

Racing Start System

DCF Clock with Countdown and start light

Datasheet

Version: Firmware 1.28-097





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Safety

Follow the manual

 ${igtimes}$ The module is only safe in operation if all instructions are read in this datasheet.

General understanding of safety

By the module there are no hazard under normal use.

Intended Use

The power should come from a safe transformer (also protected transformer) or a corresponding low voltage power supply for the circuit. Never use a higher voltage or direct mains voltage!

Concealed Hazards



following hazards may arise in case of wrong construction of the circuit and wrong handling of module:

- 🎢 With the direct connection to mains, it's a dangerous voltage on the module and other components, use a safety transformer!
- Reverse polarity and overloading the module may cause in smoke. This smoke possibly contains toxic substances which must not be inhaled! Ventilate the room.
- Reverse polarity or overload of the module can cause a hot surface on the IC or other component in the circuit.
 There is a risk of burning when touching.
 - And flammable materials, for example Paper, can come in fire.
- Spalling of parts on reverse polarity or overloading of the module.

🐨 Wear during the initial commissioning eye protection.

- The pins of the components can be pointed and sharp even after installation! Therefore, this may cause in sores in case of incorrect handling.
- If the buzzer emits more than 90 dB, it may cause hearing loss over a long period of time. The circuit board is intended for installation in a housing, thereby lowering the level of the buzzer used.
- Use always passing a ESD bracelet to avoid electric charges! The module can be damaged if handling without an earthing tape and housing!

Modifications of the example circuit

The successfully built device may be damaged. Therefore check as appropriate all housing part and lines for damage. This applies in particular to parts of the directly (for example power cord and power supply) or indirectly come into contact with mains voltage.

Application and Function description

Function description

The "Racing start system" (SPO10200.9) from StefPro is intended for starting in races where the participants start one after the other. It is controlled with a microcontroller and synchronizes for high precision with the DCF time. A digital countdown shows the remaining time until the next start. A start happens every full minute the countdown can take between 10 and 30 seconds. The virtual barrier (green LED) can be opened for 1 to 10 seconds. The complete system consists of a 6-digit clock (56 mm high, main module) and a 2-digit countdown display (100 mm high, display module). Operation is possible on a car battery or on a power supply.

Technical data

- Operating voltage: 12 volts DC
- Current: 1A
- Power: approximately 12 W

Construction description

Installation of the modules (Dimensions)

<u>PCB2399</u>





Figure 1:Installation (Dimensions) description for module PCB2399

All screw holes are for M3 screws.

PCB3100



Figure 2:Installation (Dimensions) description for module PCB3100

All screw holes are for M3 screws.

Connectors

<u>PCB2399</u>



Figure 3:Connector description for module PCB2399

The module is powered by a power supply or by a battery.

Note VDE0100!

PCB3100



Figure 4:Connector description for module PCB3100

Wiring is done via plugs which are coded with bars. Power is supplied via a 2-pin connector with open tin-plated ends. The red wire must be + voltage and black must be 0 volts (ground). The inputs are conditionally over-voltage-proof and can not be reversed (protection diode in series).

Note VDE0100!

DANGER
Make sure that you have connected all signals correctly. There is no overload and polarity protection!

X-DC : <u>DC</u> Power input : Print plug 2 pole

Pin	Name	Direction	Function	Maximum
1	GND	Power		
2	V+	Power	Power supply input of the module	12 volts DC, 1A



Pin	Name	Direction	Function	Maximum
1	GND	Power		
2	N.C.		Do not connect	VCC
3	DCF in	Digital input	<u>DCF</u> signal <u>in</u> put	VCC
4	DCF ps	Digital Output	<u>DCF P</u> ower <u>S</u> ave output	VCC
5	VCC	Power		5 volts DC, 30mA

X-DIS1 : <u>DIS</u>play output<u>1</u>, RS422 : Printstecker 5 Polig

Pin	Name	Direction	Function	Maximum
1	GND	Power		
2	N.C.		Do not connect	VCC
3	В	Digital output, RS422	Display output B	VCC
4	А	Digital output, RS422	Display output A	VCC
5	VCC	Power		5 volts DC, 30mA

X-DIS2 : <u>DIS</u>play input<u>2</u>, RS422 : Printstecker 5 Polig

Pin	Name	Direction	Function	Maximum

1	GND	Power		
2	А	Digital input, RS422	Display input A	VCC
3	В	Digital input, RS422	Display input B	VCC
4	N.C.		Do not connect	VCC
5	VCC	Power		5 volts DC, 30mA

X-RS1 : <u>Racing Start LED2</u> : Printstecker 5 Polig

Pin	Name	Direction	Function	Maximum
1	GND	Power		
2	N.C.		Do not connect	VCC
3	Start / Stop LED	Digital output	Output for start / stop LED	VCC
4	N.C.		Do not connect	VCC
5	VCC	Power		5 volts DC, 30mA

Installation the DCF clock



The external antenna receives the DCF77 signal and should be directed to Frankfurt, as shown in Figure 1. The antenna should be placed at least 1 meter away from a monitor, computer or other disturbing electronic devices .



