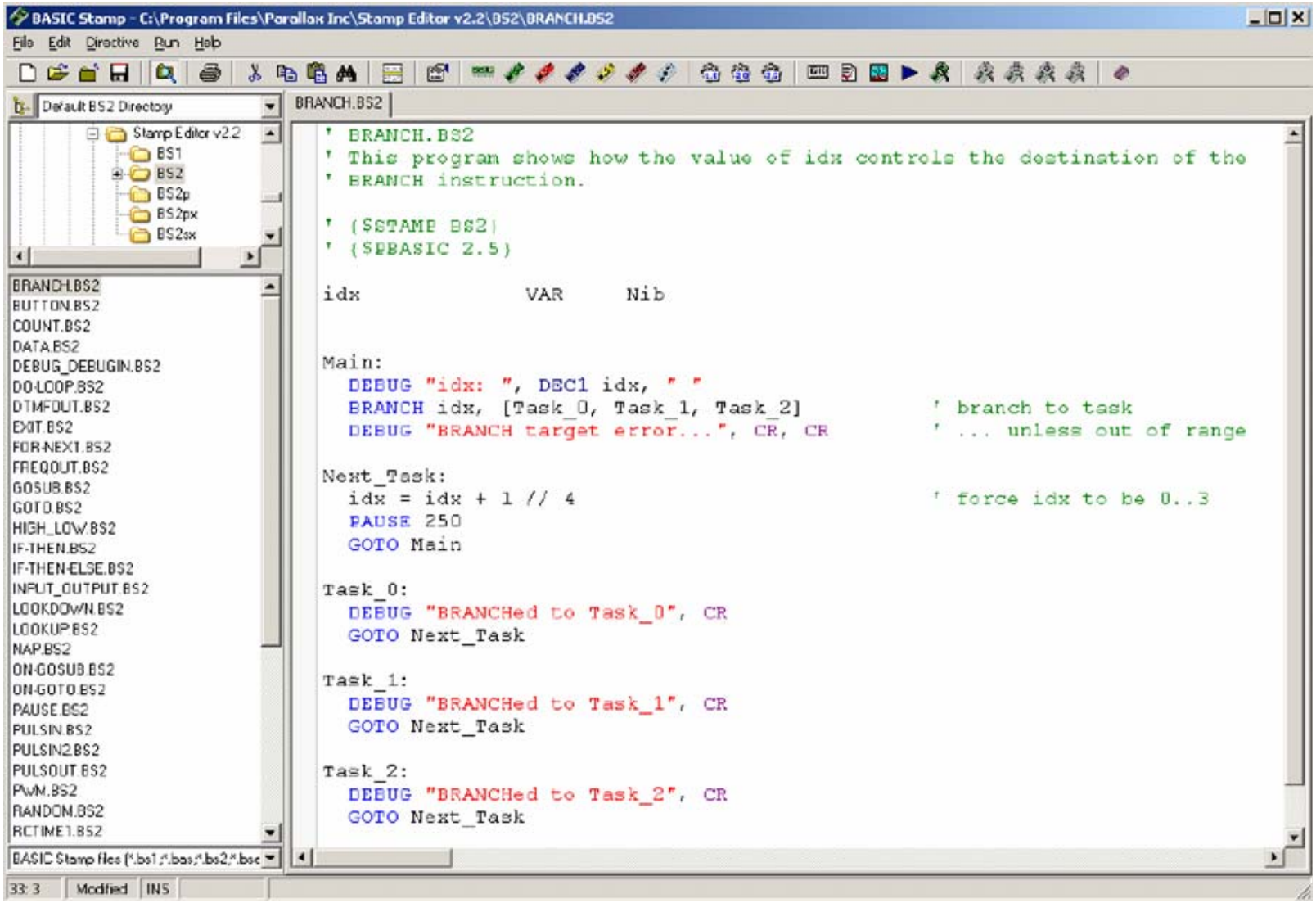
Special Lecture

Basic Stamp 2 Programming

(Presented on popular demand)

Programming Environment



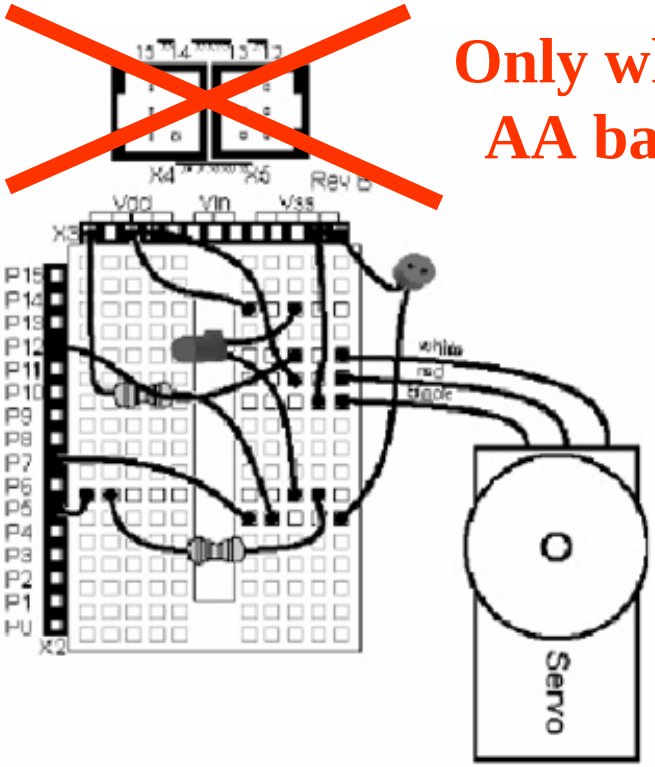
Servo Motor: How It Work?

- The editor window consists of the main edit pane with an integrated explorer panel to its left, as shown above.
- The main edit pane can be used to view and modify up to 16 different source code files at once.

Servo Motor Wiring

Syntax Element	Text Color	Character Case
Command	Blue	Upper Case
Comment	Green	No Change
Constant -Binary	Default	No Change
Constant - Decimal	Default	No Change
Constant - Hexadecimal	Default	No Change
Constant – Predefined	Purple	Upper case
Constant – String	Red	No Change
Operators	Default	Upper case
Declaration	Default	Upper Case
Directive, Conditional Compile	Gray(Bold)	Upper case
Directive, Editor	Teal (Bold)	Upper case
Directive, Target module	Teal (Bold)	Upper case
Input/Output Formatter	Navy	Upper case
Selection	White on Navy	No change
Search match	Lime on black	No change
Variable modifier	Default	Upper case
Variable – predefined	Purple	Upper case
Variable, type	Default	Capitalize

Servo Motor with BS2



Only when you use AA battery pack

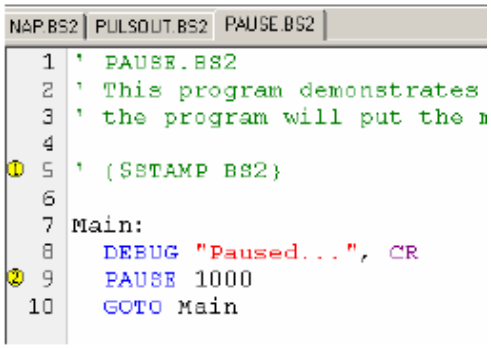
2 servo motors only

Need another capacitor for additional servo motors

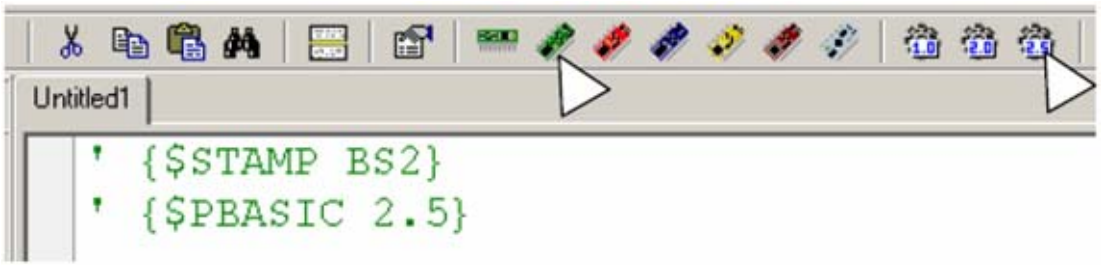
Sample Code

Automatic line numbers can be enabled or disabled via the “Show LineNumbers” checkbox on the Preferences → Editor Appearance tab.

