

CK118

Digital Clock with 24-Hour Relay Timer

Canakit

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Manufacturer of High Quality Electronic Kits

This circuit is a digital clock based around the LM8560 integrated circuit. It incorporates a 24-hour timer with relay output which can be used to turn on or off any electric device at a preset time. The relay can handle loads of up to 3A / 110V AC or 24V DC (1.5A / 220V AC).

High AC Voltage Warning:

This circuit when used to control high voltage AC powered equipment, involves AC power wiring. Please note that handling, testing and operating high voltage AC powered equipment can be dangerous when basic safety rules are not followed. If you are inexperienced or not confident in working with high voltage AC powered circuits, we strongly recommend that you DO NOT attempt to use this timer in such an application.

Step-by-step Assembly

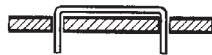
Refer to the General Assembly Guide included with the kit for detailed instructions on installation of each component.

1 Resistors:



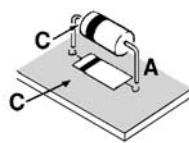
- | | | |
|-------------------------------------|--------------------|-------------------------|
| <input type="checkbox"/> R1, R2 | 10 Ω (0.5W) | Brown, Black, Black |
| <input type="checkbox"/> R3 | 120 Ω | Brown, Red, Brown |
| <input type="checkbox"/> R4, R8, R9 | 0 Ω | Black (Jumper Resistor) |
| <input type="checkbox"/> R5 | 100 K Ω | Brown, Black, Yellow |
| <input type="checkbox"/> R6 | 2.2 K Ω | Red, Red, Red |
| <input type="checkbox"/> R7 | 240 K Ω | Red, Yellow, Yellow |

2 Jumper:



- Place and solder a jumper at location marked "J1" using excess components leads. **If you live in a country where the frequency of the AC line is 50 Hz, also place and solder a jumper at location marked "50/60".**

3 Rectifier, Signal and Zener Diodes:

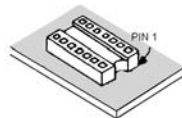


- | | |
|-------------------------------------|------------------------------|
| <input type="checkbox"/> D1, D2, D4 | 1N4004 or 1N4002 (Rectifier) |
| <input type="checkbox"/> D3 | 2.7V (Zener) |
| <input type="checkbox"/> D5, D6 | 1N4148 |

4 Push Button Switches:

- Install the four push button switches at locations marked "SW1", "SW3", "SW4", and "SW5".

5 IC Socket:



- Install the IC socket at location marked "U1". Make sure that the notched is aligned with the outline on the PC board. Be specially careful when soldering this socket so that there are no solder bridges causing shorts between adjacent pads.

6 Terminals:

- Install the 8 terminals at locations marked "A1", "G", "A2", "BAT", "NC", "COM" and "NO".



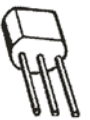
7 Ceramic Disc Capacitors:

- | | |
|-----------------------------|----------------------------|
| <input type="checkbox"/> C2 | 103 / 0.01 μ F / 10 nF |
| <input type="checkbox"/> C3 | 102 / 0.001 μ F / 1 nF |



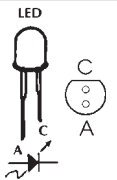
8 Transistors (TO-92):

- | | |
|-----------------------------|------|
| <input type="checkbox"/> Q1 | C945 |
|-----------------------------|------|



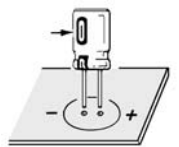
9 Light Emitting Diode (LED):

- Install the LED at location marked "LED". Note that the longer lead is the Anode.



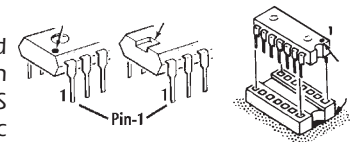
10 Electrolytic Capacitors:

- | | |
|-----------------------------|---------------------|
| <input type="checkbox"/> C1 | 1000 μ F / 25 V |
| <input type="checkbox"/> C4 | 47 μ F / 10 V |
| <input type="checkbox"/> C5 | 100 μ F / 16 V |



11 CMOS Integrated Circuit:

- Insert the LM8560 Integrated Circuit into the socket at location marked "U1". Note that CMOS ICs are sensitive to static electricity. Refer to the General Assembly Guide for instructions on how to handle CMOS ICs.



12 Slide Switch:

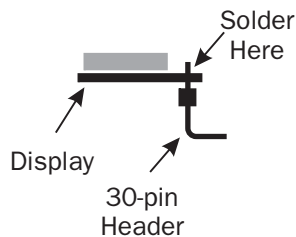
- Install the slide switch at location marked "SW2".

13 Relay:

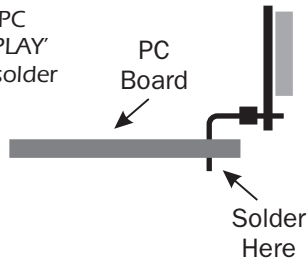
- | | |
|-------------------------------|---------------|
| <input type="checkbox"/> REL1 | 9V / 3A Relay |
|-------------------------------|---------------|

14 4-Digit LED Display:

Install the 30-pin header behind the 4-digit LED display as shown in the diagram and then solder the header pins to the display.