During installation, the receiving LED can be used as an orientation to the quality of reception. The LED should flash at intervals of one second. If the antenna is properly aligned and the signal is strong enough, the display changes of "no signal" (No impeccable DCF77 signal) in "SEArCH" (search for the 59th second). Was the 59th second found so will the display shows "rEAd60" (read the DCF time) henceforth. It still takes 60 seconds to display the correct time. If the clock is not synchronized to the DCF time, the receiver LED flashes DCF work cycle (power reserve is in operation), if the LED is enabled in the menu. Is the display not changed to "SEArCH", the antenna is probably disturbed by a device or the antenna is too close to the display. Because the DCF antenna is so sensitive that it can disturb by the display in the near field, there is the possibility to reduce the brightness of the display during the synchronization, or to deactivate the display. This problem have all other DCF clocks with multiplexed LEDs displays also. By a darker display the DCF antenna can be mounted significantly closer to the display.

Synchronize with active display



This mode is active when in menu under "receive brightness" the brightness is set > 0. Appearance of the text on the screen:

'no Sig" no signal.

"SEArCH" Search the fifty-ninth second.

"rEAdxx" read the dcf time.

Synchronize with deactivated display

This mode is active when in menu under "receive brightness" the brightness is set to 0. When synchronizing with disabled display, only one decimal point for orientation appears.



no Sig" no signal.



"SEArCH" Search the fifty-ninth second.

"rEAdxx" read the dcf time.

Button description

Overview of buttons



Menu

Level 1	Level 2
Normal⊎	
Countdown∜	
Open gate ∜	
Gate mode ↓	
Receive state display	ŀ
DCF input pull up↓	
DCF input invert∜	
Power save pin invert	U
Info section ↓	
IC number∜	
Firmware version ↓	

 \Downarrow : Next step in main menu.

⇒: Next step in sub menu.

Normal

心: The submenu starts again.

Normal mode, outside of the menu.

The + and - buttons have no function here.

Countdown



In this menu item the time can be set how long the countdown should be. Adjustable with + / -.

The number is shown on the "Countdown Display" and can be between 1 and 30.

Open gate



Gate 5 sec

Gate mode



Gate off

Receive state display



DCF status decimal point display

DCF input pull up



DCF input pull up on

88888

DCF input pull up off

DCF input invert



DCF input invert on



DCF input invert off

In this menu item the time can be set that the barrier should be "open". With + / - adjustable.

After expiry of the countdown time, turns ON a barrier (I) or OFF a 00.

Sets the mode for the receive LED, which shows the received signal. The number can be 0-2.

- 0: Only until the clock has been synchronized.
- 1: Shows the received signal when the clock is not synchronized with the DCF77 signal.
- 2: Shows the received signal permanently on the receiver LED.

DCF77 input pin with pullup

- ON: Enables the pull-up resistor
- OFF: Disables the pull-up resistor ON and OFF is activated and toggled by the - button.
- Conrad DCF module = ON
- ELV DCF module = ON
- Pollin DCF module (3.3 V) = OFF

No guarantee for correctness of the information and changes of the manufacturer.

DCF77 inverting the input pin

- ON: Input inverts
- OFF: no input invertedON and OFF is activated and toggled by the button.
- Conrad DCF module = for PIN3 ON, PIN4 OFF
- ELV DCF module = ON
- Pollin DCF module (3.3 V) = OFF

No guarantee for correctness of the information and changes of the manufacturer.

If the receive LED is off every second, the setting must be inverted.

Power save pin invert



DCF powersave invert on



DCF powersave invert off

Info section



IC number



Chip number

Firmware version



Firmware version

Menu end



Inverts DCF77 power On / Off output

- ON: Power ON / OFF output is inverted (module ON at GND)
- OFF: power on / off output is not inverted. (module ON at VCC)
- Conrad DCF module = No power on / off input pin available
- ELV DCF module = No power on / off input pin available
- Pollin DCF module (3.3 V) = ON

No guarantee for correctness of the information and changes of the manufacturer.

Read the instructions of the receiver module for the power on / off pin of the DCF module to set this setting correctly. Many modules do not have this pin, then this setting can be ignored.

This indicates the start the information area

IC / device type

Firmware version

Example, it might be something else at this point.

