

Daily Programmer, Timer











During the holiday season, when we are away for a few days or even weeks, some problems arise: what about watering the flowers or feeding the fish, as well as concerns about whether your home where nothing happens for a few days will become a target for burglars.

The circuit presented here is a timer operating in a weekly cycle programmed with an accuracy of 1 second. It is perfect for building an automatic watering can or feeder, it will work well as a simulator of the presence of householders or automatic heating switch. There are indeed many ideas for its use.

Features

- 30 independent time programs
- program settings including day of the week and time with an accuracy of 1 second
- executive component: relay 230 VAC / 8 A
- power supply 9-15 VDC or 7-12 VAC
- current consumption up to 100mA
- clock backup after power failure

Circuit description

Schematic diagram of the circuit is shown in Figure 1. It is built on an ATmega8 microcontroller with an attached 2×16 character display and 4 buttons. A PCF8563-type integrated circuit was used as the real-time clock.

Communication with the chip is via the I²C interface. Information about the current time and day of the week is taken only when the controller is switched on, and then the time is measured by the processor alone. In order to make the countdown precise, the TIMER2 processor's internal counter operates asynchronously and is clocked by a 32.768 kHz waveform provided by a generator built into the RTC. The resistor used to feed the clock signal from the

clock to the processor has a high resistance (1 $M\Omega$), so it does not interfere with or block the clock in the absence of power. The controller is designed to be supplied with AC voltage (directly from a transformer) or DC voltage (from an off-the-shelf power supply unit). Its transformer should be approximately 9 VAC and should be connected to CON7, while the power supply with a voltage of approx. 12 VDC is connected to CON6

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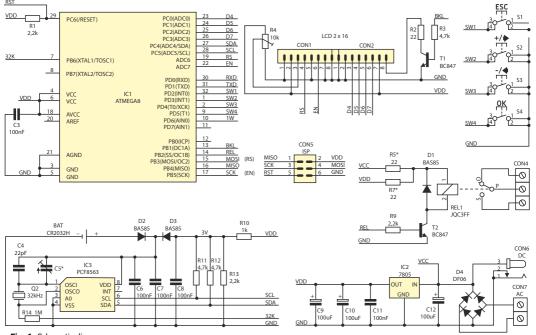


Fig. 1. Schematic diagram

Operation

Operation of the device is easy and intuitive. It has four buttons for this purpose:

ESC (exit to main window), OK (confirmation),

>/+ (go to next item or increase value),

</- (go to previous item or reduce value).

Menu structure is shown in Figure 2.

Navigate between menu screens using the arrow keys. The "Set the time" screen displays the current time. Press the **OK** button to start the time change procedure. A cursor "^^" will appear under the seconds value. Use arrows to move the cursor, press **OK** to stop the cursor and change it to "[]". You can then use the arrows to change the value of the indicated item (Figure 3). Confirm new value by pressing **OK** and complete the time setting by pressing **ESC**. Prolonged inactivity also terminates the settings.

Use 'Program' screens to input program settings - top line displays the program start time and the bottom line displays the program number. After you have selected a program (by pressing the **OK** button), the day and time for the respective program start will be displayed on the top line, and the day and time for the program stop will be displayed on the bottom line, Figure 4. Change the times in the same way as for setting the clock. Setting the day of the week to "**OFF**" means the event is inactive - it will never be executed. Hold down the **OK** button for approx. 3 seconds during normal operation to change actual output status, the display will show "**MANUAL**

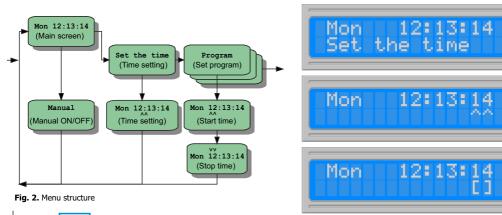
START" or "MANUAL STOP" depending on the new output status. This function allows you to stop the current program or to activate the output independently of any programs. Manual setting is valid until the next event resulting from the programs, i.e., the next program start or program stop interrupts the manual setting and sets the output as programmed. Pressing the ESC button (also exiting the settings menu) also interrupts the manual setting, and the output is set to the state that results from the programs for that moment. All programs have equal priority and do not block each other, but overlap, i.e:

if you set two programs for the same day of the week and set program 1 for start 8:00, stop 22:00 and set programme 2 for start 10:00, stop 16:00 then the output will be switched on from 8:00 to 16:00.