Bookmarks can be enabled or disabled via the “Show Bookmarks” checkbox on the Preferences → Editor Appearance tab. The bookmarks appear in the gutter as small numbered icons, providing a way to mark lines or sections of code that you need to navigate to quickly or repeatedly. You can define up to nine bookmarks by clicking on the gutter where you want one placed,



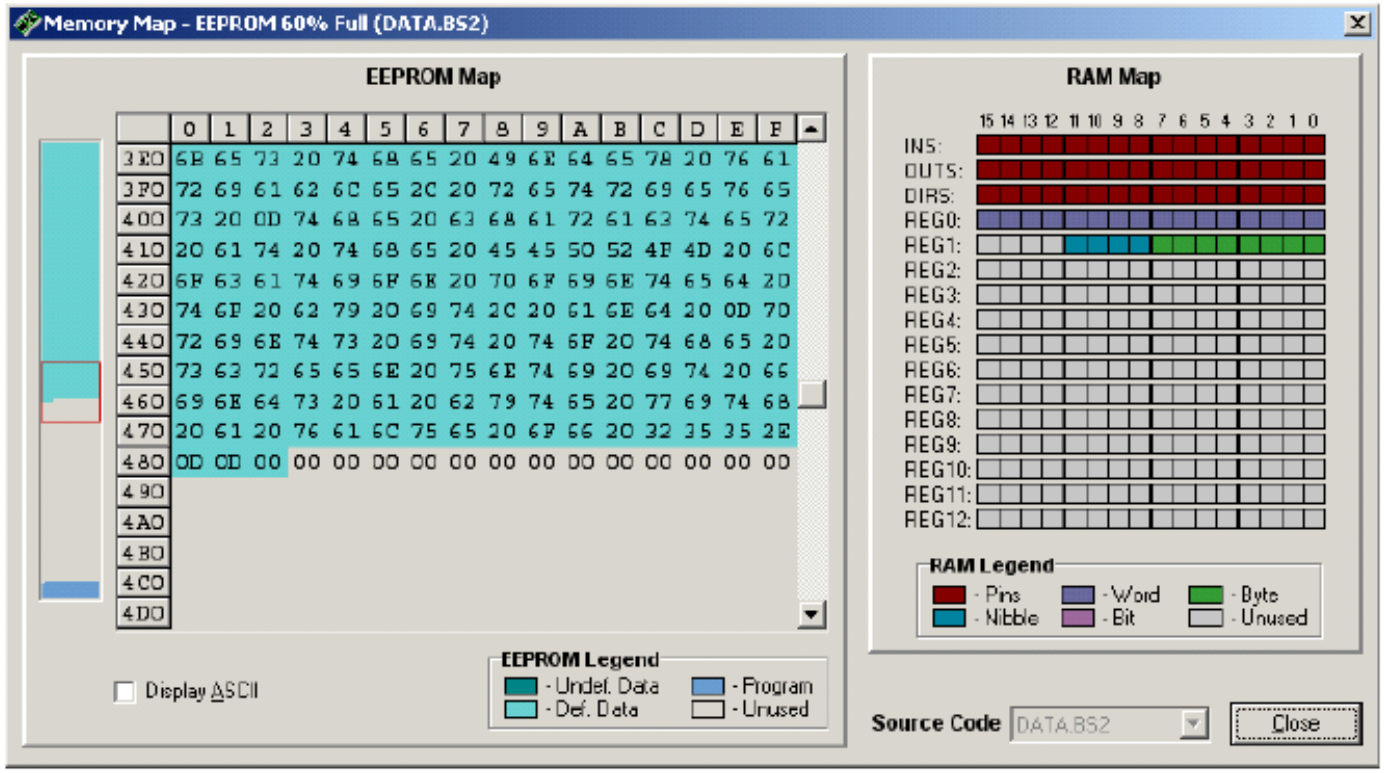
PWM



- The BASIC Stamp Editor supports all of the BASIC Stamp models, and all versions of the PBASIC programming language. Compiler directives must be placed in each program to indicate the desired BASIC Stamp model and language version.

```
' {$STAMP BS1} 'This indicates to use a BASIC Stamp 1 module
' {$STAMP BS2} 'This indicates to use a BASIC Stamp 2 module
' {$STAMP BS2e} 'This indicates to use a BASIC Stamp 2e module
' {$STAMP BS2sx} 'This indicates to use a BASIC Stamp 2sx module
' {$STAMP BS2p} 'This indicates to use a BASIC Stamp 2p module
' {$STAMP BS2pe} 'This indicates to use a BASIC Stamp 2pe module
' {$STAMP BS2px} 'This indicates to use a BASIC Stamp 2px module
```

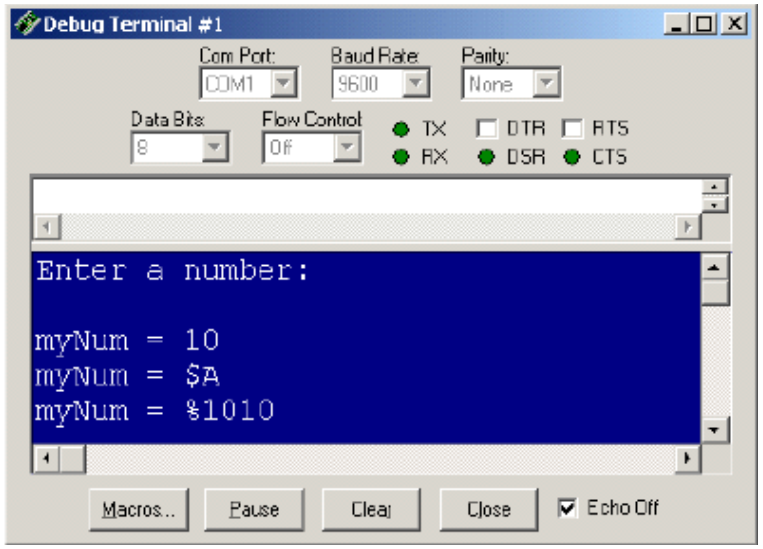
PWM - Duty Cycle

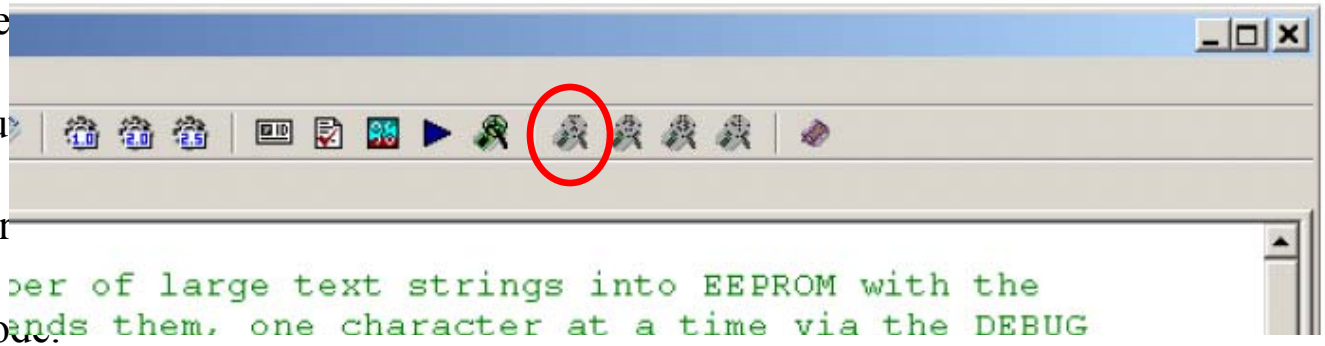


The Memory Map is divided into two sections, the RAM map and the EEPROM map. The RAM map shows how much of each register has been allotted to program variables. The RAM legend details how much is used by I/O Pins, Word, Byte, Nibble and Bit variables, and how much is unused. The main view is the detailed EEPROM map, which displays the data in hexadecimal format in each location.

