The 555 timer circuit shown in the schematic diagram is designed to provide a clock around 16 Hz. This is done by charging and discharging the capacitor C. The charging time (T1) and discharging time (T2) are dependent upon the RC time constants as follows:

\[
T1 = 0.693 \times (Ra + Rb) \times C \\
T2 = 0.693 \times Rb \times C
\]

The period of the clock T is the sum of T1 and T2:

\[
T = T1 + T2 = 0.693 \times (Ra + 2 \times Rb) \times C
\]

\[
= 0.693 \times (22 \text{K} \Omega + 66 \text{K} \Omega) \times (1 \text{µF}) \\
= 0.693 \times 88 \times 10^{-6} \\
= 0.060984 \text{ s}
\]

The frequency is the reciprocal of the period, or

\[
f = 1 / T = 1 / 0.060984 \text{ s} = 16.4 \text{ Hz}
\]

Notice that the above frequency deviates slightly from the intended frequency of 16 Hz. The 555 based clock is not recommended if accurate frequency is required. The frequency depends on the resistances (Ra and Rb) and capacitance (C), which may vary with the temperature, but is independent of the supply voltage.

The 14520 chip contains two 4-bit binary up counter. We use one of the counters to divide the frequency by 2, 4, 8, and 16, obtaining clock signals of 8 Hz, 4 Hz, 2 Hz, and 1 Hz, respectively.

**Pin Assignment and Component Identification**

**LED**

- **GND**
- **Trigger**
- **Output**
- **Reset**

\[ + \]

\[ - \]

\[ + \]

\[ - \]

**Electrolytic Capacitor**

\[ + \]

\[ - \]

**Color Code for Resistors**

- 0 – Black
- 1 – Brown
- 2 – Red
- 3 – Orange
- 4 – Yellow
- 5 – Green
- 6 – Blue
- 7 – Violet
- 8 – Gray
- 9 – White

- Red (2) - Silver = 10% error
- Orange (3) - Gold = 5% error
- Yellow (4) - Gold = 5% error

\[ 22 \times 10^3 = 22 \text{ K} \Omega \]

\[ 33 \times 10^3 = 33 \text{ K} \Omega \]

\[ 47 \times 10^1 = 470 \Omega \]