End of the menu, hide automatically after 2 seconds.

Attachment

7 segment characters

The symbolism of each character:



Change log

Safety

20.03.2017 - 1.0.3 - ADD Add ESD note

DCF module properties

21.11.2016 - 1.0.1 - ADD Add list of tested modules 20.03.2017 - 1.0.3 - ADD Update list of tested modules, add standard pin assingment

Set day

23.04.2017 - 1.0.4 - ERROR Bugfix wrong title, this sets the day not the month.

Liability, warranty and copyright notice

Definitions

- "Module": A PCB which is delivered without housing and is intended for installation.
- "Manufacturer of the whole device": The manufacturer of the whole device, the natural or legal person is mounted a device which can be made to function without special knowledge. E.G. Simple connection to the network via a euro, safety plug or by connecting to a power supply.

Liability

- Although the information contained in this document has been checked very carefully for accuracy and completeness, for errors and omissions can not be held liable. StefPro reserves the right to any time change any portion of the described hardware and software features.
- StefPro provides only specific "module" which is intended for installation. The "Manufacturer of the whole device" obliges to compliance to the relevant valided VDE, CE and EMC regulations. StefPro has verifies compliance with the requirements for this module random. Because the installation is not performed by StefPro, must additional inspection after installation of the modules by the "Manufacturer of the whole device".
- There is no liability for damages incurred directly by or in the application of the "module", as well as for damage caused by chemical or electrochemical effects of water or generally from abnormal environmental conditions.
- "Modules" by StefPro may not be used in critical equipment. At disregard exclusively the responsibility of "Manufacturer of the whole device."

Theseinclude:

- medical devices for implanting or life obtained.
- Critical equipment for space, aerospace and traffic.
- Other important life components or systems, where an error is fatal.
- All devices developed with a "Modules" by StefPro must be the responsibility of the "Manufacturer of the whole device" sufficiently tested to detect any defects.

Safety Notes

- Since the built module is operated with an electrical voltage, the valid VDE regulations are complied with.
- Components and modules do not belong in the hands of children!
- The module complies with the requirements of protection class III.
- The "module" may NOT directly to line voltage (or voltage > maximum operating voltage) in any case! It can be fatal!
 - Whenever it is that safe operation is no longer possible, the module / device must be taken out of service and secured against inadvertent operation. This assumption is justified,
 - when the module / device has visible damage,
 - when the module / device has loose parts
 - $\circ~$ when the module / device no longer works
 - after prolonged storage under unfavorable conditions (eg outdoors or in moist environments)

Watch for correct voltage and connection of the "module†Voltage and / or connection mistakes are beyond our control. Thus we can not assume any liability for damages arising out of it.

Intended operation

- The used electrical parts and components are designed for a temperature between 0 °C ... +45 °C, so the device may only be operated and stored in this temperature range. During transport, the temperature may be between -10 °C ... + 50 °C.
- If condensation has formed during transport or storage, the modules must be acclimatized for approx. 2 hours before commissioning.
- It must not be operated in an increased dust, high humidity, explosion risk or aggressive chemical exposure.
- Ensure proper operation and connection. Operating and/or connection errors are outside our area. Unfortunately, we can not accept any liability for damages resulting of this.
- The improper operation of this module may result in damage of this module, personal injury or property damage.
- The safety instructions must be observed!
- The manufacturer is not responsible for all personal injury and property damage caused by improper operation.

Warranty

• StefPro warranty only for the Modules and their firmware. The warranty is exclusively limited for the replacement of the IC within the warranty period for obvious defects in the hardware, and programming error.

Liability, warranty and copyright notice - Definitions

- Warranty does not extend the warranty period or starts a new period again.
- Additional or deviating claims are excluded, especially claims for damages arising out of the product for damage. This will not affect claims based on inalienable rules under the product liability law.

Copyrightnotice

The circuitry and firmware to the module from StefPro is protected by copyright. Unauthorized reproduction or distribution of Modules with this program or any portion of it. This is pursued bothcriminal and civil law, and may result in severe penalties and compensation for damages.

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Disposal information

Do not dispose devices in household garbage!

This modules or devices comply with the EU directive on electronic and electrical equipment (WEEE regulation) and therefore may not be disposed of with household waste. Dispose of the device over your local collection center for electronic equipment!



WEEE-Reg.-Nr.:

DE 58929072 (StefPro UG (haftungsbeschränkt) & Co. KG)

DE 78089358 (StefPro Einzellunternehmen bis zum 01.01.2015)

Impress

StefPro[™] UG (haftungsbeschränkt) & Co. KG - Softwareentwicklung für Prozessoren

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