF / 10 V	
1 pc	С9	Electrolytic capacitor, RM=2,54	100 µF / 10 V	
1 pc	C6	Electrolytic capacitor, RM=2,54	220 μF / 25 V	
1 pc	Q1	Crystal HC49/U	16,0000 MHz	
2 pcs	D5, D6	Diode 150 mA	1N4148	
1 pc	D4	Diode 1 A	1N4007	
2 pcs	D2, D3	Zener diode 5,1 volts	ZX83V005.1	
1 pc	D1	LED, 3 mm, red, 2 mA	HLMP1700	
3 pcs	VD1-VD3	7-segment LED display	HDSP-F201	
3 pcs	T1 – T3	Bipolar transistor PNP	BC327-40	
1 pc	IC1	Microprocessor, 8051 series, DIL	AT89C2051-20PU	
1 pc	(for IC1)	Socket, DIL20		
1 pc	IC2	Driver RS-485, DIL	SN76175B	
1 pc	IC3	Voltage stabilizer +5V/1A, TO220	7805	
1 pc	HS1	Heat sink for TO220 case, 19x13x6,5 mm	DO3	e.g. AAVID THERMALLOY: 577002B00000G
2 pcs	SW1, SW2	Tactile switch, 12x12 mm, projected plunger type	TACTS-24x	e.g. NINGI: TACTS-24x series
2 pcs	(for SW1, Sw2)	Button, round - diameter 11 mm	TACT-2BRxx	e.g. NINGI: TACT-2BRxx series
4 pcs	-	Screwed spacer sleeve, length 8 mm, int. thread M3	DI5M3x8	e.g. TDYSFF-M3/8
1 pc	-	Printed circuit board		See documentation
1 pc	-	Cover panel		See documentation
-	-	Coupling elements	Screws, washers	As necessary

# **GD DMX-512 BUS MONITOR**

All necessary supplemental files with data for the device manufacturing are in "dmx\_monitor.zip" archive available at **www.chd-el.cz** web site. The archive contains:

"excellon" folder: dmx\_monitor.pth = data for drilling - view from component side dmx\_monitor.drl = drill list dmx\_monitor\_pth.txt = report text file "gerber" (format RS-274-X) folder: dmx\_monitor.bot = data for layout - view from component side dmx\_monitor\_bot.txt = report text file for layout dmx\_monitor.stp = data for stop mask - view from component side dmx\_monitor\_stp.txt = report text file for stop mask
"img" folder:
 dmx\_monitor\_pcb\_layout.pdf = vector layout image - view from solder side
 dmx\_monitor\_pcb\_layout.tif = bitmap layout image (600 dpi resolution) view from solder side
"pgm" folder:
 dmx\_mon.hex = Intel hex form of program list
 dmx\_mon.bin = binary form of program list

# 3 USAGE

The device has two buttons (**UP** and **DOWN**) and one indication LED (**SLCT**) for choice of monitored DMX-512 channel. Selected DMX-512 channel number and its value are shown on 3-position display.

After the device reset, DMX channel Nr. 1 is always selected for monitoring and its actual value (0 to 255) is shown on the display. The **SLCT** indication LED doesn't light. This is normal working mode.

### 3.1 DMX CHANNEL SELECTION

Changes of monitored DMX channel can be done by **UP** button (increasing of the channel number) or by **DOWN** button (decreasing of the channel number). When a button is pressed, number of just actual DMX channel is displayed and **SLCT** LED goes on for about 0,75 sec. When a button is pressed and hold longer time, number of selected DMX channel is incremented or decremented periodically during whole time when the button is pressed (the display shows the changes and the **SLCT** LED still lights). After both buttons are released, number of newly selected DMX channel is still displayed for about 1,5 sec. Then the **SLCT** LED goes off and the display shows value of newly selected DMX channel – the device returns to normal working mode.

Any DMX channel or so called Start Code can be selected for monitoring. Choice of the Start Code is indicated with "Str" symbol on the display and DMX channels are indicated with numbers from 1 to 512 during the DMX channel selection.

### 3.2 NORMAL WORKING MODE

In normal working mode, the device's display shows actual value of selected DMX channel or value of the Start Code. The values are in range from **0** to **255**.

If the Start Code in received DMX data stream is different from zero (it can occur for some specific non-standard message, i.e. a programming messages), the display still shows value of selected channel or Start Code but all decimal points light simultaneously on the display.

If selected channel number for monitoring is not included in the DMX data stream (i.e. when DMX transmitter transmits lower number of channel packets than just selected channel number for monitoring), "- - -" symbol is displayed.

When a total communication failure occurs (e.g. a malfunction of DMX transmitter, interrupted cable, etc.), the device's display shows "**Err**" symbol (Error).

### 3.3 TESTING PROCEDURE

The device has implemented testing routine in its program. If both **UP** and **DOWN** buttons are pressed when the device is switched on (power supply voltage is connected), test of the device's display is launched: Individual segments of the display light sequentially. The **SLCT** indication LED lights together with decimal points.

The test is processed in loop. The test is ended when the device is switched off (power supply voltage is disconnected).

### DMX-512 Bus Monitor - "Do It Yourself" series device

This document and all necessary supplemental files for manufacturing are available at **www.chd-el.cz** web site.

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