Now install the display on the PC board at location marked "DISPLAY" as shown in the diagram and solder the header pins to the board.



Testing

Before testing the kit, It is highly recommended to inspect the PC board carefully as explained below:

- Check for proper placement of all components.
- Check diodes for correct position of the banded end.
- Check transistors, LEDs and electrolytic capacitors are installed with correct polarity.
- Check for proper orientation of the IC in its socket.
- Check IC pins to see that they are not folded under.
- Check for protruding leads which could touch other leads or adjacent pads.
- Check all solder connections for cold solder joints.
- Examine the PC board solder side to see that there are no solder bridges causing shorts between tracks.

Once you are satisfied that everything is correct, proceed to do the test as follows: **(Refer to wiring diagram.)**

1. Connect a 12V AC C.T. (2 x 6V AC) / 300mA transformer to the terminals marked "A1", "G" and "A2". **Note that the centre wire must be connected to the terminal marked "G".**
2. Once the transformer is connected, the display should indicate a flashing "12:00" until the time is set. You can adjust the hour by using "SW4" and the minutes using "SW5".
3. To set the timer, press and hold "SW3" and then use "SW4" and "SW5" to set the timer hour and minutes respectively. To turn on the timer, use the slide switch "SW2". When the timer is on, the LED will illuminate. When the preset timer time has been reached, the relay will be activated and will remain activated until it is turned off using the slide switch "SW2", the snooze button, "SW1", is pressed, or 2 hours have passed. The snooze button will activate the relay again in 9 minutes.

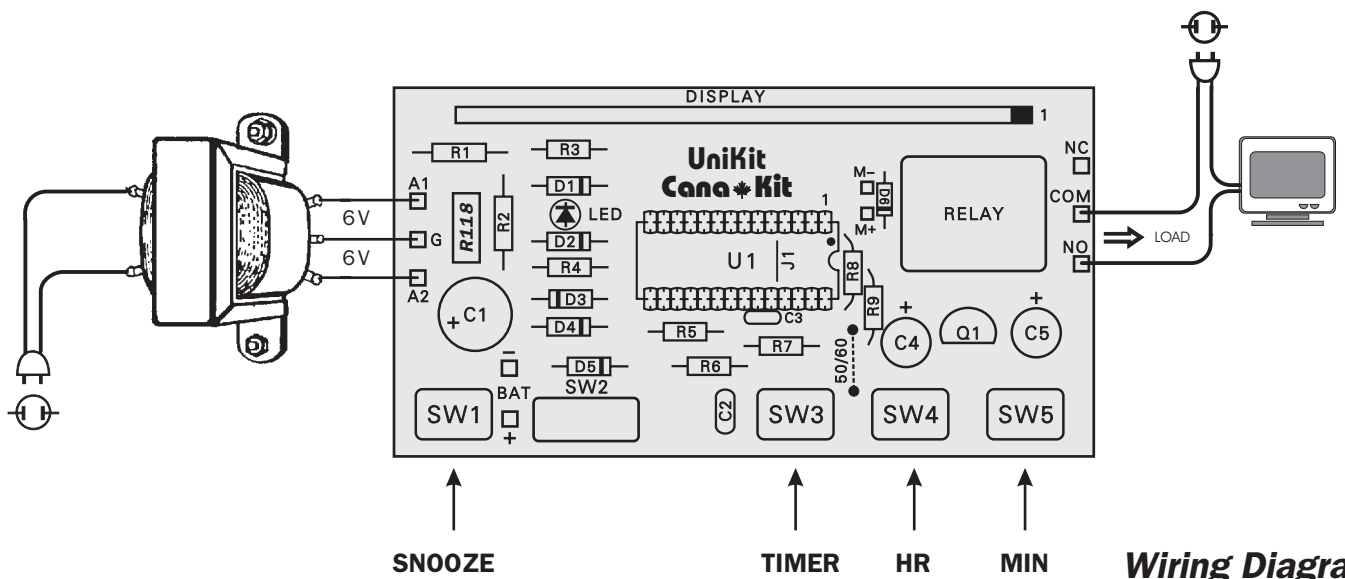
Using the Relay Output:

The relay output can be used in two modes: "Normally Open" or "Normally Closed". In the "Normally Open" mode the load will be connected when the relay is activated and it will be disconnected when the relay is deactivated. In the "Normally Closed" mode, the load will be disconnected when the relay is activated and it will be connected when the relay is deactivated.

To use the timer in the "Normally Open" mode, you must connect the relay outputs "COM" and "NO" in series with the supply voltage of the load. To use the timer in the "Normally Closed" mode, use the relay outputs "COM" and "NC". The relay can handle loads of up to 110V AC or 24V DC at a maximum current of 3A (220V AC at 1.5A).

NOTE:

- You can connect a 9V backup battery to the points marked "BAT". This will prevent the clock and timer from being reset in case the main supply is disconnected.



Wiring Diagram

Schematic Diagram

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