The Basic PWM Control

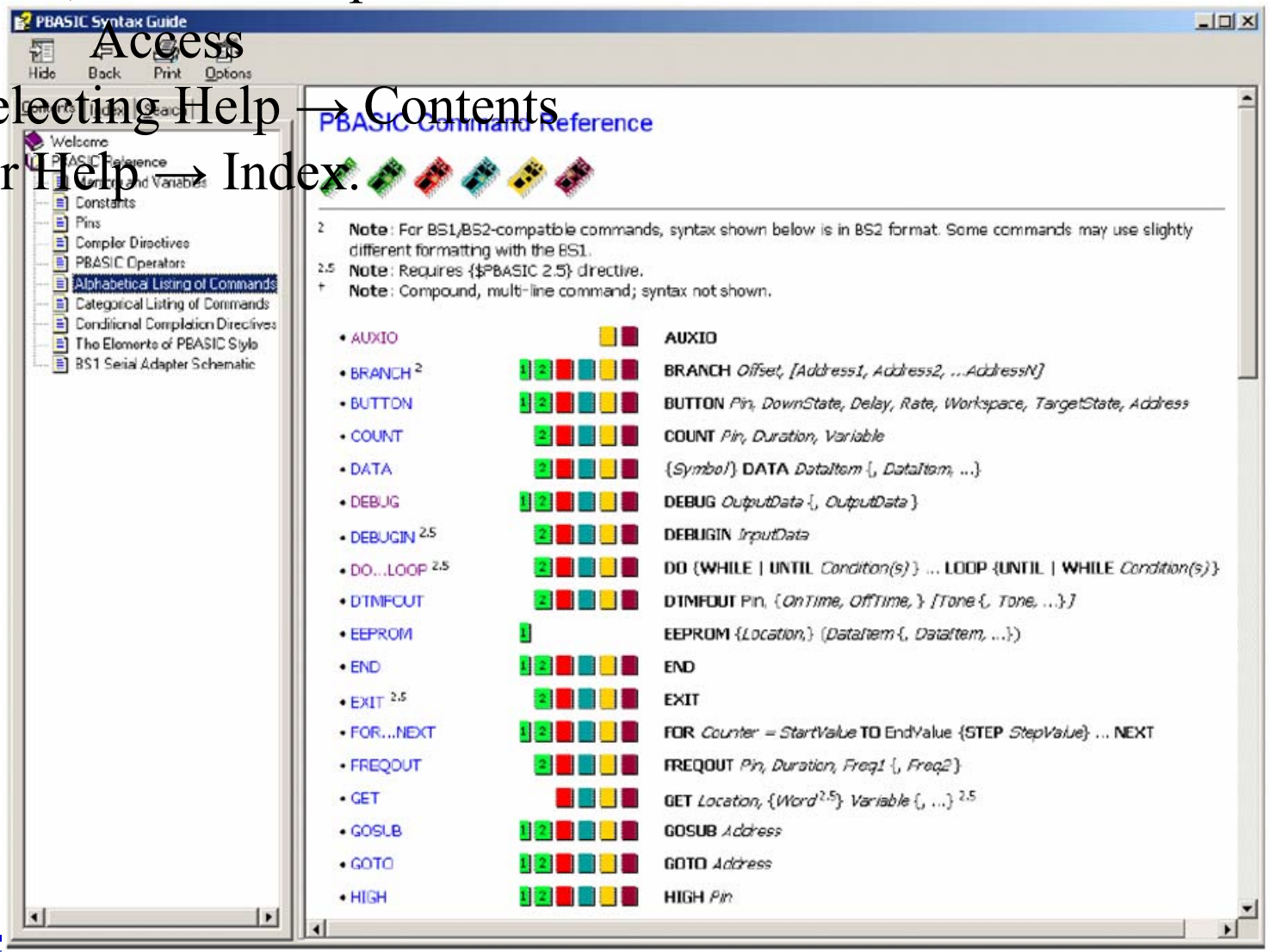
The Debug Terminal window provides a convienent display for data received from a BASIC Stamp during run-time, and also allows for the transmission of characters from the PC keyboard to the BASIC Stamp. The Debug Terminal is automatically opened and configured when a PBASIC program, containing a DEBUG command, is downloaded. You can manually open a Debug Terminal one of three ways: select Run → Debug → New, pre keyboard, or click on the Debug Terminal toolbar bu Terminals can be open at once (on four differ left open while editing and downloading source code.



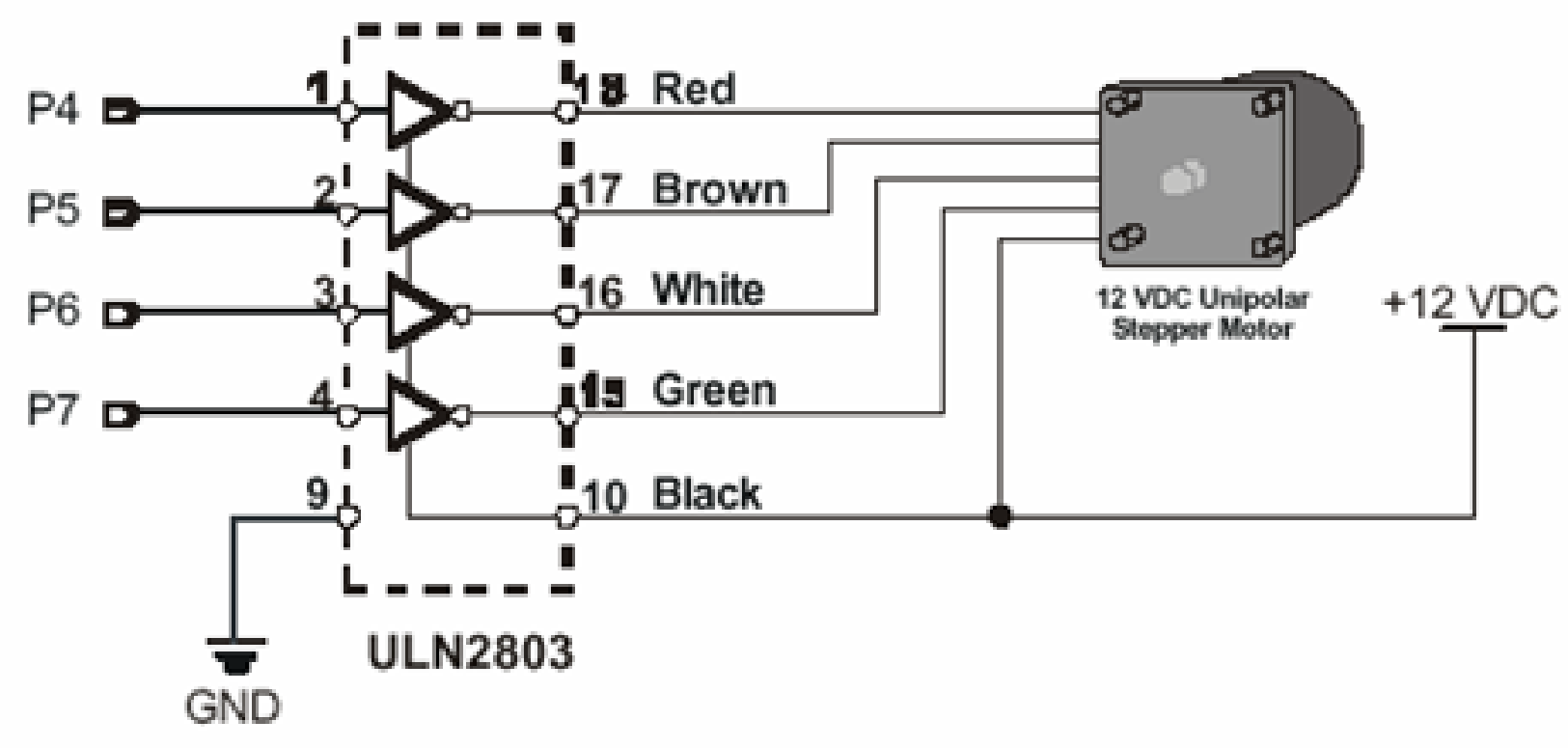


PBASIC Bible

The BASIC Stamp Editor includes searchable, indexed help files. Access Help by selecting Help → Contents or Help → Index.