A more complex example is shown in Figure 5.
Occasionally, you may need to clear the programs to set everything up again, for example. This effect can be quickly achieved by holding down the **ESC** button for about 3 seconds while powering up the device. The display will show the message "CLEAR"

MEMORY??" . Press the **OK** button to reset the program memory.

Pressing any button increases the intensity of the display backlight, while prolonged inactivity slowly dims the backlight to around 5%. In addition, the display briefly brightens when a program starts or stops.



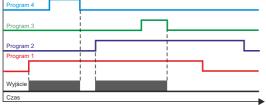


Fig. 3. Time setting



Fig. 5. Result of programs overlap

Fig. 4. Setting the program

Assembly and mounting

Mount the parts according to general principles. Just remember that you mount the buttons and display from the bottom (soldering) side. It is recommended not to install batteries and the display right away, as this will block access to certain components in the event of start-up problems. The display only needs to be slid onto the goldpins and tilted slightly so that the pins connect to the vias in the display connector. To such prepared circuit, connect supply, and the adjust display contrast with potentiometer R4. If a screen with a 'ticking' clock appears then everything can be considered OK, and first solder on the battery and then the display. Caution - do not press the display onto the board itself as it may short-circuit the

soldering points on the board. It should be lifted about 5mm from the board and then soldered. The executive relay may have a 5V coil in which case only R7 is mounted - do not mount R5. In the case of a 12 V relay, mount only R5. There are several additional components on the board (CON8, CON3) which are not used in this layout.

A front panel has been designed for the device, to be printed by yourself, Figure 7. Such a bezel will make it easier to mount the circuit in any enclosure.



Fig. 6. View of assembled board

Wykaz elementów

Resistors:	
R1, R9, R13:	2,2 kΩ (SMD 1206)
R2, R5:	22 Ω (SMD 1206)
R3, R11, R12:	4,7 kΩ (SMD 1206)
R4:10 kΩ (mc	ounting potentiometer)
R10:	1 kΩ (SMD 1206)
R14:	1 MΩ (SMD 1206)
R6-R8:	do not mount
Capacitors:	
C3, C6-C8, C11:	100 nF (SMD 1206)
C9-C11:	100 uF
C4:	10 pF (SMD 1206)
C1, C2:	22 pF (SMD 1206)
C5:	nie montować
Semiconductors:	
D1-D3:	BAS85 lub podobna
T1, T2:	BC847
D4:	mostek prostowniczy
IC1:	ATmega8 (SMD)
IC2:	7805

IC3:PCF8563 (SMD)

Other:	
Q1:	do not mount
Q2:	watch quartz 32768 Hz
BAT:b	attery e.g. CR2032 for printing
REL1:	QC3FF relay with 12V coil
SW1-SW4:	mikroswitch high
CON1, CON2:	LCD 2×16 + goldpin
CON4:	ARK3/500
CON6:	goldpin socket 2.1/5.5
CON7:	ARK2/500
CON3, CON5 CO	N8:do not mount

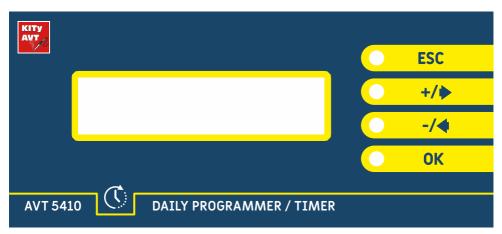


Fig. 7. Printable PDF file https://bit.ly/3pKqzdT



AVT SPV zastrzega sobie prawo do wprowadzania zmian bez uprzedniego powiadamiania.

Montaż i podłączenie urządenia niezgodny z instrukcją, samowolna zmiana części składowych oraz jakiekolwiek przeróbki konstrukcyjne mogą spowodować uszkodzenie urządzenia oraz narażć na szkodę osoby z niego korzystające. W takim przypadku producent jego autoryzowani przedstawiciele nie ponosi odpowiedzialności za jakiekolwiek szkody powstałe

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