Stepper Motor with BS2



ULN 2803 high-current transistor driver

Motor Experiments

Experiments	Chapters
What's micro controller	4
Basic A and D	
Earth measurements	
Robotics	2
StampWorks	26 and 27
Others	

Lecture 9

555 Timer

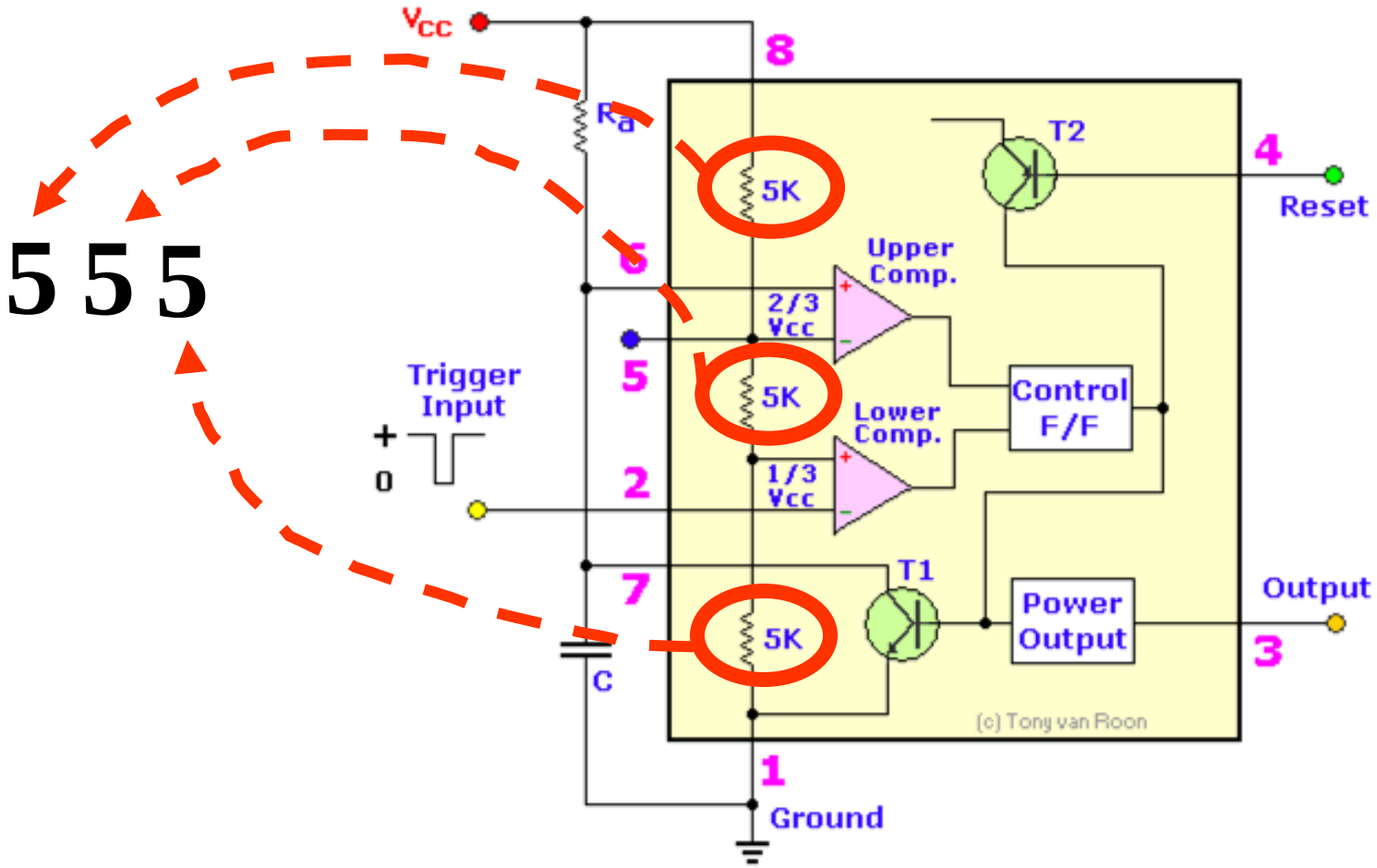
Pulse Generation

- Pulsout
  - Software version of pulse generation
  - Pulsout pin, Period
    - Pin: specified I/O pin from 0 to 15
    - Period: 2 μsec per each unit
- 555 Timer
  - Hardware version of pulse generation
  - BS2 can do other works
  - Microcontroller is not necessary

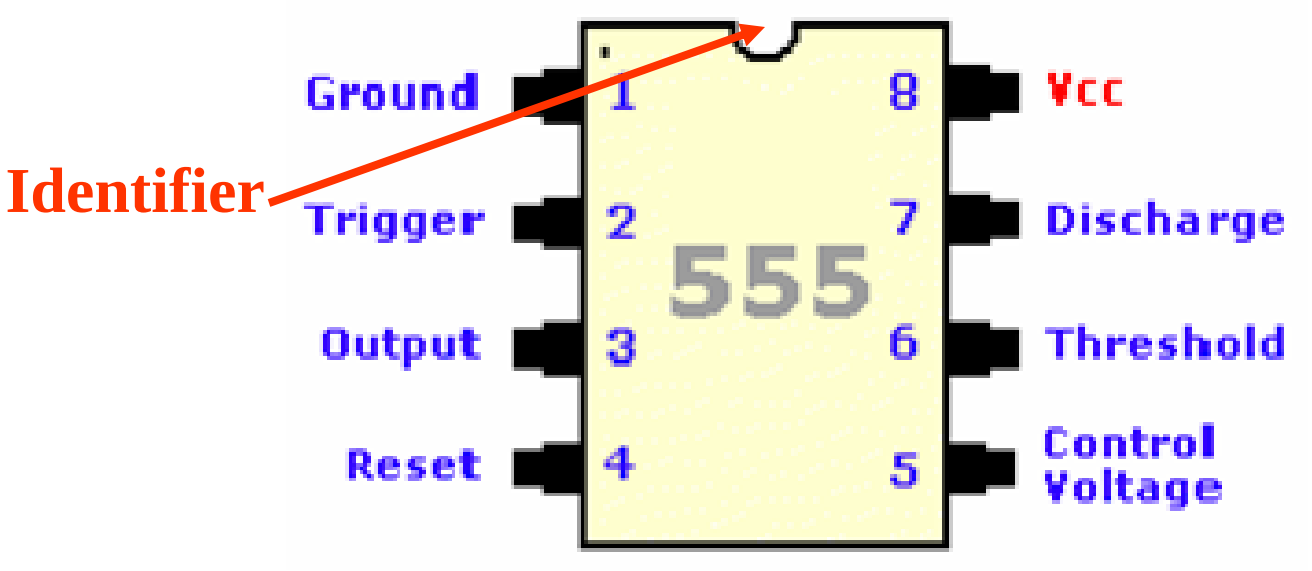
555 Timer

- Highly stable devices for generating accurate time delay or oscillation
- Not programmable
- Controlled by resistors and capacitors
- Applications
  - Pulse generation
  - PWM
  - Time delay generation

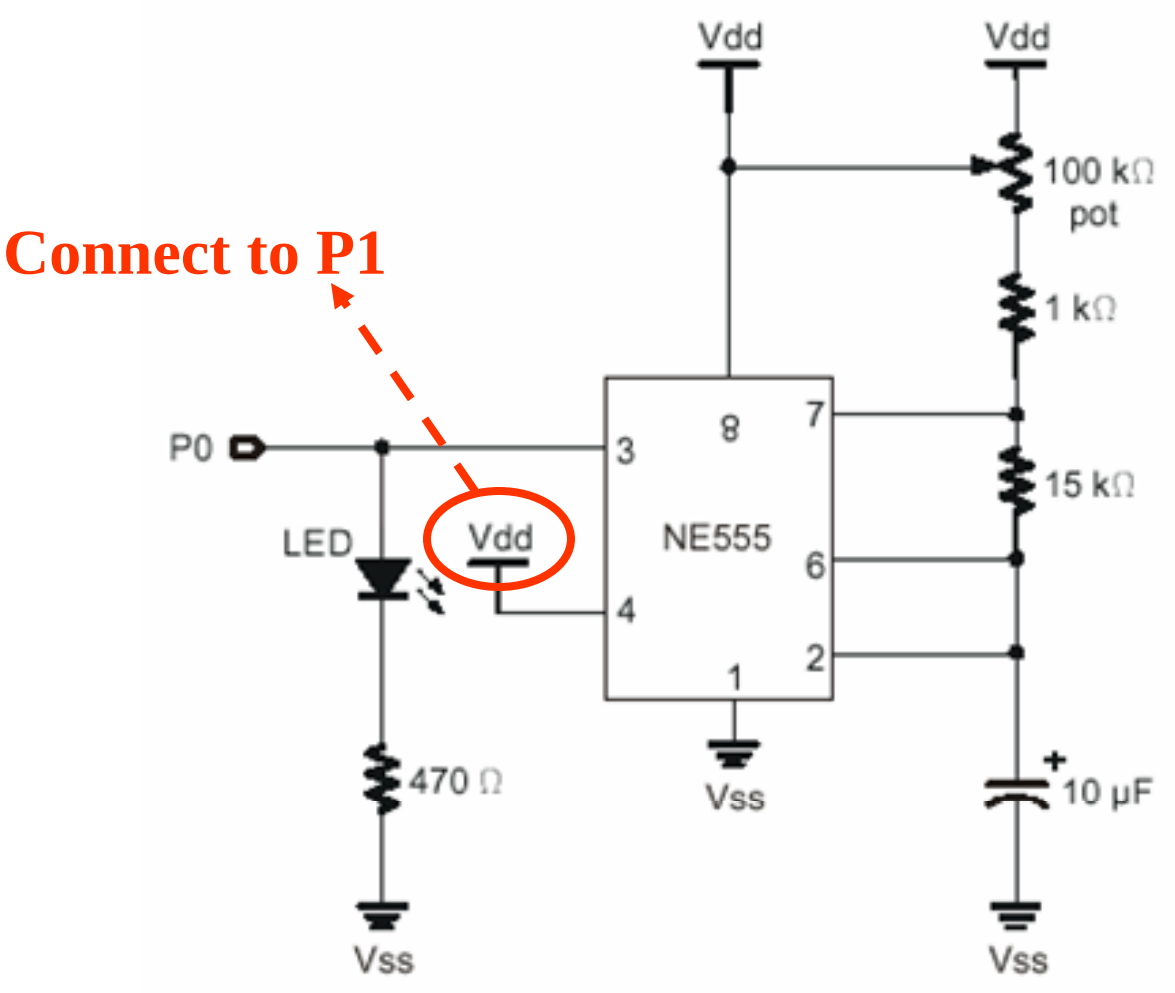
555 Timer Block Diagram



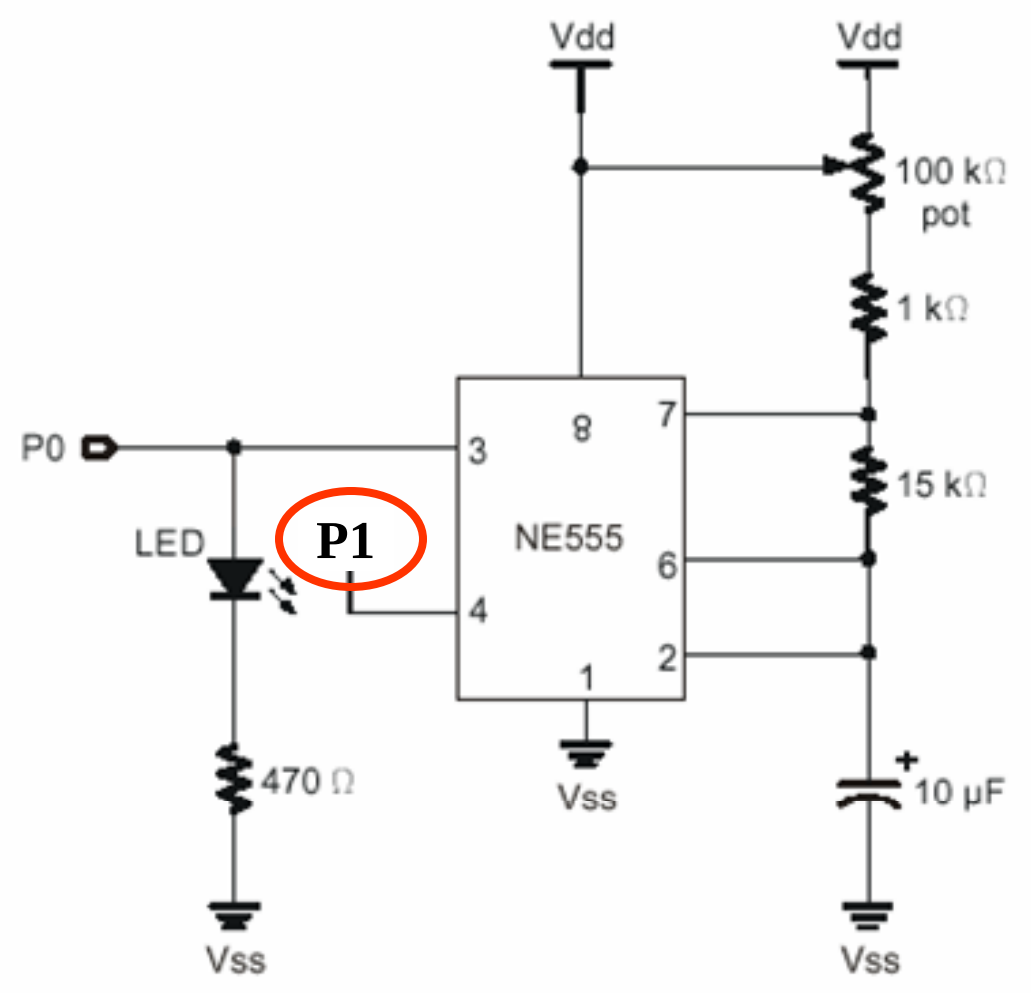
Connection Diagram



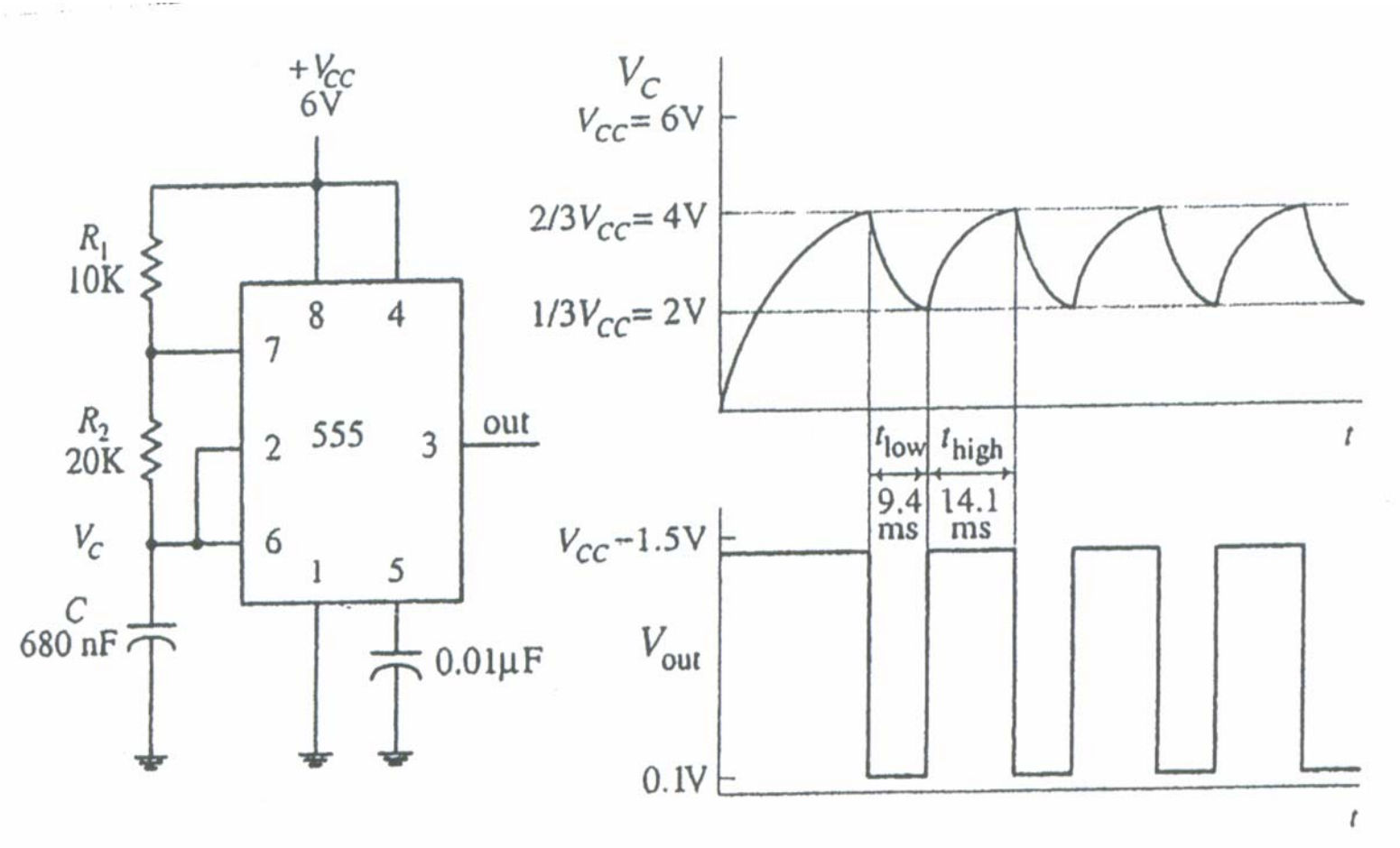
555 Timer without BS2



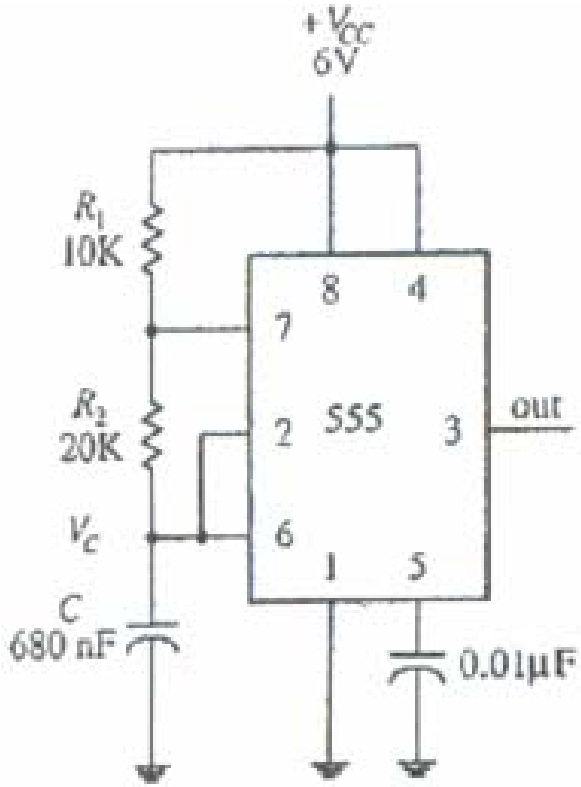
555 Timer with BS2



Astable Operation 1



Calculation of Duty Cycle

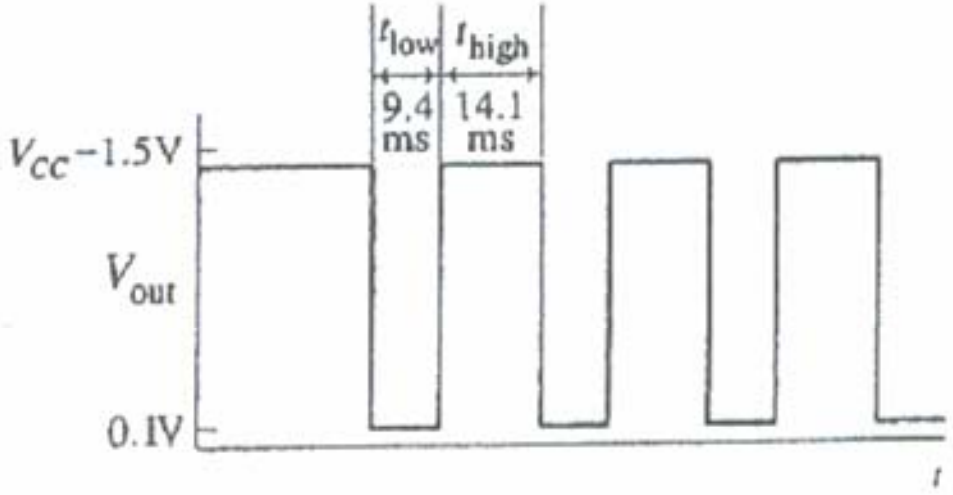


$$t_{low} = 0.693 \; R_2 C$$

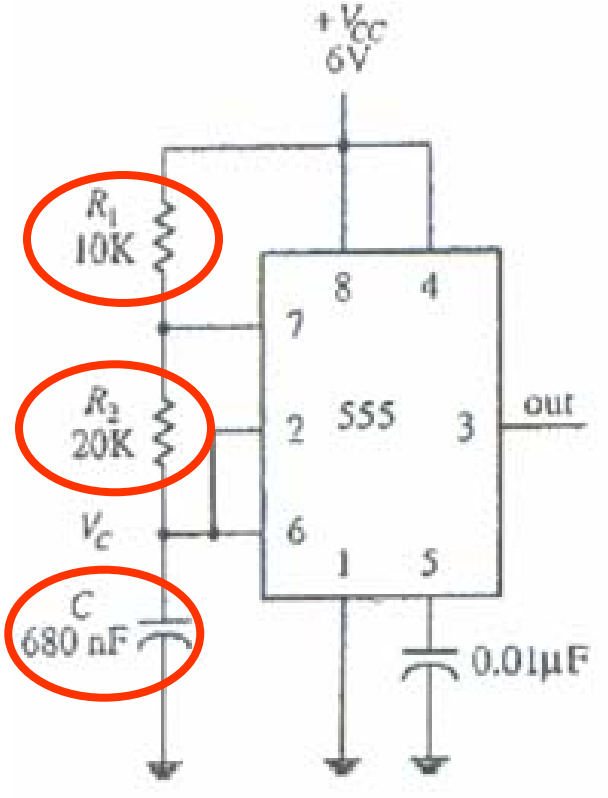
$$t_{high} = 0.693 \; (R_1 + R_2) C$$

$$Duty \quad cycle = \frac{t_{high}}{t_{high} + t_{low}}$$

$$f = \frac{1}{t_{high} + t_{low}}$$



Calculation of Duty Cycle



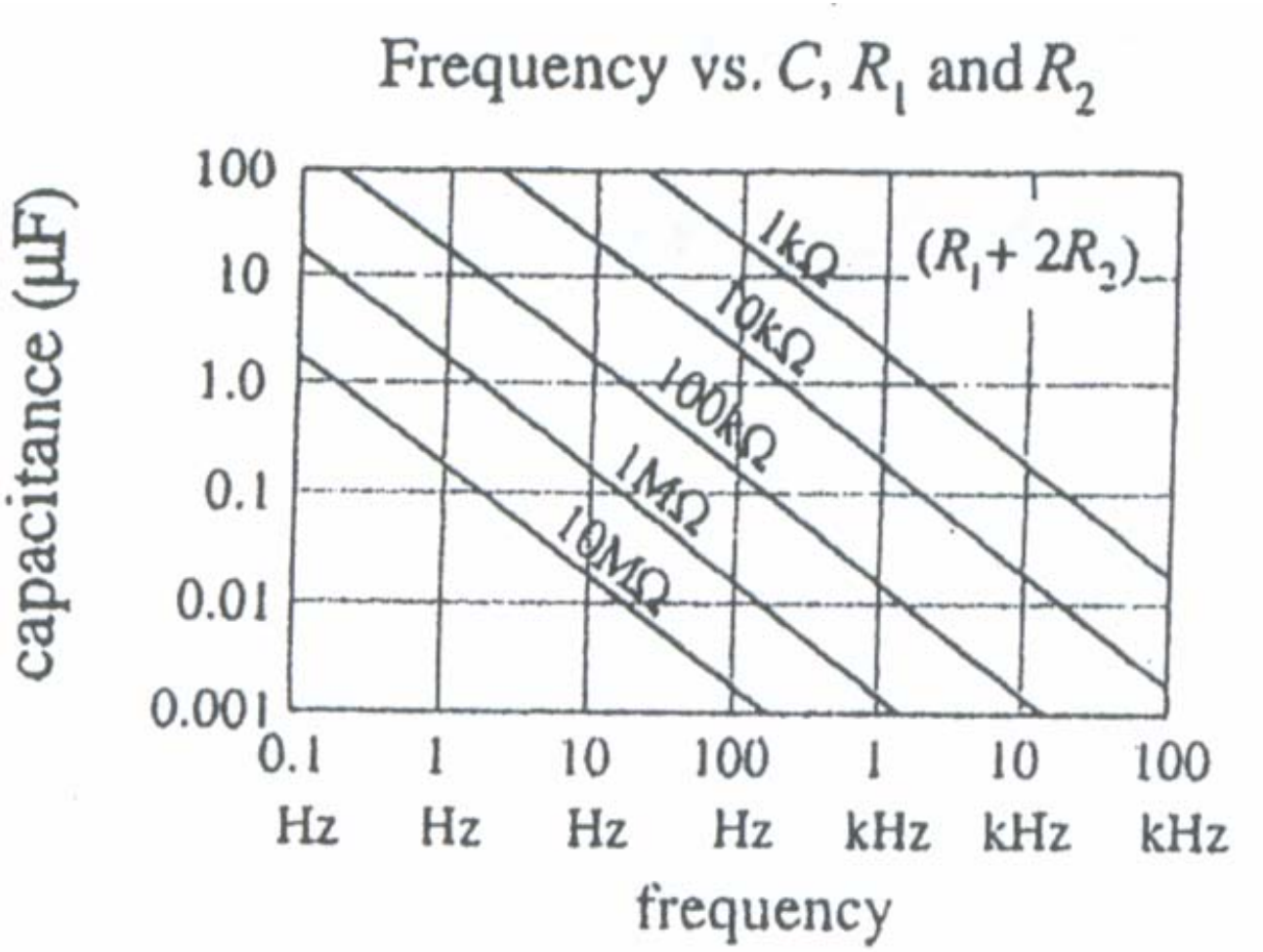
$$t_{low} = 0.693(20K)(680nF) = 9.6ms$$

$$t_{high} = 0.693(10K + 20K)(680nF) = 14.1ms$$

$$Duty\,cycle = \frac{14.1ms}{14.1ms + 9.6ms} = 0.6$$

$$f = \frac{1}{14.1ms + 9.6ms} = 42Hz$$

Astable Operation 2



Applications 1

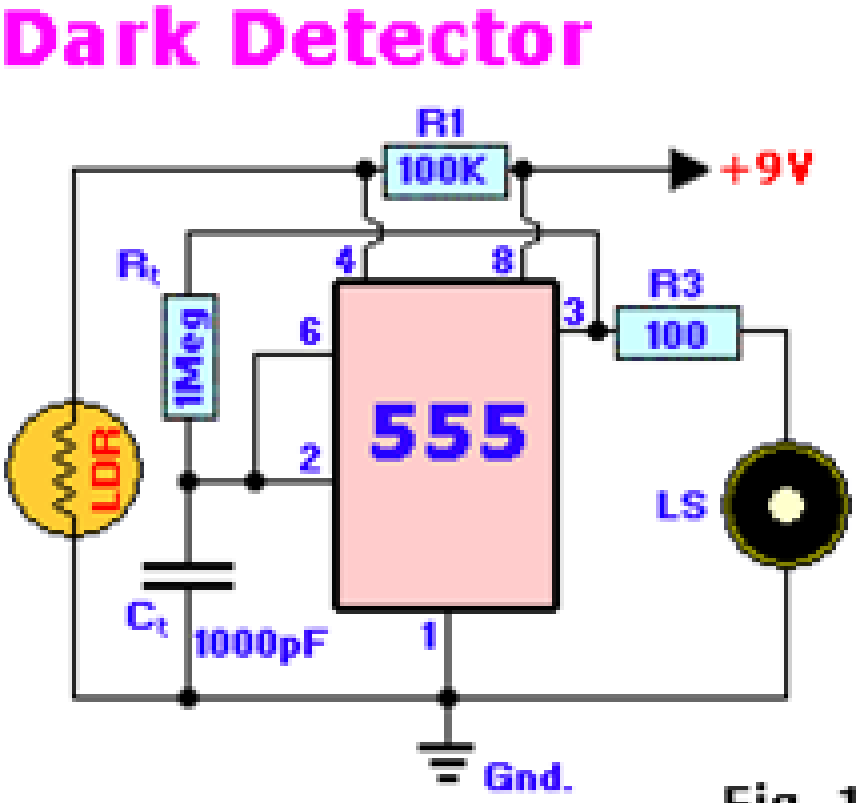


Fig. 1

- It will sound an alarm if it gets too dark all over sudden
- The LDR enables the alarm when light falls below a certain level

Applications 2

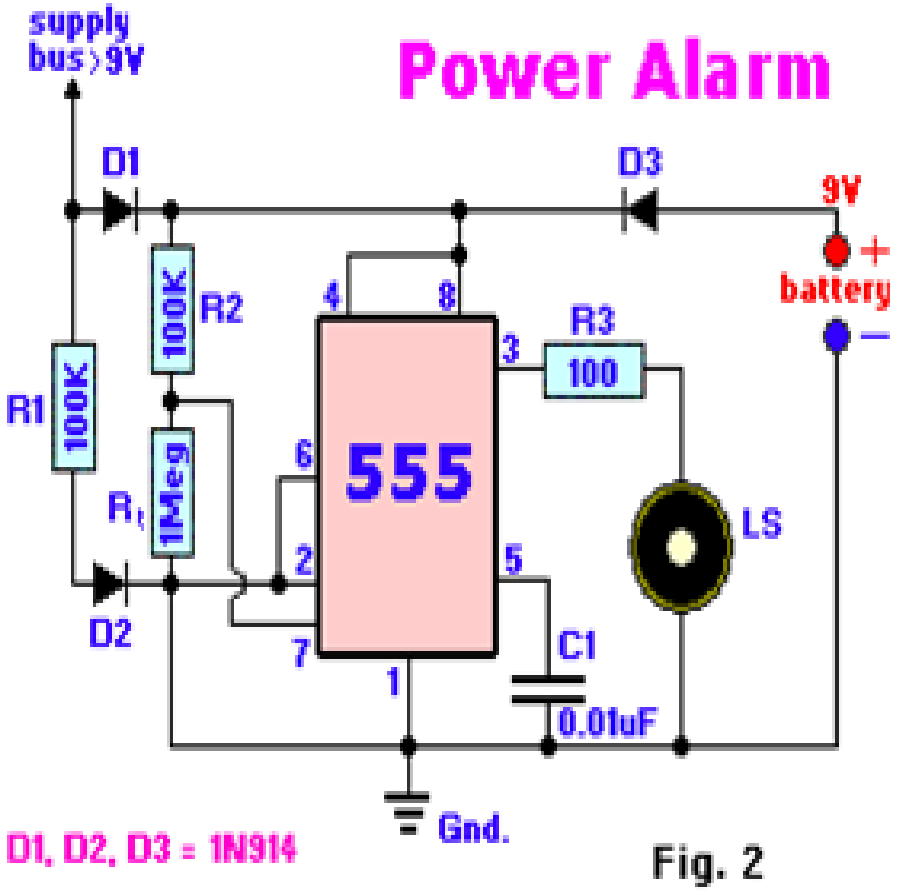


Fig. 2

- This circuit can be used as a audible 'Power-out Alarm'
- When the line voltage fails, the tone will be heard in the speaker

Applications 3

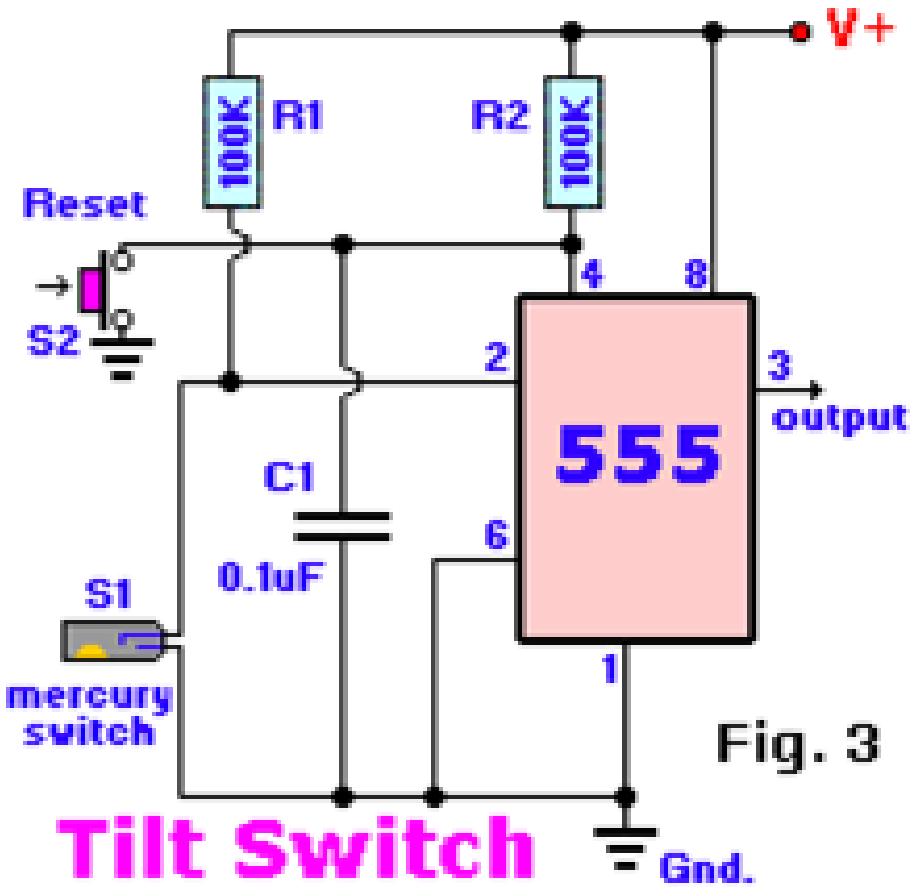
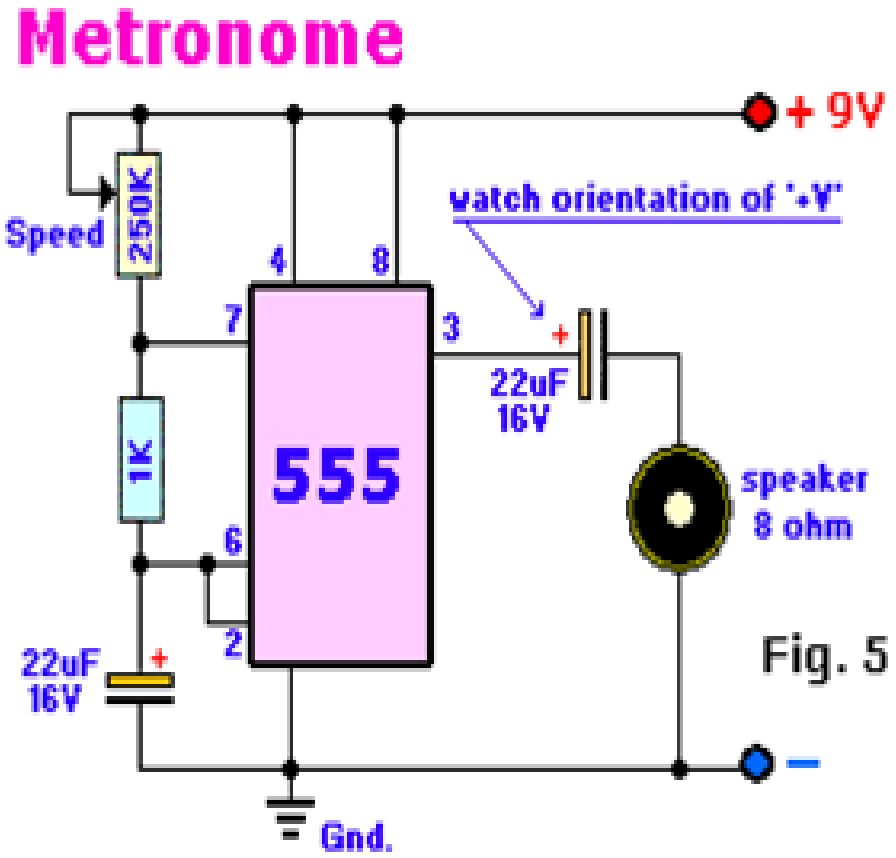


Fig. 3

- **Actually really a alarm circuit, it shows how to use a 555 timer and a small glass-encapsulated mercury switch to indicate 'tilt'.**

Applications 4



- A Metronome is a device used in the music industry
- It indicates the rhythm by a 'tic-toc' sound which speed can be adjusted with the 250K potentiometer

555 Timer Experiments

Experiments	Chapters
What's micro controller	5
Basic A and D	6
Earth measurements	
Robotics	
StampWorks	17 and 18
Others	